Sample ID	MT Aquatic Life Standard[1]	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1
Date		9/3/2008	11/25/2008	6/12/2009	9/28/2009	10/26/2009	11/24/2009	12/16/2009	1/27/2010	2/24/2010	3/22/2010	4/27/2010	5/25/2010
Alkalinity, Carbonate (mg CaCO3/L)	---			<2.5	<0.52	<0.52	<0.52	<0.26	<10.0	<5.0	<5.0	<2.5	<2.5
Alkalinity, Total (mg CaCO3/L)	---	186		190	195	189	152	192	179	187	380	206	214
Alkalinity, Bicarbonate (mg CaCO3/L	---	227		190	195	189	152	192	179	187	380	206	214
Aluminum (mg/L)	0.087	0.04	<0.01	0.0076	0.013	<0.0020	0.0027 J	0.0029 J	0.0058	0.0064	0.0042	0.026	0.0046
Aluminum (mg/L)-Dissolved	---	<0.03	<0.01	0.0066	<0.0020	<0.0020	0.0020 J	0.0026 J	0.0027 J	0.0022 J	0.0027 J	0.0030 J	0.0063
Antimony (mg/L)	---	<0.003	0.00152	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00043 J	0.00017 J	<0.00016
Antimony (mg/L)-Dissolved	---	<0.003	<0.001	0.00014	0.00030 J	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00018 J	<0.00016
Arsenic (mg/L)	0.15	0.007	0.00428	0.0049	0.0064	0.0073	0.0067	0.0090	0.0076	0.0076	0.0068	0.0046	0.0051
Arsenic (mg/L)-Dissolved	---	0.005	0.00525	0.0042	0.0048	0.0045	0.0038	0.0038	0.0038	0.0039	0.0038	0.0034	0.0051
Barium (mg/L)	---	0.017	0.0137	0.017	0.017	0.018	0.017	0.019	0.018	0.017	0.017	0.019	0.019
Barium (mg/L)-Dissolved	---	0.015	0.0147	0.015	0.019	0.017	0.017	0.016	0.018	0.016	0.017	0.019	0.020
Beryllium (mg/L)	---	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011 J	<0.00010	<0.000069	<0.000069
Beryllium (mg/L)-Dissolved	---	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000069	<0.000069
Bismuth (mg/L)	---				<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000020	<0.000020
Bismuth (mg/L)-Dissolved	---				<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000020	0.000041 J
Boron (mg/L)	---	0.0425	0.0097		0.0097	0.0072	0.0073	0.0081	0.0034 J	0.011	0.0080	0.0040 J	0.0059
Boron (mg/L)-Dissolved	---	<0.01	0.0076		0.0076	0.0078	0.0074	0.0075	0.0070	0.0067	0.013	0.0054	0.0058
Cadmium (mg/L)	0.000097 h	<0.00008	<0.001	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	0.000043 J	<0.000040	<0.000020	<0.000020
Cadmium (mg/L)-Dissolved	---	<0.00008	<0.001	<0.000050	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000020	<0.000020
Calcium (mg/L)-Dissolved	---	43	37.1	36.6	39.1	37.1	38.5	38.3	37.4	35.9	39.9	42.3	38.2
Chloride (mg/L)	230*	1		0.90 J	1.2	1	0.90 J	1.5	0.86 J	0.67 J	0.52 J	0.41 J	0.70 J
Chromium (mg/L)	0.0277 h	<0.001	<0.001	0.00040 J	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00024	<0.00024
Chromium (mg/L)-Dissolved	---	<0.001	<0.001	0.00042 J	<0.00025	<0.00025	<0.00025	<0.00025	0.00053	0.00066	<0.00025	0.00035 J	<0.00024
Copper (mg/L)	0.00285 h	0.003	0.00108	0.00076	0.0012	0.00079	0.00082	0.0012	0.00071	0.00070	0.00059	0.00050	0.00072
Copper (mg/L)-Dissolved	---	0.001	0.00131	0.00046 J	0.00092	0.00034 J	0.00069	0.00046 J	0.00033 J	0.00039 J	0.0012	0.00040 J	0.00063
Fluoride (mg/L)	---				0.070 J	0.17	0.13	0.14	0.21	0.13	0.083 J	0.058 J	0.17 J
Iron (mg/L)	1.0	0.22	0.0972	0.12	0.19	0.18	0.18	0.28	0.22	0.24	0.21	0.059	0.094
Iron (mg/L)-Dissolved	---	<0.05	0.115	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.0046 J	0.12
Lead (mg/L)	0.000545 h	<0.0005	<0.001	<0.000050	0.00011	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00035	<0.000020
Lead (mg/L)-Dissolved	---	<0.0005	<0.001	0.000052 J	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00013	<0.000020	0.000045 J
Magnesium-Dissolved (mg/L)	---	25	24.8	23.0	24.7	22.9	22.7	25.7	24.5	23.7	25.4	25.4	24.7
Manganese (mg/L)	---	0.017	0.00927	0.0069	0.013	0.01	0.0074	0.020	0.0078	0.010	0.0072	0.0084	0.010
Manganese (mg/L)-Dissolved	---	0.016	0.0112	0.0017	0.0083	0.0074	0.0052	0.0050	0.0071	0.018	0.0058	0.0058	0.0098
Mercury (ug/L)	0.91000	<0.01	<0.1	<0.014	0.019 J	0.040 J	<0.014	0.060 J	<0.014	<0.014	<0.014	0.036 J	0.076 J
Mercury (ug/L)-Dissolved	---	<0.001	<0.001	<0.014	<0.014	0.015 J	<0.014	<0.014	<0.014	<0.014	<0.014	<0.021	<0.021
Nickel (mg/L)	0.0161 h	<0.01	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00095	0.00035 J
Nickel (mg/L)-Dissolved	---	<0.01	<0.001	<0.00025	0.00033 J	0.00025 J	0.0005	<0.00025	0.00047 J	0.00042 J	0.00042 J	0.00044 J	0.00029 J
Nitrate, as N (mg/L)	---	0.18	<0.1	0.18	0.20	0.24	0.19	0.19	0.15	0.18	0.16	0.22	0.18
Nitrite, as N (mg/L)	---	<0.1	0.133	<0.0050	0.20	<0.0030	<0.0030	0.0010 J	0.00080 J	<0.0030	<0.0018	0.0019 J	0.0012 J
Nitrogen, Ammonia, as N (mg/L)	---	<0.05		<0.0080	<0.0030	0.020	<0.0080	<0.0080	0.020	<0.0080	0.010 J	<0.0080	<0.0080
Nitrogen, Kjeldahl, Total (mg/L)	---	0.2		<0.20	<0.0080	0.082 J	<0.072	0.29	0.17	0.040 J	0.055 J	<0.038	0.12
Nitrogen, NO2 plus NO3Nitrite, (mg/	---	0.18	0.133	0.18	0.27	0.24	0.19	0.19	0.15	0.18	0.16	0.22	0.18
Oil and Grease (mg/L)	---			<2.5	<2.5	<2.5	<2.5	1.3 J	<2.5	<2.5	<2.6	<1.0	<1.0
Orthophosphate (mg/L)	---	<0.001		0.0019	<0.00050	0.0044	0.0032	0.0019	0.0014	<0.00050	0.00070 J	0.0028	0.0034
pH Lab (s.u.)	6.5 - 9.0*	7.6		8.0	7.7	7.7	7.8	7.7	7.7	7.8	7.7	7.6	7.8
Phosphorus, total (mg/L)	---	0.009	<0.1	0.022	0.0091	0.0048	0.01	0.018	0.0059	0.0072		0.0050	0.0047
Potassium-Dissolved (mg/L)	---	3	2.95	3.0	3.0	2.9	2.8	2.9	2.9	2.8	3.0	2.7	2.5
Selenium (mg/L)	0.005	<0.001	<0.001	0.00037 J	0.00034 J	<0.00025	<0.00025	0.00027 J	0.00026 J	0.00030 J	0.00029 J	0.00025 J	0.00038 J
Selenium (mg/L)-Dissolved	---	<0.001	<0.001	0.00030 J	0.00027 J	0.00029 J	0.00026 J	0.00033 J	<0.00025	<0.00025	0.00032 J	0.00021 J	0.00019 J
Silver (mg/L)	0.000374 h	<0.0005	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000071	<0.000071
Silver (mg/L)-Dissolved	---	<0.0005	<0.001	0.00033 J	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000071	<0.000071
Sodium-Dissolved (mg/L)	---	3	3.01000	2.5	2.9	2.8	2.7	3.3	2.7	2.7	2.8	1.9	2.0
Specific Conductance (µhmos/cm)	---	378		365	376	367	377	379	368	372	358	399	387
Strontium (mg/L)	---	0.0945			0.083	0.093	0.09	0.10	0.095	0.092	0.091	0.070	0.075
Strontium (mg/L)-Dissolved	---	0.082			0.089	0.094	0.091	0.091	0.094	0.093	0.093	0.069	0.075
Sulfate (mg/L)	---	21		14.6	15.4	15	16.1	15.3	15.3	12.9	13.7	13.1	15.0
Thallium (mg/L)	---	<0.0002	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.000091 J	0.000092 J	0.00013	0.00040	0.00029
Thallium (mg/L)-Dissolved	---	<0.0002	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.000078 J	0.000075 J	0.000094 J	0.00042	0.00031
TDS (mg/L)	---	212		164	178	165	388	196	187	198	196	252	219
Total Hardness (mg CaCO3/L)	---	210		186	199	187	189	202	194	187	204	210	197
Total Inorganic Nitrogen (mg/L)	---			0.18	0.20	0.26	0.19	0.19	0.17	0.18	0.17	0.22	0.18
Total Suspended Solids (mg/L)	---	<3	<1	<5.0	0.87 J	0.78 J	0.51 J	0.71 J	0.63 J	1.5	<0.51	<5.0	0.52 J
Turbidity (NTU)	---			0.57	1.4	2	2	2.1	3.5	3.2	3.3	0.30	0.62
Uranium (mg/L)	---		0.0007		0.0013	0.0012	0.0012	0.0014	0.0013	0.0013	0.0012	0.0010	0.0011
Uranium (mg/L)-Dissolved	---		0.0013		0.00070	0.0012	0.0012	0.0012	0.0013	0.0012	0.0012	0.0011	0.0011
Zinc (mg/L)	0.037 h	<0.01	<0.001	<0.0025	0.0036 J	0.0026 J	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.0018 J	<0.0013
Zinc (mg/L)-Dissolved	---	<0.01	0.00108	<0.0025	0.0031 J	0.0042 J	0.0028 J	<0.0025	0.0035 J	0.0026 J	0.0041 J	0.0032 J	0.0033 J
Field pH (s.u.)	6.5 - 9.0*		7.67		7.6	7.67	7.55	7.53	7.54	7.66	7.3	7.25	6.96
Field EC (µS/cm)	---		335		399	397	398	397	395	394	380	404	394
Field DO (mg/L)	---		7.18										
Field ORP (mV)	---		175										
Field Turbidity (NTU)	---		3.1										
Field Temperature (C)	---		5.5		7.7	6.3	5.2	4.3	3.8	5.2	5.2	5.2	5.2
Flow (gpm)					87	85	85	85	90	90	85	80	70
Flow (cfs)	---				0.19	0.19	0.19	0.19	0.20	0.20	0.19	0.18	0.16
Stat Lvl (ft)	---												

Sodium (mg/L)										2730			
Cobalt (mg/L)	---		<0.001										
Cobalt (mg/L)-Dissolved	---		<0.001										
Molybdenum (ug/L)	---		1.37						1.7				
Molybdenum (ug/L)-Dissolved	---												
Vanadium (mg/L)	---		<0.001										
Vanadium (mg/L)-Dissolved	---		<0.001										

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1	WS-1
6/30/2010	7/29/2010	8/24/2010	9/30/2010	10/27/2010	11/24/2010	12/16/2010	1/27/2011	2/24/2011	3/30/2011	4/28/2011	6/1/2011	6/30/2011	7/27/2011	8/30/2011
<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
201	190	179	199	191	202	198	227	182	176	171	174	183	184	175
201	190	179	199	191	202	198	227	182	176	171	174	183	184	175
0.0036 J	<0.0020	0.0027 J	0.0038 J	0.0039 J	0.012	0.0038 J	0.0059	0.014	0.028	0.031	0.039	0.059	0.026	0.0087
0.0039 J	0.0027 J	0.0028 J	0.0038 J	<0.0020	0.0028 J	0.0058	0.0047	0.0040	0.0056	0.0044	0.0057	0.010	0.011	0.0044
<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	0.00041 J	<0.00016	0.00035 J	0.00022 J	0.00031 J	0.00020 J	0.00026 J	0.00022 J	0.00015 J
<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	0.00032 J	<0.00016	0.00017 J	0.00019 J	0.00020 J	0.00037 J	0.00016 J	0.00017 J	0.000099 J	0.00013 J
0.0034	<0.000062	0.0061	0.0069	0.0080	0.0083	0.0085	0.0033	0.0076	0.0064	0.0093	0.0085	0.0091	0.0099	0.0089
0.0026	0.0041	0.0038	0.0041	0.0048	0.0052	0.0046	0.0028	0.0043	0.0036	0.0065	0.0042	0.0055	0.0095	0.0053
0.017	<0.000043	0.018	0.019	0.018	0.020	0.019	0.014	0.019	0.014	0.013	0.013	0.015	0.013	0.013
0.015	0.019	0.017	0.018	0.018	0.019	0.030	0.014	0.020	0.014	0.015	0.014	0.014	0.0019	0.015
<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000020	<0.000020	<0.000020	<0.000020
<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000042 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000023 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
0.0051	<0.00018	0.0079	0.0067	0.0064	0.0081	0.0052	0.0045 J	0.067	0.010	0.0099	0.0096	0.0074	0.0063	0.0084
0.0030 J	0.0024 J	0.0069	0.0064	0.0077	0.0071	0.010	0.0050	0.0079	0.0081	0.0099	0.0076	0.0070	0.0018 J	0.013
<0.000020	<0.000020	<0.000020	<0.000020	0.000024 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000030	<0.000030	<0.000030	<0.000030
<0.000020	<0.000020	0.000041 J	<0.000020	0.000022 J	0.000033 J	<0.000020	<0.000020	0.000026 J	<0.000020	0.00019	<0.000030	<0.000030	<0.000030	<0.000030
39.5	37.1	37.7	39.0	41.4	40.1	38.3	43.6	38.3	34.2	46.1	39.5	40.8	9.0	38.4
1.3 J	0.96 J	0.97 J	1.1	1.1	1.0	1.2	0.97 J	1.1	1.2	1.0	1.1	1.1 J	1.2 J	1.1
<0.00024	<0.00024	0.00047 J	<0.00024	0.00049 J	0.00032 J	0.00026 J	<0.00024	0.0061	<0.00024	0.00064	0.00034 J	0.00038 J	0.00068	0.00052
0.00039 J	0.00042 J	0.00083	0.0020	0.00025 J	0.00052	0.00059	0.00040 J	0.00071	0.00091	0.00089	0.00099	0.00048 J	0.00043 J	0.00050 J
0.00066	<0.00020	0.00093	0.00048 J	0.00042 J	0.00076	0.00050	0.00067	0.00066	0.0012	0.0015	0.0014	0.0015	0.0016	0.0012
0.00046 J	0.0097	0.00048 J	0.00042 J	0.00044 J	0.00061	0.00027 J	0.00076	0.00047 J	0.00072	0.0011	0.00060	0.00076	0.00046 J	0.0012
0.077 J	0.067 J	0.082 J	0.054 J	0.056 J	0.056 J	0.079 J	0.060 J	0.090 J	0.089 J	0.083 J	0.077 J	0.095 J	0.11	0.13
0.027 J	<0.0045	0.15	0.13	0.14	0.14	0.19	0.035 J	0.19	0.22	0.29	0.31	0.34	0.31	0.26
0.0049 J	<0.0045	0.0058 J	0.012 J	0.0046 J	0.0055 J	0.0059 J	0.0053 J	0.0068 J	0.052	0.093	0.050	0.068	0.0080 J	0.045 J
<0.000020	0.000055 J	0.000033 J	0.000043 J	0.000040 J	0.000040 J	<0.000020	<0.000020	0.000035 J	0.000034 J	0.000023 J	0.000064 J	0.000087 J	<0.000050	0.000053 J
<0.000020	<0.000020	0.000038 J	0.00012	0.000021 J	0.000056 J	0.000034 J	0.000032 J	0.00049	0.00026	0.0011	0.000093 J	0.000067 J	0.00010	0.00029
23.2	23.2	24.0	23.7	24.6	23.8	24.5	26.9	24.5	22.8	25.2	22.0	26.7	1.2	24.4
0.0041	<0.000050	0.0063	0.0065	0.0078	0.0086	0.012	0.0063	0.014	0.0052	0.0051	0.0052	0.0058	0.0062	0.0057
0.0031	0.0074	0.0052	0.0051	0.0075	0.0070	0.011	0.0051	0.012	0.0093	0.0053	0.012	0.0036	0.0016	0.0074
<0.021	<0.021	0.022 J	<0.021	<0.020	<0.020	<0.020	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	0.13 J
0.091 J	<0.021	<0.021	0.053 J	<0.020	<0.020	0.025 J	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	0.041 J
0.00032 J	<0.00019	<0.00019	<0.00019	0.00031 J	0.00034 J	0.00021 J	<0.00019	0.0050	<0.00019	0.00022 J	0.00017 J	0.00030 J	0.00026 J	0.00014 J
0.00046 J	0.00036 J	0.00040 J	0.00059	0.00025 J	0.00062	0.00035 J	0.00033 J	0.0016	0.00070	0.00066	0.00061	0.00036 J	0.00048 J	0.00014 J
0.26	0.15	0.16	0.18	0.18	0.22	0.20	0.28	0.19	0.21	0.20	0.18	0.18	0.23	0.24
0.0025 J	<0.00047	0.0017 J	0.00077 J	0.00076 J	0.0025 J	0.0022 J	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
<0.0080	<0.0080	<0.0070	0.010 J	<0.0070	0.010 J	0.020	0.030	<0.0070	0.020	0.21	0.074	<0.020	0.046	<0.020
<0.038	0.090 J	<0.038	<0.077	<0.038	0.075 J	<0.038	0.080 J	<0.038	0.22	0.20	0.16	0.22	0.12	0.12
0.26	0.15	0.16	0.18	0.18	0.22	0.20	0.28	0.19	0.21	0.20	0.18	0.18	0.23	0.24
<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.6	<1.6	<1.6	<1.6
0.0026	0.0024	0.00085 J	<0.00050	0.0047	0.0010	0.0015	0.0034	0.0033	0.0068	0.0038	0.0035 J	0.0047	0.0083	0.0030
7.9	7.8	7.7	7.6	7.5	7.7	7.8	7.6	7.7	7.8	7.8	8.0	7.7	7.8	7.5
0.0047	0.0052	0.0055	0.0078	0.0057	0.0054	0.0040	0.013	0.0053	0.0075	0.0080	0.0074	0.021	0.0070	0.012
2.3	3.0	2.9	2.6	2.8	2.7	3.0	2.5	2.9	3.3	3.8	3.0	3.4	0.79	3.4
0.00024 J	<0.00010	0.00023 J	<0.00010	0.00024 J	0.00024 J	0.00025 J	0.00023 J	0.00019 J	0.00023 J	0.00041 J	0.00029 J	<0.00022	0.00028 J	<0.00022
0.00011 J	0.00037 J	0.00026 J	<0.00010	0.00012 J	<0.00010	0.00016 J	0.00011 J	0.00026 J	0.00011 J	0.00033 J	0.00029 J	0.00027 J	<0.00022	0.00028 J
<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	0.00036 J	<0.000071	<0.000071	<0.000071	<0.000071	<0.000070	0.00012 J	<0.000070	<0.000070
<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	0.00020 J	<0.000071	<0.000071	<0.000071	<0.000071	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070
1.4	2.7	2.6	2.2	2.6	2.5	2.5	1.3	2.4	2.2	2.5	2.3	2.5	1.6	2.5
428	387	378	375	357	373	374	401	348	343	360	369	382	356	356
0.052	<0.000078	0.082	0.068	0.071	0.072	0.10	0.056	0.083	0.079	0.083	0.070	0.083	0.092	0.083
0.048	0.082	0.077	0.065	0.072	0.066	0.095	0.053	0.085	0.076	0.085	0.068	0.080	0.011	0.092
13.1	11.0	14.7	13.7	13.8	11.0	12.9	14.6	13.3	14.1	14.8	12.9	14.6	16.5	14.8
0.00023	<0.000050	0.00023	0.00020	0.00019	0.00022	0.00018	0.000077 J	0.0010	0.00022	0.00017	0.00014	0.00013	0.00012	0.00010
0.00020	0.00039	0.00023	0.00020	0.00022	0.00020	0.00018	0.000079 J	0.00091	0.00022	0.00014	0.00011	0.00011	<0.000050	0.000091 J
225	204	139	<5.0	193	140	224	304	186	188	192	194	199	199	123
194	188	193	195	205	198	197	219	196	179	219	189	212	27.3	196
0.26	0.15	0.16	0.19	0.18	0.23	0.22	0.31	0.19	0.23	0.41	0.25	0.20	0.28	0.26
<0.50	<0.50	<0.52	1.1	0.50 J	0.70 J	<0.50	<0.50	0.80 J	0.70 J	0.90 J	2.6	<3.2	1.6 J	<1.0
0.11	1.7	2.0	1.4	1.4	1.7	2.5	0.23	1.7	2.6	2.3	4.0	4.8	2.7	2.0
0.0010	<0.00025	0.0014	0.0011	0.0012	0.0010	0.0011	0.00091	0.0015	0.0016	0.0018	0.0017	0.0015	0.0020	0.0016
0.00080	0.0013	0.0013	0.0011	0.0011	0.00096	0.0011	0.00099	0.0014	0.0015	0.0018	0.0017	0.0016	0.0011	0.0016
0.0026 J	<0.0013	<0.0013	0.0025 J	0.0017 J	0.0039 J	<0.0013	0.0097	0.0038 J	0.0020 J	<0.0013	<0.0025	<0.0025	<0.0025	<0.0025
0.0029 J	0.0051	0.0050	0.013	0.0024 J	0.0067	0.0017 J	0.0028 J	0.012	0.0033 J	0.0069	0.0025 J	<0.0025	0.0045 J	<0.0025
7.57	7.48	7.41	7.59	7.25	7.30	7.33	7.46	7.50	7.47	7.51	7.20	7.12	7.39	7.26
363	384	406	391	376	389	404	425	404	387	368	388	397	193	256
4.8	6.1	6.7	5.9	5.4	5.2	5.0	4.6	4.8	4.9	5.7	6.0	6.6	5.9	5.5
160	140	100	100	90	100	100	22	90	90	85	110	160	140	130
0.36	0.31	0.22	0.22	0.20	0.22	0.22	0.05	0.20	0.20	0.19	0.25	0.36	0.31	0.29
							* flow during pump test							

WS-1	WS-1	WS-1	WS-1	WS-1	WS-1
9/27/2011	10/20/2011	11/8/2011	12/12/2011	1/30/2012	3/1/2012
<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
178	176	179	177	177	183
178	176	179	177	177	183
0.0056	0.0023 J	0.0089	0.0044	0.0039 J	0.0021 J
0.0035 J	0.0056	0.0045	0.0034 J	0.0023 J	0.0039 J
0.00014 J	0.00012 J	0.00011 J	0.00012 J	<0.00025	<0.00025
0.00012 J	0.00017 J	0.00015 J	0.00012 J	<0.00025	<0.00025
0.0077	0.0069	0.0076	0.0069	0.0083	0.0077
0.0048	0.0043	0.0043	0.0046	0.0041	0.0037
0.013	0.013	0.014	0.014	0.014	0.014
0.013	0.014	0.013	0.015	0.013	0.014
<0.000020	<0.000020	<0.000020	<0.000020	<0.000092	<0.000092
0.000032 J	<0.000020	<0.000020	<0.000020	<0.000092	<0.000092
<0.000020	<0.000020	<0.000020	0.000032 J	<0.00025	<0.00025
<0.000020	<0.000020	0.00011 J	<0.000020	<0.00025	<0.00025
0.0094	0.0073	0.011	0.0077	0.0095	0.0092
0.0089	0.0093	0.010	0.0075	0.0083	0.0083
<0.000030	<0.000030	<0.000030	<0.000030	<0.000028	<0.000028
<0.000030	<0.000030	<0.000030	<0.000030	<0.000028	<0.000028
44.6	32.3	39.1	40.4	34.4	40
1.0	1.0	1.0	0.99 J	0.91 J	1.1
0.00026 J	0.00018 J	0.00053	0.00038 J	0.00071	0.00030 J
0.0012	0.00099	0.00066	0.00059	0.00047 J	0.00041 J
0.0010	0.00081	0.00079	0.00076	0.0015	0.0013
0.00082	0.00083	0.00078	0.00056	0.00071	0.00071
0.13 J	0.13 J	0.16 J	0.12 J	0.12	0.13
0.19	0.15	0.17	0.14	0.20	0.2
0.015 J	0.0094 J	0.0064 J	0.0075 J	<0.025	<0.025
0.000050 J	<0.000050	0.000050 J	<0.000050	0.000089 J	0.000064 J
<0.000050	<0.000050	0.00024	0.000075 J	0.000078 J	0.000079 J
25.9	23.9	23.8	25.6	23.0	23
0.0050	0.0050	0.0070	0.0065	0.0075	0.0062
0.0051	0.0054	0.0056	0.0069	0.0061	0.0059
0.092 J	<0.037	0.079 J	0.046 J	<0.037	<0.037
0.086 J	0.064 J	0.087 J	<0.037	<0.037	<0.037
<0.000070	0.00013 J	0.00018 J	0.00013 J	0.00031 J	0.000091 J
0.00070	0.00024 J	0.00062	0.00032 J	0.00037 J	<0.000091
0.22	0.21	0.21	0.17	0.16	0.15
<0.0050	<0.0050	<0.0050	<0.0050	0.00016 J	0 J
0.39	0.051	<0.020	<0.019	<0.019	<0.013
0.055 J	0.045 J	0.040 J	<0.032	0.074 J	0.053 J
0.22	0.21	0.21	0.17	0.16	0.15
<1.6	<1.7	<1.6	<1.6	<1.6	<1.6
0.0023	0.0017	0.0024	0.0030	0.0025	0.0016
7.6	7.8	7.9	7.6	7.5	7.4
0.0041 J	0.0016 J	0.012	0.0055	0.0077	0.0056
3.2	3.4	3.3	3.4	3.1	3.2
<0.00022	0.00022 J	0.00027 J	0.00023 J	<0.00022	<0.00022
0.00046 J	0.00029 J	<0.00022	0.00026 J	0.00024 J	0.00026 J
0.00012 J	<0.000070	<0.000070	<0.000070	<0.00025	<0.00025
<0.000070	<0.000070	0.00022 J	<0.000070	<0.00025	<0.00025
2.4	2.4	2.4	2.5	2.3	2.4
357	376	347	352	375	368
0.090	0.091	0.096	0.096	0.098	0.092
0.089	0.092	0.094	0.10	0.090	0.093
14.0	13.8	13.7	14.0	13.0	12.8
0.000096 J	0.000096 J	0.00011	0.000091 J	0.000092 J	0.000086 J
0.000095 J	0.000098 J	0.000092 J	0.000090 J	0.000069 J	0.000079 J
199	194	183	201	184	192
218	179	195	206	180	195
0.61	0.26	0.21	0.17	0.18	0.15
0.60 J	0.70 J	<0.51	0.70 J	<0.50	<0.50
1.7	1.5	1.8	1.7	3.4	2.5
0.0016	0.0016	0.0017	0.0016	0.0016	0.0015
0.0015	0.0018	0.0017	0.0019	0.0015	0.0016
<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
<0.0025	0.012	0.011	0.0051	0.0057	0.0031 J
7.54	7.40	7.33	7.74	7.48	7.34
484	388	397	425	390	189.6
4.7	4.6	4.6	4.6	5.6	4.5
130	130	120	120	105	105
0.29	0.29	0.27	0.27	0.23	0.23

Sample ID	MT Aquatic Life Standard[1]	WS-2	WS-2	WS-2	WS-2	WS-2	WS-2	WS-2	WS-2	WS-2	WS-2	WS-2	WS-2
Date		9/3/2008	11/25/2008	6/12/2009	9/28/2009	10/26/2009	11/24/2009	12/16/2009	2/24/2010	4/27/2010	5/25/2010	6/30/2010	7/29/2010
Alkalinity, Carbonate (mg CaCO3/L)	---			<2.5	<0.52	<0.26	<0.26	<0.26	<5.0	<2.5	<2.5	<2.5	<2.5
Alkalinity, Total (mg CaCO3/L)	---	37		23.5	28.7	28.2	26.6	35.0	27.5	28.4	26.6	20.4	30.4
Alkalinity, Bicarbonate (mg CaCO3/L	---	45		23.5	28.7	28.2	26.6	35.0	27.5	28.4	26.6	20.4	30.4
Aluminum (mg/L)	0.087	<0.03	<0.01	0.024	0.014	0.020	0.066	0.023	0.066	0.023	0.038	0.026	0.0039 J
Aluminum (mg/L)-Dissolved	---	<0.03	0.0162	0.029	0.0044	0.029	0.0055	0.0068	0.0054	0.0088	0.032	0.014	0.0051
Antimony (mg/L)	---	<0.003	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00019 J	<0.00016	<0.00016	<0.00016
Antimony (mg/L)-Dissolved	---	<0.003	<0.001	0.00010	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00016	<0.00016	<0.00016	<0.00016
Arsenic (mg/L)	0.15	0.011	0.0105	0.0084	0.011	0.011	0.011	0.010	0.011	0.011	0.0096	0.0088	0.0068
Arsenic (mg/L)-Dissolved	---	0.01	0.0109	0.0094	0.012	0.011	0.010	0.0089	0.010	0.010	0.0092	0.0084	0.010
Barium (mg/L)	---	<0.005	0.00185	0.0016	0.0017	0.0016	0.0018	0.0017	0.0019	0.0018	0.0020	0.0016	0.020
Barium (mg/L)-Dissolved	---	<0.005	0.00163	0.0020	0.0034	0.0016	0.0028	0.0015	0.0018	0.0016	0.0015	0.0015	0.0019
Beryllium (mg/L)	---	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000069	<0.000069	<0.000069	<0.000069
Beryllium (mg/L)-Dissolved	---	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011 J	<0.000069	<0.000069	<0.000069	<0.000069
Bismuth (mg/L)	---	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.000040 J	<0.000020	<0.000020	0.000051 J
Bismuth (mg/L)-Dissolved	---	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000020	0.000028 J	<0.000020	<0.000020
Boron (mg/L)	---	<0.01	0.0033J	<0.0025	0.0033 J	<0.0025	<0.0025	0.0026 J	0.0038 J	0.0015 J	0.0022 J	0.0020 J	0.0093
Boron (mg/L)-Dissolved	---	0.0324	0.0049 J	<0.0025	0.0049 J	<0.0025	<0.0025	<0.0025	<0.0025	<0.00018	0.0019 J	0.00091 J	<0.00018
Cadmium (mg/L)	0.000097 h	<0.00008	<0.001	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000020	<0.000020	<0.000020	<0.000020
Cadmium (mg/L)-Dissolved	---	<0.00008	<0.001	<0.000050	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000020	<0.000020	<0.000020	<0.000020
Calcium (mg/L)-Dissolved	---	10	8.65	6.4	8.2	7.8	8.6	8.6	8.4	8.5	6.9	5.9	9.0
Chloride (mg/L)	230*	<1		0.50 J	0.28 J	0.77 J	0.67 J	0.83 J	0.24 J	0.21 J	0.47 J	1.1 J	0.77 J
Chromium (mg/L)	0.0277 h	<0.001	<0.001	0.00028 J	0.00028 J	0.00026 J	<0.00025	0.00033 J	<0.00025	<0.00024	<0.00024	0.00035 J	<0.00024
Chromium (mg/L)-Dissolved	---	<0.001	<0.001	0.00084	<0.00025	0.00028 J	<0.00025	<0.00025	0.00041 J	0.00024 J	<0.00024	0.00045 J	0.00059
Copper (mg/L)	0.00285 h	<0.001	<0.001	0.00034 J	<0.00025	0.00054	0.00038 J	<0.00025	0.00034 J	0.00024 J	0.00051	0.00029 J	0.00069
Copper (mg/L)-Dissolved	---	<0.001	<0.001	0.00036 J	0.00077	<0.00025	0.00032 J	<0.00025	0.00025 J	<0.00020	0.00025 J	0.00023 J	0.00094
Fluoride (mg/L)	---				<0.021	0.13	0.086 J	0.028 J	0.039 J	0.026 J	0.13 J	0.058 J	0.045 J
Iron (mg/L)	1.0	<0.05	<0.01	0.038 J	0.039 J	<0.025	0.044 J	<0.025	0.049 J	0.023 J	0.038 J	0.017 J	0.16
Iron (mg/L)-Dissolved	---	<0.05	<0.01	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.0066 J	0.046 J	0.0083 J	0.0052 J
Lead (mg/L)	0.000545 h	<0.0005	<0.001	<0.000050	0.000055 J	<0.000050	0.00015	<0.000050	0.000083 J	0.00050	0.000055 J	0.000033 J	0.000034 J
Lead (mg/L)-Dissolved	---	<0.0005	<0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000033 J	0.000041 J	<0.000020	<0.000020
Magnesium-Dissolved (mg/L)	---	1	1.49	0.88	1.6	1.0	1.0	1.2	1.4	1.4	0.99	0.70	1.2
Manganese (mg/L)	---	<0.005	<0.001	0.00062	0.00092	0.0013	0.0035	0.00094	0.0020	0.00092	0.00080	0.00062	0.010
Manganese (mg/L)-Dissolved	---	<0.005	<0.001	0.00067	0.0017	0.00035 J	0.0019	0.00098	0.00066	0.00065	0.00064	0.00021 J	0.00046 J
Mercury (ug/L)	0.91000	<0.1	<0.1	<0.014	0.025 J	0.033 J	<0.014	0.056 J	<0.014	0.037 J	0.029 J	<0.021	<0.021
Mercury (ug/L)-Dissolved	---	<0.01	<1	<0.014	<0.014	0.026 J	<0.014	<0.014	<0.014	0.027 J	<0.021	0.11 J	<0.021
Nickel (mg/L)	0.0161 h	<0.01	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00019	<0.00019	<0.00019	<0.00019
Nickel (mg/L)-Dissolved	---	<0.01	<0.001	0.00037 J	0.00038 J	<0.00025	0.00030 J	<0.00025	0.00045 J	<0.00019	<0.00019	0.00026 J	0.00022 J
Nitrate, as N (mg/L)	---	<0.01	<0.01	0.010	0.0090 J	0.068	0.030	0.020	0.056	0.018	0.0080 J	0.0074 J	0.0098 J
Nitrite, as N (mg/L)	---	<0.01	<0.01	0.0090 J	<0.0030	<0.0030	<0.0030	0.0080 J	<0.0030	0.0020 J	0.0020 J	0.0026 J	<0.00047
Nitrogen, Ammonia, as N (mg/L)	---	<0.05		<0.0080	<0.0080	0.020	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080
Nitrogen, Kjeldahl, Total (mg/L)	---	<0.2		0.35 J	0.24	<0.072	<0.072	<0.10	0.11	0.080 J	0.16	0.13	0.045 J
Nitrogen, NO2 plus NO3Nitrite, (mg/	---	<0.01	<0.01	0.010	0.0090 J	0.068	0.030	0.020	0.056	0.020	0.010	0.010	0.010
Oil and Grease (mg/L)	---			<2.6	<2.6	<2.5	<2.6	1.9 J	<2.5	1.1 J	<1.0	<1.0	<1.0
Orthophosphate (mg/L)	---	0.017		0.016	0.018	0.020	0.023	0.021	0.020	0.023	0.020	0.015	0.017
pH Lab (s.u.)	6.5 - 9.0*	7.8		7.5	7.6	7.7	7.6	6.9	7.6	7.4	7.6	7.6	7.6
Phosphorus, total (mg/L)	---	0.025	<0.05	0.039	0.026	0.024	0.028	0.037	0.029	0.021	0.022	0.019	0.020
Potassium-Dissolved (mg/L)	---	1	0.654	0.81	0.88	0.84	0.80	0.82	0.85	0.86	0.75	0.67	0.87
Selenium (mg/L)	0.005	<0.001	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00010	0.00026 J	<0.00010	0.00025 J
Selenium (mg/L)-Dissolved	---	<0.001	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00010	<0.00010	<0.00010	0.00016 J
Silver (mg/L)	0.000374 h	<0.0005	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00014 J	<0.000071	<0.000071	<0.000071
Silver (mg/L)-Dissolved	---	<0.0005	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000071	<0.000071	<0.000071	<0.000071
Sodium-Dissolved (mg/L)	---	2	1.66	1.3	2.1	1.5	1.6	1.4	1.4	1.5	1.3	1.2	1.5
Specific Conductance (µhmos/cm)	---	69		50.0	64.0	59.0	62.0	62.1	69.0	71.0	58.6	45.7	68.3
Strontium (mg/L)	---	0.0113		na	0.013	0.010	0.011	0.012	0.012	0.012	0.012	0.0086	0.075
Strontium (mg/L)-Dissolved	---	0.0123			0.018	0.011	0.011	0.010	0.011	0.012	0.011	0.0084	0.012
Sulfate (mg/L)	---	<5		2.7 J	3.3 J	3.6 J	4.7 J	4.7 J	3.4 J	3.6 J	3.0	2.6 J	3.2 J
Thallium (mg/L)	---	<0.0002	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thallium (mg/L)-Dissolved	---	<0.0002	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
TDS (mg/L)	---	36		36	31.0	26.0	46.0	83.0	54.0	61.0	58.0	36.0	42.0
Total Hardness (mg CaCO3/L)	---	29		19.5	27.1	23.7	25.7	26.4	27.0	26.8	21.2	17.7	27.4
Total Inorganic Nitrogen (mg/L)	---			<0.030	<0.030	0.090	0.030 J	<0.030	0.060	0.020 J	0.010 J	0.010 J	0.010 J
Total Suspended Solids (mg/L)	---	7	<5	<5.0	6.4	0.81 J	1.9	1.2	3.2	<5.0	0.80 J	<0.49	0.92 J
Turbidity (NTU)	---	0.18		0.24	0.66	0.26	0.63	0.49	1.0	0.67	0.52	0.40	0.48
Uranium (mg/L)	---	<0.001	<0.00025		<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
Uranium (mg/L)-Dissolved	---	<0.001	<0.00025		<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
Zinc (mg/L)	0.037 h	<0.01	<0.001	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.0014 J	<0.0013	<0.0013	0.0021 J
Zinc (mg/L)-Dissolved	---	<0.01	<0.001	<0.0025	<0.0025	<0.0025	0.0028 J	<0.0025	<0.0025	0.0027 J	<0.0013	0.0016 J	0.0014 J
Field pH (s.u.)	6.5 - 9.0*		6.75		7.58	7.56	7.58	7.56	7.58	7.56	6.09	7.22	7.50
Field EC (µS/cm)	---		61		63.2	65.2	69.9	68.8	69.6	70.1	30.2	46.7	67.1
Field DO (mg/L)	---		14.89										
Field ORP (mV)	---		203										
Field Turbidity (NTU)	---		0.97										
Field Temperature (C)	---		-0.3		5.2	0.4	0.0	-0.1	-0.6	-0.3	0.3	3.2	4.4
Flow (gpm)					45	50	45	45	45	50	80	250	150
Flow (cfs)	---				0.10	0.11	0.10	0.10	0.10	0.11	0.18	0.56	0.33
Stat Lvl (ft)	---												

Cobalt (mg/L)	---												
Cobalt (mg/L)-Dissolved	---												
Molybdenum (mg/L)	---												
Molybdenum (mg/L)-Dissolved	---												
Vanadium (mg/L)	---	<0.001											
Vanadium (mg/L)-Dissolved	---	<0.001											

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;
NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

WS-2	WS-2	WS-2	WS-2	WS-2	WS-2	WS-2	WS-2	WS-2
8/24/2010	9/30/2010	10/27/2010	11/24/2010	12/16/2010	6/30/2011	7/27/2011	8/30/2011	9/27/2011
<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
29.0	28.3	26.1	27.6	28.3	17.2	27.6	29.2	29.6
29.0	28.3	26.1	27.6	28.3	17.2	27.6	29.2	29.6
0.016	0.036	0.013	0.026	0.020	0.049	0.020	0.017	0.032
0.0070	0.0062	<0.0020	0.0055	0.0085	0.022	0.0079	0.0058	0.0089
<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	0.00013 J	0.000075 J	<0.000070	<0.000070
<0.00016	<0.00016	0.00034 J	<0.00016	<0.00016	0.00016 J	0.00021 J	<0.000070	0.000071 J
0.011	0.012	0.012	0.0081	0.012	0.0078	0.010	0.010	0.011
0.010	0.010	0.011	0.011	0.010	0.0071	0.0063	0.010	0.011
0.0019	0.0022	0.0016	0.0012	0.0017	0.0016	0.0016	0.0017	0.0019
0.0017	0.0022	0.0016	0.0016	0.0026	0.0013	0.014	0.0018	0.0026
<0.000069	<0.000069	<0.000069	0.000080 J	<0.000069	<0.000020	<0.000020	<0.000020	<0.000020
<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	0.000039 J	<0.000020	<0.000020	0.000084 J
<0.000020	<0.000020	<0.000020	0.000028 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
0.0028 J	0.0018 J	0.0022 J	0.0018 J	<0.00018	0.0012 J	0.0015 J	0.0028 J	0.0041 J
0.0018 J	0.0042 J	0.0022 J	0.0017 J	0.0025 J	0.0034 J	0.0077	0.0054	0.0035 J
<0.000020	<0.000020	<0.000020	0.000030 J	<0.000020	<0.000030	<0.000030	<0.000030	<0.000030
0.00012	<0.000020	<0.000020	<0.000020	<0.000020	<0.000030	0.00019	<0.000030	0.000088
8.3	8.0	8.4	8.3	8.1	6.6	41.4	9.4	10.6
0.80 J	0.84 J	0.83 J	0.77 J	0.81 J	0.91 J	0.93 J	0.84 J	0.78 J
0.00057	0.00041 J	0.00061	0.00031 J	<0.00024	0.00072	0.00031 J	0.00014 J	0.00023 J
0.0012	0.00037 J	0.00041 J	0.00033 J	0.00074	0.00060	0.00082	0.00044 J	0.00090
0.00022 J	0.00025 J	<0.00020	0.00026 J	0.00025 J	0.00053	0.00036 J	0.00017 J	0.00021 J
0.00026 J	0.00035 J	<0.00020	0.00041 J	<0.00020	0.00064	0.0010	0.00050	0.0039
0.042 J	<0.023	<0.023	0.028 J	0.032 J	<0.050	0.063 J	0.088 J	0.088 J
0.014 J	0.024 J	0.013 J	0.021 J	0.014 J	0.069	0.014 J	0.0079 J	0.029 J
0.010 J	<0.0045	0.0050 J	0.0073 J	0.0074 J	0.012 J	0.077	<0.0047	0.0066 J
0.000041 J	0.00012	0.000029 J	0.00010	0.000035 J	0.00016	<0.000050	0.000052 J	0.000085 J
0.000050 J	0.000078 J	<0.000020	0.000062 J	0.000020 J	<0.000050	0.00020	0.000091 J	0.00034
1.0	1.0	1.1	1.2	1.2	0.81	25.5	1.2	1.3
0.00070	0.0020	0.00095	0.0014	0.00065	0.0012	0.00054	0.00064	0.0011
0.00086	0.00036 J	0.00032 J	0.00097	0.00024 J	0.00030 J	0.0070	0.00086	0.016
<0.021	<0.021	<0.020	<0.020	<0.020	<0.037	<0.037	<0.037	0.088 J
<0.021	0.053 J	<0.020	<0.020	0.022 J	<0.037	<0.037	<0.037	0.084 J
0.00037 J	<0.00019	0.00029 J	<0.00019	0.00028 J	0.00028 J	0.00013 J	<0.000070	0.00010 J
0.00046 J	0.00036 J	0.00020 J	0.00049 J	0.00035 J	0.00032 J	0.00094	0.000094 J	0.0017
<0.0050	0.030	0.010	0.030	0.049	0.010	0.010	<0.0050	0.010
0.00082 J	<0.00047	<0.00047	0.0015 J	0.00051 J	<0.0050	<0.0050	<0.0050	<0.0050
<0.0070	0.020	<0.0070	0.010 J	0.030	<0.020	0.038 J	0.029 J	0.28
<0.038	<0.077	0.040 J	0.14	0.12	0.13	0.045 J	0.070 J	0.055 J
<0.0042	0.030	0.010	0.030	0.050	0.010	0.010	<0.0044	0.010
<1.0	<1.0	<1.0	<1.0	<1.0	<1.6	<1.7	<1.6	<1.6
0.017	0.019	0.021	0.012	0.022	0.013	0.021	0.017	0.018
6.7	7.3	7.7	7.8	7.7	7.3	7.8	7.6	7.6
0.019	0.032	0.024	0.026	0.021	0.028	0.024	0.024	0.024
0.86	0.87	0.89	0.89	0.91	0.70	3.5	0.94	1.1
<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00022	<0.00022	<0.00022	<0.00022
<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00022	<0.00022	<0.00022	0.00024 J
<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000070	<0.000070	<0.000070	<0.000070
<0.000071	<0.000071	0.00015 J	<0.000071	0.000081 J	<0.000070	<0.000070	<0.000070	<0.000070
1.5	1.5	1.6	1.6	1.6	1.2	2.7	1.5	1.8
68.0	61.9	56.6	64.2	67.7	46.1	61.7	64.9	70.6
0.012	0.012	0.011	0.0079	0.012	0.0094	0.012	0.011	0.012
0.012	0.011	0.011	0.011	0.011	0.0080	0.088	0.012	0.013
3.2 J	3.3 J	3.2 J	3.0 J	3.3 J	2.0 J	<0.12	3.2	3.1
0.000050 J	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00011	<0.000050	<0.000050
72.0	46.0	36.0	40.0	49.0	30.0	49.0	40.0	51.0
25.0	24.1	25.4	25.7	25.0	19.7	208	28.5	32.0
<0.015	0.050	<0.015	0.040	0.080	0.029 J	0.048	0.029 J	0.28
<0.50	7.7	0.50 J	2.3	<0.51	1.4	0.50 J	0.91 J	1.4
1.2	1.2	0.39	0.85	0.29	0.41	0.60	0.49	0.90
<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.0027	<0.00025	<0.00025
<0.0013	0.0023 J	<0.0013	0.0016 J	0.0016 J	<0.0025	<0.0025	<0.0025	<0.0025
0.015	0.0039 J	0.0018 J	0.0062	<0.0013	<0.0025	0.0055	<0.0025	0.018
7.64	7.82	7.26	7.02	6.88	6.70	7.33	6.82	7.29
68.3	68.3	62.2	58.9	52.3	45.9	61.9	72	87.9
3.8	3.7	0.1	0.1	0.3	3.8	4.0	3.3	3.6
125	100	100	80	80	200	130	120	100
0.28	0.22	0.22	0.18	0.18	0.45	0.29	0.27	0.22

Sample ID	MT Aquatic Life Standard[1]	WS-3	WS-3	WS-3	WS-3	WS-3	WS-3	WS-3	WS-3	WS-3	WS-3	WS-3	WS-3
Date		9/3/2008	11/25/2008	6/12/2009	9/28/2009	10/26/2009	11/24/2009	12/16/2009	6/30/2010	7/29/2010	8/24/2010	9/30/2010	10/27/2010
Alkalinity, Carbonate (mg CaCO3/L)	---	0		<2.5	<0.52	<0.26	<0.26	<0.26	<2.5	<2.5	<2.5	<2.5	<2.5
Alkalinity, Total (mg CaCO3/L)	---	139		82.7	134	129	133	148	73.4	149	117	129	128
Alkalinity, Bicarbonate (mg CaCO3/	---	169		82.7	134	129	133	148	73.4	149	117	129	128
Aluminum (mg/L)	0.087	<0.03	0.0176	0.032	0.020	0.025	0.031	0.054	0.13	0.024	0.044	0.075	0.15
Aluminum (mg/L)-Dissolved	---	<0.03	<0.01	0.011	0.0022 J	<0.0020	0.0033 J	0.0023 J	0.0059	0.0054	0.0036 J	0.0042	0.0093
Antimony (mg/L)	---	<0.003	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00021 J	<0.00016	<0.00016	0.00016 J	<0.00016
Antimony (mg/L)-Dissolved	---	<0.003	<0.001	0.00014	<0.00025	<0.00025	<0.00025	<0.00025	<0.00016	0.00016 J	<0.00016	<0.00016	<0.00016
Arsenic (mg/L)	0.15	<0.003	0.00246	0.0047	0.0037	0.0032	0.0027	0.0021	0.0053	0.010	0.0039	0.0042	0.0042
Arsenic (mg/L)-Dissolved	---	<0.003	0.00242	0.0051	0.0039	0.0033	0.0026	0.0017	0.0047	0.0020	0.0040	0.0036	0.0032
Barium (mg/L)	---	0.008	0.00842	0.0049	0.0071	0.0064	0.0062	0.0085	0.0059	0.0019	0.0070	0.0082	0.0075
Barium (mg/L)-Dissolved	---	0.007	0.0071	0.0046	0.0094	0.0064	0.0064	0.0072	0.0046	0.010	0.0066	0.0068	0.0065
Beryllium (mg/L)	---	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Beryllium (mg/L)-Dissolved	---	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Bismuth (mg/L)	---	<0.00025	<0.00025	na	<0.00025	<0.00025	<0.00025	<0.00025	0.000027 J	<0.000020	<0.000020	0.000020 J	0.000042 J
Bismuth (mg/L)-Dissolved	---	<0.00025	<0.00025	na	<0.00025	<0.00025	<0.00025	<0.00025	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Boron (mg/L)	---	<0.01	0.0044J	na	0.0044 J	0.0032 J	0.0028 J	0.0058	0.0036 J	0.0027 J	0.0056	0.0030 J	0.0034 J
Boron (mg/L)-Dissolved	---	<0.01	0.0037J	na	0.0037 J	0.0037 J	0.0025 J	0.0047 J	0.0017 J	<0.00018	0.0067	0.0042 J	0.0033 J
Cadmium (mg/L)	0.000097 h	<0.00008	<0.001	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000020	<0.000020	<0.000020	0.000024 J	0.000032 J
Cadmium (mg/L)-Dissolved	---	<0.00008	<0.001	<0.000050	<0.000040	<0.000040	<0.000040	<0.000040	<0.000020	0.000054 J	<0.000020	<0.000020	0.000020 J
Calcium (mg/L)-Dissolved	---	35	33.6	18.9	30.7	29.0	32.0	38.3	17.6	32.8	28.0	29.4	31.2
Chloride (mg/L)	230*	<1		1.3	0.60 J	0.73 J	1.1	0.50 J	1.2 J	1.2	0.91 J	0.91 J	0.93 J
Chromium (mg/L)	0.0277 h	<0.001	<0.001	0.00048 J	0.00028 J	<0.00025	<0.00025	0.00031 J	0.00036 J	0.00037 J	<0.00024	0.00045 J	0.00030 J
Chromium (mg/L)-Dissolved	---	<0.001	<0.001	0.00065	0.00026 J	0.00029 J	<0.00025	<0.00025	0.00031 J	0.00050	0.0012	0.00044 J	<0.00024
Copper (mg/L)	0.00285 h	0.001	<0.001	0.0015	0.0011	0.0011	0.00081	0.00052	0.0021	0.00020 J	0.0011	0.0020	0.0041
Copper (mg/L)-Dissolved	---	<0.001	<0.001	0.0011	0.0011	0.00044 J	0.00059	0.00039 J	0.00092	0.0031	0.00074	0.00051	0.00069
Fluoride (mg/L)	---				0.090 J	0.088 J	0.074 J	0.053 J	0.068 J	0.10	<0.023	0.038 J	0.035 J
Iron (mg/L)	1.0	0.05	0.0274	0.066	0.057	0.043 J	0.039 J	0.090	0.12	0.016 J	0.054	0.090	0.19
Iron (mg/L)-Dissolved	---	<0.05	0.0177	<0.025	<0.025	<0.025	<0.025	<0.025	0.011 J	0.014 J	0.0089 J	<0.0045	<0.0045
Lead (mg/L)	0.000545 h	<0.0005	<0.001	0.000087 J	0.000093 J	<0.000050	0.000054 J	0.000070 J	0.00014	0.000071 J	0.000076 J	0.00016	0.00035
Lead (mg/L)-Dissolved	---	<0.0005	<0.001	<0.000050	0.000069 J	<0.000050	<0.000050	<0.000050	<0.000020	0.000029 J	0.000061 J	0.000049 J	<0.000020
Magnesium-Dissolved (mg/L)	---	14	15.6	7.8	12.4	11.9	12.8	16.5	7.1	16.2	11.6	11.9	13.5
Manganese (mg/L)	---	<0.005	0.00218	0.0027	0.0063	0.0024	0.0024	0.0038	0.0037	0.00058	0.0026	0.0040	0.011
Manganese (mg/L)-Dissolved	---	<0.005	<0.001	0.00056	0.0011	0.00066	0.0020	0.0023	0.00065	0.0015	0.00082	0.00062	0.00057
Mercury (ug/L)	0.91000	<0.01	<0.1	0.020 J	0.014 J	0.032 J	<0.014	0.022 J	<0.021	<0.021	<0.021	0.045 J	<0.020
Mercury (ug/L)-Dissolved	---	<0.01	<1	<0.014	<0.014	0.041 J	<0.014	<0.014	0.093 J	<0.021	<0.021	0.064 J	<0.020
Nickel (mg/L)	0.0161 h	<0.01	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00019	<0.00019	<0.00019	0.00020 J	0.00026 J
Nickel (mg/L)-Dissolved	---	<0.01	<0.001	0.00028 J	0.00056	<0.00025	0.00065	<0.00025	0.00030 J	0.00031 J	0.00039 J	<0.00019	<0.00019
Nitrate, as N (mg/L)	---	0.09	0.123	0.060	0.10	0.13	0.16	0.16	0.057	0.14	0.069	0.090	0.10
Nitrite, as N (mg/L)	---	<0.01	0.123	<0.0050	<0.0030	<0.0030	<0.0030	0.0020 J	0.0027 J	<0.00047	0.00052 J	<0.00047	<0.00047
Nitrogen, Ammonia, as N (mg/L)	---	<0.05		0.020	<0.0080	0.020	0.010 J	<0.0080	<0.0080	<0.0080	<0.0070	0.040	0.010 J
Nitrogen, Kjeldahl, Total (mg/L)	---	0.2		<0.20	0.25	0.090 J	<0.072	0.18 J	0.18	0.24	0.045 J	<0.077	0.23
Nitrogen, NO2 plus NO3Nitrite, (mg	---	0.09	0.123	0.060	0.10	0.13	0.16	0.16	0.060	0.14	0.070	0.090	0.10
Oil and Grease (mg/L)	---			<2.6	<2.6	<2.6	<2.6	1.5 J	1.9 J	<1.0	<1.0	<1.0	<1.0
Orthophosphate (mg/L)	---	0.006		0.0078	0.0059	0.0075	0.0059	0.0082	0.0077	0.0058	0.0059	0.0039	0.0076
pH Lab (s.u.)	6.5 - 9.0*	8.3		8.0	8.2	8.2	8.3	8.4	8.0	8.0	8.1	8.2	8.0
Phosphorus, total (mg/L)	---	0.016		0.040	0.013	0.0084	0.0091	0.026	0.015	0.0084	0.012	0.019	0.023
Potassium-Dissolved (mg/L)	---	2	1.58	1.3	1.6	1.6	1.6	2.0	1.2	1.8	1.7	1.6	1.8
Selenium (mg/L)	0.005	<0.001	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00010	<0.00010	<0.00010	<0.00010	0.00014 J
Selenium (mg/L)-Dissolved	---	<0.001	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00010	0.00028 J	<0.00010	<0.00010	<0.00010
Silver (mg/L)	0.000374 h	<0.0005	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071
Silver (mg/L)-Dissolved	---	<0.0005	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071
Sodium-Dissolved (mg/L)	---	2	1.95	1.5	2.0	1.6	1.8	2.5	1.4	2.3	1.7	1.6	1.7
Specific Conductance (µhmos/cm)	---	266		163	239	247	250	295	159	303	239	240	239
Strontium (mg/L)	---	0.0394			0.036	0.032	0.032	0.071	0.023	0.011	0.032	0.034	0.033
Strontium (mg/L)-Dissolved	---	0.0347			0.034	0.032	0.032	0.066	0.021	0.049	0.032	0.032	0.035
Sulfate (mg/L)	---	8		6.6	6.6	9.3	8.2	11.0	4.5 J	7.9	5.8	6.4	7.0
Thallium (mg/L)	---	<0.0002	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000050	<0.000050	0.000051 J	<0.000050	<0.000050
Thallium (mg/L)-Dissolved	---	<0.0002	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
TDS (mg/L)	---	148		63.0	122	109	143	64.0	97.0	175	153	126	141
Total Hardness (mg CaCO3/L)	---	145		79.3	128	122	133	163	73.3	149	118	122	133
Total Inorganic Nitrogen (mg/L)	---			0.080	0.10	0.15	0.17	0.16	0.060	0.14	0.070	0.13	0.11
Total Suspended Solids (mg/L)	---	2	<5	<5.0	2.4	1.5	1.5	2.6	5.7	3.1	1.7	0.60 J	7.6
Turbidity (NTU)	---	<0.2		0.23	1.5	0.45	0.72	1.2	0.78	1.2	1.5	1.5	1.8
Uranium (mg/L)	---	<0.001	0.00033J	na	0.00033 J	0.00030 J	0.00033 J	0.00080	<0.00025	0.00048 J	0.00028 J	0.00029 J	0.00034 J
Uranium (mg/L)-Dissolved	---	<0.001	0.00033J	na	0.00033 J	0.00030 J	0.00034 J	0.00073	<0.00025	0.00045 J	<0.00025	0.00030 J	0.00029 J
Zinc (mg/L)	0.037 h	<0.01	<0.001	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0013	<0.0013	<0.0013	0.0043 J	0.0024 J
Zinc (mg/L)-Dissolved	---	<0.01	<0.001	<0.0025	<0.0025	<0.0025	0.0034 J	<0.0025	0.0021 J	0.11	0.0024 J	0.0023 J	0.0023 J
Field pH (s.u.)	6.5 - 9.0*		7.65		8.31	8.17	8.24	8.2	7.75	7.74	7.85	7.96	7.95
Field EC (µS/cm)	---		272		258	264	279	280	166.3	294	239	251	258
Field DO (mg/L)	---		12.24										
Field ORP (mV)	---		202										
Field Turbidity (NTU)	---		3.86										
Field Temperature (C)	---		1.3		6.8	1.7	0.8	0.6	4.6	6.2	5.4	4.3	1.5
Flow (gpm)					80	100	80	80	250	220	150	175	150
Flow (cfs)	---				0.18	0.22	0.18	0.18	0.56	0.49	0.33	0.39	0.33
Stat Lvl (ft)	---												

Cobalt (mg/L)	---	<0.001											
Cobalt (mg/L)-Dissolved	---	<0.001											
Molybdenum (mg/L)	---	<0.001											
Molybdenum (mg/L)-Dissolved	---	<0.001											
Vanadium (mg/L)	---	<0.001											
Vanadium (mg/L)-Dissolved	---	<0.001											

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

WS-3	WS-3	WS-3	WS-3	WS-3	WS-3
11/24/2010	6/30/2011	7/27/2011	8/30/2011	9/27/2011	10/20/2011
<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
130	60.0	100	100	118	119
130	60.0	100	100	118	119
0.071	0.087	0.022	0.022	0.049	0.033
0.0029 J	0.011	<0.0020	<0.0020	0.018	0.0068
<0.00016	0.00016 J	0.00012 J	0.00012 J	0.00010 J	0.00011 J
<0.00016	0.00019 J	0.00014 J	0.00014 J	0.00012 J	0.00016 J
0.0028	0.0057	0.0050	0.0050	0.0039	0.0036
0.0022	0.0056	0.0048	0.0048	0.0038	0.0034
0.0060	0.0041	0.0054	0.0054	0.0071	0.0064
0.0053	0.0043	0.0057	0.0057	0.0080	0.0077
0.00012 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
<0.000069	<0.000020	<0.000020	<0.000020	0.000035 J	<0.000020
0.000026 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
0.0030 J	0.0024 J	0.0024 J	0.0024 J	0.0055	0.0038 J
0.0016 J	0.0039 J	0.0034 J	0.0034 J	0.0051	0.0074
<0.000020	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
<0.000020	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
24.7	19.0	25.2	25.2	35.9	26.1
0.92 J	0.93 J	1.0 J	1.0 J	0.89 J	0.91 J
0.00048 J	0.00038 J	0.00043 J	0.00043 J	0.00023 J	0.00024 J
0.00034 J	0.00074	0.00077	0.00077	0.0017	0.0012
0.0014	0.0022	0.0010	0.0010	0.0012	0.00094
0.00048 J	0.0012	0.0011	0.0011	0.00098	0.00077
0.041 J	0.055 J	0.075 J	0.075 J	0.10 J	0.10 J
0.094	0.092	0.025 J	0.025 J	0.059	0.047 J
0.0059 J	0.0085 J	<0.0047	<0.0047	0.23	0.011 J
0.00012	0.00018	<0.000050	<0.000050	0.000097 J	0.000067 J
0.000021 J	<0.000050	<0.000050	<0.000050	0.000053 J	<0.000050
10.6	6.4	10.0	10.0	13.4	13.7
0.0035	0.0030	0.0016	0.0016	0.0034	0.0023
0.00049 J	0.00061	0.0013	0.0013	0.0035	0.0022
<0.020	<0.037	<0.037	<0.037	0.094 J	0.066 J
<0.020	<0.037	<0.037	<0.037	0.096 J	0.056 J
<0.00019	0.00020 J	0.00026 J	0.00026 J	<0.000070	0.00014 J
0.00036 J	0.00022 J	0.00041 J	0.00041 J	0.00059	0.00039 J
0.11	0.060	0.070	0.070	0.090	0.070
0.0015 J	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
0.010 J	0.027 J	0.038 J	0.038 J	0.24	<0.020
0.20	0.14	<0.032	<0.032	0.090 J	0.070 J
0.11	0.060	0.070	0.070	0.090	0.070
1.0 J	<1.6	<1.6	<1.6	<1.6	<1.6
0.012	0.0087	0.012	0.012	0.0075	0.0041
8.3	8.0	8.2	8.2	8.1	7.9
0.013	0.027	0.013	0.013	0.023	0.0063
1.3	1.1	1.4	1.4	1.8	1.8
0.00020 J	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
<0.00010	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
<0.000071	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070
<0.000071	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070
1.3	1.3	1.8	1.8	1.8	1.7
264	137	200	200	247	262
0.030	0.020	0.029	0.029	0.034	0.033
0.026	0.020	0.027	0.027	0.035	0.035
6.4	3.6	5.2	5.2	6.0	6.3
<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
94.0	68.0	111	111	146	130
105	73.9	104	104	145	122
0.12	0.087	0.11	0.11	0.33	0.084
3.7	3.8	1.4	1.4	3.2	1.1
1.5	0.65	0.61	0.61	0.88	0.69
0.00033 J	<0.00025	<0.00025	<0.00025	0.00029 J	0.00034 J
0.00025 J	<0.00025	0.0011	0.0011	0.00029 J	0.00033 J
0.0018 J	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
0.0024 J	<0.0025	<0.0025	<0.0025	0.0032 J	<0.0025
7.65	7.39	7.72	7.51	7.86	
188	138	196.8	224	326	
3.1	4.9	5.8	5.2	4.5	
130	300	300	220	180	
0.29	0.67	0.67	0.49	0.40	

Sample ID	MT Aquatic Life Standard[1]	WS-4	WS-4	WS-4	WS-4	WS-4	WS-4	WS-4	WS-4	WS-4	WS-4	WS-4	WS-4
Date		11/25/2008	9/28/2009	10/26/2009	11/24/2009	12/16/2009	2/24/2010	4/27/2010	5/25/2010	6/30/2010	7/29/2010	8/24/2010	9/30/2010
Alkalinity, Carbonate (mg CaCO3/L)	---	<4	<0.52	<0.26	<0.26	<0.26	<5.0	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Alkalinity, Total (mg CaCO3/L)	---	200	28.7	31.0	30.3	27.6	29.3	28.4	23.6	21.1	29.3	29.4	30.4
Alkalinity, Bicarbonate (mg CaCO3/L	---	240	28.7	31.0	30.3	27.6	29.3	28.4	23.6	21.1	29.3	29.4	30.4
Aluminum (mg/L)	0.087	0.04	0.016	0.0094	0.022	0.034	0.051	0.052	0.032	0.027	0.021	0.014	0.017
Aluminum (mg/L)-Dissolved	---		0.0044	0.0043	0.0047	0.0082	0.0058	0.0081	0.036	0.013	0.0058	0.010	0.0064
Antimony (mg/L)	---	<0.003	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
Antimony (mg/L)-Dissolved	---		<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
Arsenic (mg/L)	0.15	<0.003	0.010	0.0099	0.011	0.010	0.011	0.011	0.0099	0.0088	0.011	0.010	0.011
Arsenic (mg/L)-Dissolved	---		0.011	0.011	0.010	0.0090	0.010	0.0099	0.0091	0.0083	0.010	0.010	0.011
Barium (mg/L)	---	0.014	0.0019	0.0016	0.0016	0.0017	0.0019	0.0019	0.0017	0.0015	0.0022	0.0019	0.0020
Barium (mg/L)-Dissolved	---		0.0029	0.0016	0.0017	0.0016	0.0016	0.0016	0.0016	0.0015	0.0018	0.0019	0.0020
Beryllium (mg/L)	---	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Beryllium (mg/L)-Dissolved	---		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Bismuth (mg/L)	---	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000020	0.00021 J	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (mg/L)-Dissolved	---		<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000020	0.000020 J	<0.000020	<0.000020	<0.000020	<0.000020
Boron (mg/L)	---	<0.1	0.0027 J	<0.0025	<0.0025	0.0035 J	0.0039 J	0.00027 J	0.0021 J	0.0018 J	0.0025 J	0.0022 J	0.0012 J
Boron (mg/L)-Dissolved	---		0.0032 J	<0.0025	<0.0025	<0.0025	<0.0025	<0.00018	0.0020 J	0.00026 J	<0.00018	0.0042 J	0.0020 J
Cadmium (mg/L)	0.000097 h	<0.00008	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Cadmium (mg/L)-Dissolved	---		<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000020	<0.000020	<0.000020	<0.000020	0.00039	<0.000020
Calcium (mg/L)-Dissolved	---	47	9.6	8.0	8.9	8.9	8.4	8.1	6.8	6.1	8.7	9.2	9.1
Chloride (mg/L)	230*	<1	0.70 J	1.0	0.38 J	0.44 J	0.24 J	0.20 J	0.50 J	1.2 J	0.73 J	0.75 J	0.81 J
Chromium (mg/L)	0.0277 h	<0.001	<0.00025	<0.00025	0.0014	<0.00025	<0.00025	0.00032 J	<0.00024	<0.00024	0.00026 J	<0.00024	0.0012
Chromium (mg/L)-Dissolved	---		0.00065	0.00036 J	<0.00025	<0.00025	0.00029 J	<0.00024	<0.00024	0.00036 J	0.00038 J	0.0013	0.00057
Copper (mg/L)	0.00285 h	<0.001	<0.00025	<0.00025	0.00053	0.00026 J	0.00031 J	0.00020 J	0.00032 J	0.00032 J	0.00027 J	<0.00020	<0.00020
Copper (mg/L)-Dissolved	---		<0.00025	<0.00025	0.0052	<0.00025	0.00045 J	<0.00020	0.00024 J	0.00034 J	0.00070	0.00036 J	<0.00020
Fluoride (mg/L)	---	<0.1	<0.021	0.25	0.067 J	0.078 J	0.056 J	0.035 J	0.18 J	0.061 J	0.027 J	<0.023	0.055 J
Iron (mg/L)	1.0	0.04	0.033 J	<0.025	<0.025	<0.025	0.038 J	0.037 J	0.031 J	0.017 J	0.0093 J	0.010 J	0.019 J
Iron (mg/L)-Dissolved	---		<0.025	<0.025	<0.025	<0.025	<0.025	0.0065 J	0.048 J	0.0097 J	<0.0045	0.022 J	0.0052 J
Lead (mg/L)	0.000545 h	<0.00005	0.000078 J	<0.000050	<0.000050	<0.000050	0.000071 J	0.00059	0.000047 J	0.000036 J	0.000039 J	0.000038 J	0.000056 J
Lead (mg/L)-Dissolved	---		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000020	0.000042 J	0.000042 J	<0.000020	0.000089 J	0.000043 J
Magnesium-Dissolved (mg/L)	---	20	1.2	1.2	1.2	1.5	1.4	1.3	1.0	0.79	1.1	1.3	1.3
Manganese (mg/L)	---	<0.005	0.0011	0.00055	0.0014	0.00098	0.0015	0.0017	0.00069	0.00078	0.00060	0.00061	0.0012
Manganese (mg/L)-Dissolved	---		0.00094	0.00026 J	0.00093	<0.00025	0.0041	0.00048 J	0.00069	0.00036 J	0.00034 J	0.0024	0.00027 J
Mercury (ug/L)	0.91000	<1	0.014 J	0.036 J	<0.014	0.031 J	<0.014	<0.021	<0.021	<0.021	<0.021	0.023 J	<0.021
Mercury (ug/L)-Dissolved	---		<0.014	<0.014	<0.014	<0.014	<0.014	<0.021	<0.021	0.091 J	0.026 J	<0.021	0.068 J
Nickel (mg/L)	0.0161 h	<0.01	<0.00025	<0.00025	0.00035 J	<0.00025	<0.00025	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019
Nickel (mg/L)-Dissolved	---		0.00088	<0.00025	0.00060	<0.00025	<0.00025	<0.00019	<0.00019	0.00023 J	0.00024 J	0.00063	0.00020 J
Nitrate, as N (mg/L)	---		0.012	0.098	0.053	0.010	0.056	0.018	0.0053 J	0.018	0.010	<0.0050	0.010
Nitrite, as N (mg/L)	---		<0.0030	<0.0030	0.014	0.0050 J	<0.0030	0.0021 J	0.0047 J	0.0025 J	<0.00047	0.00082 J	<0.00047
Nitrogen, Ammonia, as N (mg/L)	---	<0.1	<0.0080	0.020	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0070	0.010 J
Nitrogen, Kjeldahl, Total (mg/L)	---	<0.5	0.40	<0.072	<0.072	<0.10	0.12	0.065 J	0.17	0.19	2.2	<0.038	<0.077
Nitrogen, NO2 plus NO3Nitrite, (mg/	---	0.37	0.012 J	0.098	0.066	0.010	0.056	0.020	0.010	0.020	0.010	<0.0042	0.010
Oil and Grease (mg/L)	---		<2.5	<2.5	<2.6	2.3 J	<2.5	<1.0	1.2 J	<1.0	<1.0	<1.0	<1.0
Orthophosphate (mg/L)	---	<0.01	0.018	0.017	0.022	0.021	0.021	0.015	0.020	0.015	0.018	0.016	0.017
pH Lab (s.u.)	6.5 - 9.0*	8	7.6	7.8	7.6	7.7	7.6	7.4	7.4	7.6	7.6	7.7	7.7
Phosphorus, total (mg/L)	---	<0.01	0.025	0.024	0.023	0.041	0.026	0.025	0.023	0.018	0.022	0.021	0.028
Potassium-Dissolved (mg/L)	---	2	0.80	0.84	0.80	0.83	0.85	0.85	0.80	0.71	0.85	0.89	0.94
Selenium (mg/L)	0.005	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00010	0.00021 J	<0.00010	<0.00010	<0.00010	<0.00010
Selenium (mg/L)-Dissolved	---		<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00010	<0.00010	<0.00010	0.00017 J	<0.00010	<0.00010
Silver (mg/L)	0.000374 h	<0.0005	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071
Silver (mg/L)-Dissolved	---		<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	0.000088 J
Sodium-Dissolved (mg/L)	---	<1	1.6	1.5	1.5	1.5	1.5	1.4	1.3	1.2	1.5	1.6	1.5
Specific Conductance (µhmos/cm)	---	390	64.0	62.9	63.0	61.3	69.0	72.0	57.8	48.9	64.5	71.3	65.5
Strontium (mg/L)	---	<0.1	0.013	0.011	0.012	0.012	0.013	0.012	0.012	0.0090	0.011	0.013	0.012
Strontium (mg/L)-Dissolved	---		0.012	0.011	0.011	0.011	0.011	0.011	0.010	0.0085	0.012	0.012	0.012
Sulfate (mg/L)	---	5	3.3 J	3.7 J	3.8 J	4.0 J	3.4 J	3.5 J	2.9	2.6 J	3.0 J	3.2 J	3.2 J
Thallium (mg/L)	---	<0.0002	<0.00025	<0.00025	<0.00025	<0.00025	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000068 J	<0.000050
Thallium (mg/L)-Dissolved	---		<0.00025	<0.00025	<0.00025	<0.00025	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
TDS (mg/L)	---	203	32.0	31.0	40.0	61.0	37.0	44.0	52.0	36.0	42.0	51.0	48.0
Total Hardness (mg CaCO3/L)	---	197	29.2	24.8	27.0	28.3	26.9	25.7	21.2	18.4	26.2	28.2	28.1
Total Inorganic Nitrogen (mg/L)	---		<0.030	0.12	0.070	<0.030	0.060	0.020 J	0.010 J	0.020 J	0.010 J	<0.015	0.020 J
Total Suspended Solids (mg/L)	---	<10	1.4	0.51 J	1.2	12.6	3.2	<5.0	<0.50	0.52 J	<0.49	2.5	1.5
Turbidity (NTU)	---		1.1	0.54	0.93	0.91	1.6	0.34	1.4	0.32	0.29	0.20	1.3
Uranium (mg/L)	---	<0.001	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
Uranium (mg/L)-Dissolved	---		<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
Zinc (mg/L)	0.037 h	<0.01	<0.0025	<0.0025	<0.0025	<0.0025	0.0033 J	<0.0013	0.0014 J	0.0014 J	0.0017 J	<0.0013	0.0019 J
Zinc (mg/L)-Dissolved	---		<0.0025	<0.0025	0.0035 J	<0.0025	0.0029 J	0.0026 J	<0.0013	0.0067	<0.0013	0.049	0.0027 J
Field pH (s.u.)	6.5 - 9.0*	7.09	7.65	7.66	7.67	7.66	7.6	7.7	6.83	7.27	7.41	7.46	7.56
Field EC (µS/cm)	---	363	68.2	70.2	69.7	69.3	70.2	67.1	60.3	50	65.1	71.6	70.2
Field DO (mg/L)	---	11.1											
Field ORP (mV)	---	200											
Field Turbidity (NTU)	---	2.6											
Field Temperature (C)	---	2.1	5.4	0.3	-0.1	-0.1	-0.2	-0.7	0.3	3.3	4.6	3.8	3.7
Flow (gpm)		40	50	40	40	40	35	45	80	250	150	125	100
Flow (cfs)	---	0.09	0.11	0.09	0.09	0.09	0.08	0.10	0.18	0.56	0.33	0.28	0.22
Stat Lvl (ft)	---												

Cobalt (mg/L)	---	<0.01											
Cobalt (mg/L)-Dissolved	---												
Molybdenum (mg/L)	---	<0.005											
Molybdenum (mg/L)-Dissolved	---												
Vanadium (mg/L)	---	<0.1											
Vanadium (mg/L)-Dissolved	---												

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

WS-4	WS-4	WS-4	WS-4	WS-4	WS-4	WS-4	WS-4
10/27/2010	11/24/2010	12/16/2010	6/30/2011	7/27/2011	8/30/2011	9/27/2011	10/20/2011
<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
28.5	27.9	29.1	17.6	28.3	29.6	28.2	28.0
28.5	27.9	29.1	17.6	28.3	29.6	28.2	28.0
0.018	0.036	0.018	0.042	0.022	0.019	0.029	0.024
0.0044	0.0044	0.011	0.023	0.0089	0.0070	0.0052	0.0088
<0.00016	<0.00016	<0.00016	0.00011 J	0.000095 J	0.000075 J	0.000075 J	0.000071 J
<0.00016	<0.00016	<0.00016	0.00012 J	0.000091 J	0.000091 J	<0.000070	0.00011 J
0.011	0.010	0.012	0.0075	0.010	0.010	0.011	0.011
0.011	0.0087	0.011	0.0072	0.0096	0.010	0.011	0.011
0.0018	0.0016	0.0017	0.0015	0.0016	0.0017	0.0022	0.0016
0.0017	0.0014	0.0023	0.0015	0.0017	0.0019	0.0019	0.0019
<0.000069	<0.000069	<0.000069	<0.000020	<0.000020	0.000026 J	<0.000020	<0.000020
<0.000069	<0.000069	<0.000069	<0.000020	<0.000020	<0.000020	0.000035 J	<0.000020
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
0.0019 J	0.0018 J	<0.00018	0.0014 J	0.0013 J	0.0038 J	0.0035 J	0.0020 J
0.0018 J	0.00040 J	0.0022 J	0.0020 J	0.0022 J	0.0047 J	0.0041 J	0.0052
<0.000020	<0.000020	<0.000020	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
<0.000020	<0.000020	<0.000020	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
9.1	7.2	8.6	6.4	9.3	9.4	10.6	8.0
0.85 J	0.77 J	0.79 J	1.0 J	0.95 J	0.87 J	0.78 J	0.96 J
0.00034 J	0.00031 J	0.00055	0.00025 J	0.00038 J	0.00022 J	0.00023 J	0.00014 J
0.00032 J	0.00029 J	0.00042 J	0.00038 J	0.00092	0.00043 J	0.00059	0.0014
<0.00020	0.00025 J	0.00022 J	0.00040 J	0.00071	0.00020 J	0.00025 J	0.00018 J
0.00023 J	0.00020 J	0.00020 J	0.00074	0.00044 J	0.0098	0.00045 J	0.00055
<0.023	0.030 J	0.035 J	0.058 J	0.060 J	0.089 J	0.090 J	0.090 J
0.014 J	0.034 J	0.012 J	0.026 J	0.011 J	0.011 J	0.021 J	0.018 J
0.16	0.0057 J	0.0066 J	0.0098 J	0.0091 J	0.0048 J	<0.0047	0.0079 J
0.000040 J	0.000083 J	0.000032 J	0.00017	0.000058 J	0.000052 J	0.000069 J	0.000058 J
0.000023 J	<0.000020	<0.000020	<0.000050	0.00014	0.00079	0.000068 J	<0.000050
1.3	0.99	1.2	0.80	1.2	1.2	1.3	1.3
0.0010	0.0017	0.00067	0.00097	0.00043 J	0.00075	0.00087	0.00090
0.00092	0.00029 J	0.00024 J	0.00022 J	0.00039 J	0.0016	0.00032 J	0.00052
<0.020	<0.020	<0.020	<0.037	<0.037	<0.037	0.090 J	0.061 J
<0.020	<0.020	0.033 J	<0.037	<0.037	<0.037	0.085 J	0.066 J
<0.00019	<0.00019	0.00027 J	0.000088 J	0.00014 J	<0.000070	0.00037 J	0.000073 J
<0.00019	0.00036 J	0.00020 J	0.000076 J	0.00035 J	0.00018 J	0.00024 J	0.00031 J
0.010	0.030	0.040	0.010	0.020	<0.0050	0.010	0.010
<0.00047	0.0013 J		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
<0.0070	0.010 J	<0.0070	<0.020	0.028 J	0.020 J	0.051	0.044
<0.038	0.19	0.10	0.16	0.035 J	0.10	0.090 J	<0.032
0.010	0.030	0.040	0.010	0.020	<0.0044	0.010	0.010
<1.0	<1.0	<1.0	<1.6	<1.6	<1.6	<1.6	<1.7
0.020	0.021	0.022	0.012	0.019	0.016	0.019	0.019
7.8	7.8	7.8	7.7	7.8	7.7	7.6	7.4
0.022	0.027	0.018	0.016	0.021	0.016	0.021	0.021
0.95	0.72	0.96	0.64	0.79	0.91	0.92	0.92
<0.00010	<0.00010	<0.00010	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
<0.00010	<0.00010	<0.00010	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
<0.000071	<0.000071	<0.000071	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070
<0.000071	<0.000071	<0.000071	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070
1.7	1.3	1.7	1.1	1.6	1.5	1.6	1.6
61.6	64.9	62.9	43.2	63.5	65.2	66.7	70.1
0.012	0.010	0.012	0.0087	0.012	0.011	0.013	0.012
0.012	0.0093	0.012	0.0084	0.011	0.012	0.012	0.012
3.4 J	3.0 J	3.3 J	2.0 J	3.0	3.2	3.1	3.2
<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
73.0	16.0	44.0	25.0	36.0	40.0	46.0	44.0
28.0	22.0	26.6	19.2	27.9	28.7	32.0	25.3
<0.015	0.040	0.040	0.027 J	0.048	0.020 J	0.061	0.054
1.1	2.3	<0.50	0.62 J	0.60 J	1.2	0.70 J	<0.51
0.87	0.66	0.66	0.30	0.68	0.27	0.55	0.51
<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
<0.00025	<0.00025	<0.00025	<0.00025	0.0011	<0.00025	<0.00025	<0.00025
<0.0013	0.0024 J	<0.0013	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
0.0017 J	0.0020 J	0.0015 J	<0.0025	<0.0025	<0.0025	<0.0025	0.0039 J
7.33	7.21	7.05	6.81	7.20	6.98	7.29	
67.2	57.6	52.2	47	62.7	75.5	97.5	
0.1	0.1	0.3	3.1	3.9	3.7	3.5	
100	80	80	130	130	120	100	
0.22	0.18	0.18	0.29	0.29	0.27	0.22	

Sample ID	MT Aquatic Life Standard[1]	WS-5	WS-5	WS-5	WS-5	WS-5	WS-5	WS-5	WS-5	WS-5	WS-5	WS-5	WS-5
Date		9/28/2009	10/26/2009	11/24/2009	12/16/2009	6/30/2010	7/29/2010	8/24/2010	9/30/2010	10/27/2010	11/24/2010	6/30/2011	7/27/2011
Alkalinity, Carbonate (mg CaCO3/L)	---	<0.52	<0.26	<0.26	<0.26	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Alkalinity, Total (mg CaCO3/L)	---	163	150	159	149	123	101	150	159	157	152	144	158
Alkalinity, Bicarbonate (mg CaCO3/L	---	163	150	159	149	123	101	150	159	157	152	144	158
Aluminum (mg/L)	0.087	0.023	0.015	0.035	0.10	0.062	0.043	0.034	0.051	0.047	0.62	0.024	0.023
Aluminum (mg/L)-Dissolved	---	0.0041	0.0026 J	0.0028 J	0.0028 J	0.0066	0.0026 J	0.0033 J	0.0042	<0.0020	0.0046	0.0049	0.0045
Antimony (mg/L)	---	<0.00025	<0.00025	<0.00025	<0.00025	0.00019 J	<0.00016	0.00020 J	0.00030 J	<0.00016	0.00024 J	0.00016 J	0.00011 J
Antimony (mg/L)-Dissolved	---	<0.00025	<0.00025	<0.00025	<0.00025	0.00016 J	<0.00016	<0.00016	0.00029 J	<0.00016	<0.00016	0.00014 J	0.00012 J
Arsenic (mg/L)	0.15	0.0019	0.0016	0.0015	0.0022	0.0024	0.0049	0.0019	0.0019	0.0020	0.0034	0.0022	0.0021
Arsenic (mg/L)-Dissolved	---	0.0018	0.0016	0.0013	0.0017	0.0022	0.0045	0.0018	0.0016	0.0016	0.0015	0.0022	0.0019
Barium (mg/L)	---	0.0099	0.0091	0.0091	0.0091	0.011	0.0061	0.010	0.010	0.0094	0.012	0.010	0.010
Barium (mg/L)-Dissolved	---	0.011	0.0093	0.0093	0.0073	0.0088	0.0056	0.0097	0.010	0.0091	0.0082	0.010	0.010
Beryllium (mg/L)	---	<0.00010	<0.00010	<0.00010	<0.00010	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000020	<0.000020
Beryllium (mg/L)-Dissolved	---	<0.00010	<0.00010	<0.00010	<0.00010	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	0.000025 J	<0.000020
Bismuth (mg/L)	---	<0.00025	<0.00025	<0.00025	<0.00025	<0.000020	<0.000020	<0.000020	0.000024 J	<0.000020	0.000087 J	<0.000020	<0.000020
Bismuth (mg/L)-Dissolved	---	<0.00025	<0.00025	<0.00025	<0.00025	<0.000020	<0.000020	<0.000020	0.000062 J	<0.000020	0.000028 J	<0.000020	<0.000020
Boron (mg/L)	---	0.0050	0.0037 J	0.0034 J	0.0065	0.0050	0.0037 J	0.0041 J	0.0031 J	0.0038 J	0.0036 J	0.0034 J	0.0038 J
Boron (mg/L)-Dissolved	---	0.0045 J	0.0042 J	0.0036 J	0.0049 J	0.0034 J	<0.00018	0.0067	0.0046 J	0.0041 J	0.0028 J	0.0051	0.0044 J
Cadmium (mg/L)	0.000097 h	0.000063 J	0.000049 J	0.000046 J	<0.000040	<0.000020	0.000020 J	0.000071 J	0.000072 J	0.000057 J	0.00015	0.000090	0.000067 J
Cadmium (mg/L)-Dissolved	---	0.000060 J	0.000041 J	0.000061 J	<0.000040	0.000053 J	<0.000020	0.000059 J	0.000045 J	0.000036 J	0.000051 J	0.00011	0.00010
Calcium (mg/L)-Dissolved	---	32.7	31.3	36.6	36.6	27.9	23.6	33.8	34.2	35.4	32.6	37.6	37.5
Chloride (mg/L)	230*	0.90 J	1.5	0.77 J	0.67 J	1.4 J	0.88 J	1.1	1.1	1.1	1.0	1.1 J	1.2 J
Chromium (mg/L)	0.0277 h	<0.00025	0.00026 J	<0.00025	0.00027 J	<0.00024	0.00046 J	<0.00024	0.00049 J	0.00031 J	0.00092	0.00027 J	0.00040 J
Chromium (mg/L)-Dissolved	---	0.00035 J	<0.00025	<0.00025	<0.00025	0.0018	0.00026 J	0.00095	0.00069	<0.00024	0.00044 J	0.00062	0.00078
Copper (mg/L)	0.00285 h	0.0011	0.00071	0.00096	0.00083	0.0022	0.0012	0.0011	0.0010	0.0012	0.0061	0.0016	0.0013
Copper (mg/L)-Dissolved	---	0.00082	0.00070	0.00080	0.00043 J	0.0015	0.0016	0.00080	0.00068	0.00089	0.00069	0.0026	0.0016
Fluoride (mg/L)	---	0.050 J	0.25	0.13	0.096 J	0.088 J	0.050 J	0.053 J	0.043 J	<0.023	0.048 J	0.074 J	0.087 J
Iron (mg/L)	1.0	0.072	0.049 J	0.060	0.17	0.11	0.054	0.058	0.15	0.078	0.84	0.042 J	0.045 J
Iron (mg/L)-Dissolved	---	<0.025	<0.025	<0.025	<0.025	0.025 J	0.0058 J	0.018 J	0.013 J	0.0085 J	0.018 J	0.017 J	0.016 J
Lead (mg/L)	0.000545 h	0.00011	0.000077 J	0.000062 J	0.00015	0.00010	0.000081 J	0.000064 J	0.000094 J	0.000086 J	0.00076	0.00015	<0.000050
Lead (mg/L)-Dissolved	---	<0.000050	<0.000050	<0.000050	<0.000050	0.000046 J	<0.000020	0.000057 J	0.000084 J	<0.000020	0.000083 J	<0.000050	0.000055 J
Magnesium-Dissolved (mg/L)	---	17.5	16.1	16.5	16.9	13.4	9.6	16.5	17.2	17.8	15.9	15.6	17.9
Manganese (mg/L)	---	0.0057	0.0038	0.0045	0.0077	0.0056	0.0027	0.0041	0.0057	0.0046	0.032	0.0032	0.0032
Manganese (mg/L)-Dissolved	---	0.0023	0.0011	0.013	0.00027 J	0.0019	0.00055	0.0017	0.0011	0.0013	0.0020	0.0014	0.013
Mercury (ug/L)	0.91000	0.019 J	0.028 J	<0.014	0.047 J	<0.021	<0.021	0.021 J	<0.021	<0.020	<0.020	<0.037	<0.037
Mercury (ug/L)-Dissolved	---	0.015 J	<0.014	<0.014	<0.014	0.12 J	<0.021	<0.021	0.048 J	<0.020	<0.020	<0.037	<0.037
Nickel (mg/L)	0.0161 h	<0.00025	<0.00025	<0.00025	<0.00025	0.00020 J	<0.00019	<0.00019	0.00027 J	0.00023 J	0.00068	0.00023 J	0.00027 J
Nickel (mg/L)-Dissolved	---	0.00033 J	<0.00025	0.00050	<0.00025	0.00045 J	0.00021 J	0.00084	0.00031 J	0.00021 J	0.00047 J	0.00041 J	0.00094
Nitrate, as N (mg/L)	---	0.15	0.24	0.22	0.16	0.097	0.070	0.099	0.10	0.13	0.15	0.21	0.16
Nitrite, as N (mg/L)	---	<0.0030	<0.0030	0.0046 J	0.0060 J	0.0027 J	<0.00047	0.0011 J	<0.00047	<0.00047	0.0015 J	<0.0050	<0.0050
Nitrogen, Ammonia, as N (mg/L)	---	<0.0080	0.020	<0.0080	0.010 J	<0.0080	<0.0080	<0.0070	0.010 J	<0.0070	0.010 J	<0.020	0.052
Nitrogen, Kjeldahl, Total (mg/L)	---	0.34	0.17 J	<0.072	0.11 J	0.24	0.18	0.14	<0.077	0.085 J	0.58	0.22	0.095 J
Nitrogen, NO2 plus NO3Nitrite, (mg/	---	0.15	0.24	0.22	0.16	0.10	0.070	0.13	0.10	0.13	0.15	0.21	0.16
Oil and Grease (mg/L)	---	<2.5	<2.5	<2.6	0.40 J	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.6	<1.6
Orthophosphate (mg/L)	---	0.0032 J	0.0015	0.0069	0.0089	0.0014	0.0085	0.0021	0.00053 J	0.0036	0.0036	0.0028	0.0072
pH Lab (s.u.)	6.5 - 9.0*	8.2	8.2	8.3	8.4	8.1	8.1	8.0	8.2	8.0	8.3	8.2	8.2
Phosphorus, total (mg/L)	---	0.0096	0.0075	0.012	0.027	0.010	0.016	0.0070	0.012	0.011	0.092	0.0086	0.010
Potassium-Dissolved (mg/L)	---	1.8	1.7	1.6	2.0	1.7	1.5	1.8	1.8	1.8	1.6	1.7	1.8
Selenium (mg/L)	0.005	<0.00025	<0.00025	<0.00025	<0.00025	<0.00010	0.00014 J	0.00017 J	<0.00010	0.00014 J	0.00027 J	<0.00022	<0.00022
Selenium (mg/L)-Dissolved	---	<0.00025	<0.00025	<0.00025	<0.00025	0.00010 J	0.00023 J	0.00012 J	<0.00010	<0.00010	0.00014 J	0.00031 J	<0.00022
Silver (mg/L)	0.000374 h	<0.00025	<0.00025	<0.00025	<0.00025	<0.000071	<0.000071	<0.000071	0.00024 J	<0.000071	0.000097 J	<0.000070	<0.000070
Silver (mg/L)-Dissolved	---	<0.00025	<0.00025	<0.00025	<0.00025	<0.000071	<0.000071	<0.000071	0.00051	<0.000071	<0.000071	<0.000070	<0.000070
Sodium-Dissolved (mg/L)	---	2.2	2.3	2.6	1.9	2.1	1.6	2.3	2.2	2.4	2.1	2.2	2.5
Specific Conductance (µhmos/cm)	---	306	305	312	295	257	208	302	298	286	306	286	295
Strontium (mg/L)	---	0.048	0.046	0.044	0.071	0.043	0.030	0.051	0.050	0.049	0.045	0.048	0.055
Strontium (mg/L)-Dissolved	---	0.049	0.048	0.045	0.066	0.039	0.027	0.050	0.048	0.048	0.041	0.047	0.051
Sulfate (mg/L)	---	8.8	9.5	11.3	14.5	7.4	5.4	8.8	8.7	9.3	8.3	8.0	8.6
Thallium (mg/L)	---	<0.00025	<0.00025	<0.00025	<0.00025	<0.000050	<0.000050	0.000066 J	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thallium (mg/L)-Dissolved	---	<0.00025	<0.00025	<0.00025	<0.00025	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
TDS (mg/L)	---	154	145	171	185	158	127	181	172	169	130	157	174
Total Hardness (mg CaCO3/L)	---	154	144	159	161	125	98.4	153	156	162	147	158	167
Total Inorganic Nitrogen (mg/L)	---	0.15	0.26	0.22	0.17	0.10	0.070	0.13	0.11	0.13	0.16	0.23	0.21
Total Suspended Solids (mg/L)	---	3.1	1.7	2.0	3.5	2.7	2.8	2.0	3.1	2.8	42.4	6.9	1.6
Turbidity (NTU)	---	1.3	0.86	0.91	1.6	1.2	1.2	1.0	1.4	0.75	3.3	0.63	0.62
Uranium (mg/L)	---	0.00051	0.00043 J	0.00044 J	0.00079	0.00040 J	<0.00025	0.00046 J	0.00045 J	0.00047 J	0.00047 J	0.00044 J	0.00051
Uranium (mg/L)-Dissolved	---	0.00051	0.00044 J	0.00043 J	0.00073	0.00050	<0.00025	0.00042 J	0.00048 J	0.00040 J	0.00040 J	0.00048 J	0.0015
Zinc (mg/L)	0.037 h	<0.0025	<0.0025	<0.0025	0.0026 J	0.0028 J	<0.0013	0.0016 J	0.0028 J	0.0014 J	0.0071	<0.0025	<0.0025
Zinc (mg/L)-Dissolved	---	<0.0025	<0.0025	0.0029 J	<0.0025	0.0035 J	0.0018 J	0.0021 J	0.0033 J	0.0027 J	0.0083	<0.0025	0.0037 J
Field pH (s.u.)	6.5 - 9.0*	8.21	8.17	8.17	8.18	7.65	7.95	7.78	7.91	7.94	7.88	7.65	7.54
Field EC (µS/cm)	---	324	310	312	310	262	203	315	322	306	295	270	285
Field DO (mg/L)	---												
Field ORP (mV)	---												
Field Turbidity (NTU)	---												
Field Temperature (C)	---	6.9	1.7	0.9	1.2	5.7	5.4	5.2	4.3	1.6	2.1	2.4	2.7
Flow (gpm)		45	35	35	35	60	50	40	30	50	30	100	90
Flow (cfs)	---	0.10	0.08	0.08	0.08	0.13	0.11	0.09	0.07	0.11	0.07	0.22	0.20
Stat Lvl (ft)	---												

Cobalt (mg/L)	---												
Cobalt (mg/L)-Dissolved	---												
Molybdenum (mg/L)	---												
Molybdenum (mg/L)-Dissolved	---												
Vanadium (mg/L)	---												
Vanadium (mg/L)-Dissolved	---												

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

WS-5	WS-5	WS-5
8/30/2011	9/27/2011	10/20/2011
<2.5	<2.5	<2.5
156	145	147
154	145	147
0.047	0.11	0.048
0.0044	0.0051	0.0063
0.00011 J	0.00011 J	0.00012 J
0.00011 J	0.00010 J	0.00014 J
0.0020	0.0024	0.0017
0.0020	0.0020	0.0016
0.011	0.011	0.010
0.0097	0.010	0.010
<0.000020	<0.000020	<0.000020
<0.000020	0.000036 J	<0.000020
<0.000020	<0.000020	0.000026 J
<0.000020	<0.000020	<0.000020
0.0062	0.0067	0.0050
0.0076	0.0073	0.0077
0.000033 J	0.000066 J	0.000051 J
0.000034 J	0.000036 J	0.000036 J
35.8	41.1	30.4
1.1	1.0	1.0
0.00033 J	0.00031 J	0.00035 J
0.00038 J	0.0011	0.0014
0.0011	0.0016	0.00096
0.012	0.0011	0.00092
0.11	0.11 J	0.11 J
0.072	0.16	0.077
0.013 J	0.020 J	0.031 J
0.000085 J	0.00020	0.000071 J
0.00084	0.000056 J	0.000057 J
16.4	17.9	17.6
0.0053	0.010	0.0053
0.0032	0.0021	0.0022
<0.037	0.097 J	0.059 J
<0.037	0.087 J	<0.037
0.00014 J	0.00014 J	0.00017 J
0.00020 J	0.00053	0.00046 J
0.14	0.14	0.12
<0.0050	<0.0050	<0.0050
0.082	<0.020	<0.020
0.15	0.20	0.065 J
0.14	0.14	0.12
<1.6	<1.6	<1.7
0.0031	0.0042	0.0029
8.0	8.1	8.0
0.0089	0.021	0.0055
1.9	1.9	1.8
<0.00022	<0.00022	<0.00022
<0.00022	0.00036 J	<0.00022
<0.000070	<0.000070	0.00012 J
<0.000070	<0.000070	<0.000070
2.1	2.4	2.3
304	288	309
0.051	0.051	0.050
0.050	0.051	0.050
8.3	8.1	8.3
<0.000050	<0.000050	<0.000050
<0.000050	<0.000050	<0.000050
175	179	180
157	177	149
0.22	0.15	0.12
2.3	10.0	3.0
0.80	1.7	0.68
0.00048 J	0.00045 J	0.00045 J
0.00043 J	0.00045 J	0.00048 J
<0.0025	<0.0025	<0.0025
0.0026 J	0.0038 J	0.0038 J
7.46	7.77	
305	399	
3.0	4.5	
50	30	
0.11	0.07	

Sample ID	MT Aquatic Life Standard[1]	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6
Date		11/26/2008	9/28/2009	10/26/2009	11/24/2009	12/16/2009	1/27/2010	2/24/2010	3/22/2010	4/27/2010	5/25/2010	6/30/2010	7/29/2010
Alkalinity, Carbonate (mg CaCO3/L)	---	<4	<0.52	3.6 J	<0.26	<0.26	<5.0	<5.0	<5.0	<2.5	<2.5	2.7 J	<2.5
Alkalinity, Total (mg CaCO3/L)	---	260	243	225	219	226	212	215	211	188	163	185	224
Alkalinity, Bicarbonate (mg CaCO3/L	---	320	243	221	219	226	212	215	211	188	163	182	224
Aluminum (mg/L)	0.087	0.04	0.011	<0.0020	0.38	0.051	0.099	0.27	0.052	0.019	0.017	0.015	0.0092
Aluminum (mg/L)-Dissolved	---		<0.0020	<0.0020	0.026	0.0025 J	0.0029 J	0.0037 J	0.0046	0.0079	0.021	0.0064	0.0025 J
Antimony (mg/L)	---	<0.003	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00032 J	0.00030 J	0.00029 J	0.00031 J	0.00030 J	0.00025 J
Antimony (mg/L)-Dissolved	---		<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00026 J	0.00031 J	0.00032 J	0.00022 J
Arsenic (mg/L)	0.15	<0.003	0.0024	0.0019	0.0029	0.0025	0.0020	0.0024	0.0019	0.0027	0.0023	0.0033	0.0029
Arsenic (mg/L)-Dissolved	---		0.0024	0.0020	0.0025	0.0021	0.0018	0.0019	0.0019	0.0025	0.0024	0.0031	0.0027
Barium (mg/L)	---	0.022	0.034	0.029	0.030	0.032	0.031	0.031	0.029	0.026	0.022	0.029	0.033
Barium (mg/L)-Dissolved	---		0.032	0.028	0.033	0.028	0.030	0.028	0.028	0.025	0.022	0.026	0.032
Beryllium (mg/L)	---	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011 J	<0.00010	<0.000069	<0.000069	<0.000069	<0.000069
Beryllium (mg/L)-Dissolved	---		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000069	<0.000069	<0.000069	<0.000069
Bismuth (mg/L)	---	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000020	0.000043 J	<0.000020	<0.000020
Bismuth (mg/L)-Dissolved	---		<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000020	<0.000020	<0.000020	<0.000020
Boron (mg/L)	---	<0.1	0.0056	0.0039 J	0.0035 J	0.0057	<0.0025	0.0067	0.0047 J	0.0014 J	0.0038 J	0.0069	0.0071
Boron (mg/L)-Dissolved	---		0.0046 J	0.0044 J	0.0041 J	0.0047 J	<0.0025	0.0035 J	0.0057	0.0022 J	0.0039 J	0.0056	0.0012 J
Cadmium (mg/L)	0.000097 h	<0.00008	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000020	<0.000020	<0.000020	<0.000020
Cadmium (mg/L)-Dissolved	---		<0.000040	<0.000040	0.000092	<0.000040	<0.000040	<0.000040	<0.000040	<0.000020	<0.000020	<0.000020	<0.000020
Calcium (mg/L)-Dissolved	---	66	57.1	51.3	62.0	55.8	55.2	51.4	53.2	46.8	45.0	49.0	56.5
Chloride (mg/L)	230*	1	1.5	1.4	1.5	1.2	1.1	1.1	0.98 J	1.1	1.0	1.4 J	1.2
Chromium (mg/L)	0.0277 h	<0.001	0.00044 J	<0.00025	0.00040 J	<0.00025	<0.00025	0.00059	<0.00025	0.00026 J	0.00048 J	0.00042 J	0.00050
Chromium (mg/L)-Dissolved	---		0.00030 J	<0.00025	<0.00025	<0.00025	0.00038 J	0.00032 J	<0.00025	<0.00024	0.00047 J	0.00058	0.00037 J
Copper (mg/L)	0.00285 h	0.001	0.00099	0.00066	0.078	0.0015	0.0014	0.0026	0.0013	0.0014	0.0014	0.0017	0.0012
Copper (mg/L)-Dissolved	---		0.0018	0.00074	0.067	0.0011	0.00091	0.0013	0.0012	0.0013	0.0015	0.0015	0.0025
Fluoride (mg/L)	---	<0.1	0.030 J	0.13	0.15	0.074 J	0.071 J	0.11	0.072 J	0.050 J	0.16 J	0.093 J	0.084 J
Iron (mg/L)	1.0	0.05	0.16	0.034 J	0.42	0.074	0.093	0.27	0.050	0.023 J	0.029 J	0.020 J	0.011 J
Iron (mg/L)-Dissolved	---		<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.013 J	0.049 J	0.0099 J	0.0056 J
Lead (mg/L)	0.000545 h	<0.0005	0.000054 J	<0.000050	0.00089	0.00022	0.00019	0.00041	0.00011	0.00061	0.000052 J	0.000026 J	<0.000020
Lead (mg/L)-Dissolved	---		<0.000050	<0.000050	0.00040	<0.000050	<0.000050	<0.000050	0.000086 J	<0.000020	<0.000020	<0.000020	<0.000020
Magnesium-Dissolved (mg/L)	---	24	21.6	19.6	20.8	22.1	20.8	20.0	19.7	16.7	16.8	17.4	20.6
Manganese (mg/L)	---	0.018	0.0072	0.0017	0.044	0.019	0.010	0.028	0.0055	0.0067	0.0027	0.0032	0.0027
Manganese (mg/L)-Dissolved	---		0.0012	0.00063	0.047	0.0012	0.00063	0.00079	0.0016	0.00066	0.0026	0.0018	0.0013
Mercury (ug/L)	0.91000	<1	0.015 J	0.028 J	<0.014	0.017 J	<0.014	<0.014	<0.014	<0.021	<0.021	<0.021	<0.021
Mercury (ug/L)-Dissolved	---		0.018 J	0.021 J	<0.014	<0.014	<0.014	<0.014	<0.014	0.030 J	0.021 J	0.13 J	<0.021
Nickel (mg/L)	0.0161 h	<0.01	0.00046 J	0.00025 J	0.00056	0.00030 J	0.00029 J	0.00057	0.00027 J	0.00042 J	0.00058	0.00049 J	0.00038 J
Nickel (mg/L)-Dissolved	---		0.00045 J	0.00029 J	0.0013	<0.00025	0.00031 J	0.00028 J	0.0011	0.00042 J	0.00062	0.00057	0.00044 J
Nitrate, as N (mg/L)	---		0.0080 J	0.049	0.060	0.030	0.020	0.019	0.0075 J	0.097	0.25	0.16	0.10
Nitrite, as N (mg/L)	---		<0.0030	<0.0030	<0.0030	0.0070 J	<0.00047	0.019 J	<0.0018	0.0027 J	0.0056 J	0.0027 J	<0.00047
Nitrogen, Ammonia, as N (mg/L)	---	<0.1	<0.0080	0.020	<0.0080	0.010 J	<0.0080	<0.0030	0.020	<0.0080	0.010 J	<0.0080	<0.0080
Nitrogen, Kjeldahl, Total (mg/L)	---	<0.5	0.94	<0.072	<0.072	0.31	0.58	<0.0080	0.34	0.42	0.39	0.36	0.40
Nitrogen, NO2 plus NO3Nitrite, (mg/	---	<0.05	0.0080 J	0.049	0.060	0.030	0.020	0.38	0.0075 J	0.10	0.26	0.16	0.10
Oil and Grease (mg/L)	---		<2.5	<2.5	<2.8	1.8 J	<2.5	<2.5	<2.6	<1.0	<1.0	<1.0	<1.0
Orthophosphate (mg/L)	---	<0.01	0.0024 J	<0.00050	0.0051	0.017	na	0.0015	0.0023	0.0053	0.00090 J	0.00050 J	0.0019
pH Lab (s.u.)	6.5 - 9.0*	7.8	8.2	8.3	8.0	7.7	7.5	7.6	7.8	8.0	8.1	8.2	8.3
Phosphorus, total (mg/L)	---	0.01	0.0078	0.0044	0.022	0.040	0.010	0.0084	0.0075	0.011	0.0025	0.0045	0.0070
Potassium-Dissolved (mg/L)	---	1	1.7	1.6	1.6	1.6	1.6	1.5	1.6	1.7	1.3	1.5	1.7
Selenium (mg/L)	0.005	<0.001	<0.00025	<0.00025	0.00026 J	<0.00025	<0.00025	0.00041 J	0.00027 J	0.00021 J	0.00041 J	0.00013 J	0.00014 J
Selenium (mg/L)-Dissolved	---		<0.00025	<0.00025	<0.00025	0.00025 J	<0.00025	<0.00025	0.00028 J	0.00035 J	0.00019 J	0.00021 J	0.00026 J
Silver (mg/L)	0.000374 h	<0.0005	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000071	<0.000071	<0.000071	<0.000071
Silver (mg/L)-Dissolved	---		<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000071	<0.000071	<0.000071	<0.000071
Sodium-Dissolved (mg/L)	---	2	2.6	2.2	2.7	2.4	2.6	2.6	2.4	1.8	1.8	2.0	2.4
Specific Conductance (µhmos/cm)	---	513	425	416	407	439	412	394	383	373	364	376	439
Strontium (mg/L)	---	<0.1	0.088	0.083	0.083	0.092	0.085	0.084	0.082	0.072	0.071	0.073	0.090
Strontium (mg/L)-Dissolved	---		0.087	0.081	0.088	0.085	0.084	0.082	0.081	0.068	0.076	0.068	0.087
Sulfate (mg/L)	---	8	6.8	9.0	10.7	10.2	9.8	9.2	8.9	8.6	9.8	8.2	7.4
Thallium (mg/L)	---	<0.0002	<0.00025	<0.00025	<0.00025	<0.00025	<0.000050	<0.000050	0.000079 J	<0.000050	<0.000050	<0.000050	<0.000050
Thallium (mg/L)-Dissolved	---		<0.00025	<0.00025	<0.00025	<0.00025	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
TDS (mg/L)	---	278	225	213	231	256	223	242	215	208	190	226	256
Total Hardness (mg CaCO3/L)	---	264	231	209	240	230	223	211	214	186	182	194	226
Total Inorganic Nitrogen (mg/L)	---		<0.030	0.070	0.060	0.040 J	<0.030	0.020 J	0.028 J	0.10	0.27	0.16	0.10
Total Suspended Solids (mg/L)	---	<10	8.0	<0.49	10.8	15.6	1.4	34.7	0.90 J	<5.0	<0.50	<0.50	0.59 J
Turbidity (NTU)	---		0.70	<0.050	3.2	12.6	0.94	1.6	2.0	0.51	0.52	0.37	0.33
Uranium (mg/L)	---	<0.001	0.0012	0.0012	0.0014	0.0014	0.0016	0.0019	0.0024	0.0014	0.0011	0.0011	0.0013
Uranium (mg/L)-Dissolved	---		0.0012	0.0012	0.00068	0.0014	0.0016	0.0017	0.0024	0.0014	0.0012	0.0014	0.0012
Zinc (mg/L)	0.037 h	<0.01	<0.0025	<0.0025	0.0066	<0.0025	<0.0025	0.0033 J	<0.0025	0.0022 J	<0.0013	<0.0013	<0.0013
Zinc (mg/L)-Dissolved	---		<0.0025	<0.0025	0.022	<0.0025	0.0025 J	0.0026 J	0.0078	0.0030 J	<0.0013	0.0031 J	0.0019 J
Field pH (s.u.)	6.5 - 9.0*	7.49	8.06	8.31	7.78	7.87	7.45	7.25	7.23	7.84	7.11	7.63	7.90
Field EC (µS/cm)	---	425	457	450	464	460	435	444	421	362	352	374	426
Field DO (mg/L)	---	11.5											
Field ORP (mV)	---	206											
Field Turbidity (NTU)	---	4.1											
Field Temperature (C)	---	0.1	10.6	1.9	1.4	1.2	1.9	0.7	0.2	1.6	2.1	8.8	9.8
Flow (gpm)		3	10	2	2	2	1	1	5	10	60	60	40
Flow (cfs)	---	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.13	0.13	0.09
Stat Lvl (ft)	---												

