

APPENDIX D
SOIL SURVEY

RECEIVED

APR 29 1988

ANDALEX RESOURCES, INC.

United States
Department of
Agriculture

Soil
Conservation
Service

P. O. Box 11350
Salt Lake City, UT 84147

April 27, 1988

Mr. Michael W. Glasson
Senior Geologist
Western Operations
Andalex Resources, Inc.
P. O. Box 902
Price, Utah 84501

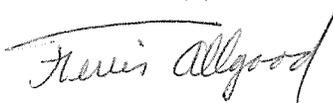
Dear Mr. Glasson:

We have completed our review of the project area, Wildcat Loadout Facility (Township 13 South, Range 9 East, Section 33), described in your letter to George Cook dated March 29, 1988.

According to the field review the project area does not contain any Important Farmland.

The completed Form AD-1006 is enclosed. If I can be of further assistance to you please contact me at the address above or on (801) 524-5064.

Sincerely,



FERRIS P. ALLGOOD
State Soil Scientist

Enclosure

cc: w/o Enclosure
Keith Beardall, DC, SCS, Price, Utah

FARMLAND CONVERSION IMPACT RATING

PART I (To be completed by Federal Agency)	Date Of Land Evaluation Request March 29, 1988
Name Of Project Wildcat Loadout Facility (Township 13 South, Range 9 East, Section 33)	Federal Agency Involved
Proposed Land Use	County And State

PART II (To be completed by SCS)		Date Request Received By SCS	
Does the site contain prime, unique, statewide or local important farmland? <i>(If no, the FPPA does not apply - do not complete additional parts of this form).</i>		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: _____ %	Acres Irrigated	Average Farm Size
Name Of Land Evaluation System Used Soil Survey	Name Of Local Site Assessment System	Amount Of Farmland As Defined in FPPA Acres: _____ %	
		Date Land Evaluation Returned By SCS April 27, 1988	

PART III (To be completed by Federal Agency)	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly				
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site				

PART IV (To be completed by SCS) Land Evaluation Information	Site A	Site B	Site C	Site D
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				

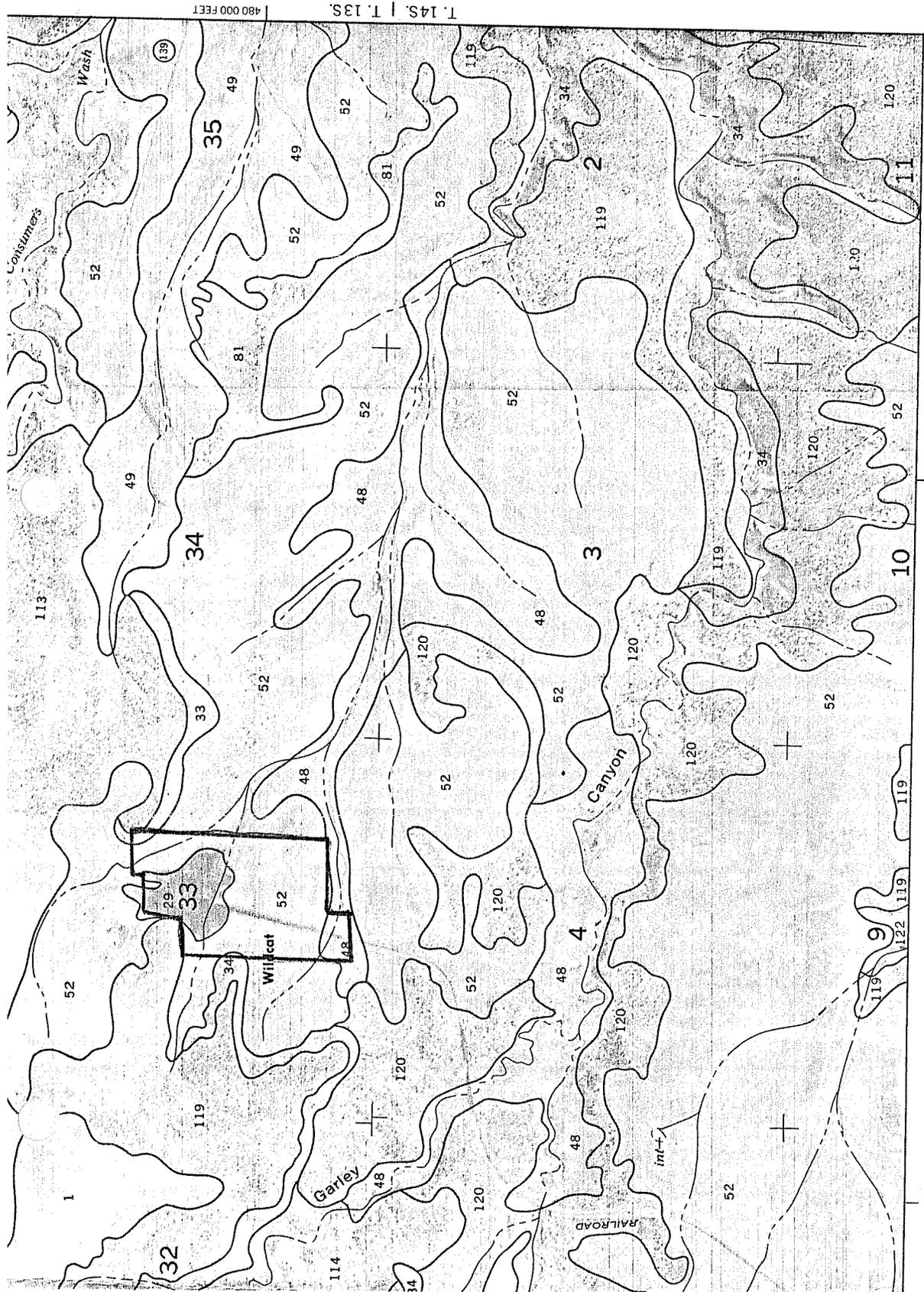
PART V (To be completed by SCS) Land Evaluation Criterion	Site A	Site B	Site C	Site D
Relative Value Of Farmland To Be Converted (Scale of 0 to 100 Points)				

PART VI (To be completed by Federal Agency)	Maximum Points	Site A	Site B	Site C	Site D
Assessment Criteria (These criteria are explained in 7 CFR 658.5(b))					
1. Area In Nonurban Use					
2. Perimeter In Nonurban Use					
3. Percent Of Site Being Farmed					
4. Protection Provided By State And Local Government					
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average					
8. Creation Of Nonfarmable Farmland					
9. Availability Of Farm Support Services					
10. On-Farm Investments					
11. Effects Of Conversion On Farm Support Services					
12. Compatibility With Existing Agricultural Use					
TOTAL SITE ASSESSMENT POINTS	160				

PART VII (To be completed by Federal Agency)	Maximum Points	Site A	Site B	Site C	Site D
Relative Value Of Farmland (From Part V)	100				
Total Site Assessment (From Part VI above or a local site assessment)	160				
TOTAL POINTS (Total of above 2 lines)	260				

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes <input type="checkbox"/> No <input type="checkbox"/>
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Reason For Selection:
No Important Farmland determination. Area involved does not qualify for any of the categories for Important Farmland (prime, unique, or state-wide importance). Primary reason this area does not qualify for important farmland is because there is no irrigation water.



Wildcat Locant

T135 R 9E Section 33

- 29 Dempsey mine
- 48 Nauded farm, 1-8% slopes
- 52 Hernandez family, 3-8% slopes



March 25, 1982

Mr. Michael W. Glasson
Senior Geologist
Tower Resources, Inc.
P.O. Box 1027 902
Price, Utah 84501

Dear Mr. Glasson:

Attached is a mapping unit description of the soils of the proposed right-of-way area. It is located in section T.13S., R.9E., at the coal loading site at the Utah Railroad and the Gordon Creek road. This mapping unit description includes a soil profile description, topographic information and some other characteristics of the soils in the area.

This soil is rated good for use as topsoil to a depth of 60 inches or more.

The A horizon (upper 9 inches) of the soil is slightly higher in organic matter and lower in carbonate content. If sufficient quantity of this soil is available, it would be slightly better for topsoil than the material below this depth.

The north part of the area has small patches with 2 to 8 inches of coal waste over the surface. This coal waste should be removed before the soil is stored for topsoil.

The thickness of topsoil to be applied to reclaim the area will depend on the amount of coal waste left on the surface. If all of this waste material is removed, a thin layer will be needed. If the waste material left is thick, more will be needed. If the soil material on the area is compacted ripping will help with revegetation of the area.

Rating and interpretation are made using U.S. Soil Conservation Service criteria and reference material.

Sincerely,

Earl Jensen
MWG *Earl Jensen*

Earl Jensen
Soil Scientist - Retired

MAPPING UNIT DESCRIPTION

Series Classification: Fine-loamy, mixed, meric
(Subgroup)

Ustalic Calciorthids
(Family)

Mapping Unit Name: Abra loam, 3 to 6 percent slopes

This Abra soil is very deep and well
(Series Name) (1) (Depth) (2) (Drainage Class)

drained. It occurs on alluvial fans at elevations of 6,100 to 6,200
(3) (Position)

feet. This soil formed in alluvium derived mainly from sandstone and

shale. The average annual precipitation is estimated to be 12 to 13

inches. Slopes are 3 to 6 percent and east facing. They are 100

to 200 feet in length and concave - convex in shape. Vegetation is
(5) (6)

dominantly Indian Ricegrass, Russian Thistle, Cheatgrass & big Sagebrush.

In disturbed areas it is mostly Rochia and Russian Thistle. Included in

mapping are small areas of a similar soil to Abra except lacking a Ca

horizon. Also included is a small area of coal waste dumps. These are

both located in the drainage area that dissects the area near the center.

