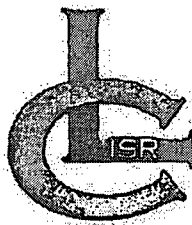


COLORADO OFFICE
10758 W. CENTENNIAL RD., STE. 200
LITTLETON, CO 80127
TEL: (866) 981-4588
FAX: (720) 981-5643



WYOMING OFFICE
5880 ENTERPRISE DR., STE. 200
CASPER, WY 82609
TEL: (307) 265-2373
FAX: (307) 265-2801

LOST CREEK ISR, LLC

August 4, 2008

Melissa L. Bautz
Senior Environmental Analyst
State of Wyoming Dept. of Environmental Quality
Land Quality Division
510 Meadowview Drive
Lander, WY 82520

Re: Drilling Notification No. 334DN; Revision to Update 4

Dear Mrs. Bautz,

Recently, BLM determined an Environmental Assessment (EA) is necessary before approving certain construction aspects of Lost Creek ISR, LLC's (LC ISR) application dated June 5, 2008. However, LC ISR is currently involved in the EA process with the Nuclear Regulatory Commission for this property and does not wish to initiate a redundant EA at this time. Therefore, please find behind this cover letter an Updated Plan of Operations without the activities which require an EA. Specifically, this Update will add the installation of the Deep Exploration Well.

An updated Form 9 covering the work proposed in the updated Plan of Operations, an area map, and a table detailing the remaining bond for each DN Update is included with this letter. The additional 10% fuel contingency and increase in revegetation costs is applied to Updates 3 and 4 since most of this work has not been performed yet. The total number of monitor wells has been significantly reduced from earlier conservative numbers that were developed before the exact shape of the first mine unit was known. The total bond required to reclaim the entire site, inclusive of any disturbance created by Update 4, is \$1,088,800. A bond of \$968,000 is currently in place so an additional \$120,800 will need to be posted.

As discussed during our June 25th meeting at the WDEQ-LQD Lander Field Office, please find enclosed a Monitor Well Plan for Mine Unit 1. The bond for the monitor well was previously approved and work has been initiated on installing the outer ring of monitor wells.

Finally, as requested during our June 25th meeting, please find below additional information regarding the installation of the deep exploration well. The well is being installed for the purposes of mineral exploration and to gain a better understanding of geologic conditions.

The surface hole (approximately 3,000 feet) likely will be drilled with fresh water and sweeps of gel (bentonite). The production hole (3,000 to approximately 11,000 feet) will be drilled with low-solids non-dispersed mud typical of oil and gas wells drilled in Wyoming. Additives to maintain fluid properties will depend on mud and hole condition. Significant lost circulation is not anticipated, but if encountered would be handled with conventional additives (sawdust, mica, walnut hulls, cottonseed hulls, etc.).

Upon completion of the hole, a full suite of geophysical logs is anticipated. The logs likely will include, at a minimum, SP, gamma, induction resistivity, conductivity and porosity (neutron/density or sonic).

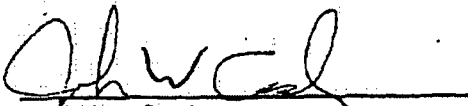
ASTM pipe will be used for the conductor casing (set to approximately 60 to 90 feet). API tubulars will be used for the surface and production casing. The casing program has not been finalized, and may depend on availability of certain types of casing. Regardless, the casing design will be consistent with typical oilfield practices; standard oilfield design criteria (tension, burst, collapse) will be used.

ASTM cement (Type I/II) will be used to isolate the conductor casing. API cements will be used on the surface and production casing. The cement design has not been finalized. In general, however, the cement likely will consist of "Lite" lead (approx. 11.4 to 12.0#/gallon) and Class G tail (approximately 15.6#/gallon). The lite cement will be used to lighten the cement column in an effort to prevent lost circulation during cementing. The anticipated bottom-hole temperature at total depth (11,000') likely will be approximately 180 degrees F. Typical ultimate strength of the tail (Class G) cement is on the order of 4,000 psi. Final design values can be provided at a later time if requested.

Centralizers will be used as warranted to center the casing in the well and enhance the quality of the cement job. A float shoe and float collar will be used for the surface and production casing. Dual wiper plugs will also be used. Because of significant depth, it is possible the production casing will be cemented in two stages, with the stage tool placed at an approximate depth of 6,000 feet. The hole will be conditioned as warranted prior to cementing casing.

If you need any additional information, please do not hesitate to contact me at the Casper office.

Sincerely,
Lost Creek ISR, LLC
By: Ur-Energy USA Inc., Manager


John W. Cash
Manager EHS and Regulatory Affairs

Cc: Nancy Fitzsimmons, URE, Littleton, CO

Attachments: DN9; Update 4
Mine Unit 1 Monitor Well Plan
Table of Bond Status



UNIT DRILLING COMPANY

RIG 138

WORKING DEPTH: 11,000'

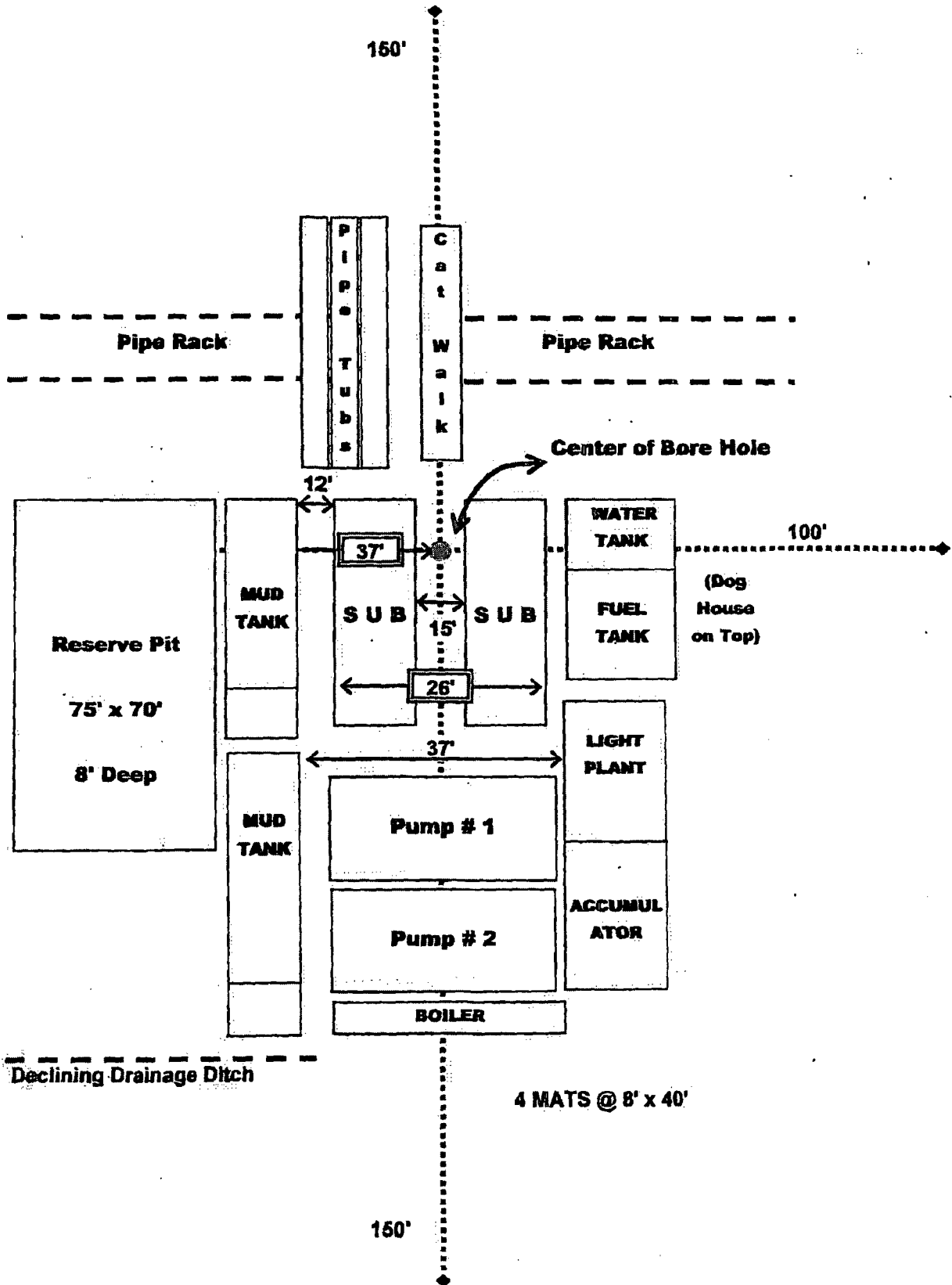
NOTE: SUMMARY IS SUBJECT TO CHANGE

DRAWWORKS	Brewster Powered by: Auxiliary Brake:	N-46 700 HP 2 C-15 Caterpillar diesel engines w/ National torque converters Parnac V-80
SCR HOUSE	N/A	
POWER	2 - 275 KW CAT SR4-275 generators powered by Caterpillar 3406 diesel engines	
#1 PUMP	Oilwell 1100 PT Powered by:	Triplex 50 HP 5 X 6 X 10 Mag Changer Caterpillar D-399 diesel engine
#2 PUMP	Oilwell 850B-PT Powered by:	Triplex 50 HP 5 X 6 X 10 Mag Changer Caterpillar D-398 diesel engine
#3 PUMP	N/A Powered by:	
MAST	135' Lee C. Moore	413,000#
SUBSTRUCTURE	12' H x 46' L x 26' W 413,000# capacity	
TRAVELING EQUIPMENT	Block: Hook: Swivel: Top Drive:	IDECO shorty unitized with hook 265 l Oilwell PC 225 ton N/A
ROTARY TABLE	Emsco 20 1/2"	
BOP EQUIPMENT	Ram Preventor:	11" 5,000# Atlas
	Annular Preventor: Closing Unit:	11" 5,000# Shaffer Valvcon 150 gallons with 4 station closing unit
DRILL PIPE	4 1/2" 16.60# 329-G-105	
DRILL COLLARS	18 - 6" 4-1/2 XH & 2 - 8" 6-5/8 Reg	
MUD SYSTEM	Working Pits:	Sand: 30'L x 9'W x 7'D Suction: 30'L x 9'W x 7'D
	Premix Pit:	19'L x 10'W x 9'D
	Mud Mixing Pumps:	3 Mission Magnum 5" x 6" x 10" centrifugal
SOLIDS CONTROL EQUIPMENT	Shale Shaker: Desander: Desilter: Prime Movers: Degasser:	2 - Swaco linear motion Harrisburg 2-cone Swaco 8-cone 3 agitators w/ 5 HP electric motors
AUXILIARY EQUIPMENT	Water Tank: Fuel Tank: Penetration Recorder: Survey Instrument: Pipe Spinner: Kelly Spinner: Mud House: Trip Tank: Transformer:	450 bbl 10,000 gallons Pason A-1 Sure-Shot 7 degree

