2010 Oversight Summary Report
Leviathan Mine Superfund Site
Alpine County, California

Prepared for

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ACRONYMS AND ABBREVIATIONS

AMD	Acid Mine Drainage
Atlantic Richfield	Atlantic Richfield Company
ARWS	Atlantic Richfield Work Season
AS	Aspen Seep
ASBR	Aspen Seep Bioreactor
Burleson	Burleson Consulting, Inc.
CUD	Channel Underdrain
Decon	Decon Environmental Inc.
DS	Delta Seep
Eh	Oxidation Reduction Potential
EDCDA	El Dorado County Department of Agriculture
EPA	U.S. Environmental Protection Agency
ERA	Early response action
Forest Service	U.S. Department of Agriculture, Forest Service
gpm	Gallons per minute
HDPE	High Density Polyethylene
HDS	High Density Sludge
HMI	Human Machine Interface
LAS	Limited Access Season
Leviathan Mine	Leviathan Mine Superfund Site
LIDAR	Light Detection and Ranging
mV	millivolt
mg/L	Milligram per liter
MRAM	Modified Removal Action Memorandum
NREL	National Renewable Energy Laboratory
ORP	Oxidation-reduction potential
PLC	Programmable Logic Controller
PUD	Pit Underdrain
PWTS	Pond Water Treatment System

ACRONYMS AND ABBREVIATIONS (continued)

RAM	Removal action memorandum
RAWP	Removal Action Work Plan
Regional Board	California Regional Water Quality Control Board—Lahontan Region
RI	Remedial Investigation
SC	Specific conductance
SCADA	Supervisor Control and Data Acquisition
SDB	Sludge Drying Bed
SPLP	Synthetic Precipitation Leaching Procedure
STLC	Soluble Threshold Limit Concentrations
TCLP	Toxicity Characteristic Leaching Procedure
Tetra Tech	Tetra Tech EM Inc.
TSIT	Treatability Studies and Interim Treatment Work Plan
UPS	Uninterruptible Power Supply
USACE	U.S. Army Corps of Engineers, Sacramento District
μS/cm	MicroSiemen per centimeter
USFS	U.S. Forest Service
USGS	U.S. Geological Survey

1.0 INTRODUCTION

This oversight summary report describes the activities completed and the information collected during Burleson Consulting, Inc. (Burleson) field oversight at the Leviathan Mine Superfund Site (Leviathan Mine) in Alpine County, California. Field oversight was provided from April 27, 2010, through November 18, 2010. Burleson performed oversight for the U.S. Environmental Protection Agency (EPA), Region IX, under contract with the U.S. Army Corps of Engineers (USACE), Sacramento District (Contract No. W91238-08-D-0012). Burleson personnel were on site once every three weeks during the 2010 Leviathan Mine construction and water treatment season (May to November). The primary focus of field oversight was to: (1) monitor the effects of mine drainage capture and treatment on the quality of Leviathan Creek and associated creeks downstream from the mine, and (2) confirm that work conducted by the California Regional Water Quality Control Board—Lahontan Region (Regional Board) and Atlantic Richfield Company (Atlantic Richfield) followed the approved work plans.

1.1 LOCATION AND BACKGROUND

The Leviathan Mine is located in Alpine County, California, 5 miles east of Markleeville (see Figure 1), and encompasses 32 patented mineral claims and a patented mill site (Regional Board 2010). Native sulfur was extracted from the Leviathan Mine by underground and open-pit mining methods, which ceased in 1962 (Regional Board 1975). Leviathan Creek flows through the mine site, where the water quality becomes impaired when water contacts sulfur- and metals-bearing rock. Acidic, metals-bearing seepage discharges to the creek from known sources including a collapsed adit, the Pit Underdrain (PUD), the Channel Underdrain (CUD), Delta Seep (DS), and Aspen Seep (AS). Additional unidentified sources of contaminants may further impair surface water quality. Acid-generating mine waste in the creek bed appears to affect Leviathan Creek, although the mine waste and water contact was reduced through remediation activities conducted by the Regional Board in 1984. Leviathan Creek flows into Bryant Creek north of the mine, and Bryant Creek flows along and through Washoe Tribal Lands, across the Nevada state line and into the East Fork of the Carson River. The Leviathan Mine was listed as an EPA Superfund site on May 11, 2000. A site map of the Leviathan Mine is presented as Figure 2. A light detection and ranging (LIDAR) map of pond area features is presented as Figure 3.

1.2 PURPOSE AND OBJECTIVES

This report summarizes Burleson's 2010 field oversight activity and presents photographic documentation of site activities. Field measurements collected during oversight at the on-site water treatment systems (located at Pond 1, Pond 4, and AS) provide insight into the effectiveness of the systems in treating acidic, metals-bearing water generated on site. Field measurements collected at monitoring points on Leviathan, Aspen, Mountaineer, and Bryant Creeks (see Figure 2) before, during, and after the treatment season are useful for evaluation of the effectiveness of the early response actions and also provide insight into the watershed's response to capture and treatment of acidic, metals-bearing water and release of effluent from the treatment systems. This insight will be used to evaluate long-term options for acid drainage treatment at the Leviathan Mine and the resulting improvement in downstream water quality in Leviathan and associated creeks.

Burleson's field oversight included maintaining communication with EPA, Regional Board, and Atlantic Richfield personnel, visiting and inspecting the treatment systems and site infrastructure, and monitoring surface water quality through the treatment season. Field observations were documented in dedicated field notebooks, on field data sheets, and in photographs. A brief oversight summary was prepared after each oversight period and was delivered to EPA and USACE. Oversight summaries and photographs are presented in Appendices A and B. Information presented in this report was acquired during field oversight and telephone calls with the Regional Board, Atlantic Richfield, and both parties' contracted personnel. Though information is accurate to the best of Burleson's knowledge, year-end reports prepared by the Regional Board and Atlantic Richfield contain information that was unavailable to Burleson during oversight.

1.3 REPORT ORGANIZATION

This report presents a summary of activities observed during field oversight at the Leviathan Mine throughout the operating season in 2010. This report is organized into the following sections:

- Section 1.0 provides an overview of the Leviathan Mine and describes objectives of oversight.
- Section 2.0 describes site activities conducted by Atlantic Richfield in 2010.
- Section 3.0 describes site activities conducted by the Regional Board in 2010.
- Section 4.0 describes site activities conducted by EPA in 2010.
- Section 5.0 describes Burleson's oversight activities and findings in 2010.
- Section 6.0 summarizes activities at Leviathan Mine in 2010 and presents conclusions and recommendations for future investigations and activities.
- Section 7.0 presents references cited in this report.

Figures and tables are presented after the report text. This report also includes the following appendices:

- Appendix A, Oversight Summaries
- Appendix B, Oversight Photographs
- Appendix C, Field Instrument Calibration Records
- Appendix D, Monitoring Well Hydrographs

2.0 ATLANTIC RICHFIELD COMPANY SITE ACTIVITIES

This section describes early response actions (ERA) conducted at the Leviathan Mine by Atlantic Richfield during the 2010 operating season. The scope, objectives, and procedures for 2010 ERA activities are presented in Atlantic Richfield's 2010 Removal Action Work Plan (AMEC 2010). The scope of Atlantic Richfield's 2010 ERAs included:

- Collection of information that will be used to evaluate reliable and suitable treatment methodologies that may be incorporated into the long-term remedy for the Site.
- Treat the previously identified CUD, DS, and AS flows to discharge criteria previously established for the Site to the extent practicable for a treatability study.
- Optimize treatment systems.
- Implement safety-related improvements at all treatment areas.
- Reduce potential for environmental contamination due to spills or treatment disruptions.

The basic objectives of Atlantic Richfield's ERAs in 2010 included the following for the DS and CUD (AMEC 2010):

- Maintain the DS collection area to optimize flow capture;
- Maintain the CUD collection area to optimize flow capture;
- Spring commissioning and startup of the high density sludge (HDS) treatment system for treatment of collected CUD and DS flows;
- Try to extend the length of the water treatment season for the CUD and DS flows to the extent practicable while gathering information on the operational and performance reliability of the HDS Treatment System, including the CUD and DS capture and conveyance equipment, during potential LAS cold weather conditions;
- Modification of the Pond 4 Intake Pumps to enhance the pump operating range and reduce the potential for freezing during potential LAS operations;
- Improvements to the HDS Treatment System data management system;
- Maintain and evaluate modifications to the DS and CUD conveyance pipelines to improve the operational efficiency and redundant capability of the insulated and un-insulated lines;
- Complete improvements to the DS Transfer tank catwalk;
- Evaluate treatment generated solids for disposal;
- Shutdown and winterization of the HDS Treatment System.

The basic objectives of Atlantic Richfield's ERAs in 2010 included the following for the Aspen Seep (AMEC 2010):

- Continue to optimize Aspen Seep Bioreactor (ASBR) system performance;
- Evaluate engineering controls to minimize personnel exposure to hydrogen sulfide (H_2S) gas in the manholes during O&M;
- Evaluate the feasibility of installing a year-round emergency shower;
- Evaluate potential upgrades to the chemical feed systems to increase the reliability of operations;
- Evaluate ASB power generation system and the Supervisory Control and Data Acquisition (SCADA) system (including the programmable logic controller [PLC] and Human Machine Interface [HMI]) operational life expectancy, as necessary, to promote continued safe and reliable operations;
- Complete the ongoing Sludge Drying Bed (SDB) Pilot Test (Phase 1), evaluate the need for conducting a second expanded SDB Pilot Test (Phase 2), and manage sludge as necessary.

Burleson observed field activities associated with Atlantic Richfield's objectives identified above, but did not review data obtained by Atlantic Richfield during treatment (such as laboratory analytical data, technical operational data, or cost information). Information gained through Burleson's oversight of Atlantic Richfield's site activities at Leviathan Mine in 2010 is presented in the following sections. Analytical and technical data are presented in Atlantic Richfield's year-end report (AMEC 2011).

2.1 CHANNEL UNDERDRAIN AND DELTA SEEP TREATMENT

The HDS commenced operations during the limited access season (LAS) after Atlantic Richfield completed mobilization during April. LAS operations began on April 7, 2010 and the HDS plant was commissioned on April 28 and operated from May 1 through November 11, 2010. The HDS plant began discharging treated Pond 4 water on May 3, 2010. Atlantic Richfield captured CUD and DS discharges and treated the combined flows in the HDS plant from May 6 to November 1, 2010. Collection of CUD flows resumed on November 5 and ceased on November 9. The HDS plant continued to operate until November 11 to lower the water level in Pond 4 to the lowest extent possible (AMEC 2011). Operators reported the treatment rate was about 47 gallons per minute (gpm) during May, and decreased to approximately 38 gpm by July. Intercepted flows of the CUD and DS were approximately 37 gpm by mid-August. Atlantic Richfield treated about 10.6 million gallons of water from the CUD and DS along with 431,000 gallons of water collected over the previous winter in Pond 4 between May 3 and November 11, 2010. The durations of CUD and DS treatment seasons since 2001 are summarized in Table 1.

Atlantic Richfield contracted AMEC to manage and conduct CUD and DS treatment. AMEC personnel operated the HDS treatment system. CUD and DS treatment — including road maintenance, site preparation, commissioning and operation of the HDS system, effluent discharges to Leviathan Creek, sampling, disruptions during treatment, and winterization — are discussed in the sections below.

2.1.1 Road Maintenance

In accordance with their US Forest Service (USFS) permit, Atlantic Richfield maintained the access roads to Leviathan Mine during the 2010 field season. AMEC cleared snow from Leviathan Mine Road to start treatment during the LAS. The surface of the Leviathan Mine Road from Nevada and California was bladed, as necessary, to maintain a smooth surface. Dust suppressants were used during 2010.

2.1.2 Pond 4 Site Preparation

Preparation of the Pond 4 area and CUD treatment system began in April 2010. The water in Pond 4 before treatment in 2010 was a combination of (1) treated water left at the end of the treatment season in 2009; (2) direct precipitation that fell on the pond through the winter; and (3) acid drainage that may have discharged into Pond 4 from the influent standpipe, which was found to be a minor source of contamination in previous years (Brown and Caldwell 2002). Photograph B-1 in Appendix B shows Pond 4 before treatment began in 2010.

Water level data for Pond 4 during the 2010 field season obtained from the USGS are shown on Figure 4. Water elevation data obtained from the U.S. Geological Survey (USGS) online database (USGS 2010) showed the water level in Pond 4 reached just above 6.7 feet on the staff gauge in late April 2010, and then began to decrease as the HDS treatment water discharge was initiated on May 3. CUD and DS treatment began on May 6, 2010 about 3 weeks after AMEC reported beginning mobilization efforts.

2.1.3 HDS Treatment System Operations

The HDS plant was re-commissioned and operated in the spring of 2010. A process flow diagram for the HDS plant at Pond 4 is provided in Figure 5. Photographs B-2 through B-13 in Appendix B show the HDS plant and HDS system components.

Pre-commissioning activity included de-winterization of the HDS plant, replacement of pipes and fittings broken over the winter, installation of site communications equipment, servicing of plant motors and gearboxes, set up and testing of the lime delivery system, maintenance and startup of site generators, programming of control systems, inspection of conveyance pumps, installation of capture pumps, delivery of site trailers, and system tests. System tests included static and dynamic hydraulic tests, hydraulic pump and valve tests, pH probe testing, and verifying that interceptor controls and communication systems functioned.

The HDS plant was designed to receive influent water from Pond 4. To minimize chemical fluctuations and equalize flows to the HDS plant, Pond 4 acts as a storage pond used to store raw CUD and DS water prior to treatment during HDS operations. Influent is pumped from Pond 4 to the lime sludge mix tank where it mixes with lime and sludge from the clarifier (initial operations do not include sludge). The mixture then flows to the reactor tank where solids form as the lime and oxygen are mixed with the solution. Reactor tank effluent enters the clarifier where flocculent is added, and solids agglomerate and settle. Water from the clarifier then flows to the effluent tank. Effluent can be used to mix flocculent, can be discharged to Pond 4, or can be discharged to Leviathan Creek. Part of the sludge is wasted to the sludge bins, and part of the sludge is recirculated to the lime/sludge mix tank. Decant water from the sludge bins is pumped back to the reactor tank, and dried sludge is profiled and disposed off site. The HDS plant was designed to drain to Pond 4 in the event of unexpected shutdown.

Operation of the HDS plant began on April 28, 2010 by pumping water from Pond 4 that had collected over the previous winter into the HDS Treatment System. The HDS system operated to treat and discharge about 11 million gallons of CUD and DS flows and generated approximately 53 tons of sludge through November 11 (Lombardi 2010). Dewatered HDS Treatment System solids had an average of 55 % moisture content by weight which equated to approximately 24 tons of dry solids (AMEC 2011).

2.1.4 Discharges of Treated Water to Leviathan Creek

Discharge of treated water during HDS operations occurred continuously during plant operating periods at a rate between 30 gpm to 80 gpm. The HDS plant discharged directly to Leviathan Creek during normal operations. The HDS discharge can also be routed to Pond 4 with the HDS plant operated in recirculation mode.

Figure 4 shows the average daily water level in Pond 4 during the 2010 treatment season. Pond 4 water level data were not available from the USGS website from May 19, 2010 to July 31, 2010. The HDS Treatment Plant began discharging treated Pond 4 water collected over the previous winter on May 3, 2010. Starting on May 6, untreated water from CUD and DS were pumped directly to Pond 4 for temporary storage before treatment in the HDS Treatment Plant. Sharp increases in the water level between May and November indicate periods of CUD and DS capture and accumulation in Pond 4. Sharp declines in the water level between May and November indicate periods of treatment and discharge from the HDS plant to Leviathan Creek. Figure 6 shows periods of discharge from the HDS Plant and other sources (including untreated waters and treatment system effluents) to Leviathan Creek. Figure 6 shows the relationship between discharges from on-site sources and flow at Station 15 in Leviathan Creek (USGS 2010).

Burleson identified 10 periods of effluent discharge from Pond 4 to Leviathan Creek based on field observations, Atlantic Richfield monthly reports, and review of available Pond 4 water elevation data obtained from the USGS (2010). From early August to early November the Pond 4 elevation fluctuated between about 4.75 and 5.25 feet. After approaching a gage height of 5 feet in early November, Pond 4 elevation was maintained below 5 feet through the end of the treatment season on November 11. At the end of the treatment activities in November, the Pond 4 elevation was approximately 4.5 feet.

Atlantic Richfield reported HDS discharges on the following dates:

- May3 to July 6
- July 9 to July 10

- July 13 to July 30
- August 3 to October 1
- October 6 to October 8
- October 11 to October 15
- October 18 to October 22
- October 26 to October 30
- November 1 to November 4
- November 9 to November 11

2.1.5 Atlantic Richfield Sampling Activities

Atlantic Richfield mobilized to begin LAS operations during early-April 2010 and HDS operations were performed under the *2010 Removal Action Work Plan Leviathan Mine Site Alpine County, California* (RAWP) (AMEC 2010). Table 5 of the RAWP specified the water quality parameters and analytes monitoring and sampling requirements during the HDS operations, and Table 6 of the RAWP specified the location and frequency of sampling during the HDS operations. Sampling was performed in accordance with the RAWP during the 2010 treatment activities at Pond 4. Figure 4 shows the sample dates associated with pond water gauge height. Water samples from the HDS were analyzed for field parameters (pH, temperature, dissolved oxygen, specific conductance [SC], oxidation-reduction potential [ORP], and ferrous iron to ferric iron ratio); laboratory analysis included acidity, alkalinity, aluminum, arsenic, cadmium, calcium, chloride, chromium, copper, hardness, iron, lead, magnesium, nickel, selenium, sulfate, total dissolved solids, total suspended solids, and zinc. Samples were analyzed in the field and laboratory to ensure compliance with the objectives in the removal action memorandum (RAM) (EPA 2001) and Modified Removal Action Memorandum (MRAM) (EPA 2008) and to obtain process information useful for evaluating long-term treatment options. Sludge in the filtration and disposal bins was sampled for laboratory analysis (total metals, leachable metals, and physical properties).

The RAWP listed the following sampling locations and frequencies:

- CUD and DS Flows: field parameters measured monthly and samples submitted for laboratory analysis monthly.
- Pond 4: Field parameters measured twice per month with pH measured on a weekly basis and samples submitted for laboratory analysis monthly.
- Pond 4 discharge to Leviathan Creek: Field parameters measured twice per month with pH measured twice daily during discharge and iron measured daily during discharge. Samples submitted for laboratory analysis once per month during discharge periods.
- Treatment solids (solids in filtration and disposal bins): total and leachable (toxicity characteristic leaching procedure [TCLP], Soluble Threshold Limit Concentration [STLC], Synthetic Precipitation Leaching Procedure [SPLP]) metals, moisture content, and density prior to disposal.

Burleson observed HDS treatment system operators collecting field parameter measurements during several site visits, and conversations with operators during oversight visits indicated that samples were being collected in accordance with the RAWP.

2.1.6 Interruptions during 2010 Treatment

The following interruptions to water treatment at Pond 4 occurred during the 2010 treatment season were reported:

May 28: Loss of power to the CUD collection pump resulted in a brief capture interruption which lasted approximately 2 minutes.

July 6: A lime feed screw malfunction resulted in a temporary interruption of treated water discharge.

July 10: A lime feed screw malfunction resulted in a temporary interruption of treated water discharge.

July 13 to July 22: Intermittent plant operations occurred.

July 30 to August 3: A malfunction of the uninterruptible power supply (UPS) located in the local control panel in the HDS building caused a temporary interruption to the treated water discharge.

August 16: Elevated turbidity conditions and a clogged sludge recycle pipeline caused three temporary interruptions of treated water discharge from the HDS plant to Leviathan Creek.

October 12 to October 13: High effluent pH condition resulted in a temporary interruption of treated water discharge.

2.1.7 Winterization

CUD and DS capture were suspended on November 1, 2010. Collection of CUD flows resumed on November 5 and ceased on November 9. CUD and DS discharges were returned to Leviathan Creek, and the HDS system was prepared for winter. Conveyance pipes and tanks from DS and CUD to Pond 4 were drained, polymer and lime systems were cleaned and emptied, selected valves were removed for storage, electrical conveyance components (pumps and controls) were removed, packaged and stored for the winter, and field trailers were removed from the site.

A final batch discharge of treated water was released from Pond 4 to Leviathan Creek from November 9 to November 11, 2010. Pond 4 was pumped down to the minimum feasible depth to provide for maximum storage capacity to retain direct precipitation during the winter/spring seasons. Winterization of all components of the HDS plant was completed on November 18, 2010.

HDS winterization activities included:

- Draining and cleaning system tanks.
- Draining and cleaning system pipes.
- Removal and storage of system pumps.
- Removal and storage of freeze-damageable equipment.

- Protective wrapping of all electrical components including control panels, motors, and valves.
- Checking and refilling the antifreeze, motor oil, and diesel fuel day tank in the generators, removal of the generator batteries, and spraying rust protection on all exposed generator surfaces.
- Filling the diesel storage tank to reduce corrosion.
- Unused bagged dry lime was wrapped and stored inside the HDS building.
- Removing sludge and sludge bins.

Accumulated sludge, documented in previous years, remained in Pond 4 after the 2010 treatment season. This accumulated sludge has significantly reduced the capacity of Pond 4 for storing precipitation should a wet year occur. Photographs B-12 and B-13 in Appendix B show the sludge accumulated in Pond 4.

2.2 ASPEN SEEP TREATMENT

Atlantic Richfield continued to treat water at the AS using the ASBR. A diagram of the ASBR operated in recirculation mode is presented in Figure 7.

Atlantic Richfield identified the following objectives for Aspen Seep treatment during 2010 operations (AMEC 2010):

- Continue to optimize system performance;
- Evaluate engineering controls to minimize personnel exposure to hydrogen sulfide (H_2S) gas in the manholes during O&M;
- Evaluate the feasibility of installing a year-round emergency shower;
- Evaluate the potential upgrades to the chemical feed systems to increase the reliability of operations;
- Evaluate ASB power generation system and the SCADA system (including the PLC and HMI) operational life expectancy, as necessary, to promote continued safe and reliable operations;
- Complete the ongoing Sludge Drying Bed (SDB) Pilot Test (Phase 1), evaluate the need for conducting a second expanded SDB Pilot Test (Phase 2), and manage sludge as necessary;

Of the tasks listed above, Burleson observed sludge removal and changes to the chemical storage systems.

2.2.1 Aspen Seep Bioreactor Operation

Atlantic Richfield's contractor Broadbent and Associates (Broadbent) continued to operate the ASBR in recirculation mode to treat AS discharge without significant modifications from 2009 operations. A temporary dewatering sludge system and centrifuge were installed adjacent to the

Aspen Seep entrance gate. The raw sludge and dewatering effluent were stored in large containment bins adjacent to the dewatering system. The dewatering system consisted of installing HDPE pipelines which supply sludge from the settling ponds to the dewatering system.

The ASBR continued to be operated in recirculation mode. With the recirculation system, sodium hydroxide is added to the AS influent which is then mixed with sulfide-rich water from bioreactor cell 2 in Settling Pond 1 for precipitation of metal sulfides. Water is pumped from the opposite end of Settling Pond 1 back to the pretreatment pond at approximately three times the system influent rate. The ASBR is operated in this mode because recirculated water has lower metals content and higher pH than raw AS water. These parameters are ideal for biological treatment in the bioreactor cells. Ethanol is added to the recirculated water to provide a carbon source for the sulfate-reducing bacteria. Settling Pond 1 discharges to Settling Pond 2 from which bioreactor effluent is discharged along a rock-lined aeration channel to an infiltration pond adjacent to and above Aspen Creek. The recirculation pumps are powered by propane generators. Photographs B-24 through B-37 in Appendix B show the ASBR in 2010.

Approximately 3.8 million gallons of water from the AS bioreactor were treated and discharged to Aspen Creek during 2010 (AMEC 2011). The AS flow rate during 2010 was similar to the 2009 AS flow rate (see Figure 8). Details of the bioreactor performance are summarized in Atlantic Richfield's year-end summary report (AMEC 2011).

Burleson's field parameter measurements showed the ASBR was effective at increasing the pH and reducing the oxidation state of Aspen Seep discharge (see Figure 9). Burleson measured ASBR effluent pH between 6.6 and 7.8 during the 2010 treatment season. The pH of ASBR effluent appears to have remained relatively stable during 2010. ORP is another key indicator of bioreactor performance. Burleson measurements show a decreasing trend in ASBR effluent ORP through early July, followed by a slight increase of ORP through the end of the treatment season. The decreasing ORP through July appears to coincide with bioreactor flushing. The slight increase of ORP for the remainder of the treatment season appears to coincide with sludge removal activities that necessitated drawing down ASBR Settling Pond 1. These elevated ORP measurements may reflect the sampling location characteristics more than the performance of the bioreactor.

The following improvements were made to the ASBR during 2010:

- A temporary sludge dewatering system and centrifuge installed.
- A gravity flow emergency shower installed.
- Chemical feed system upgrades
- Installation of secondary influent and recirculation lines
- Programmable logic controller replacement
- Replacement of AS influent pipeline located between the USGS weir box and ASB manhole 6 due to precipitate clogging

Discharge of ASBR effluent from the infiltration pond to Aspen Creek continued during 2010. Water overflows from the northeastern corner of the infiltration pond down a steep slope into

Aspen Creek. The infiltration pond is located on the margin of the Leviathan Canyon Landslide. Water in the infiltration pond is cloudy, and a chemical odor is present in area. Photograph B-38 in Appendix B shows a view of the infiltration pond.

2.2.2 Aspen Seep Bioreactor Sludge Removal

Broadbent removed and dewatered an estimated 138,000 gallons of sludge from the ASBR in 2010 (Lombardi 2010). The sludge had accumulated in Settling Pond 1 and Settling Pond 2 during biocell flushing and was pumped to the dewatering system and centrifuged to separate the solids from water. The water was then returned to the ASBR or discharged to Aspen Creek. Bioreactor 1 underwent flow reversal in June (AMEC June monthly report). Bioreactor 2 was flushed during the 2010 field season in July to remove accumulated sludge (AMEC July monthly report). Broadbent began sludge dewatering operations on September 9, 2010 by pumping sludge from Settling Pond 1 to two 20,000 gallon storage tanks. Sludge was pumped through the sludge pipeline to the sludge dewatering area. The sludge was dewatered in a centrifuge on September 10 through September 30, 2010 at an average flow rate of 12,500 gpd and a maximum flow rate of 26,700 gpd (AMEC 2011). Dewatering resulted in 168 cubic yards (95 tons) of solids with an average moisture content of 83%, which is approximately 16 tons of dry solids (AMEC 2011). Power was supplied to the centrifuge from a dedicated diesel-fueled generator. Dewatered sludge was transported off site for disposal. Dewatering system effluent was returned to settling ponds at the ASBR via the dewatering discharge pipeline.

Bioreactor flushing and sludge removal resulted in maintaining ASBR treatment performance as measured by pH and ORP of the effluent and percent sulfate removal. AMEC reported the influent sulfate for the 2010 ASBR treatment season was 1,685 milligrams per liter (mg/L) and a 19% sulfate removal rate (AMEC 2011). Sulfate removal was approximately 320 (mg/L) during 2010.

A Phase I sludge drying treatability study was conducted to compare results of sludge dewatering in a freely draining bed versus a non-draining sludge bed. The freely draining sludge bed yielded dry sludge in 24 days under winter conditions with a 63 percent reduction in sludge volume. Sludge in the non-draining bed did not dry until summer. A Phase II study will be performed after a suitable area is identified. The former study area was determined to be potentially unstable due to landslide potential (Lombardi 2010).

2.2.3 Aspen Seep Bioreactor Remote Instrumentation Implementation

Atlantic Richfield continued maintenance of the remote control technology system for the ASBR during the 2010 treatment season. Implementation of a remote communication system is an important step in the development of a year-round treatment system for other sources of AMD at the Leviathan Mine.

3.0 CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD – LAHONTAN REGION SITE ACTIVITIES

This section describes activities conducted at Leviathan Mine by the Regional Board during the 2010 operating season. The Regional Board's work plan (Regional Board 2010) identified three activities planned for the 2010 operating season: summer treatment of AMD captured year-round in a series of ponds; site maintenance of ponds, drainage and diversion channels, and gates and fences; and site monitoring of water quality, water quantity, and meteorological information. Information gained through Burleson's oversight of the Regional Board's site activities at Leviathan Mine in 2010 is presented in the following sections. Details about 2010 site activities are presented in the Regional Board's 2010 year-end report (Regional Board 2011).

3.1 POND WATER TREATMENT

The PUD and Adit drain to Pond 1. Pond 1 is connected to Ponds 2N and 2S so that the level of water in each pond is the same. The Regional Board contracted Decon Environmental, Inc. (Decon), to treat pond water in 2010. This was Decon's third year operating the pond water treatment system (PWTS) at Leviathan Mine. Average precipitation during the winter of 2009-2010 resulted in an increased filling of the evaporation pond compared to the volumes observed in the pond the last two treatment seasons and contributed to above-average discharge rates from the Adit and PUD. Average daily flow rates for the Adit and PUD are presented in Figure 10. The pond water treatment system is located at Pond 1. Pond 1 is connected to Pond 2 north and Pond 2 south via underground PVC pipes. Water can be transferred between the ponds through these pipes.

Mobilization and field preparation for Pond 1 treatment began in early-June 2010. About 598 tons of dried sludge that was generated during pond water treatment in 2009 was removed from the pit clarifier (Carey 2010). An excavator was used to remove the dried sludge. Excavated sludge was temporarily stockpiled adjacent to the pit clarifier within the mine pit before it was transferred to an off-site disposal facility. 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 the 2010 treatment season (Regional Board 2011). The Regional Board reestablished its on-site field laboratory and office trailer. V-ditches were also cleaned out, with sediment deposited on the down slope sides of the ditches. Photographs B-39 through B-52 in Appendix B show activities associated with pond water treatment in 2010.

Decon continued to use dry lime in treatment system operations during 2010. Decon also provided weather tight enclosures around control panels to prevent the need to remove them during winterization, and re-install them during mobilization each summer.

The Regional Board began Pond 1 treatment in early July, with the first treated water entering the pit clarifier on July 9, 2010. The PWTS was operated in two modes during 2010. The PWTS operated 24 hours per day, 5 days per week in July and part of August, and the PWTS operated approximately 12 hours per day, 5 days per week for the remainder of the treatment season. The Pond 1 daily discharge rate averaged approximately 100 gpm of discharge through most of the treatment period. Pond 1 treatment operations were stopped on September 1, 2010. Treated water continued to be discharged from the Pit Clarifier as the accumulated sludge drained. The Regional Board treated an increased volume of evaporation pond water at the Pond 1 LTP in the 2010 treatment season compared to the volume of evaporation pond water treated during the 2008 and 2009 treatment seasons (see Table 2).

During 2010, Decon used a single point lime addition as in the 2009 treatment season. A process flow diagram for the PWTS is presented as Figure 11. PWTS effluent was first discharged from the pit clarifier to Leviathan Creek on July 19, 2010. Discharge occurred at a rate similar to the treatment rate to maintain a constant water level in the pit clarifier. Effluent was discharged through the decant structure in the central southern side of the pit clarifier and through the U-shaped underdrain. Decon relocated the 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. Decon also 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 decant structure work was needed to remove restrictions to the flow of treated AMD discharge caused by scaling of the piping and valves (Regional Board 2011). Discharge flowed through the weir and monitoring station established in 2003 and operated by the USGS. 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 period with a near backwater condition (Regional Board 2011). Periods of PWTS discharge from the pit clarifier and flow in Leviathan Creek are shown in Figure 6. The discharge rates presented on Figure 6 are based on information from the Regional Board 2010 Annual Report. The Regional Board collected effluent samples two times per week during discharge of treated water to Leviathan Creek.

Pond water treatment was completed on September 1, 2010. Remaining effluent was discharged from the pit clarifier through the U-shaped underdrain immediately after treatment was completed. The discharge rate from the pit clarifier underdrain had decreased to less than 5 gpm on September 13. An estimated 6.7 million gallons of water from Ponds 1, 2-North, and 2-South was treated and discharged to Leviathan Creek (Carey 2010), leaving the ponds nearly dry. A comparison with volumes of water treated in previous years is presented in Table 2. Treatment system operators began winterizing the PWTS shortly after treatment was complete. The treatment system tanks were emptied and cleaned and sensitive equipment was secured for the winter. Valves were left in a position that allowed Ponds 1, 2-North, and 2-South to fill in equilibrium with Adit and PUD discharge and direct precipitation.

Burleson's field parameter measurements showed the pH of the effluent in the pit clarifier was between 7.0 and 7.8 for most of the treatment period. Previous data suggest that effluent generally meets discharge criteria in the RAM when effluent pH is between 7 and 8. Analytical results for daily samples of the pit clarifier effluent are included in the Regional Board's 2010 year-end report.

Starting treatment later in the year provided time for evaporation to reduce the volume of water requiring treatment. While potentially risky after years with above average precipitation, starting and finishing pond water treatment later in the season also reduces the quantity of Adit and PUD discharge that accumulates in the ponds before treatment begins the following year.

3.2 REVEGETATION

The Regional Board's work plan (Regional Board 2010) identified invasive plant control as an objective in 2010. The El Dorado County Department of Agriculture (EDCDA) visited the Leviathan Mine in the 2002 through 2009 treatment seasons to spray for tall whitetop (Lepidium Latifolium). Invasive plants were sprayed with herbicide by the EDCDA, on August 24, 2010.

Burleson's oversight visits in 2010 did not coincide with invasive plant control.

3.3 SITE MAINTENANCE

The Regional Board's work plan (Regional Board 2010) identified site maintenance activities in 2010, which are discussed in the subsections below.

3.3.1 Fence Repair

The Regional Board is responsible for upkeep of the barbed wire perimeter fence around the Leviathan Mine. As a result of primarily natural conditions, the fence requires repairs on an annual basis (Regional Board 2010).

3.3.2 Evaporation Pond Liner Maintenance

The Regional Board performed visual inspections of the evaporation ponds consisting of inspection for exposed areas of pond liner material. The Water Board staff did not observe any exposed pond liner in 2010.

3.3.3 Erosion Control Measures

There was not sufficient accumulated sediment in the V-ditches within the pit to warrant removal activities.

3.4 SITE MONITORING

The Regional Board continued site monitoring in 2010, including monthly surface water sampling and flow measurements (in cooperation with the USGS) and on-site collection of weather data. Site monitoring data will be incorporated into the Leviathan Mine master database managed by Atlantic Richfield. Data summary reports are not generated. Burleson encountered Regional Board staff performing surface water sampling during several 2010 oversight visits.

4.0 U.S. ENVIRONMENTAL PROTECTION AGENCY SITE ACTIVITIES

This section describes activities EPA conducted at the Leviathan Mine during the 2010 operating season. EPA maintained a presence on site through oversight visits. EPA also installed water quality monitoring equipment in the creek system, and performed macroinvertebrate surveys. EPA's oversight was conducted in part by Burleson and is presented in Section 5.0. Through a cooperative agreement with the US Department of Energy's National Renewable Energy Laboratory (NREL), EPA was able to have wind and solar energy monitoring equipment installed at the site to evaluate the potential for power generation at Leviathan Mine. EPA's water quality monitoring program, EPA's macroinvertebrate survey program, and a description of NREL progress are summarized below.

4.1 EPA WATER QUALITY MONITORING

EPA maintains Hydrolab water quality sondes at monitoring stations in the Leviathan Creek watershed. The Hydrolabs were installed to monitor water quality effects downstream from the Leviathan Mine during the treatment season. The Hydrolabs record temperature, pH, and SC readings every 30 to 60 minutes. EPA visited the site periodically to inspect and calibrate the units and retrieve stored data. Hydrolabs were used to monitor water quality at the following locations during 2010:

- Leviathan Creek at Station 15
- Aspen Creek west of the unlocked cattle gate near the culvert that carries Aspen Creek under the Leviathan Mine road
- Bryant Creek at Station 25

Data recorded by the Hydrolabs are periodically communicated to a data repository via satellite. Hydrolab data document effects of Leviathan Mine activities on downstream water quality. Selected events that affected downstream water quality during 2010 and apparent in Hydrolab data at Station 15 are listed below and shown on Figure 12.

- Data sonde records show diurnal pH fluctuations throughout the year.
- Data sonde records do not record the drop in pH and increase in specific conductance noted in earlier years as flows decline and acid drainage chemistry begins to be observed.
- Data sonde records show increasing specific conductance associated with discharge of treatment system effluent containing sulfate and other salts. A significant increase in specific conductance (from about 1 milliSiemen/cm to about 2.5 mS/cm) appeared to coincide with the Pond Water Treatment system discharge.

4.2 EPA Macroinvertebrate Surveys

EPA personnel perform macroinvertebrate sampling each spring/summer and fall in the Leviathan-Bryant watershed. This activity was started by Dr. David Herbst and is now being continued by EPA staff. The following eight stream reaches are sampled:

- Bryant Creek at Stateline
- Bryant Creek at Station 25
- Bryant Creek above Doud Spring
- Leviathan Creek Above Leviathan-Mountaineer Confluence
- Mountaineer Creek at Station 24
- Upper Mountaineer Creek below Indian Spring
- Leviathan Creek at Station 15
- Aspen Creek at Station 16

The time frame from sample collection to reporting the data has historically been 2 years, and results of 2010 surveys are not available. The macroinvertebrate sampling data will be documented in a separate report.

4.3 EPA and NREL Project

EPA and NREL personnel are collaborating to evaluate potential sources of renewable energy at Leviathan Mine. If viable renewable energy generation could be achieved, such a source could reduce or possibly eliminate the need for use of fossil fuel-powered generators during long-term remediation at the site. During the week of November 1, NREL contractors installed a new data logger and anemometer on the existing wind tower; and installed a photovoltaic system to assess the amount of solar energy at the open pit. The existing wind tower was also evaluated for potential use to collect additional wind speed and duration data.

5.0 BURLESON SITE ACTIVITIES

This section describes activities Burleson conducted at the Leviathan Mine during the 2010 operating season. Burleson's field tasks included monitoring water quality in Leviathan and associated creeks, collecting photographic documentation of site activities, and monitoring groundwater elevations in the existing well network at the Leviathan Mine. Burleson also observed impacts from a significant storm at the site during the 2010 operating season, and monitored water quality at the beaver ponds upstream from the Leviathan Canyon landslide. Burleson's site activities are summarized below.

5.1 WATER QUALITY PARAMETER MEASUREMENTS

Water quality measurements (pH, temperature, SC, and ORP) were collected along Leviathan and associated creeks. The purpose of water quality monitoring was to assess the effects of treatment on water quality in Leviathan and associated creeks during the 2010 treatment season. Similar data were collected during the 2001 through 2009 treatment seasons and are presented in the oversight summary reports (Tetra Tech 2002; 2003; 2004; 2005; 2006, 2007; USACE 2008; and Burleson 2009 and 2010). Water quality monitoring points are shown on Figure 2; data are presented in the oversight summary reports in Appendix A. Photographs B-53 through B-55 in Appendix B show surface water monitoring points during the 2010 treatment season.

5.1.1 Field Equipment and Calibration

Burleson used a Hanna HI 9828 multi-parameter meter to measure water quality during 2010 oversight. The meter was calibrated before use each day according to the manufacturer's instructions to ensure that measurements were accurate in reference to known standards. Calibration was checked at the end of the day or when readings were suspected to be erroneous. The high ionic strength and low pH of on-site waters can be damaging to sensitive field equipment. Daily field instrument calibration forms are provided in Appendix C. Water quality measurements collected during this investigation are field screening data.

5.1.2 Leviathan Creek Flow Stages in 2010

Burleson conducted water quality monitoring along the creek system 11 times from April 27 through November 18, 2010. Burleson identified three differing flow stages along Leviathan Creek during the 2010 treatment season, as shown in Table 3. Creek flow stages are not necessarily chronological because of intermittent discharges from the treatment systems. Creek flow stages represent Leviathan Creek flows as measured by daily average flows at Station 15. The three flow stages identified during 2010 are pre/post-capture of CUD and DS flows (pre/post -capture), base flow, and discharge flow. Pre/post-capture stage flows are represented by two field oversight visits (April and November). The April measurements were dominated by seasonal runoff from snowmelt, and the November measurements represent conditions immediately after CUD and DS flows were returned to Leviathan Creek. Discharge stage flows represent periods when Station 15 flow is dominated by treatment system (HDS and/or PWTS) discharges. Discharge stage measurements were made during six site visits in 2010. Base flow stage represents periods when Station 15 flow was dominated by groundwater sources on specific water quality monitoring dates. Base flow stage measurements were made during two site visits in 2010. Creek chemistry was dependent on the flow sources, which changed in response to contaminant source capture, effluent discharge, and water source (see Figure 6). The three creek flow stages are described below.

Pre/Post-Capture. The pre-capture measurements represent conditions before the seasonal ERAs began in 2010. Leviathan Creek flow during this period consisted of spring runoff and discharges from the CUD and DS. The pre-capture measurements were taken on April 27, 2010 before LAS capture or treatment began. At the time of these measurements, the EPA data sonde records showed that the seasonal decrease in pH and increase in SC caused by decrease in the amount of runoff to dilute CUD and DS flows in Leviathan Creek had just begun. Early capture of CUD and DS on May 6, 2010 prevented the lower pH typically observed after the decline of runoff and prior to capture. Post-capture measurements were made on November 18, 2010 after CUD and DS flows returned to Leviathan Creek for the winter. Figures 13 and 14 show pH measurements taken at Leviathan Creek monitoring stations throughout the 2010 field season. The average pre/post-capture stage pH reading in Leviathan Creek at Station 15 was between 6 and 6.5. The near-neutral pH is attributed to AMD dilution by spring runoff after the winter in the pre-capture sample, and dilution of CUD and DS by increased base flow related to rainfall in the post season sample. The flow rate in Leviathan Creek decreased from a daily average of about 3,000 gpm in late April to a daily average of less than 100 gpm by mid-August 2010, and Figure 14 shows that the pH at Station 15 decreased below 5 as Leviathan Creek flow declined. Pre/post-capture stage SC measurements at Station 15 also show effects of dilution by seasonal runoff and benefit of early capture and treatment of CUD and DS (see Figure 15).

Discharge Flow. The discharge flow stage represents conditions in Leviathan Creek when stream flow consisted of creek base flow with or without discharges from the treatment systems, and the average daily stream flow as measured at Station 15 was above 70 gpm. Discharge flow stage measurements were taken during seven oversight visits in May, June, July, August and October 2010. Discharge flow pH measurements ranged from 4.49 to 7.65 at Station 15. Field pH measurements were slightly higher in Leviathan Creek at several monitoring locations during discharge flow conditions than during base flow conditions (see Figure 13). The higher pH measured in Leviathan Creek at and above Station 15 during discharge flow conditions shows the benefits of removing and treating the CUD and DS on Leviathan Creek water quality. The SC measurements are slightly higher in Leviathan Creek below Station 1 during discharge than during pre-capture stage flows (see Figure 15). This is likely because of the lack of dilution after spring runoff and total dissolved solids discharged with treated water.

Base Flow. The base flow stage represented conditions in Leviathan Creek after seasonal ERAs began and when stream flow consisted of creek base flow with or without discharges from the treatment systems, and the average daily stream flow as measured at Station 15 was below 70 gpm. The base flow stage includes measurements taken during two Burleson oversight visits in

September 2010. The average base flow pH measurement was 4.63 standard units at Station 15 during the two oversight visits in September (see Figure 14). Field pH measurements were also generally lower in Leviathan Creek below the CUD and DS during base flow conditions than during discharge flow conditions. The lower pH measured in Leviathan Creek at and above Station 15 during base flow conditions was not observed downstream, likely due to buffering and dilution below the confluence with Aspen Creek. The SC of Leviathan Creek between DS and Station 15 was also higher during base flow conditions than during discharge or pre-capture stages (see Figure 15). This is likely because of the lack of dilution after spring runoff.

