ATTACHMENT A

2007-08 Work Plan Amendments

Atlantic Richfield Company

Roy I. Thun
Environmental Business Manager

6 Centerpointe Drive
LaPalma, CA 90623-1066
Office: (661) 287-3855
Fax: (661) 222-7349
E-mail: thunri1@bp.com

June 26, 2007

Mr. Kevin Mayer
SFD-7-2
USEPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

RE: Leviathan Mine, Alpine County, California:
HDS Treatment System
Process Design Criteria and Technical Decision Memorandum

Dear Mr. Mayer:

As discussed with Grant Ohland last week, Atlantic Richfield is submitting for EPA's review the enclosed Process Design Criteria and Technical Decision Memorandum for the proposed High Density Sludge (HDS) Treatment Plant at the Leviathan Mine Site. This submittal includes: (i) a Design Criteria and Verification Plan; (ii) a Technical Decision Memorandum, and (iii) the Process Flow Diagram and Building Layout Arrangement Drawings for the system.

These documents set forth the design basis for the HDS Treatment System, which is intended to be implemented at the Site as a treatability study for treating acid mine drainage from the Channel Underdrain and Delta Seep. A more conceptual description of the HDS Treatment System was included in the 2007-08 Treatability Studies and Interim Treatment Work Plan (Work Plan) submitted to EPA on June 21, 2007, and in the Work Plan Summary submitted to EPA on May 25, 2007 (approved with comments by letter dated June 7, 2007).

Atlantic Richfield's consultants and engineers have arrived at the design for the HDS Treatment System after careful consideration of discharge criteria, historical water quality and flow data, the results of and lessons learned from prior water treatment efforts, site conditions, access limitations, EPA's stated objectives for removal actions at the Site, and various other factors. The submission and finalization of these documents is a critical step in the implementation process because, in accordance with the standard design practices, all subsequent engineering and procurement activities associated with the HDS Treatment System will depend on meeting the requirements described in the attached submittal.

While Atlantic Richfield is submitting this information for EPA's approval, it should be understood that the anticipated time frames for 2008 treatment activities described in the Work Plan submitted to EPA last week (*see* Section 7.0 and Figure 7-1) assume expedited review and approval by EPA. Also, if material changes to the design criteria or other construction specifications are recommended, they may delay the timing of the commissioning of the HDS Treatment System from what is currently planned.

For the time being, Atlantic Richfield is moving ahead with certain aspects of the design process, including developing equipment specifications, identifying prospective subcontractors and equipment vendors, preparing and distributing Requests for Quotes (RFQs) and bid packages to equipment vendors and subcontractores. However, we will await EPA's review and approval of the enclosed Process Design Criteria and Technical Decision Memorandum before proceeding with equipment orders, system fabrication and formal retention of vendors and subcontractors. In the meantime, Atlantic Richfield will be preparing and providing to EPA further detailed information on the schedule for the completion of the design and construction of the HDS Treatment System including design specifications for the treatment building and the CUD and DS collection and conveyance systems. Atlantic Richfield also proposes monthly conference calls with EPA to provide status updates on work progress. These monthly conference calls are proposed for the third Tuesday of each month beginning at 8 am PDT.

It would be preferred for scheduling purposes if Atlantic Richfield could receive EPA's response to the enclosed materials within the next ten days. Please contact Grant Ohland or me with any immediate questions or comments or if you need further information about the technical aspects of the HDS Treatment System.

Sincerely,

Roy Thun
Environmental Business Manager

cc: Richard Booth, Lahontan Regional Water Quality Control Board
Chris Winsor, Atlantic Richfield Company – via electronic
Todd Normane, Esq. Atlantic Richfield Company – via electronic
Adam Cohen, Esq. Davis Graham & Stubbs LLP – via electronic
Grant Ohland, Geomatrix – via electronic
Doug Lee, AMEC – via electronic
Thomas Higgs, AMEC – via electronic
Sandy Riese, EnSci – via electronic

Process Design Criteria
and Technical Decision Memorandum
High Density Sludge Treatment Plant
Leviathan Mine
Alpine County, California

Prepared for:

Atlantic Richfield Company
6 Centerpointe Drive
LaPalma, CA 90623-1066

Prepared by:

Geomatrix Consultants, Inc.
1401 17th Street, Suite 600
Denver, Colorado 80202
(303) 534-8722

and

AMEC
111 Dunsmuir Street, Suite 400
Vancouver, British Columbia
Canada V6B 5W3
(604) 664-4367

June 2007

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ATTACHMENTS

DRAWINGS

PROCESS DESIGN CRITERIA
AND TECHNICAL DECISION MEMORANDUM
Leviathan Mine
Alpine County, California

1.0 INTRODUCTION

This Process Design Criteria and Technical Decision Memorandum (Memorandum) has been prepared by Geomatrix Consultants, Inc. (Geomatrix) and AMEC (AMEC) on behalf of Atlantic Richfield Company (Atlantic Richfield) to transmit design criteria and other details related to the engineering design of the High Density Sludge (HDS) Treatment Plant planned for initial construction at the Leviathan Mine Site (Site) in 2007 and completion and operation in 2008. Conceptual plans for the HDS Treatment Plant were provided in the 2007-08 Treatability Studies and Interim Treatment Work Plan (Work Plan) submitted to EPA on June 21, 2007. The information contained in this Memorandum is intended to supplement the information provided in the Work Plan and provide additional details on the key design parameters for the HDS Treatment Plant. The purpose of this Memorandum is to provide EPA and other project stakeholders with detailed design criteria prior to the completion of engineering designs and the procurement of treatment plant equipment. Although system implementation is currently planned for third quarter 2008, Atlantic Richfield is providing this information now to avoid scheduling delays and to facilitate the initiation of equipment procurement and system fabrication during the 2007 treatment/construction season.

2.0 SUMMARY OF KEY DESIGN PARAMETERS

This Memorandum contains design parameters for the HDS Treatment Plant including but not limited to the following:

- Design influent water quality
- Design flow rates
- Design effluent criteria
- Plant design life and operating basis
- Estimated lime usage and sludge generation rates

Detailed information on these process design criteria are provided in the Design Criteria and Verification Plan provided as Attachment A. Information regarding the process building, dry lime and flocculant feed systems, electrical and control systems, and other major equipment components are provided in the Technical Decision Memorandum (Attachment B). Engineering drawings showing general mechanical layouts and process flow are also attached.

ATTACHMENT A

Design Criteria and Verification Plan

DESIGN CRITERIA AND VERIFICATION PLAN CONTROL SHEET

PROJECT NO.:	**156495**	DESIGN CRITERIA NO.:	**156495-DC-20-P-001**	DATE:	**26 June, 2007**
CUSTOMER NAME:	Atlantic Richfield Company		REV.:		D
PROJECT TITLE:	Leviathan Water Treatment				
DESIGN CRITERIA NAME:	Process				
PLANT NAME:	2008 HDS Plant				
PLANT LOCATION:	California				

Issuing Records for this Document

Rev. No.	Issued Date	Issued for	Issued by
A	19/06/07	Approval	Doug Lee
B	19/06/07	Approval	Doug Lee
C	25/06/07	Approval	Doug Lee
D	26/06/07	Approval	Doug Lee

Approved by:

AMEC Project Manager

Doug Lee   *Date*

Discipline Lead

Tom Higgs   *Date*

Client Project Manager

Date

		Design Input	Design Output	Discipline	Verification Method	Rev. No.
Project No.:	**156495**					
Project Title:	**Leviathan Water Treatment**					
Major Area:	**2008 HDS Plant**					
Discipline:	**Process**					
Document Owner:	**T. Higgs**					
Project Document No.:	**156495-DC-20-P-001**					
Revision No.:	**D**					
Revision Date:	**26 June 2007**					

PROJECT SUMMARY					
The 2008 HDS Plant will be constructed with new equipment.			Pr		B

WATER ANALYSIS					

Description	**Units**	**Design**	**Comments**					
Influent Water Quality[1]								
Design Condition								
Aluminum	mg/L	60	At design flow	Ar		Pr		A
Arsenic	mg/L	1.0	At design flow	Ar		Pr		A
Cadmium	mg/L	0.005	At design flow	Ar		Pr		B
Calcium	mg/L	310	At design flow	Ar		Pr		A
Chromium	mg/L	0.02	At design flow	Ar		Pr		B
Copper	mg/L	0.04	At design flow	Ar		Pr		B
Iron	mg/L	500	At design flow	Ar		Pr		A
Lead	mg/L	0.002	At design flow	Ar		Pr		B
Magnesium	mg/L	85	At design flow	Ar		Pr		A
Manganese	mg/L	25	At design flow	Ar		Pr		A
Nickel	mg/L	2.0	At design flow	Ar		Pr		A
Selenium	mg/L	0.005	At design flow	Ar		Pr		B
Zinc	mg/L	0.4	At design flow	Ar		Pr		A
Sulphate	mg/L	2,500	At design flow	Ar		Pr		A
pH		2.9	At design flow	Ar		Pr		B

[1] Summarized data from 2006 HDS Preliminary DSR Summary Tables – EMC2

DESIGN AND VERIFICATION CODES

Design Input
A = AMEC Database / Recommendation
C = Calculated
E = Estimate
N = Industry Standard (Practice)
O = Other
Ar = Atlantic Richfield/EMC2
R = Regulatory Requirement
T = Testwork Data
V = Vendor Data

Principal Design Output
DS = Design & Material Standard/Spec'n
PD = P&ID/P&C/flowsheet
OL = One Line Diagram
LD = Logic Description
PS = Process Functional Specification
SP = Site Plan & Facility Layout
EL = Equipment Layout
ES = Equipment Specification
OT = Other Drawings
CS = Construction Specifications

Discipline
Ar = Architectural
Ci = Civil
El = Electrical
He = HVAC
In = Instrument & Controls
Me = Mechanical
Mi = Mining
Pi = Piping
Pr = Process
SA = Structural & Arch. Dwg.
St = Structural

Verification Method
Ch = Checking
DR = Design Review
AC = Alternate Calculation
CR = Constructability Review
HA = HAZOP Study
CE = Compare to existing
LT = Lab Testing

		Design Input	Design Output	Discipline	Verification Method	Rev. No.
Project No.:	**156495**					
Project Title:	**Leviathan Water Treatment**					
Major Area:	**2008 HDS Plant**					
Discipline:	**Process**					
Document Owner:	**T. Higgs**					
Project Document No.:	**156495-DC-20-P-001**					
Revision No.:	**D**					
Revision Date:	**26 June 2007**					

Description	Units	Design Effluent Criteria[1]	Maximum Effluent Criteria[2]	Four Day Average[1]					
Discharge Water Quality[3]									
pH		6.0 to 9.0		6.0 to 9.0	R		Pr		A
Aluminum (Diss)	mg/L	2.0	4.0	2.0	R		Pr		B
Arsenic (Diss)	mg/L	0.15	0.34	0.15	R		Pr		B
Cadmium (Diss)	mg/L	0.004	0.009	0.004	R		Pr		B
Chromium (Diss)	mg/L	0.31	0.97	0.31	R		Pr		B
Copper (Diss)	mg/L	0.016	0.026	0.016	R		Pr		B
Iron (Diss)	mg/L	1.0	2.0	1.0	R		Pr		B
Lead (Diss)	mg/L	0.005	0.136	0.005	R		Pr		B
Nickel (Diss)	mg/L	0.094	0.84	0.094	R		Pr		B
Selenium (Total)	mg/L	0.005		0.005	R		Pr		B
Zinc (Diss)	mg/L	0.21	0.21	0.21	R		Pr		B

[1] Concentrations based on four daily grab samples, each grab sample field-filtered and acid fixed promptly after collection
[2] Concentration based on daily grab sample
[3] Based on hardness value of 200 mg/L as $CaCO_3$ mg/L

		Design Input	Design Output	Discipline	Verification Method	Rev. No.
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Project Title:	**Leviathan Water Treatment**					
Major Area:	**2008 HDS Plant**					
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Project Document No.:	**156495-DC-20-P-001**					
Revision No.:	**D**					
Revision Date:	**26 June 2007**					

WATER TREATMENT PLANT					
The plant will be designed for continuous service, 24 hours per day, seven days per week for an estimated treatment season of seven months per year.	Ar		Pr		A

Description	**Units**	**Design**	**Comments**					
Plant Design								
Expected life of plant	years	5		Ar		Pr		A
Operating Basis								
Annual	months	7		Ar		Pr		A
Daily	h/d	24		Ar		Pr		A
Processing Rate								
Design	gpm	100		A	PD	Pr	Ch	B
Minimum	gpm	35		A	PD	Pr	Ch	A
Reactor Tank								
Retention time	min	60	Based on design flow	A	ES	Pr	Ch	B
pH		8.5-9.5		A		Pr		A
Aeration rate	SCFM	40		E	PD	Pr	Ch	B
Agitation			Air dispersion & mixing	A	ES	Pr	Ch	A
Lime/Sludge Mix Tank								
Retention time	min	4	Based on design flow	A	ES	Pr	Ch	B
Agitation			Solids suspension	A	ES	Pr	Ch	A
Clarifier								
Rise Rate								
At Design Flowrate	gpm/ft2	0.5		A		Pr	Ch	A
Underflow density								
Hydraulic design	% solids	20		A		Pr	Ch	A
Expected	% solids	30		A		Pr	Ch	A
Lime								
Total $Ca(OH)_2$ Dosage	mg/L	2300	Based on design flow	Ar	ES	Pr	Ch	A
Sludge								
Maximum Sludge Generation Rate	g/L	2.42	Based on design flow	E	PD	Pr	Ch	A

		Design Input	Design Output	Discipline	Verification Method	Rev. No.
Project No.:	**156495**					
Project Title:	**Leviathan Water Treatment**					
Major Area:	**2008 HDS Plant**					
Discipline:	**Process**					
Document Owner:	**T. Higgs**					
Project Document No.:	**156495-DC-20-P-001**					
Revision No.:	**D**					
Revision Date:	**26 June 2007**					

Description	**Units**	**Design**	**Comments**					
Maximum Dry Sludge Production	t/d	1.4	Based on design flow	E	PD	Pr	Ch	B
Design Mass Recycle Ratio		20	Based on design flow	E	PD	Pr	Ch	A
Maximum Sludge Recycle Rate @20% Solids	gpm	31	Based on design flow	A	PD/ES	Pr	Ch	A
Flocculant								
Type		Anionic		A		Pr		A
Consumption	mg/L	3	Based on design flow	E	PD/ES	Pr	Ch	A
Flocculant concentration								
Dry polymer	wt%	100		Ar	PD/ES	Pr	Ch	A
Feed to process	wt%	0.05	Fresh water dilution	A	PD/ES	Pr	Ch	A

Project No.:	156495	Design Input	Design Output	Discipline	Verification Method	Rev. No.
Project Title:	**Leviathan Water Treatment**					
Major Area:	**2008 HDS Plant**					
Discipline:	**Process**					
Document Owner:	**T. Higgs**					
Project Document No.:	**156495-DC-20-P-001**					
Revision No.:	**D**					
Revision Date:	**26 June 2007**					

ADDITIONAL DESIGN PARAMETERS AND CALCULATIONS

Parameters	Units	Case 1
Design Flow Rate	gpm	100
Reactor Residence Time	min	60
Mass Recycle Ratio		20
Recycle Flow Rate	gpm	31
Reactor Tank Size (minimum)	gal	6,000
Agitator Size (estimated minimum)	hp	3
Air Supply Rate (nominal, total)	SCFM	40
Lime		
Lime Ca(OH)2 Dosage	mg/L	2300.0
Lime Consumption	lb/d	2765
Polymer		
Polymer Dosage	mg/L	3.0
Polymer Consumption	lb/d	3.5
Primary Polymer Solution Concentration	%	0.50
Dilute Polymer Solution Feed Rate (0.05% concentration)	gph	36
Sludge		
Feed TSS	g/L	0.1
Sludge Generation	g/L	2.42
Total Sludge Generation Rate	g/L	2.52
Sludge Production Dry Wt Basis	t/d	1.4
Sludge Percent Solids	w/w	20%
Sludge Production Wet Wt Basis	t/d	6.9
Sludge Solids S.G.		2.3
Sludge Slurry S.G.		1.09
Slurry Production	gph	67
Sludge Percent Solids	w/w	50%
Sludge Production Wet Wt Basis	t/d	2.7
Sludge Solids S.G.		2.3
Sludge Slurry S.G.		1.39
Sludge Disposal Rate	ft^3/d	70

ATTACHMENT B

Technical Decision Memo

TECHNICAL DECISION MEMO

PROJECT NO.:	**156495**	DATE:	**26 June 2007**
CUSTOMER NAME:	Atlantic Richfield Company		
PROJECT TITLE:	Leviathan Water Treatment		
TDM NO.:	002		
SUBJECT:	2008 HDS Plant Description		

Issuing Records for this Document

Rev. No.	Issued Date	Issued for	Issued by
A	19/06/07	Approval	Doug Lee
B	26/06/07	Approval	Doug Lee

Approved by:

AMEC Project Manager

_____________________ _____________________

Doug Lee *Date*

Discipline Lead

_____________________ _____________________

Tom Higgs *Date*

Client Project Manager

_____________________ _____________________

Date

Please refer to the following documents for further information:

- Process design criteria 156495-DC-20-P-001 Rev D
- Flowsheet D-156495-20-N-001 Rev P2

Process Building

- The process building will be a pre-engineered metal building. The building will house the process equipment, including the clarifier.
- The building design will be handled by Geomatrix with input on size and configuration from AMEC.

Reactor Tank (20-TK-001) and Reactor Tank Agitator (20-AG-001)

- The Reactor Tank and Reactor Tank Agitator are new equipment.
- Acid mine drainage will be introduced to the Reactor Tank from Pond 4
- A mixture of recycled sludge and lime will flow by gravity into the Reactor Tank from the Lime/Sludge Mix Tank.
- Overflow from the Reactor Tank will flow by gravity to the clarifier.
- A pH probe will be installed in the tank to enable control of lime addition into the Sludge/Lime Mix Tank.
- An air diffuser will be required under the eye of the agitator to enable introduction of air.
- Safe access to the top of the tank will be provided by a stairway leading to a platform over the tank with handrails.

Process Air Blower (20-BL-001A/B)

- Positive displacement blowers will provide process air into the Reactor Tank. One Blower will be duty, the other standby.

Sludge/Lime Mix Tank (20-TK-002) and Sludge/Lime Mix Tank Agitator (20-AG-002)

- The Sludge/Lime Mix Tank and the Sludge/Lime Mix Tank Agitator are new equipment.
- The Sludge/Lime Mix Tank will be supported and accessed from the Reactor Tank platform.
- Dry Hydrated Lime addition to the Sludge/Lime Mix Tank will be controlled by a variable speed Hydrated Lime Metering Screw from a small hopper located adjacent to the Sludge/Lime Mix Tank. The PLC will vary the screw speed based on the pH signal from the probe in Reactor Tank No. 1.

- Slurry from the Sludge/Lime Mix Tank will flow by gravity into the Reactor Tank.

Clarifier (20-CL-001), Sludge Recycle Pumps (20-PU-001A/B) and Sludge Waste Pumps (20-PU-002A/B)

- The clarifier and pumps are new equipment.
- The clarifier will consist of a steel tank supported on steel columns and beams to allow access to the sludge cone area, and a bridge with installed mechanism. The clarifier will be equipped with a lifting rake based on torque being imposed on the mechanism by the sludge bed.
- Recycle sludge will be pumped from the clarifier cone by the Sludge Recycle Pumps. One pump will be duty, the other standby.
- Waste sludge will be pumped from the clarifier cone periodically to the Sludge Waste Bins. One pump will be duty, the other standby.
- All the pumps will be equipped with variable frequency drives and flow meters to enable the PLC to control the pump speed to maintain a flow set point.
- The pumps will be of a sturdy industrial design. If possible, an expeller type design will be utilized, eliminating the need for seal water or hose pumps may be used due to the low flow requirement.
- Flocculant will be added to the clarifier feedwell or launder to enhance solids separation.

Process Building Sump Pump (20-PU-007)

- A sump inside the process building will collect all spills and pump it back to the Reactor Tank or Pond 4.
- The pump will be new equipment.
- The pump will be of a sturdy industrial design.

Sludge Bin Sump Pump (20-PU-0010)

- A sump located close to the sludge bins lay down area will collect all run-off from the sludge bins and pump it back to the Reactor Tank or Pond 4.
- The pump will be new equipment.
- The pump will be of a sturdy industrial design.

Effluent Tank (20-TK-003) and Utility Water Pumps (20-PU-003A/B)

- The Effluent Tank and Utility Water Pumps are new equipment.
- The Clarifier will overflow by gravity into the Effluent Tank
- Any effluent that is not utilized for utility water will overflow from the tank to the discharge point.
- The tank will have a turbidity meter to indicate the quality of the effluent being discharged.
- If the turbidity in the tank exceeds allowable discharge levels, an automatically controlled valve on the tank will stop flow from being discharged to the environment, and direct the flow to Pond 4 until the condition is corrected.
- A pH probe will be installed in the tank to monitor discharge pH. If the pH in the tank exceeds allowable discharge levels, an automatically controlled valve on the tank will stop flow from being discharged to the environment, and direct the flow to Pond 4 until the condition is corrected
- The pumps will be fixed speed, and will be turned on manually and shut off by the PLC after a pre-determined delay. One pump will be duty, the other standby.
- The pumps will be of a sturdy industrial design, utilizing internal process water for gland seal and lubrication.

Fresh Water Tank (20-TK-006) and Fresh Water Pumps (20-PU-009A/B)

- The fresh water tank and fresh water pumps are new equipment.
- The fresh water will be used for Flocculant make-up & final wash down of plant equipment.
- Fresh water will be delivered to site.
- The pumps will be of a sturdy industrial design, utilizing internal process water for gland seal and lubrication.

Dry Hydrated Lime Feed Package (20-PK-002)

- The Dry Hydrated Lime Feed Package is new equipment
- Dry hydrated lime will be delivered to the site in 1-ton bags and stored in the water treatment plant building.
- The package will consist of a storage hopper sized to take 2 x 1-ton bags of hydrated lime. The storage hopper will feed a Hydrated Lime Conveyor that will deliver hydrated lime to a small feed tank on top of the Sludge/Lime Mix Tank. A variable speed Hydrated Lime Metering Screw will then deliver dry hydrated lime into the Sludge/Lime Mix Tank.
- Access to the feed hopper and Hydrated Lime Metering Screw will be from the platform around the Reactor Tank and Sludge/Lime Mix Tank.

- A jib crane will be required to lift the one ton bags over the storage hopper.

Dry Flocculant Make-Up Package (20-PK-001) and Flocculant Metering Pumps (20-PU-004A/B)

- The Dry Flocculant Make-Up Package is new equipment.
- The Flocculant Metering Pumps will feed post diluted polymer either to the Clarifier feed launder or feedwell to aid in sludge settling.
- The polymer will be delivered in 50# bags that will be emptied into a small hopper on the equipment.

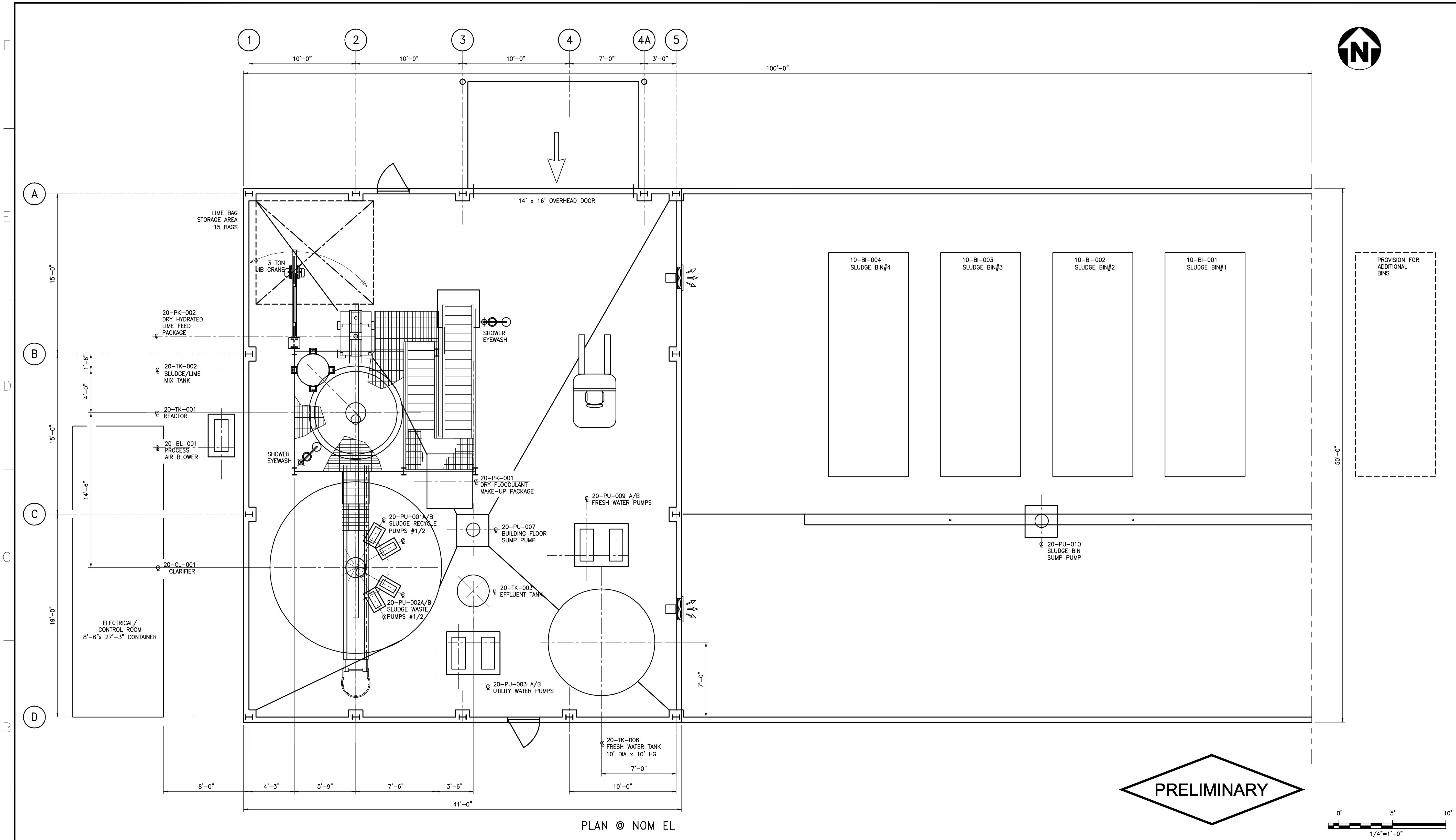
Safety Showers (20-SS-001 & 20-SS-002) and Emergency Eye Washes (20-EW-001 & 20-EW-002)

- The plant will require emergency showers in case of splashing from the lime system or flocculant system. The showers will be self-contained units capable of delivering 20 to 30 minutes of tempered water from a potable water storage tank supplied with the unit. One shower will be located on the platform above the Reactor Tank, and the other shower will be located on grade close to the lime slurry tank and base of the stairs leading to the top of the reactor tanks.
- The plant will require two self-contained emergency eye wash stations. These will be capable of providing tempered water from a potable water storage tank integral to the unit.

