0008

SAVAGE

Savage Services Corporation
2025 East 5000 South
Price, UT 84501

(435) 637-5664
Fax (435) 637-3418

Pamela Grubaugh-Littig
Permit Supervisor
Utah Division of Oil, Gas & Mining
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801

C/007/0022

Re: Additional Clean Copies
Expansion of Disturbed Area
Savage Coal Terminal, Task #2524
C\007\022
Carbon County, Utah

RECEIVED
APR 2 3 2007
DIV. OF OIL, GAS & MINING

Dear Pam:

Enclosed are 3 additional clean copies of the previously submitted information for the expansion of the disturbed area and construction of the settling ponds at the Savage Coal Terminal.

A required C_1/C_2 Form is included.

If you have any questions, or need additional information, please contact Dan Guy at (435)637-2422.

INCORPORATED
SEP 1 3 2006
Div. of Oil, Gas & Mining

Sincerely,

Dan W. Guy
for
Boyd Rhodes, Manager

cc: Pricilla Burton - DOGM
Boyd Rhodes - Savage
File

APPLICATION FOR PERMIT PROCESSING

Permit Change X	New Permit ☐	Renewal ☐	Transfer ☐	Exploration ☐	Bond Release ☐	Permit Number: C/007/022
Title of Proposal: Additional Clean Copies - Expansion of Disturbed Area, Task #2524						Mine: Savage Coal Terminal
						Permittee: Savage Services Corp.

Description, include reason for application and timing required to implement:

For New Settling Ponds.

Instructions: *If you answer yes to any of the first 8 questions (gray), submit the application to the Salt Lake Office. Otherwise, you may submit it to your reclamation*

X Yes	☐ No	1. Change in the size of the Permit Area? _____ acres Disturbed Area? 6.61 acres X increase ☐ decrease.
☐ Yes	X No	2. Is the application submitted as a result of a Division Order? DO #
☐ Yes	X No	3. Does application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes	X No	4. Does application include operations in hydrologic basins other than as currently approved?
☐ Yes	X No	5. Does application result from cancellation, reduction or increase of insurance or reclamation bond?
☐ Yes	X No	6. Does the application require or include public notice/publication?
☐ Yes	X No	7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☐ Yes	X No	8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☐ Yes	X No	9. Is the application submitted as a result of a Violation? NOV #
X Yes	☐ No	10. Is the application submitted as a result of other laws or regulations or policies? Explain: Division Request
☐ Yes	X No	11. Does the application affect the surface landowner or change the post mining land use?
☐ Yes	X No	12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2?)
☐ Yes	X No	13. Does the application require or include collection and reporting of any baseline information?
☐ Yes	X No	14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
X Yes	☐ No	15. Does application require or include soil removal, storage or placement?
X Yes	☐ No	16. Does the application require or include vegetation monitoring, removal or revegetation activities?
X Yes	☐ No	17. Does the application require or include construction, modification, or removal of surface facilities?
X Yes	☐ No	18. Does the application require or include water monitoring, sediment or drainage control measures?
X Yes	☐ No	19. Does the application require or include certified designs, maps, or calculations?
☐ Yes	X No	20. Does the application require or include subsidence control or monitoring?
X Yes	☐ No	21. Have reclamation costs for bonding been provided for?
☐ Yes	X No	22. Does application involve a perennial stream, a stream buffer zone or discharges to a stream?
☐ Yes	X No	23. Does the application affect permits issued by other agencies or permits issued to other entities?

X Attach 3 complete copies of the application.

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations, herein.

Dan W. Guy for Boyd Rhodes, Mgr.
Signed - Name - Position - Date

Subscribed and sworn to before me this 5th day of April, 2007

Brenda Hales
Notary Public

My Commission Expires: 11-10, 2009 }
Attest: STATE OF Utah
COUNTY OF Carbon }

BRENDA HALES
NOTARY PUBLIC • STATE of UTAH
239 E 800 N
PRICE UT 84501
MY COMMISSION EXPIRES: 11-10-2009

Received by Oil, Gas & Mining

ASSIGNED TRACKING NUMBER

Application for Permit Processing
Detailed Schedule of Changes to the MRP

Title of Application: Additional Clean Copies - Expansion of Disturbed Area, Task #2524	Permit Number: C/007/022
	Mine: Savage Coal Terminal
	Permittee: Savage Services Corp.

