SAVAGE

SAVAGE COAL TERMINAL

PROCESSING AND LOADOUT FACILITY
MINING AND RECLAMATION PLAN

VOLUME 2

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Savage Services Corporation
Savage Coal Terminal
C/007/022

Chapter 6

Geology

R645-301-600

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R645. Natural Resources; Oil, Gas and Mining; Coal.

R645-301. Coal Mine Permitting: Permit Application Requirements.

R645-301-600. Geology.

The rules in R645-301-600 present the requirements for information related to geology which is to be included in each permit application.

610. Introduction.

611. General Requirements. Each permit application will include descriptions of:

611.100. Since this is an existing surface operation, geology within and adjacent to the permit area is provided for applicable sections R645-301-621 through R645-301-627.

611.200. N/A - This is an existing operation.

612. All cross sections, maps and plans as required by R645-301-622 have been prepared and certified as described under R645-301-512.100.

620. Environmental Description.

621. The Savage Coal Terminal is near the middle of Castle Valley, a broad featureless plain between the Wasatch Plateau to the west, the Book Cliffs to the north, and the San Rafael swell to the east. Castle Valley has been formed by erosion of flat-lying sedimentary beds and is composed entirely of the Mancos formation of Upper Cretaceous age. The formation of the valley is not inherently related to faulting, but faults do cut through portions of the valley. The nearest known faulting is about seven miles to the southeast on the western wide of the Farnham upfold. This fault is about three miles in length, downthrown on the west with a throw of approximately 200 feet. The strata generally dip from three to six degrees to the northwest. Plate 6-1 is a geologic map of the area.

The Mancos formation consists of approximately 5000 feet of dark blue-gray shale with several prominent members. A study of the Mancos formation by Maxfield (1976) recognized three major marine shale transgressive sequences separated stratigraphically by two sandstone delta complexes which built from the west. The Savage Coal Terminal is located in the middle Bluegate shale member and 500 feet above the Ferron sandstone member as shown by the log of a gas well drilled 1/4 mile to the south. The well location is shown on Plate 6-1 and the log is included as Figure 6-1.

The Bluegate is a dark blue-gray marine mudstone with some thin lenses of shaley sandstone, sandy limestone, and calcareous shale. Parting and laminations of calcite, gypsum, and bentonite also occur infrequently. It weathers rapidly to a light gray, friable, semi-powdery mass that forms a dark gray sticky clay when wet.

The Ferron sandstone member of the Mancos shale is approximately 100 feet thick and composed of poorly cemented, light gray, fine grained, sub-rounded quartz. Cotter (1975) reports that this sandstone is a shallow marine deposit representative of a low energy eperici sea shore environment. The nearest outcrop of the Ferron sandstone is along the flank of the Farnham anticline 7 miles east of the loading facility.

Many of the ridges located throughout Castle Valley are capped by a loose deposit of boulders and gravels derived from the sandstones and limestones of the surrounding plateaus. These gravel caps are usually five to seventy five feet thick and are remnants of former erosional surfaces. One of these gravel terraces caps the ridge just 1 mile northwest of the loading facility at an elevation 200 feet above the facility. The exact age of the gravel deposits is unknown but is believed to be Late Tertiary or Early Quaternary on the basis of erosional evidence (Spieker, 1931). Slag deposits in the vicinity, formed as the underlying weathered shale is washed away, suggest that pockets and lenses of this terrace material exist as discontinuous layers within the weathered shale surface.

The Savage Coal Terminal is located on a low slope within the middle Bluegate shale member of the Mancos formation. Cores drilled at this site reveal that below to 20 to 25 feet the Bluegate is a dark blue-gray dense mudstone with veinlets of calcite and gypsum. The upper 20 feet consists of weathered brown to gray semi-powdery clay with some gypsum and calcite crystals and a few thin silty layers. This weathered surface may contain lenses and pods of gravelly material left behind as residuum as the overlying gravel terrace was eroded. During times of more rigorous climate, this residuum may have been worked into the weathered surface.

622. Cross Sections, Maps and Plans.

622.100. Locations of cores drilled at Savage Coal Terminal (formerly C.V. Spur) prior to plant construction in 1977 are presented in Figure 6-2. Logs of these core holes are shown on Figure 6-3.

These holes were drilled for a geotechnical analysis of soil foundation characteristics. The following information provides the results of these studies.

The soils of residual-type material characteristic of the apparent bedrock which is Mancos shale. Previous investigations of the westerly portion of the site indicated that the depth to unweathered bedrock was approximately 10 feet. However, the depth to bedrock on the easterly portion of the site may be substantially greater than this value. Foundations placed directly on the solid shale, which was permitted to weather under the exposure to air and water, have exhibited poor foundation performance. Swelling and contracting changes during the weathering process have resulted in considerable differential settlement. The subsurface profile at the proposed site can generally be defined in terms of three zones.

Zone #1, which extends from a depth of between 8 and 20 feet below ground surface, consists of a brown clay. The clay material in this zone is residual soils formed from the weathering of shale material. The clay soils in this zone are in a stiff condition with an unconfined compressive strength of generally greater than one ton per square foot.

Zone #2 is a transition zone between the brown clay and the hard unweathered shale. In this zone, the shale is quite highly weathered and is considerably fractured. Since the zone is a transition zone, the weathering is greatest near the upper portion of the zone and gradually decreases with depth. The thickness of this zone varies from 10 to 15 feet.

Zone #3 consists of the hard weathered shale. The unconfined compressive strengths of the material within the zone are generally greater than 1600 pounds per square inch.

When the moisture content of these materials is low, some swell potential exists in the soils and it can be anticipated that some swelling of these materials will occur if it becomes saturated throughout the life of the facility. No swelling will occur, however, at this site if the foundation pressures exceed the swell pressure for the clay material. No static water levels exist at the proposed site and no groundwater problems are anticipated for this area. Because of the relative and previous characteristics of the subsurface shales throughout the site, it is possible that a perched water table could exist above the shale if irrigation was heavily utilized.

622.200. N/A - Surface Operation Only.

622.300. N/A

622.400. N/A - There are no gas or oil wells within the permit area.

623. Geologic Information.

623.100. N/A - Surface Operation Only.

623.200. See Section R645-301-540 (Chapter 5) for reclamation details.

623.300. N/A - Surface Operation Only.

624. Geologic Information for Mining.

624.100. N/A - Surface Operation Only. No coal will be mined.

624.200. N/A - Surface Operation Only. No coal will be mined.

624.300. N/A - Surface Operation Only. No coal will be mined.

625. N/A - Surface Operation Only.

626. N/A - Surface Operation Only.

627. N/A - Surface Operation Only.

630. Operation Plan.

631. The only holes drilled at the Savage Coal Terminal have been for original foundation studies in 1977 as described in Section R645-301-622.100, and ground water monitoring wells.

The original foundation study borings have been removed by facility construction. The original ground water monitoring wells have also been removed. These wells were closed in the following manner:

(1) The PVC pipe was cut off approximately 4" - 6" below ground level:

(2) The well was filled with gravel to within approximately 3' of the surface:

(3) The remainder of the well was filled with concrete to form a permanent plug;

(4) The well surface was covered over with native soil.

Two new, shallow (20' - 22') ground water monitoring wells were installed in 2006. Details on these wells are included in Chapter 7. These wells will be removed and sealed in the same manner described above, when no longer required.

631.100. N/A - All wells have been removed and permanently sealed, with the exception of the 2 new ground water monitoring wells.

631.200. See Section R645-301-631 above for permanent closure methods.

632. N/A - Surface Operation Only. No coal will be mined.

640. Performance Standards.

641. See Section R645-301-631.

642. N/A - Surface Operation Only. No coal will be mined.

Bibliography

Rollins, R.L., R.O. Brown, R.D. Gunnell, 1977. Soil Investigations, Swisher Coal Facilities, Price, Utah.

Rollins, R.L., R.O. Brown, R.D. Gunnell, 1980. Hydrologic Study, Beaver Creek Coal Division Loading Facility Near Price, Utah.

FIGURE 6-1

LOG OF HOLMES-MCGEE WELL NO. 1 (FROM PUBLIC RECORDS)

Log of: HOLMES-MCGEE Well No. 1
Address: Amarillo, Texas

Field: S Wellington, Carbon County, Utah
Serial No.: 038175
Elevation: 5530
Location: S14, T15S, R10E. Meridian SLM. Location center of subdivision.

Date: September 17, 1927
Commenced drilling: March 31, 1927
Finished drilling: September 10, 1927

Cable tools were used from 0 feet to 2462 feet.

FORMATION RECORD

From	To	Total Feet	Formation
0	500	500	Upper Mancos
500	600	100	Ferron Sandstone
600	1120	520	Lower Mancos
1120	1160	40	Dakota Sandstone
1160	2462	1302	McElmo Formation vari colored shales

HISTORY OF WELL

The well located by J.W. McGee of Amarillo, Texas, in March 1927 and drilled by Holmes McGee Co. from March to September 1927. Formations show small field closed against a dyke to the south. It was thought worth drilling, but has proven fruitless, formation appeared to be broken and out of place, no Gypsum was encountered in McElmo formation which at other places is so frequent, there was an absence of water, gas or any showing whatsoever, to justify any further expenditure.

FIGURE 6-1
(Continued)

COPY OF DRILLING LOGS OF HOLMES MCGEE WELL ON MILLER CREEK, CARBON COUNTY, UTAH

FEET	TO	FEET	
0	-	500	shale, upper Mancos
500	-	555	sand, Ferron Sandstone
555	-	505	sand little gas
505	-	530	sand little fresh water
530	-	600	Sandy lime
600	-	645	shale little gas
645	-	1040	shale lower Mancos, set 8 1/4" caseing
1040	-	1070	Sandstone DAKOTA
1070	-	1120	Slate
1120	-	1160	Pink shale
1160	-	1205	sand small showing of il
1205	-	1255	sand
1255	-	1295	shale
1295	-	1335	Pink shale
1335	-	1400	Lime & breaks of shale
1400	-	1450	Sand
1450	-	1480	gray shale
1480	-	1505	pink shale
1505	-	1515	lime
1515	-	1615	slate & lime shells
1615	-	1640	brown shale
1640	-	1670	red white and brown shales
1670	-	1710	gray sand
1710	-	1772	shale and shell
1772	-	1777	sand
1777	-	1795	broken lime
1795	-	1805	sand & little gas
1805	-	1835	shale & shells
1835	-	1915	broken lime
1915	-	1926	hard lime
1926	-	2050	broken lime
2050	-	2057	red sand
2057	-	2215	broken lime
2215	-	2225	sand
2225	-	2245	gritty lime
2245	-	2270	red sand
2270	-	2295	white soft lime
2295	-	2400	gray lime broken
2400	-	2462	red shale mixed with lime

TOTAL DEPTH 2462 feet

FIGURE 6-2

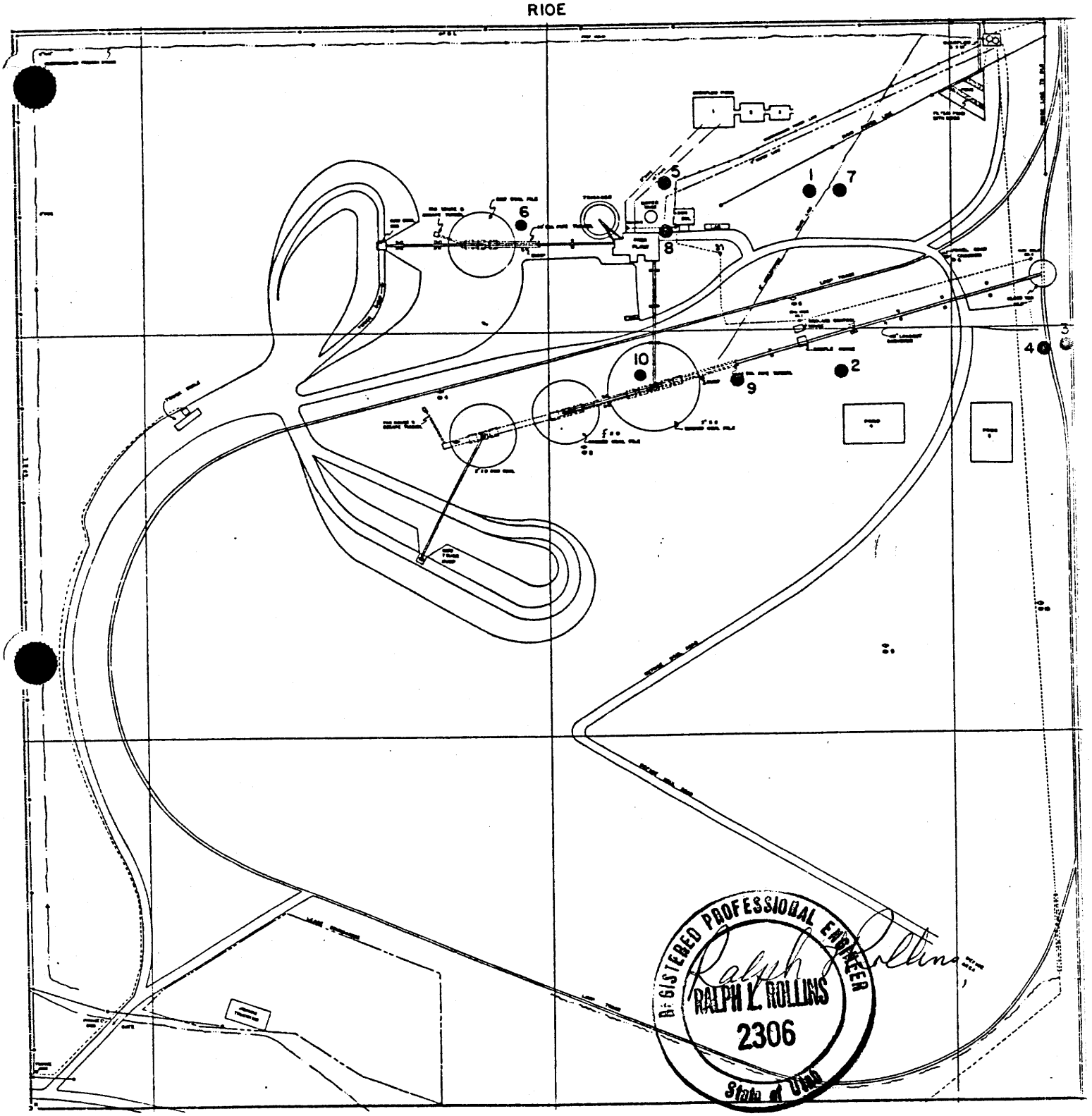
TEST BORING

AND

CORE SAMPLE LOCATIONS

TEST BORING AND CORE SAMPLE LOCATIONS

RIOE



ELEVATIONS:

1.	5490'	6.	5504'
2.	5492'	7.	5489'
3.	5482'	8.	5498'
4.	5484'	9.	5496'
5.	5497'	10.	5502'

FIGURE 6-2

Figure 6-2 (continued)

TEST BORING AND CORE SAMPLE LOCATIONS

RIOE

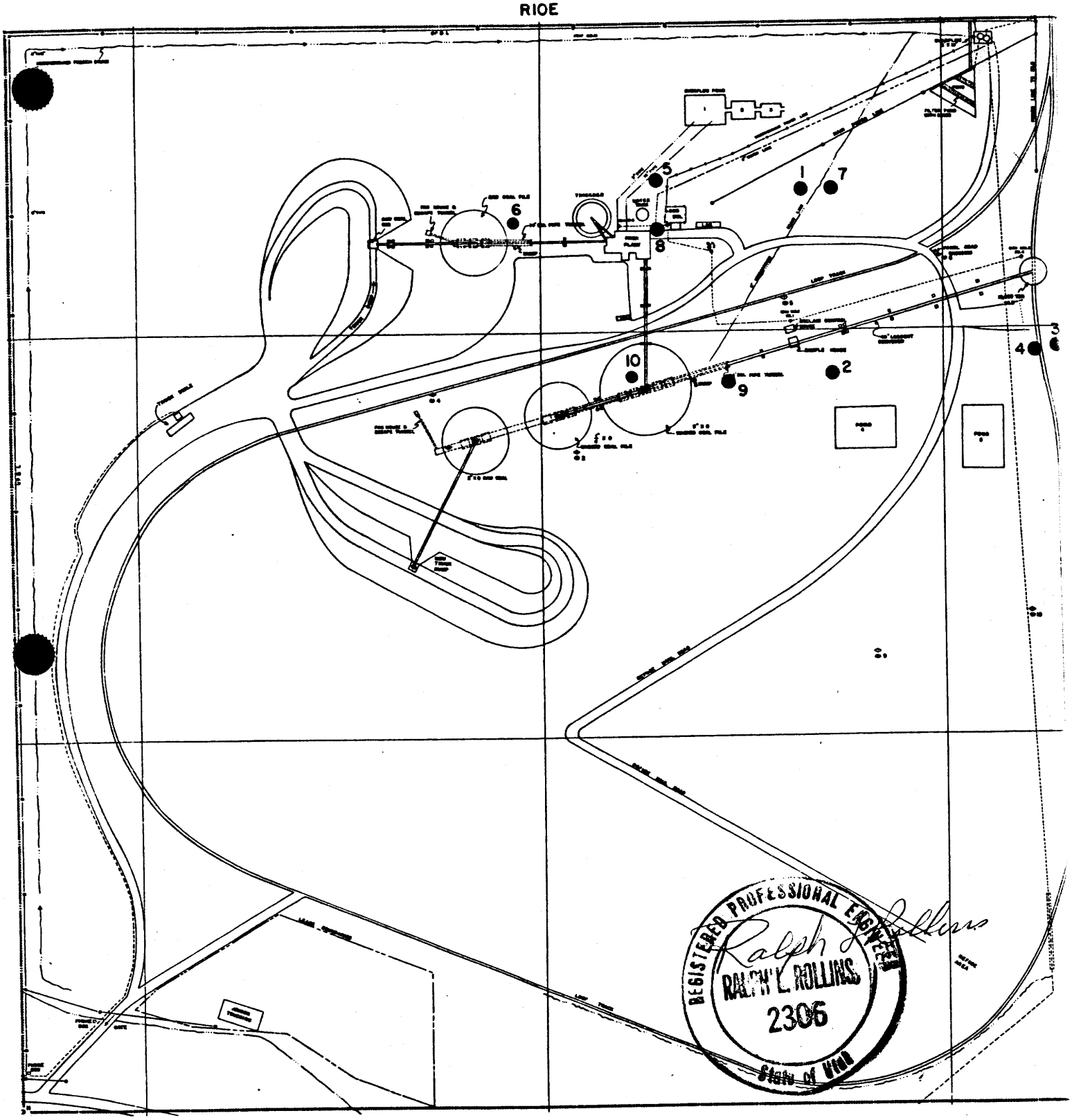


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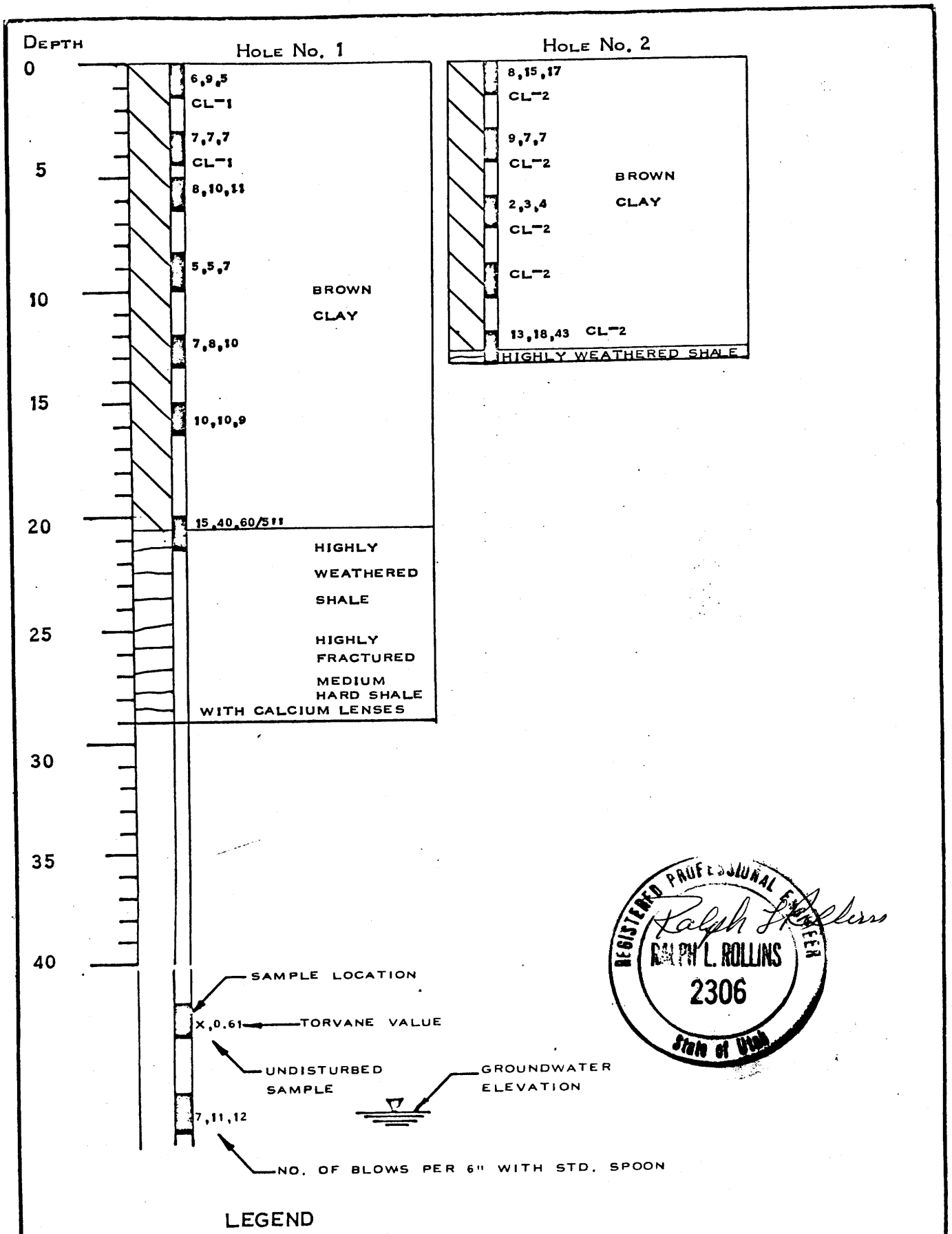
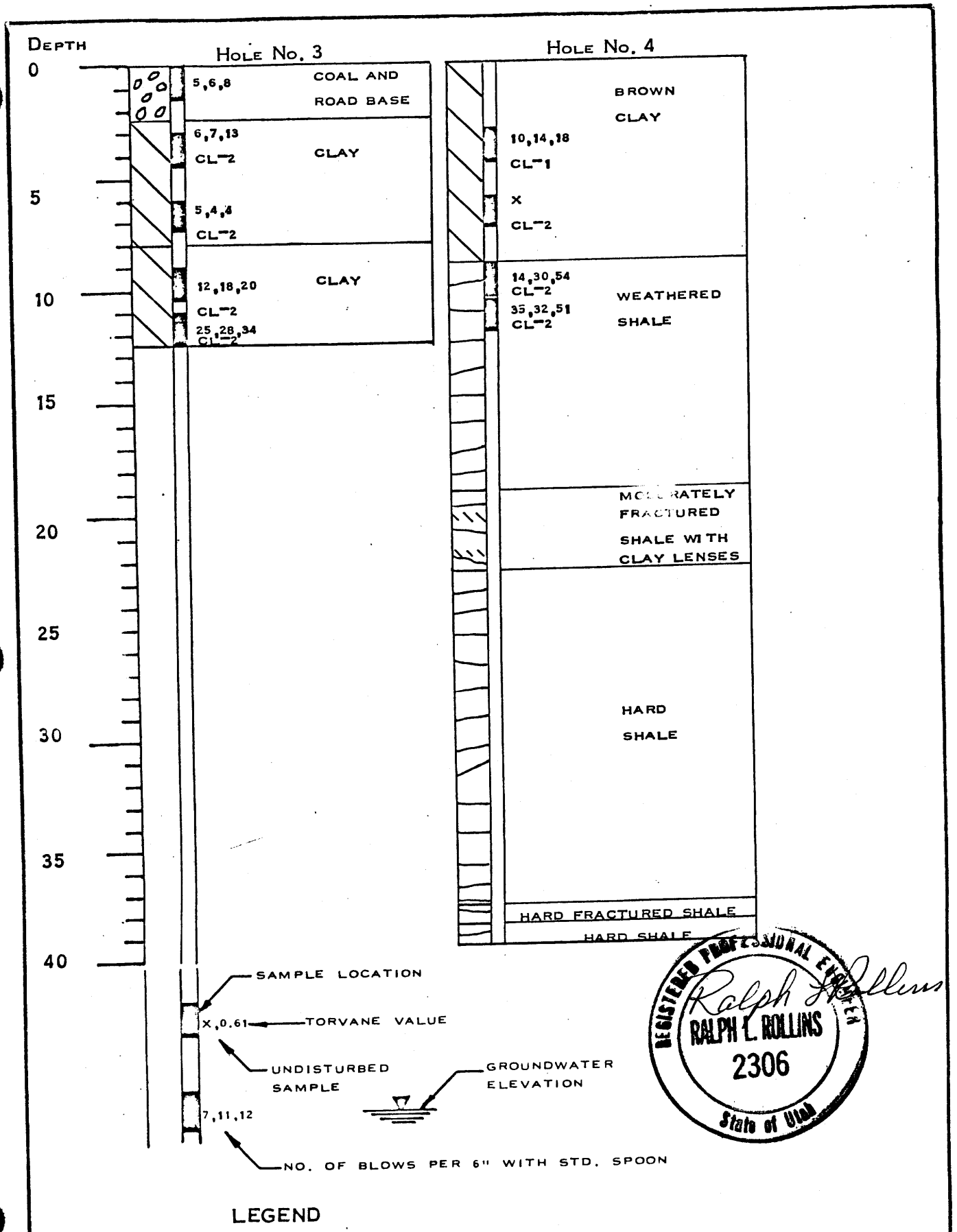
FIGURE 6-2

FIGURE 6-3

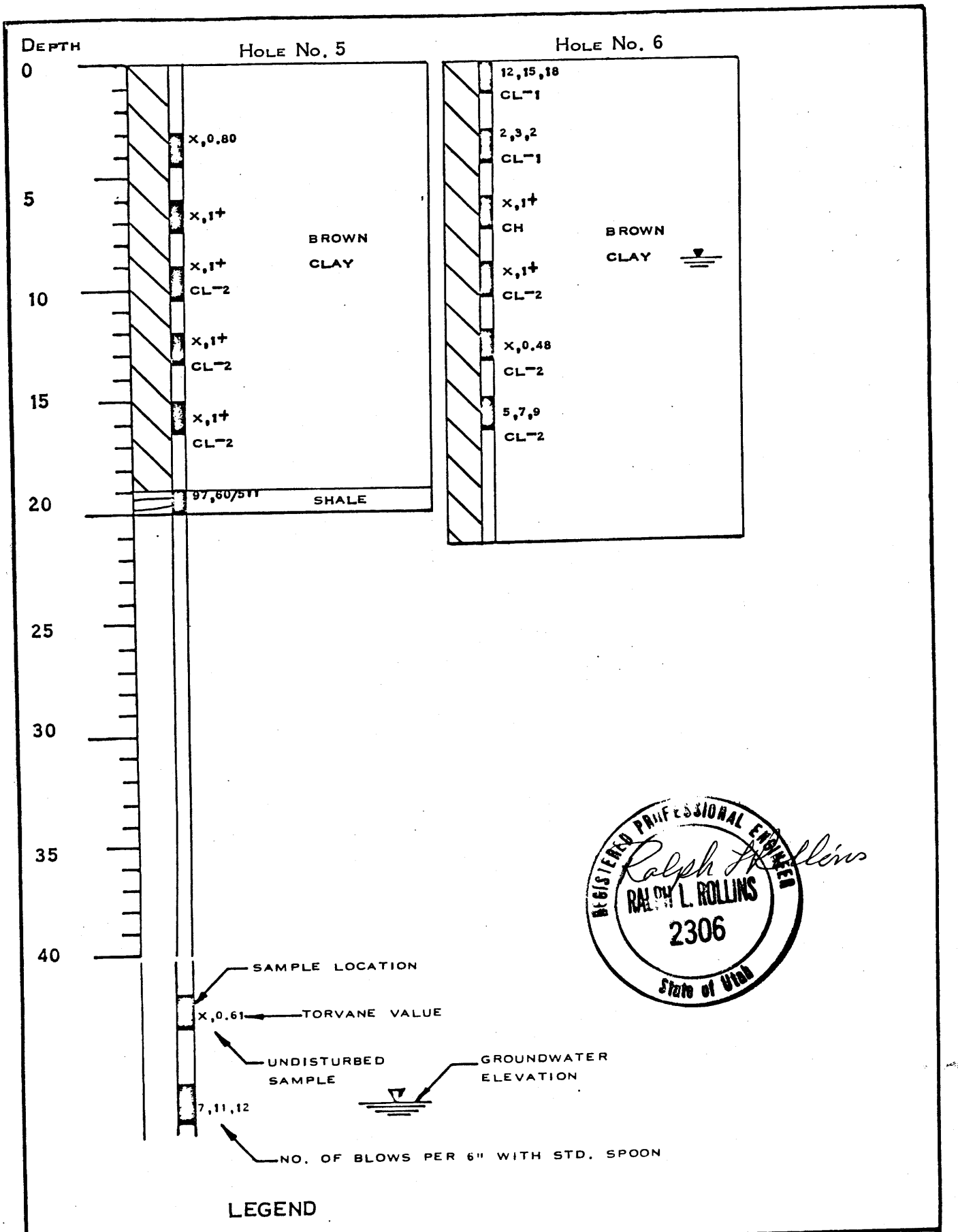
CORE SAMPLE LOGS



LOG OF BORINGS FOR: SWISHER COAL PHASE II	ROLLINS, BROWN AND GUNNELL, INC. CONSULTING ENGINEERS	FIGURE No. 6-3



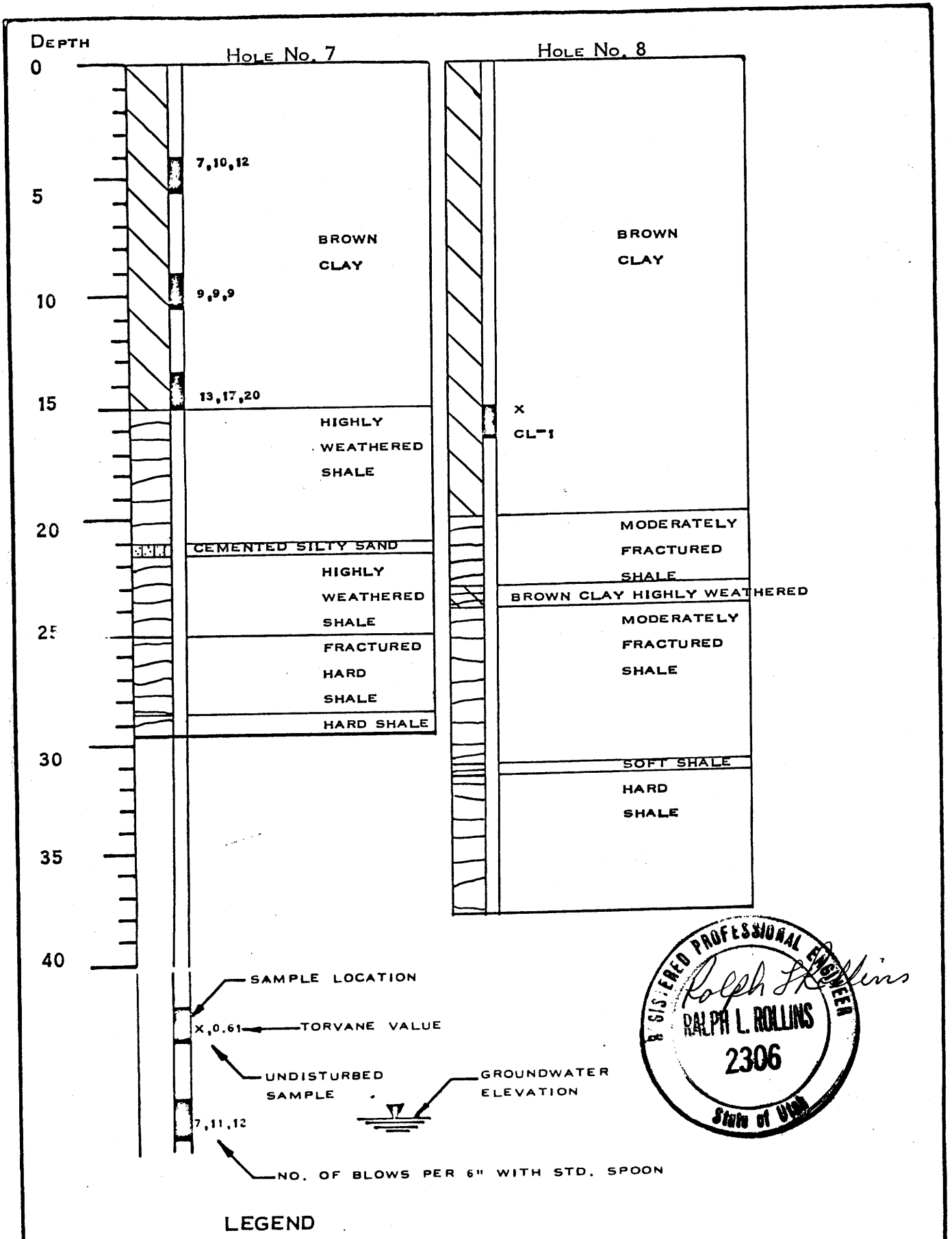
LOG OF BORINGS FOR: SWISHER COAL PHASE II	ROLLINS, BROWN AND GUNNELL, INC. CONSULTING ENGINEERS	FIGURE No. 6-3



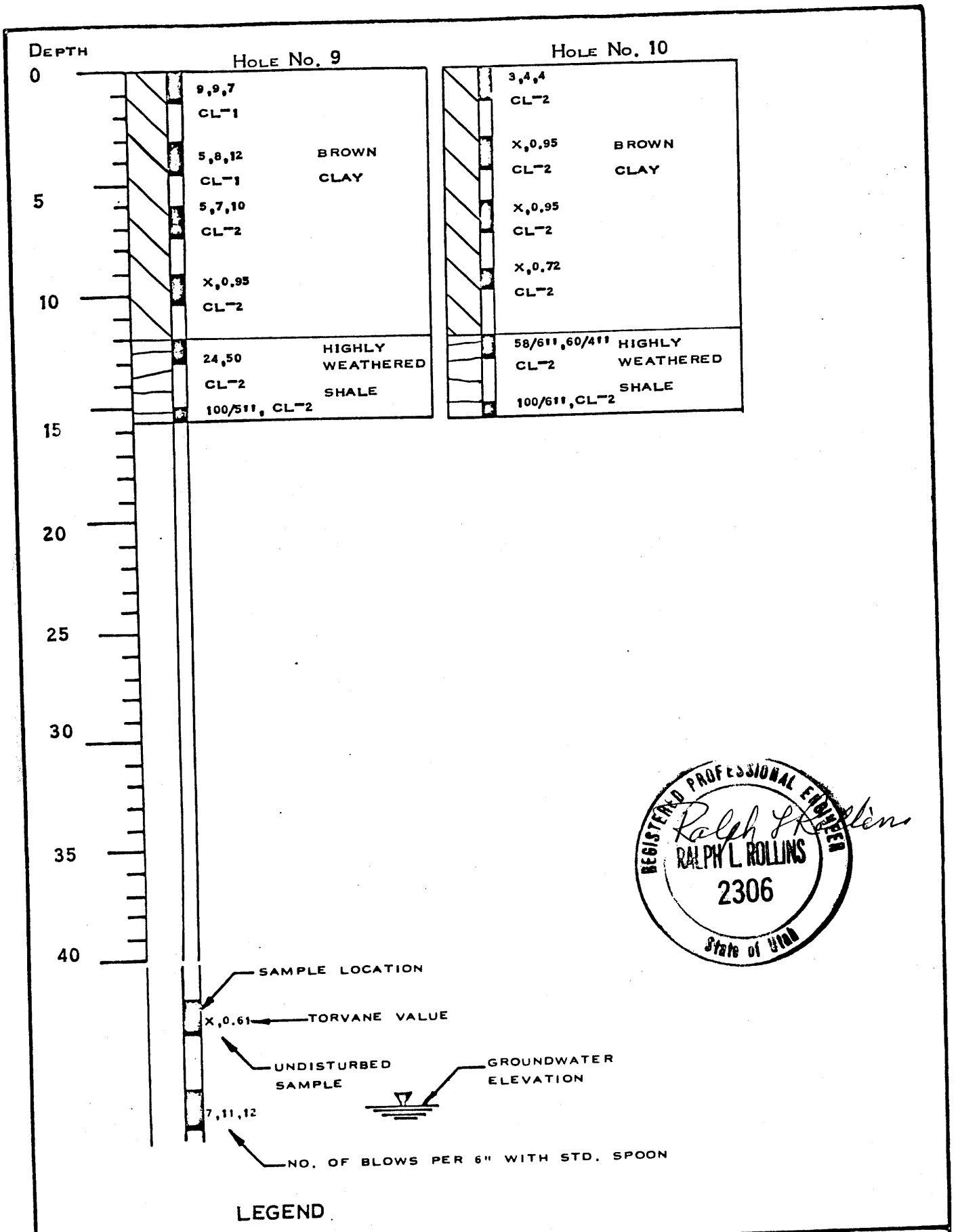
REGISTERED PROFESSIONAL ENGINEER
RALPH L. ROLLINS
2306
State of Utah

LOG OF BORINGS FOR: SWISHER COAL PHASE II	ROLLINS, BROWN AND GUNNELL, INC. CONSULTING ENGINEERS	FIGURE No. 6-3

Figure 6-3 (continued)



LOG OF BORINGS FOR: SWISHER COAL PHASE II	ROLLINS, BROWN AND GUNNELL, INC. CONSULTING ENGINEERS	FIGURE No. 6-3



LOG OF BORINGS FOR: SWISHER COAL PHASE II	ROLLINS, BROWN AND GUNNELL, INC. CONSULTING ENGINEERS	FIGURE No6-3

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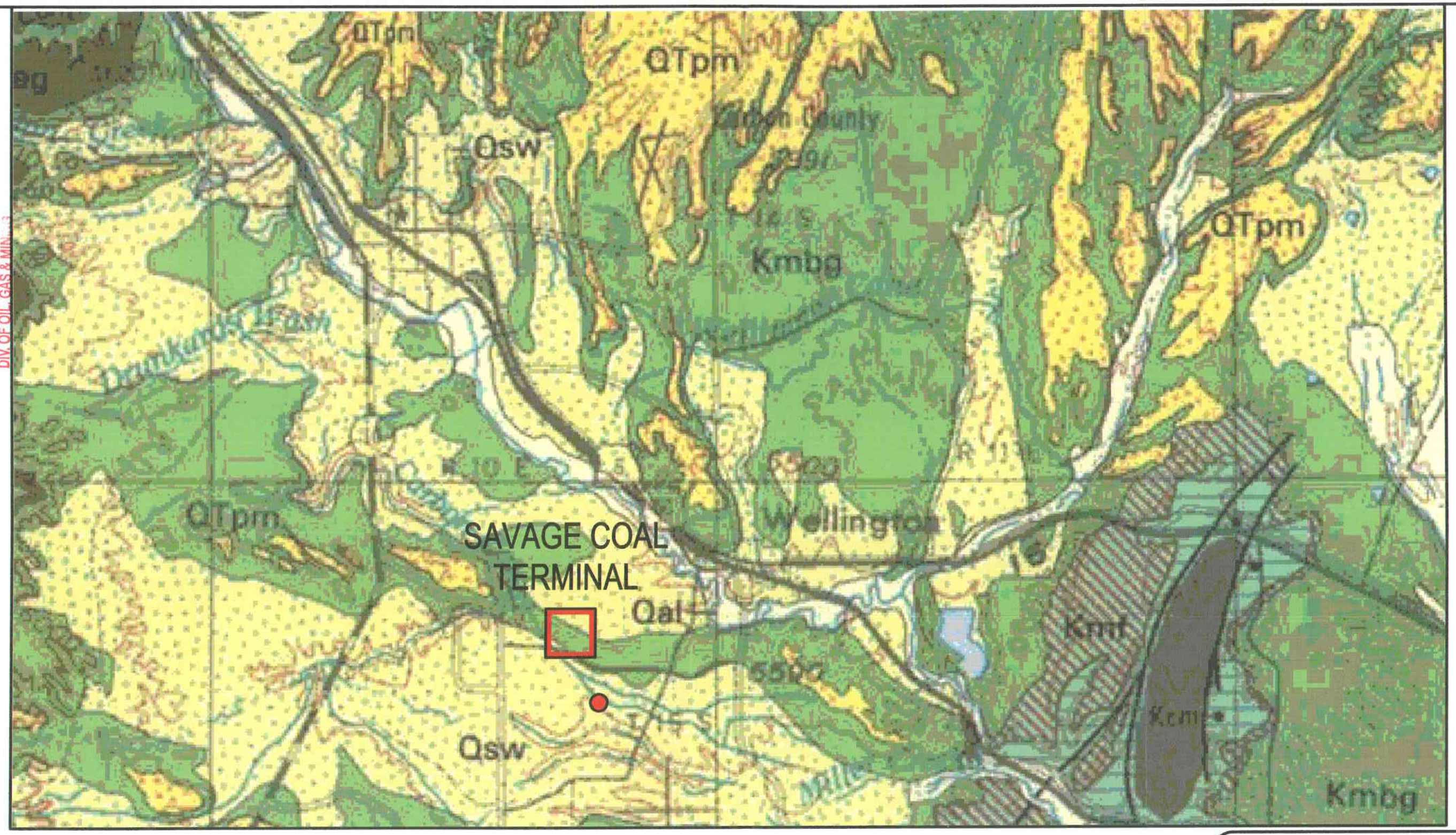

LEGEND:

Qal = Quarternary Alluvium
QTpm = Quarternary Pediment Mantle
Qsw = Quarternary Slope Wash Deposits
Kmbg = Cretaceous Blue Gate Shale Member of Mancos Formation
Kmt = Cretaceous Tununk Shale Member of Mancos Formation
Kmf = Cretaceous Ferron Sandstone Member of Mancos Formation
Kcm = Cretaceous Cedar Mountain Formation
● = Holmes Magee Well #1

N

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SAVAGE COAL TERMINAL
GEOLOGIC MAP

SCALE: NTS	DRAWN BY: BLACKHAWK ENGINEERING
DATE: AUGUST 2006	PLATE: PLATE 6-1

Savage Services Corporation
Savage Coal Terminal
C/007/022

Chapter 7

Hydrology

R645-301-700

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R645. Natural Resources; Oil, Gas and Mining; Coal.

