Utah Division of Water Quality
ADDENDUM
Statement of Basis
Wasteload Analysis

Date: **May 4, 2016**

Facility: **Rio Tinto Kennecott Copper**
UPDES No. UT-0000051

Outfall: **002, 007**

Receiving water: **C-7 Ditch, tributary to Lee Creek and Great Salt Lake**

This addendum summarizes the wasteload analysis that was performed to determine water quality based effluent limits (WQBEL) for this discharge. Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on in-stream water quality. The wasteload analysis also takes into account downstream designated uses (UAC R317-2-8). Projected concentrations are compared to numeric water quality standards to determine acceptability. The numeric criteria in this wasteload analysis may be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

Discharge
Outfall 002: C-7 Ditch → Lee Creek → Great Salt Lake
The maximum daily discharge for Outfall 002 is 50.0 MGD (77.4 cfs), as estimated by the permittee.

Outfall 007: C-7 Ditch → Lee Creek → Great Salt Lake
The maximum daily discharge for Outfall 007 is 15.0 MGD (23.2 cfs), as estimated by the permittee.

Receiving Water
The receiving water for Outfall 002 and 007 is the C-7 Ditch, which does not have designated beneficial uses. The C-7 Ditch was determined to be a drainage ditch that does not have downstream agricultural users of the water. Therefore, per UAC R317-2-13.10, the presumptive beneficial uses for all drainage canals and ditches statewide are 2B and 3E.

- *Class 2B: Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.*
- *Class 3E: Severely habitat-limited waters. Narrative standards will be applied to protect these waters for aquatic wildlife.*

The C-7 Ditch is tributary to Lee Creek, which does not have designated beneficial uses. Therefore, per UAC R317-2-13.13, the presumptive beneficial uses for all waters not specifically classified are 2B and 3D.

- *Class 3D: Protected for waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.*

Protection of Downstream Uses

Per UAC R317-2-8, *all actions to control waste discharges under these rules shall be modified as necessary to protect downstream designated uses*. For this discharge, numeric aquatic life use criteria do not apply to the immediate receiving water (C-7 Ditch), but do apply to downstream receiving waters (Lee Creek). Therefore, Lee Creek is considered the limiting condition in this wasteload allocation to ensure protection of aquatic life uses.

Receiving Water Critical Flow

The critical flow for the wasteload analysis was considered the lowest stream flow for seven consecutive days with a ten year return frequency (7Q10). Flow records from USGS stream gage # 10172640 LEE CREEK NEAR MAGNA, UT, for the period 1971 – 1982 and 2006 – 2008 was obtained. The 7Q10 was estimated as the lowest seven day average from 5/24/2006 to 4/10/2008. This more recent period of record of the gage is more representative of the current higher flow regime in the creek; however, it is insufficient to statistically calculate the 7Q10 flow. Since no discharge occurred from Outfalls 002 and 007 during this period, the gage represents the flow available for dilution.

7Q10 Flow (Annual) = 17.9 cfs

Mixing Zone

The allowable mixing zone is 15 minutes of travel time for acute conditions, not to exceed 50% of stream width, and 2,500 feet for chronic conditions, per UAC R317-2-5. Water quality standards must be met at the end of the mixing zone.

The actual length of the mixing zone was not determined; however, it was presumed to remain within the maximum allowable mixing zone dimensions. Acute limits were calculated using 50% of the annual critical low flow.

Dilution Factor

The dilution factors were calculated assuming full mix with the receiving water at the end of the mixing zone (Table 1).

Table 1: Summary of dilution factor at end of mixing zone.

Outfall	Criteria	Flow (cfs)			Dilution Factor
		Lee Creek	Effluent	Mixed	
002	Chronic	17.9	77.4	95.3	0.81
	Acute	9.0	77.4	86.4	0.90
007	Chronic	17.9	23.2	41.1	0.56
	Acute	9.0	23.2	32.2	0.72

Parameters of Concern

The potential parameters of concern for the discharge/receiving water identified were dissolved metals, total suspended solids, and pH, as determined in consultation with the UPDES Permit Writer. WQBELs were determined for metals.

TMDL

Lee Creek is listed as impaired for total dissolved solids (TDS) according to the 2012/2014 303(d) list. However, this listing was based on an erroneous beneficial use Class 4 designation, and will be removed from the 2016 303(d) list.

WET Limits

The percent of effluent in the receiving water in a fully mixed condition, and acute and chronic dilution in a not fully mixed condition are calculated in the WLA in order to generate WET limits. The LC_{50} (lethal concentration, 50%) percent effluent for acute toxicity and the IC_{25} (inhibition concentration, 25%) percent effluent for chronic toxicity, as determined by the WET test, needs to be below the WET limits, as determined by the WLA. The WET limit for LC_{50} is typically 100% effluent and does not need to be determined by the WLA.

Table 2: WET Limits for IC_{25}

Outfall	Percent Effluent
002	81%
007	56%

Receiving Water Quality and Standards

The water quality standards for dissolved metals are dependent on hardness (total as $CaCO_3$). Based on DWQ monitoring data from C-7 Ditch and Lee Creek, the average hardness exceeds 400 mg/L. Per Utah R317-2-14, a maximum hardness of 400 mg/L was used for determining the dissolved metals criteria. Ambient conditions were estimated using monitoring data from 1999-2009 from DWQ #4991430 LEE CREEK AT I80 CROSSING. The 80^{th} percentile of observed data was calculated, with one-half the reporting limit assumed for non-detects.

Table 3: Water quality standards for dissolved metals for a hardness of 400 mg/L and ambient conditions for #4991430 LEE CREEK AT I80 CROSSING (1999-2009).

Dissolved Metal	Ambient 80th Percentile (µg/L)	Acute Standard (µg/L)	Chronic Standard (µg/L)
Aluminum	58[a]	750	N/A[b]
Arsenic	15.8	340	150
Cadmium	0.50	7.7	0.64
Chromium VI	7.3[a]	16.0	11.0
Chromium III	154[a]	1,773	231
Copper	6.0	49.6	29.3
Cyanide	3.5[a]	22.0	5.2
Iron	667[a]	1,000	NONE
Lead	1.5	281	10.9
Mercury	0.008[a]	2.4	0.012
Nickel	112[a]	1,513	168
Selenium	4.2	18.4	4.6
Silver	23.3[a]	34.9	NONE
Zinc	15.0	379	382

a Ambient concentration assumed 2/3 of water quality criteria.
b The criterion for aluminum is implemented as follows:
Where the pH is equal to or greater than 7.0 and the hardness is equal to or greater than 50 ppm as CaC03 in the receiving water after mixing, the 87 µg/L chronic criterion (expressed as total recoverable) will not apply, and aluminum will be regulated based on compliance with the 750 µg/L acute aluminum criterion (expressed as total recoverable).