Electrical and Control System

- The treatment plant will require a PLC to allow automated control.
- It is assumed that the plant will have an operator present during the day shift, seven days per week, but that it will be required to run unattended during the night shift.
- The control system will have a computer based Human Machine Interface (HMI), located in the treatment plant electrical room.
- Power will be provided by diesel generators at site.
- A weatherproof containerized electrical room will be located on a concrete pad outside the treatment plant to house the MCC's and all associated electrical and control equipment.

DRAWINGS



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ISS	D/M/Y	APP	ISSUED FOR	REV
A	19/06/07	DHL	CLIENT APPROVAL	P1

REF	NUMBER	TITLE
-		

REFERENCES

STAMP/SEAL

APPROVED FOR CONSTRUCTION

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT NO.		BY	D/M/Y
156495	DSN.	DHL	19/06/07
	DRN.	RTIESSENS	19/06/07
PACKAGE CODE	CHK.		
XXX	APP.		

SCALE 1/4"=1'-0"

amec

AREA | AREA NAME HDS 2008

TITLE
ATLANTIC RICHFIELD CO
LEVIATHAN MINE
2008 HDS PLANT
MECHANICAL GENERAL ARRANGEMENT

CLIENT NAME/LOGO

PROJECT NAME

CLIENT DWG. NO.
TO COME

DRAWING NO.
D-156495-20-M-0001

REV.
P1

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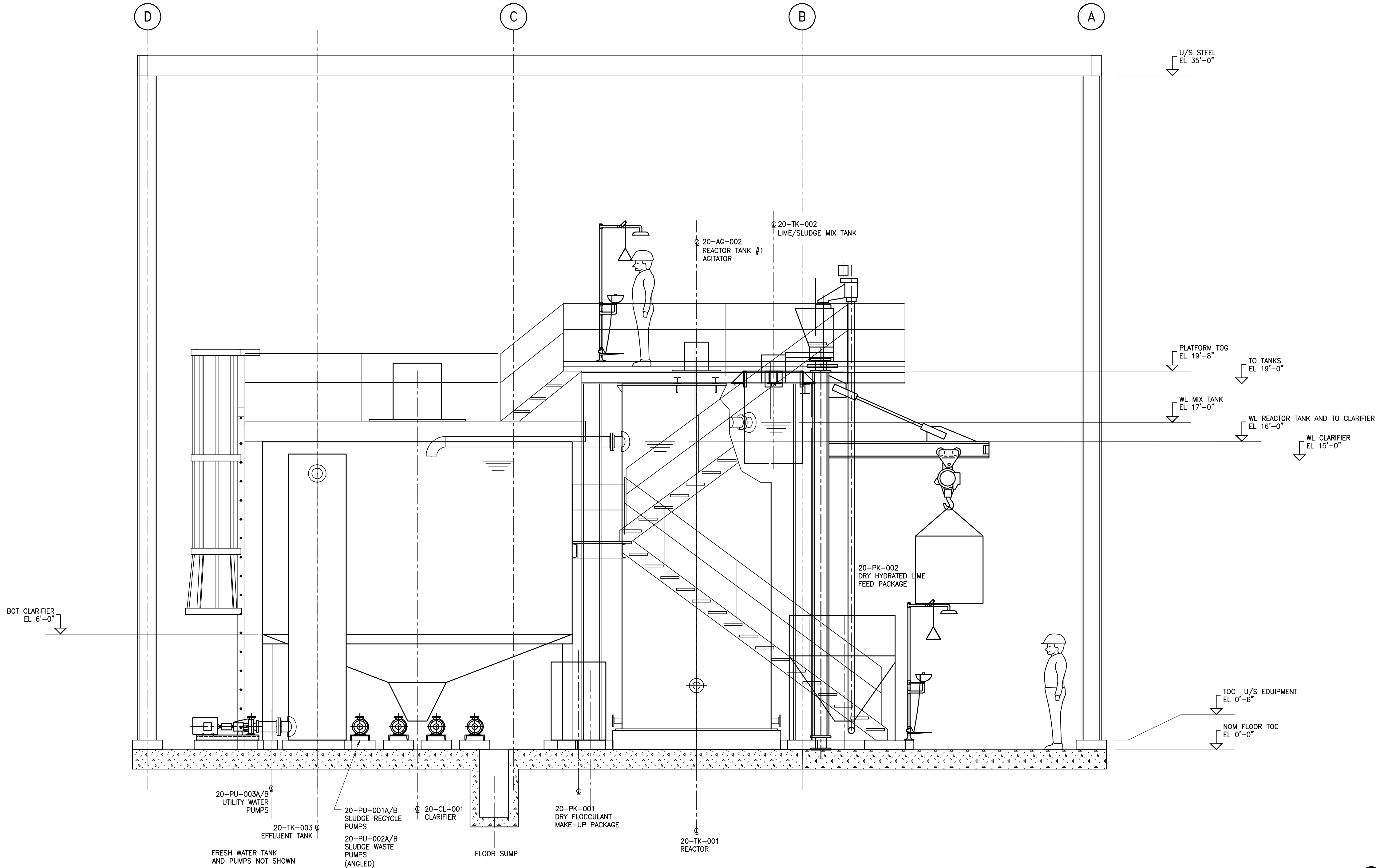

ELEVATION

PRELIMINARY

0' 5'
3/8"=1'-0"

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ISS	D/M/Y	APP	ISSUED FOR	REV
A	19/06/07	DHL	CLIENT APPROVAL	P1

REF	NUMBER	TITLE
-		

REFERENCES

STAMP/SEAL

APPROVED FOR CONSTRUCTION

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT NO.		BY	D/M/Y
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	DRN.	RTIESSENS	19/06/07
PACKAGE CODE	CHK.		
XXX	APP.		

SCALE 3/8"=1'-0"

amec

AREA | AREA NAME HDS 2008

TITLE
ATLANTIC RICHFIELD CO
LEVIATHAN MINE
2008 HDS PLANT
GENERAL ARRANGEMENT ELEVATION

CLIENT NAME/LOGO

PROJECT NAME

CLIENT DWG. NO.
TO COME

DRAWING NO.
D-156495-20-M-0002

REV.
P1

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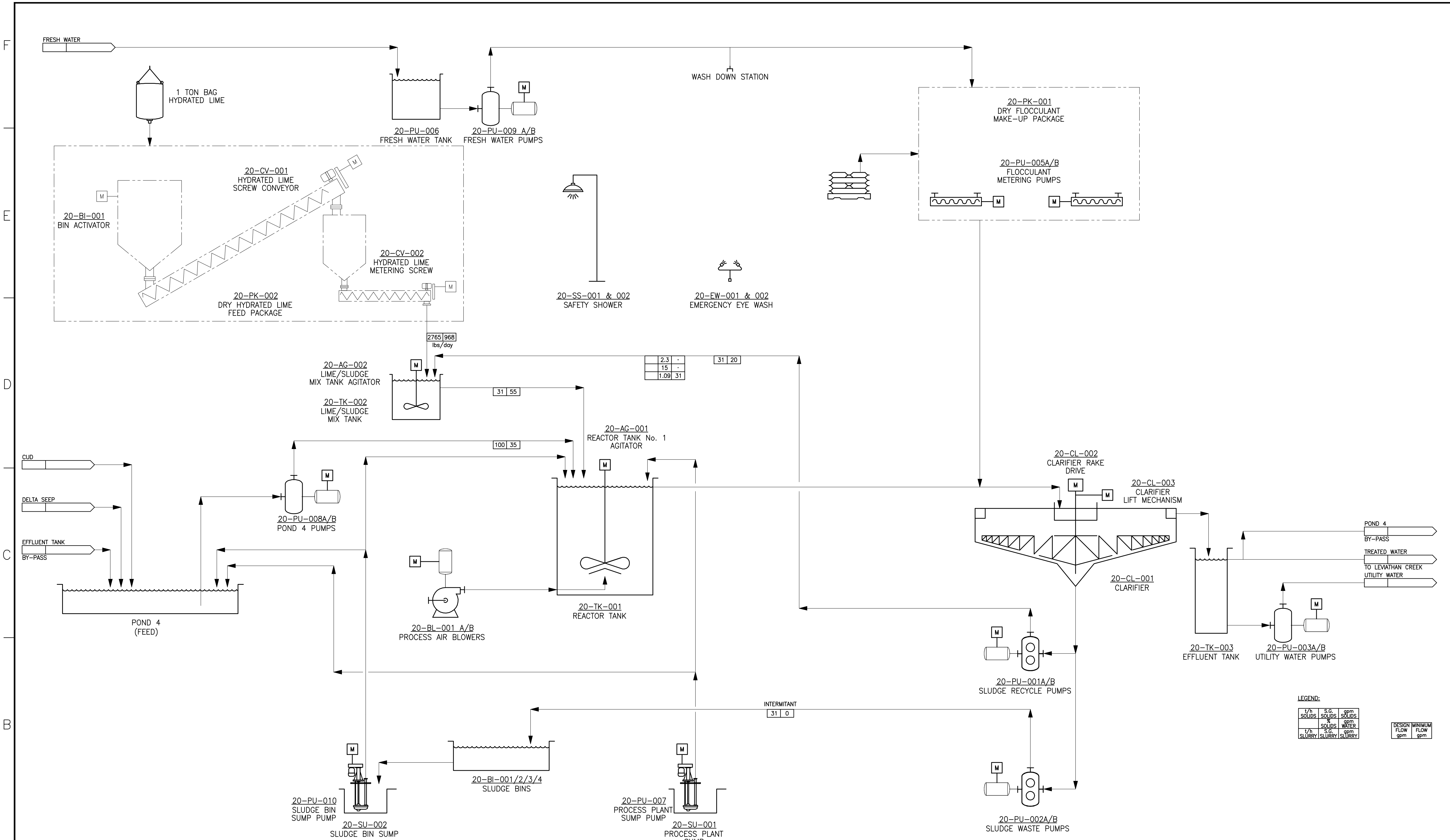

REV	D/M/Y	REVISION	DRN	CHK	APP	APP	APP	APP
B	26/06/07	LIME RATE CHANGED, CUD & DS SHOWN	RT					
A	19/06/07	ISSUED FOR CLIENT APPROVAL	RT					

ISS	D/M/Y	APP	ISSUED FOR	REV
B	26/06/07	DHL	CLIENT APPROVAL	P2
A	19/06/07	DHL	CLIENT APPROVAL	P1

REF	NUMBER	TITLE
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REFERENCES

STAMP/SEAL

APPROVED FOR CONSTRUCTION

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT NO. 156495

PACKAGE CODE

	BY	D/M/Y
DSN.	DHL	19/06/07
DRN.	RT	19/06/07
CHK.		
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SCALE NTS

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AREA | AREA NAME HDS 2008

TITLE
ATLANTIC RICHFIELD CO.
LEVIATHAN MINE
2008 HDS PLANT
PROCESS FLOWSHEET

CLIENT NAME/LOGO

PROJECT NAME LEVIATHAN MINE

CLIENT DWG. NO.

DRAWING NO. D-156495-20-N-001 | REV. P2

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Atlantic Richfield Company

Roy I. Thun
Environmental Project Manager

6 Centerpointe Drive
LaPalma, CA 90623-1066
Office: (661) 287-3855
Fax: (661) 222-7349
E-mail: thunri1@bp.com

August 13, 2007

CERTIFIED – RETURN RECEIPT REQUESTED

Mr. Kevin Mayer
SFD-7-2
USEPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

RE: Response to EPA Comments on (i) 2007-08 Treatability Studies and Interim Treatment Activities Work Plan (the "Work Plan"), and (ii) Process Design Criteria and Technical Decision Memorandum for the High Density Sludge Treatment Plant (the "Design Memo")
Leviathan Mine, Alpine County, California

Dear Mr. Mayer:

This letter responds to EPA's letter dated July 19, 2007, which granted approval of, and directed Atlantic Richfield to implement the work described in, the Work Plan and Design Memo, subject to certain comments and requests for additional information by EPA. Responses to EPA's comments and information requests are set forth below. Atlantic Richfield also incorporates herein by reference its June 21, 2007 responses to EPA's June 7, 2007 approval of the Work Plan Summary for 2007 Treatability Studies and Interim Treatment Activities (the "Work Plan Summary"), which was submitted to EPA on May 25, 2007. Consistent with EPA's instruction, Atlantic Richfield is not submitting a revised version of the Work Plan at this time. Instead, we have been proceeding with implementation of the Work Plan in accordance with the submitted schedule (Section 7.0) and design criteria.

1. *Submission Pursuant to the 2000 Administrative Order (page 1, first paragraph)*. As stated when the Work Plan was submitted (*see* June 21, 2007 letter from R. Thun to K. Mayer re: Submission of 2007-08 Treatability Studies and Interim Work Plan), Atlantic Richfield does not agree with EPA's contention that the Work Plan and Design Memo were "submitted pursuant to EPA's 2000 Administrative Order." Negotiations are presently ongoing between counsel for EPA and Atlantic Richfield to develop new administrative orders that will govern future work at

the Leviathan Site. In our view, one premise for these negotiations is that the 2000 Unilateral Administrative Order is no longer operative and cannot serve as a proper basis for requiring additional response actions at the Site. While Atlantic Richfield agrees to proceed in good faith with those negotiations and with the water treatment activities described in the Work Plan and Design Memo, we do so while reserving all legal rights and defenses available under CERCLA or otherwise.

2. *Delta Seep Capture*. EPA comments that Atlantic Richfield should address the capture of the entire discharge from the Delta Seep area in its 2008 work plan. As called for in Section 3.2.3 of the Work Plan submitted on June 21, Atlantic Richfield already has installed a temporary Delta Seep collection and conveyance system, which began capturing and conveying the majority of the Delta Seep flow (5 to 7 gpm) to the Pond 4 Lime Treatment System on June 29, 2007. Atlantic Richfield has been working on a design submittal for a semi-permanent Delta Seep collection system, which should be available for EPA review this week. Design submittals for the semi-permanent Channel Underdrain (CUD) collection system and the Delta Seep and CUD conveyance systems will follow thereafter. The Delta Seep collection system is being designed to capture Delta Seep surface flows to the greatest extent practicable, plus flows from the 15"-diameter discharge pipe from the Delta Slope Underdrain system installed in 2005 by the Lahontan Regional Water Quality Control Board ("LRWQCB"). The Delta Seep Collection system currently under design by Atlantic Richfield is intended to handle flows as high as 40 gpm, which exceeds field observations and limited measurements of historical Delta Seep and Delta Slope Underdrain flows. Although we believe our proposed design will be highly effective, hydrogeological constraints may make it impracticable to capture the "entire discharge" from the Delta Seep area. As we have previously learned and discussed, the challenge is to configure the system to collect as much of the Delta Seep flows as possible without also capturing surface water and alluvial infiltration from Leviathan Creek. Adjustments may need to be made to whatever system is installed as more is learned about the location and behavior of the seeps in this area and about seasonal changes in Delta Seep flow rates. Definitive hydrogeological characterization of these seeps has been complicated by the recent completion of the LRWQCB's slope stabilization and drainage work and by the fact that the seeps at the toe of the Delta Slope are changing in both location and flow rate and do not appear to have reached a steady state condition.

To avoid the need to make structural modifications later, Atlantic Richfield intends to wait for EPA's approval of its design for the semi-permanent Delta Seep collection and conveyance system before proceeding with construction. Atlantic Richfield also requests clarification from EPA recognizing that the requirement to capture "the entire discharge from the Delta Seep area" is subject to the practicalities and design limitations discussed herein.

3. *Storage of Consumables and Duration of Treatment Season*. EPA comments that the Work Plan should feature storage capacity for a minimum of 40 tons of dry lime and 2,000 gallons of diesel fuel to allow for extended cold weather operation of the HDS Treatment System. The current design for the HDS Treatment System building will not accommodate more than approximately 12 to 16 tons of dry lime storage. While lime storage in excess of this amount could conceivably be achieved outside of the building in properly weather-proofed

packaging, Atlantic Richfield requests that EPA reconsider its request for 40 tons of dry lime storage for the following reasons. First, at maximum hydraulic and mass loading rates for the HDS Treatment System, 12 to 16 tons of lime would be consumed by system operations in approximately the same amount of time as 2,000 gallons of diesel fuel. With the reduced CUD and Delta Seep flow rates expected during the fall season, this quantity of lime would be more than sufficient to run the system as long as there is diesel fuel available and until freezing conditions at the Site would otherwise preclude the continued utility of the outdoor sludge filtration system. Thus, storage of 40 tons of lime appears to be unnecessarily excessive. Second, HDS Treatment System operations will be limited not only by lime and diesel supplies but also by the availability of other stored consumables, including polymer and freshwater. Storage of substantially more dry lime is unlikely by itself to extend the operating season of the system because these other consumables will either become depleted or tanks and feed lines will need to be drained to prevent damage during hard-freeze conditions. Atlantic Richfield recommends matching the quantity of lime storage to the diesel and fresh water usage rates. Third, indoor storage of the lime supply is preferred since it is more likely to keep the lime dry, and it will reduce the safety and logistical problems associated with transporting the one-ton lime bags.

Based on these considerations, Atlantic Richfield requests confirmation from EPA that designing the HDS Treatment System for indoor storage of up to 16 tons of dry lime is acceptable.

4. *Aspen Seep*. EPA requests submittal of designs for continued improvements in the handling of treatment solids at the Aspen Seep bioreactor based on experience gained in 2007. Atlantic Richfield is currently investigating alternative methods for improved bioreactor sludge handling and dewatering. Atlantic Richfield will present EPA with the findings of these investigations and a proposed approach/design for bioreactor sludge management in the 2008 work plan (or 2008 Work Plan addendum).

5. *Monitoring*. EPA reiterates comments regarding water quality and flow monitoring included in its June 7, 2007 approval of the Work Plan Summary. Atlantic Richfield believes these comments were addressed by the sampling protocols and design criteria set forth in the Work Plan and Design Memo. Effluent constituent concentrations will be monitored for consistency with the discharge criteria previously established for the Site (NTCRAM, Table 4-1). Analytical methods and constituent detection limits are summarized in Table 4-4 of the Work Plan.

6. *Reporting*. EPA comments that more frequent reporting than what is indicated in the Work Plan may be required under an agreement currently being negotiated between Atlantic Richfield and EPA. Atlantic Richfield intends to comply with the reporting deadlines and deliverable requirements prescribed by that agreement once it is finalized.

7. *Transition From 2007 System to HDS*. EPA requests more detail on Atlantic Richfield's plans for transitioning from operation of the current Pond 4 Lime Treatment System to the HDS Treatment System in 2008. As discussed at our July 24, 2007 meeting at the Site, the 2007 treatment system will remain in place until the HDS Plant is fully operational. The two

systems are being designed to operate in parallel to avoid the potential for discharge of untreated effluent during the transition period. Atlantic Richfield will provide the requested information in its 2008 work plan (or 2008 Work Plan addendum).

8. *Plans for a Three-Season System*. EPA comments that Atlantic Richfield should include a design for cold weather operation of the Channel Underdrain and DS collection and transmission systems in its 2008 work plan. Atlantic Richfield previously responded to EPA comments concerning the operation of the HDS Treatment System during cold weather conditions (*see* June 21, 2007 letter re: Submission of 2007-08 Treatability Studies and Interim Treatment Work Plan, Item 10; May 25, 2007 letter re: Submission of Written Comments on EPA's Draft Request for Approval of Modification to the Removal Action at the Leviathan Mine), and those responses are incorporated herein by reference. Atlantic Richfield further notes that the designs for the CUD and Delta Seep conveyance systems will include insulated piping and heat tracing for one of the two parallel conveyance lines for each system. This is expected to make the lines less susceptible to freezing during cold weather conditions.

9. *Engineering Certification*. EPA comments that building designs and other engineering components associated with the HDS Treatment System should be certified by a California professional engineer. Atlantic Richfield has planned from the outset to design the building, foundations and other engineering components consistent with applicable county buildings codes and to have the design plans/drawings sealed by a California Professional Engineer.

10. *Final Disposition of Structures*. Atlantic Richfield acknowledges EPA's comment regarding final disposition of structures and agrees with EPA's comment that the HDS Treatment System may not be incorporated into the long-term remedy for the Site.

11. *HDS Treatment System Process Design Criteria*. EPA comments that the HDS Treatment System design criteria for operating duration (seven months) and processing rate (35 to 100 gpm) may be exceeded during the treatability study and that the prescribed life expectancy for the plant (5 years) may need to be extended. The hydraulic capacity of the HDS Treatment System was designed based on a careful review of historical flow rates for the CUD (from 1999 through 2006) and Delta Seep (field observations and limited measurements), including data from the high precipitation years of 2005 and 2006. This review indicated that a combined maximum flow rate of 80 gpm is conservative. To provide a factor of safety, we have increased the design flow rate for the HDS Treatment System to 100 gpm, which should be more than adequate for this treatability study. In light of the historical flow rates and the interim nature of this treatability study, Atlantic Richfield does not believe it is reasonable or necessary to design the HDS Treatment System to accommodate flow rates outside the 35 to 100 gpm range (for example, to account for a 100-year storm event or unprecedented snow accumulations). There is also a risk associated with designing for too high of a hydraulic capacity – because the turn down ratio of the plant is limited, a higher maximum design flow will also mean a higher minimum design flow and may reduce the ability of the plant to effectively operate under low flow conditions.

An annual operating duration of seven months will potentially allow for a treatment season running from mid-April to mid-November. While further extending this season is theoretically possible, Atlantic Richfield does not believe that designing for a longer operating duration is reasonable or necessary, given that safe access to the site by personnel and delivery vehicles has generally been limited outside this period. The treatment system plant was designed for an expected operational life of 5 years to be consistent with the expected duration of the treatability study, although the equipment is likely to be serviceable for a longer period with proper maintenance and winter decommissioning. Again, Atlantic Richfield does not believe that it is reasonable or necessary to design for a longer treatment season or plant life expectancy given the interim nature of this treatability study.

EPA also comments that the statement on page 2 of the Technical Decision Memo for the HDS Treatment System (Attachment B to the Design Memo) that "Acid Mine Drainage will be introduced to the Reactor Tank from Pond 4" appears to be a misstatement. In fact, this is an accurate description of the HDS Treatment System design. Once the HDS Treatment System is operational, Pond 4 will be used as a pre-treatment influent holding/equalization pond. CUD and Delta Seep flows will be combined in Pond 4, pumped to the HDS Treatment System, and eventually discharged directly to Leviathan Creek as treated effluent. Unlike the configuration of the current Pond 4 Lime Treatment System, the HDS Treatment System will not include or require a final polishing/holding step in Pond 4.

EPA's comments concerning the design criteria for the HDS Treatment System appear to be in the nature of observations about possible flow rates and operating periods, rather than directives to modify the operating duration or processing rate for the HDS Treatment System. **Based on the foregoing, Atlantic Richfield requests confirmation from EPA that proceeding with construction of the HDS Treatment System in accordance with the submitted design criteria is acceptable.**

* * *

Like EPA, Atlantic Richfield looks forward to making continued and rapid progress towards the completion and full implementation of the HDS Treatment System and other proposed site activities. We respectfully ask that EPA provide the clarifications and confirmations requested above before critical deadlines in our procurement and construction schedules expire. Meanwhile, please feel free to contact me at (661) 287-3855 or via e-mail at roy.thun@bp.com with any questions or comments about these responses.

Sincerely,

Roy Thun
Environmental Business Manager

cc: Richard Booth, Lahontan Regional Water Quality Control Board
Nancy Riveland-Har, USEPA Region 9 – via electronic
Chris Winsor, Atlantic Richfield Company – via electronic

Todd Normane, Esq. Atlantic Richfield Company – via electronic
Adam Cohen, Esq. Davis Graham & Stubbs LLP – via electronic
Dave McCarthy, Copper Environmental – via electronic
Grant Ohland, Geomatrix – via electronic
Tom Higgs, AMEC – via electronic
Sandy Riese, EnSci – via electronic

Atlantic Richfield Company

Roy I. Thun
Environmental Business Manager

6 Centerpointe Drive
LaPalma, CA 90623-1066
Office: (661) 287-3855
Fax: (661) 222-7349
E-mail: thunri1@bp.com

August 15, 2007

Mr. Kevin Mayer
SFD-7-2
USEPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

RE: Design Summary Memorandum: Semi-Permanent Delta Seep Collection System Leviathan Mine, Alpine County, California

Dear Mr. Mayer:

As discussed during the our Site visit on July 24, 2007, Atlantic Richfield is submitting for EPA's review the enclosed Design Summary Memorandum for the proposed Semi-Permanent Delta Seep (DS) collection system at the Leviathan Mine Site. This submittal includes: (i) a Design Summary Memorandum; (ii) Technical Specifications, and (iii) a schematic drawing of the proposed collection system.

These documents set forth the design basis for the Semi-Permanent DS Collection System, which is intended to be implemented at the Site as a component of the treatability study for treating Acid Mine Drainage (AMD) from the Channel Underdrain (CUD) and DS. A more conceptual description of the DS Collection System was included in the 2007-08 Treatability Studies and Interim Treatment Work Plan (Work Plan) submitted to EPA on June 21, 2007 (approved with comments by letter dated July 19, 2007), and in the Work Plan Summary submitted to EPA on May 25, 2007 (approved with comments by letter dated June 7, 2007).

Atlantic Richfield's consultants and engineers have arrived at the design for the Semi-Permanent DS Collection System after careful consideration of historical water quality and flow data, the results of and lessons learned from prior collection efforts, site conditions, access limitations, EPA's stated objectives for removal actions at the Site, and various other factors. The submission and finalization of these documents is a critical step in the implementation process because, in accordance with the standard design practices, all subsequent engineering and procurement activities associated with the Semi-Permanent DS Collection System will depend on meeting the requirements described in the enclosed submittal.

