

APPENDIX G
SOIL SURVEY REPORT

D7 - SOIL RESOURCES

**SALT WELLS AMENDMENT AREA
BLACK BUTTE COAL COMPANY**

POINT OF ROCKS, WYOMING

Submitted to:

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SALT WELLS AMENDMENT AREA

D7 - SOIL RESOURCES

1.0 INTRODUCTION

The identification and proper management of the topsoil resources in the proposed Salt Wells Amendment Area is essential for the success of reclamation in the mine area and the achievement of the post-mining land use. The information presented in this Section is designed to aid in formulating a practical and successful reclamation plan.

Black Butte Coal Company (BBCC) has located a proposed Pit 14 Mining Area within the Salt Wells Amendment Area as well as a proposed haul road corridor which will connect to their current mining operations to the northeast.

The Salt Wells Amendment Area soils report supports the current BBCC Appendix D7, Soils, but is intended to be a separate document describing soils as identified and mapped on the proposed amendment area itself. Where appropriate, reference is made to soils information contained in the current Appendix D7 and will not be repeated here.

Based on the detailed soil survey, soil sampling in the proposed affected areas, soil suitability evaluation, and salvage recommendations for all soil map units, it is evident that sufficient suitable soil resources are available for salvage and reapplication in order to ensure successful reclamation of the Salt Wells Amendment Area.

Location and Size of the Proposed Area

The proposed Salt Wells Amendment Area is adjacent to the current BBCC permit boundary on the southwest side. The northeast corner of the Salt Wells project area is located approximately 4 miles southwest of the current BBCC office in Section 33, T.19N., R.100W.

The amendment area is approximately 5,518.4 acres in size and contains all or portions of Sections 26, 27, 33, 34, and 35, T.18N., R.101W.; and Sections 2, 3, 4, 8, 9, 10, 16 and 17, T.17N., R.101W. Please refer to the Introduction Section of the permit application package for the complete legal descriptions of the lands included within the proposed project area.

The proposed Pit 14 Mining Area and 600 foot surrounding buffer area is approximately 1,283.8 acres in size. The proposed haul road corridor is approximately 263.6 acres within the proposed permit area and a total of approximately 363.7 acres including some acres in the adjacent already permitted Section 23, T.18N., R.101W. The detailed Order 1-2 soil survey covered all of the proposed areas to be affected by mining activities.

Topography of the Proposed Area

Please refer to the soil maps attached to this soils report for an illustration of the topography of the proposed project area.

Vegetation and Hydrology of Proposed Area

Please refer to the vegetation and hydrology reports for a description of the vegetation types and hydrology within the proposed amendment area.

2.0 METHODOLOGY

Soils mapping, description, classification, and sampling was conducted in accordance with the procedures and standards of the National Cooperative Soil Survey (Soil Survey Staff, 1993 and 1999; and Schoeneberger et. al., 1998). The soil resources of the proposed area were investigated by Jim Nyenhuis, Certified Professional Soil Scientist/Soil Classifier (ARCPACS 2753), with 25 years experience conducting soil surveys for mining projects in Wyoming.

Initial mapping units were identified using several sources of information:

- the Order 3 soil survey of a somewhat large area of Sweetwater County completed by the private firm SaLUT in the early 1980's under contract to BLM – the survey included the entire Salt Wells Amendment Area (SaLUT, 1981).
- the existing BBCC soil survey of the current permit area, and the Order 3 soil survey of Section 26, T.18N., R.101W.
- the current soil mapping unit and soil series descriptions for Sweetwater County provided by the USDA Natural Resources Conservation Service (NRCS, 2002).
- the orthophoto/topographic maps of the amendment area at a scale of 1"=500' (Aqua Terra Consultants, 2002), and
- the USGS 7.5' Point of Rocks SE and Cooper Ridge NE topographic quadrangles.

The previous soil boundaries were used during initial field reconnaissance and observation. The entire area was traversed on foot and by vehicle where possible. Detailed soil map unit boundaries were then delineated by exposing soil profiles using a sharpshooter and bucket auger as well as observing surface conditions, vegetation, slope gradient, and slope aspect. Soil resource information for adjacent permitted areas was reviewed to determine whether soils and their recommended salvage depths were similar to those within the proposed Salt Wells Amendment Area.

Previous discussion among WDEQ-LQD, BBCC, and Intermountain Resources outlined soil sampling protocol for the Salt Wells Amendment Area. Soil sampling specifications are contained in a Memorandum from Ms. Marit Sawyer (WDEQ-LQD, Lander) to Mr. Jim Orpet (Intermountain Resources, Laramie) dated April 10, 2002 (WDEQ, 2002).

The memorandum stated one sample set should be collected for each soil series mapped on the amendment area that is present in other portions of the BBCC mine. The sample data should be compared to the existing soils data. If the data are significantly different, the sample soil should be re-classified and consideration given to collecting additional samples

to adequately characterize it. If the soil series is not mapped anywhere else in the permit area, WDEQ Guideline No.1 should be used to determine how many samples should be taken. The focus is on getting samples from the proposed disturbance area.

The soil samples were sent to Inter-Mountain Laboratories (IML) in Sheridan, Wyoming for standard analysis (WDEQ, 1994). The laboratory analyses included: pH, electrical conductivity (EC); saturation percent; calcium, magnesium, and sodium (meq/l); Sodium Adsorption Ratio (SAR); percent organic matter; percent calcium carbonate equivalent, and soil texture (percent clay, silt, and sand including very fine sand). A 10 percent duplicate analysis is conducted for quality assurance/quality control (QA/QC) purposes. The results of the IML lab analysis are included with this report.

3.0 RESULTS

The Salt Wells Amendment Area has a semi-arid climate and is within a "frigid" soil temperature regime (mean annual air temperature about 38 degrees F.), and a "typic-aridic" soil moisture regime (mean annual precipitation of about 5 to under 10 inches). The average frost-free season is about 60 days.

The amendment area is characterized by the presence of very shallow, shallow, moderately deep, and deep soils. Winton is a very shallow soil (less than 10 inches to bedrock). Boltus is both a very shallow and shallow soil (10 to 20" to shale bedrock) developing in thin residuum from clay shale. Other shallow soils include Haterton, Huguston, and Tasselma. All are developing in thin residuum from sandstone and shale bedrock. Teagulf, Terada, and Thayer Variant are moderately deep soils (20 to 40" to bedrock) developing in slope alluvium and residuum dominantly from sandstone. Chrisman and Dines are deep soils (greater than 40 inches to shale bedrock) developing in drainage alluvium from both shale and sandstone sources. Other deep soils include Kandaly, Monte, and Thayer. Kandaly is mapped on stabilized sand dunes scattered throughout the amendment area. Monte and Thayer are mapped on upland drainages and are developing in fine-loamy (between 18 and 35% clay) and coarse-loamy (less than 18% clay) alluvium, respectively. All soils except Boltus and Thayer Variant were previously identified and mapped on the current BBCC permit area.

The Salt Wells Amendment Area soil maps are attached to this report. They were compiled on BBCC Digital Quadrangle/Orthophoto-Topographic Maps of the study area supplied by Aqua Terra Consultants, Inc., of Sheridan, Wyoming. There are four soil maps (Northeast, Northwest, Southeast, and Southwest), and all are at a scale of 1"=500'. Aqua Terra constructed the base maps at the request of BBCC, and obtained the orthographic photos from the University of Wyoming web site (<http://www.edvc.uwyo.edu/24k/dogq.html>). All of the orthographic photos were taken in the summer of 1994. The following list is a breakdown of the photo names and dates: E5-Bitter Creek – NW Photo 8/26/1994; F5-Bitter Creek – NE-SW Photo 8/26/1994; E6-Black Butte – NE Photo 7/28/1994; and F6-Bitter Creek – NW-SE Photo 6/27/1994.

Following detailed soil mapping, representative locations were selected for all major soils within the proposed disturbance area and these sites were fully described and sampled. As per the initial BBCC-WDEQ Salt Wells agreement (WDEQ, 2002), each major soil was fully described and sampled one time each. These soils included Haterton, Horsley, Huguston, Kandaly, Monte, Tasselma, Teagulf, Thayer, Terada, and Winton. Boltus silty clay loam was described and sampled three times because it was not previously described or sampled on the current BBCC permit area. Thayer Variant loam was also not mapped on the current permit area but was only described and sampled one time on the amendment area because it is only a soil inclusion in map unit 444 (Thayer fine sandy loam, 0 to 6% slopes), not a major component. Although the Chrisman and Dines soils are present on the amendment area, they were not sampled because they were not mapped in the proposed disturbance area.

As a result, a total of forty-seven soil samples were collected from fourteen sample locations on the Salt Wells Amendment Area. One additional soil site (Monte loam) with six samples was sampled in 2002 off the Salt Wells Amendment Area but within the current BBCC permit area. This additional data supports the Monte soil series and is included in the separate "Pit 10 Expansion" soils letter report and laboratory data on file at BBCC. All soil sample sites were located in the field and plotted on the soil base maps. The IML soils laboratory data is included as **Addendum D7-Salt Wells Lab Data** with this report.