R645-301. Coal Mine Permitting: Permit Application Requirements.

R645-301-700. Hydrology.

710. Introduction.

711. General Requirements. Each permit application will include descriptions of:

711.100. Existing Hydrologic Resources. (See Section 720.)

711.200. Proposed Operations. (See Section 730.)

711.300. Methods and Calculations. (See Section 740.)

711.400. Performance Standards. (See Section 750.)

711.500. Reclamation. (See Section 760.)

712. All required cross-sections, maps and plans have been prepared under the direction of, and certified by, a qualified, registered professional engineer of the State of Utah.

713. Inspection. Impoundments will be inspected as described under R645-301-514.300.

720. Environmental Description.

721. See Sections 724.100 and 724.200 for descriptions of the groundwater and surface water, respectively.

722. Cross Sections and Maps.

722.100. Location of Subsurface Water. (See Plates 7-1 and 7-2.)

722.200. Location of Surface Water. (See Plates 7-1 and 7-2.)

722.300. Monitoring Stations. (See Plate 7-1.)

722.400. Water Wells. (See Plates 7-1 and 7-2.)

722.500. Topography. (See Plate 7-1.)

723. Water Quality.

All water quality analyses are conducted in accordance with requirements of R645-301-723.

724. Baseline Information.

The application will include the following baseline hydrologic, geologic and climatologic information, and any additional information required by the Division.

724.100. Groundwater Hydrology

Methodology - A groundwater investigation was developed to:

1. Review all published data and geologic information concerning potential aquifers and groundwater resources in the vicinity of the Savage Coal Terminal site.

2. Identify and locate any discharge areas and uses of groundwater using photo field reconnaissance.

3. Install monitoring wells to locate the water table or pearched groundwater levels in the area and to determine aquifer characteristics.

4. Monitor water quality characteristics of the aquifer in order to establish a baseline with seasonal variation.

5. Determine rate and direction of groundwater movement.

Existing Groundwater Resources

The Savage Coal Terminal is near the middle of Castle Valley, a broad featureless plain between the Wasatch Plateau to the west and the San Rafael Swell to the east. A detailed geologic discussion is developed in Chapter 6. Briefly, the Savage Coal Terminal facility is located on the middle Bluegate shale member of the Mancos Formation and is approximately 500 feet above the Ferron sandstone member of the Mancos Formation. The Blue gate member consists of dark blue-gray marine mudstone and acts as an aquitard. The upper 10 to 20 feet consists of weathered clays, occasional lenses and pods of gravelly residuum, and residual type silty clay loam soils characteristic of the weathered Mancos shale.

Regional Groundwater Hydrology

Published groundwater data for the area surrounding the Savage Coal Terminal site is limited. However, the U.S. Geologic Survey (1979) has compiled the published selected groundwater data in the Wasatch Plateau and Book Cliffs area. Also, drilling logs for oil and gas wells drilled in the area were obtained from the Utah Division of Oil, Gas and Mining. This data is sufficient to give a good indication as to the existence and relative location of water bearing strata in the area.

Logs of oil and gas wells drilled in the area indicate that regional groundwater was first encountered in the Ferron Sandstone approximately 500 feet below the surface. Five of thirteen wells recovered brackish or salty water from this strata. The other 8 wells did not find water in this strata. Because of the variable and discontinuous nature of the sandstone and the poor quality of the water, the Ferron is not an important aquifer in this area.

A water table does exist in some locations above the impermeable Bluegate shale. In the general area, this water table exists in the alluvium or weathered shale and gravelly pods above the Bluegate Shale.

Ground Water Levels

Note: The following discussion on the observation wells is included for informational purposes, although all of the wells described have been decommissioned and removed at this time. 2 new wells were drilled in 2006; however, there is very limited data available on them at this time.

The measurements in the observation wells as recorded in Table 7-1 indicate that there is no regional ground water table at the site, although a perched water table exists at some locations on the site. The aerial extent of this perched water table could not be precisely determined from existing monitoring well network.

Wells No. CV0W, CV7W, and CV9W were dry indicating that no water table exists above the Bluegate Shale at these locations. Well CV2W was also dry throughout much of the baseline monitoring. Well CV0W was apparently influenced by the French Drain intercepting shallow groundwater flow from the north and west. Well CV9W may also be influenced by the other French Drain. Wells CV7W and CV2W appear to have been near a bedrock ridge where groundwater seldom occurs.

A water table existed near Wells CV3W, CV4W, CV6W and CV8W. The water level fluctuations in CV8W and CV6W had similar pattern with an initial rise of about one foot during August, 1980 and the generally increased during the monitoring period until November, 1981 when water levels decreased nearly one foot in CV8W and one half foot in CV6W. The direction of groundwater flow was from CV8W to CV6W although the magnitude of the potentiometric gradient varies from about 1.4 feet to 0.1 feet.

A swampy area exists on the east side of the railroad tracks in close proximity to Well CV6W (See Plate 7-1). The surface elevation of this area is approximately at the same elevation as the water level was at Well CV6W. Heavy accumulations of salt exist on the soil surface in this swampy area indicating substantial amounts of water have been lost to evaporation in the past. This location is considered to be a groundwater discharge area for water which is found beneath the Savage Coal Terminal site.

Well CV10W was located in an alfalfa field about 1,000 feet east of the swampy area. The water level in Well CV10W rose at first and then declined until it eventually went dry. A substantial water surface elevation drop existed between the swampy area near Well CV6W and Well CV10W. One would expect ground water to move towards Well CV10W from the swampy area; however, Well CV10W went dry during the monitoring period while the water level in the vicinity of Well CV6W did not change substantially. Thus, ground water does not appear to flow eastward toward observation Well No. 10. An explanation for this is that the ground water in the area of Wells CV8W and CV6W was ponded in a bedrock swale of the impermeable shale with the boggy area located along eastern edge of this swale.

Although observation Well CV9W was dry, a high water level in Well CV3W and the existence of a small swampy area between wells CV9W and CV3W suggested a perched water table west of Well CV9W. The source of this water is seepage from the canal along the southern perimeter of the property near the top of the ridge. This water probably moves downslope toward the center of the property and was a source of groundwater in the vicinity of observation wells CV6W and CV8W. In fact, water levels in CV6W and CV8W appeared to increase during the late summer when irrigation water has been flowing in the canal.

The water level in wells CV4W, CV5W, CV11W, CV12W and CV13W appeared to be influenced by the application of irrigation water to the farmland north of the site. The water level in Well CV4W was 4.5 to 6 feet below to water level indicating the influence of the french drain along the northern boundary of the Savage Coal Terminal property. It is believed that a groundwater mound exists below the irrigation fields and that irrigation return flows from the fields to the north is the dominant source of the water which discharges from the drain. The large fluctuations in observation Well CV5W on the north side of the drain indicated the influence of irrigation water applied to the adjacent field.

Table 7-1 presents the water table elevation at the various observation wells on August 1980 through December 1982. Wells which were dry show elevations for the bottom at those wells. A vertical difference of approximately one foot existed between the water levels in Wells CV6W and CV8W. If the value for hydraulic conductivity computed from the pump test is assumed to be representative, ground water will move 6 feet per year toward the east at this gradient. Ground water will move approximately 30 feet per year along the gradient toward observation well CV11W to the northeast. Consequently, a net movement of 21 feet per year to the northeast will occur.

A substantial gradient also existed between observation Well CV4W and CV11W. If no obstructions from impermeable shales exist between these two wells, groundwater movements may range from 8 to 50 feet per year depending upon the location and gradient. However, a continuous water table is not found at the site. Water is consistently found in bedrock lows but often absent along bedrock highs.

A typical ground water monitoring well design is shown on Figure 7-1.

TABLE 7-1
GROUNDWATER OBSERVATIONS

Well No.	CV2W	CV3W	CV4W	CV5W	CV6W	CV7W	CV8W	CV9W	CV10W	CV11W	CV12W	CV13W	CV0W
Total Feet Depth	11.0	6.5	17.6	16.7	16.3	9.5	18.9	18.1	17.2	17.5	19.5	14.1	11.3
Ground Surface Elevation Feet	5520.2	5531.4	5481.3	5504.4	5482.1	5538.9	5495.7	5500.8	5465.1	5454.3	5481.2	5505.2	5525.1
Dry 12/13/79 Through 02/29/80													
DEPTH TO WATER LEVEL FROM GROUND SURFACE - FEET													
08/05/80	8.0	2.0	10.3	14.1	4.3	Dry	16.9	Dry	11.4	-	-	-	Dry
08/13/80	8.9	2.0	10.9	-	4.4	Dry	16.5	Dry	-	-	6.5	Dry	
08/20/80	8.5	1.4	10.8	13.3	4.0	Dry	16.5	Dry	8.6	4.4	6.2	Dry	
08/27/80	-	-	12.2	13.7	3.3	-	15.9	Dry	-	-	6.9	Dry	
08/29/80	10.1	2.0	12.2	11.2	-	Dry	15.8	Dry	9.0	4.8	6.5	Dry	
09/30/80	-	-	-	-	3.2	-	15.9	-	-	-	-	-	
09/04/80	Dry	2.2	11.0	13.2	-	Dry	15.9	Dry	Dry	4.4	6.5	Dry	
09/11/80	Dry	1.6	10.4	12.9	3.3	Dry	15.9	Dry	Dry	4.2	6.1	Dry	
06/05/81	-	-	-	-	3.8	Dry	-	Dry	Dry	3.2	4.3	Dry	
07/21/81	Dry	2.3	10.8	13.4	2.8	Muddy	-	Muddy	Dry	2.4	4.3	Muddy	
08/18/81	Dry	2.5	11.4	13.4	2.7	Muddy	-	Dry	Dry	3.2	5.4	Muddy	
09/14/81	Dry	2.7	-	14.4	2.4	Muddy	-	Dry	Muddy	3.8	5.8	Muddy	
10/27/81	Dry	1.4	10.5	13.1	1.6	Muddy	-	Dry	Dry	2.5	4.2	Muddy	

11/22/81	Dry	3.7	11.7	13.4	2.2	Muddy	15.7	Dry	Dry	-	5.8	Muddy	
12/11/81	Dry	3.9	11.7	13.4	2.8	Muddy	16.8	Dry	Dry	4.2	6.1	Muddy	
01/19/82	Dry	4.9	14.9	14.2	2.5	Dry	16.8	Dry	Dry	4.4	6.7	Dry	
02/22/82	Dry	4.3	13.5	14.7	2.4	Dry	16.9	Dry	Dry	5.4	7.3	Dry	
03/22/82	Dry	4.7	11.6	14.3	2.4	Dry	17.0	Dry	Dry	5.9	-	Dry	
04/22/82	Dry	5.0	12.1	14.8	2.6	Dry	-	Dry	Dry	3.4	6.3	Dry	
GROUNDWATER OBSERVATIONS - SAVAGE COAL TERMINAL													
Well No.	CV2W	CV3W	CV4W	CV5W	CV6W	CV7W	CV8W	CV9W	CV10W	CV11W	CV12W	CV13W	CV0W
Total Depth Feet	11.0	6.5	17.6	16.7	16.3	9.5	18.9	18.1	17.2	17.5	19.5	14.1	11.3
Ground Surface Elevation Feet	5520.2	5531.4	5481.3	5504.4	5482.1	5538.9	5495.7	5500.8	5465.1	5454.3	5481.2	5505.2	5525.1
Dry 12/13/79 through 02/29/80													
DEPTH TO WATER LEVEL FROM GROUND SURFACE - FEET													
05/29/82	Dry	3.2	12.5	14.3	2.2	Dry	-	Dry	Dry	2.1	-	Dry	
06/22/82	Dry	0.1	13.0	14.0	2.2	Dry	-	Dry	9.8	2.1	5.6	Dry	
07/20/82	Dry	1.5	11.7	14.5	1.0	Dry	-	Dry	9.9	0.6	5.9	Dry	
08/25/82	Dry	2.2	12.3	13.5	2.1	Dry	-	Dry	9.6	3.0	6.7	Dry	
09/23/82	Dry	3.0	13.0	14.0	2.7	Dry	-	Dry	6.2	3.6	7.1	Dry	
10/13/82	Dry	2.8	13.0	14.5	3.0	Dry	-	Dry	6.3	4.3	7.5	Dry	
11/21/82	Dry	-	-	-	-	Dry	-	Dry	-	-	-	Dry	
12/29/82	Dry	4.1	9.9	14.5	2.8	Dry	-	Dry	9.4	4.5	8.3	Dry	

TABLE 7-1A GROUNDWATER MONITORING WELLS					
Well No.	Location	Total Depth (Ft.)	Casing PVC	Completion	Hole Elevation
CV0W	N.W. Corner Permit	11.3	13.3	Capped	5525.1
CV2W*	W. Central Permit	11.0	11.0	Capped	5520.2
CV3W	So. Central Permit	6.5	8.5	Capped	5531.4
CV4W	N.E. Corner Permit	17.6	19.6	Capped	5481.3
CV5W	No. Central Permit	16.7	18.7	Capped	5504.4
CV6W	E. Central Permit	16.3	18.3	Capped	5482.1
CV7W	W. Central Permit	9.5	9.5	Capped	5538.9
CV8W	E. Central Permit	18.9	18.9	Capped	5495.7
CV9W	S.E. Corner Permit	18.1	18.1	Capped	5500.8
CV10W	S.E. Adj. Property	17.2	19.2	Capped	5465.1
CV11W	N.E. Adj. Property	17.5	19.5	Capped	5454.3
CV12W	No. Adj. Property	19.5	21.5	Capped	5481.2
CV13W	N. Central Adj. Property	14.1	14.1	Capped	5505.2
S-1-GW	N.E. Corner Permit	19.5	23.5	Active	5481.0
S-2-GW	E. Central Permit	21.5	25.5	Active	5488.2

Permeability

A pump test was performed using observation Well CV6W to estimate the permeability and storage coefficient associated with the water table aquifer in the area. Two additional observation wells were drilled fifteen feet and forty feet from Well CV6W. Well CV6W was then pumped at a constant rate and measurements of draw down versus time were recorded. Analysis of the data indicated a hydraulic conductivity K of 0.007 ft/min. and an apparent specific yield of 0.27. Pump test data and calculations are provided in Table 7-2.

These values are of the magnitude of those expected for silty sand and are some what high for the clay soils at the Savage Coal Terminal site. The geology of the area indicated that there might be local pockets of granular materials in the weathered clay. Lenses of sand were found in some of the bore holes made for foundation at the site. If one of these sand lenses exist in the area of the test well, it could influence the test.

Two test Wells, CV6D and CV5D were installed and sealed in the shale and used to determine the permeability of the shale. These were filled with water and the loss measured. There was no loss in the initial measuring period. It was concluded that the permeability was extremely low.

Ground Water Quality

From a review of published ground water quality data for the area, data was obtained for two sites relatively close to the Savage Coal Terminal facility. One site is a spring which is located close to Wellington on the opposite side of the Price River. The other site is located in Miller Creek at Highway 10 just southwest of the Savage Coal Terminal facility. At this site, water seepage through the soil profile into Miller Creek from the Carbon Canal was analyzed. The chemical analyses for these two sites are given in Table 7-3.

Three observation wells were drilled at the Savage Coal Terminal site in 1977 and the personnel at the facility collected ground water quality samples from these wells beginning in December, 1979.

Ten additional wells were drilled during the summer of 1980 in order to better characterize the shallow groundwater associated with the Savage Coal Terminal Facility. Chemical analysis of water samples taken from Savage Coal Terminal wells are reported in Tables 7-5 through 7-14. Also, water quality samples were taken from the French Drain at the pump house and are reported in Table 7-4.

Available data is presented separately for each station by two tables.

The first table for each well presents the results of field and laboratory chemical analyses for each sampling performed on that well. Those parameters for which concentrations are outside the standards for aquatic or agricultural use are also identified.

The second table for each well presents the quality standards for aquatic and agricultural use. This table summarizes chemical quality data by presenting the maximum, minimum and mean concentration including the standard deviation for each parameter for the period of record. The second table also summarizes the number of times each parameter exceeded the standard or limiting range for that particular parameter with respect to domestic, agricultural use. The source for quality standards for domestic, aquatic or agriculture used in the tables were determined from the numeric stream standards for the Price River below Castle Gate. There are no domestic standards for this reach of the Price River.

Ground water quality is generally poor and dominated by sodium sulfate. Seasonal variation in TDS or conductivity is found to occur in many of the wells. Some exhibit higher concentrations during the winter and spring than in summer or fall. In other wells, no definite pattern is discernible.

It should be noted that all of the above ground water monitoring wells have been removed and plugged as of May 1999. This was approved by the Division under an amendment to the plan. Two new ground water monitoring wells were installed in 2006.

TABLE 7-2
PUMP TEST DATA

Pertinent Information

Pumped Well: Well CV6W located on east side of Savage Coal Terminal site.
Date: Starting date was September 3, 1980.
Observation Wells: Two observation wells with r = 14.3 ft. and r = 40ft.
Aquifer Thickness: M = 10 ft.
All wells are fully penetrating.

Analysis Results (Delayed drainage method)

Reference: Lohman (1979), Groundwater Hydraulics, USGS Professional Paper 708, pp 34-40.
A log-log plot of drawdown, s, versus time, t, at the observation well at distance r = 14.3 ft. was prepared. This plot was superimposed on Plate 8 from Lohman (1979) and a match point obtained for the best match with the curve r/8 = 1.5. The four parameters at the match point are:

s	=	4.56 ft.
t	=	197 min.
4 pi ts/Q	=	1.0
$4\ Tt/r^2Se$	=	1.0

The corresponding values for Transmisivity, T, and specific yield, are obtained by solution of equation (109) and (110) Lohman (1979):

$$(109)\ T = \frac{(1.0)Q}{4\ pi\ s} = \frac{(1.0)(30)\ gal\ min^{-1}}{(12.57)(4.56\ ft)(7.48\ gal\ ft^3)}$$

$$T = 0.07\ ft^2\ min^{-1}$$

$$(110)\ Se = \frac{4Tt}{r^2(1.0)} = \frac{(4)(.07\ ft^2\ min^{-1})(197\ min)}{(14.3\ ft)^2(1.0)}$$

$$Se = 0.27$$

Hydraulic Conductivity is determined by dividing T by the aquifer thickness, M:

$$K = \frac{T}{M} = \frac{.07}{10} = 0.007\ ft.\ min^{-1}$$

TEST RESULTS			
Time Since Pumping Began (minutes)	Observed Drawdown in Well #1 (So) (feet)	Adjusted Drawdown (Sa) (feet)	Observed Drawdown in Well #2 (feet)
0	0.00	0.00	
11	0.00	0.00	
21	0.00	0.00	
26	0.01	0.01	
35	0.01	0.01	
45	0.01	0.01	
55	0.02	0.02	
85	0.02	0.02	
145	0.03	0.03	
205	0.04	0.04	
265	0.26	0.26	
267	0.35	0.34	
270	0.43	0.42	0.02
280	0.55	0.53	
290	0.68	0.66	
300	0.76	0.73	
310	0.86	0.82	0.02
325	1.00	0.95	
340	1.09	1.03	
355	1.17	1.10	0.05
385	1.29	1.21	0.05
415	1.38	1.28	0.05
445	1.43	1.33	
485	1.53	1.41	
505	1.55	1.43	0.05
535	1.60	1.47	
565	1.65	1.51	0.08

TEST RESULTS			
Time Since Pumping Began (minutes)	Observed Drawdown in Well #1 (So) (feet)	Adjusted Drawdown (Sa) (feet)	Observed Drawdown in Well #2 (feet)
625	1.74	1.59	
685	1.80	1.64	
750	1.84	1.67	0.08
805	1.85	1.68	
885	1.87	1.69	0.09
925	1.88	1.70	
985	1.87	1.69	
1045	1.88	1.70	0.09
1105	1.89	1.71	
1150	1.90	1.72	0.11

TABLE 7-3
GROUND WATER CHEMICAL ANALYSES AT TWO SITES NEAR THE SAVAGE COAL TERMINAL LOADING FACILITY

Parameter pH	Spring Near Wellington 7.1 Mg/l	Seepage Water at Miller Creek 7.8 Mg/l
Silica (siO_2)	31.00	7.3
Calcium (Ca)	215.00	397.0
Magnesium (mg)	19.00	319.0
Sodium (Na)	-	649.0
Potassium (K)	-	12.0
Bicarbonate (HCO_3)	562.00	341.0
Carbonate (CO_3)	-	0.0
Sulfate (SO_3)	755.00	3010.0
Chloride (Cl)	43.00	161.0
Fluoride (F)	0.400	0.8
Nitrate (NO_3	0.54	0.0
Boron (B)	-	0.3
Dissolved solids	1708.00	4720.0
Hardness as $CaCO_3$	739.00	2300.0
Noncarbonate hardness as $CaCO_3$	-	2020.0

TABLE 7-4
FRENCH DRAIN WATER QUALITY

Water - Quality Data Report for Station: CV1W (French Drain) Property: Savage Coal Terminal

Latitude: Section: # County: Carbon
Longitude: Township: TN State: Utah
Elevation: Range: RW Country: U.S.A.

Parameter Title	11/29/77	03/08/78	04/21/79	12/18/79	01/22/80	02/29/80	12/11/81	04/22/82
Turbidity, N.T.U.	32.0	19.0	73.0	-	-	-	-	-
Lab Conductivity @25C, micromhos/cm	21100	28500	-	11000	11000	5200	9300	20000
Lab pH, std. Units	7.87	7.72	7.72	8.20	8.20	7.90	8.40	7.90
TDS @ 180C, mg/l (lab.)	13700LA	18500LA	340	7150LA	7700LA	3430LA	6480LA	13500LA
Total Alkalinity, mg/l ($CaCO_3$)	366	360	222	-	-	-	-	-
Total Hardness, mg/l ($CaCO_3$)	2900	3100	252	-	-	-	-	-
Arsenic, Total, mg/l (As)	0.001	0.001	0.002	-	-	-	-	-
Bicarbonate, mg/l (HCO_3)	447	439	271	-	-	-	-	-
Barium, Total, mg/l (Ba)	0.110	0.340	0.130	-	-	-	-	-
Baron, Total, mg/l (B)	1.10	0.880	0.100	-	-	-	-	-
Cadmium, Total, mg/l (Cd)	0.020	0.001	<0.100	-	-	-	-	-
Calcium, mg/l (Ca)	360	388	60.0	-	-	-	-	-
Carbonate, mg/l (CO_3)	0.010	0.010	0.010	-	-	-	-	-
Chloride, mg/l (Cl)	89.0	160	12.0	114	114	142	21.5	25.4
Chromium, Total, mg/l (Cr)	0.041	0.080	<1.00	-	-	-	-	-

TABLE 7-4
FRENCH DRAIN WATER QUALITY

Water - Quality Data Report for Station: CV1W (French Drain) Property: Savage Coal Terminal

Latitude: Section: # County: Carbon
Longitude: Township: TN State: Utah
Elevation: Range: RW Country: U.S.A.

Parameter Title	11/29/77	03/08/78	04/21/79	12/18/79	01/22/80	02/29/80	12/11/81	04/22/82
Copper, Total, mg/l (Cu)	0.036	0.017	0.011	-	-	-	-	-
Fluoride, mg/l (F)	0.760	0.380	0.190	-	-	-	-	-
Phosphate, mg/l (PO_4)	0.120	-	-	-	-	-	-	-
Iron, Total, mg/l (Fe)	0.799	0.425	0.714	0.850	0.060	0.050	0.090	0.080
Lead, Total, mg/l (Pb)	0.038	0.115	0.001	-	-	-	-	-
Magnesium, mg/l (Mg)	480	511	24.5	-	-	-	-	-
Manganese, Total, mg/l (Mn)	0.205	0.089	0.241	0.125	0.020	0.010	0.025	0.020
Mercury, Total, mg/l (Hg)	<0.000	<0.000	<0.000	-	-	-	-	-
Nickel, Total, mg/l (Ni)	0.001	0.004	<0.001	-	-	-	-	-
Nitrate as N, mg/l (NO_3)	9.10	2.80	0.140	1.20	9.80	6.30	3.77	3.47
Nitrate as N, mg/l (NO_2)	0.010	0.010	-	-	-	-	-	-
-Potassium, mg/l (K)	18.9	54.2	1.72	-	-	-	-	-
Selenium, Total, mg/l (Se)	0.001	0.001	<0.001	-	-	-	-	-
Silica, mg/l (SiO_2)	7.80	7.00	10.5	-	-	-	-	-
Silver, Total, mg/l (Ag)	0.033	0.039	<0.001	-	-	-	-	-
Sulfate, mg/l (SO_4)	9200	12400	41.0	7500	7600	5200	5700	7200

TABLE 7-4
FRENCH DRAIN WATER QUALITY

Water - Quality Data Report for Station: CV1W (French Drain) Property: Savage Coal Terminal

Latitude: Section: # County: Carbon
Longitude: Township: TN State: Utah
Elevation: Range: RW Country: U.S.A.

Parameter Title	11/29/77	03/08/78	04/21/79	12/18/79	01/22/80	02/29/80	12/11/81	04/22/82
Sodium, mg/l (Na)	3320LA	4790LA	19.8	-	-	-	-	-
Zinc, Total, mg/l (Zn)	0.107	0.067	0.047	-	-	-	-	-
TSS, mg/l	-	-	-	22.0	18.0	17.0	58.0	22.0

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-4
FRENCH DRAIN WATER QUALITY

Water - Quality Data Report for Station: CV1W (French Drain) Property: Savage Coal Terminal

Latitude: Section: # County: Carbon
Longitude: Township: TN State: Utah
Elevation: Range: RW Country: U.S.A.

Parameter Title	08/25/82	09/23/82	10/13/82					
Turbidity, N.T.U.	-	-	-					
Lab Conductivity @25C, micromhos/cm	12700	13000	13100					
Lab pH, std. Units	7.60	7.57	7.87					
TDS @ 180C, mg/l (lab.)	12100LA	12200LA	12500LA					
Total Alkalinity, mg/l ($CaCO_3$)	-	-	-					
Total Hardness, mg/l ($CaCO_3$)	-	-	-					
Arsenic, Total, mg/l (As)	-	-	-					
Bicarbonate, mg/l (HCO_3)	-	-	-					
Barium, Total, mg/l (Ba)	-	-	-					
Baron, Total, mg/l (B)	-	-	-					
Cadmium, Total, mg/l (Cd)	-	-	-					
Calcium, mg/l (Ca)	-	-	-					
Carbonate, mg/l (CO_3)	-	-	-					
Chloride, mg/l (Cl)	132	132	153					
Chromium, Total, mg/l (Cr)	-	-	-					

TABLE 7-4
FRENCH DRAIN WATER QUALITY

Water - Quality Data Report for Station: CV1W (French Drain) Property: Savage Coal Terminal

Latitude: Section: # County: Carbon
Longitude: Township: TN State: Utah
Elevation: Range: RW Country: U.S.A.

Parameter Title	08/25/82	09/23/82	10/13/82					
Copper, Total, mg/l (Cu)	-	-	-					
Fluoride, mg/l (F)	-	-	-					
Phosphate, mg/l (PO_4)	-	-	-					
Iron, Total, mg/l (Fe)	0.330	45.0	3.80					
Lead, Total, mg/l (Pb)	-	-	-					
Magnesium, mg/l (Mg)	-	-	-					
Manganese, Total, mg/l (Mn)	<0.030	0.030	<0.030					
Mercury, Total, mg/l (Hg)	-	-	-					
Nickel, Total, mg/l (Ni)	-	-	-					
Nitrate as N, mg/l (NO_3)	4.78	5.03	4.85					
Nitrate as N, mg/l (NO_2)	-	-	-					
-Potassium, mg/l (K)	-	-	-					
Selenium, Total, mg/l (Se)	-	-	-					
Silica, mg/l (SiO_2)	-	-	-					
Silver, Total, mg/l (Ag)	-	-	-					
Sulfate, mg/l (SO_4)	8810	8850	9010					

TABLE 7-4
FRENCH DRAIN WATER QUALITY

Water - Quality Data Report for Station: CV1W (French Drain) Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	08/25/82	09/23/82	10/13/82					
Sodium, mg/l (Na)	-	-	-					
Zinc, Total, mg/l (Zn)	-	-	-					
TSS, mg/l	38.0	28.0	38.0					

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-4a
FRENCH DRAIN WATER QUALITY SUMMARY

Water - Quality Data Report for Station: CV1W (French Drain) Property: Savage Coal Terminal

Latitude:	Section: #	County: Carbon
Longitude:	Township: TN	State: Utah
Elevation:	Range: RW	Country: U.S.A.

Quality Standards – # of Times Exceeded/Value

Parameter Title	Domestic	Aquatic (3C)	Agricultural (4)	Min.	Max.	Mean	Std. Dev.
Turbidity, N.T.U.	-	-	-	19.0	73.0	41.3	28.2
Lab Conductivity @25C, micromhos/cm	-	-	-	5200	28500	14500	6790
Lab pH, std. Units	-	8.50	9.00	7.57	8.40	7.90	0.264
TDS @ 180C, mg/l (lab.)	-	10 500	10 2000	340	18500LA	9790	5260
Total Alkalinity, mg/l ($CaCO_3$)	-	-	-	222	366	316	81.5
Total Hardness, mg/l ($CaCO_3$)	-	-	-	252	3100	2080	1590
Arsenic, Total, mg/l (As)	-	-	-	0.001	0.002	0.001	0.001
Bicarbonate, mg/l (HCO_3)	-	-	-	271	447	386	99.4
Barium, Total, mg/l (Ba)	-	-	-	0.110	0.340	0.193	0.127
Baron, Total, mg/l (B)	-	-	-	0.100	1.10	0.693	0.525
Cadmium, Total, mg/l (Cd)	-	-	-	0.001	0.100	0.040	0.053
Calcium, mg/l (Ca)	-	-	-	60.0	388	269	182
Carbonate, mg/l (CO_3)	-	-	-	0.010	0.010	0.010	0

TABLE 7-4a
FRENCH DRAIN WATER QUALITY SUMMARY

Water - Quality Data Report for Station: CV1W (French Drain) Property: Savage Coal Terminal

Latitude:	Section: #	County: Carbon
Longitude:	Township: TN	State: Utah
Elevation:	Range: RW	Country: U.S.A.

Quality Standards – # of Times Exceeded/Value

Parameter Title	Domestic	Aquatic (3C)	Agricultural (4)	Min.	Max.	Mean	Std. Dev.
Chloride, mg/l (Cl)	-	-	-	12.0	160	100	54.9
Chromium, Total, mg/l (Cr)	-	-	-	0.041	1.00	0.374	0.543
Copper, Total, mg/l (Cu)	-	-	-	0.011	0.036	0.021	0.013
Fluoride, mg/l (F)	-	-	-	0.190	0.760	0.443	0.290
Phosphate, mg/l (PO_4)	-	-	-	0.120	0.120	0.120	-
Iron, Total, mg/l (Fe)	-	-	-	0.050	45.0	4.75	13.4
Lead, Total, mg/l (Pb)	-	-	5.00	0.001	0.115	0.051	0.058
Magnesium, mg/l (Mg)	-	-	-	24.5	511	340	272
Manganese, Total, mg/l (Mn)	-	-	-	0.010	0.241	0.075	0.081
Mercury, Total, mg/l (Hg)	-	-	0.200	0.000	0.000	0.000	0.000
Nickel, Total, mg/l (Ni)	-	-	-	0.001	0.004	0.002	0.002
Nitrate as N, mg/l (NO_3)	-	-	-	0.140	9.80	4.66	2.95
Nitrate as N, mg/l (NO_2)	-	-	-	0.010	0.010	0.010	0
-Potassium, mg/l (K)	-	-	-	1.72	54.2	24.9	26.8

TABLE 7-4a
FRENCH DRAIN WATER QUALITY SUMMARY

Water - Quality Data Report for Station: CV1W (French Drain) Property: Savage Coal Terminal

Latitude:	Section: #	County: Carbon
Longitude:	Township: TN	State: Utah
Elevation:	Range: RW	Country: U.S.A.

Quality Standards – # of Times Exceeded/Value

Parameter Title	Domestic	Aquatic (3C)	Agricultural (4)	Min.	Max.	Mean	Std. Dev.
Selenium, Total, mg/l (Se)	-	-	-	0.001	0.001	0.001	0
Silica, mg/l (SiO_2)	-	-	-	7.00	10.5	8.43	1.83
Silver, Total, mg/l (Ag)	-	-	-	0.001	0.039	0.024	0.020
Sulfate, mg/l (SO_4)	-	-	-	41.0	12400	7410	3110
Sodium, mg/l (Na)	-	2 3000	2 200	19.8	4790LA	2710	2440
Zinc, Total, mg/l (Zn)	-	-	-	0.047	0.107	0.074	0.031
TSS, mg/l	-	-	-	17.0	58.0	30.1	13.9

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-5
WELL CV2W QUALITY

Water - Quality Data Report for Station: CV2W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	02/29/80	03/14/80	06/24/80	07/21/80	08/26/80			
Lab pH, std. Units	7.80	7.40	7.80	7.70	7.40			
Field Temperature, deg. C.	-	-	-	-	-			
Lab Conductivity @25C, micromhos/cm	3400	3200	7100	10800	7850			
TDS @ 180C, mg/l (lab.)	2240A	2100A	4620A	7000A	5500A			
TSS, mg/l	2540	866	980	404	238			
Iron, Total, mg/l (Fe)	2.55	1.09	3.61	3.20	0.330			
Manganese, Total, mg/l (Mn)	0.470A	0.260A	0.580A	0.120	0.320A			
Nitrate as N, mg/l (NO_3)	4.20	4.50	17.7	19.0	90.0			
Sulfate, mg/l (SO_4)	3200A	5300A	3100A	2550A	1550A			
Chloride, mg/l (Cl)	8.00	6.40	124A	132A	128A			

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-5a
WELL CV2W QUALITY SUMMARY

Water - Quality Data Report for Station: CV2W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Quality Standards – # of Times Exceeded/Value

Parameter Title	Domestic	Aquatic (3C)	Agriculture (4)	Min.	Max.	Mean	Std. Dev.
Lab pH, std. Units	-	9.00	9.00	7.40	7.80	7.62	0.205
Field Temperature, deg. C.	-	27.0	-	-	-	-	-
Lab Conductivity @25C, micromhos/cm	-	-	-	3200	10800	6470	3210
TDS @ 180C, mg/l (lab.)	-	-	5 2000	2100A	7000A	4290	2120
TSS, mg/l	-	-	-	238	2540	1010	914
Iron, Total, mg/l (Fe)	-	-	5.00	0.330	3.61	2.16	1.40
Manganese, Total, mg/l (Mn)	-	-	4 0.200	0.120	0.580A	0.350	0.180
Nitrate as N, mg/l (NO_3)	-	-	-	4.20	90.0	27.1	35.9
Sulfate, mg/l (SO_4)	-	-	5 200	2550A	5300A	3340	1140
Chloride, mg/l (Cl)	-	-	3 100	6.40	132A	79.7	66.2

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-6
WELL CV3W QUALITY

Water - Quality Data Report for Station: CV3W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	12/13/79	01/22/80	02/29/80	03/14/80	04/16/80	05/01/80	06/26/80	07/21/80
Lab pH, std. Units	8.10	-	-	7.60	7.00	7.40	7.70	7.60
Field Temperature, deg. C.	-	-	-	-	-	-	-	-
Lab Conductivity @25C, micromhos/cm	7900	5500	2400	2900	4850	5600	5200	4900
TDS @ 180C, mg/l (lab.)	5100A	-	-	1890	3150A	3640A	3400A	3200A
TSS, mg/l	112	50.0	280	87.3	25.0	25.0	29.0	92.0
Iron, Total, mg/l (Fe)	0.169	0.030	1.52	0.330	0.036	0.036	1.85	0.520
Manganese, Total, mg/l (Mn)	0.019	0.060	0.300A	0.150	0.045	0.020	0.420A	0.320
Nitrate as N, mg/l (NO_3)	0.120	0.440	0.320	0.580	0.250	0.220	0.100	0.170
Sulfate, mg/l (SO_4)	4200A	3000A	3300A	4000A	2300A	2850A	3000A	2730A
Chloride, mg/l (Cl)	118A	70.0	68.0	72.0	66.0	68.0	58.0	54.0

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-6
WELL CV3W QUALITY

Water - Quality Data Report for Station: CV3W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	08/26/80	09/24/80	04/08/81	07/21/81	08/18/81	09/14/81	10/27/81	11/22/81
Lab pH, std. Units	7.20	7.40	7.60	8.10	7.80	7.80	8.00	7.70
Field Temperature, deg. C.	-	-	-	-	-	-	-	14.0
Lab Conductivity @25C, micromhos/cm	3800	5800	4400	770	4700	4700	4760	4700
TDS @ 180C, mg/l (lab.)	2650A	3720A	2860A	3100A	3100A	3050A	3100A	3100A
TSS, mg/l	58.0	76.0	69.0	101	38.0	61.0	88.0	65.0
Iron, Total, mg/l (Fe)	0.550	0.580	0.420	0.510	0.340	0.400	0.760	0.570
Manganese, Total, mg/l (Mn)	0.310A	0.064	0.500A	0.480A	0.170	0.165	0.140	0.260A
Nitrate as N, mg/l (NO_3)	0.200	2.00	0.090	0.090	<0.010	3.35	0.180	0.130
Sulfate, mg/l (SO_4)	2820A	3300A	2690A	2600A	3000A	2040A	2400A	2520A
Chloride, mg/l (Cl)	56.0	43.5	66.0	31.2	50.0	50.0	18.7	21.0

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-6
WELL CV3W QUALITY

Water - Quality Data Report for Station: CV3W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	12/11/81	01/19/82	02/22/82	03/22/82	04/22/82	06/22/82	07/20/82	08/25/82
Lab pH, std. Units	7.80	7.40	7.60	7.50	7.40	7.80	7.40	7.25
Field Temperature, deg. C.	9.00	6.00	8.00	9.00	11.0	17.0	24.0	23.0
Lab Conductivity @25C, micromhos/cm	4000	3400	5950	6400	4700	370	2800	4050
TDS @ 180C, mg/l (lab.)	2730A	2210A	3880A	4120A	3100A	245	4010A	3780A
TSS, mg/l	60.0	83.0	189	232	534	44.0	36.0	30.0
Iron, Total, mg/l (Fe)	0.300	1.05	2.62	3.09	7.03A	0.090	0.295	0.600
Manganese, Total, mg/l (Mn)	0.166	0.289A	0.765A	0.740A	0.730A	0.165	0.200	0.180
Nitrate as N, mg/l (NO_3)	0.030	0.090	0.070	<0.010	0.060	<0.010	0.090	1.18
Sulfate, mg/l (SO_4)	2610A	420A	105	1560A	450A	2190A	330A	2620A
Chloride, mg/l (Cl)	22.1	23.5	18.2	21.4	42.1	12.1	21.6	32.0

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-6
WELL CV3W QUALITY

Water - Quality Data Report for Station: CV3W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	09/23/82	10/13/82	11/21/82	12/29/82				
Lab pH, std. Units	7.06	7.02	7.36	7.74				
Field Temperature, deg. C.	16.0	13.0	-	7.00				
Lab Conductivity @25C, micromhos/cm	4330	4220	4180	4220				
TDS @ 180C, mg/l (lab.)	4280A	4090A	4150A	4260A				
TSS, mg/l	18.0	70.0	36.0	12.0				
Iron, Total, mg/l (Fe)	0.530	3.81	0.590	1.04				
Manganese, Total, mg/l (Mn)	0.140	<0.030	0.260A	0.240A				
Nitrate as N, mg/l (NO_3)	1.17	1.28	0.150	0.120				
Sulfate, mg/l (SO_4)	1390A	2900A	2820A	2580A				
Chloride, mg/l (Cl)	35.0	37.0	41.0	42.0				

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-6a
WELL CV3W QUALITY SUMMARY

Water - Quality Data Report for Station: CV3W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Quality Standards – # of Times Exceeded/Value

Parameter Title	Domestic	Aquatic (3C)	Agriculture (4)	Min.	Max.	Mean	Std. Dev.
Lab pH, std. Units	-	9.00	9.00	7.00	8.10	7.55	0.306
Field Temperature, deg. C.	-	27.0	-	6.00	25.0	13.1	5.98
Lab Conductivity @25C, micromhos/cm	-	-	-	370	7900	4340	1550
TDS @ 180C, mg/l (lab.)	-	-	24 2000	245	5100A	3300	944
TSS, mg/l	-	-	-	12.0	534	92.9	107
Iron, Total, mg/l (Fe)	-	-	1 5.00	0.030	7.03A	1.06	1.50
Manganese, Total, mg/l (Mn)	-	-	13 0.200	0.019	0.765A	0.262	0.213
Nitrate as N, mg/l (NO_3)	-	-	-	0.010	3.35	0.447	0.745
Sulfate, mg/l (SO_4)	-	-	27 200	105	4200A	2380	1030
Chloride, mg/l (Cl)	-	-	1 100	12.1	118A	44.9	23.4

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-7
WELL CV4W QUALITY

Water - Quality Data Report for Station: CV4W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	08/26/80	09/24/80	04/08/81	07/21/81	08/18/81	09/14/81	10/27/81	11/22/81
Lab pH, std. Units	7.50	7.60	7.60	8.20	7.60	8.30	8.00	7.30
Field Temperature, deg. C.	-	-	-	-	-	-	-	12.0
Lab Conductivity @25C, micromhos/cm	7800	2800	18000	14000	-	3500	4700	6700
TDS @ 180C, mg/l (lab.)	5450A	1790	11700A	9100A	5000A	2300A	3050A	4400A
TSS, mg/l	-	89.0	97.0	113	38.0	139	162	107
Iron, Total, mg/l (Fe)	0.320	0.350	0.110	0.120	1.190	0.210	2.70	2.11
Manganese, Total, mg/l (Mn)	0.155	0.520A	0.090	0.076	0.070	0.800A	0.150	0.360A
Nitrate as N, mg/l (NO_3)	0.720	0.380	6.10	1.19	0.380	1.38	0.880	0.080
Sulfate, mg/l (SO_4)	4050A	1530A	12600A	13800A	2550A	1230A	1980A	2100A
Chloride, mg/l (Cl)	38.0	11.1	330A	250A	250A	70.0	48.1	49.3

