C0070035 Incoming
#3718
K

COPY

Sunnyside Cogeneration Associates

P.O. Box 10, East Carbon, Utah 84520 • (435) 888-4476 • Fax (435) 888-2538

December 17, 2010

Division of Oil Gas and Mining
Attn. James D Smith
1594 West North Temple, Suite 1210
Salt Lake City, UT 84116

RE: Phase 3 Bond Release – Old Coarse Refuse Road Reclamation
Sunnyside Cogeneration Associates, Sunnyside Refuse/Slurry, C007/035
Resubmittal – Task #3668

Dear Mr. Smith,

SCA previously submitted a package requesting final bond release for the Old Coarse Refuse Road Reclamation that had been completed in 1994. Comments were received via your November 16, 2010 letter. SCA has addressed these comments, completed the 30 day publication and is therefore resubmitting this request for release of $40,000 from the bond. We have prepared the enclosed documents outlining the reclamation work and its success for your review.

We have enclosed three copies of the drawings, tables, exhibits and text pages for your review. We expect that these items will address the requirements of R645-301-880 and we look forward to receiving your approval. If you have any questions, please feel free to call Rusty Netz or myself at (435) 888-4476.

Thank You,

Richard Carter
Agent For
Sunnyside Cogeneration Associates

c.c. Steve Gross
William Rossiter
Maggie Estrada
Paul Shepard
Rusty Netz
Plant File

File in:
❑ Confidential
❑ Shelf
❑ Expandable
In C/ 0070035 Incoming
Date: 12/21/2010, For additional information

RECEIVED
DEC 21 2010
DIV. OF OIL, GAS & MINING

APPLICATION FOR COAL PERMIT PROCESSING

COPY

Permit Change ☐ New Permit ☐ Renewal ☐ Exploration ☐ Bond Release ☒ Transfer ☐

Permittee: Sunnyside Cogeneration Associates
Mine: Sunnyside Refuse and Slurry
Permit Number: C/007/035
Title: Phase 3 bond release - Old Coarse Refuse Road

Description, Include reason for application and timing required to implement:
This area was reclaimed in the mid 1990's and has met all required performance standards. SCA requests final bond release for this area

Instructions: If you answer yes to any of the first eight questions, this application may require Public Notice publication.

☐ Yes ☒ No 1. Change in the size of the Permit Area? Acres: _____ Disturbed Area: _____ ☐ increase ☐ decrease.
☐ Yes ☒ No 2. Is the application submitted as a result of a Division Order? DO# _____
☐ Yes ☒ No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes ☒ No 4. Does the application include operations in hydrologic basins other than as currently approved?
☒ Yes ☐ No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
☒ Yes ☐ No 6. Does the application require or include public notice publication?
☐ Yes ☒ No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☐ Yes ☒ No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☐ Yes ☒ No 9. Is the application submitted as a result of a Violation? NOV # _____
☐ Yes ☒ No 10. Is the application submitted as a result of other laws or regulations or policies?
Explain: _____
☐ Yes ☒ No 11. Does the application affect the surface landowner or change the post mining land use?
☐ Yes ☒ No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
☐ Yes ☒ No 13. Does the application require or include collection and reporting of any baseline information?
☐ Yes ☒ No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
☐ Yes ☒ No 15. Does the application require or include soil removal, storage or placement?
☒ Yes ☐ No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
☐ Yes ☒ No 17. Does the application require or include construction, modification, or removal of surface facilities?
☐ Yes ☒ No 18. Does the application require or include water monitoring, sediment or drainage control measures?
☐ Yes ☒ No 19. Does the application require or include certified designs, maps or calculation?
☐ Yes ☒ No 20. Does the application require or include subsidence control or monitoring?
☒ Yes ☐ No 21. Have reclamation costs for bonding been provided?
☐ Yes ☒ No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
☐ Yes ☒ No 23. Does the application affect permits issued by other agencies or permits issued to other entities?
☐ Yes ☒ No 24. Does the application include confidential information and is it clearly marked and separated in the plan?

Please attach three (3) review copies of the application. If the mine is on or adjacent to Forest Service land please submit four (4) copies, thank you. (These numbers include a copy for the Price Field Office)

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

RICHARD CARTER — PLANT MGR. — 12/17/10 — [signature]
Print Name — Position — Date — Signature (Right-click above choose certify then have notary sign below)

Subscribed and sworn to before me this 17th day of December, 2010

Notary Public: [signature], state of Utah.

My commission Expires: Dec 3rd 2011
Commission Number: 571930
Address: 1 Power Plant Rd. P.O. Box 159
City: Sunnyside State: UT Zip: 84539

ss:

JODY HANSEN
Notary Public
State of Utah
My Comm. Expires Dec 3, 2011
1 Power Plant Rd P.O. Box 159
Sunnyside, UT 84539

For Office Use Only:	Assigned Tracking Number:	Received by Oil, Gas & Mining
		RECEIVED DEC 21 2010 DIV. OF OIL, GAS & MINING

Form DOGM- C1 (Revised December 10, 2007)

APPLICATION FOR COAL PERMIT PROCESSING
Detailed Schedule Of Changes to the Mining And Reclamation Plan

COPY

Permittee: Sunnyside Cogeneration Associates
Mine: Sunnyside Refuse and Slurry
Permit Number: C/007/035
Title: Phase 3 bond release - Old Coarse Refuse Road

Provide a detailed listing of all changes to the Mining and Reclamation Plan, which is required as a result of this proposed permit application. Individually list all maps and drawings that are added, replaced, or removed from the plan. Include changes to the table of contents, section of the plan, or other information as needed to specifically locate, identify and revise the existing Mining and Reclamation Plan. Include page, section and drawing number as part of the description.

			DESCRIPTION OF MAP, TEXT, OR MATERIAL TO BE CHANGED
☐ Add	☐ Replace	☐ Remove	Public Notice Advertisement - and certification from newspaper publisher
☐ Add	☐ Replace	☐ Remove	Copies of letters to adjoining property owners and local municipalities
☐ Add	☐ Replace	☐ Remove	Copies of vegetation monitoring reports (2006 and 2007 reports)
☐ Add	☒ Replace	☐ Remove	Table 8-1 - Determination of Bond Amount
☐ Add	☐ Replace	☐ Remove	Permit drawing 1-1 Permit Area (submitted as a reference in this bond release)
☐ Add	☐ Replace	☐ Remove	Permit drawings 10-2A through 10-2C (submitted as a reference in this bond release)
☐ Add	☒ Replace	☐ Remove	Chapter 10 text
☐ Add	☐ Replace	☐ Remove	Notarized statement certifying that reclamation has been accomplished
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
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Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.

Received by Oil, Gas & Mining

RECEIVED
DEC 21 2010
DIV. OF OIL, GAS & MINING

Form DOGM - C2 (Revised December 10, 2007)

Sunnyside Cogeneration Associates

P.O. Box 10, East Carbon, Utah 84520 • (435) 888-4476 • Fax (435) 888-2538

NOTARIZED STATEMENT
OLD COARSE REFUSE ROAD RECLAMATION
SUNNYSIDE REFUSE / SLURRY C007/035

SCA certifies that all applicable reclamation activities associated with the Old Coarse Refuse Road at the Sunnyside Refuse / Slurry Permit Area have been accomplished in accordance with the requirements of the Act, the regulatory program, and the approved reclamation plan.

Vegetation on the site meets density and diversity requirements necessary to accomplish the post mining land use of wildlife and grazing. No part of the land considered for bond release is contributing suspended solids to stream flow or runoff outside the permit area in excess of the requirements set by the Act and by R645-301-751 of the rules.

The application documents submitted with this bond release request further outline the details of the successful reclamation work.

Richard Carter
Agent for
Sunnyside Cogeneration Associates

12/1/10
Date

Subscribed and sworn to me this 1st day of December, 2010
Notary Public Jody Hansen state of Utah
My Commission expires Dec. 3rd 2011 }
Commission Number 571930 } ss:
Address 1 Power Plant Rd, P.O. Box 159 }
City Sunnyside, State UT, Zip 84539 }

JODY HANSEN
Notary Public
State of Utah
My Comm. Expires Dec 3, 2011
1 Power Plant Rd P.O. Box 159
Sunnyside, UT 84539

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)

ss.

County of Carbon,)

I, Richard Shaw, on oath, say that I am the Publisher of the Sun Advocate, a twice-weekly newspaper of general circulation, published at Price, State a true copy of which is hereto attached, was published in the full issue of such newspaper for 4 (Four) consecutive issues, and on the Utah legals.com website, the first publication was on the 23rd day of November, 2010, and that the last publication of such notice was in the issue of such newspaper dated the 14th day of December 2010.

Richard Shaw – Publisher

Subscribed and sworn to before me this 14th day of December, 2010.

Notary Public My commission expires January 10, 2011 Residing at Price, Utah

Publication fee, $ 400.36

LINDA THAYN
NOTARY PUBLIC - STATE OF UTAH
345 EAST MAIN
PRICE, UTAH 84501
COMM. EXP. 01-10-2011

PUBLIC NOTICE

Notice is hereby given as required by the Utah Coal Mining Rules, R645-301-800 that Sunnyside Cogeneration Associates (SCA), P.O. Box 159, Sunnyside UT 84539, has filed an application requesting Phase 3 Bond Release for a reclaimed portion of its land. Approval of this application will allow SCA to reduce its bond for approximately 5.35 acres that were reclaimed in 1994 under the provisions of the Utah Coal Mining and Reclamation Act and the Utah R645 Coal Mining Rules. (Permit # C/007/035 Sunnyside Refuse & Slurry) SCA has a cash bond for reclamation on file in the amount of $1.775 Million and is requesting this release of $40,000. The reclamation work (including grading, soil cover placement and revegetation) meets all performance standards for soil cover, vegetation success and sediment control as required by the approved plan to achieve the post mining land use for wildlife and grazing.

The existing permit area is comprised of approximately 323.95 acres located just south of Sunnyside City, Utah, within lands described as:

S ½ and SE ¼ of NE ¼ Section 6, T 15 S, R 14 E, SLB&M
N ½ Section 7, T 15 S, R 14 E, SLB&M

The reclaimed area is located within lands described as:

S ½ of N ½ of N ½ Section 7, T 15 S, R 14 E, SLB&M

Copies of the bond release application provide detailed documentation of the success of the reclamation work and will be available for inspection at the:

Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84116

Written comments, objections or requests for an informal conference regarding this application must be submitted with 30 days of the last publication date of this notice, to the Utah Division of Oil, Gas and Mining, Attention Coal Regulatory Program, 1594 West North Temple, Suite 1210, Salt Lake City, Utah 84116

Published in the Sun Advocate November 23, 30 and December 7, 14, 2010.

Phase 3 Bond Release
Old Coarse Refuse Road Reclamation
Sunnyside Cogeneration Associates
Sunnyside Refuse/Slurry, C007/035

SCA has prepared this document and enclosed materials to demonstrate to the Division the success of reclamation work conducted on the Old Coarse Refuse Road (OCRR).

History
The Old Coarse Refuse Road was constructed by Sunnyside Coal Company (prior permittee) and used for hauling refuse material to stabilize the lower bank of the refuse pile. The road was cut into the side of the hill and for safety a berm was constructed along the out slope side of the road. The road surface and the berm were constructed of coal refuse material and some of the material slid down the slope. Due to the Division's concerns for potentially acid- or toxic forming materials on this out slope, in 1994 SCA permanently ceased use of this road segment, cleaned the coal refuse materials off the slope, removed the berm, compacted the refuse materials into the cut, covered the disturbed area with clean borrow material and revegetated the site. Phase 1 bond release was granted at that time.

Permit Area and Reclaimed Area
SCA's Sunnyside permit area contains 323.95 Acres just south of Sunnyside City. (See MRP Drawing 1-1). The reclamation work being requested for bond release is on 5.35 acres in the S ½ of N ½ of N ½ Section 7, T 15 S, R 14 E, SLB&M. The existing MRP drawings 10-2A through 10-2C and the text of Chapter 10 describe in detail the reclamation work that occurred in this area. The existing MRP drawings 10-3 through 10-7 also identify the reclaimed area.

Public Notice
SCA has prepared a proposed newspaper legal notice and although SCA is the only property owner adjacent to the reclamation area, SCA has also prepared notification letters to nearby property owners and to local municipalities (enclosed). Please review the proposed notice and let us know if it is acceptable for publication.

Soil Analysis
In connection with the reclamation work, soil samples were analyzed from the material underlying the removed refuse material as well as from the borrow material used for cover (see MRP Appendix 2-10). Results of the analysis indicated an adequate reclamation condition. Vegetation success in the years following reclamation continues to support that conclusion.

Vegetation sampling
SCA commissioned Mt Nebo Scientific to conduct qualitative and quantitative analysis of the vegetation on the reclaimed site. This occurred from 1996 through 2007 and was submitted to the Division each year as part of the annual report. During 2006 and 2007 the quantitative sampling was conducted with the anticipation that SCA could submit an application for Final Phase 3 Bond Release with the 2006 data set being used as "Year 1" and the 2007 data set as "Year 2" of the two consecutive years of vegetation monitoring necessary to apply for bond release. The 2006 and 2007 vegetation reports are also enclosed with this application for your review.

The 2007 report summarizes the two years of data and notes the following concerning the revegetation success:

- The Reclaimed Old Coarse Refuse Road had **total living covers** that were significantly greater than the Atriplex/Gress Reference Area in both sample years – 2006 and 2007.
- **Woody species densities** were also significantly greater for the reclaimed road when compared to the reference area for both sample years.
- **Diversity indices** were compared between the reclaimed road and reference area in 2006 and 2007. MacArthur's Index suggested the reclaimed road had greater species diversity than the reference area.
- The **average Number of Species per Quadrat** was also greater in the reclaimed road than the reference area
- **Species Richness** was also greater for the reclaimed road.
- Year 1 and Year 2 sampling results for total living cover, cover by species, composition, woody species density and diversity all suggest that **the reclaimed road has established an adequate plant community to be considered for Phase III or Final Bond Release.**

Water Quality and Sediment Control
SCA's reclamation plan for this area was focused on providing adequate cover over coal materials, surface roughening to reduce the potential for runoff and establishment of a vegetative cover equal to or better than the surrounding area and the vegetation reference area.

The success demonstrated over the past 15 years has shown that the soils have provided a quality growth medium and the vegetation has become established and has stabilized the soils. The surface roughening has been successful at capturing precipitation to support the vegetation and very little water runs down the slope.

Evaluation of this reclamation shows that impacts to surface and / or ground water quality and quantity have been minimized at the least and more likely have been prevented for both onsite and offsite conditions. Water quality is adequate for the post mining land use of Wildlife and Grazing.

Current topographic mapping
Existing Permit drawings have periodically been updated in the years since reclamation occurred and reflect the current post-mining topographic contours.

Remaining reclamation work and structures
No ongoing maintenance has been required to reseed or to repair erosion in this area. No additional reclamation is required for this area. No sediment control structures are required to meet water quality requirements to minimize contribution of sediments to receiving waters.

Post Mining Land Use
Reclamation of the OCRR was focused on returning the area to conditions which would be favorable to the PMLU of Wildlife and Grazing. This has been accomplished by restoring slopes, soils and vegetation of the area such that it blends in with the surrounding undisturbed areas.

Bond Calculations
As is customary at permit midterm, SCA submitted calculations recently identifying current costs for reclamation at Sunnyside. These calculations indicate that the total bond to be provided by SCA should be $1,601,000 before factoring in a release of bond for the OCRR. We have attached herewith, updated calculations removing the remaining earthwork and revegetation costs associated with the OCRR area. These calculations indicate that after the requested bond release is approved, the total bond amount should be $1,561,000. Therefore, SCA is requesting a release of $40,000.

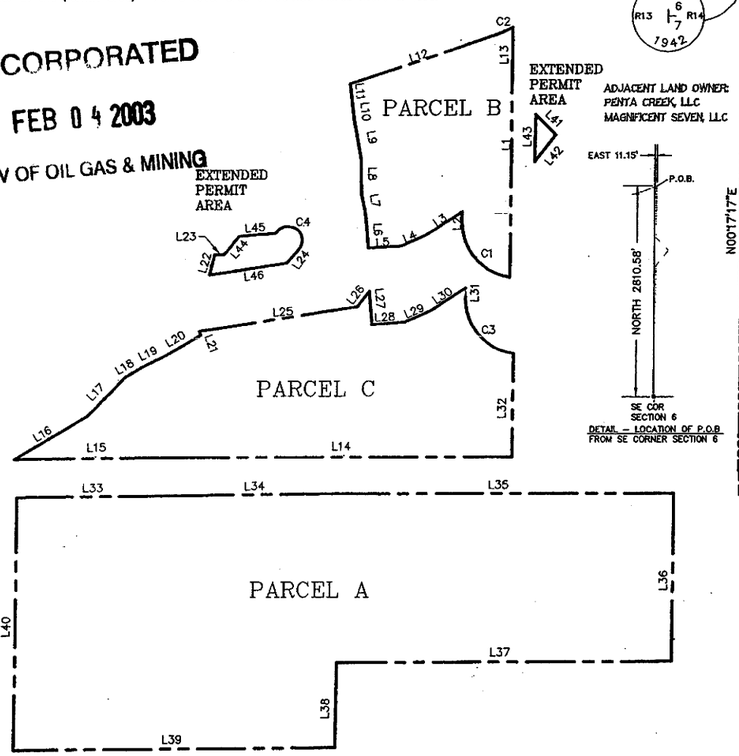
CURVE AND LINE DATA

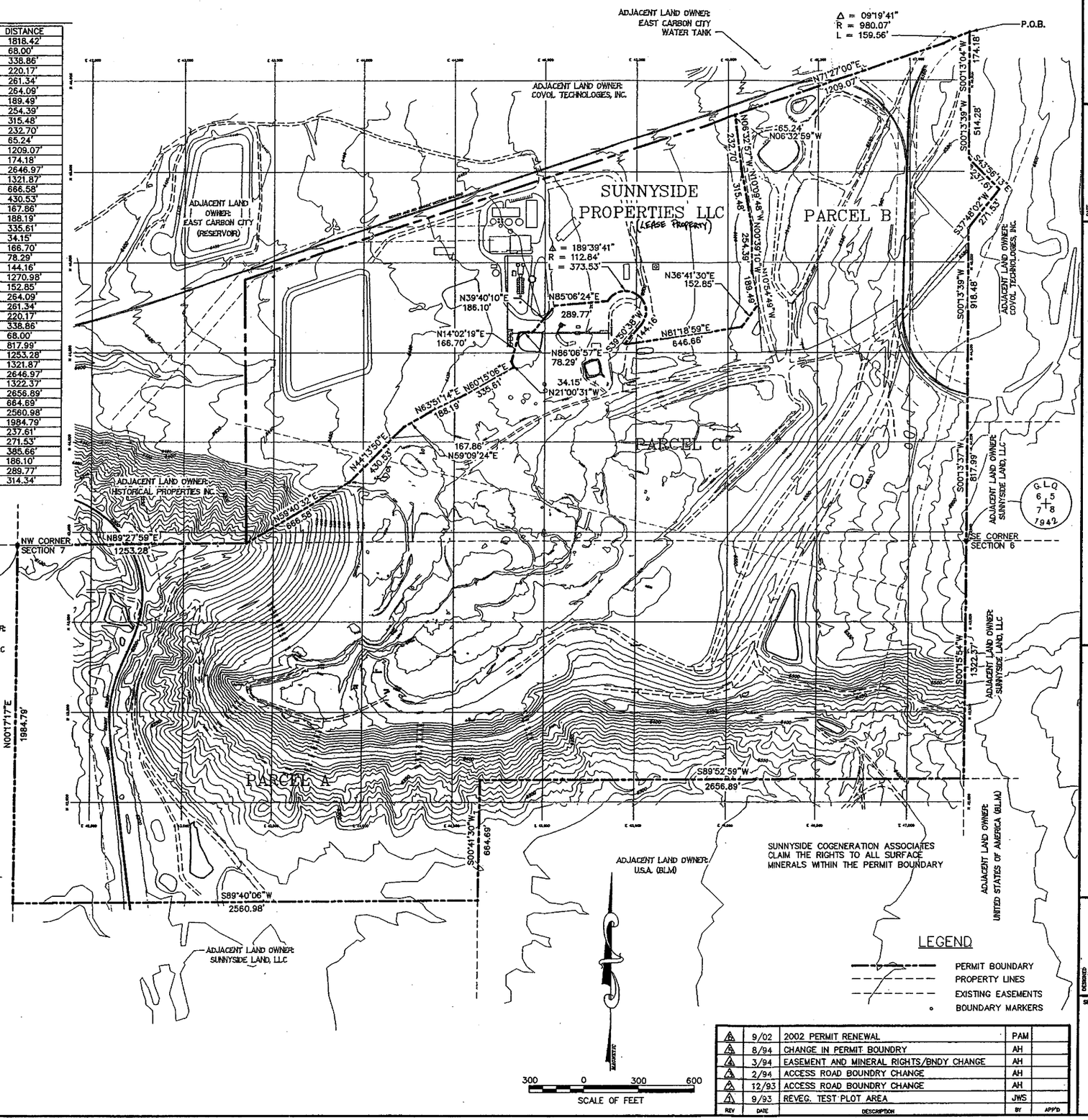
CURVE	RADIUS	LENGTH	CHORD	DELTA
C1	450.00'	656.83'	600.06'	83°37'49"
C2	980.07'	159.56'	159.38'	09°19'41"
C3	450.00'	656.83'	600.06'	83°37'49"
C4	112.84'	373.53'	224.88'	189°39'41"