The 15 soil profile descriptions completed during the sampling activity are presented below. These descriptions are in addition to those already included in the current BBCC Appendix D7 (Soils). Reference is made to those previous descriptions contained in BBCC Addendum D7-B (Soil Series). Because Chrisman and Dines soils were not mapped in the proposed disturbance area, they were not sampled nor described in this report. Reference is made to the Chrisman and Dines soil series descriptions in Addendum D7-B, pages 61 and 65 respectively, of the current BBCC permit document.

Table D7-SW1 (List of Soil Map Units and Recommended Salvage Depths) lists the soil map unit numbers, the soil map unit names, and the recommended salvage depths for each map unit within the proposed Salt Wells Amendment Area. All of the map units on the proposed amendment area, except for the new map unit 464 (Boltus-Horsley complex, 0 to 30% slopes), are similar to those described in Appendix D7 for the current BBCC permit area and will not be redescribed in this report. Reference is made to Addendum D7-A (Mapping Unit Descriptions) of the current BBCC Appendix D7 (Soils), for those similar map unit descriptions. New map unit 464 will be fully described in Section 3.1.

Table D7-SW2 (Soil Characteristics and Taxonomy) lists the soil series present on the proposed Salt Wells Amendment Area, their depth class, soil sample number, recommended salvage depth, soil taxonomic classification, and current soil series status (NRCS established, NRCS tentative, or local Sweetwater County uncorrelated soil series). This table contains updated information for soils mapped on the proposed Salt Wells Amendment Area from that presented in Appendix D7 (Soils) for the current BBCC permit area. Several soils (Leckman, Corlett, Quealman, and Wibaux Variant) were mapped on the current BBCC permit area but were not identified as present on the Salt Wells Amendment Area. In addition, two soils (Boltus and Thayer Variant) were mapped on the amendment area but were not identified on the original BBCC permit area. For update purposes, Leckman is an NRCS tentative soil series (most recent description dated 03/2003). Quealman (03/2003), Corlett (05/1981), and Wibaux (02/2000) are all NRCS established soil series.

An additional table will be completed subsequent to finalization of the Salt Wells Amendment Area Mine and Reclamation Plan for Pit 14. This table will list all soil map units on affected areas, including the new haul road corridor, their acreages, recommended salvage depths, and volumes of soil to be salvaged (acre feet, and bank cubic yards). The soils table for Pit 14 will be included in the mine and reclamation plan as well as inserted into Appendix D7 (Soils) of the current BBCC permit document.

The following text includes: (1) a full description for the new soil map unit 464 (Boltus-Horsley complex, 0 to 30% slopes), and (2) the soil series profile descriptions for all 14 soils sampled on the Salt Wells Amendment Area, as well as an evaluation of their topsoil suitability and recommended salvage depths. The soil series descriptions are presented in alphabetic order as listed in Table D7-SW2.

3.1 Soil Map Unit 464, Boltus-Horsley complex, 0 to 30% slopes

This complex occurs on level to sloping clay shale plains, sideslopes, hills, and ridge front-slopes throughout the Salt Wells Amendment Area. This complex is about 60 percent Boltus silty clay loam, 30 percent Horsley sandy clay loam, and 10 percent inclusions of Haterton sandy clay loam and shale rock outcrop. The Boltus soil is a very shallow to shallow, well drained, fine textured established soil series underlain by weathered clay shale bedrock. The Horsley soil is a very shallow, moderately fine textured, local Sweetwater County soil underlain with soft, weathered shale bedrock. Neither of these soils occupies any particular position in relation to each other. The Haterton soil inclusion is a shallow, moderately fine textured soil also underlain by soft, weathered shale bedrock.

The average annual precipitation is about 8 inches, and the average annual air temperature is about 43 degrees F. The average frost-free season is about 80 days.

The Boltus soil typically has a surface layer that is a pale brown, slightly alkaline, silty clay loam about 2 inches thick. The "C" horizon substratum is a light yellowish brown, slightly alkaline, silty clay about 2 to 5 inches thick. Weathered, light olive brown to dark gray, slightly alkaline, clay shale bedrock is encountered at 6 to 9 inches in depth.

Boltus has moderate to slow permeability, low available water capacity, and the effective rooting depth is less than 10 inches. Surface runoff is slow to rapid, and the erosion hazard is moderate to severe.

The Horsley soil typically has a surface layer that is a light brownish gray, moderately alkaline, loam about 2 to 3 inches thick. The "C" horizon substratum is light brownish gray, moderately alkaline, loam to sandy clay loam about 4 inches thick. Weathered, calcareous shale is encountered at about 7 inches in depth.

Horsley has moderate permeability, low available water capacity, and the effective rooting depth is less than 10 inches. Surface runoff is slow to medium, and the erosion hazard is slight.

The Haterton soil inclusion typically has a yellowish brown sandy clay loam surface layer that is about 3 inches thick. The substratum is yellowish brown to grayish brown, slightly alkaline, sandy clay loam about 12 inches thick. Weathered shale is at a depth of about 15 inches.

Haterton has moderate permeability, low available water capacity, and an effective rooting depth of less than 15 inches. Surface runoff is slow or medium, and the erosion hazard is slight.

Boltus, Horsley, and Haterton soils are used for grazing and wildlife habitat.

Boltus soil: Capability unit Vlls17, dryland, Shale Range Site.

Horsley soil: Capability unit Vlls17, dryland, Shale Range Site.

Haterton soil: Capability unit Vllc14, dryland, Shale Range Site.

3.2 Boltus Soil Series

The Boltus soil is an established soil series mapped primarily in central Wyoming although it has been identified on other coal mine areas in Sweetwater County. Boltus was not mapped on previous areas of BBCC's mine but it is present on the Salt Wells Amendment Area. As such, it is considered a new soil for BBCC, and was fully described and sampled three times at representative locations within the amendment area (SW9, SW11, and SW13).

Boltus silty clay loam is a very shallow (less than 10 inches to shale) to shallow (10 to 20 inches to shale), well drained soil that is developing in thin residuum from clay shale. Clay content is typically 30 to 45 percent. Boltus is mapped in complex with Horsley in Map Unit 464. Boltus is on gently sloping clay plains to somewhat steep upland hills. Boltus is classified as a "Clayey, smectitic, calcareous, frigid, shallow Typic Torriorthent".

Boltus was newly identified on the Salt Wells Amendment Area and was separately sampled at three representative locations (SW9, SW11, and SW13). Boltus sample site SW9 was located approximately 781' east, 1,063' south of the NW corner of Section 2, T.17N., R.101W. Sample site SW11 was located approximately 406' west, 2,125' south of the NE corner of Section 4, T.17N., R.101W. Sample site SW13 was located approximately 1,844' east, 1,781' north of the SW corner of Section 9, T.17N., R.101W. Laboratory data for these samples is contained in Addendum D7-Salt Wells Lab Data* of this report.

Boltus Sample Site SW9: 6% slope; NW aspect; Gardner saltbush vegetation; thin residuum from clay shale; upland hill sideslope; slight erosion; slightly moist below 2 inches at the time of sampling, 7-31-02.

Boltus SW9 Soil Profile Description:

A horizon – 0 to 2 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate coarse platy parting to moderate medium granular structure; slightly hard, friable, sticky and plastic consistence; few medium, fine and very fine roots to 7 inches; slightly effervescent; slightly alkaline (pH 7.5); gradual smooth boundary.

C horizon – 2 to 7 inches; dark gray (10YR 4/1) to dark grayish brown (10YR 4/2) silty clay, dark grayish brown (10YR 4/2) moist; massive structure; hard, firm, sticky and plastic consistence; noneffervescent, neutral (pH 7.3) gradual wavy boundary.

Cr horizon (paralithic contact) - 7 to 14 inches; dark gray (10YR 4/1) silty clay loam; massive structure; hard, firm, very sticky and very plastic consistence; noneffervescent, slightly alkaline (pH 7.6); gradual wavy boundary.

Boltus Sample Site SW11: 14% slope; north aspect; Gardner saltbush, prickly pear cactus, and some grasses vegetation; thin residuum from clay shale; upland sideslope; moderate erosion; soil profile all dry at time of sampling, 8-11-02.

Boltus SW11 Soil Profile Description:

A horizon – 0 to 2 inches; pale brown (10YR 6/3) clay loam to clay with about 20% small sandstone and shale chips on the surface and 10% in the horizon, brown (10YR 5/3) moist; moderate medium platy parting to moderate strong granular structure; slightly hard, friable, sticky and plastic consistence; few medium, fine, and very fine roots to 6 inches; moderately effervescent, slightly alkaline (pH 7.5); gradual smooth boundary.

C horizon – 2 to 6 inches; yellowish brown (10YR 5/4) silty clay loam with about 30% small soft shale chips, dark yellowish brown (10YR 4/4) moist; massive parting to weak medium subangular blocky structure; hard, friable, sticky and plastic consistence; strongly effervescent, slightly alkaline (pH 7.6); gradual wavy boundary.

Cr horizon (paralithic contact) - 6 to 13+ inches; light olive brown (2.5Y 5/4) silty clay loam with about 60% small soft shale chips, olive brown (2.5Y 4/4) moist; massive structure; hard, firm, sticky and plastic; very few fine and very fine roots to 13 inches; strongly effervescent, neutral (pH 7.3); gradual wavy boundary.