Last Updated
JS
2/3/2008

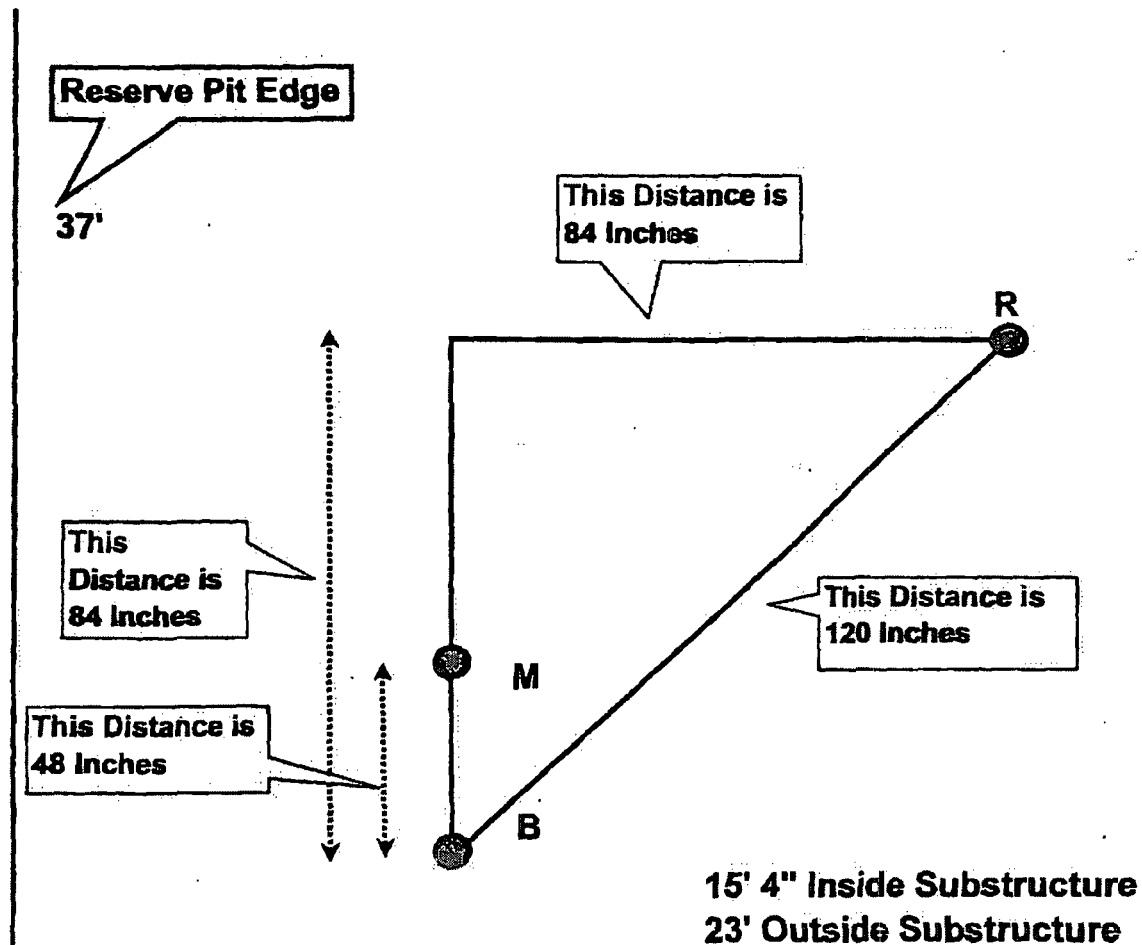
Unit Drilling Company

Rocky Mountain Division



Unit Drilling Company

Rocky Mountain Division



B - Bore Hole

M - Mouse Hole

R - Rat Hole

From Center Hole to Pit is 37 Feet

From Corner of Pit to the Center of Hole is 12 Feet

RIG 138 RAT HOLE

6/3/2008

STATE OF WYOMING

DEPARTMENT OF ENVIRONMENTAL QUALITY - LAND QUALITY DIVISION

UPDATE TO A NONCOAL NOTIFICATION TO EXPLORE BY DRILLING

This notification update and all attachments in duplicate (or in triplicate if Federal lands are involved), showing intent to explore for noncoal minerals by drilling is submitted in accordance with the provisions of the Land Quality NonCoal Rules and Regulations, Chapter 8 and accompanies the bond required by Chapter 8 Section 3. This notification update is submitted in accordance with the Cooperative Agreement between the State and the Bureau of Land Management (43 CFR 3809) if applicable by involvement of Federal locatable minerals. This form is to be used only for updating an existing Drilling Notification where the proposed exploratory activity will remain within the area previously authorized for exploration.

1. Drilling Notification Information

Drill Notification # 334DN

Project Name Lost Creek ISR

Update Number # 4

Update Name deep exploration hole

2. Discoverer Information

Name: Lost Creek ISR, LLC

Address: 5880 Enterprise Drive Suite 200, Casper, WY 82609

Contact Person: John Cash

Telephone # (307) 265-2373

3. Location

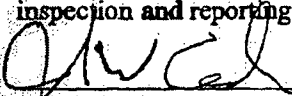
Provide a map that clearly illustrates the location of the proposed activity. The map must be oriented, contain a scale, and identify area using the Public Land Survey System (Township, Range, and Section).

4. Reclamation Cost Estimate

Provide a separate, detailed bond estimate for this Update and submit as an Attachment to this Form. Once a bond estimate for this Update has been developed, prepare a cumulative Reclamation Performance Bond estimate using the table below. Tabulate each permit action (original DN, Amendment(s), prior update(s), and this request) as an individual line item and identify the most recent WDEQ/LQD bond approval date.

Description	Bond Approval Date	Quantity (# of holes)	Bond Amount
Original Form 9DN Activity (2005)	4-11-08	14	\$1,200
Update 1 (2006)	4-11-08	12	\$1,200
Update 2 (2007)	4-11-08	195	\$4,000
Update 3 (2008)	4-11-08	451	\$748,664
Update 4 (July 2008)	Pending	deep well	\$139,636
Wells	various (n/a)	60 wells	\$194,100
Total			\$1,088,800

5. All stipulations cited in the original Form 9DN are in effect concerning disposal of hazardous material, site inspection and reporting requirements.


 Applicant Signature
John W. Cash
 Manager EHS and Reg. Affairs
 Applicant Name and Title

8/4/2008

Date

Approval and Date

334DN Update 4; Bond Status

2005 Drilling 334DN (Original DN)

Description	Unit cost (cost/hole)	Total
14 holes (reveg)	\$11/hole	\$154.00
33% of one-time mob/demob cost (\$2,500):		\$833.33
Subtotal:		\$987.33
BLM contingency (22%):		\$217.21
Total:		\$1,204.55
Bond for 2005 rounded to nearest \$100		\$1,200

2006 Drilling 334DN (Update 1)

Description	Unit cost (cost/hole)	Total
12 holes (reveg)	\$11/hole	\$132.00
33% of one-time mob/demob cost (\$2,500):		\$833.33
Subtotal:		\$965.33
BLM contingency (22%):		\$212.37
Total:		\$1,177.71
Bond for 2005 rounded to nearest \$100		\$1,200

2007 Drilling 334DN (Update 2)

Description	Unit cost (cost/hole)	Total
195 holes (reveg)	\$11/hole	\$2,145.00
30 holes (capping)	\$7.50/hole	\$225.00
Subtotal:		\$2,370.00
33% of one-time mob/demob cost (\$2,500):		\$833.33
Subtotal:		\$3,203.33
BLM contingency (22%):		\$704.73
Total:		\$3,908.07
Bond for 2007 rounded to nearest \$100		\$4,000

2008 Drilling 334DN (Update 3)

Description	Unit cost (cost/hole)	Total
P & A 100 Boreholes	\$62.50/ site + \$6.28/foot	\$445,850
P & A 51 Wells(1)	\$40/site + \$4/foot	\$108,320
Existing Roads	\$1,000/acre	\$13,000
Subtotal:		\$567,170
BLM & fuel contingency (32%):		\$181,494
Total:		\$748,664

