OK
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From: "Rodger C. Fry" <rcfry@attbi.com>
To: "Mike Suflita" <MIKESUFLITA@utah.gov>
Date: 10/9/02 3:28PM
Subject: Re: Pacificorp Comments

Mike, I have reveiwed the comments and agree with all of the PacifiCorp Comments.

Thanks for sending this to me for review.

Rodger Fry
----- Original Message -----
From: "Mike Suflita" <MIKESUFLITA@utah.gov>
To: <rcfry@attbi.com>
Sent: Wednesday, October 09, 2002 1:59 PM
Subject: Pacificorp Comments

Rodger,

Would you please review the following to see whether I've interpreted your remarks correctly. Other comments are welcome as well.

Mike

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Pacificorp Investigations

On July 31, 2002, the Division received a packet of charts and graphs from Darce Guymon, Engineering Technician, of Pacificorp. He expressed concern that Electric Lake was losing water and that this might be due to the inflows to Skyline Mine. On September 19, 2002 Pacificorp representatives Rodger Fry, Geologist, and Carly Burton, Hydrologist, came to the Division to discuss concerns they had regarding a possible connection between Electric Lake and Skyline Mine. The Division requested, and Pacificorp provided, copies of their investigations done to that time. They are summarized below. In the following discussions, "positive inflows" mean that the total inflow to the lake is greater than the total outflow. "Negative inflows" means the total inflow to the lake is less than the total outflow. That is, a negative inflow means the lake is losing water.

Date vs. Calculated Inflow

Division Comment: There is a graph of Date vs. Calculated Inflow, cfs for Electric Lake. The time span is from 1974 to 2001. There is an obvious peak during the spring of every year and inflows are all positive with three exceptions. There are two brief negative spikes, perhaps for one monthly reading, during1989 and 1991. However,

in the fall of 2001, the inflows went negative and stayed there for about 5 months. Inflows went positive thereafter as winter precipitation accumulated.

Pacificorp Comment: The gates were closed to begin filling the lake on November 27, 1973. Fall of 2001 was the first time in the history of the lake that inflows went negative and stayed there for any length of time. Since a large inflow of 4,700gpm to Skyline Mine occurred on August 16, 2001 it's believed the two events might be connected. The inflows are calculated or imputed and not measured. Pacificorp started measuring lake inflows in June 2002.

Elevation vs. Date

Division Comment: There are two graphs of Lake Elevation vs. Date. One covers the time period of 1985 to 1993 and the other from 1994 to 2002. There is an annual rise in elevation as the lake fills each spring. There is also a "flattening" of the curve as the lake empties with water usage each fall. There is a characteristic slope to the flattened part of the graph each year, which shows the rate at which the lake is being emptied. While the slopes during the years 1995 through 2000 remain relatively constant, the slope for 2001 to 2002 is sharply steeper. Approximation from the graph shows it to be about 3.8 times steeper.

Pacificorp Comment: The sharply steeper slope during 2001 to 2002 indicates the lake is emptying much faster during that time period than any other time shown on the graphs. Since the mine had significant inflows during that time, the two occurrences may be connected.

Division Comment: The Division determined the average Palmer Hydrologic Drought Index (PHDI) for each of the years to be as follows:

Year	PHDI	Year	PHDI	Year	PHDI
1985	3.76	1991	-0.96	1997	2.62
1986	3.55	1992	-2.33	1998	3.55
1987	-1.78	1993	2.24	1999	3.55
1988	-3.32	1994	0.05	2000	-1.92
1989	-3.11	1995	3.00	2001	-2.42
1990	-3.21	1996	1.24	Thru 7/2002	-1.5 prelim.

Division Comment: Notice that the 2000 to 2002 time period is a "mild to moderate drought" (as defined by the National Climatic Data Center). This may explain some of the increased slope steepness. The steep 2001 to 2002 slope is also presented on the 1985 to 1993 graph. The flattened slopes during this period vary considerably with o
ne, 1986,
being steeper than the rest. When compared to the 2001 to 2002 slope, the latter is 1.6 times steeper. Notice that 1985 and 1986 were markedly wet years and the slope was still steep.

Lost Water

Division Comment: A graph titled, Electric Lake Comparison of

Computed vs. Measured Inflows was provided. The vertical axis is CFS of Water and the horizontal axis is Date in 2002. The time span is from 19 June to 27 July. Another similar graph covers the time period from 01 Aug to 31 Aug. A bar on each day shows Computed Inflow, Measured Inflow, and Missing Water. During the period from 13 Aug to 25 Aug the Missing Water becomes noticeably greater. The pump at JC-1 was apparently shut off during this time. This would stop the 2,000-gpm inflow to the lake and logically increase the Missing Water.

Pacificorp Comment: These graphs plot Computed Inflow minus Measured Inflow = Missing Water. Based on these graphs, and other calculations, "Our calculations show over twenty acre-feet per day is being lost for which we cannot account through storage change, releases, or evaporation."