Boltus Sample Site SW13: 10% slope; NW aspect; Gardner saltbush, occasional Wyoming big sagebrush; thin residuum from clay shale; upland sideslope-upland shale flat; slight erosion; soil profile all dry at the time of sampling, 8-14-02.

Boltus SW13 Soil Profile Description:

AC horizon – 0 to 2 inches; very pale brown (10YR 7/3) silty clay loam with about 5% mixed gravel size sandstone and shale chips, brown (10YR 5/3) moist; weak coarse platy parting to weak medium granular structure; soft to slightly hard, friable, sticky and plastic consistence; few medium, fine and very fine roots to 6 inches; moderately effervescent, slightly alkaline (pH 7.5); clear smooth boundary.

C horizon – 2 to 4 inches; light yellowish brown (10YR 6/4) clay with 15% soft small shale chips, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard to hard, friable, sticky and plastic consistence; moderately effervescent, neutral (pH 6.9); gradual wavy boundary.

C/Cr horizon – 4 to 9 inches; dark gray (10YR 4/1) silty clay loam with 35% small soft shale chips, very dark gray (10YR 3/1) moist; massive structure; hard, firm, sticky and plastic consistence; very few medium, fine and very fine roots to 9 inches; slightly effervescent, slightly alkaline (pH 7.4); gradual wavy boundary.

Boltus Soil Suitability and Recommended Salvage Depth:

Boltus is entirely suitable for salvage to the paralithic contact, an average depth of 6 inches on the Salt Wells Amendment Area.

3.3 Haterton Soil Series

The Haterton soil is an established soil series of moderate extent mapped in western and south central Wyoming. Haterton sandy clay loam is a shallow, well drained soil that is developing in thin residuum from calcareous sandstone or shale. Clay content is typically 18 to 35 percent. Haterton is mapped in complex with Horsley sandy clay loam in map units 446AB and 446CD, and in complex with Huguston and Horsley in map unit 467. Haterton is on hill and ridge summits, shoulders, and sideslopes. Haterton is classified as a "Loamy, mixed, superactive, calcareous, frigid, shallow Typic Torriorthent".

Haterton was previously sampled at 14 sites in the current BBCC permit area, and at one additional site (SW10) in the Salt Wells Amendment Area. Previous laboratory data for the 14 sample sites is contained in Addendum D7-C of the current BBCC permit document. Laboratory data for Haterton sample site SW10 is contained in "Addendum D7-Salt Wells Lab Data" of this report.

Haterton sandy clay loam, sample site SW10, was located approximately 1,906' north, 719' west, of the SE corner of Section 34, T.18N., R.101W. Sample site SW10: 6% slope; east aspect; Wyoming big sagebrush and mixed grasses vegetation; thin residuum from sandy shale to sandstone bedrock; ridge upper backslope position; slight erosion; soil profile all dry at time of sampling, 7-31-02.

Haterton SW10 Soil Profile Description:

A horizon – 0 to 3 inches; yellowish brown (10YR 5/4) sandy clay loam with about 15% gravel size sandstone chips, dark yellowish brown (10YR 4/4) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic consistence; few coarse and common medium, fine, and very fine roots to 9 inches; moderately effervescent, slightly alkaline (pH 7.6); clear smooth boundary.

Bw horizon – 3 to 9 inches; yellowish brown (10YR 5/4) sandy clay loam with about 15% gravel size sandstone chips, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic consistence; moderately effervescent, slightly alkaline (pH 7.5); gradual wavy boundary.

C horizon – 9 to 15 inches; yellowish brown (10YR 5/4) sandy clay loam with about 15% gravel size sandstone chips; dark yellowish brown (10YR 4/4) moist; massive structure; hard, friable, slightly sticky and slightly plastic consistence; few coarse, medium, fine, and very fine roots to 15 inches; strongly effervescent, slightly alkaline (pH 7.6); gradual wavy boundary.

Haterton Soil Suitability and Recommended Salvage Depth:

Haterton is entirely suitable for salvage throughout its profile depth to the sandstone or shale bedrock contact, an average depth of 15 inches on the Salt Wells Amendment Area. The previous average salvage depth for Haterton over 14 sample sites on the current BBCC permit area was 14.4 inches.

3.4 Horsley Soil Series

The Horsley soil is a local Sweetwater County soil of moderate extent. Horsley sandy clay loam is a very shallow (less than 10 inches to bedrock), well drained soil that is developing in thin residuum from calcareous shale or sandstone. Clay content is typically 18 to 35 percent. Horsley is mapped in complex with Haterton sandy clay loam in map units 446AB and 446CD. Horsley is also mapped in association with Winton and Rock Outcrop in Map Units 458EF and 459, in complex with Boltus in Map Unit 464, and in complex with Huguston and Haterton in Map Unit 467. Horsley, like Haterton, is on hill and ridge summits, shoulders, and sideslopes. Horsley is classified as a "Loamy, mixed, calcareous, frigid, shallow, Typic Torriorthent".

Horsley was previously sampled at 16 sites in the current BBCC permit area, and at one additional site (SW8) in the Salt Wells Amendment Area. Previous laboratory data is contained in Addendum D7-C of the current BBCC permit document. Laboratory data for Horsley sample site SW8 is contained in "Addendum D7-Salt Wells Lab Data" of this report.

Horsley sandy clay loam, sample site SW8, was located approximately 2,406' east, 594' south of the NW corner of Section 9, T.17N., R.101W. Sample site SW8: 4% slope; SE aspect; Wyoming big sagebrush, mixed grasses, and occasional rabbitbrush vegetation; thin residuum from shale and sandstone; upland hill position; slight erosion; soil profile all dry at time of sampling, 7-30-02.

Horsley SW8 Soil Profile Description:

A horizon – 0 to 3 inches; yellowish brown (10YR 5/4) sandy clay loam with 10% sandstone channers, dark yellowish brown (10YR 4/6) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic consistence; common medium, fine and very fine, and few coarse roots to 7 inches; moderately effervescent, slightly alkaline (pH 7.4); gradual smooth boundary.

C horizon – 3 to 7 inches; yellowish brown (10YR 5/4) sandy clay loam with 15% sandstone channers, yellowish brown (10YR 5/6) moist; massive structure; hard, firm, sticky and slightly plastic consistence; strongly effervescent, slightly alkaline (pH 7.4); gradual wavy boundary.

Cr horizon (paralithic contact) 7+ inches; somewhat weathered, buff colored, calcareous sandstone.

Horsley Soil Suitability and Recommended Salvage Depth:

Horsley is entirely suitable for salvage throughout its profile depth to the sandstone or shale bedrock contact, an average depth of 7 inches on the Salt Wells Amendment Area. The previous salvage depth for Horsley over 16 sample sites on the current BBCC permit area was 6.2 inches.

3.5 Huguston Soil Series

The Huguston soil is an established soil series of moderate mapped in south-central and southwestern Wyoming. Huguston sandy loam is a shallow, well drained soil that is developing in thin residuum and slopewash from calcareous sandstone. Clay content is typically 8 to 18 percent. It is mapped in complex with Teagulf and Terada in Map Unit 436, with Teagulf in Map unit 452, with Rock Outcrop and Terada in Map Unit 466, with Horsley and Haterton in Map Unit 467, and with Kandaly and Teagulf in Map Unit 468. Huguston is on upland hills and sideslopes. Huguston is classified as a "Loamy, mixed, superactive, calcareous, frigid, shallow Typic Torricorthent".

Huguston was previously sampled at 11 sites in the current BBCC permit area, and at one additional site (SW3) in the Salt Wells Amendment Area. Previous laboratory data for the 11 sample sites is contained in Addendum D7-C of the current BBCC permit document. Laboratory data for sample site SW3 is contained in "Addendum D7-Salt Wells Lab Data" of this report.

Huguston sandy loam, sample site SW3, was located approximately 656' north, 2,188' east of SW corner of Section 9, T.17N., R.101W. Sample site SW3: 12% slope; east aspect; Wyoming big sagebrush and mixed grasses vegetation; thin residuum and slopewash from sandstone; upland sideslope; none to slight erosion; soil profile all dry at time of sampling, 6-5-02.

Huguston SW3 Soil Profile Description:

A horizon – 0 to 3 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic consistence; common medium, fine and very fine, and few coarse roots to 14 inches; noneffervescent, neutral (pH 6.9); gradual smooth boundary.

Bw horizon – 3 to 14 inches; yellowish brown (10YR 5/4) to brown (7.5YR 5/4) sandy loam, dark yellowish brown (10YR 4/4, 4/6) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic consistence; noneffervescent to slightly effervescent, neutral (pH 7.2); gradual wavy boundary.

Cr horizon (paralithic contact) 14 to 18 inches; very pale brown (10YR 7/4) sandy clay loam (soft rock crushed for texture analysis), light yellowish brown (10YR 6/4) moist; massive structure; hard, friable, slightly sticky and slightly plastic consistence; few coarse, medium, fine and very fine roots; strongly effervescent, neutral (pH 7.3); gradual wavy boundary.

