

Kennecott South Zone – Southwest Jordan Valley
Groundwater Plumes OU2

U.S. Environmental Protection Agency, Region VIII
&
Utah Department of Environmental Quality

June 2007 Explanation of Significant Difference

Comment Response Summary

Dated July 3, 2007

Kennecott South Zone – Southwest Jordan Valley Groundwater Plumes OU2

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Table of Contents

Introduction to the Comment Response Summary

Comments Received and Responses to Comments

1. Mr. Dave Becker, Western Resources Advocates
2. Mr. Rod Dansie
3. Mr. David Smith

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Introduction to the Comment Response Summary

Project Summary

This project is designed to clean up groundwater contaminated from historic mining activities in the Oquirrh Mountains in southwest Salt Lake County. The U.S. Environmental Protection Agency Region VIII (EPA) and the Utah Department of Environmental Quality (UDEQ), collectively referenced here in as the Agencies, have worked together to facilitate the implementation of the selected remedy for Operable Unit No. 2 (OU2), Southwest Jordan Valley Groundwater Plumes, as related in the 2000 Record of Decision (ROD) and previously clarified in a 2003 Explanation of Significant Difference.

In December 2000, the Agencies selected a remedy for the Zone A acid plume (which is delineated by groundwater with a sulfate concentration ≥ 1500 parts per million, ppm, or milligrams per liter, mg/l). The components of the selected remedy include:

- 1) Operate and maintain source controls (as already implemented under state Groundwater Protection Permits);
- 2) Integrate and use institutional controls;
- 3) Implement point of use management strategies (as necessary) to address private well owner quality and quantity verified impacts;
- 4) Develop a plan to contend with water level drops caused by the pumping of the acid plume;
- 5) Install a barrier well containment system at the leading edge of the acid plume (where sulfate concentrations are less than 1500 ppm) in the projected migration pathway;
- 6) Install a well or wells in the core of the acid plume;
- 7) Pretreat the acid core water using nanofiltration;
- 8) Treat the pretreated acid core water using reverse osmosis (RO);
- 9) Deliver treated water to a municipal purveyor (if a reduction of the State NRD Irrevocable Letter of Credit is sought); and
- 10) Install and maintain a network of monitoring wells to monitor the movement of the plume, progress of the remedial effort, and measure the progress of natural attenuation.

Prior to mine closure, the ROD specified that nanofiltration and reverse osmosis concentrates can be disposed in Kennecott's tailings pipeline that ends at the North Tailings Impoundment. The ROD recognized the tailings pipeline as a 13 mile linear treatment system, where acidic water would be neutralized and metals would precipitate out of solution to form solid compounds not characteristic hazardous waste. The decision to allow the use of the tailings pipeline and Impoundment was based upon geochemical investigations performed by Kennecott

on the tailings material, and submitted to the agencies as well as the South Zone Technical Review Committee for review and analysis. The ROD acknowledged that the metals precipitated from the concentrates would be stored along with solid tailings in the Magna Tailings Impoundment (active portion is the North Tailings Impoundment, otherwise referred here in as the Impoundment).

The selected remedy specified that upon cessation of mining operations and potential closure of the Impoundment, the treatment concentrates would require disposal in a facility appropriate to store the types of wastes then remaining in the concentrates. The selected remedy also required the documentation of an alternative disposal method that could be implemented quickly. The quick alternative (lime treatment of acidic waters and sequestration of metals in a non-hazardous sludge, with appropriate long term land disposal and storage of the sludge in an appropriate repository) was documented within the remedial design/remedial action (RDRA) work plan dated December 2002.

During the engineering and design work associated with developing the December 2002 RDRA work plan, Kennecott determined:

- 1) They could draw enough water from the barrier wells to meet the requirements of a project proposed under the State of Utah 1995 Natural Resource Damage Consent Decree (NRD CD) and pursue a reduction of the Irrevocable Letter of Credit;
- 2) The pretreatment of raw acid core water (by nanofiltration) would result in a small volume of water to undergo further refinement by reverse osmosis (RO) (approximately 24%);
- 3) This small volume of pretreated water would require neutralization; and
- 4) As an alternative to nanofiltration, raw acid core water could be mixed with mill tailings which provided sufficient neutralization potential (supplemented if needed, by adding lime to the system) to neutralize the acidity of the raw acid core water, hence cause dissolved metals to precipitate out of solution as solid compounds. The precipitated metals formed non-hazardous solid compatible with the chemical makeup of the tailings; hence it was proposed that sending the combined solids to the North Tailings Impoundment would be appropriate.

As a result of the design work, the Agencies issued an Explanation of Significant Difference (ESD) in August 2003 that clarified the raw acid water could be sent to the tailings pipeline. Once the acid water has been delivered to the tailings pipeline and undergone neutralization the combined water in the tailings pipeline is recycled and used in Kennecott's processes, especially at the Copperton Concentrator. As noted in the August 2003 ESD, one of the expectations in the National Contingency Plan (NCP) is that useable ground water will be returned to its beneficial use where ever practicable. Although the raw acid core water will not go to municipal culinary use, it will have a beneficial use as industrial water.

Subsequent to the completion of the design work (December 2002 RDRA work plan), Kennecott began construction of the remedial components that had not already been constructed. At the same time as construction neared completion the Agencies and Kennecott began negotiating the terms and conditions of the remedial design consent decree (RDCA). During these negotiations, Kennecott drafted an operation maintenance & replacement work plan

(October 2006 OM&R work plan) to cover operation and maintenance phase of the selected remedy.

As the Agencies began negotiating with Kennecott on a remedial design consent decree (RDCD), it became apparent that a few more clarifications of the selected remedy were necessary. On November 6, 2006 the Agencies issued a second ESD (dated December 2006) for public review until December 8, 2006. This second proposed ESD (the subject of this response summary) was drafted to provide clarification on how the barrier well water could be managed once extracted, as well as to clarify certain performance criteria. Subsequent to this review period and other actions pursued by the Agencies, the proposed December 2006 ESD was re-dated as the June 2007 ESD.

The December 2000 ROD selected treatment of barrier well water using reverse osmosis and delivery of treated water to a municipal water purveyor. Because the barrier well water contains pollutants or contaminants that do not restrict its use for some purposes, other options for the disposal or use of such water were found to be viable. Under the proposed clarification, other management options for the extracted barrier well water can include continued use by Kennecott for industrial needs or the provision of raw or treated barrier well water for any other lawful use that is “both consistent with the quality of the water, previous decision documents, and acceptable to EPA and UDEQ”. Please note that historically Kennecott has pumped the designated barrier wells (or their predecessors) to provide process water using water rights they have maintained in the aquifer since the 1960s. Again, options for managing the extracted water from the barrier wells will be judged against the quality of the water, previous decision documents rendered by both separate authorities (CERCLA and the State NRD), and judged by the two Agencies to determine the acceptability of a proposed water management option.

The selected remedy in the 2000 ROD indicated that source control measures (i.e., Eastside Collection System and Bingham Reservoirs) were to be operated under State of Utah permits. This measure was intended to prevent continued introduction of contaminants to the Zone A acid plume. The proposed December 2006 ESD simply clarifies that these permits are complementary to the OU2 selected remedy and management of the Southwest Jordan Valley Groundwater plumes.

To demonstrate effectiveness of the remedy (containment and attainment of the final cleanup concentrations) the Agencies agreed that three clarifications of the selected remedy's components for containment were necessitated. Two wells have been located within the core of the acid plume to extract heavily contaminated water in an effort to reduce the likelihood of the core's expansion into lesser contaminated portions of Zone A and to reduce the dimensions of the core directly. To ensure that this extraction scenario would assist managing containment of the acid plume in Zone A, a minimum extraction rate of 1200 acre-feet per year on a five-year rolling average was proposed by the Agencies in the December 2006 ESD. The proposed clarification allows the extraction rate to be modified pursuant to the October 2006 OM&R work plan.

The minimum extraction rate specified in the December 2006 ESD is greater than the core extraction rate of 400 acre-feet per year on a five-year rolling average required in the State of Utah's NRD CD. The State of Utah has retained its right to require the minimal extraction rate under the NRD CD if there is a reduction of the overall extraction rate some time in the future.

The 2000 ROD established that containment of the acid plume (water with a sulfate concentration ≥ 1500 mg/l) was to be measured along the Kennecott property line as of the date of the ROD. The agencies believed that the use of compliance points rather than a line boundary

would provide a more objective measure of whether Kennecott was complying with the containment requirement of the ROD. The proposed December 2006 ESD acknowledges that a series of compliance points (monitoring wells) were designated within the October 2006 OM&R work plan. These points were established along the northern, eastern and southern boundaries of the acid plume of Zone A, the most likely migration pathways for this plume. These compliance points encircle the northern, eastern and southern extent of the acid plume and draw in closer to these boundaries the decision point to which a compliance determination is made. The proposed December 2006 ESD acknowledges that these compliance points can be modified pursuant to the October 2006 OM&R work plan.

The 2000 ROD provided the final active and passive cleanup standards deemed acceptable to the Agencies at that time. Since the previous 2003 ESD clarifications, new information required the Agencies to consider clarifying these cleanup standards for the Zone A acid plume. Again the Agencies acknowledged that once the aquifer has been actively remediated to ≤ 1500 mg/l sulfate, active remediation measures may be discontinued in favor for monitored natural attenuation until sulfate concentrations throughout the plume reach 500 mg/l. Nitrate was determined not to be a contaminant of concern because nitrate concentrations have consistently been well below the groundwater quality standard. Hence the agencies removed it from the list. The treatment levels for the reverse osmosis treatment plant were proposed for deletion since the water treatment plant is operating under a permit with the Utah Division of Drinking Water.

Finally the Agencies determined that the 2000 ROD did not provide a mechanism whereby Kennecott could demonstrate that they had attained the final cleanup levels throughout the plume. The Agencies clarified this by acknowledging that a method to determine compliance with the final cleanup levels will be proposed by Kennecott as a work function under the October 2006 OM&R work plan, when the groundwater quality in the plume approaches the final cleanup levels.

Description of Comment Response Summary

This document contains responses to the public comments that were received by the Agencies on the proposed December 2006 ESD between November 6, 2006 and December 8, 2006. The proposed December 2006 ESD was described in a UDEQ fact sheet and information was posted on the UDEQ website. The proposed December 2006 ESD and the October 2006 OM&R work plan were made available for public review and comment. The 30-day period for written comments concluded on December 8, 2006. Written comments (letters and e-mails) received through midnight of December 8, 2006, were also reproduced in this response summary, together with responses from the Agencies.

Written comments were received from individuals and groups. Some of the comments were similar, or raised the same questions or concern. Responses to those common comments are provided in the first section of this Comment Response Summary and referenced in individual the response that follow. Other responses are included with the individual comment reproduced herein. Thus, by reviewing the initial sections of this document, the public can review the common issues and the Agencies' responses. In the next section of the document, all of the comments that were received during the comment period are reproduced.

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Response No. 1 - Quality of the Water Extracted at the Acid Core and Barrier Wells

Introduction

A number of the comments received during the public review period were premised on the concept that both the acid core water and the barrier well water contained hazardous substances. These same comments went further to suggest that the enacted remedy and proposed December 2006 ESD clarifications would cause the transference of the suspected hazardous substances from one location to another. The comments alluded to this transference as a deferment of permanent treatment requirements for these water streams.

The Agencies have assessed the qualities of these two water streams, the enacted remedy and the proposed management option clarification and believe that all data demonstrates compliance with the permanent treatment or removal requirement of the National Contingency Plan (NCP).

Quality of the Raw Barrier Well Water and Reverse Osmosis Concentrates

Table 1.0 provides water quality data for the raw Barrier Well water for 2005-2006. Also listed in this table are state drinking water quality standards and state numeric criteria for aquatic wildlife. Raw barrier well water does not meet drinking water standards for TDS or sulfate and one well does not meet primary drinking water standards for TDS and sulfate. Elevated sulfate and TDS are the reason that the state requires treatment of this water under the Natural Resource Damage project. Although raw barrier well water is not directly discharged to a freshwater body subject to numeric aquatic wildlife protection, it is helpful to note that this water generally meets aquatic wildlife criteria except for occasional slight exceedances of some metals and metalloids.

The limiting factor to sending the raw Barrier Well water to the Impoundment is whether Kennecott can maintain compliance with the UPDES discharge limitations for Outfall No. 012. The UPDES permit currently recognizes that the Barrier Well water can be delivered to the Impoundment as it is similar to the mine waters already directed to the Impoundment.

Outfall No. 012 is the permitted outfall from the Impoundment to the Great Salt Lake. A comparison of the Barrier Well water quality (Table 1.0 at the end of this Response No. 1) to the UPDES permit limitations for Outfall No. 012 (see table following this paragraph) demonstrates that the addition of this water to the Impoundment will not likely adversely impact Kennecott's continued compliance with the limitations. A comparison of the daily maximum and minimum UPDES permit limitations to the Barrier Well Water demonstrates that none of the contaminants of concern in the aqueous phase would have exceeded the UPDES permit limitations during 2005 and 2006. A similar comparison performed looking at the water quality of the RO concentrates (see Table 3.0 at the end of this Response No. 1) demonstrates that for 2005 and 2006 there

would not have been exceedances of the UPDES daily maximum and minimum permit limitations.

