

C/015/0017
Task ID #4580

April 22, 2014

Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, Utah 84114-5801

Subj: Application for Phase II and Phase III Bond Release of the Des Bee Dove Mine Site, Remote Portal Areas, and Sediment Pond Area, PacifiCorp, Des Bee Dove Mine, C/015/0017, Emery County, Utah

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West"), as mine operator, hereby submits an application for Phase II and Phase III bond release of the Des Bee Dove mine site, remote portal areas, and sediment pond area. The said areas covered by the bond total approximately 40.9 acres and is located on the southern end of East Mountain as shown in Attachment 4. These areas have met the regulations of the R645 Utah Coal Rules in regards to both Phase II and III bond release (R645-301-880.310).

The information included with this application provides documentation as required by Directive Number: Tech-006 and the R645-301-800 Utah Coal Regulations. This information is included as Attachments 1 through 11 and as follows:

General Information for Bond Release

- Attachment 1: Notarized Signature
- Attachment 2: Draft Letters to Interested Parties
- Attachment 3: Draft Newspaper Advertisement
- Attachment 4: Legal Description and Site Map
- Attachment 5: Reclamation Treatments Utilized
- Attachment 6: Deer Creek Mine, 9th East Portal Site General History of Mining and Reclamation Activities
- Attachment 7: Current Total Bond Amount and Amount Requested for Release

Information for Phase II Bond Release

- Attachment 8: Vegetation Analysis for Last Two Years of Responsibility
- Attachment 9: Demonstration that Area is Not Contributing Suspended Solids Outside Permit Area

Information for Phase III Bond Release

- Attachment 10: Demonstration that Responsibility Period has been Met
- Attachment 11: Demonstration that Post Mining Land Use has been Achieved

When Phase III Bond Release procedures are complete and application approved, the Des Bee Dove mine permit volumes shall be retired. The required C1 form is included with this application. Additional information for this site can be reviewed in the applications for Phase I Bond Release of the Des Bee Dove Mine (2/7/2007), Remote Portals (9/17, 2009), Sediment Pond and Access Road (9/17/2009) If you have any questions or concerns regarding the enclosed information, please contact Dennis Oakley at 435-687-4825.

Sincerely,



Ken Fleck
Geology and Environmental Affairs Manager

Enclosures: C1 Form
Attachments 1 through 11

Cc: Scott Child w/o attachments (Interwest Mining Company)
DOGM, PFO w/attachments
file

APPLICATION FOR COAL PERMIT PROCESSING

Permit Change New Permit Renewal Exploration Bond Release Transfer

Permittee: PacifiCorp

Mine: Des Bee Dove Mine

Permit Number: C/015/0017

Title: Application for Phase II and Phase III Bond Release of the Des Bee Dove Mine Site, Remote Portals Areas, and Sediment Pond Area, PacifiCorp, Des Bee Dove Mine, C015/0017, Emery County, Utah

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

Phase II and Phase III Bond Release

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

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

Please attach four (4) review copies of the application. If the mine is on or adjacent to Forest Service land please submit five (5) 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.

Kenneth Fleck
Print Name

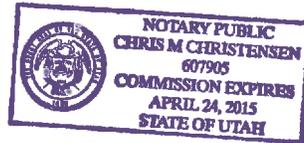
Kenneth S. Fleck
Sign Name, Position, Date

Manager of Environmental Affairs APRIL 18, 2014

Subscribed and sworn to before me this 18th day of April, 2014

Chris M. Christensen
Notary Public

My commission Expires: April 24, 2015
Attest: State of Utah } ss:
County of Emery



| | | |
|---|--|--|
| For Office Use Only: | Assigned Tracking Number: | Received by Oil, Gas & Mining |
|---|--|--|

**PacifiCorp
Energy West Mining Company
Des Bee Dove Mine
C/015/0017**

Phase II and III Bond Release on Approximately 40.9 Acres of Land Related to the Des Bee Dove Mine, Sediment Pond, and Remote Portals.

I hereby certify, to the best of my knowledge and belief, that all the information contained in this request is true and correct and that all applicable reclamation activities have been accomplished in accordance with the requirements of the Act, the regulatory program, and the approved reclamation plan.

Kenneth Fleck, Manager of Geology and Environmental Affairs

Print Name

Kenneth S. Fleck APRIL 18, 2014

Signature, Position, Date

Subscribed and sworn to before me this 18th day of April, 2014.

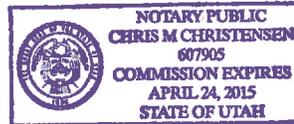
Chris M. Christensen

Notary Public

My Commission Expires: April 24, 2015

Attest: State of Utah

County of Emery



April XX, 2014

Jerry Kenczka, Field Office Manager
Bureau of Land Management
Price Field Office
125 South 600 West
Price, Utah 84501

Subject: Application for Phase II and III Bond Release for the Des Bee Dove Mine

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, has filed with the Division of Oil, Gas and Mining an application for Phase II and III Bond Release for 40.9 acres of the Des Bee Dove mine site, remote portals area, and the sediment pond and access road area.

As required by the State of Utah, R645-Coal Mining Rules (R645-301-880), all adjoining property owners, local governmental bodies, etc, are notified, informing them of the operator's intention to seek release from bond. You are receiving this notice because of your association with one of the groups mentioned above. A public notice was published in the Emery County Progress commencing on April XX, 2014 and will run for four (4) consecutive weeks.

The locations of the areas applied for bond release are as follows:

Mine Site –

NW¹/₄SW¹/₄, Section 25, T17S, R7E, SLB&M

E¹/₂SW¹/₄NE¹/₄, W¹/₂SE¹/₄NE¹/₄, NE¹/₄SE¹/₄, Section 26, T17S, R7E, SLB&M

Remote Portals –

SW¹/₄SW¹/₄, Section 13, T17S, R7E, SLB&M

SW¹/₄SE¹/₄, Section 14, T17S, R7E, SLB&M

Sediment Pond and Access Road -

SE¹/₄NE¹/₄, Section 35, T17S, R7E, SLB&M

NW¹/₄NW¹/₄, Section 36, T17S, R7E, SLB&M

The Des Bee Dove Mine consists of a long history of mining operation which began in the latter part of the 19th century. The LDS Church began mining operations in the canyon in 1938. In 1947, the LDS Church purchased other mining interests in the canyon and began a church welfare project supplying coal to the needy as well to their own church houses. The LDS Church continued operations until 1972 when the mining complex was sold to Utah Power & Light Company.

In 1987, PacifiCorp (predecessor to Utah Power & Light) temporarily idled the mine because of the lack of reserves. PacifiCorp attempted to sell the mining complex until 1997 when it submitted a Notice of Intent to Reclaim to the Utah Division of Oil, Gas, and Mining. In 1998, PacifiCorp received Phase III Bond Release for the haul road leading to the mine site. Once received, the road was transferred to Emery County and accepted into the Emery County roads system.

Incremental reclamation activities of the Des Bee Dove Mine began as early as November 1999 with the Pumphouse area located at the bottom of the main mine site. A back-hoe was utilized to remove facilities and regrade the area. The original area contained 1.62 acres. Phase I Bond Release was granted for this site in February 2007. Phase III Bond Release was granted for this site in April 2007.

The next site reclaimed consisted of the two remote portal breakout sites in Maple Gulch Canyon. One portal was broken out from inside the Bee Hive Mine, and one portal was broken out from the Deseret Mine. Total disturbance for each was approximately 0.01 acres. Reclamation activities utilized hand tools and helicopter transport of materials. Phase I Bond Release for these site was approved in September 2009.

In 2002, reclamation activities were accomplished on the upper Little Dove mine (west side of the canyon) and Bee Hive mine (east side of the canyon). Track-hoe and bull-dozer was used to backfill portals and highwalls and completely regrade the site. Total disturbance reclaimed was approximately 4.6 acres. Phase I Bond Release was approved in February 2007.

Immediately following the reclamation of the upper mine area, the lower mine or Deseret Mine commenced. Activities began early in 2003 and were completed in June of that same year. Various large earth-moving equipment were used to complete reclamation activities. A major drainage channel was constructed and all portals and slopes were backfilled and regraded and roads removed. A trail was built through the site which allows cattlemen and recreationists to pass through to access the areas of the southern end of East Mountain. Total disturbance reclaimed was approximately 22.4 acres. Phase I Bond Release for this area was approved in February 2007. Phase III Bond Release was approved for 0.9 acres near the Pumphouse area in April 2007.

The only remaining area to reclaim was the sediment pond and access road. Reclamation of this area was started in 2005 and completed in January 2006. The pond, dam, and associated appurtenances were removed, a drainage through the site was constructed, all slopes regraded, and the access road removed and regraded. Total disturbance reclaimed was approximately 13.9 acres. Phase I Bond Release was approved in September 2009.

All reclaimed sites were fertilized, mulched and seeded contemporaneously with the backfilling and regrading activities. The period of extended responsibility requirement (10 years) has been

met and the vegetation parameters identified in R645-301-356.200 has exceed the approved success standard during the growing seasons of the last two years of this responsibility period. Vegetation sampling for bond release for the mine site and sediment pond area was conducted during the fall of 2012 and 2013.

PacifiCorp currently maintains a \$511,000 surety bond payable to the Division of Oil, Gas, and Mining. A complete reduction of this surety is being requested for the release of the site. If you have any questions, or require further information pertaining this bond release application, please feel free to call me at (435) 687-4825 or Ken Fleck at 435-687-4712.

Sincerely,

Dennis Oakley
Sr. Mine Engineer

Cc Emery County Board of Commissioners
Emery County Planning and Zoning
Emery County Public Lands Council
Daron Olsen, Forest Supervisor, USFS, Region 4, Manti-LaSal National Forest
Roger Bankert, Minerals Support Supervisor, Bureau of Land Management
John Blake, Deputy Assistant Director, State Institutional Trust Lands Administration
Brad Westwood, Director, State Historic Preservation Office
Mark Stilson, Regional Engineer, Division of Water Rights
Alan Boehms, Manager, Office of Surface Mining
File

Notification List:

Emery County Commission , Commissioner Jeff Horrocks, Chairman, P.O. Box 629
Castle Dale, UT 84513

Emery County Planning and Zoning, Mike McCandless, Zoning Administrator, P.O. Box 629 Castle
Dale, UT 84513

Emery County Public Lands, Ray Peterson, Public Lands Administrator, P.O. Box 629 Castle Dale, UT
84513

State Institutional Trust Land Administration, John Blake, Deputy Assistant Director – Mineral, 675
East 500 South, Suite 500, SLC, UT 84102

Utah Division of Water Rights, Mark Stilson, Regional Manager, 319 North Carbonville Rd, Price, UT
84501

Division of State History, State Historic Preservation Office, Brad Westwood, Director, 300 S. Rio
Grande Street, Salt Lake City, Utah 84101

Bureau of Land Management, Roger Bankert, Minerals Support Supervisor, Utah State Office, 440
West 200 South, Suite 500. Salt Lake City, UT 84101-1345

Office of Surface Mining, Alan Boehms, Manager, Denver Field Branch, 1999 Broadway, Suite 3320,
Denver, CO 80202

United States Forest Service, Manti-LaSal National Forest, Darren Olsen, District Ranger, Ferron
Ranger District, 115 West Canyon Road, Ferron, UT 84523

Application for Phase II and III Bond Release
Des Bee Dove Mine
C/015/0017
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, has filed with the Division of Oil, Gas and Mining an application for Phase II and III Bond Release for 40.9 acres of the Des Bee Dove mine site.

All areas for bond release have met the regulations of the R645 Utah Coal Rules in regards to the vegetation standards for Phase II and responsibility period for III Bond Release (refer to R645-301-880.300). The entire mine site, remote portals area, and the sediment pond and access road area is proposed for release. The locations of the areas are as follows:

Mine Site – Reclamation completed 2003

NW¹/₄SW¹/₄, Section 25, T17S, R7E, SLB&M

E¹/₂SW¹/₄NE¹/₄, W¹/₂SE¹/₄NE¹/₄, NE¹/₄SE¹/₄, Section 26, T17S, R7E, SLB&M

Remote Portals – Reclamation completed 2000

SW¹/₄SW¹/₄, Section 13, T17S, R7E, SLB&M

SW¹/₄SE¹/₄, Section 14, T17S, R7E, SLB&M

Sediment Pond and Access Road – Reclamation completed 2006

SE¹/₄NE¹/₄, Section 35, T17S, R7E, SLB&M

NW¹/₄NW¹/₄, Section 36, T17S, R7E, SLB&M

Incremental reclamation of the noted areas above began in 1999. Reclamation of the sedimentation pond was completed in 2006.

Currently, a surety bond is filed with the Division of Oil, Gas and Mining in the amount of \$511,000.00 and is payable to the State of Utah, Division of Oil, Gas and Mining (DOG M), and the Office of Surface Mining Reclamation and Enforcement (OSM). A Renewed mining permit was issued by the State and became effective on August 29, 2010.

A copy of the Phase II and III application may be examined at the office of the Division of Oil, Gas and Mining, 1594 West North Temple, Suite 1210, Salt Lake City, Utah 84114-5801 and also at the Records Office located in the Emery County Courthouse in Castle Dale, Utah. Written comments, objections, or requests for an informal conference may be submitted to the Salt Lake City address. Said comments must be submitted thirty (30) days from the date of the last publication of this notice. This notice is being published to comply with the Surface Mining Control and Reclamation Act of 1977, and State and Federal regulations promulgated pursuant to said Act.

Published in the Emery County Progress for four consecutive weeks beginning April xx, 2014.

Des Bee Dove Mine Permit Boundary Description

T17S, R7E, SLB&M Emery County, UT

| Section | Description | Acreage |
|---------|-----------------------------|---------|
| Sec 25: | NW¼SW¼ | 40.00 |
| Sec 26: | E½SW¼NE¼, W½SE¼NE¼, NE¼SE¼. | 80.00 |

Sediment Pond

Beginning at a point 259.41feet West and 123.74 feet North of the East 1/4 corner of section 35, T17S. R7E., SLM and intersecting the Des-Bee-Dove Emery County Road No. 412;

thence S 61°43' E, 127.70 feet;
 thence S 51° 13' E, 459.78 feet;
 thence S 60° 43' E, 163.50 feet;
 thence S 3° 43' E, 213.14 feet;
 thence N 64° 47' E, 278.44 feet;
 thence N 22° 17' E, 249.11 feet;
 thence N 44° 13' W, 217.52 feet;
 thence N 2° 47' E, 431.98 feet;
 thence N 10° 13' W, 194.24 feet;
 thence N 6° 13' E, 231.03 feet;
 thence N 51° 13' E, 154.75 feet;
 thence N 7° 13' E, 230.82 feet;
 thence N 39° 13' W, 188.61 feet;
 thence N 13° 48' 40" W, 1030.83 feet;
 thence N 40° 36' 49" W, 46.42 feet;
 thence S 88° 27' 37" W, 100.39 feet;
 thence N 61° 03' 40" W, 163.27 feet,
 thence W, 79.30 feet,
 thence S, 0°, 08' W, 517.82 feet,
 thence S 13° 48' 40" E, 454.63 feet;
 thence S 60° 37' 19" E, 640.87 feet;
 thence S 7° 13' W, 189.18 feet;
 thence S 51° 13' W, 155.25 feet;
 thence S 6° 13' W, 258.97 feet;
 thence S 10° 13' E, 195.76 feet;
 thence S 2° 47' W, 448.02 feet;
 thence S 44° 13' E, 206.48 feet;
 thence S 22° 17' W, 196.89 feet;
 thence S 64° 47' W, 185.56 feet;
 thence N 3° 43' W, 166.86 feet;
 thence N 60° 43' W, 186.50 feet;
 thence N 51° 13' W, 460.22 feet;
 thence N 61° 43' W, 132.30 feet;
 thence S 28° 16' 51" W, 50.00 feet;
 to point of beginning. Contains 13.88 acres, more or less.

BLM Right of Way UTU-53809 Relinquished 8/22/04; No Right of Entry

Remote Portals

Behive Portal Breakout (BLM Right-of-Way Expired 5/25/01; No Right of Entry).

An 20 ft. X 20 ft. area beginning at the SW corner of Section 13, T17S. R7E., SLM, to a point 292 feet, bearing N59-34'26"E. 0.01 acres, more or less.

Deseret Portal Breakout

An 20 ft. X 20 ft. area beginning at the SE corner of Section 14, T17S. R7E., SLM, to a point 1,798 feet, bearing N49-20'41"W. 0.01 acres, more or less.

The Des Bee Dove permit covers an area approximately 133.9 acres. The total disturbed area at the mine is currently 40.90 acres.

Des Bee Dove Mine Permit Boundary Description

Disturbed Area Reconciliation Table

| Type Area | Area Name | Reclamation Completion Date | Disturbed Acreage | Phase I Bond Release Date | Phase II Bond Release Date | Phase III Bond Release Date |
|---------------|--------------------------|-----------------------------|-------------------|---------------------------|----------------------------|-----------------------------|
| Mine Site | Phase 1 Reclamation Area | May-02 | 4.60 | 2/13/2007 | | |
| Mine Site | Phase 2 Reclamation Area | Jun-03 | 22.40 | 2/13/2007 | | 04/05/2007 ¹ |
| Mine Site | Pumphouse Area | Nov-99 | 0.00 | 2/13/2007 | | 04/05/2007 ² |
| Remote Portal | Deseret Mine | Jul-00 | 0.01 | 9/17/2009 | | |
| Remote Portal | Beehive Mine | Jul-00 | 0.01 | 9/17/2009 | | |
| Sediment Pond | Phase 3 Reclamation Area | Jan-06 | 13.88 | 9/17/2009 | | |
| Access | Haul Road Area | N/A | 0.00 ⁴ | N/A | N/A | 08/24/1998 ³ |
| Total | | | 40.90 | | | |

¹ Originally the Phase 2 Reclamation Area contained 23.3 total disturbed acres. On 4/5/07 Division of Oil, Gas, and Mining approved Phase III Bond Release on 0.9 acres of disturbed land within this area

² Originally the Pumphouse Reclamation Area contained 1.62 total disturbed acres. On 4/5/07 Division of Oil, Gas, and Mining approved Phase III Bond Release on all acres of disturbed land within this area

³ The Des Bee Dove haul road and all of PacifiCorp's jurisdictional control of the road was transferred to Emery County on August 24, 1998. The road is now part of the Emery County road system.

⁴ The haul road originally consisted of 93.18 acres of disturbed land associated with the Des Bee Dove Mine.

Des Bee Dove Mine Permit Boundary Description

T17S, R7E, SLB&M Emery County, UT

Revised Page
Submitted 6/25/14

| Section | Description | Acreage |
|---------|-----------------------------|---------|
| Sec 25: | NW¼SW¼ | 40.00 |
| Sec 26: | E½SW¼NE¼, W½SE¼NE¼, NE¼SE¼. | 80.00 |

Sediment Pond

Beginning at a point 259.41feet West and 123.74 feet North of the East 1/4 corner of section 35, T17S. R7E., SLM and intersecting the Des-Bee-Dove Emery County Road No. 412;

thence S 61°43' E, 127.70 feet;

thence S 51° 13' E, 459.78 feet;

thence S 60° 43' E, 163.50 feet;

thence S 3° 43' E, 213.14 feet;

thence N 64° 47' E, 278.44 feet;

thence N 22° 17' E, 249.11 feet;

thence N 44° 13' W, 217.52 feet;

thence N 2° 47' E, 431.98 feet;

thence N 10° 13' W, 194.24 feet;

thence N 6° 13' E, 231.03 feet;

thence N 51° 13' E, 154.75 feet;

thence N 7° 13' E, 230.82 feet;

thence N 39° 13' W, 188.61 feet;

thence N 13° 48' 40" W, 1030.83 feet;

thence N 40° 36' 49" W, 46.42 feet;

thence S 88° 27' 37" W, 100.39 feet;

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thence S, 0°, 08' W, 517.82 feet,

thence S 13° 48' 40" E, 454.63 feet;

thence S 60° 37' 19" E, 640.87 feet;

thence S 7° 13' W, 189.18 feet;

thence S 51° 13' W, 155.25 feet;

thence S 6° 13' W, 258.97 feet;

thence S 10° 13' E, 195.76 feet;

thence S 2° 47' W, 448.02 feet;

thence S 44° 13' E, 206.48 feet;

thence S 22° 17' W, 196.89 feet;

thence S 64° 47' W, 185.56 feet;

thence N 3° 43' W, 166.86 feet;

thence N 60° 43' W, 186.50 feet;

thence N 51° 13' W, 460.22 feet;

thence N 61° 43' W, 132.30 feet;

thence S 28° 16' 51" W, 50.00 feet;

to point of beginning. Contains 13.88 acres, more or less.

BLM Right of Way UTU-53809 Relinquished 8/22/04; No Right of Entry

Remote Portals

Behive Portal Breakout (BLM Right-of-Way Expired 5/25/01; No Right of Entry).

An 20 ft. X 20 ft. area beginning at the SW corner of Section 13, T17S. R7E., SLM, to a point 292 feet, bearing N59°34'26"E. 0.01 acres, more or less.

Deseret Portal Breakout

An 20 ft. X 20 ft. area beginning at the SE corner of Section 14, T17S. R7E., SLM, to a point 1,798 feet, bearing N49°20'41"W. 0.01 acres, more or less.

The Des Bee Dove permit covers an area approximately 133.9 acres. The total disturbed area at the mine is currently 40.90 acres.

Des Bee Dove Mine Permit Boundary Description

Revised Page
Submitted 6/25/14

Disturbed Area Reconciliation Table

| Type Area | Area Name | Original Disturbed Acreage | Reclamation Completion Date | Disturbed Acreage | Phase I Bond Release Date | Phase II Bond Release Date | Phase III Bond Release Date |
|---------------|--------------------------|----------------------------|-----------------------------|--------------------|---------------------------|----------------------------|-----------------------------|
| Mine Site | Phase 1 Reclamation Area | 4.6 | May-02 | 4.60 | 2/13/2007 | | |
| Mine Site | Phase 2 Reclamation Area | 23.3 | Jun-03 | 22.4 ¹ | 2/13/2007 | | 4/5/2007 |
| Mine Site | Pumphouse Area | 1.62 | Nov-99 | 0.00 ² | 2/13/2007 | | 4/5/2007 |
| Remote Portal | Deseret Mine | 0.01 | Jul-00 | 0.01 | 9/17/2009 | | |
| Remote Portal | Beehive Mine | 0.01 | Jul-00 | 0.01 | 9/17/2009 | | |
| Sediment Pond | Phase 3 Reclamation Area | 13.88 | Jan-06 | 13.88 ³ | 9/17/2009 | | |
| Access | Haul Road Area | 93.18 | N/A | 0.00 ⁴ | N/A | N/A | 8/24/1998 |
| Total | | 136.6 | | 40.90 | | | |

¹ Originally the Phase 2 Reclamation Area contained 23.3 total disturbed acres. On 4/5/07 Division of Oil, Gas, and Mining approved Phase III Bond Release on 0.9 acres of disturbed land within this area as a result of an approved PMLU change.

² Originally the Pumphouse Reclamation Area contained 1.62 total disturbed acres. On 4/5/07 Division of Oil, Gas, and Mining approved Phase III Bond Release on all acres of disturbed land within this area as the result of an approved PMLU change

³ The pond was reclaimed 2 years after the main mine site was reclaimed. The Utah Coal Regs do not specify a separate liability period sediment ponds. Phase III bond release for the pond will occur concurrently with the rest of the mine site area.

⁴ The haul road originally consisted of 93.18 acres of disturbed land associated with the Des Bee Dove Mine. The Des Bee Dove haul road and all of PacifiCorp's jurisdictional control of the road was transferred to Emery County on August 24, 1998. The road is now part of the Emery County road system.

15

14

13

**DESERET MINE BREAKOUT
COMPLETED JULY 2000
0.01 ACRES
PHASE I BOND RELEASE
SEPTEMBER 17, 2009**

U.S. National Forest

**BEEHIVE MINE BREAKOUT
COMPLETED JULY 2000
0.01 ACRES
PHASE I BOND RELEASE
SEPTEMBER 17, 2009**

PacifiCorp

U.S. National Forest

PacifiCorp

22

23

24

U.S. National Forest

PacifiCorp

U.S. National Forest

**PHASE 1 RECLAMATION
COMPLETED MAY 2002
4.60 ACRES
PHASE I BOND RELEASE
FEBRUARY 13, 2007**

DES-BEE-DOVE PERMIT BOUNDARY

27

26

25

Brigham
Young
University

**PHASE 2 RECLAMATION
COMPLETED JUNE 2003
22.40 ACRES
PHASE I BOND RELEASE
FEBRUARY 13, 2007**

U.S.F.S.S.U.P.

**PHASE III BOND RELEASE
APRIL 5, 2007**

B.L.M.

T. 17 S., R. 7 E.

CAD FILE NAME/DISK#: PHASE 3 BOND RELEASE DISTURBED AREA BOUNDARIES

DES-BEE-DOVE PERMIT BOUNDARY

S.U.L.A.
#1195

State



**DES-BEE-DOVE MINE
DISTURBED AREAS
PHASE III BOND RELEASE**

B.L.M.

**PHASE 3 RECLAMATION
COMPLETED JANUARY 2006
13.88 ACRES
PHASE I BOND RELEASE
SEPTEMBER 17, 2009**

35

36

| | | |
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| DRAWN BY: | K. LARSEN | ... |
| SCALE: | 1" = 1000' | DRAWING #: |
| DATE: | APRIL 21, 2014 | SHEET 1 OF 1 REV. |

Reclamation Treatments Utilized at the Des Bee Dove Mine

(Refer to Volume 5, Appendix XIV (Phase 1 Reclamation Plan), XV (Phase 2 Reclamation Plan), and XVI (Phase 3 Reclamation Plan) for a complete discussion of the reclamation treatments employed at the reclaimed sites.)

The Des Bee Dove mine site is located in an unnamed canyon of the southern end of East Mountain. Disturbed areas consist of both east and west facing steep slopes. The area is dominated by rock outcrop, rubble land, and shallow soils. Since the area was disturbed prior to Surface Mining Control and Reclamation Act of 1977, no soils were segregated and stored for reclamation. All disturbed areas were seeded according to the interim revegetation procedures outlined in Volume 2 Part 4 of the Des Bee Dove MRP. Suitability of the soil was demonstrated by the successful growth of native vegetation throughout the site. Reclamation was conducted in three (3) phases. Phase 1 included the upper Bee Hive and Little Dove mine areas. Phase 2 included the Deseret Mine area. And Phase 3 included the Sediment Pond and Access Road.

PacifiCorp instituted a soil trenching and management plan to gather sufficient substitute soils for reclaiming the Phase 1 and Phase 2 areas (refer to the Phase 1 and Phase 2 Reclamation Volumes). To assess the quality of the substitute topsoil available these areas, PacifiCorp conducted several soil sampling programs throughout the site. To quantify the substitute topsoil availability, PacifiCorp excavated soil trenches in the pre-SMCRA cuts and fills. In addition, trenches were developed in the spoil material excavated during the 2001 tippel pad coal removal project (bathouse area) and in the substitute soil pile segregated at the Deseret coal storage area. Trenches were excavated with a backhoe to bedrock or to the proposed post reclamation elevations.

Through the soil salvage activities, PacifiCorp developed approximately 6,900 cubic yards of substitute subsoil material and 20,500 cubic yard of substitute topsoil material. These soils were placed in critical areas for creating slopes to mimic the surrounding landscapes.

The following give a very abridged discussion of the processes used for reclaiming the Des Bee Dove Mine.

Portal Sealing: All portals of the Des Bee Dove mine complex were sealed according to Mine Safety Health Administration (MSHA) specifications. The seals were constructed at least 25 feet in by the opening. The portal area was reclaimed by demolishing the surrounding portal collars. These collars were broken up and used as backfill material. The remaining void was backfilled utilizing existing fill according to the plan.

Sealing of the Remote Portals was completed inside the mine. During reclamation, the portal openings were backfilled with aerated concrete blocks that were flow in by helicopter to each of the openings. Once the openings were adequately filled, hand tools were used to cover the block backfill. The area was contoured using the hand tools to blend the portal sites with the surrounding area.

Soil Placement and Stabilization: Because of the enormity of the project, the reviewer should refer to the Phase 1, Phase 2, and Phase 3 volumes to review the complete backfilling and grading plan. Coal waste was placed against cuts and covered with subsoil and topsoil. The materials were placed in one foot lifts and compacted to an in-place unit weight equal to at least 90% of the maximum laboratory density. It was found that this density could be achieved by compacting the individual lifts a minimum of four passes with a rubber tired dozer or sheepsfoot.

Final slope configurations did not exceed 2 horizontal by 1 vertical. The top layers were not compacted to allow for plant growth and root penetration. Rocks and boulders were randomly placed on the slopes to provide natural esthetic appearance as well as slope containment.

Topsoil was placed at least one foot in depth. The final surface was roughened by placing deep gouges (3' diameter by 1.5' deep) or pocks randomly throughout the surface. This roughening technique provided an effective erosion control mechanism and allowed for water containment on slopes that enhanced plant growth.

Maple Gulch breakouts consist of one breakout in each seam (Hiawatha Seam - Deseret Mine: Main North and Blind Canyon Seam - Beehive Mine: 10th East), approximately sixteen feet wide, eight feet high, located on an extremely steep rock ledge typically void of top/subsoil resources. Natural coal and sandstone outcrops exist throughout the area. Approximately 0.04 acre was impacted by the two breakouts. Due to the limited soil resource, soil material was not salvaged or stored at the site. During the backfilling process, each coal seam exposed during mining (Hiawatha Seam - Deseret Mine: Main North and Blind Canyon Seam - Beehive Mine: 10th East), was completely covered. As part of PacifiCorp's enhancement project, rock and aesthetically appealing materials was strategically placed along the coal outcrop area to blend the portal site into the surrounding terrain. Portals were backfilled using rock/debris adjacent to and above the portal openings. Soil and native material from adjacent to and above the portal areas was utilized to establish a vegetative cover over the backfilled openings.

Erosion Control: As mentioned above, deep gouging techniques were used to control sedimentation at all the reclaimed areas of the Des Bee Dove sites. These techniques required a track-hoe or similar machine to roughen the disturbed area in a random and discontinuous fashion using the bucket. Pockmarks were created to the size of approximately three (3) feet in diameter and one and half (1 ½) feet deep. The pockmarks were designed to capture or trap precipitation, influencing infiltration. Gouging serves to control erosion through water retention, and thus enhances vegetation growth. Because of the water retaining capabilities of deep gouging techniques, contribution of sediment above background levels did not occur. All exposed surfaces were protected and stabilized by incorporating or mixing hay mulch into the top layer of soil. A wood fiber mulch and tackifier was applied to the surface as detailed below.

During soil placement for the Maple Gulch portals, organic debris was incorporated into the soil. The surface was then roughened to control runoff and erosion.

Seeding/Fertilizing Techniques: Seeding and fertilizing was conducted contemporaneously as practical following soil placement/contouring, mulching, pocking of the area being reclaimed. Certified weed free alfalfa hay was incorporated into the soil following contouring at a rate of 2000lbs/acre. Fertilizer (Triple Superphosphate) was applied at a rate of 75 lbs./acre

Pocking techniques mixed the hay mulch and fertilizer into the upper portion of the soil. The seed mixture was broadcast by hand.

Next, a wood fiber mulch was applied at a rate of 1500 lbs./acre. A tackifier was added to the mulch and applied at a rate required by the manufacturer. Typically this ratd was approximately 500 lbs/acre. Mulch and tackifier was applied simultaneously.

Revegetation: The following tables list the seed mixture that was used to revegetate the disturbed Pinyon/Juniper habitat of the Phase 1 and Phase 2 areas and the Saltbrush/Shrub community of the Phase 3 (sediment pond) area, as well as the Maple Gulch Portal breakouts.

Seed Mixture for Phase 1 and Phase 2 Areas:

| Common Name | Scientific Name | Lbs./Acre Equivalent PLS |
|------------------------------|-----------------------------|--------------------------|
| Grasses (Cool Season) | | |
| Indian Ricegrass | Achantherum hymenoides | 1.5 |
| Thickspike wheatgrass | Elymus lanceolantus | 1.0 |
| Salina wildrye* | E. salinus | 2.0 |
| Bottlebrush squirreltail | E. elymoides | 1.0 |
| Great Basin Wild Rye | Leymus cinereus | 2.0 |
| Western wheatgrass | Pasopyrum smithii | 2.0 |
| Bluebunch wheatgrass | Pseudoroegneria spicatum | 1.5 |
| Forbes | | |
| Pacific Aster | Aster chilensis | 0.1 |
| Palmer Penstemon | Penstemon palmeri | 0.5 |
| Shrubs** | | |
| Fourwing saltbrush | Atriplex canescens | 4.0 |
| Shadscale | Atriplex confertifolia | 3.5 |
| Winterfat | Ceratoides lanata | 3.5 |
| Low rabbitbrush | Chrysothamnus viscidiflorus | 0.3 |

Seed Mixture for the Phase 3 Area:

| Common Name | Scientific Name | Lbs./Acre Equivalent PLS |
|------------------------------|-----------------------------|--------------------------|
| Grasses (Cool Season) | | |
| Indian Ricegrass | Achantherum hymenoides | 1.5 |
| Thickspike wheatgrass | Elymus lanceolantus | 1.0 |
| Salina wildrye* | E. salinus | 2.0 |
| Bottlebrush squirreltail | E. elymoides | 1.0 |
| Great Basin Wild Rye | Leymus cinereus | 2.0 |
| Western wheatgrass | Pasopyrum smithii | 2.0 |
| Bluebunch wheatgrass | Pseudoroegneria spicatum | 1.5 |
| Forbes | | |
| Pacific Aster | Aster chilensis | 0.1 |
| Palmer Penstemon | Penstemon palmeri | 0.5 |
| Shrubs** | | |
| Fourwing saltbrush | Atriplex canescens | 4.0 |
| Shadscale | Atriplex confertifolia | 3.5 |
| Winterfat | Ceratoides lanata | 3.5 |
| Low rabbitbrush | Chrysothamnus viscidiflorus | 0.3 |

Seed Mixture - Final Revegetation for the Des-Bee-Dove: Maple Gulch Portal Breakouts

| <u>Common Name</u> | <u>Scientific Name</u> | <u>Lbs/Acre</u> <u>PLS*</u> |
|-------------------------|-------------------------------|--------------------------------|
| <u>Grasses</u> | | |
| Western wheatgrass | Agropyron smithii | 3.0 |
| Bluebunch wheatgrass | Agropyron spicatum | 3.0 |
| Indian ricegrass | Oryzopsis hymenoides | 3.0 |
| Needle and thread grass | Stipa comata | 1.0 |
| Thickspike wheatgrass | Agropyron dasystachyum | 1.0 |
| Great Basin wildrye | Elymus ciaereus | 2.0 |
| <u>Forbs</u> | | |
| Blueleaf aster | Aster glaucodes | 0.5 |
| Utah sweet vetch | Hedysarum boreale | 1.0 |
| Lewis flax | Linum lewisii | 1.0 |
| Globemallow | Sphaeralcea coccinea | 0.5 |
| Yarrow | Achillea millefolius | 0.5 |
| <u>Shrubs</u> | | |
| Serviceberry | Amelanchier alnifolia | 1.0 |
| Mountain big sagebrush | Artemesia tridentata vaseyana | 0.5 |
| Wyoming big sagebrush | Artemesia wyomingensis | 0.5 |
| Prairie sage | Artemesia ludoviciana | 0.5 |
| Big white rabbitbrush | Chrysothamunus nauseosus | |
| | var. albicaulis | <u>0.5</u> |
| | Total | 19.0 |

All seed mixtures were approved by DOGM with USFS and SITLA concurring. Planting techniques utilized both hydro-seeding and hand spreading.