In a typical profile the surface layer is pale brown, loam about 9 inches thick. The underlying layer is light yellowish brown and pale brown, loam about 46 inches thick. The next layer is pale brown, very fine sandy loam to a depth 60 inches or more.
(Texture)

Other Characteristics: a layer of carbonate is at a depth of 9
to 12 inches. Permeability is .6 to 2 inches per hour to a depth
of 60 inches or more. Available water capacity is 1.7 to 2 inches
per foot of soil. Organic matter content in the surface layer is
about 1 percent. The estimated moist bulk density (1/3 bar) is
1.20 to 1.30 in the surface 9 inches and 1.30 to 1.40 below this
depth. Effective rooting depth is about 60 inches. Surface runoff
is slow and erosion hazard is slight under potential native revegeta-
tion and moderate if vegetation is removed and the
(11) (Descriptive Value)
soil is left bare. Erodibility is high (K value .46)
(12) (low, moderate, high)
and wind erodibility is moderate (L4) to a depth of 60 inches.
range, wildlife habitat, woodland, recreation, urban, others

A typical pedon of Abra loam was described near the center of
(Colors are for dry
the area.
soil unless otherwise noted)

All-- 0 to 1 inches; light brownish gray (10 YR 6/2)
(Color Name) (Coord.)

loam, very dark gray (10 YR 3/1) when moist; weak medium
(Texture)

platy structure that parts to weak very fine granular; soft,

very friable, slightly sticky and slightly plastic; many very

fine and fine roots; 16 percent clay (estimated); moderately

calcareous; moderately alkaline(pH 8.0) clear smooth boundary.

A12 -- 1 to 9 inches; pale brown (10 YR 6/3) loam, brown
(horizon)

(10 YR 5/3) when moist; massive; soft, very friable, slightly

sticky and slightly plastic; common very fine and fine, few
(Abundance - Size)

medium roots, 16 percent clay (estimated); moderately calcareous;

moderately alkaline (pH 8.0); gradual smooth boundary.

C cal-- 9 to 25 inches; light yellowish gray (10 YR 6/2)
(horizon)

loam, grayish brown (10 YR 5/2) when moist; moderate coarse
(Texture)

subangular blocky structure; that parts to moderate medium

subangular; hard, firm, slightly sticky and slightly plastic ;

common very fine to medium, few coarse roots, common fine pores;

22 percent clay (estimated); moderately calcareous. Carbonater

are massive and veined; strongly alkaline (pH 8.6); clear smooth

boundary.

C ca 2 25 to 40 inches; pale brown (10 YR 6/3) loam, grayish
(horizon)

brown (10 YR 5/2) when moist; strong coarse subangular blocky

structure that parts to moderate medium subangular blocky; hard,

firm, slightly sticky and slightly plastic; few very fine to

medium roots, common fine and medium, few coarse pores; 30

percent clay (estimated); strongly calcareous, carbonates are

massive and veined; strongly alkaline (pH 8.6); clear smooth

boundary.

C ca 3 40 to 55 inches; pale brown (10 YR 6/3) loam,
(horizon) (Texture)

grayish brown (10 YR 5/2) when moist; strong coarse subangular

blocky structure that parts to moderate medium subangular blocky;

very hard, very firm, slightly sticky and slightly plastic; few

very fine roots; common fine and medium, few coarse pores; 20

percent clay (estimated); strongly calcareous, carbonates are

massive and fine modular; strongly alkaline (pH 8.8); clear

smooth boundary.

C -- 55 to 72 inches; pale brown (10 YR 6/3) very fine sandy
(horizon)

loam, brown (10 YR 5/3) when moist; massive; hard, friable, slightly

sticky and slightly plastic; few very fine roots, moderately

calcareous; strongly alkaline (pH 8.8).

CENTER

33

2-11-2

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25 1/4 CORNER SEC 22
T. 13 S. R. 9 E



United States
Department of
Agriculture

Soil
Conservation
Service

350 North 400 East
Price, Utah 84501

Mike Glasson
Andalex Inc.
P. O. Box 902
Price, Utah 84501

RECEIVED
DEC - 2 1987
ANDALEX INC.

Please find attached the soil mapping unit descriptions and a map of the area near Wildcat Loadout. The loadout is unit 29. The pertinent units are outlined in red on the map.

The units are:

29--Dumps, mine

33--Gerst-Badland-Rubbleland complex, 15-50% slopes

34--Gerst-Badland-Rubbleland complex, 50-70% slopes

52--Hernandez family, 3-8% slopes

119--Travessilla sandy loam, 1-8% slopes.

Please feel free to contact me if you have any questions or need any additional information.

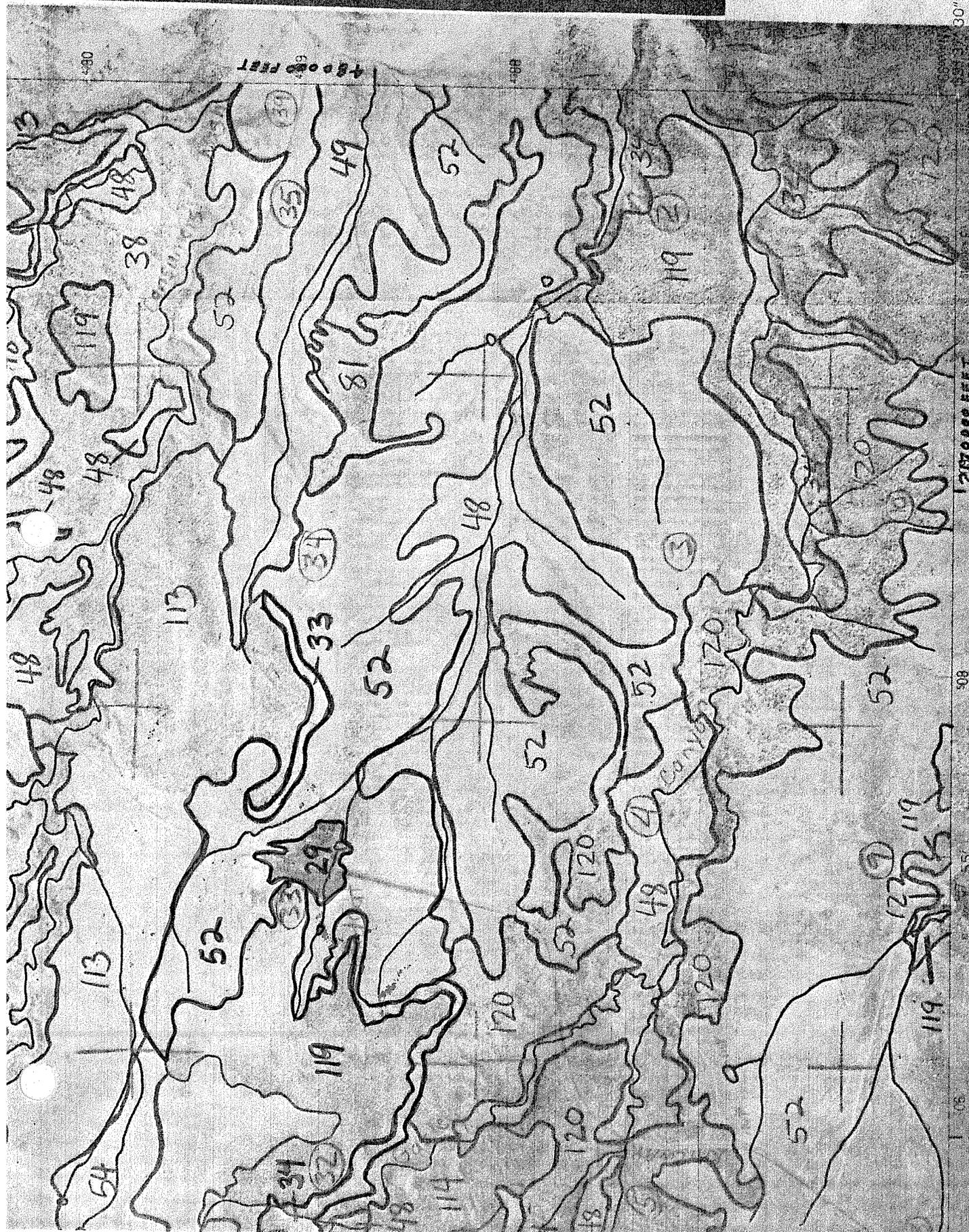
Carol D. Franks

Carol D. Franks
Soil Scientist
Price, Utah
637-0041



The Soil Conservation Service
is an agency of the
United States Department of Agriculture





1.25

CARBON AREA, UTAH
SHEET NO. 8
SCALE 1:24,000

29--Dumps, mine

These are piles of waste rock and coal from coal mines. This material consists mostly of coal, hard shale, and sandstone fragments. The fragments are about .5 to 7 inches in size and angular in shape.

Most of this material is not vegetated at the present time. Some areas have a 6 or 8 inch surface layer of mixed soil and fragments. These areas have sparse vegetation of snowberry, Salina wildrye, rabbitbrush, and some annuals.

This map unit is in capability subclass VIIIs, nonirrigated and is not placed in a range site.

33--Gerst-Badland-Rubbleland complex, 15 to 50 percent slopes

This map unit is on mesa and fan terrace sideslopes located near Mohrland, northeast of Wellington, and northwest of East Carbon City. Elevation is 6,000 to 8,000 feet. The average annual precipitation is 12 to 14 inches, the mean annual air temperature is 45 to 47 degrees F. and the average freeze-free period is 100 to 120 days.

This unit is 40 percent Gerst extremely stony loam, 15 to 50 percent slopes, 25 percent Badland; 20 percent Rubble land; and 15 percent other soils and miscellaneous areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 12 percent Strych very stony loam and small areas of Rock outcrop.

The Gerst soil is shallow and well drained. It formed in residuum and colluvium derived dominantly from sandstone and shale. Slopes are 100 to 200 feet in length, and concave-convex.

Typically the surface layer is light brownish gray extremely stony loam about 7 inches thick. The underlying material is gray and light brownish gray channery silt loam over weathered shale at a depth of 19 inches. Depth to

weathered shale ranges from 10 to 20 inches.

Permeability of the Gerst soil is moderately slow. Available water capacity is about 2 to 3 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is 1 to 3. Runoff is rapid and the hazard of water erosion is high.

Badland is steep or very steep, nearly barren areas of shale that are dissected by many intermittent drainage channels; some areas are interbedded with sandstone. Runoff is rapid to very high and geologic erosion is active.

Rubble land consists of areas covered by stones and boulders to the point that practically no soil is exposed. Rubble land supports only sparse vegetation except for lichens.

This unit is used for wildlife habitat and rangeland.

