Ground Water Discharge Permit
Permit No. UGW350008

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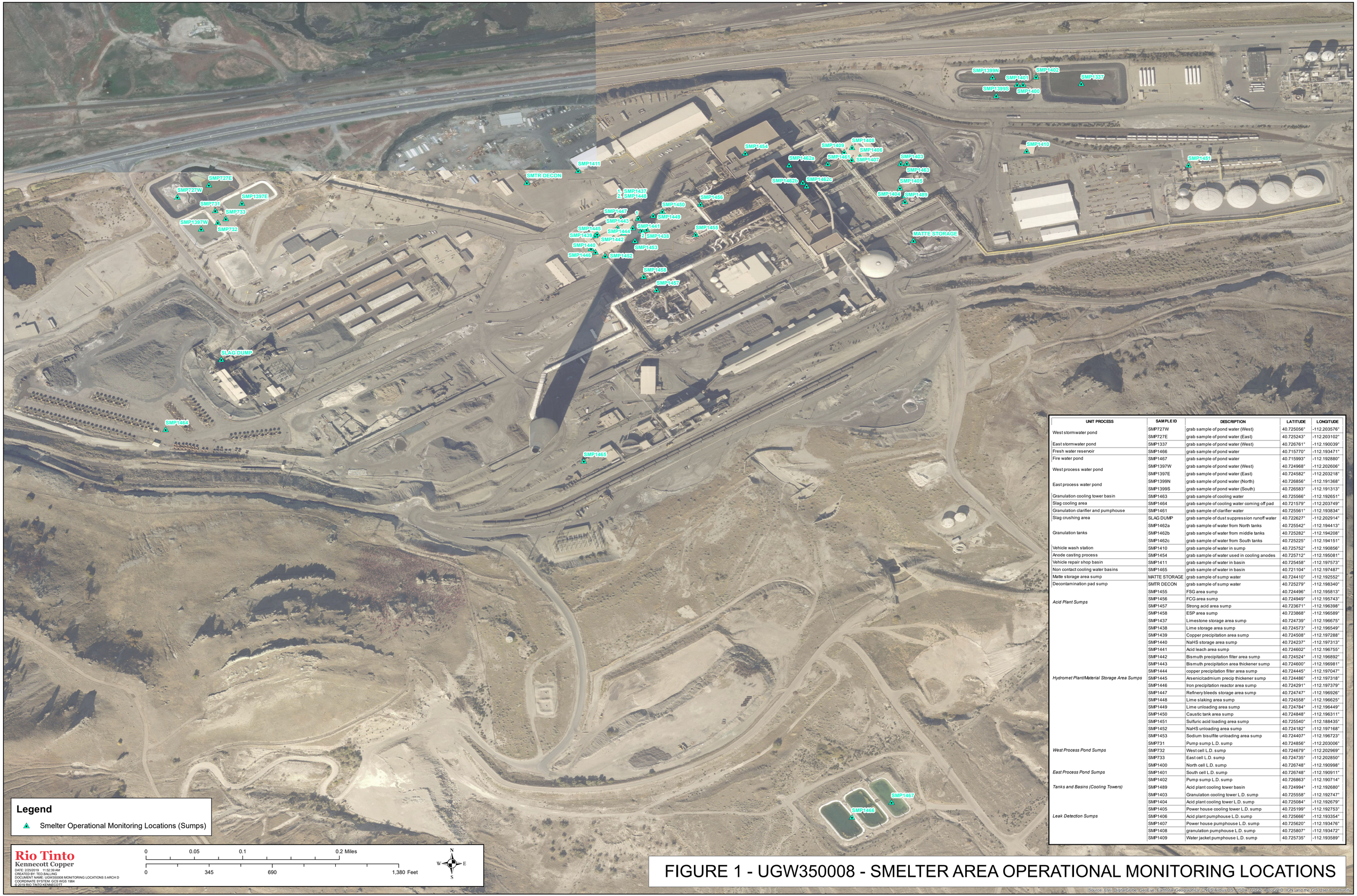
FIGURE 1
KENNECOTT SMELTER SUMP LOCATIONS



UNIT PROCESS	SAMPLE ID	DESCRIPTION	LATITUDE	LONGITUDE
West stormwater pond	SMP727W	grab sample of pond water (West)	40.725056°	-112.203576°
	SMP727E	grab sample of pond water (East)	40.725243°	-112.203102°
East stormwater pond	SMP1337	grab sample of pond water (West)	40.726761°	-112.190039°
Fresh water reservoir	SMP1466	grab sample of pond water	40.715770°	-112.193471°
Fire water pond	SMP1467	grab sample of pond water	40.715993°	-112.192880°
West process water pond	SMP1397W	grab sample of pond water (West)	40.724968°	-112.202606°
	SMP1397E	grab sample of pond water (East)	40.724582°	-112.203218°
East process water pond	SMP1399N	grab sample of pond water (North)	40.726856°	-112.191368°
	SMP1399S	grab sample of pond water (South)	40.726583°	-112.191313°
Granulation cooling tower basin	SMP1463	grab sample of cooling water	40.725566°	-112.192651°
Slag cooling area	SMP1464	grab sample of cooling water coming off pad	40.721579°	-112.203749°
Granulation clarifier and pumphouse	SMP1461	grab sample of clarifier water	40.725561°	-112.193834°
Slag crushing area	SLAG DUMP	grab sample of dust suppression runoff water	40.722627°	-112.202914°
Granulation tanks	SMP1462a	grab sample of water from North tanks	40.725542°	-112.194413°
	SMP1462b	grab sample of water from middle tanks	40.725282°	-112.194208°
	SMP1462c	grab sample of water from South tanks	40.725225°	-112.194151°
Vehicle wash station	SMP1410	grab sample of water in sump	40.725752°	-112.190856°
Anode casting process	SMP1454	grab sample of water used in cooling anodes	40.725712°	-112.195081°
Vehicle repair shop basin	SMP1411	grab sample of water in basin	40.725458°	-112.197573°
Non contact cooling water basins	SMP1465	grab sample of water in basin	40.721104°	-112.197487°
Matte storage area sump	MATTE STORAGE	grab sample of sump water	40.724410°	-112.192552°
Decontamination pad sump	SMTR DECON	grab sample of sump water	40.725279°	-112.198340°
	SMP1455	FSG area sump	40.724496°	-112.195813°
Acid Plant Sumps	SMP1456	FCG area sump	40.724949°	-112.195743°
	SMP1457	Strong acid area sump	40.723671°	-112.196398°
	SMP1458	ESP area sump	40.723868°	-112.196589°
	SMP1437	Limestone storage area sump	40.724739°	-112.196675°
	SMP1438	Lime storage area sump	40.724573°	-112.196549°
	SMP1439	Copper precipitation area sump	40.724508°	-112.197288°
	SMP1440	NaHS storage area sump	40.724237°	-112.197313°
	SMP1441	Acid leach area sump	40.724602°	-112.196755°
	SMP1442	Bismuth precipitation filter area sump	40.724524°	-112.196892°
	SMP1443	Bismuth precipitation area thickener sump	40.724600°	-112.196981°
	SMP1444	copper precipitation filter area sump	40.724445°	-112.197047°
Hydromet Plant/Material Storage Area Sumps	SMP1445	Arsenic/cadmium precip thickener sump	40.724486°	-112.197318°
	SMP1446	Iron precipitation reactor area sump	40.724291°	-112.197379°
	SMP1447	Refinery bleeds storage area sump	40.724747°	-112.196926°
	SMP1448	Lime slaking area sump	40.724558°	-112.196625°
	SMP1449	Lime unloading area sump	40.724784°	-112.196449°
	SMP1450	Caustic tank area sump	40.724848°	-112.196311°
	SMP1451	Sulfuric acid loading area sump	40.725540°	-112.188435°
	SMP1452	NaHS unloading area sump	40.724182°	-112.197168°
	SMP1453	Sodium bisulfite unloading area sump	40.724407°	-112.196723°
	SMP731	Pump sump L.D. sump	40.724856°	-112.203006°
West Process Pond Sumps	SMP732	West cell L.D. sump	40.724679°	-112.202969°
	SMP733	East cell L.D. sump	40.724735°	-112.202850°
	SMP1400	North cell L.D. sump	40.726748°	-112.190998°
East Process Pond Sumps	SMP1401	South cell L.D. sump	40.726748°	-112.190911°
	SMP1402	Pump sump L.D. sump	40.726863°	-112.190714°
Tanks and Basins (Cooling Towers)	SMP1489	Acid plant cooling tower basin	40.724994°	-112.192680°
	SMP1403	Granulation cooling tower L.D. sump	40.725558°	-112.192747°
	SMP1404	Acid plant cooling tower L.D. sump	40.725084°	-112.192679°
	SMP1405	Power house cooling tower L.D. sump	40.725199°	-112.192753°
Leak Detection Sumps	SMP1406	Acid plant pumphouse L.D. sump	40.725666°	-112.193354°
	SMP1407	Power house pumphouse L.D. sump	40.725620°	-112.193476°
	SMP1408	granulation pumphouse L.D. sump	40.725807°	-112.193472°
	SMP1409	Water jacket pumphouse L.D. sump	40.725735°	-112.193589°