Stage Summary. Water quality in Leviathan Creek remained fairly high (based on pH and SC measurements) as the flow rate in Leviathan Creek subsided from spring runoff conditions, as shown on Figure 14. USGS (2010) data show the flow rate at Station 15 decreased from more than 5,000 gpm in early May to below 100 gpm in mid August. While the flows decreased, an associated significant drop in pH and increase in SC were observed during August and September in 2010. The pH in Leviathan Creek is improved by capture and treatment of CUD and DS flows and discharge of treatment system effluent. However, lower pH and higher SC were measured in Leviathan Creek during base flow conditions in the ERA season. This observation suggests the need to determine if additional sources of acid drainage are present in Leviathan Creek between DS and Station 15, and/or evaluate the benefit of improving the DS collection system. Water quality monitoring in Leviathan Creek also noted significant changes in SC during the 2010 treatment season. Pond 1 and Pond 4 treatment system effluents were relatively high in dissolved solids, and effluent discharge caused an increase in SC measured along Leviathan Creek (see Figure 15).

5.1.3 Water Quality Trends and Observations

Average precipitation was measured at Monitor Pass during the winter of 2009-2010. Discharge rates from the AMD sources on site during 2010 were similar to those observed during 2009, and consistent with historical flow rates, considering the amount of precipitation, as shown on Figures 8 and 10.

The range of pH measurements at the CUD and DS in 2010 was similar to the pH range observed during treatment seasons between 2001 and 2009, (see Figure 16). These pH trends may reflect flushing of oxidation products from the variably saturated volume of the aquifer during the high rainfall years (2005 and 2006) and increased retention of material above the water table during recent, drier years.

5.2 Visual Observations

Visual observations were recorded during water quality monitoring to supplement field screening data. Visual observations included creek water clarity, the presence of unusual materials within the creek, and the presence of aquatic life. Photographs B-50 through B-55 in Appendix B show surface water monitoring points during the 2010 treatment season.

ERAs implemented during previous years resulted in an improved appearance in Leviathan Creek during treatment. CUD discharge has been captured and treated each summer since 2001. DS discharge was captured and treated during a 4-day trial in November 2002, for the duration of the 2003 treatment season, for more than half of the 2004 treatment season, and for the entire 2007, 2008, 2009, and 2010 treatment seasons. Previous ERAs resulted in reduced cloudiness and chemical staining in Leviathan and Bryant Creeks downstream from the mine (Tetra Tech 2002; 2003; 2004; 2005; 2006b; 2007; USACE 2008; Burleson 2009, 2010). However, CUD and DS discharges were returned to Leviathan Creek at the end of each treatment season and discharged continuously until treatment resumed late the following spring. Over the course of the winter, Leviathan Creek became cloudy and chemical precipitates coated the creek bed (see Figure 17). The appearance of Leviathan Creek before treatment in 2010 was similar to conditions before treatment in 2009 and qualitatively better than comparable periods in 2001 and 2002.

The visual appearance of Leviathan Creek began to improve in late May 2010 after Atlantic Richfield began capturing CUD and DS discharge. Flow in Leviathan Creek downstream became clearer, and orange chemical staining in the creek bed began dissipating.

Burleson noted that seepage from the east bank of Leviathan Creek beneath and immediately up and downstream from the DS collection tank observed during 2008 continued through the 2010 treatment season. Seepage flowed freely into Leviathan Creek for about 10 feet along the stream bank, and red staining was evident in the stream bank sediment (See Photograph B-22 and B-23 Appendix B). The presence of the seep suggests that shallow, acidic groundwater is present that is not intercepted by the DS collection system.

Burleson also documented aquatic life in Leviathan and Bryant Creeks during 2010 oversight visits. Burleson's aquatic life observations are qualitative; thorough documentation of aquatic communities was outside the scope of Burleson's oversight tasks. A separate ongoing aquatic macroinvertebrate study includes sampling in the Leviathan Mine watershed in the spring and late summer each year. The macroinvertebrate study quantifies the health of the aquatic community downstream from the mine. Burleson documented the following observations during the 2010 oversight period:

- Caddisfly larvae were observed in Leviathan Creek at Station 15 on July 8, 2010.
- Trout were observed in the concrete channel of Leviathan Creek near the location of Monitoring Well 10S on September 2.

5.3 GROUNDWATER ELEVATION MONITORING

Burleson measured groundwater elevations in 13 existing monitoring wells at the Leviathan Mine. The existing monitoring well network includes 17 wells that Burleson was able to locate and access. Two of these wells are screened above the current groundwater elevation, and two of these wells contain obstructions within their casings that prevent measurement of groundwater elevations. The surface completion of Well USGS-33 was damaged sometime during the 2008-2009 winter, and is no longer useful for depth to groundwater measurements due to an obstruction within the well casing. Fourteen of the wells, including three pairs of nested wells completed at different depths, were installed in 1998 by SRK Consulting (MWH 2002); the other wells (identified as piezometers) were installed in 1982 by USGS (1985). Previous site maps indicate that additional wells have been constructed on site, but Burleson did not locate them through field reconnaissance and discussions with Regional Board staff. Wells identified on older maps are no longer believed to be in useful condition, including MW-12 on the Delta Slope, which was destroyed during the 2005 slope stabilization project. Burleson measured water levels on nine occasions from May 27 to November 18, 2010. Well details are summarized in Table 4 and their locations are shown on Figure 18.

Burleson's water level measurements showed that the groundwater elevations increased through early July, 2010 at wells 4, 8, and 11 prior to overall groundwater elevation declines through the remaining monitoring period. The observation of early season (April through June) groundwater elevation increase likely reflects seasonal recharge due to infiltration of melting snow and early season rainfall. Wells 1, 3 and 7 showed increases in groundwater elevation late in the monitoring period which may reflect a decrease in evapotranspiration, and recharge from fall storms.

Figure 18 shows groundwater elevation contours on site generated using water level measurements recorded by Burleson on August 19, 2010. The contours were constructed under the assumption that available groundwater elevations represent site-wide conditions. This assumption should be evaluated during the remedial investigation. The contours show that groundwater flow generally mimics surface topography. Deflections in the groundwater contour lines near the Adit, Leviathan Creek, and CUD collection area suggest that these features influence groundwater flow.

Groundwater elevation measurements from the on-site monitoring wells appear to correlate with flow rates from AMD sources. Figure 19 shows the relationship between discharge rates from the Adit and CUD and water elevations in wells MW-5D (located near the Adit) and MW-10S (located along the CUD collection area). Hydrographs for the other wells monitored by Burleson in 2010 are presented in Appendix D.

Groundwater elevation measurements provide insight into the relationship between seasonal weather patterns and groundwater flow. These measurements also appear to show that acid drainage experienced at the water treatment systems operated during the early response actions may be related to groundwater discharge. As the remedial investigation (RI) is implemented, consideration should be given to year round monitoring of groundwater elevations to support groundwater investigations and the feasibility study.

5.4 STORMWATER RUN-OFF IMPACTS

During the treatment season a significant rainfall event was experienced at the site on October 5.

During the October 5 rain event, Burleson measured water quality parameters of stormwater runoff at several locations near MW-1, Pond 1, Pond 4 area, and CUD and Delta Seep. The stormwater runoff also filled the sludge bin sump located east of the HDS plant. Burleson conducted a visual assessment of the stormwater at these locations on October 5 and observed the runoff to be turbid. Turbid stormwater runoff in the vicinity of the HDS plant was observed discharging in concentrated flow paths to Leviathan Creek above and below the CUD, and above and below the Delta Seep. The turbid stormwater runoff in the vicinity of the HDS plant was generated from exposed soil and mine waste piles on the slopes east of the HDS plant. The storm water runoff traversed the adjacent roads and the ARCO operations area surface in the form of sheet flow in a north westerly and westerly direction towards Leviathan Creek. The stormwater runoff then concentrated into flow paths and rills as it traversed the slopes adjacent to the CUD and down the exposed soil embankments and walkway to the south and east of the Delta Seep. Burleson observed direct stormwater discharge into Leviathan Creek at several locations.

Burleson measured water quality parameters to gain insight into the effects of stormwater runoff on Leviathan and associated creeks. The range of pH values measured for stormwater runoff at the various locations was from 4.15 to 6.45. The pH values measured on October 5 for stormwater runoff were considerably lower than pH values measured at the normal monitoring locations which were in the range of 6.40 to 7.53. Furthermore, pH values measured at locations which experienced direct stormwater runoff, specifically, Leviathan Creek above and below the CUD and Leviathan Creek above and below the Delta Seep recorded the lowest pH values measured during any of Burleson's oversight visits during 2010. The pH values recorded during the rain event on October 5 for Leviathan Creek above and below the CUD were 5.14 and 5.00 respectively, whereas the pH values recorded for Leviathan Creek above and below the CUD and DS during other oversight visits in 2010 were in the range of 6.72 to 8.06 and 6.14 to 7.73 respectively. The pH values recorded on October 5 for Leviathan Creek above and below the Delta Seep were 5.15 and 5.27 respectively, and the pH values recorded for Leviathan Creek above and below the Delta Seep during oversight visits in 2010 were in the range of 6.36 to 7.54 and 5.85 to 7.16 respectively. The low pH values appear to indicate that stormwater runoff has a significant impact on the water quality of Leviathan and associated creeks. Figure 20 shows the locations of stormwater quality measurements. Photographs B-57 through B-66 show the effects of stormwater run-off at various locations at Leviathan.

5.5 BEAVER DAM AND POND IMPACTS

Beavers have erected a series of dams along Leviathan Creek at the upstream end of the Leviathan Creek landslide. The upstream-most dam observed was located in the Leviathan Creek channel where it breeches the old road bed. This dam has impounded Leviathan Creek creating a pond upstream from the old road. Another dam is present across the Leviathan Creek channel and the channel that formerly discharged from the Landslide Pond. The Landslide Pond has increased in size and depth and covers a portion of the Leviathan Creek channel downstream from the old road. Water has seeped through this lower dam and formed two streams separated by a sand/gravel bar. These two streams converge at the Leviathan Creek channel about 100 feet downstream from the dam. At least two smaller dams are present along Leviathan Creek downstream from this point.

Burleson measured water quality parameters to gain insight into the effects the beaver dams and ponds may have on water quality in Leviathan and associated creeks. Burleson measured the water quality parameters of the beaver ponds during five oversight visits from August 19, 2010 to November 18, 2010. Water quality parameter measurements are summarized in Table 5. The range of pH values recorded at the beaver ponds was 3.58 to 6.79. The Leviathan Creek Station 15 monitoring location is downstream from the beaver dams and ponds. Figure 21 shows the locations of the beaver dams, water quality measurements, and water quality measurement locations. Photographs B-67 through B-70 show features associated with the beaver dams and impoundments.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Water treatment by the Regional Board and Atlantic Richfield in 2010 led to seasonal improvements in Leviathan Creek water quality downstream from the mine. Water quality monitoring and visual observations suggest that conditions in Leviathan Creek at the end of the 2010 treatment season were generally similar to conditions at the end of the 2009 treatment season. This summer was the tenth consecutive season of CUD capture and treatment, and fourth consecutive season of DS partial capture and treatment.

Average precipitation resulted in increased accumulations of water in onsite ponds compared to the accumulations observed the last couple of drier years, and resulted in increased discharge rates from acid sources during the 2009-2010 winter as compared to earlier years. The resulting increase in pond water levels did not restrict either the Regional Board or Atlantic Richfield from treatment system operations. Free-board capacity in the ponds remained adequate to prevent discharge of untreated acid drainage.

The Regional Board treated all of the available water from Ponds 2N and 2S and Pond 1. Continued use of dry lime in the PWTS minimized truck traffic necessary to support treatment activity at Pond 1 during 2010 field activities. The PWTS operated in two modes during 2010. The PWTS operated 24 hours per day, 5 days per week in July and part of August, and operated approximately 12 hours per day, 5 days per week for the remainder of the treatment season. The reduced operating time was possible because of the large volume of water that was treated during the 24 hours per day, 5 days per week operations which reduced the need to continue operations in that mode.

Atlantic Richfield captured and treated CUD and DS discharges for 189 days in 2010, which led to noticeable improvements in Leviathan Creek. Atlantic Richfield initiated capture of the CUD and DS flows on May 6, 2010 prior to observation of significant decrease of water quality at Station 15. The HDS treatment system was commissioned, and operated into early November before demobilization. At AS, sludge was removed from the bioreactors, and dewatering via centrifuge was completed.

Burleson recommends the following actions for the 2011 treatment season:

- The surface of mine waste (overburden and waste rock) north of the pit should be evaluated to identify the feasibility of modifying the surface to minimize infiltration and promote runoff of water. For example, the former pond area is graded to drain through the prominent erosion gully visible from the Aspen Seep access road. The graded materials are very loose and porous and significant infiltration likely occurs into the mine waste in this area. Modifying the surface would likely reduce the amount of acid drainage requiring treatment. Photographs B-71 through B-75 show the drainage pattern of the overburden area and the erosion gully.

- Improvements to the storm water controls at the site should be made to prevent future damage to treatment systems, reduce damage to roads, and minimize interference of run-off with treatment activities.

- Monitoring of water chemistry and metal content should be performed at the Beaver Ponds to evaluate the chemical conditions and the potential for a source of acidity in the area.
- A survey of water quality in Leviathan Creek should be performed during base flow conditions to identify potential additional sources of acid drainage to the creek. The source of acid at the Landslide Pond encountered during the 2008 creek walk should also be investigated.
- Limited groundwater elevation monitoring since 2006 continues to provide intriguing information, including apparent correlations between groundwater elevations and acid source discharge rates. Groundwater elevation monitoring should be implemented on a year-round basis to enable evaluation of winter conditions in support of the RI. Groundwater elevation data will help characterize groundwater flow patterns on site and help interpret changes observed in acid drainage flow rates and water chemistry in response to varying amounts of precipitation.
- Traffic to and from the site should continue to be coordinated between the Regional Board and Atlantic Richfield contractors to minimize the chance for accidents and/or spills.
- Sludge in Pond 4 should be properly characterized, removed, and disposed of offsite or suspended within Pond 4 and cycled through the HDS plant for capture in the treatment plant sludge during the 2011 treatment season. Sludge removal will provide increased pond storage capacity to support future treatment activity, and minimize the chance for overflow of Pond 4 to Leviathan Creek should above average precipitation occur in the future. Recommendations for sludge removal have been made since 2006.
- The DS capture system should be evaluated and improved. Seepage of acid drainage into Leviathan Creek below the existing collection tank demonstrates that the existing collection system remains only partially effective. In addition, acidic water that flows from the Delta Slope storm water drainage system during dry conditions should also be routed to the DS capture system.
- Improvement of the DS capture system should include evaluation of methods to direct runoff and sediment around the capture system. This would prevent loss of capture during runoff due to overwhelming the pump system capacity and clogging of the inlet pipes to the capture tank.
- CUD and DS capture should begin as soon as practicable in the LAS during 2011 to minimize the impacts of CUD and DS discharges on Leviathan Creek as spring flows decrease below about 1.5 cubic feet per second.
- The chemical and hydraulic conditions at the Aspen Seep infiltration pond should be characterized to determine if impacts to Aspen Creek are possible, and identify mitigation measures, if necessary.
- Groundwater monitoring wells that have obstructions and/or are damaged, and are not feasible to rehabilitate, should be properly abandoned because they are no longer useful.

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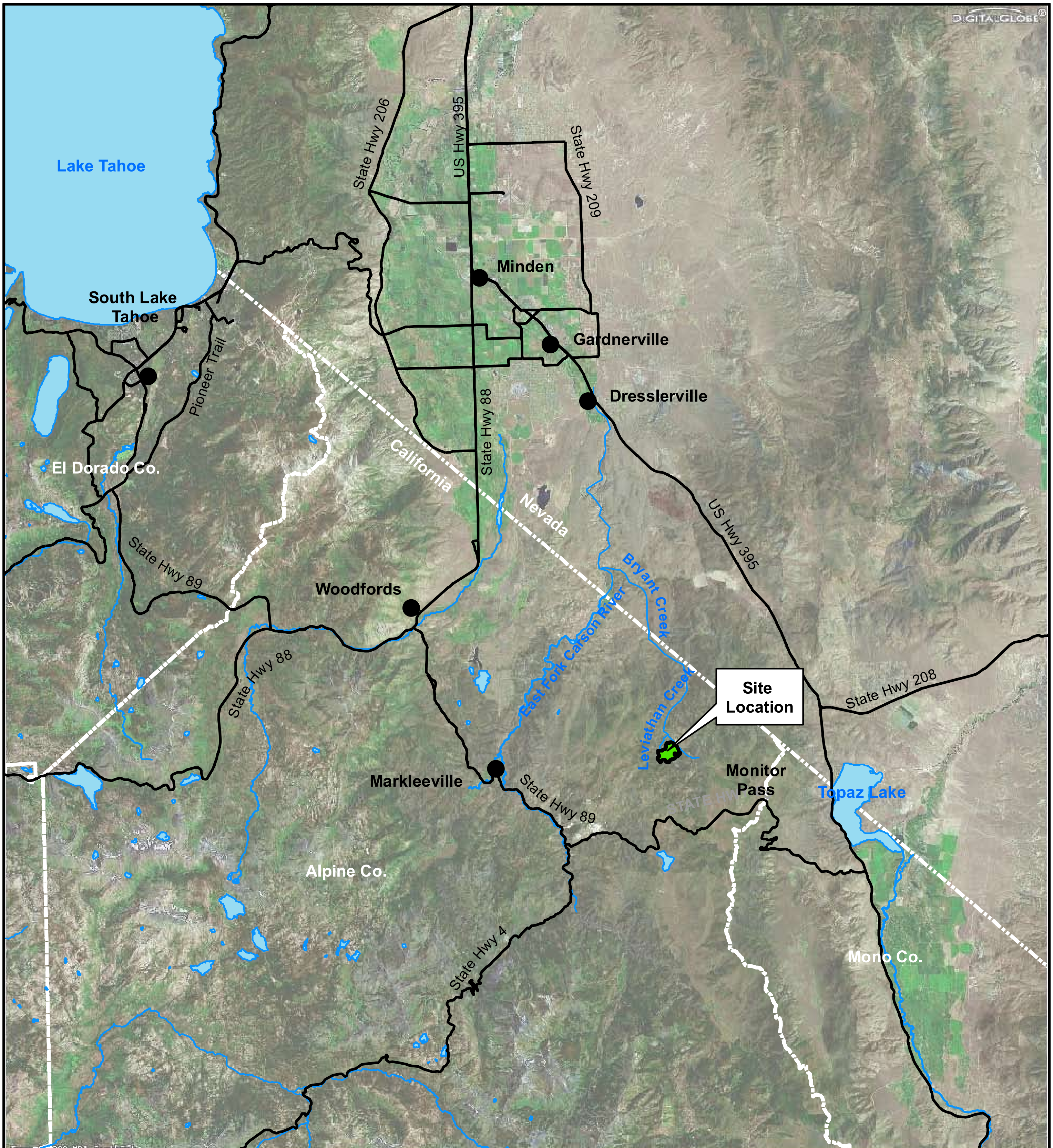
EPA. 2010. US EPA Leviathan Creek Water Quality Monitoring Data, Accessed periodically at: http://eureka-data.com/USEPAR9Lab/

USACE. 2008. “2007 Oversight Summary Report, Leviathan Mine Superfund Site, Alpine County, California.” June

U.S. Geological Survey (USGS). 1985. “Hydrologic Data for Leviathan Mine and Vicinity, Alpine County, California, 1981-83.” Open-File Report 85-160.

USGS. 2009 and 2010. USGS Real-Time and Recent Daily Water Data for California, Monitoring Stations in Alpine County. Accessed periodically during the year through: http://waterdata.usgs.gov/ca/nwis/current?type=flow

FIGURES



Legend

- Site Location
- Cities
- Roads
- Rivers and Creeks
- Lakes and Ponds

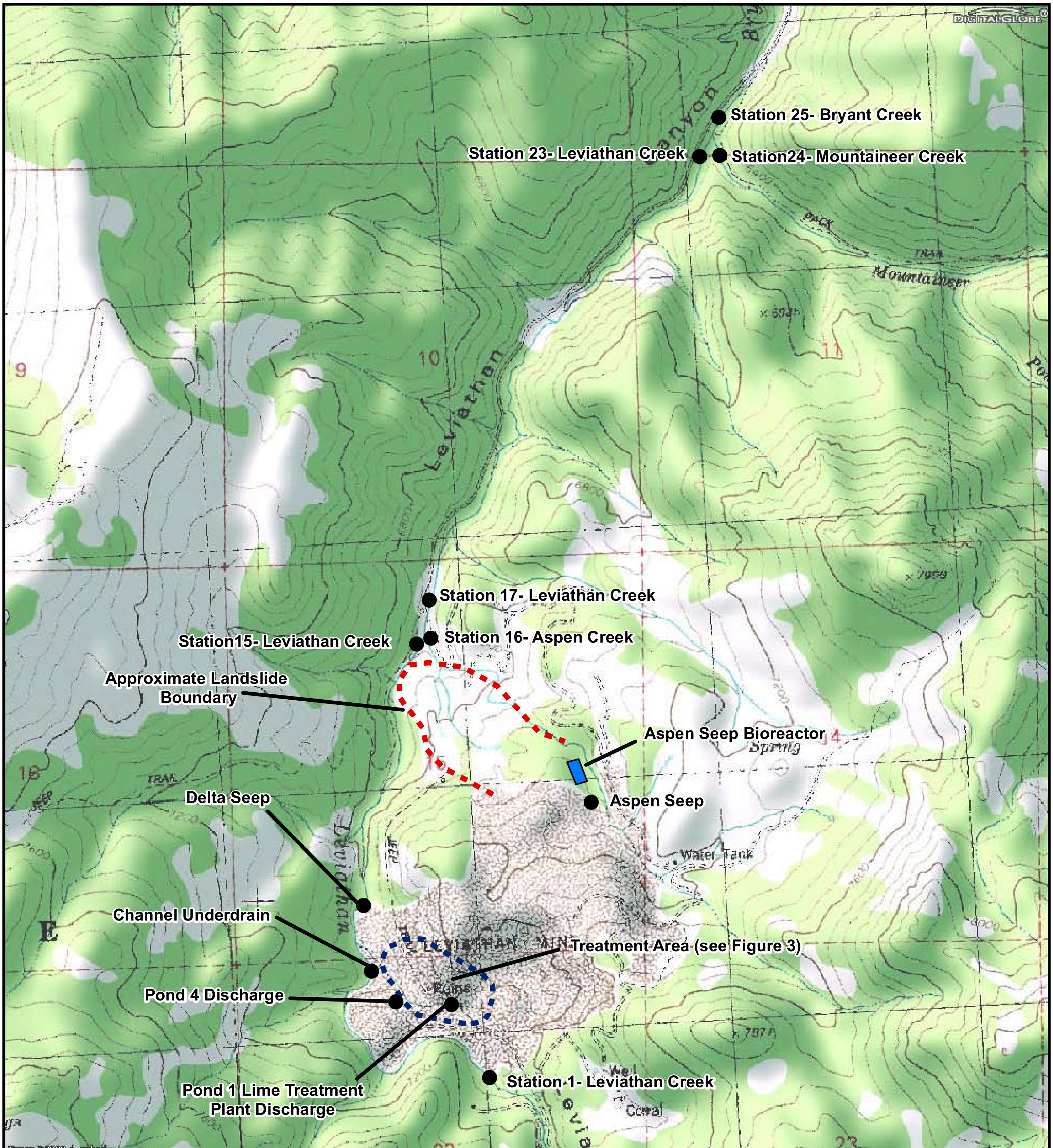
N

Figure 1

Site Location Map
Leviathan Mine Superfund Site
Alpine County, California

0 4 8 12
Miles

Burleson Consulting, Inc.



Legend

- ● point features
- Treatment Area (blue dashed line)
- Landslide Boundary (red dashed line)

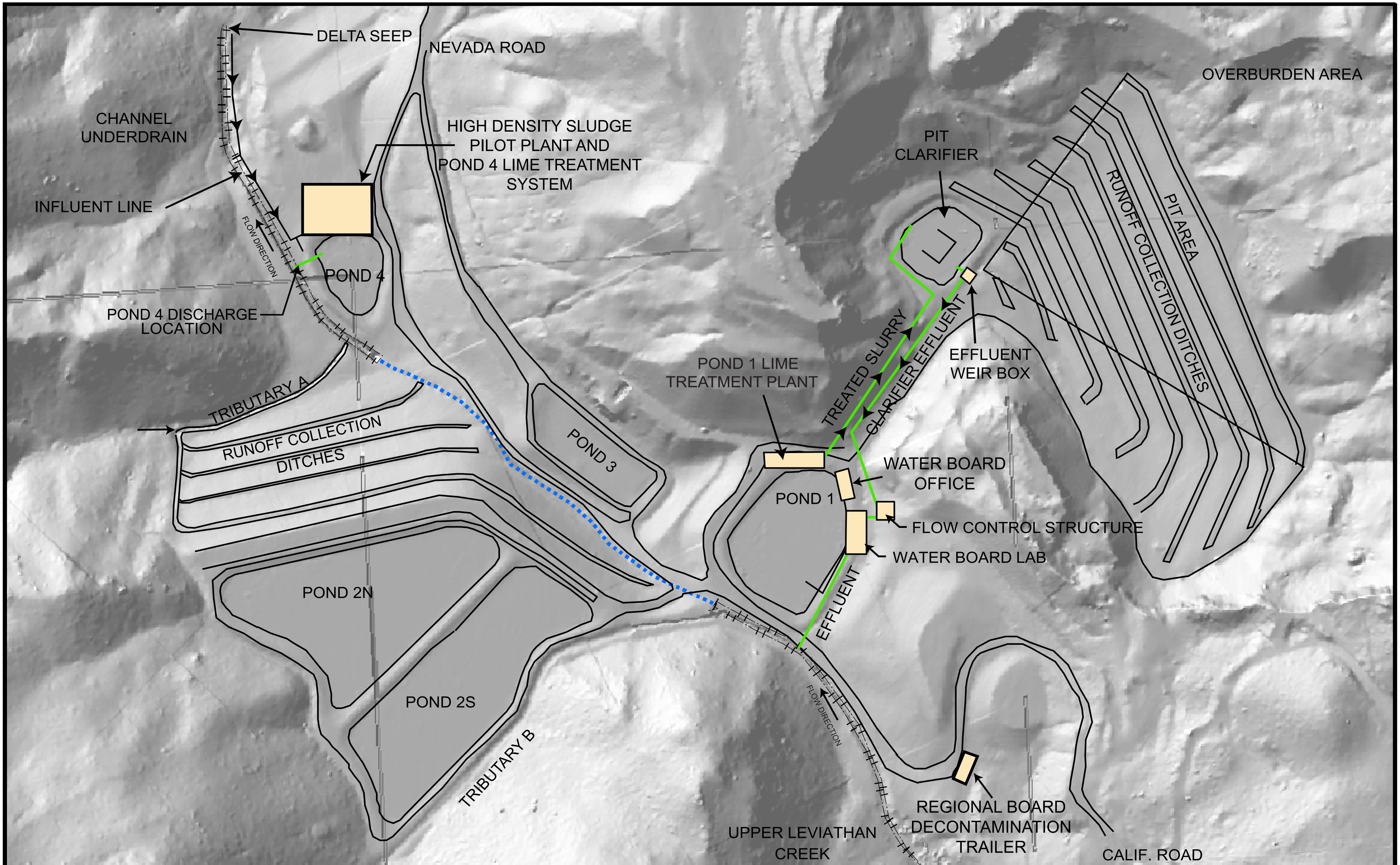
N

Figure 2

Site Map
Leviathan Mine Superfund Site
Alpine County, California

0 1,250 2,500 3,750
Feet

Burleson Consulting, Inc.



Legend

- Buildings
- Effluent Lines
- Leviathan Creek Underground
- Leviathan Creek Open Channel
- Unpaved Roads

N

0 250 500 750

Feet

Figure 3

Detailed Map of Site Features
Leviathan Mine Superfund Site
Alpine County, California

Burleson Consulting, Inc.

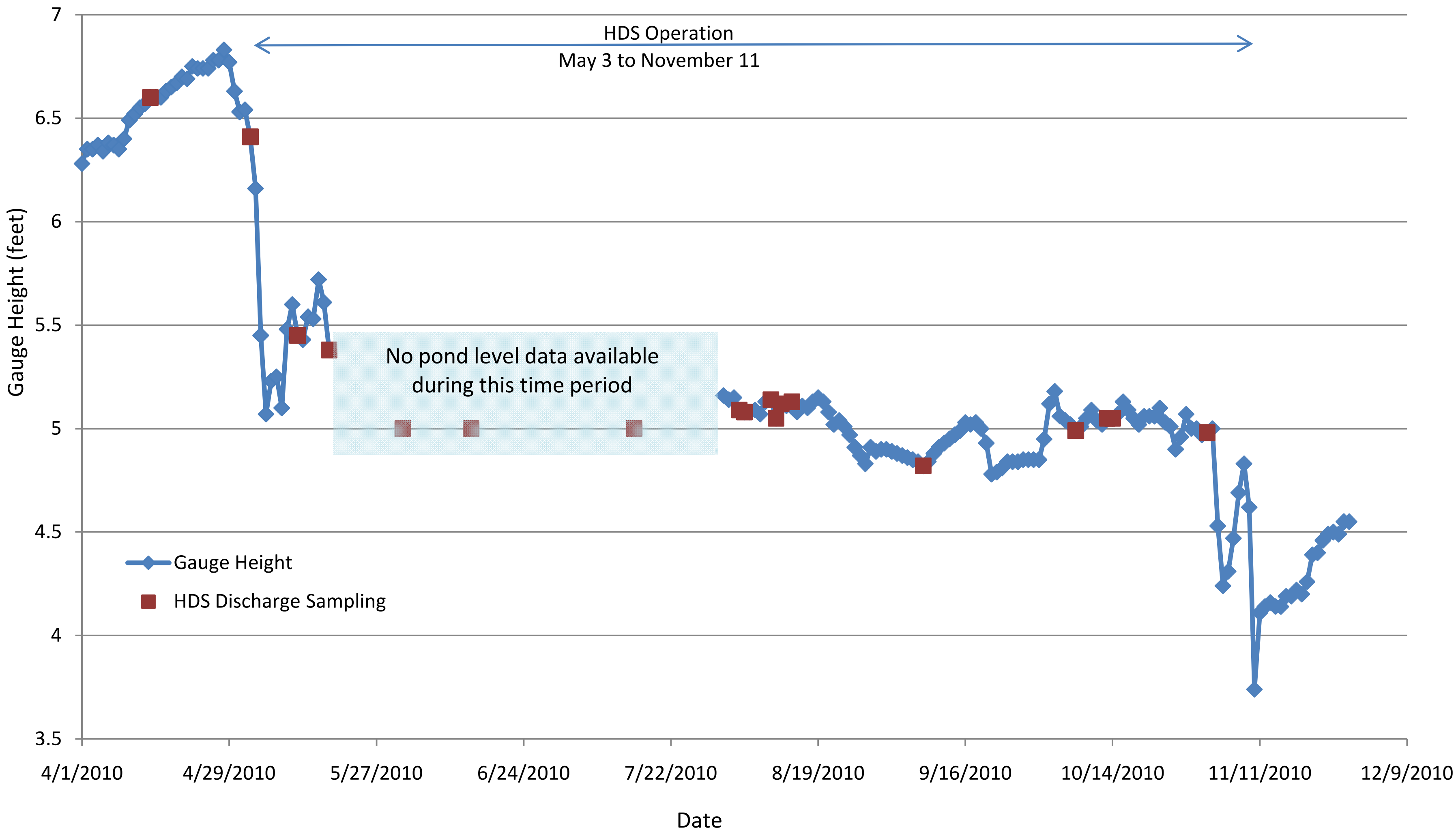


FIGURE 4

POND 4 WATER LEVEL
LEVIATHAN MINE SUPERFUND SITE
ALPINE COUNTY, CALIFORNIA

BURLESON CONSULTING, INC.

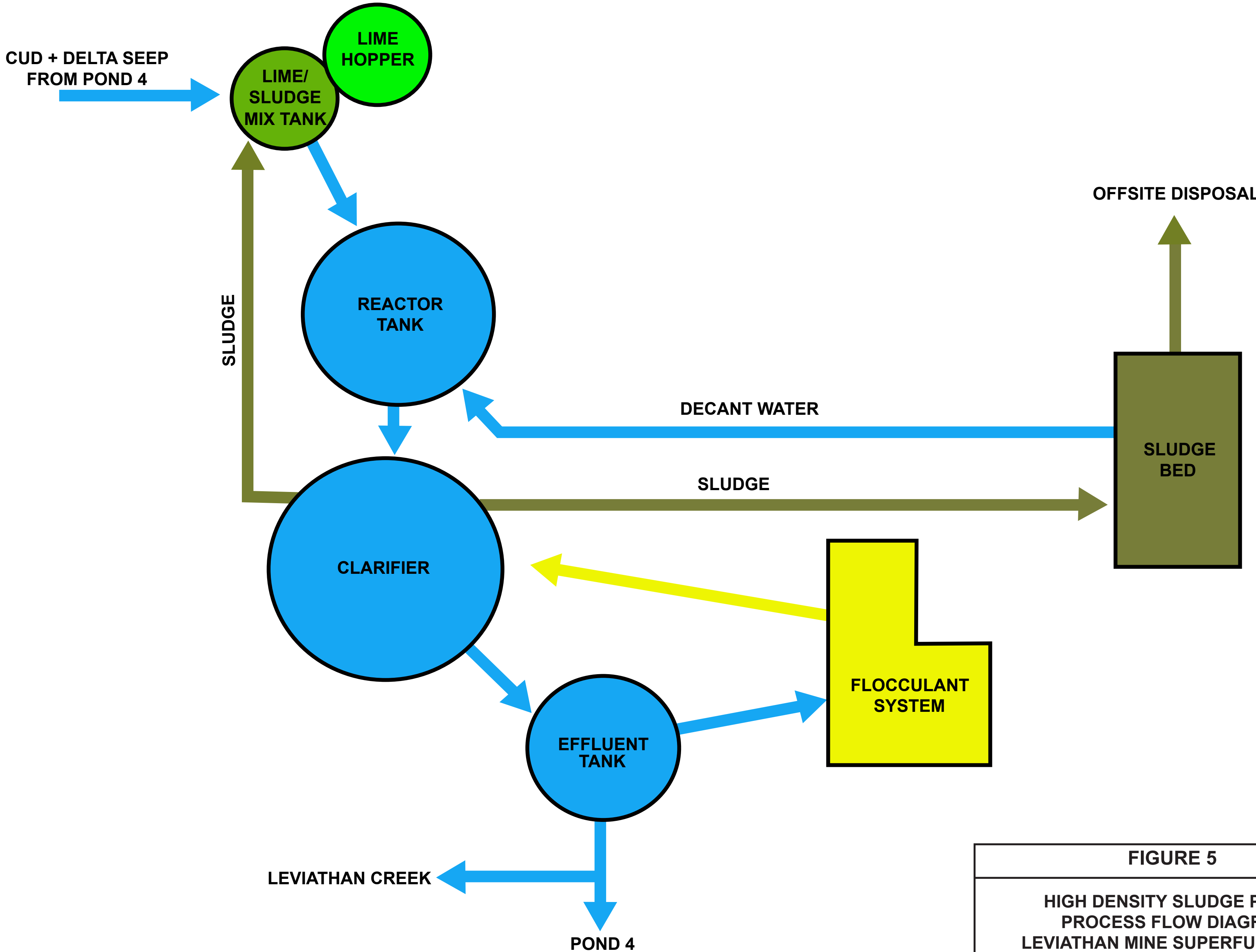
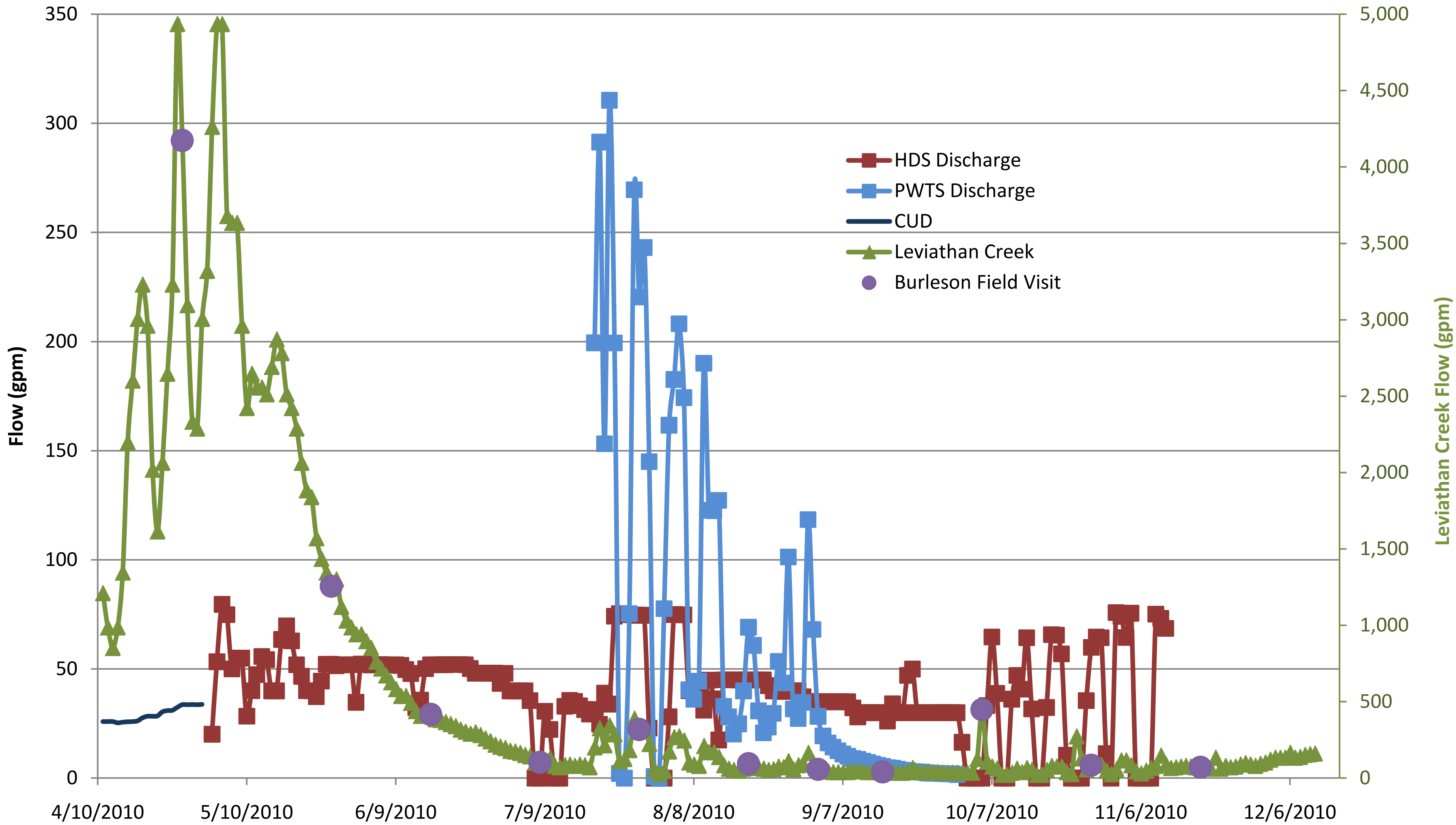


FIGURE 5

HIGH DENSITY SLUDGE PLANT
PROCESS FLOW DIAGRAM
LEVIATHAN MINE SUPERFUND SITE
ALPINE COUNTY, CALIFORNIA

Burleson Consulting, Inc.



Treatment system discharges are shown diagramatically and are not accurate depictions of actual flow rate

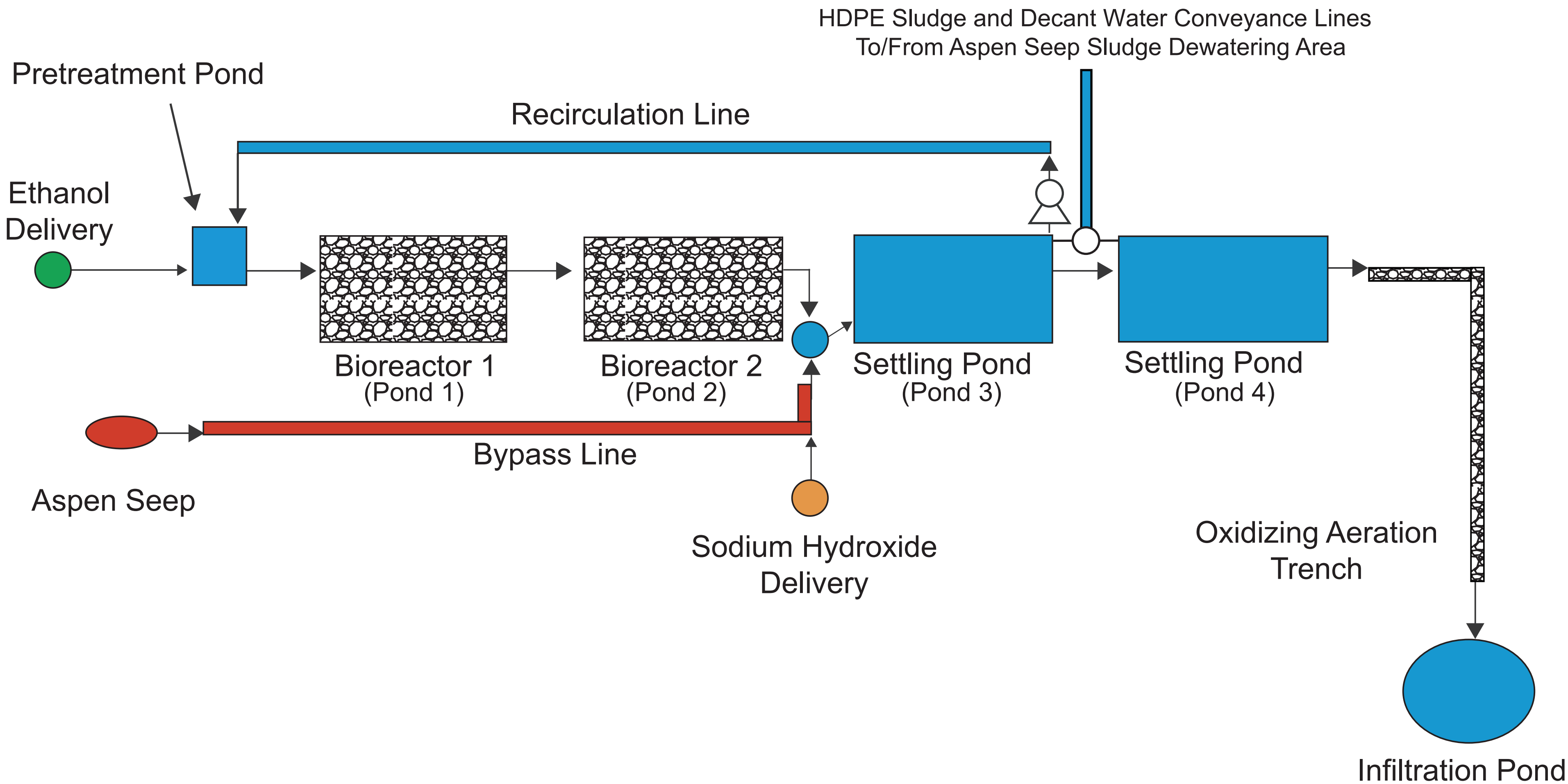
CUD and Leviathan Creek flow rates are from the U.S. Geological Survey 2010.

Recent Daily Water for California, Accessed online at: http;//waterdata.usgs.gov/ca/nwis/current?type=flow

FIGURE 6

TREATMENT SYSTEM DISCHARGE AND FLOW AT STATION 15 (LEVIATHAN CREEK) LEVIATHAN MINE SUPERFUND SITE ALPINE COUNTY, CALIFORNIA

BURLESON CONSULTING, INC.



