Clearwater Passive Treatment System
SRI O&M TAG Project #64 Request #1
OSM PTS ID: PA-65

Requesting Organization: Altoona Water Authority
Requesting Organization Representative: Amy Sipes
Municipality/County: Altoona, Blair County
Dates of work performed: 5/8/2019 to 7/11/2019

Initial Request: On 5/8/2019, while BioMost (BMI) was working on the nearby Squatter Falls system, the Altoona Water Authority (AWA) requested assistance for the Clearwater passive system. The AWA reported there was a problem with the effluent of the ALD and that water was bypassing the system. They also noted that the water bypassing the ALD was causing erosion of the access road.

Initial Site Visit, Observations, and Identified Needs: Work on this project was to be conducted in conjunction with Saint Francis University. An initial site visit was conducted on 5/9/19 with additional investigations conducted throughout the project. The system is comprised of an underground coal mine wet seal with an outlet pipe extending into an Anoxic Limestone Drain (ALD) followed by a wetland. The raw water is low pH (4.4 average), with low metals concentrations (Fe, Al, Mn average all below 1.0 mg/L), and low acidity (9 mg/L average). The use of an ALD appears to be have been appropriate based on the laboratory analyses, however, field-measured dissolved oxygen at the inlet to the ALD on 7/5/2019 was 8.63 mg/L. A review of available documents (now posted to www.datashed.org) indicate that the ALD is 20 ft wide x 5 ft high x 460 ft long. Using a bulk density of 1.35 tons/cubic yard results in an estimate of 2,300 tons of AASHTO #3 limestone being placed in the ALD.

The primary maintenance issue appears to be that the inlet end of the ALD is clogged, which was indicated by water leaking from the inlet pipe immediately upgradient of the ALD. Monitoring wells located along the length of the ALD showed that the piezometric surface of the water in the ALD was about three feet higher at the inlet end than at the midpoint and closer to the outlet. The water that was flowing through the ALD is highly alkaline (111 mg/L on 7/5/2019) but comprises a very small portion of the total flow. 5 gpm of about 50 gpm was exiting the ALD on 7/5/2019 with 45 gpm flowing out of the inlet pipe and through a road culvert installed to convey the bypass water.

There is limited construction room in the area of the mine discharge and the ALD design seemed to be a reasonable approach to accommodate site conditions that also include an access road used for the Spaghetti Hole passive treatment system north of the Clearwater system. However, persistent plugging issues indicate that the ALD is not a practical long-term solution.

Work Completed: A culvert pipe was installed underneath the access road to divert flow from the road surface and reduce future erosion. Testing on water quality and various elevations helped to assess options to improve site conditions. The raw water pipes were exposed and two test pits were dug to determine permeability of the ALD media. After assessment, a raw water infiltration structure was built as a temporary inlet to the ALD.

Recommendations & Future Considerations:
Using a buried ALD has proved problematic due to plugging at the inlet of the limestone-based component. The inlet of the ALD is about eight feet below the existing ground surface which makes maintenance difficult, especially considering the limited construction area which is bounded by the access road. Raw water characteristics for current design purposes are defined using the chemistry sampled at the inlet to the ALD

(Point CWRAW/ALD) with flow determined by adding flow measured at the bypass (point CWRAW/ALD) and the outlet of the ALD (point CWALD/WET) on dates when flow measurements were taken at both points on the same day. The number of flow measurements is limited (n=5) but results in a higher maximum and average flow than either the ALD (which is often plugged) or the CWRAW/ALD (where raw water bypasses the ALD) alone, which will help ensure that the proposed system is designed for the maximum expected flow.