Legend

▲ Smelter Operational Monitoring Locations (Sumps)

Rio Tinto
Kennecott Copper

DATE: 2/25/2019 11:52:39 AM
CREATED BY: TED BALLING
DOCUMENT NAME: UGW350008 MONITORING LOCATIONS 5 ARCH D
COORDINATE SYSTEM: GCS WGS 1984

0 0.05 0.1 0.2 Miles
0 345 690 1,380 Feet

N W E S

FIGURE 1 - UGW350008 - SMELTER AREA OPERATIONAL MONITORING LOCATIONS

FIGURE 2
KENNECOTT SMELTER MONITORING WELLS AND PERMITTED OR PERMIT BY RULE FACILITY LOCATIONS

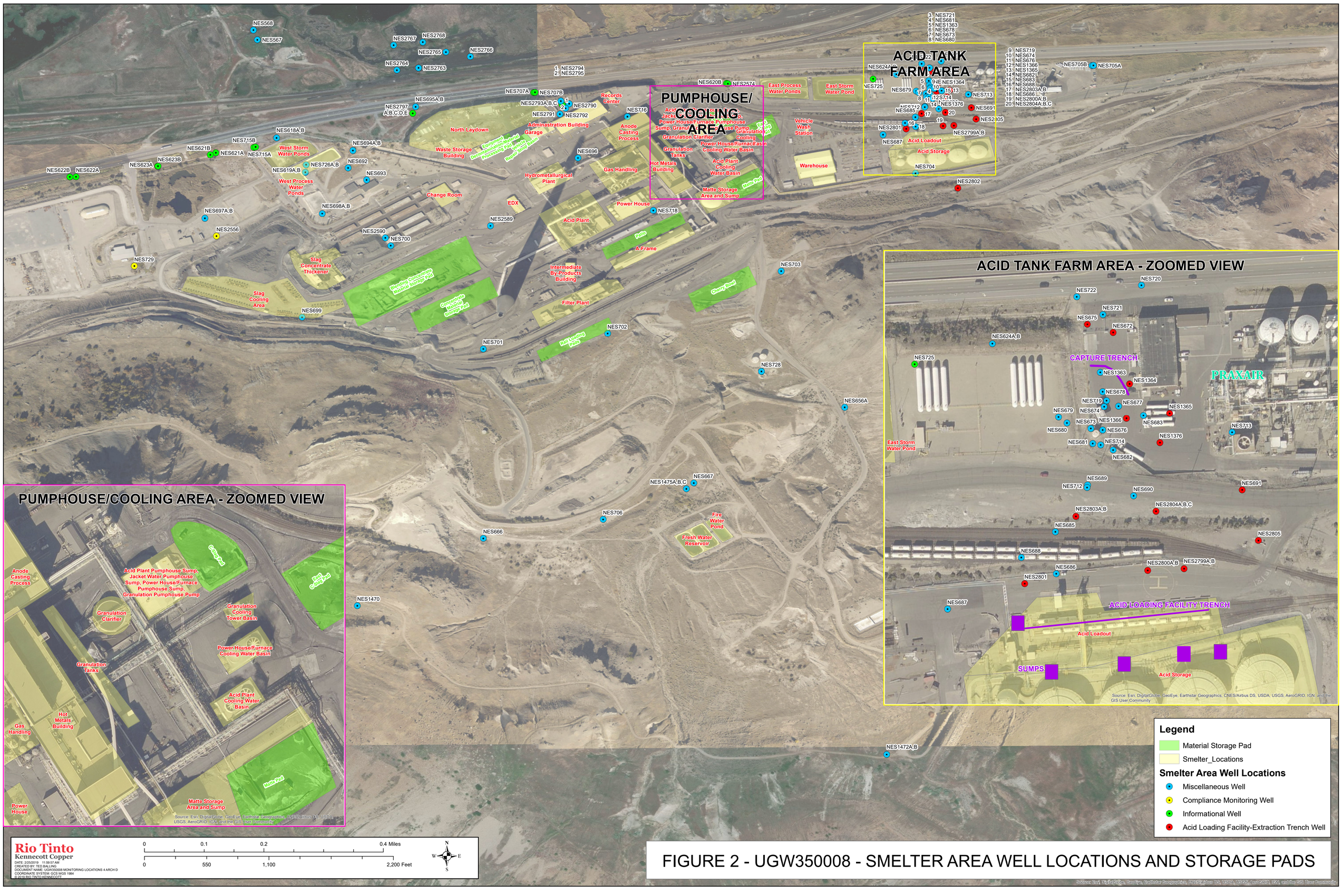


FIGURE 2 - UGW350008 - SMELTER AREA WELL LOCATIONS AND STORAGE PADS

TABLE 1A
KENNECOTT SMELTER BAT AND PERFORMANCE CRITERIA TABLE

Facility	BAT Description	Inspection and Maintenance	Performance Criteria
West Process Water Pond	Two 60 mil HDPE liners with leak collection layer; pump back system to remove leakage and minimize head; 12 inch engineered subgrade with a hydraulic conductivity of no greater than 1 x 10^{-5} cm/sec; pipe spacing in leak collection system no greater than 10 feet	Continuous water level alarm in leak collection sump; remove fluid from leak collection sump upon detection; flow rates into leak collection measured if leaking	No more than 4 gallons per minute entering leak collection system. Maintain less than 12 inches of fluid above elevation of lower HDPE liner.
East Process Water Pond	Two 60 mil HDPE liners with leak collection layer; pump back system to remove leakage and minimize head; 12 inch engineered subgrade with a hydraulic conductivity of no greater than 1 x 10^{-5} cm/sec; pipe spacing in leak collection system no greater than 10 feet	Continuous water level alarm in leak collection sump; remove fluid from leak collection sump upon detection; flow rates into leak collection measured if leaking	No more than 4 gallons per minute entering leak collection system. Maintain less than 12 inches of fluid above elevation of lower HDPE liner.
Granulation Cooling Tower Basin	Concrete basin with 60 mil HDPE underliner and leak collection and removal; continuous pump back system; pipe spacing in leak collection system no greater than 10 feet	Continuous water level alarm in leak collection sump; remove fluid from leak collection sump upon detection; flow rates into leak collection measured if leaking	No more than 2 gallons per minute entering leak collection system. Maintain less than 12 inches of fluid above elevation of lower HDPE liner.
Granulation Pumphouse Sump	Concrete basin with 60 mil HDPE underliner and leak collection and removal; continuous pump back system; pipe spacing in leak collection system no greater than 10 feet	Continuous water level alarm in leak collection sump; remove fluid from leak collection sump upon detection; flow rates into leak collection measured if leaking	No more than 2 gallons per minute entering leak collection system. Maintain less than 12 inches of fluid above elevation of lower HDPE liner.
Acid Plant Pumphouse Sump	Concrete basin with 60 mil HDPE underliner and leak collection and removal; continuous pump back system; pipe spacing in leak collection system no greater than 10 feet	Continuous water level alarm in leak collection sump; remove fluid from leak collection sump upon detection; flow rates into leak collection measured if leaking	No more than 2 gallons per minute entering leak collection system. Maintain less than 12 inches of fluid above elevation of lower HDPE liner.
Vehicle Repair Shop Basin	Concrete basin with PVC underliner and leak detection and removal	Continuous water level alarm in leak collection sump; remove fluid from leak collection sump upon detection; flow rates into leak collection measured if leaking	No more than 2 gallons per minute entering leak collection system. Maintain less than 12 inches of fluid above elevation of lower HDPE liner.
Vehicle Wash Station	Concrete basin with 60 mil HDPE underliner and leak collection and removal; continuous pump back system; pipe spacing in leak collection system no greater than 10 feet	Continuous water level alarm in leak collection sump; remove fluid from leak collection sump upon detection; flow rates into leak collection measured if leaking	No more than 2 gallons per minute entering leak collection system. Maintain less than 12 inches of fluid above elevation of lower HDPE liner