Effluent Limits

Effluent limits for conservative pollutants were determined using a mass balance mixing analysis (UDWQ 2012). The hardness dependent conversion factors (CF) per UAC R317-2-14 Table 2.14.3a and Table 2.14.3b were used to translate the dissolved metals effluent limits to total recoverable metals effluent limits, assuming a hardness of 400 mg/L. Effluent limits for total recoverable metals are presented in Table 4.

Table 4: WQBELs for Total Recoverable Metals (µg/L)

Metal	Outfall 002		Outfall 007	
	Acute 1-hr Ave	Chronic 4-day Ave	Acute 1-hr Ave	Chronic 4-day Ave
Aluminum	830	N/A	1,017	N/A
Arsenic	378	181	465	254
Cadmium	9.7	0.79	11.9	0.89
Chromium VI	17.0	11.8	19.3	13.8
Chromium III	6,205	289	7,588	337
Copper	56.9	36.1	69.2	49.2
Cyanide	24.1	5.6	29.1	6.5
Iron	1,039	NONE	1,129	NONE
Lead	532	22.3	660	30.9
Mercury	2.7	0.013	3.3	0.015
Nickel	1,678	182	2,057	212
Selenium	20.0	4.7	23.9	4.9
Silver	42.7	NONE	46.4	NONE
Zinc	431	474	531	675

Model and supporting documentation are available for review upon request.

Antidegradation Level I Review

The objective of the Level I ADR is to ensure the protection of existing uses, defined as the beneficial uses attained in the receiving water on or after November 28, 1975. No evidence is known that the existing uses deviate from the designated beneficial uses for the receiving water. Therefore, the beneficial uses will be protected if the discharge remains below the WQBELs presented in this wasteload. A Level II Antidegradation Review (ADR) is not required for this discharge since the pollutant concentration and load is not increasing under this permit renewal.

Prepared by:
Nicholas von Stackelberg, P.E.
Standards and Technical Services Section

Documents:

WLA Document: *kennecott_002&007_wla_2016-05-04.doc*
Analysis: *kennecott_wla_2016.xls*

References:

Utah Division of Water Quality. 2012. *Utah Wasteload Analysis Procedures Version 1.0.*

State of Utah
GARY R. HERBERT
Governor
SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality
Alan Matheson
Executive Director
DIVISION OF WATER QUALITY
Walter L. Baker, P.E.
Director

MEMORANDUM

TO: Kennecott Copper File UPDES UT00000051

THROUGH Kim Shelley

FROM: Dave Wham

DATE: 6-25-2012

SUBJECT: Kennecott Copper Outfall #009 WLA

I am writing in response to your request for a wasteload allocation for the permit renewal for the Kennecott Copper UPDES UT0000051. It is my understanding that this discharge emanates from the Pine Canyon Tunnel into a drainage ditch, which than flows for approximately a quarter mile before going dry. The drainage ditch is not connected to any live waters and is presumptively designated with 2B (secondary contact recreation) and 3E (Severely habitat-limited waters) classifications. The Permitee has indicated that the maximum expected flow from the tunnel is 0.086 mgd. The discharge makes up the receiving water, so the 2B end-of- pipe numeric standards for E. Coli, turbidity and pH apply. No numeric standards apply to 3E waters.

Let me know if you need any further info or clarification.

cc: John Kennington
Carl Adams

Utah Division of Water Quality
Statement of Basis
ADDENDUM
Wasteload Analysis and Antidegradation Level I Review - PRELIMINARY

Date:	**March 7, 2016**
Prepared by:	**Dave Wham** **Standards and Technical Services**
Facility:	**Rio Tinto Kennecott Copper** **UPDES No. UT-0000051** **Outfall 011**
Receiving water:	**Utah Salt Lake Canal => Ritter Canal => C7 Ditch** **=> Lee Creek River (2B, 3D, 4)**

This addendum summarizes the wasteload analysis that was performed to determine water quality based effluent limits (WQBEL) for this discharge. Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on in-stream water quality. The wasteload analysis also takes into account downstream designated uses (UAC R317-2-8). Projected concentrations are compared to numeric water quality standards to determine acceptability. The numeric criteria in this wasteload analysis may be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

Discharge

Outfall 011: Adamson Spring

The maximum daily discharge for the facility is 3.9 MGD (6.0 cfs) as estimated by the permittee.

Receiving Water

The receiving water for Outfall 011 is the Utah-Salt Lake Canal, thence to the Ritter Canal, thence the C7 ditch, which discharges to Lee Creek.

Lee Creek does not have specific designated beneficial uses; therefore per UAC R317-2-13.13, the presumptive beneficial uses are 2B and 3D.

- *Class 2B - Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.*

- *Class 3D - Protected for waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.*

Typically, the critical flow for the wasteload analysis is considered the lowest stream flow for seven consecutive days with a ten year return frequency (7Q10). Flow records from USGS stream gage # 10172640 LEE CREEK NEAR MAGNA, UT, for the period 1971 – 1982 and 2006–2008 was obtained. The 7Q10 was estimated as the lowest seven day average from 5/24/2006 to 4/10/2008. This more recent period of record of the gage is more representative of the current higher flow regime in the creek; however, it is insufficient to statistically calculate the 7Q10 flow. Since no discharge occurred from Outfalls 002 and 007 during this period, the gage represents the flow available for dilution.

7Q10 Flow (Annual) = 17.9 cfs

<u>TMDL</u>
Lee Creek is listed as impaired for total dissolved solids (TDS) according to Utah's 2014 303(d) Water Quality Assessment. However, this listing was based on an erroneous Class 4 beneficial use designation, and will be removed from the 2016 3030(d) list.

<u>Mixing Zone</u>
The maximum allowable mixing zone is 15 minutes of travel time for acute conditions, not to exceed 50% of stream width, and 2,500 feet for chronic conditions, per UAC R317-2-5. Water quality standards must be met at the end of the mixing zone.

The actual length of the mixing zone was not determined; however, it was presumed to remain within the maximum allowable mixing zone dimensions. Acute limits were calculated using 50% of the annual critical low flow.

<u>Parameters of Concern</u>
The parameters of concern identified for the discharge/receiving water were dissolved metals, total suspended solids, and pH as determined in consultation with the UPDES Permit Writer.

<u>WET Limits</u>
The percent of effluent in the receiving water in a fully mixed condition, and acute and chronic dilution in a not fully mixed condition are calculated in the WLA in order to generate WET limits. The LC_{50} (lethal concentration, 50%) percent effluent for acute toxicity and the IC_{25} (inhibition concentration, 25%) percent effluent for chronic toxicity, as determined by the WET test, needs to be below the WET limits, as determined by the WLA. The WET limit for LC_{50} is typically 100% effluent and does not need to be determined by the WLA.

IC25 WET limits for Outfall 011 should be based on 25% effluent.

