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March 15, 2017

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

Attn: Daron Haddock
Permit Supervisor

Re: West Ridge Mine C/007/041
WR17-001 2016 Annual Report

Dear Mr. Haddock

Attached you will find the completed Annual Report for West Ridge Mine, 2016.

If you ahve any questions, please feel free to call me directly at 435-888-4000.

Sincerely,

Karin Madsen
Engineering Tech
UtahAmerican Energy, Inc.

Vegetation Monitoring at the Experimental Test Plot:

A Summary Report
2008-2016

at the
West Ridge Mine,
Carbon County, Utah

Prepared by

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Patrick D. Collins, Ph.D.

for

WEST RIDGE RESOURCES
West Ridge Mine
P.O. Box 910
East Carbon, Utah 84520

January 2017

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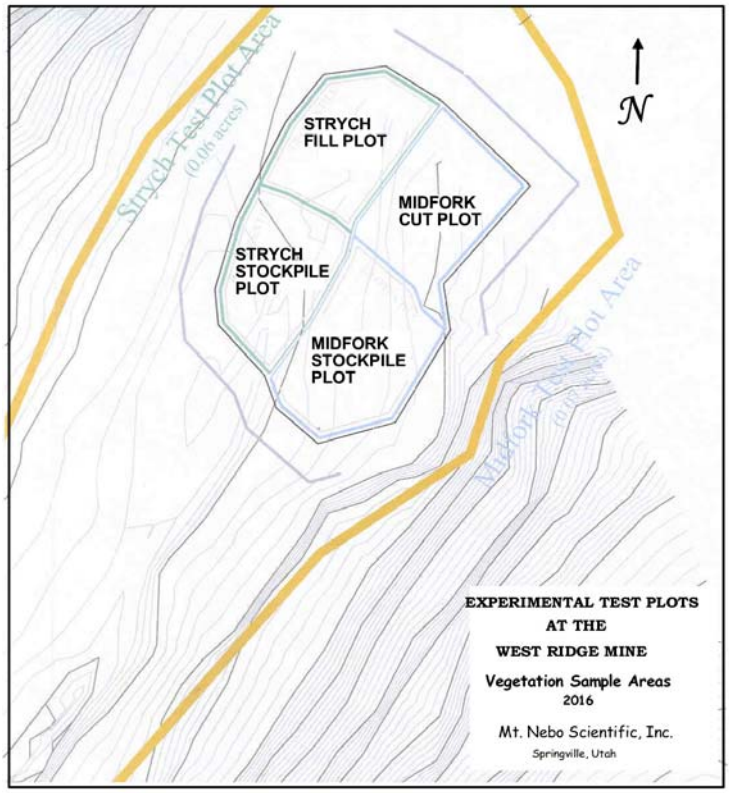
INTRODUCTION

Experimental Practice Test Plots were constructed at the West Ridge Mine site in 1999. The test plot layout is shown below. These plots were created to simulate final reclamation of those soils that have been left in-place as opposed to the more common practice to remove and stockpile them. The plot soils were covered by a geotextile layer (as a means for preservation of the in-place topsoil), identified with marker strips (to facilitate locating them at the time of reclamation), covered with fill (to simulate the material used to cover the mine pad areas during operations), then covered with other topsoil material, and finally seeded with the *interim* seed mixture for erosion control. From the information provided by the State of Utah, Division of Oil, Gas & Mining [Priscilla Burton (2009)[1]] below, it appears that the Strych Stockpile plot was the only plot that represents the experimental practice of burial and storage of soils in-place.



In 2005, or six years following the initial test plot construction, the above procedures were reversed in an attempt to imitate final reclamation and revegetation of the mine site. Or, the fill and topsoil in the Strych Stockpile plot were removed until the marker strips were exposed. These materials were then returned to their place of origin. The geotextile material was then removed exposing the topsoil and subsoil that was left "in-place",

followed by re-seeding the area with the seed mixture formulated for *final* revegetation. The more conventional treatment of returning stockpiled soils the test plots for revegetation was conducted on the remaining plots.

Quantitative sampling to monitor the vegetation of the test plots began in 2008. This document was prepared to report the current (2016) status and condition of specific parameters for the vegetation of the Experimental Test Plots at the West Ridge Mine as well as a summary of the datasets over time (2008-2016).

As a means to retain the following useful information here, in a letter to West Ridge Resources from Priscilla Burton (2009)[1], the following additional comments regarding the history of the Experimental Test Plots were stated:

- The work began with removing stinging nettle seed heads from a patch of nettle that completely covered the Midfork Stockpile Area.
- Certified noxious weed-free alfalfa hay was gouged into the regraded site (copy of certification was attached to the Inspection Report #717).
- There was no application of straw and wood fiber mulch tackifier.
- There was no soil amendment added based upon visual observation of vegetative cover, but soil samples were taken to document the soil chemistry.
- Soils were sampled from the test plots after they were regraded. The Brigham Young University Soil and Plant Analysis Lab analysis is dated October 4, 2005. (***NOTE****: The 2005 laboratory report has been provided in the appendix of this report*).
- The seeding was done on October 31, 2005.
- According to information received by the Division on September 10, 2005, the seed mix outlined in Table 3-2B (*in MRP, Appendix* 2-6) was modified due to availability: Sandberg bluegrass replaced muttongrass (*Poa fendleriana*) and neither canyon sweetvetch nor rocky mountain maple were commercially available and were not included in the seed mix.
- Containerized plants shown on Table 3-2B (*in MRP, Appendix* 2-6) were not available and not planted.
- A vegetative analysis was conducted in August 2008 and results are presented in an addendum to Appendix 2-6 (*in MRP*) .

- Burton (2009) speculates that the predominance of stinging nettle in the Midfork Cut plot may have resulted from the Midfork Stockpile area (the source of the Midfork Cut topsoil) that was covered with stinging nettle and the root propagules and seed were more than likely carried over with the soil.

- The Strych Stockpile Area is the only plot that represents the experimental practice of burial and storage in place. A comparison of the Strych Stockpile area and the Strych Fill area is the test of the conventional technique versus the experimental technique in the same soil type.

METHODS

Methodologies used for this study were performed in accordance with the guidelines supplied by the State of Utah, Division of Oil, Gas and Mining (DOGM) and were consistent for all sample years. Quantitative and qualitative data were recorded in July or August of each year; in 2016 it was recorded August 25th. The reference area proposed to ultimately be compared as final revegetation success standards was also used for comparisons of the test plots. Although the data of the reference area was from sampling in 1998, it can be used for general benchmark comparisons of the plots.

Sampling Design and Transect/Quadrat Placement

Quadrat sample locations were chosen using random numbers with the objective to record data without preconceived bias.

[1] Burton, P. 2009. Test plot evaluation and soil monitoring reports, C/007/00041, West Ridge Mine, Task ID #3111. *In:* Letter from D. Haddock. April 16, 2009, State of Utah, Division of Oil, Gas & Mining, Salt Lake City, UT.

Cover and Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition, cover by species, and relative frequencies were also assessed from the quadrats. Plant nomenclature follows *A Utah Flora* (Welsh et al., 2008)[2]

Woody Species Density

Density of woody plant species was not assessed because very few or no trees or shrubs were present on the plots.

Photographs

Color photographs of the sample areas were taken at the time of sampling and have been submitted with each final report.

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[2] Welsh, S.L., N.D. Atwood, S. Goodrich and L.C. Higgins. 2008. A Utah flora. Print Services, Brigham Young University, Provo, UT. 1019 pp.

RESULTS

Sample Year: 2016

Midfork Cut

The Midfork Cut plot, shown in Photo 1, was largely dominated by stinging nettle (*Urtica dioica*), Kentucky bluegrass (*Poa pratensis*), bluebunch wheatgrass (*Elymus spicatus*) , thickspike wheatgrass (*E. lanceolatus*) and western wheatgrass (*E. smithii*). For a list of all plant species by cover and frequency found in the test plot, refer to Table 1.

Table 1: West Ridge Mine Experimental Test Plots. Living Cover and Frequency by Plant Species (2016).
MIDFORK CUT

	Mean Percent	Standard Deviation	Percent Frequency
TREES & SHRUBS			
FORBS			
Linum lewisii	1.00	3.00	10.00
Urtica dioica	23.00	10.05	100.00
GRASSES			
Elymus lanceolatus	11.50	17.90	50.00
Elymus smithii	10.50	23.29	20.00
Elymus spicatus	11.67	13.74	40.00
Poa pratensis	19.50	20.30	70.00

Table 2: West Ridge Mine Experimental Test Plots. Total Cover and Composition (2016).
MIDFORK CUT

A. TOTAL COVER	Mean Percent	Standard Deviation
Total Living Cover	76.00	7.68
Litter	11.50	9.23
Bareground	5.80	3.09
Rock	6.70	4.22
B. % COMPOSITION		
Shrubs	0.00	0.00
Forbs	32.09	14.11
Grasses	67.91	14.11

Total living cover of the plot was estimated at 76.00% (Table 2-A). The living cover was comprised of 67.91% grasses, 32.09% forbs with no shrubs

present in the sample quadrats (Table 2-B).

Midfork Stockpile

The dominant plant species represented in the Midfork Stockpile (Photo 2) were Lewis flax (*Linum lewisii*), western wheatgrass and thickspike wheatgrass (Table 3).

Table 3: West Ridge Mine Experimental Test Plots. Living Cover and Frequency by Plant Species (2016).
MIDFORK STOCKPILE

	Mean Percent	Standard Deviation	Percent Frequency
TREES & SHRUBS			
Mahonia repens	1.00	3.00	10.00
FORBS			
Cynoglossum officinale	0.50	1.50	10.00
Hedysarum boreale	1.00	3.00	10.00
Linum lewisii	18.00	14.53	70.00
Urtica dioica	2.50	4.03	30.00
GRASSES			
Elymus lanceolatus	6.30	6.87	50.00
Elymus smithii	11.50	10.97	60.00

The total living cover for the Midfork Stockpile plot was estimated at 72.00% (Table 4-A). The composition of the living cover was comprised of 69.27% grasses, 29.48% forbs and 1.25% shrubs (Table 4-B.) .