The primary purpose of the Clearwater Passive System is to neutralize acidity and produce alkaline water. Metal removal is minimal due to the low concentrations of iron, aluminum, and manganese in the raw water (all below 1 mg/L based on monitoring conducted 2016 through 2021). In order to produce alkaline water and provide maintenance access, a unique approach is proposed. This will involve excavating the existing ALD to recover as much of the AASHTO #3 limestone as feasible. It is expected that the limestone in the lower 400 feet of the ALD will be clean and should be able to be recovered with minimal effort. For estimating purposes, it will be assumed that about two-thirds (67%) of the initial limestone placed in the lower 400 feet of the ALD will be recovered:

20 ft wide x 5 ft high x 400 ft long / 27 cy/cf x 1.35 t/cy (bulk density) x 0.67 (recovery) = 1,340 tons

The proposed system will be constructed in the footprint of the existing access road and will consist of a three-cell horizontal flow limestone bed (HFLB). The HFLB will be constructed to function as both a treatment component and access road. Approximately 3,000 tons of limestone will be needed to provide at least 12 hours of retention time and sufficient limestone to neutralize 2-3 tons of acidity over a 25-year period. In order to ensure that the mine drainage has the best opportunity to flow through the limestone, a manifold inlet will be installed that has an overflow riser located within the treatment component that will allow water to continue to be treated while maintenance work can be scheduled. The cells will be constructed using a 30-foot width and 5-foot depth that will provide 50% more cross sectional area to accommodate the 200+ gpm flow.

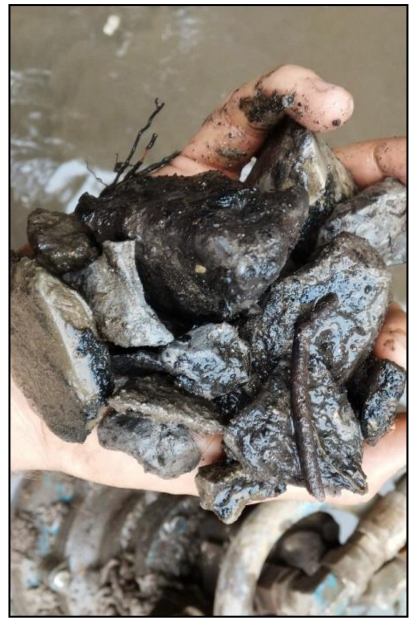
The existing access road has about three feet of elevation change over about 450 feet. It is proposed that the three HFLB cells be constructed with the bottoms of each of the three cells each at a different elevation to accommodate the road grade, but with the top choked with AASHTO #3 aggregate as needed to provide a driving surface that has constant gradual slope. It is anticipated that only the first cell will require periodic maintenance and the two downstream cells will rarely need to be cleaned.

The first (inlet end) section will be fed by an inlet manifold with multiple perforated inlet laterals and contain new R-4 riprap to help ensure flow enters the limestone, the subsequent (middle) cell will be filled with new AASHTO #1 limestone, and the final cell will be filled with the recovered AASHTO #3 aggregate.