Division Comment: Another graphic was provided by Pacificorp showing the lake conceptually as a bowl. All inflows and outflows are plotted for the time period from June 19 to August 31. The net result is 1521 acre-feet of water missing for that time period. That is 20.8 acre-feet per day of Missing Water. The 1521 acre-feet over 73 days converts to 4,714 gpm. Interestingly, the estimated inflow at 10-Left in Skyline Mine is 4,700 gpm. See Dwg. PHC A-2 of this amendment. This is a striking comparison. However, it may just be coincidence since no cause and effect relationship has been established.

Resistivity Survey

Division Comment: At the Division's request, Pacificorp submitted a report titled, PACIFICORP, ELECTRIC LAKE RESISTIVITY SURVEY, By Geo-Western, July 2002. Two maps and several sheets of plotted resistivity data accompany the 8-page report. The designations JCR- 1, 2, 3, 4, and 5 are east-west lines located 1,000 feet apart. They are all located on the east side of Electric Lake between the wells in James Canyon to the north and Electric Lake on the south.

The Results and Conclusions section of the report includes the following observations.

@ "The area stretching through lines JCR-1, JCR-2 and JCR-2, for a minimum distance of 3,000 feet North to South, and from 4 East to 14 east for an East-West distance of 1000 feet appears to contain considerable water. The center of this zone is cut by the inferred North-South fracture* This fracture is presently producing 2,500 gpm on the same fracture roughly 2,500 feet North of JCR-1."

@ "Resistivity and IP data collected over the zone appears to suggest a resistive zone at or below the 8,500 foot elevation mark"

@ "Three inferred fractures which are expected to contain fresh water above the 8,500 foot elevation are noted on line JCR-3. All three are expected to contain fresh water at least 300 feet above the 8,500 foot mark and continuing to at least the 600 foot depth."

@ "High resistivity intersects on line JCR-4* all indicate the

presence of fresh water at least 200 to 300 feet above the 8,500 foot elevation."

Division Comment: The fracture discussed above is the fault that runs between the mine inflow at 10_Left and Electric Lake. The accompanying maps show the same two faults shown in the HCI report that extend through both the mine and the lake. This resistivity study establishes a more accurate and precise location of the faults. In addition, they show 3 inferred fractures between those faults, one inferred fracture west of the west-most fault, and one inferred fracture east of the east-most fault. This establishes the area to be faulted and fractured.

Division Comment: The Division checked Pacificorp records and determined the average water surface of Electric Lake during July (the time of this survey) was 8,505 feet. The resistivity survey appears to

establish that the entire area between the lake and the mine contains "considerable water" at depths below 8,500 feet. Also, there are two main faults and five inferred faults, all north-south trending, in that same area. The elevation of the water found is consistent with the lake surface elevation during the time of the testing. These conditions are all conducive to water transfer from the lake to the mine. However, the resistivity survey did not actually indicate water flows of any kind.

AquaTrack Survey

Division Comment: At the Division's request, Pacificorp submitted a report titled, ELECTRIC LAKE SURVEY, DRAFT COPY ONLY. This report was prepared by Sunrise Engineering, Inc., Aqua Track. No date is given, but reportedly the work was done in August 2002. The report is preliminary and consists only of 6 sheets of 11"x17" paper. There is no written narrative and no explanation of the material. The last 4 sheets appear to be cross sections of electric field strength at several locations taken perpendicular to the preferred underground water path.

Pacificorp Comment: Verbal explanation by Rodger Fry, Geologist, indicates the first two sheets are a graphic representation indicating a preferred path for underground water. That is, the electrical signals used in this survey show where water would likely flow underground.

Division Comment: The preferred underground water path runs from Electric Lake to the James Canyon well, which is located directly above the mine inflow at 10-Left. This suggests that there is a path for water to follow between those two locations. However, there are some inconsistencies. The preferred path does not actually follow either of the two main faults between the lake and the mine. Going from north to south, the path crosses the east-most fault twice (at very low angles) and then turns northwest to run alongside the west-most fault. The path ends at the James Canyon wells. These inconsistencies might be explained by the results of the resistivity survey. That found the whole area to contain "considerable water" and, in addition to the two main faults, there were 5 inferred fractures in the area. These faults and inferred fractures are in the preferred path indicated in this

AquaTrack survey.

Division Comment: The Division requested, and received, a technical paper titled, "TRACKING, MAPPING, MONITORING, AND DEVELOPING OUR GROUNDWATER RESOURCES." Montgomery, Kofoed, and Sellers authored this paper. It was sent by email from Val O. Kofoed, of Sunrise Engineering, on 9/24/02. The paper presents the electromagnetic principles underlying the AquaTrack technology. While informative and very helpful, the contents will not be reviewed here. Two comments from the paper important to this discussion are presented below.

@ The technology "* can be used to*infer the shape, location, and path of the channel or porous zone used by the subsurface water being energized."

@ "At this point in the development of AquaTrack, it is not possible to determine the quantity or quality of groundwater present."

Division Comment: These parameters do not include any indication of flow, with attendant direction and amounts.

Michael Suflita
mikesuflita@utah.gov

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