SUNNYSIDE COAL COMPANY
1993 ANNUAL REPORT

ACT/007/007
March 31, 1994

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor

Ted Stewart
Executive Director

James W. Carter
Division Director

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340
801-359-3940 (Fax)
801-538-5319 (TDD)

February 15, 1994

Mr. Joe Fielder, General Manager
Sunnyside Coal Company
P.O. Box 99
Sunnyside, Utah 84539

Re: Submittal of Annual Report for 1993, Sunnyside Coal Company, Sunnyside Mine, ACT/007/007, Folder #2, Carbon County, Utah

Dear Mr. ~~Fielder~~ Joe:

Enclosed please find the forms and summaries of activities that should be included in the coal mining and reclamation monitoring report for 1993. Please submit these reports to the Division by April 15, 1994. (This date has been extended to April 15, 1994 due to the date of letter.)

If you have any questions, please call Daron Haddock or Pamela Grubaugh-Littig.

Sincerely,

Lowell

Lowell P. Braxton
Associate Director, Mining

sm/mbm
Enclosures
cc: P. Grubaugh-Littig
D. Haddock
A:/Annual

RECEIVED
FEB 17 1994

COAL MINING AND RECLAMATION OPERATIONS FOR 1993

(Must be submitted to the Division by April 15, 1994)

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
3 Triad Center, Suite 350
355 West North Temple
Salt Lake City, Utah 84180-1203
(801) 538-5340

Permittee: Sunnyside Coal Company

Mine Name: Sunnyside Mines

Mailing Address: P. O. Box 99, Sunnyside, Utah 84539

Company Representative: Joseph R. Fielder

Resident Agent: Denise Dragoo

Permit Number: ACT/007/007

MSHA ID Number: 42-00093 (No. 1 Mine) 42-01813 (Surface)

Date of Initial Permanent Program Permit: January, 1985

Date of Permit Renewal: January 20, 1991

Quantity of Coal Mined (tonnage) 1993: 577,897 tons (CLEAN)

Attach Updated Mine Sequence Map(s) showing mine development through December 31, 1993. (Same as Lease Royalty Payment Map and/or MSHA Progress Map)

All monitoring activities during the report period to be submitted with this report (including, but not limited to):

A. General

1. Discuss anomalies, missing data and monitoring changes made throughout the year.
2. Summarize any corrective actions and the results that may have occurred during the year.

B. Water Monitoring Data:
Groundwater Summary

1. Mine Discharge
   a. Summarize the total annual discharge from mine water discharge points and breakdown on a monthly basis for each site.
   b. Discuss the past five years of data comparing changes in discharge. Elements such as mining rate, location of faults or large in-mine flows during the year should be discussed.
   c. Discuss trends and exceedence in water quality parameters. A correlation with flow could provide additional information.

2. Springs
   a. Are there seasonal trends/or changes in water quality for each quarter. Stiff diagrams provide a good aid in this determination.
   b. Provide an analysis of changes in quantity of flow. Discuss any significant changes or trends. An accumulation of long-term data is necessary for this discussion.

3. Surface Water
   a. Include (discuss or tabulate) comparisons of upstream and downstream water quality and quantity for monitoring sites for each quarter. Include tributary quantity and quality information. Compare with mine water discharge where applicable.
   b. Discuss any subsidence occurring over tributaries and streams, and results from monitoring of subsided areas.

C. Summarized Water Monitoring Data

1. List of monitoring points and their locations, based on UTM coordinates, and respective frequencies of monitoring (monthly, quarterly, etc.) as approved in the PAP;
2. UPDES permit number, UPDES discharge points, and their locations based on UTM coordinates.
3. Summary of findings based on water monitoring during 1993; and
4. Submit water monitoring as DOS based files. Be specific about the format, submit data in one of the following formats only, i.e: Quattro Pro, Lotus, or ASCII.

D. Precipitation or Other Climatological Data (please submit as DOS based files: ASCII, Lotus, Quattro Pro, FoxPro, etc. -- Contact Ken Wyatt, if you have any questions).

E. Subsidence Monitoring Report:

1. Brief description of monitoring system (monuments or aerial surveys, how monitoring is done, how frequently monitoring is done);
2. List of all monitoring points (if any) and their locations and amount of displacement of each;
3. Map showing either monitoring points (if any) or a representation of subsidence which has occurred; and
4. Any owners and/or occupants of surface property and structures above the underground workings who were or will be mailed notification six months prior to mining (R645-301-525.300).
5. Discussion of any proposed mining sequence changes and how that may affect the area of monitoring for the following year.

F. Vegetation Data (test plots) or Revegetation Success Monitoring (includes interim and final):

1. Test plot monitoring data or implementation;
2. Quantitative results from interim or final seeding efforts;
3. If quantitative monitoring was not required, then at minimum, a qualitative description of the interim or final vegetation; and
4. Describe any seeding done on site during the current year.

G. Annual Impoundment Certification, (R645-301-514.312) which includes the following information:

1. Any appearances of instability;
2. Structural weakness or other hazardous conditions;
3. Depth and elevation of any impounded waters;

4. Existing storage capacity;
5. Any existing or required monitoring procedures and instrumentation; and
6. Any other aspects of the structure affecting stability.

Suggested form enclosed

H. Annual Overburden, Spoil, Refuse, Roof, Floor, and Mid-Seam Data. For Consistency and completeness, please submit data for this reporting requirement in the following manner:

1. Location of sample site, sample interval, and sample matrix (if roof or floor, then include lithologic unit and if coal, then thickness of seam at sample site);
2. Sampling technique employed in the field (i.e., grab sample, composite, depth segregated or specific procedure outlined in the permit by chapter and page) and preparation prior to analysis (i.e., sieved sample, ground sample, air dried, oven dried, etc.);
3. Laboratory analysis report sheet which includes:
   i. Sample time and date;
   ii. Date and time of lab analysis; and
   iii. Analytical method(s) employed and references. Include the soil/spoil: water ratio.
4. Summary of findings based on monitoring.

I. A current copy of the annual report of officers submitted to the Department of Commerce and any changes in the ownership and control information required under R645-301-110.

J. Any Other Information Required to be Submitted as Specified in your Permit Application Package and Permit.

Sunnyside Coal Company

Operations • Highway 123 • P.O. Box 99 • Sunnyside, Utah 84539

March 31, 1994

Mr. Lowell Braxton
Associate Director of Mining
Utah Division of Oil, Gas & Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Dear Mr. Braxton:

Please find enclosed the 1993 Annual Report for Sunnyside Coal Company.

Should you have any questions, please call me.

Sincerely,

Peter H. Hess
Environmental Coordinator

PHH:th

Enclosure

Corporate Offices
The Registry
1113 Spruce Street
Boulder, CO 80302
303-938-1506
FAX: 303-938-5050

Operations
Highway 123
P.O. Box 99
Sunnyside, UT 84539
801-888-4421
FAX: 801-888-2581

1993 ANNUAL REPORT

SUNNYSIDE MINES
ACT/007/007

MARCH 31, 1994

TABLE OF CONTENTS

TABLE OF CONTENTS

DOGM Form

Production Information

Category A
Summarized Water Monitoring Data

Category B
Precipitation Or Other Climtological Data

Category C
Subsidence Monitoring Report

Category D
Vegetation Data Or Revegetation Success Monitoring

Category E
Annual Impoundment And Refuse Pile Certification

Category F
Annual Overburden, Spoil, Refuse, Roof, Floor And Mid-Seam Data

Category G
Annual Report of Officers

Category H
Other Information

PRODUCTION INFORMATION

PRODUCTION INFORMATION

Sunnyside Coal Company, Sunnyside Mines, produced a total of 826,647 tons of raw coal and 577,897 tons of clean coal. Shipments, in-plant use, and local sales amounted to 585,496 tons of coal.

CATEGORY A

SUMMARIZED WATER MONITORING DATA

SUMMARIZED WATER MONITORING DATA

Sunnyside Mine monitors fifteen groundwater, ten surface water, and ten discharge stations as part of its permit obligations. On November 17, 1993, Permit Amendments 93Z and 93AA were approved by DOGM. 93Z removed the Twin Shafts and 19th Left Inside Seal groundwater monitoring points from ACT/007/007. 93AA removed the Coarse Refuse Seep and the Coarse Refuse Boundary sampling points. They were transferred to ACT/007/035, Sunnyside Cogeneration Associates.

UPDES

Sunnyside Coal Company continues to operate under UPDES Permit No. UT-0022942, which became effective August 1, 1992. This permit expires at midnight on July 31, 1997.

Only two of Sunnyside Coal Company's discharge points discharged on a regular basis during 1993 -- Twin Shafts Mine Water Pond, UPDES #001, and #2 Canyon Twin Tank Overflow, UPDES 015. The Sunnyside Surface Facilities Pond, UPDES #014, was decanted two times (in the months of March and April).

Mine Water Discharge Point UPDES #003, which is located at the #1 Mine Portal, did not discharge at all during the year. This line is plugged and was removed from service in March of 1987.

Sediment-Control Structure Discharge Point 006 (Manshaft Sediment Pond) discharged in July of 1993. This was due to the fact that mine water was pumped from the bottom of the Manshaft to the inflow ditch to this pond. A falling pump efficiency on the Manshaft Dips Area main mine pump necessitated this action. DOGM issued NOV93-32-4-1 on August 24, 1993, for failing to comply with the terms and conditions of the approved permit. It should be pointed out that with the decreased pump efficiency, the Manshaft Dips Area was flooding. This would have quickly disrupted

the mine ventilation in the area, causing a rapid buildup of explosive methane gas. This, in turn, would have required power de-energization, which, in turn, would have begun flooding the entire mine, ceasing productivity. The NOV was abated by the submittal and approval of ACT/007/007 Amendment 93Q on October 31, 1993.

UPDES Discharge Points #010, Lower #2 Canyon Sediment Pond; #011, Upper #2 Canyon Sediment Pond; and #013, #3 Hoist House Sediment Pond, did not discharge during 1993.

Sunnyside Coal Company received a Notice of Violation and Administrative Order, Docket No. I93-05, from the Utah Division of Water Quality on November 15, 1993. The violation was issued on the basis of water having low dissolved oxygen emanating from 001 and 015 and having Total Suspended Solids in excess of the 30-day average range from 015 during several months.

The water sampling results for the UPDES Sampling Points are presented in Attachment A-1. The UPDES monitoring site locations are presented in Figure A-1.

Sunnyside Mine is currently permitted for ten discharge points (UPDES 001, 002A, 002B, 003, 006, 010, 011, 013, 014, and 015).

Groundwater Monitoring

Fifteen groundwater stations are monitored by Sunnyside Mine. Two groundwater stations monitor seeps (CRS and CRB-1); three monitor springs (WR-1, WR-2, and PC-1); one monitors a well in Whitmore Canyon (DH86-1); and the remaining nine monitor areas of the mine.

CRS and CRB-1 were only monitored once a month for the first ten months of 1993. On November 17, 1993, ACT/007/007 Amendment 93AA removed these two sample points from the Permit. These points are now monitored by ACT/007/035, Sunnyside Cogeneration Associates.

The water sampling results for both the CRB-1 and CRS sampling points are presented in Attachment A-2. The seep monitoring site locations are presented in Figure A-1.

The springs (WR-1, WR-2, and PC-1) are sampled during the warmer months for a total of four times on a monthly basis. All three sampling points are inaccessible during the winter.

The water sampling results for all three springs are presented in Attachment A-3. The spring monitoring site locations are presented in Figure A-1.

Drill Hole DH86-1 is typically inaccessible during the winter months. The well is sampled a total of four times during the summer months on a monthly basis.

The water sampling results for the drill hole are presented in Attachment A-4. DH86-1's location is shown on Figure A-1.

The mine water sampling (Manshaft, #1 Mine; Twin Shaft, #1 Mine; 18th Left Inside, #1 Mine; 19th Left Inside, #1 Mine; Manshaft Dips Sump, #1 Mine; Pole Canyon Shaft, #1 Mine; 15th Right Sump, #1 Mine; No. 1 Slope Sump, #1 Mine; and No. 3 Slope Sump, #3 Mine) results are presented in Attachment A-5, and the mine water monitoring site locations are presented in Figure A-2. The mine water sampling points are monitored on a quarterly basis.

The Twin Shafts, #1 Mine, and the 19th Left Inside, #1 Mine, were deleted from Permit ACT/007/007 by the approval of Permit Amendment 93Z, approved November 17, 1993.

Surface Water Monitoring

Sunnyside Mine monitors ten surface water stations on a monthly basis when the streams are flowing. Measurements are limited due to no flow and frozen periods in the winter.

Six of the monitoring stations measure incoming stream flows prior to mine disturbance areas (WC-1, BC-1, POC-1, PAC-1, N2C-1, and ICE-1), and four stations monitor the water through the mine permit (GT-1, GT-2, GT-3, and GT-4). During 1993, ICE-1, GT-1, GT-2, GT-3, and GT-4 had measurable flows. The flows in Grassy Trail Creek were generated by heavy snows (46 inches measured at Sunnyside Weather Observation Station) during January and February of 1993 in addition to average flows of 400 GPM from 001 and 225 GPM from 015.

The Grassy Trail Creek sampling results are presented in Attachment A-6, and the monitoring site locations are presented in Figure A-1. Grassy Trail Creek was monitored and sampled on a quarterly basis. Flow, pH, temperature, conductivity, and dissolved oxygen data are recorded monthly.

The stream sampling results are presented in Attachment A-7, and the monitoring site locations are presented in Figure A-1. The drainage area stations were monitored on a monthly or as-flowing basis.

ATTACHMENT A-1

SUMMARIZED UPDES MONITORING DATA

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: NPDES DISCHARGE 001

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	275	180	434	418	443	430	382	433	428	444	468	470	180.00	470.00	400.42	82.62
pH	standard	8.4	8.2	8.2	7.9	8.1	8.3	8.5	7.8	7.8	8.2	8.1	8.2	7.80	8.50	8.14	0.21
Temp	o C	8	12.5	12	15	17.5	15	17	18	17	13	12	12.5	8.00	18.00	14.13	2.85
Conductivity	umhos/cm	3650	2800	3900	5000	5000	4300	4600	1990	2300	2400	2200	2500	0.00	4600.00	2553.33	1410.92
Dissolved Oxygen	ppm	6.6	6	7.4	9.5	3.9	6.4	5.1	4.3	6.4	6.8	8.5	6.8	3.90	9.50	6.48	1.52
Bicarbonate	mg/l	808	749	734	774	865	836	908	781	845	827	869	935	734.00	935.00	827.58	59.06
Calcium	mg/l	48.4	50.7	56.3	46.1	41.2	40	55.5	42.1	42.4	43.5	45.6	44.9	40.00	56.30	46.39	5.14
Carbonate	mg/l	9.1	18	10.4	18.1	11.7	21.1	18	14.6	19.2	14.3	9.3	10.5	9.10	21.10	14.53	4.08
Chloride	mg/l	32.4	35.5	30.6	48.2	49.7	50.6	61.7	48.8	47.1	53.6	52.2	54.2	30.60	61.70	47.05	9.03
Hardness	mg/l	277	285	331	253	225	213	245	259	255	290	255	235	213.00	331.00	260.25	30.60
Iron (Acid Soluable)	mg/l	0.08	0.136	0.13	0.5	0.747	0.405	0.407	0.421	0.231	0.409	0.419	0.45	0.08	0.75	0.36	0.18
Magnesium	mg/l	38.7	42.3	42.2	33.9	30.1	29.6	37.5	32.6	29.8	31.5	30.6	30.3	29.60	42.30	34.09	4.62
Manganese (Total)	mg/l		0.054	0.085	0.092	0.1	0.051	0.107	0.037	0.044	0.07	0.066	0.068	0.04	0.11	0.07	0.02
Oil & Grease	mg/l	1.11	2	1.8	5.7	5.7	5	6	5.3	5.4	5.3	5.3	7	1.11	7.00	4.63	1.81
Potassium	mg/l	11.1	8.55	17.6	8.41	8.74	7.49	10.2	8.7	8.1	7.49	7.85	7.86	7.49	17.60	9.34	2.69
Sodium	mg/l	385	410	343	479	509	541	5472	440	424	442	421	520	343.00	5472.00	865.50	1390.00
Sulfate	mg/l	345	438	439	556	579	588	594	549	486	500	483	422	345.00	594.00	498.25	74.43
TDS	mg/l	1395	1340	1339	1630	1678	1627	1734	1546	1496	1580	1552	1683	1339.00	1734.00	1550.00	128.04
TSS	mg/l	1.2	8.4	4.4	9.2	12	6.8	4.8	3.6	3.6	2	1	1	1.00	12.00	4.83	3.43
Settleable Solids	mg/l	0.25	0.25	0.22	0.3	0.22	0.2	0.25	2	0.22	0.23	0.2	0.2	0.20	2.00	0.38	0.49
C-A Balance	meq/l	-1	-1.06	0.7	0.1	1.1	-0.1	-0.3	4.9	2.7	1.8	2.8	-1.6	-1.60	4.90	0.84	1.84
Manganese (Dissolved	meq/l						0.018	0.052	0.018	0.01	0.225	0.028	0.036	0.01	0.23	0.06	0.07
Iron (Dissolved)	meq/l						0.405	0.161	0.248	0.08	0.018	0.218	0.267	0.02	0.41	0.20	0.12
Iron (Total)	meq/l						0.443	0.663	0.469	0.241	0.406	0.36	0.359	0.24	0.66	0.42	0.12

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: NPDES DISCHARGE 002A

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
pH	standard																
Temp	o C																
Conductivity	umhos/cm																
Dissolved Oxygen	ppm																
Bicarbonate	mg/l																
Calcium	mg/l																
Carbonate	mg/l																
Chloride	mg/l																
Hardness	mg/l																
Iron Total	mg/l																
Magnesium	mg/l																
Manganese	mg/l																
Oil & Grease	mg/l																
Potassium	mg/l																
Sodium	mg/l																
Sulfate	mg/l																
TDS	mg/l																
TSS	mg/l																
Settleable Solids	mg/l																
C-A Balance	meq/l																

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: NPDES DISCHARGE 002B

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
pH	standard																
Temp	o C																
Conductivity	umhos/cm																
Dissolved Oxygen	ppm																
Bicarbonate	mg/l																
Calcium	mg/l																
Carbonate	mg/l																
Chloride	mg/l																
Hardness	mg/l																
Iron Total	mg/l																
Magnesium	mg/l																
Manganese	mg/l																
Oil & Grease	mg/l																
Potassium	mg/l																
Sodium	mg/l																
Sulfate	mg/l																
TDS	mg/l																
TSS	mg/l																
Settleable Solids	mg/l																
C-A Balance	meq/l																

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: NPDES DISCHARGE 003

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
pH	standard																
Temp	o C																
Conductivity	umhos/cm																
Dissolved Oxygen	ppm																
Bicarbonate	mg/l																
Calcium	mg/l																
Carbonate	mg/l																
Chloride	mg/l																
Hardness	mg/l																
Iron Total	mg/l																
Magnesium	mg/l																
Manganese	mg/l																
Oil & Grease	mg/l																
Potassium	mg/l																
Sodium	mg/l																
Sulfate	mg/l																
TDS	mg/l																
TSS	mg/l																
Settleable Solids	mg/l																
C-A Balance	meq/l																

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: NPDES DISCHARGE 006

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	0	0	0	0	3	0	0	0	0	0	0.00	3.00	0.25	0.83
pH	standard							7.5						7.50	7.50	7.50	0.00
Temp	o C							13						13.00	13.00	13.00	0.00
Conductivity	umhos/cm							1800						1800.00	1800.00	1800.00	0.00
Dissolved Oxygen	ppm							6						6.00	6.00	6.00	0.00
Bicarbonate	mg/l							402						402.00	402.00	402.00	0.00
Calcium	mg/l							78.6						78.60	78.60	78.60	0.00
Carbonate	mg/l							4.5						4.50	4.50	4.50	0.00
Chloride	mg/l							9						9.00	9.00	9.00	0.00
Hardness	mg/l							408						408.00	408.00	408.00	0.00
Iron (Total)	mg/l							0.099						0.10	0.10	0.10	ERR
Magnesium	mg/l							65.8						65.80	65.80	65.80	ERR
Manganese (Total)	mg/l							0.01						0.01	0.01	0.01	0.00
Oil & Grease	mg/l							6						6.00	6.00	6.00	0.00
Potassium	mg/l							3.02						3.02	3.02	3.02	ERR
Sodium	mg/l							73.2						73.20	73.20	73.20	0.00
Sulfate	mg/l							202						202.00	202.00	202.00	0.00
TDS	mg/l							586						586.00	586.00	586.00	0.00
TSS	mg/l							3.2						3.20	3.20	3.20	0.00
Settleable Solids	mg/l							0.25						0.25	0.25	0.25	0.00
C-A Balance	meq/l							-1.4						-1.40	-1.40	-1.40	ERR
Manganese(Dissolved)	mg/l							0.01						0.01	0.01	0.01	0.00
Iron (Dissolved)	mg/l							0.01						0.01	0.01	0.01	0.00
Iron (Acid Soluable)	mg/l							0.069						0.07	0.07	0.07	ERR

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: NPDES DISCHARGE 010

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
pH	standard																
Temp	o C																
Conductivity	umhos/cm																
Dissolved Oxygen	ppm																
Bicarbonate	mg/l																
Calcium	mg/l																
Carbonate	mg/l																
Chloride	mg/l																
Hardness	mg/l																
Iron Total	mg/l																
Magnesium	mg/l																
Manganese	mg/l																
Oil & Grease	mg/l																
Potassium	mg/l																
Sodium	mg/l																
Sulfate	mg/l																
TDS	mg/l																
TSS	mg/l																
Settleable Solids	mg/l																
C-A Balance	meq/l																

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: NPDES DISCHARGE 011

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
pH	standard																
Temp	o C																
Conductivity	umhos/cm																
Dissolved Oxygen	ppm																
Bicarbonate	mg/l																
Calcium	mg/l																
Carbonate	mg/l																
Chloride	mg/l																
Hardness	mg/l																
Iron Total	mg/l																
Magnesium	mg/l																
Manganese	mg/l																
Oil & Grease	mg/l																
Potassium	mg/l																
Sodium	mg/l																
Sulfate	mg/l																
TDS	mg/l																
TSS	mg/l																
Settleable Solids	mg/l																
C-A Balance	meq/l																

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: NPDES DISCHARGE 013

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
pH	standard																
Temp	o C																
Conductivity	umhos/cm																
Dissolved Oxygen	ppm																
Bicarbonate	mg/l																
Calcium	mg/l																
Carbonate	mg/l																
Chloride	mg/l																
Hardness	mg/l																
Iron Total	mg/l																
Magnesium	mg/l																
Manganese	mg/l																
Oil & Grease	mg/l																
Potassium	mg/l																
Sodium	mg/l																
Sulfate	mg/l																
TDS	mg/l																
TSS	mg/l																
Settleable Solids	mg/l																
C-A Balance	meq/l																

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: NPDES DISCHARGE 014

** INDICATES POND WAS DECANTED

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	5	20	0	0	0	0	0	0	0	0	5.00	20.00	12.50	7.50
pH	standard			8.9	8.5									8.50	8.90	8.70	0.20
Temp	o C			2	8									2.00	8.00	5.00	3.00
Conductivity	umhos/cm			1850	1150									1150.00	1850.00	1500.00	350.00
Dissolved Oxygen	ppm			8.6										8.60	8.60	8.60	ERR
Bicarbonate	mg/l			144	87									87.00	144.00	115.50	28.50
Calcium	mg/l			37.3	71.3									37.30	71.30	54.30	17.00
Carbonate	mg/l			0	0									0.00	0.00	0.00	0.00
Chloride	mg/l			20.3	228.1									20.30	228.10	124.20	103.90
Hardness	mg/l			122	272									122.00	272.00	197.00	75.00
Iron (Acid Soluable)	mg/l			1.08	0.61									0.61	1.08	0.85	0.23
Magnesium	mg/l			7.1	22.7									7.10	22.70	14.90	7.80
Manganese	mg/l			0.08	0.08									0.08	0.08	0.08	0.00
Oil & Grease	mg/l				0									0.00	0.00	0.00	0.00
Potassium	mg/l			2.3	6.2									2.30	6.20	4.25	1.95
Sodium	mg/l			32.3	178.5									32.30	178.50	105.40	73.10
Sulfate	mg/l			95.1	230									95.10	230.00	162.55	67.45
TDS	mg/l			198	722									198.00	722.00	460.00	262.00
TSS	mg/l			2088	6									6.00	2088.00	1047.00	1041.00
Settleable Solids	mg/l			0.2	0.3									0.20	0.30	0.25	0.05
C-A Balance	meq/l			0.68	2.55									0.68	2.55	1.62	0.93

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: NPDES DISCHARGE 015

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	175	220	328	320	146	210	203	210	137	250	276	241	137.00	328.00	226.33	58.12
pH	standard	8.2	7.9	8.3	7.8	8.2	7.9	8	7.8	7.8	8.1	8.3	8.3	7.80	8.30	8.05	0.20
Temp	o C	10	13	15	15	17	17	16.5	18	15.5	14	12.5	11	10.00	18.00	14.54	1334.32
Conductivity	umhos/cm	3900	3100	4400	5000	4500	3800	4200	1990	2200	2100	2200	2100	1990.00	5000.00	3290.83	1080.71
Dissolved Oxygen	ppm	5.8	8.5	7.8	9.3	3.8	4.2	4.6	3.9	7.1	10	8.1	8.9	3.80	10.00	6.83	2.17
Bicarbonate	mg/l	910	872		854	858	763	762	793	768	722	826	820	722.00	910.00	813.45	54.45
Calcium	mg/l	43.3	47.7		38.7	45.1	47.9	51.6	43.4	37.6	45.6	42.7	45.6	37.60	51.60	44.47	3.84
Carbonate	mg/l	15.7	1		14.7	3.5	17.6	4.5	15.8	20.7	21.5	8.1	12.9	1.00	21.50	12.36	6.72
Chloride	mg/l	47.3	47		42.2	36.8	41.5	34.4	39.9	39.1	34.2	39.4	37	34.20	47.30	39.89	4.21
Hardness	mg/l	223	257		207	272	276	327	254	222	303	260	310	207.00	327.00	264.64	36.52
Iron (Acid Soluable)	mg/l	0.57	0.592		0.39	0.612	0.517		0.345	0.344	0.428	0.378	0.625	0.34	0.63	0.48	0.11
Magnesium	mg/l	29.7	33.2		27.1	35.9	38.5	42.7	33.6	31	38.9	37.3	39.8	27.10	42.70	35.25	4.54
Manganese (Total)	mg/l		0.05		0.019	0.025	0.03	0.018	0.033	0.026	0.02	0.02	0.024	0.02	0.05	0.03	0.01
Oil & Grease	mg/l	2.11	1	2.3	5.6	5.5	5.5	6	5.5	5.4	5.4	5.8	7	1.00	7.00	4.76	1.78
Potassium	mg/l	9.1	6.59		6.88	6.09	5.48	6.08	7.47	5.63	6.28	2.2	6.14	2.20	9.10	6.18	1.58
Sodium	mg/l	456	467		469	426	437	379	429	417	400	446	433	379.00	469.00	432.64	26.10
Sulfate	mg/l	459	508		447	455	477	535	482	405	471	454	450	405.00	535.00	467.55	32.41
TDS	mg/l	1467	1540	1471	1495	1426	1421	1460	1488	1432	1461	1472	1442	1421.00	1540.00	1464.58	31.96
TSS	mg/l	8	10	68	12	41	47	41	8	8.4	9.6	15	21	8.00	68.00	24.08	19.23
Settleable Solids	mg/l	0.25	0.25		0.3	0.21	0.2	0.25	2	0.2	0.31	0.2	0.2	0.20	2.00	0.40	0.51
C-A Balance	meq/l	1.6	0.61		0.3	0.8	-0.5	2.1	0.9	-0.1	0.2	1.9	0.2	-0.50	2.10	0.73	0.80
Acidity	mg/l						100							100.00	100.00	100.00	0.00
Iron (Dissolved)	mg/l						0.517	0.01	0.142	0.041	0.015	0.057	0.038	0.01	0.52	0.12	0.17
Iron (Total)	mg/l						0.629	0.47	0.345	0.374	0.412	0.137	0.589	0.14	0.63	0.42	0.15
Manganese (Dissolved)	mg/l						0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	ERR

ATTACHMENT A-2

SUMMARIZED SEEP GROUNDWATER MONITORING DATA

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

* Unable To Determine Flow Rate

SAMPLE LOCATION: CRS (Coarse Refuse Toe Seep, source) ***** REMOVED FROM ACT/007/007 BY AMENDMENT 93AA APPROVED 11/17/93

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm				30	10	38.5	25	17	24		*****	*****	10.00	38.50	24.08	9.06
pH	standard	6.8	6.7	6.8	6.6	7.4	6.6	7	6.6	6.2	6.8			6.20	7.40	6.75	0.29
Temp	o C	22	27	25	25.5	25.5	26	26.5	25.5	26.5	26			22.00	27.00	25.55	1.31
Conductivity	umhos/cm	5000	5000	5000	5000	5000	5000	5000	1990	5800	5600			0.00	5800.00	4640.00	1571.75
Dissolved Oxygen	ppm	1.9		0.6	0.9	1.1	1.2	1	1	1.6				0.60	1.90	1.16	0.38
Bicarbonate	mg/l	634	598	569	578	567	565	604	569	600	425			425.00	634.00	570.90	52.96
Calcium	mg/l	492	494	467	514	461	550	499	491	487	457			457.00	550.00	491.20	25.95
Carbonate	mg/l	1	1	1	1	1	1	1	1	1	1			1.00	1.00	1.00	0.00
Chloride	mg/l	81.9	90.2	88.1	98.2	95.9	97.3	102	101	102	102			81.90	102.00	95.86	6.59
Hardness	mg/l	2730	2750	2760	2790	2780	2790	2760	2720	2780	2640			2640.00	2790.00	2750.00	43.13
Iron (Acid Soluable)	mg/l	12.2	9.63	12.3	8.44	6.95								6.95	12.30	9.90	2.10
Magnesium	mg/l	315	324	295	333	298	320	304	299	279	293			279.00	333.00	306.00	15.70
Manganese	mg/l		1.46	1.48	1.48	1.46	1.47	1.47	1.42	1.35	1.49			1.35	1.49	1.45	0.04
Oil & Grease	mg/l	0.91	1	1	5.3	5.5	5.9	6	5.7	5.4	6.2			0.91	6.20	4.29	2.19
Potassium	mg/l	42	42.9	44	58.3	35.8	40.2	34.9	43.2	39.2	34.8			34.80	58.30	41.53	6.49
Sodium	mg/l	409	473	422	482	452	549	463	502	493	486			409.00	549.00	473.10	38.09
Sulfate	mg/l	3135	3190	3070	3330	3220	3140	3320	3350	3230	3280			3070.00	3350.00	3226.50	89.05
TDS	mg/l	5384	5400	5355	5630	5572	5615	5512	5646	5646	5530			5355.00	5646.00	5529.00	107.26
TSS	mg/l	26	23	21	18	27	18	17	15.2	27	21			15.20	27.00	21.32	4.09
Settleable Solids	mg/l	0.25	0.25	0.23			0.2	0.25	2	0.23	0.33			0.20	2.00	0.47	0.58
C-A Balance	meq/l	7.1	5.75	8.2	6.1	11	-1.3	10.9	9.7	10.2	-8.5			-8.50	11.00	5.92	5.92
Iron (Total)	mg/l						7.37	7.6	6.93	8.51	11.7			6.93	11.70	8.42	1.72
Iron (Dissolved)	mg/l						0.067	1.05	4.13	0.885	0.01			0.01	4.13	1.23	1.51

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

* Unable to determine flow

SAMPLE LOCATION: CRB - 1 (Coarse Refuse Toe Seep, boundary) ***** REMOVED FROM ACT/007/007 BY AMENDMENT 93AA APPROVED 11/17/93

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm		15	55	108	90	74	20	28			*****	*****	15.00	108.00	55.71	33.69
pH	standard	8.3	8.1	8	7.9	7.9	7.7	7.1	7.3	7.2	7.3			7.10	8.30	7.68	0.40
Temp	o C	8.3	7	13	17	15	21.5	21.5	15.5	13	9.5			7.00	21.50	14.13	4.78
Conductivity	umhos/cm	5000	5000	5000	5000	5000	5000	5000	1990	5200	6500			1990.00	6500.00	4869.00	1057.28
Dissolved Oxygen	ppm	8.4		8.5	5.6	7.6	4.7	5.3	6.1	6.1				4.70	8.50	6.54	1.35
Bicarbonate	mg/l	454	457	416	395	408	371	388	428	437	331			331.00	457.00	408.50	37.00
Calcium	mg/l	404	466	427	468	388	468	492	433	429	402			388.00	492.00	437.70	32.68
Carbonate	mg/l	1	1	1	1	1	1	1	1	1	1			1.00	1.00	1.00	0.00
Chloride	mg/l	92.1	110	106	118	122	131	140	139	140	141			92.10	141.00	123.91	16.29
Hardness	mg/l	2560	2610	2590	2560	2510	2480	2450	2510	5100	2380			2380.00	5100.00	2775.00	777.73
Iron (Acid Soluable)	mg/l	0.79	0.233	1.04	0.373	0.153								0.15	1.04	0.52	0.34
Magnesium	mg/l	306	341	296	317	271	297	342	278	272	277			271.00	342.00	299.70	25.36
Manganese	mg/l		0.191	0.19	0.092	0.057	0.01	0.01	0.01	0.01	0.01			0.01	0.19	0.06	0.07
Oil & Grease	mg/l	0.98	1	1.1	5.4	5.4	6.1	6	6.1	5.4	5.9			0.98	6.10	4.34	2.18
Potassium	mg/l	43	35.3	35.6	41.9	24	26.7	30.6	29.6	28.4	25.6			24.00	43.00	32.07	6.30
Sodium	mg/l	474	494	415	490	394	487	470	470	460	430			394.00	494.00	458.40	32.31
Sulfate	mg/l	2970	3230	3100	3110	2980	2870	2930	3030	2950	3000			2870.00	3230.00	3017.00	99.30
TDS	mg/l	5160	5350	5260	5150	4860	4971	5000	5142	5178	5130			4860.00	5350.00	5120.10	135.33
TSS	mg/l	12.8	4.9	23	9.2	6	5.6	1.6	1	1.6	1.2			1.00	23.00	6.69	6.55
Settleable Solids	mg/l	0.25	0.25	0.23		0.23	0.2	0.25	2	0.21	0.28			0.20	2.00	0.43	0.55
C-A Balance	meq/l	4.8	4.16	9.7	2.76	12.8	-0.1	-2.6	8.4	8.1	-9.7			-9.70	12.80	3.83	6.29
Iron (Total)	mg/l						0.162	0.059	0.048	0.035	0.04			0.04	0.16	0.07	0.05
Iron (Dissolved)	mg/l						0.03	0.01	0.01	0.01	0.01			0.01	0.03	0.01	0.01

ATTACHMENT A-3

SUMMARIZED SPRING GROUNDWATER MONITORING DATA

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: WR - 1 (West Ridge, spring 1) * Not Accessible (After approval from DOGM, started monitoring for Ground Water Operational in July 1991.)