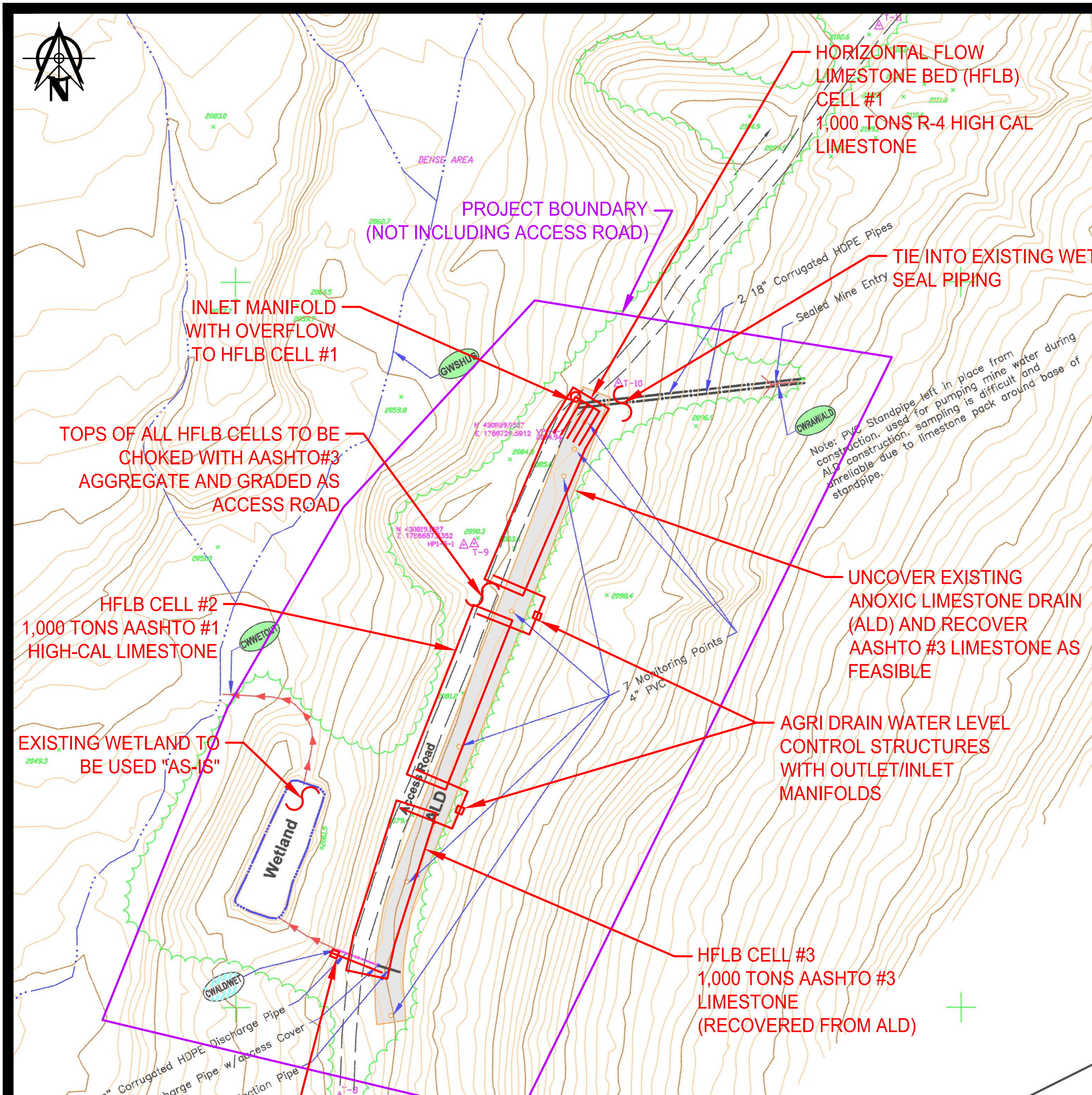
Each cell will have an outlet header pipe that will extend to an Agri Drain water level control structure. Cell two and three will be fed by an inlet header. Cell three will outlet via an outlet header and Agri Drain water level control structure to the existing wetland. Due to the low metal concentrations and frequent system bypass, no maintenance work is proposed for the existing wetland which will be used 'as-is'.

The inlet manifold should be constructed using HDPE pipe and assembled with rubber couplings (i.e., Ferncos) to allow the stone to be cleaned without damaging the inlet manifold piping. The expected maintenance would be triggered by water reaching the top of the overflow riser which would indicate that the manifold and/or aggregate around the manifold has become plugged. The stone would be excavated to expose the inlet manifolds and cleaned as needed. As the top of the stone will be at the road grade, the maximum excavation needed would be about six feet to the bottom of the limestone (as compared to the eight feet of excavation needed to reach the top of the ALD now with the bottom another five feet lower). It would be expected that the majority of the maintenance work will typically involve cleaning about 300 tons of limestone, which can be accomplished using a mini (3.5-5.0 ton) excavator in about a single day.

