

ATTACHMENT OP-5a

**Order 1 Soil Survey
Lost Creek Project - Plant Site
September 2008**

TABLE OF CONTENTS

1.0	Introduction.....	1
2.0	Methodology.....	1
2.1	Soil Survey.....	2
2.2	Laboratory Analysis.....	3
3.0	Results and Discussion.....	4
3.1	Soil Survey.....	4
3.2	Laboratory Analysis.....	4
4.0	Evaluation of Soil Suitability.....	5

FIGURES

Figure OP-5a-1 Detailed Soil Survey Map, Plant Site

TABLES

Table OP-5a-1 Soil Sampling Locations
Table OP-5a-2 Laboratory Analytical Results

ADDENDA

Addendum OP-5a-1 E-mail Correspondence with WDEQ-LQD
Addendum OP-5a-2 Field Data Sheets
Addendum OP-5a-3a Soil Pit Photographs
Addendum OP-5a-3b Soil Profile Photographs
Addendum OP-5a-4 Teagulf Sandy Loam Description and Data
Addendum OP-5a-5 Laboratory Report

ABBREVIATIONS AND ACRONYMS

AATA	AATA International, Inc.
GIS	Geographic Information System
LQD	Land Quality Division
NCSS	National Cooperative Soil Survey
NRCS	National Resource Conservation Service
Permit Area	Lost Creek Permit Area
Project	Lost Creek Project
SMU	Soil Mapping Unit
TFN	Temporary Filing Number
WDEQ	Wyoming Department of Environmental Quality

1.0 Introduction

The Lost Creek Project (Project), a proposed in-situ uranium mine, is located in Sweetwater County, on the northeastern edge of the Great Divide Basin of south-central Wyoming, approximately 38 miles northwest of Rawlins. This report describes the soils at the Plant site of the Lost Creek Permit Area (Permit Area; **Figure OP-5a-1**).

Soils in Sweetwater County have not been mapped as part of the National Cooperative Soil Survey (NCSS), although two empirical studies were conducted at the 1:100,000 and the 1:500,000 scales (Munn and Arneson, 1998 and 1999). AATA International, Inc. (AATA) of Fort Collins, Colorado completed an Order 3 field survey of the Permit Area in the summer of 2006. The results of the Order 3 survey were submitted to the Land Quality Division (LQD) of the Wyoming Department of Environmental Quality (WDEQ) in December 2007 as Appendix D7 of the Lost Creek Permit application (LQD Temporary Filing Number [TFN] 4 6/269).

In accordance with LQD Guideline No. 1 (WDEQ-LQD, 1994), a more detailed Order 1 soil survey is needed for the portions of the Permit Area where mining-related surface disturbance is proposed. Order 1 soil surveys were conducted in 2008 and 2009 for the Plant site (2008), the deep injection well locations (2009), and Mine Unit One (2008). The results of the surveys for the Plant site and the deep well locations are discussed briefly in Section D7.4 and in more detail in this attachment and Attachment OP-5b, respectively. The results of the survey of Mine Unit One will be included with the mine unit package. As the areas for additional mine units are delineated in more detail, Order 1 surveys will be conducted and the results submitted with the respective mine unit packages.

Before commencing the Order 1 soil survey in 2008, AATA discussed the scope of the survey, via e-mail, with WDEQ-LQD. The e-mail correspondence is included as **Addendum OP-5a-1**.

2.0 Methodology

The Order 1 soil survey work plan was developed based on LQD Guideline No. 1 (WDEQ-LQD, 1994). The soil survey was conducted according to protocols in the National Soil Survey Handbook, which provides the major principles and practices used in standard soil surveys (Soil Survey Staff, 1993). Information was recorded on Soil

Description Field Sheets. Copies of all the original sheets are included in **Addendum OP-5a-2**.

The Plant study area includes the Plant site and connecting roadways (**Figure OP-5a-1**). The Plant site has an anticipated disturbance area of about 14 acres. The total Plant study area, including the roads, is approximately 25 acres. The Plant study area is larger than the anticipated disturbance area to ensure adequate coverage.

The Order 1 soil survey fieldwork was completed in September 2008 by Dr. Jan Cipra with the assistance of Duncan Eccleston of AATA. The soil samples were analyzed by Energy Labs in Casper, Wyoming, in September and October 2008. The field survey data were digitized and incorporated in a Geographic Information System (GIS) database by AATA. The soil field mapping was done on high-resolution black and white satellite images of the study area at a scale of 1:4,800.

2.1 Soil Survey

A reconnaissance survey was conducted from September 2 through 5, 2008, in order to select locations for backhoe excavation of soil pits and profiles, and for soil sampling. The reconnaissance survey was conducted by traversing the Plant study area and visually examining the surface variations. Soils were examined in more detail at seven locations in the Plant study area, where a 3-inch diameter hand-held soil auger and a 16-inch tile spade were used to excavate soil "pits". The pits were excavated to a depth of 60 inches, or to the C horizon. The soil characteristics were observed and recorded with depth. Photographs of all the soil pits are included as **Addendum OP-5a-3a**. In addition to the seven pit locations, observations were also made at several of the mud pits excavated for Project-related drilling in the Permit Area. Pits from the Plant site were also compared to pits in the Mine Unit One study area, which will be included in the mine unit package.

Based on the soil pit and the mud pit observations, two soil "profile" locations were selected to describe and sample. Two soil mapping units (SMUs) were described and sampled: the Poposhia Loam and the Pepal Sandy Loam. In the Poposhia Loam mapping unit, one location was described and sampled. One location was described and sampled in the Pepal Sandy Loam mapping unit, which comprises the largest areal extent in the Plant site. A third SMU, the Teagulf Sandy Loam was identified and sampled in the Mine Unit 1 site. A description of the Teagulf Sandy Loam is included as **Addendum OP-5a-4** to this report in order to provide a comprehensive reference for all soil types known to exist in the Permit Area.

The soil profile locations were selected to correspond with soil pit locations in order to ensure sampling was adequate to represent the spatial variability of the soils. The soil profiles were excavated by a backhoe, which allowed for more detailed observations. Each excavation was approximately 15 feet in length, five feet in depth, and four to five feet in width, oriented in an east-west direction to provide good lighting on the north soil face for descriptions and pictures. The bottom of each profile was flat for a length of five feet, with a 45-degree slope at one end for access.

The profiles were excavated and described on September 9, 2008. Soil samples were collected. Between four and seven horizons or sub-horizons were described and sampled at each soil profile. The upper and lower boundary of each layer was delineated with a nail, and then representative, depth-integrated samples were collected by scraping the exposed soil into a Ziploc bag. Each sample was labeled with a unique identification code. Photographs of the soil profiles are included in **Addendum OP-5a-3b**. A preliminary soil map was developed based on observations from the soil pits, profiles, and mud pits.

Table OP-5a-1 lists the pits and profiles in the Plant study area.

2.2 Laboratory Analysis

After examining the two soil profile descriptions, samples from each SMU were selected for laboratory analysis. (The numbers of samples were not proportional to the areal extent of each SMU). Laboratory analyses included the topsoil suitability criteria noted in LQD Guideline No. 1, soil texture, and soil fertility parameters. The analyses were performed by Energy Laboratories in Casper, Wyoming.

The soil profile samples were generally taken from a single horizon but, in some cases, adjacent horizons or sub-horizons were combined if morphologically similar. The sampling locations are shown on **Figure OP-5a-1**. **Table OP-5a-2** lists the sampling locations and depths.

3.0 Results and Discussion

3.1 Soil Survey

Three soil types were identified during the Order 1 surveys in 2008 and 2009, and these three soil types can generally be identified by surface indicators. Pepal Sandy Loam is the dominant soil type, found in areas of upland big sagebrush habitat, where sagebrush is moderate to dense. The Poposhia Loam is found exclusively in drainages, where there is Lowland Big Sagebrush habitat and dense, larger sagebrush. The Teagulf Sandy Loam occurs in upland areas on subtle ridges and west-facing slopes where the sagebrush is sparse, cushion plants are common, and there is a concentration of pebbles and gravels on the soil surface due to aeolian erosion.

Two SMUs were identified in the Plant study area: the Pepal Sandy Loam and the Poposhia Loam as described in more detail below. The SMUs were identified based on comparable soils near the Permit Area that were officially surveyed and described by the National Resource Conservation Service (NRCS). The color of the SMUs is described as moist, crushed and broken.

Pepal Sandy Loam: This soil formed in calcareous loamy alluvium. This moderately deep, well-drained soil occurs on gently (one- to three-percent slopes) undulating uplands and comprises a large proportion of the study area. Typically, the surface layer is about a four-inch-thick dark brown or brown coarse sandy loam. The next layer is about a 15-inch-thick dark yellowish brown clay loam or sandy clay loam. The substratum is a dark yellowish brown loamy coarse sand or coarse sandy loam to a depth of 60 inches or more.

Poposhia Loam: This soil formed in calcareous loamy alluvium. This deep, well-drained soil occurs in narrow swales and comprises a small proportion of the study area. Typically, the surface layer is about a six-inch-thick dark brown sandy loam. The next layer is about an 18-inch-thick dark yellowish brown clay loam or sandy clay loam. The substratum is a brown or yellowish brown loam or coarse sandy loam to a depth of 60 inches or more. Its slopes range from zero to one percent.

3.2 Laboratory Analysis

The laboratory report is included as **Addendum OP-5a-4**, and the laboratory results for the Plant study area sites are summarized in **Table OP-5a-2**. The term “topsoil” in this report refers to soil horizons that occur at the surface of undisturbed soils. The term

“subsoil” refers to soil horizons that occur below the topsoil. All topsoil and subsoil laboratory samples were within the Suitability Criteria for topsoil listed in WDEQ-LQD Guideline No. 1 (shown in **Table OP-5a-2**).

The analyzed topsoil samples had textures of loam and sandy loam. The topsoil depths ranged from eight to 12 inches. The organic matter contents ranged from 0.8 to 5.6 percent. Although organic matter is not a criterion, a higher organic matter content is, in general, directly related to revegetation potential. The saturation values ranged from 27 to 54 percent, which is at the lower end of the prescribed range.

The subsoil samples were loams, clay loams, and loamy sands with depths ranging from eight to 48 inches. The organic matter content of the Poposhia Loam subsoil samples ranged from 0.7 to 1.2 percent. The organic matter of the Pepal Sandy Loam subsoil sample was 0.5 percent. This value is low and not favorable to vegetation establishment. The percent saturation (ranging from 34 to 43 percent) of the subsurface samples was at the low end of the prescribed range.

4.0 Evaluation of Soil Suitability

The topsoil of the two SMUs provides a favorable medium for plant growth, though the depth of topsoil varies between units. The primary suitable characteristics are organic matter content and favorable water holding capacity due to texture. The Poposhia Loam provides approximately 19 to 24 inches of topsoil material favorable for plant growth. The Pepal Sandy Loam provides approximately 14 to 18 inches of topsoil material favorable for plant growth. In both soils, the salvage depth can be identified in the field by a change in color from dark to light, accompanied by a change in texture from fine to coarse. The stripping depth is somewhat variable, and should be guided by local conditions, as it has been during the exploration phase of the project.

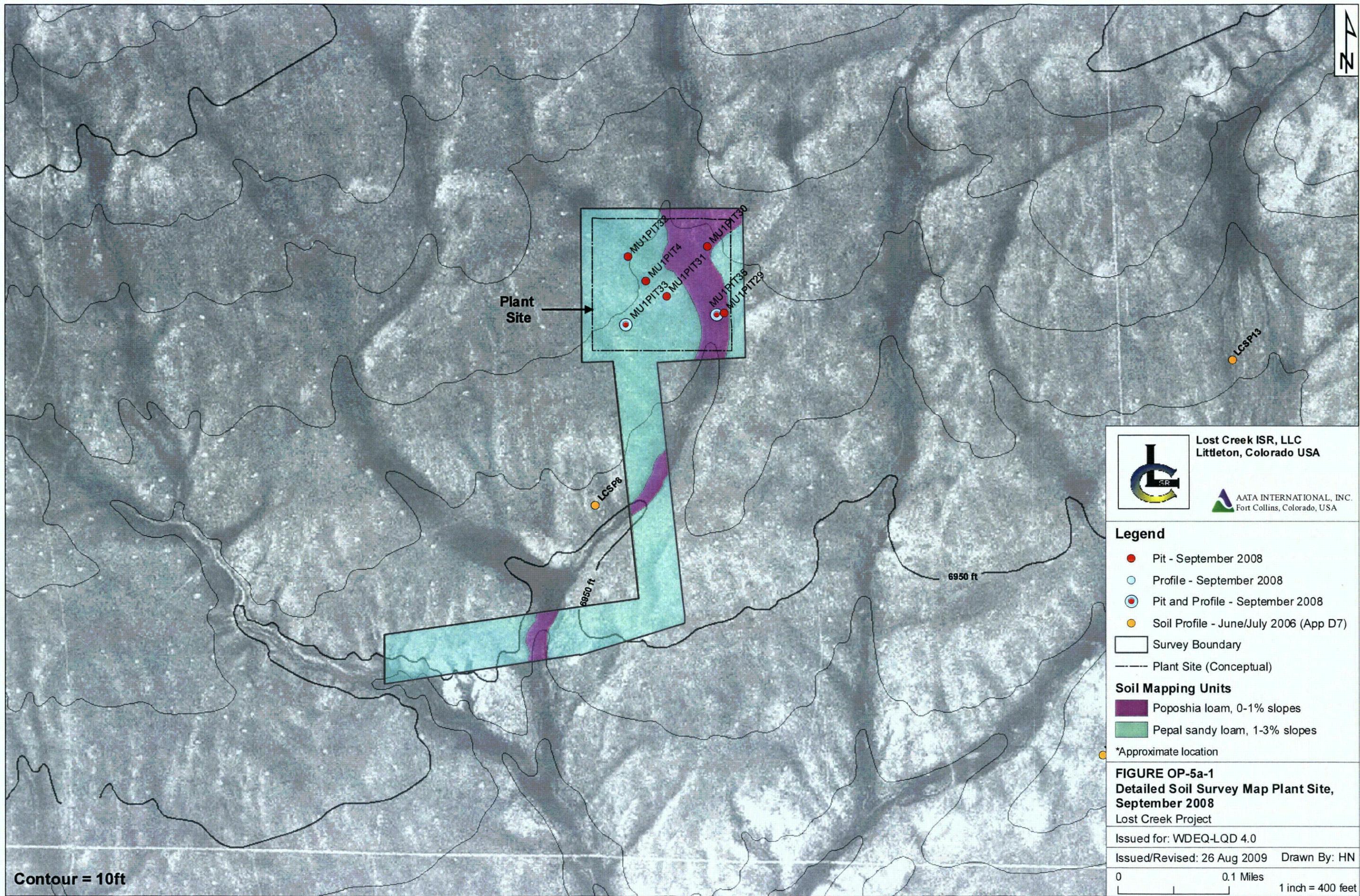
REFERENCES

Munn LC, Arneson CS. 1998. Soils of Wyoming: A digital statewide map at 1:500,000 scale. Agr. Expt. Sta. Rpt. B-1069. University of Wyoming, College of Agriculture, Laramie (WY).

Munn LC, Arneson CS. 1999. Soils of Wyoming: A digital statewide map at 1:100,000 scale. Agr. Expt. Sta. Rpt. B-1071. University of Wyoming, College of Agriculture, Laramie (WY).

Soil Survey Staff. 1993. National Soil Survey Handbook. Soil Conservation Service. US Department of Agriculture. Washington (DC). Handbook 18. Title 430-VI.

WDEQ-LQD. 1994. Guideline No. 1, Topsoil and Overburden. Cheyenne (WY). Available from: <http://deq.state.wy.us/lqd/guidelns/guide1.pdf>. Accessed on 21 July 2009.