Provide a detailed listing of all changes to the mining and reclamation plan which will be required as a result of this proposed permit application. Individually list all maps and drawings which are to be added, replaced, or removed from the plan. Include changes of the table of contents, section of the plan, pages, or other information as needed to specifically locate, identify and revise the existing mining and reclamation plan. **Include page, section and drawing numbers as part of the description.**

			DESCRIPTION OF MAP, TEXT, OR MATERIALS TO BE CHANGED
☐ ADD	X REPLACE	☐ REMOVE	Pages 7-60, 7-61, 7-62
☐ ADD	X REPLACE	☐ REMOVE	Page 7-64
☐ ADD	X REPLACE	☐ REMOVE	Page 7-68
☐ ADD	X REPLACE	☐ REMOVE	Pages 7-71, 7-71a, 7-72, 7-73, 7-74, 7-75
☐ ADD	X REPLACE	☐ REMOVE	Pages 7-78, 7-78a, 7-79, 7-80, 7-81, 7-82, 7-83, 7-84, 7-85, 7-86, and 7-86a
☐ ADD	X REPLACE	☐ REMOVE	
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Any other specific or special instructions required for insertion of this proposal into the Mining and Reclamation Plan?

Spur water supply intake above Wellington is provided in Figure 7-2.

Water is diverted from the Price River into the Carbon and Price-Wellington Canals as it enters the central portion of the basin. The Carbon Canal trends north and south and passes within about one half mile of the Savage Coal Terminal Coal loading facility. This water is used for irrigation in the area and is of good quality since it is diverted as it leaves the upper portion of the basin. In the vicinity of the Savage Coal Terminal facility, the total dissolved concentration of water in the canal ranges between 250 and 600 mg/l. Water quality analysis of Carbon Canal Water is provided in Figure 7-3.

Flow in the Price River is affected by diversions of water, mainly for irrigation and by storage reservoirs. Interbasin diversions are common.

7.2.2.2 Mine Plan Area Watersheds and Surface Runoff

For the purposes of computing surface runoff and designing water diversion and sediment control structures, the watershed associated with the Savage Coal Terminal site was divided into five subareas as shown on Figure 7-4. Subareas A and C are undisturbed areas and include upslope areas to the west of the site. There were previously subareas A and B which drained into the undisturbed diversion ditch UD-1. The new Co-op road and Covol Plant have cut off most of this drainage, and now only a smaller area A drains to the diversion (see Figure 7-4). The remaining subareas comprise drainage units that are affected by operations and are subject to sediment control. Surface runoff from subareas A and B are diverted around the site by a diversion. The remaining subareas drain into sedimentation ponds on site.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

Date: December 21, 1977

Name Swisher Coal Company

Address P.O. Box AU
Price, UT 84501

CERTIFICATE OF ANALYSIS
77-2502-1

Water labeled "11-29 River" received on December 7, 1977.

