YEAR-END REPORT
FOR THE 2010 FIELD SEASON
AT LEVIATHAN MINE

Alpine County, California

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1. INTRODUCTION

Leviathan Mine is a former sulfur mine that the State of California acquired in the early 1980s to address water quality problems caused by historical mining. Jurisdiction over Leviathan Mine rests with the State Water Resources Control Board, which, in turn, has delegated jurisdiction over cleanup work to the California Regional Water Quality Control Board, Lahontan Region (Water Board). On May 11, 2000, the United States Environmental Protection Agency (USEPA) placed Leviathan Mine on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List, thus making Leviathan Mine a federal Superfund site.

On July 19, 2000, pursuant to its authority under CERCLA, USEPA issued an Administrative Abatement Action (AAA) to the Water Board and directed the Water Board to implement certain pollution abatement and site monitoring activities at Leviathan Mine. With slight modifications, USEPA subsequently reissued the AAA in 2001, 2002, 2003, 2004, and 2005. In its 2005 AAA, USEPA decided, instead of issuing the AAA every year, to allow its Remedial Project Manager to notify Water Board of the necessity to continue the Work for an additional year, for each year that the first phase of Non-Time Critical Removal Action (NTCRA) continues.

This Year-End Report for the 2010 Field Season at Leviathan Mine (Year-End Report) has been prepared by the Water Board for the USEPA. This Year-End Report was prepared to comply with Paragraph No. 50 of USEPA's July 14, 2005 AAA, which states:

> "Within thirty (30) days after the LRWQCB [Water Board] concludes that the seasonal work on the NTCRA has been fully performed, the LRWQCB shall so notify EPA and shall schedule and conduct a pre-certification inspection to be attended by the LRWQCB and EPA. The pre-certification inspection shall be followed by a written report submitted within ninety (90) days of the inspection by the LRWQCB's Project Coordinator certifying that all work to date on the NTCRA has been completed in full satisfaction of the requirements of this Administrative Action."

The pre-certification inspection occurred on October 26, 2010. In a letter dated January 19, 2011, Water Board staff requested an extension of the due date for the 2010 Year-End Report until February 24, 2011. The USEPA granted the requested extension in a letter dated January 31, 2011.

This Year-End Report constitutes the "*written report*" as referenced in Paragraph No. 50 of the AAA, and contains year-end summaries of Water Board field activities performed in 2010. The activities required of the Water Board by the USEPA are described in Paragraph No. 37 of the AAA. These activities consist of:

1. Summer treatment of Acid Mine Drainage (AMD) captured year-round in a series of ponds;
2. Site maintenance of ponds, drainage and diversion channels, and gates and fences; and
3. Site monitoring of water quality, water quantity, and meteorological information.

Water Board staff conducted the above-listed activities in accordance with the *2010 Work Plan for Leviathan Mine, Alpine County, California* (Work Plan) prepared by the Water Board. The Work Plan was approved with comments by the USEPA on June 30, 2010.

This report describes the site activities performed in 2010, and is organized into the following sections:

- A background section that describes the site setting and history; collection and storage of AMD; and the treatment process;
- A sludge removal and pond water treatment section describing the removal and disposal of sludge and treatment of AMD in 2010;
- A site surface water monitoring section; and
- A site maintenance section.

Pond water treatment data are summarized in 5 tables (A-1 through A-5) in Appendix A. Laboratory reports and electronic data deliverables for pond water and surface water samples, USGS flow and stage data, and meteorological data are included as electronic files on the enclosed disc and organized into Appendices B through E.

2. BACKGROUND

2.1 SITE SETTING AND HISTORY

Leviathan Mine is located on the eastern slope of the Sierra Nevada Mountains in Alpine County, California (Figure 1). The mine is approximately six miles east of Markleeville, California and five miles west of Topaz Lake, Nevada. Based on the Final Title Search and Survey Report conducted by Science Applications International Corporation (SAIC) for the USEPA on January 31, 2000, the Leviathan Mine encompasses thirty-two patented mineral claims and a patented mill site. The majority of land disturbed by mining activities is on state-owned property, with the remainder of the disturbance located on property owned by the United States Department of Agriculture, Forest Service, Humboldt-Toiyabe National Forest (USFS). The USFS owns the majority of land surrounding the mine according to the above-mentioned SAIC report, with the exception of ten private parcels along the southern boundary of the mine site.

Leviathan and Aspen Creeks (Figure 2) flow across the mine site and join below the mine. Approximately 1.5 miles downstream of the confluence of Leviathan and Aspen Creeks, Leviathan Creek joins Mountaineer Creek. The combined flow of Leviathan and Mountaineer Creeks forms Bryant Creek. Approximately 3.5 miles downstream of the confluence of Leviathan and Mountaineer Creeks, Bryant Creek flows across the Nevada state line. Approximately 1.8 miles downstream of the Nevada state line, Doud Springs enters Bryant Creek. Just below this confluence, an irrigation ditch seasonally diverts flow from Bryant Creek to the River Ranch property. Approximately 1.5 miles downstream from the irrigation diversion, Bryant Creek joins the East Fork of the Carson River.

Historical mining activities at Leviathan Mine included underground and open pit extraction of sulfur-rich ore. These activities resulted in the exposure of naturally occurring sulfide minerals to air and water. This exposure triggered a series of chemical reactions that caused local groundwater to become acidic and metal-rich. The acidic groundwater discharges from an old mine tunnel as well as seeps at several locations within the Leviathan Mine site. When this AMD enters local surface water bodies, it adversely affects water quality, which, in turn, affects algae, insect, and fish growth, and damages the in-stream habitat through deposition of metal-rich precipitates.

The Water Board has implemented several projects to abate AMD from entering local surface water bodies. In 1985, the Water Board completed construction of a pollution abatement project at Leviathan Mine to address certain specific problem areas. This project included the construction of AMD storage and evaporation ponds, which are a major component of the Water Board's pond water collection and treatment activities.

2.2 AMD Collection and Storage

The 1985 pollution abatement project included construction of five lined evaporation ponds (Figure 3) to capture and evaporate AMD from remnant underground mine workings. The primary sources of AMD to the pond system are the Adit and the Pit Under-Drain (PUD).

- The Adit is the location where acidic groundwater emanated from a remnant tunnel excavated during underground mining activities in the 1930s. The exact condition of the interior of the tunnel is unknown, but the tunnel is collapsed at its portal. The approximate location of the tunnel and other site features are shown in Figure 3. As part of the 1985 pollution abatement project, the Water Board's contractor installed an underground drain to collect acidic groundwater emanating from the Adit. The underground drain consists of a 12-inch-diameter perforated pipe in a bed of drain rock. The perforated pipe is connected to a non-perforated 12-inch pipe that carries the AMD to a concrete flow control structure (FCS). AMD from the Adit has a pH of less than 3.0 and typically has a discharge rate between 9 and 15 gallons per minute (gpm) with rates as high as approximately 42 gpm (flow data collected from1999 to present).
- The Water Board's contractor installed the PUD during construction of the 1985 pollution abatement project to dewater saturated soils in the bottom of the open pit prior to backfilling the pit to its current elevation. The PUD consists of approximately 1,500 linear feet of 12-inch-diameter perforated pipe set in a bed of drain rock beneath the pit bottom, buried in pit backfill material. The perforated pipes connect to a non-perforated 18-inch-diameter pipe that conveys the PUD discharge to the FCS. AMD from the PUD has a pH of less than 3.0 and typically has a flow rate between 0.1 and 4 gpm, with rates as high as approximately 38 gpm (flow data collected from 1999 to present).
- The five evaporation ponds (Ponds 1, 2 South, 2 North, 3, and 4; see Figure 3) cover a combined surface area of approximately 12.8 acres with a cumulative holding capacity of approximately 16.5 million gallons based on an October 1998 survey conducted by ARCO Environmental Remediation, LLC. AMD from the FCS can be routed directly to Leviathan Creek or to the pond system via a weir

gate. When the AMD is directed to the pond system, it can be distributed by gravity to any combination of Ponds 1, 2 South, and 2 North via a series of valves, as these ponds are interconnected and are at the same elevation. These three ponds are commonly called the "upper ponds" and have a combined volume of approximately 14 million gallons. Pond 3 can receive overflow from the upper ponds by gravity via PVC overflow pipes. Overflow from Pond 3 flows in PVC piping and can be directed by gravity, via valves, to either the Leviathan Creek or to Pond 4. Pond 4 overflows directly to the Leviathan Creek via PVC piping.

- In 2010, no AMD was routed directly from the FCS to Leviathan Creek. Also, Pond 3 received no overflow from any of the upper ponds.
- Currently, Pond 4 is isolated from Pond 3, via valves, and is being utilized by Atlantic Richfield Company (ARCO) for storage and treatment of other AMD sources.

2.3 Pond Water Treatment (PWT) Plant Process

The Water Board treats and discharges treated pond water during the summer months using the PWT Lime Treatment System (Plant). These activities renew pond storage capacity for the subsequent winter and spring months. The Water Board assembled the Plant during the 1999 field season on the northeast corner of Pond 1 and tested the process at full-scale during the 1999 and 2000 field seasons. The Water Board has continued to operate the Plant during the summer months from 2001 through 2010. The typical Water Board field season at Leviathan Mine runs from mid-June through mid-October.

The Water Board's treatment of AMD contained in the pond system is accomplished through lime neutralization. The neutralization of AMD by the addition of lime has long been accepted as an effective means to raise pH and remove metals in AMD. Lime (calcium hydroxide or $Ca[OH]_2$), is mixed into the AMD from the pond system; the addition of lime causes an increase in pH and the precipitation of dissolved constituents, including metals, contained in the AMD. The precipitated solids are settled out of solution in an earthen clarifier called the Pit Clarifier, and the final products are: 1) a practically metal-free effluent with near neutral pH, and 2) a metal-rich waste sludge.

The Plant, which has also been referred to as the Pond 1 lime treatment plant because the treatment system is located on the north side of Pond 1, treats the AMD stored in the three upper ponds. The Plant draws the AMD from Pond 1 for treatment, thereby lowering the water elevation of Pond 1. The lower water level in Pond 1 causes AMD from Pond 2 North and Pond 2 South to flow by gravity to Pond 1 to be treated by the treatment system. As pond water levels decline toward the end of the treatment season, portable transfer pumps have to be used to move water from Ponds 2N and 2S to Pond 1. The Plant conveys the treated AMD and suspended precipitated solids to the Pit Clarifier located in the bottom of the Leviathan Mine open pit. The Pit Clarifier has plan dimensions of approximately 150-feet by 150-feet, and includes a gravel/sand covered perforated pipe underdrain and a 10-inch diameter PVC decanting device, known as the piccolo decant structure.

3. 2010 SLUDGE REMOVAL AND POND WATER TREATMENT

3.1 Sludge Removal and Disposal

As the first task of 2010 field season, approximately 598 tons of sludge generated during operation of the 2009 PWT was removed from the Pit Clarifier by the Water Board's contractor, DECON Environmental Services, Inc. (Decon), in late June 2010. The sludge had been sampled, analyzed, and characterized in the fall of 2009; the results were reported in the Water Board's 2009 year-end report. The sludge was hauled to a Class I hazardous waste landfill in Beatty, Nevada for disposal. Hazardous waste manifests are available for review at the Water Board's office in South Lake Tahoe. After the completion of sludge removal and hauling, Decon replenished the approximately 4-inch-thick sand drainage layer at the bottom of the Pit Clarifier in preparation for receiving treated AMD in summer 2010.

3.2 2010 Pond Water Treatment Plant Operation

The Water Board contracted with Decon for Plant operations for the 2010 field season. AMD treatment began in early July, with the first treated water entering the Pit Clarifier on July 9. Discharge to Leviathan Creek began on July 19, and treatment ceased on September 1, 2010 after all the AMD contained in the upper ponds was successfully treated. Decon chose to operate the Plant 24 hours per day, 5 days per week in July and about half of August, and during daylight hours, 5 days per week for the remainder of the treatment season.

As in 2008 and 2009, Decon used dry lime and made up lime slurry on site to neutralize AMD from the pond system. In 2010, dry lime was delivered to the site in pallets containing 50 pound bags. Decon staff mixed an approximately 15 percent by weight lime slurry (using Leviathan Creek water from upstream of the mine) in a 1000-gallon polyethylene tank during daily operations. As in 2009, Decon used a single point lime addition in 2010. This is a modification from past years where a two-point lime addition was used. A second lime addition point was available, if needed, as discussed below.

Depending upon Decon's desired plant influent flow rate, one or two 5-horsepower (hp) electric pump(s) conveyed AMD from Pond 1 to a 10,000-gallon fiberglass reaction tank (R-1). As in 2009, Decon used a single point lime addition in 2010 that relied on an in-line manifold with static mixers to combine a pre-set amount of lime slurry with the AMD before the mixture reached tank R-1. The lime slurry raised the pH of the AMD from approximately 2.5 to approximately 8.5, as measured in R-1.