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm					3	3	3	3					3.00	3.00	3.00	0.00
pH	standard					7.4	7.1	7.1	6.8					6.80	7.40	7.10	0.21
Temp	o C					5	5	5.5	5.5					5.00	5.50	5.25	0.25
Conductivity	umhos/cm					750	800	370	390					370.00	800.00	577.50	198.42
Dissolved Oxygen	ppm					6.3	7.6	5.8	6.7					5.80	7.60	6.60	0.66
Bicarbonate	mg/l					256	259	265	257					256.00	265.00	259.25	3.49
Calcium	mg/l					36.7	32.9	35.8	34.6					32.90	36.70	35.00	1.42
Carbonate	mg/l					1	1	1	1					1.00	1.00	1.00	0.00
Chloride	mg/l					4.2	2.4	2.2	3.1					2.20	4.20	2.98	0.78
Hardness	mg/l					190	187	192	188					187.00	192.00	189.25	1.92
Iron Total	mg/l					0.01	0.024	0.039	0.041					0.01	0.04	0.03	0.01
Magnesium	mg/l					23.8	20.7	22.4	22.7					20.70	23.80	22.40	1.11
Manganese	mg/l					0.01	0.01	0.01	0.01					0.01	0.01	0.01	0.00
Oil & Grease	mg/l													ERR	ERR	ERR	ERR
Potassium	mg/l					1.25	1	0.75	0.606					0.61	1.25	0.90	0.25
Sodium	mg/l					19	16.2	16	16.7					16.00	19.00	16.98	1.20
Sulfate	mg/l					15.8	15.5	14.8	15.7					14.80	15.80	15.45	0.39
TDS	mg/l					248	243	243	275					243.00	275.00	252.25	13.29
TSS	mg/l													ERR	ERR	ERR	ERR
Settleable Solids	mg/l													ERR	ERR	ERR	ERR
C-A Balance	meq/l					0	0.58	0.37	0.29					0.00	0.58	0.31	0.21

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: WR - 2 (West Ridge, spring 2) * Not Accessible ** Flow Too Small To Obtain Good Sample For Analysis

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm					3	3	2	2					2.00	3.00	2.50	0.50
pH	standard					7.2	7	6.9	6.7					6.70	7.20	6.95	0.18
Temp	o C					5	5	5.5	6.5					5.00	6.50	5.50	0.61
Conductivity	umhos/cm					900	850	430	470					430.00	900.00	662.50	213.70
Dissolved Oxygen	ppm					6.4	6	9.4	6.5					6.00	9.40	7.08	1.36
Bicarbonate	mg/l					244	308		302					244.00	308.00	284.67	28.86
Calcium	mg/l					50.8	47.9		49.1					47.90	50.80	49.27	1.19
Carbonate	mg/l					1	1		1					1.00	1.00	1.00	0.00
Chloride	mg/l					4.2	3.4		3.8					3.40	4.20	3.80	0.33
Hardness	mg/l					226	222		229					222.00	229.00	225.67	2.87
Iron Total	mg/l					0.193	0.103		0.445					0.10	0.45	0.25	0.14
Magnesium	mg/l					24.8	22.7		24.3					22.70	24.80	23.93	0.90
Manganese	mg/l					0.01	0.01		0.01					0.01	0.01	0.01	ERR
Oil & Grease	mg/l													ERR	ERR	ERR	ERR
Potassium	mg/l					1.68	1.11		1.12					1.11	1.68	1.30	0.27
Sodium	mg/l					18.5	17.1		18.3					17.10	18.50	17.97	0.62
Sulfate	mg/l					18.8	19.7		20.6					18.80	20.60	19.70	0.73
TDS	mg/l					299	297		310					297.00	310.00	302.00	5.72
TSS	mg/l													ERR	ERR	ERR	ERR
Settleable Solids	mg/l													ERR	ERR	ERR	ERR
C-A Balance	meq/l					-0.91	0.52		0.22					-0.91	0.52	-0.06	0.62

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: PC -1 (Pole Canyon, spring) * Not Accessible

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	0	0	5	1	0	0	0	0	0	0	1.00	5.00	3.00	2.00
pH	standard					7.8	7.9							7.80	7.90	7.85	0.05
Temp	o C					4.5	13							4.50	13.00	8.75	4.25
Conductivity	umhos/cm					5000	4000							4000.00	5000.00	4500.00	500.00
Dissolved Oxygen	ppm					5.4	7.8							5.40	7.80	6.60	1.20
Bicarbonate	mg/l					517	516							516.00	517.00	516.50	0.50
Calcium	mg/l					141	125							125.00	141.00	133.00	8.00
Carbonate	mg/l					1	1							1.00	1.00	1.00	0.00
Chloride	mg/l					34.6	31.6							31.60	34.60	33.10	1.50
Hardness	mg/l					110	1020							110.00	1020.00	565.00	455.00
Iron Total	mg/l					0.957	0.01							0.01	0.96	0.48	0.47
Magnesium	mg/l					172	144							144.00	172.00	158.00	14.00
Manganese	mg/l					0.059	0.017							0.02	0.06	0.04	0.02
Oil & Grease	mg/l													ERR	ERR	ERR	ERR
Potassium	mg/l					3.28	2.97							2.97	3.28	3.13	0.15
Sodium	mg/l					287	248							248.00	287.00	267.50	19.50
Sulfate	mg/l					1310	1080							1080.00	1310.00	1195.00	115.00
TDS	mg/l					2358	2054							2054.00	2358.00	2206.00	152.00
TSS	mg/l													ERR	ERR	ERR	ERR
Settleable Solids	mg/l													ERR	ERR	ERR	ERR
C-A Balance	meq/l					2.9	2.89							2.89	2.90	2.90	0.01

ATTACHMENT A-4

SUMMARIZED DRILL HOLE GROUNDWATER MONITORING DATA

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: DRILLHOLE 86 - 1 (Whitmore Canyon) * Not Accessible ** Not Measurable NS=NOT SAMPLED

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Depth	feet	*	*	*	*	?	?	?	?	NS	*	*	*	0.00	0.00	0.00	0.00
pH	standard					7.1	7.4	6.5	7.1					6.50	7.40	7.03	0.33
Temp	o C					10	14	11.5	12					10.00	14.00	11.88	1.43
Conductivity	umhos/cm					800	1500	800	770					770.00	1500.00	967.50	307.68
Dissolved Oxygen	ppm					3.1	2.5	0.7	1					0.70	3.10	1.83	1.00
Bicarbonate	mg/l					207	376	401	391					207.00	401.00	343.75	79.45
Calcium	mg/l					67.5	47.1	66.4	71.3					47.10	71.30	63.08	9.40
Carbonate	mg/l					1	1	1	1					1.00	1.00	1.00	0.00
Chloride	mg/l					3.2	6.1	6.2	6.7					3.20	6.70	5.55	1.38
Hardness	mg/l					337	239	357	337					239.00	357.00	317.50	46.05
Iron Total	mg/l					3.01	0.428	3.45	3.26					0.43	3.45	2.54	1.23
Magnesium	mg/l					41.1	25.1	39.3	43.9					25.10	43.90	37.35	7.26
Manganese	mg/l					0.044	0.034	0.046	0.055					0.03	0.06	0.04	0.01
Oil & Grease	mg/l													ERR	ERR	ERR	ERR
Potassium	mg/l					3.37	1.69	2.4	2.63					1.69	3.37	2.52	0.60
Sodium	mg/l					41.9	27.1	37.9	44.7					27.10	44.70	37.90	6.69
Sulfate	mg/l					63.2	138	142	140					63.20	142.00	120.80	33.29
TDS	mg/l					282	492	515	532					282.00	532.00	455.25	101.03
TSS	mg/l													ERR	ERR	ERR	ERR
Settleable Solids	mg/l													ERR	ERR	ERR	ERR
C-A Balance	meq/l							1.56	0.31					0.31	1.56	0.94	0.62

ATTACHMENT A-5

SUMMARIZED MINE WATER MONITORING DATA

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: MANSHAFT - NO. 1 MINE

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm		25			20			25			27		20.00	27.00	24.25	2.59
pH	standard		8.1			8.4			6.5			8.1		6.50	8.40	7.78	0.75
Temp	o C		8			8			14			7		7.00	14.00	9.25	2.77
Conductivity	umhos/cm		1500			1850			850			800		800.00	1850.00	1250.00	443.00
Dissolved Oxygen	ppm					4.1			4.9			8.4		4.10	8.40	5.80	1.87
Bicarbonate	mg/l		394			366			388			388		366.00	394.00	384.00	10.68
Calcium	mg/l		66.5			57.6			67			67.5		57.60	67.50	64.65	4.09
Carbonate	mg/l		7.2			7			6.8			8		6.80	8.00	7.25	0.46
Chloride	mg/l		5.7			13.8			9.1			8.5		5.70	13.80	9.28	2.91
Hardness	mg/l		387			395			388			399		387.00	399.00	392.25	4.97
Iron (ACID SOLUABLE)	mg/l		0.12											0.12	0.12	0.12	0.00
Magnesium	mg/l		58.7			61			54.7			53.4		53.40	61.00	56.95	3.05
Manganese (Total)	mg/l		0.01			0.033			0.01			0.01		0.01	0.03	0.02	0.01
Potassium	mg/l		2.42			3.47			2.38			2.4		2.38	3.47	2.67	0.46
Sodium	mg/l		63.7			80.6			68.2			61.2		61.20	80.60	68.43	7.46
Sulfate	mg/l		189			221			197			167		167.00	221.00	193.50	19.31
TDS	mg/l		602			686			604			613		602.00	686.00	626.25	34.74
Iron (Dissolved)	mg/l								0.024			0.03		0.02	0.03	0.03	0.00
Manganese (Diss)	mg/l								0.01			0.01		0.01	0.01	0.01	0.00
Iron (Total)	mg/l					0.95			0.356			0.335		0.34	0.95	0.55	0.29
Cation	meq/l		10.98			11.5			10.9					10.90	11.50	11.13	0.27
Anion	meq/l		10.8			11.2			10.9					10.80	11.20	10.97	0.17

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: TWINSHAFT - NO. 1 MINE

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm		10			5			10			12		5.00	12.00	9.25	2.59
pH	standard		7.9			8.1			7.5			8.1		7.50	8.10	7.90	0.24
Temp	o C		15			17			17.5			7		7.00	17.50	14.13	4.22
Conductivity	umhos/cm		1500			1900			950			800		800.00	1900.00	1287.50	439.28
Dissolved Oxygen	ppm					4.4			5.1			8.4		4.40	8.40	5.97	1.74
Bicarbonate	mg/l		391			392			396			388		388.00	396.00	391.75	2.86
Calcium	mg/l		79.4			77.3			77.7			67.5		67.50	79.40	75.48	4.67
Carbonate	mg/l		3.6			2.3			1			8		1.00	8.00	3.73	2.63
Chloride	mg/l		8.6			8.1			9.1			8.5		8.10	9.10	8.58	0.36
Hardness	mg/l		438			431			416			399		399.00	438.00	421.00	14.98
Iron (ACID SOLUABLE)	mg/l		0.75											0.75	0.75	0.75	0.00
Magnesium	mg/l		63.1			55.2			56.1			53.4		53.40	63.10	56.95	3.68
Manganese (Total)	mg/l		0.017			0.012			0.018			0.01		0.01	0.02	0.01	0.00
Potassium	mg/l		3.58			2.52			3.21			2.4		2.40	3.58	2.93	0.49
Sodium	mg/l		68.6			65.2			64.4			61.2		61.20	68.60	64.85	2.63
Sulfate	mg/l		239			233			232			167		167.00	239.00	217.75	29.42
TDS	mg/l		654			642			634			613		613.00	654.00	635.75	14.94
Iron (Dissolved)	mg/l								0.01			0.03		0.01	0.03	0.02	0.01
Manganese (Diss)	mg/l								0.01			0.01		0.01	0.01	0.01	0.00
Iron (Total)	mg/l					0.498			0.831			0.335		0.34	0.83	0.55	0.21
Cation	meq/l		12.23			11.3			11.4					11.30	12.23	11.64	0.42
Anion	meq/l		11.75			11.6			11.6					11.60	11.75	11.65	0.07

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: 18th LEFT INSIDE - NO. 1 MINE * Standing Water

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm		15			15				15			15	15.00	15.00	15.00	0.00
pH	standard		7.2			7.4				6.5			7.5	6.50	7.50	7.15	0.39
Temp	o C		18			18				18			17	17.00	18.00	17.75	0.43
Conductivity	umhos/cm		3400			3600				2330			2600	2330.00	3600.00	2982.50	530.96
Dissolved Oxygen	ppm					1.2				0.7			0.7	0.70	1.20	0.87	0.24
Bicarbonate	mg/l		1115			1150				1130			1120	1115.00	1150.00	1128.75	13.40
Calcium	mg/l		54			54.4				53.5			55.1	53.50	55.10	54.25	0.59
Carbonate	mg/l		1			1				1			1	1.00	1.00	1.00	0.00
Chloride	mg/l		30			32.3				32.2			31	30.00	32.30	31.38	0.94
Hardness	mg/l		255			259				257			265	255.00	265.00	259.00	3.74
Iron (ACID SOLUABLE)	mg/l		1.78			3.8								1.78	3.80	2.79	1.01
Magnesium	mg/l		30			27.8				25.4			27.6	25.40	30.00	27.70	1.63
Manganese (Total)	mg/l		0.103			0.126				0.106			0.126	0.10	0.13	0.12	0.01
Potassium	mg/l		7.07			6.45				6.5			7.03	6.45	7.07	6.76	0.29
Sodium	mg/l		500			487				431			503	431.00	503.00	480.25	29.06
Sulfate	mg/l		415			382				398			447	382.00	447.00	410.50	24.09
TDS	mg/l		1580			1568				1574			1596	1568.00	1596.00	1579.50	10.43
Iron (Diss)	mg/l									0.259			0.181	0.18	0.26	0.22	0.04
Manganese (Diss)	mg/l									0.092			0.086	0.09	0.09	0.09	0.00
Cation			27.19			26.4				23.7			27.1	23.70	27.19	26.10	1.42
Anion			27.82			27.8				27.7			28.5	27.70	28.50	27.96	0.32

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: 19th LEFT INSIDE - NO. 1 MINE * Standing Water ** Inacessible

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm		**			**			**			**					
pH	standard																
Temp	o C																
Conductivity	umhos/cm																
Dissolved Oxygen	ppm																
Bicarbonate	mg/l																
Calcium	mg/l																
Carbonate	mg/l																
Chloride	mg/l																
Hardness	mg/l																
Iron (Total)	mg/l																
Magnesium	mg/l																
Manganese (Total)	mg/l																
Potassium	mg/l																
Sodium	mg/l																
Sulfate	mg/l																
TDS	mg/l																
Manganese (Diss)																	
Iron (Diss)																	

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: MANSHAFT DIPS SUMP - NO. 1 MINE **SUMP

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm		700			SUMP			SUMP				SUMP				
pH	standard		8			8.4			7.6				8.4	7.60	8.40	8.10	0.33
Temp	o C		17			17			18				15	15.00	18.00	16.75	1.09
Conductivity	umhos/cm		3200			4200			2900				2900	2900.00	4200.00	3300.00	533.85
Dissolved Oxygen	ppm					2.9			0.2				2.1	0.20	2.90	1.73	1.13
Bicarbonate	mg/l		825			962			1022				1020	825.00	1022.00	957.25	80.07
Calcium	mg/l		48.1			31			31.6				28.5	28.50	48.10	34.80	7.77
Carbonate	mg/l		13.2			1.2			13.5				4.7	1.20	13.50	8.15	5.35
Chloride	mg/l		37.1			60.5			77.7				73	37.10	77.70	62.08	15.73
Hardness	mg/l		284			155			168				151	151.00	284.00	189.50	54.92
Iron (ACID SOLUABLE)	mg/l		0.43			1.14								0.43	1.14	0.78	0.36
Magnesium	mg/l		40.4			17.7			20.1				17	17.00	40.40	23.80	9.65
Manganese (Total)	mg/l		0.045			0.099			0.087				0.039	0.04	0.10	0.07	0.03
Potassium	mg/l		8.62			7.7			7.58				6.82	6.82	8.62	7.68	0.64
Sodium	mg/l		440			612			626				596	440.00	626.00	568.50	74.94
Sulfate	mg/l		477			604			583				520	477.00	604.00	546.00	50.42
TDS	mg/l		1490			1846			1862				1826	1490.00	1862.00	1756.00	154.10
Iron (Total)	mg/l					1.15			1.15				0.588	0.59	1.15	0.96	0.26
Iron (Diss)	mg/l								0.888				0.318	0.32	0.89	0.60	0.29
Mn (Dissolved)	mg/l								0.084				0.03	0.03	0.08	0.06	0.03
Cation	meq/l		25.09			29.8			30.7				28.9	25.09	30.70	28.62	2.14
Anion	meq/l		25			30.2			31.5				29.8	25.00	31.50	29.13	2.46

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: POLE CANYON SHAFT - NO. 1 MINE

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm		??			??			??			??					
pH	standard		8.5			7.5			7.4			8.4		7.40	8.50	7.95	0.50
Temp	o C		8			12			12			8		8.00	12.00	10.00	2.00
Conductivity	umhos/cm		1400			1600			990			1000		990.00	1600.00	1247.50	262.24
Dissolved Oxygen	ppm					4.2			5.4			13.7		4.20	13.70	7.77	4.22
Bicarbonate	mg/l		408			417			381			390		381.00	417.00	399.00	14.23
Calcium	mg/l		54.3			51.6			41.8			40.7		40.70	54.30	47.10	5.94
Carbonate	mg/l		12			2.3			14.6			11.4		2.30	14.60	10.08	4.65
Chloride	mg/l		11.8			12.2			12.7			13.1		11.80	13.10	12.45	0.49
Hardness	mg/l		367			364			316			339		316.00	367.00	346.50	20.69
Iron (ACID SOLUABLE)	mg/l		0.5			0.635								0.50	0.64	0.57	0.07
Magnesium	mg/l		61.3			55.4			56.2			52.9		52.90	61.30	56.45	3.05
Manganese (Total)	mg/l		0.017			0.01			0.011			0.01		0.01	0.02	0.01	0.00
Potassium	mg/l		5.32			4.5			4.89			4.71		4.50	5.32	4.86	0.30
Sodium	mg/l		114			106			122			106		106.00	122.00	112.00	6.63
Sulfate	mg/l		228			226			235			244		226.00	244.00	233.25	7.05
TDS	mg/l		676			816			682			687		676.00	816.00	715.25	58.30
Iron (Total)	mg/l					0.551			0.706			0.399		0.40	0.71	0.55	0.13
Iron (Dissolved)	mg/l								0.015			0.01		0.01	0.02	0.01	0.00
Mn (Dissolved)	mg/l								0.01			0.01		0.01	0.01	0.01	0.00
Cation	meq/l		12.85			11.9			12.1					11.90	12.85	12.28	0.41
Anion	meq/l		12.17			12			12					12.00	12.17	12.06	0.08

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: 15th RIGHT SUMP - NO. 1 MINE

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm		150			SUMP			SUMP			SUMP					
pH	standard		8.2			7.6			7.6			8.3		7.60	8.30	7.93	0.33
Temp	o C		10			16			17			13		10.00	17.00	14.00	2.74
Conductivity	umhos/cm		3830			3250			2200			1900		1900.00	3830.00	2795.00	779.95
Dissolved Oxygen	ppm		*			5.2			4.8			8.7		0.00	8.70	4.68	3.10
Bicarbonate	mg/l		746			818			774			687		687.00	818.00	756.25	47.51
Calcium	mg/l		102			49.6			38.9			43.6		38.90	102.00	58.53	25.39
Carbonate	mg/l		1			<1			7.9			13.6		0.00	13.60	5.63	5.52
Chloride	mg/l		83.9			51.4			44.5			41.7		41.70	83.90	55.38	16.84
Hardness	mg/l		407			246			220			243		220.00	407.00	279.00	74.58
Iron (ACID SOLUABLE)	mg/l		1.19			3.83								1.19	3.83	2.51	1.32
Magnesium	mg/l		36.8			28.9			28			33		28.00	36.80	31.68	3.51
Manganese (Total)	mg/l		0.11			0.046			0.045			0.034		0.03	0.11	0.06	0.03
Potassium	mg/l		8.78			6.91			5.6			6.38		5.60	8.78	6.92	1.17
Sodium	mg/l		560			486			443			404		404.00	560.00	473.25	57.88
Sulfate	mg/l		886			530			469			452		452.00	886.00	584.25	176.61
TDS	mg/l		2220			1540			1408			1364		1364.00	2220.00	1633.00	345.04
Iron (Total)	mg/l					3.07			1.74			1.28		1.28	3.07	2.03	0.76
Iron (Dissolved)	mg/l								0.102			0.09		0.09	0.10	0.10	0.01
Mn (Dissolved)	mg/l								0.017			0.01		0.01	0.02	0.01	0.00
Cation			32.77			26.2			23.7					23.70	32.77	27.56	3.83
Anion			33.12			26			24					24.00	33.12	27.71	3.91

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: NO. 1 SLOPE SUMP - NO. 1 MINE

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm		SUMP			SUMP			SUMP			SUMP					
pH	standard		8			7.4			7.4			7.8		7.40	8.00	7.65	0.26
Temp	o C		9			18			18			16		9.00	18.00	15.25	3.70
Conductivity	umhos/cm		4600			3800			2600			2900		2600.00	4600.00	3475.00	785.41
Dissolved Oxygen	ppm					7.5			5			12		5.00	12.00	8.17	2.90
Bicarbonate	mg/l		938			905			1083			847		847.00	1083.00	943.25	87.01
Calcium	mg/l		187			41.7			133			44.7		41.70	187.00	101.60	61.45
Carbonate	mg/l		1			1			1			9.1		1.00	9.10	3.03	3.51
Chloride	mg/l		114			61.3			70.1			60.3		60.30	114.00	76.43	22.03
Hardness	mg/l		642			195			1140			191		191.00	1140.00	542.00	390.90
Iron (ACID SOLUABLE)	mg/l		2.05			2.16								2.05	2.16	2.11	0.06
Magnesium	mg/l		37.1			19.9			52.5			24.7		19.90	52.50	33.55	12.61
Manganese (Total)	mg/l		0.292			0.064			0.654			0.048		0.05	0.65	0.26	0.24
Potassium	mg/l		10.5			6.54			4.22			7.24		4.22	10.50	7.13	2.25
Sodium	mg/l		686			547			269			550		269.00	686.00	513.00	151.65
Sulfate	mg/l		1130			585			546			533		533.00	1130.00	698.50	249.86
TDS	mg/l		2370			1730			1686			1606		1606.00	2370.00	1848.00	304.64
Iron (Total)	mg/l					2.53			25.4			0.376		0.38	25.40	9.44	11.32
Iron (Dissolved)	mg/l								0.053			0.101		0.05	0.10	0.08	0.02
Mn (Dissolved)	mg/l								0.038			0.025		0.03	0.04	0.03	0.01
Cation	meq/l		42.72			27.7			22.8					22.80	42.72	31.07	8.47
Anion	meq/l		42.2			28.8			31.1					28.80	42.20	34.03	5.85

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: NO. 3 SLOPE SUMP - NO. 3 MINE

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm		SUMP			SUMP			SUMP			SUMP					
pH	standard		7.9			7.3			6.8			7.8		6.80	7.90	7.45	0.44
Temp	o C		16			16			18			15.5		15.50	18.00	16.38	0.96
Conductivity	umhos/cm		3400			3400			2300			2200		2200.00	3400.00	2825.00	576.09
Dissolved Oxygen	ppm					3.8			4.3			16.5		3.80	16.50	8.20	5.87
Bicarbonate	mg/l		896			849			775			842		775.00	896.00	840.50	43.14
Calcium	mg/l		53			55			67.6			55		53.00	67.60	57.65	5.80
Carbonate	mg/l		7.2			1			3.4			6.8		1.00	7.20	4.60	2.55
Chloride	mg/l		32.4			33.8			33.4			32.2		32.20	33.80	32.95	0.67
Hardness	mg/l		301			333			416			328		301.00	416.00	344.50	43.04
Iron (ACID SOLUABLE)	mg/l		1.24			1.56								1.24	1.56	1.40	0.16
Magnesium	mg/l		42.3			45.2			58.9			43.2		42.30	58.90	47.40	6.72
Manganese (Total)	mg/l		0.073			0.027			0.048			0.067		0.03	0.07	0.05	0.02
Potassium	mg/l		6.58			6.55			6.74			6.46		6.46	6.74	6.58	0.10
Sodium	mg/l		436			398			392			399		392.00	436.00	406.25	17.38
Sulfate	mg/l		449			458			572			447		447.00	572.00	481.50	52.41
TDS	mg/l		1440			1450			1524			1454		1440.00	1524.00	1467.00	33.30
Iron (Total)	mg/l								1			2.39		1.00	2.39	1.70	0.70
Iron (Diss)	mg/l								0.055			0.105		0.06	0.11	0.08	0.02
Mn (Dissolved)	mg/l								0.01			0.023		0.01	0.02	0.02	0.01
Cation	meq/l		25.32			23.9			25.4					23.90	25.40	24.87	0.69
Anion	meq/l		25.25			24.5			25.7					24.50	25.70	25.15	0.49

ATTACHMENT A-6

SUMMARIZED GRASSY TRAIL CREEK SURFACE WATER MONITORING DATA

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: GT - 1 (Grassy Trail Creek, sampling point #1) (Monthly, flow & field only)

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	0	2700	10750	10416	580	534	780	212	436		212.00	10750.00	3301.00	4266.70
pH	standard				8	8.4	8	7.8	8.1	7.9	8.3	8.2	8.5	7.80	8.50	8.13	0.22
Temp	o C				4	10.5	7.5	11.5	13	8.5	11	0	0	0.00	13.00	7.33	4.63
Conductivity	umhos/cm				1300	1200	600	610	600	590	660	630	650	590.00	1300.00	760.00	263.90
Dissolved Oxygen	ppm				7	5.5	8.5	5.1	5.5	9		13.6	10.7	5.10	13.60	8.11	2.78
Bicarbonate	mg/l				350	334			300			368		300.00	368.00	338.00	25.02
Calcium	mg/l				53.2	54.6			47.1			52.2		47.10	54.60	51.78	2.83
Carbonate	mg/l				1	7			13.5			9.3		1.00	13.50	7.70	4.52
Chloride	mg/l				3.2	3			2.4			3.1		2.40	3.20	2.93	0.31
Hardness	mg/l				325	316			282			322		282.00	325.00	311.25	17.20
Iron Total	mg/l				1.53	3.22			0.111			0.068		0.07	3.22	1.23	1.29
Magnesium	mg/l				51.4	43.4			36.5			45.3		36.50	51.40	44.15	5.31
Manganese	mg/l				0.084	0.172			0.01			0.01		0.01	0.17	0.07	0.07
Oil & Grease	mg/l				5.5	5.3			5.8			6.2		5.30	6.20	5.70	0.34
Potassium	mg/l				1.46	1.61			1.51			1.44		1.44	1.61	1.51	0.07
Sodium	mg/l				38.3	29.7			31.6			39.7		29.70	39.70	34.83	4.26
Sulfate	mg/l				95.5	82			75.7			96		75.70	96.00	87.30	8.74
TDS	mg/l				424	364			340			474		340.00	474.00	400.50	52.31
TSS	mg/l				72	167			1.6			1		1.00	167.00	60.40	67.98
Settleable Solids	mg/l					0.23			2			0.2		0.20	2.00	0.81	0.84
C-A Balance	meq/l				-0.76	-0.11			0.24			0.33		-0.76	0.33	-0.08	0.43

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: GT - 2 (Grassy Trail Creek, sampling point #2) (Monthly, flow & field only) *No Side Canyon Flows, Analysis Same As 001 For Month

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm					9140	11808	1067	1001	950	928	854	754	754.00	11808.00	3312.75	4188.91
pH	standard					8.3	8.4	7.8	7.8	7.9	7.7	8.2	8.4	7.70	8.40	8.06	0.27
Temp	o C					11.5	8	13.5	16.5	13.5	11	9.3	9.8	8.00	16.50	11.64	2.58
Conductivity	umhos/cm					1350	1150	1180	1550	1420	1940	2030	2350	1150.00	2350.00	1621.25	408.61
Dissolved Oxygen	ppm					5	7.8	5	4.6	7.9		8.6	8.2	4.60	8.60	6.73	1.63
Bicarbonate	mg/l					353			575			850		353.00	850.00	592.67	203.28
Calcium	mg/l					59.7			44.1			44.4		44.10	59.70	49.40	7.28
Carbonate	mg/l					7			11.3			9.3		7.00	11.30	9.20	1.76
Chloride	mg/l					4.8			29.1			50.6		4.80	50.60	28.17	18.71
Hardness	mg/l					321			270			259		259.00	321.00	283.33	27.01
Iron Total	mg/l					6.36			0.281			0.637		0.28	6.36	2.43	2.79
Magnesium	mg/l					42.6			34.9			32		32.00	42.60	36.50	4.47
Manganese	mg/l					0.257			0.024			0.096		0.02	0.26	0.13	0.10
Oil & Grease	mg/l					5.9			5.5			5.9		5.50	5.90	5.77	0.19
Potassium	mg/l					1.82			5.3			6.8		1.82	6.80	4.64	2.09
Sodium	mg/l					46.4			270			394		46.40	394.00	236.80	143.84
Sulfate	mg/l					106			342			452		106.00	452.00	300.00	144.34
TDS	mg/l					433			1091			1467		433.00	1467.00	997.00	427.33
TSS	mg/l					256			5.2			1.48		1.48	256.00	87.56	119.11
Settleable Solids	mg/l					0.3			2			0.2		0.20	2.00	0.83	0.83
C-A Balance	meq/l					-0.59			0.7			-2.7		-2.70	0.70	-0.86	1.40

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: GT - 3 (Grassy Trail Creek, sampling point #3)

(Monthly, flow & field only)
* Frozen ** No Side Canyon Flows, Analysis Same As 001 For Month

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm					12650	14070	2091	1919	1470	863	1185		863.00	14070.00	4892.57	5382.40
pH	standard					8.4	8.4	8.2	7.8	8	7.6	8.4	8.3	7.60	8.40	8.14	0.29
Temp	o C					11	10	14.5	18.5	12	12	3	1.5	1.50	18.50	10.31	5.27
Conductivity	umhos/cm					1400	1100	1050	1400	1300	1580	1725	1730	1050.00	1730.00	1410.63	242.00
Dissolved Oxygen	ppm					5.5	8.4	5.8	4.6	7.6		12.1	10.5	4.60	12.10	7.79	2.56
Bicarbonate	mg/l					393			504			694		393.00	694.00	530.33	124.29
Calcium	mg/l					90			44.1			42.5		42.50	90.00	58.87	22.02
Carbonate	mg/l					8.2			16.9			10.4		8.20	16.90	11.83	3.69
Chloride	mg/l					4.8			24.9			38.4		4.80	38.40	22.70	13.81
Hardness	mg/l					437			293			285		285.00	437.00	338.33	69.84
Iron Total	mg/l					12.2			0.131			0.106		0.11	12.20	4.15	5.70
Magnesium	mg/l					47.3			40.7			39.3		39.30	47.30	42.43	3.49
Manganese	mg/l					0.488			0.026			0.049		0.03	0.49	0.19	0.21
Oil & Grease	mg/l					5.7			5.6			6.1		5.60	6.10	5.80	0.22
Potassium	mg/l					1.78			4.78			5.55		1.78	5.55	4.04	1.63
Sodium	mg/l					48.3			224			315		48.30	315.00	195.77	110.69
Sulfate	mg/l					112			321			416		112.00	416.00	283.00	126.98
TDS	mg/l					440			910			1270		440.00	1270.00	873.33	339.84
TSS	mg/l					614			8			1		1.00	614.00	207.67	287.34
Settleable Solids	mg/l					1.1			2			0.2		0.20	2.00	1.10	0.73
C-A Balance	meq/l					-1.35			0.8			-2.3		-2.30	0.80	-0.95	1.30

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: GT - 4 (Grassy Trail Creek, sampling point #4) (Monthly, flow & field only)

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	475	645	364	2760	11760	6081	1297	2135	1000	1041	1562	400	364.00	11760.00	2460.00	3188.16
pH	standard	8.3	8.6		8.4	8.3	8.8	8.3	8.2	8.1	7.6	8.5	8.7	7.60	8.80	8.35	0.31
Temp	o C	6	1		13.5	6.5	12.5	17.5	17.5	13	6.5	1.5	2	1.00	17.50	8.86	5.90
Conductivity	umhos/cm	3725	3300		1800	1400	1400	1260	1470	1270	1450	1650	1710	1260.00	3725.00	1857.73	801.90
Dissolved Oxygen	ppm	7	11.5		4.9	8.8	6.3	5	5	7.5		12.7	10.9	4.90	12.70	7.96	2.74
Bicarbonate	mg/l	787	543			415			520			641		415.00	787.00	581.20	125.50
Calcium	mg/l	40.7	36.3			124			37.5			40.1		36.30	124.00	55.72	34.18
Carbonate	mg/l	17	30.2			8.2			22.5			12.8		8.20	30.20	18.14	7.66
Chloride	mg/l	39.1	28.1			6.3			26.9			37.3		6.30	39.10	27.54	11.67
Hardness	mg/l	241	299			550			279			288		241.00	550.00	331.40	111.03
Iron (Acid Soluable)	mg/l	0.33	0.1			6.26						0.135		0.10	6.26	1.71	2.63
Magnesium	mg/l	35.8	46.9			52.9			39.3			40.9		35.80	52.90	43.16	6.05
Manganese	mg/l		0.019			0.7			0.01			0.028		0.01	0.70	0.19	0.29
Oil & Grease	mg/l	1.18	1			5.8			5.3			5.7		1.00	5.80	3.80	2.22
Potassium	mg/l	9.4	7.07			2.39			5.2			5.43		2.39	9.40	5.90	2.31
Sodium	mg/l	405	311			52			256			291		52.00	405.00	263.00	116.47
Sulfate	mg/l	448	449			113			351			391		113.00	449.00	350.40	124.30
TDS	mg/l	1390	1210			432			1010			1214		432.00	1390.00	1051.20	332.15
TSS	mg/l	8	2			875			3.6			2.8		2.00	875.00	178.28	348.37
Settleable Solids	mg/l	0.25	0.25			2			2			0.2		0.20	2.00	0.94	0.87
C-A Balance	meq/l	1.1	0.67			-3.3			0.9			-1.9		-3.30	1.10	-0.51	1.77

ATTACHMENT A-7

SUMMARIZED STREAM SURVEY WATER MONITORING DATA

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: WC - 1 (Water Canyon)

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	0	357	830	266	82	5	3	5	FROZEN	0	3.00	830.00	221.14	280.70
pH	standard				8.2	8.4	8	8.6	8	8.1	8.4			8.00	8.60	8.24	0.21
Temp	o C				3	4.5	4.5	10.5	18	12	4			3.00	18.00	8.07	5.18
Conductivity	umhos/cm				1600	1100	1350	1500	780	810	690			690.00	1600.00	1118.57	343.24
Dissolved Oxygen	ppm				14.6	5.4	8.7	7.4	4.8	7.9				4.80	14.60	8.13	3.20
Bicarbonate	mg/l				932	290	321	348	298		336			290.00	932.00	420.83	229.48
Calcium	mg/l				123	78.3	64.1	66.3	41.4		53.1			41.40	123.00	71.03	25.90
Carbonate	mg/l				6.8	4.7	8.2	6.8	16.9		10.8			4.70	16.90	9.03	3.97
Chloride	mg/l				4.2	26	3.7	5.1	4.8		5.6			3.70	26.00	8.23	7.97
Hardness	mg/l				525	346	368	378	360		373			346.00	525.00	391.67	60.50
Iron Total	mg/l				19.7	10.2	0.256	0.491	0.182		12.6			0.18	19.70	7.24	7.49
Magnesium	mg/l				51.3	36.2	51.5	66.5	55.7		49.8			36.20	66.50	51.83	8.93
Manganese (Total)	mg/l				0.634	0.247	0.01	0.011	0.01		0.185			0.01	0.63	0.18	0.22
Oil & Grease	mg/l				6	5.4	5.9	6	5.7		6.3			5.40	6.30	5.88	0.28
Potassium	mg/l				1.09	1.06	0.91	1.59	1.8		5.88			0.91	5.88	2.06	1.74
Sodium	mg/l				34.1	24.1	39.9	48	45.9		37.7			24.10	48.00	38.28	7.90
Sulfate	mg/l				148	101	148	170	181		177			101.00	181.00	154.17	27.06
TDS	mg/l				506	367	525	504	524		522			367.00	525.00	491.33	56.24
TSS	mg/l				1220	558	12	15	4.8		219			4.80	1220.00	338.13	440.10
Settleable Solids	mg/l				2	0.55	0.2	0.25	2		2			0.20	2.00	1.17	0.84
C-A Balance	meq/l				5.8	1.26	1.1	-1.28	0.67		1.08			-1.28	5.80	1.44	2.13
Acidity	mg/l						100							100.00	100.00	100.00	0.00
Iron (Dissolved)	mg/l						0.017	0.021	0.037					0.02	0.04	0.03	0.01
Manganese (Diss)	mg/l						0.01	0.01	0.01					0.01	0.01	0.01	ERR

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: BC - 1 (Bear Canyon)

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	0	0	165	0	0	0	0	0	0	0	165.00	165.00	165.00	0.00
pH	standard					8.4								8.40	8.40	8.40	ERR
Temp	o C					8								8.00	8.00	8.00	0.00
Conductivity	umhos/cm					1250								1250.00	1250.00	1250.00	0.00
Dissolved Oxygen	ppm					7.7								7.70	7.70	7.70	0.00
Bicarbonate	mg/l					287								287.00	287.00	287.00	0.00
Calcium	mg/l					61.4								61.40	61.40	61.40	0.00
Carbonate	mg/l					10.4								10.40	10.40	10.40	0.00
Chloride	mg/l					2.7								2.70	2.70	2.70	ERR
Hardness	mg/l					289								289.00	289.00	289.00	0.00
Iron Total	mg/l					0.735								0.74	0.74	0.74	ERR
Magnesium	mg/l					43.7								43.70	43.70	43.70	0.00
Manganese	mg/l					0.019								0.02	0.02	0.02	0.00
Oil & Grease	mg/l					5.4								5.40	5.40	5.40	ERR
Potassium	mg/l					1.94								1.94	1.94	1.94	0.00
Sodium	mg/l					36.8								36.80	36.80	36.80	ERR
Sulfate	mg/l					123								123.00	123.00	123.00	0.00
TDS	mg/l					447								447.00	447.00	447.00	0.00
TSS	mg/l					28								28.00	28.00	28.00	0.00
Settleable Solids	mg/l					0.22								0.22	0.22	0.22	ERR
C-A Balance	meq/l													0.00	0.00	0.00	0.00

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: POC - 1 (Pole Canyon)

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
pH	standard																
Temp	o C																
Conductivity	umhos/cm																
Dissolved Oxygen	ppm																
Bicarbonate	mg/l																
Calcium	mg/l																
Carbonate	mg/l																
Chloride	mg/l																
Hardness	mg/l																
Iron Total	mg/l																
Magnesium	mg/l																
Manganese	mg/l																
Oil & Grease	mg/l																
Potassium	mg/l																
Sodium	mg/l																
Sulfate	mg/l																
TDS	mg/l																
TSS	mg/l																
Settleable Solids	mg/l																
C-A Balance	meq/l																

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: PAC - 1 (Pasture Canyon)

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
pH	standard																
Temp	o C																
Conductivity	umhos/cm																
Dissolved Oxygen	ppm																
Bicarbonate	mg/l																
Calcium	mg/l																
Carbonate	mg/l																
Chloride	mg/l																
Hardness	mg/l																
Iron Total	mg/l																
Magnesium	mg/l																
Manganese	mg/l																
Oil & Grease	mg/l																
Potassium	mg/l																
Sodium	mg/l																
Sulfate	mg/l																
TDS	mg/l																
TSS	mg/l																
Settleable Solids	mg/l																
C-A Balance	meq/l																

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

1993 WATER MONITORING DATA

SAMPLE LOCATION: N2C - 1 (No. 2 Canyon)

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
pH	standard																
Temp	o C																
Conductivity	umhos/cm																
Dissolved Oxygen	ppm																
Bicarbonate	mg/l																
Calcium	mg/l																
Carbonate	mg/l																
Chloride	mg/l																
Hardness	mg/l																
Iron Total	mg/l																
Magnesium	mg/l																
Manganese	mg/l																
Oil & Grease	mg/l																
Potassium	mg/l																
Sodium	mg/l																
Sulfate	mg/l																
TDS	mg/l																
TSS	mg/l																
Settleable Solids	mg/l																
C-A Balance	meq/l																