Receiving Water Quality and Standards

The water quality standards for dissolved metals are dependent on hardness (total as CaCO3). Based on DWQ monitoring data from C-7 Ditch and Lee Creek, the average hardness exceeds 400 mg/L. Per Utah R317-2-14, a maximum hardness of 400 mg/L was used for determining the dissolved metals criteria. Ambient conditions were estimated using monitoring data from 1999-2009 from DWQ #4991430 LEE CREEK AT I80 CROSSING. The 80th percentile of observed data was calculated, with one-half the reporting limit assumed for non-detects.

Table 1: Water quality standards for dissolved metals for a hardness of 400 mg/L and ambient conditions for #4991430 LEE CREEK AT I80 CROSSING (1999-2009).

Dissolved Metal	Ambient 80th Percentile (µg/L)	Acute Standard (µg/L)	Chronic Standard (µg/L)
Aluminum	58[a]	750	NA[b]
Arsenic	15.8	340	150
Cadmium	0.50	7.7	0.64
Chromium VI	7.3[a]	16.0	11.0
Chromium III	154[a]	1773	231
Copper	6.0	49.6	29.3
Cyanide	3.5[a]	22.0	05.2
Iron	667[a]	1000	None
Lead	1.5	281	10.9
Mercury	.008[a]	2.4	.012
Nickle	112[a]	1513	168
Selenium	4.2	18.4	4.6
Silver	23.3[a]	34.9	None
Zinc	15.0	379	382

[a] Ambient concentration assumed 2/3 of water quality criteria.
[b] The criterion for aluminum is implemented as follows:
Where the pH is equal to or greater than 7.0 and the hardness is equal to or greater than 50 ppm as CaC03 in the receiving water after mixing, the 87 µg/L chronic criterion (expressed as total recoverable) will not apply, and aluminum will be regulated based on compliance with the 750 µg/L acute aluminum criterion (expressed as total recoverable).

Effluent Limits

Effluent limits for conservative pollutants were determined using a mass balance mixing analysis (UDWQ 2012). The hardness dependent conversion factors (CF) per UAC R317-2-14 Table 2.14.3a and Table 2.14.3b were used to translate the dissolved metals effluent limits to total recoverable metals effluent limits, assuming a hardness of 400 mg/L. Effluent limits for total recoverable metals are presented in Table 2

Table 2: WQBELs for Total Recoverable Metals (ug/l), Outfall 011

Metal	Acute 1-hr Average	Chronic 4-day Average
Aluminum	1776	NA
Arsenic	821	548
Cadmium	21	1.3
Chromium VI	28	21.9
Chromium III	13214	534
Copper	119	102
Cyanide	50	10.3
Iron	1495	None
Lead	1180	66.2
Mercury	6	0.024
Nickle	3598	335
Selenium	40	5.8
Silver	61	None
Zinc	940	1493

Antidegradation Level I Review

The objective of the Level I ADR is to ensure the protection of existing uses, defined as the beneficial uses attained in the receiving water on or after November 28, 1975. No evidence is known that the existing uses deviate from the designated beneficial uses for the receiving water. Therefore, the beneficial uses will be protected if the discharge remains below the WQBELs presented in this wasteload. A Level II Antidegradation Review (ADR) is not required for this discharge since the pollutant concentration and load is not increasing under this permit renewal.

Documents:

WLA Document: *Kennecott_WLA011Doc_3-7-16.docx*
Wasteload Analysis and Addendum: *Kennecott_WLA011_2016.xlsm*

References:

Utah Division of Water Quality. 2012. *Utah Wasteload Analysis Procedures Version 1.0.*

Utah Division of Water Quality
Statement of Basis
ADDENDUM
Wasteload Analysis and Antidegradation Level I Review - PRELIMINARY

Date:	**March 8, 2016**
Prepared by:	**Dave Wham** **Standards and Technical Services**
Facility:	**Rio Tinto Kennecott Copper** **UPDES No. UT-0000051** **Outfall 010; Butterfield Tunnel**
Receiving water:	**Butterfield Creek (2B, 3D, 4)**

This addendum summarizes the wasteload analysis that was performed to determine water quality based effluent limits (WQBEL) for this discharge. Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on in-stream water quality. The wasteload analysis also takes into account downstream designated uses (UAC R317-2-8). Projected concentrations are compared to numeric water quality standards to determine acceptability. The numeric criteria in this wasteload analysis may be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

Discharge

Outfall 010: Butterfield Tunnel

The maximum daily discharge for the facility is .65 MGD (1.0 cfs) as estimated by the permittee.

Receiving Water

The receiving water for Outfall 010 is Butterfield Creek which is tributary to the Jordan River.

Butterfield Creek's designated beneficial uses, as per UAC R317-2-13.5, uses are 2B, 3D, 4.

- *Class 2B - Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.*

- *Class 3D - Protected for waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.*

- *Class 4 -- Protected for agricultural uses including irrigation of crops and stock watering.*

Typically, the critical flow for the wasteload analysis is considered the lowest stream flow for seven consecutive days with a ten year return frequency (7Q10). Due to a lack of flow records for Butterfield Creek, the 20th percentile of available flow measurements was calculated for the period of record to approximate the 7Q10 low flow condition. The source of flow data was DWQ sampling station #4994450; BUTTERFIELD CANYON CK AB KCC 010 (1996-2006).

The critical low flow condition for Butterfield Creek is 0.55 cfs.

Ambient Butterfield Creek water quality was characterized based on samples collected from DWQ sampling station #4994450; BUTTERFIELD CANYON CK AB KCC 010 (1996-2006).

<u>TMDL</u>
Butterfield Creek is listed as impaired for total dissolved solids (TDS), Selenium, and *E. coli* according to Utah's 2014 303(d) Water Quality Assessment. A TMDL has not been completed for these constituents and this time. Water quality based effluent limits (WQBELs) for these constituents will be set at the applicable water quality standards with no allowance for mixing.

<u>Mixing Zone</u>
The maximum allowable mixing zone is 15 minutes of travel time for acute conditions, not to exceed 50% of stream width, and 2,500 feet for chronic conditions, per UAC R317-2-5. Water quality standards must be met at the end of the mixing zone.

The actual length of the mixing zone was not determined; however, it was presumed to remain within the maximum allowable mixing zone dimensions. Acute limits were calculated using 50% of the annual critical low flow.

<u>Parameters of Concern</u>
The parameters of concern identified for the discharge/receiving water were dissolved metals, TDS, *E. coli*, and pH as determined in consultation with the UPDES Permit Writer.

<u>WET Limits</u>
The percent of effluent in the receiving water in a fully mixed condition, and acute and chronic dilution in a not fully mixed condition are calculated in the WLA in order to generate WET limits. The LC_{50} (lethal concentration, 50%) percent effluent for acute toxicity and the IC_{25} (inhibition concentration, 25%) percent effluent for chronic toxicity, as determined by the WET test, needs to be below the WET limits, as determined by the WLA. The WET limit for LC_{50} is typically 100% effluent and does not need to be determined by the WLA.

IC25 WET limits for Outfall 010 should be based on 65% effluent.