Facility	BAT Description	Inspection and Maintenance	Performance Criteria
Sumps and Drains. See Table 2 for the list of sumps and drains	Sumps, concrete or steel lined, with impervious coatings suited for the liquids handled. Drains are concrete or asphalt lined and those that convey strong acid are lined with acid resistant materials	Annual inspections to verify integrity of the lining.	No detectable leakage
Materials Storage Pads (concentrate, matte, blister copper, pond sludge, copper reverts & fines, converter slag)	Compacted road base overlain with asphalt paving. Perimeter berms three feet high for total containment of all run-off.	Monthly inspections to verify integrity of asphalt. Prompt removal of any accumulated run off waters.	Removal of storm water runoff within **5** days after the end of a storm event. Total containment of all runoff unless storm is greater than a 25 year 24- hour storm.
Slag Cooling Area	Concrete pad with sloping drain channel to remove water to west process pond	Surface inspected quarterly; repaired if needed, drainage channels kept clear	Monitoring Well(s) of Unit Process with permit limits. All runoff contained and routed to West Process Pond.
Acid Plant	Lined basins with acid resistant material in areas with potential for acid spills.	Daily monitoring of plant operations	Prompt clean up of any spills. No process fluids allowed to pond or remain on floor or in sumps. Adherence to Best Management Practices Plan. (see Appendix A and D)
Matte Storage Area with sump	10 inch thick concrete slab with 5% slope to sump	Monthly inspections to verify integrity of concrete. Continuous removal of run-off waters via sump pump to process water circuit.	Removal of storm water runoff within **5** days after the end of a storm event. Total containment of all runoff unless storm is greater than a 25 year 24 hour storm.
Equipment Decontamination and Materials Processing Pad	6 inch thick concrete slab with slope to total containment concrete sump.	Monthly inspections to verify integrity of concrete. Hydrostatic testing of sump annually.	Total containment of all runoff unless storm is greater than a 25 year 24 hour storm.
Anode Casting Process	Sloped concrete floor to concrete collection sump	Visual inspection during scheduled shutdowns for concrete integrity	No discharge of waters used for anode cooling from floor or sump. Adherence to Best Management Practices Plan. (see Appendix A)
Intermediate By-Products Building	Concrete floor with concrete floor sumps lined with HDPE.	Visual inspection of concrete floor and sumps on a quarterly basis.	No detectable leakage

Facility	BAT Description	Inspection and Maintenance	Performance Criteria
Jacket Water Pumphouse Sump	Concrete basin with 60 mil HDPE underliner and leak collection and removal; continuous pump back system; pipe spacing in leak collection system no greater than 10 feet	Continuous water level alarm in leak collection sump; remove fluid from leak collection sump upon detection; flow rates into leak collection measured if leaking	No more than 2 gallons per minute entering leak collection system. Maintain less than 12 inches of fluid above elevation of lower HDPE liner.
Acid Plant Cooling Water Basin	Concrete basin with 60 mil HDPE underliner and leak collection and removal; continuous pump back system; pipe spacing in leak collection system no greater than 10 feet	Continuous water level alarm in leak collection sump; remove fluid from leak collection sump upon detection; flow rates into leak collection measured if leaking	No more than 2 gallons per minute entering leak collection system. Maintain less than 12 inches of fluid above elevation of lower HDPE liner.
Power House/ Furnace Cooling Water Basin	Concrete basin with 60 mil HDPE underliner and leak collection and removal; continuous pump back system; pipe spacing in leak collection system no greater than 10 feet	Continuous water level alarm in leak collection sump; remove fluid from leak collection sump upon detection; flow rates into leak collection measured if leaking	No more than 2 gallons per minute entering leak collection system. Maintain less than 12 inches of fluid above elevation of lower HDPE liner.
Power House/ Furnace Pumphouse Sump	Concrete basin with 60 mil HDPE underliner and leak collection and removal; continuous pump back system; pipe spacing in leak collection system no greater than 10 feet	Continuous water level alarm in leak collection sump; remove fluid from leak collection sump upon detection; flow rates into leak collection measured if leaking	No more than 2 gallons per minute entering leak collection system. Maintain less than 12 inches of fluid above elevation of lower HDPE liner.

TABLE 1B
KENNECOTT SMELTER PERMIT BY RULE FACILITIES

Permit by Rule Facilities	Discharge Control Technology	Inspection and Maintenance [1]
West Storm water Pond	12 inch thick clay liner and 60 mil HDPE liner	Monthly inspection to verify if any leaks exist or have occurred, evaluate the integrity of the liner for structural wear or if tears exist, and inspect diked areas for mechanical or erosion issues.
East Storm water Pond	60 mil HDPE liner	Monthly inspection to verify if any leaks exist or have occurred, evaluate the integrity of the liner for structural wear or if tears exist, and inspect diked areas for mechanical or erosion issues.
Surface Storage Tanks[2]	Steel Tanks on concrete	Quarterly inspection to verify if any leaks exist or have occurred, evaluate the integrity of the structure, and inspect concrete and diked areas for mechanical or erosion issues.
Slag Concentrate Thickener	Above ground tank on a concrete pad	Monthly inspection to verify if any leaks exist or have occurred, evaluate the integrity of the structure, and inspect concrete and diked areas for mechanical or erosion issues.
Fresh Water Reservoir	60 mil HDPE liner on top of an engineered base	Monthly inspection to verify if any leaks exist or have occurred, evaluate the integrity of the liner for structural wear or if tears exist, and inspect base material and diked areas for mechanical or erosion issues.
Fire Water Pond	60 mil HDPE liner	Monthly inspection to verify if any leaks exist or have occurred, evaluate the integrity of the liner for structural wear or if tears exist, and inspect diked areas for mechanical or erosion issues.
Acid Storage/Loadout	Steel above ground tanks with cathodic protection, "membrane liner", concrete ringwall, foundation contained in diked area lined with acid resistant asphalt (void and gilsonite coating)	Monthly inspection to verify if any leaks exist or have occurred, evaluate the integrity of the liner for structural wear or if tears exist, and inspect asphalt and diked areas for mechanical or erosion issues.
Granulation Clarifier	Above ground tank	Monthly inspection to verify if any leaks exist or have occurred, evaluate the integrity of the structure, and inspect concrete and diked areas for mechanical or erosion issues.
Granulation Tanks	Above ground tanks	Monthly inspection to verify if any leaks exist or have occurred, evaluate the integrity of the structure, and inspect concrete and diked areas for mechanical or erosion issues.

[1] No performance criteria are applied to these facilities because they are Permit-by-Rule facilities under the Utah Ground Water Quality Protection Program and are not required to obtain a ground water discharge permit provided they do not cause ground water to exceed ground water quality standards or the applicable class TDS limits. If the background concentration for affected ground water exceeds the ground water quality standard, the facility may not cause an increase over background under R317-6-6.2.