SUNNYSIDE COAL COMPANY
SUNNYSIDE MINES
ACT/007/007

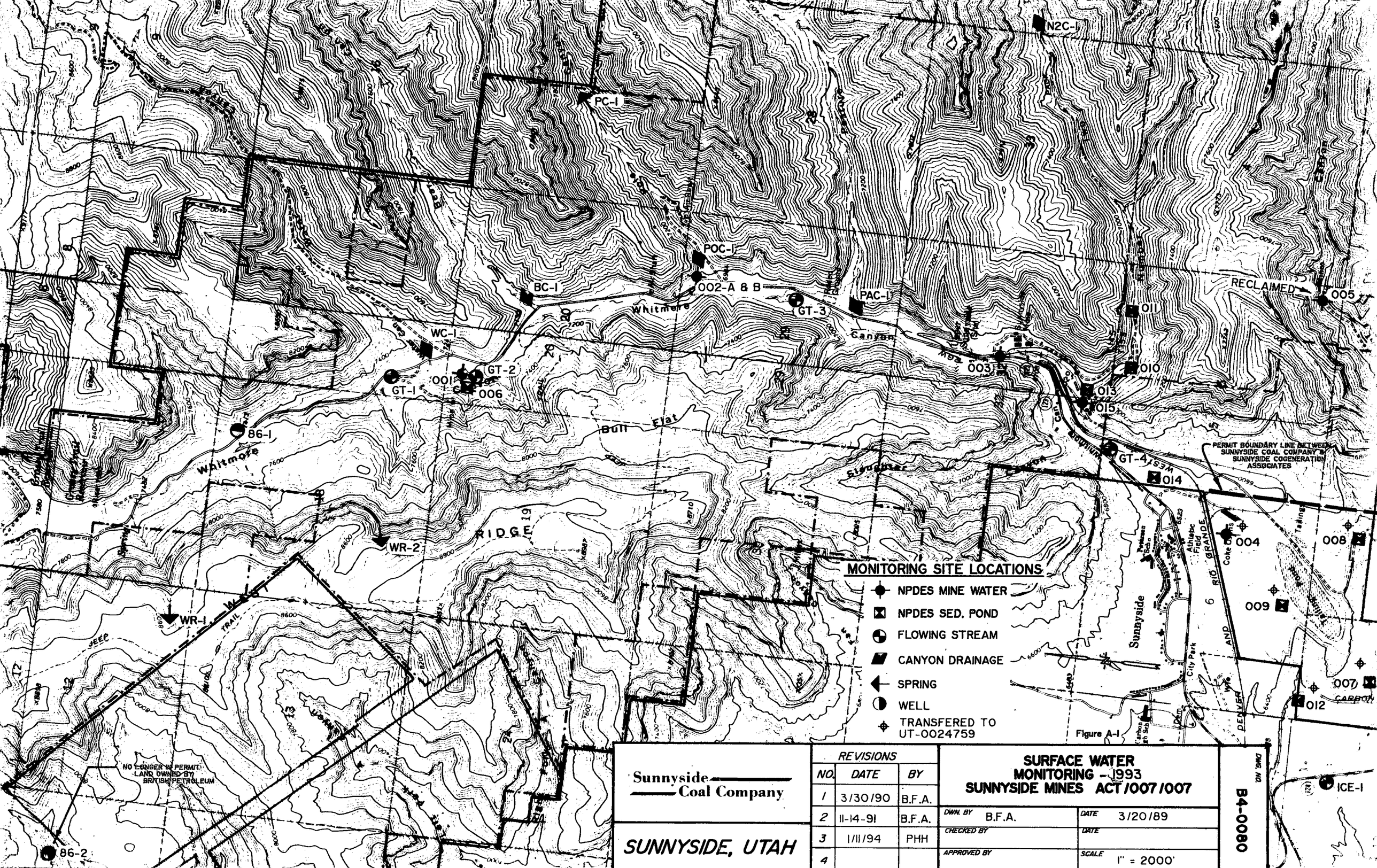
1993 WATER MONITORING DATA

SAMPLE LOCATION: ICE - 1 (Icelander Wash) * Frozen

Parameter	Units	Jan 93	Feb 93	Mar 93	Apr 93	May 93	June 93	July 93	Aug 93	Sep 93	Oct 93	Nov 93	Dec 93	Minimum Value	Maximum Value	Mean Average	Standard Deviation
Flow	gpm	17	20	1322	72	105	111	119	143	779	370	173	335	17.00	1322.00	297.17	369.43
pH	standard	8.4	8.3	8.3	8.1	7.4	8	8.1	7.9	7.9	8.3	8.4	8.2	7.40	8.40	8.11	0.27
Temp	o C	0	2	4.5	12	9	19.5	20	13.5	10.5	7	4.5	2	0.00	20.00	8.71	6.36
Conductivity	umhos/cm	4570	3400	4050	5000	5000	5000	5000	1990	2300	2300	2100	2000	1990.00	5000.00	3559.17	1284.05
Dissolved Oxygen	ppm			8.7		8.2	6.7	5.2	6.3	7.9		11.1	8.5	5.20	11.10	7.83	1.68
Bicarbonate	mg/l	545	512	614	392	497	464	529	574	573	594	594	628	392.00	628.00	543.00	65.60
Calcium	mg/l	143	140	76	187	155	138	130	107	83.2	78.4	88.8	78.4	76.00	187.00	117.07	35.19
Carbonate	mg/l	4.6	8.4	16.2	5.7	4.7	10.6	13.5	13.5	13.6	8.2	8.1	8.2	4.60	16.20	9.61	3.68
Chloride	mg/l	62	64.1	44.4	82.4	76.9	71.4	69.4	61.9	57.1		60.3	59.6	44.40	82.40	64.50	9.81
Hardness	mg/l	954	978	498	1240	1100	973	878	850	786		672	551	498.00	1240.00	861.82	214.32
Iron (ACID SOLUABLE)	mg/l	0.01	0.784	1.15	0.07	0.075								0.01	1.15	0.42	0.46
Iron (Total)	mg/l	1.54			0.141	0.217	0.169	0.127	0.08	0.049		0.08	0.128	0.05	1.54	0.28	0.45
Magnesium	mg/l	150	154	67.6	165	150	145	159	121	106		106	88.7	67.60	165.00	128.39	30.85
Manganese (TOTAL)	mg/l	0.049	0.021	0.106	0.025	0.039	0.013	0.01	0.01	0.01		0.01	0.016	0.01	0.11	0.03	0.03
Oil & Grease	mg/l	1.0	1	1	5.6	5.6	5.7	6	5.6	6.1		6.1	7	1.00	7.00	4.61	2.24
Potassium	mg/l	6.5	5.22	10.8	13	10.1	7.22	6.41	5.13	4.3		5.64	6.1	4.30	13.00	7.31	2.63
Sodium	mg/l	281	285	328	377	338	336	316	282	260		274	346	260.00	377.00	311.18	35.21
Sulfate	mg/l	972	1040	617	1620	1380	1200	1050	909	785		774	566	566.00	1620.00	992.09	303.56
TDS	mg/l	1973	2060	1505	2960	2556	2242	1934	1818	1720		1710	1500	1500.00	2960.00	1998.00	425.18
TSS	mg/l	94	73	156	7.2	5.8	5.2	2.4	1	1		1	6.4	1.00	156.00	32.09	49.85
Settleable Solids	mg/l	0.30	0.25	0.22	0.3	0.21	0.2	0.25	2	0.22		0.2	0.2	0.20	2.00	0.40	0.51
C-A Balance	meq/l	-0.87	-0.04	0.6	3.1	4.2	1.1	-0.6	2.8	2.9		2.6	2.4	-0.87	4.20	1.65	1.61
Acidity	mg/l						100							100.00	100.00	100.00	0.00
Manganese (Diss)	mg/l						0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	ERR
Iron (Diss)	mg/l						0.052	0.011	0.011	0.024		0.028	0.031	0.01	0.05	0.03	0.01

FIGURE A-1

SURFACE WATER MONITORING LOCATION MAP



Sunnyside Coal Company

SUNNYSIDE, UTAH

REVISIONS		
NO.	DATE	BY
1	3/30/90	B.F.A.
2	11-14-91	B.F.A.
3	1/11/94	PHH
4		

SURFACE WATER MONITORING - 1993
SUNNYSIDE MINES ACT/007/007

DWN. BY	B.F.A.	DATE	3/20/89
CHECKED BY		DATE	
APPROVED BY		SCALE	1" = 2000'

DWG. NO. B4-0080

FIGURE A-2

UNDERGROUND WATER MONITORING LOCATION MAP

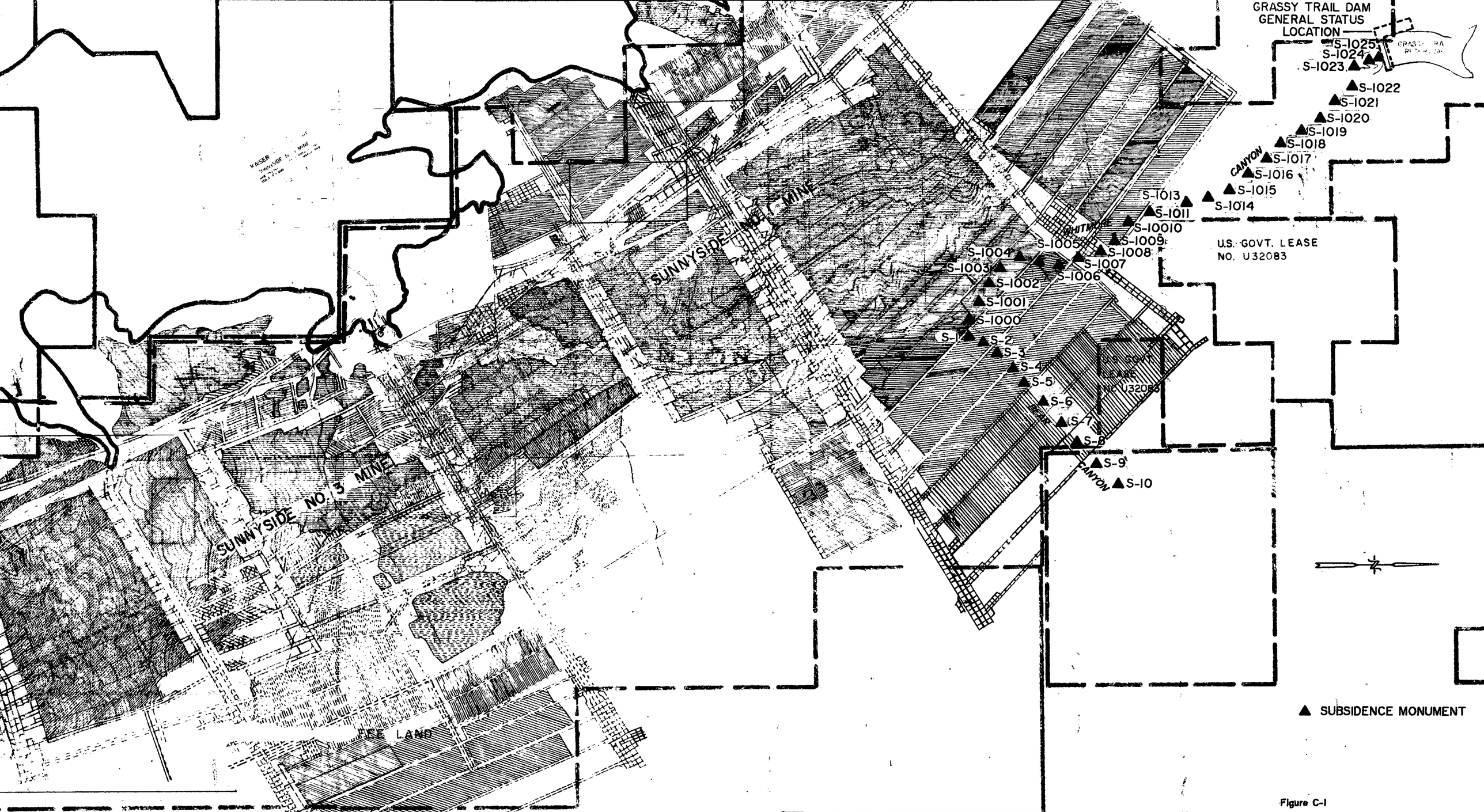


Figure C-I

Sunnyside Coal Company	REVISIONS		SUBSIDENCE MONITORING - 1993 SUNNYSIDE MINES ACT/007/007	DWG. NO. B4-0078
	NO.	DATE	BY	
	1			
	2		DWN. BY PHH	DATE 1/10/94
SUNNYSIDE, UTAH	3		CHECKED BY	DATE
	4		APPROVED BY	SCALE 1" = 2000'

CATEGORY B

PRECIPITATION OR OTHER CLIMATOLOGICAL DATA

1993 CLIMATOLOGICAL OBSERVATIONS
SUNNYSIDE, UTAH, OBSERVATION STATION

	Average Minimum Temperature Degrees F	Average Maximum Temperature Degrees F	Rain Monthly Precipitation Inches	Monthly Snowfall
January	19	36	1.94	30.50
February	20	38	1.96	16.25
March	31	52	2.06	0.00
April	33	56	1.02	0.00
May	44	69	1.83	0.00
June	49	77	.16	0.00
July	51	83	.12	0.00
August	52	80	.65	0.00
September	43	73	.05	0.00
October	35	57	2.66	0.00
November	21	40	1.12	12.50
December	18	34	.46	9.00

TABLE C-1

SUBSIDENCE MONITORING REPORT

SUBSIDENCE MONITORING REPORT

For 1993, the Bear Canyon Subsidence Survey indicates some interesting results. Stations S-01 through S-05 and S-10 showed small amounts of uplift. S-06, S-07, S-08, and S-09 all showed subsidence.

Extraction of the 23rd Left Longwall Panel began on March 3, 1993. Since that time, the panel has passed S-08 by 380 feet (as of 12/31/93). S-08 should now show significant subsidence over the next three years. S-09's result is probably a self-correcting error, since that coal has not been mined yet.

The Whitmore Canyon subsidence monitoring data indicates that all stations, S-1000 through S-1013, showed subsidence; although, S-1004 and S-1006 were not found. Station S-1009 was destroyed in 1993. There has been no mining under Whitmore Canyon since 1981. Continued gob compaction is the most probable reason for the continuing subsidence at these stations.

SUNNYSIDE COAL COMPANY -- ENGINEERING 27-Dec-93

WHITMORE CANYON SUBSIDENCE MONITORING DATA

STATION	DEPTH (FT)	SEAM HT. (FT)	DATE MINED	PANEL WIDTH (FT)	--1988-- YEAR	--1988-- TOTAL	--1989-- YEAR	--1989-- TOTAL	--1990-- YEAR	--1990-- TOTAL	--1991-- YEAR	--1991-- TOTAL	--1992-- YEAR	--1992-- TOTAL	--1993-- YEAR	--1993-- TOTAL
S-1000	1020	8.0	3/81	600	BASE	0.00	-0.07	-0.07	-0.12	-0.19	0.05	-0.14	-0.03	-0.17	-0.04	-0.21
S-1001	1030	7.5	2/82	600		0.54	-0.08	0.46	-0.15	0.31	0.10	0.41	-0.06	0.35	-0.02	0.33
S-1002	1040	7.0	12/80	600		0.06	-0.05	0.01	-0.16	-0.15	0.12	-0.03	-0.07	-0.10	-0.04	-0.14
S-1003	1050	7.0	10/80	600		0.08	-0.04	0.04	-0.14	-0.10	0.11	0.01	-0.07	-0.06	-0.04	-0.10
S-1004	1080	6.5	8/80	600		0.10	-0.06	0.04	-0.13	-0.09	0.12	0.03	-0.07	-0.04	NOT FOUND	
S-1005	1140	9.0	6/82	600		0.04	-0.05	-0.01	-0.15	-0.16	0.16	-0.00	-0.12	-0.12	-0.01	-0.13
S-1006	1200	7.0	5/82	600		0.03	-0.05	-0.02	-0.14	-0.16	0.18	0.02	-0.11	-0.09	NOT FOUND	
S-1007	1230	---MAIN ENTRIES---				0.07	-0.10	-0.03	-0.10	-0.13	0.16	0.03	-0.03	0.00	-0.06	-0.06
S-1008	1250	---MAIN ENTRIES---				0.10	-0.13	-0.03	-0.09	-0.12	0.20	0.08	-0.06	0.02	-0.07	-0.05
S-1009	1250	7.0	10/85	550		0.07	-0.12	-0.05	-0.11	-0.16	0.19	0.03	-0.06	-0.03	DESTROYED IN 1993	
S-1010	1260	7.0	9/85	550		0.06	-0.13	-0.07	-0.11	-0.18	0.18	0.00	-0.06	-0.06	-0.08	-0.14
S-1011	1320	6.5	NOT	600		0.10	-0.11	-0.01	-0.12	-0.13	0.22	0.09	-0.09	0.00	-0.06	-0.06
S-1012	1330	6.5	NOT	600		DESTROYED IN 1988										
S-1013	1350	6.5	NOT	600	BASE	0.10	-0.11	-0.01	-0.12	-0.13	0.25	0.12	-0.08	0.04	-0.06	-0.02

NOTES:
- o STATIONS S-1000 THRU S-1010 WERE ESTABLISHED IN 1986 AFTER MINING HAD OCCURRED
- o A SURVEY WAS NOT MADE IN 1987
- o ALL STATIONS IN 1988 SHOW ANOMALOUS READINGS WHICH MAY RESULT FROM EARTHQUAKE EFFECTS, FROST HEAVE OF AN EXTREMELY COLD WINTER, OR FIELD ERROR, OR COMBINATIONS. STATIONS S-1009 AND S-1010 MIGHT HAVE HAD SOME SUBSIDENCE
- o THE 1991 DATA SHOWS ANAMOLOUS READINGS WHICH ARE SOMEWHAT SELF CORRECTING IN 1992 & 1993.
- o THE - INDICATES SUBSIDENCE; THE + INDICATES UPLIFTING.

SUNNYSIDE COAL COMPANY -- ENGINEERING 27-Dec-93

BEAR CANYON SUBSIDENCE MONITORING DATA

STATION	DEPTH (FT)	SEAM HT. (FT)	DATE MINED	PANEL WIDTH (FT)	1983 YEAR	--1984-- YEAR	--1984-- TOTAL	--1985-- YEAR	--1985-- TOTAL	--1986-- YEAR	--1986-- TOTAL	--1987-- YEAR	--1987-- TOTAL	--1988-- YEAR	--1988-- TOTAL	--1989-- YEAR	--1989-- TOTAL	--1990-- YEAR	--1990-- TOTAL	--1991-- YEAR	--1991-- TOTAL	--1992-- YEAR	--1992-- TOTAL	--1993-- YEAR	--1993-- TOTAL
S-1	1050	11.0	7/83	565	-0.53	-1.06	-1.59	-0.72	-2.31	-0.67	-2.98	0.15	-2.83	0.18	-2.65	-0.27	-2.92	-0.11	-3.03	-0.02	-3.05	-0.06	-3.11	0.12	-2.99
S-2	1100	10.5	7/83	565	-0.26	-0.41	-0.67	-0.03	-0.7	-1.93	-2.63	-0.06	-2.69	0.17	-2.52	-0.29	-2.81	-0.12	-2.93	-0.04	-2.97	-0.04	-3.01	0.13	-2.88
S-3	1140	10.5	2/86	560	-0.09	-0.07	-0.16	0	-0.16	-2.12	-2.28	-0.45	-2.73	0.16	-2.57	-0.32	-2.89	-0.21	-3.10	-0.09	-3.19	-0.06	-3.25	0.10	-3.15
S-4	1190	10.5	3/87	500	-0.05	-0.02	-0.07	0	-0.07	-0.24	-0.31	-1.54	-1.85	0.09	-1.76	-0.41	-2.17	-0.52	-2.69	-0.22	-2.91	-0.08	-2.99	0.10	-2.89
S-5	1270	10.5	3/87	500	-0.08	-0.05	-0.13	-0.88	-1.01	0.86	-0.15	-0.09	-0.24	0.09	-0.15	-0.36	-0.51	-1.68	-2.19	-0.36	-2.55	-0.18	-2.73	0.09	-2.64
S-6	1370	10.5	10/89	600	*	*	*	*	*	*	*	*	*	*	*	-0.07	-0.07	-0.28	-0.35	-0.04	-0.39	-1.75	-2.14	-0.43	-2.57
S-7	1470	8.5	NOT	600	*	*	*	*	*	*	*	*	*	*	*	-0.20	-0.20	0.31	0.11	0.18	0.29	-0.81	-0.52	-0.24	-0.76
S-8	1550	8.0	NOT	600	*	*	*	*	*	*	*	*	*	*	*	-0.50	-0.50	0.50	0.00	-0.05	-0.05	0.04	-0.01	-0.03	-0.04
S-9	1650	8.0	NOT	600	*	*	*	*	*	*	*	*	*	*	*	-0.12	-0.12	0.09	-0.03	0.21	0.18	0.00	0.18	-0.30	-0.12
S-10	1750	8.0	NOT	600	*	*	*	*	*	*	*	*	*	*	*	0.04	0.04	0.19	0.23	-0.01	0.22	-0.08	0.14	0.05	0.19

NOTES:
- o S-5 SHOWS A FIELD ERROR IN 1985 WHICH CORRECTED ITSELF IN 1986.
- o BETTER SURVEYING EQUIPMENT WAS USED STARTING IN 1986.
- o S-1 SHOWS AN ANOMALY IN 1987.
- o ALL STATIONS IN 1988 SHOW ANOMALOUS READINGS WHICH MAY RESULT FROM EARTHQUAKE EFFECTS, FROST HEAVE OF AN EXTREMELY COLD WINTER, OR FIELD ERROR, OR COMBINATIONS. CERTAINLY STATION S-4 SHOULD HAVE SHOWN CONTINUATION OF SOME SUBSIDENCE AND S-5 SHOULD HAVE BEGUN SOME SUBSIDENCE.

- o STATIONS S-6, S-7, AND S-8 WERE ESTABLISHED IN 1988.
- o S-8 SHOWS A FIELD ERROR IN 1989 WHICH WAS CORRECTED IN 1990.
- o S-7 SHOWS AN ANOMALY IN 1991. THIS STATION WAS RE-CHECKED & VERIFIED AT A LATER DATE. ALTHOUGH THE CANTILEVERING EFFECT COULD ACCOUNT FOR SOME OF THE UPLIFTING, IT IS SUSPECTED THAT THE STATION IS REFLECTING SOME SURFACE EFFECTS OR POOR INSTALLATION.
- o THE - INDICATES SUBSIDENCE; THE + INDICATES UPLIFTING.

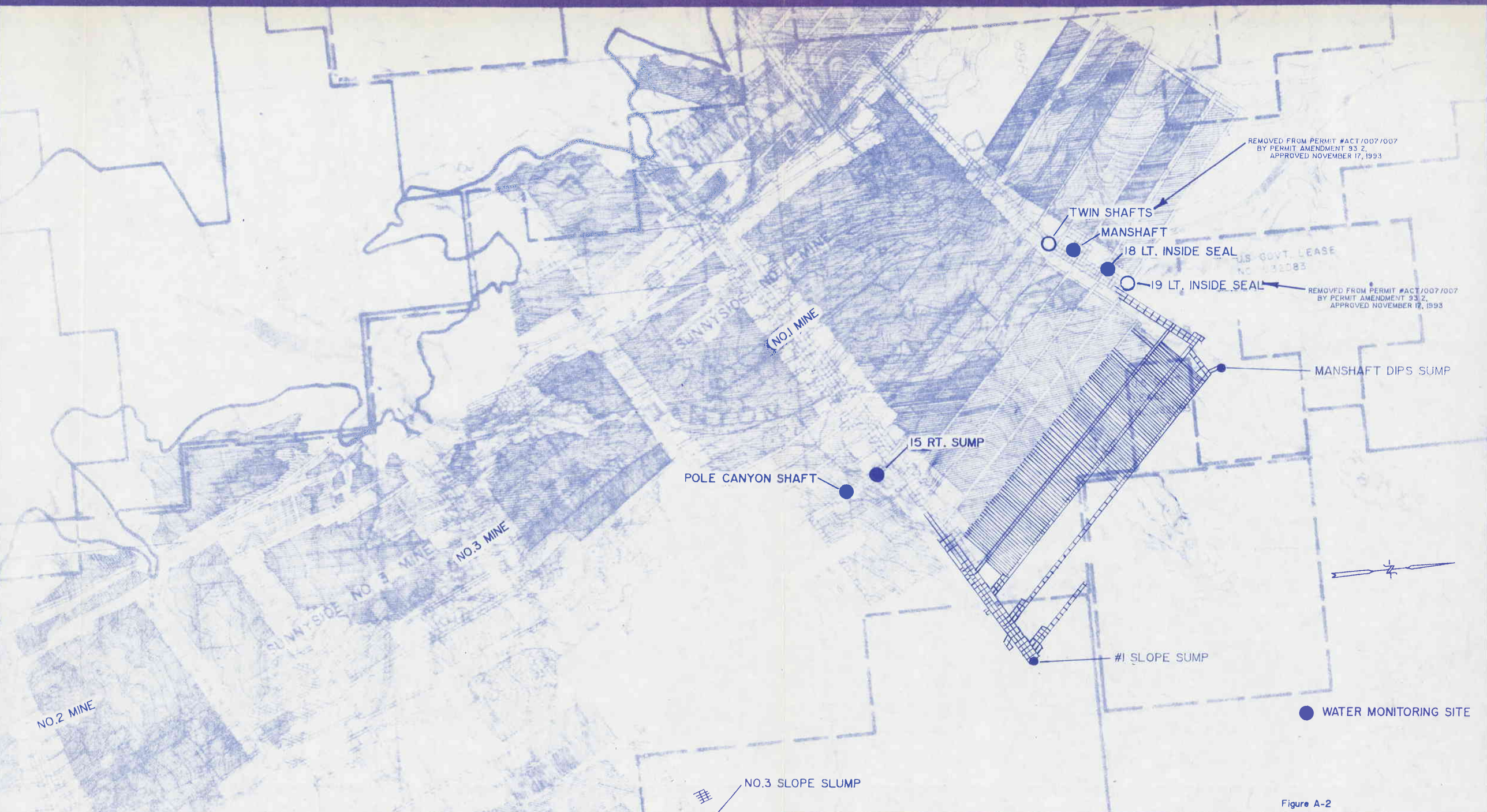


Figure A-2

	REVISIONS			
Sunnyside Coal Company	NO.	DATE	BY	UNDERGROUND WATER MONITORING - 1993 SUNNYSIDE MINES ACT/007/007
	1	1/28/91	BFA	DWN. BY B.F.A. — DATE 3/20/89
	2	1/10/94	PHH	CHECKED BY — PLATE VII-4A
SUNNYSIDE, UTAH	3			APPROVED BY — SCALE 1" = 2000'
	4			

B4-0079

CATEGORY D

VEGETATION DATA OR REVEGETATION SUCCESS MONITORING

VEGETATION DATA FOR REVEGETATION SUCCESS MONITORING FOR 1993

Interim reclamation activities were conducted on areas around the Manshaft Bathhouse sewer line, the runaway truck road (east bank of East Cell), the delineation berm at the #2 Canyon Boiler House, the new berm at the lower end of the #2 Canyon Arches, the stockpile pad drain culvert, the dirt work area covering the #2 Canyon Arches, the re-bermed back-flow prevention device area west of the Tipple Crossing, the berm breach at the Railcut Sediment Pond, the Whitmore Return Discharge Area, the area southwest of the Roadside Substation, and the back-filled erosion gullies below the Bulldozer Road below Sacco Flats.

Other areas which received seeding with the interim mix included the following:

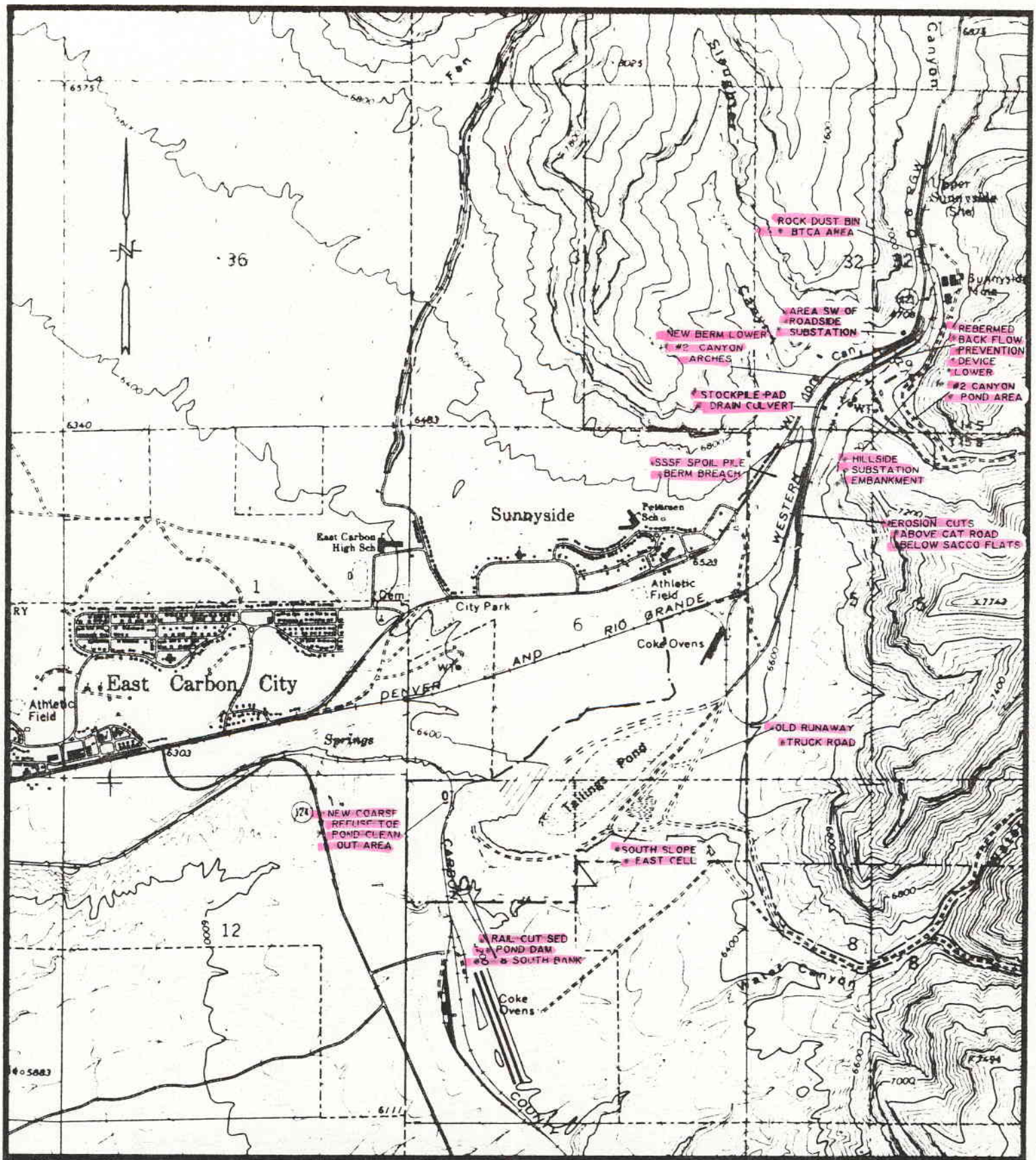
1. South bank of the Railcut Sediment Pond (NOV 93-32-3-8, 4 of 8).
2. Inby side of the Railcut Sediment Pond Dam (NOV 93-32-3-8, 4 of 8).
3. Rock Dust Bin BTCA Area (NOV 93-32-3-8, 5 of 8).
4. SSSF Spoil Pile Berm Breach (NOV 93-40-3-3, 1 of 3).
5. Coarse Refuse Toe Pond Cleanout Area (NOV 93-32-3-8, 4 of 8).
6. Northeast corner of the Whitmore Substation (NOV 93-32-3-8, 4 of 8).
7. Gully on the south bank of the East Slurry Cell (by middle piezometer hole).

The areas above, which were part of an NOV, were seeded with the approved final seed mix for this year only as the final abatement measure for the violation.

Seeding was performed twice during 1993 by Environmental Industrial Services; specifically, on June 4 and October 11 and 12, 1993.

FIGURE D-1

REVEGETATED AREAS



Sunnyside Coal Company

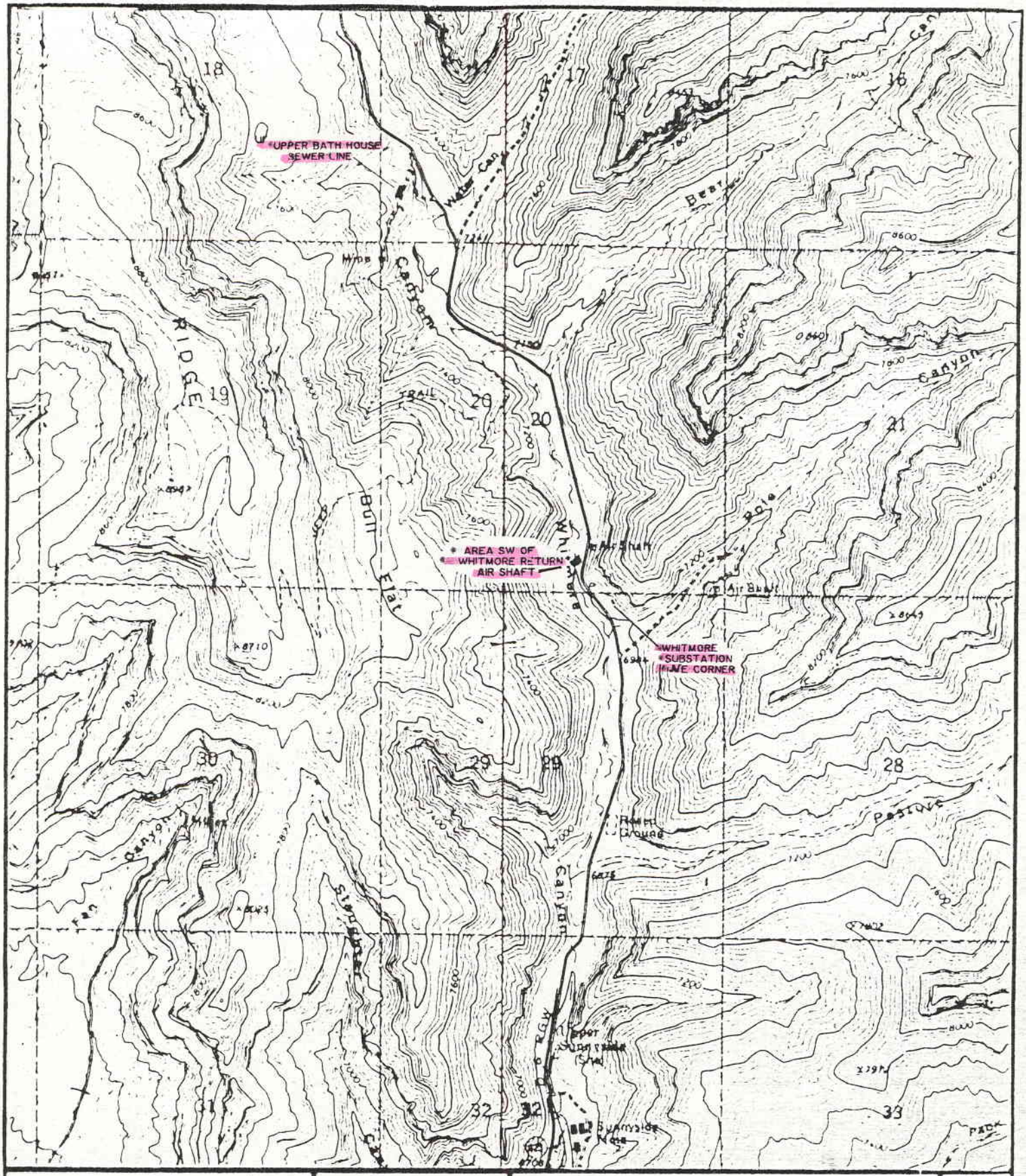
SUNNYSIDE, UTAH

REVISIONS		
NO.	DATE	BY
1	2/5/93	PHH
2	1/3/94	PHH
3		
4		

REVEGETATION ACTIVITES — 1993
SUNNYSIDE MINES ACT/007/007

DRAWN BY B.F.A.	DATE 1/31/92
CHECKED BY	DATE
APPROVED	SCALE 1" = 2,000'

DRAWING NO. A5-0266 C1



Sunnyside Coal Company	REVISIONS			REVEGETATION ACTIVITES — 1993 SUNNYSIDE MINES ACT/007/007		A5-0266
	NO	DATE	BY			
	1	2/5/93	PHH			
	2	1/13/94	PHH	DRAWN BY B.F.A.	DATE 1/31/92	
SUNNYSIDE MINES	3			CHECKED BY	DATE	
	4			APPROVED BY	DATE	

SUNNYSIDE COAL MINE
VEGETATION MONITORING

1992

Prepared by

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for

SUNNSIDE COAL MINE
Post Office Box 99
Sunnyside, Utah 84539

Report Date: March 1993

TABLE OF CONTENTS

Introduction 1

Methods 2

Results 7

001 Pond 8

001 Topsoil 11

Manshaft Sediment Pond 13

002-B Discharge Pond 16

002-B Topsoil Pile 19

002-A Discharge Pond 22

Rail Cut Sediment Pond 25

Rail Cut Topsoil Pile 28

Coarse Refuse Toe Topsoil Pile 30

Coarse Refuse Toe Sediment Pond 32

Reclaimed Coarse Refuse Toe Sediment Pond 35

Borrow Area Sediment Pond 38

Coarse Refuse Topsoil Pile 41

Haul Road (Pasture) Sediment Pond 43

Sacco Flats Topsoil Pile 45

Surface Facility Spoil Pile 47

Surface Facility Sediment Pond 50

Whitmore Test Plot 53

Slaughter Canyon 66

Sacco Test Plot 73

Color Photographs 151

SUNNYSIDE COAL MINE
VEGETATION MONITORING

1992

INTRODUCTION

This report addresses vegetation monitoring of seeded areas and test plots results for 1992. Several of the areas were also sampled in 1990, so comparisons can be made between years. The following is a list of areas monitored and reported within this document.

001 Pond
001 Topsoil
Manshaft Sediment Pond
002-B Discharge Pond
002-B Topsoil Pile
002-A Discharge Pond
Rail Cut Sediment Pond
Rail Cut Topsoil Pile
Coarse Refuse Toe Topsoil Pile
Coarse Refuse Toe Sediment Pond
Reclaimed Coarse Refuse Toe Sediment Pond
Borrow Area Sediment Pond
Coarse Refuse Topsoil Pile
Haul Road (Pasture) Sediment Pond
Sacco Flats Topsoil Pile
Surface Facility Spoil Pile
Surface Facility Sediment Pond
Whitmore Test Plot
Slaughter Canyon
Sacco Test Plot

METHODS

Vegetation monitoring was conducted on revegetated sites and test plots for SUNNYSIDE COAL MINE in the growing season of 1992. Quantitative and qualitative data were taken on each site. Methods for the monitoring are described herein, however, each data sheet may also describe the some of the sample parameters and methods specific to that site.

QUALITATIVE DATA

Qualitative data were recorded on all sites. A qualitative data sheet for each site is included in this report and provides the following information: site name, general area, sample date, observers, slope, exposure, acreage, animal disturbance, erosion damage, cover, dominant plant species observed, and other pertinent notes.

Quantitative data were also recorded. Results are shown on these data sheets and are referenced on the qualitative data sheets.

Site Name

The site name that is given correlates with permit information and maps used in the field (not included).

Date

Sample dates are also provided. All sample dates are within the 1992 growing season and were before frost.

Workers

Lists the names of the individuals who recorded the data.

Exposure

Exposure was recorded on each site. Often the site had several exposures differences. In those cases, "variable" was written for the exposure on the data sheet.

Animal Disturbance

Values were given to the relative use by animal species of

each site. The values and a brief explanation are given below.