Receiving Water Quality and Standards

The water quality standards for dissolved metals are dependent on hardness (total as CaCO3). Based on DWQ monitoring data from Butterfield Creek an average hardness of 246 mg/L was used for determining the dissolved metals criteria. Ambient conditions were estimated using monitoring data from 4994450; BUTTERFIELD CANYON CK AB KCC 010 (1996-2006). The 80th percentile of observed data was calculated, with one-half the reporting limit assumed for non-detects.

Table 1: Water quality standards for dissolved metals for a hardness of 400 mg/L and ambient conditions for #4994450; BUTTERFIELD CANYON CK AB KCC 010 (1996-2006).

Dissolved Metal	Ambient 80th Percentile (µg/L)	Acute Standard (µg/L)	Chronic Standard (µg/L)
Aluminum	15.0	750	NA[b]
Arsenic	2.5	340	150
Cadmium	0.50	4.8	0.46
Boron	50.3	750	None
Chromium VI	2.5	16.0	11.0
Chromium III	2.5	1189	155
Copper	12.9[a]	31.3	19.3
Cyanide	3.5[a]	22.0	5.2
Iron	667[a]	1000	None
Lead	4.4[a]	169	6.6
Mercury	0.008[a]	2.4	0.012
Nickle	5	1002	111
Selenium	1.2	18.4	4.6
Silver	10.1[a]	15.1	None
Zinc	15.0	251	253

[a] Ambient concentration assumed 2/3 of water quality criteria.
[b] The criterion for aluminum is implemented as follows:
Where the pH is equal to or greater than 7.0 and the hardness is equal to or greater than 50 ppm as CaC03 in the receiving water after mixing, the 87 µg/L chronic criterion (expressed as total recoverable) will not apply, and aluminum will be regulated based on compliance with the 750 µg/L acute aluminum criterion (expressed as total recoverable).

Effluent Limits

Effluent limits for conservative pollutants were determined using a mass balance mixing analysis (UDWQ 2012). The hardness dependent conversion factors (CF) per UAC R317-2-14 Table 2.14.3a and Table 2.14.3b were used to translate the dissolved metals effluent limits to total recoverable metals effluent limits, assuming a hardness of 246 mg/L. Effluent limits for total recoverable metals are presented in Table 2

Table 2: WQBELs for Total Recoverable Metals (ug/l), Outfall 010

Metal	Acute 1-hr Average	Chronic 4-day Average
Aluminum	951	NA
Arsenic	432	548
Cadmium	6.62	1.3
Boron	941	None
Chromium VI	19.7	21.9
Chromium III	4791	534
Copper	38	102
Cyanide	27	10.3
Iron	1091	None
Lead	325	66.2
Mercury	3.05	0.024
Nickle	1277	335
Selenium	18.4[a]	4.6[a]
Silver	19.4	None
Zinc	323	1493

[a] Receiving water is 303(d) listed for constituent. WQBELs equal the standard.

The receiving water is 303(d) listed for TDS, therefore, an acute limit of 1200 mg/l applies. The receiving water is 303(d) listed for *E. coli*, therefore, a 30-day geometric mean of 206 (No.#/100 ML) and a maximum of 668 (No.#/100 ML) apply.

Antidegradation Level I Review

The objective of the Level I ADR is to ensure the protection of existing uses, defined as the beneficial uses attained in the receiving water on or after November 28, 1975. No evidence is known that the existing uses deviate from the designated beneficial uses for the receiving water. Therefore, the beneficial uses will be protected if the discharge remains below the WQBELs presented in this wasteload. A Level II Antidegradation Review (ADR) is not required for this discharge since the pollutant concentration and load is not increasing under this permit renewal.

Documents:

WLA Document: *Kennecott_WLA010Doc_3-7-16.docx*
Wasteload Analysis and Addendum: *Kennecott_WLA010_2016.xlsm*

References:

Utah Division of Water Quality. 2012. *Utah Wasteload Analysis Procedures Version 1.0.*

Utah Division of Water Quality
Mixing Analysis

Date: **May 5, 2015**

Facility: **Kennecott Utah Copper**
UPDES No. UT-0000051

Outfall: **012**

Receiving water: **Outfall 012 Ditch to Great Salt Lake**

The purpose of this document is to present the methods and results of the mixing analysis for Kennecott Utah Copper's (KUC) Outfall 012 discharge to the open water of Gilbert Bay of the Great Salt Lake.

Site Reconnaissance

An inspection of Outfall 012 was conducted on December 23, 2014. The outfall originates at the KUC tailings pond and discharges to a drainage ditch within the transitional waters of the Great Salt Lake, which has designated use 5E (Figure 1). The drainage ditch was followed out to the confluence with the open waters of Gilbert Bay. Due to the low lake elevation, the ditch becomes less well-defined and forms smaller and smaller braided channels and sheet flows as it drains to the open water (Figure 2).

Parameters of Concern

The parameter of concern identified for the discharge and receiving water was copper. The mixing analysis was conducted for copper, but could apply to other conservative parameters.

The average concentration of copper in Gilbert Bay was 0.011 mg/L and the concentration of the effluent was 0.036 mg/L, for an effluent concentration excess of 0.025 mg/L.

Mixing Zone

The allowable mixing zone for discharges to lakes shall not exceed 35 feet for acute conditions and 200 feet for chronic conditions, per UAC R317-2-5.

Mixing Analysis

The dilution factor for copper at 200 feet into Gilbert Bay, which is the boundary of the mixing zone for chronic conditions, was determined for this analysis.

The CORMIX model (Doneker and Jirka, 2007), Version 9.0, was utilized for the analysis. CORMIX is a USEPA-supported mixing zone model and decision support system for environmental impact assessment of regulatory mixing zones resulting from point source discharges. CORMIX has the ability to simulate buoyant surface discharges, which occurs during low lake levels when the less dense effluent flows into the more dense hypersaline waters of Gilbert Bay.

CORMIX divides the mixing analysis into a near-field and a far-field, with different hydrodynamic equations applicable to each zone. The 200-foot boundary of the allowable chronic mixing zone typically falls within the near-field.

A sensitivity analysis was performed to evaluate the effect of key model inputs, including: effluent velocity, density, and excess copper concentration; Gilbert Bay current velocity, roughness, and ambient wind speed; and effluent channel width. The model inputs were varied over reasonably expected ranges. Gilbert Bay depth and density, and effluent channel depth were not varied.

Table 1 summarizes the model inputs and outputs for the mixing analysis simulations. The model was relatively insensitive to effluent concentration excess, effluent density, ambient wind speed, and effluent channel width. The highest dilution factor occurred under the scenario with the lowest effluent velocity and highest current velocity.

A reasonable set of parameters that represent critical conditions is highlighted in green in Table 1. With the selected model inputs, the dilution factor for copper was 1.5.

All model input and output files are available for review.