Photo Log



Top Left: ALD clogging led to short circuiting and flow on the access road.
Top Right: Limestone in the ALD was generally clean beyond the second monitoring well.
Bottom Left: A culvert was installed beneath the access road to act as a temporary overflow (bypass).
Bottom Right: A raw water infiltration structure was built as a **temporary** inlet to the ALD until system redesign.



NOTES:

Base map is image of portion of Glenwhite Clearwater Site Treatment System As-Built Plan (Sheet 3 of 3) prepared by PADEP, Job No. AMD 07(4339), dated 3/11/09.

BMI mining & reclamation services
434 SPRING STREET EXT.
MARS, PA 16046
www.biomost.com

SCALE: 1" = 100'

0 50' 100'

DATE: Dec. 2022

CONCEPTUAL DESIGN
CLEARWATER
SITE PLAN

Logan Township — Blair County

DRAWING NUMBER: 1 of 1

NOTES:

2018 PEMA aerial photograph obtained from www.pasda.psu.edu.

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SCALE: 1" = 100'

0 50' 100'

CONCEPTUAL DESIGN

DATE: Dec. 2022

CLEARWATER

AERIAL MAP

Logan Township Blair County

DRAWING NUMBER: 1 of 1

Printed on 01/24/2023

Company Name Stream Restoration Inc.

Project O&M TAG

Site Name Clearwater

AMD TREAT

AMD TREAT MAIN COST FORM

Costs

Passive Treatment	A	S	
Vertical Flow Pond			$0
Anoxic Limestone Drain			$0
Anaerobic Wetlands			$0
Aerobic Wetlands			$0
Manganese Removal Bed			$0
Oxic Limestone Channel			$0
Limestone Bed	3	0	$167,761
BIO Reactor			$0
Passive Subtotal:			**$167,761**
Active Treatment			
Caustic Soda			$0
Hydrated Lime			$0
Pebble Quick Lime			$0
Ammonia			$0
Oxidants			$0
Soda Ash			$0
Active Subtotal:			**$0**
Ancillary Cost			
Ponds			$0
Roads	1	0	$18,459
Land Access			$0
Ditching			$0
Engineering Cost	1	0	$42,944
Ancillary Subtotal:			**$61,403**
Other Cost (Capital Cost)			$28,500
Total Capital Cost:			**$257,664**
Annual Costs			
Sampling			$0
Labor			$0
Maintenance			$0
Pumping			$0
Chemical Cost			$0
Oxidant Chem Cost			$0
Sludge Removal			$0
Other Cost (Annual Cost)			$0
Land Access (Annual Cost)			$0
Total Annual Cost:			**$0**
Other Cost	1	0	

Water Quality

Design Flow	204.00	gpm
Typical Flow	116.00	gpm
Total Iron	0.10	mg/L
Ferrous Iron	0.10	mg/L
Aluminum	0.58	mg/L
Manganese	0.24	mg/L
pH	4.43	su
Alkalinity	0.40	mg/L
TIC	10.53	mg/L

- ○ Calculate Net Acidity
- ● Enter Hot Acidity manually

Acidity 9.44 mg/L

Sulfate	65.51	mg/L
Chloride	0.00	mg/L
Calcium	0.00	mg/L
Magnesium	0.00	mg/L
Sodium	0.00	mg/L
Water Temperature	9.72	C
Specific Conductivity	0.00	uS/cm
Total Dissolved Solids	0.00	mg/L
Dissolved Oxygen	0.01	mg/L
Typical Acid Loading	2.3	tons/yr

Total Annual Cost: per 1000 Gal of H2O Treated **$0.000**

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COMMENTS:

Raw water characteristics are based on monitoring 1/11/2016 through 10/12/2021 downloaded from www.datashed.org (accessed December 2022).