Table 4: West Ridge Mine Experimental Test Plots. Total Cover and Composition (2016).
MIDFORK STOCKPILE

A. TOTAL COVER	Mean Percent	Standard Deviation
Total Living Cover	72.00	7.48
Litter	15.50	7.23
Bareground	5.80	2.14
Rock	6.70	4.22
B. % COMPOSITION		
Shrubs	1.25	3.75
Forbs	29.48	20.62
Grasses	69.27	22.50

Strych Stockpile

The Strych Stockpile plot (Photo 3) was dominated by Lewis flax, Kentucky bluegrass, bluebunch wheatgrass, and western wheatgrass (Table 5).

Table 5: West Ridge Mine Experimental Test Plots. Living Cover and Frequency by Plant Species (2016).
STRYCH STOCKPILE

	Mean Percent	Standard Deviation	Percent Frequency
TREES & SHRUBS			
FORBS			
Hedysarum boreale	1.00	3.00	10.00
Linum lewisii	25.50	9.60	90.00
Urtica dioica	3.50	7.09	20.00
GRASSES			
Elymus lanceolatus	2.50	4.03	30.00
Elymus smithii	7.50	10.06	40.00
Elymus spicatus	13.00	13.64	50.00
Poa pratensis	20.50	18.36	60.00

The total living cover of the plot was estimated at 73.50% (Table 6-A); this cover consisted of 59.16% grasses and 40.84% forbs with no woody species present (Table 6-B).

Table 6: West Ridge Mine Experimental Test Plots. Total Cover and Composition (2016).
STRYCH STOCKPILE

A. TOTAL COVER	Mean Percent	Standard Deviation
Total Living Cover	73.50	7.76
Litter	11.00	3.74
Bareground	6.40	2.37
Rock	9.10	4.72
B. % COMPOSITION		
Shrubs	0.00	0.00
Forbs	40.84	11.88
Grasses	59.16	11.88

Strych Fill

The Strych Fill plot's (Photo 4) dominant plant species were Kentucky bluegrass, Western wheatgrass, stinging nettle and thickspike wheatgrass.

Table 7: West Ridge Mine Experimental Test Plots. Living Cover and Frequency by Plant Species (2016).
STRYCH FILL

	Mean Percent	Standard Deviation	Percent Frequency
TREES & SHRUBS			
Symphoricarpos oreophilus	0.50	1.50	10.00
FORBS			
Hedysarum boreale	1.00	3.00	10.00
Linum lewisii	3.50	6.34	30.00
Machaeranthera grindelioides	1.00	3.00	10.00
Tragopogon dubius	1.00	3.00	10.00
Urtica dioica	12.00	10.77	60.00
GRASSES			
Elymus lanceolatus	11.00	15.78	50.00
Elymus smithii	16.50	19.63	60.00
Elymus spicatus	7.50	8.14	50.00
Poa pratensis	22.50	21.36	70.00

All species encountered in the plots are shown on Table 7.

Table 8: West Ridge Mine Experimental Test Plots. Total Cover and Composition (2016).
STRYCH FILL

A. TOTAL COVER	Mean Percent	Standard Deviation
Total Living Cover	76.50	8.96
Litter	15.00	8.94
Bareground	3.40	1.62
Rock	5.10	4.32
B. % COMPOSITION		
Shrubs	0.67	2.00
Forbs	24.14	12.31
Grasses	75.19	11.50

Total living cover of the Strych Fill plot was estimated at 76.50% (Table 8-A). The living understory cover composition was comprised of 75.19% grasses and 24.14% forbs and 0.67% shrubs (Table 8-B).

Douglas Fir/Maple Reference Area

The existing Douglas Fir/Maple Reference Area (Photo 5) was chosen to ultimately be compared to the test plots and other sites at the time of final reclamation. Each year this dataset is included with the Experimental Test Plot monitoring data for a general comparisons only. When the final revegetation is compared to the reference area, the sampling will be accomplished during the same growing season.

Understory in the Douglas Fir/Maple Reference Area was dominated by bigtooth maple (*Acer grandidentatum)*, mountain lover (*Pachystima myrsinites)*, and Oregon grape (*Mahonia repens*). Overstory dominants were bigtooth maple and Douglas fir (*Pseudotsuga menziesii*). A list of all species present in the sample quadrats for the reference area is shown in Table 9.

The total living cover of the reference area was estimated at 63.63% of which overstory and understory cover was nearly equally represented at 31.38% and 32.25%, respectively (Table 10-A). Woody species comprised 61.57% of the total living understory cover, followed by forbs at 25.33% and grasses at 13.10% (Table 10-B).

Table 9. West Ridge Mine: Reference Area. Total Cover, Standard Deviation and Frequency by Species (1998).

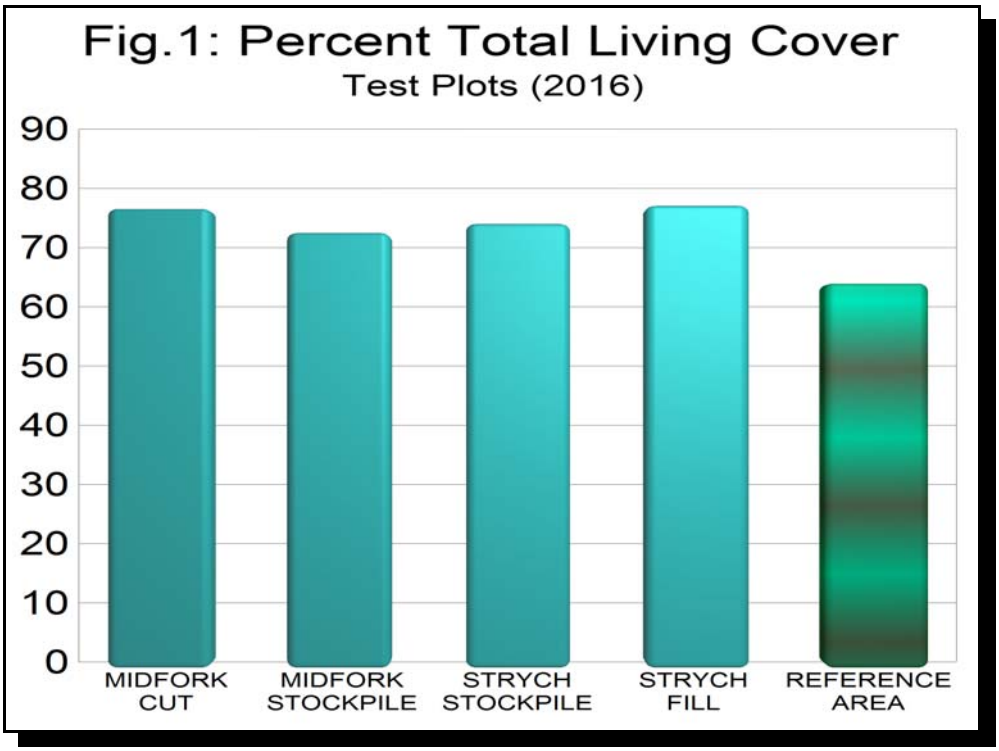
DOUGLAS FIR/ MAPLE COMMUNITY REFERENCE AREA (NEW)	Mean Percent	Standard Deviation	Percent Frequency
OVERSTORY COVER			
Acer grandidentatum	15.88	21.30	50.00
Juniperus scopulorum	1.38	6.22	5.00
Pseudotsuga menziesii	14.13	20.67	45.00
UNDERSTORY COVER			
TREES & SHRUBS			
Acer grandidentatum	6.18	11.30	47.50
Juniperus scopulorum	1.30	2.90	20.00
Mahonia repens	3.33	5.82	40.00
Pachystima myrsinites	5.73	11.04	35.00
Pseudotsuga menziesii	1.95	6.19	6.00
Symphoricarpos oreophilus	1.43	3.35	20.00
FORBS			
Antennaria parvifolia	0.25	1.09	5.00
Artemisia dracunculus	0.88	3.33	10.00
Aster sp.	3.13	7.65	30.00
Cirsium sp.	0.13	0.78	2.50
Descurainia pinnata	1.78	7.12	10.00
Erigeron engelmannii	0.25	1.09	5.00
Erysimum asperum	0.13	0.78	2.50
Fragaria vesca	0.38	1.73	5.00
Mitella stauropetala	0.05	0.31	2.50
Senecio pudicus	0.15	0.79	5.00
Smilacina racemosa	0.33	1.03	10.00
Stellaria jamesiana	0.03	0.16	2.50
Taraxacum officinale	0.13	0.78	2.50
Thalictrum fendleri	0.13	0.78	2.50
Viola adunca	0.13	0.78	2.50
GRASSES			
Bromus inermis	1.25	5.67	7.50
Poa fendleriana	2.90	4.15	45.00
Poa pratensis	0.38	1.73	5.00

Table 10. West Ridge Mine: Reference Area. Total Cover, Standard Deviation and Sample Size (1998).