2007 UPDES Discharge Limitations for Outfall No.012

Discharge Limitations	TSS	T-As	T-Cd	T-Cu	T-Pb	T-Hg	T-Zn	Se	T-Cyanide	Oil & Grease	pH
Maximum Monthly Average	20	0.25	0.05	0.15	0.30	0.001	0.224	NA	0.1	NA	NA
Daily Maximum	30	0.50	0.10	0.30	0.60	0.002	0.50	0.054	0.2	10	9.0
Daily Minimum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.5

In the appendix to this response summary, the table contained there in provides a synopsis of Kennecott’s compliance (2001 to 2006) with the permit limitations for outfall No. 12 (highlighted data blocks represent exceedances). Based upon the data provided by the Division of Water Quality, Kennecott has maintained compliance with the permit limitations during the time period from 2001 to 2006 except for one exceedance of arsenic in 2004 and several violations of the TSS (Total Suspended Solids) limit; none of these violations are related to remediation operations. Discharge water from the Impoundment contained metals concentrations below the applicable permit limitations.

It should be noted that the particular contaminants of concern in the aqueous phases of these water streams are not characteristically hazardous (a conditioned determined by the Toxicity Characteristic Leaching Protocol (TCLP) analysis method used to assess solid phase contaminants in a land disposal scenario).

Quality of the Extracted Acid Core Water

Table 2.0 (at the end of this Response No. 1) provides water quality data for the acidic water extracted from the core of the Zone A acid plume. The chemical composition of this water requires ongoing treatment and management of treatment residuals. A review of the water quality data (provided in Table 2.0) demonstrates that for a number of the contaminants of concern, the acid core water does not meet drinking water standards and/or aquatic wildlife protection criteria (based upon a fresh water environment).

As noted in Appendices A and C of the December 2002 RDRA work plan, the General Mill Tailings (tailings slurry, or waste, from the Copperton Concentrator) have a certain amount of neutralization potential that is able to neutralize the acidity of the extracted waters from the core of the Zone A acid plume as well as the other acidic mine waters Kennecott manages in its tailings system. This neutralization potential is derived from the naturally occurring carbonate minerals within the ore body being mined and milled, and from lime that the mill (Copperton Concentrator) adds to the milling process. The tailings pipeline functions as a treatment reactor for all acidic waters directed to the pipeline (as a result of the neutralizing potential inherent in the mill tailings). The neutralization reaction takes place within the tailings pipeline as the managed acidic water streams mix with the General Mill Tailings along the 13 mile system.

During the neutralization reaction the acidity of the commingled waste stream is reduced and the commingled waste stream becomes supersaturated with aluminum-hydroxides and iron-hydroxides, which bind other aqueous metals in the commingled stream. The metal complexes

are then precipitated (as a substance similar to gypsum) and deposited as a stable, non-hazardous solid in the Impoundment. Once in the Impoundment the solid deposits are sequestered in perpetuity. Operation of the Impoundment is subject to operational conditions implemented by permitting programs of the Division of Water Quality (UPDES and Groundwater Protection), the Division of Air Quality, the Division of Water Rights (Dam Safety), and ultimately the reclamation requirements of the Division of Oil, Gas and Mining. For further detail on the operation of the Impoundment and its usefulness please refer to Response No. 2 of this summary.

It should be noted that the particular contaminants of concern in the solid treatment residuals from treatment of acid core water by the addition of lime, do not exhibit characteristics of hazardous waste (December 2002 RDRA work plan Appendix C, Section 6.2 and Table 18, page 45-46).

Performance Monitoring

Kennecott has submitted annual remediation progress reports for 2002 through 2006 to the South Zone TRC for review. These reports have provided data on the neutralization potential of the mill tailings, the daily pH as recorded on a continuous basis near the end of the tailings pipeline, and the flow rate of both tailings throughput from the Concentrator and the acidic water extracted from the acid extraction wells in the core of the Zone A acid plume. Performance criteria for these parameters were established by the agencies to ensure the following:

- 1) Kennecott could manage the remedial flows directed from the Zone A acid plume along with the other waste streams it manages within the tailings pipeline;
- 2) The remedial action would not adversely affect the long-term neutralizing ability of the tailings in order to prevent potential acidification of the Impoundment; and
- 3) That the extracted acidic core water would be neutralized, subsequently binding the metals in the water stream as a solid non-hazardous complex prior to reaching the end of the pipe. Based upon a review of the data submitted to date Kennecott has met or exceeded the performance criteria established in the 2002 RDRA work plan, as modified.

Table 1.0: Barrier Well Water Quality 2005-2006

		pH	TDS	SO4	Al	As	Cd	Cr	Cu	Fe	Pb	Hg	Ni	Se	Ag	Zn
			mg/l	mg/l	mg/l-D	mg/l-D	mg/l-D	mg/l-D	mg/l-D	mg/l-D	mg/l-D	mg/l-T	mg/l-D	mg/l-D	mg/l-D	mg/l-D
Primary Drinking ¹			2000	1000		0.01	0.005	0.1	1.3		0.015	0.002		0.05		
Secondary Drinking ²		6.5-8.5	500	250	0.2				1	0.3					0.1	5
Aquatic ^{3,4}		6.5-9.0			0.087	0.15	0.00025	0.0115	0.009	1	0.0025	0.000012	0.052	0.0046	0.0016	0.12
B2G1193	2/3/05	6.8	3000	1700	<0.02	<0.005	<0.001	<0.01	<0.02	<0.3	<0.005	<0.0002	<0.04	0.004		0.018
	5/10/05	6.5	3017	1700	0.173	<0.005	0.001	<0.01	0.125	0.128	<0.005	<0.0002	<0.04			0.124
	7/1/05	6.8	2951	1750	0.245	<0.005	0.001	<0.01	0.025	0.047	<0.005	<0.0002	<0.04	0.004		0.064
	10/25/05	7.1	3040	1770	0.281	0.007	<0.001	<0.01	<0.02	0.496	<0.005		<0.04	0.005		0.028
Average		6.795	3002	1730	0.1798	0.0055	0.001	<0.01	0.0475	0.243	<0.005	<0.0002	<0.04	0.0043		0.0585
	2/8/06	7.1	2950	1840	<0.02	<0.005	<0.001	<0.01	<0.02	0.033	<0.005	<0.0002	<0.04	0.006		0.012
	6/22/06	7.0	3190	1720	<0.02	0.008	<0.001	<0.01	<0.02	<0.02	<0.005	<0.0002	<0.04	0.003		<0.01
	8/9/06	6.7	3040	1670	<0.02	<0.005	<0.001	<0.01	<0.02	0.042	<0.005	<0.0002	<0.04	0.005		0.045
Average		6.91	3060	1743.3	<0.02	0.006	<0.001	<0.01	<0.02	0.032	<0.005	<0.0002	<0.04	0.0047		0.0223
BFG1200	3/21/05	7.0	1630	853	<0.02	<0.005	<0.001		<0.02		<0.005	<0.0002		0.003		<0.01
	8/26/05	6.9	1981	981	<0.02	0.005	<0.001		<0.02		<0.005	<0.0002		0.006		0.012
	10/25/05	7.2	1794	936	0.033	0.008	<0.001		<0.02		<0.005			0.004		<0.01
Average		7.0333	1801.7	923.33	0.0243	0.006	<0.001		<0.02		<0.005	<0.0002		0.0043		0.0107
	2/8/06	7.5	1690	908	<0.02	0.005	<0.001	<0.01	<0.02	<0.02	<0.005	<0.0002	<0.04	0.004		0.016
	5/19/06	7.0	1770	989	<0.02	<0.005	<0.001	<0.01	<0.02	<0.02	<0.005	<0.0002	<0.04	0.004		0.016
	8/30/06	6.8	1800	943	<0.02	0.006	<0.001	<0.01	<0.02	<0.02	<0.005	<0.0002	<0.04	0.003		0.015
Average		7.0867	1753.3	946.67	<0.02	0.0053	<0.001	<0.01	<0.02	<0.02	<0.005	<0.0002	<0.04	0.0037		0.0157
LTG1147	1/18/05	7.3	1470	501	<0.02	<0.005	<0.001	<0.01	<0.02	<0.3	<0.005		<0.04	0.004		0.01
	3/10/05	7.3	1600	581		<0.02	<0.01		<0.015		<0.05			0.004		<0.02
	4/15/05	7.1	1500	609	<0.005	<0.001			<0.02		<0.005			0.005		0.031
	7/27/05	7.2	1603	565	<0.005	<0.001			<0.02		<0.005			0.006		<0.01
	12/7/05	7.3	1630	621	<0.005	<0.001			<0.02		0.008			0.004		0.015
Average		7.258	1560.6	575.4	<0.02	0.008	0.0028	<0.01	0.019	<0.3	0.0146		<0.04	0.0046		0.0172
	2/28/06	7.0	1660	592	<0.02	<0.005	<0.001	<0.01	<0.02	0.098	<0.005	<0.0002	<0.04	0.003		<0.01
	6/20/06	7.0	1660	649	<0.02	<0.005	<0.001	<0.01	<0.02	<0.02	<0.005		<0.04	0.003		<0.01
	9/7/06	7.2	1650	670	<0.02	<0.005	<0.001	<0.01	<0.02	<0.02	<0.005	<0.0002	<0.04	<0.002		0.026
	11/22/06	7.0	1600	642	0.033	0.012	<0.001	<0.01	0.032	0.044	0.007	<0.0002	<0.04	0.005		0.014
Average		7.065	1642.5	638.25	0.0233	0.0068	<0.001	<0.01	0.023	0.046	0.0055	<0.0002	<0.04	0.0033		0.015

¹R309-200-5

²R309-200-6

³R317-2-14, Table 2.14.2, 4-day Averages

⁴Aquatic standards which are hardness dependant are listed at 100 mg/l hardness.

⁵Chromium standards listed in R317-2-14 are listed by chromium species and standard listed is for Cr(IV); data reported here are dissolved Cr(t)

* Data series with a mixture of concentrations less than and greater than the limit of detection were averaged by accepting the LOD as the top end of the results range (i.e. from 0.00 to LOD), which provides for a conservative approach to evaluate compliance.

Table 2.0: Acidic Water Extraction Wells Water Quality 2005-2006

	pH	TDS	SO4	Al	As	Cd	Cr	Cu	Fe	Pb	Hg	Ni	Se	Ag	Zn	
		mg/l	mg/l	mg/l-D	mg/l-D	mg/l-D	mg/l-D	mg/l-D	mg/l-D	mg/l-D	mg/l-T	mg/l-D	mg/l-D	mg/l-D	mg/l-D	
Aquatic ^{1,2,4}		6.5-9.0			0.087	0.15	0.00025	0.0115	0.009	1	0.0025	0.000012	0.052	0.0046	0.0016	0.12
ECG1146	1/14/05	3.6	34100	24400	1150	0.037	0.751	<0.01	81.5	210	<0.005	<0.0002	18.1	0.122		100
	5/10/05	3.5	32409	21200	1260	0.042	0.817	0.013	100.7	251	<0.005	0.0076	17.5	0.09		95
	7/1/05	3.8	32982	20800	1290	0.160	0.880	<0.01	85.6	274	<0.00005	0.007	18.8	0.061		95
	10/25/05	3.5	31500	23700	1190	0.038	0.823	<0.01	84.2	238	<0.005		19.1			91
Average		3.5925	32748	22525	1222.5	0.0693	0.8178	0.0108	87.988	243.25	0.0038	0.004933	18.375	0.091		95.335
	2/28/06	3.1	29400	19000	1150	0.106	0.750	<0.01	82.6	232	<0.05	0.0069	16.2			91
	6/13/06	3.2	29000	23700	1060	0.117	0.800	<0.01	80.2	209	<0.1	0.0055	16.2	<0.002	<0.01	89
	8/31/06	3.3	27900	22800	1060	0.044	0.762	0.012	74.0	203	<0.005	0.0092	15.6	0.011		73
Average		3.22	28767	21833	1090	0.089	0.7707	0.0107	78.933	214.67	0.0517	0.0072	16.003	0.0065	<0.01	84.372
BSG1201	1/14/05	3.8	15600	12300	451	0.020	0.757	<0.01	20.6	30	0.028	0.0057	9.3	0.078		47
	5/16/05	3.5	16329	10500	467	0.023	0.753	<0.01	23.2	30	0.03	0.0064	8.4	0.074		37
	7/1/05	3.9	16256	10700	400	0.084	0.710	<0.01	23.2	33	<0.00005	0.0066	8.4	0.037	<0.01	37
	10/25/05		16100	11500	453	0.022	0.737	<0.01	22.8	29	0.025		8.5			41
Average		3.7233	16071	11250	442.75	0.0373	0.7393	<0.01	22.44	30.425	0.0208	0.006233	8.665	0.063	<0.01	40.463
	2/27/06	3.7	15800	10200	441	0.014	0.718	<0.01	21.6	30	0.028	0.007	8.1	0.453		39
	5/19/06	3.5	15300	12800	403	0.021	0.667	<0.01	20.5	28	0.024	0.0077	7.5	0.304		37
	8/9/06	3.5	15500	10700	409	0.020	0.692	<0.01	20.8	29	0.023	0.0072	7.8	0.011		41
Average		3.54	15533	11233	417.67	0.0183	0.6923	<0.01	20.967	28.933	0.025	0.0073	7.7867	0.256		39.133

¹R317-2-14, Table 2.14.2, 4-day Averages

²Aquatic standards which are hardness dependant are listed at 100 mg/l hardness.