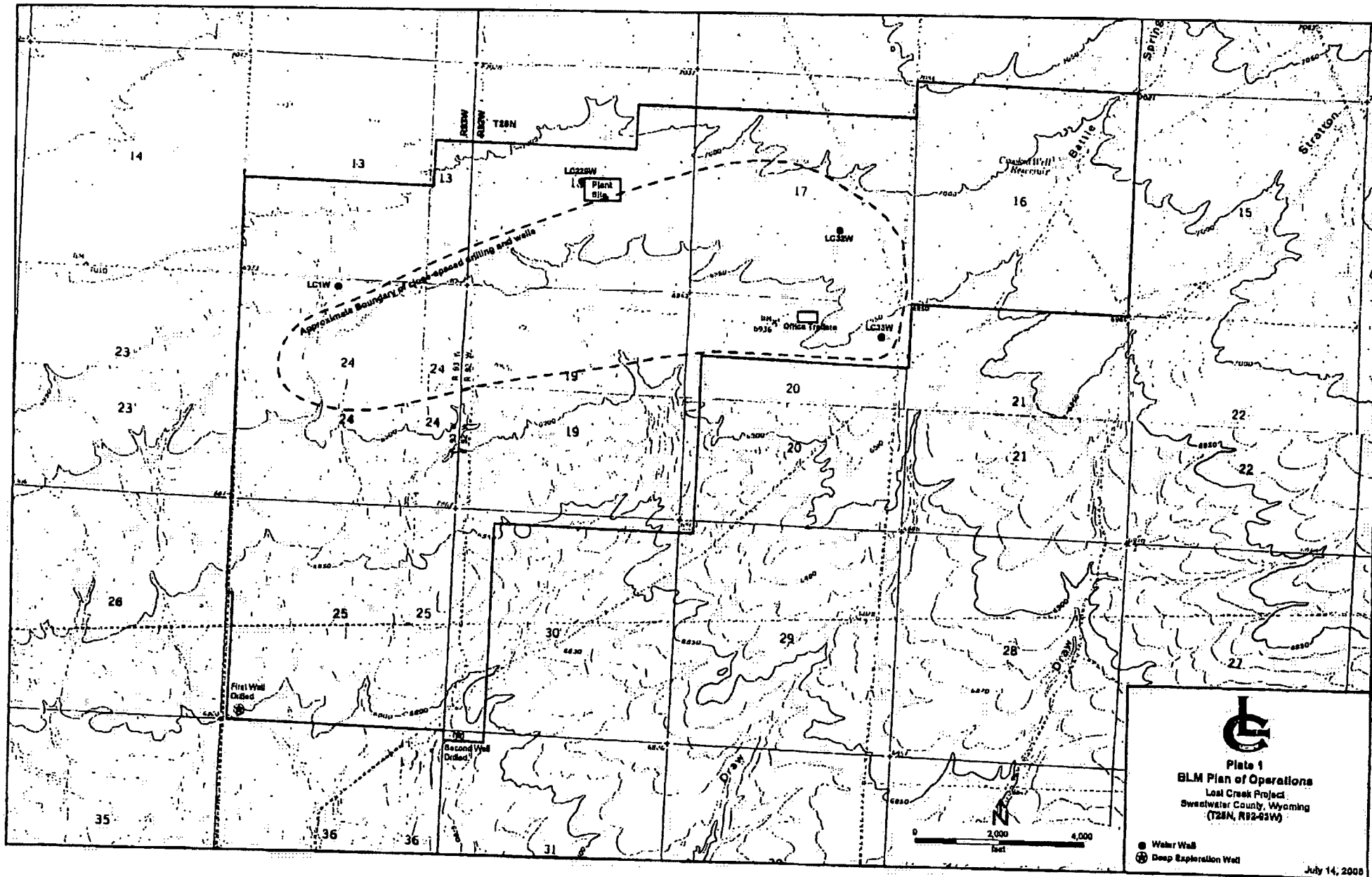
(1) Number of planned wells reduced from 85 to 51

2008 Drilling 334DN (Update 4)

Description	Unit cost (cost/hole)	Total
P & A Deep Well	\$105,785	\$105,785
Subtotal:		\$105,785
BLM & fuel contingency (32%):		\$33,851
Total:		\$139,636

Bond Calculation for wells in 334DN project

Description	Unit cost (cost/hole)	Total
78	*Lump sum	\$156,575.00
One time mob/demob cost:		\$2,500.00
Subtotal:		159,075.00
BLM contingency (22%):		\$34,996.50
Total:		\$194,071.50
Bond for wells rounded to nearest \$100		\$194,100



LOST CREEK ISR, LLC

MINE UNIT 1 MONITOR WELL PLAN

SUBMITTED TO WDEQ-LQD LANDER FIELD OFFICE

AUGUST 4, 2008

Contents

2.	Monitoring Plan	1
2.1	Methodology for Determining Zones to be Monitored.....	1
2.2	Methodology for Determining Baseline.....	1
3.	Field and Well Completion Procedures.....	2
3.1	Drill Rigs	2
3.2	Drilling Fluids	2
3.3	Geophysical Logging	3
3.4	Well Design.....	4
3.5	Well Construction and Cementing.....	4
3.6	Waste Water Disposal	6
3.7	Mechanical Integrity Testing	7
4.	Water Sampling Protocol.....	7
4.1	Mining Unit Monitor Wells	7
4.2	Interior Monitor Wells	8
4.3	Monitor Well Purging.....	8
5.	Drill Water Supply.....	9
6.	Surface Disturbance Mitigation and Reclamation	9
6.1	Topsoil Protection	9
6.2	Drill Pits	10
6.3	Revegetation.....	10
6.4	Isolation of Deleterious Material.....	11
7.	Site Inspection Plan.....	11

1. Bonding

The proposed bond for the installation of monitor wells, and other activities, was submitted to WDEQ-LQD as part of Update 3 to 334DN on April 3, 2008. The bond was subsequently approved by letter from WDEQ on May 14, 2008. The approved bond, issued by Colorado Business Bank on May 1, 2008, remains in full force and effect.

2. Monitoring Plan

2.1 Methodology for Determining Zones to be Monitored

The Mine Unit 1 monitor well plan (Figure 1) contains 28 perimeter monitor wells. Perimeter ring wells are planned 500 ft. from the nearest production pattern and approximately 490 ft. from each consecutive monitor well in the ring.

Mine Unit 1 will have a total pattern area of 37 acres. The interior monitor wells are planned so that there is 1 overlying well (MO), 1 production zone well (MP) and 1 underlying well (MU) placed for every three acres of pattern area. Therefore there are a total of 39 interior monitor wells (13 sets). Each of these well sets is planned no more than 1,000 ft. from each other within Mine Unit 1.

Within Mine Unit 1 there are four targeted production zones within the HJ sand: Zone 1 (UHJ), Zone 2 (MHJ1), Zone 3 (MHJ2) and Zone 4 (LHJ). Completion of each perimeter monitor well is dictated by the nearest production patterns to a particular well. Since each perimeter monitor well is placed at a distance of 500 feet from the edge of the pattern area, the planned monitor well completion is defined by whichever Zones will be in production within 600 feet from that monitor well (Figure 2 and 3).

Interior production zone monitor wells will be completed for the appropriate Zone depending on which pattern area it is dedicated to. The overlying monitor wells will be completed in the LFG sand (nearest overlying aquifer) and the underlying monitor wells will be completed in the UKM sand (nearest underlying aquifer).

Two pump test wells are planned for installation in Mine Unit 1. These wells are positioned centrally and will be completed for the entire HJ sand (approximately 120 ft).

2.2 Methodology for Determining Baseline

LC ISR, LLC commits to return the groundwater to the pre-operational class-of-use in accordance with WDEQ statutes and regulations. Restoration will demonstrate that Best Practicable Technology (BPT) has been applied. If possible, restoration will be conducted to achieve water quality that approximates baseline levels.

Prior to operation of each mine unit, groundwater class-of-use will be determined by the WDEQ-Water Quality Division (WQD) on the basis of baseline water quality

data collected in accordance with WDEQ requirements and submitted to WDEQ by LC ISR, LLC. For the wells in the perimeter monitor ring and for wells in overlying and underlying aquifers, the class-of-use will be determined on a well-by-well basis. For the pattern area, baseline water quality data from monitor wells in the pattern area will be averaged to determine the class-of-use for that mine unit.

Baseline water quality data will be collected from the monitor wells in the perimeter ring, in the pattern area, and in the overlying and underlying aquifers before initiating ISR operations in each mine unit, in accordance with Section 4 of this Plan.

The baseline water quality and Upper Control Limits (UCL) will be set by first analyzing the data set for outliers using the iterative Loftis technique described in WDEQ-LQD Guideline 4. Outliers will be removed from the data set. If one or more wells have parameter values that contain a relatively large number of outliers, then these wells will be treated separately as an additional baseline database for one or more parameters.

UCLs are used to determine when an excursion of mining lixiviant outside the mining zone has occurred. The UCLs for the site will be calculated following WDEQ-LQD Guideline 4 which is baseline mean plus five (5) standard deviations. For situations where chloride concentrations are very low and show little variability during baseline sampling, the UCL will be set at the baseline mean plus 15 mg/l if the result is greater than baseline mean plus five (5) standard deviations.

3. Field and Well Completion Procedures

3.1 Drill Rigs

The contract drill rigs are standard water well rotary mud rigs with the ability to install PVC cased water wells to a depth of approximately 1,000 ft. While 1400 or 1500 class drill rigs with tandem axle drive train are most commonly used, other types may be employed based on availability. Each rig will have the ability to airlift wells (capacity of 450 CFM @ 250 PSI) and have drill pipe and collars totaling at least 1,000 ft. and a mud pump to support operations at this depth. Each 60,000 pound drill rig is supported by a water truck (approximately 53,000 pounds), a pipe truck (approximately 25,000 pounds) and a light pickup (approximately 6,000 pounds).