DOUGLAS FIR/ MAPLE COMMUNITY REFERENCE AREA (NEW)	Mean Percent	Standard Deviation	Sample Size
A. TOTAL COVER			
Overstory Cover (O)	31.38	25.69	40
Understory Cover (U)	32.25	19.27	40
Cryptogams	0.25	1.09	40
Litter	18.20	12.80	40
Bareground	8.20	9.39	40
Rock	9.73	9.67	40
O+U	63.63	13.51	40
B. % COMPOSITION			
Trees & Shrubs	61.57	33.67	40
Forbs	25.33	29.49	40
Grasses	13.10	19.14	40

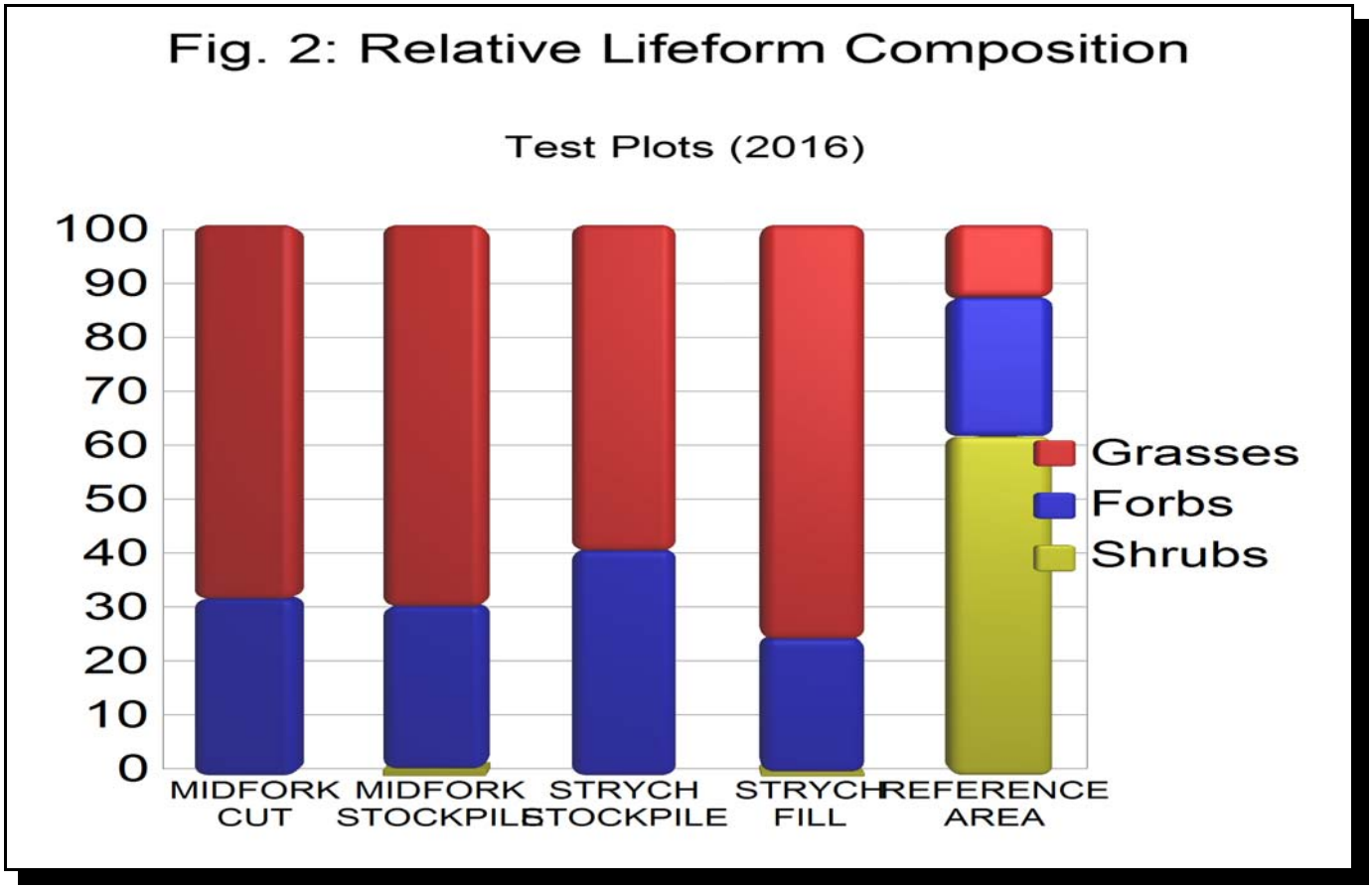
Total Living Cover Comparison

A comparison of the 2016 total living cover data with the reference area is provided in Fig. 1.



Lifeform Composition Comparison

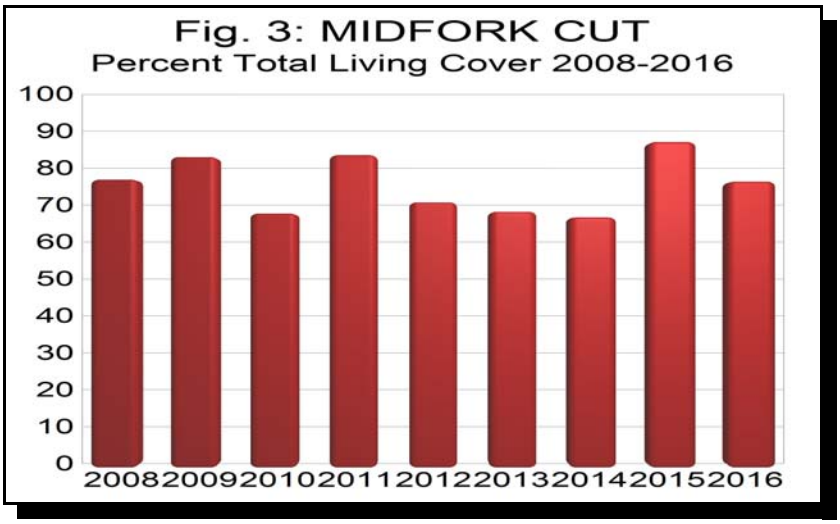
A lifeform comparison of the 2016 test plot and reference area datasets is provided in Fig. 2.



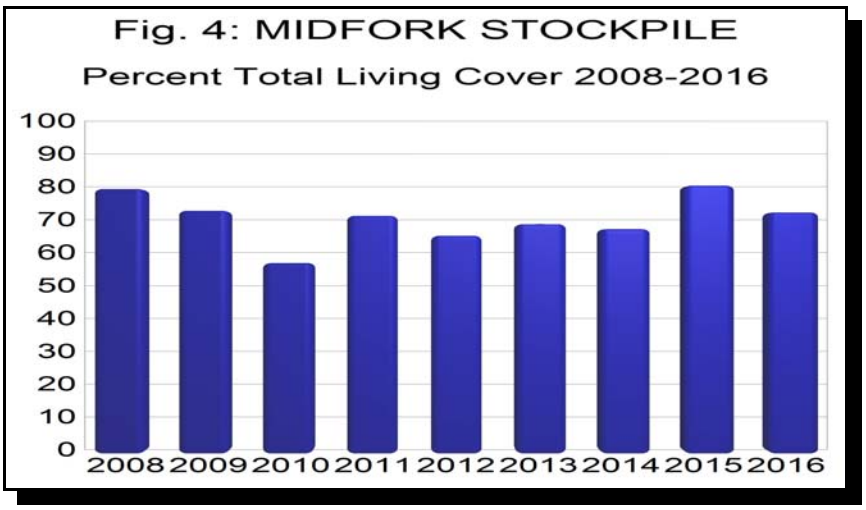
Sample Years: 2008 - 2016

Midfork Cut

A comparison of the total living cover over time for the Midfork Cut plot is shown in Fig. 3. As a side-note, *the reference area had a total living cover was* ***63.63%***. This cover comprised both the overstory and understory cover combined *(see Table 10)*. One could use the logic that only the understory cover of the reference area (32.25%) should be used for the standard at the time of final revegetation. But even if the total combined cover of the reference area is used, the Midfork Cut plot was still higher for all sample years.



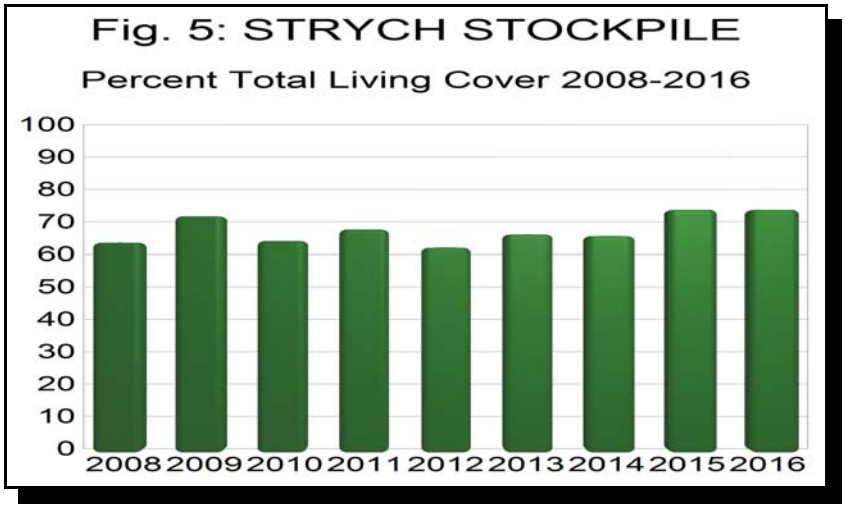
Midfork Stockpile



The year-to-year comparison for the Midfork Stockpile is shown in Fig. 4. Only one of the sample years fell short of the total living cover value of the reference area – in 2010 the cover was 57.00%.

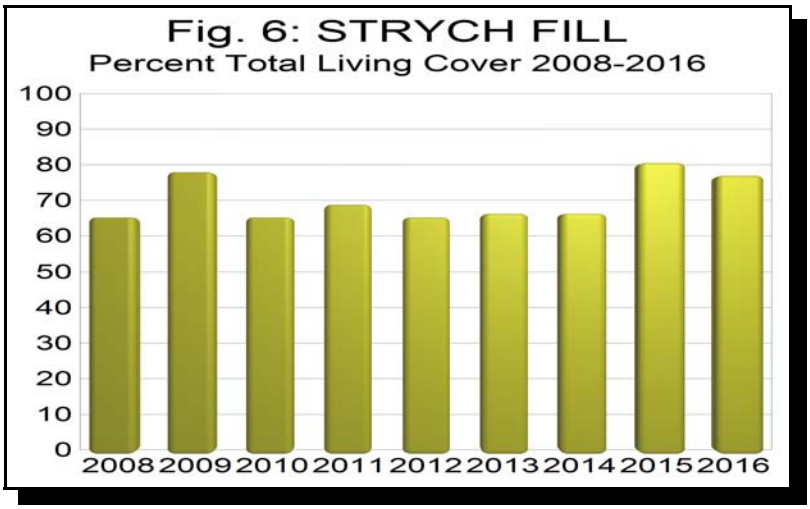
Strych Stockpile

The comparison between years of the Strych Stockpile, the test plot created to represent the experimental practice, is shown in Fig. 5. Like the test plot above, there was only one year it was below the 63.33% cover value of the reference area. That year was 2012 when the total living cover was 62.00%; this lower value was not statistically significant.