The AMD, lime slurry, and precipitate mixture (fluid mixture) flowed by gravity from R-1 through a two-chambered combination flash/flocculation mix tank (FF-1) and into a Lamella clarifier (CL-1). Decon used two mixers in the flash/flocculation tank and two mixers in CL-1 to maintain high mixing energy and keep the precipitated solids in suspension. A 1.5-inch air diaphragm pump removed settled precipitates from the bottom of CL-1 and discharged the solid-rich fluid into the outflow of CL-1 to keep precipitated solids from clogging the bottom of the clarifier.

The fluid mixture from CL-1 flowed by gravity to a second 10,000 gallon fiberglass tank referred to as R-2, which contained a 7.5 hp mixer. A pH probe in R-2 measured pH and, if necessary, metered additional lime slurry to R-2. This second lime addition was rarely needed in 2010. The fluid mixture then flowed by gravity through a second flash/flocculation mix tank (FF-2) equipped with a 5-hp mixer.

The fluid mixture flowed by gravity from FF-2 into a second Lamella clarifier (CL-2). A polyacrylamide polymer solution was injected into the fluid mixture at the bottom of CL-2 to promote flocculation and solids settling in the Pit Clarifier. Two 10-hp mud pumps transferred the fluid mixture from the bottom of CL-2 to the Pit Clarifier, where solids settled out in near-quiescent conditions. As in 2009, Decon monitored a pH probe in FF-2. The pH probe controlled the mud pumps, preventing transfer of treated AMD to the Pit Clarifier if the pH dropped below 7.9. This pH probe, controller, and pump combination provided additional reliability as well as a final confirmation pH measurement.

In 2010, the treated water was discharged from the Pit Clarifier using both the underdrain and the piccolo decant structure. Decon relocated the piccolo decant structure from the southwest corner of the Pit Clarifier to the central southern side of the Pit Clarifier near the Water-Board's weir. As part of the piccolo decant structure relocation, Decon replaced the buried 8-inch-diameter PVC piping and associated valves that convey treated AMD from the Pit Clarifier to the Water Board's weir. The piccolo decant structure work was needed to remove restrictions to the flow of treated AMD discharge due to scaling of the piping and valves.

The treated water flowed through a 90-degree V-notch weir box, where stage data were recorded and water quality control samples were collected. Stage data were also collected immediately downstream of the Water Board's weir by the USGS at their Junction Box weir (also see Section 4.2). Stage data were recorded at 15-minute intervals using a data logger/pressure transducer system in both the USGS's and the Water Board's weirs. For 2010, the USGS's stage data were used to calculate treated effluent discharge volumes because high discharge flow rates in mid-July created a near backwater condition in the Water Board's weir that rendered the data from the Water Board's weir unusable during that the period with a near backwater condition. Rather than use the USGS data for a part of the season and the Water Board's weir for the remainder of the season, we opted to use the USGS record. The USGS and Water Board weirs were flow tested by USGS, Decon and Water Board staff at both high (approximately 240 gallons per minute) and low flows (less the 50 gallons per minute). The USGS developed a rating curve based on these data; the rating curve was used to convert the 15-minute stage readings into flow rates.

Discharge to Leviathan Creek occurred during Decon's operational hours in July and early August. Beginning on August 2, 2010, and with USEPA's approval, discharge to Leviathan Creek occurred continuously; only the Pit Clarifier underdrain was used when the treatment plant was not in operation. After the pond water was treated and the Plant was shut down on September 1, 2010, treated water continued to be discharged from the Pit Clarifier as the accumulated sludge drained. By September 30, 2010, approximately 6.7 million gallons of treated AMD had been discharged to Leviathan Creek, and flows from the Pit Clarifier were well below 5 gallons per minute. A

summary of daily flow volumes discharged to Leviathan Creek is presented in Table A-1 of Appendix A.

The 2010 PWT Plant operation consumed approximately 79 standard tons of dry lime, 2410 pounds of dry polymer, 4994 gallons of diesel fuel, and 609 gallons of gasoline. The Water Board's treatment effort in 2010, combined with natural evaporation, resulted in the upper pond system having the maximum available storage capacity of approximately 14 million gallons at the end of the treatment effort.

Sludge generated by the Plant in 2010 is contained in the Pit Clarifier to allow for further dewatering. The Plant operation generated an estimated 1500 cubic yards (wet volume) of sludge. Dewatering of the sludge over the winter will increase solids content and reduce both the volume and mass of the sludge. Water Board staff estimates that the 1500 cubic yards of wet sludge will result in approximately 800 tons of sludge being disposed in 2011.

3.3 Pond Water Treatment Monitoring

Treatment process monitoring, sampling and analysis were performed in accordance with the Water Board's *Sampling and Analysis Plan for Leviathan Mine Site Pond Water Treatment* (PWT SAP) dated April 2010, with a few deviations, as noted in Section 3.4.4. A summary of the monitoring parameters, locations, and frequencies for the 2010 PWT monitoring program is presented in Table 1. Specific details of sample collection and handling are described in the PWT SAP. Effluent samples were collected and analyzed for comparison with USEPA Discharge Criteria; the USEPA Discharge Criteria are set forth in the September 25, 2008 Non-Time Critical Removal Action for the Leviathan Mine Site and summarized in Table 2. All samples submitted for laboratory analysis were analyzed by the Water Board's contracted off-site laboratory, TestAmerica Laboratories, located in Irvine, California.

To confirm the quality of treated water discharged to Leviathan Creek, Water Board staff collected grab samples of the treated effluent twice weekly during the 2010 treatment season. Water Board staff collected effluent samples from the weir box located near the Pit Clarifier. As specified in the USEPA-approved 2010 Work Plan, effluent sample collection stopped when the discharge of effluent dropped below 5 gpm, which occurred on September 13, 2010. The first effluent sample was collected on July 20, 2010, and the last effluent sample was collected on September 14, 2010. Additionally, Water Board staff collected Plant influent samples from the line conveying pond water to the treatment plant on a weekly basis to characterize pond water quality.

In summary, Water Board staff collected the following samples for analytical laboratory analysis as part of the 2010 Pond Water Treatment monitoring program:

- 17 treated effluent samples (2 per week)
- 3 treated effluent duplicate samples (>10% sample rate)
- 7 pre-treatment influent samples (1 per week)
- 3 field method blanks (>10% sample rate)

A portion of each grab sample was field filtered, preserved with nitric acid, and submitted to the laboratory to be analyzed for the following dissolved metals/metalloids: aluminum (Al), arsenic (As), copper (Cu), chromium (Cr), cadmium (Cd), nickel (Ni), iron (Fe), lead (Pb), and zinc (Zn). An unfiltered portion of each grab sample was preserved with nitric acid and submitted to the laboratory for Total Recoverable Selenium (Se) analysis. Once per week, in addition to the above analyses, Water Board staff submitted to the laboratory samples of influent and treated effluent for total dissolved solids (TDS), and dissolved sulfate (SO_4), calcium (Ca), cobalt (Co), manganese (Mn), and magnesium (Mg). During influent and effluent sample collection activities, Water Board staff monitored and recorded pH and temperature in the field on sampling record forms. Sample identification tracking forms and sampling record forms are available for review at the Water Board office in South Lake Tahoe. Analytical and field monitoring results of treated effluent and Plant influent samples are summarized in Tables A-2 and A-3 of Appendix A, respectively.

To provide real-time information on effluent quality and system operation, treatment plant operators measured the pH and temperature approximately every hour while the system was operating at four mid-process locations (R-1, R-2, FF-2, and influent to Pit Clarifier) and at one effluent location (weir box). Operators used these data to modify lime additions, if necessary, and maintain effluent quality. pH and temperature data collected by Decon from R-1, the Pit Clarifier, and the weir box are summarized in 3-hour increments in Table A-4 of Appendix A. Copies of Decon's operator logs are available for review in the Water Board's South Lake Tahoe office.

Sludge generated during the 2010 treatment effort, and contained in the Pit Clarifier, was sampled on October 27, 2010 for waste characterization and disposal purposes. Three sludge samples were collected from three different locations in the Pit Clarifier. Each sludge sample was homogenized from a vertical profile that represented the complete thickness of sludge. The sludge thickness during sampling ranged from 24 to 29 inches. Sludge samples were analyzed for comparisons with Total Threshold Limit Concentrations (TTLCs) and Soluble Threshold Limit Concentrations (STLCs) for Title 22 metals, aluminum, and iron. Analytical results for the sludge samples are summarized in Table A-5 of Appendix A.

3.4 Sampling Results from Pond Water Treatment Monitoring

3.4.1 Monitoring Objectives

Specific objectives of the PWT monitoring program are:

- Identify the chemical characteristics of the treatment plant influent.
- Identify the chemical characteristics of the treated effluent.
- Identify the chemical characteristics of solids generated in the treatment process.
- Monitor field pH at critical points within the treatment system and at the discharge point as a means to monitor and control treatment efficiency.
- Monitor the Plant's effectiveness in meeting USEPA Discharge Criteria.

3.4.2 Data Summary

Laboratory analytical results for treated effluent are summarized in Table A-2. These data are collected for comparison with the USEPA Daily Maximum Discharge Criteria, which are also included in Table A-3. No exceedences of the Daily Maximum Discharge Criteria occurred in 2010. Furthermore, no exceedences of the generally more stringent USEPA 4-day Average Discharge Criteria occurred in 2010.

Table A-3 summarizes laboratory analytical results for Plant influent samples. Results are consistent with previous treatment seasons. The pH was about 2.6 and TDS ranged from 5500 to 8900 milligrams per liter (mg/L) with an average of about 6900 mg/L.

Results of pH and temperature for data collected by Plant operators are included in Table A-4. Measurements of pH taken by Plant operators show that the discharge of treated effluent to Leviathan Creek was within the USEPA Discharge Criteria, and that desired pH levels were achieved in the Plant throughout the treatment season.

Results of the sludge characterization analyses are presented in Table A-5. The three sludge samples collected from the Pit Clarifier averaged approximately 9 percent solids. With the exception of the total concentrations for arsenic, the sludge did not exceed any other STLC or TTLC limits. The total concentrations for arsenic exceeded TTLC in all three samples collected from the Pit Clarifier. The arithmetic average arsenic concentration for the three samples was 713 milligrams per kilogram (mg/kg) on a dry-weight basis. The TTLC for arsenic is 500 mg/kg as measured on a wet-weight basis. Sludge sample results are reported on a dry-weight basis for this sampling effort because the percent solids at the time of disposal is not known, and therefore the dry-weight basis results constitute the most conservative evaluation of sludge quality. At the time of disposal in the late spring or early summer, the concentration of solids in the sludge has typically varied from about 25 to 55 percent. The average concentration of arsenic measured in the sludge would not exceed the TTLC on a wet-weight basis unless the sludge was approximately 70 percent or greater solids by weight, therefore, the sludge likely will not exceed the TTLC when it is disposed of in the late spring or early summer of 2011.

A summary of daily discharge from the Pit Clarifier is included in Table A-1. A total of 6.7 million gallons of treated effluent was discharged to Leviathan Creek in 2010. The 15-minute discharge stage data recorded by the data logger (which are the basis of discharge flow calculations) are available for review at the Water Board's South Lake Tahoe office.

Copies of the laboratory's electronic data deliverable (EDD) files for PWT effluent, influent, and sludge samples are in Appendix B on compact disc. Appendix B also includes Portable Document Format (PDF) versions of the hard copy laboratory reports.

3.4.3 Data Quality Evaluation

Water Board staff reviewed the quality of the PWT monitoring results. Sample collection, handling, preservation, and analysis were conducted as specified in the PWT SAP, and a sampling record form was completed for each sampling event. Field quality control samples, including Field Method Blanks (FMBs) and field duplicates, were collected as described in the PWT SAP. A Chain of Custody form was completed for each group of samples submitted to the analytical laboratory. Upon receipt of the laboratory report, Water Board staff reviewed the Chain of Custody to ensure that details such as the project name, sample ID numbers, sample dates, sample times, and requested parameters were properly reported. Water Board staff's data review also included an evaluation of sample holding times, an assessment of precision, an assessment of anomalous data, and a review of FMB results.

Laboratory-assigned data qualifiers are presented with the PWT data in Tables A-2, A-3, and A-5. In 2010, Water Board staff did not assign any additional data qualifiers to pond water treatment data.

Water Board staff assessed the data to confirm that holding times were met. No holding times were exceeded for PWT analyses during the 2010 field season.

Water Board staff submitted field duplicate samples of the treated effluent to the laboratory to measure the precision of the entire measurement system including sampling and analytical procedures. Water Board staff collected three duplicate PWT samples for laboratory analysis in 2010. The relative percent difference (RPD) was calculated for each analyte in the primary and corresponding duplicate samples, as follows:

- If both the sample and duplicate values were equal to or greater than five times the Reporting Limit (RL), then the RPD was calculated by dividing the absolute value of the difference of the two measurements by the average of the two measurements and multiplying by 100. The RPD must be equal to or less than 25 percent to be within control limits.
- If either the sample or duplicate value was less than five times the RL, then the absolute difference between the sample and duplicate values had to be equal to or less than the RL to be in control limits.

In 2010, all three sets of duplicate data were within the control limits for RPD. Per the PWT SAP, the control limit of 25 percent is based on the analytical precision goals for the laboratory matrix spike duplicate samples.