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-7
WELL CV4W QUALITY

Water - Quality Data Report for Station: CV4W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	12/11/81	01/19/82	02/22/82	03/22/82	04/22/82	05/29/82	06/22/82	07/20/82
Lab pH, std. Units	7.40	7.20	7.70	7.60	7.50	7.30	7.40	7.40
Field Temperature, deg. C.	11.0	9.00	10.0	10.0	12.0	10.0	12.0	19.0
Lab Conductivity @25C, micromhos/cm	9900	8400	16600	0	29000	18500	16000	16000
TDS @ 180C, mg/l (lab.)	6950A	5500A	10800A	15600A	19100A	12100A	10500A	19900A
TSS, mg/l	123	287	433	124	231	430	100	361
Iron, Total, mg/l (Fe)	1.80	3.90	3.74	1.55	1.57	3.63	0.230	3.55
Manganese, Total, mg/l (Mn)	0.145	0.310A	0.550A	0.300A	0.180	0.225A	0.190	0.218A
Nitrate as N, mg/l (NO_3)	0.150	0.170	0.120	0.560	0.600	2.33	1.11	1.06
Sulfate, mg/l (SO_4)	3000A	237A	3.00	4500A	630A	5700A	3600A	300A
Chloride, mg/l (Cl)	46.6	36.9	38.8	38.1	26.2	47.6	32.7	35.0

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-7
WELL CV4W QUALITY

Water - Quality Data Report for Station: CV4W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	08/25/82	09/23/82	10/13/82	11/21/82	12/29/82			
Lab pH, std. Units	7.26	7.06	6.85	7.43	7.68			
Field Temperature, deg. C.	14.0	17.0	13.0	-	9.00			
Lab Conductivity @25C, micromhos/cm	17800	18200	18200	18700	19100			
TDS @ 180C, mg/l (lab.)	18800A	19000A	19600A	19700A	19800A			
TSS, mg/l	256	64.0	126	82.0	50.0			
Iron, Total, mg/l (Fe)	5.97A	1.06	1.88	1.05	1.78			
Manganese, Total, mg/l (Mn)	0.510A	0.480A	0.440A	0.410A	0.030			
Nitrate as N, mg/l (NO_3)	1.17	0.820	2.01	0.710	1.16			
Sulfate, mg/l (SO_4)	13000A	13700A	13000A	13700A	11200A			
Chloride, mg/l (Cl)	220A	180A	202A	184A	234A			

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-7a
WELL CV4W QUALITY SUMMARY

Water - Quality Data Report for Station: CV4W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	Quality Standards – # of Times Exceeded/Value						
	Domestic	Aquatic (3C)	Agriculture (4)	Min.	Max.	Mean	Std. Dev.
Lab pH, std. Units	-	9.00	9.00	6.85	8.30	7.52	0.344
Field Temperature, deg. C.	-	27.0	-	9.00	19.0	12.2	3.02
Lab Conductivity @25C, micromhos/cm	-	-	-	2800	29000	13900	6810
TDS @ 180C, mg/l (lab.)	-	-	20 2000	1790	19900A	11400	6710
TSS, mg/l	-	-	-	38.0	433	171	121
Iron, Total, mg/l (Fe)	-	-	1 5.00	0.110	5.97A	1.80	1.61
Manganese, Total, mg/l (Mn)	-	-	12 0.200	0.030	0.800A	0.296	0.200
Nitrate as N, mg/l (NO_3)	-	-	-	0.080	6.10	1.10	1.29
Sulfate, mg/l (SO_4)	-	-	20 200	3.00	13800A	5830	5410
Chloride, mg/l (Cl)	-	-	8 100	11.1	330A	113	100

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-8
WELL CV5W QUALITY

Water - Quality Data Report for Station: CV5W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	08/26/80	09/24/80	01/04/81	02/03/81	03/04/81	04/08/81	07/21/81	08/18/81
Lab pH, std. Units	7.40	7.60	7.40	7.60	7.60	7.60	7.63	8.00
Field Temperature, deg. C.	-	-	-	-	-	-	-	-
Lab Conductivity @25C, micromhos/cm	7800	9400	28500	17200	16000	18000	17000	15000
TDS @ 180C, mg/l (lab.)	4900A	6020A	20000A	11200A	8540A	11700A	11000A	9750A
TSS, mg/l	4680	401	254	2150	1940	1340	537	107
Iron, Total, mg/l (Fe)	0.620	0.620	0.230	8.80A	2.10	0.460	0.380	0.090
Manganese, Total, mg/l (Mn)	0.200	0.430	0.700A	0.650A	1.10A	1.10A	0.990A	0.040
Nitrate as N, mg/l (NO_3)	0.120	0.080	<0.010	0.130	0.070	0.130	0.070	<0.010
Sulfate, mg/l (SO_4)	3400A	5700A	26600A	9900A	12000A	10800A	06400A	11100A
Chloride, mg/l (Cl)	116A	180A	570A	202A	180A	200A	238A	240A

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-8
WELL CV5W QUALITY

Water - Quality Data Report for Station: CV5W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	09/14/81	10/27/81	11/22/81	12/11/81	01/19/82	02/22/82	03/22/82	04/22/82
Lab pH, std. Units	8.00	8.30	8.10	7.80	7.70	7.90	7.60	7.80
Field Temperature, deg. C.	-	-	12.0	12.0	10.0	11.0	12.0	13.0
Lab Conductivity @25C, micromhos/cm	16600	24600	18000	15400	15300	29000	24000	32000
TDS @ 180C, mg/l (lab.)	10800A	16000A	17000A	10800A	9990A	19600A	15700A	21100A
TSS, mg/l	231	417	573	1260	1810	658	6770	15800
Iron, Total, mg/l (Fe)	0.095	1.75	3.25	5.15A	5.40A	2.49	24.0A	0.120
Manganese, Total, mg/l (Mn)	0.025	0.500A	0.620A	0.620A	0.490A	1.25A	1.50A	2.10A
Nitrate as N, mg/l (NO_3)	0.290	0.100	0.480	0.140	0.110	0.130	3.69	0.120
Sulfate, mg/l (SO_4)	6600A	228A	8100A	129	0.174	3.00	4800A	570A
Chloride, mg/l (Cl)	240A	17.7	18.2	20.0	24.1	21.9	17.4	39.0

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-8
WELL CV5W QUALITY

Water - Quality Data Report for Station: CV5W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	05/29/82	06/22/82	07/20/82	08/25/82	09/23/82	10/13/82	11/21/82	12/29/82
Lab pH, std. Units	7.60	7.80	7.80	7.94	7.71	7.50	7.85	7.90
Field Temperature, deg. C.	13.0	13.0	19.0	15.0	16.0	12.0	-	11.0
Lab Conductivity @25C, micromhos/cm	32000	19500	13200	15000	15500	14800	15400	16500
TDS @ 180C, mg/l (lab.)	20800A	12900A	1890	15700A	16400A	15900A	16500A	16800A
TSS, mg/l	1380	375	1190	112	256	208	742	64.0
Iron, Total, mg/l (Fe)	17.8A	0.380	0.395	3.60	1.67	16.0A	0.780	2.12
Manganese, Total, mg/l (Mn)	3.70A	0.200	0.220A	0.900A	0.230A	1.50A	0.170	0.540A
Nitrate as N, mg/l (NO_3)	0.120	<0.010	0.080	0.320	0.540	0.610	0.550	0.810
Sulfate, mg/l (SO_4)	6900A	3300A	450A	11200A	11400A	1130A	3200A	9570A
Chloride, mg/l (Cl)	13.4	38.7	22.6	152A	144A	153A	159A	178A

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-8a
WELL CV5W QUALITY SUMMARY

Water - Quality Data Report for Station: CV5W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Quality Standards – # of Times Exceeded/Value

Parameter Title	Domestic	Aquatic (3C)	Agriculture (4)		Min.	Max.	Mean	Std. Dev.
Lab pH, std. Units	-	9.00		9.00	7.40	8.30	7.76	0.220
Field Temperature, deg. C.	-	27.0		-	10.0	19.0	13.0	2.42
Lab Conductivity @25C, micromhos/cm	-	-		-	7000	32000	18500	6530
TDS @ 180C, mg/l (lab.)	-	-	23	2000	1890	21100A	13400	5090
TSS, mg/l	-	-		-	64.0	15800	1800	3370
Iron, Total, mg/l (Fe)	-	-	6	5.00	0.090	24.0A	4.10	6.34
Manganese, Total, mg/l (Mn)	-	-	19	0.200	0.025	3.70A	0.824	0.806
Nitrate as N, mg/l (NO_3)	-	-		-	0.010	3.69	0.363	0.741
Sulfate, mg/l (SO_4)	-	-	21	200	0.174	26600A	6810	6380
Chloride, mg/l (Cl)	-	-	14	100	13.4	570A	133	126

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-9
WELL CV6W QUALITY

Water - Quality Data Report for Station: CV6W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	08/26/80	09/24/80	01/04/81	02/03/81	03/04/81	04/08/81	07/21/81	08/18/81
Lab pH, std. Units	7.80	7.40	7.10	7.80	7.60	7.60	8.30	7.80
Field Temperature, deg. C.	-	-	-	-	-	-	-	-
Lab Conductivity @25C, micromhos/cm	14000	2200	2000	2850	2800	2900	1700	1520
TDS @ 180C, mg/l (lab.)	9800A	1410	1470	1860	2340A	1890	1100	1000
TSS, mg/l	226	47.0	109	314	176	164	107	16.0
Iron, Total, mg/l (Fe)	0.530	0.540	-	3.00	1.62	1.50	1.63	0.050
Manganese, Total, mg/l (Mn)	0.185	1.31A	0.040	0.039	0.110	0.080	0.075	0.020
Nitrate as N, mg/l (NO_3)	9.60	0.620	1.22	1.29	1.29	1.40	0.960	0.340
Sulfate, mg/l (SO_4)	12200A	1950A	600A	630A	-	765A	450A	1010A
Chloride, mg/l (Cl)	234A	7.90	73.3	69.9	73.0	70.0	58.4	0.620

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-9
WELL CV6W QUALITY

Water - Quality Data Report for Station: CV6W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	09/14/81	10/27/81	11/22/81	12/11/81	01/19/82	02/22/82	03/22/82	04/22/82
Lab pH, std. Units	8.00	8.20	7.70	7.80	8.00	8.10	7.70	7.80
Field Temperature, deg. C.	-	-	14.0	10.0	6.00	7.00	8.00	10.0
Lab Conductivity @25C, micromhos/cm	1670	1380	1400	1600	1270	2400	1850	1800
TDS @ 180C, mg/l (lab.)	1100	900	950	1100	825	1550	1200	1200
TSS, mg/l	63.0	93.0	35.0	199	51.0	130	40.0	139
Iron, Total, mg/l (Fe)	0.065	0.620	0.350	0.340	0.360	0.860	0.460	0.460
Manganese, Total, mg/l (Mn)	0.018	0.040	0.030	0.053	0.035	0.030	0.020	0.040
Nitrate as N, mg/l (NO_3)	1.38	0.650	0.480	0.870	1.09	1.43	0.480	1.52
Sulfate, mg/l (SO_4)	720A	360A	1020A	510A	210A	300A	420A	330A
Chloride, mg/l (Cl)	75.0	34.2	34.0	40.8	35.2	36.6	39.0	41.9

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-9
WELL CV6W QUALITY

Water - Quality Data Report for Station: CV6W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	05/29/82	06/22/82	07/20/82	08/25/82	09/23/82	10/13/82	11/21/82	12/29/82
Lab pH, std. Units	8.00	8.00	7.90	8.31	7.85	7.56	8.10	8.09
Field Temperature, deg. C.	19.0	18.0	24.0	20.0	17.0	12.0	-	4.00
Lab Conductivity @25C, micromhos/cm	800	560	590	790	790	620	1100	1250
TDS @ 180C, mg/l (lab.)	526	365	488	380	425	440	585	845
TSS, mg/l	122	52.0	66.0	38.0	92.0	36.0	48.0	8.00
Iron, Total, mg/l (Fe)	2.21	0.110	0.140	1.38	1.35	3.68	-	1.02
Manganese, Total, mg/l (Mn)	0.450A	0.020	0.023	0.030	0.030	<0.030	0.030	0.030
Nitrate as N, mg/l (NO_3)	0.110	<0.010	0.320	0.630	0.940	2.31	1.39	1.78
Sulfate, mg/l (SO_4)	420A	3900A	570A	187	156	158	270A	449A
Chloride, mg/l (Cl)	18.1	7.50	14.5	14.0	15.0	15.0	22.0	25.0

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-9a
WELL CV6W QUALITY SUMMARY

Water - Quality Data Report for Station: CV6W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Quality Standards – # of Times Exceeded/Value

Parameter Title	Domestic	Aquatic (3C)	Agriculture (4)	Min.	Max.	Mean	Std. Dev.
Lab pH, std. Units	-	9.00	9.00	7.10	8.31	7.85	0.283
Field Temperature, deg. C.	-	27.0	-	4.00	24.0	13.0	6.18
Lab Conductivity @25C, micromhos/cm	-	-	-	560	14000	2080	2640
TDS @ 180C, mg/l (lab.)	-	-	2 2000	365	9800A	1410	1860
TSS, mg/l	-	-	-	8.00	314	98.8	74.7
Iron, Total, mg/l (Fe)	-	-	5.00	0.050	3.68	1.01	0.968
Manganese, Total, mg/l (Mn)	-	-	2 0.200	0.018	1.31A	0.115	0.270
Nitrate as N, mg/l (NO_3)	-	-	-	0.010	9.60	1.34	1.85
Sulfate, mg/l (SO_4)	-	-	20 200	156	12200A	1200	2520
Chloride, mg/l (Cl)	-	-	1 100	0.620	234A	44.0	46.7

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-10
WELL CV7W QUALITY

Water - Quality Data Report for Station: CV7W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	08/26/80							
Lab pH, std. Units	7.60							
Field Temperature, deg. C.	-							
Lab Conductivity @25C, micromhos/cm	8570							
TDS @ 180C, mg/l (lab.)	6000A							
TSS, mg/l	1260							
Iron, Total, mg/l (Fe)	0.480							
Manganese, Total, mg/l (Mn)	0.265A							
Nitrate as N, mg/l (NO_3)	0.010							
Sulfate, mg/l (SO_4)	3450A							
Chloride, mg/l (Cl)	64.0							

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-10a
WELL CV7W QUALITY SUMMARY

Water - Quality Data Report for Station: CV7W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Quality Standards – # of Times Exceeded/Value

Parameter Title	Domestic	Aquatic (3C)	Agriculture (4)	Min.	Max.	Mean	Std. Dev.
Lab pH, std. Units	-	9.00	9.00	7.60	7.60	7.60	-
Field Temperature, deg. C.	-	27.0	-	-	-	-	-
Lab Conductivity @25C, micromhos/cm	-	-	-	8570	8570	8570	-
TDS @ 180C, mg/l (lab.)	-	-	1 2000	6000A	6000A	6000	-
TSS, mg/l	-	-	-	1260	1260	1260	-
Iron, Total, mg/l (Fe)	-	-	5.00	0.480	0.480	0.480	-
Manganese, Total, mg/l (Mn)	-	-	1 0.200	0.265A	0.265A	0.265	-
Nitrate as N, mg/l (NO_3)	-	-	-	0.010	0.010	0.010	-
Sulfate, mg/l (SO_4)	-	-	1 200	3450A	3450A	3450	-
Chloride, mg/l (Cl)	-	-	100	64.0	64.0	64.0	-

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-11
WELL CV8W QUALITY

Water - Quality Data Report for Station: CV8W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	01/04/81	02/03/81	03/04/81	04/08/81	11/22/81	12/11/81	01/19/82	02/22/82
Lab pH, std. Units	7.00	7.60	7.40	7.80	7.80	7.60	7.50	7.60
Field Temperature, deg. C.	-	-	-	-	14.0	12.0	10.0	14.0
Lab Conductivity @25C, micromhos/cm	14000	14500	16000	17000	16800	14800	12200	23000A
TDS @ 180C, mg/l (lab.)	9800A	9450A	8550A	11100A	06000A	11100A	8000A	15100A
TSS, mg/l	2200	2640	2820	1200	249	1260	110	5170
Iron, Total, mg/l (Fe)	0.090	18.5A	9.30A	6.30A	1.40	5.00	9.25A	0.250
Manganese, Total, mg/l (Mn)	0.770A	0.766A	0.680A	0.430A	0.220A	1.19A	0.225A	1.25A
Nitrate as N, mg/l (NO_3)	1.10	1.83	1.86	2.00	2.62	4.04	3.63	3.89
Sulfate, mg/l (SO_4)	9000A	6600A	9450A	10200A	8700A	9300A	156	6.00
Chloride, mg/l (Cl)	122A	134A	136A	150A	21.4	22.6	40.2	42.2

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-11
WELL CV8W QUALITY

Water - Quality Data Report for Station: CV8W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	03/22/82							
Lab pH, std. Units	7.60							
Field Temperature, deg. C.	14.0							
Lab Conductivity @25C, micromhos/cm	24000							
TDS @ 180C, mg/l (lab.)	15700A							
TSS, mg/l	6770							
Iron, Total, mg/l (Fe)	24.0A							
Manganese, Total, mg/l (Mn)	1.50A							
Nitrate as N, mg/l (NO_3)	3.69							
Sulfate, mg/l (SO_4)	4800A							
Chloride, mg/l (Cl)	27.7							

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-11a
WELL CV8W QUALITY SUMMARY

Water - Quality Data Report for Station: CV8W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Quality Standards – # of Times Exceeded/Value

Parameter Title	Domestic	Aquatic (3C)	Agriculture (4)	Min.	Max.	Mean	Std. Dev.
Lab pH, std. Units	-	9.00	9.00	7.00	7.80	7.54	0.240
Field Temperature, deg. C.	-	27.0	-	10.0	14.0	12.8	1.79
Lab Conductivity @25C, micromhos/cm	-	-	-	12200	24000	16900	4020
TDS @ 180C, mg/l (lab.)	-	-	9 2000	8000A	16000A	11600	3140
TSS, mg/l	-	-	-	110	6770	2490	2230
Iron, Total, mg/l (Fe)	-	-	5 5.00	0.090	24.0A	8.23	8.27
Manganese, Total, mg/l (Mn)	-	-	9 0.200	0.220A	1.50A	0.781	0.456
Nitrate as N, mg/l (NO_3)	-	-	-	1.10	4.04	2.74	1.09
Sulfate, mg/l (SO_4)	-	-	7 200	6.00	10200A	6470	3980
Chloride, mg/l (Cl)	-	-	4 100	21.4	150A	77.3	56.0

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-12
WELL CV10W QUALITY

Water - Quality Data Report for Station: CV10W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	08/26/80	04/08/81	06/22/82	07/20/82	08/25/82	09/23/82	10/13/82	11/21/82
Lab pH, std. Units	7.20	6.90	7.10	7.10	6.96	6.86	6.96	6.90
Field Temperature, deg. C.	-	-	14.0	17.0	17.0	17.0	16.0	-
Lab Conductivity @25C, micromhos/cm	2570	3600	3900	3610	5350	5700	4560	5500
TDS @ 180C, mg/l (lab.)	1800	2340A	2590A	4630A	5130A	5300A	4400A	4780A
TSS, mg/l	289	764	117	686	1040	236	78.0	829
Iron, Total, mg/l (Fe)	1.04	11.7A	0.640	0.650	46.0A	4.23	0.320	14.5A
Manganese, Total, mg/l (Mn)	0.250A	0.800	0.205A	0.195	0.900A	1.11A	0.830A	2.30A
Nitrate as N, mg/l (NO_3)	0.960	0.110	0.910	2.36	5.67	2.40	0.770	0.260
Sulfate, mg/l (SO_4)	915A	1860A	1770A	270A	3030A	1350A	2390A	2660A
Chloride, mg/l (Cl)	0.540	128A	70.1	129A	306A	291A	264A	295A

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-12
WELL CV10W QUALITY

Water - Quality Data Report for Station: CV10W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	12/29/82							
Lab pH, std. Units	7.38							
Field Temperature, deg. C.	7.00							
Lab Conductivity @25C, micromhos/cm	5420							
TDS @ 180C, mg/l (lab.)	4460A							
TSS, mg/l	203							
Iron, Total, mg/l (Fe)	7.72A							
Manganese, Total, mg/l (Mn)	1.88A							
Nitrate as N, mg/l (NO_3)	0.150							
Sulfate, mg/l (SO_4)	2410A							
Chloride, mg/l (Cl)	286A							

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-12a
WELL CV10W QUALITY SUMMARY

Water - Quality Data Report for Station: CV10W — Property: Savage Coal Terminal

Latitude:	Section: #	County: Carbon
Longitude:	Township: TN	State: Utah
Elevation:	Range: RW	Country: U.S.A.

Quality Standards – # of Times Exceeded/Value

Parameter Title	Domestic	Aquatic (3C)	Agriculture (4)	Min.	Max.	Mean	Std. Dev.
Lab pH, std. Units	-	9.00	9.00	6.86	7.38	7.04	0.171
Field Temperature, deg. C.	-	27.0	-	7.00	17.0	14.7	3.93
Lab Conductivity @25C, micromhos/cm	-	-	-	2570	5700	4470	1100
TDS @ 180C, mg/l (lab.)	-	-	8 2000	1800	5300A	3940	1320
TSS, mg/l	-	-	-	78.0	1040	471	358
Iron, Total, mg/l (Fe)	-	-	4 5.00	0.320	46.0A	9.64	14.6
Manganese, Total, mg/l (Mn)	-	-	8 0.200	0.195	2.30A	0.941	0.739
Nitrate as N, mg/l (NO_3)	-	-	-	0.110	5.67	1.51	1.78
Sulfate, mg/l (SO_4)	-	-	9 200	270A	3030A	1850	886
Chloride, mg/l (Cl)	-	-	7 100	0.540	306A	197	116

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-13
WELL CV11W QUALITY

Water - Quality Data Report for Station: CV11W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	08/26/80	09/24/80	01/04/81	02/03/81	03/04/81	07/21/81	08/18/81	09/14/81
Lab pH, std. Units	7.90	8.10	7.40	8.00	7.80	8.20	8.30	8.40
Field Temperature, deg. C.	-	-	-	-	-	-	-	-
Lab Conductivity @25C, micromhos/cm	2400	24000	28500	31200	28000	30000	30000	30700
TDS @ 180C, mg/l (lab.)	16800A	15400A	20000A	20300A	23500A	19500A	19600A	20000A
TSS, mg/l	63.0	228	254	616	627	192	93.0	135
Iron, Total, mg/l (Fe)	0.540	0.510	0.230	1.60	0.600	2.25	0.250	1.45
Manganese, Total, mg/l (Mn)	0.185	0.359A	0.700A	0.710A	0.710	1.13A	0.810A	0.851A
Nitrate as N, mg/l (NO_3)	0.050	<0.010	<0.010	<0.010	<0.010	0.020	<0.010	0.270
Sulfate, mg/l (SO_4)	28200A	16500A	26600A	26700A	27600A	33000A	24000A	-
Chloride, mg/l (Cl)	440A	540A	570A	479A	475A	502A	540A	520A

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-13
WELL CV11W QUALITY

Water - Quality Data Report for Station: CV11W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	10/27/81	11/22/81	12/11/81	01/19/82	02/22/82	03/22/82	04/22/82	05/29/82
Lab pH, std. Units	8.40	8.20	8.20	8.40	8.40	7.90	7.80	7.80
Field Temperature, deg. C.	-	13.0	9.00	8.00	7.00	7.00	10.0	16.0
Lab Conductivity @25C, micromhos/cm	61000	31500	28000	28600	30000	83000	79000	73000
TDS @ 180C, mg/l (lab.)	40000A	30000A	21800A	18600A	19000A	54100A	51600A	47500A
TSS, mg/l	106	143	212	2280	150	55.0	119	127
Iron, Total, mg/l (Fe)	0.620	0.800	0.420	0.480	0.560	0.520	0.350	0.400
Manganese, Total, mg/l (Mn)	0.760A	0.900A	0.720	0.860A	1.25A	1.10A	0.800A	0.655A
Nitrate as N, mg/l (NO_3)	0.020	0.310	0.350	<0.010	1.41	0.160	0.060	0.060
Sulfate, mg/l (SO_4)	129	9900A	30000A	<3.00	12.0	240A	66.0	3900A
Chloride, mg/l (Cl)	13.9	21.9	33.1	14.2	19.4	15.3	18.5	10.3

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-13
WELL CV11W QUALITY

Water - Quality Data Report for Station: CV11W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	06/22/82	07/20/82	08/25/82	09/23/82	10/13/82	11/21/82	12/29/82	
Lab pH, std. Units	7.90	7.90	7.82	7.66	7.49	7.92	7.92	
Field Temperature, deg. C.	18.0	25.0	20.0	20.0	15.0	-	5.00	
Lab Conductivity @25C, micromhos/cm	34000	32000	32000	34200	30800	32800	34000	
TDS @ 180C, mg/l (lab.)	22200A	46100A	40900A	46200A	40700A	42500A	41900A	
TSS, mg/l	37.0	160	102	104	92.0	152	86.0	
Iron, Total, mg/l (Fe)	0.220	0.270	0.900	0.860	1.95	0.930	0.920	
Manganese, Total, mg/l (Mn)	0.580A	0.620A	0.600A	0.590A	0.420A	0.740A	0.690A	
Nitrate as N, mg/l (NO_3)	<0.010	<0.010	0.440	0.260	10.9	0.260	1.20	
Sulfate, mg/l (SO_4)	4200A	240A	29100A	30900A	28600A	24500A	30700A	
Chloride, mg/l (Cl)	26.3	17.7	453A	460A	445A	460A	455A	

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-13a
WELL CV11W QUALITY SUMMARY

Water - Quality Data Report for Station: CV11W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Quality Standards – # of Times Exceeded/Value

Parameter Title	Domestic	Aquatic (3C)	Agriculture (4)	Min.	Max.	Mean	Std. Dev.
Lab pH, std. Units	-	9.00	9.00	7.40	8.40	7.99	0.286
Field Temperature, deg. C.	-	27.0	-	5.00	25.0	13.3	6.22
Lab Conductivity @25C, micromhos/cm	-	-	-	2400	83000	36900	18800
TDS @ 180C, mg/l (lab.)	-	-	23 2000	15400A	54100A	31200	13100
TSS, mg/l	-	-	-	37.0	2280	267	464
Iron, Total, mg/l (Fe)	-	-	5.00	0.220	2.25	0.767	0.553
Manganese, Total, mg/l (Mn)	-	-	22 0.200	0.185	1.25A	0.728	0.239
Nitrate as N, mg/l (NO_3)	-	-	-	0.010	10.9	0.690	2.26
Sulfate, mg/l (SO_4)	-	-	18 200	3.00	33000A	17000	13300
Chloride, mg/l (Cl)	-	-	13 100	10.3	570A	284	240

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-14
WELL CV12W QUALITY

Water - Quality Data Report for Station: CV12W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	08/26/80	09/24/80	07/21/81	08/18/81	09/14/81	10/27/81	11/22/81	12/11/81
Lab pH, std. Units	7.40	7.60	8.30	7.80	7.80	7.60	7.80	7.40
Field Temperature, deg. C.	-	-	-	-	-	-	13.0	13.0
Lab Conductivity @25C, micromhos/cm	6500	4200	4300	4300	4500	4500	5000	3700
TDS @ 180C, mg/l (lab.)	4550A	2690A	2900A	2800A	2950A	2950A	2300A	2830A
TSS, mg/l	208	4.00	271	42.0	81.0	53.0	57.0	86.0
Iron, Total, mg/l (Fe)	0.490	0.456	0.850	0.130	2.35	0.460	0.330	0.140
Manganese, Total, mg/l (Mn)	0.160	0.910A	1.19A	2.08A	1.23A	2.45A	2.20	2.85A
Nitrate as N, mg/l (NO_3)	<0.010	0.010	0.560	0.430	1.78	0.180	0.150	0.230
Sulfate, mg/l (SO_4)	1800A	2870A	2400A	2400A	2220A	2160A	201A	2700A
Chloride, mg/l (Cl)	38.0	27.0	66.8	90.0	40.0	42.7	42.3	35.9

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-14
WELL CV12W QUALITY

Water - Quality Data Report for Station: CV12W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	01/19/82	02/22/82	03/22/82	04/22/82	06/22/82	07/20/82	08/25/82	09/23/82
Lab pH, std. Units	7.50	7.50	7.30	7.20	7.40	7.30	7.22	7.09
Field Temperature, deg. C.	10.0	10.0	11.0	10.0	13.0	19.0	18.0	18.0
Lab Conductivity @25C, micromhos/cm	3300	5200	64000	4500	3800	3400	3900	4100
TDS @ 180C, mg/l (lab.)	2180A	4790A	4210A	2980A	2500A	4350A	3970A	4190A
TSS, mg/l	181	51.0	53.0	56.0	48.0	84.0	44.0	24.0
Iron, Total, mg/l (Fe)	0.280	0.430	0.480	0.390	0.090	0.155	1.38	0.440
Manganese, Total, mg/l (Mn)	2.18A	0.650A	0.300A	0.440A	0.125	0.130	3.60A	5.43A
Nitrate as N, mg/l (NO_3)	0.170	<0.010	<0.010	0.130	0.090	<0.010	7.97	3.19
Sulfate, mg/l (SO_4)	240A	75.0	1260A	420A	2520A	300A	2690A	1320A
Chloride, mg/l (Cl)	20.1	19.1	32.3	31.8	27.5	27.7	46.0	42.0

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-14
WELL CV12W QUALITY

Water - Quality Data Report for Station: CV12W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Parameter Title	10/13/82	11/21/82	12/29/82					
Lab pH, std. Units	7.00	7.51	7.43					
Field Temperature, deg. C.	16.0	-	7.00					
Lab Conductivity @25C, micromhos/cm	4050	4790	4330					
TDS @ 180C, mg/l (lab.)	4220A	4330A	4090A					
TSS, mg/l	58.0	30.0	28.0					
Iron, Total, mg/l (Fe)	3.30	0.210	2.82					
Manganese, Total, mg/l (Mn)	6.11A	5.57A	2.36A					
Nitrate as N, mg/l (NO_3)	3.20	0.790	0.300					
Sulfate, mg/l (SO_4)	2700A	2700A	2680A					
Chloride, mg/l (Cl)	42.0	40.0	25.0					

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

TABLE 7-14a
WELL CV12W QUALITY SUMMARY

Water - Quality Data Report for Station: CV12W

Property: Savage Coal Terminal

Latitude:
Longitude:
Elevation:

Section: #
Township: TN
Range: RW

County: Carbon
State: Utah
Country: U.S.A.

Quality Standards – # of Times Exceeded/Value

Parameter Title	Domestic	Aquatic (3C)	Agriculture (4)	Min.	Max.	Mean	Std. Dev.
Lab pH, std. Units	-	9.00	9.00	7.00	8.30	7.48	0.300
Field Temperature, deg. C.	-	27.0	-	7.00	19.0	13.2	3.83
Lab Conductivity @25C, micromhos/cm	-	-	-	3300	64000	7490	13700
TDS @ 180C, mg/l (lab.)	-	-	19 2000	2180A	4970A	3510	835
TSS, mg/l	-	-	-	4.00	271	76.8	68.6
Iron, Total, mg/l (Fe)	-	-	5.00	0.090	3.30	0.799	0.960
Manganese, Total, mg/l (Mn)	-	-	16 0.200	0.125	6.11A	2.10	1.90
Nitrate as N, mg/l (NO_3)	-	-	-	0.010	7.97	1.01	1.96
Sulfate, mg/l (SO_4)	-	-	18 200	75.0	2870A	1770	1040
Chloride, mg/l (Cl)	-	-	100	18.1	90.0	38.7	16.5

" -" missing data
" * " impossible data
Units are in mg/l, unless otherwise noted.

D - domestic standards exceeded
L - aquatic standards exceeded
A - agricultural standards exceeded

724.200. Surface Water Hydrology

Methodology

A hydrologic investigation was performed based on state and federal agency data, baseline monitoring data, and field reconnaissance. The investigation focused on the following:

a) The surface hydrology was characterized with descriptions of drainage basin features, including storm runoff estimates, irrigation patterns and canal usage and seepage estimates. Irrigation district and local soil conservation personnel were contacted to determine irrigation practices in the area.

b) Baseline water quality parameters and surface runoff quantity from undisturbed areas were estimated. A monitoring station, CV14W shown on Plate 7-1, was established. This station was sampled monthly, when possible, during the baseline monitoring period in order to characterize surface water quality. Due to the ephemeral nature of surface water flow at Savage Coal Terminal, flow measurements cannot be taken at any regular interval and consequently water quality samples are sporadic.

c) Water and sediment control measures were designed to minimize adverse impacts of operations on receiving waters.

Regional Surface Water Hydrology

The Department of the Interior has drafted a regional environmental statement, published in 1978, which covers the development of coal resources in Central Utah. The regional area is drained by tributaries to the Green and Colorado Rivers; principal tributaries are the Price and San Rafael Rivers and Muddy Creek. The flow is usually intermittent or perennial, in small streams in the mountains and in larger streams that originate in the higher mountains. Snowmelt is major contributor to streamflow and it provides the continuity of flow in the perennial streams as well as some seasonal flow to intermittent streams. Many streams are ephemeral and flow only in direct response to precipitation or snowmelt. Ephemeral flow is characteristic of the lowlands such as Castle Valley where the Savage Coal Terminal facility is located. Summer precipitation does not usually produce much runoff, although intense rainfall may cause high runoff in localized areas.

The Savage Coal Terminal site drains into the Price River which flows into the Green River. The water in the upper reaches of the Price River is of high quality; however, as the river traverses the central and lower portion of the Price River basin, the quality of the water in the river steadily degrades due to the geologic nature of the area and to the irrigation return flow which enters the river. Total dissolved solids concentrations are less than 400 mg/l in the upper reaches, but by the time the water reaches Wellington the total dissolved concentrations are between 600 and 2,400 mg/l. At Woodside, Utah which is 22 miles upstream from the mouth, average total dissolved solids range between 2,000 and 4,000 mg/l. Chemical analysis of Price River water sampled near the Savage Coal Terminal 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.

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 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.

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 Figure 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.

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 7-14b.

TABLE 7-14b
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	337.00	164.00
Magnesium (mg)	102.00	71.00	117.00
Sodium (Na)	272.00	377.00	310.00
Potassium (K)	11.00	-	7.00
Bicarbonate (HCO_3)	205.00	103.00	305.00
Carbonate (CO_3)	0.00	0.00	0.00
Sulfate (SO_3)	1810.00	1750.00	1260.00
Chloride (Cl)	25.00	30.00	46.00
Fluoride (F)	0.80	-	0.50
Nitrate (NO_3	0.60	0.40	4.30
Boron (B)	0.41	-	0.28
Dissolved solids	2770.00	2620.00	2060.00
Hardness as $CaCO_3$	1490.00	1130.00	890.00
Noncarbonate hardness as $CaCO_3$	1320.00	1050.00	640.00

TABLE 7-14c
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 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 7-14b 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 subarea A. The water quality analysis of samples taken from this drainage ditch are presented in Table 7-14c.

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.

724.300. Geologic Information. Each application will include geologic information in sufficient detail, as given under R645-301-624, to assist in:

724.310. See Chapter 6 and Sections 724.100 and 724.200.

724.320. See Chapter 6 and Sections 724.100 and 724.200.

724.400. Climatological Information.

Existing Environment

Climate

The climate of the Price, Utah area is varied and strongly influenced by topography. The climate can be characterized as arid, specifically dry continental. The prevailing local low-level meteorological influences are mountain-valley breeze systems. The low amount of annual precipitation is a result of the Sierra Nevada and Cascade Ranges which act as natural barriers and prevent moist maritime air from the North Pacific from reaching the interior basins to the east.

On a more local scale the Wasatch Mountains to the west of Castle Valley and the Tavaputs Plateau to the north provide a shelter from storms associated with westerly and northerly winds. Areas on the lee side of the Wasatch Range generally receive less than 10 inches of precipitation annually.

The Savage Coal Terminal is located approximately 6 miles south of Price, Utah; therefore, climatological data for Price is representative of this site.

Table 7-15 is a tabulation of Temperature, Rainfall, and Snowfall for the Price area from 1992 through April 2002. This information was provided by the Utah Climate Center, Utah State University, Logan, Utah.

Precipitation and Temperature

Based on the data in Table 7-15, the average annual precipitation over the 10 year period was 10.36 inches, with a low monthly average precipitation of 0.36 inches in December and a high monthly average precipitation of 1.37 inches in August. The record high daily precipitation for this period was 1.99 inches, which occurred during August.

The average mean temperature for this area is 51.0° F. The average maximum annual temperature is 65.0° F. with a high maximum of 89.0° F in August and a low maximum of 36.1° F in January. The average minimum annual temperature is 37.0° F, with a high minimum occurring during July and a low minimum during January. The record high temperature is 101° F in June and the record low temperature is -4° F in January.

The average annual snowfall is 19.6 inches with measured amounts during the months of October through April. The record daily snow measured was 20.0 inches, which occurred in the month of January.

TABLE 7-15

Price Warehouses													
County: Carbon Latitude: 39°37' Longitude: 110°48' Elevation: 5700 feet Period: 1992 - 2002													
Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average max temp	36.1	42.4	58.9	71.5	76.8	83.3	88.1	89.0	80.9	65.1	46.9	39.0	65.0
Average min temp	14.4	21.5	31.9	43.1	47.8	50.2	54.7	57.0	47.3	37.6	22.4	16.8	37.0
Average mean temp	26.2	32.0	46.4	59.3	62.3	66.8	71.4	73.0	64.1	51.3	34.6	27.9	51.0
Record high temp	54	66	71	84	90	101	99	99	94	84	61	50	101
Record low temp	-4	4	19	23	28	33	42	41	35	26	4	0	-4
Average precipitation	0.92	0.96	0.66	0.81	0.91	0.68	0.70	1.37	1.14	1.34	0.52	0.36	10.36
Record monthly precipitation	2.36	1.99	1.54	2.01	2.34	2.14	1.86	4.21	3.12	2.70	1.26	1.17	4.21
Record daily precipitation	1.65	0.61	0.74	0.99	0.83	1.17	1.36	1.99	0.86	1.13	0.59	0.53	1.99
Average snowfall	7.9	4.2	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.1	2.7	3.8	19.6
Record monthly snow	31.6	10.7	2.5	2.5	0.0	0.0	0.0	0.0	0.0	0.5	7.8	16.5	31.6
Record daily snow	20.0	6.1	2.5	2.5	0.0	0.0	0.0	0.0	0.0	0.5	5.0	7.3	20.0

Provided by Utah Climate Center, Utah State University, Logan, Utah.

Wind

Winds are generally light to moderate all seasons of the year. Strongest winds generally occur in the spring with moderate to strong southerly flow for several days at a time. The prevailing Castle Valley area winds are from the north through north-northwest during autumn, winter and early spring months with a shift to the south-southeast during late spring and summer.[2] Table 7-16 summarizes the mean wind speeds in Castle Valley. Depending on the proximity to the mountain and canyons a particular location in Castle Valley may experience pronounced diurnal wind flow patterns. Daytime flow may be influenced by upslope easterly winds caused by greater heating of the eastern face of the Wasatch Plateau than in the valley. At night the northwesterly drainage flow from the mountains to the valley may prevail. In summary, no one wind direction or diurnal wind flow pattern is applicable for all locations in Castle Valley. Weaker diurnal wind flow patterns are expected in locations further away from a canyon or mountain.

TABLE 7-16
MEAN SEASONAL WIND SPEEDS IN THE CASTLE VALLEY AREA

	SEASON				
Direction	Fall (m/s)	Winter (m/s)	Spring (m/s)	Summer (m/s)	Annual (m/s)
N	3.3	1.8	3.5	3.1	3.0
NNE	4.1	1.4	2.4	2.4	2.6
NE	2.2	1.6	1.6	1.9	1.8
ENE	1.8	1.3	1.6	2.1	1.6
E	1.8	1.3	1.9	1.9	1.7
ESE	1.8	1.4	2.4	2.1	1.9
SE	2.0	1.4	2.1	2.6	2.1
SSE	2.5	1.4	2.5	3.0	2.5
S	3.7	1.4	3.4	3.8	3.2
SSW	4.0	1.4	6.2	4.3	4.3
SW	3.1	1.3	4.0	3.9	3.2
WSW	2.9	1.3	4.3	3.9	3.2
W	2.9	1.7	4.0	3.8	3.1
WNW	2.3	2.0	5.3	4.6	3.9
NW	4.2	4.9	6.0	4.5	5.1
NNW	4.8	4.4	5.7	4.0	4.8
Seasonal Mean (m/s)	2.7	1.3	3.5	3.2	2.7

(To convert to miles/hour multiply by 2.2369)

Source: An evaluation of the Meteorology and Air Quality Impact for the Emery Plant, Emery County, Utah. A.J. Anderson and J.L. Sutherland, North American Weather Consultants, November 1974.

Evapotranspiration and Growing Season

The average annual evapotranspiration for this area is listed as 47.43 inches, with the maximum of 8.07 in July and the minimum of 0.85 in January.

The growing season, based on freeze-free dates, runs from 118 to 196 days, with an average of 147 days. The last spring freeze averages May 12 and the first fall freeze averages October 6.[1]

Air Quality

The Savage Coal Terminal is a coal preparation facility which blends, sizes, and stores raw coal. Material handling, sizing and storage procedures and associated air pollution control problems are largely those of dust and particulate matter emitted from the mechanical processes. The only criteria pollutant which is expected to be emitted in quantity is suspended particulate matter. The only combustion processes associated with the facility will be those associated with mobile sources, which includes light duty vehicles, heavy duty vehicles, and train locomotive. The gaseous emissions emitted from these vehicles exhausts will have a negligible impact on the air quality of the area because the emissions levels are quite low.

Run-of-mine coal must be broken, sized and screened before loading it. These processes, along with handling, moving, storage and general housekeeping account for most of the dust emissions from the facility.

Coal from the surrounding mines is transported to the site by trucks. On-site, the coal is dumped into an underground hopper. Coal is crushed or screened as necessary.

The coal is then taken from the hopper via covered conveyor and placed into a stacking tube. The coal stacking tubes with windows are allowed to open for cone stacking. The stacking tubes reduce and minimize the dust from freefall. The coal from the open stockpiles is recovered via underground feeders and carried by covered conveyor to a totally enclosed 10,000 ton silo for unit train loading. Water spray systems are located on the underground reclaimed feeders.