Cobalt (mg/L)	---												
Cobalt (mg/L)-Dissolved	---	<0.01											
Molybdenum (mg/L)	---												
Molybdenum (mg/L)-Dissolved	---	<0.005											
Vanadium (mg/L)	---												
Vanadium (mg/L)-Dissolved	---	<0.1											

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6	WS-6
8/24/2010	9/30/2010	10/27/2010	11/24/2010	12/16/2010	1/27/2011	3/30/2011	4/28/2011	6/1/2011	6/30/2011	7/27/2011	8/30/2011	9/27/2011	10/20/2011	11/8/2011
<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	9.9	16.7	<2.5	<2.5	<2.5
229	204	208	201	204	228	207	181	134	203	237	240	243	241	239
229	204	208	201	204	228	207	181	134	203	227	223	243	241	239
0.013	0.014	0.0053	0.024	0.25	0.037	0.14	0.015	0.049	0.035	0.022	0.080	0.096	0.059	0.064
0.0029 J	0.0046	0.055	0.0064	0.0056	0.0037 J	0.0024 J	0.0040	0.014	0.0033 J	0.0046	0.0039 J	0.0033 J	0.0071	0.0056
0.00027 J	0.00018 J	0.00055	0.00029 J	0.00024 J	0.00023 J	0.00025 J	0.00023 J	0.00032 J	0.00028 J	0.00024 J	0.00019 J	0.00020 J	0.00024 J	0.00019 J
0.00021 J	0.00024 J	0.00028 J	<0.00016	0.00026 J	0.00026 J	0.00024 J	0.00023 J	0.00032 J	0.00026 J	0.00023 J	0.00018 J	0.00020 J	0.00025 J	0.00022 J
0.0030	0.0040	0.0036	0.0034	0.0050	0.0021	0.0024	0.0021	0.0036	0.0039	0.0043	0.0045	0.0041	0.0035	0.0032
0.0028	0.0038	0.0034	0.0014	0.0035	0.0020	0.0019	0.0022	0.0035	0.0035	0.0041	0.0042	0.0035	0.0030	0.0027
0.034	0.025	0.022	0.021	0.024	0.025	0.027	0.026	0.019	0.029	0.031	0.030	0.029	0.026	0.025
0.032	0.024	0.022	0.0085	0.021	0.024	0.027	0.027	0.018	0.027	0.032	0.027	0.027	0.028	0.024
<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000020	<0.000020	<0.000020	<0.000020	0.000038 J	<0.000020	<0.000020
<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000020	<0.000020	0.000024 J	<0.000020	<0.000020	0.000093 J	<0.000020	<0.000020
<0.000020	<0.000020	0.000063 J	<0.000020	0.000024 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000022 J	<0.000020	<0.000020	<0.000020	<0.000020
0.0062	0.0054	0.0035 J	0.0033 J	<0.00018	0.0037 J	0.0067	0.0069	0.0064	0.0050 J	0.0064	0.0081	0.0092	0.0063	0.0067
0.0077	0.0049 J	0.0042 J	0.00082 J	0.0040 J	0.0041 J	0.0046 J	0.0050	0.0049 J	0.0070	0.0070	0.0095	0.0087	0.0089	0.0052
<0.000020	<0.000020	0.000020 J	<0.000020	0.000040 J	<0.000020	<0.000020	<0.000020	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
<0.000020	<0.000020	<0.000020	<0.000020	0.000021 J	<0.000020	<0.000020	0.000034 J	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
59.6	53.8	54.0	21.6	48.2	54.2	49.7	60.8	38.3	62.4	63.7	61.6	73.1	53.0	63.8
1.7	1.3	1.3	1.2	1.2	1.3	1.3	1.5	1.5	1.2	1.2 J	1.4 J	1.6	1.2	1.3	1.2
0.00026 J	0.00073	0.00028 J	0.0012	0.0030	0.00028 J	<0.00024	0.00030 J	0.00017 J	0.00070	0.00036 J	0.00019 J	0.00035 J	0.00027 J	0.00036 J
0.00094	0.0015	0.00035 J	0.0010	0.0029	0.00027 J	0.00089	0.0014	0.00037 J	0.00095	0.00055	0.00054	0.00045 J	0.00095	0.00077
0.0014	0.0012	0.0011	0.0012	0.0022	0.0012	0.0017	0.00096	0.0019	0.0016	0.0014	0.0013	0.0013	0.0012	0.0011
0.0013	0.0013	0.0011	0.0018	0.00092	0.0011	0.00076	0.0010	0.0018	0.0022	0.0012	0.0011	0.0016	0.0011	0.0011
0.062 J	0.050 J	0.045 J	0.065 J	0.063 J	0.080 J	0.067 J	0.17	0.058 J	0.084 J	0.10	0.13	0.13 J	0.12 J	0.13 J
0.020 J	0.018 J	0.012 J	0.034 J	0.46	0.057	0.23	0.026 J	0.062	0.074	0.044 J	0.10	0.21	0.14	0.15
0.011 J	0.012 J	0.0091 J	0.019 J	0.011 J	0.0046 J	0.0083 J	0.013 J	0.020 J	0.016 J	0.0096 J	0.0082 J	0.0072 J	0.012 J	0.010 J
0.000042 J	0.000097 J	0.000033 J	0.000050 J	0.00040	0.000067 J	0.00029	0.000022 J	0.000080 J	0.000095 J	0.000073 J	0.00015	0.00027	0.00013	0.00014
0.000051 J	0.000095 J	0.000031 J	0.00017	0.000046 J	<0.000020	0.000090 J	0.00045	0.00011	0.000052 J	<0.000050	0.000076 J	<0.000050	<0.000050	0.00022
21.3	19.7	20.7	8.4	19.4	20.2	18.6	18.8	13.3	18.8	23.4	21.7	24.4	26.3	24.1
0.0040	0.0030	0.0019	0.0048	0.072	0.011	0.043	0.0047	0.0082	0.021	0.011	0.030	0.057	0.034	0.036
0.0016	0.00098	0.0019	0.0038	0.00094	0.00096	0.0016	0.0021	0.0028	0.0047	0.0028	0.0065	0.0042	0.0033	0.0023
<0.021	<0.021	<0.020	<0.020	<0.020	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	0.097 J	0.057 J	0.082 J
<0.021	0.058 J	<0.020	<0.020	<0.020	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	0.079 J	<0.037	0.084 J
0.00036 J	0.00046 J	0.00047 J	0.00040 J	0.00065	0.00028 J	0.00034 J	0.00026 J	0.00046 J	0.00072	0.00051	0.00053	0.00062	0.00058	0.00062
0.00070	0.00074	0.00046 J	0.0014	0.00052	0.00035 J	0.00048 J	0.00062	0.00056	0.00079	0.00064	0.00051	0.00086	0.00064	0.00057
0.16	0.050	0.080	0.19	0.27	0.33	0.52	0.34	0.090	0.080	0.080	0.030	0.040	0.030	0.078
0.0014 J	0.00050 J	<0.00047	0.0019 J		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
<0.0070	0.010 J	0.010 J	0.010 J	<0.0070	0.020	0.040	0.090	0.068	0.040	0.047	0.062	<0.020	0.025 J	<0.020
0.42	0.32	0.24	0.36	0.62	0.18	0.52	0.21	0.28	0.31	0.22	0.28	0.33	0.22	0.18
0.16	0.050	0.080	0.19	0.27	0.33	0.52	0.34	0.090	0.080	0.080	0.030	0.040	0.030	0.080
<1.0		<1.0	<1.0	<1.0	<1.0	<1.1	<1.0	<1.7	<1.7	<1.7	<1.6	<1.6	<1.7	<1.6
0.0012	<0.00050	0.0021	0.0012	0.0038	0.0023	0.011	0.0033	0.00063 J	0.0018	0.0078	0.0033	0.0038	0.00074 J	0.0048
8.2	8.2	8.2	8.3	8.1	7.9	8.1	8.2	8.2	8.3	8.3	8.2	8.2	8.3	8.1
0.0084	0.0086	0.0047	0.0062	0.023	0.0094	0.032	0.0076	0.012	0.019	0.010	0.013	0.018	0.0079	0.018
2.0	1.7	1.5	0.61	1.9	1.5	1.6	1.6	1.3	1.5	2.0	1.8	1.7	1.7	1.5
<0.00010	<0.00010	0.00019 J	0.00018 J	0.00037 J	0.00020 J	0.00039 J	0.00032 J	<0.00022	<0.00022	0.00022 J	<0.00022	<0.00022	<0.00022	<0.00022
0.00011 J	<0.00010	0.00016 J	<0.00010	0.00015 J	<0.00010	0.00020 J	0.00024 J	<0.00022	<0.00022	<0.00022	0.00026 J	0.00042 J	<0.00022	<0.00022
<0.000071	<0.000071	0.00042 J	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	0.000072 J	<0.000070
<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070
2.3	2.1	2.2	0.93	2.5	2.1	2.2	2.5	1.6	2.1	2.4	2.0	2.2	2.2	2.0
445	390	373	386	393	420	404	355	275	384	442	431	461	483	413
0.091	0.073	0.071	0.067	0.066	0.080	0.075	0.078	0.050	0.077	0.088	0.080	0.084	0.079	0.082
0.090	0.071	0.066	0.027	0.061	0.076	0.074	0.078	0.049	0.075	0.083	0.083	0.081	0.083	0.079
8.4	14.1	9.7	10.8	11.5	9.8	10.2	9.4	6.7	6.2	6.6	6.3	6.7	7.2	8.1
0.000055 J	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
270	229	243	184	221	128	225	210	169	228	257	258	265	293	259
237	216	220	88.7	200	219	201	229	150	233	255	243	283	241	259
0.16	0.060	0.090	0.20	0.27	0.35	0.56	0.43	0.16	0.12	0.13	0.092	0.055	0.055	0.090
0.79 J	<0.49	0.60 J	1.1	9.5	1.8	4.7	1.2	1.6	2.8	1.4	3.1	6.0	3.7	3.9
0.96	0.41	0.67	0.61	4.2	0.83	3.3	1.7	1.3	1.4	0.86	1.2	2.2	1.1	0.99
0.0013	0.00094	0.0014	0.0015	0.0015	0.0015	0.0015	0.0014	0.00084	0.0012	0.0016	0.0014	0.0018	0.0022	0.0027
0.0012	0.0010	0.0014	0.00061	0.0016	0.0016	0.0015	0.0014	0.00084	0.0013	0.0025	0.0014	0.0018	0.0026	0.0027
0.0015 J	0.0028 J	<0.0013	<0.0013	0.0028 J	0.0014 J	0.0021 J	<0.0013	<0.0025	<0.0025	<0.0025	0.0029 J	<0.0025	<0.0025	<0.0025
0.0020 J	0.0026 J	0.0026 J	0.015	<0.0013	<0.0013	<0.0013	0.0036 J	0.0033 J	<0.0025	<0.0025	<0.0025	0.0042 J	0.0026 J	0.0049 J
7.98	7.99	7.86	7.65	7.43	7.21	7.33	7.44	7.55	7.85	7.70	7.98	7.80	7.91	7.82
456	403	399	388	405	432	405	382	397	402	423	465	598	565	494
7.6	6.5	1.6	0.8	0.5	0.8	1.4	1.5	4.5	11.4	7.8	3.4	7.5	2.1	1.7
30	40	40	30	30	10	20	60	80	80	40	30	25	25	25
0.07	0.09	0.09	0.07	0.07	0.02	0.04	0.13	0.18	0.18	0.09	0.07	0.06	0.06	0.06

WS-6	WS-6	WS-6
12/12/2011	1/31/2012	2/27/2012
<2.5	<2.5	<2.5
243	228	244
243	228	244
0.18	0.22	0.34
0.0033 J	0.011	0.0028 J
0.00028 J	<0.00025	0.00028 J
0.00023 J	<0.00025	<0.00025
0.0040	0.0034	0.0033
0.0029	0.0015	0.0015
0.029	0.033	0.037
0.026	0.023	0.028
<0.000020	<0.000092	<0.000092
0.000022 J	<0.000092	<0.000092
0.000026 J	<0.00025	<0.00025
<0.000020	<0.00025	<0.00025
0.0055	0.0078	0.006
0.0056	0.0055	0.0062
0.000061 J	0.000056 J	0.000056 J
<0.000030	<0.000028	<0.000028
68.0	62.9	59.3
1.1	1.3	1.3
0.00087	0.00041 J	0.00072
0.00076	0.00041 J	0.00057
0.0021	0.0035	0.0039
0.0030	0.0014	0.002
0.075 J	0.11	0.11
0.41	0.46	0.75
0.0079 J	<0.025	0.17
0.00043	0.00064	0.0009
0.00021	0.00011	0.00017
27.1	19.4	21.4
0.098	0.14	0.14
0.00087	0.0020	0.0025
0.044 J	<0.037	<0.037
<0.037	<0.037	<0.037
0.00090	0.00058	0.00052
0.00042 J	<0.000091	0.00038 J
0.089	0.19	0.29
<0.0050	0.0021 J	0.00060 J
0.030 J	0.040 J	0.030 J
0.45	0.55	1.1
0.090	0.20	0.29
<1.7	<1.6	<1.6
0.0034	0.0033	0.0087
8.1	7.8	7.9
0.040	0.046	0.073
1.6	1.3	1.7
0.00027 J	0.00024 J	0.00052
<0.00022	0.00023 J	0.00026 J
0.000070 J	<0.00025	<0.00025
<0.000070	<0.00025	<0.00025
2.1	1.8	2.2
442	426	444
0.084	0.080	0.089
0.087	0.070	0.086
9.1	9.2	9.5
<0.000050	<0.000050	<0.000050
<0.000050	<0.000050	<0.000050
284	246	269
281	237	236
0.12	0.24	0.32
24.3	40.4	30.9
3.8	1.9	3.6
0.0023	0.0020	0.0021
0.0027	0.0018	0.0018
0.0039 J	0.0034 J	0.005
0.0037 J	0.0028 J	0.0045 J
7.81	7.82	7.39
477	494	268
0.6	0.6	0.1
25	20	30
0.06	0.04	0.07

Sample ID	MT Aquatic Life Standard[1]	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7
Date		9/28/2009	10/26/2009	11/24/2009	12/16/2009	1/27/2010	2/24/2010	3/22/2010	4/27/2010	5/25/2010	6/30/2010	7/29/2010	8/24/2010
Alkalinity, Carbonate (mg CaCO3/L)	---	<0.52	5.5	<0.26	1.8 J	<5.0	<5.0	<5.0	9.5	9.4	15.1	4.5 J	6.3
Alkalinity, Total (mg CaCO3/L)	---	199	191	189	190	182	182	186	202	175	210	187	186
Alkalinity, Bicarbonate (mg CaCO3/L	---	199	186	189	188	182	182	186	192	166	195	182	179
Aluminum (mg/L)	0.087	1.6	0.058	0.13	0.082	0.065	0.038	0.024	0.14	11.9	0.33	0.13	0.32
Aluminum (mg/L)-Dissolved	---	0.0042	0.0020 J	0.0065	0.0024 J	0.0033 J	0.0033 J	0.0033 J	0.0039 J	15.5	0.0048	0.0020 J	0.014
Antimony (mg/L)	---	0.00030 J	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00019 J	0.00042 J	<0.00016	<0.00016	0.00016 J
Antimony (mg/L)-Dissolved	---	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00016 J	0.00044 J	0.00016 J	<0.00016	<0.00016
Arsenic (mg/L)	0.15	0.031	0.0069	0.0089	0.0084	0.0062	0.0062	0.0065	0.0050	0.022	0.0051	0.0069	0.0069
Arsenic (mg/L)-Dissolved	---	0.0052	0.0047	0.0041	0.0043	0.0042	0.0043	0.0040	0.0038	0.025	0.0040	0.0045	0.0040
Barium (mg/L)	---	0.035	0.018	0.017	0.022	0.018	0.017	0.017	0.018	0.073	0.019	0.021	0.021
Barium (mg/L)-Dissolved	---	0.017	0.017	0.016	0.016	0.017	0.016	0.016	0.017	0.075	0.016	0.018	0.017
Beryllium (mg/L)	---	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000069	0.00035	<0.000069	<0.000069	<0.000069
Beryllium (mg/L)-Dissolved	---	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000069	0.00037	<0.000069	<0.000069	<0.000069
Bismuth (mg/L)	---	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000020	0.00030 J	<0.000020	<0.000020	<0.000020
Bismuth (mg/L)-Dissolved	---	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000020	0.00051	<0.000020	<0.000020	<0.000020
Boron (mg/L)	---	0.0087	0.0072	0.0071	0.23	<0.0025	0.0094	0.0097	0.0030 J	0.0047 J	0.0060	0.0077	0.0074
Boron (mg/L)-Dissolved	---	0.0069	0.0076	0.0077	0.0078	0.0058	0.0067	0.0079	0.0031 J	0.0051	0.0032 J	0.00082 J	0.0096
Cadmium (mg/L)	0.000097 h	0.00014	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000020	0.00021	<0.000020	<0.000020	<0.000020
Cadmium (mg/L)-Dissolved	---	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000020	0.00020	<0.000020	<0.000020	<0.000020
Calcium (mg/L)-Dissolved	---	38.6	34.9	38.0	36.8	37.7	36.1	37.8	39.5	50.7	42.3	37.2	42.6
Chloride (mg/L)	230*	2.5	0.91 J	1.3	0.71 J	0.58 J	0.54 J	0.51 J	0.43 J	0.77 J	1.3 J	1.1	1.1
Chromium (mg/L)	0.0277 h	0.0015	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00027 J	0.0093	0.00066	0.00040 J	0.00066
Chromium (mg/L)-Dissolved	---	0.00061	0.00034 J	<0.00025	<0.00025	0.00025 J	<0.00025	<0.00025	<0.00024	0.0099	0.0015	0.0012	0.00094
Copper (mg/L)	0.00285 h	0.022	0.0017	0.019	0.0020	0.0011	0.00088	0.00071	0.0010	0.042	0.0021	0.0017	0.0026
Copper (mg/L)-Dissolved	---	0.0022	0.00030 J	0.0059	0.00043 J	0.00066	0.00026 J	0.00050	0.00044 J	0.048	0.00060	0.00097	0.00049 J
Fluoride (mg/L)	---	0.040 J	0.12	0.16	0.079 J	0.090 J	0.092 J	0.084 J	0.054 J	0.17 J	0.082 J	0.096 J	0.075 J
Iron (mg/L)	1.0	2.9	0.23	0.40	0.27	0.17	0.16	0.18	0.22	14.6	0.47	0.27	0.49
Iron (mg/L)-Dissolved	---	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.0076 J	17.1	0.0049 J	0.0091 J	0.0072 J
Lead (mg/L)	0.000545 h	0.0067	0.00032	0.00042	0.00031	0.00013	0.000096 J	0.00011	0.00017	0.0060	0.00029	0.00035	0.00053
Lead (mg/L)-Dissolved	---	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000020	0.0067	0.000023 J	<0.000020	0.000046 J
Magnesium-Dissolved (mg/L)	---	23.8	21.6	21.6	25.6	24.4	24.1	24.6	24.1	36.5	25.1	23.2	26.5
Manganese (mg/L)	---	0.17	0.014	0.020	0.012	0.0061	0.0057	0.0063	0.0072	0.22	0.013	0.015	0.018
Manganese (mg/L)-Dissolved	---	0.0017	0.0012	0.0048	0.00069	0.0011	0.00092	0.0013	0.00098	0.20	0.0023	0.0017	0.0013
Mercury (ug/L)	0.91000	0.079 J	0.040 J	<0.014	0.043 J	0.022 J	<0.014	<0.014	0.028 J	<0.021	<0.021	<0.021	<0.021
Mercury (ug/L)-Dissolved	---	0.019 J	0.025 J	<0.014	<0.014	<0.014	<0.014	<0.014	0.026 J	<0.021	0.13 J	0.029 J	<0.021
Nickel (mg/L)	0.0161 h	0.0018	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00027 J	0.011	0.00039 J	0.00026 J	0.00032 J
Nickel (mg/L)-Dissolved	---	0.00080	<0.00025	0.00026 J	<0.00025	<0.00025	<0.00025	0.00046 J	<0.00019	0.014	0.00026 J	0.00056	0.00038 J
Nitrate, as N (mg/L)	---	0.20	0.18	0.17	0.16	0.15	0.14	0.15	0.17	0.13	0.17	0.12	0.14
Nitrite, as N (mg/L)	---	<0.0030	<0.0030	<0.0030	0.0050 J	<0.00047	<0.0030	<0.0018	0.0019 J	0.0041 J	0.0031 J	0.00057 J	0.0044 J
Nitrogen, Ammonia, as N (mg/L)	---	<0.0080	0.020	<0.0080	0.010 J	<0.0080	<0.0080	0.010 J	<0.0080	0.050	<0.0080	<0.0080	<0.0070
Nitrogen, Kjeldahl, Total (mg/L)	---	0.50	<0.072	<0.072	0.14 J	0.019	0.075 J	0.30	<0.038	0.82	0.075 J	0.20	0.060 J
Nitrogen, NO2 plus NO3Nitrite, (mg/	---	0.20	0.18	0.17	0.16	0.15	0.14	0.15	0.17	0.13	0.17	0.12	0.14
Oil and Grease (mg/L)	---	<2.5	<2.5	<2.8	0.61 J	<2.5	<2.5	<2.6	1.2 J	2.0 J	1.4 J	<1.0	<1.0
Orthophosphate (mg/L)	---	0.0014 J	<0.00050	0.0043	0.0029	0.0025	<0.00050	0.00090 J	0.014	0.0070	0.0034	0.0046	0.0028
pH Lab (s.u.)	6.5 - 9.0*	8.3	8.4	8.5	8.4	8.4	8.3	8.4	7.9	8.4	8.5	8.3	8.4
Phosphorus, total (mg/L)	---	0.012	0.0088	0.017	0.020	0.0063	0.0050	0.0060	0.0058	0.079	0.015	0.015	0.013
Potassium-Dissolved (mg/L)	---	3.0	2.9	2.7	2.9	2.9	2.9	2.9	2.6	7.8	2.7	3.0	3.0
Selenium (mg/L)	0.005	0.00041 J	<0.00025	<0.00025	0.00029 J	<0.00025	0.00027 J	0.00028 J	0.00022 J	0.00029 J	0.00020 J	0.00020 J	0.00031 J
Selenium (mg/L)-Dissolved	---	<0.00025	0.00028 J	<0.00025	0.00028 J	<0.00025	<0.00025	0.00032 J	0.00014 J	<0.00010	0.00020 J	0.00041 J	0.00023 J
Silver (mg/L)	0.000374 h	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071
Silver (mg/L)-Dissolved	---	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.000071	0.00011 J	0.00018 J	<0.000071	<0.000071
Sodium-Dissolved (mg/L)	---	2.9	2.8	2.8	2.8	2.7	2.8	2.7	1.9	1.7	1.7	2.6	2.5
Specific Conductance (µhmos/cm)	---	364	366	372	372	369	357	369	390	372	408	383	375
Strontium (mg/L)	---	0.088	0.087	0.092	0.11	0.095	0.093	0.092	0.071	0.090	0.055	0.085	0.082
Strontium (mg/L)-Dissolved	---	0.084	0.090	0.084	0.092	0.092	0.092	0.089	0.067	0.093	0.056	0.076	0.075
Sulfate (mg/L)	---	15.4	14.7	15.9	17.1	15.2	12.7	13.7	12.9	13.4	12.8	14.2	14.7
Thallium (mg/L)	---	0.00030 J	<0.00025	<0.00025	<0.00025	0.000084 J	0.000079 J	0.00014	0.00022	0.00056	0.00017	0.00035	0.00024
Thallium (mg/L)-Dissolved	---	<0.00025	<0.00025	<0.00025	<0.00025	0.000071 J	0.000068 J	0.000068 J	0.00020	0.00065	0.00020	0.00030	0.00019
TDS (mg/L)	---	182	170	194	225	167	196	186	205	198	215	203	211
Total Hardness (mg CaCO3/L)	---	194	176	184	197	195	189	196	198	277	209	188	216
Total Inorganic Nitrogen (mg/L)	---	0.20	0.25	0.17	0.17	0.15	0.14	0.16	0.17	0.18	0.17	0.12	0.14
Total Suspended Solids (mg/L)	---	81.4	8.0	12.5	14.4	6.9	2.7	1.4	<5.0	337	13.2	3.6	19.6
Turbidity (NTU)	---	33.2	3.0	4.0	2.7	2.5	2.0	1.9	4.4	415	3.6	5.1	6.1
Uranium (mg/L)	---	0.0016	0.0012	0.0011	0.0016	0.0013	0.0013	0.0012	0.0011	0.0016	0.0010	0.0014	0.0014
Uranium (mg/L)-Dissolved	---	0.0014	0.0012	0.0011	0.0013	0.0013	0.0012	0.0012	0.0011	0.0016	0.0015	0.0013	0.0012
Zinc (mg/L)	0.037 h	0.021	0.0042 J	0.0027 J	<0.0025	<0.0025	<0.0025	<0.0025	0.0016 J	0.033	0.0018 J	0.0015 J	0.0026 J
Zinc (mg/L)-Dissolved	---	0.0095	<0.0025	0.0033 J	<0.0025	0.0030 J	<0.0025	0.0040 J	0.0075	0.037	0.0020 J	0.0014 J	0.0019 J
Field pH (s.u.)	6.5 - 9.0*	8.4	8.46	8.31	8.3	7.12	8.2	7.99	8.03	7.58	8.28	8.28	8.18
Field EC (µS/cm)	---	394	390	391	390	384	380	375	388	355	393	372	378
Field DO (mg/L)	---												
Field ORP (mV)	---												
Field Turbidity (NTU)	---												
Field Temperature (C)	---	8.8	5.8	4.1	3.7	3.5	3.4	4.2	5.2	6.2	10.4	8.7	8.2
Flow (gpm)		40	50	40	40	30	40	50	60	75	50	150	100
Flow (cfs)	---	0.09	0.11	0.09	0.09	0.07	0.09	0.11	0.13	0.17	0.11	0.33	0.22
Stat Lvl (ft)	---												

Cobalt (mg/L)	---												
Cobalt (mg/L)-Dissolved	---												
Molybdenum (mg/L)	---												
Molybdenum (mg/L)-Dissolved	---												
Vanadium (mg/L)	---												
Vanadium (mg/L)-Dissolved	---												

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7	WS-7
9/30/2010	10/27/2010	11/24/2010	12/16/2010	1/27/2011	2/24/2011	3/30/2011	4/28/2011	6/1/2011	6/30/2011	7/27/2011	8/30/2011	9/27/2011	10/20/2011	11/8/2011
<2.5	9.2	4.5 J	9.1	<2.5	<2.5	5.5	<2.5	<2.5	<2.5	8.5	9.9	2.9 J	18.0	4.6 J
192	195	202	198	224	182	179	169	170	182	190	178	176	180	181
192	185	197	189	224	182	174	169	170	182	181	168	173	162	177
0.48	0.16	0.099	0.22	0.13	0.35	0.034	1.3	0.080	0.13	0.097	0.056	0.057	0.29	0.088
0.0092	<0.0020	0.0033 J	0.0054	0.0057	0.0043	0.0031 J	0.025	0.0062	0.011	0.011	0.0053	0.0028 J	0.0047	0.0081
0.00022 J	<0.00016	<0.00016	<0.00016	<0.00016	0.00019 J	0.00019 J	0.00032 J	0.00019 J	0.00020 J	0.00019 J	0.00015 J	0.00016 J	0.00016 J	0.00012 J
<0.00016	0.00019 J	<0.00016	<0.00016	<0.00016	0.00019 J	0.00017 J	0.00035 J	0.00020 J	0.00018 J	0.00020 J	0.00014 J	0.00012 J	0.00016 J	0.00011 J
0.0088	0.0071	0.0032	0.0081	0.0049	0.0076	0.0056	0.011	0.0075	0.0085	0.0096	0.0082	0.0076	0.0091	0.0070
0.0047	0.0049	0.0048	0.0050	0.0041	0.0045	0.0040	0.0059	0.0048	0.0052	0.0067	0.0058	0.0055	0.0046	0.0046
0.023	0.020	0.0088	0.021	0.016	0.021	0.014	0.026	0.013	0.015	0.014	0.013	0.015	0.016	0.015
0.018	0.018	0.016	0.019	0.016	0.018	0.014	0.014	0.012	0.014	0.014	0.013	0.014	0.015	0.013
<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	0.000094 J	<0.000020	<0.000020	<0.000020	<0.000020	0.000023 J	0.000022 J	<0.000020
<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
0.000028 J	0.000020 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000029 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000064 J	<0.000020
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
0.0059	0.0064	0.0028 J	0.0047 J	0.0048 J	0.0099	0.0089	0.0098	0.0094	0.0066	0.0063	0.0086	0.010	0.0094	0.0098
0.0061	0.0091	0.0054	0.010	0.0053	0.0082	0.0087	0.0089	0.0066	0.0086	0.0077	0.0098	0.0092	0.011	0.0079
0.000030 J	<0.000020	<0.000020	<0.000020	<0.000020	0.000028 J	<0.000020	0.000047 J	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00011	<0.000030	<0.000030	0.000047 J	<0.000030	<0.000030	<0.000030	<0.000030
40.0	40.6	35.6	38.3	44.0	36.6	36.0	44.6	39.2	43.8	40.7	38.7	44.1	34.9	38.8
1.1	1.1	1.0	1.0	0.95 J	1.2	1.3	1.1	0.97 J	1.2 J	1.2 J	1.1	1.0	1.0	1.0
0.00056	<0.00024	0.00037 J	0.00034 J	0.00058	0.00041 J	<0.00024	0.0019	0.00036 J	0.00042 J	0.00087	0.00048 J	0.00027 J	0.00072	0.00024 J
0.00080	<0.00024	0.00027 J	0.00039 J	0.00036 J	<0.00024	0.00055	0.0013	0.00050	0.00067	0.00056	0.00048 J	0.00082	0.00087	0.00068
0.0025	0.0013	0.00070	0.0017	0.0014	0.0028	0.0010	0.0070	0.0017	0.0037	0.0022	0.0014	0.0015	0.0032	0.0013
0.00041 J	0.00049 J	0.00028 J	0.00029 J	0.00076	0.00032 J	0.00045 J	0.0011	0.00083	0.00098	0.0018	0.00072	0.00066	0.00064	0.00095
0.061 J	0.054 J	0.068 J	0.079 J	0.064 J	0.090 J	0.089 J	0.086 J	0.087 J	0.091 J	0.11	0.13	0.13 J	0.13 J	0.15 J
0.67	0.27	0.15	0.35	0.17	0.53	0.16	2.0	0.30	0.40	0.35	0.25	0.21	0.59	0.20
0.0083 J	<0.0045	0.0047 J	0.0046 J	0.0048 J	<0.0045	0.035 J	0.057	0.058	0.065	0.078	0.046 J	0.018 J	0.0066 J	0.010 J
0.00053	0.00023	0.00012	0.00025	0.00015	0.00062	0.000058 J	0.0016	0.00017	0.00028	0.00019	0.00012	0.00016	0.00061	0.00021
0.000093 J	<0.000020	0.000023 J	0.000020 J	0.000020 J	0.00014	0.000082 J	0.0012	0.000062 J	<0.000050	0.00015	0.000056 J	<0.000050	<0.000050	0.00014
24.4	24.1	20.9	24.2	26.9	22.0	24.0	24.2	21.2	24.3	25.6	24.4	25.0	25.1	23.1
0.024	0.010	0.0047	0.013	0.0062	0.023	0.0022	0.076	0.0071	0.0091	0.0080	0.0052	0.0069	0.025	0.0083
0.0015	0.0022	0.0010	0.0015	0.00054	0.0012	0.0011	0.0041	0.0029	0.0021	0.023	0.0036	0.0032	0.0014	0.0014
<0.021	<0.020	<0.020	<0.020	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	0.096 J	0.062 J	0.089 J
<0.021	<0.020	<0.020	0.033 J	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	0.086 J	<0.037	0.084 J
0.00047 J	0.00026 J	0.00021 J	0.00033 J	0.00040 J	0.00091	<0.00019	0.0013	0.00020 J	0.00026 J	0.00045 J	0.00017 J	0.000098 J	0.00050	0.00014 J
0.00041 J	0.00027 J	0.00033 J	0.00038 J	0.00025 J	0.00058	0.00033 J	0.00066	0.00029 J	0.00036 J	0.0010	<0.000070	0.00031 J	0.00023 J	0.00018 J
0.17	0.16	0.19	0.19	0.27	0.18	0.16	0.15	0.15	0.13	0.18	0.19	0.19	0.19	0.20
0.0023 J	0.00050 J	0.0020 J		<0.0050	<0.0050	<0.0050	0.0053 J	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
0.020	<0.0070	0.010 J	0.010 J	0.010 J	<0.0070	0.030	0.090	0.073	0.035 J	0.045	0.037 J	<0.020	0.023 J	<0.020
<0.077	<0.038	0.10	0.13	0.080 J	0.080 J	0.21	0.16 J	0.19	0.27	0.060 J	0.16	0.065 J	0.080 J	0.050 J
0.17	0.16	0.19	0.19	0.27	0.18	0.16	0.16	0.15	0.13	0.18	0.19	0.19	0.19	0.20
<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.7
0.0029	0.0047	0.0020	0.0043	0.0030	0.0029	0.0010	0.016	0.0037 J	0.0026	0.0076	0.0028	0.0036	0.031	0.0036
8.4	8.3	8.6	8.5	8.4	8.3	8.5	8.4	8.4	8.5	8.4	8.3	8.4	8.2	8.3
0.025	0.014	0.013	0.0088	0.017	0.020	0.0088	0.044	0.012	0.021	0.018	0.013	0.0099	0.0071	0.012
2.7	2.7	2.3	3.0	2.6	2.7	3.2	3.7	2.9	3.0	3.7	3.4	3.3	3.4	3.3
<0.00010	0.00023 J	<0.00010	0.00028 J	0.00018 J	0.00027 J	0.00020 J	0.00016 J	<0.00022	0.00024 J	0.00023 J	<0.00022	<0.00022	<0.00022	0.00022 J
<0.00010	0.00014 J	0.00025 J	0.00020 J	<0.00010	0.00038 J	0.00016 J	0.00033 J	<0.00022	0.00037 J	<0.00022	0.00026 J	0.00034 J	0.00029 J	<0.00022
<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070
<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	0.000095 J	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070
2.3	2.5	2.1	3.1	1.4	2.4	2.1	2.4	2.2	2.3	2.8	2.4	2.4	2.4	2.4
364	357	380	385	423	375	340	334	358	381	353	341	340	375	332
0.072	0.071	0.029	0.099	0.065	0.083	0.078	0.085	0.067	0.079	0.092	0.084	0.092	0.091	0.093
0.068	0.067	0.058	0.091	0.062	0.077	0.074	0.082	0.063	0.076	0.087	0.088	0.090	0.090	0.089
13.6	13.3	11.4	12.9	13.7	13.0	14.1	14.5	14.5	14.4	16.2	14.9	13.9	13.6	13.7
0.00019	0.00017	0.000081 J	0.00018	0.000096 J	0.0011	0.00026	0.00021	0.00015	0.00014	0.00013	0.00012	0.00011	0.00013	0.00010
0.00015	0.00018	0.00014	0.00017	0.000097 J	0.00081	0.00027	0.00012	0.00012	0.000080 J	0.00014	0.00010	0.000092 J	0.00010	0.000085 J
200	181	195	216	94.0	189	187	188	171	197	200	197	205	187	180
200	201	175	195	221	182	189	211	185	209	207	197	213	190	192
0.19	0.16	0.20	0.20	0.28	0.18	0.19	0.25	0.22	0.16	0.22	0.23	0.21	0.21	0.22
17.8	23.6	8.1	7.4	7.8	21.9	2.0	94.8	8.4	6.9	4.7	3.1	3.0	11.4	3.6
8.1	2.5	3.3	2.6	0.73	3.5	1.6	86.2	2.9	3.3	2.9	2.0	2.4	1.6	1.3
0.0012	0.0012	0.00047 J	0.0011	0.00097	0.0015	0.0015	0.0019	0.0016	0.0015	0.0017	0.0016	0.0016	0.0016	0.0017
0.0012	0.0012	0.00086	0.0012	0.0011	0.0013	0.0015	0.0018	0.0015	0.0015	0.0026	0.0016	0.0016	0.0018	0.0016
0.0054	0.0020 J	0.0015 J	0.0023 J	0.0027 J	0.0038 J	<0.0013	0.0064	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.0041 J	<0.0025
0.0036 J	0.0017 J	0.0016 J	<0.0013	0.0014 J	0.0034 J	<0.0013	0.0033 J	<0.0025	<0.0025	0.0052	<0.0025	<0.0025	0.0025 J	0.0040 J
8.33	8.02	8.00	7.95	7.98	7.98	8.02	8.06	8.02	8.06	8.00	8.01	7.81	8.05	8.01
381	367	388	376	392	365	359	351	377	389	356	389	473	442	427
6.9	4.2	3.3	3.0	2.3	2.4	3.5	5.2	6.6	7.9	8.2	7.3	5.8	4.7	4.6
100	90	100	100	30	90	90	90	110	160	150	140	130	130	120
0.22	0.20	0.22	0.22	0.07	0.20	0.20	0.20	0.25	0.36	0.33	0.31	0.29	0.29	0.27

WS-7	WS-7	WS-7
12/12/2011	1/30/2012	2/27/2012
13.4	4.1 J	5.4
174	176	182
161	172	177
0.11	0.061	0.066
0.0038 J	0.0026 J	0.0024 J
0.00014 J	<0.00025	<0.00025
0.00014 J	<0.00025	<0.00025
0.0075	0.0076	0.0073
0.0047	0.0044	0.0041
0.014	0.015	0.015
0.014	0.013	0.013
<0.000020	<0.000092	<0.000092
<0.000020	<0.000092	<0.000092
<0.000020	<0.00025	<0.00025
0.000022 J	<0.00025	<0.00025
0.0080	0.0089	0.0087
0.0087	0.0075	0.0094
<0.000030	<0.000028	<0.000028
<0.000030	<0.000028	<0.000028
32.9	34.7	36.4
0.91 J	0.89 J	0.90 J
0.00067	0.00060	0.00044 J
0.00064	0.00039 J	0.00055
0.0020	0.0022	0.0014
0.0011	0.0013	0.0008
0.090 J	0.13	0.12
0.28	0.23	0.23
0.0051 J	<0.025	<0.025
0.00028	0.00026	0.00026
0.000084 J	0.00011	0.000084 J
22.1	23.4	23.9
0.014	0.0096	0.0071
0.0012	0.0013	0.0012
0.044 J	<0.037	<0.037
<0.037	<0.037	<0.037
0.00021 J	0.00039 J	<0.000091
0.00025 J	0.00025 J	0.00017 J
0.17	0.15	0.15
<0.0050	0.00016 J	0.0010 J
<0.019	<0.019	<0.013
0.060 J	0.076 J	0.039 J
0.17	0.15	0.15
<1.7	<1.6	<1.7
0.0059	0.0053	0.021
8.4	8.1	8.3
0.015	0.012	0.024
3.1	3.2	3
0.00023 J	<0.00022	<0.00022
0.00025 J	0.00030 J	<0.00022
<0.000070	<0.00025	<0.00025
0.000086 J	<0.00025	<0.00025
2.4	2.3	2.2
349	353	388
0.095	0.093	0.1
0.092	0.089	0.089
14.4	13.0	13.1
0.00012	0.000091 J	0.000089 J
0.000092 J	0.000069 J	0.000079 J
193	193	189
173	183	189
0.18	0.17	0.15
4.8	4.0	3.8
2.1	2.4	2
0.0015	0.0015	0.0017
0.0016	0.0015	0.0013
0.0029 J	0.011	0.0025 J
0.0034 J	0.0027 J	0.0026 J
8.10	8.05	8.13
382	201	366
4.6	4.1	1.2
120	105	105
0.27	0.23	0.23

Sample ID	MT Aquatic Life Standard[1]	WS-8	WS-8	WS-8	WS-8	WS-8	WS-8	WS-8
Date		4/27/2010	5/25/2010	6/30/2010	7/29/2010	8/24/2010	9/30/2010	10/27/2010
Alkalinity, Carbonate (mg CaCO3/L)	---	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Alkalinity, Total (mg CaCO3/L)	---	241	233	269	306	286	310	297
Alkalinity, Bicarbonate (mg CaCO3/L	---	241	233	269	306	286	310	297
Aluminum (mg/L)	0.087	0.31	0.042	0.031	0.23	0.12	0.070	0.28
Aluminum (mg/L)-Dissolved	---	0.0028 J	0.053	0.0044	0.0023 J	0.0036 J	0.0039 J	<0.0020
Antimony (mg/L)	---	0.00047 J	0.00036 J	0.00034 J	0.00021 J	0.00022 J	0.00016 J	0.00021 J
Antimony (mg/L)-Dissolved	---	0.00040 J	0.00036 J	0.00033 J	0.00018 J	0.00020 J	<0.00016	0.00026 J
Arsenic (mg/L)	0.15	0.0034	0.0033	0.0047	0.0065	0.0053	0.0047	0.0056
Arsenic (mg/L)-Dissolved	---	0.0023	0.0034	0.0044	0.0054	0.0043	0.0037	0.0031
Barium (mg/L)	---	0.035	0.028	0.039	0.034	0.045	0.035	0.034
Barium (mg/L)-Dissolved	---	0.030	0.029	0.034	0.031	0.041	0.032	0.030
Beryllium (mg/L)	---	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Beryllium (mg/L)-Dissolved	---	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Bismuth (mg/L)	---	0.000030 J	<0.000020	<0.000020	0.000025 J	0.000033 J	<0.000020	0.000035 J
Bismuth (mg/L)-Dissolved	---	<0.000020	0.000038 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Boron (mg/L)	---	<0.00018	0.0024 J	0.0052	0.0069	0.0053	0.0020 J	0.0027 J
Boron (mg/L)-Dissolved	---	<0.00018	0.0024 J	0.0027 J	<0.00018	0.0062	0.0028 J	0.0027 J
Cadmium (mg/L)	0.000097 h	0.000055 J	<0.000020	<0.000020	0.000036 J	0.000037 J	0.000027 J	0.000052 J
Cadmium (mg/L)-Dissolved	---	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000024 J
Calcium (mg/L)-Dissolved	---	57.0	62.3	66.4	70.2	73.6	74.0	74.7
Chloride (mg/L)	230*	1.1	0.87 J	1.3 J	1.2	1.6	1.4	1.5
Chromium (mg/L)	0.0277 h	0.00040 J	<0.00024	<0.00024	0.00061	0.00030 J	0.00032 J	0.00025 J
Chromium (mg/L)-Dissolved	---	<0.00024	<0.00024	0.0013	0.00031 J	0.00092	0.0012	<0.00024
Copper (mg/L)	0.00285 h	0.0029	0.0019	0.0020	0.0019	0.0017	0.0014	0.0022
Copper (mg/L)-Dissolved	---	0.0013	0.0020	0.0017	0.0024	0.0011	0.0012	0.00078
Fluoride (mg/L)	---	0.087 J	0.13 J	0.092 J	0.050 J	0.047 J	0.048 J	0.042 J
Iron (mg/L)	1.0	0.39	0.087	0.072	0.31	0.22	0.11	0.60
Iron (mg/L)-Dissolved	---	0.017 J	0.11	0.029 J	0.011 J	0.023 J	0.016 J	0.011 J
Lead (mg/L)	0.000545 h	0.00050	0.000087 J	0.000042 J	0.00049	0.00019	0.00017	0.00047
Lead (mg/L)-Dissolved	---	<0.000020	0.000089 J	<0.000020	0.0011	0.000042 J	0.00020	0.000026 J
Magnesium-Dissolved (mg/L)	---	21.2	25.0	24.8	28.7	27.5	29.5	29.9
Manganese (mg/L)	---	0.018	0.0054	0.013	0.047	0.041	0.015	0.036
Manganese (mg/L)-Dissolved	---	0.0040	0.0053	0.011	0.0058	0.022	0.0076	0.0054
Mercury (ug/L)	0.91000	<0.021	0.021 J	<0.021	<0.021	<0.021	<0.021	<0.020
Mercury (ug/L)-Dissolved	---	0.025 J	<0.021	0.076 J	0.033 J	<0.021	<0.021	<0.020
Nickel (mg/L)	0.0161 h	0.00061	0.00042 J	0.00051	0.00064	0.00043 J	0.00038 J	0.00051
Nickel (mg/L)-Dissolved	---	0.00038 J	0.00065	0.00046 J	0.00038 J	0.00078	0.00073	<0.00019
Nitrate, as N (mg/L)	---	0.95	<0.0050	0.0075 J	0.029	<0.0050	<0.0050	<0.0050
Nitrite, as N (mg/L)	---	0.0023 J	0.0037 J	0.0025 J	0.00057 J	0.0014 J	0.00063 J	<0.00047
Nitrogen, Ammonia, as N (mg/L)	---	<0.0080	<0.0080	<0.0080	0.010 J	<0.0070	0.010 J	0.020
Nitrogen, Kjeldahl, Total (mg/L)	---	0.60	0.45	0.39	0.88	0.37	0.21	0.50
Nitrogen, NO2 plus NO3Nitrite, (mg/	---	0.95	<0.0042	0.010	0.030	<0.0042	<0.0042	<0.0042
Oil and Grease (mg/L)	---	1.7 J	<1.0	<1.0	<1.0	<1.0	<1.0	<1.1
Orthophosphate (mg/L)	---	0.0060	0.0018	0.0012	0.0096	0.0032	0.0010	0.0034
pH Lab (s.u.)	6.5 - 9.0*	7.6	7.9	8.0	8.2	7.7	7.8	8.0
Phosphorus, total (mg/L)	---	0.019	0.052	0.0064	0.027	0.016	0.015	0.034
Potassium-Dissolved (mg/L)	---	1.4	1.2	1.2	1.0	1.5	1.2	1.1
Selenium (mg/L)	0.005	<0.00010	0.00029 J	<0.00010	0.00020 J	<0.00010	<0.00010	<0.00010
Selenium (mg/L)-Dissolved	---	<0.00010	0.00012 J	0.00010 J	0.00028 J	<0.00010	<0.00010	<0.00010
Silver (mg/L)	0.000374 h	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071
Silver (mg/L)-Dissolved	---	<0.000071	<0.000071	0.000074 J	<0.000071	<0.000071	<0.000071	<0.000071
Sodium-Dissolved (mg/L)	---	1.5	1.5	1.8	1.9	2.1	1.8	2.0
Specific Conductance (µhmos/cm)	---	483	446	490	532	553	536	511
Strontium (mg/L)	---	0.062	0.062	0.064	0.069	0.076	0.072	0.068
Strontium (mg/L)-Dissolved	---	0.056	0.068	0.062	0.065	0.074	0.066	0.066
Sulfate (mg/L)	---	7.0	7.5	5.1	6.4	3.9 J	7.0	8.6
Thallium (mg/L)	---	<0.000050	<0.000050	<0.000050	<0.000050	0.000055 J	<0.000050	<0.000050
Thallium (mg/L)-Dissolved	---	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
TDS (mg/L)	---	251	254	281	309	325	301	308
Total Hardness (mg CaCO3/L)	---	230	259	268	293	297	306	310
Total Inorganic Nitrogen (mg/L)	---	0.95	0 J	0.010 J	0.040 J	<0.015	<0.015	0.020 J
Total Suspended Solids (mg/L)	---	17.9	1.0	0.79 J	30.3	6.5	4.6	21.1
Turbidity (NTU)	---	2.5	1.9	0.44	8.2	4.4	1.8	3.5
Uranium (mg/L)	---	0.00075	0.00068	0.00052	0.00055	0.00049 J	0.00056	0.00067
Uranium (mg/L)-Dissolved	---	0.00073	0.00067	0.00076	0.00051	0.00048 J	0.00056	0.00065
Zinc (mg/L)	0.037 h	0.0042 J	<0.0013	0.0020 J	0.0023 J	<0.0013	0.0053	0.0021 J
Zinc (mg/L)-Dissolved	---	0.0018 J	0.0018 J	0.0022 J	0.0016 J	0.0021 J	0.0027 J	0.0045 J
Field pH (s.u.)	6.5 - 9.0*	7.34	7.1	6.16	8.05	7.36	7.57	7.58
Field EC (µS/cm)	---	455	446	493	542	553	568	552
Field DO (mg/L)	---							
Field ORP (mV)	---							
Field Turbidity (NTU)	---							
Field Temperature (C)	---	1.9	2.6	9.7	17.4	10.4	6.0	3.0
Flow (gpm)		20	30	25	1	1	2	2
Flow (cfs)	---	0.045	0.067	0.134	0.002	0.002	0.004	0.004
Stat Lvl (ft)	---							

Cobalt (mg/L)	---							
Cobalt (mg/L)-Dissolved	---							
Molybdenum (mg/L)	---							
Molybdenum (mg/L)-Dissolved	---							
Vanadium (mg/L)	---							
Vanadium (mg/L)-Dissolved	---							

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

Sample ID Date	MT Aquatic Life Standard[1]	WS-9 12/12/2011	WS-9 1/31/2012	WS-9 2/27/2012
Alkalinity, Carbonate (mg CaCO3/L)	---	<2.5	<2.5	<2.5
Alkalinity, Total (mg CaCO3/L)	---	151	152	155
Alkalinity, Bicarbonate (mg CaCO3/L	---	151	152	155
Aluminum (mg/L)	0.087	0.056	0.045	0.041
Aluminum (mg/L)-Dissolved	---	0.017	0.0086	0.0030 J
Antimony (mg/L)	---	0.000076 J	<0.00025	<0.00025
Antimony (mg/L)-Dissolved	---	0.000070 J	<0.00025	<0.00025
Arsenic (mg/L)	0.15	0.0037	0.0034	0.0032
Arsenic (mg/L)-Dissolved	---	0.0033	0.0028	0.0026
Barium (mg/L)	---	0.022	0.021	0.023
Barium (mg/L)-Dissolved	---	0.021	0.019	0.02
Beryllium (mg/L)	---	<0.000020	<0.000092	<0.000092
Beryllium (mg/L)-Dissolved	---	<0.000020	<0.000092	<0.000092
Bismuth (mg/L)	---	<0.000020	<0.00025	<0.00025
Bismuth (mg/L)-Dissolved	---	<0.000020	<0.00025	<0.00025
Boron (mg/L)	---	0.0039 J	0.0095	0.0047 J
Boron (mg/L)-Dissolved	---	0.0026 J	0.0056	0.0046 J
Cadmium (mg/L)	0.000097 h	<0.000030	<0.000028	<0.000028
Cadmium (mg/L)-Dissolved	---	<0.000030	<0.000028	<0.000028
Calcium (mg/L)-Dissolved	---	31.6	32.2	37.3
Chloride (mg/L)	230*	1.2	1.0	0.90 J
Chromium (mg/L)	0.0277 h	0.00039 J	0.00043 J	0.00030 J
Chromium (mg/L)-Dissolved	---	0.00071	0.0011	0.00053
Copper (mg/L)	0.00285 h	0.00083	0.0010	0.00099
Copper (mg/L)-Dissolved	---	0.00067	0.00063	0.00054
Fluoride (mg/L)	---	0.16 J	0.10	0.1
Iron (mg/L)	1.0	0.11	0.075	0.076
Iron (mg/L)-Dissolved	---	0.013 J	<0.025	<0.025
Lead (mg/L)	0.000545 h	0.00018	0.00020	0.00017
Lead (mg/L)-Dissolved	---	0.000055 J	0.000073 J	0.000059 J
Magnesium-Dissolved (mg/L)	---	17.9	16.2	16.4
Manganese (mg/L)	---	0.018	0.012	0.012
Manganese (mg/L)-Dissolved	---	0.0017	0.0018	0.0019
Mercury (ug/L)	0.91000	0.040 J	<0.037	<0.037
Mercury (ug/L)-Dissolved	---	<0.037	<0.037	<0.037
Nickel (mg/L)	0.0161 h	0.00011 J	0.00013 J	<0.000091
Nickel (mg/L)-Dissolved	---	0.00015 J	<0.000091	0.00015 J
Nitrate, as N (mg/L)	---	0.11	0.11	0.12
Nitrite, as N (mg/L)	---	<0.0050	0.0018 J	0 J
Nitrogen, Ammonia, as N (mg/L)	---	0.020 J	<0.013	<0.013
Nitrogen, Kjeldahl, Total (mg/L)	---	0.24	0.12	0.15
Nitrogen, NO2 plus NO3Nitrite, (mg/	---	0.11	0.11	0.12
Oil and Grease (mg/L)	---	<1.6	<1.6	<1.6
Orthophosphate (mg/L)	---	0.0028	0.0044	0.042
pH Lab (s.u.)	6.5 - 9.0*	7.9	7.8	8
Phosphorus, total (mg/L)	---	0.0086 J	0.012	0.011
Potassium-Dissolved (mg/L)	---	1.7	1.7	1.7
Selenium (mg/L)	0.005	<0.00022	<0.00022	<0.00022
Selenium (mg/L)-Dissolved	---	<0.00022	<0.00022	<0.00022
Silver (mg/L)	0.000374 h	<0.000070	<0.00025	<0.00025
Silver (mg/L)-Dissolved	---	<0.000070	<0.00025	<0.00025
Sodium-Dissolved (mg/L)	---	2.4	2.2	2.2
Specific Conductance (µhmos/cm)	---	301	301	317
Strontium (mg/L)	---	0.068	0.063	0.07
Strontium (mg/L)-Dissolved	---	0.064	0.060	0.063
Sulfate (mg/L)	---	6.8	6.3	6.2
Thallium (mg/L)	---	<0.000050	<0.000050	<0.000050
Thallium (mg/L)-Dissolved	---	<0.000050	<0.000050	<0.000050
TDS (mg/L)	---	177	167	174
Total Hardness (mg CaCO3/L)	---	152	147	161
Total Inorganic Nitrogen (mg/L)	---	0.13	0.12	0.13
Total Suspended Solids (mg/L)	---	3.7	2.6	2.3
Turbidity (NTU)	---	2.0	1.1	1.3
Uranium (mg/L)	---	0.0016	0.0017	0.0019
Uranium (mg/L)-Dissolved	---	0.0016	0.0016	0.0015
Zinc (mg/L)	0.037 h	<0.0025	<0.0025	<0.0025
Zinc (mg/L)-Dissolved	---	0.0034 J	0.0037 J	0.0032 J
Field pH (s.u.)	6.5 - 9.0*	7.7	7.78	7.78
Field EC (µS/cm)	---	335	324	320
Field DO (mg/L)	---			
Field ORP (mV)	---			
Field Turbidity (NTU)	---			
Field Temperature (C)	---	-0.4	-0.6	-0.6
Flow (gpm)		80	60	50
Flow (cfs)	---	0.18	0.13	0.11
Stat Lvl (ft)	---			

Cobalt (mg/L)	---			
Cobalt (mg/L)-Dissolved	---			
Molybdenum (mg/L)	---			
Molybdenum (mg/L)-Dissolved	---			
Vanadium (mg/L)	---			
Vanadium (mg/L)-Dissolved	---			

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

Sample ID	MT Groundwater Standard[2]	BHH08-01	BHH08-01
Date		12/4/2008	12/9/2008
		805'	1085'
Alkalinity, Carbonate (mg CaCO3/L)	---	<4	<4
Alkalinity, Total (mg CaCO3/L)	---	200	200
Alkalinity, Bicarbonate (mg CaCO3/L	---	240	230
Aluminum (mg/L)	---	0.22	12.11
Aluminum (mg/L)-Dissolved	---	<0.03	0.28
Antimony (mg/L)	---	<0.003	<0.003
Antimony (mg/L)-Dissolved	0.006	<0.003	<0.003
Arsenic (mg/L)	---	<0.003	<0.003
Arsenic (mg/L)-Dissolved	0.01	<0.003	<0.003
Barium (mg/L)	---	0.022	0.062
Barium (mg/L)-Dissolved	2	0.017	0.011
Beryllium (mg/L)	---	<0.001	<0.001
Beryllium (mg/L)-Dissolved	0.004	<0.001	<0.001
Bismuth (mg/L)	---		
Bismuth (mg/L)-Dissolved	---		
Boron (mg/L)	---	<0.1	<0.1
Boron (mg/L)-Dissolved	---	<0.1	<0.1
Cadmium (mg/L)	---	<0.00008	<0.00008
Cadmium (mg/L)-Dissolved	0.005	<0.00008	<0.00008
Calcium (mg/L)-Dissolved	---	40	37
Chloride (mg/L)	250 s*	<1	<1
Chromium (mg/L)	---	0.003	0.024
Chromium (mg/L)-Dissolved	---	<0.001	0.001
Copper (mg/L)	---	0.005	0.037
Copper (mg/L)-Dissolved	1.3	<0.001	<0.001
Fluoride (mg/L)	4	<0.1	0.1
Iron (mg/L)	---	3.28	20.52
Iron (mg/L)-Dissolved	0.3 s	<0.03	0.67
Lead (mg/L)	---	0.0016	0.0032
Lead (mg/L)-Dissolved	0.015	<0.0005	<0.0005
Magnesium-Dissolved (mg/L)	---	23	25
Manganese (mg/L)	---	0.089	0.208
Manganese (mg/L)-Dissolved	0.05 s	0.011	0.056
Mercury (ug/L)	---	<1	<1
Mercury (ug/L)-Dissolved	0.002	<0.05	<0.05
Nickel (mg/L)	---	<0.01	0.02
Nickel (mg/L)-Dissolved	0.1	<0.01	<0.01
Nitrate, as N (mg/L)	10		
Nitrite, as N (mg/L)	1		
Nitrogen, Ammonia, as N (mg/L)	---	<0.1	<0.1
Nitrogen, Kjeldahl, Total (mg/L)	---	<0.5	<0.5
Nitrogen, NO2 plus NO3Nitrite, (mg/	10	0.98	0.54
Oil and Grease (mg/L)	---		
Orthophosphate (mg/L)	---	0.02	1.03
pH Lab (s.u.)	6.5 - 8.5 s*	8.4	8.5
Phosphorus, total (mg/L)	---	0.01	0.96
Potassium-Dissolved (mg/L)	---	2	4
Selenium (mg/L)	---	<0.001	<0.001
Selenium (mg/L)-Dissolved	0.05	<0.001	<0.001
Silver (mg/L)	---	<0.0005	<0.0005
Silver (mg/L)-Dissolved	0.1	<0.0005	<0.0005
Sodium-Dissolved (mg/L)	---	1	1
Specific Conductance (µhmos/cm)	---	339	344
Strontium (mg/L)	---	<0.1	0.1
Strontium (mg/L)-Dissolved	4.0	<0.1	<0.1
Sulfate (mg/L)	250 s*	6	7
Thallium (mg/L)	---	<0.0002	<0.0002
Thallium (mg/L)-Dissolved	0.002	<0.0002	<0.0002
TDS (mg/L)	---	185	180
Total Hardness (mg CaCO3/L)	---	194	194
Total Inorganic Nitrogen (mg/L)	---		
Total Suspended Solids (mg/L)	500 s*	115	408
Turbidity (NTU)	---	97.3	276
Uranium (mg/L)	---	<0.001	0.004
Uranium (mg/L)-Dissolved	0.03	<0.001	0.003
Zinc (mg/L)	---	0.01	0.02
Zinc (mg/L)-Dissolved	2.0	<0.01	<0.01

Field pH (s.u.)	6.5 - 8.5 s*	8.35	8.44
Field EC (µS/cm)	---		
Field DO (mg/L)	---	6.7	8.1
Field ORP (mV)	---	129	
Field Turbidity (NTU)	---	97.3	276
Field Temperature (C)	---	9.7	9.1
Flow (cfs)	---		
Stat Lvl (ft)	---	620.1	

Cobalt (mg/L)	---	<0.01	0.01
Cobalt (mg/L)-Dissolved	---	<0.01	<0.01
Molybdenum (mg/L)	---	<0.005	<0.005
Molybdenum (mg/L)-Dissolved	---	<0.005	<0.005
Vanadium (mg/L)	---	<0.1	<0.1
Vanadium (mg/L)-Dissolved	---	<0.1	<0.1

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids; NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

Sample ID	MT Groundwater Standard[2]	BHH09-01
Date		07/28/09 820'
Alkalinity, Carbonate (mg CaCO3/L)	---	<4
Alkalinity, Total (mg CaCO3/L)	---	190
Alkalinity, Bicarbonate (mg CaCO3/L	---	230
Aluminum (mg/L)	---	96.64
Aluminum (mg/L)-Dissolved	---	0.05
Antimony (mg/L)	---	0.044
Antimony (mg/L)-Dissolved	0.006	0.006
Arsenic (mg/L)	---	0.499
Arsenic (mg/L)-Dissolved	0.01	0.005
Barium (mg/L)	---	0.258
Barium (mg/L)-Dissolved	2	0.076
Beryllium (mg/L)	---	0.002
Beryllium (mg/L)-Dissolved	0.004	<0.001
Bismuth (mg/L)	---	
Bismuth (mg/L)-Dissolved	---	
Boron (mg/L)	---	0.1
Boron (mg/L)-Dissolved	---	<0.1
Cadmium (mg/L)	---	0.00162
Cadmium (mg/L)-Dissolved	0.005	<0.00008
Calcium (mg/L)-Dissolved	---	25
Chloride (mg/L)	250 s*	<1
Chromium (mg/L)	---	0.163
Chromium (mg/L)-Dissolved	---	<0.001
Copper (mg/L)	---	0.411
Copper (mg/L)-Dissolved	1.3	0.004
Fluoride (mg/L)	4	0.2
Iron (mg/L)	---	123.2
Iron (mg/L)-Dissolved	0.3 s	0.07
Lead (mg/L)	---	0.0314
Lead (mg/L)-Dissolved	0.015	<0.0005
Magnesium-Dissolved (mg/L)	---	22
Manganese (mg/L)	---	2.743
Manganese (mg/L)-Dissolved	0.05 s	0.041
Mercury (ug/L)	---	<1
Mercury (ug/L)-Dissolved	0.002	<0.05
Nickel (mg/L)	---	0.07
Nickel (mg/L)-Dissolved	0.1	<0.01
Nitrate, as N (mg/L)	10	
Nitrite, as N (mg/L)	1	
Nitrogen, Ammonia, as N (mg/L)	---	<0.1
Nitrogen, Kjeldahl, Total (mg/L)	---	<0.5
Nitrogen, NO2 plus NO3Nitrite, (mg	10	0.47
Oil and Grease (mg/L)	---	
Orthophosphate (mg/L)	---	0.02
pH Lab (s.u.)	6.5 - 8.5 s*	8.5
Phosphorus, total (mg/L)	---	0.40
Potassium-Dissolved (mg/L)	---	3
Selenium (mg/L)	---	0.003
Selenium (mg/L)-Dissolved	0.05	<0.001
Silver (mg/L)	---	0.0006
Silver (mg/L)-Dissolved	0.1	<0.0005
Sodium-Dissolved (mg/L)	---	4
Specific Conductance (µhmos/cm)	---	334
Strontium (mg/L)	---	0.6
Strontium (mg/L)-Dissolved	4.0	<0.1
Sulfate (mg/L)	250 s*	20
Thallium (mg/L)	---	0.0043
Thallium (mg/L)-Dissolved	0.002	<0.0002
TDS (mg/L)	---	172
Total Hardness (mg CaCO3/L)	---	154
Total Inorganic Nitrogen (mg/L)	---	
Total Suspended Solids (mg/L)	500 s*	663
Turbidity (NTU)	---	215
Uranium (mg/L)	---	0.027
Uranium (mg/L)-Dissolved	0.03	<0.001
Zinc (mg/L)	---	0.29
Zinc (mg/L)-Dissolved	2.0	0.02

Field pH (s.u.)	6.5 - 8.5 s*	8.24
Field EC (µmhos/cm)	---	288
Field DO (mg/L)	---	
Field ORP (mV)	---	
Field Turbidity (NTU)	---	
Field Temperature (C)	---	11.7
Flow (cfs)	---	
Stat Lvl (ft)	---	

Cobalt (mg/L)	---	<0.02
Cobalt (mg/L)-Dissolved	---	<0.01
Molybdenum (mg/L)	---	0.065
Molybdenum (mg/L)-Dissolved	---	0.007
Vanadium (mg/L)	---	0.2
Vanadium (mg/L)-Dissolved	---	<0.1

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids; NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

Sample ID	MT Groundwater Standard[2]	BHH09-02
Date		8/4/2009
		600'
Alkalinity, Carbonate (mg CaCO3/L)	---	<4
Alkalinity, Total (mg CaCO3/L)	---	190
Alkalinity, Bicarbonate (mg CaCO3/L	---	230
Aluminum (mg/L)	---	
Aluminum (mg/L)-Dissolved	---	<0.03
Antimony (mg/L)	---	
Antimony (mg/L)-Dissolved	0.006	<0.003
Arsenic (mg/L)	---	
Arsenic (mg/L)-Dissolved	0.01	0.004
Barium (mg/L)	---	
Barium (mg/L)-Dissolved	2	0.011
Beryllium (mg/L)	---	
Beryllium (mg/L)-Dissolved	0.004	0.001
Bismuth (mg/L)	---	
Bismuth (mg/L)-Dissolved	---	
Boron (mg/L)	---	
Boron (mg/L)-Dissolved	---	<0.1
Cadmium (mg/L)	---	
Cadmium (mg/L)-Dissolved	0.005	<0.00008
Calcium (mg/L)-Dissolved	---	27
Chloride (mg/L)	250 s*	1
Chromium (mg/L)	---	
Chromium (mg/L)-Dissolved	---	<0.001
Copper (mg/L)	---	
Copper (mg/L)-Dissolved	1.3	0.005
Fluoride (mg/L)	4	0.1
Iron (mg/L)	---	
Iron (mg/L)-Dissolved	0.3 s	<0.03
Lead (mg/L)	---	
Lead (mg/L)-Dissolved	0.015	<0.0005
Magnesium-Dissolved (mg/L)	---	21
Manganese (mg/L)	---	
Manganese (mg/L)-Dissolved	0.05 s	0.034
Mercury (ug/L)	---	
Mercury (ug/L)-Dissolved	0.002	<0.05
Nickel (mg/L)	---	
Nickel (mg/L)-Dissolved	0.1	<0.01
Nitrate, as N (mg/L)	10	
Nitrite, as N (mg/L)	1	
Nitrogen, Ammonia, as N (mg/L)	---	<0.1
Nitrogen, Kjeldahl, Total (mg/L)	---	<0.5
Nitrogen, NO2 plus NO3Nitrite, (mg	10	0.49
Oil and Grease (mg/L)	---	
Orthophosphate (mg/L)	---	0.02
pH Lab (s.u.)	6.5 - 8.5 s*	8.3
Phosphorus, total (mg/L)	---	0.12
Potassium-Dissolved (mg/L)	---	5
Selenium (mg/L)	---	
Selenium (mg/L)-Dissolved	0.05	<0.001
Silver (mg/L)	---	
Silver (mg/L)-Dissolved	0.1	<0.0005
Sodium-Dissolved (mg/L)	---	2
Specific Conductance (µhmos/cm)	---	325
Strontium (mg/L)	---	
Strontium (mg/L)-Dissolved	4.0	<0.1
Sulfate (mg/L)	250 s*	15
Thallium (mg/L)	---	
Thallium (mg/L)-Dissolved	0.002	<0.0002
TDS (mg/L)	---	184
Total Hardness (mg CaCO3/L)	---	151
Total Inorganic Nitrogen (mg/L)	---	
Total Suspended Solids (mg/L)	500 s*	938
Turbidity (NTU)	---	75.5
Uranium (mg/L)	---	
Uranium (mg/L)-Dissolved	0.03	0.005
Zinc (mg/L)	---	
Zinc (mg/L)-Dissolved	2.0	<0.01

Field pH (s.u.)	6.5 - 8.5 s*	7.94
Field EC (µS/cm)	---	261
Field DO (mg/L)	---	
Field ORP (mV)	---	
Field Turbidity (NTU)	---	
Field Temperature (C)	---	12
Flow (cfs)	---	
Stat Lvl (ft)	---	

Cobalt (mg/L)	---	
Cobalt (mg/L)-Dissolved	---	<0.01
Molybdenum (mg/L)	---	
Molybdenum (mg/L)-Dissolved	---	0.007
Vanadium (mg/L)	---	
Vanadium (mg/L)-Dissolved	---	<0.1

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

Sample ID	MT Groundwater Standard[2]	BHH09-04
Date		11/3/2009 1120'
Alkalinity, Carbonate (mg CaCO3/L)	---	<4
Alkalinity, Total (mg CaCO3/L)	---	170
Alkalinity, Bicarbonate (mg CaCO3/l	---	210
Aluminum (mg/L)	---	3.580
Aluminum (mg/L)-Dissolved	---	<0.03
Antimony (mg/L)	---	0.014
Antimony (mg/L)-Dissolved	0.006	0.014
Arsenic (mg/L)	---	0.018
Arsenic (mg/L)-Dissolved	0.01	<0.003
Barium (mg/L)	---	0.018
Barium (mg/L)-Dissolved	2	0.007
Beryllium (mg/L)	---	<0.001
Beryllium (mg/L)-Dissolved	0.004	<0.001
Bismuth (mg/L)	---	
Bismuth (mg/L)-Dissolved	---	
Boron (mg/L)	---	<0.1
Boron (mg/L)-Dissolved	---	<0.1
Cadmium (mg/L)	---	0.00014
Cadmium (mg/L)-Dissolved	0.005	<0.00008
Calcium (mg/L)-Dissolved	---	32
Chloride (mg/L)	250 s*	<1
Chromium (mg/L)	---	0.005
Chromium (mg/L)-Dissolved	---	<0.001
Copper (mg/L)	---	0.041
Copper (mg/L)-Dissolved	1.3	<0.001
Fluoride (mg/L)	4	<0.1
Iron (mg/L)	---	10.9
Iron (mg/L)-Dissolved	0.3 s	<0.03
Lead (mg/L)	---	0.0027
Lead (mg/L)-Dissolved	0.015	<0.0005
Magnesium-Dissolved (mg/L)	---	24
Manganese (mg/L)	---	0.43
Manganese (mg/L)-Dissolved	0.05 s	0.021
Mercury (ug/L)	---	<1
Mercury (ug/L)-Dissolved	0.002	<0.05
Nickel (mg/L)	---	<0.01
Nickel (mg/L)-Dissolved	0.1	<0.01
Nitrate, as N (mg/L)	10	
Nitrite, as N (mg/L)	1	
Nitrogen, Ammonia, as N (mg/L)	---	<0.1
Nitrogen, Kjeldahl, Total (mg/L)	---	<0.5
Nitrogen, NO2 plus NO3Nitrite, (mg	10	0.34
Oil and Grease (mg/L)	---	
Orthophosphate (mg/L)	---	0.02
pH Lab (s.u.)	6.5 - 8.5 s*	8.3
Phosphorus, total (mg/L)	---	0.15
Potassium-Dissolved (mg/L)	---	3
Selenium (mg/L)	---	0.002
Selenium (mg/L)-Dissolved	0.05	0.002
Silver (mg/L)	---	<0.0005
Silver (mg/L)-Dissolved	0.1	<0.0005
Sodium-Dissolved (mg/L)	---	2
Specific Conductance (µhmos/cm)	---	355
Strontium (mg/L)	---	<0.1
Strontium (mg/L)-Dissolved	4.0	<0.1
Sulfate (mg/L)	250 s*	16
Thallium (mg/L)	---	0.0011
Thallium (mg/L)-Dissolved	0.002	0.0008
TDS (mg/L)	---	184
Total Hardness (mg CaCO3/L)	---	178
Total Inorganic Nitrogen (mg/L)	---	
Total Suspended Solids (mg/L)	500 s*	119
Turbidity (NTU)	---	62.5
Uranium (mg/L)	---	0.009
Uranium (mg/L)-Dissolved	0.03	0.005
Zinc (mg/L)	---	0.06
Zinc (mg/L)-Dissolved	2.0	<0.01

Field pH (s.u.)	6.5 - 8.5 s*	7.92
Field EC (µS/cm)	---	336
Field DO (mg/L)	---	
Field ORP (mV)	---	
Field Turbidity (NTU)	---	
Field Temperature (C)	---	7.9
Flow (cfs)	---	
Stat Lvl (ft)	---	

Cobalt (mg/L)	---	<0.01
Cobalt (mg/L)-Dissolved	---	<0.01
Molybdenum (mg/L)	---	<0.005
Molybdenum (mg/L)-Dissolved	---	<0.005
Vanadium (mg/L)	---	<0.1
Vanadium (mg/L)-Dissolved	---	<0.1

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

Sample ID	MT Groundwater Standard[2]	DWW10-01	DWW10-01	DWW10-01	DWW10-01	DWW10-01	DWW10-01	DWW10-01	DWW10-01	DWW10-01	DWW10-01	DWW10-01
Date		1/19/2011	7/28/2011	8/3/2011	8/10/2011	8/18/2011	8/25/2011	8/31/2011	9/8/2011	9/14/2011	9/21/2011	9/29/2011
Alkalinity, Carbonate (mg CaCO3/L)	---	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Alkalinity, Total (mg CaCO3/L)	---	184	184	148	151	156	159	160	154	166	161	162
Alkalinity, Bicarbonate (mg CaCO3/l	---	184	184	148	151	156	159	160	154	166	161	162
Aluminum (mg/L)	---	0.0045	0.0035 J	0.068	0.069	0.036	0.018	0.012	0.011	0.0085	0.01	0.085
Aluminum (mg/L)-Dissolved	---	0.0051	0.0040 J	0.014	0.013	0.0092	0.012	0.0071	0.057	0.0064	0.0073	0.013
Antimony (mg/L)	---	0.00019 J	<0.000070	0.00023 J	0.00018 J	0.00018 J	0.00021 J	0.00020 J	0.00020 J	0.00024 J	0.00024 J	0.000095 J
Antimony (mg/L)-Dissolved	0.006	0.00041 J	0.00020 J	0.00018 J	0.00013 J	0.00015 J	0.00025 J	0.00018 J	0.00023 J	0.00023 J	0.00030 J	0.00016 J
Arsenic (mg/L)	---	0.0046	0.0048	0.020	0.013	0.018	0.014	0.012	0.011	0.010	0.012	0.0038
Arsenic (mg/L)-Dissolved	0.01	0.0041	0.0012	0.018	0.0093	0.015	0.013	0.011	0.0099	0.0089	0.0098	0.0094
Barium (mg/L)	---	0.020	0.018	0.063	0.058	0.057	0.058	0.055	0.053	0.053	0.054	0.013
Barium (mg/L)-Dissolved	2	0.020	0.020	0.058	0.055	0.052	0.055	0.051	0.050	0.051	0.052	0.036
Beryllium (mg/L)	---	<0.000069	<0.000020	0.000020 J	<0.000020	<0.000020	<0.000020	0.00010 J	<0.000020	<0.000020	<0.000020	<0.000020
Beryllium (mg/L)-Dissolved	0.004	<0.000069	<0.000020	<0.000020	<0.000020	<0.000020	0.00012 J	<0.000020	<0.000020	<0.000020	<0.000020	0.000060 J
Bismuth (mg/L)	---	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (mg/L)-Dissolved	---	0.000025 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000079 J	0.000098 J	<0.000020
Boron (mg/L)	---	0.0098	0.0098	0.014	0.012	0.010	0.014	0.012	0.010	0.011	0.011	0.016
Boron (mg/L)-Dissolved	---	0.011	0.012	0.014	0.014	0.0094	0.014	0.011	0.031	0.011	0.012	0.013
Cadmium (mg/L)	---	<0.000020	<0.000030	<0.000030	0.000034 J	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
Cadmium (mg/L)-Dissolved	0.005	0.000023 J	<0.000030	<0.000030	<0.000030	0.000049 J	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
Calcium (mg/L)-Dissolved	---	37.8	50.0	26.4	34.3	25.8	27.5	21.4	31.0	30.5	28.9	31.3
Chloride (mg/L)	250 s*	1.4	1.3 J	1.4 J	1.2	1.0	1.1	1.2	0.99 J	1.0 J	1.2	1.1
Chromium (mg/L)	---	0.00059	0.00086	0.00053	0.00033 J	0.00031 J	0.00054	0.00033 J	0.00031 J	0.00016 J	0.00045 J	0.00030 J
Chromium (mg/L)-Dissolved	---	0.00059	0.0047	0.00032 J	0.00038 J	0.00049 J	0.00043 J	0.00033 J	0.0010	0.0010	0.0014	0.00018 J
Copper (mg/L)	---	0.00026 J	0.00037 J	0.0092	0.0082	0.0041	0.0030	0.0016	0.0012	0.0010	0.00098	0.00094
Copper (mg/L)-Dissolved	1.3	0.00032 J	0.0029	0.0017	0.0013	0.0011	0.0010	0.00053	0.00088	0.00035 J	0.0018	0.00054
Fluoride (mg/L)	4	0.075 J	0.11	0.15	0.21	0.16	0.16	0.15	0.15	0.14	0.15	0.18 J
Iron (mg/L)	---	0.11	0.64	0.35	0.58	0.33	0.28	0.22	0.23	0.23	0.27	1.3
Iron (mg/L)-Dissolved	0.3 s	0.029 J	<0.0047	0.073	0.21	0.15	0.14	0.14	0.13	0.13	0.15	0.64
Lead (mg/L)	---	0.00038	0.00084	0.00049	0.00048	0.00025	0.00023	0.00015	0.00012	0.00018	0.00021	0.00011
Lead (mg/L)-Dissolved	0.015	0.00021	0.00011	0.000097 J	0.00014	0.00024	0.00012	0.000051 J	0.00022	0.000084 J	0.0014	0.000081 J
Magnesium-Dissolved (mg/L)	---	22.2	25.6	21.6	21.2	20.7	21.5	20.1	21.7	21.9	21.9	23.1
Manganese (mg/L)	---	0.054	0.045	0.18	0.17	0.17	0.18	0.17	0.16	0.17	0.17	0.070
Manganese (mg/L)-Dissolved	0.05 s	0.055	0.0065	0.17	0.17	0.16	0.16	0.16	0.16	0.17	0.16	0.12
Mercury (ug/L)	---	<0.037	<0.037	0.056 J	0.097 J	<0.037	<0.037	<0.037	0.099 J	<0.037	0.084 J	<0.037
Mercury (ug/L)-Dissolved	2.0	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	0.041 J	<0.037	<0.037	0.098 J
Nickel (mg/L)	---	0.0013	0.00021 J	0.0043	0.0036	0.0039	0.0041	0.0038	0.0035	0.0036	0.0036	0.00032 J
Nickel (mg/L)-Dissolved	0.1	0.0014	0.0012	0.0039	0.0033	0.0038	0.0038	0.0036	0.0039	0.0037	0.0038	0.0012
Nitrate, as N (mg/L)	10	0.13	0.0099 J	0.0087 J	<0.0050	<0.0050	0.010	0.018	0.018	0.027	0.056	0.0099 J
Nitrite, as N (mg/L)	1	0.0021 J	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrogen, Ammonia, as N (mg/L)	---	<0.0070	0.041	0.12	0.030 J	<0.020	<0.020	<0.020	0.10	0.093	0.033 J	0.068
Nitrogen, Kjeldahl, Total (mg/L)	---	0.10	0.040 J	0.56	0.32	0.25	0.16	0.18	0.080 J	0.12	0.14	0.33
Nitrogen, NO2 plus NO3Nitrite, (mg	10	0.13	0.010	0.010	<0.0044	<0.0044	0.010	0.020	0.020	0.030	0.06	0.010
Oil and Grease (mg/L)	---	<1.0	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
Orthophosphate (mg/L)	---	0.0068	0.025	0.012	0.0065	0.0066	0.0061	0.0068	0.0060	0.0051	0.0048	<0.00030
pH Lab (s.u.)	6.5 - 8.5 s*	8.0	7.8	8.0	8.0	8.1	8.1	8.0	8.0	8.0	7.9	8.1
Phosphorus, total (mg/L)	---	0.016	0.013	0.026	0.019	0.022	0.032	0.019	0.017	0.013	0.011	0.0082
Potassium-Dissolved (mg/L)	---	2.9	1.8	2.3	2.2	2.2	2.3	2.3	2.4	2.5	2.5	2.6
Selenium (mg/L)	---	<0.00010	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
Selenium (mg/L)-Dissolved	0.05	0.00015 J	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	0.00024 J
Silver (mg/L)	---	<0.000071	<0.000070	0.00029 J	0.00024 J	0.00016 J	<0.000070	0.000080 J	<0.000070	<0.000070	<0.000070	<0.000070
Silver (mg/L)-Dissolved	0.1	0.00037 J	<0.000070	<0.000070	<0.000070	<0.000070	0.00018 J	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070
Sodium-Dissolved (mg/L)	---	4.4	2.6	12.1	11.2	10.7	9.9	9.6	9.0	9.4	9	10.3
Specific Conductance (µhmos/cm)	---	350	336	319	310	325	326	329	338	352	313	319
Strontium (mg/L)	---	0.11	0.070	0.36	0.35	0.32	0.33	0.31	0.30	0.30	0.29	0.39
Strontium (mg/L)-Dissolved	4.0	0.11	0.035	0.36	0.34	0.32	0.32	0.31	0.29	0.30	0.29	0.34
Sulfate (mg/L)	250 s*	12.5	6.9	22.1	21.0	20.3	21.4	20.0	19.7	19.3	17.3	12.6
Thallium (mg/L)	---	0.00050	<0.000050	0.00018	0.00016	0.00015	0.00015	0.00015	0.00016	0.00023	0.00028	0.000063 J
Thallium (mg/L)-Dissolved	0.002	0.00050	0.00022	0.00013	0.00012	0.00013	0.00015	0.00012	0.00018	0.00021	0.00025	0.00012
TDS (mg/L)	---	209	209	178	191	179	144	173	183	172	195	182
Total Hardness (mg CaCO3/L)	---	186	230	155	173	149	157	136	167	166	162	173
Total Inorganic Nitrogen (mg/L)	---	0.13	0.051	0.13	0.030	0.016 J	<0.015	0.030	0.12	0.12	0.093	0.078
Total Suspended Solids (mg/L)	500 s*	0.72 J	2.0	2.7 J	<2.3	2.4 J	1.3 J	<2.8	<3.1	<2.1	<2.5	<3.3
Turbidity (NTU)	---	0.31	7.2	3.1	3.8	2.4	1.6	0.89	0.71	0.68	0.68	3.3
Uranium (mg/L)	---	0.0011	0.00055	0.00067	0.00062	0.00058	0.00082	0.00072	0.00082	0.00092	0.00091	0.00034 J
Uranium (mg/L)-Dissolved	0.03	0.0011	0.0014	0.00070	0.00060	0.00086	0.00070	0.00079	0.00087	0.00098	0.00082	0.00046 J
Zinc (mg/L)	---	0.0083	0.29	0.0029 J	0.0041 J	0.0031 J	0.0025 J	0.0026 J	<0.0025	<0.0025	<0.0025	0.0085
Zinc (mg/L)-Dissolved	2.0	0.0089	0.0044 J	<0.0025	<0.0025	0.0025 J	<0.0025	<0.0025	0.0031 J	<0.0025	0.0028 J	0.0034 J
Field pH (s.u.)	6.5 - 8.5 s*	7.15	7.59	7.60	7.72	7.77	7.75	7.72	7.66	7.66	7.64	7.62
Field EC (µS/cm)	---	453	406	394	380	383	386	395	404	421	444	469
Field DO (mg/L)	---											
Field ORP (mV)	---											
Field Turbidity (NTU)	---											
Field Temperature (C)	---	2.7	6.5	6.3	6.8	6.4	6.4	6.3	6.3	6.4	6.4	6.2
Field Nitrates (mg/L)	---											
Stat Lvl (ft)	---											
Tin (ug/L)	---			0.13 J								
Sodium (ug/L)	---			1970								
Potassium, (ug/L)	---			1630								
Magnesium, Dissolved (mg/L)	---			16.3								
Calcium (mg/L)	---			45900								
Cobalt (mg/L)	---			<0.22								
Cobalt (mg/L)-Dissolved	---											
Molybdenum (ug/L)	---			0.99								
Molybdenum (ug/L)-Dissolved	---											
Vanadium (ug/L)	---			0.37								
Vanadium (ug/L)-Dissolved	---											

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

Sample ID	MT Groundwater Standard[2]	UGPZ-03	UGPZ-03	UGPZ-03	UGPZ-03	UGPZ-03	UGPZ-03	UGPZ-03	UGPZ-03	UGPZ-03	UGPZ-03	UGPZ-03	UGPZ-03
Date		1/27/2011	3/30/2011	7/28/2011	8/3/2011	8/10/2011	8/18/2011	8/25/2011	8/31/2011	9/8/2011	9/14/2011	9/21/2011	9/29/2011
Alkalinity, Carbonate (mg CaCO3/L)	---	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Alkalinity, Total (mg CaCO3/L)	---	166	156	159	154	160	156	164	161	157	167	159	159
Alkalinity, Bicarbonate (mg CaCO3/l	---	166	156	159	154	160	156	164	161	157	167	159	159
Aluminum (mg/L)	---	0.0066	0.010	0.036	0.029	<0.0020	0.019	0.0028 J	0.0093	0.0021 J	0.0034 J	0.13	0.0033 J
Aluminum (mg/L)-Dissolved	---	0.0060	0.0030 J	0.0044	0.037	0.0027 J	0.0026 J	0.039	0.0046	0.0037 J	0.010	0.0067	<0.0020
Antimony (mg/L)	---	<0.00016	<0.00016	0.00011 J	0.00012 J	0.000093 J	0.00011 J	0.00013 J	0.00011 J	0.000081 J	0.000093 J	0.00012 J	0.000096 J
Antimony (mg/L)-Dissolved	0.006	<0.00016	<0.00016	0.00012 J	0.00012 J	0.00011 J	0.00011 J	0.000082 J	0.00010 J	0.00010 J	0.00013 J	0.00010 J	0.000099 J
Arsenic (mg/L)	---	0.0049	0.0045	0.0050	0.0051	0.0050	0.0048	0.0048	0.0049	0.0049	0.0050	0.0049	0.0049
Arsenic (mg/L)-Dissolved	0.01	0.0046	0.0044	0.0046	0.0050	0.0048	0.0046	0.0045	0.0046	0.0045	0.0012	0.0045	0.0049
Barium (mg/L)	---	0.0042	0.0043	0.0048	0.0050	0.0044	0.0044	0.0059	0.0047	0.0044	0.0047	0.0054	0.0048
Barium (mg/L)-Dissolved	2	0.0047	0.0046	0.0048	0.0052	0.0050	0.0043	0.0050	0.0052	0.0050	0.018	0.0044	0.0049
Beryllium (mg/L)	---	<0.000069	<0.000069	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00012 J	<0.000020	<0.000020	<0.000020	0.000050 J
Beryllium (mg/L)-Dissolved	0.004	<0.000069	<0.000069	<0.000020	<0.000020	<0.000020	<0.000020	0.00011 J	<0.000020	<0.000020	<0.000020	<0.000020	0.000042 J
Bismuth (mg/L)	---	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (mg/L)-Dissolved	---	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00024 J	0.00015 J	<0.000020
Boron (mg/L)	---	0.0072	0.0068	0.0055	0.0067	0.0074	0.0074	0.0069	0.0071	0.0047 J	0.0056	0.0064	0.0070
Boron (mg/L)-Dissolved	---	0.0062	0.0057	0.0063	0.0061	0.0073	0.0044 J	0.0073	0.0056	0.0058	0.014	0.008	0.0069
Cadmium (mg/L)	---	<0.000020	<0.000020	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
Cadmium (mg/L)-Dissolved	0.005	<0.000020	<0.000020	0.000056 J	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
Calcium (mg/L)-Dissolved	---	28.7	26.1	31.7	29.8	42.1	33.3	29.8	23.1	32.2	49.1	29.5	34.1
Chloride (mg/L)	250 s*	0.98 J	1.1	1.2 J	1.3 J	1.3	0.92 J	0.96 J	1.2	0.95 J	0.95 J	1.1	1.1
Chromium (mg/L)	---	0.00024 J	<0.00024	0.00045 J	0.00044 J	0.00032 J	0.00016 J	0.00034 J	0.00046 J	0.00012 J	0.00018 J	0.00030 J	0.00019 J
Chromium (mg/L)-Dissolved	---	0.00038 J	0.0011	0.00031 J	0.00052	0.00068	0.00045 J	0.00035 J	0.00026 J	0.00053	0.0047	0.0014	0.00032 J
Copper (mg/L)	---	<0.00020	<0.00020	0.00032 J	0.00037 J	0.00028 J	0.00023 J	0.00030 J	0.00033 J	0.00013 J	0.00025 J	0.00028 J	0.00022 J
Copper (mg/L)-Dissolved	1.3	0.00041 J	0.00021 J	0.00094	0.00051	0.00026 J	0.00028 J	0.00088	0.00028 J	0.00072	0.0026	0.00027 J	0.00072
Fluoride (mg/L)	4	0.068 J	0.067 J	0.097 J	0.097 J	0.17 J	0.12	0.11	0.12	0.10	0.099 J	0.11	0.10 J
Iron (mg/L)	---	0.12	0.025 J	0.051	0.057	0.0071 J	0.047 J	0.027 J	0.020 J	0.019 J	0.0083 J	0.16	0.013 J
Iron (mg/L)-Dissolved	0.3 s	<0.0045	0.0094 J	<0.0047	0.0083 J	0.0055 J	0.0050 J	0.0088 J	0.0062 J	0.0057 J	0.0077 J	0.0084 J	<0.0047
Lead (mg/L)	---	<0.000020	<0.000020	<0.000050	0.000071 J	<0.000050	0.000057 J	0.000061 J	0.00011	<0.000050	<0.000050	0.000054 J	0.000066 J
Lead (mg/L)-Dissolved	0.015	<0.000020	0.00036	0.000062 J	0.00014	0.000067 J	<0.000050	0.000078 J	<0.000050	0.000072 J	<0.000050	0.000062 J	<0.000050
Magnesium-Dissolved (mg/L)	---	21.0	20.9	23.6	22.3	22.3	24.9	22.4	21.2	22.0	24.8	21.4	22.2
Manganese (mg/L)	---	0.00094	0.0012	0.0024	0.0037	0.00040 J	0.0019	0.0023	0.0019	0.0018	0.0010	0.0048	0.00047 J
Manganese (mg/L)-Dissolved	0.05 s	0.0011	0.00071	0.0020	0.0016	0.0017	0.0014	0.0013	0.0012	0.0023	0.062	0.0019	0.0010
Mercury (ug/L)	---	<0.037	<0.037	<0.037	<0.037	0.062 J	<0.037	<0.037	<0.037	0.091 J	<0.037	0.081 J	0.066 J
Mercury (ug/L)-Dissolved	2.000	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	0.093 J
Nickel (mg/L)	---	<0.00019	<0.00019	0.00022 J	0.00017 J	0.000089 J	<0.000070	<0.000070	0.00020 J	<0.000070	0.000071 J	0.00011 J	0.00021 J
Nickel (mg/L)-Dissolved	0.1	0.00036 J	0.00078	0.00024 J	0.00024 J	0.00027 J	0.00031 J	0.000076 J	0.00018 J	0.00026 J	0.00052	0.00027 J	0.00020 J
Nitrate, as N (mg/L)	10	0.42	0.42	0.54	0.52	0.50	0.54	0.54	0.50	0.60	0.54	0.56	0.52
Nitrite, as N (mg/L)	1	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrogen, Ammonia, as N (mg/L)	---	0.020	0.10	0.077	<0.020	0.16	<0.020	<0.020	<0.020	<0.020	0.036 J	<0.020	0.036 J
Nitrogen, Kjeldahl, Total (mg/L)	---	<0.038	0.12	0.040 J	0.22	0.035 J	0.040 J	0.085 J	0.075 J	0.060 J	0.050 J	<0.032	0.095 J
Nitrogen, NO2 plus NO3Nitrite, (mg	10	0.42	0.42	0.54	0.52	0.50	0.54	0.54	0.50	0.60	0.54	0.56	0.52
Oil and Grease (mg/L)	---	<1.0	<1.0	<1.6	<1.6	<1.6	<1.7	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
Orthophosphate (mg/L)	---	0.012	0.012	0.030	0.014	0.0041	0.010	0.011	0.012	0.010	0.011	0.014	0.0062
pH Lab (s.u.)	6.5 - 8.5 s*	8.0	8.1	8.1	8.0	8.1	8.1	8.1	8.0	7.9	8.0	7.9	7.8
Phosphorus, total (mg/L)	---	0.019	0.014	0.014	0.014	0.013	0.017	0.024	0.024	0.054	0.011	0.024	0.013
Potassium-Dissolved (mg/L)	---	4.2	4.3	4.6	4.5	4.4	4.4	4.4	4.4	4.3	1.8	4.2	4.4
Selenium (mg/L)	---	<0.00010	0.00013 J	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
Selenium (mg/L)-Dissolved	0.05	<0.00010	<0.00010	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	0.00028 J
Silver (mg/L)	---	<0.000071	<0.000071	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070
Silver (mg/L)-Dissolved	0.1	<0.000071	<0.000071	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	0.000094 J	<0.000070
Sodium-Dissolved (mg/L)	---	1.4	1.3	1.5	1.5	1.4	1.5	1.4	1.4	1.3	2.6	1.4	1.4
Specific Conductance (µhmos/cm)	---	314	316	303	303	297	318	313	305	319	309	284	309
Strontium (mg/L)	---	0.089	0.081	0.090	0.088	0.086	0.083	0.088	0.090	0.086	0.089	0.085	0.086
Strontium (mg/L)-Dissolved	4.0	0.084	0.080	0.084	0.085	0.084	0.086	0.086	0.086	0.085	0.037	0.082	0.085
Sulfate (mg/L)	250 s*	8.1	9.0	8.5	8.0	7.1	6.4	6.7	6.7	7.0	6.8	6.6	6.6
Thallium (mg/L)	---	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thallium (mg/L)-Dissolved	0.002	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00020	<0.000050	<0.000050
TDS (mg/L)	---	<5.0	170	175	173	179	185	181	170	174	166	169	182
Total Hardness (mg CaCO3/L)	---	158	151	176	166	197	185	167	145	171	225	162	177
Total Inorganic Nitrogen (mg/L)	---	0.44	0.52	0.62	0.54	0.66	0.55	0.54	0.50	0.61	0.58	0.57	0.56
Total Suspended Solids (mg/L)	500 s*	<0.50	0.50 J	2.6	0.80 J	0.50 J	<0.50	<0.50	<0.51	<0.50	<0.50	5.2	<0.50
Turbidity (NTU)	---	0.90	0.22	1.4	0.13	0.96	0.48	0.23	0.26	0.22	0.090 J	1.9	0.090 J
Uranium (mg/L)	---	0.0036	0.0042	0.0049	0.0044	0.0045	0.0037	0.0048	0.0043	0.0043	0.0047	0.0045	0.0052
Uranium (mg/L)-Dissolved	0.03	0.0047	0.0040	0.0053	0.0042	0.0044	0.0056	0.0040	0.0044	0.0043	0.00040 J	0.0041	0.0041
Zinc (mg/L)	---	0.0040 J	0.0033 J	0.0025 J	0.0039 J	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Zinc (mg/L)-Dissolved	2.0	0.0035 J	0.0076	0.0038 J	0.0025 J	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.023	<0.0025	0.0066

Field pH (s.u.)	6.5 - 8.5 s*	7.01	10.05	7.6	7.57	7.66	7.71	7.71	7.70	7.55	7.65	7.45	7.50
Field EC (µS/cm)	---	322	229	363	378	380	370	359	366	360	303	344	323
Field DO (mg/L)	---												
Field ORP (mV)	---												
Field Turbidity (NTU)	---												
Field Temperature (C)	---	4.9	4.11	5.3	5.9	5.9	6.8	5.9	5.6	5.3	5.0	4.9	4.7
Flow (cfs)	---												
Stat Lvl (ft)	---												

Cobalt (mg/L)	---												
Cobalt (mg/L)-Dissolved	---												
Molybdenum (mg/L)	---												
Molybdenum (mg/L)-Dissolved	---												
Vanadium (mg/L)	---												
Vanadium (mg/L)-Dissolved	---												