Three FMBs were collected and submitted to TestAmerica for laboratory analysis of the same parameters as PWT effluent samples. FMBs were collected and processed in the same method as that of effluent samples, except using laboratory-supplied purified deionized water for each FMB. Dissolved copper was detected in one FMB sample (1011PWT023-FMB) at 0.0036 mg/L. Copper concentrations in the three treated effluent samples analyzed in the same batch as sample 1011PWT023-FMB ranged from 0.0057 to 0.0083 mg/L. The USEPA Discharge Criteria for copper are 0.016 (four

day average) and 0.026 mg/L (maximum). Although copper was detected in one FMB, the effluent data show that copper concentrations meet all USEPA discharge criteria.

3.4.4 Deviations from the PWT SAP

Water Board staff did not format the laboratory-supplied EDDs in accordance with the template provided by ARCO in their September 2006 Database Tech memo report (section B.6.3.1 of the 2010 PWT QAPP). ARCO indicated in early January 2011 that they are trying to improve consistency across the Site-wide database, and therefore the EDD templates are being refined. The Water Board's current laboratory provides surface water data in an EDD that will require minimal changes by ARCO prior to upload to the database. This information was submitted to ARCO in a letter dated January 13, 2011, and the USEPA was also copied on this communication.

4. SURFACE WATER MONITORING AND METEOROLOGICAL INFORMATION

As required by the USEPA, the Water Board continued their efforts in 2010 field season to monitor surface water flow and quality, and to collect meteorological information in the vicinity of Leviathan Mine. Those data collection efforts are discussed below.

4.1 Meteorological Monitoring

A weather station is located on the Water Board's construction trailer near Pond 1. It is a Davis Integrated Sensor Suite model and has been in operation since November 2002. The system measures the following conditions hourly: wind speed, wind direction, rainfall, outside temperature, outside humidity, ultraviolet radiation, and solar radiation. Water Board staff download data from this weather station periodically. Hourly data organized in monthly files in Microsoft Excel format from October 2009 to September 2010 are included on compact disc in Appendix C.

Due to winter access difficulties, Water Board staff was unable to access the site between December 14, 2009 and April 28, 2010. The weather station can hold approximately 105 days of hourly data. Therefore, some weather station data were lost. The missing data span the timeframe from Dec 14, 2009 at 1400 hours to January 11, 2010 at 1800 hours.

4.2 Flow Monitoring

Flow data are reported on the basis of water year. The 2010 water year begins October 1, 2009 and ends September 30, 2010. Under contract to the Water Board, the United States Geological Survey (USGS) monitored water flows and pond water level elevations at 18 locations during the 2010 water year. Flow monitoring locations, USGS station numbers, and equipment are detailed in Table 3. As shown in Table 3, 16 of the 18 stations have continuous stage records, one of the 18 stations (Station 16, Aspen Creek above the confluence of Aspen and Leviathan Creeks) is monitored manually only during monthly USGS field visits, and one station (Station 24, Mountaineer Creek)

is a calculated relationship derived by subtracting Station 23 (Leviathan Creek above the confluence of Mountaineer and Leviathan Creeks) from Station 25 (Bryant Creek below the confluence of Mountaineer and Leviathan Creeks). Appendix D presents the USGS's water-data reports for 2010 in PDF format for the 16 stations with continuous stage recorders and the one station measured monthly by hand.

In the fall of 2009, the USGS, under contract to the Water Board, installed three new trial stations for continuous stage monitoring:

1. Station 103087835, located on an unnamed tributary of Leviathan Creek just south of Pond 2S,
2. Station 103087865, located on an unnamed tributary of Leviathan Creek just north of Pond 2N, and
3. Station 103087855, located in the junction box in the open pit.

The three new flow monitoring stations were installed in an effort to provide additional data on surface water flows at Leviathan Mine. Because all three stations are in shaded, cold locations, ice buildup limited data collection through the winter months. USGS staff, in accordance with USGS protocols, adjusted the stage records as described below:

- Station 103087835: The period between November 4 and March 25 was deemed unreliable due to snow, ice and gage height uncertainty.
- Station 103087865: The period between November 4 and March 19 was deemed unreliable due to snow, ice and gage height uncertainty.
- Station 103087855: The period between October 13 and December 11 was deemed unreliable due to snow, ice and gage height uncertainty. The data from the period December 11 to March 14 are coded "A" (affected) for ice affect. The period from July 19 to October 2 was not used by the USGS, as AMD treatment was in process; treated effluent discharges from the Pit Clarifier enter the Pit Junction Box just upstream of the USGS's weir. By excluding the July 19 to October 2 time period, two precipitation events and associated potential runoff were not recorded at the Pit Junction Box weir. There was 0.44 inches of precipitation from July 24 to 26, 2010, with approximately 90 percent of it falling on July 25 between 1300 and 1700 hours. And, on August 29, 2010, 0.44 inches of precipitation fell between 1700 and 2200 hours. Precipitation data are in Appendix C.

Real-time provisional flow and stage recordings can be viewed on the web for the following seven stations: Adit, PUD, CUD, Station 15, Station 25, Pond 1, and Pond 4. The real-time data can be accessed through the USGS's website at: http://waterdata.usgs.gov/ca/nwis/current?type=flow.

Published data reports can be searched by USGS station number at the USGS website: http://ca.water.usgs.gov/waterdata/.

4.3 Surface Water Monitoring

Surface water sampling and analysis was performed in accordance with the *Sampling and Analysis Plan for Leviathan Mine Site Surface Water Monitoring (January 2004)* (SWM SAP) and the 2009 and 2010 addenda to the SWM SAP, with a few deviations as noted in Section 4.4.3.

During the 2010 water year, the Water Board conducted eight monthly surface water quality monitoring events (October and November 2009, and April through September of 2010). Two of the sampling events (October 2009 and May 2010) included two additional stations and are referred to as semiannual events. Measured parameters and sampling frequencies are summarized in Table 4. The Water Board's surface water quality monitoring stations are shown in Figure 4.

- Samples were collected for laboratory analysis of TDS, sulfate, and total and dissolved aluminum, arsenic, calcium, cadmium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, and zinc.
- All samples were collected using a peristaltic pump equipped with a new piece of disposable C-Flex® tubing for each sample. Samples collected for analysis of dissolved metals, TDS, and sulfate were field filtered through a new, disposable 0.45-micron filter.
- Water Board staff collected all samples in clean, new sample containers provided by the laboratory. Sample containers used for metals analyses were pre-preserved with nitric acid.
- Field quality control samples consisting of a blind duplicate sample and a FMB were collected during each sampling event.
- A Chain of Custody form was completed for each group of samples submitted to the laboratory.

The laboratory analyzed all of the monthly and semiannual surface water samples collected during the 2010 water year.

4.4 Sampling Results From Surface Water Monitoring

4.4.1 Monitoring Objectives

The monitoring objectives of the SWM program, as outlined in the SWM SAP, were to collect data of sufficient quality to:

- Identify the chemical characteristics of the various surface waters in the vicinity of Leviathan Mine, including AMD sources and creek waters.
- Monitor flows of AMD discharges and selected creeks.
- Track the impacts of remediation projects on downstream surface waters.
- Identify seasonal and annual variations in the chemical characteristics and field parameters of surface waters in the vicinity of Leviathan Mine.

- Calculate the loading of metals to the downstream surface waters from the various discharges at Leviathan Mine.

4.4.2 Data Quality Evaluation

Surface water data collected for this water year are presented in Appendix E, *2010 Surface Water Monitoring Data*. Appendix E includes each laboratory analytical report in PDF format as well as in EDD format on compact disc. The field parameter measurements collected by Water Board staff at the time of sampling, including pH, temperature, electrical conductivity, and specific conductance, are also included in Appendix E in an EDD format.

Water Board staff reviewed the quality of the surface water monitoring results. Upon receipt of the laboratory report, Water Board staff reviewed the Chain of Custody to assure that details such as the project name, sample ID numbers, sample date, sample times, and requested parameters were properly reported. Water Board staff's data review also included an evaluation of sample holding times, an assessment of precision, an assessment of anomalous data, and a review of FMB results.

The laboratory completed Data Validation Checklists for all analytical reports. The Data Validation Checklists are included with the PDF versions of the final laboratory reports in Appendix E.

An evaluation of the completeness of the USEPA-required sampling program shows that 99 primary samples were to be collected during the 2010 water year (twelve stations to be sampled monthly and two stations to be sampled semiannually). The semiannual monitoring station at 4L Creek (just above its confluence with Leviathan Creek) was not sampled during the October 2009 event because the creek had no flow at the time of sampling. All other stations and sampling events were conducted in accordance with the SWM SAP schedule as modified by the Water Board's January 19, 2010 letter and approved by the USEPA in their January 30, 2010 letter. Per the SWM SAP the completeness goal for the project is 90 percent. In total, 98 of the planned 99 samples were collected, resulting in a completeness of 99 percent. Of the 98 samples collected, none of the samples were rejected.

Water Board staff assessed the data to confirm that holding times were met. Re-analyses of sulfate in sample 1011LM026-FMB, and TDS in sample 1011LM040-FMB, were performed outside holding time requirements. These results were reported using the H-1 qualifier. No other holding times were exceeded for the surface water samples collected during the 2010 water year.

Water Board staff assigned a data qualifier of "*" for data that did not meet our field duplicate RPD assessment, and an "A" qualifier for anomalous data. In total, ten results were qualified. A summary of the Water Board staff-assigned data qualifiers is presented in Table 5. The laboratory EDDs attached in Appendix E have been updated to include the Water Board staff-assigned data qualifiers.

Total and dissolved Co results for sample 0910M087-Sta 22 were qualified "A" due to the dissolved concentration reported (0.0013 mg/L) significantly exceeding the total concentration reported (0.00025 mg/L).

Water Board staff collected one field duplicate per sampling event (for eight total duplicate samples) as required in the SWM SAP. An RPD assessment of the results for each of the 26 analytes was calculated for the duplicate and corresponding primary sample as described in Section 3.4.3. Out of 208 paired results, four pairs (8 results) of primary sample and duplicate results were flagged with an "*" qualifier for exceeding RPD control limits.

FMBs were also collected once per sampling event (eight total samples this water year) and submitted to the laboratory for analysis of the same parameters evaluated in the surface water monitoring program. FMBs were collected and processed in the field following the same methods as surface water samples using laboratory-supplied purified deionized water for each blank.

Iron was the only constituent that was detected above its RL of 0.010 mg/L in the FMBs that were collected as part of the SWM program. Total iron was detected above the RL in samples 0910LM094-FMB at 0.012 mg/L and 0910LM110-FMB at 0.016 mg/L. Dissolved iron was detected in samples 1011LM026-FMB at 0.011 mg/L and 0910LM080-FMB at 0.023 mg/L. No data qualifiers were added by the Water Board based on the FMB results.

4.4.3 Deviations from the SWM SAP

During the 2010 water year, Water Board staff identified three deviations from the SWM SAP.

1. As stated in the Water Board's 2009 Year-End Report, the preparation of two checklists for each laboratory report, the Level A/B Screening Checklist and Data Validation Checklist for Field Quality Control, as contained in the SWM SAP, was not completed for this Year End Report. The information formerly contained in these forms is discussed in Section 3.4 of this report and below.

    - The Data Validation Checklist for Field Quality Control form documented an assessment of holding times, field blanks, and field duplicates. Water Board staff performed the review and assessment of holding times, field blanks, and field duplicates but no longer use this form to document them.
    - The Level A/B Screening Checklist was used to document that basic sample collection, handling, shipping, and documentation was performed and to assess the data as Level "A", "B", or "Unusable". The Level "A", "B", and "Unusable" designations were never adopted for use in the Site-wide Database. The continuing use of this checklist appears to no longer serve any purpose.

2. In accordance with the Water Board's January 19, 2010 letter request, the USEPA's January 30, 2010 approval letter, and the Water Board's approved 2010 Work Plan, the surface water monitoring program was modified to reduce the frequency of

winter sampling events due to access and health and safety issues. The Water Board requested, and the USEPA approved, a reduction in frequency of monthly sampling events to coincide with those months during which treated effluent is being discharged to Leviathan Creek (from either the Pond 4 treatment system operated by ARCO or the Pond 1 treatment system operated by the Water Board). In addition, surface water sampling is performed the month prior to initiation of any such discharges as well as the month following the cessation of discharges from those systems at the site.

3. The Water Board did not format the laboratory-supplied EDDs in accordance with templates provided by ARCO (see Section 3.4.4). ARCO indicated in early January 2011 that it is trying to improve consistency across the Site-wide database, and therefore the EDD templates are being refined. Since this is a work in progress, and since the Water Board does not have control over the format of the database, the Water Board will supply the data as supplied by the laboratory (with addition of Water Board-assigned data qualifiers, if appropriate). The Water Board's current laboratory provides surface water data in an EDD format that will require minimal changes by ARCO prior to upload to the database. The laboratory EDDs for the 2010 water year surface water monitoring program are included in Appendix E. Water Board-assigned data qualifiers and descriptions of those qualifiers were added to the laboratory EDDs.