Air Quality

Efforts have been made throughout the coal handling system to minimize the generation of dust. This has been done through the utilization of enclosures to prevent wind action upon materials on conveyors, in the loadout silos, in the stacking tubes, and in the truck dumps. Water sprays have also been added to reduce dust emissions at the breaker, beneath pile reclaim feeders, and the stacking tubes. The inherent moisture of the coal also aids in the reduction of the dust emissions.

Estimate of Uncontrolled Emissions

The potential exists for fugitive dust emissions resulting from vehicle traffic on the access and haul roads at Savage Coal Terminal. These roads are surfaced with asphalt, or crushed or pit-run gravel. Administrative controls will be applied to maintain strict speed control at the site, which will aid in reducing the fugitive dust potential. The gravel roads are treated with Magnesium Chloride and watered as necessary to help alleviate the dust produced by traffic. The frequency of application will be determined by visual observations of the degree of road dustiness.

Air Quality Control Plan

The Savage Coal Terminal is operated under an approved Air Quality Permit DAQE-ANI793003-06, issued by the State of Utah Department of Environmental Quality. Under this permit, the facility is approved to handle up to 10 million tons of coal per year.

724.500. Supplemental information. If the determination of the PHC required by R645-301-728 indicates that adverse impacts on or off the proposed permit area may occur to the hydrologic balance, or that acid-forming or toxic-forming material is present that may result in the contamination of ground-water or surface-water supplies, then information supplemental to that required under R645-301-724.100 and R645-301-724.200 will be provided to evaluate such probable hydrologic consequences and to plan remedial and reclamation activities. Such supplemental information may be based upon drilling, aquifer tests, hydrogeologic analysis of the water-bearing strata, flood flows, or analysis of other water quality or quantity characteristics.

724.600. N/A - This is a surface operation.

724.700. N/A - No operations are proposed in a valley holding a stream.

725. Baseline Cumulative Impact Area Information.

725.100. This information has been previously compiled.

725.200. If this information is not available from such agencies, then the applicant may gather and submit this information to the Division as part of the permit application.

725.300. The permit will not be approved until the necessary hydrologic and geologic information is available to the Division.

726. N/A - Not required.

727. Alternative Water Source Information

Since there are no subsurface operations here, and since existing water rights are for irrigation and stock watering from established canals or creeks away from the operations, no adverse effect on water quantity should result from operation of this facility. In the event that a diminution of an existing water right should be shown to be a direct result of this operation, Savage Services Corporation will replace the proven lost portion of said right with water from its 357 shares of reservoir water. (See Appendix 7-2 for documentation of water rights.)

Water rights have been researched for the immediate and adjacent areas at Savage Coal Terminal, and are documented below:

*91 AREA T. 15 S.; R. 10 E.

SECTION	SERIAL NUMBER
10	None
11	2, 3, 78, 366, 764, 765, 3396, 3397, 4126
14	3294, 3295
15	3280, 3289, 3290, 3156

* Copies are on file at the State Engineer-Water Rights Office in Price, Utah.

728. Probable Hydrologic Consequences (PHC) Determination.

The probable hydrologic consequences determination is presented in Appendix 7-3.

728.100. See Appendix 7-3.

728.200. See Appendix 7-3.

728.300. See Appendix 7-3.

728.400. An application for a permit revision will be reviewed by the Division to determine whether a new or updated PHC determination will be required.

729. Cumulative Hydrologic Impact Assessment (CHIA).

729.100. Per Division.

729.200. An application for a permit revision will be reviewed by the Division to determine whether a new or updated CHIA will be required.

730. Operation Plan.

731. General

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 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.

Culinary water is supplied by Price River Water Improvement District through a buried waterline to the facility.

The primary source of water for the facility is from the Price River. A shallow, high-volume well is installed at the Price River north of the site and is pumped on demand via a 6-inch pipeline into a sump located at the northeast corner of the site (see Plate 5-2).

Savage Services Corporation has acquired rights to 357 shares of water from Scofield Reservoir. The usage at the facility is measured by a totalizing flowmeter which monitors incoming water from both the pipeline and sedimentation pond sources. Present usage averages 30-35 acre-feet per year.

Undisturbed Runoff Diversions

Runoff from approximately 7.16 acres of undisturbed area to the west of the operations area is intercepted by a diversion ditch and routed around the west and north edge of the facilities area. This undisturbed area includes subarea A shown on Figure 7-4. The diversion is designed to accommodated the peak discharge from a 10 year - 24 hour precipitation event. The diversion is designed, constructed and maintained to prevent additional contributions of suspended solids to runoff outside the permit area.

Disturbed area runoff from the site is routed to the sediment ponds via collection ditches, as shown on Plate 7-2. Collection ditches vary in size and configuration; however, ditches will be maintained at minimum cross sectional areas as shown on Figure 7-13.

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. All 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 point.

Water from Pond 6 is normally not discharged, but is placed back into 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 sediment ponds 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.

Groundwater

Two groundwater drains have been installed at the Savage Coal Terminal site in the past and are located as shown in Plate 7-1. The drain on the eastern side of the property was installed to drain a boggy area, in order to facilitate construction of the present railroad grade. Flow from the drain gradually diminished after installation and eventually it ceased. The other drain, which is located along the north and west property lines is 26 feet deep at the pump house and is installed at the surface of the Bluegate shale just below the weathered shale and soil. It flows continually throughout the year. The drain discharges into a sump and the water is used for coal preparation and dust control at the site. A flow from the drain of 22 gal/min was measured on August 20, 1980. Plant personnel report that the flow from the drain varies somewhat with the time of year.

Effects of Operations on Groundwater

In various places at or near the Savage Coal Terminal site, the water table approaches the surface and groundwater is lost to evaporation. The areas are distinguishable by heavy accumulations of salt on the soil surface and are generally soft and boggy. Two of these areas are found downslope from the Savage Coal Terminal site. One is found on the west side of the property immediately adjacent to the railroad tracks and several hundred yards south of the coal loading silo. The other is found in the farmland a half mile to the northeast of the site. Since shallow groundwater moves downslope toward the Price River, it eventually either seeps into the stream or is lost to evapotranspiration.

The principal effect of the Savage Coal Terminal operation on groundwater results from the operation of the French Drain. The drain intercepts shallow groundwater flows. This water is utilized by the facility as a source of water with excess water diverted to the Price River. Although the quality of the water is poor it is thought to be of superior quality to the water that would eventually seep into the Price River downslope of the site. Groundwater quality of water coming from the French Drain would be of superior quality to the water that would eventually seep into the Price River because it would not be subject to the degree of evaporation and concentration of salts that would occur upon natural seepage. Without direct measurements of seeps near the Price River, it is difficult to substantiate this statement. However, a review of water quality data of the two wells downgradient from the French Drain show increasing concentration at CV4W is 11,400 mg/T while the mean concentration of TDS is the French Drain is 9,790 mg/l. These data suggest decrease in groundwater quality downgradient. These trends are thought to be due to extensive evaporation of groundwater seepage.

Refuse disposal is not anticipated to impact groundwater conditions. The refuse has been determined to be non-toxic and non-acid forming (see Chapter 5). The site is a natural groundwater discharge area. The French Drain has lowered the water table and reduced the rate of seepage and evaporation. As a result seepage or saturation of the refuse material is not expected to occur during operations. Leaching may occur but the rate will be extremely slow because of the high evaporation rates. Water extract analyses of the coal refuse reported in Chapter 5, Figure 5-2 indicate that leaching will not contaminate local groundwater.

Since the refuse pile is built up from ground level, there is little, if any, chance that saturation potential is also minimized by the fact that the refuse is located at the upper or higher elevation of the site, and the gradient of the groundwater flow is to the low (northeast corner) of the property. The French Drain will be rendered unusable during the reclamation period; at this time, groundwater elevations at the site can be expected to rise to levels encountered prior to the drain installation.

The areas of refuse storage were not observed to contain high or surfacing groundwater prior to refuse disposal; therefore, it is not expected that these sites will be affected by groundwater saturation in the future.

The French Drain consists of a trench, originally dug to the unweathered shale, with a 12" perforated, galvanized culvert laid on the bottom. The trench was then filled with +2" drain rock for a depth of 4' or greater, covered with an impervious material and backfilled.

It has been in operation for nearly 30 years with no sign of plugging or failure. There is no reason to believe that the system will not continue to operate throughout the life of Savage Coal Terminal; however, should it fail at some point in time, it would be repaired. Such a failure could be detected by a sharp decrease or stoppage of the flow into the pump house. The impact of such a failure would likely not even become evident on the surface in the time it would take to restore the system, since the groundwater flow in the area is of such a small magnitude.

Since all major structures at the site are on pilings driven to bedrock, no major impacts would be expected with a failure of the drain system.

731.100. Hydrologic-Balance Protection.

731.110. Ground-Water Protection. In order to protect the hydrologic balance, coal mining and reclamation operations will be conducted according to the plan approved under R645-301-731 and the following:

731.111. Ground-water quality will be protected by handling earth materials and runoff in a manner that minimizes acidic, toxic or other harmful infiltration to ground-water systems and by managing excavations and other disturbances to prevent or control the discharge of pollutants into the ground water; and

731.112. For the purposes of SURFACE COAL MINING AND RECLAMATION ACTIVITIES ground-water quantity will be protected by handling earth materials and runoff in a manner that will restore approximate premining recharge capacity of the reclaimed area as a whole, excluding coal mine waste disposal areas and fills, so as to allow the movement of water to the ground-water system.

731.120. Surface-Water Protection. In order to protect the hydrologic balance, coal mining and reclamation operations will be conducted according to the plan approved under R645-301-731 and the following:

731.121. Surface-water quality will be protected by handling earth materials, ground-water discharges and runoff in a manner that minimizes the formation of acidic or toxic drainage; prevents, to the extent possible using the best technology currently available, additional contributions of suspended solids to streamflow outside the permit area; and, otherwise prevent water pollution. If drainage control, restabilization and revegetation of disturbed areas, diversion of runoff, mulching or other reclamation and remedial practices are not adequate to meet the requirements of R645-301-731.100 through R645-301-731.522, R645-301-731.800 and R645-301-751, the operator will use and maintain the necessary water treatment facilities or water quality controls; and

731.122. Surface-water quantity and flow rates will be protected by handling earth materials and runoff in accordance with the steps outlined in the plan approved under R645-301-731.

731.200. There are presently 2 surface water monitoring points and 3 groundwater monitoring stations at the Savage Coal Terminal. All other ground water monitoring wells have been removed and sealed as of May 1999. The following is a list of existing water monitoring stations, along with sample frequency:

WATER MONITORING PROGRAM

Station	Location	Type	Frequency	Flow Device	Results To	Remarks
CV-1-W	Pumphouse	French Drain	Bi-annually	Time/Volume or Depth	DOGM	Sample during 2nd and 4th Quarters.
CV-14-W	N.E. Corner Property	Ditch	Bi-annually	Time/Volume	DOGM	Sample during 2nd and 4th Quarters.
CV-15-W	Sediment Pond Discharge	Pond Outlet	Monthly	Hand-Held Time/Volume	E.P.A., DOGM, Utah Health Dept.	Monitored per UPDES Permit
S-1-GW	South of French Drain	Ground Water Monitoring Well	Quarterly	Grab Sample Depth	DOGM	Quarterly - 2 years Bi-Annual - After
S-2-GW	South of Pond 5	Ground Water Monitoring Well	Quarterly	Grab Sample Depth	DOGM	Quarterly - 2 years Bi-Annual - After

Water monitoring will include parameters on Table 7-17. Results will be submitted to the Division within 60 days following the end of each sampling cycle.

731.210. Ground-Water Monitoring. Ground-water monitoring will be conducted according to the plan approved under R645-301-731.200 and the following:

731.211. See 731.200 and Table 7-17.

731.212. Ground-water will be monitored and data will be submitted at least every six months for the French Drain and every quarter for the ground water monitoring wells S-1-GW and S-2-GW. Monitoring submittals will include analytical results from each sample taken during the approved reporting period. When the analysis of any ground-water sample indicates noncompliance with the permit conditions, then the operator will promptly notify the Division and immediately take the actions provided for in R645-300-145 and R645-301-731.

732.213. N/A - Not requested.

731.214. Groundwater monitoring will continue through operation; however, since the French Drain and monitoring wells will be removed during reclamation further monitoring of those sites will not be possible.

TABLE 7-17
SAVAGE COAL TERMINAL WATER MONITORING REPORT

Property:	
Date Sampled:	
Station:	
Location:	
Type:	
Frequency:	
Field Measurements:	
Water Level or Flow:	
pH:	
Specific Conductivity:	
Temperature:	
Dissolved Oxygen: (Perennial streams only)	
Laboratory Measurements (mg/l):	
**Total Settleable Solids:	
Total Suspended Solids:	
Total Dissolved Solids:	
Total Hardness (as $CACO_3$):	
Acidity ($CaCO_3$):	
*Carbonate (CO_3^{-2}):	
*Bicarbonate $(HC)_3^{-1}$):	
*Calcium (Ca):	
Chloride (Cl^-):	
Iron (Fe):	
*Magnesium (Mg):	
*Total Manganese (Mn):	
*Potassium (K):	
*Sodium (Na):	
*Sulfate (SO_4^{-2}):	
***Oil and Grease:	
Cation - Anion Balance:	

* Dissolved Form ** NPDES Samples Only *** Designated Samples Only

731.215. Equipment, structures and other devices used in conjunction with monitoring the quality and quantity of ground water on-site and off-site will be properly installed, maintained and operated and will be removed by the operator when no longer needed.

731.220. Surface-Water Monitoring. Surface-water monitoring will be conducted according to the plan approved under R645-301-731.220 and the following:

731.221. See Section 731.200 and Table 7-17.

731.222. See Section 731.200 and Table 7-17.

731.223. See Section 731.200.

731.224. Surface water monitoring will proceed through operation and continue until bond release; however, only station CV14W will remain after removal of the sediment ponds. CV15W is a UPDES Discharge Point, and will be terminated upon removal of Sediment Pond No. 6.

731.225. Equipment, structures and other devices used in conjunction with monitoring the quality and quantity of surface water on-site and off-site will be properly installed, maintained and operated and will be removed by the operator when no longer needed.

731.300. Acid- and Toxic-Forming Materials.

731.310. Drainage from acid- and toxic-forming materials and underground development waste into surface water and ground water will be avoided by:

731.311. The refuse pile has been tested and does not contain acid- or toxic-forming materials. The only other potentially acid- or toxic-forming material on site is in the form of oils, grease or fuels. These materials are stored within an enclosed concrete basin and trailer, and the fueling area is bermed to prevent spillage from reaching any drainage.

731.312. See Section 731.311 above.

731.320. Storage, burial or treatment practices will be consistent with other material handling and disposal provisions of R645 Rules.

731.400. All previously installed water monitoring wells have been removed and sealed in a safe and environmentally sound manner approved by the Division. The only remaining wells are the French Drain containment, 2 new water monitoring wells and the river pump well. These structures will be removed upon reclamation and sealed in accordance with the reclamation plan in Section R645-301-540.

731.500. Discharges.

731.510. N/A - This is a surface operation.

731.520. N/A - This is a surface operation.

731.600. N/A - There are no areas of disturbance within 100 feet of a perennial or intermittent stream.

731.610. N/A.

731.620. N/A.

731.700. Cross Sections and Maps.

731.710. See Plate 7-1.

731.720. See Plates 7-1 and 7-2.

731.730. See Plate 7-1.

731.740. See Plate 7-2.

731.750. See Plates 7-3 through 7-5.

731.760. See Plates 7-3 through 7-5.

731.800. See Section 727.

732. Sediment Control Measures.

732.100. Siltation structures on site consist of rock gabions straw bales and silt fences. A typical section of each is shown in Figures 7-8, 7-9 and 7-10. These structures are maintained on a regular basis, and will be removed upon reclamation or when no longer needed.

732.200. There are a total of 5 sedimentation ponds on this site. See Plate 7-2 for location and Section 740 for design details.

732.210. All ponds on this site are temporary, and will be removed upon reclamation.

732.220. N/A - There are no coal processing waste dams, and no ponds meet the size or other qualifying criteria of MSHA, 30 CFR 77.216(a).

732.300. There are both undisturbed and disturbed diversions on this site. See Plate 7-2 for location, and Section 740 for design details.

732.400. See Section 742.400.

732.410. N/A - There are no plans to alter or relocate a natural drainageway.

732.420. N/A - There are no ditch relief culverts on this site.

733. Impoundments.

733.100 There are a total of 9 impoundments on this site. See Plate 7-2 for location, and Section 741 for design details.

733.110. All impoundment plans have been prepared and certified by a qualified, registered professional engineer in the State of Utah.

733.120. See Plates 7-3, 7-4, 7-5 and 7-6.

733.130. See Section 741.

733.140. N/A - No underground mining has occurred here.

733.150. See Section 741.

733.160. N/A - All impoundments are constructed and there are no plans for modifications.

733.200. All impoundments are temporary and will be removed upon final reclamation.

733.210. All impoundments are incised, which eliminates possibility of embankment failure. None of the impoundments meet the size or other qualifying criteria of MSHA 30 CFR 77.216(a).

733.220. N/A - All impoundments are temporary.

733.230. All impoundments are constructed and are temporary.

733.240. If any examination or inspection discloses that a potential hazard exists, the person who examined the impoundment will promptly inform the Division according to R645-301-515.200.

734. Discharge Structures, See Section 744.

735. Excess Spoil, See Section 745.

736. Coal Mine Waste, See Section 746.

737. Non-coal Mine Waste, See Section 747.

738. Temporary Casing & Sealing of Wells, See Section 748.

740. Design Criteria and Plans.

741. 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 seven subareas as shown on Figure 7-4. Subareas A, B and C are undisturbed areas and include upslope areas to the west of the site. 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.

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 Plates 7-3 through 7-5. 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).

An average curve number for each category was determined based on soil type, general condition, and hydrologic soil group. Hydrologic soil group was determined from the Soils map, Plate 2-1. In those areas where the soil type was mapped as disturbed land, hydrologic soil group "D" was assumed. The curve numbers determined are (corresponding with the above categories):

a) 89
b) 80
c) 82
d) 87
e) 87

The ponds, of course, receive direct precipitation and therefore are considered separately from the other categories.

Table 7-18 presents the percentage of each category that was measured in each sub-drainage, and the weighted curve number for each sub-drainage.

Total runoff in each sub-drainage was determined by using the weighted curve numbers, area of each sub-drainage, and SCS rainfall-runoff relationship:

Q = rainfall excess (inches)

$$Q = \frac{P-0.2S)^2}{P+0.8S}$$

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 7-19 lists the runoff volume calculated for each sub-drainage.

TABLE 7-18
WEIGHTED CURVE NUMBER DETERMINATION

Drainage Area Number from Figure 7-5	Building Roads, Pads and Embankments CN-90 (%)	Topsoil or Soil Stockpiles CN=80 (%)	Coal Stockpiles CN=87 (%)	Compacted Coal Refuse Piles CN=87 (%)	Other Areas (excluding ponds) CN=87 (%)	Pond Areas (acres)	Total Acreage (acres)	Weighted CN for the Drainage
1a	15.0	-	12.1	-	73	0.61	14.96	87
1b	68.0	-	-	-	32.0	-	5.46	88
1c*	7.43	-	-	-	92.57	0.16**	36.65	87
5a	7.7	-	-	68.9	23.4	0.73	35.87	87
5b	9.2	-	52.3	-	38.5	-	14.31	85
5c	60.2	-	-	-	39.8	-	1.94	88
5d	14.2	-	-	-	85.5	-	17.03	87
5e	57.2	-	-	-	42.8	-	0.84	88
5f	-	10.0	-	-	-	-	4.38	80
6a	5.2	-	-	-	94.8	0.22	3.81	87
6b	66.7	-	26.7	-	6.6	-	5.46	87
6c	50.0	-	-	-	50.0	-	5.55	88
6d	10.0	-	-	-	90.0	-	2.45	87
6e	-	-	-	-	100.0	-	6.80	87
6f	10.0	-	-	-	100.0	-	5.44	87
A	-	-	-	-	100.0	-	7.16	87

* Includes subdrainage C ** Depression, no drainage but not a pond.

TABLE 7-19
RUNOFF VOLUMES ESTIMATES

Area No.	Weighted Curve No.	Q in.	A acres	Total Runoff Acre-Feet
1a	87	0.68	14.96	0.848
1b	88	0.73	5.46	0.332
1c*	87	0.68	36.65	2.08
5a	87	0.68	35.87	2.030
5b	85	0.58	14.31	0.692
5c	88	0.73	1.94	0.118
5d	87	0.68	17.03	0.965
5e	88	0.73	0.84	0.051
5f	80	0.39	4.38	0.142
6a	87	0.68	3.81	0.216
6b	87	0.68	5.46	0.309
6c	88	0.73	5.55	0.338
6d	87	0.68	2.45	0.139
6e	87	0.68	6.80	0.385
6f	87	0.68	5.44	0.308
A	87	0.68	7.16	0.406

* Includes the offsite drainage designated C, because area C drains through Pond 1.

Note: Drainage areas are based on figure 7-5 and updated hydrology map and topography.

Determination of Peak Discharge from Off-Site Area A

The OSM Storm computer program was used to determine the peak discharges from the off-site area A, whose runoff is intercepted by the diversion shown on Figure 7-4 and Plate 7-2. Physical basin parameters were determined from topographic maps. The curve number of 87 was determined from the soil survey and vegetation characteristics. For the 10 year - 24 hour rainfall event, the highest peak discharge to be conveyed by the diversion was found to be 6.3 cfs.

Size of Diversion Channel

The diversion, shown on Figure 7-4, is intended to intercept and divert runoff from drainage A. It was excavated in the native soil, and is earth lined. Low velocities and regular maintenance serve to impede erosion. The channel is maintained with a minimum cross-sectional area of 4 ft^2. A typical diversion cross section is provided in Plate 7-3.

The length of the diversion is about 1,650 ft., and the elevation change along it is about 29 ft. The average slope of the channel is therefore about 0.0176.

Manning's formula was used to determine the adequacy of the channel. Manning's N, the roughness coefficient, was assumed to be 0.05.

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.

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
NORMAL FLOW		NORMAL FLOW		NORMAL FLOW	
2.49578998	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 = 6.3cfs 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

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, 7-5 & 7-6. 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. Runoff volume estimates for the various sub-areas are developed in Table 7-19.

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

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).

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 7-21
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 excluding 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 excluding static water level allowing for plant or thickener overflows.

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).

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

TABLE 7-24
TR-20 ANALYSIS OF POND OUTLETS FOR
25 YEAR - 24 HOUR RAINFALL EVENT

Pond Number	Peak Inflow cfs	Discharge Outflow cfs	Outflow Water Depth ft	Slope %	Velocity ft/sec
1	7.03	6.82	0.89	1.0	3.25
2	6.82	6.78	0.88	1.0	3.24
3	6.78	6.73	0.87	1.0	3.23
5	11.31	9.71	1.28	0.5	2.75
6	20.29	19.93	1.16	1.0	4.16

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

Plates 7-3, 7-4 & 7-5.

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 7-18.

SAVAGE COAL TERMINAL
SPILLWAY CALCULATIONS

PARAMETER	POND NO. 5	POND NO. 6
Q = Flow (cfs)	9.71	19.93
b = Bottom Width (ft.)	4.00	6.00
H = Depth of Flow (ft.)	0.85	1.05

Based on Broad-Crested Weir Formula $Q = 3.087\ b\ H^{1.5}$

Sediment Cleanout Determination

Each pond will be equipped with a sediment marker for determination of sediment level. The sediment pond markers will be checked on a quarterly basis to determine sediment levels.

When the sediment accumulation reaches the cleanout depths as listed below (60% of maximum sediment storage) measures will be implemented to clean the affected pond within 60 days, weather permitting, of the measurement.

Cleanout levels for each of the ponds are as follows:

POND NUMBER	*SEDIMENT DEPTH (UP FROM BOTTOM)
1	1.20'
2	1.20'
3	0.96'
5	1.14'
6	0.72'

* Corresponding to the Bolt Location as shown on Figure 7-15.

The results of the TR-20 analysis for a 25 year - 24 hour rainfall and the Fletcher-Farmer Rainfall Distribution are provided in Table 7-24. The analyses was performed for the pond full when the event occurred.

Based on the analyses summarized above, the structures are more than adequate to accommodate the peak discharge from a 25 year - 24 hour rainfall. In the rare event that a discharge overtops a structure, little damage or erosion should occur because the ponds are incised.

Each of the sediment ponds is equipped with an overflow structure with erosion protection. The overflows between Pond number 1, 2, 3 and 6 consist of grouted rip-rap and concrete. The overflow from Pond 5 is protected with 8" drainrock leading into a channel with a gradient of approximately 1% flowing into Pond 6. Sediment Pond 6 has concrete and rip=rapped inlet structures, and the overflow or emergency spillway is protected by 8" drainrock channeled into an open channel discharge. Sediment pond details (including overflows) are shown on Plates 7-3, 7-4 & 7-5.

Site Drainage Control

The TR-20 storm hydrology analysis performed to assess sediment pond outlet adequacies was also structured to permit assessment of collection ditch and culvert capacities. Storm hydrographs from each sub-drainage are routed through the culverts and ditches shown on Plate 7-2. Design dimensions and design discharges and velocities for the collection ditches are provided on Plate 7-5. Design dimensions to the culverts designated on Plate 7-2 are provided in Table 7-25. All designed analyses were performed for a 25 year - 24 hour rainfall event using the Farmer-Fletcher rainfall distribution.

B.T.C.A. Areas

There are 7 small areas located within the permit area which do not drain into the sedimentation ponds. Six of these areas have been designated as "Best Technology Currently Available" or "B.T.C.A." Areas, and are shown on Plates 7-2 and 1-1 of this M.R.P. In addition, the buried pipeline area is designated a "Small Area Exemption" as shown on Plate 1-1 and detailed in Appendix 7-1. The following is a description of each area along with the treatment used for sediment control:

(1) B.T.C.A. Area #1 - This is an area of approximately 0.69 acres located between the pump house access road and the railroad tracks. The area is blocked off by a berm and is mostly vegetated. The area drains to the north-east corner of the property where it joins the sediment pond #6 outlet ditch. A silt fence is maintained at the edge of the area for additional sediment control. The only runoff from this area is from direct rainfall, which is calculated to be 0.098 acre feet for a 10 year - 24 hour event (1.7 inches, NOAA, 1973). Treatment of runoff is by vegetative filter and silt fence. (Plate 7-2).

(2) B.T.C.A. Ara #2 - This is a small area of approximately 0.28 acres located between the railroad loop and loadout tracks. The area has minimal vegetation, and is covered mostly by railroad ballast (slag). The top of the ballast is approximately 1.25 feet at the low end. Based on the slight slope, approximately ½ of the area of 0.14 acres will contain runoff at an average depth of 0.625 feet, giving the area a potential storage volume of 0.088 acre feet. Since the only runoff to this area will be from direct precipitation, a 10 year - 24 or event would result in approximately 0.040 acre feet of runoff. The area is more than adequate to contain the expected runoff; therefore, the only treatment used for this area is total containment. (Plate 7-2).

(3) B.T.C.A Area #3 - This is an area along the east edge of the property between the main railroad spur track and the silo loadout track. The area contains approximately 0.85 acres, and slopes to the north, where any runoff is contained between the two sets of tracks. The track (ballast) height is approximately 1.50' on the low end. Due to the slope, only 1/4 of the area (0.22 acres) will contain runoff. This calculates to a potential storage volume of 0.165 acre feet for this area. Since the runoff from a 10 year - 24 hour event on this area is only 0.120 acre feet, the potential storage volume is more than adequate. Total containment is therefore the only treatment proposed for this area. (Plate 7-2).

(4) B.T.C.A. Area #4 - This is an area of approximately 0.521 acres surrounding the pump house at the northeast corner of the site. A ditch on the west side intercept runoff and directs it into Pond #6. The area is in a slight depression, and is protected by berms to contain runoff. B.T.C.A for this area is total containment, since the only runoff here is from direct rainfall. The potential runoff from a 10 year - 24 hour event on this area is approximately 0.074 acre feet. The potential containment area is calculated to be a minimum of 0.26 acre feet, which is based on ½ the area at a depth of 1 foot (due to the slight slope). The area is therefore more than adequate to contain expected runoff. (Plate 7-2).

(5) B.T.C.A. Area #5 - This is an area of approximately 0.86 acres, consisting of the outslope of the railroad loop south of the refuse pile from culvert C-1 to the "Y" in the railroad. This area drains along the toe of the railroad and passes through a silt fence and a vegetated area for treatment prior to entering the 24" CMP beneath the main railroad spur track. The potential runoff from a 10 year - 24 hour event is approximately 0.12 acre feet. Treatment is by vegetation and a silt fence as mentioned above. (Plate 3-2).

(6) B.T.C.A. Area #6 - This is the area surrounding the river pump located approximately 7,500' due north of the Northeast corner of the Savage Coal Terminal. The area is approximately 0.690 acres, and includes the well, pump, pump house and associated disturbance. The entire B.T.C.A. area is in a depression and does not drain. The treatment for this area is therefore, total containment. The potential containment area is calculated to be a minimum of 0.345 acre feet, which is based on ½ the area at a depth of 1 foot (due to slight slopes). The potential runoff from a 10 year - 24 hour precipitation event is from direct rainfall, and is calculated to be 0.098 acre feet. The area is therefore more than adequate to contain the expected runoff. (Plate 1-1).

(7) Small area Exemption #1 - This is the area consisting of the 20' Right-of-Way for the buried pipeline from the river pump to the northeast corner of the Savage Coal Terminal, as described in Chapter 1 and as shown on Plate 1-1 and detailed in Appendix 7-1. The entire area for exemption is approximately 20' wide by 10,000' long, or 4.59 acres. The exemption from siltation structures or alternate sediment control measures is based on R645-301-742.240, and the following:

(a) The pipeline was installed in 1977-1978, and is totally buried;

(b) The line passes beneath farm roads and cultivated (and uncultivated) farm lands, which are graded and/or plowed at the discretion of the farmers;

(c) The area above the line is naturally revegetated or cultivated except where it passes beneath or along the roads; therefore, no surface evidence of the line exists;

(d) The area is small compared to the 160 acre permit area;

(e) It is not practical to install surface sediment controls in this area, which is used for farmland and livestock grazing.

Refuse Pile Drainage

The drainage from the refuse pile has been upgraded to accommodate a 100 year - 6 hour event (1.91 inches). As a result of the revised storm design requirements, 2 ditches and one culvert have been re-designed. Collection ditch CD-13 is on the north end of the pile parallel to the road, and drains the north and west slopes of the pile. Collection ditch CD-7 is along the south and east side of the pile, between the pile and the railroad. This is generally a broad, well vegetated area, and drains the south and east slopes of the pile. Drainage from the top of the pile is controlled by berms, which prevent drainage down the slope, and direct it to the low point of the pile where it flows into a 24" flexible culvert. This culvert is shown on Table 7-25 "Culvert Design Specifications."

The following pages will summarize the methodology used in the ditch and culvert design.

A typical cross section of the refuse pile drainage channels is shown on Figure 7-11. Design details are summarized for each of the channels in Table 7-26. The channel design is based on the following criteria:

(1) 100 year - 6 hour precipitation event - 1.91 inches.

(2) OSM Hydrology Program, using SCS-TR55 method for Type II storms.

(3) Drainage areas taken from Plate 7-2.

(4) Slopes taken from Plate 7-2.

(5) Runoff curve number of 87 used as an average for the refuse area on Table 7-18 "Refuse Area".

(6) Manning's No. of 0.035 used for roughness coefficient.

(7) Critical velocity for erosion - 5 fps.

(8) Runoff based on rainfall-runoff equation

$$Q = \frac{(P-0.2S)^2}{P+0.8S} = 0.83; \text{ where}$$

$$S = \frac{1000}{CN} - 10; \; CN = 87; \; P = 1.91 \text{ in.}$$

TABLE 7-25
CULVERT DESIGN SPECIFICATIONS

Culvert	Design	Diameter	Length	Normal Depth	Velocity
C-1	0.81	1.0	30	0.45	2.38
C-1a	0.81	2.0	55	0.45	2.38
C-2	0.98	1.5	400	0.35	2.80
C-3	3.70	(2) 1.5	60	0.59	2.90
C-4	1.11	1.5	100	0.40	2.05
C-5	9.68	2.0	260	1.35	3.59
C-6	0.80	1.5	30	0.38	2.20
C-6A	0.80	2.0	300	0.38	2.20
C-7	10.56	2.0	40	1.43	4.40
C-8	0.77	1.5	60	0.38	2.20
C-9	1.44	1.5	50	0.51	2.70
C-10	11.97	2.0	40	1.60	4.44
C-12	5.11	1.5	40	1.11	3.64
C-13	5.11	1.5	130	1.17	4.73
C-13A	5.11	1.5	60	1.11	3.64
C-13B	5.11	1.50	100	1.11	3.64
C-15	20.50	2.0	30	2.87*	7.60*
C-16	1.34	2.0	350	0.45	2.10
C-17	0.80	1.5	160	0.46	2.20
C-18	0.80	1.5	100	0.46	2.20
C-19	0.22	1.0	50	0.28	1.19
C-20	0.22	1.0	50	0.28	1.19
C-21	1.11	2.0	200	0.34	2.05
C-22	13.88	2.0	175	2.10****	11.49
C-23	0.15	1.0	45	0.20	1.50
C-24	1.44	1.5	40	0.51	2.70
C-25	1.11	1.5	60	0.40	2.05
C-25A	1.11	1.5	50	0.40	2.05
C-26	1.44	1.5	50	0.51	2.70
C-27	1.44	1.5	50	0.51	2.70
C-28	1.44	1.5	50	0.51	2.70

* Head Water Depth = 3.50 ft.

*** Erosion to be minimized by the use of 9" med. diam. rip-rap at the culvert outlet.

**** Head Water Depth - 3.50 ft.

TABLE 7-26
REFUSE PILE DRAINAGE

Design Details			
Structure	CD-13	CD-7	C-22
Drainage Area (acres)	4.16	7.18	16.45
Precipitation: 100 year - 6 hour (inches)	1.91	1.91	1.91
Peak Discharge - Q100 (cfs)	5.20	8.98	13.88
Slope (%)	4.00	3.00	2.00
Bottom Width (feet)	0.00	2.00	24" cmp
Side Slope (H:V)	1:1	1:1	N/A
Manning's No.	0.035	0.035	0.024
Velocity (fps)	4.46	4.57	11.49
Runoff Curve No.	87	87	87
Rip-Rap Required (Y/N)	N*	N*	N*
Flow Depth (feet)	1.08	0.72	2.10
Time of Conc. (hours)	0.02	0.02	0.30

* Channels will be constructed within Mancos Shale or compacted refuse where erosive velocities are estimated at 6 fps or greater ("Applied Hydrology and Sedimentology for Disturbed Areas," Table 3-2, p. 162, Barfield, Warner & Haan, 1973). If erosion becomes evident, channels will be rip-rapped as necessary.

Jensen Property Berm

The constructed berm around the Jensen property provides for diversion of drainage from this area eastward along the railroad loop to the 24" culvert beneath the main line of the railroad at the southeast corner of the property. Cross-Section of the berm is shown on Figure 7-12, and location is shown on Plate 7-2.

The berm is more than adequate to divert the entire runoff from Area 5e shown on Figure 7-5 and described on Table 7-25, which shows an expected runoff of only 0.318 acre feet with a design peak flow of 0.81 cfs (Culvert C-1). Culvert C-1 will remain in place to divert drainage from the disturbed area remaining between the Jensen Property and the railroad loop.

742. Sediment Control Measures, See Section 741.

742.100. General Requirements.

742.110. Appropriate sediment control measures are designed, constructed and maintained using the best technology currently available to:

742.111. Prevent, to the extent possible, additional contributions of sediment to stream flow or to runoff outside the permit area; (See Section 741.)

742.112. Meet the effluent limitations under R645-301-751; and (See Section 741.)

742.113. Minimize erosion to the extent possible. (See Section 741.)

742.120. Sediment control measures include practices carried out within and adjacent to the disturbed area. See Section 741.

742.121. Sediment will be retained within the disturbed area. (See Section 741.).

742.122. See Section 741 and Plate 7-2 for details on undisturbed diversions.

742.123. See Section 741.

742.124. See Section 741.

742.125. N/A - There are no plans to treat runoff with chemicals.

742.126. N/A - This is a surface operation.

742.200. Siltation Structures.

742.210. See Section 741.

742.211. Additional contributions of suspended solids and sediment to streamflow or runoff outside the permit area will be prevented to the extent possible using the best technology currently available. (See Section 741).

742.212. All siltation structures have been constructed and certified.

742.213. N/A - Siltation structures are not designed to impound water.

742.214. N/A - This is a surface operation.

742.220. Sedimentation Ponds.

There are 5 sedimentation ponds on this site. See Plate 7-2 for location and Section 741 for design details.

742.221. Sedimentation ponds, meet the following criteria:

742.221.1. Sedimentation ponds are used both in series and individually. (See Plate 7-2).

742.221.2. All ponds are located within the disturbed area and none are within a perennial stream.

742.221.3. All ponds are designed, constructed, and maintained to:

742.221.31. Provide adequate sediment storage volume - See Section 741.

742.221.32. Provide adequate detention time - See Section 741.

742.221.33. Contain the 10 year-24 hour precipitation event - See Section 741.

742.221.34. Provide a nonclogging dewatering device adequate to maintain the detention time required under R645-301-742.221.32 - See Section 741.

742.221.35. Minimize short circuiting - See Section 741.

742.221.36. Provide periodic sediment removal - See Section 741.

742.221.37. Ensure against excessive settlement - See Section 741.

742.221.38. Be free of extraneous or toxic materials - See Section 741.

742.221.39. Be compacted properly - See Section 741.

742.222. N/A - Sedimentation ponds do not meet the size or other qualifying criteria of MSHA 30 CFR 77.216(a).

742.223. All ponds are equipped with an adequately sized open-channel spillway.

742.223.1. Spillways are lined with concrete or rip-rap.

742.223.2. N/A

742.224. N/A - Ponds have open-channel spillways.

742.225. N/A - No exception rquested.

742.230 Other Treatment Facilities

The only other treatment facilities on site are the B.T.C.A. areas and S.A.E. discussed in Section 741.

742.231 B.T.C.A. areas and S.A.E. are designed to treat or contain runoff from a 10 year - 24 hour precipitation event.

742.232 See Section 741.

742.240 N/A - No exemptions are requested with the exception of the B.T.C.A. areas and S.A.E. discussed in Section 741.

742.300 Diversions are discussed in detail in Section 741.

742.310 Undisturbed diversions are noted with a UD-n number. Disturbed area diversions or collection ditches are noted with a CD-n number. All diversions are shown on Plate 7-2.

742.311 N/A

742.312 Diversion designs are detailed in Section 741 and on Figure 7-13.

742.312.1 Diversions are designed to be stable. The majority of the existing diversions have been in place for over 25 years with no instability problems.

742.312.2 Diversions provide protection against flooding and resultant damage to life and property. See Section 741.

742.312.3 Diversions are designed to prevent, to the extent possible using the best technology currently available, additional contributions of suspended solids to streamflow outside the permit area. (See Section 741).

742.312.4 Diversions have been constructed with Division and O.S.M. approval, and comply with applicable local, Utah and federal laws and regulations.

742.313 All diversions are considered temporary, and will be removed and reclaimed during final site reclamation.

742.314 N/A

742.320 N/A - There are no perennial or intermittent streams at this site.

742.321 N/A

742.322 N/A

742.323 N/A

742.324 N/A

742.330 Diversion of Miscellaneous Flows

742.331 Diversion of miscellaneous flows on this site consist of the main undisturbed diversion UD-1 to divert undisturbed runoff around the disturbed area, and the French Drain to divert ground water. These diversions are discussed in detail in Sections 741 and 731.

742.332 See Plate 7-2 and Sections 731 and 741.

742.333 The undisturbed diversion is sized to carry runoff from a 10 year - 24 hour precipitation event.

742.400 Road Drainage

742.410 All roads on site are considered primary roads, and are constructed with appropriate drainage controls.

742.411 Portions of the main haul roads on site are now paved, with the remaining roads gravel surfaced and treated with magnesium chloride. All ditches and culverts have been designed and approved in accordance with Diversion criteria.

742.412 N/A - No roads are within the channel of an intermittent or perennial stream.

742.413 Runoff from all roads is collected in sediment ponds to prevent sedimentation and flooding.

742.420 All roads on site are considered primary roads.

742.421 All roads are located on stable surfaces, and all haul roads are paved or gravel-surfaced.

742.422 N/A - There are no stream fords at this site.

742.423 Drainage Control. Drainage control for all roads consists of a combination of adequately sized ditches and culverts, as shown on Plate 7-2.

742.423.1 Drainage controls for all roads are sized to carry the peak runoff from a 10 year - 24 hour precipitation event. (See Section 741).

742.423.2 Drainage pipes and culverts are constructed to avoid plugging or collapse and are equipped with erosion protection wherever needed.

742.423.3 See Section 741 for design details on drainage ditches.

742.423.4 N/A - No natural stream channels are altered or relocated at this site.

742.423.5 N/A - There are no stream channel crossings at this site.

743 Impoundments.

743.100 All impoundments at this site are considered temporary.

743.110 N/A - There are no impoundments meeting the criteria of MSHA, 30 CFR 77.216(a).

743.120 See Section 741 for impoundment design.

743.130 All impoundments are equipped with a single open-channel spillway.

743.131 Open-channel spillways are approved by the Division, and are constructed of grouted rip-rap, or are earth-lined and vegetated and carry infrequent flows at non-erosive velocities.

743.132 N/A.

743.140 Impoundments are inspected quarterly and certified on an annual basis in accordance with R645-301-514.300.

743.200 N/A - All impoundments are temporary.

743.300 All impoundments are equipped with spillways sized to carry runoff from a 25 year - 6 hour precipitation event. (See Section 741).

744 Discharge Structures.

744.100 Discharges from ponds, culverts or diversions are considered non-erosive at less than 5 feet per second. Whenever, calculations or site conditions indicate erosive velocities, outlets are protected by grouted rip-rap or rip-rap as described in Section 741.

744.200 See Section 741.

745 N/A - There is no excess spoil generated at this operation.

745.100 N/A - No excess spoil.

745.200 N/A - There are no valley or head of hollow fills.

745.300 N/A - No durable rock fills.

745.400 N/A - No pre-existing benches or excess spoil.

746.100 The only coal mine waste generated at this site is in the form of cleanout material from ditches and sediment ponds. Prep plant reject is hauled to the plant operator's approved site.

746.110 All coal waste is placed in the existing, approved refuse pile.

746.120 Coal waste is placed in the refuse pile and treated as refuse.

746.200 Savage Coal Terminal has an MSHA approved refuse pile which is still considered active. Design and operation details of the pile are described in Chapter 5.