The potential vegetation on the Gerst soil is an overstory of pinyon and Utah juniper with a canopy of 15 percent. The understory vegetation is 40 percent grasses, 20 percent forbs, and 40 percent shrubs. Important plants are Salina wildrye, Indian ricegrass, birchleaf mountainmahogany, and Utah serviceberry.

The site index for Utah juniper and pinyon is 15 to 25. The average productivity is low. Average yields are 1 to 2 cords of wood per acre. The potential is very poor for post or Christmas tree production. Suitability of harvesting wood products on slopes 15 to 30 percent is fair.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing system and proper location of water developments. For critical erosion control, small areas may be mechanically treated and seeded. It is very hazardous or impractical to attempt range re-vegetation practices on large areas because of shallow soils and moderate water erosion. Plants that may be suitable for critical area seedings are plants native to the unit.

The Gerst soil is in capability subclass VIIs and is in the Upland Shallow Clay Loam (Utah Juniper-Pinyon) woodland site. The Badland and Rubble land are not placed in a range site.

34--Gerst-Badland-Rubbleland complex, 50 to 70 percent slopes

This map unit is on bench and mountain sideslopes. It is located north of Wattis and southeast of Mohrland. Slopes are 100 to 300 feet in length and concave-convex. The present vegetation is mainly Salina wildrye, Indian ricegrass, daisy, skeleton locoweed, shadscale, black sagebrush, and birchleaf mountainmahogany. Elevation is 6,200 to 7,200 feet. The average annual precipitation is about 12 to 14 inches, the mean annual air temperature is 45 to 47 degrees F, and the average freeze-free period is 100 to 120 days.

This unit is 45 percent Gerst extremely stony loam, 50 to 70 percent slopes, eroded; 25 percent Badland; 20 percent Rubble land; and 10 percent other soils. There is no definite pattern of soil occurrence on the landscape.

Included in this unit is 5 percent Strych very stony loam, and 5 percent Rock outcrop.

The Gerst soil is shallow and well drained. It formed in colluvium or residuum, derived dominantly from sandstone and shale.

Typically, the surface layer is light brownish gray extremely stony

loam about 7 inches thick. The underlying material is gray and light brownish gray channery silt loam over weathered shale at a depth of 19 inches. Depth to weathered shale ranges from 10 to 20 inches.

Permeability of the Gerst soil is moderately slow. Available water capacity is about 2 to 3 ~~8~~ inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is 1 to 3 percent. Runoff is rapid and the hazard of water erosion is high.

Badland consists of steep and very steep nearly barren beds of actively eroding shale, shale interbedded with gypsum, and occasionally small areas of shale capped by sandstone.

Rubble land consists of areas covered by stones and boulders to the point that practically no soil is exposed. Rubble land supports very little vegetation.

This unit is used for wildlife habitat.

The potential vegetation on the Gerst soil is an overstory of pinyon and Utah juniper with a canopy of 15 percent. The understory vegetation is 40 percent grasses, 20 percent forbs, and 40 percent shrubs. Important plants are Salina wildrye, Indian ricegrass, birchleaf mountainmahogany, and Utah serviceberry.

The site index for Utah juniper and pinyon is 15 to 25. The average productivity is low. Average yields are 1 to 2 cords of wood per acre. The potential is very poor for post or Christmas tree production. Suitability of harvesting wood products is poor because of hazard of soil erosion.

The suitability for grazing use is poor. For critical erosion control, small areas may be mechanically treated and seeded. It is very hazardous or impractical to attempt range re-vegetation practices on large areas because of shallow soils and possible severe water erosion. Plants that may be suitable for critical area seedings are plants native to the unit.

This unit is in capability subclass VIIe, nonirrigated. The Gerst soil is in the Upland Very Steep Shallow Clay Loam (Utah Juniper-Pinyon) woodland site. The Badland and Rubble land are not placed in a range site.

52--Hernandez family, 3 to 8 percent slopes

This very deep, well drained soil is on fan terraces. It is located in Clark Valley, near Sunnyside and Helper. It formed in alluvium derived dominantly from sandstone and shale. Slopes are 300 to 400 feet in length and dominantly single but includes concave-convex. The present vegetation in most areas is mainly Wyoming big sagebrush, yellowbrush, galleta, Indian ricegrass and blue grama. Elevation is 5,600 to 6,500 feet. The average annual precipitation is 10 to 12 inches, the mean annual air temperature is 47 to 49 degrees F. and the average freeze-free period is 110 to 135 days.

Typically the surface layer is brown loam 3 inches thick. The subsoil is brown loam 11 inches thick. The substratum to a depth of 60 inches or more is light brown or pink loam.

Included in this unit is about 10 percent Strych very stony loam, dry, on erratically located stony bars; 5 percent of a soil similar to Hernandez except moderately deep, on sideslopes; and 5 percent Haverdad loam, along the drainages.

Permeability of this Hernandez family soil is moderate. Available water capacity is about ~~8.5~~⁹ to ~~10~~^{10.5} inches. Water supplying capacity is 5.5

to 6.5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 3 percent. Runoff is slow and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for rangeland and wildlife habitat. A few areas are used for irrigated crops.

The potential plant community on the Hernandez family soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are Indian ricegrass, galleta, Wyoming big sagebrush, and winterfat. When a large percentage of the potential plant community has been removed, Utah juniper and pinyon may invade.

When the desirable forage plants are mostly depleted, brush management and rangeland seeding may be used to improve the rangeland vegetation.

Suitable brush management practices include prescribed burning, chemical spraying and mechanical treatment. Suitability for rangeland seeding is fair. The main limitation for rangeland seeding is low annual precipitation. Plants suitable for rangeland seeding include adapted native plants, Russian wildrye, crested wheatgrass, and prostrate kochia.

200

Under irrigation the management practices used to maintain or improve these areas include conservation cropping systems with alfalfa-grass, hay or pasture and small grain. Crop residues should be kept on the surface of the soil. Pasture management that incorporates use of rotation grazing system is best.

Sprinkler irrigation systems gives the best erosion control and the ability to apply irrigation water evenly to the fields. Flood irrigation can also be used with system modifications to control erosion.

This map unit is in capability unit IIIe-2, irrigated and capability subclass VIe, nonirrigated. The Hernandez family soil is in the Semidesert Loam (Wyoming Big Sagebrush) range site.

119-Travessilla sandy loam, 1 to 8 percent slopes

This shallow well drained soil is on benches and mesas located between Helper and Haiwatha. It formed in residuum derived dominantly from sandstone. Slopes are 300 to 400 feet in length and concave-convex. The present vegetation in most areas is mainly pinyon, juniper, Salina wildrye, Indian ricegrass and birchleaf mountainmahogany. Elevation is 6,000 to 8,700 feet. The average annual precipitation is 12 to 14 inches, the mean annual air temperature is 45 to 47 degrees F. and the average freeze-free period is 80 to 120 days.

Typically the surface layer is brown sandy loam about 3 inches thick. The upper 6 inches of the underlying material is brown loam. The lower part to a depth of 17 inches is light brown loam. Depth to sandstone ranges from 7 to 20 inches.

Included in this unit is about 5 percent Rock outcrop on ridges and 5 percent Chupedera fine sandy loam in concave areas.

Permeability of this Travessilla soil is moderately ~~rapid~~. Available water capacity is about ²1 to ³2.5 inches. Water supplying capacity is 3 to 4 inches. Effective rooting depth is 7 to 20 inches. The organic matter content of the surface layer is 1 to 2 percent. Runoff is slow and the

hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for rangeland and wildlife habitat.

The potential vegetation on the Travessilla soil is an overstory of pinyon and Utah juniper with a canopy of 60 percent. The understory vegetation is 15 percent grasses, 10 percent forbs, and 75 percent shrubs. Important plants are pinyon, Utah juniper, birchleaf mountainmahogany, and Mexican cliffrose, and *salvia wildrye*

The site index for pinyon and Utah juniper is 32. The average productivity is low. Average yields are 4 cords of wood per acre. The potential is poor for post or Christmas tree production.

Suitability of harvesting wood products on slopes 30 to 40 percent is poor because of steep slopes that will cause the equipment to move the soil downhill increasing the possibility of soil erosion.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing system and proper location of water developments. When pinyon and Utah juniper are thinned, desirable plant species present can be expected to increase for a short period of time. Then pinyon and Utah juniper can be expected to re-occupy the unit.

Suitability for rangeland seeding is very poor because of shallow soils. It is very hazardous or impractical to attempt range re-vegetation practices on large areas because of shallow soils. For critical erosion control, small areas may be mechanically treated and seeded.

This map unit is in capability subclass VIIIs, nonirrigated and in the Upland Shallow Loam (Pinyon-Utah Juniper) woodland site.

Topsoil Pile Summary, Existing

Topsoil Pile A	11,877 ft. ³
Topsoil Pile B	97,622 ft. ³
Topsoil Pile C	158,694 ft. ³
Topsoil Pile D	29,454 ft. ³
Topsoil Pile E	<u>122,176 ft.³</u>
Total	419,823 ft. ³



UTAH STATE UNIVERSITY · LOGAN, UTAH 84322

SOIL, PLANT and WATER
ANALYSIS LABORATORY
UMC 48

June 3, 1988

Andalex Resources, Inc.
Michael W. Glasson
P.O. Box 902
Price, UT 84501

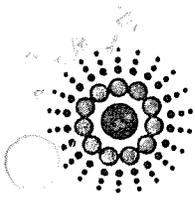
Soil samples received May 5, 1988.