Modified from: Tsukamoto, Tim K. and Miller, Glenn C. 2005. "Draft Data Summary Report for Bioreactors at the Leviathan Mine, Aspen Seep 2004." August.

FIGURE 7

ASPEN SEEP BIOREACTOR OPERATION WITH RECIRCULATION LEVIATHAN MINE SUPERFUND SITE ALPINE COUNTY, CALIFORNIA

Burleson Consulting, Inc.

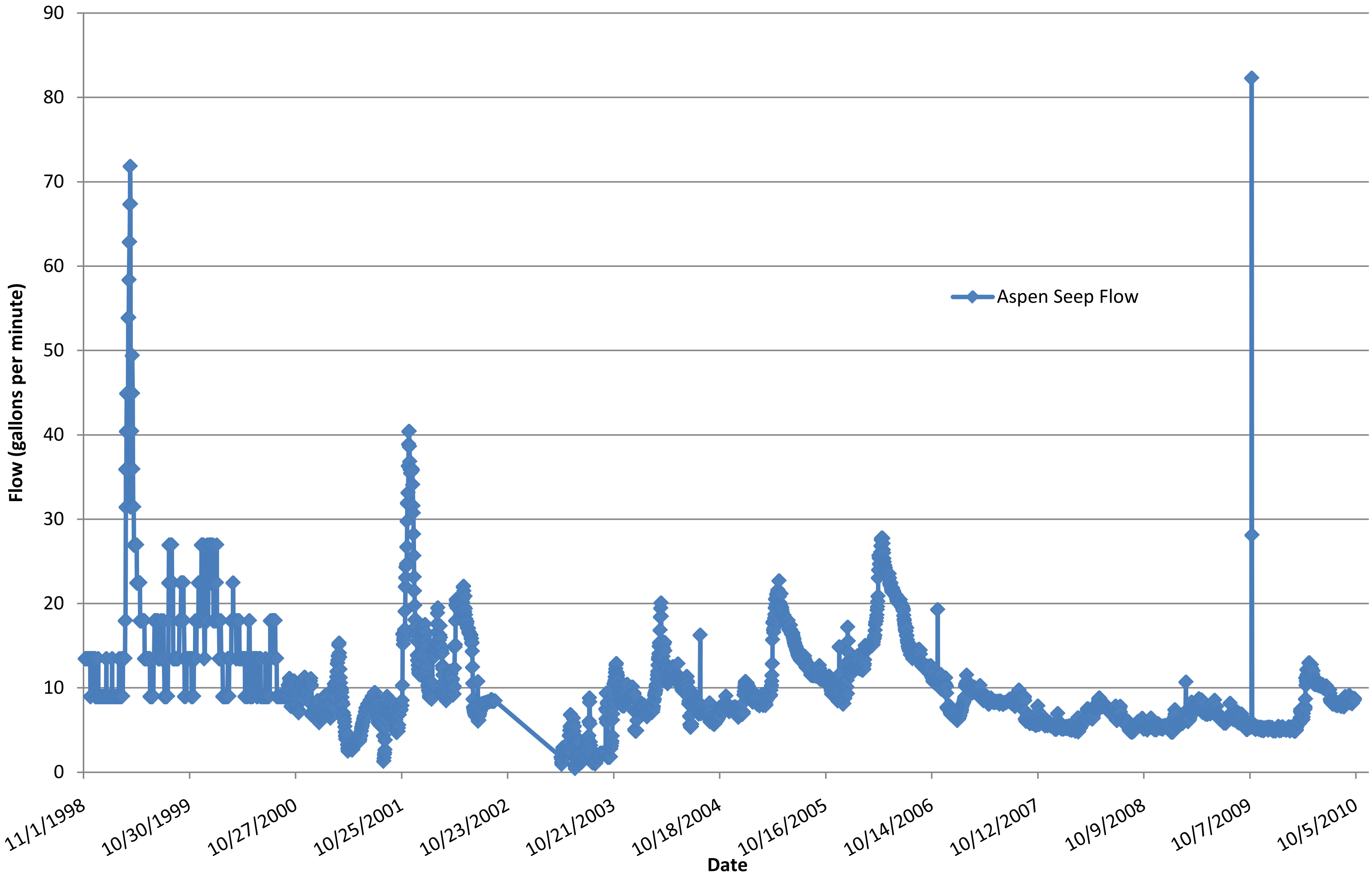


FIGURE 8

ASPEN SEEP FLOW
LEVIATHAN MINE SUPERFUND SITE
ALPINE COUNTY, CALIFORNIA

BURLESON CONSULTING, INC.

SOURCE: LEVIATHAN MINE DATABASE AND QUARTERLY REPORTS
FROM USGS TO REGIONAL BOARD

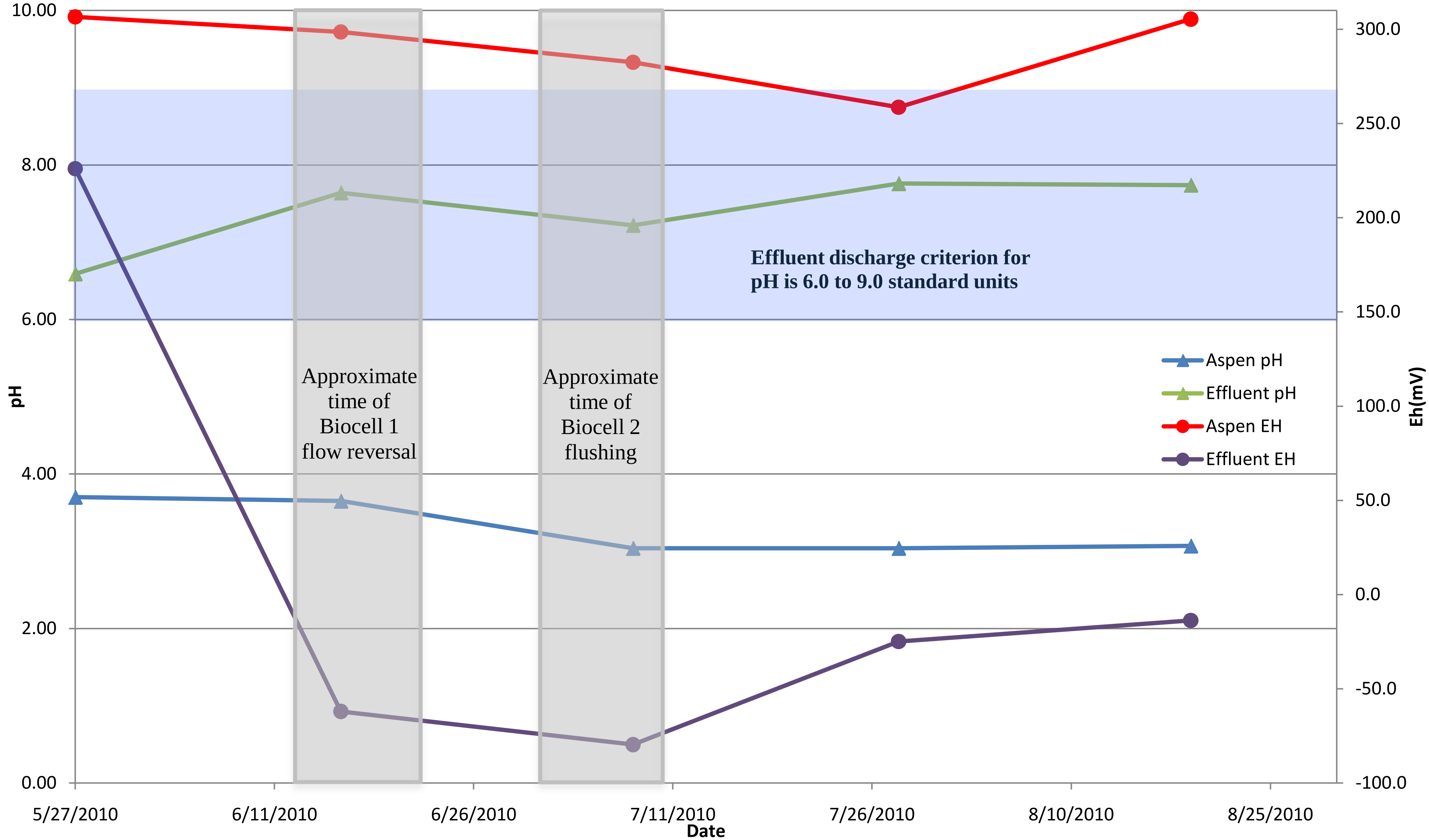
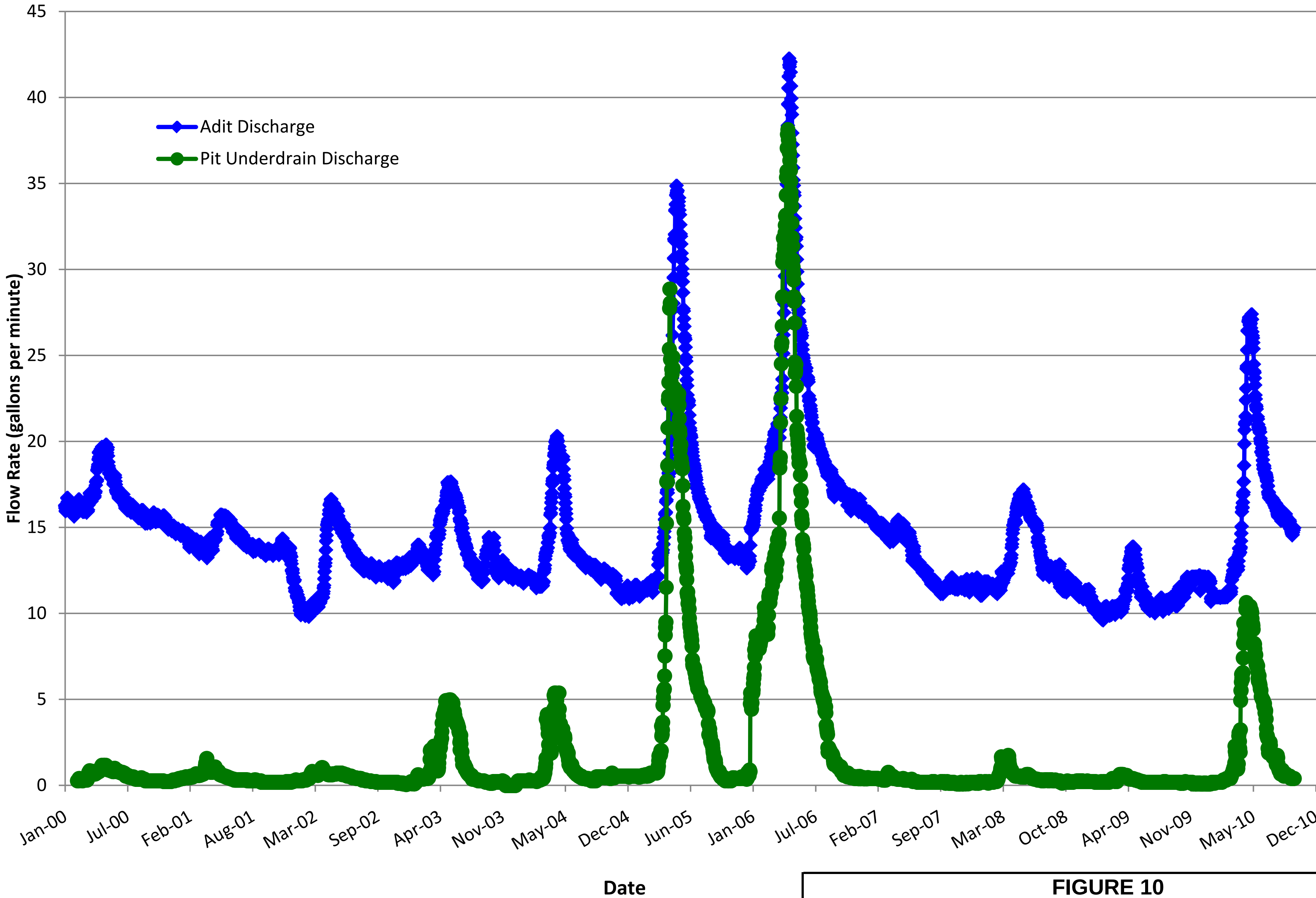


FIGURE 9

ASPEN SEEP BIOREACTOR
PERFORMANCE 2010
LEVIATHAN MINE SUPERFUND SITE
ALPINE COUNTY, CALIFORNIA

BURLESON CONSULTING, INC.



Data Sources:

U.S. Geological Survey. 2010. Recent Daily Water Data for California, Monitoring Station 10308784

Accessed online at: http://waterdata.usgs.gov/ca/nwis/uv/?site_no=10308784&amp.

U.S. Geological Survey. 2010. Recent Daily Water Data for California, Monitoring Station 10308785

Accessed online at: http://waterdata.usgs.gov/ca/nwis/uv/?site_no=10308785&amp.

FIGURE 10
ADIT AND PUD DISCHARGE RATES LEVIATHAN MINE SUPERFUND SITE ALPINE COUNTY, CALIFORNIA
BURLESON CONSULTING, INC.

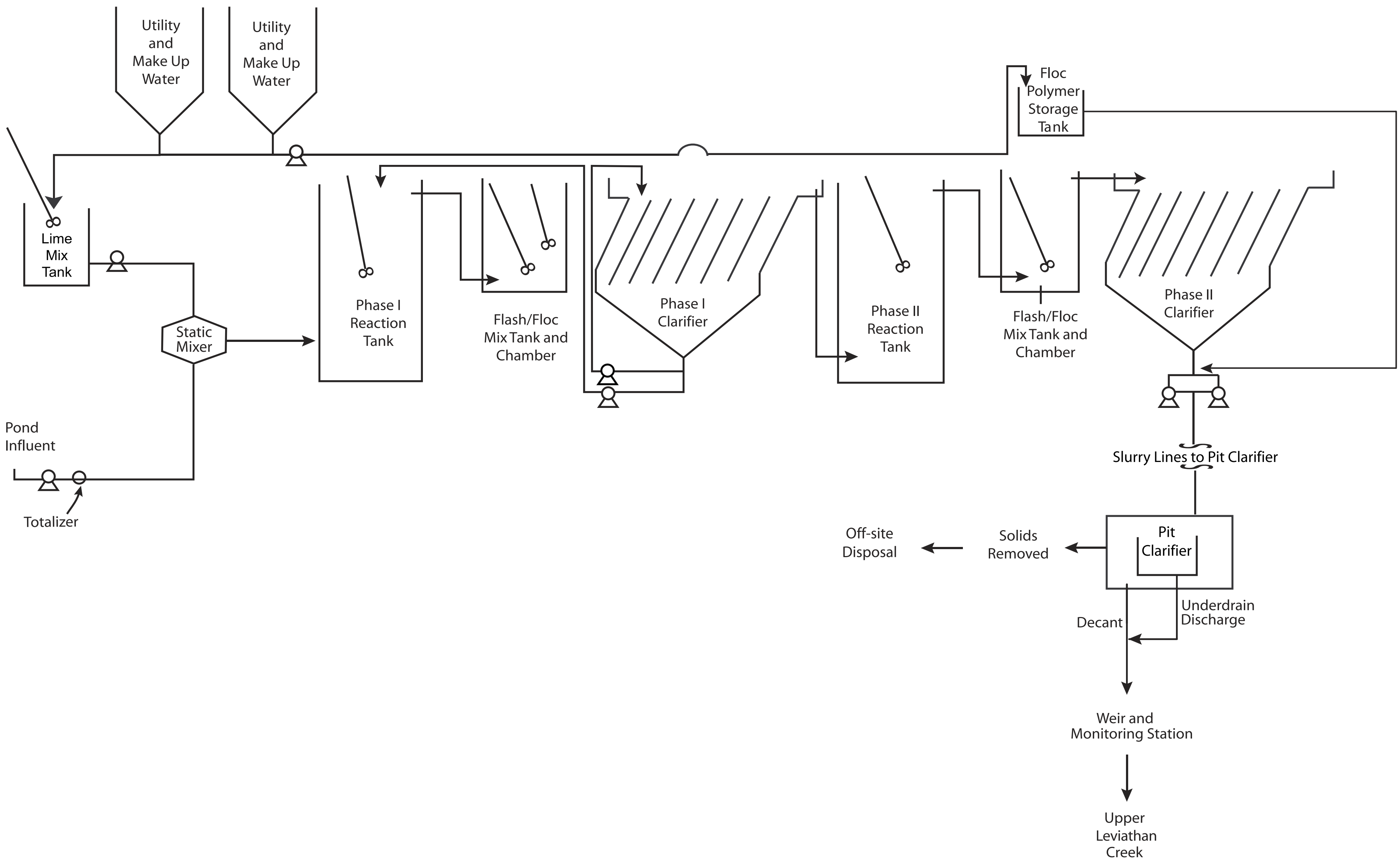
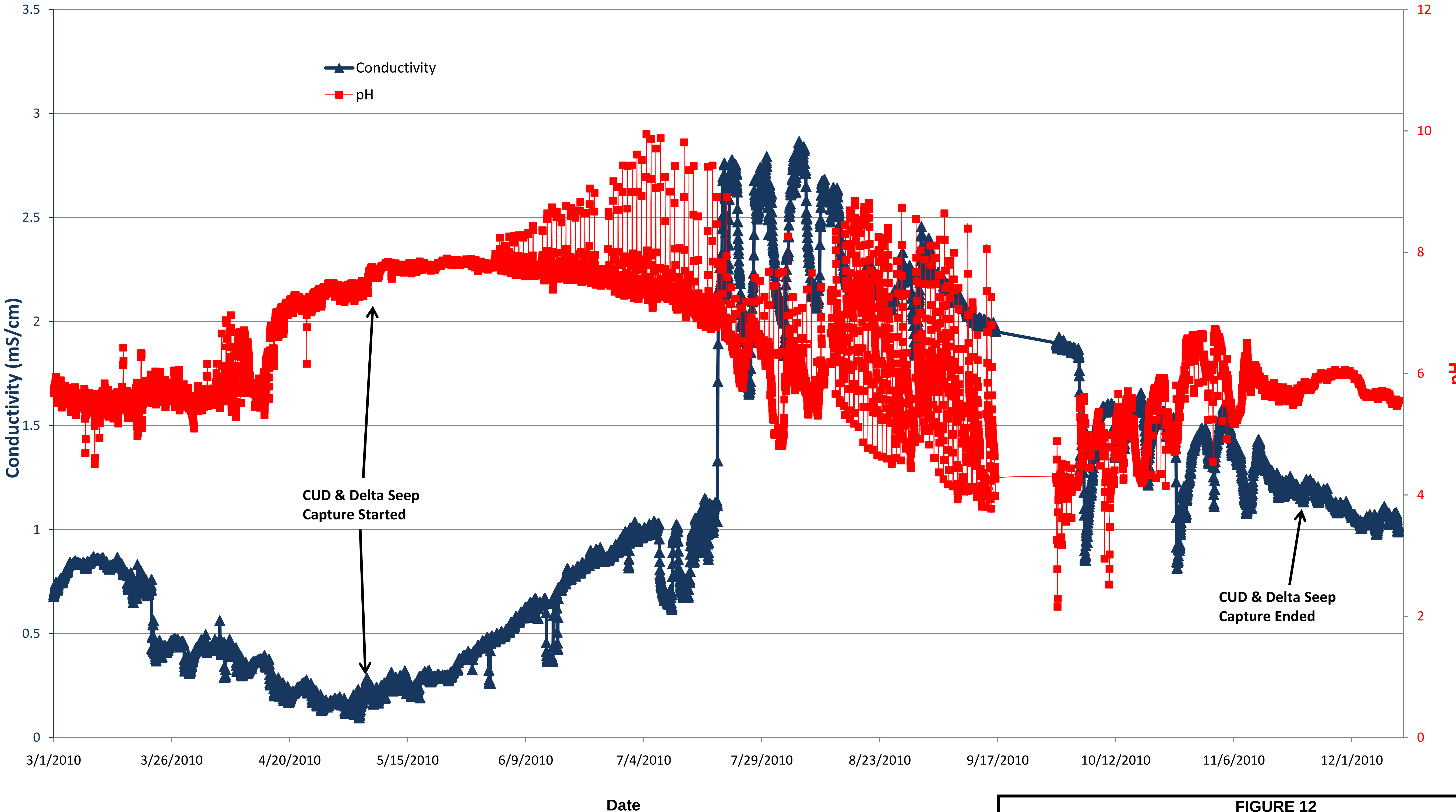


FIGURE 11

**POND 1 LIME TREATMENT PLANT
PROCESS FLOW DIAGRAM
LEVIATHAN MINE SUPERFUND SITE
ALPINE COUNTY, CALIFORNIA**

Burleson Consulting, Inc.



SOURCE: US EPA

FIGURE 12

EPA HYDROLAB WATER QUALITY DEVICES AT STATION 15
MARCH TO DECEMBER 2010
LEVIATHAN MINE SUPERFUND SITE
ALPINE COUNTY, CALIFORNIA

BURLESON CONSULTING, INC.

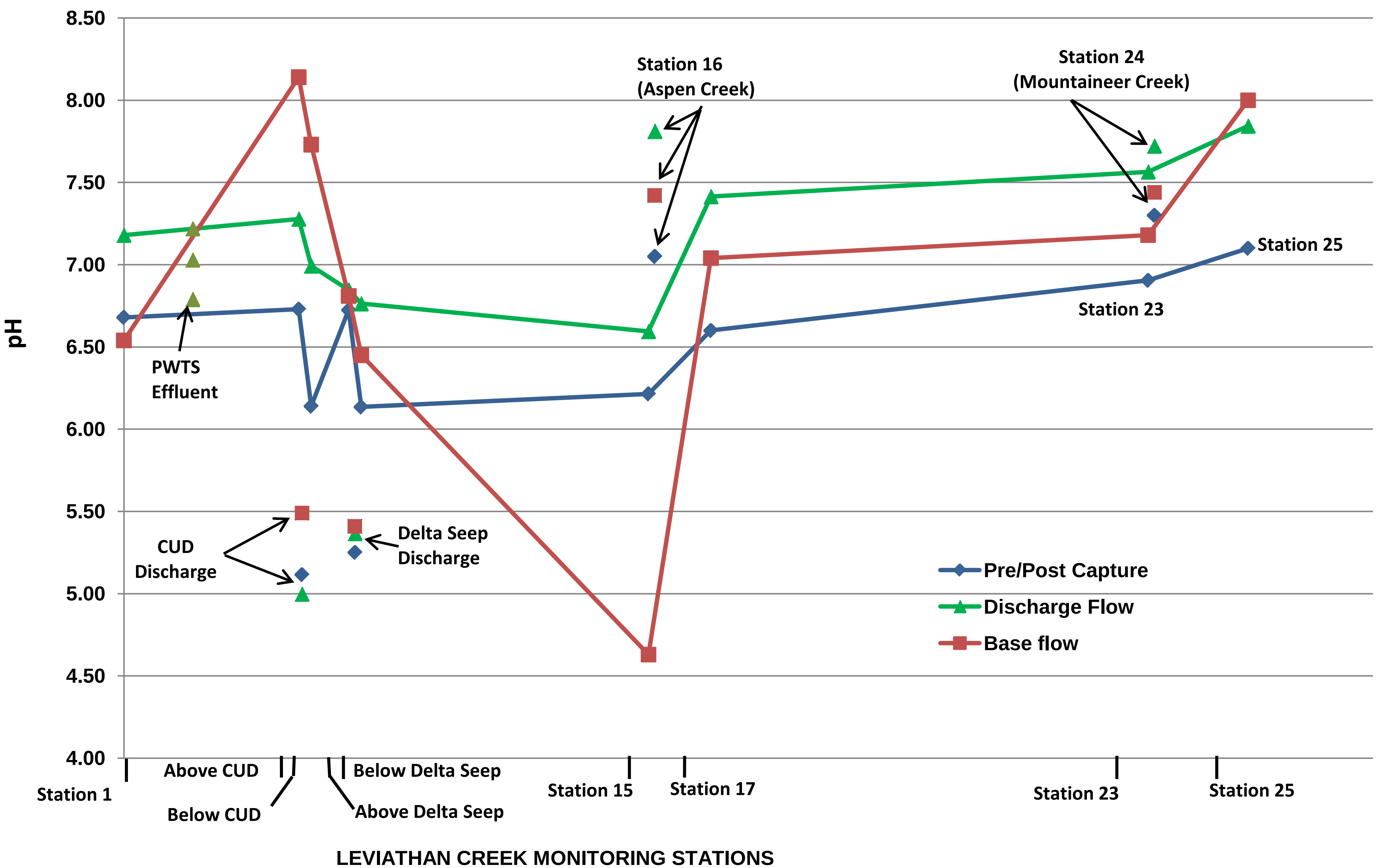
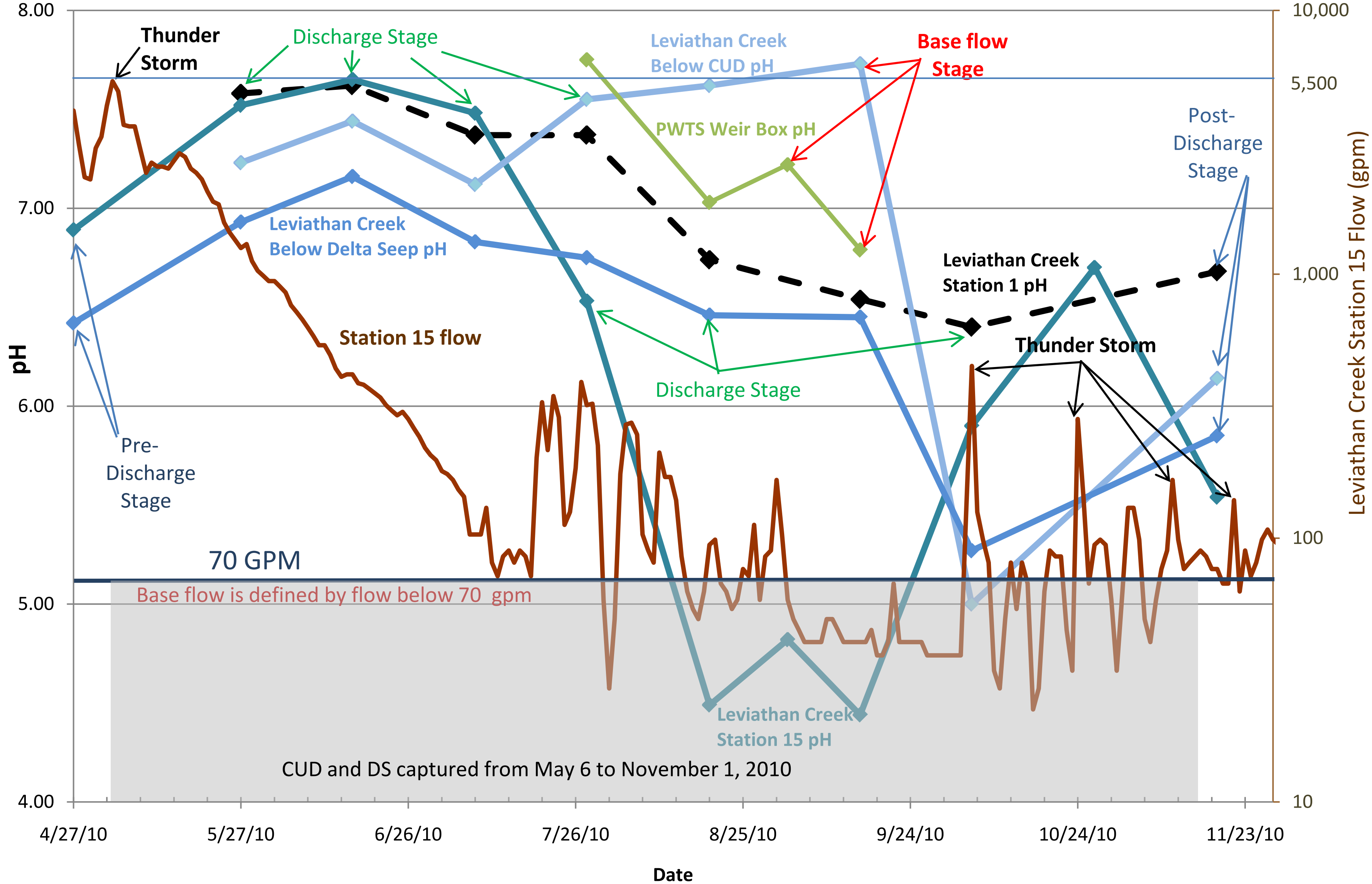


FIGURE 13
LEVIATHAN CREEK AVERAGE pH BY STAGE DURING 2010 TREATMENT LEVIATHAN MINE SUPERFUND SITE ALPINE COUNTY, CALIFORNIA
BURLESON CONSULTING, INC.

Notes:

CUD Channel Underdrain

PWTS Pond Water Treatment System



Notes:

CUD Channel Underdrain

DS Delta Seep

gpm Gallon per minute

Dashed line represents upstream monitoring location not affected by mine drainage

Leviathan Creek data from U.S.G.S. 2010. Recent Daily Water Data for California, Monitoring Station 10308789. Accessed online at: http://waterdata.usgs.gov/ca/nwis/uv/?site_no=10308789&amp.

FIGURE 14

LEVIATHAN CREEK pH AND FLOW DURING 2010 TREATMENT

LEVIATHAN MINE SUPERFUND SITE

ALPINE COUNTY, CALIFORNIA

BURLESON CONSULTING, INC.

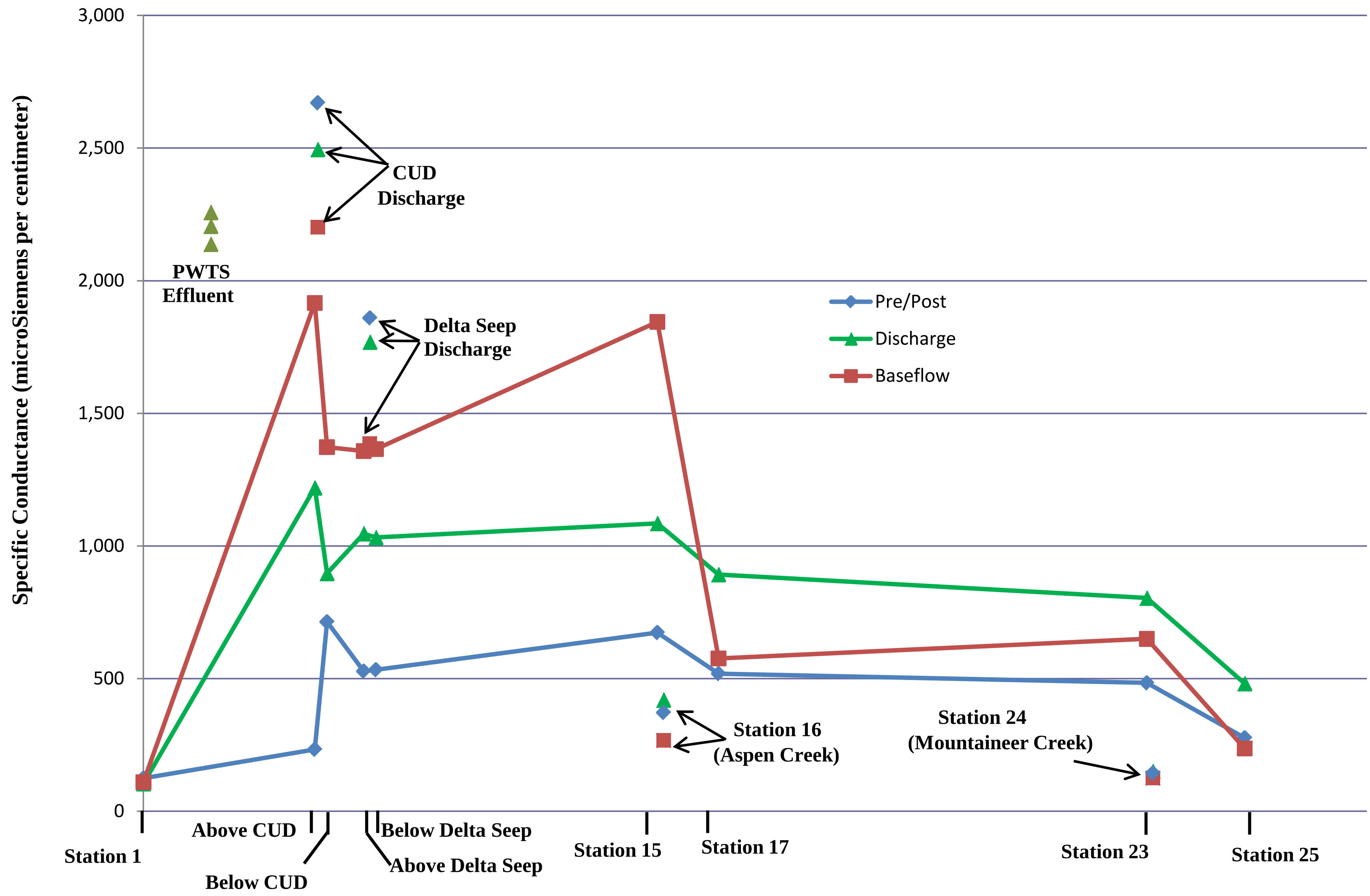


FIGURE 15

LEVIATHAN CREEK AVERAGE SPECIFIC CONDUCTANCE DURING 2010 FLOW STAGES

LEVIATHAN MINE SUPERFUND SITE

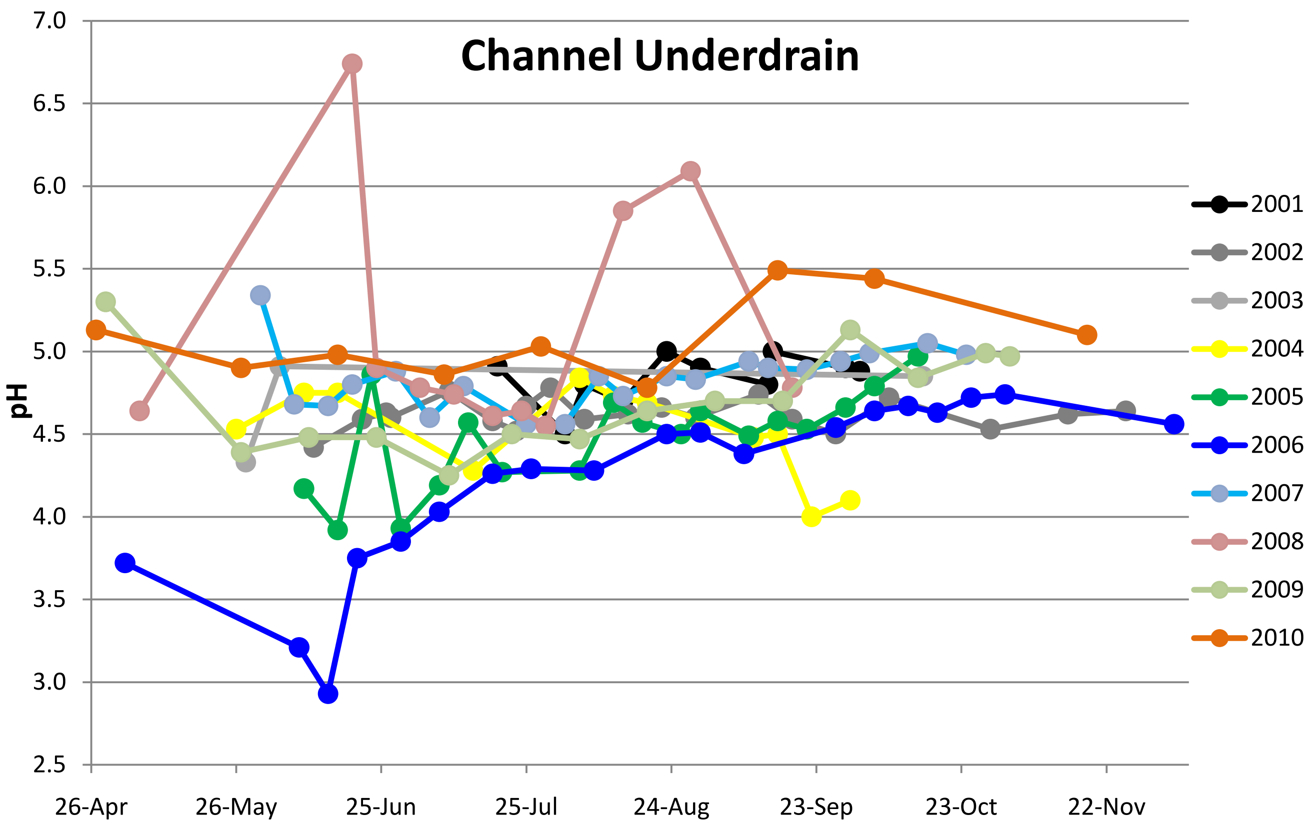
ALPINE COUNTY, CALIFORNIA

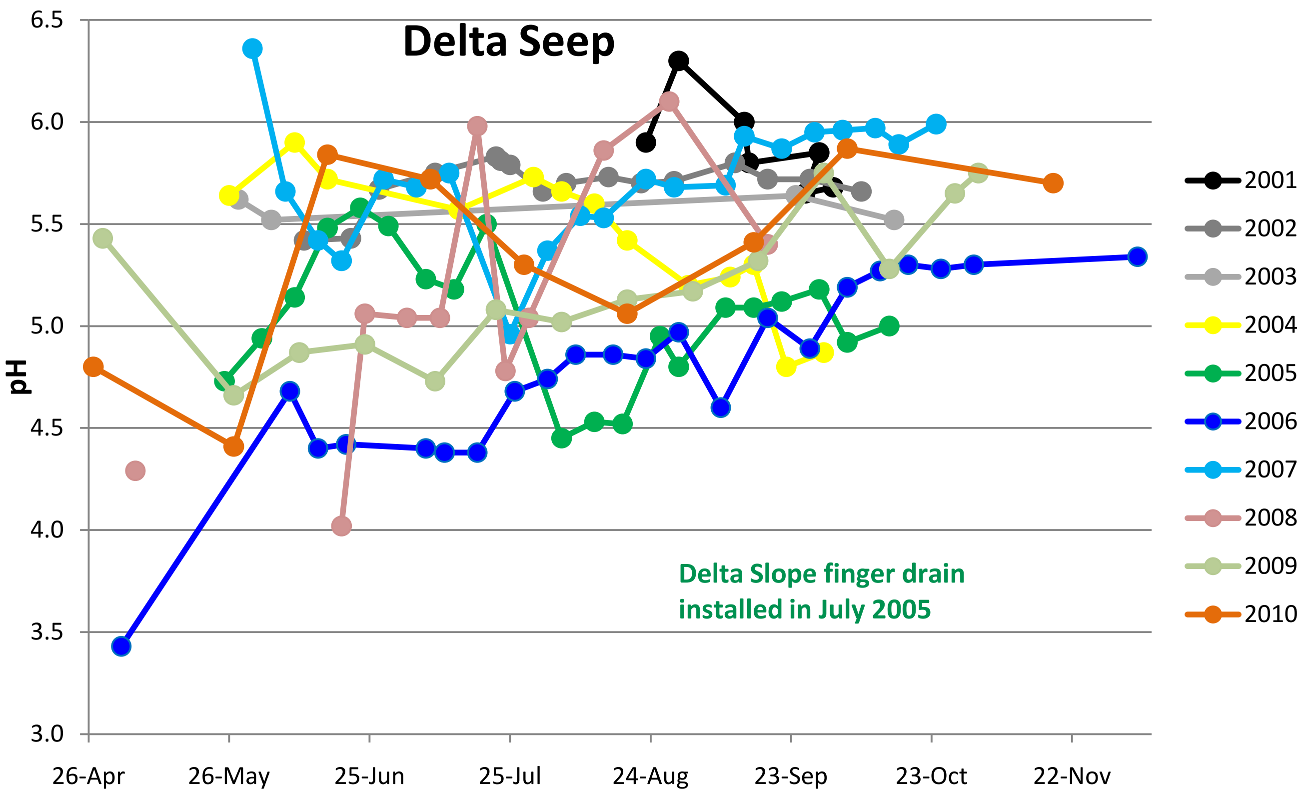
BURLESON CONSULTING, INC.

Notes:

CUD Channel Underdrain

PWTS Pond Water Treatment System





Note:
Delta Seep data since July 2005 represent the mixture of seepage and discharge from the Delta Slope finger drain.

FIGURE 16

CUD AND DELTA SEEP pH
LEVIATHAN MINE SUPERFUND SITE
ALPINE COUNTY, CALIFORNIA

BURLESON CONSULTING, INC.