While Atlantic Richfield is submitting this information for EPA's approval, it should be understood that the anticipated time frames for 2008 treatment activities described in the Work Plan submitted to EPA (*see* Section 7.0 and Figure 7-1) assume expedited review and approval by EPA. Also, if material changes to the design criteria or other construction specifications are recommended, they may delay the timing of the construction of the Semi-Permanent DS Collection System from what is currently planned.

Consistent with our with prior discussions, we also want to make it clear that construction of the improved Delta Seep collection system described in the attached Design Summary Memorandum will require that we remove the existing temporary Delta Seep collection system. As you know, there is simply not enough room between the toe of the Delta Slope and Leviathan Creek to allow the current system to remain in place while the new system is being installed. Unfortunately, this means that there will be a time period when the Delta Seep flow presently being captured will not be routed to the Pond 4 system for treatment. Atlantic Richfield will make every effort to expedite its construction activities and minimize the interruption in capture and treatment of the Delta Seep flow, but we anticipate that it will take approximately two to three weeks to complete the proposed construction activities, with work expected to begin in mid-September.

As similarly expressed in the August 13, 2007 letter to you regarding AR's request for approval from EPA on certain lime treatment system design elements, we intend to wait for EPA's review and approval of the enclosed Design Summary Memorandum before proceeding with construction of the proposed DS collection system. In the meantime, Atlantic Richfield will be preparing and providing to EPA further detailed information on the schedule for the completion of the design and construction of the Semi-Permanent CUD Collection System and the conveyance piping system for the CUD and DS.

We are requesting for scheduling purposes that EPA provide its response to the enclosed materials by August 31, 2007. Please contact Grant Ohland or me with any immediate questions or comments or if you need further information about the technical aspects of the proposed Semi-Permanent DS Collection System. Additionally, you are welcome to provide your input during next Tuesday's scheduled technical-update conference call.

Sincerely,

Grant L Ohland for

Roy Thun
Environmental Business Manager

cc: Richard Booth, Lahontan Regional Water Quality Control Board
Chris Winsor, Atlantic Richfield Company – via electronic
Todd Normane, Esq. Atlantic Richfield Company – via electronic
Adam Cohen, Esq. Davis Graham & Stubbs LLP – via electronic
Dave McCarthy, Copper Environmental
Grant Ohland, Geomatrix – via electronic
Sandy Riese, EnSci – via electronic

Design Summary Memorandum
Semi-Permanent Delta Seep Collection System
Leviathan Mine
Alpine County, California

Prepared for:

Atlantic Richfield Company
6 Centerpointe Drive
LaPalma, CA 90623-1066

Prepared by:

Geomatrix Consultants, Inc.
1401 17th Street, Suite 600
Denver, Colorado 80202
(303) 534-8722

August 2007

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ATTACHMENTS

DRAWINGS

DESIGN SUMMARY MEMORANDUM
SEMI-PERMANENT DELTA SEEP COLLECTION SYSTEM
Leviathan Mine
Alpine County, California

1.0 INTRODUCTION

This Design Summary Memorandum (Memorandum) has been prepared by Geomatrix Consultants, Inc. (Geomatrix) on behalf of Atlantic Richfield Company (Atlantic Richfield) to transmit design criteria and other details related to the engineering design of the Semi-Permanent Delta Seep (DS) Collection System planned for construction at the Leviathan Mine Site (Site) in 2007 and operation in 2008. A conceptual description for the Semi-Permanent DS Collection System was provided in the 2007-08 Treatability Studies and Interim Treatment Work Plan (Work Plan) submitted to EPA on June 21, 2007. The information contained in this Memorandum is intended to supplement the information provided in the Work Plan and provide additional details on the key design parameters for the Semi-Permanent DS Collection System. The purpose of this Memorandum is to provide EPA and other project stakeholders with design criteria and specifications prior to the completion of procurement and construction of the Semi-Permanent DS Collection System. Although system implementation is currently planned for second quarter 2008, Atlantic Richfield is providing this information now to avoid scheduling delays and to facilitate the initiation of equipment procurement and system construction during the 2007 treatment/construction season.

A temporary DS collection system was installed at the DS in late June 2007 and began operation on June 29, 2007. This system is currently capturing flow from the upper part of the DS at a rate of approximately 5 gallons per minute (gpm). As discussed with EPA and other project stakeholders during a Site tour on July 24, 2007, flows from the lower portion of the DS area are not currently being captured due to its close proximity to Leviathan Creek. Collection of seepage directly adjacent to Leviathan Creek is problematic because the collection system may capture subsurface and surface flows originating from Leviathan Creek thus resulting in the unnecessary capture and treatment of waters that are not impacted by AMD. In addition, the placement of a collection tank within the channel of Leviathan Creek requires adequate streamflow diversion features to protect the systems from the erosive forces of Leviathan Creek during periods of high stream flow. As a result, Atlantic Richfield has developed a design for a Semi-Permanent DS Collection System that will serve to capture the majority of the surface seepage from the DS area while minimizing capture of the surface and subsurface flows from

Leviathan Creek and eliminating the need for placement of engineered features within the Leviathan Creek channel.

In addition, EPA has requested that water emanating from the Delta Slope Underdrain be collected and treated along with the AMD flows from the CUD and DS. It is our understanding that the Delta Slope Underdrain was installed by contractors to the Lahontan Regional Water Quality Control Board and the State of California as part of the Delta Slope Stabilization Project implemented in 2005. Although it would be beneficial to receive additional information about the engineering of the Delta Slope Underdrain, the current design for the Semi-Permanent DS Collection System assumes that up to 15 gpm of Delta Slope Underdrain flows will be collected and treated by the HDS treatment system planned for construction in the 2008 treatment season. Flow rates from the Delta Slope Underdrain as measured in June 2007 are less than 0.5 gpm.

2.0 SUMMARY OF KEY DESIGN PARAMETERS

This Memorandum contains design parameters for the Semi-Permanent DS Collection System including but not limited to the following:

- Water quality considerations
- Design flow rates
- System design life and operating basis
- Description of system components

Detailed specifications for the construction of the proposed collection system are provided as Attachment A. An engineering drawing showing the schematic layout of the DS collection area is also attached.

3.0 WATER QUALITY CONSIDERATIONS

Water quality of flows from the DS have been considered in the design of DS collection system to ensure that the materials used are resistant to the deleterious effects of AMD discharges. A summary of the anticipated water quality from the DS based on a sample collected on June 29, 2007, is presented below in Table 3-1.

TABLE 3-1
ANTICIPATED DS WATER QUALITY
Concentrations in [measurement units]

Parameter	Value
pH	2.9 s.u.
Aluminum	1.0 mg/L
Arsenic	0.1 mg/L
Cadmium	0.001 mg/L
Calcium	300 mg/L
Chromium	0.001 mg/L
Copper	0.5 mg/L
Iron	50.0 mg/L
Lead	0.001 mg/L
Magnesium	100.0 mg/L
Nickel	0.5 mg/L
Selenium	0.001 mg/L
Sulfate	1,500 mg/L
Zinc	0.1 mg/L

4.0 DESIGN FLOW RATES

To the extent practicable, the DS AMD flows will be collected and conveyed to the 2007 Pond 4 Lime Treatment System and the 2008 HDS Treatment Plant for treatment. Historical flow data from the DS for the years 2004 through 2006 are limited but are presented below in Table 4-1.

TABLE 4-1
HISTORICAL DS TREATMENT FLOW RATES
Flows in gallons per minute (gpm)

Year	DS Flows		
	Minimum	Average	Maximum
2004	5.2	7.2	9.3
2005	No data	No data	No data
2006	5.0	18.8	25.0

Based on the limited flow data available for the DS, flow rates are anticipated to range from between 5 and 25 gpm. The flow rate from the DS as measured in July 2007 is approximately 5 gpm. Given the extremely dry winter and spring of 2006 – 2007, 5 gpm represents a reasonable lower limit to anticipated flow rates from the DS area. Given the extremely wet conditions observed in the winter and spring of 2005-2006, 25 gpm is believed to present a reasonable upper limit to flows from the DS area. However, considering possible climatic induced variabilities to flows from the DS and the potential uncertainty associated with flows from the Delta Slope Underdrain system, the design flow rate for the DS collection system has been increased to 40 gpm to provide an adequate margin of safety should flow rates be greater than expected.

Based on the historical flow rate data summarized and the expected and the maximum allowable flowrate from the Delta Slope Underdrain, design flow rates for the DS collection and conveyance systems were selected and are presented in Table 4-2.

TABLE 4-2
PROPOSED DS COLLECTION AND CONVEYANCE FLOW RATES
Flows in gallons per minute (gpm)

Parameter	Minimum	Expected Average	Maximum
Delta Seep AMD	5	15	25
Delta Slope Underdrain	0.5	<5	15
Combined Flow to Treatment	5.5	<20	40

5.0 SYSTEM DESIGN LIFE AND OPERATING BASIS

The Semi-Permanent DS Collection System will convey DS and Delta Slope Underdrain flows to the 2008 HDS treatment system and will, therefore, have a 5 year design life to match the design life of the 2008 HDS treatment system. The Semi-Permanent DS Collection System will operate 24 hours per day, 7 days per week for the proposed 7-month annual treatment season.

6.0 DESCRIPTION OF SYSTEM COMPONENTS

The Semi-Permanent DS Collection System will be constructed to collect AMD flows to the extent practicable with limited excavation to minimize the potential of mixing DS flows with unaffected shallow ground water. Collection of DS surface flows will be achieved through the use of an HDPE flared end fitting and a small section of 10-inch HDPE piping, which is routed to a 400-gallon HDPE collection tank. Surface flow will be directed to the flared end fitting through the use of a bentonite berm. To collect seep flows that may cause upwelling below this surface collection point, a cut-off wall will be placed between the base of the seep area and Leviathan Creek and a trench drain will be placed on the seep side of the cut-off wall to collect the AMD flow and direct it into a small sump. From this sump, AMD will be pumped to the collection tank for conveyance. A bentonite blanket will be placed at the ground surface between the surface collection point and the cut-off wall to direct AMD into the trench drain. The collection of water from the Delta Slope Underdrain will be achieved by connecting to the 15-inch underdrain outlet piping with an open topped reducer fitting. In the unlikely event that Delta Slope Underdrain flows exceed 15 gpm, the excess will overflow through the open topped reducer fitting, while the base flow of 15 gpm will be collected for conveyance to the treatment system. A 4-inch pipe will be used to convey the Underdrain water to the 400-gallon HDPE collection tank. A 4-inch overflow pipe will be routed to Leviathan creek from the collection tank to prevent overtopping of this tank should problems occur. The entire Delta Seep area will be protected with riprap rock to prevent erosion. Details of the system are shown on the attached schematic drawing.

ATTACHMENT A

Technical Specifications

Technical Specifications
Semi-Permanent Delta Seep Collection System
Leviathan Mine
Alpine County, California

Prepared for:

Atlantic Richfield Company
6 Centerpointe Drive
LaPalma, CA 90623-1066

Prepared by:

Geomatrix Consultants, Inc.
1401 17th Street, Suite 600
Denver, Colorado 80202
(303) 534-8722

August 2007

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SECTION 011000

SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Work phases.
3. Work under other contracts.
4. Use of premises.
5. Client's occupancy requirements.
6. Specification formats and conventions.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Semi-Permanent Delta Seep Collection System

1. Project Location: Leviathan Mine Site, Alpine County, California

B. Client: Atlantic Richfield Company, 6 Centerpoint Drive, LaPalma, CA 90623

1. Client's Representative: Roy Thun.

C. Engineer: Geomatrix Consultants, Inc., 1401 17th Street, Denver CO, 80202.

D. The Work consists of the following:

E. The Work includes installation of a cut-off wall, trench drain, trench drain sump pump system, surface collection system, collection tank, miscellaneous piping improvements, bentonite soil blanket, and riprap protection at the Delta Seep area of the Leviathan Mine Site.

1.3 WORK UNDER OTHER CONTRACTS

A. Client has awarded several separate contracts for various other work at the site. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

1.4 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Client's right to perform work or to retain other contractors on portions of Project.

B. Site Access:

1. Schedule deliveries with Engineer to minimize site access conflicts.

2. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 311000

SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Removing existing trees, shrubs, plants, and grass.

2. Clearing and grubbing.

3. Temporary erosion and sedimentation control measures.

1.2 MATERIAL OWNERSHIP

A. Except for materials indicated to remain Client's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

A. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect existing site improvements to remain from damage during construction.

1. Existing DS conveyance system shall be protected and shall remain in operation during construction.

2. Restore damaged improvements to their original condition, as acceptable to Engineer.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent Leviathan Creek, according to requirements of authorities having jurisdiction.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent erosion protection has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.

1. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.

3.4 SITE IMPROVEMENTS

A. Remove existing above-grade improvements as necessary to facilitate new construction.

B. Existing conveyance system shall remain in operation during construction. Necessary system shut-downs shall be coordinated with Engineer.

3.5 DISPOSAL

A. Disposal: Remove demolished materials, and waste materials including trash and debris, and legally dispose of them off site.

END OF SECTION

SECTION 312005

EARTHWORK AND DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Excavating and backfilling for collection system.

2. Pea gravel fill

3. Riprap slope protection.

4. Strip trench drain.

5. Bentonite blanket and berm.

6. Polymerized concrete cutoff wall.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

C. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.

2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

D. Polymerized Concrete: A mixture of aggregate, cement, water, and bentonite clay mixed at a high water-cement ratio to produce a ductile material.

E. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

F. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

1.3 PROJECT CONDITIONS

A. Existing Conveyance System: Do not interrupt the existing delta seep conveyance system unless permitted in writing by Engineer and then only after arranging to provide temporary services to avoid prolonged shutdown of the system.

PART 2 - PRODUCTS

2.1 SOIL AND ROCK MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM] or a combination of these groups; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Pea Gravel Fill: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 6.

E. Riprap: Widely graded angular rock generally conforming to the following gradation:

Equivalent Spherical Diameter (inches)	**Percent of Total Weight Passing**
12	100
8	80-90
5	20-70
3	0-10

2.2 STRIP TRENCH DRAIN

A. Molded-Sheet Strip Drainage Panels: Prefabricated geocomposite, 24 inches wide with drainage core faced with geotextile filter fabric.

1. Manufacturers:

    a. American Wick Drain Corporation.
    b. Cosella-Dorken.
    c. Eljen Corp.
    d. Greenstreak, Inc.
    e. JDR Enterprises, Inc.
    f. LINQ Industrial Fabrics, Inc.
    g. Midwest Diversified Technologies Incorporated.
    h. TC Mirafi.

2. Drainage Core: Three-dimensional, nonbiodegradable, molded PP or PS.

    a. Minimum Compressive Strength: 10,000 lbs/sq. ft. when tested according to ASTM D 1621.
    b. Minimum In-Plane Flow Rate: 7 gpm/ft of unit width at hydraulic gradient of 1.0 and compressive stress of 25 psig when tested according to ASTM D 4716.

3. Filter Fabric: Nonwoven needle-punched geotextile, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with the following properties determined according to AASHTO M 288:

    a. Survivability: Class 2.
    b. Apparent Opening Size: No. 60 sieve, maximum.
    c. Permittivity: 0.2 per second, minimum.

2.3 BENTONITE BLANKET AND BERM

A. Geosynthetic Clay Liner: Prefabricated geosynthetic composite that combines geotextile outer layers with a core of low-permeability sodium bentonite clay.

1. Manufacturers:

    a. Cetco Lining Technologies
    b. GSE Environmental
    c. Fluid Systems, Inc.
    d. Layfield Corporation.

2. Maximum Hydraulic Conductivity: $5x10^{-9}$cm/sec when tested in accordance with ASTM D 5321.

3. Typical Internal Shear Strength: 500 psf at 200 psf normal stress when tested in accordance with ASTM D 5321.

4. Bentonite Component:

   a. Mass per Unit Area: 0.75 lb/ft when tested in accordance with ASTM D 5993
   b. Swell Index: 24 mL/2g per min when tested in accordance with ASTM D 5890
   c. Moisture Content: 12 percent maximum when tested in accordance with ASTM D 4643
   d. Fluid Loss: 18 mL maximum when tested in accordance with ASTM D 5891.

5. Geotextile Component:

   a. Mass per Unit Area: 6.0 oz/yd when tested in accordance with ASTM D 5261
   b. Grab Tensile Strength: 150 pounds when tested in accordance with ASTM D 4632.
   c. Peel Strength: 15 pounds when tested in accordance with ASTM D 4632

2.4 POLYMERIZED CONCRETE

A. Materials:

1. Cementitious Material: ASTM C 150, Type II or Type V Portland cement

2. Normal-Weight Aggregates: ASTM C 33, graded, 3/4-inch nominal maximum coarse-aggregate size.

   a. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

3. Water: ASTM C 94/C 94M.

4. Bentonite Admixture: Natural pulverized sodium montmorillonite clay: API Specification 13A.

B. Mixture:

1. Minimum Compressive Strength: 300 psi at 3 days.

2. Minimum Cement Factor: 330 lbs/cu yd.

3. Maximum Water-Cementitious Materials Ratio: 1.7.

4. Bentonite Content: 20 percent, plus or minus 5 percent.

5. Slump Limit: 8 inches, plus or minus 1 inch.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, piping, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."

C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing." during earthwork operations.

3.2 EXCAVATION

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

1. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.4 EXCAVATION FOR TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of strip trench drain. Excavate trench walls vertically from trench bottom top of trench, unless otherwise indicated.

1. Clearance: 2 inches minimum each side of strip trench drain.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of strip trench drain. Remove projecting stones and sharp objects along trench subgrade.

3.5 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under structures by extending bottom elevation of concrete to excavation bottom, without altering top elevation.

1. Fill unauthorized excavations under other construction or drainage pipe as directed by Engineer.

3.6 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.7 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact pea gravel fill on trench bottoms and where indicated. Shape pea gravel to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

3.8 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials by mechanically tamping with a minimum of three passes with the tamper.

3.9 RIPRAP MATERIALS

A. Placement of riprap shall start at the toe of the slope and proceed up the slope as indicated on the drawing.

B. Place riprap such that damage to the bedding layer or geotextile fabric does not occur. Riprap shall be placed from a height of not more than one foot above ground surface. Damage to the bedding material or Geotextile fabric shall be repaired or materials replaced as directed by the Engineer at the Contractor's expense.

3.10 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Grading: Slope grades to direct water towards collection areas and to prevent ponding.

3.11 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

3.12 STRIP TRENCH DRAINAGE INSTALLATION

A. Install in accordance with manufacturer's recommendations.

1. Separate 4 inches of fabric at beginning of roll and cut away 4 inches of core. Wrap fabric around end of remaining core.

2. If additional panels are required on same row, cut away 4 inches of installed panel core, install new panel against installed panel, and overlap new panel with installed panel fabric.

3. For inside corners, bend panel. For outside corners, cut core to provide 3 inches for overlap.

4. Install tee pipe outlet fitting to connect strip trench drain to collection sump in accordance with manufacturer's recommendations. Pipe and sump installation are covered in Division 33, Section - "Collection Piping"

B. Coordinate placement with other drainage materials.

C. Add pea gravel fill to width of at least 6 inches on either side of trench drain panel.

3.13 GEOTEXTILE INSTALLATION

A. Examine substrates for compliance with requirements for soil compaction and grading; for subgrade free from angular rocks, rubble, roots, vegetation, debris, voids, protrusions, and for other conditions affecting performance of geotextile liner.

B. Preparation:

1. Provide temporary ballast, until edges are permanently secured, that does not damage geotextile liner or substrate, to prevent uplift of geotextile liner in areas with prevailing winds.
2. Prepare surfaces of construction penetrating through geotextile liner according to geotextile liner manufacturer's written instructions.

C. Place geotextile liner over prepared surfaces to ensure minimum handling. Install according to manufacturer's written instructions. In areas with prevailing winds, begin placing geotextile liner at Project's upwind direction and proceed downwind. Install geotextile liner in a relaxed condition, free from stress and with minimum wrinkles, and in full contact with subgrade. Do not bridge over voids or low areas in the subgrade. Permanently secure edges.

D. Installation in Anchor Trench: Install geotextile liner in trench according to manufacturer's written instructions, backfill, and compact to lock liner into trench.

E. Attachment to Concrete: Use manufacturer's standard system to suit Project conditions.

F. Liner Repairs: Repair tears, punctures, and other imperfections in geotextile liner field and seams using patches of geotextile liner material, liner-to-liner bonding materials, and bonding methods according to geotextile liner manufacturer's written instructions.

G. Cover Material: Provide 6 inches of satisfactory soil over geotextile liner prior to installing riprap material.

3.14 POLYMERIZED CONCRETE

A. Bentonite-water slurry mixture: slurry shall be a stable, fully hydrated, colloidal suspension of bentonite and water. Provide mixing adequate to keep the slurry homogenous and to stabilize the viscosity of the mixture.

B. Polymerized Concrete mixture: concrete shall be composed of water, bentonite, aggregate and Portland cement. Aggregate and cement shall be added to the fully hydrated bentonite-water slurry just before the introduction into the trench.

C. Formwork: Provide temporary formwork as required to hold concrete mixture in trench area. Formwork shall be maintained in-place for a minimum of 24 hours after concrete placement.

D. Placement: Deposit concrete continuously and to avoid segregation of materials.

E. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

3.15 DISPOSAL OF SURPLUS MATERIALS

A. Disposal: Remove surplus soil and waste materials and dispose of them as directed by Engineer.

END OF SECTION

SECTION 334105

COLLECTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes gravity-flow, nonpressure collection piping with the following components:

1. Pipe Fittings.

2. Prefabricated PE manholes.

1.2 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure, Collection-Piping Pressure Rating: 10-foot head of water.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

2.2 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 10 and Smaller: AASHTO M 252M, Type S, with smooth waterway for coupling joints.

1. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.

2.3 NONPRESSURE-TYPE PIPE COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.

2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Shielded Flexible Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Manufacturers:

a. Cascade Waterworks Mfg.
b. Dallas Specialty & Mfg. Co.
c. Mission Rubber Company; a division of MCP Industries, Inc.

2.4 MANHOLES

A. Standard Prefabricated HDPE Manholes: High density, high molecular weight ASTM D-3350-02 with minimum cell classification values of 345464 C.

1. Diameter: 48 inches minimum, unless otherwise indicated.

2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.

3. Base Section: Provide rectangular base section to allow the installation of ballast as required to prevent flotation.

4. Top Section: Provide manhole cover with hinged access section for inspection of manhole interior.

5. Pipe Connectors: PE Bulkhead connectors, fitted into manhole walls, for each pipe connection.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Pipe couplings and fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping, unless otherwise indicated.

a. Shielded flexible couplings for same or minor difference OD pipes.
b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.

2. Gravity-Flow, Nonpressure Sewer Piping:

a. NPS 4 to NPS 15; Corrugated PE drainage pipe and fittings, soiltight couplings, and coupled joints.

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of collection piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected.

D. Install gravity-flow, nonpressure collection piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.

E. Clear interior of piping and manholes of dirt and superfluous material as work progresses.

3.3 PIPE JOINT CONSTRUCTION

A. Follow piping manufacturer's written instructions.

B. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 MANHOLE INSTALLATION

A. General: Set manholes level and install complete with appurtenances and accessories indicated.

B. Handling of Manholes. HDPE manholes shall be stored on clean, level, and dry ground to prevent undue scratching or gouging of the pipe. The handling of HDPE manholes shall be done in such a manner that there is no damage.

3.5 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred at completion of Project.

1. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.

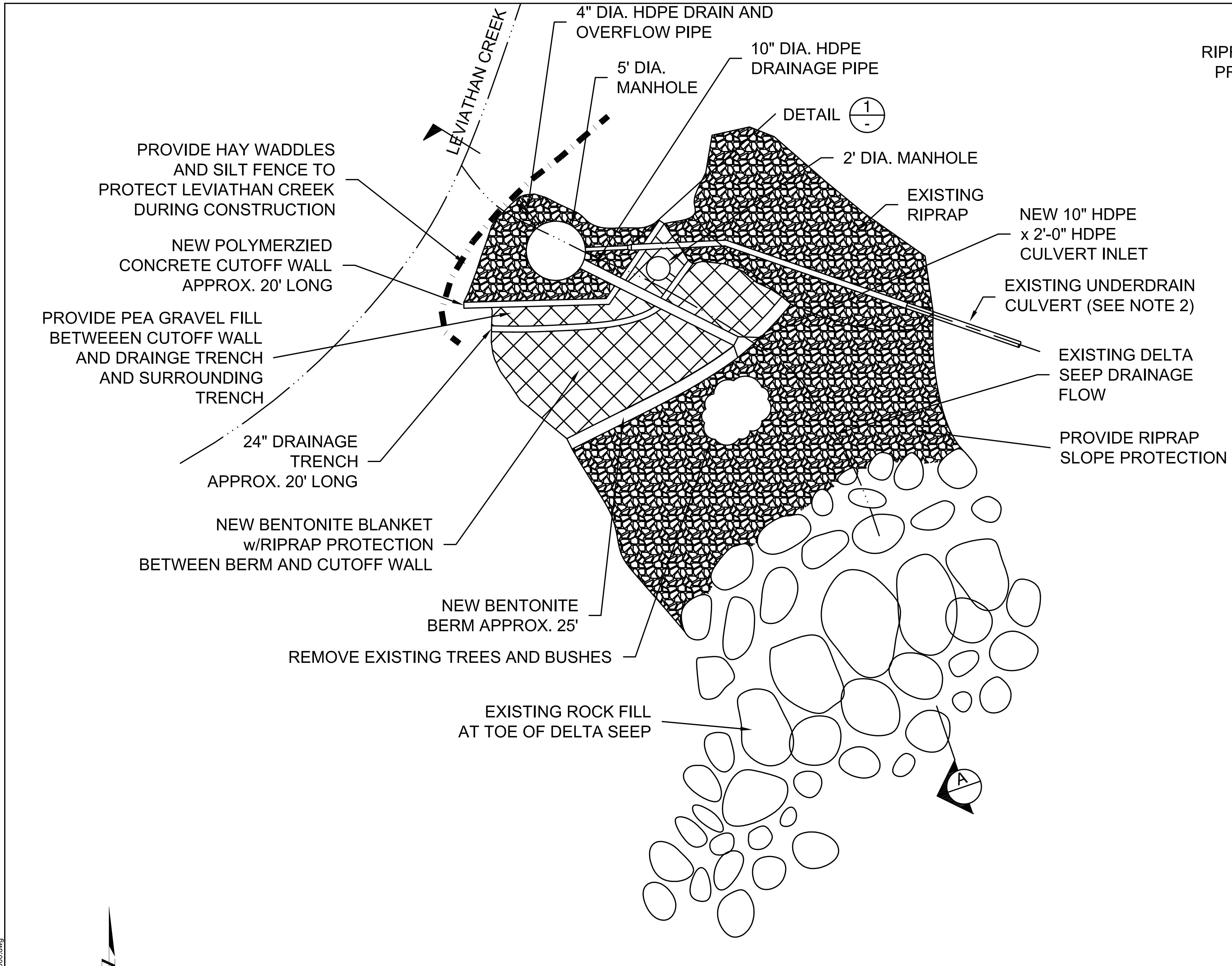
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

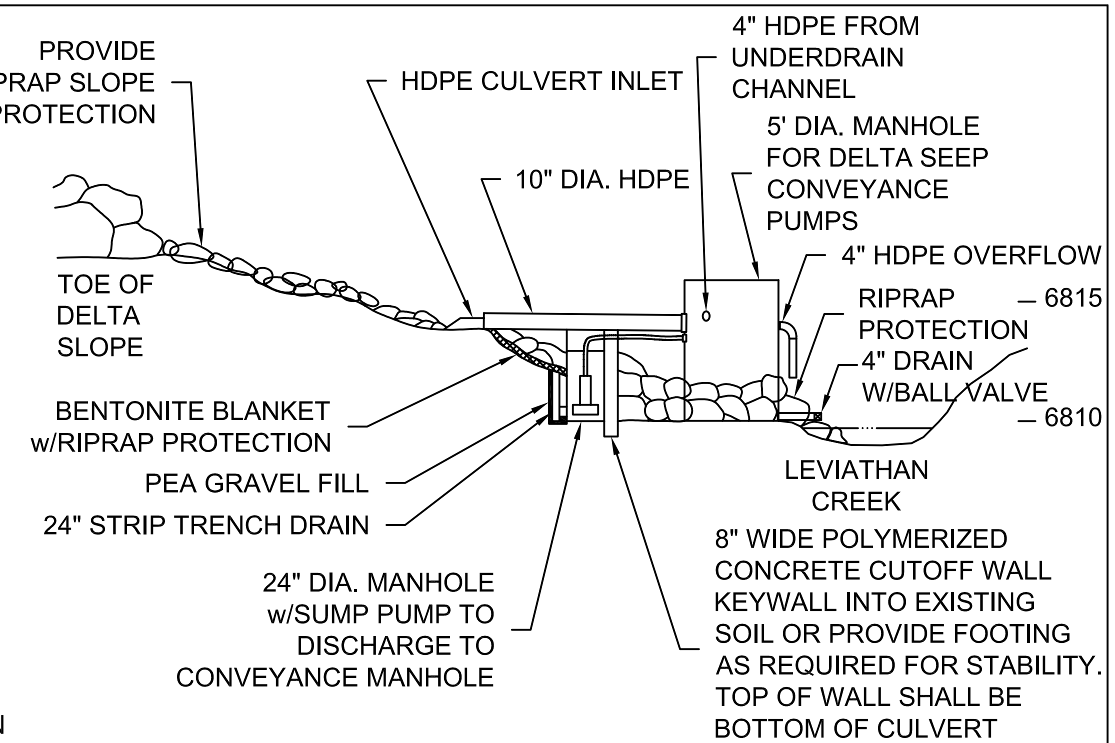
3. Reinspect and repeat procedure until results are satisfactory.

