

Company Name H & H Coal

Project MD1

Site Name James E Long



**AMD TREAT**

**Costs AMD TREAT MAIN COST FORM**

**AMDTREAT**

<u>Passive Treatment</u>	<u>A</u>	<u>S</u>	
Vertical Flow Pond			\$0
Anoxic Limestone Drain			\$0
Anaerobic Wetlands			\$0
Aerobic Wetlands			\$0
Manganese Removal Bed	1	0	\$11,438
Oxic Limestone Channel			\$0
Limestone Bed	1	0	\$15,648
BIO Reactor			\$0
Passive Subtotal:			<b>\$27,086</b>
<u>Active Treatment</u>			
Caustic Soda			\$0
Hydrated Lime			\$0
Pebble Quick Lime			\$0
Ammonia			\$0
Oxidants			\$0
Soda Ash			\$0
Active Subtotal:			<b>\$0</b>
<u>Ancillary Cost</u>			
Ponds	1	0	\$5,000
Roads			\$0
Land Access			\$0
Ditching			\$0
Engineering Cost	1	0	\$6,417
Ancillary Subtotal:			<b>\$11,417</b>
Other Cost (Capital Cost)			\$0
Total Capital Cost:			<b>\$38,503</b>
<u>Annual Costs</u>			
Sampling	1	0	\$674
Labor	1	0	\$837
Maintenance	1	0	\$271
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:			<b>\$1,782</b>
Other Cost			

**Water Quality**

Calculated Acidity  mg/L

Alkalinity  mg/L

Calculate Net Acidity (Acid-Alkalinity)

Enter Net Acidity manually

Net Acidity (Hot Acidity)  mg/L

Design Flow  gpm

Typical Flow  gpm

Total Iron  mg/L

Aluminum  mg/L

Manganese  mg/L

pH  su

Ferric Iron  mg/L

Ferrous Iron  mg/L

Sulfate  mg/L

Filtered Fe  mg/L

Filtered Al  mg/L

Filtered Mn  mg/L

Specific Conductivity  uS/cm

Total Dissolved Solids  mg/L

Dissolved Oxygen  mg/L

**Total Annual Cost: per  
1000 Gal of H2O Treated \$1.694**

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# AMD TREAT MANGANESE REMOVAL BED

MN Removal Bed Name

**SIZING METHODS** Select One

- Tons of Limestone Needed   Based on Retention Time
- Tons of Limestone Needed   Based on Tons of Limestone
- Tons of Limestone Needed   Based on Dimensions
- Tons of Limestone Needed   Based on Kinetics

- 1. Retention Time  days
- 2. Limestone Needed  tons
- 3. Length at Top of Freeboard  ft
- 4. Width at Top of Freeboard  ft
- 5. Rate Constant (k)  hr/ft

**Opening Screen  
Water Parameters**

**Influent Water  
Parameters  
that Affect  
MN Removal Bed**

Calculated Acidity  
 mg/L

Alkalinity  
 mg/L

Calculate Net  
Acidity  
(Acid-Alkalinity)

Enter Net Acidity  
manually  
Net Acidity  
(Hot Acidity)  
 mg/L

Design Flow  
 gpm

Typical Flow  
 gpm

Total Iron  
 mg/L

Aluminum  
 mg/L

Manganese  
 mg/L

- 6. Stone Diameter  inches
- 7. Effluent Mn Concentration  mg/l
- 8. % Void Space of Limestone Bed  %
- 9 Density of Loose Limestone  lbs/ft3
- 10. Limestone Unit Cost  \$/ton
- 11. Limestone Placement Unit Cost  \$/yd3
- 12. Freeboard Depth  ft
- 13. Limestone Depth  ft
- 14. Excavation Unit Cost  \$/yd3
- 15. Slope of Pond Sides  Run :  Rise

**Liner Cost**

- No Liner
- Clay Liner
  - 16. Clay Liner Unit Cost  \$/yd3
  - 17. Thickness of Clay Liner  ft
- Synthetic Liner
  - 18. Synthetic Liner Unit Cost  \$/yd2

19. Clearing and Grubbing?

- 20. Land Multiplier  ratio
- 21. Clear/Grub Acres  acres
- 22. Clear and Grub Unit Cost  \$/acre

**Manganese Removal Bed Sizing Summaries**

- 23. Top Length at Freeboard  ft
- 23. Top Width at Freeboard  ft
- 25. Freeboard Volume  yd3
- 26. Limestone Surface Area  ft2
- 27. Limestone Volume  yd3
- 28. Tons of Limestone  tons
- 29. Excavation Volume  yd3
- 30. Clear and Grub Area  acres
- 31. Liner Area  ft2
- 32. Theoretical Retention Time  days

**Manganese Removal Bed Sub-Totals**

- 33. Limestone Cost  \$
- 34. Limestone Placement Cost  \$
- 35. Excavation Cost  \$
- 36. Liner Cost  \$
- 37. Clear and Grub Cost  \$