USU No.	ID	Hydrometer			pH	mmhos /cm ECe	% SP	% O.C.	SAR	% T.N.	ppm P	% CaCO ₃	mg/l B
		Sand	Silt	Clay									
88-1229	A	40	45	15	7.6	1.2	35.5	1.57	.3	.12	19	8.7	0.30
88-1230	B	31	40	29	7.7	.8	39.9	1.02	.5	.10	7.9	10.6	0.51
88-1231	C	19	51	30	8.1	.7	36.4	1.04	.4	.10	12	5.1	0.37
88-1232	C	18	54	28	8.1	.6	37.1	1.34	.4	.10	12	8.3	0.27
88-1233	D	40	38	22	8.2	.6	34.6	1.21	.3	.09	13	4.0	0.26
88-1234	E	25	47	28	8.1	.6	39.7	.93	.2	.09	5.1	9.4	0.34
88-1235	E	32	46	22	8.1	.6	35.7	.76	.2	.07	4.1	11.7	0.40

Texture: L = Loam
CL = Clay Loam
SiCL = Silty Clay Loam

wie

Please give me a call if you have any questions.
K. Forster



ANDALEX
RESOURCES, INC.
Tower Division

P.O. BOX 902
PRICE, UTAH 84501
PHONE (801) 637-5385
TELEX 381 530 ANDALEX PRIC

May 6, 1988

Utah State University
Logan, Utah 84322-4630

Attn.: Mr. Karl Topper, Soils Plant and Water Laboratory

Dear Mr. Topper:

Enclosed please find samples taken from Andalex Resources' Topsoil Storage Piles located at the Wildcat Loadout Facility. The Division of Oil, Gas, and Mining is requiring these samples be tested for reclamation suitability. The tests which they require include:

pH
Ec
Saturation Percent
Texture
Organic C
SAR
Total N
Available P
Percent CaCO₃
Selenium
Boron

RECEIVED

JUN - 8 1988

ANDALEX RESOURCES, INC.

The samples are labeled A through E with two samples from Piles C and E. Please advise me by telephone at 637-5385 if pre-payment for this analysis is required.

Thank you very much.

Sincerely,

Michael W. Glasson
Senior Geologist
Western Division

MWG/as

Enclosures

cc: File

Revegetation Testing and Monitoring

Regarding Andalex Resource's vegetation test plots, the following measures will be taken in an effort to establish the viability of using this soil material as substitute to make up for the deficit which exists at the loadout. These methods will also be used in an attempt to establish good vegetative cover on the existing topsoil piles, with some options.

The test plots will be approximately 1600 square feet each. Their locations are shown on plate 1. This work will take place as late as possible in the fall of 1989, from early September to mid - October.

First of all the material will be ripped to a depth of 6 inches after which it will be mulched with alfalfa hay to the same depth. It is expected this will be accomplished with a tractor type tiller or disc. The hay which Andalex will use has been sampled by Mr. Carl Bott of the Utah State University extension office in Price. He observed it to be weed free. However, should weeds be observed within 30 days of mulching they will be treated with a contact herbicide with low residual and not a sterilant.

Areas will be left pitted to facilitate water entrapment. Areas will be fertilized this fall at the following per acre rate:

40 lbs	K ₂ O
60 lbs	P ₂ O ₅
60 lbs	N (as Ureah; 1/2 this fall, 1/2 next spring)

A rangeland drill will be used to plant the seed mixture to a depth of 1/2 inch.

Andalex will observe rodent behavior inside the test areas and if they become a problem, measures will be taken to keep them out.

The monitoring program will be set up as outlined in the Division's guidelines. Four separate measurements will be taken on 20 separate and random 1/4 meter areas on each of the 4 test plots. The four measurements will be:

1. Ground cover by species. Appendix A in the guidelines different options for measuring such as ocular estimates.
2. Total cover.

3. Shrub Density. Each plot will have 4 each 20' x 2' transects picked randomly.

4. Production (Years 9 and 10 only).

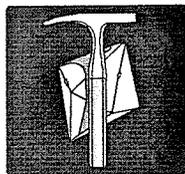
The monitoring will begin the first year after planting. The first year will be strictly a qualitative in nature and percentages of cover and etcetera will be approximated. This information will be strictly for our own use. After the first year, quantitative monitoring will take over as described above. Quantitative monitoring for both the test plots and years 2, 3, 5, 9, and 10 in accordance with the Division's guidelines.

The success standards will be based on 90% of the reference area and 90% statistical adequacy with respect to cover, woody plant density and production (the reference area will be sampled concurrently).

Essentially the same methods and techniques will be used on the existing topsoil piles however different options may be applied such as broadcast seeding versus drilling, mulching versus not mulching, pitting versus smooth surfaces or weed controlling versus no weed controlling. Various combinations will be tried.

Supplement
to
Appendix D

**SOIL SURVEY FOR THE
TWELVE-ACRE EXPANSION AREA
AT THE
WILDCAT LOADOUT**



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INTRODUCTION

Andalex Resources needs to expand their coal storage area at the Wildcat Loadout facility located just south of Consumers Road about four miles west of Helper in Carbon County. The site is located in a portion of Section 33, T.14S., R.9E. as shown on the Standardville 7.5 minute USGS topographic quadrangle. A detailed Order 1-2 soil survey was conducted in March 2003 on approximately 12 acres of land immediately adjacent to the east of the current coal storage piles. A one acre site within the current Wildcat permit area but not part of the original to-be-affected disturbance area was previously mapped, sampled, and reported in April, 2003. The current report includes the one acre but expands to include a total of approximately 12 acres all located immediately adjacent to the east of the current coal piles.

Andalex wants to utilize the one acre site for coal storage immediately and the additional eleven acres at a later time. The identification and proper management of topsoil resources on the study area is essential for the success of future reclamation and the achievement of the post-disturbance land use. The information presented in this report is designed to aid in formulating a practical and successful reclamation plan.

METHODS

Standard soil survey methods were used throughout the project. Andalex provided a site photo-map to Patrick Collins. Dr. Collins conducted field work at the site on March 5 and designated three locations as representative of the soil on the one acre study area. A backhoe pit was dug at each of the three sites. Dr. Collins examined the three soil profiles and sampled two of them, WC1 and WC2. Samples were subsequently delivered to Brigham Young University's soil testing laboratory for standard analysis as described in the "Guidelines for Management of Topsoil and Overburden" (State of Utah, 2002). Dr. Collins also investigated the extent of coal fines deposition on the one acre site by means of numerous spade holes dug on a grid transect basis.

The site was then visited on March 11 by Patrick Collins and Jim Nyenhuis, a Certified Professional Soil Scientist. Dr. Collins described his sampling rationale and Mr. Nyenhuis concurred that it was appropriate for the Hernandez soil. The next day, March 12, seven additional backhoe pits were sited and dug on the larger twelve acre study area. Ms. Priscilla Burton (UDOGM soil scientist and reclamation specialist) was present for the day and observed all ten backhoe pits and assisted in the description and sampling of several soil profiles. She observed all three pits on the primary one acre study area. Mr. Nyenhuis concluded the soils description and sampling of the larger area on the following day, March 13, 2003.

The twenty-three soil samples collected from the additional seven soil backhoe pits were delivered to Colorado State University's Soil Testing Laboratory for analysis. The following parameters

were analyzed: pH; electrical conductivity (EC); saturation percent; percent calcium carbonate equivalent; organic matter percent; texture (sand, silt, clay, and very fine sand as a part of total sand); meq/L of Ca, Mg, Na, and K; SAR; and AB-DTPA extractable nitrate nitrogen (NO₃-N), P, K, Zn, Fe, Mn, and Cu.

RESULTS

Ten backhoe pits were dug in representative locations across the 12 acre study area (see "Soil Survey Map" included with this report). Soils were described at each of the pits, and eight of the ten pits were sampled for laboratory analysis. Sample sites WC1 and WC2 were sampled as part of the one acre study, and samples sites WC4, WC6, WC7, WC8, WC9, and WC10 were sampled as part of the larger 12 acre study. The soil laboratory data is attached to this report. Three soil map units were delineated across the 12 acre study area: (A) Hernandez loam, 1 to 6 percent slopes, (B) Haverdad loam, 2 to 8% slopes, and (C) Strych Variant, shallow to moderately deep, 2 to 6% slopes.

Average elevation of the study area is about 6,100 to 6,155 feet MSL. Average annual precipitation is about 10 to 12 inches (ustic-aridic soil moisture regime). Average annual air temperature is about 47 to 49 degrees F. (mesic soil temperature regime). The average freeze-free period is 110 to 135 days per year (Jansen and Borchert, 1988).

Map Unit A: Hernandez loam, 1 to 6% slopes

Hernandez loam was described and sampled at five representative locations (WC1, WC2, WC6, WC7, and WC10). Hernandez was also described but not sampled at WC3. Although there are some differences among the six sites, each soil classifies as the Hernandez series. The Hernandez family, Map Unit 52, was also mapped for the area by NRCS on Sheet 8 of its Soil Survey of Carbon Area, Utah (Jansen and Borchert, 1988).

Hernandez family is a very deep, well drained soil mapped on uplands in the general area. The soil is developing in local alluvium derived dominantly from sandstone and shale. Site vegetation includes Wyoming big sagebrush and mixed grasses. Based on NRCS data, Hernandez has moderate permeability, high available water capacity (9.0 to 10.5 inches), slow runoff, and water supplying capacity of 5.5 to 6.5 inches. Effective rooting depth is 60 inches or more, the organic matter content of the surface layer is generally 1 to 3 percent, and the hazard of wind and water erosion is moderate (Jansen and Borchert, 1988). The Range Site for Hernandez is Semidesert Loam (Wyoming Big Sagebrush).

Hernandez is classified as a "Fine-loamy, mixed, superactive, mesic Ustic Haplocalcid".

Hernandez is an established soil series of moderate extent. The most recent NRCS official soil series description, dated October 2002, is on file at Mt. Nebo Scientific. Hernandez sites WC1, WC2, and WC3 were previously described in the one acre study area report, and are also included in the current report.

Hernandez Pedon WC1 Site and Profile Description:

Map Unit A; 3% slope, east-southeast aspect; Wyoming big sagebrush and mixed grasses vegetation; local alluvium; fan uplands; no erosion; soil slightly moist to 8 inches; 3 inches of coal fines deposition from the adjacent Wildcat Loadout facility; sampled for laboratory characterization.

Coal Fines – 3 to 0 inches (3 inches thick)

A horizon – 0 to 3 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium granular structure; soft dry consistence, very friable moist consistence, slightly sticky and slightly plastic wet consistence; common coarse, medium and many fine and very fine roots to 13 inches; moderately effervescent, slightly alkaline (pH 7.7); gradual smooth boundary.

Bw (cambic) horizon – 3 to 13 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard dry consistence, friable moist consistence, slightly sticky and slightly plastic wet consistence; strongly effervescent, slightly alkaline (pH 7.7); clear wavy boundary.