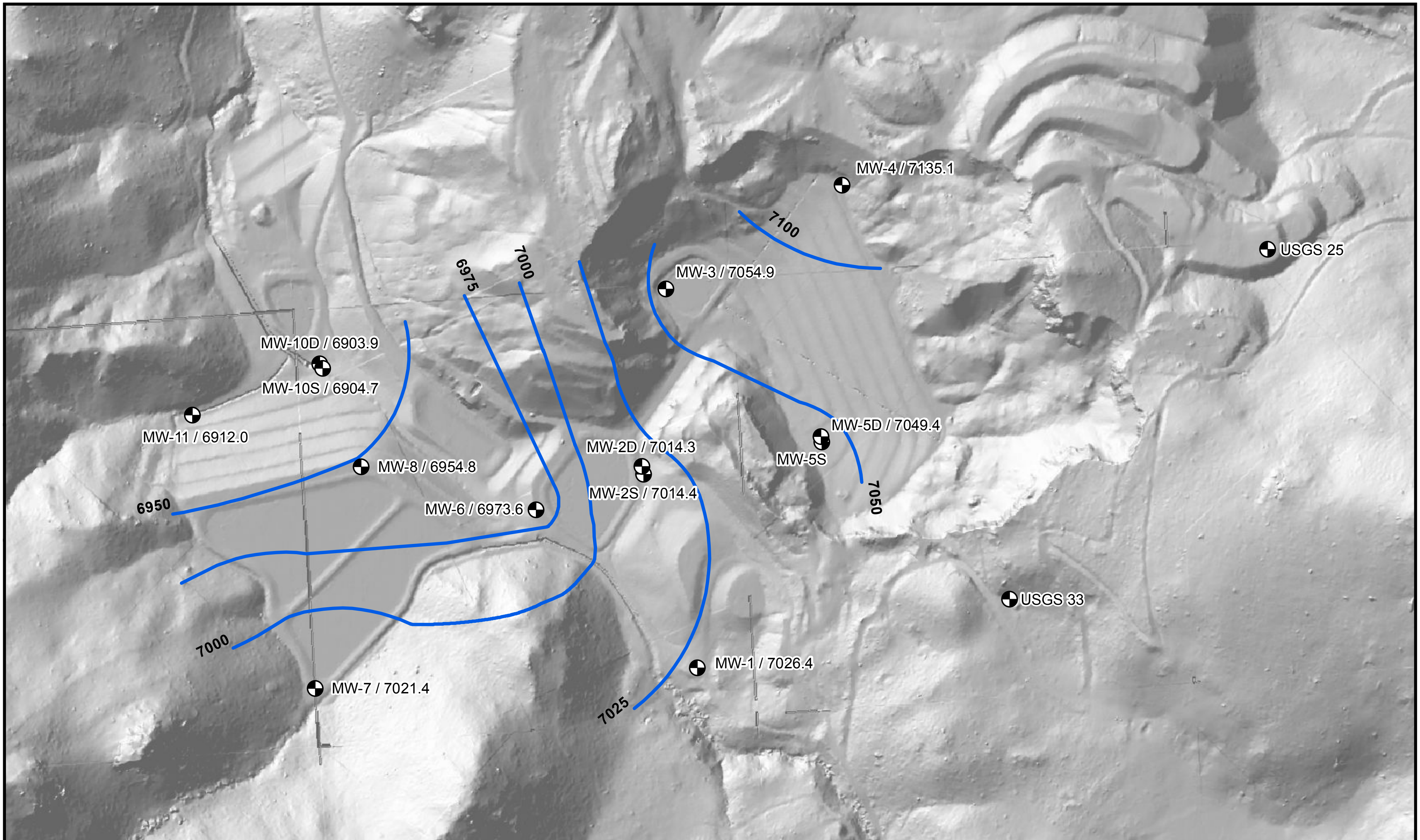
Mountaineer Creek (on left) and Leviathan Creek, before capture of Channel Underdrain and Delta Seep, April 27, 2010

Mountaineer Creek (on left) and Leviathan Creek, after capture and treatment of Channel Underdrain and Delta Seep, May 27, 2010

FIGURE 17

LEVIATHAN CREEK AT CONFLUENCE WITH MOUNTAINEER CREEK
LEVIATHAN MINE SUPERFUND SITE
ALPINE COUNTY, CALIFORNIA

BURLESON CONSULTING, INC



Legend

Monitoring Well

25ft Contour Intervals

N

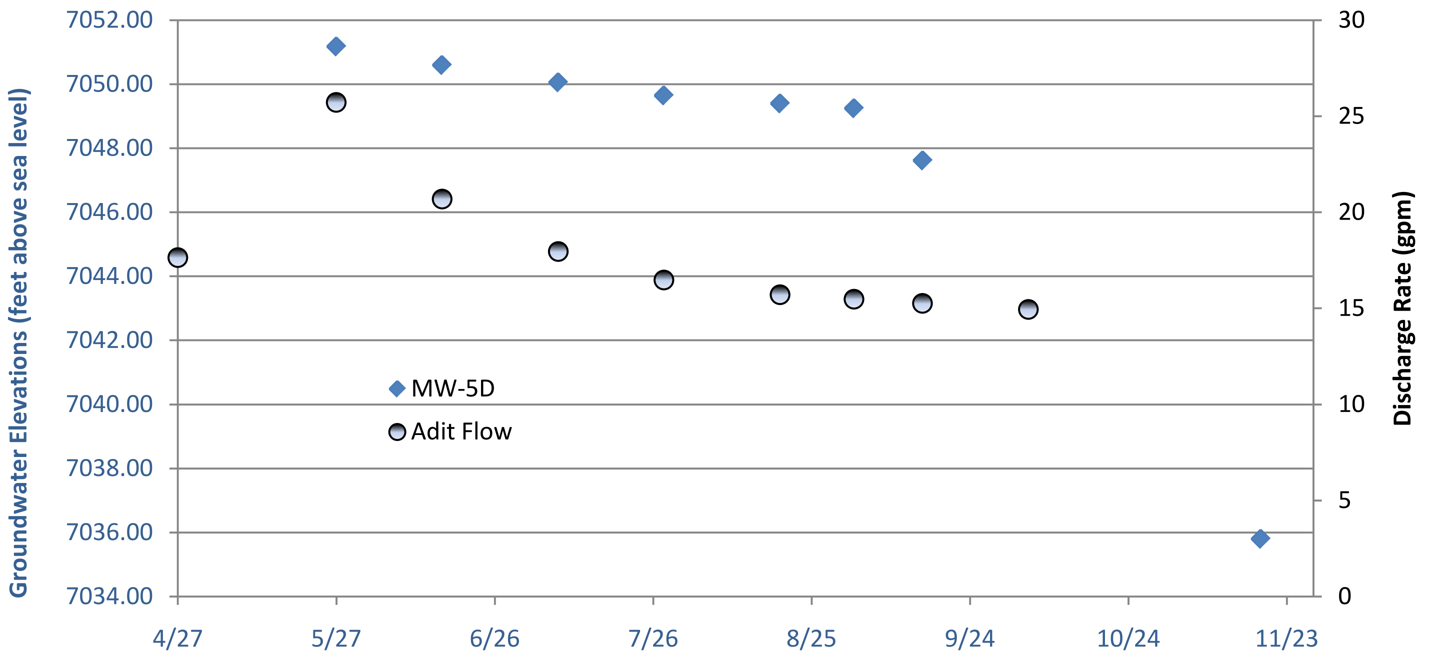
Figure 18

Groundwater Elevation Contour Map, August 19, 2010 Leviathan Mine Superfund Site Alpine County, California

0 350 700 1,050

Feet

Burleson Consulting, Inc.



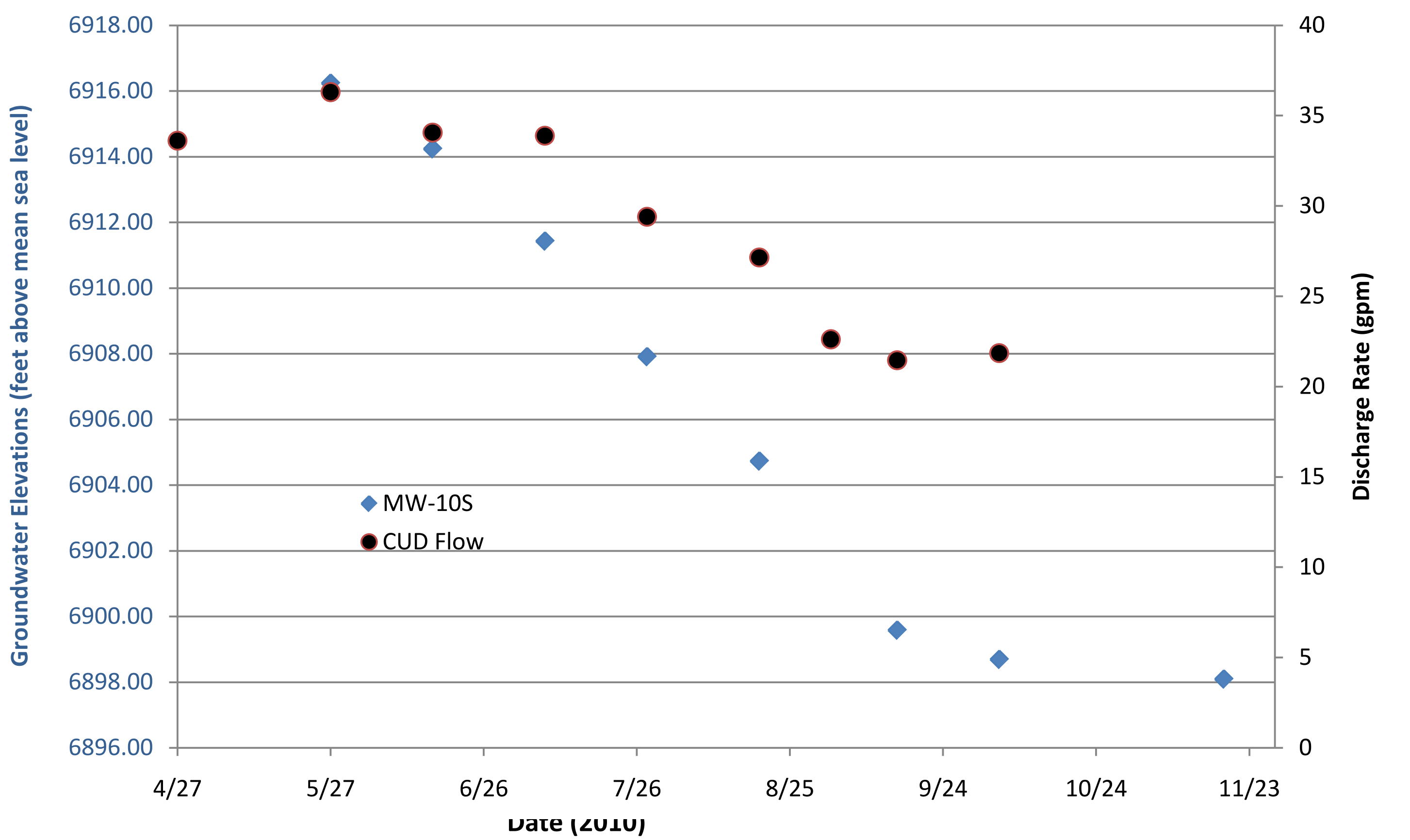


FIGURE 19

COMPARISON OF GROUNDWATER ELEVATIONS AND SOURCE WATER DISCHARGE RATES
LEVIATHAN MINE SUPERFUND SITE
ALPINE COUNTY, CALIFORNIA

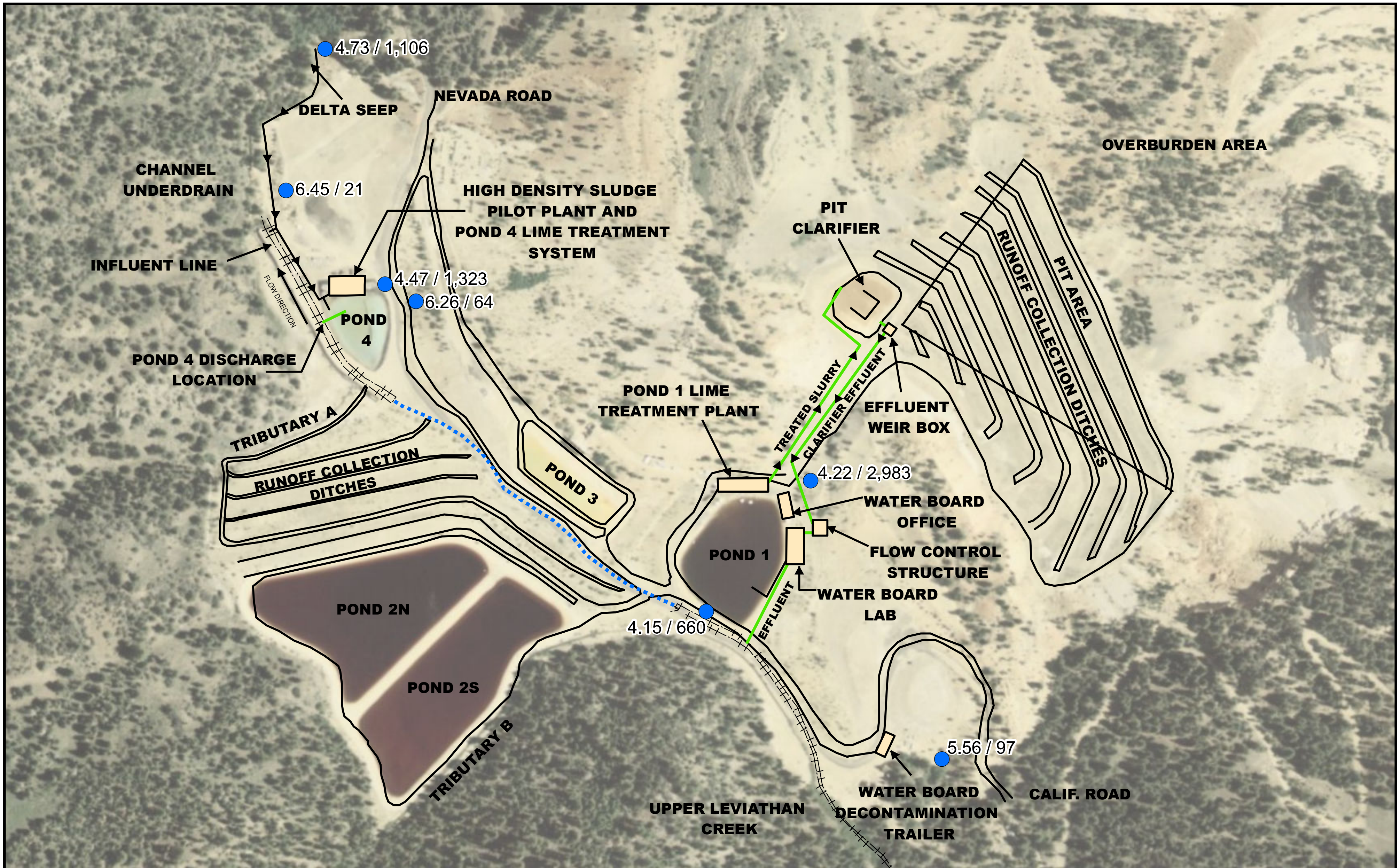
BURLESON CONSULTING, INC.

Notes:

CUD	Channel Underdrain
gpm	Gallon per minute

Adit flow data from U.S. Geological Survey 2010.

CUD flow data reported by treatment system operators.



Legend

Buildings

Effluent Lines

Leviathan Creek Underground

Leviathan Creek Open Channel

Stormwater Runoff Sample Location

pH / SC (Measured October 05, 2010)

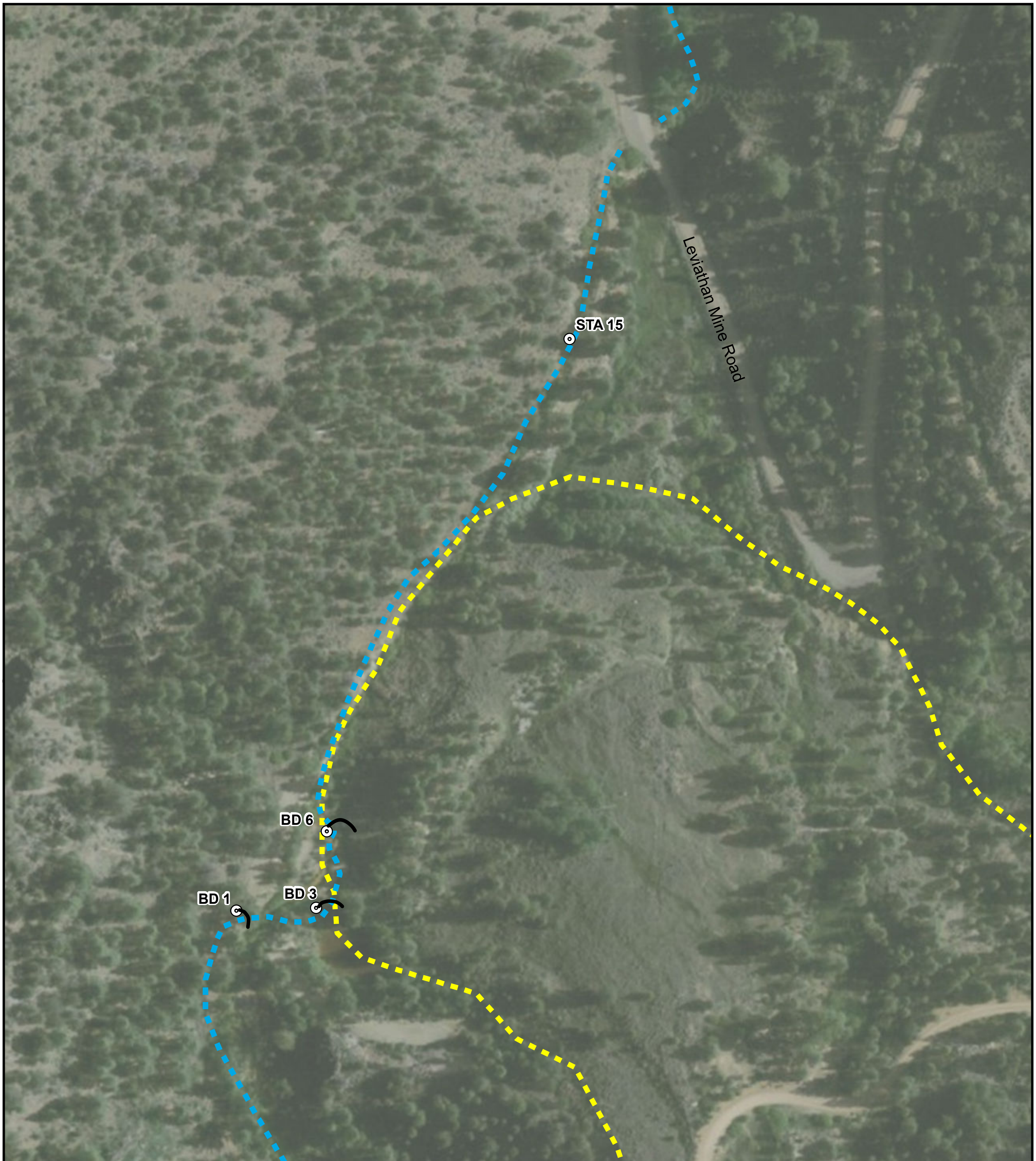
N

0 250 500 750 Feet

Figure 20

Stormwater Quality Measurement Locations
Leviathan Mine Superfund Site
Alpine County, California

Burleson Consulting, Inc.



Legend

- Approximate Location of Beaver Dam
- Water Quality Measurement Location
- Leviathan Creek
- Approximate Leviathan Creek Landslide

N

0 150 300
Feet

Figure 21

Beaver Pond
Water Quality Survey Locations
Leviathan Mine Superfund Site
Alpine County, California

Burleson Consulting, Inc.

TABLES

Table 1. Channel Underdrain and Delta Seep Treatment Summary by Year

Source	Number of Days Source was Captured and Treated, by Year and Method									
	2001 - LNP[a]	2002 - LNP[a]	2003 - LNP[a]	2004 - LNP[a]	2005 - HDS[a]	2006 - HDS/LNP[a]	2007-RCTS[d]	2008-RCTS[b]	2009-RCTS/HDS[b]	2010-HDS[b]
Channel Underdrain	61	128	104	122	66	36/48	117	135	182	183
Delta Seep	0	4	100	73	0	0	96	135	180	180
Volume of Water Treated (million gallons)	1.4[b]	3.17[b]	4.72[b]	5.0[b]	2.9[b]	1.9/1.8[c]	3.2	6	6.9	10.6

Notes:

HDS High density sludge pilot plant
LNP Pond 4 lime neutralization plant
RCTS Rotating Cylinder Treatment System

a Values are from Tetra Tech EM Inc. oversight files, as reported in:
Oversight Summary Report, Leviathan Mine Superfund Site, Alpine County, California. February 2002.
2002 Oversight Summary Report, Leviathan Mine Superfund Site, Alpine County, California. March 2003.
2003 Oversight Summary Report, Leviathan Mine Superfund Site, Alpine County, California. June 2004.
2004 Oversight Summary Report, Leviathan Mine Superfund Site, Alpine County, California. March 2005.
2005 Oversight Summary Report, Leviathan Mine Superfund Site, Alpine County, California. March 2006.
2006 Oversight Summary Report, Leviathan Mine Superfund Site, Alpine County, California. March 2007.

b Values are from Atlantic Richfield Company's annual Early Response Action completion reports:
Brown and Caldwell. 2002. *Leviathan Mine 2001 Early Response Action, Channel Underdrain Treatment Completion Report.* February.
Unipure Environmental. 2003. *Draft Leviathan Mine Site 2002 Early Response Action Completion Report.* March.
Unipure Environmental. 2004. *Draft Final Leviathan Mine Site, 2003 Early Response Action Completion Report.* April 27.
EMC^2. 2005. *Draft 2004 Early Response Action Completion Report.* May.
UniPure and EMC^2. 2006. *Draft 2005 Early Response Action Completion Report, Lime Neutralization Treatment System Using the High Density Sludge Pilot Study*. April.
Amec Geomatrix. 2009. *2008 Annual completion Report: Channel Underdrain, Delta Seep and Aspen Seep Water Treatment Activities*. April.
Amec Geomatrix. 2010. *2009 Annual completion Report: Channel Underdrain, Delta Seep and Aspen Seep Water Treatment Activities*. April.
Amec Geomatrix. 2011. 2010 *Annual completion Report: Channel Underdrain, Delta Seep and Aspen Seep Water Treatment Activities.* April.

c Value was provided by Atlantic Richfield Company's treatment system contractor at the Leviathan Mine Technical Advisory Committee Meeting on November 2, 2006.

d Values are from USACE oversight files, as reported in:
2007 Oversight Summary Report, Leviathan Mine Superfund Site, Alpine County, California. June 2007.

Table 2. Evaporation Pond Water Treatment System Summary by Year

Treatment System Location		Treatment Year									
		2001	2002	2003	2004	2005	2006	2007[f]	2008[g]	2009[b]	2010[b]
Duration of Treatment[a] (days)	Pond 1	40	79[c]	17	32	48	47	16	41[c]	33	39
	Pond 3	0	0	0	0	10	84	0	0	0	0
Volume of Treated Water Discharged[b]	Pond 1	4	3.8	3.5	5.9	9.9	13.2	3.12	3.1	2.9	6.7
	Pond 3	0	0	0	0	0.53[e]	7.5[d]	0	0	0	0

Notes:

a Values are from Tetra Tech EM Inc. oversight files, as reported in:
Oversight Summary Report, Leviathan Mine Superfund Site, Alpine County, California. February 2002.
2002 Oversight Summary Report, Leviathan Mine Superfund Site, Alpine County, California. March 2003.
2003 Oversight Summary Report, Leviathan Mine Superfund Site, Alpine County, California. June 2004.
2004 Oversight Summary Report, Leviathan Mine Superfund Site, Alpine County, California. March 2005.
2005 Oversight Summary Report, Leviathan Mine Superfund Site, Alpine County, California. March 2006.

b Values are from California Regional Water Quality Control Board, Lahontan Region annual reports:
2001 Year-end Report for Leviathan Mine, Alpine County, California. February 2002.
2002 Year-end Report for Leviathan Mine, Alpine County, California. February 2003.
2003 Year-end Report for Leviathan Mine, Alpine County, California. February 2004.
Year-end Report for the 2004 Field Season at Leviathan Mine, Alpine County, California. February 2005.
Year-end Report for the 2005 Field Season at Leviathan Mine, Alpine County, California. February 2006.
Year-end Report for the 2009 Field Season at Leviathan Mine, Alpine County, California. March 2010.
Year-end Report for the 2010 Field Season at Leviathan Mine, Alpine County, California. February 2011.

c The treatment system was not operated 24 hours per day, 7 days per week during these years.
d Values were provided by the California Regional Water Quality Control Board, Lahontan
e An additional 400,000 gallons of water was treated in Pond 3 and allowed to evaporate from the pond.
f Values are from USACE oversight files, as reported in:
2007 Oversight Summary Report, Leviathan Mine Superfund Site, Alpine County, California. June 2007.
g Kao, Chein. 2008. Presentation at the Leviathan Mine Superfund Site Technical Advisory Committee Meeting. November 18.

Table 3. Leviathan Creek Flow Stages during the 2010 Treatment Season

Creek Flow Stage	Components of Leviathan Creek Flow	Monitoring Dates
Pre/Post Capture	Spring runoff flow, CUD discharge, and Delta Seep discharge	April 27, 2010
		November 18, 2010
Discharge Flow	Base flow and treatment system discharge	May 27, 2010
		June 16, 2010
		July 8, 2010
		July 28, 2010
		August 19, 2010
		October 5, 2010
		October 27, 2010
Base Flow	Base flow (CUD and part of Delta Seep captured)	September 2, 2010
		September 15, 2010

Note:

CUD Channel Underdrain

Table 4. Summary of Well Monitoring Data in 2010

Well Number	Well Location	Total Depth[a]	Groundwater Elevation Summary in 2006			Groundwater Elevation Summary in 2007			Groundwater Elevation Summary in 2008			Groundwater Elevation Summary in 2009			Groundwater Elevation Summary in 2010			Field Observations in 2010
			Maximum[b]	Minimum[b]	Range (feet)	Maximum[b]	Minimum[b]	Range (feet)	Maximum[b]	Minimum[b]	Range (feet)	Maximum[b]	Minimum[b]	Range (feet)	Maximum[b]	Minimum[b]	Range (feet)	
MW-1	In scrap material pile beside the road southeast of Pond 1 and southwest of the Delta Slope material stockpile	73.30	7,029.46	7,028.53	0.93	7028.90	7024.65	4.25	7,030.06	7,024.45	5.61	7,030.22	7,022.79	7.43	7,031.60	7,023.22	8.38	Water level decreased from May through October.
MW-2D	Adjacent to the flow control structure near Pond 1; the deep well is closer to the flow control structure	85.81	7,019.14	7,014.74	4.40	7013.58	7013.01	0.57	7,014.43	7,012.89	1.54	7,013.75	7,012.59	1.16	7,016.91	7,013.07	3.84	Water level decreased from May through November.
MW-2S	Adjacent to the flow control structure near Pond 1; the shallow well is farther from the flow control structure	50.24	7,019.16	7,014.75	4.41	7013.6	7013.04	0.56	7,014.43	7,013.93	0.50	7,013.92	7,012.64	1.28	7,016.94	7,013.10	3.84	Water level decreased from May through November.
MW-3	In the mine pit at the northwest corner of the pit clarifier	42.37	7,055.40	7,049.59	5.81	7053.99	7053.28	0.71	7,054.59	7,052.82	1.77	7,054.04	7,053.20	0.84	7,055.44	7,054.24	1.20	Water level decreased from May to early September, then began to increase through the end of September and then declined through November
MW-4	Northeast corner of the mine pit, on the top bench of the storm water collection system	35.19	7,135.20	7,135.09	0.11	7135.07	7134.98	0.09	7,135.15	7,135.02	0.13	7,135.17	7,135.01	0.16	7,135.07	7,134.92	0.15	Very little change in elevation over the course of monitoring.
MW-5D	South side of the mine pit, near the vegetation test plots; deep well is the shorter surface completion	80.33	7,051.43	7,049.26	2.17	7048.59	7048.33	0.26	7,049.07	7,048.58	0.49	7,048.92	7,048.15	0.77	7,051.18	7,035.80	15.38	Water level decreased from May through November.
MW-5S	South side of the mine pit, near the vegetation test plots; shallow well is the taller surface completion	47.68		Dry			Dry			Dry			Dry			Dry		Well was dry during monitoring in 2010.
MW-6	West side of Pond 1 on the opposite side of the road from the twin 72-inch pipe inlets	92.83	6,981.46	6,973.87	7.59	6973.02	6970.13	2.89	6,975.21	6,969.89	5.32	6,973.87	6,969.22	4.65	6,980.27	6,970.67	9.60	Water level decreased from May through November.
MW-7	Southwest corner of Pond 2-South	35.28	7,021.67	7,021.26	0.41	7021.19	7020.28	0.91	7,021.90	7,020.72	1.18	7,021.97	7,020.57	1.40	7,021.83	7,021.09	0.74	Water level increased from May through July and declined from August through November
MW-8	Northeast corner of Pond 2-North	151.4	6,962.92	6,954.80	8.12	6953.44	6950.41	3.03	6,954.94	6,951.48	3.46	6,953.43	6,949.38	4.05	6,956.63	6,953.28	3.35	Water level increased through June 16, and declined through September.
MW-9	Northwest of Pond 3	29.27	6,961.54	6,961.34	0.20	6961.41	Dry	0?	6,961.44	6,961.41	0.03	6,961.40	6,961.35	0.05		Dry		Well was dry during monitoring in 2010.
MW-10D	Adjacent to the outlet of the twin 72-inch pipes; deep well is the taller surface completion	76.90	6,915.30	6,900.12	15.18	6898.77	6896.41	2.36	6,904.42	6,896.63	7.79	6,905.05	6,896.31	8.74	6,916.81	6,897.35	19.46	Water level decreased from May through November.
MW-10S	Adjacent to the outlet of the twin 72-inch pipes; shallow well is the shorter surface completion	40.24	6,915.45	6,901.82	13.63	6900.26	6898.08	2.18	6,905.14	6,898.24	6.90	6,905.01	6,897.86	7.15	6,916.24	6,898.09	18.15	Water level decreased from May through November. The well showed a similar groundwater elevation trend to MW-10D, but with a smaller range. The change in water elevation correlates with decreasing flow from the Channel Underdrain.
MW-11	West side of the toe of the slope at Pond 2-North, beside the lower Leviathan Creek tributary	20.30	6,916.71	6,911.36	5.35	6912.05	6910.21	1.84	6,913.32	6,910.28	3.04	6,915.77	6,910.18	5.59	6,920.23	6,911.04	9.19	Water level decreased from May through November.
USGS-25	On a plateau 100 feet west of the Leviathan mine bypass road south of Aspen Seep. The surface completion is a PVC pipe without a protective casing or lock.	107.56	7,284.14	7,283.42	0.72	7283.66	7283.48	0.18	7,284.15	7,283.49	0.66	7,284.03	7,275.75	8.28		Dry		Well was dry during monitoring in 2010.
USGS-31	Off site 15 feet north of the road just before a sharp bend in Leviathan Mine bypass road opposite a small dead end side road to the south. The well is a rusted steel casing without a cap or lock.	109.14		Dry			Well is blocked.			Well is blocked.			Well is blocked.			Well is blocked.		There is an obstruction at 21.17 feet below top of casing.
USGS-33	Located in a flat area southwest of the mine pit 15 feet east of Leviathan Mine bypass road past the turnoff to the California entrance gate. The surface completion is a PVC pipe with a screw cap and no protective casing.	112.50	7,263.55	7,259.68	3.87	7262.59	7251.23	11.36	7,251.72	7,243.95	7.77		Well is blocked.			Well is blocked.		Well riser was observed broken off on April 29, 2009 and well was obstructed.

Notes:

a Measured in feet below the top of the well casing

b Measured in feet above mean sea level. Calculated by subtracting the measured depth to water from the reported elevation at the top of the well casing.

PVC Polyvinyl chloride

Table 5. Leviathan Mine Beaver Pond Water Quality Measurements

Location	Time	pH	T (°C)	SC (μS/cm)	ORP (mV)
August 19, 2010					
BD-3	15:10	6.1	18.18	2,001	-31.5
BD-6	15:20	3.58	17.17	2,127	129.5
September 2, 2010					
BD-6	12:48	5.75	13.57	2,025	-27.1
BD-3	13:01	6.17	15.07	2,313	-52.4
BD-1	13:14	5.66	15.76	2,257	-38.4
September 15, 2010					
BD-1	16:27	6.79	12.76	1,355	-2.3
BD-3	16:39	6.18	15.1	1,506	-14.9
BD-6	16:45	4.53	13.79	1,689	26.7
October 27, 2010					
BD-3	14:10	6.85	5.54	1,107	-34.5
November 18, 2010					
BD-1	15:00	5.51	6.69	1,164	-48.5
BD-3	15:20	5.81	4.42	1,192	-58.5
BD-6	15:29	5.67	3.76	998	-31.1

°C	Degree Celsius	ORP	Oxidation-reduction potential
μS/	MicroSiemen per centimeter	SC	Specific conductance
gpr	Gallon per minute	T	Temperature
mV	MilliVolt		

Notes:

BD-1 - Upstream Beaver Dam

BD-3 - Main Beaver Dam

BD-6 - Downstream Beaver Dam

APPENDIX A: OVERSIGHT SUMMARIES (Presented on Compact Disc)	36 Pages
APPENDIX B: OVERSIGHT PHOTOGRAPHS (Presented in Hard Copy and on Compact Disc)	38 Pages
APPENDIX C: FIELD INSTRUMENT CALIBRATION RECORDS (Presented on Compact Disc)	33 Pages
APPENDIX D: MONITORING WELL HYDROGRAPHS (Presented in Hard Copy and on Compact Disc)	12 Pages

APPENDIX A: OVERSIGHT SUMMARIES 36 Pages

Leviathan Mine Superfund Site
April 27, 2010
Burleson Consulting, Inc. Oversight

Period of Oversight: 11:30 AM to 3:00 PM
Oversight Personnel: Greg Reller of Burleson, Gary Riley of US EPA

Summary of Site Activities:

California Regional Water Quality Control Board, Lahontan Region (Regional Board):

- Regional Board staff or contractors were not observed on site.

Atlantic Richfield Company (Atlantic Richfield):

- Lime was being fed into the High Density Sludge (HDS) system in preparation for starting treatment of water in Pond 4 planned for later this week.

Burleson Consulting, Inc. (Burleson)

- Burleson measured water quality in Leviathan and associated creeks on April 27 to document conditions prior to beginning the treatment season.

Leviathan and Bryant Creek Flows: According to the USGS website, flow in Leviathan Creek at Station 15 has varied from about 3 cubic feet per second (cfs) to over 20 cfs since April 22. Also according to USGS, flows at Station 25 in Bryant Creek have ranged from about 9 cfs to about 20 cfs since April 22. Flows at both stations show a diurnal fluctuation. The varying flows likely reflect the alternating freezing and thawing and associated runoff as the snow pack melts. The reported flows from either or both of these stations may be in error because the reported maximum flows are similar, and flows at Station 25 in Bryant Creek are expected to be significantly higher than those at Station 15 in Leviathan Creek.

Atlantic Richfield

HDS Treatment System: The HDS treatment system was being prepared for resumption of treatment during the limited access season (LAS). Personnel were feeding lime into the HDS plant. Generators were operating, and the temperature within the HDS building was reportedly being maintained at about 60 degrees to facilitate preparations for LAS treatment activity. Two office trailers and the control trailer were being used at the site.

According to the USGS web site (http://waterdata.usgs.gov/ca/nwis/inventory) the level of Pond 4 steadily increased over the winter. The pond is about one foot below the top of the extension on the overflow pipe.

Burleson

On April 27, Burleson measured water quality in Leviathan and associated creeks to document conditions prior to beginning of 2010 treatment activities. Water quality readings taken by Burleson in Leviathan and associated creeks are presented in Table 1.

Table 1. Leviathan Mine Surface Water Quality Measurements on April 27, 2010

Location	Time	pH	T (°C)	SC (µS/cm)	ORP (mV)
Leviathan Creek, Above CUD	13:24	6.74	4.19	185	74.3
CUD	13:15	5.13	8.34	2,834	114.6
Leviathan Creek, Above Delta Seep	12:54	7.09	4.57	228	-20.3
Delta Seep	12:59	4.80	5.36	2028	-188.1
Leviathan Creek, Below Delta Seep	13:05	6.42	4.51	291	139.9
Delta Slope Storm Drain	13:01	4.27	4.16	1725	282.3
Delta Slope Runoff	13:10	6.80	3.57	775	92.7
Leviathan Creek, Station 15	14:20	6.89	4.72	278	17.7
Aspen Creek, Station 16	14:25	7.42	7.59	312	10.5
Leviathan Creek, Station 17	14:35	7.02	5.05	309	-16.8
Leviathan Creek, Station 23	11:51	7.13	5.61	266	-27.1
Mountaineer Creek, Station 24	12:05	7.67	6.46	142	-23.6
Bryant Creek, Station 25	11:56	7.31	5.86	234	-27

Notes: Aspen Seep and Station 1 on Leviathan Creek were not visited.

°C Degree Celsius
µS/cm MicroSiemen per centimeter
gpm Gallon per minute
mV MilliVolt
ORP Oxidation-reduction potential
SC Specific conductance
T Temperature

Upcoming Events:

- Atlantic Richfield plans to begin treatment of water in Pond 4 on April 27 or 28, contingent on weather conditions. Pond 4 will be treated in recirculation mode until water quality shows the effluent can be discharged.
- After additional freeboard is created in Pond 4 by discharge of HDS effluent, capture of CUD and DS and treatment in the HDS plant will begin. Contingent on weather, capture of CUD and DS could occur by May 1.
- Atlantic Richfield will continue to closely monitor and adjust the HDS treatment system.
- Burleson will continue oversight during ongoing treatment and construction activities.
- Burleson will coordinate oversight visits with Gary Riley and Kevin Mayer (EPA), and John Erwin (USACE).

Leviathan Mine Superfund Site
May 27, 2010
Burleson Consulting, Inc. Oversight

Period of Oversight: 10:30 AM to 4:15 PM
Oversight Personnel: Greg Reller of Burleson

Summary of Site Activities:

California Regional Water Quality Control Board, Lahontan Region (Regional Board):

- Regional Board staff or contractors were not observed on site.

Atlantic Richfield Company (Atlantic Richfield):

- Captured CUD and Delta Seep discharges were being treated in the HDS plant and discharged to Leviathan Creek.

Burleson Consulting, Inc. (Burleson)

- Burleson measured water quality in Leviathan and associated creeks on May 27 to document conditions during the (limited access season) LAS. Burleson also measured depth to groundwater in monitoring wells at the site.
- Burleson escorted Joy Peterson of the Washoe Tribe of Nevada and California Environmental Management Department around the site.

The LAS consists of activities needed to capture and treat CUD and DS flows before the Atlantic Richfield Work Season that begins on June 1.

Leviathan and Bryant Creek Flows: According to the USGS website (http://waterdata.usgs.gov/ca/nwis/current?type=flow), flow in Leviathan Creek at Station 15 has varied from about 3 cubic feet per second (cfs) to nearly 30 cfs since April 28. Also according to USGS, flows at Station 25 in Bryant Creek have ranged from about 5 cfs to above 20 cfs since April 22. Flows at both stations show a pronounced diurnal fluctuation through May 17, with declining flows and a less obvious diurnal cycle since May 17. The varying flows likely reflect the alternating freezing and thawing and associated runoff as the snow pack melts. The reported flows from either or both of these stations may have been affected by freezing conditions and snow because the reported maximum flows are similar, and flows at Station 25 in Bryant Creek are expected to be significantly higher than those at Station 15 in Leviathan Creek.

Atlantic Richfield

HDS Treatment System: The HDS treatment system was operating and treatment and discharge of water from Pond 4 was in progress during the site visit. Personnel were removing scale from CUD and DS conveyance lines during the site visit.

According to the USGS web site, the water level in Pond 4 decreased from about 6.8 feet on April 28 to about 5.1 feet by May 7; remained between 5 and 6 feet through May 19; and then decreased to about 3.5 feet where the pond level has remained since May 19. The pond level changes recorded by USGS appear to correspond with commissioning of the HDS Plant in early May; treatment and discharge of Pond 4 water in mid-May; and LAS capture and treatment of CUD and DS since mid-May.

ASBR: The ASBR appeared to be functioning as intended during the site visit. Burleson measured a very high oxidation-reduction potential (226 mV) in Settling Pond 2.

Burleson

On May 27, Burleson measured water quality in Leviathan and associated creeks to document conditions during 2010 LAS treatment activities. Water quality readings taken by Burleson in Leviathan and associated creeks are presented in Table 1.

Table 1. Leviathan Mine Surface Water Quality Measurements on May 27, 2010

Location	Time	pH	T (°C)	SC (µS/cm)	ORP (mV)
Leviathan Creek, Station 1	15:27	7.58	11.61	91	84.2
Leviathan Creek, Above CUD	12:06	7.57	10.13	504	-47.6
CUD	11:57	4.90	8.57	2,932	33.4
Leviathan Creek, Below CUD	12:16	7.23	10.44	359	-49.0
Leviathan Creek, Above Delta Seep	12:27	7.03	10.68	385	20.3
Delta Seep	12:21	4.41	8.85	2,281	170.9
Leviathan Creek, Below Delta Seep	12:41	6.93	11.08	391	-28.1
Delta Slope Storm Drain	12:34	3.77	6.10	3,581	244.5
Aspen Seep Influent Weir Box	13:20	3.70	12.57	2,552	306.6
Aspen Bioreactor Settling Pond	13:30	6.59	14.42	2,671	226.0
Leviathan Creek, Station 15	11:07	7.52	6.77	375	-41.8
Aspen Creek, Station 16	11:16	7.71	10.13	609	-44.1
Leviathan Creek, Station 17	11:24	7.80	8.28	426	-46.0
Leviathan Creek, Station 23	10:39	7.43	5.31	419	-55.2
Mountaineer Creek, Station 24	10:45	8.04	5.87	152	-54.9
Bryant Creek, Station 25	10:50	7.94	5.73	308	-54.9

Notes: Aspen Seep and Station 1 on Leviathan Creek were not visited.

°C Degree Celsius
µS/cm MicroSiemen per centimeter
gpm Gallon per minute
mV MilliVolt
ORP Oxidation-reduction potential
SC Specific conductance
T Temperature

On May 27, Burleson measured depth to groundwater in on-site monitoring wells. Depth to groundwater measurements are presented in Table 2.

Table 2. Leviathan Mine Depth to Water in Monitoring Wells, May 27, 2010

Well Number	Location	Depth to Water[1]
MW-1	In scrap material pile beside the road southeast of Pond 1 and south of the Delta Slope material stockpile. Near the trail to Station 1.	53.67
MW-2D	Adjacent to the flow control structure near Pond 1. The deep well is farther from the flow control structure.	26.93
MW-2S	Adjacent to the flow control structure near Pond 1. The shallow well is closer to the flow control structure.	26.98
MW-3	In the mine pit at the northwest corner of the pit clarifier.	20.95
MW-5D	South side of the mine pit, near the vegetation test plots. Deep well is the shorter surface completion.	53.96
MW-5S	South side of the mine pit, near the vegetation test plots. Shallow well is the taller surface completion.	Dry
MW-6	West side of Pond 1 on the opposite side of the road from the twin 72-inch pipe inlets.	61.55
MW-7	Southwest corner of Pond 2 South.	23.24
MW-8	Northeast corner of Pond 2 North.	87.43
MW-9	Northwest of Pond 3.	Dry
MW-10D	Adjacent to the outlet of the twin 72-inch pipes. Deep well is the taller surface completion.	4.57
MW-10S	Adjacent to the outlet of the twin 72-inch pipes. Shallow well is the shorter surface completion.	2.99
MW-11	East side of the toe of the slope at Pond 2 North, beside the lower Leviathan Creek tributary.	4.20

Note:

[1] = Measured from surveyed reference point at top of casing.

Upcoming Events:

- Atlantic Richfield plans to continue capture and treatment of CUD and DS flows in the HDS Plant.
- Atlantic Richfield will continue to closely monitor and adjust the HDS treatment system.
- Atlantic Richfield will continue to operate the Aspen Seep Bioreactor.
- Burleson will continue oversight during ongoing treatment and construction activities.
- Burleson will coordinate oversight visits with Gary Riley and Kevin Mayer (EPA), and John Erwin (USACE).

Leviathan Mine Superfund Site
June 16, 2010
Burleson Consulting, Inc. Oversight

Period of Oversight: 9:30 AM to 4:30 PM
Oversight Personnel: Greg Reller and Jimmy Steele of Burleson

Summary of Site Activities:

California Regional Water Quality Control Board, Lahontan Region (Regional Board):

- Regional Board staff was onsite collecting surface water samples as part of monthly water quality monitoring.
- Decon (Regional Board contractor) staff was onsite preparing the Pond Water Treatment System (PWTS) at Pond 1.

Atlantic Richfield Company (Atlantic Richfield):

- The HDS plant was operating.
- Burleson discussed upcoming activities with Regional Board staff.

Burleson Consulting, Inc. (Burleson)

- Burleson measured water quality in Leviathan and associated creeks on June 16 to document treatment by Atlantic Richfield.
- Burleson measured depth to groundwater in monitoring wells at the site.

Leviathan and Bryant Creek Flows: According to the USGS website (http://waterdata.usgs.gov/ca/nwis/current?type=flow), flow in Leviathan Creek at Station 15 has decreased from about 8 cubic feet per second (cfs) to about 1 cfs since mid-May. Also according to USGS, flows at Station 25 in Bryant Creek have decreased from about 10 cfs to about 2.7 cfs since mid-May. The decreasing flows likely reflect diminishing runoff after the snow pack melted.

Regional Board

The Regional Board’s contractor, Decon, was on site preparing the Pond Water Treatment System (PWTS) to begin pond water treatment at Pond 1. Winter covers were being removed from valves and instrument controls, and the lime delivery system was being cleaned out. System control panels were being re-wired to comply with current electrical codes.

Lime stored on palates was exposed to water during the winter and has partially solidified. The Regional Board plans to dispose of the solidified lime offsite because using it would result in clogged treatment system pumps.

The excavator for removal of sludge from the pit clarifier was supposed to be delivered, with sludge removal anticipated to begin this week.

Regional Board staff are hopeful that PWTS operations will begin by July 4. Regional Board staff were collecting monthly water quality samples.

Atlantic Richfield

HDS Treatment System: The HDS treatment system was operating and treatment of captured CUD and Delta Seep discharges was in progress during the site visit.

Pond 4 water level data for the last few weeks are not currently available at the USGS web site. Water in Pond 4 had a bright orange color compared to a pale green color earlier in the season.

ASBR: The ASBR appeared to be functioning as intended during the site visit. A loader and grader were being used to grade the road to the Aspen area gate.