None - no animal use was observed.

Slight - only little animal use was observed by droppings, tracks, or cropped vegetation.

Moderate- a fair degree of use was observed mostly by the cropped vegetation. Several inches of production still remained available for use by the animals.

Severe - animal use had taken nearly all of the available current year's production.

Erosion

Erosion of the area was also assessed by qualitative methods. Actual measurements, descriptive notes or values described below were given to each site.

Negligible - almost no erosion was observed.

Slight - small erosion rills beginning, usually less than 2:1 (2 inches wide by 1 inches deep).

Moderate - erosional rills and gullies from 2:1 to 4:2.

Severe - erosional rills and gullies over to 4:2 were observed.

Cover

The "cover" on the data sheets was reserved for those areas

where quantitative data were not required - and therefore quick (qualitative) estimates were made for cover. Since quantitative data were required for most areas in 1992, one is most often referred to the raw data and summary sheets.

Dominant Plant Species Observed

Plant species that were observed, but not encountered in the quadrats when sampling were listed here. Therefore, for a list of all species on a given site, one should refer to both quantitative and qualitative data sheets.

Notes

Site-specific, pertinent notes about each area were also taken i.e. identification of special considerations, areas of differential growth patterns, etc. Notes on specific methodologies on each site also are described here.

Photographs

Color photographs were taken for each site and are included in this report for documentation.

QUANTITATIVE DATA

Cover and Composition

Cover (living, litter, rock, bareground) estimates were made using ocular methods with randomly placed meter square quadrats. Total living cover and cover by species were reported. Raw data summations were included in this report and reports all means and standard deviations.

Species composition was also assessed from the quadrats. Sample sizes depended on the size of the sample area. Because these data are presented to observe trends for revegetation success and soil stabilization, no attempt was made to achieve sample adequacy for each individual site.

Woody Species Density

In some areas density estimates were needed. Density of woody plant species were recorded using the point quarter distance method (Cottom and Curtis 1956) and by using belt transects. In the point quarter method, random points were placed on the sample sites and measured into four quarters. The distances to the nearest woody plant species were then recorded in each quarter. The average point-to-individual distance was equal to the square root of the mean area per individual. In the belt transect method, sizes of transects varied with individual

sites. In this method total counts of the woody species were conducted in each transect. They were then summed and averaged to calculate the number of individuals per acre.

RESULTS

Data sheets for qualitative and quantitative (including raw data) sampling are included in this report. This will give the reviewer an overall view of the revegetation success of each area. For results of the above parameters, refer to the site-specific data sheets.

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: 001 Pond

DATE: 3 Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: 0-25 deg.

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: small mammal & deer use

EROSION: negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES: 1) Sampled all banks randomly

SUNNYSIDE
001 Pond
Slope: 0 - 25 deg
Exposure: Var.

Sample Date: 3 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
SHRUBS										
Chrysothamnus nauseosus	5.00	0.00	20.00	5.00	5.00	35.00	20.00	0.00	0.00	0.00
FORBS										
Medicago sativa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	20.00	5.00
Melilotus officinalis	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
Artemisia ludiviciana	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00
GRASSES										
oa pratensis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
Agropyron intermedium	10.00	20.00	25.00	15.00	5.00	10.00	15.00	0.00	5.00	25.00
Agropyron dasystachyum	55.00	40.00	15.00	25.00	10.00	10.00	15.00	35.00	0.00	35.00
Oryzopsis hymenoides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00
COVER										
Total Living Cover	70.00	60.00	60.00	45.00	45.00	55.00	50.00	50.00	45.00	65.00
Litter	5.00	5.00	10.00	5.00	5.00	10.00	5.00	5.00	5.00	5.00
Bareground	10.00	15.00	10.00	25.00	25.00	15.00	15.00	15.00	5.00	5.00
Rock	15.00	20.00	20.00	25.00	25.00	20.00	30.00	30.00	45.00	25.00
% COMPOSITION										
Shrubs	7.14	0.00	33.33	11.11	11.11	63.64	40.00	0.00	0.00	0.00
Forbs	0.00	0.00	0.00	0.00	55.56	0.00	0.00	30.00	44.44	7.69
Grasses	92.86	100.00	66.67	88.89	33.33	36.36	60.00	70.00	55.56	92.31

SUNNYSIDE
001 Pond
Slope: 0 - 25 deg
Exposure: Var.
Sample Date: 3 Sept 92

Mean	SDev	Freq	
			SHRUBS
9.00	11.36		Chrysothamnus nauseosus
			FORBS
4.00	7.00		Medicago sativa
1.00	3.00		Melilotus officinalis
1.50	4.50		Artemisia ludiviciana
			GRASSES
0.50	1.50		Poa pratensis
13.00	8.12		Agropyron intermedium
24.00	16.09		Agropyron dasystachyum
1.50	4.50		Oryzopsis hymenoides
			COVER
54.50	8.50		Total Living Cover
6.00	2.00		Litter
14.00	6.63		Bareground
25.50	7.89		Rock
			% COMPOSITION
16.63	20.72		Shrubs
13.77	20.31		Forbs
69.60	22.52		Grasses

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: 001 Topsoil

DATE: 3 Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: 1-25 deg.

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: moderate use by deer and cattle

EROSION: negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES: 1) sampled randomly on the top and sides of slopes

SUNNYSIDE
001 Topsoil Pile
Slope: 0 - 25 deg
Exposure: Var.

Sample Date: 3 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	Mean	SDev	Freq
SHRUBS										
Chrysothamnus nauseosus	0.00	70.00	30.00	25.00	0.00	0.00	25.00	21.43	23.41	
Eurotia lanata	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.71	1.75	
FORBS										
GRASSES										
Agropyron intermedium	0.00	0.00	0.00	0.00	35.00	10.00	10.00	7.86	11.91	
Agropyon trachycaulum	0.00	10.00	25.00	35.00	20.00	0.00	0.00	12.86	13.05	
Agropyron dasystachyum	45.00	0.00	0.00	0.00	0.00	40.00	35.00	17.14	19.97	
Oryzopsis hymenoides	10.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	3.50	
Elymus cinereus	15.00	0.00	10.00	10.00	0.00	0.00	0.00	5.00	5.98	
COVER										
Total Living Cover	70.00	80.00	70.00	70.00	55.00	50.00	70.00	66.43	9.53	
Litter	15.00	10.00	20.00	20.00	35.00	25.00	15.00	20.00	7.56	
Bareground	5.00	5.00	5.00	5.00	3.00	5.00	5.00	4.71	0.70	
Rock	10.00	5.00	5.00	5.00	7.00	20.00	10.00	8.86	5.00	
% COMPOSITION										
Shrubs	0.00	87.50	50.00	35.71	0.00	0.00	35.71	29.85	30.41	
Forbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Grasses	100.00	12.50	50.00	64.29	100.00	100.00	64.29	70.15	30.41	

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Manshaft Sediment pond

DATE: 3 Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: 0-30 deg.

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: Wildlife use: deer and rabbit.

EROSION: Slight erosion beginning on the west slope.

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES:

1) Sampled banks and bottom of pond.
2) On the banks we sampled each exposure
3) The was some standing water on the bottom of the pond.

SUNNYSIDE
Man Shaft Sediment Pond
Slope: 0 - 25 deg
Exposure: Var.

Sample Date: 3 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
SHRUBS										
Chrysothamnus nauseosus	20.00	25.00	0.00	20.00	0.00	0.00	0.00	20.00	0.00	0.00
Gutierrezia sarothae	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rosa woodsii	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Salix sp.	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
FORBS										
Grindelia squarrosa	0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00	0.00
Medicago sativa	0.00	10.00	0.00	10.00	5.00	0.00	0.00	0.00	0.00	0.00
Artemisia ludoviciana	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00
Aster foliaceus	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Melilotus officinalis	0.00	0.00	0.00	0.00	5.00	30.00	15.00	0.00	10.00	0.00
GRASSES										
Agropyron dasystachyum	0.00	0.00	0.00	0.00	15.00	0.00	18.00	0.00	0.00	65.00
Poa pratensis	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agropyron cristatum	0.00	25.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agropyron intermedium	0.00	0.00	10.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
Sitanion hystrix	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
COVER										
Total Living Cover	60.00	60.00	60.00	30.00	30.00	35.00	40.00	20.00	25.00	75.00
Litter	5.00	5.00	20.00	10.00	5.00	5.00	5.00	5.00	5.00	5.00
Bareground	15.00	25.00	15.00	35.00	60.00	25.00	35.00	5.00	5.00	19.00
Rock	20.00	10.00	5.00	25.00	5.00	35.00	20.00	70.00	65.00	1.00
% COMPOSITION										
Shrubs	33.33	41.67	16.67	66.67	0.00	14.29	0.00	100.00	0.00	0.00
Forbs	50.00	16.67	0.00	33.33	33.33	85.71	55.00	0.00	100.00	0.00
Grasses	16.67	41.67	83.33	0.00	66.67	0.00	45.00	0.00	0.00	100.00

SUNNYSIDE
Man Shaft Sediment Pond
Slope: 0 - 25 deg
Exposure: Var.
Sample Date: 3 Sept 92

Mean	SDev	Freq	
			SHRUBS
8.50	10.50		Chrysothamnus nauseosus
0.50	1.50		Gutierrezia sarothae
0.50	1.50		Rosa woodsii
0.50	1.50		Salix sp.
			FORBS
0.70	2.10		Grindelia squarrosa
2.50	4.03		Medicago sativa
2.50	5.12		Artemisia ludoviciana
2.00	6.00		Aster foliaceus
6.00	9.43		Melilotus officinalis
			GRASSES
9.80	19.53		Agropyron dasystachyum
1.00	3.00		Poa pratensis
6.50	13.43		Agropyron cristatum
1.50	3.20		Agropyron intermedium
1.00	3.00		Sitanion hystrix
			COVER
43.50	17.76		Total Living Cover
7.00	4.58		Litter
23.90	15.65		Bareground
25.60	23.18		Rock
			% COMPOSITION
27.26	32.16		Shrubs
37.40	33.74		Forbs
35.33	35.98		Grasses

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: 002-B Discharge Pond

DATE: 3 Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: variable

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: moderate use

EROSION: negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES: 1) Sampled top and outside banks (outside of fence)

SUNNYSIDE
002-B Discharge Pond
Slope: 0 - 25 deg
Exposure: Var.

Sample Date: 3 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
SHRUBS										
Chrysothamnus nauseosus	0.00	0.00	15.00	0.00	0.00	15.00	0.00	0.00	0.00	15.00
FORBS										
Hedysarum boreale	10.00	25.00	15.00	15.00	25.00	15.00	35.00	20.00	25.00	10.00
Melilotus officinalis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
GRASSES										
Agropyron dasystachyum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
Agropyron trachycaulum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00
Agropyron intermedium	25.00	5.00	5.00	5.00	10.00	10.00	5.00	0.00	5.00	5.00
Poa pratensis	0.00	0.00	0.00	10.00	0.00	0.00	5.00	0.00	0.00	0.00
Elymus cinereus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
COVER										
Total Living Cover	35.00	30.00	35.00	30.00	35.00	40.00	45.00	30.00	35.00	40.00
Litter	10.00	10.00	10.00	5.00	10.00	5.00	5.00	5.00	5.00	5.00
Bareground	10.00	10.00	5.00	10.00	50.00	40.00	10.00	10.00	45.00	10.00
Rock	45.00	50.00	50.00	55.00	5.00	15.00	40.00	55.00	15.00	45.00
% COMPOSITION										
Shrubs	0.00	0.00	42.86	0.00	0.00	37.50	0.00	0.00	0.00	37.50
Forbs	28.57	83.33	42.86	50.00	71.43	37.50	77.78	83.33	71.43	25.00
Grasses	71.43	16.67	14.29	50.00	28.57	25.00	22.22	16.67	28.57	37.50

SUNNYSIDE
002-B Discharge Pond
Slope: 0 - 25 deg
Exposure: Var.
Sample Date: 3 Sept 92

Mean	SDev	Freq	
			SHRUBS
4.50	6.87		Chrysothamnus nauseosus
			FORBS
19.50	7.57		Hedysarum boreale
0.50	1.50		Melilotus officinalis
			GRASSES
0.50	1.50		Agropyron dasystachyum
1.00	2.00		Agropyron trachycaulum
7.50	6.42		Agropyron intermedium
1.50	3.20		Poa pratensis
0.50	1.50		Elymus cinereus
			COVER
35.50	4.72		Total Living Cover
7.00	2.45		Litter
20.00	16.58		Bareground
37.50	17.64		Rock
			% COMPOSITION
11.79	18.06		Shrubs
57.12	21.67		Forbs
31.09	16.89		Grasses

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: 002-B Topsoil Pile

DATE: 3 Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: 1-15 deg.

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: rabbit deer, and rodents use.

EROSION: negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES: 1) sampled randomly all over pile.

SUNNYSIDE
002-B Topsoil Pile
Slope: 0 - 25 deg
Exposure: Var.

Sample Date: 3 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
SHRUBS										
Artemisia tridentata	10.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus nauseosus	5.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
FORBS										
Achillea millefolium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	5.00
Sanguisorba minor	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
Hedysarum boreale	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
GRASSES										
Agropyron cristatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00
Agropyron smithii	0.00	0.00	0.00	0.00	0.00	30.00	5.00	0.00	0.00	0.00
Agropyron spicatum	0.00	0.00	0.00	0.00	50.00	0.00	0.00	10.00	0.00	0.00
Oryzopsis hymenoides	35.00	0.00	40.00	35.00	0.00	0.00	25.00	40.00	0.00	0.00
Agropyron intermedium	10.00	25.00	10.00	10.00	5.00	5.00	5.00	10.00	10.00	20.00
Agropyron dasystachyum	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Poa secunda	0.00	15.00	5.00	5.00	0.00	0.00	35.00	0.00	40.00	35.00
COVER										
Total Living Cover	65.00	40.00	65.00	60.00	55.00	40.00	75.00	70.00	60.00	65.00
Litter	10.00	5.00	5.00	10.00	5.00	5.00	23.00	28.00	15.00	20.00
Bareground	5.00	15.00	10.00	5.00	15.00	5.00	1.00	1.00	10.00	5.00
Rock	20.00	40.00	20.00	25.00	25.00	50.00	1.00	1.00	15.00	10.00
% COMPOSITION										
Shrubs	23.08	0.00	15.38	16.67	0.00	0.00	0.00	0.00	8.33	0.00
Forbs	0.00	0.00	0.00	0.00	0.00	12.50	6.67	14.29	0.00	7.69
Grasses	76.92	100.00	84.62	83.33	100.00	87.50	93.33	85.71	91.67	92.31

SUNNYSIDE
002-B Topsoil Pile
Slope: 0 - 25 deg
Exposure: Var.
Sample Date: 3 Sept 92

Mean	SDev	Freq	
			SHRUBS
2.00	4.00		Artemisia tridentata
2.00	3.32		Chrysothamnus nauseosus
			FORBS
1.50	3.20		Achillea millefolium
0.50	1.50		Sanguisorba minor
0.50	1.50		Hedysarum boreale
			GRASSES
1.00	2.00		Agropyron cristatum
3.50	8.96		Agropyron smithii
6.00	14.97		Agropyron spicatum
17.50	17.92		Oryzopsis hymenoides
11.00	6.24		Agropyron intermedium
0.50	1.50		Agropyron dasystachyum
13.50	15.82		Poa secunda
			COVER
59.50	11.06		Total Living Cover
12.60	8.06		Litter
7.20	4.83		Bareground
20.70	14.81		Rock
			% COMPOSITION
6.35	8.45		Shrubs
4.11	5.43		Forbs
89.54	6.97		Grasses

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: 002-A

DATE: 3 Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: 5-30 deg.

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: slight

EROSION: negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES:
1) Good species diversity observed
2) Sampled top and outside of banks.

SUNNYSIDE
002-A Discharge Pond
Slope: 0 - 25 deg
Exposure: Var.

Sample Date: 3 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
SHRUBS										
Artemisia tridentata	5.00	0.00	0.00	0.00	0.00	0.00	25.00	15.00	0.00	0.00
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00
FORBS										
Medicago sativa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	5.00
Penstemon palmeri	10.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00
Eriogonum umbellatum	0.00	0.00	5.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00
GRASSES										
Agropyron dasystachyum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
Agropyron cristatum	0.00	65.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00
Agropyron intermedium	20.00	0.00	0.00	5.00	10.00	50.00	40.00	35.00	30.00	50.00
Poa pratensis	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus salinus	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus cinereus	0.00	5.00	65.00	65.00	35.00	5.00	0.00	0.00	0.00	0.00
COVER										
Total Living Cover	45.00	70.00	70.00	75.00	70.00	60.00	70.00	65.00	60.00	55.00
Litter	15.00	10.00	5.00	5.00	10.00	5.00	5.00	20.00	5.00	30.00
Bareground	10.00	10.00	15.00	15.00	1.00	30.00	1.00	5.00	10.00	1.00
Rock	30.00	10.00	10.00	5.00	19.00	5.00	24.00	10.00	25.00	14.00
% COMPOSITION										
Shrubs	11.11	0.00	0.00	0.00	0.00	0.00	42.86	30.77	0.00	0.00
Forbs	22.22	0.00	7.14	0.00	28.57	8.33	0.00	0.00	50.00	9.09
Grasses	66.67	100.00	92.86	100.00	71.43	91.67	57.14	69.23	50.00	90.91

SUNNYSIDE
002-A Discharge Pond
Slope: 0 - 25 deg
Exposure: Var.
Sample Date: 3 Sept 92

Mean	SDev	Freq	
			SHRUBS
4.50	8.20		Artemisia tridentata
1.00	2.00		Chrysothamnus nauseosus
			FORBS
3.50	8.96		Medicago sativa
2.00	3.32		Penstemon palmeri
2.00	4.58		Eriogonum umbellatum
			GRASSES
1.00	3.00		Agropyron dasystachyum
7.50	19.27		Agropyron cristatum
24.00	18.68		Agropyron intermedium
0.50	1.50		Poa pratensis
0.50	1.50		Elymus salinus
17.50	25.81		Elymus cinereus
			COVER
64.00	8.60		Total Living Cover
11.00	8.00		Litter
9.80	8.47		Bareground
15.20	8.35		Rock
			% COMPOSITION
8.47	14.79		Shrubs
12.54	15.63		Forbs
78.99	17.32		Grasses

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Rail Cut Sediment Pond

DATE: 8 Sept. 1992

WORKERS: P. Collins,

SLOPE: 5-25 deg.

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: Slight

EROSION: Moderate erosion, especially on the east slope of the pond.

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES: 1) Sampled on all slopes randomly.

SUNNYSIDE
Rail Cut Sediment Pond
Slope: 15 - 25 deg
Exposure: Var.

Sample Date: 8 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
SHRUBS										
Chrysothamnus nauseosus	0.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Atriplex gardneri	0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00	0.00	0.00
FORBS										
Machaeranthera grindelioi	10.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
Malcomia africa	5.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
Halogeton glomeratus	5.00	0.00	0.00	35.00	15.00	5.00	0.00	0.00	0.00	0.00
Kochia scoparia	0.00	0.00	25.00	0.00	0.00	0.00	20.00	0.00	30.00	65.00
Salsola iberica	0.00	0.00	20.00	20.00	10.00	0.00	15.00	5.00	0.00	0.00
GRASSES										
Agropyron trachycaulum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
Oryzopsis hymenoides	15.00	0.00	0.00	10.00	0.00	8.00	5.00	5.00	5.00	0.00
COVER										
Total Living Cover	35.00	60.00	45.00	65.00	30.00	25.00	40.00	15.00	35.00	65.00
Litter	5.00	10.00	10.00	10.00	5.00	10.00	5.00	5.00	5.00	5.00
Bareground	35.00	25.00	35.00	20.00	40.00	50.00	30.00	65.00	50.00	15.00
Rock	25.00	5.00	10.00	5.00	25.00	15.00	25.00	15.00	10.00	15.00
% COMPOSITION										
Shrubs	0.00	100.00	0.00	0.00	0.00	28.00	0.00	0.00	0.00	0.00
Forbs	57.14	0.00	100.00	84.62	100.00	40.00	87.50	33.33	85.71	100.00
Grasses	42.86	0.00	0.00	15.38	0.00	32.00	12.50	66.67	14.29	0.00

SUNNYSIDE
Rail Cut Sediment Pond
Slope: 15 - 25 deg
Exposure: Var.
Sample Date: 3 Sept 92

Mean	SDev	Freq	
			SHRUBS
6.00	18.00		Chrysothamnus nauseosus
0.70	2.10		Atriplex gardneri
			FORBS
1.50	3.20		Machaeranthera grindelioides
1.00	2.00		Malcomia africa
6.00	10.68		Halogeton glomeratus
14.00	20.47		Kochia scoparia
7.00	8.12		Salsola iberica
			GRASSES
0.50	1.50		Agropyron trachycaulum
4.80	4.83		Oryzopsis hymenoides
			COVER
41.50	16.29		Total Living Cover
7.00	2.45		Litter
36.50	14.50		Bareground
15.00	7.42		Rock
			% COMPOSITION
12.80	30.24		Shrubs
68.83	32.81		Forbs
18.37	21.28		Grasses

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Rail Cut Topsoil Pile

DATE: 8 Sept. 1992

WORKERS: P. Collins

SLOPE: 5-30 deg.

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: Slight

EROSION: negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES: 1) Sampled rendomly all over the pile.

SUNNYSIDE
Rail Cut Topsoil Pile
Slope: 5 - 25 deg
Exposure: Var.

Sample Date: 8 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	Mean	SDev	Freq
SHRUBS									
FORBS									
Malcomia africa	5.00	15.00	0.00	0.00	0.00	0.00	3.33	5.53	
Halogeton glomeratus	10.00	15.00	25.00	25.00	0.00	15.00	15.00	8.66	
Salsola iberica	0.00	10.00	20.00	25.00	20.00	15.00	15.00	8.16	
GRASSES									
Agropyron trachycaulum	0.00	0.00	10.00	0.00	15.00	0.00	4.17	6.07	
Oryzopsis hymenoides	25.00	10.00	10.00	15.00	0.00	30.00	15.00	10.00	
COVER									
Total Living Cover	40.00	50.00	65.00	65.00	35.00	60.00	52.50	11.81	
Litter	10.00	5.00	5.00	5.00	10.00	5.00	6.67	2.36	
Bareground	35.00	20.00	20.00	20.00	25.00	15.00	22.50	6.29	
Rock	15.00	25.00	10.00	10.00	30.00	20.00	18.33	7.45	
% COMPOSITION									
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Forbs	37.50	80.00	69.23	76.92	57.14	50.00	61.80	15.09	
Grasses	62.50	20.00	30.77	23.08	42.86	50.00	38.20	15.09	

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Coarse Refuse Toe Topsoil Pile

DATE: 8 Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: 2-35 deg.

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: Slight

EROSION: negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES: 1) Sampled all over pile and on the top

SUNNYSIDE
Coarse Refuse Toe Topsoil Pile
Slope: 2 - 35 deg
Exposure: Var.

Sample Date: 8 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	Mean	SDev	Freq
SHRUBS									
Atriplex confertifolia	0.00	0.00	5.00	0.00	5.00	0.00	1.67	2.36	
Chrysothamnus nauseosus	0.00	0.00	5.00	0.00	0.00	0.00			
Eriogonum corymbosum	0.00	0.00	0.00	5.00	0.00	0.00			
FORBS									
Salsola iberica	10.00	0.00	50.00	10.00	0.00	30.00	16.67	17.95	
Halogeton glomeratus	10.00	15.00	0.00	10.00	5.00	0.00	6.67	5.53	
GRASSES									
Agropyron dasystachyum	0.00	0.00	0.00	5.00	0.00	0.00	0.83	1.86	
Oryzopsis hymenoides	25.00	25.00	5.00	10.00	35.00	20.00	20.00	10.00	
COVER									
Total Living Cover	45.00	40.00	65.00	40.00	45.00	50.00	47.50	8.54	
Litter	5.00	10.00	5.00	5.00	5.00	5.00	5.83	1.86	
Bareground	25.00	40.00	5.00	20.00	35.00	40.00	27.50	12.50	
Rock	25.00	10.00	25.00	35.00	15.00	5.00	19.17	10.17	
% COMPOSITION									
Shrubs	0.00	0.00	15.38	12.50	11.11	0.00	6.50	6.62	
Forbs	44.44	37.50	76.92	50.00	11.11	60.00	46.66	20.24	
Grasses	55.56	62.50	7.69	37.50	77.78	40.00	46.84	22.15	

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Coarse Refuse Toe Sediment Pond

DATE: 8 Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: 25 deg.

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: Moderate

EROSION: Moderate, low cover around the pond and erosion is occurring.

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES: 1) Sampled randomly around entire pond and on inside slopes.

SUNNYSIDE
Coarse Refuse Toe Sed. Pond
Slope: 25 deg
Exposure: Var.

Sample Date: 8 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
SHRUBS										
Atriplex confertifolia	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00
Artemisia tridentata	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
Eriogonum corymbosum	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00
FORBS										
Machaeranthera grindelioi	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Medicago sativa	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
Salsola iberica	0.00	0.00	0.00	0.00	20.00	25.00	0.00	0.00	10.00	0.00
Machaeranthera sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
GRASSES										
Agropyron dasystachyum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
Agropyron cristatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	5.00
Agropyron intermedium	5.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
Oryzopsis hymenoides	0.00	0.00	0.00	10.00	0.00	0.00	10.00	0.00	0.00	0.00
COVER										
Total Living Cover	5.00	5.00	15.00	20.00	20.00	25.00	35.00	10.00	20.00	15.00
Litter	1.00	5.00	5.00	9.00	5.00	5.00	5.00	2.00	10.00	5.00
Bareground	90.00	75.00	40.00	70.00	70.00	65.00	50.00	85.00	65.00	65.00
Rock	4.00	15.00	40.00	1.00	5.00	5.00	10.00	3.00	5.00	15.00
% COMPOSITION										
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	71.43	0.00	0.00	33.33
Forbs	0.00	0.00	66.67	50.00	100.00	100.00	0.00	0.00	50.00	33.33
Grasses	100.00	100.00	33.33	50.00	0.00	0.00	28.57	100.00	50.00	33.33

SUNNYSIDE
Coarse Refuse Toe Sed. Pond
Slope: 25 deg
Exposure: Var.
Sample Date: 8 Sept 92

Mean	SDev	Freq	
			SHRUBS
1.00	3.00		Atriplex confertifolia
0.50	1.50		Artemisia tridentata
0.50	1.50		Eriogonum corymbosum
1.00	2.00		Chrysothamnus nauseosus
			FORBS
1.00	3.00		Machaeranthera grindelioides
1.00	3.00		Medicago sativa
5.50	9.07		Salsola iberica
0.50	1.50		Machaeranthera sp.
			GRASSES
0.50	1.50		Agropyron dasystachyum
1.50	3.20		Agropyron cristatum
2.00	2.45		Agropyron intermedium
2.00	4.00		Oryzopsis hymenoides
			COVER
17.00	8.72		Total Living Cover
5.20	2.56		Litter
67.50	14.01		Bareground
10.30	10.91		Rock
			% COMPOSITION
10.48	22.62		Shrubs
40.00	38.15		Forbs
49.52	36.76		Grasses

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Reclaimed Coarse Refuse Toe Sediment Pond

DATE: Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: 15 deg.

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: Moderate

EROSION: negligible, silt fence and rough slope are doing well to control erosion.

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES:

1) Sampled between silt fences.
2) Site is in good condition
3) One quadrat placed at bottom of wet area

SUNNYSIDE
Reclaimed Coarse Refuse Toe Sed. Pond
Slope: 15 deg
Exposure: Var.

Sample Date: 8 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
SHRUBS										
Artemisia tridentata	8.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus nauseosus	0.00	0.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Atriplex canescens	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tamarix ramosissima	0.00	0.00	0.00	0.00	0.00	0.00	35.00	0.00	0.00	0.00
Eriogonum corymbosum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00
FORBS										
Medicago sativa	7.00	20.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00
Salsola iberica	0.00	0.00	0.00	10.00	0.00	0.00	0.00	5.00	25.00	25.00
Typha latifolia	0.00	0.00	0.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00
Halogeton glomeratus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00
GRASSES										
Agropyron trachycaulum	50.00	20.00	30.00	25.00	30.00	35.00	0.00	0.00	0.00	5.00
Agropyron cristatum	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus cinereus	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
Agropyron spicatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00	0.00	0.00
Agropyron intermedium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	5.00
COVER										
Total Living Cover	65.00	50.00	65.00	35.00	40.00	65.00	85.00	65.00	55.00	50.00
Litter	5.00	5.00	5.00	4.00	10.00	10.00	5.00	5.00	10.00	5.00
Bareground	25.00	40.00	20.00	50.00	40.00	15.00	5.00	5.00	30.00	40.00
Rock	5.00	5.00	10.00	11.00	10.00	10.00	5.00	25.00	5.00	5.00
% COMPOSITION										
Shrubs	12.31	0.00	53.85	0.00	25.00	0.00	41.18	38.46	0.00	0.00
Forbs	10.77	40.00	0.00	28.57	0.00	30.77	58.82	7.69	45.45	80.00
Grasses	76.92	60.00	46.15	71.43	75.00	69.23	0.00	53.85	54.55	20.00

SUNNYSIDE
Reclaimed Coarse Refuse Toe Sed. Pond
Slope: 15 deg
Exposure: Var.
Sample Date: 8 Sept 92

11.00	Mean	SDev	Freq	
				SHRUBS
0.00	1.64	3.50		Artemisia tridentata
5.00	3.18	8.60		Chrysothamnus nauseosus
0.00	0.45	1.44		Atriplex canescens
0.00	3.18	10.06		Tamarix ramosissima
0.00	2.27	7.19		Eriogonum corymbosum
				FORBS
0.00	4.27	7.68		Medicago sativa
15.00	7.27	9.62		Salsola iberica
0.00	4.55	14.37		Typha latifolia
5.00	1.82	4.41		Halogeton glomeratus
				GRASSES
15.00	19.09	15.93		Agropyron trachycaulum
0.00	0.91	2.87		Agropyron cristatum
0.00	0.91	2.87		Elymus cinereus
0.00	3.18	10.06		Agropyron spicatum
0.00	3.18	8.60		Agropyron intermedium
				COVER
40.00	55.91	14.11		Total Living Cover
10.00	6.73	2.49		Litter
45.00	28.64	15.09		Bareground
5.00	8.73	5.71		Rock
				% COMPOSITION
12.50	16.66	18.96		Shrubs
50.00	32.01	24.67		Forbs
37.50	51.33	23.09		Grasses

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Borrow Area Sediment Pond

DATE: 8 Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: variable

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: Slight

EROSION: East side of the sediment pond has moderate erosion on the inside of the pond, otherwise only slight erosion around the remainder of the pond.

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES: 1) We sampled the top, inside and outside of the pond.

SUNNYSIDE
Borrow Area Sed. Pond
Slope: Var.
Exposure: Var.

Sample Date: 8 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
SHRUBS										
Chrysothamnus nauseosus	0.00	5.00	0.00	0.00	0.00	20.00	0.00	0.00	5.00	0.00
FORBS										
Salsola iberica	20.00	0.00	25.00	40.00	20.00	0.00	25.00	0.00	5.00	35.00
Melilotus officinalis	0.00	0.00	0.00	10.00	0.00	0.00	0.00	10.00	0.00	0.00
Medicago sativa	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Machaeranthera grindelioi	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00	0.00
RASSES										
Agropyron intermedium	10.00	15.00	20.00	0.00	5.00	0.00	25.00	15.00	0.00	0.00
Agropyron dasystachyum	0.00	0.00	5.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00
Oryzopsis hymenoides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	5.00
COVER										
Total Living Cover	35.00	25.00	50.00	50.00	30.00	30.00	50.00	25.00	35.00	40.00
Litter	15.00	5.00	5.00	5.00	1.00	5.00	10.00	5.00	5.00	5.00
Bareground	15.00	25.00	15.00	25.00	9.00	45.00	25.00	25.00	25.00	5.00
Rock	35.00	45.00	30.00	20.00	60.00	20.00	15.00	45.00	35.00	50.00
% COMPOSITION										
Shrubs	0.00	20.00	0.00	0.00	0.00	66.67	0.00	0.00	14.29	0.00
Forbs	71.43	20.00	50.00	100.00	66.67	16.67	50.00	40.00	28.57	87.50
Grasses	28.57	60.00	50.00	0.00	33.33	16.67	50.00	60.00	57.14	12.50

SUNNYSIDE
Borrow Area Sed. Pond
Slope: Var.
Exposure: Var.
Sample Date: 8 Sept 92

11.00	12.00	13.00	14.00	15.00	Mean	SDev	Freq	
								SHRUBS
0.00	0.00	20.00	0.00	10.00	4.00	6.88		Chrysothamnus nauseosus
								FORBS
5.00	5.00	0.00	5.00	0.00	12.33	13.40		Salsola iberica
0.00	0.00	0.00	0.00	0.00	1.33	3.40		Melilotus officinalis
0.00	0.00	0.00	0.00	0.00	0.67	1.70		Medicago sativa
0.00	0.00	0.00	0.00	0.00	0.67	1.70		Machaeranthera grindelioides
								GRASSES
5.00	0.00	10.00	35.00	25.00	11.00	10.83		Agropyron intermedium
0.00	5.00	0.00	0.00	0.00	1.33	2.21		Agropyron dasystachyum
0.00	5.00	0.00	10.00	0.00	2.67	5.44		Oryzopsis hymenoides
								COVER
10.00	15.00	30.00	50.00	35.00	34.00	12.14		Total Living Cover
1.00	1.00	5.00	10.00	5.00	5.53	3.59		Litter
65.00	65.00	5.00	35.00	55.00	29.27	19.29		Bareground
24.00	19.00	60.00	5.00	5.00	31.20	17.34		Rock
								% COMPOSITION
0.00	0.00	66.67	0.00	28.57	13.08	22.72		Shrubs
50.00	33.33	0.00	10.00	0.00	41.61	29.48		Forbs
50.00	66.67	33.33	90.00	71.43	45.31	23.51		Grasses

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Coarse Refuse (of New Haul Road) Topsoil Pile

DATE: 8 Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: Variable

EXPOSURE: Variable

ANIMAL USE/DISTURBANCE: Moderate

EROSION: negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES:

1) The were very few weedy species.

2) There was a question from the map as to whether or not we were on the correct pile.

3) Sampled randomly over entire pile.

SUNNYSIDE
Coarse Refuse (New Haul Road)
Topsoil Pile
Slope: Var.
Exposure: Var.

Sample Date: 8 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	Mean	SDev	Freq
SHRUBS											
Chrysothamnus nauseosus	0.00	25.00	25.00	20.00	10.00	10.00	10.00	10.00	13.75	8.20	
FORBS											
Penstemon sp.	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.63	1.65	
Salsola iberica	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.63	1.65	
Machaeranthera grindelioi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.63	1.65	
GRASSES											
Oryzopsis hymenoides	60.00	15.00	20.00	20.00	40.00	45.00	15.00	25.00	30.00	15.41	
Bromus tectorum	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.63	1.65	
COVER											
Total Living Cover	60.00	40.00	50.00	45.00	50.00	55.00	30.00	40.00	46.25	8.93	
Litter	10.00	5.00	5.00	5.00	5.00	10.00	5.00	5.00	6.25	2.17	
Bareground	10.00	5.00	5.00	10.00	10.00	5.00	5.00	10.00	7.50	2.50	
Rock	20.00	50.00	40.00	40.00	35.00	30.00	60.00	45.00	40.00	11.46	
% COMPOSITION											
Shrubs	0.00	62.50	50.00	44.44	20.00	18.18	33.33	25.00	31.68	18.77	
Forbs	0.00	0.00	10.00	11.11	0.00	0.00	0.00	12.50	4.20	5.46	
Grasses	100.00	37.50	40.00	44.44	80.00	81.82	66.67	62.50	64.12	21.03	

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Haul Road (or Pasture) Sediment Pond

DATE: 8 Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: variable

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: slight

EROSION: negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES: 1) Sampled top and inner side of the pond.

SUNNYSIDE
Haul Road (Pasture)
Sediment Pond
Slope: Var.
Exposure: Var.

Sample Date: 8 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	Mean	SDev	Freq
SHRUBS										
Chrysothamnus nauseosus	35.00	0.00	25.00	50.00	25.00	30.00	30.00	27.86	13.85	
FORBS										
Eriogonum sp.	5.00	0.00	10.00	0.00	0.00	0.00	0.00	2.14	3.64	
Sisymbrium altissimum	0.00	25.00	0.00	0.00	0.00	0.00	0.00	3.57	8.75	
Salsola iberica	0.00	15.00	0.00	0.00	0.00	35.00	0.00	7.14	12.49	
Medicago sativa	0.00	0.00	5.00	0.00	0.00	0.00	0.00			
GRASSES										
Bromus tectorum	30.00	0.00	0.00	0.00	0.00	0.00	0.00	4.29	10.50	
Oryzopsis hymenoides	0.00	0.00	0.00	0.00	15.00	0.00	30.00	6.43	10.93	
								ERR	ERR	
COVER										
Total Living Cover	70.00	40.00	40.00	50.00	40.00	65.00	60.00	52.14	11.91	
Litter	5.00	5.00	2.00	10.00	10.00	15.00	15.00	8.86	4.70	
Bareground	5.00	5.00	8.00	30.00	10.00	10.00	10.00	11.14	7.97	
Rock	20.00	50.00	50.00	10.00	40.00	10.00	15.00	27.86	16.87	
% COMPOSITION										
Shrubs	50.00	0.00	62.50	100.00	62.50	46.15	50.00	53.02	27.42	
Forbs	7.14	100.00	37.50	0.00	0.00	53.85	0.00	28.36	35.31	
Grasses	42.86	0.00	0.00	0.00	37.50	0.00	50.00	18.62	21.76	

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Sacco Flats Topsoil Pile

DATE: 8 Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: variable

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: Moderate

EROSION: negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES: 1) Very "spotty" vegetation patterns

SUNNYSIDE
Sacco Flats Topsoil
Stockpile
Slope: Var.
Exposure: Var.