Huguston Soil Suitability and Recommended Salvage Depth:

Huguston is entirely suitable for salvage throughout its profile depth to the soft sandstone paralithic contact, an average depth of 14 inches on the Salt Wells Amendment Area. The previous salvage depth for Huguston over 11 sample sites on the current BBCC permit area was 14.5 inches.

3.6 Kandaly Soil Series

The Kandaly soil is an established soil series mapped extensively on the plains of southwestern Wyoming. Kandaly loamy sand is a deep, somewhat excessively drained soil that is developing in aeolian sand. Clay content is typically less than 8 percent. It is mapped alone in Map Unit 10 and in complex with Huguston and Teagulf in Map Unit 468. Kandaly is on duned uplands. Kandaly is classified as a "Mixed, frigid, Typic Torripsamment".

Kandaly was previously sampled at three sites in the current BBCC permit area, and at one additional site (SW2) in the Salt Wells Amendment Area. Previous lab data for the three sample sites is contained in Addendum D7-C of the current BBCC permit document. Laboratory data for Kandaly sample site SW2 is contained in "Addendum D7-Salt Wells Lab Data" of this report.

Kandaly loamy sand, sample site SW2, was located approximately 469' west, 906' south of the NE corner of Section 3, T.17N., R.101W. Sample site SW2: 25% slope; NE aspect; Wyoming big sagebrush, Douglas rabbitbrush, and Indian ricegrass vegetation; thick aeolian sand; stabilized sand dune on NE facing sideslope; no erosion; soil profile all dry at time of sampling, 6-4-02.

Kandaly SW2 Soil Profile Description:

A horizon – 0 to 2 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic consistence; common fine and very fine, and few coarse and medium roots to 28 inches; noneffervescent, moderately acid (pH 5.9); gradual smooth boundary.

AC horizon – 2 to 15 inches; light yellowish brown (10YR 6/4) loamy sand, dark yellowish brown (10YR 4/4) moist; massive parting to weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic consistence; noneffervescent, neutral (pH 7.3); gradual wavy boundary.

C1 horizon – 15 to 32 inches; yellowish brown (10YR 5/4) loamy sand, dark yellowish brown (10YR 4/4) moist; massive/loose structure; slightly hard, friable, nonsticky and nonplastic consistence; few coarse, medium, fine and very roots 28 to 46 inches; noneffervescent, neutral (pH 7.2); gradual wavy boundary.

C2 horizon – 32 to 50 inches; yellowish brown (10YR 5/4) loamy sand, dark yellowish brown (10YR 4/4) moist; massive/loose structure; loose, loose, nonsticky and nonplastic consistence; noneffervescent, slightly acid (pH 6.5); gradual wavy boundary.

Kandaly Soil Suitability and Recommended Salvage Depth:

Kandaly is entirely suitable for salvage throughout its profile depth, which averages 50 inches, although the loamy sand material below 32 inches (between 32 and 50 inches) has very low organic matter content and is very droughty. Kandaly is best salvaged to 32 inches, although salvage to 50 inches is possible if this additional loamy sand material is needed. Kandaly was previously salvaged, on average, to 42 inches on the current BBCC permit area.

3.7 Monte Soil Series

The Monte soil is an established soil series of moderate extent mapped in southwestern Wyoming. Monte loam is a deep, well drained soil that is developing in medium textured slopewash and streamlain alluvium from sandstone and shale sources. Clay content is typically 18 to 35 percent in the 10 to 40 inch texture control section. Monte loam is mapped in Map unit a480 and as an alkaline and saline phase in Map Unit 480. Monte is on toeslopes, fans, and upland drainages. Monte is classified as a "Fine-loamy, mixed, frigid Typic Torriorthent".

Monte was previously sampled at 6 sites in the current BBCC permit area, and at one additional site (SW5) in the Salt Wells Amendment Area. Monte loam was also sampled in 2002 at one additional site in the Pit 10 Extension Area. This additional Monte site is mentioned because the data supports the Monte soil series. Previous laboratory data for the 6 sample sites is contained in Addendum D7-C of the current BBCC permit document. Laboratory data for Monte sample site SW5 is contained in "Addendum D7-Salt Wells Lab Data" of this report.

Monte loam, sample site SW5, was located approximately 156' east, 750' north of the SW corner of Section 35, T.18N., R.101W. Sample site SW5: 3% slope; NNE aspect; Wyoming big sagebrush, mixed grasses, Gardner saltbush, occasional greasewood; local slopewash and streamlain alluvium; upland drainage position; slight erosion; soil profile all dry at time of sampling, 7-28-02.

A horizon – 0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak medium platy parting to weak medium granular structure; slightly hard, friable, slightly sticky and plastic consistence; common medium, fine and very fine, and few coarse roots to 14 inches; slightly effervescent, slightly alkaline (pH 7.4); clear smooth boundary.

BC horizon – 4 to 14 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and plastic consistence; moderately effervescent, slightly alkaline (pH 7.4); gradual wavy boundary.

C1 horizon – 14 to 24 inches; pale brown (10YR 6/3) clay loam, dark yellowish brown (10YR 4/4) moist; massive structure; hard, friable, sticky and slightly plastic consistence; few coarse, medium, fine and very fine roots 14 to 35 inches; strongly effervescent, slightly alkaline (pH 7.5); gradual wavy boundary.

C2 horizon – 24 to 35 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; massive structure; hard, firm, very sticky and plastic consistence; strongly effervescent, slightly alkaline (pH 7.4); gradual wavy boundary.

C3 horizon – 35 to 53 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; massive structure; hard, firm, very sticky and plastic consistence; moderately effervescent, slightly alkaline (pH 7.6); gradual wavy boundary.

Cr horizon (paralithic contact) 53+ inches; weathered, gray clay shale bedrock.

Monte Soil Suitability and Recommended Salvage Depth:

Monte is entirely suitable for salvage throughout its profile depth to the weathered shale or sandstone contact, an average depth of 53 inches on the Salt Wells Amendment Area. The previous average salvage depth for Monte over 6 sample sites on the current BBCC permit area was 60 inches.

3.8 Tasselma Soil Series

The Tasselma soil is a local Sweetwater County soil mapped on the current BBCC permit area as well as the Salt Wells Amendment Area. Tasselma is a shallow, well drained soil that is developing in thin residuum from sandstone. Clay content is typically about 14 to 26 percent. Tasselma is mapped in complex with Winton in Map Unit 451. Tasselma is on hill and ridge summits, shoulders, and sideslopes. Tasselma is classified as a "Loamy, mixed, calcareous, frigid, shallow Lithic Torricthert".

Tasselma was previously sampled at 5 sites in the current BBCC permit area, and at one additional site (SW12) in the Salt Wells Amendment Area. Previous laboratory data for the 5 sample sites is contained in Addendum D7-C of the current BBCC permit document. Laboratory data for Tasselma sample site SW12 is contained in "Addendum D7-Salt Wells Lab Data" of this report.

Tasselma sandy loam, sample site SW12, was located approximately 625' east, 1,156' north of the SW corner of Section 3, T.17N., R.101W. Sample site SW12: 10% slope; east aspect; Wyoming big sagebrush, mixed grasses, and occasional Gardner saltbush vegetation; thin residuum from sandstone; upland sideslope; slight erosion; soil profile all dry at time of sampling, 8-14-02.

Tasselma SW12 Soil Profile Description:

A horizon – 0 to 3 inches; pale brown (10YR 6/3) sandy loam, yellowish brown (10YR 5/4) moist; moderate coarse platy parting to moderate medium granular structure; soft, friable, slightly sticky and slightly plastic consistence; common medium, fine and very fine roots to 9 inches; moderately effervescent, neutral (pH 7.3); gradual smooth boundary.

BC horizon – 3 to 9 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic consistence; moderately effervescent, neutral (pH 7.3); gradual wavy boundary.

C horizon – 9 to 14 inches; pale brown (10YR 6/3) sandy loam, yellowish brown (10YR 5/4) moist; massive structure; hard, friable, slightly sticky and nonplastic consistence; few medium, fine and very fine roots to 14 inches; moderately effervescent, neutral (pH 7.3); gradual wavy boundary.

R (lithic contact) 14+ inches; light gray, hard sandstone bedrock.

Tasselma Soil Suitability and Recommended Salvage Depth:

Tasselma is entirely suitable for salvage throughout its profile depth to the sandstone bedrock contact, an average of 12 inches on the Salt Wells Amendment Area. The previous, corrected, average salvage depth for Tasselma over 5 sample sites on the current BBCC permit area was 12 inches.

3.9 Teagulf Soil Series

The Teagulf soil is a tentative NRCS soil series mapped extensively throughout the Green River basin of southwestern Wyoming. It was mapped on both the current BBCC permit area as well as the Salt Wells Amendment Area. Teagulf fine sandy loam is a moderately deep (20 to 40 inches to bedrock), well drained soil that is developing in slopewash alluvium and residuum from calcareous sedimentary rocks, most often sandstone. Clay content is typically less than 18 percent although the sampled pedon SW6 had slightly more, about 20 to 22 percent below 4 inches in depth. Teagulf is mapped in complex with Huguston and Terada in Map Unit 436, with Huguston in Map Unit 452, and with Kardaly and Huguston in Map Unit 468. Teagulf is on many positions including shoulders, sideslopes, and fans. Teagulf is classified as a "Coarse-loamy, mixed, superactive, frigid Typic Haplocalcid".