END OF SECTION

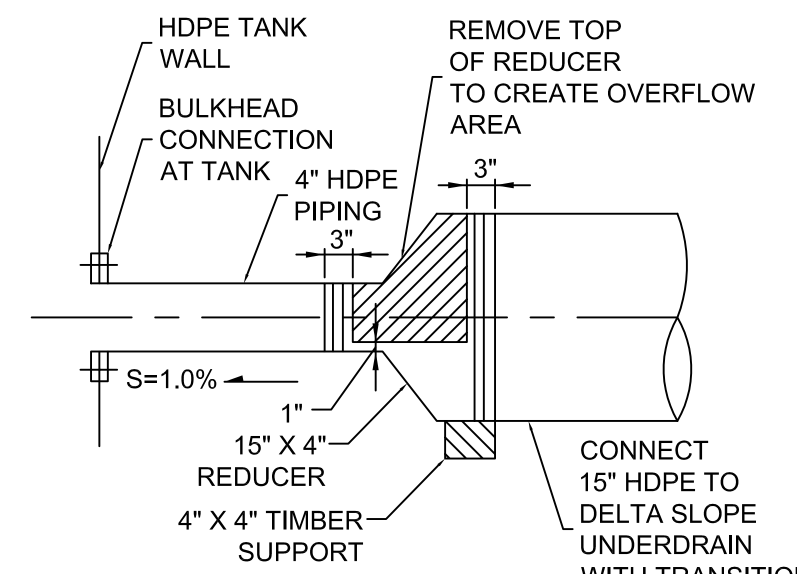
DRAWINGS



SCHEMATIC PLAN VIEW



SECTION AA



DETAIL 1

NOTES:

1. CONVEYANCE PUMPS AND PIPING NOT SHOWN.
2. ATTACH 4" HDPE COLLECTION PIPING TO EXISTING 15" HDPE CULVERT WITH 15" CULVERT PIPE AND REDUCER. PROVIDE 4x4x2'-0" TREATED TIMBER SUPPORTS AT 6'-0" O.C. TO SUPPORT PIPING.

DRAFT

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS				
DATUM				

DRAWN LD
DESIGNED AC
CHECKED
REVIEWED

Geomatrix
Geomatrix Consultants, Inc.
1401 17th Street, Suite 600
Denver, Colorado 80202
(303) 534-8731

LEVIATHAN MINE SITE

DELTA SEEP COLLECTION AREA SCHEMATIC

DATE: 06–10–07
SCALE: 1"=10'
SHEET: OF SHEETS
PROJ No: 13091

Plot Date: 08/15/07 - 10:29am, Plotted by: larry_zent
Drawing Path: C:\, Drawing Name: Levithan Fig xx Delta Seep SchematicR2000.dwg

Geomatrix

Technical Memorandum

TO:	Kevin Mayer, EPA	**DATE:**	September 6, 2007
FROM:	Geomatrix Consultants on behalf of Atlantic Richfield Company	**PROJ. NO.:**	13091
CC:		**PROJ. NAME:**	Leviathan Mine Site
SUBJECT:	**Technical Memorandum – Aspen Seep Bioreactor Sludge Removal**		

This Technical Memorandum (memorandum) has been prepared by Geomatrix Consultants, Inc. (Geomatrix) on behalf of Atlantic Richfield Company (Atlantic Richfield) to supplement the 2007-08 Treatability Studies and Interim Treatment Work Plan (Work Plan) for Leviathan Mine dated June 21, 2007. This memorandum provides a summary of the current performance of the Aspen Seep Bioreactor (ASB) and describes planned sludge removal and dewatering activities for the remainder of the 2007 field season. This memorandum was discussed with EPA on a conference call on August 21, 2007 and is intended to address EPA questions regarding the accumulation of sludge in the ASB and potential impacts on ASB performance.

Background

The ASB has been operating as a full scale sulfate-reducing bioreactor system since 2003. The quantity of sludge generated during this operational period is uncertain. However, based on measurements reported in the Aspen Seep Bioreactors, 2006 Data Summary Report (EMC^2, 2007), approximately 27 cubic yards (cy) of sludge was removed from the ASB using filter bags in the 2005 and 2006 field seasons. In addition, 77.7 and 228.1 cy of sludge was removed from the pre-treatment pond and Pond 3, respectively, in September and October of 2006. These sludge removal efforts have been hampered by difficulties associated with the handling and dewatering of the high water content sludge. As a result of these difficulties, sludge removal from the ASB has somewhat limited resulting in continued accumulation of sludge within the ASB. Sludge removal is necessary to maintain the ideal efficiency of the treatment system by minimizing hydrologic changes within the cells and potential short-circuiting. The ASB consists of a series of ponds with a total capacity of approximately 328,500 gallons. The capacities of the various ponds in the ASB as described in the Aspen Seep Biocell Construction Report (December, 2004) are summarized below.

1401 Seventeenth Street, Suite 600
Denver, Colorado 80202-1485
Tel 303.534.8722
Fax 303.534.8733
www.geomatrix.com

- Pretreatment Pond ~7,500 gallons
- Biocell 1 ~40,000 gallons
- Biocell 2 ~23,000 gallons
- Pond 3 (mixing and settling) ~123,000 gallons
- Pond 4 (settling) ~135,000 gallons

As described in the Work Plan, a sludge dewatering pilot test utilizing filter bags contained within roll-off style filter bins (dewatering bins) was commenced in June 2007. The pilot test demonstrated the feasibility of dewatering sludge using the DirtBag™ brand filter bags but indicated that considerable labor was required to optimize flow rates through the filter bags. In addition, the observed drainage rates from the filter bags was extremely slow and will require a significant number of filter bins to dewater the large volume of sludge that has accumulated in the ASB. As a result, the sludge dewatering pilot test was discontinued in July 2007. The pilot test was unable to determine the time required for dewatering of the sludge or the final percent solids that could be achieved with this method.

In the same approximate time frame that the sludge dewatering pilot test was performed, sludge accumulations in the ASB reached critical levels with sludge levels observed near the top of Pond 3 and the biocells. As a result, Atlantic Richfield directed its contractors, Geomatrix and Broadbent Associates, Inc. (BAI) to begin removing sludge immediately from the ASB. As a result, seven 20,000 gallon tanks were positioned to the south of the ASB providing temporary holding capacity for 140,000 gallons of sludge. Pumping of sludge from Pond 3 to the seven 20,000 gallon tanks was initiated in July 2007 as an immediate and short term means of reducing further introduction of sludge into the biocells associated with the recirculation of water from Pond 3. Additional sludge removal from the biocells and Pond 4 is necessary and is planned later in the 2007 summer field season as described later in this memorandum.

Current Bioreactor Performance

There has been some discussion that the long-term accumulation of sludge over the past 4 years in the Aspen has affected the performance of the bioreactor. Review of historic and current data indicates that the system continues to perform very well with respect to metals removal. The current performance of the Aspen seep bioreactor is equivalent to historical performance since monitoring began in 2003. Figure 1 shows the historical average percent metals removal and average percent metals removal by year. This demonstrates that the percentage of metals removed by the bioreactor in 2007 is equal to or greater than the historical average metals removal for all metals except nickel. However, this apparent low percentage removal of nickel is likely due to the incomplete data set for 2007, as typically less metal removal is observed during early spring when flows increase rapidly and the growth of sulfate-reducing bacteria lags behind the spring runoff. The 2007 data shown here represents data collected prior to disturbances of the bioreactor system when sludge removal activities were initiated.

The average rate of sulfate removal achieved by the ASB in 2006 and 2007 was lower than in prior years. There are several potential explanations for the decreasing sulfate removal, one of which is possible lower residence time in the biocells as the result of long-term sludge accumulation and short circuiting. The sludge removal plans described in this memorandum are intended to address this possibility by removing sludge from the biocells and restoring, to the extent possible, longer residence times in the biocells.

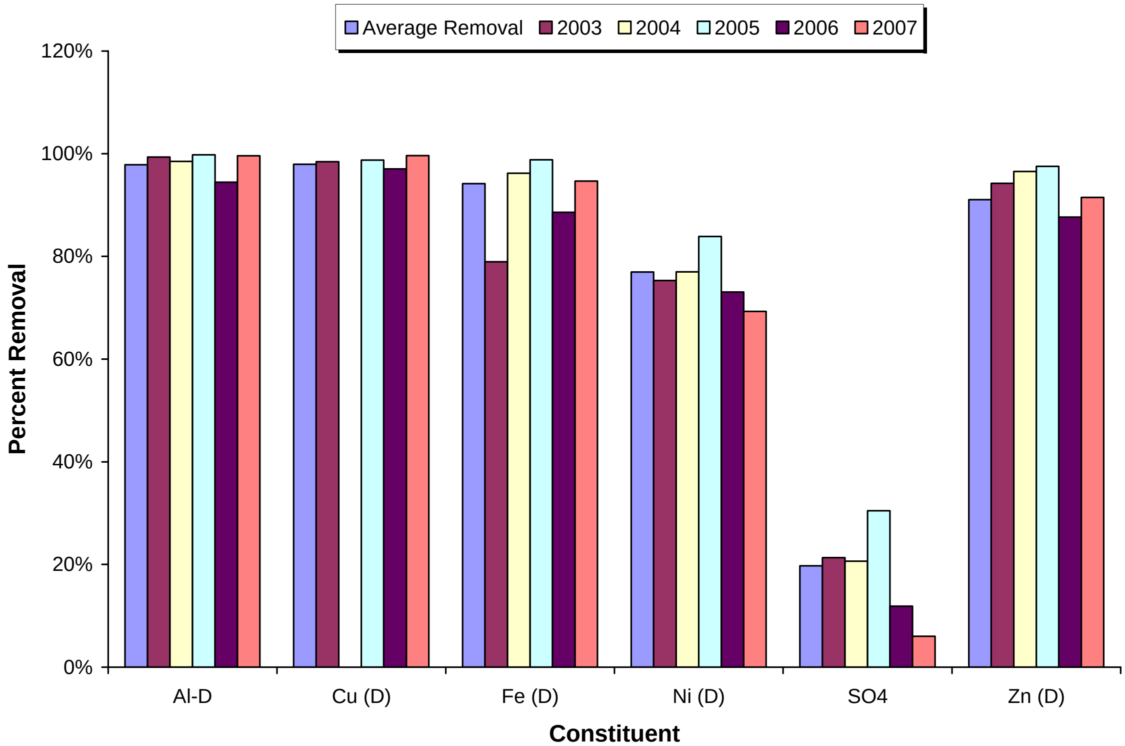


Figure 1. Aspen Seep bioreactor, comparison of historical and annual metals removal by percentage.

2007 Plans for Sludge Removal, Dewatering, and Disposal

Atlantic Richfield will continue to evaluate various alternatives for long term sludge removal and management from the ASB as described in the Work Plan. However, given the urgency to remove sludge from the ASB in 2007, Geomatrix and BAI have evaluated alternatives for short term sludge dewatering and management in consideration of space and time constraints. Short term alternatives considered for the remainder of the 2007 field season include: 1) continued use of filter bags and filter bins for onsite sludge dewatering via gravity drainage with subsequent offsite disposal of solids, 2) offsite disposal of sludge (solids and liquids) without dewatering, and 3) onsite sludge dewatering using a mobile belt filter press with subsequent offsite disposal.

This first alternative (filter bags and filter bins) is not considered feasible due to the large number of filter bins and the time necessary for sludge dewatering via gravity drainage. The second alternative (offsite disposal) is also considered infeasible due to the large liquid content of the sludge that would require transportation and disposal offsite. Inquiries to the US Ecology disposal facility in Beatty, Nevada indicate that they will most probably limit the liquid content of the sludge, thus requiring some dewatering prior to disposal. The third alternative is considered to be the most promising method for onsite sludge dewatering prior to offsite disposal given the time constraint and disposal dewatering requirements. This alternative is recommended for implementation at the ASB because it has the potential to significantly reduce the volume of sludge requiring offsite disposal relatively quickly. This would allow for both the dewatering of the 140,000 gallons of sludge currently held in the existing storage tanks while allowing for additional sludge removal from the ASB. This alternative is described in more detail below.

A belt filter press is a mechanical device that is commonly used to dewater biosolids from municipal wastewater treatment plants. The belt filter press dewaters by applying pressure to a mixture of liquids and solids and thus physically squeezing water out of the mixture leaving a higher percent solid material for disposal. Materials are sandwiched between two tensioned porous belts and are passed over rollers with increased pressure being applied as the belt passes over rollers of increasingly smaller diameter. A more comprehensive description of the belt filter press technology is described in the attached EPA Fact Sheet (Attachment A).

Atlantic Richfield proposes to mobilize a belt filter press to the Site in September 2007 to commence sludge dewatering operations and continue sludge removal from the ASB. The belt filter press will be provided and operated by Clearwater Compliance, Inc (Clearwater) of Loomis, California. A key element to the operational efficiency of a belt filter press is the polymer conditioning of the sludge. Consequently, Clearwater conducted laboratory testing of ASB sludge in order to evaluate the best combination of polymer type and dose and belt press style and size. Clearwater has indicated that the expected performance of the belt filter press technology will reduce the water content of the ASB sludge to approximately 50 percent at flow rates up to 200 gpm.

Planned sludge removal and dewatering activities will involve the setup of the mobile belt filter press in the area near the seven 20,000 gallon storage tanks mobilized to the Site in July 2007. Because the effectiveness of the belt filter press and the rate at which sludge dewatering will occur are uncertain, sludge removal and dewatering activities will first evaluate the efficiency of the belt filter press at reducing the water content of the sludge. If successful, the sludge from the storage tanks will continue to be dewatered using the belt filter press and shipped off site, and additional sludge will be removed from Pond 4 and the biocells and then dewatered as described in more detail below. In the event that belt filter press technology does not perform adequately, Atlantic Richfield will report the results of dewatering attempts using belt filter press and provide alternative plans for sludge removal during the 2007 field season.

Given the uncertainty in the rate and efficiency of sludge dewatering, the exact sequence or schedule for the planned sludge removal and dewatering activities can not be determined at this time. However, sludge dewatering and removal activities will be conducted in three general steps following setup and initial testing of the belt filter press. The first step will involve the dewatering of the 100,000+ gallons of sludge currently stored in six of the 20,000 gallon storage tanks. Following the dewatering of the sludge, the water removed from the sludge will be stored in one or more empty 20,000 gallon storage tanks and then fed back into the settling pond (Pond 4) or discharged directly to the aeration channel and Aspen Creek. Discharge rates to the aeration channel will be limited in a manner such that the capacity of the channel is not exceeded.

The second step in planned activities will consist of the removal of sludge accumulated in Pond 4 of the ASB. This will be accomplished in a manner similar to the sludge removal from Pond 3 which involved pumping sludge uphill into some of the 20,000 gallon storage tanks. Following the dewatering of the Pond 4 sludge in the storage tanks, the water removed from the sludge will be stored in empty 20,000 gallon storage tanks and then fed back into the settling pond (Pond 4) or discharged directly to the aeration channel and Aspen Creek.

The third and final step in planned sludge dewatering and removal activities for 2007 will consist of the flushing of the biocells. This will be attempted using the flushing system installed during the construction of the ASB. The effectiveness of the flushing will depend on the functionality and design of this flushing system and the consistency and volume of sludge accumulated. Water collected in the storage tanks during sludge dewatering or from Pond 3 or Pond 4 will be used for flushing to minimize the introduction of foreign water into the ASB. If time allows, the sludge flushed from the biocells into Pond 4 will be pumped uphill into some of the 20,000 gallon storage tanks for dewatering by the belt filter press. Similar to Steps 1 and 2, water removed from the sludge will be stored in empty 20,000 gallon storage tanks and then fed back into the settling pond (Pond 4) or discharged directly to the aeration channel and Aspen Creek.

Solids captured from the belt filter press during the dewatering activities described above will be loaded into water tight waste bins for waste characterization and offsite disposal. Waste characterization and disposal activities will be conducted as described in the Work Plan.

Monitoring

Monitoring of the ASB will continue during sludge removal and dewatering activities in accordance with the requirements outlined in the Work Plan. These requirements are summarized in the following table:

2007 ASPEN SEEP BIOREACTOR SAMPLING AND ANALYSIS PROGRAM

Aspen Seep Bioreactor					
Sample Location	**Sample ID Designation**	**Field Parameters**	**Sample Frequency**	**Analytical Parameters**	**Sample Frequency**
Bioreactor Influent (USGS Weir)	ASPINF	pH, Temp, Conductivity, DO, Flow rate	Weekly/ Monthly[2]	Acidity, alkalinity, Ca, Cl, Mg, sulfate, TDS, TSS, and target metals[1]	Every two weeks/ Monthly[2]
Bioreactor Effluent	ASPEFF	pH, Temp, Conductivity, DO, Flow rate	Weekly/ Monthly[2]	Acidity, alkalinity, Ca, Cl, Mg, sulfate, TDS, TSS, and target metals[1]	Every two weeks/ Monthly[2]
Process locations[3]	Vary	pH, Temp, Conductivity, DO	Weekly/ Monthly[2]	NA	NA
Bioreactor Sludge	BR-SLDG	NA	NA	TCLP, STLC, TTLC, SPLP, density, moisture	Prior to sludge disposal

NA – Not Applicable
1 - Target metals are dissolved aluminum, arsenic, cadmium, chromium, copper, iron, lead, nickel, zinc and total selenium.
2 - Monthly measurements during the winter.
3 - Process monitoring locations will vary with system configuration and will be selected as appropriate by the project engineer, data collected from process locations is used to optimize the system performance.

Current monitoring of the ASB includes sampling of influent and effluent for laboratory analysis. These data are adequate for assessing overall bioreactor performance; however, additional sampling will be performed as detailed below to evaluate the water quality of discharges during sludge removal from the ASB to Aspen Creek relative to water quality criteria outlined in the Work Plan.

During the process of sludge removal and flushing of the biocells, water from the belt filter press will need to be discharged either into the settling pond (Pond 4) or discharged directly to the aeration channel and Aspen Creek. Because the water in the storage tanks is treated water commingled with bioreactor sludge, it is expected that the water held in the storage tanks will meet discharge criteria for metals. Recent samples of water collected from the storage tanks confirms that the water contained in the tanks meets these discharge criteria. The analytical data for this sampling event are provided in the table below.

ANALYTICAL RESULTS FOR WATER COLLECTED FROM THE ASPEN SEEP SLUDGE STORAGE TANKS

Concentrations in [mg/L except pH which is in s.u.]

Parameter[1]	Analytical Results Sample Date 8-22-07	Maximum[1,2]	Average[3]
pH	--		6.0 – 9.0
Aluminum	<0.05	4.0	2.0
Arsenic	<0.005	0.34	0.15
Cadmium	<0.005	0.009[4]	0.004[4]
Chromium	<0.01	0.97[4]	0.31[4]
Copper	<0.01	0.026[4]	0.016[4]
Iron	1.0	2.0	1.0
Lead	<0.005	0.136[4]	0.005[4]
Nickel	0.012	0.84[4]	0.094[4]
Selenium	0.0028	Not Promulgated	0.005[4]
Zinc	<0.10	0.21[4]	0.21[4]

1 All metals concentrations based on dissolved fraction, except Selenium, which is for total recoverable.

2 Concentrations are based on a daily composite of three grab samples, each grab sample for metals analysis to be field-filtered and acid fixed promptly after collection.

3 Concentrations are based on four daily composite samples, each composite sample consists of three grab samples collected and combined in one day (EPA, 2001). For metals analysis each grab sample is field filtered and acid fixed promptly after collection.

4 Values calculated from 40 CFR 131.38 using hardness of 200 mg/L of $CaCO_3$.

While it is unlikely that there would be significant chemical changes during the sludge dewatering activities, supplemental monitoring (in addition to the monitoring program outlined in the above table) will be performed during the sludge removal and dewatering to ensure that water discharged to Pond 4 and/or directly to the aeration channel is chemically stable. Supplemental monitoring will consist of the sampling of discharge water for the analytical parameters listed in the above table on a weekly basis. In addition, water discharged to the aeration channel leading to Aspen Creek will be monitored daily for field parameters (pH, conductivity, temperature, and dissolved oxygen) supplemented with dissolved iron, which will be measured colorimetrically in the field. This recommended monitoring approach is based on a review of historical data that shows a very good correlation between pH and dissolved metals concentration (Figure 2). When bioreactor effluent pH is above about 7.2, the primary metals, as shown by Fe, Cu, Ni, and Zn, are below appropriate discharge criteria, and thus pH should be a reliable indicator of metals concentration. If solution pH is found to be below 7.2, water will be discharged to Pond 3 and pH will be adjusted with sodium hydroxide addition prior to discharging to either the settling pond (Pond 4) or directly to the aeration channel and Aspen Creek.

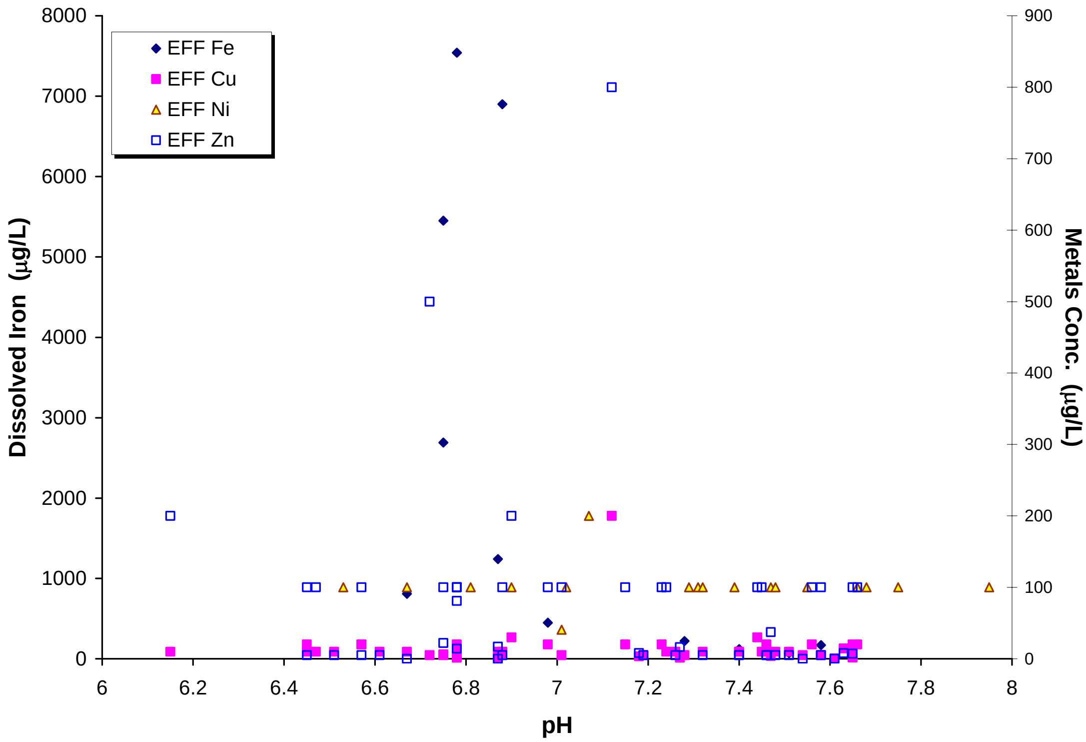


Figure 2. Correlation between bioreactor effluent pH and target metals concentrations.