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

Sample ID	MT Groundwater Standard[2]	UGPZ-04	UGPZ-04	UGPZ-04	UGPZ-04	UGPZ-04	UGPZ-04	UGPZ-04	UGPZ-04	UGPZ-04	UGPZ-04	UGPZ-04	UGPZ-04
Date		4/28/2011	6/1/2011	7/28/2011	8/3/2011	8/10/2011	8/18/2011	8/25/2011	8/31/2011	9/8/2011	9/14/2011	9/21/2011	9/29/2011
Alkalinity, Carbonate (mg CaCO3/L)	---	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Alkalinity, Total (mg CaCO3/L)	---	187	193	202	198	198	198	207	205	195	213	199	201
Alkalinity, Bicarbonate (mg CaCO3/l	---	187	193	202	198	198	198	207	205	195	213	199	201
Aluminum (mg/L)	---	0.0038 J	0.021	0.0028 J	0.0037 J	0.0020 J	0.011	0.0039 J	0.0048	0.0024 J	0.0033 J	0.0057	0.0061
Aluminum (mg/L)-Dissolved	---	0.0027 J	0.0034 J	0.0038 J	0.0035 J	0.0027 J	0.0038 J	0.12	0.0085	0.0050	0.010	0.0052	0.0042
Antimony (mg/L)	---	<0.00016	0.00011 J	0.00011 J	0.00034 J	0.00013 J	0.00033 J	0.00030 J	0.00016 J	0.00012 J	0.00016 J	0.00013 J	0.00030 J
Antimony (mg/L)-Dissolved	0.006	0.00013 J	0.00012 J	<0.000070	0.00036 J	0.00013 J	0.00027 J	0.00023 J	0.00015 J	0.00013 J	0.00010 J	0.00012 J	0.00027 J
Arsenic (mg/L)	---	0.0027	0.0010	0.0012	0.0012	0.0013	0.00081	0.00090	0.0010	0.00091	0.0010	0.00099	0.00090
Arsenic (mg/L)-Dissolved	0.01	0.0026	0.0010	0.0012	0.00095	0.0011	0.00079	0.00093	0.0010	0.0010	0.0048	0.001	0.00098
Barium (mg/L)	---	0.016	0.016	0.018	0.020	0.017	0.020	0.019	0.019	0.017	0.018	0.018	0.020
Barium (mg/L)-Dissolved	2	0.016	0.016	0.018	0.019	0.017	0.018	0.019	0.019	0.017	0.0045	0.018	0.019
Beryllium (mg/L)	---	<0.000069	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00011 J	<0.000020	<0.000020	<0.000020	0.000024 J
Beryllium (mg/L)-Dissolved	0.004	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00011 J	<0.000020	<0.000020	<0.000020	<0.000020	0.000045 J
Bismuth (mg/L)	---	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (mg/L)-Dissolved	---	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00022 J	0.000055 J	<0.000020
Boron (mg/L)	---	0.0087	0.0066	0.011	0.013	0.013	0.013	0.015	0.015	0.012	0.011	0.013	0.015
Boron (mg/L)-Dissolved	---	0.0091	0.0062	0.010	0.012	0.013	0.0092	0.017	0.013	0.013	0.0062	0.015	0.013
Cadmium (mg/L)	---	<0.000020	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
Cadmium (mg/L)-Dissolved	0.005	<0.000030	<0.000030	0.00012	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
Calcium (mg/L)-Dissolved	---	49.6	45.9	39.7	48.6	65.9	48.4	47.6	34.8	49.8	30.9	46.4	55.1
Chloride (mg/L)	250 s*	1.9	1.6	1.9 J	1.9 J	1.8	1.5	2.6	1.7	1.5	1.5	1.7	1.6
Chromium (mg/L)	---	0.0021	0.00058	0.0048	0.0049	0.0052	0.0043	0.0041	0.0037	0.0035	0.0036	0.0034	0.0036
Chromium (mg/L)-Dissolved	---	0.0030	0.0016	0.00036 J	0.0045	0.0045	0.0041	0.0039	0.0043	0.0039	0.00083	0.0041	0.0033
Copper (mg/L)	---	0.0011	0.0012	0.0016	0.0038	0.0021	0.0049	0.0040	0.0035	0.0031	0.0031	0.0029	0.0035
Copper (mg/L)-Dissolved	1.3	0.00091	0.00095	0.00051	0.0044	0.0016	0.0039	0.0034	0.0032	0.0028	0.00020 J	0.0032	0.0035
Fluoride (mg/L)	4	0.057 J	0.063 J	<0.050	<0.050	0.13 J	0.058 J	0.13	0.074 J	0.060 J	0.064 J	0.073 J	0.079 J
Iron (mg/L)	---	0.040 J	0.0094 J	0.012 J	0.031 J	0.035 J	0.018 J	0.0097 J	0.0073 J	0.0066 J	<0.0047	0.0061 J	<0.0047
Iron (mg/L)-Dissolved	0.3 s	0.0093 J	0.0086 J	0.0068 J	0.011 J	<0.0047	0.014 J	0.0083 J	0.013 J	0.0068 J	0.0061 J	0.0056 J	<0.0047
Lead (mg/L)	---	<0.000020	<0.000050	<0.000050	0.00010	0.000058 J	<0.000050	0.000075 J	0.00011	<0.000050	<0.000050	0.000063 J	<0.000050
Lead (mg/L)-Dissolved	0.015	0.00026	<0.000050	0.00012	0.00034	<0.000050	0.000074 J	0.000051 J	<0.000050	0.000092 J	<0.000050	0.000073 J	<0.000050
Magnesium-Dissolved (mg/L)	---	24.4	22.1	23.1	25.3	24.5	25.0	25.1	23.1	26.2	21.9	23.7	24.9
Manganese (mg/L)	---	0.0043	0.0042	0.0035	0.0034	0.0030	0.0030	0.0024	0.0023	0.0019	0.0018	0.0018	0.0016
Manganese (mg/L)-Dissolved	0.05 s	0.0043	0.0042	0.043	0.0032	0.0029	0.0028	0.0022	0.0049	0.0028	0.0034	0.002	0.0016
Mercury (ug/L)	---	<0.037	<0.037	<0.037	<0.037	0.064 J	<0.037	<0.037	<0.037	0.094 J	<0.037	0.080 J	<0.037
Mercury (ug/L)-Dissolved	2.000	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	0.096 J
Nickel (mg/L)	---	<0.00019	0.00025 J	0.00031 J	0.00032 J	0.00066	0.00030 J	0.00027 J	0.00023 J	0.00026 J	0.00017 J	0.00012 J	0.00025 J
Nickel (mg/L)-Dissolved	0.1	0.00051	0.00075	0.00031 J	0.00038 J	0.00017 J	0.00023 J	0.00027 J	0.00054	0.00037 J	0.00018 J	0.00011 J	0.00024 J
Nitrate, as N (mg/L)	10	0.90	0.67	1.2	1.2	1.2	1.2	1.3	1.3	1.4	1.3	1.3	1.3
Nitrite, as N (mg/L)	1	<0.0050	0.030	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrogen, Ammonia, as N (mg/L)	---	0.090	0.044	0.098	0.021 J	<0.020	0.050	<0.020	<0.020	0.022 J	0.080	<0.020	<0.020
Nitrogen, Kjeldahl, Total (mg/L)	---	0.080 J	0.070 J	0.080 J	0.16	0.12	0.075 J	0.11	0.12	0.060 J	0.080 J	0.060 J	0.090 J
Nitrogen, NO2 plus NO3Nitrite, (mg	10	0.90	0.70	1.2	1.2	1.2	1.2	1.3	1.4	1.4	1.3	1.4	1.3
Oil and Grease (mg/L)	---	<1.0	<1.7	<1.6	<1.6	<1.6	<1.7	<1.6	<1.6	<1.6	<1.7	<1.6	<1.6
Orthophosphate (mg/L)	---	0.0075	0.0028 J	0.015	0.020	0.0096	0.0041	0.0047	0.0054	0.0049	0.0051	0.0052	0.0010
pH Lab (s.u.)	6.5 - 8.5 s*	7.8	7.7	7.8	7.8	7.8	7.8	7.9	7.8	7.8	7.8	7.7	7.6
Phosphorus, total (mg/L)	---	0.013	0.0087	0.0086	0.011	0.0093	0.011	0.017	0.0077	0.018	0.0073	0.0069	0.0076
Potassium-Dissolved (mg/L)	---	2.5	1.8	3.0	1.7	1.7	1.7	1.7	1.7	1.7	4.5	1.7	1.8
Selenium (mg/L)	---	0.00023 J	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
Selenium (mg/L)-Dissolved	0.05	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
Silver (mg/L)	---	0.000073 J	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	0.00011 J	<0.000070	<0.000070	<0.000070
Silver (mg/L)-Dissolved	0.1	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070
Sodium-Dissolved (mg/L)	---	2.3	1.7	3.1	2.5	2.3	2.4	2.4	2.4	2.3	1.4	2.6	2.4
Specific Conductance (µhmos/cm)	---	395	406	399	377	382	402	397	399	400	395	384	403
Strontium (mg/L)	---	0.051	0.035	0.037	0.035	0.035	0.036	0.036	0.037	0.035	0.036	0.035	0.037
Strontium (mg/L)-Dissolved	4.0	0.048	0.035	0.063	0.035	0.035	0.035	0.037	0.037	0.035	0.087	0.036	0.036
Sulfate (mg/L)	250 s*	13.3	9.2	13.9	13.8	13.0	12.6	21.3	12.6	12.7	12.7	11.8	11.9
Thallium (mg/L)	---	0.00018	0.00029	0.00023	0.00025	0.00022	0.00022	0.00020	0.00021	0.00019	0.00021	0.00021	0.00022
Thallium (mg/L)-Dissolved	0.002	0.00018	0.00027	<0.000050	0.00022	0.00025	0.00021	0.00020	0.00019	0.00021	<0.000050	0.00021	0.00021
TDS (mg/L)	---	203	588	228	219	234	229	219	224	125	206	224	224
Total Hardness (mg CaCO3/L)	---	224	206	194	226	265	224	222	182	232	168	213	240
Total Inorganic Nitrogen (mg/L)	---	0.99	0.74	1.3	1.2	1.2	1.3	1.3	1.4	1.4	1.4	1.4	1.3
Total Suspended Solids (mg/L)	500 s*	<1.0	<0.51	<0.50	0.70 J	0.70 J	1.8	1.0	<0.50	<0.50	<0.50	0.60 J	<0.50
Turbidity (NTU)	---	0.32	0.34	0.74	40.3	0.16	0.89	0.35	<0.050	<0.050	<0.050	0.32	<0.050
Uranium (mg/L)	---	0.0012	0.00068	0.00039 J	0.00034 J	0.00035 J	0.00031 J	0.00038 J	0.00034 J	0.00035 J	0.00037 J	0.00038 J	0.00039 J
Uranium (mg/L)-Dissolved	0.03	0.0011	0.00068	0.0016	0.00035 J	0.00036 J	0.00043 J	0.00032 J	0.00036 J	0.00035 J	0.0048	0.00036 J	0.00036 J
Zinc (mg/L)	---	0.0023 J	0.0052	0.0036 J	0.0087	0.0039 J	0.0095	0.0065	0.0067	0.0049 J	0.0055	0.0057	0.0088
Zinc (mg/L)-Dissolved	2.0	0.0029 J	0.0047 J	0.0060	0.0071	0.0035 J	0.011	0.0077	0.0058	0.0068	<0.0025	0.0071	0.0075

Field pH (s.u.)	6.5 - 8.5 s*	9.2	10.05	7.53	8.61	7.49	7.49	7.49	7.51	7.47	7.43	7.23	7.43
Field EC (µS/cm)	---	413	229	487	286	475	472	471	488	496	486	520	561
Field DO (mg/L)	---												
Field ORP (mV)	---												
Field Turbidity (NTU)	---												
Field Temperature (C)	---	6.7	4.11	6.5	0.4	6.8	6.5	6.4	6.0	5.8	5.6	5.5	5.3
Flow (cfs)	---												
Stat Lvl (ft)	---			65.76									

Cobalt (mg/L)	---												
Cobalt (mg/L)-Dissolved	---												
Molybdenum (mg/L)	---												
Molybdenum (mg/L)-Dissolved	---												
Vanadium (mg/L)	---												
Vanadium (mg/L)-Dissolved	---												

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

Sample ID	MT Groundwater Standard[2]	Mine Ponds	Mine Ponds	Mine Ponds	Mine Ponds	Mine Ponds	Mine Ponds	Mine Ponds	Mine Ponds	Mine Ponds	Mine Ponds	Mine Ponds	Mine Ponds
Date		4/14/2010	5/11/2010	5/25/2010	10/27/2010	11/24/2010	12/16/2010	1/27/2011	2/24/2011	3/30/2011	6/1/2011	6/30/2011	7/27/2011
Alkalinity, Carbonate (mg CaCO3/L)	---	3.9 J	31.8		26.0	36.3	37.5	30.4	16.3	<2.5	<2.5	<2.5	<2.5
Alkalinity, Total (mg CaCO3/L)	---	137	39.6		135	80.1	106	133	132	140	83.3	148	151
Alkalinity, Bicarbonate (mg CaCO3/l	---	133	<2.5		109	43.8	68.3	103	116	140	83.3	148	151
Aluminum (mg/L)	---	0.21	0.017		0.10	0.25	0.56	0.14	0.27	0.37	0.65	0.27	0.027
Aluminum (mg/L)-Dissolved	---	0.0046	0.0096		0.0085	0.0068	0.021	0.018	0.016	0.026	0.044	0.017	0.017
Antimony (mg/L)	---	0.0015	0.00034 J		0.00033 J	0.00035 J	0.00028 J	0.00017 J	0.00019 J	0.00023 J	0.00042 J	0.00042 J	0.000097 J
Antimony (mg/L)-Dissolved	0.006	0.0013	0.00022 J		0.00034 J	0.00027 J	0.00029 J	0.00020 J	0.00020 J	0.00025 J	0.00046 J	0.00035 J	0.00011 J
Arsenic (mg/L)	---	0.015	0.0017		0.0047	0.0057	0.0054	0.0043	0.0045	0.0046	0.0041	0.0047	0.0082
Arsenic (mg/L)-Dissolved	0.01	0.0091	0.0017		0.0042	0.0044	0.0045	0.0043	0.0044	0.0041	0.0033	0.0046	0.0072
Barium (mg/L)	---	0.019	0.014		0.016	0.0089	0.015	0.012	0.012	0.011	0.013	0.015	0.020
Barium (mg/L)-Dissolved	2	0.018	0.012		0.014	0.021	0.0088	0.011	0.011	0.0096	0.0083	0.012	0.018
Beryllium (mg/L)	---	<0.000069	<0.000069		<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	0.000042 J	<0.000020	<0.000020
Beryllium (mg/L)-Dissolved	0.004	<0.000069	<0.000069		<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000020	<0.000020	<0.000020
Bismuth (mg/L)	---	0.000025 J	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000022 J	<0.000020	<0.000020
Bismuth (mg/L)-Dissolved	---	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	0.000025 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Boron (mg/L)	---	0.070	0.017		0.014	0.021	0.011	0.0096	0.020	0.0098	0.023	0.014	0.011
Boron (mg/L)-Dissolved	---	0.070	0.016		0.014	0.018	0.014	0.0085	0.0089	0.0085	0.023	0.020	0.012
Cadmium (mg/L)	---	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000030	<0.000030	<0.000030
Cadmium (mg/L)-Dissolved	0.005	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	0.000026 J	<0.000020	0.000034 J	<0.000030	0.00022
Calcium (mg/L)-Dissolved	---	27.8	17.9		24.5	12.8	19.9	23.0	23.9	23.0	18.9	35.3	30.8
Chloride (mg/L)	250 s*	0.85 J	0.77 J		1.3	1.2	1.2	1.1	1.3	1.1	1.0	1.3 J	1.4 J
Chromium (mg/L)	---	0.0070	0.025		0.011	0.021	0.022	0.0080	0.0068	0.0037	0.0037	0.0047	0.00074
Chromium (mg/L)-Dissolved	---	0.0067	0.025		0.011	0.018	0.020	0.0085	0.0063	0.0039	0.0031	0.0041	0.00076
Copper (mg/L)	---	0.0017	0.00024 J		0.0016	0.0010	0.0018	0.00068	0.0010	0.00080	0.0024	0.0015	0.00098
Copper (mg/L)-Dissolved	1.3	0.00054	0.00025 J		0.00052	0.00041 J	0.00022 J	0.00076	0.00030 J	0.00026 J	0.0010	0.00088	0.0012
Fluoride (mg/L)	4	0.13	0.19		0.077 J	0.081 J	0.081 J	0.075 J	0.078 J	0.074 J	0.071 J	0.093 J	0.094 J
Iron (mg/L)	---	0.66	0.019 J		0.10	0.30	0.66	0.14	0.27	0.24	0.51	0.24	0.24
Iron (mg/L)-Dissolved	0.3 s	0.021 J	0.0061 J		0.0061 J	0.0081 J	0.018 J	0.0087 J	0.013 J	0.037 J	0.039 J	0.023 J	0.17
Lead (mg/L)	---	0.00048	0.000042 J		0.00082	0.00080	0.00031	0.000074 J	0.00012	0.00013	0.00086	0.00043	0.00010
Lead (mg/L)-Dissolved	0.015	0.000042 J	0.000027 J		0.00014	0.00013	0.000058 J	0.000074 J	0.0012	0.00016	0.00014	0.00050	0.00033
Magnesium-Dissolved (mg/L)	---	20.6	7.8		19.0	11.1	14.1	17.5	19.0	20.2	9.5	19.2	18.9
Manganese (mg/L)	---	0.014	0.00070		0.0035	0.012	0.010	0.0023	0.0044	0.0044	0.023	0.011	0.32
Manganese (mg/L)-Dissolved	0.05 s	0.0012	0.0017		0.00049 J	0.0010	0.00037 J	0.00072	0.0017	0.0022	0.0057	0.00088	0.30
Mercury (ug/L)	---	<0.021	<0.021		<0.020	<0.020	<0.020	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037
Mercury (ug/L)-Dissolved	2.000	0.033 J	0.049 J		<0.020	<0.020	0.031 J	<0.037	<0.037	<0.037	<0.037	0.045 J	<0.037
Nickel (mg/L)	---	0.0019	0.00026 J		0.00036 J	0.00046 J	0.00093	0.00024 J	0.00046 J	0.00042 J	0.00098	0.00076	0.00096
Nickel (mg/L)-Dissolved	0.1	0.0013	0.0018		<0.00019	0.00032 J	0.00036 J	0.00026 J	0.00078	0.00065	0.00070	0.00040 J	0.0015
Nitrate, as N (mg/L)	10	22.4	4.4	7.5	1.5	1.8	0.96	0.67	0.52	0.15	0.15	1.1	0.0074 J
Nitrite, as N (mg/L)	1	0.098	0.097	0.12	0.0010 J	0.096		0.053	0.064	0.034	0.16	0.046	<0.0050
Nitrogen, Ammonia, as N (mg/L)	---	13.4	1.0		0.40	0.69	0.13	0.020	0.020	0.020	0.37	0.24	1.2
Nitrogen, Kjeldahl, Total (mg/L)	---	13.2	1.2		0.68	0.90	0.88	0.32	0.72	1.2	1.4	1.3	2.1
Nitrogen, NO2 plus NO3Nitrite, (mg	10	22.5	4.5	7.6	1.5	1.8	1.0	0.72	0.58	0.18	0.31	1.1	0.010
Oil and Grease (mg/L)	---	1.1 J	<1.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.6	<1.6	<1.6
Orthophosphate (mg/L)	---	0.0070	<0.00050		0.012	0.0031	0.025	0.014		0.015	0.034	0.019	0.081
pH Lab (s.u.)	6.5 - 8.5 s*	8.4	10.0	9.9	8.9	9.8	9.6	9.1	8.9	8.5	8.4	8.5	7.9
Phosphorus, total (mg/L)	---	0.019	0.0096		0.026	0.018	0.024	0.072	0.018	0.031	0.049	0.030	0.15
Potassium-Dissolved (mg/L)	---	3.2	6.8		5.0	5.8	6.8	5.5	5.3	5.2	2.9	4.5	4.3
Selenium (mg/L)	---	0.00049 J	0.00018 J		0.00015 J	0.00021 J	0.00026 J	0.00016 J	0.00018 J	0.00013 J	<0.00022	<0.00022	0.00025 J
Selenium (mg/L)-Dissolved	0.05	0.00055	0.00029 J		<0.00010	<0.00010	0.00013 J	<0.00010	0.00016 J	<0.00010	<0.00022	<0.00022	<0.00022
Silver (mg/L)	---	<0.000071	<0.000071		<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000070	0.000081 J	<0.000070
Silver (mg/L)-Dissolved	0.1	<0.000071	<0.000071		<0.000071	<0.000071	0.000077 J	<0.000071	<0.000071	<0.000071	<0.000070	<0.000070	<0.000070
Sodium-Dissolved (mg/L)	---	9.4	3.6		3.8	3.6	4.6	3.0	3.4	3.8	5.1	5.0	3.6
Specific Conductance (µhmos/cm)	---	484	257		268	207	237	253	283	297	204	305	323
Strontium (mg/L)	---	0.086	0.098		0.11	0.094	0.12	0.11	0.095	0.093	0.058	0.086	0.088
Strontium (mg/L)-Dissolved	4.0	0.088	0.089		0.099	0.078	0.10	0.10	0.096	0.086	0.053	0.088	0.078
Sulfate (mg/L)	250 s*	20.8	43.8		13.5	4.9 J	17.3	11.5	11.2	11.0	7.4	12.6	10.6
Thallium (mg/L)	---	0.00015	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thallium (mg/L)-Dissolved	0.002	0.00013	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
TDS (mg/L)	---	220	373		140	63.0	69.0	<5.0	152	164	119	177	183
Total Hardness (mg CaCO3/L)	---	154	76.7		140	77.6	108	130	138	141	86.3	167	155
Total Inorganic Nitrogen (mg/L)	---	35.9	5.5		1.9	2.4	1.2	0.74	0.60	0.20	0.68	1.4	1.2
Total Suspended Solids (mg/L)	500 s*	19.2	2.1		6.7	18.7	30.7	6.1	6.8	13.5	47.4	10.8	4.1
Turbidity (NTU)	---	32.1	2.2		10.4	33.6	54.3	7.8	13.2	18.1	65.1	18.4	2.7
Uranium (mg/L)	---	0.0015	0.00032 J		0.0017	0.00094	0.0013	0.0015	0.0020	0.0021	0.0010	0.0017	0.0017
Uranium (mg/L)-Dissolved	0.03	0.0016	0.00025 J		0.0017	0.00078	0.0014	0.0020	0.0019	0.0020	0.00095	0.0017	0.0025
Zinc (mg/L)	---	0.0042 J	0.0016 J		0.0028 J	0.0033 J	0.0089	0.0059	0.0059	0.0073	0.0073	0.0047 J	<0.0025
Zinc (mg/L)-Dissolved	2.0	0.0018 J	0.0059		<0.0013	0.0017 J	0.0014 J	0.0020 J	0.0081	0.0031 J	0.0036 J	<0.0025	0.0052

Field pH (s.u.)	6.5 - 8.5 s*		10.05	9.48	8.61	8.55	8.41	8.47	8.30	8.20	8.03	7.92	7.49
Field EC (µS/cm)	---		229	249	286	274	277	268	305	345	367	390	317
Field DO (mg/L)	---												
Field ORP (mV)	---												
Field Turbidity (NTU)	---												
Field Temperature (C)	---		4.11	7.28	0.4	0.4	0.6	0.9	1.4	3.3	5.5	7.7	10.9
Flow (cfs)	---												
Stat Lvl (ft)	---												

Cobalt (mg/L)	---												
Cobalt (mg/L)-Dissolved	---												
Molybdenum (mg/L)	---												
Molybdenum (mg/L)-Dissolved	---												
Vanadium (mg/L)	---												
Vanadium (mg/L)-Dissolved	---												

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

Mine Ponds	Mine Ponds	Mine Ponds	Mine Ponds	Mine Ponds	Mine Ponds	Mine Ponds
8/30/2011	9/27/2011	10/20/2011	11/8/2011	12/12/2011	1/30/2012	3/1/2012
17.7	<2.5	<2.5	<2.5	<2.5	10.4	9.3
146	171	172	169	168	155	157
128	171	172	169	168	144	148
0.033	0.013	0.011	0.013	0.010	0.018	0.026
0.0091	0.0073	0.011	0.0075	0.0064	0.0035 J	0.0042
0.00018 J	<0.000070	<0.000070	<0.000070	<0.000070	<0.00025	<0.00025
0.00019 J	<0.000070	<0.000070	<0.000070	<0.000070	<0.00025	<0.00025
0.0043	0.0084	0.0060	0.0077	0.0059	0.0044	0.0042
0.0041	0.0082	0.0065	0.0071	0.0061	0.0044	0.0038
0.012	0.030	0.025	0.025	0.023	0.013	0.012
0.011	0.028	0.027	0.023	0.023	0.013	0.012
0.000028 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000092	<0.000092
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000092	<0.000092
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00025	<0.00025
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00025	<0.00025
0.0094	0.015	0.010	0.012	0.012	0.0086	0.014
0.011	0.015	0.015	0.0097	0.012	0.0094	0.0092
<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000028	<0.000028
<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000028	<0.000028
27.1	40.3	30.2	31.2	28.8	27.1	34
1.2	1.2	1.2	1.2	1.0	0.99 J	1.2
0.0019	0.00066	0.00044 J	0.00051	0.0010	0.0018	0.0022
0.0020	0.00070	0.0014	0.0010	0.0012	0.0018	0.0017
0.0016	0.00050 J	0.00034 J	0.00027 J	0.00065	0.00098	0.00096
0.0012	0.00071	0.00032 J	0.00074	0.00036 J	0.0011	0.0011
0.11	0.12 J	0.12 J	0.12 J	0.096 J	0.11	0.12
0.031 J	0.37	0.21	0.25	0.20	<0.025	<0.025
<0.0047	0.23	0.15	0.14	0.18	<0.025	<0.025
0.00028	0.00011	0.000074 J	0.000077 J	0.000082 J	0.00013	0.00011
0.000085 J	0.00011	0.00023	0.00052	0.000094 J	0.00012	0.000033 J
19.8	20.9	20.9	20.9	21.4	22.5	21
0.0034	0.33	0.25	0.23	0.23	0.0031	0.0024
0.0017	0.30	0.27	0.22	0.23	0.00037 J	0.00029 J
<0.037	0.097 J	0.059 J	0.093 J	0.045 J	<0.037	<0.037
<0.037	0.089 J	0.065 J	0.082 J	<0.037	<0.037	<0.037
0.00031 J	0.00032 J	0.00029 J	0.00023 J	0.00043 J	0.00034 J	0.00044 J
0.00026 J	0.00060	0.00045 J	0.00048 J	0.00040 J	0.00036 J	0.00024 J
0.53	0.0097 J	<0.0050	0.013	<0.0050	0.56	0.56
0.0089 J	<0.0050	0.0072 J	0.0073 J	<0.0050	0.0026 J	0.0017 J
<0.020	2.6	2.5	1.9	2.5	<0.019	<0.013
0.26	6.1	2.6	2.0	2.2	0.16	0.13
0.54	0.010	<0.0044	0.020	<0.0044	0.57	0.56
<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
0.0037	0.21	0.18	0.15	0.16	0.0021	0.005
8.6	7.7	7.6	7.6	7.7	8.3	8.4
0.015	0.30	0.11	0.23	0.20	0.012	0.0056
4.0	4.4	4.4	4.1	4.2	4.3	4.1
<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
<0.00022	0.00026 J	0.00024 J	<0.00022	<0.00022	0.00030 J	<0.00022
<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.00025	<0.00025
<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.00025	<0.00025
2.1	3.6	3.1	2.9	3.0	2.2	2.1
274	342	362	321	335	328	326
0.071	0.095	0.087	0.091	0.092	0.079	0.079
0.073	0.093	0.088	0.085	0.088	0.081	0.079
10.2	0.55 J	1.8	3.1	1.3	10.6	10.4
<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
152	200	199	170	170	171	162
149	187	162	164	160	160	171
0.54	2.6	2.5	1.9	2.5	0.58	0.57
2.0	1.7	1.5	1.2	0.70 J	3.4	2.5
3.9	1.4	1.9	3.0	6.7	4.8	1.6
0.0019	0.00037 J	0.00043 J	0.00084	0.00048 J	0.0022	0.0022
0.0018	0.00036 J	0.00048 J	0.00093	0.00049 J	0.0024	0.0024
0.013	<0.0025	<0.0025	<0.0025	0.0027 J	<0.0025	0.0029 J
<0.0025	0.0033 J	0.0051	0.0066	0.0037 J	0.0028 J	<0.0025
7.46	7.44	7.49	7.46	7.62	8.15	8.12
366	463	390	436	348	374	349
10.7	10.6	10.5	10.4	1.4	2.7	0.8

Sample ID	MT Groundwater Standard[2]	LAD1MW	LAD1MW	LAD1MW	LAD1MW	LAD1MW	LAD1MW	LAD1MW	LAD1MW	LAD1MW	LAD1MW	LAD1MW
Date		3/22/2010	4/27/2010	5/25/2010	6/30/2010	7/29/2010	8/24/2010	9/30/2010	10/27/2010	11/24/2010	12/16/2010	1/27/2011
Alkalinity, Carbonate (mg CaCO3/L)	---	<5.0	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Alkalinity, Total (mg CaCO3/L)	---	229	233	222	231	226	215	222	228	238	236	241
Alkalinity, Bicarbonate (mg CaCO3/L	---	229	233	222	231	226	215	222	228	238	236	241
Aluminum (mg/L)	---	34.8	14.0	1.1	0.93	0.28	0.15	0.20	0.15	0.15	0.13	0.28
Aluminum (mg/L)-Dissolved	---	0.032	0.011	1.4	0.0074	0.0039 J	0.0030 J	0.0050	<0.0020	0.0041	0.0076	0.0072
Antimony (mg/L)	---	0.00054	0.00054	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
Antimony (mg/L)-Dissolved	0.006	<0.00025	0.00025 J	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
Arsenic (mg/L)	---	0.034	0.015	0.0018	0.0015	0.0014	0.00090	0.0012	0.0013	0.0012	0.0012	0.0012
Arsenic (mg/L)-Dissolved	0.01	0.001	0.0011	0.0018	0.00084	0.00090	0.00078	0.0010	0.00097	0.0010	0.00090	0.0011
Barium (mg/L)	---	0.18	0.10	0.050	0.049	0.045	0.043	0.040	0.040	0.040	0.039	0.037
Barium (mg/L)-Dissolved	2	0.043	0.046	0.047	0.042	0.039	0.036	0.037	0.043	0.037	0.037	0.037
Beryllium (mg/L)	---	0.0034	0.0011	0.000077 J	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Beryllium (mg/L)-Dissolved	0.004	<0.00010	<0.000069	0.000081 J	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Bismuth (mg/L)	---	0.00036 J	0.00015 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (mg/L)-Dissolved	---	<0.00025	0.000035 J	0.000028 J	0.000040 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Boron (mg/L)	---	0.021	0.0085	0.0058	0.0058	0.0065	0.0062	0.0046 J	0.0073	0.0063	0.00092 J	0.0058
Boron (mg/L)-Dissolved	---	0.009	0.0054	0.0073	0.0049 J	<0.00018	0.0072	0.0068	0.0067	0.0054	0.0062	0.0063
Cadmium (mg/L)	---	0.00095	0.00034	0.000043 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Cadmium (mg/L)-Dissolved	0.005	<0.000040	<0.000020	0.000040 J	0.000024 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000027 J
Calcium (mg/L)-Dissolved	---	45.3	45.8	52.3	47.1	45.8	46.4	47.6	49.6	50.6	48.5	49.1
Chloride (mg/L)	250 s*	1.4	0.99 J	1.0	1.6 J	1.3	1.3	1.3	1.4	1.3	1.2	1.2
Chromium (mg/L)	---	0.045	0.020	0.0017	0.0012	0.00094	0.00085	0.00062	0.00072	0.00074	0.00044 J	0.00060
Chromium (mg/L)-Dissolved	---	0.00047 J	0.00053	0.0016	0.0042	0.00077	0.0015	0.0014	0.00040 J	0.00074	0.00069	0.00052
Copper (mg/L)	---	0.10	0.040	0.0036	0.0024	0.00099	0.00078	0.00062	0.00046 J	0.00054	0.00028 J	0.00045 J
Copper (mg/L)-Dissolved	1.3	0.00091	0.00036 J	0.0036	0.0010	0.0012	0.00033 J	0.00043 J	0.00025 J	0.00032 J	<0.00020	0.00028 J
Fluoride (mg/L)	4	0.2	0.10	0.17 J	0.091 J	0.078 J	0.051 J	0.058 J	0.068 J	0.070 J	0.065 J	0.14
Iron (mg/L)	---	42.2	16.1	1.1	0.76	0.33	0.17	0.19	0.14	0.14	0.11	0.22
Iron (mg/L)-Dissolved	0.3 s	0.033 J	0.0059 J	1.2	0.017 J	0.0054 J	0.0052 J	0.0085 J	0.0057 J	0.032 J	0.0061 J	<0.0045
Lead (mg/L)	---	0.019	0.0070	0.00054	0.00039	0.00041	0.00033	0.00030	0.00027	0.00022	0.00021	0.00034
Lead (mg/L)-Dissolved	0.015	0.00039	<0.000020	0.00055	0.000056 J	<0.000020	0.000037 J	0.00011	0.000048 J	0.000043 J	0.000038 J	0.000040 J
Magnesium-Dissolved (mg/L)	---	23.5	24.3	29.1	25.1	24.2	24.0	25.1	25.0	25.3	25.3	26.0
Manganese (mg/L)	---	1.5	0.62	0.037	0.020	0.023	0.0084	0.0070	0.0063	0.0073	0.0038	0.016
Manganese (mg/L)-Dissolved	0.05 s	0.02	0.0038	0.035	0.0020	0.00069	0.00050	0.0011	0.0065	0.00057	0.00029 J	0.0016
Mercury (ug/L)	---	0.034 J	0.031 J	0.029 J	<0.021	<0.021	<0.021	<0.021	<0.020	<0.020	<0.020	<0.037
Mercury (ug/L)-Dissolved	2.000	<0.014	0.033 J	<0.021	0.17 J	<0.021	0.027 J	0.030 J	<0.020	<0.020	<0.020	<0.037
Nickel (mg/L)	---	0.27	0.11	0.0095	0.0047	0.0037	0.0018	0.0015	0.0015	0.0014	0.00090	0.0015
Nickel (mg/L)-Dissolved	0.1	0.0055	0.0035	0.011	0.0022	0.0013	0.0011	0.00096	0.00095	0.00097	0.00067	0.0010
Nitrate, as N (mg/L)	10	0.38	0.31	0.27	0.27	0.30	0.26	0.27	0.28	0.28	0.29	0.30
Nitrite, as N (mg/L)	1	<0.0018	0.0031 J	0.0043 J	0.0030 J	<0.00047	0.0076 J	0.0044 J	0.0032 J	0.0013 J		<0.0050
Nitrogen, Ammonia, as N (mg/L)	---	0.020	<0.0080	0.030	<0.0080	0.010 J	<0.0070	0.020	0.070	0.020	0.030	0.010 J
Nitrogen, Kjeldahl, Total (mg/L)	---	0.17	0.16	0.11	<0.038	0.040 J	<0.038	<0.077	<0.038	<0.038	<0.038	<0.038
Nitrogen, NO2 plus NO3Nitrite, (mg/	10	0.38	0.31	0.27	0.27	0.30	0.27	0.27	0.28	0.28	0.29	0.30
Oil and Grease (mg/L)	---	3.8 J	1.4 J	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Orthophosphate (mg/L)	---	0.0075	0.010	0.0085	0.030	0.033	0.012	0.012	0.016	0.0097	0.011	0.019
pH Lab (s.u.)	6.5 - 8.5 s*	7.8	7.6	7.6	7.7	7.8	7.6	7.7	7.6	8.0	7.9	7.8
Phosphorus, total (mg/L)	---		0.38	0.035	0.028	0.028	0.022	0.026	0.019	0.016	0.015	0.029
Potassium-Dissolved (mg/L)	---	2.0	2.0	1.9	2.0	2.1	2.0	2.0	2.0	2.1	2.2	2.1
Selenium (mg/L)	---	0.0039	0.0014	0.00061	0.00044 J	0.00057	0.00043 J	0.00031 J	0.00052	0.00051	0.00057	0.00048 J
Selenium (mg/L)-Dissolved	0.05	0.00064	0.00044 J	0.00039 J	0.00045 J	0.00067	0.00034 J	0.00013 J	0.00038 J	0.00041 J	0.00040 J	0.00029 J
Silver (mg/L)	---	0.0012	0.00048 J	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071
Silver (mg/L)-Dissolved	0.1	<0.00025	0.00014 J	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	0.000079 J
Sodium-Dissolved (mg/L)	---	17.3	14.4	5.3	4.4	5.4	4.1	5.6	6.0	5.4	4.7	5.6
Specific Conductance (µhmos/cm)	---	437	459	451	421	432	433	415	405	437	434	449
Strontium (mg/L)	---	0.13	0.10	0.091	0.070	0.073	0.071	0.069	0.071	0.071	0.071	0.071
Strontium (mg/L)-Dissolved	4.0	0.089	0.083	0.084	0.067	0.065	0.064	0.066	0.067	0.066	0.066	0.071
Sulfate (mg/L)	250 s*	23.4	20.9	9.9	8.4	8.9	8.0	9.2	9.4	8.2	7.7	8.3
Thallium (mg/L)	---	0.00037	0.00015	<0.000050	<0.000050	<0.000050	0.000052 J	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thallium (mg/L)-Dissolved	0.002	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
TDS (mg/L)	---	264	255	248	230	241	252	237	253	202	192	23.0
Total Hardness (mg CaCO3/L)	---	210	214	251	221	214	214	222	227	230	225	230
Total Inorganic Nitrogen (mg/L)	---	0.40	0.31	0.30	0.27	0.31	0.27	0.29	0.35	0.30	0.32	0.31
Total Suspended Solids (mg/L)	500 s*	1140	348	25.7	14.3	16.9	6.0	12.6	7.9	6.5	5.9	8.6
Turbidity (NTU)	---	649	178	12.9	9.8	8.6	5.1	3.4	3.2	2.8	2.5	3.7
Uranium (mg/L)	---	0.0062	0.0034	0.0020	0.0019	0.0020	0.0017	0.0017	0.0018	0.0018	0.0016	0.0016
Uranium (mg/L)-Dissolved	0.03	0.0027	0.0023	0.0018	0.0016	0.0017	0.0015	0.0017	0.0018	0.0016	0.0018	0.0018
Zinc (mg/L)	---	0.36	0.15	0.011	0.0062	0.0033 J	0.0019 J	0.0038 J	0.0017 J	0.0023 J	0.0031 J	0.0031 J
Zinc (mg/L)-Dissolved	2.0	0.0094	0.0060	0.011	0.0042 J	0.0015 J	0.0019 J	0.0033 J	0.0048 J	0.0041 J	<0.0013	<0.0013
Field pH (s.u.)	6.5 - 8.5 s*	7.29	7.24	6.99	7.50	7.60	7.40	7.53	7.30	7.30	7.27	7.28
Field EC (µS/cm)	---	493	451	441	433	448	440	441	429	434	434	440
Field DO (mg/L)	---											
Field ORP (mV)	---											
Field Turbidity (NTU)	---											
Field Temperature (C)	---	3.9	4.4	4.2	5.3	6.3	6.0	6.1	4.8	4.7	4.7	4.6
Field Nitrates (mg/L)	---											
Stat Lvl (ft)	---	23.53	15.76	13.8	14.37	19.30	13.02	12.08	12.45	12.20	12.10	12.43
Cobalt (mg/L)	---											
Cobalt (mg/L)-Dissolved	---											
Molybdenum (mg/L)	---											
Molybdenum (mg/L)-Dissolved	---											
Vanadium (ug/L)	---											
Vanadium (ug/L)-Dissolved	---			4.7								

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

LAD1MW	LAD1MW	LAD1MW	LAD1MW	LAD1MW	LAD1MW	LAD1MW	LAD1MW	LAD1MW	LAD1MW	LAD1MW
4/28/2011	6/1/2011	6/30/2011	7/27/2011	8/30/2011	9/27/2011	10/20/2011	11/8/2011	12/12/2011	1/31/2012	3/1/2012
<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
218	217	223	223	240	215	217	218	212	216	222
218	217	223	223	240	215	217	218	212	216	222
0.32	0.32	0.29	0.37	0.85	0.47	0.38	0.45	0.41	0.43	0.45
0.0056	0.0059	0.0042	0.0079	0.10	0.0094	0.011	0.0064	0.0093	0.017	0.0059
<0.00016	<0.000070	<0.000070	<0.000070	0.00042 J	<0.000070	<0.000070	<0.000070	<0.000070	<0.00025	<0.00025
<0.000070	<0.000070	<0.000070	<0.000070	0.00055	<0.000070	0.000079 J	<0.000070	<0.000070	<0.00025	<0.00025
0.0017	0.0013	0.0012	0.0013	0.0062	0.0012	0.0013	0.0013	0.0013	0.0013	0.0015
0.0012	0.0012	0.00096	0.0011	0.0062	0.0011	0.0011	0.0011	0.0012	0.00097	0.00098
0.038	0.035	0.036	0.034	0.032	0.036	0.034	0.034	0.031	0.032	0.033
0.035	0.034	0.033	0.033	0.029	0.034	0.037	0.032	0.031	0.030	0.031
<0.000069	0.000037 J	0.000042 J	0.000024 J	0.000092 J	0.000022 J	0.000032 J	0.000048 J	<0.000020	<0.000092	<0.000092
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000026 J	<0.000020	<0.000020	0.000036 J	<0.000092	<0.000092
<0.000020	<0.000020	<0.000020	<0.000020	0.000024 J	0.000020 J	<0.000020	<0.000020	<0.000020	<0.00025	<0.00025
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00025	<0.00025
0.0082	0.0080	0.0057	0.0047 J	0.018	0.0083	0.0073	0.0080	0.0063	0.0070	0.015
0.0072	0.0073	0.0069	0.0053	0.017	0.0072	0.0091	0.0050	0.0068	0.0070	0.0067
0.000030 J	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000028	<0.000028
0.00014	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000028	<0.000028
56.6	51.0	55.3	50.7	23.1	59.0	45.2	47.9	41.8	42.7	52.2
1.3	1.3	1.4 J	1.5 J	1.5	1.3	1.3	1.3	1.2	1.1	1.3
0.00071	0.00051	0.00059	0.00050 J	0.00044 J	0.00075	0.00060	0.00049 J	0.00079	0.00083	0.00066
0.0017	0.00086	0.0014	0.00097	0.00062	0.00098	0.0015	0.00094	0.00086	0.00078	0.00097
0.0013	0.00058	0.00068	0.0013	0.0012	0.00036 J	0.00042 J	0.00062	0.00077	0.0023	0.00096
0.00042 J	0.00025 J	0.00045 J	0.00061	0.00094	0.00073	0.00049 J	0.00076	0.0015	0.0019	0.00038 J
0.13	0.083 J	0.078 J	0.099 J	0.28	0.14 J	0.13 J	0.14 J	0.14 J	0.12	0.12
0.32	0.19	0.17	0.21	0.28	0.23	0.20	0.21	0.20	0.21	0.21
0.0098 J	0.0063 J	0.0078 J	0.0063 J	0.036 J	0.010 J	0.015 J	0.0071 J	0.0057 J	<0.025	<0.025
0.00062	0.00051	0.00049	0.00074	0.00096	0.00078	0.00063	0.00080	0.00061	0.00062	0.00077
0.0011	0.00012	0.000064 J	0.000092 J	0.00021	0.00012	0.00010	0.00040	0.00023	0.00028	0.00023
25.4	23.8	25.2	26.5	11.1	27.2	26.4	26.4	22.6	23.8	24.9
0.11	0.0058	0.0043	0.0063	0.0033	0.0072	0.0044	0.0040	0.0046	0.0050	0.0059
0.0014	0.0018	0.00057	0.00070	0.0035	0.0030	0.0030	0.0023	0.0031	0.00058	0.0006
<0.037	<0.037	<0.037	<0.037	<0.037	0.090 J	0.061 J	0.078 J	0.039 J	<0.037	<0.037
<0.037	<0.037	0.038 J	<0.037	<0.037	0.084 J	0.039 J	0.087 J	<0.037	<0.037	<0.037
0.0031	0.00094	0.00071	0.00099	0.00039 J	0.00089	0.00082	0.00069	0.00073	0.00099	0.00075
0.00091	0.00074	0.00077	0.00081	0.00021 J	0.00075	0.00075	0.00061	0.00042 J	<0.000091	0.00030 J
0.31	0.28	0.29	0.30	0.73	0.30	0.33	0.30	0.30	0.30	0.29
0.012	0.0072 J	0.0058 J	0.0093 J	0.022	0.012	0.010	0.010	0.014	0.0031 J	0.012
0.090	0.036 J	<0.020	<0.020	<0.020	0.030 J	<0.020	<0.020	<0.019	<0.013	<0.013
0.020 J	<0.032	0.14	0.055 J	0.075 J	0.095 J	<0.032	<0.032	<0.032	<0.032	0.056 J
0.32	0.29	0.30	0.31	0.75	0.31	0.34	0.31	0.31	0.30	0.3
<1.0	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
0.035	0.023	0.022	0.030	0.044	0.030	0.030	0.024	0.032	0.014	0.03
7.9	7.8	7.8	7.8	8.0	7.7	7.9	7.8	7.7	7.6	7.5
0.055	0.027	0.032	0.054	0.032	0.034	0.031	0.031	0.031	0.025	0.034
2.2	2.0	2.0	2.1	1.3	2.0	2.1	2.2	2.0	1.9	2.1
0.00046 J	0.00040 J	0.00045 J	0.00056	0.00064	0.00054	0.00046 J	0.00049 J	0.00054	0.00040 J	0.00058
0.00051	0.00046 J	0.00069	0.00032 J	0.00060	0.00049 J	0.00057	0.00041 J	0.00053	0.00057	0.00055
<0.000071	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.00025	<0.00025
0.000085 J	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.00025	0.00027 J
6.2	5.5	4.1	5.1	82.4	4.4	5.3	4.5	5.0	4.8	3.8
407	442	419	408	523	419	464	390	426	431	432
0.071	0.067	0.069	0.069	0.054	0.070	0.068	0.072	0.065	0.065	0.069
0.068	0.068	0.064	0.065	0.055	0.068	0.068	0.065	0.068	0.064	0.067
8.4	8.5	7.5	8.1	32.0	7.8	7.9	7.9	8.7	8.4	7.7
<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
245	250	241	252	334	254	238	<5.0	242	254	231
246	225	242	236	103	259	221	229	197	204	233
0.41	0.33	0.31	0.33	0.75	0.34	0.36	0.31	0.31	0.30	0.3
23.5	10.2	13.4	18.3	14.1	23.6	17.8	12.7	23.1	19.2	20.2
10.1	5.8	4.1	7.3	13.4	8.3	7.5	6.8	9.2	8.3	7.3
0.0019	0.0019	0.0017	0.0019	0.0055	0.0018	0.0017	0.0019	0.0019	0.0018	0.0017
0.0017	0.0018	0.0016	0.0025	0.0051	0.0015	0.0019	0.0018	0.0017	0.0018	0.0018
0.0027 J	<0.0025	<0.0025	0.0027 J	0.0029 J	<0.0025	0.0026 J	0.0026 J	0.0026 J	0.0032 J	0.0030 J
0.0036 J	0.0027 J	0.0038 J	<0.0025	<0.0025	0.0027 J	0.0029 J	0.0051	0.0044 J	0.0037 J	0.0035 J
7.33	7.36	7.40	7.46	7.46	7.50	7.48	7.48	7.82	7.69	7.96
439	436	432	439	488	576	432	439	440	500	446
5.7	5.5	5.9	6.5	6.3	6.0	5.9	5.9	4.8	4.6	2.5
20.80	19.90	18.77	14.50	14.32	13.70	13.65	13.50	21.55	22.12	19.50

Sample ID	MT Groundwater Standard[2]	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW
Date		3/22/2010	4/27/2010	5/25/2010	6/30/2010	7/29/2010	8/24/2010	9/30/2010	10/27/2010	11/24/2010	12/16/2010	1/27/2011	2/24/2011
Alkalinity, Carbonate (mg CaCO3/L)	---	<5.0	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Alkalinity, Total (mg CaCO3/L)	---	239	234	168	159	169	170	180	186	204	204	190	174
Alkalinity, Bicarbonate (mg CaCO3/l	---	239	234	168	159	169	170	180	186	204	204	190	174
Aluminum (mg/L)	---	7.7	3.4	0.014	0.015	0.0069	0.0055	0.0063	0.021	0.0060	0.0082	0.0079	0.0055
Aluminum (mg/L)-Dissolved	---	0.0043	0.0052	0.035	0.0047	0.019	0.0054	0.0045	<0.0020	0.0032 J	0.0050	0.0047	0.0054
Antimony (mg/L)	---	0.0026	0.0017	<0.00016	<0.00016	0.00016 J	0.00017 J	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
Antimony (mg/L)-Dissolved	0.006	<0.00025	<0.00016	0.00016 J	0.00016 J	<0.00016	0.00016 J	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
Arsenic (mg/L)	---	0.010	0.0056	0.00050	0.00056	0.00057	0.00043 J	0.00053	0.00064	0.00047 J	0.00048 J	0.00050	0.00054
Arsenic (mg/L)-Dissolved	0.01	0.00046 J	0.00036 J	0.00052	0.00048 J	0.00052	0.00053	0.00049 J	0.00048 J	0.00053	0.00051	0.00048 J	0.00054
Barium (mg/L)	---	0.092	0.052	0.023	0.023	0.023	0.026	0.024	0.025	0.024	0.027	0.023	0.023
Barium (mg/L)-Dissolved	2	0.038	0.029	0.022	0.023	0.022	0.025	0.023	0.026	0.027	0.026	0.024	0.024
Beryllium (mg/L)	---	0.00096	0.00045	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Beryllium (mg/L)-Dissolved	0.004	<0.00010	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Bismuth (mg/L)	---	<0.00025	0.000082 J	0.00012 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (mg/L)-Dissolved	---	<0.00025	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Boron (mg/L)	---	0.011	0.0053	0.0076	0.0087	0.011	0.012	0.010	0.011	0.011	0.0062	0.0080	0.012
Boron (mg/L)-Dissolved	---	0.0066	0.0028 J	0.0081	0.0095	0.0047 J	0.012	0.011	0.010	0.0096	0.0095	0.0099	0.0094
Cadmium (mg/L)	---	0.00014	0.000053 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Cadmium (mg/L)-Dissolved	0.005	<0.000040	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000021 J
Calcium (mg/L)-Dissolved	---	59.4	59.3	46.8	47.0	47.0	52.6	51.3	54.6	53.3	53.4	49.8	53.2
Chloride (mg/L)	250 s*	1.4	0.96 J	1.8	2.3 J	2.0	2.0	1.7	1.9	1.5	1.5	1.5	1.6
Chromium (mg/L)	---	0.013	0.0065	0.0029	0.0069	0.0060	0.0037	0.0027	0.0019	0.0013	0.0010	0.0030	0.0024
Chromium (mg/L)-Dissolved	---	0.00034 J	0.00033 J	0.0029	0.0080	0.0059	0.0046	0.0029	0.0019	0.0014	0.0013	0.0031	0.0025
Copper (mg/L)	---	0.046	0.020	0.0014	0.0018	0.0016	0.0015	0.0011	0.0012	0.0010	0.0012	0.0012	0.0010
Copper (mg/L)-Dissolved	1.3	0.0016	0.00099	0.0015	0.0018	0.0023	0.0016	0.0017	0.0011	0.0012	0.0012	0.0014	0.0011
Fluoride (mg/L)	4	0.14	0.068 J	0.17 J	0.10	0.070 J	0.079 J	0.051 J	0.032 J	0.062 J	0.067 J	0.080 J	0.089 J
Iron (mg/L)	---	15.3	6.8	0.024 J	0.020 J	0.011 J	0.0086 J	0.0097 J	0.042 J	0.0094 J	0.0092 J	0.0094 J	0.0064 J
Iron (mg/L)-Dissolved	0.3 s	<0.025	0.0069 J	0.080	<0.0045	0.0095 J	0.0064 J	0.0055 J	0.023 J	0.0051 J	<0.0045	0.012 J	0.0050 J
Lead (mg/L)	---	0.038	0.016	0.00010	0.000044 J	0.000037 J	0.000065 J	0.000039 J	0.000058 J	0.000023 J	0.000034 J	0.000032 J	0.000039 J
Lead (mg/L)-Dissolved	0.015	0.00016	<0.000020	0.00013	0.000033 J	<0.000020	0.000044 J	0.000084 J	0.000024 J	0.000023 J	0.000035 J	0.000040 J	0.00024
Magnesium-Dissolved (mg/L)	---	20.1	19.5	14600	15.3	14.6	16.3	15.5	17.1	16.0	16.4	15.7	15.2
Manganese (mg/L)	---	0.17	0.069	0.0015	0.00088	0.00050	0.00072	0.00062	0.00086	0.00044 J	0.00051	0.00037 J	0.00031 J
Manganese (mg/L)-Dissolved	0.05 s	0.019	0.0040	0.0014	0.00081	0.00077	0.00070	0.00079	0.00083	0.00068	0.00041 J	0.00073	0.0010
Mercury (ug/L)	---	0.038 J	0.035 J	0.032 J	<0.021	<0.021	<0.021	<0.021	<0.020	<0.020	<0.020	<0.037	<0.037
Mercury (ug/L)-Dissolved	2.0	<0.014	0.034 J	<0.021	0.18 J	<0.021	<0.021	0.050 J	<0.020	<0.020	0.030 J	<0.037	<0.037
Nickel (mg/L)	---	0.026	0.012	0.00038 J	0.00064	0.00034 J	0.00028 J	0.00029 J	0.00034 J	0.00026 J	0.00027 J	0.00037 J	0.00029 J
Nickel (mg/L)-Dissolved	0.1	0.0010	0.00036 J	0.00053	0.00068	0.00047 J	0.00063	0.00058	0.00049 J	0.00038 J	0.00031 J	0.00052	0.00047 J
Nitrate, as N (mg/L)	10	0.30	0.85	3.8	2.4	2.1	2.2	2.2	2.2	1.8	1.5	1.5	1.6
Nitrite, as N (mg/L)	1	<0.0018	0.0017 J	0.0027 J	0.0054 J	0.027	0.0061 J	0.014	0.00050 J	0.0020 J		<0.0050	<0.0050
Nitrogen, Ammonia, as N (mg/L)	---	0.010 J	<0.0080	0.040	0.060	0.040	<0.0070	0.010 J	<0.0070	0.010 J	0.010 J	0.010 J	0.010 J
Nitrogen, Kjeldahl, Total (mg/L)	---	<0.038	0.28	0.34	0.28	0.38	0.32	0.095 J	0.055 J	0.20	0.14	0.080 J	0.20
Nitrogen, NO2 plus NO3Nitrite, (mg	10	0.30	0.85	3.8	2.4	2.1	2.2	2.2	2.2	1.8	1.5	1.5	1.6
Oil and Grease (mg/L)	---	<2.5	1.4 J	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.1	<1.0	<1.0	
Orthophosphate (mg/L)	---	0.0091	0.011	0.0078	0.0066	0.0086	0.0058	0.0046	0.0086	0.0073	0.0083	0.0080	
pH Lab (s.u.)	6.5 - 8.5 s*	7.6	7.4	7.6	7.7	7.7	7.5	7.6	7.5	7.8	7.8	7.7	7.8
Phosphorus, total (mg/L)	---	2.5	1.1	0.020	0.0095	0.016	0.016	0.021	0.013	0.0094	0.0072	0.020	0.0095
Potassium-Dissolved (mg/L)	---	1.8	1.8	1.6	1.8	2.0	2.1	2.1	2.2	2.2	2.4	2.3	2.3
Selenium (mg/L)	---	0.0020	0.00056	0.00034 J	0.00012 J	0.00025 J	0.00031 J	<0.00010	0.00019 J	0.00017 J	0.00032 J	<0.00010	0.00014 J
Selenium (mg/L)-Dissolved	0.05	<0.00025	0.00010 J	0.00017 J	0.00012 J	0.00044 J	0.00018 J	<0.00010	0.00018 J	0.00011 J	<0.00010	<0.00010	0.00022 J
Silver (mg/L)	---	0.0022	0.0012	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071
Silver (mg/L)-Dissolved	0.1	<0.00025	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071	<0.000071
Sodium-Dissolved (mg/L)	---	1.9	1.9	2.0	2.4	2.7	3.0	2.9	3.2	2.7	2.9	2.8	2.8
Specific Conductance (µhmos/cm)	---	411	437	379	358	380	416	372	367	396	393	380	365
Strontium (mg/L)	---	0.11	0.10	0.074	0.062	0.067	0.075	0.070	0.074	0.070	0.079	0.073	0.067
Strontium (mg/L)-Dissolved	4.0	0.083	0.083	0.077	0.062	0.062	0.072	0.067	0.069	0.069	0.072	0.071	0.068
Sulfate (mg/L)	250 s*	7.3	8.6	15.9	20.9	20.9	17.5	14.0	14.3	11.2	11.3	13.0	12.7
Thallium (mg/L)	---	0.00014	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thallium (mg/L)-Dissolved	0.002	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
TDS (mg/L)	---	249	254	229	208	230	248	213	234	192	225	56.0	210
Total Hardness (mg CaCO3/L)	---	231	228	184	180	178	198	192	207	199	201	189	195
Total Inorganic Nitrogen (mg/L)	---	0.31	0.85	3.8	2.5	2.1	2.2	2.3	2.2	1.8	1.5	1.5	1.6
Total Suspended Solids (mg/L)	500 s*	377	178	1.2	<0.50	<0.50	<0.50	0.86 J	<0.50	<0.51	<0.52	0.51 J	<0.50
Turbidity (NTU)	---	196	81.8	0.69	0.13	0.49	0.40	0.28	0.15	0.22	0.54	0.17	0.40
Uranium (mg/L)	---	0.0025	0.0016	0.00068	0.00063	0.00072	0.00076	0.00068	0.00078	0.00075	0.00083	0.00070	0.00072
Uranium (mg/L)-Dissolved	0.03	0.0011	0.0011	0.00069	0.00064	0.00064	0.00073	0.00071	0.00082	0.00074	0.00089	0.00079	0.00067
Zinc (mg/L)	---	0.066	0.029	0.0014 J	0.0021 J	<0.0013	<0.0013	0.0018 J	<0.0013	<0.0013	<0.0013	0.0016 J	0.0017 J
Zinc (mg/L)-Dissolved	2.0	0.0049 J	0.0017 J	0.0017 J	0.0031 J	0.0023 J	0.0021 J	0.0038 J	0.0087	0.0028 J	<0.0013	0.0036 J	0.0073
Field pH (s.u.)	6.5 - 8.5 s*	7.15	7.32	6.99	6.76	7.30	7.32	7.36	7.21	7.12	7.04	6.92	7.00
Field EC (µS/cm)	---	453	465	381	365	372	402	387	387	385	381	374	398
Field DO (mg/L)	---												
Field ORP (mV)	---												
Field Turbidity (NTU)	---												
Field Temperature (C)	---	2.7	4.8	5.4	4.6	7.8	4.8	5.2	3.8	4.0	4.0	4.3	4.2
Field Nitrates (mg/L)	---												
Stat Lvl (ft)	---	5.4	5.3	5.3	5.8	6.6	6.90	7.20	7.20	7.30	7.40	5.20	5.30
Tin (ug/L)	---			0.13 J									
Sodium (ug/L)	---			1970									
Potassium, (ug/L)	---			1630									
Magnesium, Dissolved (mg/L)	---			16.3									
Calcium (mg/L)	---			45900									
Cobalt (mg/L)	---			<0.22									
Cobalt (mg/L)-Dissolved	---												
Molybdenum (ug/L)	---			0.99									
Molybdenum (ug/L)-Dissolved	---												
Vanadium (ug/L)	---			0.37									
Vanadium (ug/L)-Dissolved	---												

1: MT Aquatic Life Standards apply to total recoverable digestion methods for surface waters.

2: Groundwater Standards apply to dissolved portion of sample for ground waters.

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS = total dissolved solids; TSS = total suspended solids;

NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L).

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human health values, both from Montana Circular DEQ-7 (February 2008).

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW	LAD2MW
3/30/2011	4/28/2011	6/1/2011	6/30/2011	7/27/2011	8/30/2011	9/27/2011	10/20/2011	11/8/2011	12/12/2011	1/31/2012	3/1/2012
<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
175	169	151	169	172	186	183	189	193	194	199	202
175	169	151	169	172	186	183	189	193	194	199	202
0.011	0.0041	0.0071	0.0027 J	0.0040	0.0032 J	0.0045	0.0051	0.016	0.011	0.0040	0.0047
0.0031 J	0.0025 J	0.0041	0.0033 J	0.0045	0.0036 J	0.0036 J	0.0078	0.0083	0.0042	0.0066	0.0027 J
0.00020 J	<0.00016	0.00017 J	0.00037 J	0.00015 J	0.00013 J	0.00014 J	0.00013 J	0.00014 J	0.00019 J	<0.00025	<0.00025
<0.00016	0.00016 J	0.00016 J	0.00017 J	0.00016 J	0.00012 J	0.00014 J	0.00017 J	0.00014 J	0.00018 J	<0.00025	<0.00025
0.00062	0.00060	0.00056	0.00058	0.00060	0.00045 J	0.00041 J	0.00046 J	0.00056	0.00054	0.00047 J	0.00067
0.00056	0.00057	0.00052	0.00070	0.00053	0.00054	0.00055	0.00046 J	0.00048 J	0.00062	0.00050	0.00044 J
0.028	0.025	0.021	0.023	0.025	0.026	0.027	0.027	0.027	0.027	0.029	0.028
0.024	0.025	0.021	0.023	0.025	0.024	0.027	0.029	0.026	0.032	0.028	0.028
<0.000069	<0.000069	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000092	<0.000092
<0.000069	<0.000020	<0.000020	0.000033 J	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000092	<0.000092
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00025	<0.00025
<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000052 J	<0.00025	<0.00025
0.0099	0.0096	0.0077	0.0058	0.0083	0.0098	0.0097	0.0066	0.0093	0.0080	0.050	0.013
0.0092	0.0087	0.0082	0.0082	0.0082	0.0096	0.011	0.011	0.0093	0.0095	0.0086	0.0083
<0.000020	<0.000020	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000028	<0.000028
0.000042 J	0.000034 J	<0.000030	<0.000030	0.00012	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000028	<0.000028
50.4	58.6	46.5	54.5	55.6	52.5	76.8	47.0	54.4	69.8	52.5	61.9
1.7	1.6	1.8	1.7 J	1.8 J	1.7	1.6	1.6	1.6	1.5	1.4	1.6
0.0022	0.0015	0.00055	0.0027	0.00064	0.00047 J	0.00040 J	0.00032 J	0.00033 J	0.00042 J	0.00047 J	0.00039 J
0.0019	0.0017	0.00086	0.0011	0.00082	0.00049 J	0.00062	0.0012	0.00079	0.00094	0.00059	0.00048 J
0.0011	0.00099	0.0015	0.030	0.0016	0.0014	0.0015	0.0012	0.0018	0.0019	0.0017	0.0021
0.0012	0.0011	0.0015	0.0018	0.0018	0.0015	0.0019	0.0013	0.0017	0.0026	0.0020	0.0016
0.077 J	0.077 J	0.070 J	0.082 J	0.093 J	0.12	0.12 J	0.12 J	0.14 J	0.088 J	0.11	0.11
0.020 J	0.0055 J	0.0048 J	0.012 J	<0.0047	<0.0047	0.0089 J	<0.0047	0.015 J	0.0087 J	<0.025	<0.025
0.0047 J	<0.0047	0.0066 J	<0.0047	0.24	<0.0047	<0.0047	<0.0047	<0.0047	0.0062 J	<0.025	<0.025
0.00038	0.00011	0.000084 J	0.00033	0.000083 J	0.000063 J	0.000068 J	0.00017	0.00031	0.00017	0.000088 J	0.00018
0.0026	0.00035	0.00014	0.00011	0.00018	0.000080 J	0.000067 J	<0.000050	0.00058	0.00019	0.000090 J	0.00012
14.7	15.8	12.6	14.0	15.8	14.5	16.5	16.4	17.0	19.5	17.4	16.5
0.00058	0.00024 J	0.00023 J	0.00048 J	0.00020 J	0.00026 J	0.00034 J	0.00022 J	0.0010	0.00038 J	0.00018 J	0.00025 J
0.0010	0.00036 J	0.0010	0.00042 J	0.0025	0.0011	0.0018	0.00030 J	0.00037 J	0.00043 J	0.00031 J	0.00068
<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	0.089 J	0.054 J	0.076 J	0.040 J	<0.037	<0.037
<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	0.082 J	0.059 J	0.083 J	<0.037	<0.037	<0.037
0.00032 J	0.00024 J	0.00033 J	0.0013	0.00051	0.00034 J	0.00030 J	0.00036 J	0.00033 J	0.00025 J	0.00026 J	0.00024 J
0.00098	0.00035 J	0.00045 J	0.00051	0.0016	0.00029 J	0.00044 J	0.00046 J	0.00037 J	0.00040 J	0.00026 J	<0.000091
1.5	1.2	1.2	1.3	1.2	1.2	1.2	0.17	0.93	0.75	0.66	0.64
<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0018 J	0 J
0.030	0.070	0.059	0.033 J	0.039 J	<0.020	0.15	<0.020	<0.020	<0.019	<0.013	0.020 J
0.16	0.16 J	0.19	0.25	0.18	0.20	0.18	0.14	0.12	0.13	0.13	0.082 J
1.6	1.2	1.2	1.3	1.2	1.2	1.2	0.17	0.93	0.75	0.67	0.64
<1.0	<1.0	<1.6	<1.6	<1.7	<1.6	<1.7	<1.6	<1.6	<1.6	<1.6	<1.6
0.0091	0.0075	0.0062	0.0063	0.031	0.0057	0.0067	0.0057	0.0065	0.0067	0.0076	0.0068
7.9	7.8	7.8	7.8	7.7	7.8	7.6	7.7	7.9	7.4	7.6	7.4
0.016	0.0081	0.011	0.012	0.012 J	0.012	0.028	<0.00080	0.0085	<0.0040	0.010	0.0098
2.3	2.6	2.2	2.2	2.5	2.5	2.5	2.5	2.5	2.9	2.5	2.6
0.00010 J	0.00020 J	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
<0.00010	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
<0.000071	<0.000071	<0.000070	<0.000070	0.000085 J	<0.000070	<0.000070	<0.000070	<0.000070	0.00032 J	<0.00025	<0.00025
<0.000071	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	0.00017 J	<0.00025	<0.00025
2.6	3.0	2.5	2.5	2.9	2.5	2.8	2.7	2.6	3.0	2.7	2.6
368	366	333	364	380	372	365	432	368	399	383	431
0.069	0.073	0.061	0.069	0.076	0.070	0.077	0.076	0.080	0.080	0.083	0.08
0.065	0.071	0.059	0.065	0.071	0.071	0.076	0.075	0.075	0.092	0.080	0.079
12.7	12.5	10.3	9.5	10.6	10.6	10.1	9.8	9.7	10.1	9.0	8.9
<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
214	210	199	209	216	217	226	219	204	229	235	229
186	212	168	194	204	191	260	185	206	255	203	223
1.6	1.3	1.3	1.3	1.3	1.2	1.3	0.18	0.93	0.75	0.68	0.66
<0.51	0.51 J	<0.50	<0.50	<0.50	<0.50	<0.50	0.80 J	<0.50	<0.50	<0.50	<0.49
0.87	0.36	0.090 J	0.16	0.28	0.27	0.26	0.21	0.090 J	0.45	0.25	0.14
0.00076	0.00079	0.00066	0.00068	0.00082	0.00078	0.00081	0.00083	0.00092	0.00090	0.0010	0.00095
0.00071	0.00079	0.00064	0.00069	0.0018	0.00074	0.00081	0.00094	0.00096	0.0012	0.0010	0.001
0.0015 J	<0.0013	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
0.0095	<0.0025	0.0029 J	<0.0025	0.0048 J	<0.0025	<0.0025	0.0033 J	0.0042 J	0.0042 J	0.0039 J	<0.0025
7.04	7.11	7.22	7.32	7.52	7.22	7.29	7.51	7.46	7.35	7.66	6.82
442	482	444	422	390	412	534	482	492	417	443	441
4.3	4.5	5.0	6.1	7.1	5.1	4.7	4.5	4.4	4.2	4.1	4.8
5.40	5.40	6.50	6.50	6.90	7.00	7.00	7.20	7.30	6.20	7.30	6.50

TETRA TECH, INC.

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MEMORANDUM

TO: Phillip Mulholland CPG, Chief Mine Geologist
Butte Highlands Joint Venture

cc:

FROM: Allan R. Kirk, Senior Project Manager, Tetra Tech
Mark F. Pearson, Geologist, Tetra Tech

DATE: October 4, 2010

RE: Butte Highlands Mine
2010 Geochemical / PAR Monitoring
Tetra Tech Project No.: 114-710113.100

Butte Highlands Joint Venture (Company) has a mineral Exploration License issued by the State of Montana that includes approval to drive a decline to reach underground drill stations and thereby assess underground mineral potential at its Butte Highlands mine. As a means of characterizing waste rock and ore to be produced at the mine, the Company has agreed to conduct routine monitoring for the presence of potentially asbestiform rock (PAR) and to evaluate potential for metal release and the formation of acid rock drainage. This memorandum summarizes the results of Polarized Light Microscopic (PLM) analysis of PAR content, ME-MS41 Analysis, EPA Method 1312 Synthetic Precipitation Leachability Procedure (SPLP), and acid-base accounting (ABA) tests on samples collected from the Butte Highlands mine during June and July 2010. These samples were chosen from areas mined during 2010 to comply with the operational sampling program discussed with the Montana Department of Environmental Quality (DEQ).

Seven samples, under chain of custody, were shipped to RJ Lee Group in Monroeville, Pennsylvania for analysis of PAR mineralization using polarized light microscopy (PLM). Copies of the RJ Lee Group laboratory report and custody documents are included as **Attachment A**. Descriptions of sample lithologies are presented in **Table 1** and analytical results are summarized in **Tables 2** through **5**.

Butte Highlands mine personnel sampled, packaged, and shipped a total of seven samples, under chain of custody, to ALS Chemex (ALS) Laboratories in Sparks Nevada for sample preparation, splitting, and analysis of Trace Element Geochemistry using method ME-MS41. A copy of the ALS laboratory report is included as **Attachment B**.

The sample splits generated by ALS were shipped to Energy Laboratories in Billings, Montana for Acid-Base Accounting and SPLP testing. A copy of the Energy Laboratories analytical report and custody documents are included as **Attachment C**.

PAR Evaluation

In June 2010, seven (7) samples of rock were selected from waste areas mined in the decline section of the Butte Highlands mine. As of this sampling, the only lithology that has been encountered as waste is dolomite. Rock from contact zones where PAR mineralization is most likely to occur was collected. Following collection of the samples, Tetra Tech took custody of the samples and shipped them to RJ Lee Group laboratory. Samples were submitted for PLM analysis in order to determine the presence or absence of asbestiform minerals. Rock samples were submitted without crushing so that RJ Lee Group technicians could more accurately identify portions of the overall sample where potential asbestiform mineralization might be present. Results of the PLM analysis are summarized in **Table 2**. All samples were composed of 100 % non-fibrous material. As PLM results did not indicate the presence of PAR, further analysis was not performed.

ME-MS41 Analysis

In June and July 2010, seven (7) samples of dolomite waste rock were selected from waste areas mined in the decline section of the Butte Highlands mine. These were submitted to ALS Chemex in Elko, Nevada for preparation and analysis of 51 trace elements in accordance with method ME-MS41. Method ME-MS41 is a geochemical analytical procedure used to test for a number of elements with exception to gold. Each prepared sample is digested with aqua regia, heated, and then cooled. The resulting solution is diluted with deionized water, mixed, and analyzed by inductively coupled plasma-atomic emission spectrometry (ICP-MS). Following this analysis, the results are reviewed for high concentrations of bismuth, mercury, molybdenum, silver and tungsten and diluted accordingly. Samples are then analyzed by ICP-MS for the remaining suite of elements. Analytical results are corrected for inter-element spectral interferences. Sample results are summarized in **Table 3**.

The purpose of the multi-element trace metal geochemistry analysis is to identify relatively high trace metal concentrations in the samples that pose a potential to be mobilized from the rock during reactions involving water. Alternatively, the trace element geochemistry can be used to identify relatively low trace metal concentrations in rock that are unlikely to be mobilized and concentrated by reaction with water. Therefore, the ultimate use of the trace element geochemistry is to identify a potential suite of metals from the various rock types in the deposit that have the potential to mobilize and degrade water quality so that they can be specifically analyzed in future metal mobility testing (SPLP, column leach, or humidity cell testing). The results of the ME-MS41 analysis has been reviewed with respect to various alteration assemblages associated with ores of the Butte Highlands mining district (Koschman and Bergendahl 1968), Resource Conservation and Recovery Act (RCRA) metals, and detections that had been observed in previous water quality monitoring at the site (Timberline 2008). In addition, constituent concentrations were compared with upper crustal abundances of trace elements from two publications by Hu and Gao 2008 and Rudnick and Gao 2003.

Given that this is an initial geochemical monitoring event of dolomite waste material, with other types of waste (including ore and skarn waste rock) yet to be sampled, it is useful to review and associate the ME-MS41 element results with the occurrence of these elements in mining district ores, RCRA list, water quality results, and crustal abundance concentrations. This is for the purpose of predicting the elements that could occur in concentrations exceeding regulatory standards in future metal mobility testing. Of the 51 elements analyzed, 21 elements were highlighted in **Table 3** that have these associations. The elements in mining district ores, RCRA

metals list, and water quality results elements are listed at the bottom of **Table 3**. In addition, 19 of the metals in the ME-MS41 analysis have also been analyzed in the SPLP testing discussed below.

Upper crustal abundance values where met or exceeded by one or more sample concentrations are also highlighted in **Table 3**. The elements that meet or exceed upper crustal abundance values in the samples are Silver, Arsenic, Cadmium, Magnesium (as Magnesium Oxide), Molybdenum, Antimony, and Selenium. All of these metals with exception to Magnesium and Molybdenum have been analyzed in the SPLP testing. In addition, the ME-MS41 analysis identified the following elements having anomalous concentrations (within one tenth of the crustal abundance value or by a relatively high concentration): Cerium, Copper, Mercury, Lanthanum, Manganese, Phosphorous, Lead, Strontium, Tellurium, Uranium, Tungsten, and Zinc. Anomalous concentrations are also highlighted in **Table 3**.

Metal Mobility Testing

The leachates of seven (7) samples were analyzed during SPLP testing (metal mobility testing). These were generally of good quality, with most analytes occurring at concentrations below analyte reporting limits (**Attachment C**). Aluminum, arsenic, barium, and fluoride were detected in the samples. However, the concentrations of these constituents were below human health and/or aquatic life-based regulatory standards. The potential for release of a significant mass of metals from waste rock dumps containing the dolomite rock analyzed is predicted to be very low based on review of the low concentrations of detected constituents in the SPLP testing. Analytical results are summarized in **Table 4**.

Acid Base Accounting

Splits of the samples submitted for SPLP testing were also evaluated for acid mine drainage potential using the Modified Sobek method of acid base accounting (**Attachment C**). This method is used to determine whether sufficient neutralization potential is present to neutralize potential acidification from the weathering of sulfide minerals. Neutralization potential and acidification potential are each reported as $CaCO_3$ equivalents with neutralization values expressed as positive values and acidification as negative values. If the sum of these values (the acid base potential) for a given sample is positive it indicates that enough neutralization potential is present to neutralize any acidity that may be generated by the weathering of sulfide minerals.

No acid generation potential was detected in any of the samples. All samples were found to be net neutralizing with acid-base potentials over 1,000 t/kt (tons $CaCO_3$ per kiloton waste rock). Analytical results are summarized in **Table 5**. Because these are initial results, typical ABA diagrams have not been plotted. ABA diagrams will be produced once additional information is available for other waste rock and ore-types.

Summary

In consideration of the analyses conducted, the following summary points are presented:

- Results of PAR testing indicate that dolomite rock mined during 2010 has no potential to release asbestiform mineral fibers.

- ME-MS41 analysis of 51 metals/elements from dolomite samples compared with upper crustal abundance trace element data identified seven elements that meet or exceed upper crustal abundance concentrations: Silver, Arsenic, Cadmium, Magnesium (as Magnesium Oxide), Molybdenum, Antimony, and Selenium. In addition, elements having anomalous concentrations include: Cerium, Copper, Mercury, Lanthanum, Manganese, Phosphorous, Lead, Strontium, Tellurium, Uranium, Tungsten, and Zinc.

- Potential for trace metal mobility is low from dolomite wastes mined during 2010. Aluminum, arsenic, barium, and fluoride were detected in SPLP leachates but at concentrations that were well below all applicable regulatory standards. Therefore, the potential for release of a significant mass of these metals from dolomite in waste rock dumps is predicted to be very low.

- Results of acid base accounting indicate that all samples were net neutralizing and pose no risk of acid generation.

The conclusion that the dolomite waste mined to date pose little potential environmental risk does not preclude the importance of the testing of mined rock materials, as these same tests will be used to characterize metal mobility and acid generation potential for a variety of rock types comprising the deposit. The values obtained from all rock types will then be used to predict typical blended “run-of-mine” waste rock characteristics. The analyses of individual lithologies may also be used to identify the need for selective handling of problematic materials. However, the Butte Highlands mine anticipates that ultimately all mine wastes will be placed back underground in closure.

References

Hu, Z. and S. Gao, 2008. Upper crustal abundance of trace elements: a revision and update. Chemical Geology 253 (2008) 205-221.

Koschmann, A.H. and M.H. Bergendahl, 1968. Principal Gold-Producing Districts of the United States. USGS Professional Paper 610.

MDEQ, 2008. Montana numeric water quality standards. Montana Department of Environmental Quality Circular DEQ-7, February 2008.

Rudnick, R.L. and S. Gao, 2003. Composition of the Continental Crust. In: Rudnick, R.L. (Ed.), The Crust. In: Holland, H.D., Turekian, K.K. (Eds.), Treatise on Geochemistry, vol.3. Elsevier-Pergamon, Oxford, pp.1-64.

Timberline Resources, 2008. Groundwater Quality at Butte Highlands Mine Site, 2008 Monitoring Results (Table).

TABLES

Table 1. Summary of Sample Lithologies Butte Highlands Mine 2010 Geochemical / PAR Monitoring	
Sample Identification	**Sample Lithology**
CORE-140	mottled tan to gray dolomite, wk limonite on frax
CORE-250	lt-med tan, occ gray bands, calc. dolomite, wk-mod limonite
MAR-332	mottled tan to gray dolomite, wk-mod limonite on frax
MAR-454	mottled tan to gray dolomite, wk-mod limonite on frax
MAR-557	mottled tan to gray dolomite, wk limonite on frax
MAR-578	mottled tan to gray dolomite, wk-mod limonite on frax
MAR-650	mottled tan to gray dolomite, wk limonite on frax
MAR-690	mottled tan to gray dolomite, wk-mod limonite on frax
MAR-726	mottled tan to gray dolomite, wk limonite on frax
MAR-806	mottled tan to gray dolomite, wk-mod limonite on frax

Notes: wk : weak frax : fractures lt : light med : medium
occ : occasional calc. : calcarious

Table 2. Summary of Potentially Asbestiform Rock Results
Butte Highlands Mine
2010 Geochemical / PAR Monitoring

Sample Identification	Sample Lithology	Asbestos Detected
CORE-140	mottled tan to gray dolomite, wk limonite on frax	*ND*
CORE-250	lt-med tan, occ gray bands, calc. dolomite, wk-mod limonite	*ND*
MAR-332	mottled tan to gray dolomite, wk-mod limonite on frax	*ND*
MAR-454	mottled tan to gray dolomite, wk-mod limonite on frax	*ND*
MAR-557	mottled tan to gray dolomite, wk limonite on frax	*ND*
MAR-650	mottled tan to gray dolomite, wk limonite on frax	*ND*
MAR-726	mottled tan to gray dolomite, wk limonite on frax	*ND*

Notes: wk : weak frax : fractures lt : light med : medium
occ : occasional calc. : calcarious
ND : Not Detected

Table 3. ME-MS41 Analysis
Butte Highlands Mine
2010 Geochemical / PAR Monitoring

Sample Description	Ag ppm	Al %	As ppm	Au ppm	B ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cs ppm
CORE-140	0.04	0.12	16	<0.2	<10	10	0.07	<0.01	20.1	0.05	8.11	0.8	2	0.08
CORE-250	0.01	0.16	19	<0.2	<10	10	0.09	0.01	19.45	0.01	10.9	1.1	3	0.09
MAR-332	<0.01	0.1	7	<0.2	<10	<10	<0.05	<0.01	19.55	<0.01	9.98	0.9	1	0.09
MAR-454	0.13	0.08	9	<0.2	<10	10	<0.05	0.02	19.7	0.16	6.28	0.8	2	0.1
MAR-578	0.15	0.04	27	<0.2	<10	<10	0.05	0.02	19.15	0.09	3.82	0.8	1	0.22
MAR-690	0.02	0.11	12	<0.2	<10	10	<0.05	0.01	20.5	0.03	6.86	0.9	2	0.15
MAR-806	0.05	0.02	9	<0.2	<10	<10	<0.05	0.02	20.7	0.11	4.35	0.8	1	<0.05
Abundance(1)		--	5.7		47		1.9	0.23	--	0.06		15	73	4.9
(2)	0.053	--		1.5		624			--		63			
1/10 Value (3)	0.0053		0.57	0.15	4.7	62.4	0.19	0.023		0.006	6.3	1.5	7.3	0.49

Sample Description	Cu ppm	Fe %	Ga ppm	Ge ppm	Hf ppm	Hg ppm	In ppm	K %	La ppm	Li ppm	Mg %	Mn ppm	Mo ppm	Na %
CORE-140	3.4	0.29	0.28	<0.05	0.02	0.02	<0.005	0.06	5	0.5	12.35	277	0.21	0.02
CORE-250	4.4	0.28	0.37	<0.05	0.02	0.01	<0.005	0.1	6.3	0.6	11.7	274	0.24	0.02
MAR-332	3.2	0.29	0.28	<0.05	<0.02	0.01	<0.005	0.05	5.5	0.7	12	267	0.14	0.02
MAR-454	3.5	0.3	0.18	<0.05	0.02	<0.01	<0.005	0.05	3.5	0.6	11.95	365	0.16	0.02
MAR-578	6.7	0.33	0.12	<0.05	0.02	<0.01	<0.005	0.02	2	0.9	12.1	380	0.77	0.02
MAR-690	3.2	0.28	0.26	<0.05	<0.02	<0.01	<0.005	0.06	3.7	0.9	11.8	341	0.16	0.02
MAR-806	3	0.24	0.14	0.09	<0.02	0.01	<0.005	0.01	3.3	0.2	12.85	272	<0.05	<0.01
Abundance(1)	27	--	18.6	1.3			0.066			41		--	0.6	
(2)		--			5.3	0.05		2.8 (as K_2O)	31		2.48 (as MgO)	--		3.3 (as Na_2O)
1/10 Value (3)	2.7		1.86	0.13	0.53	0.005	0.0066	0.28	3.1	4.1	0.248		0.06	0.33

Sample Description	Nb ppm	Ni ppm	P ppm	Pb ppm	Rb ppm	Re ppm	S %	Sb ppm	Sc ppm	Se ppm	Sn ppm	Sr ppm	Ta ppm	Te ppm
CORE-140	0.44	1.3	60	1	1.4	0.001	0.16	0.63	0.5	0.2	<0.2	56.2	<0.01	0.01
CORE-250	0.52	2.8	110	0.7	2.1	<0.001	0.17	0.43	0.6	<0.2	<0.2	64.9	<0.01	0.01
MAR-332	0.44	1.5	70	6.4	1.2	<0.001	0.15	0.38	0.5	0.2	<0.2	66.9	<0.01	0.01
MAR-454	0.4	1.6	40	3.4	1.4	<0.001	0.14	0.6	0.4	0.2	<0.2	53.7	<0.01	0.01
MAR-578	0.21	1.5	20	0.9	1.1	<0.001	0.17	1.19	0.4	0.2	<0.2	53.9	<0.01	0.01
MAR-690	0.37	2	40	0.5	1.6	<0.001	0.16	0.58	0.5	0.2	<0.2	49.8	<0.01	0.01
MAR-806	0.21	<0.2	20	0.8	0.3	<0.001	<0.01	0.33	0.3	0.2	<0.2	26.2	<0.01	0.01
Abundance(1)	11.6	34	--		94			0.75	14		2.2		0.92	0.027
(2)			--	17		0.198	621			0.09		320		
1/10 Value (3)	1.16	3.4		1.7	9.4	0.0198	62.1	0.075	1.4	0.009	0.22	32	0.092	0.0027

Sample Description	Th ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Y ppm	Zn ppm	Zr ppm
CORE-140	0.7	<0.005	0.04	2.11	6	0.17	1.61	16	1
CORE-250	0.5	<0.005	0.06	0.76	7	0.06	1.89	21	1.1
MAR-332	0.6	<0.005	0.03	0.49	3	0.05	1.67	10	0.5
MAR-454	0.3	<0.005	0.05	0.64	4	0.07	1.08	15	1.2
MAR-578	0.2	<0.005	<0.02	0.96	2	0.09	0.94	19	1.2
MAR-690	0.3	<0.005	0.04	1.16	3	0.06	1.09	25	1.3
MAR-806	<0.2	<0.005	<0.02	0.33	4	0.24	0.58	17	0.5
Abundance(1)		--	0.55	2.6	106	1.4		75	
(2)	10.5	--					21		193
1/10 Value (3)	1.05		0.055	0.26	10.6	0.14	2.1	7.5	19.3

Notes : Analysis by ALS Chemex using Method ME-MS41 Aqua Regia Digestion

(1) Hu and Gao, 2008. Upper crustal abundance of trace elements: a revision and update. Chemical Geology 253 (2008) 205-221.
(2) Rudnick and Gao, 2003. Composition of the Continental Crust. In: Rudnick, r.L. (Ed.), The Crust.
In: Holland, H.D., Turekian, K.K. (Eds.), Treatise on Geochemistry, vol.3. Elsevier-Pergamon, Oxford, pp.1-64.
(3) Anomalous concentration that is considered to be 1/10th the abundance value
Trace element concentration in Butte Highlands sample equals or exceeds Abundance or Anomalous (1/10) value.
-- Abundance value not given in either publication

Principal Sulfide Ores:	Mineral	Elements*
USGS Prof Paper 610	chalcopyrite	Ag, Cu, Fe, S, Se
and	bornite	Ag, Cu, Fe, S, Pb
Jolyon Ralph and Ida Chau	galena	Pb, S, Ag, As, Bi, SB
1993-2011 (mindat.org).	pyrite	As, Cu, Fe, S, Se, Zn
	pyrrhotite	As, Cu, Fe, Ni
	arsenopyrite	As, Co, Fe, S, Sb, Pb
	tetradymite	Bi, Cu, Te, S, Se, Pb
	argentite	Ag, S, Se
	pyrargyrite	Ag, As, Sb, S

* Elements compose the listed mineral or can be associated as impurities.

Water Quality Detections:			
	Al	Cd	Hg
	As	Cu	Ni
Timberline Resources 2008	Ba	Cr	Se
	B	Fe	Sr
		Pb	U
		Mn	Zn
		Mg	
		K	
RCRA Metals:	As	Pb	
	Ba	Hg	
	Cd	Se	
	Cr	Hg	

Table 4. Comparison of SPLP Data to Regulatory Standards
Butte Highlands Mine
2010 Geochemical / PAR Monitoring

Sample Identification	Sample Lithology	Aluminum	Arsenic	Barium	Fluoride
CORE-140	mottled tan to gray dolomite, wk limonite on frax	0.03	0.005	0.009	*ND*
CORE-250	lt-med tan, occ gray bands, calc. dolomite, wk-mod limonite	*ND*	0.004	0.008	*ND*
MAR-332	mottled tan to gray dolomite, wk-mod limonite on frax	*ND*	0.004	0.009	*ND*
MAR-454	mottled tan to gray dolomite, wk-mod limonite on frax	*ND*	*ND*	0.008	*ND*
MAR-578	mottled tan to gray dolomite, wk-mod limonite on frax	*ND*	0.012	0.009	*ND*
MAR-690	mottled tan to gray dolomite, wk-mod limonite on frax	0.03	0.003	0.009	*ND*
MAR-806	mottled tan to gray dolomite, wk-mod limonite on frax	*ND*	0.006	0.010	0.1
Montana Numeric Water Quality (WQB-7) Standards					
Acute Aquatic Life		0.75 (1)(2)	0.34	*NS* (2)	*NS*
Chronic Aquatic Life		0.087 (1)(2)	0.15	*NS* (2)	*NS*
Human Health		*NS*	0.01	2	4

Notes:

Concentrations in milligrams per liter
Only constituents detected at or above the analyte reporting limt are shown
Sample Lithology abbreviations:
wk : weak frax : fractures lt : light med : medium
occ : occasional calc. : calcarious
ND : Not Detected *NS* : No Standard
(1) Aquatic life standards for aluminum apply in pH range of 6 to 9 s.u.
Sample pH's not determined.
(2) Non-Priority Pollutant Criteria
Montana Numeric Water Quality (WQB-7) Standards, February 2008 publication

Table 5. Acid Base Accounting Results
Butte Highlands Mine
2010 Geochemical / PAR Monitoring

Sample Identification	Sample Lithology	Neutralization Potential	Acid Potential	Acid/Base Potential	Sulfur Forms
CORE-140	mottled tan to gray dolomite, wk limonite on frax	1,060	0	1,060	*ND*
CORE-250	lt-med tan, occ gray bands, calc. dolomite, wk-mod limonite	1,050	0	1,050	*ND*
MAR-332	mottled tan to gray dolomite, wk-mod limonite on frax	1,060	0	1,060	*ND*
MAR-454	mottled tan to gray dolomite, wk-mod limonite on frax	1,060	0	1,060	*ND*
MAR-578	mottled tan to gray dolomite, wk-mod limonite on frax	1,060	0	1,060	*ND*
MAR-690	mottled tan to gray dolomite, wk-mod limonite on frax	1,070	0	1,070	*ND*
MAR-806	mottled tan to gray dolomite, wk-mod limonite on frax	1,080	0	1,080	*ND*

Notes:

Concentrations in milligrams per liter
Only constituents detected at or above the analyte reporting limt are shown
Sample Lithology abbreviations:
wk : weak frax : fractures lt : light med : medium
occ : occasional calc. : calcarious
ND : Not Detected *NS* : No Standard
(1) Aquatic life standards apply to pH range of 6 to 9 s.u.
Sample pH's not determined.
(2) Non-Priority Pollutant Criteria
Montana Numeric Water Quality (WQB-7) Standards, February 2008 publication

ATTACHMENT A

RJ Lee *Group*, Inc.
350 Hochberg Road, Monroeville, PA 15146
Tel: (724) 325-1776 | Fax: (724) 733-1799

Laboratory Report

Butte Highlands JV
P.O. Box 4959
Butte , MT 59702
Attention: Philip Mulholland
Telephone: 406-533-8104

Report Date	7/19/2010
Sample Receipt Date.	7/8/2010
RJ Lee Group Job No	AOH1012056-0
Authorization/P.O. No.	
Client Job No./Name	114-710113

Analysis: Asbestos in Bulk Samples by Point Count
Method: EPA/600/R-93/116

RJLG Sample Number	Client Sample Number	Homogeneous	# of Layers	Asbestos Detected(%)	Non-Asbestos Fibers(%)	Non-Fibrous Materials(%)	Matrix Material	Analyst - Analysis Date
10111808.HPL	CORE - 140	Yes	1	ND	-	100.00	CA, M	WHP-7/15/2010
Description:	Light Yellow Rock- Core Sample No Asbestiform Minerals Detected. No Amphiboles Counted.							
Weight Loss: 0 %								
10111809.HPL	CORE - 250	Yes	1	ND	-	100.00	CA, OP, M	WHP-7/15/2010
Description:	Yellow and Green Rock- Core Sample No Asbestiform Minerals Detected. No Amphiboles Counted.							
Weight Loss: 0 %								
10111810.HPL	MAR - 332	Yes	1	ND	-	100.00	CA, AM, OP, MI, M	WHP-7/15/2010
Description:	White, Yellow and Gray Rock- Grab Sample No Asbestiform Minerals Detected. One Amphibole Cleavage Fragment Counted.							
Weight Loss: 0 %								

Client Job No./Name: 114-710113 RJ Lee Group Job No: AOH1012056-0

RJLG Sample Number	Client Sample Number	Homogeneous	# of Layers	Asbestos Detected(%)	Non-Asbestos Fibers(%)	Non-Fibrous Materials(%)	Matrix Material	Analyst - Analysis Date
10111811.HPL	MAR - 454	Yes	1	ND	-	100.00	CA, OP, M	WHP-7/15/2010
Description:	White and Yellow Rock- Grab Sample No Asbestiform Minerals Detected. No Amphiboles Counted.							
Weight Loss: 0 %								
10111812.HPL	MAR - 557	Yes	1	ND	-	100.00	CA, OP, M	WHP-7/19/2010
Description:	White and Yellow Rock- Grab Sample No Asbestiform Minerals Detected. No Amphiboles Counted.							
Weight Loss: 0 %								
10111813.HPL	MAR - 650	Yes	1	ND	-	100.00	CA, OP, M	WHP-7/19/2010
Description:	White and Yellow Rock- Grab Sample No Asbestiform Minerals Detected. No Amphiboles Counted.							
Weight Loss: 0 %								
10111814.HPL	MAR - 726	Yes	1	ND	-	100.00	CA, OP, M	WHP-7/19/2010
Description:	White and Yellow Rock- Grab Sample No Asbestiform Minerals Detected. No Amphiboles Counted.							
Weight Loss: 0 %								

Client Job No./Name: 114-710113 RJ Lee Group Job No: AOH1012056-0

Authorized Signature _____

William H. Powers, Manager-Optical

ASBESTOS

AM = Amosite
AC = Actinolite
AN = Anthophyllite
CH = Chrysotile
CR = Crocidolite
TR = Tremolite

NON-ASBESTOS

CE = Cellulose
MW = Mineral Wool
FG = Fibrous Glass
SF = Synthetic Fibers
H = Hair
W = Wollastonite
OF = Other Fibers

NON-FIBROUS MATERIALS

AM = Amphibole
B = Binder
CA = Carbonates
CL = Clay
F = Feldspar
G = Gypsum
HY = Hydromagnesite
M = Miscellaneous
MI = Mica
OP = Opaque
OR = Organic
P = Perlite
Q = Quartz
T = Tar
V = Vermiculite

DISCLAIMER NOTES

- "ND" indicates no asbestos was detected; the method detection limit is 1%.
- "Trace" or "<1" indicates asbestos was identified in the sample, but the concentration is less than the method quantitation limit of 1%. PLM coefficients of variance range from approximately 1.8 at the quantitation limit of 1% to 0.1 at high fiber concentrations.
- Samples are archived for three months following analysis and are then properly discarded.
- These results are submitted pursuant to RJ Lee Group's current terms and conditions of sale, including the company's standard warranty and limitation of liability provisions. No responsibility or liability is assumed for the manner in which these results are used or interpreted.
- This test report relates only to the items tested.
- This report is not valid unless it bears the name of a NVLAP-approved signatory.
- Any reproduction of this document must be in full in order for the report to be valid.
- This report may not be used to claim product endorsement by NVLAP, any agency of the U.S. Government or any other laboratory accrediting agency.
- Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar nonfriable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as "non-asbestos-containing."
- Sample(s) for this project were analyzed at our: Monroeville, PA (AIHA #100364, NVLAP #101208-0, NY ELAP #10884) facility.
- If RJ Lee Group, Inc. did not collect the samples analyzed, the verifiability of the laboratory’s results are limited to the reported values.