General History of the Des Bee Dove Mine

The Des-Bee-Dove Mine complex is located in southeastern Utah in Emery County, approximately 8 miles north of the town of Orangeville, Utah. Geographically, the mine is located on the southern end of East Mountain, a large, relatively flat plateau, containing two mineable coal seams.

Mining began as early as 1898 in the unnamed canyon where the Des-Bee-Dove Mine complex is located. The original mine workings, called the Griffith Mine, were limited in extent due to the rugged terrain and poor access. The Griffith workings were purchased in 1936 by two men, Edwards and Broderick, who fashioned a crude access road and mined until 1938.

Castle Valley Fuel Company purchased the Edwards and Broderick property in 1938. The company produced coal and operated the facility until 1946. Also in 1938, the Church of Jesus Christ of Latter-Day Saints (LDS Church) purchased coal lands adjacent to Castle Valley Fuel Company and began its own operations in that same year. The Church Mine was operated under a private contract by Mr. John Frank Killian of Orangeville until it was closed in 1943 due to wartime shortages of materials needed to operate the mine. A decision was made to close the mine until conditions became more favorable.

In 1946, economic conditions improved and the LDS Church purchased Castle Valley Fuel's operation and combined operations to form Deseret Coal Company, an LDS Church welfare project, and provided coal for its membership. Deseret Coal Company continued operations until Utah Power & Light Company (UP&L) acquired the property in 1972.

Three separate room and pillar mines existed in the canyon. They were named the Deseret, Beehive, and Little Dove mines. Thus, the "Des-Bee-Dove" Mine complex was established and named. The Deseret Mine is located in the lower coal seam, referred to as the Hiawatha Seam. The Beehive and Little Dove mines are located in the upper coal seam, referred to as the Blind Canyon Seam. The two seams are in the lower portion of the Blackhawk Formation, separated by approximately 100 feet of inter-burden. As a result of this interburden thickness, mine portals were developed on two separate levels.

UP&L operated the mine from 1972 until the mine was temporarily idled in 1987. Total coal production from the Des-Bee-Dove mines is estimated at approximately 10 million tons. Majority of the coal produced was used locally to fuel the Carbon Power Plant located in Helper, Utah. The property sat idle from 1987 through 1997 as attempts were made to sell the mine and its assets. In 1997, PacifiCorp, which purchased UP&L in 1992, submitted a Notice of Intent (NOI) to the Utah Division of Oil, Gas, and Mining (UDOGM) to reclaim the entire Des-Bee-Dove Mine complex.

The historical use of the Des-Bee-Dove Mine site pre-dates the passage of the Surface Mining Control and Reclamation Act of 1977 (SMCRA). As surface facilities were constructed, soils were neither salvaged nor stored for their future use in reclamation. As a result of the NOI to reclaim the property, the UDOGM urged PacifiCorp to develop a complete soil management plan. This plan would require the development of sufficient substitute topsoil materials for

reclamation in a quantity that would cover the 29.5 acres of disturbed area.

PacifiCorp began reclamation in 1999 of the Pumphouse area that was located at the mouth of the canyon where the mine was located. Because the mine was dry, water had to be trucked from a remote source. Trucks delivered water to the pumphouse location which pumped the water to the mine facilities through a steel line. Reclamation of this facility was conducted in approximately 30 days with a single back-hoe and operator.

One year later, PacifiCorp conducted final reclamation activities at the portal breakouts in Maple Gulch, one air intake portal at each mine, Deseret Mine and Beehive Mine. Reclamation was completed during the month of July 2000. These Maple Gulch portals were developed as intake portals in the Deseret and Beehive mines in January and February 1980, respectfully. Each portal breakout consists of a single entry approximately eight (8) feet. x sixteen (16) feet. The portals were used for intake ventilation purposes until the Beehive Mine fire in December 1983. At that time they were temporarily sealed. The portals were reopened in 1984 for exploration purposes after the mine fire. The portals were subsequently, permanently sealed (MSHA approved) in 1986.

Also in 2000, PacifiCorp demolished all the facilities at the mine site. Once the demolition project was completed, a soil sampling program for the mine site was initiated. As part of the sampling program, holes were augered in the tippel pad to sample for soil quality in that area. It was found during this project that raw coal was stored and buried beneath the pad. Because a channel was to be constructed on top of the pad, PacifiCorp decided to remove the coal buried in the canyon and rewrite its reclamation plan. As part of this plan, the Division required PacifiCorp to develop a soil salvage and management plan to acquire sufficient substitute soil materials to reclaim the mine site. Reclamation plans for the upper and lower mines were developed between 2000 and 2002.

In 2002, PacifiCorp began reclaiming the upper mine area known as the Phase 1 Reclamation Project. This project was started in February 2002 and was completed by May 2002.

During the remainder of 2002, preparations were being made to begin reclamation of the lower (Deseret) mine. PacifiCorp began mobilizing equipment to the site in January 2003. Final reclamation was completed in June 2003.

The final area left for reclamation was the sediment pond that was located down the canyon below the mine. The reclamation plan for the sediment pond also needed rewritten because some obsolete practices being used. PacifiCorp rewrote and had approved its sediment pond reclamation plan in 2005. Final reclamation work began in November 2005 and completed in January 2006.

All disturbed sites of the Des Bee Dove mine were reclaimed according to the approved reclamation plan. Seeding of the reconstructed sites took place as contemporaneously as possible. Phase I bond release was approved for the mine site and pumphouse area on February 13, 2007. Phase I bond release was approved for the two remote portals and sediment pond on September 17, 2009.

Current Total Bond Amount and Incremental Amount Requested for Release

In April 2010, Energy West submitted a request to reduce the bond for the Des Bee Dove Mine the amount of \$671,166.00. As this reduction was approved in May 2010 by DOGM, the bond for the Des Bee Dove Mine was updated to a total of \$511,000.00. This new surety amount would carry through to 2015.

Energy West is now requesting that the total surety for the Des Bee Dove Mine be released by this amount as outlined in the table below.

Des Bee Dove Mine Bond Escalation Factors 2010 to 2015

| | |
|---|----------------------|
| Bond Posted with UDOGM in 2005 | \$ 1,837,712.00 |
| Phase I Bond Release (mine site) - Approved Feb 7, 2007 | \$ 667,994.00 |
| | |
| Bond Reduced in September 2007 | \$ 1,169,718.00 |
| | |
| <u>Pending Releases (Letter submitted to UDOGM requesting release in April 2010):</u> | |
| Phase 3 Area - Phase I Bond Release Approved 2/7/2007 | \$ 79,832.00 |
| Haul Road - Phase III Bond Release Approved 8/24/1998 | \$ 591,334.00 |
| | |
| Total 2010 Bond | \$ 498,552.00 |

Escalation Factor = 0.005

| Year | Dollar Increase | Reclamation Costs |
|------|-----------------|-------------------|
| 2011 | \$ 2,492.76 | \$ 501,044.76 |
| 2012 | \$ 2,505.22 | \$ 503,549.98 |
| 2013 | \$ 2,517.75 | \$ 506,067.73 |
| 2014 | \$ 2,530.34 | \$ 508,598.07 |
| 2015 | \$ 2,542.99 | \$ 511,141.06 |

Total Bond for 2015 = \$ 511,000.00
(rounded to nearest 1000)

REVEGETATION MONITORING
FOR PHASE III BOND RELEASE
DES-BEE-DOVE MINE SITE

YEAR ONE
2012



Reclaimed Bathhouse Slope (foreground) at the Des-Bee-Dove Mine

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March 2013



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INTRODUCTION

Brief History

The Des-Bee-Dove Mine site is an area with a rich coal mining history. State of Utah on-line information provides a brief history of the Des-Dee-Dove Mine site. Their description follows below:

The Des-Bee-Dove Mine complex (the Deseret, Beehive and Little Dove Mines) was acquired by Utah Power and Light in 1972 from Deseret Coal Company, an LDS Church enterprise. Two coal seams, the Hiawatha and Blind Canyon, were mined using the room and pillar method. The LDS Church and the Castle Valley Fuel Company mined the property from 1938 to 1947. Prior to this, from 1936 to 1938, the mine workings were operated by two men, Edward and Broderick. Mining first occurred in the canyon in 1898 when the Griffith Mine was started.

The Des-Bee-Dove mines were operated by Utah Power and Light Company until 1989 when the merging between PacifiCorp and UP&L took place. In 1990, Energy West Mining Company, a wholly owned subsidiary of PacifiCorp replaced the UP&L Mining Division as operator of its mines: Cottonwood/Wilberg, Deer Creek, Des-Bee-Dove, and Trail Mountain. The Des-Bee-Dove Mine permit area encompassed over 2,800 acres, a combination of fee land, and state and federal leases. Leases have been relinquished and the permit area has been reduced to 154 acres. The mine complex has been in temporary cessation since 1987 and was reclaimed in 2003.

Purpose of Study

After the coal mining was terminated at the site, *Energy West Mining Company* began reclamation and revegetation activities. By 2003 this work was completed. In 2004, or Year 1 following reclamation, the seeded plant species began to germinate and grow. Since that time, the restored plant communities have been monitored to document the progress in the reclaimed areas. Earlier documents submitted to the regulatory agencies reported updates on the revegetation process from sampling the area in 2005 (Year 2) and 2007 (Year 4).

Reclaimed mine sites are required to provide enough time for acceptable plant establishment before applications can be made for bond release. This time-frame, called the *Responsibility Period*, prescribes at least 10 years before the mine operator can submit a request for *Final* or

Phase III Bond Release through the state of Utah. It has been estimated that this period of time is long enough to determine whether or not adequate re-establishment of a given reclaimed plant community has occurred on sites at this precipitation zone in the western United States. The vegetation of the reclaimed lands must meet specific state and federal requirements. Consequently, at the beginning of Year 9 of the 10-year period, intensive sampling can be initiated for two consecutive years to determine whether or not the reclaimed site has met pre-determined revegetation success standards.

The purpose of this document is to compare reclaimed areas of the mine site with specific success standards (more information about these standards are provided later in this report). The content of this report provides **Year One** results of the two consecutive years of sampling required prior to submittal of an application for bond release by the mine owner through the State of Utah, Division of Oil, Gas & Mining (DOGM).

Site Description

The Des-Bee-Dove Mine site is located approximately 10 miles northwest of the town of Castle Dale, Utah. Elevation of the study sites ranged between 7,200 ft and 8,000 ft above sea level. Slopes of the study area were variable, but were often relatively steep and had various aspects.

Prior to disturbance by mining, the native vegetation was most likely dominated by pinyon-pine (*Pinus edulis*) and Utah juniper (*Juniperus osterosperma*), with Salina wildrye (*Elymus salinus*) as the most common understory species.

METHODS

Quadrat Placement

Sample quadrats for quantitative sampling the vegetation were randomly placed throughout the reclaimed areas in an attempt to adequately represent each site as a whole. This was accomplished by randomly placing several transect lines through the entire lengths of each study area. Random numbers were then generated and used to measure distances at right angles from the line to determine sample locations. Whether these random numbers were odd or even determined which side of the transect line a given quadrat was placed. The random numbers selected were high enough to place quadrats to the lateral limits of each sample area and all areas in-between.

Cover, Frequency & Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition and relative frequencies were also assessed from the quadrats. Plant nomenclature follows *A Utah Flora* (Welsh et al. 2008).

Diversity Indices

Two diversity indices have been employed to measure the reclaimed and reference areas. *MacArthur's Diversity Index* is an effective diversity measurement and is computed using the following equation:

$$1/\sum p_i^2$$

where,

p_i 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.

Another diversity measurement was provided that presents the *Average Number of Species* encountered at each quadrat.

Sample Size & Adequacy

Sampling adequacy was calculated using the formula given below.

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

where,

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

Confidence levels were calculated and reported at 80% (t) and 90% (t) with the desired change from the mean (d) placed at 0.10. Sample sizes were, however, also based on the size of each study area, resulting in more samples taken in larger areas.

Vegetation Sample Area Map

The locations of the general base map was prepared by *Energy West Mining Company*. A Vegetation Sample Area Map using this base map has been included in this report.

Photographs

Several electronic color photographs were taken of the sample areas and will be kept on file at *Mt. Nebo Scientific, Inc.* A number of representative photographs for each study site has been included in this report.

RESULTS

Sample Areas

The reclaimed Des-Bee-Dove Mine was subdivided into separate study areas. The areas were sampled and reported independently to allow closer scrutiny of individual sites. These areas, along with the sample size for each parameter, are shown on Table 1. The sample areas are also shown on the vegetation sample area map and color photographs provided later in this report.

Table 1: Sample areas, acreage and sample sizes of the reclaimed Des-Bee-Dove Mine site (2012).

| Sample Area | Acres | Cover (n) | Density (n) | Production (n) |
|-------------------------------|--------------|------------------|--------------------|-----------------------|
| Access Trail | 3.5 | 40 | 40 | 40 |
| East Slope | 5.0 | 100 | 100 | 50 |
| Bathroom Slope | 7.6 | 150 | 150 | 75 |
| Deseret Mine | 2.7 | 50 | 50 | 25 |
| Switchbacks | 1.1 | 20 | 20 | 10 |
| Substation | 0.4 | 10 | 10 | 5 |
| Beehive/Little Dove Mine | 2.1 | 40 | 40 | 20 |
| Pinyon-Juniper Reference Area | 1.0 | 40 | 40 | 40 |
| TOTALS | 23.4 | 450 | 450 | 265 |

Separated Datasets

Results of quantitatively sampling the reclaimed areas at the Des-Bee-Dove Mine site have been provided in summary tables of this report. The total acreage of the reclaimed area is relatively large, so it has been divided or *separated* into smaller sites to first enable a data review on an area-by-area basis. This design enables the reviewer to observe the successes (or failures) of individual reclaimed areas of the restored vegetation. Datasets have also been *lumped* to make statistical comparisons with the revegetation success standards for Phase III Bond Release (more on that later).

A summary of the results of sampling each reclaimed area as well as the reference area is provided in this section of the report. To facilitate access to the cover, composition and density data for each sample area in this report refer to Table 2. The *separated* data summaries are shown on Table 3 *through* Table 34. A list of the common plant names found in the summary tables is shown on Table 38.

Table 2: Data Locator for the Des-Bee-Dove Mine (2012).

| SAMPLE AREA | Cover by Species | Total Cover | Composition | Woody Species Density | Production |
|-------------------------------|-------------------------|--------------------|--------------------|------------------------------|-------------------|
| Access Trail | Table 3 | Table 4 (A) | Table 4 (B) | Table 5 | Table 6 |
| East Slope | Table 7 | Table 8 (A) | Table 8 (B) | Table 9 | Table 10 |
| Bathhouse Slope | Table 11 | Table 12 (A) | Table 12 (B) | Table 13 | Table 14 |
| Deseret Mine Area | Table 15 | Table 16 (A) | Table 16 (B) | Table 17 | Table 18 |
| Switchbacks | Table 19 | Table 20 (A) | Table 20 (B) | Table 21 | Table 22 |
| Substation Area | Table 23 | Table 24 (A) | Table 24 (B) | Table 25 | Table 26 |
| Beehive/Little Dove Mine Area | Table 27 | Table 28 (A) | Table 28 (B) | Table 29 | Table 30 |
| Pinyon-Juniper Reference Area | Table 31 | Table 32 (A) | Table 32 (B) | Table 33 | Table 34 |

Access Trail

The reclaimed Access Trail area was dominated by fourwing saltbush (*Atriplex canescens*) by quite a large margin, but also important in the sample quadrats were: shadscale (*A. confertifolia*), bluebunch wheatgrass (*Elymus spicatus*), thickspike wheatgrass (*E. lanceolatus*) and western wheatgrass (*E. smithii*). For a list of all species encountered in the quadrats, refer to Table 3. The total living cover in this area was estimated at 48.88% (Table 4-A). The living cover's lifeform composition consisted of 56.67% shrubs, 36.16% grasses and 7.16% forbs (Table 4-B). Woody species density measurements totaled 4,057 individuals per acre (Table 5); the dominant shrubs here were fourwing saltbush, shadscale and rubber rabbitbrush (*Chrysothamnus nauseosus*). Finally, the total annual biomass production for the Access Trail site was measured at 1,509.95 pounds per acre, of which was comprised of 1,176.38 pounds of woody and 333.57 pounds of herbaceous plant species (Table 6).

East Slope

The East Slope, a much larger area than the above, was also dominated by fourwing saltbush, but not by such a large margin (Table 7). Other important species here by cover and frequency were bluebunch wheatgrass, western wheatgrass, shadscale, thickspike wheatgrass and Gt. Basin wildrye (*Elymus cinereus*). Total living cover in the area was estimated at 50.45% (Table 8-A) and was comprised of 57.26% grasses, 35.29% shrubs and 7.45% forbs (Table 8-B). For density, the total number of woody species was measured at 2,809 individuals per acre with dominants that included fourwing saltbush, shadscale and rubber rabbitbrush (Table 9). The total annual biomass production for the East Slope was 1,352.88 pounds per acre of which 769.65 came from woody and 583.23 from herbaceous plants (Table 10).

Bathhouse Slope

Another relatively large study area was the Bathhouse Slope. This area was dominated and nearly equally represented by Gt. Basin wildrye, rubber rabbitbrush, fourwing saltbush, bluebunch wheatgrass and shadscale (Table 11). The total living cover at this study area was

quantified at 52.81% (Table 12-A). The lifeform composition of the cover consisted of 54.56% grasses, 40.24% shrubs and 5.20% forbs (Table 12-B). Woody species density for the Bathhouse Slope was measured at 3,824 plants per acre. The dominant shrubs in the density measurements were rubber rabbitbrush, shadscale and fourwing saltbush (Table 13). Lastly, the production at the site totaled 1,169.87 pounds per acre of which was nearly equally represented by woody and herbaceous plants (Table 14).

Deseret Mine

Next, the Deseret Mine study area was dominated by fourwing saltbush, Gt. Basin wildrye, rubber rabbitbrush, bluebunch wheatgrass, western wheatgrass and thickspike wheatgrass (Table 15). The total living cover at this site was 53.20% (Table 16-A) and was comprised of 53.09% grasses, 40.94% shrubs and 5.97% forbs (Table 16-B). Woody species measurements showed the area had a total of 2,870 plants per acre with the dominant shrubs being rubber rabbitbrush, fourwing saltbush, winterfat (*Ceratoides lanata*) and shadscale (Table 17). The total annual production was estimated at 1,302.17 pounds per acre and was comprised of 730.86 pounds of woody and 571.31 pounds of herbaceous plant species (Table 18).

Switchbacks

A relatively small area, the Switchbacks, was dominated by fourwing saltbush, western wheatgrass, thickspike wheatgrass and Gt. Basin wildrye (Table 19). This area had a total living cover of 46.25% (Table 20-A); the composition of it was 54.98% shrubs, 45.02% grasses and no forbs (Table 20-B). The total woody species density was measured at 3,008 individuals per acre and was greatly dominated by fourwing saltbush (Table 21). The total annual production here was 1,288.53 pounds per acre, most of which was comprised of woody plants (Table 22).

Substation

Another relatively small sample site was the Substation Area. The site was dominated by western wheatgrass, Palmer's penstemon (*Penstemon palmeri*), Gt. Basin wildrye and rubber rabbitbrush (Table 23). The Substation site had a total living cover of 38.50% (Table 24-A) and

was comprised of 62.96% grasses, 21.33% shrubs and 15.71% forbs (Table 24-B). Total density for the woody plants was measured at 1,932 individuals per acre (Table 25). This density was dominated by rubber rabbitbrush, shadscale, fourwing saltbush and corymb buckwheat (*Eriogonum corymbosum*). The area had a total biomass production of 970.86 pounds per acre which was nearly equally represented by woody and herbaceous plant (Table 26).

Beehive/Little Dove Mine

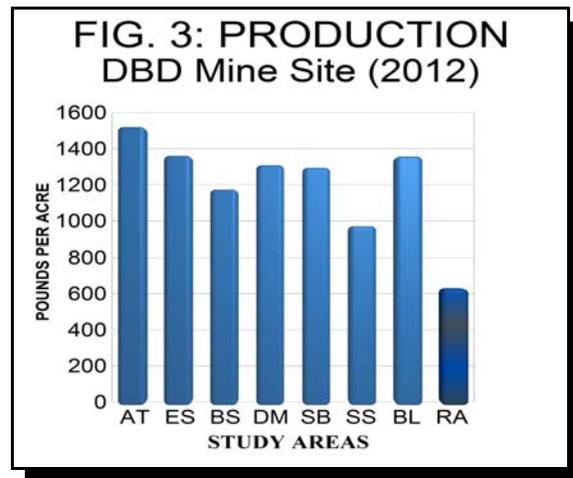
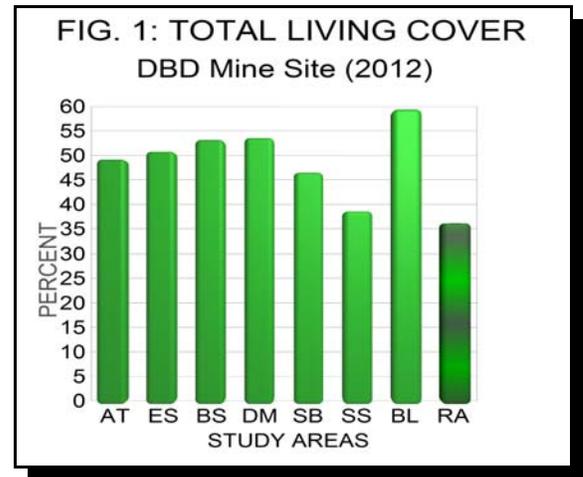
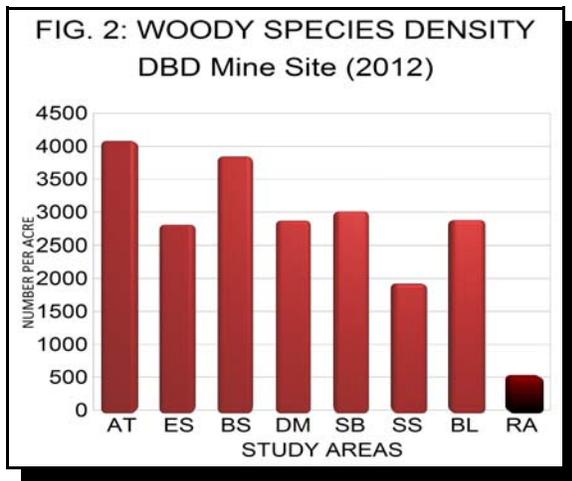
A somewhat larger area than the above two sample areas was the Beehive/Little Dove site. The site was dominated by fourwing saltbush, thickspike wheatgrass, western wheatgrass, Gt. Basin wildrye and bluebunch wheatgrass (Table 27). The total living cover for this area was estimated at 58.88% (Table 28-A); it had a composition of 67.25% grasses, 32.20% shrubs and 0.55% forbs (Table 28-B). Woody species density of the Beehive/Little Dove site had a total of 2,878 plants per acre and was dominated by fourwing saltbush, shadscale and rubber rabbitbrush (Table 29). Lastly, the total annual production of the area was 1,349.04 pounds per acre which consisted of 798.92 pounds of herbaceous and 550.12 pounds of woody plants (Table 30).

Pinyon-Juniper Reference Area

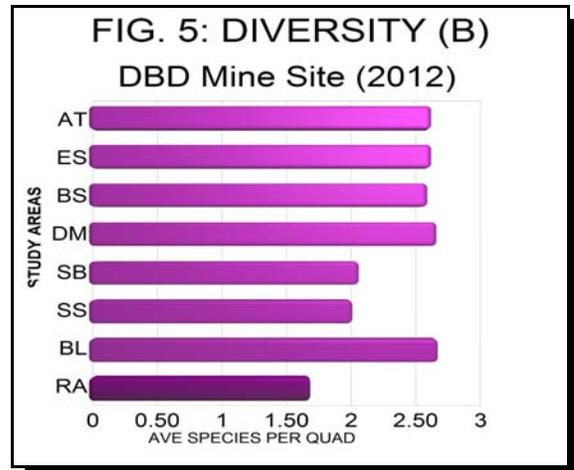
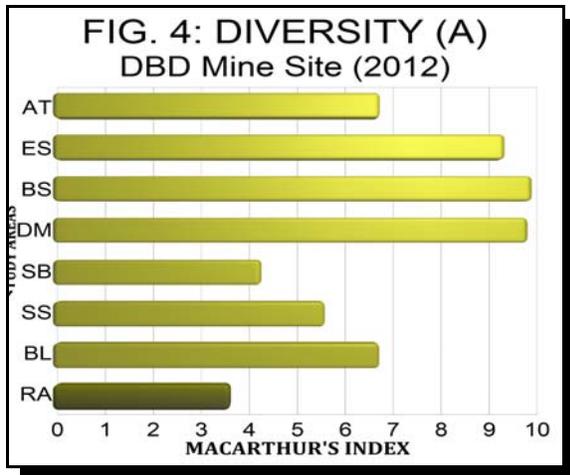
The Pinyon-Juniper Reference Area, or the area previously chosen to represent revegetation success standards, was also sampled in 2012 to make data comparisons with the reclaimed areas. This reference area was dominated by Salina wildrye, Mormon tea (*Ephedra viridis*), pinyon-pine and curl-leaf mountain-mahogany (*Cercocarpus ledifolius*). Table 31 lists all the species found in the sample quadrats by cover and frequency values. The total living cover of the reference area was 36.13%, of which 29.13% came from understory cover and 7.00% from overstory (Table 32-A). The understory cover had a composition of 63.85% grasses, 35.15% shrubs and no forb species (Table 32-B). The total woody species density of the area was 546 plants per acre and was dominated by pinyon-pine, Mormon tea, and curl-leaf mountain-mahogany (Table 33). The total annual biomass production for the reference area was 632.26 pounds per acre which was made up of 396.20 pounds of woody species and 236.06 pounds from herbaceous species (Table 34).

Comparisons of Separated Datasets

Provided below are graphic comparisons showing total living cover, woody species density, annual biomass production and diversity indices for each reclaimed study area described above. The summary data for the Pinyon-Juniper Reference Area have also been included in the graphs (Figs. 1-5)*.



*Figure Legend: AT=Access Trail; ES=East Slope; BS=Bathhouse Slope; DM=Deseret Mine; SB=Switchbacks; SS=Substation; BL=Beehive/Little Dove; RA=Reference Area.



Separating vs Lumping Data

The section above provides the summary data for each study area including individual reclaimed sites as well as the reference area. As essential as it is to be able to review individual reclaimed areas by separating the datasets, lumping (combining) the data of the reclaimed study areas and comparing the key parameters statistically with the reference area, is the next most logical rational in the process of considering the reclaimed mine site for Phase III Bond Release.

*Figure Legend: AT=Access Trail; ES=East Slope; BS=Bathhouse Slope; DM=Deseret Mine; SB=Switchbacks; SS=Substation; BL=Beehive/Little Dove; RA=Reference Area.

Lumped Datasets

There was a significant amount of vegetation data collected at the Des-Bee-Dove Mine site in 2012 to measure the revegetation success and compare it to the success standards.

Though much data has been recorded in the area, the author has attempted to find a logical and straightforward method to

compare the applicable parameters (those required by state and federal regulations) using

statistics to determine revegetation success,

yet also provide other meaningful data (that cannot readily be compared using statistics).

Because the Des-Bee-Dove Mine site has been reclaimed to a single vegetation type (Pinyon-Juniper community), the site will only be

compared to one reference area – the Pinyon-Juniper Reference Area. That said, for the

parameters applicable to Phase III Bond Release

that will be compared statistically, the reclaimed study sites have been lumped for

comparisons with the reference area.

Lumped dataset summaries have been

provided in Tables 35 through 37; they have been compared to the reference area data

mentioned earlier (Tables 32 through 34).

Figs. 6-8 provides graphs of the lumped areas compared to the reference area.

FIG. 6: TOTAL LIVING COVER (LUMPED)

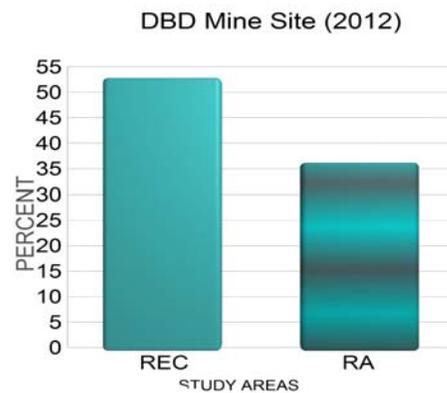


FIG. 7: WOODY SPECIES DENSITY (LUMPED)

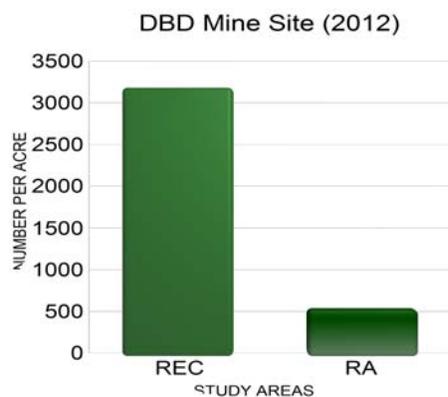
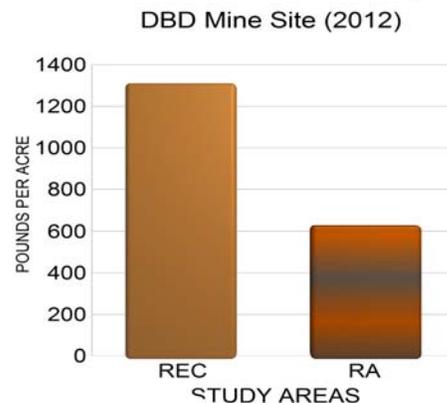


FIG. 8: ANNUAL PRODUCTION (LUMPED)



Statistical Comparisons

Statistical analyses comparing the reclaimed areas with the reference area for the fundamental parameters in determining the possibility for Phase III Bond Release have been employed. Student's t-tests indicate that for total living cover, woody species density and annual biomass production the reclaimed areas had statistical significant higher values for all of these parameters (Fig. 9).

FIG. 9. Statistical Analyses - Student's t-tests comparing total living cover, woody species density and annual biomass production for the *lumped* reclaimed and reference areas (2012).

Total Living Cover

Reclaimed Areas: \bar{x} =52.44; s=13.42; n=450

Reference Area: \bar{x} =36.13; s=7.62; n=40

t = 7.574; df = 488; SL= p<0.01

Woody Species Density

Reclaimed Areas: \bar{x} =3160.75; s=1602.69; n=450

Reference Area: \bar{x} =545.72; s=234.46; n=40

t = 10.300; df = 488; SL= p<0.01

Annual Biomass Production

Reclaimed Areas: \bar{x} =1302.47; s=394.00; n=265

Reference Area: \bar{x} =632.26; s=231.38; n=40

t = 10.477; df = 303 ; SL= p<0.01

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

SUMMARY & CONCLUSIONS

After the coal mining activities terminated at the Des-Bee-Dove Mine the site was reclaimed and revegetated using a seed mixture that was conducive to restoring an approximation of the original native plant communities that were once supported in the area prior to their disturbance. Intensive quantitative vegetation sampling was conducted within these reclaimed areas in 2012. In accordance with state and federal regulations, specific standards for revegetation success had been determined prior to reclamation. This report provides the findings for the vegetation sampling and presents the data necessary for **Year 1** of *two consecutive years* to ascertain whether or not the mine site has met revegetation success standards, thus meeting requirements needed to ultimately apply for Phase III or Final Bond Release.

As a means to compare data for specific sites within the reclaimed areas, datasets were first presented *separately*. Later, data for the reclaimed areas were *lumped* (combined) making them more appropriate to be used for statistical comparisons with the reference area.

The *separated data* shows the differences between each study site *within* the reclaimed areas as well as comparisons with the reference area. It also shows additional information including lifeform composition, frequency, species presence and diversity as well as the more fundamental parameters such as total and living cover, density and annual biomass productivity.

The *lumped data* of the reclaimed sites focuses on the total living cover, woody species density and production. The summaries of the lumped datasets, when compared statistically with the reference area, suggest that they have met or exceeded those standards pre-determined for revegetation success.

In conclusion, the **Year 2** vegetation sampling for the second consecutive year will be conducted in 2013. Results from that study will be summarized as a companion to this 2012 study. If the results so warrant it, both sample years will be submitted with an application for Phase III Bond Release at the Des-Bee Dove Mine site in the near future.

DATA SUMMARY TABLES

Table 3: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2012).

| Access Trail | | | n=40 |
|-------------------------------------|-------------------------|-------------------------------|------------------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| SHRUBS | | | |
| <i>Atriplex canescens</i> | 21.75 | 20.05 | 72.50 |
| <i>Atriplex confertifolia</i> | 5.25 | 9.35 | 30.00 |
| <i>Chrysothamnus nauseosus</i> | 1.50 | 6.04 | 7.50 |
| <i>Eriogonum corymbosum</i> | 0.50 | 2.18 | 5.00 |
| <i>Gutierrezia sarothrae</i> | 0.13 | 0.78 | 2.50 |
| FORBS | | | |
| <i>Machaeranthera grindelioides</i> | 0.13 | 0.78 | 2.50 |
| <i>Malcomia africana</i> | 0.63 | 2.78 | 5.00 |
| <i>Penstemon palmeri</i> | 2.50 | 6.42 | 15.00 |
| GRASSES | | | |
| <i>Elymus cinereus</i> | 0.88 | 3.33 | 7.50 |
| <i>Elymus junceus</i> | 2.13 | 7.57 | 7.50 |
| <i>Elymus lanceolatus</i> | 4.50 | 6.50 | 40.00 |
| <i>Elymus smithii</i> | 4.25 | 7.63 | 30.00 |
| <i>Elymus spicatus</i> | 4.75 | 8.14 | 35.00 |

Table 4: Des-Bee-Dove Mine. Total Cover and composition (2012).

| Access Trail | | | n=40 |
|-------------------------|-------------------------|-------------------------------|------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 48.88 | 12.32 | |
| Litter | 10.25 | 3.15 | |
| Bareground | 18.75 | 8.42 | |
| Rock | 22.13 | 10.89 | |
| B. % COMPOSITION | | | |
| Shrubs | 56.67 | 27.44 | |
| Forbs | 7.16 | 16.12 | |
| Grasses | 36.16 | 27.80 | |

Table 5: Des-Bee-Dove Mine. Woody Species Density (2012).

| Access Trail | | n=40 |
|------------------------------------|--------------------|------|
| SPECIES | Number/Acre | |
| <i>Amelanchier utahensis</i> | 25.36 | |
| <i>Artemisia nova</i> | 25.36 | |
| <i>Atriplex canescens</i> | 2104.64 | |
| <i>Atriplex confertifolia</i> | 1267.86 | |
| <i>Cercocarpus ledifolius</i> | 25.36 | |
| <i>Chrysothamnus nauseosus</i> | 456.43 | |
| <i>Chrysothamnus viscidiflorus</i> | 76.07 | |
| <i>Eriogonum corymbosum</i> | 50.71 | |
| <i>Gutierrezia sarothrae</i> | 25.36 | |
| TOTAL | 4057.14 | |

Table 6: Des-Bee-Dove Mine. Annual Biomass Production (2012).