Burleson

On June 16, Burleson measured water quality in Leviathan and associated creeks to document conditions during 2010 treatment activities. Water quality readings taken by Burleson in Leviathan and associated creeks are presented in Table 1.

Table 1. Leviathan Mine Surface Water Quality Measurements on June 16, 2010

Location	Time	pH	T (°C)	SC (μS/cm)	ORP (mV)
Leviathan Creek, Station 1	10:27	7.62	6.58	108	-37.2
Leviathan Creek, Above CUD	13:04	7.84	16.12	1,755	-71.6
CUD	12:58	4.98	8.64	2,736	11.8
Leviathan Creek, Below CUD	13:10	7.44	16.18	716	-79.0
Leviathan Creek, Above Delta Seep	13:28	7.54	16.01	731	-73.6
Delta Seep	12:21	4.41	8.85	2,281	170.9
Leviathan Creek, Below Delta Seep	13:33	7.16	15.97	759	-68.6
Delta Slope Storm Drain	13:20	5.84	11.17	1,807	-73.2
Aspen Seep Influent Weir Box	14:07	3.65	14.26	2,477	298.6
Aspen Bioreactor Settling Pond	14:22	7.64	20.32	2,735	-62.0
Leviathan Creek, Station 15	15:29	7.65	16.17	676	-71.3
Aspen Creek, Station 16	15:35	8.15	17.49	528	-79.2
Leviathan Creek, Station 17	15:41	7.87	16.84	646	-79.5
Leviathan Creek, Station 23	15:05	8.00	16.18	609	-64.6
Mountaineer Creek, Station 24	15:08	8.44	13.61	154	-82.1
Bryant Creek, Station 25	15:12	8.23	14.82	384	-80.6

Notes:

°C Degree Celsius
μS/cm MicroSiemen per centimeter
gpm Gallon per minute
mV MilliVolt
ORP Oxidation-reduction potential
SC Specific conductance
T Temperature

On June 16, Burleson measured depth to groundwater in on-site monitoring wells. Depth to groundwater measurements are presented in Table 2.

Table 2. Leviathan Mine Depth to Water in Monitoring Wells, June 16, 2010

Well Number	Location	Depth to Water[1]
MW-1	In scrap material pile beside the road southeast of Pond 1 and south of the Delta Slope material stockpile. Near the trail to Station 1.	54.62
MW-2D	Adjacent to the flow control structure near Pond 1. The deep well is farther from the flow control structure.	27.49
MW-2S	Adjacent to the flow control structure near Pond 1. The shallow well is closer to the flow control structure.	27.54
MW-3	In the mine pit at the northwest corner of the pit clarifier.	21.06
MW-5D	South side of the mine pit, near the vegetation test plots. Deep well is the shorter surface completion.	54.54
MW-5S	South side of the mine pit, near the vegetation test plots. Shallow well is the taller surface completion.	Dry
MW-6	West side of Pond 1 on the opposite side of the road from the twin 72-inch pipe inlets.	63.09
MW-7	Southwest corner of Pond 2 South.	23.22
MW-8	Northeast corner of Pond 2 North.	86.69
MW-9	Northwest of Pond 3.	Dry
MW-10D	Adjacent to the outlet of the twin 72-inch pipes. Deep well is the taller surface completion.	6.85
MW-10S	Adjacent to the outlet of the twin 72-inch pipes. Shallow well is the shorter surface completion.	4.99
MW-11	East side of the toe of the slope at Pond 2 North, beside the lower Leviathan Creek tributary.	7.12
MW-25	On flat waste rock/overburden pile 100 feet west of the Leviathan mine bypass road southeast of the ASB.	Dry

Note:

[1] = Measured from surveyed reference point at top of casing.

Upcoming Events:

- The Regional Board will continue to prepare to begin treatment of water at Pond 1 by July 4.
- The Regional Board anticipates removing sludge from the Pit Clarifier in the next week.
- Atlantic Richfield plans to continue capture of CUD and DS flows and treatment in the HDS Plant.
- Atlantic Richfield will continue to closely monitor and adjust the HDS treatment system.
- Atlantic Richfield will continue to operate the Aspen Seep Bioreactor.
- Burleson will continue oversight during ongoing treatment and construction activities.
- Burleson will coordinate oversight visits with Gary Riley and Kevin Mayer (EPA), and John Erwin (USACE).

Leviathan Mine Superfund Site
July 8, 2010
Burleson Consulting, Inc. Oversight

Period of Oversight: 10:30 AM to 4:30 PM

Oversight Personnel: **Burleson:** Greg Reller and Jimmy Steele
EPA: Gary Riley

Summary of Site Activities:

Environmental Protection Agency (EPA)

- Gary Riley accompanied Burleson staff for measurement of water quality in Leviathan and associated creeks and measurement of depth to groundwater in monitoring wells.

California Regional Water Quality Control Board, Lahontan Region (Regional Board):

- Chien Kao and Tom Gavigan of the Regional Board were at Pond 1 providing supervision of their contractor (Decon).
- Decon staff was onsite preparing the Pond Water Treatment System (PWTS) at Pond 1.

Atlantic Richfield Company (Atlantic Richfield):

- The HDS plant was not operating, capture of CUD and Delta Seep flows and storage in Pond 4 is ongoing.
- Repairs to the capture system at Delta Seep are in progress.
- An emergency shower is being installed near the sodium hydroxide storage tanks at Aspen Seep.

Burleson Consulting, Inc. (Burleson)

- Burleson measured water quality in Leviathan and associated creeks on July 8 to document treatment by Atlantic Richfield.
- Burleson measured depth to groundwater in monitoring wells at the site.

Leviathan and Bryant Creek Flows: According to the USGS website (http://waterdata.usgs.gov/ca/nwis/current?type=flow), flow in Leviathan Creek at Station 15 has decreased from about 1 cubic feet per second (cfs) to about 0.2 cfs since mid-June. Also according to USGS, flows at Station 25 in Bryant Creek have decreased from about 2.7 cfs to about 1.5 cfs since mid-June. The decreasing flows likely reflect diminishing runoff after the snow pack melted.

Environmental Protection Agency

Gary Riley discussed anticipated operations of the PWTS with Regional Board Staff. Mr. Riley accompanied Burleson staff for measurement of water quality in Leviathan and associated creeks and measurement of depth to groundwater in monitoring wells.

United States Geological Survey

Pond 4 water level data for the last few weeks are not currently available at the USGS web site. USGS personnel were on-site repairing the gauge.

Regional Board

The Regional Board's contractor, Decon, was on site preparing the Pond Water Treatment System (PWTS) to begin pond water treatment at Pond 1. Clean water tanks were being filled at the PWTS in preparation for starting water treatment at Pond 1. Reactor tanks, clarifiers, and associated piping at the PWS were filled with water from Pond 1 as part of leak testing, and all leaks have been repaired. Sludge removal at the pit clarifier has been completed. During sludge removal the sand bottom of the Pit Clarifier was partially removed. Replacement sand for the Pit Clarifier was in the process of delivery. Decon anticipates that the pond water treatment in the PWTS will start within the next week.

Atlantic Richfield

HDS Treatment System: The HDS treatment system was not operating during the site visit. The lime feed screw malfunctioned on Wednesday, July 7 causing the plant to shut down. Repairs were in progress during Burleson's visit. During repair, capture and conveyance of CUD and Delta Seep flows to Pond 4 was ongoing.

Repairs to the Delta Seep capture system were in progress. Excavation of rip-rap and gravel, and removal of the sump upstream of the Delta Seep capture system were completed. Sump removal was necessary due to precipitates clogging the perforations on inlet pipes to the sump. Installation of a concrete wall upstream and adjacent to, and over the existing concrete wall is planned. Installation of a new sump is expected after completion of new concrete wall. Completion of this task is anticipated after the HDS plant is successfully repaired.

ASBR: The ASBR appeared to be functioning during the site visit. The water level in Settling Pond 2 was very low during the site visit. A gravity flow emergency shower was being installed near the sodium hydroxide storage tanks.

Burleson

On July 8, Burleson measured water quality in Leviathan and associated creeks to document conditions during 2010 treatment activities. Water quality readings taken by Burleson in Leviathan and associated creeks are presented in Table 1.

Table 1. Leviathan Mine Surface Water Quality Measurements on July 8, 2010

Location	Time	pH	T (°C)	SC (µS/cm)	ORP (mV)
Leviathan Creek, Station 1	10:55	7.37	10.68	128	-52.1
Leviathan Creek, Above CUD	13:33	7.19	23.84	215	-98.1
CUD	13:25	4.86	9.13	2,739	-25.9

Location	Time	pH	T (°C)	SC (µS/cm)	ORP (mV)
Leviathan Creek, Below CUD	13:37	7.12	23.81	236	-87.4
Leviathan Creek, Above Delta Seep	13:10	7.54	21.77	292	-55.6
Delta Seep	13:05	5.72	9.74	1,891	-17.5
Leviathan Creek, Below Delta Seep	13:17	6.83	21.24	377	-72.9
Aspen Seep Influent Weir Box	14:15	3.04	17.96	2,556	282.5
Aspen Seep Bioreactor Settling Pond 1	14:27	7.22	23.11	2,822	-79.6
Leviathan Creek, Station 15	15:45	7.48	17.15	548	-104.4
Aspen Creek, Station 16	15:53	8.08	16.40	316	-101.4
Leviathan Creek, Station 17	15:59	7.82	17.47	463	-105.2
Leviathan Creek, Station 23	15:01	7.77	19.52	581	-96.0
Mountaineer Creek, Station 24	15:07	7.76	17.38	307	-110.5
Bryant Creek, Station 25	15:33	7.79	17.17	256	-88.9

Notes:

°C Degree Celsius
µS/cm MicroSiemen per centimeter
gpm Gallon per minute
mV MilliVolt
ORP Oxidation-reduction potential
SC Specific conductance
T Temperature

On July 8, Burleson measured depth to groundwater in on-site monitoring wells. Depth to groundwater measurements are presented in Table 2.

Table 2. Leviathan Mine Depth to Water in Monitoring Wells, July 8, 2010

Well Number	Location	Depth to Water[1]
MW-1	Next to the Regional Board's changing trailer. Near the trail to Station 1.	55.62
MW-2D	Adjacent to the flow control structure near Pond 1. The deep well is farther from the flow control structure.	28.32
MW-2S	Adjacent to the flow control structure near Pond 1. The shallow well is closer to the flow control structure.	28.38
MW-3	In the mine pit at the northwest corner of the pit clarifier.	21.32
MW-4	Northeast corner of the mine pit, on the top bench of the storm water collection system.	24.95
MW-5D	South side of the mine pit, near the vegetation test plots. Deep well is the shorter surface completion.	55.08
MW-5S	South side of the mine pit, near the vegetation test plots. Shallow well is the taller surface completion.	Dry
MW-6	West side of Pond 1 on the opposite side of the road from the twin 72-inch pipe inlets.	64.90
MW-7	Southwest corner of Pond 2 South.	23.22
MW-8	Northeast corner of Pond 2 North.	86.75
MW-9	Northwest of Pond 3.	N.M.
MW-10D	Adjacent to the outlet of the twin 72-inch pipes. Deep well is the taller surface completion.	8.88

Well Number	Location	Depth to Water[1]
MW-10S	Adjacent to the outlet of the twin 72-inch pipes. Shallow well is the shorter surface completion.	7.80
MW-11	East side of the toe of the slope at Pond 2 North, beside the lower Leviathan Creek tributary.	5.90
USGS-25	On flat waste rock/overburden pile 100 feet west of the Leviathan mine bypass road southeast of the ASB.	Dry

Note:

[1] = Measured from surveyed reference point at top of casing.

Upcoming Events:

- The Regional Board will begin treatment of water at Pond 1 in the near future
- Atlantic Richfield will repair the HDS lime feed system and resume water treatment.
- Atlantic Richfield will continue to operate the Aspen Seep Bioreactor.
- Burleson will continue oversight during ongoing treatment and construction activities.
- Burleson will coordinate oversight visits with Kevin Mayer (EPA), and John Erwin (USACE).

Leviathan Mine Superfund Site
July 28, 2010
Burleson Consulting, Inc. Oversight

Period of Oversight: 2:30 PM to 6:30 PM

Oversight Personnel: **Burleson:** Greg Reller and Jimmy Steele

Summary of Site Activities:
California Regional Water Quality Control Board, Lahontan Region (Regional Board):

- Decon (Regional Board contractor) staff was onsite operating the Pond Water Treatment System (PWTS) at Pond 1.
- Decon was discharging treated water from the Pit Clarifier to Leviathan Creek.

Atlantic Richfield Company (Atlantic Richfield):

- The HDS plant was operating
- Repairs to the capture system at Delta Seep are in progress.
- Replacement geotextile fabric was installed as a soil erosion control measure of CUD embankments.
- Dirt roads in the pond area were treated with Durasol as a control measure to minimize dust.

Burleson Consulting, Inc. (Burleson)

- Burleson measured water quality in Leviathan and associated creeks on July 28 to document treatment by Atlantic Richfield.
- Burleson measured depth to groundwater in monitoring wells at the site.

Leviathan and Bryant Creek Flows: According to the USGS website (http://waterdata.usgs.gov/ca/nwis/current?type=flow), flow in Leviathan Creek at Station 15 has varied from about 0.1 cubic feet per second (cfs) to about 1.8 cfs since early July. Also according to USGS, flows at Station 25 in Bryant Creek have varied from about 0.7 cfs to about 2.5 cfs since early July. A recent increase of flows at station 15 began on July 20, occurs Monday through Friday, and appears to coincide with discharge from the Pit Clarifier. The maximum flow at both stations since early July occurred on July 27 and was likely related to increased runoff from rain.

Regional Board

The Regional Board's contractor, Decon, was on site working around the Pit Clarifier and operating the Pond Water Treatment System (PWTS) at Pond 1. Treated water stored in the Pit Clarifier was being discharged to Leviathan Creek. Decon project manager John Leach indicated that a cast iron pump from PWTS pump system will soon need repair due to AMD decreasing the operating efficiency and will be replaced with a stainless steel pump. John leach reported that Decon staff is treating water 24 hours a day, 5 day a week.

Atlantic Richfield

HDS Treatment System: The HDS treatment system was operating and treatment of captured CUD and Delta Seep discharges was in progress during the site visit.

Repairs to the Delta Seep capture system were in progress. Installation of a concrete wall upstream and adjacent to, and over the existing concrete wall is completed and the new concrete in the process of curing. Removal of concrete forms will occur by the beginning of next week. Installation of a new sump is expected after completion of new concrete wall.

Replacement geotextile fabric was installed as a soil erosion control measure of CUD embankments.

Pond 4 water level data for the last few weeks are not currently available at the USGS web site. Water in Pond 4 had a bright orange color compared to a pale green color earlier in the season. There appeared to be adequate capacity in Pond 4 to contain several days of combined CUD and DS discharges.

ASBR: The ASBR appeared to be functioning as intended during the site visit. The water level in Settling Ponds 1 and 2 was high during the site visit. The sludge drying treatability study was removed in preparation for delivery of a centrifuge to dewater sludge later in the season. Sludge bins were staged at the dewatering area.

Burleson

On July 28, Burleson measured water quality in Leviathan and associated creeks to document conditions during 2010 treatment activities. Water quality readings taken by Burleson in Leviathan and associated creeks are presented in Table 1.

Table 1. Leviathan Mine Surface Water Quality Measurements on July 28, 2010

Location	Time	pH	T (°C)	SC (µS/cm)	ORP (mV)
Leviathan Creek, Station 1	18:03	7.37	14.66	85	-29.4
Pit Clarifier	18:29	7.83	23.52	3,330	-49.7
PWTS Discharge Weir Box	18:33	7.75	22.58	2,895	-53.7
Leviathan Creek, Above CUD	16:01	8.06	19.93	2,277	-59.6
CUD	15:53	5.03	8.91	2,417	-74.4
Leviathan Creek, Below CUD	16:07	7.55	19.78	2,728	-61.9
Leviathan Creek, Above Delta Seep	16:27	6.95	19.36	2,721	-48.6
Delta Seep	16:17	5.30	10.08	1,797	31.7
Leviathan Creek, Below Delta Seep	16:34	6.75	19.08	2,695	-48.1
Aspen Seep Influent Weir Box	17:13	3.04	17.08	2,343	258.6
Aspen Bioreactor Settling Pond 2	17:33	7.76	24.57	2,552	-24.9
Leviathan Creek, Station 15	15:17	6.53	20.52	2,389	-50.9
Aspen Creek, Station 16	15:26	7.96	18.73	308	-62.3
Leviathan Creek, Station 17	15:34	7.25	20.52	2,053	-61.0
Leviathan Creek, Station 23	14:54	7.56	19.87	1,394	-59.0
Mountaineer Creek, Station 24	14:58	7.63	16.87	140	-44.1
Bryant Creek, Station 25	15:01	7.80	18.47	1,097	-64.9

Notes: Aspen Seep and Station 1 on Leviathan Creek were not visited.

°C Degree Celsius
µS/cm MicroSiemen per centimeter
gpm Gallon per minute
mV MilliVolt
ORP Oxidation-reduction potential
SC Specific conductance
T Temperature

On July 28, Burleson measured depth to groundwater in on-site monitoring wells. Depth to groundwater measurements are presented in Table 2.

Table 2. Leviathan Mine Depth to Water in Monitoring Wells, July 28, 2010

Well Number	Location	Depth to Water[1]
MW-1	In pad at Regional Board changing trailer beside the road southeast of Pond 1 and south of the Delta Slope material stockpile. Near the trail to Station 1.	56.95
MW-2D	Adjacent to the flow control structure near Pond 1. The deep well is farther from the flow control structure.	28.94
MW-2S	Adjacent to the flow control structure near Pond 1. The shallow well is closer to the flow control structure.	28.98
MW-3	In the mine pit at the northwest corner of the pit clarifier.	21.38
MW-5D	South side of the mine pit, near the vegetation test plots. Deep well is the shorter surface completion.	55.49
MW-5S	South side of the mine pit, near the vegetation test plots. Shallow well is the taller surface completion.	Dry
MW-6	West side of Pond 1 on the opposite side of the road from the twin 72-inch pipe inlets.	66.54
MW-7	Southwest corner of Pond 2 South.	23.14
MW-8	Northeast corner of Pond 2 North.	87.43
MW-10D	Adjacent to the outlet of the twin 72-inch pipes. Deep well is the taller surface completion.	13.79
MW-10S	Adjacent to the outlet of the twin 72-inch pipes. Shallow well is the shorter surface completion.	11.32
MW-11	East side of the toe of the slope at Pond 2 North, beside the lower Leviathan Creek tributary.	11.18

Note: [1] = Measured from surveyed reference point at top of casing.

Upcoming Events:

- The Regional Board will continue to operate PWTS at Pond 1.
- The Regional Board will continue to store and discharge treated water from Pit Clarifier.
- Atlantic Richfield plans to continue capture of CUD and DS flows and treatment in the HDS Plant.
- Atlantic Richfield will complete repairs to the Delta Seep interceptor.
- Atlantic Richfield will continue to closely monitor and adjust the HDS treatment system.
- Atlantic Richfield will continue to operate the Aspen Seep Bioreactor.
- Atlantic Richfield will mobilize a centrifuge to the site to dewater ASBR sludge.
- Burleson will continue oversight during ongoing treatment and construction activities.
- Burleson will coordinate oversight visits with Kevin Mayer (EPA), and John Erwin (USACE).

Leviathan Mine Superfund Site
August 19, 2010
Burleson Consulting, Inc. Oversight

Period of Oversight: 10:30 PM to 4:30 PM

Oversight Personnel: **Burleson:** Greg Reller and Jimmy Steele

Summary of Site Activities:
California Regional Water Quality Control Board, Lahontan Region (Regional Board):

- Decon (Regional Board contractor) staff was onsite operating the Pond Water Treatment System (PWTS) at Pond 1.
- Decon was discharging treated water from the Pit Clarifier to Leviathan Creek.
- Pond 2 North is dry.
- Decon was pumping water from Pond 2 South to the Pit Clarifier.

Atlantic Richfield Company (Atlantic Richfield):

- The HDS plant was operating
- Repairs to the capture system at Delta Seep are in progress.
- The ASBR was operating in recirculation mode.
- Atlantic Richfield, AMEC, and CH2MHill Staff were on site conducting RI activities.

Burleson Consulting, Inc. (Burleson)

- Burleson measured water quality in Leviathan and associated creeks on August 19 to document treatment by Atlantic Richfield.
- Burleson measured depth to groundwater in monitoring wells at the site.

Leviathan and Bryant Creek Flows: According to the USGS website (http://waterdata.usgs.gov/ca/nwis/current?type=flow), flow in Leviathan Creek at Station 15 has varied from about 0.09 cubic feet per second (cfs) to about 1.0 cfs since late July with a diurnal pattern and lower flows during weekends. Also according to USGS, flows at Station 25 in Bryant Creek have a diurnal pattern ranging from about 0.4 cfs to about 1.7 cfs since late July. Recent flows at both stations are decreasing which may reflect decreased discharge from the Pit Clarifier combined with seasonal decline in base flow.

Regional Board

The Regional Board's contractor, Decon, was on site working around the Pit Clarifier and operating the Pond Water Treatment System (PWTS) at Pond 1. Treated water stored in the Pit Clarifier was being discharged to Leviathan Creek. Decon project manager John Leach reported that Pond 2 North is dry and is expecting that Pond 2 South will be dry by the end of the week. John Leach also indicated that Pond 1 operations may be complete by the end of August. John Leach reported that since Monday, Decon staff treats water 12 hours a day, 5 days a week to provide adequate settling time in the Pit Clarifier and prevent discharge of solids to Leviathan Creek.

Tom Gavigan of the California Regional Water Quality Control Board, Lahontan Region reported that plans to repair the concrete base of the inlet pipe at Pond 3 are in progress.

Atlantic Richfield

Burleson greeted Tony Brown (Atlantic Richfield) and Marc Lombardi (AMEC) at the Pond 4 area. Marc was conducting a site tour for John Lovenburg and Jim Steffanos of CH2MHill. Jim Sciacca (URS) and Britt Jones were also present evaluating site geology.

HDS Treatment System: The HDS treatment system was operating and treatment of captured CUD and Delta Seep discharges was in progress during the site visit.

Delta Seep: Repairs to the Delta Seep capture system continue. The concrete wall is cured and the wooden forms have been removed. A bentonite powder was placed at the base of the concrete wall upstream of the Delta Seep to seal the bottom of the wall. Groundwater percolation was observed in a portion of the bentonite powder. The new concrete will be coated with an epoxy sealant before installation of a new sump before the end of the treatment season.

Pond 4 water level data for the last few weeks are not currently available at the USGS web site. There appeared to be adequate capacity in Pond 4 to contain several days of combined CUD and DS discharges.

ASBR: The ASBR appeared to be functioning as intended during the site visit. The water level in Settling Ponds 1 and 2 was normal during the site visit. The installation of new piping to pump sludge from the settling ponds to a new sludge dewatering system was in progress. AMEC indicated that the area adjacent to the Aspen Seep gates is the proposed site for the sludge dewatering system. AMEC reported preparation of the sludge dewatering system might involve cutting three small trees, movement of stockpiled materials, and movement of berms. The delivery of a centrifuge to dewater sludge is expected later in the season.

Burleson

On August 19, Burleson measured water quality in Leviathan and associated creeks to document conditions during 2010 treatment activities. Water quality readings taken by Burleson in Leviathan and associated creeks are presented in Table 1. Table 1 includes measurement of water quality parameters from two locations at the landslide pond.

Table 1. Leviathan Mine Surface Water Quality Measurements on August 19, 2010

Location	Time	pH	T (°C)	SC (µS/cm)	ORP (mV)
Leviathan Creek, Station 1	10:41	6.74	8.18	124	-21.7
Pit Clarifier	11:06	6.98	15.49	1,648	-50.5
PWTS Discharge Weir Box	11:11	7.03	16.78	2,258	-59.0
Leviathan Creek, Above CUD	12:30	7.87	19.94	2,243	-88.9
CUD	12:15	4.78	8.77	2,377	-95.4
Leviathan Creek, Below CUD	12:41	7.62	21.16	1,036	-76.7
Leviathan Creek, Above Delta Seep	13:08	6.87	19.36	1,799	-56.6
Delta Seep	12:54	5.06	10.56	1,770	13.3

Location	Time	pH	T (°C)	SC (µS/cm)	ORP (mV)
Leviathan Creek, Below Delta Seep	13:14	6.46	18.73	1,597	-59.8
Aspen Seep Influent Weir Box	13:55	3.07	15.73	2,297	305.4
Aspen Bioreactor Settling Pond 2	14:14	7.74	21.62	2,521	-13.7
Leviathan Creek, Station 15	15:42	4.49	19.01	1,949	65.5
Aspen Creek, Station 16	16:00	7.52	16.26	390	-44.5
Leviathan Creek, Station 17	16:10	6.82	17.87	1,246	-52.7
Leviathan Creek, Station 23	16:25	7.12	17.21	1,233	-59.0
Mountaineer Creek, Station 24	16:33	7.41	14.41	136	-54.0
Bryant Creek, Station 25	16:36	7.77	14.99	423	-78.8
Landslide Pond	15:10	6.10	18.18	2,001	-31.5
Landslide pond Outfall	15:20	3.58	17.17	2,127	129.5

Notes: Aspen Seep above site were not visited.

°C Degree Celsius
µS/cm MicroSiemen per centimeter
gpm Gallon per minute
mV MilliVolt
ORP Oxidation-reduction potential
SC Specific conductance
T Temperature

On August 19, Burleson measured depth to groundwater in on-site monitoring wells. Depth to groundwater measurements are presented in Table 2.

Table 2. Leviathan Mine Depth to Water in Monitoring Wells, August 19, 2010

Well Number	Location	Depth to Water[1]
MW-1	In pad at Regional Board changing trailer beside the road southeast of Pond 1 and south of the Delta Slope material stockpile. Near the trail to Station 1.	58.90
MW-2D	Adjacent to the flow control structure near Pond 1. The deep well is farther from the flow control structure.	29.55
MW-2S	Adjacent to the flow control structure near Pond 1. The shallow well is closer to the flow control structure.	29.49
MW-3	In the mine pit at the northwest corner of the pit clarifier.	21.49
MW-5D	South side of the mine pit, near the vegetation test plots. Deep well is the shorter surface completion.	55.74
MW-5S	South side of the mine pit, near the vegetation test plots. Shallow well is the taller surface completion.	Dry
MW-6	West side of Pond 1 on the opposite side of the road from the twin 72-inch pipe inlets.	68.21
MW-7	Southwest corner of Pond 2 South.	23.56
MW-8	Northeast corner of Pond 2 North.	88.55
MW-10D	Adjacent to the outlet of the twin 72-inch pipes. Deep well is the taller surface completion.	17.51
MW-10S	Adjacent to the outlet of the twin 72-inch pipes. Shallow well is the shorter surface completion.	14.50
MW-11	East side of the toe of the slope at Pond 2 North, beside the lower Leviathan Creek tributary.	12.42

Note: [1] = Measured from surveyed reference point at top of casing.

Upcoming Events:

- The Regional Board will continue to operate PWTS at Pond 1, possibly completing pond water treatment by the end of August.
- The Regional Board will continue to store and discharge treated water from Pit Clarifier.
- Atlantic Richfield plans to continue capture of CUD and DS flows and treatment in the HDS Plant.
- Atlantic Richfield will continue to closely monitor and adjust the HDS treatment system.
- Atlantic Richfield will continue repairing the Delta Seep interceptor.
- Atlantic Richfield will continue to operate the Aspen Seep Bioreactor.
- Atlantic Richfield will mobilize a centrifuge to the site to dewater ASBR sludge.
- Burleson will continue oversight during ongoing treatment and construction activities.
- Burleson will coordinate oversight visits with Gary Riley, Kevin Mayer (EPA), and John Erwin (USACE).

Leviathan Mine Superfund Site
September 2, 2010
Burleson Consulting, Inc. Oversight

Period of Oversight: 10:30 PM to 4:30 PM

Oversight Personnel: **Burleson:** Greg Reller and Jimmy Steele

Summary of Site Activities:
California Regional Water Quality Control Board, Lahontan Region (Regional Board):

- Regional Board staff was onsite collecting water quality samples at the Pit Clarifier.
- Decon (Regional Board contractor) staff was onsite preparing the PWTS for the winter season.
- Pond 1 and Pond 2 North and Pond 2 South are dry.

Atlantic Richfield Company (Atlantic Richfield):

- Britt Jones was supervising monitoring well development.
- AMEC was installing a sludge dewatering system in the Aspen Seep area.

Burleson Consulting, Inc. (Burleson)

- Burleson observed well development at MW-10D.
- Burleson measured water quality in Leviathan Creek and conducted a water quality survey at the Landslide Pond.
- Burleson inspected the overburden pile and observed the road to the wind tower.
- Burleson measured depth to groundwater in some of the monitoring wells at the site.

Leviathan and Bryant Creek Flows: According to the USGS website (http://waterdata.usgs.gov/ca/nwis/current?type=flow), flow in Leviathan Creek at Station 15 has varied from about 0.10 cubic feet per second (cfs) to about 1.7 cfs since mid August with a diurnal pattern and lower flows during weekends. Also according to USGS, flows at Station 25 in Bryant Creek have a diurnal pattern ranging from about 0.5 cfs to about 1.3 cfs since mid August. Recent flows at both stations are decreasing which may reflect decreased discharge from the Pit Clarifier combined with seasonal decline in base flow.

Regional Board

The Regional Board's contractor, Decon, was on site preparing the Pond Water Treatment System (PWTS) at Pond 1 for the winter season. Treated water stored in the Pit Clarifier is being discharged to Leviathan Creek and the Pit Clarifier is almost dry. Tom Gavigan and Lisa Scoralle of the regional Board were onsite collecting monthly water quality samples at the Pit Clarifier and Pit Clarifier Weir Box.

Atlantic Richfield

Burleson greeted Britt Jones of AMEC at MW-10D. Ms. Jones was supervising well development operations. Boart Longyear staff was operating a well development rig under

Ms. Jones's direction. The monitoring well was being developed to prepare for later sampling. The methods used to develop the wells were bailing, surging, and pumping. AMEC staff was measuring the water quality parameters turbidity, pH, specific conductance, temperature, dissolved oxygen, and Eh. The volume of water bailed and pumped, rate of well recharge, depth to bottom of the well, and measured depth to ground water were also recorded. Burleson observed the turbidity of water from the well decrease from opaque to nearly transparent during pumping.

Groundwater samples will be collected after well development activities are completed.

ASBR: BAI and contractors were installing a new sludge dewatering system adjacent to the Aspen Seep entrance gate. Contractors were welding the HDPE pipeline which will supply the sludge from the settling ponds to the dewatering system.

Burleson

On September 2, Burleson measured water quality in Leviathan Creek at Station 15, and in the vicinity of the Landslide Pond. Burleson conducted the water quality survey to further evaluate the water quality near the system of ponds created by beavers in the area. GPS was used to identify locations of water quality readings. Water quality readings taken by Burleson in Leviathan Creek and the vicinity of the Landslide Pond are presented in Table 1, measurement locations are shown on the attached figure.

Table 1. Leviathan Mine Surface Water Quality Measurements on September 2, 2010

Location	Time	pH	T (°C)	SC (µS/cm)	ORP (mV)
Pit Clarifier	10:55	6.95	17.31	3,194	-33.0
PWTS Discharge Weir Box	11:05	7.22	20.04	2,206	-43.8
Leviathan Creek, Station 15	12:10	5.17	14.19	2,050	-4.00
Leviathan Creek, Station 15-1	12:18	5.13	14.92	2,067	0.10
Leviathan Creek, Station 15-2	12:27	5.09	14.62	2,071	-9.7
Leviathan Creek, Station 15-3	12:41	4.98	14.25	2,114	-8.2
Landslide Pond, BD-1	12:48	5.75	13.57	2,025	-27.1
Landslide Pond, BD-2	12:57	6.20	13.39	1,953	-80.5
Landslide Pond, BD-3	13:01	6.17	15.07	2,313	-52.4
Landslide Pond, BD-4	13:05	6.10	16.67	2,126	-54.8
Landslide Pond, BD-5	13:10	5.66	15.93	2,238	-46.2
Landslide Pond, BD-6	13:14	5.66	15.76	2,257	-38.4
Leviathan Creek, Station 15 (2nd reading)	13:32	4.82	16.34	2,065	25.3

°C Degree Celsius
µS/cm MicroSiemen per centimeter
gpm Gallon per minute
mV MilliVolt
ORP Oxidation-reduction potential
SC Specific conductance
T Temperature

Beavers have erected a series of dams along Leviathan Creek at the upstream end of the Leviathan Creek landslide. The upstream-most dam observed was located in the Leviathan Creek channel where it breeches the old road bed. This dam has impounded Leviathan Creek creating a pond upstream from the old road. Another dam was present across the Leviathan Creek channel and the channel that formerly discharged from the Landslide Pond. The Landslide Pond has increased in size and depth and now covers the portion of the Leviathan Creek channel downstream from the old road. Water is weeping through this lower dam and forms two streams separated by a sand/gravel bar. These two streams converge at the Leviathan Creek channel about 100 feet downstream from the dam. At least two smaller dams are present along Leviathan Creek downstream from this point.

On September 2, Burleson measured depth to groundwater in on-site monitoring wells. Depth to groundwater measurements are presented in Table 2.

Table 2. Leviathan Mine Depth to Water in Monitoring Wells, September 2, 2010

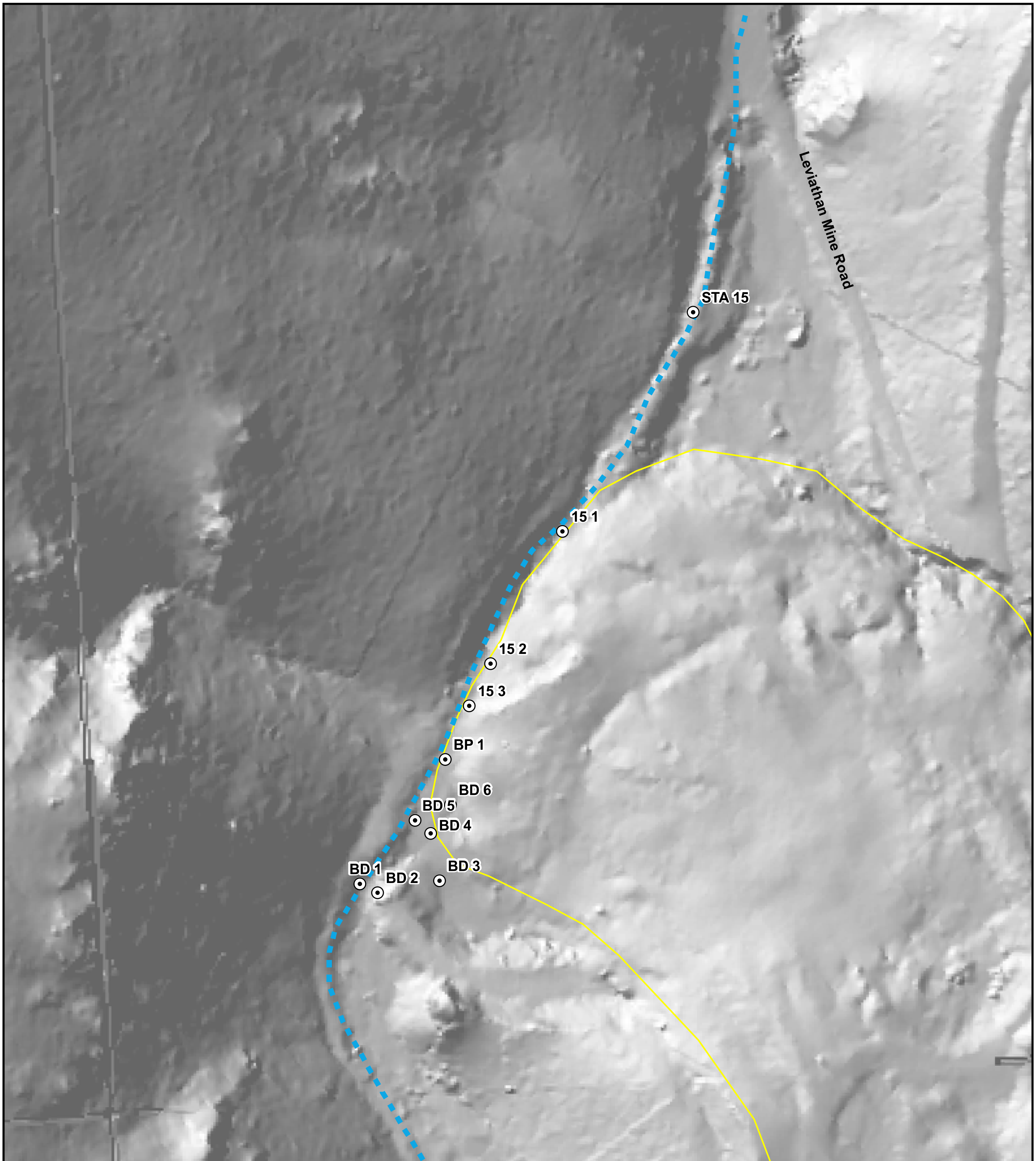
Well Number	Location	Depth to Water[1]
MW-1	In pad at Regional Board changing trailer beside the road southeast of Pond 1 and south of the Delta Slope material stockpile. Near the trail to Station 1.	60.41
MW-2D	Adjacent to the flow control structure near Pond 1. The deep well is farther from the flow control structure.	29.90
MW-2S	Adjacent to the flow control structure near Pond 1. The shallow well is closer to the flow control structure.	29.85
MW-3	In the mine pit at the northwest corner of the pit clarifier.	21.59
MW-4	Northeast corner of the mine pit, on the top bench of the storm water collection system.	24.98
MW-5D	South side of the mine pit, near the vegetation test plots. Deep well is the shorter surface completion.	55.89
MW-5S	South side of the mine pit, near the vegetation test plots. Shallow well is the taller surface completion.	Dry

Note: [1] = Measured from surveyed reference point at top of casing.

Burleson also inspected the Overburden Pile on September 2. The road to the wind tower is nearly passable by vehicle. A small amount of grading will allow access by trucks necessary to perform work on the wind tower. The former pond area above the upper Aspen Seep is now graded to drain through the prominent notch visible from the Aspen Seep access road. The graded materials are very loose and porous and significant infiltration likely occurs into the mine waste in this area. Mine waste in the notch comprises at least three different materials based on visual observation of the texture, mineralogy, and rock type. The materials are in 10+ foot thick lifts, and are readily distinguished by color and texture variations. Casual observation of other areas from a distance resulted in observation of similar variations in the material throughout the Overburden Area.

Upcoming Events:

- Decon staff will continue winterization of PWTS at Pond 1.
- The Regional Board will continue to discharge treated water from the Pit Clarifier.
- Atlantic Richfield plans to continue capture of CUD and DS flows and treatment in the HDS Plant until the winter season.
- Atlantic Richfield will complete installation of the sludge dewatering system, and begin to dewater sludge at Aspen Seep.
- Atlantic Richfield will continue to develop monitoring wells.
- Atlantic Richfield will continue to operate the Aspen Seep Bioreactor.
- Burleson will continue oversight during ongoing treatment and construction activities.
- Burleson will coordinate oversight visits with Gary Riley, Kevin Mayer (EPA), and John Erwin (USACE).



Legend

- Survey Locations
- Leviathan Creek
- Leviathan Creek Landslide

N

Figure 1

Water Quality Survey
Locations September 2, 2010
Leviathan Mine Superfund Site
Alpine County, California

0 150 300
Feet

Burleson Consulting, Inc.

Leviathan Mine Superfund Site
September 15, 2010
Burleson Consulting, Inc. Oversight

Period of Oversight: 10:30 AM to 5:00 PM

Oversight Personnel: **Burleson:** Greg Reller and Jimmy Steele

EPA: Gary Riley

Summary of Site Activities:

Environmental Protection Agency (EPA)

- Gary Riley accompanied Burleson staff for measurement of water quality in Leviathan and associated creeks, and vicinity of Landslide Pond and measurement of depth to groundwater in monitoring wells.

- EPA personnel were in the area performing a macroinvertebrate survey in Bryant, Mountaineer, and Leviathan Creeks.

California Regional Water Quality Control Board, Lahontan Region (Regional Board)

- Tom Gavigan and Doug Carey of the Regional Board were supervising contractors performing a ground-penetrating radar (GPR) survey near MW-6

- Seasonal pond water treatment activities are complete. The Pond Water Treatment System (PWTS) at Pond 1 appeared to be winterized. Decon personnel were not observed on-site.

- The Pit Clarifier was dry.

Atlantic Richfield Company (Atlantic Richfield)

- Repairs to the capture system at the Delta Seep are complete.
- BAI contractors were running preliminary testing of the new sludge dewatering system.
- Gene Mancini was assisting the macroinvertebrate survey in Bryant, Mountaineer, and Leviathan Creeks.

Burleson Consulting, Inc. (Burleson)

- Burleson measured water quality in Leviathan, associated creeks and the Landslide Pond.
- Burleson measured depth to groundwater in the monitoring wells at the site.

Leviathan and Bryant Creek Flows: According to the USGS website (http://waterdata.usgs.gov/ca/nwis/current?type=flow), flow in Leviathan Creek at Station 15 has decreased from about 0.17 cubic feet per second (cfs) to about 0.07 cfs since the beginning of September with a slight diurnal pattern. Also according to USGS, flows at Station 25 in Bryant Creek have a diurnal pattern ranging from about 0.5 cfs to about 1.3 cfs since the beginning of September. Recent flows at both stations are decreasing which may reflect decreased discharge from the Pit Clarifier combined with seasonal decline in base flow.

Environmental Protection Agency (EPA)
Gary Riley accompanied Burleson staff for measurement of water quality in Leviathan and associated creeks, at the Landslide Pond; and measurement of depth to groundwater in monitoring wells. Mr. Riley observed the Regional Water Board GPR survey near MW-6. Mr. Riley discussed invertebrate surveys and data sonde readings related to waters at Station 15 and Station 25 with Gene Mancini of Atlantic Richfield and other EPA personnel. Mr. Riley also discussed EPA's decision making process with Ms. Peterson.

Peter Husby and Greg Nagel of the US EPA were present at Station 25 along Leviathan Creek. They were preparing to begin semi-annual macroinvertebrate sampling. Macroinvertebrate sampling is expected to be completed by September 17. We discussed recently observed low pH readings reported from the Station 15 and Station 25 data sondes.

Joy Peterson of the Washoe Environmental Office also accompanied EPA and Burleson.

Regional Board
Tom Gavigan and Doug Carey of the Regional Board were onsite overseeing a ground-penetrating radar survey (GPR). The survey was being performed to evaluate the usefulness of GPR for locating underground pipes at the site.

The seasonal pond water treatment activities are complete. The PWTS appeared to be winterized with valves covered in plastic, and enclosures in place over control panels. Decon personnel were not observed on-site. Water was not visible in the Pit Clarifier and the surface of the solids is crossed by cracks. About four gallons per minute of water continues to drain through the pit clarifier weir box.

Diversion of water from Leviathan Creek at Station 1 has been stopped.

Atlantic Richfield
Gene Mancini was on-site to observe the macroinvertebrate surveys in Bryant, Leviathan, and Mountaineer Creeks. Tony Brown was at the site supervising operations.

HDS Treatment System: The HDS treatment system was operating at Pond 4 and treating CUD and Delta Seep flows.

Delta Seep: Repairs to the capture system at the Delta Seep appear complete. A sump upstream and adjacent to the new concrete wall was installed and backfilled with large rock. The new concrete wall was recently coated with a black seal. Discharge from the Delta Slope Drain appears to be routed through at weir before entering the collector sump. The electronic sensors are connected to the weir.

ASBR: BAI and contractors performed preliminary testing of the new sludge dewatering system adjacent to the Aspen Seep entrance gate. BAI personnel reported that the sludge dewatering system is capable of dewatering 12,000 gallons of sludge per day. The raw sludge and dewatering effluent are being stored in large bins adjacent to the sludge dewatering system. Dewatering effluent may be returned to the ASBR instead of being discharged to Aspen Creek because of water quality concerns.