LINE	DIRECTION	DISTANCE
L1	S00°13'39"W	1818.42'
L2	N01°21'36"E	68.00'
L3	S57°11'02"W	338.86'
L4	S66°14'45"W	220.17'
L5	S86°11'30"W	261.34'
L6	N04°41'13"W	264.09'
L7	N10°54'49"W	189.49'
L8	N00°39'10"W	254.39'
L9	N10°09'48"W	315.48'
L10	N06°32'57"W	232.70'
L11	N06°32'59"W	65.24'
L12	N71°27'00"E	1209.07'
L13	S00°13'04"W	174.18'
L14	N89°57'59"W	2646.97'
L15	S89°27'59"W	1321.87'
L16	N59°40'32"E	666.58'
L17	N44°13'50"E	430.53'
L18	N59°09'24"E	167.86'
L19	N63°51'14"E	188.19'
L20	N60°15'06"E	335.61'
L21	N21°00'31"W	34.15'
L22	N14°02'19"E	166.70'
L23	N86°06'57"E	78.29'
L24	S39°50'38"W	144.16'
L25	N81°18'59"E	1270.98'
L26	N36°41'30"E	152.85'
L27	S04°41'13"E	264.09'
L28	N86°11'30"E	261.34'
L29	N66°15'45"E	220.17'
L30	N57°11'01"E	338.86'
L31	S01°21'36"W	68.00'
L32	S00°13'37"W	817.99'
L33	N89°27'59"E	1253.28'
L34	N89°27'59"E	1321.87'
L35	S89°57'59"E	2646.97'
L36	S00°15'54"W	1322.37'
L37	S89°52'59"W	2656.89'
L38	S00°41'30"W	664.69'
L39	S89°40'06"W	2560.98'
L40	N00°17'17"E	1984.79'
L41	S43°56'13"E	237.61'
L42	S37°48'02"W	271.53'
L43	S00°13'39"W	385.66'
L44	N39°40'10"E	186.10'
L45	N85°06'24"E	289.77'
L46	N81°18'59"E	314.34'

The permit is located in Carbon County, Utah as follows:
Beginning at a point which is North 2810.58 feet and East 11.14 feet from the Southeast Corner of Section 6, Township 15 South, Range 14 East of the Salt Lake Base and Meridian and running thence South 00°13'04" West, 174.18 feet along the east line of Section 6 to a metal fence post, to the East 1/4 Sec 6; thence South 00°13'39" West 514.28 feet; thence running South 43°56'13" East, 237.61 Feet; thence running South 37° 48'02" West, 271.53 feet to a metal fence post; thence South 00°13'39" West, 918.48 feet along the east section line of Section 6; thence South 00°13'37" West 817.99 feet to the Southeast Corner of Section 6 which is a brass cap; thence South 00°15'54" West, 1322.37 feet along the east line of said Section 7 to the southeast corner of the NE1/4 NW1/4 of said Section 7 which is a metal fence post; thence South 89°52'59" West, 2656.89 feet along the south line of the N1/2 NE1/4 of the said Section 7 to the NW1/4 NE1/4 of said Section 7 which is a metal fence post; thence South 00°41'30" West, 664.69 feet along the east line of the SE1/4 NW1/4 of said Section 7 to the southeast corner of the NE1/4 SE1/4 NW1/4 of said Section 7 which is a metal fence post; thence
South 89°40'06" West, 2560.98 feet along the south line of the N1/2 S1/2 NW1/4 of said Section 7 to the southwest corner of the NW1/4 SW1/4 NW1/4 of said Section 7 which is a metal fence post; thence North 00°17'17" East, 1984.79 feet along the west section line to the Northwest Corner of Section 7 which is a brass cap; thence
North 89°27'59" East, 1253.28 feet along the north line of said Section 7 to the northeast corner of the NW1/4 NW1/4 of said Section 7 which is a brass cap; thence
North 59°40'32" East, 666.58 feet to a metal fence post; thence
North 44°13'50" East, 430.53 feet to a metal fence post; thence
North 59°09'24" East 167.86 feet to a metal fence post; thence
North 63°51'14" East, 188.19 feet to a metal fence post; thence
North 60°15'06" East, 335.61 feet to a metal fence post; thence
North 21°00'31" West, 34.15 feet to a brass post in a barbed wire fence; thence
North 14°02'19" East, 166.70 feet; thence North 86°06'57" East, 78.29 feet; thence North 39°40'10" East, 186.10 feet; thence North 85°06'24" East, 289.77 feet; thence running easterly along a curve to the right with a radius of 112.84 feet, through an angle of 189 °39'41" for a distance of 373.53 feet having a chord that bears
South 54°40'23" East, 224.88 feet; thence South 39°50'38" West, 144.16 feet; thence
North 81°18'59" East, 646.66 feet along an existing fence line to a roof bolt; thence
North 36°41'30" East, 152.85 feet along a fence line to a metal fence post; thence
North 10°54'49" West, 189.49 feet to a metal fence post; thence
North 00°39'10" West, 254.39 feet to a metal fence post; thence
North 10°09'48" West, 315.48 feet to a metal fence post; thence
North 06°32'57" West, 232.70 feet to a roof bolt in an existing fence line; thence North 06°32'59" West, 65.24 feet to the south right of way line of a Denver and Rio Grande Railroad as described in a certain deed dated July 29, 1912, which is a metal fence post; thence North 71°27'00" East, 1209.07 feet along the south line of a 50 foot wide right of way for the Denver and Rio Grande Railroad; thence northeasterly along a curve to the left with a radius of 980.07 feet, through an angle of 9°19'41", for a distance of 159.56 feet, having a chord that bears North 66°45'34" East, 159.38 feet to the east line of Section 6, to the point of beginning. Containing 323.95 Acres more or less.
Less 12.9 Acres for Carbon County Railway Right of Way (located in the Western half of the permit area). Less 6.2 Acres for Railroad Right of Way (located in the Northeast corner of the permit area). For a total area of 304.85 Acres more or less.

INCORPORATED
FEB 0 4 2003
DIV OF OIL GAS & MINING





LEGEND
- PERMIT BOUNDARY
- PROPERTY LINES
- EXISTING EASEMENTS
- BOUNDARY MARKERS

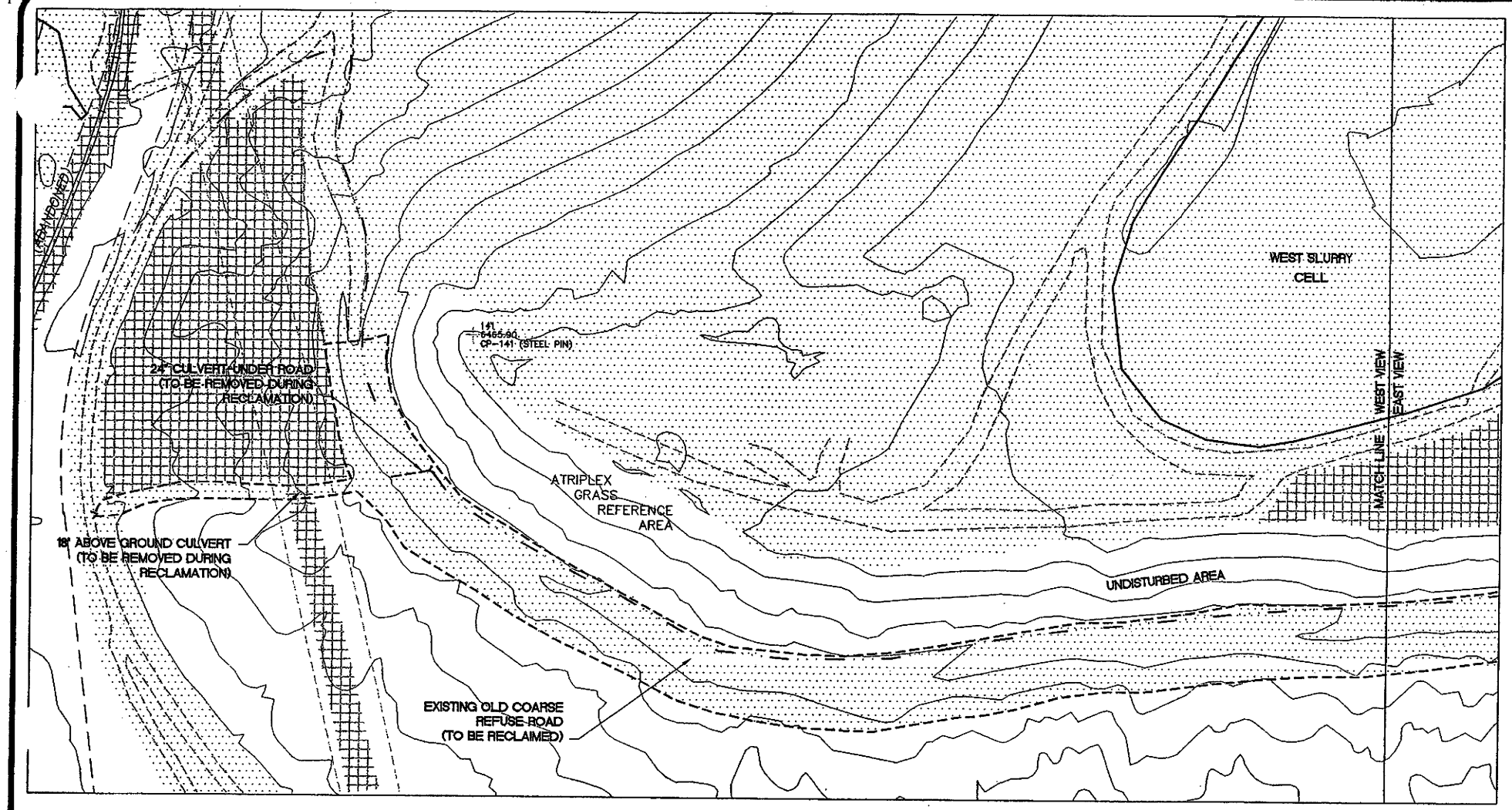
REV	DATE	DESCRIPTION	BY	APP'D
6	9/02	2002 PERMIT RENEWAL	PAM	
5	8/94	CHANGE IN PERMIT BOUNDRY	AH	
4	3/94	EASEMENT AND MINERAL RIGHTS/BNDY CHANGE	AH	
3	2/94	ACCESS ROAD BOUNDRY CHANGE	AH	
2	12/93	ACCESS ROAD BOUNDRY CHANGE	AH	
1	9/93	REVEG. TEST PLOT AREA	JWS	

Sunnyside Cogeneration Associates
SCA PERMIT AREA LEGAL DESCRIPTION
SCA LEASE AREA BOUNDARY

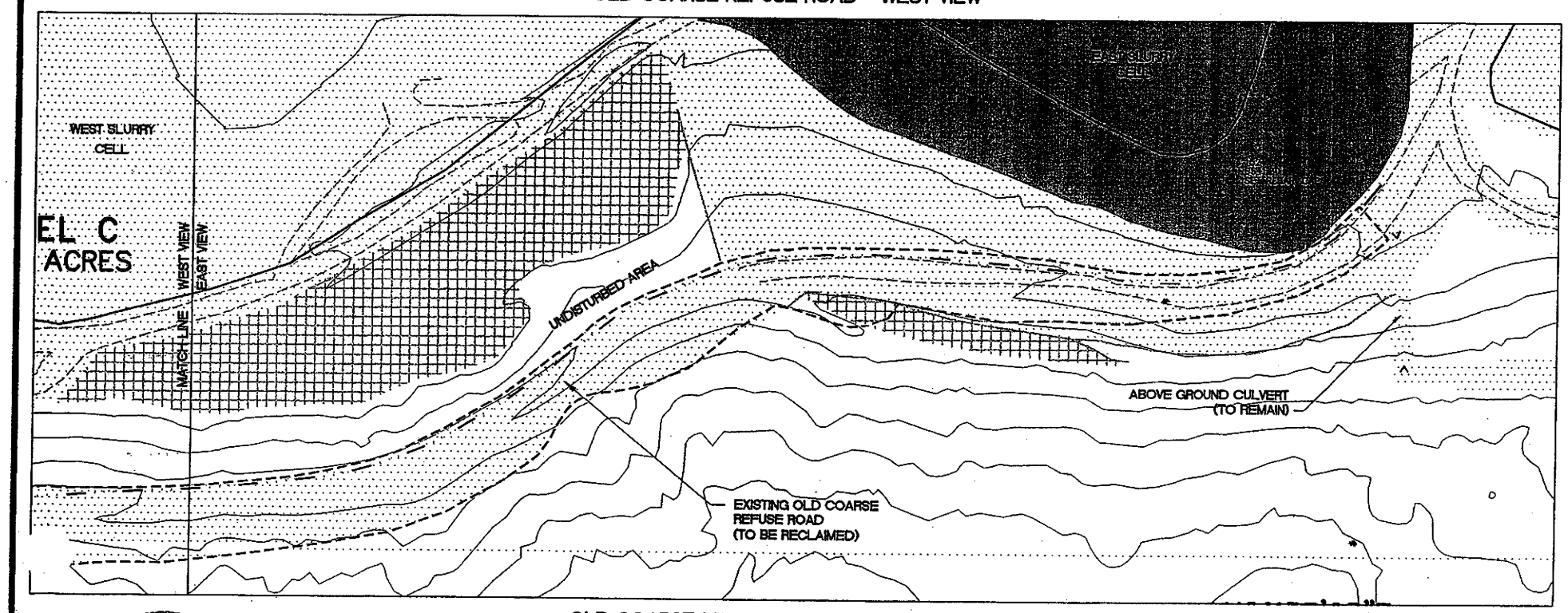
PSOMAS
2825 East Cottonwood Parkway, Suite 120
Salt Lake City, Utah 84121
(801) 270-5777 (801) 270-5782 (FAX)

DATE 11-92
SCALE 1" = 300'
PROJECT NO. 8SUN0105
DESIGNED AH
DRAWN AH
CHECKED SSC
SHEET 1-1

Oct. 02, 2002 - 14:06:57 /home/home1/k/kSUN0105000\2002 Permit\k-1.dwg Updated By: PMcrae



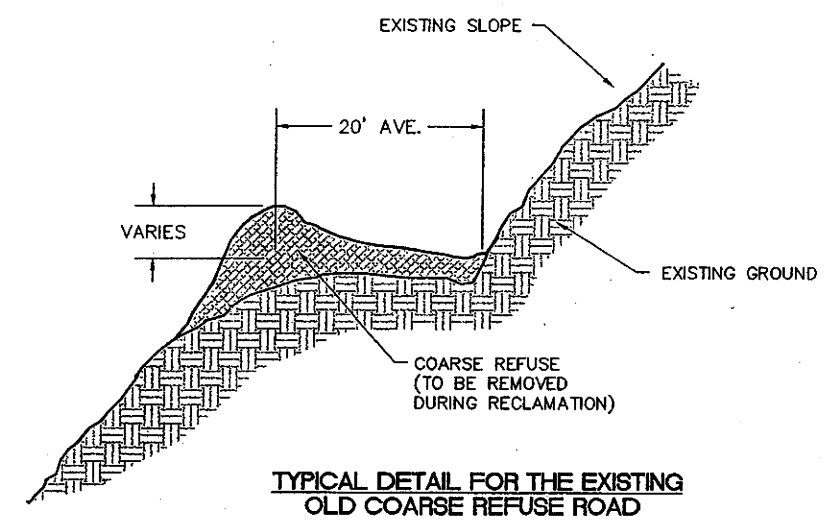
OLD COARSE REFUSE ROAD - WEST VIEW



OLD COARSE REFUSE ROAD - EAST VIEW

GRAPHIC SCALE

(IN FEET)
1 inch = 100 ft.



TYPICAL DETAIL FOR THE EXISTING OLD COARSE REFUSE ROAD

INCORPORATED

FEB 0 4 2003

DIV OF OIL GAS & MINING

RECEIVED

FEB 1 9 2003

DIV. OF OIL, GAS & MINING

LEGEND

- EXISTING CONTOURS
- FINAL CONTOURS
- ROADS
- SILT FENCE
- DRAINAGE
- PROJECT LIMITS
- POST-LAW DISTURBED AREA
- PRE-LAW DISTURBED AREA
- AREA TO BE MINED (16-20 YEARS)

REGISTERED PROFESSIONAL ENGINEER 187727 STATE OF UTAH CARLSON

10/97
Date

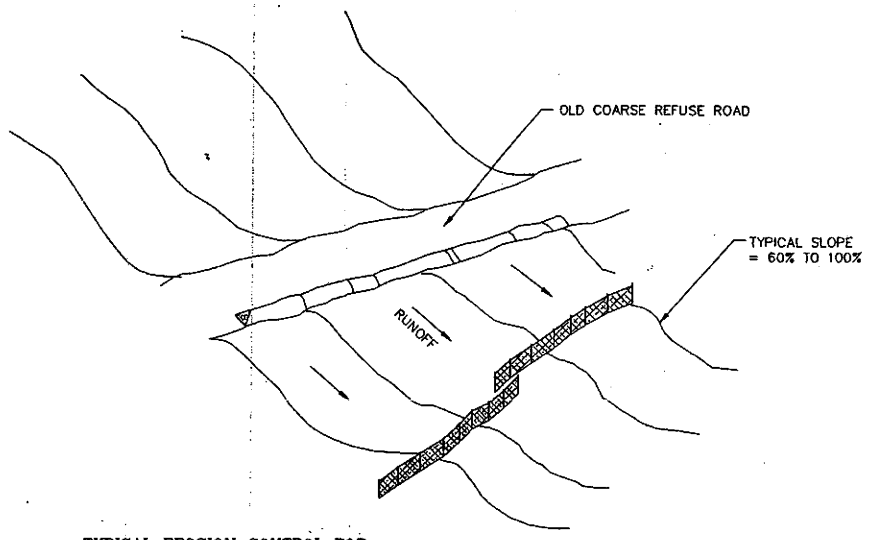
2	EXPAND PROJECT LIMITS AND REVISE DETAIL	AH	6/94
3	SO. RIDGE SED. POND	TLS	8/94

Project Number EC450593
Designed By AEB
Drawn By AH
AEB 7/94

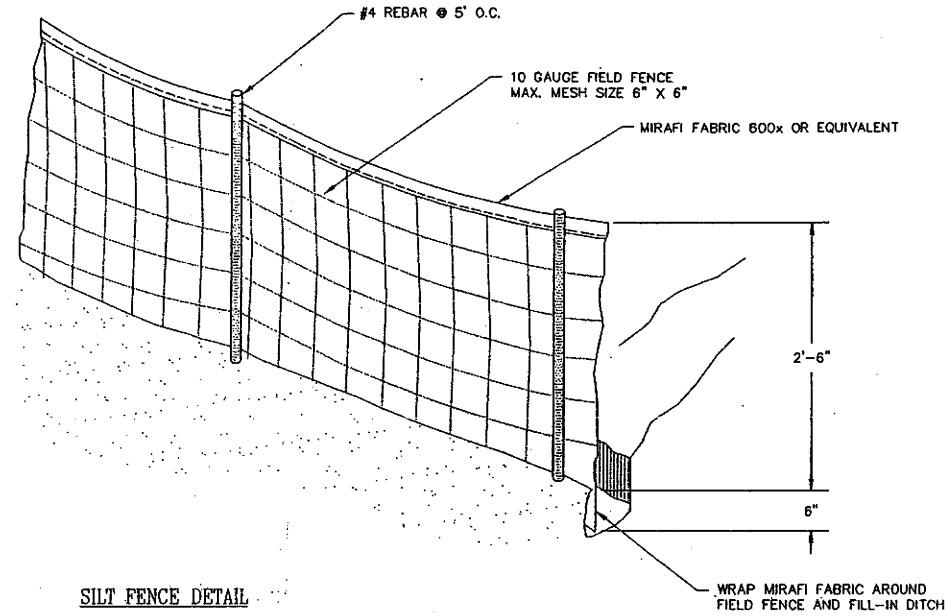
ECKHOFF WATSON AND PREATOR ENGINEERING

SUNNYSIDE COGENERATION ASSOCIATES
SUNNYSIDE COGENERATION FACILITY, CARBON COUNTY, UTAH
OLD COARSE REFUSE ROAD - EXISTING FINAL DETAIL