5. SITE MAINTENANCE

The Water Board conducted site maintenance work during the 2010 field season in accordance with the USEPA-approved Work Plan. Routine maintenance activities performed in 2010 included repairing perimeter fencing, inspecting pond liners and storm water conveyances, and coordinating invasive plant control.

The perimeter fencing is barbed-wire and surrounds the majority of the site. In late May 2010, Water Board staff inspected the perimeter fence and noted that relatively minor repairs to the fence were required in numerous locations around the site. Decon staff repaired the perimeter fence in mid June 2010.

Water Board staff visually inspected each pond, specifically looking for areas where the earthen cover had eroded and the pond liner was exposed. Water Board staff did not observe any exposed pond liner in 2010.

Water Board staff visually inspected storm water conveyances in the pit and around the ponds for the presence of excess sediment that would substantially impede the conveyance of storm water or that would result in a significant amount of sediment to be discharged and therefore warrant a removal activity. There was not sufficient accumulated sediment to warrant removal activities in 2010.

The El Dorado County, Department of Agriculture (EDCDA) visited Leviathan Mine on August 24, 2010 and spot applied an herbicide (Telar®) on invasive plants. This year (2010), as in 2002 through 2009, the EDCDA sprayed to eradicate tall whitetop (*Lepidium latifolium*).

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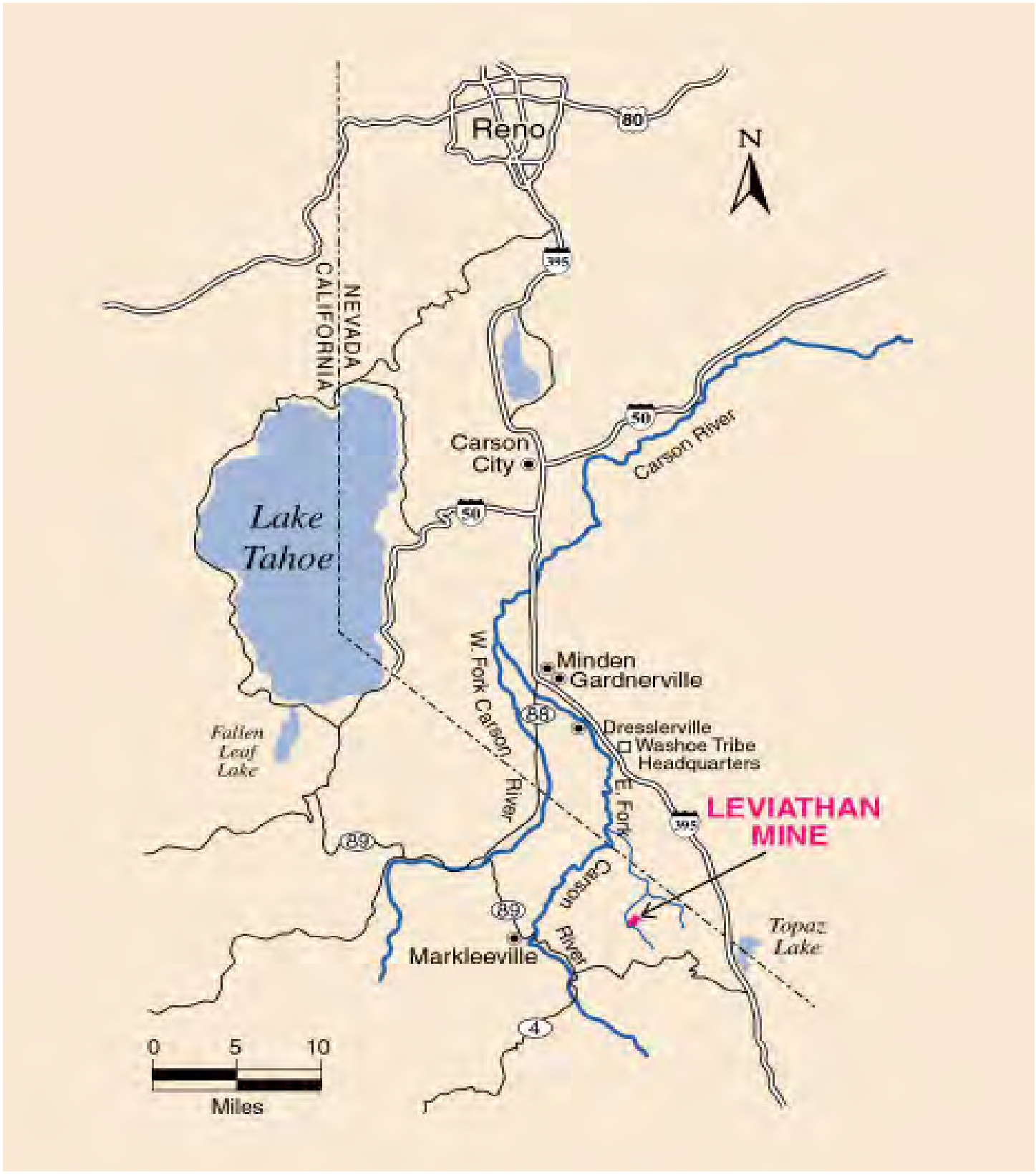

FIGURE 1
SITE LOCATION

FIGURE 2
BRYANT CREEK WATERSHED

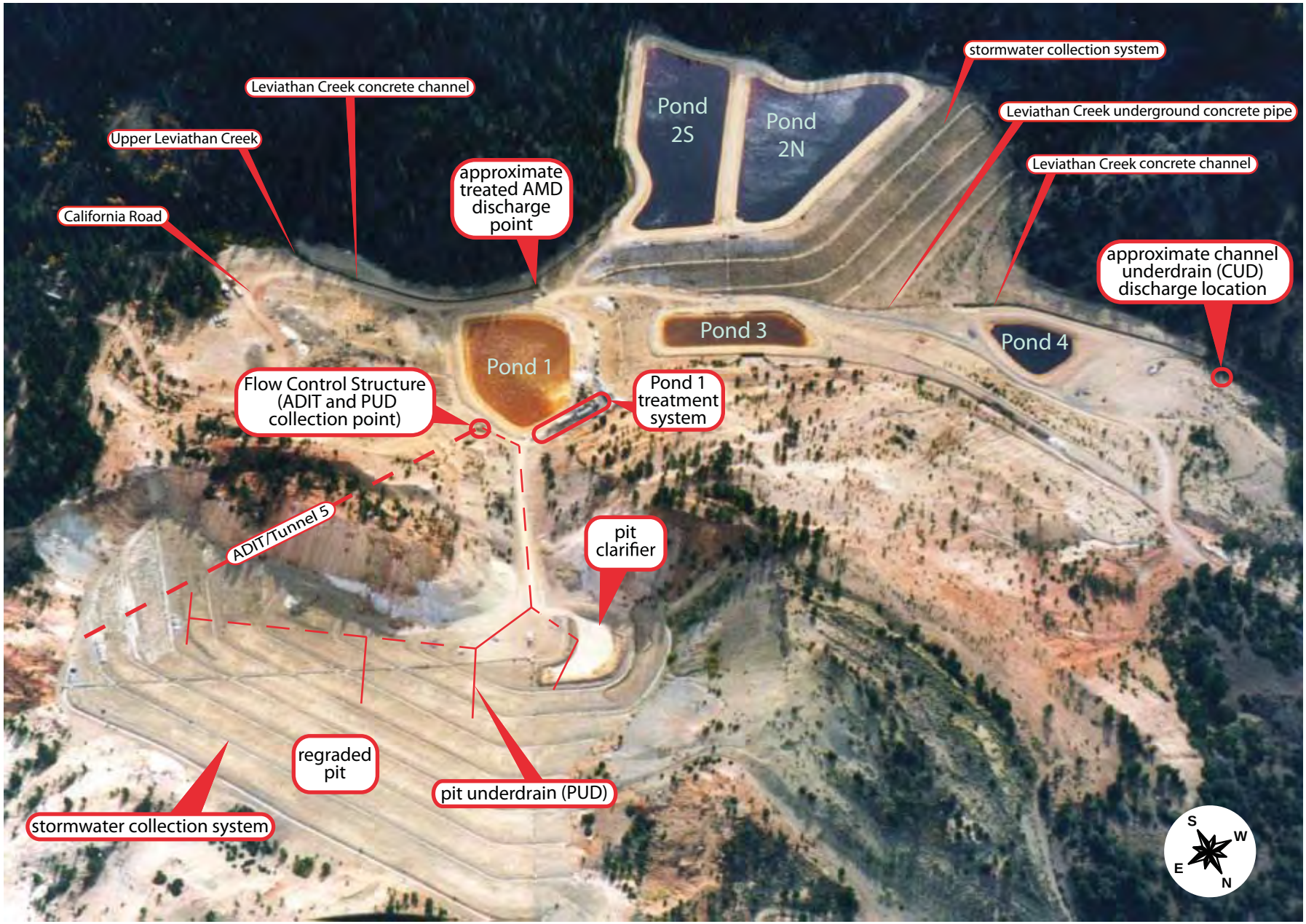

FIGURE 3
LAHONTAN WATER BOARD AMD CAPTURE AND TREATMENT SYSTEM

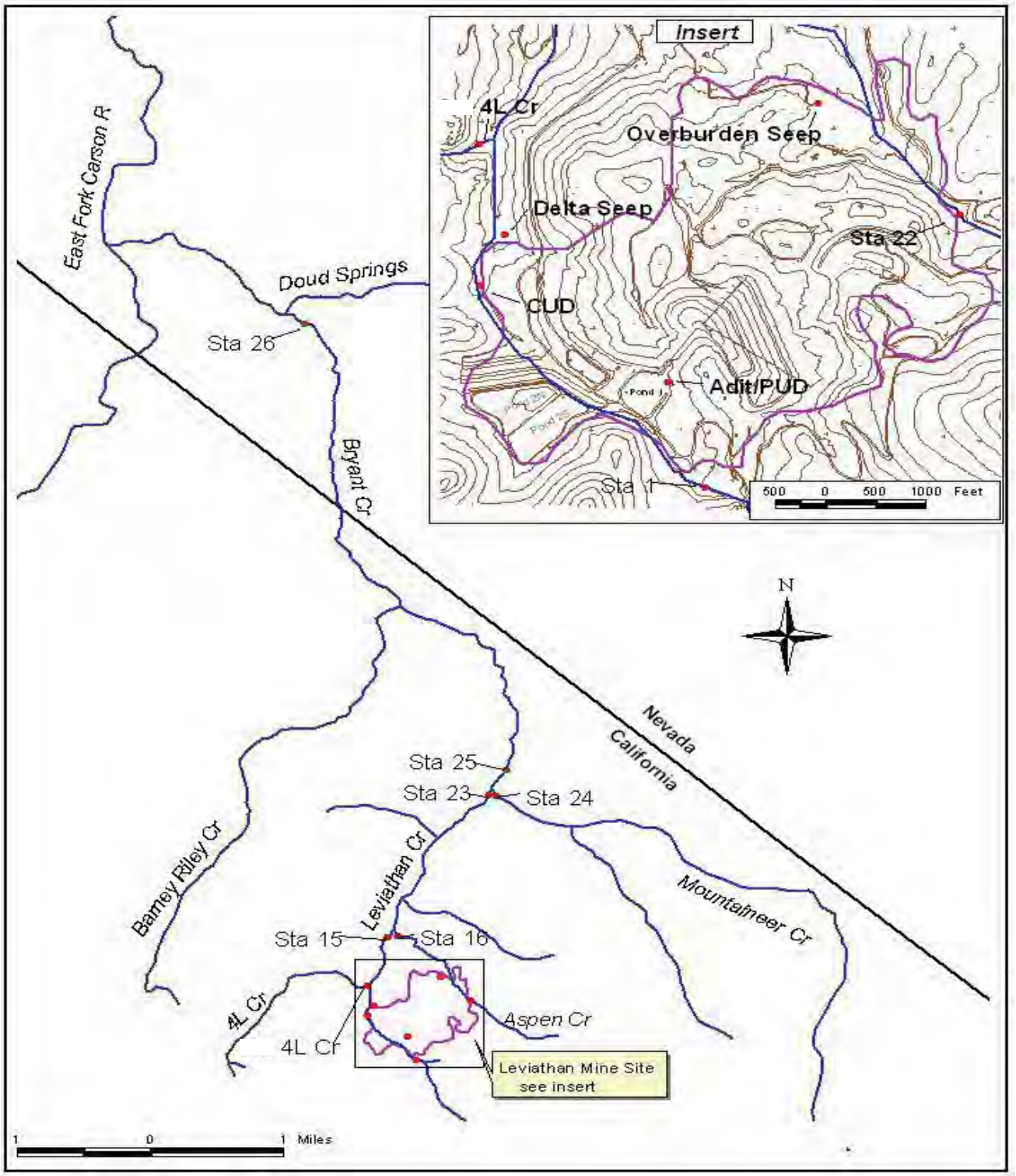

FIGURE 4
SURFACE WATER MONITORING LOCATIONS

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TABLE 1
2010 POND WATER TREATMENT MONITORING PROGRAM
LEVIATHAN MINE, ALPINE COUNTY, CALIFORNIA

SAMPLE LOCATION	LOCATION DESCRIPTION	ANALYSES	SCHEDULE	SAMPLER
Influent	Sampling port prior to lime addition	EPA-Required Discharge Criteria[1] with Additional Analytes[2]	weekly	Water Board staff
Mid Process	Various	pH, Temperature (field)	several times per day, as needed	Contractor
Effluent	Weir Box	pH, Temperature (field)	several times per day, as needed	Contractor
		EPA-Required Discharge Criteria	twice per week[5]	Water Board staff
		EPA-Required Discharge Criteria with Additional Analytes	weekly	Water Board staff
Duplicate Samples	Effluent samples at weir box	EPA-Required Discharge Criteria	minimum of 10%	Water Board staff
Field Method Blank	Collected at Weir Box using laboratory-supplied inorganic blank water	EPA-Required Discharge Criteria	minimum of 10%	Water Board staff
Sludge	Pit Clarifier	CAM-17[3] metals plus Al and Fe (for comparison with STLC and TTLC)[4]	three composite samples collected once per year after treatment	Water Board staff

Notes:
1. Dissolved As, Al, Cd, Cr, Cu, Fe, Pb, Ni, Zn (off-site laboratory); total recoverable Se (off-site laboratory); pH (field); temperature (field)
2. Dissolved Ca, Co, Mg, Mn, sulfate, TDS (off-site laboratory analysis)
3. Refers to 22 CCR 66261.24(a)(2)(A); CAM-17 metals: Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Hg, Mo, Ni, Se, Ag, Tl, V, Zn (off-site lab analysis)
4. STLC is the Soluble Threshold Limit Concentration and TTLC is the Total Threshold Limit Concentration.
5. Effluent samples were collected twice per week until discharge from the Pit Clarifier dropped below 5 gallons per minute.

