

Company Name C & K Coal

Project DER 1

Site Name Cambria 51



AMDTREAT

AMD TREAT

Costs AMD TREAT MAIN COST FORM

<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			\$0
Oxic Limestone Channel			\$0
Limestone Bed			\$0
BIO Reactor			\$0
Passive Subtotal:			\$0
Active Treatment			
Caustic Soda	1	0	\$8,387
Hydrated Lime			\$0
Pebble Quick Lime			\$0
Ammonia			\$0
Oxidants			\$0
Soda Ash			\$0
Active Subtotal:			\$0
Ancillary Cost			
Ponds	1	0	\$5,570
Roads			\$0
Land Access			\$0
Ditching			\$0
Engineering Cost	1	0	\$2,791
Ancillary Subtotal:			\$8,361
Other Cost (Capital Cost)			\$0
Total Capital Cost:			\$16,748
Annual Costs			
Sampling	2	0	\$1,226
Labor	1	0	\$10,920
Maintenance	1	0	\$252
Pumping			\$0
Chemical Cost	1	0	\$59,065
Oxidant Chem Cost			\$0
Sludge Removal	1	0	\$5,490
Other Cost (Annual Cost)			\$0
Land Access (Annual Cost)			\$0
Total Annual Cost:			\$76,953
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 **\$4.180**

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AMD TREAT CAUSTIC SODA

**Opening Screen
Water Parameters**

Caustic Soda Name

**Influent Water
Parameters
that Affect
Caustic Soda**

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

1. Gallons of Caustic per Year gal/yr
2. Gallons of Caustic per Month gal/mo
3. Gallons of Caustic per Day gal/day

4. Titration?

5. Caustic Titration Volume gal caustic/gal water treated
6. Purity of Caustic Solution purity of 20% caustic solution
7. Mixing Efficiency of Caustic Solution %
8. Tank Cost \$
9. Tank Volume gal
10. Delivery Frequency times/yr
11. Valve Unit Cost \$
12. Number of Valves nbr
13. Feeder Line Length ft
14. Feeder Line Unit Cost \$/ft
15. Installation of System Unit Cost \$/hr
16. Installation Hours hours

17. Automatic System?

18. PID pH Proportional Control \$

19. pH Probe \$

20. Chemical Metering Pump \$

21. Water Wheel Dispenser

22. Dispenser Cost \$

Caustic Sub-Totals

23. Number of Tanks Required nbr
24. Tank Cost \$
25. Automatic System or Wheel Dispenser Cost \$
26. Cost of Valves \$
27. Feeder Line Cost \$
28. Labor Cost \$

29. Total Capital Cost \$

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AMD TREAT PONDS

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Pond Name settling ponds

Pond Design Based On:

Retention Time

1. Desired Retention Time hours

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 75.000 ft

9. Pond Width at Top of Freeboard 75.000 ft

	Run	Rise
10. Slope Ratio of Pond Sides	<input type="text"/> 2.0	: <input type="text"/> 1
11. Freeboard Depth	<input type="text"/> 2.0	ft
12. Water Depth	<input type="text"/> 6.0	ft
13. Excavation Unit Cost	<input type="text"/> 2.50	\$/yd3
14. Total Length of Effluent / Inflow Pipe	<input type="text"/> 20.00	ft
15. Unit Cost of Pipe	<input type="text"/> 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 1500.00 \$/acre

24. Number of Ponds for this Design 3 number

25. Cost of Baffles 0 \$

Calculated Pond Dimensions per Pond

26. Length at Top of Freeboard 75 ft

27. Width at Top of Freeboard 75 ft

28. Freeboard Volume 1,056 yd3

29. Water Volume 682 yd3

30. Estimated Annual Sludge 0 yd3/yr

31. Volume of Sludge per Removal 0 yd3/removal

32. Excavation Volume 0.42 acre ft

33. Excavation Volume 682 yd3

34. Clear and Grub Area 0.19 acres

35. Liner Area 0 yd2

36. Calculated Retention Time 32 hours

Ponds Sub-Totals per Pond

37. Excavation Cost 5,121 \$

38. Pipe Cost 158 \$

39. Liner Cost 0 \$

40. Clearing and Grubbing Cost 0 \$

41. Revegetation Cost 290 \$

42. Baffle Cost 0 \$

43. Estimated Cost 5,570 \$

Opening Screen Water Parameters

Influent Water Parameters that Affect Ponds

Calculated Acidity 0.00 mg/L

Alkalinity 0.00 mg/L

Calculate Net Acidity (Acid-Alkalinity)

Enter Net Acidity manually

Net Acidity (Hot Acidity) 738.00 mg/L

Design Flow 70.00 gpm

Typical Flow 35.00 gpm

Total Iron 128.00 mg/L

Aluminum 55.00 mg/L

Manganese 112.00 mg/L

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1 of 1

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**AMD TREAT
ENGINEERING COST**



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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 \$

Record Number 1 of 2

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AMDTREAT

**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 \$

Record Number 2 of 2

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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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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



AMD TREAT CHEMICAL COST

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Chemical Cost Name:

Opening Screen Water Parameters

Influent Water Parameters that Affect Chemical Cost

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

A. Hydrated Lime ?

1 Titration?

2. Hydrated Lime Titration Amount lbs of hydrated lime / gal of H2O
3. Hydrated Lime Purity %
4. Mixing Efficiency of Hydrated Lime %
5. Hydrated Lime Unit Cost \$/lb

B. Pebble Quick Lime ?

6. Titration?

7. Pebble Lime Titration Amount lbs of Pebble Lime / gal of H2O
8. Pebble Lime Purity %
9. Mixing Efficiency of Pebble Lime %