Teagulf was previously sampled at 5 sites in the current BBCC permit area, and at one additional site (SW6) in the Salt Wells Amendment Area. Previous laboratory data is contained in Addendum D7-C of the current BBCC permit document. Laboratory data for Teagulf sample site SW6 is contained in "Addendum D7-Salt Wells Lab Data" of this report.

Teagulf fine sandy loam, sample site SW6, was located approximately 156' west, 531' north of the SE corner of Section 4, T.17N., R.101W. Sample site SW6: 8% slope, SE aspect; Wyoming big sagebrush, rabbitbrush, mixed grasses, and prickly pear cactus vegetation; upland sideslope; thin aeolian over residuum from calcareous sandstone; slight erosion; soil profile all dry at time of sampling, 7-29-02.

Teagulf SW6 Soil Profile Description:

A horizon – 0 to 4 inches; light yellowish brown (10YR 6/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic consistence; common medium, fine and very fine, and few coarse roots to 16 inches; slightly effervescent, neutral (pH 7.2); clear smooth boundary.

Bw horizon – 4 to 16 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/6) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic consistence; moderately effervescent, neutral (pH 7.3); gradual wavy boundary.

Bk horizon – 16 to 30 inches; very pale brown (10YR 7/4) loam, brownish yellow (10YR 6/6) moist; massive structure; hard, friable, sticky and slightly plastic consistence; few fine and very fine roots 16 to 25 inches; violently effervescent, neutral (pH 7.3); gradual wavy boundary.

Cr horizon (paralithic contact) 30+ inches; somewhat hard, weathered, buff-colored calcareous sandstone.

Teagulf Soil Suitability and Recommended Salvage Depth:

Teagulf is entirely suitable for salvage throughout its profile depth to the sandstone contact, an average depth of 30 inches on the Salt Wells Amendment Area. The previous average salvage depth for Teagulf over 5 sample sites was 28.6 inches.

3.10 Thayer Soil Series

The Thayer soil is a local Sweetwater County soil mapped on deep, coarse-loamy, non-saline and non-alkaline upland drainages on both the current BBCC permit area and the Salt Wells Amendment Area. Thayer is developing in moderately coarse textured slopewash and drainage alluvium from sedimentary rocks. Clay content is typically 8 to 18 percent. Thayer is mapped with major inclusions Thayer Variant and Monte in Map Unit 444. Thayer is classified as a "Coarse-loamy, mixed, calcareous, frigid Typic Torriorthent".

Thayer was previously sampled at 5 sites in the current BBCC permit area, and at one additional site (SW7) in the Salt Wells Amendment Area. Previous laboratory data is contained in Addendum D7-C of the current BBCC permit document. Laboratory data for Thayer sample site SW7 is contained in "Addendum D7-Salt Wells Lab Data" of this report.

Thayer sandy loam, sample site SW7, was located approximately 2,656' west, 2,219' north of the SE corner of Section 9, T.17N., R.101W. Sample site SW7: 4% slope, SE aspect; Wyoming big sagebrush, mixed grasses, occasional rabbitbrush, prickly pear cactus vegetation; upland drainage; slopewash and drainage alluvium; slight erosion; soil profile all dry at time of sampling, 7-29-02.

Thayer SW7 Soil Profile Description:

A horizon – 0 to 4 inches; yellowish brown (10YR 5/4) sandy loam, brown (10YR 4/3) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic consistence; common medium, fine and very fine, and few coarse roots to 13 inches; noneffervescent, neutral (pH 6.6); clear smooth boundary.

Bw horizon – 4 to 13 inches; yellowish brown (10YR 5/4), dark yellowish brown (10YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable, nonsticky and nonplastic consistence; noneffervescent, neutral (pH 7.3); gradual wavy boundary.

C1 horizon – 13 to 30 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive structure; hard, friable, slightly sticky and plastic consistence; common fine and very fine, and few coarse and medium roots 13 to 26 inches; slightly effervescent, neutral (pH 7.0); gradual wavy boundary.

C2 horizon – 30 to 50 inches; yellowish brown (10YR 5/4) sandy loam to sandy clay loam, dark yellowish brown (10YR 4/6) moist; massive structure; very hard, friable, sticky and slightly plastic consistence; moderately effervescent, neutral (pH 7.3); gradual wavy boundary.

Cr horizon (paralithic contact) 50+ inches; somewhat hard, weathered, buff-colored sandstone.

Thayer Soil Suitability and Recommended Salvage Depth:

Thayer is entirely suitable for salvage throughout its profile depth to the sandstone or shale contact, an average depth of 50 inches on the Salt Wells Amendment Area. The previous average salvage depth for Thayer over 5 sample sites on the current BBCC permit area was 41 inches.

3.11 Thayer Variant Soil Series

Thayer Variant loam is a new soil and was only identified in 2002 on the Salt Wells Amendment Area. It was not previously mapped in Sweetwater County or in the current BBCC permit area. Thayer Variant is a major inclusion (15%) in Map Unit 444 (Thayer fine sandy loam, 0 to 6% slopes). Thayer Variant occupies concave positions where more effective precipitation is present and the Wyoming big sagebrush and mixed grasses vegetation is more productive. Thayer Variant has a "mollic" epipedon which is a surface horizon (or horizons) at least about 7 inches thick that has a dark color and sufficient organic matter content. Although Thayer Variant does not occupy a large acreage, it is a distinct soil inclusion with Thayer in upland swale and drainage positions. Because it is only a soil inclusion, not a named soil in a map unit name, it was sampled only once on the Salt Wells Amendment Area.

Thayer Variant loam is a moderately deep (20 to 40 inches to bedrock), well drained soil that is classified as a "Fine-loamy, mixed, calcareous, frigid, Aridic Haplustoll". Typically, a Haplustoll is not mapped in a "typic-aridic" soil moisture regime but the soil is present in concave or swale positions due to increased moisture effectiveness. Laboratory data for Thayer Variant, sample site SW14, is contained in "Addendum D7-Salt Wells Lab Data" of this report.

Thayer Variant loam, sample site SW14, was located approximately 1,344' west, 563' north of the SE corner of Section 4, T.17N., R.101W. Sample site SW14: 8% slope; east aspect; Wyoming big sagebrush (up to 3' tall); upland swale drainageway; moderately fine-textured slopewash and drainage alluvium; no erosion; slightly moist between 18 and 25 inches at the time of sampling, 8-14-02.

Thayer Variant SW14 Soil Profile Description:

A horizon – 0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate coarse platy parting to moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic consistence; common coarse, medium, fine, and very fine roots to 18 inches; noneffervescent, neutral (pH 6.7); gradual smooth boundary.

Bw1 horizon – 4 to 10 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic consistence; noneffervescent, neutral (pH 6.6); gradual smooth boundary.

Bw2 horizon – 10 to 18 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive parting to moderate medium subangular blocky structure; hard, friable, slightly sticky and nonplastic consistence; slightly effervescent, neutral (pH 7.1); gradual wavy boundary.

Bk horizon – 18 to 25 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4); massive structure; hard, friable, sticky and slightly plastic consistence; few coarse, medium, fine and very fine roots 18 to 25 inches; strongly effervescent, neutral (pH 7.3); gradual wavy boundary.

C horizon – 25 to 34 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; massive structure; hard, firm, sticky and slightly plastic consistence; few coarse, fine and very fine roots 25 to 34 inches; strongly effervescent, neutral, (pH 7.3); digging stopped by auger refusal – difficult to determine whether coarse fragment (cobble) or bedrock.

Thayer Variant Soil Suitability and Recommended Salvage Depth:

Thayer Variant is entirely suitable for salvage throughout its profile depth, an average depth of 34 inches on the Salt Wells Amendment area.

3.12 Terada Soil Series

The Terada soil is a local Sweetwater County soil which has been mapped on both the current BBCC permit area and the Salt Wells Amendment Area. Terada sandy loam is moderately deep (20 to 40 inches to bedrock), well drained soil that is developing in slopewash alluvium and residuum primarily from sandstone. Clay content is typically 12 to 18 percent. Terada is mapped in complex with Teagulf and Huguston in Map Unit 436, and in complex with Huguston and Rock Outcrop in Map Unit 466. Terada is on many positions including hills, ridges, sideslopes, fans, and toeslopes. Terada is classified as a "Coarse-loamy, mixed, calcareous, frigid Typic Torriorthent".

Terada sandy loam was previously sampled at 4 sites in the current BBCC permit area, and at one additional site (SW4) in the Salt Wells Amendment Area. Previous laboratory data is contained in Addendum D7-C of the current BBCC permit document. Laboratory data for Terada sample site SW4 is contained in "Addendum D7-Salt Wells Lab Data" of this report.

Terada sandy loam, sample site SW4, was located approximately 875' west, 1,438' south of the NE corner of Section 9, T.17N., R.101W. Sample site SW4: 8% slope; E aspect; Wyoming big sagebrush, mixed grasses, and occasional prickly pear cactus vegetation; upland sideslope; local alluvium over residuum from sandstone; slight erosion; soil profile all dry at time of sampling, 7-28-03.