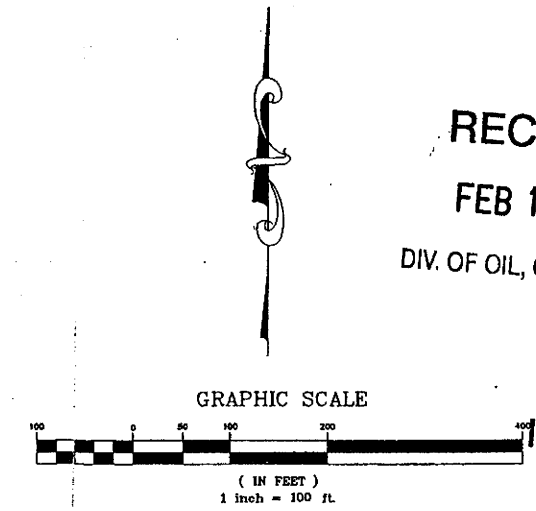
Sheet Number
10 -2A



TYPICAL EROSION CONTROL FOR OLD COARSE REFUSE ROAD

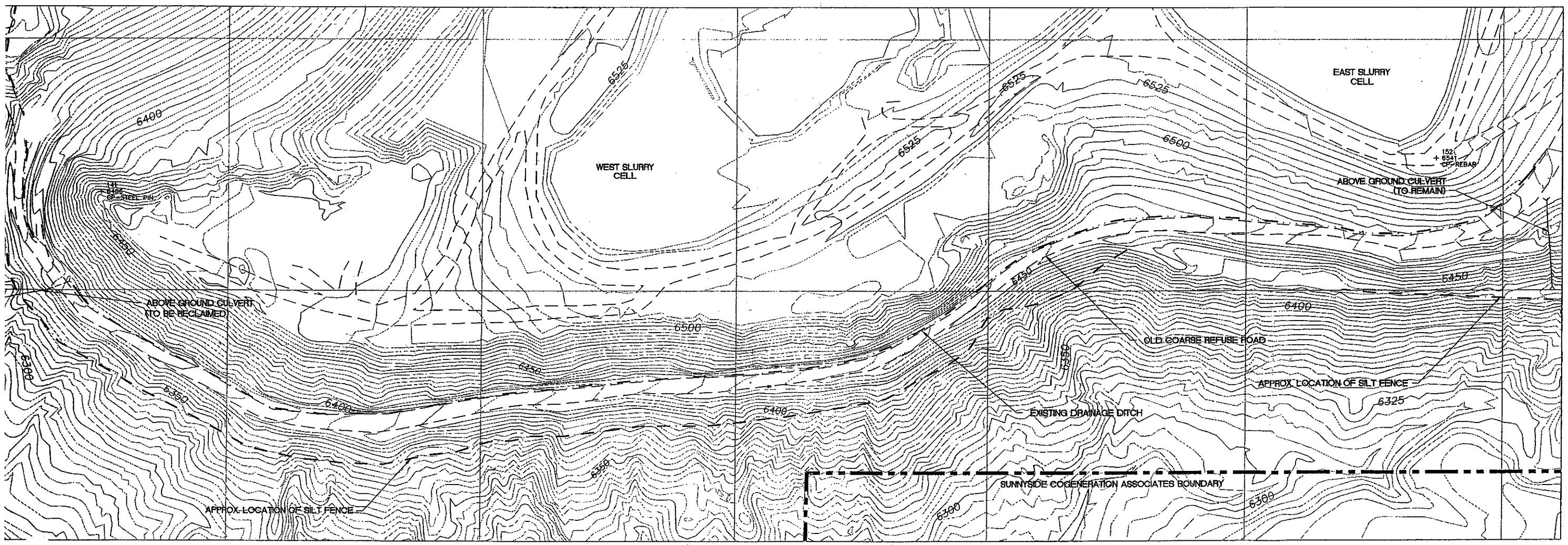


SILT FENCE DETAIL



RECEIVED
FEB 1 9 2003
DIV. OF OIL, GAS & MINING

INCORPORATED
FEB 0 4 2003
DIV OF OIL GAS & MINING



REGISTERED PROFESSIONAL ENGINEER
NO. 170148
ALANE F. BOYD
STATE OF UTAH

4/25/94
Date

No.	Revision	By	Date
1	REDRAW SILT FENCE	AH	4/94

Project Number EC450593
Designed By AEB
Drawn By AH
Checked By AEB Date 1/94

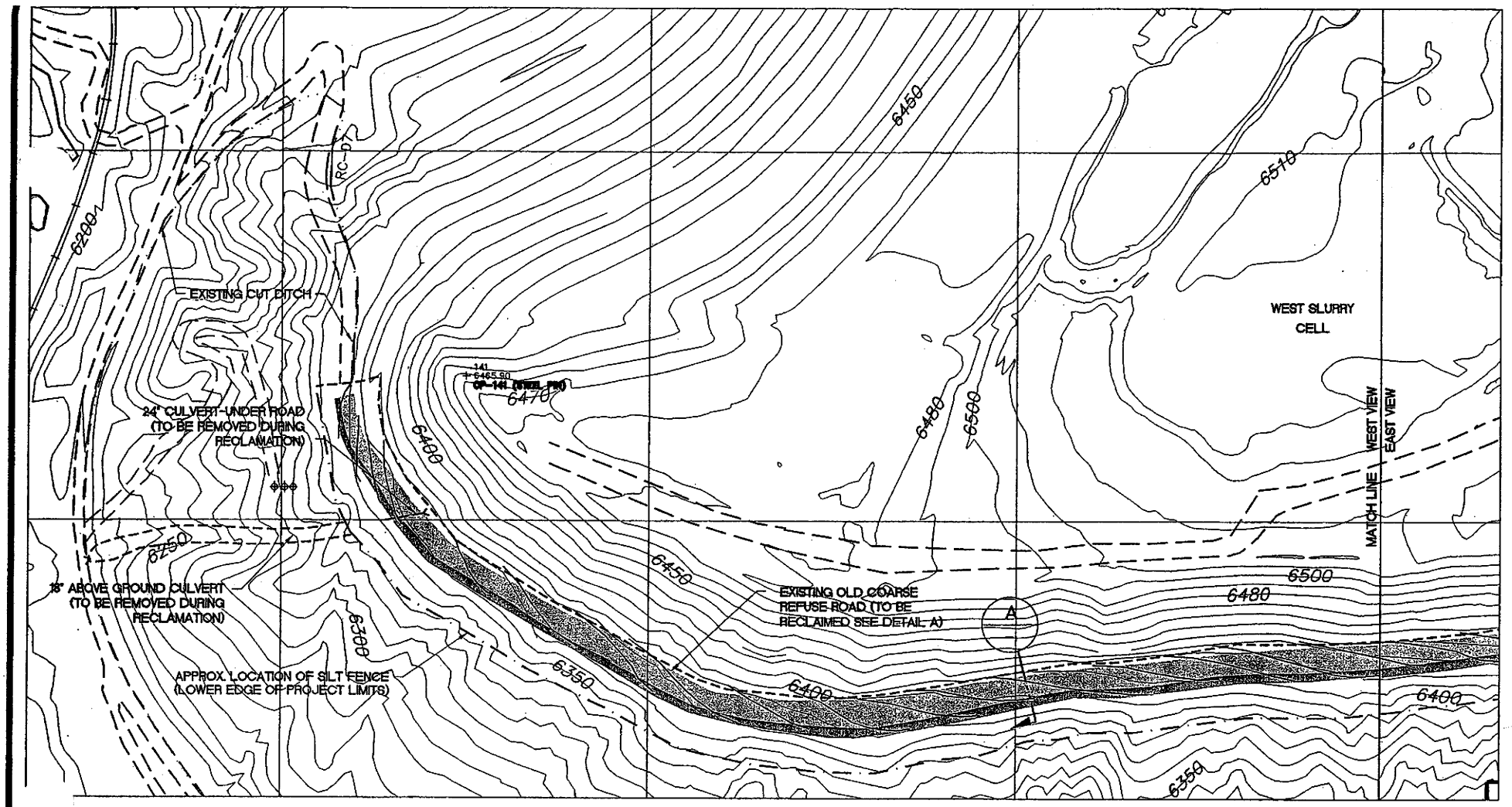
ECKHOFF WATSON AND PREATOR ENGINEERING
ENGINEERS PLANNERS SURVEYORS SALT LAKE CITY

SUNNYSIDE COGENERATION ASSOCIATES
SUNNYSIDE COGENERATION FACILITY, CARBON COUNTY, UTAH
OLD COARSE REFUSE ROAD - EROSION CONTROL PLAN + DETAILS

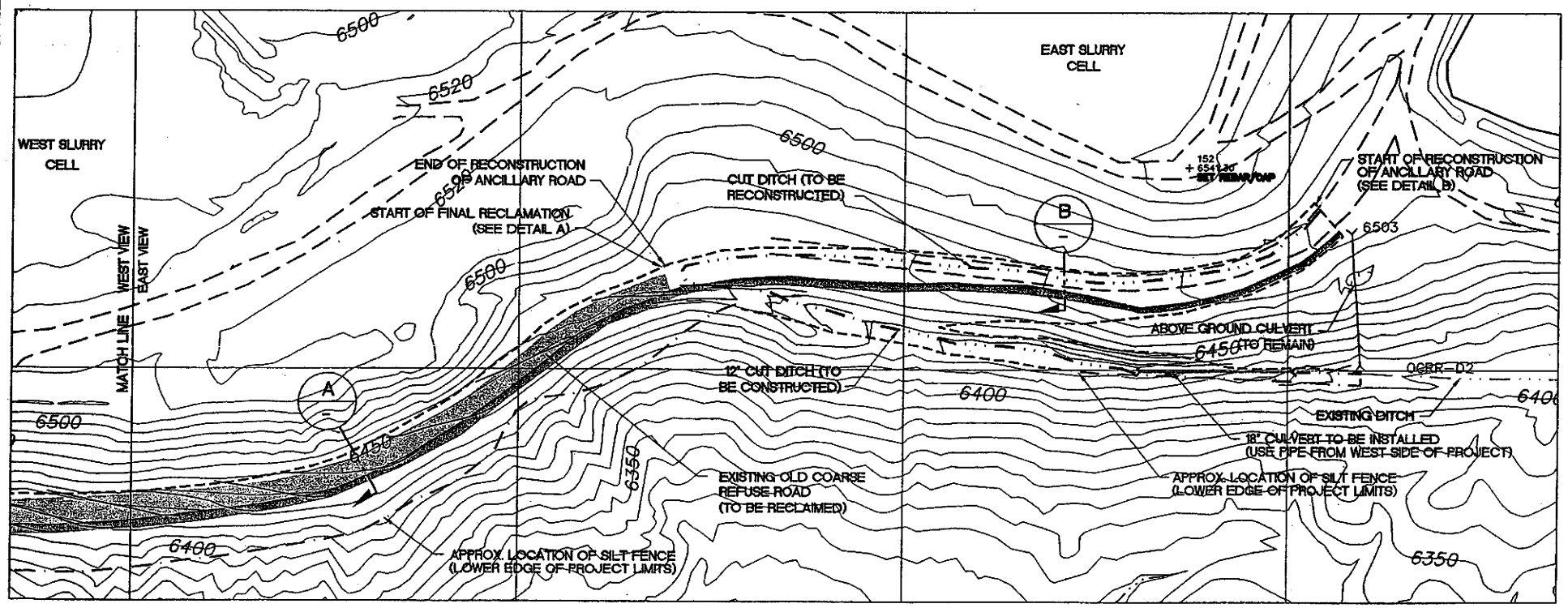
10 - 2B

RECEIVED
FEB 1 9 2003
DIV. OF OIL, GAS & MINING

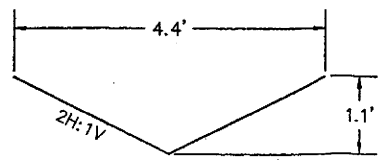
INCORPORATED
FEB 0 4 2003
DIV OF OIL GAS & MINING



OLD COARSE REFUSE ROAD - WEST VIEW

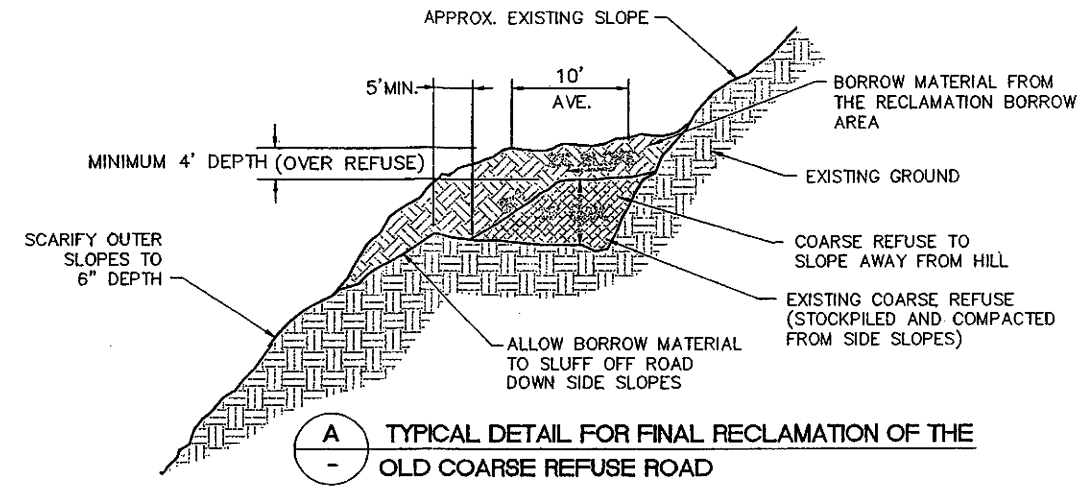


OLD COARSE REFUSE ROAD - EAST VIEW

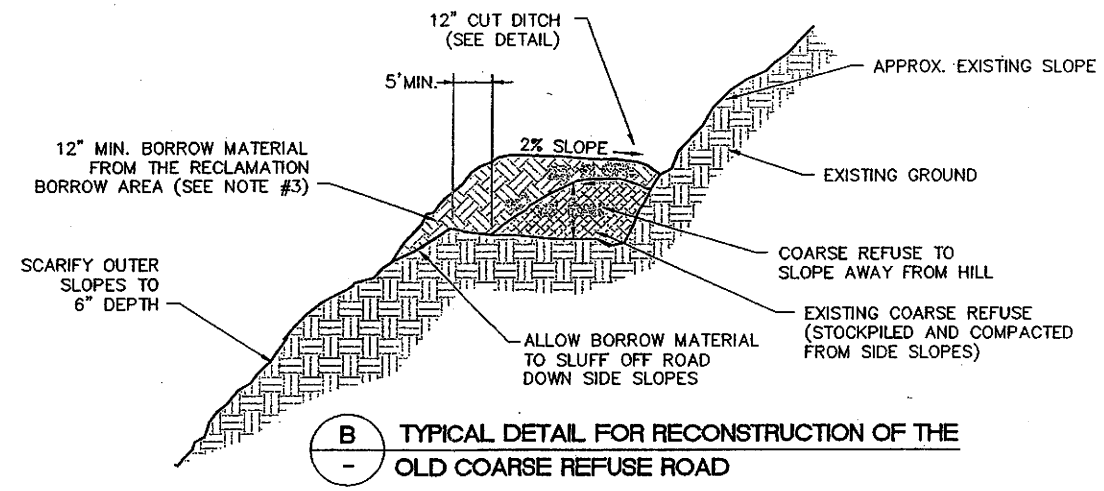


TYPICAL CROSS-SECTION FOR CUT DITCH

GRAPHIC SCALE
(IN FEET)
1 inch = 100 ft.



A - TYPICAL DETAIL FOR FINAL RECLAMATION OF THE OLD COARSE REFUSE ROAD



B - TYPICAL DETAIL FOR RECONSTRUCTION OF THE OLD COARSE REFUSE ROAD

LEGEND

- EXISTING CONTOURS
- FINAL CONTOURS
- ROADS
- PROJECT LIMITS
- SILT FENCE
- DRAINAGE
- AREA TO BE COVERED WITH 4' TOPSOIL
- SCARIFY SOIL TO 6" DEPTH

NOTES:

1. THE BORROW MATERIAL IN DETAIL (A) WILL BE DISTRIBUTED BY END DUMPING, AND MINIMAL GRADING WILL BE UTILIZED TO REDISTRIBUTE THE DUMPED MATERIALS SUFFICIENT TO COVER THE RECLAIMED SITES. THE BORROW MATERIALS WILL BE SPREAD UNEVENLY TO CREATE SMALL DEPRESSIONS WHICH WILL RETAIN MOISTURE, MINIMIZE EROSION, CREATE AND ENHANCE WILDLIFE HABITAT, AND ASSIST REVEGETATION.
2. SEED ALL AREAS WHICH HAVE BEEN COVERED WITH 4' BORROW MATERIAL OR SCARIFIED.
3. BORROW MATERIAL IN DETAIL (B) IS TO BE COMPACTED TO 90% MODIFIED PROCTOR TO FORM A STABLE BASE FOR USE AS AN ANCILLARY ROAD.
4. ADDITIONAL EROSION CONTROL MEASURES (SUCH AS NETTING) WILL BE IMPLEMENTED ON SLOPES STEAPER THAN 2H:1V.

REGISTERED PROFESSIONAL ENGINEER # 187727 L. SCOTT CARLSON STATE OF UTAH

10/97
Date

No.	Revision	By	Date
1	REDESIGN PROJECT	AH	4/94
2	EXTEND PROJECT LIMITS	AH	4/94

Project Number EC450593
Designed By AEB
Drawn By AH
Checked By AEB Date 3/94

ECKHOFF WATSON AND PREATOR ENGINEERING
ENGINEERS PLANNERS SURVEYORS SALT LAKE CITY

SUNNYSIDE COGENERATION ASSOCIATES
SUNNYSIDE COGENERATION FACILITY, CARBON COUNTY, UTAH
OLD COARSE REFUSE ROAD - RECLAMATION PLAN + DETAIL

Sheet Number
10 - 2C

Sunnyside Cogeneration Associates

P.O. Box 10, East Carbon, Utah 84520 • (435) 888-4476 • Fax (435) 888-2538

October 27, 2010

Bureau of Land Management
Jerry Kenczka
125 South 600 West
Price UT 84501

RE: Sunnyside Cogeneration Associates
Reclamation Bond Release

Dear Mr. Kenczka,

Sunnyside Cogeneration Associates wishes to provide you with notice that it has filed an application requesting final bond release from the Utah Division of Oil Gas and Mining for a small portion of its mining permit area.

SCA has a bond on file in the amount of approximately $1.6 Million and approval of this application will allow SCA to reduce its bond by $40,000 for approximately 5.35 acres that were reclaimed in 1994 under the provisions of the Utah Coal Mining and Reclamation Act and the Utah R645 Coal Mining Rules (Permit # C\007\035 Sunnyside Refuse & Slurry).

The existing permit area is comprised of approximately 323.95 acres and is located just south of Sunnyside City, Utah, within portions of the lands described as:
S ½ and SE ¼ of NE ¼ Section 6, T 15 S, R 14 E, SLB&M
N ½ Section 7, T 15 S, R 14 E, SLB&M

The reclaimed area is located within portions of the lands described as:
S ½ of N ½ of N ½ Section 7, T 15 S, R 14 E, SLB&M

Locally the reclaimed area is known as the Old Coarse Refuse Road and is located across the south facing slope just to the south of the refuse pile. The reclamation work (including grading, soil cover placement and revegetation) has been very successful and meets the requirements for bond release.

If you have any questions or concerns, we would be happy to discuss them with you. Otherwise, written comments, objections or requests for an informal conference regarding this application must be submitted with 30 days of the last publication date of this notice, to the Utah Division of Oil, Gas and Mining, Attention Coal Regulatory Program, 1594 West North Temple, Suite 1210, Salt Lake City, Utah 84116.

Thank You,

Richard Carter
Agent for
Sunnyside Cogeneration Associates

c.c. Steve Gross
William Rossiter
Maggie Estrada
Paul Shepard
Rusty Netz
Plant File

Sunnyside Cogeneration Associates

P.O. Box 10, East Carbon, Utah 84520 • (435) 888-4476 • Fax (435) 888-2538

October 27, 2010

Sunnyside City
Bruce Andrews
701 Market Street
Sunnyside, UT 84539

RE: Sunnyside Cogeneration Associates
Reclamation Bond Release

Dear Mr. Andrews,

Sunnyside Cogeneration Associates wishes to provide you with notice that it has filed an application requesting final bond release from the Utah Division of Oil Gas and Mining for a small portion of its mining permit area.

SCA has a bond on file in the amount of approximately $1.6 Million and approval of this application will allow SCA to reduce its bond by $40,000 for approximately 5.35 acres that were reclaimed in 1994 under the provisions of the Utah Coal Mining and Reclamation Act and the Utah R645 Coal Mining Rules (Permit # C\007\035 Sunnyside Refuse & Slurry).

