SUNNYSIDE COGENERATION ASSOCIATES
ACT/007/035
ANNUAL REPORT
1993

April 1994

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COAL MINING AND RECLAMATION OPERATIONS FOR 1993

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 Cogeneration Associates

Mine Name: Sunnyside Cogeneration Associates

Company Representative: Mr. David Pearce

Resident Agent: Mr. Fred Finlinson

Permit Number: ACT/007/035

MSHA ID Number: 1211-UT-09-01813-01

Date of Initial Permanent Program Permit: February 4, 1993

Date of Permit Renewal: February 4, 1998

Quantity of Coal Mined (tonnage) 1993: 266,731 tons

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SUNNYSIDE COGENERATION ASSOCIATES
1993 ANNUAL REPORT

A. GENERAL INFORMATION

Missing Data

In December, 1993, Sunnyside Cogeneration Associates (SCA) submitted a schedule which outlined the completion and submission of missing data and permit changes relevant to the SCA Permit Application Package (PAP). The schedule outlined completion dates for the twenty permit conditions issued to SCA at the time of the original permit approval. It also outlined a schedule for completion of additional information required by the Division. A copy of the schedule is included as **Exhibit One.**

Monitoring Changes

There have not been any changes to the approved water monitoring schedule since SCA began operations. The monitoring schedule currently being followed is included in Chapter Seven, Appendix 7-8 of the SCA PAP.

Recently, there have been discussions concerning the water quality of the Coarse Refuse Seep. As a result, a more rigorous monitoring schedule has been proposed for the seep area which will be implemented during 1994. The plan requires specific field parameters to be monitored on a weekly basis. It also includes a more extensive list of testing parameters for monthly samples that will be taken at three locations along the seep. The monitoring results will be reviewed every three months by the Division of Water Quality (DWQ) and will be adjusted accordingly based on the existing conditions at the seep.

Corrective Actions

Interim reclamation was accomplished on the coarse refuse lifts during November and December, 1993. The approved interim reclamation plan included covering the third and fourth lifts with 2 feet of reclamation cover and seeding them with the approved interim reclamation seed mixture included in Chapter Nine of the SCA PAP. The covering of the lifts was completed by December 31, 1993. The interim seeding was not accomplished during 1993 due to weather conditions that were not conducive to seeding. Seeding was accomplished during March, 1994.

During 1993, SCA reevaluated both the water monitoring program and the use of the East Slurry Cell in response to concern over the water quality at the coarse refuse seep. Recently, SCA drafted preliminary plans for a third slurry pond that would be constructed west of Slurry Pond #2. The third pond would be utilized instead of the East Slurry Cell. The construction of the third pond would be an attempt to eliminate the groundwater discharge into the seep which is believed to be originating in the East Slurry Cell. At this

time, the plans for the third pond are still in preliminary stages and further design has been postponed due to cessation of operatios at the Sunnyside Mine. SCA will notify the Division of any further progress.

B. SUMMARY OF WATER MONITORING DATA

Included with this report is a summary of the water monitoring that was accomplished for the Sunnyside Cogeneration Associates (SCA) Permit Site from June to December, 1993. The monitoring was performed by Huntingdon Chen-Northern (HCN) located in Salt Lake City, Utah. HCN provided all field data and analyses for the water monitoring, while Eckhoff, Watson, and Preator Engineering (EWP) coordinated with applicable agencies and filed current information on-site.

List of Monitoring Points And Locations

Baseline Water Monitoring Locations

The following table lists the baseline water monitoring locations along with their corresponding location ID and sampling elevation. **Plate A-2** shows the locations of each of the baseline water monitoring sites and **Appendix A** includes a summary of the water monitoring data. The Baseline Water Monitoring Schedule is included in Chapter Seven, Appendix 7-8, of the SCA PAP.

TABLE ONE
BASELINE WATER MONITORING LOCATIONS

SITE	LOCATION ID	SAMPLING ELEVATION
Coarse Refuse Seep at Source	CRS	6192
Coarse Refuse Seep at Boundary	CRB	6122
Icelander Columbia Dugway Spring 1350	F-2	6032
Icelander Creek	ICE-1	6182
East Carbon City Well (Municipal Use- Groundwater)	Well	N/A

Operational Water Monitoring Locations and UPDES Permit Information

The UPDES Permit issued to SCA is included in the SCA Permit Application Package (PAP) as Appendix 7-1. Table Two lists each of the operational (UPDES) monitoring stations and the corresponding outfall number, location, and sampling elevation. **Appendix A** includes a data summary for each of these sites and **Plate A-1** shows the approximate locations of the UPDES water monitoring sites. The Operational (UPDES) Water Monitoring Schedule is included in Chapter Seven, Appendix 7-8, of the SCA PAP.

TABLE TWO
OPERATIONAL (UPDES) WATER MONITORING LOCATIONS

SITE	OUTFALL NUMBER	LOCATION	SAMPLING ELEVATION
Clear Water Pond	004	Lat: 39° 32'52" Long: 110° 23' 11"	6520
Rail Cut Pond	007	Lat: 39° 32' 14" Long: 110° 23' 48"	6204
Old Coarse Refuse Road Pond	008	Lat: 39° 32' 20" Long: 110° 23' 03"	6491
Pasture Pond	009	Lat: 39° 32' 28" Long: 110° 23' 58"	6485
Coarse Refuse Toe Pond	012	Lat: 39° 32' 28" Long: 110° 23' 58"	6165
Borrow Area Pond	016	Lat: 39° 32' 25" Long: 110° 23' 45"	6513

Water Monitoring Summary

As stated above, **Appendix A** includes a summary of all operational (UPDES) and baseline water monitoring from June to December, 1993. In addition, as requested by DOGM, all water monitoring data is included as **Lotus files** on the enclosed disk labeled Disk 1.

C. PRECIPITATION OR OTHER CLIMATOLOGICAL DATA

SCA has obtained precipitation and climatological data for 1993 from the Utah Climatological Center based in Logan, Utah. This data is included as **Appendix B**. The 1993 climatological data is also included as an ASCII file on **Disk 2** labeled **1993 Sunnyside Climatological Data**. Previous climatological information is included in Appendix 7-2 of the SCA PAP.

The Air Quality Permit issued to SCA was modified on February 7, 1994 and a copy of the modified permit is included with this report as **Appendix G**.

D. SUBSIDENCE MONITORING REPORT

The Sunnyside Cogeneration Permit Area does not include any underground mines. Therefore, this section is not applicable.

E. VEGETATION DATA (test plots) and REVEGETATION SUCCESS MONITORING (includes interim and final)

Test Plot Monitoring Data

In the past, SCA has maintained a revegetation test plot area on the northeast side of the SCA Permit Site. Previously, the test plots were monitored annually by Mr. Patrick Collins of Mt. Nebo Scientific. **Appendix C** of this report includes the March, 1993 Sunnyside Coal Mine Vegetation Monitoring Report for the entire SCA Permit Site. The report addresses vegetation monitoring of seeded areas and test plot results for 1992 (a complete report of vegetation monitoring was not accomplished for 1993). The report includes a summary of the SCA and SCC Permit Sites in regards to revegetation success and establishment. The information contained within the report includes a discussion on methods, site descriptions (including photographs), a summary of results, actual field data, and recommendations (where applicable).

Qualitative Description of Interim and Final Vegetation

During 1993, minimal revegetation was accomplished within the SCA Permit Area. The areas that were revegetated were done so for the purposes of either erosion control or interim reclamation. These areas total approximately 0.14 acres (approximately 0.125 acres near the Railcut Pond and approximately 0.015 acres adjacent to the Old Coarse Refuse Road Pond) and are shown on **Plate A-3.**

The areas shown on **Plate A-3** were revegetated with the interim seed mixture included in the Sunnyside Coal Company (SCC) PAP. The seed mixture was approved by DOGM prior to its application and is included as **Exhibit Three**. Presently, the areas that were revegetated appear to be stable and do not show signs of excessive erosion. Photographs of these areas were taken on February 4, 1994 and are included as **Exhibit Two**.

Exhibit Four includes photographs of the coarse refuse lifts. At the time the photographs were taken, the third and fourth lifts of the coarse refuse pile had not yet been seeded, although, seeding was accomplished during March, 1994. The photographs show the the third and fourth lifts which are the areas that were seeded (areas that were covered with 2 feet of reclamation cover). The interim seed mix included as Figure 9-1 in Chapter Nine of the SCA PAP was utilized for seeding the third and fourth lifts of the coarse refuse pile. Seeding methods were in accordance with those outlined in Chapter Nine of the SCA PAP.

F. ANNUAL IMPOUNDMENT CERTIFICATION, (R645-301-514.312)

The SCA Permit Site currently has eight impoundment structures, two of which are slurry impoundments. Each of the structures was inspected quarterly during 1993 according to DOGM regulations and certified as to their present condition. **Appendix D** includes a certified maintenance inspection report for each impoundment. In addition, the inspection reports for the East Slurry Cell, the West Slurry Cell, and the Coarse Refuse Lifts were submitted to MSHA.

G. ANNUAL OVERBURDEN, SPOIL, AND REFUSE DATA

Refuse

During 1993, SCA utilized a combined total of 266,731 tons of coarse refuse and fines in the cogeneration facility. The coarse refuse was obtained from the coarse refuse pile according to the quality of coal as determined in the field. An Updated Mine Sequence Map will be submitted to the Division by May 15, 1994.

As part of the approved operating procedures, SCA also accepts coarse refuse and slurry from the Sunnyside Mine onto the SCA Permit Site. The material obtained from the Sunnyside Mine is delivered to the SCA Permit Site and placed in a designated area according to the quality of material, i.e. slurry is channeled to an approved slurry pond and the coarse refuse is placed in either Storage Area One or Storage Area Two. During 1993, SCC delivered an average of approximately 6,219 tons of slurry per month and an average of approximately 14,510 tons of coarse refuse per month to the SCA Permit Site. This totals approximately 248,750 tons of slurry and coarse refuse delivered to the SCA Permit Site from the Sunnyside Mine during 1993. A break down of these quantities is included as **Exhibit Five.**

Prior to being utilized in the cogeneration facility, the coarse refuse was tested for specific parameters to determine the quality of the material. Accurate test results are available for October through December, 1993 only. The results of these tests are included as **Appendix E.**

During 1993, coarse refuse has been excavated from the SCA Permit Site and utilized in the cogeneration facility. Presently, the amount of material that has been excavated and from what locations is undetermined. SCA is in the process of conducting an accurate survey of the site to determine quantities of refuse that have been removed from the site. The resulting information will allow SCA to provide an Updated Mine Sequence Map as required for this report. SCA expects to have this map completed by May 15, 1994.

Spoil

Currently, SCA has a designated disposal site for excess spoil (noncombustible) material. The site is approximately 6.5 acres and is located on the SCA Permit Site south of the coarse refuse lifts. During 1993, SCA accepted approximately 400 tons of spoil from the Sunnyside Mine which was placed within this disposal site. There was no spoil uncovered from the SCA Permit Site during 1993 which required disposal. When additional material is placed in the Spoil (Noncombustible) Disposal Site, whether it be from SCC or the SCA Permit Site, SCA commits to sampling as necessary.

Presently, SCA plans to conduct a thorough foundation investigation of the Spoil (Noncombustible) Disposal Site. The investigation will include drilling, sampling, and testing which will provide an accurate description of the physical characteristics of the site. When the investigation is complete, a more detailed plan for groundwater protection, mass stability, and sampling will be submitted to DOGM for approval.

H. ANNUAL REPORT OF OFFICERS SUBMITTED TO THE DEPARTMENT OF COMMERCE

The annual report of officers is included as **Appendix F.**

LIST OF EXHIBITS

Exhibit One, Schedule for Permit Completion
Exhibit Two, Photographs of the Revegetation Areas
Exhibit Three, Seed Mixture for Railcut Pond and Coarse Refuse Toe Pond Revegetation Areas
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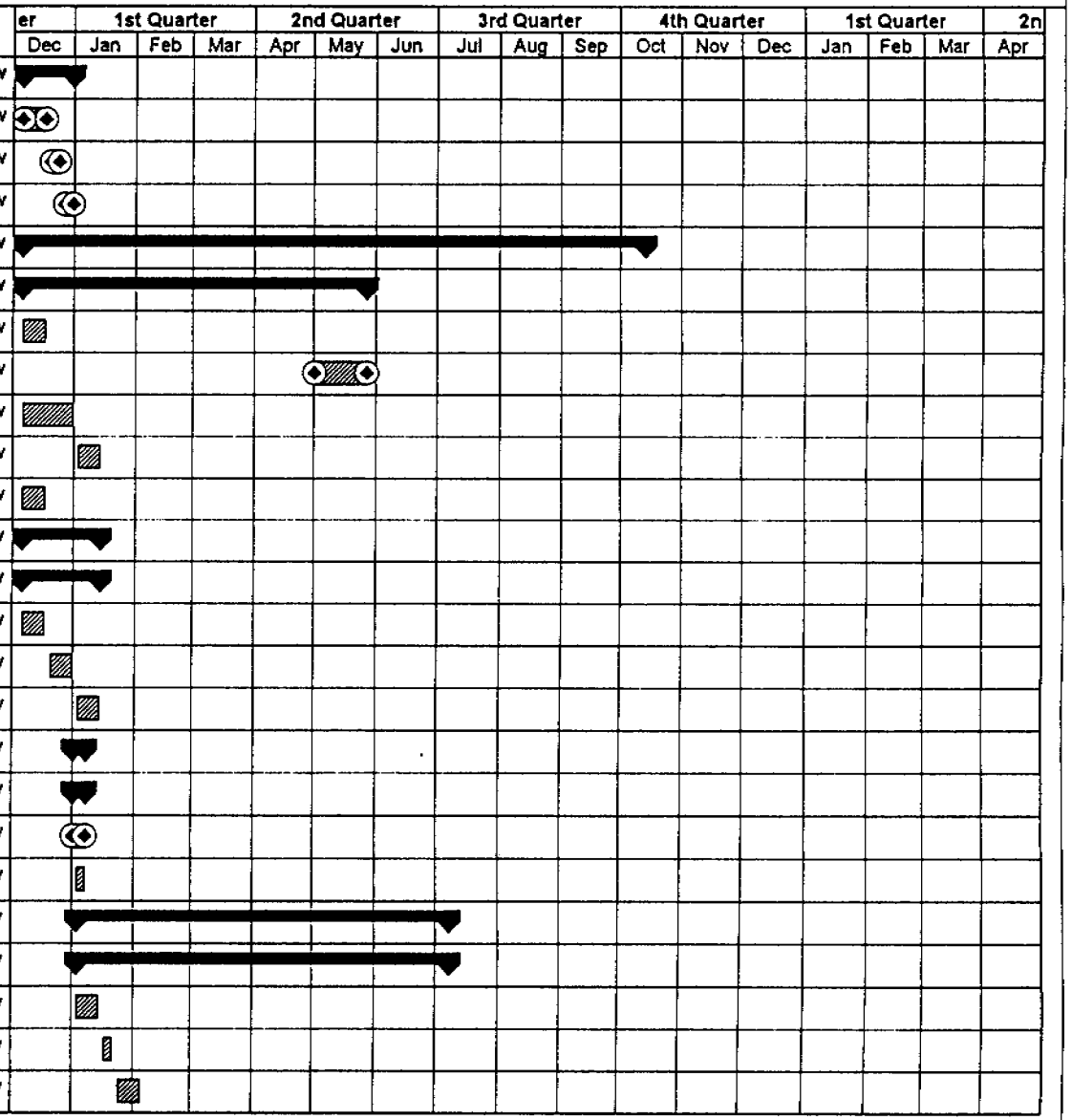
Exhibit One
Schedule for Permit Completion

SUNNYSIDE COGENERATION ASSOCIATES PAP COMPLETION
SCHEDULE/PROGRESS CONTROL
RESPONSE TO VIOLATION 93-13-2-1

ID	Name	Duration
1	**SCHEDULING OF PAP INFORMATION**	4w
2	PRLIMINARY SCHEDULE	2w
3	REVIEW WITH DOGM	1w
4	FINAL SCHEDULE - ABATEMENT OF VIOLATION 93-13-2-1	1w
5	**RESOURCE INFORMATION**	44.8w
6	**300 - BIOLOGY**	25w
7	DESCRIPTION OF RIPARIAN AREA 321.100	2w
8	SPRING FISH INVENTORY & REPORTING 322.200	4w
9	ENGINEERING SURVEY OF REFERENCE AREAS 323.100	4w
10	FINAL VEGETATION RESOURCE MAP	2w
11	MAP DELINEATING FISH INVENTORY LOCATIONS	2w
12	**400 - LAND USE & AIR QUALITY**	6w
13	**DISTURBED AREA MAPS**	6w
14	PRELIMINARY DISTURBED AREA MAPS	2w
15	FIELD VERIFY DISTURBED AREA	2w
16	FINAL DISTURBED AREA MAPS	2w
17	**500 - ENGINEERING**	1w
18	**INSPECTION SCHEDULE 514**	1w
19	REFUSE PILE 514.200	1w
20	IMPOUNDMENTS 514.300	1w
21	**600 - GEOLOGY**	26.8w
22	**TOXIC & ACID FORMING DATA**	26.8w
23	DRILLING PLAN	2w
24	REVIEW WITH DOGM	1w
25	FINAL DRILLING PLAN	2w



Project Manager: Alane E. Boyd
Date: 12/13/93
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Critical — Noncritical — Progress — Milestone — Summary — Rolled Up

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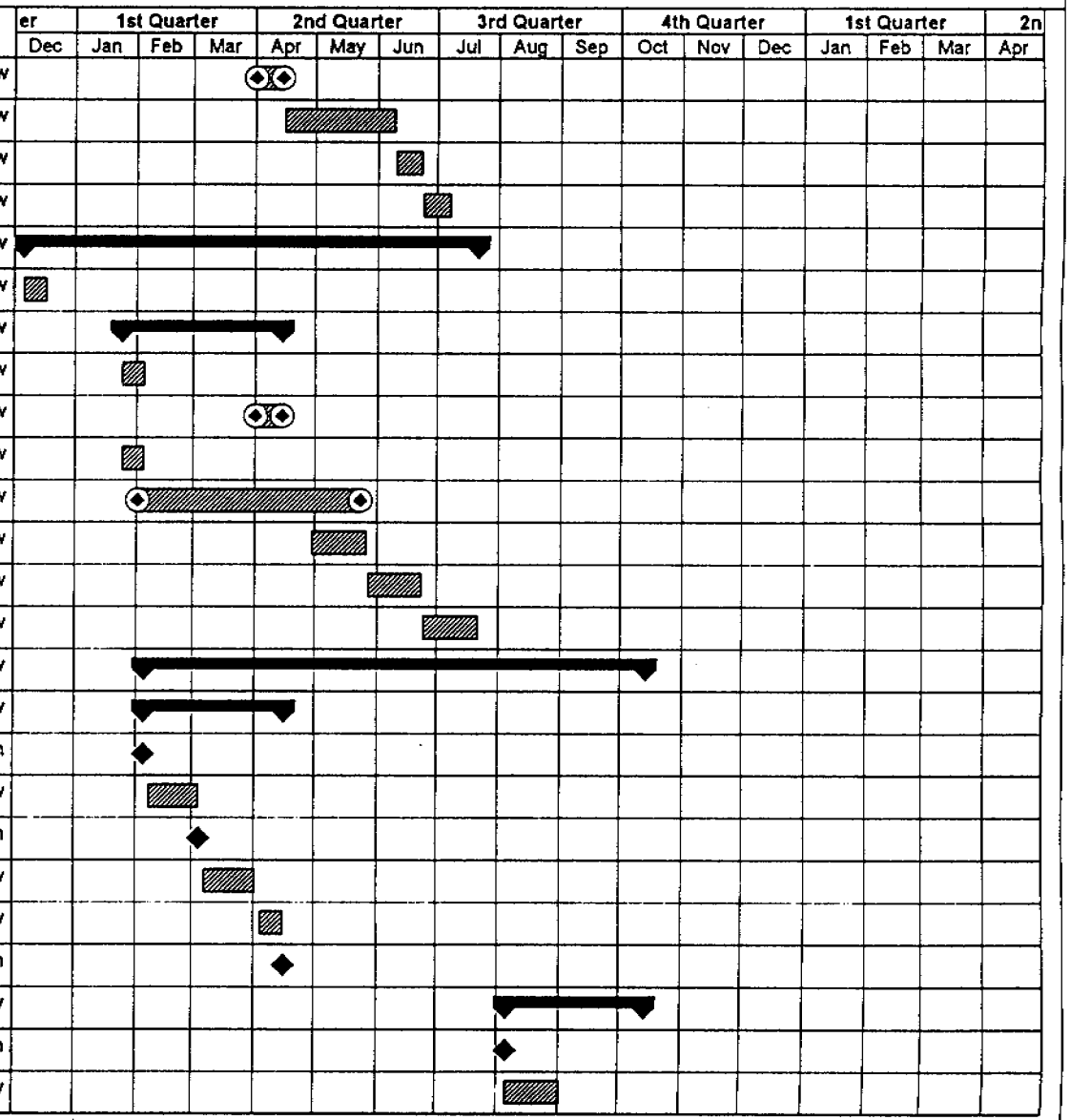
SUNNYSIDE COGENERATION ASSOCIATES PAP COMPLETION
SCHEDULE/PROGRESS CONTROL
RESPONSE TO VIOLATION 93-13-2-1

ID	Name	Duration
26	DRILLING (WEATHER DEPENDENT)	2w
27	SAMPLING	8w
28	ANALYSIS	2w
29	REPORTING	2w
30	700 - HYDROLOGY	32.8w
31	FINAL SED POND & DIVERSION DRAWINGS	2w
32	PEIZOMETERS	11.8w
33	LOCATION PLAN	2w
34	DRILLING (WEATHER DEPENDENT)	2w
35	SAMPLING PLAN	2w
36	GATHER FLOW DATA	16w
37	DETERMINE GROUNDWATER MOVEMENT	4w
38	MASS BALANCE CALCULATIONS	4w
39	PROBABLE HYDROLOGIC CONSEQUENCES	4w
40	RESOUCE INFORMATION SUBMITTALS	35.8w
41	SUBMITTALR.I. #1	10w
42	MEET WITH DOGM	0h
43	PREPARE DRAFT SUBMITTAL	4w
44	SUBMIT TO DOGM	0h
45	REVIEW BY DOGM	4w
46	INCORPORATE INTO PAP	2w
47	FINAL SUBMITTAL R.I.#1	0h
48	SUBMITTAL R.I.#2	10w
49	MEET WITH DOGM	0h
50	PREPARE DRAFT SUBMITTAL	4w



Project Manager: Alane E. Boyd
Date: 12/13/93
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SUNNYSIDE COGENERATION ASSOCIATES PAP COMPLETION
SCHEDULE/PROGRESS CONTROL
RESPONSE TO VIOLATION 93-13-2-1

ID	Name	Duration	er	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter			1st Quarter			2n
			Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
51	SUBMIT TO DOGM	0h										◆							
52	REVIEW BY DOGM	4w										▨							
53	INCORPORATE INTO PAP	2w											▨						
54	FINAL SUBMITTAL R.I.#2	0h											◆						

Project Manager: Alane E. Boyd
Date: 12/13/93
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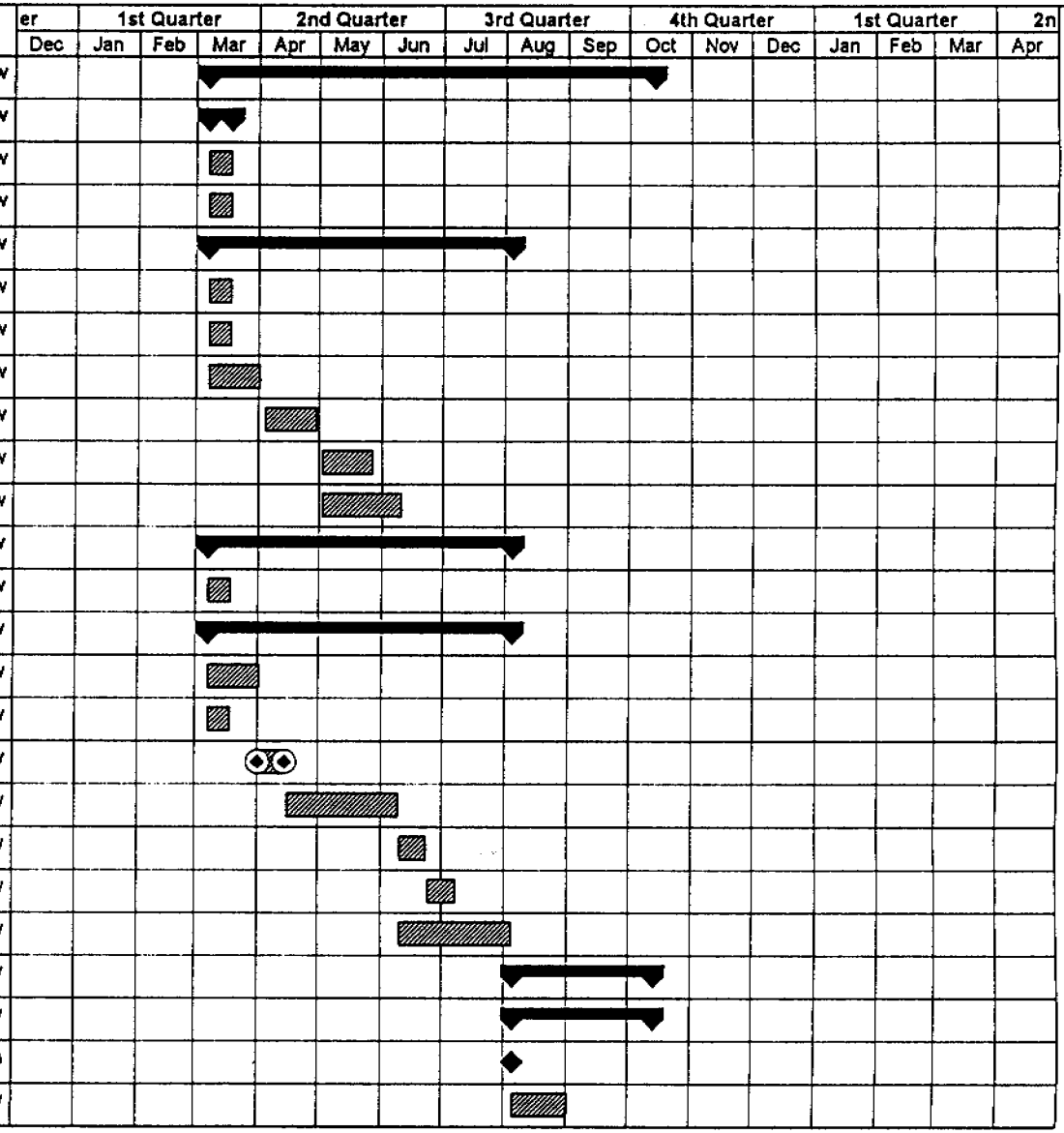
ECKHOFF, WATSON REATOR ENGINEERING

SUNNYSIDE COGENERATION ASSOCIATES PAP COMPLETION
SCHEDULE/PROGRESS CONTROL
RESPONSE TO VIOLATION 93-13-2-1

ID	Name	Duration
55	**OPERATION PLAN**	**31.8w**
56	**200 -SOILS**	**2w**
57	TOPSOIL HANDLING TESTING PLAN	2w
58	NARRATIVE DESCRIBING TOPSOIL HANDLING & STORAG	2w
59	**500 - ENGINEERING**	**21.8w**
60	PREVIOUSLY MINED AREAS MAP 521.112	2w
61	EXISTING SURFACE FEATURES MAP 521.120	2w
62	MINE SEQUENCING MAPS 521.141	4w
63	MINING METHODS DESCRIPTION 523	4w
64	MINE STRUCTURES & FACILITIES DESCRIPTION 526.110	4w
65	MINING QUANTITIES CALCULATIONS	6w
66	**HANDLING & DISPOSAL OF COAL MINE WASTE 528**	**21.8w**
67	BURNING & BURNED WASTE UTILIZATION PLAN 528.	2w
68	**SPOIL PLACEMENT PLAN 528.300**	**21.8w**
69	CONCEPTUAL PLANS	4w
70	DRILLING PLAN	2w
71	DRILLING (WEATHER DEPENDENT)	2w
72	SAMPLING	8w
73	ANALYSIS	2w
74	REPORTING	2w
75	WASTE SITE DESIGN DRAWINGS	8w
76	**OPERATION PLAN SUBMITTALS**	**10w**
77	**SUBMITTAL O.P.#1**	**10w**
78	MEET WITH DOGM	0h
79	PREPARE DRAFT SUBMITTAL	4w



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SUNNYSIDE COGENERATION ASSOCIATES PAP COMPLETION
SCHEDULE/PROGRESS CONTROL
RESPONSE TO VIOLATION 93-13-2-1

ID	Name	Duration	er	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter			1st Quarter			2n
			Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
80	SUBMIT TO DOGM	0h										◆							
81	REVIEW BY DOGM	4w																	
82	INCORPORATE INTO PAP	2w																	
83	FINAL SUBMITTAL O.P.#1	0h											◆						