ATTACHMENT B

EL10095627 - Finalized
CLIENT : "TETTEC - Tetra Tech"
# of SAMPLES : 7
DATE RECEIVED : 2010-07-14 DATE FINALIZED : 2010-07-26
PROJECT : "BUTTE HIGHLANDS"
CERTIFICATE COMMENTS : "There is no charge for prep as a re-imbursement for another workorder t
PO NUMBER : "114-710113"

	WEI-21	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
SAMPLE	Recvd Wt.	Ag	Al	As	Au	B	Ba	Be
DESCRIPT	kg	ppm	%	ppm	ppm	ppm	ppm	ppm
CORE-140	1.25	0.04	0.12	16	<0.2	<10	10	0.07
CORE-250	1.7	0.01	0.16	19	<0.2	<10	10	0.09
MAR-332	2.76	<0.01	0.1	7	<0.2	<10	<10	<0.05
MAR-454	2.52	0.13	0.08	9	<0.2	<10	10	<0.05
MAR-578	3.25	0.15	0.04	27	<0.2	<10	<10	0.05
MAR-690	2.57	0.02	0.11	12	<0.2	<10	10	<0.05
MAR-806	3.07	0.05	0.02	9	<0.2	<10	<10	<0.05

that was crushed too fine and discarded. ME-MS41:Interference: Ca>10% on ICP-MS As ICP-AES resul

ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu	Fe
ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%
<0.01	20.1	0.05	8.11	0.8	2	0.08	3.4	0.29
0.01	19.45	0.01	10.9	1.1	3	0.09	4.4	0.28
<0.01	19.55	<0.01	9.98	0.9	1	0.09	3.2	0.29
0.02	19.7	0.16	6.28	0.8	2	0.1	3.5	0.3
0.02	19.15	0.09	3.82	0.8	1	0.22	6.7	0.33
0.01	20.5	0.03	6.86	0.9	2	0.15	3.2	0.28
0.02	20.7	0.11	4.35	0.8	1	<0.05	3	0.24

lts shown. ME-MS41:Gold determinations by this method are semi-quantitative due to the small sample

ME-MS41 Ga ppm	ME-MS41 Ge ppm	ME-MS41 Hf ppm	ME-MS41 Hg ppm	ME-MS41 In ppm	ME-MS41 K %	ME-MS41 La ppm	ME-MS41 Li ppm	ME-MS41 Mg %
0.28	<0.05	0.02	0.02	<0.005	0.06	5	0.5	12.35
0.37	<0.05	0.02	0.01	<0.005	0.1	6.3	0.6	11.7
0.28	<0.05	<0.02	0.01	<0.005	0.05	5.5	0.7	12
0.18	<0.05	0.02	<0.01	<0.005	0.05	3.5	0.6	11.95
0.12	<0.05	0.02	<0.01	<0.005	0.02	2	0.9	12.1
0.26	<0.05	<0.02	<0.01	<0.005	0.06	3.7	0.9	11.8
0.14	0.09	<0.02	0.01	<0.005	0.01	3.3	0.2	12.85

weight used (0.5g). "

ME-MS41 Mn ppm	ME-MS41 Mo ppm	ME-MS41 Na %	ME-MS41 Nb ppm	ME-MS41 Ni ppm	ME-MS41 P ppm	ME-MS41 Pb ppm	ME-MS41 Rb ppm	ME-MS41 Re ppm
277	0.21	0.02	0.44	1.3	60	1	1.4	0.001
274	0.24	0.02	0.52	2.8	110	0.7	2.1	<0.001
267	0.14	0.02	0.44	1.5	70	6.4	1.2	<0.001
365	0.16	0.02	0.4	1.6	40	3.4	1.4	<0.001
380	0.77	0.02	0.21	1.5	20	0.9	1.1	<0.001
341	0.16	0.02	0.37	2	40	0.5	1.6	<0.001
272	<0.05	<0.01	0.21	<0.2	20	0.8	0.3	<0.001

ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
S	Sb	Sc	Se	Sn	Sr	Ta	Te	Th
%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
0.16	0.63	0.5	0.2	<0.2	56.2	<0.01	0.01	0.7
0.17	0.43	0.6	<0.2	<0.2	64.9	<0.01	0.01	0.5
0.15	0.38	0.5	0.2	<0.2	66.9	<0.01	0.01	0.6
0.14	0.6	0.4	0.2	<0.2	53.7	<0.01	0.01	0.3
0.17	1.19	0.4	0.2	<0.2	53.9	<0.01	0.01	0.2
0.16	0.58	0.5	0.2	<0.2	49.8	<0.01	0.01	0.3
<0.01	0.33	0.3	0.2	<0.2	26.2	<0.01	0.01	<0.2

ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
Ti	Tl	U	V	W	Y	Zn	Zr
%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
<0.005	0.04	2.11	6	0.17	1.61	16	1
<0.005	0.06	0.76	7	0.06	1.89	21	1.1
<0.005	0.03	0.49	3	0.05	1.67	10	0.5
<0.005	0.05	0.64	4	0.07	1.08	15	1.2
<0.005	<0.02	0.96	2	0.09	0.94	19	1.2
<0.005	0.04	1.16	3	0.06	1.09	25	1.3
<0.005	<0.02	0.33	4	0.24	0.58	17	0.5

ATTACHMENT C

ANALYTICAL SUMMARY REPORT

August 21, 2010

Tetra Tech
851 Bridger Dr Ste 6
Bozeman, MT 59715

Workorder No.: B10072506 Quote ID: B2150

Project Name: Butte Highlands Mine

Energy Laboratories Inc received the following 7 samples for Tetra Tech on 7/27/2010 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
B10072506-001	Core-140	06/01/10 0:00	07/27/10	Soil	Metals by ICP/ICPMS, SPLP Acid/Base Potential Mercury, SPLP Fluoride, SPLP Digestion, Mercury by CVAA Sulfur Forms Anions, SPLP SPLP Extraction, Regular Digestion, Total Metals
B10072506-002	Core-250	06/01/10 0:00	07/27/10	Soil	Same As Above
B10072506-003	MAR-332	06/01/10 0:00	07/27/10	Soil	Same As Above
B10072506-004	MAR-454	07/01/10 0:00	07/27/10	Soil	Same As Above
B10072506-005	MAR-578	07/01/10 0:00	07/27/10	Soil	Same As Above
B10072506-006	MAR-690	07/01/10 0:00	07/27/10	Soil	Same As Above
B10072506-007	MAR-806	07/01/10 0:00	07/27/10	Soil	Same As Above

This report was prepared by Energy Laboratories, Inc., 1120 S 27th St., Billings, MT 59101. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:

LABORATORY ANALYTICAL REPORT

Client: Tetra Tech
Project: Butte Highlands Mine
Lab ID: B10072506-001
Client Sample ID Core-140

Report Date: 08/21/10
Collection Date: 06/01/10
DateReceived: 07/27/10
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
ACID-BASE ACCOUNTING							
Neutralization Potential	1060	t/kt		1		Sobek Modified	08/03/10 15:31 / srm
Acid Potential	0	t/kt		1		Sobek Modified	08/03/10 15:31 / srm
Acid/Base Potential	1060	t/kt				Sobek Modified	08/03/10 15:31 / srm
Sulfur, Total	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, Hot Water Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, HCl Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, HNO3 Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, Residual	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
The acid-base potential was calculated from the non-sulfate sulfur %							
SPLP EXTRACTABLE CONSTITUENTS							
Aluminum	0.03	mg/L		0.03		SW6020	08/11/10 12:50 / car
Antimony	ND	mg/L		0.003		SW6020	08/09/10 14:14 / jjw
Arsenic	0.005	mg/L		0.003		SW6020	08/09/10 14:14 / jjw
Barium	0.009	mg/L		0.005		SW6020	08/09/10 14:14 / jjw
Beryllium	ND	mg/L		0.001		SW6020	08/11/10 01:19 / car
Cadmium	ND	mg/L		0.00008		SW6020	08/09/10 14:14 / jjw
Chromium	ND	mg/L		0.001		SW6020	08/09/10 14:14 / jjw
Copper	ND	mg/L		0.001		SW6020	08/09/10 14:14 / jjw
Iron	ND	mg/L		0.05		SW6020	08/09/10 14:14 / jjw
Lead	ND	mg/L		0.0005		SW6020	08/09/10 14:14 / jjw
Manganese	ND	mg/L		0.005		SW6020	08/09/10 14:14 / jjw
Mercury	ND	mg/L	L	0.00005		SW7470A	08/06/10 15:35 / age
Nickel	ND	mg/L		0.01		SW6020	08/09/10 14:14 / jjw
Phosphorus	ND	mg/L	D	0.02		SW6010B	08/17/10 17:24 / rlh
Selenium	ND	mg/L		0.001		SW6020	08/09/10 14:14 / jjw
Silver	ND	mg/L		0.0006		SW6020	08/09/10 14:14 / jjw
Thallium	ND	mg/L	D	0.0005		SW6020	08/09/10 14:14 / jjw
Uranium	ND	mg/L		0.00003		SW6020	08/09/10 14:14 / jjw
Zinc	ND	mg/L		0.1		SW6020	08/09/10 14:14 / jjw
Fluoride	ND	mg/L		0.1		A4500-F C	08/06/10 16:58 / qed
Chloride	ND	mg/L		1		E300.0	08/06/10 16:58 / qed

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
L - Lowest available reporting limit for the analytical method us

LABORATORY ANALYTICAL REPORT

Client: Tetra Tech
Project: Butte Highlands Mine
Lab ID: B10072506-002
Client Sample ID Core-250

Report Date: 08/21/10
Collection Date: 06/01/10
DateReceived: 07/27/10
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
ACID-BASE ACCOUNTING							
Neutralization Potential	1050	t/kt		1		Sobek Modified	08/03/10 15:31 / srm
Acid Potential	0	t/kt		1		Sobek Modified	08/03/10 15:31 / srm
Acid/Base Potential	1050	t/kt				Sobek Modified	08/03/10 15:31 / srm
Sulfur, Total	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, Hot Water Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, HCl Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, HNO3 Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, Residual	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
The acid-base potential was calculated from the non-sulfate sulfur %							
SPLP EXTRACTABLE CONSTITUENTS							
Aluminum	ND	mg/L		0.03		SW6020	08/11/10 12:58 / car
Antimony	ND	mg/L		0.003		SW6020	08/09/10 14:37 / jjw
Arsenic	0.004	mg/L		0.003		SW6020	08/09/10 14:37 / jjw
Barium	0.008	mg/L		0.005		SW6020	08/09/10 14:37 / jjw
Beryllium	ND	mg/L		0.001		SW6020	08/11/10 01:23 / car
Cadmium	ND	mg/L		0.00008		SW6020	08/11/10 12:58 / car
Chromium	ND	mg/L		0.001		SW6020	08/09/10 14:37 / jjw
Copper	ND	mg/L		0.001		SW6020	08/09/10 14:37 / jjw
Iron	ND	mg/L		0.05		SW6020	08/09/10 14:37 / jjw
Lead	ND	mg/L		0.0005		SW6020	08/09/10 14:37 / jjw
Manganese	ND	mg/L		0.005		SW6020	08/09/10 14:37 / jjw
Mercury	ND	mg/L	D	0.0001		SW7470A	08/12/10 14:49 / age
Nickel	ND	mg/L		0.01		SW6020	08/09/10 14:37 / jjw
Phosphorus	ND	mg/L	D	0.02		SW6010B	08/17/10 17:40 / rlh
Selenium	ND	mg/L		0.001		SW6020	08/09/10 14:37 / jjw
Silver	ND	mg/L		0.0006		SW6020	08/09/10 14:37 / jjw
Thallium	ND	mg/L	D	0.0005		SW6020	08/09/10 14:37 / jjw
Uranium	ND	mg/L		0.00003		SW6020	08/09/10 14:37 / jjw
Zinc	ND	mg/L		0.1		SW6020	08/09/10 14:37 / jjw
Fluoride	ND	mg/L		0.1		A4500-F C	08/06/10 17:09 / qed
Chloride	ND	mg/L		1		E300.0	08/06/10 17:09 / qed

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: Tetra Tech
Project: Butte Highlands Mine
Lab ID: B10072506-003
Client Sample ID MAR-332

Report Date: 08/21/10
Collection Date: 06/01/10
DateReceived: 07/27/10
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
ACID-BASE ACCOUNTING							
Neutralization Potential	1060	t/kt		1		Sobek Modified	08/03/10 15:31 / srm
Acid Potential	0	t/kt		1		Sobek Modified	08/03/10 15:31 / srm
Acid/Base Potential	1060	t/kt				Sobek Modified	08/03/10 15:31 / srm
Sulfur, Total	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, Hot Water Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, HCl Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, HNO3 Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, Residual	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
The acid-base potential was calculated from the non-sulfate sulfur %							
SPLP EXTRACTABLE CONSTITUENTS							
Aluminum	ND	mg/L		0.03		SW6020	08/11/10 13:02 / car
Antimony	ND	mg/L		0.003		SW6020	08/09/10 14:41 / jjw
Arsenic	0.004	mg/L		0.003		SW6020	08/09/10 14:41 / jjw
Barium	0.009	mg/L		0.005		SW6020	08/09/10 14:41 / jjw
Beryllium	ND	mg/L		0.001		SW6020	08/11/10 01:31 / car
Cadmium	ND	mg/L		0.00008		SW6020	08/09/10 14:41 / jjw
Chromium	ND	mg/L		0.001		SW6020	08/09/10 14:41 / jjw
Copper	ND	mg/L		0.001		SW6020	08/11/10 13:02 / car
Iron	ND	mg/L		0.05		SW6020	08/09/10 14:41 / jjw
Lead	ND	mg/L		0.0005		SW6020	08/09/10 14:41 / jjw
Manganese	ND	mg/L		0.005		SW6020	08/09/10 14:41 / jjw
Mercury	ND	mg/L	D	0.0001		SW7470A	08/12/10 14:52 / age
Nickel	ND	mg/L		0.01		SW6020	08/09/10 14:41 / jjw
Phosphorus	ND	mg/L	D	0.02		SW6010B	08/17/10 17:49 / rlh
Selenium	ND	mg/L		0.001		SW6020	08/09/10 14:41 / jjw
Silver	ND	mg/L		0.0006		SW6020	08/09/10 14:41 / jjw
Thallium	ND	mg/L	D	0.0005		SW6020	08/09/10 14:41 / jjw
Uranium	ND	mg/L		0.00003		SW6020	08/09/10 14:41 / jjw
Zinc	ND	mg/L		0.1		SW6020	08/09/10 14:41 / jjw
Fluoride	ND	mg/L		0.1		A4500-F C	08/06/10 17:21 / qed
Chloride	ND	mg/L		1		E300.0	08/06/10 17:21 / qed

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: Tetra Tech
Project: Butte Highlands Mine
Lab ID: B10072506-004
Client Sample ID MAR-454

Report Date: 08/21/10
Collection Date: 07/01/10
DateReceived: 07/27/10
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
ACID-BASE ACCOUNTING							
Neutralization Potential	1060	t/kt		1		Sobek Modified	08/03/10 15:31 / srm
Acid Potential	0	t/kt		1		Sobek Modified	08/03/10 15:31 / srm
Acid/Base Potential	1060	t/kt				Sobek Modified	08/03/10 15:31 / srm
Sulfur, Total	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, Hot Water Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, HCl Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, HNO3 Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, Residual	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
The acid-base potential was calculated from the non-sulfate sulfur %							
SPLP EXTRACTABLE CONSTITUENTS							
Aluminum	ND	mg/L		0.03		SW6020	08/11/10 13:06 / car
Antimony	ND	mg/L		0.003		SW6020	08/09/10 14:46 / jjw
Arsenic	ND	mg/L		0.003		SW6020	08/09/10 14:46 / jjw
Barium	0.008	mg/L		0.005		SW6020	08/09/10 14:46 / jjw
Beryllium	ND	mg/L		0.001		SW6020	08/11/10 01:35 / car
Cadmium	ND	mg/L		0.00008		SW6020	08/09/10 14:46 / jjw
Chromium	ND	mg/L		0.001		SW6020	08/09/10 14:46 / jjw
Copper	ND	mg/L		0.001		SW6020	08/11/10 13:06 / car
Iron	ND	mg/L		0.05		SW6020	08/09/10 14:46 / jjw
Lead	ND	mg/L		0.0005		SW6020	08/09/10 14:46 / jjw
Manganese	ND	mg/L		0.005		SW6020	08/09/10 14:46 / jjw
Mercury	ND	mg/L	L	0.00005		SW7470A	08/06/10 15:45 / age
Nickel	ND	mg/L		0.01		SW6020	08/09/10 14:46 / jjw
Phosphorus	ND	mg/L	D	0.02		SW6010B	08/17/10 17:57 / rlh
Selenium	ND	mg/L		0.001		SW6020	08/09/10 14:46 / jjw
Silver	ND	mg/L		0.0006		SW6020	08/09/10 14:46 / jjw
Thallium	ND	mg/L	D	0.0005		SW6020	08/09/10 14:46 / jjw
Uranium	ND	mg/L		0.00003		SW6020	08/09/10 14:46 / jjw
Zinc	ND	mg/L		0.1		SW6020	08/09/10 14:46 / jjw
Fluoride	ND	mg/L		0.1		A4500-F C	08/06/10 17:56 / qed
Chloride	ND	mg/L		1		E300.0	08/06/10 17:56 / qed

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
L - Lowest available reporting limit for the analytical method us

LABORATORY ANALYTICAL REPORT

Client: Tetra Tech
Project: Butte Highlands Mine
Lab ID: B10072506-005
Client Sample ID MAR-578

Report Date: 08/21/10
Collection Date: 07/01/10
DateReceived: 07/27/10
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
ACID-BASE ACCOUNTING							
Neutralization Potential	1060	t/kt		1		Sobek Modified	08/03/10 15:31 / srm
Acid Potential	0	t/kt		1		Sobek Modified	08/03/10 15:31 / srm
Acid/Base Potential	1060	t/kt				Sobek Modified	08/03/10 15:31 / srm
Sulfur, Total	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, Hot Water Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, HCl Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, HNO3 Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, Residual	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
The acid-base potential was calculated from the non-sulfate sulfur %							
SPLP EXTRACTABLE CONSTITUENTS							
Aluminum	ND	mg/L		0.03		SW6020	08/11/10 13:10 / car
Antimony	ND	mg/L		0.003		SW6020	08/09/10 14:50 / jjw
Arsenic	0.012	mg/L		0.003		SW6020	08/09/10 14:50 / jjw
Barium	0.009	mg/L		0.005		SW6020	08/09/10 14:50 / jjw
Beryllium	ND	mg/L		0.001		SW6020	08/11/10 01:40 / car
Cadmium	ND	mg/L		0.00008		SW6020	08/09/10 14:50 / jjw
Chromium	ND	mg/L		0.001		SW6020	08/09/10 14:50 / jjw
Copper	ND	mg/L		0.001		SW6020	08/11/10 13:10 / car
Iron	ND	mg/L		0.05		SW6020	08/09/10 14:50 / jjw
Lead	ND	mg/L		0.0005		SW6020	08/09/10 14:50 / jjw
Manganese	ND	mg/L		0.005		SW6020	08/09/10 14:50 / jjw
Mercury	ND	mg/L	L	0.00005		SW7470A	08/06/10 15:54 / age
Nickel	ND	mg/L		0.01		SW6020	08/09/10 14:50 / jjw
Phosphorus	ND	mg/L	D	0.02		SW6010B	08/17/10 18:13 / rlh
Selenium	ND	mg/L		0.001		SW6020	08/09/10 14:50 / jjw
Silver	ND	mg/L		0.0006		SW6020	08/09/10 14:50 / jjw
Thallium	ND	mg/L	D	0.0005		SW6020	08/09/10 14:50 / jjw
Uranium	ND	mg/L		0.00003		SW6020	08/09/10 14:50 / jjw
Zinc	ND	mg/L		0.1		SW6020	08/09/10 14:50 / jjw
Fluoride	ND	mg/L		0.1		A4500-F C	08/06/10 18:07 / qed
Chloride	ND	mg/L		1		E300.0	08/06/10 18:07 / qed

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
L - Lowest available reporting limit for the analytical method us

LABORATORY ANALYTICAL REPORT

Client: Tetra Tech
Project: Butte Highlands Mine
Lab ID: B10072506-006
Client Sample ID MAR-690

Report Date: 08/21/10
Collection Date: 07/01/10
DateReceived: 07/27/10
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
ACID-BASE ACCOUNTING							
Neutralization Potential	1070	t/kt		1		Sobek Modified	08/03/10 15:31 / srm
Acid Potential	0	t/kt		1		Sobek Modified	08/03/10 15:31 / srm
Acid/Base Potential	1070	t/kt				Sobek Modified	08/03/10 15:31 / srm
Sulfur, Total	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, Hot Water Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, HCl Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, HNO3 Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, Residual	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
The acid-base potential was calculated from the non-sulfate sulfur %							
SPLP EXTRACTABLE CONSTITUENTS							
Aluminum	0.03	mg/L		0.03		SW6020	08/11/10 13:14 / car
Antimony	ND	mg/L		0.003		SW6020	08/09/10 14:55 / jjw
Arsenic	0.003	mg/L		0.003		SW6020	08/09/10 14:55 / jjw
Barium	0.009	mg/L		0.005		SW6020	08/09/10 14:55 / jjw
Beryllium	ND	mg/L		0.001		SW6020	08/11/10 01:44 / car
Cadmium	ND	mg/L		0.00008		SW6020	08/09/10 14:55 / jjw
Chromium	ND	mg/L		0.001		SW6020	08/09/10 14:55 / jjw
Copper	ND	mg/L		0.001		SW6020	08/11/10 13:14 / car
Iron	ND	mg/L		0.05		SW6020	08/09/10 14:55 / jjw
Lead	ND	mg/L		0.0005		SW6020	08/09/10 14:55 / jjw
Manganese	ND	mg/L		0.005		SW6020	08/09/10 14:55 / jjw
Mercury	ND	mg/L	L	0.00005		SW7470A	08/06/10 15:58 / age
Nickel	ND	mg/L		0.01		SW6020	08/09/10 14:55 / jjw
Phosphorus	ND	mg/L	D	0.02		SW6010B	08/17/10 18:21 / rlh
Selenium	ND	mg/L		0.001		SW6020	08/09/10 14:55 / jjw
Silver	ND	mg/L		0.0006		SW6020	08/09/10 14:55 / jjw
Thallium	ND	mg/L	D	0.0005		SW6020	08/09/10 14:55 / jjw
Uranium	ND	mg/L		0.00003		SW6020	08/09/10 14:55 / jjw
Zinc	ND	mg/L		0.1		SW6020	08/09/10 14:55 / jjw
Fluoride	ND	mg/L		0.1		A4500-F C	08/06/10 18:19 / qed
Chloride	ND	mg/L		1		E300.0	08/06/10 18:19 / qed

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
L - Lowest available reporting limit for the analytical method us

LABORATORY ANALYTICAL REPORT

Client: Tetra Tech
Project: Butte Highlands Mine
Lab ID: B10072506-007
Client Sample ID MAR-806

Report Date: 08/21/10
Collection Date: 07/01/10
DateReceived: 07/27/10
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
ACID-BASE ACCOUNTING							
Neutralization Potential	1080	t/kt		1		Sobek Modified	08/03/10 15:31 / srm
Acid Potential	0	t/kt		1		Sobek Modified	08/03/10 15:31 / srm
Acid/Base Potential	1080	t/kt				Sobek Modified	08/03/10 15:31 / srm
Sulfur, Total	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, Hot Water Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, HCl Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, HNO3 Extractable	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
Sulfur, Residual	ND	%		0.01		Sobek Modified	08/03/10 15:31 / srm
The acid-base potential was calculated from the non-sulfate sulfur %							
SPLP EXTRACTABLE CONSTITUENTS							
Aluminum	ND	mg/L		0.03		SW6020	08/11/10 13:19 / car
Antimony	ND	mg/L		0.003		SW6020	08/09/10 15:00 / jjw
Arsenic	0.006	mg/L		0.003		SW6020	08/09/10 15:00 / jjw
Barium	0.010	mg/L		0.005		SW6020	08/09/10 15:00 / jjw
Beryllium	ND	mg/L		0.001		SW6020	08/11/10 01:48 / car
Cadmium	ND	mg/L		0.00008		SW6020	08/09/10 15:00 / jjw
Chromium	ND	mg/L		0.001		SW6020	08/09/10 15:00 / jjw
Copper	ND	mg/L		0.001		SW6020	08/11/10 13:19 / car
Iron	ND	mg/L		0.05		SW6020	08/09/10 15:00 / jjw
Lead	ND	mg/L		0.0005		SW6020	08/09/10 15:00 / jjw
Manganese	ND	mg/L		0.005		SW6020	08/09/10 15:00 / jjw
Mercury	ND	mg/L	L	0.00005		SW7470A	08/06/10 16:01 / age
Nickel	ND	mg/L		0.01		SW6020	08/09/10 15:00 / jjw
Phosphorus	ND	mg/L	D	0.02		SW6010B	08/17/10 18:29 / rlh
Selenium	ND	mg/L		0.001		SW6020	08/09/10 15:00 / jjw
Silver	ND	mg/L		0.0006		SW6020	08/09/10 15:00 / jjw
Thallium	ND	mg/L	D	0.0005		SW6020	08/09/10 15:00 / jjw
Uranium	ND	mg/L		0.00003		SW6020	08/09/10 15:00 / jjw
Zinc	ND	mg/L		0.1		SW6020	08/09/10 15:00 / jjw
Fluoride	0.1	mg/L	B	0.1		A4500-F C	08/06/10 18:31 / qed
Chloride	ND	mg/L		1		E300.0	08/06/10 18:31 / qed

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
B - The analyte was detected in the method blank.
L - Lowest available reporting limit for the analytical method used.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A4500-F C									Batch: 48143
Sample ID: MB-48143	Method Blank				Run: IC202-B_100806A				08/06/10 16:23
Fluoride	0.2	mg/L	0.009						
Sample ID: MBS-48143	Method Blank				Run: IC202-B_100806A				08/06/10 16:34
Fluoride	10	mg/L	0.009						
Sample ID: MBSD-48143	Method Blank				Run: IC202-B_100806A				08/06/10 16:46
Fluoride	10	mg/L	0.009						
Sample ID: B10072506-007AMS	Sample Matrix Spike				Run: IC202-B_100806A				08/06/10 18:42
Fluoride	13.2	mg/L	0.11	105	80	120			
Sample ID: B10072506-007AMSD	Sample Matrix Spike Duplicate				Run: IC202-B_100806A				08/06/10 18:54
Fluoride	13.0	mg/L	0.11	104	80	120	1	10	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte		Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method:	**E300.0**								Analytical Run: IC202-B_100806A	
Sample ID:	**ICV080610-11**	Initial Calibration Verification Standard							08/06/10 15:01	
Chloride		24.8	mg/L	1.0	99	90	110			
Method:	**E300.0**								Batch: 48143	
Sample ID:	**MB-48143**	Method Blank				Run: IC202-B_100806A			08/06/10 16:23	
Chloride		0.5	mg/L	0.03						
Sample ID:	**MBS-48143**	Method Blank				Run: IC202-B_100806A			08/06/10 16:34	
Chloride		20	mg/L	0.03						
Sample ID:	**MBSD-48143**	Method Blank				Run: IC202-B_100806A			08/06/10 16:46	
Chloride		20	mg/L	0.03						
Sample ID:	**B10072506-007AMS**	Sample Matrix Spike				Run: IC202-B_100806A			08/06/10 18:42	
Chloride		23.7	mg/L	1.0	93	0	0			
Sample ID:	**B10072506-007AMSD**	Sample Matrix Spike Duplicate				Run: IC202-B_100806A			08/06/10 18:54	
Chloride		23.5	mg/L	1.0	92	0	0			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: Sobek Modified								Batch: R151755	
Sample ID: B10072506-001ADUP	Sample Duplicate				Run: MISC-SOIL_100803C			08/03/10 15:31	
Neutralization Potential	1100	t/kt	0.10				0.5	50	
Acid Potential	0	t/kt	0.10					50	
Acid/Base Potential	1100	t/kt					0.5	50	
The acid-base potential was calculated from the non-sulfate sulfur %									
Sample ID: LCS-SOL0715100803153	Laboratory Control Sample				Run: MISC-SOIL_100803C			08/03/10 15:31	
Neutralization Potential	81	t/kt	0.10	101	50	200			
Acid Potential	3.3	t/kt	0.10	82	50	200			
Acid/Base Potential	78	t/kt		102	50	200			
The acid-base potential was calculated from the non-sulfate sulfur %									
Sample ID: B10072506-001ADUP	Sample Duplicate				Run: MISC-SOIL_100803C			08/03/10 15:31	
Sulfur, Total	ND	%	0.010					50	
Sulfur, Hot Water Extractable	ND	%	0.010					50	
Sulfur, HCl Extractable	ND	%	0.010					50	
Sulfur, HNO3 Extractable	ND	%	0.010					50	
Sulfur, Residual	ND	%	0.010					50	
Sample ID: LCS-SOL0715100803153	Laboratory Control Sample				Run: MISC-SOIL_100803C			08/03/10 15:31	
Sulfur, Total	0.167	%	0.010	93	50	200			
Sulfur, Hot Water Extractable	0.0620	%	0.010	103	50	200			
Sulfur, HCl Extractable	0.0136	%	0.010	68	50	200			
Sulfur, HNO3 Extractable	0.0730	%	0.010	81	50	200			
Sulfur, Residual	0.0184	%	0.010	92	50	200			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6010B								Analytical Run: ICP202-B_100817A	
Sample ID: QCS	Initial Calibration Verification Standard								08/17/10 12:06
Phosphorus	8.09	mg/L	0.10	101	89.5	110.5			
Sample ID: ICSA	Interference Check Sample A								08/17/10 12:22
Phosphorus	0.0296	mg/L	0.10		0	0			
Sample ID: ICSAB	Interference Check Sample AB								08/17/10 12:26
Phosphorus	10.4	mg/L	0.10	104	80	120			
Method: SW6010B								Batch: 48211	
Sample ID: MB-48211	Method Blank				Run: ICP202-B_100817A				08/17/10 17:04
Phosphorus	ND	mg/L	0.02						
Sample ID: LCS-48211	Laboratory Control Sample				Run: ICP202-B_100817A				08/17/10 17:08
Phosphorus	4.96	mg/L	10	99	85	115			
Sample ID: LCSD-48211	Laboratory Control Sample Duplicate				Run: ICP202-B_100817A				08/17/10 17:12
Phosphorus	4.87	mg/L	10	97	85	115		20	
Sample ID: B10072506-001ADIL	Serial Dilution				Run: ICP202-B_100817A				08/17/10 17:28
Phosphorus	ND	mg/L	10		0	0		20	
Sample ID: B10072506-001AMS5	Sample Matrix Spike				Run: ICP202-B_100817A				08/17/10 17:36
Phosphorus	4.92	mg/L	10	98	75	125			
Sample ID: B10072506-002AMS5	Sample Matrix Spike				Run: ICP202-B_100817A				08/17/10 17:45
Phosphorus	4.92	mg/L	10	98	75	125			
Sample ID: B10072506-003AMS5	Sample Matrix Spike				Run: ICP202-B_100817A				08/17/10 17:53
Phosphorus	4.86	mg/L	10	97	75	125			
Sample ID: B10072506-004AMS5	Sample Matrix Spike				Run: ICP202-B_100817A				08/17/10 18:01
Phosphorus	4.88	mg/L	10	98	75	125			
Sample ID: B10072506-005AMS5	Sample Matrix Spike				Run: ICP202-B_100817A				08/17/10 18:17
Phosphorus	4.89	mg/L	10	98	75	125			
Sample ID: B10072506-006AMS5	Sample Matrix Spike				Run: ICP202-B_100817A				08/17/10 18:25
Phosphorus	4.85	mg/L	10	97	75	125			
Sample ID: B10072506-007AMS5	Sample Matrix Spike				Run: ICP202-B_100817A				08/17/10 18:33
Phosphorus	4.96	mg/L	10	99	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020								Analytical Run: ICPMS203-B_100809A	
Sample ID: ICSA-ME091229B	Interference Check Sample A								08/09/10 12:28
Antimony	0.00200	mg/L	0.0010						
Arsenic	0.000132	mg/L	0.0010						
Barium	0.000122	mg/L	0.0010						
Cadmium	0.000864	mg/L	0.0010						
Chromium	0.000586	mg/L	0.0010						
Copper	0.00163	mg/L	0.0010						
Iron	94.9	mg/L	0.0010	76					
Lead	7.80E-05	mg/L	0.0010						
Manganese	0.00256	mg/L	0.0010						
Nickel	0.00106	mg/L	0.0010						
Selenium	0.000154	mg/L	0.0010						
Silver	0.000111	mg/L	0.0010						
Thallium	1.10E-05	mg/L	0.0010						
Uranium	1.80E-05	mg/L	0.00030						
Zinc	0.00185	mg/L	0.0010						
Sample ID: ICSAB-ME091229B,09100	Interference Check Sample AB								08/09/10 12:33
Antimony	0.000569	mg/L	0.0010		0	0			
Arsenic	0.00986	mg/L	0.0010	99	70	130			
Barium	0.000109	mg/L	0.0010		0	0			
Cadmium	0.0100	mg/L	0.0010	100	70	130			
Chromium	0.0200	mg/L	0.0010	100	70	130			
Copper	0.0207	mg/L	0.0010	104	70	130			
Iron	86.0	mg/L	0.0010	86	70	130			
Lead	7.60E-05	mg/L	0.0010		0	0			
Manganese	0.0216	mg/L	0.0010	108	70	130			
Nickel	0.0208	mg/L	0.0010	104	70	130			
Selenium	0.00985	mg/L	0.0010	98	70	130			
Silver	0.0180	mg/L	0.0010	90	70	130			
Thallium	3.00E-06	mg/L	0.0010		0	0			
Uranium	8.00E-06	mg/L	0.00030		0	0			
Zinc	0.0107	mg/L	0.0010	107	70	130			
Sample ID: QCS-100607A,100726A,1	Initial Calibration Verification Standard								08/09/10 15:04
Antimony	0.0493	mg/L	0.0010	99	90	110			
Arsenic	0.0491	mg/L	0.0010	98	90	110			
Barium	0.0479	mg/L	0.0010	96	90	110			
Cadmium	0.0253	mg/L	0.0010	101	90	110			
Chromium	0.0504	mg/L	0.0010	101	90	110			
Copper	0.0508	mg/L	0.0010	102	90	110			
Iron	0.270	mg/L	0.0010	108	90	110			
Lead	0.0497	mg/L	0.0010	99	90	110			
Manganese	0.266	mg/L	0.0010	106	90	110			
Nickel	0.0515	mg/L	0.0010	103	90	110			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020							Analytical Run: ICPMS203-B_100809A		
Sample ID: QCS-100607A,100726A,1	Initial Calibration Verification Standard							08/09/10 15:04	
Selenium	0.0497	mg/L	0.0010	99	90	110			
Silver	0.0250	mg/L	0.0010	100	90	110			
Thallium	0.0494	mg/L	0.0010	99	90	110			
Uranium	0.0188	mg/L	0.00030	94	90	110			
Zinc	0.0509	mg/L	0.0010	102	90	110			
Method: SW6020								Batch: 48211	
Sample ID: MB-48211	Method Blank				Run: ICPMS203-B_100809A			08/09/10 13:28	
Aluminum	0.02	mg/L	0.0002						
Antimony	0.0006	mg/L	2E-05						
Arsenic	0.0002	mg/L	2E-05						
Barium	0.004	mg/L	2E-05						
Beryllium	ND	mg/L	2E-05						
Cadmium	0.0001	mg/L	5E-06						
Chromium	0.0005	mg/L	1E-05						
Copper	0.003	mg/L	2E-05						
Iron	0.004	mg/L	0.0003						
Lead	3E-05	mg/L	2E-05						
Manganese	0.0008	mg/L	2E-05						
Nickel	9E-05	mg/L	2E-05						
Selenium	4E-05	mg/L	2E-05						
Silver	9E-05	mg/L	2E-05						
Thallium	ND	mg/L	0.0002						
Uranium	ND	mg/L	2E-05						
Zinc	0.003	mg/L	0.0003						
Sample ID: B10070100-048ADIL	Serial Dilution				Run: ICPMS203-B_100809A			08/09/10 14:05	
Aluminum	0.930	mg/L	5.0		0	0		20	N
Antimony	0.00109	mg/L	0.50		0	0		20	N
Arsenic	0.00184	mg/L	0.50		0	0		20	N
Barium	0.118	mg/L	1.0		0	0		20	
Beryllium	0.000522	mg/L	0.50		0	0		20	N
Cadmium	0.00311	mg/L	0.10		0	0		20	
Chromium	0.782	mg/L	0.50		0	0		20	N
Copper	0.0319	mg/L	0.50		0	0		20	N
Iron	49.4	mg/L	1.0		0	0		20	N
Lead	0.0261	mg/L	0.50		0	0		20	N
Manganese	0.602	mg/L	0.50		0	0		20	
Nickel	0.412	mg/L	0.50		0	0		20	N
Selenium	0.00369	mg/L	0.10		0	0		20	
Silver	0.000259	mg/L	0.50		0	0		20	N
Thallium	ND	mg/L	0.50		0	0		20	
Uranium	0.00354	mg/L	0.50		0	0		20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

N - The analyte concentration was not sufficiently high to calculate a RPD for the serial dilution test.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte		Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method:	**SW6020**								Batch: 48211	
Sample ID:	**B10070100-048ADIL**	Serial Dilution				Run: ICPMS203-B_100809A			08/09/10 14:05	
Zinc		0.203	mg/L	1.0		0	0		20	N
Sample ID:	**LCS-48211**	Laboratory Control Sample				Run: ICPMS203-B_100809A			08/09/10 15:09	
Aluminum		2.74	mg/L	5.0	109	85	115			
Antimony		0.512	mg/L	0.50	102	85	115			
Arsenic		0.487	mg/L	0.50	97	85	115			
Barium		5.63	mg/L	1.0	102	85	115			
Beryllium		0.289	mg/L	0.50	115	85	115			
Cadmium		0.260	mg/L	0.10	104	85	115			
Chromium		0.499	mg/L	0.50	100	85	115			
Copper		0.495	mg/L	0.50	98	85	115			
Iron		2.71	mg/L	1.0	108	85	115			
Lead		0.523	mg/L	0.50	105	85	115			
Manganese		2.57	mg/L	0.50	103	85	115			
Nickel		0.497	mg/L	0.50	99	85	115			
Selenium		0.512	mg/L	0.10	102	85	115			
Silver		0.0507	mg/L	0.50	101	85	115			
Thallium		0.524	mg/L	0.50	105	85	115			
Uranium		0.542	mg/L	0.50	108	85	115			
Zinc		0.506	mg/L	1.0	101	85	115			
Sample ID:	**LCSD-48211**	Laboratory Control Sample				Run: ICPMS203-B_100809A			08/09/10 15:13	
Aluminum		2.76	mg/L	5.0	110	85	115			
Antimony		0.514	mg/L	0.50	103	85	115			
Arsenic		0.501	mg/L	0.50	100	85	115			
Barium		5.73	mg/L	1.0	104	85	115			
Beryllium		0.287	mg/L	0.50	115	85	115			
Cadmium		0.261	mg/L	0.10	104	85	115			
Chromium		0.515	mg/L	0.50	103	85	115			
Copper		0.510	mg/L	0.50	101	85	115			
Iron		2.77	mg/L	1.0	111	85	115			
Lead		0.521	mg/L	0.50	104	85	115			
Manganese		2.59	mg/L	0.50	103	85	115			
Nickel		0.509	mg/L	0.50	102	85	115			
Selenium		0.513	mg/L	0.10	103	85	115			
Silver		0.0502	mg/L	0.50	100	85	115			
Thallium		0.524	mg/L	0.50	105	85	115			
Uranium		0.561	mg/L	0.50	112	85	115			
Zinc		0.509	mg/L	1.0	101	85	115			
Sample ID:	**B10072506-001AMS5**	Sample Matrix Spike				Run: ICPMS203-B_100809A			08/09/10 15:59	
Aluminum		2.79	mg/L	5.0	110	75	125			
Antimony		0.516	mg/L	0.50	103	75	125			
Arsenic		0.507	mg/L	0.50	100	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

N - The analyte concentration was not sufficiently high to calculate a RPD for the serial dilution test.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 48211
Sample ID: B10072506-001AMS5	Sample Matrix Spike				Run: ICPMS203-B_100809A				08/09/10 15:59
Barium	5.80	mg/L	1.0	105	75	125			
Beryllium	0.289	mg/L	0.50	116	75	125			
Cadmium	0.262	mg/L	0.10	105	75	125			
Chromium	0.517	mg/L	0.50	103	75	125			
Copper	0.511	mg/L	0.50	102	75	125			
Iron	2.78	mg/L	1.0	111	75	125			
Lead	0.524	mg/L	0.50	105	75	125			
Manganese	2.61	mg/L	0.50	104	75	125			
Nickel	0.512	mg/L	0.50	102	75	125			
Selenium	0.520	mg/L	0.10	104	75	125			
Silver	0.0512	mg/L	0.50	102	75	125			
Thallium	0.526	mg/L	0.50	105	75	125			
Uranium	0.548	mg/L	0.50	110	75	125			
Zinc	0.505	mg/L	1.0	100	75	125			
Sample ID: B10072506-002AMS5	Sample Matrix Spike				Run: ICPMS203-B_100809A				08/09/10 16:06
Aluminum	2.81	mg/L	5.0	111	75	125			
Antimony	0.514	mg/L	0.50	103	75	125			
Arsenic	0.507	mg/L	0.50	101	75	125			
Barium	5.76	mg/L	1.0	105	75	125			
Beryllium	0.290	mg/L	0.50	116	75	125			
Cadmium	0.262	mg/L	0.10	105	75	125			
Chromium	0.522	mg/L	0.50	104	75	125			
Copper	0.518	mg/L	0.50	103	75	125			
Iron	2.81	mg/L	1.0	112	75	125			
Lead	0.524	mg/L	0.50	105	75	125			
Manganese	2.60	mg/L	0.50	104	75	125			
Nickel	0.516	mg/L	0.50	103	75	125			
Selenium	0.522	mg/L	0.10	104	75	125			
Silver	0.0512	mg/L	0.50	102	75	125			
Thallium	0.525	mg/L	0.50	105	75	125			
Uranium	0.548	mg/L	0.50	110	75	125			
Zinc	0.510	mg/L	1.0	101	75	125			
Sample ID: B10072506-003AMS5	Sample Matrix Spike				Run: ICPMS203-B_100809A				08/09/10 16:11
Aluminum	2.77	mg/L	5.0	110	75	125			
Antimony	0.508	mg/L	0.50	101	75	125			
Arsenic	0.502	mg/L	0.50	100	75	125			
Barium	5.75	mg/L	1.0	104	75	125			
Beryllium	0.288	mg/L	0.50	115	75	125			
Cadmium	0.259	mg/L	0.10	103	75	125			
Chromium	0.517	mg/L	0.50	103	75	125			
Copper	0.513	mg/L	0.50	102	75	125			
Iron	2.83	mg/L	1.0	113	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 48211
Sample ID: B10072506-003AMS5	Sample Matrix Spike				Run: ICPMS203-B_100809A				08/09/10 16:11
Lead	0.520	mg/L	0.50	104	75	125			
Manganese	2.57	mg/L	0.50	103	75	125			
Nickel	0.513	mg/L	0.50	103	75	125			
Selenium	0.528	mg/L	0.10	106	75	125			
Silver	0.0508	mg/L	0.50	102	75	125			
Thallium	0.521	mg/L	0.50	104	75	125			
Uranium	0.544	mg/L	0.50	109	75	125			
Zinc	0.517	mg/L	1.0	103	75	125			
Sample ID: B10072506-004AMS5	Sample Matrix Spike				Run: ICPMS203-B_100809A				08/09/10 16:15
Aluminum	2.78	mg/L	5.0	110	75	125			
Antimony	0.523	mg/L	0.50	104	75	125			
Arsenic	0.503	mg/L	0.50	100	75	125			
Barium	5.82	mg/L	1.0	106	75	125			
Beryllium	0.291	mg/L	0.50	116	75	125			
Cadmium	0.265	mg/L	0.10	106	75	125			
Chromium	0.512	mg/L	0.50	102	75	125			
Copper	0.508	mg/L	0.50	101	75	125			
Iron	2.75	mg/L	1.0	110	75	125			
Lead	0.529	mg/L	0.50	106	75	125			
Manganese	2.61	mg/L	0.50	104	75	125			
Nickel	0.504	mg/L	0.50	101	75	125			
Selenium	0.508	mg/L	0.10	102	75	125			
Silver	0.0521	mg/L	0.50	104	75	125			
Thallium	0.536	mg/L	0.50	107	75	125			
Uranium	0.556	mg/L	0.50	111	75	125			
Zinc	0.501	mg/L	1.0	100	75	125			
Sample ID: B10072506-005AMS5	Sample Matrix Spike				Run: ICPMS203-B_100809A				08/09/10 16:19
Aluminum	2.81	mg/L	5.0	111	75	125			
Antimony	0.525	mg/L	0.50	105	75	125			
Arsenic	0.516	mg/L	0.50	101	75	125			
Barium	5.81	mg/L	1.0	106	75	125			
Beryllium	0.290	mg/L	0.50	116	75	125			
Cadmium	0.266	mg/L	0.10	106	75	125			
Chromium	0.514	mg/L	0.50	103	75	125			
Copper	0.510	mg/L	0.50	102	75	125			
Iron	2.73	mg/L	1.0	109	75	125			
Lead	0.530	mg/L	0.50	106	75	125			
Manganese	2.64	mg/L	0.50	106	75	125			
Nickel	0.508	mg/L	0.50	102	75	125			
Selenium	0.507	mg/L	0.10	101	75	125			
Silver	0.0517	mg/L	0.50	103	75	125			
Thallium	0.530	mg/L	0.50	106	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 48211
Sample ID: B10072506-005AMS5	Sample Matrix Spike				Run: ICPMS203-B_100809A				08/09/10 16:19
Uranium	0.547	mg/L	0.50	109	75	125			
Zinc	0.511	mg/L	1.0	101	75	125			
Sample ID: B10072506-006AMS5	Sample Matrix Spike				Run: ICPMS203-B_100809A				08/09/10 16:24
Aluminum	2.78	mg/L	5.0	110	75	125			
Antimony	0.513	mg/L	0.50	102	75	125			
Arsenic	0.510	mg/L	0.50	101	75	125			
Barium	5.79	mg/L	1.0	105	75	125			
Beryllium	0.286	mg/L	0.50	114	75	125			
Cadmium	0.261	mg/L	0.10	104	75	125			
Chromium	0.523	mg/L	0.50	104	75	125			
Copper	0.514	mg/L	0.50	103	75	125			
Iron	2.70	mg/L	1.0	108	75	125			
Lead	0.521	mg/L	0.50	104	75	125			
Manganese	2.59	mg/L	0.50	103	75	125			
Nickel	0.517	mg/L	0.50	103	75	125			
Selenium	0.505	mg/L	0.10	101	75	125			
Silver	0.0506	mg/L	0.50	101	75	125			
Thallium	0.527	mg/L	0.50	105	75	125			
Uranium	0.546	mg/L	0.50	109	75	125			
Zinc	0.512	mg/L	1.0	101	75	125			
Sample ID: B10072506-007AMS5	Sample Matrix Spike				Run: ICPMS203-B_100809A				08/09/10 16:28
Aluminum	2.78	mg/L	5.0	110	75	125			
Antimony	0.514	mg/L	0.50	103	75	125			
Arsenic	0.512	mg/L	0.50	101	75	125			
Barium	5.86	mg/L	1.0	106	75	125			
Beryllium	0.291	mg/L	0.50	117	75	125			
Cadmium	0.262	mg/L	0.10	105	75	125			
Chromium	0.514	mg/L	0.50	103	75	125			
Copper	0.507	mg/L	0.50	101	75	125			
Iron	2.77	mg/L	1.0	110	75	125			
Lead	0.525	mg/L	0.50	105	75	125			
Manganese	2.61	mg/L	0.50	104	75	125			
Nickel	0.507	mg/L	0.50	101	75	125			
Selenium	0.504	mg/L	0.10	101	75	125			
Silver	0.0512	mg/L	0.50	102	75	125			
Thallium	0.535	mg/L	0.50	107	75	125			
Uranium	0.544	mg/L	0.50	109	75	125			
Zinc	0.513	mg/L	1.0	102	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020							Analytical Run: ICPMS203-B_100810B		
Sample ID: QCS-100607A,100726A,1	Initial Calibration Verification Standard							08/10/10 22:49	
Beryllium	0.0255	mg/L	0.0010	102	90	110			
Sample ID: ICSA-ME091229B	Interference Check Sample A							08/10/10 22:58	
Beryllium	1.60E-05	mg/L	0.0010						
Sample ID: ICSAB-ME091229B,09100	Interference Check Sample AB							08/10/10 23:02	
Beryllium	1.10E-05	mg/L	0.0010		0	0			
Method: SW6020								Batch: 48211	
Sample ID: MB-48211	Method Blank				Run: ICPMS203-B_100810B			08/11/10 01:15	
Aluminum	0.02	mg/L	0.0002						
Antimony	0.0004	mg/L	2E-05						
Arsenic	3E-05	mg/L	2E-05						
Barium	0.004	mg/L	2E-05						
Beryllium	ND	mg/L	2E-05						
Cadmium	8E-05	mg/L	5E-06						
Chromium	0.0006	mg/L	1E-05						
Copper	0.0002	mg/L	2E-05						
Iron	0.008	mg/L	0.0003						
Lead	3E-05	mg/L	2E-05						
Manganese	ND	mg/L	2E-05						
Nickel	0.0002	mg/L	2E-05						
Selenium	0.0001	mg/L	2E-05						
Silver	8E-05	mg/L	2E-05						
Thallium	ND	mg/L	0.0002						
Uranium	ND	mg/L	2E-05						
Zinc	0.003	mg/L	0.0003						
Sample ID: B10072506-002ADIL	Serial Dilution				Run: ICPMS203-B_100810B			08/11/10 01:27	
Aluminum	0.0234	mg/L	5.0		0	0		20	
Antimony	0.000297	mg/L	0.50		0	0		20	N
Arsenic	0.00309	mg/L	0.50		0	0		20	
Barium	0.00709	mg/L	1.0		0	0		20	
Beryllium	ND	mg/L	0.50		0	0		20	
Cadmium	ND	mg/L	0.10		0	0		20	
Chromium	0.000956	mg/L	0.50		0	0		20	N
Copper	0.000237	mg/L	0.50		0	0		20	N
Iron	0.00488	mg/L	1.0		0	0		20	N
Lead	ND	mg/L	0.50		0	0		20	
Manganese	ND	mg/L	0.50		0	0		20	
Nickel	ND	mg/L	0.50		0	0		20	
Selenium	0.000235	mg/L	0.10		0	0		20	N
Silver	ND	mg/L	0.50		0	0		20	
Thallium	ND	mg/L	0.50		0	0		20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

N - The analyte concentration was not sufficiently high to calculate a RPD for the serial dilution test.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte		Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method:	**SW6020**								Batch: 48211	
Sample ID:	**B10072506-002ADIL**	Serial Dilution				Run: ICPMS203-B_100810B			08/11/10 01:27	
Uranium		ND	mg/L	0.50		0	0		20	
Zinc		0.00516	mg/L	1.0		0	0		20	N
Sample ID:	**LCS-48211**	Laboratory Control Sample				Run: ICPMS203-B_100810B			08/11/10 02:09	
Aluminum		2.54	mg/L	5.0	101	85	115			
Antimony		0.504	mg/L	0.50	101	85	115			
Arsenic		0.491	mg/L	0.50	98	85	115			
Barium		5.57	mg/L	1.0	101	85	115			
Beryllium		0.261	mg/L	0.50	104	85	115			
Cadmium		0.259	mg/L	0.10	104	85	115			
Chromium		0.512	mg/L	0.50	102	85	115			
Copper		0.512	mg/L	0.50	102	85	115			
Iron		2.68	mg/L	1.0	107	85	115			
Lead		0.524	mg/L	0.50	105	85	115			
Manganese		2.46	mg/L	0.50	98	85	115			
Nickel		0.517	mg/L	0.50	103	85	115			
Selenium		0.481	mg/L	0.10	96	85	115			
Silver		0.0507	mg/L	0.50	101	85	115			
Thallium		0.527	mg/L	0.50	105	85	115			
Uranium		0.523	mg/L	0.50	105	85	115			
Zinc		0.510	mg/L	1.0	101	85	115			
Sample ID:	**LCSD-48211**	Laboratory Control Sample				Run: ICPMS203-B_100810B			08/11/10 02:13	
Aluminum		2.52	mg/L	5.0	100	85	115			
Antimony		0.505	mg/L	0.50	101	85	115			
Arsenic		0.493	mg/L	0.50	99	85	115			
Barium		5.54	mg/L	1.0	101	85	115			
Beryllium		0.259	mg/L	0.50	104	85	115			
Cadmium		0.258	mg/L	0.10	103	85	115			
Chromium		0.514	mg/L	0.50	103	85	115			
Copper		0.517	mg/L	0.50	103	85	115			
Iron		2.65	mg/L	1.0	106	85	115			
Lead		0.525	mg/L	0.50	105	85	115			
Manganese		2.48	mg/L	0.50	99	85	115			
Nickel		0.521	mg/L	0.50	104	85	115			
Selenium		0.481	mg/L	0.10	96	85	115			
Silver		0.0496	mg/L	0.50	99	85	115			
Thallium		0.531	mg/L	0.50	106	85	115			
Uranium		0.550	mg/L	0.50	110	85	115			
Zinc		0.506	mg/L	1.0	101	85	115			
Sample ID:	**B10072506-001AMS5**	Sample Matrix Spike				Run: ICPMS203-B_100810B			08/11/10 02:17	
Aluminum		2.53	mg/L	5.0	100	75	125			
Antimony		0.511	mg/L	0.50	102	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

N - The analyte concentration was not sufficiently high to calculate a RPD for the serial dilution test.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 48211
Sample ID: B10072506-001AMS5	Sample Matrix Spike				Run: ICPMS203-B_100810B				08/11/10 02:17
Arsenic	0.506	mg/L	0.50	100	75	125			
Barium	5.64	mg/L	1.0	102	75	125			
Beryllium	0.260	mg/L	0.50	104	75	125			
Cadmium	0.259	mg/L	0.10	104	75	125			
Chromium	0.522	mg/L	0.50	104	75	125			
Copper	0.524	mg/L	0.50	105	75	125			
Iron	2.62	mg/L	1.0	105	75	125			
Lead	0.525	mg/L	0.50	105	75	125			
Manganese	2.46	mg/L	0.50	99	75	125			
Nickel	0.526	mg/L	0.50	105	75	125			
Selenium	0.481	mg/L	0.10	96	75	125			
Silver	0.0506	mg/L	0.50	101	75	125			
Thallium	0.530	mg/L	0.50	106	75	125			
Uranium	0.540	mg/L	0.50	108	75	125			
Zinc	0.520	mg/L	1.0	103	75	125			
Sample ID: B10072506-002AMS5	Sample Matrix Spike				Run: ICPMS203-B_100810B				08/11/10 02:21
Aluminum	2.58	mg/L	5.0	102	75	125			
Antimony	0.516	mg/L	0.50	103	75	125			
Arsenic	0.504	mg/L	0.50	100	75	125			
Barium	5.67	mg/L	1.0	103	75	125			
Beryllium	0.264	mg/L	0.50	106	75	125			
Cadmium	0.260	mg/L	0.10	104	75	125			
Chromium	0.517	mg/L	0.50	103	75	125			
Copper	0.519	mg/L	0.50	104	75	125			
Iron	2.64	mg/L	1.0	105	75	125			
Lead	0.529	mg/L	0.50	106	75	125			
Manganese	2.45	mg/L	0.50	98	75	125			
Nickel	0.521	mg/L	0.50	104	75	125			
Selenium	0.479	mg/L	0.10	96	75	125			
Silver	0.0507	mg/L	0.50	101	75	125			
Thallium	0.531	mg/L	0.50	106	75	125			
Uranium	0.533	mg/L	0.50	107	75	125			
Zinc	0.520	mg/L	1.0	103	75	125			
Sample ID: B10072506-003AMS5	Sample Matrix Spike				Run: ICPMS203-B_100810B				08/11/10 02:25
Aluminum	2.55	mg/L	5.0	101	75	125			
Antimony	0.511	mg/L	0.50	102	75	125			
Arsenic	0.504	mg/L	0.50	100	75	125			
Barium	5.68	mg/L	1.0	103	75	125			
Beryllium	0.260	mg/L	0.50	104	75	125			
Cadmium	0.260	mg/L	0.10	104	75	125			
Chromium	0.519	mg/L	0.50	104	75	125			
Copper	0.519	mg/L	0.50	104	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 48211
Sample ID: B10072506-003AMS5	Sample Matrix Spike				Run: ICPMS203-B_100810B				08/11/10 02:25
Iron	2.80	mg/L	1.0	112	75	125			
Lead	0.530	mg/L	0.50	106	75	125			
Manganese	2.42	mg/L	0.50	97	75	125			
Nickel	0.524	mg/L	0.50	105	75	125			
Selenium	0.507	mg/L	0.10	101	75	125			
Silver	0.0506	mg/L	0.50	101	75	125			
Thallium	0.533	mg/L	0.50	107	75	125			
Uranium	0.540	mg/L	0.50	108	75	125			
Zinc	0.525	mg/L	1.0	104	75	125			
Sample ID: B10072506-004AMS5	Sample Matrix Spike				Run: ICPMS203-B_100810B				08/11/10 02:29
Aluminum	2.53	mg/L	5.0	101	75	125			
Antimony	0.512	mg/L	0.50	102	75	125			
Arsenic	0.502	mg/L	0.50	100	75	125			
Barium	5.67	mg/L	1.0	103	75	125			
Beryllium	0.260	mg/L	0.50	104	75	125			
Cadmium	0.258	mg/L	0.10	103	75	125			
Chromium	0.522	mg/L	0.50	104	75	125			
Copper	0.524	mg/L	0.50	105	75	125			
Iron	2.68	mg/L	1.0	107	75	125			
Lead	0.524	mg/L	0.50	105	75	125			
Manganese	2.47	mg/L	0.50	99	75	125			
Nickel	0.524	mg/L	0.50	105	75	125			
Selenium	0.484	mg/L	0.10	97	75	125			
Silver	0.0500	mg/L	0.50	100	75	125			
Thallium	0.528	mg/L	0.50	106	75	125			
Uranium	0.532	mg/L	0.50	106	75	125			
Zinc	0.529	mg/L	1.0	105	75	125			
Sample ID: B10072506-005AMS5	Sample Matrix Spike				Run: ICPMS203-B_100810B				08/11/10 02:33
Aluminum	2.54	mg/L	5.0	100	75	125			
Antimony	0.514	mg/L	0.50	103	75	125			
Arsenic	0.505	mg/L	0.50	98	75	125			
Barium	5.64	mg/L	1.0	102	75	125			
Beryllium	0.261	mg/L	0.50	104	75	125			
Cadmium	0.261	mg/L	0.10	105	75	125			
Chromium	0.515	mg/L	0.50	103	75	125			
Copper	0.514	mg/L	0.50	103	75	125			
Iron	2.63	mg/L	1.0	105	75	125			
Lead	0.531	mg/L	0.50	106	75	125			
Manganese	2.48	mg/L	0.50	99	75	125			
Nickel	0.514	mg/L	0.50	103	75	125			
Selenium	0.477	mg/L	0.10	95	75	125			
Silver	0.0505	mg/L	0.50	101	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 48211
Sample ID: B10072506-005AMS5	Sample Matrix Spike				Run: ICPMS203-B_100810B				08/11/10 02:33
Thallium	0.534	mg/L	0.50	107	75	125			
Uranium	0.533	mg/L	0.50	107	75	125			
Zinc	0.519	mg/L	1.0	103	75	125			
Sample ID: B10072506-006AMS5	Sample Matrix Spike				Run: ICPMS203-B_100810B				08/11/10 02:37
Aluminum	2.53	mg/L	5.0	100	75	125			
Antimony	0.512	mg/L	0.50	102	75	125			
Arsenic	0.492	mg/L	0.50	98	75	125			
Barium	5.67	mg/L	1.0	103	75	125			
Beryllium	0.257	mg/L	0.50	103	75	125			
Cadmium	0.259	mg/L	0.10	104	75	125			
Chromium	0.505	mg/L	0.50	101	75	125			
Copper	0.505	mg/L	0.50	101	75	125			
Iron	2.63	mg/L	1.0	105	75	125			
Lead	0.527	mg/L	0.50	105	75	125			
Manganese	2.47	mg/L	0.50	99	75	125			
Nickel	0.511	mg/L	0.50	102	75	125			
Selenium	0.473	mg/L	0.10	95	75	125			
Silver	0.0500	mg/L	0.50	100	75	125			
Thallium	0.531	mg/L	0.50	106	75	125			
Uranium	0.536	mg/L	0.50	107	75	125			
Zinc	0.510	mg/L	1.0	101	75	125			
Sample ID: B10072506-007AMS5	Sample Matrix Spike				Run: ICPMS203-B_100810B				08/11/10 02:41
Aluminum	2.51	mg/L	5.0	99	75	125			
Antimony	0.511	mg/L	0.50	102	75	125			
Arsenic	0.503	mg/L	0.50	99	75	125			
Barium	5.68	mg/L	1.0	103	75	125			
Beryllium	0.259	mg/L	0.50	103	75	125			
Cadmium	0.261	mg/L	0.10	104	75	125			
Chromium	0.521	mg/L	0.50	104	75	125			
Copper	0.516	mg/L	0.50	103	75	125			
Iron	2.67	mg/L	1.0	106	75	125			
Lead	0.531	mg/L	0.50	106	75	125			
Manganese	2.46	mg/L	0.50	98	75	125			
Nickel	0.522	mg/L	0.50	104	75	125			
Selenium	0.483	mg/L	0.10	97	75	125			
Silver	0.0509	mg/L	0.50	102	75	125			
Thallium	0.534	mg/L	0.50	107	75	125			
Uranium	0.536	mg/L	0.50	107	75	125			
Zinc	0.515	mg/L	1.0	102	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020							Analytical Run: ICPMS203-B_100811A		
Sample ID: QCS-100607A,100420A,1	Initial Calibration Verification Standard							08/11/10 10:28	
Aluminum	0.259	mg/L	0.0010	104	90	110			
Cadmium	0.0267	mg/L	0.0010	107	90	110			
Copper	0.0520	mg/L	0.0010	104	90	110			
Sample ID: ICSA-ME091229B	Interference Check Sample A							08/11/10 10:32	
Aluminum	37.8	mg/L	0.0010	95					
Cadmium	0.000846	mg/L	0.0010						
Copper	0.00151	mg/L	0.0010						
Sample ID: ICSAB-ME091229B,09100	Interference Check Sample AB							08/11/10 10:36	
Aluminum	37.8	mg/L	0.0010	95	70	130			
Cadmium	0.0105	mg/L	0.0010	105	70	130			
Copper	0.0229	mg/L	0.0010	115	70	130			
Method: SW6020								Batch: 48211	
Sample ID: MB-48211	Method Blank				Run: ICPMS203-B_100811A			08/11/10 12:29	
Aluminum	0.02	mg/L	0.0002						
Antimony	0.0003	mg/L	2E-05						
Arsenic	0.0002	mg/L	2E-05						
Barium	0.004	mg/L	2E-05						
Beryllium	ND	mg/L	2E-05						
Cadmium	0.0001	mg/L	5E-06						
Chromium	0.0006	mg/L	1E-05						
Copper	0.0003	mg/L	2E-05						
Iron	0.005	mg/L	0.0003						
Lead	3E-05	mg/L	2E-05						
Manganese	0.005	mg/L	2E-05						
Nickel	0.0001	mg/L	2E-05						
Silver	5E-05	mg/L	2E-05						
Thallium	ND	mg/L	0.0002						
Uranium	ND	mg/L	2E-05						
Zinc	0.006	mg/L	0.0003						
Sample ID: B10072506-001ADIL	Serial Dilution				Run: ICPMS203-B_100811A			08/11/10 12:54	
Aluminum	0.0364	mg/L	5.0		0	0		20	
Antimony	0.000652	mg/L	0.50		0	0		20	N
Arsenic	0.00547	mg/L	0.50		0	0		20	
Barium	0.00914	mg/L	1.0		0	0		20	
Beryllium	ND	mg/L	0.50		0	0		20	
Cadmium	0.000162	mg/L	0.10		0	0		20	N
Chromium	0.000567	mg/L	0.50		0	0		20	N
Copper	ND	mg/L	0.50		0	0		20	
Iron	0.0111	mg/L	1.0		0	0		20	N
Lead	ND	mg/L	0.50		0	0		20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

N - The analyte concentration was not sufficiently high to calculate a RPD for the serial dilution test.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020								Batch: 48211	
Sample ID: B10072506-001ADIL	Serial Dilution				Run: ICPMS203-B_100811A			08/11/10 12:54	
Manganese	0.00310	mg/L	0.50		0	0		20	N
Nickel	ND	mg/L	0.50		0	0		20	
Selenium	0.00607	mg/L	0.10		0	0		20	N
Silver	ND	mg/L	0.50		0	0		20	
Thallium	ND	mg/L	0.50		0	0		20	
Uranium	ND	mg/L	0.50		0	0		20	
Zinc	0.00590	mg/L	1.0		0	0		20	N
Sample ID: B10072506-006AMS5	Sample Matrix Spike				Run: ICPMS203-B_100811A			08/11/10 13:23	
Aluminum	2.52	mg/L	5.0	100	75	125			
Antimony	0.535	mg/L	0.50	107	75	125			
Arsenic	0.546	mg/L	0.50	108	75	125			
Barium	5.91	mg/L	1.0	107	75	125			
Beryllium	0.255	mg/L	0.50	102	75	125			
Cadmium	0.272	mg/L	0.10	109	75	125			
Chromium	0.549	mg/L	0.50	110	75	125			
Copper	0.541	mg/L	0.50	108	75	125			
Iron	2.39	mg/L	1.0	95	75	125			
Lead	0.546	mg/L	0.50	109	75	125			
Manganese	2.54	mg/L	0.50	101	75	125			
Nickel	0.538	mg/L	0.50	108	75	125			
Selenium	0.532	mg/L	0.10	106	75	125			
Silver	0.0515	mg/L	0.50	103	75	125			
Thallium	0.533	mg/L	0.50	107	75	125			
Uranium	0.547	mg/L	0.50	109	0	0			
Zinc	0.560	mg/L	1.0	111	75	125			
Sample ID: B10072506-007AMS5	Sample Matrix Spike				Run: ICPMS203-B_100811A			08/11/10 13:43	
Aluminum	2.41	mg/L	5.0	96	75	125			
Antimony	0.530	mg/L	0.50	106	75	125			
Arsenic	0.536	mg/L	0.50	106	75	125			
Barium	5.86	mg/L	1.0	106	75	125			
Beryllium	0.246	mg/L	0.50	98	75	125			
Cadmium	0.268	mg/L	0.10	107	75	125			
Chromium	0.531	mg/L	0.50	106	75	125			
Copper	0.523	mg/L	0.50	105	75	125			
Iron	2.36	mg/L	1.0	93	75	125			
Lead	0.535	mg/L	0.50	107	75	125			
Manganese	2.48	mg/L	0.50	99	75	125			
Nickel	0.521	mg/L	0.50	104	75	125			
Selenium	0.509	mg/L	0.10	102	75	125			
Silver	0.0505	mg/L	0.50	101	75	125			
Thallium	0.520	mg/L	0.50	104	75	125			
Uranium	0.534	mg/L	0.50	107	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

N - The analyte concentration was not sufficiently high to calculate a RPD for the serial dilution test.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 48211
Sample ID: B10072506-007AMS5	Sample Matrix Spike				Run: ICPMS203-B_100811A				08/11/10 13:43
Zinc	0.545	mg/L	1.0	108	75	125			
Sample ID: B10072506-001AMS5	Sample Matrix Spike				Run: ICPMS203-B_100811A				08/11/10 13:47
Aluminum	2.48	mg/L	5.0	98	75	125			
Antimony	0.539	mg/L	0.50	108	75	125			
Arsenic	0.553	mg/L	0.50	110	75	125			
Barium	5.90	mg/L	1.0	107	75	125			
Beryllium	0.250	mg/L	0.50	100	75	125			
Cadmium	0.272	mg/L	0.10	109	75	125			
Chromium	0.546	mg/L	0.50	109	75	125			
Copper	0.538	mg/L	0.50	108	75	125			
Iron	2.37	mg/L	1.0	95	75	125			
Lead	0.541	mg/L	0.50	108	75	125			
Manganese	2.53	mg/L	0.50	101	75	125			
Nickel	0.539	mg/L	0.50	108	75	125			
Selenium	0.520	mg/L	0.10	104	75	125			
Silver	0.0513	mg/L	0.50	102	75	125			
Thallium	0.521	mg/L	0.50	104	75	125			
Uranium	0.546	mg/L	0.50	109	75	125			
Zinc	0.552	mg/L	1.0	110	75	125			
Sample ID: B10072506-002AMS5	Sample Matrix Spike				Run: ICPMS203-B_100811A				08/11/10 13:51
Aluminum	2.44	mg/L	5.0	97	75	125			
Antimony	0.538	mg/L	0.50	107	75	125			
Arsenic	0.554	mg/L	0.50	110	75	125			
Barium	5.88	mg/L	1.0	107	75	125			
Beryllium	0.248	mg/L	0.50	99	75	125			
Cadmium	0.269	mg/L	0.10	108	75	125			
Chromium	0.546	mg/L	0.50	109	75	125			
Copper	0.546	mg/L	0.50	109	75	125			
Iron	2.31	mg/L	1.0	92	75	125			
Lead	0.537	mg/L	0.50	107	75	125			
Manganese	2.52	mg/L	0.50	101	75	125			
Nickel	0.544	mg/L	0.50	109	75	125			
Selenium	0.523	mg/L	0.10	105	75	125			
Silver	0.0518	mg/L	0.50	104	75	125			
Thallium	0.516	mg/L	0.50	103	75	125			
Uranium	0.533	mg/L	0.50	107	75	125			
Zinc	0.565	mg/L	1.0	112	75	125			
Sample ID: B10072506-003AMS5	Sample Matrix Spike				Run: ICPMS203-B_100811A				08/11/10 13:55
Aluminum	2.45	mg/L	5.0	97	75	125			
Antimony	0.535	mg/L	0.50	107	75	125			
Arsenic	0.550	mg/L	0.50	109	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 48211
Sample ID: B10072506-003AMS5	Sample Matrix Spike				Run: ICPMS203-B_100811A				08/11/10 13:55
Barium	5.82	mg/L	1.0	106	75	125			
Beryllium	0.249	mg/L	0.50	100	75	125			
Cadmium	0.271	mg/L	0.10	108	75	125			
Chromium	0.541	mg/L	0.50	108	75	125			
Copper	0.535	mg/L	0.50	107	75	125			
Iron	2.39	mg/L	1.0	95	75	125			
Lead	0.534	mg/L	0.50	107	75	125			
Manganese	2.49	mg/L	0.50	100	75	125			
Nickel	0.540	mg/L	0.50	108	75	125			
Selenium	0.514	mg/L	0.10	103	75	125			
Silver	0.0520	mg/L	0.50	104	75	125			
Thallium	0.524	mg/L	0.50	105	75	125			
Uranium	0.538	mg/L	0.50	108	75	125			
Zinc	0.562	mg/L	1.0	111	75	125			
Sample ID: B10072506-004AMS5	Sample Matrix Spike				Run: ICPMS203-B_100811A				08/11/10 13:59
Aluminum	2.47	mg/L	5.0	98	75	125			
Antimony	0.538	mg/L	0.50	107	75	125			
Arsenic	0.544	mg/L	0.50	108	75	125			
Barium	5.89	mg/L	1.0	107	75	125			
Beryllium	0.252	mg/L	0.50	101	75	125			
Cadmium	0.270	mg/L	0.10	108	75	125			
Chromium	0.538	mg/L	0.50	108	75	125			
Copper	0.533	mg/L	0.50	107	75	125			
Iron	2.39	mg/L	1.0	95	75	125			
Lead	0.541	mg/L	0.50	108	75	125			
Manganese	2.50	mg/L	0.50	100	75	125			
Nickel	0.534	mg/L	0.50	107	75	125			
Selenium	0.517	mg/L	0.10	103	75	125			
Silver	0.0508	mg/L	0.50	102	75	125			
Thallium	0.522	mg/L	0.50	104	75	125			
Uranium	0.544	mg/L	0.50	109	75	125			
Zinc	0.555	mg/L	1.0	110	75	125			
Sample ID: B10072506-005AMS5	Sample Matrix Spike				Run: ICPMS203-B_100811A				08/11/10 14:03
Aluminum	2.45	mg/L	5.0	97	75	125			
Antimony	0.536	mg/L	0.50	107	75	125			
Arsenic	0.563	mg/L	0.50	110	75	125			
Barium	5.87	mg/L	1.0	106	75	125			
Beryllium	0.249	mg/L	0.50	99	75	125			
Cadmium	0.270	mg/L	0.10	108	75	125			
Chromium	0.547	mg/L	0.50	109	75	125			
Copper	0.538	mg/L	0.50	108	75	125			
Iron	2.39	mg/L	1.0	95	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 48211
Sample ID: B10072506-005AMS5	Sample Matrix Spike				Run: ICPMS203-B_100811A				08/11/10 14:03
Lead	0.533	mg/L	0.50	107	75	125			
Manganese	2.49	mg/L	0.50	100	75	125			
Nickel	0.541	mg/L	0.50	108	75	125			
Selenium	0.508	mg/L	0.10	102	75	125			
Silver	0.0516	mg/L	0.50	103	75	125			
Thallium	0.516	mg/L	0.50	103	75	125			
Uranium	0.529	mg/L	0.50	106	75	125			
Zinc	0.559	mg/L	1.0	111	75	125			
Sample ID: LCS-48211	Laboratory Control Sample				Run: ICPMS203-B_100811A				08/11/10 14:07
Aluminum	2.42	mg/L	5.0	96	85	115			
Antimony	0.529	mg/L	0.50	106	85	115			
Arsenic	0.543	mg/L	0.50	109	85	115			
Barium	5.75	mg/L	1.0	104	85	115			
Beryllium	0.246	mg/L	0.50	98	85	115			
Cadmium	0.269	mg/L	0.10	108	85	115			
Chromium	0.537	mg/L	0.50	107	85	115			
Copper	0.534	mg/L	0.50	107	85	115			
Iron	2.37	mg/L	1.0	95	85	115			
Lead	0.537	mg/L	0.50	107	85	115			
Manganese	2.49	mg/L	0.50	99	85	115			
Nickel	0.530	mg/L	0.50	106	85	115			
Selenium	0.518	mg/L	0.10	104	85	115			
Silver	0.0508	mg/L	0.50	102	85	115			
Thallium	0.514	mg/L	0.50	103	85	115			
Uranium	0.533	mg/L	0.50	107	85	115			
Zinc	0.559	mg/L	1.0	111	85	115			
Sample ID: LCSD-48211	Laboratory Control Sample				Run: ICPMS203-B_100811A				08/11/10 14:10
Aluminum	2.45	mg/L	5.0	97	85	115			
Antimony	0.540	mg/L	0.50	108	85	115			
Arsenic	0.542	mg/L	0.50	108	85	115			
Barium	5.95	mg/L	1.0	108	85	115			
Beryllium	0.248	mg/L	0.50	99	85	115			
Cadmium	0.272	mg/L	0.10	109	85	115			
Chromium	0.536	mg/L	0.50	107	85	115			
Copper	0.532	mg/L	0.50	106	85	115			
Iron	2.42	mg/L	1.0	96	85	115			
Lead	0.541	mg/L	0.50	108	85	115			
Manganese	2.49	mg/L	0.50	100	85	115			
Nickel	0.530	mg/L	0.50	106	85	115			
Selenium	0.511	mg/L	0.10	102	85	115			
Silver	0.0516	mg/L	0.50	103	85	115			
Thallium	0.517	mg/L	0.50	103	85	115			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 48211
Sample ID: LCSD-48211	Laboratory Control Sample				Run: ICPMS203-B_100811A				08/11/10 14:10
Uranium	0.554	mg/L	0.50	111	85	115			
Zinc	0.554	mg/L	1.0	110	85	115			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte		Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method:	**SW7470A**								Analytical Run: HGCV201-B_100806C	
Sample ID:	**QCS**	Initial Calibration Verification Standard							08/06/10 14:40	
Mercury		0.00213	mg/L	0.020	106	90	110			
Method:	**SW7470A**								Batch: 48171	
Sample ID:	**MB-48171**	Method Blank				Run: HGCV201-B_100806C			08/06/10 15:30	
Mercury		0.0001	mg/L	6E-05						
Sample ID:	**LCS-48171**	Laboratory Control Sample				Run: HGCV201-B_100806C			08/06/10 15:32	
Mercury		0.00900	mg/L	0.020	89	85	115			
Sample ID:	**LCSD-48171**	Laboratory Control Sample Duplicate				Run: HGCV201-B_100806C			08/06/10 15:33	
Mercury		0.00855	mg/L	0.020	85	85	115			
Sample ID:	**B10072506-001AMS**	Sample Matrix Spike				Run: HGCV201-B_100806C			08/06/10 15:37	
Mercury		0.00211	mg/L	0.020	104	85	115			
Sample ID:	**B10072506-004AMS**	Sample Matrix Spike				Run: HGCV201-B_100806C			08/06/10 15:53	
Mercury		0.00211	mg/L	0.020	104	85	115			
Sample ID:	**B10072506-005AMS**	Sample Matrix Spike				Run: HGCV201-B_100806C			08/06/10 15:56	
Mercury		0.00213	mg/L	0.020	105	85	115			
Sample ID:	**B10072506-006AMS**	Sample Matrix Spike				Run: HGCV201-B_100806C			08/06/10 15:59	
Mercury		0.00203	mg/L	0.020	101	85	115			
Sample ID:	**B10072506-007ADIL**	Serial Dilution				Run: HGCV201-B_100806C			08/06/10 16:03	
Mercury		ND	mg/L	0.020		0	0		20	N
Sample ID:	**B10072506-007AMS**	Sample Matrix Spike				Run: HGCV201-B_100806C			08/06/10 16:04	
Mercury		0.00209	mg/L	0.020	103	85	115			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

N - The analyte concentration was not sufficiently high to calculate a RPD for the serial dilution test.

QA/QC Summary Report

Client: Tetra Tech
Project: Butte Highlands Mine

Report Date: 08/21/10
Work Order: B10072506

Analyte		Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method:	**SW7470A**								Analytical Run: HGCV201-B_100812B	
Sample ID:	**QCS**	Initial Calibration Verification Standard							08/12/10 14:21	
Mercury		0.00199	mg/L	0.020	100	90	110			
Method:	**SW7470A**								Batch: 48322	
Sample ID:	**MB-48322**	Method Blank				Run: HGCV201-B_100812B			08/12/10 14:44	
Mercury		0.0002	mg/L	6E-05						
Sample ID:	**LCS-48322**	Laboratory Control Sample				Run: HGCV201-B_100812B			08/12/10 14:45	
Mercury		0.00925	mg/L	0.0020	91	85	115			
Sample ID:	**LCSD-48322**	Laboratory Control Sample Duplicate				Run: HGCV201-B_100812B			08/12/10 14:47	
Mercury		0.00910	mg/L	0.0020	89	85	115			
Sample ID:	**B10072506-002AMS**	Sample Matrix Spike				Run: HGCV201-B_100812B			08/12/10 14:50	
Mercury		0.00386	mg/L	0.020	95	85	115			
Sample ID:	**B10072506-003ADIL**	Serial Dilution				Run: HGCV201-B_100812B			08/12/10 14:53	
Mercury		ND	mg/L	0.020		0	0		20	
Sample ID:	**B10072506-003AMS**	Sample Matrix Spike				Run: HGCV201-B_100812B			08/12/10 14:55	
Mercury		0.00376	mg/L	0.020	92	85	115			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

Workorder Receipt Checklist

B10072506

Tetra Tech

Login completed by: Jill M. Lippard
Reviewed by: BL2000\kmcdonald
Reviewed Date: 7/28/2010

Date Received: 7/27/2010
Received by: tn
Carrier name: UPS

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature:	22°C		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	Not Applicable ☑

Contact and Corrective Action Comments:

None

Chain of Custody and Analytical Request Record

ENERGY LABORATORIES

Page 1 of 1

PLEASE PRINT- Provide as much information as possible.

Company Name:	Project Name, PWS, Permit, Etc.	Sample Origin	EPA/State Compliance:
Butte Highlands JV	Butte Highlands Mine	State: MT	Yes ☐ No ☐
Report Mail Address:	**Contact Name:** Phone/Fax:	Email:	Sampler: (Please Print)
P.O. Box 4959 Butte, MT 59702	Philip Mulholland 406/533-8104	auworks@gmail.com	P. Mulholland
Invoice Address: Tetra tech 851 Bridger, Ste. 6 Bozeman, MT 59715	**Invoice Contact & Phone:** Allan Kirk 406/582-8780	Purchase Order:	Quote/Bottle Order:

Special Report/Formats – ELI must be notified prior to sample submittal for the following:

- ☐ DW
- ☐ GSA
- ☐ POTW/WWTP
- ☐ State: _____
- ☐ Other: _____
- ☐ A2LA
- ☐ EDD/EDT (Electronic Data) Format: _____
- ☐ LEVEL IV
- ☐ NELAC

ANALYSIS REQUESTED

Contact ELI prior to RUSH sample submittal for charges and scheduling – See Instruction Page

Comments: logged per quote 2150 jl 7/27/10

Shipped by: UPS Grnd

Cooler ID(s):

Receipt Temp 8.2 °C

On Ice: Yes (No)

Custody Seal Y (N) Intact Y N Signature Match Y N

	SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX (Number of Containers; Sample Type: A W S V B O; Air Water Soils/Solids Vegetation Bioassay Other)	Modified Sobek	SPLP								SEE ATTACHED	Normal Turnaround (TAT)	RUSH		LABORATORY USE ONLY
1	Core - 140	6/2010		1 - S	↓	↓												1008725060-1
2	Core - 250	↓		↓														-2
3	MAR - 332																	-3
4	MAR - 454	↓																-4
5	MAR - 578	7/2010																-5
6	MAR - 690	↓																-6
7	MAR - 806	↓		↓	↓	↓												-7
8																		
9																		
10																		

Custody Record MUST be Signed

Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
Philip Mulholland	7/12/10 11:00 AM	P J Mulholland	Nathaniel Lancaster	7-14-10	
Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
Sample Disposal: Return to Client: ✓		Lab Disposal:	Received by Laboratory: Allan Kirk	Date/Time: 7/27/10 0900	Signature:

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report. Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

Butte Highlands JV
Butte Highlands Project
Waste Dump Expansion, Phase 1
Design Report

October 28, 2010

Prepared for

Butte Highlands JV
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Facsimile: 303.935.6375

Project 74201272A0

Butte Highlands JV
Butte Highlands Project
Waste Dump Expansion, Phase 1
Design Report

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Butte Highlands JV
Butte Highlands Project
Waste Dump Expansion, Phase 1
Design Report

1.0 Introduction

AMEC Earth and Environmental (AMEC) was commissioned by Butte Highlands JV (BHJV) to prepare an engineering design for a proposed waste dump expansion at the Butte Highlands Project that will increase the total capacity to 250,000 tons based on a density of 1.55 tons/cy.

Butte Highlands JV shipped a 4-bucket representative sample of waste rock from the waste dump for to the AMEC office in Denver for inspection and subsequent laboratory testing at the Advanced Terra Testing laboratory. The purpose of the laboratory testing was to identify geotechnical factors that could potentially affect the height of the waste dump.

1.1 Project Location and Description

The Butte Highlands Project is a small underground gold mining project located in Silver Bow County, Montana approximately 18 miles south of the town of Butte. Specifically, the project is located in Sections 31 and 32 in Township 1 North and Range 7 West on patented mining claims: Pony Placer Claim, Red Mountain Claim, Purchance Claim, Only Chance Claim, J.B. Thompson Claim and Murphy Claim.

The site includes a Facilities area comprised of buildings, laydown/storage areas, a portal, a waste dump, two ponds and diversion channels, and Land Application Disposal (LAD) areas. The proposed waste dump expansion is shown on the Issued for Construction Drawing A100, dated October 28, 2010.

1.2 Scope of Work

AMEC's scope of work completed for this project included the following:

1. A new waste dump surface was designed based on the defined limits from BHJV and existing site features. The goal was to tie into existing site features such as access roads and portal yards and avoid encroaching on existing stormwater diversion ditches, utility corridors and existing stockpiles.

2. Laboratory testing was performed on a sample of the waste rock material to determine the classification and engineering characteristics of the material.

3. A geotechnical slope stability analysis was performed using parameters developed from the laboratory testing results and the new waste dump layout.

4. “Issued for Construction” drawings and a design report were prepared to present the expanded waste dump layout and summarize the results of the testing and analysis.

2.0 Site Conditions

The Butte Highlands area lies in the Highland Mountains near the intersection of Highlands Road and Fish Creek Road. The portal is located on the east end of the Pony Placer Claim where the terrain becomes steep. The terrain to the west of the portal is moderately sloped with an average grade of approximately 10% to the county road which serves as the site boundary line.

The existing waste dump is located immediately east of the portal yard and buildings in the facilities area. The boundaries for the proposed expansion to the waste dump provided by BHJV included a portal yard boundary on the east, the stormwater collection ditches to the west and north and the pond excavation spoils stockpile to the south. The maximum grade for access onto the waste dump was specified by BHJV at 10%.

3.0 Waste Rock Laboratory Testing

3.1 Laboratory Testing

A sample collected by BHJV was shipped to AMEC for inspection and laboratory testing. After inspection by AMEC, the samples were delivered to Advanced Terra Testing for the required testing. Laboratory index testing included natural moisture content, specific gravity, grain size analyses, and liquid and plastic limits. Direct Shear testing was performed on the waste rock sample to determine the strength and friction angle of the material.

The laboratory testing was conducted in general accordance with applicable ASTM guidelines.

3.1.1 Index Properties

In order to identify soils and classify them into categories of similar engineering properties, the Unified Soil Classification System (USCS) (ASTM D-2487) was used. This system is based on index property tests, including the determination of natural water content (ASTM D-2216), Atterberg limits test (ASTM D-4318), and grain size distribution (ASTM D-6913). Results of the moisture content, specific gravity, Atterberg limits, and grain size distribution are presented in Table 1. Individual index property test results are presented in Appendix A.

3.1.2 Direct Shear Testing

Direct shear testing (ASTM D 3080 modified) was performed on the waste rock sample to determine the consolidated-drained shear strength of the soil. This test method consists of placing the test specimen in a square direct shear device and applying a predetermined normal stress. The granular sample was tested using a 12-inch x 12-inch box. After allowing for wetting or draining of the test specimen and consolidating the specimen under the normal stress, the frames that hold the test specimen were unlocked and one frame displaced horizontally with respect to the other at a constant rate of shearing deformation. The shearing force and horizontal displacements were measured as the specimen was sheared.

From this test, the friction angle of the waste rock material was able to be determined and is shown on Table 1. Individual direct shear test results are provided in Appendix A.

4.0 Stability Analysis

4.1 Analysis Methods

The stability analyses were conducted using SLIDE 5.0, which is a commercially available computer program (Rocscience, 2007) which enable the user to conduct limit equilibrium slope stability calculations by a variety of methods.

For the failure mechanisms considered in the analyses, slope stability was evaluated using limit equilibrium methods based on Spencer's method of analysis (Spencer, 1967). Spencer's method is a method of slices (consideration of potential failure masses as rigid bodies divided into adjacent regions or "slices," separated by vertical boundary planes) that satisfies both moment and force equilibrium. It is based on the principle of limiting equilibrium (i.e., the method calculates the shear strengths that would be required to just maintain equilibrium along the selected failure plane, and then determines a safety factor by dividing the available shear strength by the driving shear stress). Consequently, safety factors calculated by Spencer's, or by any other limiting equilibrium method, indicate the percentage by which the available shear strength exceeds, or falls short of, that required to maintain equilibrium. Therefore, safety factors in excess of 1.0 indicate stability and those less than 1.0 indicate instability, while the greater the mathematical difference between a safety factor and 1.0, the larger the margin of safety (for safety factors in excess of 1.0), or the more extreme the likelihood of failure (for safety factors less than 1.0). For non-water impoundment facilities, which is the standard to which the Waste Dump is designed, the desired minimum static factor of safety is typically 1.3.

Pseudostatic-based analyses are commonly used to apply equivalent seismic loading on earthfill structures. In an actual seismic event, the peak acceleration would be sustained for only a fraction of a second. Actual seismic time histories are characterized by multiple-frequency attenuating motions. The accelerations produced by seismic events rapidly reverse motion and generally tend to build to a peak acceleration that quickly decays to lesser accelerations. Consequently, the duration that a mass is actually subjected to a unidirectional, peak seismic acceleration is finite, rather than infinite. The pseudo-static analyses conservatively models seismic events as constant acceleration and direction (i.e., an infinitely long pulse). Therefore, it is customary for geotechnical engineers to take only a fraction of the predicted peak maximum acceleration when modeling seismic events using pseudo-static analyses. The stability of the waste dump under earthquake loading was evaluated based on a 2,475-year return period, and a pseudostatic coefficient equal to two-thirds of the peak ground acceleration (i.e., 0.14 g). This

represents a conservative approach as Hynes-Griffin and Franklin (1984) suggest using one-half the peak horizontal ground acceleration.

4.2 Model Development

The cross section developed was considered representative of the most critical configuration through the waste dump and is shown on Figure 1. The section was developed at a point of maximum waste dump height with the steepest underlying topography. The east-west section 1 (Figure 2) has a maximum height of approximately 53 feet, measured from toe to crest. The assumed operating waste dump angle of repose configuration is shown at 1.4H:1V slope.

4.3 Strength Parameters

The cross section under consideration for the stability analysis include the following materials: (1) waste material and (2) foundation soil. The material properties for the foundation soil were estimated based upon a previous geotechnical investigation performed at the site included SPT blow counts, typical strength values from literature (USBR, 1977; Das, 2004) based upon index testing, and experience with similar materials. The material properties for the waste material was based on the laboratory test results performed on the sample provided by BHJV. The material properties used in the stability analysis are summarized in the table below:

Stability Analysis Material Properties

Material Type	Moist Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (deg)
Waste Rock	125	0	40
Foundation Soil	115	0	35

4.4 Slope Stability Results

Results of the static and seismic slope stability analyses for the cross section under consideration are presented on Figure 2, and summarized in the table below. For a non-water impounding facility such as the waste rock dump, the desired minimum static and pseudostatic factors of safety are typically 1.3 and 1.0, respectively.

Slope Stability Results

Section	Scenario	Failure Type	Static Factor of Safety	Pseudostatic Factor of Safety
1 (East - West)	Operating	Shallow Dump	1.4	1.1
1 (East - West)	Operating	Deep Foundation	1.8	1.3

As shown in the above table, the analyses indicate that the Waste Rock Dump is stable under both static and seismic loading conditions since the computed factors of safety exceed the typical prescriptive values. Although minimal deformation is anticipated due to seismic events, some minor maintenance and repair may be necessary due to localized zones of sloughing material.

5.0 Preliminary Recommendations

The following are preliminary recommendations to be considered for construction of the waste dump.

1. If the angle of repose is less than a 1.4H:1V slope then a new toe limit should be calculated to maintain the dump within the planned reclamation limits. To prevent double handling of waste rock during reclamation, markers should be set out to show the crest and toe limits of the designed operating dump at its assumed 1.4H:1V angle of repose. These limits are shown in the Issued for Construction drawings.

2. An effective angle of internal friction equal to 40 degrees was used for the waste dump static and pseudostatic stability analysis. If the waste dump material changes and the fines content increases significantly then another stability analysis should be performed on the material. In any case, there is always a risk for a failure so as a minimum precaution, access between the operating dump toe and the reclaimed toe as provided in this design should be restricted.

6.0 Limitations

This report has been prepared in accordance with generally accepted soil and foundation engineering practices in this area for use by the client for design and construction purposes. The conclusions and recommendations submitted in this report are based on the data obtained from the laboratory test results of the waste rock sample provided by Butte Highlands JV. If waste rock conditions appear to be different from those described herein, the geotechnical engineer should be advised at once so that reevaluation of the recommendations may be made.

7.0 References

ASTM. 2009. ASTM Book of Standards Volume 4.08: Construction: Soil and Rock (I). American Society for Testing and Materials International. West Conshohocken, Pennsylvania. March, 2009. 1840 pp.

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Tables

Table 1
Butte Highlands Project, Waste Dump Expansion Phase 1
Waste Rock Laboratory Testing Summary

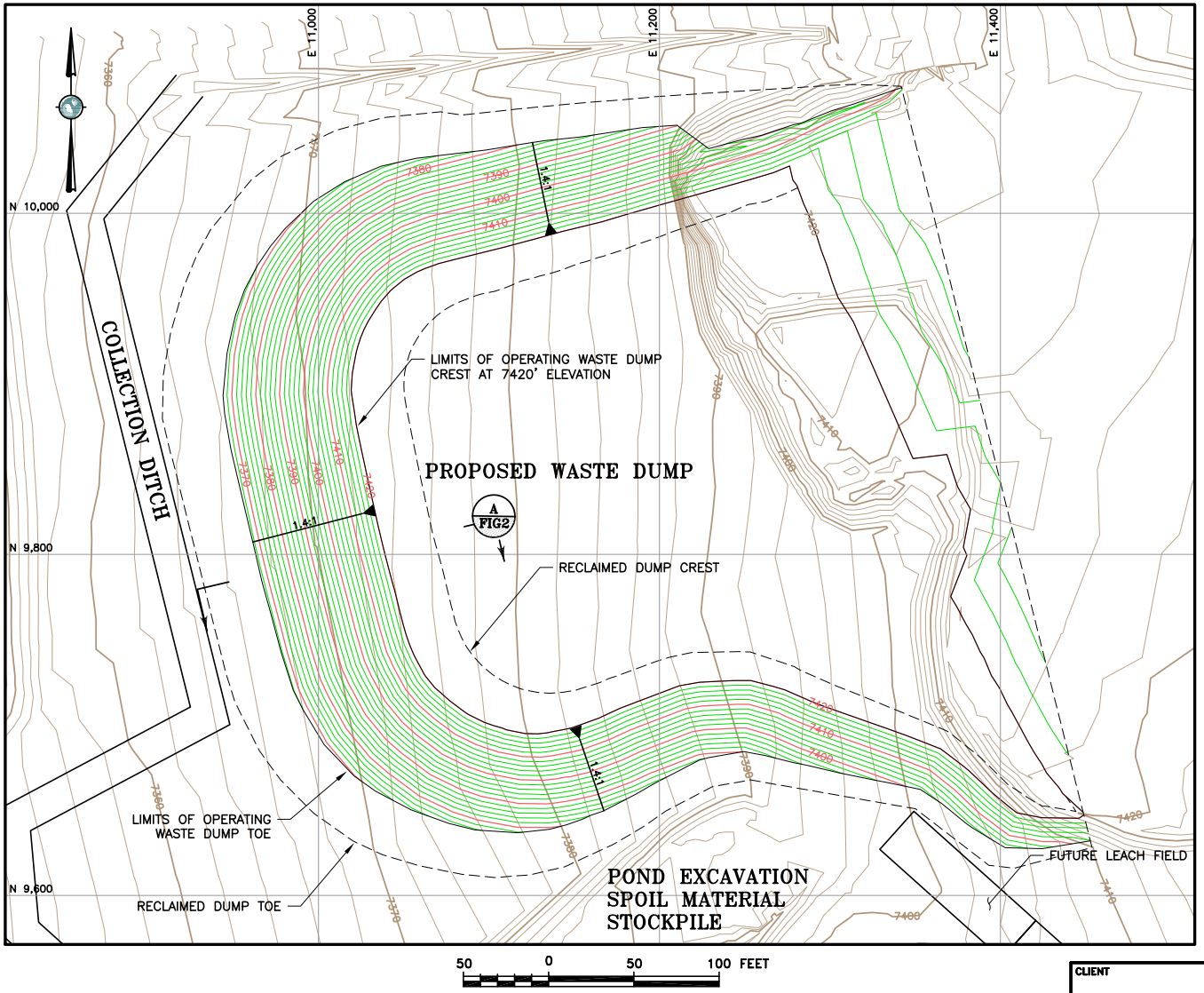
Sample Location	Depth (ft)	Material Description	USCS	Grain Size Analysis - Percent Passing												Atterberg Limits			Natural Moisture Content (%)	Specific Gravity	Friction Angle (degrees)
				6"	3"	1.5"	3/4"	3/8"	#4	#10	#20	#40	#60	#100	#200	Plastic Limit	Liquid Limit	Plasticity Index			
Waste Rock	Surface	Well graded gravel with sand, cobbles and boulders	GW	100	71	55	44	36	31	28	25	15	10	7.1	4.9			NP	2.1	2.85	46.5

Notes:

NP - Non Plastic

USCS - Unified Soil Classification System

Figures



50 0 50 100 FEET

LEGEND:

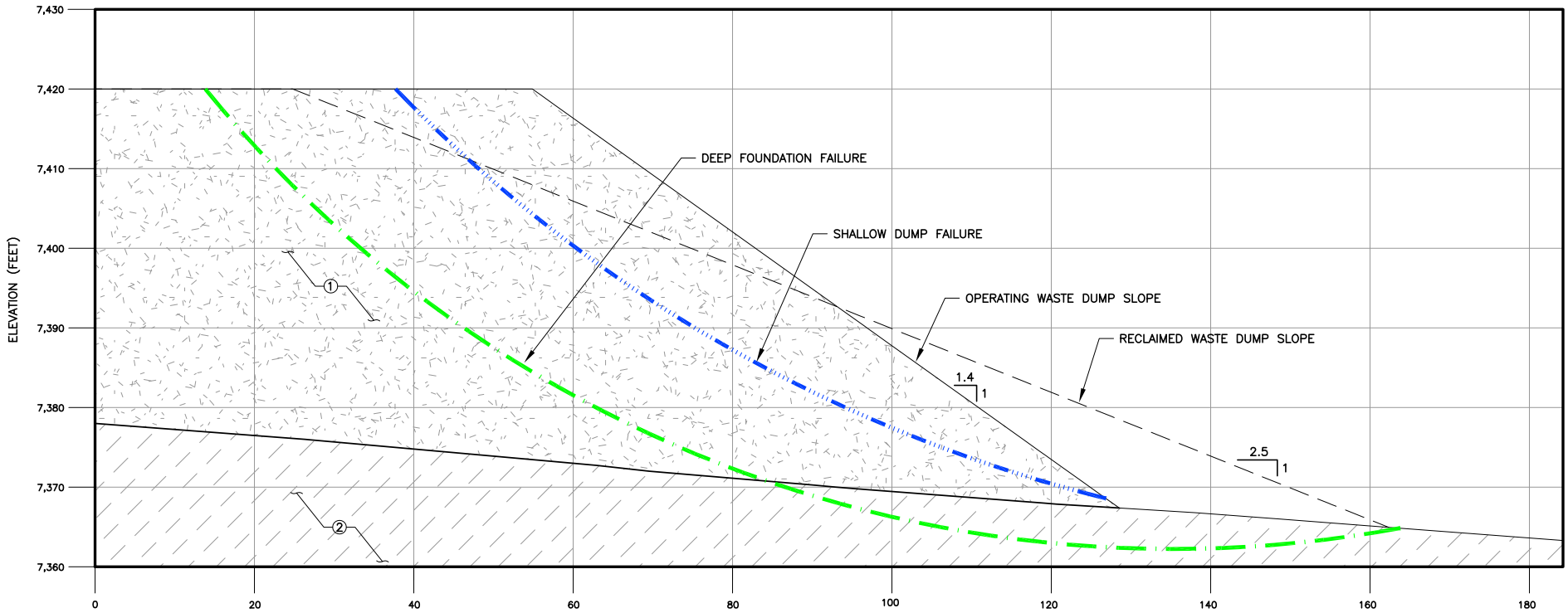
- 7400 — EXISTING GROUND SURFACE CONTOUR EL, FEET
- 7420 — PROPOSED GROUND SURFACE CONTOUR EL, FEET
- PROPOSED WASTE DUMP LIMITS
- PROPOSED WASTE DUMP RECLAMATION LIMITS

CLIENT	BUTTE HIGHLANDS JV
PROJECT	WASTE DUMP EXPANSION, PHASE 1
TITLE	STABILITY ANALYSIS SECTION LOCATION

amec EARTH AND ENVIRONMENTAL

DESIGNED BY	MTH	CHECKED BY	RTB	DATE
DRAWN BY	MTH	APPROVED BY	RTB	10/28/10

FILENAME	FIGURE No.	REV
1272AF04	1	A



1 FIG1 CRITICAL STABILITY SECTION 1

10 0 10 20 FEET
VERTICAL SCALE

10 0 10 20 FEET
HORIZONTAL SCALE

VERTICAL EXAGGERATION = 1X

MATERIAL PROPERTIES

ZONE	SOIL TYPE	UNIT WEIGHT MOIST (PCF)	EFFECTIVE STRESS ANALYSIS	
			FRICTION ANGLE (DEGREES)	COHESION (PSF)
①	WASTE ROCK	125	40	0
②	FOUNDATION	115	35	0

STABILITY RESULTS

FAILURE MODELED	STATIC FACTOR OF SAFETY	PSEUDOSTATIC FACTOR OF SAFETY
SHALLOW DUMP FAILURE	1.4	1.1
DEEP FOUNDATION FAILURE	1.8	1.3

CLIENT
BUTTE HIGHLANDS JV

PROJECT
WASTE DUMP EXPANSION, PHASE 1

TITLE
WASTE DUMP STABILITY
CROSS SECTION 1

amec
EARTH AND ENVIRONMENTAL

DESIGNED BY	MTH	CHECKED BY	RTB	DATE
DRAWN BY	MTH	APPROVED BY	RTB	10/28/10

FILENAME	FIGURE No.	REV
1272AF05	2	A

Drawings

BUTTE HIGHLANDS PROJECT
WASTE DUMP EXPANSION, PHASE 1

ISSUED FOR CONSTRUCTION
OCTOBER 28, 2010

INDEX OF DRAWINGS

TITLE	AUTOCAD FILENAME	DRAWING NO.	REV
COVER SHEET	1272AC01	A000	A
SITE LAYOUT	1272AM02	A100	A
SECTION AND DETAILS	1272AD03	A200	A

PREPARED FOR:

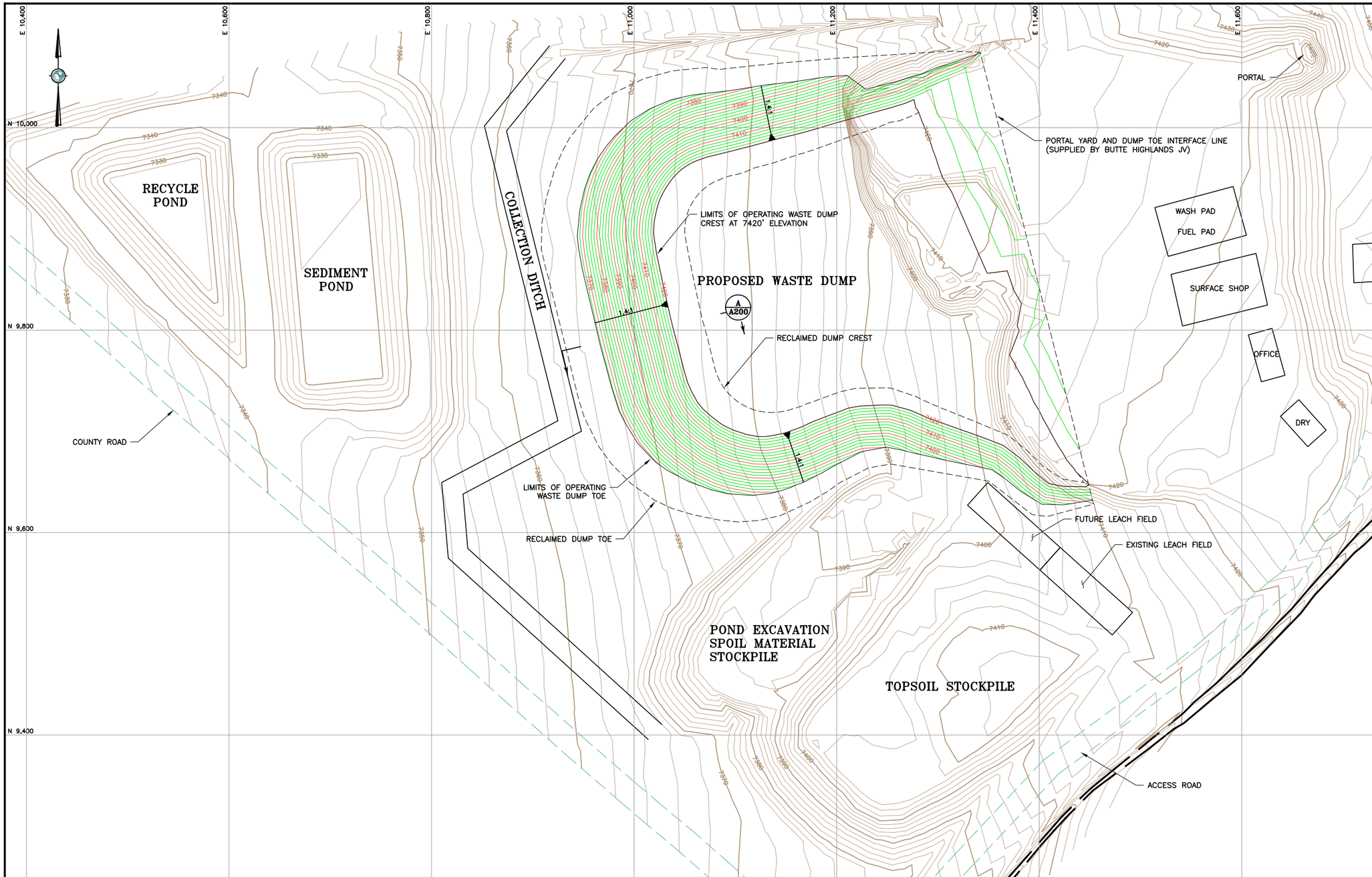
BUTTE HIGHLANDS JV
P.O. BOX 4959
BUTTE, MONTANA 59702

PREPARED BY:

amec
EARTH AND ENVIRONMENTAL

Colorado Center Tower 2
2000 S. Colorado Blvd, Suite 2-1000
Denver, CO 80222

Phone: 303-935-6505
Fax: 303-935-6575



LEGEND:

- 7400 — EXISTING GROUND SURFACE CONTOUR EL, FEET
- 7420 — PROPOSED GROUND SURFACE CONTOUR EL, FEET
- EXISTING ROADS
- PROPOSED WASTE DUMP LIMITS
- PROPOSED WASTE DUMP RECLAMATION LIMITS

50 0 50 100 FEET

NOTES:

1. IT IS RECOMMENDED THAT THE TOE LIMIT OF THE PROPOSED OPERATING WASTE DUMP BE DELINEATED IN THE FIELD.
2. AMEC SHOULD BE NOTIFIED IF THE DUMP ELEVATION WILL BE GREATER THAN 7420' OR IF THE OPERATING FOOTPRINT WILL EXPAND BEYOND THE DESIGNATED LIMITS.
3. THE DUMP SHALL BE SLOPED TO PROMOTE RUNOFF TO THE DESIGNATED DITCHES.
4. IF THE OPERATING WASTE DUMP ANGLE OF REPOSE IS STEEPER THAN 1.4H:1V, A NEW TOE LIMIT SHOULD BE CALCULATED TO MAINTAIN THE DUMP WITHIN THE PLANNED RECLAMATION LIMITS.
5. RECLAIMED WASTE DUMP TOE AND CREST IS BASED ON A REGRADED SLOPE OF 2.5:1.

A	10/28/10	ISSUED FOR CONSTRUCTION	RTB / MTH

DISCLAIMER

AMEC EARTH AND ENVIRONMENTAL PRODUCED THE INFORMATION PRESENTED ON THIS DRAWING THROUGH THE USE OF TECHNICAL INFORMATION AND PRACTICAL EXPERIENCE SPECIFIC TO ITS EFFORTS. RECEIVING THIS DRAWING DOES NOT GUARANTEE ANY RIGHTS TO SUCH TECHNICAL INFORMATION AND PRACTICAL EXPERIENCE. ANY ALTERATION OR ADAPTATION OF THE DATA OR CONTENTS OF THIS DRAWING SHALL BE AT USER'S SOLE RISK AND WITHOUT ANY LIABILITY OR LEGAL RESPONSIBILITY TO AMEC EARTH AND ENVIRONMENTAL.

CLIENT: BUTTE HIGHLANDS JV

PROJECT: WASTE DUMP EXPANSION, PHASE 1

TITLE: SITE LAYOUT

amec EARTH AND ENVIRONMENTAL

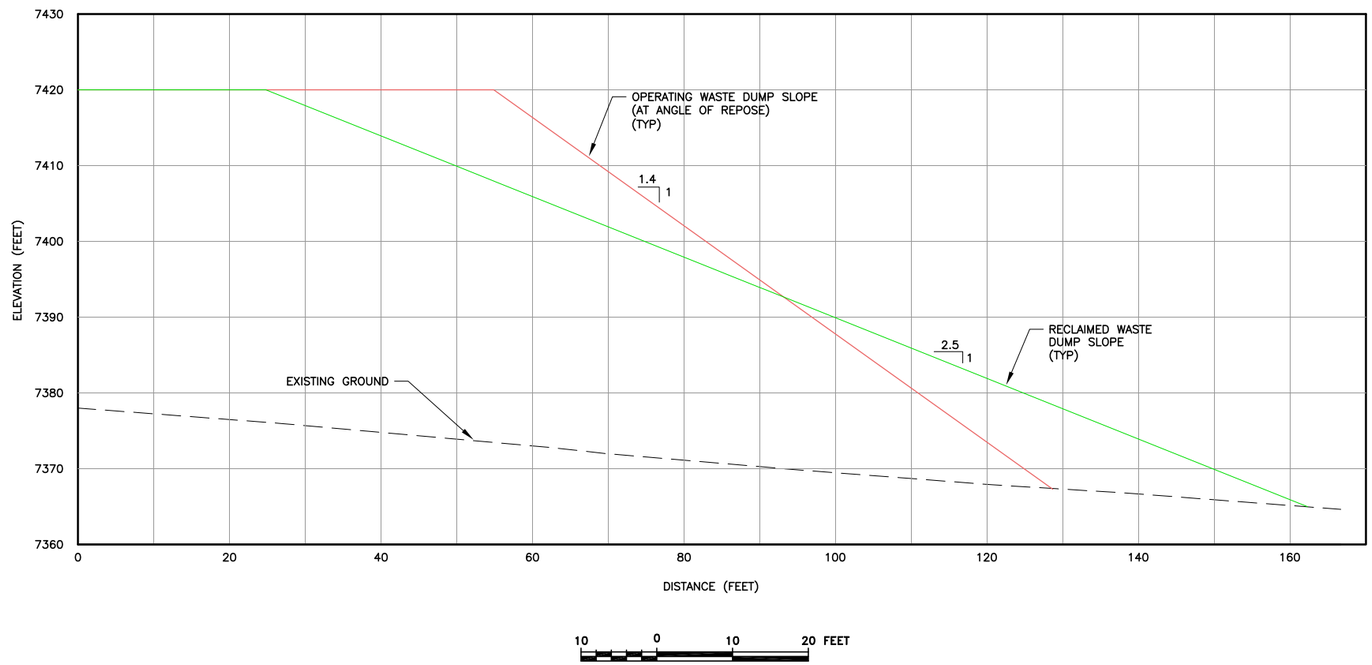
DESIGNED BY	MTH	CHECKED BY	RTB
DRAWN BY	MTH	APPROVED BY	RTB

FILENAME	DRAWING No.	REV
1272AM02	A100	A

1272AM02.dwg;06-OCT-2010

LEGEND:

- EXISTING GROUND
- PROPOSED OPERATING WASTE DUMP
- PROPOSED RECLAIMED WASTE DUMP



A
A100

WASTE DUMP TYPICAL SECTION

A	10/28/10	ISSUED FOR CONSTRUCTION	RTB / MTH

DISCLAIMER

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CLIENT: BUTTE HIGHLANDS JV

PROJECT: WASTE DUMP EXPANSION, PHASE 1

TITLE: SECTION AND DETAILS

amec EARTH AND ENVIRONMENTAL

DESIGNED BY	MTH	CHECKED BY	RTB
DRAWN BY	MTH	APPROVED BY	RTB

FILENAME	DRAWING No.	REV
1272AD03	A200	A

1272AD03.dwg,06-OCT-2010

Appendix A

Laboratory Testing Data

Moisture Content Determinations
ASTM D 2216

CLIENT: AMEC Earth & Environmental JOB NO.: 2399-25
LOCATION: Butte Highlands Project

BORING	Waste Rock
SAMPLE DEPTH	
SAMPLE NO.	Composite
DATE SAMPLED	
DATE TESTED	10/08/10 WAR
SOIL DESCRIPTION	74201272AO

MOISTURE DETERMINATIONS	
Wt. of Wet Soil & Dish (gms)	986.72
Wt. of Dry Soil & Dish (gms)	966.70
Net Loss of Moisture (gms)	20.02
Wt. of Dish (gms)	8.19
Wt. of Dry Soil (gms)	958.51
Moisture Content (%)	2.1

Data entered by: MLM Date: 10/09/2010
Data checked by: LB Date: 10-12-10
FileName: ARN0WSTE

ADVANCED TERRA TESTING, INC. ATT

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 6913

CLIENT	AMEC Earth & Environmental	JOB NO.	2399-25
BORING NO.	Waste Rock	SAMPLED	
DEPTH		DATE+#4 DRY SIEVED	10/11/10 WAR
SAMPLE NO.	Composite	DATE -#4 WASHED	10/12/10 PW
SOIL DESCR.	74201272AO	WASH SIEVE	Yes
LOCATION	Butte Highlands Project	DRY SIEVE	No

MOISTURE DATA

HYGROSCOPIC	Yes
NATURAL	No

Wt. Wet Soil & Pan (g)	1084.23
Wt. Dry Soil & Pan (g)	1080.10
Wt. Lost Moisture (g)	4.13
Wt. of Pan Only (g)	792.66
Wt. of Dry Soil (g)	287.44
Moisture Content %	1.4
Wt. Partial -#4 Sample Wet (g)	291.57
Wt. Partial Sample Dry (g)	287.44

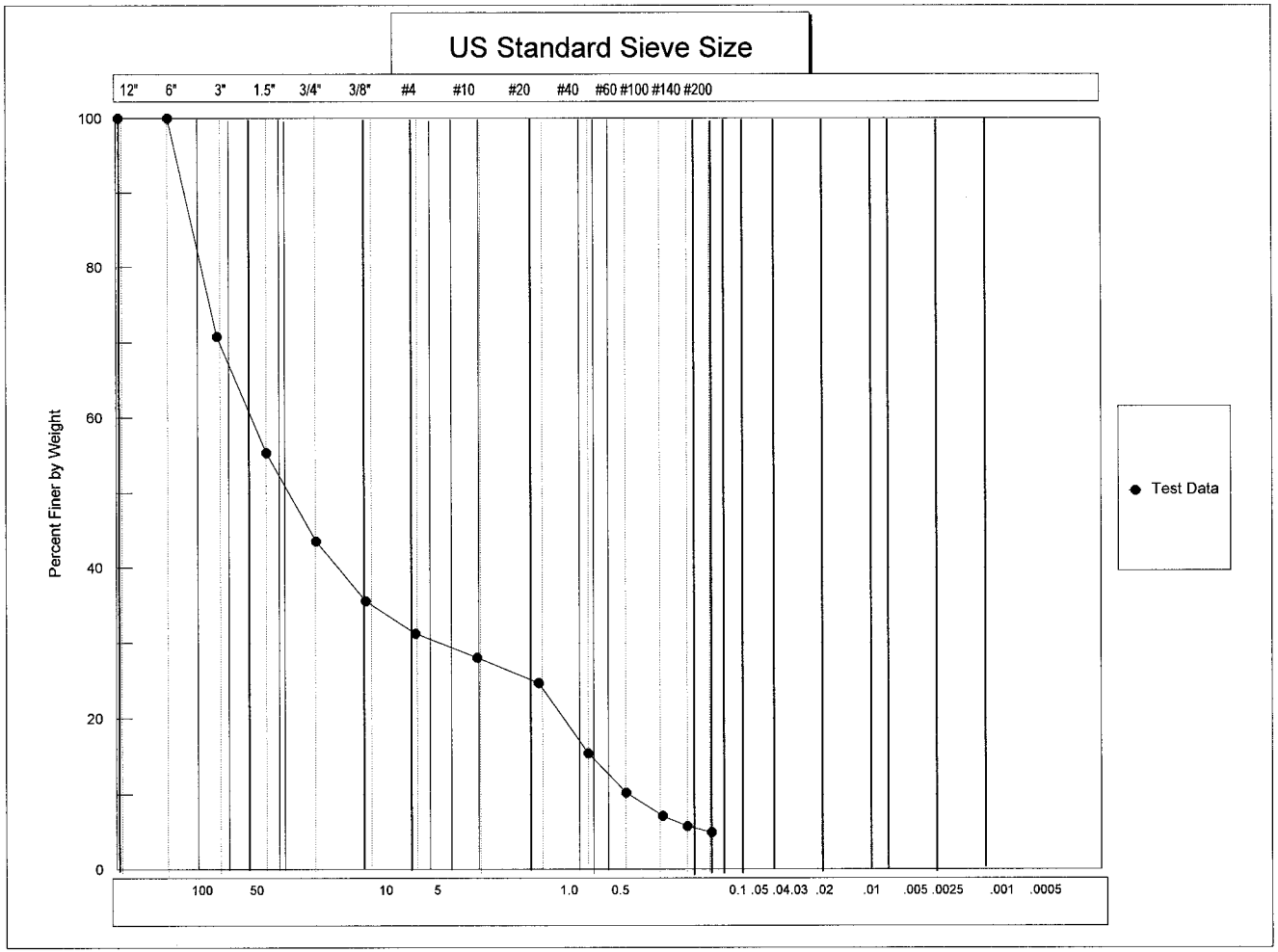
WASH SIEVE ANALYSIS

Wt. Total Sample Wet (g)	103929.00
Weight of + #4 Before Washing (g)	71111.00
Weight of + #4 After Washing (g)	71111.00
Weight of - #4 Wet (g)	32818.00
Weight of - #4 Dry (g)	32353.14
Wt. Total Sample Dry (g)	103464.14
Calc. Wt. "W" (g)	919.22
Calc. Mass + #4	631.78

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
12"	0.00	0.00	0.00	0.00	0.0	100.0
6"	0.00	0.00	0.00	0.00	0.0	100.0
3"	0.00	30250.00	30250.00	30250.00	29.2	70.8
1 1/2"	0.00	15967.00	15967.00	46217.00	44.7	55.3
3/4"	0.00	12215.00	12215.00	58432.00	56.5	43.5
3/8"	0.00	8295.00	8295.00	66727.00	64.5	35.5
#4	0.00	4384.00	4384.00	71111.00	68.7	31.3
#10	3.24	32.91	29.67	29.67	72.0	28.0
#20	3.17	34.41	31.24	60.91	75.4	24.6
#40	3.14	87.86	84.72	145.63	84.6	15.4
#60	3.00	50.98	47.98	193.61	89.8	10.2
#100	2.99	31.29	28.30	221.91	92.9	7.1
#140	3.06	15.76	12.70	234.61	94.3	5.7
#200	3.04	10.71	7.67	242.28	95.1	4.9

Data entered by: MLM Date: 10/13/2010
Data checked by: BKL Date: 10/14/10
FileName: ARM0WSTE

ADVANCED TERRA TESTING, INC. ATT



COBBLES	GRAVEL		SAND			SILT OR CLAY		USCS
	COARSE	FINE	CRS	MEDIUM	FINE			

COBBLES	PEBBLE GRAVEL			SAND			SILT	CLAY	WENTWORTH
TO BOULDERS	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

Client: AMEC Earth & Environmenta Boring No.: Waste Rock Sample No.: Composite
Job Number: 2399-25 Depth:
Classification: **Classification Not Performed**

USCS Classification
D 2487

CLIENT	AMEC Earth & Environmental	JOB NO.	2399-25
BORING NO.	Waste Rock	SAMPLED	
DEPTH		DATE TESTED	10/11/10 WAR
SAMPLE NO.	Composite	WASH SIEVE	10/12/10 PW
SOIL DESCR.	74201272AO	DRY SIEVE	Yes
LOCATION	Butte Highlands Project		

ATTERBERG CLASSIFICATION: ML

% Gravel =	56.48
% Sand =	38.61
% Fines =	4.91
D60 =	11.74766
D30 =	2.23118
D10 =	0.24154
Cu =	48.64
Cc =	1.75

Classification = GW, Well-graded gravel with sand

Data entered by: MLM
Data checked by: WAK
FileName: ARM0WSTE

Date: 10/21/2010
Date: 10/21/10
ADVANCED TERRA TESTING, INC.

