

Appendix E

Permit # UGW350010

BINGHAM CANYON MINE AND WATER COLLECTION SYSTEM OPERATIONAL MONITORING PLAN

MONITORING REQUIREMENTS AND PLAN CONTENT

Operational monitoring includes flow and quality sampling of meteoric and storm-water flow. Kennecott Utah Copper LLC (Kennecott) has an existing general, operational, and groundwater monitoring plan that is described in the Ground Water Characterization and Monitoring Plan (GCMP) Kennecott, 2014.

This Operational Monitoring Plan for the Bingham Canyon Mine/Water Collection System includes the Water Quality Sampling program.

WATER QUALITY MONITORING PROGRAM

Surface Water Sampling

Meteoric and Water Collection System - As a part of a continuing operational monitoring program, water quality samples from all drainages associated with the water collection system will be collected two times per year. The Water Collection System concrete drainage structures will be sampled once in April or May and again in September or October. The Surface Water Sample Sites Drawing (Figure 1 of the Permit) shows the current locations of the 23 operational surface water sample sites. There are 25 surface water sampling sites (refer to figure 454-T-0119).

Tunnels and Seeps - Additionally, quarterly flow and semiannual water quality samples will be collected for each of the flows from mine tunnels that underlie the Bingham Canyon Mine Waste Rock Piles. Surface seeps will also be sampled for semiannual flow and water quality. Refer to Appendix A for additional permit conditions related to surface seeps.

Table E-1 lists all current monitoring sites for the operational monitoring program and E-2 lists new and replaced cutoff walls installed during the EWRE.

Table E-3 lists the cutoff walls removed or moved during the SWRR project. The cutoff walls kept their designation descriptions.

Flow information for each surface water sample site will be provided in the annual report as part of the operational monitoring discussion.

All sampling will be performed in compliance with the protocols and standard operating practices specified in the current approved version of the GCMP and attachments. The water quality date will be provided in the annual report as part of the operational monitoring discussion.

Bluewater Repository - The leachate collection system sumps for the Bluewater Repository shall be

examined semi-annually. A semi-annual water quality sample will be collected of leachate flowing into each collection sump. Results from sampling will be reported in the annual operational monitoring report provided to the Utah Division of Water Quality (DWQ). Refer to Appendix B for additional permit conditions related to the repository.

MONITORING TECHNIQUES AND DATA VALIDATION

All monitoring will be performed using the methods for sampling, analyses, and quality control specified in the GCMP.

If data outliers or quality assurance/quality control problems are identified, the sample will be retested, and the wells will be re-sampled within 30 days. If the results from the retesting or re-sampling show that the data is an outlier, normal monitoring will resume.

REPORTING

Kennecott will submit compliance groundwater monitoring data to the DWQ on a quarterly basis. The reports will include a summary of all monitoring data collected during the quarter. Field measurements (groundwater levels, specific conductance, pH) and certificates of analysis will be provided.

Operational monitoring data for operational sites including cut-off walls, seeps, tunnels, Bluewater Repository, informational wells and extraction wells will be submitted to the DWQ in an annual report to be provided by March 31 each year. The annual report will contain results of monitoring in a tabular form with descriptive statistics such as: number of samples, average, standard deviation, maximum and minimum values for each site. Each site will be described with time series graphs of significant parameters over the period of record for that site; with analytical data reported from the past three years through the current reporting cycle. A narrative description shall be included that describes any significant trends or observations on the data.

Table E-1

OPERATIONAL SURFACE SITES	NORTHING	EASTING	MONITORING FREQUENCY
<i>WATER COLLECTION SYSTEM</i>			
Bingham Ck. Cut-off wall (ECP2562)	15784	16905	Semiannual water quality and quarterly volumetric flow
Bluewater 1/2 Collection Box (ECP2682)	15145	13910	Semiannual water quality and quarterly volumetric flow
Bluewater 1 Flume (MDP2679)	14467	13613	Semiannual water quality and quarterly volumetric flow
Bluewater 2 Flume (ECP2709)	12271	16656	Semiannual water quality and quarterly volumetric flow
Bluewater 3 Flume (ECP2674)	11022	16182	Semiannual water quality and quarterly volumetric flow
Midas 1 Flume (ECP2670)	9391	15692	Semiannual water quality and quarterly volumetric flow
Midas 2 Flume (ECP2668)	9189	15494	Semiannual water quality and quarterly volumetric flow
Midas Flume (ECP2662)	8842	16582	Semiannual water quality and quarterly volumetric flow
South Congor Flume (ECP2654)	8840	16582	Semiannual water quality and quarterly volumetric flow
Crapo Flume (ECP2651)	6831	17037	Semiannual water quality and quarterly volumetric flow
South Crapo Flume (ECP2858)	6670	17332	Semiannual water quality and quarterly volumetric flow
North Keystone Flume (ECP2648)	6029	17716	Semiannual water quality and quarterly volumetric flow
Keystone and Lost Creek Flume (ECP2629)	3397	17201	Semiannual water quality and quarterly volumetric flow
OPERATIONAL SURFACE SITES	NORTHING	EASTING	MONITORING FREQUENCY