Sample Date: 8 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	Mean	SDev	Freq
SHRUBS										
Chrysothamnus nauseosus	0.00	5.00	0.00	0.00	0.00	20.00	0.00	3.57	6.93	
FORBS										
Clematis sp.	10.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	3.50	
Salsola iberica	20.00	0.00	5.00	0.00	30.00	5.00	5.00	9.29	10.50	
Sphaeralcea grossulariaef	0.00	20.00	0.00	0.00	0.00	5.00	5.00	4.29	6.78	
Sisymbrium altissimum	0.00	0.00	0.00	0.00	40.00	5.00	0.00	6.43	13.81	
GRASSES										
Agropryon intermedium	40.00	0.00	0.00	0.00	0.00	35.00	0.00	10.71	16.99	
Agropyron dasystachyum	0.00	5.00	35.00	0.00	0.00	0.00	0.00	5.71	12.08	
Poa secunda	0.00	0.00	0.00	60.00	0.00	0.00	0.00	8.57	21.00	
COVER										
Total Living Cover	70.00	30.00	40.00	60.00	70.00	70.00	10.00	50.00	22.04	
Litter	10.00	5.00	5.00	5.00	5.00	5.00	5.00	5.71	1.75	
Bareground	15.00	30.00	20.00	30.00	5.00	20.00	45.00	23.57	11.87	
Rock	5.00	35.00	35.00	5.00	20.00	5.00	40.00	20.71	14.74	
% COMPOSITION										
Shrubs	0.00	16.67	0.00	0.00	0.00	28.57	0.00	6.46	10.70	
Forbs	42.86	66.67	12.50	0.00	100.00	21.43	100.00	49.06	37.88	
Grasses	57.14	16.67	87.50	100.00	0.00	50.00	0.00	44.47	37.52	

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Surface Facility Spoil Pile (S.F.S.P.)

DATE: Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: Mostly Flat

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: Moderate rabbit

EROSION: negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES: 1) "Spotty" growth patterns of both desirable species and weeds.

SUNNYSIDE
Surface Facility Spoil Pile
Slope: Var.
Exposure: Var.

Sample Date: 8 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
SHRUBS										
Artemisia tridentata	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrythamnus nauseosus	0.00	0.00	25.00	0.00	5.00	15.00	0.00	0.00	25.00	30.00
FORBS										
Salsola iberica	5.00	55.00	0.00	0.00	20.00	0.00	5.00	0.00	5.00	0.00
Astragalus sp.	5.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
Kochia scoparia	5.00	5.00	0.00	0.00	10.00	20.00	5.00	0.00	0.00	5.00
Melilotus officinalis	0.00	0.00	20.00	40.00	10.00	0.00	0.00	5.00	15.00	0.00
GRASSES										
Agropyron cristatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00
Oryzopsis hymenoides	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
COVER										
Total Living Cover	45.00	60.00	50.00	40.00	45.00	35.00	15.00	30.00	50.00	35.00
Litter	5.00	5.00	5.00	5.00	10.00	5.00	5.00	5.00	10.00	7.00
Bareground	5.00	10.00	5.00	50.00	25.00	5.00	20.00	20.00	5.00	13.00
Rock	45.00	25.00	40.00	5.00	20.00	55.00	60.00	45.00	35.00	45.00
% COMPOSITION										
Shrubs	0.00	0.00	60.00	0.00	11.11	42.86	0.00	0.00	50.00	85.71
Forbs	33.33	100.00	40.00	100.00	88.89	57.14	100.00	16.67	40.00	14.29
Grasses	66.67	0.00	0.00	0.00	0.00	0.00	0.00	83.33	10.00	0.00

SUNNYSIDE
Surface Facility Spoil Pile
Slope: Var.
Exposure: Var.
Sample Date: 8 Sept 92

Mean	SDev	Freq	
			SHRUBS
0.50	1.50		Artemisia tridentata
10.00	11.83		Chrythamnus nauseosus
			FORBS
9.00	16.40		Salsola iberica
1.00	2.00		Astragalus sp.
5.00	5.92		Kochia scoparia
9.00	12.41		Melilotus officinalis
			GRASSES
2.50	7.50		Agropyron cristatum
3.50	8.96		Oryzopsis hymenoides
			COVER
40.50	11.93		Total Living Cover
6.20	1.99		Litter
15.80	13.41		Bareground
37.50	15.85		Rock
			% COMPOSITION
24.97	30.29		Shrubs
59.03	33.33		Forbs
16.00	29.88		Grasses

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Surface Facility Sediment Pond (S.F.S.P.)

DATE: Sept. 1992

WORKERS: P. Collins, D. Collins

SLOPE: variable

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: Slight

EROSION: negligible in most areas, but NE end had moderate erosion in the corner of pond.

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES: 1) Sampled randomly.

SUNNYSIDE
SFSP Pond
(Surface Facility Sediment Pond)
Slope: Var.
Exposure: Var.

Sample Date: 8 Sept 92	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
SHRUBS										
Chrysothamnus nauseosus	5.00	25.00	0.00	55.00	0.00	20.00	25.00	20.00	10.00	5.00
FORBS										
Kochia scoparia	5.00	40.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
Salsola iberica	20.00	5.00	15.00	0.00	15.00	20.00	10.00	20.00	5.00	0.00
Aster foliaceus	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
Medicago sativa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
GRASSES										
Agropyron cristatum	15.00	0.00	15.00	0.00	15.00	0.00	0.00	0.00	0.00	15.00
Agropyron trachycaulum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	5.00
COVER										
Total Living Cover	45.00	70.00	30.00	65.00	35.00	40.00	35.00	40.00	30.00	35.00
Litter	10.00	15.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Bareground	5.00	5.00	20.00	5.00	5.00	5.00	55.00	5.00	35.00	5.00
Rock	40.00	10.00	45.00	25.00	55.00	50.00	5.00	50.00	30.00	55.00
% COMPOSITION										
Shrubs	11.11	35.71	0.00	84.62	0.00	50.00	71.43	50.00	33.33	14.29
Forbs	55.56	64.29	50.00	15.38	57.14	50.00	28.57	50.00	16.67	28.57
Grasses	33.33	0.00	50.00	0.00	42.86	0.00	0.00	0.00	50.00	57.14

SUNNYSIDE
SFSP Pond

Slope: Var.
Exposure: Var.
Sample Date: 8 Sept 92

Mean	SDev	Freq	
			SHRUBS
16.50	15.82		Chrysothamnus nauseosus
			FORBS
5.00	11.83		Kochia scoparia
11.00	7.68		Salsola iberica
1.00	3.00		Aster foliaceus
1.00	3.00		Medicago sativa
			GRASSES
6.00	7.35		Agropyron cristatum
2.00	4.58		Agropyron trachycaulum
			COVER
42.50	13.28		Total Living Cover
6.50	3.20		Litter
14.50	16.50		Bareground
36.50	17.33		Rock
			% COMPOSITION
35.05	27.73		Shrubs
41.62	16.77		Forbs
23.33	24.02		Grasses

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Whitmore Test Plot

DATE: 2 August 1992

WORKERS: P. Collins, D. Collins

SLOPE: Flat

EXPOSURE:

ANIMAL USE/DISTURBANCE: Fenced

EROSION: negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES:

1) For treatments, see quantitative data.

2) For more detail of each plot treatments, see 1982 report.

3) Placed one meter square quadrat in the center of each subplot for a total of six (n=6) for each treatment.

4) For woody species density, we counted the individuals of the entire plot (3.5 ft. by 10.0 ft.)

5) See 1992 study for plot designs.

SUNNYSIDE COAL MINE
QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Whitmore Test Plot

DATE: 2 August 1992

WORKERS: P. Collins, D. Collins

SLOPE: Flat

ANIMAL USE/DISTURBANCE: Fenced

EROSION: negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

DENSITY:

	NO./ACRE
o Coarse Refuse (24")	833.86
o Slurry (24")	1244.57
o Topsoil (2") over Coarse Refuse (22")	7260.00
o Topsoil (2") over Slurry (22")	622.24
o Topsoil (6") over Coarse Refuse (18")	1659.43
o Topsoil (6") over Slurry (18")	622.29
o Mancos Shale (24")	2074.29
o Topsoil (24")	829.71

NOTES:
1) For treatments, see quantitative data.
2) For more detail of each plot treatments, see 1982 report.
3) Placed one meter square quadrat in the center of each subplot for a total of six (n=6) for each treatment.
4) For woody species density, we counted the individuals of the entire plot (3.5 ft. by 10.0 ft.)
5) See 1982 study for plot designs.
6) For more details about plot design and results, refer to subsequent pages.

THE WHITMORE REVEGETATION TEST PLOTS

Plot Size

The research site was selected in a valley bottom adjacent to Trail Creek. A 40 ft. by 42 ft. area was excavated in 1980 by a front end loader to a 2 ft. depth. Forty-eight (48) smaller plots (3.5 ft. by 10 ft.) were divided within the large test plot. The following treatments were implemented to compare revegetation potential for different growing medium.

Plot Treatments

- Coarse Refuse (24")
- Slurry (24")
- Topsoil (2") over Coarse Refuse (22")
- Topsoil (2") over Slurry (22")
- Topsoil (6") over Coarse Refuse (18")
- Topsoil (6") over Slurry (18")
- Mancos Shale (24")
- Topsoil (24")

Each of these treatments were replicated in six (6) of the smaller plots (3.5 ft. by 10 ft.).

Methods

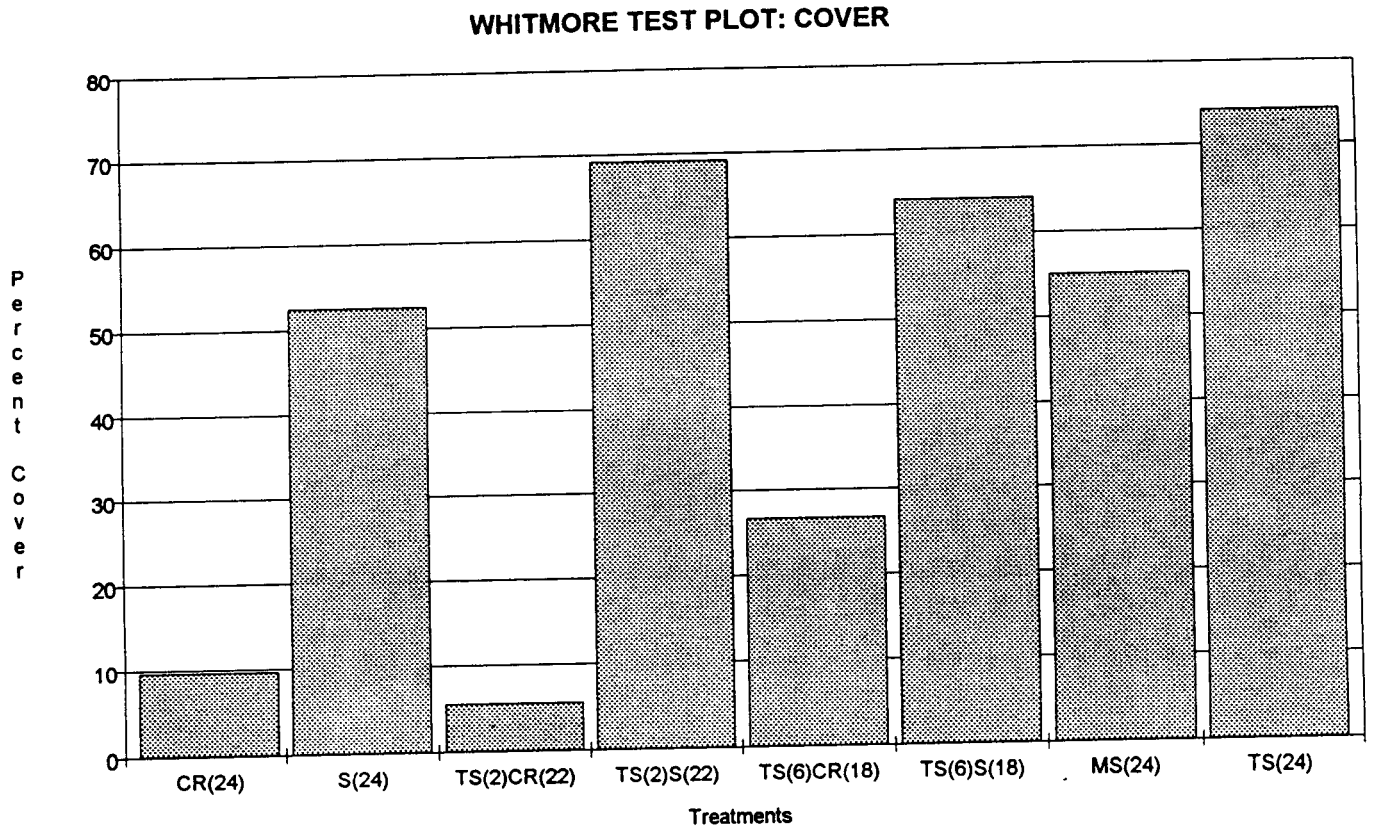
General sampling methods were discussed on the Qualitative/Quantitative data sheets on the previous pages.

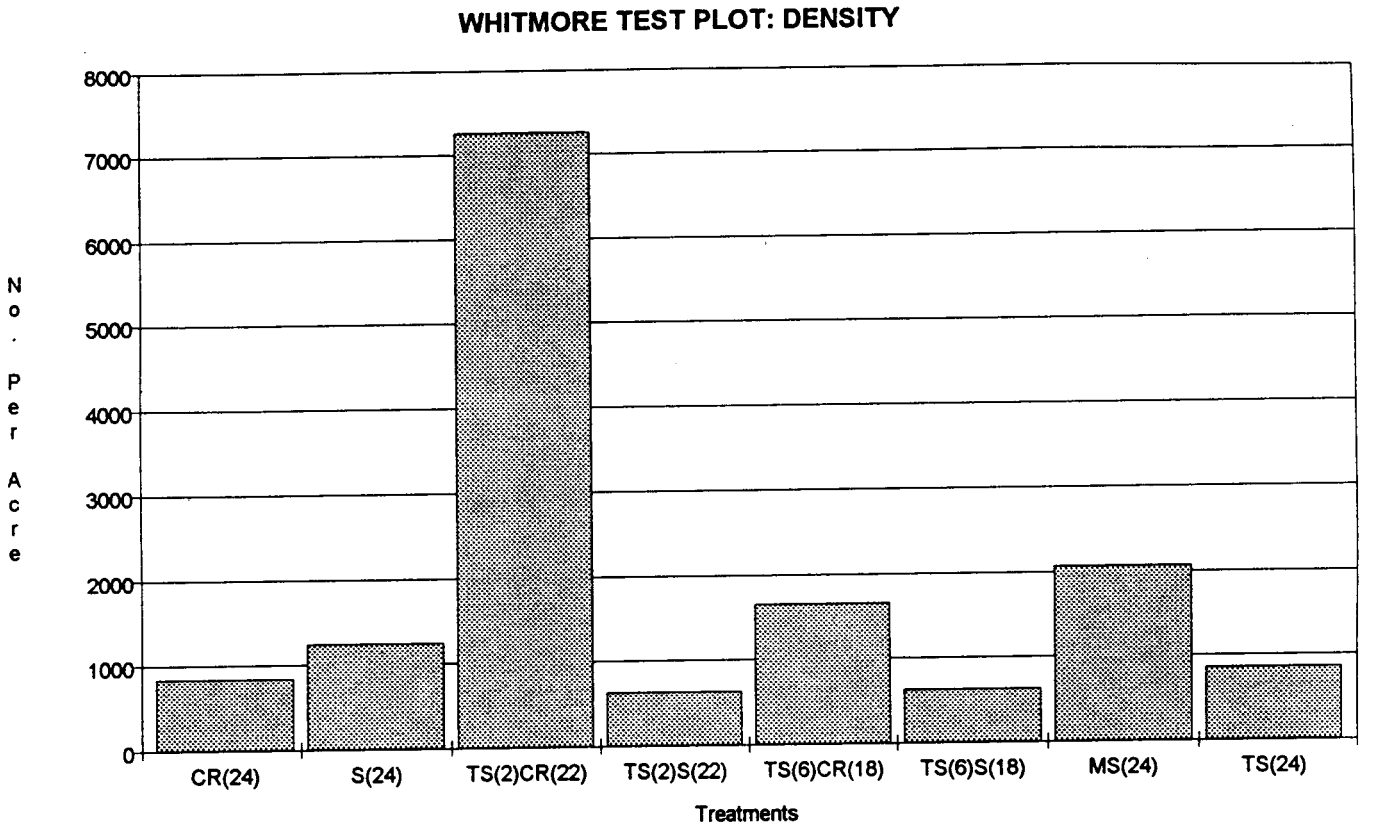
Results

Results are illustrated by the following graphs for cover and woody species density.

Discussion

No obvious trends seem to be evident. Most plots had good species diversity and the cover was represented by mostly "desirable" species (see raw data included). It does appear that there may be some competition for resources between the herbaceous and woody species. For example, when woody species density was high, cover was low and vice versa.


WHITMORE TEST PLOT: COVER
Percent Cover
80
70
60
50
40
30
20
10
0
CR(24)
S(24)
TS(2)CR(22)
TS(2)S(22)
TS(6)CR(18)
TS(6)S(18)
MS(24)
TS(24)
Treatments


WHITMORE TEST PLOT: DENSITY
No. Per Acre
8000
7000
6000
5000
4000
3000
2000
1000
0
CR(24)
S(24)
TS(2)CR(22)
TS(2)S(22)
TS(6)CR(18)
TS(6)S(18)
MS(24)
TS(24)
Treatments

SUNNYSIDE
Whitmore Plot
Slope & Exp: 0
Coarse Refuse

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	Mean	SDev	Freq
SHRUBS									
Chrysothamnus nauseosus	7.00	1.00	0.00	4.00	10.00	0.00	3.67	3.77	
FORBS									
Melilotus officialis	0.00	0.00	15.00	1.00	2.00	2.00	3.33	5.28	
Artemisia ludoviciana	0.00	0.00	0.00	0.00	8.00	8.00	2.67	3.77	
GRASSES									
COVER									
Total Living Cover	7.00	1.00	15.00	5.00	20.00	10.00	9.67	6.32	
Litter	3.00	1.00	5.00	1.00	5.00	10.00	4.17	3.08	
Bareground	1.00	2.00	5.00	2.00	5.00	5.00	3.33	1.70	
Rock	89.00	96.00	75.00	92.00	70.00	75.00	82.83	9.86	
% COMPOSITION									
Shrubs	100.00	100.00	0.00	80.00	50.00	0.00	55.00	42.33	
Forbs	0.00	0.00	100.00	20.00	50.00	100.00	45.00	42.33	
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

SUNNYSIDE
Whitmore Plot
Slope & Exp: 0
Slurry

Sample Date: 2 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	Mean	SDev	Freq
SHRUBS									
Chrysothamus nauseosus	21.00	70.00	35.00	0.00	5.00	0.00	21.83	24.94	
FORBS									
Melilotus officinalis	2.00	0.00	5.00	5.00	10.00	5.00	4.50	3.10	
Eriogonum sp.	1.00	0.00	5.00	5.00	0.00	5.00	2.67	2.36	
Erigeron sp.	1.00	0.00	0.00	0.00	0.00	0.00	0.17	0.37	
GRASSES									
Agropyron cristatum	25.00	20.00	30.00	15.00	25.00	25.00	23.33	4.71	
COVER									
Total Living Cover	50.00	90.00	75.00	25.00	40.00	35.00	52.50	22.87	
Litter	5.00	5.00	10.00	10.00	10.00	10.00	8.33	2.36	
Bareground	40.00	4.00	14.00	45.00	45.00	50.00	33.00	17.45	
Rock	5.00	1.00	1.00	20.00	5.00	5.00	6.17	6.44	
% COMPOSITION									
Shrubs	42.00	77.78	46.67	0.00	12.50	0.00	29.82	28.32	
Forbs	8.00	0.00	13.33	40.00	25.00	28.57	19.15	13.43	
Grasses	50.00	22.22	40.00	60.00	62.50	71.43	51.03	16.23	

SUNNYSIDE
Whitmore Plot
Slope & Exp: 0
2" Top 22" Refuse

Sample Date: 2 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	Mean	SDev	Freq
SHRUBS									
Chrysothamnus nauseosus	5.00	0.00	2.00	4.00	3.00	2.00	2.67	1.60	
FORBS									
Lactuca pulchella	0.00	0.00	2.00	0.00	0.00	0.00	0.33	0.75	
Melilotus officinalis	0.00	0.00	1.00	0.00	0.00	0.00	0.17	0.37	
Erigeron sp.	0.00	0.00	1.00	0.00	0.00	0.00	0.17	0.37	
GRASSES									
Agropyron cristatum	0.00	6.00	1.00	5.00	1.00	0.00	2.17	2.41	
COVER									
Total Living Cover	5.00	6.00	7.00	9.00	4.00	2.00	5.50	2.22	
Litter	1.00	2.00	3.00	1.00	1.00	4.00	2.00	1.15	
Bareground	90.00	80.00	70.00	80.00	85.00	80.00	80.83	6.07	
Rock	4.00	12.00	20.00	10.00	10.00	14.00	11.67	4.82	
% COMPOSITION									
Shrubs	100.00	0.00	28.57	44.44	75.00	100.00	58.00	37.04	
Forbs	0.00	0.00	57.14	0.00	0.00	0.00	9.52	21.30	
Grasses	0.00	100.00	14.29	55.56	25.00	0.00	32.47	35.56	

SUNNYSIDE
Whitmore Plot
Slope & Exp: 0
2" Top 22" Slurry

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	Mean	SDev	Freq
SHRUBS									
Chrysothamnus nauseosus	30.00	85.00	85.00	5.00	0.00	0.00	34.17	37.35	
FORBS									
Melilotus officinalis	10.00	0.00	0.00	20.00	25.00	15.00	11.67	9.43	
GRASSES									
Agropyron cristatum	35.00	10.00	10.00	10.00	10.00	20.00	15.83	9.32	
Elymus salinus	0.00	0.00	0.00	0.00	35.00	10.00	7.50	12.83	
COVER									
Total Living Cover	75.00	95.00	95.00	35.00	70.00	45.00	69.17	22.81	
Litter	5.00	1.00	3.00	10.00	5.00	5.00	4.83	2.73	
Bareground	15.00	3.00	1.00	50.00	23.00	45.00	22.83	18.98	
Rock	5.00	1.00	1.00	5.00	2.00	5.00	3.17	1.86	
% COMPOSITION									
Shrubs	40.00	89.47	89.47	14.29	0.00	0.00	38.87	38.19	
Forbs	13.33	0.00	0.00	57.14	35.71	33.33	23.25	20.76	
Grasses	46.67	10.53	10.53	28.57	64.29	66.67	37.87	23.04	

SUNNYSIDE
Whitmore Plot
Slope & Exp: 0
6" Top 18" Refuse

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	Mean	SDev	Freq
SHRUBS									
Chrysothamus nauseosus	5.00	0.00	0.00	45.00	20.00	0.00	11.67	16.50	
Artemisia tridentata	2.00	0.00	0.00	2.00	0.00	0.00	0.67	0.94	
FORBS									
Artemisia ludioviciana	0.00	0.00	0.00	0.00	5.00	0.00	0.83	1.86	
Melilotus officinalis	8.00	0.00	0.00	0.00	5.00	2.00	2.50	3.04	
GRASSES									
Agropyron cristatum	0.00	5.00	20.00	8.00	10.00	8.00	8.50	6.05	
Elymus salinus	0.00	10.00	0.00	0.00	0.00	0.00	1.67	3.73	
Oryzopsis hymenoides	0.00	5.00	0.00	0.00	0.00	0.00	0.83	1.86	
COVER									
Total Living Cover	15.00	20.00	20.00	55.00	40.00	10.00	26.67	15.72	
Litter	5.00	5.00	5.00	5.00	10.00	5.00	5.83	1.86	
Bareground	55.00	70.00	65.00	30.00	40.00	75.00	55.83	16.18	
Rock	25.00	5.00	10.00	10.00	10.00	10.00	11.67	6.24	
% COMPOSITION									
Shrubs	46.67	0.00	0.00	85.45	50.00	0.00	30.35	32.79	
Forbs	53.33	0.00	0.00	0.00	25.00	20.00	16.39	19.40	
Grasses	0.00	100.00	100.00	14.55	25.00	80.00	53.26	41.27	

SUNNYSIDE
Whitmore Plot
Slope & Exp: 0
6" Top 18" slurry

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	Mean	SDev	Freq
SHRUBS									
Chrysothamnus nauseosus	35.00	95.00	30.00	0.00	0.00	0.00	26.67	33.87	
FORBS									
Melilotus officinalis	10.00	0.00	0.00	10.00	15.00	20.00	9.17	7.31	
Eriogonum sp.	0.00	0.00	0.00	0.00	0.00	5.00	0.83	1.86	
GRASSES									
Agropyron cristatum	35.00	0.00	35.00	20.00	15.00	10.00	19.17	12.72	
Elymus salinus	0.00	0.00	0.00	0.00	35.00	5.00	6.67	12.80	
Agropyron riparium	0.00	0.00	5.00	5.00	0.00	0.00	1.67	2.36	
COVER									
Total Living Cover	80.00	95.00	70.00	35.00	65.00	40.00	64.17	21.10	
Litter	5.00	3.00	5.00	5.00	5.00	10.00	5.50	2.14	
Bareground	14.00	1.00	20.00	55.00	25.00	45.00	26.67	18.28	
Rock	1.00	1.00	5.00	5.00	5.00	5.00	3.67	1.89	
% COMPOSITION									
Shrubs	43.75	100.00	42.86	0.00	0.00	0.00	31.10	36.39	
Forbs	12.50	0.00	0.00	28.57	23.08	62.50	21.11	21.36	
Grasses	43.75	0.00	57.14	71.43	76.92	37.50	47.79	25.50	

SUNNYSIDE
Whitmore Plot
Slope & Exp: 0
Mancos Shale

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	Mean	SDev	Freq
SHRUBS									
Chrysothamnus nauseosus	0.00	0.00	33.00	30.00	15.00	0.00	13.00	14.14	
FORBS									
Melilotus officinalis	20.00	0.00	2.00	10.00	15.00	0.00	7.83	7.75	
GRASSES									
Agropyron cristatum	0.00	0.00	0.00	10.00	30.00	30.00	11.67	13.44	
Elymus salinus	10.00	80.00	0.00	0.00	0.00	10.00	16.67	28.67	
Agropyron riparium	15.00	0.00	0.00	15.00	0.00	5.00	5.83	6.72	
COVER									
Total Living Cover	45.00	80.00	35.00	65.00	60.00	45.00	55.00	15.00	
Litter	5.00	5.00	5.00	5.00	5.00	25.00	8.33	7.45	
Bareground	45.00	10.00	50.00	25.00	30.00	25.00	30.83	13.36	
Rock	5.00	5.00	10.00	5.00	5.00	5.00	5.83	1.86	
% COMPOSITION									
Shrubs	0.00	0.00	94.29	46.15	25.00	0.00	27.57	34.36	
Forbs	44.44	0.00	5.71	15.38	25.00	0.00	15.09	15.83	
Grasses	55.56	100.00	0.00	38.46	50.00	100.00	57.34	34.98	

SUNNYSIDE
Whitmore Plot
Slope & Exp: 0
24" Topsoil

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	Mean	SDev	Freq
SHRUBS									
Chrysothamnus nauseosus	50.00	75.00	35.00	10.00	0.00	0.00	28.33	27.79	
FORBS									
Melilotus officinalis	0.00	0.00	0.00	2.00	0.00	0.00	0.33	0.75	
Sphaeralcea coccinea	0.00	0.00	0.00	5.00	0.00	0.00	0.83	1.86	
GRASSES									
Agropyron cristatum	25.00	20.00	10.00	25.00	10.00	5.00	15.83	7.86	
Elymus salinus	0.00	0.00	0.00	0.00	70.00	0.00	11.67	26.09	
Agropyron riparium	0.00	0.00	30.00	23.00	0.00	50.00	17.17	18.98	
COVER									
Total Living Cover	75.00	95.00	75.00	65.00	80.00	55.00	74.17	12.39	
Litter	5.00	3.00	5.00	10.00	5.00	5.00	5.50	2.14	
Bareground	15.00	1.00	19.00	20.00	14.00	39.00	18.00	11.25	
Rock	5.00	1.00	1.00	5.00	1.00	1.00	2.33	1.89	
% COMPOSITION									
Shrubs	66.67	78.95	46.67	15.38	0.00	0.00	34.61	31.37	
Forbs	0.00	0.00	0.00	10.77	0.00	0.00	1.79	4.01	
Grasses	33.33	21.05	53.33	73.85	100.00	100.00	63.59	30.51	

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Slaughter Canyon

DATE: 22 August 1992

WORKERS: P. Collins, D. Collins

SLOPE: 0-10 deg.

EXPOSURE: variable

ANIMAL USE/DISTURBANCE: moderate

EROSION: negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES:

1) The is a reclaimed road.

2) The road was approximately 3600 ft. long.

3) For cover and frequency, we sampled at regular interval every 60 ft. with a meter square quadrat.

4) For density we placed 5 ft. by 50 ft. belt transects at regular intervals every 100 ft for the entire length of the road.

SUNNYSIDE MINE
Slaughter Canyon
Exposure: var.
Slope: var.

Sample Date: 22 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
TREES & SHRUBS										
Atriplex canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Artemisia tridentata	0.00	0.00	5.00	0.00	45.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutierrizia sarothrae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS										
Melilotus officinalis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Medicago sativa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Penstemon palmeri	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES										
Agropyron spicatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
Agropyron cristatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00	10.00
Agropyron intermedium	55.00	35.00	35.00	35.00	5.00	20.00	30.00	5.00	30.00	40.00
Elymus cinereus	0.00	0.00	0.00	0.00	5.00	0.00	15.00	15.00	0.00	0.00
Orzopsis hymenoides	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
Poa pratensis	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
Elymus salinus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bromus tectorum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bromus carinatus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER										
Total Living Cover	55.00	35.00	40.00	35.00	55.00	40.00	45.00	30.00	40.00	60.00
Litter	5.00	5.00	10.00	45.00	5.00	10.00	10.00	10.00	5.00	10.00
Bareground	15.00	30.00	45.00	10.00	5.00	15.00	25.00	25.00	35.00	5.00
Rock	25.00	30.00	5.00	10.00	35.00	35.00	20.00	35.00	20.00	25.00
% COMPOSITION										
Shrubs	0.00	0.00	12.50	0.00	81.82	0.00	0.00	0.00	0.00	0.00
Forbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grasses	100.00	100.00	87.50	100.00	18.18	100.00	100.00	100.00	100.00	100.00

11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	55.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00
0.00	0.00	15.00	0.00	10.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00
30.00	15.00	30.00	40.00	30.00	60.00	25.00	20.00	10.00	5.00	20.00	45.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30.00	35.00	45.00	45.00	40.00	60.00	25.00	60.00	25.00	70.00	40.00	50.00
30.00	10.00	10.00	20.00	20.00	10.00	30.00	15.00	10.00	10.00	50.00	25.00
15.00	25.00	20.00	15.00	5.00	15.00	30.00	10.00	25.00	5.00	5.00	10.00
25.00	30.00	25.00	20.00	35.00	15.00	15.00	15.00	40.00	15.00	5.00	15.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.67	20.00	78.57	0.00	10.00
0.00	14.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.50	0.00
100.00	85.71	100.00	100.00	100.00	100.00	100.00	58.33	80.00	21.43	82.50	90.00

23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.00	31.00	32.00	33.00	34.00
0.00	0.00	0.00	0.00	0.00	20.00	15.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45.00	0.00	0.00	0.00	0.00	10.00	5.00	0.00	0.00	0.00	10.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	10.00	5.00	0.00	0.00	0.00	0.00
5.00	35.00	25.00	0.00	10.00	20.00	10.00	20.00	35.00	20.00	30.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	10.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60.00	35.00	40.00	20.00	35.00	50.00	40.00	35.00	40.00	20.00	45.00	50.00
15.00	10.00	30.00	10.00	10.00	25.00	15.00	10.00	25.00	50.00	10.00	10.00
5.00	35.00	5.00	25.00	50.00	15.00	20.00	25.00	20.00	20.00	5.00	39.00
20.00	20.00	25.00	45.00	5.00	10.00	25.00	30.00	15.00	10.00	40.00	1.00
0.00	0.00	0.00	0.00	0.00	40.00	37.50	0.00	0.00	0.00	11.11	40.00
0.00	0.00	25.00	0.00	14.29	0.00	0.00	14.29	12.50	0.00	0.00	0.00
100.00	100.00	75.00	100.00	85.71	60.00	62.50	85.71	87.50	100.00	88.89	60.00

35.00	36.00	37.00	38.00	39.00	40.00	41.00	42.00	43.00	44.00	45.00	46.00
0.00	0.00	0.00	0.00	0.00	50.00	0.00	15.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00
0.00	0.00	0.00	0.00	0.00	20.00	10.00	0.00	0.00	0.00	0.00	0.00
15.00	25.00	20.00	45.00	40.00	0.00	5.00	10.00	50.00	20.00	50.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	10.00	0.00	0.00	10.00	5.00	0.00	5.00	15.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
25.00	30.00	20.00	55.00	40.00	70.00	35.00	40.00	65.00	25.00	65.00	50.00
5.00	25.00	10.00	10.00	25.00	5.00	35.00	10.00	5.00	5.00	15.00	5.00
60.00	10.00	35.00	15.00	10.00	20.00	5.00	10.00	10.00	5.00	10.00	10.00
10.00	35.00	35.00	20.00	25.00	5.00	25.00	40.00	20.00	65.00	10.00	35.00
40.00	0.00	0.00	0.00	0.00	71.43	0.00	62.50	23.08	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
60.00	100.00	100.00	100.00	100.00	28.57	100.00	37.50	76.92	100.00	100.00	90.00

47.00	48.00	49.00	50.00	51.00	52.00	53.00	54.00	55.00	56.00	57.00	58.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	0.00	0.00	35.00	0.00	0.00	10.00	0.00	5.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	35.00	50.00	10.00	30.00	5.00	25.00	45.00	35.00	50.00	45.00	40.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00	5.00	0.00	0.00	0.00
50.00	35.00	65.00	50.00	45.00	25.00	50.00	45.00	45.00	50.00	45.00	40.00
15.00	5.00	25.00	20.00	5.00	25.00	25.00	25.00	25.00	25.00	25.00	5.00
20.00	40.00	5.00	5.00	25.00	25.00	5.00	5.00	5.00	5.00	25.00	50.00
15.00	20.00	5.00	25.00	25.00	25.00	20.00	25.00	25.00	20.00	5.00	5.00
20.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	11.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80.00	100.00	100.00	100.00	88.89	100.00	70.00	100.00	100.00	100.00	100.00	100.00

SUNNYSIDE MINE
Slaughter Canyon
Exposure: var.
Slope: var.
Sample Date: 22 Aug 1992

59.00	60.00	Mean	SDev	Freq	
					TREES & SHRUBS
0.00	0.00	2.08	7.87		Atriplex canescens
0.00	25.00	2.50	9.55		Artemisia tridentata
0.00	0.00	1.00	3.85		Chrysothamnus nauseosus
0.00	0.00	0.25	1.42		Gutierrizia sarothrae
					FORBS
0.00	5.00	0.53	1.86		Melilotus officinalis
0.00	0.00	0.33	1.25		Medicago sativa
0.00	10.00	0.17	1.28		Penstemon palmeri
					GRASSES
0.00	0.00	3.47	8.94		Agropyron spicatum
0.00	0.00	2.08	4.59		Agropyron cristatum
50.00	10.00	25.92	15.93		Agropyron intermedium
0.00	0.00	0.75	2.86		Elymus cinereus
0.00	0.00	0.83	2.61		Orzopsis hymenoides
0.00	0.00	0.50	2.18		Poa pratensis
0.00	0.00	2.08	5.02		Elymus salinus
0.00	0.00	0.08	0.64		Bromus tectorum
0.00	0.00	0.67	2.95		Bromus carinatus
					COVER
50.00	50.00	43.25	12.48		Total Living Cover
25.00	25.00	16.75	11.10		Litter
5.00	5.00	17.98	13.40		Bareground
20.00	20.00	22.02	11.84		Rock
					% COMPOSITION
0.00	50.00	11.17	21.39		Shrubs
0.00	30.00	2.48	6.39		Forbs
100.00	20.00	86.35	22.20		Grasses

SUNNYSIDE COAL MINE

QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Sacco Test Plot

DATE: 20 August 1992

WORKERS: P. Collins, D. Collins

SLOPE: 0 deg.

EXPOSURE: flat

ANIMAL USE/DISTURBANCE: severe

EROSION: negligible

COVER: (see quantitative data)

DENSITY: (see following page)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES:

1) Approximately 98% of the sagebrush density was seedlings that germinated this year.

2) However, approximately 90% of the rabbitbrush plants in the density measurements were mature plants.

3) The fence should be repaired.

4) Rabbits probably took most of the production, but ants seemed to have contributed a great deal.

5) The middle of the entire plot may get more moisture from runoff of ground water.

6) The drought may have contributed to the plot.

7) Gouging could have helped.

8) For cover and frequency, we used meter square quadrats, placed regularly them randomly at rt. angles (see raw field data for exact locations).

9) For density, we used 5' by 40' belt transects (see raw field data for designs).

10) More details about the plot design and results from sampling can be found on the following pages.

THE SACCO FLATS TEST PLOTS

Plot Size

The Sacco Test Plots were constructed in the Fall of 1985 on refuse material from past coal cleaning activities. The entire plot size was about 262 ft. by 305 ft. Within this large plot there were thirty-six (36) smaller plots. Each of the smaller plots were 20 ft. by 90 ft. in size. An as-built drawing of the plot was shown on plate D5-0113 of the Sunnyside Coal Mine.

Plot Treatments

Several treatments were applied on the refuse material to compare potential revegetation techniques. The treatments are listed below.

- Lime Application
- Topsoil Application (12")
- Coarse Refuse (168")
- Borrow Material (6")
- Borrow Material (12")
- Borrow Material (24")
- Borrow Material (48")

Each of these treatments were replicated in three of the smaller plots (20 ft. by 90 ft.).

Methods

General sampling methods were discussed on the Qualitative/Quantitative data sheets on the previous pages.

Results

Mean cover and woody species densities for the three replications of each treatment listed above were calculated. The mean values were then compared and plotted on the bar graphs included in this report.