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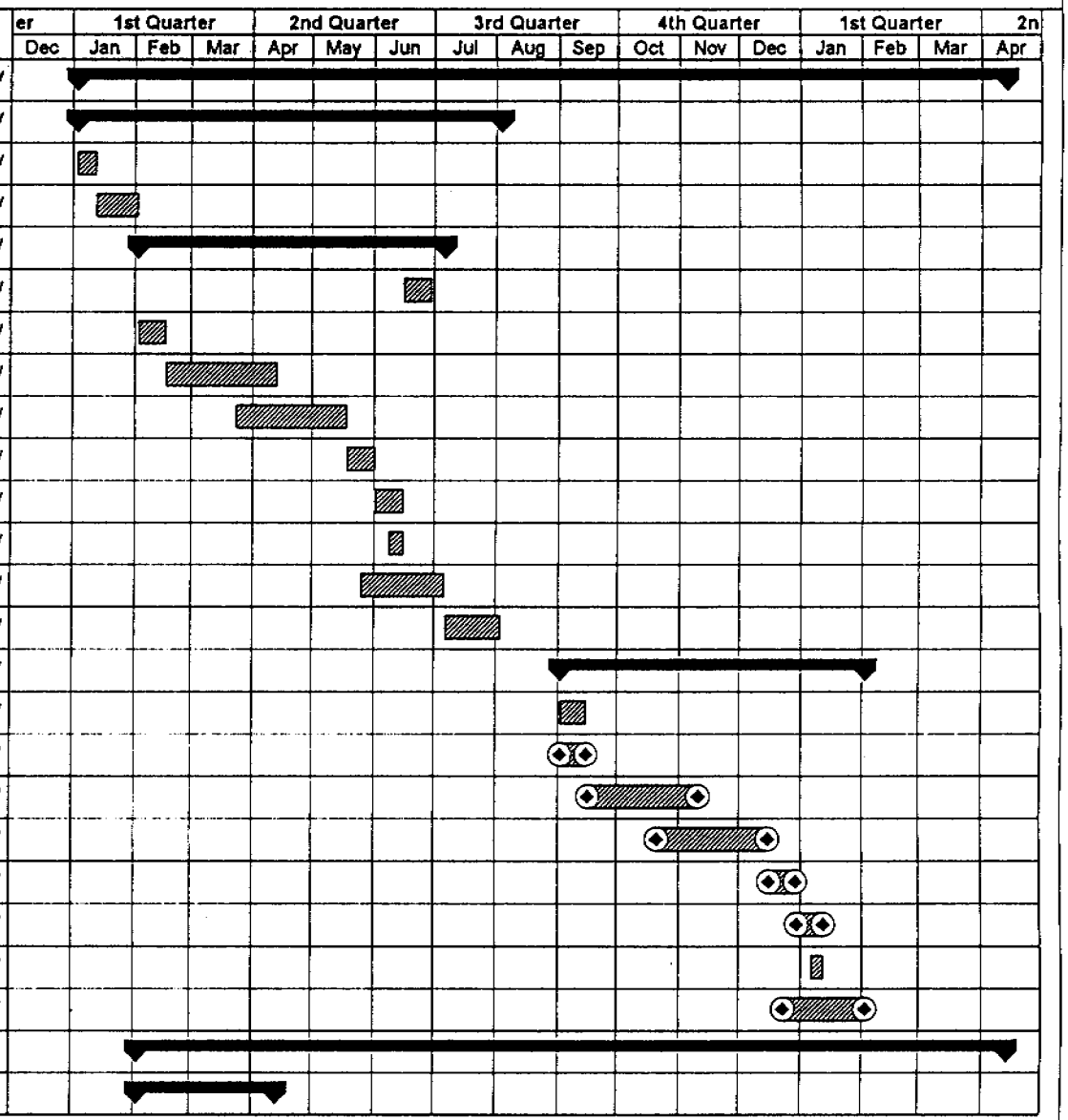
SUNNYSIDE COGENERATION ASSOCIATES PAP COMPLETION
SCHEDULE/PROGRESS CONTROL
RESPONSE TO VIOLATION 93-13-2-1

ID	Name	Duration
84	RECLAMATION PLAN	66.8w
85	WORST CASE SCENARIO RECLAMATION PLAN	30.5w
86	CONCEPTUAL PLAN	1.5w
87	CALCULATE DRAFT BOND QUANTITY	3w
88	FINAL WORST CASE SCENARIO RECLAMATION PLAN	22w
89	AREAS FOR BOND QUANTITIES	2w
90	PHASING PLAN	2w
91	DRAINAGE PLANS	8w
92	GRADING PLANS	8w
93	TOPSOIL PLAN	2w
94	SEEDING PLAN	2w
95	DETAIL SHEETS	1w
96	WORST CASE SCENARIO RECLAMATION TEXT	6w
97	FINAL BOND QUANTITIES	4w
98	FINAL RECLAMATION PLAN	22w
99	AREAS FOR CONTEMPORANEOUS RECLAMATION	2w
100	PHASING PLAN	2w
101	DRAINAGE PLANS	8w
102	GRADING PLANS	8w
103	TOPSOIL PLAN	2w
104	SEEDING PLAN	2w
105	DETAIL SHEETS	1w
106	FINAL RECLAMATION PLAN TEXT	6w
107	RECLAMATION PLAN SUBMITTALS	62.3w
108	SUBMITTAL OF DRAFT BOND	10w



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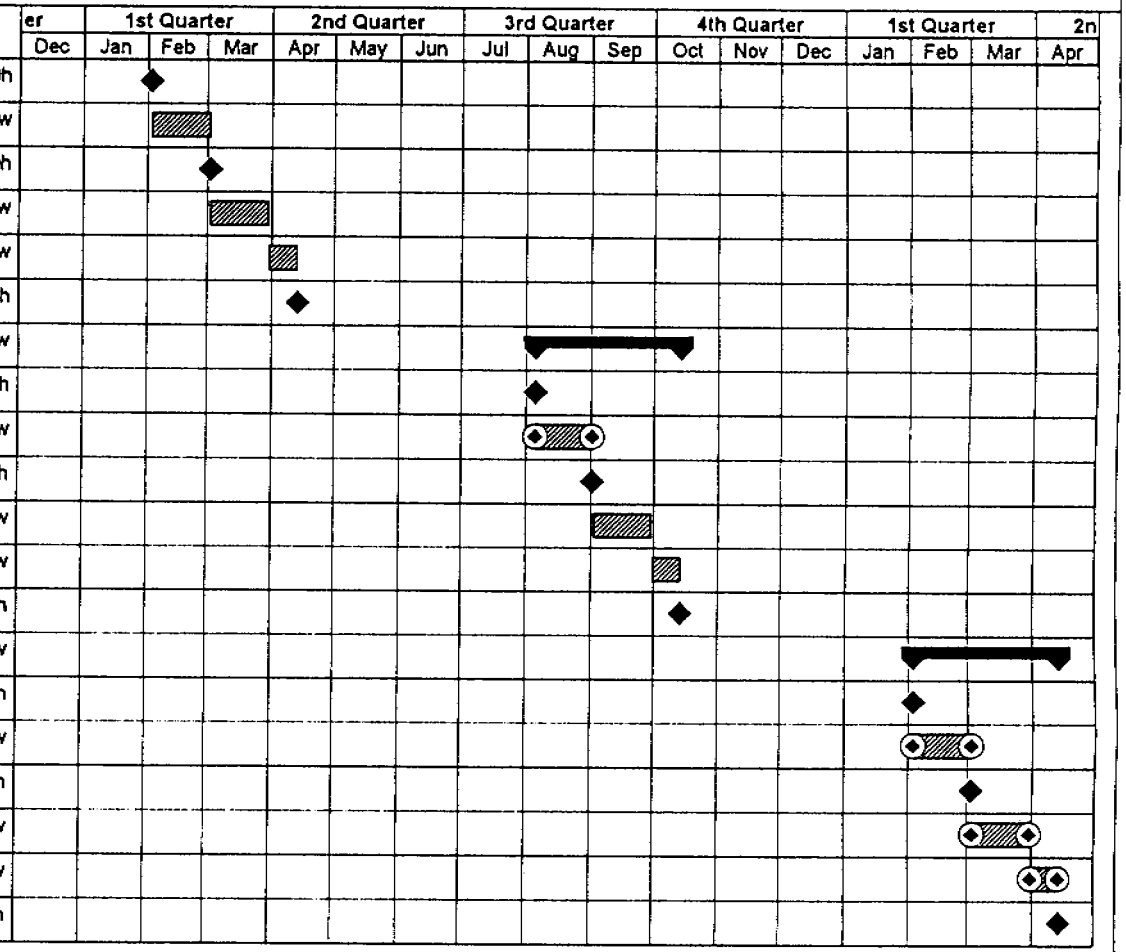
SUNNYSIDE COGENERATION ASSOCIATES PAP COMPLETION
SCHEDULE/PROGRESS CONTROL
RESPONSE TO VIOLATION 93-13-2-1

ID	Name	Duration
109	MEET WITH DOGM	0h
110	PREPARE DRAFT SUBMITTAL	4w
111	SUBMIT TO DOGM	0h
112	REVIEW BY DOGM	4w
113	INCORPORATE INTO PAP	2w
114	FINAL SUBMITTAL OF DRAFT BOND	0h
115	SUBMITTAL WORST CASE SCENARIO	10w
116	MEET WITH DOGM	0h
117	PREPARE DRAFT SUBMITTAL	4w
118	SUBMIT TO DOGM	0h
119	REVIEW BY DOGM	4w
120	INCORPORATE INTO PAP	2w
121	FINAL SUBMITTAL FOR WORST CASE	0h
122	SUBMITTAL FINAL RECLAMATION PLAN	10w
123	MEET WITH DOGM	0h
124	PREPARE DRAFT SUBMITTAL	4w
125	SUBMIT TO DOGM	0h
126	REVIEW BY DOGM	4w
127	INCORPORATE INTO PAP	2w
128	FINAL SUBMITTAL FOR FINAL RECLAMATION	0h



Project Manager: Alane E. Boyd
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File: SUNNYII.MPP

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ECKHOFF, WATSON a REATOR ENGINEERING

Exhibit Two
Photographs of the Revegetation Areas

EXHIBIT TWO
REVEGETATION AREAS
(Coarse Refuse Toe Pond)

EXHIBIT TWO (cont.)
REVEGETATION AREAS
(Railcut Pond)

Exhibit Three
Seed Mixture for the Railcut Pond and Coarse Refuse Toe Pond Revegetation Areas

EXHIBIT THREE

SUNNYSIDE COAL COMPANY
INTERIM SEED MIXTURE
USED FOR THE
SUNNYSIDE COGENERATION ASSOCIATES PERMIT AREA
(RAILCUT POND AND COARSE REFUSE TOE POND)

SPECIES	Seeds/Pound	Drill Rate #PLS/acre	Broadcast Rate #PLS/acre
Agropyron intermedium intermediate wheatgrass	93,000	3.5	5.3
Agropyron smithii western wheatgrass	110,000	4.0	5.9
Agropyron trichophorum pubescent wheatgrass	90,000	2.4	3.6
Agropyron trachycalum slender wheatgrass	135,000	3.2	4.8
Agropyron dasystachum thickspike wheatgrass	186,000	1.2	1.8
Elymus cinereus great basin wildrye	130,000	2.5	3.77
Sanguisorba minor small burnett	55,000	2.0	3.0
Achillea lanulosa western yarrow	4,123,635	0.1	0.1
Onobrychis viciaefolia sainfoin	30,000	3.63	5.44
TOTAL #PLS		**22.5**	**33.7**

Exhibit Four
Photographs of the Coarse Refuse Lifts

EXHIBIT FOUR

COARSE REFUSE LIFTS
(prior to being revegetated)

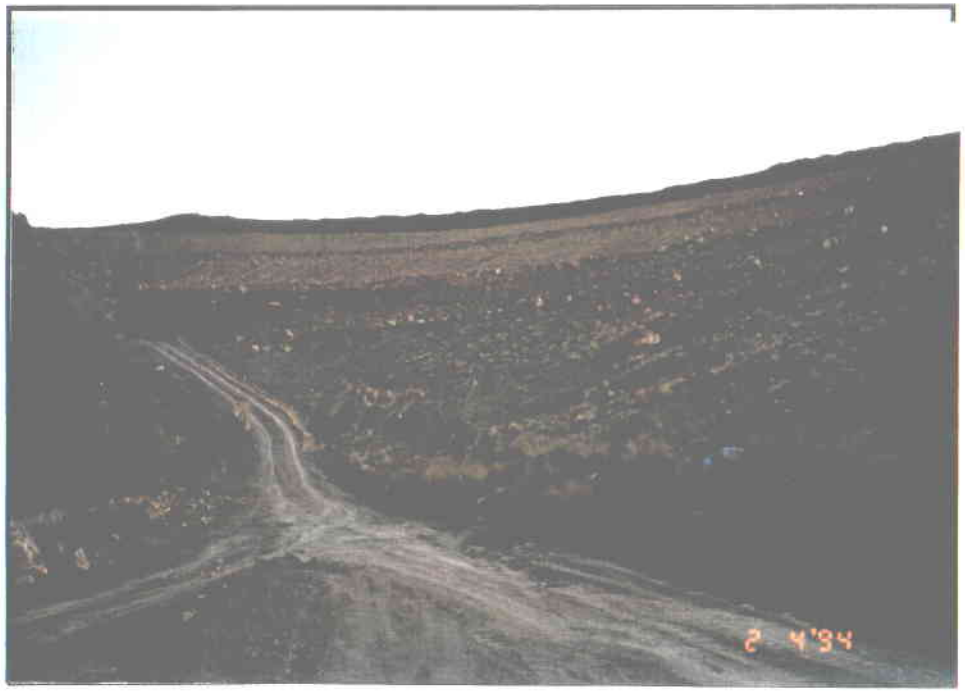

Exhibit Five
1993 Total Monthly Coarse Refuse and Slurry Quantities from the Sunnyside Mine

EXHIBIT FIVE					
1993 TOTAL MONTHLY COARSE REFUSE AND SLURRY QUANTITIES					
FROM THE SUNNYSIDE MINE					
3/22/94 16:25					
1993	*Total R.O.M. (Raw)	*Total Washed	**Total Quantity of Mat'l Delivered	***Total Coarse	****Total Slurry
Month	Coal Produced	Coal Produced	to the SCA Permit Site	Refuse (70%)	(30%)
January	23,365	21,474	1,891	1,324	567
February	10,964	10,880	84	59	25
March	81,238	62,726	18,512	12,958	5,554
April	69,561	52,233	17,328	12,130	5,198
May	79,847	63,052	16,795	11,757	5,039
June	91,571	70,239	21,332	14,932	6,400
July	60,357	42,772	17,585	12,310	5,276
August	63,956	41,061	22,895	16,027	6,869
September	86,437	51,637	34,800	24,360	10,440
October	114,662	71,507	43,155	30,209	12,947
November	69,682	41,592	28,090	19,663	8,427
December	75,007	48,724	26,283	18,398	7,885
TOTAL			248,750	174,125	74,625
MONTHLY AVERAGE			20,729	14,510	6,219
*Total Quantity of Run of Mine Coal and Washed Coal Produced was obtained from Sunnyside Mine					
**Total Quantity of Material Delivered to the SCA Permit Site equals the difference					
between Total R.O.M. Coal and Total Washed Coal					
***Total Coarse Refuse is approximately 70% of the Total Quantity of Material					
****Total Slurry is approximately 30% of the Total Quantity of Material					

LIST OF APPENDICES

Appendix A, 1993 Operational (UPDES) and Baseline Water Monitoring Data Summary
Appendix B, Precipitation and Climatalogical Data for 1993
Appendix C, March, 1993 Sunnyside Coal Mine Vegetation Monitoring Report
Appendix D, Certified Maintenance Inspection Reports for Impoundments
Appendix E, Testing Results of Coarse Refuse Material
Appendix F, Annual Report of Officers (Department of Commerce)
Appendix G, Division of Air Quality, Modified Approval Order for Cogeneration Plant, Sunnyside Mine

Appendix A
1993 Operational (UPDES) and Baseline Water Monitoring Data Summary

Huntingdon
Consulting Engineers Environmental Scientists

Chen-Northern, Inc.

1127 West 2320 South, Suite B
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(801) 972-4787
Fax: (801) 972-4552

Prepared For:

ECKHOFF, WATSON and PREATOR ENGINEERING
1121 East 3900 South, Suite C 100
Salt Lake City, Utah 84124

ANNUAL WATER QUALITY REPORT
MONITORING PERIOD: June through December, 1993
DOGM PERMIT BOUNDARY WATER QUALTIY
MONITORING PLAN
SUNNYSIDE COGENERATION FACITY

Prepared By:

HUNTINGDON CHEN-NORTHERN
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SALT LAKE CITY, UTAH 84119

HCN Job No. 5-137.4-91

February 28, 1994

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February 28, 1994

Eckhoff, Watson and Preator Engineering
1121 East 3900 South, Suite C 100
Salt Lake City, Utah 84124

Attention: Ms. Alane Boyd
Ms. Jessica Smith

Subject: Annual Water Quality Report
Monitoring Period: June through December, 1993
DOGM Permit Boundary Water Quality Monitoring Plan
Sunnyside Cogeneration Facility
HCN Job No. 5-137.4-91

Dear Ms. Boyd and Ms. Smith:

This letter report includes a summary and interpretation of water quality monitoring data collected during 1993 as part of the Sunnyside Cogeneration Facility DOGM Permit Boundary Water Quality Monitoring Plan (monitoring plan). The monitoring plan includes quarterly collection of water quality samples and monthly collection of field parameter data at five monitoring locations, and inspection and sample collection at the Sunnyside Cogeneration Facility (SCF) UPDES permit outfall locations. The monitoring locations are listed in Table 1. Huntingdon Chen-Northern (HCN) is responsible for collecting the required water quality samples and field parameter data. HCN initiated the monitoring plan in June, 1993 by collecting the first round of water quality samples. This report covers the monitoring period of June through December, 1993.

The monthly field-parameter data collected during the monitoring period is presented as Table 2. HCN collected the quarterly water-quality samples on June 29 and 30, and October 26, 1993. Immediately after collection, the water samples were filtered and preserved (when necessary), placed on ice in a cooler and delivered under chain of custody documentation to the Utah certified HCN laboratory in Billings, Montana. The analytical laboratory results are summarized in Table 3. The field-parameter data sheets, analytical laboratory reports and chain of custody documentation are included as Attachment A.

Of the UPDES permit outfalls covered under the monitoring plan, only Outfall 004 (Coal Runoff Basin) discharged effluent during the above referenced monitoring period. The field data sheets documenting the UPDES permit outfall inspections, analytical laboratory reports and chain of custody documentation are included as Attachment B.

February 28, 1994

Annual Monitoring Report
Monitoring Period: June through December, 1993
DOGM Permit Boundary Water Quality Monitoring Plan
Sunnyside Cogeneration Facility

HCN hydrogeologists reviewed the analytical laboratory data and field-parameter data obtained during 1993 to evaluate any trends or anomalies in the water chemistry at the monitoring locations. The interpretations detailed below should be considered qualitative due to the limited data set (two-quarterly water quality monitoring events, and seven-months of field parameter data collection).

The following objectives were considered during this evaluation:

- Evaluate the different water chemistry types present at the individual monitoring locations (comparing the water chemistries of Icelander Creek and the Draegerton Well locations for example);

- Determine any changes in water chemistry over time for each location (comparing the water chemistry of Icelander Creek in June and October, 1993 for example);

- Locate and define any anomalous analytical laboratory data or field parameter data; and

- Perform a quality assurance evaluation of the collected data to identify and resolve any sample collection or analytical laboratory errors.

To evaluate the different water chemistry types present at the SCF site and determine any changes in water chemistry at each location over time, major ion data for the quarterly sampling events were plotted on Stiff and Piper diagrams. Due to lack of discharge, major ion chemistry data is not available for the Coal Runoff Basin monitoring location for the June, 1993 data set. The Coal Runoff Basin major ion chemistry data for the monitoring period of April, 1993 is included in this evaluation to provide a frame of reference for this monitoring location.

Stiff plots produce a graphical representation of major ion distributions within a given sample in the form of a single polygon. Stiff plots are a useful tool in mapping different water chemistry types and identifying major changes in water chemistry by defining and evaluating water chemistry changes both over time and between different sampling points. The Stiff plots are included as Attachment C.

Piper diagrams consist of a graphic representation of major-ion distributions and combinations using combined trilinear graphs. Piper diagrams can accommodate data from an individual or large number of water samples, and can be used to determine water chemistry trends and to interpret water chemistry types. The Piper plots are included as Attachment D. The results of each water chemistry plotting method are detailed below, followed by an interpretation of the findings.

A review of the Stiff plots produced for the quarterly monitoring events indicates three groupings of water chemistry:

- Water containing a "balanced" chemistry of sodium and sulfate, and relatively moderate amounts of magnesium, associated with Icelander Creek, F-2 Spring and the Draegerton Well monitoring locations;

- Water rich in sulfate, magnesium, sodium and calcium associated with the Coarse Refuse Seep monitoring locations;

- Water deficient in magnesium and containing substantial amounts of sodium associated with the Coal Runoff Basin (UPDES Outfall 004) monitoring location.

An evaluation of the Piper diagrams reveals three clusters of data points on the cation-trilinear and diamond-graph portions of the diagram, supporting the three water chemistry groupings noted in the Stiff plots. Only the Icelander Creek and F-2 Spring monitoring locations exhibit noticeable changes in major ion chemistry between the June and October, 1993 sampling events. These chemistry changes are similar in ion chemistry and magnitude indicating a strong communication between the two monitoring locations. The changes consist of a decrease in sulfate and magnesium concentrations at both monitoring locations. The cause is unknown. The Piper diagrams indicate a consistent major-ion chemistry for each of the remaining monitoring locations over the monitoring period.

In conjunction with the three water chemistry groupings evident in the Stiff plots and Piper diagrams, an examination of the field parameter data indicates the water at the Coarse Refuse Seep monitoring locations is higher in specific conductivity and lower in dissolved oxygen than the remaining monitoring locations. In addition to the field parameter differences, the analytical laboratory results reveal the Coarse Refuse Spring monitoring locations also contain substantially higher concentrations of total dissolved solids (a direct reflection of the elevated sulfate, magnesium, sodium and calcium ion concentrations indicated earlier).

The analytical laboratory results and field parameter data further define the differences between the two Coarse Refuse Seep monitoring locations. The upstream monitoring location (Coarse Refuse Seep Source) is characterized by water temperatures consistently in excess of 23 degrees celsius, while the water temperatures of the downstream monitoring location (Coarse Refuse Seep Boundary) are consistently within the range of the remaining monitoring locations. The analytical laboratory results indicate the Coarse Refuse Seep Source monitoring location typically contains concentrations of total and dissolved iron and manganese three-orders of magnitude higher than the remaining monitoring locations. The dissolved oxygen concentrations at the Coarse Refuse Seep Source location are typically less than 50 percent of the remaining monitoring locations.

The elevated concentrations of sulfate, magnesium, sodium, calcium, total dissolved solids, and total and dissolved iron and manganese appear to be the result of leaching of the Coarse Refuse material consisting primarily of waste coal and rock in direct contact with the Mancos Shale. The elevated concentrations of iron and sulfate can likely be attributed to the oxidation of pyrite contained within the Coarse Refuse material. The elevated temperatures and low levels of dissolved oxygen at the Coarse Refuse Seep Source monitoring location are likely the result of historical coal-fires within the Coarse Refuse Pile. Oxidation of pyrite contained in the coarse refuse material would also consume oxygen present in the water, lowering the amount of dissolved oxygen.

The Coal Runoff Basin (UPDES Outfall 004) effluent is derived from the coal wash-down and de-sliming processes of the Sunnyside Coal Company mine located directly east of the Sunnyside Cogeneration Facility. The sodium concentrations contained in water at the Coal Runoff Basin monitoring location (referenced in the evaluation of the Stiff plots and Piper diagrams) are likely the result of the wash-down and desliming processes. The sodium concentrations present in the Coal Runoff Basin effluent do not appear to be of environmental concern and are merely referenced in this report as a distinguishing water chemistry feature.

Anomalous analytical laboratory data, such as the ion concentrations associated with the Coarse Refuse Seep monitoring locations, were confirmed with the HCN analytical laboratory. Two analytical laboratory data deficiencies occurred during the 1993 monitoring period:

- Potassium was not analyzed for during the October, 1993 sampling round; and
- Incorrect analyte concentrations were reported for total and dissolved iron and manganese at the Coarse Refuse Boundary monitoring location for October, 1993.

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Annual Monitoring Report
Monitoring Period: June through December, 1993
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The lack of potassium analyses is the result of miscommunication between the HCN field personnel that collected the sample and HCN laboratory personnel. Although "common ions" were indicated for analysis on the monitoring plan samples collected during the October, 1993 sampling round the laboratory personnel failed to perform the potassium analyses due to an incomplete parameter list shipped with the samples. HCN apologizes for this omission, and has resolved the matter by clarifying all monitoring plan parameters with the HCN laboratory manager and all field staff associated with this project.

It should be noted that both Stiff plots and Piper diagrams consider potassium data in their function. To enable accurate comparisons of the monitoring data, and remove any bias that may be caused by omitting potassium values for one data set, all potassium concentrations were considered 0 (zero) for the purpose of Stiff plots and Piper diagrams. This decision did not affect the basic shapes of the Stiff plots or alter the patterns of the Piper diagrams, given the low concentrations of potassium present at the site (typically less than 15 mg/l)

The incorrect analyte concentrations for total and dissolved iron and manganese are the result of improper sample handling on the part of the field technician that collected the samples during the October, 1993 sampling round. The field technician was not intimately familiar with the standard operating procedures for collecting and preparing water samples for metals analysis. Unfortunately this error was not discovered until the samples had been disposed of by the HCN laboratory, and the samples could not be reanalyzed. HCN apologizes for this error. In response to this error, all field staff involved with the project have been familiarized with the standard operating procedure for collecting and preparing water samples for metals analysis.

As referenced in quarterly reports and additional correspondence with EWP personnel during 1993, the lack of accurate measuring flow devices at the Coarse Refuse Seep monitoring locations has resulted in the visual estimation of flow rates at these locations. It is our understanding that EWP is currently preparing to install weir-boxes at the Coarse Refuse Seep monitoring locations. Installation of these devices will enable HCN and EWP personnel to accurately record the flow rate at the Coarse Refuse Seep monitoring locations, and aid in future interpretations of water chemistry data. Flow rates at the remaining monitoring locations are currently obtained either using a stopwatch and calibrated container, or digital open-channel flow meter.

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I have included a copy of the 1993 analytical laboratory data and field parameter data in LOTUS 123 format on high-density diskette. If you have any questions concerning this report contact Chuck Wemple or Greg McDonald at (801) 972-4787.

Sincerely;

Huntingdon Chen-Northern

Chuck Wemple
Hydrogeologist

cc Mr. David Pearce, Environmental Power Corporation
Mr. Ed Ghantous, Parsons MAIN
Mr. Kendall Reed, Tampella Services, Inc., Sunnyside Cogeneration Facility
Mr. Brian Burnett, Calister, Duncan and Nebeker
Mr. Ken Wyatt, State of Utah, Division of Oil, Gas and Mining

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TABLE 1

Compliance Monitoring Locations

Sunnyside Cogeneration Associates Facility
Sunnyside, Utah

DOGM Permit Boundary Water Quality Monitoring Plan

DOGM UPDES Permit Monitoring Locations
Outfall 004, Coal Runoff Basin Outfall 007, Rail Cut Pond Outfall 008, Old Coarse Refuse Pond Outfall 009, Pasture Pond Outfall 012, Coarse Refuse Toe Outfall 013, Facility Sediment Pond Outfall 014, Coal Pile Runoff Pond Outfall 015, Landfill Sediment Pond Outfall 016, Borrow Area Pond
DOGM Baseline Water Quality Monitoring Locations
ICE–1, Icelander Creek F–2, Whitmore Springs CRS, Coarse Refuse Seep–Source CRB, Coarse Refuse Seep–Boundary WELL–1, Draegerton Well

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TABLE 2

Field Parameter Data 1993

Sunnyside Cogeneration Associates Facility

Sunnyside, Utah

DOGM Permit Boundary Water Quality Monitoring Plan

		June 30, 1993					July 27, 1993					August 26, 1993				
		Field Parameters					Field Parameters					Field Parameters				
Monitoring Location	Location I.D.	Temp. (C)	pH (s.u.)	SC (umhos)	Dissolved Oxygen (ug/l)	Flow Rate (gpm)	Temp. (C)	pH (s.u.)	SC (umhos)	Dissolved Oxygen (ug/l)	Flow Rate (gpm)	Temp. (C)	pH (s.u.)	SC (umhos)	Dissolved Oxygen (ug/l)	Flow Rate (gpm)
elander Creek	ICE-1	29	8.08	2200	7.4	85	23	8.17	2300	6.2	200	16	7.18	2200	7.2	120
olumbia Dugway Spring	F-2	25	8.4	2300	7.8	100	23	8.02	1900	5.9	90	15	7.18	2150	6.2	100
oarse Refuse Seep Source	CRS	32	6.77	4600	6.2	30*	28	7.25	3200	2.4	30*	25	6.81	2800	3.4	40*
oarse Refuse Seep Boundary	CRB	26	7.6	4300	8.1	30*	21	7.87	4600	5.0	30*	18.5	6.5	2450	5.4	60*
raegerton Well	Well-1	16	7.8	1800	7.2	50	17	8.18	3100	5.8	50	12	6.77	920	4.9	50
oal Runoff Basin	Outfall 004	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
ail Cut Pond	Outfall 007	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
ld Coarse Refuse Pond	Outfall 008	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
asture Sediment Pond	Outfall 009	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
oarse Refuse Toe Pond	Outfall 012	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
orrow Area Pond	Outfall 016	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

		September 2, 1993					October 27, 1993					November 16, 1993				
		Field Parameters					Field Parameters					Field Parameters				
Monitoring Location	Location I.D.	Temp. (C)	pH (s.u.)	SC (umhos)	Dissolved Oxygen (ug/l)	Flow Rate (gpm)	Temp. (C)	pH (s.u.)	SC (umhos)	Dissolved Oxygen (ug/l)	Flow Rate (gpm)	Temp. (C)	pH (s.u.)	SC (umhos)	Dissolved Oxygen (ug/l)	Flow Rate (gpm)
elander Creek	ICE-1	20.0	8.23	2150	5.4	150	3.3	8.50	1200	6.0	150	5.0	8.48	1800	5.6	150
olumbia Dugway Spring	F-2	17.0	7.54	2100	6.4	100	1.5	8.30	1200	7.0	100	5.3	8.49	1300	6.2	100
oarse Refuse Seep Source	CRS	28.0	7.12	4600	1.9	40*	23.0	6.98	4700	3.5	40*	23.2	6.86	4850	2.1	50*
oarse Refuse Seep Boundary	CRB	20.0	7.92	4150	4.9	40*	8.3	7.50	3400	6.0	40*	7.9	7.10	3300	5.5	40*
raegerton Well	Well-1	15.0	7.10	1450	5.2	46	7.0	8.00	1300	4.5	50	10.0	7.27	1300	4.6	50
oal Runoff Basin	Outfall 004	12.0	8.09	2900	5.9	49	7.9	8.44	1250	6.5	97	4.2	8.90	1250	6.1	97
ail Cut Pond	Outfall 007	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
ld Coarse Refuse Pond	Outfall 008	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
asture Sediment Pond	Outfall 009	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
oarse Refuse Toe Pond	Outfall 012	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
orrow Area Pond	Outfall 016	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

ote:

A. indicates that data is not available due to lack of discharge.

ow rates were m ed using a calibrated container and stopwatch method, unless marked w *.