746.210 The refuse pile is approved by both the Division and MSHA, and meets all applicable regulations as described in Chapter 5.

746.211 N/A - The refuse pile does not contain springs, water courses or seeps and is not constructed with underdrains.

746.212 The top of the refuse pile is surrounded by a berm to prevent uncontrolled runoff from the outslopes of the pile. The perimeter of the pile is also drained by diversion ditches sized to carry the runoff from the pile from a 100 year - 6 hour precipitation event, as required.

746.213 N/A - There are no underdrains.

746.220 The refuse pile is constructed by an approved plan which provides for stability through adequate compaction and drainage control.

746.221 The refuse pile is considered active and still under construction (and/or removal as discussed in Chapter 5); therefore, slopes and diversions have not been revegetated at this time.

746.222	N/A - No impoundments are planned on the refuse pile.
746.300	N/A - No impounding structures are constructed of coal mine waste.
746.400	N/A - There are no plans to return coal processing waste abandoned underground workings.
747	Non-coal mine waste is collected, stored and disposed of as described in Section 528.330.
747.100	See Section 528.330.
747.200	See Section 528.330.
747.300	See Section 528.330.
748	All decommissioned water monitoring wells have been plugged and sealed as approved by the Division. The 2 existing water monitoring wells, French Drain collection sump and river pump well are shallow, water systems. They will be reclaimed according to the approved plan as described in Section 540 of this permit.
750	All coal mining and reclamation operations will be conducted to minimize disturbance to the hydrologic balance within the permit and adjacent areas, to prevent material damage to the hydrologic balance outside the permit area and support approved postmining land uses in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302.
751	Discharges or water from areas disturbed by coal processing and reclamation operations will be made in compliance with all Utah and federal water quality laws and regulations and with effluent limitations for coal mining promulgated by the U.S. Environmental Protection Agency set forth in 40 CFR Part 434. (See approved UPDES Permit).

752 Sediment control measures are located, maintained, constructed and will be reclaimed according to plans and designs given under R645-301-312.240, R645-301-732, R645-301-742 and R645-301-760.

753 See Section 741.

754 See Section 528.

755 See Section 748.

760 Reclamation is discussed in Section 540 of this M.R.P.

761 Reclamation will be performed as per Sections 540 and 550

762 All roads will be removed and reclaimed during final reclamation.

763 Siltation structures will remain in place as described in Section 540, until removal by the Division.

764 See Section 540 for reclamation timetable.

765 See Section 540 and 748 for details on sealing of wells.

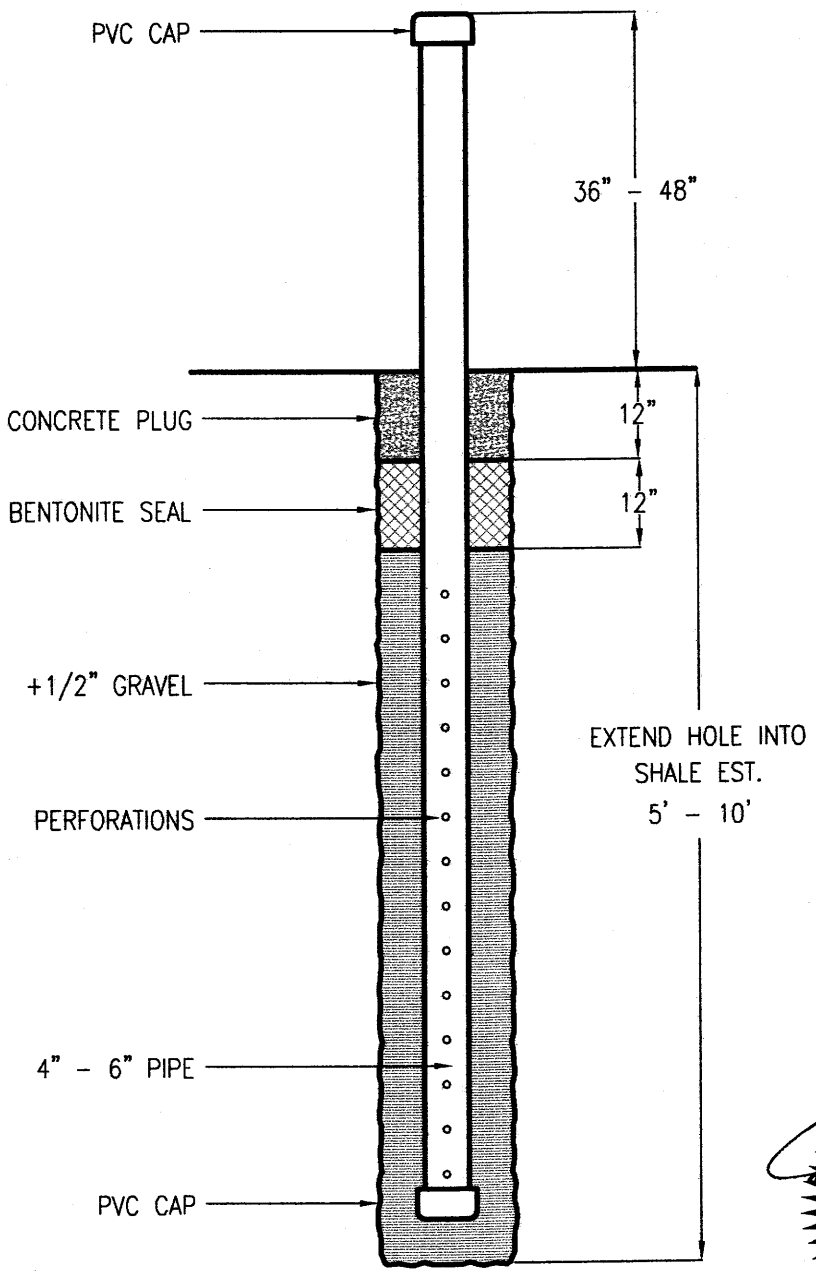
References

[1] "Utah Climate", by Gaylene L. Ashcroft, Donald T. Jensen and Jeffrey L. Brown, Utah Climate Center, Utah State University, 1992.

[2] Utah Power & Light Company, 1974: Emery Generating Station Applicants Environmental Analysis - Volume II. Salt Lake City, p. 50.

SAVAGE COAL TERMINAL
MONITORING WELL DESIGN

(NOT TO SCALE)



TYPICAL GROUND WATER MONITORING WELL

FIGURE 7-1

FIGURE 7-2
CHEMICAL ANALYSIS
PRICE RIVER

MINING AND RECLAMATION PLAN

Ford Chemical LABORATORY, INC.

Bacteriological and Chemical Analysis

40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

RECEIVED
EFFECTIVE:
SEP 13 2007
UTAH DIVISION OIL, GAS AND MINING
PRICE FIELD OFFICE

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

Ford Chemical Laboratory, Inc.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

FIGURE 7-3
CHEMICAL ANALYSIS
CARBON CANAL

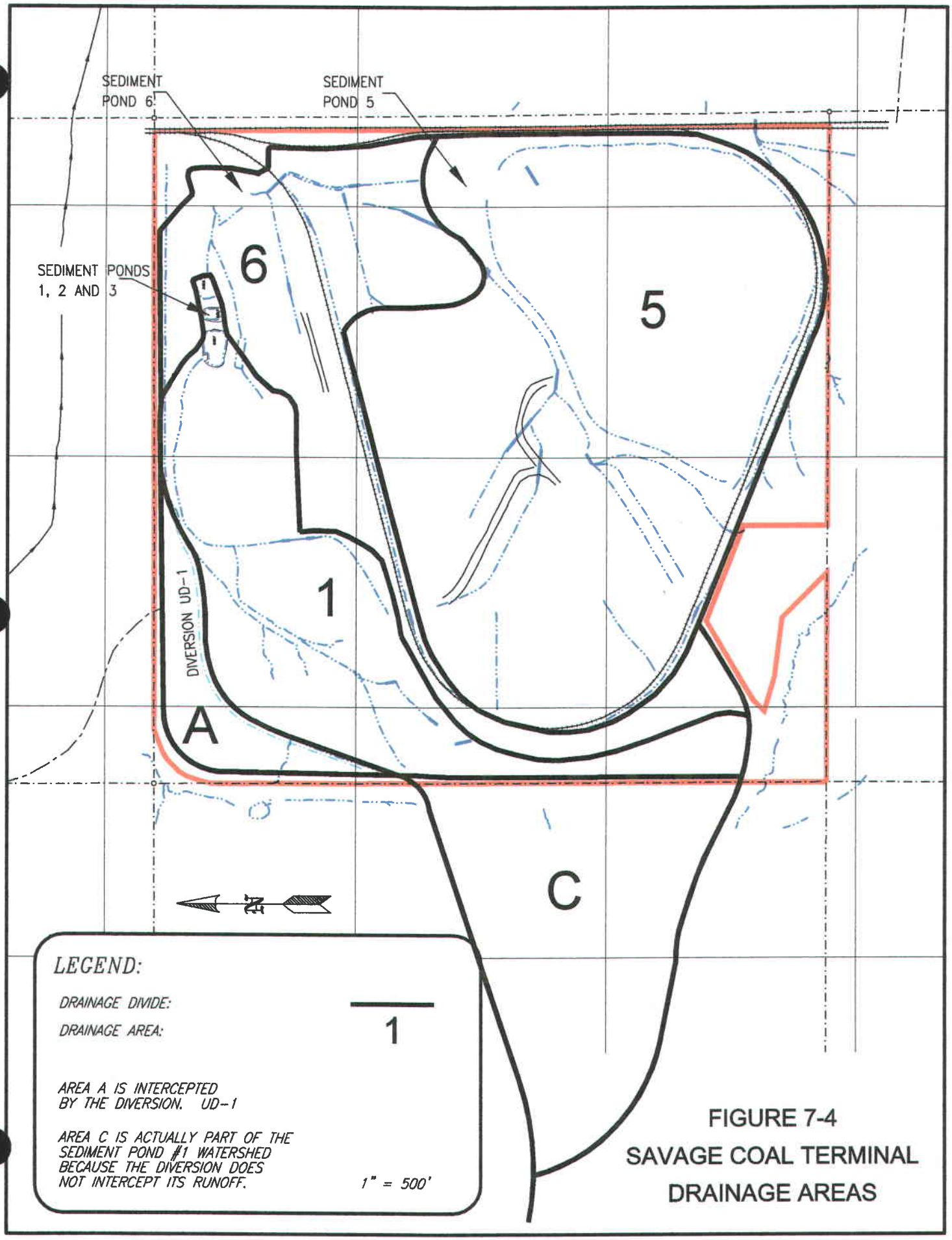
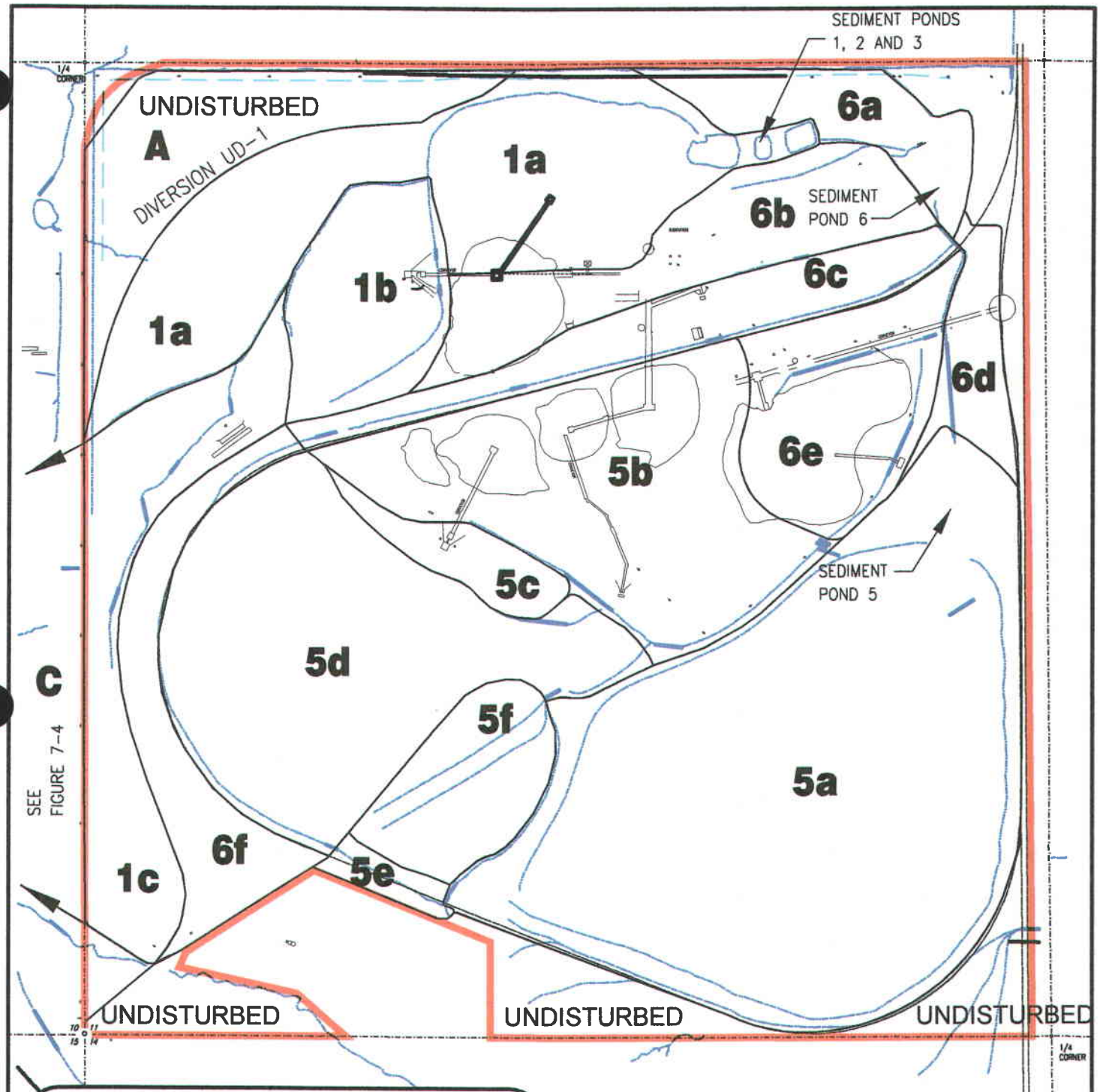


FIGURE 7-4
SAVAGE COAL TERMINAL
DRAINAGE AREAS



LEGEND:

SUBDRAINAGE BOUNDARY: ———

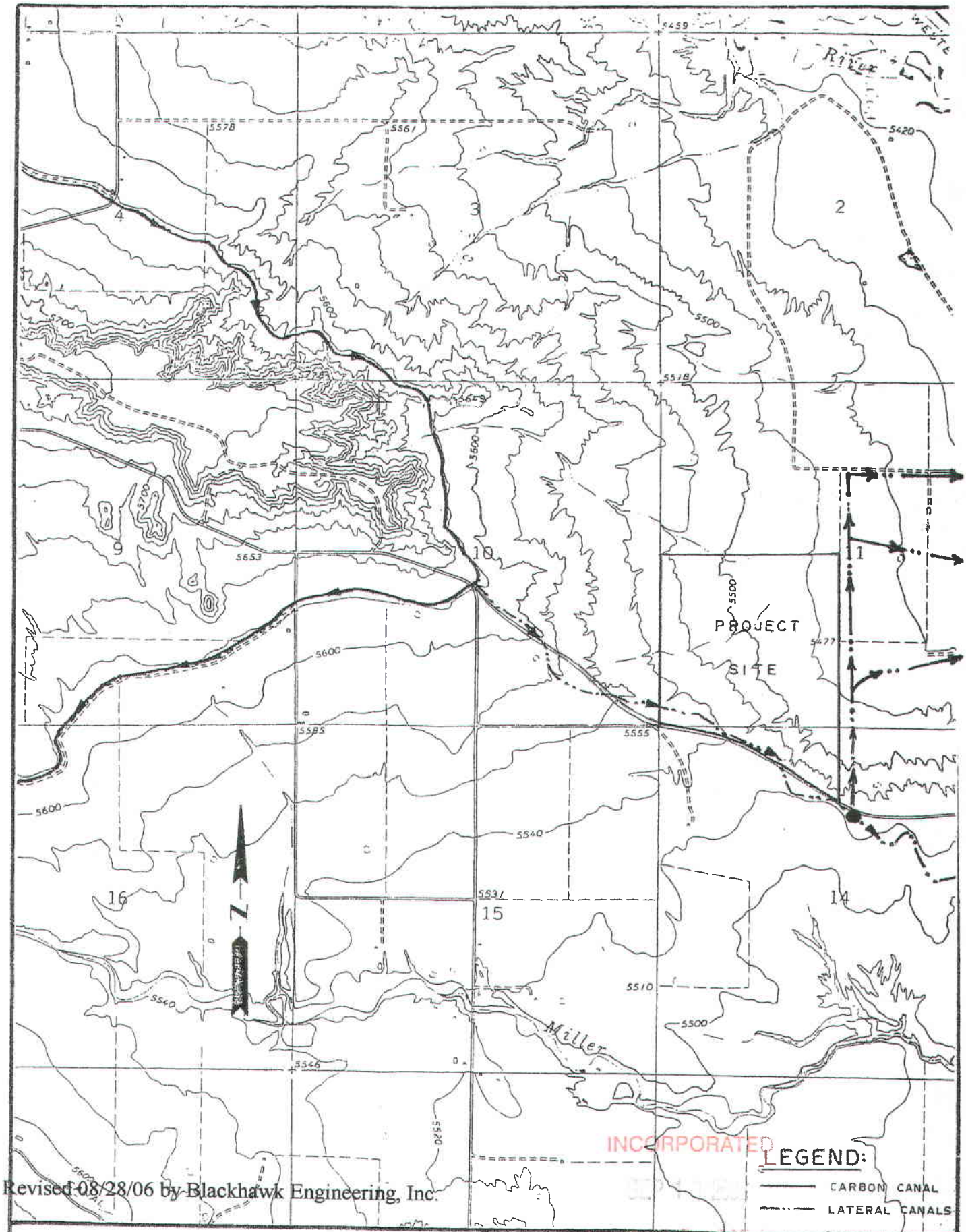
SUBDRAINAGE AREA: **1a**

All areas starting with 1 drain into Sediment Pond No.1, all areas starting with 5 drain into Pond 5, etc. Area 1c includes Undisturbed Area C.

N

1"=400'

FIGURE 7-5
SAVAGE COAL TERMINAL
AREA SUBDRAINAGES



Revised 08/28/06 by Blackhawk Engineering, Inc.

ROLLINS, BROWN & GUNNELL, INC. CONSULTING ENGINEERS	LOCATION OF IRRIGATION CANALS ● Irrigation Intake	FIGURE 7-6

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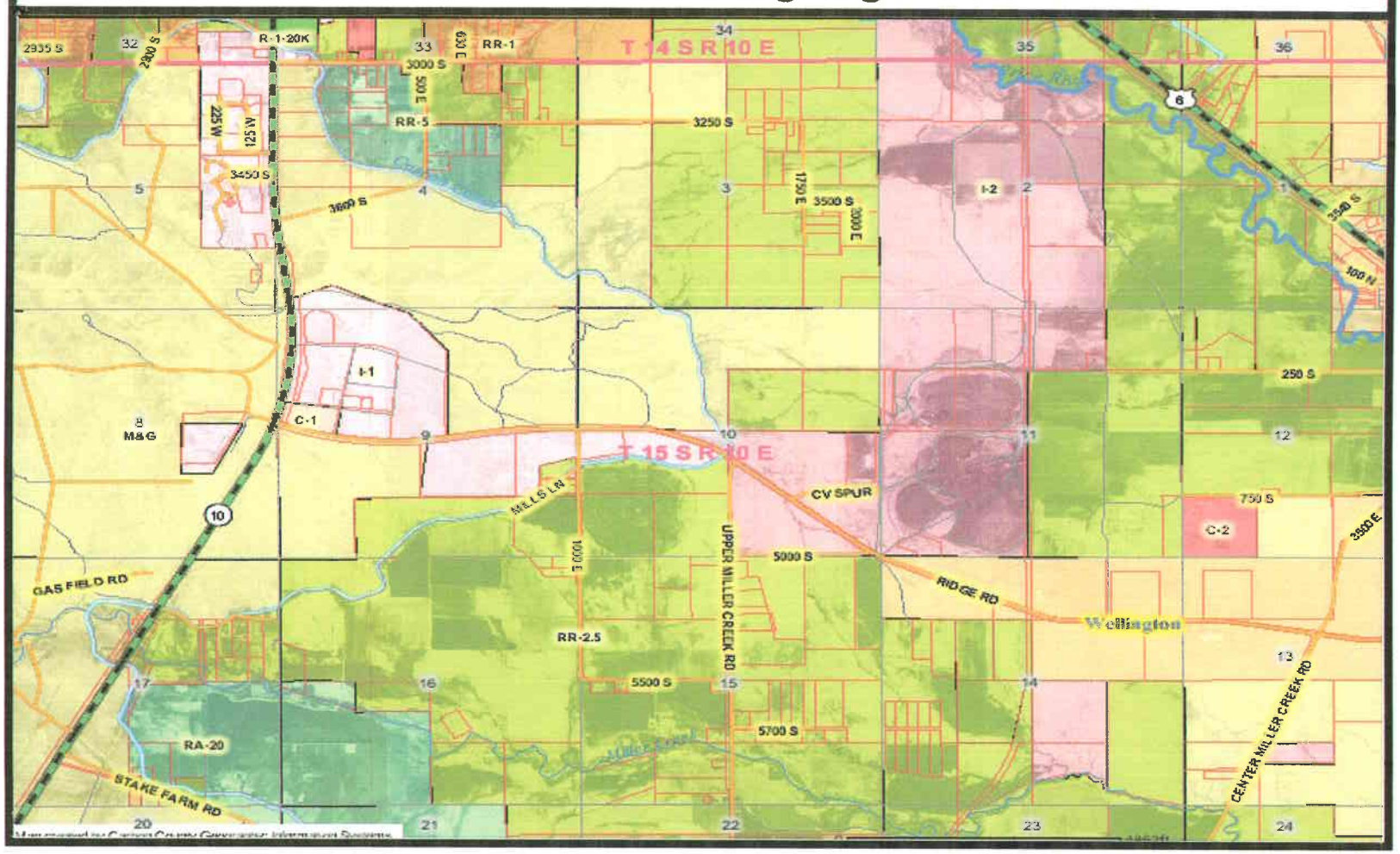
AUG 3 1 2006
INCORPORATED
Div. of Oil, Gas & Mining

AVF and Zoning Figure

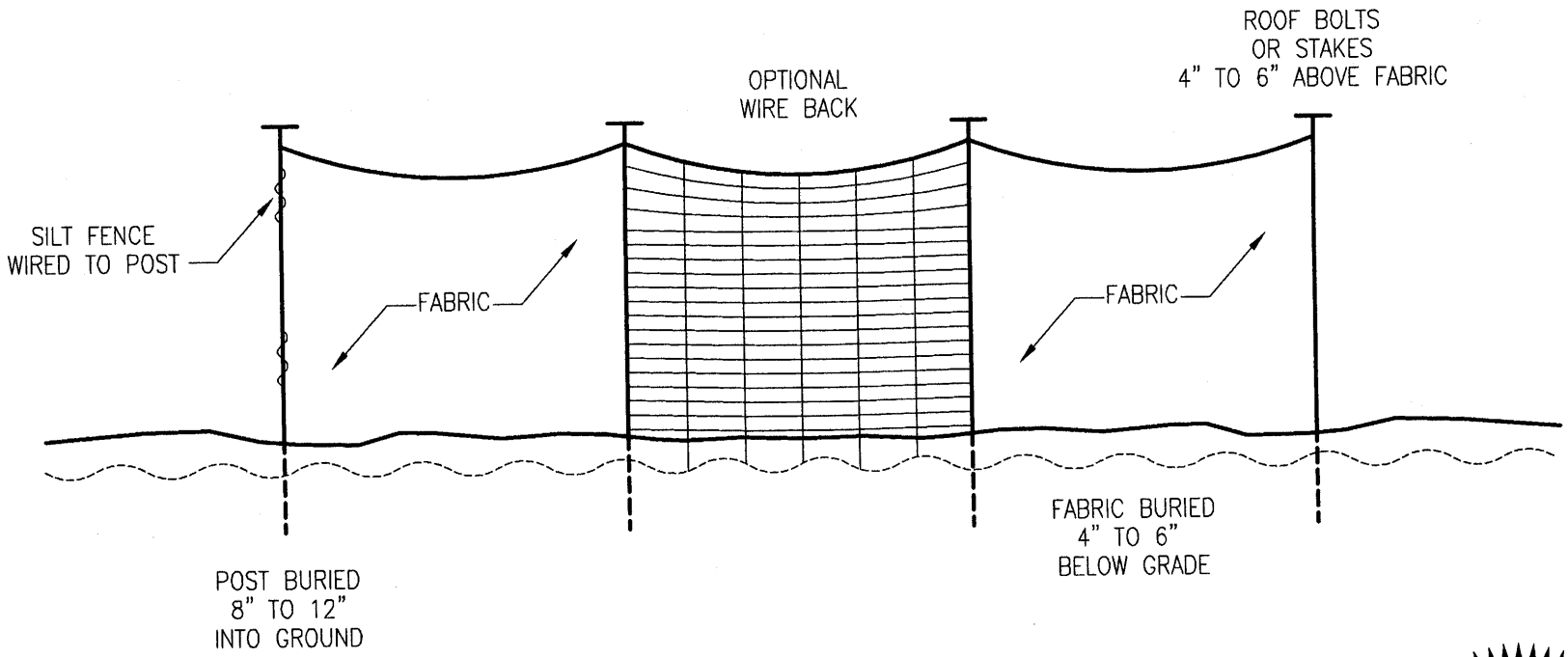


I-2		Heavy Industrial Zone
RR-2.5		Rural Residential 2.5 Acre Zone
M&G		Mining and Grazing Zone

Figure 7-7

SAVAGE COAL TERMINAL
TYPICAL SILT FENCE

(NOT TO SCALE)



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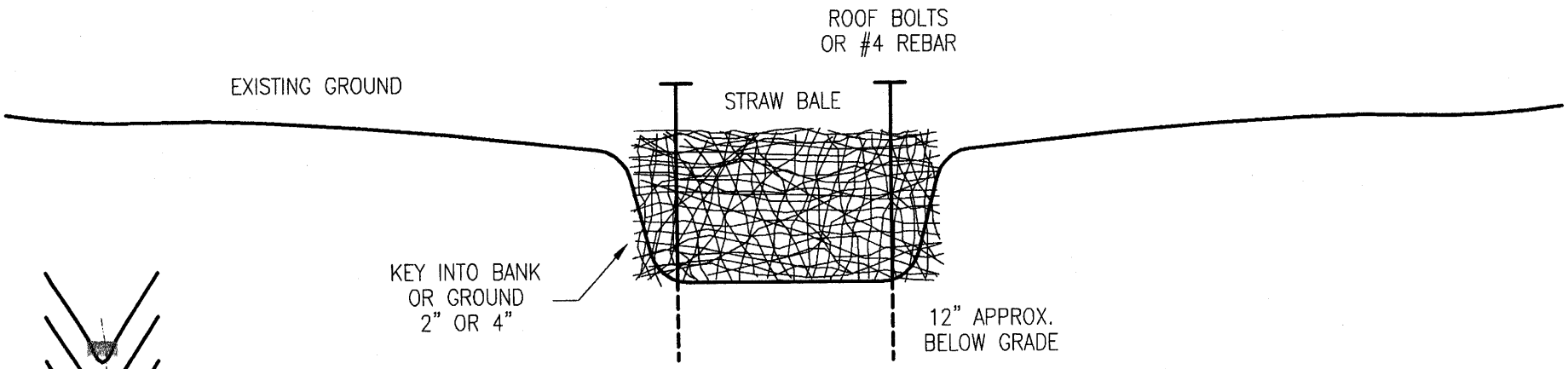
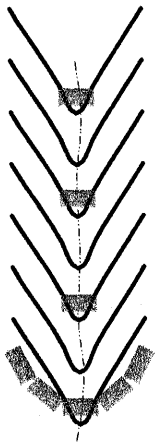
PROFESSIONAL ENGINEER

FIGURE 7-8

SAVAGE COAL TERMINAL
TYPICAL STRAW BALE INSTALLATION

(NOT TO SCALE)





SPACING DEPENDENT
UPON GRADE

BALES PLACED IN SERIES

NOTE: STRAW BALES MAY ALSO BE USED AS BERMS WHERE NEEDED.

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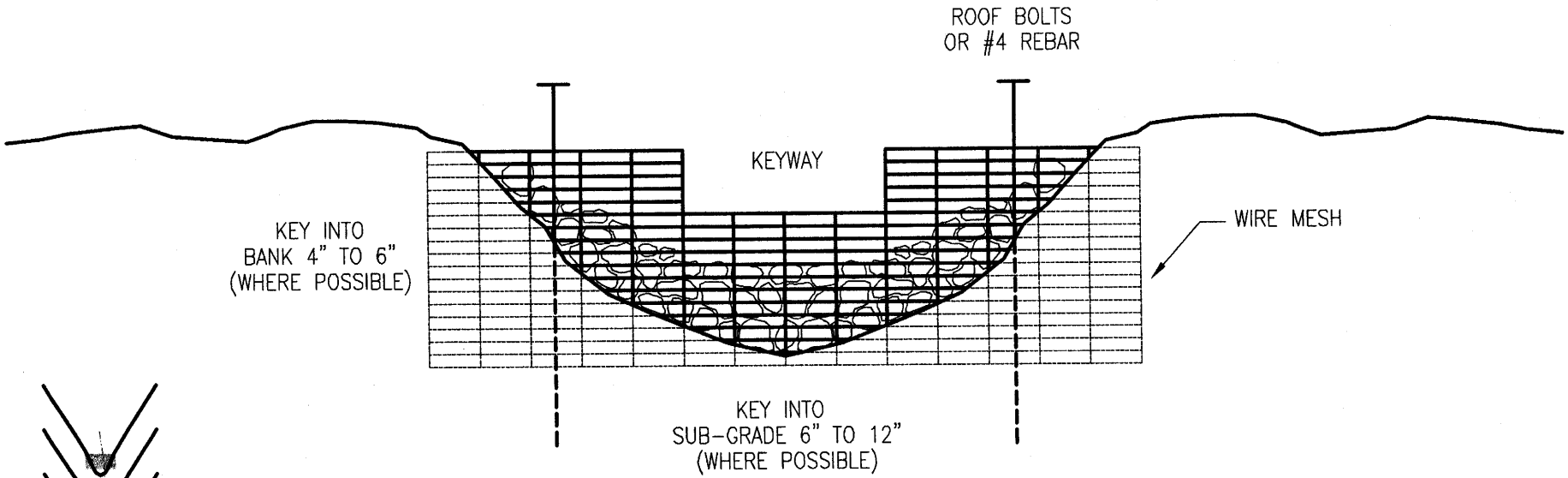
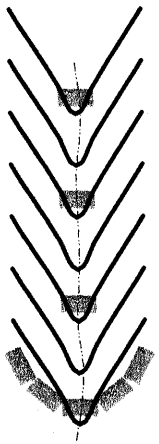
FIGURE 7-9

SAVAGE COAL TERMINAL
TYPICAL WIRE GABION

(NOT TO SCALE)





SPACING DEPENDENT
UPON GRADE

BALES PLACED IN SERIES

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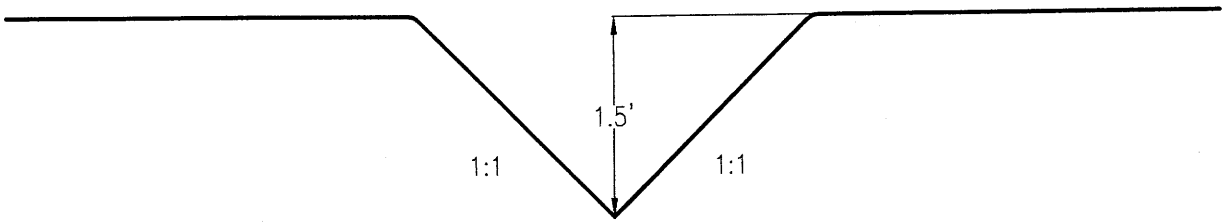
FIGURE 7-10

SAVAGE COAL TERMINAL
REFUSE PILE DRAINAGE CHANNELS

(NOT TO SCALE)



TYPICAL CROSS-SECTION
CD-7 and CD-13

NOTE:

DITCH CONFIGURATION MAY VARY; HOWEVER, DITHCES WILL BE MAINTAINED WITH A MINIMUM CROSS-SECTIONAL AREA OF 2.25 SQUARE FT. DIMENSTIONS FOR CONSTRUCTION PURPOSES ONLY.

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FIGURE 7-11

SAVAGE COAL TERMINAL
JENSEN PROPERTY BERM

(NOT TO SCALE)

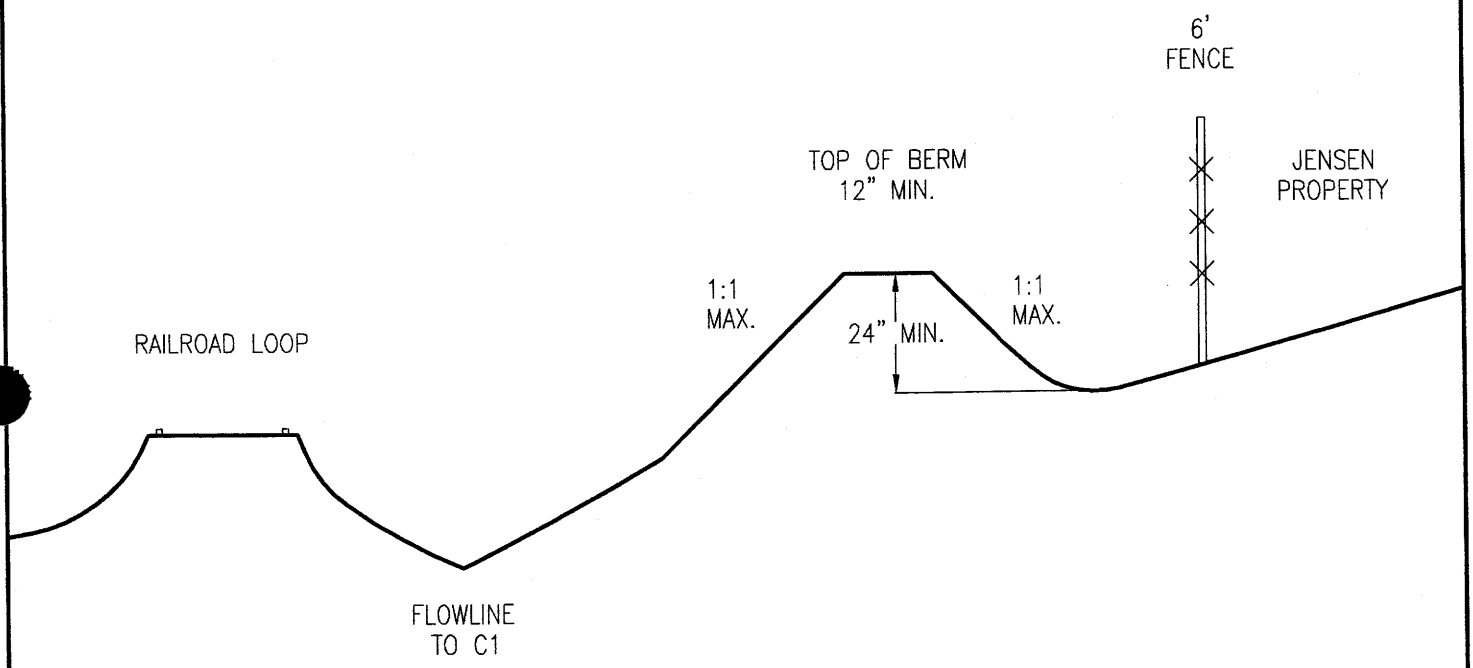

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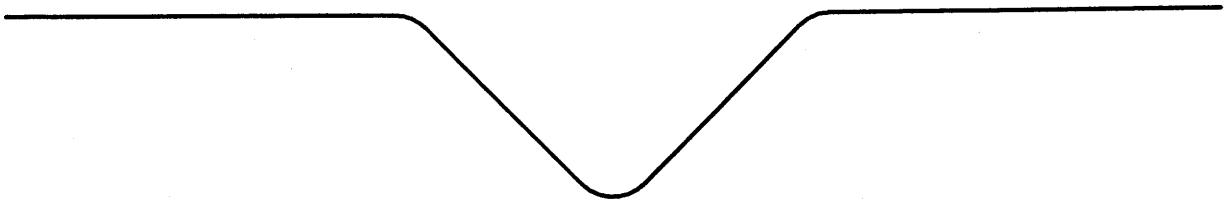
FIGURE 7-12

SAVAGE COAL TERMINAL
TYPICAL COLLECTION DITCHES

(NOT TO SCALE)

DITCH	MINIMUM X-SECTION AREA FT2	LENGTH AREA FT.	SLOPE %	NORMAL DEPTH FT.	DESIGN VELOCITY FT/SEC	DESIGN DISCHARGE
CD-1	3.00	200	3.0	0.26	2.97	1.64
CD-2	3.00	180	0.5	0.54	2.75	0.80
CD-3	1.50	600	1.8	0.23	2.00	0.57
CD-4	3.00	220	2.5	0.70	4.55	7.03
CD-5	1.50	170	3.5	0.23	2.82	0.82
CD-6	1.50	1440	1.8	0.79	3.83	5.47
CD-7	2.25	2600	3.0	1.40	4.61	8.98
CD-8	1.50	800	2.0	0.56	3.39	2.93
CD-9	1.50	340	1.2	0.86	3.27	5.26
CD-10	1.50	1600	2.0	0.26	2.29	0.77
CD-11	3.00	225	1.0	1.08	3.58	10.48
CD-12	3.00	180	0.5	0.46	1.62	1.44
CD-8A	1.50	630	2.0	0.59	2.30	0.80
CD-13	2.25	1500	4.0	1.08	4.46	5.20



TYPICAL CROSS-SECTION

NOTES:

1. COLLECTION DITCHES ARE EARTH-LINED.
2. DITCH CONFIGURATIONS MAY VARY; HOWEVER, DITCHES WILL BE MAINTAINED AT MINIMUM X-SECTION AREAS AS SHOWN ABOVE.

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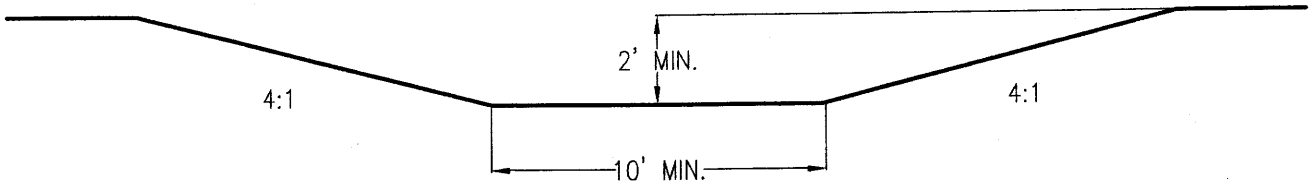
FIGURE 7-13

SAVAGE COAL TERMINAL
RECLAIMED CHANNEL

(NOT TO SCALE)



TYPICAL CROSS-SECTION

NOTE:

DITCH CONFIGURATION MAY VARY; HOWEVER, DITHCES WILL BE MAINTAINED WITH A MINIMUM CROSS-SECTIONAL AREA OF 15 SQUARE FT. DIMENSTIONS FOR CONSTRUCTION PURPOSES ONLY.

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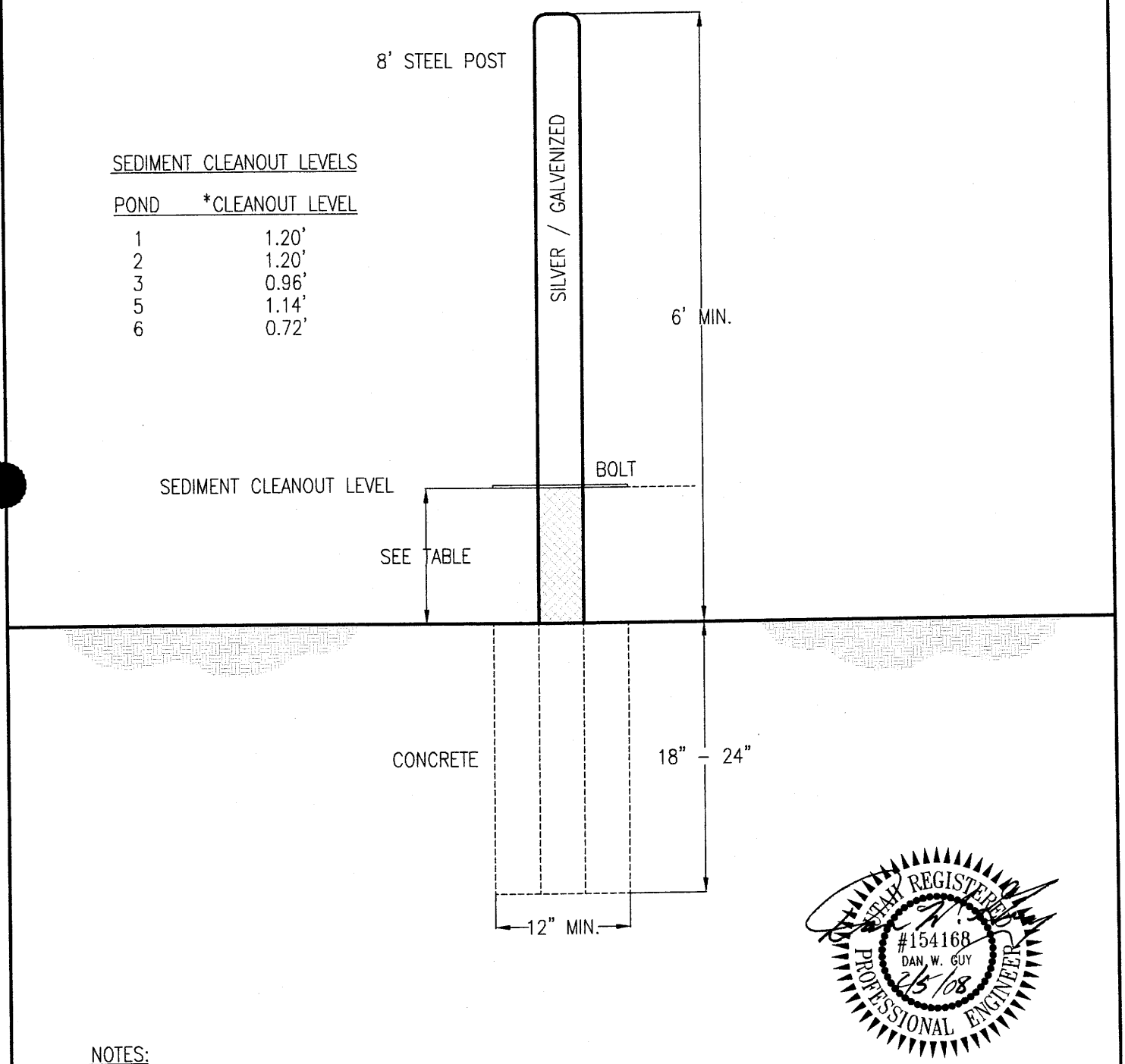
FIGURE 7-14

SAVAGE COAL TERMINAL
SEDIMENT MARKER

(NOT TO SCALE)



SEDIMENT CLEANOUT LEVELS

POND	*CLEANOUT LEVEL
1	1.20'
2	1.20'
3	0.96'
5	1.14'
6	0.72'

NOTES:

* DETERMINED BY BOLT LOCATION. SEDIMENT DEPTH MAY VARY AFTER CLEANING OF PONDS.