ATTACHMENT

Attachment A – EPA Biosolids Technology Fact Sheet, Belt Filter Press (EPA Publication 832-F-00-057, September 2000)

Geomatrix

Technical Memorandum

TO:	Kevin Mayer, EPA	**DATE:**	September 14, 2007
FROM:	Geomatrix Consultants on behalf of Atlantic Richfield	**PROJ. NO.:**	13091

SUBJECT: **Technical Memorandum – Pond 4 LTS Monitoring Program Modifications Leviathan Mine Site, Alpine County, California**

This Technical Memorandum was prepared by Geomatrix Consultants (Geomatrix) on behalf of Atlantic Richfield Company to: 1) outline a proposed Monitoring Optimization Study for the monitoring of effluent from the Pond 4 Lime Treatment System (LTS), and 2) document other modifications to the monitoring program for 2007 water treatment activities at the Leviathan Mine Site. The proposed Monitoring Optimization Study was discussed, in concept, with Kevin Mayer of EPA Region 9 in a telephone conversation on September 7, 2007. The purpose of Monitoring Optimization Study is to evaluate the use of field parameters as a surrogate for time consuming laboratory analyses for assessing the acceptability of water quality for discharge. The use of field parameters as a surrogate for laboratory analyses also eliminates the need for pre-discharge sampling Pond 4 thus allowing continuous discharges to Leviathan Creek. Continuous discharge is considered beneficial to Leviathan Creek given the extremely dry (no flow) conditions in Leviathan Creek and the planned interruption of DS capture during the construction of improvements to the DS collection system.

Plans for the proposed Monitoring Optimization Study are described in greater detail below. Thereafter, the remainder of this Technical Memorandum describes several modifications to the monitoring program for the Pond 4 LTS and CUD/DS collection and conveyance systems that were outlined in the 2007-08 Treatability Studies and Interim Treatment Work Plan (2007-08 Work Plan) dated June 21, 2007. These modifications were implemented to accommodate changed field conditions and to reduce the monitoring frequencies commensurate with those data needed to assess treatment system performance.

Monitoring Optimization Study

The following description of the proposed Monitoring Optimization Study consists of: 1) a background discussion explaining the rationale for the proposed activities, 2) an evaluation of the performance of the 2007 Pond 4 LTS relative to the use of selected field parameters as an indicator of Pond 4 water quality, and 3) a summary of proposed plans for continuous discharge from Pond 4 and related monitoring during DS construction activities.

Background

The proposed Monitoring Optimization Study is proposed to occur mid- to late-September 2007 during the construction of improvements to the DS collection system. These improvements were described in a Design Submittal for the Semi-Permanent Delta Seep Collection System dated August 15, 2007. In the letter accompanying the design submittal, Atlantic Richfield indicated that there was not enough space between the toe of the Delta Slope and Leviathan Creek to allow the current DS collection system to remain in place while the new DS collection system is being installed. Consequently, Atlantic Richfield indicated that an interruption in DS collection would occur for a period of two to three weeks beginning in mid-September. Due to minimal flow conditions in Leviathan Creek during the summer months of 2007, EPA expressed concern about the planned interruption in DS collection and potential impacts on Leviathan Creek. As a result of these discussions with EPA, it was agreed that continuous discharge of treated water from Pond 4 during DS construction activities might be beneficial to Leviathan Creek. EPA acknowledged that continuous discharge from Pond 4 might increase the probability that discharges might exceed the water quality discharge criteria outlined in the 2007-08, largely due to the impracticability of performing continuous laboratory analyses on the waters prior to discharge to Leviathan Creek. As a result, Geomatrix agreed to evaluate the use of field parameter measurements as an indicator of metals concentrations in the discharge from Pond 4. This evaluation was performed comparing field parameters measurements and laboratory analyses for selected metals (iron and aluminum) collected during the 2007 treatment season as described below.

Field Indicators of Pond 4 Water Quality

Removal of metal constituents in the lime treatment process is a function of equilibrium thermodynamics and reaction kinetics. Under oxidizing conditions and at a pH of approximately 7.0, the thermodynamically stable form of iron is ferric hydroxide [$Fe(OH)_3$]. The precipitation of iron is very rapid at this pH particularly when the ferrous iron has been oxidized to the ferric form. The precipitation of aluminum hydroxide [$Al(OH)_3$] is also predicted from thermodynamics and is also very rapid under these conditions. Iron and aluminum combined make up more than 96% of the metals in the CUD flow on a molar basis each representing approximately 77% and 19% of the metals concentrations, respectively, and therefore dominate the system chemistry. Other trace metals in the system can also form oxide or hydroxide phases, but more likely will be removed by co-precipitation and/or adsorption to the iron and aluminum hydroxides.

The Pond 4 LTS has been very effective at maintaining the pH and DO of system effluent at levels that promote Fe and Al hydroxide formation as shown in Figure 1. In addition, the pH of Pond 4 has been generally consistent at all four of the sampling locations in the pond as shown in Figure 2, with an average pH of 8.33. Thus, the system operation to date has provided the proper conditions and residence time to allow for the removal of the constituents of concern to levels below the current discharge criteria in pre-discharge samples collected from Pond 4 and Pond 4 effluent samples. The analytical data to support this has been provided previously in the monthly progress reports. It is anticipated that these conditions will continue to be maintained and thereby minimize the potential for exceedances of discharge criteria during the proposed period of continuous discharge from Pond 4. Pre-discharge and discharge data collected during the 2007 have shown that under these conditions the concentrations of metals in Pond 4 and the Pond 4 discharge meet all water quality discharge criteria. Therefore, close monitoring of pH and DO such that conditions are maintained within an acceptable range should result in discharge water that continues to meet water quality discharge criteria.

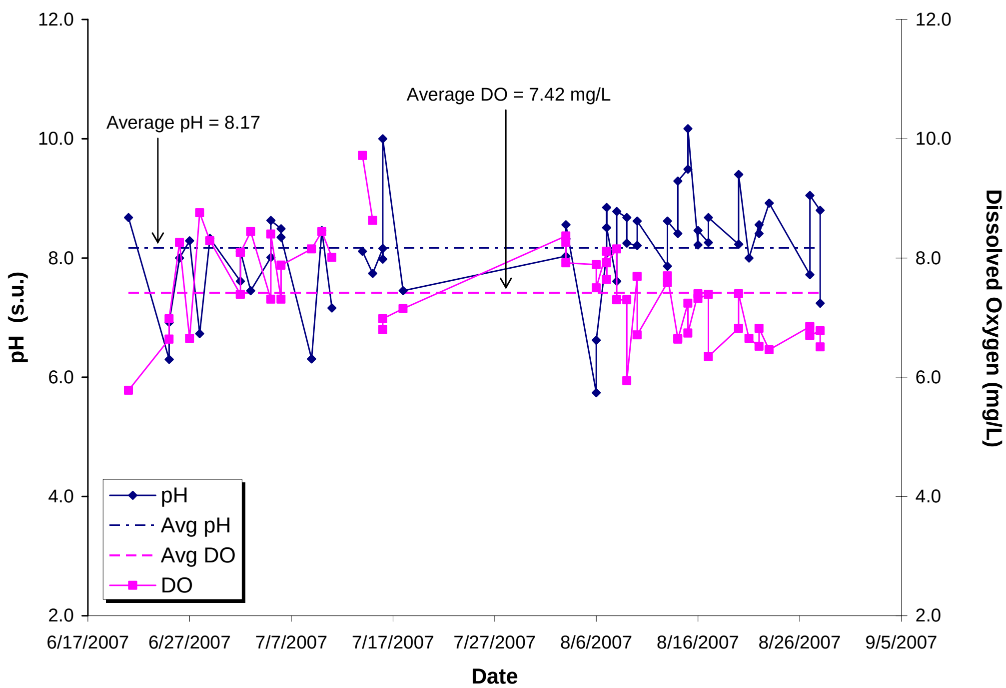


Figure 1. Pond 4 LTS performance as demonstrated by pH and DO levels in system effluent during the 2007 treatment season

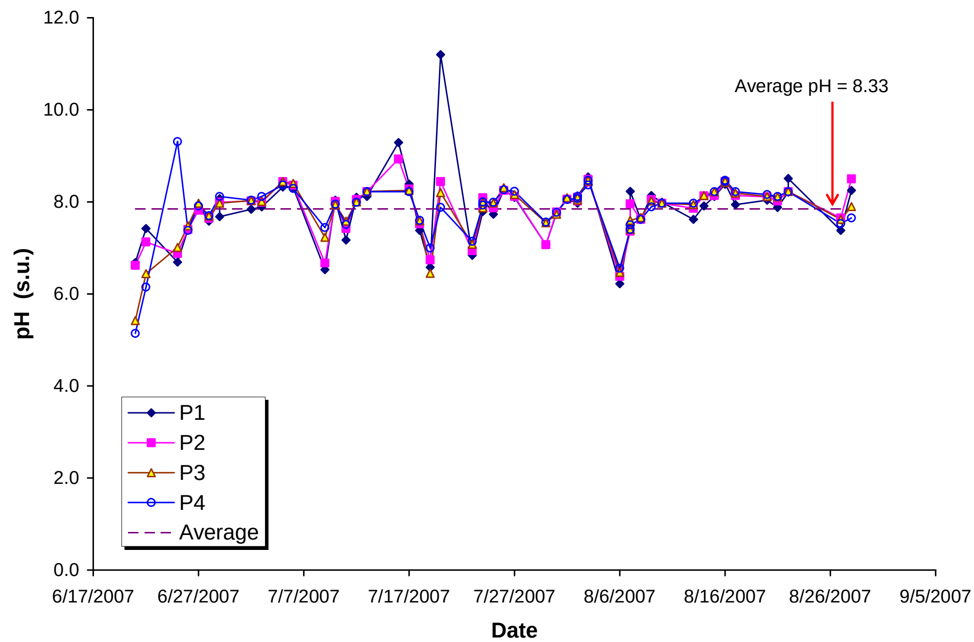


Figure 2. Measured pH values observed at the four sampling locations in Pond 4 during the 2007 treatment season.

Proposed Plans for Pond 4 Discharge and Monitoring

Construction activities for improvements to the DS collection system are scheduled to begin the week of September 10, 2007. Continuous discharges from Pond 4 are proposed to begin at that time extending through the period of DS construction activities. Geomatrix will make every effort to expedite DS construction activities to minimize the interruption in capture and treatment of the Delta Seep flow. However, the duration of the interruption in DS capture could be as much as 14 days. This duration is subject to change depending on field conditions and related work progress. Geomatrix will keep EPA notified of work progress during DS construction activities and will notify them when DS capture is interrupted and resumed.

To ensure that continuous discharge to Leviathan Creek will occur for as much of the DS construction activities as possible, Geomatrix proposes to discharge at a continuous rate of approximately 40 to 50 gallons per minute. This should provide approximately 10 days of continuous discharge assuming available pond storage of 500,000 gallons and ongoing treatment of CUD flows at approximately 16 gpm (average flow in August was 16.5 gpm). Given these assumptions, continuous discharge of 40 - 50 gpm should provide an approximate 10 to 12-fold dilution of the DS flows that are currently being collected and treated (average flow in August was 4.2 gpm).

Proposed monitoring during continuous discharges from Pond 4 to Leviathan Creek is summarized in the following table.

**PROPOSED POND 4 LTS AND CUD/DS MONITORING
MONITORING OPTIMIZATION STUDY**

Sample Location	Sample ID Designation	Field Parameters	Sample Frequency	Analytical Parameters	Sample Frequency
Pond 4 Lime Treatment System					
CUD Flow	CUD	pH, Temp, Conductivity, DO, Flow rate	Minimum of every 2 to 3 days	Acidity, alkalinity, hardness, Ca, Cl, Mg, sulfate, TDS, TSS, and target metals[1]	Weekly[2]
P4LTS Effluent	P4LTS-EFF	pH, Temp, Conductivity, DO, Flow rate, Fe^{2+}/Fe_{total} (Hach) [3]	Minimum of every 2 to 3 days	Alkalinity, hardness, Ca, Cl, Mg, sulfate, TDS, TSS, and target metals[1]	Weekly[2]
Pond 4 Pre-discharge	PND4 PREDIS	pH, Temp, Conductivity, DO, Fe^{2+}/Fe_{total} (Hach) [3]	Prior to discharge & daily during discharge[4]	NA	NA
Effluent	Effluent	pH, Temp, Conductivity, DO, Flow rate	Daily during discharge	Acidity, alkalinity, hardness, Ca, Cl, Mg, sulfate, TDS, TSS, and target metals[1]	Every 3 days during discharge[2]

NA – Not Applicable
1 - Target metals are dissolved aluminum, arsenic, cadmium, chromium, copper, iron, lead, nickel, zinc and total selenium.
2 - Sample to consist of a composite of one grab sample to be field-filtered and acid fixed as required promptly after collection.
3 - Fe^{2+}/Fe_{total} measured calorimetrically.
4 - Pond field monitoring samples may be labeled P1, P2, P3, P4 as various locations around the pond.
5 -

Other 2007 Monitoring Program Modifications

Performance monitoring of the Pond 4 LTS as outlined in the 2007-08 Work Plan contemplated the sampling of water in the equalization tank consisting of combined flows from the CUD and DS. Under actual operating conditions however, flows from the CUD and DS are variable due to the cycling of the pumps at each location. In addition, water from Pond 4 is pumped into the equalization tank to even out the flows and re-circulate the water in the pond. These changes from the anticipated operation of the Pond 4 LTS render any water quality data collected from the equalization tank irrelevant to the overall influent water quality to the treatment system. Instead, the Pond 4 LTS operator, Ionics Water Technologies (IWT), has been monitoring water quality data from the CUD and DS, from the flash tank after lime dosing, and Pond 4 to adjust and maintain the proper lime dosing required to meet treatment objectives.

The 2007-08 Work Plan also calls for daily monitoring of field parameters (pH, temperature, conductivity, DO, and iron). Field parameter measurements collected over the first 30 days of operation indicates that there is very little variability in the water quality from these sources over short time intervals as measured by specific conductance and pH. Therefore the frequency of monitoring at these locations was decreased to every 2 to 3 days. This change in monitoring frequency does not affect treatment effectiveness or the overall monitoring program Data Quality Objectives (DQOs).

Also, in accordance with the 2007-08 Work Plan, monitoring of the Pond 4 LTS effluent was scheduled for three times daily or continuously. However, because the chemistry of the influent flows is relatively constant, the lime feed system has effectively maintained the pH of the effluent within a range from 6.8 to 9.4 with a median pH of 7.9 (see Figure 1 above). Consequently, the effluent is monitored from one to several times a day during the standard work week (Monday through Friday) when the operators are on Site, but is not monitored on weekends. The discharge of treated water to Pond 4 where it is stored prior to periodic event based discharge provides a safe guard against release of water that exceeds treatment criteria to Leviathan Creek, should an interruption of treatment allow for poorer quality effluent to exit the system during the weekend breaks in monitoring. Because Pond 4 is sampled prior to discharge, potential exceedances in the discharge criteria can be identified and addressed by recycling Pond 4 through the treatment system until discharge criteria are met.

The monitoring program outlined in Table 4-3 of the 2007-08 Work Plan indicated that Fe^{2+}/Fe_{total} were scheduled to be monitored at the CUD, DS, Equalization Tank, P4LTS Effluent, and Pond 4 Discharge during the measurement of field parameters. During the initial operation of the treatment system these parameters were not measured at all stations indicated or at the frequency indicated. This deviation from the Work Plan occurred due to equipment issues and has been remedied by the procurement of a new colorimeter for dissolved iron measurements in the field. This change in sampling field parameters does not affect the monitoring program because these parameters were included originally for the sole purpose of providing yet another tool for evaluating and optimizing treatment system performance. Given the relatively consistent field data that has been collected to date and discussed above, the frequency of field measurements for iron was decreased to every 2 to 3 days.

Table 4-3 from the 2007-08 Work Plan has been updated to reflect the modifications to the monitoring program described above and is attached is to this Technical Memorandum for future reference.

Please contact Grant Ohland at (303) 534-8722 with comments or questions regarding the contents of this memorandum.

LIST OF ATTACHMENTS

Modified Table 4-3 from the 2007-08 Work Plan - 2007 Pond 4 LTS and Aspen Seep Bioreactor, Sampling and Analysis Schedule

MODIFIED TABLE 4-3
2007 POND 4 LIME TREATMENT SYSTEM AND ASPEN SEEP BIOREACTOR SAMPLINGAND ANALYSIS SCHEDULE

Sample Location	Sample ID Designation	Field Parameters	Sample Frequency	Analytical Parameters	Sample Frequency
Pond 4 Lime Treatment System					
CUD Flow &, DS Flow	CUD & DS	pH, Temp, Conductivity, DO, Flow rate	Minimum of every 2 to 3 days	Acidity, alkalinity, hardness, Ca, Cl, Mg, sulfate, TDS, TSS, and target metals[1]	Weekly[2,4]
P4LTS Effluent	P4LTS-EFF	pH, Temp, Conductivity, DO, Flow rate, Fe^{2+}/Fe_{total} (Hach) [3]	Minimum of every 2 to 3 days	Alkalinity, hardness, Ca, Cl, Mg, sulfate, TDS, TSS, and target metals[1]	Weekly[2,4]
Pond 4 Pre-discharge	PND4 PREDIS	pH, Temp, Conductivity, DO, Fe^{2+}/Fe_{total} (Hach) [3]	Prior to discharge & during discharge[5]	Acidity, alkalinity, hardness, Ca, Cl, Mg, sulfate, TDS, TSS, and target metals[1]	Prior to discharge to Leviathan Creek[2]
Effluent	Effluent	pH, Temp, Conductivity, DO, Flow rate	Daily during discharge	Acidity, alkalinity, hardness, Ca, Cl, Mg, sulfate, TDS, TSS, and target metals[1]	Daily during discharge[2]
Pond 4 Sludge	P4-SLDG	NA	NA	TCLP, STLC, TTLC, SPLP, density, moisture content	Prior to sludge disposal
Aspen Seep Bioreactor					
Bioreactor Influent (USGS Weir)	ASPINF	pH, Temp, Conductivity, DO, Flow rate	Weekly/ Monthly[6]	Acidity, alkalinity, Ca, Cl, Mg, sulfate, TDS, TSS, and target metals[1]	Every two weeks/ Monthly[6]
Bioreactor Effluent	ASPEFF	pH, Temp, Conductivity, DO, Flow rate	Weekly/ Monthly[6]	Acidity, alkalinity, Ca, Cl, Mg, sulfate, TDS, TSS, and target metals[1]	Every two weeks/ Monthly[6]
Process locations[7]	Vary	pH, Temp, Conductivity, DO	Weekly/ Monthly[6]	NA	NA
Bioreactor Sludge	BR-SLDG	NA	NA	TCLP, STLC, TTLC, SPLP, density, moisture	Prior to sludge disposal

[1] Target metals are those listed in Table 4.1 to be measured as dissolved except selenium.
[2] Sample to consist of a composite of three grab samples, each grab sample field-filtered and acid fixed as required promptly after collection.
[3] Fe^{2+}/Fe_{total} measured calorimetrically and the frequency may vary from other field parameters dependent on the usefulness of the data for guiding system operations.
[4] Weekly sampling will be conducted initially, with frequency adjusted based on correlation analysis of field measurements (ph and Fe_{total}) with analytical values.
[5] Pond field monitoring samples may be labeled P1, P2, P3, P4 as various locations around the pond.
[6] Monthly measurements during the winter.
[7] Process monitoring locations will vary with system configuration and will be selected as appropriate by the project engineer, data collected from process locations is used to optimize the system performance.

Atlantic Richfield Company

Roy I. Thun
Environmental Business Manager

4 Centerpointe Drive
LaPalma, CA 90623-1066
Office: (661) 287-3855
Fax: (661) 222-7349
E-mail: Roy.Thun@bp.com

September 14, 2007

Mr. Kevin Mayer
SFD-7-2
USEPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

RE: Design Summary Memorandum: Semi-Permanent Channel Underdrain Collection System Leviathan Mine, Alpine County, California

Dear Mr. Mayer:

As discussed during the Site visit on July 24, 2007, Atlantic Richfield is submitting for EPA's review the enclosed Design Summary Memorandum for the proposed Semi-Permanent Channel Underdrain (CUD) collection system at the Leviathan Mine Site. This submittal includes: (i) a Design Summary Memorandum; (ii) Technical Specifications, and (iii) schematic drawings of the proposed collection system.

These documents set forth the design basis for the Semi-Permanent CUD Collection System, which is intended to be implemented at the Site as a component of the treatability study for treating Acid Mine Drainage (AMD) from the CUD and Delta Seep (DS). A more conceptual description of the CUD Collection System was included in the 2007-08 Treatability Studies and Interim Treatment Work Plan (Work Plan) submitted to EPA on June 21, 2007 (approved with comments by letter dated July 19, 2007), and in the Work Plan Summary submitted to EPA on May 25, 2007 (approved with comments by letter dated June 7, 2007).

Atlantic Richfield's consultants and engineers have arrived at the design for the Semi-Permanent CUD Collection System after careful consideration of historical water quality and flow data, the results of and lessons learned from prior collection efforts, site conditions, access limitations, EPA's stated objectives for removal actions at the Site, and various other factors. The submission and finalization of these documents is a critical step in the implementation process because, in accordance with the standard design practices, subsequent engineering and procurement activities associated with the Semi-Permanent CUD Collection System will depend on meeting the requirements described in the enclosed submittal.

While Atlantic Richfield is submitting this information for EPA's approval, it should be understood that the anticipated time frames for 2008 treatment activities described in the Work Plan submitted to EPA (*see* Section 7.0 and Figure 7-1) assume expedited review and approval by EPA. Also, if material changes to the design criteria or other construction specifications are recommended, they may delay the timing of the construction of the Semi-Permanent CUD Collection System from what is currently planned.

Consistent with our with prior discussions, we also want to make it clear that construction of the improved CUD collection system described in the attached Design Summary Memorandum will require that we remove the existing temporary CUD collection system. As you know, there is simply not enough room between the outlet from the USGS weir box and Leviathan Creek to allow the current system to remain in place while the new system is being installed. Unfortunately, this means that there may be short periods when the CUD flow presently being captured will not be routed to the Pond 4 system for treatment. Atlantic Richfield will make every effort to expedite its construction activities and minimize the interruption in capture and treatment of the CUD flow. We anticipate that this work will be completed sometime in October.

As similarly expressed in the August 15, 2007 letter to you regarding AR's request for approval from EPA on the Semi-Permanent DS Collection System, we intend to wait for EPA's review and approval of the enclosed Design Summary Memorandum before proceeding with construction of the proposed CUD collection system. In the meantime, Atlantic Richfield will be preparing and providing to EPA further detailed information on the schedule for the completion of the design and construction of the semi-permanent conveyance piping system for the CUD and DS.

We are requesting for scheduling purposes that EPA provide its response to the enclosed materials by September 28, 2007. Please contact Grant Ohland or me with any immediate questions or comments or if you need further information about the technical aspects of the proposed Semi-Permanent CUD Collection System.

Sincerely,

Grant L Ohland for

Roy Thun
Environmental Business Manager

cc: Richard Booth, Lahontan Regional Water Quality Control Board
Chris Winsor, Atlantic Richfield Company – via electronic
Todd Normane, Esq. Atlantic Richfield Company – via electronic
Adam Cohen, Esq. Davis Graham & Stubbs LLP – via electronic
Dave McCarthy, Copper Environmental
Grant Ohland, Geomatrix – via electronic
Sandy Riese, EnSci – via electronic

Geomatrix

Design Summary Memorandum
Semi-Permanent Channel Underdrain Collection System

Leviathan Mine
Alpine County, California

Prepared for:

Atlantic Richfield Company
6 Centerpointe Drive
LaPalma, CA 90623-1066

Prepared by:

Geomatrix Consultants, Inc.
1401 17th Street, Suite 600
Denver, Colorado 80202
(303) 534-8722

September 2007

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DRAWINGS

DESIGN SUMMARY MEMORANDUM
SEMI-PERMANENT CHANNEL UNDERDRAIN COLLECTION SYSTEM

Leviathan Mine
Alpine County, California

1.0 INTRODUCTION

This Design Summary Memorandum (Memorandum) has been prepared by Geomatrix Consultants, Inc. (Geomatrix) on behalf of Atlantic Richfield Company (Atlantic Richfield) to transmit design criteria and other details related to the engineering design of the Semi-Permanent Channel Underdrain (CUD) Collection System planned for construction at the Leviathan Mine Site (Site) in 2007 and operation in 2008. A conceptual description for the Semi-Permanent CUD Collection System was provided in the 2007-08 Treatability Studies and Interim Treatment Work Plan (Work Plan) submitted to EPA on June 21, 2007. The information contained in this Memorandum is intended to supplement the information provided in the Work Plan and provide additional details on the key design parameters for the Semi-Permanent CUD Collection System. The purpose of this Memorandum is to provide EPA with design criteria and specifications prior to the completion of procurement and construction of the Semi-Permanent CUD Collection System. Construction of the design elements described in this Memorandum are planned for September or October 2007. A temporary CUD collection system was installed at the CUD in June 2007 and began operation on June 15, 2007. This system is currently capturing CUD flow from the effluent pipe of the USGS weir box at a rate of approximately 20 gallons per minute (gpm). As discussed with EPA during a Site tour on July 24, 2007, site improvements are proposed to stabilize the slope above the USGS weir box, replace the existing collection tank, and improve worker access to the CUD collection area.

2.0 SUMMARY OF KEY DESIGN PARAMETERS

This Memorandum contains design parameters for the Semi-Permanent CUD Collection System including, but not limited to, the following:

- Water quality considerations
- Design flow rates
- System design life and operating basis
- Description of system components

Detailed specifications for the construction of the proposed collection system are provided as Attachment A. Engineering drawings showing the schematic layout of the CUD collection area and access details are also attached.

3.0 WATER QUALITY CONSIDERATIONS

Water quality of flows from the CUD have been considered in the design of the CUD collection system to ensure that the materials used are resistant to the deleterious effects of AMD discharges. A summary of the anticipated water quality from the CUD based on a sample collected on June 29, 2007, is presented below in Table 3-1.

TABLE 3-1
ANTICIPATED CUD WATER QUALITY
Concentrations in [measurement units]

Parameter	Value
pH	2.9 s.u.
Aluminum	45.0 mg/L
Arsenic	0.1 mg/L
Cadmium	0.001 mg/L
Calcium	400 mg/L
Chromium	0.01 mg/L
Copper	1.0 mg/L
Iron	400.0 mg/L
Lead	0.001 mg/L
Magnesium	100.0 mg/L
Nickel	2.0 mg/L
Selenium	0.005 mg/L
Sulfate	3,000 mg/L
Zinc	0.5 mg/L

4.0 DESIGN FLOW RATES

To the extent practicable, the CUD AMD flows will be collected and conveyed to the 2007 Pond 4 Lime Treatment System and the 2008 HDS Treatment Plant for treatment. Historical flow data from the CUD for the years 2004 through 2006 are presented below in Table 4-1.