Bk (calcic) horizon – 13 to 23 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; massive structure; slightly hard dry consistence, friable moist consistence, slightly sticky and slightly plastic wet consistence; few coarse, medium, fine and very fine roots; violently effervescent, slightly alkaline (pH 7.8); gradual wavy boundary.

Ck horizon – 23 to 60 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; massive structure; very hard dry consistence, firm moist consistence, sticky and slightly plastic wet consistence; strongly effervescent, moderately alkaline (pH 8.2); did not hit bedrock.

Hernandez Pedon WC2 Site and Profile Description:

Map Unit A; 4% slope; east-southeast aspect; Wyoming big sagebrush and mixed grasses vegetation; local alluvium; fan uplands; no erosion; soil slightly moist to 3 inches; 3 inches of coal fines deposition from adjacent Wildcat Loadout facility; sampled for laboratory characterization.

Coal Fines – 3 to 0 inches (3 inches thick)

A horizon – 0 to 3 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; strong, medium platy structure (mechanically compacted); hard dry consistence, friable moist consistence, slightly sticky and slightly plastic wet consistence; few to common coarse and medium and many fine and very fine roots to 10 inches; strongly effervescent, moderately alkaline (pH 7.8); gradual smooth boundary.

Bw (cambic) horizon – 3 to 10 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium platy structure (mechanically compacted); hard dry consistence, firm moist consistence, slightly sticky and slightly plastic wet consistence; strongly effervescent, moderately alkaline (pH 7.8); clear wavy boundary.

Bk (calcic) horizon – 10 to 32 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; massive structure; extremely hard dry consistence; very firm moist consistence; sticky and slightly plastic wet consistence; few medium, fine, and very fine roots; violently effervescent, moderately alkaline (pH 7.8); gradual wavy boundary.

Ck horizon – 32 to 60 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; massive structure; very hard dry consistence, firm moist consistence, sticky and slightly plastic wet consistence; violently effervescent, strongly alkaline (pH 8.5); did not hit bedrock.

Hernandez Pedon WC3 Site and Profile Description:

Map Unit A; 3% slope' east-southeast aspect; Wyoming big sagebrush and mixed grasses vegetation; local alluvium; fan uplands; soil slightly moist to 9 inches; no erosion; 3 inches of coal fines deposition from adjacent wildcat Loadout facility; not sampled for laboratory characterization.

Coal Fines – 3 to 0 inches (3 inches thick).

A horizon – 0 to 3 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium granular structure; soft dry consistence, very friable moist consistence, slightly sticky and slightly plastic wet consistence; common medium, fine, and very fine and few coarse roots to 9 inches; strongly effervescent; gradual smooth boundary.

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

Bk1 horizon – 9 to 18 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; massive structure parting to moderate medium subangular blocky; slightly hard dry consistence, friable moist consistence, slightly sticky and slightly plastic wet consistence; common fine and very fine and few coarse and medium roots; strongly effervescent; gradual wavy boundary.

Bk2 horizon – 18 to 32 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3)

moist; massive structure; very hard dry consistence, firm moist consistence, sticky and slightly plastic wet consistence; few medium, fine, and very fine roots; violently effervescent; gradual wavy boundary.

Ck horizon – 32 to 52 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; massive structure; very hard dry consistence, very firm moist consistence, sticky and slightly plastic wet consistence; violently effervescent; gradual wavy boundary.

C horizon – 52 to 64 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; massive structure; hard dry consistence, firm moist consistence, slightly sticky and slightly plastic wet consistence; did not hit bedrock.

Hernandez Pedon WC6 Site and Profile Description:

Map Unit A; 4% slope; east aspect; mixed grasses, dead Wyoming big sagebrush vegetation; local alluvium; fan uplands; no erosion; soil slightly moist to 18 inches at time of sampling, 3-12-03; 3 inches of coal fines deposition from adjacent wildcat loadout facility; sampled for laboratory characterization.

Coal fines – 3 to 0 inches (3 inches thick)

A horizon- 0 to 3.5 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; weak medium granular structure; soft dry consistence, very friable moist, slightly sticky and slightly plastic wet consistence; common medium, fine, very fine, and few coarse roots to 13 inches; moderately effervescent, moderately alkaline (pH 7.9); gradual smooth boundary.

Bw horizon – 3.5 to 13 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard dry consistence, friable moist consistence, sticky and slightly plastic wet consistence; moderately effervescent, slightly alkaline (pH 7.8); gradual wavy boundary.

Bk horizon – 13 to 25 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; massive structure; hard dry consistence, friable moist consistence; slightly sticky and slightly plastic wet consistence; common fine and very fine, and few coarse and medium roots 13 to 18 inches, few coarse, medium, fine, and very fine roots 18 to 25 inches; strongly effervescent, moderately alkaline (pH 8.0); gradual wavy boundary.

Ck horizon – 25 to 38 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; massive structure; very hard to extremely hard dry consistence; firm moist consistence, sticky and slightly plastic wet consistence; strongly effervescent, moderately alkaline (pH 8.4); gradual wavy boundary.

C horizon – 38 to 64 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish

brown (10YR 4/4) moist; massive structure; hard dry consistence, firm moist consistence, sticky and slightly plastic wet consistence; moderately effervescent, strongly alkaline (pH 8.5); did not hit bedrock.

Hernandez Pedon WC7 Site and Profile Description:

Map Unit A; 4% slope; east aspect; Wyoming big sagebrush and mixed grasses vegetation; local alluvium; fan uplands; no erosion; soil slightly moist to 10 inches at time of sampling, 3-13-03; 2 inches of coal fines deposition from adjacent Wildcat Loadout facility; sampled for laboratory characterization.

Coal Fines – 2 to 0 inches (2 inches thick)

A horizon – 0 to 3 inches; brown (10YR 5/3) loam with some areas with coal fines mixed in, brown (10YR 4/3) moist; weak medium granular structure; soft dry consistence, very friable moist consistence, sticky and slightly plastic wet consistence; many fine and very fine, and few coarse and medium roots to 10 inches; moderately effervescent, moderately alkaline (pH 7.9); gradual smooth boundary.

Bw horizon – 3 to 10 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard dry consistence, friable moist consistence, slightly sticky and slightly plastic wet consistence; moderate to strongly effervescent, slightly alkaline (pH 7.8); gradual wavy boundary.

Bk1 horizon – 10 to 22 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 5/3) moist; massive structure; hard-very hard dry consistence, firm moist consistence, sticky and slightly plastic wet consistence; common fine and very fine, and few medium and coarse roots 10 to 22 inches; strongly effervescent, moderately alkaline (pH 7.9); common krotovinas from 10 to 38 inches; gradual wavy boundary.

Bk2 horizon – 22 to 38 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 5/3) moist; massive structure; extremely hard dry consistence, very firm moist consistence, slightly sticky and nonplastic wet consistence; few fine and very fine roots 22 to 38 inches; violently effervescent, moderately alkaline (pH 8.3); gradual wavy boundary.

C horizon – 38 to 56 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; massive structure; hard dry consistence, friable moist consistence, slightly sticky and slightly plastic wet consistence; strongly effervescent, strongly alkaline (pH 8.6); did not hit bedrock.

Hernandez Pedon WC10 Site and Profile Description:

Map Unit A; 6% slope; east aspect; rabbitbrush and mixed grasses vegetation; local alluvium; fan uplands; no erosion; soil slightly moist to 12 inches at time of sampling, 3-13-03; 1.5 inches of coal fines deposition from the adjacent Wildcat Loadout facility; sampled for laboratory characterization; sample site is just outside of the 12 acre study area but in an area for a future sedimentation pond.

Coal Fines – 1.5 to 0 inches (1.5 inches thick)

A horizon - 0 to 3 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) loam, weak medium granular structure; soft dry consistence, very friable moist consistence, slightly sticky and slightly plastic wet consistence; common few and very few, and few coarse and medium roots to 12 inches; strongly effervescent, moderately alkaline (pH 8.0); gradual smooth boundary.

Bw horizon – 3 to 12 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard dry consistence; friable moist consistence, slightly sticky and slightly plastic wet consistence; strongly effervescent, moderately alkaline (pH 8.0); gradual wavy boundary.

Bky horizon – 12 to 30 inches; very pale brown (10YR 7/4) clay loam, light yellowish brown (10YR 6/4) moist; massive structure; very hard dry consistence, firm moist consistence, sticky and plastic wet consistence; few medium, fine, and very fine roots 12 to 24 inches; violently effervescent, moderately alkaline (pH 8.0); gradual wavy boundary.

C horizon – 30 to 62 inches; light yellowish brown (10YR 6/4) loam/sandy loam, pale brown (10YR 6/3) moist; massive structure; hard dry consistence, firm moist consistence, slightly sticky and slightly plastic wet consistence; strongly effervescent, moderately alkaline (pH 8.0); did not hit bedrock.

Hernandez Range of Characteristics:

The described and sampled pedons WC-1, WC-2, WC-3, WC-6, WC-7, and WC-10 are typical of Hernandez, and are within the range of characteristics for the Hernandez official soil series description (NRCS, October 2002).

Hernandez Soil Suitability and Salvage Depth Recommendation:

Initial One-Acre Study Area

Based on an evaluation of the field and laboratory data (see Appendix), the Hernandez soil is entirely suitable throughout its profile depth to 54 inches or more. Soil textures are good with loam dominating the upper profile, and loam to clay loam in the lower profile. Soil salinity is low with electrical conductivity (EC) values less than 1 in the upper profile and 2 to 3 in the lower profile. Sodium Adsorption Ratio (SAR) is low throughout the profile with values less than 1 for all samples except the 32 to 54 inch depth interval of WC-2 (SAR=6.5). Soil reaction (pH) is slightly to moderately alkaline with values in the high 7's and low 8's (range of pH 7.7 to 8.5). Calcium carbonate content ranges from 9.7 to 18.7 percent and averages 13.9 percent across all samples. Organic matter content is somewhat high in the upper profile (2.8 to 3.6 percent) and generally low in the lower profile (0.5 to 0.9 percent).