Copper 1 Flume (ECP2624)	1457	17078	Semiannual water quality and quarterly volumetric flow
Copper 2 Flume (ECP2857)	1205	17093	Semiannual water quality and quarterly volumetric flow
Copper 3 Flume (ECP2618)	629	16596	Semiannual water quality and quarterly volumetric flow
Copper 4 Flume (ECP2856)	-326	16111	Semiannual water quality and quarterly volumetric flow
Yosemite Cut-off wall (ECP2616)	-1302	12460	Semiannual water quality and quarterly volumetric flow
Saints Rest Cut-off wall (ECP2614)	-2797	13156	Semiannual water quality and quarterly volumetric flow
S. Saints Rest Cut-off wall (ECP2612)	-4318	13304	Semiannual water quality and quarterly volumetric flow
Castro Flume (ECP2606)	-5637	13598	Semiannual water quality and quarterly volumetric flow
Butterfield 1 Cut-off wall (ECP2605)	-7876	9515	Semiannual water quality and quarterly volumetric flow
Olsen Cut-off wall (ECP2603)	-8670	8481	Semiannual water quality and quarterly volumetric flow
Queens Cut-off wall (ECP2601)	-9483	6350	Semiannual water quality and quarterly volumetric flow

TUNNELS

Old Bingham Tunnel (ECP2664)	8990	16938	Semiannual water quality and quarterly volumetric flow
Butterfield Tunnel (UPD010)	-10026	10313	Semiannual water quality and quarterly volumetric flow
Utah Metals Tunnel (BMP2712)	-1255	-2563	Semiannual water quality and quarterly volumetric flow
OPERATIONAL SURFACE SITES	NORTHING	EASTING	MONITORING FREQUENCY
Mascotte Tunnel (ECP2631)	3569	17231	Semiannual water quality and quarterly volumetric flow

5490 Tunnel (ECP2710)	15715	14960	Semiannual water quality and quarterly volumetric flow
Bingham Tunnel (LWP2632)	3736	17773	Semiannual water quality and quarterly volumetric flow
<i>SURFACE SEEPS</i>			
Butterfield 1 Seep (ECS2715)	-7980	10500	Semiannual water quality and semiannual volumetric flow
Upper Keystone Seep (ECS2716)	4220	15520	Semiannual water quality and semiannual volumetric flow
Lower Keystone Seep (LWS2717)	3700	18600	Semiannual water quality and semiannual volumetric flow
Crapo Seep (ECS2718)	6930	16130	Semiannual water quality and semiannual volumetric flow
Upper Queen Seep (ECS2786)	-7263	5097	Semiannual water quality and semiannual volumetric flow
<i>REPOSITORY</i>			
Bluewater 1 North Sump (BRP292)	14146	16561	Semiannual water quality
Bluewater 1 Main Sump (BRP1476)	13770	15740	Semiannual water quality

Note: Coordinate system in Kennecott True North, See Permit Table 4 for Lat/Long Coordinates TBD – the lat and long will change when the construction is complete. The permit will be modified to reflect those changes.

Table E-2Original and New Cut-off Walls

Original Cut-off Wall (historic)	New Cut-off Wall (relocated)
Copper	Copper 4
	Copper 3
	Copper 2
North Copper	Copper 1
	Lark
Lost Creek	Lost Creek
Keystone	Keystone
North Keystone	North Keystone
	South Crapo
Crapo	Crapo
South Congor 2	South Congor
Congor 1	Midas
Congor 2	

Table E-3Original and New Cut-off Walls

Original Cut-off Wall (historic)	New Cut-off Wall (relocated)
Yosemite	Upper Yosemite – Re-located ~500 feet down gradient of existing Yosemite cut-off wall
	Lower Yosemite – Located ~850' down gradient of Upper Yosemite cut-off wall
Castro	Upper wall breached and buried; lower Castro cut-off wall will remain in place
Butterfield 1	Butterfield 1 – Located ~1500' down gradient of existing cut-off wall
Olsen	Olsen – Located ~900' down gradient of existing cut-off wall

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