FIGURE 7-15

Appendix 7-1

Small Area Exemption

River Pump/Pipeline

Savage Services Corporation
Savage Coal Terminal

May 26, 1994

EarthFax

EarthFax
Engineering Inc.
Engineers/Scientists
7324 So. Union Park Ave.
Suite 100
Midvale, Utah 84047
Telephone 801-561-1555
Fax 801-561-1861

Kathleen G. Welt
Mountain Coal Company
P.O. Box 591
Somerset, Colorado 81434

Subject: Sediment Analysis of C.V. Spur Facility

Dear Kathleen:

The purpose of this letter is to compare the erosion potential from the disturbed area of the C.V. Spur River Pump Pipeline System, under existing conditions, to that of the pre-disturbed area. The Utah Division of Oil, Gas & Mining (DOGM) requested a detailed sediment analysis of the C.V. Spur Pipeline to evaluate the potential for erosion under existing site conditions. Due to the nature of the disturbance, I am not convinced a detailed analysis is required. It is my intent to evaluate the information required for a detailed sediment analysis and determine the deviations between the undisturbed and existing conditions of the C.V. Spur Pipeline within the disturbed area boundary.

The C.V. Spur Pipeline was installed in 1977. The actual disturbance consists of a single trench which contains two pipelines. The length of the disturbance is approximately 10,000 feet, and it crosses portions of farm roads, pasture, cultivated areas, undisturbed areas, and railroad facilities. The width of the trench disturbance is only 30 inches; however, a 20-foot right-of-way was assumed for the disturbed area boundary. The disturbed area was revegetated after the pipeline was installed, and the vegetation is well established under existing conditions.

For the purpose of this discussion, it is assumed that the surface backfill material in the trench is the native material removed from the trench during construction. In addition, it is assumed that the area was re-graded to the approximate original contours after the pipeline was installed.

The information required to perform a detailed sediment analysis using SEDCAD or a similar software consists of hydrologic data and sediment data. The information required to determine the runoff volume and peak flow for the design watershed includes:

- Curve number
- Watershed slope
- Watershed area
- Hydraulic length of watershed
- Design storm and rainfall distribution

In evaluating the hydrologic data for an analysis, the determination of the curve number is the most sensitive piece of information. The curve number for a watershed is determined by evaluating the watershed surface characteristics based on soils and vegetative type. Since

the soils for the disturbed and undisturbed areas are assumed to be the same, the vegetative cover is of primary concern in the curve number determination. The total ground cover (includes vegetation and litter) is used to determine the appropriate curve number. The results of a recent vegetative study conducted by Environmental Industrial Services reported the total ground cover for the disturbed area (under existing conditions) to be 82.3%, and the total ground cover for the undisturbed (reference) area to be 79.3%. The vegetative type identified in both areas consisted primarily of forbs. From this analysis, it is expected that the curve number, although not determined, would be slightly lower for the disturbed area under existing conditions because it had a greater total ground cover.

The watershed characteristics (i.e., area, slope, hydraulic length) for the undisturbed watershed would be the same as those for existing conditions since it is assumed that the disturbed area was re-graded to the approximate original contours. In addition, the design storm and rainfall distribution would be the same for both undisturbed and existing conditions. Therefore, it is expected that the runoff volume and peak flow would be less under existing conditions than for undisturbed conditions due to the lower curve number.

The information required to determine sediment volumes, using the Revised Universal Soil Loss Equation, includes:

- Runoff volume and peak flow (determined from hydrology calculations)
- Soil erodibility factor
- Sediment particle size distribution
- Land-slope factor
- Control-practice factor

In determining the sediment yield for the undisturbed and existing watersheds, the soil erodibility factor is critical. This factor is a numeric representation of the ability of the soil to resist the erosive energy of rain. The soil erodibility factor is independent of slope, and dependent only upon particle size and distribution, structure, void space and pore size, and organic matter. The particle size distributions of the undisturbed and disturbed conditions are assumed to be the same, since the trench was backfilled with the native material excavated during construction. It is possible that the structure of the compacted soil in the trench is different than the native material; however, it is probable that greater compaction was achieved within the trench during backfill operations which would provide the soils a greater resistance to erosion. Thus, it is conservatively assumed that the soil erodibility factor is equal for both undisturbed and existing conditions.

The land-slope factor is a multiplier which accounts for the topography of the surface under evaluation. It is assumed that the land-slope factor is the same for both undisturbed and existing conditions because it is assumed that the disturbed area was re-graded to the approximate original contours.

The control-practice factor is a ratio of sediment loss from an area with a given cover and conservation practice to that of a field in continuous fallow. Since the total ground cover under the existing conditions is slightly greater than that of the undisturbed area, and assuming an equal conservation practice for both conditions, it is expected that the control-practice factor for the existing conditions would be slightly lower than for the undisturbed area.

In summary, it is expected that the sediment yield from the disturbed area of the C.V. Spur Pipeline, under existing conditions, would be slightly less than the sediment yield of the same area before it was disturbed. This conclusion is based primarily on the results of the vegetative study, which indicated that the total ground cover was slightly greater under existing conditions. The greater ground cover will result in a lower curve number determination, and thus a lower runoff volume and peak flow. In addition, the greater ground cover will result in a lower control-practice factor. Both of these effects will, analytically, result in a lower sediment yield from the existing site.

It has been a pleasure to provide this discussion for you. If you have any questions or need additional information, please contact me.

Sincerely,

Carol A. Bjork

Carol A. Bjork, P.E.
Civil Engineer

cc: Dan Guy, Blackhawk Engineering

MOUNTAIN COAL COMPANY: CV SPUR WATERLINE ROW GROUND COVER ASSESSMENT

MAY 11-12, 1994
PERFORMED AND PREPARED BY
ENVIRONMENTAL INDUSTRIAL SERVICES

INTRODUCTION

The analysis detailed within this report was conducted by Environmental Industrial Services (EIS) for Mountain Coal Coal Company on May 11-12, 1994. The purpose of this assessment was to determine ground cover similarity of a water line right-of-way (ROW) to the relatively undisturbed area bordering the ROW. The level of disturbance present in the vicinity of the study site is quite extensive; therefore, this study's determinate degree of "disturbance" is relative only to the ROW. Grazing and farming disturbances limited assessment in and around the length of the ROW to approximately 78,000 square feet. This prevented any sort of significant analysis for more than 100,000 square feet of ROW underlying irrigated alfalfa fields and grazed pasture.

METHODS

Eight (8) transects were established for assessment of ground cover. Four (4) transects were randomly established along the length of the twenty (20) foot wide ROW using a random number generator. Actual lateral location of a particular transect within the ROW was established by the same random number generator. Four (4) transects were established near each ROW transect in relatively undisturbed areas. The transects established in these areas were used as a reference on which to qualitatively determine any difference in percentage of ground cover for the disturbed ROW and the undisturbed sites. Reference transects were established whenever ground cover type was ocularly determined to change (>50 percent community difference).

A modified ten-point frame was used to acquire actual sample points along each one hundred (100) foot transect. Ten (10) sample points were gathered on each side of the transect at every 20 foot increment. Points gathered were classified into litter, bare ground, rock, or vegetation. Vegetation was grouped into grass, forb, or shrub. Four hundred (400) points were gathered for disturbed (ROW) sites. The same was done for reference sites.

Points acquired for each respective grouping were compared to determine similarity. Points for disturbed and reference areas were compared as follows:

$$\frac{\text{Group Cover A}}{\text{Group Cover B*}} = \text{percent similarity}$$

* Where Cover B is determined to be larger value

Percent total cover similarity was determined with this same method. Litter and total living vegetation was lumped together to determine percent similarity between the disturbed and reference (undisturbed) sites.

RESULTS

Total vegetation cover similarity of the disturbed ROW and surrounding undisturbed reference sites was determined to be 74.2% (25.8% difference). Bare ground similarity was 85.5% (14.5% difference), while litter cover similarity was 66.5% (33% difference). Total ground cover similarity was 96.4% (3.6% difference).

Vegetation cover percentage was higher in the undisturbed reference sites (48.5% vs. 36.0% for disturbed sites). Total cover, however, was higher in the disturbed ROW sites (82.3% vs. 79.3% for reference sites). Litter cover was quite extensive for all ROW sites (33.5% higher than undisturbed sites). See TABLE 1 and 2 for this data.

Vegetation type similarity differed widely between the two areas. Grasses were far more abundant along all undisturbed transects and little similarity existed (78.1% difference). Forbs and shrubs were relatively similar for both areas (82.8% and 71.4% respectively). Individual plant similarity of each area varied, favoring the undisturbed area (See TABLE 3 and 4).

DISCUSSION

Though the sample size is too small to obtain any quantitative treatment, a qualitative assessment of cover similarity can readily be obtained. Analysis of points sampled allow us to determine inherent similarities and differences for community sites along the ROW. Although vegetation percentages for ground cover was higher in undisturbed areas, the high similarity between sites for total ground cover (litter and vegetation) leads us to believe that substantial ground cover is present to impede most erosional impacts. Areas not sampled because of use for farmland and grazing have extensive ground cover that contribute to its ability to resist erosional impacts. Therefore it is in our opinion that the pipeline ROW has sufficient ground cover to be exempt from any sort of additional erosion control. We also feel that any future studies, no matter how extensive, will reflect our conclusion.

Species present within disturbed areas had a 50% similarity with those in the undisturbed reference sites. The cause of the diversity seen for plant species is difficult to define. Diversity of individual species within the disturbed area may be the result of past re-seeding efforts. Whatever the reasons for the diversity seen in individual plant cover, the species that compose the vegetative cover of the ROW are predominantly forbs with extensive root growth that will provide adequate soil stabilization.

TABLE 1. GROUP COVER POINTS AND PERCENTAGES FOR DISTURBED (ROW) SITES.

Disturbed Right-of-Way:

Transect 1		Points
Litter		54
Bare		7
Rock		0
Vegetation		39
grasses	7	
forbs	32	
shrubs	0	

Transect 2		
Litter		30
Bare		13
Rock		0
Vegetation		57
grasses	0	
forbs	55	
shrubs	2	

Transect 3		
Litter		70
Bare		8
Rock		0
Vegetation		22
grasses	0	
forbs	19	
shrubs	3	

Transect 4		
Litter		31
Bare		43
Rock		0
Vegetation		26
grasses	0	
forbs	24	
shrubs	2	

Total Disturbance (Transect 1-4)		Percentage
Litter	185	46.25
Bare	71	17.75
Vegetation	144	36.0
grasses	7 (1.75%)	
forbs	130 (32.5%)	
shrubs	7 (1.75%)	

TABLE 2. GROUP COVER POINTS AND PERCENTAGES FOR UNDISTURBED (REFERENCE) SITES

Undisturbed (Reference):

Transect 1		Points
Litter		55
Bare		2
Rock		0
Vegetation		43
grasses	16	
forbs	27	
shrubs	0	

Transect 2		
Litter		20
Bare		3
Rock		0
Vegetation		77
grasses	0	
forbs	77	
shrubs	0	

Transect 3		
Litter		29
Bare		16
Rock		0
Vegetation		55
grasses	11	
forbs	44	
shrubs	0	

Transect 4		
Litter		19
Bare		62
Rock		0
Vegetation		19
grasses	5	
forbs	9	
shrubs	5	

Total Undisturbed (Transect 1-4)		Percentage
Litter	123	30.75
Bare	83	20.75
Vegetation	194	48.5
Grasses	32 (8%)	
Forbs	157 (39.25%)	
Shrubs	5 (1.25%)	

TABLE 3. PERCENT COVER OF PLANT SPECIES PRESENT WITHIN DISTURBED AND UNDISTURBED AREAS

Disturbed

		Species Name	Cover (%)	Common Name
Grasses				
	Agrop	Agropyron spp.	3.5	wheatgrass
		Unidentified	1.4	
Forbs				
	Kosc	Kochia scoparia	53.5	kochia
	Centa	Centaurea spp.	16.0	knapweed
	Convo	Convolvulus spp.	2.1	bindweed
	Maca	Machaeranthera canescens	2.1	purple aster
	Daca	Daucus carota	16.7	wild carrot
Shrubs				
	Cadr	Cardaria draba	1.4	hoary cress
	Atco	Atriplex confertifolia	0.7	shadscale
	Chna	Chrysothamnus nauseosus	2.1	Gray rabbitbrush
			100.0%	

Undisturbed

Grasses				
	Elel	Elymus elymoides	4.1	squirreltail
	Agrop	Agropyron spp.	6.7	wheatgrass
Forbs				
	Kosc	Kochia scoparia	42.3	kochia
	Vepe	Veronica peregrina	7.2	purslane speedwell
	Centa	Centaurea spp.	8.3	knapweed
	Convo	Convolvulus spp.	1.0	bindweed
	Daca	Daucus carota	26.8	wild carrot
	Mesa	Medicago sativa	1.0	alfalfa
Shrubs				
	Atco	Atriplex confertifolia	2.6	shadscale
			100.0%	

TABLE 4. PERCENT COVER SIMILARITY OF VEGETATION FOR DISTURBED AND UNDISTURBED AREAS

COVER	SPECIES	SIMILARITY (%)	FAVOR
Grasses			
	Agropyron spp.	38.5	Undisturbed
Forbs			
	Kochia scoparia	93.9	Undisturbed
	Centaurea spp.	69.6	Disturbed
	Convolvulus spp.	66.6	Disturbed
	Daucus carota	46.2	Undisturbed
Shrubs			
	Atriplex confertifolia	20.0	Undisturbed

Appendix 7-2

Water Rights Documentation

Savage Services Corporation
Savage Coal Terminal

APPENDIX 7-2

WATER RIGHTS DOCUMENTATION

7/25/89

RIGINAL DELIVERING COMPANY

ARBON CANAL COMPANY

INCORPORATED UNDER THE LAWS OF

State of Utah

No. 2814

Shares 137.1

PRICE RIVER WATER USERS ASSOCIATION

(A NON-PROFIT MUTUAL IRRIGATION CORPORATION)

PRICE, UTAH

This Certifies that SWIEHER COAL COMPANY is the owner of

ONE HUNDRED THIRTY SEVEN & 1/10 (137.1) shares of the Capital Stock of

PRICE RIVER WATER USERS ASSOCIATION

transferable only on the books of the Association upon surrender of this certificate properly endorsed.

In Witness Whereof, the said Association has caused this certificate to be signed by its officers and its corporate seal to be affixed hereto this 2nd day of May, A.D. 1911

Secretary

President

SHARES Non-Par VALUE EACH

© GOES 46

ORIGINAL DELIVERING COMPANY:
WEL[illegible]GTON CANAL

INCORPORATED UNDER THE LAWS OF

State of Utah

No. 2589

Shares 20.00

PRICE RIVER WATER USERS ASSOCIATION

(A NON-PROFIT MUTUAL IRRIGATION CORPORATION)

PRICE, UTAH

This Certifies that SWISHER COAL COMPANY is the owner of

TWENTY (20) Shares of the Capital Stock of

PRICE RIVER WATER USERS ASSOCIATION

transferable on the books of the Corporation only by the holder hereof in person or by Attorney, upon surrender of this Certificate properly endorsed.

In Witness Whereof, the said Corporation has caused this Certificate to be signed by its duly authorized officers and to be sealed with the Seal of the Corporation this 1st day of March A.D. 1976

Jesse R. Hershey
SECRETARY

Tyler D. Fryer
PRESIDENT

SHARE Non-Par PEACH

©GOES 46

BILL OF SALE AND RECEIPT

Pursuant to that certain Agreement dated March 14, 1980, by and between Wallace V. Jacobson and William P. Hansen ("Sellers"), and Atlantic Richfield Company, a Pennsylvania corporation, ("Buyer"), and in consideration for the payment by Buyer of $132,000.00, receipt of which is hereby acknowledged, Sellers hereby sell, transfer and convey to Buyer, free of liens, encumbrances or assessments of any kind, 55 shares of the capital stock of Price River Water Users Association. Sellers warrant that they have valid title to said stock; that said stock is presently free of liens, encumbrances or assessments of any kind; and that they will defend the same at their own cost.

IN WITNESS WHEREOF, the Sellers have executed this Bill of Sale and Receipt this 21st day of March, 1980.

Wallace V. Jacobson

William P. Hansen

STATE OF UTAH)
: ss.
COUNTY OF SALT LAKE)

On this 20 day of March, 1980, personally appeared before me Wallace V. Jacobson and William P. Hansen, the signers of the above instrument, who duly acknowledged to me that they executed the same.

Notary Public

My Commission Expires:

10/8/83

CARBON CANAL CO.

INCORPORATED UNDER THE LAWS OF

No. 3648 State of Utah Shares 55.00

PRICE RIVER WATER USERS ASSOCIATION

(A NON-PROFIT, MUTUAL IRRIGATION CORPORATION)

PRICE, UTAH

This Certifies that ATLANTIC RICHFIELD COMPANY, A Penn Corp. is the owner of

FIFTY FIVE & 00/100 (55.00) Shares of the Capital Stock of

PRICE RIVER WATER USERS ASSOCIATION

transferable only on the books of the Corporation by the holder hereof in person or by attorney upon surrender of this certificate properly endorsed.

In Witness Whereof, the said corporation has caused this certificate to be signed by its President and its Secretary, and its seal to be affixed hereto this 14th day of April A.D. 1980

Geo. E. O'Brien
SECRETARY

Kyle B. Stagner
PRESIDENT

SHARES Non-Par EACH

©GOES 46

May 2, 1980

Price River Water Users Association
c/o Ann O'Brien
Carbon County Courthouse
Price, UT 84501

Gentlemen:

This letter is to advise you of the sale by Lola Mae Marsing Easton and Ann Kay Marsing Archibald of 150 shares of capital stock of the Price River Water Users Association, to Atlantic Richfield Company, a Pennsylvania corporation. This sale took place on May 2, 1980.

A portion of said 150 shares of stock has been placed in escrow and will be delivered to Atlantic Richfield Company as payments of the purchase price are made over a ten-year period. As the stock is delivered to Atlantic Richfield Company, the company will present it to you in order to obtain stock certificates in its own name. In the meantime, the stock will remain in the names of Lola Mae Marsing Easton and Ann Kay Marsing Archibald.

As of May 2, 1980, Atlantic Richfield Company shall have the sole and exclusive right to the use of all water represented by said 150 shares of stock, and shall be responsible for payment of all water assessments and other charges made upon the stock. Please therefore send all assessments and other charges on the stock to Atlantic Richfield Company at the following address:

John R. Hardin, Land Manager
Atlantic Richfield Company
555 Seventeenth Street
P.O. Box 5300
Denver, CO 80217

Please advise Mr. Hardin if you need any additional information.

Sincerely,

Lola Mae Marsing Easton
Lola Mae Marsing Easton

Ann Kay Marsing Archibald
Ann Kay Marsing Archibald

Received 5/2/80 by
Ann O'Brien

STATE OF UTAH
NATURAL RESOURCES
Water Rights

Norman H. Bangerter, Governor
Dee C. Hansen, Executive Director
Robert L. Morgan, State Engineer

Southeastern Area • 453 S. Carbon Avenue • P.O. Box 718 • Price, UT 84501-0718 • 801-637-1303

April 19, 1988

Beaver Creek Coal Company
Attn: Dan Guy
P.O. Box AU
Price, Utah 84501

Re: Water Right No. 91-4164

Dear Mr. Guy:

In lieu of Proof of Appropriation on Application No. 91-4164, you executed an Election to File a Water Users Claim, thereby requesting the State Engineer's Office to prepare a Statement of Water Users Claim in the pending general determination of water rights.

The enclosed Water Users Claims have been prepared by the Division of Water Rights to cover the proof on the above referenced application. Examine the claims carefully, and if you are in agreement with the information, please sign the three copies in the presence of a Notary Public, and return the stapled copies to this office within fifteen days of the date hereon. Retain the third copy for your records.

Should you have any questions, please feel free to come into the Southeastern Utah Area Office located at 453 South Carbon Avenue, P.O. Box 718, Price, Utah 84501, or phone us at 637-1303. Thank you for your cooperation.

Sincerely,

Mark

Mark P. Page
Area Engineer

Enclosures
MPP/mjk

Form 114
25M 4-63

IN THE SEVENTH JUDICIAL DISTRICT COURT, IN AND FOR THE COUNTY OF CARBON STATE OF UTAH

IN THE MATTER OF THE GENERAL DETERMINATION OF RIGHTS TO THE USE OF WATER, BOTH SURFACE AND UNDERGROUND, WITHIN THE DRAINAGE AREA OF THE PRICE RIVER AND OF THE DRAINAGE AREA OF THE GREEN RIVER FROM THE CONFLUENCE OF THE PRICE AND GREEN RIVERS TO THE CONFLUENCE OF THE GREEN AND COLORADO RIVERS EXCLUDING THE DRAINAGE AREA OF THE SAN RAFAEL RIVER IN UTAH

STATEMENT OF WATER USER'S CLAIM
CODE NO. 91 SERIAL NO. 4164
MAP NO. .....

NOTE: This blank is sent to you in accordance with Utah Law. The information called for herein will be used in connection with the adjudication of water rights on the above mentioned drainage area. All questions applicable to your claim must be answered fully, and one copy of this form must be filed with the Clerk of the District Court at ....., Utah, within sixty (60) days from date of service of the attached Notice. A copy shall be filed with the State Engineer, State Capitol, Salt Lake City. Failure to file the attached Statement of the Water User's Claim with the Clerk of the District Court within the time stated will forever bar and estop you from asserting any right to the use of water from said drainage area.

1. Name of Claimant Beaver Creek Coal Company
   P.O. Box AU Interest Claimed Full
2. Address Price, Utah 84501
3. Name of particular spring, spring area, stream, well, tunnel or drain from which water is diverted is Underground water well in Carbon County.
4. Priority date claimed July 22, 1977 Date when water was first used .....
   Date when work on diverting system was first begun ..... Date when diverting system was completed ..... Nature of work .....
5. Class of Right (Indicate by X):
   (a)....Right to surface water initiated by beneficial use before 1903 Claim No. .....
   (b)....Right to underground water initiated before 1935 Claim No. .....
   (c)....Right decreed by court, cite title of case .....
   (d)...X..Application filed, State Engineer's Office No. 49858 Cert. of App. No. Election
   (e)....Right acquired by adverse use prior to 1939 .....
6. Nature (Indicate by X), Amount, and Annual Period of Use (by month & day):
   (a)....Irrigation Sec. Ft. ..... from ..... to ..... (both dates incl.)
   (b)....Stockwatering Sec. Ft. ..... from ..... to ..... (both dates incl.)
   (c)....Domestic Sec. Ft. ..... from ..... to ..... (both dates incl.)
   (d)....Municipal Sec. Ft. ..... from ..... to ..... (both dates incl.)
   (e)...X..Industrial Sec. Ft. 0.25 from November 1 to March 31 (both dates incl.)
7. Direct Flow Appropriation (must be described with reference to U. S. Government Survey Corner)
   (a) Point of diversion from spring, spring area, stream, well, tunnel, drain
   S. 520 ft. & W. 105 ft. from N¼ Cor. Sec. 2, T15S, R10E, SLB&M.
   (b) Description of spring area .....
   (c) Point of rediversion or point of return to natural channel .....
   (d) If flow is intermittently diverted, list by number or description, all rights involved .....
8. Where water is used for irrigation purposes:
   (a) Area irrigated in legal subdivisions of land by 40-acre tract. (All sources of water for same land or lands must be described in each instance by name or claim number) .....
   (b) Do you get water under a ditch owned by several users ..... If so, give names of all users and divisions of interest .....
9. Where water is used for Stockwatering:
   (a) Number of each kind of stock watered .....
   (b) All sources of water for same stock. (Describe by name or claim number) .....
10. Where water is used for Domestic: .....
   (a) Number of families or their equivalent ..... All sources of water for same use. (Describe by name or claim number) .....

11. Where water is used for Municipal Purposes:
(a) Name of city or town supplied ..... Population .....
Number of families ..... Quantity of water .....

12. Where water is used for a purpose not above enumerated:
(a) Nature of Use Industrial ..... Extent of Use .....
Industrial uses pertinent to a coal preparation and unit load-out facility: SW¼ Sec. 11, T15S, R10E, SLB&M.

13. Appropriation for Storage Purposes:
(a) Name of reservoir .....
(b) Location of reservoir by legal subdivisions described by 40-acre tracts .....
(c) Maximum capacity of reservoir in acre feet .....: Year construction commenced .....
Completed .....: Water first used ..... Is reservoir located on or off stream.....
(d) Period of Storage from ..... to ..... (both dates incl.). Period of use from .....
to..... (both dates incl.). Maximum area in acres inundated ..... Max. depth in feet.....
Average depth in feet..... Is reservoir drained each year..... Maximum number of fillings per year..... Is reservoir used for equalizing purposes..... If feeder canal is used, give maximum carrying capacity in sec. ft.....

14. Diverting Works:
(a) Surface water diverting dam: Material composed of .....
Max. length..... Max. height.....Max. width at bottom..... Max. width at top.....
(b) Underground water diverting works: Is well flowing or pump..... Depth of well.....
Diameter of well..... Length of drain..... Width of drain ..... Depth of drain.....
Diameter of drain..... Length of tunnel .....Width of tunnel..... Height of tunnel.....
Type of pump..... Capacity of pump.....
(c) Surface and underground water conveying works: Length of ditch to first place of use..... Width of ditch at top ..... Width of ditch at bottom..... Depth of water..... Grade of ditch per 1000 ft..... .. Material through which ditch passes..... Maximum length of pipe line to first place of use..... Diameter of pipe line ..... Grade of pipe line per 1000 feet.....

15. The undersigned hereby enters his appearance and waives service of summons or other process.

STATE OF UTAH
COUNTY OF..... } SS. (To be used if claimant is an individual)

..... being first duly sworn, upon oath deposes and says that he is the claimant whose name appears hereon, that he has read the foregoing statement of his claim and knows the contents thereof, that he has signed the same, and that the answers set forth therein are true to his best knowledge and belief.

.....
Signature of Claimant

Subscribed and sworn to before me this ..... day of ..... 19.....

.....
NOTARY PUBLIC

STATE OF UTAH
COUNTY OF Carbon } SS. (To be used if claimant is a corporation or an estate)

Daniel R. Meadows, being first duly sworn, upon oath deposes and says that he is the authorized representative of the above claimant, that he makes this certification on behalf of said claimant, that he has read the foregoing statement of claim and knows the contents thereof, and that he has signed the name of said claimant to said statement, that the answers set forth therein are true to his best knowledge and belief.

Subscribed and sworn to before me this 6th day of July 1988

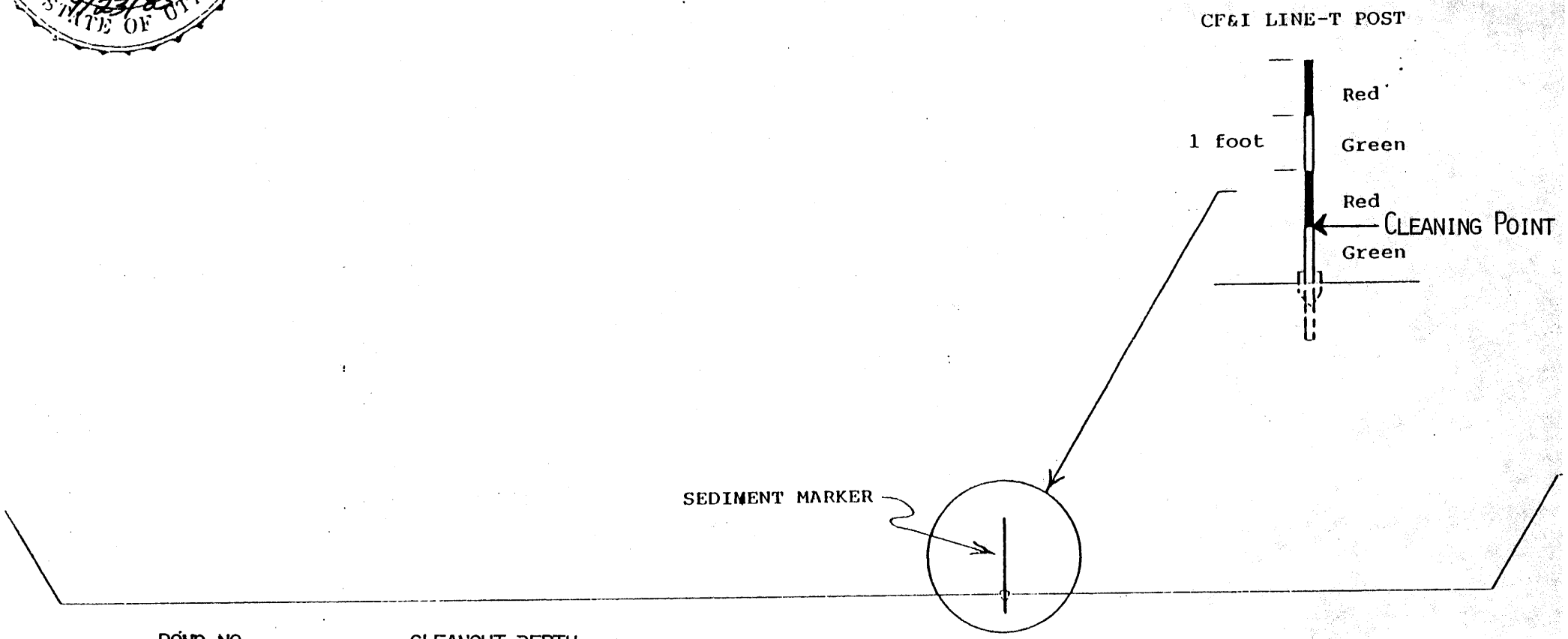
Raina Liapesa
NOTARY PUBLIC

4/13/92.

MOUNTAIN COAL COMPANY

C.V. SPUR

SEDIMENT MARKER



POND NO.	CLEANOUT DEPTH
1	1.20'
2	1.20'
3	0.96'
5	1.14'
6	0.72'

NOTE: Posts are set so the cleaning point is at the base of the red.

PLATE 7-4C

Appendix 7-3

Probable Hydrologic Consequences Determination

Savage Services Corporation
Savage Coal Terminal

Appendix 7-3
Probable Hydrologic
Consequences Determination

General

The original Probable Hydrologic Consequences Determination, or PHC, was developed for this site in 1983. At this time, the wash plant was operating full time and refuse was actively being deposited on site.

A series of groundwater monitoring wells were installed to monitor changes in water quality and levels. A sediment control plan was also developed to control surface runofff from the site. At that time, based on information provided in Chapter 7 of the MRP, it was determined that the proposed operation would not have an adverse impact on the hydrologic balance.

Since that time, a number of changes have taken place, including cessation of coal washing and refuse placement, and removal of all ground water monitoring wells after acquiring 18 years of data.

At this time, one more major change is proposed for the site. It is proposed to restart the wash plant, and install a series of settling ponds to remove -28 mesh material from the wash water. Refuse will once again be stored on-site, but only on a temporary basis, not to exceed 1 year from start-up.

Procedure

The PHC Determination is based on information provided in Chapter 7, which includes baseline and operational hydrologic data acquired since 1983.

Groundwater Hydrology

Existing Groundwater Resources

The Savage Coal Terminal is near the middle of Castle Valley, a broad featureless plain between the Wasatch Plateau to the west and the San Rafael Swell to the east. The facility is located on the middle Bluegate shale member of the Mancos Formation and is approximately 500 feet above the Ferron sandstone member of the Mancos Formation. The Bluegate member consists of dark blue-gray marine mudstone and acts as an aquitard. The upper 10 to 20 feet consists of weathered clays, occasional lenses and pods of gravelly residuum, and residual type silty clay loam soils characteristic of the weathered Mancos shale.

Regional Groundwater Hydrology

A water table does exist in some locations above the impermeable Bluegate shale. In the general area, this water table exists in the alluvium or weathered shale and gravelly ponds above the Bluegate shale. The water is of poor quality and accumulations of salt are found where the water table approaches the ground surface. Groundwater is not used for irrigation in the area because of its poor quality. The nearest springs or wells to the Savage Coal Terminal site are located close to the town of Wellington on the opposite side of the Price River. Five wells and one spring exist in the alluvium above the Bluegate shale in this area. These wells and springs are in a different drainage and are not associated with the Savage Coal Terminal site.

Mine Plan Area Aquifers

Monitoring wells were completed in the weathered material above the Bluegate shale. In addition several wells were completed in the Bluegate shale in order to test the hypotheses that the low permeability of this unit isolates the water table aquifer from groundwater in the Ferron sandstone or deeper formations.

A total of 13 monitoring wells were completed on this site from 1980 - 1982. The wells were consistently monitored through 1998, when the wells were approved to be deactivated and removed.

The measurements in the observation wells as recorded in Table 7-1 of Chapter 7 indicate that there is no regional ground water table at the site, although a perched water table exists at some locations on the site. The aerial extent of this perched water table could not be precisely determined from existing monitoring well network.

As previously mentioned, the observation wells were monitored for 18 years at this site. When the wells were finally approved for removal, 5 of the 8 remaining wells had been dry for more than 5 years, 2 wells showed some ground water which appeared to be recharged by the irrigation canal south of the site. Water from one of these wells is also evident as ground water in Sediment Pond No. 5. The last remaining well was in an irrigated field east of the site, on land not controlled by Savage Services Corporation.

When the facilities were first constructed in 1977 - 1978, ground water was present throughout the site, ranging in depths from 0' to 20' from the surface. A French Drain system was placed along the western and northern edge of the property to intercept a majority of the ground water, which appears to be recharged primarily by the irrigation canal systems located west of the property. This ground water is collected in a deep tank located at the northeastern corner of the property, and is regularly monitored as point CV-1W.

The French Drain has been in operation for approximately 28 years, and has been monitored on a regular basis. The inflow continues to range from 20 to 25 gpm. Water quality is poor - typical of ground water in this area - with TDS concentrations running approximately 10,000 mg/l.

Proposed Facilities

The primary change to the operation and hydrology will be the restart of the preparation plant, construction of 2 - 2 celled settling ponds, and temporary storage of refuse on site. The water supply system for the wash plant is already in place as is the refuse storage area. The area proposed for the new settling ponds has been checked for ground water, and none is evident to the proposed depth of the ponds. It should also be noted that previous tests of the coal refuse as well as ground water have shown it to be non-acid and non-toxic. The refuse to be temporarily stored on site from the new washing operation will also be checked on a regular basis for acid/toxic potential.

Effects of Operations on Groundwater

This site has been in operation for over 28 years with no negative impacts to the ground water. During this time, the site has had coal washing and refuse generating activities, as well as a long period of operating as a coal storage and loadout facility.

The only potential for negative impact from the proposed facilities would be from possible acid/toxic contamination of the groundwater from the coal or refuse. This potential will be minimized by regular testing of the refuse for acid/toxic potential, as well as regular monitoring of the groundwater.

Based on the past history of the site, and the proposed new operating and testing procedures, there should be no negative impact to the groundwater resources on this site.

Surface Water Hydrology

Regional Surface Water Hydrology

The regional area is drained by tributaries to the Green and Colorado Rivers; principal tributaries are the Price and San Rafael Rivers and Muddy Creek. The flow is usually intermittent or perennial, in small streams in the mountains and in larger streams that originate in the higher mountains. Snowmelt is major contributor to streamflow and it provides the continuity of flow in the perennial streams as well as some seasonal flow to intermittent streams. Many streams are ephemeral and flow only in direct response to precipitation or snowmelt. Ephemeral flow is characteristic of the lowlands such as Castle Valley where the Savage Coal Terminal facility is located. Summer precipitation does not usually produce much runoff, although intense rainfall may cause high runoff in localized areas.

The site drains into the Price River which flows into the Green River. The water in the upper reaches of the Price River is of high quality; however, as the river traverses the central and lower portion of the Price River basin, the quality of the water in the river steadily degrades due to the geologic nature of the area and to the irrigation return flow which enters the river.

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 in Chapter 7. Subareas A and C are undisturbed areas and include upslope areas to the west of the site. The remaining subareas comprise drainage units that are affected by operations and are subject to sediment control. Surface runoff from subarea A is diverted around the site by a diversion. The remaining subareas drain into sedimentation ponds on site.

Runoff from the disturbed areas on site is directed to a series of 5 sediment ponds by a combination of collection ditches and culverts. All surface hydrologic structures are sized to carry runoff from a 10 year-24 hour storm event, including the storage capacity of the sediment ponds. Sediment Ponds 1, 2 and 3 are in series and flow to Sediment Pond 6. Sediment Pond 5 also flows to Sediment Pond 6. The water from Pond 6 is normally drawn into the pumphouse and pumped back to the wash plant for use in the wash cycle or as dust suppression water. In the event Pond 6 overflows, it is sampled according to the approved UPDES Discharge Permit.

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. Site discharges are even less frequent, with only 2 UPDES discharges within the last 5 years.

Proposed Facilities

The proposed restart of the wash plant, temporary refuse storage and settling ponds will have little, if any, effect on the surface water hydrology at the site. The wash plant will recirculate water, as well as use make-up water from the existing supply system and recirculated runoff water from the sediment ponds. The temporary refuse storage area will be within the existing refuse area, and will be drained by the existing refuse pile ditch to Sediment Pond 5. The new settling ponds will be incised with berms to prevent any inflow of surface runoff. The new disturbed area will drain to the existing disturbed ditch to Sediment Pond 1. The undisturbed area runoff will continue to be diverted around the property by a reconstructed diversion ditch.

Effects of Mining on Surface Water

Protection of the hydrologic balance at Savage Coal Terminal is accomplished by control of runoff from disturbed areas, diversion of runoff from undisturbed areas, and diversion collection and recirculation of water supply and storm water. There are no subsurface operations at this site.

In general, most of the disturbed area runoff, poor quality groundwater, and all plant overflow water is cleaned and recirculated with no discharge from the property. The natural (undisturbed) drainage is allowed to flow into natural channels, bypassing the disturbed areas. Excess french drain water may be released to the Price River. Storm water runoff from disturbed areas may also be released to the Price River once effluent limits have been met.

This site has been in operation for more than 28 years, with no negative impacts to surface water quality or quantity. The proposed new washing scenario is very similar to the original system on this site, and therefore, also should not have any negative effects.

It should be noted that the existing water monitoring program will continue to be implemented to evaluate any potential impacts of the operation.

PHC Determination

In accordance with R645-301-728.100, the proposed operation will not have a negative impact on quality and quantity of surface and ground water under seasonal flow conditions for the proposed permit and adjacent areas.

This determination is based on baseline hydrologic, geologic and 26 years of historical operating and monitoring data for this site.

The following findings are included in this PHC determination:

(1) There are no adverse impacts expected to occur to the gydrologic balance, based on historical data;

(2) No acid-forming or toxic-forming materials are known or expected to be present, based on past and on-going sampling;

(3) There are no expected impacts from the operation on sediment yield, quality parameters, flooding or streamflow alterations or water availability, as discussed in the previous text;

(4) Based on available data, the proposed operation will likely not proximately result in contamination, diminution or interruption of an underground or surface source of water within the proposed permit or adjacent areas which is used for domestic, agricultural, industrial or other legitimate purpose.