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Thank You,

Richard Carter
Agent for
Sunnyside Cogeneration Associates

c.c. Steve Gross
William Rossiter
Maggie Estrada
Paul Shepard
Rusty Netz
Plant File

Sunnyside Cogeneration Associates

P.O. Box 10, East Carbon, Utah 84520 • (435) 888-4476 • Fax (435) 888-2538

October 27, 2010

East Carbon City
Orlando LaFontaine
105 West Geneva Dr.
East Carbon City, UT 84520

RE: Sunnyside Cogeneration Associates
Reclamation Bond Release

Dear Mr. LaFontaine,

Sunnyside Cogeneration Associates wishes to provide you with notice that it has filed an application requesting final bond release from the Utah Division of Oil Gas and Mining for a small portion of its mining permit area.

SCA has a bond on file in the amount of approximately $1.6 Million and approval of this application will allow SCA to reduce its bond by $40,000 for approximately 5.35 acres that were reclaimed in 1994 under the provisions of the Utah Coal Mining and Reclamation Act and the Utah R645 Coal Mining Rules (Permit # C\007\035 Sunnyside Refuse & Slurry).

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Thank You,

Richard Carter
Agent for
Sunnyside Cogeneration Associates

c.c. Steve Gross
William Rossiter
Maggie Estrada
Paul Shepard
Rusty Netz
Plant File

TABLE 8-1

DETERMINATION OF BOND AMOUNT

DETERMINATION OF BOND AMOUNT - Summary

ITEM	QUANTITY	RATE	COST
Total Crusher Demolition Culvert Removal & Riprap			$ 130,042
Total Backfill, Grading and support			$ 760,525
Total Revegetation and Erosion Control			$ 309,898
Total (Direct Costs)			**$ 1,200,465**
Mobilization and Demobilization	10%		$ 120,047
Contingency	5%		$ 60,023
Engineering Redesign	2.5%		$ 30,012
Main Office Expense	6.8%		$ 81,632
Project Management Fee	2.5%		$ 30,012
Total (Indirect Costs)	**26.8%**		**$ 321,725**
Total (Direct and Indirect Costs - 2010 dollars)			**$ 1,522,190**
Escalation 5 years to Mid Term 2015	5	0.50%	$ 38,437
Total Reclamation Costs (Escalated)			$ 1,560,627
Bond Amount Required (Rounded to the nearest $1,000)			**$ 1,561,000**

DETERMINATION OF BOND AMOUNT - Revegetation

ITEM	QUANTITY	UNIT COST	COST
Atriplex Grass Revegetation Areas			
Seed Material Costs (Granite Seed Sept 2010)	12.0 Acres	$ 359.00	$ 4,308
Tractor Spreader (equip & labor) B-66 Reveg 004 + 10%	523 MSF	$ 11.55	$ 6,037
Fertilizer hydrospread M029351000180 + 10%	523 MSF	$ 4.18	$ 2,185
Pinyon Jumiper Sagebrush Revegetation Areas			
Seed Material Costs (Granite Seed Sept 2010)	183.8 Acres	$ 566.70	$ 104,159
Tractor Spreader (equip & labor) B-66 Reveg 004 + 10%	8,006 MSF	$ 11.55	$ 92,473
Fertilizer hydrospread M029351000180 + 10%	8,006 MSF	$ 4.18	$ 33,466
Hydrophytic Revegetation Areas			
Seed Material Costs (Granite Seed Sept 2010)	0.6 Acres	$ 279.90	$ 168
Tractor Spreader (equip & labor) B-66 Reveg 004 + 10%	26 MSF	$ 11.55	$ 302
Fertilizer hydrospread M029351000180 + 10%	26 MSF	$ 4.18	$ 109
Subtotal Revegetation	196.4 Acres		$ 243,208
Reseeding 25%	49.1 Acres		$ 60,802
Plastic netting (Means 312513100100)	5,000 square yards	$ 1.13	$ 5,650
Silt fences (Means 312513101000)	300 Linear Feet	$ 0.79	$ 237
Total Erosion Control			$ 5,887
Total Revegetation and Erosion Control			$ 309,898

DETERMINATION OF BOND AMOUNT - Backfill and Grading

ITEM	QUANTITY		PRODUCTION RATE		HOURS REQUIRED	UNIT COST	COST
Backfilling and Grading							
General site grading: High walls, Refuse Cleanup and Drainage needs							
D-10 R Dozer	200,000	Cubic Yards	1,800	cy/hr	111	$ 320.00	$ 35,556
Disturbed area covered with refuse (4' borrow)	75.9	Acres					
C-631 E Scraper	489,808	Cubic Yards	375	cy/hr	1306	$ 240.00	$ 313,477
D-10 R Dozer (one dozer to assist loading four scrapers)					327	$ 320.00	$ 104,492
Disturbed area w/ 2' existing cover over refuse (2' additional borrow)	14.1	Acres					
C-631 E Scraper	45,367	Cubic Yards	375	cy/hr	121	$ 240.00	$ 29,035
D-10 R Dozer (one dozer to assist loading four scrapers)					30	$ 320.00	$ 9,678
D-10 R Dozer (spreading on hillside)	45,367	Cubic Yards	375	cy/hr	121	$ 320.00	$ 38,713
Disturbed area contaminated by refuse (1.5 ' borrow)	45.2	Acres					
C-631 E Scraper	109,481	Cubic Yards	375	cy/hr	292	$ 240.00	$ 70,068
D-10 R Dozer (one dozer to assist loading four scrapers)					73	$ 320.00	$ 23,356
D-10 R Dozer (minor spreading in some hillside areas - 25%)	27,370	Cubic Yards	700	cy/hr	39	$ 320.00	$ 12,512
~~Old Coarse Refuse Road - Bonded Earthwork Amount (40% of 4' borrow)~~	~~5.5~~	~~Acres~~					
~~C-631 E Scraper~~	~~14,197~~	~~Cubic Yards~~	~~375~~	~~cy/hr~~	~~38~~	~~$ 240.00~~	~~$ 9,086~~
~~D-10 R Dozer (one dozer to assist loading four scrapers)~~					~~9~~	~~$ 320.00~~	~~$ 3,029~~
~~D-10 R Dozer (spreading on hillside)~~	~~14,197~~	~~Cubic Yards~~	~~375~~	~~cy/hr~~	~~38~~	~~$ 320.00~~	~~$ 12,115~~
Distribution of salvaged topsoil	6	Acres					
D-10 R Dozer	8,685	Cubic Yards	375	cy/hr	23	$ 320.00	$ 7,411
Scarification (average 18" depth)	199	Acres					
D-10 R Dozer with multishank ripper	481,580	Cubic Yards	3,000	cy/hr	161	$ 320.00	$ 51,369
Construction Management							
Water Truck	3.5	Months	87	hr/mo	305	$ 100.00	$ 30,450
Foreman and 4x4 pickup - Nielson	3.5	Months	174	hr/mo	609	$ 56.50	$ 34,409
Total Construction Management							**$ 64,859**

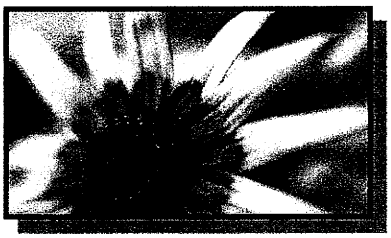
Total Backfill, Grading and support						**$ 760,525**

DETERMINATION OF BOND AMOUNT - Const Mgt, Demolition, Erosion Control

ITEM	QUANTITY	PRODUCTION RATE	HOURS REQUIRED	UNIT COST	COST
Crusher Facilities, Culverts and Riprap Channels					
Demolition of crusher facilities					
Concrete - Crush and bury on site	50 Cubic Yards			$ 24.02	$ 1,201
Steel - Disassemble and send for scrap	100 Tons			$ 33.00	$ 3,300
Culvert excavation, removal and disposal					
Track Excavator 325 CL (av 1 cy ex per 3 ft culvert)	217 Cubic Yards	15 yd/hr	14.4	$ 135.00	$ 1,950
Disposal	650 LF			$ 3.30	$ 2,145
Drainage Channel Reconstruction					
Major Channels with riprap and filter bed	1,700 Linear Feet	1.76 cy/lf			
Material cost (means 313713100100) +10%	2,992 cubic yards			$ 27.06	$ 80,964
Equipment and Labor	2,992 cubic yards	180 yd/hr	16.6	$ 135.00	$ 2,244
Minor Channels requiring riprap	2,500 Linear Feet	0.55 cy/lf			
Material cost (means 313713100100) +10%	1,375 cubic yards			$ 27.06	$ 37,208
Equipment and Labor	1,375 cubic yards	180 yd/hr	7.6	$ 135.00	$ 1,031
Total Crusher Demolition Culvert Removal & Riprap					**$ 130,042**

VEGETATION MONITORING
FOR PHASE III BOND RELEASE: YEAR 2
AT THE
SUNNYSIDE COGENERATION FACILITY
2007

RECLAIMED OLD COARSE REFUSE ROAD
AND THE
ATRIPLEX/GRASS REFERENCE AREA



Prepared by

MT. NEBO SCIENTIFIC, INC.
330 East 400 South, Suite 6
P.O. Box 337
Springville, Utah 84663
(801) 489-6937

Patrick D. Collins, Ph.D.

for

SUNNYSIDE COGENERATION ASSOCIATES
#1 Power Plant Road
Sunnyside, Utah 84539

March 2008

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VEGETATION MONITORING FOR PHASE III BOND RELEASE: YEAR 2 AT THE SUNNYSIDE COGENERATION FACILITY 2007

INTRODUCTION

The **Reclaimed Old Coarse Refuse Road** has been revegetated on the south end of the refuse pile at the *Sunnyside Cogeneration Facility*. To monitor the success of revegetation establishment, either quantitative or qualitative sampling of the reclaimed road has been conducted during the growing seasons of 1996 through 2007. An **Atriplex/Grass Reference Area** had been chosen at an earlier date to represent standards for revegetation success. For many of the monitoring years, the reference area was also sampled for comparisons with the reclaimed road.

The old road has been reclaimed long enough that the "*responsibility period*" for final reclamation has been met. This means that the required time period has passed for vegetation establishment on reclaimed land before an application for bond release can be initiated. Because of this, the *Sunnyside Cogeneration Facility* could submit the application for *final* or Phase III Bond Release. Consequently, sampling in 2006 and 2007 was conducted with rigorous sampling methods so the data could be used in the application for bond release. Because sample adequacy

and statistical analyses meet the required levels, the 2006 and 2007 datasets can be used for the "Year 1" and "Year 2" of the two consecutive years of vegetation monitoring required to apply for the bond release. A report was submitted previously to *Sunnyside Cogeneration Associates* by *Mt. Nebo Scientific, Inc.* that included 2006 sampling results for the Year 1 called VEGETATION MONITORING FOR PHASE III BOND RELEASE: YEAR 1. The document herein provides sampling results for Year 2 of the sampling regime.

Like previous years, this vegetation monitoring report provides a brief history of the reclamation in this area. *Sunnyside Cogeneration Associates* reclaimed an existing road on the south side of an old coarse refuse pile in the summer and fall of 1994. The work entailed regrading the road and reshaping the cut-and-fill areas to approximate the contours of the surrounding slopes. A seed mixture of native plant species (or approved introduced) to the area was then planted. The plant species used in the reclamation seed mixture are shown below.

PLANT SPECIES SEEDED
SHRUBS Four-wing saltbush (*Atriplex canescens*) Shadscale (*Atriplex confertifolia*) Winterfat (*Ceratoides lanata*) Gardner saltbush (*Atriplex gardneri*)
FORBS Lewis Flax (*Linum lewisii*) Yellow sweetclover (*Melilotus officinalis*) Globemallow (*Sphaeralcea grossulariifolia*)
GRASSES Thickspike wheatgrass (*Elymus lanceolatus*) Western wheatgrass (*Elymus smithii*) Needle-and-thread (*Stipa comata*) Indian ricegrass (*Stipa hymenoides*) Squirreltail (*Sitanion hystrix*) Slender wheatgrass (*Elymus trachycaulus*)

METHODS

Sampling methods have remained consistent for all monitoring years. For this report, the Reclaimed Old Coarse Refuse Road and Atriplex/Grass Reference Area were sampled on August 13-15, 2007.

Transect & Quadrat Placement

Transect lines for sampling were randomly placed for the length of the reclaimed road and the width of the reference area to adequately represent the entire areas. From these transect lines, sample locations were chosen using random numbers at right angles to them for placement of the quadrats.

Cover, Frequency & Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition and frequencies were also assessed from the quadrat data. The frequency values were assessed for each plant species and stated as the relative proportion of the number of times a given species was present in the quadrats. Plant nomenclature follows "*A Utah Flora*" (Welsh et al. 2003).

Density

Density estimates of woody plant species for the reclaimed road and reference area were made using a distance method called the point-quarter. In this 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.

Sample Adequacy

Sample adequacy for cover and density was achieved using 90% statistical confidence interval (± 0.10 deviation from the mean). The following formula was used:

$$nMIN = \frac{t^2 s^2}{(dx)^2}$$

where,

nMIN	= minimum adequate sample
t	= appropriate confidence t-value
s	= standard deviation
x	= sample mean
d	= desired change from mean

Diversity

Three diversity indices have been reported in this document for the reclaimed area and the reference area. To begin, **MacArthur's Diversity Index** was calculated. This index is an effective diversity measurement and is computed using the equation $1/\sum pi^2$ (MacArthur and Wilson 1976, *The Theory of Island Biogeography,* Princeton: Princeton University Press). In this equation *pi* is the proportion of sum frequency contributed by the *i*th species in the sample area of concern. The proportional contribution of each species is then squared and the values for all species in the sample areas are summed. This index integrates the number of species and the degree to which frequency of occurrence was equitably distributed among those species. In other words, this index provides greater weight to those species that are present more often (with greater frequency) than those that are merely "present" in one or two quadrats. The **average number of species** per sample quadrat is another measure of species diversity provided from the data in this report. Finally, the *total number of species present* in the sample quadrats, or "**richness**", was calculated for the sample areas.

Photographs

Color photographs were taken of the sample areas and have been included in this report.

Raw Data

The raw cover, composition, and frequency data have been summarized on spreadsheets and have been included in the Appendix of this report.

RESULTS

Reclaimed Old Coarse Refuse Road

The total living cover of the Reclaimed Old Coarse Refuse Road was estimated at 32.90% [Table 1 (A)]. The composition of the total living cover consisted of 76.76% shrubs, 20.42% grasses and 2.82% forbs [Table 1 (B)]. Diversity indices calculated for the reclaimed road revealed the following: MacArthur's Index = 4.576, Average Number of Species per Quadrat = 2.02 and Richness = 18.0 [Table 1 (C)].

The most dominant species by quite a wide range was fourwing saltbush (*Atriplex canescens*), followed distantly by shadscale (*Atriplex confertifolia*), cheatgrass (*Bromus tectorum*), mat saltbush (*Atriplex corrugata*) and winterfat (*Ceratoides lanata*). For a list all species present in the sample quadrats refer to Table 2.

Total woody species density of the reclaimed road was estimated at 3,314 (Table 3). Like the total living cover estimates, the most common woody plant was fourwing saltbush, followed by

shadscale, mat saltbush and winterfat.

Atriplex/Grass Reference Area

The total living cover for the Atriplex/Grass Reference Area at the Sunnyside Cogeneration Facility was estimated at 28.00% [Table 4 (A)]. Composition by lifeform of the living cover consisted of 64.07% grasses, 29.26% shrubs and 6.67% forbs [Table 4 (B)]. Diversity indices calculated for the reference area revealed the following: MacArthur's Index = 4.371, Average Number of Species per Quadrat = 1.88 and Richness = 9.0 [Table 4 (C)].

The most common or dominant species by cover for the reference area were Salina wildrye (*Elymus salinus*) and shadscale (Table 5).

Total woody species density of the reference area was estimated at 1,357 plants per acre, with the most common by far as shadscale. For the density all woody plant species present in the samples, refer to Table 6.

DISCUSSION & SUMMARY

Quantitative sampling results for 2007, or **Year 2** of the two consecutive years required for the application to the State of Utah, Division of Oil, Gas & Mining (DOGM), for the bond release are provided in this report. Complete datasets and results for 2006, or **Year 1**, were provided to *Sunnyside Cogeneration Associates* in an earlier report called: VEGETATION MONITORING

FOR PHASE III BOND RELEASE: YEAR 1. For this Discussion & Summary, sample results for both sample years have been included on the figures to facilitate comparisons between years and parameters.

The Reclaimed Old Coarse Refuse Road had **total living covers** that were significantly greater than the Atriplex/Grass Reference Area in both sample years – 2006 and 2007 (Table 7; Fig 1). **Woody species densities** were also significantly greater for the reclaimed road when compared to the reference area for both sample years (Table 7; Fig. 2).

Additionally, **diversity indices** were compared between the reclaimed road and reference area in 2006 and 2007. MacArthur's Index suggested the reclaimed road had greater species diversity than the reference area (Fig. 3). The Average Number of Species per Quadrat, another diversity measurement, was also greater in the reclaimed road than the reference area (Fig. 4). Finally, Species Richness, or the total number of species encountered in the sample quadrats of each area, was also greater for the reclaimed road (Fig. 5).

Composition of the total living cover by lifeform was derived from the data. Although not compared statistically, graphic representations of the results are shown on Figures 6 and 7.

Year 1 and Year 2 sampling results for total living cover, cover by species, composition, woody species density and diversity all suggest that the reclaimed road has established an adequate plant community to be considered for Phase III or Final Bond Release.

SUMMARY TABLES

TABLE 1: Total cover, composition and diversity summary for the Reclaimed Old Coarse Refuse Road at the Sunnyside Cogeneration Facility (2007).

A. TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	32.90*	9.28	50
Litter	16.10	7.09	50
Bareground	22.90	9.49	50
Rock	28.10	15.10	50
B. COMPOSITION			
Shrubs	76.76	26.82	50
Forbs	2.82	11.12	50
Grasses	20.42	26.08	50

C. DIVERSITY

MacArthur's Index ($1/\sum pi^2$) = 4.576
Average No. Species/Quadrat = 2.02
Richness =18.0

Sample Adequacy:
$\bar{x}$ = 32.90*
s = 9.28
n = 50
nMIN = 21.53

TABLE 2: Species cover and frequency summary for the Reclaimed Old Coarse Refuse Road at the Sunnyside Cogeneration Facility (2007).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Atriplex canescens	19.60	13.92	50	82.00
Atriplex confertifolia	3.30	7.32	50	20.00
Atriplex corrugata	1.10	3.78	50	10.00
Atriplex gardneri	0.40	2.20	50	4.00
Ceratoides lanata	1.00	4.69	50	6.00
Gutierrezia sarothrae	0.10	0.70	50	2.00
FORBS				
Machaeranthera grindelioides	0.10	0.70	50	2.00
Penstemon palmeri	0.10	0.70	50	2.00
Salsola tragus	0.30	2.10	50	2.00
Sisymbrium altissimum	0.40	2.80	50	2.00
GRASSES				
Bromus tectorum	3.30	5.16	50	36.00
Elymus lanceolatus	1.40	3.61	50	16.00
Elymus salinus	0.20	1.40	50	2.00
Elymus smithii	0.20	0.98	50	4.00
Elymus spicatum	0.10	0.70	50	2.00
Elymus trachycaulus	0.20	1.40	50	2.00
Hilaria jamesii	0.30	2.10	50	2.00
Stipa hymenoides	0.80	3.37	50	6.00

TABLE 3: Woody species densities of the Reclaimed Old Coarse Refuse Road at the Sunnyside Cogeneration Facility (2007).

	NUMBER/ACRE
Atriplex canescens	2270.19
Atriplex confertifolia	381.13
Atriplex corrugata	314.84
Atriplex gardneri	66.28
Ceratoides lanata	198.85
Chrysothamnus nauseosus	41.43
Gutierrezia sarothrae	41.43
TOTAL	3314.14*

Sample Adequacy:
$\bar{x}$ = 3314.14*
s = 1552.38
n = 100
nMIN = 59

TABLE 4: Total cover, composition and diversity summary for the Atriplex/Grass Reference Area at the Sunnyside Cogeneration Facility (2007).

A. TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	28.00*	6.69	40
Litter	18.00	6.50	40
Bareground	16.38	5.91	40
Rock	37.63	10.06	40
B. COMPOSITION			
Shrubs	29.26	32.43	40
Forbs	6.67	16.73	40
Grasses	64.07	34.40	40

C. DIVERSITY

MacArthur's Index ($1/\sum pi^2$) = 4.371
Average No. Species/Quadrat = 1.88
Richness =9.0

Sample Adequacy:
$\bar{x}$ = 28.00*
s = 6.69
n = 40
nMIN = 15.45

TABLE 5: Species cover and frequency summary for the Atriplex/Grass Reference Area at the Sunnyside Cogeneration Facility (2007).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Atriplex confertifolia	7.38	10.06	40	45.00
Atriplex gardneri	0.88	3.14	40	7.50
Gutierrezia sarothrae	0.38	1.73	40	5.00
FORBS				
Machaeranthera grindelioides	0.50	2.18	40	5.00
Sisymbrium altissimum	1.00	3.20	40	10.00
GRASSES				
Bromus tectorum	2.75	5.36	40	27.50
Elymus salinus	12.63	10.84	40	70.00
Elymus trachycaulus	1.13	5.18	40	7.50
Hilaria jamesii	1.38	5.24	40	10.00

TABLE 6: Woody species densities of the Atriplex/Grass Reference Area at the Sunnyside Cogeneration Facility (2007).

	NUMBER/ACRE
Atriplex canescens	6.17
Atriplex confertifolia	1181.28
Atriplex gardneri	15.42
Artemisia tridentata	3.08
Chrysothamnus nauseosus	27.76
Ephedra viridis	12.34
Gutierrezia sarothrae	86.36
Juniperus osteosperma	15.42
Pinus edulis	3.08
Sarcobatus vermiculatus	6.17
TOTAL	1357.08*

Sample Adequacy:
$\bar{x}$ = 1357.08*
s = 627.93
n = 120
nMIN = 58

TABLE 7: Statistical summary sheet for the reclaimed road and reference areas at the Sunnyside Cogeneration Facility (2007).

RECLAIMED ROAD			
Total Living Cover	$\bar{x}$=32.90	s=9.28	n=50
Density	$\bar{x}$=3314.14	s=1552.38	n=100
REFERENCE AREA			
Total Living Cover	$\bar{x}$=28.00	s=6.69	n=40
Density	$\bar{x}$=1357.08	s=629.93	n=120
STATISTICAL ANALYSES			
Total Living Cover	t=2.806	df=88	SL=p<.010
Density	t=12.624	df=218	SL=p<.001

$\bar{x}$= sample mean, s = sample standard deviation, n = sample size, NS = nonsignificant, t = Student's t-value, df = degrees of freedom, SL = significance level, p = probability level

FIGURES

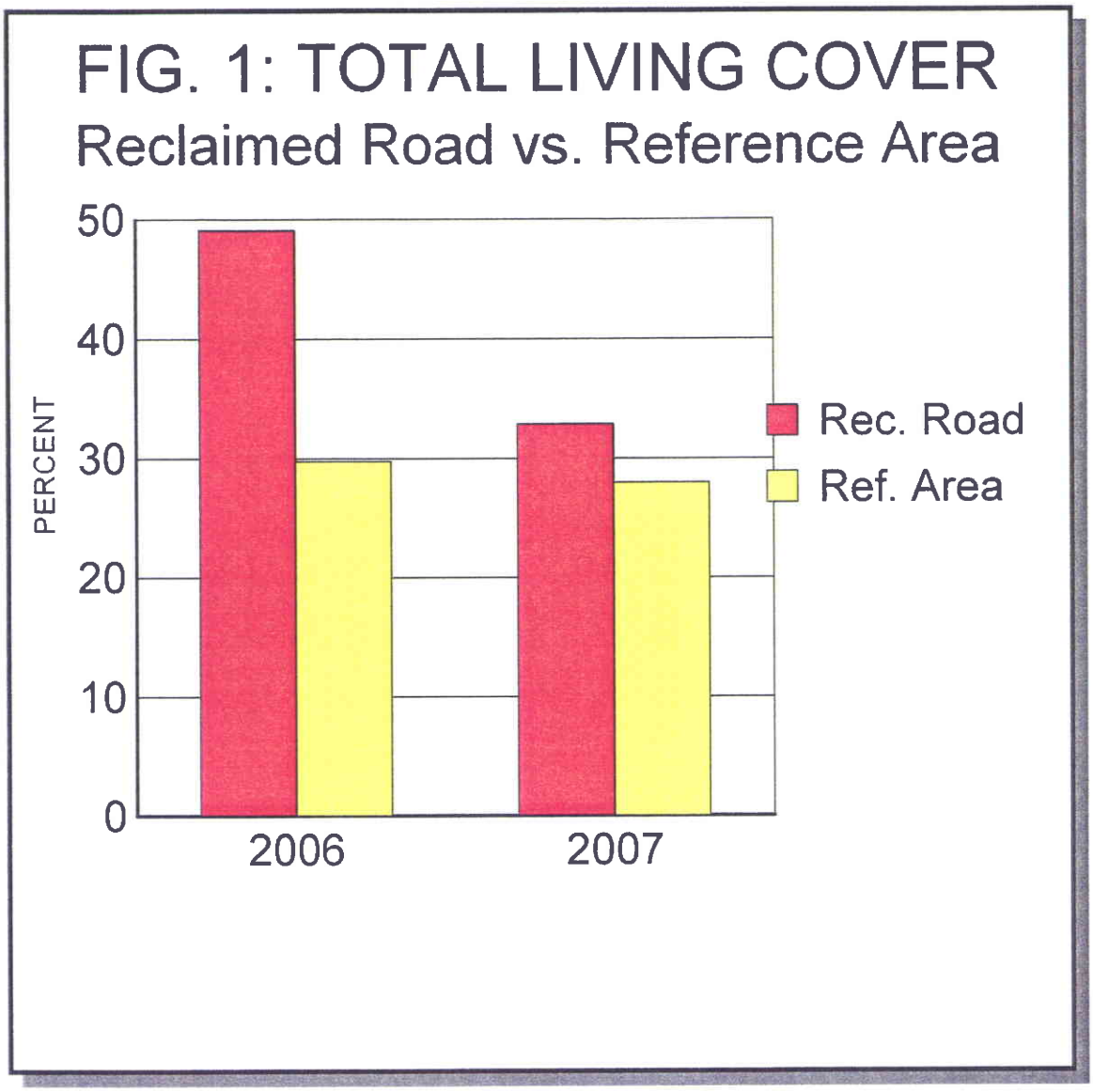


FIG. 1: TOTAL LIVING COVER
Reclaimed Road vs. Reference Area
PERCENT
50
40
30
20
10
0
2006
2007
Rec. Road
Ref. Area

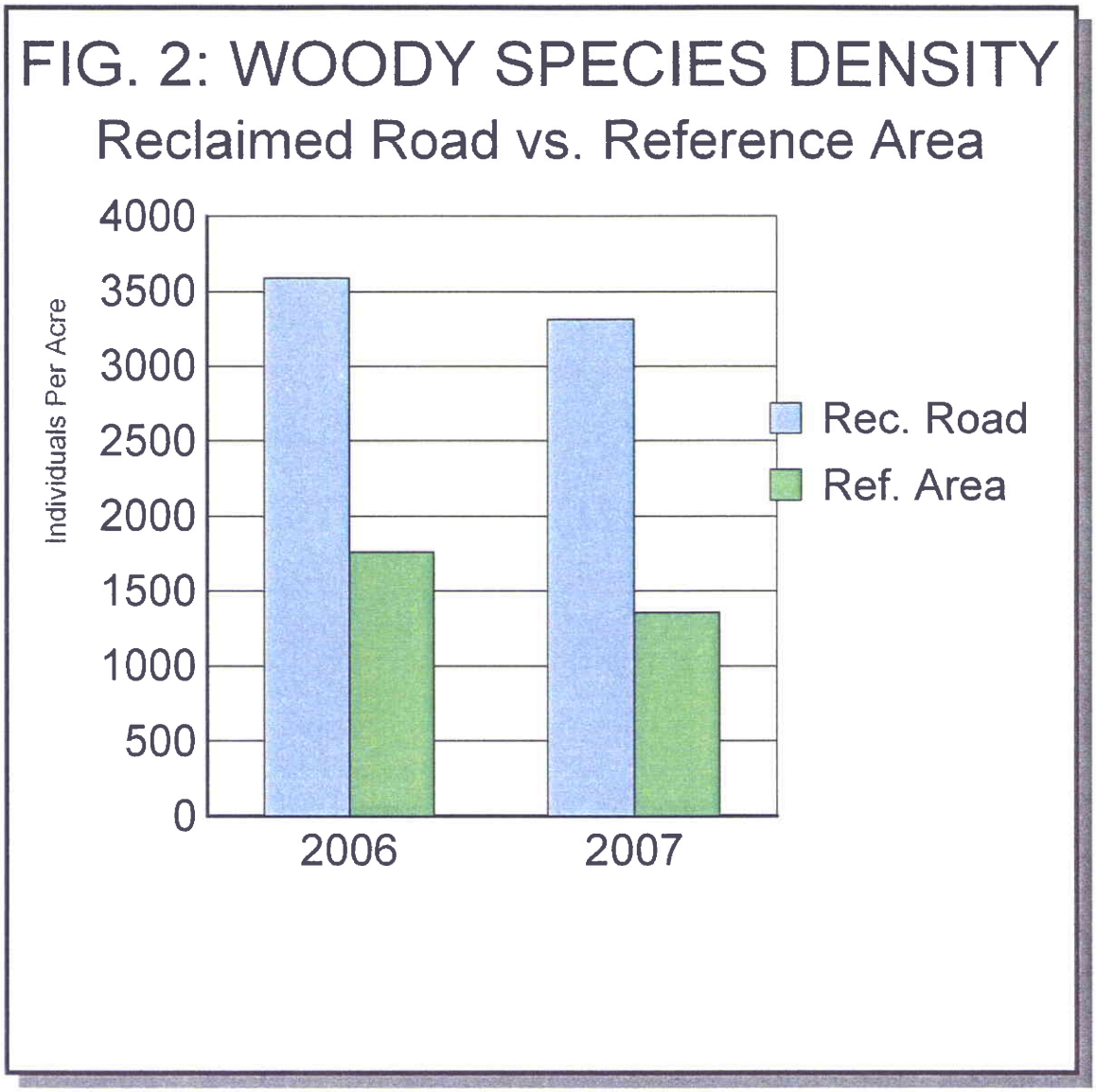


FIG. 2: WOODY SPECIES DENSITY
Reclaimed Road vs. Reference Area
Individuals Per Acre
4000
3500
3000
2500
2000
1500
1000
500
0
2006
2007
Rec. Road
Ref. Area

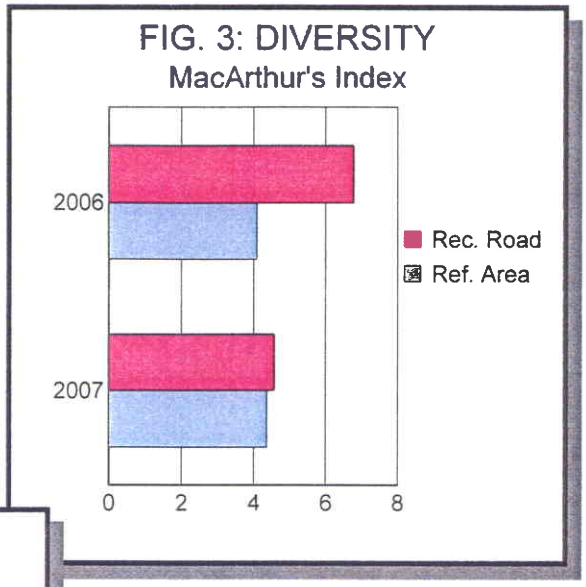


FIG. 3: DIVERSITY
MacArthur's Index
2006
2007
0
2
4
6
8
Rec. Road
Ref. Area

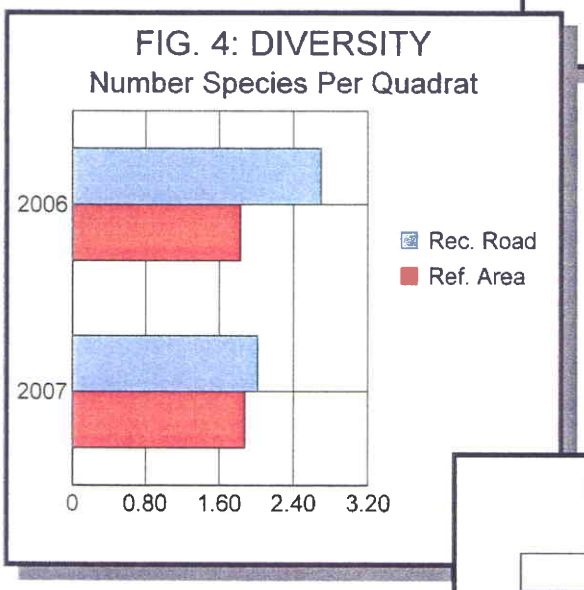


FIG. 4: DIVERSITY
Number Species Per Quadrat
2006
2007
0
0.80
1.60
2.40
3.20
Rec. Road
Ref. Area

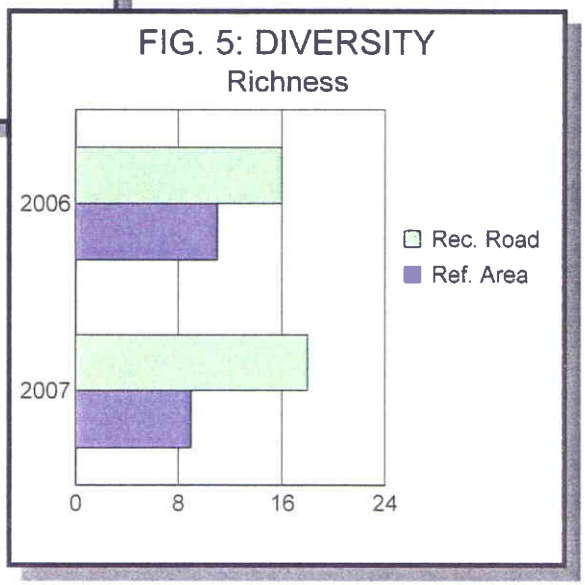


FIG. 5: DIVERSITY
Richness
2006
2007
0
8
16
24
Rec. Road
Ref. Area

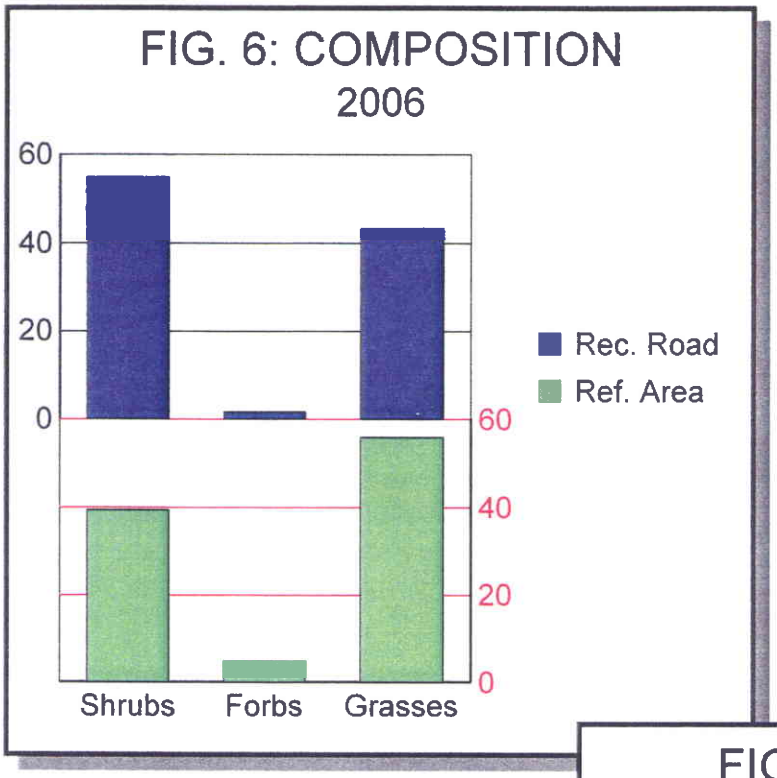


FIG. 6: COMPOSITION
2006
60
40
20
0
60
40
20
0
Rec. Road
Ref. Area
Shrubs
Forbs
Grasses

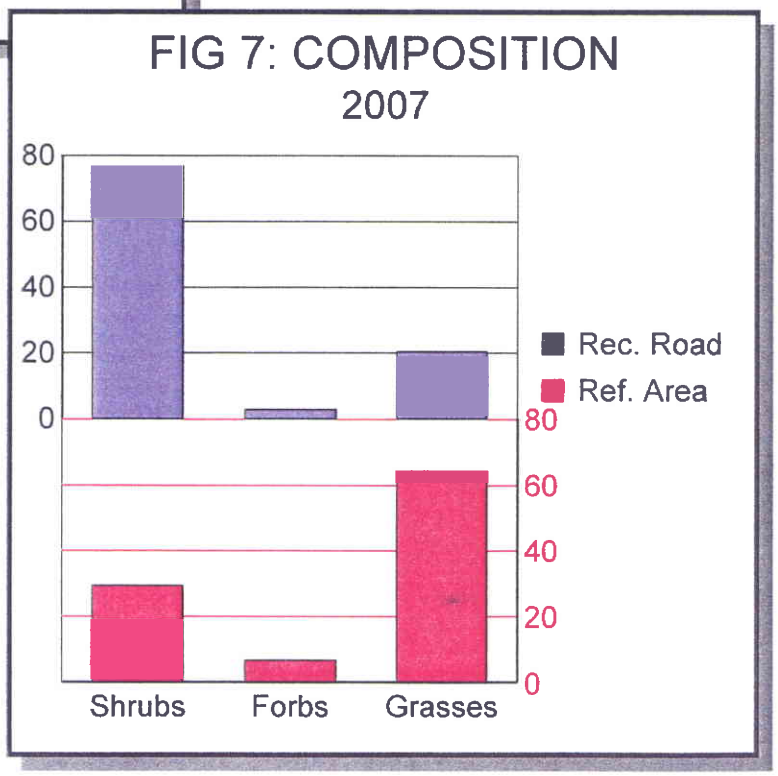


FIG 7: COMPOSITION
2007
80
60
40
20
0
80
60
40
20
0
Rec. Road
Ref. Area
Shrubs
Forbs
Grasses

COLOR PHOTOGRAPHS OF THE SAMPLE AREAS

RECLAIMED OLD COARSE REFUSE ROAD

ATRIPLEX/GRASS REFERENCE AREA

APPENDIX

(Raw Data)

SUNNYSIDE

Reclaimed Road

Exposure: Variable

Slope: Variable

Sample Date: 13-15 Aug 2007	1.00	2.00	3.00	4.00	5.00	6.00	7.00
SHRUBS							
Atriplex canescens	0.00	0.00	50.00	25.00	0.00	30.00	30.00
Atriplex confertifolia	25.00	15.00	0.00	0.00	0.00	0.00	0.00
Atriplex corrugata	0.00	0.00	0.00	0.00	20.00	0.00	0.00
Atriplex gardneri	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ceratoides lanata	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutierrezia sarothrae	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS							
Machaeranthera grindelioides	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
Salsola tragus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sisymbrium altissimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES							
Bromus tectorum	5.00	10.00	0.00	0.00	0.00	0.00	0.00
Elymus lanceolata	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus salinus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus smithii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus spicatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus trachycaulus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hilaria jamesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stipa comata	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER							
Total Living Cover	30.00	25.00	50.00	25.00	20.00	30.00	30.00
Litter	20.00	10.00	25.00	10.00	10.00	25.00	10.00
Bareground	30.00	25.00	20.00	10.00	25.00	35.00	25.00
Rock	20.00	40.00	5.00	55.00	45.00	10.00	35.00
% COMPOSITION							
Shrubs	83.33	60.00	100.00	100.00	100.00	100.00	100.00
Forbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grasses	16.67	40.00	0.00	0.00	0.00	0.00	0.00

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
45.00	40.00	0.00	35.00	15.00	20.00	15.00	45.00	25.00	25.00
0.00	0.00	5.00	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	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	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	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	10.00	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	0.00	0.00	0.00	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	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	0.00
45.00	50.00	25.00	35.00	20.00	40.00	20.00	55.00	30.00	30.00
25.00	25.00	10.00	25.00	20.00	10.00	10.00	10.00	25.00	20.00
20.00	10.00	10.00	20.00	20.00	10.00	25.00	25.00	35.00	30.00
10.00	15.00	55.00	20.00	40.00	40.00	45.00	10.00	10.00	20.00
100.00	80.00	40.00	100.00	100.00	100.00	100.00	81.82	83.33	83.33
0.00	0.00	60.00	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	18.18	16.67	16.67

18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00
35.00	10.00	15.00	10.00	15.00	25.00	20.00	30.00	20.00	10.00
0.00	10.00	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	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	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	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	5.00	5.00	10.00	5.00	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
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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	25.00	20.00	20.00	20.00	35.00	40.00	30.00	25.00	30.00
30.00	25.00	10.00	5.00	20.00	10.00	10.00	25.00	25.00	15.00
25.00	30.00	40.00	25.00	45.00	10.00	20.00	10.00	10.00	15.00
10.00	20.00	30.00	50.00	15.00	45.00	30.00	35.00	40.00	40.00
100.00	80.00	75.00	50.00	75.00	71.43	87.50	100.00	100.00	100.00
0.00	0.00	0.00	0.00	0.00	14.29	0.00	0.00	0.00	0.00
0.00	20.00	25.00	50.00	25.00	14.29	12.50	0.00	0.00	0.00