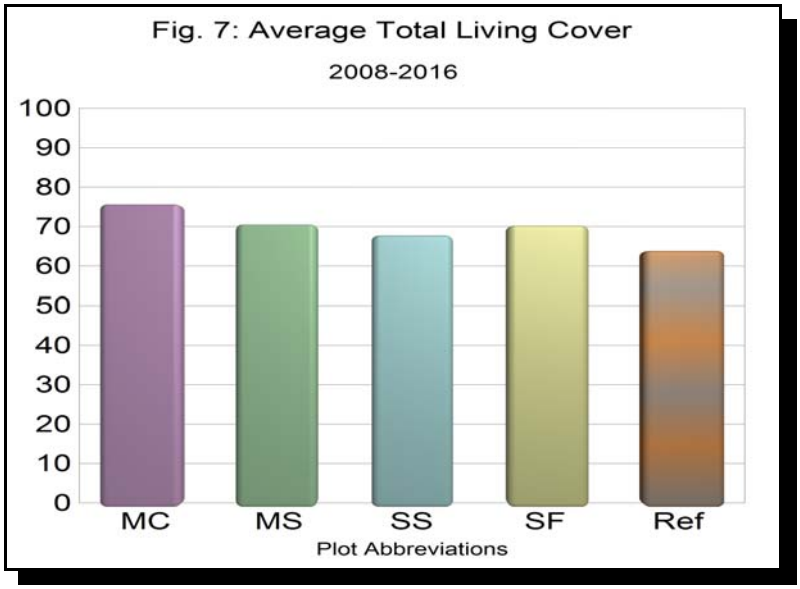
Strych Fill

Finally, the Strych Fill test plot comparison is shown in Fig. 6. The total living cover in this plot was higher than the reference area in all sample years.



Total Living Cover Averages

The average total living cover for all sample years for each test plot was also calculated and compared with the reference area (Fig. 7). The mean cover values of all plots were greater than the reference area.



SUMMARY & DISCUSSION

Experimental Practice Test Plots were constructed at the West Ridge Mine site in 1999. To compare the more common preservation practice of removing topsoil and fill in an area disturbed by mining activities, these experimental plots were created to simulate final reclamation of those soils if they area are left *in-place* and covered with geotextile material prior to covering them with fill. The Strych Stockpile plot was the only plot that represents the experimental practice of storage and burial of soils left in-place, the remaining plots simulated the more traditional approach mentioned above. Following simulation of the two reclamation practices, the plots were seeded with the final revegetation seed mixture. The vegetation of the plots were then quantitatively sampled from 2008 through 2016. This document reports the results from sampling in 2016 as well as provides comparisons with the previous sample years.

To summarize the findings, there was little difference between the different treatments for total living cover, composition and species present. The total living cover for all treatments exceeded that of the reference area, or the area chosen to represent final revegetation success standards.

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

APPENDIX

Laboratory Analyses
(2005)

10/05/2005 10:18 FAX 4220008 002

BRIGHAM YOUNG UNIVERSITY

Soil and Plant Analysis Laboratory
255 WIDB
Provo, UT 84602
801-422-2147

Plant and Animal Science Department

SOIL TEST REPORT
AND
RECOMMENDATIONS

Name Gary Gray-West Ridge Resources
Street PO Box 790
Lehi UT 84043
City State Zip

Date: 04-Oct-05
Time: 11:12 AM
Telephone:
Fax:

Sample Identification	Crop to be grown	pH	% Sand	% Silt	% Clay	Soil Texture	Cation Exchange meq/100g	% Organic Matter
Strych Fill area	Turf	7.31	43.00	35.16	21.84	Loam		4.58

Soil Test	Results	Very Low	Low	Medium	High	Very High	Recomendations
Nitrate-Nitrogen ppm N	7.17	X					apply 2.8 lbs of N/1000 sq ft
Phosphorus ppm P	9.29		X				apply 1.4 lbs of P2O5/1000 sq ft
Potassium ppm K	672.00					X	no fertilizer needed
Salinity-ECe dS/m	1.06		X				no salinity problem
SAR-Sodium Absorption Ratio	0.17	X					no sodium hazard
Calcium-SAR ppm Ca	227.20						
Potassium SAR ppm K	33.80						
Magnesium SAR ppm Mg	25.12						
Sodium SAR ppm Na	10.08						
HCO3 ppm HCO3	592.29						
% moisture sat. % sat	30.60						
Ca Carbonate %CaCO3	19.47						
Total N ppm total N	963.70						
% rock %	20.14						

10/06/2005 10:18 FAX 4220008 003

BRIGHAM YOUNG UNIVERSITY

Soil and Plant Analysis Laboratory
255 WIDB
Provo, UT 84602
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Plant and Animal Science Department

SOIL TEST REPORT AND RECOMMENDATIONS

Name Gary Gray-West Ridge Resources
Street PO Box 790
Lehi UT 84043
City State Zip

Date: 04-Oct-05
Time: 11:12 AM
Telephone:
Fax:

Sample Identification	Crop to be grown	pH	% Sand	% Silt	% Clay	Soil Texture	Cation Exchange meq/100g	% Organic Matter
Strych stockpile area	Turf	7.62	42.00	33.16	24.84	Loam		2.89

Soil Test	Results	Very Low	Low	Medium	High	Very High	Recomendations
Nitrate-Nitrogen ppm N	10.50		X				apply 2.1 lbs of N/1000 sq ft
Phosphorus ppm P	5.70	X					apply 2.1 lbs of P2O5/1000 sq ft
Potassium ppm K	448.00					X	no fertilizer needed
Salinity-ECe dS/m	0.77	X					no salinity problem
SAR-Sodium Absorption Ratio	0.34	X					no sodium hazard
Calcium-SAR ppm Ca	136.48						
Potassium SAR ppm K	22.40						
Magnesium SAR ppm Mg	32.32						
Sodium SAR ppm Na	17.28						
HCO3 ppm HCO3	432.63						
% moisture sat. % sat	30.05						
Ca Carbonate %CaCO3	20.25						
Total N ppm total N	502.60						
% rock %	15.14						

BRIGHAM YOUNG UNIVERSITY

Soil and Plant Analysis Laboratory
265 WIDB
Provo, UT 84602
801-422-2147

Plant and Animal Science Department

SOIL TEST REPORT
AND
RECOMMENDATIONS

Name Gary Gray-West Ridge Resources
Street PO Box 790
Lehi UT 84043
City State Zip

Date: 04-Oct-05
Time: 11:12 AM
Telephone:
Fax:

Sample Identification	Crop to be grown	pH	% Sand	% Silt	% Clay	Soil Texture	Cation Exchange meq/100g	% Organic Matter
Midfork cut area	Turf	7.27	40.00	36.16	23.84	Loam		5.67

Soil Test	Results	Very Low	Low	Medium	High	Very High	Recomendations
Nitrate-Nitrogen ppm N	16.80		X				apply 2.1 lbs of N/1000 sq ft
Phosphorus ppm P	13.14		X				apply 1.4 lbs of P2O5/1000 sq ft
Potassium ppm K	566.40					X	no fertilizer needed
Salinity-ECe dS/m	0.98	X					no salinity problem
SAR-Sodium Absorption Ratio	0.13	X					no sodium hazard
Calcium-SAR ppm Ca	205.12						
Potassium SAR ppm K	28.32						
Magnesium SAR ppm Mg	24.64						
Sodium SAR ppm Na	7.20						
HCO3 ppm HCO3	669.54						
%moisture sat % sat	52.97						
Ca Carbonate %CaCO3	16.00						
Total N ppm total N	923.60						
% rock %	10.11						

BRIGHAM YOUNG UNIVERSITY

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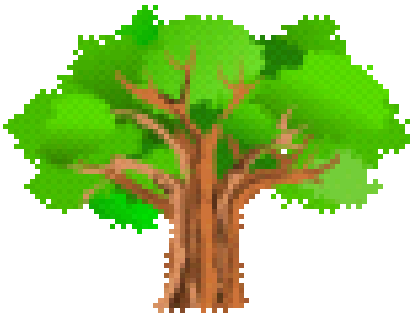
Telephone:
Fax:

Sample Identification	Crop to be grown	pH	% Sand	% Silt	% Clay	Soil Texture	Cation Exchange meq/100g	% Organic Matter
Midfork stockpile area	Turf	7.39	35	39.16	25.84	Loam		4.59

Soil Test	Results	Very Low	Low	Medium	High	Very High	Recomendations
Nitrate-Nitrogen ppm N	7.46	X					apply 2.8 lbs of N/1000 sq ft
Phosphorus ppm P	13.76		X				apply 1.4 lbs of P2O5/1000 sq ft
Potassium ppm K	592.00					X	no fertilizer needed
Salinity-ECe dS/m	0.90	X					no salinity problem
SAR-Sodium Absorption Ratio	0.19	X					no sodium hazard
Calcium-SAR ppm Ca	188.48						
Potassium SAR ppm K	29.80						
Magnesium SAR ppm Mg	23.84						
Sodium SAR ppm Na	10.56						
HCO3 ppm HCO3	545.94						
%moisture sat. % sat.	48.25						
Ca Carbonate %CaCO3	10.83						
Total N ppm total N	975.80						
% rock %	10.65						

Vegetation Reference Areas
at the
West Ridge Mine
2016

in
Carbon County
Utah



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for

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November 2016

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INTRODUCTION

In the summer of 2016 representatives from the West Ridge Mine, State of Utah, Division of Oil, Gas & Mining (UDOGM) and U.S. Department of Interior, Office of Surface Mining Reclamation and Enforcement (OSMRE) visited the West Ridge Mine site in Carbon County, Utah. The purpose of the site visit was to locate, inspect and review the plant communities that were chosen during the mine permit process to represent future revegetation success standards at the time of final reclamation. These sites were called "reference areas".