Contour = 10ft


Lost Creek ISR, LLC
 Littleton, Colorado USA

AATA INTERNATIONAL, INC.
 Fort Collins, Colorado, USA

- Legend**
- Pit - September 2008
 - Profile - September 2008
 - Pit and Profile - September 2008
 - Soil Profile - June/July 2006 (App D7)
 - Survey Boundary
 - Plant Site (Conceptual)
- Soil Mapping Units**
- Poposhia loam, 0-1% slopes
 - Pepal sandy loam, 1-3% slopes
- *Approximate location

FIGURE OP-5a-1
Detailed Soil Survey Map Plant Site,
September 2008
 Lost Creek Project
 Issued for: WDEQ-LQD 4.0
 Issued/Revised: 26 Aug 2009 Drawn By: HN
 0 0.1 Miles 1 inch = 400 feet

Table OP-5a-1 Soil Sampling Locations at Plant Site (Page 1 of 1)

Pit or Profile Number	Location	Soil Designation	Date Excavated
MU1PIT4	Plant Site.	Pepal sandy loam	9/2/08
MU1PIT29	Plant Site.	Poposhia loam	9/5/08
MU1PIT30	Plant Site.	Poposhia loam	9/5/08
MU1PIT31	Plant Site.	Pepal sandy loam	9/5/08
MU1PIT32	Plant Site.	Pepal sandy loam	9/5/08
MU1PIT33	Plant Site. Expanded to soil profile. Sampled for laboratory analyses.	Pepal sandy loam	9/5/08 (Expanded 9/9/08; Sampled 9/9/08)
MU1PIT35	Plant Site. Expanded to soil profile. Sampled for laboratory analyses.	Poposhia loam	9/5/08 (Expanded 9/9/08; Sampled 9/9/08)

Table OP-5a-2 Laboratory Analytical Results (Page 1 of 1)

Profile Number	Sample Depth (inches)	Soil Horizon	LQD Topsoil Suitability Parameters						Additional Fertility Analyses					Texture Information			
			pH (standard units)	Electrical Conductivity (mmhos/cm)	Saturation (%)	Sodium Adsorption Ratio	Selenium (ppm)	Boron (ppm)	Lime as CaCO ₃ (%)	Calcium (meq/L)	Magnesium (meq/L)	Sodium (meq/L)	Organic Matter (%)	Sand (%)	Silt (%)	Clay (%)	Texture
Poposhia Loam (about 20% of Plant Site Study Area)																	
MU1PR35	0-8	A	6.1	0.78	53.8	0.10	0.011	0.78	2.0	3.84	1.70	0.17	5.6	31	44	25	L
	8-18	B	6.5	0.31	34.1	0.17	0.005	0.21	1.1	1.86	0.86	0.20	1.2	38	40	22	L
	18-34	B	6.3	2.77	43.2	0.25	0.009	0.27	1.3	1.96	0.80	0.30	0.9	28	44	28	CL
	34-48	C	6.6	0.53	40.7	0.27	0.004	0.22	1.2	3.21	1.38	0.41	0.7	44	33	23	L
Pepal Sandy Loam (about 80% of Plant Site Study Area)																	
MU1PR33	0-12	A, B	7.0	0.39	27.1	0.39	<0.002	<0.20	1.1	2.77	1.16	0.55	0.8	58	24	18	SL
	12-33	B	7.0	0.51	34.4	0.68	<0.002	<0.20	0.9	3.26	1.42	1.03	0.5	84	4	12	LS
LQD Topsoil Suitability Criteria ¹			5.5 - 8.5	0-8	25-80	0 - 10	<0.1	<5.0	--	--	--	--	--	--	--	--	--

¹ Suitability criteria are from LQD Guideline No. 1 (WDEQ-LQD, 1994). Per the August 28, 2008, e-mail from M. Moxley (see Attachment 1), particle size was not applied as a suitability criterion.

Addendum OP-5a-1

E-mail Correspondence with WDEQ-LQD

From: Moxley, Mark [mailto:mmoxle@wyo.gov]
Sent: Thursday, August 28, 2008 1:09 PM
To: Ethan Brown
Cc: Bautz, Melissa
Subject: RE: Soil Survey at Lost Creek

Ethan,

I just reviewed the soils section of the permit application and I thought it might be good for you to see my draft comments. If you have any questions please feel free to contact me.

Mark Moxley

RE: Soils, Appendix D-7

1. Lands to be affected by the operation (plant site, parking/laydown areas, ponds, roads, wellfields, etc.) must be outlined on the soils map.
2. The soils map should be presented at a normal engineering scale (i.e. 1"=400' or 1"=500'). The township, range and county should be clearly noted on the map.
3. The soils on lands to be affected by the operation must be mapped at an Order 1-2 level.
4. A map must be presented to show topsoil suitability/stripping depths.
5. Coarse fragments is one of the criteria listed in Guideline No. 1 for establishing soil suitability. However, where soils resources are limited and marginal in quality LQD recommends that coarse fragments not be used as the determining factor for soil suitability.
6. The volumes of soil to be salvaged and stockpiled from the various major affected areas should be listed.
7. The person(s) who conducted the soils study should be identified.

From: Bautz, Melissa [mbautz@wyo.gov]
Sent: Thursday, August 28, 2008 8:42 AM
To: Ethan Brown
Cc: Moxley, Mark; Roberta Hoy
Subject: RE: Soil Survey at Lost Creek

Ethan

This seems like a reasonable, good plan to quantify and qualify the soil at Mine Unit 1. I have no problems with this approach. Thank you for the information.

Melissa

From: Ethan Brown [mailto:ethan.brown@aata.com]
Sent: Wednesday, August 27, 2008 2:02 PM
To: Bautz, Melissa
Cc: Ping Wang; Roberta Hoy
Subject: Soil Survey at Lost Creek

Hello Melissa,

AATA has the opportunity to complete the Order One survey of the Lost Creek proposed facility site and Mine Unit One this coming week (September 2nd – 5th). The current plan is to walk the area and dig shallow pits to determine the quantity and distributions of the different soil types in the area. After approximately three days of evaluation, one to two locations per soil type will be chosen for profile excavation. Each profile will be approximately 5 feet deep and will be large enough to allow entry. Based on the previous Lost Creek Sub-Order Three survey, we expect to encounter relatively few soil types in the two areas. Therefore, we anticipate the need for approximately 5 to 10 soil profiles. Samples will be taken from at least one profile in each soil type. The samples will be collected from the middle portions of each main horizon down to the C Horizon. The samples will be sent to Energy Laboratories in Casper Wyoming where they will be analyzed for topsoil suitability. The parameters will include:

- pH,
- EC,
- Saturation percentage,
- Texture,
- SAR,
- Selenium,
- Boron, and
- Coarse fragments.

Because of the limited soil surveying in this area prior to Lost Creek's work, it may not be possible to correlate the soils with existing SCS soil series. Both the State Soil Scientist and the Sweetwater County Soil Scientist have expressed their willingness to help if necessary. However, we have been focusing on topsoil suitability rather than the identification of SCS soil series.

Please let us know if you have any questions or concerns.

Thank You,

Ethan Brown
Environmental Specialist
AATA International, Inc.
2240 Blake Street, Suite 210
Denver Colorado, USA 80205
Office Phone: 1-720-974-2550
Cell (Field Phone): 1-970-443-8448

Addendum OP-A5-2

Field Data Sheets

Soil Description:

Location

MULTIPLE Facility west end

Site No.

Date

9/2

Time

Vegetation

Elevation

Slope

Aspect

Geomorphic Surface

Parent Material(s)

Described by

Depth (cm)	Horizon	Color		Structure	Gravel %		Consistence				Texture	pH	Clay films			Boundaries		notes		
		moist	dry		0	50	Wet	Moist	Dry	v1			n	pf	a	s				
0-6		10YR 3/3		m sg 1 2 3	vf f o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so sa s vs	po ps p vp	lo vfr fr fl vfl eff	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n mk co k	pf po br co cobr	a o g d	s w i b	∅
6-19		10YR 4/4		m sg 1 2 3	vf f o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so sa s vs	po ps p vp	lo vfr fr fl vfl eff	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n mk co k	pf po br co cobr	a o g d	s w i b	∅
19-30		10YR 4/6		m sg 1 2 3	vf f o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so sa s vs	po ps p vp	lo vfr fr fl vfl eff	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n mk co k	pf po br co cobr	a o g d	s w i b	∅
30-33+		10YR 5/6		m sg 1 2 3	vf f o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so sa s vs	po ps p vp	lo vfr fr fl vfl eff	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n mk co k	pf po br co cobr	a o g d	s w i b	∅
		-----		m sg 1 2 3	vf f o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so sa s vs	po ps p vp	lo vfr fr fl vfl eff	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n mk co k	pf po br co cobr	a o g d	s w i b	
		-----		m sg 1 2 3	vf f o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so sa s vs	po ps p vp	lo vfr fr fl vfl eff	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n mk co k	pf po br co cobr	a o g d	s w i b	

Soil Description: Location MU 1 PIT 29 (see P 35) EDGE OF SWALE
 Site No. _____ Date 9/5 Time 9:12 Vegetation dense sage - 20" +
 Elevation _____ Slope 120 Aspect W Geomorphic Surface _____
 Parent Material(s) _____ Described by Lipra

Depth (cm)	Horizon	Color		Structure	Gravel %	Consistence			Texture	pH	Clay films	Boundaries	notes			
		moist	dry			Wet	Moist	Dry								
0-6		10YR 3.5/3		m eg 1 2 3	0 >10 10 25	60 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC	v1 1 2 3 4	n po br co cobr	a o g d	s w i b	A 28" "B" x 4"
6-12		4/4		m eg 1 2 3	0 <10 10 25	60 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC	v1 1 2 3 4	n po br co cobr	a o g d	s w i b	PM - siltstone or fines
12-18	C _r	5/4		m eg 1 2 3	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC	v1 1 2 3 4	n po br co cobr	a o g d	s w i b	
18-24	C _v	5/4		m eg 1 2 3	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC	v1 1 2 3 4	n po br co cobr	a o g d	s w i b	ef = sl
24-30	C _v	10YR 5/4 5/3		m eg 1 2 3	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC	v1 1 2 3 4	n po br co cobr	a o g d	s w i b	ef = mod
				m eg 1 2 3	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC	v1 1 2 3 4	n po br co cobr	a o g d	s w i b	

Soil Description: Location

MULPT30

Site No.

Date

9/5

Time

9:50

Vegetation

Mod sage cover - 15"

Elevation

Slope

0-1

Aspect

S?

Geomorphic Surface

- nearly level, gently rolling

Parent Material(s)

Described by

receiving position in landscape

Depth (cm)	Horizon	Color		Structure	Gravel %		Consistence			Texture	pH	Clay films	Boundaries		notes				
		moist	dry		Wet	Moist	Dry	a	o				g	d					
0-6		10YR 3/3		m eg 1 2 3	vf f m c vo	gr pl pr opr abk abk	0 <10 10 25	50 75 >75	so ss e vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	vi 1 2 3 4	n pf po br co cobr	a o g d	e w i b	shallower to shale than expected
6-12		10YR 4/3		m eg 1 2 3	vf f m c vo	gr pl pr cpr abk abk	0 <10 10 25	50 75 >75	so ss e vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	vi 1 2 3 4	n pf po br co cobr	a o g d	e w i b	note - pattern ground litter on surface
12-18	cr	10YR 4/4		m eg 1 2 3	vf f m c vo	gr pl pr cpr abk abk	0 <10 10 25	50 75 >75	so ss e vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	vi 1 2 3 4	n pf po br co cobr	a o g d	e w i b	ef = sl totally undisturbed site
18-24		5YR 3/3		m eg 1 2 3	vf f m c vo	gr pl pr cpr abk abk	0 <10 10 25	50 75 >75	so ss e vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	vi 1 2 3 4	n pf po br co cobr	a o g d	e w i b	maroon shale
				m eg 1 2 3	vf f m c vo	gr pl pr cpr abk abk	0 <10 10 25	50 75 >75	so ss e vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	vi 1 2 3 4	n pf po br co cobr	a o g d	e w i b	
				m eg 1 2 3	vf f m c vo	gr pl pr cpr abk abk	0 <10 10 25	50 75 >75	so ss e vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	vi 1 2 3 4	n pf po br co cobr	a o g d	e w i b	

Soil Description: Location MU1 PIT 31 (see reverse side) white coarse sand at
 Site No. _____ Date _____ Time 10:25 Vegetation _____
 Elevation _____ Slope _____ Aspect SE Geomorphic Surface hill top
 Parent Material(s) _____ Described by CYRA

Depth (cm)	Horizon	Color		Structure	Gravel %		Consistence				Texture	pH	Clay films			Bound-aries		notes
		moist	dry		Wet	Moist	Dry	v1	n	pl			a	s				
0-6		10YR 4/3		m vf gr sg f pl 1 m pr 2 c cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po ss ps s p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC		v1 n pl 1 po 2 mk br 3 co 4 k cobr	a o g d	s w i b					
6-12		10YR 4/4		m vf gr sg f pl 1 m pr 2 c cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po ss ps s p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC		v1 n pl 1 po 2 mk br 3 co 4 k cobr	a o g d	s w i b					
12-18		10YR 5/4		m vf gr sg f pl 1 m pr 2 c cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po ss ps s p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC		v1 n pl 1 po 2 mk br 3 co 4 k cobr	a o g d	s w i b					
18-36		10YR 6/4		m vf gr sg f pl 1 m pr 2 c cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po ss ps s p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC	C	v1 n pl 1 po 2 mk br 3 co 4 k cobr	a o g d	s w i b	no bedrock noted				
				m vf gr sg f pl 1 m pr 2 c cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po ss ps s p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC		v1 n pl 1 po 2 mk br 3 co 4 k cobr	a o g d	s w i b					
				m vf gr sg f pl 1 m pr 2 c cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po ss ps s p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC		v1 n pl 1 po 2 mk br 3 co 4 k cobr	a o g d	s w i b					

Soil Description: Location MAL PIT 32 Typical of this mapunit
 Site No. _____ Date 9/5 Time _____ Vegetation _____ See reverse of
 Elevation _____ Slope 10% Aspect SE Geomorphic Surface _____ Pit 31
 Parent Material(s) _____ Described by Cipra

Depth (cm)	Horizon	Color		Structure	Gravel %		Consistence			Texture	pH	Clay films			Boundaries		notes		
		moist	dry		Wet	Moist	Dry	v1	n			pf	a	s					
	6	10YR	3/3	m eg 1 2 3	vf f m c vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s ve	po ps p vp	lo vfr fr fl vll eff	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	a o g d	s w i b	⊕
	12	10YR	4/4	m eg 1 2 3	vf f m c vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s ve	po ps p vp	lo vfr fr fl vll eff	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	a o g d	s w i b	⊕
	18	10YR	4/4	m eg 1 2 3	vf f m c vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s ve	po ps p vp	lo vfr fr fl vll eff	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	a o g d	s w i b	⊕
	24	10YR	4/4	m eg 1 2 3	vf f m c vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s ve	po ps p vp	lo vfr fr fl vll eff	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	a o g d	s w i b	⊕
	30	10YR	5/4	m eg 1 2 3	vf f m c vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s ve	po ps p vp	lo vfr fr fl vll eff	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	a o g d	s w i b	Sicl - shale med coarse sandy clay loam V
				m eg 1 2 3	vf f m c vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s ve	po ps p vp	lo vfr fr fl vll eff	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	a o g d	s w i b	
				m eg 1 2 3	vf f m c vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s ve	po ps p vp	lo vfr fr fl vll eff	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	a o g d	s w i b	

Soil Description: Location Mul Pit 33 See ~~field~~ notes below
 Site No. _____ Date 9/5 Time 10:50 Vegetation mod sage cover
 Elevation _____ Slope 3% Aspect SE Geomorphic Surface _____
 Parent Material(s) _____ Described by lipra

Depth (cm)	Horizon	Color		Structure	Gravel %		Consistence			Texture	pH	Clay films			Boundaries		notes		
		moist	dry		0	50	Wet	Moist	Dry			v1	n	pf	a	e			
6		10YR 3/3		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	a o g d	e w i b	0
12		10YR 4/4		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	a o g d	e w i b	0
18		10YR 4/4		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	a o g d	e w i b	0
24		7.5 or WYR 5/3		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	a o g d	e w i b	st
30		WYR 5/3		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	a o g d	e w i b	st
36		10YR 6/3 (7/3)		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	a o g d	e w i b	v

Soil Description: Location MUL PIT 35 Desc to 24" Soil
 Site No. _____ Date 9/5 Time 9:35 Vegetation _____ is likely 60"
 Elevation _____ Slope _____ Aspect _____ Geomorphic Surface _____
 Parent Material(s) _____ Described by _____

Depth (cm)	Horizon	Color		Structure	Gravel %		Consistence			Texture	pH	Clay films			Bound-aries		notes			
		moist	dry		0	>75	Wet	Moist	Dry			v1	n	pf	a	o		g	d	s
0-6		10YR 3/3		m sg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n mk co k	pf po br co cobr	a o g d	s w i b	typical swale Deep
6-12		10YR 3/4 ^{8/5}		m sg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n mk co k	pf po br co cobr	a o g d	s w i b	mod texture dark
12-18		10YR 4/3 ^{7/4}		m sg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n mk co k	pf po br co cobr	a o g d	s w i b	
18-24		10YR 4/4		m sg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n mk co k	pf po br co cobr	a o g d	s w i b	
		-----		m sg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n mk co k	pf po br co cobr	a o g d	s w i b	
		-----		m sg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL L CL	SICL SIL SI SIC C SC	v1 1 2 3 4	n mk co k	pf po br co cobr	a o g d	s w i b	