TABLE 4-1
HISTORICAL CUD TREATMENT FLOW RATES
Flows in gallons per minute (gpm)

Year	DS Flows		
	Minimum	**Average**	**Maximum**
2004	13.7	20.4	35.3
2005	28.0	32.1	36.8
2006	30.2	37.7	45.0

Based on the flow data available for the CUD, flow rates are anticipated to range from between 10 and 45 gpm. The flow rate from the CUD as measured in July and August 2007 is approximately 20 gpm. Given the minimum flow rate of 13.7 gpm experienced in 2004, a flow rate of 10 gpm has been estimated as a reasonable lower limit to anticipated flow rates from the CUD area. Given the extremely wet conditions observed in the winter and spring of 2005-2006, 45 gpm is believed to present a reasonable upper limit to flows from the CUD. However, considering possible climatic induced variabilities to flows from the CUD, the design flow rate for the CUD collection system has been increased to 60 gpm to provide an adequate margin of safety should flow rates be greater than expected.

Based on the historical flow rate data summarized, design flow rates for the CUD collection and conveyance systems were selected and are presented in Table 4-2.

TABLE 4-2
PROPOSED CUD COLLECTION AND CONVEYANCE FLOW RATES
Flows in gallons per minute (gpm)

Parameter	Minimum	Expected Average	Maximum
Channel Underdrain AMD	10	<40	60

5.0 SYSTEM DESIGN LIFE AND OPERATING BASIS

The Semi-Permanent CUD Collection System will convey Channel Underdrain flows to the 2008 HDS treatment system and will, therefore, have a 5 year design life to match the design life of the 2008 HDS treatment system. The Semi-Permanent CUD Collection System will operate 24 hours per day, 7 days per week during the treatment season.

6.0 DESCRIPTION OF SYSTEM COMPONENTS

The Semi-Permanent CUD Collection System will be constructed to collect AMD flows to the extent practicable by collecting discharge from the existing USGS weir box. Collection of CUD AMD flows will be achieved through the use of a rubber transition coupling and schedule 80 polyvinyl chloride (PVC) piping connected to the outlet fitting of the weir box and directed to a new heavy walled 400-gallon HDPE collection tank suitable for burial. A 6-inch overflow pipe will be routed to Leviathan creek from the collection tank to prevent overtopping of this tank should problems occur. A 4-inch drain line with isolation valve will be provided at the collection tank. During the treatment season this valve will be closed to allow AMD to be conveyed to the treatment system, and when the treatment system is not operating, the valve will be opened to allow water to pass through the tank without freezing. This will allow the uninterrupted recording of CUD AMD flow at the USGS weir box. The base of the new collection tank will be armored with riprap rock to prevent erosion and counteract tank buoyancy during spring runoff conditions. Details of the system are shown on the attached schematic drawings.

Proposed site access improvements include an access platform running along the east side of the CUD collection tank and terminating at the USGS weir box. The access platform will be supported by railroad tie timbers, which bear on the riprap adjacent to the tank, and are anchored to the soil at either end of the platform. Personnel will access the collection tank and pumping equipment from above from this platform. Access to the USGS weir box and CUD conveyance piping will also be provided via this platform. Access to the base of the CUD collection tank and the west side of the USGS weir box will be provided by a short stairway leading down from the access platform. The stairway will be equipped with non-slip treads and handrail. Details of the proposed site access improvements are provided on the attached schematic drawings.

ATTACHMENT A

Technical Specifications

Geomatrix

Technical Specifications
Semi-Permanent Channel Underdrain Collection System

Leviathan Mine
Alpine County, California

Prepared for:

Atlantic Richfield Company
6 Centerpointe Drive
LaPalma, CA 90623-1066

Prepared by:

Geomatrix Consultants, Inc.
1401 17th Street, Suite 600
Denver, Colorado 80202
(303) 534-8722

September 2007

TABLE OF CONTENTS

INCLUDED BY REFERENCE:

- CalTrans Standard Specifications:
  - Section 25: Aggregate Subbases

CalTrans Specifications can be obtained from their website at the following URL:

http://www.dot.ca.gov/hq/esc/oe/specs_html/2006_specs.html

SECTION 011000

SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Work under other contracts.
3. Use of premises.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Semi-Permanent Channel Underdrain Collection System

1. Project Location: Leviathan Mine Site, Alpine County, California

B. Client: Atlantic Richfield Company, 6 Centerpoint Drive, LaPalma, CA 90623

1. Client's Representative: Roy Thun.

C. Engineer: Geomatrix Consultants, Inc., 1401 17th Street, Denver CO, 80202.

D. The Work consists of the following:

E. The Work includes installation of timber access walkways, stairway, collection tank, miscellaneous piping improvements, and riprap protection at the Channel Underdrain area of the Leviathan Mine Site.

1.3 WORK UNDER OTHER CONTRACTS

A. Client has awarded several separate contracts for various other work at the site. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

1.4 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Client's right to perform work or to retain other contractors on portions of Project.

B. Site Access:

1. Schedule deliveries with Engineer to minimize site access conflicts.

2. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 061063

EXTERIOR ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elevated platforms including plastic decking, stairs, railings, and support framing.

1.2 DESIGN REQUIREMENTS

A. OSHA – 29 CFR as it pertains to worker safety and walking-working surfaces for stairs, handrail and platforms.

1.3 SUBMITTALS

A. Product Data: For preservative-treated wood products, plastic decking, and metal framing anchors.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Lumber: Comply with DOC PS 20 and with applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by ALSC's Board of Review. Provide lumber graded by an agency certified by ALSC's Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each item with grade stamp of grading agency.

2. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 DIMENSION LUMBER

A. Maximum Moisture Content: 19 percent.

B. Stair Framing: Select Structural No. 2 grade and any of the following species:

1. Hem-fir (North); NLGA.

2. Southern pine; SPIB.

3. Douglas fir-larch; WCLIB or WWPA.

4. Spruce-pine-fir; NLGA.

5. Douglas fir-south; WWPA.

6. Hem-fir; WCLIB or WWPA.

7. Douglas fir-larch (North); NLGA.

8. Spruce-pine-fir (South); NeLMA, WCLIB, or WWPA.

2.3 PRESERVATIVE TREATMENT

A. Pressure treat lumber with waterborne preservative according to AWPA C2.

1. Treatment with CCA shall include post-treatment fixation process.

B. Use process that includes water-repellent treatment.

C. After treatment, redry lumber to 19 percent maximum moisture content.

D. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.

E. Application: Treat all exterior rough carpentry unless otherwise indicated.

2.4 FIBERGLASS DECKING AND TREADS

A. Designed to support 150 lbs/sq. ft. uniform load. Deflection shall not exceed 0.25 inch.

B. Molded or pultruded grating made from fiberglass strands and Isophthalic Polyester resin with ultraviolet inhibitors and integral embedded grit top surface.

C. Stair treads shall have 1-3/4” safety yellow integral bull nosing.

2.5 PLASTIC DECKING AND TREADS

A. Designed to support 150 lbs/sq. ft. uniform load. Deflection shall not exceed 0.25 inch.

B. Composite Plastic Lumber: Solid shapes made from high-density polyethylene with ultraviolet inhibitors and slip resistant surface.

2.6 FIBERGLASS HANDRAILING

A. Handrail posts and rail shall be 2”x2”x1/4” square tube. All connections shall have a smooth transition between post and rail.

B. Tube shall be pultruded and made from fiberglass strands and Isophthalic Polyester resin with ultraviolet inhibitors.

2.7 STEEL HANDRAILING

A. Handrail posts and rail shall be 1-1/4 inch schedule 40 pipe or shall be prefabricated 1-1/4 inch railing.

B. All connections shall be welded. All welding shall be done neatly to produce a smooth weld.

C. Handrail shall be galvanized after welding and shall be polished to provide a smooth finish.

2.8 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

1. Use stainless steel fasteners unless otherwise indicated.

2. Stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.9 METAL FRAMING ANCHORS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:

1. Cleveland Steel Specialty Co.

2. Harlen Metal Products, Inc.

3. KC Metals Products, Inc.

4. Simpson Strong-Tie Co., Inc.

5. Southeastern Metals Manufacturing Co., Inc.

6. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

D. Stainless-Steel Sheet: ASTM A 666, Type 316.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set exterior rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit exterior rough carpentry to other construction; scribe and cope as needed for accurate fit.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction" unless otherwise indicated.

C. Install fiberglass grating or plastic lumber to comply with manufacturer's written instructions.

D. Install metal framing anchors to comply with manufacturer's written instructions.

E. Do not splice structural members between supports unless otherwise indicated.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

G. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

H. Treads: Extend treads over carriages and finish with bullnose edge.

I. Handrail: Comply with OSHA – 29 CFR requirements.

END OF SECTION

SECTION 061323

HEAVY TIMBER CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes sitework using timbers.

1.2 DEFINITIONS

A. Timbers: Lumber of 5 inches nominal or greater in least dimension.

B. Inspection agencies, and the abbreviations used to reference them, include the following:

1. NeLMA - Northeastern Lumber Manufacturers Association.
2. NHLA - National Hardwood Lumber Association.
3. NLGA - National Lumber Grades Authority.
4. SPIB - Southern Pine Inspection Bureau.
5. WCLIB - West Coast Lumber Inspection Bureau.
6. WWPA - Western Wood Products Association.

PART 2 - PRODUCTS

2.1 TIMBER

A. General: Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable.

1. Factory mark each item of timber with grade stamp of grading agency.

B. Timber Species and Grade: Balsam fir, Douglas fir-larch, Douglas fir-larch (North), eastern hemlock tamarack (North), hem-fir, southern pine, western hemlock, or western hemlock (North); No. 1 or o. 2, NeLMA, NLGA, SPIB, WCLIB, or WWPA.

C. Moisture Content: Provide timber with 19 percent maximum moisture content at time of dressing.

D. Dressing: Provide dressed timber (S4S) or timber that is rough sawn (Rgh).

E. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

2.2 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

1. Use stainless steel fasteners unless otherwise indicated.

B. Reinforcing Steel Anchors: ASTM A615, Grade 60 deformed.

1. Size as indicated on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Erect heavy timber construction true and plumb.

B. Fit members by cutting and restoring exposed surfaces to match specified surfacing. Predrill for soil anchors.

C. Coat crosscuts with end sealer.

D. Install timber connectors as indicated.

END OF SECTION

SECTION 311000

SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Removing existing trees, shrubs, plants, and grass as necessary to perform work.

2. Clearing and grubbing.

3. Temporary erosion and sedimentation control measures.

1.2 MATERIAL OWNERSHIP

A. Except for materials indicated to remain Client's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

A. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 WATTLES

A. Tubes manufactured from rice or barley straw, wrapped in a tubular plastic netting.

1. Netting: High density polyethylene and vinyl acetate with UV color inhibition and an approximate weight of 0.35 ounce per foot.

2. Diameter: 9 inches, minimum.

3. Density: 1.6 pounds per foot, minimum.

2.2 SILT FENCE

A. Posts: metal or wood with a minimum length of 42 inches.

1. Metal posts shall be studded tee or u type with a minimum weight of 1.33 lbs per linear foot.

2. Wood posts shall have a minimum diameter or cross section dimension of 2 inches.

B. Geotextile:

1. Long chain sysnthetic polymers composed of at least 95 percent by weight polyolefins, polyesters, or polyamides.

2. Tensile Strength: 90 pounds when tested in accordance with ASTM D 4632.

3. Elongation: 50 percent maximum at 50 percent minimum tensile strength when tested in accordance with ASTM D 4632.

4. Permittivity: 0.01 minimum when tested in accordance with ASTM D 4491

5. Apparent Opening Size: 0.84 mm when tested in accordance with ASTM D 4751

6. Ultraviolet Degradation: Minimum 70 percent strength retained at 500 hours when tested in accordance with ASTM D 4355

7. Attach to posts with three or more staples per post.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect existing trees as indicated.

B. Protect existing site improvements to remain from damage during construction.

1. Existing CUD conveyance system and USGS weir box shall be protected and shall remain in operation during construction.

2. Restore damaged improvements to their original condition, as acceptable to Engineer.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent Leviathan Creek, according to requirements of authorities having jurisdiction.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent erosion protection has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.

1. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.

3.4 SITE IMPROVEMENTS

A. Remove existing above-grade improvements as necessary to facilitate new construction.

B. Existing conveyance system shall remain in operation during construction. Necessary system shut-downs shall be coordinated with Engineer.

3.5 DISPOSAL

A. Disposal: Remove demolished materials, and waste materials including trash and debris, and legally dispose of them off site.

END OF SECTION

SECTION 312006

EXCAVATION, BACKFILL AND GRADING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Perform earth excavation, backfill, fill and grading as indicated or specified.

B. Provide materials for backfilling excavations and constructing grades as indicated and specified.

C. Grade and compact surfaces to meet finished grades indicated.

D. Remove boulders within the excavation limits.

E. Provide erosion protection as indicated or specified.

1.2 REFERENCES:

A. American Society for Testing and Materials (ASTM) Publications:

1. D448: Standard Classification for Sizes of Aggregate for Road and Bridge Construction.

2. D1556: Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

3. D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft^3 (2,700 kN-m/m^3)).

4. D4491: Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

B. State of California; Business, Transportation and Housing Agency; Department of Transportation (Caltrans); Standard Specifications.

1.3 DEFINITIONS:

A. Percentage of compaction is defined as the ratio of the field dry density, as determined by ASTM D1556 to the maximum dry density determined by ASTM D1557 Procedure C, multiplied by 100.

B. Proof Roll: Compaction with a minimum of one (1) pass of a smooth drum roller. Vibratory plate compactors shall be used in small areas where smooth drum roller can not be used.

C. Acceptable Material: Material which does not contain organic silt or organic clay, peat, vegetation, wood or roots, stones or rock fragments over three (3) inches in diameter, porous biodegradable matter, loose or soft fill, excavated pavement, construction debris, or refuse. Stones or rock fragments shall not exceed 40 percent by weight of the backfill material.

D. Unacceptable Materials: Materials does not comply with the requirements for the acceptable material or which cannot be compacted to the specified or indicated density.

1.4 SUBMITTALS:

A. Submit the following:

1. The following material certifications shall be submitted for review and approval prior to backfilling and filling:
    a. Class II Aggregate Subbase: As specified in Caltrans Standard Specification Section 25: Aggregate Subbases.
    b. Coarse Gravel: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57.

1.5 QUALITY ASSURANCE AND CONTROL:

A. Excavations shall be performed in the dry, and kept free from water, snow and ice during construction. Bedding and backfill material shall not be placed in water. Water shall not be allowed to rise upon or flow over the bedding and backfill material.

B. The Contractor shall be solely responsible for making all excavations in a safe manner. All excavation, trenching, and related sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

C. Do not excavate, construct embankments, or fill until all the required submittals have been reviewed and approved.

D. Formulate excavation, backfilling, and filling schedule and procedures to eliminate possibility of undermining or disturbing foundations of existing, partially completed and completed structures.

E. Employ an independent testing laboratory to perform particle size and gradation analyses in accordance with ASTM D422, and to determine compactibility in accordance with ASTM D1557 for all the proposed backfill and fill materials, and monitoring field compaction operations. The independent testing laboratory shall have the following qualifications:

1. Be accredited by the American Associates of State Highway and Transportation Officials (AASHTO) Accreditation Program.

2. Have three (3) years experience in sampling, testing and analysis of soil and aggregates, and monitoring field compaction operations.

2. Able to provide three (3) references from previous work.

F. Field Testing and Inspections:

1. Field testing for compaction shall be performed by the Engineer. Provide 48 hours advance notice for testing to occur without interrupting work.

2. In the event compacted material does not meet specified in-place density, recompact material until specified results are obtained at no additional cost.

3. Engineer shall perform inspection at least once daily to confirm lift thickness and compaction effort for entire fill area.

G. Material Testing Frequency: The following testing frequencies shall be performed by the Engineer.

1. Field In-Place Density and Moisture Content – One test per every 3,500 square feet per lift.

2. Moisture Density - One per source and once for every 2,000 cubic yards of material used, and whenever visual inspection indicates a change in material gradation as determined by the Engineer.

H. Carefully support and protect from damage, existing structures, which the Client or his agent determines must be preserved in place without being temporarily or permanently relocated. Should such items be damaged, restore without compensation therefore, to at least as good condition as that in which they were found immediately before the work was begun.

I. Restore existing property or structures as promptly as practicable.

J. Do not remove excavation materials from the site of the work or dispose of except as directed or permitted by the Engineer.

1.6 PROJECT CONDITIONS

A. Existing Conveyance System: Do not interrupt the existing channel underdrain conveyance system unless permitted in writing by Engineer and then only after arranging to provide temporary services to avoid prolonged shutdown of the system.

PART 2 - PRODUCTS

2.1 GENERAL:

A. Provide Class II Aggregate Subbase, as specified in CalTrans Standard Specification Section 25: Aggregate Subbases.

B. Coarse Gravel: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57.

C. Riprap: Widely graded angular rock generally conforming to the following gradation:

Equivalent Spherical Diameter (inches)	Percent of Total Weight Passing
12	100
8	80-90
5	20-70
3	0-10

D. Contractor shall be responsible testing or certifying that all imported material meets the specifications.

2.2 EROSION CONTROL:

A. Soil Retention Blanket: Machine produced mat of 100 percent coconut fiber.

1. Coconut Fiber Content: 0.50 to 0.60 lb/sq. yd.

2. Netting: Top and bottom; polypropylene netting having ultraviolet additives to reduce breakdown.
   a. Mesh Size: Approximately 5/8 inch by 5/8 inch.
   b. Weight: 3 lbs/sq. yd.

3. Thread: the blanket shall be sewn together with polyester, biodegradable or photodegradable thread.

B. Geotextile Membrane: Fabric of polypropylene polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.

1. Structure Type: Nonwoven, needle-punched continuous filament or woven, monofilament or multifilament.

2. Style: Flat.

2.3 EQUIPMENT:

A. The compaction equipment shall be selected by the Contractor, and shall be capable of consistently achieving the specified compaction requirements. The selected compaction equipment shall meet the following minimum requirements:

1. Manually operated vibratory plate compactors weighing no less than 200 pounds with vibration frequency no less than 1600 cycles per minute.

2. Vibratory steel drum or rubber tire roller.

PART 3 - EXECUTION

3.1 EXCAVATION:

A. Execution of any earth excavation shall not commence until the related submittals are reviewed by the Engineer and all comments are satisfactorily addressed.

B. Carry out program of excavation, dewatering, and excavation support systems to eliminate possibility of undermining or disturbing foundations of existing structures or of work previously completed under this contract.

C. Excavate to elevations indicated, or deeper, as directed by the Engineer, to remove unacceptable bottom material.

D. Use proper equipment and exercise care to preserve material below and beyond the lines of excavations.

E. Excavation shall not exceed a slope of 1 horizontal to 1 vertical, unless Contractor obtains an independent engineering evaluation allowing a steeper slope.

3.2 BACKFILLING - GENERAL:

A. Do not place frozen materials in backfill or place backfill upon frozen material. Remove previously frozen material or treat before new backfill is placed.

B. Do not place, spread, roll or compact fill material during unfavorable weather conditions. If interrupted by heavy rain or other unfavorable conditions, do not resume until ascertaining that the moisture content and density of the previously placed soil are as specified.

C. Do not use puddling, ponding or flooding as a means of compaction.

3.3 MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS:

A. All fill and backfill shall be as indicated on the project plans:

1. Contractor shall moisture condition fill and backfill material within 2 percent of optimum.

2. Dump and spread in layers not to exceed eight (8) inches in uncompacted thickness. Engineer shall perform field compaction tests at a frequency of not less than once per lift.

3. All base material for the collection tank and riprap shall be compacted to 95 percent relative compaction according to ASTM Standard D1557.

4. All unsuitable material shall be replaced with Cal Trans Class II aggregate.

B. Backfilling and filling operation shall be suspended in areas where tests are being made until tests are completed and the Engineer has advised the Client or his agent that adequate densities are obtained.

3.4 COMPACTION CONTROL OF BACKFILL, FILL, AND EMBANKMENT:

A. Compact to density specified and indicated for various types of material. Control moisture content of material being placed as specified or if not specified, at a level slightly lower than optimum.

B. Moisture control may be required either at the stockpile area, pits, or on embankment or backfill. Increase moisture content when material is too dry by sprinkling or other means of wetting uniformly. Reduce moisture content when material is too wet by using ditches, pumps, drainage wells, or other devices and by exposing the greatest possible area to sun and air in conjunction with harrowing, plowing, spreading of material or any other effective methods.

3.5 SLOPE PROTECTION

A. Following final grading, contractor shall stabilize the slope above the access platform and adjacent to the railroad tie walkway with soil retention blanket material.

1. Place blanket loosely on the soil surface without stretching and staple to soil per manufacturer’s recommendations.

2. The upslope end shall be buried in a trench 6 inches wide by 6 inches deep beyond the crest of the slope. Provide 6-inch overlap at blanket joints, with uphill blanket on top of downhill blanket.

3.6 CONSTRUCTION OF NEW TOE OF SLOPE:

A. Contractor shall be required to excavate existing material to the collection tank base level and to scarify and recompact 6 inches below the bottom of this excavation. Scarification and recompaction requirement may be waived if field conditions allow and shall be determined in the field by the Engineer. Contractor shall remove all unsuitable material from the bottom of the excavation and replace with Cal Trans Class II aggregate.

B. Geotextile fabric shall be placed along excavated slope and under collection tank to prevent fines from eroding into riprap.

C. Riprap shall be placed such that damage to the collection tank or geotextile fabric does not occur. Riprap shall be placed from a height of not more than one foot above ground surface. Damage to the collection tank or geotextile fabric shall be repaired or materials replaced as directed by the Engineer at the Contractor’s expense. The upper layer of riprap under the access platform shall be hand placed to create a level surface under the railroad ties.

END OF SECTION

DRAWINGS

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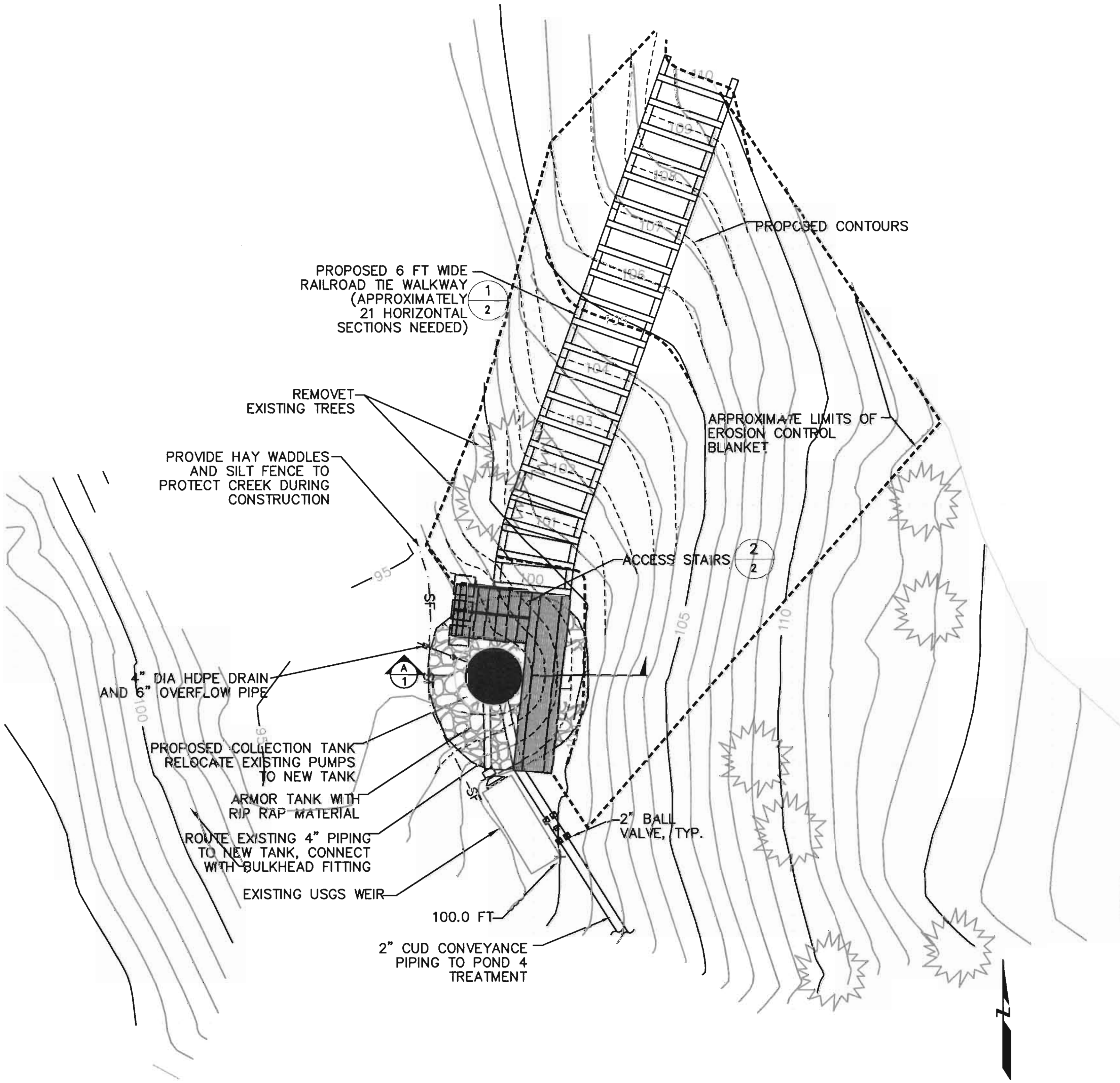
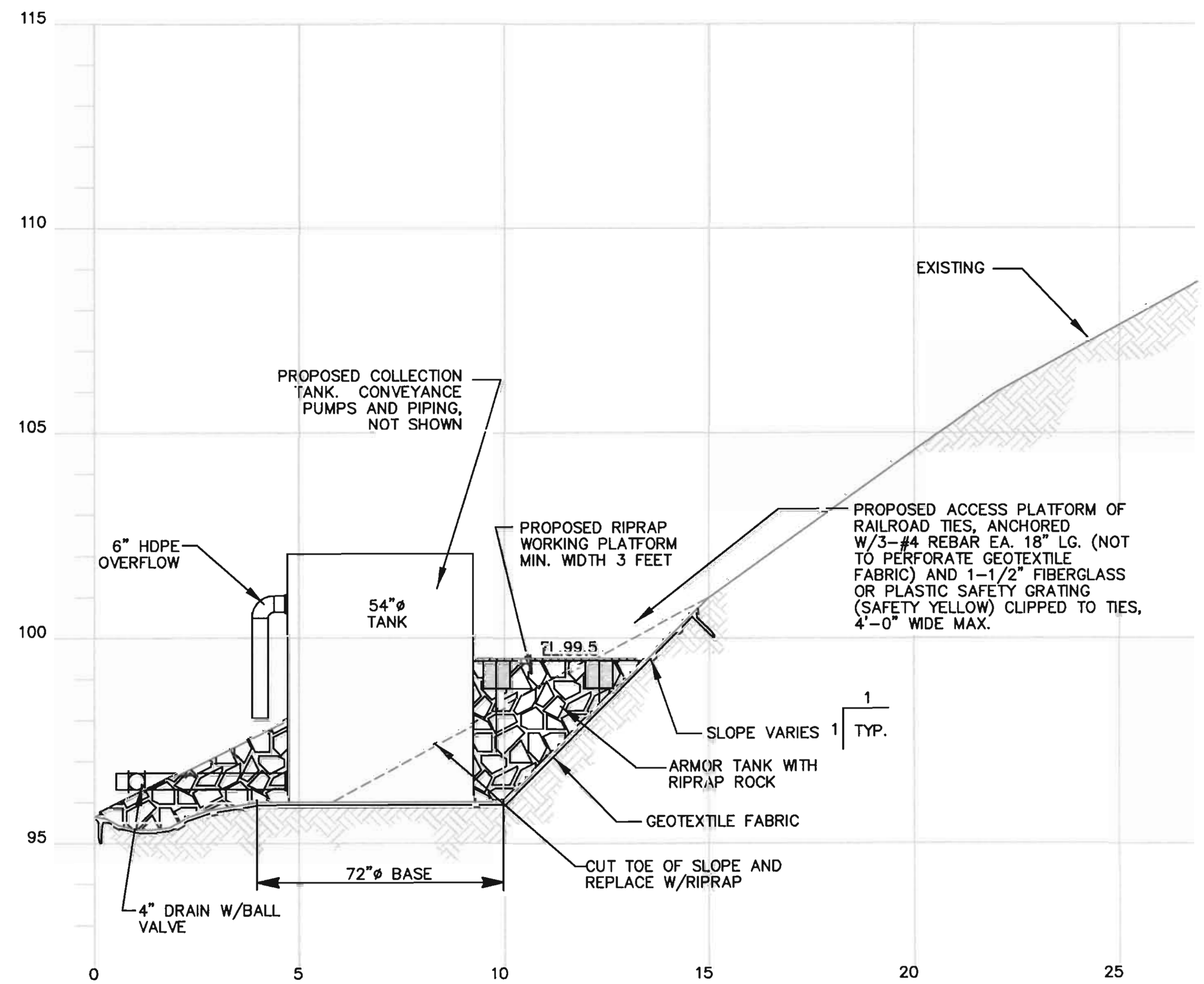
Drawing Path: I:\Project\13091\CAD\CLID-DS conveyance Drawings\, Drawing Name: _sht_01.dwg



PLAN VIEW

PROJECT DATUM:
SOUTHEAST CORNER OF TOP OF USGS WEIR BOX = + 100.0 FT.