3.2 Drilling Fluids

The following materials will be used in varying concentrations to minimize fluid loss, create wall cake, lubricate the bit and transport drill cuttings to the surface:

- Polymer: Alcomer 123LA, Drispac Plus
- Bentonite: Plug Gel, Super Gel
- Lost Circulation Material: Cedar Fiber, Magma Fiber

Polymer is added to the drill water during piloting and reaming to aid in lubrication and cuttings transport. A typical Alcomer mixture for a 500 ft. hole is 1 gallon added

to the pit before/during drilling. A typical Drispac Plus mixture is 1 cup added to the pit before/during drilling.

Bentonite, commonly referred to as gel, is used as a viscosifier and for filtration control in water based muds. When mixed appropriately, it may also be used to plug holes and isolate formations. Most pilot holes are drilled with just water and little or no bentonite products.

Lost circulation material is used only as needed to reduce loss to a thief zone and may also incorporate varying quantities of bentonite gel.

Attachment A contains Material Safety Data Sheets for each of the drilling fluids.

3.3 Geophysical Logging

Geophysical logging is performed immediately after the borehole has been completed and is done within an open hole (uncased hole and not through drill-pipe). The Geophysical Logging Unit typically consists of a $\frac{3}{4}$ ton pickup or small box van equipped with:

- An electronic sonde (probe). Typically, the sonde is approximately seven feet long and approximately 2- $\frac{1}{2}$ " in diameter;
- Hydraulic draw-works for lowering and raising the sonde; and
- Computer electronics for field processing of the data.

The logging procedure involves lowering the probe down the borehole to the total drilled depth (TD) and then measuring the formation characteristics as the probe is raised to the surface at a rate of approximately 50 feet per minute. Total time required for logging a typical bore hole is approximately $\frac{1}{2}$ to 1 hour.

The probe measures rock characteristics by recording three data-output curves:

1. Natural Gamma: For indirect detection of uranium
2. Spontaneous Potential (SP): Indicates formation lithology
3. Single Point Resistance: Indicates formation lithology

Additional output includes:

1. Bore hole deviation data
2. Ore grade analysis data

No radioactive source is employed in this logging procedure.

In boreholes of particular interest, a second geophysical logging procedure may be performed by a PFN (Prompt Fission Neutron) Unit. This unit provides a direct measurement of the uranium content. Once again, this logging procedure is done in an open-hole as soon as possible after the completion of the borehole. In general, the PFN vehicle, draw-works, probe, and computer electronics are very similar to that of the standard Geophysical Logging Unit described above. This type of logging utilizes a neutron source, consequently special safety measures are

employed as per regulations and guidelines established by the NRC (Nuclear Regulatory Commission).

3.4 Well Design

The well casing will be polyvinyl chloride (PVC) pipe. A typical casing will be CertainTeed's spline-locking standard dimension ratio (SDR) 17 PVC well casing, which has a nominal 4.5 inch O.D, 0.291 inch minimum wall thickness, and is rated for 160 pounds per square inch (psi) burst pressure and 224 psi collapse pressure. The PVC casing joints normally have a length of 20 feet each. Each connection is sealed with an o-ring and spline lock. This configuration provides a seal without the installation of screws to hold each joint together and has been proven effective at other ISR facilities. Casing centralizers, located every 40 feet, are run on the casing to ensure it is centered in the drill hole and that an effective cement seal is provided.

3.5 Well Construction and Cementing

Upon completion of reaming the hole to at least 3 inches in diameter greater than the casing OD and prior to installation of the casing, the hole will be circulated bottoms up with drilling fluid to remove any remaining cuttings. No chemicals are used to treat the well bore.

Cementing operations will utilize PVC or steel centralizers capable of centralizing the casing at least 1-1/2 inches in all directions (3 inches total) positioned at least every 40 feet vertically in the well. A rubber wiper plug may or may not be used depending on the extent of the completion interval and the desired positioning of the casing shoe. A "proper" float shoe will not be utilized. However, in the case of a wiper plug, a dowel will be installed within a foot of the casing bottom to stop the wiper plug. In the cases where a wiper plug is not used, chase fluid will be utilized to displace the cement and a heel of 5 to 10 feet will be left in the casing and drilled out prior to completion.

The purpose of the cement is to stabilize and strengthen the casing and seal the well annulus to prevent vertical migration of solutions. WDEQ-LQD Rules and Regulations Chapter 11, Sect. 6(c)(iv)(A) requires, *"Neat cement slurry shall be composed of Portland Cement and clean water in a proportion to yield a slurry weight of approximately 15 pounds per gallon."* The volume of cement used is the calculated volume required to fill the annulus and return cement to the surface. In most cases, the cement returns to the surface, at least initially. However, in some cases, the drilling may result in a larger annulus volume than anticipated and cement may not return to the surface. In these cases, the upper portion of the annulus will be cemented from the surface. In the majority of cases, where the cement fails to return to surface, the reason will be a washout or a casing failure. In the event of a casing problem, the well will not pass the mechanical integrity test (MIT). In all cases, wells are required to pass an MIT before operations approval. This will ensure that there is sufficient integrity to allow the use of the well in handling lixiviant.

Type I/II Portland cement will be mixed in a trailer mounted cementing unit. The unit is comprised of a 20 barrel mix tank, an eductor assembly, a diesel motor, transmission and a centrifugal pump. The cementer will utilize the pump to circulate

fresh water while the dry cement is added through the eductor to create a uniform slurry prior to pumping downhole. The cementer and the dry cement are delivered to the well of interest prior to running of casing. Once the casing is installed downhole, the cementer is partially filled with fresh water. The dry cement along with 2% bentonite gel, 2% calcium chloride and additional fresh water are mixed to achieve a slurry of 15 pounds per gallon. The cementer utilizes the centrifugal pump to force the slurry down the PVC well casing and up the annulus. Two procedures exist depending on whether the well will be cased above the zone of interest or cased through the zone of interest.

Case Above The Zone: Depending on the depth of the well, either weighted mud or fresh water will be used to displace the cement in the casing to the annulus. Once the prescribed amount of cement is pumped into the casing using the cementing unit, the cementing tank is filled with the appropriate amount of displacement fluid to maintain approximately 10 feet of cement in the casing. The casing head valve is then shut and the cement allowed to cure for a minimum of 72 hours.

Case Through The Zone: Depending on the depth of the well, either weighted mud or fresh water will be used to displace the cement in the casing to the annulus. Once the prescribed amount of cement is pumped into the casing using the cementing unit, a wiper plug is installed in the casing head. The cementing tank is filled with the appropriate amount of displacement fluid to push the wiper plug and the cement to total depth. The cementing unit pump will pump the displacement water. Pumping pressure and volume pumped will be monitored to determine when the wiper plug has bottomed out. Once the plug is at TD, the casing head valve is then shut and the cement allowed to cure for a minimum of 72 hours.

Prior to any additional work, all the monitor wells will be topped off with neat cement from surface and allowed to cure. Once topped off, the following procedures apply for completing those scenarios:

Case Above The Zone: In this case there will be 5 to 10 feet of cement in the casing. The drill will enter the well with the underreamer and a 4 inch roller cone bit on the bottom. The cement in the casing will be drilled out as well as the formation to the underream depth plus 3 to 5 feet for rat hole. The drill operator will open the blade underreamer to a diameter of approximately 11 inches and underream the zone of interest. Upon completion, the drill operator will close the underreamer blades and remove the tool from the well.

Case Through The Zone: In this case the zone of interest will have cemented casing through it with approximately 5 to 10 feet of rat hole below it and a cement plug at the bottom. The drill will enter the well with the underreamer. The drill operator will open the blade underreamer to a diameter of approximately 11 inches and underream the zone of interest. Upon completion, the drill operator will close the underreamer blades and remove the tool from the well.

The screen will be either PVC or Stainless Steel with the following specifications:

Screen OD: 3.781" Nom.
Screen ID: 3.068" Nom.
Screen Size: 0.020
Open Area: 18.23 square inches per foot
Collapse Strength: 154 psi

Monitor well screen assemblies will not be gravel packed typically. If abnormal hole conditions exist, 10-20 mesh gravel pack sand and the cementing unit will be used to transport gravel into the annular space surrounding the well screen.

Two (2) K-Packer assemblies will be utilized to support and hold the well screen in each well. They are 4.5" OD rubber attached to 3" threaded steel pipe. There are various manufacturers of the product and they are specifically turned down to fit in 4.5" SDR-17 well casing.

The monitor well cap will be made using either a sanitary water well cap with holes for wire and the production tubing or from a PVC, spline-lock completion cap. The spline-lock cap serves the same purpose as a sanitary seal except it is held in place with an o-ring and a spline similar to the connections for each casing joint. Both methods will ensure a seal to the surface.

Well development occurs in two stages. The first stage occurs after underreaming is complete and the well screen is set. The drill operator will move down the hole from static water level air lifting the well for approximately 1 to 2 hours. The second stage of well development will be completed by a swabbing unit. The truck mounted swabbing unit lowers a swab cup into the well until water level is reached. The swab cup is lowered approximately 50 feet below water level and the cup is pulled out of the hole. This action pulls fresh water into the wellbore from the completion zone. To ensure the well is adequately developed, the water sampler will purge the well with a submersible pump until field parameters are stable.

3.6 Waste Water Disposal

During the drilling and development of monitor wells two types of water will be generated.

While boring the well, fresh water will be fortified with drilling fluids such as bentonite and polymer. The resulting drill solution will be circulated down hole and through a mud pit. Upon the completion of drilling, the water remaining in the mud pit will be allowed to dissipate through evaporation and soaking into the soil.