Soil Description: Location MU1PR33

photos 100-1277

Site No. _____ Date 9/3/08 Time 2:50 Vegetation open, sparse grasses

Elevation _____ Slope 2% Aspect S Geomorphic Surface side slope

Parent Material(s) _____ Described by JG

Depth (cm)	Horizon	Color		Structure			Gravel %		Consistence				Texture	pH	Clay films			Boundaries	notes		
		moist	dry	w	c	pl	<	>	Wet	Moist	Dry	Loam			clay	sil	org				
0-6	A1	7.5 YR 4/3		m	vf	gr	0	50	so	po	lo	lo	S	SICL		v1	n	pf	a	s	Very hard
				eg	f	pl	<10	75	ss	ps	vfr	so	LS	SIL		1		po	o	w	hearty massive
				1	m	pr	10	>75	s	p	fr	sh	SL	SI		2	mk	br	o	w	
6-12	Bt	7.5 YR 4/4		2	o	cpr	25		vs	vp	fl	h	SCL	SIC		3		co	d	b	Bt
				3	vo	abk					vll	vh	L	C		4	k	cobr			EF = 0 lower 10-14"
				(w)		(sbk)					ell	eh	CL	SC							
12-25		10 YR 5/4		m	vf	gr	0	50	so	po	lo	lo	S	SICL		v1	n	pf	a	s	upper sandy
				eg	f	pl	<10	75	ss	ps	vfr	so	LS	SIL		1		po	o	w	@ 10-14"
				1	m	pr	10	>75	s	p	fr	sh	SL	SI		2	mk	br	o	w	Coarse sandy loam
				2	o	cpr	25		vs	vp	fl	h	SCL	SIC		3		co	d	b	(COSL)
				3	vo	abk					vll	vh	L	C		4	k	cobr			EF = 0
				(w)		(sbk)					ell	eh	CL	SC							
25-33		10 YR 5/4		m	vf	gr	0	50	so	po	lo	lo	S	SICL		v1	n	pf	a	s	
				eg	f	pl	<10	75	ss	ps	vfr	so	LS	SIL		1		po	o	w	
				1	m	pr	10	>75	s	p	fr	sh	SL	SI		2	mk	br	o	w	
				2	o	cpr	25		vs	vp	fl	h	SCL	SIC		3		co	d	b	EF = 0
				3	vo	abk					vll	vh	L	C		4	k	cobr			
				(w)		(sbk)					ell	eh	CL	SC							
33-60	Cr	10 YR 7/3		m	vf	gr	0	50	so	po	lo	lo	S	SICL		v1	n	pf	a	s	highly indurated shale
				eg	f	pl	<10	75	ss	ps	vfr	so	LS	SIL		1		po	o	w	
				1	m	pr	10	>75	s	p	fr	sh	SL	SI		2	mk	br	o	w	upper EF = V
				2	o	cpr	25		vs	vp	fl	h	SCL	SIC		3		co	d	b	lower EF = slight calcareous shale
				3	vo	abk					vll	vh	L	C		4	k	cobr			
				(w)		(sbk)					ell	eh	CL	SC							
				m	vf	gr	0	50	so	po	lo	lo	S	SICL		v1	n	pf	a	s	
				eg	f	pl	<10	75	ss	ps	vfr	so	LS	SIL		1		po	o	w	
				1	m	pr	10	>75	s	p	fr	sh	SL	SI		2	mk	br	o	w	
				2	o	cpr	25		vs	vp	fl	h	SCL	SIC		3		co	d	b	
				3	vo	abk					vll	vh	L	C		4	k	cobr			
				(w)		(sbk)					ell	eh	CL	SC							

Soil Description: Location MU1 PR35 pils 100-1235
 Site No. _____ Date 9/9/08 Time 11:20 Vegetation 14 drainage: sage " 4
 Elevation _____ Slope 1% Aspect S Geomorphic Surface position edge of partly defined " 6
 Parent Material(s) _____ Described by JC Broad swale drainage

Depth (cm)	Horizon	Color		Structure	Gravel %		Consistence			Texture	pH	Clay films			Bound-aries		notes			
		moist	dry		Wet	Moist	Dry	v1	n			pf	a	s						
0-4		10YR 3/2		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL C SC	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	pf po br co cobr	a o g d	s w i b	1/2" of diff @ top
4-8		10YR 3/3		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL C SC	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	pf po br co cobr	a o g d	s w i b	
8-12		10YR 4/3		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL C SC	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	pf po br co cobr	a o g d	s w i b	Heavy loam
12-18		10YR 4/4		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL C SC	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	pf po br co cobr	a o g d	s w i b	Heavy loam
18-34		10YR 4/4		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL C SC	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	pf po br co cobr	a o g d	s w i b	
34-48		10YR 4/3		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL C SC	SICL SIL SI SIC C SC	v1 1 2 3 4	n po br co cobr	pf po br co cobr	a o g d	s w i b	

11/2/11

Location MU 4 PR35
 Date 9/5/08 Time 11:20 Vegetation 17-dwarf shrub: sage
 Elevation _____ Slope 17° Aspect S Geomorphic Surface edge of partly disturbed drainage
 Parent Material(s) _____ Described by JC

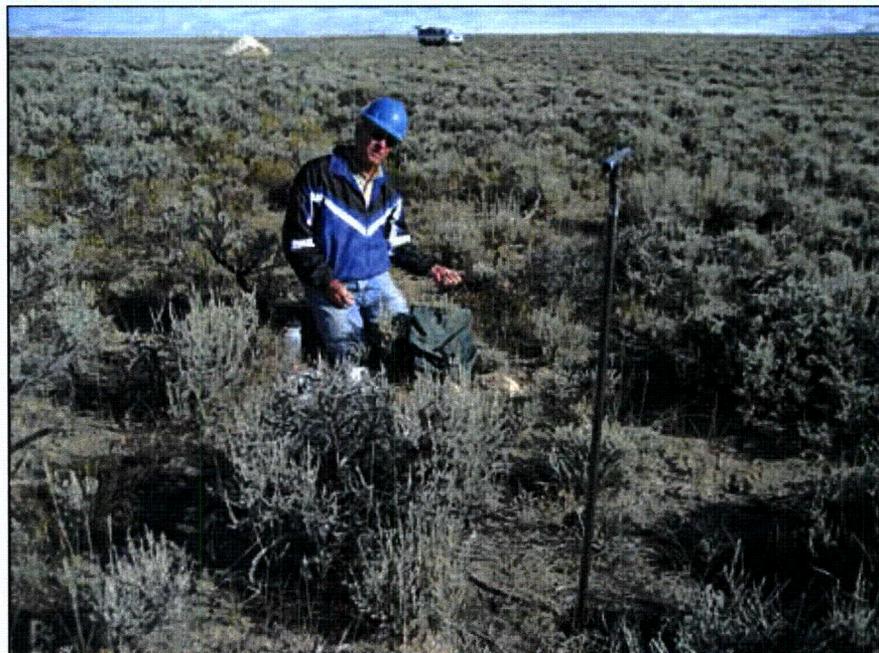
Depth (cm)	Horizon	Color		Structure	Gravel %		Consistence			Texture	pH	Clay films			Boundaries		notes
		moist	dry		Wet	Moist	Dry	1	2			3	a	s	w	i	
40-60	C	10 YR 5/3		m vf gr eg f pl 1 m pr 2 c cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po ss ps s p vs vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	s w i b	Structure massive-structureless visible filaments of humic EF=V			
		-----		m vf gr eg f pl 1 m pr 2 c cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po ss ps s p vs vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	s w i b				
		-----		m vf gr eg f pl 1 m pr 2 c cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po ss ps s p vs vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	s w i b				
		-----		m vf gr eg f pl 1 m pr 2 c cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po ss ps s p vs vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	s w i b				
		-----		m vf gr eg f pl 1 m pr 2 c cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po ss ps s p vs vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	s w i b				
		-----		m vf gr eg f pl 1 m pr 2 c cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po ss ps s p vs vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIC L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	s w i b				

Addendum OP-5a-3a

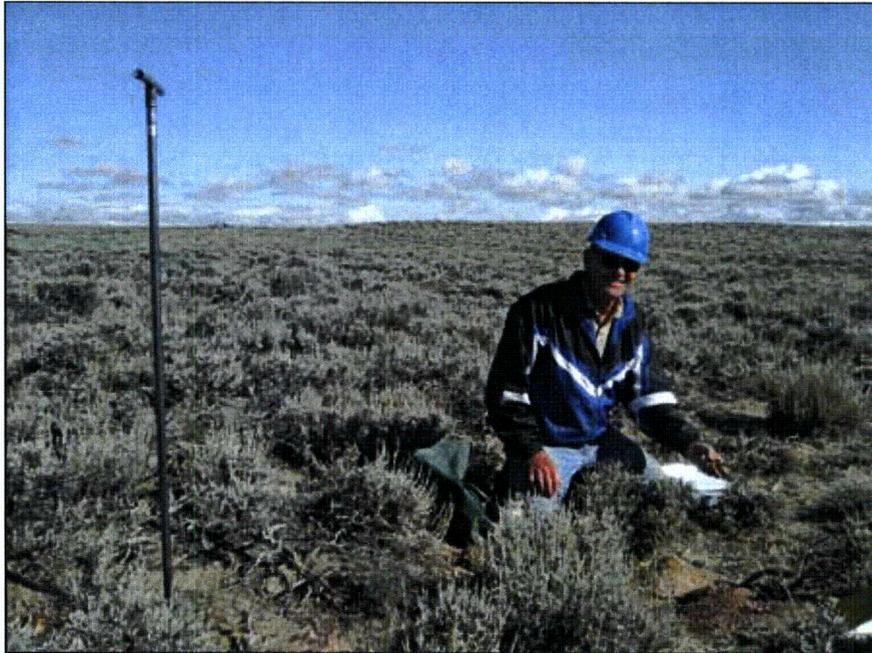
Soil Pit Photographs



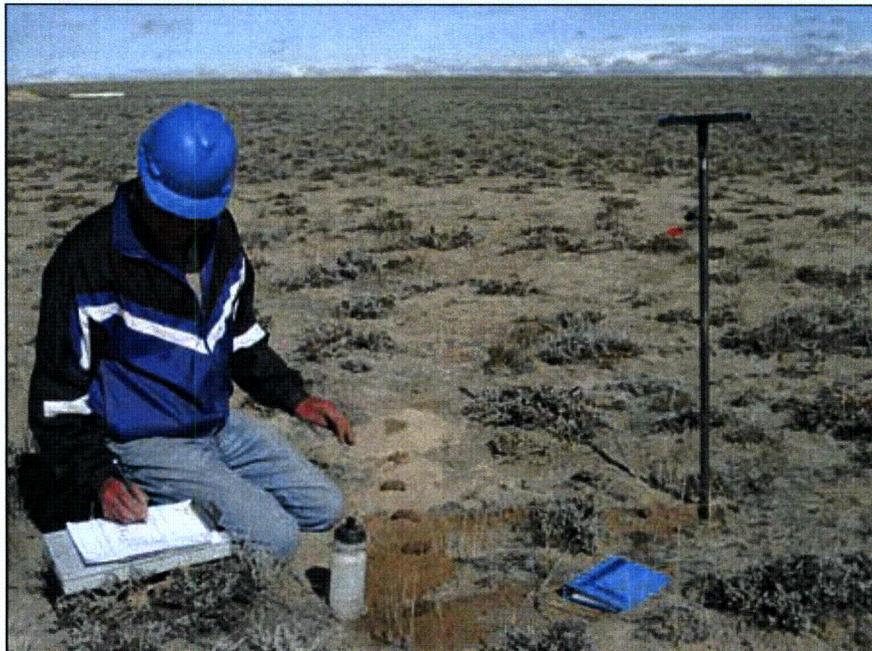
Mine Unit 1 Pit 4. West side of the Plant site, approximately 165 ft in from the edge. Vegetation on site had 60% ground cover, including 40% sage, 10% grass & 10% litter. Drilled to depth of 33 in.



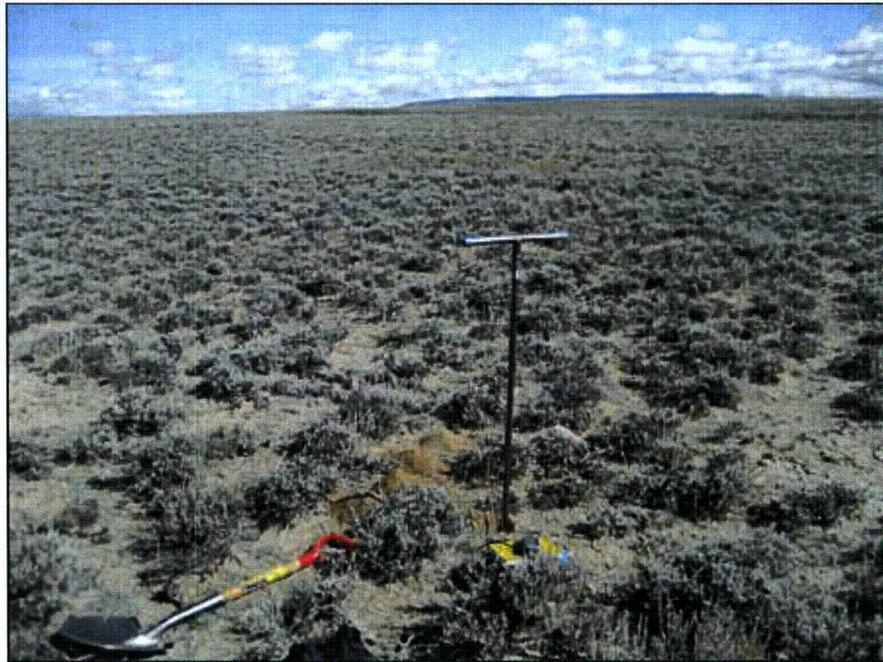
Mine Unit 1 Pit 29. Plant Site. Elevation 6985 ft. Vegetation on site had 80% ground cover, including 60 % sage to 2 ft high, 15% grasses & 5% litter. Site was undisturbed. Drilled to depth of 30 in.



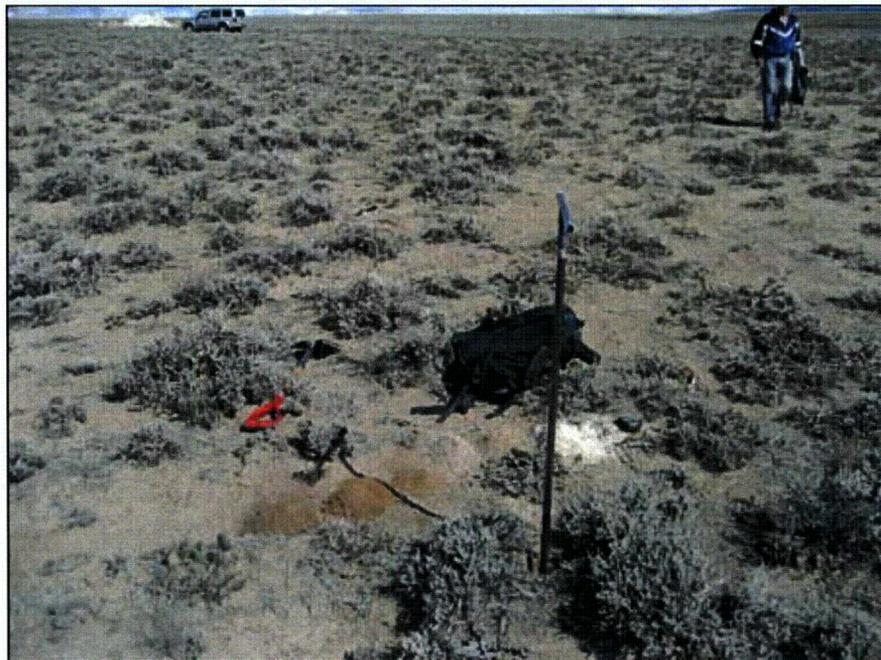
Mine Unit 1 Pit 30. Plant Site. Elevation 6988 ft. Vegetation on site had 70% ground cover, including 60% sage to 1 ft high, 5% grasses & 5% other. Site was undisturbed. Drilled to depth of 24 in.



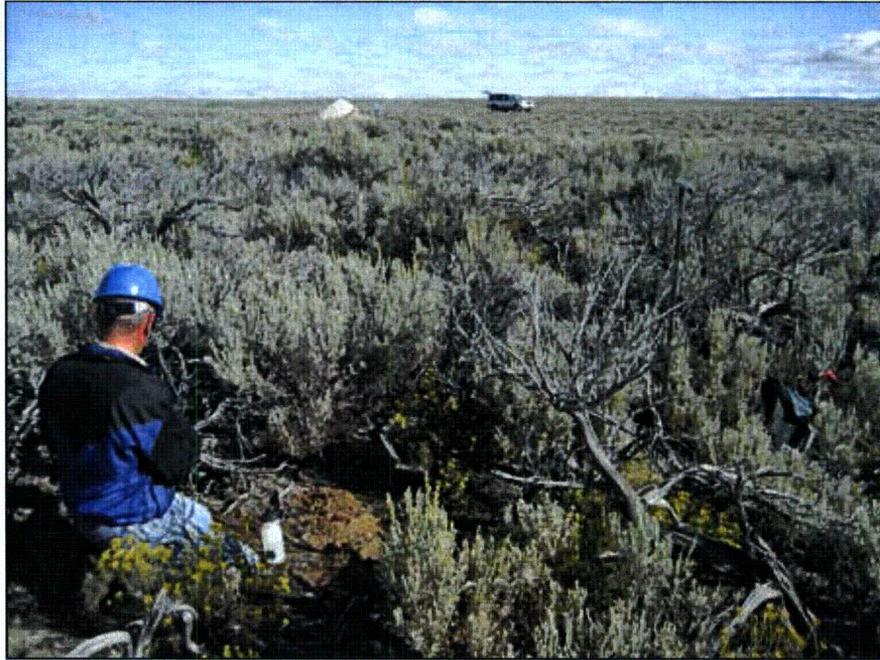
Mine Unit 1 Pit 31. Plant Site. Elevation 6992 ft. Vegetation on site had 25% ground cover, including 20% sage & 5% other cover. The site was disturbed by passenger vehicles. Drilled to depth of 36 in.



Mine Unit 1 Pit 32. Plant Site. Elevation 6992 ft. Vegetation on site had 45% ground cover, including 35% sage to 1 ft high, 5% grasses & prickly pear cactus, & 5% other vegetation. Drilled to depth of 36 in.