Access Trail

(n=40; double sampling n=160)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 333.57 | 389.00 |
| Woody | 1176.38 | 653.72 |
| TOTAL | 1509.95 | 498.06 |

Table 7: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2012).

| East Slope | | | n=100 |
|--------------------------------|---------------------|---------------------------|--------------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| SHRUBS | | | |
| <i>Atriplex canescens</i> | 10.00 | 15.15 | 44.00 |
| <i>Atriplex confertifolia</i> | 4.65 | 8.81 | 31.00 |
| <i>Chrysothamnus nauseosus</i> | 3.00 | 7.55 | 20.00 |
| <i>Eriogonum corymbosum</i> | 0.55 | 4.58 | 2.00 |
| FORBS | | | |
| <i>Aster sp.</i> | 0.30 | 2.98 | 1.00 |
| <i>Halogeton glomeratus</i> | 0.10 | 0.99 | 1.00 |
| <i>Medicago sativa</i> | 0.10 | 0.99 | 1.00 |
| <i>Penstemon palmeri</i> | 2.65 | 5.12 | 26.00 |
| GRASSES | | | |
| <i>Agropyron cristatum</i> | 0.40 | 3.14 | 2.00 |
| <i>Elymus cinereus</i> | 3.75 | 7.46 | 25.00 |
| <i>Elymus junceus</i> | 2.85 | 7.88 | 17.00 |
| <i>Elymus lanceolatus</i> | 3.90 | 8.62 | 22.00 |
| <i>Elymus salinus</i> | 1.90 | 8.57 | 6.00 |
| <i>Elymus smithii</i> | 6.10 | 13.33 | 23.00 |
| <i>Elymus spicatus</i> | 9.85 | 15.29 | 37.00 |
| <i>Stipa hymenoides</i> | 0.35 | 2.67 | 2.00 |

Table 8: Des-Bee-Dove Mine. Total Cover and composition (2012).

| East Slope | | | n=100 |
|-------------------------|---------------------|---------------------------|-------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 50.45 | 13.51 | |
| Litter | 10.20 | 2.82 | |
| Bareground | 16.55 | 7.77 | |
| Rock | 22.80 | 10.57 | |
| B. % COMPOSITION | | | |
| Shrubs | 35.29 | 29.57 | |
| Forbs | 7.45 | 14.82 | |
| Grasses | 57.26 | 31.14 | |

Table 9: Des-Bee-Dove Mine. Woody Species Density (2012).

| East Slope | | n=100 |
|--------------------------------|--------------------|-------|
| SPECIES | Number/Acre | |
| <i>Atriplex canescens</i> | 1095.33 | |
| <i>Atriplex confertifolia</i> | 1088.31 | |
| <i>Atriplex gardneri</i> | 7.02 | |
| <i>Cercocarpus ledifolius</i> | 7.02 | |
| <i>Chrysothamnus nauseosus</i> | 596.81 | |
| <i>Eriogonum corymbosum</i> | 14.04 | |
| TOTAL | 2808.53 | |

Table 10: Des-Bee-Dove Mine. Annual Biomass Production (2012).

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 583.23 | 625.46 |
| Woody | 769.65 | 755.81 |
| TOTAL | 1352.88 | 340.63 |

Table 11: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2012).

| Bathhouse Slope | | | n=150 |
|--------------------------------|-------------------------|-------------------------------|------------------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| SHRUBS | | | |
| <i>Artemisia tridentata</i> | 0.43 | 3.83 | 1.33 |
| <i>Atriplex canescens</i> | 7.23 | 13.41 | 29.33 |
| <i>Atriplex confertifolia</i> | 5.27 | 10.55 | 24.67 |
| <i>Atriplex gardneri</i> | 0.30 | 3.66 | 0.67 |
| <i>Cercocarpus ledifolius</i> | 0.20 | 2.44 | 0.67 |
| <i>Chrysothamnus nauseosus</i> | 7.53 | 12.87 | 38.00 |
| <i>Eriogonum corymbosum</i> | 0.30 | 2.72 | 1.33 |
| FORBS | | | |
| <i>Aster sp.</i> | 0.10 | 0.91 | 1.33 |
| <i>Penstemon palmeri</i> | 2.43 | 4.92 | 25.33 |
| GRASSES | | | |
| <i>Agropyron cristatum</i> | 0.47 | 3.38 | 2.00 |
| <i>Elymus cinereus</i> | 7.53 | 12.74 | 34.00 |
| <i>Elymus junceus</i> | 2.83 | 9.56 | 13.33 |
| <i>Elymus lanceolatus</i> | 3.13 | 7.08 | 19.33 |
| <i>Elymus salinus</i> | 1.77 | 7.10 | 6.67 |
| <i>Elymus smithii</i> | 4.57 | 11.39 | 18.67 |
| <i>Elymus spicatus</i> | 6.80 | 11.77 | 32.00 |
| <i>Stipa hymenoides</i> | 1.90 | 6.65 | 8.67 |

Table 12: Des-Bee-Dove Mine. Total Cover and composition (2012).

| Bathhouse Slope | | | n=150 |
|-------------------------|-------------------------|-------------------------------|-------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 52.81 | 14.59 | |
| Litter | 10.73 | 2.67 | |
| Bareground | 14.23 | 6.85 | |
| Rock | 22.23 | 12.27 | |
| B. % COMPOSITION | | | |
| Shrubs | 40.24 | 29.77 | |
| Forbs | 5.20 | 10.18 | |
| Grasses | 54.56 | 30.02 | |

Table 13: Des-Bee-Dove Mine. Woody Species Density (2012).

| Bathhouse Slope | | n=150 |
|--------------------------------|--------------------|-------|
| SPECIES | Number/Acre | |
| <i>Artemisia tridentata</i> | 25.49 | |
| <i>Atriplex canescens</i> | 822.08 | |
| <i>Atriplex confertifolia</i> | 1204.44 | |
| <i>Atriplex gardneri</i> | 6.37 | |
| <i>Ceratoides lanata</i> | 12.75 | |
| <i>Cercocarpus ledifolius</i> | 38.24 | |
| <i>Chrysothamnus nauseosus</i> | 1637.79 | |
| <i>Eriogonum corymbosum</i> | 63.73 | |
| <i>Gutierrezia sarothrae</i> | 12.75 | |
| TOTAL | 3823.63 | |

Table 14: Des-Bee-Dove Mine. Annual Biomass Production (2012).

Bathhouse Slope

(n=75; double sampling n=300)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 563.43 | 576.06 |
| Woody | 606.44 | 672.04 |
| TOTAL | 1169.87 | 338.16 |

Table 15: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2012).

| Deseret Mine | | | n=50 |
|--------------------------------|-------------------------|-------------------------------|------------------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| SHRUBS | | | |
| <i>Atriplex canescens</i> | 10.20 | 16.28 | 32.00 |
| <i>Atriplex confertifolia</i> | 2.10 | 6.09 | 14.00 |
| <i>Cercocarpus ledifolius</i> | 1.70 | 4.08 | 16.00 |
| <i>Cercocarpus ledifolius</i> | 0.50 | 2.50 | 4.00 |
| <i>Chrysothamnus nauseosus</i> | 7.30 | 12.22 | 36.00 |
| <i>Eriogonum corymbosum</i> | 0.20 | 1.40 | 2.00 |
| FORBS | | | |
| <i>Penstemon palmeri</i> | 2.70 | 5.12 | 24.00 |
| GRASSES | | | |
| <i>Agropyron cristatum</i> | 0.50 | 3.50 | 2.00 |
| <i>Elymus cinereus</i> | 9.20 | 13.83 | 40.00 |
| <i>Elymus junceus</i> | 0.30 | 2.10 | 2.00 |
| <i>Elymus lanceolatus</i> | 4.60 | 8.30 | 28.00 |
| <i>Elymus salinus</i> | 1.50 | 6.65 | 6.00 |
| <i>Elymus smithii</i> | 5.20 | 9.90 | 26.00 |
| <i>Elymus spicatus</i> | 6.10 | 12.34 | 26.00 |
| <i>Stipa hymenoides</i> | 1.10 | 5.22 | 6.00 |

Table 16: Des-Bee-Dove Mine. Total Cover and composition (2012).

| Deseret Mine | | | n=50 |
|-------------------------|-------------------------|-------------------------------|------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 53.20 | 12.76 | |
| Litter | 10.60 | 2.37 | |
| Bareground | 14.20 | 7.51 | |
| Rock | 22.00 | 11.66 | |
| B. % COMPOSITION | | | |
| Shrubs | 40.94 | 29.54 | |
| Forbs | 5.97 | 11.52 | |
| Grasses | 53.09 | 27.97 | |

Table 17: Des-Bee-Dove Mine. Woody Species Density (2012).

| Deseret Mine | | n=50 |
|--------------------------------|--------------------|------|
| SPECIES | Number/Acre | |
| <i>Atriplex canescens</i> | 717.41 | |
| <i>Atriplex confertifolia</i> | 602.63 | |
| <i>Ceratoides lanata</i> | 602.63 | |
| <i>Cercocarpus ledifolius</i> | 86.09 | |
| <i>Chrysothamnus nauseosus</i> | 789.15 | |
| <i>Eriogonum corymbosum</i> | 71.74 | |
| TOTAL | 2869.65 | |

Table 18: Des-Bee-Dove Mine. Annual Biomass Production (2012).

Deseret Mine

(n=25; double sampling n=100)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 571.31 | 705.79 |
| Woody | 730.86 | 688.03 |
| TOTAL | 1302.17 | 369.39 |

Table 19: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2012).

| Switchbacks | | | n=20 |
|--------------------------------|-------------------------|-------------------------------|------------------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| SHRUBS | | | |
| <i>Atriplex canescens</i> | 24.25 | 18.32 | 80.00 |
| <i>Atriplex confertifolia</i> | 0.50 | 1.50 | 10.00 |
| <i>Chrysothamnus nauseosus</i> | 2.25 | 6.02 | 15.00 |
| FORBS | | | |
| GRASSES | | | |
| <i>Elymus cinereus</i> | 3.00 | 6.60 | 20.00 |
| <i>Elymus lanceolatus</i> | 4.00 | 7.84 | 25.00 |
| <i>Elymus smithii</i> | 9.75 | 12.50 | 45.00 |
| <i>Elymus spicatus</i> | 2.50 | 7.50 | 10.00 |

Table 20: Des-Bee-Dove Mine. Total Cover and composition (2012).

| Switchbacks | | | n=20 |
|-------------------------|-------------------------|-------------------------------|------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 46.25 | 11.28 | |
| Litter | 9.25 | 2.38 | |
| Bareground | 18.50 | 9.63 | |
| Rock | 26.00 | 8.89 | |
| B. % COMPOSITION | | | |
| Shrubs | 54.98 | 31.37 | |
| Forbs | 0.00 | 0.00 | |
| Grasses | 45.02 | 31.37 | |

Table 21: Des-Bee-Dove Mine. Woody Species Density (2012).

| Switchbacks | | n=20 |
|--------------------------------|--------------------|------|
| SPECIES | Number/Acre | |
| <i>Atriplex canescens</i> | 2331.17 | |
| <i>Atriplex confertifolia</i> | 188.00 | |
| <i>Ceratoides lanata</i> | 112.80 | |
| <i>Chrysothamnus nauseosus</i> | 376.00 | |
| TOTAL | 3007.96 | |

Table 22: Des-Bee-Dove Mine. Annual Biomass Production (2012).

Switchbacks

(n=10; double sampling n=40)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | | |
| Woody | 164.19 | 492.57 |
| | 1124.34 | 491.54 |
| TOTAL | 1288.53 | 339.16 |

Table 23: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2012).

| Substation | | | n=10 |
|--------------------------------|-------------------------|-------------------------------|------------------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| SHRUBS | | | |
| <i>Atriplex canescens</i> | 2.00 | 6.00 | 10.00 |
| <i>Atriplex confertifolia</i> | 2.50 | 5.12 | 20.00 |
| <i>Chrysothamnus nauseosus</i> | 4.00 | 6.63 | 30.00 |
| FORBS | | | |
| <i>Penstemon palmeri</i> | 6.00 | 10.20 | 30.00 |
| GRASSES | | | |
| <i>Elymus cinereus</i> | 4.50 | 10.59 | 20.00 |
| <i>Elymus lanceolatus</i> | 2.50 | 4.61 | 30.00 |
| <i>Elymus smithii</i> | 17.00 | 15.36 | 60.00 |

Table 24: Des-Bee-Dove Mine. Total Cover and composition (2012).

| Substation | | | n=10 |
|-------------------------|-------------------------|-------------------------------|------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 38.50 | 4.50 | |
| Litter | 9.50 | 1.50 | |
| Bareground | 17.50 | 4.03 | |
| Rock | 34.50 | 6.87 | |
| B. % COMPOSITION | | | |
| Shrubs | 21.33 | 23.81 | |
| Forbs | 15.71 | 25.20 | |
| Grasses | 62.96 | 33.98 | |

Table 25: Des-Bee-Dove Mine. Woody Species Density (2012).

| Substation | | n=10 |
|--------------------------------|--------------------|------|
| SPECIES | Number/Acre | |
| <i>Atriplex canescens</i> | 241.55 | |
| <i>Atriplex confertifolia</i> | 628.02 | |
| <i>Chrysothamnus nauseosus</i> | 772.95 | |
| <i>Eriogonum corymbosum</i> | 193.24 | |
| <i>Gutierrezia sarothrae</i> | 96.62 | |
| TOTAL | 1932.38 | |

Table 26: Des-Bee-Dove Mine. Annual Biomass Production (2012).

Substation

(n=5; double sampling n=20)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 449.74 | 551.85 |
| Woody | 521.12 | 425.69 |
| TOTAL | 970.86 | 130.46 |

Table 27: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2012).

| Beehive/Little Dove Mine | | | |
|---------------------------------|-----------------|-----------------------|----------------------|
| | | | n=40 |
| | Mean Percent | Standard Deviation | Percent Frequency |
| SHRUBS | | | |
| TREES & SHRUBS | | | |
| <i>Atriplex canescens</i> | 15.50 | 18.36 | 50.00 |
| <i>Atriplex confertifolia</i> | 2.13 | 6.01 | 15.00 |
| <i>Chrysothamnus nauseosus</i> | 1.38 | 5.12 | 10.00 |
| FORBS | | | |
| <i>Penstemon palmeri</i> | 0.38 | 1.73 | 5.00 |
| GRASSES | | | |
| <i>Agropyron cristatum</i> | 1.88 | 5.09 | 15.00 |
| <i>Elymus cinereus</i> | 8.25 | 10.16 | 47.50 |
| <i>Elymus lanceolatus</i> | 12.75 | 18.61 | 52.50 |
| <i>Elymus salinus</i> | 0.50 | 3.12 | 2.50 |
| <i>Elymus smithii</i> | 9.13 | 13.78 | 45.00 |
| <i>Elymus spicatus</i> | 6.63 | 14.25 | 20.00 |
| <i>Stipa hymenoides</i> | 0.38 | 2.34 | 2.50 |

Table 28: Des-Bee-Dove Mine. Total Cover and composition (2012).

| Beehive/Little Dove Mine | | |
|---------------------------------|--------------|-----------------------|
| | | n=40 |
| | Mean Percent | Standard Deviation |
| A. TOTAL COVER | | |
| Total Living Cover | 58.88 | 9.32 |
| Litter | 10.00 | 2.24 |
| Bareground | 14.00 | 6.91 |
| Rock | 17.13 | 7.41 |
| B. % COMPOSITION | | |
| Shrubs | 32.20 | 29.94 |
| Forbs | 0.55 | 2.51 |
| Grasses | 67.25 | 30.10 |

Table 29: Des-Bee-Dove Mine. Woody Species Density (2012).

| Beehive/Little Dove Mine | | n=40 |
|---------------------------------|--------------------|------|
| SPECIES | Number/Acre | |
| <i>Atriplex canescens</i> | 1708.63 | |
| <i>Atriplex confertifolia</i> | 773.38 | |
| <i>Chrysothamnus nauseosus</i> | 377.70 | |
| <i>Eriogonum corymbosum</i> | 17.99 | |
| TOTAL | 2877.70 | |

Table 30: Des-Bee-Dove Mine. Annual Biomass Production (2012).

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 798.92 | 762.51 |
| Woody | 550.12 | 637.88 |
| TOTAL | 1349.04 | 332.97 |

Table 31: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2012).

Pinyon-Juniper Reference Area n=40

| | Mean Percent | Standard Deviation | Percent Frequency |
|--------------------------------|---------------------|---------------------------|--------------------------|
| OVERSTORY | | | |
| TREES & SHRUBS | | | |
| <i>Cercocarpus ledifolius</i> | 1.38 | 5.36 | 7.50 |
| <i>Juniperus osteosperma</i> | 1.50 | 6.04 | 7.50 |
| <i>Pinus edulis</i> | 4.13 | 9.21 | 17.50 |
| UNDERSTORY | | | |
| TREES & SHRUBS | | | |
| <i>Cercocarpus ledifolius</i> | 2.88 | 7.98 | 12.50 |
| <i>Chrysothamnus nauseosus</i> | 0.50 | 3.12 | 2.50 |
| <i>Ephedra viridis</i> | 5.50 | 10.48 | 25.00 |
| <i>Pinus edulis</i> | 3.00 | 7.97 | 12.50 |
| FORBS | | | |
| GRASSES | | | |
| <i>Elymus salinus</i> | 17.25 | 11.07 | 82.50 |

Table 32: Des-Bee-Dove Mine. Total Cover and composition (2012).

Pinyon-Juniper Reference Area

Sample size (n)=40
SAMPLE ADEQUACY (nMIN)
nMIN (80%± 0.10)= 7
nMIN (90%± 0.10)=12

| | Mean Percent | Standard Deviation |
|-------------------------|---------------------|---------------------------|
| A. TOTAL COVER | | |
| Overstory (O) | 7.00 | 11.06 |
| Understory (U) | 29.13 | 10.48 |
| Litter | 21.13 | 16.53 |
| Bareground | 12.63 | 7.90 |
| Rock | 37.13 | 15.08 |
| O + U | 36.13 | 7.62 |
| B. % COMPOSITION | | |
| Shrubs | 36.15 | 38.55 |
| Forbs | 0.00 | 0.00 |
| Grasses | 63.85 | 38.55 |

Table 33: Des-Bee-Dove Mine. Woody Species Density (2012).

| Pinyon-Juniper Reference Area | |
|--------------------------------------|--|
| | Sample size (n)=40 SAMPLE ADEQUACY (nMIN) nMIN (80%± 0.10)= 30 nMIN (90%± 0.10)= 50 |
| SPECIES | Number/Acre |
| <i>Cercocarpus ledifolius</i> | 122.79 |
| <i>Chrysothamnus nauseosus</i> | 13.64 |
| <i>Ephedra viridis</i> | 163.72 |
| <i>Juniperus osteosperma</i> | 68.21 |
| <i>Pinus edulis</i> | 177.36 |
| TOTAL | 545.72 |

Table 34: Des-Bee-Dove Mine. Annual Biomass Production (2012).

Pinyon-Juniper Reference Area

Sample size (n)= 40; double sampling n=160
SAMPLE ADEQUACY (nMIN)
nMIN (80%± 0.10)=22
nMIN (90%± 0.10)=37

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 236.06 | 253.40 |
| Woody | 396.20 | 419.97 |
| TOTAL | 632.26 | 231.38 |

Table 35: Des-Bee-Dove Mine. *Lumped* Data for Total Living Cover (2012).

| Reclaimed Study Sites Combined | | |
|---|---------------------|---------------------------|
| | Mean Percent | Standard Deviation |
| TOTAL LIVING COVER | 52.44 | 13.42 |
| Sample size (n) = 450 SAMPLE ADEQUACY (nMIN) 80%± 0.10 = 11 90%± 0.10 = 18 | | |

Table 36: Des-Bee-Dove Mine. *Lumped* Data for Woody Species Density (2012).

| Reclaimed Study Sites Combined | | |
|---|--------------------------|---------------------------|
| Number of Individuals Per Acre | Mean No. Per Acre | Standard Deviation |
| TOTAL | 3160.75 | 1602.69 |
| Sample size (n) = 450 SAMPLE ADEQUACY (nMIN) 80%± 0.10 = 42 90%± 0.10 = 70 | | |

Table 37: Des-Bee-Dove Mine. *Lumped* Data for Annual Biomass Production (2012).

Reclaimed Study Sites Combined

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 528.50 | 607.95 |
| Woody | 773.97 | 711.81 |
| TOTAL | 1302.47 | 394.00 |

Sample size (n) = 265
SAMPLE ADEQUACY (nMIN)
80%± 0.10 = 15
90%± 0.10 = 25

Table 38: Names of plant species listed in the summary tables.

| SCIENTIFIC NAMES | COMMON NAMES |
|-------------------------------------|-----------------------------|
| TREES & SHRUBS | |
| <i>Amelanchier utahensis</i> | Utah serviceberry |
| <i>Artemisia nova</i> | Black sagebrush |
| <i>Artemisia tridentata</i> | Big sagebrush |
| <i>Atriplex canescens</i> | Fourwing saltbush |
| <i>Atriplex confertifolia</i> | Shadscale |
| <i>Atriplex gardneri</i> | Gardner saltbush |
| <i>Ceratoides lanata</i> | Winterfat |
| <i>Cercocarpus ledifolius</i> | Curl-leaf mountain-mahogany |
| <i>Chrysothamnus nauseosus</i> | Rubber rabbitbrush |
| <i>Chrysothamnus viscidiflorus</i> | Viscid rabbitbrush |
| <i>Ephedra viridis</i> | Mormon tea |
| <i>Eriogonum corymbosum</i> | Corymb buckwheat |
| <i>Gutierrezia sarothrae</i> | Broom snakeweed |
| <i>Juniperus osteosperma</i> | Utah juniper |
| <i>Pinus edulis</i> | Pinyon-pine |
| FORBS | |
| <i>Aster ascendens</i> | Pacific aster |
| <i>Aster sp.</i> | Aster |
| <i>Halogeton glomeratus</i> | Halogeton |
| <i>Malcomia africana</i> | African mustard |
| <i>Penstemon palmeri</i> | Palmer penstemon |
| <i>Salsola tragus</i> | Russian thistle |
| <i>Medicago sativa</i> | Alfalfa |
| <i>Machaeranthera grindelioides</i> | Gumweed aster |
| GRASSES | |
| <i>Agropyron cristatum</i> | Crested wheatgrass |
| <i>Elymus cinereus</i> | Gt. Basin wildrye |
| <i>Elymus junceus</i> | Russian wildrye |
| <i>Elymus lanceolatus</i> | Thickspike wheatgrass |
| <i>Elymus salinus</i> | Salina wildrye |
| <i>Elymus smithii</i> | Western wheatgrass |
| <i>Elymus spicatus</i> | Bluebunch wheatgrass |
| <i>Stipa hymenoides</i> | Indian ricegrass |

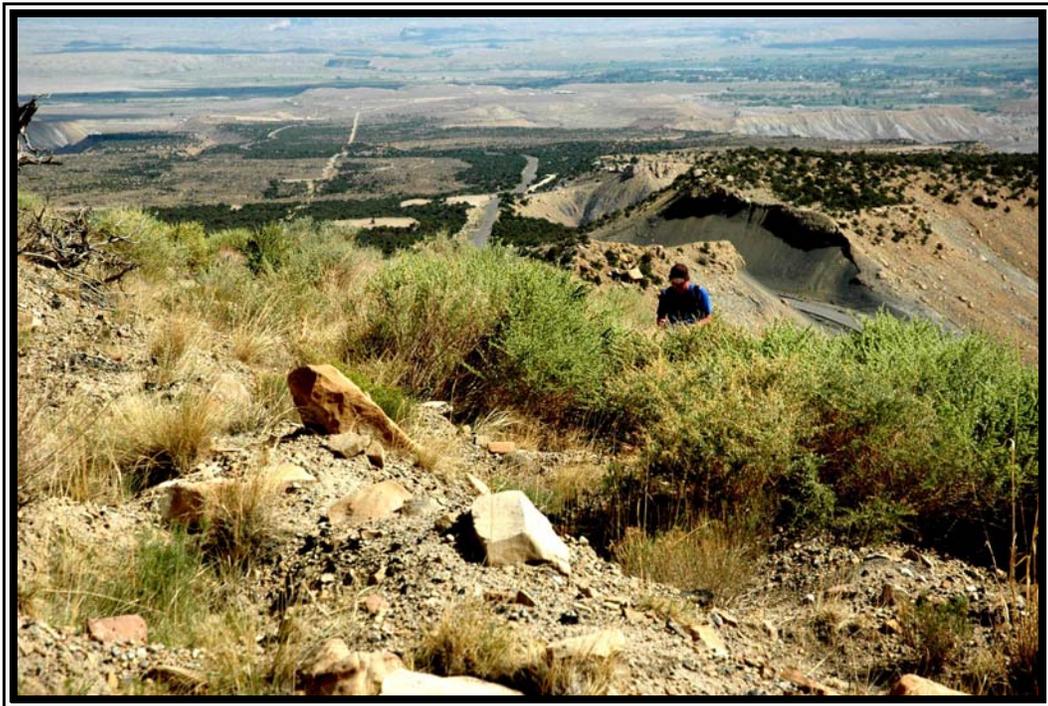
**COLOR PHOTOGRAPHS
OF THE
SAMPLE AREAS**