Following the site visit, a recommendation was made to have a qualified botanist re-locate the reference areas, inspect the condition of them and record their GPS coordinates to facilitate future visits.

METHODS

To begin the study, maps that show the locations of the reference areas at the West Ridge Mine were reviewed in the Mining & Reclamation Plan (MRP). The original reports by *Mt. Nebo Scientific, Inc.*[1, 2, 3] were also reviewed; they describe the reference areas, when they were chosen and results from quantitatively sampling them. A topographic map program was then employed to place waypoints on a map to be used in the field. The waypoints were transferred to a hand-held GPS unit, also for field use. A trip to the sites was conducted by the author on September 27, 2016 to revisit and re-locate the reference areas using the GPS unit and aforementioned new field maps. Once the reference areas were found, their general conditions were assessed and the GPS coordinates were adjusted when appropriate.

---

[1] Collins, P.D.. 1997. Plant communities of the West Ridge project mine area. A professional report for Andalex Resources, Price, UT. Mt. Nebo Scientific, Research & Consulting, Springville, UT. 36 pp.

[2] Collins, P.D.. 1998. Douglas Fir/Maple reference area (new) , West Ridge Mine project. A professional report for Andalex Resources, Price, UT. Mt. Nebo Scientific, Research & Consulting, Springville, UT. 16 pp.

[3] Collins, P.D.. 1998. Nonvascular plant cover of the Douglas Fir/Rocky Mtn. Juniper community at the West Ridge project . A professional report for Andalex Resources, Price, UT. Mt. Nebo Scientific, Research & Consulting, Springville, UT. 8 pp.

RESULTS

Table 1 lists the reference areas at the West Ridge Mine along with their respective GPS coordinates. Photographs of the reference areas taken during the visit are also shown below.

All reference areas were in good condition and remain viable as revegetation success standards at the time of final reclamation of the mine site. When the site was visited by OSMRE and UDOGM, it was thought that a rock slide may have covered the Douglas Fir/Maple Reference Area. However, when the site was visited by the author, this reference area was located up-canyon and beyond the rock slide area.

Table 1: Reference Areas at the West Ridge Mine, Carbon County, Utah

REFERENCE AREA	**GPS NAME**	**COORDINATES** (UTM NAD 27)
Pinyon-Juniper	WRPJref	12S 547959E 4385364N
Douglas Fir/Rocky Mountain Juniper	WRDFRMJref	12S 548286E 4385192N
Douglas Fir/Maple	WRDFMref	12S 548993E 4385858N

Pinyon-Juniper Reference Area

Douglas Fir/ Rocky Mountain Juniper Reference Area

Douglas Fir/ Maple Reference Area

UtahAmerican Energy
West Ridge Mine
Grassy Trail Reservoir
Differential Level survey data

9/25/2016

STATION	C-1	C-2	C-3	C-4	C-5	C-6	C-7
NORTHING	38,830.55	38,865.88	38,892.13	38,917.88	38,943.74	38,969.37	38,996.01
EASTING	37,333.20	37,471.64	37,570.28	37,668.82	37,767.40	37,866.16	37,964.74
Differential level survey date.							
07/30/2002 Elevation	7593.49	7590.63	7590.29	7590.67	7590.44	7590.08	7590.08
08/29/2003 Elevation	7593.50	7590.65	7590.31	7590.69	7590.46	7590.08	7590.08
10/27/2004 Elevation	7593.50	7590.62	7590.30	7590.68	7590.45	7590.08	7590.08
08/12/2005 Elevation	7593.52	7590.66	7590.32	7590.69	7590.46	7590.09	7590.08
03/21/2006 Elevation	7593.50	7590.70	7590.30	7590.68	7590.45	7590.09	7590.08
04/14/2006 Elevation	7593.53	7590.73	7590.31	7590.67	7590.44	7590.08	7590.08
05/4/2006 Elevation	7593.54	7590.75	7590.31	7590.66	7590.43	7590.08	7590.08
05/30/2006 Elevation	7593.55	7590.78	7590.31	7590.65	7590.43	7590.07	7590.08
08/11/2006 Elevation	7593.49	7590.79	7590.31	7590.64	7590.43	7590.07	7590.08
09/18/2006 Elevation	7593.51	7590.82	7590.33	7590.66	7590.43	7590.08	7590.08
10/09/2007 Elevation	7593.54	7590.83	7590.33	7590.67	7590.44	7590.08	7590.08
04/28/2008 Elevation	7593.59	7590.84	7590.34	7590.69	7590.45	7590.09	7590.08
05/30/2008 Elevation	7593.56	7590.82	7590.32	7590.65	7590.44	7590.09	7590.08
07/13/2008 Elevation	7593.56	7590.84	7590.33	7590.66	7590.44	7590.08	7590.08
08/29/2008 Elevation	7593.57	7590.83	7590.33	7590.67	7590.44	7590.08	7590.08
09/27/2008 Elevation	7593.56	7590.84	7590.34	7590.68	7590.45	7590.09	7590.08
11/24/2008 Elevation	7593.55	7590.82	7590.32	7590.66	7590.44	7590.08	7590.08
02/23/2009 Elevation	7593.57	7590.83	7590.33	7590.67	7590.45	7590.08	7590.08
03/31/2009 Elevation	7593.57	7590.83	7590.32	7590.67	7590.44	7590.08	7590.08
04/27/2009 Elevation	7593.58	7590.83	7590.33	7590.68	7590.45	7590.08	7590.08
05/29/2009 Elevation	7593.59	7590.84	7590.33	7590.67	7590.44	7590.08	7590.08
06/28/2009 Elevation	7593.57	7590.83	7590.33	7590.67	7590.44	7590.08	7590.08
08/6/2009 Elevation	7593.57	7590.84	7590.33	7590.68	7590.45	7590.08	7590.08
09/9/2009 Elevation	7593.58	7590.84	7590.33	7590.68	7590.45	7590.08	7590.08
10/25/2009 Elevation	7593.56	7590.84	7590.33	7590.68	7590.44	7590.08	7590.08
11/20/2009 Elevation	7593.56	7590.83	7590.32	7590.67	7590.44	7590.08	7590.08
03/05/2010 Elevation	7593.58	7590.84	7590.33	7590.67	7590.45	7590.08	7590.08
04/15/2010 Elevation	7593.60	7590.84	7590.34	7590.68	7590.46	7590.08	7590.08
05/17/2010 Elevation	7593.59	7590.84	7590.33	7590.67	7590.45	7590.08	7590.08
06/24/2010 Elevation	7593.58	7590.84	7590.34	7590.68	7590.45	7590.08	7590.08
07/27/2010 Elevation	7593.56	7590.83	7590.32	7590.68	7590.45	7590.08	7590.08
09/02/2010 Elevation	7593.56	7590.84	7590.33	7590.69	7590.46	7590.08	7590.08
10/15/2010 Elevation	7593.56	7590.84	7590.33	7590.69	7590.46	7590.08	7590.08
11/18/2010 Elevation	7593.56	7590.83	7590.33	7590.67	7590.48	7590.08	7590.08
05/05/2011 Elevation	7593.58	7590.84	7590.33	7590.68	7590.45	7590.08	7590.08
06/03/2011 Elevation	7593.59	7590.84	7590.34	7590.68	7590.46	7590.08	7590.08
07/21/2011 Elevation	7593.58	7590.84	7590.33	7590.68	7590.45	7590.08	7590.08
08/29/2011 Elevation	7593.58	7590.83	7590.34	7590.67	7590.46	7590.08	7590.08
10/4/2011 Elevation	7593.57	7590.83	7590.33	7590.67	7590.45	7590.08	7590.08
11/7/2011 Elevation	7593.58	7590.84	7590.34	7590.67	7590.46	7590.08	7590.08
10/05/2012 Elevation	7593.58	7590.83	7590.33	7590.66	7590.44	7590.08	7590.08
10/22/2013 Elevation	7593.58	7590.84	7590.33	7590.66	7590.44	7590.08	7590.08
11/19/2014 Elevation	7593.59	7590.84	7590.33	7590.67	7590.44	7590.08	7590.08
09/10/2015 Elevation	7593.61	7590.85	7590.34	7590.69	7590.45	7590.08	DESTROYED?
09/24/2016 Elevation	7593.62	7590.85	7590.34	7590.68	7590.44	7590.08	DESTROYED?
2015-2016	-0.01	0.00	0.00	0.01	0.01	0.00	

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UtahAmerican Energy
West Ridge Mine
Grassy Trail Reservoir
"Straight line" survey data