SPECIFIC GRAVITY TESTS ASTM D 854

CLIENT:	AMEC Earth & Environmental	JOB NO.	2399-25
SOIL DESCR.	74201272AO	LOCATION	Butte Highlands Project

BORING NO.	Waste Rock
DEPTH	
SAMPLE NO.	Composite
DATE SAMPLED	
DATE TESTED	10/15/10 MLM

Pycnometer #	Big 10
Weight of oven dry soil (g) (Wo)	127.240
Weight of flask, soil, and water. (g) (Wb)	754.480
Temperature (deg. C) (Tx)	24.4
Weight of water & flask at Tx (from cal. curve)(Wa)	671.938
Specific Gravity*	2.85

*Specific Gravity = Wo/[Wo+(Wa-Wb)]

Data entry by: MLM Date: 10/15/2010
Data checked by: Date: 10/15/10
FileName: ARE0WSTE

ADVANCED TERRA TESTING, Inc. ATT

ATTERBERG LIMITS TEST
ASTM D 4318

CLIENT	AMEC Earth & Environmental	JOB NO.	2399-25
BORING NO.	Waste Rock	DATE SAMPLED	
DEPTH		DATE TESTED	10/14/10 WAR
SAMPLE NO.	Composite		
SOIL DESCR.	74201272AO		
LOCATION	Butte Highlands Project		

Plastic Limit
Determination

Wt Dish & Wet Soil
Wt Dish & Dry Soil
Wt of Moisture
Wt of Dish — NON-PLASTIC
Wt of Dry Soil
Moisture Content

Liquid Limit — Device Number 0860
Determination

Number of Blows

Wt Dish & Wet Soil
Wt Dish & Dry Soil
Wt of Moisture
Wt of Dish — NON-PLASTIC
Wt of Dry Soil
Moisture Content

Liquid Limit	NP
Plastic Limit	NP
Plasticity Index	NP

Atterberg Classification NP

Data entry by: MLM Date: 10/14/2010
Checked by: BKL Date: 10/14/10
FileName: ARG0WSTE

ADVANCED TERRA TESTING, Inc. ATT

LARGE SCALE INTERNAL DIRECT SHEAR TEST DATA

ASTM D 3080 (Modified) - 12" x 12" Box

Client:	AMEC Earth & Enviromental	Date:	10/15/2010
Project No:	2399-25	Test Date:	10/15/10
Project:	Butte Highlands Project	Technician:	WAR
Interface:	Waste Rock Composite	Shear Rate:	0.1"/min
Special conditions:	Inundated	Test Series:	DS-1

Displacement (inches)	Normal Stress 2160 psf Shear Stress (psf)	Normal Stress 4320 psf Shear Stress (psf)	Normal Stress 6480 psf Shear Stress (psf)
0	0	0	0
0.041	475	966	1200
0.106	716	1633	1931
0.173	948	2086	2651
0.238	1161	2626	3390
0.299	1302	3116	3996
0.365	1466	3504	4531
0.428	1599	3816	5079
0.5	1700	4099	5505
0.558	1800	4226	5872
0.624	1904	4504	6091
0.692	1991	4695	6320
0.756	2079	4841	6535
0.816	2129	4955	6726
0.886	2163	5058	6892
0.95	2183	5071	7029
1.018	2202	5083	7161
1.078	2250	5209	7356
1.145	2280	5377	7444
1.211	2303	5420	7547
1.279	2358	5445	7620
1.338	2371	5531	7604
1.405	2402	5596	7589
1.472	2459	5649	7574
1.537	2386	5792	7566
1.599	2447	5900	7517
1.664	2469	5985	7366
1.732	2534	6081	7328
1.798	2555	6154	7355
1.859	2577	6149	7275
1.925	2608	5990	7242
1.993	2620	5833	7257
2.056	2675	6089	7323
2.118	2799	6224	7345

WAR 10/15/2010

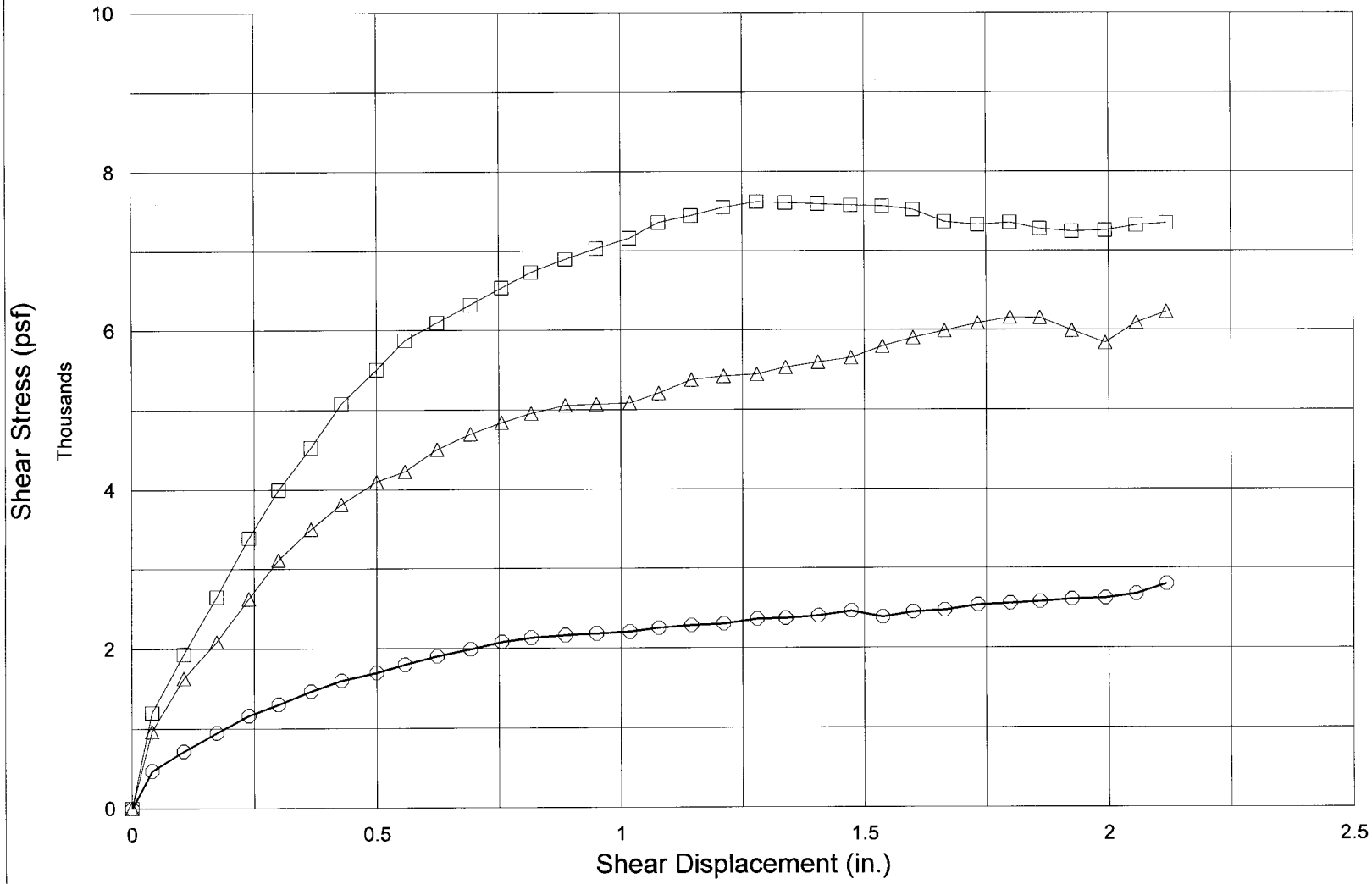
Data Checked By: MM Date: 10/15/10

File Name: ARLD25

ADVANCED TERRA TESTING, INC. ATT

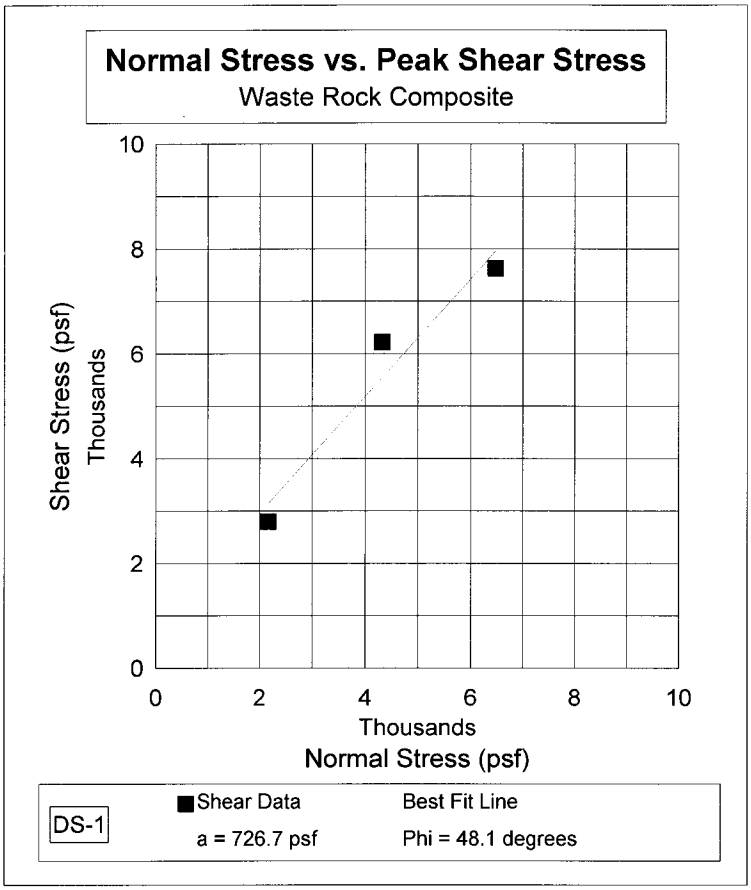
Shear Stress vs. Displacement

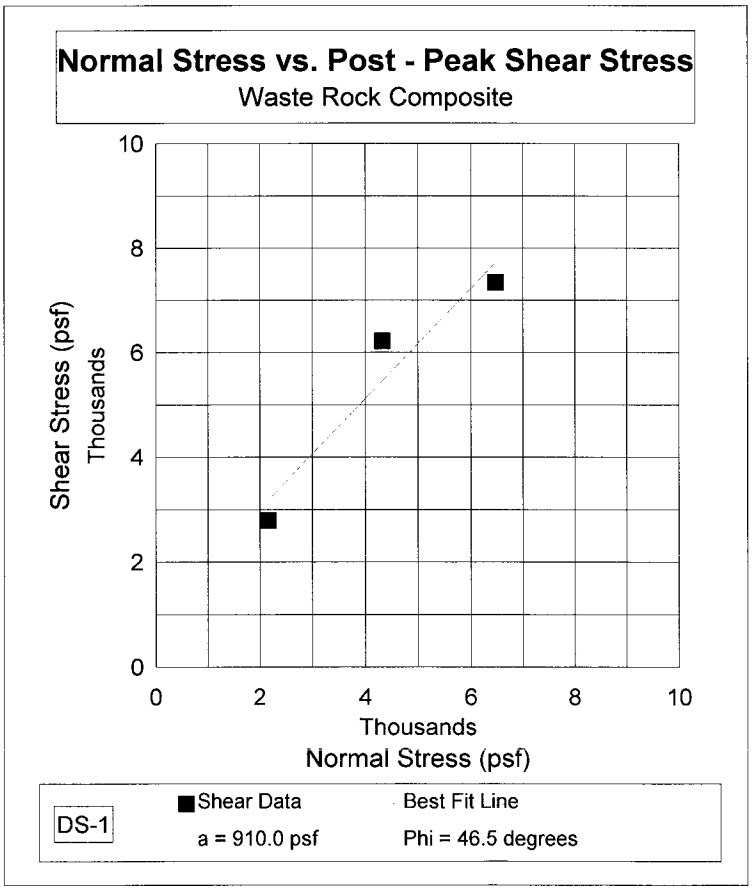
Waste Rock Composite



Normal Stress 2160 psf Normal Stress 4320 psf Normal Stress 6480 psf

DS-1


Normal Stress vs. Peak Shear Stress
Waste Rock Composite
Shear Stress (psf)
Thousands
0
2
4
6
8
10
Thousands
Normal Stress (psf)
DS-1
Shear Data
a = 726.7 psf
Best Fit Line
Phi = 48.1 degrees


Normal Stress vs. Post - Peak Shear Stress
Waste Rock Composite
Shear Stress (psf)
Thousands
0
2
4
6
8
10
Thousands
Normal Stress (psf)
DS-1
Shear Data
a = 910.0 psf
Best Fit Line
Phi = 46.5 degrees

Consulting Scientists & Engineers
480 East Park
Suite 200
Butte, MT 59701

Phone: (406) 782-5220
Fax: (406)723-1537

MEMORANDUM

TO: Paul Riley
Permitting & Compliance Program Director
Butte-Silver Bow County Health Department

CC: Lou Myers, Superintendent, Small Mine Development, LLC
Henry Bogert, Ph.D., P.E., Small Mine Development, LLC

FROM: Rochelle Garrison, Staff Engineer
Water & Environmental Technologies, PC

DATE: September 9, 2009

RE: Butte Silver Bow (BSB) County Septic Permit for Butte Highlands Project

---

This memo summarizes the Silver Bow County septic permit requirements for the Butte Highlands Project, owned by Small Mine Development, LLC.

Location
The Butte Highlands Project property is located in Section 31, Township 1 North, Range 7 West, south of Butte, Montana as shown on **Figures 1a and 1b**. The proposed plan includes an on-site wastewater system and new well to service various industrial buildings (restrooms and showers only, no kitchen).

Soil Characterization
On August 21, 2009 five test pits in the drainfield area were excavated and characterized by WET personnel; a soil application rate of 0.5 gpd/ft^2 was assigned to the test pits in the drainfield area (test pits #1 and #2). The test pit locations are shown in **Figures 2a and 2b.** The complete test pit descriptions are included in **Attachment 1.**

Hydraulic Conductivity/ Hydraulic Gradient
Hydraulic conductivity was determined using data from the three closest wells as shown on **Figure 3a**. The average hydraulic conductivity for an unconfined aquifer was found to be 8 ft/day using the Fetter equation. The results are summarized in Table I.

Table I. Hydraulic Conductivity

Figure 3a ID#	Well Name	Fetter equation (ft/day)
A	Fredland	3
B	Tuesday	11
C	Atkerson	10
	Average	8
Average Hydraulic Conductivity (ft/day) = 8		

The regional surface gradient was determined by measuring the change of elevation from the 7460 foot contour to the 7390 foot contour, or 70 vertical feet over 600 horizontal feet as shown on **Figure 3b.** The hydraulic gradient is approximately 1/3 the surface gradient or 0.04 ft/ft; this value is used in the nondegradation calculations.

The MDEQ Hydraulic Transmissivity and Conductivity Calculations and MBMG-GWIC well site reports for the Fredland, Tuesday and Atkerson wells are in **Attachment 2.**

Water Sample Analysis

Two vicinity springs were sampled for background nitrate and specific conductivity. The WS-1 spring is located 2500 ft north of the project site; WS-6 is 4500 ft south west. The WS-1 spring was sampled 9/3/2008 and 11/25/2008 and the WS-6 spring on 11/26/2008, locations of both are shown on **Figure1b**. The analytical results are summarized in Table II.

Table II. Spring Sample Results

Spring ID	Nitrate-Nitrite (mg/L)	Specific Conductivity (μmhos/cm)
WS-1	0.18	335
WS-6	<0.05	425

The highest nitrate value from spring WS-1 (0.18 mg/L) was used in the nitrate sensitivity calculation; laboratory results are included in **Attachment 3.**

Drainfield Design

Drainfield size was determined using the application rates derived from the soil textures present in the test pits and the 2004 Edition of Circular DEQ 4 (DEQ 4). The drainfield details for a commercial industrial building (sanitary waste only) follows.

The commercial wastewater system using standard gravity flow design is detailed below.

Primary Drainfield using Gravelless Absorption Trenches:

- 49 workers x 13 gpd (Industrial Building) = 637 gpd,
- 637 gpd /0.5 gpd/ft^2 = 1274 ft^2,
- 1274 ft^2 less 25% for gravelless = 956 ft^2,
- 956 ft^2/2-ft gravity flow trenches = 478 ft required,
- Use five 96-ft laterals (480 ft total).

Replacement Drainfield using Standard Absorption Trenches:

- 36 workers x 13 gpd (Industrial Building) = 468 gpd,
- 468 gpd /0.5 gpd/ft^2 = 936 ft^2,
- 936 ft^2 /2-ft gravity flow trenches = 468 ft required,
- Use five 96-ft laterals (480 ft total).

This drainfield is <u>not</u> designed to accommodate kitchen wastewater, which requires additional treatment.

The proposed drainfield location is shown in **Figures 2a and 2b** with design details shown in **Figure 4**.

Septic Tank

Non-residential flows of less than or equal to 1,500 gallons per day, require a tank capacity of at least 2.7 times the design flow according to <u>DEQ 4</u> 7.2.10.1. With a design flow of 637 gpd; 2.7 times 637 gpd is 1,720 gpd. Therefore a minimum of a 2,000 gallon tank is required.

Nitrate Sensitivity and Phosphorus Breakthrough Analyses

The nitrate sensitivity calculation for a commercial drainfield requires an adjustment of the input *#l* (number of single family homes); an explanation follows:

- Drainfield capacity = 637 gpd,
- Single family home = 300 gpd, and
- *#l*-number of single family homes = 637 gpd /300 gpd = 2.1.

The nondegradation results are summarized in Table III.

Table III. Nitrate and Phosphorus Analyses

Constituent	Butte Highlands Drainfield	MDEQ Limits
Total Measurable Nitrates after Development (mg/L)	4.79	<5.00
Phosphorus Breakthrough Analysis (years)	55	>50

The phosphorus calculation requires a distance from the drainfield to surface water. The proposed Butte Highlands drainfield is approximately 175 feet from the Middle Fork drainage located south west of the property as shown on **Figure 1b**.

Based on the nondegradation analyses, this drainfield system should not have a significant effect on nitrate in ground water or phosphorus in the surface water. The nondegradation analyses are included in **Attachment 4**.

Water & Environmental Technologies, PC assumes all information related to this project supplied by outside sources to be accurate. No expressed or implied warranties, including but not limited to any as to the accuracy of the information obtained, are made. All warranties are expressly disclaimed.

This report represents the professional opinions of Water & Environmental Technologies, PC. Recommendations contained in this document were arrived at in accordance with reasonable and customary practices, which were currently accepted as of the date and at the location at which the work was performed. Water and Environmental Technologies, PC assumes no responsibility for conditions that did not come to its actual knowledge or from conditions not recognized as environmentally unacceptable at the time this report was prepared.

Prepared By:

_____

ITS: Staff Engineer

Reviewed By:

_____

ITS: Senior Engineer

Figures:

Figure 1a. Site Location (aerial)
Figure 1b. Site Location (USGS)
Figure 2a. Proposed Layout (aerial)
Figure 2b. Proposed Layout (plan view)
Figure 3a. Vicinity Wells
Figure 3b. Hydraulic Gradient
Figure 4. Drainfield Design

Attachments:

1. Butte Highlands Project Test Pit Descriptions
2. MDEQ Hydraulic Transmissivity and Conductivity Calculations
   MBMG-GWIC Well Site Reports for Fredland, Tuesday, and Atkerson Wells
3. WS-1 and WS-6 Spring Analytic Results
4. Nitrate Sensitivity Analysis
   Phosphorus Breakthrough Analysis

ATTACHMENT 1

Butte Highlands Project Test Pit Descriptions

Location: Butte Highlands JV, LLC - **Test Pit #1** (up gradient to the east)		
Date: 8-21-09	Time: 8:50 am	Vegetation: pine trees, grass
Slope:13-14% (inclinometer)		Aspect:
Geomorphic Surface:	Parent Material(s):	

Application Rate: <u>0.5 gpd/ft^2</u>

Described by: P. Hamblock, E. Erickson

Depth (in)	Horizon	Color moist/dry	Structure			Gravel %	Consistence Dry	Consistence Moist	Consistence Wet	Texture	Boundaries		Notes
0-3	Topsoil with roots												
3-24		10YR 4/4 dark yellowish brown moist ◆**<u>dry</u>**	m sg ◆**<u>1</u>** 2 3	◆**<u>vf</u>** f m c vc	◆**<u>gr</u>** pl pr abk sbk	0 <10 10 ◆**<u>25</u>** 50 75 >75	lo ◆**<u>so</u>** sh h vh eh	lo vfr fr fi vfi efi	so ss s vs po ps p vp	GS, VCS LS, CS MS, ◆**<u>SL</u>** FSL, L, SiL VFS, SCL CL, SiCL SCL, C, SiC	a c ◆**<u>g</u>** d	◆**<u>s</u>** w i b	Subangular pebbles to cobbles
24-56		10YR 5/6 yellowish brown moist ◆**<u>dry</u>**	m sg ◆**<u>1</u>** 2 3	vf ◆**<u>f</u>** m c vc	gr pl pr abk ◆**<u>sbk</u>**	0 <10 10 ◆**<u>25</u>** 50 75 >75	lo so ◆**<u>sh</u>** h vh eh	lo vfr fr fi vfi efi	so ss s vs po ps p vp	GS, VCS LS, CS MS, SL ◆**<u>FSL</u>**, L, SiL VFS, SCL CL, SiCL SCL, C, SiC	a c ◆**<u>g</u>** d	◆**<u>s</u>** w i b	Subangular pebbles to cobbles, (gyprock present, slightly indurated)
56-98		10YR 5/8 yellowish brown ◆**<u>moist</u>** dry	m sg ◆**<u>1</u>** 2 3	vf ◆**<u>f</u>** m c vc	gr pl pr abk ◆**<u>sbk</u>**	0 <10 10 ◆**<u>25</u>** 50 75 >75	lo so sh h vh eh	lo ◆**<u>vfr</u>** fr fi vfi efi	so ss s vs po ps p vp	GS, VCS LS, CS MS, SL ◆**<u>FSL</u>**, L, SiL VFS, SCL CL, SiCL SCL, C, SiC	a c g d	s w i b	Subangular pebbles to cobbles

Location: Butte Highlands JV, LLC - **Test Pit #2** (east of mid)		
Date: 8-21-09	Time: 9:15 am	Vegetation: pine trees, grass
Slope:12% (inclinometer)		Aspect:
Geomorphic Surface:	Parent Material(s):	

Application Rate: <u>0.5 gpd/ft^2</u>

Described by: P. Hamblock, E. Erickson

Depth (in)	Horizon	Color moist/dry	Structure			Gravel %	Consistence Dry	Consistence Moist	Consistence Wet	Texture	Boundaries		Notes
0-9	Topsoil with roots												
9-60		10YR 4/6 dark yellowish brown moist ◆**<u>dry</u>**	m sg ◆**<u>1</u>** 2 3	◆**<u>vf</u>** ◆**<u>f</u>** m c vc	◆**<u>gr</u>** pl pr abk sbk	0 <10 ◆**<u>10</u>** 25 50 75 >75	lo ◆**<u>so</u>** sh h vh eh	lo vfr fr fi vfi efi	so ss s vs po ps p vp	GS, VCS LS, CS MS, SL ◆**<u>FSL</u>**, L, SiL VFS, SCL CL, SiCL SCL, C, SiC	a c ◆**<u>g</u>** d	s ◆**<u>w</u>** i b	Subangular pebbles to cobbles
60-96		10YR 8/6 yellow moist ◆**<u>dry</u>**	m ◆**<u>sg</u>** 1 2 3	vf ◆**<u>f</u>** m c vc	gr pl pr abk ◆**<u>sbk</u>**	0 <10 ◆**<u>10</u>** 25 50 75 >75	lo ◆**<u>so</u>** sh h vh eh	lo vfr fr fi vfi efi	so ss s vs po ps p vp	GS, VCS LS, CS MS, SL FSL, L, SiL ◆**<u>VFS</u>**, SCL CL, SiCL SCL, C, SiC	a c ◆**<u>g</u>** d	◆**<u>s</u>** w i b	Subangular pebbles to cobbles, (gyprock present, slightly indurated)

Location: Butte Highlands JV, LLC - **Test Pit #3** (mid)		
Date: 8-21-09	Time: 9:30 am	Vegetation: pine trees, grass
Slope:10-11% (inclinometer)		Aspect:
Geomorphic Surface:	Parent Material(s):	

Application Rate: <u>0.6 gpd/ft^2</u>

Described by: P. Hamblock, E. Erickson

Depth (in)	Horizon	Color moist/dry	Structure			Gravel %	Consistence Dry	Consistence Moist	Consistence Wet	Texture	Boundaries		Notes
0-5	Topsoil with roots												
5-18		10YR 3/2 Very dark grayish brown moist ◆**<u>dry</u>**	m sg ◆**<u>1</u>** 2 3	◆**<u>vf</u>** f m c vc	◆**<u>gr</u>** pl pr abk sbk	0 <10 10 25 ◆**<u>50</u>** 75 >75	lo ◆**<u>so</u>** sh h vh eh	lo vfr fr fi vfi efi	so ss s vs po ps p vp	GS, VCS LS, CS MS, ◆**<u>SL</u>** FSL, L, SiL VFS, SCL CL, SiCL SCL, C, SiC	a ◆**<u>c</u>** g d	s ◆**<u>w</u>** i b	Subangular pebbles to cobbles
18-39		10YR 6/6 Brownish yellow moist ◆**<u>dry</u>**	m sg ◆**<u>1</u>** 2 3	vf ◆**<u>f</u>** ◆**<u>m</u>** c vc	gr pl pr abk ◆**<u>sbk</u>**	0 <10 ◆**<u>10 to 25</u>** 50 75 >75	lo ◆**<u>so</u>** sh h vh eh	lo vfr fr fi vfi efi	so ss s vs po ps p vp	GS, VCS LS, CS ◆**<u>MS</u>**, SL FSL, L, SiL VFS, SCL CL, SiCL SCL, C, SiC	a ◆**<u>c</u>** g d	s ◆**<u>w</u>** i b	Subangular pebbles to cobbles, (gyprock present, slightly indurated)
39-102		10YR 8/6 Yellow moist ◆**<u>dry</u>**	m ◆ **<u>sg</u>** 1 2 3	vf ◆**<u>f</u>** ◆**<u>m</u>** c vc	gr pl pr abk ◆**<u>sbk</u>**	0 ◆**<u><10</u>** 10 25 50 75 >75	◆**<u>lo</u>** so sh h vh eh	lo vfr fr fi vfi efi	so ss s vs po ps p vp	GS, VCS LS, CS MS, SL ◆**<u>FSL</u>**, L, SiL VFS, SCL CL, SiCL SCL, C, SiC	a c ◆**<u>g</u>** d	◆**<u>s</u>** w i b	Subangular pebbles to boulders, (gyprock present, slightly indurated)

Location: Butte Highlands JV, LLC - **Test Pit #4** (mid west)		
Date: 8-21-09	Time: 10:00 am	Vegetation: pine trees, grass
Slope:10% (inclinometer)		Aspect:
Geomorphic Surface:	Parent Material(s):	

Application Rate: <u>0.6 gpd/ft^2</u>

Described by: P. Hamblock, E. Erickson

Depth (in)	Horizon	Color moist/dry	Structure			Gravel %	Consistence Dry	Consistence Moist	Consistence Wet	Texture	Boundaries		Notes
0-10	Topsoil with roots												
10-54		10YR 4/6 dark yellowish brown moist ◆**<u>dry</u>**	m ◆ **<u>sg</u>** 1 2 3	vf ◆**<u>f</u>** m c vc	gr pl pr abk ◆**<u>sbk</u>**	0 <10 ◆**<u>10 to 25</u>** 50 75 >75	lo ◆**<u>so</u>** sh h vh eh	lo vfr fr fi vfi efi	so ss s vs po ps p vp	GS, VCS LS, CS MS, ◆**<u>SL</u>** FSL, L, SiL VFS, SCL CL, SiCL SCL, C, SiC	a ◆**<u>c</u>** g d	◆**<u>s</u>** w i b	Subangular pebbles to cobbles, (gyprock present, slightly indurated)
54-96		10YR 5/8 yellowish brown ◆**<u>moist</u>** dry	m sg ◆**<u>1</u>** 2 3	vf ◆**<u>f</u>** m c vc	gr pl pr abk ◆**<u>sbk</u>**	0 ◆ **<u><10</u>** 10 to 25 50 75 >75	lo so sh h vh eh	lo ◆**<u>vfr</u>** fr fi vfi efi	so ss s vs po ps p vp	GS, VCS LS, CS ◆**<u>MS</u>**, SL FSL, L, SiL VFS, SCL CL, SiCL SCL, C, SiC	a c g d	s w i b	

Location: Butte Highlands JV, LLC - **Test Pit #5** (west)		
Date: 8-21-09	Time: 10:15 am	Vegetation: pine trees, grass
Slope:11-12% (inclinometer)		Aspect:
Geomorphic Surface:	Parent Material(s):	

Application Rate: <u>0.6 gpd/ft^2</u>

Described by: P. Hamblock, E. Erickson

Depth (in)	Horizon	Color moist/dry	Structure			Gravel %	Consistence Dry	Consistence Moist	Consistence Wet	Texture	Boundaries		Notes
0-4	Topsoil with roots												
4-24		10YR 3/3 dark brown moist ◆**<u>dry</u>**	m sg ◆**<u>1</u>** 2 3	vf ◆**<u>f</u>** m c vc	◆**<u>gr</u>** pl pr abk sbk	0 ◆ **<u><10</u>** 10 to 25 50 75 >75	lo ◆**<u>so</u>** sh h vh eh	lo vfr fr fi vfi efi	so ss s vs po ps p vp	GS, VCS LS, CS MS, ◆**<u>SL</u>** FSL, L, SiL VFS, SCL CL, SiCL SCL, C, SiC	a ◆**<u>c</u>** g d	◆**<u>s</u>** w i b	Subangular pebbles to cobbles,
24-60		10YR 5/6 yellowish brown moist ◆**<u>dry</u>**	m ◆ **<u>sg</u>** 1 2 3	vf ◆**<u>f</u>** m c vc	gr pl pr abk ◆**<u>sbk</u>**	0 ◆ **<u><10</u>** 10 to 25 50 75 >75	lo ◆**<u>so</u>** sh h vh eh	lo vfr fr fi vfi efi	so ss s vs po ps p vp	GS, VCS LS, CS MS, ◆**<u>SL</u>** FSL, L, SiL VFS, SCL CL, SiCL SCL, C, SiC	a ◆**<u>c</u>** g d	◆**<u>s</u>** w i b	
60-102		10YR 4/6 dark yellowish brown ◆**<u>moist</u>** dry	m ◆ **<u>sg</u>** 1 2 3	vf f ◆**<u>m</u>** c vc	gr pl pr abk ◆**<u>sbk</u>**	0 ◆ **<u><10</u>** 10 to 25 50 75 >75	lo so sh h vh eh	lo ◆**<u>vfr</u>** fr fi vfi efi	so ss s vs po ps p vp	GS, VCS LS, CS ◆**<u>MS</u>**, SL FSL, L, SiL VFS, SCL CL, SiCL SCL, C, SiC	a c g d	s w i b	

ATTACHMENT 2

MDEQ Hydraulic Transmissivity and Conductivity Calculations

MBMG-GWIC Well Site Report for Fredland, Tuesday, and Atkerson Wells

HYDRAULIC TRANSMISSIVITY AND CONDUCTIVITY

Site Name: Butte Highlands Project
County: Silver Bow

(re: Applied Hydrogeology, 3rd Edition by C.W. Fetter {T=(33.6((Q)(192.5)/S)^0.67) & K=T/b & S=PWL-SWL}

Owner's Name	Fredland A	Tuesday	Atkerson
Figure 3a ID:	A	B	C
GWIC ID:	48767	156092	202076
Total Depth of Well	167	220	260
(Q) Gallons Per Minute	3	12	12
Static Water Level	100	38	100
Pumping Water Level/Drill Stem Setting	150	90	259
(b) Aquifer Thickness	50	40	20
	perforated from 117 to 167 ft	perforated from 180 to 220 ft	screened from 240 to 260 ft
Type of well test	air	air	air
(T) Transmissivity (ft^2/d)	173	427	202
(K) Conductivity (ft/d)	3	11	10
Average Conductivity (ft/d)	8		

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is complied electronically from the contents of the Ground-Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Plot this site on a topographic map
View scanned well log (4/2/2009 9:53:44 AM)

Site Name: FREDLAND DALE
GWIC Id: 48767

WELL A

Section 1: Well Owner

Owner Name
FREDLAND DALE
Mailing Address
PO BOX 3708 BUTTE MT 59701
City **State** **Zip Code**

Section 2: Location

Township	Range	Section	Quarter Sections
01N	07W	17	NE¼

County
SILVER BOW
Geocode

Latitude	Longitude	Geomethod	Datum
45.840277	112.492871	TRS-SEC	NAD83

Altitude **Method** **Datum** **Date**

Addition **Block** **Lot**

Section 3: Proposed Use of Water

DOMESTIC (1)

Section 4: Type of Work

Drilling Method: AIR ROTARY

Section 5: Well Completion Date

Date well completed: Tuesday, January 01, 1974

Section 6: Well Construction Details

There are no borehole dimensions assigned to this well.

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0	12	6				STEEL
7	167	4				PVC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
117	167	4		1/4X4	SLOTS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	12	MUD	

Section 7: Well Test Data

Total Depth: 167
Static Water Level: 100
Water Temperature:

Air Test *

3 gpm with drill stem set at _ feet for 3 hours.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level 150 feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
211BDBT - BOULDER BATHOLITH

From	To	Description
0	4	TOP SOIL AND DECOMPOSED GRANITE
4	12	DECOMPOSED GRANITE
12	167	GRANITE BEDROCK

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company: LINDSAY DRILLING CO INC
License No: WWC-38
Date Completed: 1/1/1974

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is complied electronically from the contents of the Ground-Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Plot this site on a topographic map
View scanned well log (4/2/2009 9:52:11 AM)

Site Name: TUESDAY DAVID
GWIC Id: 156092

WELL B

Section 1: Well Owner

Owner Name
TUESDAY DAVID
Mailing Address
140 LIME KILN RD BUTTE MT 59701
City **State** **Zip Code**

Section 2: Location

Township	Range	Section	Quarter Sections
01N	07W	16	NW¼ SW¼ NE¼

County **Geocode**
SILVER BOW

Latitude	Longitude	Geomethod	Datum
45.839168	112.476046	TRS-SEC	NAD83

Altitude **Method** **Datum** **Date**

Addition **Block** **Lot**

Section 3: Proposed Use of Water

DOMESTIC (1)

Section 4: Type of Work

Drilling Method: ROTARY

Section 5: Well Completion Date

Date well completed: Friday, May 03, 1996

Section 6: Well Construction Details

There are no borehole dimensions assigned to this well.

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-1.8	16	8				STEEL
10	220	4				PVC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
180	220	4		0.025	FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	173	BENTONITE	

Section 7: Well Test Data

Total Depth: 220
Static Water Level: 38
Water Temperature:

Air Test *

12 gpm with drill stem set at _ feet for 1 hours.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level 90 feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
211BDBT - BOULDER BATHOLITH

From	To	Description
0	4	GRANITE COLLUVIUM
4	80	DECOMPOSED GRANITE REDDISH WHITE TO BROWN
80	220	GRANITE VERY HARD

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company: HAYES DRILLING
License No: WWC-361
Date Completed: 5/3/1996

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is complied electronically from the contents of the Ground-Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Plot this site on a topographic map
View scanned well log (4/2/2009 9:50:56 AM)

Site Name: ATKERSON JOHN W
GWIC Id: 202076

WELL C

Section 1: Well Owner

Owner Name
ATKERSON JOHN W
Mailing Address
120 LIME KILN

City	State	Zip Code
BUTTE	MT	59701

Section 2: Location

Township	Range	Section	Quarter Sections
01N	07W	16	NE¼ NE¼

County
SILVER BOW

Geocode

Latitude	Longitude	Geomethod	Datum
45.841907	112.4696	TRS-SEC	NAD83

Altitude	Method	Datum	Date

Addition	Block	Lot

Section 3: Proposed Use of Water
DOMESTIC (1)

Section 4: Type of Work
Drilling Method: ROTARY

Section 5: Well Completion Date
Date well completed: Wednesday, April 23, 2003

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	40	8
40	260	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	40	6	0.250			STEEL
10	240	4				PVC-SCHED40

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
240	260	4		0.025	SCREEN-PVC

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	40	BENTONITE	

Section 7: Well Test Data

Total Depth: 260
Static Water Level: 100
Water Temperature:

Air Test *

12 gpm with drill stem set at 259 feet for 2 hours.
Time of recovery 0.5 hours.
Recovery water level 100 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
211BDBT - BOULDER BATHOLITH

From	To	Description
0	1	TOPSOIL
1	38	DECOMPOSED GRANITE
38	180	GRANITE
180	220	GRANITE HARD
220	260	GRANITE WATER

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company: PARSONS
License No: WWC-596
Date Completed: 4/23/2003

ATTACHMENT 3

WS-1 and WS-6 Spring Analytic Results

SURFACE WATER QUALITY AT BUTTE HIGHLANDS MINE SITE - TIMBERLINE RESOURCES

1993 and 2008 Monitoring Results

Parameter	Surface Water Station				
	WS-1 / BH-1 09/03/08	WS-1 / BH-1 09/03/08	WS-1 / BH-1 11/25/08	WS-1 / BH-1 11/25/08	WS-6 11/26/08
Location	Highland Mine Adit Discharge	Highland Mine Adit Discharge	Highland Mine Adit Discharge	Highland Mine Adit Discharge	Moose Creek - Middle Fork
Nitrate+Nitrite, as N (mg/l)	0.18	---		---	<0.05
Field EC (µS/cm)	---	---	335	---	425

NOTE:

s.u. = standard units; EC = electrical conductance; µS/cm = microsiemens per centimeter; mg/l = milligrams per liter; TDS =
NTU = nephelometric turbidity units; CaCO3 = calcium carbonate; C = Celsius; mV = millivolts.

s = secondary standard; h = hardness dependent (for this table, values presented are based on a hardness of 150 mg/L)

* = federal U.S. EPA standard. --- = no standard or not analyzed.

Aquatic life standards are the lowest reported for acute and chronic standards; and groundwater standards are the human heal

ATTACHMENT 4

Nitrate Sensitivity Analysis

Phosphorus Breakthrough Analysis

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

NITRATE SENSITIVITY ANALYSIS

SITE NAME: Butte Highlands Project
COUNTY: Butte-Silver Bow
BY: R.Garrison
DATE: 09/22/09
PRECIPITATION: Butte,12.78 inches annually, NOAA 1971-2000

Nitrate at end of mixing zone(s) with no cumulative effects

Variable	*(K)*	*(I)*	*(D)*	*(L)*	*(Y)*	*(Ng)*	*(Nr)*	*(Ne)*	*(#l)*	*(Ql)*	*(P)*	*(V)*	*(W)*	*(Am)*	*(As)*	*(Qg)*	*(Qr)*	*(Qe)*	**Nt**
			Mix	**Down**	**Drain-**	**Back-**	**Nitrate**	**Effluent**	**# of**	**Effluent**			**Down-**	**Mix**	**Mix. zone**	**Ground**			
	Hydr.	**Hydr.**	**zone**	**grad.**	**field**	**ground**	**in**	**Nitrate**	**single**	**per**	**Annual**	**Percent**	**grad.**	**zone**	**surface**	**water**	**Recharge**	**Effluent**	**Resulting**
	cond.	**grad.**	**thick**	**distance**	**width**	**nitrate**	**precip**	**conc.**	**family**	**drain.**	**precip.**	**precip.**	**width**	**area**	**area**	**flow**	**flow**	**flow**	**nitrate (N)**
TRACT #	**(ft/day)**	**(ft/ft)**	**(feet)**	**(feet)**	**(feet)**	**(mg/l)**	**(mg/l)**	**(mg/l)**	**homes**	**(ft3/day)**	**(in/yr)**	**recharge**	**(feet)**	**(ft^2)**	**(ft^2)**	**(ft3/day)**	**(ft3/day)**	**(ft3/day)**	**(mg/l)**
Butte Highlands	8	0.04	15.0	100	96	0.18	1.0	50.0	2.1	26.70	12.78	0.2	113.50	1702.50	11350.00	544.80	6.62	56.07	**4.79**
									(637/300 = 2.1)										

NOTES:

= fill in values in these cells

= these cells are calculated for you

Hydr. cond. =	*K*	Hydraulic Conductivity
Hydr. grad. =	*I*	Hydraulic Gradient
Mix zone thick =	*D*	Thickness of Mixing Zone up to a Maximum of 15 feet (usually constant at 15 feet)
Down grad. distance =	*L*	Mixing Zone Length (see ARM 17.30.517(1)(d)(viii), or this may also be the distance to end of last mixing zone when calculating cumulative effects.
Drainfield width =	*Y*	Width of Drainfield Perpendicular to Ground Water Flow
Background nitrate =	*Ng*	Background Nitrate (as Nitrogen) Concentration
Nitrate in precip. =	*Nr*	Nitrate (as Nitrogen) Concentration in Precipitation (usually constant at 1.0 mg/L)
Effluent Nitrate conc. =	*Ne*	Nitrate (as Nitrogen) Concentration in Effluent (50 for conventional; 24 for level II; 30 for level 1a; 40 for level 1b)
# single family homes =	*#l*	Number of Single Family Homes on the Drainfield (leave as 1 if effluent volume in next column is adjusted to equal total effluent from drainfield)
Effluent per drain. =	*Ql*	Quantity of Effluent from drainfield (average rate varies depending on number of bedrooms)
Annual precip. =	*P*	Annual local Precipitation
Percent precip recharge =	*V*	Percent of Precipitation Recharging Ground Water (usually constant at 0.2)
Down grad. width =	*W*	Width of Mixing Zone Perpendicular to Ground Water Flow = (0.175)(L) + (Y)
Mix zone area =	*Am*	Cross Sectional Area of Aquifer Mixing Zone = (D)(W)
Mix zone surface area =	*As*	Surface Area of Mixing Zone = (L)(W)
Ground water flow =	*Qg*	Ground Water Flow Rate = (K)(I)(Am)
Recharge flow =	*Qr*	Recharge Flow Rate = (As)(P/12/365)(V)
Effluent flow =	*Qe*	Effluent Flow Rate = (#l)(Ql)
Resulting nitrate (N) =	*Nt*	Nitrate (as Nitrogen) Concentration at End of Mixing Zone = ((Ng)(Qg) + (Nr)(Qr) + (Ne)(Qe)) / ((Qg) + (Qr) + (Qe))
		(or nitrate concentration to use as background nitrate for next downgradient drainfield when determining cumulative effects

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

PHOSPHOROUS BREAKTHROUGH ANALYSIS

SITE NAME: Butte Highlands Project
COUNTY: Butte-Silver Bow

VARIABLES	DESCRIPTION	VALUE	UNITS
Lg	Length of Primary Drainfield as Measured Perpendicular to Ground Water Flow	96.0	ft
L	Length of Primary Drainfield's Long Axis	96.0	ft
W	Width of Primary Drainfield's Short Axis	30.0	ft
B	Depth to Limiting Layer from Bottom of Drainfield Laterals* - TP#1 @76" ; TP#2 @ 72"	6.2	ft
D	Distance from Drainfield to Surface Water (drainage to the south west)	175.0	ft
T	Phosphorous Mixing Depth in Ground Water (0.5 ft for coarse soils,	1.0	ft
Ne	1.0 ft for fine soils)**		
Sw	Soil Weight (usually constant)	100.0	lb/ft3
Pa	Phosphorous Adsorption Capacity of Soil (usually constant)	200.0	ppm
#l	Number of Single Family Homes on the Drainfield	2.1	
CONSTANTS			
Pl	Phosphorous Load per Single Family Home (constant)	6.44	lbs/yr
X	Conversion Factor for ppm to percentage (constant)	1.0E+06	
EQUATIONS			
Pt	Total Phosphorous Load = (Pl)(#l)	13.524	lbs/yr
W1	Soil Weight under Drainfield = (L)(W)(B)(Sw)	1776000.0	lbs
W2	Soil Weight from Drainfield to Surface Water = [(Lg)(D) + (0.0875)(D)(D)] (T)(Sw)	1947968.8	lbs
P	Total Phosphorous Adsorption by Soils = (W1 + W2)[(Pa)/(X)]	744.8	lbs
SOLUTION			
BT	**Breakthrough Time to Surface Water = P / Pt**	55	years

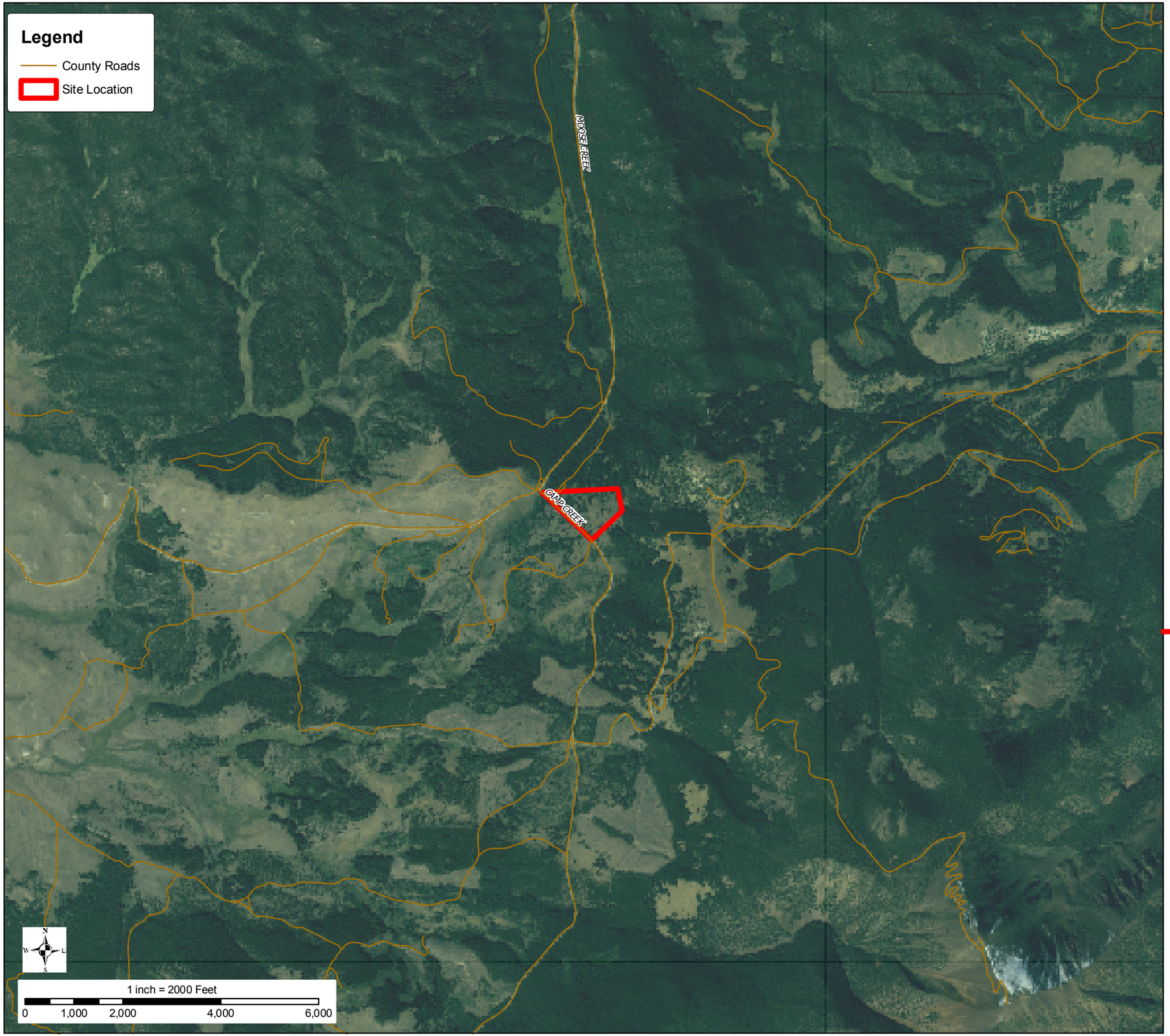
BY: R. Garrison
DATE: September 22, 2009

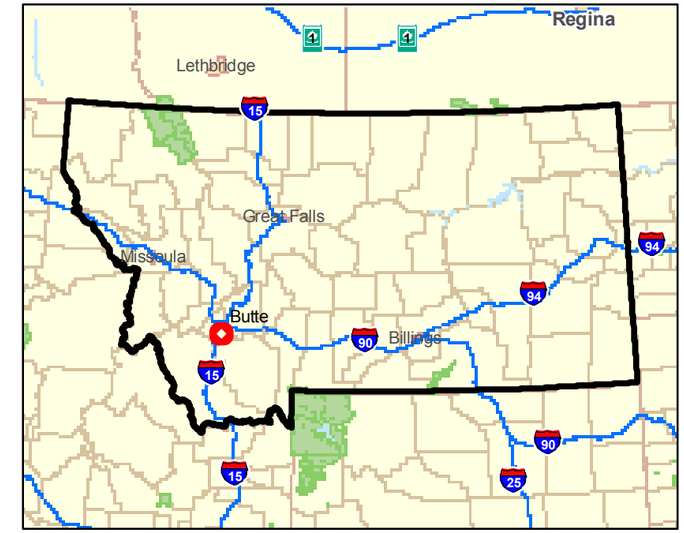
NOTES:

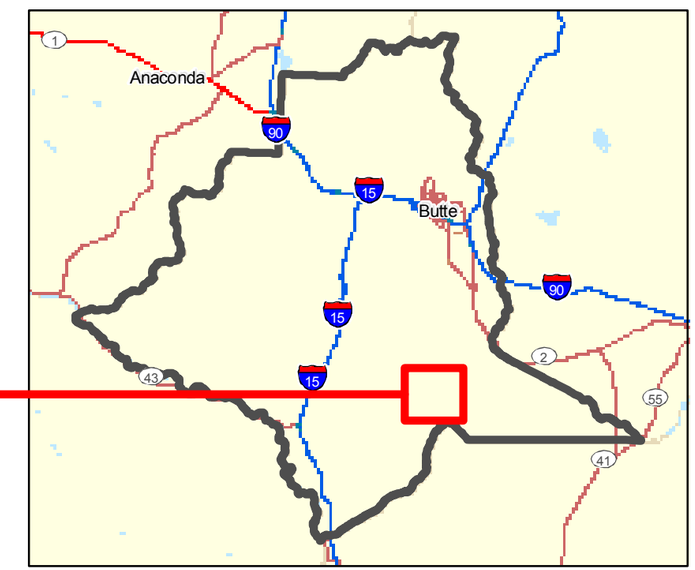
** Depth to limiting layer is typically based on depth to water in a test pit or bottom of a dry test pit minus two feet to account for burial depth of standard drainfield laterals.*
*** Material type is usually based on test pit. A soil that can be described as loam (e.g. gravelly loam, sandy loam, etc.) or finer according to the USDA soil texture classification system is considered a "fine" soil.*

REV. 12/2004

FIGURES







WATER & ENVIRONMENTAL TECHNOLOGIES, PC

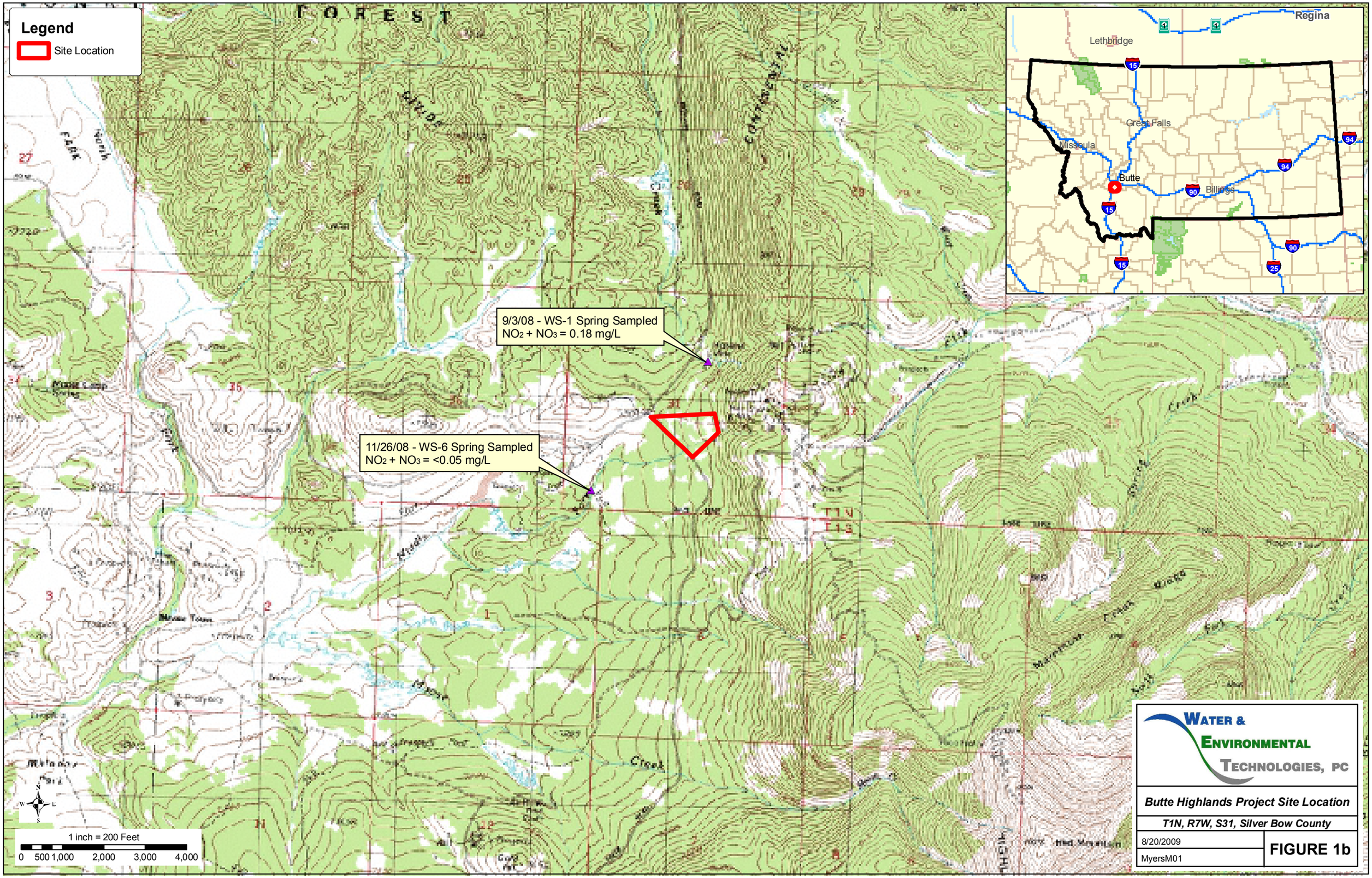
Butte Highlands Project Site Location

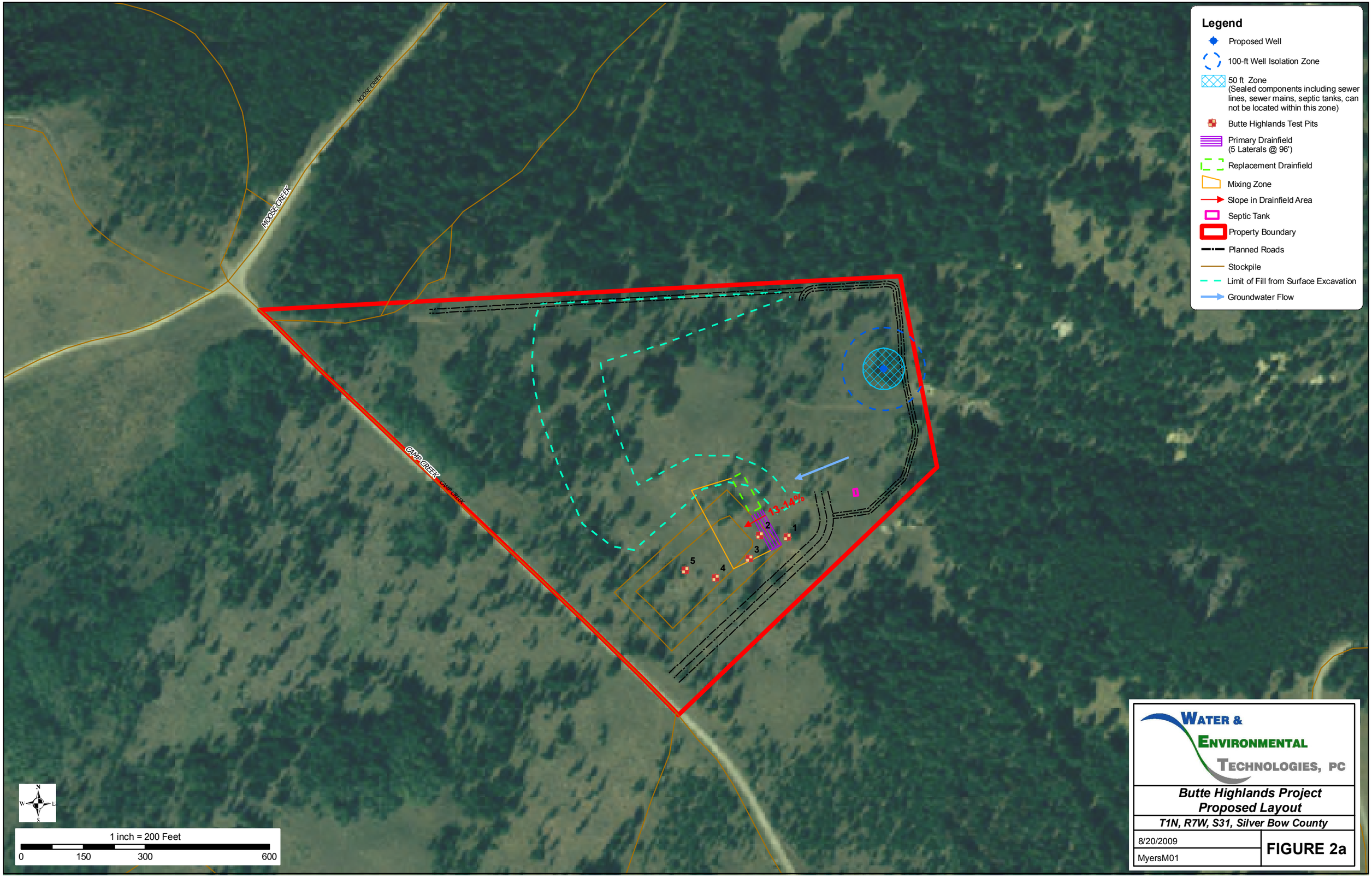
T1N, R7W, S31, Silver Bow County

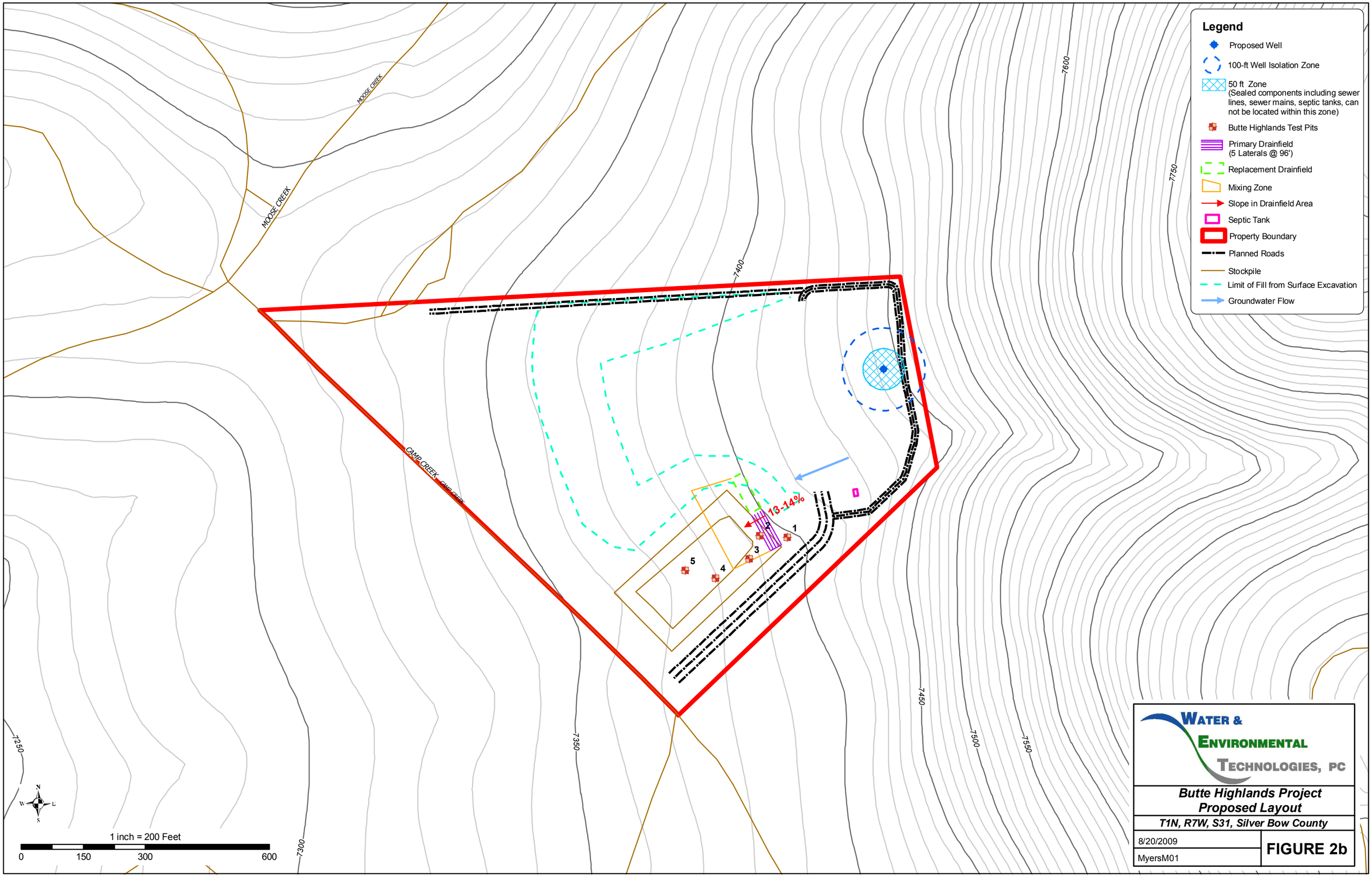
8/20/2009

MyersM01

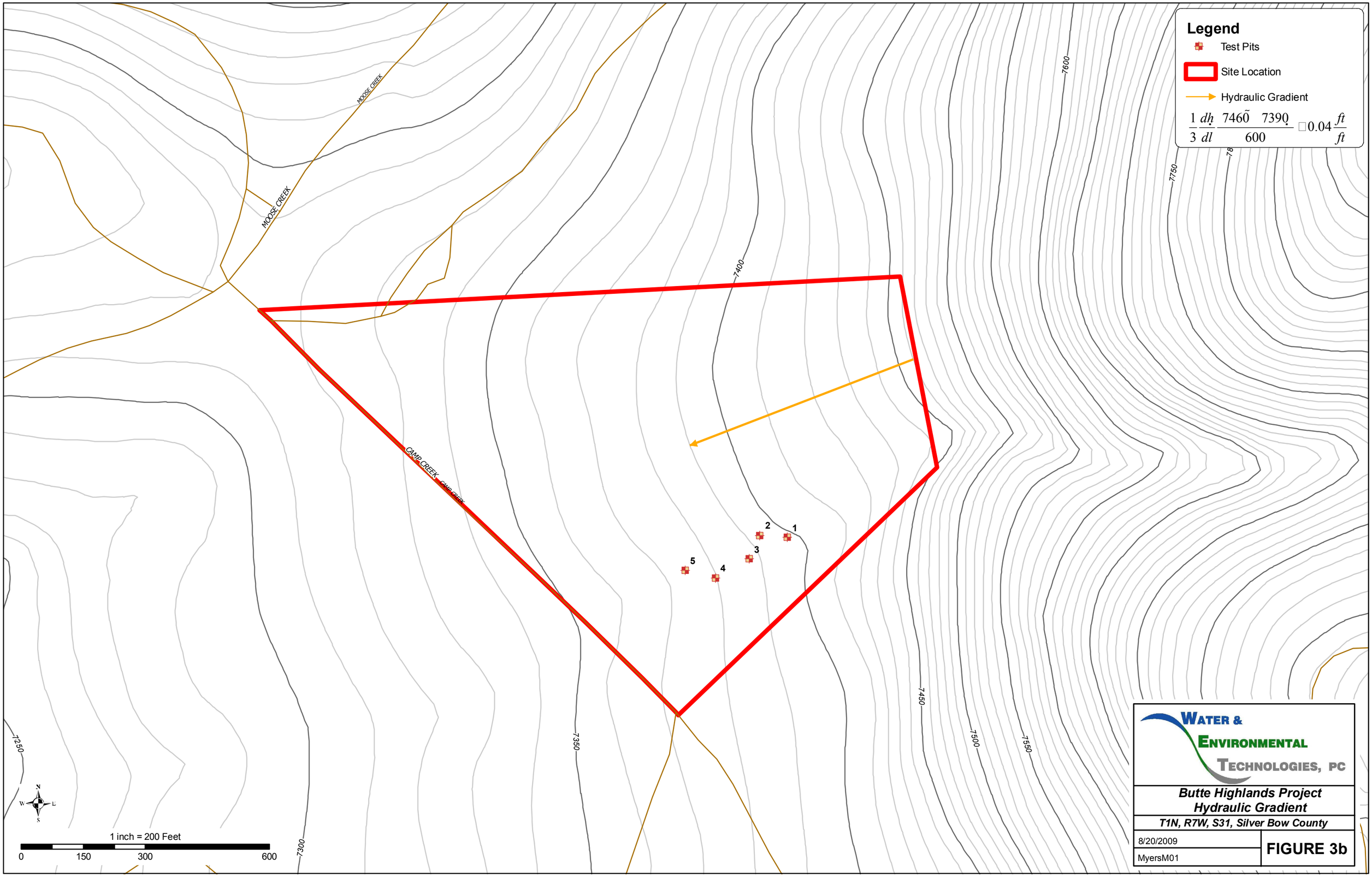
FIGURE 1a


Legend
Site Location
9/3/08 - WS-1 Spring Sampled
NO2 + NO3 = 0.18 mg/L
11/26/08 - WS-6 Spring Sampled
NO2 + NO3 = <0.05 mg/L
1 inch = 200 Feet
0 500 1,000 2,000 3,000 4,000
Regina
Lethbridge
Great Falls
Missoula
Butte
Billings
Water & Environmental Technologies, PC
Butte Highlands Project Site Location
T1N, R7W, S31, Silver Bow County
8/20/2009
MyersM01
FIGURE 1b


Legend
Proposed Well
100-ft Well Isolation Zone
50 ft Zone
(Sealed components including sewer lines, sewer mains, septic tanks, can not be located within this zone)
Butte Highlands Test Pits
Primary Drainfield
(5 Laterals @ 96')
Replacement Drainfield
Mixing Zone
Slope in Drainfield Area
Septic Tank
Property Boundary
Planned Roads
Stockpile
Limit of Fill from Surface Excavation
Groundwater Flow
MOOSE CREEK
MOOSE CREEK
CAMP CREEK
CAMP CREEK
13-14%
1
2
3
4
5
N
W
E
S
1 inch = 200 Feet
0
150
300
600
WATER &
ENVIRONMENTAL
TECHNOLOGIES, PC
Butte Highlands Project
Proposed Layout
T1N, R7W, S31, Silver Bow County
8/20/2009
MyersM01
FIGURE 2a

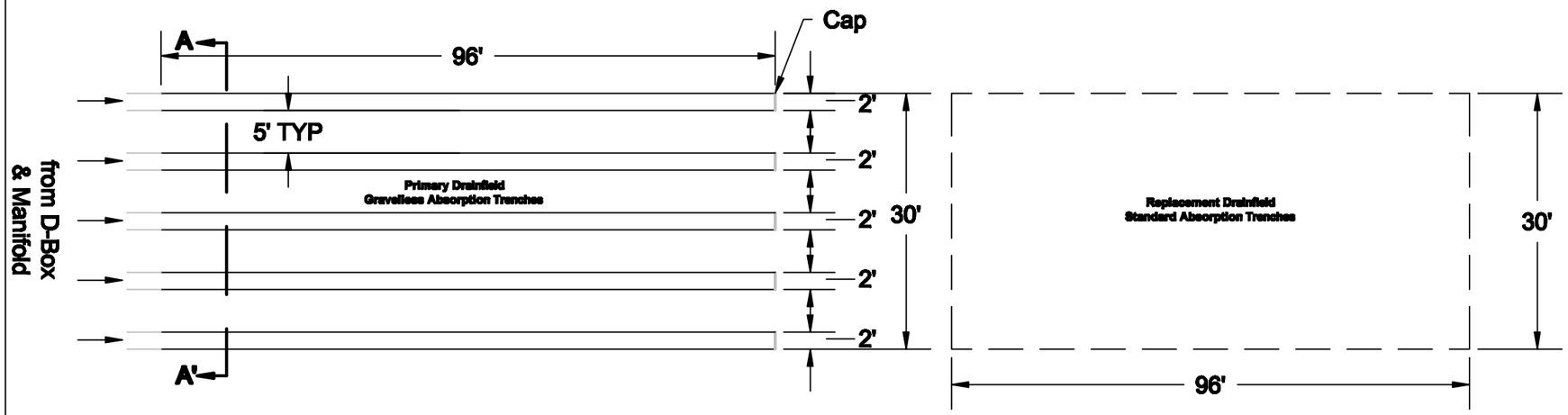

Legend
Proposed Well
100-ft Well Isolation Zone
50 ft Zone
(Sealed components including sewer lines, sewer mains, septic tanks, can not be located within this zone)
Butte Highlands Test Pits
Primary Drainfield
(5 Laterals @ 96')
Replacement Drainfield
Mixing Zone
Slope in Drainfield Area
Septic Tank
Property Boundary
Planned Roads
Stockpile
Limit of Fill from Surface Excavation
Groundwater Flow
MOOSE CREEK
MOOSE CREEK
CAMP CREEK
CAMP CREEK
13-14%
1
2
3
4
5
7250
7300
7350
7400
7450
7500
7550
7600
7750
N
W
E
S
1 inch = 200 Feet
0
150
300
600
WATER & ENVIRONMENTAL TECHNOLOGIES, PC
Butte Highlands Project
Proposed Layout
T1N, R7W, S31, Silver Bow County
8/20/2009
MyersM01
FIGURE 2b

Legend
Vicinity Wells
A - FREDLAND DALE
B -TUESDAY DAVID
C - ATKERSON JOHN W
Site Location
A
B
C
Site Location
1 inch = 2,000 Feet
0
1,500
3,000
6,000
WATER & ENVIRONMENTAL TECHNOLOGIES, PC
Butte Highlands Project
Vicinity Wells
T1N, R7W, S31, Silver Bow County
8/20/2009
MyersM01
FIGURE 3a

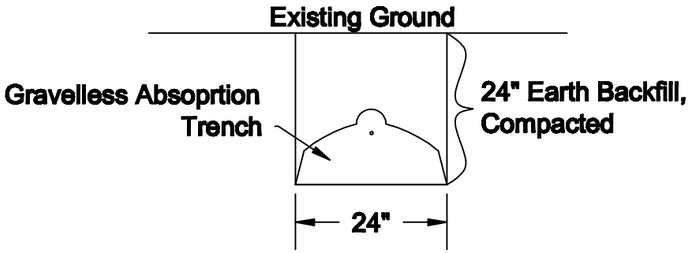

Legend
Test Pits
Site Location
Hydraulic Gradient
MOOSE CREEK
MOOSE CREEK
CAMP CREEK
CAMP CREEK
7400
7350
7300
7250
7450
7500
7550
7600
7750
1
2
3
4
5
N
W
E
S
1 inch = 200 Feet
0
150
300
600
WATER &
ENVIRONMENTAL
TECHNOLOGIES, PC
Butte Highlands Project
Hydraulic Gradient
T1N, R7W, S31, Silver Bow County
8/20/2009
MyersM01
FIGURE 3b

Butte Highlands Project - Butte, MT

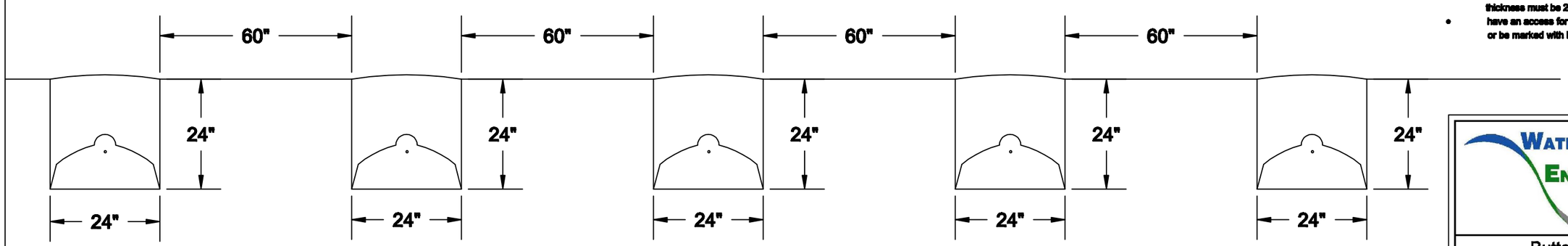
Drainfield Design



Gravelless Absorption Trench



Cross Section A - A'



Drainfield Design Criteria

Primary Drainfield (Gravelless Absorption Trenches):

- Industrial building wastewater flow is 637 gpd. (49 workers)
- 637 gpd/0.5 gpd/ft² = 1274 ft² less 25% for gravelless.
- 956 ft²/ 2ft trenches = 478 ft
- 5 laterals @ 96 ft (Total 480 ft)

Replacement Drainfield (Standard Absorption Trenches):

- Industrial building wastewater flow is 468 gpd. (36 workers)
- 468 gpd/0.5 gpd/ft² = 936 ft²
- 936 ft²/ 2ft trenches = 468 ft
- 5 laterals @ 96 ft (Total 480 ft)

Gravelless Absorption Trenches:

- may be used in lieu of pipe and drain rock.
- be level, 24-inches wide by 24-inches deep, separated by 5 feet, and capped at end.

Standard Absorption Trenches must:

- be level, 24-inches wide by 24-inches deep, separated by 5 feet, and capped at end.
- use 4-inch diameter ASTM D-3034 PVC with perforations per ASTM D-2729.
- be at least 6-inches of drain rock must be placed placed in the bottom of the trench.
- Drain rock must be washed, maximum of 2.5 inches in diameter and contain no more than 2% passing in No. 8 sieve.
- Distribution pipe must be properly bedded and covered with at least 2-inches of drain rock.
- Must have a minimum of 12-inches of soil or fill above drain rock.
- Drain rock must be covered with a synthetic drainage fabric of 2 to 4 layers of untreated building paper.

Manifold must:

- be installed between septic tank and absorption trenches.
- be of watertight construction.
- be set level and arranged so effluent is distributed to an equal length of distribution pipe on both sides of the junction of the inlet pipe to manifold.

Distribution Box must:

- be set level and bedded to prevent settling.
- use some flow control of baffling device to ensure equal distribution of effluent.
- be water tested for equal distribution.
- have each outlet serving and equal length of absorption trench.
- If constructed of concrete, the minimum wall, floor, and lid thickness must be 2-inches.
- have an access for inspection provided either through a riser or be marked with iron or a suitable, durable marker.

WATER & ENVIRONMENTAL TECHNOLOGIES, PC

Butte Highlands Project
Drainfield Design

T1N, R7W - Section 31 Silver Bow County, MT

MyersM01

9/1/09

Figure 4

1245

SMALL MINE DEVELOPMENT, LLC
PAYROLL ACCOUNT
PH 208-338-8880 FAX 208-338-8881
967 E. PARK CENTER BLVD. PMB #396
BOISE, ID 83706-6700

WELLS FARGO BANK, N.A.
11-24-1210

PAY TWO HUNDRED DOLLARS & NO 100

TO THE ORDER OF BSB

DATE 9/15/09

AMOUNT $200.00

Randel W. Gudell

MP

081004/9-89

Security Features Included. Details on back.

⑈001245⑈ ⑆121000248⑆4121461107⑈

SMALL MINE DEVELOPMENT, LLC
PAYROLL ACCOUNT

1245

BUTTE HIGHLANDS JV
SITE SEPTIC PERMIT
SILVER BOW COUNTY.

PERMIT TO INSTALL AN INDIVIDUAL SEWER SYSTEM **PERMIT FEE:** 200.00

This permit is valid for 12 months

As purchaser of this permit, I agree to install an individual sewer system which meets all requirements as specified in the Butte-Silver Bow rules and regulations for subsurface sewage disposal systems.

2009-32-1027

Permit Purchaser X _____ **Date** X 9/15/09

Health Authority _____ **Date** 9/15/09

Date: **January 2012**

To: **Henry Bogert, PE, PhD**
Butte Highlands Joint Venture, LLC (BHJV)

From: **Philip J Joggerst, MPH**
Small Mine Development, LLC (SMD)

Re: **Butte Highlands – Noise Study**

Executive Summary

A noise study was conducted at the Butte Highlands mining property to measure the current noise levels at the boundaries of the property. The current noise levels, as well as a comparative analysis of similar sized equipment as that proposed in future expansions of the property, were used to estimate the noise levels that could reasonably be expected upon expansion of activities at the property. Based on measurements taken during this study, current noise levels range from 48.5 decibels (dB) to 78.4 dB, measured at nine locations around the perimeter of the property. Additionally, based on a comparative analysis, the noise level at the property boundary is estimated to *decrease* with the addition of equipment and infrastructure associated with expanded operations at the Butte Highlands project. This reduction in noise level is attributed to the increased distance from the property boundary of the stationary equipment under the current expansion plan.

Introduction

As part of the on-going permitting process, a noise study was conducted to determine the current noise levels associated with mining activities at the property boundaries of the Butte Highlands exploration project. This study was conducted to not only measure the noise levels under the current operating conditions and procedures, but to also use the acquired data to estimate the noise levels that may reasonably be expected with planned expansion and modification of the equipment and processes on site.

To best characterize noise levels immediately adjacent to the active mine site, nine sample locations were chosen around the perimeter. These locations were spaced at approximated even intervals along the property boundary, with additional samples taken at locations where higher than average noise levels were expected. The areas of the highest noise levels were expected to be at locations where stationary equipment (i.e. diesel powered generators and compressor, etc.) is positioned in closest proximity to the property boundary.

The date and time of the study period was chosen to best represent normal operating procedures of a typical working day. Additionally, the mid-day study period chosen would also take into consideration noise produced along Camp Creek Road from local public traffic, as well as deliveries coming to and from the property.

In addition to characterizing noise levels under the current operating parameters, this study also includes an estimation of the expected noise levels at the property boundary when the project is expanded to its full scale. The basis for these estimations is presented later in this report.

Procedures

As has been mentioned previously, nine noise samples were collected on a date and time that was determined to be a valid representation of the current operations. These measurements were taken at intervals around the property boundary, with more samples being collected at the northeast corner of the property as this is the location of most of the stationary, diesel-powered equipment. Because the noise levels remain fairly constant throughout the day, approximately 15 to 20 minute samples were taken as an adequate representation of the day as a whole.

The noise measurements were taken using a Quest Technologies Q400 Noise Dosimeter. The instrument was set with a threshold level of 40 dB as to not exclude any noise from the ambient environment. Additional settings include an "A" weighting curve with a slow response rate to better mimic the human ear. These settings are the most commonly used when performing environmental and occupational noise monitoring. The instrument was properly calibrated using a QC-10 114dB – 1000Hz noise source calibrator, as per the manufacturer's specifications.

The data collected in this manner is available in Table 1 and is also plotted on the map of the property (Figure 3). All noise levels are reported as the average sound level (L_{avg}) for the measurement period with a 5 dB exchange rate.

Estimation of expected noise upon the planned expansion is more difficult to quantify. Due to the inherent variability of installation methods, operating conditions, and utilization of the equipment proposed by BHJV for expansion of the property, very little data regarding noise levels is available from the equipment manufacturers. Because of this, estimates were made based on studies previously completed on existing plants and equipment of a similar type to those proposed in the Butte Highlands expansion. Additionally, measurements taken on current equipment and operating conditions were used to make reasonable estimates of the noise levels produced by the similar, yet larger, equipment prescribed for the property expansion.

Discussion

The discussion necessary for current noise levels at the property is negligible due to the straight forward nature of the data collection technique employed. The collection method for this data has been previously described and the results available in Table 1 and again on the accompanying map as Figure 3.

Crushing and Screening Plant Estimation

An extensive literature search revealed several noise studies that were conducted to characterize the noise levels produced at various crushing and screening plants throughout the United States. From these studies, noise level data was chosen that would be most representative of that which is planned at the

Butte Highlands property. While no two plants will be exactly the same, efforts were made to choose the most representative data based on equipment type and size, material being processed, and material throughput. The noise levels for the crushing and screening plant estimate were obtained from a study published by ER Bauer and DR Babich of the National Institute for Occupational Safety and Health (NIOSH).[1] A range of noise levels were reported in the study for both the crushing and screening plants. The screening plant was measured at noise levels ranging from 85 to 106 dB. The crushing portion of the process was measured at approximately 88 dB to 105 dB. For estimation purposes, the highest levels were chosen to reflect the worst case scenario for the comparison. Assuming this worst case scenario, the crushing and screening plant can both be expected to contribute approximately 105 dB to the overall noise level. Using the additive properties of sound pressure levels, the overall noise from the crushing and screening plant combined would be 108 dB. Table 2 depicts a tabular summary of the decibel addition calculation. Assuming the plant will be located approximately 200 ft (61 meters) from the edge of property; the sound propagation equation in Figure 1 was used to calculate the noise level at the property boundary. Using a directivity factor (Q) of 2 for a noise source near the ground with the sound radiating hemispherically, this calculated to be 64 dB.

Generator and Compressor

To estimate the noise levels of the larger generator and compressor, the average noise levels of the current equipment were taken and used as a baseline. To obtain a representative level and to take into consideration structures housing and dampening the noise produced by the equipment, two measurements were taken for each piece of equipment. One measurement was taken inside the structures housing the compressor and generator at the source of the noise, and one was taken immediately outside the structures. These two measurements were averaged using the equation shown in Figure 2. The average noise level produced by the current generator was calculated to be 104 dB, while the average for the current compressor is 102 dB.

To estimate the increased noise level of larger capacity generators and compressors, 3 dB were added to each of the current equipment's measured noise level. This is a reasonable assumption, since a 3 dB increase essentially equates to doubling of the noise level for equipment of increased size in future configurations of the mine's infrastructure.

In future plans, a larger air compressor with an approximated noise level of 105 dB, would be situated by itself as a lone noise source approximately 65' (20 meters) from the property boundary. Again employing the sound propagation equation, the noise level at the property boundary is estimated to be 71 dB.

To estimate the noise level that may be expected from expanded power generation requirements, the worst case scenario must be assumed in which all 3 generators will be operating simultaneously. Given this scenario, the total noise level produced from power generation can be expected to reach approximately 110 dB. This level was reached by combining current generator noise levels with estimates of larger facilities. The generators will be situated a distance of approximately 140' (43 meters) from the permit boundary. Using the sound propagation equation, the noise level at the boundary is estimated to be approximately 70 dB.

Data & Calculations

Table 1 – Current Noise Measurements at the Permit Boundary:

Event	Date	Time	Duration (min)	L_{avg} (dBA)
1	10/30/10	11:42 AM	15	48.5
2	10/30/10	12:00 PM	15	52.2
3	10/30/10	12:18 PM	14	50.1
4	10/30/10	12:37 PM	14	48.5
5	10/30/10	12:54 PM	21	68.8
6	10/30/10	1:18 PM	15	71.4
7	10/30/10	1:34 PM	22	78.4
8	10/30/10	1:58 PM	15	69.2
9	10/30/10	2:15 PM	15	52.6

Table 2 – Short Cut Decibel Addition:[2]

Difference Between Two Levels to be Added	Amount to Add to Higher Level to Determine Sum
0-1 dB	3 dB
2-4 dB	2 dB
5-9 dB	1 dB
10 dB	0 dB

Figure 1 – Sound Propagation Equation:[2]

$$L_p = L_W + 10\log_{10}\left(\frac{Q}{4\pi r^2}\right)$$

where: L_P = sound pressure level
L_W = sound power level
Q = directivity coefficient
r = distance (in meters)

Data & Calculations, con't

Figure 2 – Average Sound Pressure Equation:[2]

$$Average\ L_p = 10\log_{10}\left(\frac{1}{n}\sum_{1}^{n} 10^{\frac{L_{Pn}}{10}}\right)$$

where : L_p = sound pressure level
n = noise event

Conclusions

From the measurements taken at the property boundaries, the current noise levels ranged from 48.5 to 78.4 dB. The highest of these values are located in the northeast corner of the property due to their proximity to the stationary, diesel powered equipment.

Based on the estimation methods employed, the highest noise level at the property boundary that may be expected is 71 dB. This noise level would be produced from the combination of a new generator and a larger compressor in place of the current on-site equipment. This estimation may be effected by several factors including installation techniques and actual location of the new equipment. The estimation is based on the current plan as is known and is subject to change given future changes to the operation.

Given the distance of the crushing and screening plant from the property boundaries (≈200 ft), this plant is not expected to contribute greatly to the overall noise level at the permit boundary. It is expected that the noise level generated from this plant will be approximately 63 dB at the nearest property boundary.

References

1. Bauer, ER and Babich DR. "Noise Assessment of Stone/Aggregate Mines: Six Case Studies." National Institute for Occupational Safety and Health. *Min Eng 2007 Aug; 59(8):55-63*.

2. DiNardi, Salvatore R, editor. "The Occupational Environment – It's Evaluation and Control." *American Industrial Hygiene Association*. 1997.

Figure 3 – Noise Levels at Permit Boundary

11:42AM 30Oct10
L_{avg} = 48.5dBa
2:15PM 30Oct10
L_{avg} = 52.6dBa
1:58PM 30Oct10
L_{avg} = 69.2dBa
1:34PM 30Oct10
L_{avg} = 78.4dBa
1:18PM 30Oct10
L_{avg} = 71.4dBa
12:54PM 30Oct10
L_{avg} = 68.8dBa
12:37PM 30Oct10
L_{avg} = 48.5dBa
12:16PM 30Oct10
L_{avg} = 50.1dBa
12:00PM 30Oct10
L_{avg} = 52.2dBa
Camp Creek Road
Point Aiken
U.S.F.S.
E 10,400
E 10,800
E 11,200
E 11,600
N 9,800
N 9,200
0 25 50 75 100 200
Scale In Feet
BUTTE HIGHLANDS PROJECT
Figure 3:
Noise Levels at Permit Boundary
DATE: February 2011
SCALE: 1" = 200'
DWG. NAME: Fig 3D Noise Levels

TETRA TECH, INC.

851 Bridger Drive, Suite F
Bozeman, MT 59715
Telephone: (406) 582-8780
Fax: (406) 582-8790

MEMORANDUM

TO: Henry Bogert, Mining Engineer Geologist
Butte Highlands Joint Venture

cc:

FROM: Allan R. Kirk, Senior Project Manager, Tetra Tech
Shane Matolyak, Environmental Scientist, Tetra Tech

DATE: March 1, 2011

RE: Butte Highlands Mine
2010 Geochemical / PAR Monitoring
Tetra Tech Project No.: 114-710113.100

Butte Highlands Joint Venture (Company) has a mineral Exploration License issued by the State of Montana that includes approval to drive a decline to reach underground drill stations and thereby assess underground mineral potential at its Butte Highlands mine. As a means of characterizing waste rock and ore to be produced at the mine, the Company has agreed to conduct routine monitoring for the presence of potentially asbestiform rock (PAR) and to evaluate potential for metal release and the formation of acid rock drainage.

This memorandum summarizes the results of Polarized Light Microscopic (PLM) analysis of potentially asbestiform rock (PAR) content, ME-MS41 whole rock total trace element analysis, EPA Method 1312 Synthetic Precipitation Leachability Procedure (SPLP), and acid-base accounting (ABA) tests on samples collected from the Butte Highlands mine.

Data for all samples collected to date are summarized in this memorandum and copies of analytical laboratory reports for the most recent round of six samples collected in November 2010 are included (**Attachments A, B, and C**). Copies of laboratory reports for other samples were provided in a previous report (Tetra Tech, 2010). To date, a total of 13 samples of rock were collected from waste areas mined in the decline section of the Butte Highlands mine. Seven samples of dolomite, three diorite samples, one hornfels sample, and two samples of quartzite (one Belt quartzite and one Flathead quartzite sample) were collected (**Table 1**).

PAR Evaluation

Samples of rock were collected from contact zones where PAR mineralization is most likely to occur. Samples were submitted to RJ Lee Group in Monroeville, Pennsylvania for analysis of PAR mineralization using polarized light microscopy (PLM) to determine the presence or absence of asbestiform minerals. Rock samples were submitted without crushing so that RJ Lee Group technicians could more accurately identify portions of the overall sample where potential

asbestiform mineralization might be present. Results of the PLM analysis are summarized in **Table 2**. All samples were composed of 100 % non-fibrous material. As PLM results did not indicate the presence of PAR, further analysis was not performed.

Whole Rock Trace Element Analysis

Splits of the samples described above were submitted to ALS Chemex in Reno, Nevada for preparation and analysis of 51 trace elements in accordance with method ME-MS41. Method ME-MS41 is an analytical procedure that uses an aqua-regia digestion followed by ICP-MS (Inductively Coupled Plasma Mass Sepctrometry) to measure whole-rock total trace element concentrations. Sample results are reported in **Table 3**.

Multi-element trace metal geochemical analysis serves two purposes. Initially, these data are used to guide the selection of parameters to analyze during metal mobility (SPLP) testing by identifying relatively high trace metal concentrations that pose a potential to be mobilized from the rock during reactions involving water (Tetra Tech, 2010). The trace element geochemistry can also be used to identify relatively low trace metal concentrations in rock that are unlikely to be mobilized and concentrated by reaction with water. Some of these latter trace metals may be able to be eliminated from the parameter list for future SPLP testing after discussion with the Montana Department of Environmental Quality (DEQ) .

A secondary use of trace metal data is to serve as a geochemical “fingerprint” of the characterization of rock samples and for potential use in statistical evaluations of the samples. For instance if a subset of samples from a given lithology are found to have elevated metal mobility, trace element relationships may be used to develop a plan to identify suspect rock during operations and to modify waste handling methods.

Metal Mobility Testing

Sample splits were also submitted to Energy Laboratories in Billings, Montana for metal mobility testing using the Synthetic Precipitate Leaching Procedure (SPLP). Extract produced during testing were generally of good quality, with most analytes occurring at concentrations below analyte reporting limits (**Attachment C**). Analytical results for detected constituents are summarized in **Table 4**.

Extracts from dolomite samples were of good quality with metal concentrations that were typically below analytical detection limits and did not exceed DEQ-7 standards for any parameter. The test extract from the hornfells sample had similarly good quality and only exceeded the secondary standard for iron. Extracts from the diorite and Belt quartzite samples were of poorer quality, exceeding the chronic aquatic life standard for iron and the acute aquatic life standard for copper. One diorite and the Belt quartzite sample also exceeded the secondary standard for manganese.

The total chromium concentration measured in the Belt quartzite extract was equal to the chronic aquatic life standard for this metal. However, the DEQ-7 chromium standard is based on the chromium (VI) oxidation state and not total chromium as was measured during the SPLP test. It is a certainty that the chromium (VI) concentration in the SPLP extract was less than the total

chromium concentration, in which case the chromium standard would not have been exceeded by this sample.

No standards were exceeded in the SPLP extract for the Flathead quartzite sample.

Aluminum concentrations in all hornfells, diorite, and quartzite samples collected in November 2011 are elevated relative to DEQ-7 standards however the pH of SPLP extracts for these samples ranged from 9.2 to 9.7. These pH values are above the range where DEQ-7 aluminum standards are applicable. Dissolution of aluminum bearing minerals can occur under high pH conditions, however, these conditions may not occur on a run-of-mine basis during operations.

Acid Base Accounting

Energy Laboratories also evaluated samples for acid mine drainage potential using the Modified Sobek method of acid base accounting (**Attachment C**). Acid-base account testing determines the Acidification Potential (AP) and Neutralization Potential (NP) of a sample. The test uses relatively complete digestion of finely ground rock, and therefore tends to over-estimate the reactivity of available sulfide to evaluate a sample's potential to generate acid when in contact with water and atmospheric oxygen. AP and NP values are reported in units of tons $CaCO_3$ / kiloton of rock. The ratio of these values (NP:AP) along with Net Neutralization Potential (NNP = NP-AP, also known as acid/base potential), are used by regulatory agencies to assess the acid generation potential of rock samples based on the generally accepted criteria shown in footnotes to **Table 5**.

No sample is suspected to be acid generating as indicated by high NNP and NP:AP values **Table 5**. Only one sample (diorite) had detectable acidification potential (3 tons/kiloton) however this amount of acidification would be easily consumed by the sample's neutralization potential (29 tons/kiloton). Because these are initial results and because only one sample had detectable acidification potential, typical ABA diagrams have not been plotted. ABA diagrams will be produced once additional information is available for other waste rock and ore-types.

Summary

The following summary points are based on data for all samples collected to date:

- Results of PAR testing indicate that dolomite, diorite, hornfells, and quartzite rock mined during 2010 has no potential to release asbestiform mineral fibers.

- ME-MS41 analysis of 51 metals/elements from dolomite samples compared with upper crustal abundance trace element data identified seven elements that meet or exceed upper crustal abundance concentrations (Tetra Tech, 2010). These data, along with consultation with MDEQ and in consideration with State of Montana surface water quality standards, were used to identify parameters to analyze during metal mobility testing.

- Potential for trace metal mobility is low from dolomite and hornfells wastes mined during 2010. Diorite and Belt quartzite have the potential to release copper, iron, and manganese at concentrations greater than DEQ-7 standards. Aluminum may be released from non-dolomite rock if sufficiently elevated pH conditions are established in waste rock leachate. It is currently unclear whether such pH conditions will become

established or whether a large quantity of aluminum bearing rock will be encountered or placed into the waste rock dump during mining.

- Results of acid-base accounting indicate that all samples were net neutralizing and pose no risk of acid generation.

The conclusion that the dolomite waste mined to date poses little potential environmental risk does not preclude the importance of the testing of mined rock materials, as these same tests will be used to characterize metal mobility and acid generation potential for all or most varieties of rock types comprising the deposit. The values obtained from all rock types will then be used to predict typical blended "run-of-mine" waste rock characteristics. The analyses of individual lithologies may also be used to identify the need for selective handling of problematic materials. However, the Butte Highlands mine anticipates that ultimately all mine wastes will be placed as backfill underground in closure.

References

MDEQ, 2010. Montana numeric water quality standards. Montana Department of Environmental Quality Circular DEQ-7, August 2010.

Tetra Tech, 2010. Memo Re: Butte Highlands Mine 2010 Geochemical / PAR Monitoring, October 4th, 2010.

TABLES

Table 1. Summary of Sample Lithologies Butte Highlands Mine 2010 Geochemical / PAR Monitoring		
Sample Identification	**Collection Date**	**Sample Lithology**
CORE-140	June 2010	mottled tan to gray dolomite, wk limonite on frax
CORE-250	June 2010	lt-med tan, occ gray bands, calc. dolomite, wk-mod limonite
MAR-332	June 2010	mottled tan to gray dolomite, wk-mod limonite on frax
MAR-454	June 2010	mottled tan to gray dolomite, wk-mod limonite on frax
MAR-557	June 2010	mottled tan to gray dolomite, wk limonite on frax
MAR-578	July 2010	mottled tan to gray dolomite, wk-mod limonite on frax
MAR-650	June 2010	mottled tan to gray dolomite, wk limonite on frax
MAR-690	July 2010	mottled tan to gray dolomite, wk-mod limonite on frax
MAR-726	June 2010	mottled tan to gray dolomite, wk limonite on frax
MAR-806	July 2010	mottled tan to gray dolomite, wk-mod limonite on frax
UAR-759	November 2010	fine grained diorite, wk chlorite, tr. Actinolite
UAR-772	November 2010	fine grained, grey, hfels, mod limonite on frax
UAR-808	November 2010	Diorite
UAR-844	November 2010	Diorite
UAR-893	November 2010	Belt Quartzite
UAR-1005	November 2010	Flathead Quartzite

Notes: wk : weak frax : fractures lt : light med : medium
occ : occasional calc. : calcarious

Table 2. Summary of Potentially Asbestiform Rock Results
Butte Highlands Mine
2010 Geochemical / PAR Monitoring

Sample Identification	Collection Date	Matrix Material (1)	Asbestos Detected
CORE-140	June 2010	CA, M	*ND*
CORE-250	June 2010	CA, OP, M	*ND*
MAR-332	June 2010	CA, AM, OP, MI, M	*ND*
MAR-454	June 2010	CA, OP, M	*ND*
MAR-557	June 2010	CA, OP, M	*ND*
MAR-650	June 2010	CA, OP, M	*ND*
MAR-726	June 2010	CA, OP, M	*ND*
UAR-759	November 2010	Q, CA, AM, F, OP, MI, M	*ND*
UAR-772	November 2010	Q, F,OP, MI, M	*ND*
UAR-808	November 2010	Q, CA, AM, OP, MI, M	*ND*
UAR-844	November 2010	Q, CA, MI, M	*ND*
UAR-893	November 2010	Q, CA, AM, F, OP, MI, M	*ND*
UAR-1005	November 2010	Q, CA, AM, F, OP, M	*ND*

Notes: *ND* : Not Detected

(1) Key to abbreviations for Matrix Material:

ASBESTOS	NON-ASBESTOS	NON-FIBROUS MATERIALS	
AM = Amosite	CE = Cellulose	AM = Amphibole	MI = Mica
AC = Actinolite	MW = Mineral Wool	B = Binder	OP = Opaque
AN = Anthophyllite	FG = Fibrous Glass	CA = Carbonates	OR = Organic
CH = Chrysotile	SF = Synthetic Fibers	CL = Clay	P = Perlite
CR = Crocidolite	H = Hair	F = Feldspar	Q = Quartz
TR = Tremolite	W = Wollastonite	G = Gypsum	T = Tar
	OF = Other Fibers	HY = Hydromagnesite	V = Vermiculite
		M = Miscellaneous	

Table 3. Whole-Rock Trace Metal Analysis
Butte Highlands Mine
2010 Geochemical / PAR Monitoring

Sample Description	Ag ppm	Al %	As ppm	Au ppm	B ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cs ppm
CORE-140	0.04	0.12	16	<0.2	<10	10	0.07	<0.01	20.1	0.05	8.11	0.8	2	0.08
CORE-250	0.01	0.16	19	<0.2	<10	10	0.09	0.01	19.45	0.01	10.9	1.1	3	0.09
MAR-332	<0.01	0.1	7	<0.2	<10	<10	<0.05	<0.01	19.55	<0.01	9.98	0.9	1	0.09
MAR-454	0.13	0.08	9	<0.2	<10	10	<0.05	0.02	19.7	0.16	6.28	0.8	2	0.1
MAR-578	0.15	0.04	27	<0.2	<10	<10	0.05	0.02	19.15	0.09	3.82	0.8	1	0.22
MAR-690	0.02	0.11	12	<0.2	<10	10	<0.05	0.01	20.5	0.03	6.86	0.9	2	0.15
MAR-806	0.05	0.02	9	<0.2	<10	<10	<0.05	0.02	20.7	0.11	4.35	0.8	1	<0.05
UAR-759	0.01	1.57	1.7	<0.2	10	50	0.72	0.03	0.27	0.01	62.4	5.6	23	5.89
UAR-772	0.02	2.61	1.9	<0.2	10	100	0.62	0.05	1.92	0.04	53.9	12.3	55	6.26
UAR-808	0.11	2.19	4.3	<0.2	<10	210	0.17	0.11	0.77	0.05	31.9	16.6	6	2.93
UAR-844	0.13	2.85	0.6	<0.2	<10	50	0.6	0.48	0.58	0.01	54.7	6.1	50	7.61
UAR-893	0.06	2.89	2.9	<0.2	<10	450	0.19	0.05	1.03	0.03	26.7	19.7	53	2.87
UAR-1005	0.02	0.76	0.9	<0.2	<10	20	0.28	0.05	1.15	0.02	22.6	0.7	9	0.8

Sample Description	Cu ppm	Fe %	Ga ppm	Ge ppm	Hf ppm	Hg ppm	In ppm	K %	La ppm	Li ppm	Mg %	Mn ppm	Mo ppm	Na %
CORE-140	3.4	0.29	0.28	<0.05	0.02	0.02	<0.005	0.06	5	0.5	12.35	277	0.21	0.02
CORE-250	4.4	0.28	0.37	<0.05	0.02	0.01	<0.005	0.1	6.3	0.6	11.7	274	0.24	0.02
MAR-332	3.2	0.29	0.28	<0.05	<0.02	0.01	<0.005	0.05	5.5	0.7	12	267	0.14	0.02
MAR-454	3.5	0.3	0.18	<0.05	0.02	<0.01	<0.005	0.05	3.5	0.6	11.95	365	0.16	0.02
MAR-578	6.7	0.33	0.12	<0.05	0.02	<0.01	<0.005	0.02	2	0.9	12.1	380	0.77	0.02
MAR-690	3.2	0.28	0.26	<0.05	<0.02	<0.01	<0.005	0.06	3.7	0.9	11.8	341	0.16	0.02
MAR-806	3	0.24	0.14	0.09	<0.02	0.01	<0.005	0.01	3.3	0.2	12.85	272	<0.05	<0.01
UAR-759	0.9	1.71	4.91	0.09	0.04	<0.01	0.01	1.09	26.8	27.9	0.96	113	0.15	0.01
UAR-772	5.5	4.22	10.35	0.13	0.06	<0.01	0.053	1.46	24.4	36.4	2.14	725	0.28	0.03
UAR-808	106	4.71	7.94	0.17	0.11	<0.01	0.038	1.31	15.6	17.1	1.39	666	0.54	0.12
UAR-844	241	3.21	11.8	0.16	0.07	0.01	0.072	2	24.5	39.7	2.22	424	0.18	0.06
UAR-893	76	4.09	8.19	0.13	0.07	<0.01	0.019	1.38	13	21.4	1.44	473	0.46	0.21
UAR-1005	2.3	0.36	2.42	<0.05	0.09	0.01	0.009	0.2	9.5	6	0.53	78	0.27	0.02

Table 3. Whole-Rock Trace Metal Analysis (continued)
Butte Highlands Mine
2010 Geochemical / PAR Monitoring

Sample Description	Nb ppm	Ni ppm	P ppm	Pb ppm	Rb ppm	Re ppm	S %	Sb ppm	Sc ppm	Se ppm	Sn ppm	Sr ppm	Ta ppm	Te ppm
CORE-140	0.44	1.3	60	1	1.4	0.001	0.16	0.63	0.5	0.2	<0.2	56.2	<0.01	0.01
CORE-250	0.52	2.8	110	0.7	2.1	<0.001	0.17	0.43	0.6	<0.2	<0.2	64.9	<0.01	0.01
MAR-332	0.44	1.5	70	6.4	1.2	<0.001	0.15	0.38	0.5	0.2	<0.2	66.9	<0.01	0.01
MAR-454	0.4	1.6	40	3.4	1.4	<0.001	0.14	0.6	0.4	0.2	<0.2	53.7	<0.01	0.01
MAR-578	0.21	1.5	20	0.9	1.1	<0.001	0.17	1.19	0.4	0.2	<0.2	53.9	<0.01	0.01
MAR-690	0.37	2	40	0.5	1.6	<0.001	0.16	0.58	0.5	0.2	<0.2	49.8	<0.01	0.01
MAR-806	0.21	<0.2	20	0.8	0.3	<0.001	<0.01	0.33	0.3	0.2	<0.2	26.2	<0.01	0.01
UAR-759	0.16	10.6	240	0.9	68.2	<0.001	0.01	0.22	2.8	0.2	0.6	7.7	<0.01	0.01
UAR-772	0.21	15.8	690	2	65.1	<0.001	<0.01	0.28	10.2	0.4	1.2	38.8	0.01	0.02
UAR-808	0.23	4.9	1240	1.6	55.9	0.001	0.13	0.37	8.1	0.5	0.7	24.8	0.01	0.05
UAR-844	0.43	14.4	620	1.1	105	<0.001	<0.01	0.18	10.7	0.4	2.2	9.6	0.01	0.02
UAR-893	0.17	18.5	1270	2.3	47.5	<0.001	0.02	0.2	5.1	0.4	0.3	102	<0.01	0.04
UAR-1005	0.36	1.5	130	3.1	7.8	<0.001	<0.01	0.11	1.7	0.2	0.4	24.5	0.01	0.01

Sample Description	Th ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Y ppm	Zn ppm	Zr ppm
CORE-140	0.7	<0.005	0.04	2.11	6	0.17	1.61	16	1
CORE-250	0.5	<0.005	0.06	0.76	7	0.06	1.89	21	1.1
MAR-332	0.6	<0.005	0.03	0.49	3	0.05	1.67	10	0.5
MAR-454	0.3	<0.005	0.05	0.64	4	0.07	1.08	15	1.2
MAR-578	0.2	<0.005	<0.02	0.96	2	0.09	0.94	19	1.2
MAR-690	0.3	<0.005	0.04	1.16	3	0.06	1.09	25	1.3
MAR-806	<0.2	<0.005	<0.02	0.33	4	0.24	0.58	17	0.5
UAR-759	10.1	0.11	0.27	0.82	19	0.2	5.62	13	1
UAR-772	6.7	0.208	0.26	0.73	82	0.28	13.55	50	1.3
UAR-808	3.2	0.328	0.32	0.47	113	0.25	14.25	65	1.8
UAR-844	8.6	0.296	0.38	0.83	65	0.38	8.82	29	1.7
UAR-893	2.6	0.307	0.26	0.38	94	0.14	11.1	56	1.5
UAR-1005	4.7	0.053	0.03	0.61	7	3.4	7.83	5	1.8

Table 4. Comparison of SPLP Data to Regulatory Standards
Butte Highlands Mine
2010 Geochemical / PAR Monitoring

Sample Identification	Lithology	pH	Aluminum	Arsenic	Barium	Chromium	Copper	Fluoride	Iron	Lead	Manganese	Phos-phorous	Uranium
CORE-140	Dolomite	*NA*	0.03	0.005	0.009	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
CORE-250	Dolomite	*NA*	*ND*	0.004	0.008	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
MAR-332	Dolomite	*NA*	*ND*	0.004	0.009	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
MAR-454	Dolomite	*NA*	*ND*	*ND*	0.008	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
MAR-578	Dolomite	*NA*	*ND*	0.012	0.009	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
MAR-690	Dolomite	*NA*	0.03	0.003	0.009	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
MAR-806	Dolomite	*NA*	*ND*	0.006	0.010	*ND*	*ND*	0.1	*ND*	*ND*	*ND*	*ND*	*ND*
UAR-759	Diorite	9.7	3.70	*ND*	0.036	0.006	*ND*	*ND*	1.7	0.0006	0.009	0.02	0.00017
UAR-808	Diorite	9.4	3.18	0.003	0.028	0.001	0.017	*ND*	4.24	0.0006	0.1	0.03	0.00006
UAR-844	Diorite	9.4	2.20	*ND*	0.018	0.002	0.041	*ND*	1.19	*ND*	0.014	*ND*	0.00010
UAR-772	Hornfells	9.2	0.51	*ND*	0.007	0.003	*ND*	*ND*	0.34	*ND*	*ND*	0.01	*ND*
UAR-893	Belt Quartzite	9.6	4.08	*ND*	0.041	0.011	0.016	*ND*	4.39	0.0007	0.056	0.05	0.00004
UAR-1005	Flathead Quartzite	9.3	1.130	*ND*	0.011	0.002	*ND*	*ND*	0.19	*ND*	0.006	0.01	*ND*
Montana Numeric Water Quality (DEQ-7 August 2010) Standards													
Acute Aquatic Life		6.5-8.5 (1)	0.75 (2)(3)	0.34	*NS* (3)	0.016 (4)	0.007 (5)	*NS*	*NS*	0.03 (5)	*NS*	*NS*	*NS*
Chronic Aquatic Life		6.5-8.5 (1)	0.087 (2)(3)	0.15	*NS* (3)	0.011 (4)	0.005 (5)	*NS*	1	0.001 (5)	*NS*	*NS*	*NS*
Human Health		6.5-8.5 (1)	*NS*	0.01	1	0.1	1.3	4	0.3 (5)	0.015	0.05 (6)	*NS*	0.03

Notes:

Concentrations in milligrams per liter
Only constituents detected at or above the analyte reporting limit are shown
ND : Not Detected *NS* : No Standard NA : Not Analyzed
(1) Reported pH "standard" is general guideline. Actual pH compliance criteria are maximum allowalbe change to natural condition and/or dependent on stream classification.
(2) Aquatic life standards for aluminum apply in pH range of 6 to 9 s.u.
(3) Non-Priority Pollutant Criteria
(4) Aquatic life criteria reported for chromium are based on Cr (VI). SPLP analyses measured total chromium only. Any indicated exceedances should be considered conservative.
(5) Hardness dependent standards calculated for waters having a hardness of 50 mg/L.
(6) Aesthetics based secondary Maximum Contaminant Limit.