³Chromium standards listed in R317-2-14 are listed by chromium species and standard listed is for Cr(IV); data reported here are dissolved Cr(t)

⁴The listed aquatic standards are for a fresh water environment.

* Data series with a mixture of concentrations less than and greater than the limit of detection were averaged by accepting the LOD as the top end of the results range (i.e. from 0.00 to LOD), which provides for a conservative approach to evaluate compliance.

Table 3.0: Reverse Osmosis Concentrate Water Quality 2005-2006

		pH	TDS	SO4	Al	As	Cd	Cr	Cu	Fe	Pb	Hg	Ni	Se	Ag	Zn
		mg/l	mg/l	mg/l-D	mg/l-D	mg/l-D	mg/l-D	mg/l-D	mg/l-D	mg/l-D	mg/l-D	mg/l-T	mg/l-D	mg/l-D	mg/l-D	mg/l-D
Aquatic ^{1,2}		6.5-9.0			0.087	0.15	0.00025	0.011 ³	0.009	1	0.0025	0.000012	0.052	0.0046	0.0016	0.12
ECP2745	7/28/05	7.1	8326	4840	<0.02	0.012	<0.001		0.02	0.224	<0.005			0.021		0.017
	10/4/05	7.3	8420	4740	<0.02	0.014	<0.001		<0.02	<0.02	<0.005			0.015		0.018
	10/18/05	7.3	8207	3990												
	11/8/05	7.3	7920	4570												
	12/6/05	7.3	8360	4330	<0.1	0.016	<0.001		<0.02	<0.02	<0.005			0.013		0.016
Average		7.244	8246.6	4494	0.0467	0.014	<0.001		0.02	0.088	<0.005			0.0163		0.017
	1/10/06	7.4	7910	4320	<0.1	0.015	<0.001	<0.01	<0.015	<0.02	<0.005			0.012	<0.001	0.017
	2/8/06	7.2	8110	4500		0.015	<0.001	0.016	0.03	<0.02	<0.005			0.012	<0.001	0.015
	3/7/06	7.3	7930	4380		0.016	<0.001	0.012	0.037		<0.005			0.01	<0.001	0.012
	4/11/06	7.6	7520	4020		0.016	<0.001	0.029	<0.02		<0.005			0.012	<0.001	0.014
	5/23/06	7.3	5100	2790		0.014	<0.001	0.01	<0.02		<0.005			0.01	<0.001	0.019
	6/20/06	7.5	7600	4130		0.011	<0.001	<0.01	<0.02		<0.005			0.011	<0.001	<0.01
	7/18/06	7.5	8390	3930		0.015	<0.001	<0.01	<0.02		<0.005			0.015	<0.001	0.018
	8/22/06	7.5	8030	3950		0.016	<0.001	<0.01	<0.02		<0.005			0.01	<0.001	<0.01
	9/21/06	7.2	8100	4320		0.014	<0.001	0.011	<0.02		<0.005			0.013	<0.001	0.014
	10/25/06	7.4	7980	4430		0.014	<0.001	<0.01	<0.02		<0.005			0.013	<0.001	0.011
	12/19/06	7.5	7810	4510										0.013		
Average		7.3918	7680	4116.4	<0.1	0.0146	<0.001	0.0128	0.0222	<0.02	<0.005			0.0119	<0.001	0.014
ECP2771	1/10/06	7.3	8150	4530	<0.1	0.016	<0.001	<0.01	<0.015	<0.02	<0.005			0.013	0.002	0.019
	2/8/06	7.3	8570	5100		0.016	<0.001	0.013	0.034		<0.005			0.02	<0.001	0.015
	3/7/06	7.4	8080	4360		0.017	<0.001	0.013	<0.02		<0.005			0.012	<0.001	0.011
	4/11/06	7.5	7970	4020		0.016	<0.001	0.023	<0.02		<0.005			0.011	<0.001	0.015
	5/31/06	7.3	8110	4090		0.013	<0.001	0.01	0.021		<0.005			0.012	<0.001	0.022
	6/20/06	7.5	7850	4320		0.011	<0.001	0.013	<0.02		<0.005			0.011	<0.001	<0.01
	7/18/06	7.4	7940	4640		0.015	<0.001	0.012	<0.02		<0.005			0.016	<0.001	0.014
	8/22/06	7.5	8173	4280		0.013	<0.001	0.01	<0.02		<0.005			0.012	<0.001	<0.01
	9/21/06	7.1	8280	4190		0.015	<0.001	0.015	<0.02		<0.005			0.012	<0.001	0.016
	10/25/06	7.3	8170	4560		0.015	<0.001	<0.01	<0.02		<0.005			0.013	<0.001	0.013
	12/19/06	7.5	8160	4450										0.013		
Average		7.3764	8132.1	4412.7	<0.1	0.0147	<0.001	0.0129	0.021	<0.02	<0.005			0.0132	0.0011	0.0145

¹R317-2-14, Table 2.14.2, 4-day Averages

²Aquatic standards which are hardness dependant are listed at 100 mg/l hardness.

³Chromium standards listed in R317-2-14 are listed by chromium species and standard listed is for Cr(IV); data reported here are dissolved Cr(t)

*Data series with a mixture of concentrations less than and greater than the limit of detection were averaged by accepting the LOD as the top end of the results range (i.e. from 0.00 to LOD), which provides for a conservative approach to evaluate compliance.

Kennecott South Zone – Southwest Jordan Valley Groundwater Plumes OU2
U.S. Environmental Protection Agency, Region VIII
&
Utah Department of Environmental Quality

June 2007 Explanation of Significant Difference
Comment Response Summary

Response No. 2 - Appropriateness to Deliver Extracted Water to the Tailings Pipeline and North Tailings Impoundment

Introduction

As noted in the Response No. 1, some comments received during the public review period suggested that the selected remedy and the proposed clarifications would cause the transference of suspected hazardous substances from one location to another. The comments alluded to this transference as a deferment of permanent treatment requirements for the water streams derived from the planned and implemented extractions from the acid core and barrier wells in Zone A.

The selected remedy (as described in the December 2000 Record of Decision and the 2003 ESD) for OU2 includes extraction and neutralization of acidic waters from the core of the Zone A plume, and extraction of neutral waters from the plume margin and treatment through RO technology. Management of these waters results in three treatment residual streams:

- Neutralized core water
- Solids generated from core water neutralization reaction
- RO treatment concentrate water

Submitted comments question the suitability of using the Impoundment for management of aqueous treatment residuals and disposal of solid treatment residuals. The Agencies note that the decision to manage and dispose of treatment residuals in the Impoundment is founded on extensive evaluation of the geochemical characteristics and stability of the residuals as described in Appendices A and C of the December 2002 RDRA work plan. This decision was reached following review by the Agencies and the South Zone Technical Review Committee (TRC). Through full-scale testing, Kennecott has demonstrated that the acid plume water can be neutralized in the Tailings Pipeline, relying on excess neutralization potential in the tailings and/or lime amendments. Metals are precipitated out of the water and deposited in stable, non hazardous solid form in the Impoundment. The decant water from the Impoundment can be reused in Kennecott's milling process or discharged into the Great Salt Lake if in compliance with Kennecott's UPDES discharge permit.

The Agencies have determined that the Impoundment is a suitable long-term repository for the solid treatment residuals and that disposal in this location permanently removes contaminants from the environment and prevents threats to human health or the environment. This determination is based on a number of factors:

- Metals and other solutes are removed from solution by reaction of the acidic flows with the available neutralization potential of the tailings, plus any lime added to the line. The

fundamental reaction is the neutralization of acidity, buffering pH to circum-neutral values. At near-neutral pH, Al and Fe precipitate as hydroxides, sorbing other metals and metalloids. A portion (perhaps 10% to 20%) of the sulfate also is removed from solution by precipitation of gypsum. Removal rates during neutralization established by monitoring range from 60% for Mn to > 99% for Al, Cu, Fe, and Zn. For these conditions, the five major metals (Al, Cu, Fe, Mn, and Zn) in the acidic waters would account for only 2% of the same total metals deposited in solid form by the tailing solids.

- The hydroxide and sulfate solid phases that form in the line do not leach elevated levels of metals and metalloids in the tailing environment, provided the tailings environment does not become acidic.
- Extensive monitoring of tailings shows that tailings are predominantly net neutralizing and that treatment of acidic waters in the tailings line does not deplete the long term neutralizing potential of the tailings. Thus it is unlikely that an acidic environment will develop within the Impoundment. As part of implementation of the remedy, KUCC will and does regularly monitor the neutralization potential and acidification potential of tailings to react to changes in operations or ore types that could impact the ability of the tailings to adequately neutralize acidic waters without depleting neutralizing potential of tailings.
- The acidic water to be neutralized is not characteristic hazardous waste.
- Lime treatment solid residuals are not characteristic hazardous waste (as described in Appendices A and C of the December 2002 RDRA work plan).
- Lime-treatment overflow waters and RO concentrates (Table 3.0 under Response No. 1) are generally similar to Great Salt Lake waters. These waters do not exceed current UPDES permit limit concentrations. Because the treatment waters are similar to Great Salt Lake water, there is little or no change to water of the lake during mixing at ratios ranging from 1:1 to 10:1. KUCC has determined through full scale testing that a pH of 6.7 or higher must be maintained in the tailings system to assure that metals fully precipitate in order to meet discharge standards. KUCC monitors the pH of the tailings system in real time to assure that this management criterion is met.
- The location of the Impoundment is highly suitable for both the disposal of tailings as well as the disposal of solid residuals from acid water treatment. As described in the Environmental Impact Statement prepared for the North Tailings Impoundment Expansion project, the Impoundment is located over a 10-20 foot thick lacustrine clay unit that prevents water from the Impoundment from impacting groundwater that would eventually discharge to the Great Salt Lake. Additionally the groundwater gradient at this location is upward, providing further assurance that waters from the impoundment will not impact groundwater. Any water seeping from the impoundment is collected by a ditch that must be managed by Kennecott in accordance with environmental permits.
- The Impoundment is constructed according to an engineered design approved by the Division of Water Rights, the State agency which regulates dam safety, to assure that the Impoundment is gravitationally and seismically stable and thus can serve as a permanent repository.

Additionally, the Agencies rely on extensive monitoring of the tailings system which has been implemented by Kennecott under the 2002 Final Design, as well as monitoring and controls provided by State permitting programs for operation of the Impoundment. Kennecott reports data collected for the CERCLA response in its annual remedial progress reports. A discussion of the monitoring data that indicates operation of the remedy produces aqueous and solid treatment residuals that are consistent with those predicted in the December 2002 RDRA work plan, and documents Kennecott's attainment of the performance standards (as modified) is provided in the annual reports for 2002- 2006. Kennecott has also complied with its UPDES discharge permit limits since implementation of the remedy (except for an arsenic excursion in February 2004 which was not related to remedial activities).

Airborne Contaminants

Wind blown dust from the Tailings Impoundment is monitored and regulated by the DEQ Division of Air Quality. The table below compares constituents in the tailings to typical human health protection levels for ingestion.

Metal	Average Concentration in Tailings (ppm) *	Typical Human Health Protection Levels (ppm)
Arsenic	30.7	100
Lead	16.5	500
Cadmium	1.11	40
Copper	716	>2000

* Includes treatment plant concentrate streams

The issue of airborne contaminants was considered by the TRC, by comparing the existing concentrations of metals in tailings with the metal concentrations in the RO concentrate. (See Table 5.6A of the NRD Joint Proposal). If the differences had been significant, it would have triggered an investigation by the Risk Assessment Task Force that was established by the TRC. The increases are not significant.

Kennecott South Zone – Southwest Jordan Valley Groundwater Plumes OU2
U.S. Environmental Protection Agency, Region VIII
&
Utah Department of Environmental Quality

June 2007 Explanation of Significant Difference
Comment Response Summary

Response No. 3 - Request for an Extension & Public Review Period

Introduction

A request to extend the public notice and review period was received from two of the three commenters. It should be noted that under Section 117 (42 USC § 9617) of the Comprehensive Environmental Response, Compensation, Liability Act (CERCLA) Subsections (a) and (b) require that the public be given an opportunity to comment on a proposed remedial action plan. Subsection (c) allows for publication of an explanation of significant differences (ESD) which is intended to document changes from the final plan(selected remedy), but there is no statutory requirement that the public be given an opportunity to comment on an ESD.

The National Contingency Plan (40 CFR Sections 300.435 and 825) expands upon the statutory requirements of CERCLA. Under §300.435(c), the agency (EPA) must either publish an explanation of significant difference (ESD) from the Record of Decision (ROD) or publish a proposal for an amendment of the ROD for proposed changes to the selected remedy prior to implementation. If a ROD amendment is sought, the public must be given an opportunity to comment as provided under §300.435(c). However, there is no comment requirement for an ESD. 40 CFR § 300.825 requires that an ESD be included in the administrative record and (as applicable) permits, but does not require consideration of public comments on it.

The Agencies have acknowledged the significant amount of public interest associated with the remedy selected for Operable Unit No. 2 of the Kennecott South Zone. This interest prompted the Agencies to take a proactive stance in allowing for a public review period of the proposed December 2006 ESD for thirty days (even though statutorily that review period is not required). Thirty days was judged by the Agencies to be a sufficient amount of time to allow the public to review the five-page ESD and provide comments. As such, the Agencies made it clear in the announcement of the review period that an extension would not be provided.