Table 2
USEPA Discharge Criteria
Leviathan Mine, Alpine County, California

Water Quality Parameter	**Maximum** f2	**Average** f4
pH	Between 6.0 – 9.0 SU f1	
Arsenic (dissolved)	0.34 mg/l	0.15 mg/l f3
Aluminum (dissolved)	4.0 mg/l	2.0 mg/l f3
Cadmium (dissolved)	0.009 mg/l	0.004 mg/l f3
Chromium (dissolved)	0.97 mg/l	0.31 mg/l f3
Copper (dissolved)	0.026 mg/l	0.016 mg/l f3
Iron (dissolved)	2.0 mg/l	1.0 mg/l f3
Lead (dissolved)	0.136 mg/l	0.005 mg/l f3
Nickel (dissolved)	0.84 mg/l	0.094 mg/l f3
Selenium (Total Recoverable)	Not Promulgated	0.005 mg/l f3
Zinc (dissolved)	0.21 mg/l	0.21 mg/l f3

Notes:
f1: pH measurement based on 24-hour (single day) average discharge.
f2: Concentrations based on a daily grab samples, each grab sample field-filtered and acid fixed promptly after collection.
f3: Concentrations based on four daily grab samples, each grab sample field-filtered and acid fixed promplty after collection.
f4: If the concentration detected by the contract laboratory is less than the detection limit, 1/2 the detection limit shall be used in calculating the Average concentration.

TABLE 3
2010 FLOW AND STAGE MONITORING LOCATIONS
LEVIATHAN MINE, ALPINE COUNTY, CALIFORNIA

Station ID (USGS Number)	Station Description	Equipment	Installation of Gaging Station
Continuous Stage Measurement and Calculated Flow			
Station 1 (10308783)	Leviathan Creek above the mine	Continuous flow recorder and appurtenances, solar power supply.	October 1998
Pit Under Drain (PUD) (10308785)	Drainage from shallow ground water collection pipes in pit, diverted into evaporation ponds	Continuous flow recorder and appurtenances, solar power supply, telemetry (real time provisional data available).	October 1999
Adit (10308784)	Drainage from tunnel #5 diverted into evaporation ponds	Continuous flow recorder and appurtenances, solar power supply, telemetry (real time provisional data available).	October 1999
Channel Under Drain (CUD) (103087885)	Discharge from channel under drain below Leviathan Creek concrete channel	Continuous flow recorder and appurtenances, solar power supply, telemetry (real time provisional data available).	October 1999
Overburden Seep (OS) (103087892)	Overburden seepage (a.k.a. Aspen Seep), above the Bioreactors	Continuous flow recorder and appurtenances, solar power supply.	October 1998
4L Creek (103087889)	4L Creek just above confluence with Leviathan Creek	Continuous flow recorder and appurtenances, solar power supply.	October 2003
Station 15 (10308789)	Leviathan Creek, above the confluence of Leviathan and Aspen creeks	Continuous flow recorder and appurtenances, solar power supply, telemetry (real time provisional data available).	October 1998
Station 22 (103087891)	Aspen Creek above mine	Continuous flow recorder and appurtenances, solar power supply.	October 2003
Station 23 (10308792)	Leviathan Creek above the confluence of Leviathan and Mountaineer creeks	Continuous flow recorder and appurtenances, solar power supply	November 1999
Station 25 (10308794)	Bryant Creek below the confluence of Leviathan and Mountaineer creeks	Continuous flow recorder and appurtenances, solar power supply, telemetry (real time provisional data available).	October 1998
Station 26 (10308800)	Bryant Creek above the confluence of Doud Springs and Bryant Creek	Continuous flow recorder and appurtenances, solar power supply, telemetry (real time provisional data available).	August 2001
Pit Junction Box (103087855)	Storm water collection vault in open pit	Continuous flow recorder and appurtenances, solar power supply.	October 2010
Tributary A (103087865)	Ephemeral tributary north of Pond 2 North (USGS refers to this site as Unnamed Trib 2)	Continuous flow recorder and appurtenances, solar power supply.	November 2010
Tributary B (103087835)	Ephemeral tributary south of Pond 2 South (USGS refers to this site as unnamed Trib1)	Continuous flow recorder and appurtenances, solar power supply.	November 2010
Continuous Stage Measurement			
Pond 1 Stage (103087853)	Water level in Pond 1	Continuous stage recorder and appurtenances, solar power supply, telemetry (real time provisional data available).	October 1999
Pond 4 Stage (103087887)	Water level in Pond 4	Continuous stage recorder and appurtenances, solar power supply, telemetry (real time provisional data available).	October 1999
Other Flow Data			
Station 16 (103087898)	Aspen Creek, above the confluence of Leviathan and Aspen creeks	Hand-held flow meters. Monthly flow measurements to establish relationship with STA 15.	not applicable
Station 24	Mountaineer Creek above the confluence of Leviathan and Mountaineer creeks	None. Flow calculated by difference on a monthly basis: (STA 25 – STA 23 = STA 24).	not applicable

TABLE 4
2010 SURFACE WATER QUALITY SAMPLING LOCATIONS
LEVIATHAN MINE, ALPINE COUNTY, CALIFORNIA

Station ID	Station Description	Sampling Events	Parameters Measured
Station 1	Leviathan Creek above the mine	Monthly: October and November 2009 Monthly: April through September 2010	Analytical Laboratory: total and dissolved Al, As, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Ni, Zn; total dissolved solids (TDS); sulfate Field: pH, temperature, electrical conductivity, and specific conductance
Adit	Drainage from tunnel No. 5, diverted into evaporation ponds	Same as above	Same as above
Pit Under Drain (PUD)	Drainage from shallow ground water collection pipes in pit, diverted into evaporation ponds	Same as above	Same as above
Channel Under Drain (CUD)	Discharge from channel under drain below Leviathan Creek concrete channel	Same as above	Same as above
Delta Seep (DS)	Seepage from the Delta Slope, just before entering Leviathan Creek	Same as above	Same as above
Station 15	Leviathan Creek, above the confluence of Leviathan and Aspen creeks	Same as above	Same as above
Station 16	Aspen Creek, above the confluence of Leviathan and Aspen creeks	Same as above	Same as above
Station 22	Aspen Creek above mine	Same as above	Same as above
Overburden Seep (OS)	Overburden seepage (a.k.a. Aspen Seep), above the Bioreactors	Same as above	Same as above
Station 23	Leviathan Creek above the confluence of Leviathan and Mountaineer creeks	Same as above	Same as above
Station 24	Mountaineer above the confluence of Leviathan and Mountaineer creeks	Same as above	Same as above
Station 25	Bryant Creek below the confluence of Leviathan and Mountaineer creeks	Same as above	Same as above
4L Creek	4L Creek just above confluence with Leviathan Creek	Semiannually: October 2009 and May 2010	Same as above
Station 26	Bryant Creek above the confluence of Doud Springs and Bryant creeks	Semiannually: October 2009 and May 2010	Same as above

TABLE 5
2010 WATER BOARD-ASSIGNED DATA QUALIFIERS
LEVIATHAN MINE, ALPINE COUNTY, CALIFORNIA

Station Identification	Laboratory Report Number	Sample Date	Sample Identification	LRWQCB-assigned Data Qualifier	Qualified Parameter(s)	Description of Anamolous Value(s)
Delta Seep (DS)	ISJ2605	10/21/2009	0910LM053-DS	*	Total As	Fails field duplicate RPD assessment (duplicate sample = 0910LM052-Sta D)
Delta Seep (DS)	ISJ2605	10/21/2009	0910LM052-Sta D	*	Total As	Fails field duplicate RPD assessment (primary sample = 0910LM053-DS)
Station 22	ITE2091	5/19/2010	0910LM087-Sta 22	A	Total Co Dissolved Co	Diss = 0.0013 mg/L; Total = 0.00025 mg/L; dissolved concentration significantly exceeds total concentration
Station 23	ITH2376	8/24/2010	1011LM023-Sta 23	*	Dissolved Al Dissolved As Dissolved Fe	Fails field duplicate RPD assessment (duplicate sample = 1011LM027-Sta D)
Station 23	ITH2376	8/24/2010	1011LM027-Sta D	*	Dissolved Al Dissolved As Dissolved Fe	Fails field duplicate RPD assessment (primary sample = 1011LM023-Sta 23)

Qualifiers
* : Results failed the Relative Percent Difference (RPD) assessment
A: Anomalous value

Leviathan Mine 2010 Year End Report

APPENDICES

Appendix A - Data Summary for 2010 Pond Water Treatment

Table A-1
2010 Pond Water Treatment
Daily Discharge Summary

Date	Daily Discharge (gallons)	Cumulative Discharge (gallons)
7/19/2010	287,184	287,184
7/20/2010	419,626	706,810
7/21/2010	220,568	927,378
7/22/2010	447,228	1,374,606
7/23/2010	287,127	1,661,733
7/24/2010	3,080	1,664,813
7/25/2010	0	1,664,813
7/26/2010	108,502	1,773,314
7/27/2010	388,167	2,161,482
7/28/2010	317,411	2,478,892
7/29/2010	350,062	2,828,954
7/30/2010	208,740	3,037,694
7/31/2010	1,106	3,038,800
8/1/2010	0	3,038,800
8/2/2010	111,812	3,150,612
8/3/2010	232,884	3,383,496
8/4/2010	263,000	3,646,496
8/5/2010	299,827	3,946,322
8/6/2010	250,994	4,197,316
8/7/2010	58,379	4,255,695
8/8/2010	52,043	4,307,739
8/9/2010	64,023	4,371,762
8/10/2010	273,759	4,645,521
8/11/2010	176,687	4,822,208
8/12/2010	176,351	4,998,559
8/13/2010	183,199	5,181,759
8/14/2010	47,354	5,229,113
8/15/2010	40,465	5,269,578
8/16/2010	29,109	5,298,687
8/17/2010	35,807	5,334,494
8/18/2010	57,585	5,392,078
8/19/2010	99,579	5,491,658
8/20/2010	87,551	5,579,209
8/21/2010	44,350	5,623,558
8/22/2010	29,939	5,653,497
8/23/2010	33,773	5,687,270
8/24/2010	42,756	5,730,026
8/25/2010	76,986	5,807,013
8/26/2010	62,768	5,869,780
8/27/2010	145,950	6,015,730
8/28/2010	45,652	6,061,382
8/29/2010	39,435	6,100,817
8/30/2010	49,997	6,150,814
8/31/2010	170,580	6,321,394
9/1/2010	98,042	6,419,436
9/2/2010	40,767	6,460,203
9/3/2010	27,832	6,488,035
9/4/2010	23,262	6,511,297
9/5/2010	20,466	6,531,763
9/6/2010	18,067	6,549,830
9/7/2010	15,925	6,565,754
9/8/2010	14,421	6,580,175
9/9/2010	12,976	6,593,151
9/10/2010	12,329	6,605,480
9/11/2010	11,122	6,616,602
9/12/2010	10,260	6,626,861
9/13/2010	9,279	6,636,140
9/14/2010	8,413	6,644,553
9/15/2010	7,801	6,652,353
9/16/2010	6,933	6,659,287
9/17/2010	6,587	6,665,874
9/18/2010	5,918	6,671,792
9/19/2010	5,148	6,676,940
9/20/2010	5,071	6,682,012
9/21/2010	4,289	6,686,301
9/22/2010	4,090	6,690,391
9/23/2010	3,916	6,694,307
9/24/2010	3,448	6,697,756
9/25/2010	3,122	6,700,878
9/26/2010	3,198	6,704,076
9/27/2010	3,006	6,707,082
9/28/2010	2,934	6,710,016
9/29/2010	2,802	6,712,819
9/30/2010	2,319	6,715,138

Note:
Volume of treated AMD discharged to Leviathan Creek as measured at the Junction Box weir.