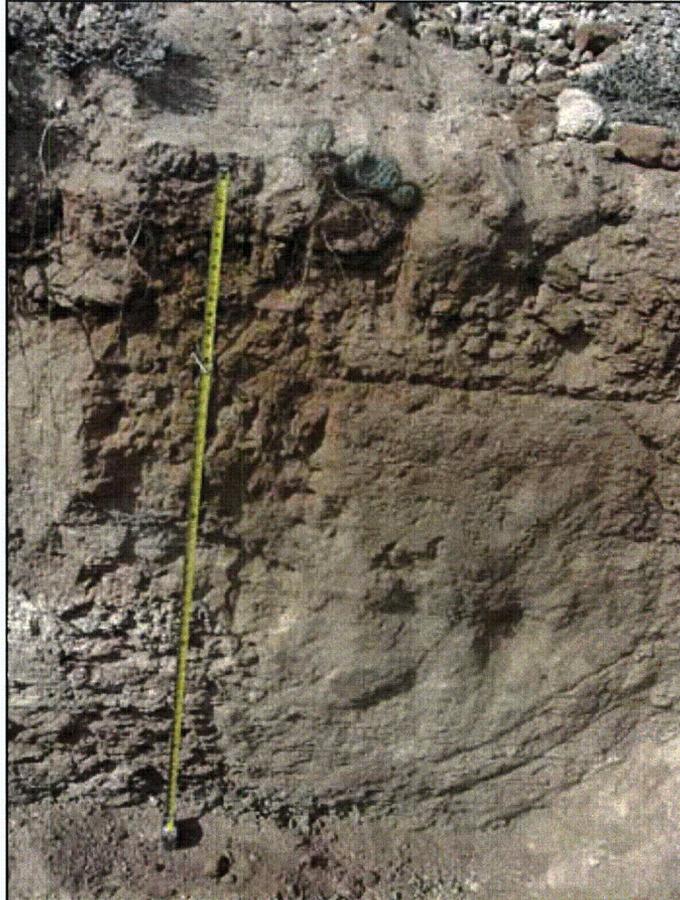


Mine Unit 1 Pit 33 (Expanded to soil profile & sampled). Plant Site. Elevation 6985 ft. Vegetation on site had 50% ground cover, including 40% sage, 5% grasses & 5% litter. Site was relatively undisturbed. Drilled to depth of 36 in.



Mine Unit 1 Pit 35 (Expanded to soil profile & sampled.) Plant Site. Elevation 6978 ft. Vegetation on site had 85% ground cover, including 80% large sage to 4 ft high & 5% other vegetation. Picture was taken in the undisturbed terrain west of Mine Unit 1 Pit 29 in the swale. Site was undisturbed. Drilled to depth of 24 in.

Addendum OP-5a-3b
Soil Profile Photographs



Mine Unit 1 Profile 33
Plant Site (Sampled for laboratory analyses.)



Mine Unit 1 Profile 35 (Sampled for laboratory analyses.) Plant Site

Addendum OP-5a-4

**Teagulf Sandy Loam
Description and Data**

TABLE OF CONTENTS

1.0	Introduction.....	3
2.0	Methods.....	3
3.0	Results.....	3
4.0	Evaluation of Soil Suitability.....	11

FIGURES

Figure 1	Teagulf Sandy Loam Sampling Sites
Figure 2a	Soil Profile of MU1PR13
Figure 2b	Soil Profile of MU1PR16
Figure 2c	Soil Profile of MU1PR23
Figure 3a	Field Data sheet for MU1PR13
Figure 3b	Field Data sheet for MU1PR16
Figure 3c	Field Data sheet for MU1PR23

TABLES

Table 1	Laboratory Analytical Results
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1.0 Introduction

Along with the Order 1 soil survey of the Plant site, an Order 1 soil survey was also conducted in 2008 for Mine Unit 1, where mining disturbance is anticipated. The results of the Mine Unit 1 soils survey will be presented in a separate document. Three soil types were described and sampled in the Mine Unit 1 area. Two of the soil mapping units (SMUs) were also identified within the Plant site: the Poposhia Loam and the Pepal Sandy Loam. Because the Teagulf Sandy Loam was not identified within the Plant site, it is described here so that the WDEQ permit application provides a comprehensive reference of all soil types identified on the Lost Creek site to date.

2.0 Methods

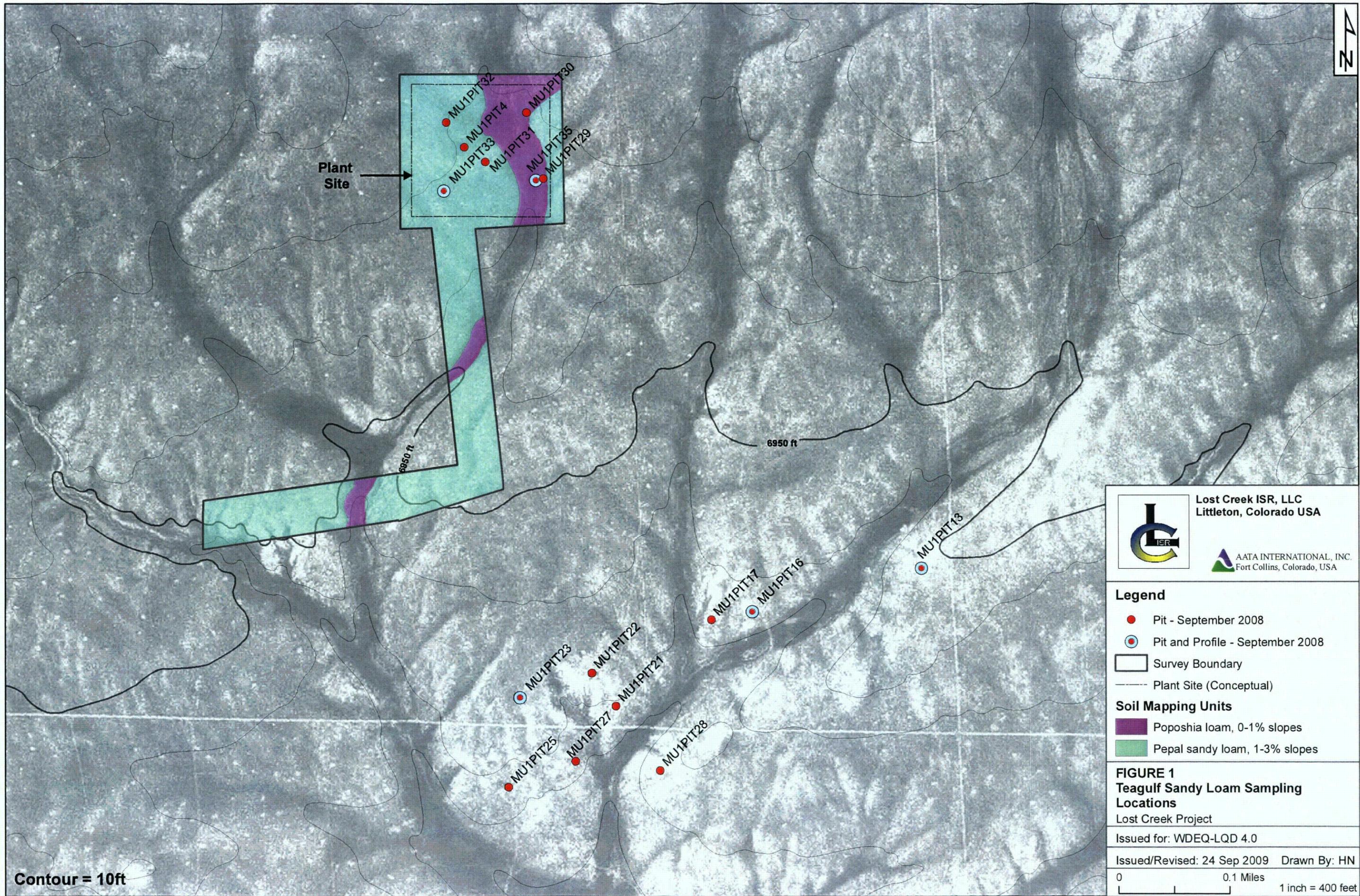
The methods for the Order 1 soil survey outside the Plant site are identical to the Order 1 soil survey of the plant site. Please refer to OPS Attachment 4a Section 2 for more detail.

3.0 Results

Figure 1 shows pit and profile locations within the Teagulf Sandy Loam SMU from September 2008. The Teagulf Sandy Loam is described below. The SMU was identified based on comparable soils near the Permit Area that were officially surveyed and described by the National Resource Conservation Service (NRCS). The color of the SMU is described as moist, crushed and broken.

Teagulf Sandy Loam: This soil formed in calcareous loamy or sandy alluvium, and is influenced by sandstone, siltstone, and mudstone or shale bedrock. Comprising a small proportion of the study area, this shallow, well-drained soil occurs on side slopes and upland ridges of slightly dissected plains. Its slopes range from three to seven percent. Typically, the surface layer is about a three-inch-thick brown or dark yellowish brown loam. The subsoil is about a seven-inch-thick dark yellowish brown sandy clay loam or heavy sandy loam. The substratum is a brown or yellowish brown loamy coarse sand or coarse sand to a depth of 60 inches or more. Substrata consisting of silt loam or sandy clay loam also occur, but are less prevalent.

The laboratory results from Teagulf Sandy Loam samples are summarized in Table 1. The term "topsoil" in this report refers to soil horizons that occur at the surface of undisturbed soils. The term "subsoil" refers to soil horizons that occur below the topsoil. All topsoil and subsoil laboratory samples were within the Suitability Criteria for topsoil listed in WDEQ-LQD Guideline No. 1



Contour = 10ft

Lost Creek ISR, LLC
Littleton, Colorado USA

AATA INTERNATIONAL, INC.
Fort Collins, Colorado, USA

- Legend**
- Pit - September 2008
 - Pit and Profile - September 2008
 - ▭ Survey Boundary
 - Plant Site (Conceptual)
- Soil Mapping Units**
- Poposhia loam, 0-1% slopes
 - Pepal sandy loam, 1-3% slopes

FIGURE 1
Teagulf Sandy Loam Sampling Locations
Lost Creek Project

Issued for: WDEQ-LQD 4.0

Issued/Revised: 24 Sep 2009 Drawn By: HN

0 0.1 Miles 1 inch = 400 feet

Table 1 Laboratory Analytical Results

Profile Number	Sample Depth (inches)	Soil Horizon	LQD Topsoil Suitability Parameters						Additional Fertility Analyses					Texture Information			
			pH (standard units)	Electrical Conductivity (mmhos/cm)	Saturation (%)	Sodium Adsorption Ratio	Selenium (ppm)	Boron (ppm)	Lime as CaCO ₃ (%)	Calcium (meq/L)	Magnesium (meq/L)	Sodium (meq/L)	Organic Matter (%)	Sand (%)	Silt (%)	Clay (%)	Texture
Teagulf Sandy Loam (about 15% of Study Area)																	
MU1PR13	0-10	A, B	7.8	0.48	27.1	0.83	<0.002	0.23	0.8	3.22	1.03	1.20	1	66	16	18	SL
MU1PR23	0-10	A, B	7.3	0.55	31.7	0.52	0.005	<0.20	1.1	3.56	1.83	0.85	0.9	68	16	16	SL
	10-60	C	8.0	1.82	30.6	4.34	0.007	0.31	0.9	7.80	3.33	10.20	0.3	82	6	12	SL
LQD Topsoil Suitability Criteria¹			5.5 - 8.5	0-8	25-80	0-10	<0.1	<5.0	-	-	-	-	-	-	-	-	-

¹ Suitability criteria are from LQD Guideline No. 1 (WDEQ-LQD, 1994). Per the August 28, 2008, e-mail from M. Moxley (see Attachment 1), particle size was not applied as a suitability criterion.

The analyzed topsoil samples had textures of sandy loam. The organic matter content in the topsoil ranged from 0.9 to 1.0 percent. Although organic matter is not a criterion, a higher organic matter content is, in general, directly related to revegetation potential. The saturation values ranged from 27 to 32 percent, which is at the lower end of the prescribed range.

The subsoil sample of the Teagulf SMU was a sandy loam from a depth interval of ten to sixty inches. The organic matter content was 0.3 percent, and not favorable to vegetation establishment. The percent saturation, 31 percent, of the subsurface sample was at the low end of the prescribed range.

Figures 2a, 2b, and 2c are photographs of the three profiles excavated in the Teagulf Sandy Loam.

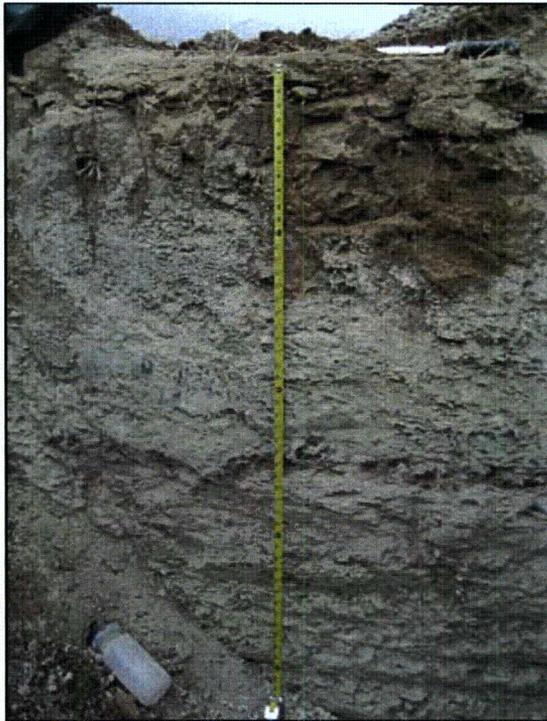


Figure 2a Soil Profile of MU1PR13

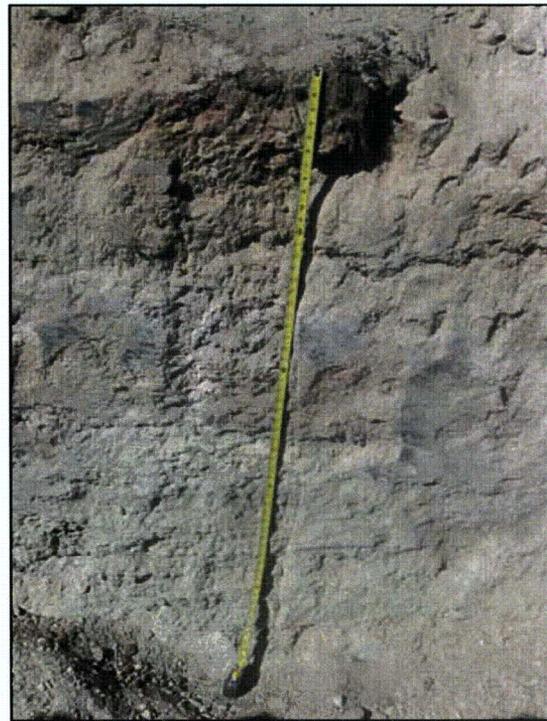


Figure 2b Soil Profile of MU1PR16

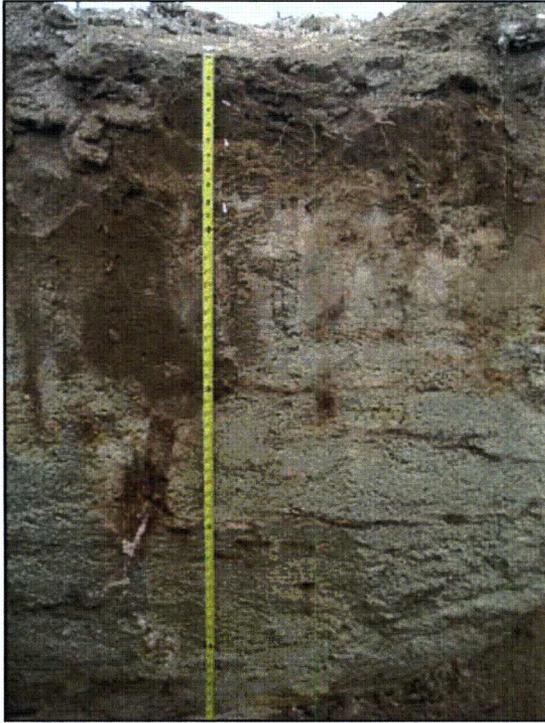


Figure 2c Soil Profile of MU1PR23

Soil Description: Location MU1PIT13
 Site No. _____ Date _____ Time 3:05 Vegetation _____
 Elevation _____ Slope _____ Aspect _____ Geomorphic Surface _____
 Parent Material(s) _____ Described by _____

Depth (cm)	Horizon	Color		Structure	Gravel %	Consistence			Texture	pH	Clay films	Bound-aries	notes
		moist	dry			Wet	Moist	Dry					
0-6 6-12		4/3 ----- 4/4		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po es ps s p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SCL LS SIL SL SI SCL SIC L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a a o o g g d d	ef=Ø Loam ef=sl H ₁ Loam
6-18 18-24		10 YR 5/4 ----- 10 YR 5/4		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po es ps s p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SCL LS SIL SL SI SCL SIC L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a a o o g g d d	ef=XV
		-----		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po es ps s p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SCL LS SIL SL SI SCL SIC L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a a o o g g d d	
		-----		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po es ps s p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SCL LS SIL SL SI SCL SIC L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a a o o g g d d	
		-----		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po es ps s p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SCL LS SIL SL SI SCL SIC L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a a o o g g d d	
		-----		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po es ps s p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SCL LS SIL SL SI SCL SIC L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a a o o g g d d	

Figure 3a Field Data sheet for MU1PR13

Soil Description: Location MUIPR16 #16 G.P.S. Recheck 9/4 point OK=16 location
 Site No. _____ Date 9/13 Time 4:45 pm Vegetation sparse Sage + grasses
 Elevation _____ Slope 5% Aspect SE Geomorphic Surface: _____
 Parent Material(s) wind + water reworked alluvial fan Described by C.P.R.