The second source of water is from well development discussed in Section 3.5. Well development sorts the gravel pack in the completed interval and removes native fines that may restrict flow into the well. The water resulting from air lifting will be directed to the mud pit where it will dissipate through evaporation and soaking into the ground. Water resulting from swabbing will be directed to the mud pit if it is still present. If the mud pit is not open, the water will be allowed to soak into the ground.

None of the water types generated during well boring and development is hazardous and the procedures described above follow standard industry practices.

3.7 Mechanical Integrity Testing

After a well has been completed and before it is made operational, an MIT of the well casing will be conducted. An MIT will also be conducted on any monitor well that has been damaged by surface or subsurface activity or that has had a drill bit or cutting tool inserted in the well. Any well with evidence of subsurface damage will require an MIT prior to the well being returned to service.

In the integrity test, the bottom of the casing adjacent to or below the confining layer above the zone of interest is sealed with an inflatable packer or other suitable device. The top of the casing is then sealed in a similar manner or with a cap, and a pressure gauge is installed to monitor the pressure inside the casing. The pressure in the sealed casing is then increased to a specified test pressure and will maintain 95 percent of this pressure for ten minutes to pass the test. If any well casing that fails the test cannot be repaired, the well shall be plugged and abandoned.

If there are obvious leaks or the pressure drops by more than five percent during the ten-minute period, the seals and fittings will be reset and/or checked and another test will be conducted. If the pressure drops less than five percent, the well casing is considered to have demonstrated acceptable mechanical integrity.

If a well casing does not meet the mechanical integrity criteria, the casing will be repaired and the well re-tested or the well will be properly plugged within 120 days of the failed test. If a repaired well passes the MIT, it will be employed in its intended service. Also, if the well defect occurs at depth, the well may be plugged back and re-completed, within 120 days of the failed test, for use in a shallower zone, provided it passes an MIT after re-completion. If an acceptable test cannot be obtained after repairs, the well will be plugged within 120 days of the failed post-repair test. The documentation for the MITs will include the well designation, date of the test, test duration, beginning and ending pressures, and the signature of the individual responsible for conducting the test. Results of the integrity tests shall be maintained on-site and will be available for inspection by WDEQ.

4. Water Sampling Protocol

4.1 Mining Unit Monitor Wells

As a part of the baseline water quality assessment, all the mine unit monitor wells (monitor well ring, overlying and underlying aquifer wells) will be sampled at least four times at intervals at least 14 days apart. Water levels will be measured at the same frequency as the monitor well sampling to within 1/10 of a foot. One round of samples will be analyzed for the parameters listed in LQD Guideline 8 (Appendix 1 parts II, IV, V(A)(1) and V(E) as updated in March 2005) and three rounds will be analyzed for just the UCL parameters. UCLs will be set for parameters that would be indicative of a migration of lixiviant from the mine unit, and it is anticipated that these parameters will be chloride, conductivity, and total alkalinity. Chloride is a

common UCL in Wyoming due to its low natural levels in the native groundwater and because chloride is introduced into the lixiviant from the ion exchange process (uranium is exchanged for chloride on the ion exchange resin). Chloride is also a very mobile constituent in the groundwater and will show up quickly in the case of a lixiviant migration to a monitor well. Conductivity is another common UCL because it is an excellent general indicator of overall groundwater quality. Total alkalinity concentrations should be affected during a potential excursion, as bicarbonate is the major constituent added to the lixiviant during mining.

As recommended in LQD Guideline 4, the QA/QC will include at least one duplicate, one standard, and one blank per set of Guideline 8 samples. The samples will be preserved and analyzed using the EPA approved analytical methods described in LQD Guideline 8 and within the prescribed holding times. Preservation techniques generally involve filtration to 0.456 micron and/or acidification with nitric or sulfuric acid depending on the parameters to be analyzed. Field parameters will be measured using instruments calibrated in accordance with the manufacturer's instructions. Additionally, the contract lab performing the Guideline 8 analysis will complete an anion/cation balance to ensure no significant ions are being left out of the analysis. The field samplers will maintain sampling data as outlined in LQD Guideline 8(VI). Samples will be stored in a cool dark location until analysis. A chain of custody record will be maintained for each sample and will detail the company name and contact information, sample name, date and time of collection, parameters to be analyzed, preservation techniques and a timeline describing who handled the samples and when. A copy of the chain of custody will be maintained by the company and the original will be sent to the laboratory to ensure quality control.

4.2 Interior Monitor Wells

As a part of the baseline assessment, all the interior monitor wells (ore zone baseline wells) will be sampled at least four times at intervals at least 14 days apart. Water levels will be measured at the same frequency as the monitor well sampling. The first two rounds of samples will be analyzed for the parameters listed in LQD Guideline 8 (Appendix 1 parts II, IV, V(A)(1) and V(E) as updated in March 2005). The third and fourth rounds will be analyzed for just the parameters which were above detection limits in either or both of the first two rounds.

The QA/QC program for well field monitor wells will be the same as that for mining unit monitor wells described in section 4.1.

4.3 Monitor Well Purging

Before collecting the final sample, each well is to be purged until the field parameters are stable (per LQD Guideline 8 Section IV(A)(4)(b)). Stability will be defined as a change of less than 0.2 standard units in pH, 1.0 degree change in temperature (Celsius) and less than 10% change in specific conductance in the time period it takes to pump at least one casing volume. In the event that the well pumps dry, the sample may be collected after pumping the well dry and allowing enough recharge to collect a sample. Field parameters will consist of pH, specific conductance, and temperature with accuracies as defined in WDEQ-LQD Guideline 8, Appendix 1.

5. Drill Water Supply

A total of four water supply wells have been permitted through the State Engineer's Office and are capable of supplying the water needed to drill the monitor wells and support regional exploration drilling. The three existing wells are LC1W in the NE, NW of Section 24, LC32W in the NW, SE of Section 17, and LC33W in the NE, NE of Section 20. The fourth well, LC 229W, is to be drilled in the SW, NE of Section 18 near the proposed plant location. Water well LC28M was originally permitted as a monitor well but a request to the State Engineer's Office is being prepared to convert the well to a water supply well. If the request is successful, water from LC28M will be used to drill the deep exploration well.

6. Surface Disturbance Mitigation and Reclamation

6.1 Topsoil Protection

LC ISR will continue the topsoil protection measures historically used for exploration drilling during delineation drilling (generally on closer spacing than exploration drilling) and monitor well installation. Those measures include topsoil removal and replacement from specific locations (e.g., mud pits), minimizing traffic routes, and general maintenance.

At drilling sites, which are in use for only a few days, topsoil will be protected by:

- Stripping topsoil from the mud pit locations. Topsoil in the area is generally 12" deep;
- Stockpiling the topsoil separate from the stockpile of the deeper material excavated from the mud pit;
- After drilling, allowing the mud pit to dry and replacing the deeper excavated material;
- Replacing topsoil; and
- Surface preparation and reseeding

In addition, care will be taken to prevent drilling mud from flowing out of mud pits and to keep rig and support vehicle traffic to a minimum number of routes so topsoil compaction, tire ruts, and similar problems are minimized.

Access to the Plan area will be restricted and vehicular traffic will be minimized during drilling activities and restricted to specific routes. In particular, traffic routes will be established within areas of dense drilling. This will reduce the occurrence of compacted soils.

Erosion control will be an important factor in protecting the topsoil resource. When soil is disturbed in such a manner that wind or water erosion may result, one or more of the following practices will be followed to mitigate the potential risk:

- mulching;
- terracing;
- wind breaks;
- dust suppression with water; and/or
- sediment trapping structures

6.2 Drill Pits

Drill pits will be constructed so that they are at least 25% greater in volume than the anticipated volume of drill cuttings and mud. The pits will be backfilled as soon as the moisture dissipates sufficiently to prevent mud from flowing out of the pit. Depending on numerous factors (including soil moisture content, temperature, size of pit, volume of water, etc.) it may take from two weeks to four weeks before pits can be safely backfilled. Regardless of the time required before backfilling, the pits will remain fenced to prevent entry by wildlife and livestock. Once the backfilled pit can support the weight of a vehicle, the topsoil will be re-applied. The soil will be slightly mounded, 6 to 12", to allow for settling.

6.3 Revegetation

The permanent seed mix and seeding rates for re-vegetation are provided in Table 1. This seed mix will adequately support the post-operational land uses, livestock grazing and wildlife habitat, and was previously approved by Mark Newman of the BLM Rawlins Office on November 17, 2006 and by Melissa Bautz of the WDEQ-LQD Lander Field Office on November 3, 2006 (e-mail communications). If any of the approved seed is unavailable or prohibitive in cost at the time of seeding, other locally adapted and certified seed may be substituted with prior approval of BLM and WDEQ-LQD. On occasion it may be beneficial to stabilize soil by planting a vigorous annual cover crop of rhizomatous species as directed in LQD Guideline 2. LC ISR will seek and receive approval from BLM and LQD before planting such species.

TABLE 1: Seed Mixture

SEED	LBS/ACRE
Thickspike Wheatgrass	4
Western Wheatgrass	2
Indian Ricegrass	2
Prairie Sandreed	2
Great Basin Wildrye	2
Big Sagebrush	1
Rubber Rabbitbrush	1
Winterfat (<i>Ceratoides lanata</i>)	1.5
Slender Wheatgrass	2.5
Sandberg Bluegrass	1.5

The seed bed will be prepared by first leveling with a tractor, backhoe or other implement. As discussed above, the pit will be left slightly mounded to allow for

settling over time. If the ground surface is hard it may be necessary to rip or scarify the soil before planting in order for the seed drill to work properly.

Three methods of seeding (drill, pit and broadcast) will be used. Seeding will be performed as a continuous operation when conditions allow. In general, seeding will be completed during the spring or fall, whichever is the first normal period for favorable planting after the seed bed preparation.