Discussion

Cover

The bar graphs seem to illustrate some trends rather nicely. For total living cover, the lime treatments seem to have little or no affect. Interestingly, the more borrow material applied, the greater the living cover. Best results came from adding 48"

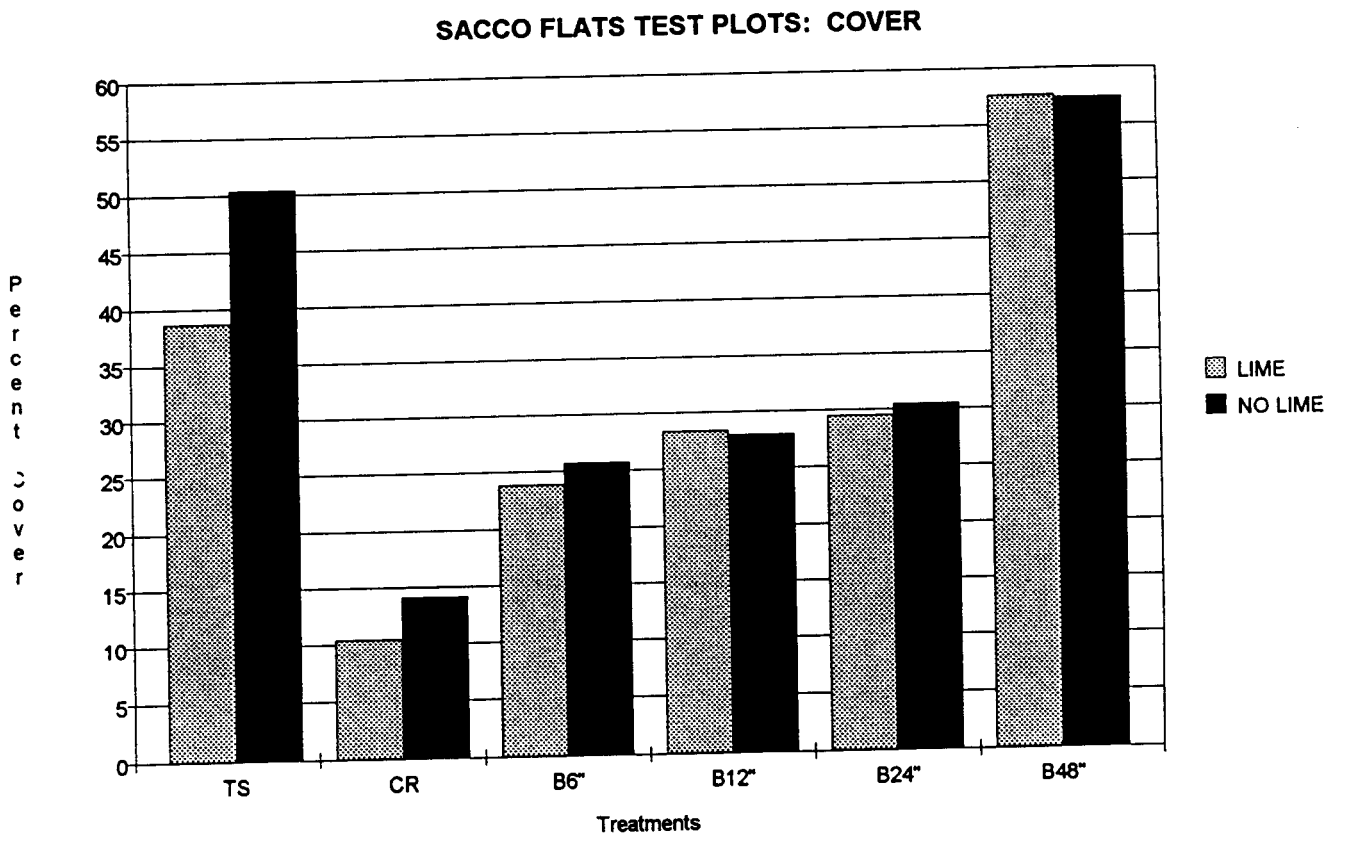
of borrow material *or* 12" of topsoil.

Density

Lime application treatments were inconclusive for woody species density. However, the graphs indicate similar results as reported for the cover -- the more borrow material added, the better the results. Topsoil application also resulted in greater woody species density.

Future Study

When one first observes the plot from a qualitative viewpoint, it appears as though there is nothing about the plot worth studying. Before the plot is "scraped" as a failure some questions should be entertained. Quantitative sampling resulted in some definite, possibly encouraging trends. However, the scope of this report precluded further investigations. For example, would the results be different if all weedy species were deleted from the data set? Have the past seven years of drought had an affect on the plot? Why were there so many woody species that germinated this Spring? Were moisture conditions in the Spring of 1992 finally favorable enough to encourage such germination? The fence around the plot was in disrepair. If the operator reseeded the plot and repaired the fence, would more desirable species result? Further study, sampling and/or data manipulations may produce some interesting results!



TREATMENTS

TS = Topsoil (12")

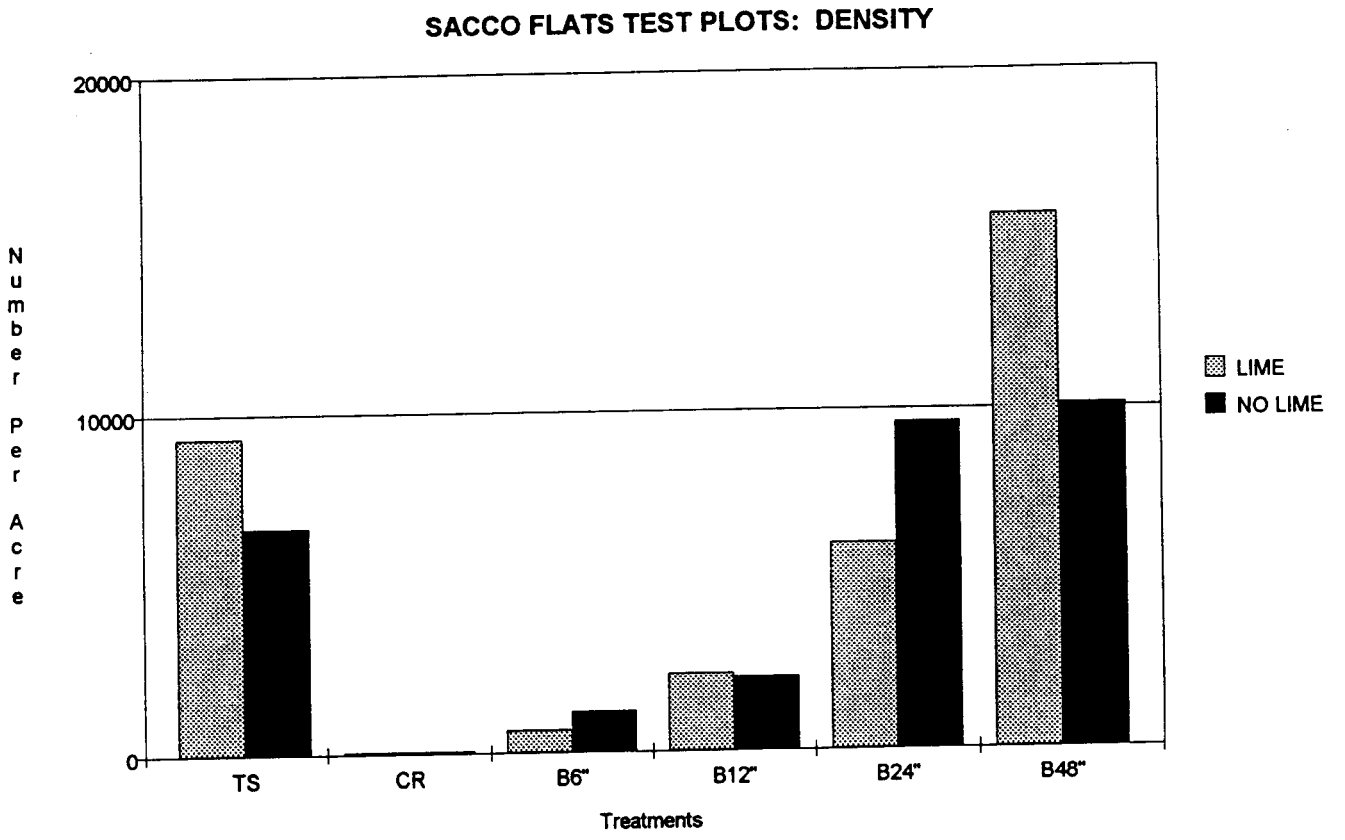
CR = Coarse Refuse (166")

B6" = Borrow Material (6")

B12" = Borrow Material (12")

B24" = Borrow Material (24")

B48" = Borrow Material (48")



TREATMENTS

TS = Topsoil (12")

CR = Coarse Refuse (166")

B6" = Borrow Material (6")

B12" = Borrow Material (12")

B24" = Borrow Material (24")

B48" = Borrow Material (48")

SACCO FLATS TEST PLOT
WOODY SPECIES DENSITY

PLOT NUMBERS	NO./ACRE
1	7,514.10
2	54.45
3	544.50
4	2,776.95
5	3,593.70
6	19,329.75
7	8,439.75
8	4,954.95
9	2,286.90
10	1,197.90
11	54.45
12	54.45
13	19,656.45
14	54.45
15	2,123.55
16	2,232.45
17	13,068.00
18	16,933.95
19	9,474.30
20	10,182.15
21	1,851.30
22	54.45
23	54,45
24	108.90
25	20,309.85
26	54.45
27	1,306.80
28	2,123.55
29	4,301.55
30	18,349.65
31	11,761.20
32	10,835.55
33	1,851.30
34	163.35
35	54.45
36	163.35

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #1

Sample Date: 20 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	3.00	1.00	2.00	0.00	0.00	5.00	2.00	5.00	5.00
FORBS									
Salsola iberica	7.00	5.00	5.00	5.00	0.00	5.00	10.00	0.00	5.00
Eriogonum cernuum	15.00	19.00	23.00	40.00	50.00	30.00	13.00	10.00	15.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00
Sisymbrium altissimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
GRASSES									
COVER									
Total Living Cover	25.00	25.00	30.00	45.00	50.00	40.00	25.00	25.00	35.00
Litter	5.00	5.00	10.00	15.00	5.00	5.00	5.00	5.00	5.00
Bareground	40.00	40.00	50.00	25.00	15.00	15.00	35.00	45.00	25.00
Rock	30.00	30.00	10.00	15.00	30.00	40.00	35.00	25.00	35.00
% COMPOSITION									
Shrubs	12.00	4.00	6.67	0.00	0.00	12.50	8.00	20.00	14.29
Forbs	88.00	96.00	93.33	100.00	100.00	87.50	92.00	80.00	85.71
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #1
Sample Date: 20 Aug 1992

Mean	SDev	Freq	
			SHRUBS
2.56	1.95		Artemisia tridentata vas.
			FORBS
4.67	2.94		Salsola iberica
23.89	12.79		Eriogonum cernuum
1.11	3.14		Machaeranthera canescens
1.11	3.14		Sisymbrium altissimum
			GRASSES
			COVER
33.33	9.13		Total Living Cover
6.67	3.33		Litter
32.22	12.04		Bareground
27.78	9.16		Rock
			% COMPOSITION
8.61	6.34		Shrubs
91.39	6.34		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #2

Sample Date: 20 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Atriplex canescens	0.00	0.00	0.00	0.00	7.00	0.00	0.00	0.00	0.00
FORBS									
Salsola iberica	1.00	5.00	0.00	1.00	3.00	5.00	5.00	3.00	5.00
Eriogonum cernuum	3.00	5.00	5.00	4.00	3.00	20.00	29.00	32.00	20.00
Penstemon strictus	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
Sisymbrium altissimum	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
GRASSES									
COVER									
Total Living Cover	4.00	10.00	5.00	5.00	15.00	25.00	35.00	35.00	25.00
Litter	1.00	1.00	1.00	1.00	5.00	2.00	1.00	2.00	3.00
Bareground	10.00	9.00	4.00	9.00	10.00	23.00	4.00	13.00	7.00
Rock	85.00	80.00	90.00	85.00	70.00	50.00	60.00	50.00	65.00
% COMPOSITION									
Shrubs	0.00	0.00	0.00	0.00	46.67	0.00	0.00	0.00	0.00
Forbs	100.00	100.00	100.00	100.00	53.33	100.00	100.00	100.00	100.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #2
Sample Date: 20 Aug 1992

Mean	SDev	Freq	
			SHRUBS
0.78	2.20		Atriplex canescens
			FORBS
3.11	1.91		Salsola iberica
13.44	11.17		Eriogonum cernuum
0.11	0.31		Penstemon strictus
0.22	0.63		Sisymbrium altissimum
			GRASSES
			COVER
17.67	11.94		Total Living Cover
1.89	1.29		Litter
9.89	5.38		Bareground
70.56	14.42		Rock
			% COMPOSITION
5.19	14.67		Shrubs
94.81	14.67		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #3

Sample Date: 20 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata	0.00	0.00	0.00	0.00	9.00	0.00	0.00	0.00	0.00
Chrysothamnus nauseosus	0.00	0.00	0.00	22.00	1.00	0.00	0.00	0.00	0.00
FORBS									
Eriogonum cernuum	13.00	5.00	5.00	0.00	0.00	5.00	0.00	5.00	0.00
Salsola iberica	7.00	7.00	20.00	5.00	2.00	8.00	10.00	5.00	20.00
Machaeranthera canescens	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00
Kochia iberica	0.00	0.00	0.00	0.00	0.00	2.00	3.00	0.00	0.00
Sisymbrium altissimum	0.00	0.00	0.00	5.00	0.00	5.00	2.00	0.00	0.00
GRASSES									
COVER									
Total Living Cover	20.00	12.00	25.00	35.00	12.00	20.00	15.00	10.00	20.00
Litter	1.00	2.00	2.00	5.00	5.00	2.00	2.00	1.00	2.00
Bareground	34.00	45.00	50.00	30.00	58.00	55.00	50.00	60.00	55.00
Rock	45.00	41.00	23.00	30.00	25.00	23.00	33.00	29.00	23.00
% COMPOSITION									
Shrubs	0.00	0.00	0.00	62.86	83.33	0.00	0.00	0.00	0.00
Forbs	100.00	100.00	100.00	37.14	16.67	100.00	100.00	100.00	100.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #3
Sample Date: 20 Aug 1992

Mean	SDev	Freq	
			SHRUBS
1.00	2.83		Artemisia tridentata
2.56	6.88		Chrysothamnus nauseosus
			FORBS
3.67	4.06		Eriogonum cernuum
9.33	6.07		Salsola iberica
0.33	0.94		Machaeranthera canescens
0.56	1.07		Kochia iberica
1.33	2.05		Sisymbrium altissimum
			GRASSES
			COVER
18.78	7.38		Total Living Cover
2.44	1.42		Litter
48.56	9.87		Bareground
30.22	7.66		Rock
			% COMPOSITION
16.24	30.77		Shrubs
83.76	30.77		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #4

Sample Date: 20 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata	0.00	2.00	0.00	0.00	12.00	5.00	0.00	0.00	0.00
Chrysothamnus nauseosus	0.00	5.00	0.00	37.00	13.00	0.00	0.00	0.00	0.00
FORBS									
Eriogonum cernuum	2.00	10.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
Salsola iberica	23.00	13.00	5.00	3.00	5.00	20.00	25.00	25.00	30.00
Sisymbrium altissimum	0.00	0.00	5.00	0.00	0.00	5.00	5.00	0.00	5.00
Machaeranthera canescens	0.00	0.00	15.00	10.00	5.00	0.00	0.00	0.00	0.00
GRASSES									
COVER									
Total Living Cover	25.00	30.00	30.00	50.00	35.00	30.00	30.00	25.00	35.00
Litter	2.00	5.00	5.00	20.00	5.00	5.00	5.00	2.00	5.00
Bareground	50.00	40.00	40.00	15.00	50.00	30.00	40.00	50.00	30.00
Rock	23.00	25.00	25.00	15.00	10.00	35.00	25.00	23.00	30.00
% COMPOSITION									
Shrubs	0.00	23.33	0.00	74.00	71.43	16.67	0.00	0.00	0.00
Forbs	100.00	76.67	100.00	26.00	28.57	83.33	100.00	100.00	100.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #4
Sample Date: 20 Aug 1992

Mean	SDev	Freq	
			SHRUBS
2.11	3.84		Artemisia tridentata
6.11	11.68		Chrysothamnus nauseosus
			FORBS
1.89	3.28		Eriogonum cernuum
16.56	9.66		Salsola iberica
2.22	2.48		Sisymbrium altissimum
3.33	5.27		Machaeranthera canescens
			GRASSES
			COVER
32.22	7.11		Total Living Cover
6.00	5.10		Litter
38.33	11.06		Bareground
23.44	6.96		Rock
			% COMPOSITION
20.60	29.02		Shrubs
79.40	29.02		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #5

Sample Date: 20 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata	0.00	0.00	0.00	2.00	3.00	0.00	0.00	15.00	0.00
Chrysothamnus nauseosus	3.00	60.00	25.00	2.00	2.00	5.00	3.00	0.00	9.00
FORBS									
Penstemon strictus	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
Artemisia ludioviciana	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
Salsola iberica	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
Sisymbrium altissimum	1.00	3.00	2.00	0.00	0.00	0.00	2.00	5.00	0.00
Machaeranthera canescens	1.00	5.00	1.00	2.00	0.00	0.00	0.00	0.00	0.00
Eriogonum cernuum	0.00	2.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
Astragalus sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
Hedysarum boreale	0.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00	5.00
GRASSES									
COVER									
Total Living Cover	5.00	70.00	30.00	7.00	5.00	35.00	10.00	20.00	15.00
Litter	1.00	5.00	5.00	2.00	5.00	3.00	2.00	5.00	2.00
Bareground	70.00	20.00	30.00	30.00	55.00	30.00	65.00	70.00	50.00
Rock	24.00	5.00	35.00	61.00	35.00	32.00	23.00	5.00	33.00
% COMPOSITION									
Shrubs	60.00	85.71	83.33	57.14	100.00	14.29	30.00	75.00	60.00
Forbs	40.00	14.29	16.67	42.86	0.00	85.71	70.00	25.00	40.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #5
Sample Date: 20 Aug 1992

Mean	SDev	Freq	
			SHRUBS
2.22	4.64		Artemisia tridentata
12.11	18.37		Chrysothamnus nauseosus
			FORBS
0.56	1.57		Penstemon strictus
0.56	1.57		Artemisia ludioviciana
0.22	0.63		Salsola iberica
1.44	1.64		Sisymbrium altissimum
1.00	1.56		Machaeranthera canescens
0.33	0.67		Eriogonum cernuum
0.11	0.31		Astragalus sp.
3.33	7.82		Hedysarum boreale
			GRASSES

		COVER
21.89	19.82	Total Living Cover
3.33	1.56	Litter
46.67	18.41	Bareground
28.11	16.08	Rock
		% COMPOSITION
62.83	25.73	Shrubs
37.17	25.73	Forbs
0.00	0.00	Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #6

Sample Date: 20 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata	0.00	0.00	0.00	0.00	8.00	5.00	5.00	65.00	10.00
FORBS									
Sisymbrium altissimum	60.00	0.00	25.00	10.00	10.00	5.00	15.00	10.00	15.00
Eriogonum cernuum	10.00	0.00	0.00	0.00	16.00	5.00	0.00	10.00	5.00
Salsola iberica	10.00	10.00	50.00	80.00	11.00	60.00	55.00	0.00	40.00
GRASSES									
COVER									
Total Living Cover	80.00	10.00	75.00	90.00	45.00	75.00	75.00	85.00	70.00
Litter	2.00	5.00	5.00	5.00	5.00	5.00	5.00	10.00	10.00
Bareground	15.00	80.00	15.00	4.00	40.00	15.00	15.00	4.00	10.00
Rock	3.00	5.00	5.00	1.00	10.00	5.00	5.00	1.00	10.00
% COMPOSITION									
Shrubs	0.00	0.00	0.00	0.00	17.78	6.67	6.67	76.47	14.29
Forbs	100.00	100.00	100.00	100.00	82.22	93.33	93.33	23.53	85.71
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #6
Sample Date: 20 Aug 1992

Mean	SDev	Freq	
			SHRUBS
10.33	19.66		Artemisia tridentata
			FORBS
16.67	16.67		Sisymbrium altissimum
5.11	5.49		Eriogonum cernuum
35.11	26.56		Salsola iberica
			GRASSES
			COVER
67.22	23.47		Total Living Cover
5.78	2.44		Litter
22.00	22.79		Bareground
5.00	3.09		Rock
			% COMPOSITION
13.54	23.11		Shrubs
86.46	23.11		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #7

Sample Date: 20 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata	0.00	5.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	0.00	0.00	15.00	25.00	85.00
FORBS									
Sisymbrium altissimum	15.00	15.00	30.00	70.00	25.00	5.00	5.00	5.00	0.00
Eriogonum cernuum	0.00	10.00	35.00	10.00	10.00	5.00	5.00	3.00	0.00
Salsola iberica	70.00	15.00	10.00	0.00	50.00	35.00	15.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
GRASSES									
COVER									
Total Living Cover	85.00	45.00	75.00	80.00	85.00	45.00	45.00	40.00	85.00
Litter	5.00	10.00	5.00	10.00	5.00	5.00	10.00	10.00	5.00
Bareground	5.00	40.00	15.00	5.00	8.00	45.00	35.00	30.00	5.00
Rock	5.00	5.00	5.00	5.00	2.00	5.00	10.00	20.00	5.00
% COMPOSITION									
Shrubs	0.00	11.11	0.00	0.00	0.00	0.00	33.33	80.00	100.00
Forbs	100.00	88.89	100.00	100.00	100.00	100.00	66.67	20.00	0.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #7
Sample Date: 20 Aug 1992

Mean	SDev	Freq	
			SHRUBS
1.33	2.54		Artemisia tridentata
13.89	26.54		Chrysothamnus nauseosus
			FORBS
18.89	20.38		Sisymbrium altissimum
8.67	10.04		Eriogonum cernuum
21.67	23.45		Salsola iberica
0.56	1.57		Machaeranthera canescens
			GRASSES
			COVER
65.00	19.29		Total Living Cover
7.22	2.48		Litter
20.89	15.59		Bareground
6.89	5.02		Rock
			% COMPOSITION
24.94	36.57		Shrubs
75.06	36.57		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #8

Sample Date: 20 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata	0.00	0.00	1.00	0.00	0.00	0.00	7.00	35.00	0.00
Chrysothamnus nauseosus	0.00	0.00	7.00	35.00	0.00	35.00	0.00	0.00	25.00
FORBS									
Eriogonum cernuum	30.00	20.00	20.00	0.00	10.00	10.00	8.00	0.00	5.00
Sisymbrium altissimum	20.00	0.00	0.00	10.00	0.00	5.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	8.00	0.00	10.00	0.00	0.00	0.00	0.00
Salsola iberica	5.00	35.00	9.00	0.00	10.00	0.00	10.00	0.00	0.00
GRASSES									
COVER									
Total Living Cover	55.00	55.00	45.00	45.00	30.00	50.00	25.00	35.00	30.00
Litter	10.00	5.00	5.00	10.00	5.00	10.00	5.00	5.00	10.00
Bareground	25.00	30.00	35.00	30.00	45.00	30.00	40.00	55.00	55.00
Rock	10.00	10.00	15.00	15.00	20.00	10.00	30.00	5.00	5.00
% COMPOSITION									
Shrubs	0.00	0.00	17.78	77.78	0.00	70.00	28.00	100.00	83.33
Forbs	100.00	100.00	82.22	22.22	100.00	30.00	72.00	0.00	16.67
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #8
Sample Date: 20 Aug 1992

Mean	SDev	Freq	
			SHRUBS
4.78	10.90		Artemisia tridentata
11.33	14.79		Chrysothamnus nauseosus
			FORBS
11.44	9.49		Eriogonum cernuum
3.89	6.57		Sisymbrium altissimum
2.00	3.77		Machaeranthera canescens
7.67	10.55		Salsola iberica
			GRASSES
			COVER
41.11	10.74		Total Living Cover
7.22	2.48		Litter
38.33	10.54		Bareground
13.33	7.45		Rock
			% COMPOSITION
41.88	38.31		Shrubs
58.12	38.31		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #9

Sample Date: 20 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	0.00	10.00	7.00	0.00	23.00
FORBS									
Eriogonum cernuum	20.00	10.00	25.00	10.00	15.00	15.00	20.00	10.00	0.00
Salsola iberica	25.00	20.00	25.00	35.00	20.00	10.00	0.00	35.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	2.00
GRASSES									
COVER									
Total Living Cover	45.00	30.00	50.00	45.00	40.00	35.00	30.00	45.00	25.00
Litter	5.00	5.00	5.00	5.00	3.00	5.00	5.00	2.00	10.00
Bareground	15.00	40.00	35.00	25.00	45.00	55.00	30.00	40.00	40.00
Rock	35.00	25.00	10.00	25.00	12.00	5.00	35.00	13.00	25.00
% COMPOSITION									
Shrubs	0.00	0.00	0.00	0.00	0.00	28.57	33.33	0.00	92.00
Forbs	100.00	100.00	100.00	100.00	100.00	71.43	66.67	100.00	8.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #9
Sample Date: 20 Aug 1992

Mean	SDev	Freq	
			SHRUBS
0.33	0.94		Artemisia tridentata
4.44	7.46		Chrysothamnus nauseosus
			FORBS
13.89	6.98		Eriogonum cernuum
18.89	12.42		Salsola iberica
0.78	1.62		Machaeranthera canescens
			GRASSES
			COVER
38.33	8.16		Total Living Cover
5.00	2.05		Litter
36.11	11.00		Bareground
20.56	10.33		Rock
			% COMPOSITION
17.10	29.36		Shrubs
82.90	29.36		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #10

Sample Date: 20 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00
FORBS									
Eriogonum cernuum	50.00	20.00	25.00	25.00	10.00	20.00	15.00	15.00	5.00
Sisymbrium altissimum	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
Salsola iberica	0.00	25.00	3.00	0.00	15.00	15.00	15.00	20.00	10.00
Machaeranthera canescens	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES									
Agropyron riparium	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER									
Total Living Cover	50.00	45.00	35.00	30.00	25.00	35.00	30.00	35.00	35.00
Litter	5.00	5.00	5.00	2.00	2.00	3.00	2.00	4.00	10.00
Bareground	30.00	15.00	30.00	55.00	60.00	50.00	50.00	40.00	35.00
Rock	15.00	35.00	30.00	13.00	13.00	12.00	18.00	21.00	20.00
% COMPOSITION									
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57.14
Forbs	100.00	100.00	85.71	100.00	100.00	100.00	100.00	100.00	42.86
Grasses	0.00	0.00	14.29	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #10
Sample Date: 20 Aug 1992

Mean	SDev	Freq	
			SHRUBS
2.22	6.29		Chrysothamnus nauseosus
			FORBS
20.56	12.12		Eriogonum cernuum
0.56	1.57		Sisymbrium altissimum
11.44	8.37		Salsola iberica
0.22	0.63		Machaeranthera canescens
			GRASSES
0.56	1.57		Agropyron riparium

			COVER
35.56	7.24		Total Living Cover
4.22	2.39		Litter
40.56	13.63		Bareground
19.67	7.57		Rock
			% COMPOSITION
6.35	17.96		Shrubs
92.06	17.96		Forbs
1.59	4.49		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #11

Sample Date: 20 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
FORBS									
Eriogonum cernuum	25.00	18.00	13.00	15.00	10.00	11.00	4.00	8.00	5.00
Salsola iberica	5.00	2.00	2.00	0.00	5.00	9.00	1.00	2.00	5.00
GRASSES									
COVER									
Total Living Cover	30.00	20.00	15.00	15.00	15.00	20.00	5.00	10.00	10.00
Litter	5.00	1.00	2.00	1.00	2.00	2.00	1.00	1.00	1.00
Bareground	5.00	4.00	3.00	4.00	3.00	8.00	19.00	9.00	9.00
Rock	60.00	75.00	80.00	80.00	80.00	70.00	75.00	80.00	80.00
% COMPOSITION									
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forbs	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #11
Sample Date: 20 Aug 1992

Mean	SDev	Freq	
			SHRUBS
			FORBS
12.11	6.23		Eriogonum cernuum
3.44	2.63		Salsola iberica
			GRASSES
			COVER
15.56	6.85		Total Living Cover
1.78	1.23		Litter
7.11	4.79		Bareground
75.56	6.43		Rock
			% COMPOSITION
0.00	0.00		Shrubs
100.00	0.00		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #12

Sample Date: 20 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
FORBS									
Sisymbrium altissimum	5.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	15.00
Salsola iberica	45.00	50.00	60.00	45.00	60.00	65.00	65.00	65.00	45.00
GRASSES									
Bromus tectorum	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
COVER									
Total Living Cover	50.00	50.00	65.00	55.00	60.00	65.00	70.00	65.00	60.00
Litter	5.00	5.00	5.00	5.00	5.00	10.00	5.00	5.00	5.00
Bareground	30.00	35.00	20.00	25.00	20.00	10.00	15.00	15.00	30.00
Rock	15.00	10.00	10.00	15.00	15.00	15.00	10.00	15.00	5.00
% COMPOSITION									
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forbs	100.00	100.00	100.00	81.82	100.00	100.00	100.00	100.00	100.00
Grasses	0.00	0.00	0.00	18.18	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #12
Sample Date: 20 Aug 1992

Mean	SDev	Freq	
			SHRUBS
			FORBS
3.33	4.71		Sisymbrium altissimum
55.56	8.64		Salsola iberica
			GRASSES
1.11	3.14		Bromus tectorum
			COVER
60.00	6.67		Total Living Cover
5.56	1.57		Litter
22.22	7.86		Bareground
12.22	3.42		Rock
			% COMPOSITION
0.00	0.00		Shrubs
97.98	5.71		Forbs
2.02	5.71		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #13

Sample Date: 20 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	55.00	5.00	5.00	0.00	0.00	0.00	0.00	5.00	10.00
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
FORBS									
Eriogonum cernuum	0.00	13.00	45.00	35.00	70.00	40.00	45.00	15.00	15.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	5.00
Sisymbrium altissimum	0.00	10.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
Salsola iberica	5.00	12.00	10.00	10.00	0.00	0.00	5.00	0.00	0.00
`RASSES									
COVER									
Total Living Cover	60.00	40.00	60.00	45.00	70.00	50.00	50.00	25.00	35.00
Litter	5.00	5.00	5.00	5.00	2.00	5.00	2.00	5.00	5.00
Bareground	25.00	35.00	20.00	30.00	20.00	35.00	40.00	55.00	50.00
Rock	10.00	20.00	15.00	20.00	8.00	10.00	8.00	15.00	10.00
% COMPOSITION									
Shrubs	91.67	12.50	8.33	0.00	0.00	0.00	0.00	20.00	42.86
Forbs	8.33	87.50	91.67	100.00	100.00	100.00	100.00	80.00	57.14
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #13
Sample Date: 20 Aug 1992

Mean	SDev	Freq	
			SHRUBS
8.89	16.63		Artemisia tridentata vas.
0.56	1.57		Chrysothamnus nauseosus
			FORBS
30.89	20.57		Eriogonum cernuum
1.67	3.33		Machaeranthera canescens
1.67	3.33		Sisymbrium altissimum
4.67	4.69		Salsola iberica
			GRASSES
			COVER
48.33	13.12		Total Living Cover
4.33	1.25		Litter
34.44	11.65		Bareground
12.89	4.51		Rock
			% COMPOSITION
19.48	28.77		Shrubs
80.52	28.77		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #14

Sample Date: 20 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
FORBS									
Eriogonum cernuum	25.00	30.00	10.00	25.00	7.00	9.00	2.00	3.00	0.00
Salsola iberica	5.00	5.00	5.00	0.00	0.00	1.00	0.00	0.00	2.00
GRASSES									
COVER									
Total Living Cover	30.00	35.00	15.00	25.00	7.00	10.00	2.00	3.00	2.00
Litter	5.00	5.00	5.00	2.00	1.00	1.00	2.00	5.00	2.00
Bareground	5.00	5.00	10.00	4.00	3.00	9.00	11.00	7.00	8.00
Rock	60.00	55.00	70.00	69.00	89.00	80.00	85.00	85.00	88.00
% COMPOSITION									
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forbs	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #14
Sample Date: 20 Aug 1992

Mean	SDev	Freq	
			SHRUBS
			FORBS
12.33	10.67		Eriogonum cernuum
2.00	2.21		Salsola iberica
			GRASSES
			COVER
14.33	11.98		Total Living Cover
3.11	1.73		Litter
6.89	2.64		Bareground
75.67	11.89		Rock
			% COMPOSITION
0.00	0.00		Shrubs
100.00	0.00		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #15

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	0.00	0.00	3.00	2.00	2.00	3.00	2.00	2.00	3.00
Atriplex canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	1.00	0.00	0.00	8.00	2.00
FORBS									
Sisymbrium altissimum	0.00	0.00	0.00	1.00	0.00	0.00	5.00	2.00	0.00
Eriogonum cernuum	5.00	0.00	0.00	2.00	2.00	2.00	0.00	1.00	0.00
Salsola iberica	15.00	25.00	22.00	5.00	5.00	15.00	15.00	7.00	3.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	5.00	8.00	5.00	0.00
GRASSES									
Oryzopsis hymenoides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00
COVER									
Total Living Cover	20.00	25.00	25.00	10.00	10.00	25.00	30.00	25.00	20.00
Litter	2.00	5.00	3.00	2.00	2.00	2.00	1.00	5.00	5.00
Bareground	45.00	45.00	50.00	70.00	75.00	50.00	45.00	35.00	45.00
Rock	33.00	25.00	22.00	18.00	13.00	23.00	24.00	35.00	30.00
% COMPOSITION									
Shrubs	0.00	0.00	12.00	20.00	30.00	12.00	6.67	40.00	75.00
Forbs	100.00	100.00	88.00	80.00	70.00	88.00	93.33	60.00	15.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #15
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
1.89	1.10		Artemisia tridentata vas.
1.11	3.14		Atriplex canescens
1.22	2.48		Chrysothamnus nauseosus
			FORBS
0.89	1.59		Sisymbrium altissimum
1.33	1.56		Eriogonum cernuum
12.44	7.44		Salsola iberica
2.00	2.94		Machaeranthera canescens
			GRASSES
0.22	0.63		Oryzopsis hymenoides

		COVER
21.11	6.57	Total Living Cover
3.00	1.49	Litter
51.11	12.20	Bareground
24.78	6.63	Rock
		% COMPOSITION
21.74	22.62	Shrubs
77.15	25.29	Forbs
1.11	3.14	Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #16

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	2.00	0.00	2.00	1.00	3.00	2.00	0.00	0.00	1.00
Chrysothamnus nauseosus	0.00	24.00	0.00	18.00	1.00	0.00	0.00	0.00	10.00
FORBS									
Ambrosia sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00
Sisymbrium altissimum	0.00	1.00	5.00	0.00	1.00	0.00	0.00	1.00	1.00
Salsola iberica	1.00	5.00	28.00	0.00	0.00	18.00	30.00	10.00	2.00
Machaeranthera canescens	2.00	0.00	0.00	0.00	5.00	5.00	5.00	7.00	0.00
GRASSES									
Oryzopsis hymenoides	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
COVER									
Total Living Cover	5.00	30.00	35.00	20.00	10.00	25.00	35.00	20.00	15.00
Litter	5.00	5.00	5.00	1.00	5.00	5.00	5.00	3.00	5.00
Bareground	40.00	35.00	30.00	44.00	45.00	25.00	20.00	22.00	30.00
Rock	50.00	30.00	30.00	35.00	40.00	45.00	40.00	55.00	50.00
% COMPOSITION									
Shrubs	40.00	80.00	5.71	95.00	40.00	8.00	0.00	0.00	73.33
Forbs	60.00	20.00	94.29	0.00	60.00	92.00	100.00	100.00	20.00
Grasses	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	6.67

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #16
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
1.22	1.03		Artemisia tridentata vas.
5.89	8.75		Chrysothamnus nauseosus
			FORBS
0.22	0.63		Ambrosia sp.
1.00	1.49		Sisymbrium altissimum
10.44	11.33		Salsola iberica
2.67	2.67		Machaeranthera canescens
			GRASSES
0.22	0.42		Oryzopsis hymenoides
			COVER
21.67	10.00		Total Living Cover
4.33	1.33		Litter
32.33	8.73		Bareground
41.67	8.50		Rock
			% COMPOSITION
38.01	35.12		Shrubs
60.70	36.81		Forbs
1.30	2.46		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #17

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	2.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	2.00
Chrysothamnus nauseosus	35.00	50.00	17.00	5.00	1.00	13.00	54.00	0.00	20.00
Ribes aureum	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
FORBS									
Penstemon strictus	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
Artemisia ludioviciana	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
Melilotus officinalis	0.00	0.00	0.00	1.00	0.00	0.00	0.00	10.00	2.00
Sisymbrium altissimum	2.00	4.00	2.00	1.00	1.00	1.00	0.00	0.00	1.00
Eriogonum cernuum	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES									
COVER									
Total Living Cover	40.00	55.00	25.00	8.00	5.00	15.00	55.00	20.00	25.00
Litter	15.00	10.00	5.00	2.00	2.00	5.00	5.00	5.00	5.00
Bareground	30.00	25.00	35.00	55.00	55.00	55.00	30.00	40.00	35.00
Rock	15.00	10.00	35.00	35.00	38.00	25.00	10.00	35.00	35.00
% COMPOSITION									
Shrubs	92.50	92.73	72.00	75.00	40.00	93.33	100.00	0.00	88.00
Forbs	7.50	7.27	28.00	25.00	60.00	6.67	0.00	100.00	12.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #17
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
1.00	0.67		Artemisia tridentata vas.
21.67	19.15		Chrysothamnus nauseosus
0.11	0.31		Ribes aureum
			FORBS
0.56	1.57		Penstemon strictus
1.11	3.14		Artemisia ludioviciana
0.22	0.63		Machaeranthera canescens
1.44	3.10		Melilotus officinalis
1.33	1.15		Sisymbrium altissimum
0.11	0.31		Eriogonum cernuum
			GRASSES
			COVER
27.56	17.58		Total Living Cover
6.00	3.86		Litter
40.00	11.30		Bareground
26.44	11.06		Rock
			% COMPOSITION
72.62	30.84		Shrubs
27.38	30.84		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #18

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00
FORBS									
Machaeranthera canescens	0.00	5.00	0.00	5.00	0.00	0.00	0.00	0.00	15.00
Sisymbrium altissimum	20.00	15.00	10.00	25.00	25.00	35.00	40.00	30.00	10.00
Salsola iberica	40.00	30.00	30.00	35.00	30.00	45.00	40.00	15.00	10.00
Eriogonum cernuum	5.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	10.00
GRASSES									
Bromus tectorum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
COVER									
Total Living Cover	65.00	50.00	45.00	65.00	55.00	80.00	80.00	45.00	65.00
Litter	10.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Bareground	15.00	20.00	45.00	20.00	30.00	10.00	10.00	25.00	20.00
Rock	10.00	25.00	5.00	10.00	10.00	5.00	5.00	25.00	10.00
% COMPOSITION									
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.08
Forbs	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	69.23
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.69