[2] Tanks included in this category are outside of buildings and actively storing hazardous liquids. Tanks storing fuels and oil are covered under SPCC regulations and excluded.

TABLE 2
KENNECOTT OPERATIONAL MONITORING POINTS (PONDS AND SUMPS)

UNIT PROCESS	SAMPLE ID	SAMPLING LOCATION
West storm water pond (East and West)	SMP737E and W	grab sample of pond water
East storm water pond	SMP1337	grab sample of pond water
Fresh water reservoir	SMP1466	grab sample of pond water
Fire water pond	SMP1467	grab sample of pond water
West process water pond (East and West)	SMP1397E and W	grab sample of pond water
East process water pond (North and South)	SMP1399N and S	grab sample of pond water
Granulation cooling tower basin	SMP1463	grab sample of cooling water
Slag cooling area	SMP1464	grab sample of cooling water coming off pad
Granulation clarifier and pumphouse	SMP1461	grab sample of clarifier water
Slag crushing area	SLAG DUMP	grab sample of dust suppression runoff water
Granulation tanks (A, B and C)	SMP1462A, B & C	grab sample of water from tanks
Vehicle wash station	SMP1410	grab sample of water in sump
Anode casting process	SMP1454	grab sample of water used in cooling anodes
Vehicle repair shop basin	SMP1411	grab sample of water in basin
Non-contact cooling water basins	SMP1465	grab sample of water in basin
Material storage pads	By Pad name	grab sample of storm water
Matte storage area sump	MATTE STORAGE	grab sample of sump water
Decontamination pad sump	SMTR DECON	grab sample of sump water
Acid Plant Sump	SMP1455	FSG area sump
Acid Plant Sump	SMP1456	FCG area sump
Acid Plant Sump	SMP1457	Strong acid area sump
Acid Plant Sump	SMP1458	ESP area sump
Hydromet Plant/Material Storage Area Sumps	SMP1437	Limestone storage area sump
Hydromet Plant/Material Storage Area Sumps	SMP1438	Lime storage area sump
Hydromet Plant/Material Storage Area Sumps	SMP1439	Copper precipitation area sump
Hydromet Plant/Material Storage Area Sumps	SMP1440	NaHS storage area sump
Hydromet Plant/Material Storage Area Sumps	SMP1441	Acid leach area sump
Hydromet Plant/Material Storage Area Sumps	SMP1442	Bismuth precipitation filter area sump
Hydromet Plant/Material Storage Area Sumps	SMP1443	Bismuth precipitation area thickener sump
Hydromet Plant/Material Storage Area Sumps	SMP1444	copper precipitation filter area sump
Hydromet Plant/Material Storage Area Sumps	SMP1445	Arsenic/cadmium precip thickener sump
Hydromet Plant/Material Storage Area Sumps	SMP1446	Iron precipitation reactor area sump
Hydromet Plant/Material Storage Area Sumps	SMP1447	Refinery bleeds storage area sump
Hydromet Plant/Material Storage Area Sumps	SMP1448	Lime slaking area sump
Hydromet Plant/Material Storage Area Sumps	SMP1449	Lime unloading area sump
Hydromet Plant/Material Storage Area Sumps	SMP1450	Caustic tank area sump
Hydromet Plant/Material Storage Area Sumps	SMP1451	Sulfuric acid unloading area sump

UNIT PROCESS	SAMPLE ID	SAMPLING LOCATION
Hydromet Plant/Material Storage Area Sumps	SMP1452	NaHS unloading area sump
Hydromet Plant/Material Storage Area Sumps	SMP1453	Sodium bisulfite unloading area sump
West Process Pond Sumps	SMP731	Pump sump L.D. sump
West Process Pond Sumps	SMP732	West cell L.D. sump
West Process Pond Sumps	SMP733	East cell L.D. sump
East Process Pond Sumps	SMP1400	North cell L.D. sump
East Process Pond Sumps	SMP1401	South cell L.D. sump
East Process Pond Sumps	SMP1402	Pump sump L.D. sump
Tanks and Basins (Cooling Towers)	SMP1489	Acid plant cooling tower basin
Leak Detection Sumps	SMP1403	Granulation cooling tower L.D. sump
Leak Detection Sumps	SMP1404	Acid plant cooling tower L.D. sump
Leak Detection Sumps	SMP1405	Power house cooling tower L.D. sump
Leak Detection Sumps	SMP1406	Acid plant pumphouse L.D. sump
Leak Detection Sumps	SMP1407	Power house pumphouse L.D. sump
Leak Detection Sumps	SMP1408	granulation pumphouse L.D. sump
Leak Detection Sumps	SMP1409	Water jacket pumphouse L.D. sump

TABLE 3
KENNECOTT SMELTER PERMIT COMPLIANCE LIMITS

Parameter	Utah Ground Water Quality Standard (mg/L)	Class III Monitoring Well NES729			Class III Monitoring Well NES2556		
		Background Level (mg/L)		Groundwater Protection Level (mg/L)	Background Level (mg/L)		Groundwater Protection Level (mg/L)
		mean	stdev		mean	stdev	
pH (units)	6.5-8.5	7.45	0.2	6.5 - 8.5	7.27	0.21	6.5 - 8.5
Arsenic	0.05	0.006	0.002	0.05	0.009	0.007	0.05
Barium	2	0.028	0.005	0.042	0.032	0.01	0.05
Cadmium	0.005	nd	n/a	0.005	nd	n/a	0.005
Chromium	0.1	nd	n/a	0.05	nd	n/a	0.05
Copper	1.3	nd	n/a	0.65	0.082	0.16	0.124
Lead	0.015	nd	n/a	0.008	nd	n/a	0.008
Se (hydride)	0.05	0.031	0.01	0.05	0.052	0.015	0.083
Zinc	5	nd	n/a	2.5	0.021	0.018	2.5
Chloride	-	152	39	228	339	139	617
Sulfate	-	225	27	338	303	80	462
TDS	10,000	800	66	1200	1200	303	1810

[1] Utah Ground Water Quality Protection Levels established in accordance with R317-6-4.
[2] nd = non-detectable concentrations
[3] n/a = not applicable

APPENDIX A

BEST MANAGEMENT PRACTICES PLAN
FOR
ACID PLANT
HYDROMETALLURGICAL PLANT
ANODE CASTING PROCESS
DECONTAMINATION PAD AND SUMP
MATTE STORAGE AREA AND SUMP
MATERIAL STORAGE PADS
INTERMEDIATE BY-PRODUCTS STORAGE BUILDING

INTRODUCTION

The Kennecott Utah Copper Smelter has been granted a Ground Water Discharge Permit (Permit No. UGW350008) by the State of Utah. This permit details the construction, operation and monitoring requirements for the facilities at the Smelter that have the potential of releasing fluids to the ground water. The permit specifies that Best Available Technology (BAT) be used in the construction of all facilities and that facilities are operated according to Best Management Practices (BMP).

The permit lists nineteen individual facilities that have BAT criteria associated with them and nine facilities under permit-by-rule (Figure 2). This document addresses the facilities that require a BMP. These facilities are the Acid Plant, Hydrometallurgical Plant, the Anode Casting Process, the matte storage pad and sump, the decontamination pad and several material storage pads. The BMP describes operations and maintenance practices that will be utilized for spill prevention, spill cleanup, materials handling, housekeeping practices and reporting of spill events (Figure 2).

BEST AVAILABLE TECHNOLOGY

Acid Plant

The acid plant is located on the southwestern portion of the modernized Smelter foot print (Figure 2). The plant incorporates lined basins with acid-resistant material in areas where the potential for acid spills exists. Equipment is constructed above-grade. Above- ground acid lines are constructed of corrosion resistant materials.

Hydrometallurgical Plant

The hydrometallurgical plant is located in the northwest corner of the modernized Smelter foot print (Figure 2). All of the process tanks are constructed above-ground on concrete pads. Floor sumps are constructed of acid-resistant materials. Process areas are provided with containment in areas where the potential for spills exists.