The ESD was made available at the offices of the Utah Department of Environmental Quality (UDEQ) and was posted on the project website supported by the UDEQ; all of which was explained as part of the newspaper advertisement and e-mailed announcement to interested stakeholders. Interested stakeholders were notified by e-mail (as they elected to have done) of the review period and were noticed of the project website link at the same time. A fact sheet was developed by the Agencies on the ESD components and was provided as part of the e-mailed notifications to the interested stakeholders. The e-mailed notifications and fact sheet also covered the notion that the review period on the ESD would not be extended.

The Agencies appreciated the receipt of the comments from the review period. It is through continued interaction with interested stakeholders that the Agencies believe the success of the remedial project for Operable Unit No.2 will be ensured.

Kennecott South Zone – Southwest Jordan Valley Groundwater Plumes OU2
U.S. Environmental Protection Agency, Region VIII
&
Utah Department of Environmental Quality

June 2007 Explanation of Significant Difference
Comment Response Summary

Response No. 4 - Complementary Remedies – CERCLA & NRD Authorities

Introduction

There was some confusion of the authorities involved in overseeing Kennecott's response actions noted in the comments submitted to Agencies. The comments pertaining to the response actions taken by Kennecott to address the concerns of the CERCLA authorities and the State of Utah Natural Resource Damage (NRD) authority (UDEQ) and the particular remedial components being overseen by both authorities (CERCLA and NRD) were confused. Please note that there are two response actions being implemented by Kennecott. Both actions are somewhat integrated with each other, but are being overseen by two different authorities (represented by the Agencies).

Authority Explanation

In December 2000 the CERCLA authorities (EPA and UDEQ) rendered a Record of Decision which selected a remedy for the acid plume of Zone A. The CERCLA authorities distinguish the leading edge of the acid plume as the isoconcentration line where sulfate concentrations are equal to or greater than 1500 parts per million, ppm (or milligrams per liter, mg/l). Groundwater in Zone A that is above 1500 ppm for sulfate represents the extent of the Zone A acid plume. Pursuant to the selected remedy (which was clarified by the 2003 ESD), Kennecott is required to pump from the core of the acid plume and to send the extracted water to the tailings pipeline. Once delivered to the tailings pipeline, the extracted waters are to be commingled with mill tailings (tailings slurry) from the Copperton Concentrator and other mine related waters that Kennecott manages, and ultimately disposed of in the Impoundment. As noted previously, the CERCLA authorities recognized that the inherent neutralization potential of the mill tailings slurry is sufficient (due to inherent neutralizing capacity of the tailings and lime added to the mill circuit) to address the mineral acidity and aqueous acidity associated with the extracted acid core water. By raising the pH of the water toward circum-neutral and causing precipitation of aluminum and iron hydroxides, the heavy metals (in the extracted acid plume water) combine in the chemical complexes formed after neutralization and are precipitated from solution and sequestered into a solid, non-hazardous precipitant.

Recognizing that Kennecott needed to reduce the acid plume over time but also prevent it from migrating, the CERCLA authorities required Kennecott to contain the acid plume waters within certain defined compliance boundaries. As part of the CERCLA selected remedy Kennecott was required to locate and/or construct a series of extraction wells along the leading edge of the acid plume in Zone A to ensure the containment of groundwater with a concentration of sulfate equal to or greater than 1500 ppm. These wells have been called the leading edge wells, the barrier wells and/or the feed water wells to the reverse osmosis treatment plant in numerous presentations and reports. The barrier wells (B2G1193, BFG1200, and LTG1147)

serve the function to prevent the leading edge of the acid plume from migrating beyond the compliance point established by the CERCLA authorities under the selected remedy listed in the ROD and clarified in the proposed December 2006 ESD.

The quality of the groundwater extracted at the barrier wells requires Kennecott to manage its potential use or disposal, not due to CERCLA hazardous substances as is the case for the groundwater extracted at the acid core wells, but because some of the dissolved contaminants are a potential Clean Water Act pollutant of concern dependent upon the intended use of the water. For most of the dissolved contaminants of concern the extracted groundwater from the barrier wells could be used as secondary water for non-consumptive use by the public or used as process water at the Kennecott mineral concentrating operation in Copperton (as it has been for some time). The CERCLA authorities assessed that both options would be allowable under the CERCLA and NCP requirements and subsequently moved to clarify the applicability of these two uses under the proposed December 2006 ESD.

The State of Utah NRD authority (UDEQ) recognized (in 1986) that the groundwater in Zone A could be used for drinking water if it were not for certain contaminants of concern. For example, some of the chemical constituents (i.e. total dissolved solids and sulfate) are above the State of Utah Primary and Secondary drinking water standards (sulfate plume of Zone A). In 1986 the State of Utah NRD authority filed a natural resource damage claim against Kennecott for the groundwater which exceeded these two drinking water quality standards (which included a portion of the aquifer that is solely being addressed by this authority, known as the Zone B plume). Groundwater has historically represented a source of potential drinking water to the State of Utah and as such is a resource held in trust by the State for the benefit of the citizens of the State. Since the State's filing, the parties involved in addressing a solution for the plume in Zone A (acid and sulfate) have recognized a joint shared benefit if Kennecott addresses the requirements of the State of Utah NRD authority at the same time the company addresses the requirements of the CERCLA authority.

Kennecott understood that it would eventually be required to extract groundwater from the barrier wells to contain the acid plume of Zone A while it worked to reduce the acid plume over time. As such, Kennecott elected to perform treatment feasibility studies (with agency oversight) on the extracted groundwater during the remedial investigation and feasibility study work required by the CERCLA authorities and completed in 1998. Kennecott intended these studies to assess if this source (barrier wells) of impacted groundwater could somehow fulfill the letter of credit reduction provisions of the NRD CD if Kennecott were to seek a reduction of the NRD Letter of Credit.

During the Trustee's assessment of the remedial investigation and feasibility study, the pilot treatment studies and the proposed NRD project the CERCLA authorities were requested to assist in the evaluation. The CERCLA authorities were already involved in evaluating the investigatory work being produced by Kennecott and its contractors as part of Kennecott complying with the responsibilities it had under the CERCLA investigation. In August of 2004 the State Trustee for Natural Resource Damages accepted (for implementation) the joint proposed project by Kennecott and the Jordan Valley Water Conservancy District (District) to the Trustee and the CERCLA authorities. Since then Kennecott completed construction of the Zone A Reverse Osmosis treatment plant (Bingham Canyon Water Treatment Plant, BCWTP) in May 2006 and began providing treated groundwater derived from the barrier wells to the residents in the affected area (as described under the various NRD project documents).

The actions implemented by Kennecott are intended to address the remedial and recovery response requirements of both the CERCLA and State NRD authorities. Both authorities have continued to be involved in overseeing Kennecott continued efforts to implement the required actions.

Proposed Water Management Section of the December 2006 Proposed ESD

In light of the two fold project that Kennecott was implementing, in the fall of 2006 the CERCLA authorities recognized a need to clarify the water management strategies that could be employed by Kennecott to properly manage the extracted groundwater derived from the barrier wells. The CERCLA December 2000 ROD required that the extracted groundwater from the barrier wells be delivered to the Zone A reverse osmosis treatment plant for treatment and provision to the public as drinking quality water. The CERCLA authorities recognized that the NCP and CERCLA statute could have included provisions allowing the extracted groundwater to be delivered as secondary water for non-consumptive use by the public or to have it delivered as process water to Kennecott's milling process circuit. Treatment to drinking water quality standards was a requirement of the NRD agreements, which the CERCLA authorities also judged to be appropriate.

As noted from the proposed December 2006 ESD, the intended clarification to the selected remedy "is to allow other management options for barrier well water including continued use by Kennecott for industrial needs or the provision of raw or treated barrier well water for any other lawful use that is both consistent with the quality of the water, previous decision documents and acceptable to EPA and UDEQ." This provision of the ESD allows for both agencies to judge a proposal by Kennecott on how it manages barrier well water once extracted. During such review UDEQ will continue focusing on the delivery of the extracted groundwater to the Bingham Canyon Water Treatment Plant to ensure fulfillment of the 2004 Three Party Agreement. As noted elsewhere, EPA has judged this management option as appropriate.

Kennecott South Zone – Southwest Jordan Valley Groundwater Plumes OU2
U.S. Environmental Protection Agency, Region VIII
&
Utah Department of Environmental Quality

June 2007 Explanation of Significant Difference
Comment Response Summary

2006 E-mails and Letters

**Comments From Mr. Dave Becker, Western Resources
Advocates – E-mail No. 06-E1**

From: "Dave Becker"
dbecker@westernresources.org
To: <thomas.rebecca@epa.gov>,
<dbacon@utah.gov>
Date: 12/8/2006 4:46 PM
Subject: Comments on Explanation of Significant
Different to Record of Decision for
Kennecott South Zone OU2 Southwest
Jordan River Valley Groundwater Plumes

Attachments: FRIENDS Comments on ESD - WJRV
Cleanup - 12-8-06.doc

Dear Ms. Thomas and Mr. Bacon,

Attached please find comments on the above-
captioned document. Thank you for the opportunity
to comment on the proposed ESD.

Regards,

Dave Becker
Staff Attorney
Western Resource Advocates
425 East 100 South
Salt Lake City, Utah 84111
phone: (801) 487-9911 fax: (801) 486-4233
dbecker@westernresources.org
<<http://www.westernresourceadvocates.org>>
www.westernresourceadvocates.org

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and exempt from disclosure **

*** XMISSION has generously donated this internet
service ***

Attachment -

December 8, 2006

Rebecca Thomas
EPA Region 8
999 18th Street, Suite 300
Denver, CO 80202-2466
thomas.rebecca@epa.gov

Doug Bacon
UDEQ-DERR Project Manager
168 North 1950 West
Salt Lake City, UT 84116
dbacon@utah.gov

Via e-mail

Re: Comments on Explanation of Significant Differences (ESD) to Record of Decision for Kennecott South Zone Operable Unit 2 Southwest Jordan Valley Groundwater Plumes

Dear Ms. Thomas and Mr. Bacon,

Please accept the following comments on the Explanation of Significant Differences (2006 ESD) to Record of Decision (ROD) for Kennecott South Zone Operable Unit 2 Southwest Jordan Valley Groundwater Plumes. We make these comments on behalf of FRIENDS of Great Salt Lake (FRIENDS).

FRIENDS has, as its mission, the preservation and protection of the Great Salt Lake ecosystem and seeks to increase public awareness and appreciation of the lake through education, research, and advocacy. The organization has long been involved in the protection and restoration of Great Salt Lake and its ecosystems, advocating for ways in which the public may enjoy these resources by fishing, birdwatching, boating, photographing, hiking and studying these natural areas. FRIENDS

has commented at every stage of the ROD and remedy process, consistently noting that the aquifer clean up jeopardized Great Salt Lake and its ecosystem.

E1-1

We appreciate the opportunity to make these comments and your efforts to elicit them as well as to consider them in the important decision making process you have undertaken. We hope that, as part of that process, you will take into account the following:

The 2006 EDS and the Underlying ROD Promise to Have Significant Adverse Effects on Great Salt Lake.

E1-2

Initially, FRIENDS wishes to emphasize that as currently envisioned, the remedy selected and implemented by the ROD, the 2003 EDS, and the 2006 EDS will have significant adverse effect on Great Salt Lake. Indeed, the ROD serves to extract contaminants from the poisoned aquifer, concentrate them and then either discharge them directly into Great Salt Lake or leave them in the tailings pond where they pose an unacceptable risk to the Lake. As a result, the remedy is not protective of human health or the environment, does not offer a permanent solution to the contamination, fails to utilize effective treatment technologies, fails to permanently reduce the volume and toxicity of the contaminants and indeed increases the mobility of these pollutants. In short, the ROD and subsequent EDSs deal with the contaminated aquifer at the direct expense of one of the most valuable and unique ecosystems in the world - Great Salt Lake. This is unacceptable and contrary to the public interest.

The local, national and international value of Great Salt Lake, its islands, and its wetlands

E1-1 The Agencies express their appreciation for the level of involvement the Friends of the Great Salt Lake (FOGSL) has had with the project to date. The CERCLA agencies acknowledge and thank the FOGSL for providing a representative to the Kennecott South Zone TRC group, which as a group has assisted the agencies in monitoring the implementation of the remedy since 2001.

E1-2 See Response No. 1 and No. 2.

cannot be overstated. Overall, 257 avian species use the Great Salt Lake ecosystem. Of these, 112 species are exclusively associated with the lake's varied wetland areas, while 117 species reportedly nest on the lake's periphery or on its islands. At least 33 species of shorebirds representing 2-5 million individuals use Great Salt Lake annually. In addition, up to 5 million waterfowl migrate through the lake each year, stopping along routes that take them elsewhere in North America or to Central and South America. Approximately 30 percent of the waterfowl migrating along the Pacific Flyway depend upon the Great Salt Lake wetlands. For these migrants, the lake provides a critical food supply, allowing them fuel up for the rest of their migrations, sometimes doubling their body weight before they leave. In recognition of its role in these international flights, Great Salt Lake is designated as one of only 19 sites in the Western Hemisphere Shorebird Reserve Network.