Access Trail



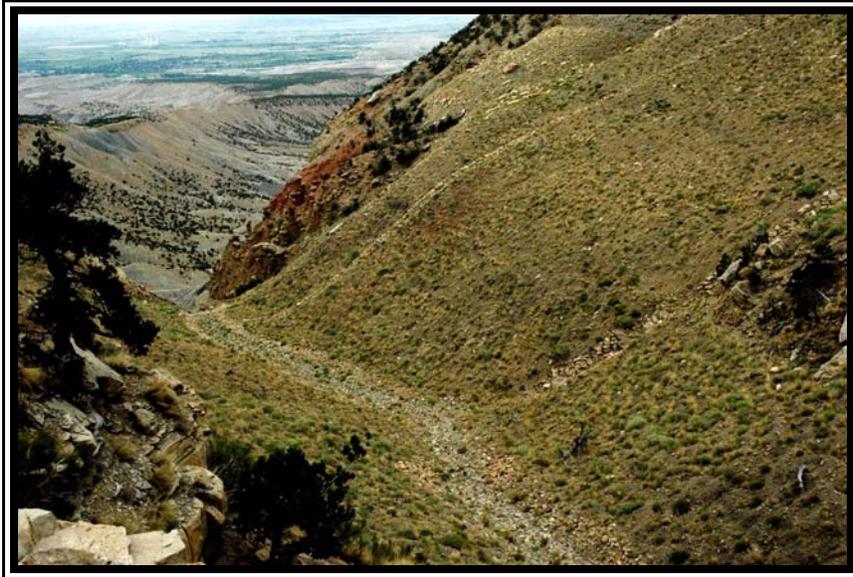
East Slope



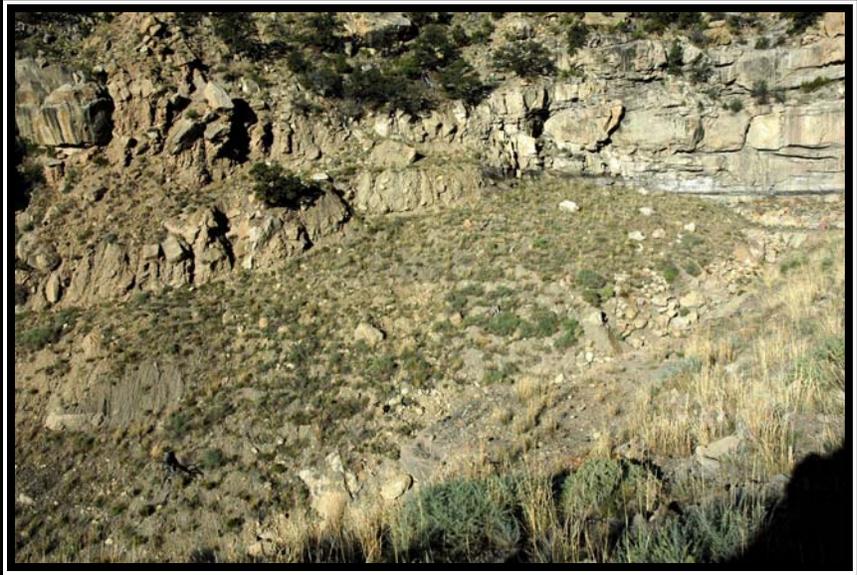


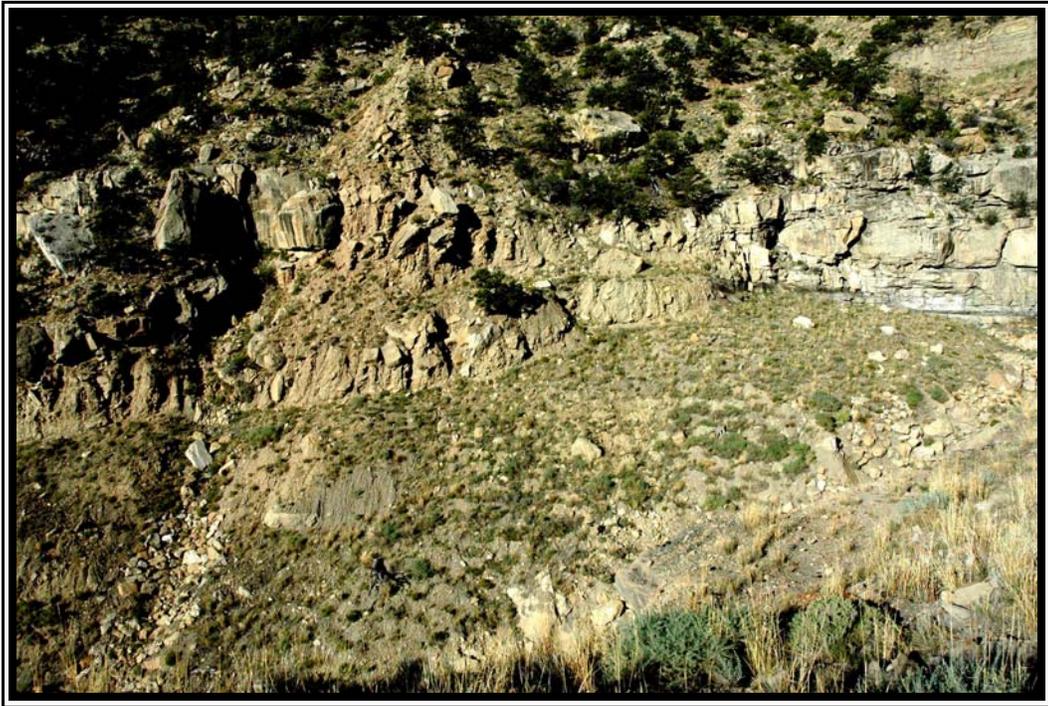
Bathhouse Slope



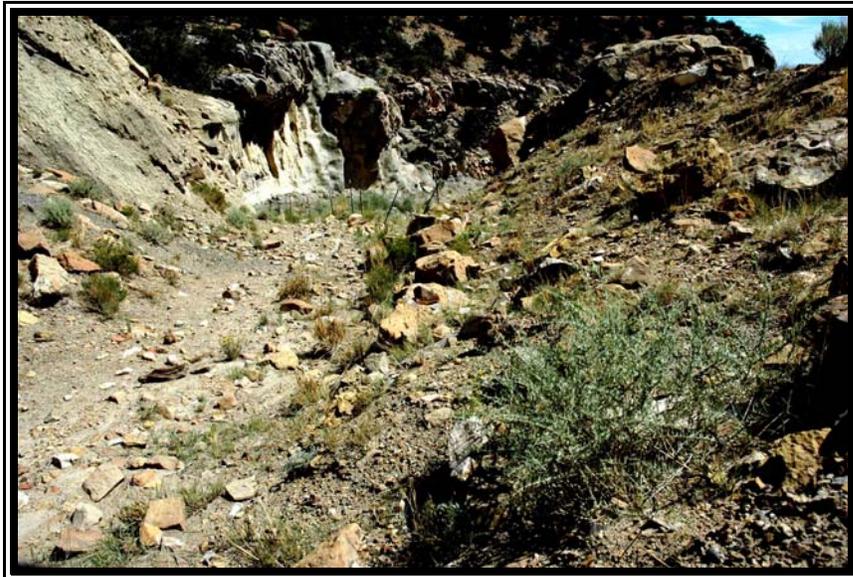


Deseret Mine





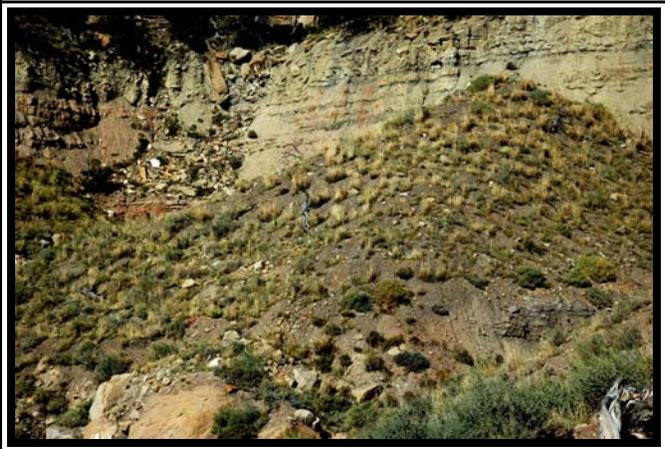
Switchbacks



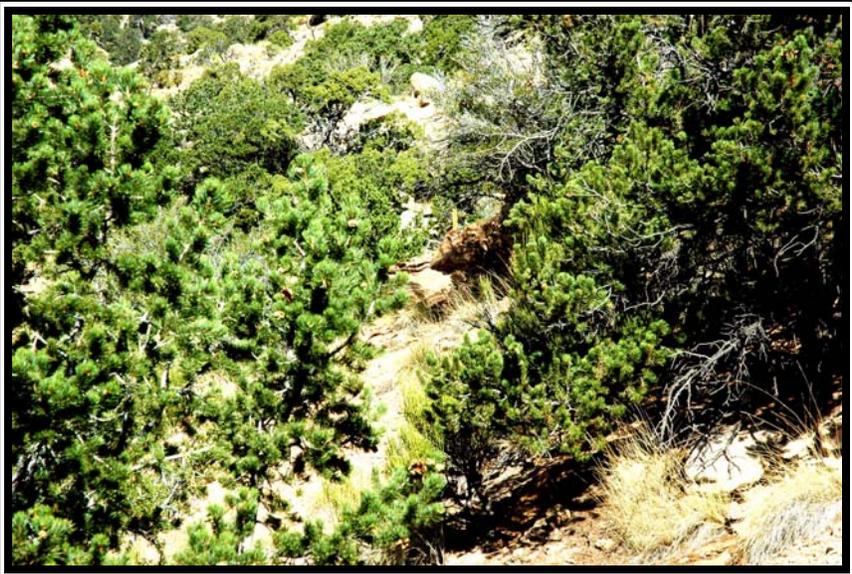
Substation

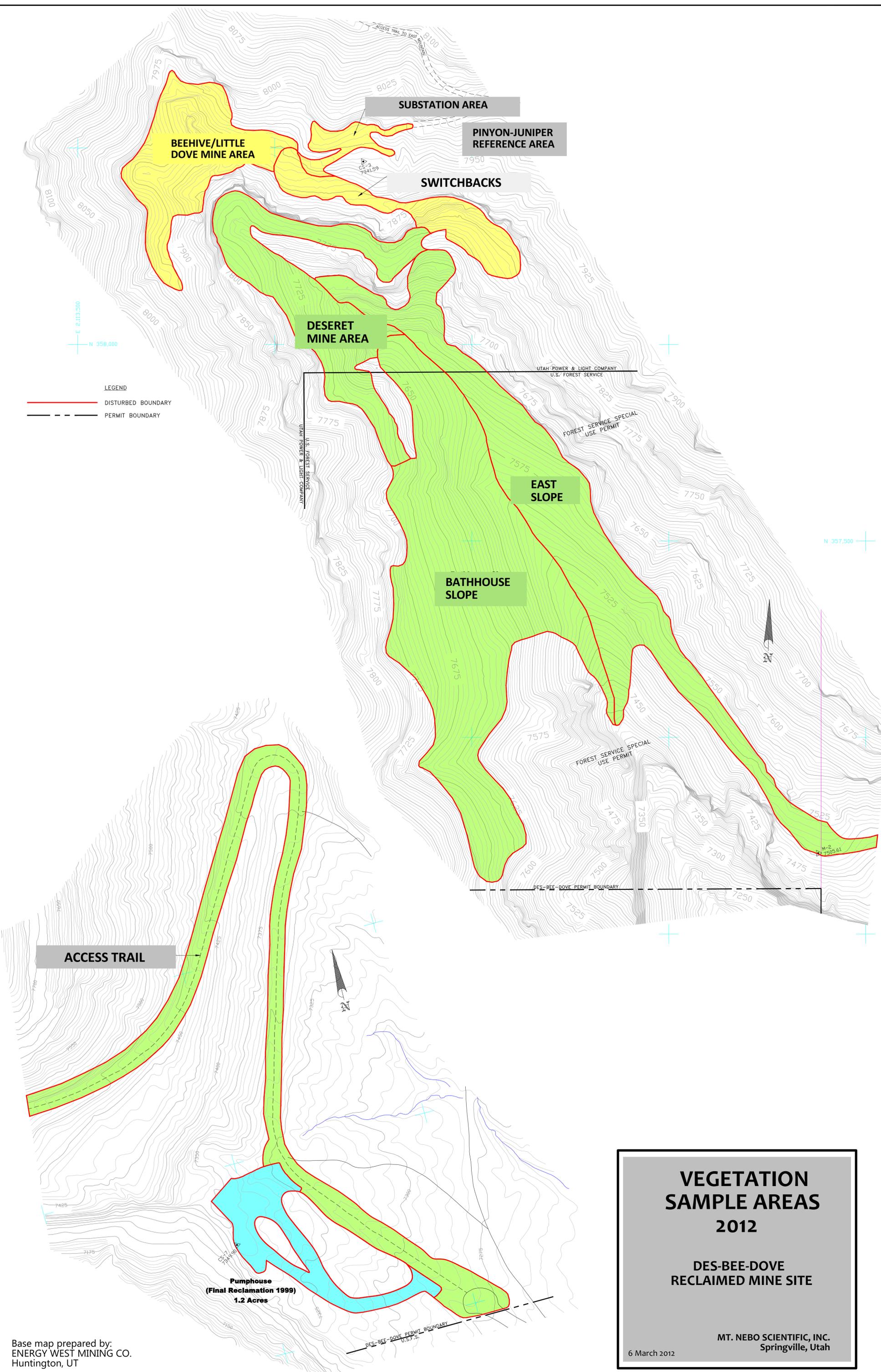


Beehive/Little Dove



Pinyon-Juniper Reference Area





LEGEND
 ——— DISTURBED BOUNDARY
 - - - PERMIT BOUNDARY

SUBSTATION AREA

PINYON-JUNIPER REFERENCE AREA

SWITCHBACKS

BEEHIVE/LITTLE DOVE MINE AREA

DESERT MINE AREA

EAST SLOPE

BATHHOUSE SLOPE

ACCESS TRAIL

**Pumphouse
 (Final Reclamation 1999)
 1.2 Acres**

**VEGETATION
 SAMPLE AREAS
 2012**

**DES-BEE-DOVE
 RECLAIMED MINE SITE**

**MT. NEBO SCIENTIFIC, INC.
 Springville, Utah**

6 March 2012

Base map prepared by:
 ENERGY WEST MINING CO.
 Huntington, UT

Revegetation Monitoring
at the
Sediment Pond Area
Year 6
2012

Des-Bee-Dove Mine Site
Emery County, Utah



Aerial View of the Des-Bee-Dove Sediment Pond Area

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March 2013



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INTRODUCTION

The Des-Bee-Dove Mine is a site with a long history of coal mining activities dating back to at least 1898. In 1987 the mining activities were terminated and the site went into what is called *temporary cessation*. In 2003, most of the disturbed areas of the mine site were reclaimed to their approximate pre-mining contours and then re-seeded with native plant seed mixtures. The only areas not reclaimed at that time were those that were to remain for the purpose of sediment control measures for the newly establishing vegetation. These areas were the Sediment Pond Area and the access road to it. Ultimately, in 2006 the *Sediment Pond Area* and *Access Road* were also reclaimed.

Because the Des-Bee-Dove Mine site was reclaimed 2003, the 10-Year “*Responsibility Period*” is approaching and *Phase III* or *Final Bond Release* may soon be possible. Consequently, in 2012, or Year 9 following reclamation activities, vegetation at the mine site was sampled to provide the first of two consecutive years necessary to be submitted for bond release considerations through the State of Utah, Division of Oil, Gas & Mining (DOGM). Even though the Sediment Pond and its access road were reclaimed later, because they were only temporarily retained for sediment control reasons, they too may be considered for final bond release at the end of the aforementioned Responsibility Period. Therefore, the purpose of this report is to provide revegetation monitoring data to ascertain whether or not these remaining areas have become established enough to also be considered for Phase III Bond Release through DOGM.

In order to achieve approval for Phase III Bond Release, vegetation of a reclaimed mine site must meet specific standards for revegetation success. Consequently, a “reference area”, or a native, undisturbed plant community is often chosen beforehand to provide future success standards following final reclamation. Prior to disturbance by mining activities, the native vegetation in the Sediment Pond Area was mostly dominated by plant communities supporting saltbush species (*Atriplex* spp.), pinyon-pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*). Subsequently, the native plant community chosen to be compared to the reclaimed Des-Bee-Dove Sediment Pond Area was located in close proximity to the reclaimed areas and was called the Saltbush Shrub Reference Area.

METHODS

Transect Placement

Transect lines for quantitative sampling were randomly placed for the entire length of the reclaimed Sediment Pond Area, the reclaimed Access Road and the Saltbush Shrub Reference Area. From these transect lines, sample locations were chosen using random numbers on both sides and at right angles to them.

Cover, Frequency & Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition and relative frequencies were also assessed from the quadrats. Plant nomenclature follows "A Utah Flora" (Welsh et al. 2008).

Density

Density estimates for the woody plant species on the reclaimed and reference areas were made using a distance method called the point-quarter technique. 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, density and production was attempted 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:

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

where,

| | |
|-----------|----------------------------------|
| n_{MIN} | = minimum adequate sample |
| t | = appropriate confidence t-value |
| s | = standard deviation |
| x | = sample mean |
| d | = desired change from mean |

Diversity

Two diversity indices have been employed to the datasets for comparisons. 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.

Photographs & Sample Location Maps

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

RESULTS

The reclaimed *Sediment Pond Area* (Map 1) dataset was separated from the reclaimed *Sediment Pond Access Road* (Map 2) in this report to enable a more accurate depiction of each revegetated area individually rather than lumped together. Subsequently, the data of

reclaimed areas were compared with that of the *Saltbush Shrub Reference Area* (also shown on Map 1).

Color photographs and maps of the sample areas have been included following the Summary Tables in this report.

Sediment Pond Area

The dominant plant species in the reclaimed Sediment Pond Area were four-wing saltbush (*Atriplex canescens*), Gardner saltbush (*A. gardneri*), western wheatgrass (*Elymus smithii*) and Gt. Basin wildrye (*Elymus cinereus*). There were several other species present in the area, all of which are shown on Table 1.

The total living cover of the Sediment Pond Area was estimated at 43.25% (Table 2-A). Of that total, 62.40% was represented by shrub species, 36.69% grasses and 0.91% were forbs (Table 2-B).

Woody species density was also recorded. The total density of the area was estimated at 5,711 individuals per acre (Table 3). The density was mostly comprised of four-wing saltbush, Gardner saltbush, prostrate kochia (*Bassia prostrata*), winterfat (*Ceratoides lanata*), rubber rabbitbrush (*Chrysothamnus nauseosus*) and shadscale (*Atriplex confertifolia*).

Finally, total annual biomass production at the site was estimated at 1,507.60 pounds per acre; this total consisted of 1,183.15 pounds from woody plants and 324.45 pounds from herbaceous species (Table 4).

Sediment Pond Access Road

No single plant species dominated the Sediment Pond Access Road by a wide margin. The most common plants, however, were prostrate kochia, western wheatgrass, thickspike wheatgrass (*Elymus lanceolatus*) and rubber rabbitbrush (Table 5).

The total living cover for the access road area was estimated at 26.29% (Table 6-A), of which 46.15% were shrubs, 41.41% grasses and 12.44% were forb species (Table 6-B).

The total density of the Sediment Pond Access Road was estimated at 1,894 individuals per acre and was dominated by rubber rabbitbrush, prostrate kochia, broom snakeweed (*Gutierrezia sarothrae*), shadscale and fourwing saltbush (Table 7).

Productivity of the area had a total of 523.47 pounds per acre; the production was comprised of 355.80 pounds from woody plants and 167.67 pounds from herbaceous species (Table 8).

Saltbush Shrub Reference Area

The area chosen to be compared to the reclaimed areas and to represent final revegetation success standards was called the Saltbush Shrub Reference Area. The dominant species in this area were Salina wildrye (*Elymus salinus*), Gardner saltbush and shadscale. All species listed by cover and frequency in the reference area are shown on Table 9.

The total living cover for the reference area was estimated at 36.63% (Table 10-A). The cover's lifeform composition was comprised of 55.70% shrubs, 44.30% grasses, with no forbs encountered in the samples (Table 10-B).

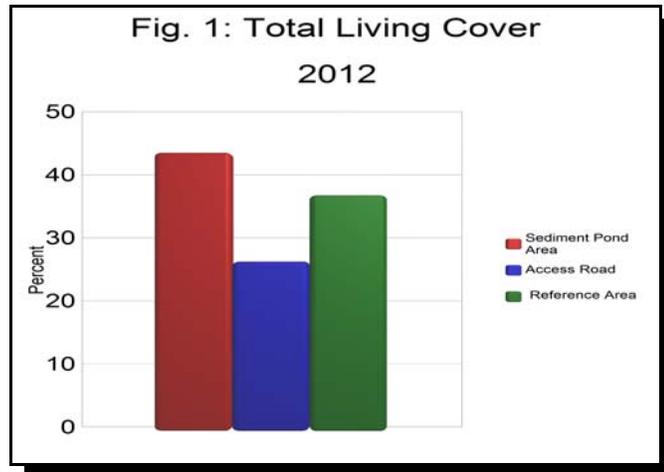
Woody species density in the reference area totaled 4,384 individuals per acre and was dominated by Gardner saltbush, shadscale and corymb buckwheat (*Eriogonum corymbosum*). For a list of all density estimates refer to Table 11.

The total annual biomass productivity in the reference area was measure at 711.91 pounds per acre. This total consisted of 410.67 pounds from woody plants and 301.24 pounds from herbaceous species.

Total Living Cover Comparisons

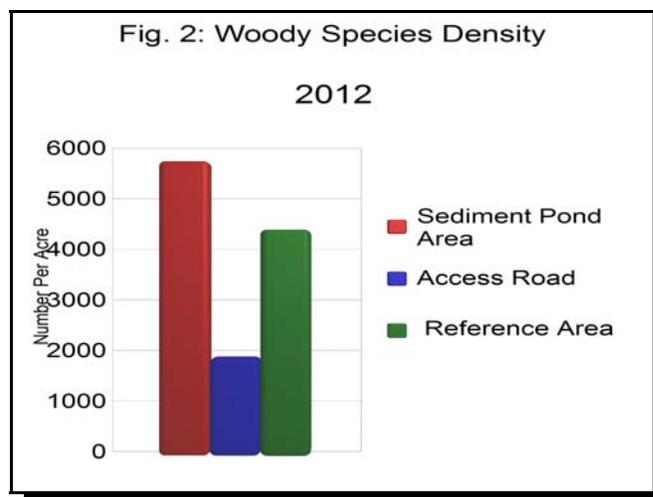
The results described above indicate that the total living cover of the Sediment Pond Area is greater than that of the Saltbush Shrub Reference Area. The opposite is true for the Access Road. Fig. 1 is a graph that shows this comparison.

When statistics were employed to test whether or not the differences are significant, the analyses suggested that they are – the Sediment Pond Area had a statistically significant greater amount of total living cover than that of the Saltbush Shrub Reference Area. Moreover, the Access Road had significantly less cover (Fig. 6-A).



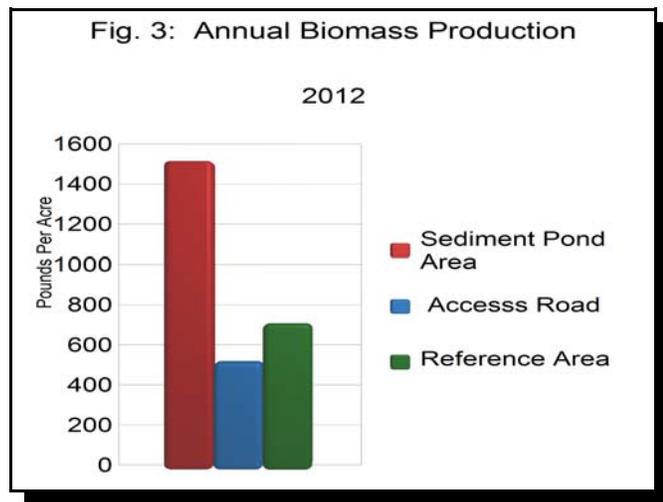
Woody Species Density Comparisons

When the total woody species densities for all areas were compared, the results were similar as the cover results (Fig. 2). The Sediment Pond Area had more plants per acre and the Access Road had less than the reference area. These differences were also statistically significant (Fig. 6-B).



Annual Biomass Production Comparisons

When the total annual biomass production was compared, the results again were similar to the above results (Fig. 3). The Sediment Pond Area had greater production and the Access Road had less than the reference area. These differences were again statistically significant (Fig. 6-C).



Diversity Comparisons

Two diversity measurements were calculated on the datasets for comparison purposes. First, MacArthur's Index was employed. Using this index, both the Sediment Pond and the Access Road areas were more diverse (Fig. 4). Next, the Average Number of Species per Quadrat indicated that the reference area has slightly more than both reclaimed areas (Fig. 5).

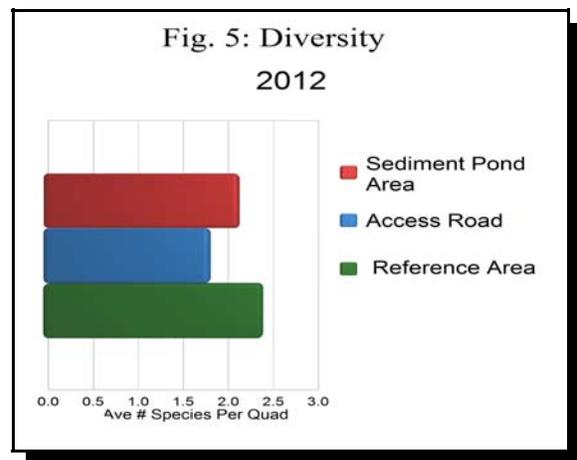
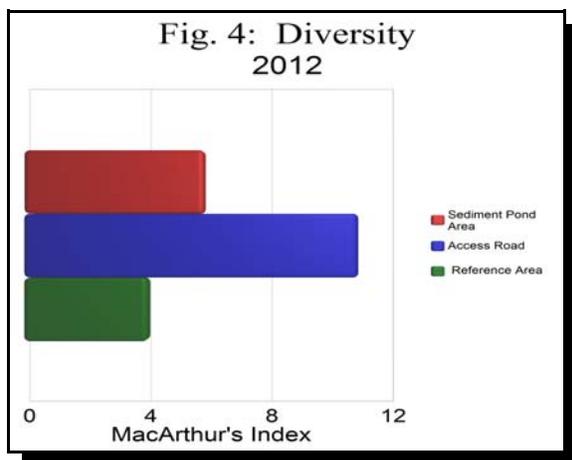


FIG. 6. STUDENT'S T-TEST - Total living cover, woody species density and annual biomass production comparisons between the reclaimed and reference areas (2012).

A. Total Living Cover

Reclaimed Sediment Pond: $\bar{x}=43.25$; $s=12.40$; $n=80$

Saltbush Shrub Reference Area: $\bar{x}=36.63$; $s=10.42$; $n=80$

$t = 3.656$; $df = 158$; $SL= p<0.01$

Reclaimed Access Road: $\bar{x}=26.29$; $s=11.91$; $n=120$

Saltbush Shrub Reference Area: $\bar{x}=36.63$; $s=10.42$; $n=80$

$t = 6.318$; $df = 198$; $SL= p<0.01$

B. Woody Species Density

Reclaimed Sediment Pond: $\bar{x}=5711.02$; $s=2382.59$; $n=80$

Saltbush Shrub Reference Area: $\bar{x}=4384.22$; $s=2098.54$; $n=80$

$t = 3.738$; $df = 158$; $SL= p<0.01$

Reclaimed Access Road: $\bar{x}=1893.68$; $s=1793.97$; $n=120$

Saltbush Shrub Reference Area: $\bar{x}=4384.22$; $s=2098.54$; $n=80$

$t = 8.980$; $df = 198$; $SL= p<0.01$

C. Annual Biomass Production

Reclaimed Sediment Pond: $\bar{x}=1507.60$; $s=473.23$; $n=80$

Saltbush Shrub Reference Area: $\bar{x}=711.91$; $s=222.79$; $n=80$

$t = 13.607$; $df = 158$; $SL= p<0.01$

Reclaimed Access Road: $\bar{x}=523.47$; $s=278.21$; $n=120$

Saltbush Shrub Reference Area: $\bar{x}=711.91$; $s=222.79$; $n=80$

$t = 5.070$; $df = 198$; $SL= p<0.01$

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

SUMMARY & DISCUSSION

Most of the Des-Bee-Dove Mine site was reclaimed in 2003, however, because they were retained for sediment control purposes, the Sediment Pond Area and the Access Road were reclaimed and reseeded later in 2006. For reclaimed sites, mine land operators have a 10-year time-frame before an application can be submitted to the State of Utah for *Phase III* or *Final Bond Release*. This time period, called the *Responsibility Period*, is thought to be long enough to be able to judge whether or not reclaimed lands are established enough to have met pre-set standards of revegetation success. This applies to nearly all reclaimed areas at the mine sites, however, one exception may include those areas that have been temporarily retained to control sediments from runoff during the initial plant establishment period. The *Responsibility Period* for these areas may be somewhat shorter if they meet state and federal requirements. Generally speaking, the reestablished vegetation cover must be: a) diverse, effective, and permanent, b) the plant species be compatible with the approved post-mining land use, c) will have the same seasonal characteristics of growth as the original vegetation, d) are capable of self-regeneration and plant succession and e) be compatible with the plant and animal species of the area. To meet these requirements, specific parameters of the reclaimed areas are often compared with a reference area, or a native plant community with characteristics similar to those of the mine site's plant communities before they were disturbed by mining activities. In other words, the reference area is used to drive or set the revegetation success standards for the reclaimed lands.

The datasets for the Sediment Pond Area and Access Road at the Des-Bee-Dove Mine site have been compared to the Saltbush Shrub Reference Area. It appears that when cover by species, frequency, lifeform composition, total living cover, woody species density, annual biomass productivity and diversity of the reclaimed Sediment Pond Area are compared statistically (or otherwise) to the reference area, this area may be approaching the requirements necessary for *Phase III Bond Release*. The small incremental area of the Access Road, however, is not establishing equally as that of the Sediment Pond Area and may be deficient for meeting the requirements of the success standards.

SUMMARY TABLES

Table 1: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2012).

| Sediment Pond Area | | | |
|--------------------------------|---------------------|---------------------------|--------------------------|
| | | | n=80 |
| | Mean Percent | Standard Deviation | Percent Frequency |
| SHRUBS | | | |
| <i>Atriplex canescens</i> | 12.63 | 14.66 | 56.25 |
| <i>Atriplex confertifolia</i> | 1.00 | 5.99 | 3.75 |
| <i>Atriplex gardneri</i> | 9.94 | 16.63 | 31.25 |
| <i>Ceratoides lanata</i> | 0.56 | 2.50 | 5.00 |
| <i>Chrysothamnus nauseosus</i> | 1.56 | 6.78 | 7.50 |
| <i>Gutierrezia sarothrae</i> | 0.06 | 0.56 | 1.25 |
| <i>Bassia prostrata</i> | 1.75 | 4.26 | 15.00 |
| <i>Sarcobatus vermiculatus</i> | 0.13 | 1.11 | 1.25 |
| FORBS | | | |
| <i>Malcomia africana</i> | 0.56 | 2.96 | 3.75 |
| GRASSES | | | |
| <i>Agropyron cristatum</i> | 0.31 | 2.78 | 1.25 |
| <i>Elymus spicatus</i> | 0.44 | 2.98 | 2.50 |
| <i>Elymus cinereus</i> | 5.75 | 9.39 | 35.00 |
| <i>Elymus lanceolatus</i> | 0.50 | 3.22 | 2.50 |
| <i>Elymus smithii</i> | 7.94 | 10.71 | 45.00 |
| <i>Stipa hymenoides</i> | 0.13 | 1.11 | 1.25 |

Table 2: Des-Bee-Dove Mine. Total Cover and composition (2012).

| Sediment Pond Area | | |
|---------------------------|---------------------|---------------------------|
| | | n=80 |
| | Mean Percent | Standard Deviation |
| A. TOTAL COVER | | |
| Total Living Cover | 43.25 | 12.40 |
| Litter | 9.88 | 1.93 |
| Bareground | 29.25 | 13.18 |
| Rock | 17.63 | 6.52 |
| B. % COMPOSITION | | |
| Shrubs | 62.40 | 31.42 |
| Forbs | 0.91 | 4.81 |
| Grasses | 36.69 | 31.90 |

Table 3: Des-Bee-Dove Mine. Woody Species Density (2012).

| Sediment Pond Area | | n=80 |
|--------------------------------|--------------------|------|
| SPECIES | Number/Acre | |
| <i>Atriplex canescens</i> | 2748.43 | |
| <i>Atriplex confertifolia</i> | 267.70 | |
| <i>Atriplex corrugata</i> | 17.85 | |
| <i>Atriplex gardneri</i> | 999.43 | |
| <i>Bassia prostrata</i> | 838.81 | |
| <i>Ceratoides lanata</i> | 481.87 | |
| <i>Chrysothamnus nauseosus</i> | 285.55 | |
| <i>Gutierrezia sarothrae</i> | 53.54 | |
| <i>Sarcobatus vermiculatus</i> | 17.85 | |
| TOTAL | 5711.02 | |

Table 4: Willow Creek Mine. Annual Biomass Production (2012).

Sediment Pond Area

(n=80; double sampling n=320)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 324.45 | 613.51 |
| Woody | 1183.15 | 784.41 |
| TOTAL | 1507.60 | 473.23 |

Table 5: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2012).

| Sediment Pond Access Road | | | | n=120 |
|-------------------------------------|---------------------|---------------------------|--------------------------|-------|
| | Mean Percent | Standard Deviation | Percent Frequency | |
| SHRUBS | | | | |
| <i>Artemisia nova</i> | 0.34 | 2.31 | 2.50 | |
| <i>Atriplex canescens</i> | 1.07 | 3.87 | 9.17 | |
| <i>Atriplex confertifolia</i> | 1.04 | 4.95 | 5.83 | |
| <i>Atriplex gardneri</i> | 1.08 | 4.53 | 5.83 | |
| <i>Ceratoides lanata</i> | 0.10 | 0.66 | 2.50 | |
| <i>Chrysothamnus nauseosus</i> | 2.58 | 5.99 | 19.17 | |
| <i>Eriogonum corymbosum</i> | 0.04 | 0.45 | 0.83 | |
| <i>Gutierrezia sarothrae</i> | 1.02 | 3.33 | 12.50 | |
| <i>Bassia prostrata</i> | 5.83 | 11.30 | 26.67 | |
| FORBS | | | | |
| <i>Eriogonum bicolor</i> | 0.04 | 0.45 | 0.83 | |
| <i>Halogeton glomeratus</i> | 1.42 | 5.85 | 9.17 | |
| <i>Machaeranthera canescens</i> | 0.38 | 2.90 | 2.50 | |
| <i>Machaeranthera grindelioides</i> | 0.13 | 1.36 | 0.83 | |
| <i>Malcomia africana</i> | 1.38 | 5.04 | 9.17 | |
| <i>Salsola tragus</i> | 0.08 | 0.91 | 0.83 | |
| GRASSES | | | | |
| <i>Elymus spicatus</i> | 0.83 | 4.35 | 5.00 | |
| <i>Elymus cinereus</i> | 0.17 | 1.11 | 2.50 | |
| <i>Elymus lanceolatus</i> | 3.34 | 6.73 | 26.67 | |
| <i>Elymus salinus</i> | 0.38 | 2.60 | 2.50 | |
| <i>Elymus smithii</i> | 3.52 | 7.75 | 23.33 | |
| <i>Stipa hymenoides</i> | 1.54 | 4.65 | 12.50 | |

Table 6: Des-Bee-Dove Mine. Total Cover and composition (2012).

| Sediment Pond Access Road | | | n=120 |
|----------------------------------|---------------------|---------------------------|-------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 26.29 | 11.91 | |
| Litter | 9.38 | 3.13 | |
| Bareground | 35.92 | 13.84 | |
| Rock | 28.42 | 13.78 | |
| B. % COMPOSITION | | | |
| Shrubs | 46.15 | 38.90 | |
| Forbs | 12.44 | 27.07 | |
| Grasses | 41.41 | 39.64 | |

Table 7: Des-Bee-Dove Mine. Woody Species Density (2012).

| Sediment Pond Access Road | | n=120 |
|----------------------------------|--------------------|-------|
| SPECIES | Number/Acre | |
| <i>Artemisia nova</i> | 59.18 | |
| <i>Atriplex canescens</i> | 173.59 | |
| <i>Atriplex confertifolia</i> | 260.38 | |
| <i>Atriplex corrugata</i> | 27.62 | |
| <i>Atriplex gardneri</i> | 90.74 | |
| <i>Bassia prostrata</i> | 457.64 | |
| <i>Ceratoides lanata</i> | 27.62 | |
| <i>Chrysothamnus nauseosus</i> | 461.58 | |
| <i>Ephedra viridis</i> | 3.95 | |
| <i>Eriogonum corymbosum</i> | 3.95 | |
| <i>Gutierrezia sarothrae</i> | 299.83 | |
| <i>Juniperus osteosperma</i> | 15.78 | |
| <i>Pinus edulis</i> | 11.84 | |
| TOTAL | 1893.68 | |

Table 8: Willow Creek Mine. Annual Biomass Production (2012).

Sediment Pond Access Road

(n=120; double sampling n=480)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 167.67 | 259.60 |
| Woody | 355.80 | 359.08 |
| TOTAL | 523.47 | 278.21 |

Table 9: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2012).

| Saltbush Shrub Reference Area | | | |
|--------------------------------------|---------------------|---------------------------|--------------------------|
| | | | n=80 |
| | Mean Percent | Standard Deviation | Percent Frequency |
| SHRUBS | | | |
| <i>Atriplex confertifolia</i> | 3.94 | 7.53 | 27.50 |
| <i>Atriplex gardneri</i> | 15.00 | 15.85 | 53.75 |
| <i>Chrysothamnus nauseosus</i> | 0.94 | 4.41 | 1.25 |
| <i>Eriogonum corymbosum</i> | 0.25 | 2.22 | 5.00 |
| <i>Sarcobatus vermiculatus</i> | 0.54 | 2.84 | 3.75 |
| <i>Suaeda nigra</i> | 0.21 | 1.35 | 2.50 |
| FORBS | | | |
| GRASSES | | | |
| <i>Elymus salinus</i> | 16.13 | 13.09 | 70.00 |

Table 10: Des-Bee-Dove Mine. Total Cover and composition (2012).

| Saltbush Shrub Reference Area | | |
|--------------------------------------|---------------------|---------------------------|
| | | n=80 |
| | Mean Percent | Standard Deviation |
| A. TOTAL COVER | | |
| Total Living Cover | 36.63 | 10.42 |
| Litter | 9.35 | 3.14 |
| Bareground | 32.63 | 15.67 |
| Rock | 21.40 | 11.47 |
| B. % COMPOSITION | | |
| Shrubs | 55.70 | 36.26 |
| Forbs | 0.00 | 0.00 |
| Grasses | 44.30 | 36.26 |

Table 11: Des-Bee-Dove Mine. Woody Species Density (2012).

| Saltbush Shrub Reference Area | | n=80 |
|--------------------------------------|--------------------|------|
| SPECIES | Number/Acre | |
| <i>Atriplex confertifolia</i> | 1328.97 | |
| <i>Atriplex gardneri</i> | 2589.43 | |
| <i>Chrysothamnus nauseosus</i> | 13.70 | |
| <i>Ephedra viridis</i> | 13.70 | |
| <i>Eriogonum corymbosum</i> | 287.71 | |
| <i>Gutierrezia sarothrae</i> | 13.70 | |
| <i>Juniperus osteosperma</i> | 41.10 | |
| <i>Sarcobatus vermiculatus</i> | 68.50 | |
| <i>Suaeda nigra</i> | 27.40 | |
| TOTAL | 4384.22 | |

Table 12: Willow Creek Mine. Annual Biomass Production (2012).