Table 5. Acid Base Accounting Results
Butte Highlands Mine
2010 Geochemical / PAR Monitoring

Sample Identification	Lithology	Neutralization Potential (tons / kiloton)	Acidification Potential (tons / kiloton)	Net Neutralization Potential (tons / kiloton) (1)	NP:AP(2)	Total Sulfur (%)
CORE-140	Dolomite	1,060	0	1,060	1,060	*ND*
CORE-250	Dolomite	1,050	0	1,050	1,050	*ND*
MAR-332	Dolomite	1,060	0	1,060	1,060	*ND*
MAR-454	Dolomite	1,060	0	1,060	1,060	*ND*
MAR-578	Dolomite	1,060	0	1,060	1,060	*ND*
MAR-690	Dolomite	1,070	0	1,070	1,070	*ND*
MAR-806	Dolomite	1,080	0	1,080	1,080	*ND*
UAR-759	Diorite	15	0	15	15	0.04
UAR-808	Diorite	29	3	26	10	*ND*
UAR-844	Diorite	22	0	22	22	*ND*
UAR-772	Hornfells	60	0	60	60	*ND*
UAR-893	Belt Quartzite	29	0	28	29	0.02
UAR-1005	Flathead Quartzite	21	0	21	21	*ND*

Notes: Potentially Acid Generating: NP:AP < 1 and NNP < -20 tons/kton.
Uncertain Acidt Generation Potential : NP:AP between 1 and 3 and/or NNP between -20 and + 20.
Unlikely to Generate Acid: NP:AP > 3 and NNP > +20 tons/kton.
Source: BLM 1996. Instruction Memorandum No. 96-97 and EPA 1994 Technical Document EPA 530-R-94-036 NTIS PB94-201829

(1) Net Neutralization Potential = Neutralization Potential - Acidification Potential
(2) NP:AP is the ratio of neutralization potential divided by acidification potential

Technical Memorandum

To: Henry Bogert
Butte Highlands Joint Venture

From: Doug Rogness; AMEC

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Date: August 23, 2011

Subject: Soil Sampling in LAD Areas
Butte Highlands Mine Project, Montana

AMEC has prepared this Memo for the Butte Highlands Joint Venture (BHJV) to provide information regarding results of sampling and laboratory analysis of soil samples collected in the land application discharge (LAD) areas at the Butte Highlands Mine site near Butte, Montana (**Figure 1**). Figures for this Memo are in **Attachment A**, and the laboratory report for soil analysis is in **Attachment B**.

1.0 INTRODUCTION

The LAD system at the Butte Highlands site consists of the following four areas (**Figure 2**):

- LAD#1: 12-acre surface sprinkler area
- LAD#2: 11-acre subsurface perforated pipe system area (drip emitter)
- LAD#3: 7-acre subsurface drip-emitter area
- LAD#4: 12-acre surface snow-making area

LAD#1, LAD#2, and LAD#4 were used periodically in 2010 and/or 2011; LAD#3 has not been constructed and is not planned for LAD application unless greater than expected water disposal needs arise. The purpose for LAD#1 and LAD#2 is to dispose of groundwater encountered in the underground adit, drill-holes, and mine workings for the Butte Highlands Project. This water for LAD disposal is first pumped to a sediment pond, then to a recycle pond, and finally to a pump vault prior to being pumped to the LAD area(s). The purpose for LAD#4 is to dispose of water from dewatering and test wells completed in the vicinity of the proposed mine workings.

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2.0 MINE WATER QUALITY

As previously discussed, water pumped to LAD#1 and LAD#2 is from groundwater encountered from the underground adit, drill-holes, and mine workings. Samples of this "mine water" have been collected and analyzed by a laboratory since April 2010 when water started being discharged to LAD#2. These samples are designated "Mine Ponds". This groundwater was initially affected by nitrate from the blasting compound (ANFO), but declined promptly when a less-mobile blasting compound was initiated. A more complete discussion of water quality for applied LAD water and for groundwater monitoring wells is included in the March 29, 2011 AMEC Memo.

General quality characteristics of the "Mine Ponds" samples include the following:

pH = 8.4 – 10.0 standard units (s.u.)
Specific Conductance (SC) = 207 – 484 micromhos per centimeter (µmhos/cm)
Sulfate = 5 – 44 milligrams per liter (mg/L)
Calcium = 12.8 – 27.8 mg/L
Bicarbonate = 44 – 133 mg/L
Arsenic (dissolved) = 0.0017 – 0.0091 mg/L
Iron (dissolved) = 0.0061 – 0.021 mg/L
Manganese (dissolved) = 0.00037 – 0.0017 mg/L

The only constituents in "Mine Ponds" samples that have exceeded groundwater quality standards are pH (upper limit of 8.5 s.u.), and nitrate and nitrate+nitrite (10 mg/l standard). Chromium (total) is the only constituent that has exceeded any surface water aquatic life standards.

Results of nitrate analysis show that the underground mine water was initially affected in April 2010 by elevated nitrate (22.4 mg/L) from blasting compounds (ammonium-nitrate fuel oil (ANFO)), but declined to less than 1 mg/L by the end of 2010. Similar declines in ammonia concentrations were observed in the "Mine Ponds" samples, from an initial value of 13.4 mg/L in April 2010, to 0.02 mg/L in January 2011. Underground blasting operations for exploration activities were temporarily ceased on December 20, 2010 at the Butte Highlands Project.

3.0 SOIL CONDITIONS

A baseline soil study was completed at the Butte Highlands site in 2009 (AMEC Geomatrix 2009). Near surface soil at the LAD sites generally consist of a dark-brown silty-sandy loam with scattered gravel or rock fragments. Soil types in the LAD areas generally consist of the following groups or families: Cryofluvents-Finn family - Water Complex (rolling stream terraces and floodplains); and Kurrie-Goldflint-Warwood families (low relief mountain slopes and ridges). These families include the following four soil map units: 64GJ1, 75GD2, 51CH2, and 75GB2. The surface runoff class for LAD#1 and LAD#2 is "low", with a portion of LAD#4 being "medium". The ground surface at these three sites slopes to the west at a gradient of approximately 7 percent.

4.0 SOIL SAMPLING AND ANALYSIS

Soil samples collected from several LAD area test pits constructed in 2009 were analyzed for total metals (arsenic, cadmium, copper, manganese, molybdenum, nickel, selenium, and zinc) (AMEC Geomatrix 2009). Results show that arsenic is elevated in most samples in the uppermost horizons. Copper, manganese, nickel, and zinc were also commonly detected at concentrations above the laboratory reporting limits. Some of the arsenic concentrations are above the MDEQ (2005) Generic Action Level of 40 mg/kg for arsenic in soil. None of the metal concentrations, however, are above the upper range of background concentrations reported for the western United States (Shacklette and Boerngen 1984).

On August 4, 2011, seven soil samples were collected within and adjacent to LAD#1, LAD#2, and LAD#4 (**Figure 2**) and submitted to Energy Laboratories in Billings, MT for analysis of 11 metals using the Synthetic Precipitation Leaching Procedure (SPLP; Method SW6020). The metals include: arsenic, cadmium, copper, lead, manganese, molybdenum, nickel, selenium, silver, thallium, and zinc.

The seven composite soil samples for SPLP analysis were collected from the sidewalls of backhoe excavated pits at depths down to the base of the primary soil horizon in accordance with the following (**Figure 2**):

- <u>LAD #1</u>: Sample sites 1A, 1B, and 1C to depths of about 20 inches. One sample site is located within the LAD area, and two sample sites are located outside the LAD area within the two soil map units.
- <u>LAD #2</u>: Sample sites 2A and 2B to depths of about 14 inches. One sample site is located within the LAD area, and one sample site is located outside the LAD area. These soil samples are located above the zone that would be subject to LAD water

because the perforated pipes are buried approximately 5 feet below ground surface. Results of SPLP testing of the soil samples, however, would indicate potential metal leaching by rain water in that area.

- LAD #4: Sample site 4A and 4B to depths of about 20 inches. Both sample sites are located within the LAD area because only water from a dewatering test well has been applied to this LAD area (i.e., water not in contact with underground workings).

Results of the SPLP soil analysis show that all seven soil samples were non-detectable for the 11 metals analyzed (see **Attachment B** for laboratory report). Laboratory reporting limits are 0.1 mg/L for cadmium and selenium; 0.5 mg/L for arsenic, copper, lead, manganese, molybdenum, nickel, silver, and thallium; and 1.0 mg/L for zinc.

5.0 DEFICIENCY REVIEW COMMENTS

As part of Montana Department of Environmental Quality's (MDEQ) review of the Butte Highlands Project permit, several deficiency comments were provided that relate to the LAD operation.

First Deficiency Review Comment 22) Section 1.7.4, p 58, Discussion, and Appendix K: LAD studies completed for the Beal Mountain Mine project above Fairmont Hot Springs revealed elevated levels of metals resulting from fallout from the Anaconda Smelter. Total metals values in area soils indicated the presence of arsenic. Please conduct field soil leaching studies with rain water to identify baseline leachable metal levels in LAD area soils. Please sample the standard set of metals plus arsenic, selenium, and thallium.

Second Deficiency Review Comment 13) DEQ reiterates the need for rain water field leaching studies in LAD Area soils. DEQ disagrees that soil sample results show actual in-place soil leaching results. DEQ is not worried about action levels in soils as much as LAD water leaching metals from the sites to ground and potentially to surface water. The metals in leachate need to be identified as otherwise BHJV could be held responsible for metals leaching out of the soils and showing up downgradient in seeps, springs, and groundwater wells. Please commit to field studies as soon as possible in 2011.

Third Deficiency Review Comment 13) DEQ disagrees that soil testing shows in place soil leaching results for the project site. Please commit to the soil leaching field studies similar to those completed for the Beal Mountain Mine LAD studies. Please add the response text to a replacement page in Section 1.7.4."

In response to the above deficiency comments, a "Proposal for Soil Sampling at Butte Highlands in Land Application Discharge (LAD) Areas for Synthetic Precipitation Leaching Procedure (SPLP) Analysis" was prepared by AMEC (March 10, 2011). This proposal was approved by

MDEQ, and was then implemented on August 4, 2011 with the collection of seven soil samples from three LAD areas for SPLP analysis. This Memo, along with a previous Technical Memo from AMEC titled "LAD System Operation and Monitoring" (March 29, 2011), provide the information in response to the deficiency comments noted above.

The response text to replace Section 1.7.4 in the Butte Highlands Project Hard Rock Operating Permit Application is:

1.7.4 Discussion

Soil samples collected from several LAD area test pits constructed in 2009 were analyzed for total metals (arsenic, cadmium, copper, manganese, molybdenum, nickel, selenium, and zinc) (AMEC Geomatrix 2009). Results show that arsenic is elevated in most samples in the uppermost horizons (up to 88 mg/kg). Copper, manganese, nickel, and zinc were also commonly detected at concentrations above the laboratory reporting limits. Some of the arsenic concentrations are above the MDEQ (2005) Generic Action Level of 40 mg/kg for arsenic in soil. None of the metal concentrations, however, are above the upper range limit of background concentrations reported for the western United States (Shacklette and Boerngen 1984).

On August 4, 2011, seven soil samples were collected in and near LAD#1, LAD#2, and LAD#4 and submitted to the laboratory for analysis of 11 metals using the Synthetic Precipitation Leaching Procedure (SPLP). The metals include: arsenic, cadmium, copper, lead, manganese, molybdenum, nickel, selenium, silver, thallium, and zinc. Results of the SPLP soil analysis show that all seven soil samples were non-detectable for the 11 metals analyzed. Laboratory reporting limits are 0.1 mg/L for cadmium and selenium; 0.5 mg/L for arsenic, copper, lead, manganese, molybdenum, nickel, silver, and thallium; and 1.0 mg/L for zinc.

Due to shallow depths of root restriction and the relatively permanent nature of these restrictions, soil in the Project area requires a high degree of protection from erosion in order to maintain productivity as a plant-growth medium. This consideration will be factored into BMPs and reclamation plans.

6.0 REFERENCES

AMEC Geomatrix, 2009. Baseline Report for Soil Resources, Butte Highlands Project, Silver Bow County, Montana. Prepared for Timberline Resources, Coeur d'Alene, Idaho. December 2009.

AMEC Geomatrix, 2011. Technical Memorandum: LAD System Operation and Monitoring, Butte Highlands Mine Project, Montana. Prepared for Butte Highlands Joint Venture, Butte, Montana. March 29, 2011.

Shacklette, H.T., and Boerngen, J.G., 1984. Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. USGS Professional Paper 1270.

Montana Department of Environmental Quality (DEQ), 2005. Position Paper - Action Level for Arsenic in Surface Soil. April 2005. Available at http://deq.mt.gov/StateSuperfund/PDFs/ArsenicPositionPaper.pdf

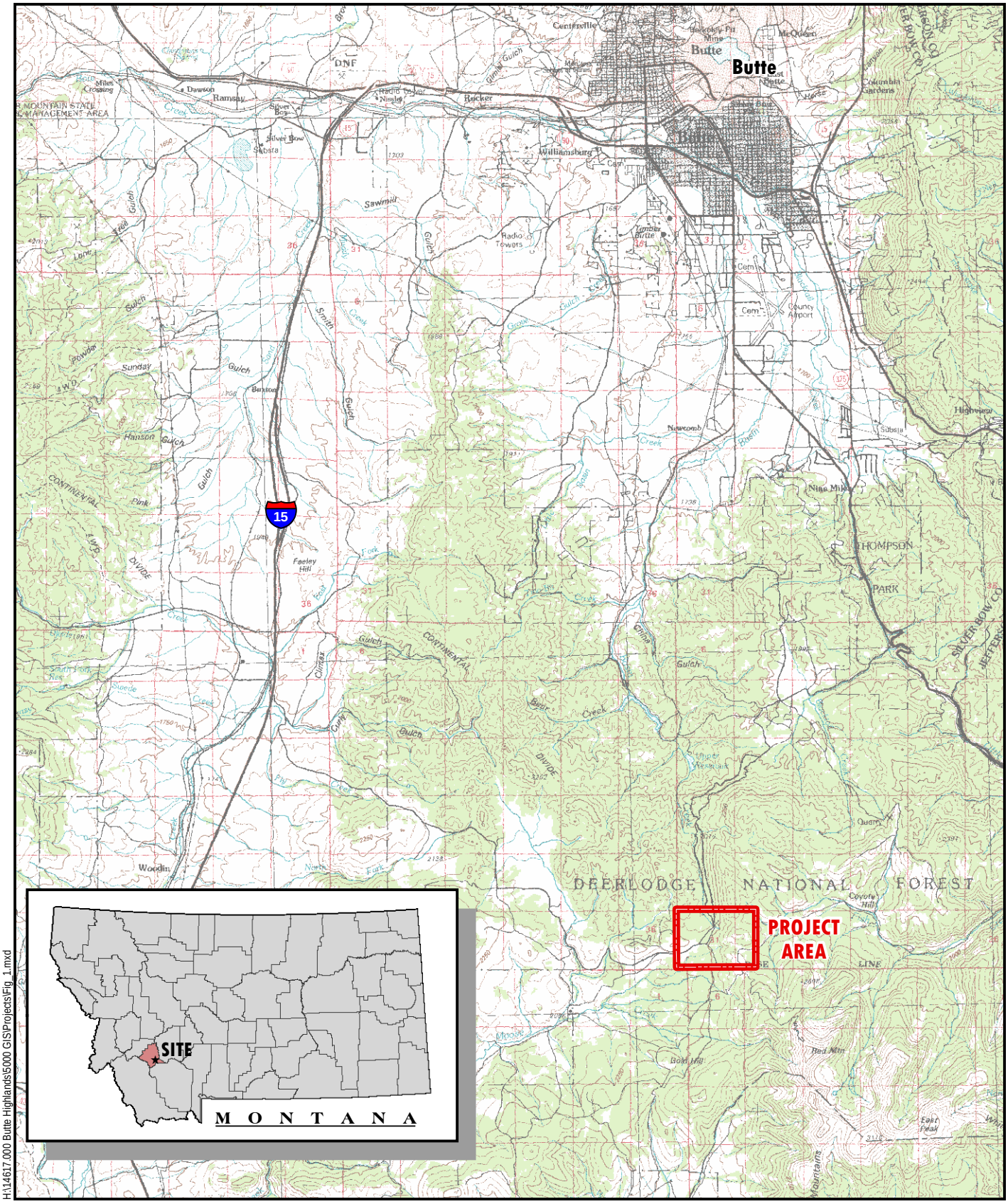
ATTACHMENTS

A – Figures

B – Laboratory Report

ATTACHMENT A

FIGURES



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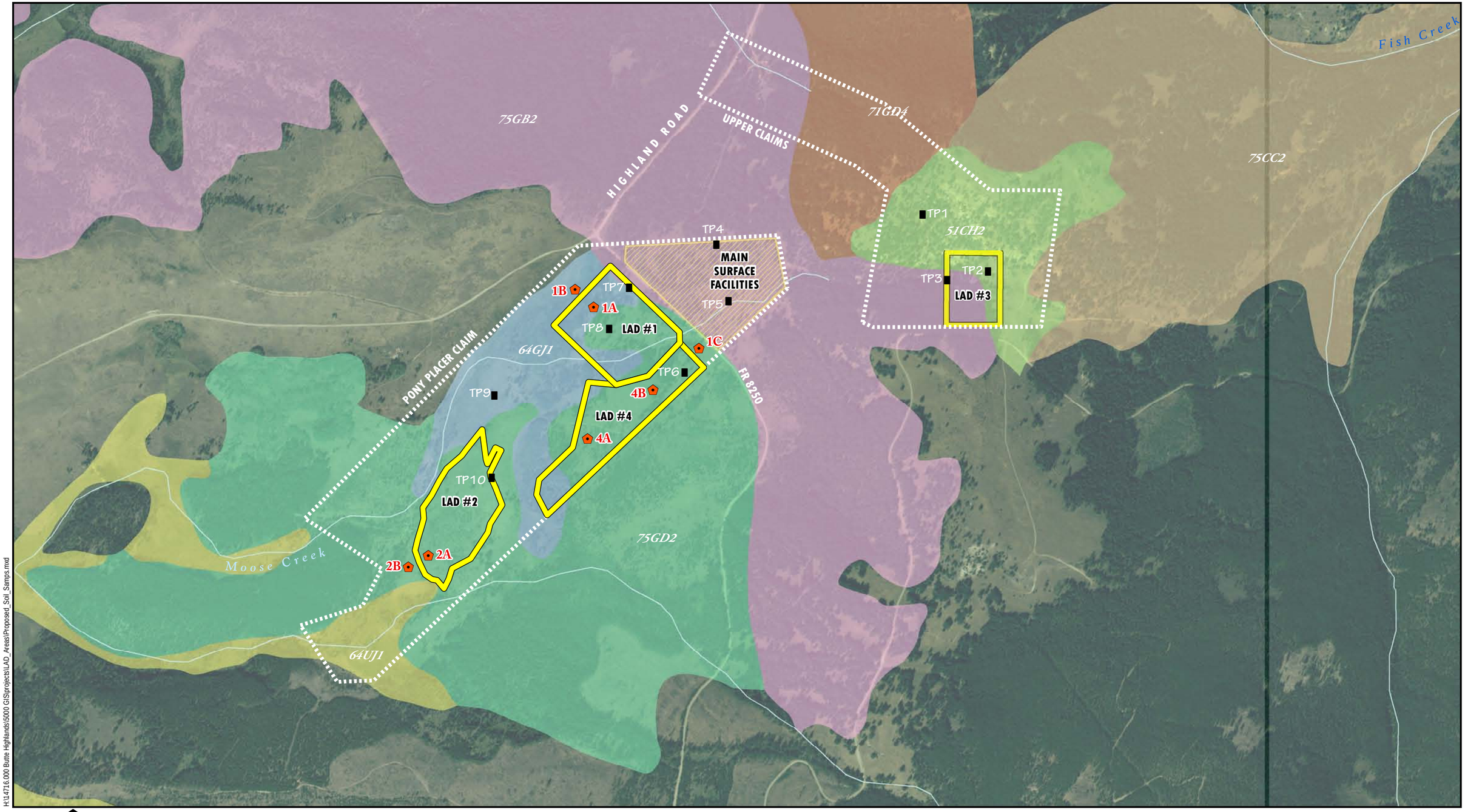
AMEC Geomatrix

Location Map
Butte Highlands Project
Silver Bow County, Montana
FIGURE 1



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Source: NAIP 2005, NRIS

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0 Feet 1,000

AMEC Geomatrix

Soil Map Units

- Project Area
- Test Pit Location
- Soil Sample Site for SPLP Analysis
- 51CH2, Hanson-Tiban families-Rubble land complex, steep ridges and mountain slopes
- 64GJ1, Cryofluvents-Finn family-Water complex, rolling stream terraces and flood plains
- 64UJ1, Finn-Lowder-Dunkleber families, complex, stream terraces and flood plains
- 71GD4, Blackleed-Ovando-Kurrie families, complex, high relief mountain slopes and ridges
- 75CC2, Helmville-Relyea-Whitore families, complex, low relief mountain slopes and ridges
- 75GB2, Windyridge-Como-Hiore families, complex, low relief mountain slopes and ridges
- 75GD2, Kurrie-Goldflint-Warwood families, complex, low relief mountain slopes and ridges

SPLP Soil Sample Sites
Butte Highlands
Silver Bow County, Montana
FIGURE 2

ATTACHMENT B

LABORATORY REPORT

ANALYTICAL SUMMARY REPORT

August 15, 2011

Butte Highlands Joint Venture
PO Box 4959
Butte, MT 59702-4959

Workorder No.: B11080634

Project Name: Butte Highlands

Energy Laboratories Inc Billings MT received the following 7 samples for Butte Highlands Joint Venture on 8/5/2011 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
B11080634-001	BHJV 1A	08/04/11 10:07	08/05/11	Soil	Metals by ICP/ICPMS, SPLP SPLP Extraction, Regular Digestion, Total Metals
B11080634-002	BHJV 1B	08/04/11 10:05	08/05/11	Soil	Same As Above
B11080634-003	BHJV 1C	08/04/11 9:30	08/05/11	Soil	Same As Above
B11080634-004	BHJV 2A	08/04/11 8:10	08/05/11	Soil	Same As Above
B11080634-005	BHJV 2B	08/04/11 8:20	08/05/11	Soil	Same As Above
B11080634-006	BHJV 4A	08/04/11 9:00	08/05/11	Soil	Same As Above
B11080634-007	BHJV 4B	08/04/11 9:12	08/05/11	Soil	Same As Above

This report was prepared by Energy Laboratories, Inc., 1120 S 27th St., Billings, MT 59101. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:

LABORATORY ANALYTICAL REPORT

Prepared by Billings, MT Branch

Client: Butte Highlands Joint Venture
Project: Butte Highlands
Lab ID: B11080634-001
Client Sample ID BHJV 1A

Report Date: 08/15/11
Collection Date: 08/04/11 10:07
DateReceived: 08/05/11
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, SPLP EXTRACTABLE							
Arsenic	ND	mg/L		0.5		SW6020	08/12/11 15:44 / mas
Cadmium	ND	mg/L		0.1		SW6020	08/12/11 15:44 / mas
Copper	ND	mg/L		0.5		SW6020	08/12/11 15:44 / mas
Lead	ND	mg/L		0.5		SW6020	08/12/11 15:44 / mas
Manganese	ND	mg/L		0.5		SW6020	08/12/11 15:44 / mas
Molybdenum	ND	mg/L		0.5		SW6020	08/12/11 15:44 / mas
Nickel	ND	mg/L		0.5		SW6020	08/12/11 15:44 / mas
Selenium	ND	mg/L		0.1		SW6020	08/12/11 15:44 / mas
Silver	ND	mg/L		0.5		SW6020	08/12/11 15:44 / mas
Thallium	ND	mg/L		0.5		SW6020	08/12/11 15:44 / mas
Zinc	ND	mg/L		1		SW6020	08/12/11 15:44 / mas

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Billings, MT Branch

Client: Butte Highlands Joint Venture
Project: Butte Highlands
Lab ID: B11080634-002
Client Sample ID BHJV 1B

Report Date: 08/15/11
Collection Date: 08/04/11 10:05
DateReceived: 08/05/11
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, SPLP EXTRACTABLE							
Arsenic	ND	mg/L		0.5		SW6020	08/12/11 15:48 / mas
Cadmium	ND	mg/L		0.1		SW6020	08/12/11 15:48 / mas
Copper	ND	mg/L		0.5		SW6020	08/12/11 15:48 / mas
Lead	ND	mg/L		0.5		SW6020	08/12/11 15:48 / mas
Manganese	ND	mg/L		0.5		SW6020	08/12/11 15:48 / mas
Molybdenum	ND	mg/L		0.5		SW6020	08/12/11 15:48 / mas
Nickel	ND	mg/L		0.5		SW6020	08/12/11 15:48 / mas
Selenium	ND	mg/L		0.1		SW6020	08/12/11 15:48 / mas
Silver	ND	mg/L		0.5		SW6020	08/12/11 15:48 / mas
Thallium	ND	mg/L		0.5		SW6020	08/12/11 15:48 / mas
Zinc	ND	mg/L		1		SW6020	08/12/11 15:48 / mas

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Billings, MT Branch

Client: Butte Highlands Joint Venture
Project: Butte Highlands
Lab ID: B11080634-003
Client Sample ID BHJV 1C

Report Date: 08/15/11
Collection Date: 08/04/11 09:30
DateReceived: 08/05/11
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, SPLP EXTRACTABLE							
Arsenic	ND	mg/L		0.5		SW6020	08/12/11 15:53 / mas
Cadmium	ND	mg/L		0.1		SW6020	08/12/11 15:53 / mas
Copper	ND	mg/L		0.5		SW6020	08/12/11 15:53 / mas
Lead	ND	mg/L		0.5		SW6020	08/12/11 15:53 / mas
Manganese	ND	mg/L		0.5		SW6020	08/12/11 15:53 / mas
Molybdenum	ND	mg/L		0.5		SW6020	08/12/11 15:53 / mas
Nickel	ND	mg/L		0.5		SW6020	08/12/11 15:53 / mas
Selenium	ND	mg/L		0.1		SW6020	08/12/11 15:53 / mas
Silver	ND	mg/L		0.5		SW6020	08/12/11 15:53 / mas
Thallium	ND	mg/L		0.5		SW6020	08/12/11 15:53 / mas
Zinc	ND	mg/L		1		SW6020	08/12/11 15:53 / mas

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Billings, MT Branch

Client: Butte Highlands Joint Venture
Project: Butte Highlands
Lab ID: B11080634-004
Client Sample ID BHJV 2A

Report Date: 08/15/11
Collection Date: 08/04/11 08:10
DateReceived: 08/05/11
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, SPLP EXTRACTABLE							
Arsenic	ND	mg/L		0.5		SW6020	08/12/11 15:58 / mas
Cadmium	ND	mg/L		0.1		SW6020	08/12/11 15:58 / mas
Copper	ND	mg/L		0.5		SW6020	08/12/11 15:58 / mas
Lead	ND	mg/L		0.5		SW6020	08/12/11 15:58 / mas
Manganese	ND	mg/L		0.5		SW6020	08/12/11 15:58 / mas
Molybdenum	ND	mg/L		0.5		SW6020	08/12/11 15:58 / mas
Nickel	ND	mg/L		0.5		SW6020	08/12/11 15:58 / mas
Selenium	ND	mg/L		0.1		SW6020	08/12/11 15:58 / mas
Silver	ND	mg/L		0.5		SW6020	08/12/11 15:58 / mas
Thallium	ND	mg/L		0.5		SW6020	08/12/11 15:58 / mas
Zinc	ND	mg/L		1		SW6020	08/12/11 15:58 / mas

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Billings, MT Branch

Client: Butte Highlands Joint Venture
Project: Butte Highlands
Lab ID: B11080634-005
Client Sample ID BHJV 2B

Report Date: 08/15/11
Collection Date: 08/04/11 08:20
DateReceived: 08/05/11
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, SPLP EXTRACTABLE							
Arsenic	ND	mg/L		0.5		SW6020	08/12/11 16:02 / mas
Cadmium	ND	mg/L		0.1		SW6020	08/12/11 16:02 / mas
Copper	ND	mg/L		0.5		SW6020	08/12/11 16:02 / mas
Lead	ND	mg/L		0.5		SW6020	08/12/11 16:02 / mas
Manganese	ND	mg/L		0.5		SW6020	08/12/11 16:02 / mas
Molybdenum	ND	mg/L		0.5		SW6020	08/12/11 16:02 / mas
Nickel	ND	mg/L		0.5		SW6020	08/12/11 16:02 / mas
Selenium	ND	mg/L		0.1		SW6020	08/12/11 16:02 / mas
Silver	ND	mg/L		0.5		SW6020	08/12/11 16:02 / mas
Thallium	ND	mg/L		0.5		SW6020	08/12/11 16:02 / mas
Zinc	ND	mg/L		1		SW6020	08/12/11 16:02 / mas

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Billings, MT Branch

Client: Butte Highlands Joint Venture
Project: Butte Highlands
Lab ID: B11080634-006
Client Sample ID BHJV 4A

Report Date: 08/15/11
Collection Date: 08/04/11 09:00
DateReceived: 08/05/11
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, SPLP EXTRACTABLE							
Arsenic	ND	mg/L		0.5		SW6020	08/12/11 16:07 / mas
Cadmium	ND	mg/L		0.1		SW6020	08/12/11 16:07 / mas
Copper	ND	mg/L		0.5		SW6020	08/12/11 16:07 / mas
Lead	ND	mg/L		0.5		SW6020	08/12/11 16:07 / mas
Manganese	ND	mg/L		0.5		SW6020	08/12/11 16:07 / mas
Molybdenum	ND	mg/L		0.5		SW6020	08/12/11 16:07 / mas
Nickel	ND	mg/L		0.5		SW6020	08/12/11 16:07 / mas
Selenium	ND	mg/L		0.1		SW6020	08/12/11 16:07 / mas
Silver	ND	mg/L		0.5		SW6020	08/12/11 16:07 / mas
Thallium	ND	mg/L		0.5		SW6020	08/12/11 16:07 / mas
Zinc	ND	mg/L		1		SW6020	08/12/11 16:07 / mas

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Billings, MT Branch

Client: Butte Highlands Joint Venture
Project: Butte Highlands
Lab ID: B11080634-007
Client Sample ID BHJV 4B

Report Date: 08/15/11
Collection Date: 08/04/11 09:12
DateReceived: 08/05/11
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, SPLP EXTRACTABLE							
Arsenic	ND	mg/L		0.5		SW6020	08/12/11 16:11 / mas
Cadmium	ND	mg/L		0.1		SW6020	08/12/11 16:11 / mas
Copper	ND	mg/L		0.5		SW6020	08/12/11 16:11 / mas
Lead	ND	mg/L		0.5		SW6020	08/12/11 16:11 / mas
Manganese	ND	mg/L		0.5		SW6020	08/12/11 16:11 / mas
Molybdenum	ND	mg/L		0.5		SW6020	08/12/11 16:11 / mas
Nickel	ND	mg/L		0.5		SW6020	08/12/11 16:11 / mas
Selenium	ND	mg/L		0.1		SW6020	08/12/11 16:11 / mas
Silver	ND	mg/L		0.5		SW6020	08/12/11 16:11 / mas
Thallium	ND	mg/L		0.5		SW6020	08/12/11 16:11 / mas
Zinc	ND	mg/L		1		SW6020	08/12/11 16:11 / mas

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Butte Highlands Joint Venture **Report Date:** 08/15/11
Project: Butte Highlands **Work Order:** B11080634

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020							Analytical Run: ICPMS203-B_110812A		
Sample ID: ICSA	Interference Check Sample A								08/12/11 10:18
Arsenic	4.80E-05	mg/L	0.0010						
Cadmium	0.000894	mg/L	0.0010						
Copper	-0.000143	mg/L	0.0010						
Lead	0.000103	mg/L	0.0010						
Manganese	0.000338	mg/L	0.0010						
Molybdenum	0.833	mg/L	0.0010	104	70	130			
Nickel	0.000285	mg/L	0.0010						
Selenium	6.60E-05	mg/L	0.0010						
Silver	7.70E-05	mg/L	0.0010						
Thallium	1.80E-05	mg/L	0.0010						
Zinc	0.000962	mg/L	0.0010						
Sample ID: ICSAB	Interference Check Sample AB								08/12/11 10:23
Arsenic	0.00989	mg/L	0.0010	99	70	130			
Cadmium	0.0103	mg/L	0.0010	103	70	130			
Copper	0.0195	mg/L	0.0010	97	70	130			
Lead	0.000110	mg/L	0.0010		0	0			
Manganese	0.0191	mg/L	0.0010	96	70	130			
Molybdenum	0.854	mg/L	0.0010	107	70	130			
Nickel	0.0198	mg/L	0.0010	99	70	130			
Selenium	0.00974	mg/L	0.0010	97	70	130			
Silver	0.0172	mg/L	0.0010	86	70	130			
Thallium	3.00E-06	mg/L	0.0010		0	0			
Zinc	0.0104	mg/L	0.0010	104	70	130			
Sample ID: QCS	Initial Calibration Verification Standard								08/12/11 14:16
Arsenic	0.0497	mg/L	0.0010	99	90	110			
Cadmium	0.0254	mg/L	0.0010	101	90	110			
Copper	0.0515	mg/L	0.0010	103	90	110			
Lead	0.0495	mg/L	0.0010	99	90	110			
Manganese	0.252	mg/L	0.0010	101	90	110			
Molybdenum	0.0471	mg/L	0.0010	94	90	110			
Nickel	0.0511	mg/L	0.0010	102	90	110			
Selenium	0.0501	mg/L	0.0010	100	90	110			
Silver	0.0239	mg/L	0.0010	96	90	110			
Thallium	0.0457	mg/L	0.0010	91	90	110			
Zinc	0.0523	mg/L	0.0010	105	90	110			
Method: SW6020									Batch: 56156
Sample ID: MB-56156	Method Blank				Run: ICPMS203-B_110812A				08/12/11 15:21
Arsenic	0.0006	mg/L	0.0003						
Cadmium	0.0001	mg/L	3E-05						
Copper	0.0008	mg/L	0.0002						

Qualifiers:

RL - Analyte reporting limit. ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Butte Highlands Joint Venture **Report Date:** 08/15/11

Project: Butte Highlands **Work Order:** B11080634

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 56156
Sample ID: MB-56156	Method Blank				Run: ICPMS203-B_110812A			08/12/11 15:21	
Lead	0.0001	mg/L	2E-05						
Manganese	ND	mg/L	9E-05						
Molybdenum	ND	mg/L	0.0002						
Nickel	0.001	mg/L	0.0002						
Selenium	ND	mg/L	0.0005						
Silver	0.0006	mg/L	0.0001						
Thallium	ND	mg/L	3E-05						
Zinc	0.004	mg/L	0.001						
Sample ID: B11080634-007ADIL	Serial Dilution				Run: ICPMS203-B_110812A			08/12/11 16:16	
Arsenic	0.0684	mg/L	0.50		0	0		20	
Cadmium	ND	mg/L	0.10		0	0		20	
Copper	0.0596	mg/L	0.50		0	0		20	
Lead	0.0168	mg/L	0.50		0	0		20	
Manganese	0.362	mg/L	0.50		0	0		20	
Molybdenum	0.00113	mg/L	0.50		0	0		20	N
Nickel	0.0348	mg/L	0.50		0	0		20	
Selenium	0.00321	mg/L	0.10		0	0		20	N
Silver	ND	mg/L	0.50		0	0		20	
Thallium	ND	mg/L	0.50		0	0		20	
Zinc	0.108	mg/L	1.0		0	0		20	
Sample ID: LCS-56156	Laboratory Control Sample				Run: ICPMS203-B_110812A			08/12/11 16:21	
Arsenic	0.500	mg/L	0.50	100	85	115			
Cadmium	0.245	mg/L	0.10	98	85	115			
Copper	0.536	mg/L	0.50	107	85	115			
Lead	0.492	mg/L	0.50	98	85	115			
Manganese	2.44	mg/L	0.50	98	85	115			
Molybdenum	0.478	mg/L	0.50	96	85	115			
Nickel	0.534	mg/L	0.50	107	85	115			
Selenium	0.525	mg/L	0.10	105	85	115			
Silver	0.0445	mg/L	0.50	88	85	115			
Thallium	0.519	mg/L	0.50	104	85	115			
Zinc	0.578	mg/L	1.0	115	85	115			
Sample ID: LCSD-56156	Laboratory Control Sample Duplicate				Run: ICPMS203-B_110812A			08/12/11 16:44	
Arsenic	0.492	mg/L	0.50	98	85	115			
Cadmium	0.252	mg/L	0.10	101	85	115			
Copper	0.523	mg/L	0.50	104	85	115			
Lead	0.501	mg/L	0.50	100	85	115			
Manganese	2.48	mg/L	0.50	99	85	115			
Molybdenum	0.495	mg/L	0.50	99	85	115			
Nickel	0.522	mg/L	0.50	104	85	115			
Selenium	0.508	mg/L	0.10	102	85	115			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

N - The analyte concentration was not sufficiently high to calculate a RPD for the serial dilution test.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Butte Highlands Joint Venture **Report Date:** 08/15/11

Project: Butte Highlands **Work Order:** B11080634

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 56156
Sample ID: LCSD-56156	Laboratory Control Sample Duplicate				Run: ICPMS203-B_110812A				08/12/11 16:44
Silver	0.0462	mg/L	0.50	91	85	115			
Thallium	0.524	mg/L	0.50	105	85	115			
Zinc	0.506	mg/L	1.0	100	85	115			
Sample ID: B11080634-001AMS3	Sample Matrix Spike				Run: ICPMS203-B_110812A				08/12/11 16:48
Arsenic	0.514	mg/L	0.50	101	75	125			
Cadmium	0.251	mg/L	0.10	100	75	125			
Copper	0.550	mg/L	0.50	106	75	125			
Lead	0.508	mg/L	0.50	101	75	125			
Manganese	2.56	mg/L	0.50	100	75	125			
Molybdenum	0.487	mg/L	0.50	97	75	125			
Nickel	0.537	mg/L	0.50	106	75	125			
Selenium	0.518	mg/L	0.10	104	75	125			
Silver	0.0469	mg/L	0.50	93	75	125			
Thallium	0.528	mg/L	0.50	105	75	125			
Zinc	0.556	mg/L	1.0	101	75	125			
Sample ID: B11080634-002AMS3	Sample Matrix Spike				Run: ICPMS203-B_110812A				08/12/11 16:53
Arsenic	0.529	mg/L	0.50	98	75	125			
Cadmium	0.245	mg/L	0.10	98	75	125			
Copper	0.533	mg/L	0.50	103	75	125			
Lead	0.499	mg/L	0.50	99	75	125			
Manganese	2.64	mg/L	0.50	98	75	125			
Molybdenum	0.488	mg/L	0.50	98	75	125			
Nickel	0.525	mg/L	0.50	104	75	125			
Selenium	0.504	mg/L	0.10	101	75	125			
Silver	0.0466	mg/L	0.50	92	75	125			
Thallium	0.520	mg/L	0.50	104	75	125			
Zinc	0.524	mg/L	1.0	96	75	125			
Sample ID: B11080634-003AMS3	Sample Matrix Spike				Run: ICPMS203-B_110812A				08/12/11 16:58
Arsenic	0.505	mg/L	0.50	100	75	125			
Cadmium	0.249	mg/L	0.10	99	75	125			
Copper	0.534	mg/L	0.50	105	75	125			
Lead	0.504	mg/L	0.50	100	75	125			
Manganese	2.60	mg/L	0.50	100	75	125			
Molybdenum	0.490	mg/L	0.50	98	75	125			
Nickel	0.528	mg/L	0.50	105	75	125			
Selenium	0.514	mg/L	0.10	103	75	125			
Silver	0.0472	mg/L	0.50	94	75	125			
Thallium	0.528	mg/L	0.50	106	75	125			
Zinc	0.522	mg/L	1.0	99	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Butte Highlands Joint Venture **Report Date:** 08/15/11
Project: Butte Highlands **Work Order:** B11080634

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 56156
Sample ID: B11080634-004AMS3	Sample Matrix Spike				Run: ICPMS203-B_110812A				08/12/11 17:02
Arsenic	0.520	mg/L	0.50	101	75	125			
Cadmium	0.254	mg/L	0.10	102	75	125			
Copper	0.544	mg/L	0.50	107	75	125			
Lead	0.517	mg/L	0.50	102	75	125			
Manganese	2.70	mg/L	0.50	102	75	125			
Molybdenum	0.498	mg/L	0.50	100	75	125			
Nickel	0.540	mg/L	0.50	106	75	125			
Selenium	0.503	mg/L	0.10	100	75	125			
Silver	0.0474	mg/L	0.50	95	75	125			
Thallium	0.540	mg/L	0.50	108	75	125			
Zinc	0.532	mg/L	1.0	101	75	125			
Sample ID: B11080634-005AMS3	Sample Matrix Spike				Run: ICPMS203-B_110812A				08/12/11 17:07
Arsenic	0.506	mg/L	0.50	98	75	125			
Cadmium	0.252	mg/L	0.10	101	75	125			
Copper	0.534	mg/L	0.50	104	75	125			
Lead	0.513	mg/L	0.50	101	75	125			
Manganese	2.73	mg/L	0.50	100	75	125			
Molybdenum	0.499	mg/L	0.50	100	75	125			
Nickel	0.537	mg/L	0.50	105	75	125			
Selenium	0.497	mg/L	0.10	99	75	125			
Silver	0.0478	mg/L	0.50	96	75	125			
Thallium	0.522	mg/L	0.50	104	75	125			
Zinc	0.550	mg/L	1.0	102	75	125			
Sample ID: B11080634-006AMS3	Sample Matrix Spike				Run: ICPMS203-B_110812A				08/12/11 17:11
Arsenic	0.508	mg/L	0.50	98	75	125			
Cadmium	0.247	mg/L	0.10	99	75	125			
Copper	0.535	mg/L	0.50	104	75	125			
Lead	0.508	mg/L	0.50	100	75	125			
Manganese	2.69	mg/L	0.50	101	75	125			
Molybdenum	0.482	mg/L	0.50	96	75	125			
Nickel	0.526	mg/L	0.50	104	75	125			
Selenium	0.500	mg/L	0.10	100	75	125			
Silver	0.0470	mg/L	0.50	94	75	125			
Thallium	0.517	mg/L	0.50	103	75	125			
Zinc	0.526	mg/L	1.0	93	75	125			
Sample ID: B11080634-007AMS3	Sample Matrix Spike				Run: ICPMS203-B_110812A				08/12/11 17:16
Arsenic	0.576	mg/L	0.50	102	75	125			
Cadmium	0.258	mg/L	0.10	103	75	125			
Copper	0.594	mg/L	0.50	108	75	125			
Lead	0.534	mg/L	0.50	104	75	125			
Manganese	2.98	mg/L	0.50	104	75	125			

Qualifiers:

RL - Analyte reporting limit. ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Butte Highlands Joint Venture **Report Date:** 08/15/11

Project: Butte Highlands **Work Order:** B11080634

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 56156
Sample ID: B11080634-007AMS3	Sample Matrix Spike				Run: ICPMS203-B_110812A				08/12/11 17:16
Molybdenum	0.506	mg/L	0.50	101	75	125			
Nickel	0.568	mg/L	0.50	107	75	125			
Selenium	0.510	mg/L	0.10	102	75	125			
Silver	0.0503	mg/L	0.50	99	75	125			
Thallium	0.542	mg/L	0.50	108	75	125			
Zinc	0.700	mg/L	1.0	123	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

Workorder Receipt Checklist

B11080634

Butte Highlands Joint Venture

Login completed by: Gina McCartney
Date Received: 8/5/2011
Reviewed by: BL2000\kmcdonald
Received by: krr
Reviewed Date: 8/5/2011
Carrier name: Return-UPS Ground

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☐	No ☑	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature:	20.4°C		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	Not Applicable ☑

Contact and Corrective Action Comments:

The container for sample BHJV 4A was received broken. Was able to save enough of the sample to continue with analysis.

Per phone call to Doug Rogness of AMEC, analyze for SPLP metals.

ENERGY

Chain of Custody and Analytical Request Record

PLEASE PRINT (Provide as much information as possible.)

Company Name: BUTTE HIGHLANDS JV

Project Name, PWS, Permit, Etc.: BUTTE HIGHLANDS

Sample Origin State: MONTANA

EPA/State Compliance: Yes ☐ No ☑

Report Mail Address: P.O. BOX 4959, BUTTE, MT 59702

Contact Name: HENRY BOGERT Phone/Fax: 406-491-5632 Email: HENRYBOGERT@GMAIL.COM

Sampler: (Please Print) HENRY BOGERT

Invoice Address: P.O. BOX 4959, BUTTE, MT 59702

Invoice Contact & Phone: HENRY BOGERT 406-491-5632

Purchase Order:

Quote/Bottle Order: 50771

Special Report/Formats:

☐ DW ☐ POTW/WWTP ☐ State: _____ ☐ Other: _____

☐ EDD/EDT (Electronic Data) Format: _____ ☐ LEVEL IV ☐ NELAC

ANALYSIS REQUESTED

Number of Containers
Sample Type: A W S V B O DW
Air Water Soils/Solids Vegetation Bioassay Other DW - Drinking Water

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	SPLP	SEE ATTACHED	Standard Turnaround (TAT)	RUSH
1 BHJV 1A	04AUG11	1007	1S	✓		✓	
2 BHJV 1B		1005	1S	✓		✓	
3 BHJV 1C		0930	1S	✓		✓	
4 BHJV 2A		0810	1S	✓		✓	
5 BHJV 2B		0820	1S	✓		✓	
6 BHJV 4A		0900	1S	✓		✓	
7 BHJV 4B		0912	1S	✓		✓	
8							
9							
10							

Contact ELI prior to **RUSH** sample submittal for charges and scheduling – See Instruction Page

Comments: Metals: (L) As, Cd, Cu, Pb Mn, Mo, Ni, Se, Ag, Tl, Zn

Shipped by: Rth UPS

Cooler ID(s):

Receipt Temp 20.4°C

On Ice: Y (N)

Custody Seal On Bottle Y (N) On Cooler (Y) N

Intact (Y) N

Signature Match (Y) N

LABORATORY USE ONLY: 1408063400/ -002 -003 -004 -005 -006 -007

Custody Record MUST be Signed

Relinquished by (print): HENRY BOGERT Date/Time: 04AUG11/1052 Signature:

Relinquished by (print): Date/Time: Signature:

Received by (print): Date/Time: Signature:

Received by (print): Date/Time: Signature:

Received by Laboratory: Date/Time: 8/5/11 0900 Signature:

Sample Disposal: Return to Client: _____ Lab Disposal: ✓

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.

HYDROGEOLOGIC CHARACTERIZATION
AND
NUMERICAL GROUNDWATER MODELING
FOR THE
BUTTE HIGHLANDS UNDERGROUND MINE

REVISED

Prepared

for

Butte Highlands Joint Venture

Prepared
by
Itasca Denver, Inc.

June 2011
***REVISED* January 2012**

#1938

ITASCA™
Denver, Inc.

ITASCA Denver, Inc.

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EXECUTIVE SUMMARY

Method of Investigation

A hydrogeologic investigation has been conducted by Itasca Denver, Inc. of Colorado (Itasca) at the Butte Highlands Joint Venture (BHJV) project over the last nine months. The investigation has included:

1) conducting a review of existing hydrogeologic reports by previous consultants and geologic and hydrologic data collected by BHJV staff;
2) recommendations for additions to the existing groundwater monitoring system by BHJV's construction of two multi-level piezometers to assess groundwater hydraulic gradients (both horizontal and vertical);
3) assistance in the location and design of a prototype mine dewatering well;
4) assistance with the completion of a step-drawdown test and a 10-day constant-rate pumping test of the prototype dewatering well to estimate the hydraulic properties of the various hydrogeologic units in the vicinity of the Butte Highlands mine; and
5) developing a numerical groundwater flow model to estimate the amount of dewatering that will be required to maintain the planned underground mine under "dry" conditions, and to assess the potential impacts of mine dewatering on nearby surface-water resources.

Findings from Investigations

Findings from the field programs and data analyses that were used to create the groundwater flow model included the following:

1) The geology in the project area is complex and includes several different sedimentary formations, intrusive rocks, and mineralized zones which have been folded and faulted.
2) The hydrogeologic system is complex and is characterized by a wide range of hydraulic heads, hydraulic gradients, and rock hydraulic properties.
3) The groundwater system in the project area is divided into compartments that are separated by faults and/or different rock types/formations.
4) From the standpoint of mine dewatering, rock permeability is governed by secondary permeability (i.e., permeability induced by faulting and fracturing).
5) The flooded workings of the Old Highlands mine are hydraulically connected to the Butte Highlands mine.
6) The method of constructing the prototype dewatering well by setting steel casing followed by mechanical perforation is judged to be an adequate well construction method and could serve as a model for future dewatering wells.

EXECUTIVE SUMMARY
(continued)

Predicted Mine Dewatering Requirements

The principal conclusions of the numerical groundwater modeling study are the following:

1) The Meagher dolomite is the main water-bearing unit in the mine area. Most of the projected dewatering wells should be targeted in the Meagher, with smaller yielding wells targeted to dewater the intrusive and Belt Group rocks south of the ore deposit.
2) The predicted dewatering rate for the proposed Butte Highlands mine is predicted to be approximately 750 gpm. Itasca assumed that it would be best from a water discharge standpoint to dewater at a constant rate rather than dewatering to just staying ahead of mining which would result in a higher pumping rate the last year of mining. It is possible that the pumping rate would need to increase slightly during spring/summer snowmelt and associated groundwater recharge.
3) Mine dewatering is predicted to stop the outflow of water from the Old Highlands mine portal. Dewatering is also predicted to cause decrease of baseflow in a small side stream that feeds into Fish Creek, resulting in a reduction of approximately 10 percent of the Fish Creek baseflow. The southernmost tributary to Fish Creek, which contributes the most baseflow to the creek, is not predicted to be impacted. Moose Creek is also predicted to have no impact from mine dewatering and flows in all drainages during spring runoff are not expected to be impacted.

Recommendations for Further Studies

1) The hydraulic properties of the Belt Group rocks should be investigated further. A flow/shut-in test should be conducted at UGPZ-3 to further refine estimates of the hydraulic properties of these geologic materials. This test would further assess the behavior of the Belt Group rocks and the efficacy of installing dewatering wells in the Belt Group rocks.
2) Installation of a piezometer in the diorite should be considered. This piezometer could be constructed in the same way as UGPZ-3 (i.e., an open hole with sealed surface casing and pressure gauge).
3) This report is not meant to fully describe the location and timing of dewatering well installation at the proposed Butte Highland mine. Itasca understands that dewatering wells will be drilled from access ramps, and that wells will be replaced as the water levels and mining become deeper. Itasca suggests that there is sufficient lead time to test the hydraulic properties of each well, especially if they are installed in the Wolsey, diorite or Belt Group rocks, since only the hydraulic properties of the Meagher have been evaluated.

1.0 INTRODUCTION

Butte Highlands Joint Venture (BHJV) is in the process of developing the Butte Highlands mine, an underground gold mine that is located approximately 15 miles south of Butte, Montana (Figure 1). Initial groundwater investigations resulted in estimates of cumulative inflow to the mine during the exploration and production phases ranging from 200 to 400 gallons per minute (gpm). After advancement of the exploration ramp began, actual inflows were significantly higher than estimated. In response, BHJV contacted Itasca Denver, Inc., (Itasca) to undertake additional investigations designed to refine estimates of mine inflow.

A primary goal of this investigation is to characterize and describe the behavior of the groundwater flow system at the BHJV project so that effective dewatering systems can be designed that will allow mining under dewatered conditions. An additional issue that was addressed was the potential impact of mine dewatering on the surface-water resources near the mine.

The following report describes the methods and findings of groundwater investigations that were conducted by Itasca as part of the development of the BHJV project. The numerical groundwater flow modeling, that is the focus of this report, is based upon a conceptual hydrogeologic model developed using data collected during previous investigations conducted in 2009 and 2010 by others, and the field hydraulic testing conducted jointly by BHJV and Itasca in January 2011.

The primary analytical tool of this investigation is a numerical groundwater flow model developed by Itasca that simulates the proposed mine and dewatering system and predicts the potential impacts of mine dewatering on the groundwater and surface-water resources in the vicinity of the mine.

2.0 PREVIOUS WORK

This investigation relied on previously collected data and information from earlier studies of the BHJV mine area. The primary sources of information reviewed and utilized in this evaluation were the following:

- Hydrogeologic Characterization Report — Butte Highlands Mine Project, Montana. Prepared by AMEC Geomatrix, Inc., for Timberline Resources, January 2009;
- Groundwater Study Update — Butte Highlands Mine Project, Montana. Prepared by AMEC Geomatrix, Inc., for Timberline Resources, August 2009.
- Updated Hydrogeologic Characterization Report — Butte Highlands Mine Project, Montana. Prepared by AMEC Geomatrix, Inc., for Timberline Resources, April 2010.

3.0 PROJECT LOCATION

The Butte Highlands project site is located in the Highlands mining district approximately 15 miles south of Butte, Montana along the Continental Divide in the Highland Mountains of Deerlodge National Forest (Figure 1). The project area is located in Sections 31 and 32, Township 01 North, Range 07 West. U.S. Geological Survey topographic coverage is provided by the Mount Humbug and Pipestone Pass 7.5 minute quadrangles. Elevations in the project area range from a high of 10,070 ft NGVD (National Geodetic Vertical Datum) at the summit of Red Mountain to about 7,200 ft NGVD on the west side of the project area. The project area covers the headwaters of drainage basins for three creeks: Fish Creek, Basin Creek, and Moose Creek.

The climate of the project area is characterized by four seasons, with warm summers and cold, snowy winters. Precipitation is approximately 24 to 26 inches per year (in/yr). A SNOTEL station located in the upper Basin Creek watershed at an elevation of 7,180 ft shows a 30-year annual average precipitation of about 24.5 inches, with about 10 inches occurring as snow-water equivalent during the period of October through April (NRCS, 2008).

3.1 MINING HISTORY

Placer miners working the Fish Creek and Moose Creek drainages discovered gold-bearing rock sometime before 1868. By 1897, hardrock mining at the Highlands mine site included a shaft driven to a depth of 200 ft. The Highlands Mining Company was formed in 1931 and by 1932, 600 tons of ore containing more than one ounce per ton gold was produced. Mining operations continued until 1942 when the operation was closed by order of the U. S. government with the advent of World War II. Total production from the district from the 1860s has been estimated to be in excess of 63,000 ounces of gold (Sahinen, 1950).

The Old Highlands mine (Figure 2) consists of a 2,300 ft long ramp driven in a southeasterly direction on an upward slope of about 1.5 percent. The ramp connects to an inclined shaft which was driven 600 ft at an angle of -60 degrees paralleling the dip of the orebody. The orebody was accessed on four levels from cross cuts extending from the inclined shaft. During shaft sinking, large inflows of groundwater, up to 600 gpm, were experienced (Sahinen, 1950). These mine workings are currently flooded and contribute outflow at the portal that is being monitored by the BHJV.

3.2 CURRENT PROJECT STATUS

The project is currently in an exploration phase with underground operations consisting of the following elements (Figure 2):

The Main Access Ramp (MAR) was driven down at a -15 percent grade. Groundwater inflows were first encountered on 29 March 2010 at a ramp elevation of about 7,339 ft. On 15 June 2010, at a ramp elevation of about 7,283 ft, operations ceased in this drift due to excessive groundwater inflow (about 250 gpm) and it was allowed to flood.

The Crosscut (XCUT) was driven to connect the MAR to the Upper Access Ramp (UAR).

The UAR was driven at a +2 percent grade towards planned exploration drilling stations. Advancement of this ramp was begun after the MAR flooded. In late August 2010, groundwater inflows in this heading reached 340 gpm when it was advanced into a diorite intrusive. The area was subsequently grouted and flows were reduced to about 34 gpm.

The Hanging Wall Access Ramp (HWAR) was also driven at a +2 percent grade towards planned exploration drilling locations. Significant groundwater inflows were not encountered. The HWAR also provides access to the prototype mine dewatering well (DWW10-01) and underground piezometers (UGPZ-1, -2, and -3).

Since the MAR was allowed to flood, groundwater inflow has steadily decreased as the water level in the MAR approached the level of the surrounding water table, and also as a result of grouting in the ramps. At the time of this report (June 2011), inflow to the ramps was averaging approximately 34 gpm.

4.0 PROTOTYPE DEWATERING WELL PROGRAM AND AQUIFER TESTING

In August 2010, Itasca visited the BHJV project to meet with BHJV personnel and observe groundwater inflow conditions in the underground mine. As a result of this visit, Itasca recommended that aquifer testing be performed to further assess the hydrogeologic characteristics of the project site and mine dewatering requirements.

Subsequently, Itasca submitted a Work Plan (Itasca, 2010) recommending hydraulic testing to estimate the hydraulic properties of the rock in the mine area and to assess the feasibility of mine dewatering using dewatering wells. Following Itasca's recommendations, BHJV installed a prototype dewatering well (DWW10-01) and two grouted-in, multi-level piezometers (UGPZ-1 and UGPZ-2) (Figure 3).

Prototype dewatering well DWW10-01 was drilled and completed from a location on the ground surface using an air-rotary/casing advance system. Drilling services were provided by O'Keefe Drilling of Butte, Montana. From the ground surface to a depth of 600 ft (7,287 ft NGVD) a 12-inch diameter bore and 10-inch steel casing were advanced and the casing was cemented. Next, a 10-inch bore and 8-inch steel casing were advanced to a depth of 980 ft (6,907 ft NGVD) when the drill bit and casing became stuck in the bore. As a result, the bit and casing were shot off at a depth of 952 ft (6,935 ft NGVD). The 8-inch casing was perforated from a depth of 520 ft (7,367 ft NGVD) to a depth of 935 ft (6,952 ft NGVD).

Subsequently the HWAR was advanced to intercept the well. The well casing was cut, effectively moving the well collar from the ground surface to a location along the HWAR at the elevation 7,370 ft NGVD (Figure 3). The well was equipped with an electric submersible Franklin ™ pump capable of 400 gpm. A variable frequency drive (VFD) and flow meter were installed so that the well production rate could be controlled and measured.

Underground piezometer UGPZ-2 was installed 57 ft from the dewatering well. The NQ-size bore for this piezometer was drilled to a depth of 560 ft (6,836 ft NGVD) and three vibrating wire pressure transducers were grouted in at depths of 270 ft (7,094.8 ft NGVD), 320 ft (7,044.8 ft NGVD), and 370 ft (6,944.8 ft NGVD).

Underground piezometer UGPZ-1 was installed 528 ft southwest of the dewatering well. The NQ-size bore for this piezometer was drilled to a depth of 429 ft (6,936 ft NGVD) and three vibrating wire pressure transducers were grouted in at depths of 390 ft (6,966.4 ft NGVD), 440 ft (6,916.4 ft NGVD), and 490 ft (6,866.4 ft NGVD).

A third underground piezometer, UGPZ-3, was installed by BHJV. This piezometer is located near the end of the UAR (Figure 2). This is an open NQ-size angle bore (-60°, azimuth 123°) drilled to a length of 200 ft. It is equipped with a cemented surface casing and pressure gauge.

4.1 DEWATERING WELL PUMPING TESTS

The 5.4-hour step-drawdown test followed by a 10-day constant-rate pumping test with recovery measurements were designed to hydraulically stress the groundwater system so that responses in piezometers could be used to:

- assess dewatering well performance;
- assess whether aquifer boundaries exist (i.e., assess the degree of aquifer compartmentalization); and
- provide the necessary rock hydraulic property data for development of a numerical groundwater flow model to be used to assess the long-term underground mine dewatering requirements.

During these pumping tests, formation water pressures were monitored in underground piezometers UGPZ-1, UPGZ-2, and UGPZ-3. Surface monitoring wells BHH08-01, BHH09-01, BHH09-02, BHH09-04, and BHH09-05 were equipped with submersible pressure transducers to monitor water levels during the test. The results of the tests are described in the following sections of this report.

4.1.1 Dewatering Well DWW10-01 Step-Drawdown Test

The DWW10-01 step-drawdown test was conducted to assess well performance and to estimate the optimum pumping rate for the constant-rate test. During the test, water levels in the pumping well were monitored at one-minute intervals using a submersible pressure transducer. The well pumping rates were increased in steps from 126, to 175, to 294, to 376, and to the maximum achievable rate of 409 gpm.

Figure 4 shows the observed drawdown at each of the pumping rates. As indicated, relatively stable drawdown occurred almost immediately after each pumping rate increase with a maximum drawdown of approximately 80 ft at a pumping rate of 409 gpm.

The specific capacity (in gpm/ft) at each of the five pumping rates was 12.4 at 126 gpm, 10.3 at 175 gpm, 6.9 at 294 gpm, 5.6 at 376 gpm, and 5.1 at 409 gpm.

4.1.2 10-Day Constant-Rate Pumping Test

Pumping for the constant-rate test of well DWW10-01 began at 14:10 on 18 January 2011 and continued through 14:14 on 28 January 2011 (a period of 10.05 days), after which water-level recovery was monitored for 10 days. Based on the step-drawdown test, a nominal pumping rate of 350 gpm was selected to allow extra pumping capacity in the event that it was needed due to increasing drawdown during the test. The average pumping rate for the 10-day pumping period was 347 gpm.

Appendix A contains the pumping and recovery curves for DWW10-01, the underground piezometers, and the surface monitoring wells. Appendix B contains the pumping-test analyses.

4.1.2.1 Drawdown Response

Drawdown in the Pumped Well

Table 1 (see page 9) presents the maximum drawdown measured in pumping well DWW10-01, the monitoring wells, and the piezometers. Figure 5 is a distance-drawdown plot showing the maximum drawdowns, measured at the same time, in each monitoring well and piezometer versus the distance from pumping well DWW10-01. The drawdown in DWW10-01 at the end of the pumping period was 70 ft. This plot was used to assess the efficiency of well DWW10-01 which can be defined as:

$$\textit{Well Efficiency} = \frac{\textit{Theoretical Drawdown}}{\textit{Measured Drawdown}} \, x \, 100\%$$

Theoretical drawdown is estimated by extending the regression line in Figure 5 to its intercept with the Y axis (Y = 27 ft). Using this technique, the efficiency of well DWW10-01 is estimated at 39 percent at a pumping rate of 347 gpm.

The difference between theoretical and measured drawdown in the pumping well is due to "well loss." In all wells, well losses increase with increasing pumping rates. For DWW10-01, this is indicated by the decreasing specific capacity (the number of gallons per minute required to produce a foot of drawdown) as the pumping rate increases. Well loss can be caused by a number of factors including poor well development (i.e., drilling fluid left in the bore, or a poorly designed gravel pack and/or well screen). Because well DWW10-01 was drilled using only air and water and because a gravel pack was not installed, these factors are unlikely to be the cause of well loss. In wells completed in aquifers in which the primary source of hydraulic conductivity (*K*) is flow

through fractures, well loss can be significant. This is because, as the rate of flow to the well increases, flow through the fractures transitions from laminar to turbulent flow. At low pumping rates, fracture flow is laminar but as the rate increases the flow becomes turbulent and well loss increases. Well efficiency is a concern for water-supply wells where long-term, steady production is the goal. DWW10-01 would be more efficient at lower pumping rates but it would also be less effective as a dewatering well.

Drawdown in the Observation Wells and Piezometers

Pumping from an ideal confined aquifer of infinite extent will result in a time-drawdown response similar to that shown in Figure 6 for the portion of the curve labeled "Theoretical Drawdown – Infinite Aquifer." For this condition, the time-drawdown relationship is linear for all but the earliest minutes of pumping. In Figure 6, the section of the curve labeled "Observed Drawdown – Boundary Effect" is taken from piezometer UGPZ-2 and is typical of the responses observed in the monitoring wells and piezometers during the 10-day test (Appendix B). The increasing steepness of the curve with time is a result of the cone of depression around the pumping well reaching a boundary of lower *K* relative to the aquifer in which the pumping well is completed. At Butte Highlands, such a boundary is likely to be a fault—the mine is in a structurally complex setting in which faults are common—or, less permeable rock such as the intrusive bodies that surround the mine area.

Another indication of a boundary effect is derived from the observed drawdowns in the wells and piezometers. Drawdown in monitoring wells BHH09-02, BHH-09-04, and piezometer UGPZ-1 was 11.7, 20.59, and 16 ft, respectively. In comparison, drawdown in monitoring wells BHH08-01, BHH09-01, and BHH09-05 was much less at 2.87, 2.6 and 4.94 ft, respectively. As shown in Figure 7, wells BHH08-01, BHH09-01, and BHH09-05 are on the opposite side of the northeast trending fault from BHH09-02, BHH-09-04, and UGPZ-1. This indicates that the fault may act as a barrier to groundwater flow. This observation is consistent with the segmented nature of the drawdown curves, as discussed above, which indicate aquifer boundaries.

From the standpoint of mine dewatering, boundary effects are a favorable result indicating that the water-bearing rocks are compartmentalized which could limit the amount of dewatering required.

Table 1

Summary of Results - DWW10-01 Constant-Rate Test

Well/Piezometer ID	Maximum Drawdown (ft)	Percent Recovery (time of recovery in hours)	Transmissivity (ft^2/day)	Hydraulic Conductivity (*K*) (ft/day)	Monitored Formation
DWW10-01	70	86 (67)			Meagher
Theis Recovery			2,701	7.0	
C-J early time			1,504	3.9	
BHH08-01	2.9	39 (240)			Meagher
Theis Recovery			Insufficient recovery for *K* estimate		
C-J early time			9,571	24.9	
BHH09-01	2.6	no recovery			Meagher
Theis Recovery			Insufficient recovery for *K* estimate		
C-J early time			1,757	4.6	
BHH09-02	11.7	85 (191)			Wolsey, skarn
Theis Recovery			3,847	10	
C-J early time			3,652	9.5	
C-J middle time			1,647	4.3	
C-J late time			1,207	3.1	
BHH09-04	20.6	90 (240)			Meagher
Theis Recovery			1,706	4.4	
C-J early time			3,264	8.5	
C-J middle time			1,048	2.7	
C-J late time			543	1.4	
BHH09-05	4.9	63 (240)			Meagher
Theis Recovery			6,015	15.7	
C-J early time			11,460	29.8	
C-J middle time			3,476	9.1	
C-J late time			1,320	3.4	
UGPZ-1 upper	16.2	84 (240)			Meagher
Theis Recovery			2,531	6.6	
C-J early time			3,408	8.9	
C-J middle time			1,227	3.2	
C-J late time			594	1.5	
UGPZ-1 middle	16.2	83 (240)			Meagher/Wolsey
Theis Recovery			3,139	8.2	
C-J early time			4,644	12.1	
C-J middle time			1,431	3.7	
C-J late time			1,114	2.9	

Well/Piezometer ID	Maximum Drawdown (ft)	Percent Recovery (time of recovery in hours)	Transmissivity (ft^2/day)	Hydraulic Conductivity (*K*) (ft/day)	Monitored Formation
UGPZ-1 lower	12.6	90 (240)			Flathead/Belt ±
Theis Recovery			3,139	8.2	diorite
C-J early time			4,644	12.1	
C-J middle time			1,431	3.7	
C-J late time			1,114	2.9	
UGPZ-2 upper	27.4	92 (240)			Meagher
Theis Recovery			2,253	5.9	
C-J early time			2,204	5.7	
C-J middle time			847	2.2	
C-J late time			592	1.5	
UGPZ-2 middle	24.6	87 (240)			Meagher/Wolsey
Theis Recovery			2,195	5.7	
C-J early time			1,473	3.8	
C-J middle time			1,157	3.0	
C-J late time			493	1.3	
UGPZ-2 lower	14.4	95 (240)			Wolsey
Theis Recovery			6,043	15.7	
C-J early time			5,783	15.1	
C-J middle time			1,742	4.5	
C-J late time			746	1.9	
UGPZ-3	Insufficient data for analysis				Belt

Notes: C-J = Cooper-Jacob method

4.1.2.2 Water-Level Recovery

Table 1 also presents the percent of water-level recovery measured in each of the piezometers and wells at various times after the 10-day pumping period. In most instances, the percent recovery was calculated ten days (240 hours) after the cessation of pumping. However, for dewatering well DWW10-01 recovery was monitored for only 67 hours. In monitoring well BHH09-02, the water level began to decline after 191 hours, perhaps in response to drilling activities in the mine. The water level in well BHH09-01 did not recover after the end of pumping.

As indicated, recovery at DWW10-01, BHH90-02, BHH09-04, UGPZ-1, and UGPZ-2 exceeded 83 percent in 10 days or less. In contrast, recovery at BHH08-01, BHH09-01, and BHH09-05 was 63 percent or less after 10 days.

Partial recovery after an extended pumping period is indicative of aquifer storage depletion and limited, or absent, recharge. From the standpoint of mine dewatering, this is a favorable indication in that it will tend to reduce the amount of dewatering required.

4.1.2.3 Estimates of Hydraulic Conductivity

Hydraulic conductivities (*K*) of the geologic materials were estimated for the pumping and recovery phases of the test using analytical techniques. These techniques included the Cooper-Jacob method for analysis of data acquired during the pumping period of the test and the Theis Recovery method for water-level recovery data acquired after the cessation of pumping. The computer program AQTESOLV© was used to facilitate the analyses. The Cooper-Jacob method was used because boundary-associated changes in slope of the drawdown curves can be easily identified. Key assumptions of the Cooper-Jacob and Theis Recovery methods are that the aquifer is of infinite areal extent, and that it is homogeneous, isotropic, and of uniform thickness. These assumptions are not specifically applicable to the Butte Highlands mine site thereby limiting the applicability of these methods—and many other analytical methods as well. Nevertheless, it is useful to perform such analyses to obtain initial estimates of *K* and to assess other aquifer characteristics, such as the existence of boundaries. Hydraulic property estimates of the various rock types were refined as part of the numerical model calibration process.

The *K* values presented in Table 1 were estimated using water-level data recorded during early, middle, and late times during the 10-day test and water-level recovery data. Early, middle, and late time data correspond to distinct changes in slope of the drawdown curves (Appendix B) that indicate aquifer boundaries. Estimates of *K* made using the early time data are judged to be most representative of the Meagher dolomite and the Wolsey shale in which well DWW10-01 is completed.

The *K* values derived from the early time data in underground piezometers UGPZ-1 and UGPZ-2 are judged to be most representative of the Meagher dolomite in which these piezometers are completed. The early time average for the underground piezometers is 9.1 ft/day. *K* values derived from middle and late time data in these piezometers are lower because of boundary effects and average 2.6 ft/day. The overall average *K* value for all of the wells and piezometers is 7 ft/day. In general, there is little variation among these values and they are typical of fractured rock (Freeze and Cherry, 1979).

5.0 CONCEPTUAL HYDROGEOLOGIC MODEL

Mine site groundwater investigations designed to support numerical modeling programs should assess the geologic and hydrologic components that will influence the surrounding groundwater system and mining operation. Such an assessment results in the creation of a conceptual model which is the foundation for subsequent numerical modeling efforts. Each of the sections below discusses a component of the conceptual model based on Itasca's understanding of the hydrogeologic system.

5.1 HYDROGEOLOGIC SETTING

The Butte Highlands mine area is located near Nevin Hill in the Highland Mountains which are part of the Montana frontal fold and thrust zone (Pearson et al., 1990). The area occupies a border zone between plutonic rocks of Boulder batholith affinity to the north and structurally complex sedimentary rocks occurring as part of folded thrust sheets to the south. Thrusting took place generally from west to east during Late Cretaceous and Paleocene time producing complex structural and stratigraphic relationships. From oldest to youngest, rocks in the area include schist and gneiss of Archean age and middle Proterozoic sedimentary rocks which are part of the Belt Supergroup. Cambrian sedimentary rocks include the Flathead quartzite, Wolsey shale, Meagher dolomite, Park shale, and Pilgrim limestone. Younger sedimentary rocks range in age from Devonian to Pennsylvanian. This sequence has been intruded by various Cretaceous plutons of granitic and granodioritic composition associated with the Boulder batholith.

The geology at the 7,300 ft NGVD elevation of the Butte Highlands mine is shown in Figure 7. This elevation is representative of the current underground workings which range in elevation from 7,417 at the mine portal, to 7,298 ft NGVD near the end of the MAR. The Cambrian strata dip steeply (60 degrees) north and are folded into a sequence of northward plunging synclines and anticlines. The ore deposit at BHJV is considered a skarn and occurs primarily in lower Paleozoic Meagher dolomite and Wolsey shale with higher-grade mineralization occurring within sediments proximal to diorite sills and dikes. Geologic investigations show that several faults extend through the project site.

The groundwater flow system is driven by recharge of infiltrating precipitation which occurs mostly as snowmelt. Groundwater flows from the mountain highlands to lower elevations along rivers and creeks but also through regional stratigraphic units and structures.

Groundwater inflow to the mine workings is governed by the local to sub-regional groundwater recharge, as well as by the *K* of the geologic formations, including faults, dikes, and sills. The *K* of rocks in the mine area is dependent mostly on secondary permeability (e.g., fracturing due to folding, faulting, and intrusions). Primary permeability, which originates from pores in the sedimentary rocks, is less important in the overall flow system. Initial large inflows to the mine workings flow from fractured rock and are due to depletion of water from storage; however, long-term flows are governed by the ability of the structures and rocks to transmit water from areas of recharge.

5.2 HYDROGEOLOGIC BOUNDARIES

The numerical model domain is shown in Figure 8. The Butte Highlands mine is near the geographic center of an area which encompasses the Highlands Mountains and is bordered on all sides by drainages which are judged to constitute groundwater divides. The western boundary of the study area is approximately coincident with Interstate Highway 15 in the valleys of Divide Creek and the Big Hole River. The southern boundary extends across the low hills in the McCartney Creek drainage between the towns of Melrose and Twin Bridges. The eastern boundary is along the western edge of the Jefferson River valley and the northern boundary parallels the path of Interstate Highway 90 in Homestake Creek canyon and in the valley of Blacktail Creek south of Butte.

5.3 HYDROSTRATIGRAPHY

A hydrostratigraphic unit is a unit that is defined as having similar hydrologic properties. A hydrostratigraphic unit is not limited to a particular geologic unit or formation. The conceptual hydrogeologic model incorporates nine hydrostratigraphic units from oldest to youngest:

1) Undifferentiated schist and gneiss (Archean)
2) Undifferentiated Belt Group sediments (Middle Proterozoic)
3) Flathead quartzite (Middle Cambrian)
4) Wolsey Formation (Middle Cambrian)
5) Meagher dolomite (Middle Cambrian)
6) Park shale (Middle Cambrian)
7) Pilgrim Formation (Upper Cambrian)
8) Undifferentiated sedimentary rocks (Permian to Mississippian)

9) Undifferentiated granitic and dioritic intrusive rocks (Cretaceous)

The hydrostratigraphy immediately surrounding the mine area includes all of the sedimentary units from the Belt sediments to the Park shale and a dioritic stock related to the mineralizing event. The distribution of these units is based on information provided by BHJV geologists in the form of geologic contact information as digital files. As mentioned above, the units dip steeply (greater than 60 degrees) to the north and have been folded into a series of antiforms and synforms. The dioritic stock primarily intrudes sediments of the Wolsey Formation as a sill between the Wolsey/Meagher contact and the Wolsey/Flathead contact.

5.4 GROUNDWATER ELEVATIONS

Groundwater elevations in the mine area are measured at several monitoring points which include five surface monitoring wells and two underground piezometers. The surface monitoring wells (BHH08-01 and BHH09 series) have long screened intervals and are completed in both the Meagher and Wolsey formations (Table 2). Information regarding the installation of these wells is presented in AMEC (2010). The two underground piezometers (UGPZ-1 and UGPZ-2) are each completed with three, multi-level, grouted-in vibrating wire pressure transducers and are designed to separately measure hydraulic heads in the Meagher, Wolsey, and Flathead formations and in the contact zone between the Meagher and Wolsey (Figure 3). The contact zone was targeted because mine personnel have observed relatively high groundwater inflows when mining through this zone.

Table 2

Summary of Monitoring Wells and Piezometers

Well/ Piezometer ID	Easting (ft)	Northing (ft)	Surface Elevation (ft NGVD)	Screened Interval (ft bgs)	TDX[1] Depth/Elev. (ft bgs/ ft NGVD)	Pre-Mining Water-Level Elevation (ft NGVD)[2]	January 2011 Water-Level Elevation (ft NGVD)[3]	Monitored Formation
BHH08-01	13,591	10,372	7,969	600-1,167	Na	7,356	7,348	Meagher
BHH09-01	13,631	9,722	7,820	5-820	Na	7,543	7,526	Wolsey/Diorite
BHH09-02	13,249	10,094	7,846	545-980	Na	7,410	7,368	Wolsey/Diorite
BHH09-04	12,734	10,529	7,895	620-1,120	Na	7,329	7,331	Meagher/Wolsey
BHH09-05	13,572	10,592	8,045	680-1,285	Na	7,350	7,347	Meagher/Wolsey
UGPZ-1 (upper)	12,595	10,033.1	7,357	Na	390/6,966	Na	7,325	Meagher
UGPZ-1 (middle)	12,595	10,033.1	7,357	Na	440/6,916	Na	7,318	M/W[4] contact
UGPZ-1 (lower)	12,595	10,033.1	7,357	Na	490/6,866	Na	7,330	Wolsey
UGPZ-2 (upper)	12,974	10,313	7,365	Na	270/7,095	Na	7,314	Meagher
UGPZ-2 (middle)	12,974	10,313	7,365	Na	320/7,045	Na	7,315	M/W contact
UGPZ-2 (lower)	12,974	10,313	7,365	Na	370/6,995	Na	7,328	Wolsey
UGPZ-3	13,167	9,931	7,368	0-200[5]	Na	Na	7,507	Belt Supergroup

Notes: NA = not applicable, not established until after underground mine development
[1] Vibrating wire pressure transducer
[2] Water-levels measured April 2010
[3] Water-levels measured January 2011 prior to the 10-day pumping test
[4] Meagher/Wolsey contact
[5] open hole

Pre-mining groundwater elevations in the surface monitoring wells ranged from 7,543 (BHH09-01) to 7,329 (BHH09-04) ft NGVD, a range of 221 ft.

Compared to the other monitoring points, water levels in BHH09-01 and UGPZ-3 are anomalously high. Well BHH09-01 is completed in the Wolsey and the diorite intrusive while piezometer UGPZ-3 is completed in Belt Supergroup Rocks south of where the diorite intrudes the Wolsey. These high water levels may be due to the low conductivity of the diorite sill, or due

contact metamorphic zones where the Wolsey has been altered and acts as an aquitard and thereby "damming" the water behind it.

By January 2011, the underground mine had been developed to the extent shown in Figure 2 and measured water levels had dropped by about 5 to 50 ft as a result of underground mine development activities.

Data from the grouted-in piezometers show different water-level elevations at each of the transducers indicating different heads in the Meagher, Wolsey, and Flathead formations and in the Meagher/Wolsey contact zone.

5.5 STREAMS, RUNOFF, AND WATER CHEMISTRY

BHJV provided flow data from streams that immediately surround the mine site. The stream-flow measurement locations are shown in Figure 9. Flow rates are from data provided by AMEC (2010). As is typical of many surface streams, some of the measured flow comes from runoff and remains in the stream channel, never becoming part of the groundwater system. However, some recharge reaches the groundwater system then later discharges to surface water and becomes baseflow. The groundwater model only simulates that part of the near surface system which occurs as baseflow. Baseflow is best estimated during late fall and winter when runoff is lowest. Estimated baseflows at the WS stream gauges are:

- WS-1—approximately 80 to 90 gpm (flow from Old Highlands mine portal)
- WS-2—approximately 40 gpm
- WS-3—approximately 80 gpm
- WS-4—approximately 30 to 40 gpm
- WS-5—approximately 20 to 35 gpm
- WS-6—approximately 1 to 10 gpm

Water-chemistry data collected from the streams at the gauging stations shown on Figure 9 are plotted on a Piper diagram in Figure 10. The WS-2 and WS-4 sample locations are located along an upper reach of a Fish Creek tributary,[1] and as illustrated on Figure 10, their calcium-

[1] Site WS-4 was relocated from the middle tributary of Fish Creek to the southern tributary of Fish Creek in August 2009. As illustrated in Figure 11, the water quality of the one sample prior to August 2009 was chemically similar to WS-1, WS-3, and WS-5.

bicarbonate type water chemistries are distinct from other (calcium+magnesium-bicarbonate) waters at the site.

In addition to the lower relative magnesium contents apparent on Figure 10, the lower bicarbonate and potassium concentrations (Figure 11a) and calcium and magnesium concentrations (Figure 11b) from WS-2 and WS-4 also distinguish these locations from other waters at the site. The bicarbonate concentrations are less than approximately 60 mg/L in WS-2 and WS-4, whereas locations WS-1, WS-3, WS-5, DWW10-01, and UGPZ-03 have bicarbonate concentrations typically between 100 mg/L and 300 mg/L, which are at or slightly greater than the solubility of the common carbonate minerals calcite and dolomite. The lower concentrations in WS-2 and WS-4 suggest a much shorter residence time in the water-bearing zone and/or a different source (e.g., runoff and shallow infiltration). Outflow from the Old Highlands mine portal (WS-1), has a similar chemical signature to other water from underground at the mine (UGPZ-03 and DWW10-01), and magnesium to calcium ratios that are generally consistent with equilibration with dolomite (Figure 11b). Waters from WS-3 and WS-5 have chemical signatures that are generally consistent with a mixture of the water from underground at the mine (i.e., DWW10-01) and more dilute surface water (i.e., WS-2 and WS-4), and has magnesium to calcium ratios that are generally consistent with equilibration with both dolomite and calcite (Figure 11b). However, WS-5 has a chemical signature that is slightly more similar to water from underground at the mine site (i.e., DWW10-01 and UGPZ-3). In summary, the water chemistry information suggests that waters at WS-2 and WS-4 are not related to waters encountered in the mine; whereas, water at WS-5 has a component that is similar to water encountered within the mine and as discussed above is a mixture of surface water and some water that is typical of water found underground in the mine.

5.6 GROUNDWATER RECHARGE

Recharge to the groundwater relies on estimates of precipitation and an estimate of the percent of total precipitation that becomes part of the groundwater system.

Precipitation in the Highlands Mountains was estimated using precipitation data from the web-based PRISM (Parameter-elevation Regressions on Independent Slopes Model) climate database maintained at Oregon State University. PRISM uses point measurements of precipitation, temperature, and other climatic factors to produce continuous, digital grid estimates of monthly, yearly, and event-based climatic parameters. It incorporates point data, a digital elevation model,

and knowledge of complex climatic extremes including rain shadows, coastal effects, and temperature inversions.

Based on a study (Magruder, 2009) of mountain block recharge in the nearby Tobacco Root Mountains of Montana, it was assumed that 19 percent of precipitation becomes recharge to the groundwater system.

To verify the 19 percent recharge estimate, Itasca calculated recharge using a well-known method for estimating recharge in Nevada referred to as the Maxey-Eakin method; the difference between the two methods varied by less than 1 percent.

5.7 OLD HIGHLANDS UNDERGROUND MINE

As discussed in Section 3.1, the Old Highlands mine consists of a 2,300 ft long ramp connected to an inclined shaft which was driven 600 ft. The workings are currently flooded and contribute outflow at the portal which is being monitored by the BHJV.

Outflow from the portal has been reported to range from 80 to 140 gpm and to be seasonally influenced by recharge from precipitation and snowmelt (AMEC, 2010).

Recent data show that outflow at the portal is also strongly influenced by groundwater inflow to the Butte Highlands mine. Figure 12 presents the record of flows beginning 28 September 2009 and extending to 31 January 2011. As indicated, outflow averaged about 85 gpm prior to beginning the MAR. From March through June 2010, as inflow to the MAR increased, outflow from the portal decreased until the MAR was allowed to flood on 20 June 2010. Outflow immediately began to increase to 140 gpm in late July 2010 and then to decrease again as inflow to the UAR began. The maximum inflow to the UAR was recorded in late August 2010 at 340 gpm. Outflow increased slightly after the UAR was grouted and then declined abruptly to zero during the 10-day pumping test of well DWW10-01.

This relationship clearly indicates that the Old Highlands mine is flooded to the level of its access ramp and that the Old Highlands mine is hydraulically connected to the Butte Highlands mine.

5.8 BUTTE HIGHLANDS UNDERGROUND MINE

As currently planned, the Butte Highlands mine will comprise the following components:

1) the MAR, which will extend down from the portal to the elevation of about 6,719 ft and provide access to the spiral stope access ramps;
2) two spiral stope access ramps, that will extend to the elevation of about 6,600 ft and provide access to the stope attack ramps;
3) stope attack ramps, which will provide access to the stopes;
4) two raises; and
5) stopes, which are to be mined using underhand cut and fill methods then backfilled with paste rockfill.

The current mining schedule is shown below in Table 3.

Table 3

Mining Schedule

Year of Mining	Development Level (ft NGVD)	Target Dewatering Depth (ft NGVD)
0	7,340	7,340
1	7,095	7,045
2	6,870	6,820
3	6,735	6,685
4	6,620	6,570
4.5 - 5	6,345	6,300

6.0 NUMERICAL MODEL DESIGN

A 3-D numerical groundwater flow model of the Butte Highlands mine and surrounding area was constructed by Itasca using the finite-element code *MINEDW* (Azrag et al., 1998). The finite-element grid is shown in Figure 13. The model mesh is more finely discretized in the vicinity of the mine, where the horizontal dimensions of the elements range from approximately 35 to 50 ft. The finer discretization enables better numerical resolution where the hydraulic gradients are the greatest and also allows the geometry of the underground workings and surrounding hydrogeologic units to be represented at a reasonable level of detail. The triangular elements forming the mesh depict the top (or bottom) of triangular prisms, with the points at the corners of the prisms constituting the finite-element "nodes." The model comprises 130,550 elements and 68,357 nodes.

The vertical discretization of the model is shown in cross section in Figure 14. The model comprises 22 element layers (23 node layers) in the mine area. The mesh elevation ranges from about 9,950 ft NGVD near Red Mountain to an elevation of 3,500 ft NGVD at the bottom of the model. The area of the proposed underground mine between the elevations of 7,300 and 6,500 ft amsl was divided into 16 model layers (by using the so-called "pinch-out" feature of *MINEDW*) to adequately represent mining operations and obtain better accuracy in the numerical computations. The vertical discretization in this part of the model domain is 50 ft.

6.1 HYDROSTRATIGRAPHIC UNITS

In the finite-element method, hydraulic properties are assigned to elements; and hydraulic heads and fluxes are associated with nodes. Every element in the model is assigned to a model "zone," as depicted in plan view in Figure 13 for the third layer in the model. Each model zone has specified values for horizontal (K_h) and vertical (K_v) hydraulic conductivity, specific storage (S_s), and specific yield (S_y). The latter is only utilized if the water table is located within the element. There are 12 different zones incorporated into the Butte Highlands mine groundwater flow model, each with its own hydraulic properties. In addition, some elements represent low-permeability fault zones.

The 3-D geologic model developed by BHJV was used to assign hydrogeologic zones on each layer in the mine area. Table 4 summarizes the hydraulic properties of the 12 hydrogeologic zones and the fault zones in the model. Some of these zones (e.g., intrusives) are considered to be isotropic (*K* is the same in all directions), but most of the zones are assumed to be anisotropic with

K_h greater than K_v. The values of K_v are assumed to be 0.10 of the K_h for the sedimentary units. The K_h value used for the Meagher dolomite and Wolsey shale is close to the value obtained from the DWW10-01 aquifer test. The K values for the other rock units were estimated during the model calibration process. The storage parameters (both S_s and S_y) are based on literature data and professional judgment.

Table 4

Hydraulic Properties of Geologic Units Used in Groundwater Flow Model

Hydrogeologic Zone or Unit	K_h (ft/day)	K_v (ft/day)	Anisotropy (K_h/K_v)	S_s (ft $^{-1}$)	S_y
Archean Schist and Gneiss	0.02	0.01	2	2×10^{-7}	0.005
Belt Sediments	0.03	0.003	10	5×10^{-7}	0.01
Flathead Quartzite	5	0.5	10	5×10^{-7}	0.01
Wolsey Formation	10	1	1	1×10^{-6}	0.01
Meagher Dolomite	10	1	10	5×10^{-6}	0.015
Park Shale	0.05	0.01	5	5×10^{-7}	0.01
Pilgrim Formation	0.5	0.05	10	5×10^{-7}	0.01
Perm to Miss Sedimentary Rocks	0.1	0.01	10	5×10^{-7}	0.01
Cretaceous Intrusive Rocks	0.01	0.01	1	2×10^{-7}	0.005
Diorite	0.001	0.001	0.001	1×10^{-6}	0.01
Tertiary Sedimentary Rocks	0.1	0.01	10	1×10^{-6}	0.01
Quaternary Sediments	5	0.5	10	1×10^{-5}	0.05
Faults	0.0001 to 0.001	0.0001 to 0.001	1	5×10^{-7}	0.005

6.2 MODEL BOUNDARIES

The groundwater model boundaries (Figure 8) are located far from the mine site so they will not influence the mine dewatering simulation. As previously discussed, the model boundaries, where possible, follow major rivers and streams which are likely to act as groundwater divides.

All model boundaries are set as drain nodes to simulate mountain block recharge flowing to discharge areas along the rivers and streams at the model boundaries. During pre-mining, steady-state conditions, groundwater that does not leave the model by streamflow, flows from

the model as groundwater flow from the Highlands Mountains toward lower elevations and the river valleys.

6.3 SIMULATION OF FAULT ZONES

The BHJV geologic model and O'Neill (1996) identify several faults that cross through and bound the proposed mine area (Figure 13). These faults were incorporated into the groundwater flow model based on 1) the geologic mapping and aquifer response to the DWW10-01 pumping test which clearly showed boundaries, and 2) on water levels and spring elevations across the Butte Highlands area. Itasca simulated the faults shown in Figure 13 as leaky barriers to groundwater flow. Not only did the aquifer test response to DWW10-01 demonstrate the presence of aquifer boundaries, the wide range of measured water levels across the site and the high elevation of flow in a southern Fish Creek tributary (over 8,500 ft) could not be simulated without faults and intrusive bodies acting as leaky barriers to groundwater flow.

All of the faults represented in the groundwater model are discrete features with low *K* values on the order of 0.001 to 0.0001 ft/day.

6.4 SIMULATION OF THE UNDERGROUND MINES

A 3-D drawing of the Old Highlands mine workings, supplied by BHJV, was used to assign model elements to each 50 ft-thick model layer in the old mine area. The old workings were represented as an area of high *K* and high S_y.

Future mining was not discretely represented in the model because it is only necessary to predict the well pumping rates necessary to maintain the water level below the mine workings according to the mining schedule (Table 3).

6.5 SIMULATION OF DEWATERING WELLS

Dewatering well DWW10-01 was represented in the model by hydraulically linking model nodes through model layers to represent the well's screened interval. In the simulation, this well was "deepened" to effectively dewater the area around the well. Four additional underground dewatering wells were represented and were extended deeper as water levels dropped in response to dewatering. The simulation was not meant to predict the exact location or timing of the dewatering wells, but rather to predict the overall volume of water that will need to be pumped to maintain relatively "dry" working conditions.

6.6 MODEL CALIBRATION

Two types of model calibrations were performed known as steady-state and transient calibrations. These calibrations are discussed in the following sections.

6.6.1 Steady-State Calibration

For the steady-state calibration, the model was calibrated to the average long-term flow from the Old Highlands mine workings (as measured at surface-water monitoring station WS-1) and to water levels measured in the surface monitoring wells before Butte Highlands mine development was initiated. The fall/winter flows from the old portal are reported to be about 80 to 90 gpm. The calibrated steady-state model predicted a flow of about 90 gpm from the old portal prior to 2010 developments.

Table 5 shows the steady-state predicted water levels compared to the measured pre-mining water levels.

Table 5

Steady-State Calibrated Water Levels vs. Measured Water Levels

Surface Monitoring Well	Measured Water Level (ft)	Predicted Water Level (ft)	Difference (ft)
BHH08-01	7,356	7,357	-1
BHH09-01	7,543	7,503	40
BHH09-02	7,410	7,357	53
BHH09-04	7,329	7,335	-6
BHH09-05	7,350	7,357	-7

The calibration to wells BHH08-01, BHH09-04, and BHH09-05 is considered good, however, the calibration to wells BHH09-01 and BHH09-02 differ by 40 and 53 ft, respectively. This difficulty may be reflective of a number of complications. Well BHH09-01 has an open interval spanning 815 ft (Table 2) from 5 ft below the ground surface to a depth of 820 ft. This interval spans the Meagher dolomite, the Wolsey Formation, and the diorite. The water level in this well is reflective of an integration of heads in these units and may be affected by its proximity to the ground surface

which could allow recharge into the well. For example, during the summer of 2010, water levels in this well increased from 7,535 ft to 7,626 ft. This seasonal fluctuation of 91 ft is much greater than that of the other monitoring wells with deeper screened intervals in which seasonal fluctuations range from approximately 6 to 16 ft. BHH09-01 is also on the east side of the north trending fault (Figure 7) which may account for its high pre-mining water-level elevation of 7,543 ft.

Calibration of water levels in well BHH09-02 is likely complicated by its long open interval (435 ft) that also spans the Wolsey Formation and the diorite; again an integration of heads from each hydrostratigraphic unit.

In addition, both of these wells are in a complex hydrogeologic setting which is affected by faults, folded and apparently rapidly varying stratigraphy, and the effects of the intrusion of the diorite. These factors are difficult to duplicate in the model with the current data set.

6.6.2 Transient Calibration and Interpretation

The transient calibration was performed by matching simulated water-level elevations and drawdown to the observed water levels and drawdown measured in wells and piezometers during the DWW10-01 pumping test. Figures 15a and 15b present the transient calibration results.

The best calibration is to piezometers UGPZ-1, UGPZ-2, and wells BHH09-02 and BHH09-04. Most likely this is because they are 1) located nearest the pumping well, 2) monitoring water levels in the Meagher dolomite, the same formation from which DWW10-01 pumps, and 3) apparently, not strongly affected by aquifer boundaries between the pumping well and these observation points. UGPZ-2 Lower is the exception. The transducer at UGPZ-2 Lower is in the Wolsey Formation and the model is overpredicting drawdown by approximately 8 ft.

Calibrating to the other surface monitoring wells was more problematic because of the long screened intervals (as discussed above), greater distances from the pumping well, and the apparent existence of aquifer boundaries. The model simulates very little drawdown (i.e. less than 1 ft) at BHH09-01. This well is located on the opposite side of a low-permeability north trending fault (Figure 7) and is screened high in the section. It has continued to drawdown long after the aquifer test which suggests that the observed drawdown in this well may be more related to the large observed seasonal fluctuation of head than a response to the aquifer test. BHH09-01 seems to be more connected to surface infiltration than to heads lower in the aquifer. The structural complexity both vertically and horizontally between the Meagher aquifer and BHH09-01 makes the model difficult to calibrate.

For the remaining wells (BHH08-01 and BHH09-05) drawdown was over predicted by 3 ft and 1 ft, respectively. Both wells are near faults which could influence their response to pumping.

For the purposes of assessing mine dewatering requirements, these calibrations are considered adequate. The differences between measured and simulated water levels in the mine area where dewatering will be centered, range from 0 to only approximately 8 ft. Reducing the error in these calibration targets would not significantly affect the predicted dewatering requirements.

7.0 MODEL PREDICTIONS

Dewatering was simulated to assess the quantity of water that will have to be pumped from underground dewatering wells to maintain "dry" conditions in the ramps and stopes. The dewatering simulation and its results are discussed below.

7.1 PREDICTED DEWATERING RATE

Most dewatering is assumed to occur in the Meagher dolomite which has the highest *K* as evidenced by aquifer testing. Dewatering wells may need to be placed in various structural compartments, but the majority of the water will need to be removed from the Meagher dolomite. Figure 16 presents the locations that were simulated as dewatering wells. The actual locations will depend on actual ramp locations as determined by BHJV engineers.

Figure 17 shows the predicted dewatering rate for the Butte Highland mine. Dewatering is expected to be about 750 gpm throughout the first 4 ½ years of mining. By the end of 4 ½ years of dewatering/mining water levels are predicted to reach the ultimate depth of 6,300 ft NGVD. During the last six months of mining, the model predicts that pumping rates can be reduced to about 500 gpm to maintain water levels at 6,300 ft elevation. The pumping rate is not optimized to the mine plan, but by simulating a 750 gpm pumping rate until water levels are lowered to their ultimate depth, the model predicts that groundwater levels will remain below the target dewatering depths listed in Table 3.

It should be noted that it is possible during the late spring/early summer snowmelt that additional inflow to the mine could occur. Outflow from the Old Highlands mine portal increases during this period, but it is not clear how much seasonal recharge will impact dewatering rates. Itasca recommends that the dewatering infrastructure design take into account the potential for these seasonal fluctuations.

7.2 PREDICTED EXTENT OF DRAWDOWN AT END OF MINING AND WATER LEVEL RECOVERY

Figure 18 presents the predicted extent of the 10-ft water-table drawdown contour after five years of mine dewatering. The shape of the contour is influenced by faults and intrusive bodies (Section 6.3) which are simulated as low *K* features.

The 10-ft drawdown contour encompasses surface-water monitoring stations WS-1, WS-3, and WS-5. WS-1 is predicted to stop flowing within days of the beginning of mine dewatering as

evidenced by the cessation of flow during the DWW10-01 pump test (Figure 12). Water levels upstream from WS-5 are predicted to lower by dewatering and may reduce streamflow, which could also reduce streamflow at WS-3.

After mining and dewatering are completed, water levels around the mine area will begin to recover. Water levels will be almost fully recovered within nine years after mining, and water is predicted to begin flowing from the Old Highlands portal again approximately eight years after mining and dewatering are completed.

7.3 PREDICTED EFFECTS OF DEWATERING ON SURFACE-WATER FLOW

The groundwater model was used to assess potential impacts that mine dewatering could have on baseflow in streams in the immediate vicinity of the mine. As previously discussed, Itasca assumed that flow during the late fall and winter months best represents baseflow conditions.

Table 6 lists the estimated baseflow at each of the six surface-water measurement locations. The simulation indicates that baseflow will be reduced at WS-1, WS-3 and WS-5. Note that flow from WS-1 originates from flooding in Old Highlands mine and reductions at this location are a direct result of the hydraulic connection between the Old Highlands mine and the proposed Butte Highlands mine. If additional leaky-barrier faults or intrusive dikes and sills lie between the mine and WS-5, the model is likely overpredicting impacts to that area of upper Fish Creek.

It is important to note that that these flow predictions are for baseflow only and that dewatering should not impact runoff resulting from spring snowmelt and/or rainfall. Also, the period of record for these streams is extremely short, extending back only to September 2009, and the predicted decrease in baseflow (except at WS-1) could be within the normal variations of streamflows.

Table 6

Predicted Mine Dewatering Effect on Surface-Water Flows

Surface Water Measurement Location	Estimated Baseflow From Measured Flow During Fall/Winter (gpm)	Predicted Baseflow Before Dewatering (gpm)	Predicted Baseflow After 5 Years of Dewatering (gpm)	Predicted Loss of Baseflow Due to Dewatering (gpm)
WS-1	80-90	90	0	90
WS-2	40	60	60	0
WS-3	80	140	126	14
WS-4	30-40	71	71	0
WS-5	20-35	62	50	12
WS-6	1-10	8	8	0

8.0 SUMMARY AND CONCLUSIONS

Following are the four principal conclusions of this study:

1) The Meagher dolomite is the main water-bearing aquifer in the mine area. Most of the dewatering capacity needs to be targeted in the Meagher dolomite.

2) The predicted dewatering rate for the proposed Butte Highlands mine will range from approximately 750 gpm, for most of mine life, to 500 gpm, the last six months of mining, where water levels will not be lowered but will only be maintained to complete mining. It is probable that these rates would need to increase slightly during spring/summer snowmelt or other recharge events.

3) The 10-ft drawdown contour due to mine dewatering is predicted to be confined by structures and intrusive rocks in the area, and encompasses roughly one square mile.

4) Mine dewatering is predicted to not impact baseflow in Moose Creek or the southern tributary to Fish Creek. Flow from the Old Highlands mine portal (WS-1) is predicted to cease when dewatering begins, and then begin to flow approximately eight years after mining has completed. A northern tributary to Fish Creek is predicted to have a decreased baseflow of about 12 gpm, which is less than 10 percent of the flow predicted at WS-3. Flows during spring runoff and precipitation events are not expected to be impacted.

9.0 RECOMMENDATIONS

If BHJV decides to mine the Butte Highlands gold deposit, it is likely that further groundwater investigations will be warranted to refine the mine dewatering plan. It is recommended that additional investigations include the following:

1) Further evaluation of the permeability of the Wolsey Formation, the diorite, and the Belt Group rocks in the vicinity of the planned spiral ramps and stoping areas. It may be possible to assess the behavior of the Belt Group rocks by conducting a flow/shut-in test at UGPZ-3, while monitoring responses in surface wells and underground piezometers.

2) Installation of an additional piezometer deep in the diorite—this piezometer could be constructed in the same way as UGPZ-1 and UGPZ-2 (i.e., with grouted-in pressure transducers). Such a piezometer would serve to monitor the heads in the diorite as mine development and dewatering proceed.

3) The possibility of installing another Meagher dewatering well—the feasibility of installing this well from an underground location should be investigated.