Depth (cm)	Horizon	Color		Structure	Gravel %	Consistence				Texture	pH	Clay films	Boundaries	Notes
		moist	dry			Wet	Moist	Dry						
0-6 K		10YR 3/3		m vf gr eg f pl 1 m pr 2 c cpr 3 vo ebk ebk	0 50 <10 75 10 >75 25	so po lo lo es ps vfr so s p fr sh ve vp fl h vll vh ell eh	S S1CL LS S1L SL S1 SCL S1C L C CL SC	C	v1 n pf 1 o w 2 mk br 3 co d 4 k coobr	a a o w g l d b		EF=φ		
6-12		10YR 5/4		m vf gr eg f pl 1 m pr 2 c cpr 3 vo ebk ebk	0 50 <10 75 10 >75 25	so po lo lo es ps vfr so s p fr sh ve vp fl h vll vh ell eh	S S1CL LS S1L SL S1 SCL S1C L C CL SC	H C	v1 n pf 1 o w 2 mk br 3 co d 4 k coobr	a a o w g l d b		EF=φ		
12-18	YB	10YR 5/4		m vf gr eg f pl 1 m pr 2 c cpr 3 vo ebk ebk	0 50 <10 75 10 >75 25	so po lo lo es ps vfr so s p fr sh ve vp fl h vll vh ell eh	S S1CL LS S1L SL S1 SCL S1C L C CL SC	C	v1 n pf 1 o w 2 mk br 3 co d 4 k coobr	a a o w g l d b		EF-5L		
18-21	B	7.5YR 5/3		m vf gr eg f pl 1 m pr 2 c cpr 3 vo ebk ebk	0 50 <10 75 10 >75 25	so po lo lo es ps vfr so s p fr sh ve vp fl h vll vh ell eh	S S1CL LS S1L SL S1 SCL S1C L C CL SC	C	v1 n pf 1 o w 2 mk br 3 co d 4 k coobr	a a o w g l d b		EF-V		
		-----		m vf gr eg f pl 1 m pr 2 c cpr 3 vo ebk ebk	0 50 <10 75 10 >75 25	so po lo lo es ps vfr so s p fr sh ve vp fl h vll vh ell eh	S S1CL LS S1L SL S1 SCL S1C L C CL SC		v1 n pf 1 o w 2 mk br 3 co d 4 k coobr	a a o w g l d b		Note 9/8 SC PM is probably not alluvial		
		-----		m vf gr eg f pl 1 m pr 2 c cpr 3 vo ebk ebk	0 50 <10 75 10 >75 25	so po lo lo es ps vfr so s p fr sh ve vp fl h vll vh ell eh	S S1CL LS S1L SL S1 SCL S1C L C CL SC		v1 n pf 1 o w 2 mk br 3 co d 4 k coobr	a a o w g l d b		rather sandstone- coarse grained		

Figure 3b. Field Data sheet for MUIPR16

Lost Creek Project
 WDEQ-LQD Permit to Mine Application
 Original Dec07; Rev4 Oct09

Soil Description: Location PIT23
 Site No. _____ Date 9/4 Time 2:00 Vegetation Sage/grass very sparse
 Elevation _____ Slope 0% ↓ Aspect _____ Geomorphic Surface Pit located on a broad flat
 Parent Material(s) _____ Described by Cipra very sparse veg

Depth (cm)	Horizon	Color		Structure	Gravel %	Consistence				Texture	pH	Clay films	Boundaries	notes
		moist	dry			Wet	Moist	Dry						
0-6		4/3		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	eo po es pe e p vs vp	lo vfr fr fl vll eff	lo so sh h vh eh	S BCL LS SIL SIL SI SCL SIC L C CL SO	H C	v1 n pf 1 po 2 mk br 3 co 4 k cobr	a e o w g l d b	ef=0 ef=0	
12-18		5/4		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	eo po es pe e p vs vp	lo vfr fr fl vll eff	lo so sh h vh eh	S BCL LS SIL SIL SI SCL SIC L C CL SO	H C	v1 n pf 1 po 2 mk br 3 co 4 k cobr	a e o w g l d b	ef=V V	
24-30	gc	10 yr 3/4		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	eo po es pe e p vs vp	lo vfr fr fl vll eff	lo so sh h vh eh	S BCL LS SIL SIL SI SCL SIC L C CL SO		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a e o w g l d b	sl	
30-36	vgr	2.5 yr 6/4		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	eo po es pe e p vs vp	lo vfr fr fl vll eff	lo so sh h vh eh	S BCL LS SIL SIL SI SCL SIC L C CL SO		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a e o w g l d b	vgr sl gr	
				m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	eo po es pe e p vs vp	lo vfr fr fl vll eff	lo so sh h vh eh	S BCL LS SIL SIL SI SCL SIC L C CL SO		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a e o w g l d b		
				m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	eo po es pe e p vs vp	lo vfr fr fl vll eff	lo so sh h vh eh	S BCL LS SIL SIL SI SCL SIC L C CL SO		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a e o w g l d b		

Figure 3b Field Data sheet for MU1PR23

4.0 Evaluation of Soil Suitability

The topsoil of the Teagulf Sand Loam provides a favorable medium for plant growth. The primary suitable characteristics are organic matter content and favorable water holding capacity due to texture. The Teagulf Sandy Loam provides approximately six to 15 inches of topsoil material favorable for plant growth. The salvage depth can be reliably observed in the field as a change in color from dark brown reddish-brown to very light brown or gray, accompanied by a change in texture from sandy clay loam or heavy sandy loam to loamy coarse sand or coarse sand. The stripping depth is somewhat variable, and should be guided by local conditions, as it has been during the exploration phase of the project.

Addendum OP-5a-5

Laboratory Report



ANALYTICAL SUMMARY REPORT

October 26, 2008

AATA International Inc
300 E Boardwalk Dr STE 4A
Fort Collins, CO 80525

Workorder No.: C08090808

Quote ID: C2932 - Topsoil Suitability

Project Name: Not Indicated

Energy Laboratories, Inc. received the following 13 samples from AATA International Inc on 9/19/2008 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C08090808-001	MV1PR35-0-8	09/09/08 11:20	09/19/08	Soil	Saturated Paste Electrical Conductivity Selenium, ABDTPA Extractable Metals, CaCl2 Extractable Metals, Soluble Lime as CaCO3 Organic Carbon Saturation Percentage Saturated Paste pH ABDTPA Soil Extraction CaCl2 Hot Water Soil Extraction Lime Percentage Particle Size Analysis / Texture Prep Saturated Paste Total Organic Carbon Prep Particle Size Analysis / Texture Sodium Adsorption Ratio in Soil
C08090808-002	MV1PR35-8-18	09/09/08 11:20	09/19/08	Soil	Same As Above
C08090808-003	MV1PR35-18-34	09/09/08 11:20	09/19/08	Soil	Same As Above
C08090808-004	MV1PR35-34-48	09/09/08 11:20	09/19/08	Soil	Same As Above
C08090808-005	MV1PR33-0-12	09/09/08 14:50	09/19/08	Soil	Same As Above
C08090808-006	MV1PR33-12-33	09/09/08 14:50	09/19/08	Soil	Same As Above
C08090808-007	MV1PR50-0-6	09/11/08 13:22	09/19/08	Soil	Same As Above
C08090808-008	MV1PR50-6-60	09/11/08 13:22	09/19/08	Soil	Same As Above
C08090808-009	MV1PR13-0-10	09/11/08 12:46	09/19/08	Soil	Same As Above
C08090808-010	MV1PR15-0-24	09/11/08 12:00	09/19/08	Soil	Same As Above
C08090808-011	MV1PR15-24-60	09/11/08 12:00	09/19/08	Soil	Same As Above
C08090808-012	MV1PR23-0-10	09/11/08 15:00	09/19/08	Soil	Same As Above
C08090808-013	MV1PR23-10-60	09/11/08 15:00	09/19/08	Soil	Same As Above

As appropriate, any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

If you have any questions regarding these tests results, please call.

Report Approved By:


STEVE CARLSTON

Summary Report: Page 1 of 1

LABORATORY ANALYTICAL REPORT

Client: AATA International Inc
 Project: Not Indicated
 Workorder: C08090808

Report Date: 10/26/08
 Date Received: 09/19/08



Sample ID	Client Sample ID	Analysis	EC SatPst	Saturation SatPst	Lime as CaCO3	pH SatPst	Ca SatPst	Mg SatPst	Na SatPst	SAR	Sand	Silt	Clay	Texture	Se-ABDTPA
		Units	mmhos/cm	%	%	s_u_	mcq/L	mcq/L	mcq/L	unitless	%	%	%	Results	Results
C08090808-001	MVIPR35-0-8	Results	0.78	53.8	2.0	6.1	3.84	1.70	0.17	0.10	31	44	25	L	0.011
C08090808-002	MVIPR35-8-18	Results	0.31	34.1	1.1	6.5	1.86	0.86	0.20	0.17	38	40	22	L	0.005
C08090808-003	MVIPR35-18-34	Results	2.77	43.2	1.3	6.3	1.98	0.8	0.3	0.25	28	44	28	CL	0.009
C08090808-004	MVIPR35-34-48	Results	0.53	40.7	1.2	6.6	3.21	1.38	0.41	0.27	44	33	23	L	0.004
C08090808-005	MVIPR33-0-12	Results	0.39	27.1	1.1	7.0	2.77	1.16	0.55	0.39	58	24	18	SL	< 0.002
C08090808-006	MVIPR33-12-33	Results	0.51	34.4	0.9	7.0	3.26	1.42	1.03	0.68	84	4	12	LS	< 0.002
C08090808-007	MVIPR50-0-6	Results	0.47	41.5	1.0	7.8	2.54	1.13	1.13	0.84	72	10	18	SL	0.007
C08090808-008	MVIPR50-6-60	Results	0.47	35.1	0.7	7.7	2.94	1.30	0.70	0.48	80	8	14	SL	0.005
C08090808-009	MVIPR13-0-10	Results	0.48	27.1	0.8	7.8	3.22	1.03	1.20	0.83	66	16	18	SL	< 0.002
C08090808-010	MVIPR15-0-24	Results	0.52	37.0	1.0	7.6	4.02	1.85	0.44	0.28	42	38	20	L	0.003
C08090808-011	MVIPR15-24-60	Results	0.57	31.6	0.7	6.9	4.14	1.69	0.58	0.34	52	28	20	L	0.004
C08090808-012	MVIPR23-0-10	Results	0.55	31.7	1.1	7.3	3.56	1.83	0.85	0.52	68	16	16	SL	0.005
C08090808-013	MVIPR23-10-60	Results	1.82	30.6	0.9	8.0	7.80	3.33	10.2	4.34	82	6	12	SL	0.007

ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (28201) • P.O. Box 2258 • Casper, WY 82602
 Toll Free 888.236.0515 • 307.236.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

LABORATORY ANALYTICAL REPORT

Client: AATA International Inc
 Project: Not Indicated
 Workorder: C08090808

Report Date: 10/26/08
 Date Received: 09/19/08



ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (28801) • P.O. Box 3238 • Casper, WY 82402
 Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

Sample ID	Client Sample ID	Analysis	B-CACL2	Organic
		Units	mg/kg-dry	Matter
		Results	Res	uts
C08090808-001	MV1PR35-0-8		0.78	5.8
C08090808-002	MV1PR35-8-18		0.21	1.2
C08090808-003	MV1PR35-18-34		0.27	0.9
C08090808-004	MV1PR35-34-48		0.22	0.7
C08090808-005	MV1PR33-0-12		< 0.20	0.8
C08090808-006	MV1PR33-12-33		< 0.20	0.5
C08090808-007	MV1PR50-0-6		< 0.20	1.5
C08090808-008	MV1PR50-6-60		< 0.20	0.5
C08090808-009	MV1PR13-0-10		0.23	1.0
C08090808-010	MV1PR15-0-24		0.63	2.4
C08090808-011	MV1PR15-24-60		0.29	0.9
C08090808-012	MV1PR23-0-10		< 0.20	0.9
C08090808-013	MV1PR23-10-60		0.31	0.3



QA/QC Summary Report

Client: AATA International Inc
 Project: Not Indicated

Report Date: 10/26/08
 Work Order: C08090808

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: ASA15-6							Batch: 20140		
Sample ID: LCS-20140	Laboratory Control Sample				Run: PSA_081017A		10/17/08 07:01		
Sand	90.0	%	1.0	93	85	115			
Sample ID: C08091132-001ADUP	Sample Duplicate				Run: PSA_081017A		10/17/08 07:02		
Sand	76.0	%	1.0				0	20	
Silt	16.0	%	1.0				0	20	
Clay	8.00	%	1.0				0	20	
Method: ASA29-3							Batch: 20046		
Sample ID: MBLK-1	Method Blank				Run: HACH DR3000_081009C		10/09/08 14:03		
Organic Carbon, Total (TOC)	ND	%	0.02						
Organic Matter, Total (TOM)	ND	%	0.03						
Sample ID: LCS-2	Laboratory Control Sample				Run: HACH DR3000_081009C		10/09/08 14:03		
Organic Carbon, Total (TOC)	1.5	%	0.10	106	70	120			
Organic Matter, Total (TOM)	2.6	%	0.17	102	70	120			
Sample ID: C08091057-007ADUP	Sample Duplicate				Run: HACH DR3000_081009C		10/09/08 14:07		
Organic Carbon, Total (TOC)	0.060	%	0.10				0	20	
Organic Matter, Total (TOM)	0.10	%	0.17				0	20	
Method: ASAM10-3							Batch: 20053		
Sample ID: LCS-20053	Laboratory Control Sample				Run: COND1-C_081010A		10/10/08 07:21		
Conductivity, paste extract	3.13	mmhos/cm	0.010	101	70	130			
Sample ID: C08090808-013ADUP	Sample Duplicate				Run: COND1-C_081010A		10/10/08 07:24		
Conductivity, paste extract	1.80	mmhos/cm	0.010				0.9	20	
Method: ASAM10-3.2							Batch: 20053		
Sample ID: LCS-20053	Laboratory Control Sample				Run: COND1-C_081010A		10/10/08 07:21		
pH, sat. paste	2.1	s.u.	0.10	91	80	120			
Sample ID: C08090808-013ADUP	Sample Duplicate				Run: COND1-C_081010A		10/10/08 07:24		
pH, sat. paste	8.1	s.u.	0.10				1	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.



QA/QC Summary Report

Client: AATA International Inc
 Project: Not Indicated

Report Date: 10/26/08
 Work Order: C08090808

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6010B Batch: 19918									
Sample ID: MB-19918	Method Blank								
Boron	ND	mg/kg-dry	0.09						09/30/08 23:37
Run: ICP2-C_080930A									
Sample ID: LCS-19918	Laboratory Control Sample								
Boron	1.3	mg/kg-dry	0.20	98	80	120			09/30/08 23:41
Run: ICP2-C_080930A									
Sample ID: C08090808-013AMS	Sample Matrix Spike								
Boron	1.6	mg/kg-dry	0.20	94	80	120			10/01/08 00:55
Run: ICP2-C_080930A									
Sample ID: C08090808-013AMSD	Sample Matrix Spike Duplicate								
Boron	1.6	mg/kg-dry	0.20	97	80	120	2		10/01/08 00:59 20
Run: ICP2-C_080930A									
Method: SW6010B Batch: 20053									
Sample ID: MB-20053	Method Blank								
Calcium	ND	mg/L	0.2						10/13/08 23:17
Magnesium	ND	mg/L	0.2						
Sodium	ND	mg/L	0.3						
Calcium, sat. paste	ND	meq/L	0.008						
Magnesium, sat. paste	ND	meq/L	0.02						
Sodium, sat. paste	ND	meq/L	0.01						
Run: ICP2-C_081013A									
Sample ID: LCS-20053	Laboratory Control Sample								
Calcium	61.7	mg/L	0.50	123	70	130			10/13/08 23:21
Magnesium	62.3	mg/L	0.50	125	70	130			
Sodium	51.3	mg/L	0.50	103	70	130			
Run: ICP2-C_081013A									
Sample ID: C08090808-001AMS2	Sample Matrix Spike								
Calcium	183	mg/L	0.50	212	75	125			10/13/08 23:30 S
Magnesium	129	mg/L	0.50	217	75	125			S
Sodium	106	mg/L	0.54	204	75	125			S
Run: ICP2-C_081013A									
Sample ID: C08090808-001AMSD2	Sample Matrix Spike Duplicate								
Calcium	190	mg/L	0.50	227	75	125	4.2		10/13/08 23:34 20 S
Magnesium	134	mg/L	0.50	226	75	125	3.4		20 S
Sodium	105	mg/L	0.54	203	75	125	0.6		20 S
Run: ICP2-C_081013A									
Sample ID: C08090808-013ADUP	Sample Duplicate								
Calcium	146	mg/L	0.79				6.7		10/14/08 00:55 20
Magnesium	37.0	mg/L	0.95				7.8		20
Sodium	227	mg/L	1.3				3.3		20
Calcium, sat. paste	7.29	meq/L	0.040						
Magnesium, sat. paste	3.08	meq/L	0.080						
Sodium, sat. paste	9.89	meq/L	0.058						
Run: ICP2-C_081013A									

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.