Saltbush Shrub Reference Area

(n=80; double sampling n=320)

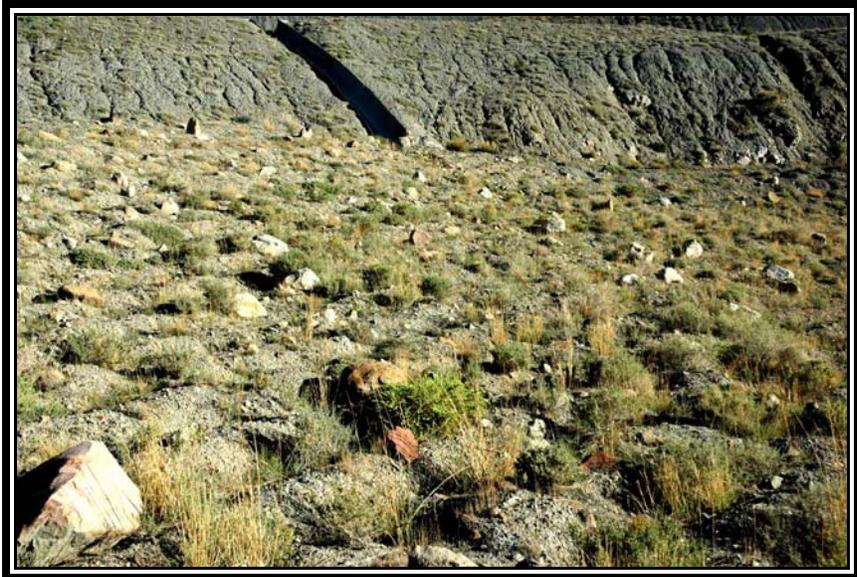
| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 301.24 | 324.85 |
| Woody | 410.67 | 437.66 |
| TOTAL | 711.91 | 222.79 |

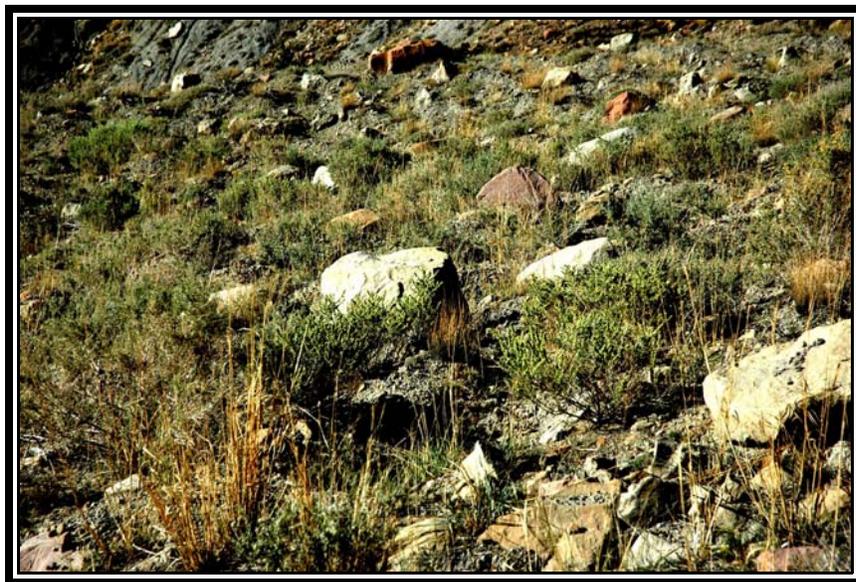
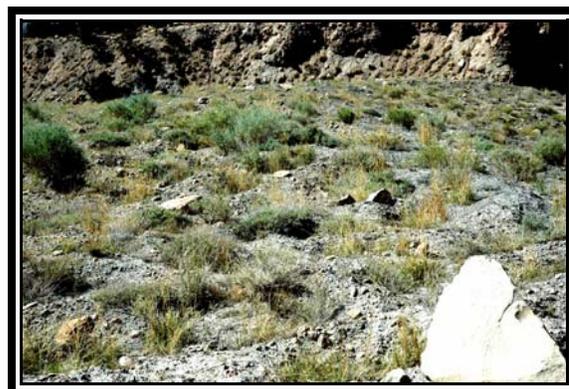
Table 13: Names of plant species listed in the summary tables.

| SCIENTIFIC NAMES | COMMON NAMES |
|-------------------------------------|-----------------------|
| TREES & SHRUBS | |
| <i>Artemisia nova</i> | Black sagebrush |
| <i>Atriplex canescens</i> | Fourwing saltbush |
| <i>Atriplex confertifolia</i> | Shadscale |
| <i>Atriplex corrugata</i> | Mat saltbush |
| <i>Atriplex gardneri</i> | Gardner saltbush |
| <i>Bassia prostrata</i> | Prostrate Kochia |
| <i>Ceratoides lanata</i> | Winterfat |
| <i>Chrysothamnus nauseosus</i> | Rubber rabbitbrush |
| <i>Ephedra viridis</i> | Mormon tea |
| <i>Eriogonum corymbosum</i> | Corymb buckwheat |
| <i>Gutierrezia sarothrae</i> | Broom snakeweed |
| <i>Juniperus osteosperma</i> | Utah juniper |
| <i>Pinus edulis</i> | Pinyon-pine |
| <i>Sarcobatus vermiculatus</i> | Greasewood |
| <i>Suaeda nigra</i> | Torrey's seepweed |
| FORBS | |
| <i>Eriogonum bicolor</i> | Pretty buckwheat |
| <i>Halogeton glomeratus</i> | Halogeton |
| <i>Machaeranthera canescens</i> | Hoary aster |
| <i>Machaeranthera grindelioides</i> | Gumweed aster |
| <i>Malcomia africana</i> | African mustard |
| <i>Salsola tragus</i> | Russian thistle |
| GRASSES | |
| <i>Agropyron cristatum</i> | Crested wheatgrass |
| <i>Elymus cinereus</i> | Gt. Basin wildrye |
| <i>Elymus lanceolatus</i> | Thickspike wheatgrass |
| <i>Elymus salinus</i> | Salina wildrye |
| <i>Elymus smithii</i> | Western wheatgrass |
| <i>Elymus spicatus</i> | Bluebunch wheatgrass |
| <i>Stipa hymenoides</i> | Indian ricegrass |

COLOR PHOTOGRAPHS
OF THE
SAMPLE AREAS

SEDIMENT POND AREA



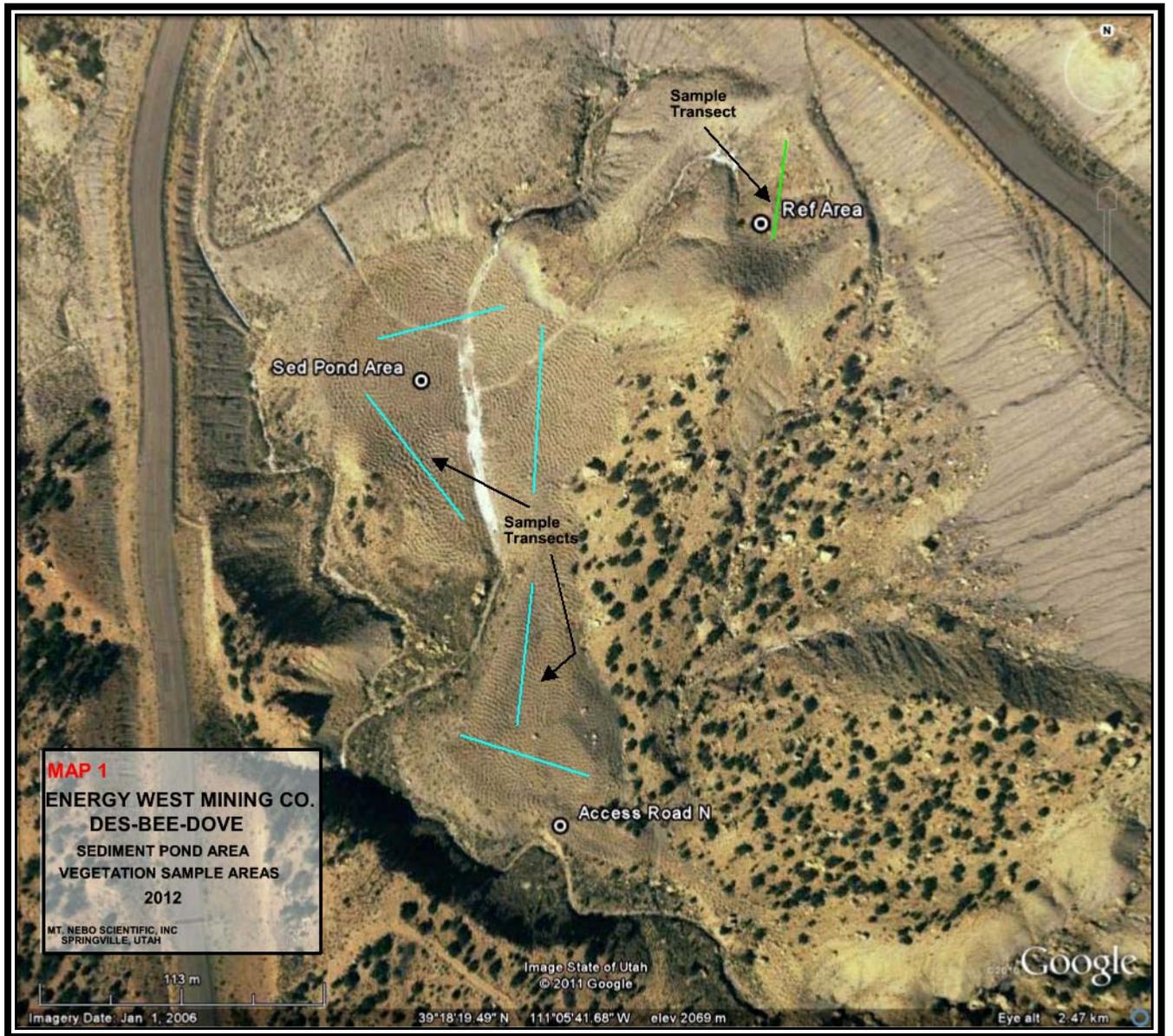


ACCESS ROAD





MAPS
OF THE
SAMPLE AREAS





REVEGETATION MONITORING
FOR PHASE III BOND RELEASE
DES-BEE-DOVE MINE SITE

YEAR TWO
2013



View from the reclaimed Bathhouse Slope

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February 2014



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INTRODUCTION

Scope

In 1987, after coal mining activities mining had been terminated at the Des-Bee-Dove Mine, in Emery County, Utah, it was put into the status of “temporary cessation”. *Energy West Mining Company* later began reclamation activities at the mine site, and by 2003 this work was completed. In 2004, or Year 1 following reclamation, the seeded plant species began to germinate and grow. Since that time, the restored plant communities have been monitored to document the progress in the reclaimed areas. Earlier documents submitted to the regulatory agencies reported updates on the revegetation process from sampling the area in 2005 (Year 2), 2007 (Year 4) and 2012 (Year 9).

Following reclamation activities, mine sites are required to provide enough time to pass for acceptable plant establishment before applications can be made for bond release. This time-frame, called the *Responsibility Period*, prescribes at least 10 years before the mine operator can submit a request for *Final or Phase III Bond Release* through the state of Utah. It has been estimated that this period of time is long enough to determine whether or not adequate re-establishment of a given reclaimed plant community has occurred on sites at this precipitation zone in the western United States. The vegetation of the reclaimed lands must meet specific state and federal requirements. Consequently, at the beginning of Year 9 of the 10-year period, intensive sampling can be initiated for two consecutive years to determine whether or not the reclaimed site has met pre-determined revegetation success standards. The revegetation success standards are derived from a *reference area*, or a native, undisturbed plant community chosen beforehand that approximates the mine site before it was disturbed by the mining activities. Data is recorded in the reference areas during the same sample period as the reclaimed areas.

In 2012, the reclaimed sites were quantitatively sampled to provide vegetation data for Year 9 following reclamation, or the *first year* results (**Year 1**) of the two consecutive years of sampling required prior to submittal of an application for bond release through the State of Utah,

Division of Oil, Gas & Mining (DOGGM). In 2013, the second consecutive year (**Year 2**), vegetation sampling was again accomplished in the reclaimed areas.

The purpose of this document is to compare reclaimed areas of the mine site with specific revegetation success standards to determine whether or not Phase III Bond Release may be warranted at the Des-Bee-Dove Mine site.

Brief History of Mining

The Des-Bee-Dove Mine site is an area with a long history of coal mining. State of Utah information documents reports that some of the first mining in the area occurred in 1898 when the Griffith Mine began. From 1936 to 1938, the mine workings were operated by two men, Edward and Broderick. Later, the LDS Church and Castle Valley Fuel Company conducted the mining from 1938 to 1947. Under the current name, the Des-Bee-Dove Mines, Utah Power and Light Company operated the mines until 1989. In 1990, Energy West Mining Company became the operator.

Site Description

The Des-Bee-Dove Mine site is located approximately 10 miles northwest of the town of Castle Dale, Utah. Elevation of the study sites ranged between 7,200 ft and 8,000 ft above sea level. Slopes of the study area were variable, but were often relatively steep and had various aspects.

Prior to disturbance by mining, the native vegetation was most likely dominated by pinyon-pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*), with Salina wildrye (*Elymus salinus*) as the most common understory species.

METHODS

Quadrat Placement

Sample quadrats for quantitative sampling of the vegetation were randomly placed throughout the reclaimed areas in an attempt to adequately represent each site. This was accomplished by randomly placing several transect lines through the entire lengths of each study area. Random numbers were then generated and used to measure distances at right angles from the lines to determine sample locations. Whether these random numbers were odd or even determined which side of the transect line a given quadrat was placed. The random numbers selected were high enough to place quadrats to the lateral limits of each sample area and all areas in-between.

Cover, Frequency & Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition and relative frequencies were also assessed from the quadrats. Plant nomenclature follows *A Utah Flora* (Welsh et al. 2008).

Biomass Production

Total annual biomass productivity was estimated by clipping, drying and weighing current annual growth in sample quadrats. "Double sampling" methods were employed by placing four additional quadrats around the clipped quadrat, then estimating the production of them relative to the clipped plot. Herbaceous and woody species production were clipped, weighed and recorded separately.

Diversity Indices

Two diversity indices have been employed to measure the reclaimed and reference areas.

MacArthur's Diversity Index is an effective diversity measurement and is computed using the following equation:

$$1/\sum pi^2$$

where,

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.

Another diversity measurement was provided that presents the *Average Number of Species* encountered at each quadrat.

Sample Size & Adequacy

Sampling adequacy was calculated using the formula given below.

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

where,

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

Confidence levels were calculated and reported at 80% (t) and 90% (t) with the desired change from the mean (d) placed at 0.10. Sample sizes were, however, also based on the size of each study area, resulting in more samples taken in larger areas.

Vegetation Sample Area Map

The locations of the general base map was prepared by *Energy West Mining Company*. A Vegetation Sample Area Map using this base map has been included in this report.

Photographs

Several electronic color photographs were taken of the sample areas and will be kept on file at *Mt. Nebo Scientific, Inc.* A number of representative photographs for each study site has been included in this report.

RESULTS

Sample Areas

Like the sampling design in the earlier 2012 study, in 2013 the reclaimed sites at the Des-Bee-Dove Mine were subdivided into separate study areas. The areas were first sampled and reported independently to allow closer scrutiny of individual sites. These areas, along with the sample size for each parameter, are shown on Table 1. The sample areas are also shown on the vegetation sample area map and color photographs provided later in this report.

Table 1: Sample areas, acreage and sample sizes of the reclaimed Des-Bee-Dove Mine site (2013).

| Sample Area | Acres | Cover (n) | Density (n) | Production (n) |
|-------------------------------|-------------|------------|-------------|----------------|
| Access Trail | 3.5 | 40 | 40 | 20 |
| East Slope | 5.0 | 80 | 80 | 40 |
| Bathhouse Slope | 7.6 | 120 | 120 | 60 |
| Deseret Mine | 2.7 | 50 | 50 | 25 |
| Switchbacks | 1.1 | 20 | 20 | 10 |
| Substation | 0.4 | 10 | 10 | 5 |
| Beehive/Little Dove Mine | 2.1 | 40 | 40 | 20 |
| Pinyon-Juniper Reference Area | 1.0 | 50 | 50 | 50 |
| TOTALS | 23.4 | 410 | 410 | 230 |

Separated Datasets

Results of quantitatively sampling the reclaimed areas at the Des-Bee-Dove Mine site have been provided in summary tables of this report. Because the total acreage of the reclaimed area is relatively large, it has been divided or *separated* into smaller sites to first enable a data review on an area-by-area basis. This design enables the reviewer to observe the successes (or failures) of individual reclaimed areas. Datasets were later *lumped* to make statistical comparisons with the revegetation success standards for Phase III Bond Release (more on that later).

A summary of the results of sampling each reclaimed area as well as the reference area is provided in this section of the report. To facilitate access to the cover, composition and density data for each sample area in this report refer to Table 2. The *separated* data summaries are shown on Table 3 *through* Table 34. A list of the common plant names found in the summary tables is shown on Table 38.

Table 2: Data Locator for the Des-Bee-Dove Mine (2013).

| SAMPLE AREA | Cover by Species | Total Cover | Composition | Woody Species Density | Production |
|-------------------------------|------------------|--------------|--------------|-----------------------|------------|
| Access Trail | Table 3 | Table 4 (A) | Table 4 (B) | Table 5 | Table 6 |
| East Slope | Table 7 | Table 8 (A) | Table 8 (B) | Table 9 | Table 10 |
| Bathhouse Slope | Table 11 | Table 12 (A) | Table 12 (B) | Table 13 | Table 14 |
| Deseret Mine Area | Table 15 | Table 16 (A) | Table 16 (B) | Table 17 | Table 18 |
| Switchbacks | Table 19 | Table 20 (A) | Table 20 (B) | Table 21 | Table 22 |
| Substation Area | Table 23 | Table 24 (A) | Table 24 (B) | Table 25 | Table 26 |
| Beehive/Little Dove Mine Area | Table 27 | Table 28 (A) | Table 28 (B) | Table 29 | Table 30 |
| Pinyon-Juniper Reference Area | Table 31 | Table 32 (A) | Table 32 (B) | Table 33 | Table 34 |

Access Trail

The vegetation at the reclaimed Access Trail was dominated equally by fourwing saltbush (*Atriplex canescens*) and shadscale (*A. confertifolia*), followed by Palmer penstemon (*Penstemon palmeri*) and rubber rabbitbrush (*Chrysothamnus nauseosus*). Other important species here were bluebunch wheatgrass (*Elymus spicatus*), western wheatgrass (*E. smithii*), thickspike wheatgrass (*E. lanceolatus*) and Russian wildrye (*E. junceum*). For a list of all species encountered in the sample quadrats, refer to Table 3.

The total living cover in this area was estimated at 42.25% (Table 4-A). The living cover's lifeform composition consisted of 44.07% shrubs, 37.53% grasses and 18.40% forbs (Table 4-B). Woody species density measurements totaled 4,187 individuals per acre – the dominant shrubs here were fourwing saltbush, shadscale and rubber rabbitbrush (Table 5).

Lastly, the total annual biomass production for the Access Trail site was measured at 1,054.91 pounds per acre, which was nearly equally represented by woody and herbaceous plant species (Table 6).

East Slope

The dominant plants at the East Slope were: fourwing saltbush, western wheatgrass, shadscale and Gt. Basin wildrye (*Elymus cinereus*), however, several other well-represented species were also encountered in the sample quadrats (Table 7).

Total living cover in the area was estimated at 45.69% (Table 8-A) and was comprised of 55.55% grasses, 35.49% shrubs and 8.96% forbs (Table 8-B).

The total density of the woody plants was measured at 2,774 individuals per acre with dominants that included shadscale, fourwing saltbush and rubber rabbitbrush (Table 9).

The total annual biomass production for the East Slope was 1,037.87 pounds per acre of which 594.92 came from herbaceous and 442.95 from woody plants (Table 10).

Bathhouse Slope

Like the East Slope described above, the Bathhouse Slope was a relatively large study area. The plants that dominated this area were rubber rabbitbrush, bluebunch wheatgrass and Gt. Basin wildrye (Table 11).

The total living cover at this study area was estimate at 50.25% (Table 12-A). The lifeform composition of the cover consisted of 49.67% grasses, 38.21% shrubs and 12.12% forbs (Table 12-B).

Woody species density for the Bathhouse Slope was measured at 4,086 plants per acre. The dominant shrubs in the density measurements were rubber rabbitbrush, shadscale and fourwing saltbush (Table 13).

Finally, the production at the site totaled 1,329.07 pounds per acre of which was nearly equally represented by woody and herbaceous plants (Table 14).

Deseret Mine

The Deseret Mine study area was dominated by Gt. Basin wildrye, bluebunch wheatgrass fourwing saltbush, western wheatgrass and shadscale (Table 15).

The total living cover at this site was 51.70% (Table 16-A) and was comprised of 67.96% grasses, 23.50% shrubs and 8.54% forbs (Table 16-B).

Woody species measurements showed the area had a total of 2,961 plants per acre with the dominant shrubs being winterfat (*Ceratoides lanata*), shadscale, fourwing saltbush and rubber rabbitbrush (Table 17).

The total annual production was estimated at 1,389.47 pounds per acre and was comprised of 854.64 pounds of herbaceous and 534.83 pounds of woody plant species (Table 18).

Switchbacks

A relatively small area, the Switchbacks, is often greatly impacted by cattle on their way to and from grazing the high country. The site was dominated by shadscale, halogeton (*Halogeton glomeratus*), western wheatgrass, and rubber rabbitbrush (Table 19).

This area had a total living cover of 36.00% (Table 20-A); the composition of it was 39.99% shrubs, 36.11% grasses and 23.90% forbs (Table 20-B).

The total woody species density was measured at 2,436 individuals per acre and was greatly dominated by fourwing saltbush and rubber rabbitbrush (Table 21).

The total annual production here was 970.86 pounds per acre, most of which was comprised of woody plants (Table 22).

Substation

Another relatively small sample site was the Substation area. The site was dominated by western wheatgrass, fourwing saltbush and thickspike wheatgrass (Table 23).

The Substation site had a total living cover of 36.50% (Table 24-A) and was comprised of 63.40% grasses, 36.60 grasses with no forbs present in the samples (Table 24-B).

Total density for the woody plants was measured at 2,379 individuals per acre (Table 25). This density was dominated by shadscale, fourwing saltbush and rubber rabbitbrush.

The area had a total biomass production of 749.56 pounds per acre which was represented entirely by woody plants (Table 26).

Beehive/Little Dove Mine

A somewhat larger area than the above two sample areas was the Beehive/Little Dove site. The site was dominated by fourwing saltbush, Gt. Basin wildrye and western wheatgrass (Table 27).

The total living cover for this area was estimated at 45.63% (Table 28-A); it had a composition of 55.23% grasses, 43.71% shrubs and 1.06% forbs (Table 28-B).

Woody species density of the Beehive/Little Dove site had a total of 3,434 plants per acre and was dominated by fourwing saltbush and shadscale (Table 29).

Lastly, the total annual production of the area was 1,242.58 pounds per acre which consisted of 882.07 pounds of woody and 360.51 pounds of herbaceous plants (Table 30).

Pinyon-Juniper Reference Area

The Pinyon-Juniper Reference Area, or the area previously chosen to represent revegetation success standards, was also sampled in 2012 and 2013 to make data comparisons with the reclaimed areas. Like 2012, the sample results for 2013 show this reference area to be dominated by Salina wildrye (*Elymus salinus*), pinyon-pine (*Pinus edulis*), Mormon tea (*Ephedra viridis*) and curl-leaf mountain-mahogany (*Cercocarpus ledifolius*). Table 31 lists all the species found in the sample quadrats by cover and frequency values.

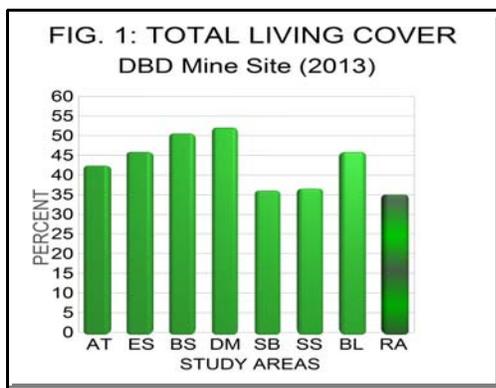
The total living cover of the reference area was 35.00%, of which 29.70% came from understory cover and 5.30% from overstory (Table 32-A). The understory cover had a composition of 75.59% grasses, 24.08% trees/shrubs and 0.33% forb species (Table 32-B).

The total woody species density of the area was 1,056 plants per acre and was dominated by Mormon tea, curl-leaf mountain-mahogany and pinyon-pine (Table 33).

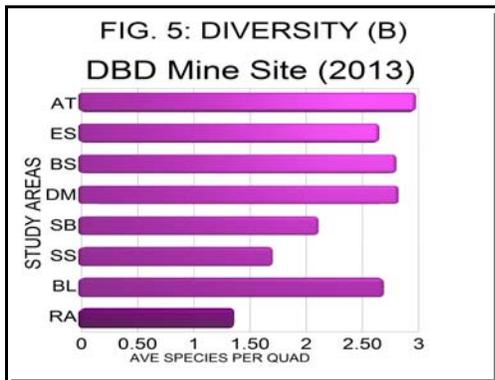
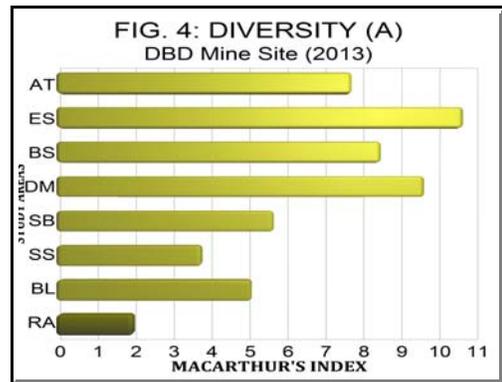
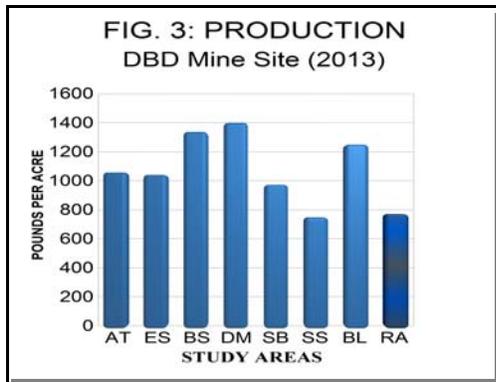
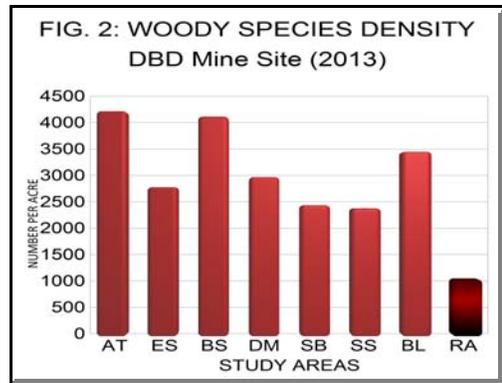
The total annual biomass production for the reference area was 771.26 pounds per acre which was made up of 442.24 pounds of herbaceous species and 329.02 pounds from woody species (Table 34).

Comparisons of Separated Datasets

Provided below are graphic comparisons showing the 2013 summaries for total living cover, woody species density, annual biomass production and diversity indices for each reclaimed



study area described above (Figs. 1-5)*. The summary data for the Pinyon-Juniper Reference Area have also been included in the graphs.



*Figure Legend: AT=Access Trail; ES=East Slope; BS=Bathroom Slope; DM=Deseret Mine; SB=Switchbacks; SS=Substation; BL=Beehive/Little Dove; RA=Reference Area.

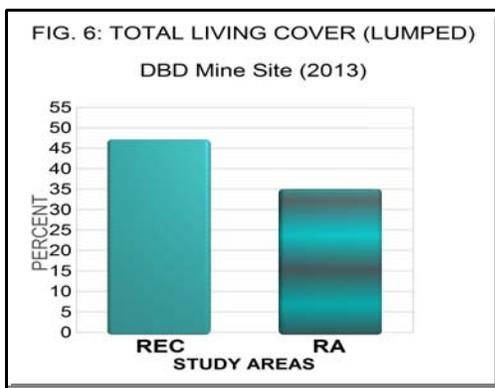
Separating vs Lumping Data

Similar to the 2012 data reported in an earlier report, the section above provides the 2013 summary data for each study area including individual reclaimed sites as well as the reference area. As important as it is to be able to review individual reclaimed areas by separating the datasets, lumping (combining) the data of the reclaimed study areas and comparing the key parameters statistically with the reference area, is the next most logical rationale in the process of comparing and considering the reclaimed mine site for Phase III Bond Release.

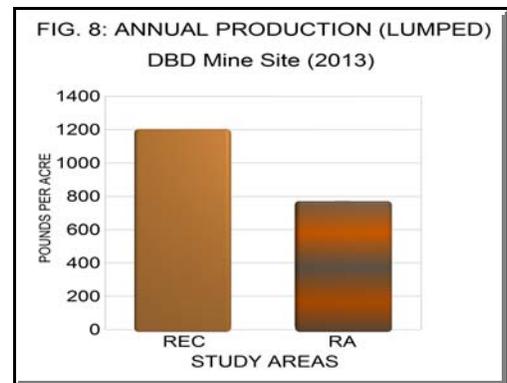
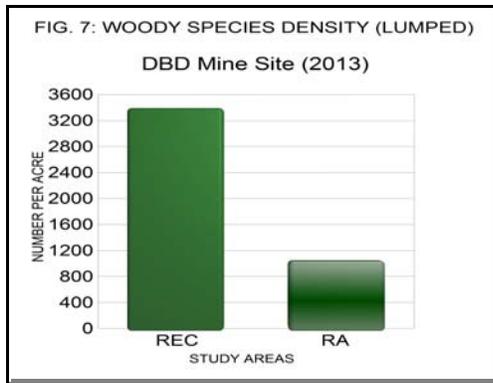
Lumped Datasets

There was a significant amount of vegetation data collected at the Des-Bee-Dove Mine site in 2013 to measure the revegetation success and compare it to the revegetation success standards.

Though much data has been recorded in the area, the author has attempted to find a logical and straightforward method to compare the applicable parameters (those suggested by state and federal regulations) using statistics to determine revegetation success, yet also provide other meaningful data (that cannot readily be compared using statistics). Because the Des-Bee-Dove Mine site has been reclaimed to a single vegetation type (Pinyon-Juniper community), the site was only compared to one reference area – the Pinyon-Juniper Reference Area. That said, for the parameters applicable to Phase III Bond Release that will be compared statistically, the reclaimed study sites have been lumped for comparisons with



the reference area. Lumped dataset summaries have been provided in Tables 35 through 37; they have been compared to the reference area data mentioned earlier (Tables 32 through 34). Figs. 6-8* provides graphs of the lumped areas compared to the reference area.



*Figure Legend: REC=Reclaimed Areas; RA=Reference Area.

Statistical Comparisons

Statistical analyses comparing the reclaimed areas with the reference area for the fundamental parameters in determining the possibility for Phase III Bond Release have been employed. Student's t-tests indicate that for total living cover, woody species density and annual biomass production of the reclaimed areas had statistical significant higher values for all of these parameters (Fig. 9).

FIG. 9. Statistical Analyses - Student's t-tests comparing total living cover, woody species density and annual biomass production for the *lumped* reclaimed and reference areas (2013).

Total Living Cover

Reclaimed Areas: \bar{x} =46.86; s=12.70; n=360

Reference Area: \bar{x} =35.00; s=7.00; n=50

t = 6.4638; df = 408; SL= p<0.01

Woody Species Density

Reclaimed Areas: \bar{x} =3311.60; s=1550.22; n=360

Reference Area: \bar{x} =1056.06; s=266.27; n=50

t = 10.2568; df = 408; SL= p<0.01

Annual Biomass Production

Reclaimed Areas: \bar{x} =1196.68; s=421.47; n=175

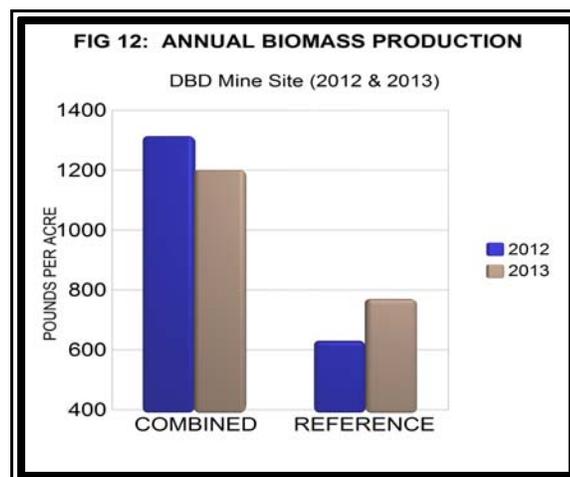
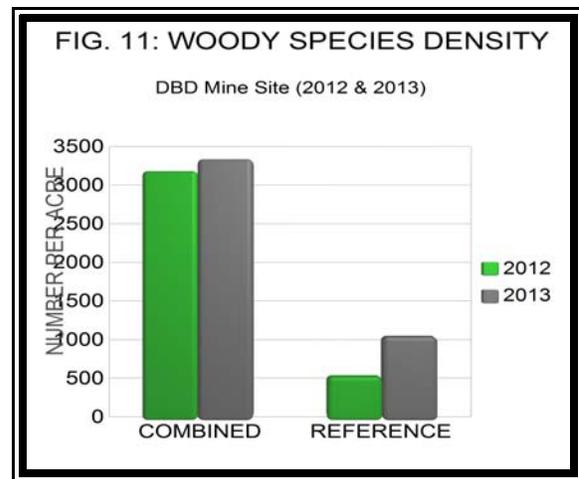
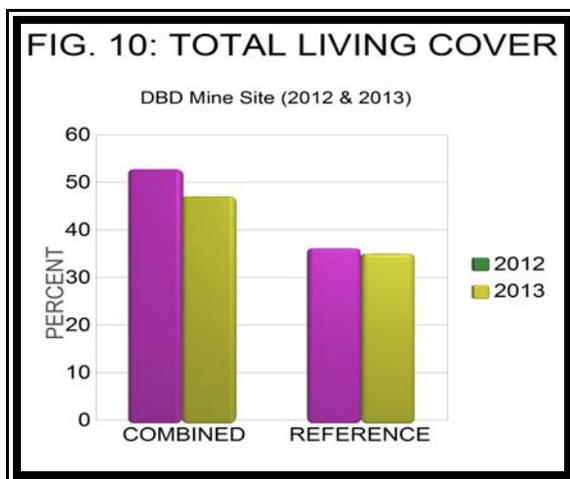
Reference Area: \bar{x} =771.26; s=302.33; n=50

t = 6.6597; df= 223 ; SL= p<0.01

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

Comparisons Between Years

Although the scope of this report was to show the findings of the 2013 vegetation sampling for Year 2 of the two consecutive sample years required for Phase III Bond Release (as mentioned, Year 1 report was previously submitted for the 2012 sample year), two-year comparisons of the primary parameters used for comparisons with the reference area has been shown graphically below (Figs 10-12).



SUMMARY & CONCLUSIONS

This report provides the findings for the vegetation sampling and presents the data necessary for **Year 2** of *two consecutive years* to ascertain whether or not the mine site has met revegetation success standards, thus meeting requirements needed to ultimately apply for Phase III or Final Bond Release. An earlier report was submitted that provided **Year 1** sample results.

Mining at the Des-Bee-Dove coal mine terminated in the 1980s. Reclamation began later began and by 2003, final reclamation was completed. The mine site was revegetated using a seed mixture that was conducive to restoring an approximation of the original native plant communities that were once supported in the area prior to their disturbance. Intensive quantitative vegetation sampling was conducted within these reclaimed areas in 2012 and 2013. In accordance with state and federal regulations, specific standards for revegetation success must be achieved prior to bond release.

As a means to compare data for specific sites within the reclaimed areas, datasets were first presented *separately*. Later, data for the reclaimed areas were *lumped* (combined) making them more appropriate to be used for statistical comparisons as a whole with the reference area.

The *separated data* shows the differences between each study site as well as comparisons with the reference area. It also shows additional information of individual sites including lifeform composition, frequency, species presence and diversity as well as the more fundamental parameters such as total living cover, density and annual biomass productivity.

The *lumped data* of the reclaimed sites focuses on the total living cover, woody species density and production. The summaries of the lumped datasets, when compared statistically with the reference area, suggest that they have met or exceeded those standards pre-determined for revegetation success.

In conclusion, the Year 2 sampling results show that the restored plant communities at the Des-

Bee-Dove Mine site met or exceeded all final revegetation success standards. When considering the 2013 findings as well as those submitted previously for 2012, it appears Phase III Bond Release at the Des-Bee Dove Mine may be warranted.