If needed, the entire profile to 54 inches or more could be salvaged for use in reclamation activities. The better soil material is in the approximate upper 24 inches. Soil texture is loam and organic matter content is somewhat high in this upper 2 feet. EC and SAR values are low. Soil texture is good and the soil material can be easily handled. If a more limited amount of soil material is needed, the upper 24 inches can be salvaged as Topsoil. Additional underlying material could be salvaged, as needed, for use as Subsoil.

Larger Eleven-Acre Study Area

Soil description and sample sites WC6, WC7, and WC10 were evaluated for suitability and salvage depth recommendation for the remaining 11 acre study area. WC10 is located in a proposed sedimentation pond area just outside the 11 acre study area but was included in the evaluation of Hernandez. The upper 25 inches of WC6 is good rated. The depth between 25 and 38 inches is good rated except both EC (5.5) and SAR (9.1) are fair rated. The lower zone between 38 and 64 inches has poor EC (10.1) and unacceptable SAR (16.7). The upper 38 inches of WC7 is good rated; between 38 and 56 inches is good rated except for fair rated SAR (6.8). The upper 12 inches of WC10 is good rated; between 12 and 30 inches has fair to poor EC (8.5) and fair SAR (8.4). Both EC (12) and SAR (10.4) are poor rated for the zone between 30 and 62 inches. For laboratory reports, refer to the Appendix of this document.

Given that WC10 is located outside the 11 acre study area, it is recommended that the upper 38 inches of Map Unit A be salvaged as Topsoil. The underlying material has good to poor rated EC and fair to unacceptable SAR. If additional material is needed and can be somewhat mixed during salvage, it is possible to salvage this lower material between 38 and about 62 inches as Subsoil.

Map Unit B: Haverdad loam, 2 to 8% slopes

Haverdad loam was described and sampled at two representative locations, WC4 and WC8.

Haverdad loam was previously mapped by NRCS as a soil inclusion along drainageways in Map

Unit 52 of the Soil Survey of Carbon Area, Utah (Jansen and Borchert, 1988). Haverdad loam is a very deep, well drained soil mapped in small upland drainageways in the general area. The soil is developing in local alluvium derived dominantly from sandstone and shale. Site vegetation includes mixed grasses, sagebrush, and occasional scattered greasewood.

Permeability of Haverdad is moderate. Available water capacity is about 10 inches. Effective rooting depth is 40 inches or more. Runoff is slow, and the hazard of wind and water erosion is moderate (Jansen and Borchert, 1988). The Range Site for Borchert is Semidesert Loam (Wyoming Big Sagebrush).

Haverdad is classified as a "Fine-loamy, mixed, superactive, calcareous, mesic Ustic Torrifuvent". Haverdad is an established soil series of moderate extent. The most recent NRCS official soil series description, dated June 2002, is on file at Mt. Nebo Scientific. Haverdad site and profile descriptions for WC4 and WC8 follow.

Haverdad Pedon WC4 Site and Profile Description:

Map Unit B; 3% slope; east aspect; mixed grasses and few scattered greasewood vegetation; fine-loamy local alluvium with <1% coarse fragments; small fan on side of small upland drainage; no erosion; soil slightly moist to 14 inches at time of sampling, 3-12-03; 3 inches of coal fines deposition from adjacent Wildcat Loadout facility; sampled for laboratory characterization.

Coal Fines – 3 to 0 inches (3 inches thick)

A horizon – 0 to 4 inches; yellowish brown (10YR 5/6) loam, dark yellowish brown (10YR 4/6) moist; moderate medium granular structure; slightly hard dry consistence,

friable moist consistence, slightly sticky and slightly plastic wet consistence; many medium, fine, and very fine, and few coarse roots to 14 inches; strongly effervescent, moderately alkaline (pH 8.3); gradual smooth boundary.

Bw horizon – 4 to 14 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; slightly hard dry consistence, friable moist consistence, slightly sticky and slightly plastic wet consistence; strongly effervescent, strongly alkaline (pH 8.5); gradual wavy boundary.

Bk horizon – 14 to 28 inches; light yellowish brown (10YR 6/4) loam, brown (10YR 4/3) moist; massive structure; hard dry consistence, friable moist consistence, slightly sticky and slightly plastic wet consistence; common fine and very fine and few medium roots; strongly effervescent, moderately alkaline (pH 8.3); gradual wavy boundary.

C horizon – 28 to 58 inches; yellowish brown (10YR 5/4) loam to sandy loam, brown (10YR 4/3) moist; massive structure; slightly hard dry consistence, friable moist consistence, slightly sticky and slightly plastic wet consistence; few fine and very fine roots 28 to 44 inches; strongly effervescent, moderately alkaline (pH 8.0); gradual wavy boundary.

2C “red” horizon – 58 to 70+ inches; brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 4/4) moist; massive structure; slightly hard dry consistence, friable moist consistence, slightly sticky and slightly plastic wet consistence; slightly effervescent; this horizon not sampled.

Haverdad Pedon WC8 Site and Profile Description:

Map Unit B; 2% slope; east aspect; big sagebrush and mixed grasses (mostly dead) vegetation; fine-loamy local alluvium with < 2% sandstone gravels; small upland drainage; no erosion; 3 inches of coal fines deposition from adjacent Wildcat Loadout facility; soil slightly moist to 26 inches at time of sampling, 3-13-03; sampled for laboratory characterization.

Coal Fines – 3 to 0 inches (3 inches thick)

A horizon – 0 to 4 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; weak medium platy structure; soft dry consistence, very friable moist consistence, slightly sticky and slightly plastic wet consistence; common coarse, medium, fine, and very fine roots to 12 inches; moderately effervescent, slightly alkaline (pH 7.7); gradual smooth boundary.

Bw horizon – 4 to 12 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard dry consistence, very friable moist consistence, slightly sticky and slightly plastic wet

consistence; moderately effervescent, slightly alkaline (pH 7.8); gradual wavy boundary.

Bk horizon – 12 to 26 inches; light yellowish brown (10YR 6/4) loam, brown (10YR 4/3) moist; massive structure; hard dry consistence, friable moist consistence, slightly sticky and slightly plastic wet consistence; common fine and very fine, and few coarse and medium roots; strongly effervescent, slightly alkaline (pH 7.8); gradual wavy boundary.

Ck horizon – 26 to 38 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; massive structure; hard dry consistence, firm moist consistence, slightly sticky and slightly plastic wet consistence; few coarse, medium, fine, and very fine roots; krotovinas present; moderately effervescent, moderately alkaline (pH 7.9); gradual wavy boundary.

C horizon – 38 to 64 inches; yellowish brown (10YR 5/4) loam-sandy loam, brown (10YR 4/3) moist; massive structure; hard dry consistence, friable moist consistence, slightly sticky and slightly plastic wet consistence; moderately effervescent, moderately alkaline (pH 7.9); did not hit bedrock.

Haverdad Range of Characteristics:

The described and sampled pedons WC4 and WC8 are typical of Haverdad and are within the range of characteristics for the Haverdad official soil series description (NRCS, June 2002).

Haverdad Soil Suitability and Salvage Depth Recommendations:

Based on an evaluation of the field and laboratory data (see Appendix), Haverdad loam is entirely suitable throughout its profile depth to 54 inches or more. Soil textures are good with loam dominating the upper profile to about 38 inches, and loam to sandy loam to gravelly loam present in the lower substratum. Soil salinity is low with electrical conductivity (EC) values about 0.5 to 2 in the upper profile, and about 0.5 to 4 in the lower “C” horizon. Sodium Adsorption Ratio (SAR) is generally less than 1.0 but can range up to about 4.5 to 6.0 below 14 inches in some

pedons. Soil reaction (pH) is slightly to strongly alkaline with values between 7.7 and 8.5. Calcium carbonate content ranges from about 6 to 11 percent. Organic matter content ranges from about 1.2 to 1.9 percent in the surface layer, to about 0.9 to 1.5 percent at depth in the profile.

If needed, the entire profile to 54 inches or more could be salvaged for use in reclamation activities. The better soil material is in the approximate upper 28 inches. Soil texture is loam and organic matter is about 1 to almost 2 percent. EC and SAR are generally low. Soil texture is good and the soil material can be easily handled. If a more limited amount of soil material is needed, the upper 28 inches can be salvaged as Topsoil. Additional underlying material could be salvaged, as needed, for use as Subsoil.

Map Unit C: Strych Variant, shallow to moderately deep, 2 to 6% slopes

Strych Variant was described and sampled at two representative locations (WC5 and WC9). Strych (deep) was previously mapped in the area as a 10% soil inclusion in NRCS Map Unit 52 (Jansen and Borchert, 1988). Although the official Strych soil series is deep to very deep, the site-specific Strych Variant soil on the Wildcat study area is shallow to moderately deep (10 inches to slightly greater than 20 inches to sandstone bedrock). Strych Variant is developing in thin slopewash alluvium and residuum from calcareous sandstone. Vegetation is open, scattered Pinyon-Juniper woodland with a mixed grass understory.

Strych Variant is shallow to moderately deep and well drained. Strych Variant typically has a pale brown to yellowish brown gravelly to very gravelly loam surface layer about 3 inches thick. The “Bw” cambic upper subsoil layer is a pale brown to light yellowish brown gravelly to very gravelly loam to a depth of about 8 or 9 inches. The underlying “Bk” calcic horizon is a pale to very pale brown very to extremely gravelly loam to sandy loam to a depth of about 15 or 16 inches. The substratum is a mixture of “C” horizon and paralithic “Cr” extremely gravelly loam to bedrock encountered at about 20 to 23 inches in depth.

Strych Variant has moderately rapid permeability, low available water capacity, and an effective rooting depth equal to the depth to bedrock. The organic matter content of the surface layer is about 1 to 3 percent. Runoff is medium, and the water erosion hazard is moderate. The Range Site is Semidesert Bouldery Loam (Jansen and Borchert, 1988). Strych Variant is classified as a “Loamy-skeletal, mixed, superactive, mesic, shallow Ustic Haplocalcid”. The most recent NRCS official soil series description for Strych, dated October 2002, is on file at Mt. Nebo Scientific.

