Printed on **05/20/2008**

Company Name BENJ COAL CO
Project ABS DISCHARGES
Site Name MARSHALL (MP3)

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	1	0	$28,848
Manganese Removal Bed			$0
Oxic Limestone Channel			$0
Limestone Bed			$0
BIO Reactor			$0
Passive Subtotal:			**$28,848**
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	1	0	$5,000
Roads			$0
Land Access			$0
Ditching			$0
Engineering Cost	1	0	$3,385
Ancillary Subtotal:			**$8,385**
Other Cost (Capital Cost)			$0
Total Capital Cost:			**$37,233**
Annual Costs			
Sampling	1	0	$1,147
Labor	1	0	$1,820
Maintenance	1	0	$463
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:			**$3,430**
Other Cost			

Water Quality

Calculated Acidity	0.00	mg/L
Alkalinity	48.00	mg/L

(•) Calculate Net Acidity (Acid-Alkalinity)
( ) Enter Net Acidity manually

Net Acidity (Hot Acidity)	-48.00	mg/L
Design Flow	20.00	gpm
Typical Flow	20.00	gpm
Total Iron	33.00	mg/L
Aluminum	0.50	mg/L
Manganese	7.80	mg/L
pH	5.80	su
Ferric Iron	0.00	mg/L
Ferrous Iron	0.00	mg/L
Sulfate	0.00	mg/L
Filtered Fe	0.00	mg/L
Filtered Al	0.00	mg/L
Filtered Mn	0.00	mg/L
Specific Conductivity	0.00	uS/cm
Total Dissolved Solids	0.00	mg/L
Dissolved Oxygen	0.00	mg/L
Typical Acid Loading	-2.1	tons/yr

Total Annual Cost: per 1000 Gal of H2O Treated **$0.326**

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COMMENTS:

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AMD TREAT

AEROBIC WETLANDS

AMDTREAT

Aerobic Wetlands Name

☑ **Opening Screen Water Parameters**

Influent Water Parameters that Affect Aerobic Wetlands

Calculated Acidity: 0.00 mg/L
Alkalinity: 48.00 mg/L

○ Calculate Net Acidity (Acid-Alkalinity)
○ Enter Net Acidity manually
Net Acidity (Hot Acidity): -48.00 mg/L

Design Flow: 20.00 gpm
Typical Flow: 20.00 gpm
Total Iron: 33.00 mg/L
Aluminum: 0.50 mg/L
Manganese: 7.80 mg/L
pH: 5.80 su

SIZING METHODS Select One

- ◉ Aerobic Wetland Based on Metal Removal Rates — 1. Iron Removal Rate: 20.0 g/m2/day — 2. Mn Removal Rate: 0.5 g/m2/day
- ○ Aerobic Wetland Based on Dimensions — 3. Top Length at Freeboard: ft — 4. Top Width at Freeboard: ft
- ○ Aerobic Wetland Based on Iron Oxidation Kinetics — 5. Rate Constant: moles/sec — 6. Effluent Fe Concentration: mg/l
- 7. Dissolved Oxygen: mg/l — 8. H2O Temperature: °C

	Length		Width
9. Length to Width Ratio	2.0	:	1.000
	Run of Slope		Rise of Slope
10. Slope of Wetland Sides	2.0	:	1.000
11. Freeboard Depth	1.50 ft		
12. Free Standing Water Depth	0.50 ft		
13. Organic Matter Depth	1.00 ft		
14. Organic Matter Unit Cost	20.00 $/yd3		
15. Organic Matter Spreading Unit Cost	4.50 $/yd3		
16. Excavation Unit Cost	5.50 $/yd3		
17. Wetland Planting Unit Cost	3700 $/acre		

Liner Cost

- ○ No Liner
- ◉ Clay Liner
  - 18. Clay Liner Unit Cost: 5.00 $/yd3
  - 19. Thickness of Clay Liner: 0.50 ft
- ○ Synthetic Liner
  - 20. Synthetic Liner Unit Cost: $/yd2

☑ 21. Clearing and Grubbing?

- ◉ 22. Land Multiplier: 1.5 ratio
- ○ 23. Clear/Grub Acres: acres

24. Clear and Grub Unit Cost: 1300 $/acre

Aerobic Wetland Sizing Summaries

25. Length at Top of Freeboard	207.19	ft
26. Width at Top of Freeboard	106.59	ft
27. Freeboard Volume	1,175	yd3
28. Water Surface Area	20,240	ft2
29. Water Volume	369	yd3
30. Organic Matter Volume	705	yd3
31. Excavation Volume	1,074	yd3
32. Clear and Grub Area	0.7	acres
33. Liner Area	2,784	ft2
34. Retention Time	62	hrs

Aerobic Cost Summaries

35. Organic Matter Cost	17,287	$
36. Excavation Cost	5,912	$
37. Liner Cost	2,784	$
38. Clear and Grub Cost	989	$
39. Wetland Planting Cost	1,876	$
40. Total Cost	28,848	$

Record Number 1 of 1

Company Name BENJ COAL CO
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AMD TREAT

PONDS

AMDTREAT

Pond Name

Pond Design Based On:

- (•) Retention Time
  - 1. Desired Retention Time: 24.0 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	2.0	:	1	
11. Freeboard Depth	2.0			ft
12. Water Depth	4.0			ft
13. Excavation Unit Cost	5.50			$/yd3
14. Total Length of Effluent / Influent Pipe	0.00			ft
15. Unit Cost of Pipe	10.00			$/ft

Liner Cost

- ( ) No Liner
- (•) Clay Liner
  - 16. Clay Liner Unit Cost: 5.00 $/yd3
  - 17. Thickness of Clay Liner: 1.0 ft
- ( ) Synthetic Liner
  - 18. Synthetic Liner Unit Cost: $/yd2

[x] 19. Clearing and Grubbing?