<u>References</u>

Doneker, R.L. and G.H. Jirka. 2007. CORMIX User Manual, A Hydrodynamic Mixing Zone Model and Decision Support System for Pollutant Discharges into Surface Waters. United States Environmental Protection Agency. EPA-823-K-07-001

Prepared by:
Nicholas von Stackelberg, P.E.
Standards and Technical Services Section

Table 1: CORMIX model inputs and dilution results at 200 foot mixing zone boundary for chronic criteria

Effluent			Gilbert Bay					Discharge Geometry		Output		Inputs
Velocity (ft/s)	Concentration Excess (mg/L)	Density (kg/m^3)	Depth (ft)	Velocity (ft/s)	Wind (mph)	Mannings n	Density (kg/m^3)	Channel Width (ft)	Channel Depth (ft)	Concentration Excess (mg/L)	Dilution	
0.5	0.025	1005.71	0.5	0.1	6.8	0.04	1100	10	0.5	0.016513	1.5	Baseline Scenario; Min. monthly wind
0.1	0.025	1005.71	0.5	0.1	6.8	0.04	1100	10	0.5	0.002238	11.2	Low effluent velocity
1.0	0.025	1005.71	0.5	0.1	6.8	0.04	1100	10	0.5	0.018075	1.4	High effluent velocity
0.5	0.025	1005.71	0.5	0.01	6.8	0.04	1100	10	0.5	0.025	1.0	Stagnant water
0.5	0.025	1005.71	0.5	0.1	0	0.04	1100	10	0.5	0.016997	1.5	No wind
0.5	0.025	1005.71	0.5	0.1	8.3	0.04	1100	10	0.5	0.016199	1.5	Ave annual wind speed
0.5	0.043	1005.71	0.5	0.1	6.8	0.04	1100	10	0.5	0.028402	1.5	Max monthly conc. exceedance
0.5	0.025	1007.27	0.5	0.1	6.8	0.04	1100	10	0.5	0.016659	1.5	High effluent density
0.5	0.025	1005.71	0.5	0.1	6.8	0.04	1100	5	0.5	0.015473	1.6	Low channel width
0.5	0.025	1005.71	0.5	0.1	6.8	0.02	1100	10	0.5	0.025	1.0	Low Mannings n
0.5	0.025	1005.71	0.5	0.5	0	0.04	1100	10	0.5	0.00321	7.8	High current velocity; No wind
1.0	0.025	1005.71	0.5	0.1	0	0.04	1100	10	0.5	0.025	1.0	High effluent velocity; No wind
1.0	0.025	1005.71	0.5	0.1	8.3	0.04	1100	10	0.5	0.017684	1.4	High effluent velocity; Ave annual wind speed
0.5	0.025	1005.71	0.5	0.5	0	0.04	1100	5	0.5	0.001484	16.8	High current velocity; No wind; Low channel width
1.0	0.025	1005.71	0.5	0.5	0	0.04	1100	10	0.5	0.0061	4.1	High effluent velocity; High current velocity; No wind
0.1	0.025	1005.71	0.5	0.5	0	0.04	1100	10	0.5	0.000507	49.4	Low effluent velocity; High current velocity; No wind

Figure 1: Drainage ditch at KUC Outfall 012

Figure 2: Drainage ditch forming smaller braided channels and sheet flow.

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DIVISION OF WATER QUALITY
Walter L. Baker, P.E.
Director

Date: May 17, 2016

Subject: Memorandum for Rio Tinto Kennecott Copper 2015 Permit Renewal Fact Sheet Statement of Basis, Use support evaluation for Outfall 012 to Gilbert Bay, Great Salt Lake

Prepared By: Chris Bittner, Standards Coordinator

Summary: The purpose of this evaluation was to determine if the uses of the receiving water will be protected and if the permit must include water quality-based effluent limits. Based on the information provided by Rio Tinto Kennecott Copper (Kennecott) regarding pollutant concentrations in the effluent for outfall 012 the uses designated in R317-2-12 and existing uses of the receiving waters (Class 5E Transitional Waters→Class 5A Gilbert Bay, Great Salt Lake) will be protected. To ensure that the uses remain protected, a new loading limit derived in accordance with UAC R317-8-4.2(4)a.2. for selenium is required. Additional requirements for monitoring the outfall delta and open waters, and a sufficiently sensitive analytical method for mercury monitoring were also added.

Receiving Waters and Designated Uses (UAC R317-2-6):

Transitional Waters

Class 5E protected for infrequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain

Gilbert Bay, Great Salt Lake

Class 5A protected for frequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain

Introduction

At the current lake level, outfall 012 discharges to Class 5E Transitional Waters along the Great Salt Lake (GSL or Lake) shoreline and then to Class 5A Gilbert Bay of GSL. The Transitional Waters are mudflats where the discharge creates a channel to Gilbert Bay. The channel appears to discharge some groundwater as well. The channel in the Transitional Waters currently exceeds one mile but these Transitional Waters only exist when GSL is below an elevation of 4,208 feet. At a lake elevation of 4,208feet the Transitional Waters do not exist as a separate use class because they are inundated by Gilbert Bay.

Outfall 001 from the Jordan Valley Water Conservancy District Southwest Groundwater Treatment Plant (JVWCD) is also permitted to discharge next to RTKC outfall 012. The effluents from the two outfalls are expected to comingle in the Transitional Waters when both are discharging. The SGTP outfall is expected to continuously discharge whereas the Kennecott discharge is intermittent.

Use Support Evaluation
At the Division of Water Quality's (Division's) request, Kennecott provided supplemental information in support of their permit renewal application (Kennecott submittals dated April 29, 2014 [DWQ-2014-006141] and October 31, 2014 [DWQ-2014-014376]). The information was evaluated to: 1) document that the effluent will not violate water quality standards, and 2) determine if water quality-based effluents are required for the permit. Water quality-based effluent limits are required when the effluent has "reasonable potential" to cause or contribute to a violation of a water quality standard. The standard may be a numeric criterion or the Narrative Standards (UAC R317-2-7.2). Final permit limits are the lower of water quality-based effluent limits or technology-based effluent limits such as secondary treatment standards or categorical limits.

For Utah waters other than GSL, use support is determined by comparing the receiving water concentrations after mixing with the appropriate numeric criteria in UAC R317-2-14. This approach cannot be used for GSL because of the lack of numeric criteria. With the exception of a selenium standard for Gilbert Bay, the Transitional Waters and Gilbert Bay do not have numeric water quality criteria. However, the designated uses must still be protected and the requirements of the Narrative Standards met. In the absence of applicable numeric criteria to determine the need for effluent limits, the procedures described in UAC R317-8-4.2(4)(a)6 were applied to determine reasonable potential and if necessary, determine the water quality-based effluent limits to ensure protection of the uses.