Anode Casting Process

The anode casting process is located in the casting building of the modernized Smelter (Figure 2). Molten blister copper is poured from the anode refining furnace directly into an anode mold. The anode is then cooled by water sprays as it is rotated. The anode is stripped from the mold and placed in an above-grade, anode cooling tank. Wash-down water will have a slightly elevated pH and metals concentration due to contact with the anode copper and the barite-coated mold.

The anode casting process area is constructed with a sloped concrete floor which drains to a circular concrete collection sump. Sumps and floor drains in the area flow to the process water recycle system.

Decontamination Pad and Sump

The equipment decontamination and material processing pad is located due west of the modernized Smelter Maintenance/Administration Building (Figure 2). The facility is used to decontaminate equipment and scrap metal via water spray. This facility is also used for processing solutions collected off materials storage pads, out of sumps or containments and from street sweeping equipment. Solutions are collected in a two-cell collection basin which separates solids for recycle and desilted water for introduction back into the process water system.

The decontamination pad is constructed with a sloped concrete floor which drains to a concrete collection basin. Solutions reporting to the basin are designed to gravity flow to the west process water ponds. The collection basin is comprised of two cells. Each cell will be hydrostatically tested once annually to demonstrate no leakage is occurring as described in the last paragraph on page 5 of this appendix.

Matte Storage Area and Sump

The matte storage area and sump are located due east of the matte dome (Figure 2). This facility is used to store granulated matte generated from the flash smelting process prior to transport for further processing or sale.

The matte storage pad is constructed of a 10-inch thick concrete slab with a 5% slope draining to a collection sump. Solutions reporting to the collection sump are pumped to the granulation clarifier tank.

Material Storage Pads

Nine material storage pads (Concentrate Pad, Blending Concentrate Pad, Cherry Bowl, C Slag Pad, East C Slag Pad, Patio Pad, Matte Pad, Decontamination Pad and Rail Loading Pads) and several smaller pads are located throughout the active smelter footprint (Figure 2). These pads have been constructed to temporarily store concentrate, matte, blister copper, pond sludge, copper reverts and converter slag prior to introducing these materials back into the smelting process.

The pads are constructed of compacted road base overlain with asphalt paving. Perimeter berms provide containment of all run-off up to a 25 year, 24-hour storm event. The pads are positioned such that no run-on of surface flows is allowed. Pads are either equipped with sump and piping to continuously remove liquids from the pad or vacuum trucks will provide removal of accumulated waters within 5 days following storm events.

INSPECTION AND MAINTENANCE PROCEDURES

General

Operations

Operations at the acid plant, hydrometallurgical plant and anode casting process are monitored on a continuous basis via a distributed control system (DCS). Operators are assigned to monitor the DCS on a twenty-four hour per day basis. Additionally, employees are assigned to each area and are responsible for patrolling areas at least once a day to verify system operations. Operator logs are kept to verify day patrols have been conducted. Any irregularities in operating components are investigated immediately and necessary action taken to correct the problem.

Maintenance

Each area (acid plant, hydrometallurgical plant, matte storage area and sump, decontamination pad and sump and anode casting process area and Intermediate By-Products Storage Building) has been assigned personnel responsible for repair and maintenance of all equipment. Scheduling of maintenance activities is part of a comprehensive preventive and predictive maintenance program (PM). The Smelter maintenance program utilizes computer assisted preventive maintenance scheduling. For each piece of equipment, a PM schedule has been developed.

Tracking of the PM schedule, as well as the PM procedures, is done via a computerized maintenance program. The Smelter utilizes an information management system for scheduling maintenance tasks and compiling equipment, material and supply data. Based on information from the control system, feedback from operator inspections, and preset schedule inputs, the information management system assists maintenance planners in tracking and scheduling PMs. When a PM is due, the computer system triggers the PM process for a specific piece of equipment. The pumps and sumps are included in the information management system.

When a PM is due, the information management system triggers the process of scheduling the PM. Pre-established job procedures are printed out for the PM. Maintenance schedulers then assign an employee the responsibility of completing the PM.

After the PM is completed, the employee returns the signed PM checklist indicating the PM has been completed to the maintenance scheduler. Any items noted during the inspection that require additional repair are noted by the maintenance planner. A work order is then written for any additional repair work and the work will be scheduled. Any repair work not completed will be highlighted on a work order backlog. The work order tracking system should assure that proper and complete implementation of required repairs occurs.

As previously mentioned, the pumping system components are included in a scheduled preventative and predictive maintenance (PM) program. Pumping system components include the pump, motor, inlet and outlet piping and pump fittings. The pumping system is inspected and a PM conducted at a minimum of once every three months. The PM procedures for the pumping

systems include changing lubricating fluids as needed, inspecting foundations and mounting assemblies, checking pump for excessive heat, noise, or vibration, inspecting piping for leaking and proper sealing and checking automatic level controls as required. The level controls will be checked manually to ensure the controls activate at the appropriate levels. Piping inspections are done on a visual basis. An example of a PM for a pump is provided as Attachment A.

Sumps in the acid plant, hydrometallurgical plant, anode casting process area, equipment decontamination and material processing pad, matte storage area, and Intermediate By-Products Storage Building are also included in the PM program and are tracked through the information management system. Via the information management system, sumps are scheduled for hydrostatic testing during planned shutdowns (or a minimum of once every three years, except for the decontamination pad which is tested annually). The inspection will consist of filling the sump with fresh water and monitoring the liquid level for a period of two hours (or longer if the equipment down-time allows). If the test indicates leakage, necessary corrective action is taken. An example of a PM for a sump is provided as Attachment A. A list of sumps and pumps in the hydrometallurgical plant, anode casting process area, acid plant, decontamination pad, and matte storage area is provided in Table 1 of this Appendix A and Figure 1.

PERFORMANCE CRITERIA

Housekeeping

Any spillage within the contained areas is designed to drain to sumps. Sumps that are equipped with automatically controlled pumps, will pump the sump contents to the appropriate location for use as a reagent. Sumps that are not equipped with automatically controlled pumps will activate a high level alarm. Upon indication of a high level, an operator is dispatched to investigate the problem and take appropriate corrective action.

The plant is designed to facilitate meeting strict housekeeping standards. Appropriately designed floor slopes, drains, and area containments are incorporated into the system. KUC housekeeping standards require prompt cleanup of spilled materials and areas are to be kept reasonably free of excess dirt, grease, and oil.

Spill Prevention/Spill Cleanup

The acid plant, hydrometallurgical plant and anode casting process area are included in the Emergency Response as required. The plans specify procedures to be followed for spill response. Spills are contained and cleaned up as quickly as possible.

Materials Handling

Various chemicals and reagents are used throughout the Smelter operations. The Occupational Safety and Health Administration (OSHA) requirements for Hazard Communications are enforced at the Kennecott Smelter. The purpose of the standard is to ensure that:

- Labels and/or appropriate warning concerning hazardous chemicals, as required by the standard, are in place.
- Safety Data Sheets (SDS) are obtained and distributed such that they are readily available to employees working in areas where hazardous chemicals are used. KUC has developed a computerized SDS system that expedites retrieval.
- Employees are informed and trained concerning hazardous chemicals and the Hazard Communication program.
- Employees are informed concerning non-routine tasks involving hazardous chemicals.
- Contractor employers are informed concerning hazardous chemicals to which their employees may be exposed while working at the Kennecott Smelter.

Tanks used for chemical storage are provided with secondary containment. Material transfer operations are conducted in such a manner as to minimize the potential for spillage. Through the Hazard Communication program, employees and contractors/vendors are trained to understand the proper methods for handling chemicals.

Chemicals are stored, in compatible containers and tanks. Containers are properly labeled with NFPA stickers. Drums are stored on pallets to minimize the potential for corrosion and to facilitate visual inspections. Storage racks, cabinets and tanks are provided for secondary containment.