28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00
5.00	10.00	0.00	10.00	25.00	5.00	0.00	40.00	20.00	5.00
10.00	10.00	0.00	0.00	0.00	25.00	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	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	30.00	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	0.00	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	10.00	15.00	5.00	5.00	0.00	0.00	10.00	0.00
10.00	0.00	0.00	0.00	15.00	0.00	5.00	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	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	0.00	15.00	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	10.00	0.00
35.00	40.00	40.00	40.00	45.00	35.00	35.00	40.00	45.00	35.00
10.00	10.00	10.00	10.00	10.00	10.00	15.00	20.00	10.00	10.00
15.00	15.00	40.00	25.00	35.00	40.00	25.00	30.00	15.00	40.00
40.00	35.00	10.00	25.00	10.00	15.00	25.00	10.00	30.00	15.00
42.86	50.00	75.00	25.00	55.56	85.71	71.43	100.00	44.44	85.71
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
57.14	50.00	25.00	75.00	44.44	14.29	28.57	0.00	55.56	14.29

38.00	39.00	40.00	41.00	42.00	43.00	44.00	45.00	46.00	47.00
25.00	0.00	30.00	15.00	0.00	0.00	25.00	30.00	35.00	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	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	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	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
15.00	15.00	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	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	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	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
40.00	25.00	40.00	30.00	20.00	20.00	25.00	30.00	35.00	40.00
10.00	20.00	10.00	10.00	10.00	10.00	20.00	25.00	25.00	30.00
15.00	20.00	10.00	15.00	25.00	10.00	20.00	20.00	30.00	20.00
35.00	35.00	40.00	45.00	45.00	60.00	35.00	25.00	10.00	10.00
62.50	0.00	75.00	50.00	0.00	25.00	100.00	100.00	100.00	50.00
0.00	0.00	0.00	16.67	0.00	0.00	0.00	0.00	0.00	50.00
37.50	100.00	25.00	33.33	100.00	75.00	0.00	0.00	0.00	0.00

SUNNYSIDE
Reclaimed Road
Exposure: Variable
Slope: Variable
Sample Date: 13-15 Aug 2007

48.00	49.00	50.00	Mean	SDev	Freq	
						SHRUBS
40.00	20.00	30.00	19.60	13.92	82.00	*Atriplex canescens*
0.00	0.00	0.00	3.30	7.32	20.00	*Atriplex confertifolia*
0.00	0.00	15.00	1.10	3.78	10.00	*Atriplex corrugata*
0.00	0.00	0.00	0.40	2.20	4.00	*Atriplex gardneri*
0.00	0.00	0.00	1.00	4.69	6.00	*Ceratoides lanata*
0.00	0.00	0.00	0.10	0.70	2.00	*Gutierrezia sarothrae*
						FORBS
0.00	0.00	0.00	0.10	0.70	2.00	*Machaeranthera grindelioides*
0.00	0.00	0.00	0.10	0.70	2.00	*Penstemon palmeri*
0.00	0.00	0.00	0.30	2.10	2.00	*Salsola tragus*
0.00	0.00	0.00	0.40	2.80	2.00	*Sisymbrium altissimum*
						GRASSES
0.00	0.00	0.00	3.30	5.16	36.00	*Bromus tectorum,*
0.00	0.00	0.00	1.40	3.61	16.00	*Elymus lanceolata*
0.00	0.00	0.00	0.20	1.40	2.00	*Elymus salinus*
5.00	0.00	0.00	0.20	0.98	4.00	*Elymus smithii*
0.00	0.00	0.00	0.10	0.70	2.00	*Elymus spicatum*
0.00	0.00	0.00	0.20	1.40	2.00	*Elymus trachycaulus*
0.00	0.00	0.00	0.30	2.10	2.00	*Hilaria jamesii*
0.00	0.00	0.00	0.80	3.37	6.00	*Stipa comata*
						COVER
45.00	20.00	45.00	32.90	9.28		Total Living Cover
10.00	20.00	25.00	16.10	7.09		Litter
35.00	20.00	20.00	22.90	9.49		Bareground
10.00	40.00	10.00	28.10	15.00		Rock
						% COMPOSITION
88.89	100.00	100.00	76.76	26.82		Shrubs
0.00	0.00	0.00	2.82	11.12		Forbs
11.11	0.00	0.00	20.42	26.08		Grasses

SUNNYSIDE

Atriplex Reference Area

Exposure: Variable

Slope: Variable

Sample Date: 13-15 Aug 2007	1.00	2.00	3.00	4.00	5.00	6.00	7.00
SHRUBS							
Atriplex confertifolia	0.00	5.00	0.00	0.00	25.00	0.00	0.00
Atriplex gardneri	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutierrezia sarothrae	0.00	0.00	5.00	0.00	0.00	0.00	0.00
FORBS							
Machaeranthera grindelioides	0.00	0.00	0.00	10.00	0.00	10.00	0.00
Sisymbrium altissimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES							
Bromus tectorum,	5.00	0.00	0.00	0.00	5.00	0.00	0.00
Elymus salinus	25.00	0.00	0.00	10.00	0.00	10.00	25.00
Elymus trachycaulus	0.00	30.00	15.00	0.00	0.00	0.00	0.00
Hilaria jamesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER							
Total Living Cover	30.00	35.00	20.00	20.00	30.00	20.00	25.00
Litter	15.00	10.00	10.00	10.00	10.00	20.00	15.00
Bareground	10.00	10.00	15.00	15.00	10.00	15.00	20.00
Rock	45.00	45.00	55.00	55.00	50.00	45.00	40.00
% COMPOSITION							
Shrubs	0.00	14.29	25.00	0.00	83.33	0.00	0.00
Forbs	0.00	0.00	0.00	50.00	0.00	50.00	0.00
Grasses	100.00	85.71	75.00	50.00	16.67	50.00	100.00

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
0.00	10.00	10.00	0.00	15.00	0.00	0.00	0.00	30.00	15.00
0.00	0.00	0.00	0.00	0.00	10.00	10.00	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	15.00	0.00	0.00	0.00	0.00	10.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	10.00	0.00	10.00	0.00	0.00
25.00	0.00	20.00	25.00	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	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
25.00	25.00	30.00	25.00	25.00	20.00	25.00	30.00	30.00	25.00
10.00	25.00	10.00	20.00	20.00	15.00	25.00	10.00	25.00	10.00
20.00	20.00	20.00	25.00	20.00	10.00	20.00	25.00	20.00	10.00
45.00	30.00	40.00	30.00	35.00	55.00	30.00	35.00	25.00	55.00
0.00	40.00	33.33	0.00	60.00	50.00	40.00	50.00	100.00	60.00
0.00	60.00	0.00	0.00	0.00	0.00	40.00	16.67	0.00	0.00
100.00	0.00	66.67	100.00	40.00	50.00	20.00	33.33	0.00	40.00

18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00
15.00	5.00	10.00	0.00	30.00	10.00	0.00	0.00	10.00	15.00
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	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	5.00	10.00	0.00	0.00	0.00	0.00
10.00	10.00	15.00	5.00	5.00	10.00	20.00	35.00	25.00	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	15.00
35.00	15.00	25.00	20.00	40.00	30.00	20.00	35.00	35.00	40.00
25.00	25.00	25.00	20.00	10.00	10.00	25.00	20.00	20.00	10.00
20.00	20.00	10.00	10.00	10.00	25.00	15.00	15.00	20.00	10.00
20.00	40.00	40.00	50.00	40.00	35.00	40.00	30.00	25.00	40.00
71.43	33.33	40.00	0.00	75.00	33.33	0.00	0.00	28.57	37.50
0.00	0.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00
28.57	66.67	60.00	50.00	25.00	66.67	100.00	100.00	71.43	62.50

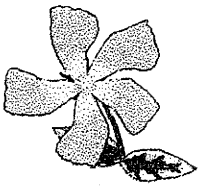
28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00
0.00	0.00	0.00	0.00	20.00	0.00	35.00	25.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	15.00
30.00	30.00	25.00	15.00	0.00	25.00	0.00	0.00	25.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30.00	35.00	25.00	15.00	30.00	25.00	35.00	25.00	25.00	25.00
25.00	25.00	25.00	15.00	20.00	10.00	25.00	25.00	25.00	30.00
10.00	20.00	10.00	15.00	20.00	30.00	20.00	30.00	20.00	10.00
35.00	20.00	40.00	55.00	30.00	35.00	20.00	20.00	30.00	35.00
0.00	0.00	0.00	0.00	66.67	0.00	100.00	100.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	100.00	100.00	100.00	33.33	100.00	0.00	0.00	100.00	100.00

SUNNYSIDE
Atriplex Reference Area
Exposure: Variable
Slope: Variable
Sample Date: 13-15 Aug 2007

38.00	39.00	40.00	Mean	SDev	Freq	
						SHRUBS
0.00	0.00	10.00	7.38	10.06	45.00	*Atriplex confertifolia*
0.00	0.00	0.00	0.88	3.14	7.50	*Atriplex gardneri*
0.00	0.00	0.00	0.38	1.73	5.00	*Gutierrezia sarothrae*
						FORBS
0.00	0.00	0.00	0.50	2.18	5.00	*Machaeranthera grindelioides*
0.00	0.00	0.00	1.00	3.20	10.00	*Sisymbrium altissimum*
						GRASSES
10.00	25.00	0.00	2.75	5.36	27.50	*Bromus tectorum,*
0.00	15.00	25.00	12.63	10.84	70.00	*Elymus salinus* ,
0.00	0.00	0.00	1.13	5.18	7.50	*Elymus trachycaulus*
30.00	0.00	0.00	1.38	5.24	10.00	*Hilaria jamesii*
						COVER
40.00	40.00	35.00	28.00	6.69		Total Living Cover
10.00	15.00	20.00	18.00	6.50		Litter
10.00	10.00	10.00	16.38	5.91		Bareground
40.00	35.00	35.00	37.63	10.06		Rock
						% COMPOSITION
0.00	0.00	28.57	29.26	32.43		Shrubs
0.00	0.00	0.00	6.67	16.73		Forbs
100.00	100.00	71.43	64.07	34.40		Grasses

VEGETATION MONITORING
FOR PHASE III BOND RELEASE: YEAR 1
AT THE
SUNNYSIDE COGENERATION FACILITY
2006

RECLAIMED OLD COARSE REFUSE ROAD
AND THE
ATRIPLEX/GRASS REFERENCE AREA



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SUNNYSIDE COGENERATION ASSOCIATES
#1 Power Plant Road
Sunnyside, Utah 84539

March 2007

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VEGETATION MONITORING
AT THE
SUNNYSIDE COGENERATION FACILITY
2006

INTRODUCTION

An old road has been reclaimed and seeded on the south end of the refuse pile at the Sunnyside Cogeneration Facility. To monitor the success of vegetation establishment, either quantitative or qualitative sampling of the revegetated road has been conducted during the growing seasons of 1996 through 2006. A reference area had been chosen at an earlier date to represent standards for revegetation success. This reference area was also sampled for comparisons during the same periods as the reclaimed road in some of those years.

The Reclaimed Old Coarse Refuse Road has been reclaimed long enough that the "Responsibility Period" has passed. This means that the time required for vegetation establishment on reclaimed land before an application for bond release can be initiated. Because of this the Sunnyside Cogeneration Facility could submit the application for Phase III Bond Release. Consequently, sampling in 2006 was conducted with this in mind. Because sample adequacy and statistical analyses meet the required levels, this data set can be used as "Year 1" of the two consecutive years of vegetation monitoring necessary to apply for bond release.

Like previous years this vegetation monitoring report provides a brief history of the reclamation in

this area. Sunnyside Cogeneration Associates reclaimed an existing road on the south side of an old coarse refuse pile in the summer and fall of 1994. The work entailed regrading the road and reshaping the cut-and-fill areas to approximate the contours of the surrounding slopes. A seed mixture of native plant species (or approved introduced) to the area was then planted. The plant species used in the reclamation seed mixture are shown below.

PLANT SPECIES SEEDED
SHRUBS Four-wing saltbush (*Atriplex canescens*) Shadscale (*Atriplex confertifolia*) Winterfat (*Ceratoides lanata*) Gardner saltbush (*Atriplex gardneri*)
FORBS Lewis Flax (*Linum lewisii*) Yellow sweetclover (*Melilotus officinalis*) Globemallow (*Sphaeralcea grossulariifolia*)
GRASSES Thickspike wheatgrass (*Elymus lanceolatus*) Western wheatgrass (*Elymus smithii*) Needle-and-thread (*Stipa comata*) Indian ricegrass (*Stipa hymenoides*) Squirreltail (*Sitanion hystrix*) Slender wheatgrass (*Elymus trachycaulus*)

METHODS

Sampling methods have remained consistent for all monitoring years. For this report, the reclaimed Old Coarse Refuse Road and Atriplex/Grass Reference Area were sampled on September 12-15, 2006. Transect lines for sampling were randomly placed for the length of the reclaimed road to adequately represent the area as a whole. From these transect lines, sample locations were chosen using random numbers at right angles to them.

Cover

Cover estimates were made using ocular methods with meter square quadrats. Species composition and frequencies were also assessed from the quadrat data. The frequency values were assessed for each plant species and stated as the relative proportion of the number of times a given species was present in the quadrats. Plant nomenclature follows "A Utah Flora" (Welsh et al. 2003).

Density

Density estimates of woody plant species for the reclaimed road and reference area were made using a distance method called the point-quarter. In this 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.

Sample Adequacy

Sample adequacy for cover and density was attempt with the goal that 90% of the samples were within 10% of the true mean for the plant communities in the area. The following formula was used:

$$nMIN = \frac{t^2 s^2}{(dx)^2}$$

where,

nMIN	= minimum adequate sample
t	= appropriate confidence t-value
s	= standard deviation
x	= sample mean
d	= desired change from mean

Diversity

Three diversity indices have been reported in this document for the reclaimed area and the reference area. To begin, **MacArthur's Diversity Index** was calculated. This index is an effective diversity measurement and is computed using the equation $1/\sum pi^2$ (MacArthur and Wilson 1976, *The Theory of Island Biogeography,* Princeton: Princeton University Press). In this equation *pi* is the proportion of sum frequency contributed by the *i*th species in the sample area of concern. The proportional contribution of each species is then squared and the values for all species in the sample areas are summed. This index integrates the number of species and the degree to which frequency of occurrence was equitably distributed among those species. In other words, this index provides greater weight to those species that are present more often (with greater frequency) than those that are merely "present" in one or two quadrats. The **average number of species** per sample quadrat is another measure of species diversity provided from the data in this report. Finally, the *total number of species present* in the sample quadrats, or "**richness**", was calculated for the sample areas.

Photographs

Color photographs were taken of the sample areas and are included in this report. All sample means, standard deviations, and raw data were also included in this report.

Raw Data

The raw cover, composition, and frequency data have been summarized on spreadsheets and have been included in the Appendix.

RESULTS

Reclaimed Road

The total living cover of the reclaimed Old Coarse Refuse Road in 2006 was 49.10% (Table 1-A). Of the living cover, 54.84% of it was comprised of shrubs, 43.47% were grasses, and 1.69% were forbs (Table 1-B). The dominant plant species in the total living cover (Table 2) were fourwing saltbush (*Atriplex canescens*), cheatgrass (*Bromus tectorum*), western wheatgrass (*Elymus smithii*), shadscale (*Atriplex confertifolia*), and winterfat (*Ceratoides lanata*).

The total woody species density for the reclaimed road was estimated at 3,592 plants per acre (Table 3). The most common shrubs in this measurement were fourwing saltbush, shadscale,

winterfat, and mat saltbush (*Atriplex corrugata*).

Reference Area

The total living cover for the Atriplex/Grass reference area was 29.75% (Table 4-A). Grasses dominated the living cover in the reference area comprising 55.90%; shrubs comprised 39.34%, and forbs 4.71% (Table 4-B). The dominant plants by cover and frequency for the reference area were shadscale, Salina wildrye (*Elymus salinus*), and cheatgrass (Table 5).

The total woody species density for the area was estimated at 1,761 plants per acre (Table 6) and was dominated by shadscale by a wide margin and followed by broom snakeweed (*Gutierrezia sarothrae*).

Comparisons Between Areas

Statistical analyses using Student's t-tests were employed to compare the total living cover and woody species density of the reclaimed road with the reference area. This comparison analysis is often used when submitting an application for Phase III Bond Release. For total living cover and woody species density, Student's t-tests suggested that the reclaimed road was significantly greater than the reference area (Table 7). Diversity indices of the reclaimed road were also compared with the reference area and have been discussed below.

DISCUSSION & SUMMARY

According to the results of sampling the vegetation in 2006, the reclaimed refuse road at the Sunnyside Cogeneration Facility could soon be considered for final (or Phase III) bond release. The results herein could be considered for **Year 1** of the two consecutive years required for the application to the State of Utah, Division of Oil, Gas & Mining (DOGM) for the bond release.

In summary, sample adequacy required for final bond release (90% ± 0.10) was achieved in all sample areas. As such, the reclaimed road had a total living cover and woody species density that were significantly greater than the reference area which was chosen to represent final revegetation success standards. Additionally, diversity indices were compared between the two areas. McArthur's Index suggested the reclaimed road had greater species diversity than the reference area (Fig. 1-A). The average number of species per quadrat, another diversity measurement, was also greater in the reclaimed road than the reference area (Fig. 1-B). Finally, species richness, or the total number of species encountered in the sample quadrats of each area, was also greater for the reclaimed road (Fig. 1-C).

FIG. 1. Diversity in the Sunnyside Cogeneration Area (2006).

A.
MacArthur's Index ($1/\sum p_i^2$) =
Reclaimed Road: 6.778
Reference Area: 4.090

B.
Average No. Species/Quadrat =
Reclaimed Road: 2.70
Reference Area: 1.83

C.
Richness =
Reclaimed Road: 16.0
Reference Area: 11.0

Year 1 sampling results for total living cover, woody species density, and diversity all suggest that the reclaimed road has established an adequate plant community to be considered for final bond

release. Vegetation sampling for Year 2, for the second of the two consecutive years required for final bond release, should be accomplished in the growing season of 2007.

TABLE 1: Total cover and composition summary for the reclaimed Old Coarse Refuse Road at the Sunnyside Cogeneration Facility (2006).

A. TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	49.10*	13.44	50
Litter	10.70	4.90	50
Bareground	18.80	7.65	50
Rock	21.40	13.49	50
B. COMPOSITION			
Shrubs	54.84	28.31	50
Forbs	1.69	5.80	50
Grasses	43.47	28.81	50

Sample Adequacy:
$\bar{x}$ = 49.10*
s = 13.44
n = 50
nMIN = 20

TABLE 2: Species cover and frequency summary for the reclaimed Old Coarse Refuse Road at the Sunnyside Cogeneration Facility (2006).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Atriplex canescens	15.50	17.70	50	60.00
Atriplex confertifolia	3.90	8.44	50	20.00
Atriplex corrugata	2.00	7.68	50	12.00
Atriplex gardneri	1.70	6.75	50	8.00
Ceratoides lanata	3.50	10.92	50	14.00
Chrysothamnus nauseosus	1.30	6.39	50	2.00
FORBS				
Machaeranthera grindelioides	0.30	1.19	50	6.00
Salsola pestifer	0.20	1.40	50	2.00
Sisymbrium altissimum	0.20	1.40	50	2.00
GRASSES				
Agropyron cristatum	0.30	2.10	50	2.00
Bromus tectorum	8.60	7.49	50	68.00
Elymus lanceolatus	2.80	5.21	50	28.00
Elymus salinus	0.20	0.98	50	4.00
Elymus smithii	5.50	12.34	50	26.00
Hilaria jamesii	0.20	1.40	50	2.00
Stipa hymenoides	2.90	8.31	50	14.00

TABLE 3: Woody species densities of the reclaimed Old Coarse Refuse Road at the Sunnyside Cogeneration Facility (2006).

	NUMBER/ACRE
Atriplex canescens	1930.66
Atriplex confertifolia	754.30
Atriplex corrugata	296.33
Atriplex gardneri	125.72
Ceratoides lanata	296.33
Chrysothamnus nauseosus	116.74
Gutierrezia sarothrae	71.84
TOTAL	3591.92*

Sample Adequacy:
$\bar{x}$ = 3591.92*
s = 1627.14
n = 100
nMIN = 56

TABLE 4: Total cover and composition summary for the Atriplex/Grass Reference Area at the Sunnyside Cogeneration Facility (2006).

A. TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	29.75*	9.93	40
Litter	12.80	6.67	40
Bareground	14.00	13.24	40
Rock	43.45	13.16	40
B. COMPOSITION			
Shrubs	39.34	35.84	40
Forbs	4.71	18.39	40
Grasses	55.90	37.85	40

Sample Adequacy:
$\bar{x}$ = 29.75*
s = 9.93
n = 40
nMIN = 30

TABLE 5: Species cover and frequency summary for the Atriplex/Grass Reference Area at the Sunnyside Cogeneration Facility (2006).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Atriplex confertifolia	10.75	12.38	40	57.50
Chrysothamnus nauseosus	0.50	3.12	40	2.50
Gutierrezia sarothrae	1.13	3.62	40	10.00
Juniperus osteosperma	0.13	0.78	40	2.50
FORBS				
Halogeton glomeratus	0.38	2.34	40	2.50
Malcomia africana	0.25	1.56	40	2.50
Sisymbrium altissimum	0.75	4.68	40	2.50
GRASSES				
Bromus tectorum	4.50	7.48	40	32.50
Elymus salinus	9.75	10.30	40	60.00
Hilaria jamesii	0.50	2.18	40	5.00
Stipa hymenoides	1.13	4.94	40	5.00

TABLE 6: Woody species densities of the Atriplex/Grass Reference Area at the Sunnyside Cogeneration Facility (2006).

	NUMBER/ACRE
Atriplex confertifolia	1520.80
Atriplex gardneri	8.00
Artemisia tridentata	12.01
Chrysothamnus nauseosus	32.02
Eriogonum corymbosum	4.00
Gutierrezia sarothrae	176.09
Juniperus osteosperma	8.00
TOTAL	1760.92*

Sample Adequacy:
$\bar{x}$ = 1760.92*
s = 1089.24
n = 110
nMIN = 104

TABLE 7: Statistical summary sheet for the reclaimed road and reference areas at the Sunnyside Cogeneration Facility (2005).

RECLAIMED ROAD			
Total Living Cover	$\bar{x}$=49.10	s=13.44	n=50
Density	$\bar{x}$=3591.92	s=1627.14	n=100
REFERENCE AREA			
Total Living Cover	$\bar{x}$=29.75	s=9.93	n=40
Density	$\bar{x}$=1760.92	s=1089.24	n=110
STATISTICAL ANALYSES			
Total Living Cover	t=7.594	df=88	SL=p<.001
Density	t=9.660	df=208	SL=p<.001

$\bar{x}$= sample mean, s = sample standard deviation, n = sample size, NS = nonsignificant, t = Student's t-value, df = degrees of freedom, SL = significance level, p = probability level

COLOR PHOTOGRAPHS OF THE SAMPLE AREAS

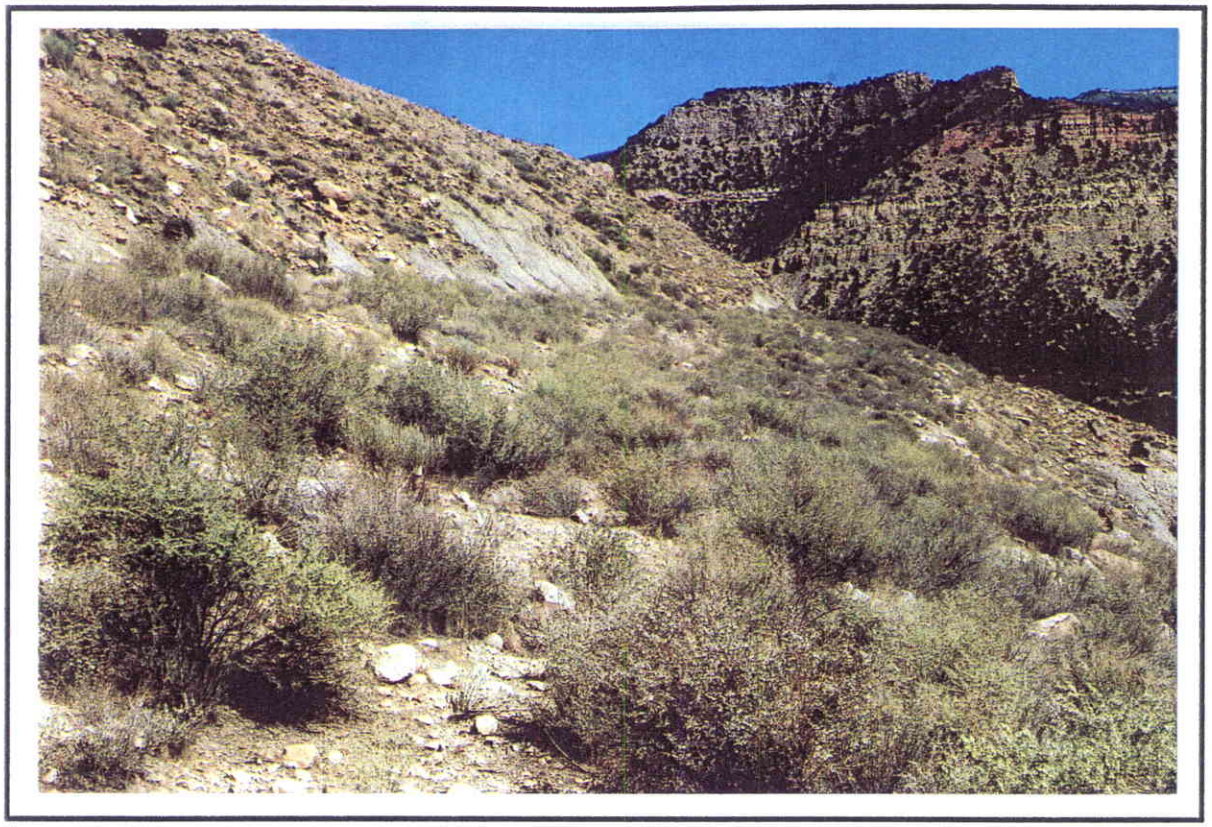

FIG 2: Reclaimed Road (1 of 2)

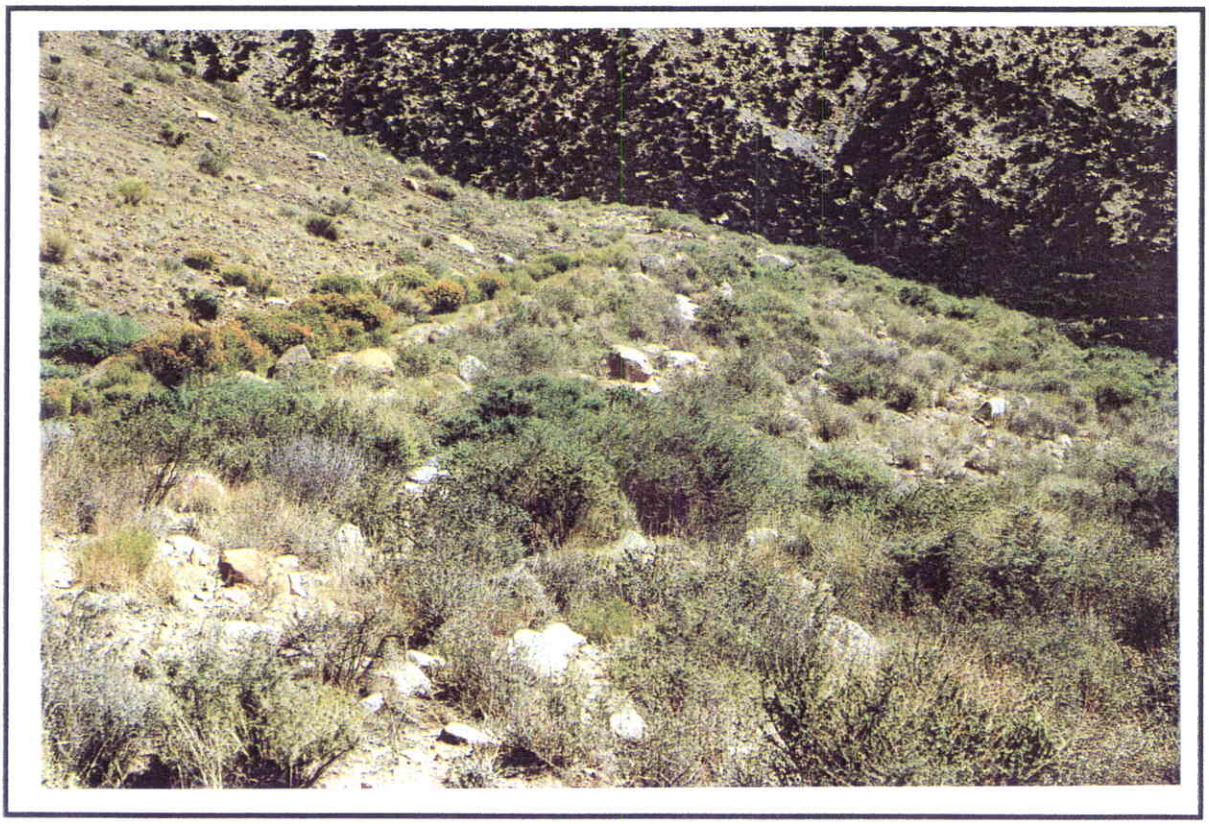

FIG 3: Reclaimed Road (2 of 2)

FIG 4: Reference Area (1 of 2)

FIG 5: Reference Area (2 of 2)

APPENDIX

(Raw Data)

SUNNYSIDE CO-GENERATION
Reclaimed Road
Exposure: Variable
Slope: Variable

Sample Date: 12 Sept 2006	1.00	2.00	3.00	4.00	5.00	6.00	7.00
TREES & SHRUBS							
Atriplex canescens	10.00	60.00	35.00	0.00	25.00	10.00	0.00
Atriplex confertifolia	20.00	0.00	0.00	0.00	0.00	0.00	20.00
Atriplex corrugata	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Atriplex gardneri	0.00	0.00	0.00	40.00	0.00	0.00	0.00
Ceratoides lanata	0.00	0.00	0.00	0.00	5.00	0.00	0.00
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS							
Machaeranthera grindelioides	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Salsola pestifer	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sisymbrium altissimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES							
Agropyron cristatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bromus tectorum	10.00	15.00	15.00	5.00	0.00	20.00	20.00
Elymus lanceolatus	0.00	0.00	0.00	0.00	5.00	15.00	0.00
Elymus salinas	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus smithii	0.00	0.00	0.00	0.00	5.00	0.00	0.00
Hilaria jamesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stipa hymenoides	0.00	0.00	0.00	0.00	0.00	5.00	0.00
COVER							
Total Living Cover	40.00	75.00	50.00	45.00	40.00	50.00	40.00
Litter	20.00	10.00	10.00	5.00	5.00	5.00	10.00
Bareground	15.00	5.00	30.00	30.00	35.00	25.00	35.00
Rock	25.00	10.00	10.00	20.00	20.00	20.00	15.00
% COMPOSITION							
Shrubs	75.00	80.00	70.00	88.89	75.00	20.00	50.00
Forbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grasses	25.00	20.00	30.00	11.11	25.00	80.00	50.00

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
15.00	40.00	45.00	5.00	5.00	0.00	10.00	30.00	0.00	35.00
0.00	0.00	0.00	0.00	20.00	25.00	0.00	0.00	35.00	0.00
0.00	0.00	0.00	0.00	0.00	10.00	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	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	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	0.00	0.00	0.00	0.00	0.00
20.00	15.00	20.00	5.00	5.00	0.00	0.00	10.00	15.00	10.00
0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00	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	55.00	30.00	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	20.00	0.00	0.00	0.00	0.00	0.00	0.00
35.00	55.00	65.00	30.00	30.00	50.00	65.00	70.00	55.00	65.00
25.00	20.00	10.00	10.00	10.00	20.00	10.00	20.00	10.00	10.00
20.00	10.00	15.00	10.00	30.00	20.00	15.00	5.00	25.00	15.00
20.00	15.00	10.00	50.00	30.00	10.00	10.00	5.00	10.00	10.00
42.86	72.73	69.23	16.67	83.33	70.00	15.38	42.86	63.64	61.54
0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	7.69
57.14	27.27	30.77	83.33	16.67	20.00	84.62	57.14	36.36	30.77

18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00
0.00	45.00	50.00	0.00	0.00	10.00	25.00	0.00	0.00	30.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	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	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	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	15.00	15.00	5.00	0.00	30.00	0.00	0.00	0.00	20.00
0.00	0.00	0.00	10.00	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	5.00	0.00	10.00	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	0.00	0.00	0.00	0.00	5.00	0.00	30.00	30.00	0.00
65.00	65.00	65.00	40.00	40.00	55.00	25.00	30.00	30.00	60.00
5.00	10.00	10.00	10.00	5.00	5.00	5.00	5.00	10.00	10.00
25.00	10.00	20.00	30.00	15.00	10.00	10.00	10.00	25.00	15.00
5.00	15.00	5.00	20.00	40.00	30.00	60.00	55.00	35.00	15.00
84.62	69.23	76.92	37.50	0.00	18.18	100.00	0.00	0.00	50.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.67
15.38	30.77	23.08	62.50	100.00	81.82	0.00	100.00	100.00	33.33

28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00
0.00	0.00	35.00	0.00	55.00	20.00	0.00	20.00	0.00	25.00
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	10.00	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
40.00	20.00	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	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	0.00	0.00	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	10.00	5.00	0.00	15.00	0.00	0.00
10.00	0.00	0.00	5.00	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	35.00	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	35.00	20.00
50.00	30.00	70.00	30.00	65.00	35.00	55.00	55.00	35.00	45.00
5.00	10.00	5.00	10.00	10.00	10.00	20.00	10.00	5.00	15.00
20.00	25.00	10.00	10.00	10.00	20.00	20.00	10.00	35.00	15.00
25.00	35.00	15.00	50.00	15.00	35.00	5.00	25.00	25.00	25.00
80.00	66.67	100.00	50.00	84.62	85.71	36.36	36.36	0.00	55.56
0.00	0.00	0.00	16.67	0.00	0.00	0.00	0.00	0.00	0.00
20.00	33.33	0.00	33.33	15.38	14.29	63.64	63.64	100.00	44.44

38.00	39.00	40.00	41.00	42.00	43.00	44.00	45.00	46.00	47.00
40.00	40.00	10.00	0.00	0.00	0.00	25.00	0.00	0.00	5.00
0.00	0.00	0.00	15.00	0.00	20.00	0.00	20.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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	60.00	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	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	15.00	0.00	0.00	0.00
10.00	10.00	10.00	0.00	0.00	15.00	15.00	0.00	15.00	0.00
10.00	0.00	20.00	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	5.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	25.00	0.00	5.00	0.00	35.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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	50.00	45.00	30.00	60.00	60.00	55.00	30.00	45.00	40.00
10.00	15.00	20.00	10.00	10.00	10.00	15.00	15.00	10.00	10.00
25.00	15.00	20.00	15.00	20.00	20.00	20.00	25.00	20.00	25.00
5.00	20.00	15.00	45.00	10.00	10.00	10.00	30.00	25.00	25.00
66.67	80.00	22.22	50.00	100.00	33.33	45.45	66.67	66.67	12.50
0.00	0.00	0.00	33.33	0.00	0.00	0.00	0.00	0.00	0.00
33.33	20.00	77.78	16.67	0.00	66.67	54.55	33.33	33.33	87.50

SUNNYSIDE CO-GENERATION
Reclaimed Road
Exposure: Variable
Slope: Variable
Sample Date: 12 Sept 2006

48.00	49.00	50.00	Mean	SDev	Freq	
						TREES & SHRUBS
10.00	0.00	5.00	15.50	17.70	60.00	*Atriplex canescens*
0.00	0.00	0.00	3.90	8.44	20.00	*Atriplex confertifolia*
0.00	0.00	0.00	2.00	7.68	12.00	*Atriplex corrugata*
10.00	25.00	10.00	1.70	6.75	8.00	*Atriplex gardneri*
10.00	0.00	0.00	3.50	10.92	14.00	*Ceratoides lanata*
0.00	30.00	0.00	1.30	6.39	2.00	*Chrysothamnus nauseosus*
						FORBS
0.00	0.00	0.00	0.30	1.19	6.00	*Machaeranthera grindelioides*
0.00	0.00	0.00	0.20	1.40	2.00	*Salsola pestifer*
0.00	0.00	0.00	0.20	1.40	2.00	*Sisymbrium altissimum*
						GRASSES
0.00	0.00	0.00	0.30	2.10	2.00	*Agropyron cristatum*
10.00	10.00	10.00	8.60	7.49	68.00	*Bromus tectorum*
10.00	0.00	20.00	2.80	5.21	28.00	*Elymus lanceolatus*
0.00	0.00	0.00	0.20	0.98	4.00	*Elymus salinas*
0.00	0.00	15.00	5.50	12.34	26.00	*Elymus smithii*
0.00	0.00	0.00	0.20	1.40	2.00	*Hilaria jamesii*
0.00	0.00	0.00	2.90	8.31	14.00	*Stipa hymenoides*
						COVER
50.00	65.00	60.00	49.10	13.44		Total Living Cover
10.00	10.00	5.00	10.70	4.90		Litter
20.00	15.00	15.00	18.80	7.65		Bareground
20.00	10.00	20.00	21.40	13.49		Rock
						% COMPOSITION
60.00	84.62	25.00	54.84	28.31		Shrubs
0.00	0.00	0.00	1.69	5.80		Forbs
40.00	15.38	75.00	43.47	28.81		Grasses

SUNNYSIDE CO-GENERATION
Atriplex Reference Area
Exposure: S & SE
Slope: 37 deg
Sample Date: 12 Sept 2006

	1.00	2.00	3.00	4.00	5.00	6.00	7.00
TREES & SHRUBS							
Atriplex confertifolia	20.00	20.00	0.00	0.00	15.00	0.00	30.00
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	20.00	0.00	0.00
Gutierrezia sarothrae	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Juniperus osteosperma	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS							
Halogeton glomeratus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Malcomia africana	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sisymbrium altissimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES							
Bromus tectorum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus salinas	10.00	0.00	25.00	0.00	0.00	25.00	10.00
Hilaria jamesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stipa hymenoides	0.00	0.00	0.00	25.00	0.00	0.00	0.00
COVER							
Total Living Cover	30.00	20.00	25.00	25.00	35.00	25.00	40.00
Litter	20.00	20.00	10.00	5.00	20.00	25.00	10.00
Bareground	5.00	20.00	5.00	5.00	5.00	5.00	25.00
Rock	45.00	40.00	60.00	65.00	40.00	45.00	25.00
% COMPOSITION							
Shrubs	66.67	100.00	0.00	0.00	100.00	0.00	75.00
Forbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grasses	33.33	0.00	100.00	100.00	0.00	100.00	25.00

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
10.00	20.00	10.00	15.00	10.00	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	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	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	10.00	5.00	15.00	0.00	0.00	25.00	25.00	25.00
0.00	0.00	5.00	0.00	0.00	15.00	15.00	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
20.00	20.00	25.00	25.00	25.00	15.00	15.00	50.00	25.00	30.00
35.00	10.00	10.00	15.00	10.00	10.00	10.00	5.00	10.00	10.00
10.00	10.00	40.00	10.00	10.00	25.00	20.00	10.00	10.00	10.00
35.00	60.00	25.00	50.00	55.00	50.00	55.00	35.00	55.00	50.00
50.00	100.00	40.00	80.00	40.00	0.00	0.00	50.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	0.00	60.00	20.00	60.00	100.00	100.00	50.00	100.00	100.00

18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00
60.00	10.00	0.00	15.00	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	10.00	5.00	15.00	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	30.00	0.00	0.00	0.00	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	25.00	0.00	10.00	20.00	0.00	30.00	15.00	15.00	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	0.00	0.00	0.00	0.00	0.00	0.00
60.00	35.00	30.00	35.00	25.00	15.00	45.00	40.00	25.00	20.00
5.00	10.00	40.00	10.00	5.00	2.00	5.00	25.00	10.00	10.00
5.00	5.00	5.00	5.00	5.00	70.00	25.00	10.00	5.00	5.00
30.00	50.00	25.00	50.00	65.00	13.00	25.00	25.00	60.00	65.00
100.00	28.57	0.00	71.43	20.00	100.00	33.33	62.50	0.00	0.00
0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	71.43	0.00	28.57	80.00	0.00	66.67	37.50	100.00	100.00

28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00
0.00	15.00	10.00	30.00	15.00	0.00	10.00	10.00	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	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	10.00	15.00	0.00	0.00	0.00	0.00	10.00
0.00	10.00	10.00	0.00	10.00	20.00	0.00	10.00	10.00	25.00
0.00	10.00	10.00	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
20.00	35.00	40.00	40.00	40.00	20.00	25.00	20.00	35.00	35.00
10.00	15.00	20.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
10.00	5.00	10.00	10.00	10.00	45.00	20.00	35.00	10.00	10.00
60.00	45.00	30.00	40.00	40.00	25.00	45.00	35.00	45.00	45.00
0.00	42.86	25.00	75.00	37.50	0.00	40.00	50.00	42.86	0.00
0.00	0.00	0.00	0.00	0.00	0.00	60.00	0.00	28.57	0.00
100.00	57.14	75.00	25.00	62.50	100.00	0.00	50.00	28.57	100.00

SUNNYSIDE CO-GENERATION
Atriplex Reference Area
Exposure: S & SE
Slope: 37 deg
Sample Date: 12 Sept 2006

38.00	39.00	40.00	Mean	SDev	Freq	
						TREES & SHRUBS
25.00	0.00	15.00	10.75	12.38	57.50	*Atriplex confertifolia*
0.00	0.00	0.00	0.50	3.12	2.50	*Chrysothamnus nauseosus*
0.00	0.00	0.00	1.13	3.62	10.00	*Gutierrezia sarothrae*
0.00	0.00	0.00	0.13	0.78	2.50	*Juniperus osteosperma*
						FORBS
0.00	0.00	0.00	0.38	2.34	2.50	*Halogeton glomeratus*
0.00	0.00	0.00	0.25	1.56	2.50	*Malcomia africana*
0.00	0.00	0.00	0.75	4.68	2.50	*Sisymbrium altissimum*
						GRASSES
0.00	0.00	10.00	4.50	7.48	32.50	*Bromus tectorum*
0.00	40.00	10.00	9.75	10.30	60.00	*Elymus salinas*
0.00	0.00	0.00	0.50	2.18	5.00	*Hilaria jamesii*
0.00	0.00	0.00	1.13	4.94	5.00	*Stipa hymenoides*
						COVER
25.00	40.00	35.00	29.75	9.93		Total Living Cover
10.00	15.00	15.00	12.80	7.67		Litter
10.00	10.00	10.00	14.00	13.24		Bareground
55.00	35.00	40.00	43.45	13.16		Rock
						% COMPOSITION
100.00	0.00	42.86	39.34	35.84		Shrubs
0.00	0.00	0.00	4.71	18.39		Forbs
0.00	100.00	57.14	55.95	37.85		Grasses

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FINAL RECLAMATION PLAN

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CHAPTER TEN

10.1 INTRODUCTION

After removal of the coarse refuse and slurry material is completed, SCA will notify DOGM of the cessation of operation and commence final reclamation of the remaining disturbed areas. A conceptual surface configuration is provided in Plate 10-1. The scenario proposed for final reclamation represents complete removal of the refuse material of acceptable fuel quality and disposal of lesser grade coal mine wastes. The estimated bond calculations are based on a proposed worst case scenario which would not necessarily reflect conditions proposed in the final reclamation plan.