Burleson

On September 15, Burleson measured water quality in Leviathan and associated creeks, and at the Landslide Pond to document conditions during the 2010 treatment season. Water quality readings taken by Burleson in Leviathan and associated creeks, and at the Landslide Pond are presented in Table 1.

Table 1. Leviathan Mine Surface Water Quality Measurements on September 15, 2010

Location	Time	pH	T (°C)	SC (µS/cm)	ORP (mV)
Leviathan Creek, Station 1	10:52	6.54	5.84	110	6.40
PWTS Discharge Weir Box	11:32	6.79	14.27	2,138	-39.3
Leviathan Creek, Above CUD	12:58	8.14	21.11	1,916	-105.1
CUD	12:49	5.49	8.77	2,202	-310.8
Leviathan Creek, Below CUD	13:04	7.73	19.92	1,373	-85.2
Leviathan Creek, Above Delta Seep	13:26	6.81	15.96	1,358	-52.6
Delta Seep (collection tank)	13:16	5.41	9.84	1,386	1.90
Leviathan Creek, Below Delta Seep	13:32	6.45	15.23	1,365	-54.3
Leviathan Creek, Station 15	15:27	4.44	15.66	1,625	33.8
Aspen Creek, Station 16	15:41	7.42	13.48	267	-38.1
Leviathan Creek, Station 17	15:51	7.04	14.29	576	-48.4
Leviathan Creek, Station 23	14:15	7.18	13.74	650	-25.5
Mountaineer Creek, Station 24	14:20	7.44	11.01	125	-25.0
Bryant Creek, Station 25	14:26	8.00	11.61	237	-63.8
Bryant Creek at EPA Data Sonde	14:53	7.52	12.59	240	-42.4
Bryant Creek upstream of EPA Data Sonde	14:58	7.86	12.32	236	-57.3
Leviathan Creek above Beaver Pond	16:21	6.89	11.59	1,356	-25.5
Upper end of Beaver Pond	16:27	6.79	12.76	1,355	-2.3
Beaver Pond	16:39	6.18	15.10	1,506	-14.9
Leviathan Creek Downstream of Beaver Pond	16:45	4.53	13.79	1,689	26.7

°C Degree Celsius
µS/cm MicroSiemen per centimeter
gpm Gallon per minute
mV MilliVolt
ORP Oxidation-reduction potential
SC Specific conductance
T Temperature

Beavers have erected a series of dams along Leviathan Creek at the upstream end of the Leviathan Creek landslide. The upstream-most dam observed was located in the Leviathan Creek channel where it breeches the old road bed. This dam has impounded Leviathan Creek creating a pond upstream from the old road. Another dam was present across the Leviathan Creek channel and the channel that formerly discharged from the Landslide Pond. The Landslide Pond has increased in size and depth and now covers the portion of the Leviathan Creek channel downstream from the old road. Water is weeping through this lower dam and forms two streams separated by a sand/gravel bar. These two streams converge at the Leviathan Creek channel about 100 feet downstream from the dam. At least two smaller dams are present along Leviathan Creek downstream from this point.

On September 15, Burleson measured depth to groundwater in on-site monitoring wells. Depth to groundwater measurements are presented in Table 2.

Table 2. Leviathan Mine Depth to Water in Monitoring Wells, September 15, 2010

Well Number	Location	Depth to Water[1]
MW-1	In pad at Regional Board changing trailer beside the road southeast of Pond 1 and south of the Delta Slope material stockpile. Near the trail to Station 1.	60.98
MW-2D	Adjacent to the flow control structure near Pond 1. The deep well is farther from the flow control structure.	30.18
MW-2S	Adjacent to the flow control structure near Pond 1. The shallow well is closer to the flow control structure.	30.23
MW-3	In the mine pit at the northwest corner of the pit clarifier.	20.65
MW-4	Northeast corner of the mine pit, on the top bench of the storm water collection system.	25.00
MW-5D	South side of the mine pit, near the vegetation test plots. Deep well is the shorter surface completion.	77.52
MW-5S	South side of the mine pit, near the vegetation test plots. Shallow well is the taller surface completion.	Dry
MW-6	West side of Pond 1 on the opposite side of the road from the twin 72-inch pipe inlets.	70.45
MW-7	Southwest corner of Pond 2 South.	23.88
MW-8	Northeast corner of Pond 2 North.	90.10
MW-10D	Adjacent to the outlet of the twin 72-inch pipes. Deep well is the taller surface completion.	20.92
MW-10S	Adjacent to the outlet of the twin 72-inch pipes. Shallow well is the shorter surface completion.	19.65
MW-11	East side of the toe of the slope at Pond 2 North, beside the lower Leviathan Creek tributary.	13.11

Note: [1] = Measured from surveyed reference point at top of casing.

Upcoming Events:

- Atlantic Richfield plans to continue capture of CUD and DS flows and treatment in the HDS Plant until the winter season.
- Atlantic Richfield will continue to operate the Aspen Seep Bioreactor.
- Atlantic Richfield will continue to dewater sludge at Aspen Seep. Atlantic Richfield will decide what to do with dewatering effluent (discharge to Aspen Creek or return to the bioreactor).
- Burleson will continue oversight during ongoing treatment and construction activities.
- Burleson will coordinate oversight visits with Gary Riley, Kevin Mayer (EPA), and John Erwin (USACE).
- NREL may install meters to assess wind and solar energy resources during the next couple of weeks.

Leviathan Mine Superfund Site
October 5, 2010
Burleson Consulting, Inc. Oversight

Period of Oversight: 10:00 AM to 5:00 PM

Oversight Personnel: **Burleson:** Greg Reller and Jimmy Steele

Summary of Site Activities:
California Regional Water Quality Control Board, Lahontan Region (Regional Board)

- Seasonal pond water treatment activities are completed, the Pond Water Treatment System PWTS appeared to be winterized and no personnel were on-site.

Atlantic Richfield Company (Atlantic Richfield)

- The High Density Sludge (HDS) system appeared to be operating and treating water at Pond 4.
- Atlantic Richfield staff and contractors were not operating treatment systems at the site due to inclement weather.

Burleson Consulting, Inc. (Burleson)

- Burleson visited Leviathan on a cold, windy day which included some precipitation and snow. The NRCS Snotel precipitation data at Monitor Pass recorded rainfall of 0.1 inches on October 4, 2010 and 0.9 inches of rain on October 5, 2010.
- Burleson observed site stormwater run-off at several locations as well as observed rills created from the recent rainfall events on slopes and roads.
- Burleson measured water quality in Leviathan, associated creeks and site stormwater run-off.
- Burleson measured depth to groundwater in some of the monitoring wells at the site.

Leviathan and Bryant Creek Flows: According to the USGS website (http://waterdata.usgs.gov/ca/nwis/current?type=flow), flow in Leviathan Creek at Station 15 has varied from about 0.07 cubic feet per second (cfs) to above 4 cfs since late September. Also according to USGS, flows at Station 25 in Bryant Creek varied from about 0.65 cfs to about 7 cfs since late September. The maximum flows occurred during recent storms on October 3 through October 5.

Regional Board
Regional Board staff was not observed on-site.

Atlantic Richfield
Tony Brown and five other Atlantic Richfield and contractor personnel were on-site to evaluate the communication system and the Pond 4 infrastructure. Tony reported that communications with Pond 4 had been lost overnight, and the status of the HDS system was unclear prior to the site visit. The work crews were attempting to re-establish remote communications, and verify that the HDS plant and interceptors were functioning as designed. (Operations personnel were not on site due to the inclement weather).

Atlantic Richfield reported that the rain gauge located at Pond 4 recorded precipitation in excess of one inch from October 4 to October 5, 2010. The SNOTEL website (http://www.wcc.nrcs.usda.gov/snow/) reported an accumulation of 0.9 inches of rain at Monitor Pass from October 4 to October 5, 2010.

Leviathan Mine Road adjacent to residences near Highway 395 was recently paved and provided a smooth driving surface. The pavement included water dips to direct overland flow off the road surface.

HDS Treatment System: The HDS treatment system appeared to be operating at Pond 4 and the natural gas-fired generators were running during the site visit. Pumps at the Delta Seep interceptor, Delta Seep mid-tank, and CUD collection tank were heard cycling on during the site visit.

Delta Seep: The Delta Seep interceptor appeared to be functioning appropriately. The slope above Delta Seep appeared to have shed water as intended. The gravel lined swale on the uphill side of the bench above the interceptor overflowed at two locations. Clear water was draining from rock filled rills, crossing the bench, and flowing under the Delta interceptor pipeline.

ASBR: The Aspen Seep Bioreactor was not visited due to a very soft road surface at Aspen Gate.

Burleson

On October 5, 2010 Burleson measured water quality in Leviathan, associated creeks, and site stormwater run-off to document conditions during the 2010 treatment season. Water quality readings taken by Burleson in Leviathan and associated creeks, and site stormwater run-off are presented in Table 1.

Table 1. Leviathan Mine Surface Water Quality Measurements on October 5, 2010

Location	Time	pH	T (°C)	SC (µS/cm)	ORP (mV)
Leviathan Creek, Station 1	14:51	6.40	4.61	90	-29.40
Leviathan Creek, Above CUD	13:32	5.14	6.39	323	92.5
CUD	13:27	5.44	8.69	1,767	-146.8
Leviathan Creek, Below CUD	13:39	5.00	6.04	306	125.9
Leviathan Creek, Above Delta Seep	13:15	5.15	5.51	352	117.7
Delta Seep (collection tank)	13:06	5.87	7.81	1,065	97.4
Leviathan Creek, Below Delta Seep	13:18	5.27	5.67	373	97.9
Leviathan Creek, Station 15	11:49	5.90	6.46	575	7.4
Aspen Creek, Station 16	12:18	7.45	6.16	369	-60.7
Leviathan Creek, Station 17	11:36	6.93	6.39	521	-21.2
Leviathan Creek, Station 23	11:25	7.51	6.58	588	-48.9
Mountaineer Creek, Station 24	11:13	7.05	6.26	14	3.0
Bryant Creek, Station 25	11:20	7.53	6.48	422	-45.2
Drain inlet above Pond 4 Area	12:33	4.47	5.21	1,323	263.7

Location	Time	pH	T (°C)	SC (µS/cm)	ORP (mV)
Puddle at sump adjacent to Pond 4	12:40	6.26	6.33	64	50.2
Rill below Atlantic Richfield trailer near HDS plant	12:45	6.45	5.16	21	26.4
Delta Slope Storm Water Outlet	13:01	4.73	6.06	1,106	255.9
Drain Inlet at Pond 1	14:19	4.15	10.79	660	146.2
MW-1 Ditch	14:39	5.56	7.75	97	9.1
Stormwater from Pit	15:12	4.22	9.34	2,983	260.5

°C Degree Celsius
µS/cm MicroSiemen per centimeter
gpm Gallon per minute
mV MilliVolt
ORP Oxidation-reduction potential
SC Specific conductance
T Temperature

On October 5, 2010 Burleson measured depth to groundwater in some of the on-site monitoring wells. Depth to groundwater measurements are presented in Table 2.

Table 2. Leviathan Mine Depth to Water in Monitoring Wells, October 5, 2010

Well Number	Location	Depth to Water[1]
MW-1	In pad at Regional Board changing trailer beside the road southeast of Pond 1 and south of the Delta Slope material stockpile. Near the trail to Station 1.	62.05
MW-2D	Adjacent to the flow control structure near Pond 1. The deep well is farther from the flow control structure.	30.43
MW-2S	Adjacent to the flow control structure near Pond 1. The shallow well is closer to the flow control structure.	30.39
MW-6	West side of Pond 1 on the opposite side of the road from the twin 72-inch pipe inlets.	70.87
MW-10D	Adjacent to the outlet of the twin 72-inch pipes. Deep well is the taller surface completion.	22.67
MW-10S	Adjacent to the outlet of the twin 72-inch pipes. Shallow well is the shorter surface completion.	20.54

Note: [1] = Measured from surveyed reference point at top of casing.

Upcoming Events:

- Atlantic Richfield plans to continue capture of CUD and DS flows and treatment in the HDS Plant until the winter season.
- Atlantic Richfield will continue to operate the Aspen Seep Bioreactor.
- Atlantic Richfield will continue to dewater sludge at Aspen Seep.
- Burleson will continue oversight during ongoing treatment activities.
- Burleson will coordinate oversight visits with Gary Riley, Kevin Mayer (EPA), and John Erwin (USACE).
- NREL plans to install meters to assess wind and solar energy resources in Mid-October

Leviathan Mine Superfund Site
October 27, 2010
Burleson Consulting, Inc. Oversight

Period of Oversight: 10:00 AM to 5:00 PM

Oversight Personnel: **Burleson:** Greg Reller

Other Personnel: US EPA: Kevin Mayer

Washoe Tribe: Lynelle Hartway and Joy Peterson

USFWS: John Henderson

Summary of Site Activities:
California Regional Water Quality Control Board, Lahontan Region (Regional Board)

- The Pond Water Treatment System (PWTS) was winterized, Regional Board staff (Tom Gavigan and Lisa Scoralle) greeted us, provided a site safety briefing and described the recently completed Regional Board activities for the group.

Atlantic Richfield Company (Atlantic Richfield)

- The High Density Sludge (HDS) system appeared to be operating and treating water at Pond 4.
- Marc Lombardi of AMEC greeted us and described ongoing treatment activities at Pond 4 and the Aspen Seep Bioreactor (ASBR).

Burleson Consulting, Inc. (Burleson)

- Burleson accompanied the site visit personnel.
- Burleson observed site activities and measured water quality in Leviathan Creek at Station 15 and at the beaver pond upstream from the landslide.

Leviathan and Bryant Creek Flows: According to the USGS website (http://waterdata.usgs.gov/ca/nwis/current?type=flow), flow in Leviathan Creek at Station 15 has varied from about 0.07 cubic feet per second (cfs) to about 3.5 cfs since early October. Also according to USGS, flows at Station 25 in Bryant Creek varied from about 0.9 cfs to about 7 cfs since early October. The maximum flows occurred during recent storms on October 24.

Regional Board
Regional Board staff greeted us on-site and accompanied us to Pond 1 and the pit clarifier. Regional board staff explained the operation of the PWTS, described performance during 2010 in comparison to prior years, and described the function of the Pit Clarifier, and described surface water flow, the pit under drain, and adit drainage controls at the Pit. Regional Board staff also answered questions regarding storage pond capacity and frequency of pond discharge.

Atlantic Richfield
Marc Lombardi of AMEC (Atlantic Richfield contractor) greeted us at the Pond 4 check in trailer. Marc described the HDS plant performance during 2010 and discussed activities completed to date at the ASBR. Sludge dewatering at ASBR is complete and the dewatering

system has been removed from the site. Marc described the preparations by AMEC to make a winter time maintenance visit to the site.

During our site visit a bin of HDS sludge was removed from the site. Marc indicated that the HDS plant is being cycled now due to lower flows from the CUD and Delta Seep than are needed for optimal HDS plant operation. Similar to the 2009 treatment season, the HDS plant is put in recirculation mode while sufficient water accumulates in Pond 4 to support continuous treatment operations for a few days. Marc was hopeful that if the weather did not deteriorate further this year that CUD and DS interception would continue through early November, with another week of HDS treatment to empty Pond 4, followed by winterization. Winterization requires about 2 weeks.

Burleson

On October 27, 2010 Burleson measured water quality in Leviathan, Creek at Station 15, and at the Beaver Pond. Water quality readings taken by Burleson are presented in Table 1.

Table 1. Leviathan Mine Surface Water Quality Measurements on October 27, 2010

Location	Time	pH	T (°C)	SC (µS/cm)	ORP (mV)
Leviathan Creek, Station 15	14:20	6.70	7.91	1,059	-52.9
Beaver Dam-3	14:10	6.85	5.54	1,107	-34.5

°C Degree Celsius
µS/cm MicroSiemen per centimeter
gpm Gallon per minute
mV MilliVolt
ORP Oxidation-reduction potential
SC Specific conductance
T Temperature

Upcoming Events:

- Atlantic Richfield plans to continue capture of CUD and DS flows through early November.
- Atlantic Richfield will continue to operate the Aspen Seep Bioreactor.
- Atlantic Richfield will begin winterization at the HDS plant in early November.
- NREL may mobilize to the site to install wind and solar energy monitoring equipment in early November.
- Burleson will continue oversight during ongoing treatment activities.
- Burleson will coordinate oversight visits with Gary Riley, Kevin Mayer (EPA), and John Erwin (USACE).

Leviathan Mine Superfund Site
November 18, 2010
Burleson Consulting, Inc. Oversight

Period of Oversight: 10:00 AM to 4:30 PM
Oversight Personnel: Greg Reller and Jimmy Steele

Summary of Site Activities:

California Regional Water Quality Control Board, Lahontan Region (Regional Board):

- No activities were observed.

Atlantic Richfield Company (Atlantic Richfield):

- Site personnel were winterizing the High Density Sludge (HDS) system.

Burleson Consulting, Inc. (Burleson)

- Burleson measured water quality in Leviathan, associated creeks, and the beaver ponds.
- Burleson measured depth to groundwater in monitoring wells at the site.

Leviathan and Bryant Creek Flows: According to the USGS website (http://waterdata.usgs.gov/ca/nwis/current?type=flow), flow in Leviathan Creek at Station 15 has varied from about 0.06 cubic feet per second (cfs) to about 0.4 cfs since early November. Also according to USGS, flows at Station 25 in Bryant Creek varied from about 1.2 cfs to about 2.5 cfs since early November.

Regional Board

No activities were observed. The PWTS, pit clarifier, and weir box were winterized.

Atlantic Richfield

HDS Operations: Interception of CUD and Delta Seep flows was stopped in early November, with flows from both sources returned to Leviathan Creek. Site personnel were completing the final winterization activities for the 2010 treatment season, and anticipated completion of winterization on November 18, 2010. Site personnel reported that motion sensors were planned to be installed at cracks in pavement along the hairpin turn on November 19, 2010.

Burleson

A base and tower for a solar energy monitoring device were present in the Pit, east of the Pit Clarifier. Personnel involved in the installation of the monitoring device were not encountered.

On November 18, 2010 the Leviathan Creek channel at the confluence of Leviathan and Mountaineer creeks was brown, and the water was clear. The orange color associated with discharges from Leviathan Mine was not observed. The channel of Leviathan Creek upstream from the beaver dams contained orange and tan precipitates, and the water impounded by the beaver dams was translucent and had a pale blue-green color.

On November 18, 2010 Burleson measured water quality in Leviathan Creek, associated creeks, and the beaver ponds to document conditions after 2010 treatment activities. Water quality readings taken by Burleson in Leviathan, associated creeks, and the beaver ponds are presented in Table 1.

Table 1. Leviathan Mine Surface Water Quality Measurements on November 18, 2010

Location	Time	pH	T (°C)[1]	SC (µS/cm)	ORP (mV)
Leviathan Creek, Station 1	11:50	6.68	0.79	125	17.8
Leviathan Creek, Above CUD	13:36	6.72	4.86	282	-33.3
CUD	13:22	5.10	8.91	2,507	-55.1
Leviathan Creek, Below CUD	13:43	6.14	4.58	714	-39.1
Leviathan Creek, Above Delta Seep	13:53	6.36	5.13	828	-48.8
Delta Seep	14:00	5.70	7.90	1,691	-67.7
Leviathan Creek, Below Delta Seep	14:08	5.85	5.38	776	-38.9
Leviathan Creek, Station 15	14:48	5.54	5.86	1,069	-27.5
Leviathan Creek, Station 16	15:48	6.68	3.14	432	-38.5
Leviathan Creek, Station 17	14:36	6.18	4.41	729	-25.5
Leviathan Creek, Station 23	15:59	6.68	3.28	702	-48.0
Mountaineer Creek, Station 24	16:03	6.93	3.20	146	-61.4
Bryant Creek, Station 25	16:07	6.89	3.23	320	-60.6
West Abutment of Downstream Dam	15:00	5.51	6.69	1,164	-48.5
Western Channel between Main Dam and Downstream Dam	15:08	4.65	4.84	1,348	-3.4
Eastern Channel between Main Dam and Downstream Dam	15:14	5.62	4.72	1,192	-58.5
West Abutment of Main Dam	15:20	5.81	4.42	1,078	-49.3
West Abutment of Upstream Dam	15:29	5.67	3.76	998	-31.1

Notes:

°C Degree Celsius

µS/cm MicroSiemen per centimeter

gpm Gallon per minute

mV MilliVolt

ORP Oxidation-reduction potential

SC Specific conductance

T Temperature

On November 18, Burleson measured depth to groundwater in on-site monitoring wells. Depth to groundwater measurements are presented in Table 2.

Table 2. Leviathan Mine Depth to Water in Monitoring Wells, November 18, 2010

Well Number	Location	Depth to Water[1]
MW-1	In scrap material pile beside the road southeast of Pond 1 and south of the Delta Slope material stockpile. Near the trail to Station 1.	56.54
MW-2D	Adjacent to the flow control structure near Pond 1. The deep well is farther from the flow control structure.	30.77
MW-2S	Adjacent to the flow control structure near Pond 1. The shallow well is closer to the flow control structure.	30.82
MW-3	In the mine pit at the northwest corner of the pit clarifier.	22.15
MW-4	Northeast corner of the mine pit, on the top bench of the storm water collection system.	25.10
MW-5D	South side of the mine pit, near the vegetation test plots. Deep well is the shorter surface completion.	69.34
MW-6	West side of Pond 1 on the opposite side of the road from the twin 72-inch pipe inlets.	71.15
MW-10D	Adjacent to the outlet of the twin 72-inch pipes. Deep well is the taller surface completion.	24.03
MW-10S	Adjacent to the outlet of the twin 72-inch pipes. Shallow well is the shorter surface completion.	21.14
MW-11	East side of the toe of the slope at Pond 2 North, beside the lower Leviathan Creek tributary.	13.39

Note:

[1] = Measured from surveyed reference point at top of casing.

Upcoming Events:

- Atlantic Richfield plans to install motion detectors along the access road at the hairpin turn where tension cracks in the asphalt pavement were observed. Installation is scheduled for November 19, 2010.
- Atlantic Richfield plans to conduct periodic winter maintenance of the Aspen Seep Bioreactor.

APPENDIX B: OVERSIGHT PHOTOGRAPHS 38 Pages

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

(38 Pages)

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-1	View of Pond 4 before the 2010 treatment season. View to south. April 27, 2010	
B-2	Overview of Pond 4 at the beginning of the 2010 season. Note pale blue water color. View to northwest. May 27, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-3	View of HDS at Pond 4. Note the red color of pond. View to North. June 16, 2010	
B-4	Sludge at Pond 4. View to North. July 28, 2010	

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Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-5	Sludge bins used for the HDS at Pond 4. View to North. July 28, 2010	
B-6	Sludge bins used for the HDS at Pond 4. View to South. September 15, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-7	Overview of HDS treatment plant operations. View to West. September 2, 2010	
B-8	View of open HDS power generation building. View to Southeast July 28, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-9	View of lime treatement system components at Pond 4. Lime slurry tanks, lime dilution tanks, emergency shower. View to East. July 28, 2010	
B-10	Fresh water tanks and sludge drying beds outside of HDS building. View to South. July 28, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-11	Overview of HDS building and operations area. View to Southwest. October 27, 2010	
B-12	View of Pond 4 at the end of 2010 treatment season. View to North. November 18, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-13	Pond 4 at the end of 2010 treatment season. Note bright orange sludge. View to West. November 18,2010	
B-14	Leviathan Creek at Pond 4, note vegetation growing in sediment. View to northwest. August 19, 2010	

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Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-15	View of Leviathan Creek concrete channel at CUD before treatment season. View to Southwest. April 27, 2010	
B-16	View of Leviathan Creek concrete channel at CUD after treatment season. View to Southwest. November 18, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-17	Embankment at CUD with deteriorating erosion control matting. View to Southwest June 16, 2010	
B-18	CUD embankments with new erosion control matting. View to Northeast. July 28, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-19	View of repairs to Delta Seep capture system in progress. Rip rap and gravel are removed along with the sump. View to West. July 8, 2010	
B-20	View of repairs to Delta Seep capture system in progress. Concrete forms in place while the concrete cures. View to West. July 28, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-21	Delta Seep capture system repair complete. Concrete wall coated with sealant. Sump, rip rap, and gravel replaced. View to West. September 15, 2010	
B-22	Leviathan Creek at Delta Seep, creek flows from left to right. Facing Northwest. July 28, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-23	Close up of seepage below Delta Seep Capture system. View to North. July 28, 2010	
B-24	Aspen Seep with gray overflow pipe in foreground. View to Southeast. May 27, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-25	View of Ethanol feed tank, sodium hydroxide basin, and Aspen Seep influent pipe. View to West. May 27, 2010	
B-26	View of ASBR settling pond 2. View to southwest. June 16, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-27	ASBR settling pond 2 during flushing. View to North. July 8, 2010	
B-28	Discharge of bioreactor effluent into settling pond 1. View to West. August 19, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-29	View of ASBR bioreactor 1, with ethanol tank in background. View to southwest. August 18, 2010	
B-30	View of installation of emergency shower at ASBR. View to Southeast. July 8, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-31	Close-up view of emergency shower. View to east. July 8, 2010	
B-32	Close-up view of sludge bin for Phase 1 sludge drying bed pilot test. View to North. July 8, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-33	View of test area of sludge drying bins for Phase 1 pilot test. View to North. July 8, 2010	
B-34	View of sludge dewatering components in preparation for new sludge dewatering system and centrifuge. View to Southeast. September 2, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-35	View of ASBR sludge dewatering system and centrifuge. View to South. September 15, 2010	
B-36	View of ASBR sludge dewatering system and centrifuge. View to Southwest. October 5, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-37	View of sludge bins for sludge dewatering system. View to east. September 15, 2010	
B-38	View of Aspen Seep infiltration Pond (cloudy water visible through trees). View to Northeast May 27, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-39	Winterized pond water treatment system before treatment season with Pond 1 in foreground. View to northeast. April 27, 2010	
B-40	Overview of PWTS and Pond 1 during treatment season. Note reddish hue of water in Pond 1. View to Northwest. August 19, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-41	View of pit clarifier before sludge removal from 2009 treatment season. View to Northwest. May 27, 2010	
B-42	View of pit clarifier after removal of sludge from 2009 treatment season. View to Northwest. July 8, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-43	Discharge from PWTS to pit clarifier. View to west. July 28, 2010	
B-44	Decant structure in Pit Clarifier. View to Northwest. August 19, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-45	Overview of open pit after 2010 treatment season. View to Northwest. October 27, 2010	
B-46	Pit Clarifier weir box during discharge of treated water from the Pit Clarifier. View to West. August 19, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-47	View of Pond 2N in foreground before the treatment season. View to South. May 27, 2010	
B-48	View of Pond 2N after the treatment season. View to South. September 15, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-49	Winterized PWTS following 2010 treatment season. View to East. November 18, 2010	
B-50	Winterized PWTS components (note plywood electrical panel enclosures and plastic wrapped around motors at tops of tanks). View to Southeast. November 18, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-51	Leviathan Creek at Station 1 before 2010 treatment season and without diversion to Pond Water Treatment System. View to East. May 27, 2010	
B-52	Leviathan Creek at Station 1 with diversion to Pond Water Treatment System in place. View to East. June 16, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-53	Leviathan Creek at Station 15. View to West. August 19, 2010	
B-54	Leviathan Creek at Station 17, looking upstream. View to Southeast. April 27, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-55	Leviathan Creek-Mountaineer Creek confluence before treatment season looking upstream. View to South. April 27, 2010	
B-56	Leviathan Creek-Mountaineer Creek confluence after treatment season looking upstream. View to South. November 18, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-57	View of stormwater run-on at HDS sludge bin area. View to Southwest. October 5, 2010	
B-58	View of stormwater inlet/outlet pipe adjacent to HDS plant during rain event. View to South. October 5, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-59	View of sediment clogged stormwater inlet/outlet pipe adjacent to HDS plant during rain event. View to North. October 5, 2010	
B-60	View of stormwater run-off and rills at HDS trailers during rain event. View to East. October 5, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-61	View of stormwater run-off and rills on pathway between CUD and Delta Seep during rain event. View to North. October 5, 2010	
B-62	View of stormwater inlet/outlet pipe adjacent to Delta Seep during rain event. View to Southeast. October 5, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-63	View of a turbid Leviathan Creek at Delta Seep during rain event. View to North. October 5, 2010	
B-64	View of stormwater runoff in rills adjacent to MW-1 during rain event. View to West. October 5, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-65	View of sediment filled v-ditch adjacent to Pond 1 during rain event. View to West. October 5, 2010	
B-66	View of sediment obstructed outlet pipe adjacent to Pond 1 during rain event. View to Southwest. October 5, 2010	

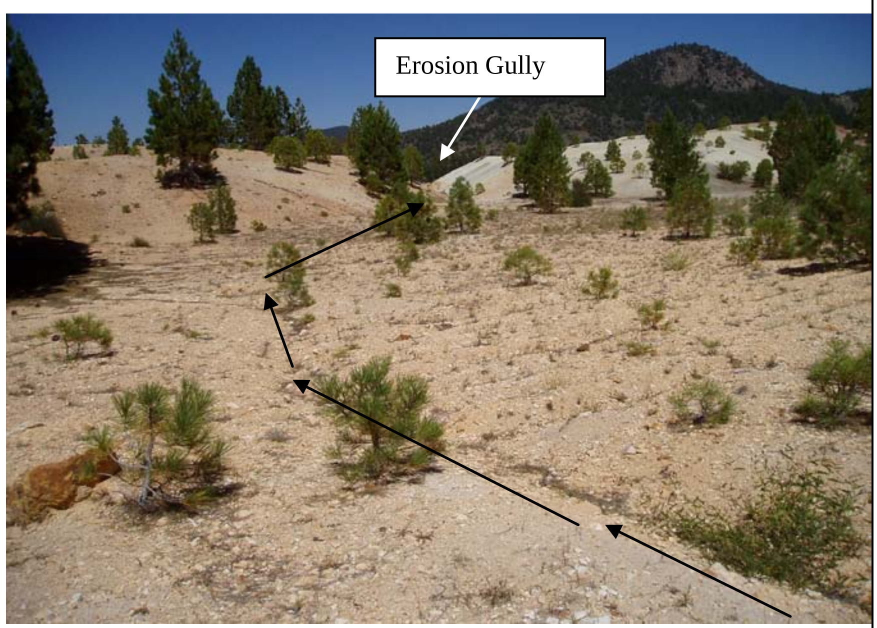
Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-67	View of beaver den at beaver pond on Leviathan Creek upstream from Station 15. View to Southeast. August 19, 2010	
B-68	View of beaver pond with main beaver dam in foreground. View to South. November 18, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-69	View of outfall from main beaver pond. View to Southeast. November 18, 2010	
B-70	View of orange precipitate in outfall adjacent to main beaver pond. View to East. November 18, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-71	View of the erosion gully in overburden pile below former pond. View to South. September 2, 2010	
B-72	View of drainage pattern of stormwater runoff in former pond area at upper end of erosion gully. View to North. September 2, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-73	View of steep slope above the former pond area. View to Northeast. September 2, 2010	
B-74	View of the erosion gully in the overburden pile. View to Northwest. September 2, 2010	

Appendix B
Leviathan 2010 Oversight Summary Report
Oversight Photographs

Photo Number	Photo Description	Photo
B-75	View of erosion gully in the overburden pile (red area above trees in middle of photo). View to South July 8, 2010	

APPENDIX C: FIELD INSTRUMENT CALIBRATION RECORDS 33 Pages

LEVIATHAN MINE
WATER QUALITY MONITORING

Date: 27 JAN 10 **Weather Conditions:** RAINY/SNOWY/WINDY **Personnel:** GSA / GARY AICEY

Location	Time	pH	Temperature (C)	Specific Cond. (µS/cm)	Eh (mV)	Comments
Leviathan Creek, Station 1						
Pit Clarifier						
PWTS Discharge Weir Box						
Leviathan Creek upstream from the ~~CUD~~ DS	12:54	7.09	4.57	228	-20.3	
~~CUD~~ DS		4.80	5.36	2028	188.1	
Leviathan Creek downstream from the ~~CUD~~ DS	13:05	6.42	4.51	291	129.9	
Leviathan Creek upstream from ~~Delta Seep~~ CUD	13:24	6.74	4.19	185	74.3	
Leviathan Creek downstream from Delta Seep	13:08	6.43	4.48	290	114.7	
Delta Seep (collection tank) CUD		5.13	[illegible]	2834	114.6	
Aspen Seep (influent weir box)						
Aspen Bioreactor Settling Pond						
Leviathan Creek, Station 15	14:20	6.89	4.72	278	17.7	BLO FALLS
Aspen Creek, Station 16	14:25	7.42	7.59	312	10.5	
Leviathan Creek, Station 17	14:35	7.02	5.05	309	-16.8	
Leviathan Creek, Station 23	11:51	7.13	5.61	266	+27.1	STAFF GA: 7.47
Mountaineer Creek, Station 25	11:56	7.31	5.46	234	-27	↑
Bryant Creek, Station 24		7.67	6.46	142	-23.6	STAFF GA: 4.48
Del SLOPE STORM RD.	13:01	4.27	4.15	1725	212.3	
Del SLOPE		6.80	3.57	775	927	

FIELD INSTRUMENT CALIBRATION RECORD

Leviathan Mine

Calibration Code:		Sheet 1 of 1
Employee Performing Calibration: G. Reller		Date: 27 APRIL 10
Instruments:	**Standards:**	**Lot Number and Expiration Date:**
(1) pH meter	pH = 7.00	
(2) pH meter	pH = 4.00	
(3) pH meter	pH = 10.00	
(4) Specific conductance meter	____________µS/cm	
(5) Specific conductance meter	____________µS/cm	
(6) Oxidation reduction potential meter	____________mV	
(7) DO meter		
(8)		
(9)		
(10)		
(11)		

Instrument Calibration Data

Inst. No.	Time	Standard Solution	Response As Found	Response As Left	Solution Temp. (C)	Zero	Battery Check	Alarm Point	Notes
1	11:40	6.86	6.82	6.84	14.79				
2			3660	5128	14.79				
3	14:37		6.69						
4			5017						
5									
6									
7									
8									
9									
10									
11									

Review

______________________________ On-Site Health and Safety Officer — Date ____________

______________________________ Site Manager/Project Manager — Date ____________

Action

Leviathan Mine Superfund Site Monitoring Well Water Level Measurements

Well Number	Northing	Easting	TOC Elevation (feet msl)	Total Depth[1] 7/7/2006	Date: DTW (ft)	Time	Comments
MW-1	385684.28	2668848.50	7085.27	76.18	53.67	15:17	
MW-2D	386459.41	2668627.72	7043.84	85.83	26.93	15:46	
MW-2S	386456.26	2668628.32	7043.92	50.33	26.98	15:45	
MW-3	387129.33	2668741.99	7076.39	42.39	20.95	15:55	
MW-4	387505.23	2669358.22	7160.02	35.39			
MW-5D	386528.48	2669272.11	7105.14	84.38	53.96	16:01	
MW-5S	386530.53	2669270.88	7104.02	47.68	47.91	16:02	
MW-6	386285.42	2668236.24	7041.82	98.4	61.55	15:13	
MW-7	385629.95	2667410.50	7044.97	35.35	23.24	15:01	
MW-8	386474.24	2667588.11	7043.38	159.4	87.43	15:08	
MW-9	386808.44	2667741.76	6990.64	29.34			
MW-10D	386889.18	2667419.17	6921.38	76.98	4.57	14:43	
MW-10S	386890.62	2667417.73	6919.23	40.31	~~4.57~~ 2.99	14:45	
MW-11	386689.18	2666950.41	6924.43	20.37	4.20	14:50	
25	387220.01	2671002.31	7382.40	106.6			
31	385609.79	2670196.18	7314.43	1623			
33	385931.61	2669994.93	7298.65	112.1			

Note:
1 Depth to water and total depth measurements are in feet below the mark on the top of the well casing.

LEVIATHAN MINE
WATER QUALITY MONITORING

Date: 27 MAY 10 Weather Conditions: BREEZY, PC, COOL Personnel: GJR w/ [illegible]

Location	Time	pH	Temperature (C)	Specific Cond. (µS/cm)	Eh (mV)	Comments
Leviathan Creek, Station 1	15:27	7.58	11.61	91	84.2	
Pit Clarifier						
PWTS Discharge Weir Box						
Leviathan Creek upstream from the CUD	12:06	7.57	10.13	504	-47.6	
CUD	11:57	4.90	8.57	2,732	334	
Leviathan Creek downstream from the CUD	12:16	7.23	10.44	359	-49.0	
Leviathan Creek upstream from Delta Seep	12:27	7.03	10.68	385	20.3	
Leviathan Creek downstream from Delta Seep	12:41	6.93	11.08	391	-28.1	
Delta Seep (collection tank)	12:21	4.41	8.85	2,281	170.9	
Aspen Seep (influent weir box)	13:20	3.70	12.57	2,552	306.6	
Aspen Bioreactor Settling Pond	13:30	6.59	14.42	2,671	226.0	
Leviathan Creek, Station 15	11:07	7.52	6.77	375	-41.8	STAFF GA: 4.69
Aspen Creek, Station 16	11:16	7.71	10.13	609	-44.1	
Leviathan Creek, Station 17	11:24	7.80	8.28	426	-46.0	
Leviathan Creek, Station 23	10:39	7.43	5.31	419	-55.2	
Mountaineer Creek, Station 24	10:45	8.04	5.87	152	-54.9	
Bryant Creek, Station 25	10:50	7.94	5.73	308	-54.9	
DELTA SLOPE STORM DRAIN		3.77	6.10	3,581	244.5	

FIELD INSTRUMENT CALIBRATION RECORD

Leviathan Mine

Calibration Code:		Sheet 1 of
Employee Performing Calibration: G. Roller		Date: 27 MAY 10
Instruments:	**Standards:**	**Lot Number and Expiration Date:**
(1) pH meter	pH = 7.00	1506 / 03/2014 -H19828-
(2) pH meter	pH = 4.00	
(3) pH meter	pH = 10.00	
(4) Specific conductance meter	________ µS/cm	
(5) Specific conductance meter	________ µS/cm	
(6) Oxidation reduction potential meter	________ mV	
(7) DO meter		
(8)		
(9)		
(10)		
(11)		

Instrument Calibration Data

Inst. No.	Time	Standard Solution	Response As Found	Response As Left	Solution Temp. (C)	Zero	Battery Check	Alarm Point	Notes
1	9:25	H19828-0	pH = 7.93	6.89	15.61				
2	9:35	H19828-0	SC = 5200	4986	15.61				
3	15:40	"	pH = 6.60						
4	15:40	"	SC = 5,010						
5									
6									
7									
8									
9									
10									
11									

Review

Action

On-Site Health and Safety Officer ____________ Date ____________

Site Manager/Project Manager ____________ Date ____________

Leviathan Mine Superfund Site Monitoring Well Water Level Measurements

Well Number	Northing	Easting	TOC Elevation (feet msl)	Total Depth[1] 7/7/2006	Date: 16 JUNE 10 DTW (ft)	Time	Comments
MW-1	385684.28	2668848.50	7085.27	76.18	54.62	10:15	
MW-2D	386459.41	2668627.72	7043.84	85.83	27.49	10:53	
MW-2S	386456.26	2668628.32	7043.92	50.33	27.54	10:38	
MW-3	387129.33	2668741.99	7076.39	42.39	21.06	11:35	
MW-4	387505.23	2669358.22	7160.02	35.39	24.98	11:26	
MW-5D	386528.48	2669272.11	7105.14	84.38	54.54	11:09	
MW-5S	386530.53	2669270.88	7104.02	47.68	'DRY'	11:19	
MW-6	386285.42	2668236.24	7041.82	98.4	63.09	11:45	
MW-7	385629.95	2667410.50	7044.97	35.35	23.22	11:51	
MW-8	386474.24	2667588.11	7043.38	159.4	86.69	11:59	
MW-9	386808.44	2667741.76	6990.64	29.34	'DRY'	12:11	SOME MOISTURE AT BOTTOM
MW-10D	386889.18	2667419.17	6921.38	76.98	6.85	12:14	
MW-10S	386890.62	2667417.73	6919.23	40.31	4.99	12:17	WASP
MW-11	386689.18	2666950.41	6924.43	20.37	7.12		
25	387220.01	2671002.31	7382.40	106.6	'DRY'	16:14	
31	385609.79	2670196.18	7314.43	1623	NM		
33	385931.61	2669994.93	7298.65	112.1	NM	~~110~~ 109.8	

Note:
[1] Depth to water and total depth measurements are in feet below the mark on the top of the well casing.

FIELD INSTRUMENT CALIBRATION RECORD

Leviathan Mine

Calibration Code:		Sheet 1 of 1
Employee Performing Calibration:		Date: 16 JUN 10
Instruments:	**Standards:**	**Lot Number and Expiration Date:**
(1) pH meter	pH = 7.00	7614 / 01-07-2011
(2) pH meter	pH = 4.00	
(3) pH meter	pH = 10.00	
(4) Specific conductance meter	____________µS/cm	
(5) Specific conductance meter	____________µS/cm	
(6) Oxidation reduction potential meter	____________mV	
(7) DO meter		
(8) pH/SC HI9828-0	pH = 6.89 / 5,000	
(9)		
(10)		
(11)		

Instrument Calibration Data

Inst. No.	Time	Standard Solution	Response As Found	Response As Left	Solution Temp. (C)	Zero	Battery Check	Alarm Point	Notes
1	9:35	pH 7	6.76	7.02					SC = 6,044
2	9:41	HI9828 pH	6.53	6.87					
3		SC	5,135	5,046					
4	15:45	PH 7	7.05						Skipping from 7.05 → 7.12
5									
6									
7									
8									
9									
10									
11									

Review

On-Site Health and Safety Officer ____________ Date ____________

Site Manager/Project Manager ____________ Date ____________

Action

05/22/09 11:43 AM

LEVIATHAN MINE
WATER QUALITY MONITORING

Date: 16 JUNE 10 **Weather Conditions:** PC/BREEZE/TEMPERATE **Personnel:** GJR/JPS

Location	Time	pH	Temperature (C)	Specific Cond. (µS/cm)	Eh (mV)	Comments
Leviathan Creek, Station 1	10:27	7.62	6.58	108	-37.2	STAFF GA: 3.89
Pit Clarifier						NOT FLOWING / DRY
PWTS Discharge Weir Box						NOT FLOWING
Leviathan Creek upstream from the CUD	13:04	7.84	16.12	1,755	-71.6	
CUD	12:58	4.98	8.64	2,736	11.8	
Leviathan Creek downstream from the CUD	13:10	7.74	16.18	716	-79.0	
Leviathan Creek upstream from Delta Seep	13:28	7.54	16.01	731	-73.6	
Leviathan Creek downstream from Delta Seep	13:33	7.16	15.97	759	-68.6	
Delta Seep (collection tank)	13:20	5.84	11.17	1807	-73.2	MEASURED IN CHANNEL ABOVE COLLECTOR
Aspen Seep (influent weir box)	14:07	3.65	14.26	2477	298.6	
Aspen Bioreactor Settling Pond	14:22	7.64	20.32	2735	-62.0	
Leviathan Creek, Station 15	15:29	7.65	16.17	676	-71.3	
Aspen Creek, Station 16	15:35	8.15	17.49	528	-79.2	
Leviathan Creek, Station 17	15:41	7.87	16.84	646	-79.5	
Leviathan Creek, Station 23	15:05	8.00	16.18	609	-64.6	
Mountaineer Creek, Station 24	15:06	8.44	13.61	154	-82.1	
Bryant Creek, Station 25	15:12	8.23	14.82	384	-80.6	-

Leviathan Mine Superfund Site Monitoring Well Water Level Measurements

Well Number	Northing	Easting	TOC Elevation (feet msl)	Total Depth[1] 7/7/2006	Date: 16 JUNE 10 DTW (ft)	Time	Comments
MW-1	385684.28	2668848.50	7085.27	76.18	54.62	10:15	
MW-2D	386459.41	2668627.72	7043.84	85.83	27.49	10:53	
MW-2S	386456.26	2668628.32	7043.92	50.33	27.54	10:38	
MW-3	387129.33	2668741.99	7076.39	42.39	21.06	11:35	
MW-4	387505.23	2669358.22	7160.02	35.39	24.98	11:26	
MW-5D	386528.48	2669272.11	7105.14	84.38	54.54	11:09	
MW-5S	386530.53	2669270.88	7104.02	47.68	'DRY'	11:19	
MW-6	386285.42	2668236.24	7041.82	98.4	63.09	11:45	
MW-7	385629.95	2667410.50	7044.97	35.35	23.22	11:51	
MW-8	386474.24	2667588.11	7043.38	159.4	86.69	11:59	
MW-9	386808.44	2667741.76	6990.64	29.34	'DRY'	12:11	SOME MOISTURE AT BOTTOM
MW-10D	386889.18	2667419.17	6921.38	76.98	6.85	12:14	
MW-10S	386890.62	2667417.73	6919.23	40.31	4.99	12:17	WASP
MW-11	386689.18	2666950.41	6924.43	20.37	7.12		
25	387220.01	2671002.31	7382.40	106.6	'DRY'	16:14	
31	385609.79	2670196.18	7314.43	1623	NM		
33	385931.61	2669994.93	7298.65	112.1	NM	~~110~~ 109.8	

Note:
1 Depth to water and total depth measurements are in feet below the mark on the top of the well casing.