Housekeeping standards have been established for the principal purpose of ensuring consistent application of housekeeping throughout KUC. KUC facility standards require floors be washed at an interval necessary to keep them in a clean state. In areas where washing is not feasible, vacuum systems have been installed. Floors are kept as dry as possible to minimize potential for slips and falls. Hoses, brooms, squeegees and similar type of equipment are located in strategic areas to facilitate housekeeping. Spills are to be promptly contained and cleaned up.

Each employee at KUC is responsible for maintaining housekeeping standards. As part of the new hire orientation, housekeeping is reviewed with each new employee. Supervisors are responsible for conducting periodic housekeeping inspections and ensuring areas are kept clean.

Spill Reporting

A verbal report of any noncompliance, or spills subject to the provisions of UCA 19-5-114 which may endanger public health or the environment are made as soon as possible, but no later than twenty-four hours from the time KUC first became aware of the incident. The report will be made to the Utah Department of Environmental Quality 24 hour number, (801) 536-4123 and to the Division of Water Quality, Ground Water Protection Section at (801) 536-4300, during normal business hours.

A written report will be provided to the Director within five days of the time that KUC becomes aware of the incident. The written submission will contain:

a) A description of the noncompliance event and its cause;

b) The period of noncompliance event, including exact dates and times;

c) The estimated time noncompliance is expected to continue if it has not been corrected;

d) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance event.

Training

All new employees are given an overview of the KUC housekeeping requirements and spill reporting elements. Supervisors and salaried employees are provided annual training on key environmental and safety policies and procedures including the spill reporting and housekeeping standards.

For the Smelter operations, all personnel have undergone extensive training for the startup of the

facilities. This training has been given to both hourly and salaried personnel.

KUC also encourages employee participation and suggestions in developing ways of improving operations from both safety, environmental and productivity perspectives. This process is part of KUC's ongoing commitment to continuous improvement in all areas of its operations.

Record keeping

Records which document compliance with the elements required in the BMP will be maintained for a minimum of three years. Copies of records are kept at the Smelter Record keeping Center or on a tape backup of the DCS and the information management system files.

APPENDIX A TABLE 1
LIST OF EQUIPMENT (Revised 1-7-99)
HYDROMETALLURGICAL PLANT

PUMP	SUMP	AREA DESCRIPTION
551-PP-715	551-ZM-715	Lime Storage Area
551-PP-716	551-ZM-716	Lime Area
551-PP-767	551-ZM-767	Copper Precipitation Area
551-PP-768	551-ZM-768	NaHS Storage Area
551-PP-791	551-ZM-791	Acid Leach Area
551-PP-792	551-ZM-792	Bismuth Precipitation Filter Area
551-PP-793	551-ZM-793	Bismuth Precipitation Thickener Area
551-PP-794	551-ZM-794	Copper Precipitation Filter Area
551-PP-795	551-ZM-795	Arsenic/Cadmium Precip. Thickener Area
551-PP-796	551-ZM-796	Iron Precipitation Reactor Area
551-PP-797	551-ZM-797	Refinery Bleeds Storage Area
551-PP-799	551-ZM-799	Lime Slaking Area
572-PP-810	572-ZM-810	Lime Unloading Area
572-PP-857	572-ZM-857	Caustic Tank Area

ANODE CASTING AREA

PUMP	SUMP	AREA DESCRIPTION
527-PP-265 & 266	527-TK-261	Anode Cooling Water Area

ACID PLANT

PUMP	SUMP	AREA DESCRIPTION
546-PP-509	546-ZM-509	FSG Area
546-PP-519	546-ZM-519	FCG Area
546-PP-649	546-SU-649	Strong Acid Area
546-PP-531	546-ZM-531	ESP Area
546-PP-672	546-SU-641	Backup Acid Cooling System

OTHER FACILITIES

PUMP	SUMP	AREA DESCRIPTION
N/A	572-SU-001	Decontamination Pad
572-PP-893	572-SU-893	Matte Storage Pad
N/A	N/A	Material Storage Pads
N/A	572-SU-726	Intermediate By Products Building
N/A	572-SU-724	Intermediate By Products Building
N/A	572-SU-723	Intermediate By Products Building

APPENDIX B

BAT PERFORMANCE MONITORING PLAN FOR SMELTER FACILITIES WITH LEAK COLLECTION AND REMOVAL SYSTEMS

INTRODUCTION

The Kennecott Utah Smelter has been granted a Ground Water Discharge Permit (Permit No. UGW350008) by the State of Utah. This permit details the construction, operation, and monitoring requirements for the facilities at the Smelter that have the potential of releasing fluids to the ground water. The permit specifies that Best Available Technology (BAT) be used in the construction of all facilities and that facilities be operated according to Best Management Practices (BMP).

The permit lists nineteen individual facilities that have BAT criteria associated with them (Figure 2). This monitoring plan addresses the facilities that require leak collection and removal systems. These facilities and their BAT and performance criteria are listed in Table 1A.

Each of the nineteen facilities consists of a concrete or HDPE sump or basin. Under the concrete structure is an HDPE lined sump with drain pipes sloped to a low point. At the low point there is a collection pipe to allow access to measure the level of liquid in the sump and to remove the liquid. The theory of operation is that if the concrete basin leaks, the fluid will be trapped in the drain field on top of the liner. When fluid is detected in the collection pipe, this is an indication that the basin is leaking. In each collection pipe a level detector has been installed. The level detector will signal an alarm in the Smelter central control room. Installations not connected to the Smelter control room will have a local strobe light installed to function as an alarm. Fluid can be removed from the collection pipe with portable pumps to maintain a low head of fluid on the liner. If leakage is discovered, the permit details required response actions.

The permit requires that the Smelter develop and follow a monitoring, inspection and maintenance plan for permitted facilities. In addition, it details what actions must be taken if a leak is detected or a system is out of compliance with the permit. This document describes the procedures required to comply with the Ground Water Discharge Permit for the nineteen facilities with leak collection and removal systems.

MONITORING, INSPECTION AND MAINTENANCE

Kennecott is responsible for implementing the best available technology (Table 1A) to prevent discharge of process fluids from the permitted facilities to ground water. Maintenance of the performance standard will be demonstrated by operation and maintenance of the leak collection and removal systems and adherence to the performance criteria.

BAT Performance Monitoring

Inspection and Maintenance: Each system will be included in the Smelter Preventive Maintenance (PM) Program. The PM program requires that inspections and the PM requirements be performed quarterly.

Attached, under the Record keeping section, are checklist/forms for inspections of each facility and the PM requirements for the continuous water level alarms.

Monitoring Plan: The primary tool for monitoring the leak collection systems will be the continuous water level alarms in the leak collection sumps. These alarms will be monitored at the Smelter control room. Any alarms will be logged by the operators and the cause of the alarm investigated and documented.

Monitoring results will be documented on an alarm and leak removal form contained in this plan. Records will be kept according to criteria in the Record keeping section of this plan.

A summary of monitoring results will be reported to the Department of Water Quality on a semi-annual basis. This report will be due 45 days following the end of the reporting semester.

Leakage Rate Evaluation: To determine the leakage rate into a leak collection system, flow totalizers will be used to measure the amount of water pumped from the leak collection pipe over a given period of time. If the flow totalizer fails or is unable to be successfully read, the pump will be de-energized, a measurement taken and another measurement taken at a later time. Based upon the diameter of the pipe and quantity of water collected over a specific time period, a leakage rate will be calculated.

LEAK DETECTION AND REMOVAL PROCEDURES

Leak Detection

Leaks into the collection system will be detected by the continuous level alarms or by physical measurements taken during scheduled inspections. When a collection sump alarm is received at the Smelter control room, the operator will log the time on the alarm and dispatch the appropriate person to verify that the level alarm is working correctly and verify the level in the monitoring collection pipe. If the level in the collection pipe is in fact at the alarm level, leak response procedures will be implemented. If the cause of the high level alarm or leakage rate can be repaired within 24 hours of detection of the alarm condition, Kennecott is not obligated to undertake the Response of Leak procedures in the following paragraph. If the alarm is not valid, the alarm system will be repaired as soon as possible. Until the alarm is repaired, periodic measurements of the liquid level in the collection pipe will be taken and recorded.