The importance of Great Salt Lake to the birds of the Americas is borne out by the sheer numbers that depend on its resources, including

- 80 percent of the world's population of Wilson's phalaropes,
- The largest staging concentration of eared grebes in North America,
- The world's largest breeding population of white-faced ibis and California gulls,
- Over half of the entire breeding population of snowy plovers west of the Rocky Mountains,
- More than three quarters of the entire western population of tundra swan,
- The largest breeding colony of American white pelicans, and

- One of the ten largest wintering populations of bald eagle in the lower 48 states.

The Lake boasts several protected areas including the Bear River Migratory Bird Refuge, Farmington Bay Waterfowl Management Area, Nature Conservancy Great Salt Lake Shorelands Preserve, Audubon Gilmore Sanctuary and Lee Creek Natural Area.

Not surprisingly, hundreds of thousands of bird watchers comb the shores of Great Salt Lake to be rewarded by incredible views of feeding, flying and nesting birds that journey thousands of miles to gorge on the bounty of our nation's largest inland "sea." The Lake also attracts recreationists enjoying other water-based activities such as sailing, rowing, floating, wading and kayaking. Others hike, ride horseback and mountain bike to enjoy scenery, solitude and wildlife. Great Salt Lake also supports a robust community of waterfowl enthusiasts who not only enjoy hunting but are working to preserve and protect Utah's waterfowl, its unique and rich habitat and its rich heritage.

The Reliance of the 2006 EDS and ROD on State Permitting Authority is Unfounded.

E1-3

The ROD and 2006 EDS rely heavily on the State permitting process to protect water quality in Great Salt Lake. For several reasons, this reliance is unfounded. First, in violation of the Clean Water Act, there are no numeric water quality standards for Great Salt Lake. As a result, the State cannot adequately safeguard this ecosystem.

E1-4

Second, the narrative standard for the open waters of the Lake is also inadequate. Importantly, the State does not use the narrative

E1-3 The Division of Water Quality (DWQ) has been working with various groups and with a variety of stakeholders for the past three years to collect data and information on Farmington Bay and the Great Salt Lake. Three committees, the Great Salt Lake Water Quality Steering Committee and the Great Salt Lake Science Panel and the Farmington Bay Technical Advisory Committee were formed to assist in collecting and reviewing data from the current project(s) and to provide input into the development of water quality standards for both water bodies. The issues related to these waters are numerous and complex. Briefly, they involve the extreme and variable salinity and important ecosystem responses and constraints dictated by this hyper-saline environment. In short, none of EPA's water quality criteria apply to Great Salt Lake. In addition, EPA has not published water quality criteria for nutrients. Rather, they are encouraging states to develop their own nutrient criteria and standards. Toward this end the Division has been engaged in an intensive effort for the last three years to identify meaningful biological response variables that will provide protection of the beneficial uses identified for the lake and Farmington Bay. A large part of this effort has been the organization of a Technical Advisory Committee for Farmington Bay to focus on the nutrient issue, a Science Advisory Panel for setting a selenium standard and the Great Salt Lake Water Quality Steering Committee to oversee both. The DWQ strongly supports the process where all interested parties are involved in developing standards based on sound data and judgment that are both protective of the resource and address potential issues related to municipal and industrial development and public interest

E1-4 The DWQ has adopted the narrative criteria listed in R317-2, Utah Administrative Rules, Standards of Quality for Waters of the State, to address water quality in the Great Salt Lake. In addition, all discharges, including POTWs are monitored for compliance of all toxics (e.g. metals, ammonia, etc.) with State freshwater standards. All discharges to the Jordan River, Weber River, or to Farmington Bay directly are monitored for compliance. In addition, nine stations in the north and south arms of Great Salt Lake have been monitored quarterly for nearly 30 years for major ions and a complete ICP-MS metal scan (not including mercury). Nevertheless, the Division believes that site specific standards are warranted. DWQ is currently collecting data: water chemistry, biological and habitat data in Farmington Bay to establish such standards for nutrients on a site-specific basis. The data will also be used to develop the tools necessary to assess this unique environment. The DWQ is also collecting data on the main

E1-4

standard, or even have a strategy for using this standard to protect the Lake. To date, the State has not systematically evaluated water quality in the Lake against the narrative standard, or used the standard to adjust a discharge based on some understanding of the requirements of this standard. Even if the standard were applied, it would be open to subjective interpretation and difficult to apply in any meaningful way.

E1-5

Third, because there are no numeric standards for the open waters of Great Salt Lake, the State does no waste load analysis for discharge permits for the Lake. This means that the State has no way of knowing whether water quality standards for Great Salt Lake are being met. Rather, the State relies solely on effluent limits to limit discharges into the Lake. Particularly because Great Salt Lake is a terminal basin, effluent limitations alone are necessarily incomplete and inadequate, as there is no guarantee that they are sufficiently protective of the Lake and its ecosystems.

E1-6

Fourth, by the same token, the effluent limits for the tailings discharge upon which the State relies are applicable to mining waste only. The limits do not, as a result, adequately take into account other wastes that exist in the tailings pond as a result of the aquifer cleanup - be it reverse osmosis residue or raw water from the contaminated aquifer. Therefore, these limits are insufficient to protect Great Salt Lake water quality.

E1-7

Fifth, apparently because there are no numeric standards for the Lake, the State does little or no water quality monitoring of Great Salt Lake. Examination of the EPA's STORET database bears this out - there are no long term, or even short term monitoring stations for

E1-4 (Cont.) portion of the Great Salt Lake to establish water quality standards. This initial effort is to establish a site-specific selenium standard, although DWQ anticipates a similar approach for mercury and potentially other metals as well. The Kennecott UPDES permit will be reevaluated as standards are set for the Great Salt Lake.

E1-5 See specific response to E1-3 & E1-4 above.

E1-6 See specific response to E1-3 & E1-4 above.

E1-7 See specific response to E1-3 & E1-4 above. The State has been conducting a monitoring program for nearly 30 years. The STORET numbers include: 4982000, 4982080, 4982130, 4982450, 4982500, 4982600, 4983150, 4983380, 4983100, 4983050, 4983200, and 4983000. While the amount of data at each of these sites is variable, several are data rich.

E1-7

the Lake. Again, this underscores that the State is not in a position to protect Great Salt Lake from the contaminants that result from the processes envisioned by the ROD or 2006 EDS.

E1-8

We appreciate the efforts of the State to determine a numeric standard for selenium for the open waters of Great Salt Lake. However, until a protective standard is adopted for this contaminant as well as the others that threaten Great Salt Lake water quality, the health of the Great Salt Lake ecosystem is jeopardized. This means that the ROD and 2006 EDS cannot rely on the State's permitting authority to protect Great Salt Lake. Moreover, the conclusion must be that the ROD and 2006 EDS are indeed sacrificing the ecosystems of Great Salt Lake to the ground water clean up and are not merely moving contaminants to the Lake where they can do even more harm.

Contaminants from the Aquifer are a Threat to the Great Salt Lake Ecosystem.

E1-9

The contaminants from the groundwater that will make their way to Great Salt Lake or that will threaten the Lake by their close proximity are of significant concern. This is particularly true because all assessments of the contribution of the reverse osmosis residue to the tailings line and the subsequent impact on the Lake are based on concentrations, and not on loading. There is no question that the reverse osmosis residue will add significantly to the totals of regulated contaminants discharged into Great Salt Lake. Moreover, there is no monitoring data on contaminant concentrations in the Lake and no real understanding of the impact of the loading of these contaminants on the Lake ecosystem.

That these contaminants adversely impact aquatic life and wildlife is certain. The state

E1-8 See specific response to E1-3 & E1-4 above.

E1-9 See Response No. 1 and No. 2 and specific responses E1-3, E1-4 and E1-7.

It is noted that the remedial investigations performed by Kennecott in response to the Agencies' request, and the data collected were reviewed by various organizations that have been part of an advisory council (South Zone and North Zone Technical Review Committees) to the Agencies. The Agencies note that the Friends of the Great Salt Lake are members of both advisory councils.

E1-9

and federal government have established water quality standards for inorganic substances and metals found in significant levels in the reverse osmosis residue such as chlorine, aluminum, arsenic, cadmium, copper, lead, selenium and zinc specifically because of the threat they pose to aquatic life. Indeed, such standards apply to every water body in the state other than Great Salt Lake.

The Comment Period for the 2006 ESD Should Be Extended.

FRIENDS is concerned that the public has not had sufficient opportunity or adequate disclosure of the issues raised by the 2006 ESD. Although the 2006 ESD indicates that key documents and reports are available at the West Jordan City Recorder's Office, the October 2006 Operation, Maintenance and Replacement Plan is not among the documents available there - notwithstanding that the members of the public potentially most affected by decisions related to the OU2 groundwater live closest to that repository.

E1-10

Nor is there any information provided in the draft 2006 ESD as to what alternative Water Management options are being considered in fundamentally altering the provision in the 2000 ROD that treated water from the barrier wells must be delivered to a municipal water purveyor. The lack of such information puts commenters in the untenable position of speculating on potential effects of this fundamental change without having any publicly-available data or detailed information regarding the proposed change. The Agencies should address these deficiencies in the information and documentation provided in the public notice of the draft 2006 ESD and extend the public comment period for at least 30 days after new notice to the public that full documentation

E1-10 See Response No. 3 and please refer to the introduction section of this response document.

E1-10 | is available in all document repositories.

The 2006 ESD as Proposed Represents an Inappropriate Change to a Flawed CERCLA Remedy.

The overarching purposes of CERCLA are to permanently remove hazardous substances which have been released into the environment, eliminate threats to health or the environment, and place the costs of remediation on the parties responsible for the releases. As commenters have pointed out with regard to earlier documents related to the selected remedy and Natural Resource Damages (NRD) cleanup program, the remedy selected and its implementation do not achieve the intended purpose of a CERCLA remedial action.

The remedy selected in the 2000 ROD, as modified by the 2003 ESD, effectively defeats all three purposes of CERCLA. First, hazardous substances in the contaminated groundwater are not being permanently removed from the environment - they are being moved to another location (the North Tailings Impoundment) where they are subject to minimal regulation under applicable environmental statutes. Second, in this new location, the hazardous substances pose potentially greater threats to human health and the environment than they did in the groundwater, whereas a proper CERCLA remedy should eliminate any threat from these contaminants. Finally, Kennecott, as the responsible party, is not only avoiding the cost of remediation, but has the potential under the 2006 ESD to draw further benefits from avoiding proper remediation of the contaminated groundwater by being allowed to keep and use water from the barrier wells in its processes, to dump raw water directly into the tailings line, or for treating and supplying to Kennecott's Daybreak community.

E1-11

E1-11 See Response No. 1, 2, and 4.

Remedial costs are being assumed by Kennecott during its implementation of the selected remedial responses to the CERCLA and NRD projects. Under various agreements (to include the soon to be lodged RDCD for Operable Unit No. 2) Kennecott will have the financial obligation to ensure that it continues to implement the selected response actions.

As noted during the public comment period on the NRD Joint Proposal and acceptance by the State of Utah Trustee of said proposal, Kennecott is not treating groundwater from Zone A and providing it directly to Kennecott Land's Daybreak Master Planned Community. Drinking water to the Daybreak community is derived under contract that the development has with the City of South Jordan.

E1-12

The 2006 ESD represents an opportunity for the Environmental Protection Agency (EPA) and the Department of Environmental Quality (DEQ) (collectively, "the Agencies") to correct these deficiencies in the selected remedy and extract a financial commitment from Kennecott to guarantee the permanent and proper disposal of the hazardous substances being extracted from the contaminated groundwater in the West Jordan River Valley. The Natural Resource Damages Trustee determined in 2004 that Kennecott had triggered the provisions of the 1995 Consent Decree that allowed it to begin reducing the Irrevocable Letter of Credit guaranteeing the cleanup of the contaminated aquifer - a determination which allows the responsible party potentially to escape financial commitment to the cleanup process, notwithstanding the obligation remains on paper. That determination reduced the certainty to the people of Utah that the responsible party will follow through on its obligations under the 1995 Consent Decree, and drastically reduced the leverage that the state and federal governments have to guarantee that, sooner or later, the hazardous substances in the groundwater for which Kennecott is undoubtedly liable will be permanently removed from the environment at the expense of the responsible party.

E1-13

In the 2006 ESD, Kennecott is asking for the right to change the provision of the 2000 ROD that waters extracted from the barrier wells is to be treated and delivered to a municipal water purveyor. This change increases the likelihood that the selected remedy will result in threats to the environment from the extracted but inadequately disposed-of hazardous substances in the groundwater plume, if the excess barrier water is routed directly into the tailings line. Alternatively, allowing a responsible party to

E1-12 See Response No. 1, 2, and 4. The NRD CD and the 2004 NRD Three Party Agreement are in place to ensure that the Trust Fund money provided during the settlement is used to facilitate the cleanup of the aquifer or provide a means to acquire the lost resource. Implemented response actions have to comply not only with the terms negotiated under either document but also with applicable federal, state and local regulations.

The proposed December 2006 ESD does not affect the contractual terms of the 2004 NRD Three Party Agreement.

E1-13 See Response No. 1, 2, and 4.

The proposed December 2006 ESD simply recognizes the CERCLA authority to ensure proper management of the barrier well water once extracted. It further delineates that as part of assessing proposed management options, the CERCLA authorities will ensure that the quality of the water is appropriate for the proposed management option and that all other obligations for the this water are met. As such, the treatment via RO will be ensured by the State of Utah for the length of the operating period required under the 2004 NRD Three Party Agreement.