SECTION A/1
NTS

CAUTION: THIS PLAN MAY BE REDUCED 0 1" 2" ORIGINAL SCALE

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS				
DATUM				

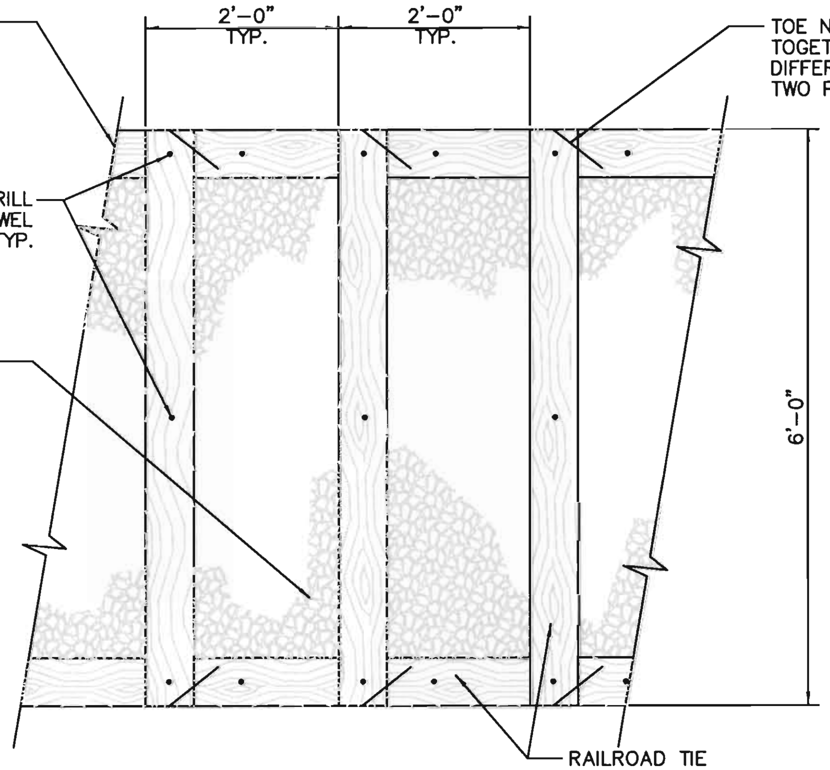
DRAWN SW
DESIGNED MR
CHECKED ---
REVIEWED ---

Geomatrix
Geomatrix Consultants, Inc.
2101 Webster Street, 12th Floor
Oakland, California 94612
(510) 663-4100

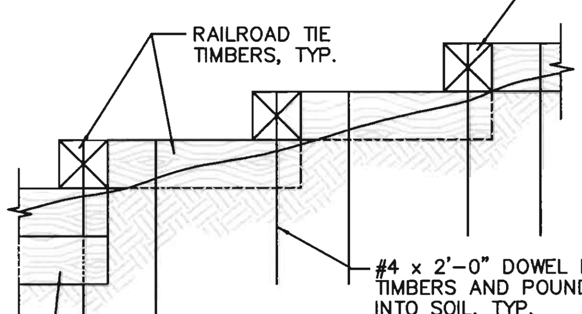
LEVIATHAN MINE SITE

CHANNEL UNDER DRAIN COLLECTION
AREA SCHEMATIC
ALPINE COUNTY, CALIFORNIA

DATE: 08/31/07
SCALE: 1" = 5'
SHEET: OF SHEETS
PROJ No: 13091.012.0
C-1

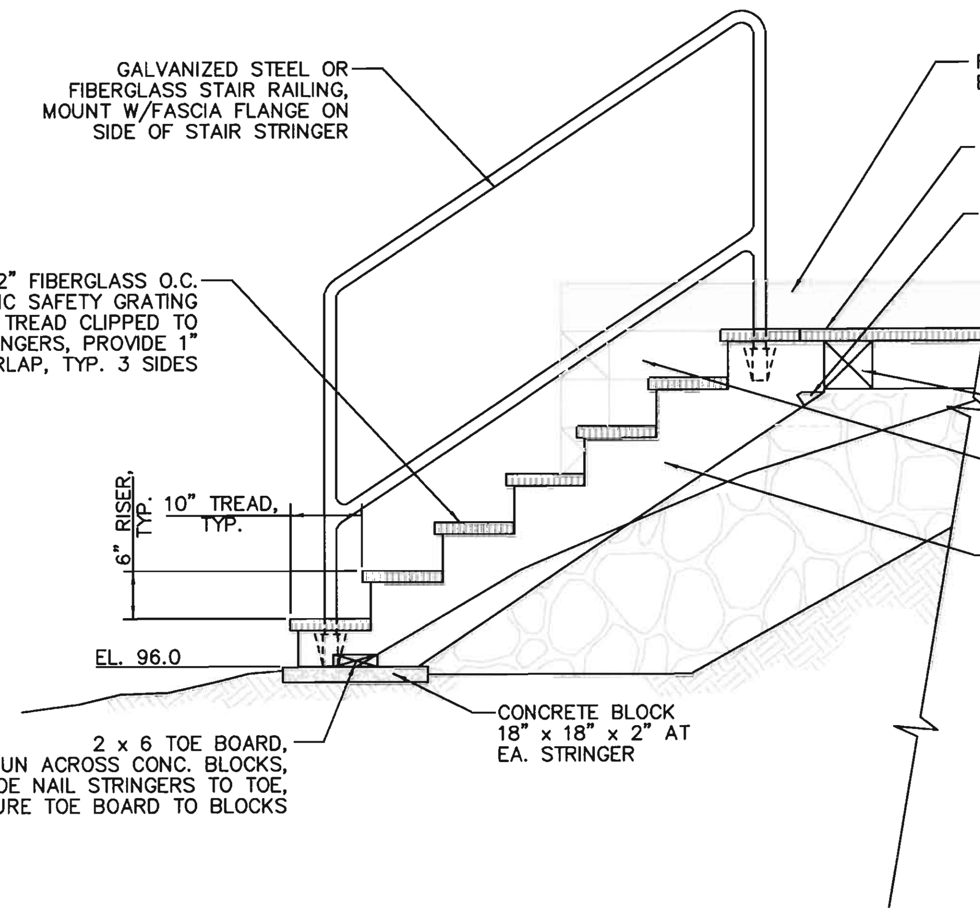


PLAN VIEW



ELEVATION VIEW

DETAIL 1/1
NTS



DETAIL 2/1
NTS

Plot Date: 09/14/07 - 11:52am, Plotted by: lurmy
Drawing Path: I:\Project\13091\CAD\CLID-DS conveyance Drawings\, Drawing Name: _sht_01.dwg

CAUTION: THIS PLAN MAY BE REDUCED — 0 1" 2" ORIGINAL SCALE

REFERENCES:
PLANS
DATUM

NO.	REVISION	DATE	APRVD

DRAWN SW
DESIGNED MR
CHECKED ---
REVIEWED ---

Geomatrix
Geomatrix Consultants, Inc.
2101 Webster Street, 12th Floor
Oakland, California 94612
(510) 663-4100

LEVIATHAN MINE SITE
ALPINE COUNTY, CALIFORNIA

CHANNEL UNDER DRAIN COLLECTION
ACCESS DETAILS

DATE: 08/31/07
SCALE: NOT TO SCALE
SHEET: OF SHEETS
PROJ No: 13091.012.0
C-2

Geomatrix

Technical Memorandum

TO:	Kevin Mayer, EPA	**DATE:**	September 20, 2007
FROM:	Geomatrix Consultants on behalf of Atlantic Richfield	**PROJ. NO.:**	13091

SUBJECT: **Technical Memorandum – Semi-Permanent Delta Seep Collection Design Modifications, Leviathan Mine, Alpine County, California**

This Technical Memorandum was prepared by Geomatrix Consultants (Geomatrix) on behalf of Atlantic Richfield Company to outline some minor modifications to the design of the Semi-Permanent Delta Seep (DS) Collection Design dated August 15, 2007. These modifications were discussed in a conference call with you on September 18, 2007. Modifications are proposed to provide increased flexibility in capturing acid mine drainage (AMD) flowing from the Delta Seep area by providing an overflow pipe through the cutoff wall to allow flow via gravity to the collection tank thus reducing the dependence on the mechanical sump pump for DS collection.

Rationale for Design Modifications

The original Semi-Permanent Collection System design submitted on August 15, 2007 provided for separate collection of the upper and lower seeps in the DS area. The upper seep was to be collected by capturing the upper seep with gravity flow into a culvert inlet and piping to the collection tank. The lower seep was to be collected by installing a concrete cutoff wall and strip drain piped to a small sump (manhole). Flows from the lower seep were to be collected in the sump and then pumped to the collection tank by a small sump pump. This design was intended to reduce the accumulation of water behind the cutoff wall but was dependant on the sump pump for the transfer of water from the sump to the collection tank. Due to concerns about the dependence of collection system performance on the sump pump, elements were added to the design to allow collection of the DS flow to the collection tank without the use of the sump pump.

Performance of the collection system will be monitored and if it is determined that water levels behind the cutoff wall either: 1) do not reach the invert of the collection pipe, or 2) induce seepage beneath or around the ends of the cutoff wall, the modified design will be converted back to the design presented original DS Semi-Permanent Collection System dated August 15, 2007. This conversion will involve the extension of the 15-inch HDPE pipe to the upper seep collection area which will serve to reduce the amount of AMD that must be pumped by the sump pump.

DS Collection System Design Modifications

The modified Semi-Permanent Collection System design provides for collection point of both the upper and lower seep areas to evaluate the possibility of collecting the seep flows without relying on mechanical systems. With this revised approach, the cutoff wall will be raised above the upper seep collection point and a 15-inch HDPE collection pipe will be placed through the wall and terminate just upgradient from the wall. This will provide an area for AMD water to collect behind the cutoff wall to a depth of approximately two feet and then the combined seep water would flow into the collection tank through the 15-inch HDPE pipe.

The strip drain, manhole, and sump pump would still be installed and would be used in a backup capacity should the DS flow increase above the capacity of the collection pipe. The sump pump could also be utilized to collect flow should the water level depth behind the cutoff wall not reach the invert of the collection pipe. A 4-inch drain pipe and valve will be added between the strip drain/manhole and the collection tank allow flow to be diverted to the collection tank in the winter months without building up behind the cutoff wall.

The proposed modifications are shown on the attached schematic drawings (Drawings 1 and 2).

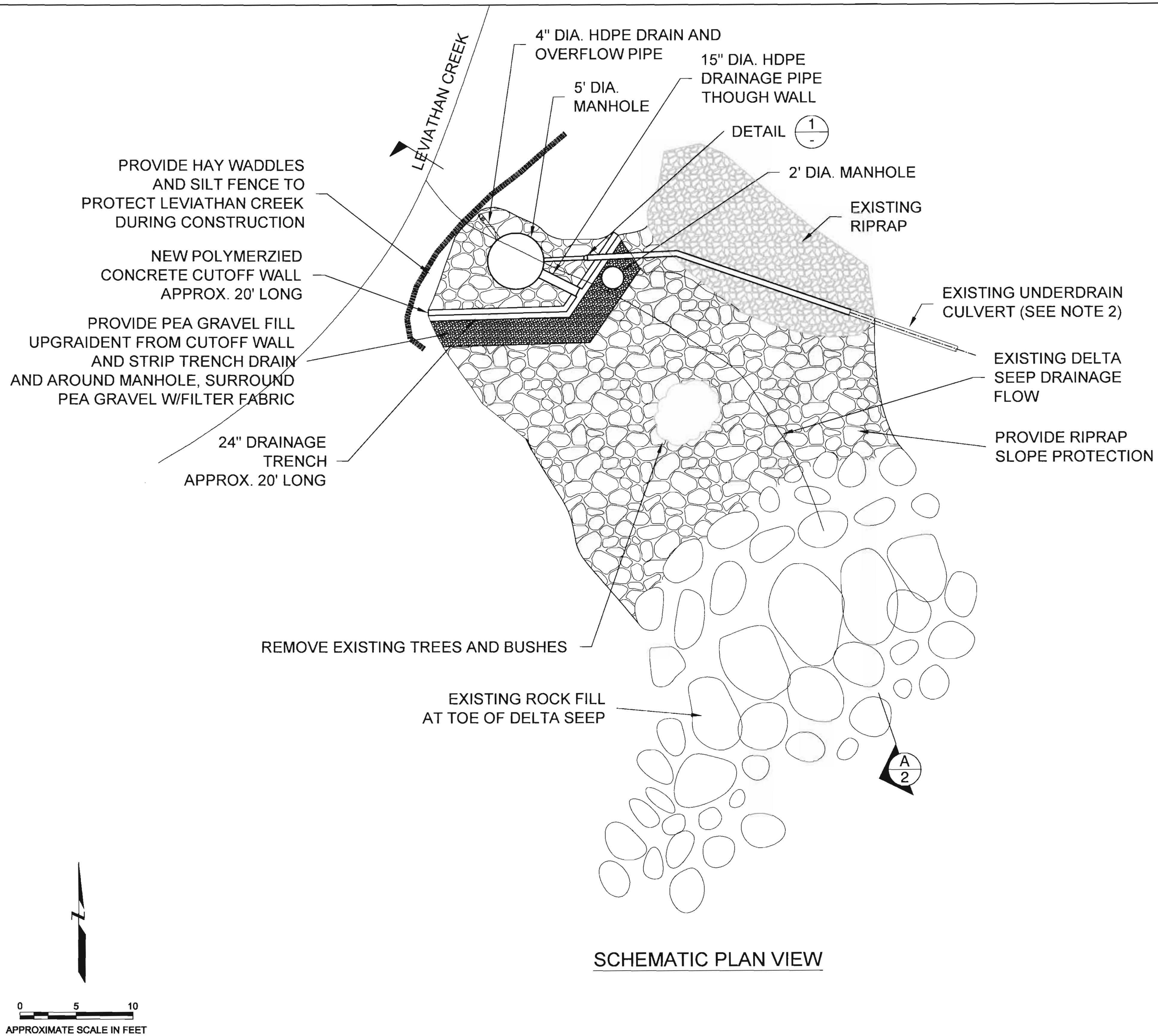
DS Collection Electrical and Control Design Modifications

In order to provide flexibility in the sump pump operation, a control box will be added to the electrical supply system for the sump pump. This box will provide for On/Off and Automatic control of the sump pump via a hand switch. In the “Off” position, the pump will not operate. In the “On” position, the pump will be controlled based on the integral float position. In the “Auto” position, the pump will be controlled based on an exterior level control system, which will turn on the pump should the water level behind the cutoff wall exceed the top of the collection pipe or the water level in the collection tank remain at the conveyance pump cutoff elevation for an extended period of time. The first control point is necessary should the DS flow increase above the capacity of the collection pipe and the second control point is necessary should water levels behind the cutoff wall not reach the invert of the collection pipe.

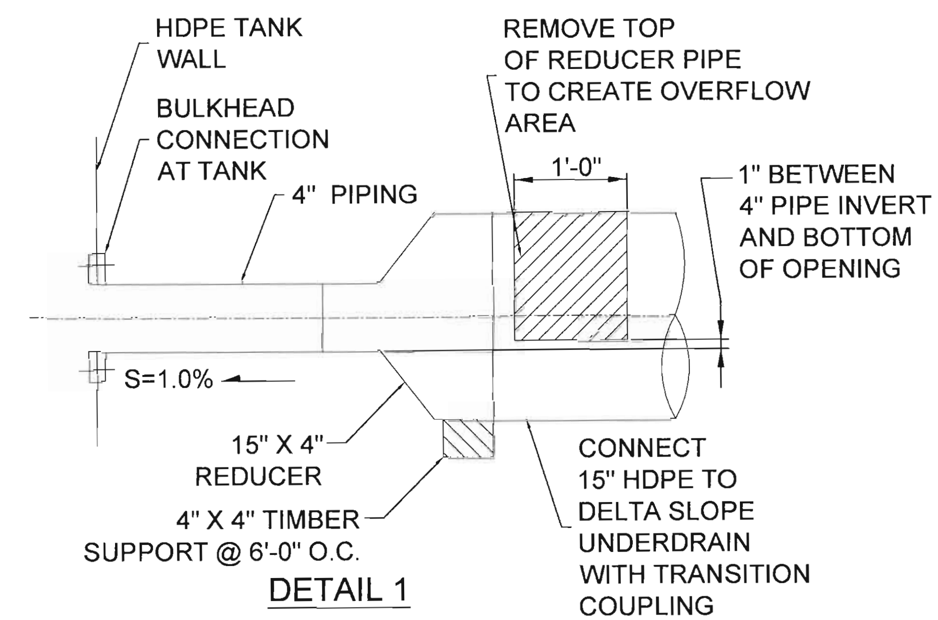
LIST OF ATTACHMENTS

Revised Drawings - Delta Seep Collection Area Schematic Drawings 1 and 2

1401 Seventeenth Street, Suite 600
Denver, Colorado 80202-1485
Tel 303.534.8722
Fax 303.534.8733
www.geomatrix.com



SCHEMATIC PLAN VIEW



DETAIL 1

NOTES:

1. CONVEYANCE PUMPS AND PIPING NOT SHOWN.

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS				
DATUM				

DRAWN LD
DESIGNED AC
CHECKED
REVIEWED

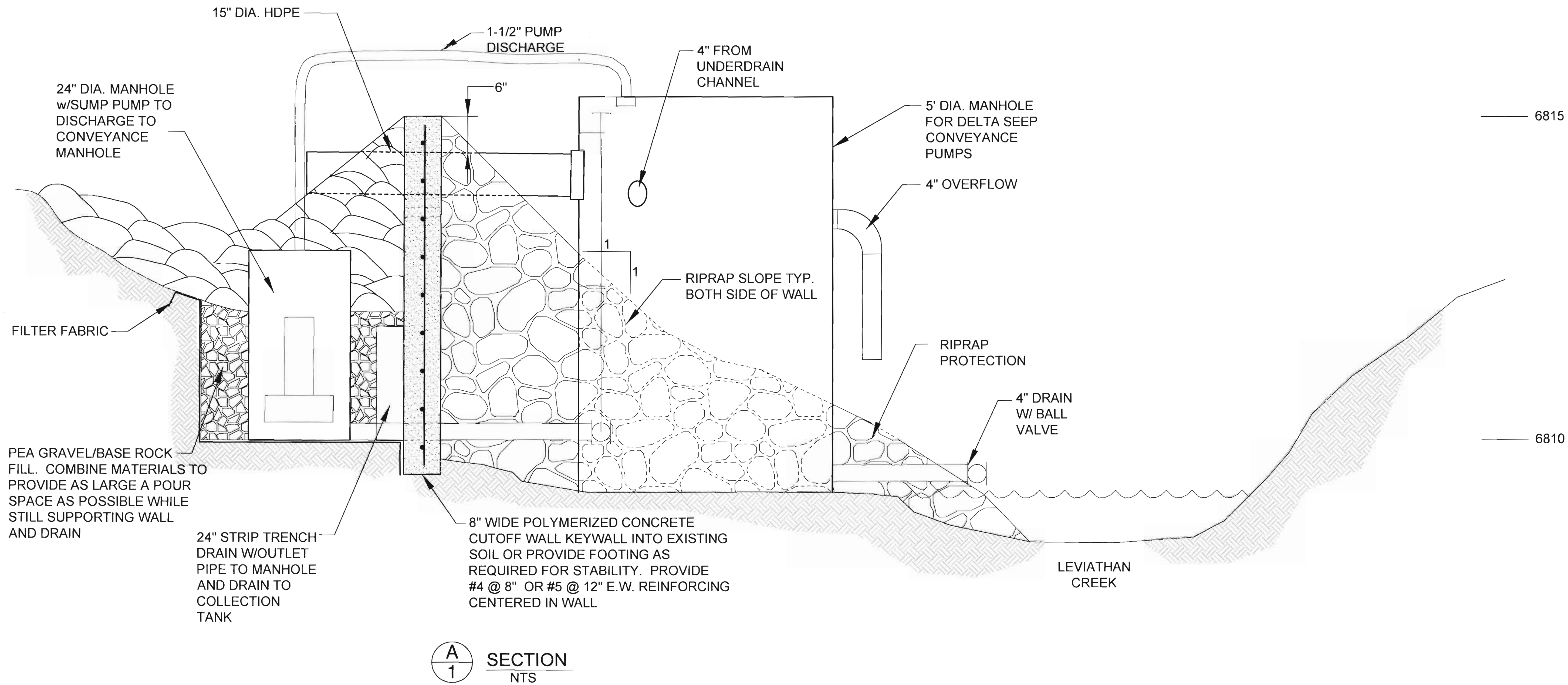
Geomatrix
Geomatrix Consultants, Inc.
1401 17th Street, Suite 600
Denver, Colorado 80202
(303) 534-8731

LEVIATHAN MINE SITE

DELTA SEEP COLLECTION AREA SCHEMATIC PLAN AND DETAIL

DATE: 06-10-07
SCALE: 1"=10'
SHEET: OF SHEETS
PROJ No: 13091
1

Plot Date: 09/18/07 - 1:47pm, Plotted by: lurmy
Drawing Path: I:\Project\13091\CAD\CLID-DS conveyance Drawings\, Drawing Name: Levithan Fig xx Delta Seep SchematicR2000.dwg



A/1 SECTION
NTS

Plot Date: 09/18/07 - 2:13pm, Plotted by: lurmy
Drawing Path: I:\Project\13091\CAD\CLID-DS conveyance Drawings\, Drawing Name: Levithan Fig xx Delta Seep SchematicR2000.dwg

REFERENCES:
PLANS
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REVIEWED

Geomatrix
Geomatrix Consultants, Inc.
1401 17th Street, Suite 600
Denver, Colorado 80202
(303) 534-8731

LEVIATHAN MINE SITE

DELTA SEEP COLLECTION AREA SCHEMATIC SECTION

DATE: 06-10-07
SCALE: NTS
SHEET: OF SHEETS
PROJ No: 13091
2

Geomatrix

Technical Memorandum

TO:	Kevin Mayer, EPA	**DATE:**	September 24, 2007
FROM:	Geomatrix Consultants on behalf of Atlantic Richfield Company	**PROJ. NO.:**	13091
CC:	Roy Thun, Atlantic Richfield Company Richard Booth, LRWQCB	**PROJ. NAME:**	Leviathan Mine Site
SUBJECT:	**Technical Memorandum – Site Improvements at the Aspen Seep Bioreactor**		

This Technical Memorandum (Memorandum) has been prepared by Geomatrix Consultants, Inc. (Geomatrix) on behalf of Atlantic Richfield Company (Atlantic Richfield) to supplement the 2007-08 Treatability Studies and Interim Treatment Work Plan (2007-08 Work Plan) for Leviathan Mine dated June 21, 2007. This Memorandum summarizes ongoing site improvements at the Aspen Seep Bioreactor (ASB) as listed below:

- Power Supply Conversion
- Sodium Hydroxide and Ethanol Storage Tank Improvements
- Recirculation and Chemical Feed Pump Replacement
- Telemetry System Improvements

These site improvement activities supplement the sludge removal and dewatering activities at the ASB as described in the Technical Memorandum – Aspen Seep Bioreactor Sludge Removal dated September 9, 2007. The remainder of this Memorandum provides a summary of the above listed site improvements.