Analysis started on: December 7, 1977

Turbidity	32.0	NTU	Total Hardness as $CaCO_3$	1,080	mg/1
Conductivity	3,976	umhos/cm	Iron as Fe (Total)	1.301	mg/1
pH	7.69	Units	Iron as Fe (Filtered)	0.355	mg/1
Total Dissolved Solids at 180°C.	2,584	mg/1	Lead as Pb	0.012	mg/1
Alkalinity as $CaCO_3$	300.0	mg/1	Magnesium as Mg	93.6	mg/1
Arsenic as As	<0.001	mg/1	Manganese as Mn	0.155	mg/1
Bicarbonate as HCO_3	366.0	mg/1	Mercury as Hg	<0.0002	mg/1
Barium as Ba	0.08	mg/1	Nickel as Ni	<0.001	mg/1
Boron as B	0.48	mg/1	Nitrate as NO_3-N	1.08	mg/1
Cadmium as Cd	0.005	mg/1	Nitrite as NO_2-N	0.07	mg/1
Calcium as Ca	280.0	mg/1	Potassium as K	6.69	mg/1
Carbonate as CO_3	<0.01	mg/1	Selenium as Se	<0.001	mg/1
Chloride as Cl	42.0	mg/1	Silica as SiO_2	57.0	mg/1
Chromium as Cr (Total)	0.002	mg/1	Silver as Ag	<0.001	mg/1
Chromium as Cr (Hex)	<0.001	mg/1	Sulfate as SO_4	1,580	mg/1
Copper as Cu	0.014	mg/1	Sodium as Na	400.0	mg/1
Surfactants MBAS	<0.01	mg/1	Zinc as Zn	0.030	mg/1
Fluoride as F	0.54	mg/1			
Phosphorus as PO4-P	0.06	mg/1			

Ford Chemical Laboratory, Inc.

05/16/83

Ford Chemical LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

Date: December 21, 1977

Name Swisher Coal Company

Address P.O. Box AU
Price, UT 84501

CERTIFICATE OF ANALYSIS
77-2502-2

Water labeled "11-29 Canal" received on December 7, 1977.

Analysis started on: December 7, 1977

Turbidity	15.0	NTU	Total Hardness as $CaCO_3$	360.0	mg/1
Conductivity	1,556	umhos/cm	Iron as Fe (Total)	0.416	mg/1
pH	7.90	Units	Iron as Fe (Filtered)	0.398	mg/1
Total Dissolved Solids at 180°C.	1,012	mg/1	Lead as Pb	0.009	mg/1
Alkalinity as $CaCO_3$	238.0	mg/1	Magnesium as Mg	21.6	mg/1
Arsenic as As	<0.001	mg/1	Manganese as Mn	0.025	mg/1
Bicarbonate as HCO_3	290.3	mg/1	Mercury as Hg	<0.0002	mg/1
Barium as Ba	0.10	mg/1	Nickel as Ni	<0.001	mg/1
Boron as B	0.65	mg/1	Nitrate as NO_3-N	1.06	mg/1
Cadmium as Cd	0.002	mg/1	Nitrite as NO_2-N	0.04	mg/1
Calcium as Ca	108.0	mg/1	Potassium as K	3.53	mg/1
Carbonate as CO_3	<0.01	mg/1	Selenium as Se	<0.001	mg/1
Chloride as Cl	28.0	mg/1	Silica as SiO_2	6.10	mg/1
Chromium as Cr (Total)	<0.001	mg/1	Silver as Ag	<0.001	mg/1
Chromium as Cr (Hex)	<0.001	mg/1	Sulfate as SO_4	400.0	mg/1
Copper as Cu	0.016	mg/1	Sodium as Na	307.0	mg/1
Surfactants MBAS	<0.01	mg/1	Zinc as Zn	0.022	mg/1
Fluoride as F	0.50	mg/1			
Phosphorus as Po4-P	0.11	mg/1			

Ford Chemical Laboratory, Inc.

7.2.2.2 Mine Plan Area Watersheds and Surface Runoff (continued)

The 10 year - 24 hour precipitation event for the area was determined from an isopluvial map prepared by the National Weather Service (NOAA, 1973) and was found to be 1.7 inches. The SCS curve number method (Soil Conversation Service, 1972) was used to determine runoff volumes.

Runoff Volumes

Each of the on-site subareas was further subdivided as shown on Figure 7-5 and Plate 7-2. Weighted curve numbers for the subareas were determined by the following procedure.

The percentage of each on-site sub-drainage that is occupied by the following categories was determined:

a) Roads, buildings, pads and embankments.
b) Topsoil, or soil, stockpiles.
c) Coal Stockpiles.
d) Compacted coal refuse piles.
e) Other areas, including undisturbed area.
f) Ponds.