The proposed December 2006 ESD does not contradict the NRD CD. That Decree and agreement do not allow Kennecott to utilize for its own use any of 7000 acre-feet of municipal quality water to be produced annually. Kennecott is entitled under valid water rights to utilize other water that may be extracted from the barrier wells or acid wells for purposes authorized by those water rights.

E1-13

extract contaminated water, separate out the hazardous substances and dispose of them in a minimally-regulated setting without a substantial financial guarantee of eventual remediation, and keep the resulting clean drinking water for its own profit turns the "responsible party pays" principle in CERCLA on its head. It also contradicts section V(D)(5) of the 1995 Consent Decree, which provides that "Kennecott shall not receive or beneficially use any of the surface or ground water resources provided to the public, and which are developed for credit or developed by expenditures of the Trustee pursuant to Section VD of this Decree."

Allowing Excess Water From Barrier Wells to be Used for Purposes Other Than Delivery to a Municipal Water Purveyor Contradicts the Agencies' Selected Remedy.

E1-14

A major concern of FRIENDS regarding the Southwest Jordan River Valley Groundwater Cleanup Project is the potential for adverse effects to Great Salt Lake from the methods chosen for the remedy and the implementation of those methods. The alternative selected in the December 2000 ROD requires treatment of waters from the barrier wells and the delivery of treated waters to a municipal water purveyor. December 2000 ROD at 82. In the 2003 ESD, DEQ and EPA approved a change to the remedy that allowed Kennecott to pump acid water from the heart of the plume directly to the tailings line leading to the North Tailings Impoundment, without first undergoing treatment at the reverse osmosis facility. This allowed Kennecott to potentially defer, permanently, the removal from the environment of hazardous substances in the water extracted from the acid wells.

Now, in the 2006 ESD, the Agencies propose

E1-14 See Response No. 1, 2, and 4.

The original remedy under the 2000 ROD contemplated that the acid core water would undergo pretreatment prior to being sent to the reverse osmosis treatment plant for treatment to the applicable Utah primary and secondary drinking water standards. The pretreatment was required because of the concentrations of the contaminants of concern dissolved in the acid core water. The pretreatment was to be accomplished through the use of nanofiltration. Pilot tests of the nanofiltration option determined: 1) the production volumes of feed water for the reverse osmosis plant were small, 2) the pretreated water still required pH adjustments to neutralize the water after the nanofiltration process, 3) the treatment membranes were fouled often requiring frequent plant shutdowns for maintenance or replacement activities. These issues culminated with Kennecott researching and subsequently recommending an alternative: delivery of the extracted acid core water to the Tailings Pipeline to undergo neutralization (which would allow the metals of concern to sorb to aluminum and iron hydroxide precipitants). Since the CERCLA authorities are required to ensure the proper management of extracted water in this particular case, the Agencies evaluated the option proposed by Kennecott with assistance from the South Zone TRC and rendered a clarification in the August 2003 ESD.

Please refer to Appendices A and C in the December 2002 RDRA work plan.

E1-14

under "Water Management" a "clarification" which would "allow other management options for barrier well water including continued use by Kennecott for industrial needs or the provision of raw or treated barrier well water for any other lawful use that is both consistent with the quality of the water, previous decision documents and acceptable to EPA and UDEQ." This change is unwarranted. As an initial matter, there is no question that EPA and DEQ have authority under CERCLA to regulate the cleanup of the contaminated water being drawn from the barrier wells. The courts of appeals are uniform in holding that liability under CERCLA for the costs of remedial action or NRD arises from the release of any amount of a hazardous substance.¹ Even at the edges of a release plume, where hazardous substances are present, CERCLA authority persists. Indeed, EPA has long considered the entire 200-length of the Hudson River to be a Superfund site based on contamination from PCBs, even though the area of principal concern is a 13-mile stretch in the upper reaches of the river and even though PCB levels downstream are closer to background levels for northeastern waters.

The change to water management proposed in the 2006 ESD, in addition to the change allowed in

¹ For example, the First Circuit has held that there is no minimum quantity threshold for the imposition of liability on responsible parties. United States v. Davis, 261 F.3d 1, 52 (1st Cir. 2001). In Acushnet Co. v. Mohasco Corp., 191 F.3d 69, 76 (1st Cir. 1999), the same court noted that the Ninth, Second, and Fifth Circuits agreed on this point, citing also the absence of any definition of minimum level in CERCLA's definition of a "hazardous substance" in 42 U.S.C. § 9601(14) and the broad use of the term "any person" in the liability provision in 42 U.S.C. § 9607(a).

E1-14

the handling of water from the acid wells in the 2003 ESD, could allow contaminated water (that would, by itself, likely be considered a hazardous waste) to be added back into Kennecott's tailings line for disposal of the toxic constituents in the North Tailings Impoundment. Under the 2006 ESD, the remedy for the contaminated groundwater in the West Jordan River Valley² allows Kennecott yet another avenue of permanently deferring the removal of hazardous substances from the environment. Raw contaminated water from the barrier wells could now directly increase the deposition of toxic chemicals into the North Tailings Impoundment.

E1-15

Although page 4 of the October 2006 South Facilities Groundwater OM&R Plan refers to the solids deposited in the North Tailings Impoundment as "non-hazardous treatment residuals," the heavy metals which precipitate out of the tailings line neutralization process are in fact highly toxic, even though they may not technically be "hazardous waste" under Resource Conservation and Recovery Act ("RCRA") regulations that exempt mining-related waste from the definition of "hazardous" waste. Indeed, the Kennecott mine, concentrators and power plant consistently rank as having the highest releases of toxics to land in the State of Utah. In 2003, the most recent reporting year, Kennecott accounted for 89% of the toxic releases to land - over 180 million pounds of toxic chemical releases to land - the great bulk of which go into the North Tailings Impoundment. Allowing Kennecott, through the 2006 ESD, to increase the deposition of toxic chemicals in the

² The 2006 ESD contains occasional references to the "West Jordan Valley," which should be corrected to "West Jordan River Valley" where it occurs.

E1-15 See Response No. 1 & 2

E1-15

tailings pond is a direct contradiction of the intent of the 1995 Consent Decree and the remedy selected in the 2000 ROD that the extracted groundwater be removed, treated to drinking water standards, and permanently remediated, at the expense of the responsible party.

The 2006 ESD Further Increases the Possibility of Contamination of Great Salt Lake by Increasing the Deposition of Toxic Chemicals in the North Tailings Impoundment.

E1-16

The proposed change in the allowable usage of water in Zone A, diverting the water from use for municipal drinking water, potentially allows another source of untreated, contaminated water to be added to the tailings line, increasing the concentration and quantity of toxic metals and other water pollutants in the North Tailings Impoundment. This increases the risk that storm discharge events or other upset events will result in an adverse impact to Great Salt Lake, because larger amounts of toxic metals will be stored in the tailings pond subject to unplanned discharge. If raw water from the barrier wells were sent directly into the tailings line, the increased quantity of water entering the North Tailings Impoundment could also result in larger outflows into Great Salt Lake.

The result of the 2000 ROD, the 2003 ESD, and the proposed 2006 ESD allows Kennecott to remove acid and toxic metals from an aquifer where these contaminants are regulated under CERCLA and move them, with minimal treatment for the toxic metals, into an unlined impoundment where they may not be subject to regulation under RCRA. Once in the North Tailings Impoundment, these toxic sediments are susceptible to discharge into Great Salt Lake, into the air, into the groundwater, or

E1-16 See Responses No. 1 & 2, and specific responses E1-3 and E1-4.

E1-16

onto land as a result of winds, storms, or stormwater overflow events. A rise in the level of Great Salt Lake could also cause the unregulated discharge of the toxic sediments into the lake or the lands and groundwater surrounding the Tailings Impoundment.

EPA and DEQ should use the opportunity presented by the proposed ESD to require Kennecott to create and provide a present financial guarantee against the inevitable remediation and closure of the North Tailings Impoundment.

The purpose of the 1995 Consent Decree was clearly to treat the contaminated water removed from the potential Superfund site, and EPA and DEQ extracted a promise from Kennecott to do just that in exchange for not listing the site on the National Priorities List. The 2000 ROD reflects this purpose in its remedy selection. The 2006 ESD itself reiterates that CERCLA Section 121 requires EPA to select a remedy that "uses permanent solutions" and "resource recovery technologies" to the maximum extent practicable. The extraction of metals from the contaminated groundwater, and the permanent isolation of these contaminants from the environment by disposal in a RCRA-permitted hazardous waste disposal facility, is necessary for a "permanent solution" to the contamination of the groundwater underlying the West Jordan River Valley.

Through the 2003 ESD, Kennecott escaped part of its obligation to thoroughly remediate the water extracted from the acid wells, instead transferring the contaminated water into its tailing line for Kennecott now seeks through the 2006 ESD to further minimize its remediation obligation or achieve some financial benefit from an additional change that would allow it to beneficially use water extracted from the aquifer

E1-17

E1-17 See Responses No. 1, 2, and 4.

Closure requirements for the Impoundment are within the jurisdiction of the Division of Oil, Gas and Mining (DOG M) reclamation program. Kennecott has received from DOGM a permit for the Impoundment, for which it has posted a full cost reclamation bond, which specifies the tasks to be undertaken by Kennecott at the time that the facility is no longer needed for operations. Because the Agencies have recognized the benefit from coordinating activities with DOGM, representatives from the DOGM have been members of the South Zone TRC for some time.

The NRD CD with Kennecott Utah Copper Corporation and the intervener, Jordan Valley Water Conservancy District, was a settlement to resolve the damage claim the State of Utah filed against Kennecott for the TDS and Sulfate impacted groundwater in Zone A and B. Though treatment was contemplated under the consent decree as a response action, treatment was only a requirement if Kennecott Utah Copper Corporation determined to make use of the Decree provision that allowed it to request a reduction of the Letter of Credit by providing drinking water to the public.

The NRD CD required the following primary actions: 1) Complete the federal Remedial Investigation and Feasibility Study for OU2, 2) Complete the construction of source control measures (specifically noting the completion of the Bingham Canyon Cut-off Wall), 3) Construct and operate an extraction well within the acid core of Zone A and equip the well to extract at least 400 acre-feet per year on a five year rolling average (with the understood purpose to begin reducing the footprint of the acid plume of Zone A and to contain the sulfate groundwater), 4) provide the State of Utah Trustee with a \$9 million cash settlement and a \$27 million Letter of Credit to be used by the Trustee to "restore, replace or acquire the equivalent lost resource). Furthermore the NRD CD required that response actions be performed in compliance with appropriate federal, state and local regulations.

The provisions of the NRD CD prevent Kennecott from benefiting from the use of extracted and "treated" water. The proposed December 2006 ESD does not alter this requirement, but as stated in the proposed ESD (and noted by the bolded/underlined quoted text) allows "other management options for barrier well water including continued use by Kennecott

E1-17

for its own profit, in violation of section V(D) (5) of the 1995 Consent Decree. Under that provision, Kennecott has developed the barrier well water, and received credit for doing so through the August 31, 2004 NRD Trustee Findings and Conclusions. Any use of the barrier well water by Kennecott is strictly limited by this provision, and the 2006 ESD should place a corresponding limitation on "Water Management," in place of the provision in the proposed ESD that Kennecott would be allowed to use this water for any lawful use.

E1-18

In the alternative, EPA and DEQ should use this opportunity of Kennecott's request for beneficial use of the excess water from the barrier wells to extract a financial guarantee for the eventual closure and remediation or total isolation of the hazardous substances now being removed from the OU2 groundwater and being dumped into the North Tailings Impoundment. Although the 2006 ESD reiterates that a post-closure plan will someday be developed for the mine and tailings impoundment (2006 ESD at 2, bullet point 8)³ the appropriate time to deal with the toxic chemicals derived from the groundwater of the West Jordan River Valley is now - not years from now, when it may no longer be possible to obtain financial guarantees related to a closed facility.

As a condition of any change to the remedy, the Agencies should insist on the preparation of a post-closure plan related to the hazardous substances disposed of from the OU2 cleanup, even if those hazardous substances are being placed for the time being in the tailings pond until the mine

³ The draft 2006 ESD's reference on page 2, bullet 8 to "post-mine closure plan" could be corrected to read "mine post-closure plan" to track the language in other cleanup-related documents.

E1-17 (cont.) for industrial needs or the provision of raw or treated barrier well water for any other lawful use that is both consistent with the quality of the water, previous decision documents and acceptable to EPA and UDEQ."

Deferment of the proposed listing package for the Kennecott North and South Zones was provided by the Agencies, not because of the NRD CD, but because of the 1995 Memorandum of Understanding negotiated and rendered between Kennecott Utah Copper Corporation and the Agencies. The MOU required Kennecott to undertake certain activities, including the completion of the Remedial Investigation and Feasibility Study for Operable Unit No. 2 (Zone A Acid Plume). In Response the U.S. EPA Region VIII and UDEQ agreed to take certain actions, which included reducing duplicative oversight and deferment and eventual withdrawal of the NPL listing packet.

E1-18 See Response No. 2.

E1-18

and pond are ultimately closed, and require Kennecott to open a new Irrevocable Letter of Credit or provide a similar secured financial guarantee to assure that the hazardous substances derived from the groundwater cleanup will be permanently removed from the environment.