TABLE 2 (continued)

Field Parameter Data 1993

Sunnyside Cogeneration Associates Facility

Sunnyside, Utah

DOGM Permit Boundary Water Quality Monitoring Plan

Monitoring Location	Location I.D.	December 9, 1993 Field Parameters				
		Temp. (C)	pH (s.u.)	SC (umhos)	Dissolved Oxygen (ug/l)	Flow Rate (gpm)
Icelander Creek	ICE-1	4.8	8.49	1800	10.3	300*
Columbia Dugway Spring	F-2	6	7.82	1800	12.7	150
Coarse Refuse Seep Source	CRS	23.2	6.93	4306	1.9	30*
Coarse Refuse Seep Boundary	CRB	5.9	7.94	3900	8.4	40*
Draegerton Well	Well-1	N.A.	N.A.	N.A.	N.A.	N.A.
Coal Runof Basin	Outfall 004	3.4	8.24	2023	7.4	148
Rail Cut Pond	Outfall 007	N.A.	N.A.	N.A.	N.A.	N.A.
Old Coarse Refuse Pond	Outfall 008	N.A.	N.A.	N.A.	N.A.	N.A.
Pasture Sediment Pond	Outfall 009	N.A.	N.A.	N.A.	N.A.	N.A.
Coarse Refuse Toe Pond	Outfall 012	N.A.	N.A.	N.A.	N.A.	N.A.
Borrow Area Pond	Outfall 016	N.A.	N.A.	N.A.	N.A.	N.A.

Note:
N.A. indicates that data is not available due to lack of discharge.
Flow rates were measured using a calibrated container and stopwatch method, unless marked with an *.
Flow rates marked with an * indicate the flow rate was estimated due to a lack of an appropriate measuring location.

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TABLE 3

DOGM Quarterly Compliance Sampling Results
Sampling Dates: June and October, 1993

Sunnyside Cogeneration Associates Facility

Sunnyside, Utah

Sample Location		Analytical Parameters															
		Metals (mg/l)													Inorganics		
		Aluminum Dissolved	Arsenic Dissolved	Boron Dissolved	Cadmium Dissolved	Copper Dissolved	Iron Dissolved	Iron Total	Lead Dissolved	Manganese Dissolved	Manganese Total	Molybdenum Dissolved	Selenium Dissolved	Zinc Dissolved	Electrical Conductivity	Oil & Grease	Sulfide as S
CE-1	06/93	0.2	<0.002	0.3	<0.003	<0.02	<0.05	0.08	<0.01	<0.02	<0.02	<0.05	<0.002	<0.02	NA	<1	<1
	10/93	0.1	<0.002	0.3	<0.001	<0.02	<0.05	<0.05	<0.002	<0.02	<0.02	<0.05	<0.002	<0.02	2410	<1	<1
-2	06/93	0.2	<0.002	0.3	<0.003	<0.02	<0.05	0.26	<0.01	<0.02	0.04	<0.05	<0.002	<0.02	NA	<1	<1
	10/93	0.2	<0.002	0.3	<0.001	<0.02	<0.05	0.41	<0.002	0.04	0.06	<0.05	<0.002	1.02	2240	3	<1
RS	06/93	0.6	<0.002	1.0	<0.003	<0.02	<0.12	8.90	<0.01	1.75	1.50	<0.10	<0.002	0.08	NA	<1	<1
	10/93	0.5	<0.002	1.1	<0.001	<0.02	6.30	47	<0.002	1.35	2.2	<0.05	<0.002	0.33	5310	<1	<1
RB	06/93	0.6	<0.002	0.7	<0.003	<0.02	<0.12	<0.12	<0.01	<0.02	<0.02	<0.10	<0.002	0.10	NA	<1	<1
	10/93	0.5	<0.002	1.0	<0.001	<0.02	*19.2	*<0.05	<0.002	*1.35	*<0.02	<0.05	<0.002	0.35	4860	1	1
VELL	06/93	<0.1	<0.002	0.2	<0.003	<0.02	<0.05	<0.05	<0.01	<0.02	<0.02	<0.05	<0.002	0.02	NA	<1	6
	10/93	<0.1	<0.002	0.3	<0.001	<0.02	<0.05	0.14	<0.002	<0.02	<0.02	<0.05	<0.002	<0.02	2100	<1	<1
04	06/93	ND	ND	ND	ND	ND	ND	0.7	ND	ND	ND	ND	ND	ND	ND	5.0	ND
	10/93	NA	<0.002	NA	<0.003	<0.02	NA	0.33	<0.01	NA	NA	NA	<0.002	0.08	NA	<1	NA

Sample Location		Analytical Parameters															
		Inorganics (mg/l)			Anions (mg/l)					Cations (mg/l)				Nutrients (mg/l)			
		Settleable Solids	Dissolved Solids	Suspended Solids	Bicarbonate Alkalinity	Carbonate Alkalinity	Total Alkalinity	Chloride as Cl	Sulfate as SO4	Calcium as Ca	Hardness as CaCO3	Magnesium as Mg	Sodium as Na	Ammonia as N	Nitrite as N	Nitrate as N	Phosphorous Total
CE-1	06/93	<0.1	1920	8	505	0	414	66	1060	126	944	153	318	0.31	<0.05	1.72	0.02
	10/93	<0.2	1600	<2	593	0	486	65	777	90	660	105	340	<0.05	<0.05	0.77	0.05
-2	06/93	<0.1	1910	10	569	0	466	64	985	144	965	147	306	<0.05	0.06	1.54	0.02
	10/93	<0.2	1500	9	622	0	510	59	700	102	650	96	300	0.11	<0.05	0.88	0.06
RS	06/93	0.2	5210	15	553	0	453	97	3380	570	2945	370	550	1.86	<0.05	0.38	0.23
	10/93	<0.2	5200	41	548	0	449	96	2930	558	2800	342	543	1.73	<0.05	0.33	0.68
RB	06/93	<0.1	4610	<2	394	0	323	131	3010	513	2638	330	483	0.11	<0.05	1.34	<0.02
	10/93	<0.2	4700	<5	384	0	315	116	2710	550	2810	350	555	<0.05	<0.05	1.07	0.05
VELL	06/93	<0.1	1250	<2	599	0	491	34	510	93	578	84	231	<0.05	<0.05	0.90	<0.02
	10/93	<0.2	1400	<2	599	0	491	47	604	99	590	84	276	<0.05	<0.05	1.21	0.05
04	06/93	ND	1180	61.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	10/93	NA	1200	66	580	10	493	86	436	24	134	18	432	NA	NA	NA	NA

* < * sign indicates the value reported was the practical quantitation limit for this sample using the method described. Concentrations of analyte, if present, below this limit.
re not quantifiable. These results should be considered non-detect.
Samples were reanalyzed and results verified on December 8. These appear to be different samples.
.D. = No Discharge
.A. = Not Applicable
le: N:\WEMPLE\SCA[illegible]VP\ANN93T3.WK3

ATTACHMENT A

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah
Groundwater Discharge Permit Number UGW070002
Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: ICE-1 DOGM

Runoff Basin / Spring / Other: STREAM

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow ~~(cfs)~~ gpm	Flow Meas. Method	Basin Water Level (feet)	Field Parameters: Temp ~~(°C)~~	pH	SC (umhos)	DO ~~Meter No.~~	Collection Point	Sample Taken (yes/no)
4/30/93	1335	GM CW	Sunny Hot	yes		185	~~Vis~~ CC		29	8.08	2200	7.4	Marked	yes
7/27	1517	GM	Sunny Hot	yes		200	~~Vis~~ CC		23	8.17	2300	6.2	"	NO
8/26/93	1103	GM	—	yes		120	CC		16	7.18	2200	7.2	"	NO
9/2/93	1700	GM CW	Slt	yes		150	CC	-	20	8.23	2150	5.4	"	~~NO~~ yes
10/27	0830	MH	Warm	yes		150	Vis		3.3	8.50	1200	6.0	"	NO
11/16	1310	MH	Cold	yes		150	Vis		5.0	8.48	1800	5.6	"	~~NO~~
12/9	1555	GM	Cold	yes	Clear	300	Vis		4.8	8.49	2471	10.3	"	NO
1/13/94	1438	GM	Cold Clear	yes	Clear ICE-2 duplicate	~200	Vis		5.1	8.29	2220	6.4	"	yes

* Basin water level measurements are taken from permanent reference point at basin location.
Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah

Groundwater Discharge Permit Number UGW070002

Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen–Northern

MONITORING LOCATION NUMBER: F-2 (Whit. Sp) DOGM

Runoff Basin / Spring / Other:

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	gpm ~~Flow (cfs)~~	Flow Meas. Method	Basin Water Level (feet)	Field Parameters: Temp (~~F~~ C)	pH	SC (umhos)	DO ~~Meter No.~~	Collection Point	Sample Taken (yes/no)
6/30/93	1515	GMCW	Sunny/Hot	yes	Clear water	100	CC		25	8.4	2300	7.8	Mouth of Point	yes
7/27	1456	GM	Sunny/Hot	yes	"	~90	Vis		23	8.02	1900	5.9	/ "	yes
8/26/93	1058	GM	Overcast	yes	"	100	CC		15	7.18	2150	6.2	"	NO
9/2/93	1757	GMCW	SW	yes	"	100	CC		17	7.54	2100	6.4	"	yes
10/27	0730	MH	W-dy	yes	"	100	CC		1.5	8.3	1200	7.0	"	NO
11/16	1310	MH	Cold	yes	"	100	CC		5.3	8.49	1300	6.20	"	NO
12/9	1530	GM	Cold	yes	Grey from TSS(004)	150	CC		6.0	7.82	1800	12.7	"	NO
1/13/94	1535	GM	Cold Clear	yes	Clear	~90	CC		5.6	8.51	1824	6.2	"	yes

* Basin water level measurements are taken from permanent reference point at basin location.

Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah

Groundwater Discharge Permit Number UGW070002

Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: CRS (source) DOGM

Runoff Basin / Spring / Other:

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow (cfs)	Flow Meas. Method	Basin Water Level (feet)	Field Parameters: Temp (°C)	pH	SC (umhos)	DO Meter ~~No.~~	Collection Point	Sample Taken (yes/no)
6/30/93	1335	GM CW	Sunny Hot	yes	Much Rust, Warm.	~30	Vis		32	6.77	4600	6.2	Flagged Point	yes
7/27	1620	CW	Sunny Hot	yes	" "	~30	Vis		28	7.25	3200	2.4	"	NO
08/26/93	1158	GM	overcast	yes	" "	~40	VIS		25	6.81	2860	3.4	"	NO
9/21/93	1555	CW GM	SW	yes	"	~40	Vis		28	7.12	4600	1.9	"	yes
10/26	1320	MH	windy	yes	"	40	Vis		23	6.98	4700	3.5	"	NO
11/16	1405	MH	Cold	yes	"	50	Vis		23.2	6.86	4850	2.1	"	NO
12/9	1612	GM	Cold	yes	Warmer less flow	~30	Vis		23.2	6.93	4306	1.9	"	NO
1/14/94	1011	GM	Clear Cold	yes		~100	Vis		21.2	7.08	4748	2.4	"	yes

* Basin water level measurements are taken from permanent reference point at basin location.

Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah

Groundwater Discharge Permit Number UGW070002

Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: CRB (Boundary) DOGM

Runoff Basin / Spring / Other:

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow (cfs)	Flow Meas. Method	Basin Water Level (feet)	Field Parameters: Temp (~~F~~ C)	pH	SC (umhos)	DO ~~Meter No.~~	Collection Point	Sample Taken (yes/no)
6/30/93	1355	GmCW	Sunny Hot	yes	Much less FE on rocks	~30	Vis		26	7.60	4200	8.1	Standard Point	yes
7/27	1620	Gm	Sunny Hot	yes	"	~30	Vis		21	7.87	4600	5.0	"	NO
8/26/93	1159	Gm	Overcast	yes	" "	~60	Vis.		18.5	6.80	2450	5.4	"	NO
9/2	1643	GmCW	SW	~	~	~40	Vis		20	7.92	4150	4.9	"	NO
10/26	1400	MH	Windy	~	"	40	Vis		8.3	7.50	3400	6.0	"	NO
11/16	1430	MH	Cold	yes	~	40?	Vis		7.9	7.10	3300	5.5	"	NO
12/9	1627	Gm	Cold	yes	Clear water	40?	Vis		5.9	7.94	3900	8.4	"	NO
1/14/94	1103	Gm	Clear Cold	yes	Clear	200est	Vis		5.0	8.17	3100	6.0	"	yes

* Basin water level measurements are taken from permanent reference point at basin location.

Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah
Groundwater Discharge Permit Number UGW070002
Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: WELL (E. Carbon Municipal well) DOGM

Runoff Basin / Spring / Other: Well

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow (cfs)	Flow Meas. Method	Basin Water Level (feet)	Field Parameters: Temp (~~F~~C)	pH	SC (umhos)	DO ~~Meter~~ No.	Collection Point	Sample Taken (yes/no)
6/30/93	1130	GMCW	Sunny/Hot	~~yes~~ N.	Clear water	50 gpm	CC		16	7.8	1800	7.2	Hose	yes
7/27	1700	GM	Sunny/Hot	yes	" "	50 gpm	V.E		17	8.18	3100	5.8	Hose	NO
8/26/93	1036	GM	overcast	yes	" "	50 gpm	CC		12	6.77	920	4.9	"	NO
9/7/93	1400	GMCW	SW	yes	" "	46	CC		15	7.10	1450	5.2	"	yes
10/27	0915	MH	Windy	yes	" "	50	CC		7	8.00	1300	4.5	—	NO
11/16	1250	MH	Cold	yes	" "	50	CC		10.0	7.27	1300	4.6	—	NO
12/9	1514	GM	Cold	NO	Pipe from well to stand pipe is Frozen.								—	NO
1/14/94	1357	GM	Cold Clear	NO	Pipe is still Frozen.								—	NO

* Basin water level measurements are taken from permanent reference point at basin location.
Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah
Groundwater Discharge Permit Number UGW070002
Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: Coal Runoff Basin (inlet) GWD

Runoff Basin / Spring / Other:

Sampling Parameters: Cations, Anions, METALS, pH, TDS

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow (cfs)	Flow Meas. Method	Basin Water Level (feet)	Field Parameters: Temp (F)C	pH	SC (umhos)	Meter No.	Collection Point	Sample Taken (yes/no)
9/4/92	1715	CW/Gm	Cold/rainy	yes	no sheen, no foam, no debris	10gpm	VE	—	12	6.75	2173	1/1/1	discharge ditch	yes
10/3/92	825	GM	Clear Cool	yes		~10	VE	–	9	8.19	2897	DO 11.1	"	yes
11/5/92	1335	GM	Scattered Snow	yes		~20	VE	–	4	8.33	2400	8.6	"	yes
12/3/92	1457	GM CW	Cold Clear	yes		25	VE	–	1.5	—	2386	9.8	"	yes
* 12/3/92	1515	GM CW	"	yes	taken near res.	25	VE	–	2.0	—	2352	10.0	Near Res.	yes
1/28/93	1057	GM CW	Cold Clear	yes		25	VE	–	6		.15 c4		at Outfall	yes
2/24/93	1115	GM CW	Cold Pc	yes	"	20	VE	–	4	7.90	2150	10.2	"	yes
3/23/93	1049	CW	Warm Sunny	yes	Flow Reduced Construction	15	VE	–	11.0	7.43	1920	—	"	yes
4/8/93	1510	GM CW	Clear Cold	yes	at Out flow point	20	VE	–	6	7.32	1900	10.6	"	yes
4/29	1156	GM	Clear Warm	yes		20	VE	–	13	8.59	2150	10.8	"	yes
5/21	1328	GM	" "	yes	Flow ~ Normal.	35	VE	–	17.5	8.81	1950		"	yes
6/15	1430	RG	Warm Windy	yes	Flow reduced ~	8	Flume	–	7	8.3	1900	7.5		NO
6/22	0858	GM	Sunny/Hot	NO	No Discharge, slurry water is being diverted & bypasses decanting process.									NO
7/12	1337	CW GM	SW	NO	Some Water in Basin									
7/27	1024	GM	SW	NO	1'-2' of Water									
8/12	1350	MH	SNW	NO										
8/20	1400	MH	SW	NO	Dry									

* Basin water level measurements are taken from permanent reference point at basin location.
Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

* Taken downstream near reservoir; sample called OOH-RES

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah
Groundwater Discharge Permit Number UGW070002
Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: Coal Runoff Basin (004) GWD

Runoff Basin / Spring / Other:

Sampling Parameters: Ions, Metals, pH TDS

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow (cfs)	Flow Meas. Method	Basin Water Level (feet)	Field Parameters: Temp (F)	pH	SC (umhos)	Meter No.	Collection Point	Sample Taken (yes/no)
9/2	1125	CW CM	SW	NO	Dry	—	—	—	—	—	—	—	—	NO
9/30	1800	RB	Windy	Yes		49	Flume		12	8.09	2900		Below Flume	yes
10/13	1135	MH	Cool Windy	Yes	Black High TSS	97.4	"		10.4	8.28	1300			yes
10/26	1140	MH	" "	yes			"		7.9	8.44	1250	6.5		yes
11/6	1200	MH	Cold	yes	High TSS Black	97.35	Flume		4.2	8.9	1250	6.1	"	yes
11/30	1312	GM CW	Cold	yes	High TSS Black w/ fines	102.6	"		4.9	8.78	1050	-	"	yes
12/9	1036	CM	Cold	yes	Black Light TSS	148.1	Flume		3.4	8.24	2023	7.4	"	yes
12/23	1040	GM	Cold	yes	Clear V. low flow	4.3	Flume		3.0	8.57	2676	—	"	yes
1/13/94	1345	GM	Cold Clear	NO	Slurry → SC 1 → SC-2	—	—	—	—	—	—	—	—	NO

* Basin water level measurements are taken from permanent reference point at basin location.
Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

Huntingdon
Chen-Northern, Inc.
300 SOUTH 25TH STREET
P.O. BOX 30615
BILLINGS, MT 59107
(406) 248-9161
FAX (406) 248-9282

TECHNICAL REPORT

REPORT TO: ATTN: MR. CHUCK WEMPLE
CHEN-NORTHERN, INC.
1127 WEST 2320 SOUTH, SUITE B
SALT LAKE CITY, UT 84119

DATE: August 3, 1993
JOB NUMBER: 87-927
SHEET: 1 of 11
INVOICE NO.: 23900

REPORT OF: Water Analysis - SCA/DOGM (5-137.3-91)

SAMPLE IDENTIFICATION:

On July 3, 1993, these water samples (laboratory numbers 142325 through 142329) were delivered to our laboratory for analysis. Tests were conducted in accordance with the U.S. Environmental Protection Agency Manual EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes".

The test results are shown on the following pages.

A < sign indicates the value reported was the practical quantitation limit for this sample using the method described. Concentrations of analyte, if present, below this were not quantifiable.

Reviewed by David Connell

rmr

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF OUR CLIENTS AND AUTHORIZATION FOR

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Project Name: SCA/DOGM 5-137.3-91

August 3, 1993

Laboratory No.: 142325
Sample Name: DS-WELL/063093
Sample Date: 06/30/93
Collected by: CHUCK WEMPLE/GREG McDONALD
Time Sampled: 1145
Sample Type: WATER

PARAMETER	CATION ANION BALANCE	MEASURED VALUE	METHOD DETECTION LIMIT	DATE OF ANALYSIS	TIME OF ANALYSIS	ANALYST
ANIONS:						
Alkalinity Bicarbonate as HCO_3	9.82 meq/l	599 mg/l	1.02	07/13/93	1400	DD
Alkalinity Carbonate as CO_3	0 meq/l	0 mg/l	-	07/13/93	1400	DD
Alkalinity Total as $CaCO_3$	9.82 meq/l	491 mg/l	0.84	07/13/93	1400	DD
Chloride as Cl	0.96 meq/l	34 mg/l	1.41	07/08/93	1500	DD
Fluoride as F	0.01 meq/l	0.28 mg/l	0.03	07/23/93	1430	HB
Sulfate as SO_4	10.62 meq/l	510 mg/l	1.83	07/13/93	1000	CC
Total Anions	21.41 meq/l					
CATIONS:						
Calcium as Ca	4.64 meq/l	93 mg/l	0.39	07/19/93	1200	NH
Hardness as $CaCO_3$	11.55 meq/l	578 mg/l	2.25	07/19/93	1200	NH
Magnesium as Mg	6.91 meq/l	84 mg/l	0.31	07/19/93	1200	NH
Potassium as K	0.13 meq/l	5 mg/l	0.18	07/13/93	1630	NH
Sodium as Na	10.05 meq/l	231 mg/l	0.81	07/19/93	1200	NH
Total Cations	21.73 meq/l					
Difference	0.32 meq/l					
Allowable	0.89 meq/l					
INORGANICS:						
Oil & Grease		<1 mg/l	0.9	07/16/93	1600	DD
Settleable Solids		<0.1 ml/l	-	07/03/93	0900	DD
Sulfide as S		6 mg/l	0.61	07/07/93	1530	DD
Total Dissolved Solids		1250 mg/l	11.7	07/06/93	1730	CC
Total Suspended Solids		<2 mg/l	3.5	07/06/93	1630	CC
METALS:						
Aluminum as Al (Dissolved)		<0.1 mg/l	0.023	07/21/93	1130	NH
Aluminum as Al (Total)		<0.1 mg/l	0.023	07/21/93	1130	NH
Arsenic as As (Dissolved)		<0.002 mg/l	0.0014	07/08/93	1300	PB
Arsenic as As (Total)		<0.002 mg/l	0.0014	07/22/93	1400	AH

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Project Name: SCA/DOGM 5-137.3-91

August 3, 1993

Laboratory No.: 142325
Sample Name: DS-WELL/063093
Sample Date: 06/30/93
Collected by: CHUCK WEMPLE/GREG McDONALD
Time Sampled: 1145
Sample Type: WATER

PARAMETER	MEASURED VALUE		METHOD DETECTION LIMIT	DATE OF ANALYSIS	TIME OF ANALYSIS	ANALYST
METALS (cont.):						
Barium as Ba (Dissolved)	<0.1	mg/l	0.031	07/21/93	0900	NH
Barium as Ba (Total)	<0.1	mg/l	0.031	07/21/93	0900	NH
Boron as B (Dissolved)	0.2	mg/l	0.045	07/21/93	0900	NH
Boron as B (Total)	0.2	mg/l	0.045	07/21/93	0900	NH
Cadmium as Cd (Dissolved)	<0.003	mg/l	0.0002	07/20/93	1300	AH
Cadmium as Cd (Total)	<0.003	mg/l	0.0002	07/23/93	1300	AH
Chromium as Cr (Total)	<0.02	mg/l	0.009	07/21/93	0900	NH
Chromium as Cr (Dissolved)	<0.02	mg/l	0.009	07/21/93	0900	NH
Copper as Cu (Dissolved)	<0.02	mg/l	0.005	07/21/93	0900	NH
Copper as Cu (Total)	<0.02	mg/l	0.005	07/21/93	0900	NH
Iron as Fe (Dissolved)	<0.05	mg/l	0.008	07/21/93	0900	NH
Iron as Fe (Total)	<0.05	mg/l	0.008	07/21/93	0900	NH
Lead as Pb (Dissolved)	<0.01	mg/l	0.0012	07/13/93	1330	NH
Lead as Pb (Total)	<0.01	mg/l	0.0012	07/27/93	1000	NH
Manganese as Mn (Dissolved)	<0.02	mg/l	0.003	07/21/93	0900	NH
Manganese as Mn (Total)	<0.02	mg/l	0.003	07/21/93	0900	NH
Mercury as Hg (Dissolved)	<0.0005	mg/l	0.0002	07/19/93	0940	AH
Mercury as Hg (Total)	<0.0005	mg/l	0.0002	07/19/93	0940	AH
Molybdenum as Mo (Dissolved)	<0.05	mg/l	0.023	07/21/93	0900	NH
Molybdenum as Mo (Total)	<0.05	mg/l	0.023	07/21/93	0900	NH
Nickel as Ni (Dissolved)	<0.02	mg/l	0.011	07/21/93	0900	NH
Nickel as Ni (Total)	<0.02	mg/l	0.011	07/21/93	0900	NH
Selenium as Se (Dissolved)	<0.002	mg/l	0.0011	07/12/93	1540	AH
Selenium as Se (Total)	<0.002	mg/l	0.0011	07/16/93	1320	AH
Zinc as Zn (Dissolved)	0.02	mg/l	0.008	07/21/93	0900	NH
Zinc as Zn (Total)	0.04	mg/l	0.008	07/21/93	0900	NH
NUTRIENTS:						
Ammonia Nitrogen as N	<0.05	mg/l	0.034	07/20/93	1330	BH
Nitrite as N	<0.05	mg/l	0.005	07/08/93	1400	BH
Phosphorous Total	<0.02	mg/l	0.002	07/15/93	1600	CC
Nitrate as N	0.90	mg/l	0.005	07/09/93	1115	BH

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Project Name: SCA/DOGM 5-137.3-91

August 3, 1993

Laboratory No.: 142326
Sample Name: ICE/063093
Sample Date: 06/30/93
Collected by: CHUCK WEMPLE/GREG McDONALD
Time Sampled: 1335
Sample Type: WATER

PARAMETER	CATION ANION BALANCE	MEASURED VALUE	METHOD DETECTION LIMIT	DATE OF ANALYSIS	TIME OF ANALYSIS	ANALYST
ANIONS:						
Alkalinity Bicarbonate as HCO_3	8.28 meq/l	505 mg/l	1.02	07/13/93	1400	DD
Alkalinity Carbonate as CO_3	0 meq/l	0 mg/l	-	07/13/93	1400	DD
Alkalinity Total as $CaCO_3$	8.28 meq/l	414 mg/l	0.84	07/13/93	1400	DD
Chloride as Cl	1.86 meq/l	66 mg/l	1.41	07/08/93	1500	DD
Fluoride as F	0.02 meq/l	0.32 mg/l	0.03	07/23/93	1430	HB
Sulfate as SO_4	22.07 meq/l	1060 mg/l	1.83	07/28/93	1100	CC
Total Anions	32.23 meq/l					
CATIONS:						
Calcium as Ca	6.29 meq/l	126 mg/l	0.39	07/19/93	1200	NH
Hardness as $CaCO_3$	18.88 meq/l	944 mg/l	2.25	07/19/93	1200	NH
Magnesium as Mg	12.59 meq/l	153 mg/l	0.31	07/19/93	1200	NH
Potassium as K	0.23 meq/l	9 mg/l	0.18	07/13/93	1630	NH
Sodium as Na	13.83 meq/l	318 mg/l	0.81	07/19/93	1200	NH
Total Cations	32.94 meq/l					
Difference	0.71					
Allowable	1.23					
INORGANICS:						
Oil & Grease		<1 mg/l	0.9	07/16/93	1600	DD
Settleable Solids		<0.1 ml/l	-	07/03/93	0900	DD
Sulfide as S		<1 mg/l	0.61	07/07/93	1530	DD
Total Dissolved Solids		1920 mg/l	11.7	07/06/93	1730	CC
Total Suspended Solids		8 mg/l	3.5	07/06/93	1630	CC
METALS:						
Aluminum as Al (Dissolved)		0.2 mg/l	0.023	07/21/93	1130	NH
Aluminum as Al (Total)		0.2 mg/l	0.023	07/21/93	1130	NH
Arsenic as As (Dissolved)		<0.002 mg/l	0.0014	07/08/93	1300	PB
Arsenic as As (Total)		<0.002 mg/l	0.0014	07/22/93	1400	AH

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Project Name: SCA/DOGM 5-137.3-91

August 3, 1993

Laboratory No.: 142326
Sample Name: ICE/063093
Sample Date: 06/30/93
Collected by: CHUCK WEMPLE/GREG McDONALD
Time Sampled: 1335
Sample Type: WATER