Terada SW4 Soil Profile Description:

A horizon – 0 to 3 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic consistence; common medium, fine and very fine, and few coarse roots to 14 inches; moderately effervescent, slightly alkaline (pH 7.4); clear smooth boundary.

Bw horizon – 3 to 9 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; moderate, medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic consistence; slightly effervescent, neutral (pH 7.3); gradual wavy boundary.

C horizon – 9 to 30 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive structure; slightly hard to hard, friable, slightly sticky and slightly plastic; few coarse, medium, fine and very fine roots 14 to 30 inches; moderately effervescent, slightly alkaline (pH 7.4); gradual wavy boundary.

Cr horizon (paralithic contact) 30+ inches; somewhat hard, weathered, buff-colored sandstone.

Terada Soil Suitability and Recommended Salvage Depth:

Terada is entirely suitable for salvage throughout its profile depth to the sandstone contact, an average depth of 30 inches on the Salt Wells Amendment Area. The previous average salvage depth for Terada over 4 sample sites on the current BBCC permit area was 25.5 inches.

3.13 Winton Soil Series

The Winton soil is a local Sweetwater County soil which has been mapped on both the current BBCC permit area and the Salt Wells Amendment Area. Winton very channery sandy loam is a very shallow (less than 10 inches to bedrock), well drained soil that is developing in thin residuum from sandstone or shale. Clay content is typically about 10 to 24 percent. Winton is mapped alone in Map Unit 6, in complex with Tasselman in Map Unit 451, in association with Horsley and Rock Outcrop in Map Unit 458EF, and in association with Rock Outcrop and Horsley in Map Unit 459. Winton is on ridge crests, backlopes, and some sideslopes. Winton is classified as a "Loamy, mixed, calcareous, frigid Lithic Torriorthent".

Winton very channery sandy loam, sample site SW1, was located approximately 719' west, 656' north of the SE corner of Section 34, T.18N., R.101W. Sample site SW1: 18% slope; ESE aspect; Wyoming big sagebrush, Gardner saltbush, some mixed grasses and forbs; backslope of sandstone ridge; thin residuum from calcareous sandstone; no erosion; soil profile moist from 1 to 4 inches at the time of sampling, 6-4-02.

Winton SW1 Soil Profile Description:

A horizon – 0 to 2 inches; pale brown (10YR 6/3) very channery sandy loam with about 60% ¼ to 3" sandstone channers on the soil surface and about 20% channers in the horizon, brown (10YR 5/3) moist; moderate medium platy parting to moderate medium granular structure; slightly hard, very friable, slightly sticky and plastic consistence; common fine and very fine, and few coarse and medium roots to 7 inches; moderately effervescent, neutral (pH 7.3); gradual smooth boundary.

BC horizon – 2 to 7 inches; yellowish brown (10YR 5/4) channery sandy loam with about 25% sandstone channers, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and plastic consistence; strongly effervescent, slightly alkaline (pH 7.4); gradual wavy boundary.

Ck horizon – 7 to 9 inches; brownish yellow (10YR 6/6) very channery sandy clay loam with about 40% sandstone channers, yellowish brown (10YR 5/6) moist; massive structure; slightly hard, friable, slightly sticky and slightly plastic consistence; few coarse, medium fine and very fine roots 7 to 9 inches; strongly effervescent, neutral (pH 7.3); gradual wavy boundary.

R (lithic contact) 9+ inches; hard, somewhat fractured, calcareous sandstone.

Winton Soil Suitability and Recommended Salvage Depth:

Winton is entirely suitable for salvage throughout its profile depth to the sandstone or shale contact, an average depth of 6 inches on the Salt Wells Amendment Area. The previous average salvage depth for Winton over 5 sample sites was 6 inches.

4.0 REFERENCES

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TABLE D7-SW1

LIST OF SOIL MAP UNITS AND RECOMMENDED SALVAGE DEPTHS
SALT WELLS AMENDMENT AREA

Map Unit No.	Map Unit Name	Recommended Salvage Depth
8	Winton very channery sandy loam, 0 to 45% slopes	6"
10	Kandaly loamy sand, 6 to 15% slopes	32" or 50" ¹
436	Teagulf-Huguston-Terada complex, 0 to 6% slopes	25"
444	Thayer fine sandy loam, 0 to 6% slopes	48"
446AB	Horsley-Haterton complex, 0 to 6% slopes	10"
446CD	Horsley-Haterton complex, 6 to 15% slopes	10"
451	Tasselmann-Winton complex, 3 to 30% slopes	9"
452	Huguston-Teagulf complex, 3 to 10% slopes	20"
458EF	Winton-Horsley-Rock Outcrop association, very steep	4" RO = 0"
459	Rock Outcrop-Winton-Horsley association, steep	3" RO = 0"
461	Rock Land, 0 to 75% slopes	0"
464	Boltus-Horsley complex, 0 to 30% slopes	6"
466	Huguston-Rock Outcrop-Terada complex, 6 to 30% slopes	15" RO = 0"
467	Huguston-Horsley-Haterton complex, 6 to 30% slopes	12"
468	Kandaly-Huguston-Teagulf complex, 3 to 30% slopes	25"
480	Monte loam, alkaline and saline phase, 0 to 3% slopes	- ²
a480	Monte loam, 0 to 6% slopes	53"
481	Chrisman-Dines complex, 0 to 3% slopes	- ²
DL	Disturbed Land	0"

¹See discussion of Kandaly Soil Series, Section 3.6.²Map Units 480 and 481 are not within the proposed disturbance areas and were not evaluated for soil suitability and recommended salvage depth.

TABLE D7-SW2

**SOIL CHARACTERISTICS AND TAXONOMY
SALT WELLS AMENDMENT AREA**

Soil Series	Soil Depth	Soil Sample No.	Recommended Salvage Depth	Soil Classification ¹	Soil Series Status ¹
BOLTUS	Very Shallow & Shallow	SW9, SW11, SW13	6	Clayey, smectitic, calcareous, frigid, shallow Typic Torriorthent	Established, 02/1997
CHRISMAN	Deep	--	--	Fine, mixed, superactive, calcareous, frigid Typic Torrifluent	Tentative, 03/2003
DINES	Deep	--	--	Fine-silty, mixed, superactive, calcareous, frigid Typic Torrifluent	Tentative, 03/2003
HATERTON	Shallow	SW10	15	Loamy, mixed, superactive, calcareous, frigid, shallow Typic Torrifluent	Established, 03/2003
HORSLEY	Very Shallow	SW8	7	Loamy, mixed, calcareous, frigid, shallow Typic Torriorthent	Sweetwater Co, 02/1979
HUGUSTON	Shallow	SW3	14	Loamy, mixed, superactive, calcareous, frigid, shallow Typic Torrifluent	Established, 03/2003
KANDALY	Deep	SW2	32 to 50	Mixed, frigid, Typic Torripsamment	Established, 07/1985
MONTE	Deep	SW5	53	Fine-loamy, mixed, superactive, calcareous, frigid Typic Torrifluent	Established, 03/2003
TASSELMAN	Shallow	SW12	12	Loamy, mixed, calcareous, frigid, shallow Lithic Torriorthent	Sweetwater Co, 03/1981
TEAGULF	Moderately Deep	SW6	30	Coarse-loamy, mixed, superactive, frigid Typic Haplocalcid	Tentative, 02/1980
THAYER	Deep	SW7	50	Coarse-loamy, mixed, calcareous, frigid Typic Torriorthent	Sweetwater Co, 02/1983
THAYER VAR.	Moderately Deep	SW14	34	Fine-loamy, mixed, calcareous, frigid Aridic Haplustoll	Salt Wells amend area
TERADA	Moderately Deep	SW4	30	Coarse-loamy, mixed, calcareous, frigid Typic Torriorthent	Sweetwater Co, 02/1972
WINTON	Very Shallow	SW1	6	Loamy, mixed, calcareous, frigid Lithic Torriorthent	Sweetwater Co, 02/1981

¹ Information obtained from current NRCS official Soil Series Description as present on the NRCS Official Series Description (OSD) internet site. Information for local Sweetwater County Soils (Horsley, Tasselmann, Thayer, Terada, and Winton) obtained from NRCS files for Sweetwater County.