Chemistry is raw (Point CWRAW/ALD) n=15

Flow measured at CWRAW/ALD and CWALD/WL (combined concurrent dates) n=5

Typical flow = Average

Design flow = Maximum

Limestone Bed (HFLB) liner intended to be geotextile liner on bottom and sides.

Access road cost includes geotextile to separate road stone from treatment limestone.

HFLB #3 using $20/ton for limestone to account for estimated cost to expose and recover limestone in existing ALD.

Engineering Costs set at 25% (10% design, 10% permitting, 5% construction oversight)

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Printed on 01/24/2023

AMD TREAT
LIMESTONE BED (LSB)

AMDTREAT

Limestone Bed Name: HFLB Cell #1

☐ Opening Screen Water Parameters

SIZING METHODS Select One

1. Tons of Limestone Needed	165	LSB Based on Acidity Neutralization
2. Tons of Limestone Needed	51,970	◯ LSB Based on Retention Time
3. Tons of Limestone Needed	1,794	◯ LSB Based on Alkalinity Generation Rate
4. Tons of Limestone Needed	1,000	◉ LSB Based on Tons Limestone Entered
5. Tons of Limestone Needed	1,297	◯ LSB Based on Dimensions

6. Retention Time: ____ hours
7. Alkalinity Generation Rate: ____ g/m2/day
8. Limestone Needed: 1,000 tons
9. Length at Top of Freeboard: ____ ft
10. Width at Top of Freeboard: ____ ft

Influent Water Parameters that Affect LSB

Calculated Acidity	5.30	mg/L
Alkalinity	0.40	mg/L

◯ Calculate Net Acidity (Acid-Alkalinity)

◉ Enter Net Acidity manually

Net Acidity (Hot Acidity)	9.44	mg/L
Design Flow	204.00	gpm
Typical Flow	116.00	gpm
Total Iron	0.10	mg/L
Aluminum	0.58	mg/L
Manganese	0.24	mg/L

11. % Void Space of LS. Bed	4.00	%
12. System Life		years
13. Limestone Purity	85.00	%
14. Limestone Efficiency		%
15. Density of Loose Limestone	158.81	lbs/ft3
16. Limestone Unit Cost	40.00	$/ton
17. LS Placement Unit Cost	5.00	$/yd3
18. Slope of Pond Sides (Run of Slope : Rise of Slope)	2.0 : 1	
19. Freeboard Depth	1.00	ft
20. Free Standing Water Depth	0.0	ft
24. Limestone Depth	5.0	ft
25. Excavation Unit Cost	10.00	$/yd3
23. Siphon System Cost	0.00	$

Liner Cost

◯ No Liner

◯ Clay Liner

11. Clay Liner Unit Cost		$/yd3
12. Thickness of Clay Liner		ft

◉ Synthetic Liner

13. Synthetic Liner Unit Cost	5.00	$/yd2

☐ 29. Clearing and Grubbing?

◯ 30a. Land Multiplier		ratio
◯ 30b. Clear/Grub Acres		acres
31. Clear and Grub Unit Cost		$/acre
32. Nbr. of Valves	1	nbr
33. Unit Cost of Valves	7500.00	$ ea.

◯ AMDTreat Piping Costs

34. Total Length of Effluent / Influent Pipe		ft
35. Pipe Install Rate		ft/hr
36. Labor Rate		$/hr
37. Segment Len. of Trunk Pipe		ft/pipe seg.
38. Trunk Pipe Cost		$/ft
39. Trunk Coupler Cost		$/coupler
40. Spur Cost		$/ft
41. Spur Coupler Cost		$/spur
42. "T" Connector Cost		$/T coupler
43. Segment Len. of Spur Pipe		ft/pipe seg.
44. Spur Pipe Spacing		ft

◯ Custom Piping Costs

	Length	Diameter	Unit Cost
45. Pipe #1	ft	in	$
46. Pipe #2	ft	in	$
47. Pipe #3	ft	in	$