Response to a Leak

Upon determination that the maximum fluid level specified in the permit has been exceeded**, and the cause of the elevated level has not been repaired within 24 hours**, the following actions are required:

- Sample the effluent from the collection system for water quality field and lab constituents. Results must be submitted to the State in the next semiannual report. Sample collection, analysis, and reporting will be the responsibility of the Environmental Department.

- Immediately, remove fluid from the affected leak collection system to a level below the allowable maximum fluid level specified in the permit and determine the leakage rate entering the leak collection system. The fluid removed from the collection pipe should be discharged back into the basin. Plant personnel are responsible for implementing this action.

- Notify the Director in writing within five days that a performance criteria has been exceeded and what the measured leakage rate in the affected leak collection system is. All communications with the State will be done by the Environmental Department.

- If the leakage rate is in excess of the maximum rate or level specified, Kennecott shall implement the approved leak detection and repair plan.

- Remove fluids from any affected leak collection system on a continuous basis to maintain fluid levels less than the specified maximum.

AREA RESPONSIBILITIES

Completion of the required actions in the permit is the responsibility of the following functional areas:

- The overall responsibility for compliance with the permit and auditing of required actions rests with the Smelter Environmental Facility Engineer and Smelter Management.

- Alarm monitoring is the responsibility of the Smelter Operations - Control Room Supervisor.

- Routine inspections are done by the Environmental Department.

- Compliance with the PM requirements is the responsibility of Smelter Operations and the Maintenance Service Provider.

- Leak response is the responsibility of Smelter Operations and the Maintenance Service Provider.

- Sampling, Analysis, and Reporting is the responsibility of the Environmental Department.

RECORD KEEPING

The Kennecott Environmental Record keeping Procedures is used for all records. Copies of the records are kept at the Smelter Record keeping Center and at the Environmental Record keeping Center. The following forms and procedures follow this section:

- Quarterly Inspection Form.
  This form is used to document routine inspections of the facilities.

QUARTERLY PM REQUIREMENTS

All inspections and services performed on this equipment shall be done in accordance with accepted safety rules and formal procedures. Visually inspect this equipment for damage or problems which might cause unsafe operation.

Continuous Level Alarm

1) Notify the Control Room and advise that the leak detection system is being inspected. Ask control Room if the system is in alarm on the DCS system

2) Remove the alarm cable

3) Invert the end of the cable, allowing the ball float to drop to the top of the probe.

4) Notify the Control Room to verify the alarm probe on the DCS screen

5) Drop the ball float to the bottom end of the probe.

6) Notify the Control Room to verify a normal mode on the DCS screen.

7) Inspect all mechanical and electrical components for proper operation.

8) Inspect all components for corrosion.

9) Take a flow totalizer reading or measure the water depth and record the reading and time. Note: If water depth is measured, remove pumpcord from power source.

10) Take a second reading at least two hours later and record the current time. Note: If a water depth was measured, be sure to re-energize power to the pump.

11) Replace all protective covers

12) Calculate gallons per minute (gpm) and record.

SMELTER PLANT - QUARTERLY INSPECTION
Leak Detection & Removal Systems - Summary Report

Quarter: **Year:** **Date:**

The following checks were made as part of this inspection:
1. Alarm Status was checked first at the EMC DCS consol to confirm "normal" status. Then the function of the alarm was checked by field activation with confirmation acknowleged by the control room.
2. Basin Status was checked by verifying if process materials were present and/or being pumped through the protected facility.
3. Liquid Depth was checked by opening the leak detection pump sump and measuring using Schill IT30 electron depth measure probe.
4. Visual Inspection was conducted to verify the condition and function of leak detection components.
5. Leakage Rate was calculated by verifying a "pump down" condition and then taking a beginning totalizer and time reading during initial inspection, with follow-up reading taken two to six hours later.
6. Wells with a "zero" leakage rate were confirmed by a "no change" manual measurement of well depth.

Leak Detection Facility (location)	DCS ID	Monitor Well No.	Alarm Status	Basin Status	Liquid Depth ft.	Leakage Rate in gpm	Comments (Visual Inspection)	Date Inspected	Inspected By
West Process Ponds									
West Cell (west)	572268	SMP732							
East Cell (east)	572267	SMP733							
Pump Sump (center)	572269	SMP731							
East Process Ponds									
North Cell (west)	572409	SMP1400							
South Cell (east)	572407	SMP1401							
Pump Sump (north)	572413	SMP1402							
Pump House									
Jacket Cooling Water (NW)	529008	SMP1409							
Granulation Water (NE)	529363	SMP1408							
Powerhouse/Furnace (SW)	529469	SMP1407							
Acid Plant (SE)	529414	SMP1406							
Cooling Towers									
Granulation (north)	529361	SMP1403							
Powerhouse (center)	529468	SMP1405							
Acid Plant (south)	529416	SMP1404							
Others									
Vehicle Wash	572176	SMP1410							
Vehicle Repair Wash Bay Sump	572177	SMP1411							

Inspection Report Completed By: _____

APPENDIX C

KENNECOTT UTAH COPPER
SMELTER LEAK DETECTION AND REPAIR PLAN

1. INTRODUCTION

The following procedures reflect the Kennecott standard protocol for QA/QC and address the elements consistent with quality workmanship and liner integrity of the geomembrane. Should the performance criteria fluid level established in the BAT Performance Monitoring Plan (Appendix B) be exceeded, Kennecott will immediately remove fluid from the affected leak collection system to a level below the allowable maximum fluid level specified in the permit and determine the leakage rate entering the leak collection system. If the leakage rate is in excess of the maximum rate or level specified, Kennecott shall within seven (7) days initiate the identification of liner damage. During this time, Kennecott will remove fluids from any affected leak collection system on a continuous basis to maintain fluid levels less than specified maximum. Repairs will be completed within thirty (30) days or the pond will be taken out of service until repairs can be made.

2. DEFECTS AND REPAIRS

A. Earthwork

- If damage to the subgrade below the liner is observed, the subgrade will be prepared to specifications suitable for installation of the liner.
- Surfaces to be lined shall be smooth and free of debris, roots, and angular or sharp rocks. All fill material shall be free of trash, organics and other deleterious material that could potentially cause damage to the geomembrane. The upper 6" of subgrade shall not contain material larger than 1/2".
- The subgrade shall be compacted to provide a firm unyielding foundation.

B. Repair Procedures

Any portion of the geomembrane or geomembrane seam showing a flaw, or failing a destructive or non-destructive test in non-compliance shall be repaired. Several procedures exist for repair and the decision as to the appropriate repair procedure shall be made by Kennecott's Project Manager. Options available for repair include the following:

- **Patching** used to repair large holes, tears, and destructive sample locations. All patches shall extend at least three inches (3") beyond the edges of the defect and all corners of patches shall be rounded.
- **Grinding and Welding** used to repair sections of extruded fillet seams.

- **Spot Welding or Seaming** used to repair small tears, pinholes, or other minor localized flaws.

- **Capping** used to repair lengths of extrusion or fusion welded seams. Extrude overlap along the length of fusion welded seams.

- Removal of a seam and replacement with a strip of new material seamed into place.

C. Verification of Repairs

Every repair shall be non-destructively tested. Testing protocol is based upon the method of repair. The following non-destructive testing procedures may be utilized.

- **Seam Testing** The welded seam created by the fusion welding process is composed of a primary seam and a secondary track that creates an unleaded channel. The presence of an unleaded channel permits the fusion seams to be tested by inflating the sealed channel with air to a predetermined pressure and observing the stability of the pressurized channel over time.