QA/QC Summary Report

Client: AATA International Inc
 Project: Not Indicated

Report Date: 10/26/08
 Work Order: C08090808

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW7742									Batch: 19919
Sample ID: MB-19919	Method Blank						Run: CVAA-C202_081001B		10/01/08 15:06
Selenium	ND	mg/kg-dry	0.001						
Sample ID: LCS-19919	Laboratory Control Sample						Run: CVAA-C202_081001B		10/01/08 15:15
Selenium	0.272	mg/kg-dry	0.0020	80	80	120			
Sample ID: C08090808-013AMSD	Sample Matrix Spike Duplicate						Run: CVAA-C202_081001B		10/01/08 16:00
Selenium	0.392	mg/kg-dry	0.0040	116	80	120	2.7	20	
Sample ID: C08090808-013AMS	Sample Matrix Spike						Run: CVAA-C202_081001B		10/01/08 16:04
Selenium	0.382	mg/kg-dry	0.0040	113	80	120			
Method: USDA23c									Batch: 19920
Sample ID: MB-19920	Method Blank						Run: ORION 3 STAR PH_080927A		09/27/08 11:44
Lime as CaCO3	0.2	%	0.1						
Sample ID: LCS-19920	Laboratory Control Sample						Run: ORION 3 STAR PH_080927A		09/27/08 11:45
Lime as CaCO3	2.75	%	0.10	102	70	120			
Sample ID: C08090808-013ADUP	Sample Duplicate						Run: ORION 3 STAR PH_080927A		09/27/08 11:58
Lime as CaCO3	0.744	%	0.10				18	20	
Method: USDA27a									Batch: R109023
Sample ID: LCS-20053	Laboratory Control Sample						Run: SARTORIUS_081010A		10/08/08 15:42
Saturation Percentage	49.3	%	0.10	99	80	120			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.



Chain of Custody and Analytical Request Record

PLEASE PRINT. Provide as much information as possible.

Company Name: AATA INT'L	Project Name, PWS, Permit, Etc.	Sample Origin State:	EPA/State Compliance: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Report Mail Address: 2240 BLAKE ST. STE 210 DENVER, CO 80205	Contact Name: ETHAN BROWN	Phone/Fax: 720-974-2550	Email: ethan.brown@ata2.com
Invoice Address: SAME	Invoice Contact & Phone:	Purchase Order: 301-805	Quote/Bottle Order: C2932

Special Report/Formats – ELI must be notified prior to sample submittal for the following:			ANALYSIS REQUESTED	SEE ATTACHED	Normal Turnaround (TAT)	RUSH	Contact ELI prior to RUSH sample submittal for charges and scheduling – See instruction Page	Shipped by: DIE
<input type="checkbox"/> DW <input type="checkbox"/> A2LA <input type="checkbox"/> GSA <input type="checkbox"/> EDD/EDT (Electronic Data) <input type="checkbox"/> POTW/WWTP Format: _____ <input type="checkbox"/> State: _____ <input type="checkbox"/> LEVEL IV <input type="checkbox"/> Other: _____ <input type="checkbox"/> NELAC							Number of Containers Sample Type: A W S V B O Air Water Soils/Solids Vegetation Egressway Other	Comments:
SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX					Custody Seal Intact <input checked="" type="checkbox"/> N Signature Match <input checked="" type="checkbox"/> N
1 MU1 PR35-0-8	9/9/08	11:20	S					
2 MU1 PR35-8-18	9/9/08	11:26						
3 MU1 PR35-18-34	9/9/08	11:20						
4 MU1 PR35-34-48	9/9/08	11:20						
5 MU1 PR35-0-12	9/9/08	14:50						
6 MU1 PR35-12-33	9/9/08	14:50						
7 MU1 PR50-0-6	9/11/08	13:22						
8 MU1 PR50-6-60	9/11/08	13:22						
9								
10								

Custody Record MUST be Signed	Relinquished by (print): DWIGHT ELLIOTT	Date/Time: 9/12/08	Signature: <i>[Signature]</i>	Received by (print): ETHAN BROWN	Date/Time: 9-20-08 10:20	Signature: <i>[Signature]</i>
	Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
	Sample Disposal: Return to Client:	Lab Disposal: <input checked="" type="checkbox"/>	Received by Laboratory:	Date/Time:	Signature:	

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report. Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

Attachment OP-5b

**Lost Creek Project
Order 1 Soil Survey - Deep Well Sites & Corridors
September 2009**

TABLE OF CONTENTS

1.0	Introduction.....	1
2.0	Methodology.....	1
2.1	Laboratory Analysis.....	2
3.0	Results and Discussion	2

FIGURES

Figure OP-5b-1 Sampling Locations Map

ADDENDA

Addendum OP-5b-1 Field Photographs

ABBREVIATIONS AND ACRONYMS

AATA	AATA International, Inc.
GIS	Geographic Information System
LQD	Land Quality Division
NCSS	National Cooperative Soil Survey
NRCS	National Resource Conservation Service
Permit Area	Lost Creek Permit Area
Project	Lost Creek Project
SMU	Soil Mapping Unit
TFN	Temporary Filing Number
WDEQ	Wyoming Department of Environmental Quality

1.0 Introduction

The Lost Creek Project (Project), a proposed in-situ uranium mine, is located in Sweetwater County, on the northeastern edge of the Great Divide Basin of south-central Wyoming, approximately 38 miles northwest of Rawlins. This report describes the soils at the Plant site of the Lost Creek Permit Area (Permit Area; **Figure OP-5b-1**).

Soils in Sweetwater County have not been mapped as part of the National Cooperative Soil Survey (NCSS), although two empirical studies were conducted at the 1:100,000 and the 1:500,000 scales (Munn and Arneson, 1998 and 1999). AATA International, Inc. (AATA) of Fort Collins, Colorado completed an Order 3 field survey of the Permit Area in the summer of 2006. The results of the Order 3 survey were submitted to the Land Quality Division (LQD) of the Wyoming Department of Environmental Quality (WDEQ) in December 2007 as **Appendix D7** of the Lost Creek Permit application (LQD Temporary Filing Number [TFN] 4 6/269).

In accordance with LQD Guideline No. 1 (WDEQ-LQD, 1994), a more detailed Order 1 soil survey is needed for the portions of the Permit Area where mining-related surface disturbance is proposed. The Plant site is one of the first proposed surface disturbance areas of the Project; therefore, an Order 1 soil survey was conducted at the Plant site in September 2008; these results are included in the WDEQ Permit Application as Operations Plan **Attachment OP-5a**. An Order 1 soil survey was conducted concurrently for Mine Unit 1, another area of proposed disturbance, which will be summarized in the Mine Unit One package. The most recent Order 1 soil survey occurred in September, 2009. This survey included areas where the surface will be disturbed by deep injection wells or road/pipeline corridors. Laboratory analysis is not yet complete. This report will be updated when the laboratory results are available.

2.0 Methodology

The Order 1 soil survey work plan was developed based on LQD Guideline No. 1 (WDEQ-LQD, 1994). The soil survey was conducted according to protocols in the National Soil Survey Handbook, which provides the major principles and practices used in standard soil surveys (Soil Survey Staff, 1993). Information was recorded on Soil Description Field Sheets.

The study area included four deep injection well sites, connecting roadways (where present), and a corridor for a pipeline and road (**Figure OP-A5b-1**). The total study area

is approximately 55 acres. The study area is somewhat larger than the anticipated disturbance area to ensure adequate coverage.

The Order 1 soil survey fieldwork was completed in September 2009 by Jim Nyenhuis under the supervision of AATA. In preparation for the survey, Nyenhuis reviewed field photographs, laboratory data, and previous reports in order to become familiar with existing knowledge of site soils.

The field survey began on September 8 2009 with the examination of unused dry mud pits as examples of site soil profiles. Fifteen locations were selected for excavation, based on site topography and surface conditions. Sampling locations are shown in **Figure OP-5b-1**. These locations were excavated to a depth of 60 inches, or to the C horizon, by a backhoe on September 9 through 11. Each excavation was approximately 15 feet in length, five feet in depth, and four to five feet in width, and oriented to provide good lighting on the north soil face for descriptions and pictures. The bottom of each profile was flat for a length of five feet, with a slope at one end for access. Each of the profiles was described and sampled. Photographs of the soil profiles are included as **Addendum OP-5b-1**.

Four or five horizons or sub-horizons were described and sampled at each soil profile. The upper and lower boundary of each layer was delineated, and then representative, depth-integrated samples were collected by scraping the exposed soil into a container. Samples were prepared on-site, and labeled with a unique identification code. For QA/QC purposes, one sample each day was split, and each subsample submitted to the laboratory with a unique identification code.

2.1 Laboratory Analysis

All samples collected from the study area were sent to the Colorado State University Soils Lab, in Ft Collins, Colorado in September 2009 for analysis. One deep well site was relocated, so SEPADPR-1 was no longer within the study area; samples from this site were not analyzed. Laboratory analyses included the topsoil suitability criteria noted in LQD Guideline No. 1, soil texture, and soil fertility parameters.

3.0 Results and Discussion

Three soil types were identified during the Order 1 surveys in 2008 and 2009, and these three soil types can generally be identified by surface indicators. Pepal Sandy Loam is the dominant soil type, found in areas of upland big sagebrush habitat, where sagebrush is moderate to dense. The Poposhia Loam is found exclusively in drainages, where there is

Lowland Big Sagebrush habitat and dense, larger sagebrush. The Teagulf Sandy Loam occurs in upland areas on subtle ridges and west-facing slopes where the sagebrush is sparse, cushion plants are common, and there is a concentration of pebbles and gravels on the soil surface due to aeolian erosion.

This abbreviated report is intended to keep DEQ personnel updated regarding the progress of on-site soil studies. A comprehensive report will be submitted once lab results become available. No soil types, other than the three described above, were found during the September 2009 Order 1 soil survey of the deep well sites and associated corridors.

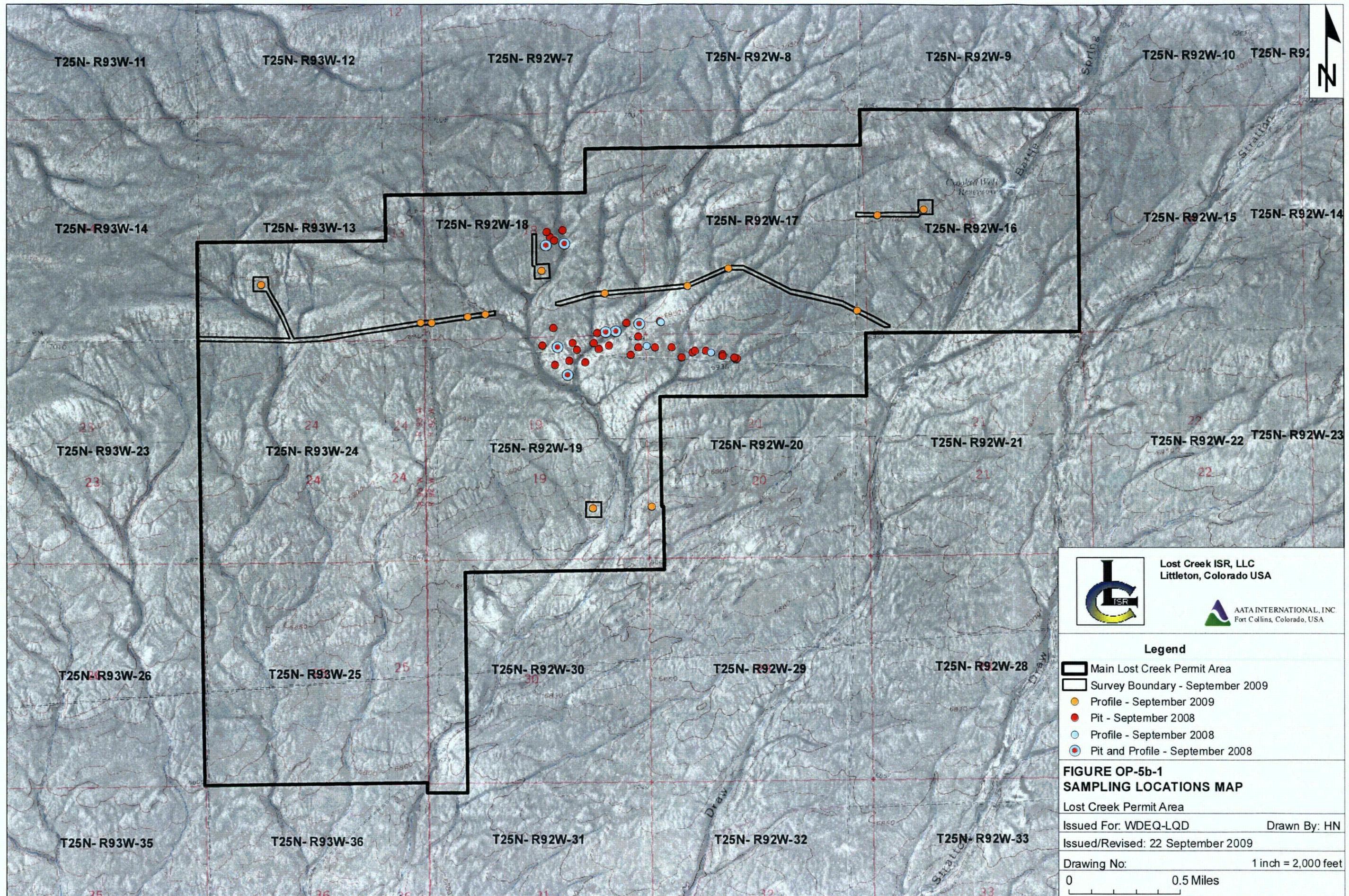
REFERENCES

Munn LC, Arneson CS. 1998. Soils of Wyoming: A digital statewide map at 1:500,000 scale. Agr. Expt. Sta. Rpt. B-1069. University of Wyoming, College of Agriculture, Laramie (WY).

Munn LC, Arneson CS. 1999. Soils of Wyoming: A digital statewide map at 1:100,000 scale. Agr. Expt. Sta. Rpt. B-1071. University of Wyoming, College of Agriculture, Laramie (WY).

Soil Survey Staff. 1993. National Soil Survey Handbook. Soil Conservation Service. US Department of Agriculture. Washington (DC). Handbook 18. Title 430-VI.

WDEQ-LQD. 1994. Guideline No. 1, Topsoil and Overburden. Cheyenne (WY). Available from: <http://deq.state.wy.us/lqd/guidelns/guide1.pdf>. Accessed on 21 July 2009.



Lost Creek ISR, LLC
Littleton, Colorado USA



AATA INTERNATIONAL, INC.
Fort Collins, Colorado, USA

Legend

- Main Lost Creek Permit Area
- Survey Boundary - September 2009
- Profile - September 2009
- Pit - September 2008
- Profile - September 2008
- Pit and Profile - September 2008

**FIGURE OP-5b-1
SAMPLING LOCATIONS MAP**

Lost Creek Permit Area

Issued For: WDEQ-LQD

Drawn By: HN

Issued/Revised: 22 September 2009

Drawing No:

1 inch = 2,000 feet

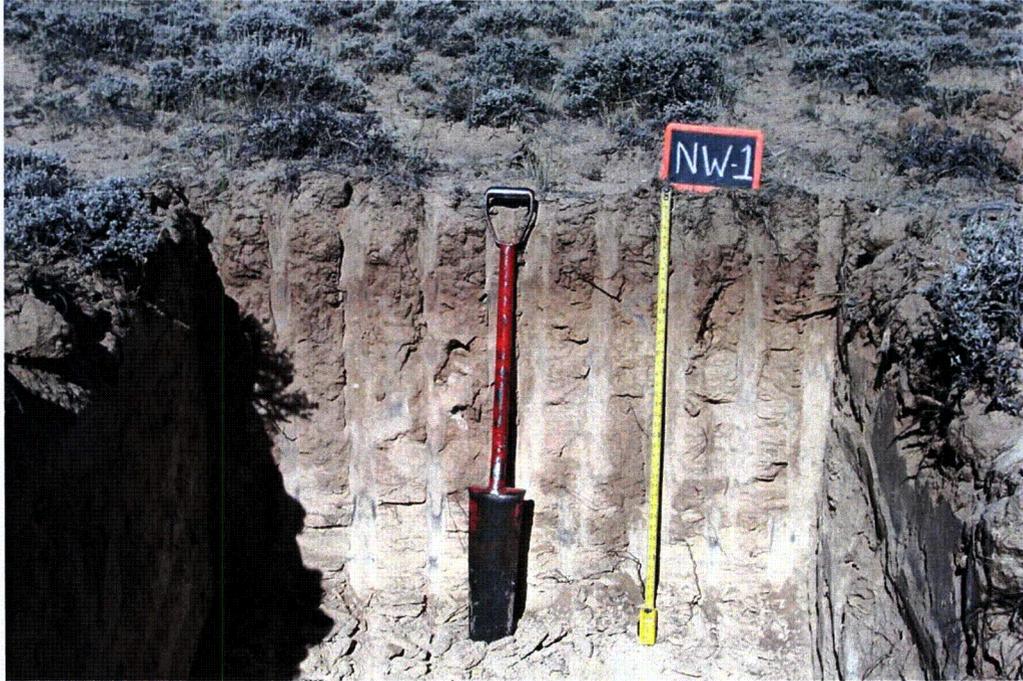
0 0.5 Miles

Addendum OP-5b-1
Field Photographs

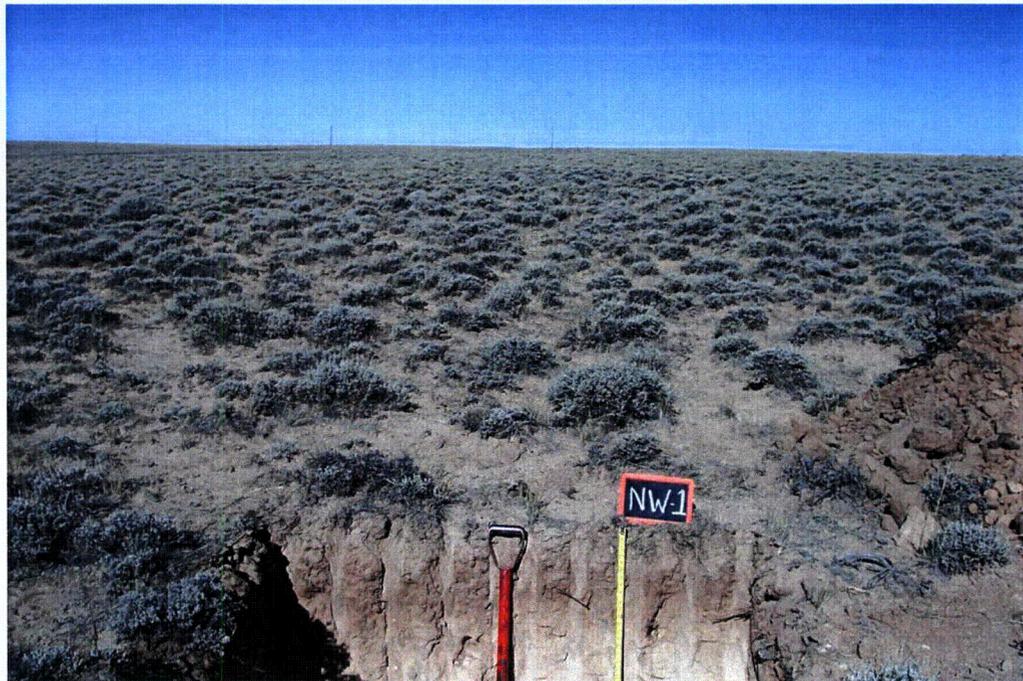
Order 1 Soil Survey Photolog

No.	File Name	Easting	Northing	Date	Description
1	019_19	261463	4668821	13-Sep-09	Photo of NWPadPr1 pit
2	023_23	261463	4668821	13-Sep-09	Photo of NWPadPr1 landscape
3	034_34	263500	4668834	13-Sep-09	Photo of NCPadPr1 landscape
4	038_38	263500	4668834	13-Sep-09	Photo of NCPadPr1 pit
5	046_46	264221	4667085	13-Sep-09	Photo of SEPadPr1 pit
6	049_49	264221	4667085	13-Sep-09	Photo of SEPadPr1 landscape
7	057_57	266288	4669157	13-Sep-09	Photo of NEPadPr1 landscape
8	062_62	266288	4669157	13-Sep-09	Photo of NEPadPr1 pit
9	067_67	265955	4669129	13-Sep-09	Photo of NEPadPr2 pit
10	070_70	265955	4669129	13-Sep-09	Photo of NEPadPr2 landscape
11	074_74	262682	4668495	13-Sep-09	Photo of EWPadPr2 pit
12	077_77	262682	4668495	13-Sep-09	Photo of EWPadPr2 landscape
13	082_82	262604	4668494	13-Sep-09	Photo of EWPadPr1 pit
14	099_99	263079	4668535	13-Sep-09	Photo of EWPadPr4 pit
15	105_105	263946	4668649	13-Sep-09	Photo of EWPadPr5 pit
16	106_106	263946	4668649	13-Sep-09	Photo of EWPadPr5 landscape
17	110_110	264859	4668795	13-Sep-09	Photo of EWPadPr7 pit
18	113_113	264859	4668795	13-Sep-09	Photo of EWPadPr7 landscape
19	121_121	264554	4668677	13-Sep-09	Photo of EWPadPr6 pit
20	123_123	264554	4668677	13-Sep-09	Photo of EWPadPr6 landscape
21	127_127	265777	4668445	13-Sep-09	Photo of EWPadPr8 pit
22	129_129	265777	4668445	13-Sep-09	Photo of EWPadPr8 landscape
23	133_133	263794	4667093	13-Sep-09	Photo of SEPad2Pr1 landscape
24	136_136	263794	4667093	13-Sep-09	Photo of SEPad2Pr1 pit

Photos by J. Nyenhuis



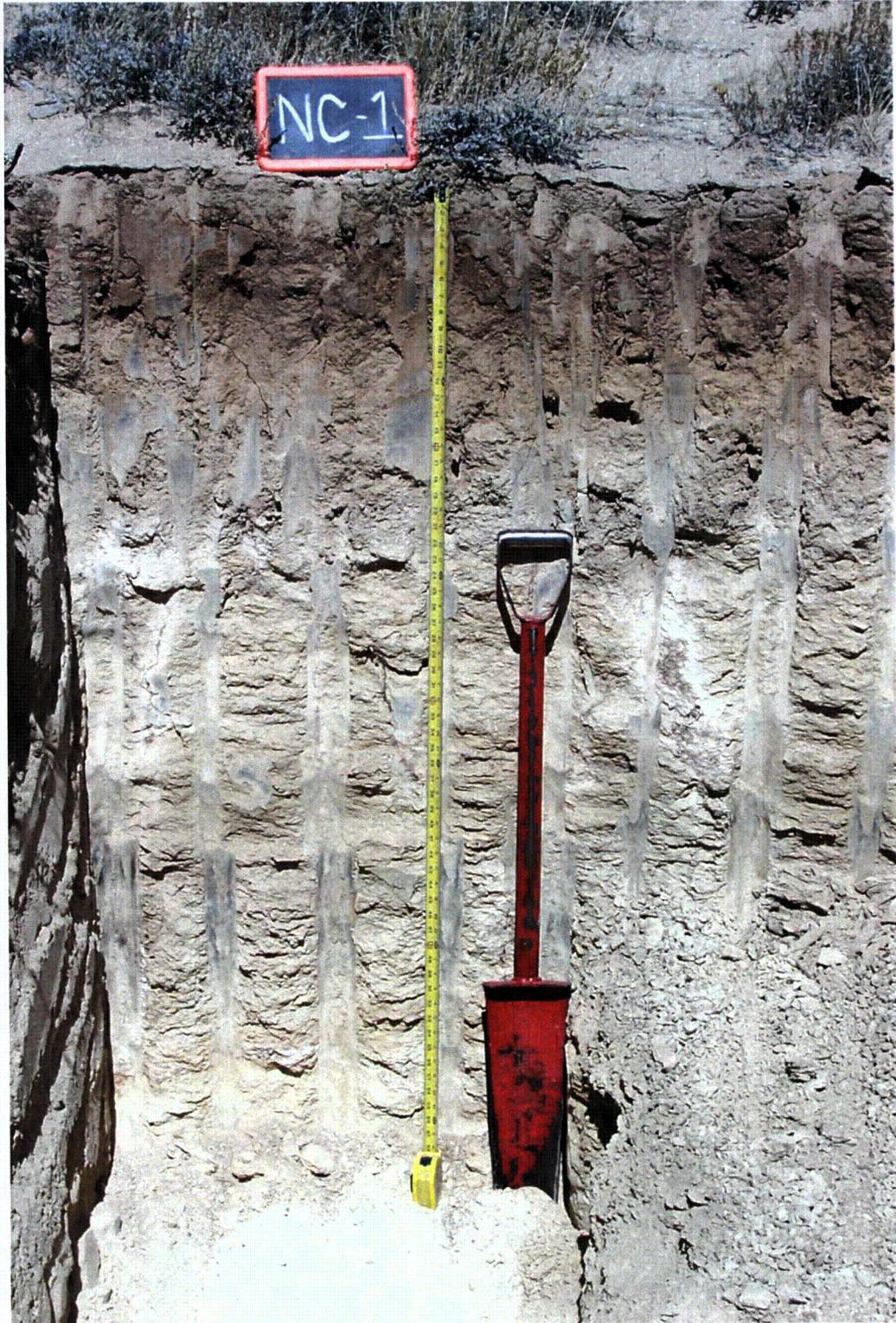
1. Photo of NWPadPr1 pit.



2. Photo of NWPadPr1 landscape.



3. Photo of NCPadPr1 landscape.



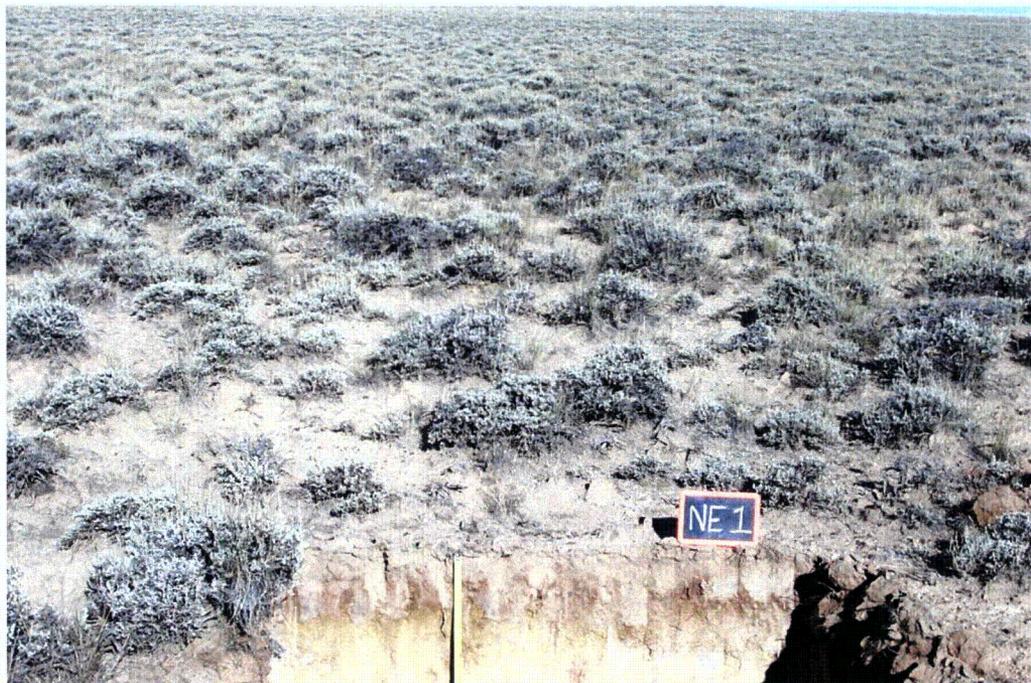
4. Photo of NCPadPr1 pit.



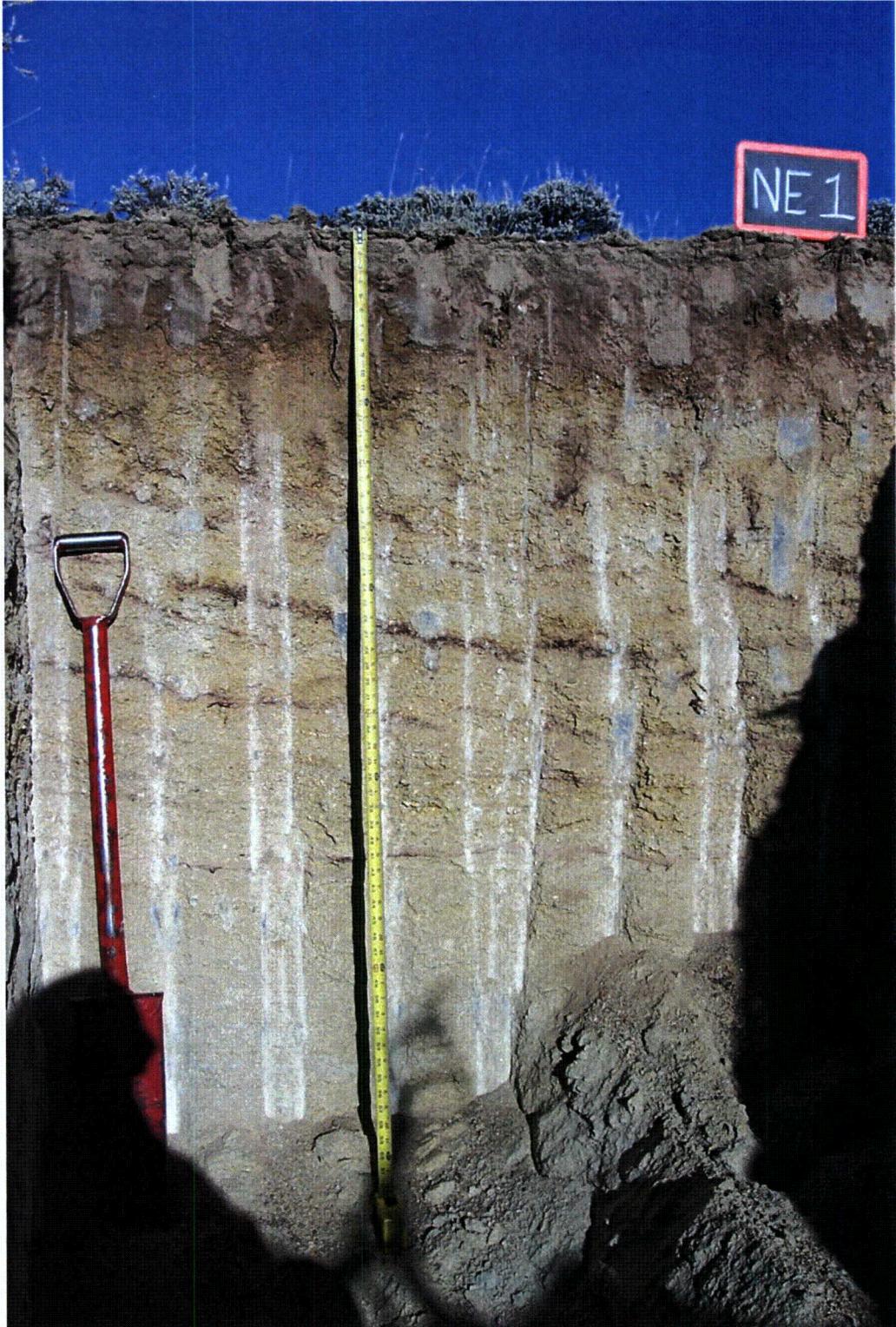
5. Photo of SEPadPr1 pit.



6. Photo of SEPadPr1 landscape.



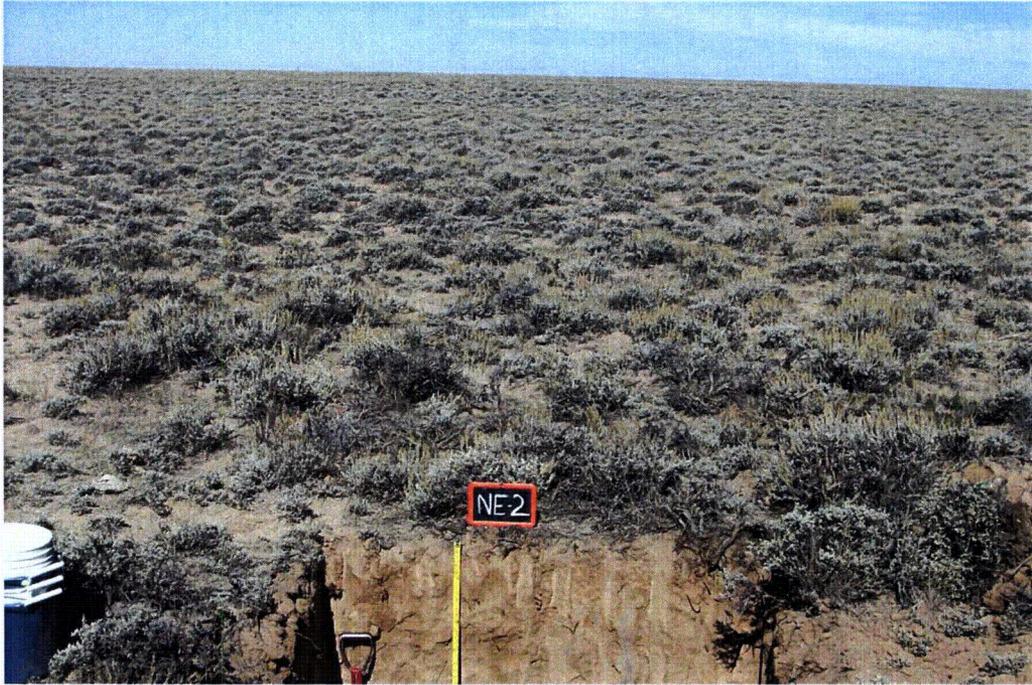
7. Photo of NEPadPr1 landscape.