9/25/2016

Distance from control point to face of Monitoring Well (MW) in feet									
Date of survey	**MW-1**	**MW-2**	**MW-3**	**MW-4**	**MW-5**	**MW-6**	**MW-7**	**West Mon.**	**Straight Line Movement**
12/14/2006	94.21	141.49	245.90	295.13	394.71	493.96	556.71	na	No
1/31/2007	94.21	141.49	245.90	295.13	394.71	493.96	556.71	na	No
3/1/2007	94.21	141.49	245.90	295.13	394.71	493.96	556.71	na	No
3/29/2007	94.21	141.49	245.90	295.13	394.71	493.95	556.70	na	No
5/30/2007	94.20	141.49	245.89	295.12	394.70	493.94	556.70	na	No
6/5/2007	94.20	141.49	245.89	295.12	394.69	493.94	556.68	na	No
7/2/2007	94.20	141.49	245.89	295.12	394.69	493.94	556.69	na	No
10/9/2007	94.21	141.50	245.90	295.13	394.71	493.95	556.70	na	No
11/10/2007	94.22	141.50	245.90	295.13	394.70	493.95	556.70	na	No
12/27/2007	94.21	141.50	245.91	295.13	394.71	493.95	na	710.95	No
4/28/2008	94.20	141.49	245.90	295.12	394.70	493.95	556.69	710.95	No
5/30/2008	94.20	141.49	245.90	295.12	394.70	493.94	556.69	710.94	No
7/13/2008	94.20	141.49	245.90	295.12	394.70	493.95	556.69	710.94	No
8/29/2008	94.21	141.50	245.90	295.14	394.71	493.96	556.70	710.95	No
9/27/2008	94.21	141.50	245.91	295.14	394.71	493.96	556.70	710.95	No
11/24/2008	94.21	141.51	245.91	295.14	394.71	493.96	556.70	710.95	No
1/26/2009	94.20	141.50	245.91	295.13	394.71	493.96	556.70	710.94	No
2/23/2009	94.20	141.49	245.90	295.13	394.70	493.96	556.69	710.94	No
3/31/2009	94.20	141.50	245.90	295.13	394.71	493.96	556.70	710.95	No
4/27/2009	94.21	141.50	245.90	295.13	394.70	493.95	556.70	710.95	No
5/29/2009	94.20	141.49	245.90	295.12	394.70	493.95	556.69	710.95	No
6/28/2009	94.21	141.51	245.91	295.13	394.71	493.96	556.70	710.95	No
8/6/2009	94.21	141.51	245.91	295.14	394.70	493.96	556.70	710.96	No
9/9/2009	94.22	141.51	245.91	295.14	394.71	493.96	556.70	710.96	No
10/25/2009	94.21	141.51	245.91	295.14	394.71	493.96	556.70	710.96	No
11/20/2009	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.95	No
3/5/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.95	No
4/15/2010	94.21	141.50	245.90	295.13	394.70	493.94	556.69	710.94	No
5/17/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.95	No
6/24/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.95	No
7/22/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.70	710.95	No
9/2/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.94	No
10/15/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.94	No
11/18/2010	94.20	141.49	245.89	295.12	394.70	493.95	556.68	710.94	No
5/5/2011	94.21	141.49	245.89	295.12	394.69	493.94	556.68	710.94	No
6/3/2011	94.20	141.49	245.90	295.12	394.69	493.93	556.68	710.93	No
7/21/2011	94.21	141.50	245.90	295.13	394.69	493.94	556.68	710.94	No
8/29/2011	94.20	141.49	245.89	295.12	394.70	493.94	556.69	710.93	No
10/4/2011	94.21	141.49	245.90	295.13	394.70	493.95	556.69	710.93	No
11/7/2011	94.21	141.49	245.90	295.13	394.70	493.94	556.69	710.93	No
12/5/2011	94.21	141.50	245.90	295.13	394.70	493.94	556.69	710.94	No
1/2/2012	94.21	141.50	245.90	295.14	394.70	493.95	556.69	710.94	No
10/5/2012	94.21	141.49	245.89	295.12	394.68	493.93	556.67	710.91	No
10/22/2013	94.21	141.49	245.89	295.13	394.69	493.93	556.67	710.91	No
11/19/2014	94.22	*141.69*	245.90	295.13	394.69	493.93	556.67	710.92	No*
9/10/2015	94.21	141.69	245.89	295.12	394.68	493.92	556.66	710.90	No
9/24/2016	94.21	141.68	245.89	295.12	394.68	493.92	556.65	710.90	No
2015-2016	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	
Notes	*MW-2 appears to have been bumped, a new distance and straight line mark was recorded								

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UtahAmerican Energy
West Ridge Mine
Grassy Trail Reservoir
GPS Survey Data
Anticipated vertical accuracy ~ 0.08'+/-

9/25/2016

STATION	12	13	14	MID	TOE
NORTHING	38,509.85	38,555.42	38,610.87	38,828.21	38,719.59
EASTING	37,047.46	37,064.56	37,099.85	37,580.00	37,664.94
GPS survey date.					
September 2004	7789.87	7771.43	7739.26		
November 2004	7789.84	7771.39	7739.21		
August 2005	7789.75	7771.30	7739.13		
April 2006	7789.46	7771.02	7738.83		
October 2006	7789.39	7770.95	7738.66		
May 2007	7789.45	7771.00	7738.77		
October 2007	7789.45	7771.01	7738.76		
May 2008	7789.57	7771.10	7738.78	7565.52	7515.69
7/13/2008	7789.54	7771.12	7738.82	7565.54	7515.68
8/29/2008	7789.51	7771.08	7738.75	7565.51	7515.63
9/27/2008	7789.49	7771.05	7738.79	7565.52	7515.66
11/24/2008	7789.52	7771.09	7738.76	7565.54	7515.67
3/31/2009	7789.52	7771.07	7738.74	7565.55	7515.65
4/27/2009	7789.50	7771.05	7738.71	7565.53	7515.64
5/29/2009	7789.39	7771.01	7738.72	7565.48	7515.62
6/28/2009	7789.44	7771.08	7738.71	7565.50	7515.63
8/6/2009	7789.49	7771.12	7738.68	7565.49	7515.64
9/9/2009	7789.50	7771.10	7738.67	7565.51	7515.66
10/25/2009	7789.48	7771.11	7738.70	7565.50	7515.67
11/20/2009	7789.49	7771.10	7738.69	7565.49	7515.65
4/15/2010	7789.35	7770.99	7738.80	7565.49	7515.66
5/26/2010	7789.32	7770.91	7738.84	7565.50	7515.66
6/24/2010	7789.36	7770.96	7738.74	7565.46	7515.64
7/22/2010	7789.33	7770.93	7738.75	7565.48	7515.64
9/2/2010	7789.32	7770.91	7738.75	7565.47	7515.64
10/15/2010	7789.34	7770.93	7738.76	7565.49	7515.66
11/18/2010	7789.33	7770.92	7738.73	7565.49	7515.65
5/5/2011	7789.44	7770.93	7738.70	7565.46	7515.62
6/3/2011	7789.46	7770.99	7738.72	7565.50	7515.61
7/21/2011	7789.40	7770.96	7738.75	7565.47	7515.64
8/29/2011	7789.36	7770.96	7738.74	7565.49	7515.62
10/4/2011	7789.33	7770.95	7738.78	7565.48	7515.65
11/7/2011	7789.38	7770.92	7738.77	7565.48	7515.63
10/5/2012	7789.35	7770.91	7738.78	7565.47	7515.62
10/22/2013	7789.37	7770.95	7738.79	7565.47	7515.65
11/19/2014	7789.36	7770.92	7738.78	7565.49	7515.63
9/10/2015	7789.63	7771.15	7739.08	7565.52	7515.65
9/24/2016	7789.54	7771.10	7738.91	7565.51	7515.62
2015-2016	0.09	0.05	0.17	0.01	0.03

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Soil Monitoring
at the
West Ridge Mine, Utah

A Summery Report:

2001 - 2016

for

WEST RIDGE RESOURCES

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for

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January 2017

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SAMPLE LOCATION MAP 8

LABORATORY REPORT ..... Appendix

INTRODUCTION

As described in previous annual monitoring reports for the West Ridge Mine, an '*experimental practice*' for the protection of soil resources was designed and implemented at the site. The experimental practice was designed to test the effectiveness of burying soils *in-place* rather than salvaging (removing) them and returning them at the time of final reclamation. The *in-situ* topsoil was covered with a geotextile material and layer markers followed by fill material to create working areas for surface operations of the mine.

As a method to monitor the buried soil resources, the operators of the West Ridge Mine committed to sampling mine pad areas in specific locations to determine whether or not they are being affected by coal mining surface operations. In the document called *West Ridge Mine Experimental Practice Annual Evaluation 2000: Addendum to Appendix 2-6*, page 4, it stated that a monitoring program, starting in the year 2000, will be implemented to sample and determine if the mine pad areas affected by the coal are being "acidified". The same document states that the samples will be analyzed for acid/toxic-forming potential per Division Guidelines. In consulting with soils specialist, Priscilla Burton, from the State of Utah, Division of Oil, Gas & Mining (DOGM) prior to sampling in 2001, it was determined that the most appropriate parameters to be analyzed on the mine pad areas were: pH, electrical conductivity (EC), sodium adsorption ratio (SAR) and calcium carbonate ($CaCO_3$). Moreover, it was determined that sampling should be done at the depth of 6-12 inches as opposed to 3 inches as stated in the addendum cited above.