Similar as was done for evaluating other permitted discharges to GSL, a screening approach was implemented to evaluate reasonable potential and use protection. The screening approach compared pollutant concentrations in the effluent to comparison values such as freshwater numeric criteria and ambient concentrations in the receiving waters (April 29, 2014 Kennecott submittal). Absent evidence to the contrary, if the effluent pollutant concentrations are equal to or less than the comparison values, the conclusion is that the aquatic life uses of the receiving waters will remain supported with the addition of the pollutants in the effluent. Consistent with a screening process, failure to meet the comparison values is not an indication that the aquatic life uses would not be supported but does indicate that further analyses or data are needed to make a determination. If effluent concentrations potentially exceed the concentrations that would adversely affect the aquatic life uses for the Transitional Waters and Gilbert Bay, the pollutant has reasonable potential and water quality-based effluent limits are required. Reasonable potential determinations were based on best professional judgment after consideration of the magnitude between the effluent concentrations and the comparison values, the confidence in the applicability of the comparison values, the expected variability in effluent concentrations, and the representativeness of the effluent data.

Table 1 summarizes the outcome of the initial screening steps for each pollutant from the permit application and the Kennecott supplemental data and analyses provided as April 29, 2014 and October 31, 2014 Kennecott submittals. In the absence of contrary information, pollutants meeting the comparison values do not require further evaluation. If a pollutant is potentially bioaccumulative and the comparison values did not consider bioaccumulation, additional evaluations may be necessary to determine if the bioaccumulative pollutant has reasonable potential. Bioaccumulative pollutants may accumulate in the aquatic food web of the transitional and open waters. The amount accumulated is dependent on both the concentration and length of time the aquatic organisms are exposed unless equilibrium is achieved within the organism's life span.

Selenium and mercury are potentially bioaccumulative pollutants in Kennecott's effluent and are also expected to be in the effluent from the Jordan Valley Conservancy District (JVWCD) Southwest Groundwater Treatment Plant (UPDES # UT0025836). The two outfalls are expected to comingle in a common drainage in the Class 5E Transitional Waters when both are discharging. The potential impacts of the combined effluents were considered for these two potentially bioaccumulative pollutants.

Table 1
Summary of Initial Screening of Effluent Pollutants from April 29, 2014 Kennecott Submittal

Pollutants with effluent concentrations less than the comparison values and concluded to not have reasonable potential (technology-based effluent limits may still apply)	Antimony Beryllium Chromium Lead Nickel Silver Thallium Zinc
Pollutants requiring additional evaluation to determine reasonable potential	Arsenic Cadmium Copper Mercury Selenium

Additional Evaluation of Pollutants Listed in Table 1

Arsenic concentrations in the effluent exceed the comparison values. However, arsenic concentrations are concluded to not have reasonable potential based on additional evaluation using the results of toxicity tests conducted using brine shrimp, an important ecosystem and commercial species in GSL, by Brix et al. (2003) as documented in the April 29, 2014 Kennecott submittal. The no-effects concentration reported by Brix et al. (2003) for arsenic is substantially higher than the effluent concentrations and arsenic is concluded to not have reasonable potential.

Cadmium concentrations in the effluent exceed the comparison values. However, cadmium concentrations are concluded to not have reasonable potential based on the results of toxicity tests conducted using brine shrimp by Brix et al. (2006) as documented in the April 29, 2014 Kennecott submittal. The no-effects concentration reported by Brix et al. (2006) for cadmium is substantially higher than the effluent concentrations.

Copper concentrations in the effluent exceed the comparison values. The potential for copper to impair the uses was further evaluated using the effluent concentrations reported by Brix et al. (2006) to adversely affect brine shrimp reproduction.

As documented in April 29, 2014 Kennecott submittal (DWQ-2014-006141), Brix et al. (2006) reported that the median effective concentration[1] (EC_{50}) for effects on brine shrimp reproduction was 68 µg/l (dissolved)[2]. To protect against chronic effects on reproduction, an estimate of the no-observed-effects concentration or EC_{20} as opposed to an EC_{50} was derived by Kennecott. Kennecott obtained the raw data from Brix and calculated an EC_{20} of 59 µg/l.

Applying the default conversion factor from dissolved to total copper specified in UAC R317-2-14, the no-effects concentration for total recoverable copper concentration is 61 µg/l. This conversion factor appears to be conservative based on the data reported in Adams et al. (2015). Adams et al. (2015) reported geometric and arithmetic mean Cu translators of 0.67 and 0.77, respectively, based on dissolved and total recoverable Cu concentrations in Great Salt Lake water samples. Kennecott has developed an extensive data set based on water samples collected from Outfall 012 which indicates the arithmetic and geometric mean translators are 0.75 and 0.73, respectively. The study design of Adams et al. (2015) wasn't specifically intended for developing translators and the Kennecott effluent translators may not be representative of Gilbert Bay waters, but these translators would result in a total recoverable copper concentrations ranging from 79 to 91 µg/l before mixing.

Brine shrimp are not expected to inhabit the Class 5E Transitional Waters, so a dilution of 1.5 (May 5, 2015 Mixing Analysis Outfall Ditch to Great Salt Lake [DWQ-2015-016387]) was calculated based on discharging to Class 5A Gilbert Bay in accordance with the mixing zone requirements of UAC R317-2-5. Applying the dilution to the 61 µg/l results in a maximum allowable average effluent concentration of 91 µg/l (total recoverable). Kennecott reports in the April 29, 2014 Kennecott submittal that long-term average concentrations of copper in the effluent were 32 µg/l (total recoverable) and the maximum of the daily maximums was 55 µg/l (total recoverable). The maximum of the daily maximums (55 µg/l) is less than allowable average concentration of 91 µg/l indicating no reasonable potential.

Mercury concentrations in the effluent generally do not exceed the comparison values. Mercury was nondetect for the majority of the required effluent monitoring results using an analytical method sufficient to meet the technology-based limits. A different analytical method is needed to measure mercury concentrations at Utah's freshwater criterion of 12 ng/l (UAC R317-2-14). Kennecott voluntarily analyzed additional samples collected from the tailings barge using a more sensitive mercury analytical method (no effluent was being discharged). Mercury concentrations in Great Salt Lake remain a focus of water quality investigations because of the concentrations

[1] Concentration at which 50% of the test population was affected

[2] RTKC reports the copper EC_{50} as 69 µg/l in the April 29, 2014 RTKC Submittal but Brix et al. (2006) reports 68 µg/l.

measured in previous studies (see Great Salt Lake discussions in the DWQ 2008, 2010, and 2012/2014 Integrated Reports).

Methylmercury (MeHg), an organic form of mercury, is present in Gilbert Bay's water and biota at measurable concentrations (Appendix A, UDWQ, 2010). Because of the increased toxicity and biotransfer potential of MeHg compared to other forms of Hg found in the environment, MeHg has the greater potential for impairing the uses. The reader is cautioned to discern between MeHg and mercury in the following discussions.