- **Pressure Testing**
  - Both ends of the seam to be tested will be sealed.
  - An approved pressure feed device will be fed into the sealed channel.
  - The test channel will be inflated and pressure maintained within the range listed below:

Material (Mill)	Min. PSI	Max PSI
40	24	30
60	27	35
80	30	35
100	30	35

  - After 5 minutes, the pressure should be observed and recorded. If the loss of pressure exceeds 4 psi, pressure loss source should be identified and repaired.
  - All cuts or needle holes through the liner, as a result of testing, will be repaired by extrusion bead or welding.

- **Vacuum Testing** This test is used on extrusion welds, or when the geometry of fusion weld makes air pressure testing impractical, or when attempting to locate the precise location of a defect believed to exist after air pressure testing.

  - Trim excess overlap from the seam.

  - Apply a generous amount of strong soapy solution to the area to be tested.

  - Place the vacuum box over the area to be tested and apply downward pressure to seat the seal strip against the liner.

  - Apply a minimum of 5 psi vacuum to the area.

  - For a period of approximately 10 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.

3. DOCUMENTATION

Repairs which pass the non-destructive test shall be deemed acceptable. Repairs in excess of 150 consecutive feet require destructive testing. Testing of repairs shall be recorded with information regarding the location or repairs, date of testing, time, weather conditions and name of technician performing the tests. Before and after photographs of the repaired liner will be collected.

4. ASSESSMENT OF POTENTIAL LOSSES OF PROCESS WATER TO GROUNDWATER

Complete an assessment of the potential for the loss of process water to ground water and an assessment of the potential impacts.

5. REPORTING

The QA/QC documentation information and the assessment of the potential impacts of the leak will be submitted to the Division of Water Quality (DWQ) as part of the Ground Water Discharge Permit Semi-Annual Report.

APPENDIX D
CORRECTIVE ACTION PLAN FOR KUC SMELTER ACID LOADING FACILITY

1. INTRODUCTION

The following Corrective Action Plan (CAP) reflects KUC's procedure implemented in response to the unintended release of diluted sulfuric acid from a breach in the containment system of the KUC Smelter Acid Loading facility. The purpose of the CAP is to provide containment for the low pH fluids, inhibit plume migration, avoid groundwater contaminant seepage to downgradient wetlands, and remediation of the soil and groundwater at the Smelter Acid Loading Facility. The CAP was approved by Utah Division of Water Quality on January 25, 2011 for implementation to attain cleanup standards as shown in Table 1 below.

2. CORRECTIVE ACTION

KUC investigated the reactivation and use of a shallow groundwater water/vadose zone water capture trench that was installed in 1995 and last operated in 2002 to contain a sulfuric acid spill which occurred in 1991. Water and pump test information available allowed KUC to determine that the capture trench is adequately located to effectively capture contamination from the acid tank loading area breach location.

KUC inspected the capture trench condition and conducted a pump test using temporary power and a portable pump in early October 2010 to verify that drawdown and capture induced from pumping will cause vadose zone water and shallow ground water to report to the trench. The inspection and 48 hour pump test did confirm that the trench was functional and that sufficient water table drawdown was induced for containment.

Restoration of the trench to an operating condition required replacement of the electrical supply components and installation of a new pump and motor control and monitoring equipment. Following the reactivation work, KUC operated and conveyed the extracted water to the KUC process water system. KUC prepared and submitted to DWQ a pumping strategy to maximize the effectiveness of the trench system for plume containment and remediation, which is reviewed annually and adjusted as warranted. KUC will continue extraction from the trench until groundwater cleanup standards are achieved or contaminant levels are reduced to a point that monitored natural attenuation will be protective of downgradient wetlands. KUC must seek and receive approval from DWQ for a transition to a monitored natural attenuation strategy.

KUC initially provided a visual inspection on the extraction trench sump on a weekly basis to evaluate equipment operating condition. Once the remote telemetry system was installed and operable, KUC reduced the visual inspection frequency to quarterly or as needed based on real time data. These inspections include visual inspections and equipment manufacture recommendations for preventative maintenance. KUC will maintain telemetry equipment that will provide notification of high/low sump levels, general fault condition related to electrical interruption and leak alarm status of the primary discharge pipe. Telemetry will be monitored on a daily frequency by personnel in the environmental department. KUC will make a timely response to mechanical or electrical conditions that prevent or restrict operation of the trench performance. The leak alarm system has controls that automatically shut off the pump until alarm status can be investigated and resolved. KUC will operate a totalizing flow meter on the discharge piping of the trench sump and report quantities in the annual report.

3. GROUNDWATER CLEANUP STANDARDS

The extraction trench is designed to capture the plume of low pH ground water migrating downgradient from the release site. The groundwater cleanup standards in Table 1 will be applied to monitoring wells NES1364 and NES1365 for compliance and to evaluate the effectiveness of the capture trench. The groundwater cleanup standards in Table 1 are less than or equal to the Utah Ground Water Quality Standards except for pH. A pH standard of 5.5 was established under a Stipulation and Consent Order (No. 9212006) issued on March 1, 1994 by the Utah Solid and Hazardous Waste Control Board for a previous release from this facility.

Table 1
Ground Water Cleanup Standards for the KUC Smelter Acid Loading Facility

Ground Water Parameter	Cleanup Standard[(a)] (mg/L)	GWQS
pH (units)	>5.5	6.5-8.5
Chloride	900	N/A
Sulfate	3,950	N/A
Arsenic-D	0.015	0.005
Barium-D	2.0	2.0
Cadmium-D	0.005	0.005
Chromium-D	0.1	0.1
Copper-D	1.3	1.3
Lead-D	0.005	0.015
Selenium-D	0.025	0.05
Zinc-D	5.0	5.0

(a) Except for pH, standards based on background data measured in 2009 and 2010 in compliance monitoring wells NES1364 and NES1365. No net increase allowed.

D Dissolved
GWQS Ground Water Quality Standards in UAC R317-6-2.1
mg/L Milligrams per liter
N/A Not applicable; no GWQS in UAC R317-6-2.1

4. MONITORING

KUC will monitor groundwater quality and water levels at a network of monitoring wells in the release area. KUC will monitor water quality at the extraction trench. Compliance monitoring wells NES1364 and NES1365 will be sampled on a quarterly basis.

Monitoring wells NES1366 and NES1376 will be sampled at the same frequency as the

compliance wells.

Monitoring wells NES691, NES672 and NES675 will be sampled on a quarterly frequency while pumping is occurring at the capture trench.

Monitoring wells NES2799A and B, NES2800B, NES2801, NES2802, NES2803A and B, NES2804B, and C and NES2805 will be sampled on a semi-annual basis. NES2800A and NES2804A currently show low pH water and elevated concentrations of TDS and metals due to the September 2009 breach event and will continue to be sampled quarterly. Both wells pump dry when current sampling occurs due to the limited transmissivity at both sites.

KUC's Groundwater Characterization and Monitoring Plan (GCMP), as updated, and associated Standard Operating Procedures (SOPs), as updated, will be followed for all water quality sampling and water level measurements. The GCMP has been approved by the DWQ and is updated on an annual basis. Procedures for documentation and sample handling, equipment maintenance and decontamination, quality control sampling, field measurements, and groundwater sampling are detailed in the SOPs. All water quality analyses will be conducted by Kennecott Environmental Laboratory or another state-certified environmental laboratory.

5. **REPORTING**

KUC will include reporting of CAP activities and monitoring. All groundwater monitoring information collected as part of the CAP effort will be included in the semi-annual Smelter reports.

If any water sample from a Compliance Well falls below the >5.5 pH criterion, KUC will notify DWQ in writing of a probable out-of-compliance status within 10 working days of receiving official laboratory analytical results. Informal verbal notification will be provided as soon as practical after KUC becomes aware of the results. KUC will have the opportunity to resample the well within 5 working days of making written notification to DWQ. If the resampling verifies an out-of-compliance situation, KUC will investigate the cause of the condition and provide such results and a proposal for any necessary additional response actions needed under this CAP to DWQ within 30 days of receipt of the resample results