DATA SUMMARY TABLES
(2013)

Table 3: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2013).

| Access Trail | | | n=40 |
|--------------------------------|-------------------------|-------------------------------|------------------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| TREES/SHRUBS | | | |
| <i>Atriplex canescens</i> | 11.88 | 15.40 | 50.00 |
| <i>Atriplex confertifolia</i> | 11.88 | 15.40 | 35.00 |
| <i>Chrysothamnus nauseosus</i> | 3.00 | 6.40 | 22.50 |
| <i>Juniperus osteosperma</i> | 0.13 | 0.78 | 2.50 |
| FORBS | | | |
| <i>Penstemon palmeri</i> | 7.00 | 8.28 | 55.00 |
| GRASSES | | | |
| <i>Elymus junceus</i> | 2.50 | 4.33 | 27.50 |
| <i>Elymus lanceolatus</i> | 2.58 | 4.54 | 27.50 |
| <i>Elymus salinus</i> | 0.25 | 1.56 | 2.50 |
| <i>Elymus smithii</i> | 5.43 | 6.84 | 47.50 |
| <i>Elymus spicatus</i> | 2.75 | 6.89 | 17.50 |
| <i>Stipa hymenoides</i> | 0.88 | 3.14 | 7.50 |

Table 4: Des-Bee-Dove Mine. Total Cover and composition (2013).

| Access Trail | | | n=40 |
|-----------------------|-------------------------|-------------------------------|------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 42.25 | 13.32 | |
| Litter | 11.50 | 4.21 | |
| Bareground | 22.75 | 10.12 | |
| Rock | 23.50 | 9.30 | |
| B. COMPOSITION | | | |
| Shrubs | 44.07 | 27.05 | |
| Forbs | 18.40 | 22.00 | |
| Grasses | 37.53 | 22.38 | |

Table 5: Des-Bee-Dove Mine. Woody Species Density (2013).

| Access Trail | | n=40 |
|--------------------------------|--------------------|------|
| SPECIES | Number/Acre | |
| <i>Atriplex canescens</i> | 1805.47 | |
| <i>Atriplex confertifolia</i> | 1255.98 | |
| <i>Ceratoides lanata</i> | 52.33 | |
| <i>Chrysothamnus nauseosus</i> | 915.82 | |
| <i>Eriogonum corymbosum</i> | 52.33 | |
| <i>Gutierrezia sarothrae</i> | 52.33 | |
| <i>Juniperus osteosperma</i> | 52.33 | |
| TOTAL | 4186.59 | |

Table 6: Des-Bee-Dove Mine. Annual Biomass Production (2013).

Access Trail

(n=20; double sampling n=80)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 481.68 | 620.15 |
| Woody | 573.23 | 587.85 |
| TOTAL | 1054.91 | 421.80 |

Table 7: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2013).

| East Slope | | | n=80 |
|--------------------------------|---------------------|---------------------------|--------------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| SHRUBS | | | |
| <i>Atriplex canescens</i> | 7.06 | 12.98 | 31.25 |
| <i>Atriplex confertifolia</i> | 4.50 | 7.52 | 32.50 |
| <i>Ceratoides lanata</i> | 0.44 | 3.89 | 1.25 |
| <i>Cercocarpus ledifolius</i> | 1.00 | 5.56 | 5.00 |
| <i>Chrysothamnus nauseosus</i> | 3.13 | 7.56 | 18.75 |
| <i>Eriogonum corymbosum</i> | 0.50 | 3.92 | 2.50 |
| FORBS | | | |
| <i>Halogeton glomeratus</i> | 0.06 | 0.56 | 1.25 |
| <i>Penstemon palmeri</i> | 3.63 | 5.64 | 35.00 |
| GRASSES | | | |
| <i>Agropyron cristatum</i> | 0.69 | 5.11 | 2.50 |
| <i>Elymus cinereus</i> | 3.66 | 8.56 | 22.50 |
| <i>Elymus junceus</i> | 2.81 | 6.79 | 17.50 |
| <i>Elymus lanceolatus</i> | 2.44 | 6.80 | 16.25 |
| <i>Elymus salinus</i> | 2.94 | 9.18 | 11.25 |
| <i>Elymus smithii</i> | 6.78 | 12.50 | 35.00 |
| <i>Elymus spicatus</i> | 3.63 | 8.21 | 18.75 |
| <i>Stipa hymenoides</i> | 2.44 | 8.02 | 11.25 |

Table 8: Des-Bee-Dove Mine. Total Cover and composition (2013).

| East Slope | | n=80 |
|-----------------------|---------------------|---------------------------|
| | Mean Percent | Standard Deviation |
| A. TOTAL COVER | | |
| Total Living Cover | 45.69 | 11.83 |
| Litter | 11.63 | 3.60 |
| Bareground | 17.13 | 8.43 |
| Rock | 25.56 | 11.73 |
| B. COMPOSITION | | |
| Shrubs | 35.49 | 27.33 |
| Forbs | 8.96 | 14.78 |
| Grasses | 55.55 | 28.25 |

Table 9: Des-Bee-Dove Mine. Woody Species Density (2013).

| East Slope | | n=80 |
|--------------------------------|--------------------|--------------|
| SPECIES | Number/Acre | No/Ac |
| <i>Atriplex canescens</i> | 875.51 | |
| <i>Atriplex confertifolia</i> | 1178.90 | |
| <i>Cercocarpus ledifolius</i> | 95.35 | |
| <i>Chrysothamnus nauseosus</i> | 502.77 | |
| <i>Eriogonum corymbosum</i> | 86.68 | |
| <i>Gutierrezia sarothrae</i> | 8.67 | |
| <i>Juniperus osteosperma</i> | 26.01 | |
| TOTAL | 2773.89 | |

Table 10: Des-Bee-Dove Mine. Annual Biomass Production (2013).

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 594.92 | 499.12 |
| Woody | 442.95 | 637.81 |
| TOTAL | 1037.87 | 359.01 |

Table 11: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2013).

| Bathhouse Slope | | | n=120 |
|------------------------------------|-------------------------|-------------------------------|------------------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| TREES/SHRUBS | | | |
| <i>Amelanchier utahensis</i> | 0.04 | 0.45 | 0.83 |
| <i>Atriplex canescens</i> | 2.79 | 8.63 | 13.33 |
| <i>Atriplex confertifolia</i> | 4.54 | 9.87 | 24.17 |
| <i>Cercocarpus ledifolius</i> | 0.46 | 3.65 | 1.67 |
| <i>Chrysothamnus nauseosus</i> | 10.96 | 14.26 | 51.67 |
| <i>Chrysothamnus viscidiflorus</i> | 0.25 | 2.73 | 0.83 |
| <i>Eriogonum corymbosum</i> | 0.46 | 3.42 | 2.50 |
| FORBS | | | |
| <i>Aster sp.</i> | 0.71 | 3.99 | 3.33 |
| <i>Malcolmia africana</i> | 0.17 | 1.82 | 0.83 |
| <i>Penstemon palmeri</i> | 4.83 | 7.04 | 45.83 |
| GRASSES | | | |
| <i>Agropyron cristatum</i> | 0.33 | 3.64 | 0.83 |
| <i>Elymus cinereus</i> | 7.13 | 11.76 | 34.17 |
| <i>Elymus junceus</i> | 1.67 | 5.18 | 10.83 |
| <i>Elymus lanceolatus</i> | 1.38 | 4.61 | 13.33 |
| <i>Elymus smithii</i> | 4.83 | 10.72 | 26.67 |
| <i>Elymus spicatus</i> | 8.33 | 13.19 | 37.50 |
| <i>Stipa hymenoides</i> | 1.38 | 4.47 | 10.00 |

Table 12: Des-Bee-Dove Mine. Total Cover and composition (2013).

| Bathhouse Slope | | | n=120 |
|------------------------|-------------------------|-------------------------------|-------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 50.25 | 12.79 | |
| Litter | 11.04 | 4.23 | |
| Bareground | 12.50 | 6.92 | |
| Rock | 26.21 | 11.74 | |
| B. COMPOSITION | | | |
| Shrubs | 38.21 | 29.10 | |
| Forbs | 12.12 | 18.07 | |
| Grasses | 49.67 | 30.69 | |

Table 13: Des-Bee-Dove Mine. Woody Species Density (2013).

| Bathhouse Slope | | n=120 |
|------------------------------------|--------------------|-------|
| SPECIES | Number/Acre | |
| <i>Amelanchier utahensis</i> | 17.03 | |
| <i>Artemisia tridentata</i> | 17.03 | |
| <i>Atriplex canescens</i> | 519.31 | |
| <i>Atriplex confertifolia</i> | 1174.83 | |
| <i>Cercocarpus ledifolius</i> | 51.08 | |
| <i>Chrysothamnus nauseosus</i> | 2213.45 | |
| <i>Eriogonum corymbosum</i> | 68.11 | |
| <i>Chrysothamnus viscidiflorus</i> | 25.54 | |
| <i>Ceratoides lanata</i> | 0.00 | |
| TOTAL | 4086.37 | |

Table 14: Des-Bee-Dove Mine. Annual Biomass Production (2013).

Bathhouse Slope

(n=60; double sampling n=240)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 684.09 | 705.09 |
| Woody | 644.98 | 726.86 |
| TOTAL | 1329.07 | 378.69 |

Table 15: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2013).

| Deseret Mine | | | |
|--------------------------------|--------------|--------------------|-------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| n=50 | | | |
| SHRUBS | | | |
| <i>Atriplex canescens</i> | 4.60 | 11.22 | 20.00 |
| <i>Atriplex confertifolia</i> | 3.90 | 10.06 | 18.00 |
| <i>Ceratoides lanata</i> | 1.50 | 3.50 | 18.00 |
| <i>Cercocarpus ledifolius</i> | 0.30 | 2.10 | 2.00 |
| <i>Chrysothamnus nauseosus</i> | 2.60 | 6.58 | 18.00 |
| <i>Eriogonum corymbosum</i> | 0.70 | 4.24 | 4.00 |
| FORBS | | | |
| <i>Penstemon palmeri</i> | 4.10 | 7.40 | 34.00 |
| GRASSES | | | |
| <i>Bromus tectorum</i> | 0.40 | 2.20 | 4.00 |
| <i>Agropyron cristatum</i> | 0.40 | 1.96 | 4.00 |
| <i>Elymus cinereus</i> | 13.30 | 14.51 | 58.00 |
| <i>Elymus junceus</i> | 2.70 | 7.76 | 14.00 |
| <i>Elymus lanceolatus</i> | 1.50 | 3.50 | 18.00 |
| <i>Elymus salinus</i> | 1.20 | 5.96 | 4.00 |
| <i>Elymus smithii</i> | 4.20 | 8.91 | 24.00 |
| <i>Elymus spicatus</i> | 9.40 | 14.68 | 34.00 |
| <i>Stipa hymenoides</i> | 0.90 | 3.96 | 6.00 |

Table 16: Des-Bee-Dove Mine. Total Cover and composition (2013).

| Deseret Mine | | |
|-----------------------|--------------|--------------------|
| | Mean Percent | Standard Deviation |
| n=50 | | |
| A. TOTAL COVER | | |
| Total Living Cover | 51.70 | 12.15 |
| Litter | 13.60 | 7.21 |
| Bareground | 12.30 | 8.84 |
| Rock | 22.40 | 12.18 |
| B. COMPOSITION | | |
| Shrubs | 23.50 | 24.34 |
| Forbs | 8.54 | 16.91 |
| Grasses | 67.96 | 26.41 |

Table 17: Des-Bee-Dove Mine. Woody Species Density (2013).

| Deseret Mine | | n=50 |
|--------------------------------|--------------------|------|
| SPECIES | Number/Acre | |
| <i>Atriplex canescens</i> | 681.09 | |
| <i>Atriplex confertifolia</i> | 740.31 | |
| <i>Cercocarpus ledifolius</i> | 14.81 | |
| <i>Ceratoides lanata</i> | 977.21 | |
| <i>Chrysothamnus nauseosus</i> | 503.41 | |
| <i>Eriogonum corymbosum</i> | 44.42 | |
| TOTAL | 2961.26 | |

Table 18: Des-Bee-Dove Mine. Annual Biomass Production (2013).

Deseret Mine

(n=25; double sampling n=100)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 854.64 | 677.09 |
| Woody | 534.83 | 776.51 |
| TOTAL | 1389.47 | 383.72 |

Table 19: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2013).

| Switchbacks | | | n=20 |
|--------------------------------|-------------------------|-------------------------------|------------------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| SHRUBS | | | |
| <i>Atriplex canescens</i> | 10.00 | 12.04 | 45.00 |
| <i>Atriplex confertifolia</i> | 0.25 | 1.09 | 5.00 |
| <i>Chrysothamnus nauseosus</i> | 4.50 | 9.60 | 20.00 |
| FORBS | | | |
| <i>Halogeton glomeratus</i> | 7.50 | 10.78 | 35.00 |
| <i>Penstemon palmeri</i> | 0.50 | 1.50 | 10.00 |
| GRASSES | | | |
| <i>Elymus cinereus</i> | 3.50 | 8.96 | 15.00 |
| <i>Elymus lanceolatus</i> | 1.75 | 4.26 | 15.00 |
| <i>Elymus smithii</i> | 7.25 | 6.98 | 60.00 |
| <i>Elymus spicatus</i> | 0.75 | 3.27 | 5.00 |

Table 20: Des-Bee-Dove Mine. Total Cover and composition (2013).

| Switchbacks | | | n=20 |
|-----------------------|-------------------------|-------------------------------|------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 36.00 | 4.36 | |
| Litter | 11.25 | 4.71 | |
| Bareground | 28.75 | 6.10 | |
| Rock | 24.00 | 7.18 | |
| B. COMPOSITION | | | |
| Shrubs | 39.99 | 31.27 | |
| Forbs | 23.90 | 33.49 | |
| Grasses | 36.11 | 26.26 | |

Table 21: Des-Bee-Dove Mine. Woody Species Density (2013).

| Switchbacks | | n=20 |
|--------------------------------|--------------------|------|
| SPECIES | Number/Acre | |
| <i>Atriplex canescens</i> | 1583.30 | |
| <i>Atriplex confertifolia</i> | 152.24 | |
| <i>Chrysothamnus nauseosus</i> | 700.31 | |
| TOTAL | 2435.85 | |

Table 22: Des-Bee-Dove Mine. Annual Biomass Production (2013).

Switchbacks

(n=10; double sampling n=40)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 71.39 | 214.16 |
| Woody | 899.47 | 368.80 |
| TOTAL | 970.86 | 231.21 |

Table 23: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2013).

| Substation | | | n=10 |
|--------------------------------|-------------------------|-------------------------------|------------------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| SHRUBS | | | |
| <i>Atriplex canescens</i> | 11.00 | 13.93 | 40.00 |
| <i>Atriplex confertifolia</i> | 2.00 | 6.00 | 10.00 |
| <i>Chrysothamnus nauseosus</i> | 2.00 | 6.00 | 10.00 |
| FORBS | | | |
| GRASSES | | | |
| <i>Elymus cinereus</i> | 2.00 | 6.00 | 10.00 |
| <i>Elymus lanceolatus</i> | 6.50 | 10.50 | 30.00 |
| <i>Elymus smithii</i> | 13.00 | 10.77 | 70.00 |

Table 24: Des-Bee-Dove Mine. Total Cover and composition (2013).

| Substation | | | n=10 |
|-----------------------|-------------------------|-------------------------------|------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 36.50 | 7.43 | |
| Litter | 10.50 | 1.50 | |
| Bareground | 25.50 | 7.57 | |
| Rock | 27.50 | 7.16 | |
| B. COMPOSITION | | | |
| Shrubs | 36.60 | 30.40 | |
| Forbs | 0.00 | 0.00 | |
| Grasses | 63.40 | 38.40 | |

Table 25: Des-Bee-Dove Mine. Woody Species Density (2013).

| Substation | | n=10 |
|--------------------------------|--------------------|------|
| SPECIES | Number/Acre | |
| <i>Amelanchier utahensis</i> | 59.47 | |
| <i>Atriplex canescens</i> | 892.00 | |
| <i>Atriplex confertifolia</i> | 1010.94 | |
| <i>Chrysothamnus nauseosus</i> | 416.27 | |
| TOTAL | 2378.67 | |

Table 26: Des-Bee-Dove Mine. Annual Biomass Production (2013).

Substation

(n=5; double sampling n=20)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 0.00 | 0.00 |
| Woody | 749.56 | 164.34 |
| TOTAL | 749.56 | 164.34 |

Table 27: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2013).

| Beehive/Little Dove Mine | | | | n=40 |
|---------------------------------|-------------------------|-------------------------------|------------------------------|------|
| | Mean Percent | Standard Deviation | Percent Frequency | |
| SHRUBS | | | | |
| <i>Atriplex canescens</i> | 18.38 | 14.93 | 95.00 | |
| <i>Atriplex confertifolia</i> | 1.50 | 3.74 | 15.00 | |
| <i>Chrysothamnus nauseosus</i> | 0.38 | 1.73 | 4.00 | |
| FORBS | | | | |
| <i>Penstemon palmeri</i> | 0.38 | 1.32 | 7.50 | |
| GRASSES | | | | |
| <i>Agropyron cristatum</i> | 1.38 | 4.33 | 10.00 | |
| <i>Elymus cinereus</i> | 8.38 | 12.57 | 40.00 | |
| <i>Elymus junceus</i> | 0.88 | 3.52 | 7.50 | |
| <i>Elymus lanceolatus</i> | 2.38 | 5.91 | 15.00 | |
| <i>Elymus salinus</i> | 2.00 | 8.12 | 10.00 | |
| <i>Elymus smithii</i> | 7.25 | 9.08 | 50.00 | |
| <i>Elymus spicatus</i> | 2.75 | 9.42 | 12.50 | |

Table 28: Des-Bee-Dove Mine. Total Cover and composition (2013).

| Beehive/Little Dove Mine | | | n=40 |
|---------------------------------|-------------------------|-------------------------------|------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 45.63 | 10.97 | |
| Litter | 12.50 | 4.18 | |
| Bareground | 20.13 | 9.32 | |
| Rock | 21.75 | 8.55 | |
| B. COMPOSITION | | | |
| Shrubs | 43.71 | 28.70 | |
| Forbs | 1.06 | 3.85 | |
| Grasses | 55.23 | 28.81 | |

Table 29: Des-Bee-Dove Mine. Woody Species Density (2013).

| Beehive/Little Dove Mine | | n=40 |
|---------------------------------|--------------------|------|
| SPECIES | Number/Acre | |
| <i>Atriplex canescens</i> | 2532.51 | |
| <i>Atriplex confertifolia</i> | 772.63 | |
| <i>Chrysothamnus nauseosus</i> | 85.85 | |
| <i>Gutierrezia sarothrae</i> | 42.92 | |
| TOTAL | 3433.91 | |

Table 30: Des-Bee-Dove Mine. Annual Biomass Production (2013).

| Beehive/Little Dove Mine | | (n=20; double sampling n=80) | |
|---------------------------------|--------------------|------------------------------|------------------|
| LIFEFORM | Pounds/Acre | | |
| | | MEAN | STD. DEV. |
| Herbaceous | | | |
| Woody | | 360.51 | 575.87 |
| | | 882.07 | 756.66 |
| TOTAL | | 1242.58 | 517.84 |

Table 31: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2013)

n=50

Pinyon-Juniper Reference Area

| | Mean Percent | Standard Deviation | Percent Frequency |
|--------------------------------|--------------|--------------------|-------------------|
| OVERSTORY | | | |
| <i>Cercocarpus ledifolius</i> | 2.20 | 6.10 | 12.00 |
| <i>Pinus edulis</i> | 3.10 | 7.20 | 18.00 |
| UNDERSTORY | | | |
| TREES/SHRUBS | | | |
| <i>Pinus edulis</i> | 2.56 | 7.05 | 14.00 |
| <i>Ephedra viridis</i> | 2.70 | 8.32 | 10.00 |
| <i>Cercocarpus ledifolius</i> | 2.20 | 6.87 | 12.00 |
| <i>Chrysothamnus nauseosus</i> | 0.20 | 1.40 | 2.00 |
| <i>Gutierrezia sarothrae</i> | 0.10 | 0.70 | 2.00 |
| FORBS | | | |
| <i>Stanleya pinnata</i> | 0.10 | 0.70 | 2.00 |
| GRASSES | | | |
| <i>Elymus salinus</i> | 21.84 | 11.55 | 94.00 |

Table 32: Des-Bee-Dove Mine. Total Cover and composition (2013)

Pinyon-Juniper Reference Area

Sample size (n)=50
SAMPLE ADEQUACY (nMIN)
nMIN (80%± 0.10)=
nMIN (90%± 0.10)=

| | Mean Percent | Standard Deviation |
|-----------------------|--------------|--------------------|
| A. TOTAL COVER | | |
| Overstory (O) | 5.30 | 8.68 |
| Understory (U) | 29.70 | 9.02 |
| Litter | 13.60 | 8.00 |
| Bareground | 16.90 | 10.95 |
| Rock | 39.80 | 12.61 |
| O + U | 35.00 | 7.00 |
| B. COMPOSITION | | |
| Trees/Shrubs | 24.08 | 33.36 |
| Forbs | 0.33 | 2.33 |
| Grasses | 75.59 | 33.20 |

Table 33: Des-Bee-Dove Mine. Woody Species Density (2013).

Pinyon-Juniper Reference Area

| | Sample size (n)=50 SAMPLE ADEQUACY (nMIN) nMIN (80%± 0.10)= nMIN (90%± 0.10)= |
|--------------------------------|--|
| <i>Cercocarpus ledifolius</i> | 311.54 |
| <i>Chrysothamnus nauseosus</i> | 42.24 |
| <i>Juniperus osteosperma</i> | 79.20 |
| <i>Gutierrezia sarothrae</i> | 10.56 |
| <i>Pinus edulis</i> | 248.18 |
| <i>Ephedra viridis</i> | 364.34 |
| TOTAL | 1056.06 |

Table 34: Des-Bee-Dove Mine. Annual Biomass Production (2013).

Pinyon-Juniper Reference Area

| LIFEFORM | Pounds/Acre | |
|--------------|---------------|---------------|
| | MEAN | STD. DEV. |
| Herbaceous | 442.24 | 338.84 |
| Woody | 329.02 | 517.31 |
| TOTAL | 771.26 | 302.33 |

Table 35: Des-Bee-Dove Mine. *Lumped* Data for Total Living Cover (2013).

| Reclaimed Study Sites Combined | | |
|---|---------------------|---------------------------|
| | Mean Percent | Standard Deviation |
| TOTAL LIVING COVER | 46.86 | 12.70 |
| Sample size (n) = 360 SAMPLE ADEQUACY (nMIN) 80%± 0.10 =12 90%± 0.10 =20 | | |

Table 36: Des-Bee-Dove Mine. *Lumped* Data for Woody Species Density (2013).

| Reclaimed Study Sites Combined | | |
|--|--------------------------|---------------------------|
| Number of Individuals Per Acre | Mean No. Per Acre | Standard Deviation |
| TOTAL | 3311.60 | 1550.22 |
| Sample size (n) = 360 SAMPLE ADEQUACY (nMIN) 80%± 0.10 = 36 90%± 0.10 =59 | | |

Table 37: Des-Bee-Dove Mine. *Lumped* Data for Annual Biomass Production (2013).

Reclaimed Study Sites Combined

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 576.48 | 641.21 |
| Woody | 620.20 | 693.85 |
| TOTAL | 1196.68 | 421.47 |

Sample size (n) = 175
SAMPLE ADEQUACY (nMIN)
80%± 0.10 = 20
90%± 0.10 = 34

Table 38: Names of plant species listed in the summary tables.

| SCIENTIFIC NAMES | COMMON NAMES |
|------------------------------------|-----------------------------|
| TREES & SHRUBS | |
| <i>Amelanchier utahensis</i> | Utah Serviceberry |
| <i>Atriplex canescens</i> | Fourwing saltbush |
| <i>Atriplex confertifolia</i> | Shadscale |
| <i>Ceratoides lanata</i> | Winterfat |
| <i>Cercocarpus ledifolius</i> | Curl-leaf mountain-mahogany |
| <i>Chrysothamnus nauseosus</i> | Rubber rabbitbrush |
| <i>Chrysothamnus viscidiflorus</i> | Viscid rabbitbrush |
| <i>Ephedra viridis</i> | Mormon tea |
| <i>Eriogonum corymbosum</i> | Corymb buckwheat |
| <i>Gutierrezia sarothrae</i> | Broom snakeweed |
| <i>Juniperus osteosperma</i> | Utah juniper |
| <i>Pinus edulis</i> | Pinyon-pine |
| FORBS | |
| <i>Aster sp.</i> | Aster |
| <i>Halogeton glomeratus</i> | Halogeton |
| <i>Malcomia africana</i> | African mustard |
| <i>Penstemon palmeri</i> | Palmer penstemon |
| <i>Stanleya pinnata</i> | Prince's plum |
| GRASSES | |
| <i>Agropyron cristatum</i> | Crested wheatgrass |
| <i>Bromus tectorum</i> | Cheatgrass |
| <i>Elymus cinereus</i> | Gt. Basin wildrye |
| <i>Elymus junceus</i> | Russian wildrye |
| <i>Elymus lanceolatus</i> | Thickspike wheatgrass |
| <i>Elymus salinus</i> | Salina wildrye |
| <i>Elymus smithii</i> | Western wheatgrass |
| <i>Elymus spicatus</i> | Bluebunch wheatgrass |
| <i>Stipa hymenoides</i> | Indian ricegrass |

COLOR PHOTOGRAPHS OF THE SAMPLE AREAS
(2013)



View from the Reclaimed Areas

Access Trail



East Slope





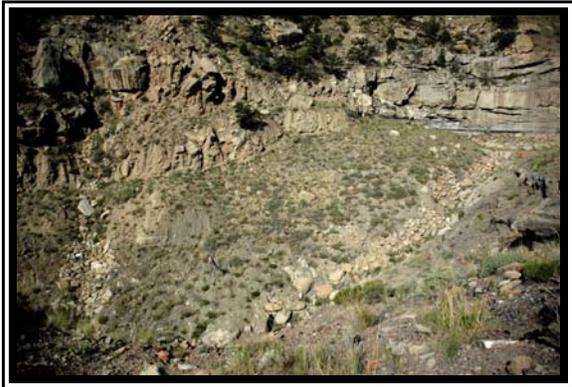
Bathhouse Slope



1



Deseret Mine



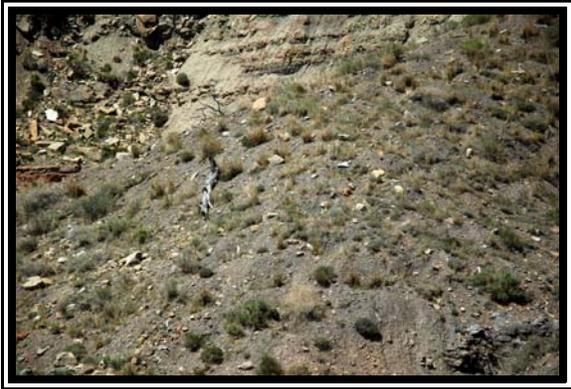
Switchbacks



Substation

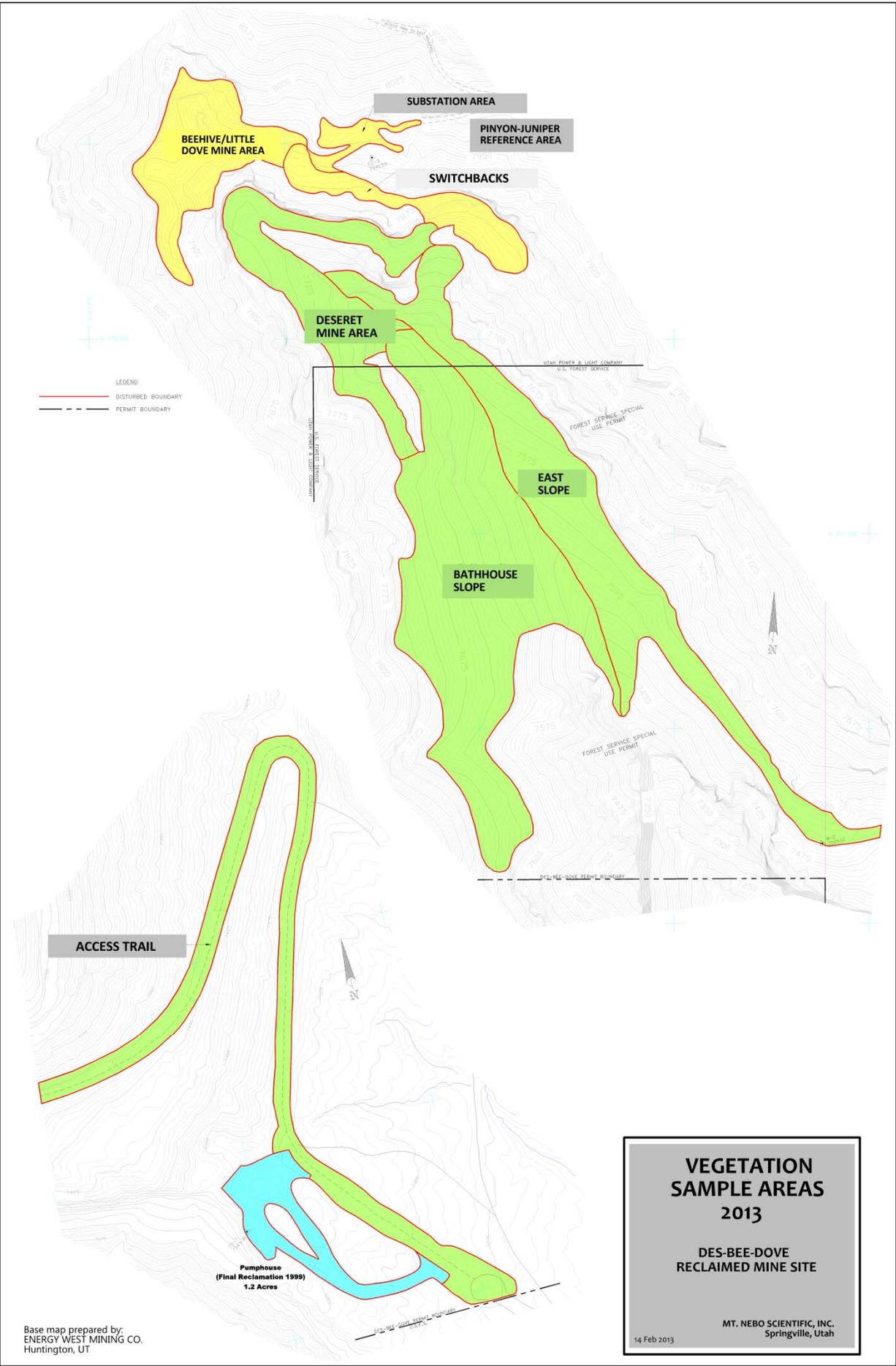


Beehive/Little Dove Mine



Pinyon-Juniper Reference Area





LEGEND
 ——— DISTURBED BOUNDARY
 - - - PERMIT BOUNDARY

ACCESS TRAIL

Pumphouse
 (Final Reclamation 1999)
 1.2 Acres

**VEGETATION
 SAMPLE AREAS
 2013**

**DES-BEE-DOVE
 RECLAIMED MINE SITE**

MT. NEBO SCIENTIFIC, INC.
 Springville, Utah

14 Feb 2013

Base map prepared by:
 ENERGY WEST MINING CO.
 Huntington, UT

Revegetation Monitoring
at the
Sediment Pond Area
Year 7
2013

Des-Bee-Dove Mine Site
Emery County, Utah



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February 2014



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INTRODUCTION

The *Sediment Pond Area* is a site that was once used to control runoff and sediment from an active coal mine in Emery County, Utah. The mine was called the Des-Bee-Dove Mine and had a long history of mining operations. Although the coal mine operations area was reclaimed in 2003, the *Sediment Pond Area* along with its designed sediment control ponds and structures remained in-place to continue to function as sediment control during the first few years following revegetation of the mine site. Later, in 2006, the *Sediment Pond Area* and *Access Road* to it were also reclaimed.

Because the Des-Bee-Dove Mine site was reclaimed in 2003, the 10-Year “*Responsibility Period*” is now complete and an application for *Phase III* or *Final Bond Release* is possible. Consequently, in 2012 and 2013, or Year’s 9 and 10 following reclamation activities, vegetation at the mine site was sampled to provide the two consecutive years necessary to be submitted for bond release considerations through the State of Utah, Division of Oil, Gas & Mining (DOGM). Because they were temporarily retained for sediment control reasons during the first few years following reclamation activities, the *Sediment Pond Area* and *Access Road* were reclaimed later, but they can also be considered for final bond release at the end of the aforementioned *Responsibility Period*. Therefore, the purpose of this report is to provide 2013 revegetation monitoring data to ascertain whether or not these remaining areas can meet the criteria for *Phase III* Bond Release through DOGM. The site was also sampled earlier (2012) and a report was written that provided the sample results from that year, or Year 6 following reclamation.

In order to achieve approval for *Phase III* Bond Release, vegetation of a reclaimed site must meet specific standards for revegetation success. Consequently, a “reference area”, or a native, undisturbed plant community is often chosen beforehand to provide future success standards following final reclamation. Prior to disturbance by mining activities, the native vegetation in the *Sediment Pond Area* was mostly dominated by plant communities supporting saltbush species (*Atriplex* spp.), pinyon-pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*). Subsequently, the native plant community chosen to be compared to the reclaimed *Sediment Pond Area* was located in close proximity to the reclaimed sites. It was called the Saltbush Shrub Reference Area.

METHODS

Transect Placement

Transect lines for quantitative sampling were randomly placed throughout the reclaimed Sediment Pond Area, Access Road and Saltbush Shrub Reference Area. From these transect lines, sample locations were chosen using random numbers on both sides and at right angles to them.

Cover, Frequency & Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition and relative frequencies were also assessed from the quadrats. Plant nomenclature follows "*A Utah Flora*" (Welsh et al. 2008).

Density

Density estimates for the woody plant species on the reclaimed and reference areas were made using a distance method called the point-quarter technique. In this method, random points were placed on the sample sites and divided 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. Final calculations resulted in the number of individual woody plants per acre.

Biomass Production

Total annual biomass productivity was estimated by clipping, drying and weighing current annual growth in sample quadrats. "Double sampling" methods were employed by placing four additional quadrats around the clipped quadrat, then estimating the production of them relative to the clipped plot. Herbaceous and woody species production were clipped, weighed and recorded separately.

Sample Adequacy

Sample adequacy for cover, density and production was attempted 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

Two diversity indices have been employed to the datasets for comparisons. 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.

Photographs & Sample Location Maps

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

RESULTS

The reclaimed *Sediment Pond Area* (see Map 1) dataset was first separated from the reclaimed *Access Road* (Map 2) in this report to enable a more accurate depiction of each revegetated area individually. This sample design can more accurately show where success or “problem” areas are located. However, because the areas were reclaimed with the same seed mixture and were to be compared with the same reference area, the datasets were then combined or “lumped” together to present the reclaimed areas as a whole. Finally, the lumped dataset of reclaimed areas was compared with that of the *Saltbush Shrub Reference Area* (also shown on Map 1).

Color photographs and maps of the sample areas have been included following the Data Summary Tables in this report.

Data Separated

The Sediment Pond Area

In 2013, the dominant plant species in the reclaimed Sediment Pond Area were Gardner saltbush (*A. gardneri*), four-wing saltbush (*Atriplex canescens*), Gt. Basin wildrye (*Elymus cinereus*) and western wheatgrass (*Elymus smithii*). There were several other species present in the area, all of which are shown on Table 1.