The areas, except for ponds, were determined by making planimeter measurements on a 1:2400 scale base map. Pond areas were determined from Plate 7-4, "Sediment Ponds, Sections and Details". Aerial photographs were used as an aid in interpreting the areal extent of each category. The percentage in each category was determined by dividing the area in a given category by the total area of the sub-drainage (excluding pond area).

Where:

$$S = \frac{1000}{CN} - 10$$

CN = Weighted curve number
P = 10 year - 24 hour precipitation value = 1.7 in. (NOAA, 1973)

Rainfall excess, Q, is generally determined graphically. In this instance, however, it was not practical to use the graphical method with the actual values, and therefore, the rainfall-runoff equation was used. Table 7-17 lists the runoff volume calculated for each sub-drainage.

Canal Usage and Seepage Routes

The Carbon Canal located about one-half mile to the west and uphill from the Savage Coal Terminal site (see Figure 7-6) is used to nearly year round. During the irrigation season, which extends from April to October, up to 140 cfs is diverted into the canal from the Price River. During the winter, up to 25 cfs is diverted into the canal for purposes of supplying stockwater with diversion discontinued at times when icing occurs. Seepage loss from the Carbon Canal in the vicinity of the Savage Coal Terminal site is estimated at 0.30 cfs per canal mile or about 65 acre-feet annual loss assuming flow 300 days per year. Seepage losses were estimated by a method proposed by Worstell (1976) which allows estimation of seepage losses from canal length, canal width, and soil type.

7.2.2.2 Mine Plan Area Watersheds and Surface Runoff (continued)

The two lateral canals, one on the north and one on the south, are used mainly during the irrigation season during which time water is diverted from the Carbon Canal almost continuously (see Figure 7-6). The canal on the ridge to the south of the Savage Coal Terminal site is also used intermittently during the winter for purposes of providing stock water. Seepage loss from this canal is estimated at about 0.10 cfs per canal mile or about 45 acre-feet annual loss assuming flow 180 days per year. Seepage from the canal on the north is felt to not significantly affect the Savage Coal Terminal site.

Irrigation Patterns and Practices - The owners of the alfalfa fields adjacent to the Savage Coal Terminal site were contacted to determine irrigation patterns. They indicated that the fields are now irrigated at least two and up to three times per cutting with cutting occurring every 4 to 5 weeks. Irrigation begins sometime in April and the annual application is 3 to 4 acre feet per acre.

The water used to irrigate the fields is from the Carbon Canal and is of good quality. The total dissolved solids of this water ranges between 250 and 600 mg/l. There is no usage of groundwater for irrigation in the area at the present time and it is not anticipated that ground water will be used in the future due to its very poor quality.

There are no water intakes located within the permit area. One intake is located on the adjacent property; however, this intake is from the canal running south (upslope) of the property, and is located some 1200' from Savage Coal Terminal, across the county road and D. & R.G.W. railroad spur. The intake location and canal locations are shown on Plate 7-6.

Stream Channels - All stream channels in the vicinity of the site are of an ephemeral nature. The highest stream order which can be distinguished from aerial photographs for these ephemeral stream channels is 4. The banks and bottom sediments of many of the stream channels are covered by white salt deposits known as efflorescence.

7.2.2.2 Mine Plan Area Watersheds and Surface Runoff (continued)

Readily soluble salt efflorescences cover the bars, banks, and exposed pebbles of nearly all stream channels in the central portion of the Price River Basin. Efflorescences also accumulate on the general soil surface as soil water evaporates and accumulations can be especially heavy in areas where ground water is very close to the surface. Several of these areas of heavy accumulation of salt efflorescences occur at or near the Savage Coal Terminal site. These salt efflorescences are predominantly sodium and sulfate with significant amounts of magnesium (Utah Department of Natural Resources, 1972). Salt efflorescence is a major initial source of salinity in surface runoff, while the inherent characteristics of the soil determine the equilibrium salt output of a given hydrologic event (White, 1976).