Borrow material is proposed to be placed over portions of the disturbed area in approximate depths corresponding to the representation in Plate 10-6. Evidence was not found in the program to characterize the refuse pile which indicated significant quantities of precipitate materials under the refuse as previously suspected by the Division. Contaminated underlying soil materials were also not found (see Appendix 6-7). Large quantities of material are not anticipated to require disposal at intermediate stages of operation nor following extraction of combustible fuel materials. Disposal of excess spoil and coal mine waste is expected to occur throughout the mining operation.

The methods and schedule for the reclamation of the remaining facilities are described in this chapter.

10.2 PROPOSED POST-MINING LAND USE

The planned post-mining land use will be for wildlife habitat. The use of the land, following reclamation, for any non-industrial or commercial purpose more intensive than for wildlife habitat, is not justified. Sufficient land for significant cropland development does not exist; nor is there sufficient water for irrigation.

The reclamation as described in this chapter is designed to achieve post-mining land use. Further discussion of post-mining land use is presented in Chapter Four, Land Use and Air Quality.

10.3 SCHEDULE AND TIMING

When the decision is made to permanently cease operations, SCA will notify DOGM and commence implementation of the remaining portions of the reclamation plan as indicated in Figure 10-1. SCA intends to perform reclamation activities as contemporaneously as possible. SCA has already completed final reclamation of some areas within the permit area, such as the Old Coarse Refuse Road. Some disturbed areas of the SCA Permit Site may be reclaimed prior to SCA's permanently ceasing operations if that area is determined by SCA to no longer be needed for current or future operations on the site. A projection of the reclamation phasing schedule is provided in Plate 10-3. SCA has considered certain areas for earlier reclamation (areas adjacent to the Clearwater pond, east of the slurry ponds, and other areas where only a small veneer of refuse or waste material covers the site) as suggested by DOGM. However each area considered has operational or contractual constraints which prohibit reclamation at this time. There are no additional areas, which are currently planned or proposed to be reclaimed within the current permit term. If areas become available for final reclamation

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which are not currently anticipated, DOGM will be notified of SCA's intent to perform final reclamation prior to commencement of the work.

10.4 EXCAVATION OF COAL MATERIALS

The nature of SCA's operations is the excavation and removal of coal mine waste disposed of throughout decades of mining operations in the Sunnyside Coal Mine. Final reclamation of disturbed areas within the SCA permit area may include removal of coal mine waste and scarifying the native soil for revegetation instead of covering with four feet of borrow material. This will be determined as needed to effectively meet the planned post-mining land use. A projection of the grading plan is provided in Plate 10-4.

10.4.1 Old Coarse Refuse Road Reclamation

The south part of the Old Coarse Refuse Road is no longer needed for operations or for access to areas of the SCA permit site. It was reclaimed in accordance with the regulations for final reclamation as shown on plates 10-2A, 10-2B, & 10-2C.

Construction activities associated with final reclamation of the Old Coarse Refuse Road included excavation of the potentially acid-forming material from the berm and outer slopes of the roadway. This material was placed and graded on the inside cut of the reclaimed road. Acid-forming materials were compacted in 12-inch lifts by wheel-rolling and the top of the fill was graded to a minimum 2% side slope.

The outer slope was scarified to a minimum depth of six inches to reduce the potential slippage of the distributed material and to promote root penetration. The outer slope has small depressions and a roughly-graded surface to minimize erosion and assist revegetation.

Reclamation work was completed in 1994. SCA monitored revegetation success and requested final phase 3 bond release in 2010.

10.5 BACKFILLING AND GRADING

Generally, final reclamation will be accomplished as outlined below. Detailed information for specific sites is discussed following the general specifications. Plate 10-6 identifies the borrow material cover that may be needed for each part of the disturbed area.

- Any areas that remain covered with coarse refuse or other coal mine waste which is determined to be potentially acid- or toxic forming will be covered with four (4) feet of borrow material and the area revegetated.

- At the time of final revegetation, the outer surface of the Excess Spoil Disposal Areas (shown in Plates 9-1B and 9-8B) will have at least eighteen (18) inches of suitable plant growth material and be revegetated. Materials which have been placed in the Excess Spoil Disposal Areas that were determined to be potentially acid- or toxic-forming will be covered with a minimum of four feet of

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non-acid/non-toxic forming material. Attempts will be made to place spoil that is suitable plant growth material on the final surface. If suitable spoil is not available then borrow material will be used to obtain the needed depth.

- At the time of final reclamation, areas which have had topsoil removed and stockpiled, will have the topsoil redistributed. These areas will be scarified to reduce potential slippage of the redistributed material and to assist revegetation.

- Other areas as shown on Plate 10-6 will be covered with up to eighteen (18) inches of borrow material or be cleaned and scarified. Sufficient samples shall be taken and analyzed of the existing soil types to demonstrate that the combined depth of borrow material and existing material is sufficient to provide suitable growth medium comparable to the natural conditions which existed prior to disturbance.

- The borrow material and topsoil are to be distributed by end-dumping. Minimal grading will be utilized to redistribute the dumped materials to sufficiently cover the reclaimed site. The borrow materials will be spread unevenly to create small depressions which will retain moisture, minimize erosion, create and enhance wildlife habitat, and assist revegetation.

- The reclamation borrow areas used during this final reclamation will be contoured during borrow material removal, left as a small depression and revegetated after required borrow material has been removed. A berm or diversion may be used to direct runoff from the undisturbed area around the disturbed borrow area.

10.5.1 Old Coarse Refuse Road Reclamation

Four feet of borrow material was placed over all areas of the reclaimed Old Coarse Refuse Road where potentially acid-forming material remain after excavation. Samples analyzed from the underlying material (where coal materials have been removed) were analyzed for their acid/toxic forming potential.

Borrow material was placed on the outer slope creating a layer of sufficient depth (minimum six inches) over the scarified soil to create conditions comparable to or better than the natural conditions which existed prior to disturbance and to assist revegetation of the atriplex/grass seed mixture.

Results of the soils analysis are included in Appendix 2-10. A statement of best available technology entitled, "Placement, Assessment, and Monitoring in Reclaimed Environments of Materials Containing Selenium: A Program for Wyoming Surface Coal Mines" is also included in Appendix 2-10.

These samples were taken prior to covering the slope with borrow material. Since the borrow material is good quality a composite sample taken after covering with borrow material is expected to be much better quality than these samples.

Based on these samples analyzed, the plan presented by SCA is adequate to justify the depth of borrow material cover less then eighteen (18) inches on the outer slopes of the Old Coarse Refuse Road.

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Borrow material was excavated from approved borrow areas within the SCA permit site. It was hauled to the reclamation area via existing roads which are adequate for this purpose. The borrow material was placed by end dumping and roughly graded sufficient to cover the acid-forming material with a four-foot depth. It was spread unevenly to create small depressions which retain moisture, minimize erosion, and assist revegetation as well as improving interim soil stabilization.

At the completion of borrow material excavation, leaving slopes of approximately 3H:1V, the borrow area was seeded with the approved interim seed mix. Additional borrow excavation is not expected during the next year.

All attempts were made to achieve the approximate original contour by matching into the upper and lower sides of the road cut as nearly as is possible within the constraints of a safe fill slope. The natural slope of the hill may be as steep as one horizontal to one vertical in some places. It was not necessarily prudent for this fill to be constructed with side slopes this steep.

The "Circular Failure Method" from Hoek & Bray, Rock Slope Engineering, was used to verify that the long term static safety factor of at least 1.3 will be achieved. The data used in this analysis was gathered by conservatively comparing information from the ACZ Soil Borrow Material Report (Appendix 2-9), the SCS Soil Survey for the Carbon Area, and soil tests performed by Huntington-Chen Northern and by Sergent, Hauskins, & Beckwith (SHB-AGRA). Data values to estimate the safety factors are as follows:

Saturated Slope Subjected to Heavy Surface Recharge (very conservative)

Cohesion c,	250 lb/ft^2
Density γ,	125 lb/ft^3
Friction angle φ,	37□
Maximum height of fill H,	20 ft
S	Factor of Safety = 1.7
S	Factor of Safety = 1.3

In order to maintain a safe slope, the acid-forming materials placed in the fill was compacted in one-foot lifts by wheel rolling, has an outer slope approximately two horizontal to one vertical, and does not exceed 15 feet high. As an additional precaution, the potentially acid-forming type materials were set back from the natural outer slope a minimum distance of five feet.

The borrow material follows a similar outer slope as the compacted acid-forming material but still has sufficient factor of safety if the outer slope is not steeper than one horizontal to one vertical and does not increase the height of the fill to a depth greater than 20 feet.

10.5.2 Roads and Permanent Structures

Some existing roads within the SCA permit area will be required to provide occasional access to other non-mining related entities in accordance with existing easements through the SCA property. The easements which require road access are those associated with maintenance of power lines which cross through the property (power lines are identified on Plates 5-1 and easements are identified on Plate 1-1). An easement or right of way also exists for the railroad towards the west side of the permit area and access may also be needed at some future time. The anticipated level of activity for these roads would be minimal.

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Portions of Roads A, B, E, J, Q, & R (as identified on Plates 5-2) are anticipated to be necessary for future access. The portions of these roads which will not be reclaimed are represented on Plates 10-3, 10-4, 10-6, and 10-7 by leaving these roadway sections uncolored, unshaded, or unhatched. All other roadways are planned for reclamation and are shown as such on the above named plates. Roads which are not reclaimed will be maintained in accordance with the requirements for permanent transportation facilities. Chapter Five and associated drawings discuss the design, operation and maintenance for all roadways. The approved post-mining land use as described in Chapter Four should not be adversely affected by retention of the five roadway sections mentioned above.

No other structures associated with the mining operation are anticipated to remain as permanent structures. If other structures which are not currently anticipated in this plan, become necessary to meet the post-mining land use, SCA will submit a permit amendment to DOGM to request the change.

10.5.3 Erosion Controls

SCA will perform reclamation work in accordance with the best available technology for minimizing erosion of soil materials to the extent possible. Vegetation is intended to be the major erosion control throughout the post mining period. Efforts will be made to establish vegetative cover in the most prudent manner possible. A description of designed revegetation techniques is included in Chapter 9. Designs are included for treatment of highly erodible areas and for addressing potential rills and gullies. Additional reference material with which those involved in supervising the reclamation work should be familiar include the following: the Soil Conservation Service Critical Planting recommendations, and Appendix C of the Division's "Vegetation Information Guidelines". They should also be familiar with other successful practices used at other reclamation sites in the State of Utah.

10.6 DRAINAGE CONTROL

This section presents the plan to be implemented during reclamation in order to control drainage from the site, including a discussion of the drainage plan and of the measures to be taken to control sediment.

10.6.1 Drainage Plan

Additional temporary controls during the reclamation work will include berms, straw bales and/or silt fences at the base of slopes that have been regraded. Runoff from the recontoured area will be directed to the existing berms and ditches and then to the existing sedimentation ponds. Plates 10-5 show the diversion ditches designed to carry surface runoff to the sediment ponds. The design criteria for the Hydrologic Plan is found in Appendix 10-1. Following adequate revegetation, minor modifications will be made in the drainage pattern as identified on Plates 10-5 as phase two diversions. The diversion ditches will all be constructed in phase one such that at the end of phase one only small areas will need to be affected to connect in the phase two diversions.

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The final channel which will remain in the canyon bottom will be comprised of channels designed in Appendix 10-1 and constructed in phase one (RC-FD1, RC-FD2, RC-FD3, CRT-FD3, CRT-FD4, and the CCRR natural drainage). The peak flows from each sub-watershed modeled for the 10 year - 6 hour phase one storms are greater than the peak flows modeled for the 100 year - 6 hour phase two storms because of the difference in vegetative cover.

The Division has determined that the design for this final channel be based on the 100 year - 6 hour storm. This would be associated with the conditions of higher vegetation cover which exist during phase two of the reclamation program and would therefore produce a lesser design flow. SCA has selected the design flows generated in the phase one conditions. A supplement to Appendix 10-1 was submitted to the Division on November 17, 1995 which included the modeling of the 100 year - 6 hour storm event.

This final reclamation design is based on the scenario that refuse materials would not exist in the canyon bottom under the final channel discussed above. The post mining land use is such that no loss of life or serious property damage would be expected from failure of these diversions due to storms exceeding the design flows. Erosion is a natural process in the environment of this area and efforts to provide additional hard armoring to the entire channel would not necessarily fit within the intent of the post mining land use. The current design specifies that riprap will be placed in these channels which are of concern. Large boulders encountered during excavation of borrow material could occasionally be placed in the channel bottom in locations which appear relatively stable, but specific information concerning location and construction of such permanent features will need to be investigated after the refuse pile is removed.

Rills and gullies, which form in areas that have been regraded and covered with borrow material, will be filled, regraded, or otherwise stabilized; borrow material will be placed; and the areas will be reseeded if they disrupt the approved post-mining land use or the establishment of the vegetative cover, or cause or contribute to a violation of water quality standards for receiving streams.

10.6.1.1 Old Coarse Refuse Road Reclamation

A diversion terrace (OCRR-D4) and culvert (OCRR-C2) was constructed and is shown on Plates 7-1B and 10-2C. This diversion will control runoff from the south bank of the East Slurry Cell and other areas not being reclaimed due to future plans to excavate the coal materials from the East Slurry Cell at a later date as indicated in the mining plan.

Silt fences were installed, before construction, along the toe of the acid-forming material on the outer slopes of the Old Coarse Refuse Road and along the outer slope of the diversion terrace OCRR-D4 to control the contribution of sediment to receiving streams. The existing aboveground culvert (RC-C1) was removed during reclamation of the Old Coarse Refuse Road and the area previously disturbed by the culvert was reclaimed and revegetated.

10.6.2 Sediment Control

During the final reclamation period, sediment production and water quality will be controlled with sedimentation ponds, as described in Chapter Seven, Hydrology and Appendix 10-1. These structures will remain in place until water quality standards are achieved. When water quality standards are achieved, these

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sedimentation ponds will be taken out of use. The ponds will be breached at the location of the emergency spillway and be recontoured. A silt fence will be installed at the area of the discharge point to control runoff until final water quality standards are achieved.

These ponds will generally retain their current size and configuration as described in the operational plan. The watersheds associated with each pond may change due to topographic changes following mining. Several ponds will have a decrease in watershed area whereas some will have an increase in area. The proposed reclamation watersheds are shown on Plates 10-5 and have been utilized in the modeling associated with Appendix 10-1. The modeling has demonstrated that in the ponds which incur discharge during the 10 year - 24 hour storm event, the peak concentration of settleable solids does not exceed the UPDES requirement of 0.5 ml/l. DOGM indicated concern for the treatment capacity of the Coarse Refuse Toe Pond, Railcut Pond, and Clearwater Pond. The model routing the 10 year 24 hour storm through these ponds projects detention times of 2.3 hours, 2.3 hours, and 15.6 hours. These long detention times should be adequate to demonstrate treatment of storm runoff. (See Appendix 10-1 Table Three for peak effluent concentrations and for detention times for each sediment pond.)

SCA is committed to maintaining and monitoring all sediment ponds and potential discharges in accordance with its UPDES permit. SCA will ensure that all possible efforts are made to minimize the potential for discharges that exceed the required limits. If it appears that maintenance efforts (such as pond clean out) are needed to stay within the required limits, SCA understands the obvious benefit of conducting maintenance prior to seasons in which larger storm events are more likely.

10.6.2.1 Old Coarse Refuse Road Reclamation

The diversion terrace (OCRR-D4) diverts runoff into the Old Coarse Refuse Sediment Pond to control sediment in accordance with Appendix 7-3. The silt fences were maintained throughout the construction activities and until the slopes became sufficiently stable to justify removal of the silt fence. Slopes steeper than 2:1 were treated with erosion control matting. Silt fences below areas treated with erosion control matting were not maintained and were removed when field conditions indicated that they are no longer of significant value. Surface roughening also helps control sediment.

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10.7 TOPSOIL AND BORROW MATERIAL HANDLING

Topsoil and borrow material handling during the final reclamation phase of the project will be performed as outlined in Chapter Two: Soils; and Chapter Nine: Mining Plan, Section 9.8. The borrow areas used during the Mining Plan phase will be extended and contoured to act as a catchment basin.

10.8 REVEGETATION

Revegetation of the areas recontoured during the final reclamation period will be performed as described in Chapter Nine, Mining Plan, Section 9.9. Plate 10-7 identifies the areas to be seeded according to the seeding schedules found in Figures 10-2, 10-3, and 10-4. Plate 10-7 also identifies the areas which are scheduled to receive pinyon or juniper tublings planted in addition to the specified seed mix.

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10.8.1 Old Coarse Refuse Road Reclamation

All areas from which acid-forming materials were excavated and all areas covered with borrow material during the reclamation process have been revegetated and have reached the objective of the post-mining land use. Revegetation success was monitored and compared with the Atriplex / Grass reference area identified in Plates 3-1 and 3-3.

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The Atriplex / Grass seed mix listed in Figure 10-2 was applied during November 1994. The application rate #PLS/acre was employed in accordance with the surface broadcasting method instead of drill seeding in this area. Shrubs were not planted in this application. The permittee incorporated an organic mulch (one ton per acre) into the top foot of borrow material cover during application and spreading. Barley or oat seed was not distributed for the purpose of additional interim soil protection until the mulch or matting is applied because it was too close to the seeding window and competition with the permanent seeding was not desired.

Fertilizers (16,16,8 at a rate of 210 lbs per acre) were evenly applied just prior to final seeding. Additional mulch (two tons wood fiber hydromulch or 1.5 tons straw mulch per acre) and tackifier was applied to slopes less steep than 2H:1V during seeding. Increased erosion control measures, consisting of excelsior type mats and/or fiber roving) were implemented for slopes steeper than 2H:1V.

If delays had caused the seeding to not be completed within the Fall seeding window, the area would have been seeded in the following Spring.

Quantitative and qualitative assessments of the revegetation during the years of operator responsiblity provided adequate demonstration that the standards for revegetation success were met.

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10.9 ENVIRONMENTAL MONITORING AND MAINTENANCE

Monitoring and maintenance for vegetation, erosion, structural stability and water quality concerns will be carried out as required through the post mining period until bond release. For additional details, see Appendix 7-8 and Chapter Nine, Sections 9.9.5, 9.9.6, & 9.11. Maps which show water monitoring locations are included in Chapter Seven. Vegetation reference areas are shown on maps associated with Chapter 3.

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