Translators are necessary to determine reasonable potential for bioaccumulative compounds. Translators are simple mathematical models of complex processes. Translators are used to estimate the concentration of a pollutant in one media, for instance, brine shrimp, from the concentration in a different media, for instance, water. When mercury is released to the receiving waters, a portion of the mercury is expected to be methylated by indigenous bacteria (mercury to MeHg translator). A portion of this MeHg is taken up by the lower life forms such as invertebrates and a portion of this MeHg is transferred higher in the food web to other biota (MeHg in water to the lower and higher food web receptors). Currently these translators are unknown but ongoing studies may define the translators in the future.

Beginning in 2011, the SGTP and Kennecott conducted monitoring of invertebrates, bird eggs, water and sediment in the transitional and open waters prior to any actual discharge from the SGTP (CH_2MHill, 2012; 2013; 2014; 2015; 2015a). Kennecott outfall 012 has discharged during this time period but this area is also impacted by other potential sources of pollutants from the Lake.

The outfall delta is also being investigated as part of Tailing Causeway (GEI, 2015). Historically, mine tailings were used to construct a causeway at the south end of the Lake and to the east of the discharge delta. Some of these tailings have elevated metals concentrations relative to ambient concentrations and elevated metals concentrations were also measured in the outfall delta sediments. Metals concentrations were higher near the outfall and copper concentrations were higher in samples from the 6-12" interval than in the 0-6" interval (GEI, 2015). Evaluations of the significance of these elevated concentrations by the Utah Division of Environmental Response and Remediation are pending.

A less sensitive mercury analytical method was used for the GEI (2015) investigation compared to the CH2M Hill studies and when mercury was detected, the concentrations were generally higher than the concentrations measured in the CH2M Hill studies. GEI (2015) reports total mercury concentrations up to 200 µg/kg compared to a maximum of 25 µg/kg reported by CH2M Hill (2012; 2013; 2014; 2015; 2015a). Mercury concentrations measured in the invertebrate biota were variable ranging from 5 to 400 µg/kg DW (dry weight) (CH2M Hill, 2012; 2013; 2014; 2015; 2015a). The cause of the variability in mercury concentrations was not identified.

The available data is insufficient to determine if the mercury concentrations in GSL are supporting or impairing the uses (DWQ, 2014). However, the available studies on bird health suggest that birds are not being measurably adversely affected by mercury concentrations:

- Ackerman, J.T., Herzog, M.P., Hartman, C.A., Isanhart, J., Herring, G., Vaughn, S., Cavitt, J.F., Eagles-Smith, C.A., Browers, H., Cline, C., and Vest, J., 2015, Mercury and selenium contamination in waterbird eggs and risk to avian reproduction at Great Salt Lake, Utah: U.S. Geological Survey Open-File Report 2015-1020
- Cavitt, J. F. and N. Wilson, 2012. Concentrations of Selenium and Mercury in American Avocet Eggs at Great Salt Lake, Utah 2011 Report . Avian Ecology Laboratory, Weber State University
- Cavitt, J.F., M. Linford, and N. Wilson. Selenium Concentration in Shorebird Eggs at Great Salt Lake Utah 2010 Report, Avian Ecology Laboratory, Weber State University
- U.S. Fish and Wildlife Service (USFWS). 2009. Assessment of Contaminants in the Wetlands and Open Waters of the Great Salt Lake, Utah 1996-2000
- Vest, J.L., M.R. Conover, C. Perschon, J. Luft, and J.O. Hall. 2009. Trace Element Concentrations in Wintering Waterfowl from Great Salt Lake. Arch. Environ. Contam. Toxicol. 56:302-316
- Conover, M.R. and J.L. Vest. 2008. Selenium and Mercury Concentrations in California Gulls Breeding on the Great Salt Lake, Utah, USA. Environ. Tox. Chem.

Mercury concentrations are concluded to have unknown reasonable potential (USEPA, 2009) because 1) mercury is potentially bioaccumulative and no translators from effluent mercury to methyl mercury and from water to tissue are available and 2) and 3) in 2005, mercury concentrations in the tissues of some waterfowl were determined to have accumulated to concentrations potentially unsafe for human consumption (see http://waterfowladvisories.utah.gov/), 4) the mercury results reported by CH2MHill (2012; 2013; 2014; 2015; 2015a) are highly variable and the current data is insufficient to characterize this variability or identify causes. No water quality-based effluent limits are required but the technology-based limit from the previous permit remains.

To attempt to address the uncertainties regarding the lack of mercury translators, this permit includes monitoring requirements for the Joint Discharge Area Transitional Monitoring Program. The Joint Discharge Area Transitional Monitoring Program requires the monitoring of mercury in water, sediment, invertebrates, and bird eggs (if available) in the vicinity of the outfall delta and water and collocated brine shrimp (if available) in the open waters to address the data gaps regarding reasonable potential. The SGTP permit includes these same requirements. The Joint Discharge Area Transitional Monitoring Program may be conducted in cooperation with SGTP.

The limited sampling and analyses using analytical methods capable of measuring the 0.012 µg/l comparison value voluntarily conducted by Kennecott, mercury concentrations in the Kennecott's effluent alone should not adversely the uses. However, because the available data may not adequately characterize the effluent variability, additional effluent monitoring is also required. This permit requires that one effluent sample be analyzed for every 30 days of discharging.

Selenium concentrations in the effluent exceed the comparison values and selenium was concluded to have reasonable potential for the previous permit cycle. Utah does have a water quality standard for Gilbert Bay for selenium standard of 12.5 mg/kg DW in bird eggs. However, no translator is available to predict allowable water concentrations that correspond to a bird egg concentration of 12.5 mg/kg DW and hence the reliance on other comparison values for acceptable water concentrations. To date, hundreds of eggs have been sampled from Great Salt

Lake and all of the egg selenium concentrations were below 12.5 mg/kg DW which supports that the current loadings of selenium to the Lake are not impairing the uses.

As presented in the Jordan Valley Conservancy District SGTP UPDES # UT0025836 Fact Sheet and Statement of Basis (DWQ, 2014) the SGTP will be a new source of selenium loading to the Lake. The SGTP outfall is permitted to discharge next to Kennecott's outfall 012. The SGTP discharge, which also will contain selenium, was evaluated for reasonable potential along with Kennecott's discharge as part of the SGTP permit evaluation (DWQ, 2014). Kennecott's selenium discharge was evaluated at the current effluent limit of 54 µg/l and a maximum annual loading of 900 kg. The 900 kg/yr selenium loading limit is a new limit for this permit.

Selenium loading from Kennecott's discharge decreased markedly from 1999 to 2001 and then was relatively constant from 2003 through 2006 at about 900 kg/yr (Figure 1). Several studies investigating the potential impacts of selenium on birds were initiated when selenium loading was about 900 kg/yr from the Kennecott discharge and these studies did not observe any adverse effects (e.g., DWQ, 2008). Lake concentrations of dissolved selenium did not increase or decrease predictably and remained less than 1 µg/l and appear uninfluenced by changes in selenium loading from Kennecott (Figures 1 and 2). Total selenium loading for one year from 2006 to 2007 was estimated to be 1,500 kg and permanent losses were estimated to be 2,650 kg (Johnson and Naftz et al., in DWQ, 2008). Kennecott's discharge was identified as the largest contributor to the 1,500 kg but the source of over 1,100 kg was not identified. In any case, dissolved selenium concentrations remain below 1 µg/l.