Surface Water Quality - The U.S. Geological Survey in cooperation with the Utah Division of Water Rights conducted an investigation of the chemical quality of surface water in the Price River basin during 1969 and 1970. Water quality sampling was conducted at three sites during storm runoff on August 29, 1969 near the Savage Coal Terminal facility. Data which were obtained from these sites give a good indication as to the natural chemical quality of surface runoff which could be expected from Savage Coal Terminal site. The three sites include Drunkards Wash which is located several miles north of the Savage Coal Terminal, an unnamed creek located just south of Drunkards Wash, and Miller Creek which is located just south of the site. Total dissolved solids for storm runoff at these three sites was 2,770, 2,620, and 2,060 mg/l respectively. The chemical analyses of the samples from each site are given in Table 7-18.

TABLE 7-18
CHEMICAL ANALYSES OF STORM RUNOFF AT THREE SITES
NEAR THE SAVAGE COAL TERMINAL LOADING FACILITY

Parameter pH	Drunkards Wash at Highway 10 7.4 mg/l	Unnamed Creek at Highway 10 7.5 mg/l	Miller Creek near Wellington 8.0 mg/l
Silica (siO_2)	14.00	-	5.80
Calcium (Ca)	430.00	337.0	164.00
Magnesium (mg)	102.00	71.0	117.00
Sodium (Na)	272.00	377.0	310.00
Potassium (K)	11.00	-	7.00
Bicarbonate (HCO_3)	205.00	103.0	305.00
Carbonate (CO_3)	0.00	0.0	0.00
Sulfate (SO_3)	1,810.00	1,750.0	1,260.00
Chloride (Cl)	25.00	30.0	46.00
Fluoride (F)	0.80	-	0.50
Nitrate (NO_3)	0.60	0.4	4.30
Boron (B)	0.41	-	0.28
Dissolved solids	2,770.00	2,620.0	2,060.00
Hardness as $CaCO_3$	1,490.00	1,130.0	890.00
Noncarbonate hardness as $CaCO_3$	1,320.00	1,050.0	640.00

7.2.2.2 Mine Plan Area Watersheds and Surface Runoff (continued)

The natural surface runoff in the area is of poor quality with total dissolved solids ranging from 2000 to 3000 mg/l. Surface runoff from most of the site occurs infrequently. The data in Table 7-18 is indicative of the water quality to be expected from the site. Water quality samples have been collected by the Company from a drainage ditch, Station CV14W, located at the northeast corner of the property. This drainage ditch receives natural runoff and irrigation return flows from the "undisturbed" watershed subareas A and B. The water quality analysis of samples taken from this drainage ditch are presented in Table 7-19.

Irrigation water is of high quality with total dissolved solids of 200 to 600 mg/l. Levels of groundwater in the fields adjacent to the site are below the plant root zone. It would appear that irrigation practices in the area are designed to leach soluble salts from the soil resulting in high dissolved solids in irrigation return flows.

7.2.3 Surface Water Development, Control and Diversions

Water supply, drainage and sediment control are critical and essential factors to the successful operation of the Savage Coal Terminal. The main water supply for the operation is from the Price River, however, nearly all precipitation runoff is recirculated into the plant makeup water system for beneficial use following sedimentation treatment. Shallow groundwater which occurred prior to site development is now intercepted and diverted around the area for the benefit to site stability.

Table 7-19

CHEMICAL ANALYSIS OF SURFACE WATER FROM DITCH NORTH OF SITE

Station CV14W	12/13/79	1/23/80	2/29/80
Turbidity NTU		No Data	
Conductivity	8,000.000	Water Froze	7,700.000
pH	8.100		8.200
TDS mg/l	5,200.000		1,750.000
Alkalinity $CaCO_3$ mg/l			
Hardness $CaCO_3$			
As			
HCO_3			
Ba			
B			
Cd			
CO_3			
Cl mg/l	110.000		94.000
Cr (Total)			
Cu			
Surfactants MBAS			
F			
PO_4 -Pl			
Fe (Total) mg/l	.160		.690
Fe (Filtered)			
Pb			
Mg			
Mn mg/l	.016		.060
Hg			
Ni			
NO_3 -N mg/l	11.800		.280
NO_2 -N			
K			
Se			
SiO_2			
Ag			
SO_4 mg/l	4,200.000		3,000.000
Na			
Zn			
Oil and Grease mg/l	17.000		144.700
Suspended Solids mg/l	42.000		111.000
Acidiity			