38. Total Cost  \$

**Record Number 1 of 1**



**AMD TREAT  
LIMESTONE BED (LSB)**

**AMDTREAT**

Limestone Bed Name proposed limestone bed

**Opening Screen  
Water Parameters**

**Influent Water  
Parameters  
that Affect LSB**

Calculated Acidity  mg/L  
Alkalinity  mg/L

Calculate Net Acidity (Acid-Alkalinity)  
 Enter Net Acidity manually  
Net Acidity (Hot Acidity)  mg/L

Design Flow  gpm  
Typical Flow  gpm  
Total Iron  mg/L  
Aluminum  mg/L  
Manganese  mg/L

**Record Number**  
1 of 1

**SIZING METHODS Select One**

- 1. Tons of Limestone Needed   LSB Based on Acidity Neutralization
- 2. Tons of Limestone Needed   LSB Based on Retention Time
- 3. Tons of Limestone Needed   LSB Based on Alkalinity Generation Rate
- 4. Tons of Limestone Needed   LSB Based on Tons Limestone Entered
- 5. Tons of Limestone Needed   LSB Based on Dimensions
- 6. Retention Time  hours
- 7. Alkalinity Generation Rate  g/m2/day
- 8. Limestone Needed  tons
- 9. Length at Top of Freeboard  ft
- 10. Width at Top of Freeboard  ft

- 11. % Void Space of LS. Bed  %
- 12. System Life  years
- 13. Limestone Purity  %
- 14. Limestone Efficiency  %
- 15. Density of Loose Limestone  lbs/ft3
- 16. Limestone Unit Cost  \$/ton
- 17. LS Placement Unit Cost  \$/yd3
- 18. Slope of Pond Sides  :  Run of Slope Rise of Slope
- 19. Freeboard Depth  ft
- 20. Free Standing Water Depth  ft
- 24. Limestone Depth  ft
- 25. Excavation Unit Cost  \$/yd3
- 23. Siphon System Cost  \$

**Liner Cost**

- No Liner
- Clay Liner
- Synthetic Liner
- 11. Clay Liner Unit Cost  \$/yd3
- 12. Thickness of Clay Liner  ft
- 13. Synthetic Liner Unit Cost  \$/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  nbr
- 33. Unit Cost of Valves  \$ 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 | <input type="text" value=""/> ft | <input type="text" value=""/> in | <input type="text" value=""/> \$ |
| 46. Pipe #2 | <input type="text" value=""/> ft | <input type="text" value=""/> in | <input type="text" value=""/> \$ |
| 47. Pipe #3 | <input type="text" value=""/> ft | <input type="text" value=""/> in | <input type="text" value=""/> \$ |

**LSB Sizing Summaries**

- 48. Length at Top of Freeboard  ft
- 49. Width at Top of Freeboard  ft
- 50. Freeboard Volume  yd3
- 51. Water Surface Area  ft2
- 52. Total Water Volume  yd3
- 54. Limestone Surface Area  ft2
- 55. Limestone Volume  yd3
- 56. Excavation Volume  yd3
- 57. Clear and Grub Area  acr.
- 58. Liner Area  ft2
- 59. Theoretical Retention Time  hrs

**LSB Cost Summaries**

- 60. Siphon System Cost  \$
- 61. Limestone Cost  \$
- 62. Limestone Placement Cost  \$
- 63. Excavation Cost  \$
- 64. Liner Cost  \$
- 65. Clear and Grub Cost  \$
- 66. Valve Cost  \$
- 67. Pipe Cost  \$

68. Total Cost  \$

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# AMD TREAT PONDS

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Pond Name

Opening Screen Water Parameters

**Influent Water Parameters that Affect Ponds**

Calculated Acidity  mg/L  
 Alkalinity  mg/L

Calculate Net Acidity (Acid-Alkalinity)  
 Enter Net Acidity manually  
 Net Acidity (Hot Acidity)  mg/L

Design Flow  gpm  
 Typical Flow  gpm  
 Total Iron  mg/L  
 Aluminum  mg/L  
 Manganese  mg/L

**Record Number**  
1 of 1

**Pond Design Based On:**

Retention Time

1. Desired Retention Time  hours

2. Include Sludge Removal?

3. Sludge Removal Frequency  times/year

4. Titration?

5. Sludge Rate  gal sludge/gal H2O  
 6. Percent Solids  %  
 7. Sludge Density  lbs./gal

Pond Size

8. Pond Length at Top of Freeboard  ft  
 9. Pond Width at Top of Freeboard  ft

	Run	Rise
10. Slope Ratio of Pond Sides	<input type="text" value="2.0"/>	<input type="text" value="1"/>
11. Freeboard Depth	<input type="text" value="2.0"/> ft	
12. Water Depth	<input type="text" value="4.3"/> ft	
13. Excavation Unit Cost	<input type="text" value="2.50"/> \$/yd3	
14. Total Length of Effluent / Influent Pipe	<input type="text" value="20.00"/> ft	
15. Unit Cost of Pipe	<input type="text" value="7.90"/> \$/ft	

Liner Cost

No Liner  
 Clay Liner  
 16. Clay Liner Unit Cost  \$/yd3  
 17. Thickness of Clay Liner  ft  
 Synthetic Liner  
 18. Synthetic Liner Unit Cost  \$/yd2  
 19. Clearing and Grubbing?