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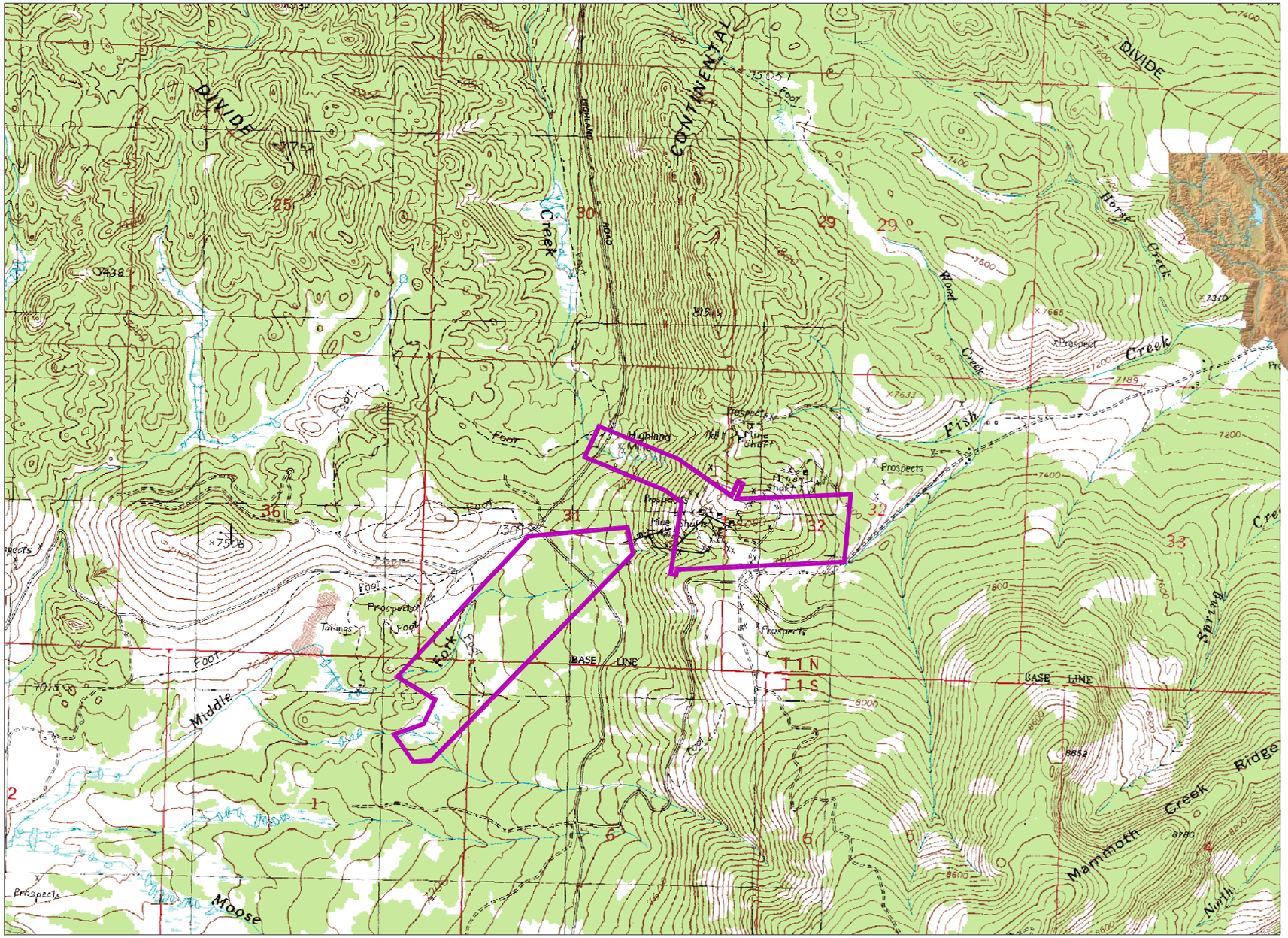
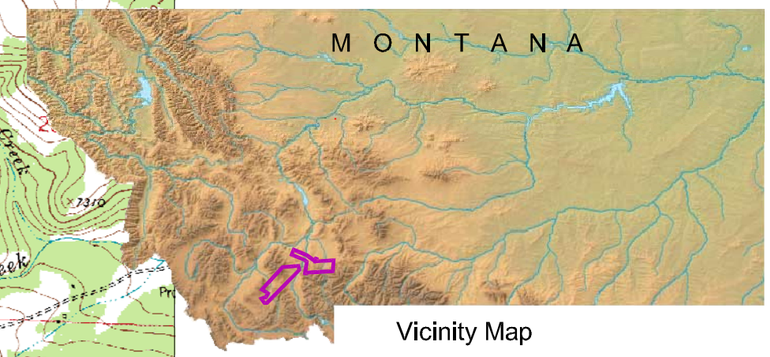




Vicinity Map

EXPLANATION

BUTTE HIGHLANDS CLAIM BOUNDARIES

N

0 1,000 2,000
SCALE (ft)

SOURCE: U.S.G.S. 7-1/2 MINUTE QUADRANGLE MAPS: PIPESTONE PASS AND MOUNT HUMBUG

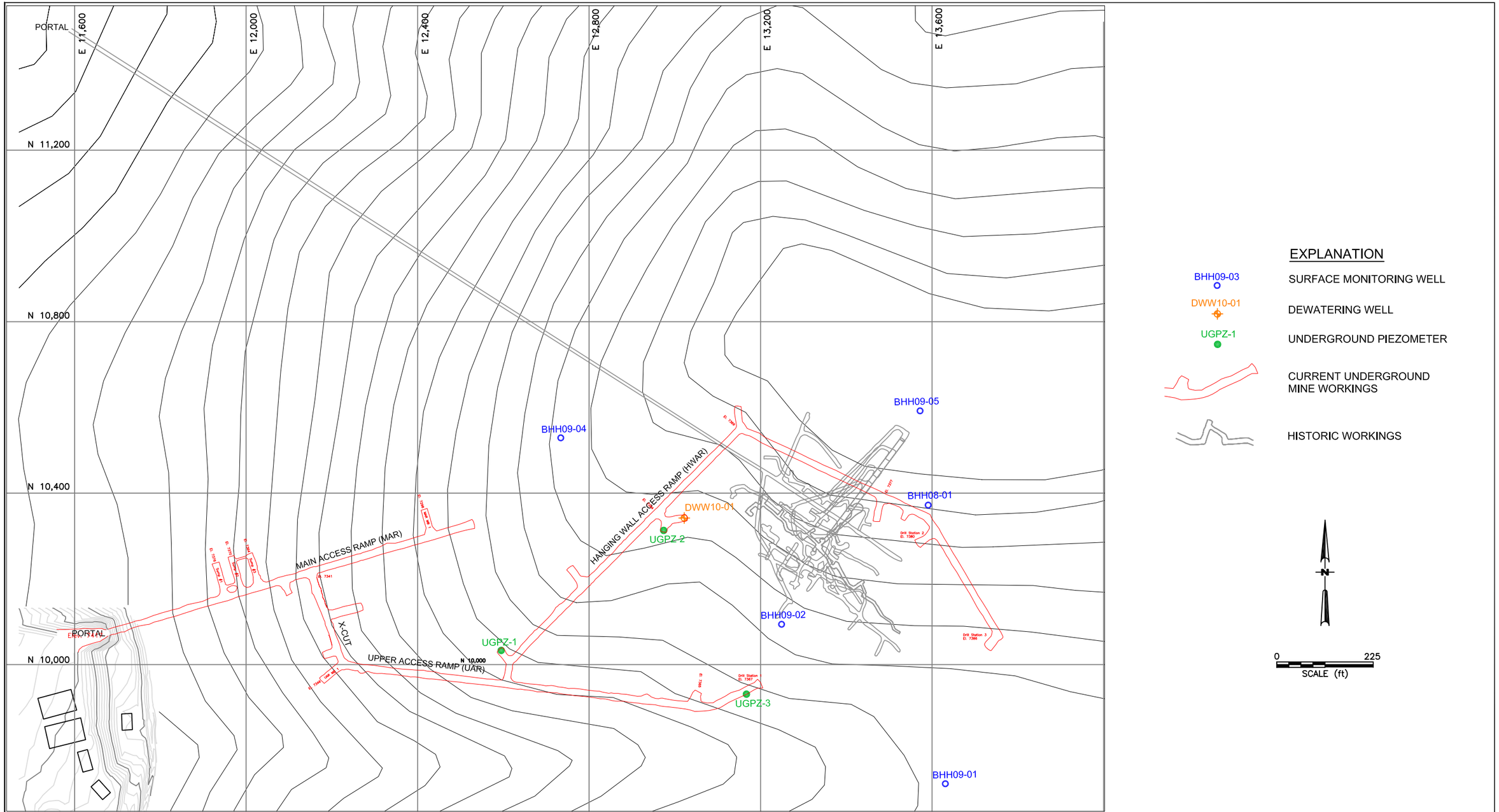
PROJECT NO.	1938
BY	JCW
CHECKED	--
DRAWN	SAC
DRAWING NAME	LOC-MAP
DRAWING DATE	1 JUN 2011
REVISION DATE	--

ITASCA™ Denver, Inc.

Project Location Map

CLIENT: Butte Highlands Joint Venture

FIGURE NO. 1



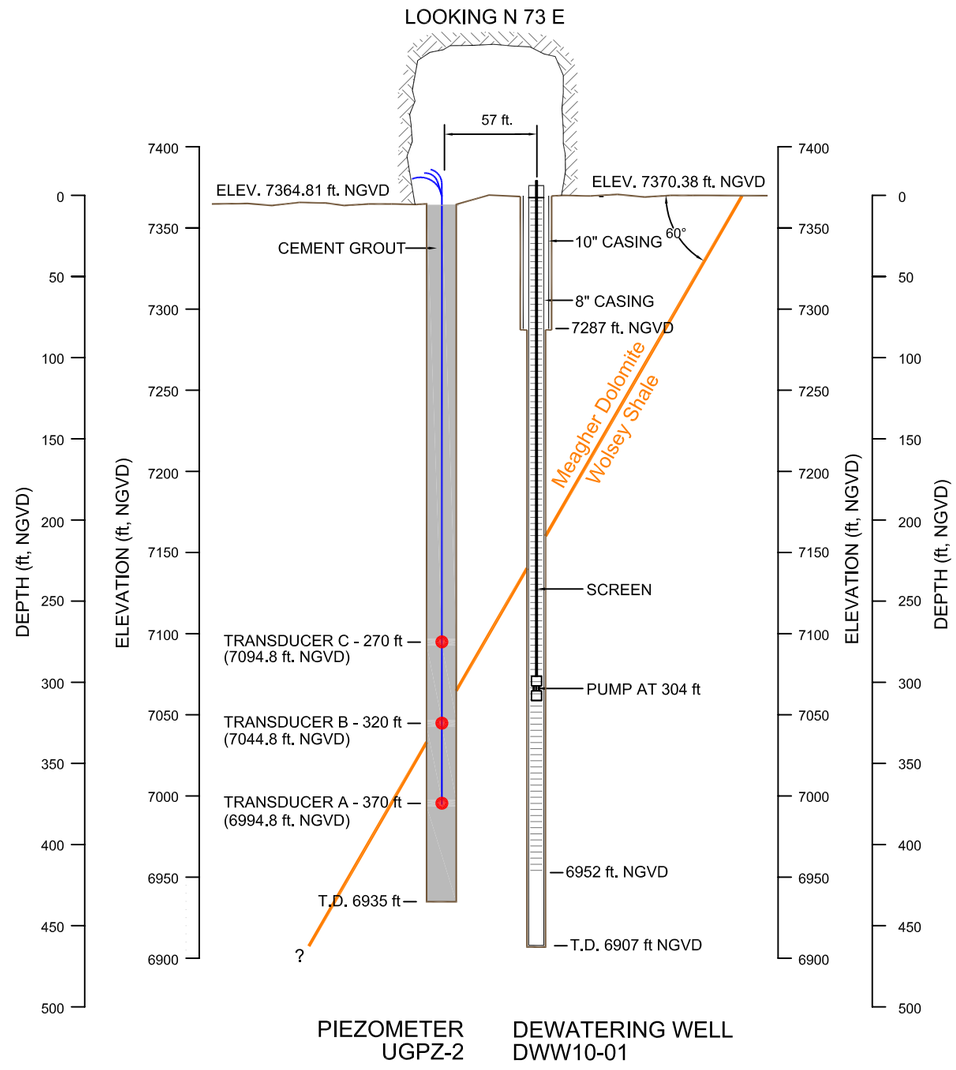
PROJECT NO.	1938
BY	JCW
CHECKED	RJS
DRAWN	SAC
DRAWING NAME	OLD–NEW–WORKINGS
DRAWING DATE	1 JUN 2011
REVISION DATE	--

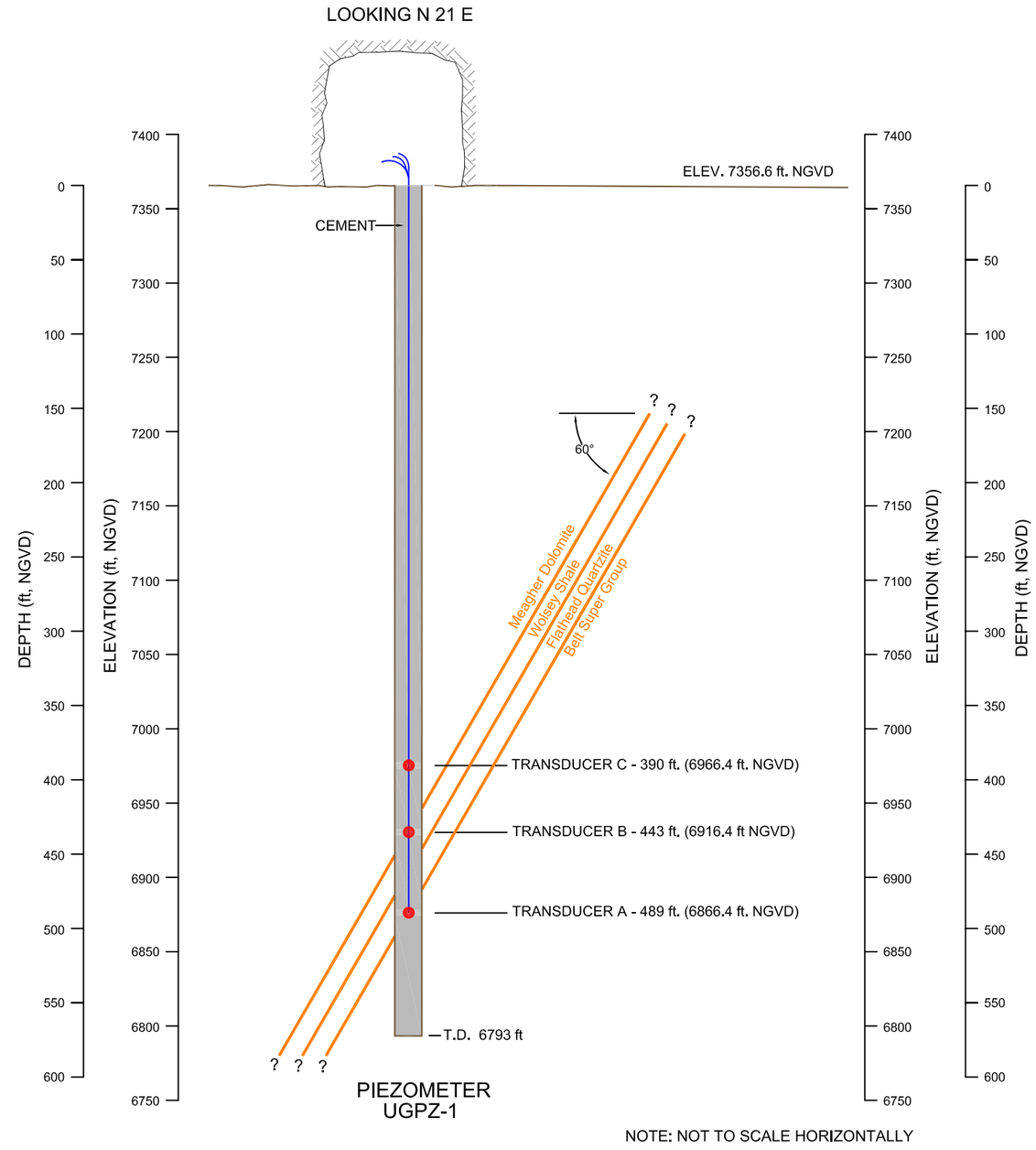
ITASCA™ Denver, Inc.

Current Underground Mine Workings and Old Highlands Mine Map

CLIENT: Butte Highlands Joint Venture

FIGURE NO. 2





NOTE: NOT TO SCALE HORIZONTALLY

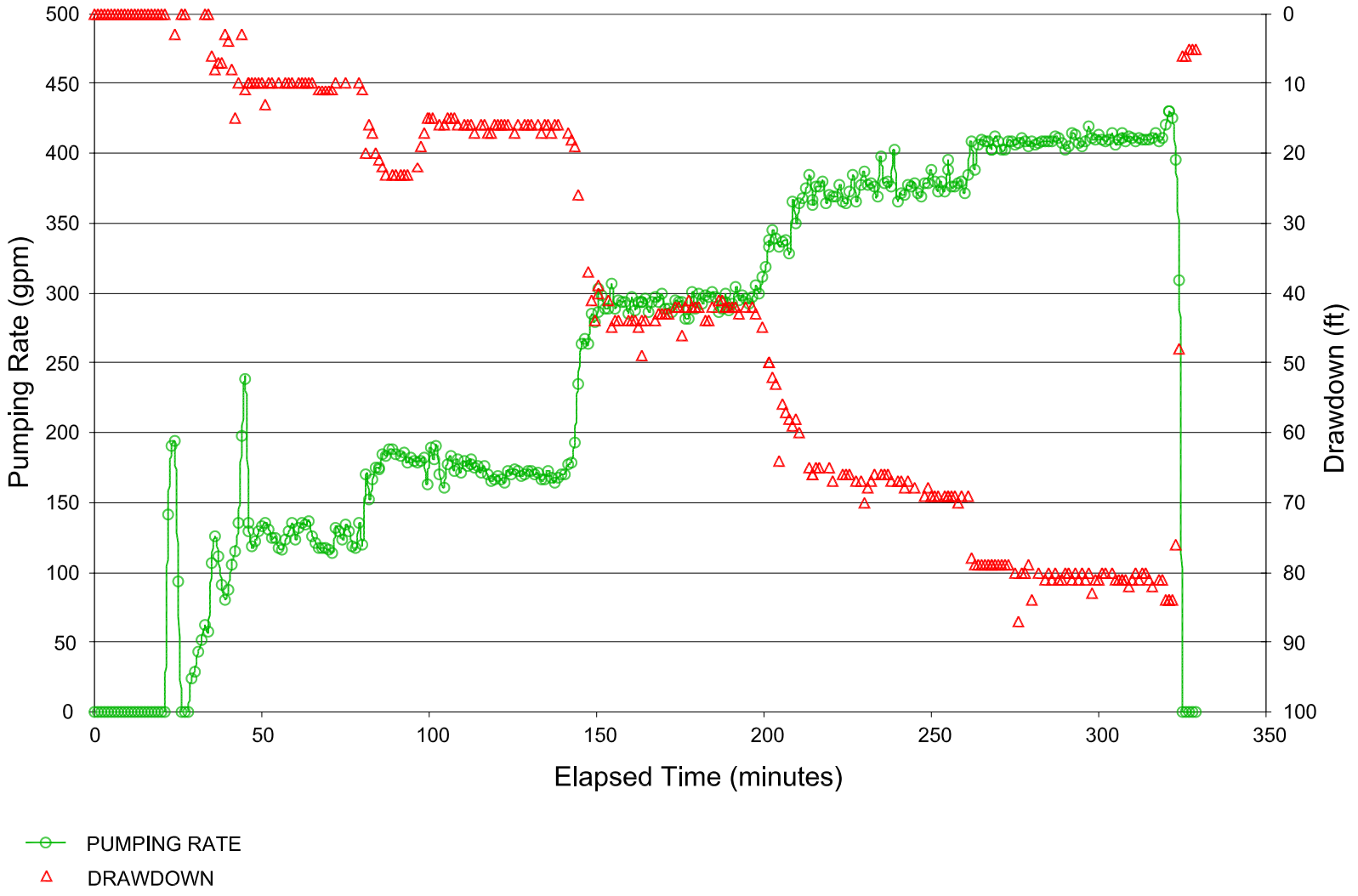
PROJECT NO.	1938
BY	JCW
CHECKED	RJS
DRAWN	SAC
DRAWING NAME	PROTO-DW-PIEZO
DRAWING DATE	1 JUN 2011
REVISION DATE	--

ITASCA™ Denver, Inc.

Prototype Dewatering Well and Piezometers

CLIENT: Butte Highlands Joint Venture

FIGURE NO. 3



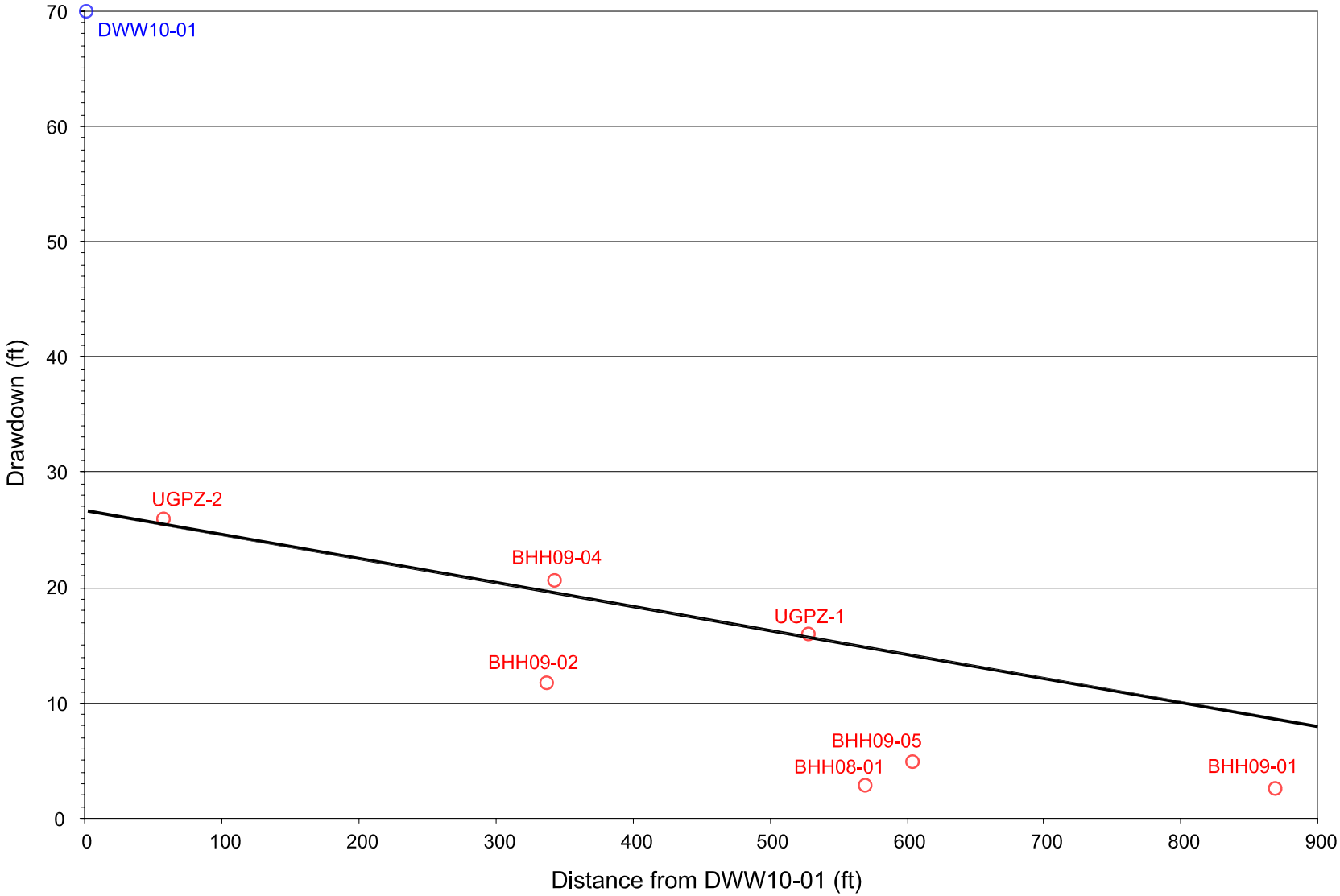
PROJECT NO.	1938
BY	JCW
CHECKED	RJS
DRAWN	SAC
DRAWING NAME	STEP–DD
DRAWING DATE	1 JUN 2011
REVISION DATE	--

ITASCA™ Denver, Inc.

DWW10-01 Step Drawdown Test

CLIENT: Butte Highlands Joint Venture

FIGURE NO. 4



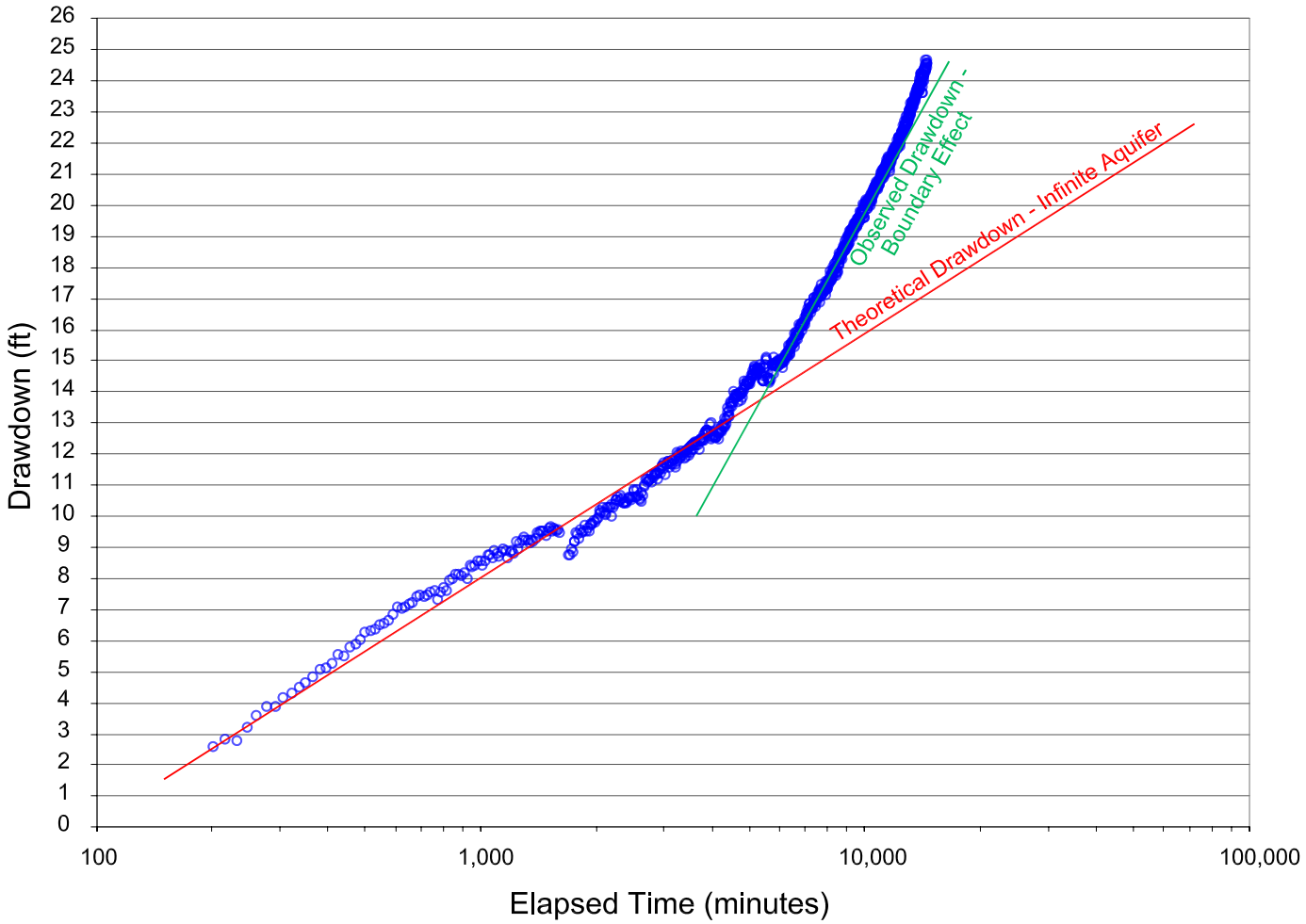
PROJECT NO.	1938
BY	JCW
CHECKED	SJH
DRAWN	SAC
DRAWING NAME	DIST–DD
DRAWING DATE	1 JUN 2011
REVISION DATE	--

ITASCA™ Denver, Inc.

Distance Drawdown Plot
at End of Pumping Test

CLIENT:
Butte Highlands Joint Venture

FIGURE NO.
5



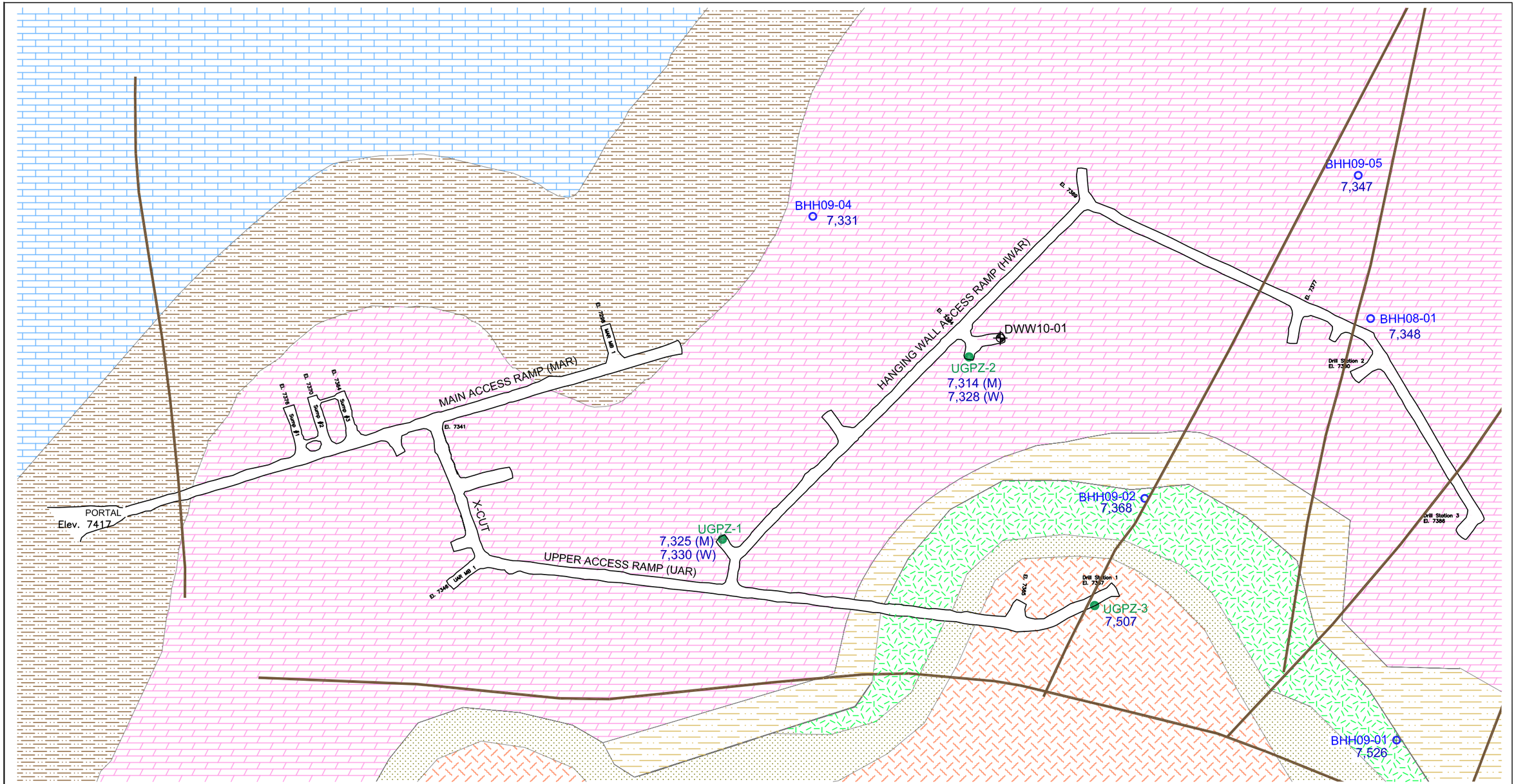
PROJECT NO.	1938
BY	JCW
CHECKED	RJS
DRAWN	SAC
DRAWING NAME	TIME-DD-CURVE
DRAWING DATE	1 JUN 2011
REVISION DATE	--

ITASCA™ Denver, Inc.

UGPZ-2 Time-Drawdown Curve

CLIENT: Butte Highlands Joint Venture

FIGURE NO. 6



EXPLANATION

- PILGRIM LIMESTONE
- PARK SHALE
- MEAGHER DOLOMITE
- BELT SUPERGROUP
- WOLSEY SHALE
- DIORITE INTRUSIVE
- FLATHEAD QUARTZITE
- FAULT
- CURRENT UNDERGROUND MINE WORKINGS
- BHH09-03 — SURFACE MONITORING WELL
- DWW10-01 — DEWATERING WELL
- UGPZ-1 — UNDERGROUND PIEZOMETER

0 150
SCALE (ft)

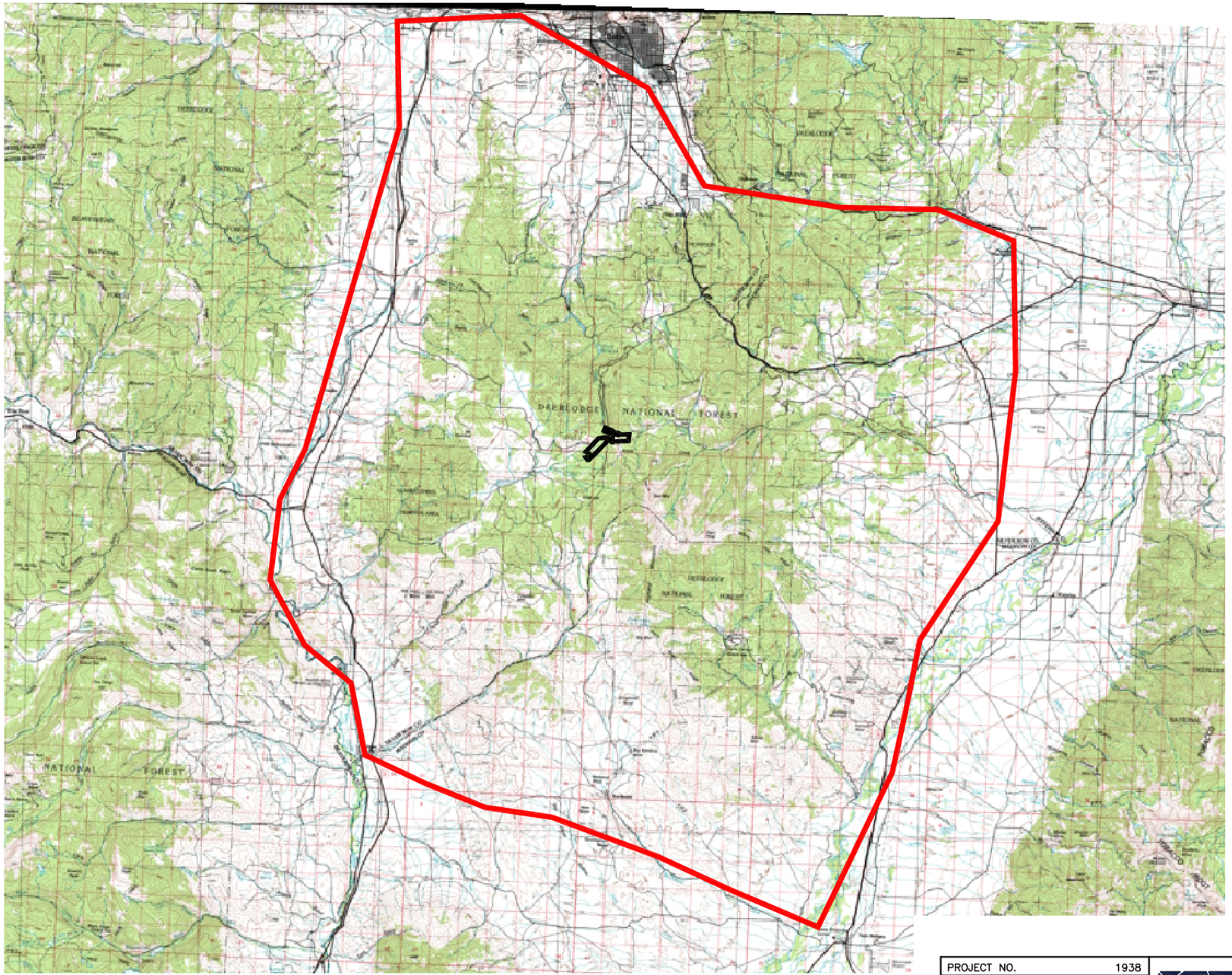
PROJECT NO.	1938
BY	SJH
CHECKED	--
DRAWN	SAC
DRAWING NAME	7300-GEOLOGY
DRAWING DATE	1 JUN 2011
REVISION DATE	--

ITASCA™ Denver, Inc.

Geology at Level of Current Mine (approximately 7300 ft., NGVD)

CLIENT: Butte Highlands Joint Venture

FIGURE NO. 7



EXPLANATION

NUMERICAL MODEL DOMAIN

BUTTE HIGHLANDS CLAIM BOUNDARIES

N

0 2 4

SCALE (miles)

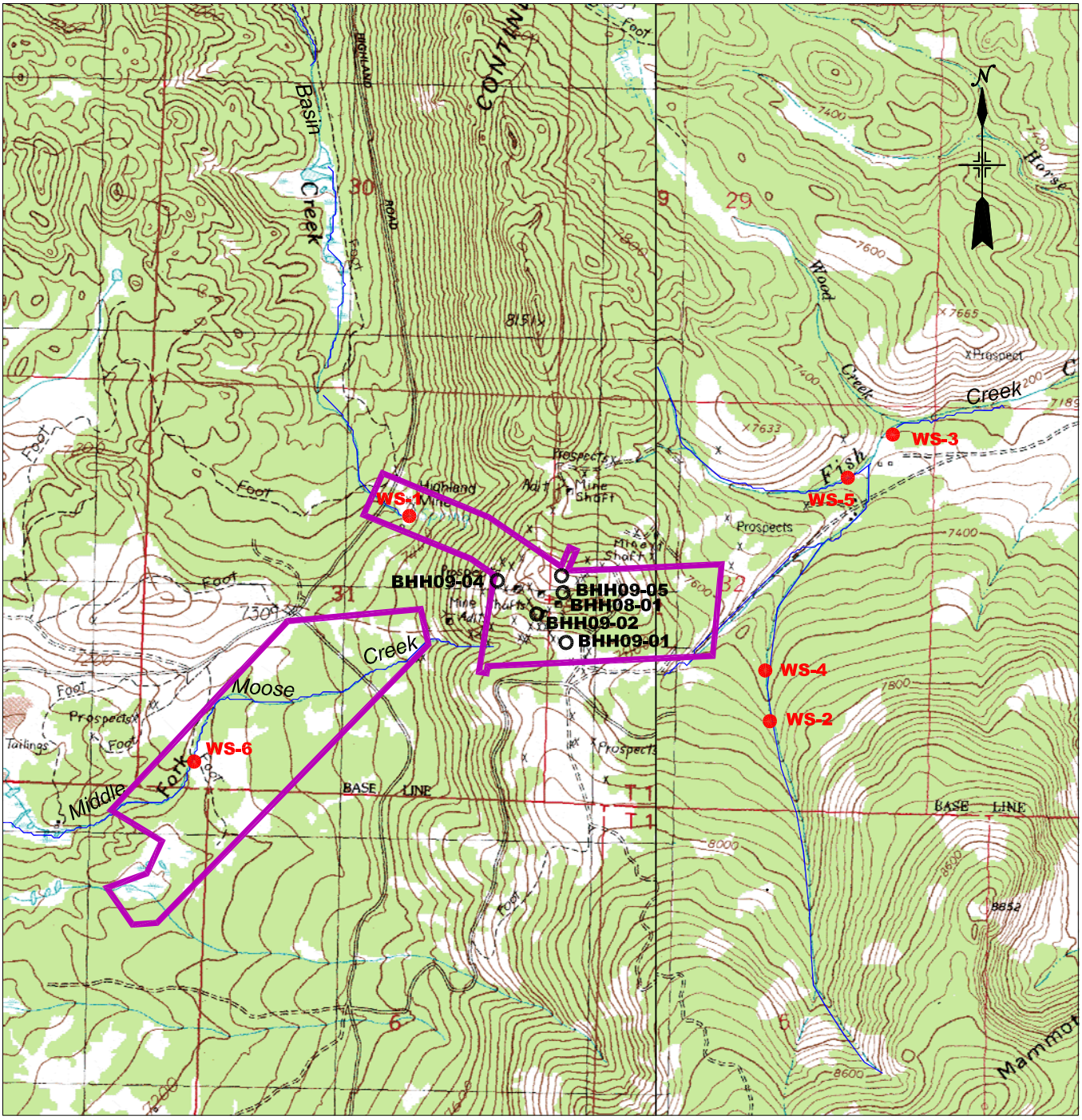
PROJECT NO.	1938
BY	JCW
CHECKED	RJS
DRAWN	SAC
DRAWING NAME	MOD–DOMAIN
DRAWING DATE	1 JUN 2011
REVISION DATE	––

ITASCA™ Denver, Inc.

Numerical Model Domain

CLIENT: Butte Highlands Joint Venture

FIGURE NO. 8



SOURCE: U.S.G.S. 7-1/2 MINUTE QUADRANGLE MAPS: PIPESTONE PASS AND MOUNT HUMBUG

EXPLANATION

- SURFACE WATER SAMPLING LOCATION
- GROUNDWATER MONITORING WELL
- BUTTE HIGHLANDS CLAIM BOUNDARIES

0 1,000 2,000
SCALE (ft)

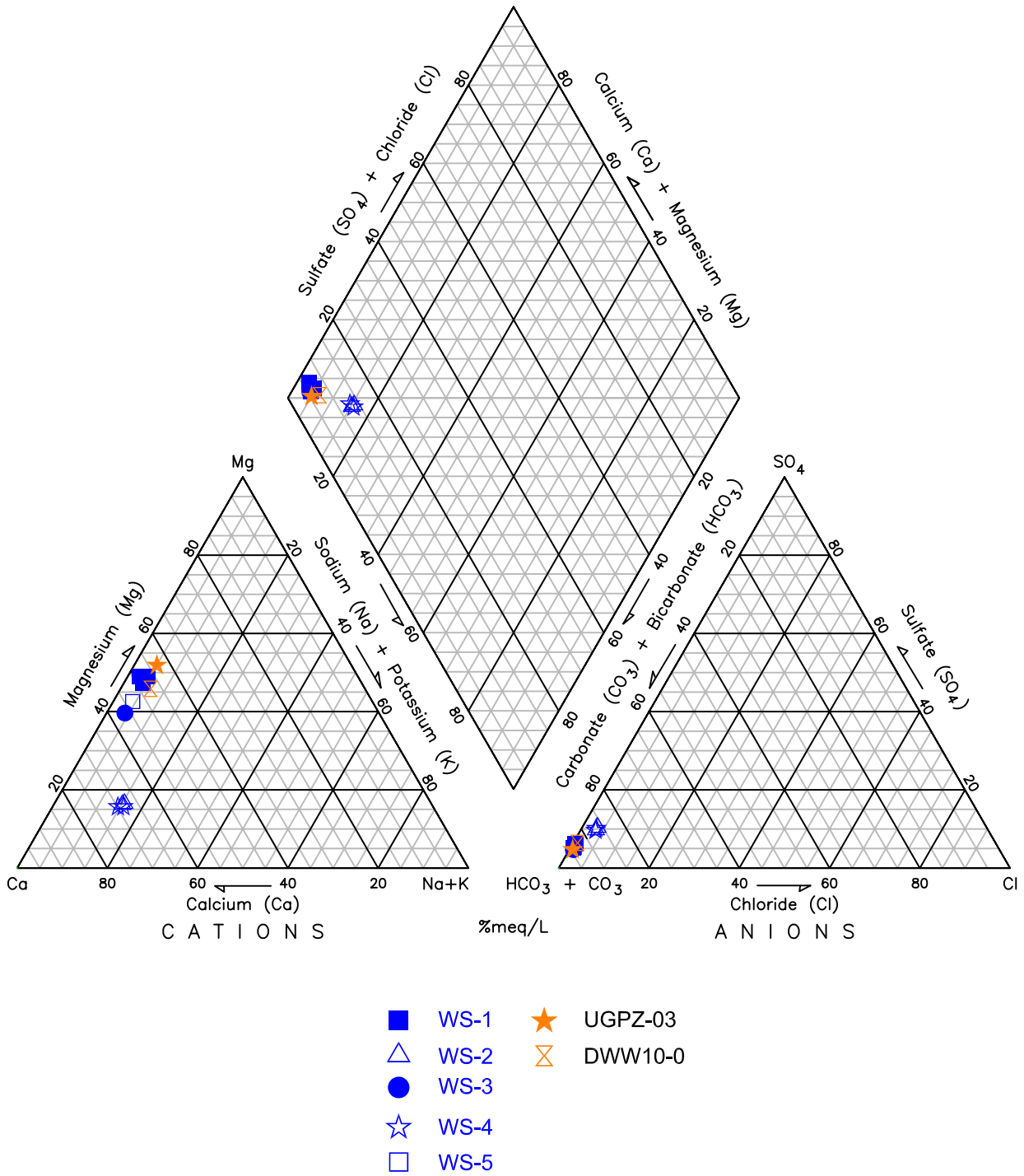
PROJECT NO.	1938
BY	SJH
CHECKED	RJS
DRAWN	SAC
DRAWING NAME	SURFWATER–MEAS
DRAWING DATE	1 JUN 2011
REVISION DATE	

ITASCA™ Denver, Inc.

Locations of Surface-Water Measurement Stations

CLIENT: Butte Highlands Joint Venture

FIGURE NO. 9



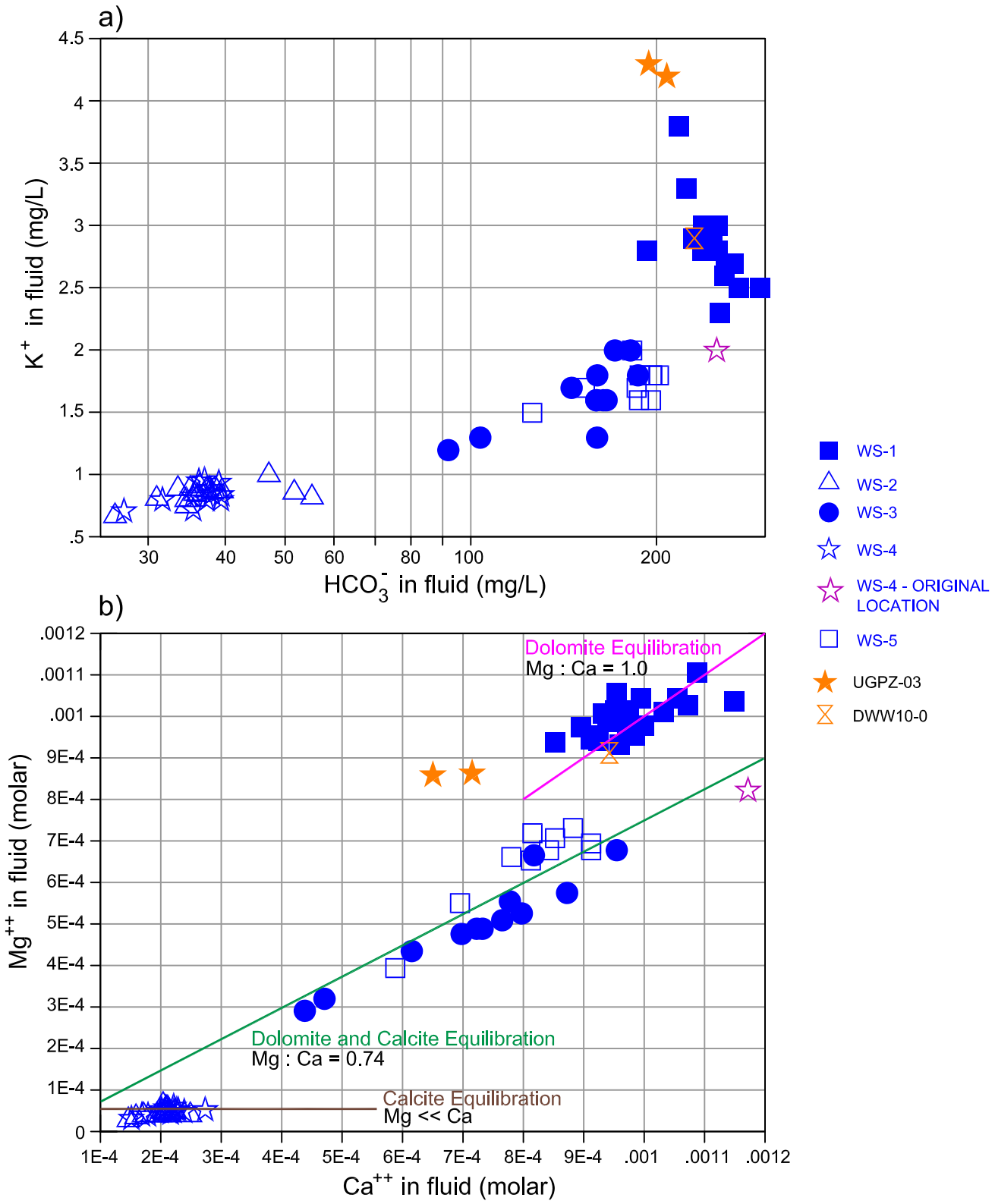
PROJECT NO.	1938
BY	BTH
CHECKED	--
DRAWN	SAC
DRAWING NAME	GEOCHEM1
DRAWING DATE	1 JUN 2011
REVISION DATE	--

ITASCA™ Denver, Inc.

Piper Diagram of Select Locations Sampled between November 2010 and January 2011

CLIENT: Butte Highlands Joint Venture

FIGURE NO. 10



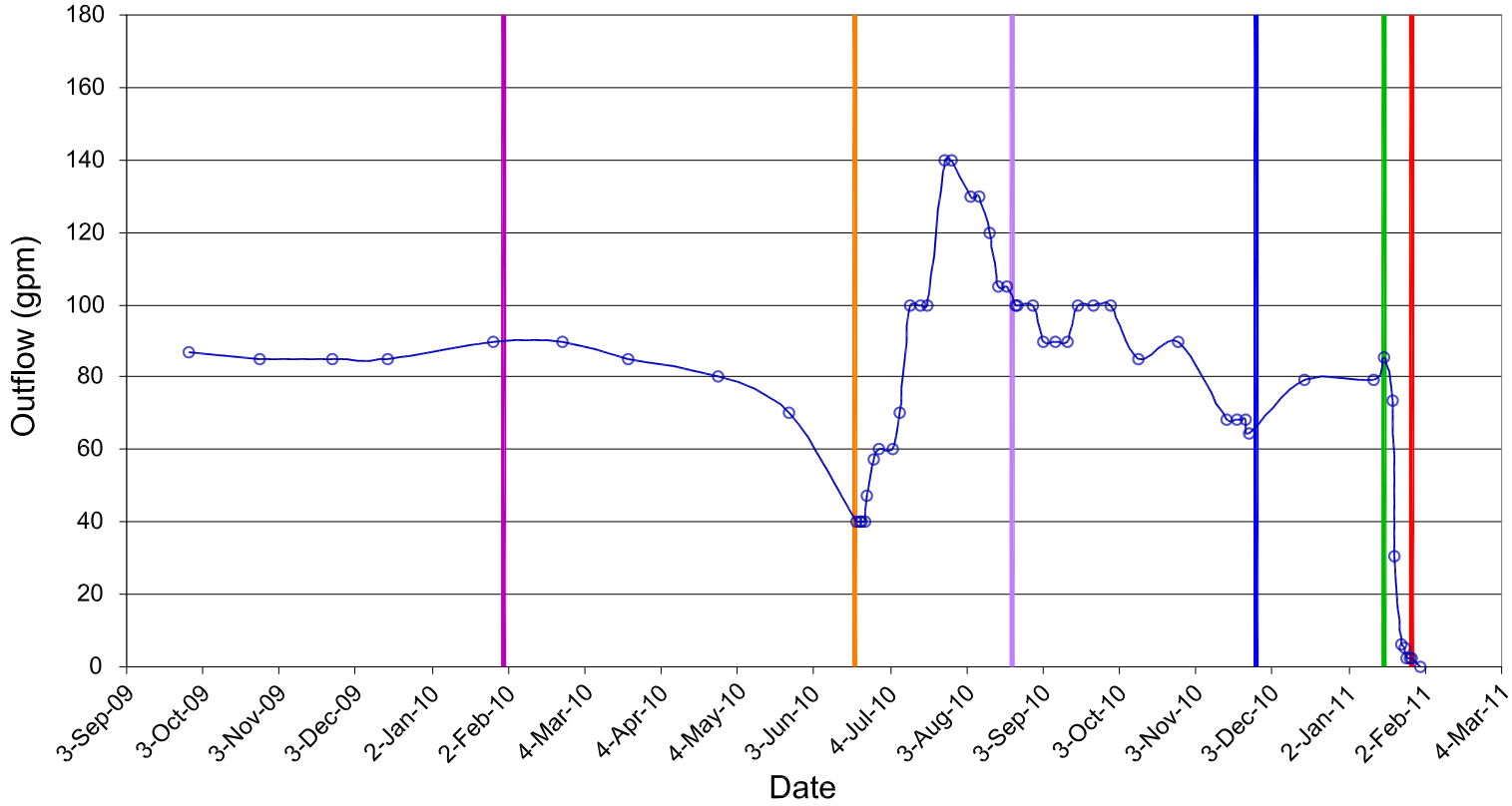
PROJECT NO.	1938
BY	BTH
CHECKED	--
DRAWN	SAC
DRAWING NAME	GEOCHEM2
DRAWING DATE	1 JUN 2011
REVISION DATE	--

ITASCA™ Denver, Inc.

Plots of (a) Bicarbonate and Potassium Concentrations and (b) Calcium and Magnesium Concentrations in Samples from Select Locations

CLIENT: Butte Highlands Joint Venture

FIGURE NO. 11



BEGIN MAR

BEGIN FLOODING MAR

MAXIMUM INFLOW TO UAR

UAR GROUTED

PUMP ON } DWW10-01 10-DAY PUMP TEST

PUMP OFF } DWW10-01 10-DAY PUMP TEST

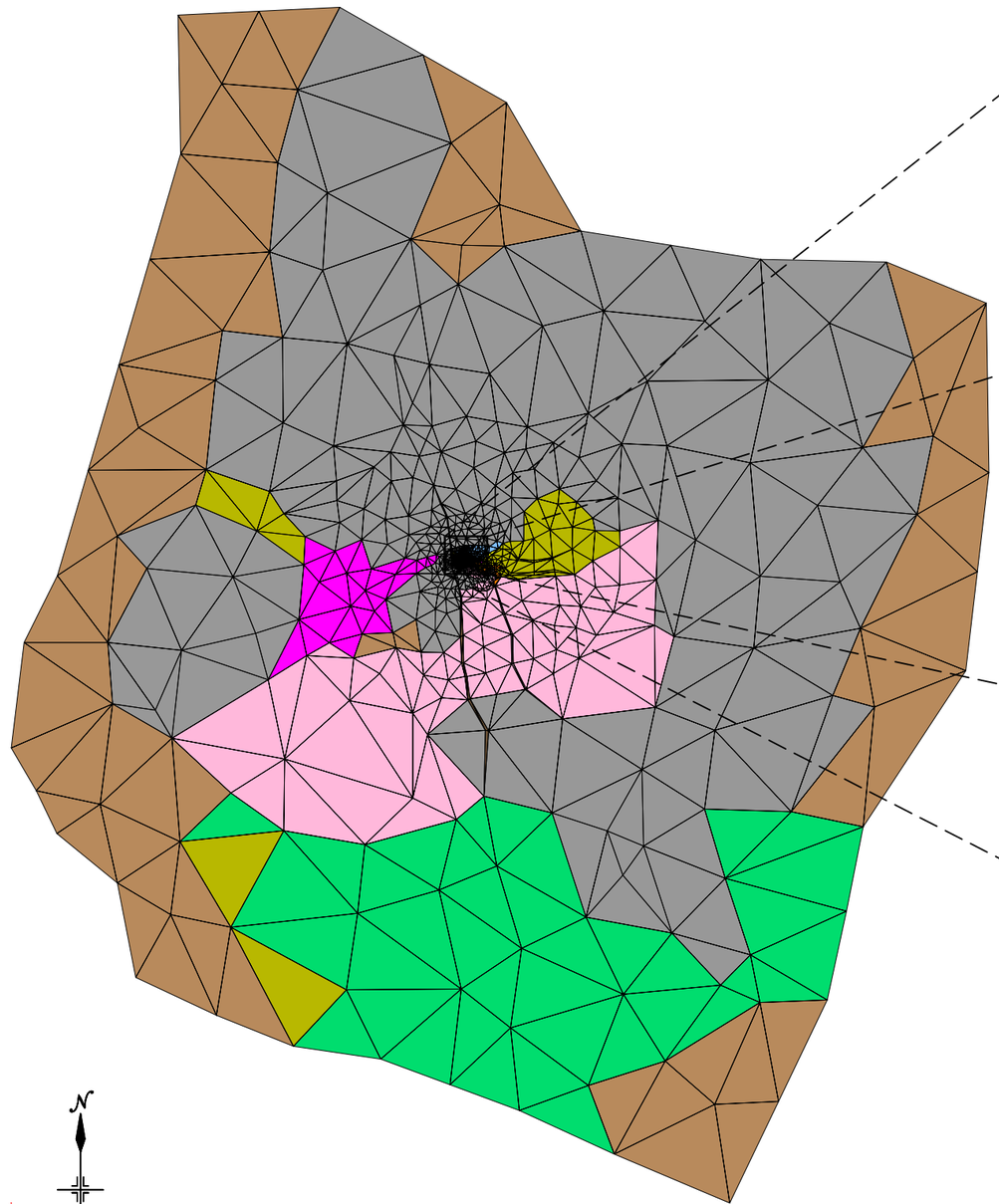
PROJECT NO.	1938
BY	JCW
CHECKED	RJS
DRAWN	SAC
DRAWING NAME	PORTAL–OUTFLOW
DRAWING DATE	1 JUN 2011
REVISION DATE	--

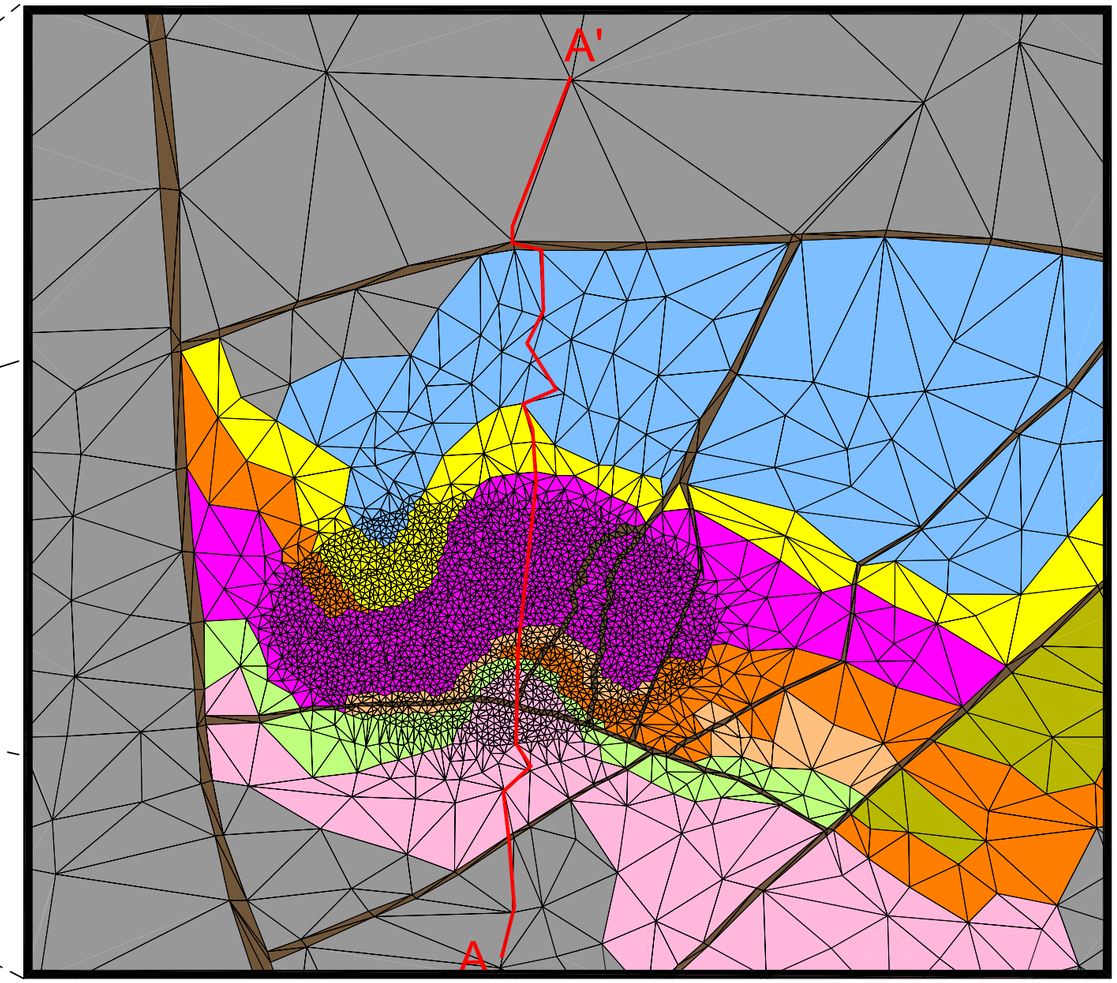
ITASCA™ Denver, Inc.

Portal Outflow - Old Highlands Mine

CLIENT: Butte Highlands Joint Venture

FIGURE NO. 12





EXPLANATION

0 500 1,000
SCALE (ft)

- ARCHEAN METAMORPHIC ROCKS
- BELT SUPER GROUP
- FLATHEAD QUARTZITE
- WOLSEY SHALE/SANDSTONE
- MEAGHER DOLOMITE
- PARK SHALE
- PILGRIM DOLOMITE/LIMESTONE
- DEVONIAN-PERMIAN SEDIMENTS - UNDIFFERENTIATED
- TERTIARY SEDIMENTS
- DIORITE INTRUSIVE
- INTRUSIVE
- FAULT
- A——A' CROSS SECTION LOCATION (SEE FIGURE 14)

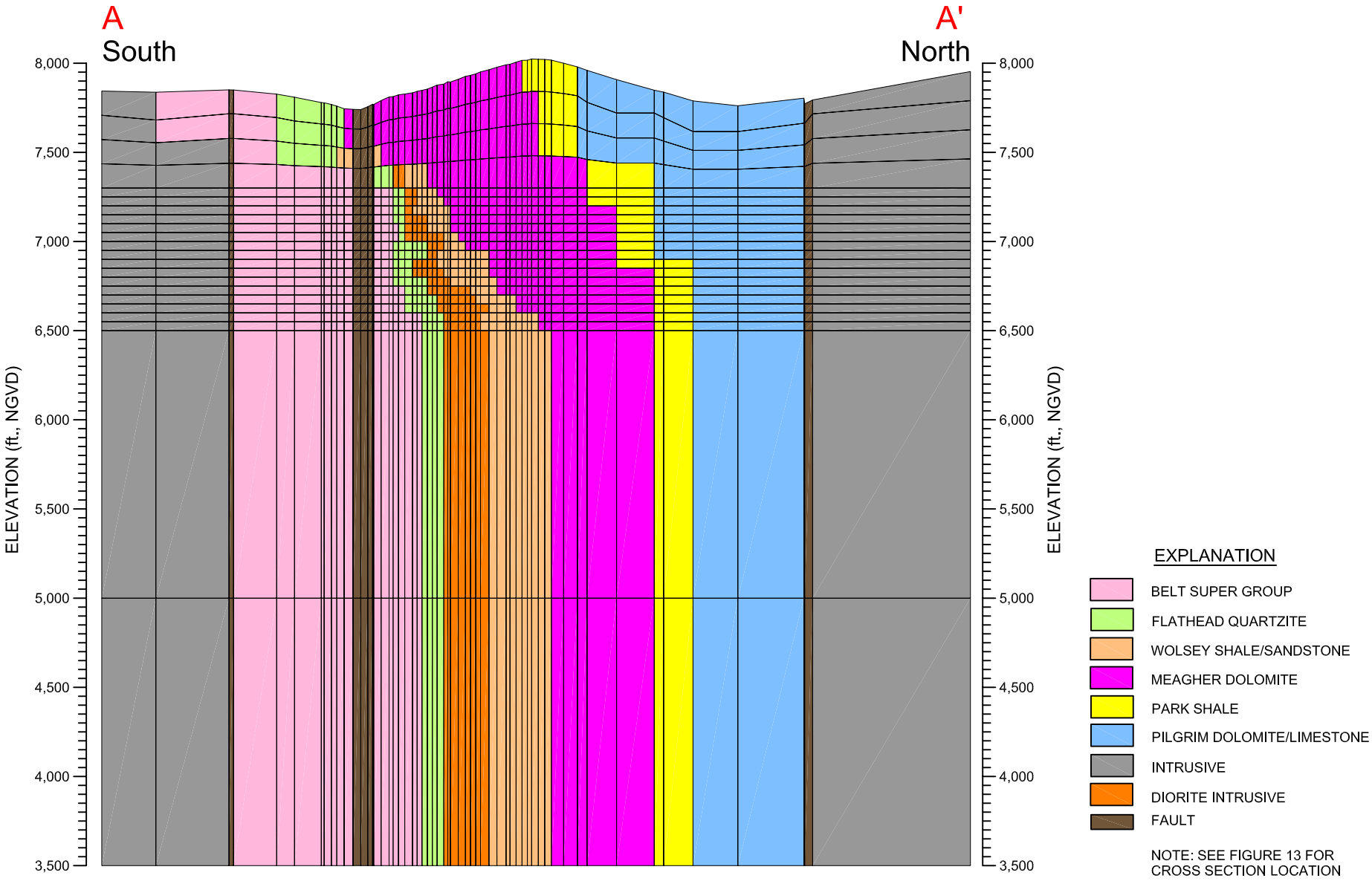
PROJECT NO.	1938
BY	SJH
CHECKED	RJS
DRAWN	SAC
DRAWING NAME	LAYER5
DRAWING DATE	1 JUN 2011
REVISION DATE	--

ITASCA™ Denver, Inc.

Finite-Element Grid - Plan View of Layer 5

CLIENT: Butte Highlands Joint Venture

FIGURE NO. 13



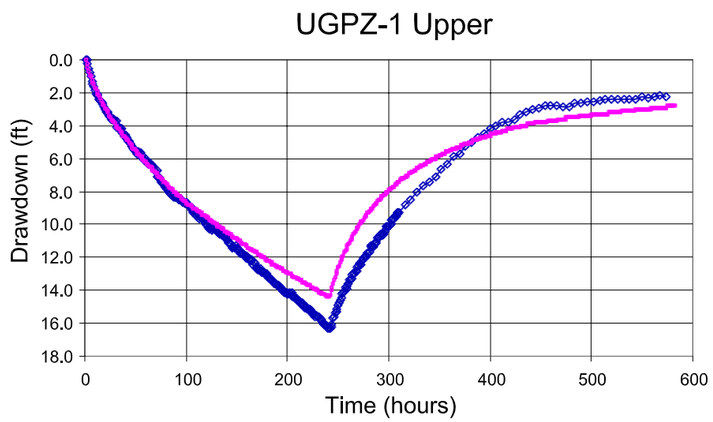
PROJECT NO.	1938
BY	SJH
CHECKED	RJS
DRAWN	SAC
DRAWING NAME	NS–XSEC
DRAWING DATE	1 JUN 2011
REVISION DATE	--

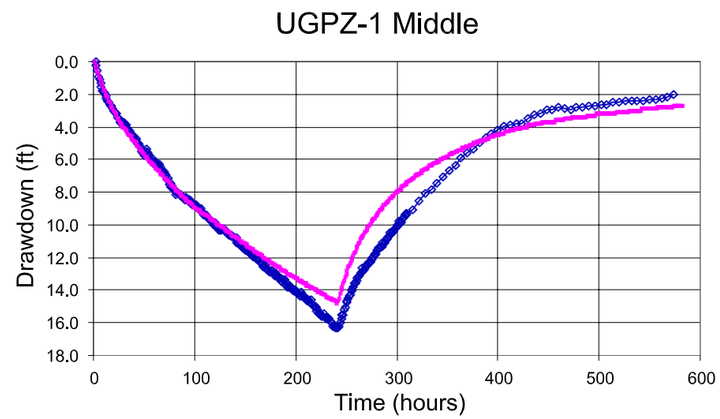
ITASCA™ Denver, Inc.

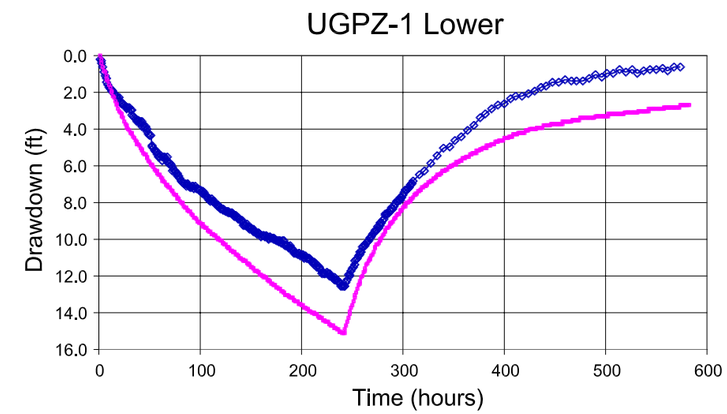
Finite-Element Grid - Cross-Sectional View

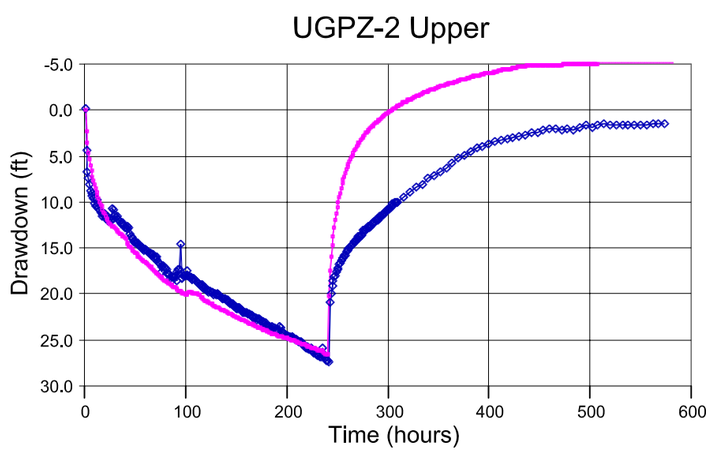
CLIENT: Butte Highlands Joint Venture

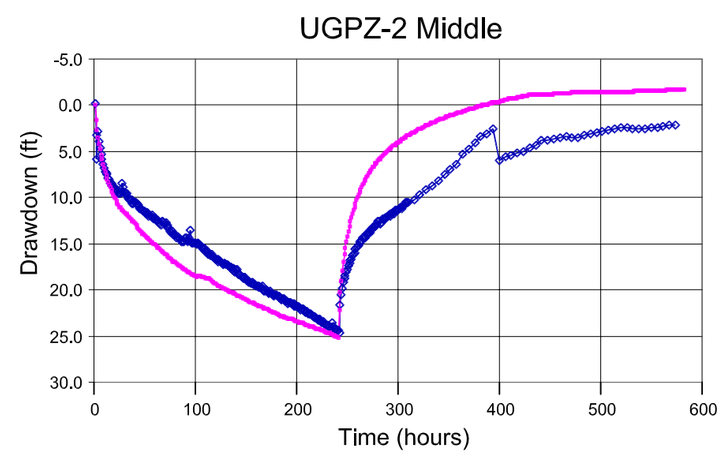
FIGURE NO. 14

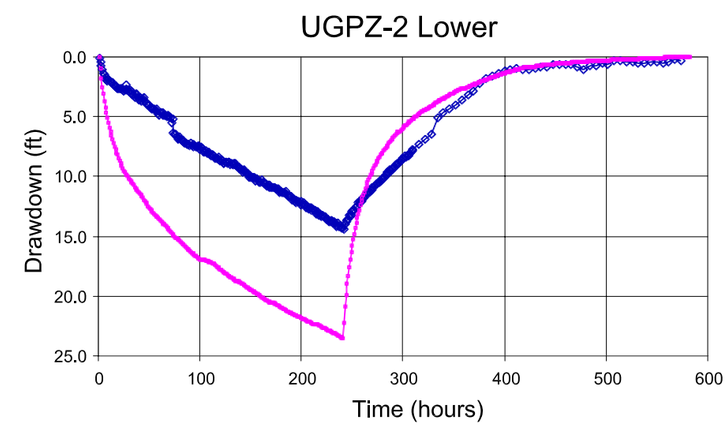


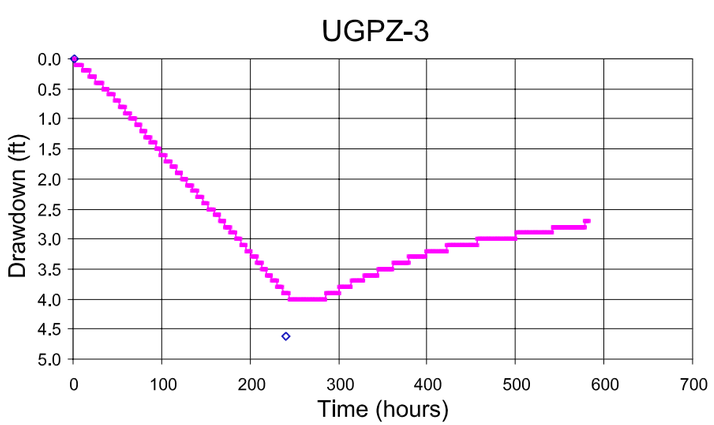












EXPLANATION

OBSERVED — SIMULATED

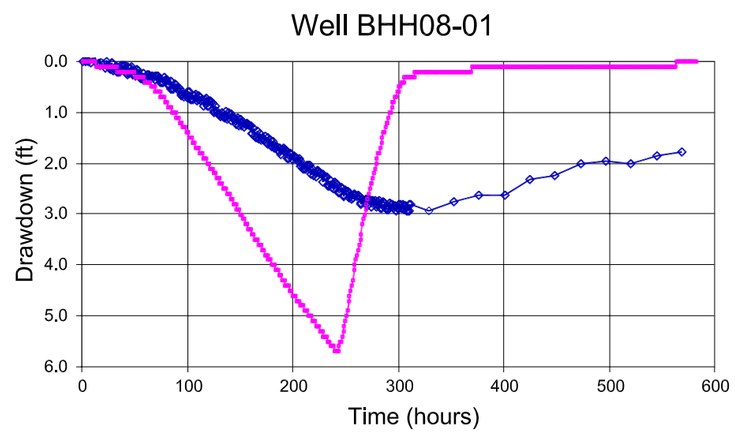
PROJECT NO.	1938
BY	SJH
CHECKED	RJS
DRAWN	SAC
DRAWING NAME	CALIBRATION1
DRAWING DATE	1 JUN 2011
REVISION DATE	--

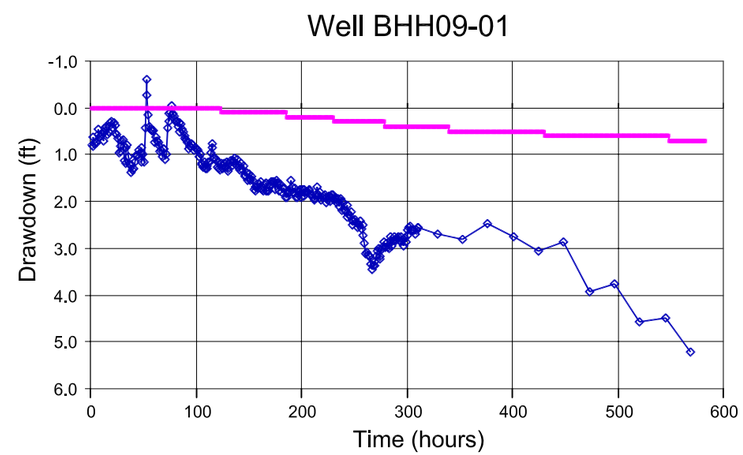
ITASCA™ Denver, Inc.

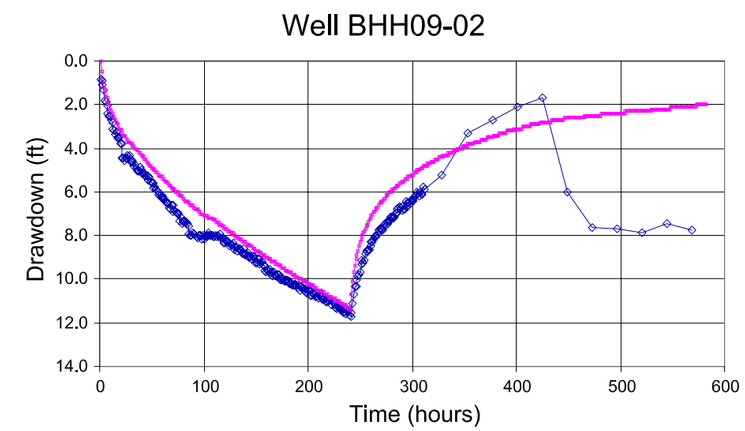
Transient Calibration Results

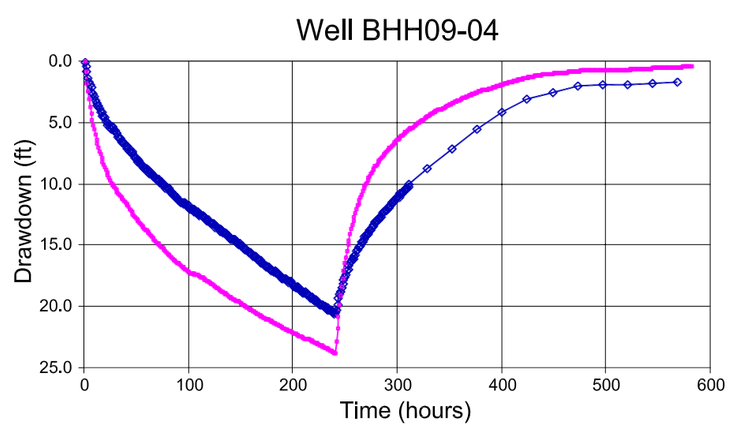
CLIENT: Butte Highlands Joint Venture

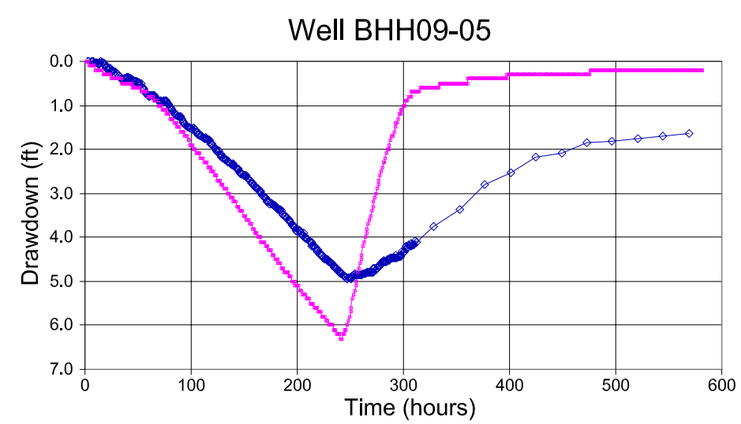
FIGURE NO. 15a











EXPLANATION

OBSERVED — SIMULATED

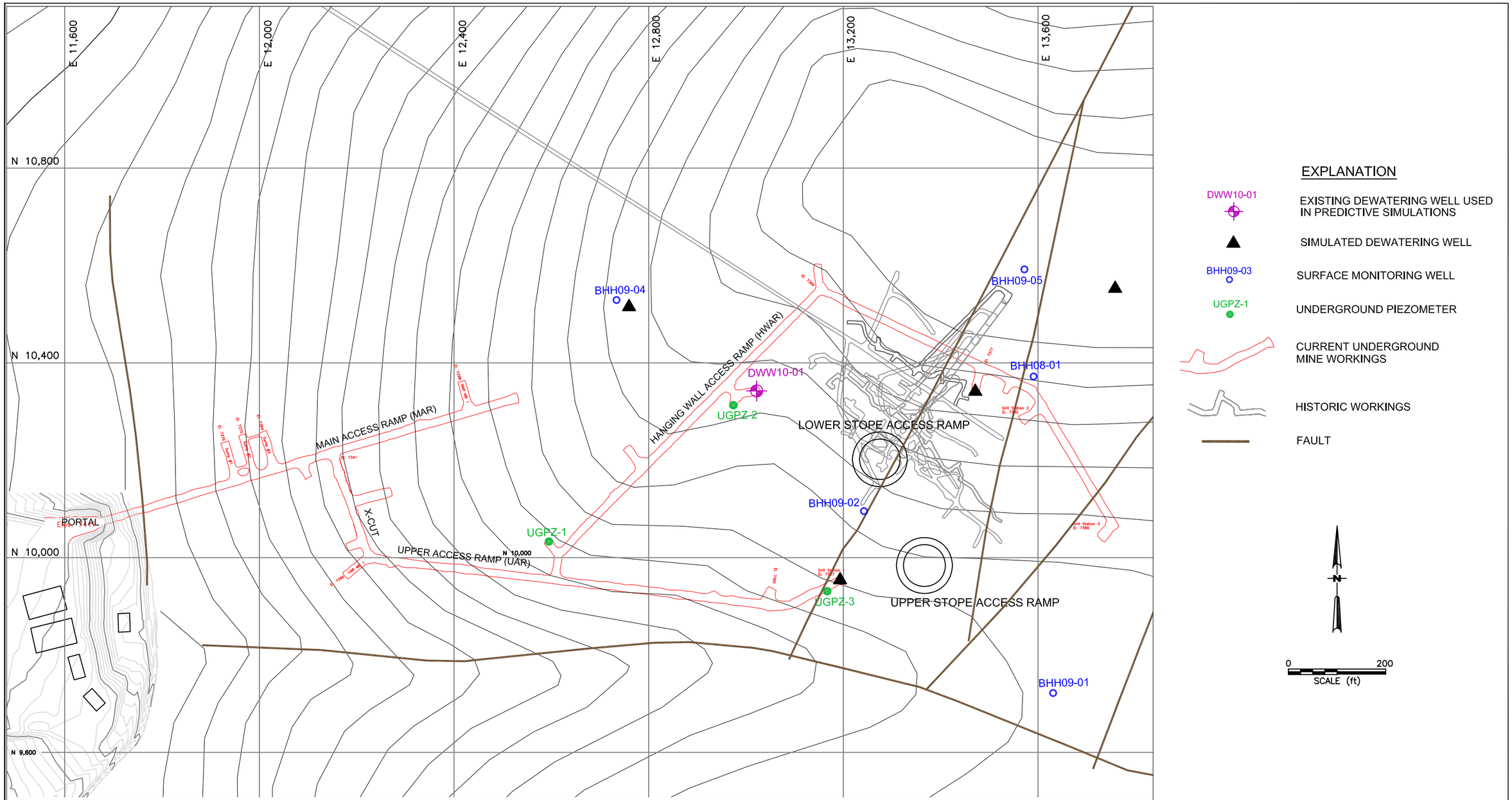
PROJECT NO.	1938
BY	SJH
CHECKED	RJS
DRAWN	SAC
DRAWING NAME	CALIBRATION2
DRAWING DATE	1 JUN 2011
REVISION DATE	10 MAR 2011

ITASCA™ Denver, Inc.

Transient Calibration Results

CLIENT: Butte Highlands Joint Venture

FIGURE NO. 15b



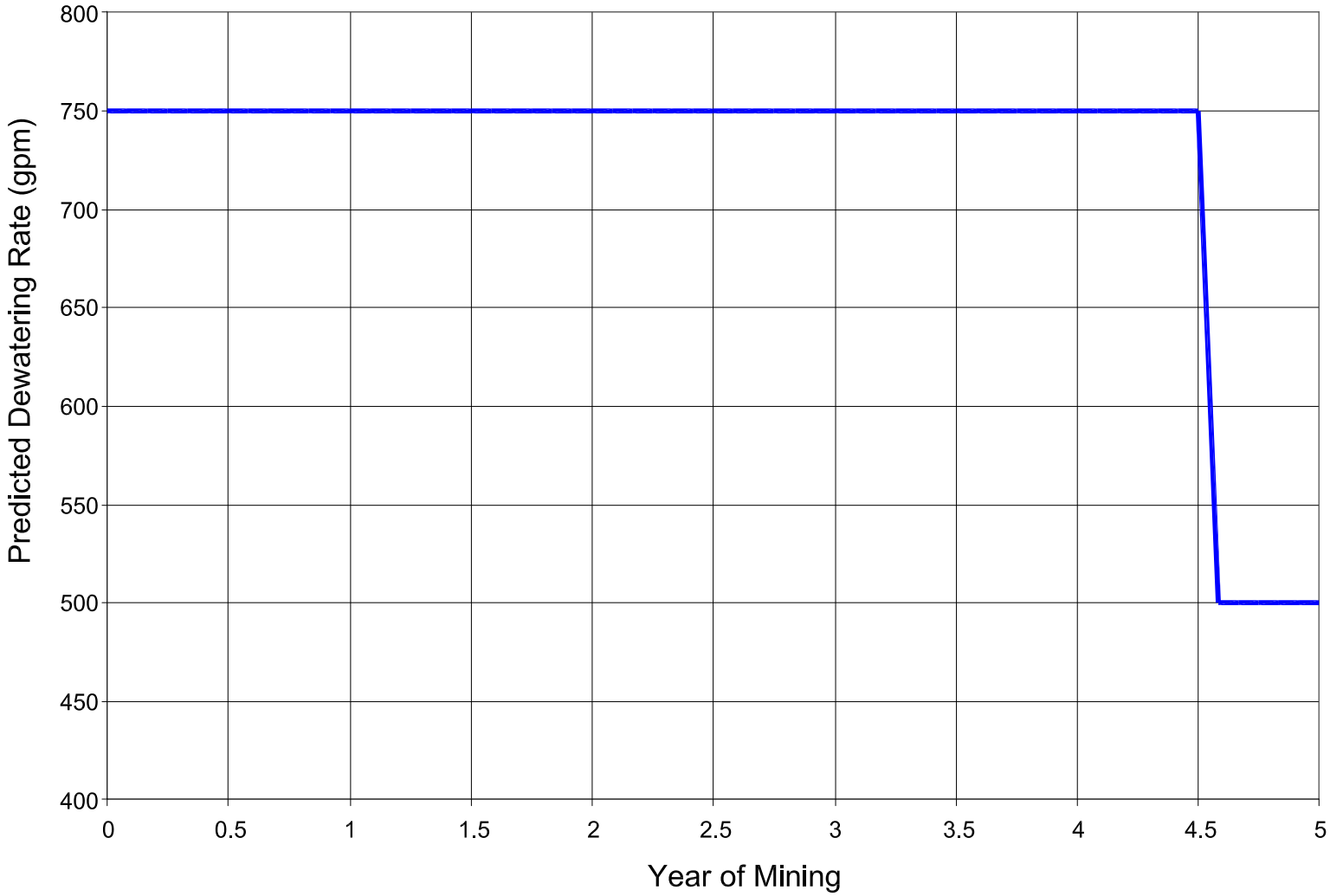
PROJECT NO.	1938
BY	JCW
CHECKED	RJS
DRAWN	SAC
DRAWING NAME	SIM–DW
DRAWING DATE	1 JUN 2011
REVISION DATE	--

ITASCA™ Denver, Inc.

Locations of Simulated Dewatering Wells

CLIENT: Butte Highlands Joint Venture

FIGURE NO. 16



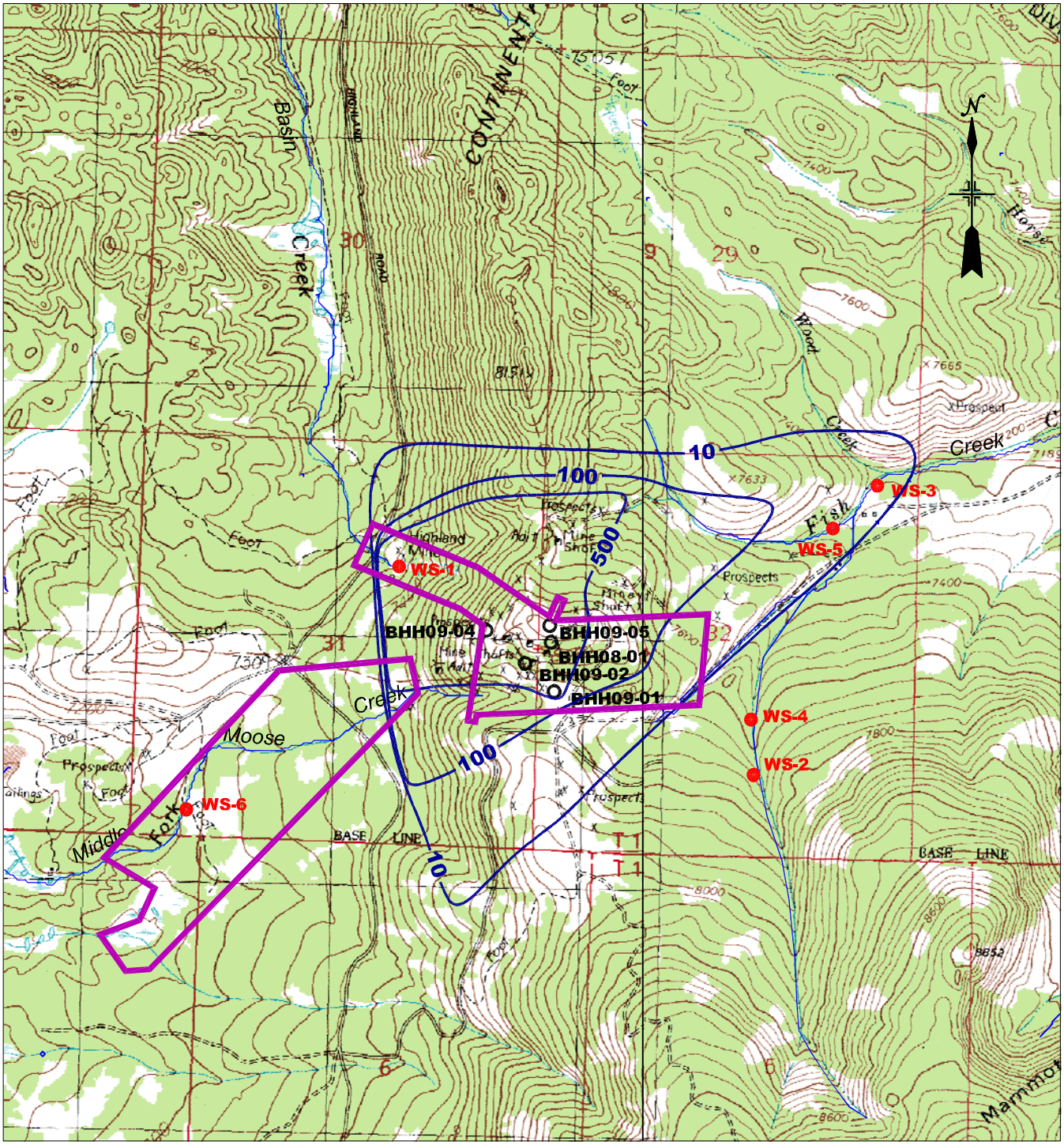
PROJECT NO.	1938
BY	SJH
CHECKED	RJS
DRAWN	SAC
DRAWING NAME	PRED–DW–RATE
DRAWING DATE	1 JUN 2011
REVISION DATE	30 JAN 2012

ITASCA™
Denver, Inc.

Predicted Dewatering Rate

CLIENT:
Butte Highlands Joint Venture

FIGURE NO.
17



SOURCE: U.S.G.S. 7-1/2 MINUTE QUADRANGLE MAPS: PIPESTONE PASS AND MOUNT HUMBUG

EXPLANATION

- SURFACE WATER SAMPLING LOCATION
- GROUNDWATER MONITORING WELL
- CONTOUR OF PREDICTED DRAWDOWN (ft.)
- BUTTE HIGHLANDS CLAIM BOUNDARIES

0 1,000 2,000
SCALE (ft)

PROJECT NO.	1938
BY	SJH
CHECKED	RJS
DRAWN	SAC
DRAWING NAME	PRED–DD
DRAWING DATE	1 JUN 2011
REVISION DATE	

ITASCA™ Denver, Inc.