PARAMETER	MEASURED VALUE		METHOD DETECTION LIMIT	DATE OF ANALYSIS	TIME OF ANALYSIS	ANALYST
METALS (cont.):						
Barium as Ba (Dissolved)	<0.1	mg/l	0.031	07/21/93	0900	NH
Barium as Ba (Total)	<0.1	mg/l	0.031	07/21/93	0900	NH
Boron as B (Dissolved)	0.3	mg/l	0.045	07/21/93	0900	NH
Boron as B (Total)	0.3	mg/l	0.045	07/21/93	0900	NH
Cadmium as Cd (Dissolved)	<0.003	mg/l	0.0002	07/20/93	1300	AH
Cadmium as Cd (Total)	<0.003	mg/l	0.0002	07/23/93	1300	AH
Chromium as Cr (Total)	<0.02	mg/l	0.009	07/21/93	0900	NH
Chromium as Cr (Dissolved)	<0.02	mg/l	0.009	07/21/93	0900	NH
Copper as Cu (Dissolved)	<0.02	mg/l	0.005	07/21/93	0900	NH
Copper as Cu (Total)	<0.02	mg/l	0.005	07/21/93	0900	NH
Iron as Fe (Dissolved)	<0.05	mg/l	0.008	07/21/93	0900	NH
Iron as Fe (Total)	0.08	mg/l	0.008	07/21/93	0900	NH
Lead as Pb (Dissolved)	<0.01	mg/l	0.0012	07/13/93	1330	NH
Lead as Pb (Total)	<0.01	mg/l	0.0012	07/27/93	1000	NH
Manganese as Mn (Dissolved)	<0.02	mg/l	0.003	07/21/93	0900	NH
Manganese as Mn (Total)	<0.02	mg/l	0.003	07/21/93	0900	NH
Mercury as Hg (Dissolved)	<0.0005	mg/l	0.0002	07/19/93	0940	AH
Mercury as Hg (Total)	<0.0005	mg/l	0.0002	07/19/93	0940	AH
Molybdenum as Mo (Dissolved)	<0.05	mg/l	0.023	07/21/93	0900	NH
Molybdenum as Mo (Total)	<0.05	mg/l	0.023	07/21/93	0900	NH
Nickel as Ni (Dissolved)	<0.02	mg/l	0.011	07/21/93	0900	NH
Nickel as Ni (Total)	<0.02	mg/l	0.011	07/21/93	0900	NH
Selenium as Se (Dissolved)	<0.002	mg/l	0.0011	07/12/93	1540	AH
Selenium as Se (Total)	<0.002	mg/l	0.0011	07/16/93	1320	AH
Zinc as Zn (Dissolved)	<0.02	mg/l	0.008	07/21/93	0900	NH
Zinc as Zn (Total)	0.04	mg/l	0.008	07/21/93	0900	NH
NUTRIENTS:						
Ammonia Nitrogen as N	0.31	mg/l	0.034	07/20/93	1330	BH
Nitrite as N	<0.05	mg/l	0.005	07/08/93	1400	BH
Phosphorous Total	0.02	mg/l	0.002	07/15/93	1600	CC
Nitrate as N	1.72	mg/l	0.005	07/09/93	1115	BH

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Project Name: SCA/DOGM 5-137.3-91

August 3, 1993

Laboratory No.: 142327
Sample Name: F-2/063093
Sample Date: 06/30/93
Collected by: CHUCK WEMPLE/GREG McDONALD
Time Sampled: 1515
Sample Type: WATER

PARAMETER	CATION ANION BALANCE	MEASURED VALUE	METHOD DETECTION LIMIT	DATE OF ANALYSIS	TIME OF ANALYSIS	ANALYST
ANIONS:						
Alkalinity Bicarbonate as HCO_3	9.32 meq/l	569 mg/l	1.02	07/13/93	1400	DD
Alkalinity Carbonate as CO_3	0 meq/l	0 mg/l	-	07/13/93	1400	DD
Alkalinity Total as $CaCO_3$	9.32 meq/l	466 mg/l	0.84	07/13/93	1400	DD
Chloride as Cl	1.81 meq/l	64 mg/l	1.41	07/08/93	1500	DD
Fluoride as F	0.02 meq/l	0.30 mg/l	0.03	07/23/93	1430	HB
Sulfate as SO_4	20.51 meq/l	985 mg/l	1.83	07/28/93	1100	CC
Total Anions	31.66 meq/l					
CATIONS:						
Calcium as Ca	7.19 meq/l	144 mg/l	0.39	07/19/93	1200	NH
Hardness as $CaCO_3$	19.29 meq/l	965 mg/l	2.25	07/19/93	1200	NH
Magnesium as Mg	12.10 meq/l	147 mg/l	0.31	07/19/93	1200	NH
Potassium as K	0.18 meq/l	7 mg/l	0.18	07/13/93	1630	NH
Sodium as Na	13.31 meq/l	306 mg/l	0.81	07/19/93	1200	NH
Total Cations	32.78 meq/l					
Difference	1.12 meq/l					
Allowable	1.23 meq/l					
INORGANICS:						
Oil & Grease		<1 mg/l	0.9	07/16/93	1600	DD
Settleable Solids		<0.1 ml/l	-	07/03/93	0900	DD
Sulfide as S		<1 mg/l	0.61	07/07/93	1530	DD
Total Dissolved Solids		1910 mg/l	11.7	07/06/93	1730	CC
Total Suspended Solids		10 mg/l	3.5	07/06/93	1630	CC
METALS:						
Aluminum as Al (Dissolved)		0.2 mg/l	0.023	07/21/93	1130	NH
Aluminum as Al (Total)		0.2 mg/l	0.023	07/21/93	1130	NH
Arsenic as As (Dissolved)		<0.002 mg/l	0.0014	07/08/93	1300	PB
Arsenic as As (Total)		<0.002 mg/l	0.0014	07/22/93	1400	AH

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Project Name: SCA/DOGM 5-137.3-91

Laboratory No.: 142327
Sample Name: F-2/063093
Sample Date: 06/30/93
Collected by: CHUCK WEMPLE/GREG McDONALD
Time Sampled: 1515
Sample Type: WATER

PARAMETER	MEASURED VALUE		METHOD DETECTION LIMIT	DATE OF ANALYSIS	TIME OF ANALYSIS	ANALYST
METALS (cont.):						
Barium as Ba (Dissolved)	<0.1	mg/l	0.031	07/21/93	0900	NH
Barium as Ba (Total)	<0.1	mg/l	0.031	07/21/93	0900	NH
Boron as B (Dissolved)	0.3	mg/l	0.045	07/21/93	0900	NH
Boron as B (Total)	0.2	mg/l	0.045	07/21/93	0900	NH
Cadmium as Cd (Dissolved)	<0.003	mg/l	0.0002	07/20/93	1300	AH
Cadmium as Cd (Total)	<0.003	mg/l	0.0002	07/23/93	1300	AH
Chromium as Cr (Total)	<0.02	mg/l	0.009	07/21/93	0900	NH
Chromium as Cr (Dissolved)	<0.02	mg/l	0.009	07/21/93	0900	NH
Copper as Cu (Dissolved)	<0.02	mg/l	0.005	07/21/93	0900	NH
Copper as Cu (Total)	<0.02	mg/l	0.005	07/21/93	0900	NH
Iron as Fe (Dissolved)	<0.05	mg/l	0.008	07/21/93	0900	NH
Iron as Fe (Total)	0.26	mg/l	0.008	07/21/93	0900	NH
Lead as Pb (Dissolved)	<0.01	mg/l	0.0012	07/13/93	1330	NH
Lead as Pb (Total)	<0.01	mg/l	0.0012	07/27/93	1000	NH
Manganese as Mn (Dissolved)	<0.02	mg/l	0.003	07/21/93	0900	NH
Manganese as Mn (Total)	0.04	mg/l	0.003	07/21/93	0900	NH
Mercury as Hg (Dissolved)	<0.0005	mg/l	0.0002	07/19/93	0940	AH
Mercury as Hg (Total)	<0.0005	mg/l	0.0002	07/19/93	0940	AH
Molybdenum as Mo (Dissolved)	<0.05	mg/l	0.023	07/21/93	0900	NH
Molybdenum as Mo (Total)	<0.05	mg/l	0.023	07/21/93	0900	NH
Nickel as Ni (Dissolved)	*<0.04	mg/l	0.011	07/21/93	0900	NH
Nickel as Ni (Total)	*<0.04	mg/l	0.011	07/21/93	0900	NH
Selenium as Se (Dissolved)	<0.002	mg/l	0.0011	07/12/93	1540	AH
Selenium as Se (Total)	<0.002	mg/l	0.0011	07/16/93	1320	AH
Zinc as Zn (Dissolved)	<0.02	mg/l	0.008	07/21/93	0900	NH
Zinc as Zn (Total)	0.03	mg/l	0.008	07/21/93	0900	NH
NUTRIENTS:						
Ammonia Nitrogen as N	<0.05	mg/l	0.034	07/20/93	1330	BH
Nitrite as N	0.06	mg/l	0.005	07/08/93	1400	BH
Phosphorous Total	0.02	mg/l	0.002	07/15/93	1600	CC
Nitrate as N	1.54	mg/l	0.005	07/09/93	1115	BH

* Higher detection limit due to background interference.

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Project Name: SCA/DOGM 5-137.3-91

Laboratory No.: 142328
Sample Name: CRB/063093
Sample Date: 06/30/93
Collected by: CHUCK WEMPLE/GREG McDONALD
Time Sampled: 1405
Sample Type: WATER

PARAMETER	CATION ANION BALANCE	MEASURED VALUE	METHOD DETECTION LIMIT	DATE OF ANALYSIS	TIME OF ANALYSIS	ANALYST
ANIONS:						
Alkalinity Bicarbonate as HCO_3	6.46 meq/l	394 mg/l	1.02	07/13/93	1400	DD
Alkalinity Carbonate as CO_3	0 meq/l	0 mg/l	-	07/13/93	1400	DD
Alkalinity Total as $CaCO_3$	6.46 meq/l	323 mg/l	0.84	07/13/93	1400	DD
Chloride as Cl	3.70 meq/l	131 mg/l	1.41	07/08/93	1500	DD
Fluoride as F	0.04 meq/l	0.75 mg/l	0.03	07/23/93	1430	HB
Sulfate as SO_4	62.67 meq/l	3010 mg/l	1.83	07/28/93	1100	CC
Total Anions	72.87 meq/l					
CATIONS:						
Calcium as Ca	25.60 meq/l	513 mg/l	0.39	07/19/93	1200	NH
Hardness as $CaCO_3$	52.76 meq/l	2638 mg/l	2.25	07/19/93	1200	NH
Magnesium as Mg	27.16 meq/l	330 mg/l	0.31	07/19/93	1200	NH
Potassium as K	0.82 meq/l	32 mg/l	0.18	07/13/93	1630	NH
Sodium as Na	21.01 meq/l	483 mg/l	0.81	07/19/93	1200	NH
Total Cations	74.59 meq/l					
Difference	1.72 meq/l					
Allowable	2.53 meq/l					
INORGANICS:						
Oil & Grease		<1 mg/l	0.9	07/16/93	1600	DD
Settleable Solids		<0.1 ml/l	-	07/03/93	0900	DD
Sulfide as S		<1 mg/l	0.61	07/07/93	1530	DD
Total Dissolved Solids		4610 mg/l	11.7	07/06/93	1730	CC
Total Suspended Solids		<2 mg/l	3.5	07/06/93	1630	CC
METALS:						
Aluminum as Al (Dissolved)		0.6 mg/l	0.023	07/21/93	1130	NH
Aluminum as Al (Total)		0.4 mg/l	0.023	07/21/93	1130	NH
Arsenic as As (Dissolved)		<0.002 mg/l	0.0014	07/08/93	1300	PB
Arsenic as As (Total)		<0.002 mg/l	0.0014	07/22/93	1400	AH

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Project Name: SCA/DOGM 5-137.3-91

Laboratory No.: 142328
Sample Name: CRB/063093
Sample Date: 06/30/93
Collected by: CHUCK WEMPLE/GREG McDONALD
Time Sampled: 1405
Sample Type: WATER

PARAMETER	MEASURED VALUE		METHOD DETECTION LIMIT	DATE OF ANALYSIS	TIME OF ANALYSIS	ANALYST
METALS (cont.):						
Barium as Ba (Dissolved)	<0.1	mg/l	0.031	07/21/93	0900	NH
Barium as Ba (Total)	<0.1	mg/l	0.031	07/21/93	0900	NH
Boron as B (Dissolved)	0.7	mg/l	0.045	07/21/93	0900	NH
Boron as B (Total)	0.8	mg/l	0.045	07/21/93	0900	NH
Cadmium as Cd (Dissolved)	<0.003	mg/l	0.0002	07/20/93	1300	AH
Cadmium as Cd (Total)	<0.003	mg/l	0.0002	07/23/93	1300	AH
Chromium as Cr (Total)	*<0.05	mg/l	0.009	07/21/93	0900	NH
Chromium as Cr (Dissolved)	*<0.05	mg/l	0.009	07/21/93	0900	NH
Copper as Cu (Dissolved)	<0.02	mg/l	0.005	07/21/93	0900	NH
Copper as Cu (Total)	<0.02	mg/l	0.005	07/21/93	0900	NH
Iron as Fe (Dissolved)	*<0.12	mg/l	0.008	07/21/93	0900	NH
Iron as Fe (Total)	*<0.12	mg/l	0.008	07/21/93	0900	NH
Lead as Pb (Dissolved)	<0.01	mg/l	0.0012	07/13/93	1330	NH
Lead as Pb (Total)	<0.01	mg/l	0.0012	07/27/93	1000	NH
Manganese as Mn (Dissolved)	<0.02	mg/l	0.003	07/21/93	0900	NH
Manganese as Mn (Total)	<0.02	mg/l	0.003	07/21/93	0900	NH
Mercury as Hg (Dissolved)	<0.0005	mg/l	0.0002	07/19/93	0940	AH
Mercury as Hg (Total)	<0.0005	mg/l	0.0002	07/19/93	0940	AH
Molybdenum as Mo (Dissolved)	*<0.10	mg/l	0.023	07/21/93	0900	NH
Molybdenum as Mo (Total)	*<0.10	mg/l	0.023	07/21/93	0900	NH
Nickel as Ni (Dissolved)	*<0.10	mg/l	0.011	07/21/93	0900	NH
Nickel as Ni (Total)	*<0.10	mg/l	0.011	07/21/93	0900	NH
Selenium as Se (Dissolved)	<0.002	mg/l	0.0011	07/12/93	1540	AH
Selenium as Se (Total)	0.008	mg/l	0.0011	07/16/93	1320	AH
Zinc as Zn (Dissolved)	0.10	mg/l	0.008	07/21/93	0900	NH
Zinc as Zn (Total)	0.06	mg/l	0.008	07/21/93	0900	NH
NUTRIENTS:						
Ammonia Nitrogen as N	0.11	mg/l	0.034	07/20/93	1330	BH
Nitrite as N	<0.05	mg/l	0.005	07/08/93	1400	BH
Phosphorous Total	<0.02	mg/l	0.002	07/15/93	1600	CC
Nitrate as N	1.34	mg/l	0.005	07/09/93	1115	BH

* Higher detection limit due to background interference.

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Project Name: SCA/DOGM 5-137.3-91

August 3, 1993

Laboratory No.: 142329
Sample Name: CRS/063093
Sample Date: 06/30/93
Collected by: CHUCK WEMPLE/GREG McDONALD
Time Sampled: 1335
Sample Type: WATER

PARAMETER	CATION ANION BALANCE	MEASURED VALUE	METHOD DETECTION LIMIT	DATE OF ANALYSIS	TIME OF ANALYSIS	ANALYST
ANIONS:						
Alkalinity Bicarbonate as HCO_3	9.06 meq/l	553 mg/l	1.02	07/13/93	1400	DD
Alkalinity Carbonate as CO_3	0 meq/l	0 mg/l	-	07/13/93	1400	DD
Alkalinity Total as $CaCO_3$	9.06 meq/l	453 mg/l	0.84	07/13/93	1400	DD
Chloride as Cl	2.74 meq/l	97 mg/l	1.41	07/08/93	1500	DD
Fluoride as F	0.07 meq/l	1.31 mg/l	0.03	07/23/93	1430	HB
Sulfate as SO_4	70.37 meq/l	3380 mg/l	1.83	07/28/93	1100	CC
Total Anions	82.24 meq/l					
CATIONS:						
Calcium as Ca	28.44 meq/l	570 mg/l	0.39	07/27/93	1100	NH
Hardness as $CaCO_3$	58.89 meq/l	2945 mg/l	2.25	07/27/93	1100	NH
Magnesium as Mg	30.45 meq/l	370 mg/l	0.31	07/27/93	1100	NH
Potassium as K	1.25 meq/l	49 mg/l	0.18	07/13/93	1630	NH
Sodium as Na	23.92 meq/l	550 mg/l	0.81	07/19/93	1200	NH
Total Cations	84.06 meq/l					
Difference	1.82 meq/l					
Allowable	2.82 meq/l					
INORGANICS:						
Oil & Grease		<1 mg/l	0.9	07/16/93	1600	DD
Settleable Solids		0.2 ml/l	-	07/03/93	0900	DD
Sulfide as S		<1 mg/l	0.61	07/07/93	1530	DD
Total Dissolved Solids		5210 mg/l	11.7	07/06/93	1730	CC
Total Suspended Solids		15 mg/l	3.5	07/06/93	1630	CC
METALS:						
Aluminum as Al (Dissolved)		0.6 mg/l	0.023	07/21/93	1130	NH
Aluminum as Al (Total)		0.4 mg/l	0.023	07/21/93	1130	NH
Arsenic as As (Dissolved)		<0.002 mg/l	0.0014	07/08/93	1300	PB
Arsenic as As (Total)		0.002 mg/l	0.0014	07/22/93	1400	AH

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Project Name: SCA/DOGM 5-137.3-91

Laboratory No.: 142329
Sample Name: CRS/063093
Sample Date: 06/30/93
Collected by: CHUCK WEMPLE/GREG McDONALD
Time Sampled: 1335
Sample Type: WATER

PARAMETER	MEASURED VALUE		METHOD DETECTION LIMIT	DATE OF ANALYSIS	TIME OF ANALYSIS	ANALYST
METALS (cont.):						
Barium as Ba (Dissolved)	<0.1	mg/l	0.031	07/21/93	0900	NH
Barium as Ba (Total)	<0.1	mg/l	0.031	07/21/93	0900	NH
Boron as B (Dissolved)	1.0	mg/l	0.045	07/21/93	0900	NH
Boron as B (Total)	1.0	mg/l	0.045	07/21/93	0900	NH
Cadmium as Cd (Dissolved)	<0.003	mg/l	0.0002	07/20/93	1300	AH
Cadmium as Cd (Total)	<0.003	mg/l	0.0002	07/23/93	1300	AH
Chromium as Cr (Total)	*<0.05	mg/l	0.009	07/21/93	0900	NH
Chromium as Cr (Dissolved)	*<0.05	mg/l	0.009	07/21/93	0900	NH
Copper as Cu (Dissolved)	<0.02	mg/l	0.005	07/21/93	0900	NH
Copper as Cu (Total)	<0.02	mg/l	0.005	07/21/93	0900	NH
Iron as Fe (Dissolved)	*<0.12	mg/l	0.008	07/21/93	0900	NH
Iron as Fe (Total)	8.90	mg/l	0.008	07/21/93	0900	NH
Lead as Pb (Dissolved)	<0.01	mg/l	0.0012	07/13/93	1330	NH
Lead as Pb (Total)	<0.01	mg/l	0.0012	07/27/93	1000	NH
Manganese as Mn (Dissolved)	1.75	mg/l	0.003	07/21/93	0900	NH
Manganese as Mn (Total)	1.50	mg/l	0.003	07/21/93	0900	NH
Mercury as Hg (Dissolved)	<0.0005	mg/l	0.0002	07/19/93	0940	AH
Mercury as Hg (Total)	<0.0005	mg/l	0.0002	07/19/93	0940	AH
Molybdenum as Mo (Dissolved)	*<0.10	mg/l	0.023	07/21/93	0900	NH
Molybdenum as Mo (Total)	*<0.10	mg/l	0.023	07/21/93	0900	NH
Nickel as Ni (Dissolved)	*<0.10	mg/l	0.011	07/21/93	0900	NH
Nickel as Ni (Total)	*<0.10	mg/l	0.011	07/21/93	0900	NH
Selenium as Se (Dissolved)	<0.002	mg/l	0.0011	07/12/93	1540	AH
Selenium as Se (Total)	<0.002	mg/l	0.0011	07/16/93	1320	AH
Zinc as Zn (Dissolved)	0.08	mg/l	0.008	07/21/93	0900	NH
Zinc as Zn (Total)	0.04	mg/l	0.008	07/21/93	0900	NH
NUTRIENTS:						
Ammonia Nitrogen as N	1.86	mg/l	0.034	07/20/93	1330	BH
Nitrite as N	<0.05	mg/l	0.005	07/08/93	1400	BH
Phosphorous Total	0.23	mg/l	0.002	07/15/93	1600	CC
Nitrate as N	0.38	mg/l	0.005	07/09/93	1115	BH

* Higher detection limit due to background interference.

CHAIN OF CUSTODY RECORD

Huntingdon
Consulting Engineers & Environmental Scientists

- [x] Chen-Northern, Inc., Division
- [ ] Thomas-Hartig & Associates, Inc., Division
- [ ] Schaefer Dixon Associates, Inc., Division
- [ ] Herzog Associates, Inc., Division

SCA/DOGM
Project or Site Name

5-737.3-91
Project Number

C. Chuck Wample / Greg McDonald
Sampler Name (Printed)

CW/GM
Contact or Report to

SLC, UT
Contact Address or Location

Sampler Signature

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	413.1	Sulphide	Total Metals	Dissolved Metals	TSS	Settleable Solids	Cyanide Ions	NOTES	LAB NUMBER
6/30/93	1145	DS-WELL/063093	Grab	Water	8	X	X	X	X	X	X	X		142325
6/30/93	1335	ICE/063093	Grab	Water	8	X	X	X	X	X	X	X		142326
6/30/93	1525	F-2/063093	Grab	Water	8	X	X	X	X	X	X	X		142327
6/30/93	1405	CR3/063093	Grab	Water	8	X	X	X	X	X	X	X		142328
6/30/93	1535	CR5/063093	Grab	Water	8	X	X	X	X	X	X	X		142329

Relinquished by:	Date 7/3/93	Time 1600	Received by: D. Dilly 7/3/93
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by:

Remarks: Attn: David Council
See attached list for complete parameter list.

Huntingdon
n-Northern, Inc.
SOUTH 25TH STREET
P.O. BOX 30615
BILLINGS, MT 59107
(406) 248-9161
FAX (406) 248-9282

TECHNICAL REPORT

REPORT TO: ATTN: CHUCK WEMPLE
CHEN-NORTHERN, INC.
1127 WEST 2320 SOUTH, SUITE B
SALT LAKE CITY UT 84119

DATE: December 9, 1993
JOB NUMBER: 87-927
SHEET: 1 of 11
INVOICE NO.: 003917

REPORT OF: Water Analysis - SCA-DOGM 5-137.3-91

SAMPLE IDENTIFICATION:

On November 1, 1993, these water samples (our laboratory numbers 146281 through 146287) were received in our laboratory for analysis. Tests were conducted in accordance with the U.S. Environmental Protection Agency Manual EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes."

The results of the analysis are shown on the following pages.

A < sign indicates the value reported was the practical quantitation limit for this sample using the method described. Concentrations of analyte, if present, below this were not quantifiable.

Reviewed by David Cornell

rmr

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Laboratory No.: 146281
Sample Name: CRS-102693
Sample Date: 10/26/93
Collected by: G. HOWELL
Time Sampled: 1320
Sample Type: WATER

PARAMETER	MEASURED VALUE	METHOD DETECTION LIMIT	TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
***ANIONS**					
Alkalinity Bicarbonate as HCO3	548 mg/l	1.02	0900	11/09/93	BH
Alkalinity Carbonate as CO3	0 mg/l	-	0900	11/09/93	BH
Alkalinity Total as CaCO3	449 mg/l	0.84	0900	11/09/93	BH
Chloride as Cl	96 mg/l	0.24	1300	11/09/93	BH
Sulfate as SO4	2930 mg/l	2.29	1345	11/10/93	CC
***CATIONS**					
Calcium as Ca	558 mg/l	0.39	1130	11/15/93	NH
Hardness as CaCO3	2800 mg/l	-	1130	11/15/93	NH
Magnesium as Mg	342 mg/l	0.31	1130	11/15/93	NH
Sodium as Na	543 mg/l	0.81	1130	11/15/93	NH
INORGANICS					
Electrical Conductivity	5310 umhos/cm	5.1	1500	11/12/93	BH
Oil & Grease	<1 mg/l	1	1130	11/05/93	CC
Settleable Solids	<0.2 ml/l	0.2	1510	11/01/93	CC
Sulfide as S	<1 mg/l	0.61	1500	11/02/93	DD
Total Dissolved Solids	5200 mg/l	11.7	1605	11/02/93	CC
Total Suspended Solids	41 mg/l	3.5	1525	11/02/93	CC
METALS					
Aluminum as Al (Dissolved	0.5 mg/l	0.023	1100	11/17/93	NH
Arsenic as As (Dissolved)	<0.002 mg/l	0.0014	1300	11/08/93	AH
Boron as B (Dissolved)	1.1 mg/l	0.045	1100	11/17/93	NH
Cadmium as Cd (Dissolved)	<0.001 mg/l	0.0002	1130	11/30/93	AH
Copper as Cu (Dissolved)	<0.02 mg/l	0.005	1100	11/17/93	NH
Iron as Fe (Dissolved)	6.30 mg/l	0.008	1100	11/17/93	NH
Iron as Fe (Total)	47 mg/l	0.008	1330	12/01/93	BH
Lead as Pb (Dissolved)	<0.002 mg/l	0.0012	1400	11/22/93	NH
Manganese as Mn (Dissolved)	1.35 mg/l	0.003	1100	11/17/93	NH

* The cation-anion analysis does not meet our quality assurance requirements. However, the values reported herein were verified by duplicate analysis. This indicates there are other unmeasured cations or anions present in the sample.

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Laboratory No.: 146281
Sample Name: CRS-102693
Sample Date: 10/26/93
Collected by: G. HOWELL
Time Sampled: 1320
Sample Type: WATER

PARAMETER	MEASURED VALUE		METHOD DETECTION LIMIT	TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
METALS (cont)						
Manganese as Mn (Total)	2.2	mg/l	0.003	1330	12/01/93	BH
Molybdenum as Mn (Total)	<0.05	mg/l	0.023	1100	11/17/93	NH
Selenium as Se (Dissolved	<0.002	mg/l	0.0011	1400	11/10/93	AH
Zinc as Zn (Dissolved)	0.33	mg/l	0.008	1100	11/17/93	NH
NUTRIENTS						
Ammonia Nitrogen as N	1.73	mg/l	0.034	1130	11/12/30	DD
Nitrite as N	<0.05	mg/l	0.005	1130	11/02/93	DD
Phosphorous Total	0.68	mg/l	<0.002	1330	11/18/93	CC
Nitrate as N	0.33	mg/l	0.005	1130	11/03/93	DD

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Laboratory No.: 146282
Sample Name: CRB-102693
Sample Date: 10/26/93
Collected by: G. HOWELL
Time Sampled: 1400
Sample Type: WATER

PARAMETER	MEASURED VALUE	METHOD DETECTION LIMIT	TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
ANIONS**					
Alkalinity Bicarbonate as HCO3	384 mg/l	1.02	0900	11/09/93	BH
Alkalinity Carbonate as CO3	0 mg/l	-	0900	11/09/93	BH
Alkalinity Total as CaCO3	315 mg/l	0.84	0900	11/09/93	BH
Chloride as Cl	116 mg/l	0.24	1300	11/09/93	BH
Sulfate as SO4	2710 mg/l	2.29	1345	11/10/93	CC
CATIONS**					
Calcium as Ca	550 mg/l	0.39	1130	11/15/93	NH
Hardness as CaCO3	2810 mg/l	-	1130	11/15/93	NH
Magnesium as Mg	350 mg/l	0.31	1130	11/15/93	NH
Sodium as Na	555 mg/l	0.81	1130	11/15/93	NH
INORGANICS					
Electrical Conductivity	4860 umhos/cm	5.1	1500	11/12/93	BH
Oil & Grease	1 mg/l	1	1130	11/05/93	CC
Settleable Solids	<0.2 ml/l	0.2	1615	11/01/93	CC
Sulfide as S	1 mg/l	0.61	1500	11/02/93	DD
Total Dissolved Solids	4700 mg/l	11.7	1605	11/02/93	CC
Total Suspended Solids	<5 mg/l	3.5	1525	11/02/93	CC
METALS					
Aluminum as Al (Dissolved	0.5 mg/l	0.023	1100	11/17/93	NH
Arsenic as As (Dissolved)	<0.002 mg/l	0.0014	1300	11/08/93	AH
Boron as B (Dissolved)	1.0 mg/l	0.045	1100	11/17/93	NH
Cadmium as Cd (Dissolved)	<0.001 mg/l	0.0002	1130	11/30/93	AH
Copper as Cu (Dissolved)	<0.02 mg/l	0.005	1100	11/17/93	NH

** The cation-anion analysis does not meet our quality assurance requirements. However, the values reported herein were verified by duplicate analysis. This indicates there are other unmeasured cations or anions present in the sample.