FIELD INSTRUMENT CALIBRATION RECORD

Leviathan Mine

Calibration Code:		Sheet 1 of 1
Employee Performing Calibration:		Date: 16 JUN 10
Instruments:	**Standards:**	**Lot Number and Expiration Date:**
(1) pH meter	pH = 7.00	7614 / 01-07-2011
(2) pH meter	pH = 4.00	
(3) pH meter	pH = 10.00	
(4) Specific conductance meter	________ μS/cm	
(5) Specific conductance meter	________ μS/cm	
(6) Oxidation reduction potential meter	________ mV	
(7) DO meter		
(8) pH/SC HI9828-0	pH = 6.89 / 5,000	
(9)		
(10)		
(11)		

Instrument Calibration Data

Inst. No.	Time	Standard Solution	Response As Found	Response As Left	Solution Temp. (C)	Zero	Battery Check	Alarm Point	Notes
1	9:35	pH 7	6.76	7.02					SC = 6,044
2	9:41	HI9828 pH	6.53	6.87					
3		SC	5,135	5,046					
4	15:45	pH 7	7.05						Skipping from 7.05 → 7.12
5									
6									
7									
8									
9									
10									
11									

Review

On-Site Health and Safety Officer ____________ Date ________

Site Manager/Project Manager ____________ Date ________

Action

05/22/09 11:43 AM

LEVIATHAN MINE
WATER QUALITY MONITORING

Date: 16 JUNE 10 **Weather Conditions:** PC/BREEZE/TEMPERATE **Personnel:** GJR/JPS

Location	Time	pH	Temperature (C)	Specific Cond. (µS/cm)	Eh (mV)	Comments
Leviathan Creek, Station 1	10:27	7.62	6.58	108	-37.2	STAFF GA: 3.89
Pit Clarifier						NOT FLOWING/DRY
PWTS Discharge Weir Box						NOT FLOWING
Leviathan Creek upstream from the CUD	13:04	7.84	16.12	1,755	-71.6	
CUD	12:58	4.98	8.64	2,736	11.8	
Leviathan Creek downstream from the CUD	13:10	7.44	16.18	716	-79.0	
Leviathan Creek upstream from Delta Seep	13:28	7.54	16.01	731	-73.6	
Leviathan Creek downstream from Delta Seep	13:33	7.16	15.97	759	-68.6	
Delta Seep (collection tank)	13:20	5.84	11.17	1807	-73.2	MEASURED IN CHANNEL ABOVE COLLECTOR
Aspen Seep (influent weir box)	14:07	3.65	14.26	2477	298.6	
Aspen Bioreactor Settling Pond	14:22	7.64	20.32	2735	-62.0	
Leviathan Creek, Station 15	15:29	7.65	16.17	676	-71.3	
Aspen Creek, Station 16	15:35	8.15	17.49	528	-79.2	
Leviathan Creek, Station 17	15:41	7.87	16.89	646	-79.5	
Leviathan Creek, Station 23	15:05	8.00	16.18	609	-64.6	
Mountaineer Creek, Station 24	15:06	8.44	13.61	154	-82.1	
Bryant Creek, Station 25	15:12	8.23	14.82	384	-80.6	-

FIELD INSTRUMENT CALIBRATION RECORD

Leviathan Mine

Calibration Code:		Sheet 1 of 1
Employee Performing Calibration: Jimmy Steele		Date: July 8, 2010
Instruments:	**Standards:**	**Lot Number and Expiration Date:**
(1) pH meter	pH = 7.00	
(2) pH meter	pH = 4.00	
(3) pH meter	pH = 10.00	
(4) Specific conductance meter	__________μS/cm	
(5) Specific conductance meter	__________μS/cm	
(6) Oxidation reduction potential meter	__________mV	
(7) DO meter		
(8) pH/sc	6.89 / 5,000	1506 / 03 / 2014
(9)		
(10)		
(11)		

Instrument Calibration Data

Inst. No.	Time	Standard Solution	Response As Found	Response As Left	Solution Temp. (C)	Zero	Battery Check	Alarm Point	Notes
1	10:28	HI 9828-0	7.10	6.87					
2		SC	5,187	4889					
3	15:15	pH7	6.81	6.96					
4	16:02	HI 9828-0	6.88						
5		SC	4,270						
6									
7									
8									
9									
10									
11									

Review

______________________________ ____________
On-Site Health and Safety Officer — Date

______________________________ ____________
Site Manager/Project Manager — Date

Action

LEVIATHAN MINE

WATER QUALITY MONITORING

Date: July 8, 2010 **Weather Conditions:** Dry **Personnel:** GJR/JPS/GARY RILEY

Location	Time	pH	Temperature (C)	Specific Cond. (µS/cm)	Eh (mV)	Comments
Leviathan Creek, Station 1	10:55	7.37	10.68	128	-52.1	
Pit Clarifier						
PWTS Discharge Weir Box						
Leviathan Creek upstream from the CUD	13:33	7.19	23.84	215	-98.1	
CUD	13:25	4.86	9.13	2739	-25.9	
Leviathan Creek downstream from the CUD	13:37	7.12	23.81	236	-87.4	
Leviathan Creek upstream from Delta Seep	13:10	7.54	21.77	292	-55.6	
Leviathan Creek downstream from Delta Seep	13:17	6.83	21.24	377	-72.9	
Delta Seep (collection tank)	13:05	5.72	9.24	1891	-17.5	upstream/uphill of tank
Aspen Seep (influent weir box)	14:15	3.04	17.96	2556	282.5	
Aspen Bioreactor Settling Pond	14:27	7.22	23.11	2822	-79.6	settling pond 1
Leviathan Creek, Station 15	15:45	7.48	17.15	548	-104.4	
Aspen Creek, Station 16	15:53	8.08	16.40	316	-101.4	
Leviathan Creek, Station 17	14:59	7.82	17.47	463	-105.2	
Leviathan Creek, Station 23	15:01	7.77	19.52	581	-96.0	
Mountaineer Creek, Station 24	15:07	7.76	16.44	157	-89.0	
Bryant Creek, Station 25	15:11	8.01	17.38	307	-110.5	
Sta 25 Dup	15:33	7.79	17.17	256	-88.9	After meter pH re-calibration

Leviathan Mine Superfund Site Monitoring Well Water Level Measurements

Well Number	Northing	Easting	TOC Elevation (feet msl)	Total Depth[1] 7/7/2006	Date: DTW (ft)	8JULY06 Time	Comments
MW-1	385684.28	2668848.50	7085.27	76.18	55.62	10:32	3.81 = STAFF GAUGE
MW-2D	386459.41	2668627.72	7043.84	85.83	28.32	11:09	
MW-2S	386456.26	2668628.32	7043.92	50.33	28.38	11:05	
MW-3	387129.33	2668741.99	7076.39	42.39	~~28.32~~ 21.22	11:09	
MW-4	387505.23	2669358.22	7160.02	35.39	24.95	11:30	
MW-5D	386528.48	2669272.11	7105.14	84.38	55.08	11:22	
MW-5S	386530.53	2669270.88	7104.02	47.68	'DRY'	11:20	
MW-6	386285.42	2668236.24	7041.82	98.4	64.90	12:01	
MW-7	385629.95	2667410.50	7044.97	35.35	23.22	12:07	
MW-8	386474.24	2667588.11	7043.38	159.4	86.75	12:12	
MW-9	386808.44	2667741.76	6990.64	29.34	N.M.		
MW-10~~D~~S	386889.18	2667419.17	6921.38	76.98	8.88	12:33	
MW-10~~S~~D	386890.62	2667417.73	6919.23	40.31	7.80	12:34	
MW-11	386689.18	2666950.41	6924.43	20.37	5.90	12:37	
25	387220.01	2671002.31	7382.40	106.6	'DRY'	16:28	107.18 - BUZZED AT BOTTOM
31	385609.79	2670196.18	7314.43	1623			
33	385931.61	2669994.93	7298.65	112.1			

Note:
1 Depth to water and total depth measurements are in feet below the mark on the top of the well casing.

FIELD INSTRUMENT CALIBRATION RECORD

Leviathan Mine

Calibration Code:		Sheet 1 of 1
Employee Performing Calibration: Jimmy Steele		Date: July 27, 2010
Instruments:	**Standards:**	**Lot Number and Expiration Date:**
(1) pH meter	pH = 7.00	#7979 5-18-2011
(2) pH meter	pH = 4.00	#7979 5-18-2011
(3) pH meter	pH = 10.00	#7484 10-22-2010
(4) Specific conductance meter	____ µS/cm	
(5) Specific conductance meter	____ µS/cm	
(6) Oxidation reduction potential meter	____ mV	
(7) DO meter		
(8) pH / SC HI 9828-0	pH = 6.89/5,000	
(9)		
(10)		
(11)		

Instrument Calibration Data

Inst. No.	Time	Standard Solution	Response As Found	Response As Left	Solution Temp. (C)	Zero	Battery Check	Alarm Point	Notes
1	14:00	pH 7	7.00	7.00					
2	14:10	pH 4		4.00					
3	14:16	pH 10		10.01					
4									
5	14:32		6.85/4918						
6	18:50		6.72						
7									
8									
9									
10									
11									

1/28/10

Review	***Action***
On-Site Health and Safety Officer ____ Date ____	
Site Manager/Project Manager ____ Date ____	

05/22/09 11:43 AM

LEVIATHAN MINE
WATER QUALITY MONITORING

Date: 28 JULY 10 Weather Conditions: SUNNY/WARM Personnel: GJR / JIMMY STEELE

Location	Time	pH	Temperature (C)	Specific Cond. (µS/cm)	Eh (mV)	Comments
Leviathan Creek, Station 1	6:03	7.37	14.64	85	-29.4	
Pit Clarifier	18:29	7.83	23.52	3,330	-49.7	AT PICOLO
PWTS Discharge Weir Box	18:33	7.75	22.58	2,895	-53.7	
Leviathan Creek upstream from the CUD	16:01	8.06	19.93	2,277	-59.6	
CUD	15:53	5.03	8.91	2,417	-74.4	
Leviathan Creek downstream from the CUD	16:07	7.55	19.78	2,728	-61.9	
Leviathan Creek upstream from Delta Seep	16:27	6.95	19.36	2,721	-~~48~~.6	
Delta Seep (collection tank)	16:17	5.30	10.08	1,797	31.7	FROM COLLECTION TANK
Leviathan Creek downstream from Delta Seep	16:34	6.75	19.08	2,695	-48.1	
Aspen Seep (influent weir box)	17:13	3.04	17.08	2,343	258.6	FROM SEEP OUTSIDE ENCLOSURE
Aspen Bioreactor Settling Pond	17:33	7.76	24.57	2,552	-24.9	↓
Leviathan Creek, Station 15	15:17	6.53	20.52	2389	-50.9	STAFF GA: 4.47, PROBE UNDER EPA SONDE
Aspen Creek, Station 16	15:26	7.96	18.73	308	-62.3	
Leviathan Creek, Station 17	15:34	7.25	20.52	2053	-61.0	
Leviathan Creek, Station 23	14:54	7.58	19.87	1,394	-59.0	
Mountaineer Creek, Station 24	14:58	7.63	16.87	140	-44.1	
Bryant Creek, Station 25	15:01	7.80	18.47	1,097	-64.9	
Aspen Creek above site						
						STA 15: WATER FLOWING ↑

Leviathan Mine Superfund Site Monitoring Well Water Level Measurements

Well Number	Northing	Easting	TOC Elevation (feet msl)	Total Depth[1] 7/7/2006	Date: 28 JULY 10 DTW (ft)	Time	Comments
MW-1	385684.28	2668848.50	7085.27	76.18	56.95	17:55	
MW-2D	386459.41	2668627.72	7043.84	85.83	28.94	18:15	
MW-2S	386456.26	2668628.32	7043.92	50.33	28.98	18:14	
MW-3	387129.33	2668741.99	7076.39	42.39	21.38	18:20	
MW-4	387505.23	2669358.22	7160.02	35.39	~~23.10~~		
MW-5D	386528.48	2669272.11	7105.14	84.38	55.49	18:30	
MW-5S	386530.53	2669270.88	7104.02	47.68	Dry	~~18:30~~	
MW-6	386285.42	2668236.24	7041.82	98.4	66.54	18:10	
MW-7	385629.95	2667410.50	7044.97	35.35	23.14	18:44	
MW-8	386474.24	2667588.11	7043.38	159.4	87.43	18:49	
MW-9	386808.44	2667741.76	6990.64	29.34			
MW-10D	386889.18	2667419.17	6921.38	76.98	13.79	16:46	
MW-10S	386890.62	2667417.73	6919.23	40.31	11.32	16:48	
MW-11	386689.18	2666950.41	6924.43	20.37	11.18	16:51	
25	387220.01	2671002.31	7382.40	106.6			
31	385609.79	2670196.18	7314.43	1623			
33	385931.61	2669994.93	7298.65	112.1			

Note:
[1] Depth to water and total depth measurements are in feet below the mark on the top of the well casing.

FIELD INSTRUMENT CALIBRATION RECORD

Leviathan Mine

Calibration Code:		Sheet 1 of 1
Employee Performing Calibration: Jimmy Steele		Date: August 18, 2010
Instruments:	**Standards:**	**Lot Number and Expiration Date:**
(1) pH meter	pH = 7.00	
(2) pH meter	pH = 4.00	
(3) pH meter	pH = 10.00	
(4) Specific conductance meter	____________µS/cm	
(5) Specific conductance meter	____________µS/cm	
(6) Oxidation reduction potential meter	____________mV	
(7) DO meter		
(8) pH / SC HI 9828 -0	pH = 6.89 / SC = 5,000	1964 / 10-2014
(9)		
(10)		
(11)		

Instrument Calibration Data

Inst. No.	Time	Standard Solution	Response As Found	Response As Left	Solution Temp. (C)	Zero	Battery Check	Alarm Point	Notes
1	14:00	pH 6.89 HI-9828-0	6.92	6.86					
2		SC	5,003	5,014					~~8/19/10~~
3	10:00	pH 6.89 HI-9828-0	6.89	~~6.86~~ J.S.					8/19/10
4		SC	4,934						
5	16:38	HI-9828-0		6.67					
6				5,295	27.67				
7									
8									
9									
10									
11									

Review

_______________________________ On-Site Health and Safety Officer ______________ Date

_______________________________ Site Manager/Project Manager ______________ Date

Action

LEVIATHAN MINE
WATER QUALITY MONITORING

Date: 8/19/10 **Weather Conditions:** Clear, BREEZY **Personnel:** Jimmy Steele / Greg Reller

Location	Time	pH	Temperature (C)	Specific Cond. (µS/cm)	Eh (mV)	Comments
Leviathan Creek, Station 1	10:41	6.74	8.18	124	-21.7	
Pit Clarifier	11:06	6.98	15.49	1,648	-50.5	
PWTS Discharge Weir Box	11:11	7.03	16.78	2,258	-59.0	
Leviathan Creek upstream from the CUD	12:30	7.87	19.94	2243	-88.9	
CUD	12:15	4.78	8.77	2377	-95.7	
Leviathan Creek downstream from the CUD	12:41	7.62	21.16	1,036	-76.7	
Leviathan Creek upstream from Delta Seep	13:08	6.87	19.36	1,799	-56.6	
Delta Seep (collection tank)	12:54	5.06	10.56	1,770	13.3	
Leviathan Creek downstream from Delta Seep	13:14	6.46	18.73	1,597	-59.8	
Aspen Seep (influent weir box)	13:55	3.07	15.73	2,297	305.4	
Aspen Bioreactor Settling Pond	14:14	7.74	21.62	2,521	-13.7	Eh still dropping
Leviathan Creek, Station 15	15:42	4.49	19.07	1949	65.5	
Aspen Creek, Station 16	16:00	7.52	16.26	390	-44.5	
Leviathan Creek, Station 17	16:10	6.82	17.87	1244	-52.7	
Leviathan Creek, Station 23	16:25	7.12	17.21	1237	-59.0	
Mountaineer Creek, Station 24	16:33	7.41	14.41	136	-54.0	
Bryant Creek, Station 25	16:34	7.77	14.99	423	-78.8	
Aspen Creek above site						
Landslide pond	15:10	6.10	18.18	2,001	-31.5	
landslide pond outfall	15:20	3.58	17.17	2,127	129.5	

Leviathan Mine Superfund Site Monitoring Well Water Level Measurements

Well Number	Northing	Easting	TOC Elevation (feet msl)	Total Depth[1] 7/7/2006	Date: DTW (ft)	Time	Comments
MW-1	385684.28	2668848.50	7085.27	76.18	58.90	10:27	
MW-2D	386459.41	2668627.72	7043.84	85.83	~~68.21~~ 29.55	~~10:41~~ 11:00	well on right
MW-2S	386456.26	2668628.32	7043.92	50.33	29.49	11:01	
MW-3	387129.33	2668741.99	7076.39	42.39	21.49	11:05	
MW-4	387505.23	2669358.22	7160.02	35.39	24.96	11:11	
MW-5D	386528.48	2669272.11	7105.14	84.38	55.74	11:17	
MW-5S	386530.53	2669270.88	7104.02	47.68	Dry		
MW-6	386285.42	2668236.24	7041.82	98.4	68.21	10:51	
MW-7	385629.95	2667410.50	7044.97	35.35	23.56	11:38	
MW-8	386474.24	2667588.11	7043.38	159.4	88.55	11:44	
MW-9	386808.44	2667741.76	6990.64	29.34			
MW-10D	386889.18	2667419.17	6921.38	76.98	17.51	11:50	well on left
MW-10S	386890.62	2667417.73	6919.23	40.31	14.50	11:51	
MW-11	386689.18	2666950.41	6924.43	20.37	12.42	11:55	
25	387220.01	2671002.31	7382.40	106.6			
31	385609.79	2670196.18	7314.43	1623			
33	385931.61	2669994.93	7298.65	112.1			

Note:
1 Depth to water and total depth measurements are in feet below the mark on the top of the well casing.

FIELD INSTRUMENT CALIBRATION RECORD

Leviathan Mine

Calibration Code:		Sheet 1 of 1
Employee Performing Calibration:		Date: 2SEP710
Instruments:	**Standards:**	**Lot Number and Expiration Date:**
Hanna 9828 meter with pH-ORP probe	pH = 7.00	7979 /18MAY11
	pH = 4.00	
	pH = 10.00	
	pH = 6.89	
	________μS/cm	
	________μS/cm	
	________mV	

Instrument Calibration Data

Trial No.	Time	Parameter	Response As Found	Response As Left	Solution Temp. (C)	Zero	Battery Check	Alarm Point	Notes
1	9:55	pH	6.99	—	21.76				As Found
2	13:40	pH	6.85	—	25.58				

Review

_______________________________ Date ___________
On-Site Health and Safety Officer

_______________________________ Date ___________
Site Manager/Project Manager

Action

07/27/10 04:49 PM

LEVIATHAN MINE
WATER QUALITY MONITORING

Date: 9/2/10 **Weather Conditions:** Clear, Slightly Breezy **Personnel:** Greg Reller, Jimmy Steele

Location	Time	pH	Temperature (C)	Specific Cond. (µS/cm)	Eh (mV)	Comments
Pit clarifier	10:55	6.95	17.31	3194	-33.0	
PWTS weir Box	11:05	6.95	15.38	2210	-21.1	pH - 7.22, Temp - 20.04°C, SC - 2204, orp - -43.8
Station 15	12:10	5.17	14.19	2050	-4.00	
15-1	12:18	5.13	14.92	2067	0.1	
15-2	12:27	5.09	14.62	2071	-9.7	
15-3	12:41	4.98	14.25	2114	-8.2	
BD-1	12:48	6.75	13.57	2025	-27.1	AT dam in leviathan Creek
BD-2	12:57	6.20	13.39	1957	-80.5	downstream of dam @ Leviathan Creek
BD-3	13:01	6.17	15.07	2313	-52.4	
BD-4	13:05	6.10	16.67	2126	-54.9	
BD-5	13:10	5.66	15.93	2238	-46.2	
BD-6	13:14	5.66	15.76	2257	-38.4	
Station 15	13:32	4.82	16.34	2065	25.3	2nd time

Leviathan Mine Superfund Site Monitoring Well Water Level Measurements

Well Number	Northing	Easting	TOC Elevation (feet msl)	Total Depth[1] 7/7/2006	Date: 9/2/10 DTW (ft)	Time	Comments
MW-1	385684.28	2668848.50	7085.27	76.18	60.41	9:47	measured well depth @ 78.15 ft
MW-2D	386459.41	2668627.72	7043.84	85.83	29.90	10:40	well to right
MW-2S	386456.26	2668628.32	7043.92	50.33	29.85	10:41	
MW-3	387129.33	2668741.99	7076.39	42.39	21.59	11:02	
MW-4	387505.23	2669358.22	7160.02	35.39	24.98	11:21	
MW-5D	386528.48	2669272.11	7105.14	84.38	55.89	11:15	
MW-5S	386530.53	2669270.88	7104.02	47.68			Dry
MW-6	386285.42	2668236.24	7041.82	98.4			
MW-7	385629.95	2667410.50	7044.97	35.35			
MW-8	386474.24	2667588.11	7043.38	159.4			
MW-9	386808.44	2667741.76	6990.64	29.34			
MW-10D	386889.18	2667419.17	6921.38	76.98			
MW-10S	386890.62	2667417.73	6919.23	40.31			
MW-11	386689.18	2666950.41	6924.43	20.37			
25	387220.01	2671002.31	7382.40	106.6			
31	385609.79	2670196.18	7314.43	1623			
33	385931.61	2669994.93	7298.65	112.1			

Note:

1 Depth to water and total depth measurements are in feet below the mark on the top of the well casing.

LEVIATHAN MINE
WATER QUALITY MONITORING

Date: 9-15-10 Weather Conditions: Clear Personnel: Greg Reller, Jimmy Steele

Location	Time	pH	Temperature (C)	Specific Cond. (µS/cm)	Eh (mV)	Comments
Leviathan Creek, Station 1	10:52	6.54	5.84	110	6.40	
Pit Clarifier						NO WATER PRESENT
PWTS Discharge Weir Box	11:32	6.79	14.27	2138	-39.3	
Leviathan Creek upstream from the CUD	12:58	8.14	21.11	1914	-105.1	
CUD	12:49	5.49	8.77	2202	-310.8	
Leviathan Creek downstream from the CUD	13:04	7.13	19.92	1373	-85.2	
Leviathan Creek upstream from Delta Seep	13:26	6.81	15.96	1,358	-52.6	
Delta Seep (collection tank)	13:14	5.41	9.84	1,386	1.9	
Leviathan Creek downstream from Delta Seep	13:32	6.45	15.23	1,365	-54.3	
Aspen Seep (influent weir box)						
Aspen Bioreactor Settling Pond						
Leviathan Creek, Station 15	15:27	4.44	15.66	1625	33.8	
Aspen Creek, Station 16	15:41	7.42	13.48	267	-38.1	
Leviathan Creek, Station 17	1551	7.04	14.29	576	-48.4	pH = 7.04
Leviathan Creek, Station 23	14:15	7.18	13.74	650	-25.5	
Mountaineer Creek, Station 24	14:20	7.44	11.01	125	-25.0	
Bryant Creek, Station 25	14:26	8.00	11.61	237	-63.8	
Aspen Creek above site						
Bryant Creek @ Sonde	14:53	7.52	12.59	240	-42.4	
Bryant Creek above Sonde	14:58	7.86	12.32	236	-57.3	
Leviathan above Beaver	16:21	6.89	11.59	1356	25.5	
Upper end of pond	16:27	6.79	12.76	1355	-7.3	
Beaver Pond	16:39	6.18	15.10	1506	-14.9	
Downstream of Beaver	16:48	4.53	13.79	1687	24.7	

Leviathan Mine Superfund Site Monitoring Well Water Level Measurements

Well Number	Northing	Easting	TOC Elevation (feet msl)	Total Depth[1] 7/7/2006	Date: DTW (ft)	Time	Comments
MW-1	385684.28	2668848.50	7085.27	76.18	60.98	10:37	
MW-2D	386459.41	2668627.72	7043.84	85.83	30.23	11:03	
MW-2S	386456.26	2668628.32	7043.92	50.33	30.18	11:02	well on right
MW-3	387129.33	2668741.99	7076.39	42.39	2045	11:08	
MW-4	387505.23	2669358.22	7160.02	35.39	~~77.~~ 25.0	11:20	
MW-5D	386528.48	2669272.11	7105.14	84.38	77.52	11:14	
MW-5S	386530.53	2669270.88	7104.02	47.68	Dry		
MW-6	386285.42	2668236.24	7041.82	98.4	70.45	11:41	
MW-7	385629.95	2667410.50	7044.97	35.35	23.98	11:45	
MW-8	386474.24	2667588.11	7043.38	159.4	90.10	11:50	
MW-9	386808.44	2667741.76	6990.64	29.34		|	
MW-10D	386889.18	2667419.17	6921.38	76.98	20.92	11:56	wellon left
MW-10S	386890.62	2667417.73	6919.23	40.31	19.65	11:58	
MW-11	386689.18	2666950.41	6924.43	20.37	13.11	12:01	
25	387220.01	2671002.31	7382.40	106.6			
31	385609.79	2670196.18	7314.43	1623			
33	385931.61	2669994.93	7298.65	112.1			

Note:
[1] Depth to water and total depth measurements are in feet below the mark on the top of the well casing.

FIELD INSTRUMENT CALIBRATION RECORD

Leviathan Mine

Calibration Code:		Sheet 1 of 1
Employee Performing Calibration: Jimmy Steele		Date: 9-15-10
Instruments:	**Standards:**	**Lot Number and Expiration Date:**
(1) pH meter	pH = 7.00	
(2) pH meter	pH = 4.00	
(3) pH meter	pH = 10.00	
(4) Specific conductance meter	______ µS/cm	
(5) Specific conductance meter	______ µS/cm	
(6) Oxidation reduction potential meter	______ mV	
(7) DO meter		
(8) PH → HI- 9828-0	pH=6.89/SC=5,000	1964 / 10-2014
(9)		
(10)		
(11)		

Instrument Calibration Data

Inst. No.	Time	Standard Solution	Response As Found	Response As Left	Solution Temp. (C)	Zero	Battery Check	Alarm Point	Notes
1	10:40	pH=6.89	6.86						SC = 3,867
2				6.87					SC = 5,006
3	14:30	pH=7.00	6.94						
4	17:05	pH=6.89		6.73					SC=4488
5									
6									
7									
8									
9									
10									
11									

Review

On-Site Health and Safety Officer ______ Date ______

Site Manager/Project Manager ______ Date ______

Action

08/04/09 11:07 AM

LEVIATHAN MINE
WATER QUALITY MONITORING

Date: 10/5/10 Weather Conditions: Cold, Rainy Personnel: Jimmy Steele, Greg Reller

Location	Time	pH	Temperature (C)	Specific Cond. (µS/cm)	Eh (mV)	Comments
Leviathan Creek, Station 1	14:51	6.40	4.61	90	-29.4	
Leviathan Creek upstream from the CUD	13:32	5.14	6.39	323	92.5	
CUD	13:27	5.44	8.09	1767	-146.8	
Leviathan Creek downstream from the CUD	13:39	5.00	6.04	306	125.9	
Leviathan Creek upstream from Delta Seep	13:15	5.[illegible]	5.51	352	117.7	
Leviathan Creek downstream from Delta Seep	13:18	5.27	5.67	373	97.9	
Delta Seep (collection tank)	13:04	5.87	7.81	1065	97.7	
Aspen Seep (influent weir box)						
Aspen Bioreactor Settling Pond						
Leviathan Creek, Station 15	11:49	5.90	6.46	575	7.4	
Aspen Creek, Station 16	12:18	7.45	6.16	369	-40.7	
Leviathan Creek, Station 17	11:36	6.93	6.39	521	-21.2	
Leviathan Creek, Station 23	11:10	6.83	6.56	574	-7.8	pH 7.51 Temp 6.58 SC 588 Eh -48.9 11:28
Mountaineer Creek, Station 24	11:13	7.05	6.74	14	3.0	
Bryant Creek, Station 25	11:20	7.53	6.48	422	-45.2	
D1 above pond 4	12:33	4.47	5.71	1373	263.7	
Puddle at sum	12:40	6.26	6.33	64	50.2	
Rill below Trible	12:45	6.45	5.16	21	26.9	@ HDS plant
Delta slope D.O.	13:01	4.73	6.06	1104	255.9	
D1 @ pond 1	14:19	4.15	10.79	660	196.2	
MW-1 Ditch	14:39	5.56	7.15	97	9.1	
SW from pit	15:12	4.22	9.34	2953	260.5	

Leviathan Mine Superfund Site Monitoring Well Water Level Measurements

Well Number	Northing	Easting	TOC Elevation	Total Depth[1]	Date:	10-5-10	Comments
			(feet msl)	7/7/2006	DTW (ft)	Time	
MW-1	385684.28	2668848.50	7085.27	76.18	62.05	14:29	
MW-2D	386459.41	2668627.72	7043.84	85.83	30.43	15:05	on right
MW-2S	386456.26	2668628.32	7043.92	50.33	30.39	15:06	
MW-3	387129.33	2668741.99	7076.39	42.39			
MW-4	387505.23	2669358.22	7160.02	35.39			
MW-5D	386528.48	2669272.11	7105.14	84.38			
MW-5S	386530.53	2669270.88	7104.02	47.68			
MW-6	386285.42	2668236.24	7041.82	98.4	70.87	14:15	
MW-7	385629.95	2667410.50	7044.97	35.35			
MW-8	386474.24	2667588.11	7043.38	159.4			
MW-9	386808.44	2667741.76	6990.64	29.34			
MW-10D	386889.18	2667419.17	6921.38	76.98	22.67	14:07	on left
MW-10S	386890.62	2667417.73	6919.23	40.31	20.54	14:08	
MW-11	386689.18	2666950.41	6924.43	20.37			
25	387220.01	2671002.31	7382.40	106.6			
31	385609.79	2670196.18	7314.43	1623			
33	385931.61	2669994.93	7298.65	112.1			

Note:
1 Depth to water and total depth measurements are in feet below the mark on the top of the well casing.

FIELD INSTRUMENT CALIBRATION RECORD

Leviathan Mine

Calibration Code:		Sheet 1 of 1
Employee Performing Calibration:		Date: 10/5/10
Instruments:	**Standards:**	**Lot Number and Expiration Date:**
(1) pH meter	pH = 7.00	
(2) pH meter	pH = 4.00	
(3) pH meter	pH = 10.00	
(4) Specific conductance meter	________ µS/cm	
(5) Specific conductance meter	________ µS/cm	
(6) Oxidation reduction potential meter	________ mV	
(7) DO meter		
(8) HI-9828-0 pH 6.89/SC=5,000		1944 / 10-2011
(9)		
(10)		
(11)		

Instrument Calibration Data

Inst. No.	Time	Standard Solution	Response As Found	Response As Left	Solution Temp. (C)	Zero	Battery Check	Alarm Point	Notes
1	11:00	6.89	6.89		17.34				SC=6276
2	11:03			6.88					SC=4980
3	13:49	6.89	8.73	6.90					SC=3567
4				→					SC=4945
5	15:43	6.89	6.79						SC=4944
6									
7									
8									
9									
10									
11									

Review

On-Site Health and Safety Officer ________ Date ________

Site Manager/Project Manager ________ Date ________

Action

FIELD INSTRUMENT CALIBRATION RECORD

Leviathan Mine

Calibration Code:		Sheet 1 of 1
Employee Performing Calibration: Grey Reller		Date: 27 OCT 10
Instruments:	**Standards:**	**Lot Number and Expiration Date:**
Hanna 9828 meter with pH-ORP probe	pH = 7.00	7979, 18MAY11
	pH = 4.00	
	pH = 10.00	
	pH = 6.89	1964, 10/2014
	________ µS/cm	
	________ µS/cm	
	________ mV	

Instrument Calibration Data

Trial No.	Time	Parameter	Response As Found	Response As Left	Solution Temp. (C)	Zero	Battery Check	Alarm Point	Notes
1	8:40	pH	7.18	6.86	19.78		OK	N.A.	H898 28-0 SOLN
		Sc	4,950 µS	4,993	19.78		OK	N.A.	〃
									pH 7.00 STD SOLN
2	17:00	pH	7.08	6,508	16.19		〃		

Review

_______________________________ On-Site Health and Safety Officer — _________ Date

_______________________________ Site Manager/Project Manager — _________ Date

Action

07/27/10 04:49 PM

FIELD INSTRUMENT CALIBRATION RECORD

Leviathan Mine

Calibration Code:		Sheet 1 of 1
Employee Performing Calibration: Jimmy Steele		Date: 11/18/10
Instruments: Hanna HI 9828	**Standards:**	**Lot Number and Expiration Date:**
(1) pH meter	pH = 7.00	
(2) pH meter	pH = 4.00	
(3) pH meter	pH = 10.00	
(4) Specific conductance meter	________ µS/cm	
(5) Specific conductance meter	________ µS/cm	
(6) Oxidation reduction potential meter	________ mV	
(7) DO meter		
(8)		
(9)		
(10)		
(11)		

Instrument Calibration Data

Inst. No.	Time	Standard Solution	Response As Found	Response As Left	Solution Temp. (C)	Zero	Battery Check	Alarm Point	Notes
1	11:35	HI 9828-0 pH = 6.99	7.05	6.84	18.89				
2			SC = 4876	SC = 4991					
3	16:12			6.56	10.12				
4									
5									
6									
7									
8									
9									
10									
11									

Review

Action

______________________________ On-Site Health and Safety Officer ________ Date

______________________________ Site Manager/Project Manager ________ Date

08/04/09 11:07 AM

LEVIATHAN MINE
WATER QUALITY MONITORING

Date: 11/18/10 Weather Conditions: clear, Breezy Personnel: Jimmy Steele / Greg Reller

Location	Time	pH	Temperature (C)	Specific Cond. (µS/cm)	Eh (mV)	Comments
Leviathan Creek, Station 1	11:50	6.68	0.79	125	17.8	
Pit Clarifier						
PWTS Discharge Weir Box						
Leviathan Creek upstream from the CUD	13:36	6.72	4.86	282	-33.3	
CUD	13:22	5.10	8.91	2507	-55.1	
Leviathan Creek downstream from the CUD	13:43	6.14	4.58	714	-39.1	
Leviathan Creek upstream from Delta Seep	13:53	6.36	5.13	828	-48.8	
Delta Seep (~~collection~~ tank)	14:00	5.70	7.10	1691	-67.7	measured at at fall
Leviathan Creek downstream from Delta Seep	14:08	5.85	5.38	776	-38.9	
Aspen Seep (influent weir box)						
Aspen Bioreactor Settling Pond						
Leviathan Creek, Station 15	14:48	5.54	5.86	1069	-27.5	
Aspen Creek, Station 16	15:48	6.66	3.14	432	-38.5	
Leviathan Creek, Station 17	14:36	6.18	4.41	729	-25.5	
Leviathan Creek, Station 23	15:59	6.68	3.28	702	-48.0	
Mountaineer Creek, Station 24	16:03	6.93	3.20	146	-61.4	
Bryant Creek, Station 25	16:07	6.89	3.23	320	-60.4	
Aspen Creek above site						
Beaver Dam Downstream	15:00	5.51	6.69	1164	-48.5	
western chnnl between Dams	15:08	4.65	4.84	1348	-3.4	
Eastern chnnl between Dams	15:14	5.62	4.72	1192	-58.5	
Main Dam western abutment	15:20	5.81	4.42	1078	-49.3	
western abutment of upstream Dam	15:29	5.67	3.76	998	-31.1	

Leviathan Mine Superfund Site Monitoring Well Water Level Measurements

WNDY/COOL/SLT CLOUDS

Well Number	Northing	Easting	TOC Elevation (feet msl)	Total Depth[1] 7/7/2006	Date: DTW (ft)	18 NOV 10 Time	Comments
MW-1	385684.28	2668848.50	7085.27	76.18	56.54	11:40	
MW-2D	386459.41	2668627.72	7043.84	85.83	30.77	12:16	ON 'L' FACING UP HILL
MW-2S	386456.26	2668628.32	7043.92	50.33	30.82	12:15	ON RIGHT
MW-3	387129.33	2668741.99	7076.39	42.39	22.45	12:40	
MW-4	387505.23	2669358.22	7160.02	35.39	25.10	12:33	
MW-5D	386528.48	2669272.11	7105.14	84.38	69.34	12:27	SHORTER OF 2 + DOWN HILL
MW-5S	386530.53	2669270.88	7104.02	47.68	N.M.	—	USUALLY DRY
MW-6	386285.42	2668236.24	7041.82	98.4	71.15	12:48	
MW-7	385629.95	2667410.50	7044.97	35.35			N.M.
MW-8	386474.24	2667588.11	7043.38	159.4			N.M.
MW-9	386808.44	2667741.76	6990.64	29.34			N.M.
MW-10D	386889.18	2667419.17	6921.38	76.98	24.03	12:53	
MW-10S	386890.62	2667417.73	6919.23	40.31	21.14	12:54	
MW-11	386689.18	2666950.41	6924.43	20.37	13.39	12:58	
25	387220.01	2671002.31	7382.40	106.6			
31	385609.79	2670196.18	7314.43	1623			
33	385931.61	2669994.93	7298.65	112.1			

Note:
1 Depth to water and total depth measurements are in feet below the mark on the top of the well casing.