Table A-2
2010 Pond Water Treatment Effluent Field and Analytical Results

Sample ID	Sample Description	Sample Date	pH (SU)	Temp. (oC)	AL	Q	As	Q	Ca	Q	Cd	Q	Co	Q	Cr	Q	Cu	Q	Fe	Q	Mg	Q	Mn	Q	Ni	Q	Pb	Q	Se	Q	SO4	Q	TDS	Q	Zn	Q
USEPA Daily Maximum Discharge Criteria:			**6-9**	**n/a**	**4.0**		**0.34**		**n/a**		**0.009**		**n/a**		**0.97**		**0.026**		**2.0**		**n/a**		**n/a**		**0.84**		**0.136**		**n/a**		**n/a**		**n/a**		**0.21**	
USEPA 4-day Average Discharge Criteria:			**n/a**	**n/a**	**2.0**		**0.15**		**n/a**		**0.004**		**n/a**		**0.31**		**0.016**		**1.0**		**n/a**		**n/a**		**0.094**		**0.005**		**0.005**		**n/a**		**n/a**		**0.21**	
1011 PWT001-PC	Pre-Discharge	07/09/2010	7.0	24.5	0.081		0.0020		n/a		0.0043		n/a		0.0010	J	0.0036		0.063						0.78	MHA	0.00020	U	0.0027						0.0074	J
1011PWT002-PC	Pre-Discharge	07/12/2010	7.4	29.6	0.43	MHA	0.0012		n/a		0.00057	J	n/a		0.0010	J	0.022		0.045	B					0.14		0.00020	U	0.0046						0.016	
1011 PWT003-PC	Pre-Discharge	07/13/2010	7.8	15.8	0.91	MHA	0.0031		n/a		0.00017	J	n/a		0.0013	J	0.010		0.017						0.020		0.00020	C,U	0.0038	RL1, J					0.0083	J
1011 PWT004-PC	Pre-Discharge	07/14/2010	8.1	19.8	0.76	MHA	0.0043		n/a		0.00021	J	n/a		0.0017	J	0.015		0.018						0.019		0.00020	U	0.0042	M1					0.0075	J
1011PWT005-PC	Pre-Discharge	07/15/2010	8.6	23.6	2.3	MHA	0.0090		n/a		0.00027	J	n/a		0.0024		0.0067		0.75						0.023		0.00020	U	0.0046						0.0040	U
1011PWT006-EFF	PWT Effluent	07/20/2010	7.8	19.6	0.51	MHA	0.0040		n/a		0.00033	RL1, J	n/a		0.0030	RL1, J	0.0029		0.044						0.030		0.00040	C, RL1,U	0.0035	RL1, J					0.0080	RL1,U
1011PWT007-EFF	PWT Effluent	07/22/2010	7.7	18.3	0.31		0.0042		910		0.00036	J	0.016		0.0025		0.0031		0.026		42		1.0		0.041		0.00020	C,U	0.0035		2300		3700		0.0040	U
1011PWT009-EFF	PWT Effluent	07/27/2010	7.8	18.6	0.57	MHA	0.0048		n/a		0.00030	J	n/a		0.00090	U	0.0024		0.053						0.046		0.00020	U	0.0036	M1					0.0056	J
1011PWT011-EFF	PWT Effluent	07/29/2010	7.9	18.1	0.92		0.0050		910	MHA	0.00018	J	0.0078		0.0012	J	0.0023		0.048		45	MHA	0.55		0.042		0.00020	U	0.0033		2400	MHA	3500		0.026	
1011PWT013-EFF	PWT Effluent	08/03/2010	7.7	16.2	0.43		0.0035		n/a		0.00023	J	n/a		0.00090	U	0.0070		0.0080	U					0.011		0.00020	B,U	0.0033						0.0040	U
1011PWT014-EFF	PWT Effluent	08/05/2010	7.7	16.4	0.51		0.0055		960		0.00034	J	0.012		0.0013	J	0.0098		0.066		49		0.80		0.018		0.00020	B,U	0.0034		2700		4000		0.0040	U
1011PWT015-EFF	PWT Effluent-Dup	08/05/2010	7.7	16.4	0.50		0.0053		n/a		0.00031	J	n/a		0.0015	J	0.0084		0.056						0.018		0.00020	B,U	0.0034						0.0055	J
1011PWT017-EFF	PWT Effluent	08/10/2010	7.8	17.7	0.35	MHA	0.0079		n/a		0.00027	J	n/a		0.0013	J	0.0077		0.078						0.020		0.00020	U	0.0048						0.0040	U
1011PWT018-EFF	PWT Effluent	08/12/2010	7.7	13.9	0.30		0.0031		800	MHA	0.00024	J	0.0070		0.0012	J	0.0095		0.060		51	MHA	0.66		0.011		0.00020	U	0.0047		2300		3500		0.0049	J
1011PWT020-EFF	PWT Effluent	08/17/2010	7.2	16.8	0.021		0.0024		n/a		0.00010	U	n/a		0.0096		0.0077		0.046						0.00075	J	0.00020	U	0.0031						0.0046	J
1011PWT021-EFF	PWT Effluent-Dup	08/17/2010	7.2	16.8	0.022		0.0024		n/a		0.00010	U	n/a		0.0085		0.0057		0.041						0.00056	J	0.00025	J	0.0030						0.0040	U
1011PWT022-EFF	PWT Effluent	08/19/2010	7.3	16.6	0.019		0.00090	U	550		0.00010	U	0.00010	U	0.0092		0.0083		0.039		56		0.026		0.00078	J	0.00020	U	0.0038		1700		2500		0.0040	U
1011PWT025-EFF	PWT Effluent	08/24/2010	7.0	15.8	0.023		0.0017		530	MHA	0.00020	J	0.0017		0.00094	J	0.0068		0.0080	U	57	MHA	0.28		0.017		0.00020	U	0.0032		1700		2500		0.0068	J
1011PWT027-EFF	PWT Effluent	08/26/2010	7.4	20.8	0.18		0.0066		n/a		0.00020	J	n/a		0.00090	U	0.0041		0.043						0.024		0.00020	U	0.0036						0.0051	J
1011PWT028-EFF	PWT Effluent	08/31/2010	7.6	16.5	0.54		0.0065		n/a		0.00036	J	n/a		0.0049	RL1, J	0.0055		0.044	RL1, J					0.062		0.00020	U	0.0047						0.020	RL1, J
1011PWT030-EFF	PWT Effluent	09/02/2010	7.3	15.2	0.042	RL1,U	0.0045	RL1,U	540		0.00050	RL1,U	0.0016	RL1, J	0.0045	RL1,U	0.0046	RL1, J	0.11		60		0.36		0.020		0.0010	RL1,U	0.0029	RL1, J	1700		2500		0.020	RL1,U
1011PWT031-EFF	PWT Effluent	09/07/2010	7.5	15.3	0.029		0.0028		n/a		0.00030	J	n/a		0.00090	U	0.0023		0.0099	J					0.013		0.00020	U	0.0018	J					0.0040	U
1011PWT032-EFF	PWT Effluent-Dup	09/07/2010	7.5	15.3	0.033		0.0027		n/a		0.00029	J	n/a		0.00090	U	0.0024		0.012						0.014		0.00020	U	0.0011	J					0.0053	J
1011PWT034-EFF	PWT Effluent	09/09/2010	7.6	15.1	0.027		0.0022		510	MHA, B-1	0.00025	J	0.0018		0.00090	U	0.0021		0.026		59	MHA	0.53		0.013		0.00020	U	0.00072	J	1700	MHA	2400		0.0047	J
1011PWT035-EFF	PWT Effluent	09/14/2010	7.5	14.4	0.019		0.0032		n/a		0.00022	J	n/a		0.0025	B	0.0078		0.027						0.022		0.00020	U	0.0017	J					0.0072	J

Notes:

PC indicates sample collected from Pit Clarifier prior to the start of discharge of treated AMD to Leviathan Creek.

EFF indicates sample is a sample of effluent discharged to Leviathan Creek

All values reported in milligrams per liter (mg/L) except pH and temperature which are in Standard Units and degrees Celsius, respectively.

All parameters are dissolved except Selenium which is total recoverable.

Dup indicates sample is a duplicate.

Qualifiers (Q):

B=Analyte was detected in the associated Method Blank.

C=Calibration Verification recovery was above the method control limit for this analyte. Analyte not detected, data not impacted.

J=Estimated value. Analyte detected at a level less than the Reporting Limit (RL) and greater than or equal to the Method Detection Limit (MDL). The user of this data should be aware that this data is of limited reliability.

M1=The MS and/or MSD were above the acceptance limits due to sample matrix interference. See Blank Spike (LCS).

MHA=Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. See Blank Spike (LCS).

RL1=Reporting limit raised due to sample matrix effects.

U=Non-Detect
'B-1=Analyte was detected in the associated method blank. Analyte concentration in the sample is greater than 10x the concentration found in the method blank.

Table A-3
2010 Pond Water Treatment Influent Field and Analytical Results

Sample Description	Sample ID	Sample Date	pH (SU)	Temp. (°C)	Al	Q	As	Q	Ca	Q	Cd	Q	Co	Q	Cr	Q	Cu	Q	Fe	Q	Mg	Q	Mn	Q	Ni	Q	Pb	Q	Se	Q	SO4	Q	TDS	Q	Zn	Q
PWT Influent	1011PWT008-INF	07/22/2010	2.63	23.3	300		3.5		230	MHA	0.046		1.7		0.77		1.3		440		47	MHA	8.5		4.2		0.0020	C, RL1,U	0.0039		3500		5500		0.84	
PWT Influent	1011PWT012-INF	07/29/2010	2.6	19.2	310		3.5		200		0.051		2.0		0.95		1.6		470		49		10		5.1		0.010	U. RL1	0.012	RL1, J	3900		5900		0.89	
PWT Influent	1011PWT016-INF	08/05/2010	2.6	18.6	350		3.1		200		0.044		1.7		0.84		1.2		480		55		9.2		4.2		0.0010	RL1, B,U	0.0042		4200		6700		0.82	
PWT Influent	1011PWT019-INF	08/12/2010	2.6	16.4	350		2.9		210		0.030		1.3		0.68		0.95		580		54		7.4		3.1		0.00069	J	0.012	RL1, J	4400		6400		0.55	
PWT Influent	1011PWT024-INF	08/19/2010	2.6	16.5	400		4.8	MHA	260		0.061	RL1, J	2.6	MHA	1.2	B-1, MHA	2.1	MHA	660		64		13	MHA	6.6	MHA	0.020	RL1, MNR,U	0.0084	RL1, J	4800		7200		1.2	MHA
PWT Influent	1011PWT026-INF	08/24/2010	2.6	12.2	460		5.2		260		0.055		2.8		1.2		1.9		630		68		14		6.3		0.0020	RL1,U	0.011	RL1, J	5600		8900		1.2	
PWT Influent	1011PWT029-INF	09/01/2010	2.7	11.7	400		5.1		240	MHA	0.041		1.4		0.72		1.1		770		64	MHA	11		3.4		0.0020	J	0.012	RL1, J	5200		7900		0.69	

Notes:

All values reported in milligrams/liter (mg/L), except pH and temperature which are in Standard Units and degrees Celsius, respectively.

pH and Temperature readings were collected in the field at the time of sample collection.

All parameters are dissolved, except Selenium, which is total recoverable.

Qualifiers:

B=Analyte was detected in the associated Method Blank.

C=Calibration Verification recovery was above the method control limit for this analyte. Analyte not detected, data not impacted.

J=Estimated value. Analyte detected at a level less than the Reporting Limit (RL) and greater than or equal to the Method Detection Limit (MDL). The user of this data should be aware that this data is of limited reliability.

MHA=Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. See Blank Spike (LCS).

MNR=No results were reported for the MS/MSD. The sample used for the MS/MSD required dilution due to the sample matrix. Because of this, the spike compounds were diluted below the detection limit.

RL1=Reporting limit raised due to sample matrix effects.

U=Non-Detect
'B-1=Analyte was detected in the associated method blank. Analyte concentration in the sample is greater than 10x the concentration found in the method blank.