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT

Project No.: 87-927
Laboratory No.: 146282
Sample Name: CRB-102693
Sample Date: 10/26/93
Collected by: G. HOWELL
Time Sampled: 1400
Sample Type: WATER

PARAMETER	MEASURED VALUE		METHOD DETECTION LIMIT	TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
Iron as Fe (Dissolved)	*19.2	mg/l	0.008	1100	11/17/93	NH
Iron as Fe (Total)	*<0.05	mg/l	0.008	1330	12/01/93	BH
Lead as Pb (Dissolved)	<0.002	mg/l	0.0012	1400	11/22/93	NH
Manganese as Mn (Dissolved)	*1.35	mg/l	0.003	1100	11/17/93	NH
Manganese as Mn (Total)	*<0.02	mg/l	0.003	1330	12/01/93	BH
Molybdenum as Mn (Total)	<0.05	mg/l	0.023	1100	11/17/93	NH
Selenium as Se (Dissolved	<0.002	mg/l	0.0011	1400	11/10/93	AH
Zinc as Zn (Dissolved)	0.35	mg/l	0.008	1100	11/17/93	NH
NUTRIENTS						
Ammonia Nitrogen as N	<0.05	mg/l	0.034	1130	11/12/30	DD
Nitrite as N	<0.05	mg/l	0.005	1130	11/02/93	DD
Phosphorous Total	0.05	mg/l	<0.002	1330	11/18/93	CC
Nitrate as N	1.07	mg/l	0.005	1130	11/03/93	DD

* Samples were reanalyzed and results verified on December 8. These appear to be different samples.

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Laboratory No.: 146283
Sample Name: F-Z/102793
Sample Date: 10/27/93
Collected by: G. HOWELL
Time Sampled: 0730
Sample Type: WATER

PARAMETER	MEASURED VALUE	METHOD DETECTION LIMIT	TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
ANIONS					
Alkalinity Bicarbonate as HCO3	622 mg/l	1.02	0900	11/09/93	BH
Alkalinity Carbonate as CO3	0 mg/l	-	0900	11/09/93	BH
Alkalinity Total as CaCO3	510 mg/l	0.84	0900	11/09/93	BH
Chloride as Cl	59 mg/l	0.24	1300	11/09/93	BH
Sulfate as SO4	700 mg/l	2.29	1145	11/09/93	CC
CATIONS					
Calcium as Ca	102 mg/l	0.39	1000	11/05/93	NH
Hardness as CaCO3	650 mg/l	-	1000	11/05/93	NH
Magnesium as Mg	96 mg/l	0.31	1000	11/05/93	NH
Sodium as Na	300 mg/l	0.81	1000	11/05/93	NH
INORGANICS					
Electrical Conductivity	2240 umhos/cm	5.1	1500	11/12/93	BH
Oil & Grease	3 mg/l	1	1130	11/05/93	CC
Settleable Solids	<0.2 ml/l	0.2	1615	11/01/93	CC
Sulfide as S	<1 mg/l	0.61	1500	11/02/93	DD
Total Dissolved Solids	1500 mg/l	11.7	1605	11/02/93	CC
Total Suspended Solids	9 mg/l	3.5	1525	11/02/93	CC
METALS					
Aluminum as Al (Dissolved	0.2 mg/l	0.023	1100	11/17/93	NH
Arsenic as As (Dissolved)	<0.002 mg/l	0.0014	1300	11/08/93	AH
Boron as B (Dissolved)	0.3 mg/l	0.045	1100	11/17/93	NH
Cadmium as Cd (Dissolved)	<0.001 mg/l	0.0002	1130	11/30/93	AH
Copper as Cu (Dissolved)	<0.02 mg/l	0.005	1100	11/17/93	NH
Iron as Fe (Dissolved)	<0.05 mg/l	0.008	1100	11/17/93	NH
Iron as Fe (Total)	0.41 mg/l	0.008	1330	12/01/93	BH
Lead as Pb (Dissolved)	<0.002 mg/l	0.0012	1400	11/22/93	NH
Manganese as Mn (Dissolved)	0.04 mg/l	0.003	1100	11/17/93	NH
Manganese as Mn (Total)	0.06 mg/l	0.003	1330	12/01/93	BH
Molybdenum as Mn (Total)	<0.05 mg/l	0.023	1100	11/17/93	NH
Selenium as Se (Dissolved	<0.002 mg/l	0.0011	1400	11/10/93	AH
Zinc as Zn (Dissolved)	1.02 mg/l	0.008	1100	11/17/93	NH
NUTRIENTS					
Ammonia Nitrogen as N	0.11 mg/l	0.034	1130	11/12/30	DD
Nitrite as N	<0.05 mg/l	0.005	1130	11/02/93	DD
Phosphorous Total	0.06 mg/l	<0.002	1330	11/18/93	CC
Nitrate as N	0.88 mg/l	0.005	1130	11/03/93	DD

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Laboratory No.: 146284
Sample Name: ICE-1/102693
Sample Date: 10/27/93
Collected by: G. HOWELL
Time Sampled: 0830
Sample Type: WATER

PARAMETER	MEASURED VALUE	METHOD DETECTION LIMIT	TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
ANIONS					
Alkalinity Bicarbonate as HCO3	593 mg/l	1.02	0900	11/09/93	BH
Alkalinity Carbonate as CO3	0 mg/l	-	0900	11/09/93	BH
Alkalinity Total as CaCO3	486 mg/l	0.84	0900	11/09/93	BH
Chloride as Cl	65 mg/l	0.24	1300	11/09/93	BH
Sulfate as SO4	777 mg/l	2.29	1145	11/09/93	CC
CATIONS					
Calcium as Ca	90 mg/l	0.39	1130	11/15/93	NH
Hardness as CaCO3	660 mg/l	-	1130	11/15/93	NH
Magnesium as Mg	105 mg/l	0.31	1000	11/05/93	NH
Sodium as Na	340 mg/l	0.81	1130	11/15/93	NH
INORGANICS					
Electrical Conductivity	2410 umhos/cm	5.1	1500	11/12/93	BH
Oil & Grease	<1 mg/l	1	1130	11/05/93	CC
Settleable Solids	<0.2 ml/l	0.2	0945	11/02/93	CC
Sulfide as S	<1 mg/l	0.61	1500	11/02/93	DD
Total Dissolved Solids	1600 mg/l	11.7	1605	11/02/93	CC
Total Suspended Solids	<2 mg/l	3.5	1525	11/02/93	CC
METALS					
Aluminum as Al (Dissolved	0.1 mg/l	0.023	1100	11/17/93	NH
Arsenic as As (Dissolved)	<0.002 mg/l	0.0014	1300	11/08/93	AH
Boron as B (Dissolved)	0.3 mg/l	0.045	1100	11/17/93	NH
Cadmium as Cd (Dissolved)	<0.001 mg/l	0.0002	1130	11/30/93	AH
Copper as Cu (Dissolved)	<0.02 mg/l	0.005	1100	11/17/93	NH
Iron as Fe (Dissolved)	<0.05 mg/l	0.008	1100	11/17/93	NH
Iron as Fe (Total)	<0.05 mg/l	0.008	1330	12/01/93	BH
Lead as Pb (Dissolved)	<0.002 mg/l	0.0012	1400	11/22/93	NH
Manganese as Mn (Dissolved)	<0.02 mg/l	0.003	1100	11/17/93	NH
Manganese as Mn (Total)	<0.02 mg/l	0.003	1330	12/01/93	BH
Molybdenum as Mn (Total)	<0.05 mg/l	0.023	1100	11/17/93	NH
Selenium as Se (Dissolved	<0.002 mg/l	0.0011	1400	11/10/93	AH
Zinc as Zn (Dissolved)	<0.02 mg/l	0.008	1100	11/17/93	NH
NUTRIENTS					
Ammonia Nitrogen as N	<0.05 mg/l	0.034	1130	11/12/30	DD
Nitrite as N	<0.05 mg/l	0.005	1130	11/02/93	DD
Phosphorous Total	0.05 mg/l	<0.002	1330	11/18/93	CC
Nitrate as N	0.77 mg/l	0.005	1130	11/03/93	DD

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Laboratory No.: 146285
Sample Name: WELL/102783
Sample Date: 10/27/93
Collected by: G. HOWELL
Time Sampled: 0915
Sample Type: WATER

PARAMETER	MEASURED VALUE	METHOD DETECTION LIMIT	TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
ANIONS					
Alkalinity Bicarbonate as HCO3	599 mg/l	1.02	0900	11/09/93	BH
Alkalinity Carbonate as CO3	0 mg/l	-	0900	11/09/93	BH
Alkalinity Total as CaCO3	491 mg/l	0.84	0900	11/09/93	BH
Chloride as Cl	47 mg/l	0.24	1300	11/09/93	BH
Sulfate as SO4	604 mg/l	2.29	1145	11/09/93	CC
CATIONS					
Calcium as Ca	99 mg/l	0.39	1130	11/15/93	NH
Hardness as CaCO3	590 mg/l	-	1130	11/15/93	NH
Magnesium as Mg	84 mg/l	0.31	1000	11/05/93	NH
Sodium as Na	276 mg/l	0.81	1000	11/05/93	NH
INORGANICS					
Electrical Conductivity	2100 umhos/cm	5.1	1500	11/12/93	BH
Oil & Grease	<1 mg/l	1	1130	11/05/93	CC
Settleable Solids	<0.2 ml/l	0.2	1130	11/02/93	CC
Sulfide as S	<1 mg/l	0.61	1500	11/02/93	DD
Total Dissolved Solids	1400 mg/l	11.7	1605	11/02/93	CC
Total Suspended Solids	<2 mg/l	3.5	1525	11/02/93	CC
METALS					
Aluminum as Al (Dissolved	<0.1 mg/l	0.023	1100	11/17/93	NH
Arsenic as As (Dissolved)	<0.002 mg/l	0.0014	1300	11/08/93	AH
Boron as B (Dissolved)	0.3 mg/l	0.045	1100	11/17/93	NH
Cadmium as Cd (Dissolved)	<0.001 mg/l	0.0002	1130	11/30/93	AH
Copper as Cu (Dissolved)	<0.02 mg/l	0.005	1100	11/17/93	NH
Iron as Fe (Dissolved)	<0.05 mg/l	0.008	1100	11/17/93	NH
Iron as Fe (Total)	0.14 mg/l	0.008	1330	12/01/93	BH
Lead as Pb (Dissolved)	<0.002 mg/l	0.0012	1400	11/22/93	NH
Manganese as Mn (Dissolved)	<0.02 mg/l	0.003	1100	11/17/93	NH
Manganese as Mn (Total)	<0.02 mg/l	0.003	1330	12/01/93	BH
Molybdenum as Mn (Total)	<0.05 mg/l	0.023	1100	11/17/93	NH
Selenium as Se (Dissolved	<0.002 mg/l	0.0011	1400	11/10/93	AH
Zinc as Zn (Dissolved)	<0.02 mg/l	0.008	1100	11/17/93	NH
NUTRIENTS					
Ammonia Nitrogen as N	<0.05 mg/l	0.034	1130	11/12/30	DD
Nitrite as N	<0.05 mg/l	0.005	1130	11/02/93	DD
Phosphorous Total	0.05 mg/l	<0.002	1330	11/18/93	CC
Nitrate as N	1.21 mg/l	0.005	1130	11/03/93	DD

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Laboratory No.: 146286
Sample Name: DUPLICATE 146281 CRS/102693
Sample Date: 10/26/93
Collected by: G. HOWELL
Time Sampled: 1320
Sample Type: WATER

PARAMETER	MEASURED VALUE	METHOD DETECTION LIMIT	TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
ANIONS*					
Alkalinity Bicarbonate as HCO3	542 mg/l	1.02	0900	11/09/93	BH
Alkalinity Carbonate as CO3	0 mg/l	-	0900	11/09/93	BH
Alkalinity Total as CaCO3	444 mg/l	0.84	0900	11/09/93	BH
Chloride as Cl	97 mg/l	0.24	1300	11/09/93	BH
Sulfate as SO4	2860 mg/l	2.29	1345	11/10/93	CC
CATIONS*					
Calcium as Ca	549 mg/l	0.39	1130	11/15/93	NH
Hardness as CaCO3	2780 mg/l	-	1130	11/15/93	NH
Magnesium as Mg	342 mg/l	0.31	1130	11/15/93	NH
Sodium as Na	552 mg/l	0.81	1130	11/15/93	NH
INORGANICS					
Electrical Conductivity	5370 umhos/cm	5.1	1500	11/12/93	BH
Settleable Solids	<0.2 ml/l	0.2	1510	11/01/93	CC
Sulfide as S	<1 mg/l	0.61	1500	11/02/93	DD
Total Dissolved Solids	5100 mg/l	11.7	1605	11/02/93	CC
Total Suspended Solids	42 mg/l	3.5	1525	11/02/93	CC
METALS					
Aluminum as Al (Dissolved	0.4 mg/l	0.023	1100	11/17/93	NH
Arsenic as As (Dissolved)	<0.002 mg/l	0.0014	1300	11/08/93	AH
Boron as B (Dissolved)	1.0 mg/l	0.045	1100	11/17/93	NH
Cadmium as Cd (Dissolved)	<0.001 mg/l	0.0002	1130	11/30/93	AH
Copper as Cu (Dissolved)	<0.02 mg/l	0.005	1100	11/17/93	NH
Iron as Fe (Dissolved)	6.35 mg/l	0.008	1100	11/17/93	NH
Iron as Fe (Total)	50 mg/l	0.008	1330	12/01/93	BH
Lead as Pb (Dissolved)	<0.002 mg/l	0.0012	1400	11/22/93	NH
Manganese as Mn (Dissolved)	1.30 mg/l	0.003	1100	11/17/93	NH
Manganese as Mn (Total)	2.3 mg/l	0.003	1330	12/01/93	BH

* The cation-anion analysis does not meet our quality assurance requirements. However, the values reported herein were verified by duplicate analysis. This indicates there are other unmeasured cations or anions present in the sample.

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Laboratory No.: 146286
Sample Name: DUPLICATE 146281 CRS/102693
Sample Date: 10/26/93
Collected by: G. HOWELL
Time Sampled: 1320
Sample Type: WATER

PARAMETER	MEASURED VALUE		METHOD DETECTION LIMIT	TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
Molybdenum as Mn (Total)	<0.05	mg/l	0.023	1100	11/17/93	NH
Selenium as Se (Dissolved	<0.002	mg/l	0.0011	1400	11/10/93	AH
Zinc as Zn (Dissolved)	0.34	mg/l	0.008	1100	11/17/93	NH
NUTRIENTS						
Ammonia Nitrogen as N	1.73	mg/l	0.034	1130	11/12/30	DD
Nitrite as N	<0.05	mg/l	0.005	1130	11/02/93	DD
Phosphorous Total	0.85	mg/l	<0.002	1330	11/18/93	CC
Nitrate as N	0.34	mg/l	0.005	1130	11/03/93	DD

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Laboratory No.: 146287
Sample Name: SPIKE 146284 ICE-1/102793
Sample Date: 10/26/93
Collected by: G. HOWELL
Time Sampled: 1320
Sample Type: WATER

PARAMETER	MEASURED VALUE		TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
ANIONS					
Alkalinity Total as CaCO3	98	%	0900	11/09/93	BH
Chloride as Cl	95	%	1300	11/09/93	BH
Sulfate as SO4	97	%	1145	11/09/93	CC
CATIONS					
Calcium as Ca	100	%	1130	11/15/93	NH
Magnesium as Mg	102	%	1130	11/15/93	NH
Sodium as Na	100	%	1130	11/15/93	NH
INORGANICS					
Sulfide as S	110	%	1500	11/02/93	DD
METALS					
Aluminum as Al (Dissolved	94	%	1100	11/17/93	NH
Arsenic as As (Dissolved)	93	%	1300	11/08/93	AH
Boron as B (Dissolved)	104	%	1100	11/17/93	NH
Cadmium as Cd (Dissolved)	105	%	1130	11/30/93	AH
Copper as Cu (Dissolved)	100	%	1100	11/17/93	NH
Iron as Fe (Dissolved)	104	%	1100	11/17/93	NH
Iron as Fe (Total)	100	%	1330	12/01/93	BH
Lead as Pb (Dissolved)	90	%	1400	11/22/93	NH
Manganese as Mn (Dissolved)	100	%	1100	11/17/93	NH
Manganese as Mn (Total)	90	%	1330	12/01/93	BH
Molybdenum as Mn (Total)	100	%	1100	11/17/93	NH
Selenium as Se (Dissolved	100	%	1400	11/10/93	AH
Zinc as Zn (Dissolved)	100	%	1100	11/17/93	NH
NUTRIENTS					
Ammonia Nitrogen as N	106	%	1130	11/12/30	DD
Nitrite as N	103	%	1130	11/02/93	DD
Phosphorous Total	96	%	1330	11/18/93	CC
Nitrate as N	102	%	1130	11/03/93	DD

Pr[illegible] or Sit[illegible]e

5-137.3-91 DOGM

Project Number

M. Howell

Sampler Name (Printed)

Huntingdon

Consulting Engineers Environmental Scientists

- [x] Chen-Northern, Inc., Division
- [ ] Thomas-Hartig & Associates, Inc., Division
- [ ] Schaefer Dixon Associates, Inc., Division
- [ ] Herzog Associates, Inc., Division

Conta[illegible] Repor[illegible]

1127 W. 2320 S. # B. SLC, UT 84119

Contact Address or Location

Sampler Signature

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	413.1	Sulphide	Total Metals	Dissolved Metals	TSS	Settleable Solids	Gamma Scan	NOTES	LAB NUMBER
10-26-93	1320	CRS/102693	grab	H_2O	7 (Rec'd 6 only)	x	x	x	x	x	x	x	413.1, Nitr, TCG/OS, Metals Sulfides DIST	146281
10-26-93	1400	CRB/102693	grab	H_2O	7 (Rec'd 6 only)	x	x	x	x	x	x	x		82
10-27-93	0730	F-2/102793	grab	H_2O	7	x	x	x	x	x	x	x		83
10-27-93	0830	ICE-1/102793	grab	H_2O	7	x	x	x	x	x	x	x		84
10-27-93	0915	WELL/102793	grab	H_2O	7	x	x	x	x	x	x	x		85
													Dup 146281 CRS/102693 10/26 1330	86
													Sp 146281 ICE-1/102793 10/27 0830	87
													Sulfide	
													+ Nitrate preserved in lab - (may not hold)	

Relinquished by:	Date	Time	Received by:
Carrier Bill	11/1/93	1100	C.A.I. Kab Bkpr / H. Cleveland
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by:

Remarks: ATTN: David Council 11/1/93 3:15 pm

SEE attached list for Complete parameter listing

Cooler temp 15.7°C

ATTACHMENT B

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah

Groundwater Discharge Permit Number UGW070002

Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: 004 UPDES

Runoff Basin / Spring / Other:

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow (cfs)	Flow Meas. Method	Basin Water Level (feet)	Field Parameters: Temp (°C)	pH	SC (umhos)	DO ~~Meter No.~~	Collection Point	Sample Taken (yes/no)
9/4/92	1715	CW/GM	Cold/rainy	yes	no sheen, foam, or debris	10 gpm	VE	–	12	6.75	2173	11.1	discharge dike	yes
10/3/92	825	GM	Clear, cold	yes		~10	VE	–	9	8.19	2897	11.1	"	yes
11/5/92	1335	GM	Sunny/Snow	yes		~20	VE	–	4	8.33	2400	8.6		yes
12/3/92	1457	GM CW	Cold Clear	yes		~25	VE	–	1.5	–	2386	9.8		yes
* "	1515	"	"	yes		"	"	–	20	–	2352	10.0	Near Res.	yes
1/28/93	1057	GM CW	Cold Clear	yes		~25	"		6		1504		At Outfall	yes
2/14/93	1617	GM	Cold Clear	yes		~25	VE	-	4	8.21	2150		"	yes
4/22/93	928	GM CW	Cold Hazy	yes		~25	VE	–	2	8.45	1636	9.6	"	yes
														yes
2/8/93	1345	GM RP	Cold Snowing	yes		~25	VE	–	4	8.58	2282	10.4	"	yes
2/25/93	1115	GM CW	Cold PC	yes		~20	VE	–	4	7.90	2150	10.2	"	yes
3/12/93	1309	GM	Cool Sunny	yes		~30	VE	–	6	8.65	2645	11.2	"	yes
3/22/93	1053	CW	Sunny Warm	yes	reduced Flow	~15	VE	–	11	7.43	1920	–	"	yes
4/8/93	1570	GM CW	Clear Cold	yes		20	VE	–	6	7.32	1900	10.6	"	yes
4/29	1156	GM	Clear Warm	yes		20	VE	-	13	8.54	2150	10.8	"	yes
5/7/93	1100	GM	Warm Sunny	yes		~25	VE	–	10.5	8.69	2200	9.8	"	yes
5/26/93	1328	GM	Warm	yes		25	VE	–	17.5	8.81	1950	–	"	yes
6/15/93	1430	RG	Warm Windy	yes	Flow Reduced by ½	8	Flume	–	7	8.3	1400	7.5	"	yes

* Basin water level measurements are taken from permanent reference point at basin location.

Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

* Taken downstream near reservoir: sample named 004-RES

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah

Groundwater Discharge Permit Number UGW070002

Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: 004 (cont.) UPDES

Runoff Basin / Spring / Other:

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow ~~(cfs)~~ gpm	Flow Meas. Method	Basin Water Level (feet)	Field Parameters: Temp (F) C	pH	SC (umhos)	DO Meter No.	Collection Point	Sample Taken (yes/no)
6/24/03	0853	GM/MH	Sunny, Hot	NO	No Discharge Slurry water is by passing decanting process & into 3rd bay in.									
7/12/03	1337	CW GM	SH	NO	Some water in Basin, lower than 0/ng									NO
7/22/03	1024	GM	S, H	NO	1'-2' of water in basin									"
8/12/03	1350	MH	S, H	NO										"
8/20	1400	MH	SW	NO	Dry									"
9/2/03	1125	CW, GM	S, warm	NO	NO Discharge									"
9/30	1800	RG	S, Windy	Yes		49	Flume		12	8.09	2900		below flume	yes
10/13	1135	MH	Cold/Windy	Yes	Black high TSS	97.4	"		10.4	8.28	1300			
10/26	1140	MH	Cool/Windy	Yes					7.9	8.44	1250	6.5		
11/16	1200	MH	Cold	yes	Much Fines (TSS)	97.35	Flume		4.2	8.9	1250	6.1	"	yes
11/30	1312	GM CW	Cold	yes	Black V. high TSS	107.6	Flume		4.9	8.78	1050		"	yes
12/9	1036	GM	Cold Overcast	yes	Black V. High TSS high flow	148.1	Flume		3.4	8.24	2023	7.4	"	yes
12/23	1040	GM	Cold Overcast	yes	Clear V. Low Flow	4.3	Flume		3.0	8.57	2676	—	"	yes
1/13/04	1345	GM	Clear Cold	~~NO~~	NO DISCHARGE	—	-	—						NO
1/14/04	1348	MH	Clear Cold	NO	NO Discharge	0	—	—	—	—		—	—	NO

* Basin water level measurements are taken from permanent reference point at basin location.

Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah

Groundwater Discharge Permit Number UGW070002

Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: 007 UPDES

Runoff Basin / Spring / Other:

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow (cfs)	Flow Meas. Method	Basin Water Level (feet)	Field Parameters: Temp (C)	pH	SC (umhos)	DO Meter No.	SC corrected ~~Collection Point~~	Sample Taken (yes/no)
11/5/92	1150	GM	Clear, Cool	yes	Murky, stormwater	<1	VE	<2'	2	8.78	700	8.6	1230	
4/20	1621	GM	Warm Partly Cl.	NO	Basin is Dry									
5/7/93	1157	GM	" "	NO	Basin is Dry									
6/20	1434	GM/MH	Sunny Hot	NO	Basin is Dry									
7/12/93	1353	CW GM	S, H	NO	Basin is Dry									
7/27/93	1527	GM	S, H	NO	Basin is Dry									
8/12/93	1406	MH	S, H	NO	Basin is Dry									
8/20/93	1430	MH	S, W	NO	Basin is Dry									
9/2/93	1504	CW, GM	SW	NO	Basin is Dry									
9/30	1703	CW, RG	S, W	NO	Basin is Dry									
10/13	1040	MH	Cloudy	NO	Basin contains ~1-2" w.w									
10/26	1251	MH	Windy	NO	6" of Water									
11/16	1345	MH	Cold	NO	1.5" of Snow in Basin									
11/30	1440	GM CW	Cold	NO	Damp spots in Basin									
12/9	1142	GM	Cold	NO	Snow in Basin									
12/23	1153	GM	Cold	NO	2" Snow in basin									
1/14/94	1001	GM	Cold Clear	NO	Snow in Basin									
1/31/94	1500	MH	Cold Clear	No	Basin is Dry									

* Basin water level measurements are taken from permanent reference point at basin location.

Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah

Groundwater Discharge Permit Number UGW070002

Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: 008 Old Coarse Refuse Pond UPDES

Runoff Basin / Spring / Other:

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow (cfs)	Flow Meas. Method	Basin Water Level (feet)	Field Parameters Temp (F)	pH	SC (umhos)	Meter No.	Collection Point	Sample Taken (yes/no)
4/29	1636	GM	PC	NO	Basin is Dry									
5/7	1215	GM	PC warm	NO	Basin is Dry									
6/29	1404	GM/MH	Sunny Hot	NO	Basin is Dry									
7/12/93	1400	CW GM	S H	NO	Basin is Dry									
7/27	1034	GM	S H	NO	Basin is Dry.									
8/17/93	1413	MH	S H	NO	Basin is Dry									
8/20	1410	MH	Warm	NO	Basin is Dry									
9/2/93	1346	CW GM	Warm	NO	Basin is Dry Installed Mile Post									
9/30	1402	CWRG	Windy Warm	NO	Basin is Dry									
10/13	1120	MH	Warm	NO	6" of Water									
10/26	1100	MH	Windy	NO	Basin is Dry									
11/16	1145	MH	Cold	NO	1' of snow in Basin									
11/30	1520	GM CW	Cold	NO	"									
12/9	1133	GM	Cold	NO	Snow in Basin									
12/23	1123	GM	Cold	NO	2" of snow in Basin									
1/14/94	0940	JM	Cold Clear	NO	Snow in Basin									
1/31/94	1400	MH	Cold Clear	NO	Trace of Snow in Basin									

* Basin water level measurements are taken from permanent reference point at basin location.

Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah

Groundwater Discharge Permit Number UGW070002

Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

UPDES

MONITORING LOCATION NUMBER: 009 Pasture Pond

Runoff Basin / Spring / Other:

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow (cfs)	Flow Meas. Method	Basin Water Level (feet)	Field Parameters Temp (F)	pH	SC (umhos)	Meter No.	Collection Point	Sample Taken (yes/no)
4/29	1606	GM	Cloudy	NO	Basin is Dry									
5/7	1120	GM	PC.	NO	Basin is Dry									
6/29	1358	GM MH	Sunny/Hot	NO	Basin is Dry; has been expanded/deepened.									
7/12/93	1340	GM CW	Sit	NO	Basin is Dry									
7/27/93	1020	GM	Sit	NO	Basin is Dry									
8/12/93	1355	GM	Sit	NO	Basin is Dry									
8/20	1357	MH	SW	NO	Basin has 6" of black water									
9/7	1305	CW GM	SW	NO	Basin is Dry. Installed Post									
9/20	1355	CW RG	Warm	NO	Basin is Dry									
10/13	1110	MH	Warm	NO	2" Water level Black Film.									
10/26	1215	MH	Warm	NO	2" Water level									
11/16	1230	MH	Cold	NO	2" w/ Equal Black water									
11/30	1307	GM CW	Cold	NO	Snowmelt & Ice present									
12/9	1117	GM	Cold	NO	No water / Ice in basin									
12/23	1105	GM	Cold	NO	6" of ice in basin									
1/14/94	0933	GM	Cold Clear	NO	Dry									
1/31/94	1410	MH	Clear/Cold	NO	Dry									

* Basin water level measurements are taken from permanent reference point at basin location.

Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah

Groundwater Discharge Permit Number UGW070002

Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: 012 Coarse Refuse Toe UPDES

Runoff Basin / Spring / Other:

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow (cfs)	Flow Meas. Method	Basin Water Level (feet)	Field Parameters Temp (F)	pH	SC (umhos)	Meter No.	Collection Point	Sample Taken (yes/no)
4/29	1624	GM	PC	NO	Basin is Dry									
5/7	1159	GM	PC	NO	Basin is Dry									
6/29	1435	GM/MH	Sunny/Hot	NO	Basin is Dry									
7/12/93	1350	CW/GM	S/H	NO	Basin is Dry									
7/27/93	1529	GM	S/H	NO	Basin is Dry									
8/12/93	1404	MH	S/H	NO	Basin is Dry									
8/20	1450	MH	Warm	NO	Basin is Dry									
9/2	1515	CW/GM	Warm	NO	Basin is Dry									
9/30	1709	CW RG	Warm	NO	Basin is Dry									
10/13	1035	MH	Warm	NO	2' water level									
10/26	1300	MH	Windy	NO	2' WL									
11/16	1350	MH	Cold	NO	2' WL No Ice Layer									
11/30	1443	GM CW	Cold	NO	Water/Ice 5 5" below discharge									
12/9	1140	GM	Cold	NO	ICE/water 2" in basin									
12/23	1156	GM	Cold	NO	2" of Snow in Basin									
1/14/94	1008	GM	Cold Clear	NO	6" of Ice									
1/31/94	1510	MH	Cold / Clear	NO	6" of Ice									

* Basin water level measurements are taken from permanent reference point at basin location.

Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah
Groundwater Discharge Permit Number UGW070002
Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: 013 Facility Sed Pond UPDES

Runoff Basin / Spring / Other:

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow (cfs)	Flow Meas. Method	Basin Water Level (feet)	Field Parameters Temp (F)	pH	SC (umhos)	Meter No.	Collection Point	Sample Taken (yes/no)
4/29	1557	GM	PC	NO	Low Water level (~6' below overflow)									
5/7	1051	GM	PC	NO	" " " (6-8' " ")									
6/29	1351	GM/MH	Sunny Hot	NO	" " " "									
7/12/93	1320	GM/CW	S,H	NO	Lower WL than previously									
7/27	1016	GM	S,H	NO	Higher WL (3' below standpipe)									
8/12/93	1334	MH	S,H	NO	Low WL									
8/20	1350	MH	SW	NO	2" clear Water									
9/2	1220	CW, GM	warm	NO	Some water (1') by stand Marker Post.									
9/30	1245	CW, RG	warm	NO	Water, Algae in pond.									
10/13	1100	MH	warm	NO	2.5-3' WL									
10/26	1230	MH	windy	NO	Water on Red stripe on standpipe									
11/10	1245	MH	Cold	NO	WL on Red stripe Ice on surface									
11/20	1307	GM CW	Cold	NO	Snow melt at discharge.									
12/9	1110	GM	cold	NO	water/Ice 1' below ~~[illegible]~~ red stripe									
12/30	1059	GM	Cold	NO	Ice 1' below red stripe									
1/14/94	0424	GM	Cold Clear	NO	Ice 6" below Red stripe									
1/21/94	1435	MH	Cold & Clear	NO	1' WL 1" Ice Cap (3' below Red Stripe)									

* Basin water level measurements are taken from permanent reference point at basin location.
Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah

Groundwater Discharge Permit Number UGW070002

Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: 014 Coal Pile Sed. Pond UPDES

Runoff Basin / Spring / Other:

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow (cfs)	Flow Meas. Method	Basin Water Level (feet)	Field Parameters: Temp (F)	pH	SC (umhos)	Meter No.	Collection Point	Sample Taken (yes/no)
4/29	1602	GM	PC	NO	1' below top of overflow									
5/1	1053	GM	PC	NO	1' " " "									
6/29	1355	GM MH	Sunny Hot	NO	" " " "									
7/9/03	1330	GM CW	Sl. H	NO	Low water level.									
7/22/03	1018	GM	Sl. H	NO	Damp Seds in Basin									
8/12/03	1342	GM	MH	NO	Dry Basin									
8/20	1355	MH	SH	NO	Basin is dry									
9/2	1243	MH GM	W m	NO	Basin is Dry Installed Marker Post.									
9/30	1248	CW RG	Warm	NO	Basin is Dry Much Coal Fines in Basin									
10/3	1105	MH	W m	NO	1' from Discharge Black water Coal Fines.									
10/26	1225	MH	Windy	NO	" " "									
11/6	1240	MH	Cold	NO	1.5' from DP.									
11/20	1257	GM CW	Cold	NO	Ice/snowmelt at discharge point through stand pipe									
12/9	1115	GM	Cold	NO	Ice 1' below overspill									
12/23	1102	GM	Cold	NO	Ice 1' below overspill									
1/14/04	0930	GM	Cold Clear	NO	Ice 1' below overspill									
1/31/04	1430	MH	Cold Clear	NO	No ice. film sheen present 2' below spill pipe									

* Basin water level measurements are taken from permanent reference point at basin location.

Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah

Groundwater Discharge Permit Number UGW070002

Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: 015 Landfill Sed. Pond UPDES

Runoff Basin / Spring / Other:

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow (cfs)	Flow Meas. Method	Basin Water Level (feet)	Field Parameters: Temp (F)	pH	SC (umhos)	Meter No.	Collection Point	Sample Taken (yes/no)
4/29	1502	GM	Overcast	NO	Water in Basin ~10" below overflow Sample collected for GW permit at spillway									yes
5/7	1150	GM	PC	NO	1" " " 2" " " Some Ash running into basin.									
6/29	1341	GM/MH	Sunny/Hot	NO	Basin is Dry. Ash is Flowing into it.									
7/17/93	1417	CW/GM	SH	NO	Basin is Dry									
7/27/93	1422	GM	SH	NO	Basin is Dry									
8/11/93	1422	MH	SH	NO	Basin is Dry									
8/20	1315	MH	SH	NO	Dry Ash in Basin									
9/2	1740	CW, GM	SW	NO	Basin is Dry Installed Marker Post.									
9/30	1421	CW/RG	W	NO	Basin is Dry Some ash in Basin									
10/13	2000	MH	W	NO	6" of Water in East side									
10/26	1245	MH	Windy	NO	Basin is Dry									
11/16	1330	MH	Cold	NO	1" of snow									
11/30	1431	GM/CW	Cold	NO	Ash seal present in basin									
12/9	1150	GM	Cold	NO	Water/Ice @ East End									
12/23	1150	GM	Cold	NO	Snow in basin, No discharge									
1/13/94	1430	GM	Cold/Clear	NO	Basin is Dry Dump in place.									
1/31/94	1445	MH	Cold Clear	NO	Basin is Dry									

* Basin water level measurements are taken from permanent reference point at basin location.

Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

SUNNYSIDE COGENERATION ASSOCIATES FACILITY

Carbon County, Utah

Groundwater Discharge Permit Number UGW070002

Surface Water and Discharge Basin Compliance Sampling

HUNTINGDON Chen – Northern

MONITORING LOCATION NUMBER: 016 Borrow Area Pond. UPDES

Runoff Basin / Spring / Other:

Sampling Parameters:

Date	Time	Personnel	Weather	Discharge Present (yes/no)	Observations (color, sheen, odor, etc.)	Flow (cfs)	Flow Meas. Method	Basin Water Level (feet)	Field Parameters: Temp (F)	pH	SC (umhos)	Meter No.	Collection Point	Sample Taken (yes/no)
4/29	1608	GM	Overcast	NO	Basin is Dry									
5/1	1129	GM	PC	NO	Basin is Dry.									
6/29	1400	GM MH	Sunny Warm	NO	Basin is Dry.									
7/12/93	1356	GM CW	S H	NO	Basin is Dry									
7/27/93	1034	GM	S H	NO	Basin is Dry									
8/12/93	1410	MH	S H	NO	Basin is Dry									
8/20	1420	MH	S H	NO	Basin is Dry									
9/2	1317	CW GM	SW	NO	Basin is Dry									
9/30	1410	CW RG	W	NO	Basin is Dry									
10/13	1130	MH	W	NO	Basin is Dry									
10/26	1105	MH	Windy	NO	Basin is Dry									
11/16	1145	MH	Cold	NO	1" of snow									
11/30	1528	GM CW	Cold	NO	"									
12/9	1130	GM	Cold	NO	Snow in basin									
12/13	1118	GM	Cold	NO	2" of snow in basin									
1/13/94	0936	GM	Cold Clear	NO	Snow in basin									
1/31/94	1355	MH	Cold Clear	NO	1" of Snow in Basin									

* Basin water level measurements are taken from permanent reference point at basin location.

Flow measurement methods: W = Weir, VE = Visual Estimate, CC = Calibrated Container, DF = Debris Flow Rate Estimate

Huntingdon
Chen-Northern, Inc.
600 SOUTH 25TH STREET
P.O. BOX 30615
BILLINGS, MT 59107
(406) 248-9161
FAX (406) 248-9282

TECHNICAL REPORT

REPORT TO: ATTN: MR. CHUCK WEMPLE
CHEN-NORTHERN, INC.
1127 WEST 2320 SOUTH, SUITE B
SALT LAKE CITY, UT 84119

DATE: July 1, 1993
JOB NUMBER: 87-927
SHEET: 1 of 2
INVOICE NO.: 23618

REPORT OF: Water Analysis - Sunnyside Cogen. Facility - 5-137.1-91

SAMPLE IDENTIFICATION:

On June 17, 1993, this water sample (laboratory number 141864) was delivered to our laboratory for analysis. Tests were conducted in accordance with the U.S. Environmental Protection Agency Manual EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes".

The test results are shown on the following page.

Reviewed by David Comrie

rmr

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF OUR CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL. SAMPLES WILL BE DISPOSED OF AFTER TESTING IS COMPLETED UNLESS OTHER ARRANGEMENTS ARE AGREED TO IN WRITING.

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Project Name: Sunnyside Cogen. Facility (5-137.1-91)

Laboratory No.: 141864
Sample Name: 004/061593
Sample Date: 06/15/93
Collected by: RICHARD E. GIRAUD
Time Sampled: 1430
Sample Type: WATER

PARAMETER	MEASURED VALUE	METHOD DETECTION LIMIT	DATE OF ANALYSIS	TIME OF ANALYSIS	ANALYST
INORGANICS:					
pH (150.1)	8.5 S.U.	-	06/17/93	16:55	C. Corder
Total Dissolved Solids (160.1)	1180 mg/l	20 mg/l	06/22/93	17:30	B. Hebert
Total Suspended Solids (160.2)	61 mg/l	5 mg/l	06/17/93	15:45	C. Corder
METALS:					
Iron as Fe (Total)(200.7)	0.73 mg/l	0.05 mg/l	06/23/93	10:15	N. Halloway
PETROLEUM HYDROCARBONS:					
Recoverable Petroleum Hydrocarbons (418.1)	5.0 mg/l	0.2 mg/l	06/23/93	9:35	A. Holm

CHAIN OF CUSTODY RECORD

Huntingdon
Consulting Engineers & Environmental Scientists

- ☐ Chen-Northern, Inc. Division
- ☐ Thomas-Hartig & Associates, Inc. Division
- ☐ Schaefer-Dixon Associates, Inc. Division
- ☐ Herzog Associates, Inc. Division

Sunnyside Cogeneration
Project or Site Name

5-1372-91
Project Number

Richard E. Giraud
Sampler Name (Printed)

Chuck Wemple
Contact or Report to

1127 W 2320 S Suite B SLC UT 84119
Contact Address or Location

Richard E. Giraud
Sampler Signature

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: Metals	TDS	pH	Metals	Oil & Grease			NOTES	LAB NUMBER
6-15-93	14:30	CRB/032393	G	W	3	✓	✓	✓	✓				Coal runoff basin	

Corrected
See attached

Relinquished by	Date	Time	Received by	Remarks
Richard E. Giraud	6-16-93	14:00	Corrible Airborne	Analysis Date, Time, Name Method and minimum detection level must appear on the lab report.
Relinquished by:	Date 6/17/93	Time	Received by: GWI Lab Blgs L. Cleveland	
Relinquished by:	Date	Time	Received by:	
Relinquished by:	Date	Time	Received by:	

Huntingdon
Chen-Northern, Inc.
[illegible] SOUTH 25TH STREET
P.O. BOX 30615
BILLINGS, MT 59107
(406) 248-9161
FAX (406) 248-9282

TECHNICAL REPORT

REPORT TO: ATTN: CHUCK WEMPLE
CHEN-NORTHERN, INC.
1127 WEST 2320 SOUTH, SUITE B
SALT LAKE CITY UT 84119

DATE: November 4, 1993
JOB NUMBER: 87-927
SHEET: 1 of 3
INVOICE NO.: 003676

REPORT OF: Water Analysis - Sunnyside Cogeneration Facility 5-137.1-41

SAMPLE IDENTIFICATION:

On October 16, 1993, these water samples (our laboratory numbers 145792 through 145795) were received in our laboratory for analysis. Tests were conducted in accordance with the U.S. Environmental Protection Agency Manual EPA 600/4-79-020, *"Methods for Chemical Analysis of Water and Wastes."*

The results of the analysis are shown on the following pages.

A < sign indicates the value reported was the practical quantitation limit for this sample using the method described. Concentrations of analyte, if present, below this were not quantifiable.

Reviewed by David Cowell

rmr

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Laboratory No.: 145792
Sample Name: OUTFALL 004-101393
Sample Date: 10/13/93
Collected by: HOWELL
Time Sampled: 1215
Sample Type: WATER

PARAMETER	MEASURED VALUE	METHOD DETECTION LIMIT	TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
INORGANICS					
Oil & Grease	<1 mg/l	1	1530	10/28/93	CC

Laboratory No.: 145793
Sample Name: OUTFALL 004-101393
Sample Date: 10/13/93
Collected by: HOWELL
Time Sampled: 1215
Sample Type: WATER

PARAMETER	MEASURED VALUE	METHOD DETECTION LIMIT	TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
METALS					
Iron as Fe (Total)	0.55 mg/l	0.008	1330	10/28/93	NH

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Laboratory No.: 145794
Sample Name: OUTFALL 004-101393
Sample Date: 10/13/93
Collected by: HOWELL
Time Sampled: 1215
Sample Type: WATER

PARAMETER	MEASURED VALUE	METHOD DETECTION LIMIT	TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
INORGANICS					
Total Suspended Solids	115 mg/l	5	1130	10/20/93	BH

Laboratory No.: 145795
Sample Name: OUTFALL 004-101393
Sample Date: 10/13/93
Collected by: HOWELL
Time Sampled: 1215
Sample Type: WATER

PARAMETER	MEASURED VALUE	METHOD DETECTION LIMIT	TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
INORGANICS					
pH	8.2 S.U.	-	1655	10/19/93	BH
Total Dissolved Solids	1240 mg/l	20	1600	10/20/93	BH

CHAIN OF CUSTODY RECORD

Huntingdon
Consulting Engineers & Environmental Scientists

- [x] Chen-Northern, Inc., Division
- [ ] Thomas-Hartig & Associates, Inc., Division
- [ ] Schaefer Dixon Associates, Inc., Division
- [ ] Herzog Associates, Inc., Division

10-30

Sunnyside Cogeneration Facility
Project or Site Name

5-137.1-91
Project Number

Sampler Name (Printed)

Chuck Wemple
Contact or Report to

1127 W. 2320 S. SLC, UT. 84119
Contact Address or Location

Sampler Signature

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: TDS	TSS	Oil & Grease	Total Hg	PH			NOTES	LAB NUMBER
10/13	1215	outfall 004/101393		H2O	1-1,000 ml Poly			✓					TDS: EPA 160.1	145752
10/13	1215	Outfall 004/101393			1-1,000 ml				✓				PH: EPA 150.1	753
10/13	1215	Outfall 004/101393			1-500 ml		✓						Oil+Grease: EPA 413.1	754
10/13	1215	Outfall 004/101393			1-500 ml	✓				✓			TSS: 160.2	755
													Total Hg via digestion filtration - analysis by CVAS.	

Relinquished by:	Date	Time	Received by:
	10/14/93	9:00	B.U.S
B.U.S	10/16	12:00	CNE BISS Lab

Remarks:
Attn: David Council

Huntingdon
Chen-Northern, Inc.
00 SOUTH 25TH STREET
.O. BOX 30615
BILLINGS, MT 59107
(406) 248-9161
FAX (406) 248-9282

TECHNICAL REPORT

REPORT TO: ATTN: CHUCK WEMPLE
CHEN-NORTHERN, INC.
1127 WEST 2320 SOUTH, SUITE B
SALT LAKE CITY UT 84119

DATE: November 11, 1993
JOB NUMBER: 87-927
SHEET: 1 of 2
INVOICE NO.: 003873

REPORT OF: Water Analysis - SCA - UPDES (5-137.1-91)

SAMPLE IDENTIFICATION:

On November 1, 1993, this water sample (our laboratory number 146288) was received in our laboratory for analysis. Tests were conducted in accordance with the U.S. Environmental Protection Agency Manual EPA 600/4-79-020, *"Methods for Chemical Analysis of Water and Wastes."*

The results of the analysis are shown on the following page.

A < sign indicates the value reported was the practical quantitation limit for this sample using the method described. Concentrations of analyte, if present, below this were not quantifiable.

Reviewed by David Connell

rmr

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF OUR CLIENTS AND AUTHORIZATION FOR

Client Name: CHEN-NORTHERN, INC. SALT LAKE CITY, UT
Project No.: 87-927
Laboratory No.: 146288
Sample Name: OUTFALL 004/102
Sample Date: 10/26/93
Collected by: M. HOWELL
Time Sampled: 1140
Sample Type: WATER

	MEASURED VALUE	METHOD DETECTION LIMIT	TIME OF ANALYSIS	DATE OF ANALYSIS	ANALYST
INORGANICS					
Oil & Grease	<1 mg/l	1	1130	11/05/93	CC
pH	8.8 S.U.	-	1600	11/01/93	BH
Total Dissolved Solids	1200 mg/l	12	1605	11/02/93	CC
Total Suspended Solids	66 mg/l	4	1525	11/02/93	CC
METALS					
Iron as Fe (Soluble)	0.33 mg/l	0.008	1100	11/05/93	NH

Project or Site

5 - 137.1-91 UPDES

Project Number

M. Howell

Sampler Name (Printed)

Huntingdon

Consulting Engineers & Environmental Scientists

- [x] Chen-Northern, Inc., Division
- [ ] Thomas-Hartig & Associates, Inc., Division
- [ ] Schaefer Dixon Associates, Inc., Division
- [ ] Herzog Associates, Inc., Division

Contact or Report to

1127 W. 2320 S. #B

Contact Address or Location

Sampler Signature

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: Total Fe	Oil+Grease	TSS	TDS	pH			NOTES	LAB NUMBER
12-6-93	1140	outfall 004/102	grab	H_2O	4	✓	✓	✓	✓	✓			oil+Grease - 413.1 EPA	146284
													Total Suspended Solids - 160.2 EPA	
													Total Dissolved Solids - EPA 160.3	
													Iron as Fe No digestion filtration analysis by AAS.	
													pH - EPA 150.1	

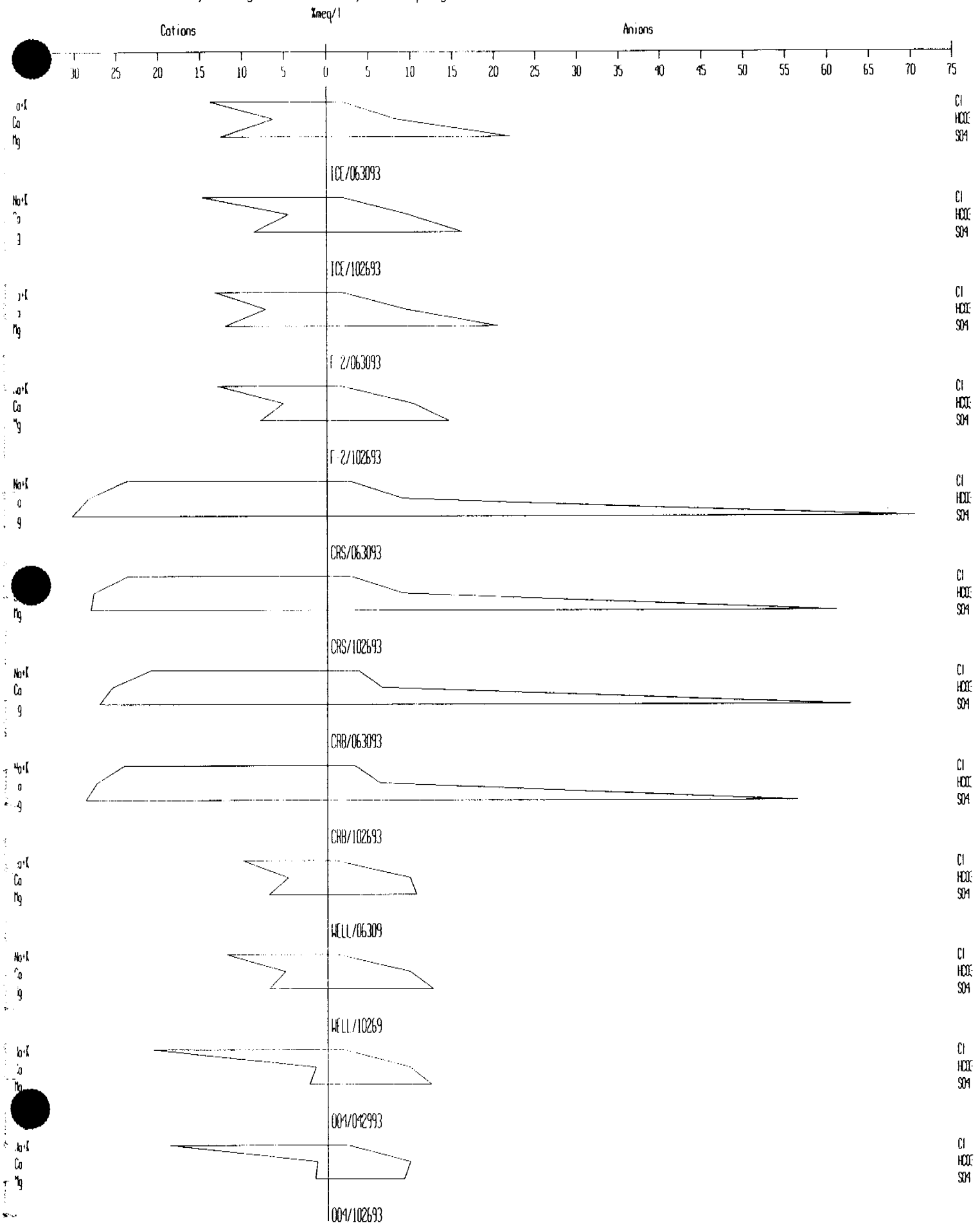
Relinquished by:	Date	Time	Received by:
Carrier / Bus	12/1/93	1100	C.N.I. Lab Bldg L. Blevins
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by:

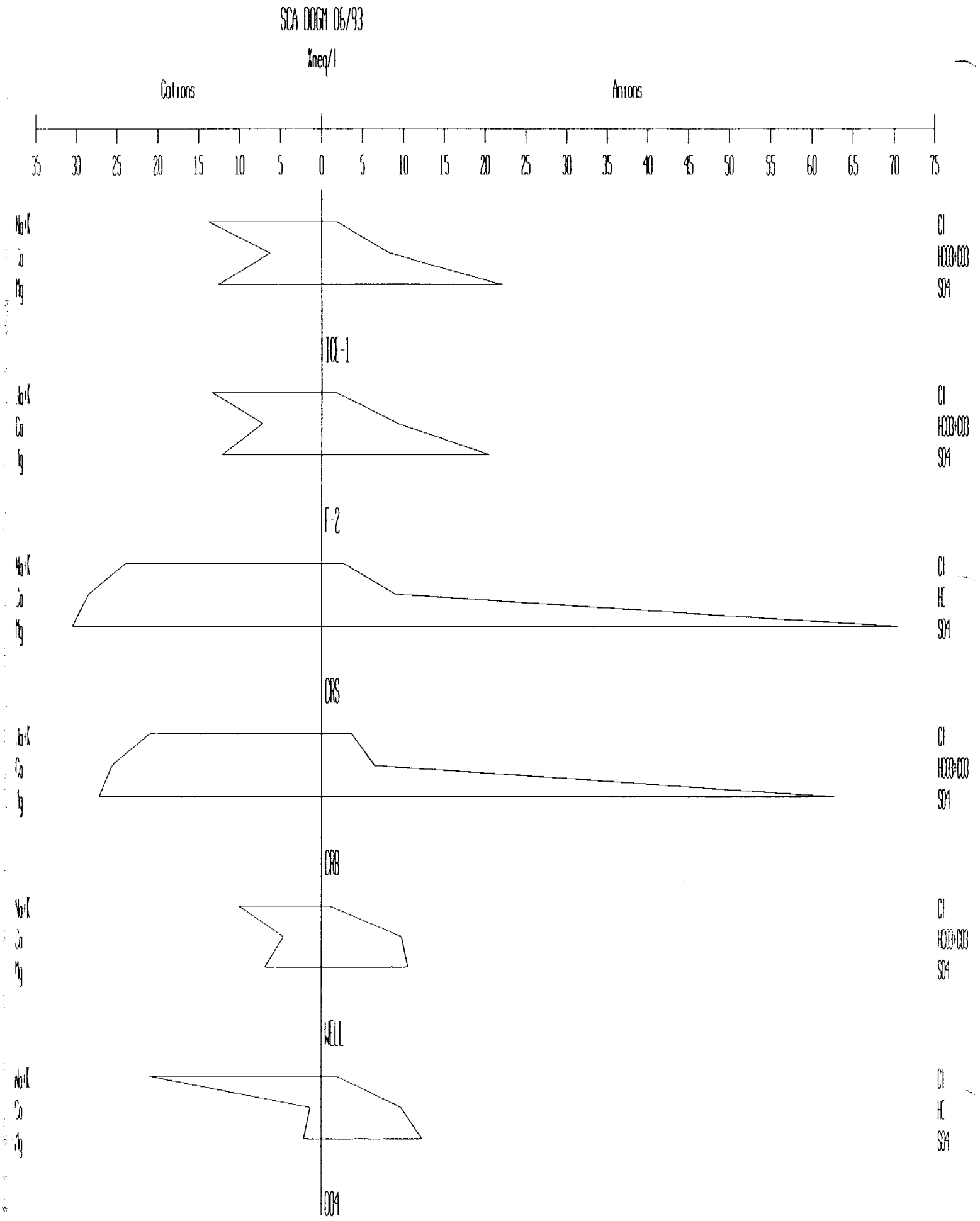
Remarks:

Cooler temp 17.9°C

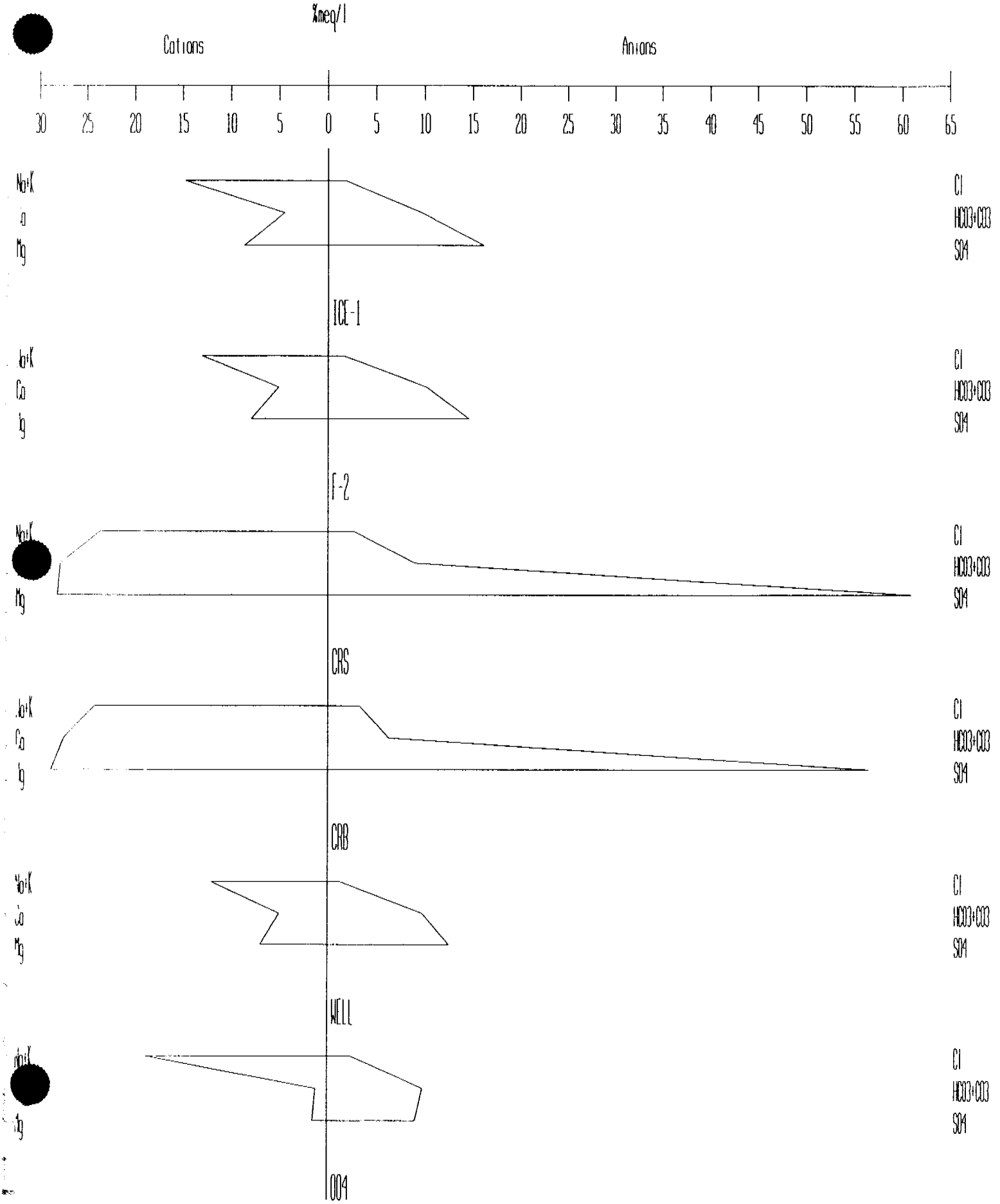
ATTACHMENT C

Sunnyside Cogeneration Facility DOGM Sampling Data



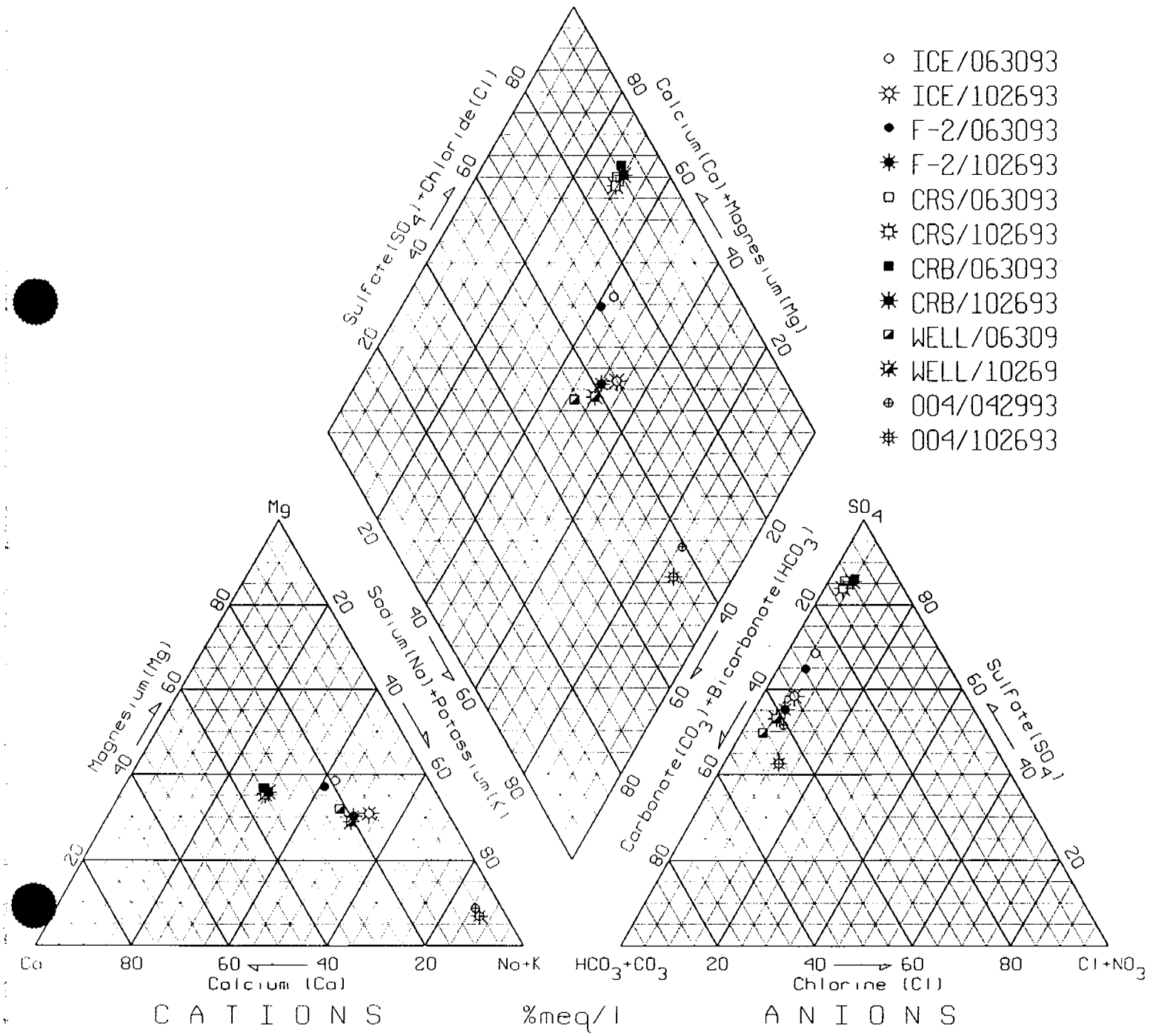

SCA DOGM 06/93
%meq/l
Cations
Anions
35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
Na+K
Ca
Mg
Cl
HCO3+CO3
SO4
IQC-1
F-2
HL
CRS
CRB
WELL
004