The data are inadequate to support modifications to the existing water quality-based effluent limits for both the Transitional Waters and Gilbert Bay. The data does support that Kennecott's existing effluent limit of 54 µg/l is protective under existing conditions but additional data is needed to confirm that this limit remains protective if for instance, Kennecott discharges more frequently than in the recent past. Therefore, the available data are insufficient to support changes to the existing selenium water quality-based effluent limit of 54 µg/l. The available data are also insufficient to determine reasonable potential when selenium loadings from both the SGTP and Kennecott exceed 900 kg/year data. Therefore, a new interim annual loading limit of 900 kg is required by this permit.

In addition to conserving the previous use-based effluent limit, this permit includes new selenium monitoring requirement for water, sediment, invertebrates, and bird eggs (if available) in the vicinity of the outfall delta and collocated water and brine shrimp (if available) in the open waters to address the uncertainties regarding reasonable potential. As the data gaps and geographic locations are the same as identified for the SGTP, this permit includes the same Joint Discharge Area Transitional Monitoring Program requirements and implementation triggers for interpreting the egg data.

Level II Antidegradation Review

In accordance with UAC R317-2-3.5.b.1.(b), a Level II antidegradation review is not required because there are no changes to effluent concentrations or loading compared to the previous permit.

WET (Whole Effluent Toxicity) Testing

WET is one of the tools used by the Division to evaluate compliance with the Narrative Standards. KUC is required to conduct acute WET monitoring under the requirements of the previous permit. For the upcoming permit cycle, chronic WET monitoring is required because the dilution in the initial receiving waters is zero (effluent dependent) resulting in dilution of less than 20:1. Both acute and chronic WET test results should be conducted and the results reported. The requirements and reporting of the acute WET testing should be conserved from the previous permit. The results of the new requirements for chronic testing will be used as an indicator of toxicity as recommended by the Utah Division of Water Quality *Interim Methods for Evaluating Use Support For Great Salt Lake, Utah Pollution Discharge Elimination System (UDPES) Permits, Review Draft Permitting Implementation Guidance for Great Salt Lake* (January 4, 2016).

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Brix, K.V., R.M. Gerdes, W.J. Adams, and M. Grosell, 2006. Effects of Copper, Cadmium, and Zinc on the Hatching Success of Brine Shrimp (*Artemia fransciscana*). Archives of Environmental Contamination and Toxicology. 51:580-583

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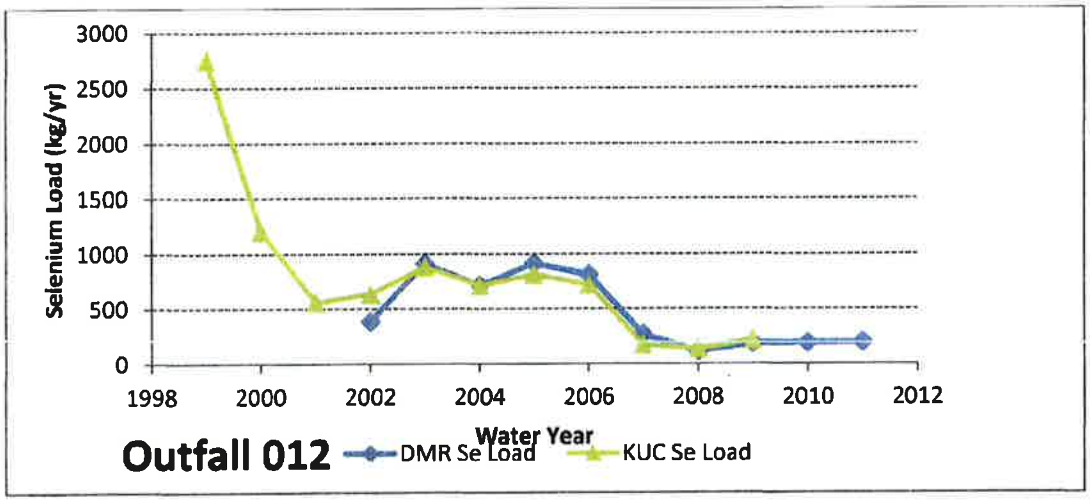

Figure 1. Selenium loads calculated from the DWQ Discharge Monitoring Reporting (DMR) Database and as estimated by Rio-Tinto Kennecott Copper

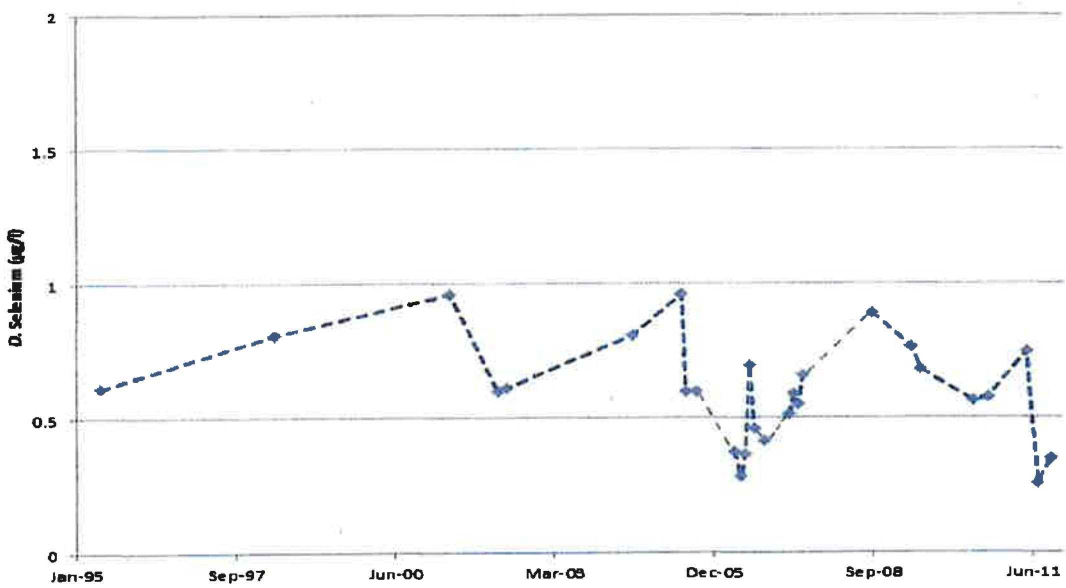

Figure 2. Selenium geometric mean concentrations for Gilbert Bay from USGS, Rio Tinto Kennecott Copper, and DWQ data