- (•) 20. Land Multiplier: 1.50 ratio
- ( ) 21. Clear/Grub Acres: acres
- 22. Clear and Grub Unit Cost: 1300.00 $/acre

23. Revegetation Cost: 1500.00 $/acre

24. Cost of Baffles: 0 $

Calculated Pond Dimensions per Pond

25. Length at Top of Freeboard	63	ft
26. Width at Top of Freeboard	35	ft
27. Freeboard Volume	283	yd3
28. Water Volume	142	yd3
29. Estimated Annual Sludge	0	yd3/yr
30. Volume of Sludge per Removal	0	yd3/ removal
31. Excavation Volume	0.08	acre ft
32. Excavation Volume	142	yd3
33. Clear and Grub Area	0.07	acres
34. Liner Area	320	yd2
35. Calculated Retention Time	24	hours

Ponds Sub-Totals per Pond

36. Excavation Cost	1,196	$
37. Pipe Cost	0	$
38. Liner Cost	374	$
39. Clearing and Grubbing Cost	101	$
40. Revegetation Cost	39	$
41. Baffle Cost	0	$
[x] 42. Estimated Cost	1,712	$

[x] 43. Accept Minimum Pond Cost?

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

44. Recommended Minimum Cost: 5,000 $

45. Total Cost: 5,000 $

[x] **Opening Screen Water Parameters**

Influent Water Parameters that Affect Ponds

Calculated Acidity: 0.00 mg/L
Alkalinity: 48.00 mg/L

- ( ) Calculate Net Acidity (Acid-Alkalinity)
- (•) Enter Net Acidity manually

Net Acidity (Hot Acidity): -48.00 mg/L

Design Flow: 20.00 gpm
Typical Flow: 20.00 gpm
Total Iron: 33.00 mg/L
Aluminum: 0.50 mg/L
Manganese: 7.80 mg/L

Record Number 1 of 1

Company Name BENJ COAL CO

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AMD TREAT

ENGINEERING COST

1. Capital Cost *	33,848	$
(•) 2. Per Cent of Capital Cost	10.00	%
( ) 3. Actual Engineering Cost		$
4. Total Engineering Cost	3,385	$

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

Company Name BENJ COAL CO

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Site Name MARSHALL (MP3)

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AMD TREAT

SAMPLING

AMDTREAT

Sampling Name

Estimate Sampling Cost

1. Unit Labor Cost	35.00	$/hr
2. Collection Time per Sample	0.33	hours/sample
3. Travel Time	1.00	hr
4. Sample Frequency	1.30	samples/mo
5. Lab Cost Per Sample	27.00	$/sample
6. Number of Sample Points	1	points

Enter Established Annual Sampling Cost

7. Actual Annual Sampling Cost		$

Sampling Sub-Totals

8. Yearly Sample Analysis Cost	421	$
9. Yearly Travel Cost	546	$
10. Yearly Collection Cost	180	$
11. Sampling Cost	1,147	$

Record Number 1 of 1

Company Name BENJ COAL CO

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AMD TREAT

LABOR

Labor Name

Estimate Labor Cost

1. Site Visits per Week	0.25	
2. Site Labor Time per Visit	2.00	hours
3. Travel Time per Visit	2.00	hours
4. Unit Labor Cost	35.00	$/hour

Enter Established Annual Labor Cost

5. Actual Annual Labor Cost		$

6. Total Cost	1,820	$

Record Number 1 of 1

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Company Name BENJ COAL CO

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AMD TREAT

MAINTANENCE

Estimate Maintenance Cost

1. Percent of Active Cost	3.50	%
2. Percent of Passive Cost	1.00	%
3. Percent of Ancillary Cost *	3.50	%
4. Percent of Other Capital Cost	3.50	%

Enter Established Annual Maintenance Cost

5. Annual Maintenance Cost		$

Maintenance Sub-Totals

6 Total Maintenance Active Cost	0	$
7. Total Maintenance Passive Cost	288	$
8. Total Maintenance Ancillary Cost	175	$
9. Total Maintenance Other Capital Cost	0	$
10. Total Maintenance Cost	463	$

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

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AMD TREAT
RECAPITIZALITION COST

AMDTREAT

Calculation Period 75 yrs Inflation Rate 3.10 % Net Return Rate 6.00 %

Recapitizalition 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. Organic Matter Cost	17,287	1	17,287	20	3	18,898
2. Excavation Cost	5,912	1	5,912	20	3	6,463
3. Liner Cost	2,784	1	2,784	20	3	3,043
4. Wetland Planting	1,876	1	1,876	20	3	2,051
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 27,859 $ PV Grand Total 30,455 $

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