SCA DOGM 10/93

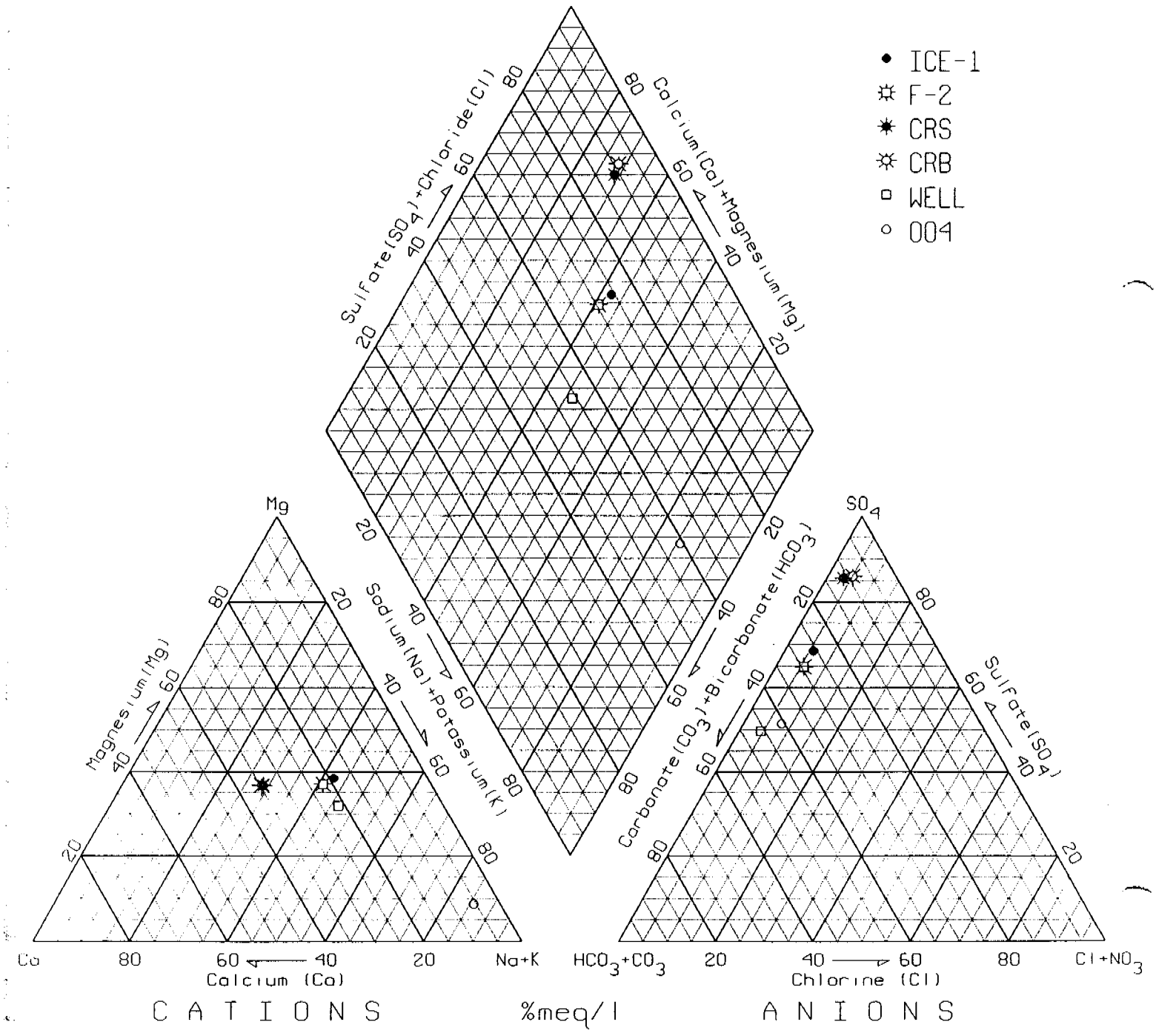


ATTACHMENT D

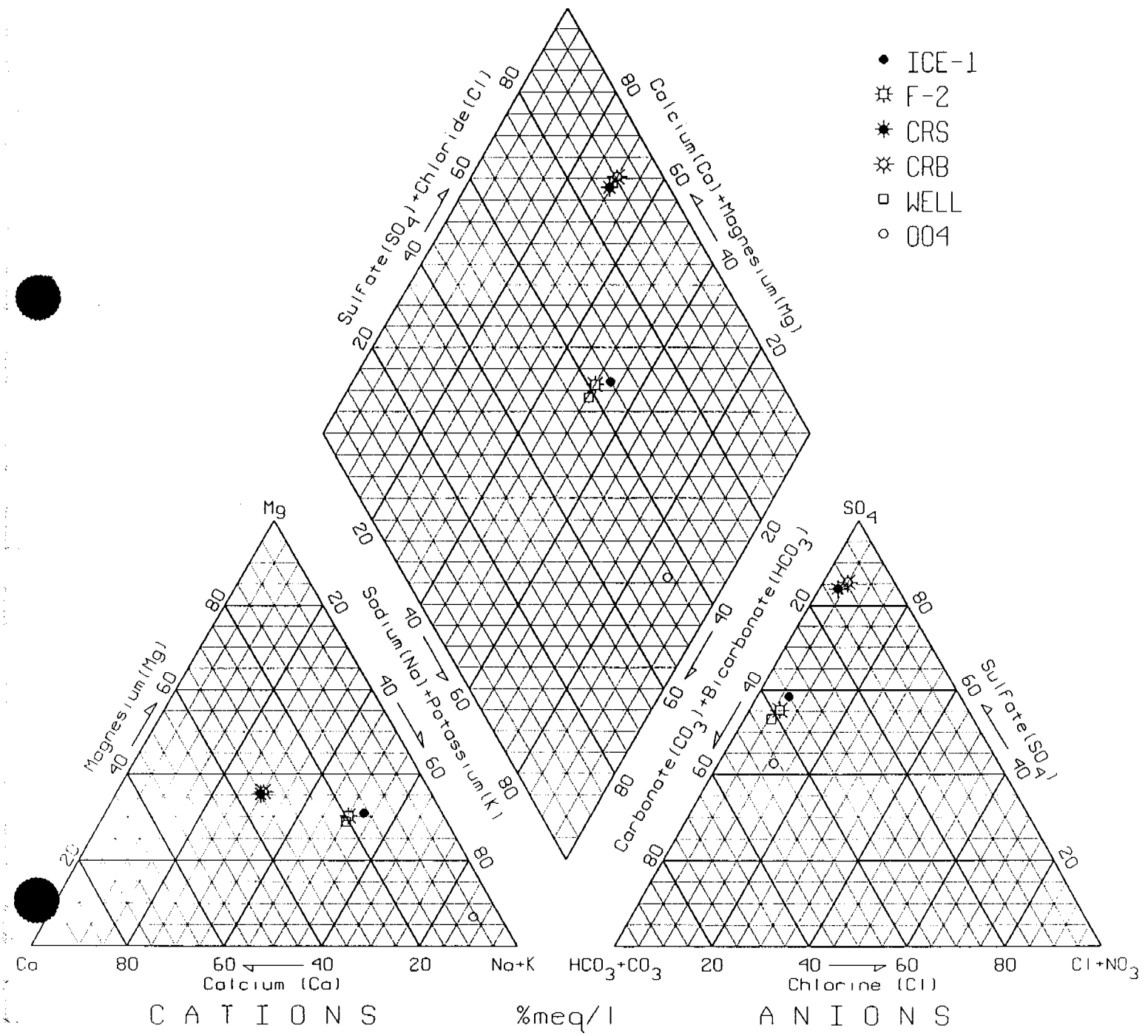
Sunnyside Cogeneration Facility DOGM Sampling Data



SCA DOGM 06/93



SCA DOGM 10/93



Appendix B
Precipitation and Climatalogical Data for 1993

STATION	YEAR	MON	MAX	MIN	MEAN	PCPN	SNOW
SUNNYSIDE,	1993,	Jan,	35.1, ,	17.5, ,	26.3, ,	1.94, ,	30.5,
SUNNYSIDE,	1993,	Feb,	38.2, ,	18.9, ,	28.6, ,	1.96, ,	16.4,I
SUNNYSIDE,	1993,	Mar,	51.8, ,	29.1, ,	40.4, ,	2.06, ,	0.0,
SUNNYSIDE,	1993,	Apr,	56.0, ,	32.7, ,	44.3, ,	1.02, ,	0.0,
SUNNYSIDE,	1993,	May,	68.9, ,	43.7, ,	56.3, ,	1.83, ,	0.0,
SUNNYSIDE,	1993,	Jun,	76.5, ,	48.4, ,	62.5, ,	0.16, ,	0.0,
SUNNYSIDE,	1993,	Jul,	82.8, ,	50.5, ,	66.7, ,	0.12, ,	0.0,
SUNNYSIDE,	1993,	Aug,	79.3, ,	51.5, ,	65.4, ,	0.65, ,	0.0,
SUNNYSIDE,	1993,	Sep,	72.8, ,	43.3, ,	58.0, ,	0.05, ,	0.0,
SUNNYSIDE,	1993,	Oct,	56.4, ,	34.6, ,	45.5, ,	2.66, ,	0.0,
SUNNYSIDE,	1993	Nov,	40.0, ,	21.2, ,	30.6, ,	1.12, ,	12.5,

Appendix C
March, 1993 Sunnyside Coal Mine
Vegetation Monitoring Report

SUNNYSIDE COAL MINE
VEGETATION MONITORING

1992

MT. NEBO SCIENTIFIC

Prepared by

MT. NEBO SCIENTIFIC RESEARCH & CONSULTING
330 East 400 South, Suite 6
Post Office Box 337
Springville, Utah 84663
(801) 489-6937

for

SUNNYSIDE COAL MINE
Post Office Box 99
Sunnyside, Utah 84539

Report Date: March 1993

Prepared by

MT. NEBO SCIENTIFIC RESEARCH & CONSULTING
330 East 400 South, Suite 6
Post Office Box 337
Springville, Utah 84663
(801) 489-6937

for

SUNNYSIDE COAL MINE
Post Office Box 99
Sunnyside, Utah 84539

Report Date: March 1993

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Sacco Flats Topsoil Pile 45

Surface Facility Spoil Pile 47

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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										
Poa 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
Sanquisorba 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		Sanquisorba 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
GRASSES										
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

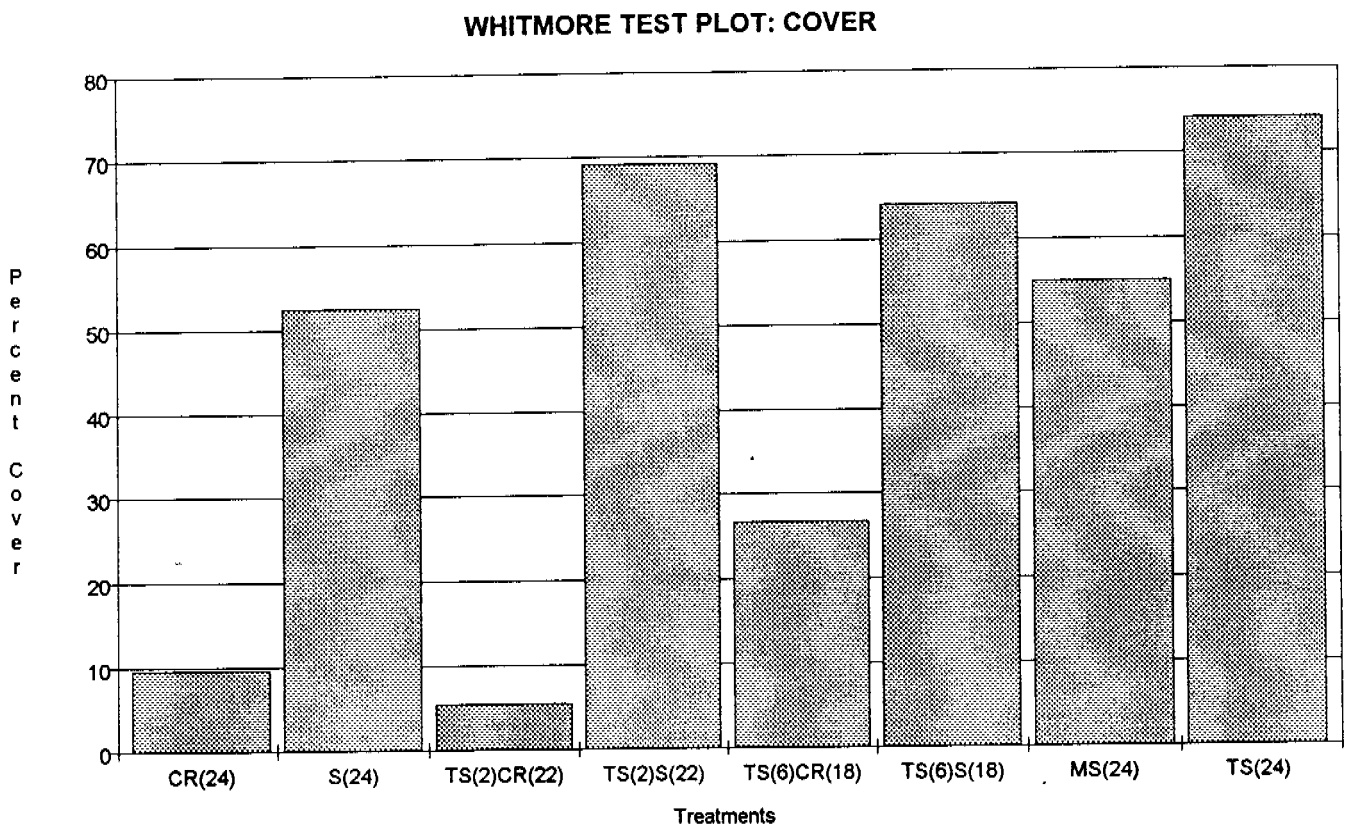
General sampling methods were discussed on the Qualitative/Quantitative data sheets on the previous pages.

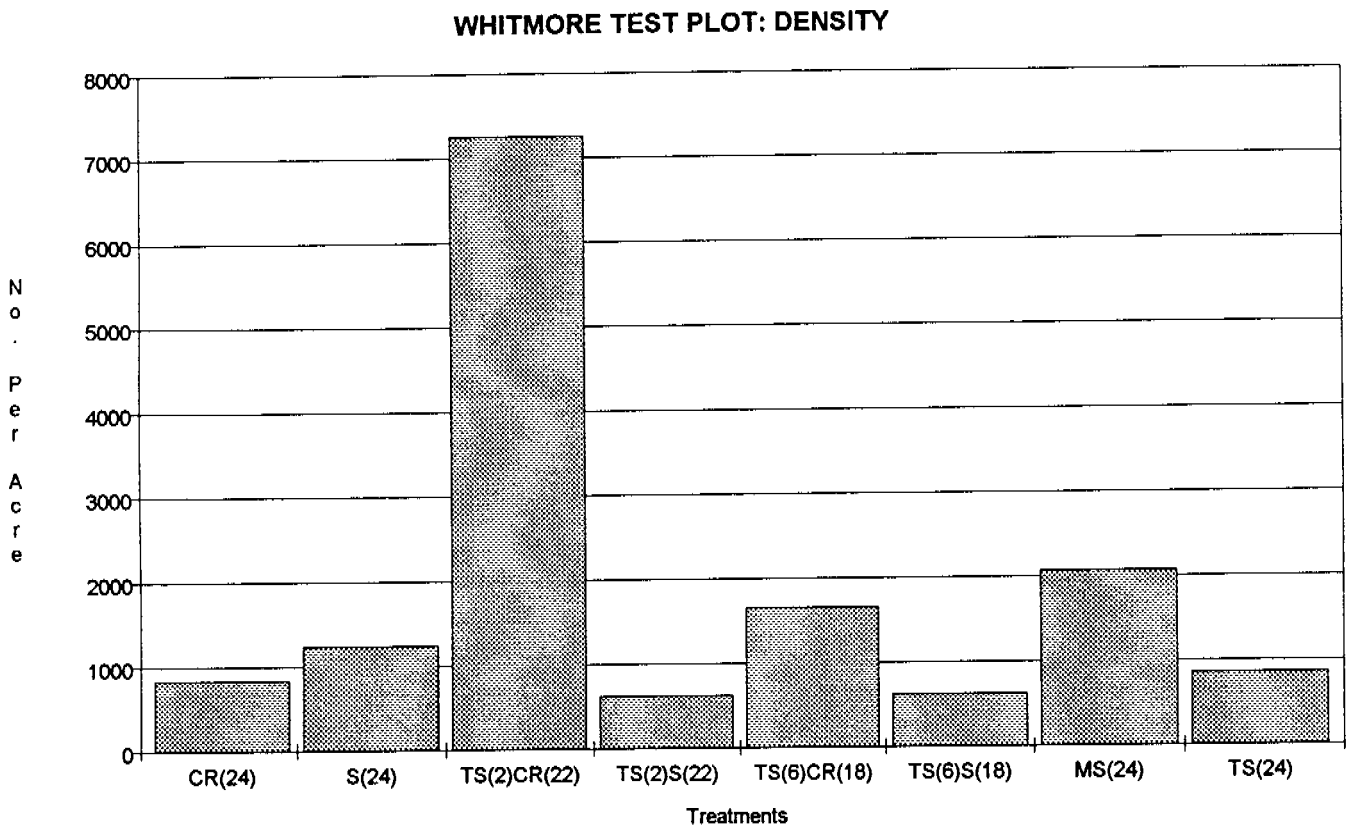
Results

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"

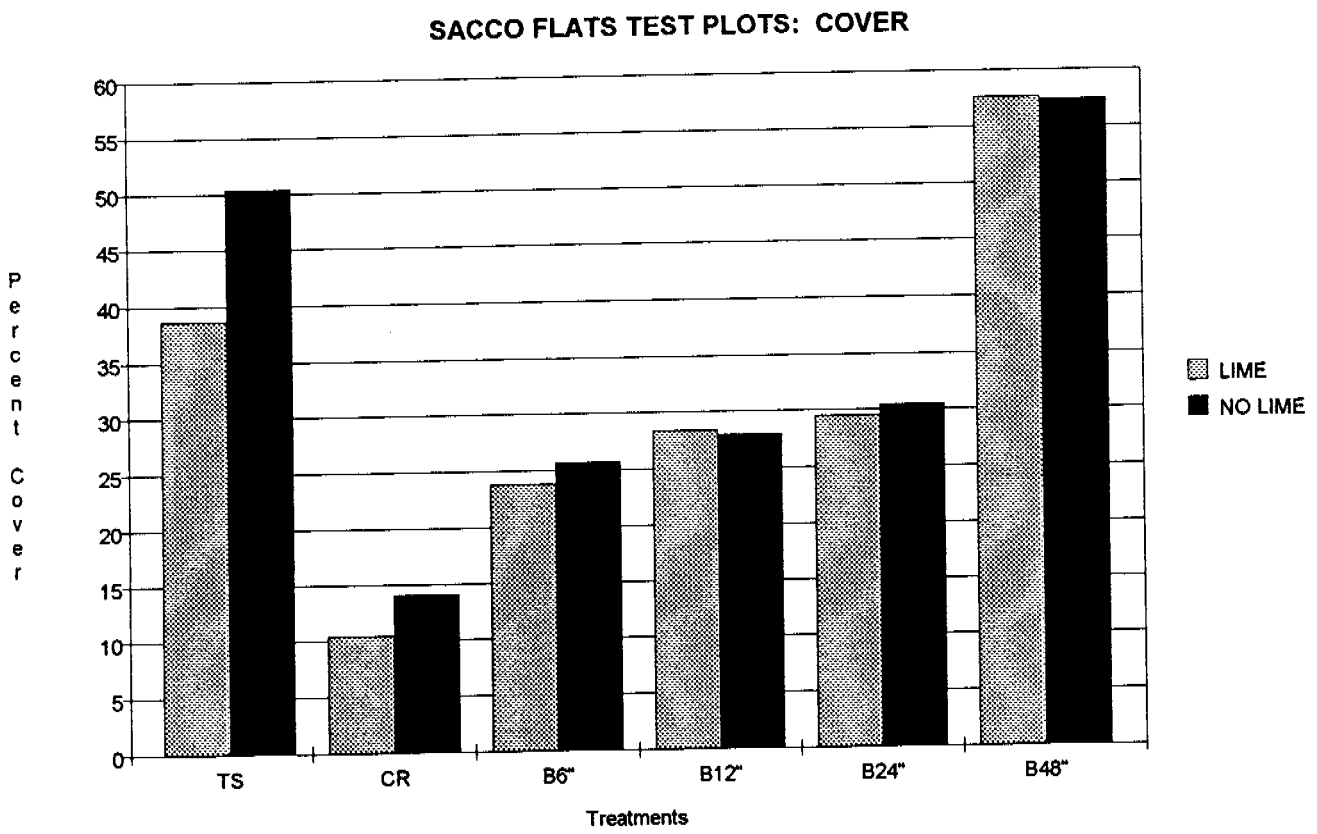
of borrow material *or* 12" of topsoil.

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")

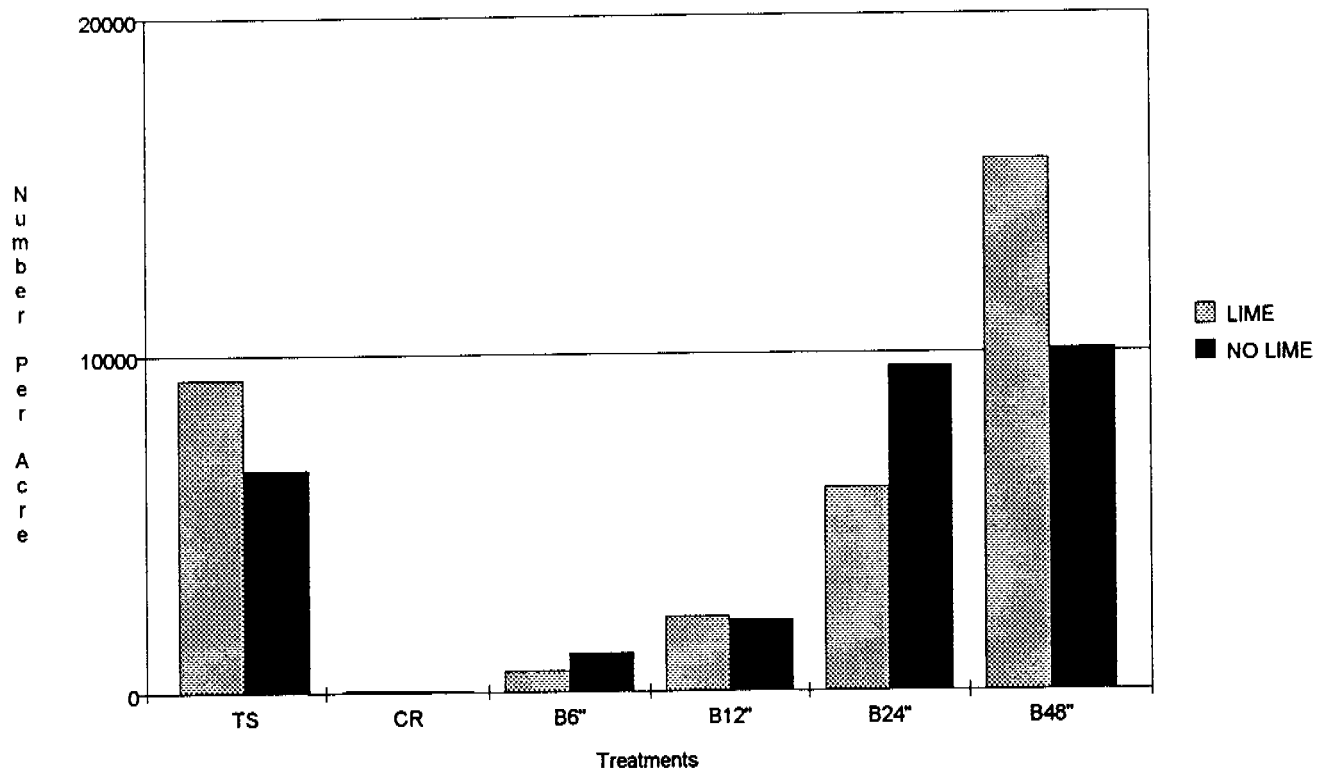
B6" = Borrow Material (6")

B12" = Borrow Material (12")

B24" = Borrow Material (24")

B48" = Borrow Material (48")

SACCO FLATS TEST PLOTS: DENSITY



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
GRASSES									
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
Sample Date: 21 Aug 1992

Mean	SDev	Freq	
			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
GRASSES									
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 & Exo: 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

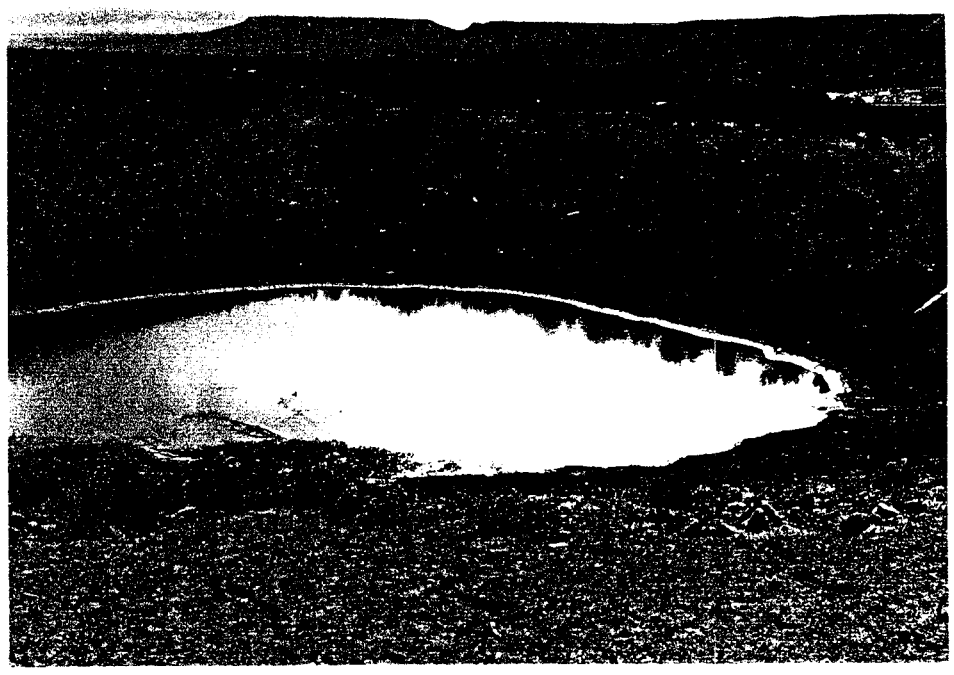
SUNNYSIDE
Sacco Flat - Test Plot
Slope & Exp: 0
PLOT #36
Sample Date: 21 Aug 1992