LSB Sizing Summaries

48. Length at Top of Freeboard	89.68	ft
49. Width at Top of Freeboard	46.84	ft
50. Freeboard Volume	145	yd3
51. Water Surface Area	3,670	ft2
52. Total Water Volume	0	yd3
54. Limestone Surface Area	3,670	ft2
55. Limestone Volume	466.43	yd3
56. Excavation Volume	466.4	yd3
57. Clear and Grub Area	0.0	acr.
58. Liner Area	898.2	ft2
59. Theoretical Retention Time	0.30	hrs

LSB Cost Summaries

60. Siphon System Cost	0	$
61. Limestone Cost	40,000	$
62. Limestone Placement Cost	2,332	$
63. Excavation Cost	4,664	$
64. Liner Cost	4,491	$
65. Clear and Grub Cost	0	$
66. Valve Cost	7,500	$
67. Pipe Cost	6,400	$
68. Total Cost	65,387	$

Record Number 1 of 3

Company Name Stream Restoration Inc.

Project O&M TAG

Site Name Clearwater

Printed on 01/24/2023

AMD TREAT
LIMESTONE BED (LSB)

AMDTREAT

Limestone Bed Name: HFLB Cell #2

☐ **Opening Screen Water Parameters**

SIZING METHODS Select One

1. Tons of Limestone Needed	165	LSB Based on Acidity Neutralization
2. Tons of Limestone Needed	51,970	◯ LSB Based on Retention Time
3. Tons of Limestone Needed	1,794	◯ LSB Based on Alkalinity Generation Rate
4. Tons of Limestone Needed	1,000	◉ LSB Based on Tons Limestone Entered
5. Tons of Limestone Needed	1,297	◯ LSB Based on Dimensions

6. Retention Time ____ hours

7. Alkalinity Generation Rate ____ g/m2/day

8. Limestone Needed 1,000 tons

9. Length at Top of Freeboard ____ ft

10. Width at Top of Freeboard ____ ft

Influent Water Parameters that Affect LSB

Calculated Acidity	5.30	mg/L
Alkalinity	0.40	mg/L

◯ Calculate Net Acidity (Acid-Alkalinity)

◉ Enter Net Acidity manually

Net Acidity (Hot Acidity)	9.44	mg/L
Design Flow	204.00	gpm
Typical Flow	116.00	gpm
Total Iron	0.10	mg/L
Aluminum	0.58	mg/L
Manganese	0.24	mg/L

Record Number

2 of 3

11. % Void Space of LS. Bed	4.00	%
12. System Life		years
13. Limestone Purity	85.00	%
14. Limestone Efficiency		%
15. Density of Loose Limestone	158.81	lbs/ft3
16. Limestone Unit Cost	40.00	$/ton
17. LS Placement Unit Cost	5.00	$/yd3
18. Slope of Pond Sides (Run of Slope : Rise of Slope)	2.0 : 1	
19. Freeboard Depth	1.00	ft
20. Free Standing Water Depth	0.0	ft
24. Limestone Depth	5.0	ft
25. Excavation Unit Cost	10.00	$/yd3
23. Siphon System Cost	0.00	$

Liner Cost

◯ No Liner

◯ Clay Liner

11. Clay Liner Unit Cost		$/yd3
12. Thickness of Clay Liner		ft

◉ Synthetic Liner

13. Synthetic Liner Unit Cost	5.00	$/yd2

☐ 29. Clearing and Grubbing?

◯ 30a. Land Multiplier		ratio
◯ 30b. Clear/Grub Acres		acres
31. Clear and Grub Unit Cost		$/acre
32. Nbr. of Valves	1	nbr
33. Unit Cost of Valves	7500.00	$ ea.