The water depth, in the channel, is about 0.77 ft. for a discharge of 6.3 cfs. When depths of 0.5 ft. and 1.0 ft. were assumed, the discharge was found to be about 3.0 and 10.0, respectively. In all cases channel flow velocities are less than 3 ft. per second.

7.2.3.2.1 Disturbed Area Runoff

Disturbed area runoff from the site is routed to the sediment ponds via collection ditches, as shown on Plate 3-2. Collection ditches vary in size and configuration; however, ditches will be maintained at minimum cross-sectional areas as shown on Plate 7-5.

7.2.3.3 Sedimentation Control

Sedimentation Ponds and on-site drainage controls are shown on Plate 7-2. Sedimentation ponds are located to collect and treat runoff from various sub-drainages. The ponds are designed to store at least one year of sediment plus the runoff volume from a 10 year - 24 hour rainfall. The sedimentation ponds are arranged in series such that all runoff from disturbed areas passes through Sedimentation Pond No, 6. The outlet of Sedimentation Pond No. 6 is a UPDES discharge monitoring and Compliance Point.

Water from Pond 6 is normally not discharged, but is placed back into the raw water feed for the preparation plant for re-use.

The sedimentation and other ponds will be cleaned periodically to maintain at least one year's sediment storage capacity. Cleaning is accomplished by a backhoe or dragline.

The drainage from the refuse pile is also collected in the settling pond with the other runoff water; therefore, the system is essentially a closed type, with no expected discharge, except in the event of a storm which exceeds the pond design limits.

Sedimentation Pond Designs

The ponds are built below the level of the natural ground. Overflow of adequate capacity is provided at, or near, original ground level with a compacted berm approximately three feet high around the pond. The berm is for added protection from overflow only and does not serve as a dam. All ponds were constructed under the supervision of, and certified by, a registered, professional engineer.

Sedimentation Pond design specifications and details are provided in Plate 7-4. The design capacities of each of the existing sedimentation ponds together with the required capacities for sediment storage and runoff volume are provided in Table 7-21.

Pond Number 1 refers to the series of ponds designated as 1, 2, and 3 on Plate 7-2. Pond Number 1 collects and treats runoff from sub-drainage areas 1 and C shown on Figure 7-4. Overflows from Pond Number 1 and Pond Number 5 flow to Pond Number 6.

The required runoff volume capacities reported in Table 7-21 were determined by adding the direct precipitation on the pond to the runoff volume from a 10 year - 24 hour rainfall for each of the sub-areas contributing to the pond. The direct precipitation to the ponds from a 10 year - 24 hour precipitation event is provided in Table 7-22. As shown on Table 7-22, the runoff from a 10 year - 24 hour precipitation event plus

Table 7-20

DIVERSION DESIGN CALCULATIONS

OSM CHANNEL FLOW		OSM CHANNEL FLOW		OSM CHANNEL FLOW	
6.3	Q	0.	Q	0.	Q
1.	Z	1.	Z	1.	Z
0.	Y	0.5	Y	1.	Y
0.016	S	0.016	S	0.016	S
0.05	N	0.05	N	0.05	N

NORM. FLOW		NORM. FLOW		NORM. FLOW	
2.495078998	V	1.988722023	V	2.848320997	V
2.524970153	A	1.5	A	3.5	A
6.3	Q	2.983083035	Q	9.969123489	Q
1.	Z	1.	Z	1.	Z
2.5	W	2.5	W	2.5	W
.7714323391	Y	0.5	Y	1.	Y
0.016	S	0.016	S	0.016	S
0.05	N	0.05	N	0.05	N

For:

Q = 6.3 cfs　　Y = 0.5 ft　　Y = 1.0 ft

Where:

Q = discharge, cfs

Z = side slope, H:V

W = bottom width, ft

Y = flow depth, ft

S = bed slope, rise/run

N = roughness coefficient

sediment storage would be slightly larger than the pond capacities for Ponds 1 and 5; however, since these ponds are in series with Pond 6, and excess runoff would easily be contained within Pond 6 with no overflow. Runoff volume estimates for the various sub-areas are developed in Table 7-17.