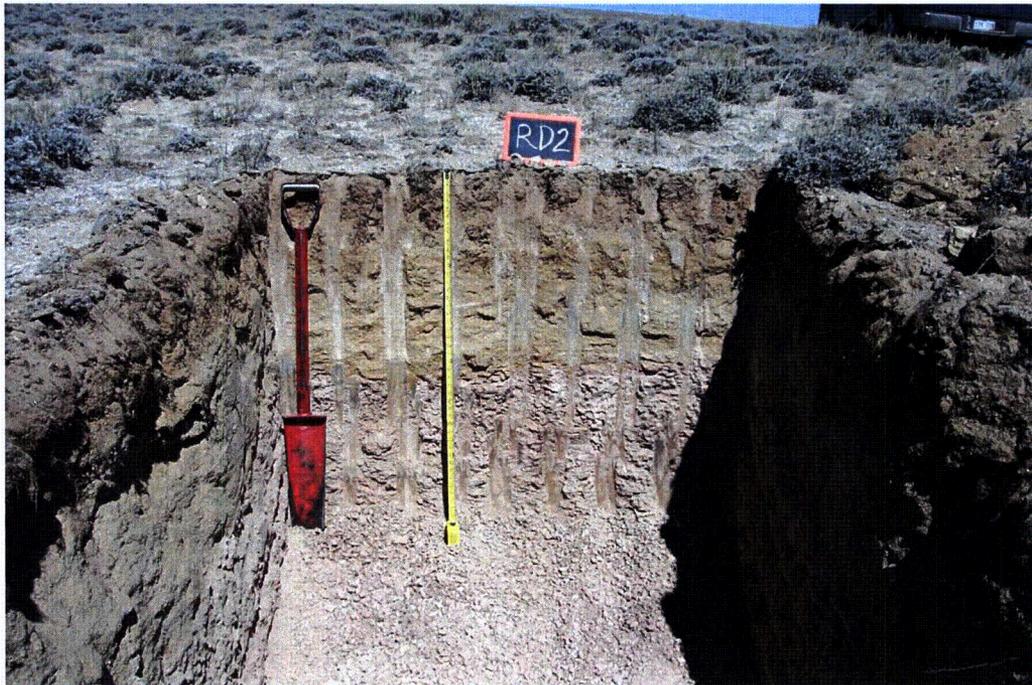
8. Photo of NEPadPr1 pit.



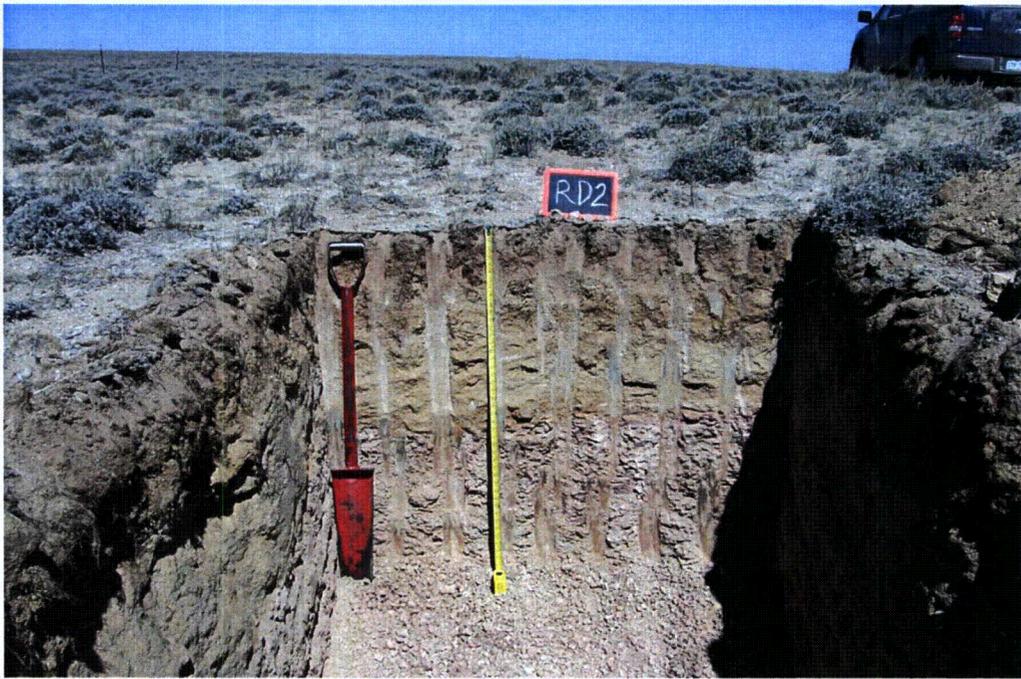
9. Photo of NEPadPr2 pit.



10. Photo of NEPadPr2 landscape.



11. Photo of EWPadPr2 pit.



12. Photo of EWPadPr2 landscape.



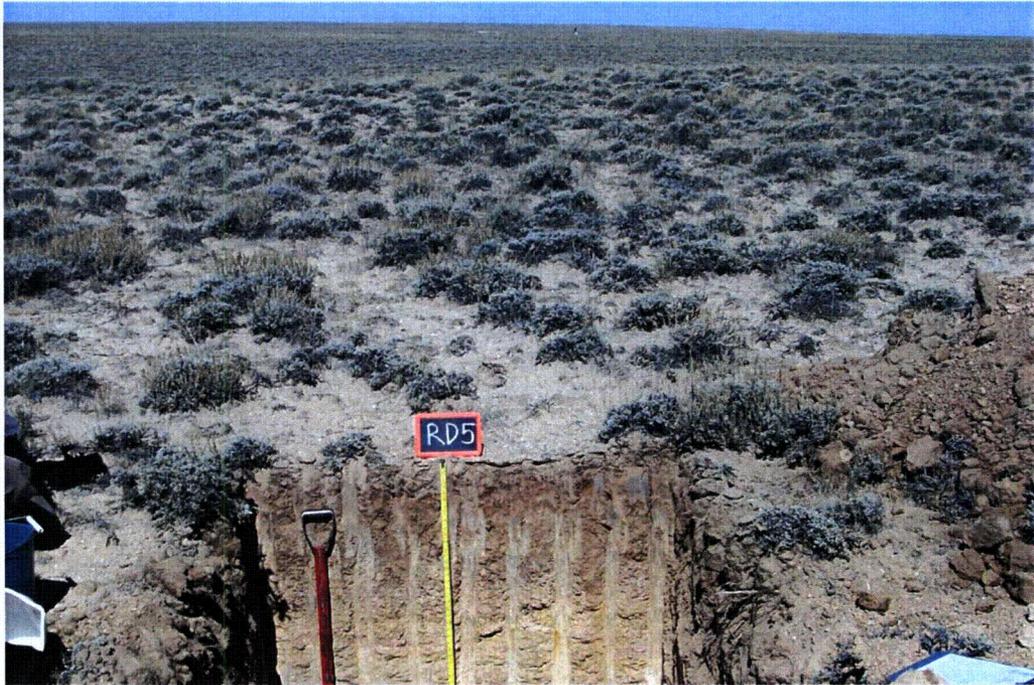
13. Photo of EWPadPr1 pit.



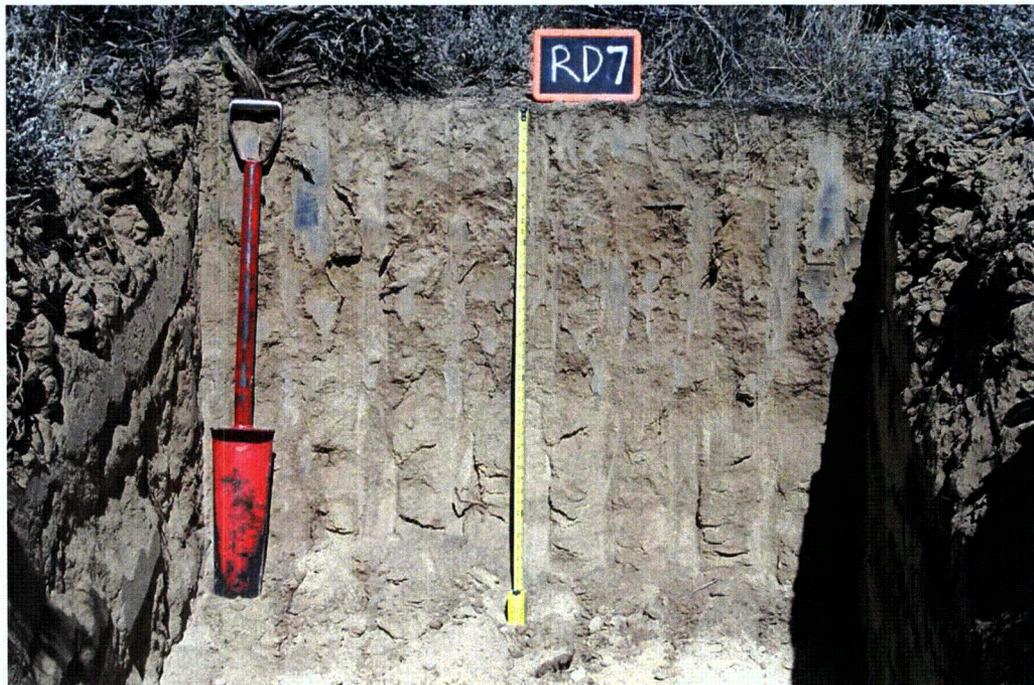
14. Photo of EWPadPr4 pit.



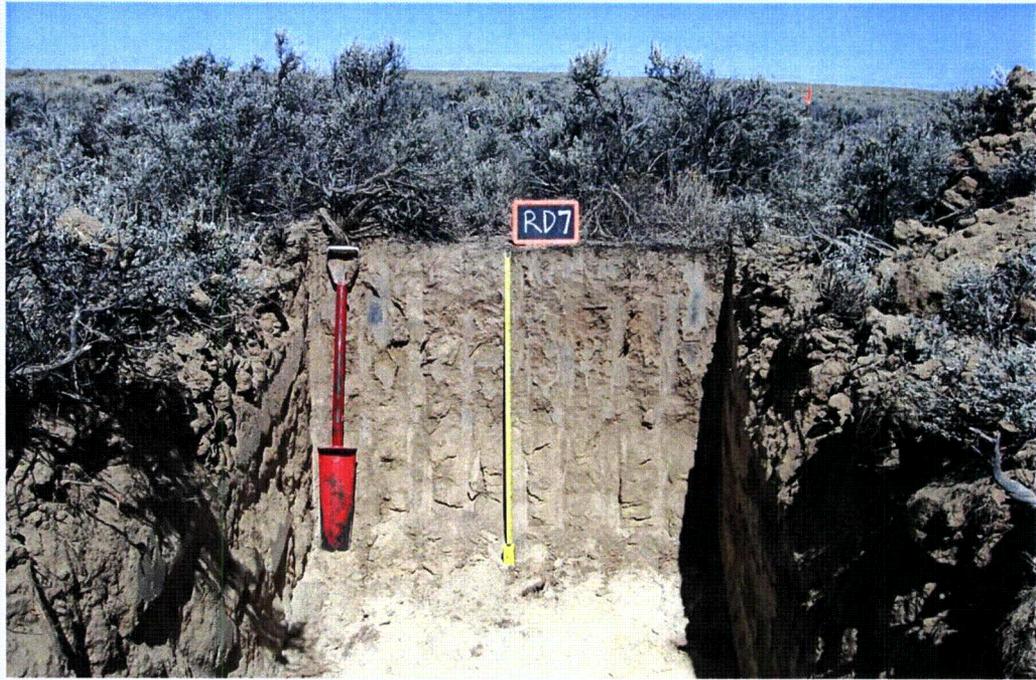
15. Photo of EWPadPr5 pit.



16. Photo of EWPadPr5 landscape.



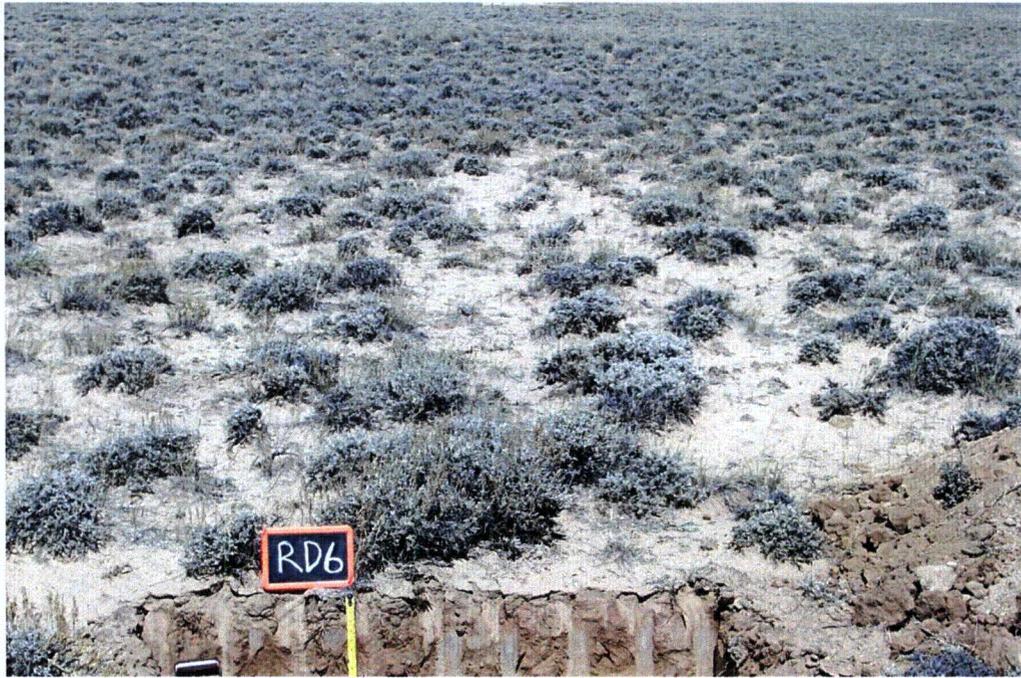
17. Photo of EWPadPr7 pit.



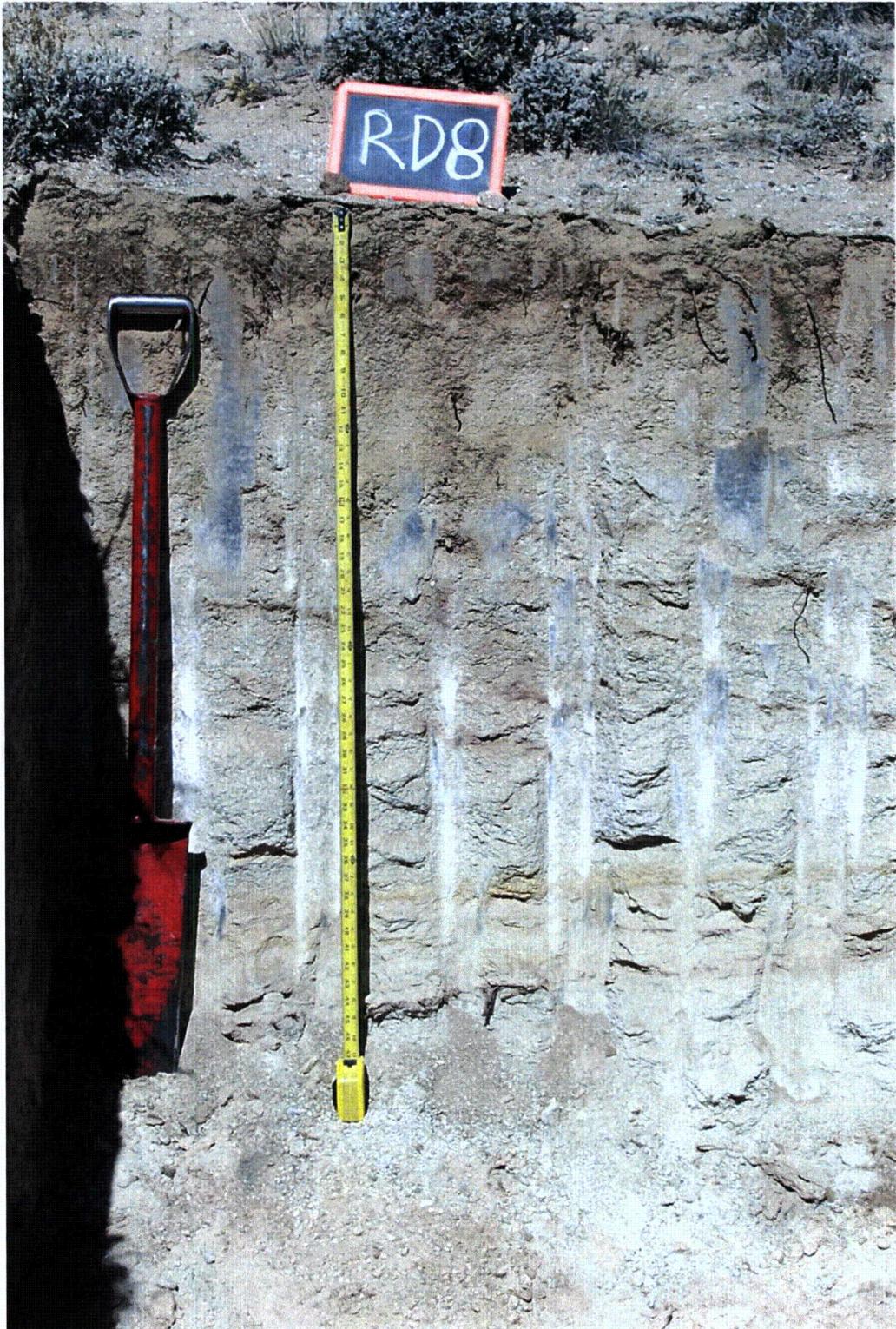
18. Photo of EWPadPr7 landscape.



19. Photo of EWPadPr6 pit.



20. Photo of EWPadPr6 landscape.



21. Photo of EWPadPr8 pit.



22. Photo of EWPadPr8 landscape.



23. Photo of SEPad2Pr1 landscape.



24. Photo of SEPad2Pr1 pit.