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #18
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
1.67	4.71		Artemisia tridentata vas.
			FORBS
2.78	4.78		Machaeranthera canescens
23.33	10.00		Sisymbrium altissimum
30.56	10.91		Salsola iberica
2.22	3.42		Eriogonum cernuum
			GRASSES
0.56	1.57		Bromus tectorum

		COVER
61.11	12.64	Total Living Cover
5.56	1.57	Litter
21.67	10.27	Bareground
11.67	7.45	Rock
		% COMPOSITION
2.56	7.25	Shrubs
96.58	9.67	Forbs
0.85	2.42	Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #19

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	2.00	0.00	0.00	0.00	1.00	0.00	0.00	5.00	50.00
Chrysothamnus nauseosus	0.00	5.00	20.00	45.00	24.00	50.00	85.00	35.00	20.00
FORBS									
Artemisia ludioviciana	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
Machaeranthera canescens	0.00	5.00	15.00	5.00	0.00	0.00	0.00	5.00	0.00
Eriogonum cernuum	5.00	5.00	0.00	5.00	0.00	5.00	0.00	5.00	0.00
Sisymbrium altissimum	2.00	5.00	5.00	0.00	2.00	5.00	0.00	10.00	0.00
Salsola iberica	16.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00
GRASSES									
COVER									
Total Living Cover	25.00	20.00	40.00	55.00	30.00	60.00	85.00	65.00	70.00
Litter	25.00	5.00	10.00	10.00	10.00	10.00	5.00	5.00	2.00
Bareground	25.00	60.00	40.00	30.00	50.00	25.00	5.00	25.00	23.00
Rock	25.00	15.00	10.00	5.00	10.00	5.00	5.00	5.00	5.00
% COMPOSITION									
Shrubs	8.00	25.00	50.00	81.82	83.33	83.33	100.00	61.54	100.00
Forbs	92.00	75.00	50.00	18.18	16.67	16.67	0.00	38.46	0.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #19
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
6.44	15.48		Artemisia tridentata vas.
31.56	24.53		Chrysothamnus nauseosus
			FORBS
0.56	1.57		Artemisia ludioviciana
3.33	4.71		Machaeranthera canescens
2.78	2.48		Eriogonum cernuum
3.22	3.15		Sisymbrium altissimum
2.11	5.00		Salsola iberica
			GRASSES
			COVER
50.00	21.08		Total Living Cover
9.11	6.30		Litter
31.44	15.38		Bareground
9.44	6.43		Rock
			% COMPOSITION
65.89	30.70		Shrubs
34.11	30.70		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #20

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	2.00	0.00	0.00	0.00	5.00	0.00	0.00	10.00	0.00
Chrysothamnus nauseosus	10.00	20.00	35.00	50.00	15.00	15.00	25.00	20.00	30.00
FORBS									
Sisymbrium altissimum	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
Salsola iberica	0.00	0.00	2.00	0.00	0.00	5.00	5.00	5.00	0.00
Machaeranthera canescens	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eriogonum cernuum	2.00	0.00	2.00	0.00	5.00	5.00	0.00	0.00	0.00
Ambrosia sp.	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES									
COVER									
Total Living Cover	15.00	25.00	40.00	50.00	25.00	25.00	30.00	35.00	30.00
Litter	5.00	10.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Bareground	55.00	50.00	45.00	35.00	45.00	45.00	40.00	35.00	40.00
Rock	25.00	15.00	10.00	10.00	25.00	25.00	25.00	25.00	25.00
% COMPOSITION									
Shrubs	80.00	80.00	87.50	100.00	80.00	60.00	83.33	85.71	100.00
Forbs	20.00	20.00	12.50	0.00	20.00	40.00	16.67	14.29	0.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #20
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
1.89	3.28		Artemisia tridentata vas.
24.44	11.65		Chrysothamnus nauseosus
			FORBS
0.11	0.31		Sisymbrium altissimum
1.89	2.28		Salsola iberica
0.11	0.31		Machaeranthera canescens
1.56	2.01		Eriogonum cernuum
0.56	1.57		Ambrosia sp.
			GRASSES
			COVER
30.56	9.56		Total Living Cover
5.56	1.57		Litter
43.33	6.24		Bareground
20.56	6.43		Rock
			% COMPOSITION
84.06	11.31		Shrubs
15.94	11.31		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #21

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Atriplex canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
Chrysothamnus nauseosus	45.00	1.00	1.00	0.00	15.00	5.00	25.00	0.00	0.00
FORBS									
Machaeranthera canescens	0.00	0.00	3.00	0.00	0.00	0.00	0.00	5.00	0.00
Salsola iberica	0.00	40.00	15.00	17.00	5.00	15.00	5.00	10.00	35.00
Eriogonum cernuum	0.00	4.00	1.00	3.00	5.00	5.00	0.00	5.00	5.00
GRASSES									
COVER									
Total Living Cover	45.00	45.00	20.00	20.00	25.00	25.00	30.00	25.00	40.00
Litter	10.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Bareground	25.00	25.00	50.00	55.00	45.00	50.00	45.00	50.00	30.00
Rock	20.00	25.00	25.00	20.00	25.00	20.00	20.00	20.00	25.00
% COMPOSITION									
Shrubs	100.00	2.22	5.00	0.00	60.00	20.00	83.33	20.00	0.00
Forbs	0.00	97.78	95.00	100.00	40.00	80.00	16.67	80.00	100.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #21
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
0.56	1.57		Atriplex canescens
10.22	14.76		Chrysothamnus nauseosus
			FORBS
0.89	1.73		Machaeranthera canescens
15.78	12.80		Salsola iberica
3.11	2.08		Eriogonum cernuum
			GRASSES
			COVER
30.56	9.56		Total Living Cover
5.56	1.57		Litter
41.67	11.06		Bareground
22.22	2.48		Rock
			% COMPOSITION
32.28	36.51		Shrubs
67.72	36.51		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #22

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
FORBS									
Eriogonum cernuum	5.00	0.00	10.00	5.00	20.00	10.00	5.00	10.00	15.00
Salsola iberica	35.00	25.00	40.00	20.00	25.00	25.00	25.00	15.00	10.00
GRASSES									
COVER									
Total Living Cover	40.00	25.00	50.00	25.00	45.00	35.00	30.00	25.00	25.00
Litter	5.00	3.00	5.00	5.00	5.00	5.00	2.00	2.00	2.00
Bareground	30.00	55.00	25.00	65.00	25.00	50.00	60.00	45.00	45.00
Rock	25.00	17.00	20.00	5.00	25.00	10.00	8.00	28.00	28.00
% COMPOSITION									
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forbs	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #22
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
			FORBS
8.89	5.67		Eriogonum cernuum
24.44	8.64		Salsola iberica
			GRASSES
			COVER
33.33	9.13		Total Living Cover
3.78	1.40		Litter
44.44	14.03		Bareground
18.44	8.39		Rock
			% COMPOSITION
0.00	0.00		Shrubs
100.00	0.00		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #23

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
FORBS									
Salsola iberica	2.00	2.00	3.00	7.00	1.00	5.00	2.00	2.00	10.00
Eriogonum cernuum	3.00	5.00	2.00	8.00	4.00	25.00	3.00	1.00	15.00
GRASSES									
COVER									
Total Living Cover	5.00	7.00	5.00	15.00	5.00	30.00	5.00	3.00	25.00
Litter	1.00	1.00	1.00	3.00	2.00	5.00	1.00	1.00	2.00
Bareground	4.00	2.00	4.00	2.00	8.00	10.00	4.00	2.00	8.00
Rock	90.00	90.00	90.00	80.00	85.00	55.00	90.00	94.00	65.00
% COMPOSITION									
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forbs	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #23
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
			FORBS
3.78	2.82		Salsola iberica
7.33	7.41		Eriogonum cernuum
			GRASSES
			COVER
11.11	9.41		Total Living Cover
1.89	1.29		Litter
4.89	2.85		Bareground
82.11	12.61		Rock
			% COMPOSITION
0.00	0.00		Shrubs
100.00	0.00		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #24

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Chrysothamnus nauseosus	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS									
Kochia scoparia	0.00	0.00	5.00	0.00	5.00	0.00	0.00	0.00	0.00
Sisymbrium altissimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00
Eriogonum cernuum	0.00	5.00	10.00	0.00	0.00	0.00	10.00	0.00	15.00
Salsola iberica	65.00	0.00	45.00	55.00	50.00	70.00	55.00	25.00	20.00
GRASSES									
COVER									
Total Living Cover	65.00	25.00	60.00	55.00	55.00	70.00	65.00	35.00	35.00
Litter	5.00	5.00	5.00	5.00	5.00	5.00	10.00	5.00	4.00
Bareground	25.00	35.00	25.00	30.00	30.00	15.00	20.00	35.00	52.00
Rock	5.00	35.00	10.00	10.00	10.00	10.00	5.00	25.00	9.00
% COMPOSITION									
Shrubs	0.00	80.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forbs	100.00	20.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #24

Mean	SDev	Freq	Sample Date: 21 Aug 1992
			SHRUBS
2.22	6.29		Chrysothamnus nauseosus
			FORBS
1.11	2.08		Kochia scoparia
1.11	3.14		Sisymbrium altissimum
4.44	5.50		Eriogonum cernuum
42.78	21.74		Salsola iberica
			GRASSES
			COVER
51.67	15.09		Total Living Cover
5.44	1.64		Litter
29.67	10.04		Bareground
13.22	9.47		Rock
			% COMPOSITION
8.89	25.14		Shrubs
91.11	25.14		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #25

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	0.00	35.00	10.00	0.00	0.00	5.00	5.00	10.00	0.00
Atriplex canescens	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus nauseosus	2.00	20.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS									
Sisymbrium altissimum	1.00	0.00	0.00	10.00	10.00	15.00	10.00	5.00	20.00
Salsola iberica	7.00	0.00	10.00	10.00	20.00	15.00	5.00	5.00	10.00
Eriogonum cernuum	0.00	0.00	0.00	0.00	0.00	0.00	5.00	10.00	10.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
GRASSES									
COVER									
Total Living Cover	15.00	55.00	25.00	20.00	30.00	35.00	25.00	35.00	40.00
Litter	2.00	5.00	5.00	5.00	5.00	5.00	5.00	10.00	5.00
Bareground	70.00	30.00	55.00	55.00	40.00	35.00	55.00	40.00	30.00
Rock	13.00	10.00	15.00	20.00	25.00	25.00	15.00	15.00	25.00
% COMPOSITION									
Shrubs	46.67	100.00	60.00	0.00	0.00	14.29	20.00	28.57	0.00
Forbs	53.33	0.00	40.00	100.00	100.00	85.71	80.00	71.43	100.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #25
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
7.22	10.57		Artemisia tridentata vas.
0.56	1.57		Atriplex canescens
3.00	6.22		Chrysothamnus nauseosus
			FORBS
7.89	6.59		Sisymbrium altissimum
9.11	5.55		Salsola iberica
2.78	4.16		Eriogonum cernuum
0.56	1.57		Machaeranthera canescens
			GRASSES
			COVER
31.11	11.25		Total Living Cover
5.22	1.93		Litter
45.56	13.01		Bareground
18.11	5.45		Rock
			% COMPOSITION
29.95	31.84		Shrubs
70.05	31.84		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #26

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
FORBS									
Eriogonum cernuum	0.00	0.00	0.00	0.00	0.00	1.00	5.00	5.00	1.00
Salsola iberica	0.00	2.00	1.00	1.00	1.00	0.00	5.00	0.00	0.00
GRASSES									
Oryzopsis hymenoides	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER									
Total Living Cover	1.00	2.00	1.00	1.00	1.00	1.00	10.00	5.00	1.00
Litter	2.00	2.00	1.00	5.00	4.00	2.00	5.00	2.00	4.00
Bareground	2.00	11.00	13.00	19.00	10.00	5.00	5.00	8.00	10.00
Rock	95.00	85.00	85.00	75.00	85.00	92.00	80.00	85.00	85.00
% COMPOSITION									
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forbs	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Grasses	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #26
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
			FORBS
1.33	2.00		Eriogonum cernuum
1.11	1.52		Salsola iberica
			GRASSES
0.11	0.31		Oryzopsis hymenoides
			COVER
2.56	2.91		Total Living Cover
3.00	1.41		Litter
9.22	4.76		Bareground
85.22	5.51		Rock
			% COMPOSITION
0.00	0.00		Shrubs
88.89	31.43		Forbs
11.11	31.43		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #27

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00
Chrysothamnus nauseosus	0.00	0.00	20.00	15.00	10.00	0.00	1.00	0.00	0.00
FORBS									
Sisymbrium altissimum	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
Melilotus officinalis	0.00	0.00	0.00	2.00	0.00	2.00	1.00	0.00	0.00
Kochia scoparia	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Salsola iberica	30.00	25.00	5.00	2.00	15.00	6.00	2.00	5.00	5.00
Eriogonum cernuum	5.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	5.00	6.00	0.00	0.00	0.00
'RASSES									
COVER									
Total Living Cover	35.00	30.00	25.00	20.00	30.00	15.00	5.00	5.00	10.00
Litter	2.00	2.00	5.00	5.00	5.00	2.00	5.00	5.00	5.00
Bareground	40.00	45.00	40.00	50.00	35.00	50.00	55.00	60.00	60.00
Rock	23.00	23.00	30.00	25.00	30.00	33.00	35.00	30.00	25.00
% COMPOSITION									
Shrubs	0.00	0.00	80.00	75.00	33.33	6.67	40.00	0.00	0.00
Forbs	100.00	100.00	20.00	25.00	66.67	93.33	60.00	100.00	100.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #27
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
0.22	0.42		Artemisia tridentata vas.
5.11	7.39		Chrysothamnus nauseosus
			FORBS
0.11	0.31		Sisymbrium altissimum
0.56	0.83		Melilotus officinalis
0.33	0.94		Kochia scoparia
10.56	9.81		Salsola iberica
1.33	2.05		Eriogonum cernuum
1.22	2.30		Machaeranthera canescens
			GRASSES
			COVER
19.44	10.66		Total Living Cover
4.00	1.41		Litter
48.33	8.50		Bareground
28.22	4.13		Rock
			% COMPOSITION
26.11	30.99		Shrubs
73.89	30.99		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #28

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	5.00	5.00	0.00	0.00	30.00	0.00	1.00	0.00	2.00
Atriplex canescens	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus nauseosus	0.00	15.00	5.00	10.00	0.00	29.00	1.00	0.00	17.00
FORBS									
Ambrosia sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
Penstemon strictus	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Melilotus officinalis	0.00	0.00	0.00	5.00	0.00	1.00	0.00	1.00	0.00
Eriogonum cernuum	0.00	2.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
Sisymbrium altissimum	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Salsola iberica	0.00	2.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00
Machaeranthera canescens	5.00	5.00	0.00	0.00	5.00	0.00	3.00	2.00	3.00
Hedsarum boreale	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0.00
GRASSES									
Agropyron smithii	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Oryzopsis hymenoides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.00
COVER									
Total Living Cover	25.00	30.00	25.00	15.00	35.00	30.00	5.00	12.00	25.00
Litter	5.00	5.00	5.00	5.00	5.00	5.00	5.00	3.00	5.00
Bareground	55.00	20.00	40.00	45.00	40.00	40.00	15.00	15.00	10.00
Rock	15.00	45.00	30.00	35.00	20.00	25.00	75.00	70.00	60.00
% COMPOSITION									
Shrubs	20.00	66.67	80.00	66.67	85.71	96.67	40.00	0.00	76.00
Forbs	40.00	33.33	20.00	33.33	14.29	3.33	60.00	91.67	16.00
Grasses	40.00	0.00	0.00	0.00	0.00	0.00	0.00	8.33	8.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #28
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
4.78	9.13		Artemisia tridentata vas.
1.67	4.71		Atriplex canescens
8.56	9.56		Chrysothamnus nauseosus
			FORBS
0.11	0.31		Ambrosia sp.
0.56	1.57		Penstemon strictus
0.78	1.55		Melilotus officinalis
0.78	1.62		Eriogonum cernuum
0.11	0.31		Sisymbrium altissimum
0.44	0.83		Salsola iberica
2.56	2.06		Machaeranthera canescens
0.67	1.89		Hedsarum boreale
			GRASSES
1.11	3.14		Agropyron smithii
0.33	0.67		Oryzopsis hymenoides

			COVER
22.44	9.19		Total Living Cover
4.78	0.63		Litter
31.11	15.23		Bareground
41.67	20.82		Rock
			% COMPOSITION
59.08	30.45		Shrubs
34.66	25.57		Forbs
6.26	12.39		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #29

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	0.00	5.00	45.00	5.00	0.00	7.00	75.00	0.00	0.00
Chrysothamnus nauseosus	5.00	5.00	0.00	5.00	5.00	10.00	4.00	0.00	2.00
FORBS									
Kochia scoparia	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eriogonum cernuum	0.00	15.00	15.00	25.00	40.00	8.00	0.00	2.00	0.00
Salsola iberica	0.00	0.00	5.00	5.00	5.00	5.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	10.00	5.00	0.00	1.00	3.00	3.00
GRASSES									
COVER									
Total Living Cover	5.00	30.00	65.00	50.00	55.00	30.00	80.00	5.00	5.00
Litter	5.00	5.00	5.00	15.00	5.00	10.00	10.00	5.00	5.00
Bareground	65.00	40.00	25.00	20.00	15.00	45.00	5.00	50.00	75.00
Rock	25.00	25.00	5.00	15.00	25.00	15.00	5.00	40.00	15.00
% COMPOSITION									
Shrubs	100.00	33.33	69.23	20.00	9.09	56.67	98.75	0.00	40.00
Forbs	0.00	66.67	30.77	80.00	90.91	43.33	1.25	100.00	60.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #29
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
15.22	25.09		Artemisia tridentata vas.
4.00	2.91		Chrysothamnus nauseosus
			FORBS
0.56	1.57		Kochia scoparia
11.67	12.99		Eriogonum cernuum
2.22	2.48		Salsola iberica
2.44	3.17		Machaeranthera canescens
			GRASSES
			COVER
36.11	26.43		Total Living Cover
7.22	3.42		Litter
37.78	22.12		Bareground
18.89	10.48		Rock
			% COMPOSITION
47.45	34.45		Shrubs
52.55	34.45		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #30

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	5.00	5.00	75.00	5.00	5.00	5.00	65.00	2.00	5.00
Chrysothamnus nauseosus	50.00	20.00	0.00	30.00	15.00	35.00	0.00	0.00	0.00
FORBS									
Salsola iberica	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	5.00
Sisymbrium altissimum	0.00	0.00	0.00	5.00	5.00	5.00	5.00	20.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00	25.00
Eriogonum cernuum	10.00	15.00	0.00	5.00	20.00	10.00	5.00	3.00	0.00
GRASSES									
Stipa hymenoides	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER									
Total Living Cover	65.00	45.00	75.00	50.00	50.00	55.00	75.00	50.00	35.00
Litter	10.00	5.00	5.00	5.00	10.00	5.00	5.00	5.00	5.00
Bareground	15.00	35.00	15.00	40.00	25.00	30.00	15.00	30.00	55.00
Rock	10.00	15.00	5.00	5.00	15.00	10.00	5.00	15.00	5.00
% COMPOSITION									
Shrubs	84.62	55.56	100.00	70.00	40.00	72.73	86.67	4.00	14.29
Forbs	15.38	33.33	0.00	30.00	60.00	27.27	13.33	96.00	85.71
Grasses	0.00	11.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #30
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
19.11	27.32		Artemisia tridentata vas.
16.67	17.48		Chrysothamnus nauseosus
			FORBS
3.33	7.82		Salsola iberica
4.44	5.98		Sisymbrium altissimum
3.89	7.74		Machaeranthera canescens
7.56	6.41		Eriogonum cernuum
			GRASSES
0.56	1.57		Stipa hymenoides
			COVER
55.56	12.79		Total Living Cover
6.11	2.08		Litter
28.89	12.64		Bareground
9.44	4.37		Rock
			% COMPOSITION
58.65	31.28		Shrubs
40.12	31.36		Forbs
1.23	3.49		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #31

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	0.00	0.00	0.00	0.00	0.00	0.00	40.00	5.00	2.00
Chrysothamnus nauseosus	30.00	25.00	70.00	55.00	40.00	30.00	10.00	10.00	30.00
FORBS									
Sisymbrium altissimum	0.00	5.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00
Machaeranthera canescens	8.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
Eriogonum cernuum	7.00	10.00	0.00	0.00	0.00	0.00	0.00	5.00	3.00
GRASSES									
Agropyron smithii	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
Agropyron riparium	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
Agropyron spicatum	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
COVER									
Total Living Cover	45.00	40.00	70.00	55.00	55.00	30.00	55.00	30.00	35.00
Litter	10.00	20.00	10.00	5.00	5.00	5.00	5.00	10.00	20.00
Bareground	20.00	35.00	15.00	35.00	35.00	50.00	25.00	50.00	35.00
Rock	25.00	5.00	5.00	5.00	5.00	15.00	15.00	10.00	10.00
% COMPOSITION									
Shrubs	66.67	62.50	100.00	100.00	72.73	100.00	90.91	50.00	91.43
Forbs	33.33	37.50	0.00	0.00	0.00	0.00	9.09	50.00	8.57
Grasses	0.00	0.00	0.00	0.00	27.27	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #31
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
5.22	12.40		Artemisia tridentata vas.
33.33	18.41		Chrysothamnus nauseosus
			FORBS
1.67	2.36		Sisymbrium altissimum
1.44	2.79		Machaeranthera canescens
2.78	3.55		Eriogonum cernuum
			GRASSES
0.56	1.57		Agropyron smithii
0.56	1.57		Agropyron riparium
0.56	1.57		Agropyron spicatum
			COVER
46.11	12.86		Total Living Cover
10.00	5.77		Litter
33.33	11.30		Bareground
10.56	6.43		Rock
			% COMPOSITION
81.58	17.84		Shrubs
15.39	18.39		Forbs
3.03	8.57		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #32

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus nauseosus	0.00	9.00	15.00	25.00	25.00	25.00	30.00	20.00	10.00
FORBS									
Machaeranthera canescens	0.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
Eriogonum cernuum	13.00	4.00	5.00	0.00	5.00	0.00	0.00	0.00	0.00
Salsola iberica	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES									
COVER									
Total Living Cover	20.00	20.00	25.00	25.00	30.00	25.00	30.00	20.00	10.00
Litter	5.00	5.00	5.00	10.00	10.00	5.00	10.00	5.00	5.00
Bareground	65.00	65.00	60.00	55.00	50.00	65.00	50.00	55.00	65.00
Rock	10.00	10.00	10.00	10.00	10.00	5.00	10.00	20.00	20.00
% COMPOSITION									
Shrubs	10.00	55.00	60.00	100.00	83.33	100.00	100.00	100.00	100.00
Forbs	90.00	45.00	40.00	0.00	16.67	0.00	0.00	0.00	0.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #32
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
0.44	0.83		Artemisia tridentata vas.
17.67	9.26		Chrysothamnus nauseosus
			FORBS
1.11	2.08		Machaeranthera canescens
3.00	4.14		Eriogonum cernuum
0.56	1.57		Salsola iberica
			GRASSES
			COVER
22.78	5.83		Total Living Cover
6.67	2.36		Litter
58.89	6.14		Bareground
11.67	4.71		Rock
			% COMPOSITION
78.70	29.67		Shrubs
21.30	29.67		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #33

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	0.00	2.00	5.00	1.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	10.00	10.00	10.00	15.00	0.00
FORBS									
Sisymbrium altissimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
Machaeranthera canescens	0.00	0.00	5.00	2.00	0.00	0.00	0.00	0.00	0.00
Eriogonum cernuum	0.00	15.00	5.00	2.00	5.00	5.00	10.00	5.00	10.00
Salsola iberica	50.00	23.00	0.00	0.00	5.00	5.00	5.00	0.00	5.00
GRASSES									
COVER									
Total Living Cover	50.00	40.00	15.00	5.00	20.00	20.00	25.00	25.00	15.00
Litter	10.00	5.00	5.00	5.00	5.00	5.00	5.00	10.00	5.00
Bareground	30.00	40.00	55.00	85.00	60.00	70.00	60.00	50.00	55.00
Rock	10.00	15.00	25.00	5.00	15.00	5.00	10.00	15.00	25.00
% COMPOSITION									
Shrubs	0.00	5.00	33.33	20.00	50.00	50.00	40.00	60.00	0.00
Forbs	100.00	95.00	66.67	80.00	50.00	50.00	60.00	40.00	100.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #33
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
0.89	1.59		Artemisia tridentata vas.
5.00	5.77		Chrysothamnus nauseosus
			FORBS
0.56	1.57		Sisymbrium altissimum
0.78	1.62		Machaeranthera canescens
6.33	4.32		Eriogonum cernuum
10.33	15.52		Salsola iberica
			GRASSES
			COVER
23.89	12.86		Total Living Cover
6.11	2.08		Litter
56.11	15.05		Bareground
13.89	6.98		Rock
			% COMPOSITION
28.70	21.91		Shrubs
71.30	21.91		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #34

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00
Atriplex canescens	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS									
Kochia scoparia	0.00	5.00	2.00	0.00	0.00	0.00	0.00	0.00	5.00
Salsola iberica	30.00	5.00	8.00	5.00	7.00	7.00	8.00	8.00	5.00
Eriogonum cernuum	5.00	10.00	15.00	15.00	15.00	8.00	7.00	2.00	5.00
GRASSES									
COVER									
Total Living Cover	40.00	20.00	25.00	20.00	25.00	15.00	15.00	10.00	15.00
Litter	5.00	5.00	5.00	2.00	5.00	2.00	2.00	1.00	2.00
Bareground	40.00	45.00	50.00	65.00	55.00	70.00	70.00	70.00	70.00
Rock	15.00	30.00	20.00	13.00	15.00	13.00	13.00	19.00	13.00
% COMPOSITION									
Shrubs	12.50	0.00	0.00	0.00	12.00	0.00	0.00	0.00	0.00
Forbs	87.50	100.00	100.00	100.00	88.00	100.00	100.00	100.00	100.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #34
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
0.33	0.94		Artemisia tridentata vas.
0.56	1.57		Atriplex canescens
			FORBS
1.33	2.05		Kochia scoparia
9.22	7.45		Salsola iberica
9.11	4.65		Eriogonum cernuum
			GRASSES
			COVER
20.56	8.31		Total Living Cover
3.22	1.62		Litter
59.44	11.41		Bareground
16.78	5.31		Rock
			% COMPOSITION
2.72	5.09		Shrubs
97.28	5.09		Forbs
0.00	0.00		Grasses

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #35

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
FORBS									
Eriogonum cernuum	3.00	13.00	25.00	15.00	5.00	5.00	8.00	8.00	2.00
Salsola iberica	2.00	2.00	0.00	10.00	5.00	0.00	2.00	2.00	5.00
GRASSES									
COVER									
Total Living Cover	5.00	15.00	25.00	25.00	10.00	5.00	10.00	10.00	7.00
Litter	5.00	2.00	5.00	5.00	2.00	5.00	5.00	2.00	3.00
Bareground	15.00	8.00	20.00	40.00	8.00	10.00	5.00	18.00	40.00
Rock	75.00	75.00	50.00	30.00	80.00	80.00	80.00	70.00	50.00
% COMPOSITION									
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forbs	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #35
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
			FORBS
9.33	6.88		Eriogonum cernuum
3.11	2.96		Salsola iberica
			GRASSES
			COVER
12.44	7.30		Total Living Cover
3.78	1.40		Litter
18.22	12.53		Bareground
65.56	16.91		Rock
			% COMPOSITION
0.00	0.00		Shrubs
100.00	0.00		Forbs
0.00	0.00		Grasses

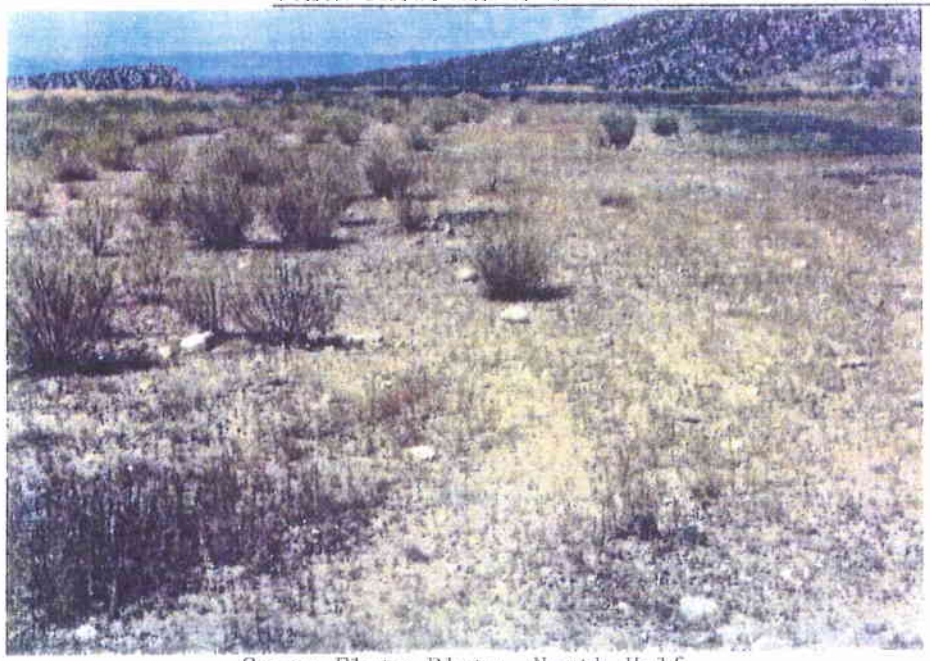
SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #36

Sample Date: 21 Aug 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
SHRUBS									
Artemisia tridentata vas.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
FORBS									
Penstemon strictus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
Kochia scoparia	5.00	0.00	5.00	5.00	5.00	5.00	5.00	0.00	0.00
Sisymbrium altissimum	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
Eriogonum cernuum	0.00	0.00	20.00	10.00	5.00	0.00	10.00	5.00	0.00
Salsola iberica	45.00	55.00	20.00	20.00	25.00	25.00	15.00	25.00	50.00
GRASSES									
Bromus tectorum	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	5.00
COVER									
Total Living Cover	50.00	55.00	45.00	40.00	35.00	30.00	35.00	40.00	55.00
Litter	5.00	5.00	10.00	5.00	10.00	5.00	2.00	5.00	5.00
Bareground	25.00	20.00	40.00	45.00	40.00	40.00	45.00	30.00	15.00
Rock	20.00	20.00	5.00	10.00	15.00	25.00	18.00	25.00	25.00
% COMPOSITION									
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.50	0.00
Forbs	100.00	100.00	100.00	87.50	100.00	100.00	100.00	87.50	90.91
Grasses	0.00	0.00	0.00	12.50	0.00	0.00	0.00	0.00	9.09

SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #36
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			SHRUBS
0.56	1.57		Artemisia tridentata vas.
			FORBS
0.56	1.57		Penstemon strictus
3.33	2.36		Kochia scoparia
0.56	1.57		Sisymbrium altissimum
5.56	6.43		Eriogonum cernuum
31.11	13.90		Salsola iberica
			GRASSES
1.11	2.08		Bromus tectorum
			COVER
42.78	8.53		Total Living Cover
5.78	2.44		Litter
33.33	10.54		Bareground
18.11	6.64		Rock
			% COMPOSITION
1.39	3.93		Shrubs
96.21	5.44		Forbs
2.40	4.56		Grasses

COLOR PHOTOGRAPHS OF THE REVEGETATION MONITORING SITES FOR SUNNYSIDE MINE (SEPT. 1992)



Sacco Flats Plots, North Half
Borrow Fill, 12" (L), 6" (R)

Sacco Flats Plots, South Half
Borrow Fill, 12" (L), 6" (R)

Sacco Flats Plots, North Half
Borrow Fill, 48" (L), 24" (R)

Sacco Flats Plots, South Half
Borrow Fill, 48" (L), 24" (R)

COLOR PHOTOGRAPHS OF THE REVEGETATION MONITORING SITES FOR SUNNYSIDE MINE (SEPT. 1992)

Surface Facility Sediment Pond

Whitmore Test Plot

Slaughter Canyon Road

Slaughter Canyon Road

Slaughter Canyon Road

Sacco Flats Plots (Entire Plot View)

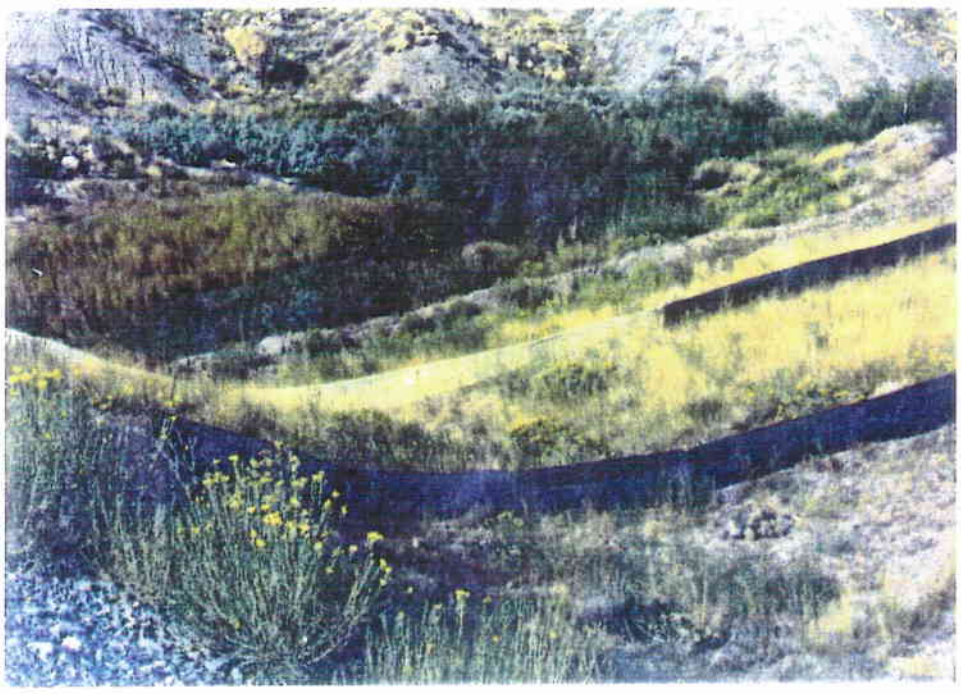
Sacco Flats Plots, South Half, Topsoil (R) CR (L)

Sacco Flats Plots, North Half, Topsoil (R) CR (L)

COLOR PHOTOGRAPHS OF THE REVEGETATION MONITORING SITES FOR SUNNYSIDE MINE (SEPT. 1992)

Coarse Refuse Toe Topsoil Pile

Coarse Refuse Toe Sediment Pond



Reclaimed Coarse Refuse Toe Sediment Pond

Borrow Area Sediment Pond

Coarse Refuse Topsoil Pile

Haul Road (Pasture) Sediment Pond

Sacco Flats Topsoil Pile

Surface Facility Spoil Pile

COLOR PHOTOGRAPHS OF THE REVEGETATION MONITORING SITES FOR SUNNYSIDE MINE (SEPT. 1992)

001 Pond

001 Topsoil

Manshaft Sediment Pond

002-B Discharge Pond

002-B Topsoil Pile

002-A Discharge Pond

Rail Cut Sediment Pond

Rail Cut Topsoil Pile

CATEGORY E

ANNUAL IMPOUNDMENT CERTIFICATION

SUNNYSIDE COAL COMPANY
ACT/007/007
QUARTERLY INSPECTIONS OF IMPOUNDMENTS AND REFUSE PILE

QUARTER___FOURTH,_(INSPECTED DEC 16,1993)_

Year_____1993_____
COLD,SNOWING

Impoundment	Instability (Yes/No)	Structural Weakness (Yes/No)	Hazardous Conditions (Yes/No)	Water Depth (Feet)	Water Elevation (Feet)	Storage Capacity (Acre Feet)	* Other	Comments
Twinshafts (001)	No	No	No	Full	7224.0	2.65	None,(Water murky, but IMPROVED).	Pond is active / discharging water/OK
Old Whitmore (002A)	No	No	No	0	6999.0	2.70	None,spillway needs repair in spring	OK, Snow Covered
New Whitmore (002B)	No	No	No	0	6985.0	5.17	None	OK. Snow Covered.
Manshaft (006)	No	No	No	0	7228.5	0.40	New Sediment Marker Installed	Ok. Snow Covered.
Lower #2 Canyon (010)	No	No	No	0	6744.7	0.28	None.	OK. Snow Covered.
Upper #2 Canyon (011)	No	No	No	0	6819.0	0.16	None.	OK. Full of Sediment. Needs cleaning. Snow Covered.
#3 Hoist House (013)	No	No	No		6730.0	0.24	None	Ok. No change. Snow Covered.
Surface Facilities (014)	No	No	No		6579.4	7.13	None	Frozen.Snow Covered.Cleaning to be resumed in Spring.

* Other = Any existing or required monitoring procedures, instrumentation or aspects of the structure affecting stability.

Date 1-18-94

State of Utah No. 3250

Professional Engineer [signature]

REGISTERED PROFESSIONAL ENGINEER
JOHN S. HUEFNER
3250
STATE OF UTAH

CERTIFICATION REPORT

On December 16, 1993, an inspection of Twinshafts Sediment Pond (UPDES #001), Area No. -- 's Sedimentation Pond 001 revealed the following:

A. The pond has been constructed and maintained in accordance with the approved plan.

B. The pond's dam appeared sound with no signs of instability or hazardous conditions.

C. The water elevation was 7224 feet. The water depth was 6 feet.

D. The existing storage capacity is 4.54 acre-feet which is greater than the 3.42 acre-feet required by the approved plan.

E. Ponds are visually inspected weekly for structural problems. Bi-monthly sampling of discharge is performed with analysis results submitted monthly. U.P.D.E.S. and DOGM requirements are followed during sampling, analysis, and reporting.

Based on this field inspection, Pond 001 has been certified as required by R645-301-514.310 through R645-301-514.313.

Affix seal of engineer
making this certification.
All data in the seal
must be legible.

Seal

02-11-93

1-18-94

CERTIFICATION REPORT

On December 16, 1993, an inspection of Old Whitmore Mine Water Pond (UPDES#002A Area No. -- 's Sedimentation Pond 002A revealed the following:

A. The pond has been constructed and maintained in accordance with the approved plan.

B. The pond's dam appeared sound with no signs of instability or hazardous conditions.

C. The water elevation was 6999 feet. The water depth was 0 feet.

D. The existing storage capacity is 2.74 acre-feet which is greater than the 2.05 acre-feet required by the approved plan.

E. Ponds are visually inspected weekly for structural problems. Bi-monthly sampling of discharge is performed with analysis results submitted monthly. U.P.D.E.S. and DOGM requirements are followed during sampling, analysis, and reporting.