Table A-4
Summary of 2010 Pond Water Treatment Plant Operators' Log

Date	Time	R-1		Pit Clarifier		Weir Discharge		Valve to Leviathan Creek Status	INF and EFF Samples Collected During Operations
		pH	Temp	pH	Temp	pH	Temp		
7/9/10	--	--	--	--	--	--	--	Closed	1011 PWT001-PC
7/10/10								↓	Plant shut down for weekend
7/11/10								↓	Plant shut down for weekend
7/12/10	9:00	8.6	22.6	8.3	20.2	n/a	n/a	↓	
7/12/10	12:00	8.6	23.5	8.4	23.7	n/a	n/a	↓	1011PWT002-PC
7/12/10	15:00	8.7	24.3	8.6	24.8	n/a	n/a	↓	
7/12/10	18:00	8.7	25.0	8.6	24.1	n/a	n/a	↓	
7/13/10	9:00	8.5	24.1	8.0	20.6	n/a	n/a	↓	
7/13/10	12:00	8.6	23.9	8.3	22.8	n/a	n/a	↓	1011 PWT003-PC
7/13/10	15:00	8.6	26.3	8.5	22.3	n/a	n/a	↓	
7/13/10	18:00	8.6	27.0	8.4	25.8	n/a	n/a	↓	
7/14/10	7:00	8.3	19.8	7.7	20.1	n/a	n/a	↓	
7/14/10	10:00	8.5	23.4	8.5	20.1	n/a	n/a	↓	1011 PWT004-PC
7/14/10	13:00	8.6	26.2	8.5	24.4	n/a	n/a	↓	
7/14/10	16:00	8.4	28.4	25.3	24.1	n/a	n/a	↓	
7/15/10	6:00	8.4	26.0	8.1	19.2	n/a	n/a	↓	
7/15/10	9:00	8.2	23.0	8.3	20.7	n/a	n/a	↓	1011PWT005-PC
7/15/10	12:00	8.3	27.2	8.7	23.6	n/a	n/a	↓	
7/15/10	15:00	8.3	27.9	8.4	26.2	n/a	n/a	↓	
7/16/10	7:00	8.7	24.4	8.1	22.3	n/a	n/a	↓	
7/16/10	10:00	8.3	26.2	7.8	23.1	n/a	n/a	↓	
7/16/10	13:00	8.4	27.0	7.6	22.8	n/a	n/a	↓	
7/19/10	9:00	8.0	20.9	7.6	25.6	n/a	n/a	↓	
7/19/10	12:00	8.2	23.9	7.7	22.8	6.7	22.1	Opened (at 1030)	
7/19/10	15:00	8.2	26.2	7.8	23.6	7.5	22.2	↓	
7/19/10	18:00	8.4	27.4	8.1	22.7	7.0	22.1	↓	
7/19/10	21:00	8.3	27.1	7.8	20.0	7.6	20.3	↓	
7/20/10	7:00	8.2	21.5	7.9	16.1	7.9	20.3	↓	
7/20/10	10:00	8.3	21.9	7.9	18.5	7.7	19.3	↓	1011PWT006-EFF
7/20/10	13:00	8.3	25.6	7.7	19.2	7.4	21.1	↓	
7/20/10	16:00	8.2	26.7	7.6	22.0	7.2	22.3	↓	
7/20/10	19:00	8.3	27.4	8.3	22.0	7.5	21.7	↓	
7/20/10	22:00	8.1	27.8	7.8	19.1	7.7	19.6	↓	
7/21/10	0:00	8.5	24.9	7.8	13.8	7.8	10.6	↓	
7/21/10	3:00	8.1	23.1	8.7	14.1	8.2	13.4	↓	
7/21/10	6:00	8.2	21.9	--	--	--	--	↓	
7/21/10	9:00	8.2	22.2	7.8	17.7	7.7	18.1	↓	
7/21/10	12:00	8.1	24.2	7.7	21.4	7.7	21.1	↓	
7/21/10	15:00	8.0	26.5	7.7	20.7	7.7	21.6	↓	
7/21/10	18:00	8.1	27.9	7.7	22.4	7.6	22.8	↓	
7/21/10	21:00	8.2	27.2	7.7	19.3	7.5	20.3	↓	
7/22/10	0:00	8.2	25.8	7.6	18.8	7.3	19.2	↓	
7/22/10	3:00	8.2	24.0	7.5	17.6	7.3	19.3	↓	
7/22/10	6:00	8.2	22.1	7.6	15.5	7.3	16.6	↓	
7/22/10	9:00	8.2	22.1	7.5	17.3	7.5	18.1	↓	1011PWT007-EFF
7/22/10	12:00	8.2	25.6	7.6	21.9	7.6	21.8	↓	1011PWT008-INF
7/22/10	16:00	8.1	28.7	7.6	22.9	7.6	22.8	↓	
7/22/10	19:00	8.1	29.3	8.1	26.2	7.3	22.5	↓	
7/22/10	22:00	8.1	27.9	7.9	22.1	7.8	21.2	↓	
7/23/10	0:00	8.1	26.7	8.0	20.8	7.9	20.5	↓	
7/23/10	3:00	8.2	24.7	7.9	18.3	7.9	19.0	↓	
7/23/10	6:00	8.2	22.7	8.2	17.3	8.1	16.8	↓	
7/23/10	9:00	8.1	22.9	7.9	18.4	8.0	19.3	↓	
7/23/10	12:00	8.1	27.2	7.4	23.2	7.7	24.1	closed (midnight)	
7/24/10								↓	Plant shut down for weekend
7/25/10								↓	Plant shut down for weekend

Table A-4
Summary of 2010 Pond Water Treatment Plant Operators' Log

Date	Time	R-1		Pit Clarifier		Weir Discharge		Valve to Leviathan Creek Status	INF and EFF Samples Collected During Operations
		pH	Temp	pH	Temp	pH	Temp		
7/26/10	9:00	8.1	22.9	7.6	18.9	7.3	18.9	Opened (at 0800)	
7/26/10	12:00	8.0	25.3	8.0	20.3	8.0	20.4	↓	
7/26/10	15:00	8.1	25.6	8.1	21.6	7.6	20.4	↓	
7/26/10	18:00	8.0	28.3	8.4	22.8	8.0	21.9	↓	
7/26/10	21:00	8.0	27.4	8.0	19.4	8.0	19.3	↓	
7/27/10	0:00	8.0	25.6	7.6	15.6	7.8	15.1	↓	
7/27/10	3:00	8.0	23.5	7.7	13.1	7.9	14.8	↓	
7/27/10	6:00	8.0	21.8	7.3	15.5	7.3	15.0	↓	
7/27/10	9:00	7.9	22.3	7.8	17.2	7.6	18.7	↓	1011PWT009-EFF
7/27/10	12:00	7.9	26.0	8.0	21.8	7.9	21.3	↓	
7/27/10	15:00	8.3	28.3	7.6	23.2	7.4	22.4	↓	
7/27/10	18:00	7.9	27.8	8.1	22.4	8.0	21.6	↓	
7/27/10	21:00	8.0	28.8	8.2	16.6	8.1	19.6	↓	
7/28/10	0:00	8.2	27.0	8.0	19.4	8.0	19.0	↓	
7/28/10	3:00	8.1	24.7	7.9	15.2	7.4	17.9	↓	
7/28/10	6:00	8.0	22.9	7.8	13.7	7.6	17.3	↓	
7/28/10	9:00	8.0	22.1	8.1	16.8	8.0	18.0	↓	
7/28/10	12:00	8.0	25.2	8.1	20.7	8.0	20.5	↓	
7/28/10	15:00	7.9	28.1	8.0	22.8	8.0	21.9	↓	
7/28/10	18:00	8.1	29.7	8.2	23.6	7.6	23.6	↓	
7/28/10	21:00	8.0	28.9	8.3	20.5	8.1	20.5	↓	
7/29/10	0:00	8.0	27.6	8.0	19.1	8.0	18.7	↓	
7/29/10	3:00	8.0	24.2	8.1	15.9	8.0	17.2	↓	
7/29/10	6:00	8.0	23.1	7.9	12.7	7.9	15.1	↓	
7/29/10	9:00	8.0	23.1	7.9	17.6	7.5	18.7	↓	1011PWT011-EFF
7/29/10	12:00	8.1	25.6	8.0	22.2	8.0	20.4	↓	1011PWT012-INF
7/29/10	15:00	8.1	28.4	8.0	24.7	7.7	22.0	↓	
7/29/10	18:00	8.2	30.1	8.3	24.0	8.2	22.9	↓	
7/29/10	21:00	8.2	28.7	8.2	21.1	7.5	19.3	↓	
7/30/10	0:00	8.2	26.0	8.2	18.9	7.8	17.8	↓	
7/30/10	3:00	8.2	24.1	7.9	15.5	7.7	17.6	↓	
7/30/10	6:00	8.3	22.6	7.9	16.5	7.9	17.1	↓	
7/30/10	9:00	8.3	22.2	8.1	17.3	8.0	18.4	↓	
7/30/10	12:00	8.3	24.6	8.0	21.1	8.0	20.4	↓	
7/30/10	15:00	8.2	29.2	8.0	22.4	7.9	22.6	↓	
7/30/10	18:00	8.1	30.7	8.2	24.3	8.0	22.6	↓	
7/30/10	20:00	8.1	29.9	8.1	23.7	7.9	22.0	Closed (at midnight)	
7/31/10								↓	Plant shut down for weekend
8/1/10								↓	Plant shut down for weekend
8/2/10	7:00	8.1	22.1	7.5	16.9	7.0	18.2	Opened (at 0700)	
8/2/10	10:00	8.2	21.1	7.7	17.1	7.5	19.1	↓	
8/2/10	13:00	8.2	23.8	7.9	19.9	7.8	20.1	↓	
8/2/10	16:00	8.2	27.0	8.0	22.6	7.7	21.3	↓	
8/2/10	19:00	8.1	28.0	7.8	21.1	7.5	19.3	↓	
8/2/10	22:00	8.1	26.7	7.6	18.7	7.5	19.2	↓	
8/3/10	0:00	8.2	23.8	7.5	17.1	7.5	18.7	↓	
8/3/10	3:00	8.1	22.5	7.6	15.5	7.1	17.9	↓	
8/3/10	6:00	8.1	19.9	7.3	13.3	7.2	17.8	↓	
8/3/10	9:00	8.2	19.0	7.6	15.7	7.0	16.1	↓	1011PWT013-EFF
8/3/10	12:00	8.1	22.1	7.3	20.6	7.3	19.2	↓	
8/3/10	15:00	8.1	26.0	7.8	21.6	7.6	21.9	↓	
8/3/10	18:00	8.2	28.1	7.9	20.5	7.8	21.1	↓	
8/3/10	21:00	8.2	27.7	8.0	20.4	7.7	18.8	↓	

Table A-4
Summary of 2010 Pond Water Treatment Plant Operators' Log

Date	Time	R-1		Pit Clarifier		Weir Discharge		Valve to Leviathan Creek Status	INF and EFF Samples Collected During Operations
		pH	Temp	pH	Temp	pH	Temp		
8/4/10	0:00	8.2	24.4	8.0	18.6	7.3	17.9	↓	
8/4/10	3:00	8.3	22.1	8.0	15.0	7.5	17.3	↓	
8/4/10	6:00	8.2	20.2	7.9	13.2	7.7	17.7	↓	
8/4/10	9:00	8.2	19.7	7.9	15.2	8.0	16.1	↓	
8/4/10	12:00	8.2	24.4	7.6	20.8	7.7	20.6	↓	
8/4/10	15:00	down for maintenance				7.6	22.2	↓	
8/4/10	18:00	8.3	29.1	8.0	22.3	7.9	20.3	↓	
8/4/10	21:00	8.2	28.8	8.1	18.8	7.5	18.3	↓	
8/5/10	0:00	8.2	25.0	8.1	17.6	7.8	16.3	↓	
8/5/10	3:00	8.3	24.0	7.9	15.7	7.7	17.9	↓	
8/5/10	6:00	8.2	20.3	7.8	14.4	7.6	17.8	↓	
8/5/10	9:00	8.1	20.1	7.9	15.0	7.9	16.0	↓	1011PWT014-EFF
8/5/10	12:00	8.1	23.1	7.7	19.6	7.7	20.1	↓	1011PWT015-EFF (duplicate)
8/5/10	15:00	8.2	28.4	7.7	23.4	7.7	22.7	↓	1011PWT016-INF
8/5/10	18:00	8.1	30.1	7.8	23.8	7.7	22.3	↓	
8/5/10	21:00	8.0	27.0	7.9	21.2	7.7	17.7	↓	
8/6/10	0:00	8.2	25.7	7.9	19.9	7.4	17.5	↓	
8/6/10	3:00	8.0	22.0	7.7	15.6	7.3	17.0	↓	
8/6/10	6:00	8.1	20.0	7.7	13.3	7.3	17.1	↓	
8/6/10	9:00	8.0	19.2	7.6	15.0	7.8	14.6	↓	
8/6/10	12:00	8.0	24.2	7.8	20.0	7.8	20.9	↓	
8/6/10	15:00	8.0	26.3	7.6	15.0	7.8	14.6	↓	
8/6/10	18:00	7.9	30.3	7.9	24.2	7.9	21.8	↓	
8/6/10	21:00	8.0	27.9	8.0	22.0	8.1	18.1	↓	
8/7/10								↓	Plant shut down for weekend
8/8/10								↓	Plant shut down for weekend
8/9/10	8:00	7.9	18.8	7.5	15.6	7.8	17.3	↓	
8/9/10	11:00	7.8	21.0	7.4	16.9	7.3	18.1	↓	
8/9/10	14:00	7.9	23.4	7.6	18.2	7.4	18.7	↓	
8/9/10	17:00	7.9	25.4	7.7	19.9	7.6	17.7	↓	
8/9/10	20:00	8.0	25.6	7.8	18.7	7.5	17.8	↓	
8/9/10	23:00	8.0	24.6	8.0	18.3	7.6	15.4	↓	
8/10/10	0:00	8.1	24.1	8.0	18.3	8.0	15.7	↓	
8/10/10	3:00	8.1	22.3	7.8	15.9	7.8	14.8	↓	
8/10/10	6:00	8.1	20.7	7.9	13.8	7.9	13.2	↓	
8/10/10	9:00	8.1	19.7	7.8	15.6	7.8	15.0	↓	1011PWT017-EFF
8/10/10	12:00	8.1	21.9	7.7	17.7	7.6	20.3	↓	
8/10/10	15:00	8.1	25.2	7.8	19.6	7.8	21.9	↓	
8/10/10	18:00	8.0	27.5	8.0	19.9	8.0	20.1	↓	
8/10/10	21:00	8.0	25.8	7.9	19.8	7.9	15.3	↓	
8/11/10	0:00	8.2	24.1	7.9	17.7	7.9	17.2	↓	
8/11/10	3:00	8.0	22.5	7.9	16.8	7.9	14.3	↓	
8/11/10	6:00	8.0	19.9	7.8	15.5	7.8	12.5	↓	
8/11/10	9:00	8.0	20.6	7.8	15.3	7.9	14.2	↓	
8/11/10	12:00	8.0	22.3	7.5	17.2	7.4	20.0	↓	
8/11/10	15:00	8.0	26.0	7.1	19.3	7.0	22.1	↓	
8/11/10	18:00	8.0	27.4	7.9	20.8	7.9	20.6	↓	
8/11/10	21:00	8.1	26.3	7.7	15.8	7.4	15.8	↓	
8/12/10	0:00	7.9	23.7	8.0	16.0	7.7	13.2	↓	
8/12/10	3:00	7.7	21.5	7.7	13.2	7.8	12.7	↓	
8/12/10	6:00	7.7	21.2	7.7	12.3	7.6	10.7	↓	
8/12/10	9:00	8.3	18.4	7.7	14.5	7.7	13.8	↓	1011PWT018-EFF
8/12/10	12:00	7.7	21.1	7.7	17.3	7.7	19.2	↓	1011PWT019-INF
8/12/10	15:00	8.1	25.9	7.8	18.9	7.5	23.7	↓	
8/12/10	18:00	7.8	27.8	8.0	19.7	7.8	22.1	↓	
8/12/10	21:00	8.1	26.8	8.0	17.3	8.1	16.1	↓	