Strych Variant Pedon WC5 Site and Profile Description:

Map Unit C; 8% slope; south aspect; Pinyon-Juniper and scattered mixed grasses vegetation; thin residuum from sandstone; upland low ridge; slight erosion; 2 inches of coal fines deposition from adjacent Wildcat Loadout facility; soil slightly moist at time of sampling, 3-12-03; not sampled for laboratory analysis.

Coal Fines – 2 to 0 inches (2 inches thick, varies up to 6 inches thick)

A horizon – 0 to 3 inches; pale brown (10YR 6/3) gravelly loam with about 20% sandstone gravels, brown (10YR 5/3) moist; moderate medium granular structure; soft dry consistence, very friable moist consistence, slightly sticky and slightly plastic wet

consistence; many fine and very fine, common medium and coarse roots to 8 inches; strongly effervescent; gradual smooth boundary.

Bw horizon – 3 to 8 inches; pale brown (10YR 6/3) gravelly loam with about 25% sandstone gravels, brown (10YR 4/3) moist; moderate fine subangular blocky structure; slightly hard dry consistence; friable moist consistence, slightly sticky and slightly plastic wet consistence; strongly effervescent; gradual wavy boundary.

Bk horizon – 8 to 15 inches; very pale brown (10YR 7/30) very gravelly silt loam to light silty clay loam with about 45% sandstone gravels; massive structure; very hard dry consistence, firm moist consistence, sticky and slightly plastic wet consistence; few coarse, medium, fine, and very fine roots; violently effervescent; gradual wavy boundary.

C/Cr mixed horizon (weathered, fractured sandstone with calcium carbonate and soil fines in cracks and beneath rock fragments) – 15 to 20 inches; pale brown (10YR 6/3) extremely gravelly loam with about 65% sandstone gravels, brown (10YR 5/3) moist; massive structure; very hard dry consistence, firm moist consistence, slightly sticky and slightly plastic wet consistence; few roots in cracks and beneath rock fragments; violently effervescent.

Strych Variant Pedon WC9 Site and Profile Description:

Map Unit C; 8% slope; south aspect; Pinyon-Juniper and mixed grasses vegetation; thin eolian over thin residuum from sandstone; low weathered ridge; slight erosion; 1 inch of coal fines deposition from adjacent Wildcat Loadout facility; soil slightly moist to 9 inches at time of sampling, 3-12-03; sampled for laboratory analysis.

Coal Fines – 1 to 0 inches (1 inch thick)

A horizon – 0 to 3 inches; yellowish brown (10YR 5/4) very gravelly loam with about 25% gravel size sandstone chips, dark yellowish brown (10YR 4/4) moist; weak medium granular structure; slightly hard dry consistence, friable moist consistence; slightly sticky and slightly plastic wet consistence; many medium, fine, and very fine roots to 9 inches; strongly effervescent, slightly alkaline (pH 7/6); clear smooth boundary.

Bw horizon – 3 to 9 inches; light yellowish brown (10YR 6/4) very gravelly loam with about 55% gravel size sandstone chips, brown (10YR 5/3) moist; moderate medium subangular blocky structure; slightly hard-hard dry consistence, friable moist consistence, slightly sticky and slightly plastic wet consistence; strongly effervescent, slightly alkaline (pH 7.5); gradual wavy boundary.

Bk horizon – 9 to 16 inches; pale brown (10YR 6/3) extremely gravelly loam-sandy loam with about 75% gravel size sandstone chips, brown (10YR 5/3) moist; massive structure; hard-very hard dry consistence, friable moist consistence, slightly sticky and slightly plastic

wet consistence; common to few medium, fine and very fine roots; violently effervescent, slightly alkaline (pH 7.8); gradual wavy boundary.

C/Cr mixed horizon (weathered, fractured sandstone with calcium carbonate and soil fines in cracks and beneath rock fragments) – 16 to 23 inches; pale brown (10YR 6/3) extremely gravelly sandy loam with over 75% gravel and cobble size sandstone chips, brown (10YR 5/3) moist; massive structure; very hard dry consistence, firm moist consistence, slightly sticky and slightly plastic wet consistence; few roots in cracks and beneath rock fragments; violently effervescent; horizon not sampled for laboratory analysis.

Strych Variant Range of Characteristics:

Depth to the weathered sandstone contact ranges from about 15 to 16 inches. Coarse fragment content ranges from 20 to 25% for the surface layer, from 25 to 55% for the upper subsoil layer (Bw), from 45 to 75% for the lower subsoil layer (Bk), and over 65% for the weathered substratum. Reaction (pH) is typically slightly alkaline (pH from 7.5 to 7.8). Soil fines are typically loam to sandy loam.

Strych Variant Soil Suitability and Salvage Depth Recommendation:

Strych Variant is entirely suitable for salvage. EC and SAR are very low, organic matter content ranges from 2.6% in the surface layer, to 2.3% in the upper subsoil, to 0.9% in the lower subsoil. Calcium carbonate content is fair rated with values ranging from 21 to 27 percent. Soil texture (fines) are loam to sandy loam. Coarse fragment content can be moderate to very high. The upper 12 inches can be salvaged as Topsoil, with the underlying material left in place to aid reclamation after mining activities are completed. For laboratory reports, refer to the Appendix

of this document.

Map Unit DL: Disturbed Land

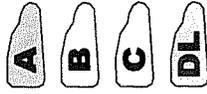
One sedimentation pond is present in the study area, and it is mapped as Disturbed Land. It is immediately adjacent to the current Wildcat Loadout facility. Soil salvage was not evaluated and is not recommended due to the amount of coal fines deposition in the pond. In addition, there is another Disturbed Land delineation in the study area – a recent oil and gas drilling pad. This bladed and highly compacted pad area is in the south-central to south-east portion of the study area, and has no soil available for salvage. It appears that topsoil was not salvaged during the construction of the pad because no soil stockpile was evident near the pad during the current soil survey.

REFERENCES

Jansen, Earl H. and James W. Borchert. 1988. Soil Survey of Carbon Area, Utah. USDA-Soil Conservation Service (now NRCS).

State of Utah, Division of Oil, Gas & Mining. 2002. Guidelines for Management of Topsoil and Overburden (*Draft*). Revised by Priscilla Burton and Robert Davidson. Department of Natural Resources, Salt Lake City, UT.

LEGEND



MAP UNIT A
HERNANDEZ LOAM, 1 TO 6% SLOPES

MAP UNIT B
HAVERDAK LOAM, 2 TO 8% SLOPES

MAP UNIT C
MOUNTAIN SHALLOW TO
MODERATELY DEEP, 2 TO 6% SLOPES

MAP UNIT D
DISTURBED LAND

○ SOIL SAMPLE LOCATIONS



SCALE: 1" = 80'

SOIL SURVEY MAP

12 ACRE STUDY AREA

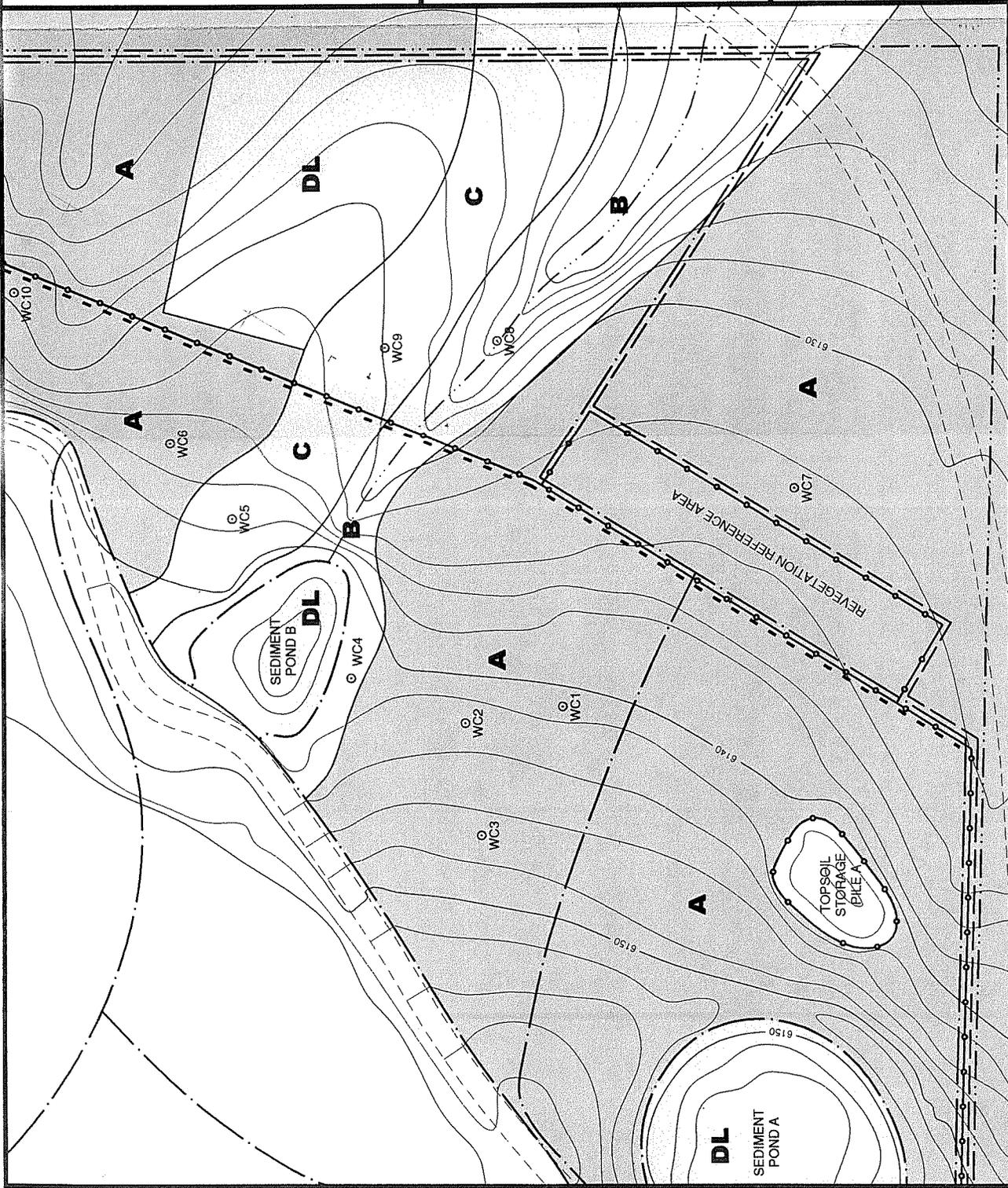


ANDALEX RESOURCES, INC.
WILDCAT LOADOUT



MT. NEBO SCIENTIFIC, INC.
RESEARCH & CONSULTING

FIELD MAPPED J. NYENHEIS CHECKED P. COLLINS
DRAWN G. BARTON DATE JULY 08, 2003
FILE MAP/MT-NEBO/ANDEX-WILDCAT/12 ACRE SOIL V01.DWG