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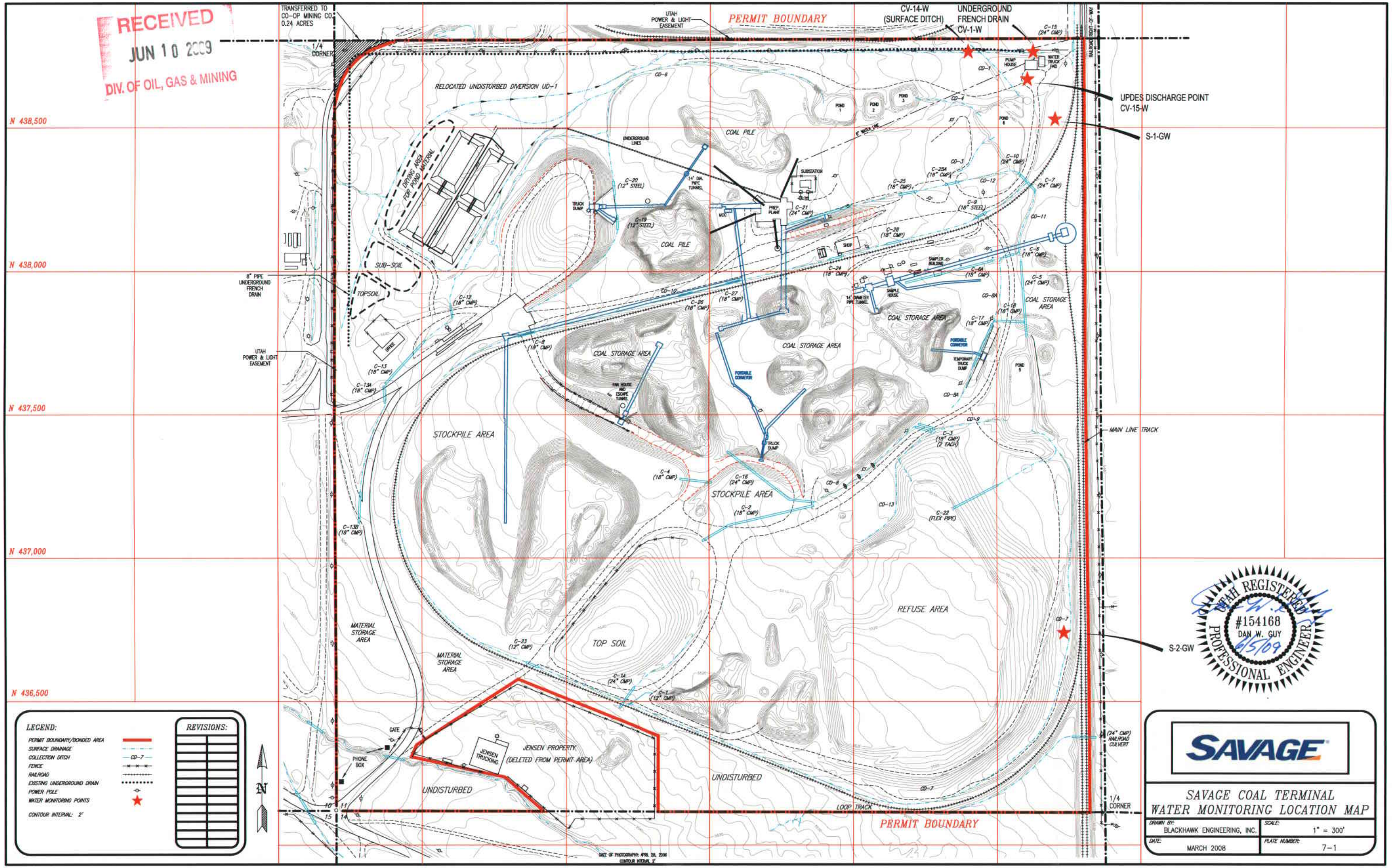

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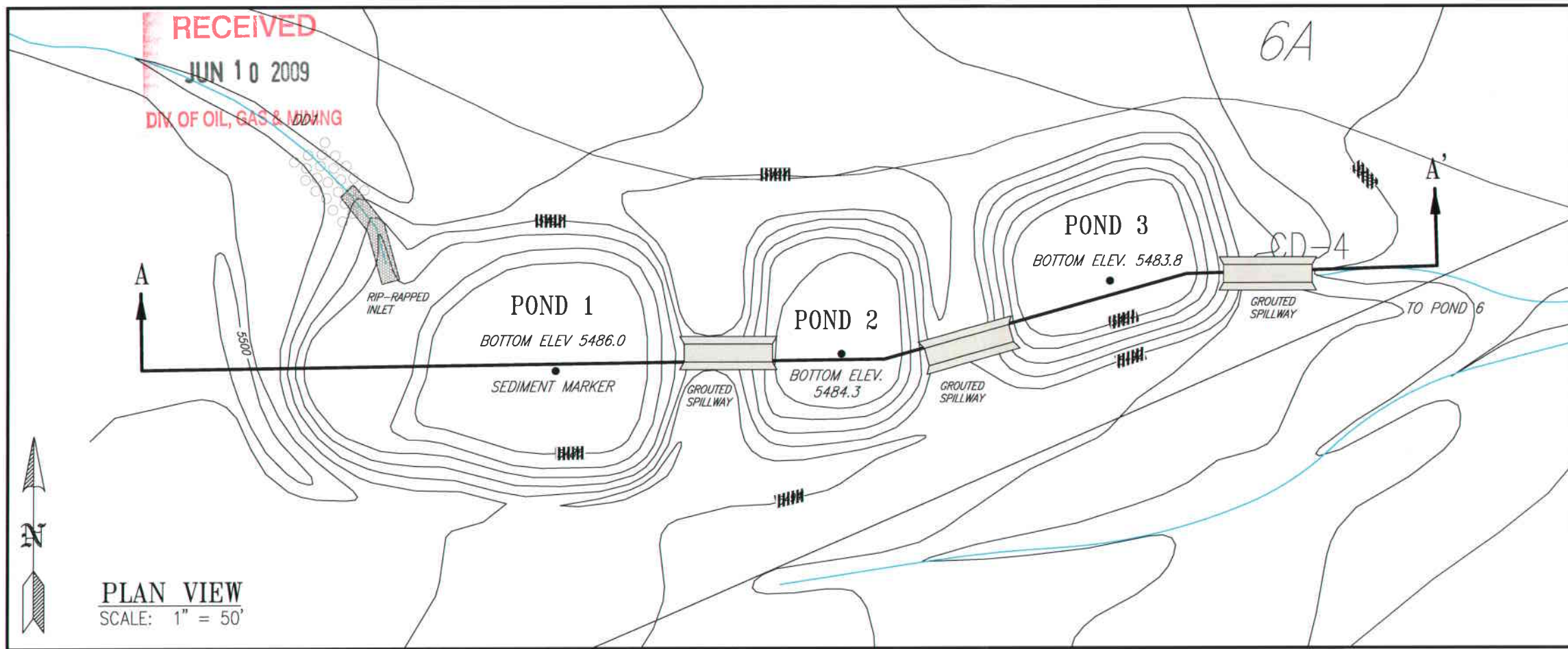
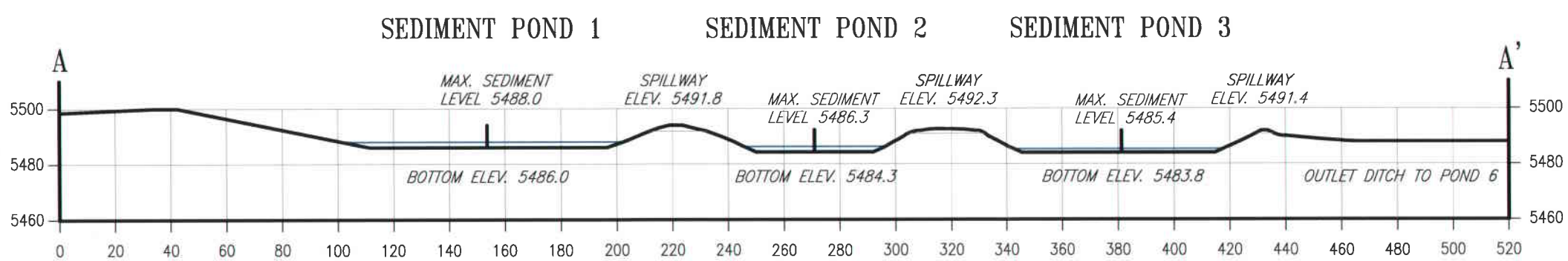


PLAN VIEW
SCALE: 1" = 50'

POND VOLUMES

ITEM	SEDIMENT VOLUME	VOLUME @ SPILLWAY
POND 1	0.48 AC.FT.	1.40 AC.FT.
POND 2	0.24 AC.FT.	0.96 AC.FT.
POND 3	0.20 AC.FT.	0.94 AC.FT.



SECTION A-A'
SCALE: 1" = 50'

UTAH REGISTERED PROFESSIONAL ENGINEER #154168 DAN W. GUY 6/5/09

SAVAGE

SAVAGE COAL TERMINAL
SEDIMENT PONDS 1, 2 AND 3

SCALE: 1" = 50'	DRAWN BY: BLACKHAWK ENGINEERING
DATE: MARCH 2008	PLATE: PLATE 7-3

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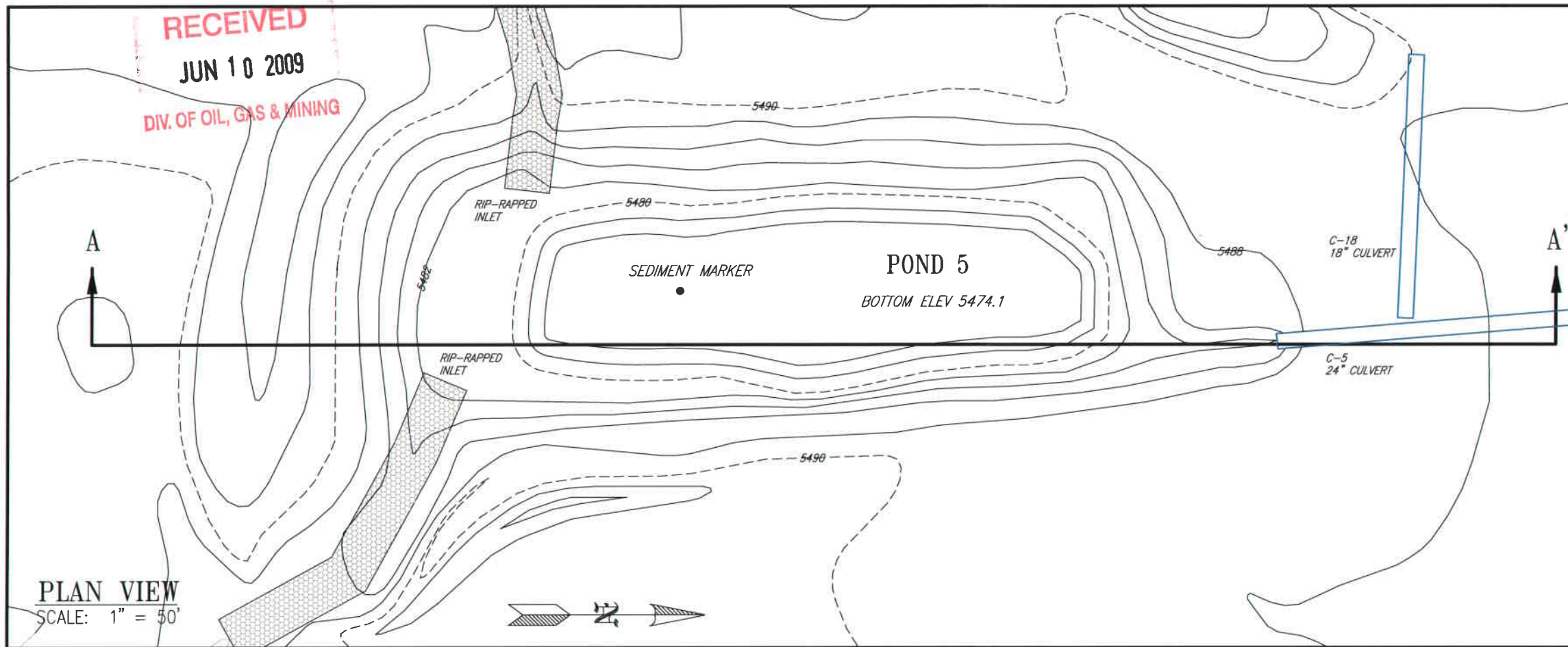


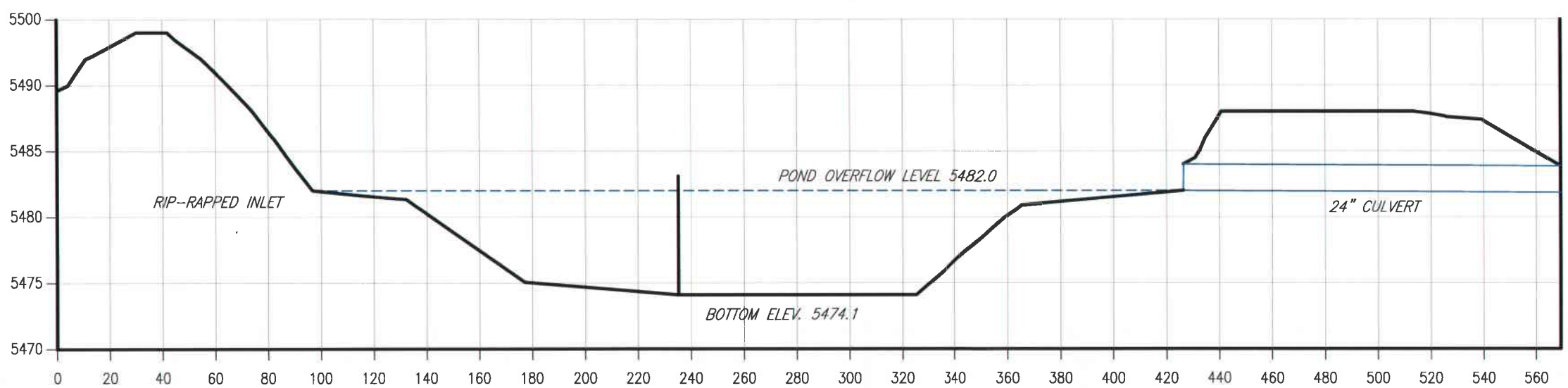
PLAN VIEW
SCALE: 1" = 50'

POND VOLUMES

ITEM	ELEVATION	VOLUME
SPILLWAY	5482.0	4.16 AC.FT.
MAXIMUM SEDIMENT LEVEL	5476.0	0.59 AC.FT.
BOTTOM OF POND	5474.1	–

A A'

SEDIMENT POND 5



SECTION A-A'
VERTICAL EXAGGERATION 5X

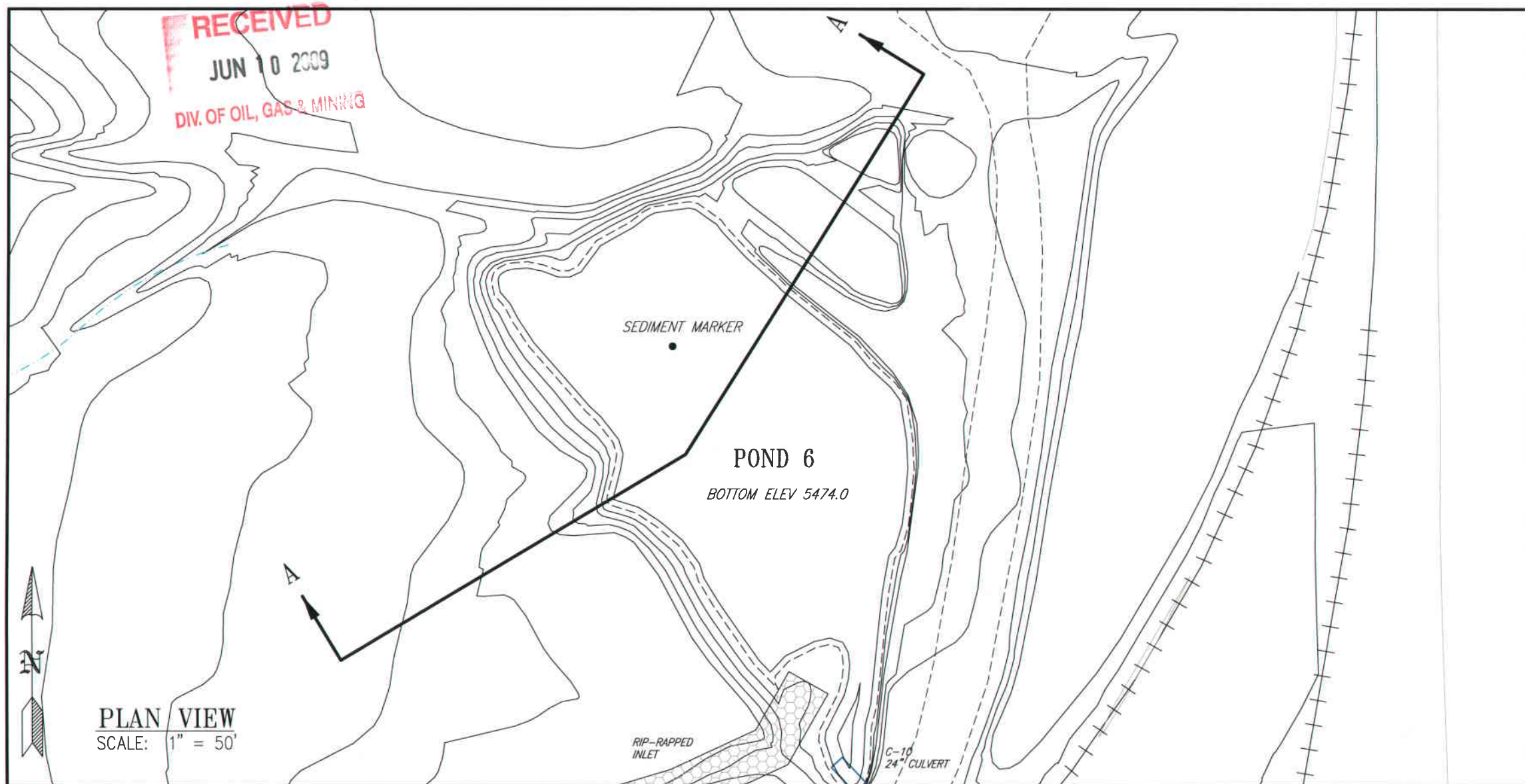
HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 10'

SAVAGE

SAVAGE COAL TERMINAL
SEDIMENT POND 5

SCALE: 1" = 50'	DRAWN BY: BLACKHAWK ENGINEERING
DATE: MARCH 2008	PLATE: PLATE 7-4

RECEIVED
JUN 10 2009
DIV. OF OIL, GAS & MINING

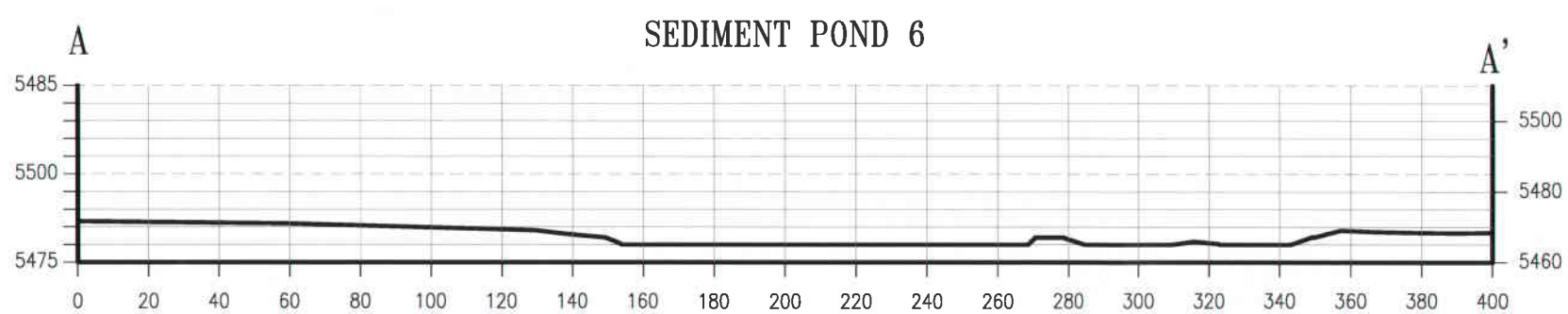


PLAN VIEW
SCALE: 1" = 50'

POND VOLUMES

ITEM	ELEVATION	VOLUME
PRINCIPLE OVERFLOW	5480.3	1.92 AC.FT.
UPPER CELL	5480.3	1.76 AC.FT.
MIDDLE CELL	5480.3	0.12 AC.FT.
LOWER CELL	5480.3	0.03 AC.FT.
BOOTOM OF POND	5474.0	
MAX. SEDIMENT LEVEL	5475.2	0.24 AC.FT.
* UPPER DIKE	5480.0	0.16 AC.FT.
* LOWER DIKE	5479.0	0.07 AC.FT.
TOTAL POND VOLUME:		2.15 AC.FT.

* DIKES CALCULATED AT 40% POROSITY.



SECTION A-A'
VERTICAL EXAGGERATION 5X

HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 10'

SAVAGE

SAVAGE COAL TERMINAL
SEDIMENT POND 6

SCALE: 1" = 50'	DRAWN BY: BLACKHAWK ENGINEERING
DATE: MARCH 2008	PLATE: PLATE 7-5

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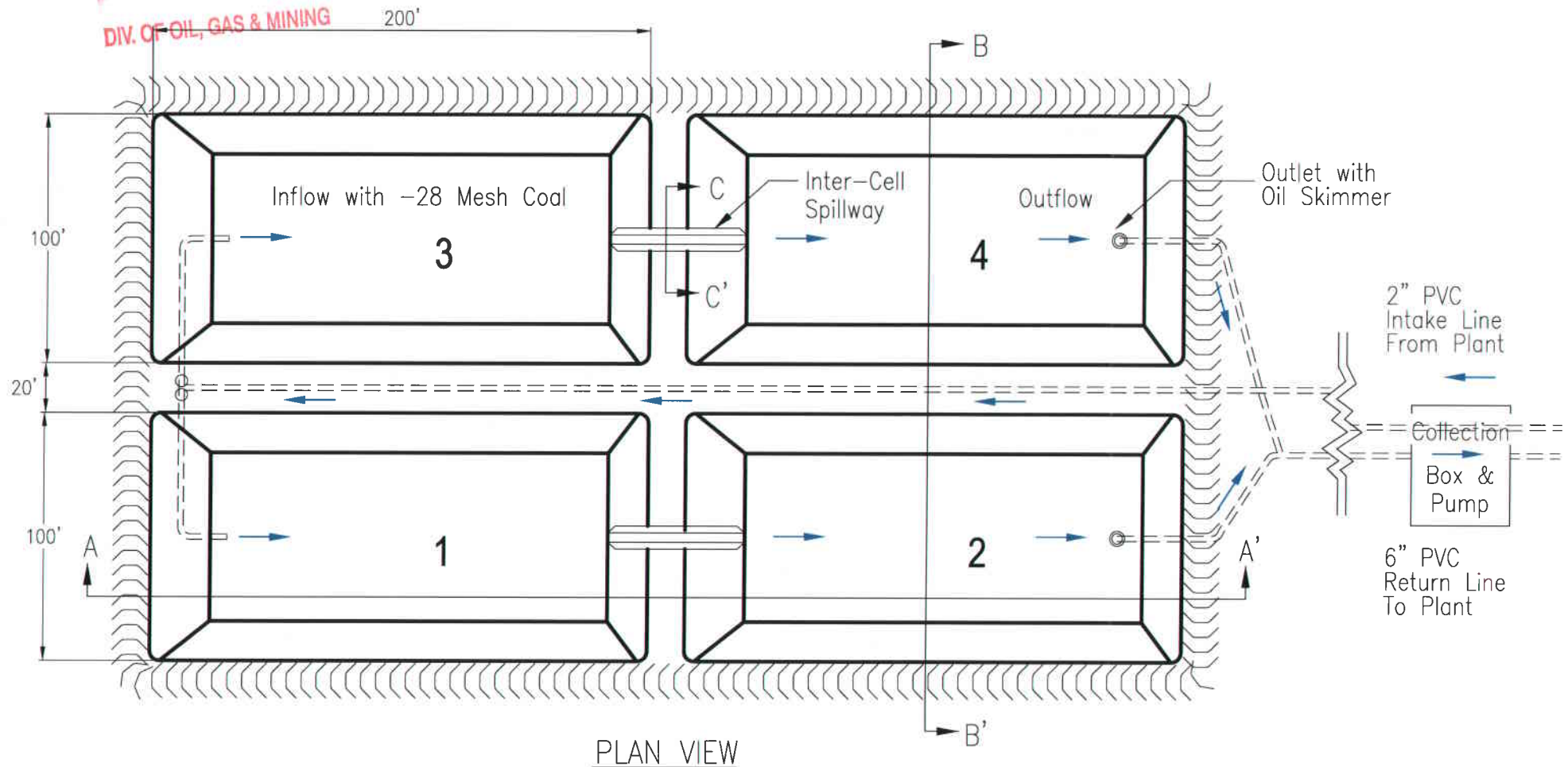
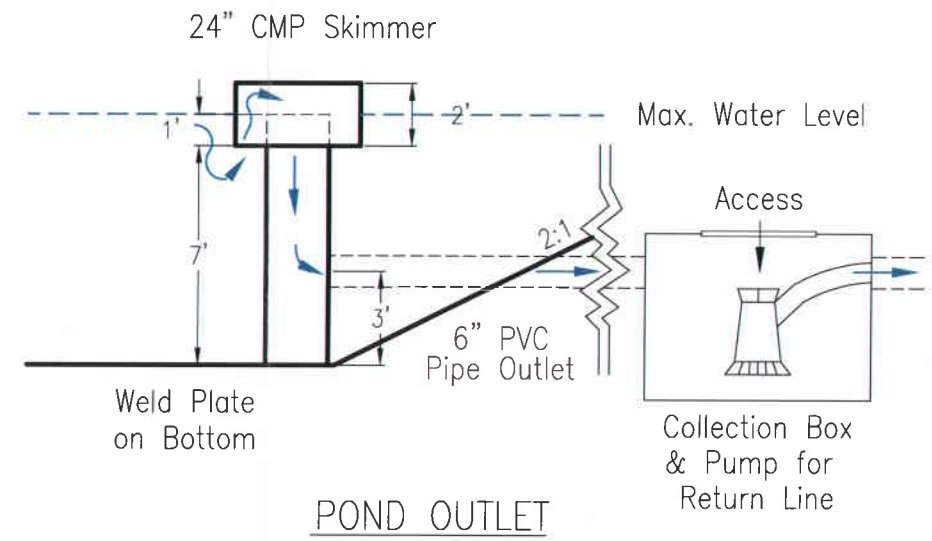
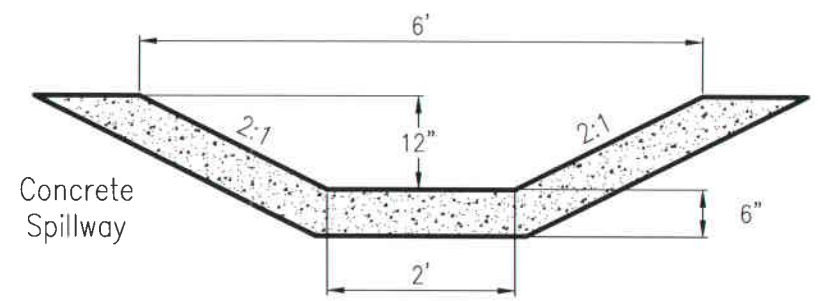


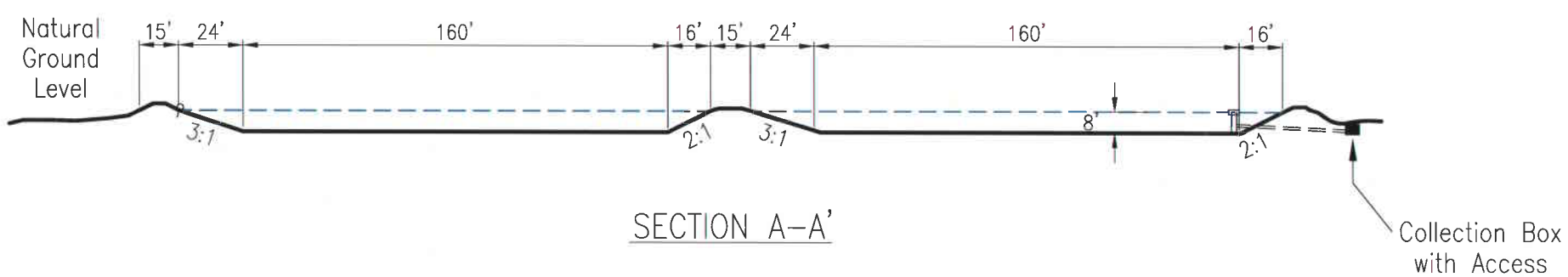
PLAN VIEW



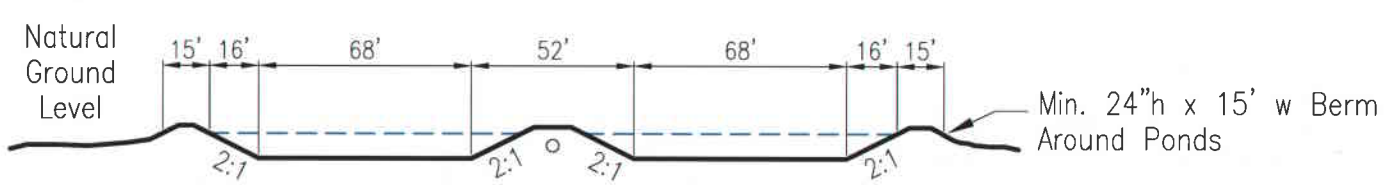
POND OUTLET



SECTION C−C'
INTER−CELL SPILLWAY



SECTION A−A'



SECTION B−B'

NOTE:
EACH POND CELL CAPACITY IS 2.78 AC.FT.

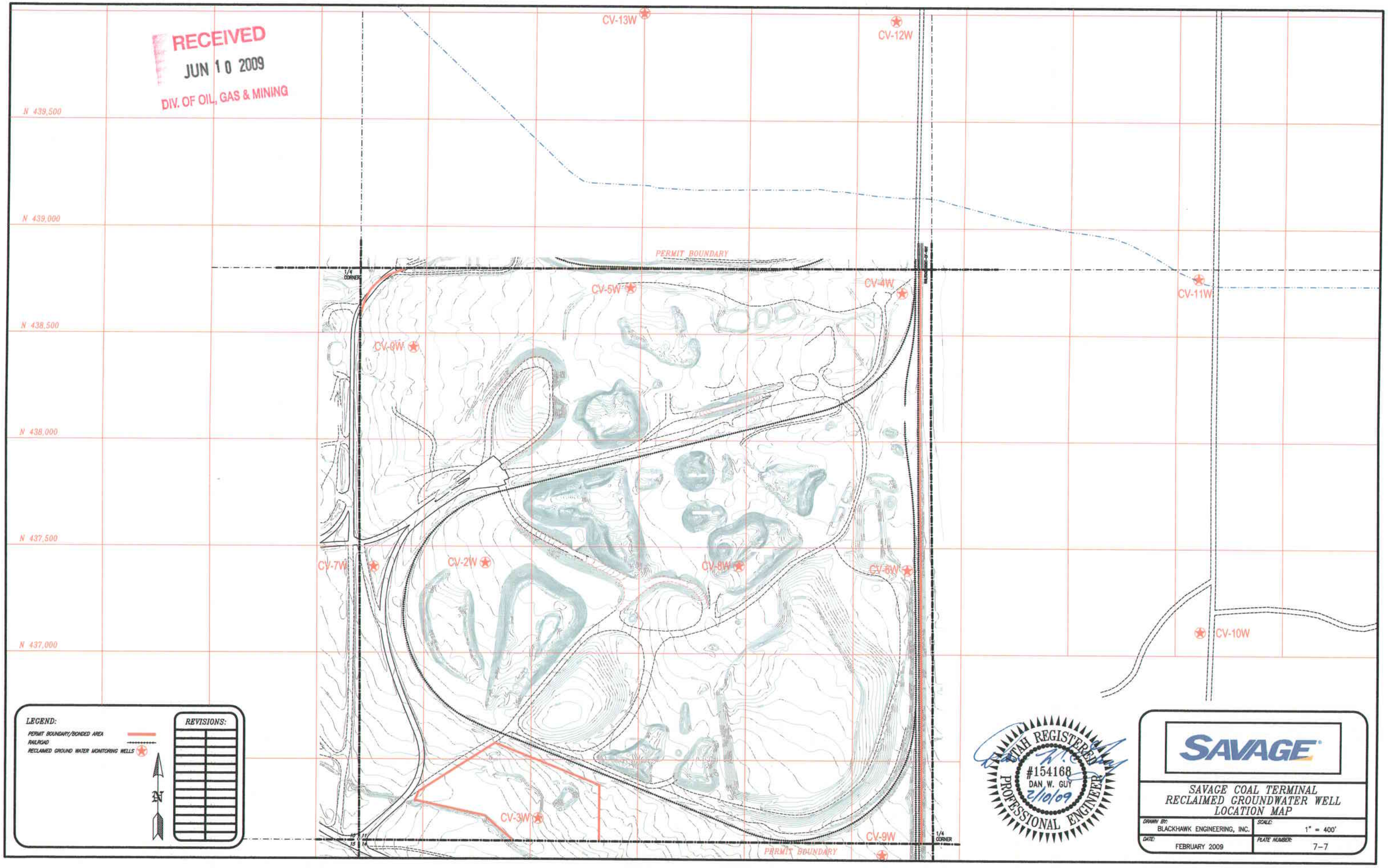
STATE OF UTAH REGISTERED #154168 DAN W. GUY PROFESSIONAL ENGINEER 6/5/09

SAVAGE

SAVAGE COAL TERMINAL
SETTLING PONDS

SCALE: NTS	DRAWN BY: BLACKHAWK ENGINEERING
DATE: MARCH 2008	PLATE: PLATE 7−6

RECEIVED
JUN 10 2009
DIV. OF OIL, GAS & MINING



Savage Services Corporation
Savage Coal Terminal
C/007/022

Chapter 8

Bonding and Insurance

R645-301-800

Table of Contents
Savage Coal Terminal
Chapter 8 - Bonding and Insurance

R645-301-800.	Bonding and Insurance
R645-301-820.	Requirements to File a Bond
R645-301-830.	Determination of Bond Amount
R645-301-850.	Bonding Requirements
R645-301-860.	Form of Bond
R645-301-880.	Bond Release Application
R645-301-890.	Liability Insurance
Appendix 8-1	Reclamation Cost Estimate
Appendix 8-2	Reclamation Performance Bond
Appendix 8-3	Liability Insurance

R645. Natural Resources; Oil, Gas and Mining; Coal.

R645-301. Coal Mine Permitting: Permit Application Requirements.

R645-301-800. Bonding and Insurance.

810. Bonding Definitions and Division Responsibilities.

811. Terms used in R645-301-800 may be found defined in R645-100-200.

812. Division Responsibilities -- Bonding.

820. Requirements to File a Bond.

820.100. Savage Services Corporation has an approved permit and bond on file with the Division, on a form prescribed and furnished by the Division, an approved bond payable to the division and conditioned upon the faithful performance of all the requirements of the State Program, the permit and the reclamation plan. (See Appendix 8-1 and 8-2).

820.110. Areas to be covered by the Performance Bond are:

820.111. The bond covers the proposed disturbed area within the permit area.

820.112. N/A - There are no plans at this time for incremental bonding.

820.113. N/A

820.114. N/A

820.120. Savage Services Corporation will not disturb any surface areas prior to acceptance by the Division of the required performance bond. The existing approved bond covers the existing disturbance, facilities and permit area.

820.130. A performance bond is posted for the full reclamation of the entire proposed disturbed area within the permit area.

820.200. Form of the Performance Bond - See Appendix 8-2.

820.221. The bond is a surety bond.

820.300. Period of Liability.

Performance bond liability will be for the duration of the coal mining and reclamation operations and for a period which is coincident with the operator's period of extended responsibility for successful revegetation provided in R645-301-356 or until achievement of the reclamation requirements of the State Program and permit, whichever is later.

820.350. General.

820.351. The bond liability of the permittee will include only those actions which he or she is obligated to take under the permit, including completion of the reclamation plan, so that the land will be capable of supporting the postmining land use approved under R645-301-413.

820.352. Implementation of an alternative postmining land-use approved under R645-301-413.300 which is beyond the control of the permittee need not be covered by the bond. Bond liability for prime farmland will be as specified in R645-301-880.320.

830. Determination of Bond Amount

830.110. The bond amount has been determined by the Division.

830.120. The bonding calculations provided in Appendix 8-1 of this chapter are based on the proposed permit and reclamation plan and have been determined by the Division.

830.130. Bonding calculations provided have been based on probable difficulty of reclamation, with particular emphasis on the geology, hydrology and revegetation potential.

830.140. Detailed estimated bonding costs, with supporting calculations are provided in Appendix 8-1 of this permit application.

830.200. The bond cost in Appendix 8-1 is based on current labor and equipment rates (Means, Cat Handbook) and are expected to be sufficient to assure the completion of the reclamation plan if the work has to be performed by the Division in the event of forfeiture.

830.300. The proposed reclamation cost has been inflated over a 5 year period (permit term) using the latest Gross National Index (GNI).

830.400. Adjustment of Amount - Per Division.

830.410. The amount of the bond or deposit required and the terms of the acceptance of the applicant's bond will be adjusted by the Division from time to time as the area requiring bond coverage is increased or decreased or where the cost of future reclamation changes. The Division may specify periodic times or set a schedule for reevaluating and adjusting the bond amount to fulfill this requirement.

830.420. The Division will:

830.421. Notify the permittee, the surety, and any person with a property interest in collateral who has requested notification under R645-301-860.260 of any proposed adjustment to the bond amount; and

830.422. Provide the permittee an opportunity for an informal conference on the adjustment.

830.430. A permittee may request reduction of the amount of the performance bond upon submission of evidence to the Division providing that the permittee's method of operation or other circumstances reduces the estimated cost for the Division to reclaim the bonded area. Bond adjustments which involve undisturbed land or revision of the cost estimate of reclamation are not considered bond release subject to procedures of R645-301-880.100 through R645-301-880.800.

830.440. In the event that an approved permit is revised in accordance with the R645 rules, the Division will review the bond for adequacy and, if necessary, will require adjustment of the bond to conform to the permit as revised.

830.500. N/A - This is a surface operation.

840. The bond as approved, meets the terms and conditions of this section.

840.100. See Appendix 8-1

840.200. See Appendix 8-2

840.300. See Appendix 8-2

840.400. See Appendix 8-2.

840.500. General.

840.510. See Appendix 8-2.

840.520. See Appendix 8-2.

850. Bonding Requirements.

Bonding Requirements for UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES and Associated Long-Term Coal-Related Surface Facilities and Structures.

850.100. Responsibilities. The Division will require bond coverage, in an amount determined under R645-301-830, for long-term surface facilities and structures, and for areas disturbed by surface impacts incident to UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES, for which a permit is required. Specific reclamation techniques required for underground mines and long-term facilities will be considered in determining the amount of bond to complete the reclamation.

850.200. Long-term period of liability.

850.210. N/A - Incremental bonding is not planned for this operation.

850.220. This facility meets the definition of a long-term surface disturbance, and is bonded as such.

850.230. The bond meets the requirements of continuous coverage throughout the required liability period.

850.240. The bond meets the requirements of continuous coverage throughout the required liability period.

850.300. Bond Forfeiture. The Division will take action to forfeit a bond pursuant to R645-301-850 if 30 days prior to bond expiration the operator has not filed:

850.310. The bond will be renewed at least 30 days prior to the expiration of the permit term to provide continuous coverage.

850.320. The bond will be renewed as required to provide coverage for the period of liability, including the period of extended responsibility for successful revegetation.

860. Form of Bonds.

860.100. Savage Services Corporation has posted a surety bond for this operation.

860.110. The surety bond has been executed by Savage Services Corporation and a corporate surety licensed to do business in Utah.

860.120. The surety bond is issued for the expected permit term (5 years) and will be noncancellable during the term.

860.200. N/A - There are no plans for a collateral bond for this operation.

860.220. N/A

860.300. N/A - Self bonding is not planned for this operation.

880. Bond Release Application.

Bond release applications will be submitted upon appropriate schedules after final reclamation.

890. Liability Insurance.

Required liability insurance is included in Appendix 8-3.