Based on this field inspection, Pond 002A has been certified as required by R645-301-514.310 through R645-301-514.313.

Affix seal of engineer
making this certification.
All data in the seal
must be legible.

Seal

02-11-93

1-18-94

CERTIFICATION REPORT

On December 16, 1993, an inspection of New Whitmore Mine Water Pond, (UPDES #002B) Area No. -- 's Sedimentation Pond 002B revealed the following:

A. The pond has been constructed and maintained in accordance with the approved plan.

B. The pond's dam appeared sound with no signs of instability or hazardous conditions.

C. The water elevation was 6985 feet. The water depth was 0 feet. (DRY)

D. The existing storage capacity is 6.33 acre-feet which is greater than the 4.12 acre-feet required by the approved plan.

E. Ponds are visually inspected weekly for structural problems. Bi-monthly sampling of discharge is performed with analysis results submitted monthly. U.P.D.E.S. and DOGM requirements are followed during sampling, analysis, and reporting.

Based on this field inspection, Pond 002B has been certified as required by R645-301-514.310 through R645-301-514.313.

Affix seal of engineer
making this certification.
All data in the seal
must be legible.

Seal

02-11-93

REGISTERED PROFESSIONAL ENGINEER
JOHN S. HUEBNER
STATE OF UTAH

1-18-94

CERTIFICATION REPORT

On December 16, 1993, an inspection of Manshaft Sediment Pond (UPDES #006), Area No. -- 's Sedimentation Pond 006 revealed the following:

A. The pond has been constructed and maintained in accordance with the approved plan.

B. The pond's dam appeared sound with no signs of instability or hazardous conditions.

C. The water elevation was 7228.5 feet. The water depth was 0 feet.

D. The existing storage capacity is 1.25 acre-feet which is greater than the 1.11 acre-feet required by the approved plan.

E. Ponds are visually inspected weekly for structural problems. Bi-monthly sampling of discharge is performed with analysis results submitted monthly. U.P.D.E.S. and DOGM requirements are followed during sampling, analysis, and reporting.

Based on this field inspection, Pond 006 has been certified as required by R645-301-514.310 through R645-301-514.313.

Affix seal of engineer
making this certification.
All data in the seal
must be legible.

Seal

02-11-93

1-18-94

CERTIFICATION REPORT

On December 16, 1993, an inspection of Lower #2 Canyon Pond (UPDES #010), Area No. -- 's Sedimentation Pond 010 revealed the following:

A. The pond has been constructed and maintained in accordance with the approved plan.

B. The pond's dam appeared sound with no signs of instability or hazardous conditions.

C. The water elevation was 6744.7 feet. The water depth was 0 feet. (DRY)

D. The existing storage capacity is 0.66 acre-feet which is greater than the 0.57 acre-feet required by the approved plan.

E. Ponds are visually inspected weekly for structural problems. Bi-monthly sampling of discharge is performed with analysis results submitted monthly. U.P.D.E.S. and DOGM requirements are followed during sampling, analysis, and reporting.

Based on this field inspection, Pond 010 has been certified as required by R645-301-514.310 through R645-301-514.313.

Affix seal of engineer
making this certification.
All data in the seal
must be legible.

Seal

02-11-93

1-18-94

CERTIFICATION REPORT

On December 16, 1993, an inspection of Upper #2 Canyon Pond (UPDES #011), Area No. -- 's Sedimentation Pond 011 revealed the following:

A. The pond has been constructed and maintained in accordance with the approved plan.

B. The pond's dam appeared sound with no signs of instability or hazardous conditions.

C. The water elevation was 6819 feet. The water depth was 0 feet. (Dry)

D. The existing storage capacity is 0.30 acre-feet which is ~~greater than~~ equal to the 0.30 acre-feet required by the approved plan.

E. Ponds are visually inspected weekly for structural problems. Bi-monthly sampling of discharge is performed with analysis results submitted monthly. U.P.D.E.S. and DOGM requirements are followed during sampling, analysis, and reporting.

Based on this field inspection, Pond 011 has been certified as required by R645-301-514.310 through R645-301-514.313.

Affix seal of engineer making this certification. All data in the seal must be legible.

Seal

02-11-93

1-18-94

CERTIFICATION REPORT

On December 16, 1993, an inspection of #3 Hoist House Sediment Pond (UPDES #013), Area No. -- 's Sedimentation Pond 013 revealed the following:

A. The pond has been constructed and maintained in accordance with the approved plan.

B. The pond's dam appeared sound with no signs of instability or hazardous conditions.

C. The water elevation was 6730 feet. The water depth was 0 feet. (Dry)

D. The existing storage capacity is 0.84 acre-feet which is greater than the 0.58 acre-feet required by the approved plan.

E. Ponds are visually inspected weekly for structural problems. Bi-monthly sampling of discharge is performed with analysis results submitted monthly. U.P.D.E.S. and DOGM requirements are followed during sampling, analysis, and reporting.

Based on this field inspection, Pond 013 has been certified as required by R645-301-514.310 through R645-301-514.313.

Affix seal of engineer
making this certification.
All data in the seal
must be legible.

Seal

02-11-93

1-18-94

CERTIFICATION REPORT

On December 16, 1993, an inspection of Sunnyside Surface Facilities Pond (UPDES #014), Area No. -- 's Sedimentation Pond 014 revealed the following:

A. The pond has been constructed and maintained in accordance with the approved plan.

B. The pond's dam appeared sound with no signs of instability or hazardous conditions.

C. The water elevation was 6579 feet. The water depth was 1.6 feet.

D. The existing storage capacity is 7.13 acre-feet which is greater than the 4.84 acre-feet required by the approved plan.

E. Ponds are visually inspected weekly for structural problems. Bi-monthly sampling of discharge is performed with analysis results submitted monthly. U.P.D.E.S. and DOGM requirements are followed during sampling, analysis, and reporting.

Based on this field inspection, Pond 014 has been certified as required by R645-301-514.310 through R645-301-514.313.

Affix seal of engineer
making this certification.
All data in the seal
must be legible.

Seal

REGISTERED PROFESSIONAL ENGINEER
JOHN S. WHEELER
3250
STATE OF UTAH

1-18-94

02-11-93

CATEGORY F

ANNUAL OVERBURDEN, SPOIL,ROOF, FLOOR, AND MID-SEAM DATA

ANNUAL OVERBURDEN, SPOIL, REFUSE, ROOF,FLOOR, AND MID-SEAM DATA

The following data was collected in 1993.

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (708) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

October 8, 1993

SUNNYSIDE COAL CO.
P.O. Box 99
Sunnyside Utah 84539

Sample identification by
SUNNYSIDE COAL CO.

Kind of sample reported to us: Coal

Soil Sample

Sample taken at: Sunnyside

ANALYZED AT INTERMOUNTAIN LABS.

Sample taken by: Sunnyside

ADDITIONAL PARAMETERS ADDED

Date sampled: ------

Date received: August 26, 1993

Analysis report no. 59-163884

SOIL ANALYSIS

pH	7.5 units
Conductivity	2.37mmhos/cm
Saturation %	36.9

Rock Fragments	4.7 %
Total Nitrogen	0.04 %
Nitrate-nitrogen	1.42 mg/kg
Organic Carbon	3.2 %

PARTICLE SIZE ANALYSIS

% Sand	23.3
% Silt	54.7
% Clay	22.0

TEXTURE: Silt Loam

Total Available Selenium
<0.02mg/kg

Total Available Boron
0.28mg/kg

SOLUBLE CATIONS

Calcium	23.0 meq/l
Magnesium	4.25 meq/l
Sodium	1.15 meq/l

Available Water Capacity
16.2 (1/3)
10.9 (15)

Sodium Adsorption Ratio	0.31
Exchangeable Sodium Percentage	2.47

ACID BASE POTENTIAL

Maximum Acid Potential	1.87 tons $CaCO_3$/ 1000 tons
Neutralization Potential	141.0 tons $CaCO_3$/ 1000 tons
Acid-Base Potential	139.0 tons $CaCO_3$/ 1000 tons

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (708) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

October 8, 1993

SUNNYSIDE COAL CO.
P.O. Box 99
Sunnyside Utah 84539

Sample identification by
SUNNYSIDE COAL CO.

Kind of sample reported to us: Coal

Sample taken at: Sunnyside

Sample taken by: Sunnyside

Date sampled: ------

Date received: September 13, 1993

Soil Sample
Sacco Flats Coarse Refuse
Storage Date 08/31/93
Sample Date 09/01/93
ID# 93-001CR-PH

ANALYZED AT INTERMOUNTAIN LABS.

Analysis report no. 59-163453

SOIL ANALYSIS

pH	7.7 units
Conductivity	1.56mmhos/cm
Saturation %	29.6

PARTICLE SIZE ANALYSIS

% Sand	76.0
% Silt	21.3
% Clay	2.7

TEXTURE: Loamy Sand

SOLUBLE CATIONS

Calcium	2.06 meq/l
Magnesium	1.25 meq/l
Sodium	12.3 meq/l

Sodium Adsorption Ratio 9.53
Exchangeable Sodium Percentage 0.71

Rock Fragments	0.0 %
Total Nitrogen	0.35 %
Nitrate-nitrogen	0.08 mg/kg
Organic Carbon	22.3 %

Total Available Selenium
0.02 mg/kg

Total Available Boron
0.81mg/kg

Available Water Capacity
15.9 (1/3)
20.8 (15)

ACID BASE POTENTIAL

Maximum Acid Potential	68.7 tons $CaCO_3$/ 1000 tons
Neutralization Potential	20.1 tons $CaCO_3$/ 1000 tons
Acid-Base Potential	-48.6 tons $CaCO_3$/ 1000 tons

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • TEL: 708-953-9300 FAX: 708-953-9306
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TEL: (801) 653-2311
FAX: (801) 653-2436

September 1, 1993

SUNNYSIDE COAL CO.
P.O. Box 99
Sunnyside Utah 84539

Sample identification by
SUNNYSIDE COAL CO.
CRT Soil Sample
(Sediment Cleanout Material)

Kind of sample reported to us: Soil

Soil Sample

Sample taken at: Sunnyside

Sample taken by: Sunnyside

Date sampled: July 15, 1993

Date received: July 15, 1993

Analysis report no. 59-163257

SOIL ANALYSIS

pH	7.3 units
Conductivity	2.82mmhos/cm
Saturation %	38.7

PARTICLE SIZE ANALYSIS

% Sand	23.1
% Silt	54.5
% Clay	22.4
TEXTURE	Silt Loam

SOLUBLE CATIONS

Calcium	26.5 meq/l
Magnesium	7.08 meq/l
Sodium	2.75 meq/l

Sodium Adsorption Ratio	0.67
Exchangeable Sodium Percentage	4.04

Rock Fragments	0.0 %
Total Nitrogen	0.21 %
Nitrate-nitrogen	5.80 mg/kg
Organic Carbon	5.5 %

Total Available Selenium
<0.02mg/kg

Total Available Boron
0.14mg/kg

Available Water Capacity
22.0 (1/3)
18.1 (15)

ACID BASE POTENTIAL

Maximum Acid Potential	12.5 tons CaCO3/ 1000 tons
Neutralization Potential	153.0 tons CaCO3/ 1000 tons
Acid-Base Potential	140.0 tons CaCO3/ 1000 tons

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

SUMMARY OF FINDINGS

Sample Number	Sample Site	Sample Intervals	Sample Matrix
1. 59-163884	Sacco Flats	Random	Washed Coal Refuse
2. 59-163453	Sacco Flats	Every 10th Pile	Washed Coal Refuse

All samples were taken employing a grab technique. All samples were prepared prior to analysis by grinding and air drying. Analyses were performed by Commercial Testing and Engineering Company, Huntington, Utah.

SUMMARY OF FINDINGS

Analyses of Refuse Samples 59-163884 and 59-163453 indicate that there was no significant change in all but one of the parameters normally analyzed in Sunnyside Coal's clean coal refuse. The Acid-Base Potential on Sample #59-163453, A-48.6 Tons $CaCO_3$/1000 Tons, indicates possible acid-forming material, which was removed from the Sacco Flats Temporary Coarse Refuse Storage to the Sunnyside Cogeneration Associates' #1 Temporary Storage Area.

CATEGORY G

ANNUAL REPORT OF OFFICERS

STATE OF UTAH
DEPARTMENT OF COMMERCE
DIVISION OF CORPORATIONS AND COMMERCIAL CODE

PROFIT CORPORATION ANNUAL REPORT

The following information is on file in this office. All profit corporations must file their annual reports and corrections within the month of their anniversary date. Failure to do so will result in dissolution of the corporate charter.

THIS BOX MUST BE COMPLETED

CORPORATE NAME, REGISTERED AGENT, REGISTERED OFFICE, CITY, STATE & ZIP

CORPORATION # 135854
F 03/10/89

1. SUNNYSIDE COAL COMPANY
2. DENISE A. DRAGOO, ESQ.
3. 215 SOUTH STATE ST12TH FL
4. SALT LAKE CITY UT 84111

MAKE ALL CORRECTIONS IN THIS COLUMN

(Print New Agent Name) (Signature)

(New City) REGISTERED AGENT MUST BE IN UTAH UTAH (Zip)

5. INCORPORATED IN THE STATE AND UNDER THE LAWS OF COLORADO

6. ADDRESS OF THE PRINCIPAL OFFICE IN THE HOME STATE.
1113 SPRUCE STREET
BOULDER CO 80302

(Street Address) (State or Country)
(City) (ZIP)

7. BUSINESS PURPOSE: BITUMINOS COAL(UNDERGROUND)

OFFICERS

8.	PRESIDENT	ROBERT M. BURNHAM	8.
	ADDRESS	1113 SPRUCE STREET	
	CITY, STATE & ZIP	BOULDER CO 80302	
9.	VICE PRESIDENT	JOSEPH R. FIELDER	9.
	ADDRESS	HIGHWAY 123 P O BOX 99	
	CITY, STATE & ZIP	SUNNYSIDE UT 84539	
10.	SECRETARY	KENNETH R. OLDHAM	10. Tawnie Hintze
	ADDRESS	1050 WALNUT STREET #212	Highway 123, P.O. Box 99
	CITY, STATE & ZIP	BOULDER CO 80302	Sunnyside, UT 84539
11.	TREASURER	ROBERT M. BURNHAM	11.
	ADDRESS	1113 SPRUCE STREET	
	CITY, STATE & ZIP	BOULDER CO 80302	

DIRECTORS (If you have less than 3 shareholders you may list less than 3 directors.)

12.	DIRECTOR	ROBERT M. BURNHAM	12.
	ADDRESS	1113 SPRUCE STREET	
	CITY, STATE & ZIP	BOULDER CO 80302	
13.	DIRECTOR		13.
	ADDRESS		
	CITY, STATE & ZIP		
14.	DIRECTOR	KENNETH R. OLDHAM	14. Joseph R. Fielder
	ADDRESS	1050 WALNUT STREET #212	Highway 123, P.O. Box 99
	CITY, STATE & ZIP	BOULDER CO 80302	Sunnyside, UT 84539

Under penalties of perjury and as an authorized officer, I declare that this annual report and, if applicable, the statement change of registered office and/or agent, has been examined by me and is, to the best of my knowledge and belief, true, correct, and complete.

15. BY [signature] (Signature of Authorized Corporate Officer)

16. PRESIDENT (Title or Position)

17. 2/15 1994 (Date)

IF THERE ARE NO CHANGES FROM THE PREVIOUS YEAR, PLEASE DETACH THE COUPON BELOW AND RETURN IT IN THE ENCLOSED ENVELOPE WITH YOUR PAYMENT. YOU MAY KEEP THE ABOVE REPORT FOR YOUR RECORDS

CATEGORY H

OTHER

Other

Permit Amendment Status

Sunnyside Coal Company continues to operate under a Five-Year Permit Renewal, which it received from Utah Division of Oil, Gas and Mining in January of 1991. This renewal is enclosed as Attachment G-1.

Permit amendments that were submitted by Sunnyside Coal Company during 1993 and their current status include the following:

1. 93A - Sunnyside Cogeneration Associates Area - Removal from SCC Permit Area; Specifically, the Coarse Refuse Pile (Withdrawn October 1993)

2. 93B - Bond Reduction for 93A

3. 93C - Fan Canyon Culverts - Removal of Never-Installed Culverts from Permit (Approved April 14, 1993)

4. 93D - Water Monitoring Revision - Parameters (Approved April 14, 1993)

5. 93E - Storage Areas in Facilities and Non-Coal Waste Disposal (Approved August 10, 1993)

6. 93F - East Slurry Cell Cleanout Procedure Revision (Denied August 4, 1993)

7. 93G - Bulk Rock Dust Tank BTCA Area Revision - Temporary Silt Fence (Approved June 1, 1993)

8. 93H - Updated Legal Identification of Directors and Officers (Approved August 4, 1993)

9. 93I - Stream Buffer Zone Map Revision - Sign Location and Manshaft (Approved August 14, 1993) (DO 93A)

10. 93J - Addition of BTCA Areas into Permit - 001 Topsoil Pile, etc. (Approved August 14, 1993)

11. 93K - As-Built Road Cross Sections and Certifications (Approved September 30, 1993)

12. 93L - 46KV Power Line Corridor Shown as Disturbed Area (DO 93B) (Approved) (OSM Violation Terminated November 1, 1993)

13. 93M - Removal of Silt Fences from Permit - CRP and SSSF Pond Area (Approved August 14, 1993)

14. 93N - Updated Legal Identification - SMI Officers and Directors (Supersedes 93H; Approved August 14, 1993)

15. 93O - Recertify Ponds - After Cleanout (Approved August 11, 1993)

16. 93P - Ancillary Road/Haul Road Redesignation (Approved October 31, 1993)

17. 93Q - Manshaft Four-Inch Water Line to 001 and Tie In with Old City Culinary Line (Approved October 31, 1993)

18. 93R - Incidental Boundary Change for 24th and 25th Left (Approved September 30, 1993)

19. 93S - Temporary Refuse Storage Area in SCA Permit Area (Vacated November 16, 1993)

20. 93T - Road Classification Revision - SCA NOV (Vacated November 16, 1993)

21. 93U - Updated Legal Identification - SCA and Savage (Vacated November 16, 1993)

22. 93V - CRP Contemporaneous Reclamation (Vacated November 16, 1993)

23. 93W - Sediment Controls at 001 Topsoil Pile, Central Metering, and Power Line Corridor (Approved November 18, 1993)

24. 93X - Topsoil Pile Added to BTCA Area - SCA NOV (Vacated November 16, 1993)

25. 93Y - Pasture Pond Outlet Ditch Revision (Vacated November 16, 1993)

26. 93Z - Groundwater Monitoring, Removal of 19th Left Inside and Twin Shaft Monitor Points (Approved November 17, 1993)

27. 93AA - Water Monitoring, Removal of Coarse Refuse Seep, and Coarse Refuse Boundary Monitoring Points (Approved November 17, 1993)

28. 93BB - Methane Drainage Borehole Addition (Approved December 20, 1993)

29. 93CC - Surface Facility Maps and Hydrology (Pending)

30. 93DD - Revised #3 Hoist House Pond Drainage - Hillside Substation (Pending)

Division Order 93A

Division Order 93A was issued on May 12, 1993, for the failure to identify all areas within 100 feet of Grassy Trail Creek where coal mining and reclamation activities have occurred. The DO followed an OSM TDN (X-93-02-352-005 TV 007, 2 of 7) issued on April 28, 1993. The DOGM regulations cited were R645-301-521.260-261 and R645-301-731.600. Plate III-26 was revised to denote all disturbed areas; additional stream buffer zone signs were installed from the Manshaft/Grassy Trail Bridge to south of the Sunnyside Surface Facilities Spoil Pile.

Division Order 93B

Division Order 93B was issued on June 1, 1993, for failure to identify all power lines that pass over the permit area, including the 46KV line that supplies power to the main facilities. The DO followed an OSM TDN (93-020-352-005, 5 of 7), which was issued April 28, 1993. Federal NOV93-020-370-005, 2 of 2, was issued on August 5, 1993. Its concern was the permitting and bonding of the power line corridors from Central Metering to the Hillside Substation.

Closure Order 93-20-1-1

CO93-20-1-1 was issued on April 19, 1993, by the Utah Division of Oil, Gas and Mining for failure to post an adequate reclamation bond. Mining was suspended for 48 hours until an agreement was reached and a modification was granted allowing resumption of mining for 30 days. Following several meetings between DOGM, OSM, and SCC, it was determined on May 21, 1993, that SCC did have adequate bonding. The CO was vacated.

Closure Order 93-32-1-1

CO93-32-1-1 was issued to Sunnyside Coal Company on April 28, 1993, for failure to complete the structure necessary for abatement of NOV92-32-8-1, the #2 Canyon Arches. Lack of material to complete this job was the basis for the NOV. Sunnyside Coal Company subcontracted Pacific Central Steel Fabrication to complete the arches by May 1, 1993.

OSM Inspections

Sunnyside Coal Company received three inspections from the Department of Interior, Office of Surface Mining, during 1993.

1. April 20-22 and 26-28, 1993 Inspection - During this inspection, the following was received:

   A. CO93-20-1-1
      CO93-32-1-1 (Previously Described)

   B. N93-40-2-2, 2 Parts (Issued by DOGM)
      N93-40-3-3, 3 Parts (Issued by DOGM)
      N93-32-2-5, 5 Parts (Issued by DOGM)
      N93-32-3-8, 8 Parts (Issued by DOGM)

   C. TDN X-93-02-352-005 TV 007 (Issued by OSM to DOGM)

2. August 4-5 and 10-11, 1993 - OSM Inspection

   A. A modification for 93-020-370-005, Violation 1 of 2, was received.

   B. NOV93-40-5-9, 9 Parts (Issued by DOGM)

3. November 17, 18, 19, 1993 - OSM Inspection

   A. Sunnyside Coal Company received termination notices for 93-020-370-005, 1 of 2 and 2 of 2.

   B. NOV93-32-7-1, Coarse Refuse in an Undisturbed Diversion, was written because coarse refuse from the Sacco Flats Temporary Coarse Refuse Storage Area was inadvertently placed in an undisturbed drainage.

Reclamation Work Accomplished

1. Fan Canyon (September 13 to November 13, 1993)
   SCC removed eight out-of-service transformers from this area, demolished the substation and all cement work, and performed the rough-grade work during this time.

2. #2 Canyon/#2 Canyon Fan Pad (September 14 to September 20, 1993)
   SCC removed three out-of-service transformers from the #2 Canyon Fan Pad Area and five more from the #2 Canyon Storage Yard Area.

   Approximately 80 out-of-service power poles were removed from the area between Cato's Crossing and the Lower Gate Road and the #2 Canyon.

   The fan and diffuser were removed from the #2 Canyon Fan Pad Area.

   The old trestle across the #2 Canyon Wash at the #2 Mine Material Portal was removed.

Approximately 1,800 feet of mine material track and trolley was removed from the #3 Hoist House Area up to #2 Canyon Supply Yard.

Material in the upper part of #2 Canyon Supply Yard is being removed to allow future reclamation of the area.

ATTACHMENT G-1

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Norman H. Bangerter
Governor
Dee C. Hansen
Executive Director
Dianne R. Nielson, Ph.D.
Division Director

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340

January 18, 1991

Mr. Joe Fielder
Sunnyside Coal Company
P.O. Box 99
Sunnyside, Utah 84539

Dear ~~Mr.~~ Joe Fielder:

Re: Successive Five-Year Permit Renewal, Sunnyside Coal Company, Sunnyside Mines, ACT/007/007, Folder #3, Carbon County, Utah

Enclosed please find the Findings and Five-Year Permit Renewal for the Sunnyside Mines. Please sign both copies of the permit and return one signed copy to the Division offices.

If you have any questions, please call me.

Sincerely,

Dianne

Dianne R. Nielson
Director

jbe
Enclosures
cc: Pamela Grubaugh-Littig
A:\Success.5-Y

an equal opportunity employer

FINDINGS
FIVE-YEAR RENEWAL
Sunnyside Coal Company
Sunnyside Mine
ACT/007/007
Carbon County, Utah
January 20, 1991

1. The terms and conditions of the existing permit are being satisfactorily met. (R614-303-233.110)

2. The present coal mining and reclamation operations are in compliance with the environmental protection standards of the State Program. (R614-303-233.120)

3. The requested renewal does not substantially jeopardize the operator's continuing ability to comply with the State Program on existing permit areas. (R614-303-233.130)

4. The operator has provided evidence of having liability insurance. (R614-303-233.140) (Federal Insurance Company-Policy Number 3528-55-64)

5. The operator has provided evidence that a performance bond is in effect for the operation and will continue in full force and effect for the proposed period of renewal. (R614-303-233.150) (First Deed of Trust for Undisturbed Lands and Water Rights)

Permit Supervisor

Associate Director

Director

A:\007007.2

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
(801) 538-5340

This permit, ACT/007/007, is issued for the state of Utah by the Utah Division of Oil, Gas and Mining (Division) to:

Sunnyside Coal Company
P.O. Box 99
Sunnyside, Utah 84539
(801) 888-4421

for the Sunnyside Mine. A First Deed of Trust for Undisturbed Lands and Water Rights is filed with the Division in the amount of $2,639,088, payable to the State of Utah, Division of Oil, Gas and Mining and the Office of Surface Mining Reclamation and Enforcement (OSM). The Division must receive a copy of this permit signed and dated by the permittee.

Sec. 1 STATUTES AND REGULATIONS - This permit is issued pursuant to the Utah Coal Mining and Reclamation Act of 1979, Utah Code Annotated (UCA) 40-10-1 et seq, hereafter referred to as the Act.

Sec. 2 PERMIT AREA - The permittee is authorized to conduct underground coal mining activities on the following described lands (as shown on the map appended as Attachment A) within the permit area at the Sunnyside Mine, situated in the state of Utah, Carbon County, and located:

Fee Land

Township 14 South, Range 14 East, SLB&M, Utah

Section 6: N1/2, S1/2 SW1/4, S1/2 SE1/4, NW1/4 SE1/4
Section 7: NW1/4, SW1/4 NE1/4, E1/2 SW1/4, S1/2 SE1/4, NW1/4 SE1/4
Section 17: NE1/4, SE1/4 NW1/4, SW1/4, S1/2 SE1/4
Section 18: E1/2, S1/2 SW1/4, NE1/4 SW1/4, NW1/4 SW1/4, SW1/4 NW1/4 less the following descirbed area:

Beginning at the NW corner of SW1/4 NW1/4 of Section 18, Township 14 South, Range 14 East:

Thence S 45° 05' E, 1,577.42 ft;
thence S 39° 25' W, 1,759.22 ft;
thence N 2,472.87 ft to point of beginning.

Section 19: All
Section 20: All
Section 21: W1/2
Section 28: All
Section 29: All
Section 30: NE1/4, NE1/4 NW1/4, NW1/4 SE1/4
Section 31: S1/2 NE1/4, NE1/4 NE1/4
Section 32: All
Section 33: All
Section 34: W1/2

Township 15 South, Range 14 East, SLB&M, Utah

Section 3: W1/2
Section 4: All
Section 5: NE1/4, N1/2 SE1/4, SE1/4 SE1/4, W1/2, SW1/4 SE1/4
Section 6: S1/2 SE1/4, SE1/4 SW1/4, portions of N1/2 SE1/4 and NE1/4 SW1/4, South of the D&RGW Railroad right-of-way.
Section 7: N1/2 NE1/4, N3/4 NW1/4
Section 8: NE1/4 NE1/4, N1/2 NW1/4, NW1/4 NE1/4
Section 9: All
Section 10: W1/2, SE1/4
Section 15: W1/2, N1/2 NE1/4
Section 16: E1/2, NW1/4, E1/2 SW1/4
Section 17: E1/2 NE1/4

Federal Leases

Federal Coal Leases numbers Salt Lake 062966-063383-Utah 010140, Utah 32083 and SL-068754. Areas within both the leases and the permit area are described as follows:

Township 14 South, Range 13 East, SLB&M, Utah

Section 1: SE1/4, SE1/4 SW1/4
Section 12: NW1/4, NE1/4, SE1/4, NE1/4 SW1/4 less the following described area:

Beginning at a point which bears S 1,320 ft from the NW corner of Section 12:

Thence S, 1,320 ft;
thence S 89° 55' 30" E, 1,327.01 ft;
thence S, 1,320 ft;
thence S 89° 53' 15" E, 1,327.22 ft;
thence S, 1,320 ft;
thence S 89° 51' E, 1,327.43 ft;
thence N 45° 05' 07" W, 5,623.40 ft to the point of beginning.

Section 13: Portions of NE1/4 NE1/4, E1/2 SE1/4, SW1/4 SE1/4, SE1/4 SW1/4, NE1/4 SW1/4, NW1/4 SW1/4, SW1/4 NW1/4 which are shown on Plate II-2 of the Mining and Reclamation Plan (MRP).

Section 24: S1/2 SE1/4, Portions of N1/2 NE1/4, SE1/4 NE1/4, N1/2 SE1/4 and NE1/4 SW1/4 which are shown on Plate II-2 of the MRP.

Section 14: Portions of NE1/4 which is shown on Plate II-2 of the MRP.
Section 11: Portions of SW1/4 SE1/4 which is shown on Plate II-2 of the MRP.
Section 25: NE1/4 NE1/4

Township 14 South, Range 14 East, SLB&M, Utah

Section 6: N1/2 SW1/4
Section 7: W1/2 SW1/4
Section 8: SW1/4, SW1/4 SE1/4
Section 17: W1/2 NW1/4, NE1/4 NW1/4, N1/2 SE1/4
Section 18: E1/2 NW1/4, NW1/4 NW1/4
Section 30: NW1/4 NW1/4, SE1/4 NW1/4, NE1/4 SW1/4, S1/2 SE1/4, NE1/4 SE1/4
Section 31: NW1/4 NE1/4

Carbon County Lease

Township 14 South, Range 14 East, SLM, Utah

Section 21: SE1/4
Section 27: SW1/4, SW1/4 NW1/4
Section 34: E1/2

Township 15 South, Range 14 East, SLM, Utah

Section 3: E1/2
Section 10: NE1/4

This legal description is for the permit area (as shown on Attachment A) of the Sunnyside Mine. The permittee is authorized to conduct underground coal mining activities and related surface activities on the foregoing described property subject to the conditions of all applicable conditions, laws and regulations.

Sec. 3 COMPLIANCE - The permittee will comply with the terms and conditions of the permit, all applicable performance standards and requirements of the State Program.

Sec. 4 PERMIT TERM - This permit becomes effective on January 20, 1991, and expires on January 20, 1996.

Sec. 5 ASSIGNMENT OF PERMIT RIGHTS - The permit rights may not be transferred, assigned or sold without the approval of the Director, Division. Transfer, assignment or sale of permit rights must be done in accordance with applicable regulations, including but not limited to 30 CFR 740.13{e} and R614-303-300.

Sec. 6 RIGHT OF ENTRY - The permittee shall allow the authorized representative of the Division, including but not limited to inspectors, and representatives of the Office of Surface Mining Reclamation and Enforcement (OSM), without advance notice or a search warrant, upon presentation of appropriate credentials, and without delay to:

(a) have the rights of entry provided for in 30 CFR 840.12, R614-400-220, 30 CFR 842.13 and R614-400-110;

(b) be accompanied by private persons for the purpose of conducting an inspection in accordance with R614-400-100 and R614-400-200 when the inspection is in response to an alleged violation reported to the Division by the private person.

Sec. 7 SCOPE OF OPERATIONS - The permittee shall conduct underground coal mining activities only on those lands specifically designated as within the permit area on the maps submitted in the approved plan and approved for the term of the permit and which are subject to the performance bond.

Sec. 8 ENVIRONMENTAL IMPACTS - The permittee shall take all possible steps to minimize any adverse impact to the environment or public health and safety resulting from noncompliance with any term or condition of the permit, including, but not limited to:

(a) Any accelerated or additional monitoring necessary to determine the nature and extent of noncompliance and the results of the noncompliance;

(b) immediate implementation of measures necessary to comply; and

(c) warning, as soon as possible after learning of such noncompliance, any person whose health and safety is in imminent danger due to the noncompliance.

Sec. 9 CONDUCT OF OPERATIONS - The permittee shall conduct its operations:

(a) in accordance with the terms of the permit to prevent significant, imminent environmental harm to the health and safety of the public; and

(b) utilizing methods specified as conditions of the permit by the Division in approving alternative methods of compliance with the performance standards of the Act, the approved Utah State Program and the Federal Lands Program.

Sec. 10 EXISTING STRUCTURES - As applicable, the permittee will comply with R614-301 and R614-302 for compliance, modification, or abandonment of existing structures.

Sec. 11 RECLAMATION FEE PAYMENTS - The operator shall pay all reclamation fees required by 30 CFR Part 870 for coal produced under the permit, for sale, transfer or use.

Sec. 12 AUTHORIZED AGENT - The permittee shall provide the names, addresses and telephone numbers of persons responsible for operations under the permit to whom notices and orders are to be delivered.

Sec. 13 COMPLIANCE WITH OTHER LAWS - The permittee shall comply with the provisions of the Water Pollution Control Act (33 USC 1151 et seq,) and the Clean Air Act (42 USC 7401 et seq), UCA 26-11-1 et seq, and UCA 26-13-1 et seq.

Sec. 14 PERMIT RENEWAL - Upon expiration, this permit may be renewed for areas within the boundaries of the existing permit in accordance with the Act, the approved Utah State Program and the Federal Lands Program.

Sec. 15 CULTURAL RESOURCES - If during the course of mining operations, previously unidentified cultural resources are discovered, the permittee shall ensure that the site(s) is not disturbed and shall notify the Division. The Division, after coordination with OSM, shall inform the permittee of necessary actions required. The permittee shall implement the mitigation measures required by Division within the time frame specified by Division.

Sec. 16 APPEALS - The permittee shall have the right to appeal as provided for under R614-300-200.

The above conditions (Secs. 1-16) are also imposed upon the permittee's agents and employees. The failure or refusal of any of these persons to comply with these conditions shall be deemed a failure of the permittee to comply with the terms of this permit and the lease. The permittee shall require his agents, contractors and subcontractors involved in activities concerning this permit to include these conditions in the contracts between and among them. These conditions may be revised or amended, in writing, by the mutual consent of the Division and the permittee at any time to adjust to changed conditions or to correct an oversight. The Division may amend these conditions at any time without the consent of the permittee in order to make them consistent with any federal or state statutes and any regulations.

THE STATE OF UTAH

By: Dianne R. Nielson

Date: 1-18-91

I certify that I have read, understand and accept the requirements of this permit and any special conditions attached.

Joe Fielder

Authorized Representative of the Permittee

Date: 1/24/91

APPROVED AS TO FORM:

By: _____
Assistant Attorney General

Date: 1/22/91

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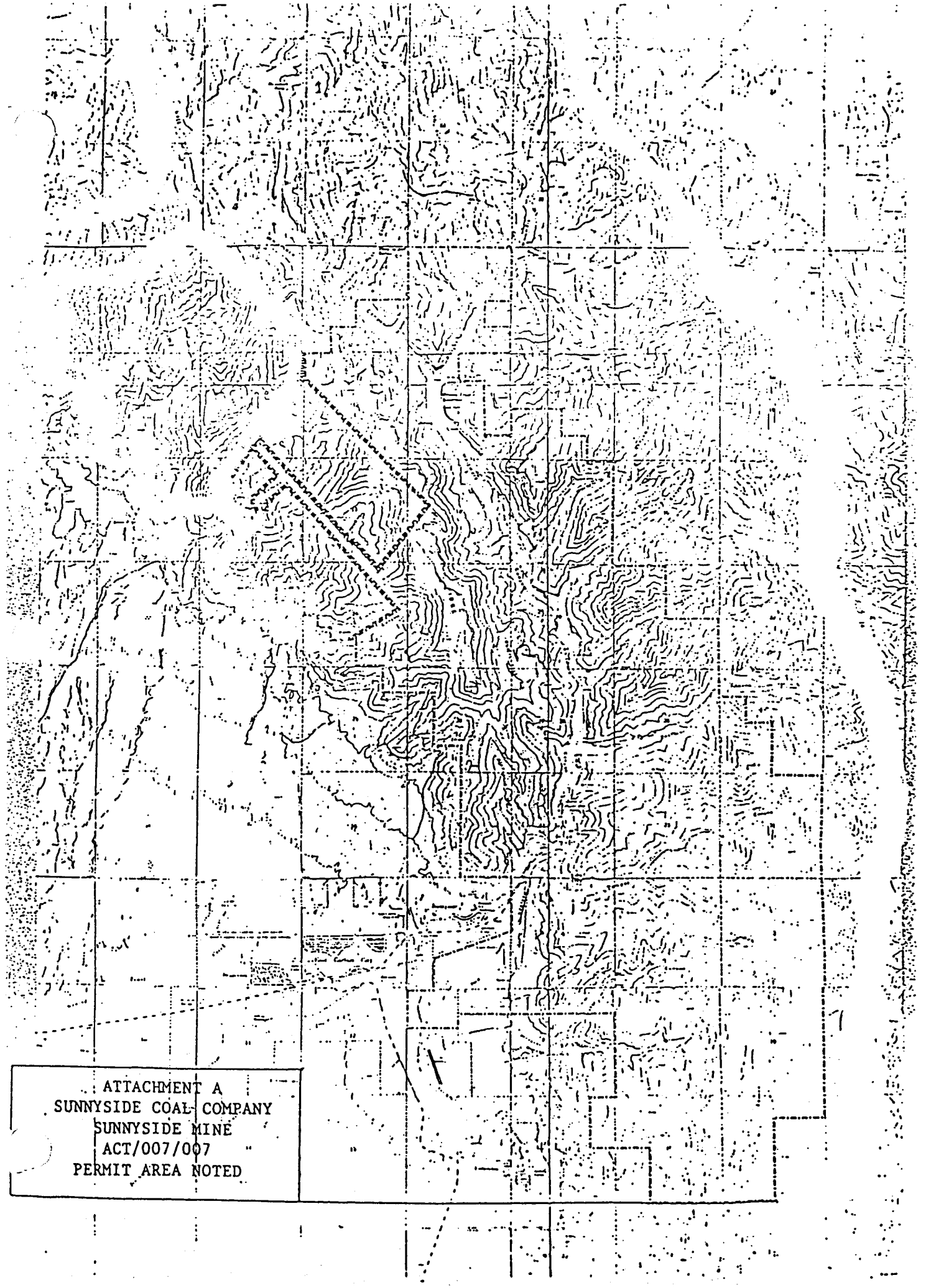

ATTACHMENT A
SUNNYSIDE COAL COMPANY
SUNNYSIDE MINE
ACT/007/007
PERMIT AREA NOTED