APPENDIX
(Laboratory Data)

Soil and Plant Analysis Lab
255 WIDB
Brigham Young University
Provo, Utah 84602
801-378-2147

Name: Rick Collins/Mt. Nebo
Address: P.O. Box 337
City, ST, ZIP: Springville, UT 84663
Date: 3/14/03

SOIL ID: Wildcat

Customer Sample ID	ppm P	ppm NO3-N	%OM	pH	EC dSM	%Sand	%Clay
Wildcat 1 East 0-13"	4.52	4.39	2.79	7.68	0.65	43.84	24.72
Wildcat 1 East 13-23"	0.03	5.32	0.56	7.83	0.58	47.84	16.72
Wildcat 1 East 23-54"	1.51	2.07	0.67	8.18	2.00	26.56	29.72
Wildcat 2 North 0-12"	3.77	4.13	3.64	7.81	0.62	38.56	24.72
Wildcat 2 North 12-32"	0.79	2.67	0.90	7.83	0.60	32.20	25.72
Wildcat 2 North 32-54"	4.99	1.23	0.48	8.46	3.00	32.56	23.72

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Name: Rick Collins/Mt. Nebo
Address: P.O. Box 337
City, ST, ZIP: Springville, UT 84666
Date: 3/14/03

SOIL ID: Wildcat

Customer Sample ID	%Silt	ppm Ca-SAR	ppm Mg-SAR	ppm K-SAR	ppm Na-SAR	SAR
Wildcat 1 East 0-13"	31.44	129.20	29.44	40.65	13.51	0.28
Wildcat 1 East 13-23"	35.44	97.56	36.75	6.90	17.34	0.38
Wildcat 1 East 23-54"	43.72	49.15	142.00	6.10	60.82	0.99
Wildcat 2 North 0-12"	36.72	115.10	21.62	10.87	16.31	0.36
Wildcat 2 North 12-32"	42.08	92.96	30.80	9.29	21.07	0.48
Wildcat 2 North 32-54"	43.72	32.78	220.40	22.23	469.70	6.46

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Name: Rick Collins/Mt. Nebo
Address: P.O. Box 337
City, ST, ZIP: Springville, UT 84666
Date: 3/14/03

SOIL ID: Wildcat

Customer Sample ID	%Moisture Sat.	%CaCO ₃	ppm HCO ₃
Wildcat 1 East 0-13"	35.17	9.66	270.25
Wildcat 1 East 13-23"	33.50	18.68	181.90
Wildcat 1 East 23-54"	39.56	15.55	161.11
Wildcat 2 North 0-12"	36.60	10.77	187.10
Wildcat 2 North 12-32"	37.29	13.75	174.11
Wildcat 2 North 32-54"	34.70	15.11	166.31

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DATE RECEIVED: 03-17-2003
 DATE REPORTED: 04-15-2003

BILLING: 5 B19592

RESEARCH SOIL ANALYSIS
 ANDALEX RESOURCES, WILDCAT LOADOUT, HELPER, UTAH

Lab #	Sample ID #	pH	EC mmhos/cm	% saturation	Lime Estimate	% OM	NO ₃ -N	P	K	AB-DTPA Extract				
										Zn	Fe	Mn	Cu	
R3518	WC4 0-4	8.3	0.9	37.2	High	1.2	1.4	5.2	176	<0.01	4.49	1.05	0.63	
R3519	WC4 4-14	8.5	0.7	36.7	High	1.0	1.5	4.5	147	<0.01	3.52	0.83	0.57	
R3520	WC4 14-28	8.3	1.7	33.4	High	1.0	1.2	2.6	141	<0.01	4.11	0.72	0.87	
R3521	WC4 28-58	8.0	4.2	36.2	High	0.9	0.9	3.4	117	<0.01	2.52	0.56	0.71	
R3522	WC6 0-3/4	7.9	0.6	36.4	High	2.1	3.0	11.0	360	0.16	4.06	2.10	1.50	
R3523	WC6 3/4-13	7.8	0.5	41.3	High	1.6	3.2	0.5	192	<0.01	3.81	0.97	0.93	
R3524	WC6 13-25	8.0	0.5	37.7	High	1.2	2.3	0.5	84.9	<0.01	6.19	0.97	0.95	
R3525	WC6 25-38	8.4	5.5	39.8	High	1.2	1.4	1.4	97.9	<0.01	7.03	0.83	0.77	
R3526	WC6 38-64	8.5	10.1	45.6	High	1.7	1.6	4.5	174	0.07	6.12	0.77	1.14	
R3527	WC7 0-3	7.9	0.5	35.1	High	2.6	1.8	7.5	274	0.29	4.62	1.78	1.54	
R3528	WC7 3-10	7.8	0.5	36.5	High	2.1	2.2	0.5	273	0.05	4.27	0.95	1.29	
R3529	WC7 10-22	7.9	0.4	41.1	High	1.9	3.0	0.4	103	<0.01	4.72	1.03	1.14	
R3530	WC7 22-38	8.3	1.7	47.2	High	1.8	1.7	1.4	116	<0.01	4.77	1.10	0.91	
R3531	WC7 38-56	8.6	2.4	36.5	High	1.2	1.4	4.0	106	<0.01	4.42	0.77	0.64	
R3532	WC8 0-12	7.7	0.9	36.1	High	1.9	18.9	3.3	207	0.23	4.34	1.14	1.44	
R3533	WC8 12-26	7.8	0.6	37.1	High	1.7	7.5	0.5	159	<0.01	3.51	0.74	0.93	
R3534	WC8 26-54	7.9	0.4	33.5	High	1.5	2.6	0.6	81.5	<0.01	4.68	0.81	1.06	
R3535	WC9 0-3	7.6	0.6	42.5	High	2.6	6.1	2.5	171	0.18	6.91	1.80	1.38	
R3536	WC9 3-9	7.5	1.0	45.9	High	2.3	11.5	0.6	104	<0.01	5.51	1.28	1.04	
R3537	WC9 9-16	7.8	0.5	43.4	High	0.9	6.1	0.6	55.3	0.01	3.18	0.86	1.03	
R3538	WC10 0-12	8.0	1.7	38.1	High	1.5	1.2	1.7	91.5	<0.01	4.36	0.72	0.64	
R3539	WC10 12-30	8.0	8.5	42.5	High	1.9	0.9	4.4	115	0.04	5.14	0.81	0.63	
R3540	WC10 30-62	8.0	12.0	35.0	High	1.2	0.9	3.8	84.7	0.08	2.49	0.67	0.35	

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BILLING: \$ 319592

RESEARCH SOIL ANALYSIS
 ANDALEX RESOURCES, WILDCAT LOADOUT, HELPER, UTAH

Lab #	Sample ID #	% Sand			% Silt			% Clay			Texture	very fine sand from hydrometer	% CaCO ₃ equiv	meq/L			
		Sand	Silt	Clay	Sand	Silt	Clay	Ca	Mg	Na				K	SAR		
R3518	WC4 0-4	42	35	23	38	11.8	2.0	6.8	2.2	0.6	1.0						
R3519	WC4 4-14	42	38	20	42	12.8	0.9	5.9	1.4	0.6	0.7						
R3520	WC4 14-28	40	40	20	38	13.6	2.7	5.4	11.3	0.6	5.6						
R3521	WC4 28-58	48	36	16	46	11.3	15.4	17.9	18.8	<0.1	4.6						
R3522	WC6 0-3 1/2	36	36	28	31	10.5	3.5	1.5	1.7	0.9	1.1						
R3523	WC6 3 1/2-13	30	40	30	30	14.2	2.9	1.4	0.8	0.4	0.5						
R3524	WC6 13-25	38	39	23	38	11.6	1.8	2.3	1.3	0.2	0.9						
R3525	WC6 25-38	38	41	21	38	11.8	4.1	21.5	32.5	0.1	9.1						
R3526	WC6 38-64	28	40	32	24	11.8	4.8	29.8	69.3	0.2	16.7						
R3527	WC7 0-3	40	34	26	38	6.40	3.8	1.2	0.7	0.3	0.5						
R3528	WC7 3-10	38	46	16	38	7.10	2.9	1.1	0.7	0.4	0.5						
R3529	WC7 10-22	30	42	28	29	14.2	1.6	1.7	0.8	0.1	0.6						
R3530	WC7 22-38	21	48	31	18	16.6	1.8	9.4	6.8	0.2	2.9						
R3531	WC7 38-56	40	41	19	40	12.3	1.0	8.6	14.9	0.5	6.8						
R3532	WC8 0-12	36	45	19	36	6.17	6.3	1.6	0.5	0.2	0.3						
R3533	WC8 12-26	39	39	22	39	9.43	3.4	1.1	0.7	0.3	0.4						
R3534	WC8 26-54	42	39	19	42	8.15	1.7	1.2	0.7	0.1	0.6						
R3535	WC9 0-3	48	29	23	37	27.1	3.6	1.1	0.5	0.3	0.3						
R3536	WC9 3-9	49	30	21	47	21.7	4.5	2.0	0.5	1.6	0.3						
R3537	WC9 9-16	52	30	18	51	21.8	2.8	1.4	0.4	0.1	0.3						
R3538	WC10 0-12	34	44	22	33	14.4	7.2	7.8	1.3	<0.1	0.5						
R3539	WC10 12-30	22	50	28	17	10.7	17.4	25.7	38.9	<0.1	8.4						
R3540	WC10 30-62	43	39	18	43	8.04	18.0	28.6	50.4	<0.1	10.4						

APPROVED
 TITLE
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