◯ AMDTreat Piping Costs

34. Total Length of Effluent / Influent Pipe		ft
35. Pipe Install Rate		ft/hr
36. Labor Rate		$/hr
37. Segment Len. of Trunk Pipe		ft/pipe seg.
38. Trunk Pipe Cost		$/ft
39. Trunk Coupler Cost		$/coupler
40. Spur Cost		$/ft
41. Spur Coupler Cost		$/spur
42. "T" Connector Cost		$/T coupler
43. Segment Len. of Spur Pipe		ft/pipe seg.
44. Spur Pipe Spacing		ft

◯ Custom Piping Costs

	Length	Diameter	Unit Cost
45. Pipe #1	ft	in	$
46. Pipe #2	ft	in	$
47. Pipe #3	ft	in	$

LSB Sizing Summaries

48. Length at Top of Freeboard	89.68	ft
49. Width at Top of Freeboard	46.84	ft
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54. Limestone Surface Area	3,670	ft2
55. Limestone Volume	466.43	yd3
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57. Clear and Grub Area	0.0	acr.
58. Liner Area	898.2	ft2
59. Theoretical Retention Time	0.30	hrs

LSB Cost Summaries

60. Siphon System Cost	0	$
61. Limestone Cost	40,000	$
62. Limestone Placement Cost	2,332	$
63. Excavation Cost	4,664	$
64. Liner Cost	4,491	$
65. Clear and Grub Cost	0	$
66. Valve Cost	7,500	$
67. Pipe Cost	2,400	$
68. Total Cost	61,387	$

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Project O&M TAG

Site Name Clearwater

Printed on 01/24/2023

AMDTREAT

AMD TREAT
LIMESTONE BED (LSB)

Limestone Bed Name: HFLB Cell #3

☐ Opening Screen Water Parameters

Influent Water Parameters that Affect LSB

Calculated Acidity	5.30	mg/L
Alkalinity	0.40	mg/L

○ Calculate Net Acidity (Acid-Alkalinity)
◉ Enter Net Acidity manually

Net Acidity (Hot Acidity)	9.44	mg/L
Design Flow	204.00	gpm
Typical Flow	116.00	gpm
Total Iron	0.10	mg/L
Aluminum	0.58	mg/L
Manganese	0.24	mg/L

Record Number 3 of 3

SIZING METHODS Select One

1. Tons of Limestone Needed	165	LSB Based on Acidity Neutralization
2. Tons of Limestone Needed	51,970	○ LSB Based on Retention Time
3. Tons of Limestone Needed	1,794	○ LSB Based on Alkalinity Generation Rate
4. Tons of Limestone Needed	1,000	◉ LSB Based on Tons Limestone Entered
5. Tons of Limestone Needed	1,297	○ LSB Based on Dimensions

6. Retention Time		hours
7. Alkalinity Generation Rate		g/m2/day
8. Limestone Needed	1,000	tons
9. Length at Top of Freeboard		ft
10. Width at Top of Freeboard		ft

11. % Void Space of LS. Bed	4.00	%
12. System Life		years
13. Limestone Purity	85.00	%
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23. Siphon System Cost	0.00	$

Liner Cost

○ No Liner
○ Clay Liner

11. Clay Liner Unit Cost		$/yd3
12. Thickness of Clay Liner		ft

◉ Synthetic Liner

13. Synthetic Liner Unit Cost	5.00	$/yd2

☐ 29. Clearing and Grubbing?

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○ 30b. Clear/Grub Acres		acres
31. Clear and Grub Unit Cost		$/acre
32. Nbr. of Valves	1	nbr
33. Unit Cost of Valves	7500.00	$ ea.