METHODS

Soil samples of the mine **pad areas** were taken by Patrick Collins (*Mt. Nebo Scientific, Inc.*) at the West Ridge Mine site in specified locations on September 11, 2001, November 25, 2008, July 2, 2009, July 22, 2010, September 1, 2011, August 30, 2012, August 23, 2013, August 14, 2014, August 20, 2015 and August 25, 2016. The *approximate* (see below) same locations were sampled all years and are shown on the attached map (Figure 1). Below are brief descriptions of these locations:

T1 *Located in the right fork, it was originally described to be 64 ft northwest of the jersey barrier in the center of the canyon. Because this location was so close to construction and where equipment was placed at the time, the sample was taken about 25 ft north of that location in 2008 and 2009. In 2010 there was a new building at the previous sample area, so the soil sample pit was re-located close-by, but 10 ft west of the northwest corner of the new building (2010 GPS name and UTM coordinates: WR T1, NAD 27, 12 S 548475 E, 4385176 N). In 2011-16, the sample was taken in the same place as described for 2010.*

T2 *Located in the left fork in the coal storage area, the sample was taken at the base of the embankment that encloses the coal storage area located in the center of the canyon. In 2009, coal covered the previous sample pit location so the sample was taken at the outside base of the embankment. In 2010, the coal pile had been removed from the original sample location, so the soil sample was taken once again at inside toe of the embankment (2010 GPS name and UTM coordinates: WR T2, NAD 27,12 S 548098 E, 4385201 N). In 2011, the coal had again been placed in the 2010 sample location. So, the sample was taken on the inside berm where the pure coal pile ended; nonetheless some coal was mixed with the soil sample because the coal level had been at that elevation previously (new UTM coordinates: WRT2, NAD 27, 12S 548089 E, 4385214 N). In 2012 and 2013, the coal pile had been removed at this site so the soil sampling pit was dug to a level where surface coal was not visible, then the composite sample was taken. This was about 30 ft inside and away from the embankment (not on it). In 2014 the coal pile covered the previous year's sample location with about 80 ft of coal, so the sample was taken on the top of the yard berm adjacent to the coal pile. A sample could not be taken here in 2015 due to inaccessibility and safety concerns. The coal pile appeared to be at capacity and was unstable to cross safely. Consequently, the sample site was under more than 50 ft of coal. Nearly all of the coal pile had been removed by 2016 but a thick layer of coal material remained on the surface. Therefore, the sample was taken on the inside lower ½ of the berm (still, there was also some coal material on the surface of the berm).*

T3 *Located in the load-out area, the sample was taken 54 ft uphill from the conveyor belt footing on the north side of the ditch. In 2010, because of the equipment*

stored in the area, the pit location was slightly different from 2009, or 60 ft from the concrete conveyor belt footing on the north side of the drainage ditch in the area (2010 GPS name and UTM coordinates: WR T3, NAD 27,12 S 548175 E, 4384956 N). In 2011-16, the sample was taken at nearly the same place as described for 2010.

Soil sampling in the **Experimental Test Plots** was also conducted by Gary Gray, *P.E. (Andalex Resources*) in the fall of 2005 (more information about that is given later in the report).

Soil sample pits were hand-dug with a pick and shovel. A composite sample was taken at depths between 6 and 12 inches at each of the locations described above. Soil material was taken at each depth and mixed in the field. Soils were analyzed by the Brigham Young University, Environmental Analytical Laboratory, Provo, Utah. Parameters and laboratory methods used are shown below.

pH	*ASA Mono. No. 9, Part 2, (2 ed), 1982. Method 10-3.2, page 171. Perform pH on saturated paste.*
ECe	*Electrical conductivity reported as mmhos/cm 25°C. ASA Mono. No. 9, Part 2, (2 ed), 1982. Method 10-3.3, page 172-173.*
SAR	*Sodium Adsorption Ratio. Calculated from soluble Ca, Mg and Na.*
$CaCO_3$	*Method S-13.20. Acetic acid dissolution method. Western States Laboratory Proficiency Testing Program. Soil and Plant Analytical Methods. 1998.*

RESULTS

The laboratory results for 2001, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015 and 2016 for the soils in the pad areas are summarized on Table 1. Like the previous years, the current (2016) and entire lab report has been included in the Appendix of this report; original lab reports

for the other years were included in the respective sample reports for those years.

In 2008, some sample values exceeded acceptable levels according to DOGM soil guidelines; the parameters that exceeded the standards were EC and SAR in sample T3. The high concentration of salts (EC and SAR) was likely the result of road salt that is often placed in the travel areas at the mine to treat snow and ice. The road salts can also accumulate in the snow and on the coal trucks while using the haul road to and from the mine. This snow and salt no doubt can drop off the trucks while idling at the loadout site. By 2009, however, the salts appear to have leached below the sampling depths. In 2010, the SAR in T3 was high again and would be considered "poor" by Division standards, but again it was not in the "unacceptable" range. The mean values for the sample years rendered all parameter values within the acceptable limits according to Division Guidelines. Additionally, "acidification" of the soils will probably not be a problem due to the neutralizing or "buffering" effect caused by the high percentage of calcium carbonates (% $CaCO_3$) present in all samples. By 2011, the values for nearly all parameters were in the "good" range by Division standards (the one exception was the pH value in T1 where 8.4 put it in the "fair" range. In 2012, however, the sodium values (SAR) were again elevated in the T3 sample. This is an area that is constantly undergoing changes due to the onsite operations. Unless there was a laboratory problem, the explanation for the higher SAR and EC may be the same as described above in 2008. In 2013 the pH values were in the "good" range for T2 and T3, but the "poor" range for T1. The mean of the three samples that year was 8.10, or would be considered "good". The EC values were "good" for T1 and T2 and "fair" for T3. All SAR values would be placed in the

"good" category. $CaCO_3$ values for T2 and T3 were "good", whereas T1 was "fair". In 2014, the only notable value (rated at *poor*) was the EC in T3, the site that always has the most onsite activity associated with it and, as explained above, is often reflected in the yearly monitoring data. In 2015 all parameters were in the fair to good range remembering, however, that T-2 was not accessible, but this sample location has never had any problems from the previous years according to the soil analyses. Finally, in 2016 the parameters in all samples fell within the "good" range in the DOGM evaluation standards with the single exception of T3 where the SAR value was considered "fair".

As a side note, Priscilla Burton (DOGM) made the following request for the 2012 annual soil monitoring report.

> *"As I was reviewing the West Ridge annual report, I wondered if you could provide information on the variability of each parameter at each location T1, T2, T3 over time in the next (2012) annual report. i.e. calculate the mean and standard deviation for each row in Table 1 of the soils report. Thereby providing the range, mean and std dev. of values for pH, EC, SAR and $CaCO_2$ for each general location T1, T2, & T3."*

This was done in 2012-16 and the calculations are shown on Table 1. One can easily compare each year with this table. When the mean value for all years of each parameter is considered, all values fell within the "good" range except for EC where the value was within the "fair" range and SAR that barely exceeded the "good" range putting it also in the "fair" range. With the constant mine activities and circumstances that were explained above for a relatively few number of years, samples and parameters, and when individual and mean lab values were compared to DOGM's soil suitability/unsuitability evaluation tables, it appears that the operations of the coal mine has had relatively little or long-term negative effect on the mine site pad soil material at the West Ridge Mine.

Table 1: Laboratory Results for Soil Sampling in Mine Pad Areas at West Ridge Mine (2001, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015 & 2016).

Sample No.	2001	2008	2009	2010	2011	2012	2013	2014	2015	2016	Mean	SDev.**
A. pH												
T1	8.04	7.75	7.81	8.15	8.40	7.35	8.7	7.50	840	8.20	8.03	0.40
T2	7.52	7.23	7.91	7.63	7.55	7.42	7.9	7.30	n/a	7.80	7.58	0.23
T3	7.83	8.42	8.21	7.82	7.35	7.59	7.7	7.40	7.80	7.80	7.79	0.31
Mean	7.80	7.80	7.98	7.87	7.77	7.45	8.10	7.40	8.10	7.93	7.82	0.23
SDev.	0.26	0.60	0.21	0.21	0.46	0.12	0.53	0.10	0.42	0.23	0.33	0.17
B. EC (Salinity or ECe dS/m)												
T1	6.20	4.80	14.20	1.55	3.65	2.75	2.90	2.90	2.70	2.30	4.40	3.50
T2	2.70	4.80	0.62	1.90	3.20	3.00	2.30	3.10	n/a	2.50	2.68	1.06
T3	4.20	17.50*	3.50	4.80	2.70	5.40	6.00	11.30	6.80	3.60	6.58	4.31
Mean	4.37	9.03	6.11	2.75	3.18	3.72	3.73	5.77	4.75	2.80	4.62	1.83
SDev.	1.76	7.33	7.16	1.46	0.39	1.46	1.99	4.79	2.90	0.70	3.03	2.39
C. SAR (Sodium Adsorption Ration; see Appendix A for lab data and units to calculate the SAR's)												
T1	2.19	5.83	2.53	3.65	1.22	0.83	0.60	0.90	0.30	1.60	1.97	1.61
T2	0.74	4.14	0.14	0.74	0.77	1.91	0.30	1.00	n/a	2.30	1.34	1.19
T3	1.94	31.31*	7.07	12.26	0.96	21.91*	0.20	0.20	5.10	9.30	9.03	9.82
Mean	1.62	13.76	3.25	5.55	0.98	8.22	0.37	0.70	2.70	4.40	4.15	3.96
SDev.	0.78	15.22	3.52	4.89	0.18	11.87	0.21	0.44	3.39	4.26	4.59	4.91
D. $CaCO_3$ (% Calcium Carbonate)												
T1	19.21	11.85	16.60	7.96	10.82	12.09	24.40	24.80	14.20	14.10	15.60	5.37
T2	5.10	11.25	10.77	6.18	12.38	4.80	6.00	12.90	n/a	13.40	9.20	3.39
T3	15.00	12.02	12.25	17.67	12.64	11.18	12.30	19.00	14.00	14.10	14.02	2.43
Mean	13.10	11.71	13.21	10.60	11.95	9.36	14.23	18.90	14.10	13.87	13.10	2.45
SDev.	7.24	0.40	3.03	5.05	0.80	3.97	9.35	5.95	0.14	0.40	3.77	3.13