The total living cover of the Sediment Pond Area was estimated at 39.94% (Table 2-A). The composition of the cover consisted of 61.19% shrubs, 35.52% grasses and 3.29% forbs (Table 2-B).

The total density of the area was estimated 7,215 individuals per acre (Table 3). The density was mostly comprised of prostrate kochia (*Bassia prostrata*), four-wing saltbush, Gardner saltbush, winterfat (*Ceratoides lanata*), rubber rabbitbrush (*Chrysothamnus nauseosus*) and shadscale (*Atriplex confertifolia*).

Finally, total annual biomass production at the site was estimated at 1,607.16 pounds per acre; this total consisted of 1,178.39 pounds from woody plants and 428.77 pounds from herbaceous species (Table 4).

The Sediment Pond Access Road

The most common plants in the Sediment Pond Access Road in 2013 were prostrate kochia, western wheatgrass, thickspike wheatgrass (*Elymus lanceolatus*), rubber rabbitbrush and Indian ricegrass and (Table 5).

The total living cover for this reclaimed area was estimated at 32.62% (Table 6-A), of which 55.35% were shrubs, 41.35% grasses and 3.30% were forb species (Table 6-B).

Table 7 shows the woody species density estimates of the Sediment Pond Access Road. The total density was estimated at 4,261 individuals per acre and was dominated by prostrate kochia, rubber rabbitbrush, fourwing saltbush, shadscale and broom snakeweed (*Gutierrezia sarothrae*).

Total biomass production of the area was measured at 1,067.73 pounds per acre. This production was comprised of woody plants at 692.34 pounds and herbaceous at 375.38 pounds per acre (Table 8).

Saltbush Shrub Reference Area

The area chosen to be compared to the reclaimed areas and to represent final revegetation success standards was called the Saltbush Shrub Reference Area. The dominant species in this area were Salina wildrye (*Elymus salinus*) and Gardner saltbush. All species listed by

cover and frequency in the reference area are shown on Table 9.

The total living cover for the reference area was estimated at 33.67% (Table 10-A). The cover's lifeform composition was comprised of 56.66% shrubs, 42.30% grasses and only 1.03% forbs (Table 10-B).

Woody species density in the reference area totaled 3,920 individuals per acre and was dominated by Gardner saltbush, shadscale and corymb buckwheat (*Eriogonum corymbosum*). For a list of all density estimates refer to Table 11.

The total annual biomass productivity in the reference area was measure at 920.50 pounds per acre. This total consisted of 571.51 pounds from woody plants and 348.99 pounds from herbaceous species.

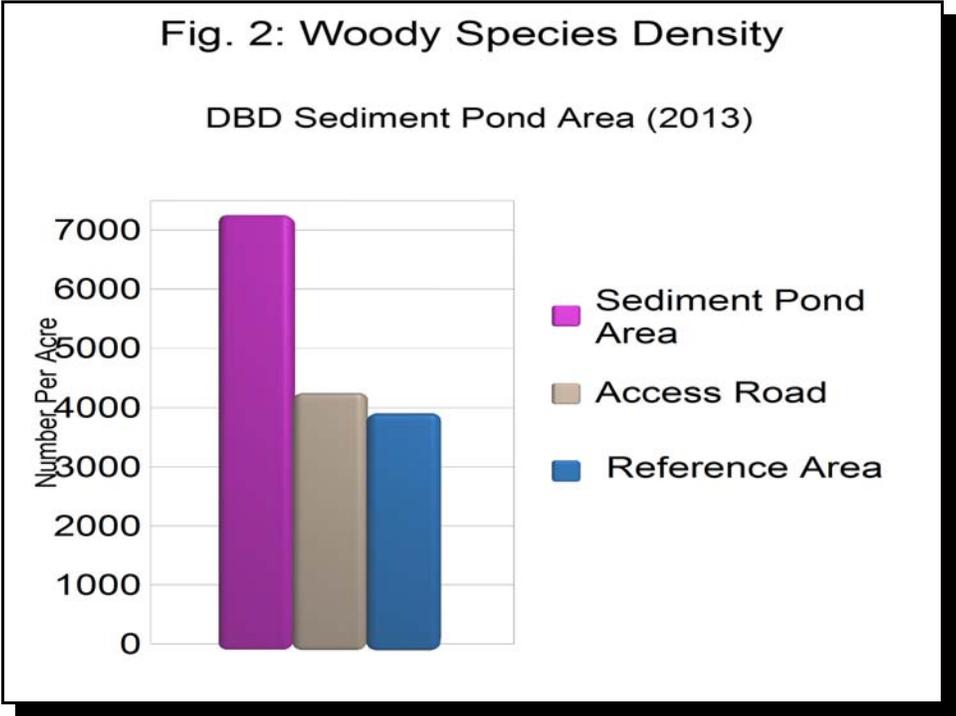
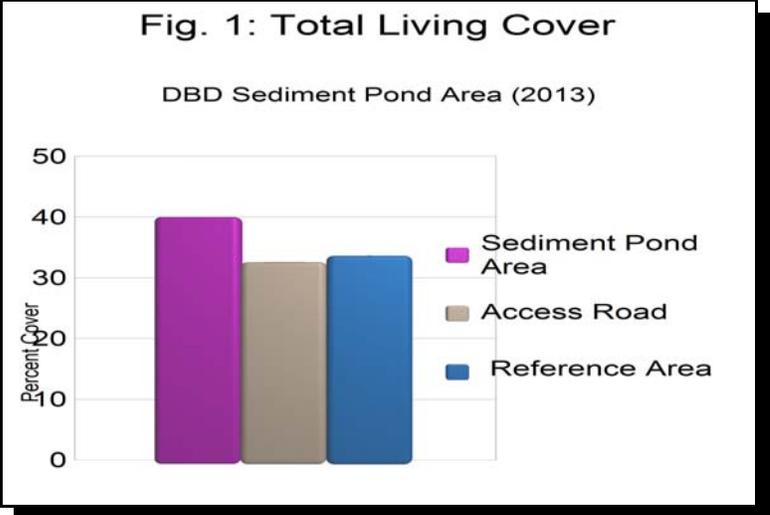
Total Living Cover Comparisons

The results described above indicate that the total living cover of the Sediment Pond Area is greater than that of the Saltbush Shrub Reference Area. Total living cover of the Sediment Pond Access Road was only slightly less than the reference area. Fig. 1 is a graph that illustrates this comparison.

When statistics were employed to test whether or not the differences are significant, the analyses indicated that the Sediment Pond Area had a statistically significant greater amount of total living cover than that of the Saltbush Shrub Reference Area, but there was no significant difference when cover of the Access Road was compared.

Woody Species Density Comparisons

When the total woody species densities for the areas were compared separately, both reclaimed areas had greater density values (Fig. 2). The Sediment Pond Area had significantly more plants per acre whereas the Access Road was only slightly higher than the reference area.

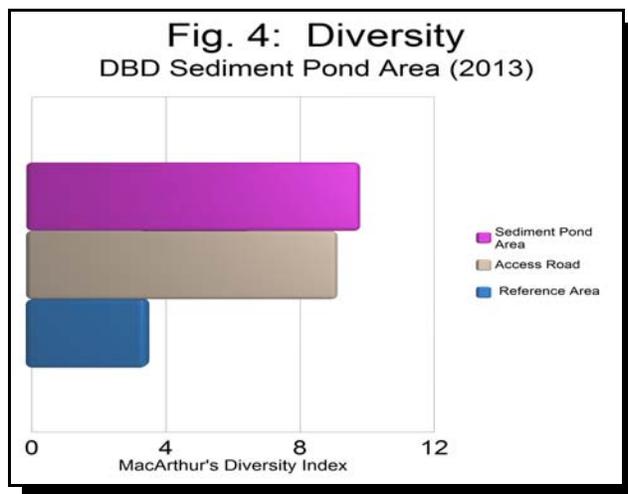
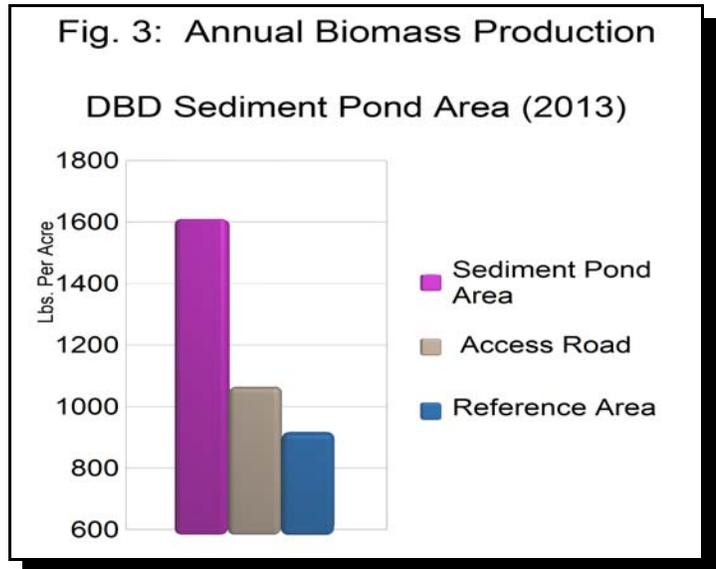


Annual Biomass Production Comparisons

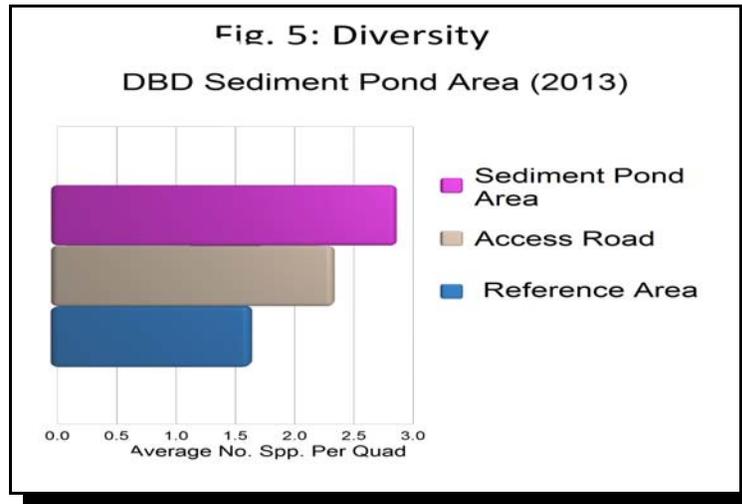
When the total annual biomass production was compared, the results again were similar to the those described above (Fig. 3). The Sediment Pond Area and the Access Road had greater production than the Saltbush Shrub Reference Area.

Diversity Comparisons

Two diversity indices were calculated on the datasets for comparison purposes. First, MacArthur's Index was employed. With this index, both the Sediment Pond and the Access Road areas were more diverse than the reference area (Fig. 4).



Using another index, the same was true for the Average Number of Species per Quadrat (Fig. 5).



Data Combined

Reclaimed Areas

Separating data between areas provides meaningful information because it shows more site specificity on an area-by-area basis. However, combining (lumping) data provides a method of comparison of the reclaimed area as a whole. And, although the cover by plant species and diversity measurements reported above were important parameters to record and compare with the reference area, the more applicable parameters to lump for statistical comparisons were 1) total living cover, 2) woody species density and 3) annual biomass productivity.

When the reclaimed areas datasets were combined, or the Sediment Pond Area data was lumped together with the Sediment Pond Access Road data, results were similar as the separated data. The total living cover of the lumped data was 35.87% (Table 13); the total woody species density was 5,215 individuals per acre (Table 14); the total annual biomass

production was 1,300.25 (Table 15).

These parameters were then compared statistically to the Saltbush Shrub Reference Area that were chosen for revegetation success standards. When the total living covers were compared the differences were not significant statistically (Fig. 6-A). When the woody species densities were compared, again the difference was non-significant (Fig. 6-B). Finally, the same statistical analysis was used to compared for the total annual biomass production, this time the difference was significant – the reclaimed area had more production (Fig. 6-C).

Fig. 6. STUDENT'S T-TEST - Total living cover, woody species density and annual biomass production comparisons between the combined reclaimed areas and reference area (2013).

A. Total Living Cover

Reclaimed Areas: \bar{x} =35.87; s=11.93; n=180

Saltbush Shrub Reference Area: \bar{x} =33.67; s=5.98; n=60

t =1.3708 ; df =238; SL=NS

B. Woody Species Density

Reclaimed Areas: \bar{x} =5215.27; s=5592.62; n=180

Saltbush Shrub Reference Area: \bar{x} =3920.46; s=1668.67; n=60

t =1.7651; df = 238 ; SL= NS

C. Annual Biomass Production

Reclaimed Areas: \bar{x} =1300.25; s=539.23; n=180

Saltbush Shrub Reference Area: \bar{x} =920.50; s=252.28; n=60

t =5.2610 ; df = 238 ; SL= p<0.01

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

DISCUSSION

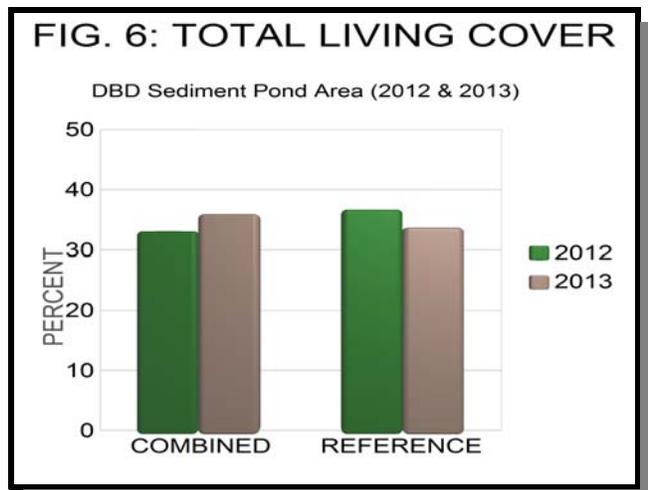
Comparisons Between Years

This report provides the results from quantitative sampling the vegetation at the Des-Bee-Dove Sediment Pond Site in 2013, or the Year 7 following reclamation and revegetation procedures. As mentioned, the site was also sampled in 2012 and a report was submitted showing those results (Year 6).

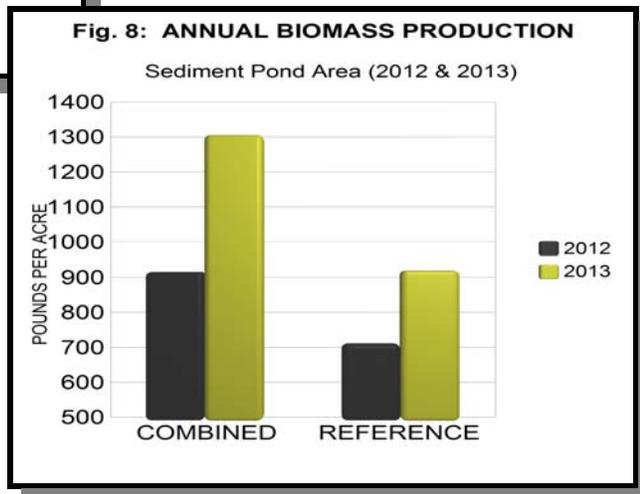
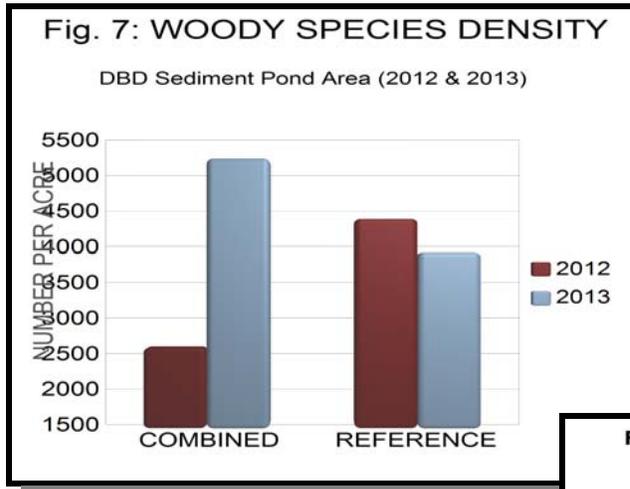
The Year 6 sampling design had some of the same goals as described in this report. One such goal was to sample and provide findings of the reclaimed areas separately that enabled a review of each revegetated area individually.

The Year 6 (2012) report revealed that the Sediment Pond Area was greater than the Saltbush Shrub Reference Area for total living cover, woody species density and annual biomass production. The Sediment Pond Access Road, however, fell short of reaching reference area standards.

In 2013, however, there was a noteworthy turnaround in the vegetation of the reclaimed areas, especially the Access Road. Total living cover went from 26.29% in 2012 to 32.62% in 2013; woody species density increased from 1,894 plants per acre to 4,261; annual biomass production increased from 523.47 pounds per acre to 1,067.73. [NOTE: It was observed when the sampling was being conducted that there were many more shrub seedlings in 2013 that undoubtedly accounted for the drastic increase in density when compared to 2012).



Year-to-year comparisons of the lumped datasets for total living cover, woody species density and biomass production are shown in Figs. 6, 7 and 8, respectively (the reference area was also included in those figures).



Potential Explanations for the Improvements

It is difficult to provide with certainty reasons for the significant improvement in the reclaimed areas from 2012 to 2013, but there are some possible explanations. For one thing, establishment of vegetation in disturbed areas is dynamic under natural conditions, such as wildfires and landslides, and artificial conditions like mining and subsequent reclamation activities. Plant establishment often begins with invader or opportunist species such as “weedy” exotics, often annuals, that can take immediate advantage of the open niche. Later, these species may be displaced by biennials or the more long-lived perennials. Finally, often woody species and a mixture of compatible grasses and forbs may then result in a

stable and self-perpetuating plant community. Because this area was re-seeded more recently than the mine-proper, it may be subject to more year-to-year variability before it will finally compare favorably to the revegetation standards, like it has in 2013.

Another possible explanation for the improvement may be the precipitation patterns over that period of time. When the data from three different weather stations in Emery County (Castle Dale, Huntington Plant and East Mountain) were reviewed and the average calculated, it showed the average percent of normal for the winter months (October-February) for 2011-12 to be below normal ($\bar{x} = 78.80\%$ of normal), followed by a below average spring in 2012 ($\bar{x} = 29.11\%$). When the same data were compared for the winter of 2012-13; the percent of normal average was also low ($\bar{x} = 43.00\%$). But in spring 2013, all stations were well above the normal ($\bar{x} = 162.44\%$).

The precipitation patterns do not, however, explain why the Sediment Pond Area showed more success in 2012 when compared to the Sediment Pond Access Road, but the former also showed better revegetation success in the 2013 dataset. *Nonetheless, all statistical comparisons between the reclaimed and reference areas suggest that the revegetation success standards were met in 2013.*

SUMMARY & CONCLUSIONS

The Des-Bee-Dove Mine in Emery County, Utah was reclaimed in 2003. There was a pond area retained for sediment control purposes for a period of time after revegetation of the mine site, but it was reclaimed a few years later, or in 2006. Under those circumstances, state regulations allows for Phase III Bond Release (Final Bond Release) at the same time as the mine-proper if the vegetation of the area has meet its revegetation success standards. Generally speaking, the reestablished vegetation must be: a) diverse, effective, and permanent, b) the plant species be compatible with the approved post-mining land use, c) will have the same seasonal characteristics of growth as the original vegetation, d) are capable of self-regeneration and plant succession and e) be compatible with the plant and animal species of the area. To meet these requirements, specific parameters of the reclaimed areas are often compared with a reference area, or a native plant community with

characteristics similar to those of the mine site's plant communities before they were disturbed by mining activities. In other words, the reference area is used to drive or set the revegetation success standards for the reclaimed lands.

To determine whether or not Phase III Bond Release may be warranted at the site, quantitative sampling of the vegetation was conducted at the reclaimed Sediment Pond Area, Sediment Pond Access Road and the Saltbush Shrub Reference Area in 2012 and 2013.

In 2012, when the data were summarized separately and compared to the reference area, the results of all parameters for the Sediment Pond Area suggested revegetation success was achieved. However, the Access Road fell somewhat short of that goal for some of the standards. Interestingly, the Access Road dramatically improved in 2013 and met all criteria for revegetation success including total living cover, woody species density, annual biomass production and diversity.

In 2013, reclaimed areas were first compared to the reference area individually – these areas met or exceeded the revegetation success standards. Next, for statistical analyses, the datasets for the reclaimed areas were lumped together and compared with the reference area. These analyses again suggested that all parameters of the reclaimed area as a whole met or exceeded those of the reference area.

In conclusion, results from quantitative sampling in 2013 and analyzing the results by comparing them to the Saltbush Shrub Reference Area, suggest the reclaimed areas at Sediment Pond Area site of the Des-Bee-Dove Mine may be a candidate for Phase III Bond Release by the State of Utah, Division of Oil, Gas & Mining.

DATA SUMMARY TABLES

Table 1: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2013).

| Sediment Pond Area | | | n=80 |
|--------------------------------|---------------------|---------------------------|--------------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| SHRUBS | | | |
| <i>Artemisia nova</i> | 0.13 | 1.11 | 1.25 |
| <i>Atriplex canescens</i> | 8.48 | 11.52 | 48.75 |
| <i>Atriplex confertifolia</i> | 1.13 | 5.81 | 6.25 |
| <i>Atriplex corrugata</i> | 0.19 | 1.67 | 1.25 |
| <i>Atriplex gardneri</i> | 8.69 | 13.73 | 38.75 |
| <i>Bassia prostrata</i> | 3.59 | 5.88 | 40.00 |
| <i>Ceratoides lanata</i> | 0.75 | 2.86 | 7.50 |
| <i>Chrysothamnus nauseosus</i> | 2.19 | 5.91 | 15.00 |
| FORBS | | | |
| <i>Atriplex powellii</i> | 0.06 | 0.56 | 1.25 |
| <i>Bassia scoparia</i> | 0.31 | 2.78 | 1.25 |
| <i>Halogeton glomeratus</i> | 0.44 | 2.40 | 5.00 |
| <i>Malcomia africana</i> | 0.50 | 2.18 | 6.25 |
| GRASSES | | | |
| <i>Agropyron cristatum</i> | 0.31 | 1.99 | 2.50 |
| <i>Elymus cinereus</i> | 4.88 | 8.21 | 33.75 |
| <i>Elymus junceus</i> | 0.44 | 2.12 | 5.00 |
| <i>Elymus lanceolatus</i> | 2.06 | 4.72 | 21.25 |
| <i>Elymus salinus</i> | 0.88 | 3.43 | 7.50 |
| <i>Elymus smithii</i> | 2.88 | 5.52 | 27.50 |
| <i>Elymus spicatus</i> | 0.56 | 2.74 | 5.00 |
| <i>Stipa hymenoides</i> | 1.50 | 4.50 | 11.25 |

Table 2: Des-Bee-Dove Mine. Total Cover and composition (2013).

| Sediment Pond Area | | | n=80 |
|---------------------------|---------------------|---------------------------|------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 39.94 | 9.83 | |
| Litter | 11.75 | 4.68 | |
| Bareground | 27.94 | 10.21 | |
| Rock | 20.38 | 7.15 | |
| B. COMPOSITION | | | |
| Shrubs | 61.19 | 29.57 | |
| Forbs | 3.29 | 10.27 | |
| Grasses | 35.52 | 30.68 | |

Table 3: Des-Bee-Dove Mine. Woody Species Density (2013).

| Sediment Pond Area | | n=80 |
|--------------------------------|--------------------|------|
| SPECIES | Number/Acre | |
| <i>Artemisia nova</i> | 45.09 | |
| <i>Atriplex canescens</i> | 1623.39 | |
| <i>Atriplex confertifolia</i> | 428.39 | |
| <i>Atriplex corrugata</i> | 157.83 | |
| <i>Atriplex gardneri</i> | 1510.65 | |
| <i>Bassia prostrata</i> | 2006.69 | |
| <i>Ceratoides lanata</i> | 744.05 | |
| <i>Chrysothamnus nauseosus</i> | 563.68 | |
| <i>Gutierrezia sarothrae</i> | 112.74 | |
| <i>Ephedra viridis</i> | 22.55 | |
| TOTAL | 7215.05 | |

Table 4: Des-Bee-Dove Mine. Annual Biomass Production (2013).

Sediment Pond Area

(n=80; double sampling n=320)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 428.77 | 608.84 |
| Woody | 1178.39 | 971.94 |
| TOTAL | 1607.16 | 552.14 |

Table 5: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2013).

| Sediment Pond Access Road | | | n=100 |
|-------------------------------------|-------------------------|-------------------------------|------------------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| SHRUBS | | | |
| <i>Artemisia nova</i> | 0.10 | 0.99 | 1.00 |
| <i>Artemisia tridentata</i> | 0.20 | 1.99 | 1.00 |
| <i>Atriplex canescens</i> | 2.42 | 6.32 | 17.00 |
| <i>Atriplex confertifolia</i> | 0.75 | 3.03 | 7.00 |
| <i>Atriplex corrugata</i> | 0.10 | 0.70 | 2.00 |
| <i>Atriplex gardneri</i> | 2.25 | 7.63 | 11.00 |
| <i>Bassia prostrata</i> | 8.43 | 13.09 | 45.00 |
| <i>Ceratoides lanata</i> | 0.65 | 3.44 | 5.00 |
| <i>Chrysothamnus nauseosus</i> | 3.29 | 6.57 | 26.00 |
| <i>Eriogonum corymbosum</i> | 0.15 | 1.49 | 1.00 |
| <i>Gutierrezia sarothrae</i> | 0.73 | 2.62 | 10.00 |
| <i>Sarcobatus vermiculatus</i> | 0.15 | 1.49 | 1.00 |
| FORBS | | | |
| <i>Linum perenne</i> | 0.05 | 0.50 | 1.00 |
| <i>Astragalus cicer</i> | 0.30 | 1.85 | 3.00 |
| <i>Halogeton glomeratus</i> | 0.30 | 1.71 | 3.00 |
| <i>Machaeranthera grindelioides</i> | 0.05 | 0.50 | 1 |
| <i>Malcomia africana</i> | 0.30 | 2.22 | 2.00 |
| GRASSES | | | |
| <i>Elymus junceus</i> | 0.95 | 4.40 | 9.00 |
| <i>Elymus lanceolatus</i> | 2.50 | 5.27 | 22.00 |
| <i>Elymus salinus</i> | 0.45 | 2.65 | 3.00 |
| <i>Elymus smithii</i> | 5.15 | 7.52 | 41.00 |
| <i>Hordeum jubatum</i> | 0.20 | 1.99 | 1.00 |
| <i>Stipa hymenoides</i> | 3.15 | 7.30 | 21.00 |

Table 6: Des-Bee-Dove Mine. Total Cover and composition (2013).

| Sediment Pond Access Road | | | n=100 |
|----------------------------------|-------------------------|-------------------------------|-------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 32.62 | 12.46 | |
| Litter | 10.88 | 4.06 | |
| Bareground | 32.30 | 13.14 | |
| Rock | 24.20 | 10.53 | |
| B. COMPOSITION | | | |
| Shrubs | 55.35 | 33.14 | |
| Forbs | 3.30 | 11.81 | |
| Grasses | 41.35 | 34.38 | |

Table 7: Des-Bee-Dove Mine. Woody Species Density (2013).

| Sediment Pond Access Road | | n=100 |
|----------------------------------|--------------------|-------|
| SPECIES | Number/Acre | |
| <i>Artemisia tridentata</i> | 31.96 | |
| <i>Artemisia nova</i> | 21.30 | |
| <i>Atriplex confertifolia</i> | 394.14 | |
| <i>Atriplex corrugata</i> | 74.57 | |
| <i>Atriplex canescens</i> | 458.05 | |
| <i>Atriplex gardneri</i> | 351.53 | |
| <i>Bassia prostrata</i> | 1374.15 | |
| <i>Ceratoides lanata</i> | 138.48 | |
| <i>Cercocarpus montanus</i> | 10.65 | |
| <i>Chrysothamnus nauseosus</i> | 948.06 | |
| <i>Eriogonum corymbosum</i> | 21.30 | |
| <i>Gutierrezia sarothrae</i> | 372.83 | |
| <i>Juniperus osteosperma</i> | 10.65 | |
| <i>Sarcobatus vermiculatus</i> | 42.61 | |
| <i>Yucca harrimaniae</i> | 10.65 | |
| TOTAL | 4260.94 | |

Table 8: Des-Bee-Dove Mine Annual Biomass Production (2013).

Sediment Pond Access Road

(n=100; double sampling n=400)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 375.38 | 483.15 |
| Woody | 692.34 | 745.60 |
| TOTAL | 1067.73 | 531.39 |

Table 9: Des-Bee-Dove Mine. Total cover, standard deviation and frequency by species (2013).

| Saltbush Shrub Reference Area | | | n=60 |
|--------------------------------------|---------------------|---------------------------|--------------------------|
| | Mean Percent | Standard Deviation | Percent Frequency |
| TREES & SHRUBS | | | |
| <i>Atriplex confertifolia</i> | 2.58 | 5.74 | 20.00 |
| <i>Atriplex gardneri</i> | 12.58 | 14.07 | 51.67 |
| <i>Chrysothamnus nauseosus</i> | 0.08 | 0.64 | 1.67 |
| <i>Eriogonum corymbosum</i> | 2.17 | 6.48 | 11.67 |
| <i>Pinus edulis</i> | 0.17 | 1.28 | 1.67 |
| <i>Sarcobatus vermiculatus</i> | 1.00 | 3.85 | 6.67 |
| <i>Suaeda torreyana</i> | 0.33 | 2.56 | 1.67 |
| FORBS | | | |
| <i>Petroradia pumila</i> | 0.33 | 1.80 | 3.33 |
| GRASSES | | | |
| <i>Elymus salinus</i> | 14.42 | 12.82 | 66.67 |

Table 10: Des-Bee-Dove Mine. Total Cover and composition (2013).

| Saltbush Shrub Reference Area | | | n=60 |
|--------------------------------------|---------------------|---------------------------|------|
| | Mean Percent | Standard Deviation | |
| A. TOTAL COVER | | | |
| Total Living Cover | 33.67 | 5.98 | |
| Litter | 9.50 | 4.02 | |
| Bareground | 35.58 | 16.20 | |
| Rock | 21.25 | 13.24 | |
| B. COMPOSITION | | | |
| Trees & Shrubs | 56.66 | 38.01 | |
| Forbs | 1.03 | 5.57 | |
| Grasses | 42.30 | 37.23 | |

Table 11: Des-Bee-Dove Mine. Woody Species Density (2013).

| Saltbush Shrub Reference Area | | n=60 |
|--------------------------------------|--------------------|------|
| SPECIES | Number/Acre | |
| <i>Atriplex confertifolia</i> | 1225.14 | |
| <i>Atriplex gardneri</i> | 1992.90 | |
| <i>Chrysothamnus nauseosus</i> | 16.34 | |
| <i>Eriogonum corymbosum</i> | 522.73 | |
| <i>Gutierrezia sarothrae</i> | 16.34 | |
| <i>Opuntia polyacantha</i> | 16.34 | |
| <i>Pinus edulis</i> | 32.67 | |
| <i>Suaeda nigra</i> | 16.34 | |
| <i>Sarcobatus vermiculatus</i> | 81.68 | |
| TOTAL | 3920.46 | |

Table 12: Des-Bee-Dove Mine. Annual Biomass Production (2013).

Saltbush Shrub Reference Area

(n=60; double sampling n=240)

| LIFEFORM | Pounds/Acre | |
|-----------------|--------------------|------------------|
| | MEAN | STD. DEV. |
| Herbaceous | 348.99 | 385.54 |
| Woody | 571.51 | 525.47 |
| TOTAL | 920.50 | 252.28 |

Table 13: Des-Bee-Dove Mine. Combined Data for Total Living Cover (2013).

| Reclaimed Sediment Pond and Access Road Areas | | |
|--|---------------------|---------------------------|
| | Mean Percent | Standard Deviation |
| TOTAL LIVING COVER | 35.87 | 11.93 |

Sample size (n) = 180
SAMPLE ADEQUACY (nMIN)
80%± 0.10 = 18 samples
90%± 0.10 = 30 samples

Table 14: Des-Bee-Dove Mine. Combined Data for Woody Species Density (2013).

| Reclaimed Sediment Pond and Access Road Areas | | |
|--|-------------|---------------------------|
| Number of Individuals Per Acre | Mean | Standard Deviation |
| TOTAL | 5215.27 | 5592.62 |

Sample size (n) = 180 *
SAMPLE ADEQUACY (nMIN)
80%± 0.10 = 188 samples
90%± 0.10 = 311 samples
* Sample adequacy was greater when formulas were calculated on separate datasets.

Table 15: Des-Bee-Dove Mine. Combined Data for Annual Biomass Production (2013).