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

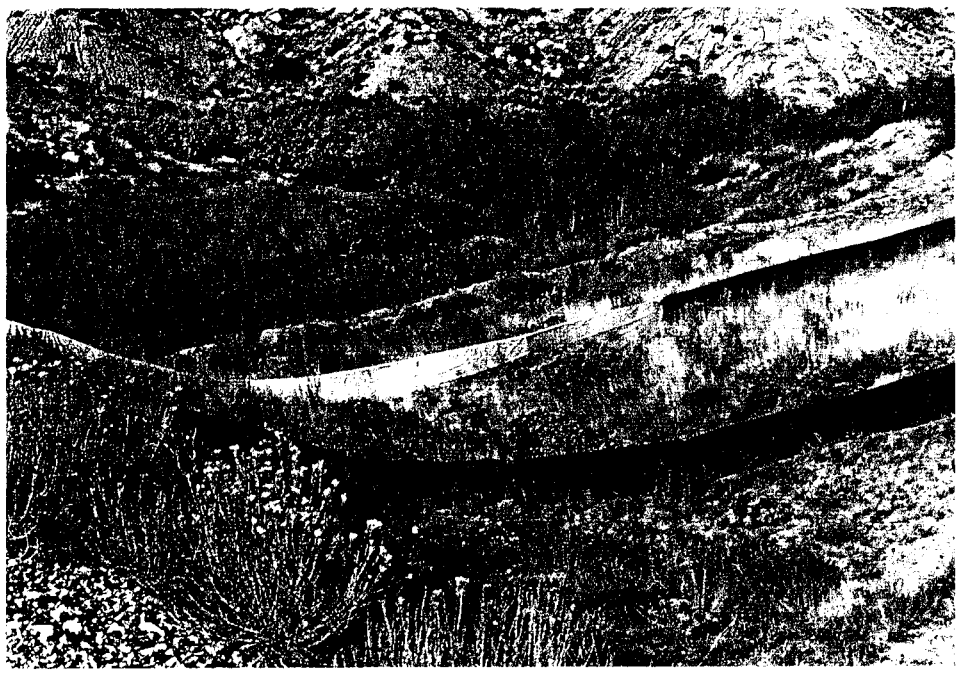
		COVER
42.78	8.53	Total Living Cover
5.78	2.44	Litter
33.33	10.54	Bareground
18.11	6.64	Rock
		% COMPOSITION
1.39	3.93	Shrubs
96.21	5.44	Forbs
2.40	4.56	Grasses

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

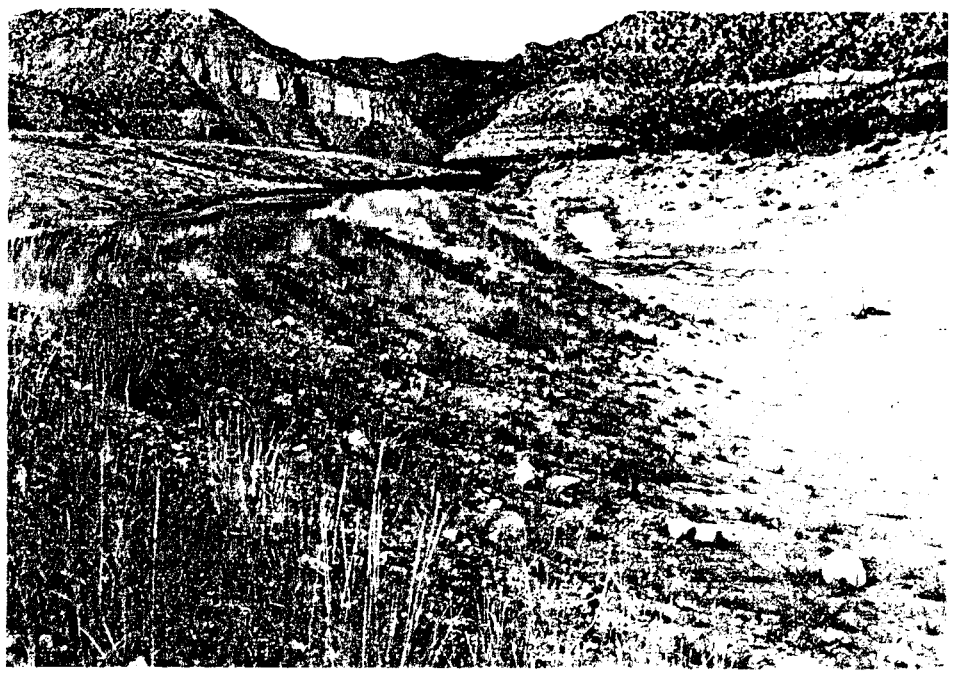
Coarse Refuse Toe Topsoil Pile



Coarse Refuse Toe Sediment Pond



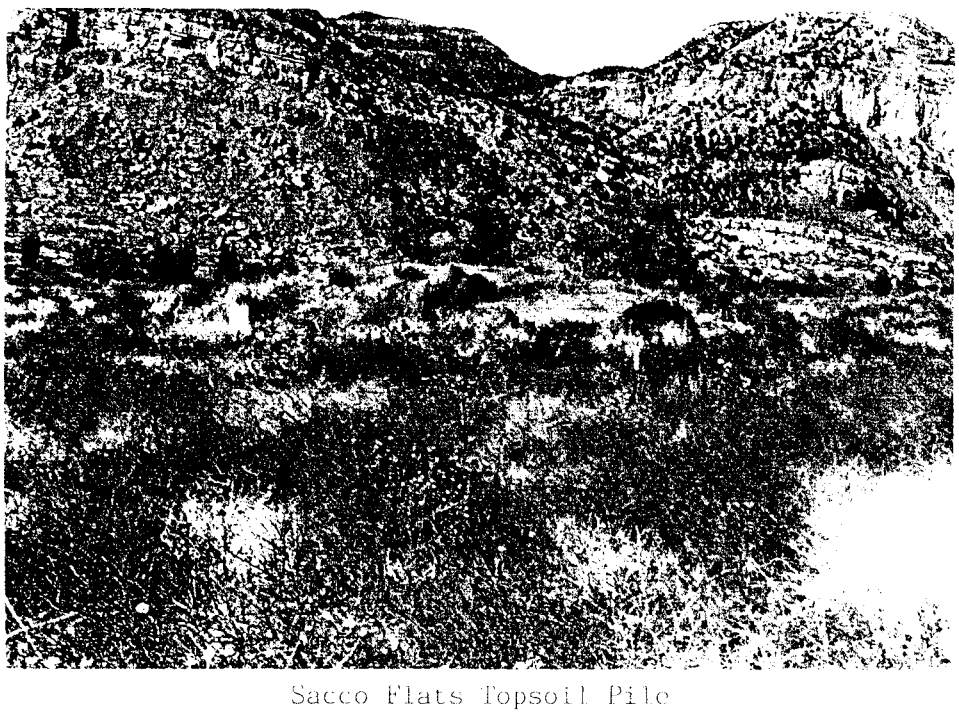
Reclaimed Coarse Refuse Toe Sediment Pond



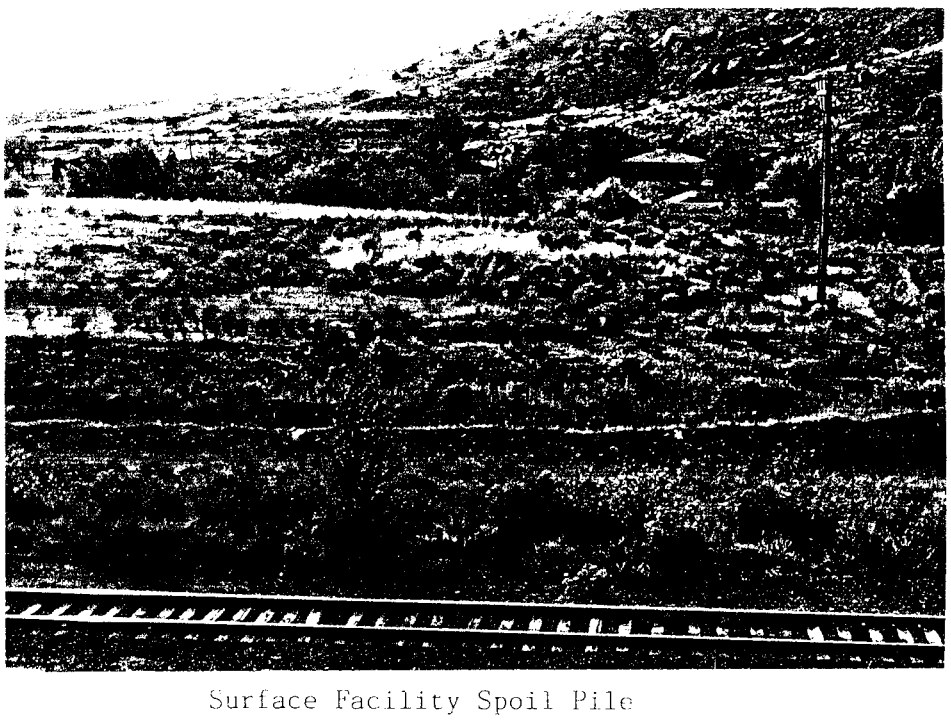
Borrow Area Sediment Pond

Coarse Refuse Topsoil Pile

Haul Road (Pasture) Sediment Pond



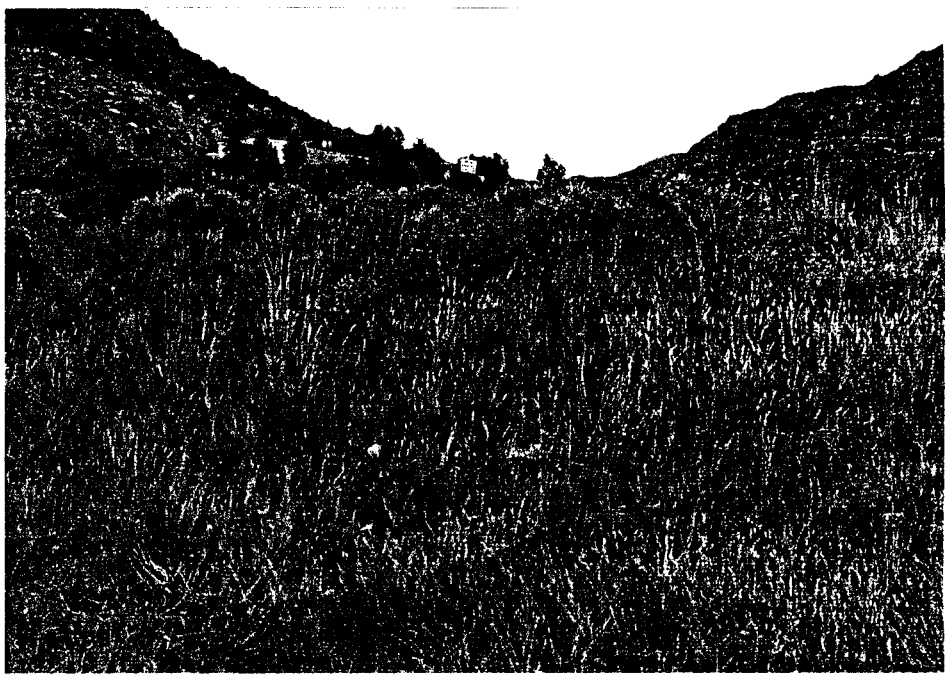
Sacco Flats Topsoil Pile



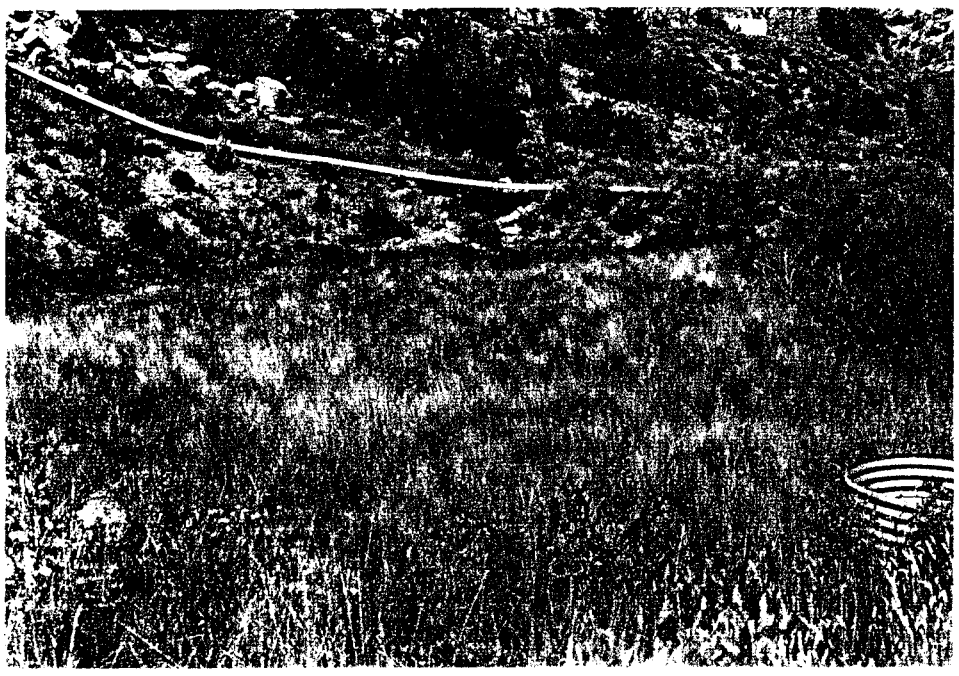
Surface Facility Spoil Pile

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

001 Pond



001 Topsoil



Manshaft Sediment Pond

002-B Discharge Pond

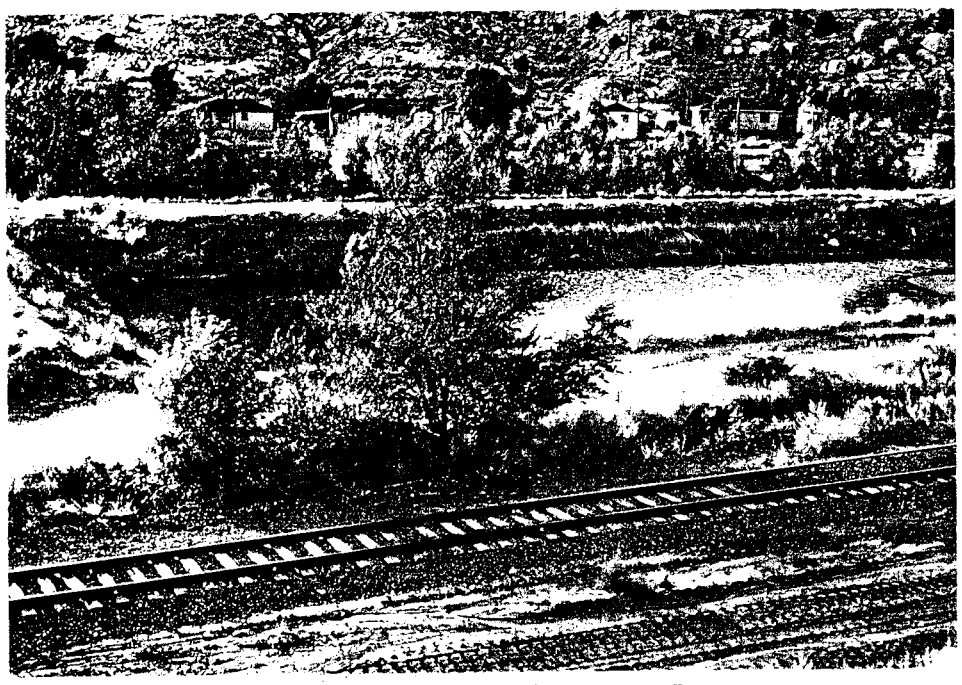
002-B Topsoil Pile

002-A Discharge Pond

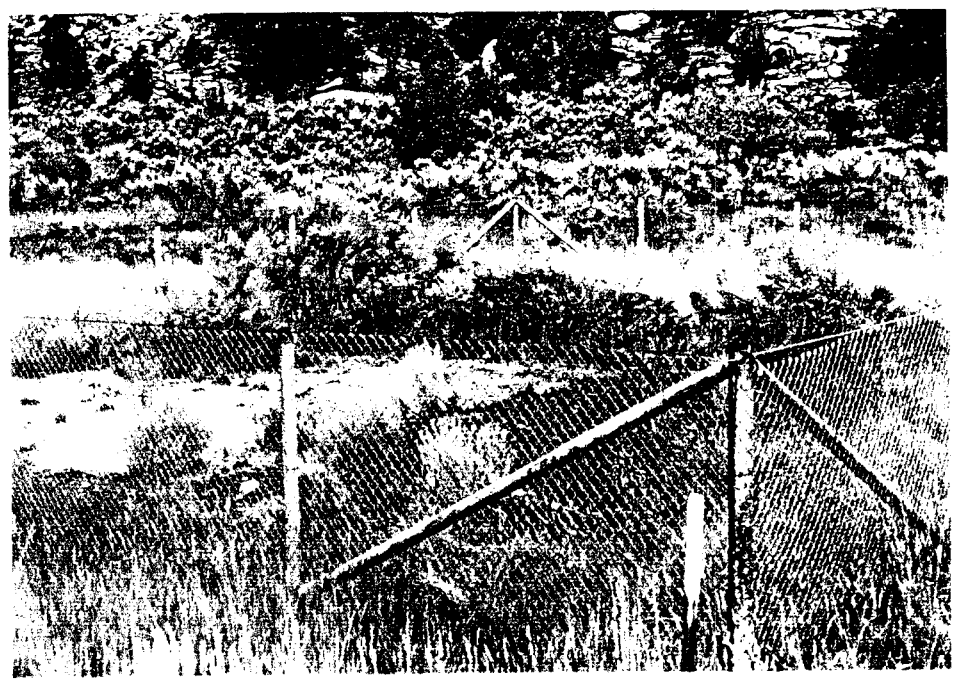
Rail Cut Sediment Pond

Rail Cut Topsoil Pile

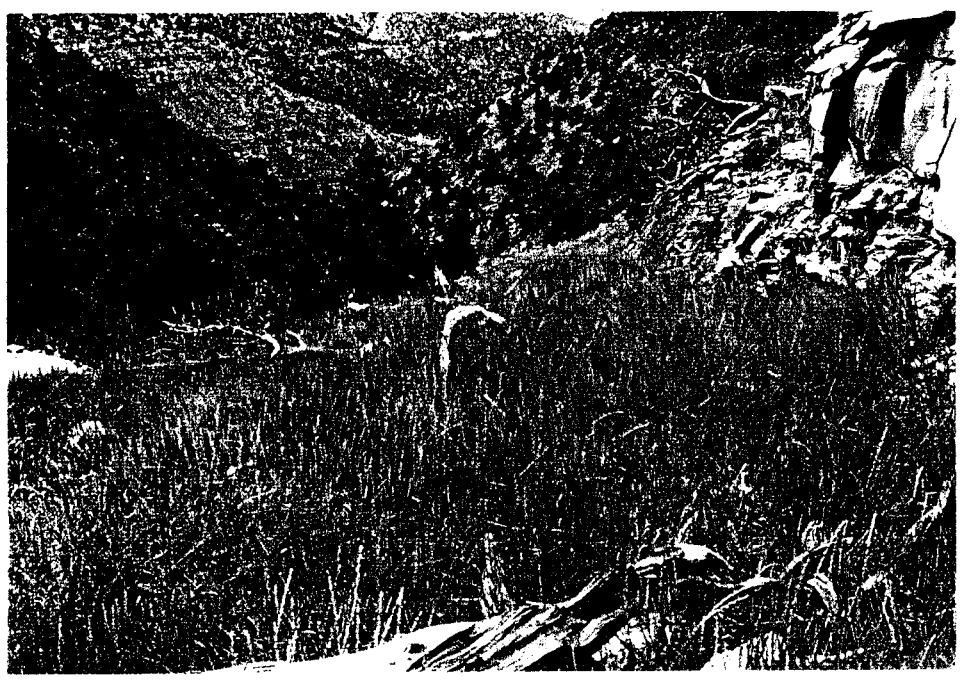
COLOR PHOTOGRAPHS OF THE REVEGETATION MONITORING SITES FOR SUNNYSIDE MINE (SEPT. 1992)



Surface Facility Sediment Pond



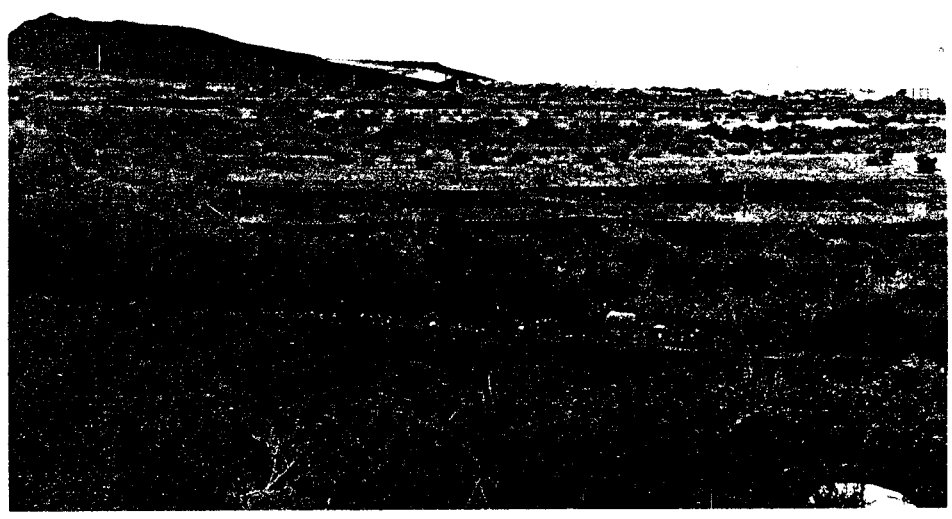
Whitmore Test Plot



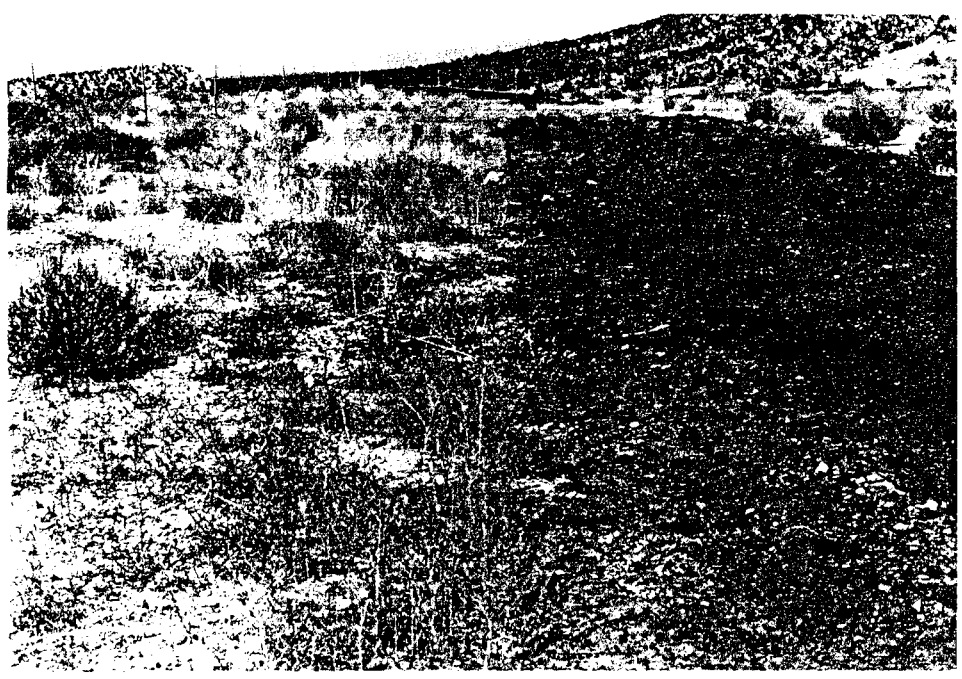
Slaughter Canyon Road

Slaughter Canyon Road

Slaughter Canyon Road



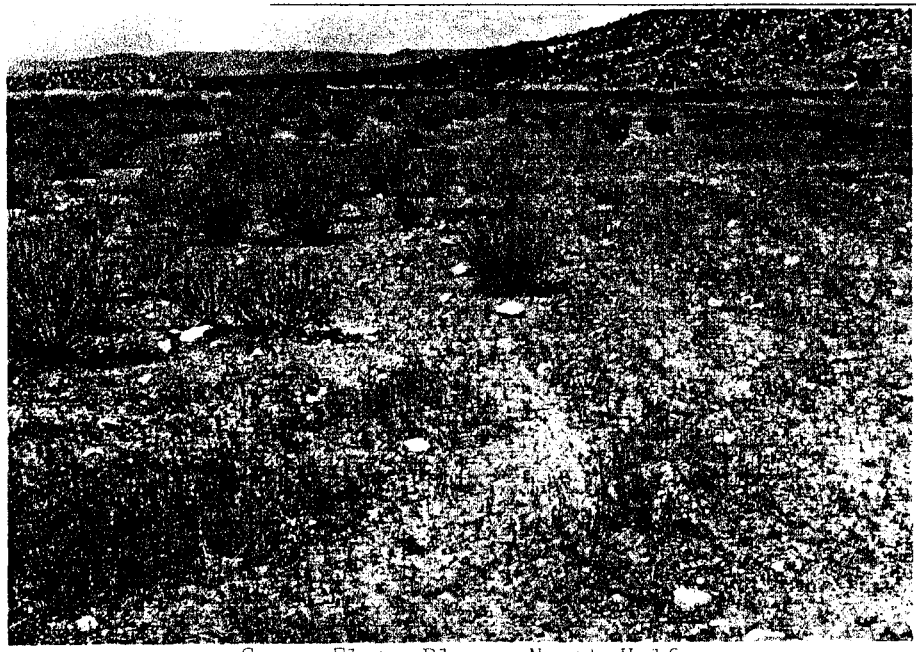
Sacco Flats Plots (Entire Plot View)



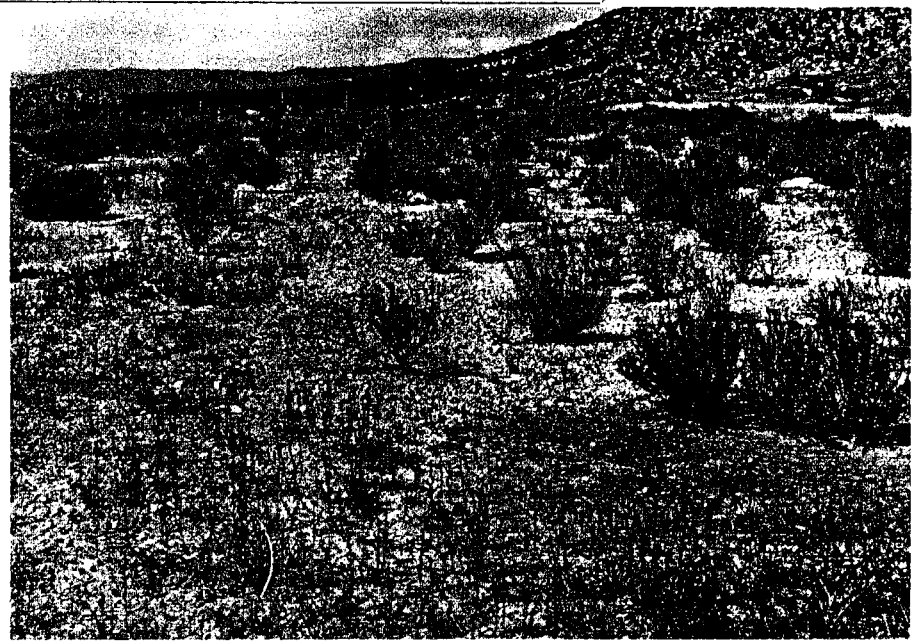
Sacco Flats Plots, South Half, Topsoil (R) CR (L)

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

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

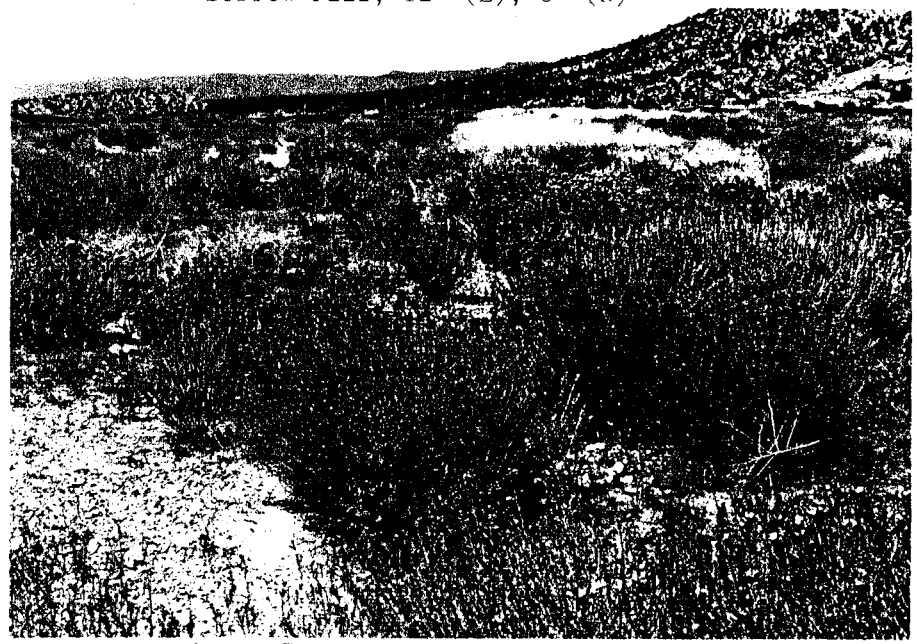


Sacco Flats Plots, North Half
Borrow Fill, 12" (L), 6" (R)



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)