ADDENDUM D7
SALT WELLS LAB DATA

Client Project ID: Salt Wells

Black Butte Coal Company

Point of Rocks, WY

Set #0102S10513

Date Received: 06/12/02

Report Date: 06/25/02

Lab Id	Sample Id	Depths (Inches)	VFS %	Sand %	Silt %	Clay %	Texture	CO3 %	Organic Matter %
0102S10513	SW1	0 - 2	13.3	68.0	21.0	11.0	SANDY LOAM	2.8	0.8
0102S10514	SW1	2 - 7	17.7	66.0	18.0	16.0	SANDY LOAM	4.6	0.9
0102S10515	SW1	7 - 9	16.4	66.0	22.0	22.0	SANDY CLAY LOAM	5.8	0.8
0102S10516	SW2	0 - 2	11.7	66.0	8.0	6.0	LOAMY SAND	0.2	2.5
0102S10517	SW2	2 - 15	9.6	85.0	7.0	8.0	LOAMY SAND	0.5	0.7
0102S10518	SW2	15 - 32	9.3	85.0	7.0	8.0	LOAMY SAND	0.3	0.8
0102S10519	SW2	32 - 50	8.1	87.0	7.0	6.0	LOAMY SAND	0.1	0.4
0102S10520	SW3	0 - 3	14.7	78.0	14.0	8.0	SANDY LOAM	0.8	1.7
0102S10521	SW3	3 - 14	15.6	74.0	12.0	14.0	SANDY LOAM	0.9	1.1
0102S10522	SW3	14 - 18	27.6	58.0	22.0	20.0	SANDY CLAY LOAM	15.3	1.0

Abbreviations for extractants: PE= Saturated Paste Extract, H2Osol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By:

Joey Sheeley

Black Butte Coal Company
Point of Rocks, WY

Client Project ID: Salt Wells

Date Received: 06/12/02

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Set #0102S10513

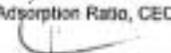
Report Date: 06/26/02

Lab Id	Sample Id	Depth (Inches)	pH s.u.	Saturation %	EC	Calcium meq/L	Magnesium meq/L	Sodium meq/L	SAR
					@ 25°C mmhos/cm				
0102S10518	SW2	15 - 32	7.2	31.6	0.41	2.20	0.80	0.77	0.63
0102S10518D	SW2	15 - 32	7.2	32.0	0.41	2.18	0.77	0.80	0.66

Abbreviations for extractants: PE= Saturated Paste Extract, H2Osol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: Joey Sheeley
Soils Lab Supervisor

Client Project ID: Salt Wells

Black Butte Coal Company

Point of Rocks, WY

Set #0102S10513

Date Received: 06/12/02

Report Date: 06/28/02

Lab Id	Sample Id	Depth (Inches)	VFS %	Sand %	Silt %	Clay %	Texture	CO3 %	Organic Matter %
H02S10518	SW2	15 - 32	8.3	85.0	7.0	8.0	LOAMY SAND	0.3	0.5
H02S10518D	SW2	15 - 32	7.9	84.0	8.0	8.0	LOAMY SAND	0.3	0.5

Abbreviations for extractants: PE= Saturated Paste Extract, H2Osol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAC= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot = Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By:

Joey Sheeley

Black Butte Coal Company
Point of Rocks, WY

Client Project ID: Salt Wells

Date Received: 06/12/02

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Set #0102S10513

Report Date: 06/28/02

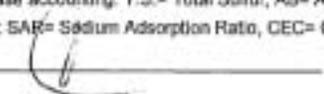
Lab Id	Sample Id	Depth (Inches)	pH s.u.	Saturation %	EC	Calcium mg/L	Magnesium mg/L	Sodium mg/L	SAR
					@ 25°C mmhos/cm				
0102S10513	SW1	0 - 2	7.3	26.8	0.45	2.47	0.67	0.85	0.68
0102S10514	SW1	2 - 7	7.4	26.1	0.36	1.72	0.53	0.89	0.64
0102S10515	SW1	7 - 9	7.3	26.9	0.33	1.07	0.51	1.14	1.28
0102S10516	SW2	0 - 2	5.9	38.1	0.35	1.51	0.61	0.56	0.54
0102S10517	SW2	2 - 15	7.3	31.9	0.63	2.76	1.61	0.83	0.56
0102S10518	SW2	15 - 32	7.2	31.6	0.41	2.20	0.80	0.77	0.63
0102S10519	SW2	32 - 50	6.6	31.8	0.34	1.19	0.53	1.04	1.12
0102S10520	SW3	0 - 3	6.9	35.7	0.58	3.20	1.24	0.63	0.42
0102S10521	SW3	3 - 14	7.2	29.9	0.60	3.87	1.26	0.75	0.47
0102S10522	SW3	14 - 18	7.3	37.5	0.50	2.86	1.48	0.75	0.51

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By:


 Joey Sheeley

Soils Lab Supervisor

Client Project ID: Topsoil

Black Butte Coal Company

Point of Rocks, WY

Date Received: 08/09/02

Set #0102S15272

Report Date: 08/19/02

Lab Id	Sample Id	Depth (Inches)	pH s.u.	Saturation %	EC @ 25°C mmhos/cm	Calcium mg/L	Magnesium mg/L	Sodium mg/L	SAR
0102S15272	SW4	0 - 3	7.4	29.7	0.57	3.22	1.03	0.67	0.46
0102S15273	SW4	3 - 9	7.3	29.3	0.47	2.53	0.86	0.70	0.54
0102S15274	SW4	9 - 30	7.4	23.3	5.14	20.4	39.3	6.57	1.20
0102S15275	SW5	0 - 4	7.4	41.3	0.69	3.92	1.44	0.84	0.51
0102S15276	SW5	4 - 14	7.4	35.5	0.43	1.63	0.78	1.05	0.97
0102S15277	SW5	14 - 24	7.5	36.0	0.51	1.71	0.95	1.53	1.33
0102S15278	SW5	24 - 35	7.4	49.8	3.70	23.6	15.4	3.99	0.90
0102S15279	SW5	35 - 53	7.6	50.2	4.16	22.4	22.6	7.90	1.67
0102S15280	SW6	0 - 4	7.2	31.8	0.74	4.26	1.31	0.99	0.69
0102S15281	SW6	4 - 16	7.3	29.8	0.65	4.14	1.22	0.98	0.60
0102S15282	SW6	16 - 30	7.3	37.9	0.72	2.60	1.26	1.44	1.03
0102S15283	SW7	0 - 4	6.6	40.5	0.36	1.50	0.73	0.40	0.38
0102S15284	SW7	4 - 13	7.0	32.2	0.43	1.90	0.87	0.53	0.45
0102S15285	SW7	13 - 30	7.0	32.9	0.44	2.47	1.05	0.64	0.48
0102S15286	SW7	30 - 50	7.3	33.5	0.62	3.01	1.65	1.16	0.76
0102S15287	SW8	0 - 3	7.4	34.2	0.45	2.10	0.69	0.83	0.70
0102S15288	SW8	3 - 7	7.4	33.7	0.40	2.01	0.55	0.70	0.62
0102S15289	SW9	0 - 2	7.5	48.1	2.69	23.1	4.19	1.49	0.40
0102S15290	SW9	2 - 7	7.3	66.1	3.21	19.6	12.9	2.50	0.62
0102S15291	SW9	7 - 14	7.6	67.5	8.70	16.3	127	2.90	0.34
0102S15292	SW10	0 - 3	7.6	28.9	0.40	1.96	1.07	0.71	0.58
0102S15293	SW10	3 - 9	7.5	26.1	0.42	1.64	1.13	0.85	0.72
0102S15294	SW10	9 - 15	7.6	35.2	0.37	1.51	0.52	1.10	1.10

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By:

Joey Sheeley

Black Butte Coal Company
Point of Rocks, WY

Client Project ID: Topsoil

Set #0102S15272

Date Received: 08/09/02

Report Date: 08/19/02

Lab Id	Sample Id	Depths (Inches)	Very Fine Sand %	Sand %	Silt %	Clay %	Texture	CO3 %	Organic Matter %
0102S15272	SW4	0 - 3	5.70	74.0	12.0	14.0	SANDY LOAM	2.8	1.0
0102S15273	SW4	3 - 9	3.10	74.0	12.0	14.0	SANDY LOAM	1.3	0.9
0102S15274	SW4	9 - 30	8.30	82.0	6.0	12.0	SANDY LOAM	2.4	0.8
0102S15275	SW5	0 - 4	21.8	30.0	49.0	21.0	LOAM	3.5	3.7
0102S15276	SW5	4 - 14	19.7	34.0	43.0	23.0	LOAM	3.7	2.3
0102S15277	SW5	14 - 24	18.4	39.0	33.0	28.0	CLAY LOAM	5.0	1.4
0102S15278	SW5	24 - 35	13.5	19.0	41.0	40.0	SILTY CLAY	4.9	1.6
0102S15279	SW5	35 - 53	8.20	11.0	46.0	43.0	SILTY CLAY	3.1	1.2
0102S15280	SW6	0 - 4	16.6	79.0	9.0	12.0	SANDY LOAM	1.9	1.8
0102S15281	SW6	4 - 16	20.3	70.0	10.0	20.0	SANDY CLAY LOAM	2.4	1.0
0102S15282	SW6	16 - 30	26.5	46.0	32.0	22.0	LOAM	13.4	1.2
0102S15283	SW7	0 - 4	28.6	65.0	26.0	8.0	SANDY LOAM	0.6	2.5
0102S15284	SW7	4 - 13	29.7	69.0	21.0	10.0	SANDY LOAM	0.4	0.9
0102S15285	SW7	13 - 30	16.1	71.0	19.0	10.0	SANDY LOAM	0.4	0.9
0102S15286	SW7	30 - 50	31.5	66.0	20.0	14.0	SANDY LOAM	1.0	1.0
0102S15287	SW8	0 - 3	13.7	59.0	15.0	26.0	SANDY CLAY LOAM	10.9	1.7
0102S15288	SW8	3 - 7	8.80	67.0	12.0	21.0	SANDY CLAY LOAM	11.3	1.2
0102S15289	SW9	0 - 2	9.20	16.0	46.0	38.0	SILTY CLAY LOAM	4.4	1.4
0102S15290	SW9	2 - 7	8.60	17.0	43.0	40.0	SILTY CLAY	4.0	1.6
0102S15291	SW9	7 - 14	4.30	14.0	50.0	36.0	SILTY CLAY LOAM	4.5	1.4
0102S15292	SW10	0 - 3	19.4	55.0	25.0	20.0	SANDY CLAY LOAM	6.3	1.8
0102S15293	SW10	3 - 9	17.3	56.0	22.0	22.0	SANDY CLAY LOAM	7.5	1.4
0102S15294	SW10	9 - 15	16.7	53.0	22.0	25.0	SANDY CLAY LOAM	6.5	1.4