890.100. A certificate of liability insurance for the operation is included in this permit application in Appendix 8-3.

890.200. See Appendix 8-3.

890.300. See Appendix 8-3.

890.400. N/A - There are no plans to provide self-insurance.

Appendix 8-1

Reclamation Cost Estimate

Savage Services Corporation
Savage Coal Terminal

Bonding Calculations

Direct Costs

Subtotal Demolition and Removal	$901,466.00	
Subtotal Backfilling and Grading	$493,173.00	
Subtotal Revegetation	$230,648.00	
Direct Costs	$1,625,287.00	
Indirect Costs		
Mob/Demob	$162,529.00	10.0%
Contingency	$81,264.00	5.0%
Engineering Redesign	$40,632.00	2.5%
Main Office Expense	$110,520.00	6.8%
Project Mainagement Fee	$40,632.00	2.5%
Subtotal Indirect Costs	$435,577.00	26.8%
Total Cost	$2,060,864.00	
Escalation factor		0.032
Number of years		5
Escalation	$351,528.00	
Reclamation Cost Escalated	$2,412,392.00	
Bond Amount (rounded to nearest $1,000)	$2,412,000.00	
2012 Dollars		
Bond Posted Dollars	$2,525,000.00	
Difference Between Cost Estimate and Bond	$113,000.00	
Percent Difference	4.68%	

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Shop Office 01																			16329
	Scale House 02																			1721
	No 1 Truck Dump 03																			4851
	No 2 Truck Dump 04																			2638
	No 3 Truck Dump 05																			1551
	No 4 Truck Dump 06																			1885
	No 5 Truck Dump 07																			1143
	Conveyors Eight 08																			9290
	Conveyor 48 inch 09																			9290
	No 4 Radial Stacker 10																			3759
	No 5 Radial Stacker 11																			1043
	Conveyor Piers 12																			2194
	Support Structure 13																			1582
	Water Tank 14																			8737
	Reclaim Tunnel 15																			34896
	Portable Hopper 16																			976
	Trailer 17																			1413
	Transfer Bin 18																			2177
	Preparation Plant 19																			217261
	Substation 20																			6049
	Fuel Storage 21																			4391
	Reclaim Control Bld 22																			1503
	Sample House 23																			4491
	Stacking Tube 24																			46338
	Loadout Silo 25																			225965
	Railroad 26																			15000
	Powerline 27																			2500
	Aphalt 28																			118266
	Pumphouse 29																			13095
	River Pump 30																			204
	Guard Rails 31																			63360
	Culverts 32																			1593
	Stacking Tube 33																			24886
	Coal Sampler Addition 34																			5866
	Convevor Transfer 35																			17189
	New Shop Oil Storage Bld 36																			20566
	Plant Expansion 37																			7668
	Total																			901466

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Shop Office 01																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	100	45	10								FT		45000	CF	12600
	Structure's Vol. Demolished																0.01	17	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						17					CY		17	CY	595
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			13195
	Equipment 's Disposal Cost	Chain link remove 8'-10'	02 41 13 60 1700	3.57	/LF	240										LF		240	LF	857
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			857
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	100	45	0.5								FT		83	CY	815
	Concrete's Vol. Demolished																1.3	108	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													108	CY	162
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	31 23 23 17 0320	3.79	/CY													108	CY	409
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													108	CY	891
	Subtotal																			2277
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			16329

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Scale House 02															FT		1152	CF	323
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	12	12	8									0.01	0	CY	
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						0					CY		0	CY	
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			323
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	75	15	3								FT		3375	CF	945
	Structure's Vol. Demolished																0.01	1	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						1					CY		1	CY	35
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			980
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Footer's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY						15					CY		15	CY	147
	Footer's Vol. Demolished																1.3	20	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													20	CY	30
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													20	CY	76
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													20	CY	165
	Subtotal																			418
	Total																			1721

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	No 1 Truck Dump 03																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	16	16	22								FT		5632	CF	1577
	Structure's Vol. Demolished																0.01	2	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						2					CY		2	CY	70
	Subtotal																			1647
	No. 2 Truck Dump	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	16	6	8								FT		768	CF	215
	Structure's Demolition Cost																0.01	1	CY	
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						1					CY		1	CY	35
	Subtotal																			250
	No. 2 Truck Dump	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	200	30	1								FT		6000	CF	1680
	Structure's Demolition Cost																0.01	2	CY	
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						2					CY		2	CY	70
	Subtotal																			1750
	Footer's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	30	40	1								FT		44	CY	432
	Footer's Vol. Demolished																1.3	57	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													57	CY	86
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. tri	31 23 23 17 0320	3.79	/CY													57	CY	216
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													57	CY	470
	Subtotal																			1204
	Total																			4851

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	No 2 Truck Dump 04																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	16	16	22								FT		5632	CF	1577
	Structure's Vol. Demolished																0.01	2	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						2					CY		2	CY	70
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			1647
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Footer's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	120	8	1								FT		36	CY	354
	Footer's Vol. Demolished																1.3	47	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													47	CY	71
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													47	CY	178
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													47	CY	388
	Subtotal																			991
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			2638

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	No 3 Truck Dump 05																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	14	14	20								FT		3920	CF	1098
	Structure's Vol. Demolished																0.01	1	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						1					CY		1	CY	35
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			1133
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Footer's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	20	20	1								FT		15	CY	147
	Footer's Vol. Demolished																1.3	20	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													20	CY	30
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	31 23 23 17 0320	3.79	/CY													20	CY	76
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													20	CY	165
	Subtotal																			418
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			1551

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	No 4 Truck Dump 06																			
	Structure's Demolition Cost	Steel Bld, Large	02 41 16 13.0012	0.28	/CF	16	16	20								FT		5120	CF	1434
	Structure's Vol. Demolished																0.01	2	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						2					CY		2	CY	70
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			1504
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Footer's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	48	4	2								FT		14	CY	137
	Footer's Vol. Demolished																1.3	18	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													18	CY	27
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													18	CY	68
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													18	CY	149
	Subtotal																			381
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			1885

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	No 5 Truck Dump 07																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	30	14	8								FT		3360	CF	941
	Structure's Vol. Demolished																0.01	1	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						1					CY		1	CY	35
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			976
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Footer's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	10	15	1								FT		6	CY	59
	Footer's Vol. Demolished																1.3	8	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													8	CY	12
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													8	CY	30
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													8	CY	66
	Subtotal																			167
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			1143

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Conveyors Eight 08																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	1980	4	4								FT		31680	CF	8870
	Structure's Vol. Demolished																0.01	12	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						12					CY		12	CY	420
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			9290
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			9290

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Conveyor 48 inch 09																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	1980	4	4								FT		31680	CF	8870
	Structure's Vol. Demolished																0.01	12	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						12					CY		12	CY	420
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			9290
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Floor Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	10	15	1								FT		0	CY	0
	Floor's Vol. Demolished																1.3	0	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													0	CY	0
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. tri	31 23 23 17 0320	3.79	/CY													0	CY	0
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													0	CY	0
	Subtotal																			0
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			9290

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	No 4 Radial Stacker 10																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	200	8	8								FT		12800	CF	3584
	Structure's Vol. Demolished																0.01	5	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						5					CY		5	CY	175
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			3759
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Floor Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	10	15	1								FT		0	CY	0
	Floor's Vol. Demolished																1.3	0	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													0	CY	0
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. tri	31 23 23 17 0320	3.79	/CY													0	CY	0
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													0	CY	0
	Subtotal																			0
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			3759

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	No 5 Radial Stacker 11																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	100	6	6								FT		3600	CF	1008
	Structure's Vol. Demolished																0.01	1	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						1					CY		1	CY	35
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			1043
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Floor Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	0	0	0								FT		0	CY	0
	Floor's Vol. Demolished																1.3	0	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													0	CY	0
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. tri	31 23 23 17 0320	3.79	/CY													0	CY	0
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													0	CY	0
	Subtotal																			0
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			1043

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Conveyor Piers 12																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	0	0	0								FT		0	CF	0
	Structure's Vol. Demolished																0.01	0	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						0					CY		0	CY	0
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			0
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Floor Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	3	3	6							40	FT		80	CY	786
	Floor's Vol. Demolished																1.3	104	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													104	CY	156
	Transportation Cost	12 CY (18 Ton) Dump Truck 1/2 mi, rnd. tri	31 23 23 17 0320	3.79	/CY													104	CY	394
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													104	CY	858
	Subtotal																			2194
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			2194

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Support Structure 13																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	300	1	1							18	FT		5400	CF	1512
	Structure's Vol. Demolished																0.01	2	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						2					CY		2	CY	70
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			1582
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Floor Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	0	0	0							0	FT		0	CY	0
	Floor's Vol. Demolished																1.3	0	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													0	CY	0
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													0	CY	0
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													0	CY	0
	Subtotal																			0
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			1582

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Water Tank 14																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF						21390					CF		21390	CF	5989
	Structure's Vol. Demolished																0.01	8	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						8					CY		8	CY	280
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			6269
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Floor Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY						90					CY		90	CY	884
	Floor's Vol. Demolished																1.3	117	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													117	CY	176
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													117	CY	443
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													117	CY	965
	Subtotal																			2468
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			8737

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Reclaim Tunnel 15																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	1040	14	8								FT		116480	CF	32614
	Structure's Vol. Demolished																0.01	43	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						43					CY		43	CY	1505
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			34119
	Escape Tunnel																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF			160	4							FT		2011	CF	563
	Structure's Vol. Demolished																0.01	1	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						1					CY		1	CY	35
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			598
	Reclaim Tunnel 15																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	4	4	4							2	FT		128	CF	36
	Structure's Vol. Demolished																0.01	0	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						0					CY		0	CY	0
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			36
	Escape Tunnel																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	8	8	8								FT		512	CF	143
	Structure's Vol. Demolished																0.01	0	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						0					CY		0	CY	0
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			143
	Total																			34896

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Portable Hopper 16																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	20	12	14								FT		3360	CF	941
	Structure's Vol. Demolished																0.01	1	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						1					CY		1	CY	35
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			976
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Pad's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	0	0	0								FT		0	CY	0
	Pad's Vol. Demolished																1.3	0	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													0	CY	0
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. tri	31 23 23 17 0320	3.79	/CY													0	CY	0
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													0	CY	0
	Subtotal																			0
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			976

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Trailer 17																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	30	8	8								FT		1920	CF	538
	Structure's Vol. Demolished																0.01	1	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						25					CY		25	CY	875
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			1413
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			1413

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Transfer Bin 18																			
	Structure's Demolition Cost	Steel Bld, Large	02 41 16 13 0012	0.28	/CF			30	16							FT		6032	CF	1689
	Structure's Vol. Demolished																0.01	2	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						2					CY		2	CY	70
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			1759
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Pad's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	20	20	1								FT		15	CY	147
	Pad's Vol. Demolished																1.3	20	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													20	CY	30
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. tri	31 23 23 17 0320	3.79	/CY													20	CY	76
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													20	CY	165
	Subtotal																			418
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			2177

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Preparation Plant 19																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	110	80	80								FT		704000	CF	197120
	Structure's Vol. Demolished																0.01	261	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						261					CY		261	CY	9135
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			206255
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	110	80	1								FT		326	CY	3201
	Concrete's Vol. Demolished																1.3	424	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													424	CY	636
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. tri	31 23 23 17 0320	3.79	/CY													424	CY	1607
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													424	CY	3498
	Subtotal																			8942
	Pad's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY						75					CY		75	CY	737
	Pad's Vol. Demolished																1.3	98	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													98	CY	147
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. tri	31 23 23 17 0320	3.79	/CY													98	CY	371
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													98	CY	809
	Subtotal																			2064
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			217261

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Substation 20																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	20	27	8								FT		4320	CF	1210
	Structure's Vol. Demolished																0.01	2	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						64					CY		64	CY	2240
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			3450
	Transformers 's Disposal Cost	Mechanical equipment heavy	25 05 05 10 3600	890	/ton							2				Ton		2	Ton	1780
	Fence Cost	Chain link remove 8'-10'	02 41 13 60 1700	3.57	/LF	180										FT		180	FT	643
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			2423
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	20	27	0.5								FT		10	CY	
	Concrete's Vol. Demolished																1.3	13	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													13	CY	20
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	31 23 23 17 0320	3.79	/CY													13	CY	49
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													13	CY	107
	Subtotal																			176
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			6049

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Fuel Storage 21																			
	Structure's Demolition Cost	3000 gal. to 5000 gal. tank	02 65 10 30 0110	630	Ea.										2	EA		2	EA	1260
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						0					CY		0	CY	0
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			1260
	Trailer																			
	Structure's Demolition Cost	Mixed Materials Bld. Large	02 41 16 13 0100	0.3	/CF	10	50	8								FT		4000	CF	1200
	Structure's Vol. Demolished																0.01	1	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						1					CY		1	CY	35
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			1235
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	30	30	0.68							4	FT		91	CY	
	Concrete's Vol. Demolished																1.3	118	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													118	CY	177
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													118	CY	447
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													118	CY	974
	Subtotal																			1598
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	30	30	0.5								FT		17	CY	
	Concrete's Vol. Demolished																1.3	22	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													22	CY	33
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													22	CY	83
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													22	CY	182
	Subtotal																			298
	Total																			4391

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Reclaim Control Bld 22																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	22	16	12								FT		4224	CF	1183
	Structure's Vol. Demolished																0.01	2	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						2					CY		2	CY	70
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			1253
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Pad's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	22	22	0.5								FT		9	CY	88
	Pad's Vol. Demolished																1.3	12	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													12	CY	18
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. tri	31 23 23 17 0320	3.79	/CY													12	CY	45
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													12	CY	99
	Subtotal																			250
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			1503

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Sample House 23																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	22	22	30								FT		14520	CF	4066
	Structure's Vol. Demolished																0.01	5	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						5					CY		5	CY	175
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			4241
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Pad's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	22	22	0.5								FT		9	CY	88
	Pad's Vol. Demolished																1.3	12	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													12	CY	18
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													12	CY	45
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													12	CY	99
	Subtotal																			250
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			4491

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Stacking Tube 24																			
	Structure's Demolition Cost	Concrete Bld. Large	02 41 16 13 0050	0.4	/CF			200	20						4	FT		62832	CF	25133
	Structure's Vol. Demolished																0.01	23	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						23					CY		23	CY	805
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			25938
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Pad's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY					186					4	CY		744	CY	7306
	Pad's Vol. Demolished																1.3	967	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													967	CY	1451
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													967	CY	3665
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													967	CY	7978
	Subtotal																			20400
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			46338

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Loadout Silo 25																			
	Structure's Demolition Cost	Concrete Bld. Large	02 41 16 13 0050	0.4	/CF			200	50						4	FT		392699	CF	157080
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						145					CY		145	CY	5075
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			162155
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Pad's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY					2327					1	CY		2327	CY	22851
	Pad's Vol. Demolished																1.3	3025	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													3025	CY	4538
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	31 23 23 17 0320	3.79	/CY													3025	CY	11465
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													3025	CY	24956
	Subtotal																			63810
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			225965

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Railroad 26																			
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment 's Disposal Cost	Rail Road Removal	Contractors	10000	/Mi	8100										LF		1.5	Mi	15000
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			15000
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			15000

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Powerline 27																			
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment 's Disposal Cost	Powerpole	Hiawatha	100	EA										25	EA.		25	EA.	2500
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			2500
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			2500

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Aphalt 28																			
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Haul Road																			
	Pavement's Demolition																			
	Demolition Cost	Pavement Removal 4-6"	02 41 13 15 5050	7.15	/SY	4700	24									FT		12533	SY	89611
	Pavement's Vol. Demolished							0.5									1.3	2715	CY	
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CY													2715	CY	22399
	Subtotal																			112010
	Parking Lot																			
	Pavement's Demolition																			
	Demolition Cost	Pavement Removal 4-6"	02 41 13 15 5050	7.15	/SY	50	140									FT		778	SY	5563
	Pavement's Vol. Demolished							0.25										84	CY	
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CY													84	CY	693
	Subtotal																			6256
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			118266

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Pumphouse 29																			
	Structure's Demolition Cost	Mixed Materials Bld. Large	02 41 16 13 0100	0.3	/CF	40	26	10								FT		10400	CF	3120
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						135					CY		135	CY	4725
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			7845
	Pumphouse																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF			8	12						1	Ft.		905	CF	253
	Structure's Vol. Demolished																0.01	5	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						5					CY		5	CY	175
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			428
	Pumphouse																			
	Structure's Demolition Cost	Concrete Bld. Large	02 41 16 13 0050	0.4	/CF			30	21						1	Ft.		10391	CF	4156
	Structure's Vol. Demolished																0.01	4	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON						4					CY		4	CY	140
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			4296
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Pad's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	40	26	0.5								FT		19	CY	187
	Pad's Vol. Demolished																1.3	25	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													25	CY	38
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													25	CY	95
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													25	CY	206
	Subtotal																			526
	Total																			13095

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	River Pump 30																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	8	8	8								FT		512	CF	143
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			143
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Pad's Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	8	8	1								FT		2	CY	20
	Pad's Vol. Demolished																1.3	3	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													3	CY	5
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													3	CY	11
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													3	CY	25
	Subtotal																			61
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			204

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Guard Rails 31																			
	Structure's Demolition Cost	Guiderail remove	02 41 13 33 0800	12.8	LF	4950										LF		4950	LF	63360
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			63360
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			63360

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Culverts 32																			
	Excavate 12" diameter culvert	Excavation Bulk Bank 2 CY (322BL)	31 23 16 32 0260	1.86	/CY	300	2	2								FT		44	CY	82
	Backfill 12" diameter culvert	Backfill Trench Mininal Haul 2 1/4 CY	31 23 16 13 3080	1.71	/CY	300	2	2								FT		44	CY	75
	Excavate 18" diameter culvert	Excavation Bulk Bank 2 CY (322BL)	31 23 16 32 0260	1.86	/CY	810	2	3								FT		180	CY	335
	Backfill 18" diameter culvert	Backfill Trench Mininal Haul 2 1/4 CY	31 23 16 13 3080	1.71	/CY	810	2	3								FT		180	CY	308
	Excavate 24" diameter culvert	Excavation Bulk Bank 2 CY (322BL)	31 23 16 32 0260	1.86	/CY	750	2	4								FT		222	CY	413
	Backfill 24" diameter culvert	Backfill Trench Mininal Haul 2 1/4 CY	31 23 16 13 3080	1.71	/CY	750	2	4								FT		222	CY	380
	Subtotal																			1593
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			1593

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Stacking Tube 33																			
	36" Conveyor																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	100	45	10								FT		45000	CF	12600
	Structure's Vol. Demolished																0.1	167	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON											CY		167	CY	5845
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			18445
	Steel Stacking Tube																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF			80.3	10						2	FT		12613	CF	3532
	Structure's Vol. Demolished																0.1	47	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON											CY		47	CY	1645
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			5177
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY						46					CY		46	CY	452
	Concrete's Vol. Demolished																1.3	60	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													60	CY	90
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. tri	31 23 23 17 0320	3.79	/CY													60	CY	227
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													60	CY	495
	Subtotal																			1264
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			24886

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Coal Sampler Addition 34																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	27	26	16								FT		11232	CF	3145
	Structure's Vol. Demolished																0.1	42	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON								100			lb/cf		57	ton	1995
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			5140
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	27	26	0.75								FT		19	CY	187
	Concrete's Vol. Demolished																1.3	25	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													25	CY	38
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. tri	31 23 23 17 0320	3.79	/CY													25	CY	95
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													25	CY	206
	Subtotal																			526
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			5666

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Convevor Transfer 36																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	1538	7	4								FT		43064	CF	12058
	Structure's Vol. Demolished																0.05	80	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON								100			lb/cf		108	ton	3780
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			15838
	Excavate 18" diameter culvert	Excavation Bulk Bank 2 CY (322BL)	31 23 16 32 0260	1.86	/CY	800	2	3								FT		178	CY	331
	Backfill 18" diameter culvert	Backfill Trench Mininal Haul 2 1/4 CY	31 23 16 13 3080	1.71	/CY	800	2	3								FT		178	CY	304
	Subtotal																			635
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY	8	2	2							22	FT		26	CY	255
	Concrete's Vol. Demolished																1.3	34	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													34	CY	51
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	31 23 23 17 0320	3.79	/CY													34	CY	129
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													34	CY	281
	Subtotal																			716
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			17189

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	New Shop Oil Storage Bld 36																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	40	80	18								FT		57600	CF	16128
	Structure's Vol. Demolished																0.01	21	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON								100			lb/cf		28	ton	980
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			17108
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			0
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY						126					CY		126	CY	1237
	Concrete's Vol. Demolished																1.3	164	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													164	CY	246
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													164	CY	622
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													164	CY	1353
	Subtotal																			3458
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			20566

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Plant Expansion 37																			
	Plant Feed Convevor																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	233	4	4								FT		3728	CF	1044
	Structure's Vol. Demolished																0.01	1	CY	
	Fine Raow Coal Convevor																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	200	4	4								FT		3200	CF	896
	Structure's Vol. Demolished																0.01	1	CY	
	Refuse Convevor																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	100	4	4								FT		1600	CF	448
	Structure's Vol. Demolished																0.01	1	CY	
	Stacking Convevor																			
	Structure's Demolition Cost	Steel Bld. Large	02 41 16 13 0012	0.28	/CF	100	4	4								FT		1600	CF	448
	Structure's Vol. Demolished																0.01	1	CY	
	Subtotal																			2836
	Plant Feed Convevor																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY						42.6					CY		42.6	CY	418
	Concrete's Vol. Demolished																1.3	55	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													55	CY	83
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													55	CY	208
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													55	CY	454
	Subtotal																			1163
	Fine Raow Coal Convevor																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY						33.1					CY		33.1	CY	325
	Concrete's Vol. Demolished																1.3	43	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													43	CY	65
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													43	CY	163
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													43	CY	355
	Subtotal																			908
	Refuse Convevor																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY						15.3					CY		15.3	CY	150
	Concrete's Vol. Demolished																1.3	20	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													20	CY	30
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													20	CY	76
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													20	CY	165
	Subtotal																			421
	Stacking Convevor																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.82	/CY						85.1					CY		85.1	CY	836
	Concrete's Vol. Demolished																1.3	111	CY	
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.5	/CY													111	CY	167
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. tri	31 23 23 17 0320	3.79	/CY													111	CY	421
	Disposal Costs	Disposal on site	02 41 16 17 4200	8.25	/CF													111	CY	916
	Subtotal																			2340
	Total																			7668

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Cleanup Coal Piles															8419
Recontouring															263804
Topsoil															109743
Ripping															111207
Subtotal															493173

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Savage Coal Terminal															
Cleanup Coal Piles															
D9R Semi-U EROPS (9-50) (2H2006)	19530	90.4	0.1	57.85	279.35	1	279.35	HR	1500	CY	187	CY/HR	8	HR	2235
988G EROPS (9-34) (2nd2006) 2005	15505	77.35	0.1	57.85	239.84	1	239.84	HR	1500	CY	187	CY/HR	8	HR	1919
CLAB					44.75	1	44.75	HR					16	HR	716
Foreman Average, Outside					62.25	1	62.25	HR					16	HR	996
5,000 gal H2O truck Diesel (20-17) (2nd2006)	5170	55	0.1	45.65	138.46	1	138.46	HR					16	HR	2215
Pickup Truck Crew 4x4 1 ton (20-17) (2nd2006)	1070	13.1	0.1	0	21.1	1	21.1	HR					16	HR	338
Subtotal															8419

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Svage Coal Terminal Recontouring															
D9R Semi-U EROPS (9-50) (2H2006)	19530	90.4	0.1	57.85	279.35	1	279.35	HR					639	HR	178505
CLAB					44.75	1	44.75	HR					320	HR	14320
Foreman Average, Outside					62.25	1	62.25	HR					320	HR	19920
5,000 gal H2O truck Diesel (20-17) (2nd2006)	5170	55	0.1	45.65	138.46	1	138.46	HR					320	HR	44307
Pickup Truck Crew 4x4 1 ton (20-17) (2nd2006)	1070	13.1	0.1	0	21.1	1	21.1	HR					320	HR	6752
Subtotal															263804

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Savage Coal Terminal Topsoil															
D8R Series II (9-50(2nd2006)	15125	67.55	0.1	57.85	226.69	1	226.69	HR					102	HR	23122
627G EROPS (9-47) (2nd2006)	17460	113.05	0.1	57.85	291.33	1	291.33	HR					204	HR	59431
CLAB					44.75	1	44.75	HR					102	HR	4565
Foreman Average, Outside					62.25	1	62.25	HR					102	HR	6350
5,000 gal H2O truck Diesel (20-17) (2nd2006)	5170	55	0.1	45.65	138.46	1	138.46	HR					102	HR	14123
Pickup Truck Crew 4x4 1 ton (20-17) (2nd2006)	1070	13.1	0.1	0	21.1	1	21.1	HR					102	HR	2152
Subtotal															109743

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Ripping															
D7R Series II (9-50) (2nd2006)	11575	52.85	0.1	57.85	188.33	1	188.33	HR					139	HR	26178
Multi-Shank Ripper 190-259 P (9-56) (2nd2006)	1955	545	0.1		611.72	1	611.72	HR					139	HR	85029
Subtotal															111207

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Vegetation																			
	General Area																			
	Seeding Equipment and Labor	Tractor Spreader (equip. & labor) B-66	Reveg004	12.71	/MSF					132.5						AC		5772	MSF	73362
	Seeding Material	General Seed Mix	Savage07221	151.15	/AC					132.5						AC		132.5	AC	20027
	Mulch	Crew B 65	Reveg008	1090.98	/Day										11	Days		11	Day	12001
		Hay bale	Reveg007	166.1	/ton					132.5						AC		132.5	AC	22008
	Riprarian																			
	Seeding Equipment and Labor	Hydro Spreader (equip. & labor) B-81 80MS	Reveg002	210.37	/MSF					5.28						AC		230	MSF	48385
	Seeding Material	Riparian Seed Mix	Savage07222	49.5	/AC					5.28						AC		5	AC	248
	Area									5.28										
										5.28						AC				
		Bare root seedlings, 11" to 16" med. soil	32 93 43 10 0140	1.71	Ea										4963	EA		4963	EA	8487
	Subtotal																			184518
	Revegetation																			
	25% Revegetation Rate																			46130
	Subtotal																			46130
	Subtotal																			
	Subtotal																			
	Total																			230648

Appendix 8-2

Reclamation Performance Bond

Savage Services Corporation
Savage Coal Terminal

Orig. Fireproof File
cc: C0070008

L. Dean Rees
Sr. V.P. - Finance & Administrative Services

SAVAGE
Savage Services Corporation
6340 South 3000 East #600
Salt Lake City, UT 84121
(801) 944-6600
Fax (801) 944-6500

February 26, 2004

Fireproof
C/007/0222

Pamela Grubaugh-Littig
State of Utah
Division of Oil, Gas & Mining
P.O. Box 145801
Salt Lake City, UT 84114-5801

Dear Ms. Grubaugh-Littig:

Enclosed is a reclamation bond as required by the State of Utah in the amount of $2,525,000 which covers the property at our coal handling terminal in Carbon County. This bond replaces the bond currently on file. Please return the previous bond so it may be appropriately cancelled by the Surety.

Thank you for your attention to this matter. If you have any questions you may call me at the above listed number.

Sincerely,

L. Dean Rees

RECEIVED
FEB 27 2004
DIV. OF OIL, GAS & MINING

EXHIBIT "B"

Bonding Agreement
Surety Forms

(Non-Federal Coal)

THIS BOND REPLACES NATIONAL FIRE INSURANCE COMPANY OF HARTFORD BOND NO - 158987108

Exhibit "B"
Non-Federal Surety Bond
Non-Federal

Bond Number: 965-003-641

EXHIBIT "B"
SURETY BOND
(NON-FEDERAL COAL)
--ooOOoo--

This **SURETY BOND** entered into by and between the undersigned **PERMITTEE/PRINCIPAL** SAVAGE SERVICES CORPORATION, and **SURETY** LIBERTY MUTUAL INSURANCE COMPANY, hereby jointly and severally bind ourselves, our heirs, administrators, executors, successors and assigns unto the State of Utah, Division of Oil, Gas & Mining (**DIVISION**) in the penal sum of TWO MILLION FIVE HUNDRED TWENTY-FIVE THOUSAND AND NO/100 DOLLARS ($2,525,000.00) ($) (Surety Bond Amount) for the timely performance of reclamation responsibilities of the surface disturbance described in Exhibit "A" of the Reclamation Agreement.

This **SURETY BOND** will remain in effect until all of the **PERMITTEE'S/ PRINCIPAL'S** reclamation obligation have been met and released by the **DIVISION** and is conditioned upon faithful performance of all of the requirements of the Act, the applicable rules and regulations, the approved permit, and the **DIVISION**.

The **SURETY** will not cancel this bond at any time for any reason, including non-payment of premium or bankruptcy of the Principal during the period of liability.

The **SURETY** and their successors and assigns, agree to guarantee the obligation and to indemnify, defend, and hold harmless the **DIVISION** from all expenses which the **DIVISION** may sustain as a result of the **PERMITTEE'S/PRINCIPAL'S** failure to comply with the condition(s) of the reclamation obligation.

The **SURETY** will give prompt notice to the **PERMITTEE/PRINCIPAL** and to the **DIVISION** of any notice received or action alleging the insolvency or bankruptcy of the **SURETY**, or alleging any violations or regulatory requirement which could result in suspension or revocation of the **SURETY'S** license.

Terms for release or adjustment of the **BOND** are as written and agreed to by the **DIVISION** and the **PERMITTEE/PRINCIPAL** in the **RECLAMATION AGREEMENT** incorporated by reference herein, to which this **SURETY AGREEEMNT** has been attached as Exhibit "B".

IN WITNESS WHEREOF, the **PERMITTEE/PRINCIPAL** has hereunto set it's signature and seal this 9TH day of DECEMBER, 2003.

SAVAGE SERVICES CORPORATION
PERMITTEE/PRINCIPAL

By:

S.V.P.
Title:

Exhibit "B"
Non-Federal Surety Bond
Non-Federal

Bond Number: 965-003-641

IN WITNESS WHEREOF, the **SURETY** has hereto set it's signature and seal this 9TH day of DECEMBER, 2003.

LIBERTY MUTUAL INSURANCE COMPANY
SURETY

By:

TINA DAVIS, ATTORNEY-IN-FACT
Title:

ACCEPTED BY THE STATE OF UTAH:

Lowell P Braxton
Director,
Division of Oil, Gas & Mining

NOTE: An **Affidavit of Qualification** must be completed and attached to this form for each authorized agent or officer. Where one signs by virtue of Power of Attorney for a company, such Power of Attorney must be filed with this Agreement. If the **PERMITTEE/PRINCIPAL** is a corporation, the Agreement shall be executed by it's duly authorized officer.

AFFIDAVIT OF QUALIFICATION
PERMITTEE
-oo00oo-

I, L. DEAN REES being first duly sworn under oath, deposes and says that he/she is the SR. VICE PRESIDENT of SAVAGE SERVICES CORPORATION, the **PERMITTEE**; and that he is duly authorized to execute and deliver the foregoing obligations; and that said **PERMITTEE** is authorized to execute the same and has complied in all respects with the laws of Utah in reference to commitments, undertakings and obligations herein.

Subscribed and sworn to before me this 9TH day of DECEMBER, 19 2003

Notary Public

My Commission Expires:

Attest:

STATE OF UTAH)

COUNTY OF SALT LAKE)ss:

AFFIDAVIT OF QUALIFICATION
SURETY COMPANY
—oo0oo—

I, TINA DAVIS, being first duly sworn under oath, deposes and says that he/she is the (officer or agent) ATTORNEY-IN-FACT of LIBERTY MUTUAL INSURANCE COMPANY; and that he/she is duly authorized to execute and deliver the foregoing obligations; and that said **SURETY COMPANY** is authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations herein.

~~(Surety Company Officer)~~

ATTORNEY-IN-FACT

(Position)

Subscribed and sworn to before me this 9TH day of DECEMBER, ~~19~~ 2003

Notary Public

My Commission Expires: 10/1/07

NOTARY PUBLIC
AUBREY LORBAX
2087 Fremont Crest Ave.
Syracuse, Utah 84075
My Commission Expires
October 1, 2007
STATE OF UTAH

Attest:

STATE OF UTAH)

COUNTY OF SALT LAKE)ss:

NOTICE FROM SURETY REQUIRED BY TERRORISM RISK INSURANCE ACT OF 2002

In accordance with the Terrorism Risk Insurance Act of 2002 (referred to hereinafter as the "Act"), this disclosure notice is provided for surety bonds on which one or more of the following companies is the issuing surety: Liberty Mutual Insurance Company; Liberty Mutual Fire Insurance Company; LM Insurance Corporation; The First Liberty Insurance Corporation; Liberty Insurance Corporation; Employers Insurance Company of Wausau (formerly "EMPLOYERS INSURANCE OF WAUSAU A Mutual Company"); Peerless Insurance Company; and any other company that is a part of or added to the Liberty Mutual Group for which surety business is underwritten by Liberty Bond Services (referred to collectively hereinafter as the "Issuing Sureties").

NOTICE FORMS PART OF BOND

This notice forms part of surety bonds issued by any one or more of the Issuing Sureties.

DISCLOSURE OF PREMIUM

The premium attributable to any bond coverage for "acts of terrorism" as defined in Section 102(1) of the Act is Zero Dollars ($0.00).

DISCLOSURE OF FEDERAL PARTICIPATION IN PAYMENT OF TERRORISM LOSSES

The United States will reimburse the Issuing Sureties for ninety percent (90%) of any covered losses from terrorist acts certified under the Act exceeding the applicable surety deductible.

Fireproof File

CC: C0070022
Attached to Pam

CNA SURETY

220 South 500 East Suite 460 Salt Lake City UT 84102

Thomas W. Kershaw
Underwriting Manager
Salt Lake City Branch
Telephone 801-321-4967
800-262-7873
Facsimile 801-364-7532
Internet twkershaw@cnasurety.com

March 2, 2004

Pamela Grubaugh-Littig, Permit Supervisor
State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
1594 West Temple, Suite 1210
Salt Lake City, UT 84114-5801

Savage Industries, Inc.
Bond #158987108-Reclamation Bond

Dear Ms. Grubaugh-Littig,

It is our understanding that Liberty Mutual Insurance Company Bond Number 965-003-641, issued effective December 9, 2003 in the amount of $2,525,000 for Savage Services Corporation, has replaced the captioned bond.

In as much as Liberty Mutual Insurance Company's bond now provides the surety guarantee for Savage's reclamation obligations under their Reclamation Agreement, we respectfully request that National Fire Insurance Company of Hartford be released effective December 9, 2003 from Bond #158987108 either by the return of the original bond issued December 9, 1997, an unqualified written release of our liability issued on Division letterhead or acknowledging, accepting and returning the enclosed Request For Release.

Thank you for you cooperation in this matter and please advise if you will need additional information.

Regards,

Thomas W. Kershaw

Enc.

RECEIVED
MAR 08 2004
DIV. OF OIL, GAS & MINING

CNA SURETY

230 South 500 East, Suite 480, Salt Lake City, UT 84102 (801) 321-4971

MARCH 3, 2004

REQUEST FOR RELEASE

OBLIGEE:

STATE OF UTAH – DEPT. OF NATURAL RESOURCES
DIVISION OF OIL, GAS & MINING
1594 WEST NORTH TEMPLE, SUITE 1210
SALT LAKE CITY, UT 84114-5801

Notice is hereby given of a Request for Release of this Company's Suretyship on behalf of SAVAGE INDUSTRIES, INC. (principal) located in MURRAY, UT for TWO MILLION FIVE HUNDRED TWENTY-FIVE THOUSAND AND 00/100 DOLLARS ($2,525,000.00) under Bond No. 158987108 originally issued on or about NOVEMBER 9, 1997.

Please accept notice of this Request for Release to be effective on December 9, 2003. This Reclamation is now held under **Liberty Mutual Insurance Company bond 965-003-641**, effective December 9, 2003, in the name of Savage Services Corporation. Please sign below and return a copy of this notice in the envelope provided.

NATIONAL FIRE INSURANCE COMPANY OF HARTFORD

By: _____
THOMAS W. KERSHAW, ATTORNEY-IN-FACT

Type of Bond: *RECLAMATION BOND*

CC: AGENT
PRINCIPAL

OBLIGEE: The Obligee hereby gives a complete and unqualified release of liability by acknowledging the receipt and acceptance of this Request for Release of liability.

Obligee
Accepted: _____ Date: _____

A copy of the Obligee's signed acceptance must be returned to the Surety.

POWER OF ATTORNEY APPOINTING INDIVIDUAL ATTORNEY-IN-FACT

Know All Men By These Presents, That Continental Casualty Company, an Illinois corporation, National Fire Insurance Company of Hartford, a Connecticut corporation, and American Casualty Company of Reading, Pennsylvania, a Pennsylvania corporation (herein called "the CNA Companies"), [illegible]ly organized and existing corporations having their principal offices in the City of Chicago, and State of Illinois, and that they do by virtue of the [illegible]ures and seals herein affixed hereby make, constitute and appoint

Jon S. Way, Thomas W. Kershaw, Ronald M. Mitchell, Individually

of their true and lawful Attorney(s)-in-Fact with full power and authority hereby conferred to sign, seal and execute for and on their behalf bonds, undertakings and other obligatory instruments of similar nature

- In Unlimited Amounts -

and to bind them thereby as fully and to the same extent as if such instruments were signed by a duly authorized officer of their corporations and all the acts of said Attorney, pursuant to the authority hereby given is hereby ratified and confirmed.

This Power of Attorney is made and executed pursuant to and by authority of the By-Law and Resolutions, printed on the reverse hereof, duly adopted, as indicated, by the Boards of Directors of the corporations.

In Witness Whereof, the CNA Companies have caused these presents to be signed by their Vice President and their corporate seals to be hereto affixed on this 28th day of July, 2003.

Continental Casualty Company
National Fire Insurance Company of Hartford
American Casualty Company of Reading, Pennsylvania

Michael Gengler — Senior Vice President

State of Illinois, County of Cook, ss:

On this 28th day of July, 2003, before me personally came Michael Gengler to me known, who, being by me duly sworn, did depose and say: that he resides in the City of Chicago, State of Illinois; that he is a Senior Vice President of Continental Casualty Company, an Illinois corporation, National Fire Insurance Company of Hartford, a Connecticut corporation, and American Casualty Company of Reading, Pennsylvania, a Pennsylvania corporation described in and which executed the above instrument; that he knows the seals of said corporations; that the seals affixed to the said instrument are such corporate seals; that they were so affixed pursuant to authority given by the Boards of Directors of said corporations and that he signed his name thereto pursuant to like authority, and acknowledges same to be the act and deed of said corporations.

OFFICIAL SEAL
ELIZA PRICE
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES: 09/17/06

My Commission Expires September 17, 2006

Eliza Price — Notary Public

CERTIFICATE

I, Mary A. Ribikawskis, Assistant Secretary of Continental Casualty Company, an Illinois corporation, National Fire Insurance Company of Hartford, a Connecticut corporation, and American Casualty Company of Reading, Pennsylvania, a Pennsylvania corporation do hereby certify that the Power of Attorney herein above set forth is still in force, and further certify that the By-Law and Resolution of the Board of Directors of the corporations printed on the reverse hereof is still in force. In testimony whereof I have hereunto subscribed my name and affixed the seal of the said corporations this 3rd day of March, 2004.

Continental Casualty Company
National Fire Insurance Company of Hartford
American Casualty Company of Reading, Pennsylvania

Mary A. Ribikawskis — Assistant Secretary

Form F6853

1403395

HIS POWER OF ATTORNEY IS NOT VALID UNLESS IT IS PRINTED ON RED BACKGROUND.
This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

LIBERTY MUTUAL INSURANCE COMPANY
BOSTON, MASSACHUSETTS
POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS: That Liberty Mutual Insurance Company (the "Company"), a Massachusetts stock insurance company, pursuant to and by authority of the By-law and Authorization hereinafter set forth, does hereby name, constitute and appoint
JACE PEARSON, TINA DAVIS, DORIS MARTIN, KAREN HONE, VICKI SORENSEN, ALL OF THE CITY OF SALT LAKE CITY, STATE OF UTAH

, each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations in the penal sum not exceeding **SEVENTY-FIVE MILLION AND 00/100**************************** DOLLARS ($ **75,000,000.00*******) each, and the execution of such undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents, shall be as binding upon the Company as if they had been duly signed by the president and attested by the secretary of the Company in their own proper persons.

That this power is made and executed pursuant to and by authority of the following By-law and Authorization:

ARTICLE XIII - Execution of Contracts: Section 5. Surety Bonds and Undertakings.
Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

By the following instrument the chairman or the president has authorized the officer or other official named therein to appoint attorneys-in-fact:

Pursuant to Article XIII, Section 5 of the By-Laws, Garnet W. Elliott, Assistant Secretary of Liberty Mutual Insurance Company, is hereby authorized to appoint such attorneys-in-fact as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

That the By-law and the Authorization set forth above are true copies thereof and are now in full force and effect.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Company and the corporate seal of Liberty Mutual Insurance Company has been affixed thereto in Plymouth Meeting, Pennsylvania this 27th day of October, 2003.

LIBERTY MUTUAL INSURANCE COMPANY

By Garnet W. Elliott
Garnet W. Elliott, Assistant Secretary

COMMONWEALTH OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 27th day of October, 2003, before me, a Notary Public, personally came Garnet W. Elliott, to me known, and acknowledged that he is an Assistant Secretary of Liberty Mutual Insurance Company; that he knows the seal of said corporation; and that he executed the above Power of Attorney and affixed the corporate seal of Liberty Mutual Insurance Company thereto with the authority and at the direction of said corporation.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at Plymouth Meeting, Pennsylvania, on the day and year first above written.

TERESA PASTELLA COMMONWEALTH OF PENNSYLVANIA NOTARY PUBLIC

Notarial Seal
Teresa Pastella, Notary Public
Plymouth Twp., Montgomery County
My Commission Expires Mar. 28, 2005
Member, Pennsylvania Association of Notaries

By Teresa Pastella
Teresa Pastella, Notary Public

CERTIFICATE

I, the undersigned, Assistant Secretary of Liberty Mutual Insurance Company, do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy, is in full force and effect on the date of this certificate; and I do further certify that the officer or official who executed the said power of attorney is an Assistant Secretary specially authorized by the chairman or the president to appoint attorneys-in-fact as provided in Article XIII, Section 5 of the By-laws of Liberty Mutual Insurance Company.

This certificate and the above power of attorney may be signed by facsimile or mechanically reproduced signatures under and by authority of the following vote of the board of directors of Liberty Mutual Insurance Company at a meeting duly called and held on the 12th day of March, 1980.

VOTED that the facsimile or mechanically reproduced signature of any assistant secretary of the company, wherever appearing upon a certified copy of any power of attorney issued by the company in connection with surety bonds, shall be valid and binding upon the company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seal of the said company, this 9TH day of DECEMBER, 2003.

By David M. Carey
David M. Carey, Assistant Secretary

currency rate, interest rate or residual value guarantee

To confirm the validity of this Power of Attorney call 610-832-8240 between 9AM and 4PM in the City of Philadelphia on business day

Appendix 8-3

Liability Insurance

Savage Services Corporation
Savage Coal Terminal

ACORD. CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 03/20/2009

PRODUCER
Marsh USA Risk & Insurance Services
15 West South Temple, Suite 700
Salt Lake City, UT 84101
Attn: Chris Brimhall (801) 533-3627

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURED
SAVAGE COMPANIES
6340 SOUTH 3000 EAST, SUITE 600
SALT LAKE CITY, UT 84121

INSURERS AFFORDING COVERAGE	NAIC #
INSURER A: National Union Fire Ins Co Pittsburgh PA	19445
INSURER B: Insurance Company Of The State Of PA	19429
INSURER C: New Hampshire Insurance Company	23841
INSURER D:	
INSURER E:	

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	ADD'L INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A		GENERAL LIABILITY X COMMERCIAL GENERAL LIABILITY CLAIMS MADE X OCCUR X SIR $500,000 GENERAL AGGREGATE LIMIT APPLIES PER: POLICY PRO-JECT LOC	GL948887	04/01/09	04/01/10	EACH OCCURRENCE	$ 4,500,000
						DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 4,500,000
						MED EXP (Any one person)	$
						PERSONAL & ADV INJURY	$ 4,500,000
						GENERAL AGGREGATE	$ 9,500,000
						PRODUCTS - COMP/OP AGG	$ 4,500,000
A		AUTOMOBILE LIABILITY X ANY AUTO	CA948483 (AOS)	04/01/09	04/01/10	COMBINED SINGLE LIMIT (Ea accident)	$ 5,000,000
A		ALL OWNED AUTOS SCHEDULED AUTOS X HIRED AUTOS X NON-OWNED AUTOS	CA948484 (MA)	04/01/09	04/01/10	BODILY INJURY (Per person)	$
						BODILY INJURY (Per accident)	$
						PROPERTY DAMAGE (Per accident)	$
		GARAGE LIABILITY ANY AUTO				AUTO ONLY - EA ACCIDENT	$
						OTHER THAN AUTO ONLY: EA ACC	$
						AGG	$
		EXCESS/UMBRELLA LIABILITY OCCUR CLAIMS MADE				EACH OCCURRENCE	$
						AGGREGATE	$
		DEDUCTIBLE					$
		RETENTION $					$
							$
B		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY	WC4375735 (AOS)	04/01/09	04/01/10	X WC STATUTORY LIMITS OTHER	
B		ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED?	WC4375734 (CA)	04/01/09	04/01/10	E.L. EACH ACCIDENT	$ 1,000,000
B		If yes, describe under: SPECIAL PROVISIONS below	WC4375736 (FL & OR)	04/01/09	04/01/10	E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
C			WC4375737 (TX)	04/01/09	04/01/10	E.L. DISEASE - POLICY LIMIT	$ 1,000,000
		OTHER					

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS

SUBJECT TO THE STANDARD EXCLUSIONS IN THE 2000 GENERAL LIABILITY ISO FORM, CG 00 01 10 01. COVERAGE FOR DAMAGE CAUSED BY EXPLOSIVES IS NOT SPECIFICALLY EXCLUDED ON THE GENERAL LIABILITY POLICY. RE: SAVAGE COAL TERMINAL PROCESS AND LOADOUT FACILITY ACT/007/022.

CERTIFICATE HOLDER SEA-001100711-22

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS & MINING
PO BOX 145801
SALT LAKE CITY, UT 84114-5801

RECEIVED
MAR 23 2009
DIV. OF OIL, GAS & MINING

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL [redacted] MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT. [redacted]

AUTHORIZED REPRESENTATIVE
of Marsh USA Risk & Insurance Services
Chris Brimhall

Chris Brimhall

ACORD 25 (2001/08)

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