○ AMDTreat Piping Costs

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35. Pipe Install Rate		ft/hr
36. Labor Rate		$/hr
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38. Trunk Pipe Cost		$/ft
39. Trunk Coupler Cost		$/coupler
40. Spur Cost		$/ft
41. Spur Coupler Cost		$/spur
42. "T" Connector Cost		$/T coupler
43. Segment Len. of Spur Pipe		ft/pipe seg.
44. Spur Pipe Spacing		ft

○ Custom Piping Costs

	Length (ft)	Diameter (in)	Unit Cost ($)
45. Pipe #1			
46. Pipe #2			
47. Pipe #3			

LSB Sizing Summaries

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LSB Cost Summaries

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61. Limestone Cost	20,000	$
62. Limestone Placement Cost	2,332	$
63. Excavation Cost	4,664	$
64. Liner Cost	4,491	$
65. Clear and Grub Cost	0	$
66. Valve Cost	7,500	$
67. Pipe Cost	2,000	$
68. Total Cost	40,987	$

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AMD TREAT

ROADS

Road Name: Choke HFLBs to function as Access Road

1. Road Length	460	ft
2. Road Width	12	ft
3. Road Depth	1.00	ft
4. Aggregate Unit Cost	35.00	$/yd3
5. GeoTextile Length	460	ft
6. GeoTextile Unit Cost	2.00	$/yd2
7. Length of Silt Fence	0	ft
8. Unit Cost of Silt Fence	0.00	$/ft
☐ 9. Surveying?		
10. Survey Rate		acres/day
11. Survey Unit Cost		$/day
☐ 12. Clearing and Grubbing?		
13. Clear and Grub Cost		$/acre
14. Reveg Unit Cost	3000.00	$/acre
15. Culvert Unit Cost	50.00	$/ft
16. Culvert Length	200	ft

Roads Sub-Totals

17. Road Surface Cost	7,156	$
18. GeoTextile Cost	1,227	$
19. Silt Fence Cost	0	$
20. Culvert Cost	10,000	$
21. Revegetation Cost	76	$
22. Survey Cost	0	$
23. Clear and Grub Cost	0	$
24. Total Cost	18,459	$

Record Number 1 of 1

Company Name Stream Restoration Inc.

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AMD TREAT

ENGINEERING COST

1. Capital Cost *	214,720	$
◉ 2. Per Cent of Capital Cost	20.00	%
○ 3. Actual Engineering Cost		$
4. Total Engineering Cost	42,944	$

*** Total Capital Cost minus Engineering and Land Access Capital Cost**

Company Name Stream Restoration Inc.

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Site Name Clearwater

AMD TREAT

OTHER COST

AMDTREAT

Oher Cost Name Clearwater Improvements

A. Description of Item	B. Unit Cost Per Item	C. Quantity	D. Total Item Cost	E. Capital Cost Annual Cost
1. Tie into existing wet seal piping (JOB)	5,000.00	1	5,000	(•) Capital Cost ( ) Annual Cost
2. Mob/Demob (JOB)	9,500.00	1	9,500	(•) Capital Cost ( ) Annual Cost
3. E&S Controls (JOB)	11,000.00	1	11,000	(•) Capital Cost ( ) Annual Cost
4. Revegetation (AC)	3,000.00	1	3,000	(•) Capital Cost ( ) Annual Cost
5.	0.00	0	0	(•) Capital Cost ( ) Annual Cost
6.	0.00	0	0	(•) Capital Cost ( ) Annual Cost
7.	0.00	0	0	(•) Capital Cost ( ) Annual Cost
8.	0.00	0	0	(•) Capital Cost ( ) Annual Cost
9.	0.00	0	0	(•) Capital Cost ( ) Annual Cost
10.	0.00	0	0	(•) Capital Cost ( ) Annual Cost
11.	0.00	0	0	(•) Capital Cost ( ) Annual Cost
12.	0.00	0	0	(•) Capital Cost ( ) Annual Cost
13.	0.00	0	0	(•) Capital Cost ( ) Annual Cost
14.	0.00	0	0	(•) Capital Cost ( ) Annual Cost
15.	0.00	0	0	(•) Capital Cost ( ) Annual Cost

Record Number
1 of 1

Curent Capital Cost 28,500 $
Current Annual Cost 0 $

Total Capital Cost 28,500 $
Total Annual Cost 0 $