The 2006 ESD Will Allow Kennecott to Violate the Terms of the Selected Remedy.

E1-19

On the second page of the 2006 ESD, the Agencies erroneously state that “[n]eutralization and metals removal takes place in the tailings line.” Metal removal is not achieved through the process approved in the selected remedy; rather, as the 2000 ROD states on page 82, “[a]cids would be neutralized and metals would precipitate into the tailings slurry” as a result of the insertion of water from the barrier wells into the tailings line. As discussed above, the fundamental shortcoming of the selected remedy, which the 2006 ESD does not change, is that metals are not being removed permanently from the environment, nor threats to health and the environment eliminated, by the precipitation of these metals into the North Tailings Impoundment. The 2006 ESD in final form should not include a statement that “metals removal takes place” when it evidently does not – at a minimum, this language must be conformed to the language of the 2000 ROD.

The Final Cleanup Level for Sulfate is Unwarranted Because Natural Attenuation to 500 mg/L is Unlikely to Occur.

E1-20

FRIENDS is also concerned that the hydrological conditions of the West Jordan River Valley will never achieve natural attenuation of sulfate to 500 mg/L if active remediation is

E1-19 See Response No. 1 & 2. The neutralization reaction (as supported and documented in Appendices A and C of the December 2002 RDRA work plan) does cause the metals and metalloids to precipitate from solution. Thus the metals and metalloids are removed from the water that is either recycled from the Impoundment by Kennecott into its process circuit or is allowed to be discharged in compliance with the permit limitations of the recognized “Applicable, Relevant, Appropriate Regulation”, the State of Utah UPDES program. Kennecott then manages the solids (tailings, metal hydroxides, etc.) in the Impoundment.

Operational controls at the Impoundment (such as directed solids placement, decanting of water, and various applied environmental controls) facilitate the permanent sequestration of these metals in the Impoundment, so as to permanently render them stable and unavailable. As noted previously, once sequestered in the Impoundment the metal/metalloid complexes are insoluble under the geochemical conditions prevailing in the impoundment.

E1-20 The Agencies certainly recognize that in order for natural attenuation to work for an inorganic contaminant such as sulfate, there must be a source of cleaner water to facilitate attenuation. At this time, the Agencies do not have any objective indication that there is insufficient recharge to allow for natural attenuation of sulfate when concentrations are less than 1,500 mg/l. Indeed, the Agencies are encouraged by monitoring data from the plume which indicate not only clean-up in the core of the plume as a direct result of pumping, but also declining sulfate concentrations in a number of wells on the plume margin which are affected by both pumping and natural attenuation.

E1-20

halted once sulfate has reached 1500 mg/L.⁴ The West Jordan River Valley is overdrafted, Kennecott cuts off potential fresh water recharge as a byproduct of its mine dewatering efforts, and allowing the diversion of barrier well water either to the process operations, the tailings line, or for use as drinking water in the privately-operated Daybreak community eliminates an important source of fresh water that otherwise would be available to recharge the aquifer. Without recharge sources, it is highly unlikely that there will be any natural attenuation of sulfate in the aquifer. Accordingly, active remediation of the sulfate plume below the 1500 mg/L threshold currently proposed should be required as a condition of the remedial action.

Thank you again for this opportunity to comment on the 2006 EDS. FRIENDS hopes that you will take into account its concerns when making crucial decisions regarding the aquifer cleanup. Most importantly, we hope that you will not allow efforts to clean up the aquifer to result in any additional contamination of Great Salt Lake and, in any case, that the mechanisms are in place to ensure real protection of this invaluable ecosystem.

David Becker
Joro Walker
Attorneys for FRIENDS of
Great Salt Lake

cc: Rep. Jackie Biskupski (jbiskupski@utah.gov)

⁴ The reference to "1500 ppm or less" in bullet 4 on page 2 of the 2006 ESD should probably be changed to "1500 ppm or more."

Comments From Mr. Rod Dansie – E-mail No. 06-E2

From: "Rodney Dansie" <rod@pcmw.net>
To: <dbacon@utah.gov>
Date: 12/7/2006 9:54 PM
Subject: Fw: E. S. D. unit 2 12/8/06 comments to DEQ/EPA

----- Original Message -----

From: Rodney Dansie
To: dbacon@utah.gov
Sent: Thursday, December 07, 2006 9:41 PM
Subject: E. S. D. unit 2 12/8/06 comments to DEQ/EPA

12/7/2008
Doug Bacon / D E Q

Hi Doug the following are a few comments regarding the E.S.D. proposed by DEQ-EPA
1. recomend numbering each of the 5 pages for future reference and to verify that all pages have been copied.

E2-1

2. Why does the document allow Kennecott to use "treated" water for their own use if more is produced to clean the plume. It should not go back to Kennecott for there benefit in the land developmetnt projects.

E2-2

3. I am most concerned about the addational pumping of water from the bairer wells rather than the plume area since this addational pumping will further draw down the acqifers in the South West area specifically west of Herriman and may well futher impact the existing water rights with the water going to Kennecott. (There is only so much water to pump out and this will increase that

E2-1 The State of Utah has reached a settlement with Kennecott Utah Copper for damages to groundwater resources in the Southwest Jordan Valley. This settlement is the subject of the NRD CD and the 2004 project proposal jointly made by Kennecott and Jordan Valley Water Conservancy District and approved by the State Trustee for Natural Resources in August 2004. Under the settlement, Kennecott will extract groundwater from the plume and provide a certain volume of drinking water annually for 40 years. This water is distributed to the communities of West Jordan, South Jordan, Riverton, and Herriman at discount rates by Jordan Valley. Kennecott must comply with state water rights law in its groundwater extraction and remediation program and has assigned water rights to this project to allow the extraction of water from the plume. Kennecott's water rights allow use of extracted water for drinking water production and for other valid uses.

E2-2 The remedy selected for this site by the Agencies includes extraction of water from the barrier wells. The Agencies consider this a critical component of the remedy that is intended to prevent the further migration of contaminated water to areas east of the barrier wells. Kennecott has not made a proposal to increase the extraction of water from the barrier wells and the ESD is not approving any increased extraction from these wells.

The barrier wells are located on the margin of but within the sulfate plume associated with Zone A. Additional wells are located in the core of the plume. These wells accomplish the remedial action objectives of containment and remediation.

Kennecott must comply with state water rights law in its groundwater extraction and remediation program and has assigned water rights to this project to allow the extraction of water from the plume. When reviewing the December 2002 RDRA work plan, the Agencies and members of the South Zone Technical Review Committee recognized that aquifer drawdown was a likely consequence of the proposed remedial program. In response, Kennecott articulated a process for working with third-party water right holders in the final design (see Section 4.3). This process is preserved in the October 2006 OM&R work plan (see Section 6.0).

E2-3 The primary focus of the CERCLA remedy is containing and reducing the acid plume of Zone A.

amount effecting existing water rights and the dewatering of the South West area and benefiting Kennecott by allowing the use of the industrial water for land development projects)

The recharge is already being effected since the water goes away in pipes and the recharge is gone lowering the water table. (It doesn't seem right under the 1995 consent decree)

E2-3

4. The area affected above Herriman is not getting any water municipal or industrial replaced to the area affected. (Still a problem and should be revisited in view of the additional pumping allowed under the Proposed E.S. D. unit2) This is a problem and time will show that the south west area is being dewatered by the pump and treat program since no water is going back to re-charge the area.

E2-4

5. If this extra pumping is allowed to lower Kennecott's cost of cleaning the plume and lower the costs for producing the municipal water it is at the expense of land owners, water rights holders and tax payers and should not be approved as it does not follow the 1995 consent decree.

E2-5

6. Kennecott should not be rewarded for producing copper by acid leach operations for 30 years which have polluted the water and then be paid to pump the water and clean it for their own use at the expense of tax payers. The water is to go back to the area effected and that is not happening and the area is being further dewatered by the proposed changes to the 1995 decree and clean up plan.

E2-6

7. The model should be updated to show the effect of the proposed additional pumping and how it will effect the whole South West quadrant.

E2-3 (cont.) Prior to the initiation of the remediation project by Kennecott in the early 1990's, Kennecott began a groundwater monitoring program to measure the water level elevations of the aquifer in the southwest Jordan Valley. Future monitoring data will be compared to the baseline representation to evaluate the effectiveness of the remediation and its impacts on water levels and groundwater quality in the valley. This information is reported on an annual basis to the South Zone TRC, including the Agencies. Such information will continue to be used to evaluate potential quantity or quality impacts, including reduction in contaminants and prevention of migration of the acid plume of Zone A.

Data collected through this monitoring program have shown that the aquifer has historically been over extracted and continues to drop as a function of current extractions both related and unrelated to Kennecott's remediation program. Based on the data, it has been determined that drawdown of the aquifer in the immediate area of the Zone A plume is unavoidable and necessary to contain the contamination. In the absence of this extraction, the acid contaminated water could spread to contaminate other areas of the aquifer.

Because of the potential to cause localized water level impacts the CERCLA Authorities recognized a need for Kennecott to develop procedures to address potential water level impacts caused by pumping of the acid plume.

The procedures are intended to provide an avenue for water rights owners to have their concerns addressed. If an affected water rights owner chooses not to participate in this process, or if the owner disagrees with the determination in this informal process, there is no prohibition on pursuing other available legal avenues to address the claim or concern. In addressing impacts, Kennecott will include an evaluation involving the water rights holder and consultation with the Division of Water Rights. The existence of these procedures does not affect the rights of the well owners or the rights of Kennecott or JWCD. The procedures are designed to provide a voluntary avenue to resolve potential well owner claims.

E2-4 Kennecott has not made a proposal to increase the extraction of water from the barrier wells and the ESD is not approving any increased extraction from these wells. Subsequent to the notice of the proposed December 2006 ESD and the acceptance of public comments, KUCC has

Conclusions:

E2-7

The Rod and 1995 Consent decree are not being followed and it is at the expense of the ground water and water rights in the South West and Butterfield cayan area and drainage by lowering the water tables and dewatering the mountains and giving another windfall to Kennecott for its land developments by allowing them to pump extra water and keep the cleaned up industrial water. It is a bad idea and should not be allowed as proposed.

E2-8

It is here by requested that a extension of at least 30 to 60 days be granted to allow for further investigation of the effects of the proposed E. S. D. and more public information be made avaiable and imput allowed on further investigation in to the proposed changes. IT APPEARS THAT NO ONE IS LOOKING OUT FOR THE EFFECT TO THE ENVIOREMENT AND THE DEWATERING OF THE SOUTHWEST AREA AND THE CANYONS AND WEST MOUNTAINS. SAMES AS THE LAST 150 YEARS BEFORE REGULATION. WE CAN DO BETTER. PLEASE GRANT A EXTENSION OF TIME TO GET INFORMATION AND MAKE FURTHER COMMENTS

E2-9

Comments submitted and extension of time requested for further study and comments./

Thanks J. Rodney Dansie

P. S. please cc: this memo of comments and request to addational time to investigate and write comments to

1. Max H. Dodson EPA region 8

2. Dianne R. Nielson, Ph.D. Executive Director of Utah DEQ

E2-4 (cont.) notified the Agencies of an application to the Division of Water Rights to assign additional water rights to the acidic water extraction wells in order to increase the extraction of highly-contaminated groundwater and optimize and expedite aquifer remediation. Increased extraction of acidic waters can only increase Kennecott's costs.

E2-5 See Response No. 4.

The water management option clarification of the proposed December 2006 ESD does not allow for Kennecott to get paid "to pump the water and clean it for there own use at the expense of the tax payers". The water management option does provide an opportunity to Kennecott to propose to the Agencies an alternative to managing the raw or treated water derived from the Barrier Wells. However as noted in the proposed December 2006 ESD, the Agencies will evaluate any proposal to ensure that the proposed option is lawful and "...is both consistent with the quality of the water, previous decision documents and acceptable to EPA and UDEQ." The Agencies recognize the need for Kennecott to comply with the contractual clauses of the 2004 NRD Three Party Agreement and will ensure that the water necessary to meet these clauses is not sent elsewhere.

E2-6 See introduction of this response summary concerning the purpose and rationale behind the proposed clarifications in the proposed December 2006 ESD. The proposed extraction rate for the acid core extraction wells is a minimum extraction rate that is intended to ensure containment and reduction of the acid plume in Zone A. In review of the December 2002 RDRA work plan, higher extraction rates were contemplated, modeled and found to be feasible.

The Agencies are interested in seeing the acid plumes reduced over the quickest time frame possible, hence reducing the time that this plume acts as a threat to the aquifer system in the southwest quadrant of the valley. The minimum extraction rate stated within the proposed December 2006 ESD is intended to ensure that this happens.