Abbreviations for extractants: PE= Saturated Paste Extract, H2Osol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAD= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S. = Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyS= Pyritic Sulfur, Pyr=Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By:


 Joey Sheeley
 Soils Lab Supervisor

Black Butte Coal Company
Point of Rocks, WY

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Client Project ID: Topsoil

Set #0102S15272

Date Received: 08/09/02

Report Date: 08/19/02

Lab Id	Sample Id	Depths (Inches)	pH s.u.	Saturation %	EC @ 25°C mmhos/cm	Calcium meq/L	Magnesium meq/L	Sodium meq/L	SAR
0102S15284	SW7	4 - 13	7.0	32.2	0.43	1.90	0.87	0.53	0.45
0102S15284D	SW7	4 - 13	7.0	32.3	0.46	2.05	0.99	0.52	0.42
0102S15292	SW10	0 - 3	7.6	26.9	0.40	1.95	1.07	0.71	0.58
0102S15292D	SW10	0 - 3	7.6	27.7	0.39	1.97	0.47	0.72	0.65

Abbreviations for extractants: PE= Saturated Paste Extract, H2Osol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyS= Pyritic Sulfur, Py+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential

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Reviewed By:

Joey Sheeley

Black Butte Coal Company
Point of Rocks, WY

Client Project ID: Topsoil

Set #0102S15272

Date Received: 08/09/02

Report Date: 08/19/02

Lab Id	Sample Id	Depth (Inches)	Very		Silt %	Clay %	Texture	CO3 %	Organic Matter %
			Fine Sand %	Sand %					
0102S15284	SW7	4 - 13	29.7	69.0	21.0	10.0	SANDY LOAM	0.4	0.9
0102S15284D	SW7	4 - 13	29.0	69.0	21.0	10.0	SANDY LOAM	0.4	0.9
0102S15292	SW10	0 - 3	19.4	55.0	25.0	20.0	SANDY CLAY LOAM	5.3	1.8
0102S15292D	SW10	0 - 3	18.9	54.0	26.0	20.0	SANDY CLAY LOAM	5.8	1.7

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____

Joey Sheeley

Soils Lab Supervisor

Black Butte Coal Company

Point of Rocks, WY

Client Project ID: Point of Rocks

Set #0102S16075

Date Received: 08/21/02

Report Date: 09/06/02

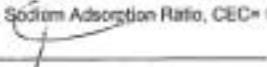
Lab Id	Sample Id	Depth (Inches)	pH s.u.	Saturation %	EC	Calcium mg/L	Magnesium mg/L	Sodium mg/L	SAR
					@ 25°C mmhos/cm				
0102S16075	SW11	0 - 2	7.5	39.4	0.65	2.78	1.33	2.30	1.60
0102S16076	SW11	2 - 6	7.6	43.1	0.41	1.44	0.78	2.05	1.95
0102S16077	SW11	6 - 13	7.3	46.2	1.52	7.41	4.38	2.63	1.08
0102S16078	SW12	0 - 3	7.3	27.8	0.51	3.09	1.06	0.86	0.61
0102S16079	SW12	3 - 9	7.3	33.4	1.29	6.79	4.44	1.55	0.66
0102S16080	SW12	9 - 14	7.3	30.3	0.98	6.88	2.19	1.35	0.63
0102S16081	SW13	0 - 2	7.5	48.2	2.61	29.1	3.54	1.79	0.44
0102S16082	SW13	2 - 4	6.9	53.2	2.93	24.1	15.6	1.72	0.39
0102S16083	SW13	4 - 9	7.4	61.8	9.90	17.0	176	3.15	0.32
0102S16084	SW14	0 - 4	6.7	51.3	0.52	2.57	1.74	0.92	0.62
0102S16085	SW14	4 - 10	6.6	41.0	0.40	2.38	0.98	0.63	0.49
0102S16086	SW14	10 - 16	7.1	33.5	0.58	3.91	1.37	0.70	0.43
0102S16087	SW14	16 - 25	7.3	33.5	0.41	2.22	0.72	1.26	1.06
0102S16088	SW14	25 - 34	7.3	33.0	0.41	2.20	0.67	1.12	0.91

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S. = Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot = Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By:


 Joey Sheeley

Black Butte Coal Company
Point of Rocks, WY

Client Project ID: Point of Rocks

Set #0102S16075

Date Received: 08/21/02

Report Date: 09/05/02

Lab Id	Sample Id	Depths (Inches)	Very Fine		Silt %	Clay %	Texture	Carbonate %	Organic Matter %
			Sand %	Sand %					
0102S16075	SW11	0 - 2	19.7	29.0	39.0	32.0	CLAY LOAM	7.8	2.1
0102S16076	SW11	2 - 6	13.6	17.0	45.0	38.0	SILTY CLAY LOAM	6.9	1.8
0102S16077	SW11	6 - 13	12.5	17.0	53.0	30.0	SILTY CLAY LOAM	11.4	1.7
0102S16078	SW12	0 - 3	14.8	68.0	15.0	18.0	SANDY LOAM	1.3	1.0
0102S16079	SW12	3 - 9	10.6	68.0	10.0	22.0	SANDY CLAY LOAM	1.7	1.1
0102S16080	SW12	9 - 14	8.0	75.0	11.0	14.0	SANDY LOAM	2.2	0.7
0102S16081	SW13	0 - 2	11.8	19.0	42.0	39.0	SILTY CLAY LOAM	4.0	1.4
0102S16082	SW13	2 - 4	11.9	24.0	32.0	44.0	CLAY	1.8	1.2
0102S16083	SW13	4 - 9	11.1	14.0	48.0	38.0	SILTY CLAY LOAM	3.8	1.3
0102S16084	SW14	0 - 4	24.9	40.0	40.0	20.0	LOAM	0.9	5.4
0102S16085	SW14	4 - 10	24.7	46.0	34.0	20.0	LOAM	0.9	3.3
0102S16086	SW14	10 - 18	21.2	56.0	26.0	18.0	SANDY LOAM	2.2	1.3
0102S16087	SW14	18 - 25	17.3	55.0	24.0	21.0	SANDY CLAY LOAM	5.8	0.8
0102S16088	SW14	25 - 34	16.8	62.0	19.0	19.0	SANDY LOAM	7.8	0.8

Abbreviations for extractants: PE= Saturated Paste Extract, H2Osol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot = Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____

Joey Sheeley
Soils Lab Supervisor

Black Butte Coal Company
Point of Rocks, WY

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Client Project ID: Point of Rocks

Set #0102S16075

Date Received: 08/21/02

Report Date: 09/06/02

Lab Id	Sample Id	Depth (Inches)	pH s.u.	Saturation %	EC	Calcium meq/L	Magnesium meq/L	Sodium meq/L	SAR
					@ 25°C mhos/cm				
0102S16078	SW11	2 - 6	7.6	43.1	0.41	1.44	0.78	2.05	1.95
0102S16076D	SW11	2 - 6	7.6	43.9	0.43	1.65	0.87	1.88	1.68
0102S16080	SW12	9 - 14	7.3	30.3	0.98	8.88	2.19	1.35	0.53
0102S16080D	SW12	9 - 14	7.3	29.5	0.98	8.92	2.19	1.21	0.57

Abbreviations for extractants: PE= Saturated Paste Extract, H2Osol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot = Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

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Black Butte Coal Company
Point of Rocks, WY

Client Project ID: Point of Rocks

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Date Received: 08/21/02

Set #0102S16075

Report Date: 09/05/02

Lab Id	Sample Id	Depth (Inches)	Very Fine		Silt %	Clay %	Texture	Carbonate %	Organic Matter %
			Sand %	Sand %					
0102S16076	SW11	2 - 6	13.6	17.0	45.0	38.0	SILTY CLAY LOAM	6.9	1.8
0102S16076D	SW11	2 - 6	13.4	17.0	45.0	38.0	SILTY CLAY LOAM	6.5	1.9
0102S16080	SW12	9 - 14	8.0	75.0	11.0	14.0	SANDY LOAM	2.2	0.7
0102S16080D	SW12	9 - 14	9.4	77.0	9.0	14.0	SANDY LOAM	2.1	0.6

Abbreviations for extractants: PE= Saturated Pepsin Extract, H2Osol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

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