The sediment capacity requirements were determined using the one year soil loss estimated by the USLE. Sediment capacity estimates are developed below:

Table 7-21 SEDIMENTATION POND DESIGN CAPACITIES			
Pond [1] Number	Design Capacity (acre - feet)	Required [2] Runoff Capacity (acre - feet)	Required [3] Sediment Capacity (acre - feet)
1	3.300	3.346	0.022
5	4.199	4.101	0.105
6*	2.150	1.726	0.025
Total	9.649	9.173	0.152

1 Pond Number 1 includes ponds 1, 2 and 3 in Series.

2 Required Runoff capacity includes runoff from a 10 year - 24 hour rainfall plus direct precipitation on the ponds.

3 Required Sediment Capacity is the estimated one year soil loss as determined from the USLE.

a.* Design Capacity is <u>excluding</u> filter dikes.

b. Flow through filter dikes is approximately 40 gpm, based on measurements.

c. Water entering pond No. 6 will be at a rate of approximately 40 gpm (pumping), except in the event of inflow from Ponds 1 or 5.

d. Porosity of filter dikes allows for passage of 40 gpm by actual measurement.

e. Design capacity is <u>excluding</u> static water level allowing for plant or thickener overflows.

Sedimentation Pond #6

Volume Calculations

Area of Top	19,458 ft^2
Area of Bottom	15,228 ft^2
Average Area	17,343 ft^2
Pond Depth (above pipe)	5 ft.
Pond Volume (with dikes)	1.990 ac. ft.
Dike Volume	0.62 ac. ft. (40% voids)
Pond Volume (excluding dikes)	1.618 ac. ft.
40 gpm Recirculation (24 hours)	+0.177 ac. ft.
Total Pond Volume (10 yr. 24 hrs.)	1.795 ac. ft.
Required Volume	1.770 ac. ft.

Soil Loss and Sedimentation

The Universal Soil Loss Equation (USLE) was used to predict the rate of erosion for each on-site sub-drainage. The method, while having limitations, was useful because no better method was available. The USLE is,

$$A = (R)(K)(LS)(C)(P)$$
$$= \text{erosion rate (ton/acre/year)}$$

The variables, R, K, LS, C, and P, are defined in the following discussion.

R is the rainfall factor, which, simply stated, accounts for the erosive force of specific rainfall. R is either found on an isoerodent map, or calculated from

$R = 27P^{2.2}$, where P is the 2 year - 6 hour precipitation value (Barfield, Warner, and Haan, 1981). P, for Savage Coal Terminal, is 0.8 inch, and therefore, R is 16.5 (NOAA, 1973).

Table 7-22
DIRECT PRECIPITATION TO SEDIMENT PONDS*

Pond No.	Pond Area (acres)	Volume (ft^3)	Volume (acre-feet)
1	0.61	3754	0.0864
5	0.73	4505	0.1034
6	0.22	1360	0.0312

* 10 year - 24 hour precipitation value is 1.7 inch (NOAA, 1973).

7.2.3.3 Sedimentation Control (continued)

K is the soil erodibility factor. Appendix A of Preliminary Guidance for Estimating Erosion on Areas Disturbed by Surface Mining Activities in the Interior Western United States (EPA, 1977), lists K values for all established soil series in the western U. S. The K value for the native soils, except the Saltair series, is 0.43. K for the Saltair series is 0.55. Ka values are unknown for coal piles, coal refuse piles, roads, embankments, and other disturbed lands. A certain amount of judgment had to be exercised in selecting K values for the above types of areas. The K value for loose coal is likely relatively high, due to coal's low density and a large percentage of fines. A K of 0.60 was therefore assumed for the sub-drainages containing coal stockpiles.