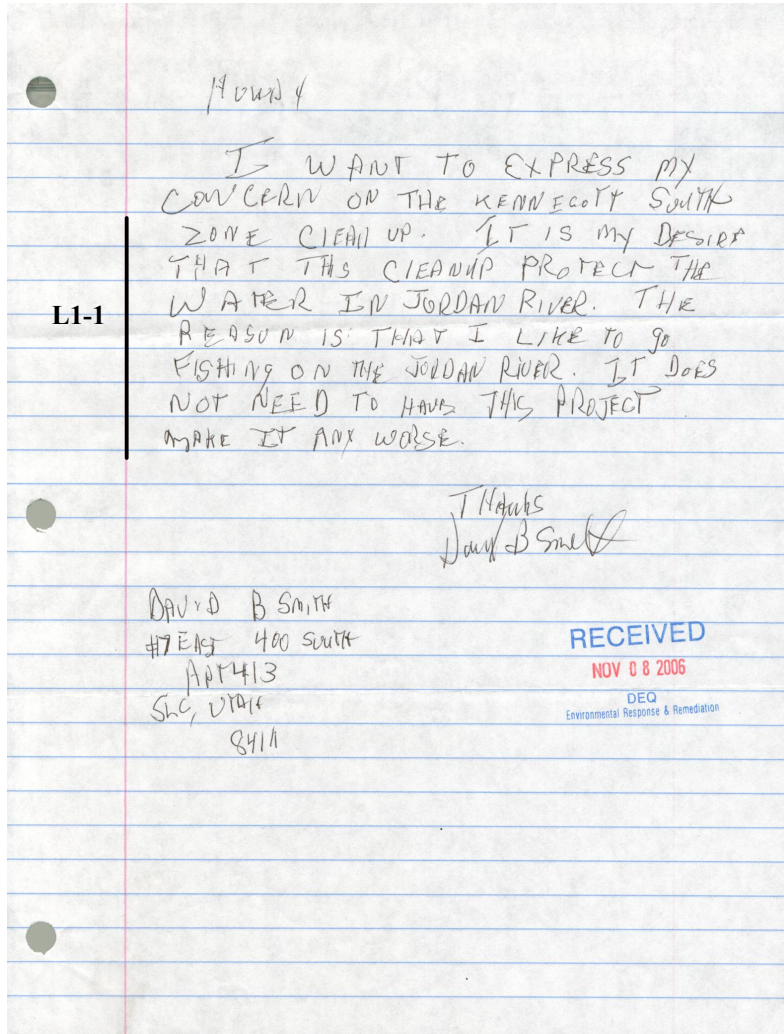
E2-7 See introduction section of this response document on the purpose of the proposed minimal extraction rate and specific responses E2-3 and E2-6.

E2-8 See Response No. 3.

E2-9 See Response No. 4.

The Agencies have been involved with overseeing the progress of the remedial activities employed at Operable Unit No. 2, since the site's initial characterization. The Agencies continue to be involved in reviewing annual remediation progress reports, reviewing Kennecott's responsiveness to third party impact claims, providing feedback to the communities in the affected area on the remediation progress, assessing and addressing issues that have or may arise that effect the environment where this work is taking place, and assessing the impact the remediation project has on the overall aquifer.

Comments From Mr. David B. Smith – Letter No. 06-L1



L1-1 See Response No. 1 & 2.

The waste water streams (extracted acid core water and reverse osmosis concentrate) derived from addressing Zone A are both being directed to Kennecott's tailings pipeline not to the Jordan River.

Kennecott South Zone – Southwest Jordan Valley Groundwater Plumes OU2
U.S. Environmental Protection Agency, Region VIII
&
Utah Department of Environmental Quality

June 2007 Explanation of Significant Difference
Comment Response Summary

Appendix

Limits	Flow MGD		pH SU		TSS mg/L		Total Cyanide (as CN) mg/L		Total Arsenic (as AS) mg/L		Total Cadmium (as Cd) mg/L		Total Copper (as CU) mg/L		Total Lead (as PB) mg/L		Total Zinc (as ZN) mg/L		Total Selenium (as SE) mg/L		TDS mg/L		Total Mercury (as Hg) mg/L		
	30DA AVG	MX 7D AV	6.5 MN VALUE	9 MAXIMUM	20 30DA AVG	30 DAILY MX	0.1 30 day Ave	0.2 Daily Max	0.25 MN VALUE	0.5 MAXIMUM	0.05 30DA AVG	0.1 30DA MAX	0.15 30DA AVG	0.3 DAILY MX	0.3 30DA AVG	0.6 DAILY MX	0.224 30DA AVG	0.5 DAILY MX	Report 30DA AVG	0.054 DAILY MX	Report 30DA AVG	Report DAILY MX	0.001 30DA AVG	0.002 DAILY MX	
																									0.005
May-01	9.1	17.4	8.26	8.52	11.5	12	0.01	0.01	0.009	0.009	0.003	0.003	0.021	0.021	< 0.005	< 0.005	0.024	0.027	0.003	0.003	8380	8530	< 0.0002	< 0.0002	
June-01			7.51	8.18	< 10.0	21	0.012	0.014	0.017	0.026	0.003	0.005	0.04	0.128	< 0.005	0.007	0.027	0.121	0.003	0.003	8292	8660	< 0.0002	< 0.0002	
July-01																									
August-01																									
September-01																									
October-01	13.8	18.7	7.36	7.93	11	19	0.029	0.029	0.055	0.079	0.005	0.006	0.044	0.061	0.005	0.005	0.042	0.055			9389	9790	0.0002	0.0002	
November-01	21.3	31.3	7.52	7.86	9.5	29	0.005	0.005	0.02	0.037	0.006	0.008	0.042	0.073	0.005	0.005	0.061	0.08			9113	9510	0.0002	0.0002	
December-01	15.9	27.6	7.45	7.85	7.4	13	0.035	0.035	0.018	0.033	0.007	0.009	0.055	0.089	0.005	0.005	0.113	0.193			8671	8671	0.0002	0.0002	
January-02	20.5	46.2	7.5	8.01	5.9	11	0.023	0.023	0.039	0.058	0.008	0.009	0.127	0.176	0.005	0.005	0.204	0.319	0.045	0.053	8622	8980	0.0002	0.0002	
February-02	29.1	46.3	7.33	8.01	5.2	9	0.026	0.026	0.022	0.029	0.008	0.009	0.068	0.111	0.005	0.005	0.159	0.214	0.041	0.049	8563	8930	0.0002	0.0002	
March-02	13.7	29.3	7.43	8.13	7	15	0.027	0.027	0.015	0.022	0.006	0.007	0.06	0.105	0.005	0.005	0.105	0.136	0.032	0.043	8104	8520	0.0002	0.0002	
April-02	5.9	23.8	7.96	8.79	13	21	0.011	0.011	0.029	0.052	0.006	0.007	0.049	0.078	0.005	0.005	0.089	0.125	0.039	0.042	8052	8510	0.0002	0.0002	
May-02	10.4	16.5	7.94	8.32	11	16	0.005	0.005	0.054	0.075	0.006	0.007	0.039	0.055	0.005	0.005	0.054	0.077	0.036	0.045	8133	8610	0.0002	0.0002	
June-02	3.85	20	7.87	8.33	8	16	0.006	0.006	0.051	0.078	0.005	0.006	0.036	0.068	0.005	0.005	0.047	0.162	0.034	0.045	8612	9180	0.0002	0.0002	
July-02	0.43	12.7	7.94	8.06	8	9	0.005	0.005	0.049	0.049	0.005	0.005	0.028	0.029	0.005	0.005	0.025	0.026	0.05	0.051	8755	9030	0.0002	0.0002	
August-02	1.4	16.95	7.43	7.92	8	9	0.021	0.021	0.045	0.053	0.006	0.006	0.032	0.035	0.005	0.005	0.021	0.025	0.047	0.051	9075	9310	0.0002	0.0002	
September-02																									
October-02																									
November-02	21.4	47.6	7.8	7.97	12	27	0.012	0.012	0.014	0.019	0.004	0.005	0.038	0.058	0.005	0.005	0.034	0.049	0.042	0.048	6285	6680	0.0002	0.0002	
December-02	33.6	48	7.65	7.98	10	26	0.046	0.046	0.015	0.02	0.004	0.004	0.036	0.055	0.005	0.005	0.034	0.044	0.038	0.04	6176	6450	0.0002	0.0002	
Average FY 02	14.03	30.74	7.69	8.15	8.81	15.90	0.018	0.018	0.033	0.046	0.006	0.007	0.051	0.077	0.005	0.005	0.077	0.118	0.040	0.047	8038	8420	0.00020	0.00020	
January-03	39.2	46.9	7.3	8.01	9	21	0.045	0.045	0.02	0.025	0.004	0.007	0.034	0.053	0.005	0.009	0.044	0.058	0.037	0.04	6228	6620	0.0002	0.0002	
February-03	27.6	42.4	7.56	8.11	9	14	0.06	0.06	0.013	0.016	0.004	0.004	0.034	0.043	0.005	0.005	0.041	0.051	0.035	0.038	6075	7110	0.0002	0.0002	
March-03	18.6	42.5	7.3	7.98	9	23	0.015	0.015	0.017	0.022	0.004	0.005	0.043	0.07	0.005	0.005	0.052	0.059	0.041	0.046	8706	9090	0.0002	0.0002	
April-03	7.2	26.7	7.2	8.06	15.3	24	0.01	0.01	0.018	0.022	0.004	0.005	0.06	0.185	0.005	0.006	0.039	0.052	0.046	0.05	7692	8150	0.0002	0.0002	
May-03	19.1	26.1	7.01	7.9	11.9	20	0.005	0.005	0.058	0.149	0.004	0.005	0.049	0.103	0.005	0.005	0.035	0.055	0.036	0.043	7684	7990	0.0002	0.0002	
June-03	17.5	26.4	7.38	8.34	12.5	16	0.01	0.01	0.04	0.062	0.004	0.005	0.042	0.07	0.005	0.005	0.032	0.075	0.04	0.045	7816	8440	0.0002	0.0002	
July-03	11.6	25.9	6.95	7.85	10	17	0.007	0.007	0.029	0.035	0.003	0.004	0.035	0.052	0.005	0.005	0.035	0.067	0.037	0.041	8062	8310	0.0002	0.0002	
August-03	6.1	20.4	6.93	7.4	13	40	0.008	0.008	0.049	0.089	0.003	0.004	0.029	0.049	0.005	0.005	0.03	0.064	0.033	0.039	7843	8000	0.0002	0.0002	
September-03	6.8	27.5	6.94	7.42	11.9	23	0.008	0.008	0.195	0.227	0.005	0.005	0.039	0.048	0.005	0.005	0.026	0.039	0.031	0.035	7945	8190	0.0002	0.0002	
October-03	17.8	29.1	7.02	7.62	11.5	28	0.012	0.012	0.176	0.227	0.006	0.011	0.038	0.051	0.005	0.005	0.024	0.036	0.031	0.035	8133	8480	0.0002	0.0002	
November-03	24.2	43.5	7.05	7.87	15.1	60	0.02	0.02	0.065	0.117	0.007	0.009	0.037	0.067	0.005	0.005	0.029	0.053	0.033	0.038	7952	9270	0.0002	0.0002	
December-03	17.2	40.5	7.14	7.43	7	19	0.013	0.013	0.045	0.071	0.006	0.007	0.03	0.041	0.005	0.005	0.029	0.036	0.033	0.038	7401	7550	0.0002	0.0002	
Average FY 03	17.74	33.16	7.15	7.83	11.27	25.42	0.018	0.018	0.060	0.089	0.005	0.006	0.039	0.069	0.005	0.005	0.035	0.054	0.036	0.041	7628	8100	0.00020	0.00020	
January-04	32.6	42.6	6.9	7.67	6.5	18	0.005	0.005	0.069	0.107	0.006	0.007	0.03	0.047	0.005	0.005	0.032	0.04	0.033	0.035	7375	7680	0.0002	0.0002	
February-04	21.6	41.7	7	7.46	11.5	28	0.005	0.005	0.071	0.226	0.005	0.008	0.021	0.026	0.005	0.005	0.038	0.053	0.033	0.036	7239	7400	0.0002	0.0002	
March-04	5.6	39.2	7.67	7.9	3.8	5	0.008	0.008	0.402	0.726	0.003	0.004	0.023	0.025	0.005	0.005	0.022	0.025	0.034	0.037	6323	6490	0.0002	0.0002	
April-04	19.7	31.3	7.15	8.83	12	18	0.008	0.008	0.166	0.201	0.004	0.006	0.033	0.047	0.005	0.005	0.018	0.026	0.034	0.039	6726	7170	0.0002	0.0002	
May-04																									
June-04																									
July-04	22.1	32.1	7.22	7.65	6	18	0.005	0.005	0.096	0.135	0.005	0.006	0.032	0.064	0.005	0.005	0.027	0.03	0.027	0.03	8188	8800	0.0002	0.0002	
August-04																									
September-04																									
October-04	23.8	30	7.04	7.61	4.5	17	0.005	0.005	0.08	0.093	0.005	0.007	0.036	0.058	0.005	0.005	0.023	0.036	0.027	0.031	840	840	8.9E-07	8.9E-07	
November-04	0.12	0.12	7.1	7.1	3	3	0.018	0.018	0.018	0.018	0.002	0.002	0.02	0.02	0.005	0.005	0.203	0.203	0.002	0.002	840	840	8.9E-07	8.9E-07	
December-04	19.2	42.8	7.1	7.49	6.9	27	0.013	0.013	0.054	0.08	0.005	0.007	0.028	0.051	0.005	0.005	0.02	0.027	0.03	0.032	8436	8680	0.0002	0.0002	
Average FY 04	18.09	32.48	7.15	7.71	6.78	16.75	0.008	0.008	0.120	0.198	0.004	0.006	0.028	0.042	0.005	0.005	0.048	0.055	0.028	0.030	5746	5988	0.00015	0.00015	
January-05	42	32.5	7.11	7.48	4.8	12	0.014	0.014	0.032																