Delivered in Bags

10. Pebble Lime Bag Unit Cost \$/lb

Bulk Delivery

11. Pebble Lime Bulk Unit Cost \$/lb

C. Caustic Soda ?

12. Titration?

13. Caustic Titration Amount gal of caustic / gal H2O
14. Caustic Purity purity of 20% caustic solution
15. Mixing Efficiency of Caustic %

Non-Bulk Delivery

16. Caustic Non-Bulk Unit Cost \$/gal

Bulk Delivery

17. Caustic Bulk Unit Cost \$/gal

D. Limestone ?

18. Limestone Purity %
19. Limestone Efficiency %
20. Limestone Unit Cost \$/ton

E. Anhydrous Ammonia ?

21. Titration?

22. Ammonia Titration Amount lbs of ammonia / gal H2O
23. Ammonia Purity %
24. Mixing Efficiency of Ammonia %

Non-Bulk Delivery

25. Ammonia Non-Bulk Unit Cost \$/lb

Bulk Delivery

26. Ammonia Bulk Unit Cost \$/lb

F. Soda Ash ?

27. Titration?

28. Soda Ash Titration Amount lbs of soda ash / gal of H2O
29. Soda Ash Purity %
30. Mixing Efficiency of Soda Ash %
31. Soda Ash Unit Cost \$/lb

G. Known Chemical Cost ?

32. Known Annual Chemical Cost \$

Chemical Cost Sub-Totals

33. Total Hydrated Lime Cost \$
34. Total Pebble Lime Cost \$
35. Total Caustic Soda Cost \$
36. Total Limestone Cost \$
37. Total Anhydrous Ammonia Cost \$
38. Total Soda Ash Cost \$
39. Total Known Chemical Cost \$

Annual Amount of Chemicals Consumed

- lbs
- lbs
- gals
- tons
- lbs
- lbs

40. Selected Chemical: **CAUSTIC SODA**

Annual Chemical Cost \$

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AMDTREAT

**AMD TREAT
SLUDGE REMOVAL**

Opening Screen Water Parameters

Sludge Removal Name

Influent Water Parameters that Affect Sludge Removal

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

1. Select One Selection for Method of Removing Sludge

Sludge Removal by \$ per Gallon

2. Sludge Removal Unit Cost \$/gal

Sludge Removal by Vacuum Truck

3. Vacuum Truck Unit Cost \$/hr

4. Mobilization Cost \$

5. Hours to be Used hr

Sludge Removal by Mechanical Excavation

6. Mechanical Excavation Unit Rate \$/hr

7. Mobilization Cost \$

8. Hours to be Used hr

Sludge Removal by Lagoon Cleaner

9. Lagoon Cleaning Unit Rate \$/hr

10. Mobilization Cost \$

11. Hours to be Used hr

Actual Sludge Removal Cost

12. Actual Sludge Removal Cost \$

13. Off Site Disposal Cost \$

14. Iron Concentration mg/L

15. Manganese Concentration mg/L

16. Aluminum Concentration mg/L

17. Total Miscellaneous Concentration mg/L

18. Percent Solids %

19. Sludge Density lbs/gal

20 Titration?

21. Gal. of Sludge per Gal of Water Treated gal

22. Estimated Sludge Volume yd3/yr

Cost for Sludge Removal Types

23. Removal by \$ per Gallon \$

24. Removal by Vacuum Truck \$

25. Removal by Mechanical Excavation \$

26. Removal by Lagoon Cleaner \$

27. Actual Sludge Removal Cost \$

Sludge Removal Sub-Totals

28. Currently Selected Removal Cost Plus Off Site Disposal Cost \$

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AMD TREAT RECAPITIALIZATION COST

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Calculation Period yrs Inflation Rate % Net Return Rate %

Recapitalization Name

A. Description of Item	B. Unit Cost Per Item	C. Quantity	D. Total Item Cost	E. Life Cycle	F. Number of Periods	G. Total PV
1. replace entire caustic system	13,957	1	13,957	25	3	12,206
2.	0	0	0	0	0	0
3.	0	0	0	0	0	0
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 \$

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AMDTREAT

AMD TREAT MASS BALANCE CALCULATOR

The Mass Balance Calculator is used to determine the final flow and concentration (loading) for a chemical specie(s) after two discharges are combined.

Equation Used: $C_3 = ((Q_1 \times C_1) + (Q_2 \times C_2)) / Q_3$
 Where:
 Q = Flow Rate (gpm)
 C = Concentration of Chemical Specie(s) (mg/L)

Discharge 1 + Discharge 2 = Combined Discharge

	Discharge 1	+	Discharge 2	=	Combined Discharge
Flow Rate	25.00 gpm		10.00 gpm		35.00 gpm
Iron Concentration	167.00 mg/L		31.00 mg/L		128.14 mg/L
	50.17257110 lbs/day		3.72538851 lbs/day		53.89795961 lbs/day
	18,312.9 lbs/year		1,359.7 lbs/year		19,672.7 lbs/year
Aluminum Concentration	68.00 mg/L		23.00 mg/L		55.14 mg/L
	20.42954991 lbs/day		2.76399792 lbs/day		23.19354783 lbs/day
	7,456.7 lbs/year		1,008.8 lbs/year		8,465.6 lbs/year
Manganese Concentration	120.00 mg/L		92.00 mg/L		112.00 mg/L
	36.05214690 lbs/day		11.05599171 lbs/day		47.10813861 lbs/day
	13,159.0 lbs/year		4,035.4 lbs/year		17,194.4 lbs/year
Acidity Concentration	855.00 mg/L		445.00 mg/L		737.85 mg/L
	256.87154666 lbs/day		53.47735123 lbs/day		310.34889789 lbs/day
	93,758.1 lbs/year		19,519.2 lbs/year		113,277.3 lbs/year