Reclaimed Sediment Pond and Access Road Areas

| Pounds/Acre | Mean | Std. Dev. |
|--------------------|-------------|------------------|
| TOTAL | 1300.25 | 539.23 |

Sample size (n) = 180
SAMPLE ADEQUACY (nMIN)
80%± 0.10 = 28 samples
90%± 0.10 = 47 samples

| Table 16: Names of plant species listed in the summary tables. | |
|---|---------------------|
| SCIENTIFIC NAMES | COMMON NAMES |
| TREES & SHRUBS | |
| <i>Artemisia nova</i> | Black sagebrush |
| <i>Atriplex canescens</i> | Fourwing saltbush |
| <i>Atriplex confertifolia</i> | Shadscale |
| <i>Atriplex corrugata</i> | Mat saltbush |
| <i>Atriplex gardneri</i> | Gardner saltbush |
| <i>Bassia prostrata</i> | Prostrate kochia |
| <i>Ceratoides lanata</i> | Winterfat |
| <i>Chrysothamnus nauseosus</i> | Rubber rabbitbrush |
| <i>Ephedra viridis</i> | Mormon tea |
| <i>Eriogonum corymbosum</i> | Corymb buckwheat |
| <i>Gutierrezia sarothrae</i> | Broom snakeweed |
| <i>Juniperus osteosperma</i> | Utah juniper |
| <i>Pinus edulis</i> | Pinyon-pine |
| <i>Sarcobatus vermiculatus</i> | Greasewood |
| <i>Suaeda nigra</i> | Torrey's seepweed |
| FORBS | |
| <i>Atriplex powellii</i> | Powell's orach |
| <i>Eriogonum bicolor</i> | Pretty buckwheat |
| <i>Halogeton glomeratus</i> | Halogeton |
| <i>Linum perenne</i> | Blue flax |
| <i>Machaeranthera canescens</i> | Hoary aster |
| <i>Machaeranthera grindelioides</i> | Gumweed aster |
| <i>Malcomia africana</i> | African mustard |
| <i>Petradoria pumila</i> | Rock goldenrod |
| <i>Salsola tragus</i> | Russian thistle |

Table 16: Names of plant species listed in the summary tables.

| GRASSES | |
|----------------------------|-----------------------|
| <i>Agropyron cristatum</i> | Crested wheatgrass |
| <i>Elymus cinereus</i> | Gt. Basin wildrye |
| <i>Elymus junceus</i> | Russian wildrye |
| <i>Elymus lanceolatus</i> | Thickspike wheatgrass |
| <i>Elymus salinus</i> | Salina wildrye |
| <i>Elymus smithii</i> | Western wheatgrass |
| <i>Elymus spicatus</i> | Bluebunch wheatgrass |
| <i>Hordeum jubatum</i> | Foxtail barley |
| <i>Stipa hymenoides</i> | Indian ricegrass |

COLOR PHOTOGRAPHS
OF THE
SAMPLE AREAS

Reclaimed Sediment Pond Area





Reclaimed Sediment Pond Access Road

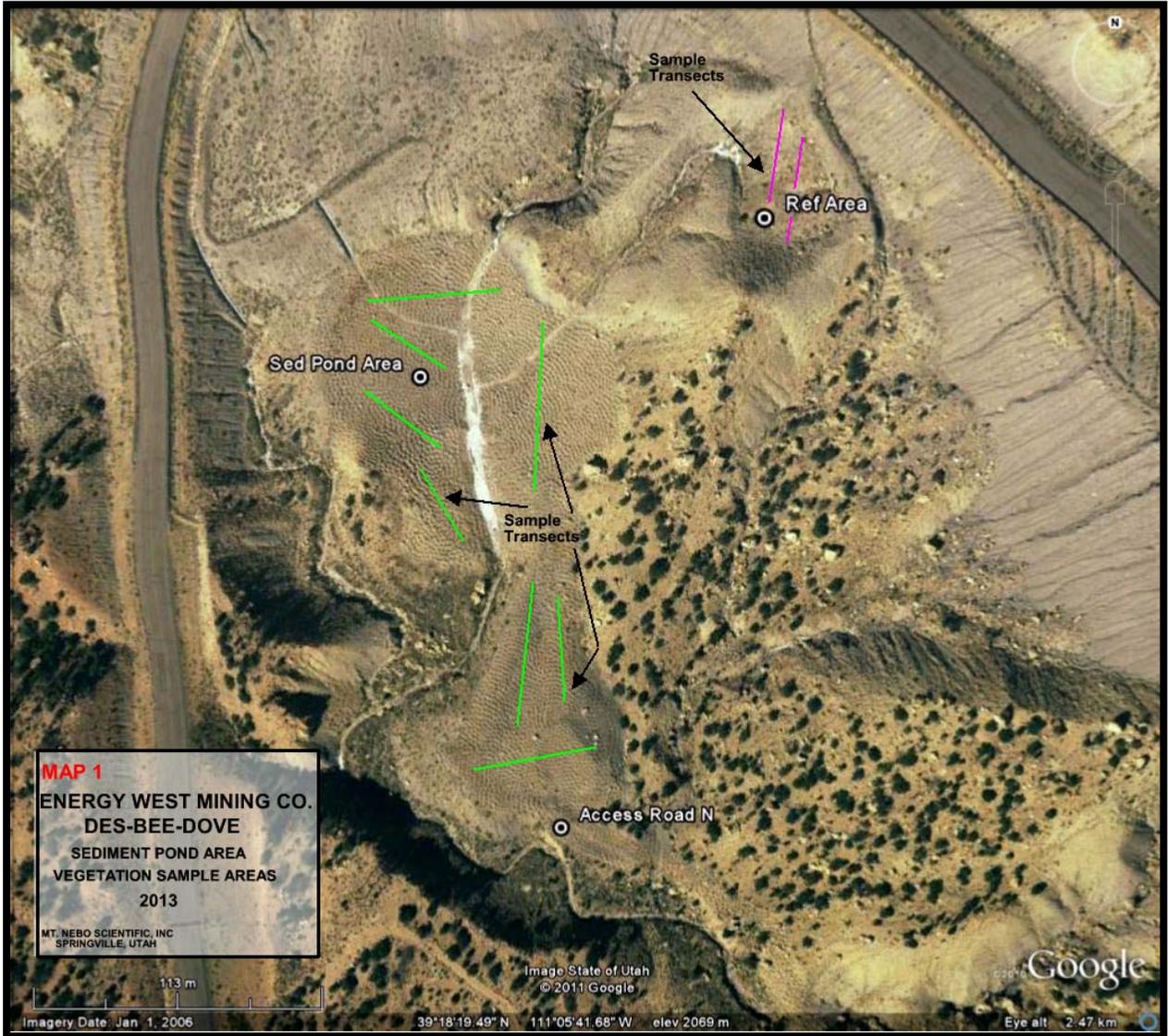




Saltbush Shrub Reference Area









RUSLE2 Worksheet Erosion Calculation Record

Info: Disturbed Area of Mine

Inputs:

| <i>Owner name</i> | <i>Location</i> |
|----------------------------|----------------------------------|
| Energy West Mining Company | Utah\Emery County\UT_Emercy_R_13 |

| <i>Location</i> | <i>Soil</i> | <i>Slope length (horiz)</i> | <i>Avg. slope steepness, %</i> |
|----------------------------------|---|-----------------------------|--------------------------------|
| Utah\Emery County\UT_Emercy_R_13 | DZG2 Gerst-Strych-Rock outcrop complex, 30 to 65 percent slopes\Strych very cobbly loam 20% | 264.0 | 45 |

Outputs:

| <i>Management</i> | <i>Contouring</i> | <i>Strips / barriers</i> | <i>Diversion/terrace, sediment basin</i> | <i>Soil loss erod. portion, t/ac/yr</i> | <i>Soil detachment, t/ac/yr</i> | <i>Cons. plan. soil loss, t/ac/yr</i> | <i>Sed. delivery, t/ac/yr</i> |
|-------------------|--|--------------------------|--|---|---------------------------------|---------------------------------------|-------------------------------|
| default | e. relative row grade 50 percent of slope grade | (none) | 3 Water and Sediment Control Basins in middle of RUSLE slope | 2.7 | 2.7 | 1.6 | 0.75 |

RUSLE2 Worksheet Erosion Calculation Record

Info: Reference Area Above Mine

Inputs:

| | | |
|----------------------------|----------------------------------|----|
| <i>Owner name</i> | <i>Location</i> | -- |
| Energy West Mining Company | Utah\Emery County\UT_Emercy_R_13 | |

| <i>Location</i> | <i>Soil</i> | <i>Slope length (horiz)</i> | <i>Avg. slope steepness, %</i> |
|----------------------------------|---|-----------------------------|--------------------------------|
| Utah\Emery County\UT_Emercy_R_13 | DZG2 Gerst-Strych-Rock outcrop complex, 30 to 65 percent slopes\Strych very cobbly loam 20% | 53.22 | 64 |

Outputs:

| <i>Management</i> | <i>Contouring</i> | <i>Strips / barriers</i> | <i>Diversion/terrace, sediment basin</i> | <i>Soil loss erod. portion, t/ac/yr</i> | <i>Soil detachment, t/ac/yr</i> | <i>Cons. plan. soil loss, t/ac/yr</i> | <i>Sed. delivery, t/ac/yr</i> |
|-------------------|--------------------------|--------------------------|--|---|---------------------------------|---------------------------------------|-------------------------------|
| default | a. rows up-and-down hill | (none) | (none) | 8.6 | 8.6 | 8.6 | 8.6 |

Demonstration that Area is Not Contributing Suspended Solids Outside Permit Area

To demonstrate that the area is not contributing suspended solids outside the permit area, the 2013 Vegetation Monitoring Report for the Des Bee Dove Mine and Sediment Pond is reviewed. The results show that the reclaimed areas exceed the revegetation success standards of the reference areas for total living cover, woody species density, productivity, and diversity. Although productivity and diversity are parameters that demonstrate the sustainability of the vegetation of a site, erosion and sediment control is better explained using the cover and density parameters.

Summarizing the 2013 report, the total living cover estimate for the reclaimed area was 46.86% (Table 35*) and 35.87% (Table 13**); whereas, the living cover for the reference area was estimated at 35.00% (Table 31*) and 33.67% (Table 10**).

The species densities estimates for the reclaimed and reference sites show that the reclaimed area totaled 3,311.6 plants per acre (Table 36*) and 5,215.3 plants per acre (Table 14**) as compared to 1056.1 plants per acre (Table 33*) and 3,920.5 plants per acre (Table 11**) for the reference area. Dominate species of the mine site reclaimed area include shrubs such as fourwing saltbrush, shadscale, Great Basin wildrye. A high density of these plants help to protect from; 1) raindrop impacts that dislodges soil particles contributing to sedimentation, 2) slows runoff by the shear number of plants within the ground cover, and 3) provides a higher root mass in the soil surface to better hold soil in place.

Modeling the variables in RUSLE2 verify the vegetation monitoring results of the 2013 monitoring. RUSLE2 (see attached) shows that the soil detachment of the reference area to be 8.6 tons/ac/year. The reclaimed area contributes only 2.7 tons/ac/year.

*see "Revegetation Monitoring for Phase III Bond Release, Des-Bee-Dove Mine Site, Year Two, 2013" in Attachment 8.

**see "Revegetation Monitoring at the Sediment Pond Area Year 7, 2013" in Attachment 8.

Demonstration that Responsibility Period has been Met

As stated in the Utah Coal Regulations, R645-301-357 Revegetation: Extended Responsibility Period:

357.100. The period of extended responsibility for successful vegetation will begin after the last year of augmented seeding, fertilization, irrigation, or other work, excluding husbandry practices that are approved by the Division in accordance with paragraph R645-301-357.300.

There has been no augmented seeding at the Des Bee Dove Mine or Sediment Pond.

357.200. Vegetation parameters identified in R645-301-356.200 will equal or exceed the approved success standard during the growing seasons for the last two years of the responsibility period. The period of extended responsibility will continue for five or ten years based on precipitation data reported pursuant to R645-301-724.411, as follows:

357.210. In areas of more than 26.0 inches average annual precipitation, the period of responsibility will continue for a period of not less than five full years.

357.220. In areas of 26.0 inches or less average annual precipitation, the period of responsibility will continue for a period of not less than ten full years.

Meteorological weather data has been collected by PacifiCorp since 1980 (refer to Annual Report.) This data indicates that the 33 year average annual precipitation for the East Mountain area is 12.54 inches. Since this amount is less than 25 inches, SMCRA specifies that the responsibility period [for Energy West mines] will be ten full years. Reclamation for the mine site was completed June 2003. The ten year responsibility period was completed in full for the Des Bee Dove Mine as of June 2013. Final reclamation of the sediment pond was completed January 2006.

Vegetation monitoring for Phase II and III bond release occurred in 2012 and 2013. The standards of success for this area were set within the original reclamation plan (Volume 2, Part 4, pg. 4-28 through 4-30). Also, the coal regulations dictate that vegetation will be diverse, effective, and permanent. As stated above, vegetation parameters will equal or exceed the approved standard. The standards in which the vegetation shall be compared are the reference areas for the mine site and sediment pond.

As concluded in the year 9 and year 10 vegetation monitoring report, the vegetation parameters (cover, density, productivity, diversity) monitored at the reclaimed areas of the mine site exceeds those same parameters monitored at the reference area. For the sediment pond area, there were a couple of transects along the access road in Year 9 monitoring that did not exceed the standard. In Year 10 however, all areas of the sediment pond exceeded the standard. A summary of the standards for year 10 monitoring are outlined below.

Mine Site –

Statistical Analyses - Student's t-tests comparing total living cover, woody species density and annual biomass production for the *lumped* reclaimed and reference areas (2013).

Total Living Cover

Reclaimed Areas: 0=46.86; s=12.70; n=360

Reference Area: 0=35.00; s=7.00; n=50

t = 6.4638; df = 408; SL= p<0.01

Woody Species Density

Reclaimed Areas: 0=3311.60; s=1550.22; n=360

Reference Area: 0=1056.06; s=266.27; n=50

t = 10.2568; df = 408; SL= p<0.01

Annual Biomass Production

Reclaimed Areas: 0=1196.68; s=421.47; n=175

Reference Area: 0=771.26; s=302.33;

n=50

t = 6.6597; df= 223 ; SL= p<0.01

Sediment Pond –

Statistical Analysis – Student's t-tests comparing total living cover, woody species density and annual biomass production comparisons between the combined reclaimed areas and reference area (2013).

Total Living Cover

Reclaimed Areas: 0=35.87; s=11.93; n=180

Saltbush Shrub Reference Area: 0=33.67; s=5.98; n=60 t =1.3708 ; df =238; SL=NS

Woody Species Density

Reclaimed Areas: 0=5215.27; s=5592.62; n=180

Saltbush Shrub Reference Area: 0=3920.46; s=1668.67; n=60 t =1.7651; df = 238 ; SL= NS

Annual Biomass Production

Reclaimed Areas: 0=1300.25; s=539.23; n=180

Saltbush Shrub Reference Area: 0=920.50; s=252.28; n=60 t =5.2610 ; df = 238 ; SL= p<0.01

0= sample mean
s = sample standard deviation
n = sample size
NS = non-significant
t = Student's t-value
df = degrees of freedom
SL = significance level
p = probability level

Demonstration that Post Mining Land Use has been Met

The disturbed area (portal areas of the Des-Bee-Dove Mines) lies within a small, steep, dry wash. The sediment pond is located at the bottom of this wash. Reclamation work for both areas returned the sites back to their approximate original contours. Final reclamation of the Des-Bee Dove Mine was completed in June 2003 followed by the sediment pond in January 2006. All areas (including Little Dove/Beehive Pad, Deseret Pad, Bathhouse Pad, Tipple Pad, and Sediment Pond) have been reclaimed to their approximate original contour. A diverse seed mix for revegetation was planted and provides equivalent cover for grazing that existed prior to mining.

As part of final reclamation, a “cattle trail” was established to allow the cattlemen to herd their livestock through the mine permit area to access their grazing allotments. This “cattle trail” is also used by horseback rider and hikers to access the upper ranges of the southern end of East Mountain. These users frequently utilize this trail throughout the year for recreational activities. Hunters also utilize the trail to access favorite hunting grounds on the southern end of East Mountain. Hunters typically only use the trail during hunting seasons occurring from August through December.

The LDS Church promotes the Castle Valley Pageant to reenact the migration of Mormon settlers into the Castle Valley. This re-enactment occurs annually every July and is attended by hundreds of visitors. The re-enactment starts on top of East Mountain and routes down the cattle trail through the reclaimed mine site and ends at the Castle Valley Pageant site located approximately ½ mile below the mine site.

The land use information of the permit area described in Volume 1, Part 2 (pages 2-220 through 2-222) allows for grazing, wildlife habitat, recreation, and industrial/commercial uses. The absence of water resources limits the potential of other alternative uses in this area.

The extended period of responsibility (ten (10) years) was met in June 2013. During this time period following the completed reclamation of the mine site (bonding period), vegetation has establish and grown sufficiently to meet and achieve the requirements of the post-mining land uses set forth within the applicant’s reclamation plans found in Appendices XIV, XV, and XVI. The data collected during the vegetation monitoring for years nine and ten has shown that the standards of success for vegetation has met the requirements of the Utah Coal Regulations.

The areas which have been disturbed and reclaimed are either owned by the applicant or the applicant has obtained a special use permit to utilize the surface from others. Where the applicant is the legal surface owner, the land use is grazing, wildlife habitat, and recreation. The other legal/equitable surface owners are the United States Forest Service, State Institutional Trust Lands Administration, and Bureau of Land Management. The land uses for these lands are grazing, wildlife habitat, recreation, and industrial/commercial. Refer to Map 1-2 in Volume 3 for surface ownership within the Des-Bee-Dove mine permit area. The United States Forest Service special use permit stipulates that upon abandonment that each site will be restored to their natural state insofar as practical and subject to their satisfaction. Said lands have been restored to those standards. The other state and federal lands have been restored to the standards dictated by their respective administrator and the approved reclamation plan.



P. O. Box 310
15 No Main Street
Huntington, UT 84528

June 26, 2014

Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, Utah 84114-5801

Submitted Electronically

**RE: Deficiency Response to Discrepancies in Phase II and III Bond Release Application,
Des Bee Dove Mine, C/015/0017, Task ID #4580, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West"), as mine operator, hereby submits responses to the discrepancies of the Phase II and III bond release application identified by the Division.

If you have any questions or concerns regarding the enclosed information, please contact Dennis Oakley at 435-687-4825.

Sincerely,

Ken Fleck
Geology and Environmental Affairs Manager

Enclosures: C1 Form
Addendum 1
Addendum 2

Cc: file

The following responds to discrepancies found in the April 2014 Des Bee Dove Mine Phase II and III bond release application. The discrepancies are listed in the order they were received. Responses are shown in *italics*.

1) Please verify the accuracy of the sediment pond mix information that was included in the bond release application. The seed mix reported in the bond release application for the sediment pond reclamation area is not the same as the mix found in Appendix V XI Section 300 pg. 3. (pburton)

The sediment pond seed mix found in the April 2014 Des Bee Dove Mine Phase II and III bond release application is shown in error. Attachment 5 of this application has been amended and is attached as Addendum 1.

2) The disturbed area acreages for the Phase II Reclamation and Pumphouse areas listed in the 'Disturbed Area Reconciliation Table' should be 23.3 acres and 1.6 acres in order to coincide with the acreage figures in corresponding footnotes 1 and 2. The footnotes should include a justification for phase III bond release during years 4 and 8 of the 10 year liability period. Additionally, please provide a footnote describing the justification for phase III bond release for the sediment pond area. (jhelfrich)

The Division suggests that Appendix G of the Legal and Financial Volume be amended to make the Disturbed Area Reconciliation Table more clear. In discussion with Joe Helfrich, the permittee has made the recommended changes to the table. Appendix G – Des Bee Dove Permit is attached as Addendum 2. Only the table and footnotes contain the recommended changes. Note that until bond release is approved by OSM and the Division, the Legal and Financial Volume cannot be amended. Therefore, the proposed changes shall be approved conditionally by the Division.

APPLICATION FOR COAL PERMIT PROCESSING

Permit Change New Permit Renewal Exploration Bond Release Transfer

Permittee: PacifiCorp

Mine: Des Bee Dove Mine

Permit Number: C/015/0017

Title: Deficiency Response to Discrepancies in Phase II and III Bond Release Application, Des Bee Dove Mine, C/015/0017, Task ID #4580, Emery County, Utah

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

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

- Yes No 1. Change in the size of the Permit Area? Acres: ___ 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?

Please attach four (4) review copies of the application. If the mine is on or adjacent to Forest Service land please submit five (5) 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.

Kenneth Fleck
Print Name

Kenneth S. Fleck
Sign Name, Position, Date

Manager of Environmental Affairs JUNE 26, 2014

Subscribed and sworn to before me this 26 day of June, 2014

Brookelle Langi
Notary Public

My commission Expires: February 4, 2017
Attest: State of Utah } ss:
County of Emery



| | | |
|-----------------------------|----------------------------------|--|
| For Office Use Only: | Assigned Tracking Number: | Received by Oil, Gas & Mining |
| | | |

Addendum 1

Reclamation Treatments Utilized at the Des Bee Dove Mine

(Refer to Volume 5, Appendix XIV (Phase 1 Reclamation Plan), XV (Phase 2 Reclamation Plan), and XVI (Phase 3 Reclamation Plan) for a complete discussion of the reclamation treatments employed at the reclaimed sites.)

The Des Bee Dove mine site is located in an unnamed canyon of the southern end of East Mountain. Disturbed areas consist of both east and west facing steep slopes. The area is dominated by rock outcrop, rubble land, and shallow soils. Since the area was disturbed prior to Surface Mining Control and Reclamation Act of 1977, no soils were segregated and stored for reclamation. All disturbed areas were seeded according to the interim revegetation procedures outlined in Volume 2 Part 4 of the Des Bee Dove MRP. Suitability of the soil was demonstrated by the successful growth of native vegetation throughout the site. Reclamation was conducted in three (3) phases. Phase 1 included the upper Bee Hive and Little Dove mine areas. Phase 2 included the Deseret Mine area. And Phase 3 included the Sediment Pond and Access Road.

PacifiCorp instituted a soil trenching and management plan to gather sufficient substitute soils for reclaiming the Phase 1 and Phase 2 areas (refer to the Phase 1 and Phase 2 Reclamation Volumes). To assess the quality of the substitute topsoil available these areas, PacifiCorp conducted several soil sampling programs throughout the site. To quantify the substitute topsoil availability, PacifiCorp excavated soil trenches in the pre-SMCRA cuts and fills. In addition, trenches were developed in the spoil material excavated during the 2001 tippel pad coal removal project (bathhouse area) and in the substitute soil pile segregated at the Deseret coal storage area. Trenches were excavated with a backhoe to bedrock or to the proposed post reclamation elevations.

Through the soil salvage activities, PacifiCorp developed approximately 6,900 cubic yards of substitute subsoil material and 20,500 cubic yard of substitute topsoil material. These soils were placed in critical areas for creating slopes to mimic the surrounding landscapes.

The following give a very abridged discussion of the processes used for reclaiming the Des Bee Dove Mine.

Portal Sealing: All portals of the Des Bee Dove mine complex were sealed according to Mine Safety Health Administration (MSHA) specifications. The seals were constructed at least 25 feet in by the opening. The portal area was reclaimed by demolishing the surrounding portal collars. These collars were broken up and used as backfill material. The remaining void was backfilled utilizing existing fill according to the plan.

Sealing of the Remote Portals was completed inside the mine. During reclamation, the portal openings were backfilled with aerated concrete blocks that were flow in by helicopter to each of the openings. Once the openings were adequately filled, hand tools were used to cover the block backfill. The area was contoured using the hand tools to blend the portal sites with the surrounding area.

Soil Placement and Stabilization: Because of the enormity of the project, the reviewer should refer to the Phase 1, Phase 2, and Phase 3 volumes to review the complete backfilling and grading plan. Coal waste was placed against cuts and covered with subsoil and topsoil. The materials were placed in one foot lifts and compacted to an in-place unit weight equal to at least 90% of the maximum laboratory density. It was found that this density could be achieved by compacting the individual lifts a minimum of four passes with a rubber tired dozer or sheepfoot.

Final slope configurations did not exceed 2 horizontal by 1 vertical. The top layers were not compacted to allow for plant growth and root penetration. Rocks and boulders were randomly placed on the slopes to provide natural esthetic appearance as well as slope containment.

Topsoil was placed at least one foot in depth. The final surface was roughened by placing deep gouges (3' diameter by 1.5' deep) or pocks randomly throughout the surface. This roughening technique provided an effective erosion control mechanism and allowed for water containment on slopes that enhanced plant growth.

Maple Gulch breakouts consist of one breakout in each seam (Hiawatha Seam - Deseret Mine: Main North and Blind Canyon Seam - Beehive Mine: 10th East), approximately sixteen feet wide, eight feet high, located on an extremely steep rock ledge typically void of top/subsoil resources. Natural coal and sandstone outcrops exist throughout the area. Approximately 0.04 acre was impacted by the two breakouts. Due to the limited soil resource, soil material was not salvaged or stored at the site. During the backfilling process, each coal seam exposed during mining (Hiawatha Seam - Deseret Mine: Main North and Blind Canyon Seam - Beehive Mine: 10th East), was completely covered. As part of PacifiCorp's enhancement project, rock and aesthetically appealing materials was strategically placed along the coal outcrop area to blend the portal site into the surrounding terrain. Portals were backfilled using rock/debris adjacent to and above the portal openings. Soil and native material from adjacent to and above the portal areas was utilized to establish a vegetative cover over the backfilled openings.

Erosion Control: As mentioned above, deep gouging techniques were used to control sedimentation at all the reclaimed areas of the Des Bee Dove sites. These techniques required a track-hoe or similar machine to roughen the disturbed area in a random and discontinuous fashion using the bucket. Pockmarks were created to the size of approximately three (3) feet in diameter and one and half (1 ½) feet deep. The pockmarks were designed to capture or trap precipitation, influencing infiltration. Gouging serves to control erosion through water retention, and thus enhances vegetation growth. Because of the water retaining capabilities of deep gouging techniques, contribution of sediment above background levels did not occur. All exposed surfaces were protected and stabilized by incorporating or mixing hay mulch into the top layer of soil. A wood fiber mulch and tackifier was applied to the surface as detailed below.

During soil placement for the Maple Gulch portals, organic debris was incorporated into the soil. The surface was then roughened to control runoff and erosion.

Seeding/Fertilizing Techniques: Seeding and fertilizing was conducted contemporaneously as practical following soil placement/contouring, mulching, pocking of the area being reclaimed. Certified weed free alfalfa hay was incorporated into the soil following contouring at a rate of 2000lbs/acre. Fertilizer (Triple Superphosphate) was applied at a rate of 75 lbs./acre

Pocking techniques mixed the hay mulch and fertilizer into the upper portion of the soil. The seed mixture was broadcast by hand.

Next, a wood fiber mulch was applied at a rate of 1500 lbs./acre. A tackifier was added to the mulch and applied at a rate required by the manufacturer. Typically this rate was approximately 500 lbs/acre. Mulch and tackifier was applied simultaneously.

Revegetation: The following tables list the seed mixture that was used to revegetate the disturbed Pinyon/Juniper habitat of the Phase 1 and Phase 2 areas and the Saltbrush/Shrub community of the Phase 3 (sediment pond) area, as well as the Maple Gulch Portal breakouts.

Seed Mixture for Phase 1 and Phase 2 Areas:

| Common Name | Scientific Name | Lbs./Acre Equivalent PLS |
|------------------------------|------------------------------------|-----------------------------|
| Grasses (Cool Season) | | |
| Indian Ricegrass | <i>Achantherum hymenoides</i> | 1.5 |
| Thickspike wheatgrass | <i>Elymus lanceolantus</i> | 1.0 |
| Salina wildrye* | <i>E. salinus</i> | 2.0 |
| Bottlebrush squirreltail | <i>E. elymoides</i> | 1.0 |
| Great Basin Wild Rye | <i>Leymus cinereus</i> | 2.0 |
| Western wheatgrass | <i>Pasopyrum smithii</i> | 2.0 |
| Bluebunch wheatgrass | <i>Pseudoroegneria spicatum</i> | 1.5 |
| Forbes | | |
| Pacific Aster | <i>Aster chilensis</i> | 0.1 |
| Palmer Penstemon | <i>Penstemon palmeri</i> | 0.5 |
| Shrubs** | | |
| Fourwing saltbrush | <i>Atriplex canescens</i> | 4.0 |
| Shadscale | <i>Atriplex confertifolia</i> | 3.5 |
| Winterfat | <i>Ceratoides lanata</i> | 3.5 |
| Low rabbitbrush | <i>Chrysothamnus viscidiflorus</i> | 0.3 |

Seed Mixture for the Phase 3 Area:

| Common Name | Scientific Name | Lbs/ac Equivalent PLS |
|-----------------------|------------------------------------|--------------------------|
| Thickspike wheatgrass | <i>Elymus lanceolatus</i> | 3.0 |
| Western wheatgrass | <i>E. smithii</i> | 4.0 |
| Basin wildrye | <i>E. cinereus</i> | 4.0 |
| Indian ricegrass | <i>Stipa hymenoides</i> | 3.0 |
| Alkali sakatoon | <i>Sporobolus airoides</i> | 0.25 |
| Lewis flax | <i>Linum lewisii</i> | 1.0 |
| Globemallow | <i>Sphaeralcea grossularifolia</i> | 0.5 |
| Fourwing saltbrush | <i>Atriplex canescens</i> | 2.0 |
| Mat saltbrush | <i>A. corrugata</i> | 2.0 |
| Shadscale | <i>A. confertifolia</i> | 2.0 |
| Winterfat | <i>Ceratoides lanata</i> | 2.0 |
| Prostrata kochia | <i>Kochia prostrata</i> | 0.5 |

Seed Mixture - Final Revegetation for the Des-Bee-Dove: Maple Gulch Portal Breakouts

| <u>Common Name</u> | <u>Scientific Name</u> | <u>Lbs/Acre</u> <u>PLS*</u> |
|-------------------------|-------------------------------|--------------------------------|
| <u>Grasses</u> | | |
| Western wheatgrass | Agropyron smithii | 3.0 |
| Bluebunch wheatgrass | Agropyron spicatum | 3.0 |
| Indian ricegrass | Oryzposis hymenoides | 3.0 |
| Needle and thread grass | Stipa comata | 1.0 |
| Thickspike wheatgrass | Agropyron dasystachyum | 1.0 |
| Great Basin wildrye | Elymus ciaereus | 2.0 |
| <u>Forbs</u> | | |
| Blueleaf aster | Aster glaucodes | 0.5 |
| Utah sweet vetch | Hedysarum boreale | 1.0 |
| Lewis flax | Linum lewisii | 1.0 |
| Globemallow | Sphaeralcea coccinea | 0.5 |
| Yarrow | Achillea millefolius | 0.5 |
| <u>Shrubs</u> | | |
| Serviceberry | Amelanchier alnifolia | 1.0 |
| Mountain big sagebrush | Artemesia tridentata vaseyana | 0.5 |
| Wyoming big sagebrush | Artemesia wyomingensis | 0.5 |
| Prairie sage | Artemesia ludoviciana | 0.5 |
| Big white rabbitbrush | Chrysothamunus nauseosus | |
| | var. albicaulis | <u>0.5</u> |
| | Total | 19.0 |

All seed mixtures were approve by DOGM with USFS and SITLA concurring. Planting techniques utilized both hydro-seeding and hand spreading.

Addendum 2

Des Bee Dove Mine Permit Boundary Description

T17S, R7E, SLB&M Emery County, UT

| Section | Description | Acreage |
|---------|-----------------------------|---------|
| Sec 25: | NW¼SW¼ | 40.00 |
| Sec 26: | E½SW½NE¼, W½SE½NE¼, NE¼SE¼. | 80.00 |

Sediment Pond

Beginning at a point 259.41 feet West and 123.74 feet North of the East 1/4 corner of section 35, T17S. R7E., SLM and intersecting the Des-Bee-Dove Emery County Road No. 412;

thence S 61°43' E, 127.70 feet;
 thence S 51° 13' E, 459.78 feet;
 thence S 60° 43' E, 163.50 feet;
 thence S 3° 43' E, 213.14 feet;
 thence N 64° 47' E, 278.44 feet;
 thence N 22° 17' E, 249.11 feet;
 thence N 44° 13' W, 217.52 feet;
 thence N 2° 47' E, 431.98 feet;
 thence N 10° 13' W, 194.24 feet;
 thence N 6° 13' E, 231.03 feet;
 thence N 51° 13' E, 154.75 feet;
 thence N 7° 13' E, 230.82 feet;
 thence N 39° 13' W, 188.61 feet;
 thence N 13° 48' 40" W, 1030.83 feet;
 thence N 40° 36' 49" W, 46.42 feet;
 thence S 88° 27' 37" W, 100.39 feet;
 thence N 61° 03' 40" W, 163.27 feet,
 thence W, 79.30 feet,
 thence S, 0°, 08' W, 517.82 feet,
 thence S 13° 48' 40" E, 454.63 feet;
 thence S 60° 37' 19" E, 640.87 feet;
 thence S 7° 13' W, 189.18 feet;
 thence S 51° 13' W, 155.25 feet;
 thence S 6° 13' W, 258.97 feet;
 thence S 10° 13' E, 195.76 feet;
 thence S 2° 47' W, 448.02 feet;
 thence S 44° 13' E, 206.48 feet;
 thence S 22° 17' W, 196.89 feet;
 thence S 64° 47' W, 185.56 feet;
 thence N 3° 43' W, 166.86 feet;
 thence N 60° 43' W, 186.50 feet;
 thence N 51° 13' W, 460.22 feet;
 thence N 61° 43' W, 132.30 feet;
 thence S 28° 16' 51" W, 50.00 feet;
 to point of beginning. Contains 13.88 acres, more or less.

BLM Right of Way UTU-53809 Relinquished 8/22/04; No Right of Entry

Remote Portals

Behive Portal Breakout (BLM Right-of-Way Expired 5/25/01; No Right of Entry).

An 20 ft. X 20 ft. area beginning at the SW corner of Section 13, T17S. R7E., SLM, to a point 292 feet, bearing N59°34'26"E. 0.01 acres, more or less.

Deseret Portal Breakout

An 20 ft. X 20 ft. area beginning at the SE corner of Section 14, T17S. R7E., SLM, to a point 1,798 feet, bearing N49°20'41"W. 0.01 acres, more or less.

The Des Bee Dove permit covers an area approximately 133.9 acres. The total disturbed area at the mine is currently 40.90 acres.

Des Bee Dove Mine Permit Boundary Description

Disturbed Area Reconciliation Table

| Type Area | Area Name | Original Disturbed Acreage | Reclamation Completion Date | Disturbed Acreage | Phase I Bond Release Date | Phase II Bond Release Date | Phase III Bond Release Date |
|---------------|--------------------------|----------------------------|-----------------------------|--------------------|---------------------------|----------------------------|-----------------------------|
| Mine Site | Phase 1 Reclamation Area | 4.6 | May-02 | 4.60 | 2/13/2007 | | |
| Mine Site | Phase 2 Reclamation Area | 23.3 | Jun-03 | 22.4 ¹ | 2/13/2007 | | 4/5/2007 |
| Mine Site | Pumphouse Area | 1.62 | Nov-99 | 0.00 ² | 2/13/2007 | | 4/5/2007 |
| Remote Portal | Deseret Mine | 0.01 | Jul-00 | 0.01 | 9/17/2009 | | |
| Remote Portal | Beehive Mine | 0.01 | Jul-00 | 0.01 | 9/17/2009 | | |
| Sediment Pond | Phase 3 Reclamation Area | 13.88 | Jan-06 | 13.88 ³ | 9/17/2009 | | |
| Access | Haul Road Area | 93.18 | N/A | 0.00 ⁴ | N/A | N/A | 8/24/1998 |
| Total | | 136.6 | | 40.90 | | | |

¹ Originally the Phase 2 Reclamation Area contained 23.3 total disturbed acres. On 4/5/07 Division of Oil, Gas, and Mining approved Phase III Bond Release on 0.9 acres of disturbed land within this area as a result of an approved PMLU change.

² Originally the Pumphouse Reclamation Area contained 1.62 total disturbed acres. On 4/5/07 Division of Oil, Gas, and Mining approved Phase III Bond Release on all acres of disturbed land within this area as the result of an approved PMLU change

³ According to Utah's Coal Regulatory Program rules a sediment pond is by definition a siltation structure and as such is not required to meet the ten year liability period for phase III bond release. However vegetation success standards do apply to the reclaimed pond and access road. These standards were met for phase III bond release. (JH)

⁴ The haul road originally consisted of 93.18 acres of disturbed land associated with the Des Bee Dove Mine. The Des Bee Dove haul road and all of PacifiCorp's jurisdictional control of the road was transferred to Emery County on August 24, 1998. The road is now part of the Emery County road system.

(JH) - Joe Helfrich Division of Oil, Gas, and Mining