Drill seeding will be the primary method. Areas with little gradient will be seeded with the rows perpendicular to the direction of the prevailing wind. Where necessary to prevent erosion, seeding will be done along the contour. Broadcast seeding will be performed on any steep slopes and drainage areas that may be disturbed in the Permit Area. The seed will be distributed uniformly over the area using a mechanical seed spreader. Immediately after broadcast seeding, the areas will be raked or dragged along the contour. This will cover the seeds with approximately one-quarter inch of soil. Pit seeding will be used in areas in which vegetation re-establishment is particularly difficult because the method allows for sheltering seeds from eolian erosion and capturing moisture in the area of the seed.

6.4 Isolation of Deleterious Material

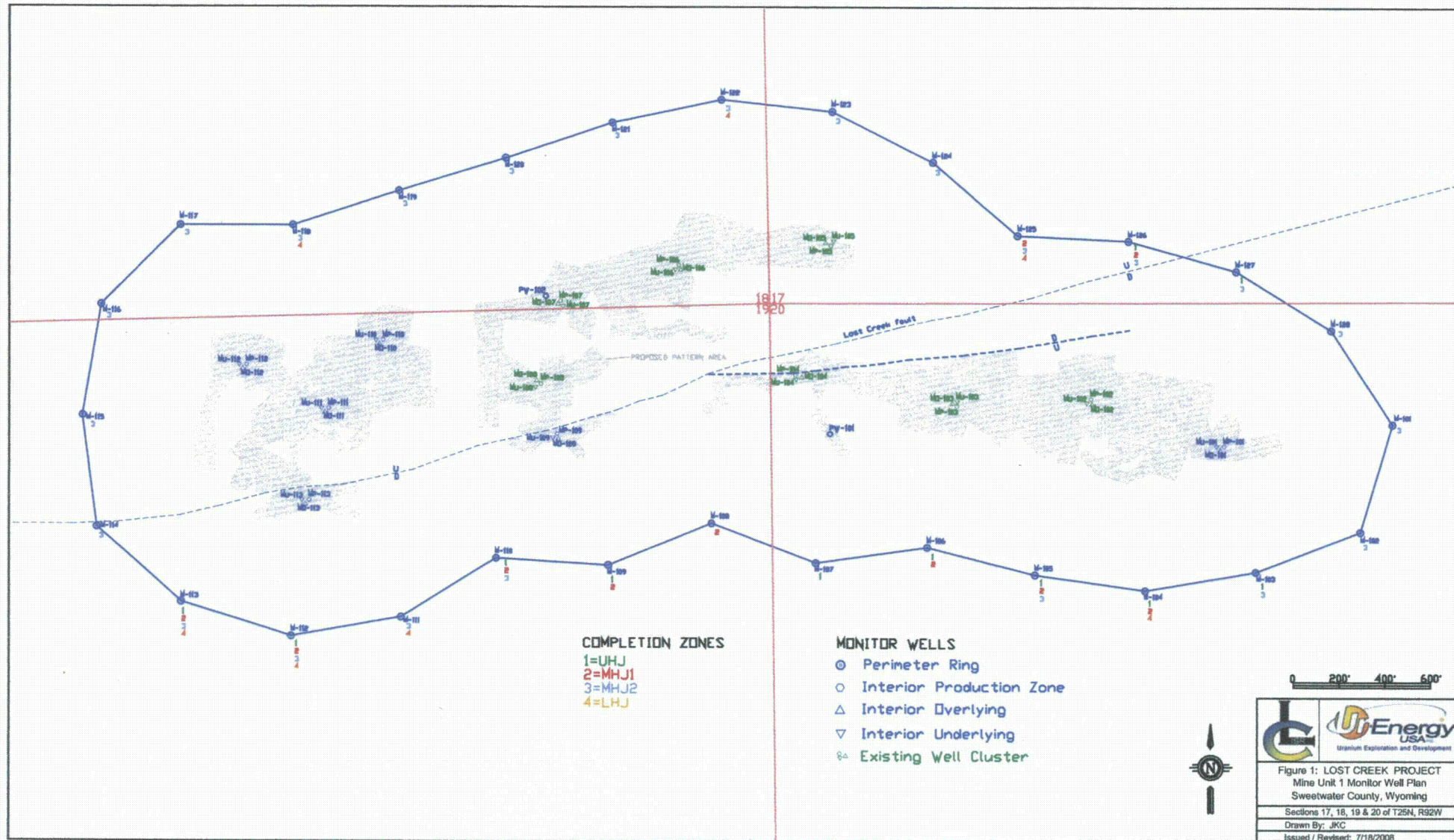
Any leaks of petroleum products from equipment will be repaired or controlled in such a manner as to prevent spills to the ground (i.e. placement of catchment basins). Any soil contaminated with petroleum products will be collected and farmed in a waterproof tank pursuant to *de minimis* quantity guidance found in WDEQ-SHW Guideline 2. Section 7 describes the procedures for ensuring vehicle leaks are found and properly mitigated.

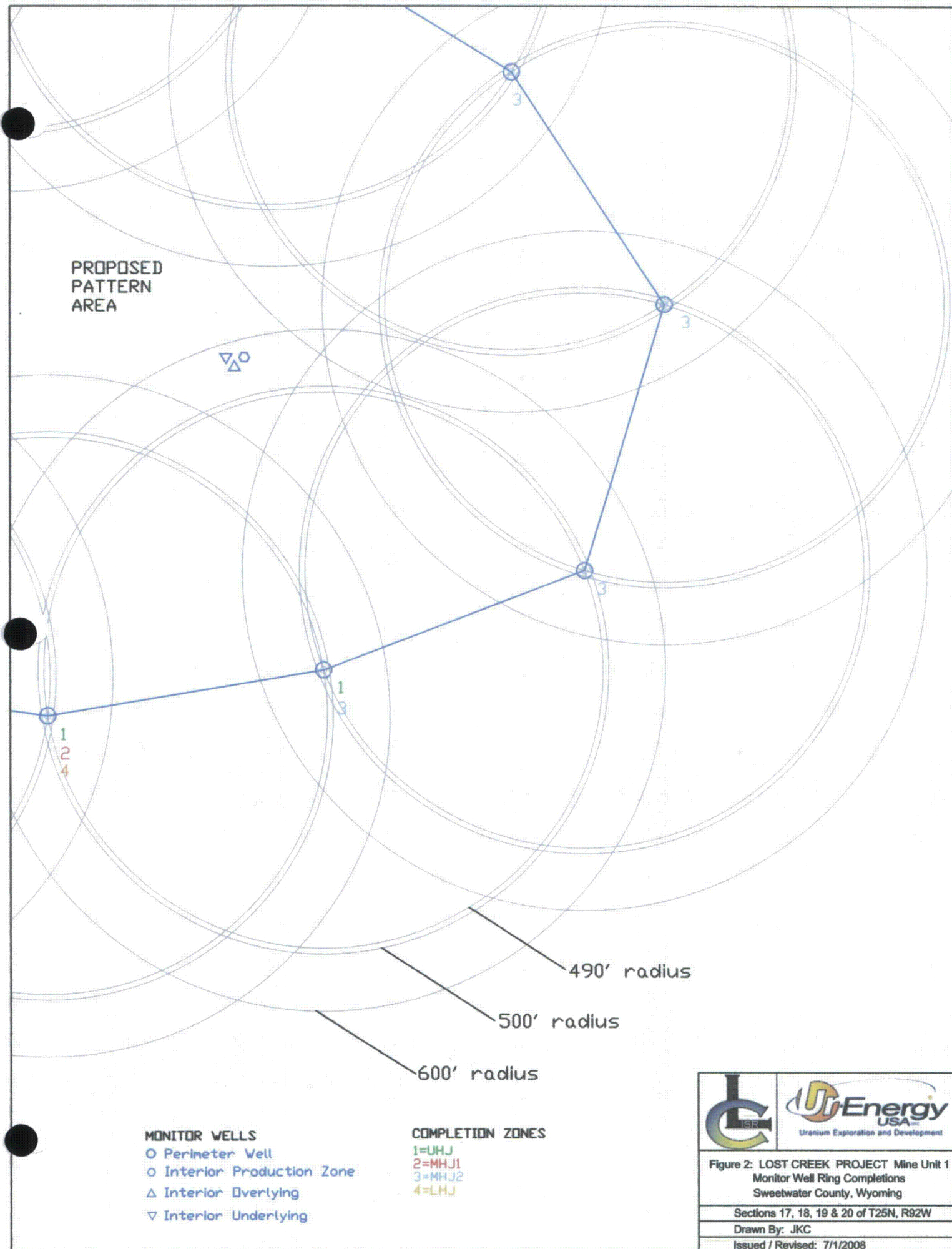
7. Site Inspection Plan

During the life of the project, a weekly inspection will be performed and documented by an individual familiar with the commitments of the Plan of Operations. Inspections may be delayed in the event of inclement weather or work stoppage. The inspector will review the following items:

- Leakage from equipment;
- Growth of noxious weeds;
- Proper backfilling of pits with capture of all drilling mud in pits;
- Proper removal and storage of topsoil;
- Proper trash storage and removal;
- Proper installation and maintenance of erosion control structures; and
- Proper drill hole and well abandonment

Any problems noted by the inspector will be documented and passed on to the Site Supervisor. The Site Supervisor will mitigate the issue in a timely manner and document the results.