20. Land Multiplier  ratio  
 21. Clear/Grub Acres  acres  
 22. Clear and Grub Unit Cost  \$/acre

23. Revegetation Cost  \$/acre  
 24. Number of Ponds for this Design  number  
 25. Cost of Baffles  \$

**Calculated Pond Dimensions per Pond**

26. Length at Top of Freeboard  ft  
 27. Width at Top of Freeboard  ft  
 28. Freeboard Volume  yd3  
 29. Water Volume  yd3  
 30. Estimated Annual Sludge  yd3/yr  
 31. Volume of Sludge per Removal  yd3/removal  
 32. Excavation Volume  acre ft  
 33. Excavation Volume  yd3  
 34. Clear and Grub Area  acres  
 35. Liner Area  yd2  
 36. Calculated Retention Time  hours

**Ponds Sub-Totals per Pond**

37. Excavation Cost  \$  
 38. Pipe Cost  \$  
 39. Liner Cost  \$  
 40. Clearing and Grubbing Cost  \$  
 41. Revegetation Cost  \$  
 42. Baffle Cost  \$

43. Estimated Cost  \$

44. Accept Minimum Pond Cost?

The Recommended Minimum Construction Cost of Building a Pond is \$ 5,000

45. Recommended Minimum Cost  \$

46. Total Cost  \$

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## AMD TREAT ENGINEERING COST

1. Capital Cost \*  \$

2. Per Cent of Capital Cost  %

3. Actual Engineering Cost

4. Total Engineering Cost  \$

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

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## AMD TREAT SAMPLING

Sampling Name

### Ⓔ Estimate Sampling Cost

1. Unit Labor Cost  \$/hr

2. Collection Time per Sample  hours/sample

3. Travel Time  hr

4. Sample Frequency  samples/mo

5. Lab Cost Per Sample  \$/sample

6. Number of Sample Points  points

### Ⓒ Enter Established Annual Sampling Cost

7. Actual Annual Sampling Cost  \$

### Sampling Sub-Totals

8. Yearly Sample Analysis Cost  \$

9. Yearly Travel Cost  \$

10. Yearly Collection Cost  \$

11. Sampling Cost  \$

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## AMD TREAT

### LABOR

Labor Name

#### Estimate Labor Cost

- 1. Site Visits per Week
- 2. Site Labor Time per Visit  hours
- 3. Travel Time per Visit  hours
- 4. Unit Labor Cost  \$/hour

#### Enter Established Annual Labor Cost

5. Actual Annual Labor Cost  \$

6. Total Cost  \$

Record Number 1 of 1

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### AMD TREAT

### MAINTANENCE

**Ⓒ Estimate Maintenance Cost**

- 1. Percent of Active Cost  %
- 2. Percent of Passive Cost  %
- 3. Percent of Ancillary Cost \*  %
- 4. Percent of Other Capital Cost  %

**Ⓒ Enter Established Annual Maintenance Cost**

5. Annual Maintenance Cost  \$

**Maintenance Sub-Totals**

- 6 Total Maintenance Active Cost  \$
- 7. Total Maintenance Passive Cost  \$
- 8. Total Maintenance Ancillary Cost  \$
- 9. Total Maintenance Other Capital Cost  \$

**10. Total Maintenance Cost  \$**

\* Ancillary Cost does int include Cost for Land Access and Engineering Cost



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### AMD TREAT RECAPITIALIZATION COST

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Calculation Period  yrs    Inflation Rate  %    Net Return Rate  %

Recapitalization Name

A.	B.	C.	D.	E.	F.	G.
Description of Item	Unit Cost Per Item	Quantity	Total Item Cost	Life Cycle	Number of Periods	Total PV
1. replace limestone bed	15,638	1	15,638	10	7	41,899
2. replace settling pond	5,000	1	5,000	20	3	5,466
3. reolace mn removal bed	11,438	1	11,438	10	7	30,646
4.	0	0	0	0	0	0
5.	0	0	0	0	0	0
6.	0	0	0	0	0	0
7.	0	0	0	0	0	0
8.	0	0	0	0	0	0
9.	0	0	0	0	0	0
10.	0	0	0	0	0	0
11.	0	0	0	0	0	0
12.	0	0	0	0	0	0
13.	0	0	0	0	0	0
14.	0	0	0	0	0	0
15.	0	0	0	0	0	0
16.	0	0	0	0	0	0
17.	0	0	0	0	0	0
18.	0	0	0	0	0	0
19.	0	0	0	0	0	0
20.	0	0	0	0	0	0

Total Capital Cost  \$    PV Grand Total  \$