APPENDIX D: MONITORING WELL HYDROGRAPHS 12 Pages

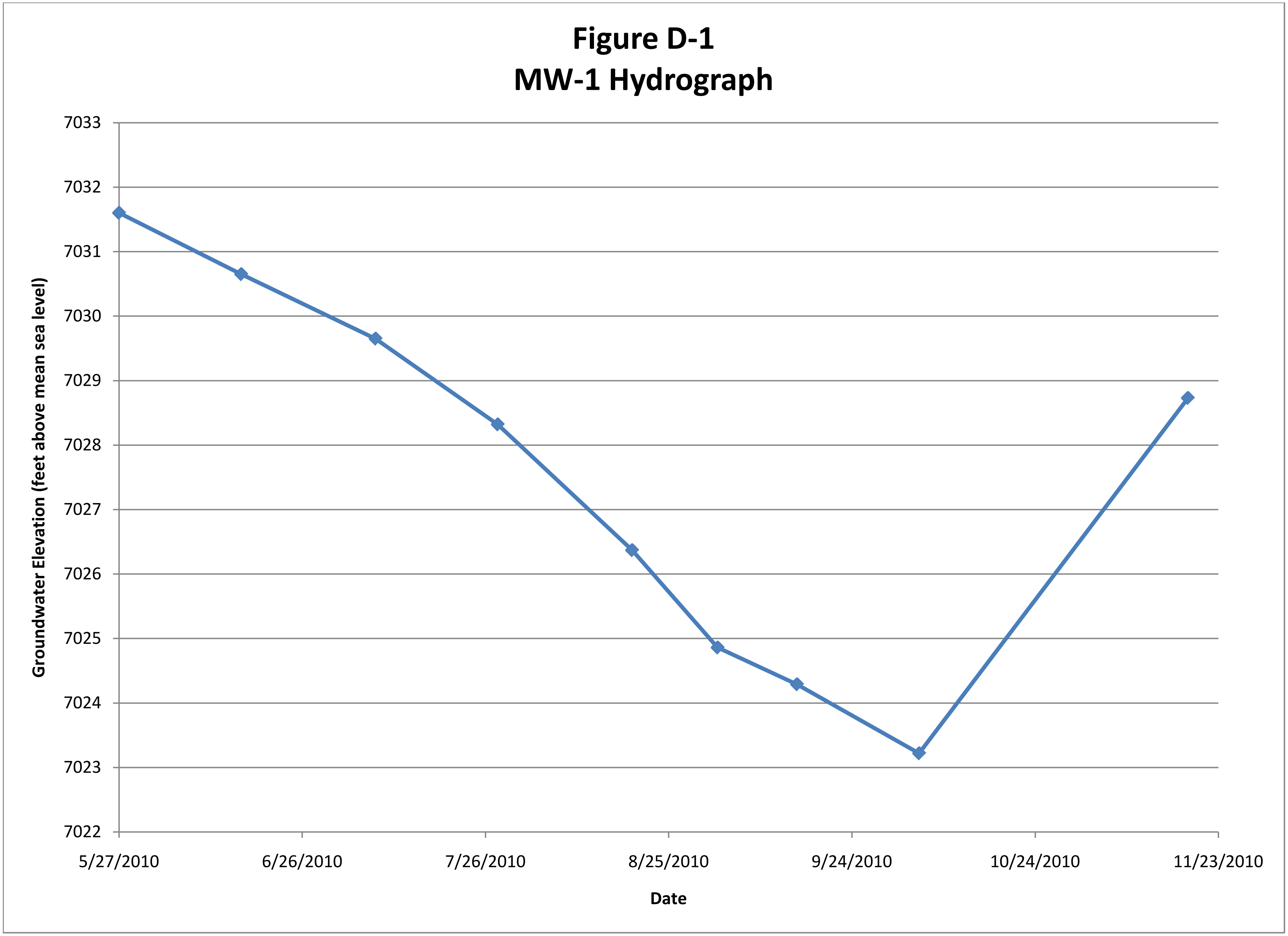
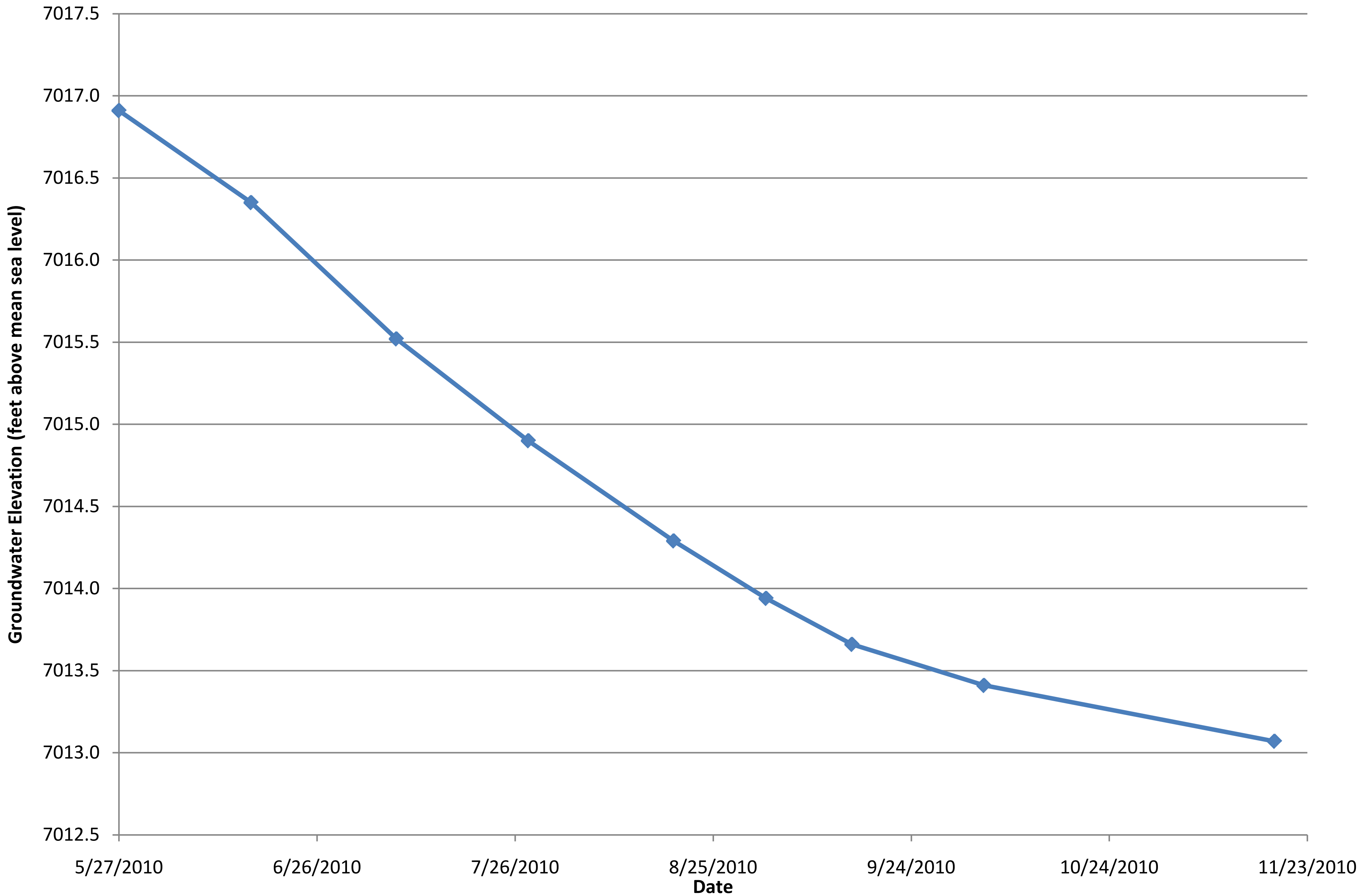


Figure D-1
MW-1 Hydrograph
Groundwater Elevation (feet above mean sea level)
7033
7032
7031
7030
7029
7028
7027
7026
7025
7024
7023
7022
5/27/2010
6/26/2010
7/26/2010
8/25/2010
9/24/2010
10/24/2010
11/23/2010
Date

Figure D-2
MW-2D Hydrograph



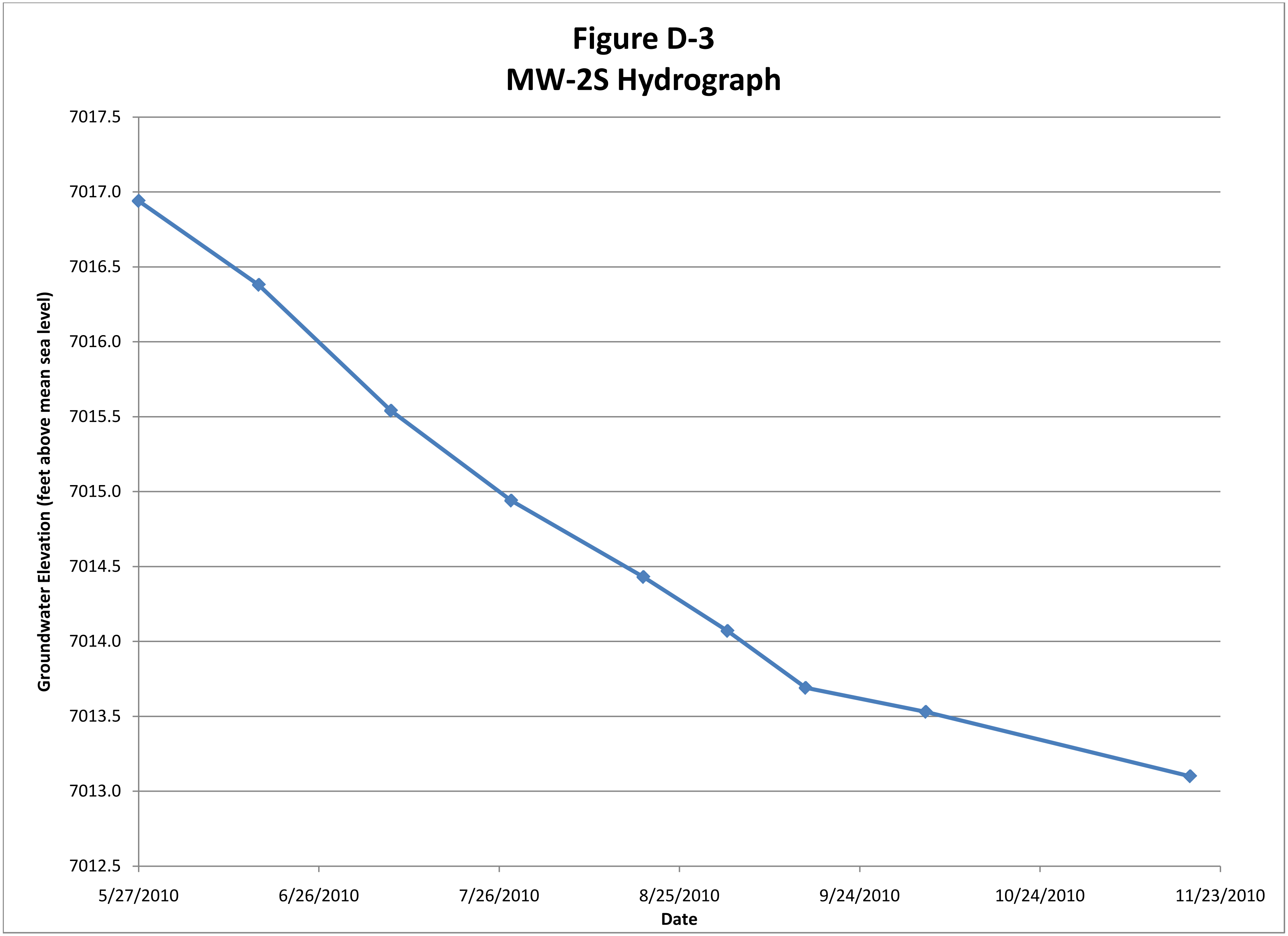


Figure D-3
MW-2S Hydrograph
Groundwater Elevation (feet above mean sea level)
7017.5
7017.0
7016.5
7016.0
7015.5
7015.0
7014.5
7014.0
7013.5
7013.0
7012.5
5/27/2010
6/26/2010
7/26/2010
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9/24/2010
10/24/2010
11/23/2010
Date

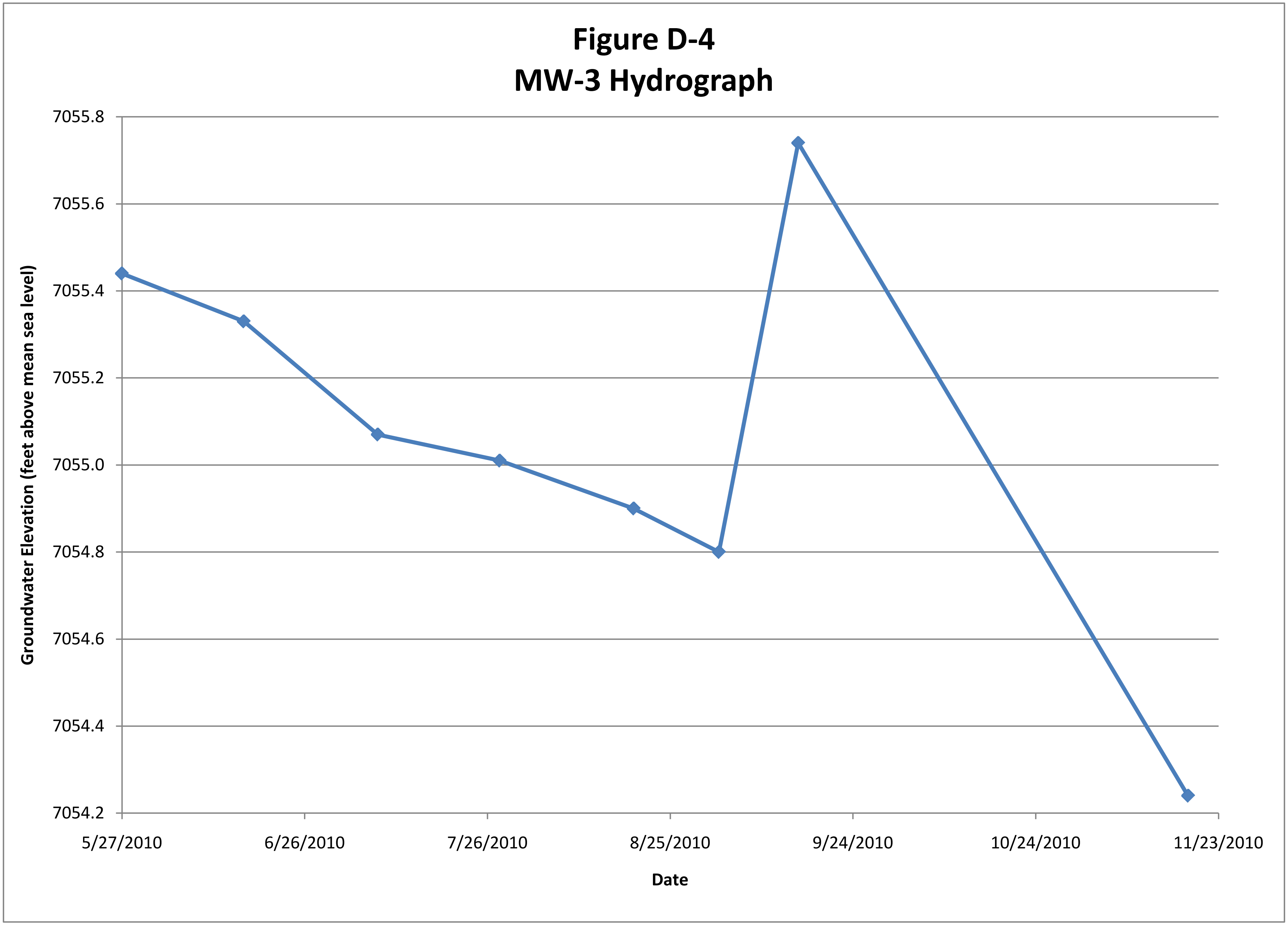

Figure D-4
MW-3 Hydrograph
7055.8
7055.6
7055.4
7055.2
7055.0
7054.8
7054.6
7054.4
7054.2
Groundwater Elevation (feet above mean sea level)
5/27/2010
6/26/2010
7/26/2010
8/25/2010
9/24/2010
10/24/2010
11/23/2010
Date

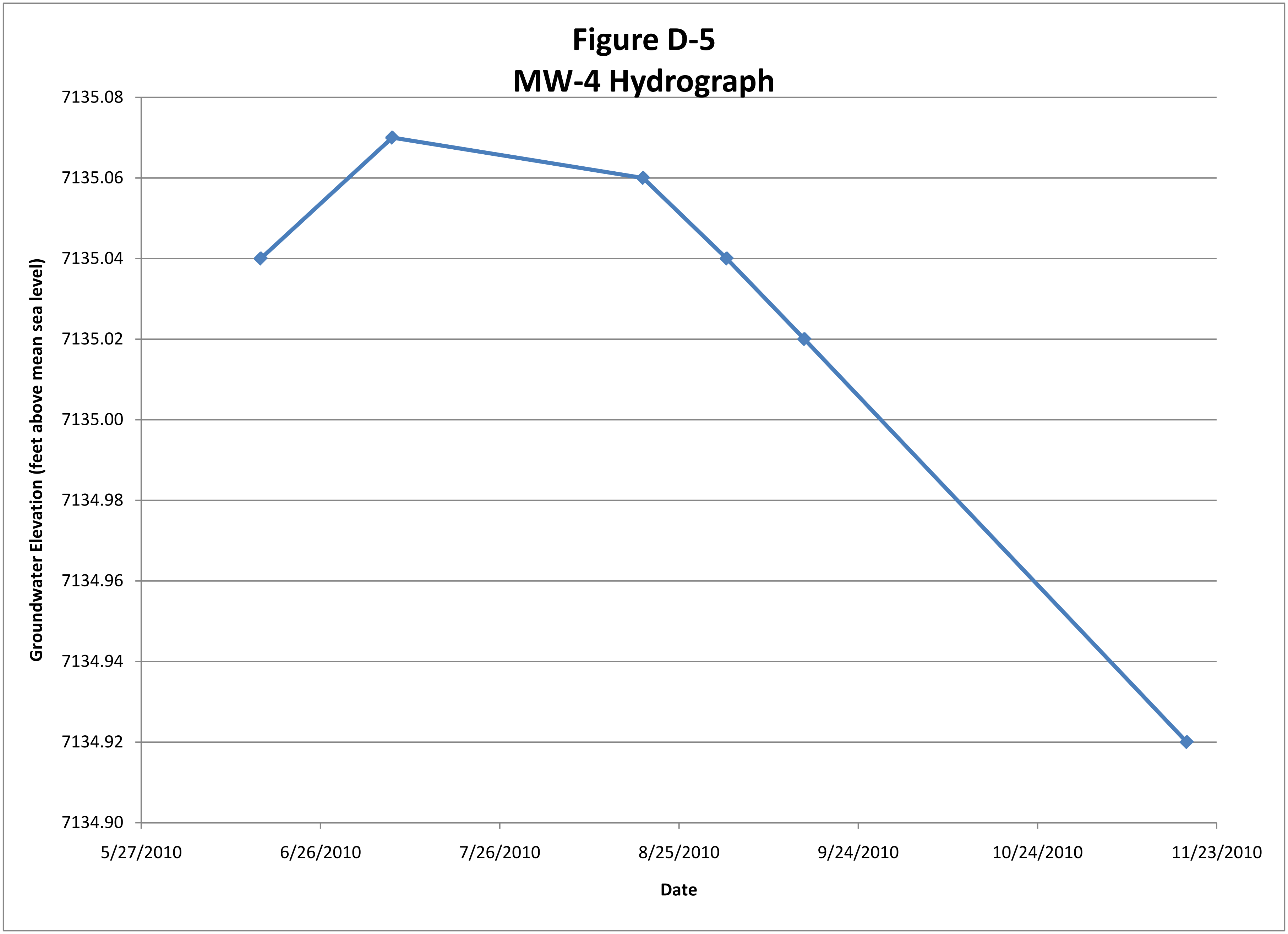

Figure D-5
MW-4 Hydrograph
Groundwater Elevation (feet above mean sea level)
7135.08
7135.06
7135.04
7135.02
7135.00
7134.98
7134.96
7134.94
7134.92
7134.90
5/27/2010
6/26/2010
7/26/2010
8/25/2010
9/24/2010
10/24/2010
11/23/2010
Date

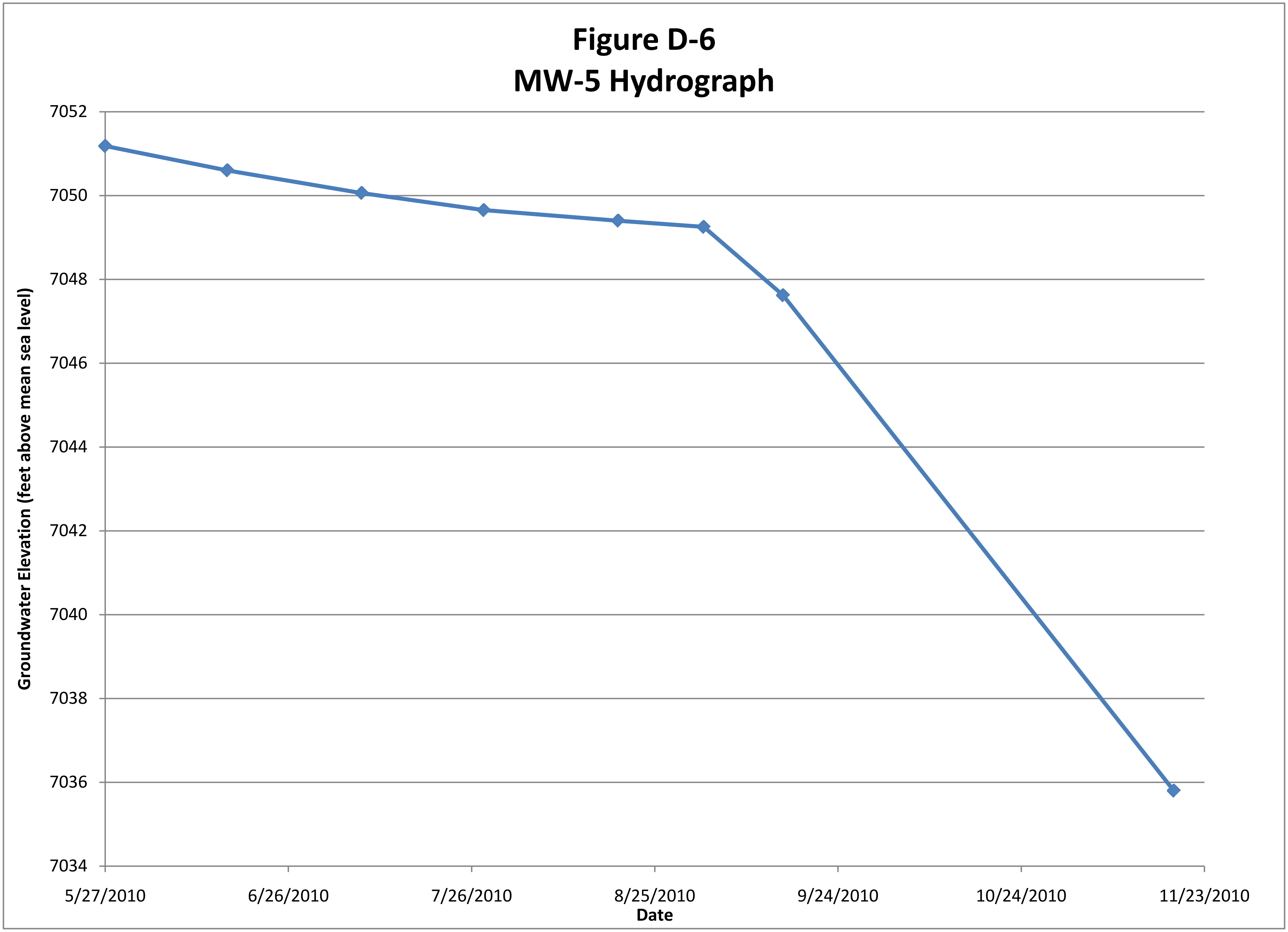
Figure D-6
MW-5 Hydrograph
7052
7050
7048
7046
7044
7042
7040
7038
7036
7034
Groundwater Elevation (feet above mean sea level)
5/27/2010
6/26/2010
7/26/2010
8/25/2010
9/24/2010
10/24/2010
11/23/2010
Date

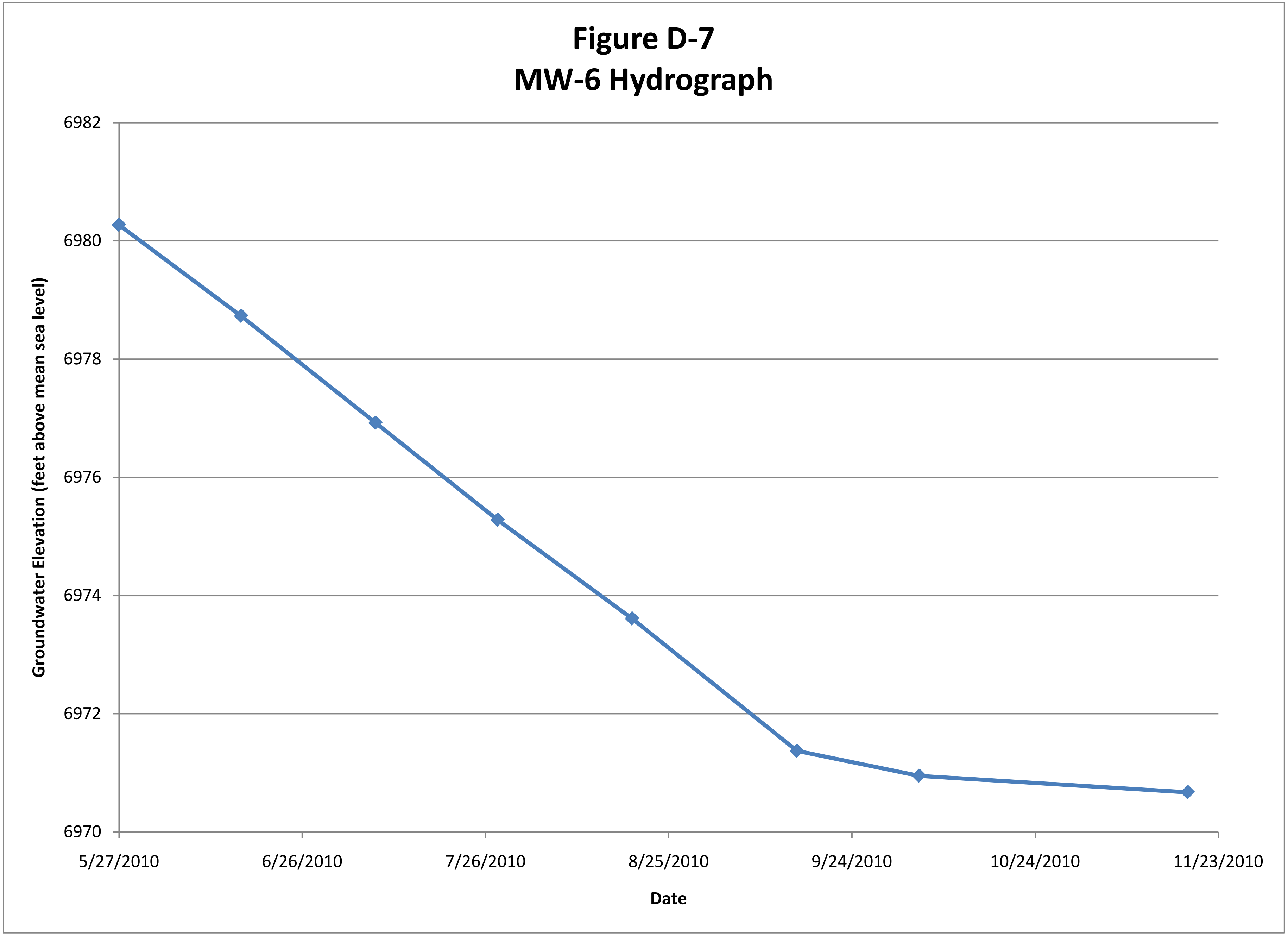

Figure D-7
MW-6 Hydrograph
6982
6980
6978
6976
6974
6972
6970
Groundwater Elevation (feet above mean sea level)
5/27/2010
6/26/2010
7/26/2010
8/25/2010
9/24/2010
10/24/2010
11/23/2010
Date

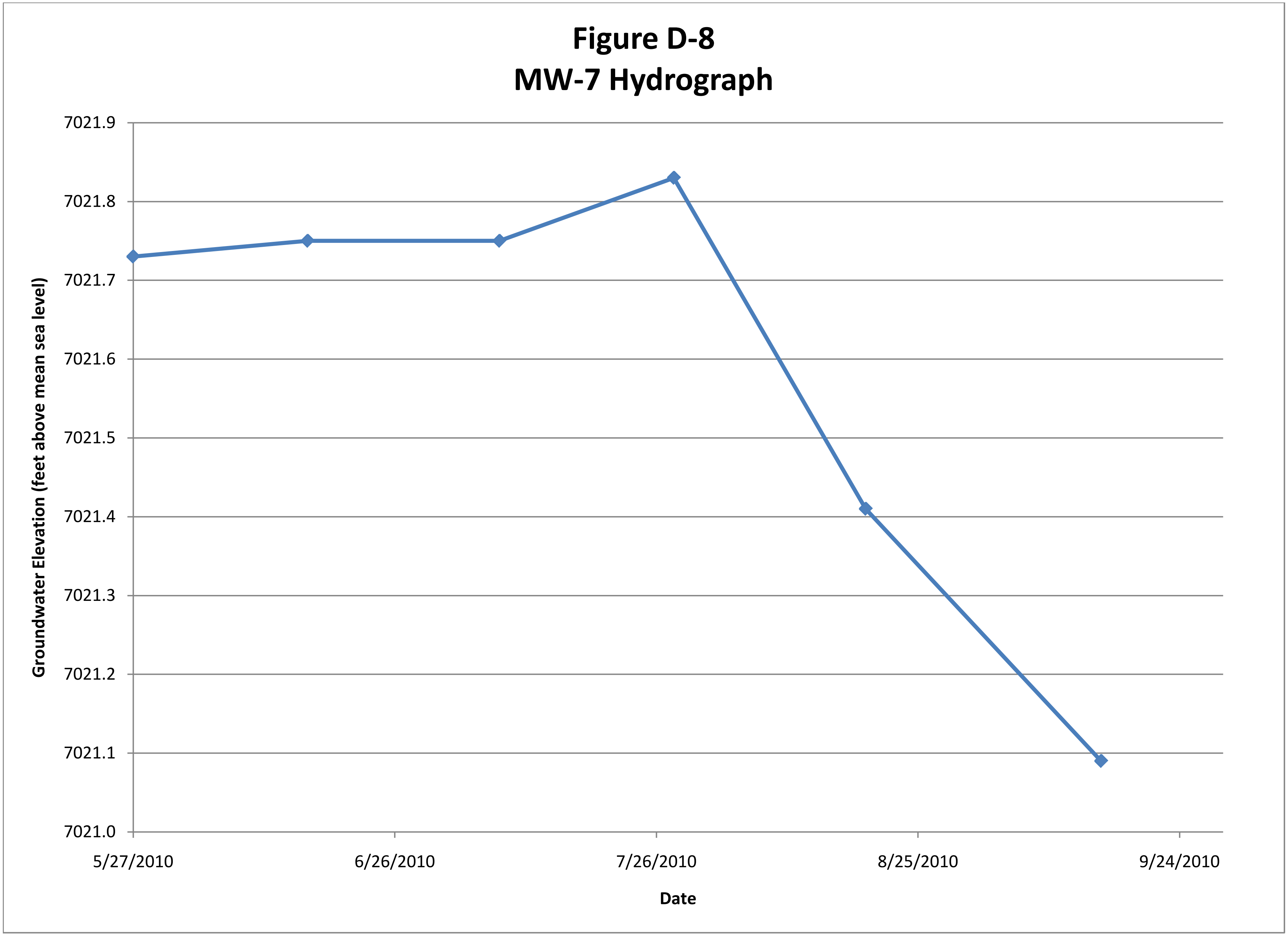
Figure D-8
MW-7 Hydrograph
7021.9
7021.8
7021.7
7021.6
7021.5
7021.4
7021.3
7021.2
7021.1
7021.0
Groundwater Elevation (feet above mean sea level)
5/27/2010
6/26/2010
7/26/2010
8/25/2010
9/24/2010
Date

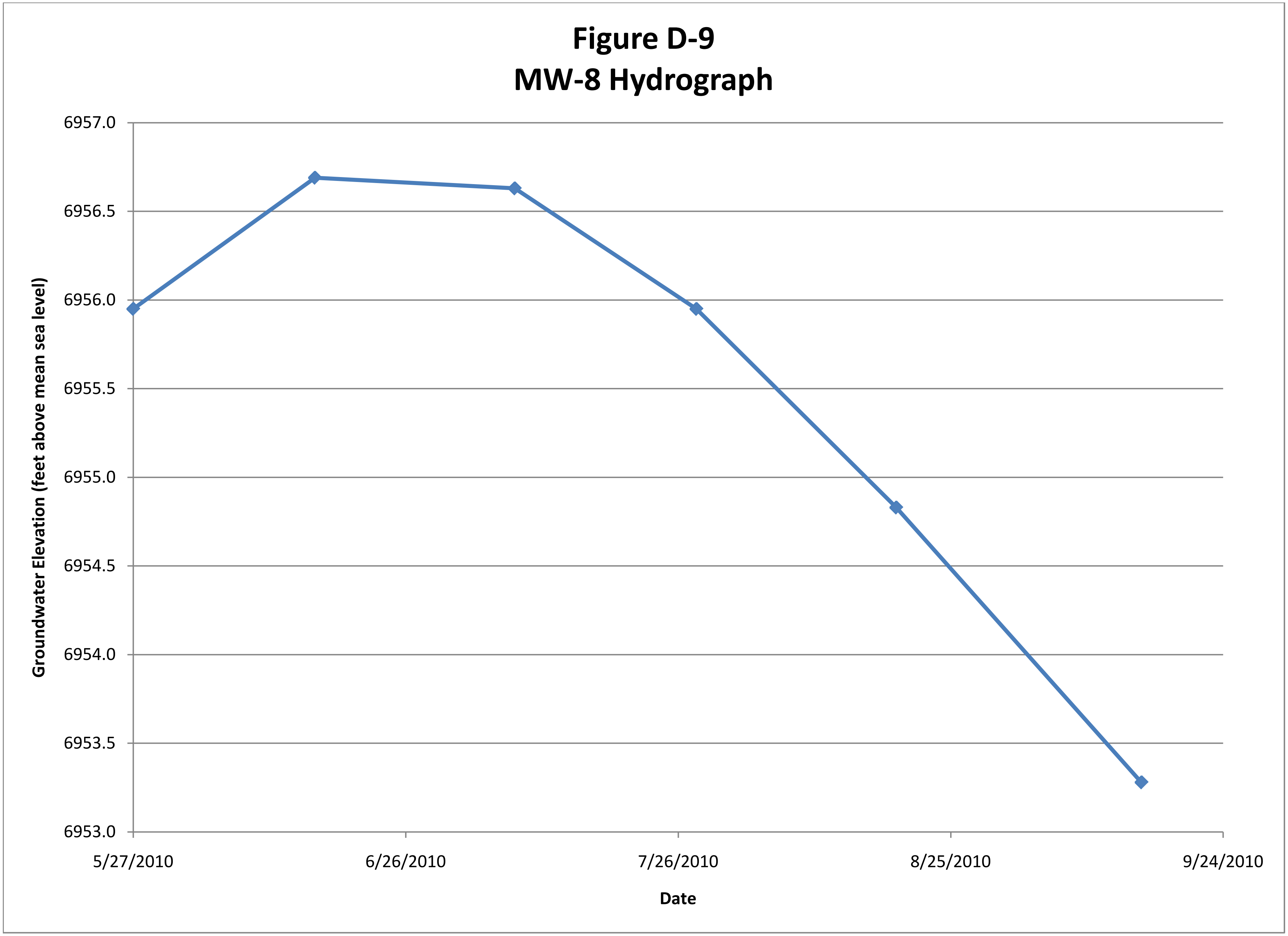

Figure D-9
MW-8 Hydrograph
Groundwater Elevation (feet above mean sea level)
6957.0
6956.5
6956.0
6955.5
6955.0
6954.5
6954.0
6953.5
6953.0
5/27/2010
6/26/2010
7/26/2010
8/25/2010
9/24/2010
Date

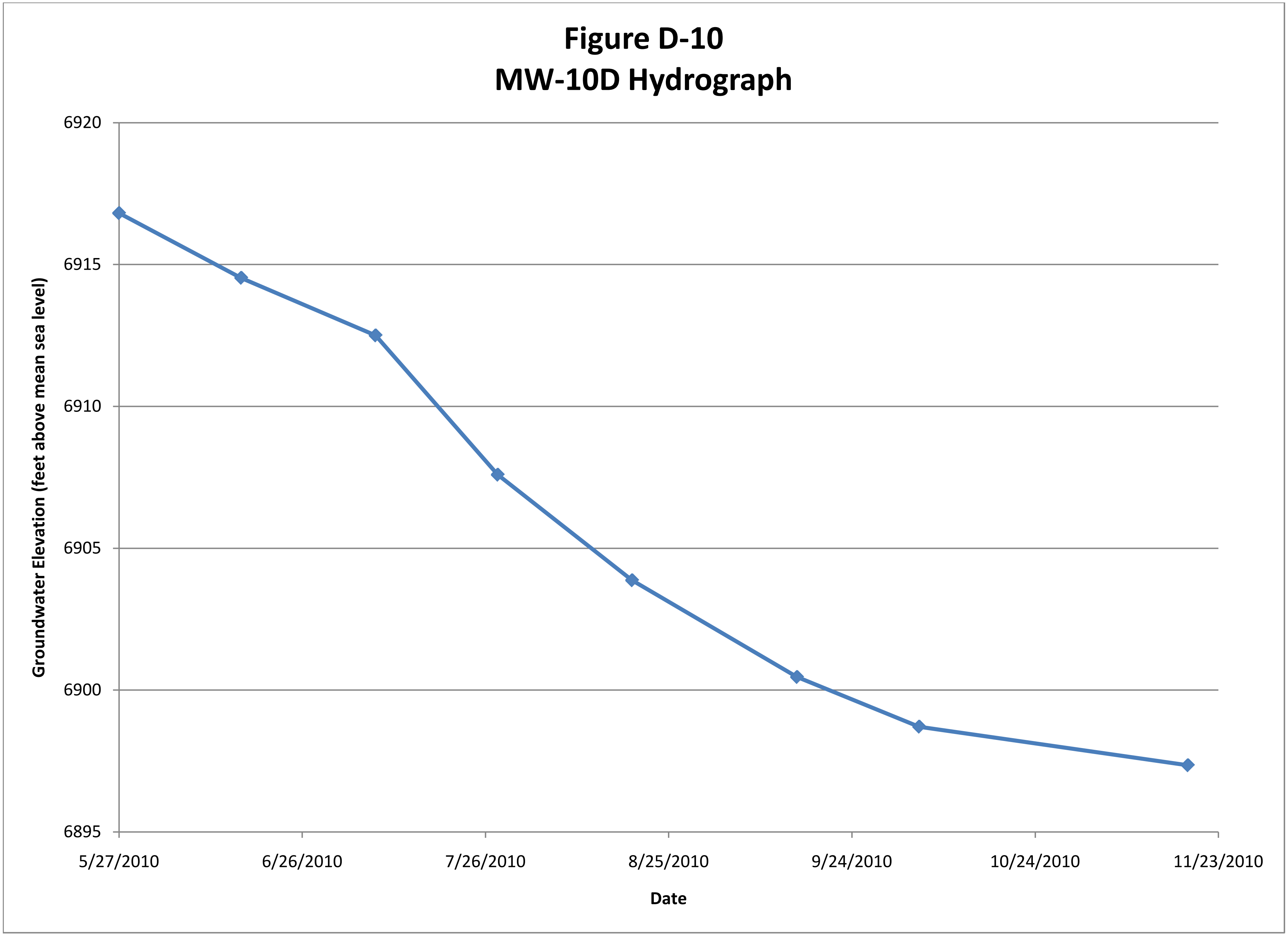
Figure D-10
MW-10D Hydrograph
6920
6915
6910
6905
6900
6895
Groundwater Elevation (feet above mean sea level)
5/27/2010
6/26/2010
7/26/2010
8/25/2010
9/24/2010
10/24/2010
11/23/2010
Date

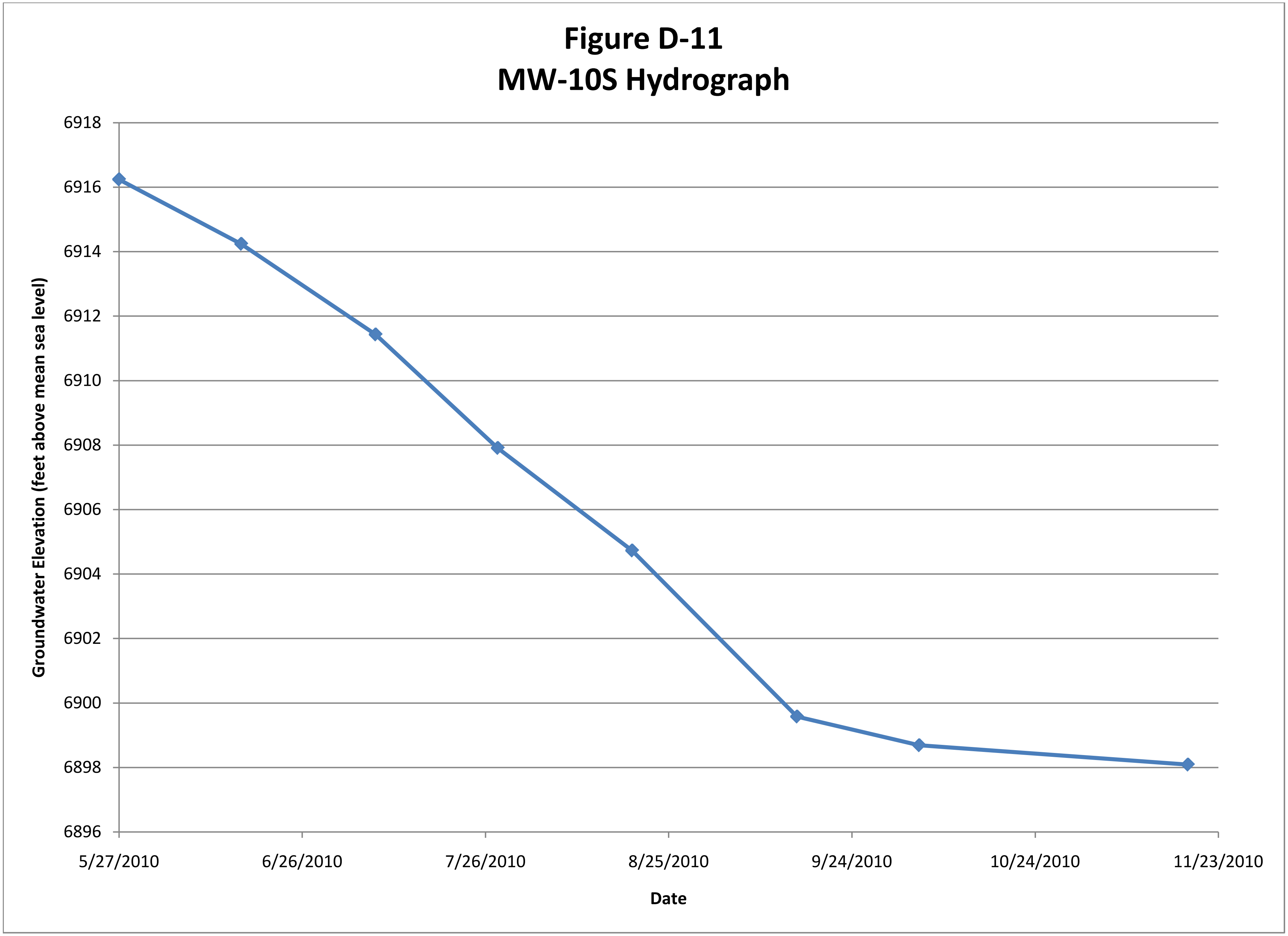
Figure D-11
MW-10S Hydrograph
Groundwater Elevation (feet above mean sea level)
6918
6916
6914
6912
6910
6908
6906
6904
6902
6900
6898
6896
5/27/2010
6/26/2010
7/26/2010
8/25/2010
9/24/2010
10/24/2010
11/23/2010
Date

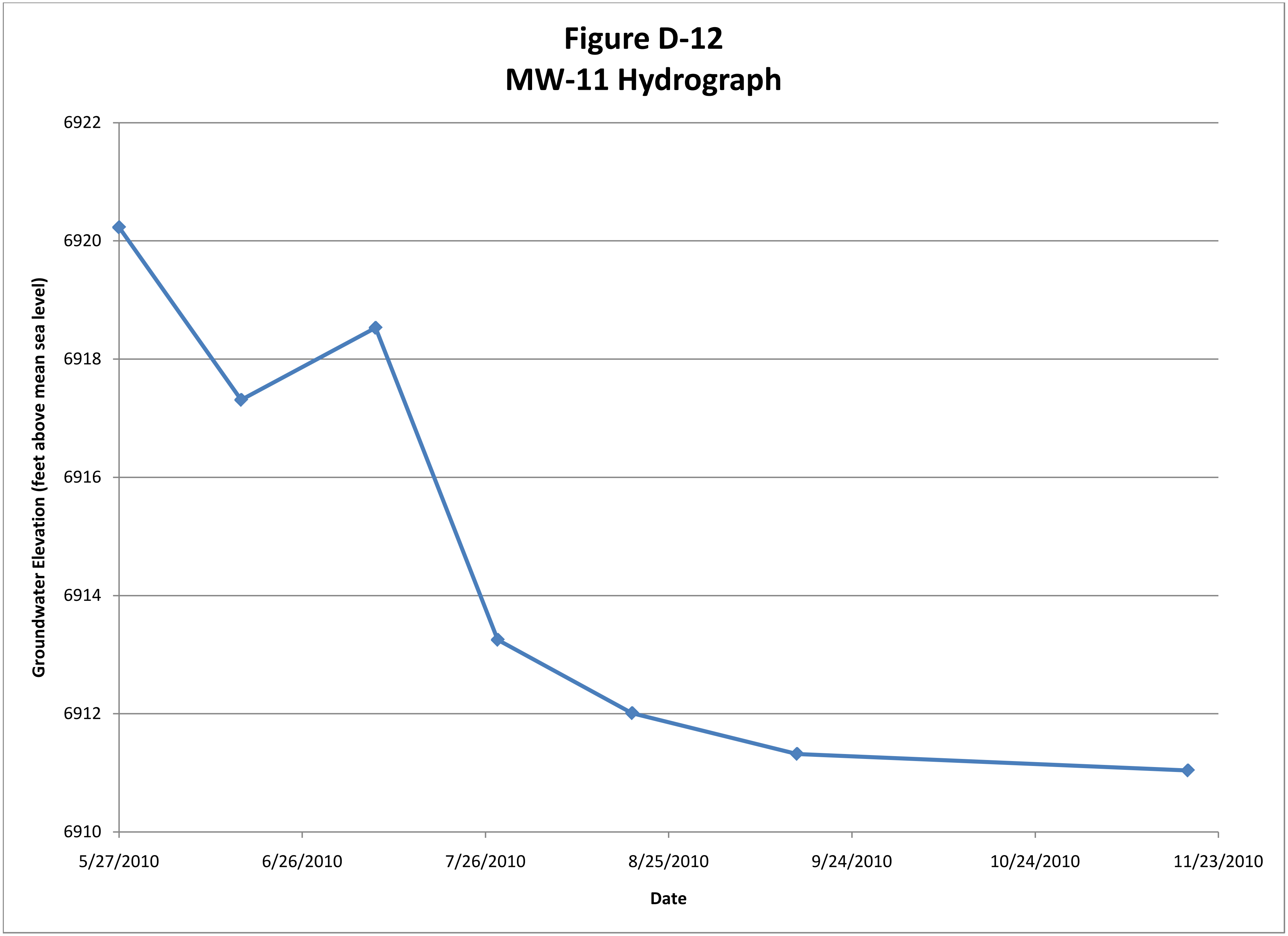
Figure D-12
MW-11 Hydrograph
Groundwater Elevation (feet above mean sea level)
6922
6920
6918
6916
6914
6912
6910
5/27/2010
6/26/2010
7/26/2010
8/25/2010
9/24/2010
10/24/2010
11/23/2010
Date