Power Supply Conversion

Geomatrix has conducted a detailed evaluation of various power supply alternatives for the ASB. Power requirements at the ASB were estimated at approximately 45 kilowatt (KW) hours per day for the continuous year-round operation of the Pond 3 recirculation pump, two peristaltic chemical feed pumps (one for delivery of ethanol and one for delivery of sodium hydroxide), two min-mag flow meters, the data collection and telemetry system and the camera. This evaluation focused on factors such as implementability, reliability, maintenance requirements, and safety considerations. The most reliable and proven power sources (solar, diesel, and propane) were evaluated with the goal of reducing the number of required maintenance visits to the ASB to once per month during the winter. Other power sources such as wind and hydroelectric power (from a generating wheel on Aspen Creek) were considered, however, were not evaluated further because they were determined to be difficult to implement and unreliable. A number of equipment vendors with experience providing power to remote locations were contacted and provided guidance on power supply alternatives. Based on discussions with these vendors, it was determined that a solar only power supply was not practical at the ASB due to low solar efficiencies during the winter months. Consequently, a combination of partial solar and conventional fossil fuel (diesel and propane) powered generator systems were evaluated further. Based on implementability, reliability, maintenance requirements, and safety considerations, it was concluded that a battery system charged by a series of propane generators would provide the most reliable power supply during the winter months while reducing the number of required maintenance visits to approximately once per month. Multiple generators were deemed necessary to allow the generators to operate within their 100-hour maintenance interval between site visits. The design of this system was provided by Sustainable Technologies located in Alameda, California. Various equipment requirements for this system are listed below:

- 4 – 7 KW propane fired generators connected to an AC power grid and controlled using a generator management box inclusive of a sequential timer control panel to switch from one generator to another after 100 hours of run time.

- 4 – 1,000-gallon propane storage tanks to be installed below ground surface in compliance with the National Fire Protection Association (NFPA) 58 Liquefied Petroleum Gas Code (2008 Edition) and Alpine County requirements.

- A battery bank to be enclosed with the generators and control panels inside a 20-foot long shipping container (Conex box) modified with vents and exhaust pipes for the generators.

The proposed location of the Conex box and propane storage tanks are shown on the attached drawing (Figure 1). It is anticipated that installation of the propane storage tanks will occur during the first week of October, and the delivery of the Conex box (equipped with propane generators, a battery bank, and control panel) is scheduled for mid to late October 2007.

Sodium Hydroxide and Ethanol Storage Tank Improvements

As described in the 2007-08 Work Plan, Geomatrix is currently implementing site improvements to the sodium hydroxide and ethanol storage tanks at the ASB. A summary of these improvements is as follows:

- Construction of a gravel pad and secondary containment system (berm and PVC liner) to reduce the potential for sodium hydroxide releases to the environment.

- Installation of work platforms to improve safe access to sodium hydroxide and ethanol tanks.

- Installation of top fill manifold system to the sodium hydroxide and ethanol tanks to reduce the potential for spills or accidents associated with the transfer of sodium hydroxide and ethanol from delivery trucks.

Recirculation and Chemical Feed Pump Replacement

As reported in the Monthly Progress Report for August 2007, Geomatrix has replaced the recirulation pump in Pond 3 of the ASB due to the failure of the previous pump. In addition, a redundant backup recirculation pump has been installed. These pumps are designed to operate on a continuous basis at a flow rates ranging from approximately 25 to 50 gallons per minute (gpm).

As described in the 2007-08 Work Plan, Geomatrix has evaluated various options for the delivery of sodium hydroxide and ethanol to the ASB in consideration of our goals of improved reliability and the reduction of required site visits to once per month during the winter months. Based on this evaluation, we have concluded that a top-feed system reduces the risk of chemical releases because a break in the feed line would not result in gravity drainage from the tanks. In addition, our evaluation indicated that peristaltic pumps equipped with Santoprene tubing will reduce potential problems associated with tubing damage and breakage as encountered in past winter operations. Santoprene tubing has a recommended replacement interval of 50 days, has a brittle temperature of -76 degrees Fahrenheit, and is compatible with both NaOH and ethanol solutions. A summary of the proposed improvements to the chemical feed systems is as follows:

- Installation of a top-feed configuration and chemical feed pump for ethanol delivery to the bioreactors. Chemical feed tubes will be housed in secondary containment. Installation of a redundant backup chemical feed pumps which will be housed in a protective cover with secondary containment. These improvements are designed to reduce the potential for ethanol release to the environment; reduce the number of required maintenance visits (the current system requires a maintenance visit approximately once per week to transfer ethanol from the 2,500 gallon storage tanks to 55-gallon drums); and improve health and safety by reducing chemical handling and potential exposure.

- Installation of top-feed configuration and chemical feel pumps for sodium hydroxide delivery to Pond 3. Chemical feed tubes will be housed in secondary containment. Installation of redundant backup chemical feed pumps which will be housed in a protective cover with secondary containment. These improvements are designed to reduce the potential for sodium hydroxide release to the environment, and improve health and safety by reducing chemical handling and potential exposure.

Telemetry System Improvements

As described in the 2007-08 Work Plan, the existing telemetry system at the ASB was evaluated relative to reliability. This evaluation indicated that the satellite dish tower is unable to handle wind loads resulting in movement of the satellite dish and inconsistent signal strength. Geomatrix is working to replace the satellite dish tower during the 2007 field season to improve signal strength and system reliability in the winter months of 2007-08. Other existing telemetry equipment will be utilized with the new satellite dish tower during the winter months of 2007-08 to assess the reliability of the telemetry system and evaluate whether additional improvements are needed. Installation of the satellite dish tower and establishment of the satellite uplink are subject to telecommunications subcontractor availability and suitable weather conditions.

Plot Date: 09/20/07 - 12:35pm, Plotted by: dvalasek
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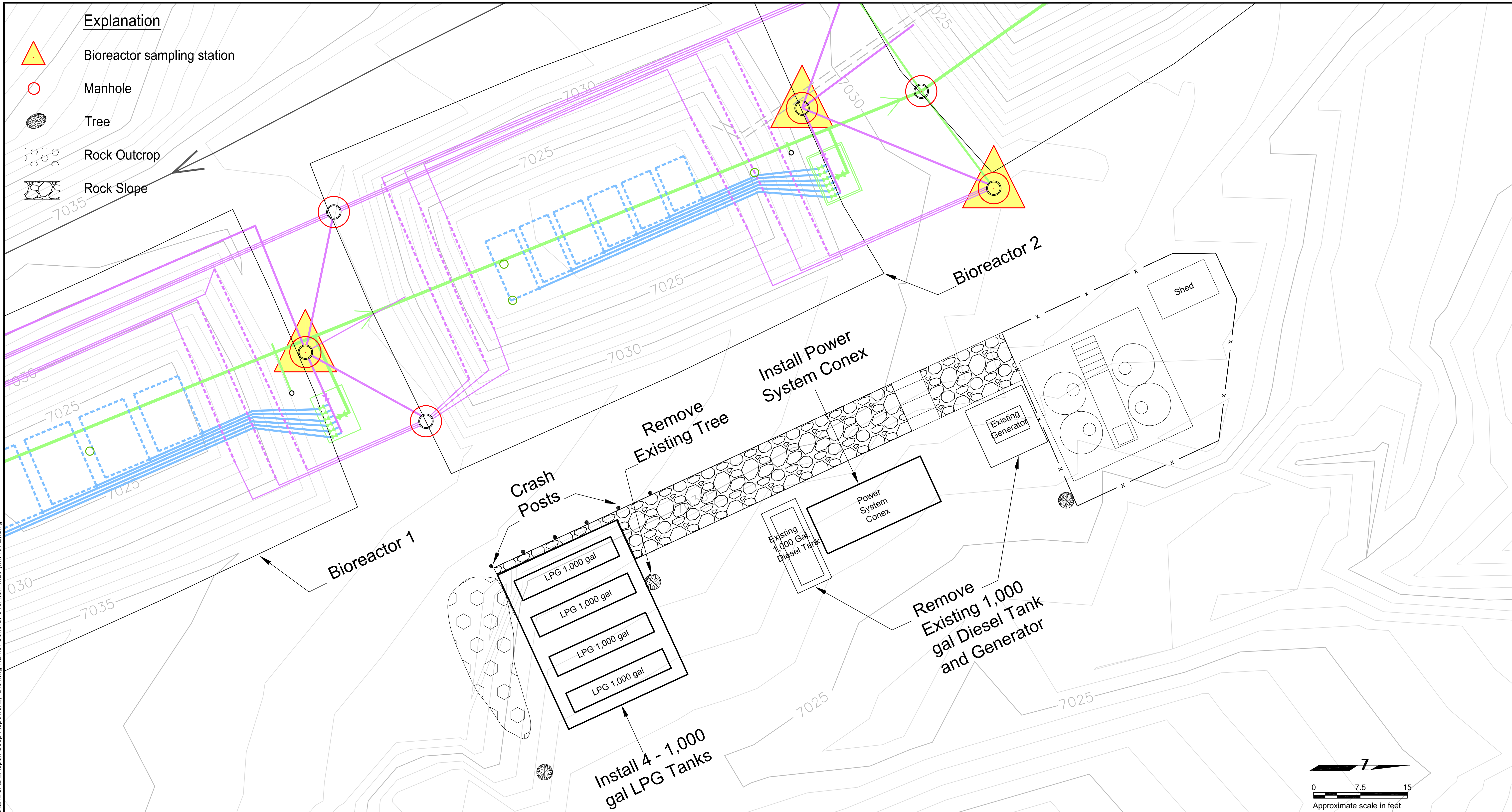


Note:

Locations of all site features depicted on figure are approximate.

PROPOSED PROPANE POWER GENERATOR SYSTEM

Leviathan Mine Site
Alpine County, California

By: dpv	Date: 7/23/07	Project No. 13091
Geomatrix		Figure 1

Roy I. Thun
Environmental Business Manager

4 Centerpointe Drive
LaPalma, CA 90623-1066
Office: (661) 287-3855
Fax: (661) 222-7349
E-mail: Roy.Thun@bp.com

October 12, 2007

Mr. Kevin Mayer
SFD-7-2
USEPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

RE: 2007 Year-End Shut-Down and Decommissioning of the Pond 4 Lime Treatment System and Channel Underdrain ("CUD") and Delta Seep Collection and Conveyance Systems, Leviathan Mine Site, Alpine County, California

Dear Mr. Mayer:

Atlantic Richfield is submitting this letter to EPA to formally document discussions held and decisions made over the past few days concerning the need to discontinue operation of the Pond 4 Lime Treatment System for the remainder of 2007 because of the onset of sub-freezing temperatures and winter conditions at the Leviathan site. As Grant Ohland explained to you verbally and by e-mail on October 9 and 10, 2007, we have experienced increasing weather-related equipment damage and impaired treatment system performance since approximately October 5. After evaluating the risks of further damage to the treatment system and the potential for a discharge of untreated water because of freeze-related tank or pipe breakage, Atlantic Richfield determined on October 9 that it was necessary to discontinue the collection and treatment of CUD and Delta Seep flows for the year and begin draining and decommissioning the Pond 4 Lime Treatment System. The CUD and Delta Seep collection pumps were turned off during the afternoon of October 10, 2007 after Mr. Ohland verbally notified you of the weather-related problems being experienced and Atlantic Richfield's determination that the system should be shut down.

Atlantic Richfield only arrived at this determination after careful consideration of a number of factors. Low temperatures measured at the Site last weekend were in the teens, with daily high temperatures in the low 30s. Between October 5 and October 8, this resulted in at least four broken PVC valves or pipelines that carry influent, effluent and lime slurry. Fortunately, the damage was discovered before any significant loss of untreated water occurred. However, we were concerned that if a more severe pipe or tank rupture occurred when personnel are not present at the Site there could be a large discharge of untreated AMD or lime slurry either onto the ground, into Pond 4 or back to Leviathan Creek. With the weekend coming up and more cold weather and snow in the forecast, we concluded that any benefit of continuing treatment for a few more days was outweighed by the environmental and safety risks associated with further freeze-related damage to the treatment system. Ionic Water Technologies, the operator of the Pond 4 Lime Treatment System, also reported that daily temperature swings were making it very difficult to keep the treatment system in balance due to the effects on the lime slurry delivery process. And we were concerned about causing more significant harm to the tanks and system instrumentation, which could have resulted in delays in the start-up of treatment operations next spring. Finally, we recognized that it would take some effort to drain, disconnect and clean the treatment and conveyance systems. We did not want to leave ourselves without sufficient time to properly winterize the system.

We felt that it was important to consult with EPA before shutting down the system for the winter, even though the approved schedule in the 2007-08 Treatability Studies and Interim Treatment Work Plan (the "Work Plan") acknowledges that the continued operation of the Pond 4 Lime Treatment System after September 30 would be subject to weather-related restrictions. It is my understanding that after speaking with Mr. Ohland, EPA understands and agreed with the decision to discontinue the collection and treatment of CUD and Delta Seep flows and drain and decommission the treatment system. As Mr. Ohland also noted, Pond 4 currently is nearly full with treated effluent meeting NTCRAM discharge criteria. In an effort to extend the ecological benefits of water treatment to Leviathan Creek, EPA and Atlantic Richfield have further agreed that Pond 4 should be emptied for the season by continuously discharging at a reduced flow rate of approximately 40 to 45 gallons per minute (discharge began on the afternoon of October 10 at about the same time that the CUD and Delta Seep collection pumps were turned off). This should lengthen the period of discharge to approximately 5 to 10 days, providing extended dilution of untreated CUD and Delta Seep flows entering Leviathan Creek after the shut-down of the Pond 4 Lime Treatment System.

As noted during the October 3, 2007 TAC telephone conference, our intention was to submit a technical memorandum to EPA laying out in advance the procedures that Atlantic Richfield would follow for determining when and how to shut-down and decommission the Pond 4 Lime Treatment System. Based on our review of historical weather patterns, we reasonably believed that we would be able to continue treatment operations into the week of October 21. However, the Pond 4 Lime Treatment System was more susceptible to freezing temperatures than was anticipated, resulting in the earlier than expected equipment damage described above. Geomatrix began work on the technical memorandum last week and expects to submit it shortly under a separate cover. The document will provide additional details on the cold weather operational issues encountered and our plans for winter decommissioning of the Pond 4 Lime Treatment System and the CUD and Delta Seep collection and conveyance systems

Atlantic Richfield appreciates EPA's understanding and support of the determination to shut down Pond 4 treatment operations for the year. As you and Mr. Ohland discussed, we will continue with the on-site construction of the HDS Treatment System building and related work activities consistent with the schedule set forth in Figure 7-1 of the Work Plan as long as personnel continue to be able to safely access and perform work at the Site without undue risk of weather-related injury.

If you have any questions or comments, please feel free to contact me at (661) 287-3855 or via e-mail at roy.thun@bp.com.

Sincerely,

Roy Thun
Environmental Business Manager

cc: Nancy Riveland, EPA Region 9
Gary Riley, EPA Region 9
Chuck Curtis, Lahontan Regional Water Quality Control Board
Chris Winsor, Atlantic Richfield Company – via electronic
Karen Gase, Esq., BP America Inc. – via electronic
Adam Cohen, Esq., Davis Graham & Stubbs LLP – via electronic
Robert Lawrence, Esq., Davis Graham & Stubbs LLP – via electronic
Dave McCarthy, Copper Environmental – via electronic
Grant Ohland, Geomatrix – via electronic
Tom Higgs, AMEC – via electronic
Sandy Riese, EnSci – via electronic

Technical Memorandum

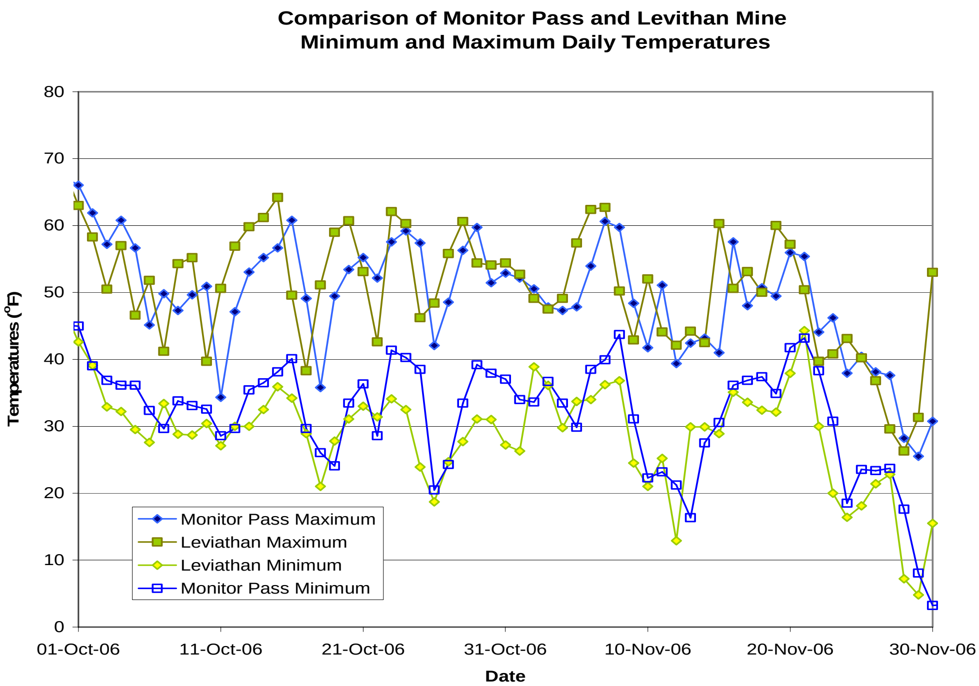
TO:	Kevin Mayer, EPA	**DATE:**	October 16, 2007
FROM:	Geomatrix Consultants on behalf of Atlantic Richfield	**PROJ. NO.:**	13091

SUBJECT: **Technical Memorandum – Pond 4 LTS Cold Weather Operations and Winter Decommissioning Plans**
Leviathan Mine Site, Alpine County, California

This Technical Memorandum was prepared by Geomatrix Consultants (Geomatrix) on behalf of Atlantic Richfield Company to: 1) describe issues encountered with cold weather operations of the Pond 4 Lime Treatment System (LTS) in late September and early October 2007, and 2) outline plans for the decommissioning of the Pond 4 LTS and Channel Underdrain (CUD) and Delta Seep (DS) collection and conveyance systems for the winter months of 2007-08. As indicated in electronic mails to EPA on October 9 and 11, 2007, operations of the Pond 4 LTS and the CUD and DS collection and conveyance systems were ceased on October 10, 2007 due to operational issues associated with subfreezing temperatures in the nighttime hours over the past week.

Background

Nighttime temperatures at the Leviathan Site (Site) began to fall significantly below freezing in late September 2007. Temperature readings at the Site are not yet available for 2007 because these data are collected by the LRWQCB and have not yet been provided to Atlantic Richfield. However, a comparison of minimum and maximum temperatures for previous years suggests that the temperature data at Monitor Pass provide a reasonable approximation of temperatures at the Site. It should be noted that the elevation of the meteorological station at the Site is approximately 7050 feet above mean sea level (msl) whereas the Monitor Pass station is located at 8350 feet msl. The following graph provides a comparison of minimum and maximum daily temperatures at Monitor Pass and the Site for the months of September through October for 2006.



The above comparison indicates that daily maximum temperatures at the Site were slightly higher than those measured at Monitor Pass in 2006. Conversely, daily minimum temperatures were slightly lower at the Site in comparison to temperature measurements at Monitor Pass. These trends are consistent with temperature measurements at the Site and Monitor Pass for prior years (2003 – 2005) where temperature measurements were recorded at both locations. Given these conclusions, one can further conclude that minimum daily temperatures at Monitor Pass are similar or slightly higher than temperatures experienced thus far in September and October of 2007. The following table presents maximum, minimum, and average daily temperatures at Monitor Pass beginning in mid-September through October 11, 2007. These data suggest that minimum daily temperatures at the Site first dropped below freezing on September 21, 2007. Thereafter, minimum daily temperatures fluctuated near the freezing mark until September 30 when temperatures fell below 20 degrees Fahrenheit (^{o}F). Temperatures below 20 ^{o}F occurred again on October 7, 2007.

Summary of Maximum, Minimum, and Average Daily Temperatures
Provisional Data for Monitor Pass

Date	Maximum Daily Temperature (degrees F)	Minimum Daily Temperature (degrees F)	Average Daily Temperature (degrees F)	Date	Maximum Daily Temperature (degrees F)	Minimum Daily Temperature (degrees F)	Average Daily Temperature (degrees F)
9/15/2007	62.06	36.5	48.2	10/1/2007	60.8	35.6	50
9/16/2007	62.78	36.5	48.2	10/2/2007	53.6	33.8	42.8
9/17/2007	63.32	38.12	49.28	10/3/2007	66.2	28.4	50
9/18/2007	57.56	34.7	45.86	10/4/2007	60.8	44.6	50
9/19/2007	62.06	36.32	48.38	10/5/2007	50	26.6	41
9/20/2007	51.08	30.92	41.9	10/6/2007	35.6	23	26.6
9/21/2007	50.72	31.1	40.28	10/7/2007	41	17.6	30.2
9/22/2007	56.12	36.32	45.14	10/8/2007	53.6	30.2	41
9/23/2007	46.94	31.46	38.48	10/9/2007	62.6	39.2	50
9/24/2007	49.64	32.54	38.48	10/10/2007	59	41	48.2
9/25/2007	49.28	30.74	37.94	10/11/2007	46.4	28.4	37.4
9/26/2007	54.5	30.02	41.9	10/12/2007	59	30.2	44.6
9/27/2007	58.46	35.78	46.4	10/13/2007	44.6	32	39.2
9/28/2007	63.68	38.48	50	10/14/2007	48.2	30.2	39.2
9/29/2007	53.78	24.8	43.16	10/15/2007	59	32	44.6
9/30/2007	46.76	18.68	32.72				

Cold Weather Operational Issues

Operational issues associated with freezing nighttime temperatures were noted by field personnel operating the Pond 4 LTS beginning on the weekend of September 29 and 30, 2007 when nighttime temperatures first dropped significantly below freezing. The first cold weather operational issue encountered was related to a frozen fresh water pump and associated water line from the fresh water storage tank to the lime slurry dilution tank. This problem was corrected and the fresh water delivery system returned to service on October 1, 2007.

On October 5, 2007, damage to a 2-inch diameter ball valve in the secondary conveyance piping from the DS collection system was discovered. The conveyance piping was not in use at the time but was subsequently repaired because it is part of a backup conveyance system installed earlier this summer.

On October 6, 2007, field personnel noted that a butterfly valve from the fresh water storage tank had ruptured during the nighttime hours releasing approximately 800 gallons of fresh water to Pond 4. This valve was replaced on October 8, 2007.

On October 8, 2007, field personnel noted a cracked 2-inch diameter ball valve at the base of the influent Equalization Tank (EQ Tank) in the Pond 4 LTS. This valve could not be repaired without shutting down the CUD and DS collection and conveyance systems and draining the tank. As a result, the valve was temporarily enveloped in expandable foam due to the potential for rupture and release of untreated water from the CUD and DS. Also on October 8, it was noted that that a 2-inch diameter ball valve in the pipeline from the treated water effluent tank to the lime solids filtration system was damaged. This valve was repaired on October 8, 2007.

As stated earlier in this Technical Memorandum, Atlantic Richfield's contractors ceased operation of the Pond 4 LTS and CUD & DS collection and conveyance systems on October 10, 2007, after consulting with EPA on October 9. Atlantic Richfield contractor's recommended that the conveyance and treatment systems be shut down after close consideration of a number of issues including the below freezing temperatures experienced at the Site and the inability to protect equipment from further damage due to the large amount of exposed valving and piping. In addition, there were concerns about potentially more severe pipe or tank ruptures resulting in discharges of untreated AMD or lime slurry either onto the ground, into Pond 4 or back to Leviathan Creek. These situations were particularly worrisome should they occur when personnel are not present at the Site. With additional cold temperatures and snow in the forecast for the upcoming weekend, it was concluded that any benefit of continuing treatment for a few more days was outweighed by the environmental and safety risks associated with further freeze-related damage to the treatment system and pumping equipment. Ionic Water Technologies also was reporting that daily temperature swings were making it very difficult to keep the treatment system in balance due to difficulties associated with fluctuations in the dosing of lime slurry to the Flash Tank. This issue is believed to be related to freezing of the lime slurry in the lime feed lines to the Flash Tank or freezing of the lime slurry storage tanks or feed pump. Another consideration in the decision to shut down the conveyance and treatment systems relates to the need to avoid significant damage to the treatment system equipment that might result in delays in the start-up of treatment operations next spring.

<u>Plans for Winter Decommissioning</u>

Following the decision to cease operation of the conveyance and treatment systems described above, the Pond 4 LTS and CUD and DS collection and conveyance systems were shutdown on October 10, 2007. Following shutdown, the EQ Tank was drained into Pond 4 to avoid a potential rupture of the damaged valve described above. Other winter decommissioning activities for the Pond 4 LTS and CUD/DS collection and conveyance systems will focus on leaving as much of the treatment and conveyance equipment in place as possible to reduce the amount of time necessary to start-up treatment operations in 2008. However, certain portions of the conveyance and treatment systems will require removal and storage for the winter months. A summary of planned decommissioning activities is as follows:

- Remove, clean, and store submersible pumps from the CUD and DS collection tanks while winterizing temporary electrical panels at the CUD and DS in place. Open valves to allow CUD and DS flow through collection tanks to Leviathan Creek.

- Drain and disconnect CUD and DS conveyance lines and remove, clean and store pumps from the DS booster pump station. Drain the DS booster pump station collection tank.

- Weatherproof all electrical components including control panels and motors. Disconnect and store electrical generator on Site and remove the backup generator for the winter.

- Drain and weatherproof Rotating Cylinder Treatment System (RCTS) units in their current location on the Pond 4 berm.

- Drain all tanks on the Pond 4 berm into Pond 4. Disconnect and/or drain piping on the Pond 4 berm and disconnect, clean, and store magnetic flow meters.

- Remove filter bins containing lime solids following waste profiling. Wastes will be disposed of the US Ecology facility in Beatty, Nevada.

- Remove field office trailers to prevent damage from snow loads.

- Drain the level of Pond 4 as low as practicable at a continuous discharge rate of 40 – 45 gpm while conducting daily measurements of pH, temperature, specific conductance, and dissolved oxygen, and discharge flow rate.

- Discontinue further deliveries of lime slurry and diesel fuel and utilize remaining diesel fuel to avoid contamination during the winter months.

- Following the draining of Pond 4, drain unused lime slurry (about 500 gallons) into Pond 4.

Please contact Grant Ohland at (303) 534-8722 with comments or questions regarding the contents of this memorandum.