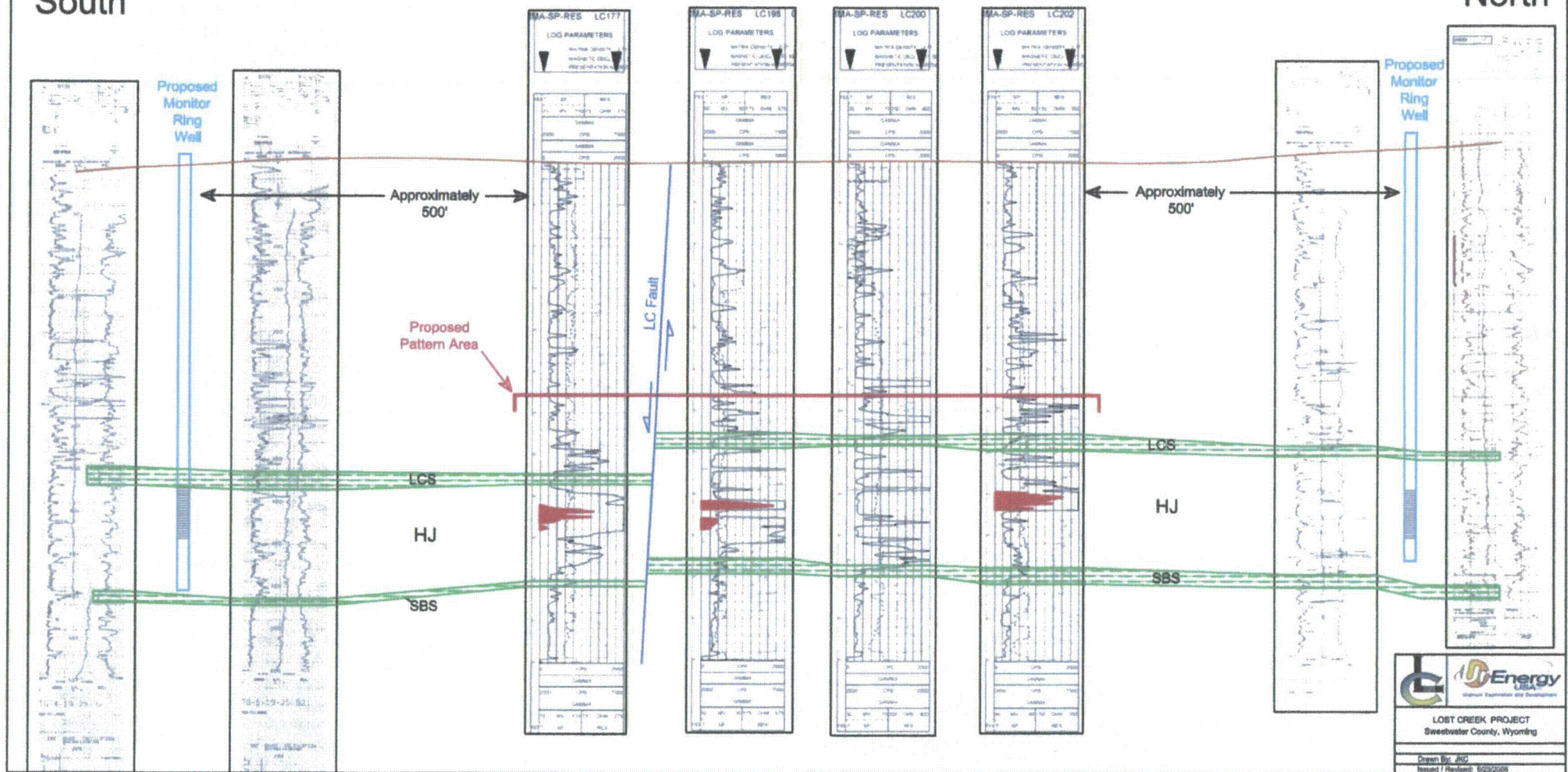




Typical Section Through Proposed Mine Unit 1 and Monitor Well Ring

A
South

A'
North



Attachment A

Material Safety Data Sheet

OSHA / ANSI 2003 Compliant

MSDS date: 07-May-2004

NFPA Rating: Health: 2 Flammability: 1 Instability: 0 Special Hazards: None known.
HMIS Rating: Health: 2 Flammability: 1 Physical Hazard: 0 Personal Protection: B

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: **ALCOMER 1231A**
Product Number: 7861709
Chemical Family: Anionic polyacrylamide emulsion
Manufacturer/Supplier: Ciba Specialty Chemicals Corporation
2301 Wilroy Road
Suffolk, VA 23434
8:30am - 5pm Phone Number: 1-757-538-3700
MSDS Request Line (voicemail): 1-800-431-2360
Customer Service/Product Information 1-800-322-3885

Emergency 24-Hour Health/Environmental Phone: 1-800-873-1138

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Signal Word: CAUTION!
Physical Form: Liquid
Color: White
Odor: Hydrocarbon-like
Health: This product may cause eye, skin and respiratory tract irritation. Prolonged or repeated contact may cause dermatitis and serious irreversible skin disorders. Mists and vapors may cause irritation to nose and respiratory tract. Exposure to aerosols may result in lung damage. Ingestion may cause nausea, vomiting and diarrhea. Aspiration of liquid during ingestion or vomiting may cause severe chemical pneumonitis..
Physical Hazards: Spills are very slippery.

OSHA Hazardous Substance: This material is classified as hazardous under OSHA regulations.

Primary Route(s) of Entry: Skin, Inhalation, Eyes.

3. COMPOSITION/INFORMATION ON INGREDIENTS**HAZARDOUS COMPONENTS**

Components	CAS Number	Weight %
DISTILLATES, PETROLEUM, HYDROTREATED LIGHT	64742-47-8	20-40

NON-HAZARDOUS COMPONENTS

Components	CAS Number	Weight %
2-Propenamide, polymer with 2-propenoic acid, ammonium salt	26100-47-0	20-40

4. FIRST AID MEASURES

- Eyes:** Flush the eye(s) with lukewarm, gently flowing water for 5-10 minutes or until the chemical is removed. Get medical attention if irritation persists.
- Skin:** Wash off immediately with soap and plenty of water. Get medical attention if irritation occurs. If clothing is contaminated, remove and launder before reuse.
- Inhalation:** Remove to fresh air, if not breathing give artificial respiration. If breathing is difficult, give oxygen and get immediate medical attention.
- Ingestion:** Do not induce vomiting. If vomiting occurs naturally, have casualty lean forward to reduce the risk of aspiration. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

- Fire Fighting Measures:** Standard procedure for chemical fires. Cool fire-exposed containers with water.
- Suitable Extinguishing Media:** Carbon dioxide, dry chemical or foam.
- Fire Fighting Equipment:** Wear self-contained breathing apparatus and protective suit.
- Hazardous Combustion Products:** Burning may produce toxic combustion products.

6. ACCIDENTAL RELEASE MEASURES

- Cleanup Instructions:** Absorb spill with inert material (e.g. dry sand or earth), then place in a chemical waste container. Wear suitable protective equipment. Should not be released into the environment. Spills are very slippery. Clean up promptly.
- Other Information:** The petroleum distillates in this product is/are classified as an oil under Section 311 of the Clean Water Act. Spills entering (A) surface waters or (B) any water courses or sewers entering/leading to surface waters that cause a sheen must be reported to the National Response Center (NRC: 800-424-8801).

7. HANDLING AND STORAGE

- Handling:** As with all industrial chemicals, use good industrial practices when handling. Avoid eye, skin, and clothing contact. Do not inhale. Do not taste or swallow. Use only with adequate ventilation. Keep away from heat, sparks and flame.

Storage:

Avoid extremes of temperature. Store between 10 - 40 °C (50 - 104 °F). Do not store in mild steel containers.

For Industrial Use Only**8. EXPOSURE CONTROLS / PERSONAL PROTECTION****Exposure Guidelines:**

There are no OSHA or ACGIH exposure guidelines available for component(s) in this product.

Components	OSHA PEL	OSHA STEL	ACGIH TWA	ACGIH STEL	Ciba/ Manufacturer IEL:
DISTILLATES, PETROLEUM, HYDROTREATED LIGHT 64742-47-8			200 mg/m ³		

Personal Protective Equipment

Eye/Face Protection:	Wear splash proof chemical goggles.
Skin Protection:	Wear chemical resistant gloves and protective clothing.
Respiratory Protection:	Use NIOSH approved respirator as needed to mitigate exposure.
Engineering Controls:	Work in well ventilated areas. Do not breathe vapors or mist. Local exhaust recommended.
Other Protective Equipment:	Eye wash station and safety shower should be available in immediate work area. Select additional protective equipment based upon potential for exposure.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form:	Liquid
Color:	White
Odor:	Hydrocarbon-like.
Boiling Point:	Not determined
Freezing/Melting Point:	-18°C (0°F)
Solubility in water:	Soluble, solubility limited by viscosity
Vapor Density:	Not determined
Vapor Pressure:	As water
Specific Gravity:	~ 1
pH:	6 - 9.5
Percent Volatile:	Not determined
VOC:	Not determined
Partition Coefficient (Octanol/Water):	Not determined
Autoignition Temperature:	Not determined
Decomposition Temperature:	Not determined
Flammability Limits in Air:	
Upper	Not determined
Lower	Not determined
Flash point:	> 93.33°C (200°F)
Test Method (for Flash Point):	Pensky-Martens Closed Cup (ASTM D-93)

10. STABILITY AND REACTIVITY

Stability:	Stable.
Conditions to Avoid:	Avoid wet and humid conditions. Avoid high temperatures.
Incompatibility:	Strong oxidizing agents. (may degrade polymer)
Hazardous Decomposition Products:	No decomposition expected under normal storage conditions.
Possibility of Hazardous Reactions:	None expected.