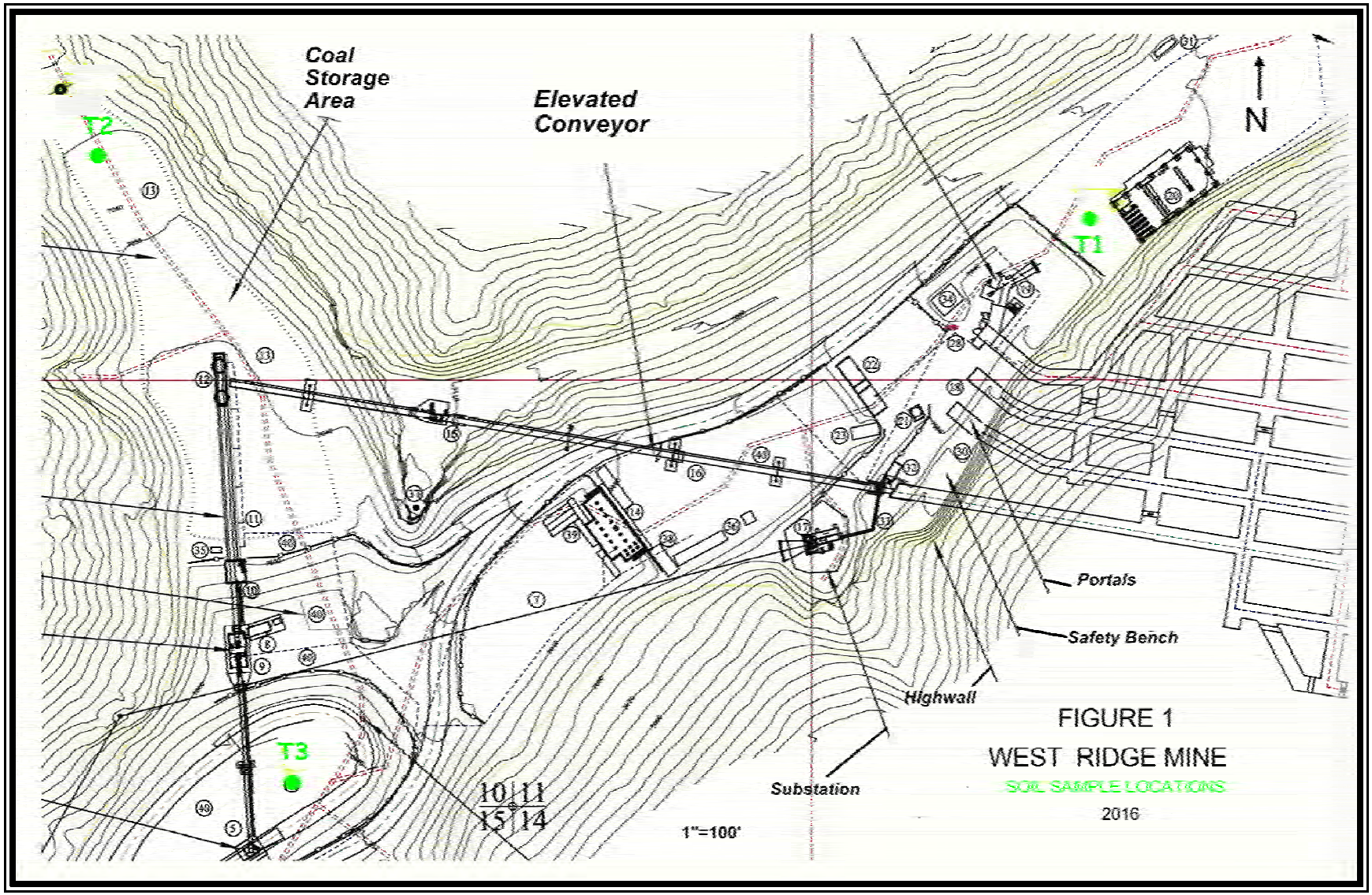
***** Value considered "unacceptable" according evaluation in the Division soil guidelines.
** Slightly different formulae were used for standard deviations between years; they have been adjusted to be consistent in this table.

As a means for comparison, Table 2 shows results of soil sampling in *the Experimental Test Plots* at the West Ridge Mine in 2005. These plots were created to simulate final reclamation of those soils that were left in-place, covered by a geotextile layer, marked with strips, then covered with fill material for the life of the mine. At the time of final reclamation the geotextile fabric, markers and fill will be removed thus exposing the native soils enabling revegetation to proceed. A similar process to test this reclamation design was implemented in the Experimental Test Plot area by placing material over existing soils, then later removing it, followed by revegetation techniques.

Table 2: Laboratory Results for Soil Sampling in Experimental Test Plot at West Ridge Mine (2005).*

	pH	EC	SAR	$CaCO_3$
Subplot Name				
Strych Fill	7.31	1.06	0.17	19.47
Strych Stockpile	7.62	0.77	0.34	20.25
Midfork Cut	7.27	0.98	0.13	16.00
Midfork Stockpile	7.39	0.90	0.19	10.83
Mean	7.40	0.93	0.21	16.64
SDev.	0.16	0.12	0.09	4.29

** Results are a subset showing specific parameters from the complete soil laboratory report prepared by Brigham Young University (October 4, 2005). Sampling was conducted by Gary Gray, P.E. from the West Ridge Mine. A complete copy of the lab report has been provided to DOGM.*


Coal
Storage
Area
Elevated
Conveyor
N
T1
T2
T3
Portals
Safety Bench
Highwall
Substation
10 11
15 14
1"=100'
FIGURE 1
WEST RIDGE MINE
SOIL SAMPLE LOCATIONS
2016

APPENDIX

(Laboratory Report)

BRIGHAM YOUNG UNIVERSITY

Environmental Analytical Laboratory
1026 LSB
Provo, UT 84602
801-422-2147

Plant and Wildlife Sciences Department

Name: Mt. Nebo Scientific
Street: PO Box 337
Springville (City) Utah (State) 84663 (Zip)

SOIL TEST REPORT AND RECOMMENDATIONS

Date: 2-Sep-16
Telephone: 801-489-6937
Fax:

Sample Identification	Crop to be grown	pH	% Sand	% Silt	% Clay	Soil Texture	Cation Exchange meq/100g	% Organic Matter
T1	Turf	8.2						

Test	Results	Very Low	Low	Medium	High	Very High	Recommendations
Salinity-ECe dS/m	2.3			X			no salinity problem
SAR-Sodium Adsorption Ratio	1.6	X					no sodium hazard
Calcium-SAR ppm Ca	20						
Magnesium SAR ppm Mg	35						
Sodium SAR ppm Na	50						
Ca Carbonate %CaCO3	14.1						

Notes:

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SOIL TEST REPORT AND RECOMMENDATIONS

Date: 2-Sep-16
Telephone: 801-489-6937
Fax:

Sample Identification	Crop to be grown	pH	% Sand	% Silt	% Clay	Soil Texture	Cation Exchange meq/100g	% Organic Matter
T2	Turf	7.8						

Test	Results	Very Low	Low	Medium	High	Very High	Recommendations
Salinity-ECe dS/m	2.5			X			no salinity problem
SAR-Sodium Adsorption Ratio	2.3		X				no sodium hazard
Calcium-SAR ppm Ca	21						
Magnesium SAR ppm Mg	35						
Sodium SAR ppm Na	74						
Ca Carbonate %CaCO3	13.4						

Notes:

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Street PO Box 337
Springville Utah 84663
City State Zip

SOIL TEST REPORT AND RECOMMENDATIONS

Date: 2-Sep-16
Telephone: 801-489-6937
Fax:

Sample Identification	Crop to be grown	pH	% Sand	% Silt	% Clay	Soil Texture	Cation Exchange meq/100g	% Organic Matter
T3	Turf	7.8						

Test	Results	Very Low	Low	Medium	High	Very High	Recommendations
Salinity-ECe dS/m	3.6				X		salinity a problem for sensitive crops
SAR-Sodium Adsorption Ratio	9.3			X			potential sodium hazard
Calcium-SAR ppm Ca	21						
Magnesium SAR ppm Mg	36						
Sodium SAR ppm Na	304						
Ca Carbonate %CaCO3	14.1						

Notes:

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT		Page 1 of

Permit Number	ACT/007/041	Report Date	12-8-16
Mine Name	West Ridge Mine		
Company Name	UtahAmerican Energy, Inc		
Impoundment Identification	Impoundment Name	None	
	Impoundment Number	None	
	UPDES Permit Number	UTG040023	
	MSHA ID Number	42-02233	

IMPOUNDMENT INSPECTION

Inspection Date	12-8-16
Inspected By	Karin Madsen
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	4th Quarter

1. **Describe any appearance of any instability, structural weakness, or any other hazardous condition.**

No appearance of instability, structural weakness, or any other hazardous condition was observed at the time of inspection.

Required for an impoundment which functions as a SEDIMENTATION POND.

2. **Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.**

Sediment Elevations:

Cell A (Upper)		Cell B (Lower)	
60%	6942.8'	60%	6928.8'
100%	6945.4'	100%	6930.0'

Current Sediment Levels:

Cell A (Upper)	Cell B (Lower)
6938.1'	6926.8'

3. **Principle and emergency spillway elevations.**

	Cell A (Upper)		Cell B (Lower)
Principle	6952.5'	Principle	6937.0'
Emergency	-------	Emergency	6938.0'

4. **Field Information.** Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

Approximately 3' of ice in Cell A (Upper).

Approximately 2' of ice in the bottom of Cell B (Lower).

Neither pond is close to discharging.

Ponds were cleaned in October of 2015 and Surveyed in November of 2016.

5. **Field Evaluation.** Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

No changes in geometry have occurred.
No observable conditions were apparent that could affect the stability or function of the structures.

The water elevation is far below the spillway in Cell A (Upper) and in Cell B (Lower). I do not foresee any discharge within the near future.

Qualification Statement

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability.

Signature: _____ **Date:** 12-8-16

CERTIFIED REPORT

IMPOUNDMENT EVALUATION (If NO, explain under Comments)	YES	NO
1. Is impoundment designed and constructed in accordance with the approved plan?	XXXXX	
2. Is impoundment free of instability, structural weakness, or any other hazardous condition?	XXXXX	
3. Has the impoundment met all applicable performance standards and effluent limitations from the previous date of inspection?	XXXXX	

COMMENTS AND OTHER INFORMATION

NONE

Certification Statement:

[PE Seal Stamp]

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself or under my direction and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability in accordance with the Utah R645 Coal Mining Rules.

By: David Hibbs, President
(Full Name and Title)

Signature: David Hibbs Date: 12/8/16

P.E. Number & State: #6449561- Utah