Table A-4
Summary of 2010 Pond Water Treatment Plant Operators' Log

Date	Time	R-1		Pit Clarifier		Weir Discharge		Valve to Leviathan Creek Status	INF and EFF Samples Collected During Operations
		pH	Temp	pH	Temp	pH	Temp		
8/13/10	0:00	8.1	24.8	8.2	17.3	8.3	15.5	↓	
8/13/10	3:00	7.9	22.3	8.1	14.4	8.2	14.3	↓	
8/13/10	6:00	8.0	21.4	8.0	6.2	8.0	13.4	↓	
8/13/10	9:00	8.0	19.2	8.1	15.8	8.0	14.5	↓	
8/13/10	12:00	8.3	21.8	8.0	18.9	7.9	21.9	↓	
8/13/10	15:00	8.0	26.0	7.8	21.1	7.7	25.4	↓	
8/13/10	18:00	7.7	28.2	7.7	22.4	7.8	21.7	↓	
8/13/10	21:00	7.6	24.4	8.5	18.7	8.4	16.6	↓	
8/14/10								↓	Plant shut down for weekend
8/15/10								↓	Plant shut down for weekend
8/16/10								↓	Plant shut down for weekend
8/17/10	9:00	9.2	22.3	7.6	18.2	7.6	17.0	↓	
8/17/10	12:00	8.2	28.5	7.8	20.2	7.9	17.9	↓	1011PWT020-EFF
8/17/10	15:00	8.1	26.8	8.0	21.8	8.0	17.9	↓	1011PWT021-EFF (duplicate)
8/17/10	18:00	8.2	28.3	8.2	22.4	8.1	16.8	↓	
8/18/10	7:00	8.2	24.6	7.5	16.8	7.0	15.8	↓	
8/18/10	10:00	9.0	21.5	7.9	18.8	7.8	17.0	↓	
8/18/10	13:00	8.1	23.8	8.0	20.5	7.9	19.7	↓	
8/18/10	16:00	8.1	27.0	8.1	22.1	8.0	20.6	↓	
8/19/10	7:00	8.1	23.1	7.7	15.9	7.3	14.0	↓	
8/19/10	10:00	8.1	20.0	7.8	17.2	7.8	16.8	↓	1011PWT022-EFF
8/19/10	13:00	8.1	22.2	8.1	17.9	8.0	18.5	↓	1011PWT024-INF
8/19/10	16:00	8.1	25.1	8.2	19.8	8.0	23.1	↓	
8/20/10	7:00	8.0	22.3	7.8	16.0	7.5	15.2	↓	
8/20/10	10:00	8.1	20.9	8.0	18.0	7.9	16.8	↓	
8/20/10	13:00	8.0	22.7	8.1	18.5	8.0	21.3	↓	
8/20/10	16:00	8.0	29.9	8.2	20.4	8.0	21.6	↓	
8/21/10								↓	Plant shut down for weekend
8/22/10								↓	Plant shut down for weekend
8/23/10	7:00	8.0	19.6	7.8	16.2	7.8	16.2	↓	
8/23/10	10:00	8.0	20.1	8.0	16.3	7.9	16.4	↓	
8/23/10	13:00	8.0	23.7	7.9	21.0	7.9	16.8	↓	
8/23/10	16:00	8.0	26.2	8.1	21.2	8.0	16.6	↓	
8/24/10	7:00	8.0	20.2	7.8	16.2	7.7	15.6	↓	
8/24/10	10:00	8.0	19.7	8.0	17.5	7.9	16.4	↓	1011PWT025-EFF
8/24/10	13:00	8.0	21.1	8.1	19.1	8.0	16.9	↓	1011PWT026-INF
8/24/10	16:00	8.0	26.0	8.0	20.1	8.0	16.5	↓	
8/25/10	7:00	8.0	23.9	7.8	15.0	7.7	15.9	↓	
8/25/10	10:00	8.0	21.1	7.8	18.8	7.5	17.2	↓	
8/25/10	13:00	7.9	24.4	8.1	20.7	8.0	19.7	↓	
8/25/10	16:00	7.9	27.0	8.2	22.4	8.0	22.8	↓	
8/26/10	7:00	8.0	23.8	7.8	14.4	7.7	18.7	↓	
8/26/10	10:00	7.9	23.7	8.1	20.0	8.0	18.1	↓	1011PWT027-EFF
8/26/10	13:00	8.0	26.0	8.2	21.8	8.0	20.7	↓	
8/26/10	16:00	8.0	29.5	7.9	22.2	7.7	19.4	↓	
8/27/10	7:00	7.4	25.0	7.6	16.7	7.0	13.8	↓	
8/27/10	10:00	7.9	22.9	7.8	20.2	7.8	16.9	↓	
8/27/10	13:00	7.9	25.5	7.8	20.1	7.8	21.6	↓	
8/27/10	16:00	8.0	28.8	7.9	22.2	7.9	22.1	↓	
8/28/10								↓	Plant shut down for weekend
8/29/10								↓	Plant shut down for weekend
8/30/10	10:00	7.9	19.7	8.0	11.7	7.7	16.6	↓	
8/30/10	13:00	7.6	20.0	7.8	14.3	7.8	16.3	↓	
8/30/10	16:00	7.5	23.4	7.8	16.8	7.7	17.4	↓	

Table A-4
Summary of 2010 Pond Water Treatment Plant Operators' Log

Date	Time	R-1		Pit Clarifier		Weir Discharge		Valve to Leviathan Creek Status	INF and EFF Samples Collected During Operations
		pH	Temp	pH	Temp	pH	Temp		
8/31/10	7:00	7.9	18.1	7.8	13.3	7.7	10.4	↓	
8/31/10	10:00	7.5	15.6	7.7	10.9	7.7	11.7	↓	1011PWT028-EFF
8/31/10	13:00	7.8	21.7	7.8	14.7	7.7	19.0	↓	
8/31/10	16:00	7.6	28.2	8.0	15.5	7.9	21.0	↓	
9/1/10	7:00	7.8	15.3	7.8	14.2	7.7	14.9	↓	
9/1/10	10:00	7.9	14.9	7.8	10.6	7.8	10.7	↓	1011PWT029-INF
9/1/10	12:00	8.1	20.9	7.8	13.7	7.3	18.0	↓	

Notes:
R-1 = Reactor Vessel 1
pH in Standard Units; Temperature in degrees Celsius
pH in R-1 recorded from in-plant pH controllers; pit clarifier and weir pH recorded using hand-held meter.
PC = pit clarifier; samples collected to evaluate treated water quality prior to discharge
INF = influent; samples collected to characterize treatment plant influent water quality
EFF = effluent; samples collected to characterize quality of water discharged to Leviathan Creek

Table A-5
2010 Pond Water Treatment Sludge Analytical Results

Regulatory Criteria	Percent Solids	Al		Sb		As		Ba		Be		Cd		Cr		Co		Cu		Fe		Pb		Hg		Mo		Ni		Se		Ag		Tl		V		Zn	
TTLC (mg/kg)	NP	NP		500		500		10000		75		100		2500		8000		2500		NP		1000		20		3500		2000		100		500		700		2400		5000	
STLC (mg/L)	NP	NP		15		5		100		0.75		1		560		80		25		NP		5		0.2		350		20		1		5		7		24		250	
Sample ID and Testing Procedure	**Percent Solids**	**Al**	**Q**	**Sb**	**Q**	**As**	**Q**	**Ba**	**Q**	**Be**	**Q**	**Cd**	**Q**	**Cr**	**Q**	**Co**	**Q**	**Cu**	**Q**	**Fe**	**Q**	**Pb**	**Q**	**Hg**	**Q**	**Mo**	**Q**	**Ni**	**Q**	**Se**	**Q**	**Ag**	**Q**	**Tl**	**Q**	**V**	**Q**	**Zn**	**Q**
1011PWT036-PC-A	9.1																																						
TTLC (mg/kg dry)		75000		9.5	U	730		12		2.9	J	6.7		190		400		340		99000	B-1	5.4	U	0.13	U	2.2	U	1100		11	U	9.6	J	8.7	U	46		180	
STLC (mg/L)		590		0.14	U	2.2		0.34		0.037	J	0.040	U	2.9		5.5		4.3		1200		0.080	U	0.0010	U	0.040	B,U	11		0.16	U	0.12	U	0.14	U	0.65		2.9	
1011PWT037-PC-B	7.2																																						
TTLC (mg/kg dry)		83000		12	U	800		14		3.1	J	7.4		190		440		380		110000	B-1	6.9	U	0.17	U	2.8	U	1200		14	U	11	J	11	U	52		200	
STLC (mg/L)		500		0.14	U	2.7		0.12	U	0.027	J	0.041	J	2.2		4.3		3.4		960		0.080	U	0.0010	U	0.040	B,U	9.1		0.16	U	0.12	U	0.14	U	0.51		2.6	
1011PWT038-PC-C	12																																						
TTLC (mg/kg dry)		52000		7.5	U	610		61		2.5	J	5.8		160		350		310		86000	B-1	4.2	U	0.20		1.7	U	930		8.5	U	7.4	J	6.8	U	52		170	
STLC (mg/L)		610		0.14	U	1.2		0.71		0.044	J	0.045	J	3.2		6.6		5.0		1300		0.080	U	0.0010	U	0.040	B,U	12		0.16	U	0.12	U	0.14	U	0.51		3.4	

Notes:

Sludge samples were collected on October 27, 2010. The samples represent a homogenized section through the entire sludge blanket thickness at each location.

TTLC - Total Threshold Limit Concentration

STLC - Soluble Threshold Limit Concentration

NP - Not Promulgated

Qualifiers:

U - Analyte not detected at the given Method Detection Limit (MDL).

J - Estimated value. Analyte detected at a level less than the Reporting Limit (RL) and greater than or equal to the Method Detection Limit (MDL). The user of this data should be aware that this data is of limited reliability.

B-1=Analyte was detected in the associated method blank. Analyte concentration in the sample is greater than 10x the concentration found in the method blank.

B-=Analyte was detected in the associated method blank.

Appendices B through E (on compact disc)

Appendix B – 2010 Pond Water Treatment Data

Laboratory Reports (PDF format)
Analytical Laboratory Electronic Data Deliverable Files (Microsoft Excel format)

Appendix C – 2010 Water Year Pond 1 Weather Station Data

Hourly data organized by month (Microsoft Excel Format)

Appendix D – 2010 Water Year Flow and Stage Annual Data Reports

Annual Water Data Reports for 16 Stations (PDF format)

Appendix E – 2010 Water Year Surface Water Monitoring Data

Laboratory Reports (PDF format)
Analytical Laboratory Electronic Data Deliverable Files (Microsoft Excel format)
Electronic Data Deliverable File of Field Parameter Data (Microsoft Excel format)