The K value for intentionally compacted constructions, such as refuse piles, roads and embankments was assumed to be 0.50. The K value for relatively undisturbed native soils was assumed to be 0.43.

LS, the length slope factor, accounts for the length and steepness of the slopes on which erosion occurs. Length and slope estimates for the various sub-drainages are listed in Table 7-23. LS for the various areas was determined from these estimates using the procedure from the previously mentioned EPA reference (EPA, 1977).

The cover factor, C, accounts for the effects of various types of ground cover on erosion. For no ground cover a value of 1.0 is suggested. In this analysis, C was assumed to be 1.0 for most areas. For three relatively undisturbed areas, C was assumed to be 0.22 based on percentage and type of cover.

Table 7-23
EROSION RATE DETERMINATION

Area No.	R	K	L(A)	S%	LS	C	P	A t/a/yr	Area (acres)	Erosion Rate (tons/yr)
1a	16.5	0.60	150	1	0.15	1.00	1.0	1.485	14.96	22.216
1b	16.5	0.50	250	2	0.27	1.00	1.0	2.228	5.46	12.165
1c	16.5	0.50	70	2	0.18	1.00	1.0	1.485	8.54	12.682
5a	16.5	0.50	800	2	0.38	1.00	1.0	3.135	35.87	112.453
5b	16.5	0.60	450	2	0.32	1.00	1.0	3.168	14.31	45.334
5c	16.5	0.50	70	4	0.35	1.00	1.0	2.888	1.94	5.603
5d	16.5	0.60	700	2	0.36	1.00	1.0	3.564	17.03	60.695
5e	16.5	0.50	150	1	0.15	1.00	1.0	1.238	0.84	1.040
5f	16.5	0.43	400	3	0.44	0.22	1.0	0.687	4.38	3.008
6a	16.5	0.50	200	2	0.25	1.00	1.0	2.063	3.81	7.860
6b	16.5	0.60	500	2	0.33	1.00	1.0	3.267	5.46	17.838
6c	16.5	0.50	100	2	0.20	1.00	1.0	1.650	5.55	9.158
6d	16.5	0.50	100	1	0.13	1.00	1.0	1.073	2.45	2.629
6e	16.5	0.50	300	2	0.28	1.00	1.0	2.310	6.80	15.708
6f	16.5	0.43	110	2	0.21	0.22	1.0	0.328	5.44	1.784

1) L was measured on topographic map.

2) C value of 0.22 was derived from Table 4, EPA-908/4-77-005, 1977. Assumption was, no appreciable canopy, weeds, 25% ground cover.

	tons/yr	ac/ft/yr
1	47.063	0.022
5	228.133	0.105
6	54.977	0.025
Total	330.173	0.152

7.2.3.3 Sedimentation Control (continued)

P is the erosion control practice factor. When no erosion control measures are taken, P is assumed to be 1.0. In this analysis, P is assumed to be 1.0.

Erosion rates were estimated for each of the sub-drainages using the USLE factors and basin areas as shown in Table 7-23. The total weight of sediment eroded from each sub-drainage (in on year) was determined by adding the erosion rates for all of the sub-areas in each sub-drainage. A unit weight of 100 lbs/ft^3 was assumed in order to determine the yearly volume of soil loss that may be delivered to the ponds (a sediment delivery ratio of 1.0 was assumed). The required sediment capacity provided in Table 7-21 represents the total annual soil loss from the dub-drainage contributing to the pond.

Outlet Designs

The design specifications for outlet structures are listed in Plate 7-4. A stage-discharge relation was developed for the outlet channels using manning's equation with the channel dimensions listed in Plate 7-4 and a roughness coefficient of 0.03.

An inflow hydrograph to each was derived using the SCS runoff Curve Number procedures and the associated computer model TR-20. A weighted curve number was obtained for each sub-drainage using the procedures described in Table 7-16.