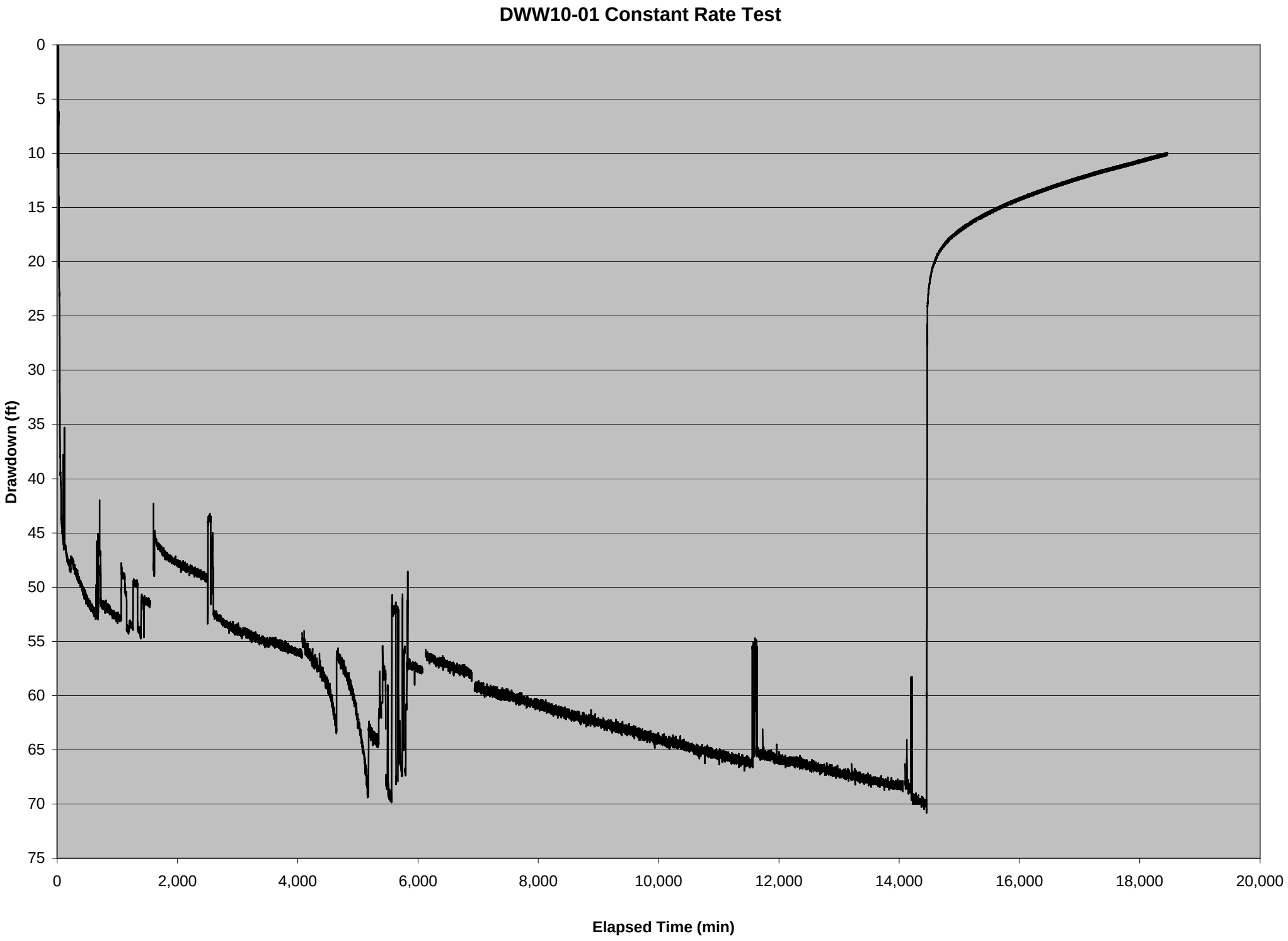
Predicted Water-Table Drawdown at End of Mining

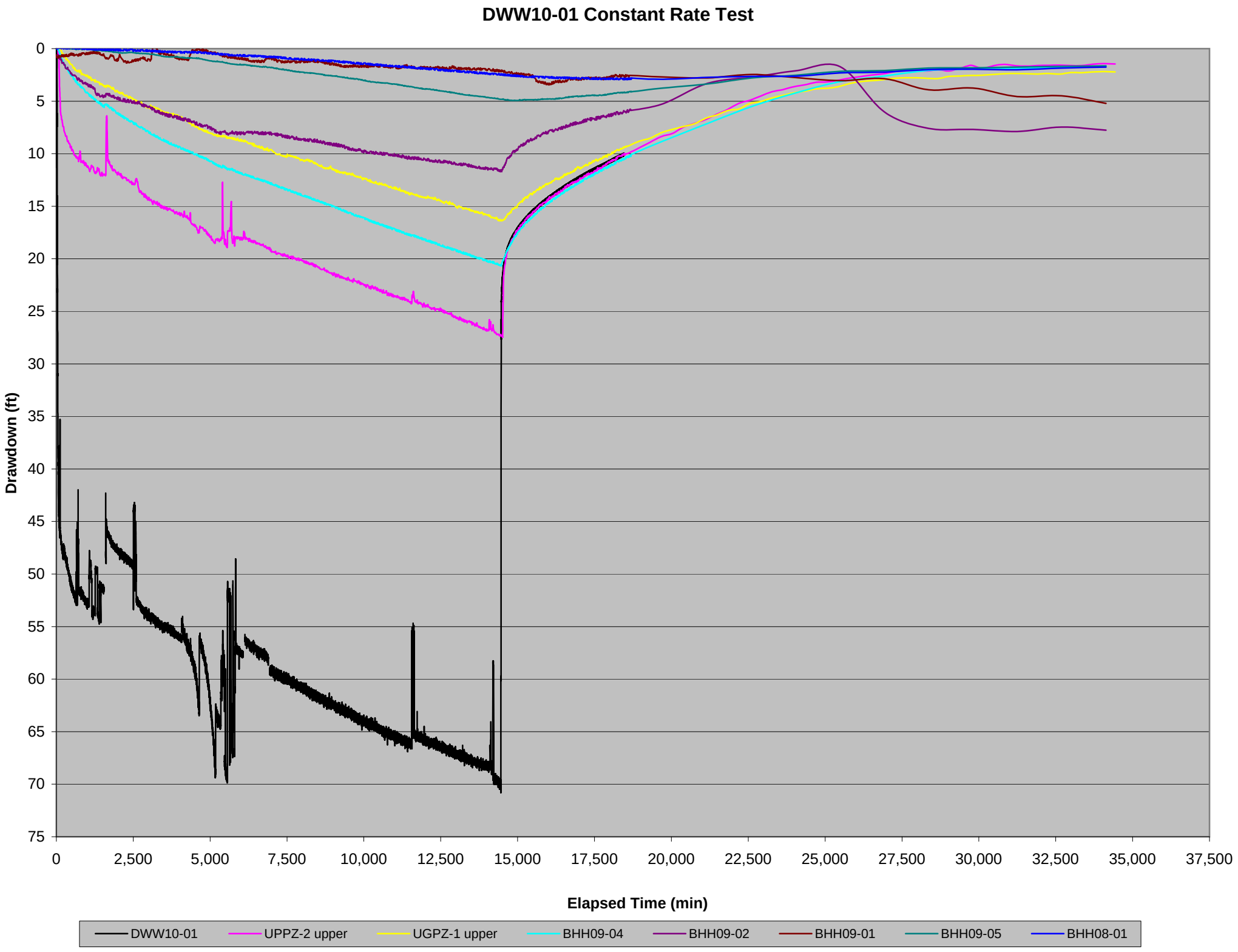
CLIENT: Butte Highlands Joint Venture

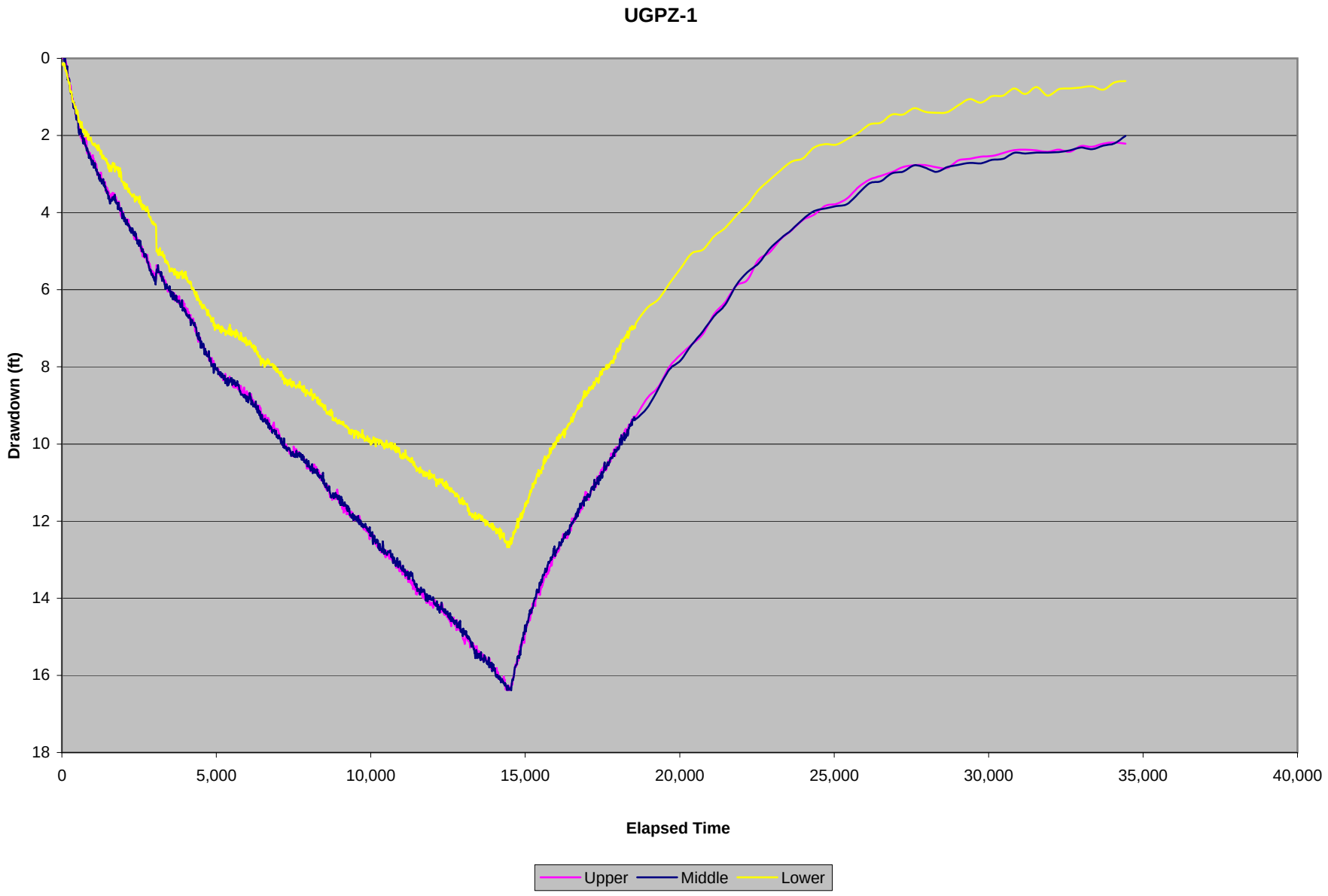
FIGURE NO. 18

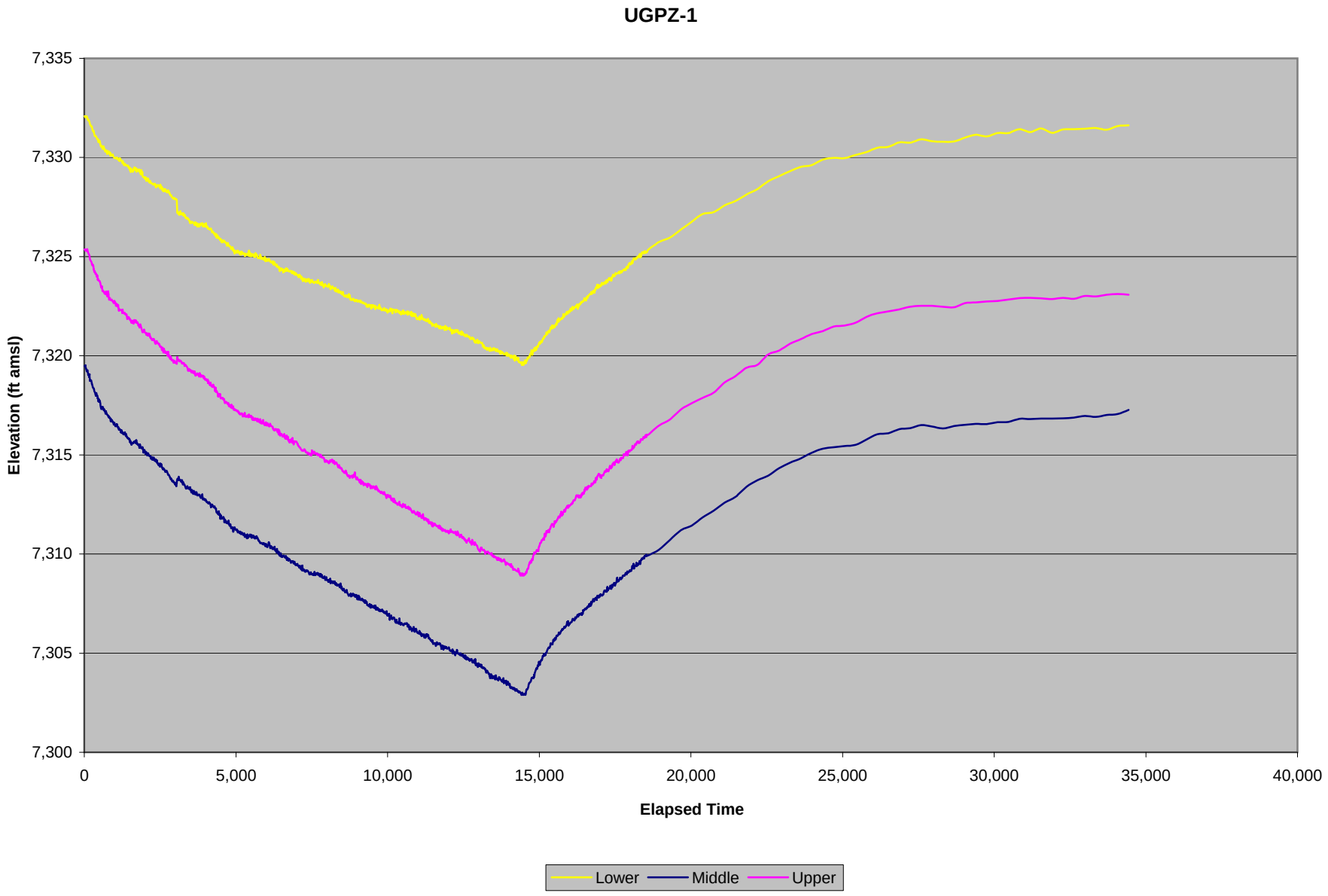
APPENDIX A

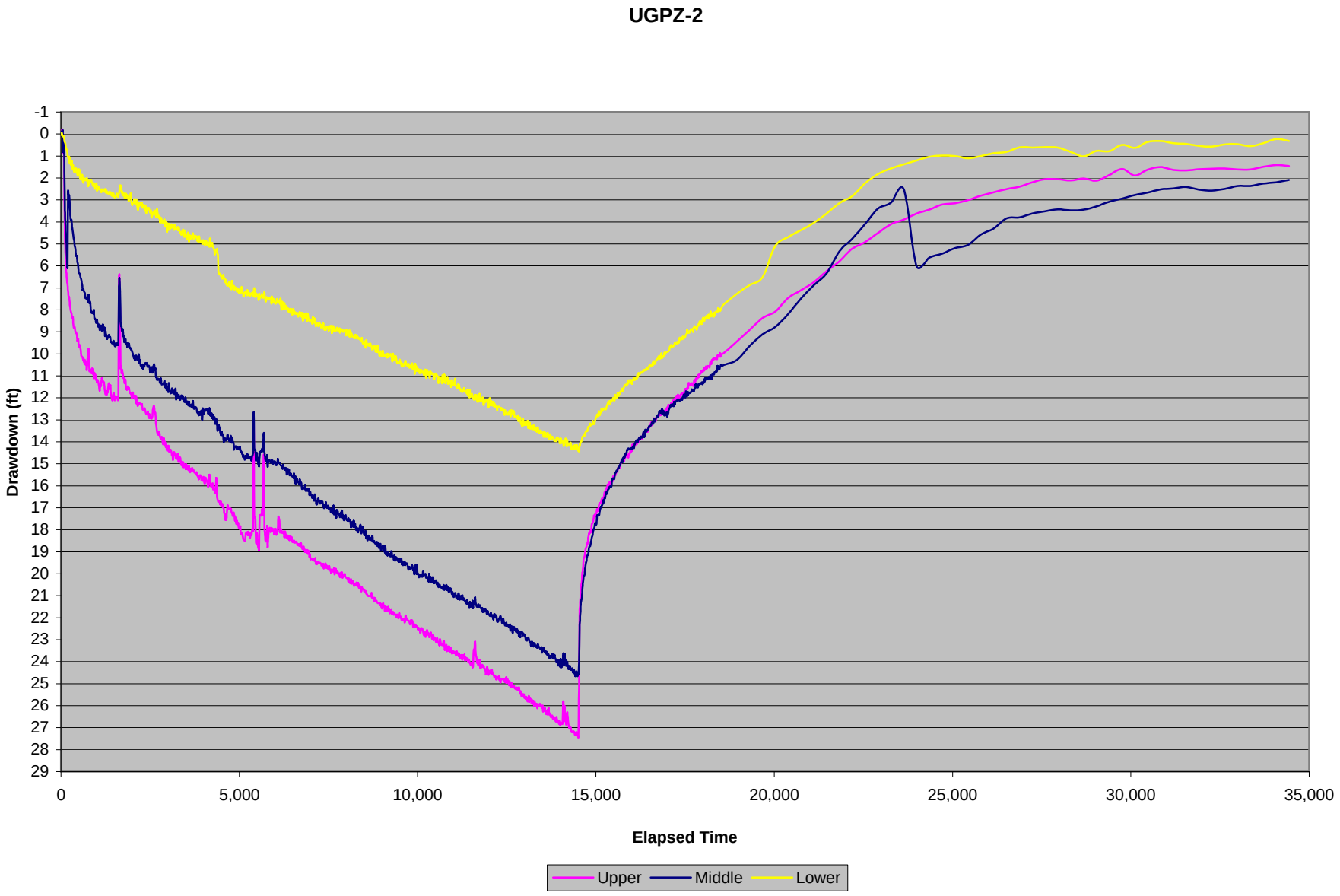
Pumping and Recovery Curves for Pumping Tests

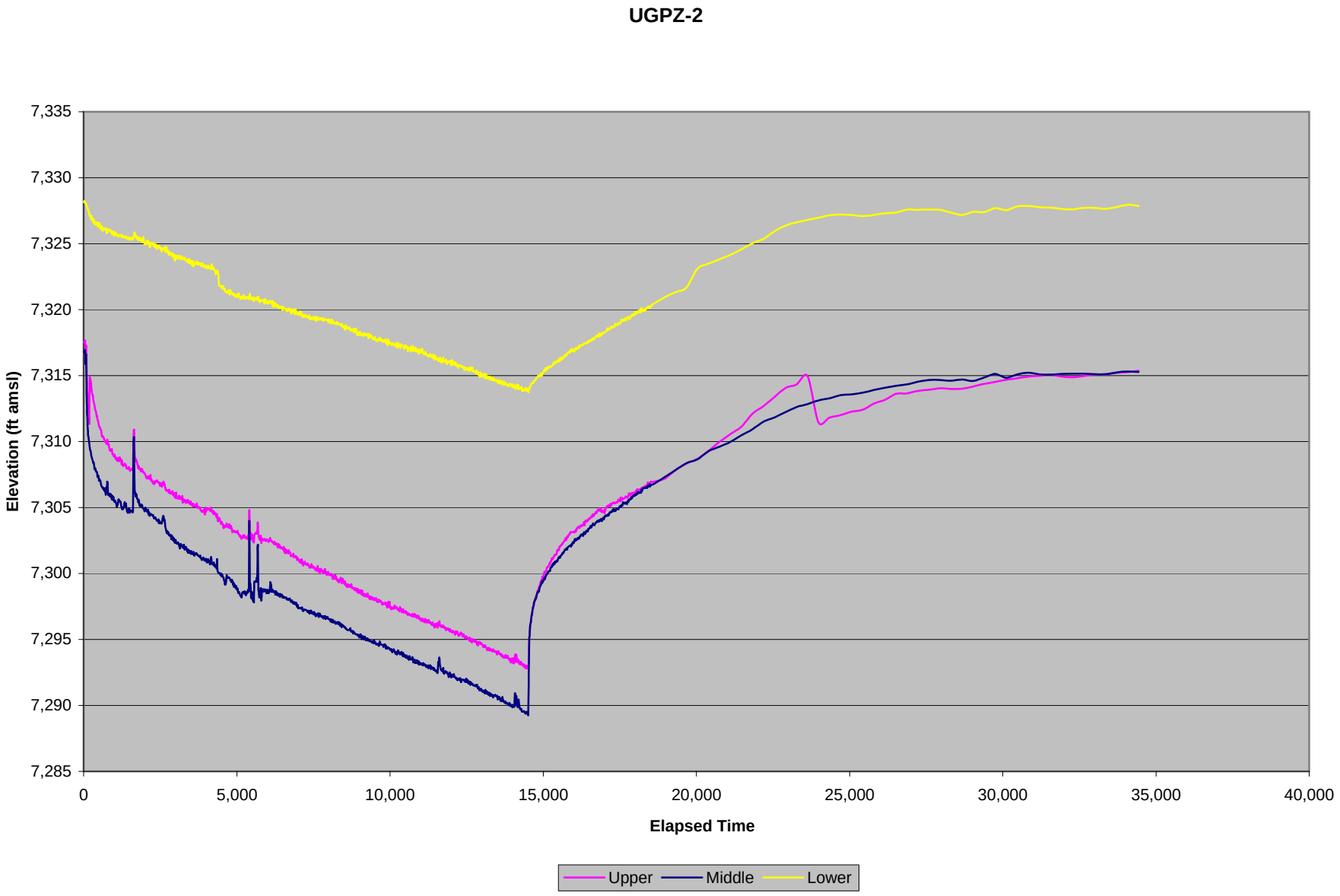

DWW10-01 Constant Rate Test
Drawdown (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
Elapsed Time (min)

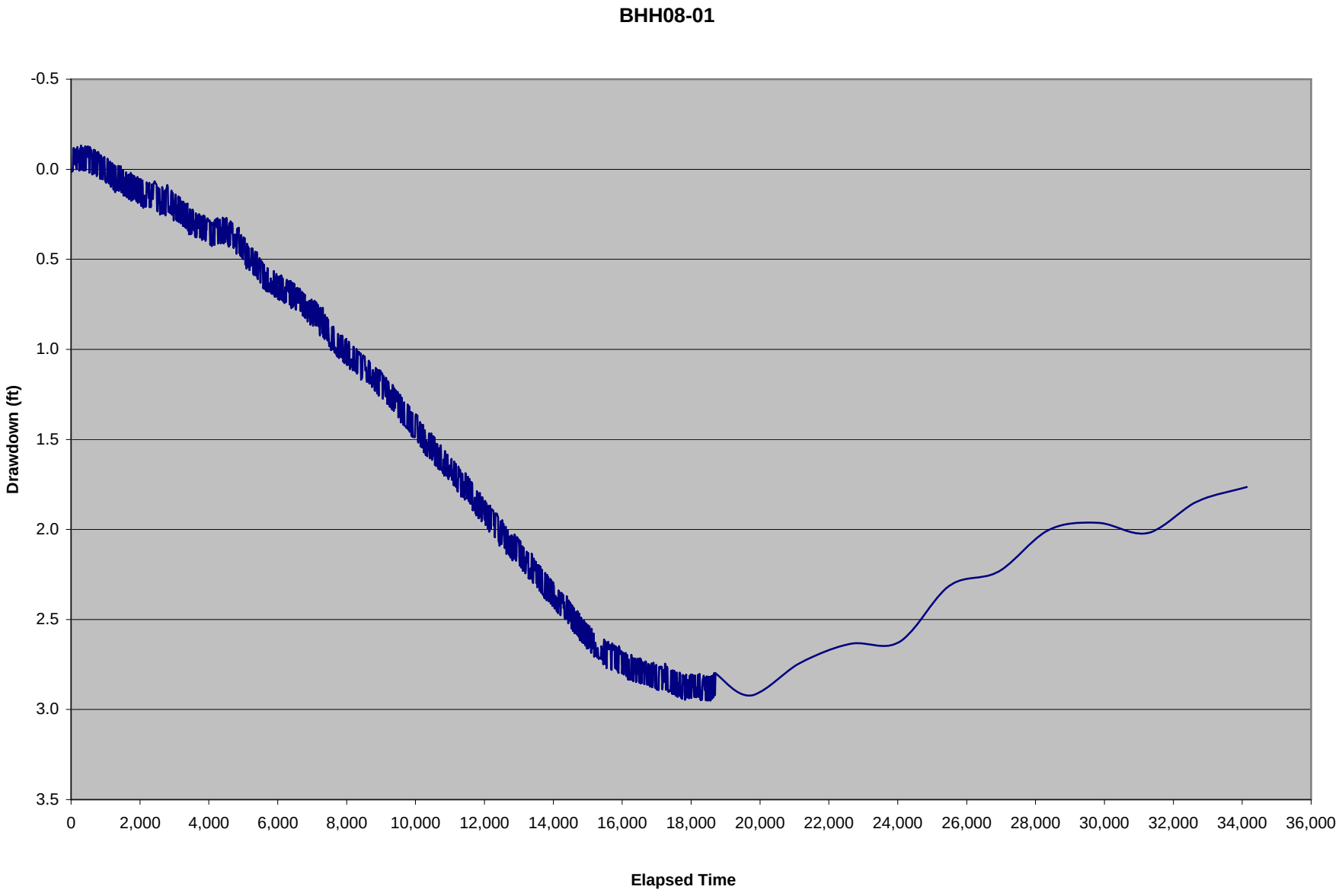

DWW10-01 Constant Rate Test
Drawdown (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
0
2,500
5,000
7,500
10,000
12,500
15,000
17,500
20,000
22,500
25,000
27,500
30,000
32,500
35,000
37,500
Elapsed Time (min)
DWW10-01
UPPZ-2 upper
UGPZ-1 upper
BHH09-04
BHH09-02
BHH09-01
BHH09-05
BHH08-01

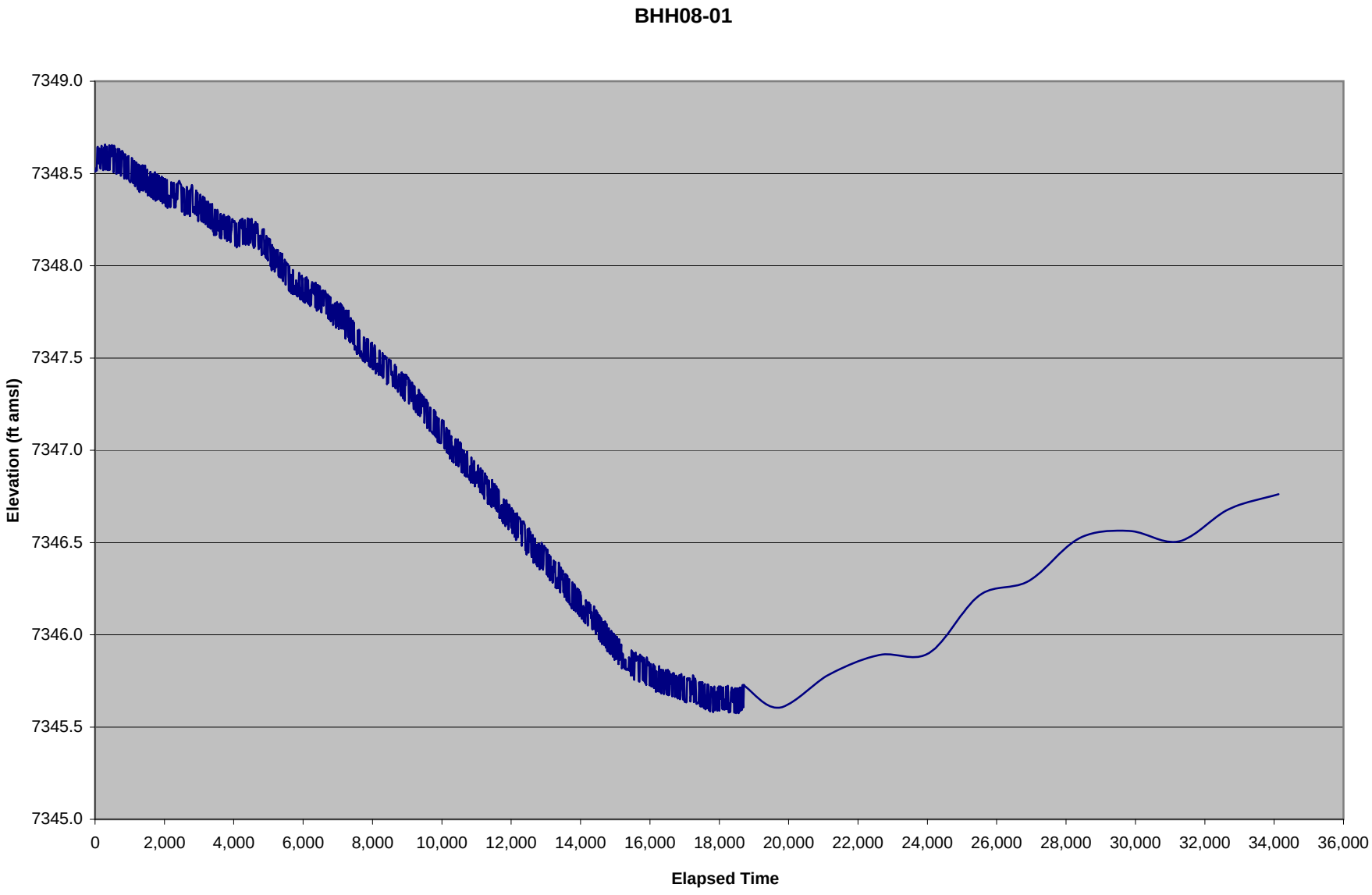

UGPZ-1
Drawdown (ft)
0
2
4
6
8
10
12
14
16
18
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
Elapsed Time
Upper
Middle
Lower

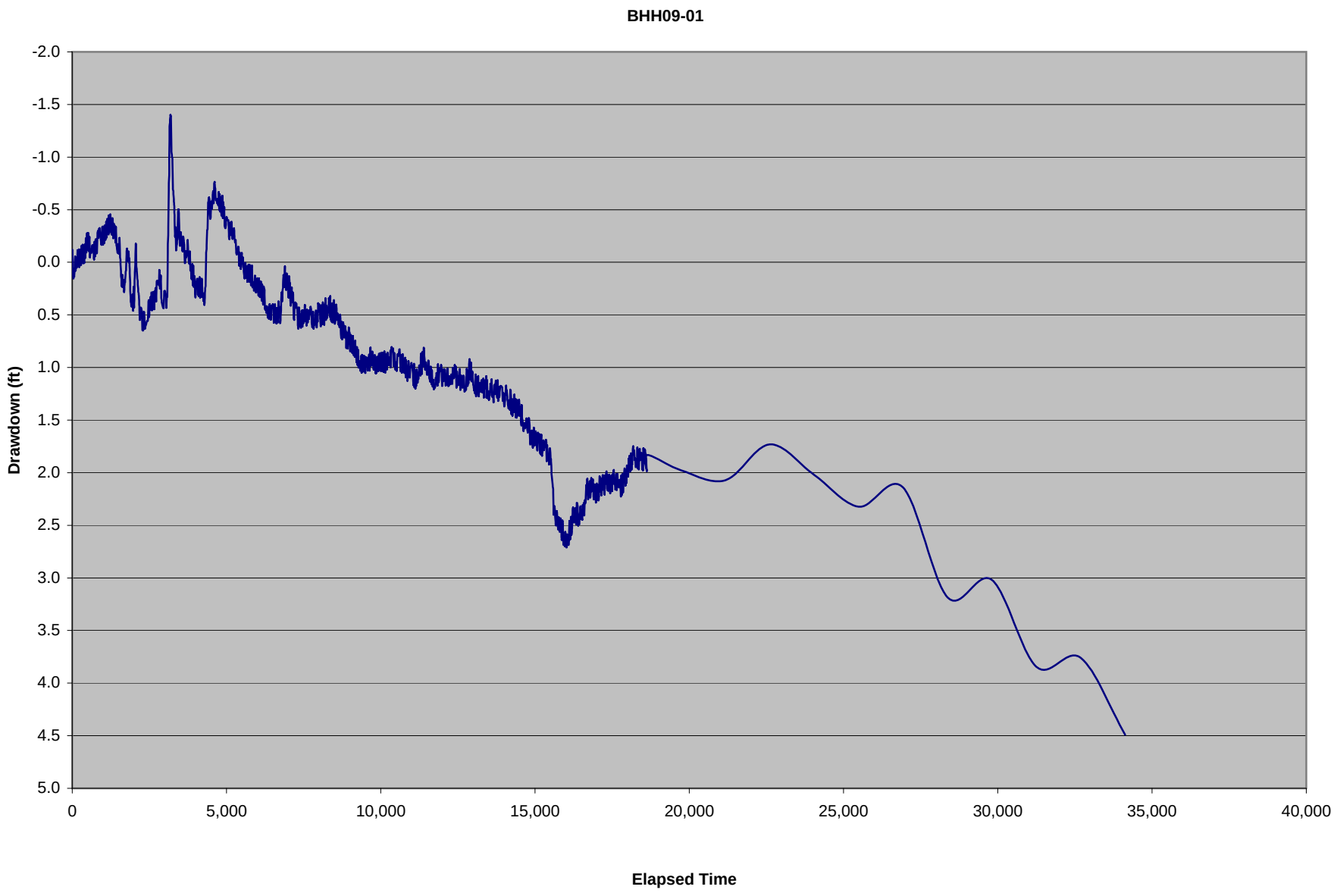

UGPZ-1
7,335
7,330
7,325
7,320
7,315
7,310
7,305
7,300
Elevation (ft amsl)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
Elapsed Time
Lower
Middle
Upper

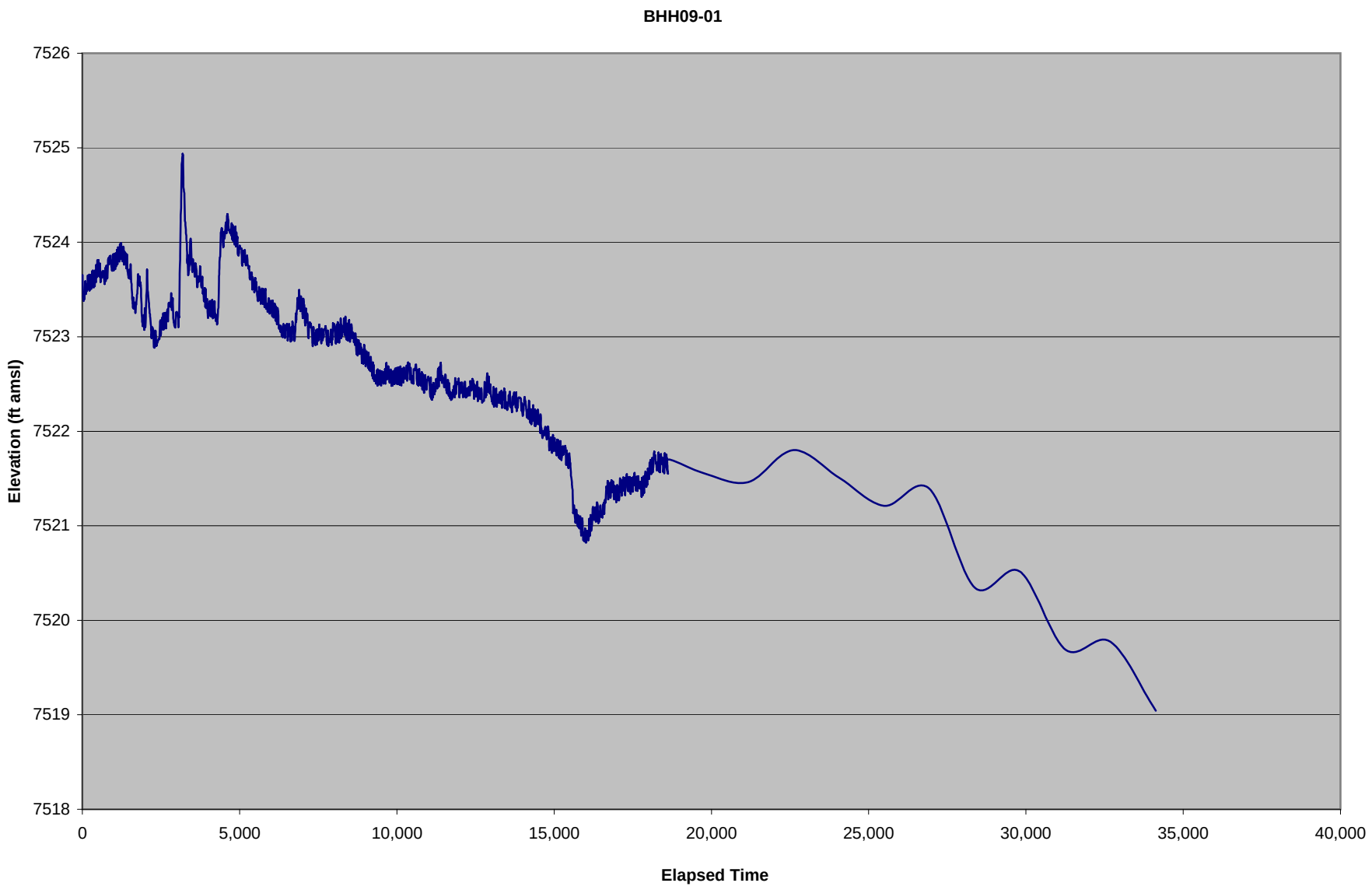

UGPZ-2
Drawdown (ft)
-1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
Elapsed Time
Upper
Middle
Lower

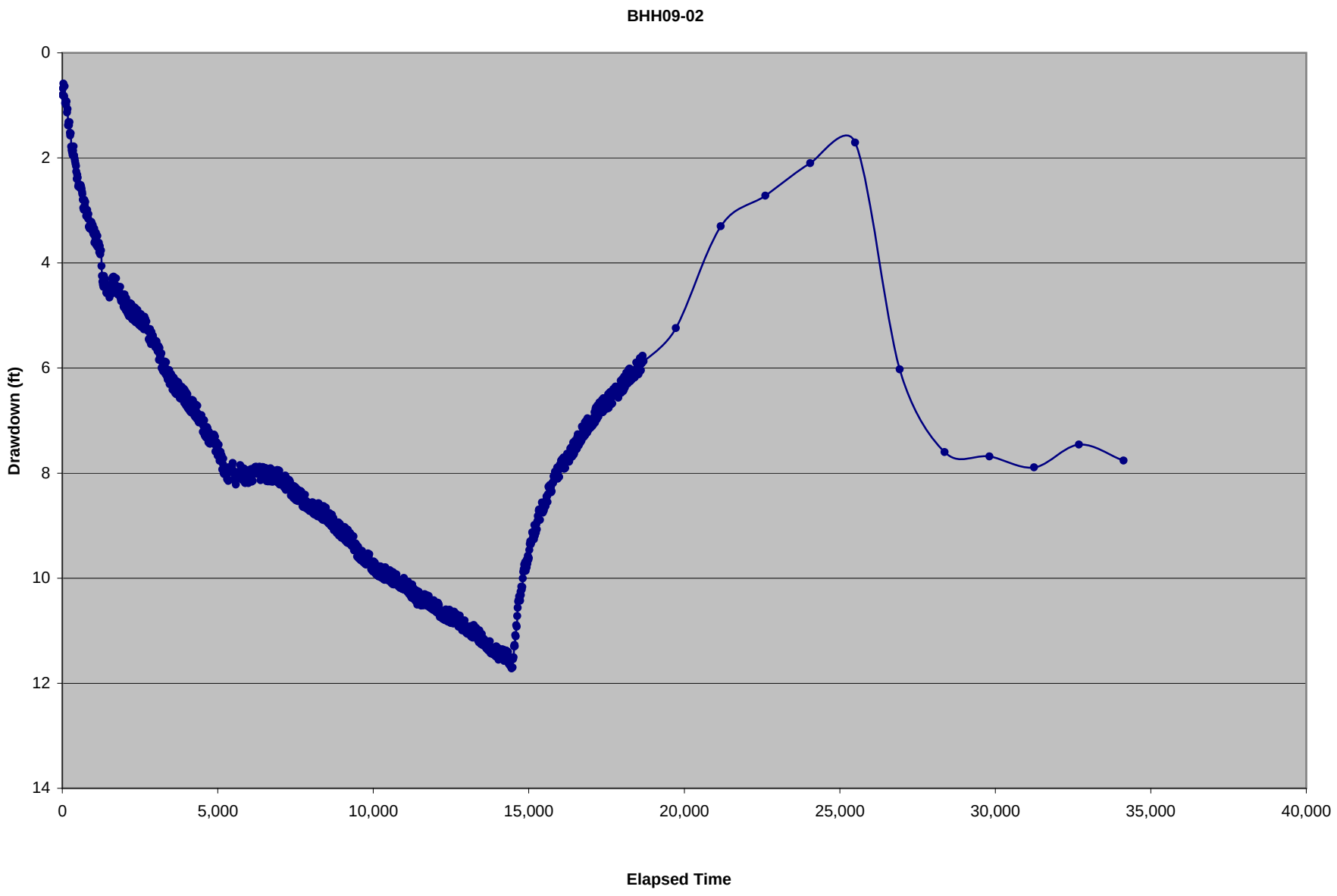

UGPZ-2
7,335
7,330
7,325
7,320
7,315
7,310
7,305
7,300
7,295
7,290
7,285
Elevation (ft amsl)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
Elapsed Time
Upper
Middle
Lower

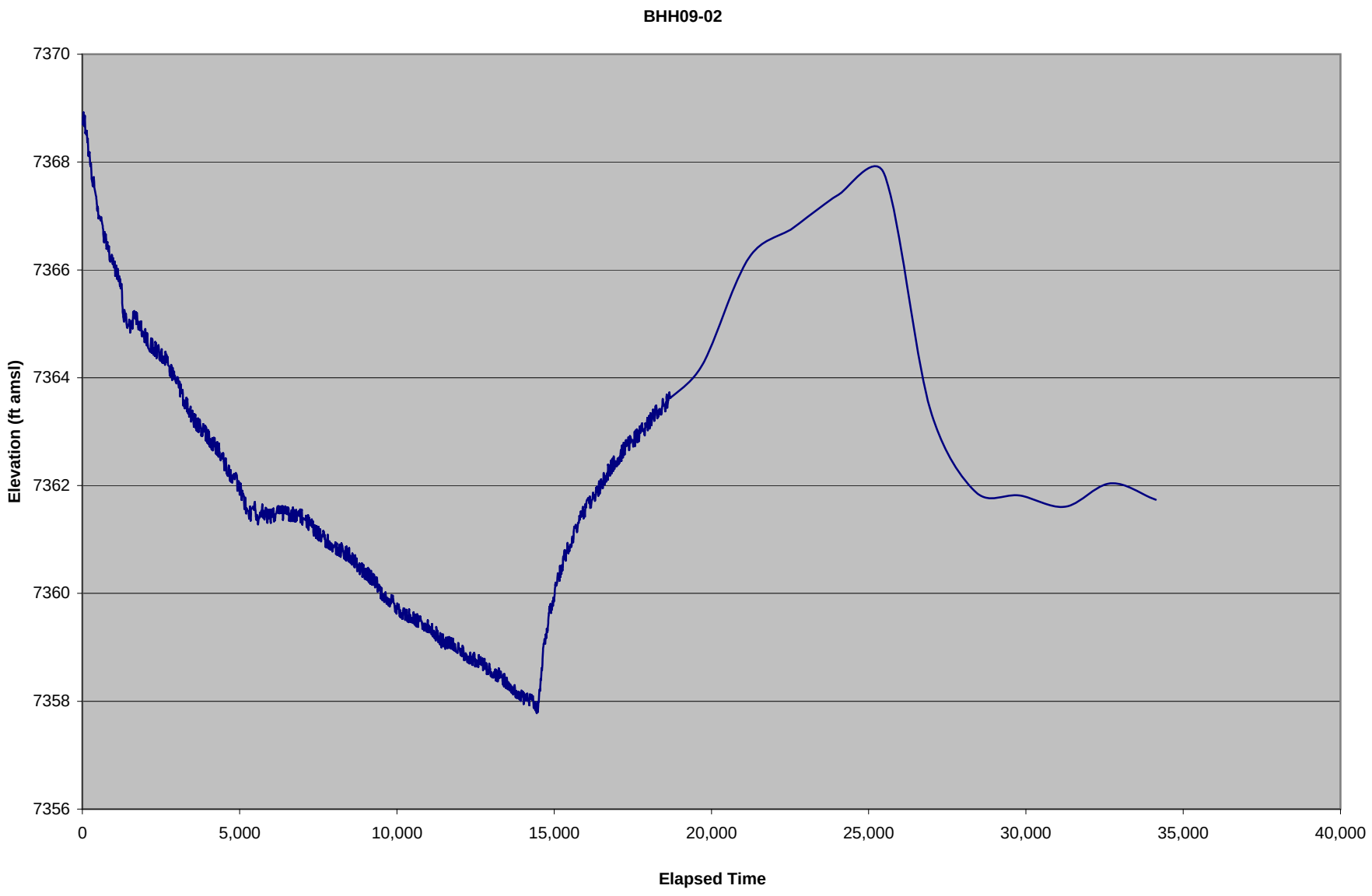

BHH08-01
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Drawdown (ft)
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
28,000
30,000
32,000
34,000
36,000
Elapsed Time

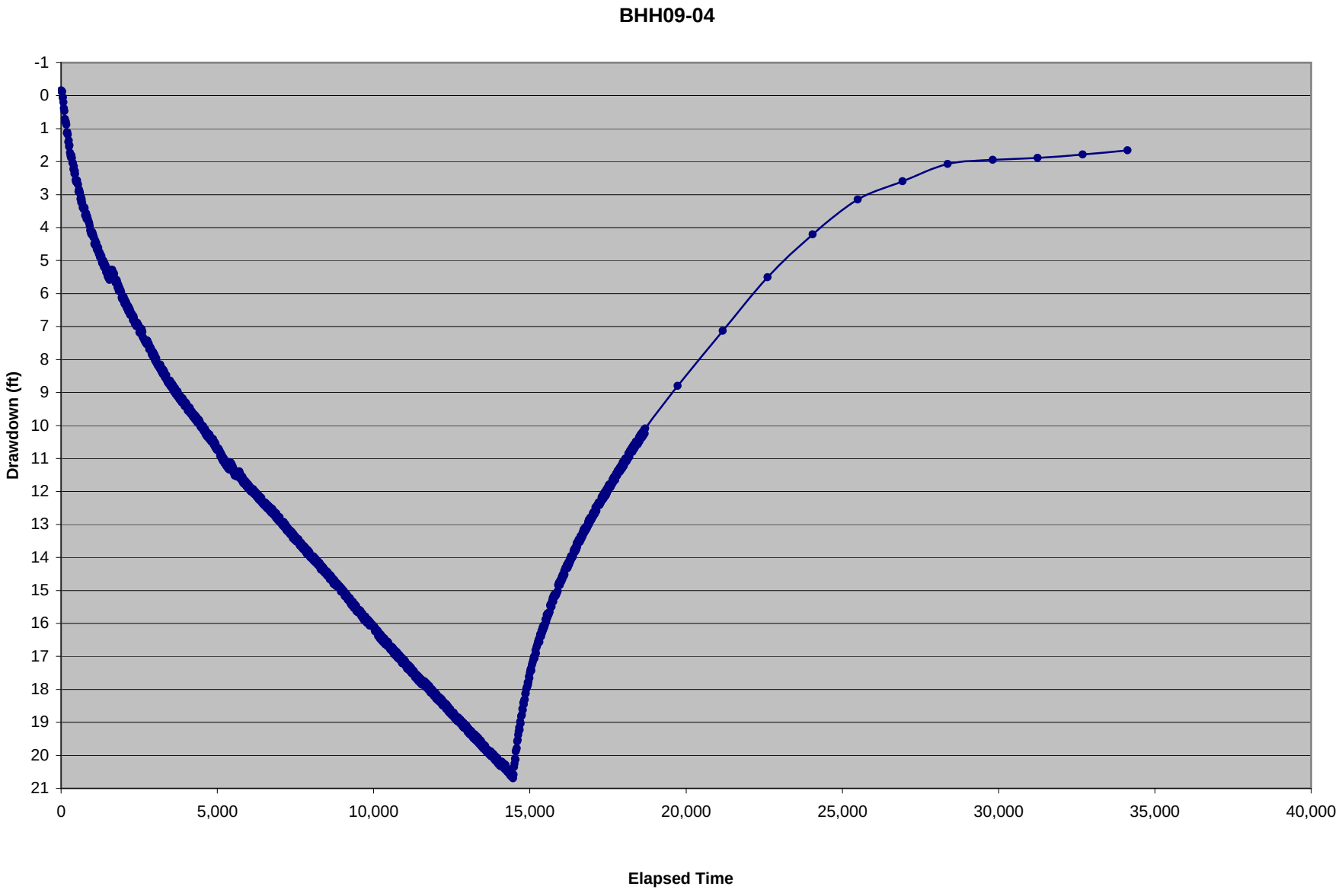

BHH08-01
7349.0
7348.5
7348.0
7347.5
7347.0
7346.5
7346.0
7345.5
7345.0
Elevation (ft amsl)
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
28,000
30,000
32,000
34,000
36,000
Elapsed Time

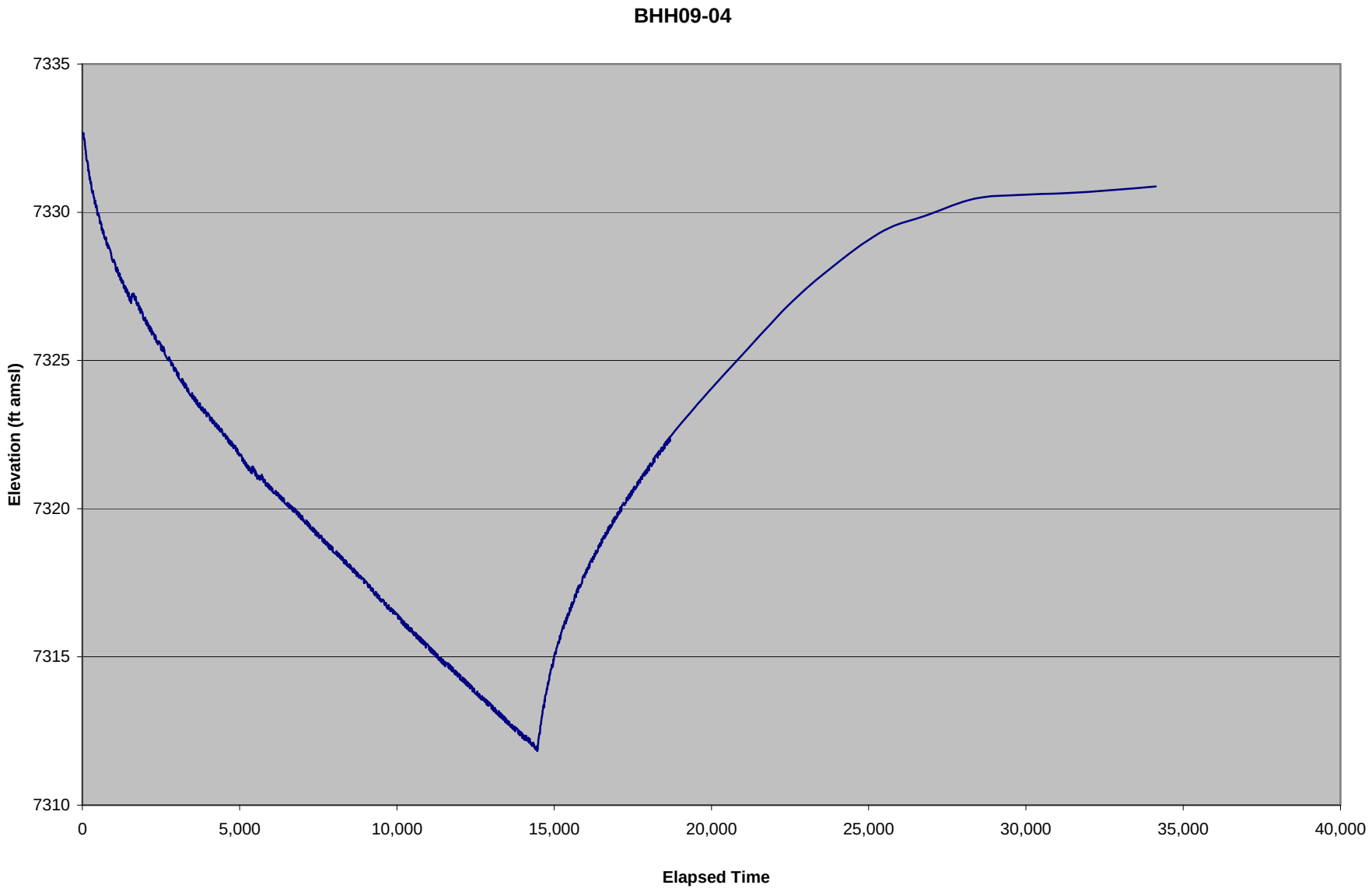

BHH09-01
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Drawdown (ft)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
Elapsed Time

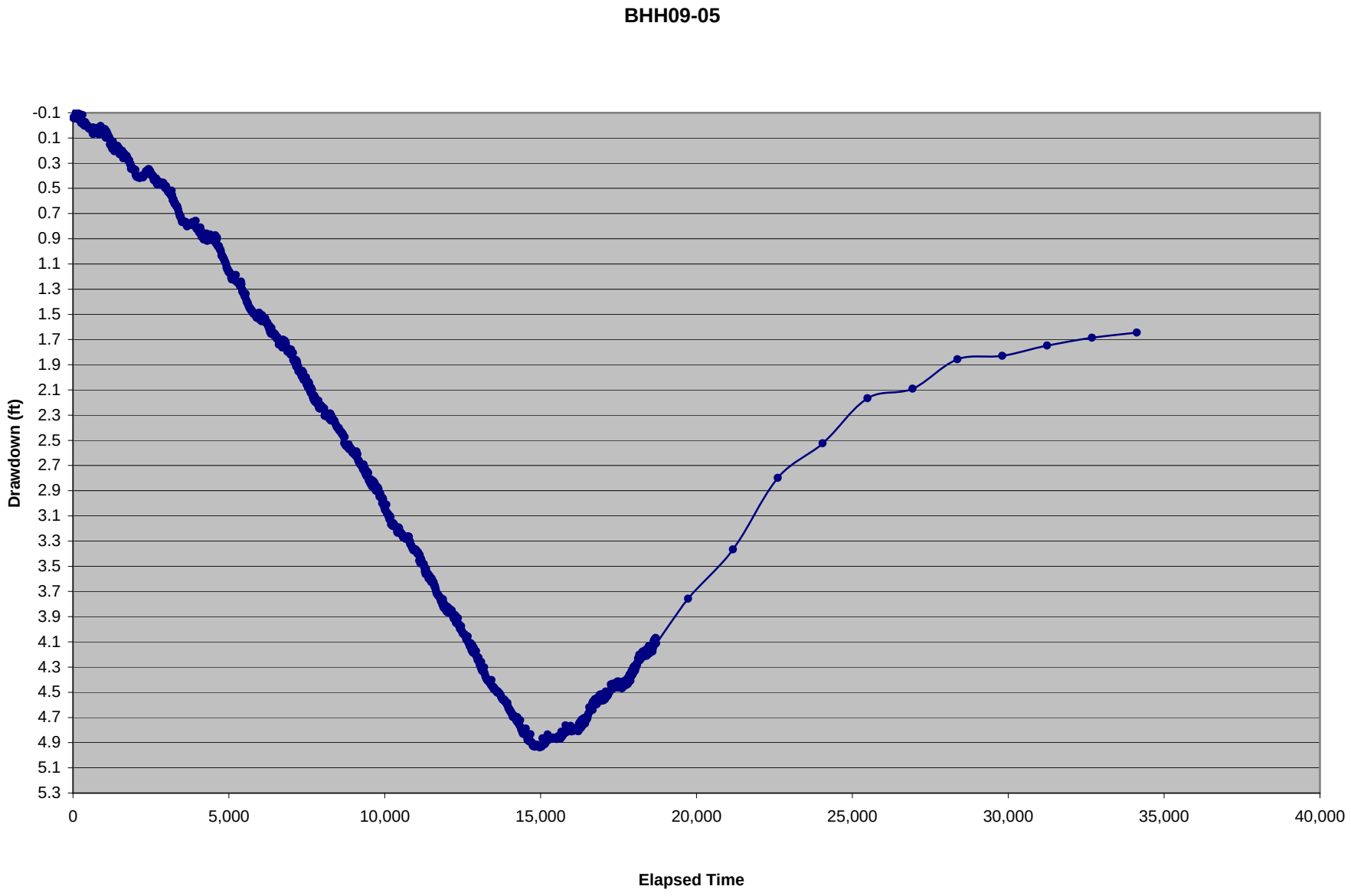

BHH09-01
7526
7525
7524
7523
7522
7521
7520
7519
7518
Elevation (ft amsl)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
Elapsed Time

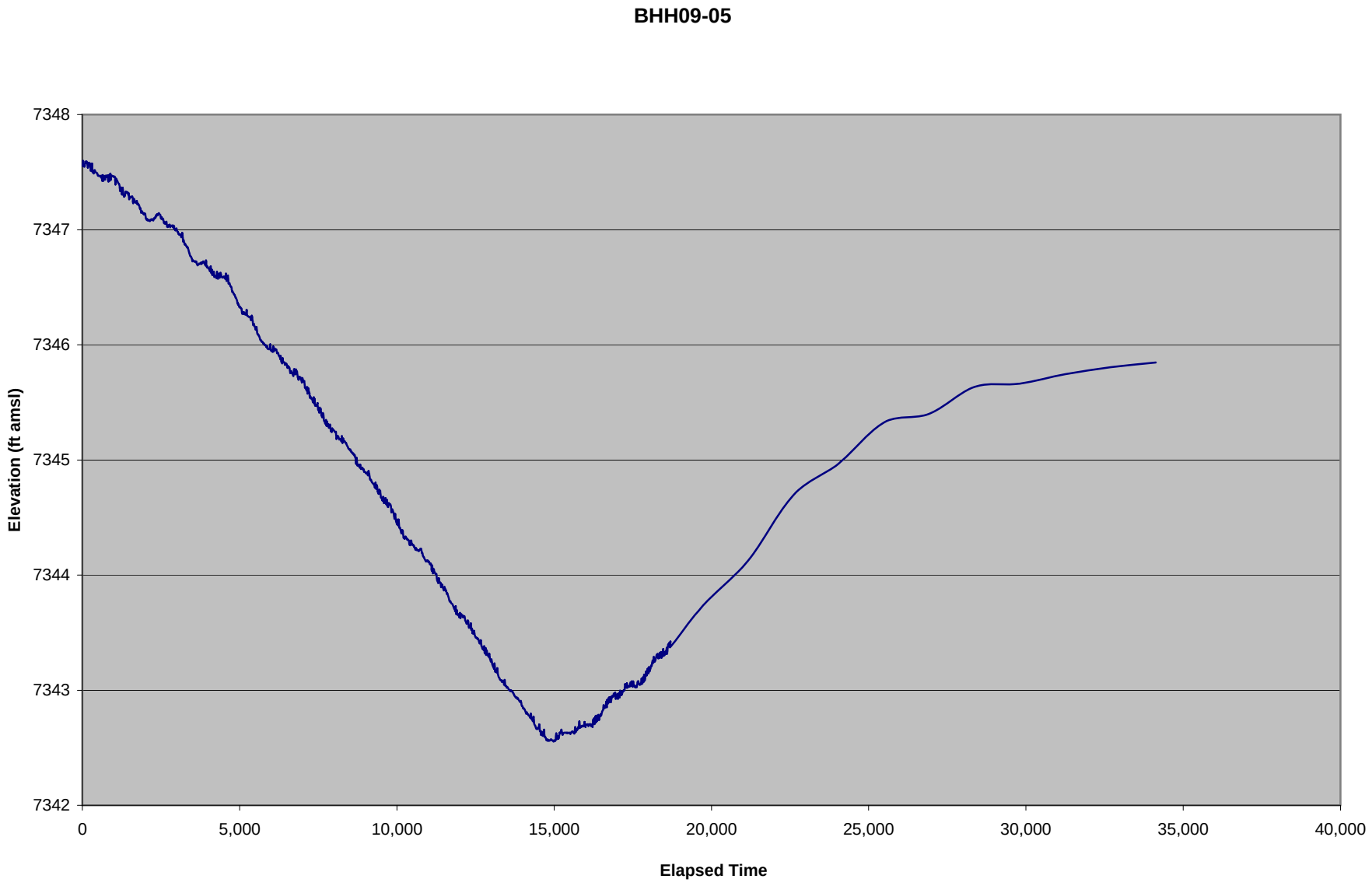

BHH09-02
Drawdown (ft)
0
2
4
6
8
10
12
14
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
Elapsed Time


BHH09-02
7370
7368
7366
7364
7362
7360
7358
7356
Elevation (ft amsl)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
Elapsed Time

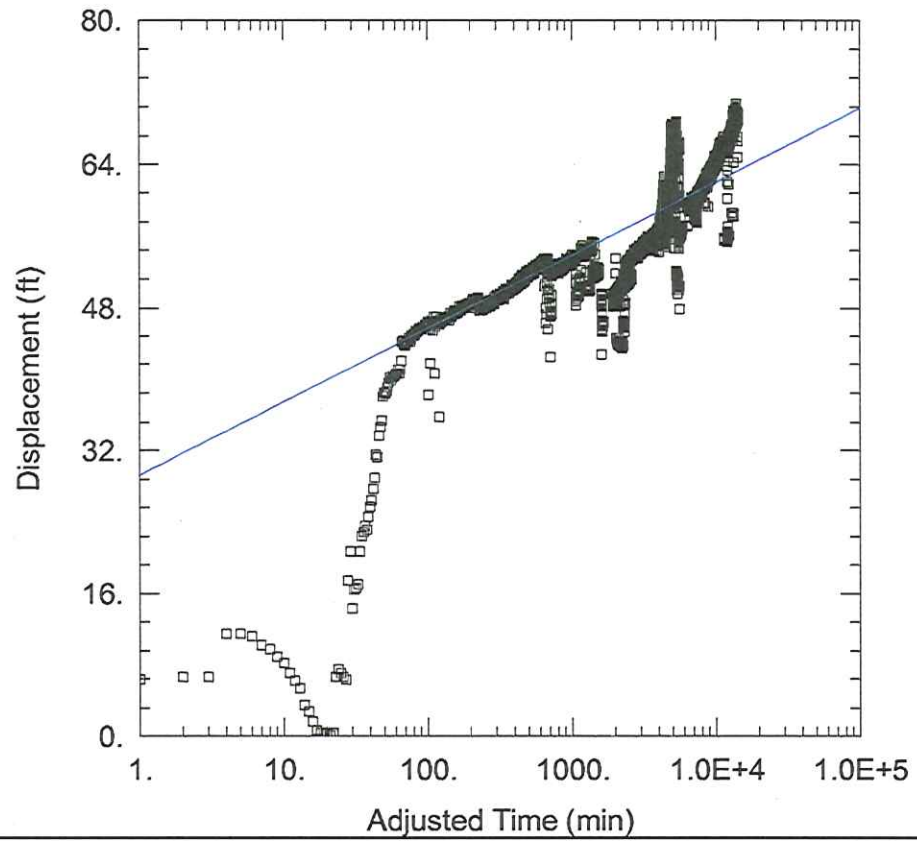

BHH09-04
Drawdown (ft)
-1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
Elapsed Time


BHH09-04
7335
7330
7325
7320
7315
7310
Elevation (ft amsl)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
Elapsed Time


BHH09-05
Drawdown (ft)
-0.1
0.1
0.3
0.5
0.7
0.9
1.1
1.3
1.5
1.7
1.9
2.1
2.3
2.5
2.7
2.9
3.1
3.3
3.5
3.7
3.9
4.1
4.3
4.5
4.7
4.9
5.1
5.3
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
Elapsed Time


BHH09-05
7348
7347
7346
7345
7344
7343
7342
Elevation (ft amsl)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
Elapsed Time

APPENDIX B
Pumping Test Analyses



DWW10-01

Data Set: C:\...\DWW10-01.aqt
Date: 02/24/11 Time: 10:36:01

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

T = 1504.5 ft^2/day
S = 0.001436

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

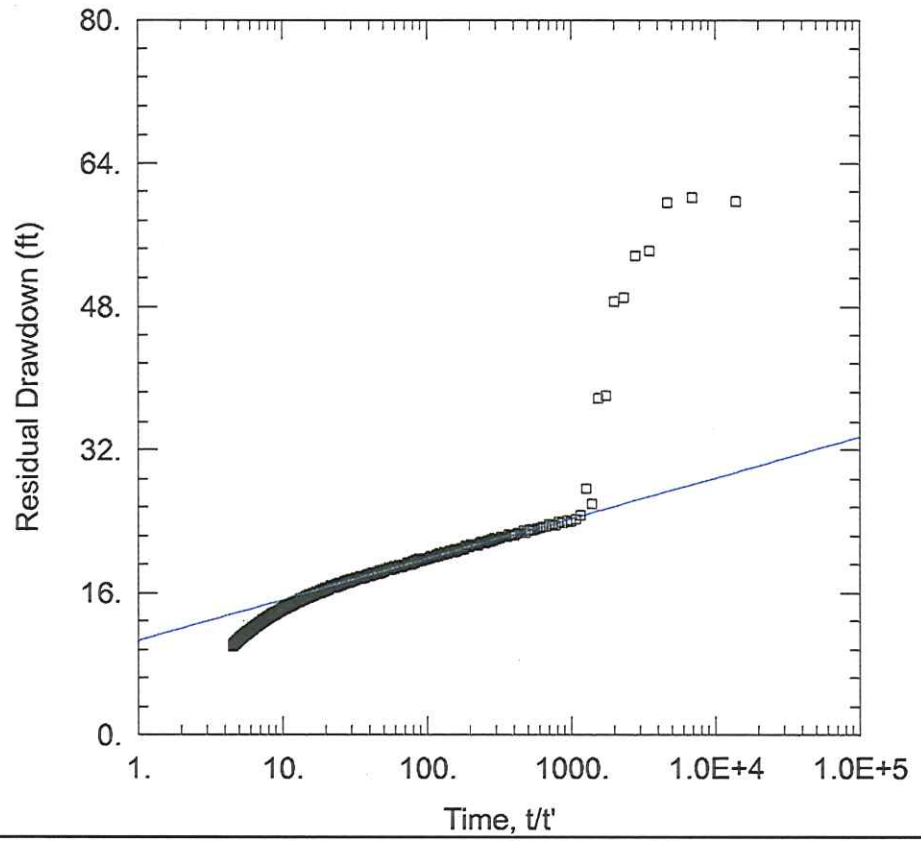
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ DWW10-01	13026	10342



DWW10-01

Data Set: C:\...\DWW10-01 rec.aqt
Date: 02/24/11 Time: 10:37:44

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

T = 2701. ft^2/day
S/S' = 0.004676

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

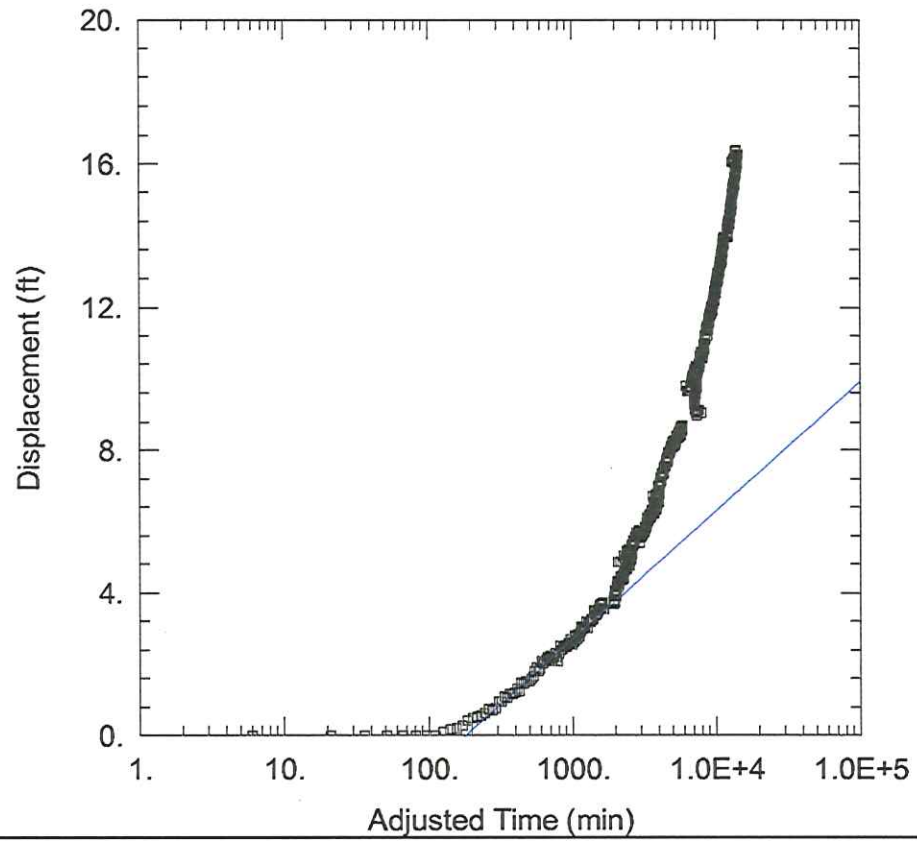
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ DWW10-01	13026	10342



UGPZ-1 UPPER

Data Set: C:\...\UGPZ-1 upper.aqt
Date: 03/07/11 Time: 14:42:38

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

T = 3408.8 ft^2/day
S = 0.003415

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

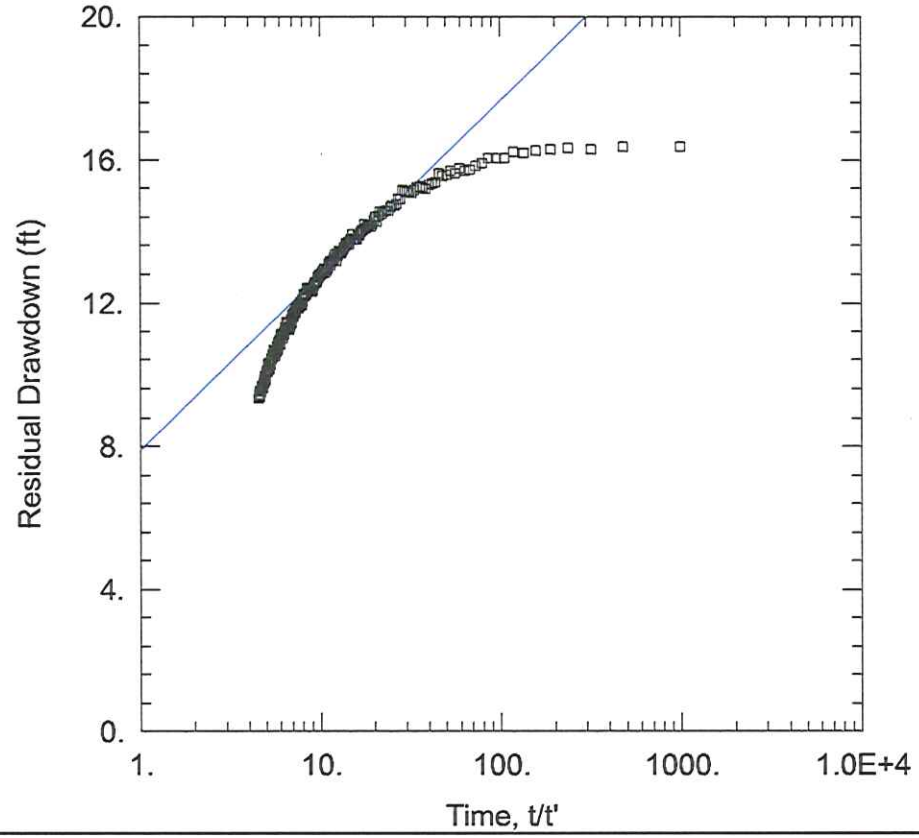
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ UGPZ-1 upper	12595	10033



UGPZ-1 UPPER

Data Set: C:\...\UGPZ-1 upper rec.aqt
Date: 02/24/11 Time: 09:31:05

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

T = 2531.6 ft^2/day
S/S' = 0.02403

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

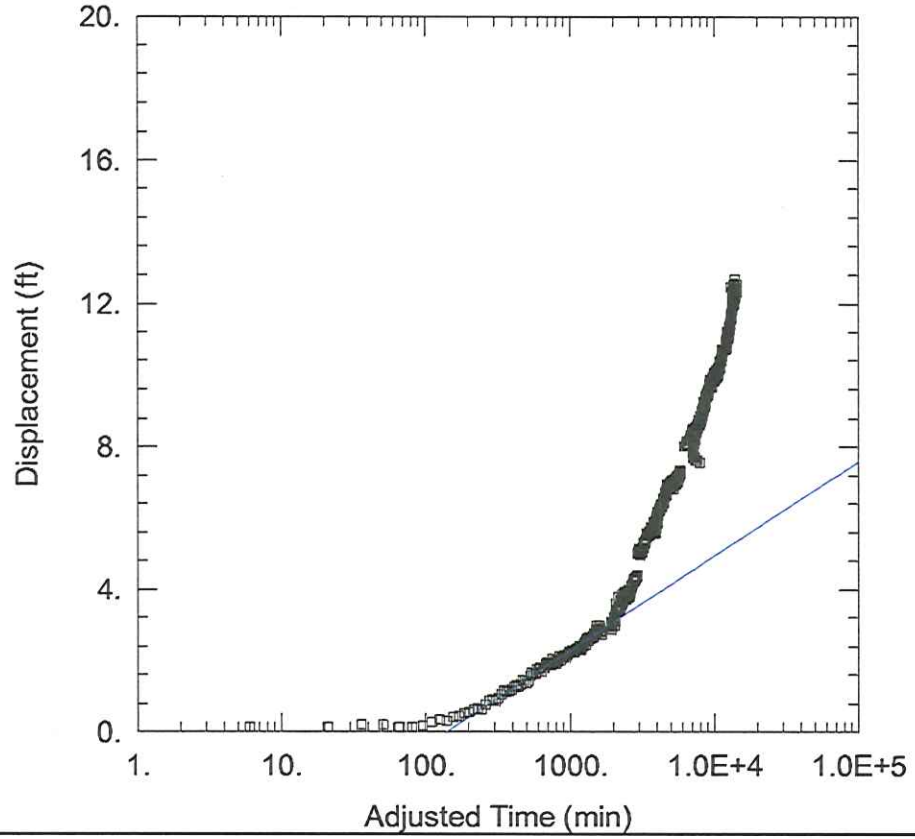
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ UGPZ-1 upper	12595	10033



UPPZ-1 LOWER

Data Set: C:\...\UGPZ-1 lower.aqt
Date: 02/22/11 Time: 08:12:39

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

T = 4643.9 ft^2/day
S = 0.003581

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

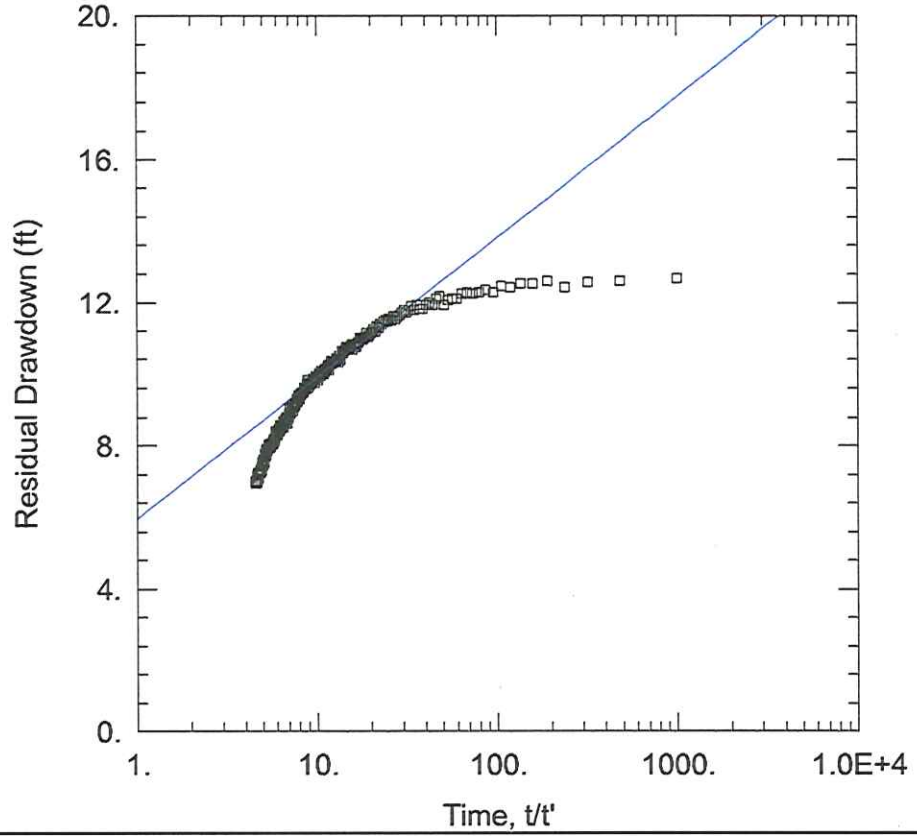
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ UGPZ-1 lower	12595	10033



UPPZ-1 LOWER

Data Set: C:\...\UGPZ-1 lower rec.aqt
Date: 02/24/11 Time: 09:29:55

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

T = 3139.2 ft^2/day
S/S' = 0.03043

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

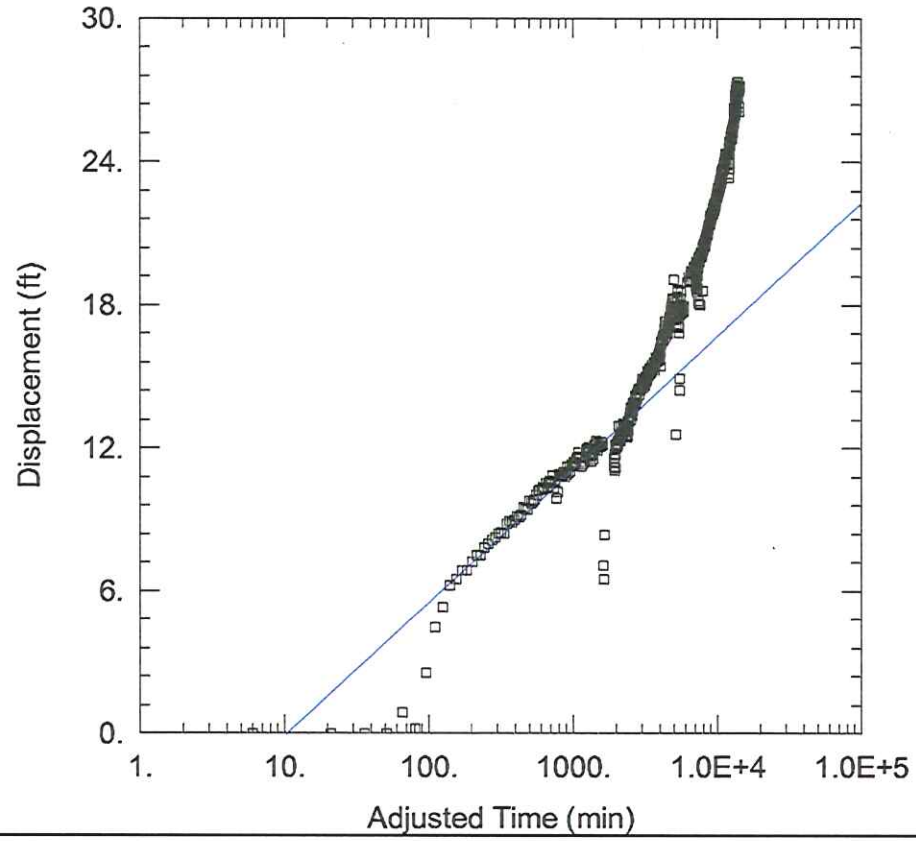
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ UGPZ-1 lower	12595	10033



UGPZ-2 UPPER

Data Set: C:\...\UGPZ-2 upper.aqt
Date: 02/22/11 Time: 08:09:42

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

T = 2204. ft^2/day
S = 0.01068

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

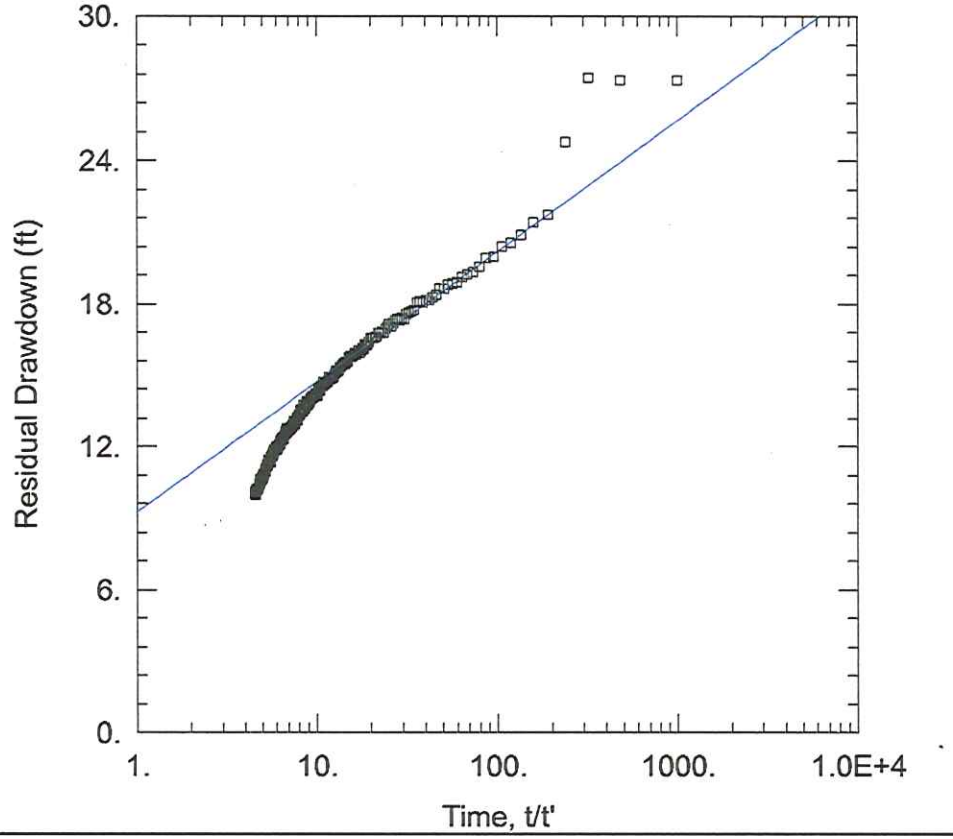
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ UGPZ-2 upper	12975	10314



UGPZ-2 UPPER

Data Set: C:\...\UGPZ-2 upper rec.aqt
Date: 02/23/11 Time: 11:56:42

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

T = 2253.5 ft^2/day
S/S' = 0.02059

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

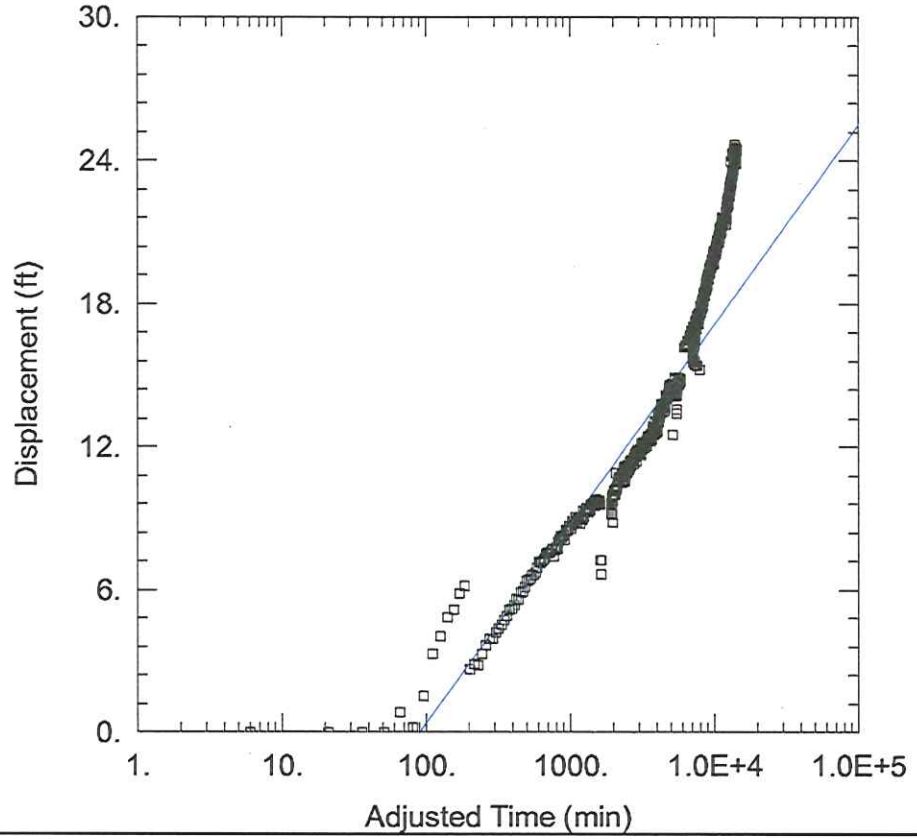
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ UGPZ-2 upper	12975	10314



UGPZ-2 MIDDLE

Data Set: C:\...\UGPZ-2 middle.aqt
Date: 02/22/11 Time: 08:12:15

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

T = 1473. ft^2/day
S = 0.06143

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

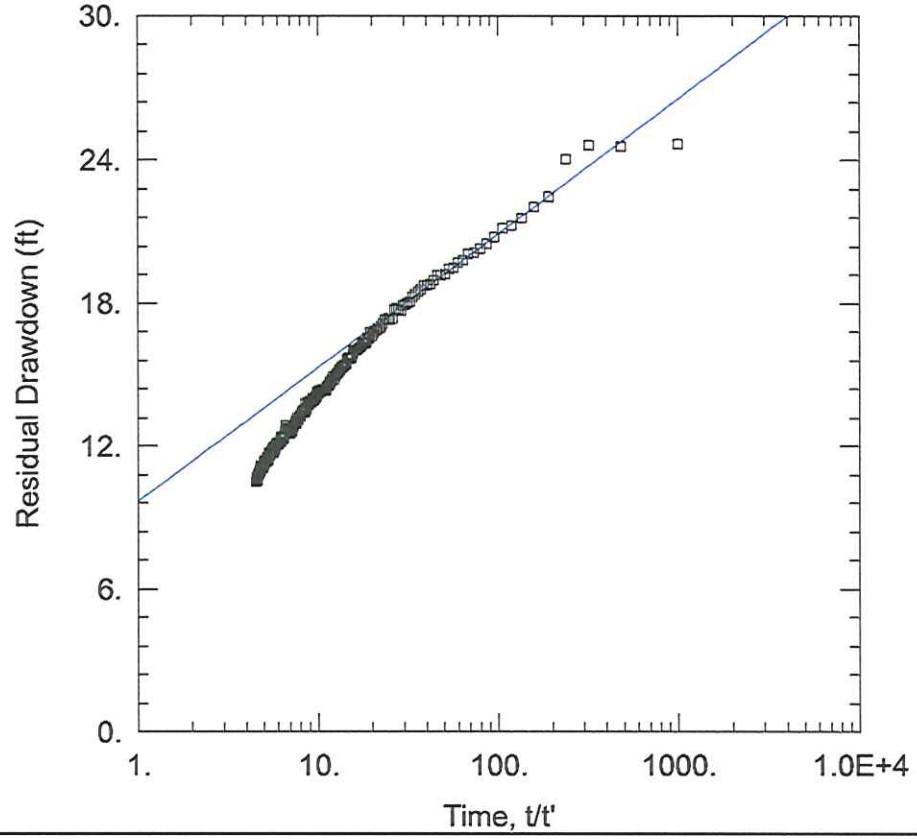
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ UGPZ-2 middle	12975	10314



UGPZ-2 MIDDLE

Data Set: C:\...\UGPZ-2 middle rec.aqt
Date: 02/23/11 Time: 14:42:37

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

T = 2195.1 ft^2/day
S/S' = 0.01897

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

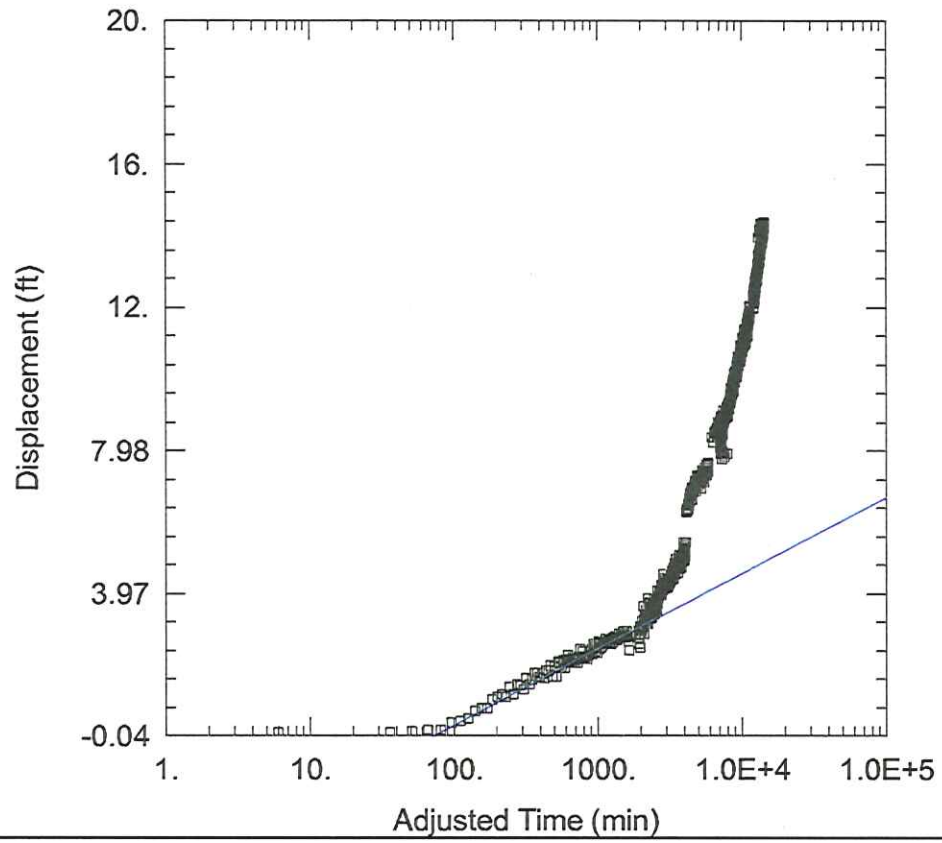
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ UGPZ-2 middle	12975	10314



UGPZ-2 LOWER

Data Set: C:\...\UGPZ-2 lower.aqt
Date: 02/22/11 Time: 08:10:32

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

T = 5783. ft^2/day
S = 0.1994

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

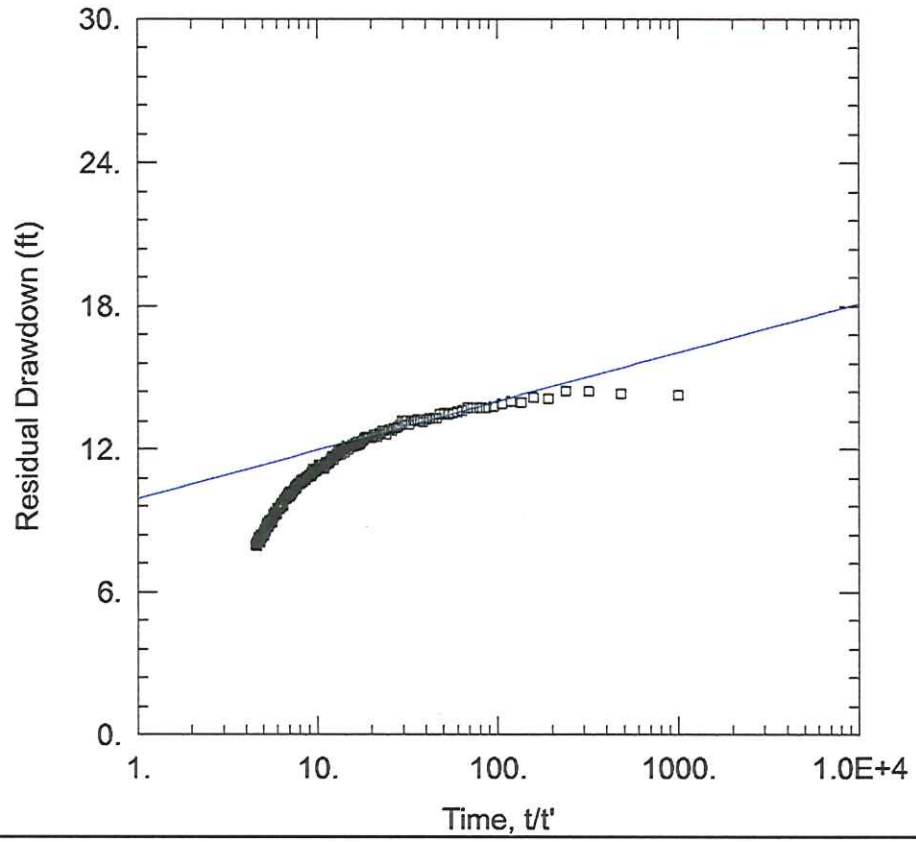
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ UGPZ-2 lower	12975	10314



UGPZ-2 LOWER

Data Set: C:\...\UGPZ-2 lower rec.aqt
Date: 02/24/11 Time: 09:25:02

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

T = 6042.6 ft^2/day
S/S' = 1.361E-5

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

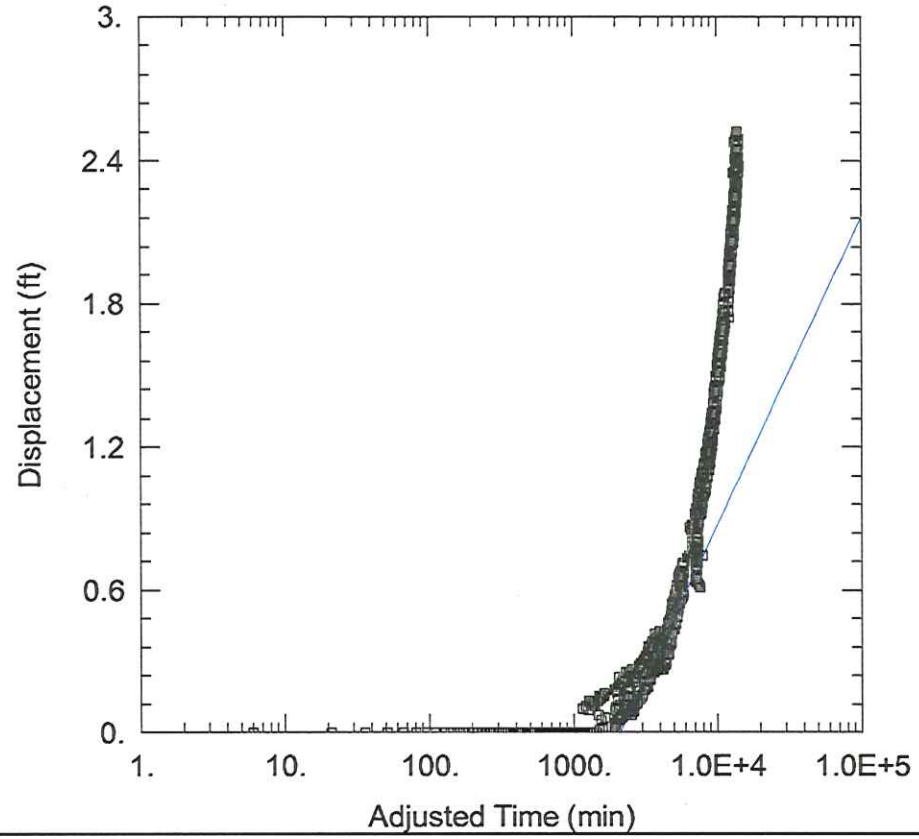
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ UGPZ-2 lower	12975	10314



BHH08-01

Data Set: C:\...\BHH08-01.aqt
Date: 02/24/11 Time: 14:51:13

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

T = 9571.7 ft^2/day
S = 0.09867

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

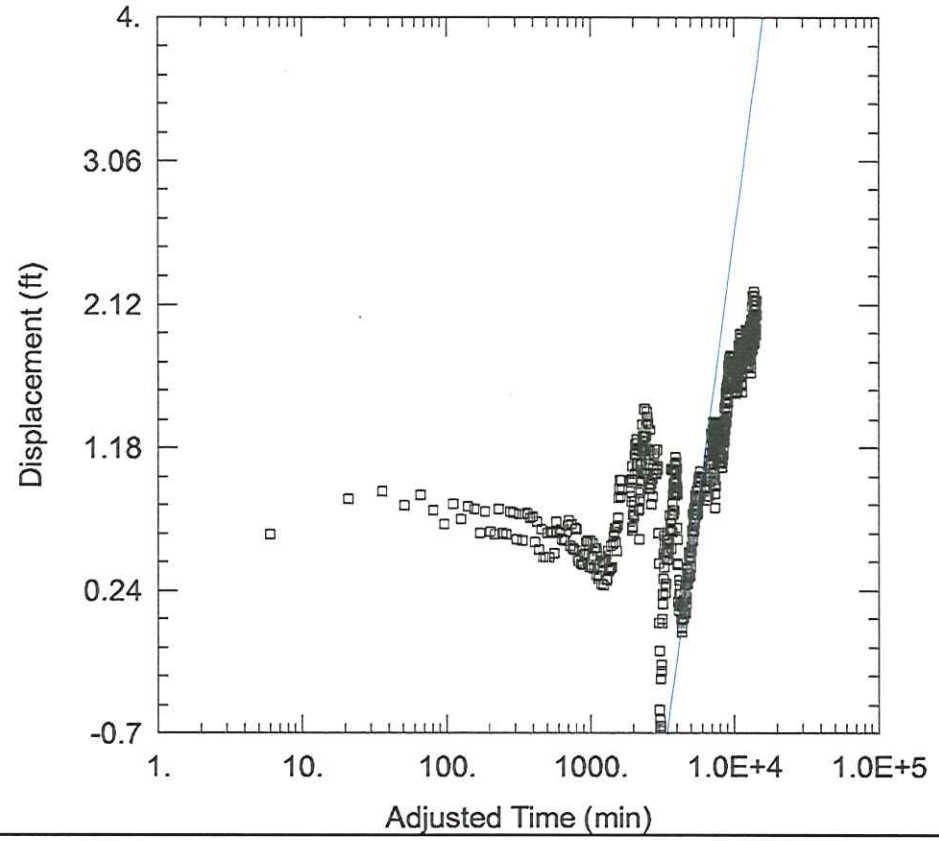
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ BHH08-01	13591	10372



BHH09-01

Data Set: C:\...\BHH09-01.aqt
Date: 02/22/11 Time: 08:13:02

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

T = 1757.4 ft^2/day
S = 0.01574

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

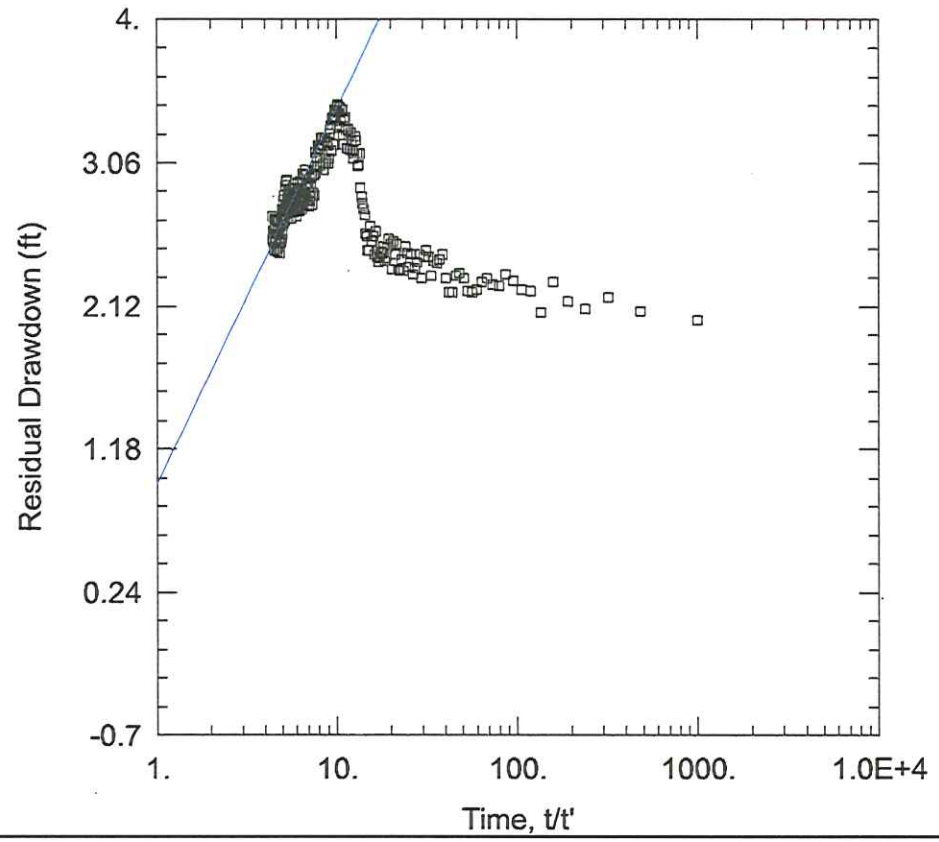
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ BHH09-01	13631	9722



BHH09-01

Data Set: C:\...\BHH09-01.aqt
Date: 03/07/11 Time: 14:41:58

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

T = 5020.8 ft^2/day
S/S' = 0.4094

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

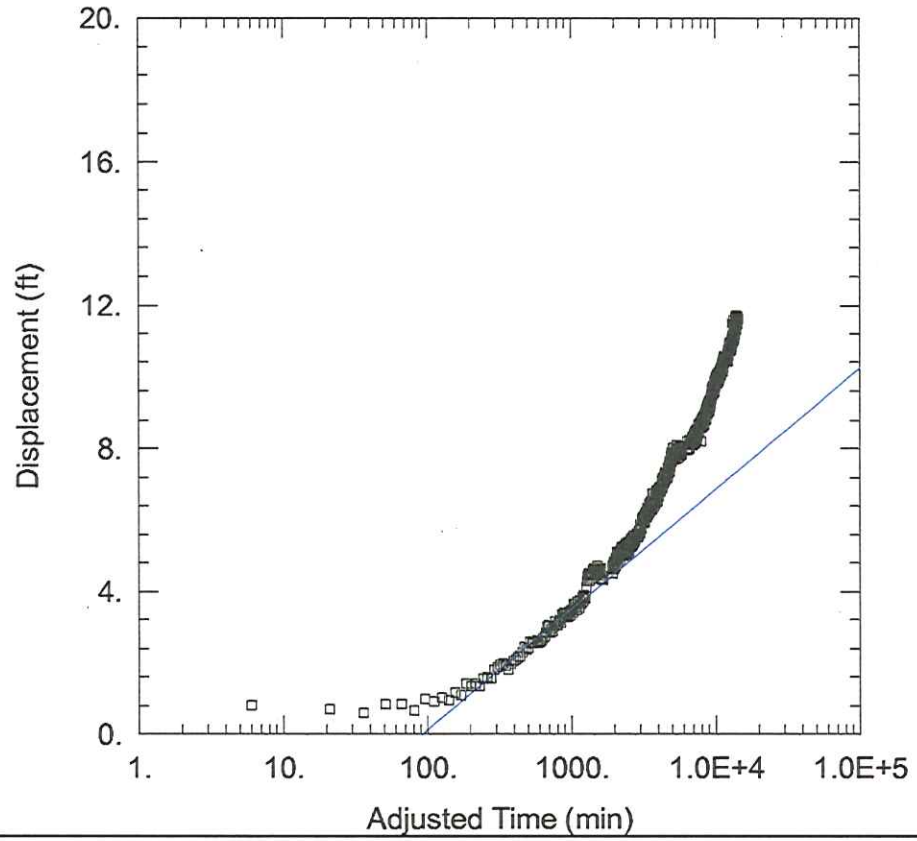
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ BHH09-01	13631	9722



BHH09-02

Data Set: C:\...\BHH09-02.aqt
Date: 02/22/11 Time: 08:13:12

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

T = 3652. ft^2/day
S = 0.004733

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

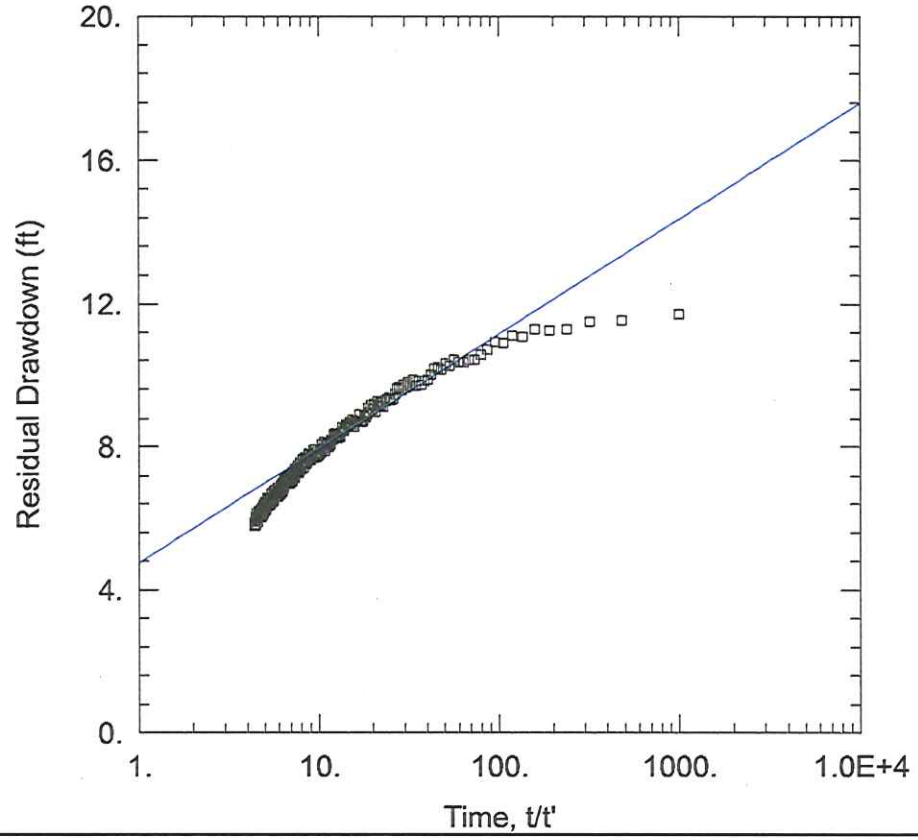
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ BHH09-02	13249	10094



BHH09-02

Data Set: C:\...\BHH09-02 rec.aqt
Date: 02/23/11 Time: 14:57:04

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

T = 3846.7 ft^2/day
S/S' = 0.03299

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

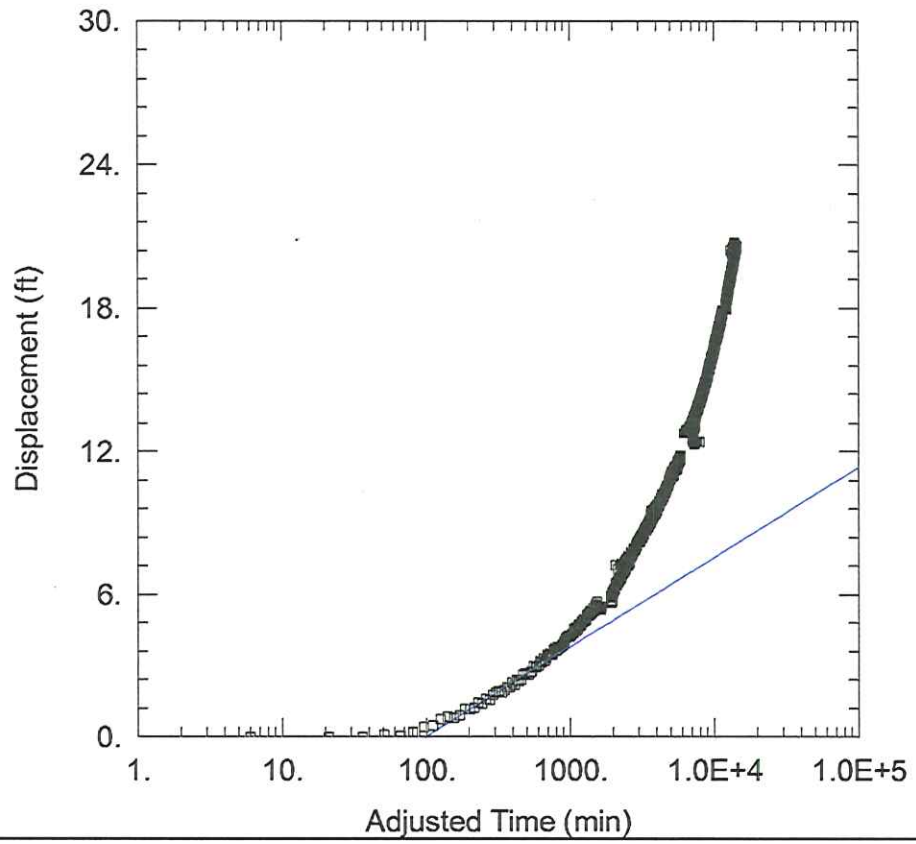
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ BHH09-02	13249	10094



BHH09-04

Data Set: C:\...\BHH09-04.aqt
Date: 02/22/11 Time: 08:13:22

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

T = 3264.4 ft^2/day
S = 0.004203

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

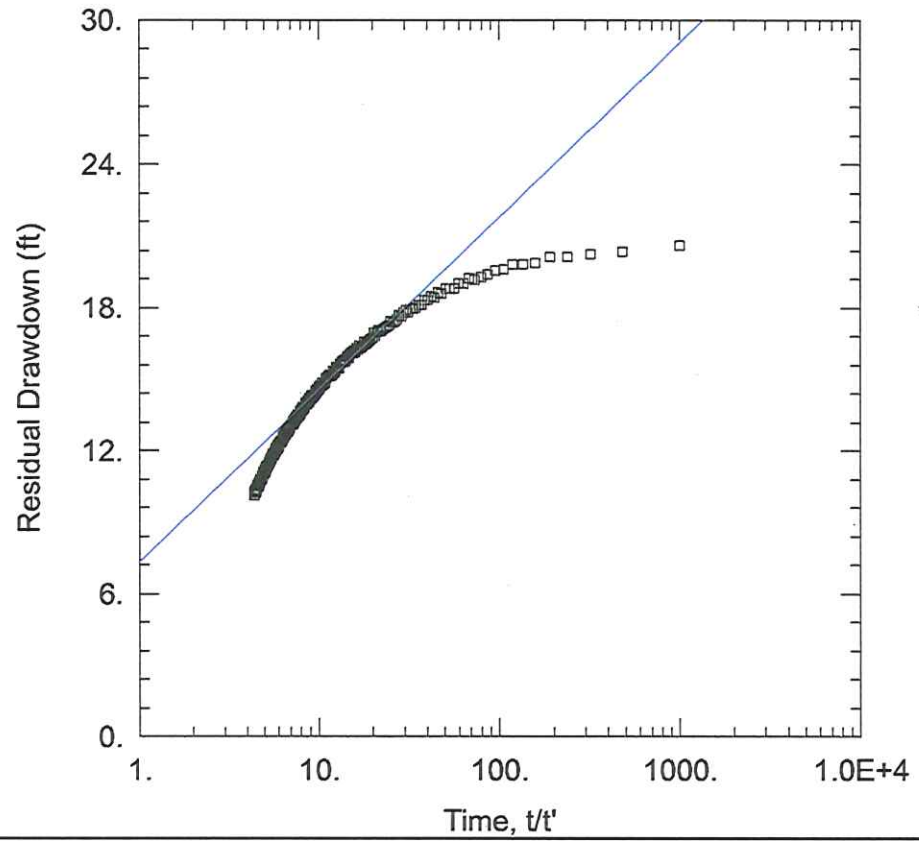
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ BHH09-04	12734	10529



BHH09-04

Data Set: C:\...\BHH09-04 rec.aqt
Date: 02/24/11 Time: 09:44:19

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

T = 1705.8 ft^2/day
S/S' = 0.09739

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

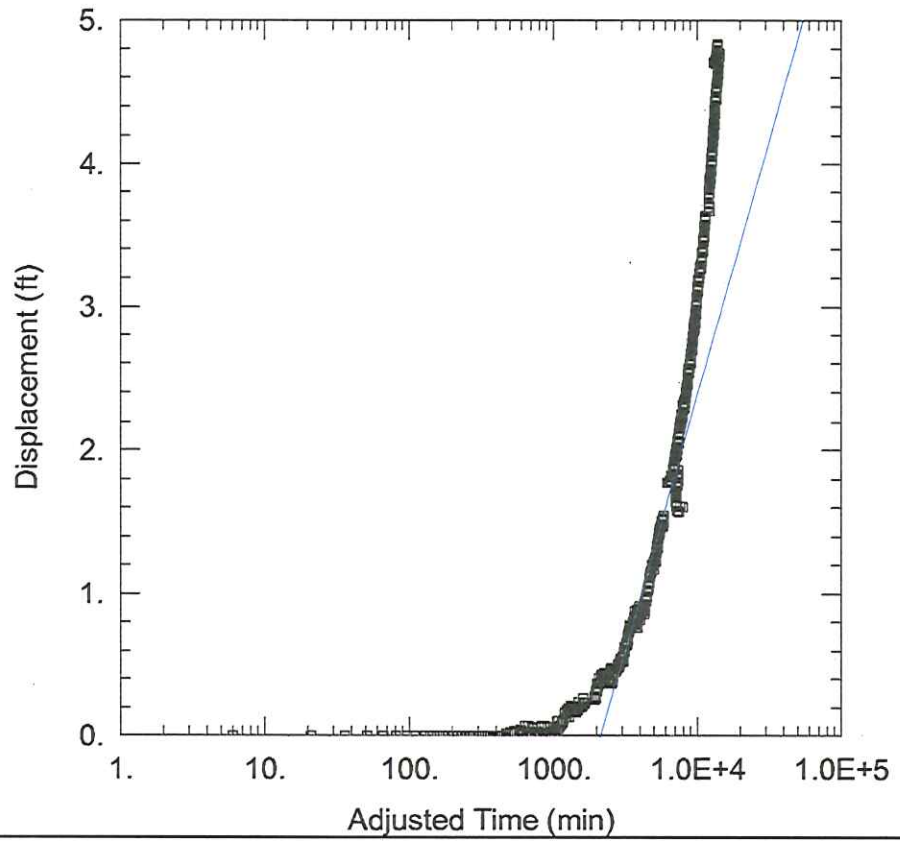
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ BHH09-04	12734	10529



BHH09-05

Data Set: C:\...\BHH09-05.aqt
Date: 02/22/11 Time: 08:13:32

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

T = 3476.2 ft^2/day
S = 0.03212

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

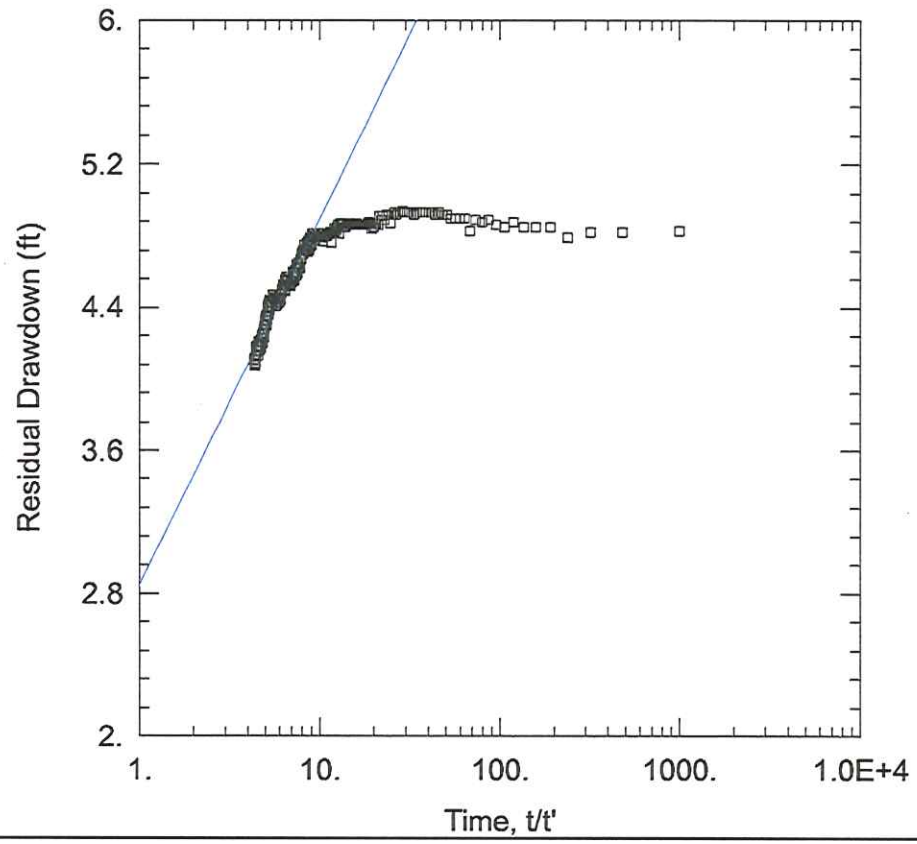
WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ BHH09-05	13572	10592



BHH09-05

Data Set: C:\...\BHH09-05 rec.aqt
Date: 02/24/11 Time: 09:47:31

PROJECT INFORMATION

Company: Itasca Denver
Client: Butte Highlands Joint Venture
Project: 1938
Location: Butte Highlands Mine
Test Well: DWW10-01
Test Date: 18 Jan 2011

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

T = 6015.5 ft^2/day
S/S' = 0.04125

AQUIFER DATA

Saturated Thickness: 384. ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
DWW10-01	13026	10342

Observation Wells

Well Name	X (ft)	Y (ft)
▫ BHH09-05	13572	10592