11. TOXICOLOGICAL INFORMATION

Acute Oral Toxicity:	Low oral toxicity.
Acute Dermal Toxicity:	Not determined
Acute Inhalation Toxicity:	Not determined
Eye Irritation:	May cause eye irritation.
Skin Irritation:	Prolonged or repeated contact can remove skin oils, possibly leading to dry skin, irritation, or dermatitis.
Skin Sensitization:	Not determined
Carcinogenicity (IARC; NTP; OSHA; ACGIH):	None of the components in this product at concentrations greater than 0.1% are listed by IARC; NTP, OSHA or ACGIH as a carcinogen.
Carcinogenicity Studies:	Not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.
Mutagenicity:	No data for product.
Reproductive Toxicity:	No data for product.
Teratogenicity:	No data for product.
Neurotoxicity:	Not determined
Subacute Toxicity:	Not determined
Subchronic Toxicity:	Not determined
Chronic toxicity:	Not determined
Absorption / Distribution / Excretion / Metabolism:	Not determined
Additional Information:	Not determined

12. ECOLOGICAL INFORMATION

Toxicity to Fish:	Not determined
Toxicity to Invertebrates:	Not determined
Toxicity to Algae:	Not determined
Toxicity to Sewage Bacteria:	Not determined
Activated Sludge Respiration Inhibition Test:	Not determined
Biochemical Oxygen Demand (BOD):	Not determined
Chemical Oxygen Demand (COD):	Not determined
Total Oxygen Demand (TOD):	Not determined
Biodegradability:	Not determined
Bioaccumulation:	Not determined
Additional Environmental Data:	No data available.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose in accordance with local, state, provincial and federal regulations.

Container Disposal Information: Emptied containers may contain product residue and should not be reused.

14. TRANSPORT INFORMATION**U.S. Department of Transportation (DOT):**

Not regulated for this mode of transport.

DOT (Bulk) Oil Statement:

This product is considered to be an oil per the definitions in 49 CFR 130.2. If packed in a container with a capacity of 3,500 gallons or more, the Communication Requirements at 49 CFR 130.11 and the Response Plan Requirements at 49 CFR 130.31 and 130.33 apply to Domestic transportation by motor vehicles and rolling stock.

Notification of releases to the National Response Center (NRC), 800-424-8802, may be necessary. In the Washington, DC metropolitan area, call 202-426-2675.

International Maritime Dangerous Goods (IMDG):

Not regulated for this mode of transport.

International Air Transportation Authority (IATA):

Not regulated for this mode of transport.

15 REGULATORY INFORMATION**Federal Regulations**

OSHA Hazardous Substance: This material is classified as hazardous under OSHA regulations

Clean Air Act - Hazardous Air Pollutants (HAP): This product contains the following Hazardous Air Pollutants (HAP), as defined by the U.S. Clean Air Act Section 112 (40 CFR 61).

Components	CAA Section 112 Statutory Hazardous Air Pollutants
2-propenamide 79-06-1	Listed.

Clean Air Act - Volatile Organic Compounds (VOC): This product contains the following SOCM Intermediate or Final Volatile Organic Compounds (VOC), as defined by the U.S. Clean Air Act Section 111 (40 CFR 60.489).

Components	CAA Section 111 Volatile Organic Compounds
2-propenamide 79-06-1	Listed.

Clean Air Act - Ozone Depleting Substances (ODS): This product neither contains, nor was manufactured with, a Class I or Class II ozone depleting substance (ODS), as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App. A+B).

Clean Water Act - Priority Pollutants (PP): This product does not contain any priority pollutants listed under the U.S. Clean Water Act Section 307 (2)(1) Priority Pollutant List (40 CFR 401.15).

Resource Conservation and Recovery Act (RCRA): Not a hazardous waste under RCRA (40 CFR 261.21).

SARA Section 302 Extremely Hazardous Substances (EHS): This product contains the following component(s) regulated under Section 302 (40 CFR 355) as Extremely Hazardous Substances.

Components	Section 302 Extremely Hazardous Substances (EHS)
2-propenamide 79-06-1 (0-0.05 %)	Listed.

SARA Section 304 CERCLA Hazardous Substances: This product contains the following component(s) regulated under Section 304 (40 CFR 302) as hazardous chemicals for emergency release notification ("CERCLA" List).

Components	Section 304 CERCLA Hazardous Substances	CERCLA Reportable Quantity
2-propenamide 79-06-1 (0-0.05 %)	Listed.	5000 LBS

SARA Section 311/312 Hazard Communication Standard (HCS): This product is regulated under Section 311/312 HCS (40 CFR 370), Acute (immediate) health hazard.

SARA Section 313 Toxic Chemical List (TCL): This product does not contain any component(s) listed on the Section 313 Toxic Chemical List.

TSCA Section 8(b) Inventory Status: All component(s) comprising this product are either exempt or listed on the TSCA Inventory.

TSCA Section 5(e) Consent Orders: This product is not subject to a Section 5(e) Consent Order.

TSCA Significant New Use Rule (SNUR): This product is not subject to a Significant New Use Rule (SNUR).

TSCA Section 5(f): This product is not subject to a Section 5(f)/6(a) rule.

TSCA Section 12(b) Export Notification: This product does not contain any component(s) that are subject to a Section 12(b) Export Notification

FDA Status: Has been cleared for use as Adhesives complying with 21 CFR 175.105 and also cleared for use as Acrylamide-acrylic acid resins complying with 21 CFR 176.110, 176.170 and 176.180 used as an adjuvant in the manufacture of paper and paperboard at a use level not to exceed 2% by weight of the paper or paperboard.

State Regulations

California Proposition 65: This product contains the following component(s) currently on the California list of Known Carcinogens and Reproductive Toxins.

Components	California Proposition 65
2-propenamide 79-06-1	Carcinogenic.

Pennsylvania Right-To-Know: This product contains the following component(s) which are subject to Pennsylvania Right-to-Know disclosure requirement.

Components	CAS Number	Pennsylvania Right-to-Know
2-Propenamide, polymer with 2-propenoic acid, ammonium salt	26100-47-0	Not Listed.
2-propenamide	79-06-1	Listed. Environmental hazard.
Water	7732-18-5	Not Listed.
DISTILLATES, PETROLEUM, HYDROTREATED LIGHT	64742-47-8	Not Listed.
VENDOR PROPRIETARY.	T179	Not Listed.

International Regulations

Chemical Weapons Convention (CWC): This product does not contain any component(s) listed under the Chemical Weapons Convention Schedule of Chemicals.

Domestic Substance List (DSL) Status: All components are listed on the DSL.

16. OTHER INFORMATION

Reason for revision: New MSDS format.

Product Safety & Regulatory (PS&R) contact: Amy Perkins (757) 538-5126

Disclaimer: The information contained herein is based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to such data or information. The user is responsible for determining whether the product is suitable for its intended conditions of use.

MATERIAL SAFETY DATA SHEET

DRISPAC POLYMER (All grades)

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

TRADE NAME: DRISPAC POLYMER (All grades)

CHEMICAL CLASS: Cellulosic polymer.

APPLICATIONS: Oil well drilling fluid additive. Fluid Loss reducer

EMERGENCY TELEPHONE: 281-561-1600

SUPPLIER: Supplied by a Business Unit of
M-I L.L.C.
P.O. Box 42842, Houston, Texas 77242-2842
See cover sheet for local supplier.

TELEPHONE: 281-561-1509

FAX: 281-561-7240

CONTACT PERSON: Sam Hoskin - Manager, Occupational Health

2. COMPOSITION, INFORMATION ON INGREDIENTS

INGREDIENT NAME:	CAS No.:	CONTENTS :	EPA RQ:	TPQ:
Cellulosic Polymer		100 %		

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

CAUTION! MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION. Avoid contact with eyes, skin and clothing. Avoid breathing airborne product. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.

May form explosive dust-air mixtures. This product is a/an white powder. Slippery when wet. No significant immediate hazards for emergency response personnel are known.

ACUTE EFFECTS:

HEALTH HAZARDS, GENERAL:

Particulates may cause mechanical irritation to the eyes, nose, throat and lungs. Particulate inhalation may lead to pulmonary fibrosis, chronic bronchitis, emphysema and bronchial asthma. Dermatitis and asthma may result from short contact periods.

INHALATION: May be irritating to the respiratory tract if inhaled.

INGESTION: May cause gastric distress, nausea and vomiting if ingested.

SKIN: May be irritating to the skin.

EYES: May be irritating to the eyes.

CHRONIC EFFECTS:

CARCINOGENICITY:

IARC: Not listed. OSHA: Not regulated. NTP: Not listed.

ROUTE OF ENTRY:

Inhalation. Skin and/or eye contact.

TARGET ORGANS:

Respiratory system, lungs. Skin. Eyes.

4. FIRST AID MEASURES

GENERAL:

Persons seeking medical attention should carry a copy of this MSDS with them.

INHALATION:

Move the exposed person to fresh air at once. Perform artificial respiration if breathing has stopped. Get medical attention.

INGESTION:

Drink a couple of glasses water or milk. Do not give victim anything to drink if he is unconscious. Get medical attention.

SKIN:

Wash skin thoroughly with soap and water. Remove contaminated clothing. Get medical attention if any discomfort continues.

EYES:

Promptly wash eyes with lots of water while lifting the eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

5. FIRE FIGHTING MEASURES

AUTO IGNITION TEMP. (°F):

N/D

FLAMMABILITY LIMIT - LOWER(%):

N/D

FLAMMABILITY LIMIT - UPPER(%):

N/D

EXTINGUISHING MEDIA:

Carbon dioxide (CO2). Dry chemicals. Foam. Water spray, fog or mist.

SPECIAL FIRE FIGHTING PROCEDURES:

No specific fire fighting procedure given.

UNUSUAL FIRE & EXPLOSION HAZARDS:

Dust in high concentrations may form explosive mixtures with air.

HAZARDOUS COMBUSTION PRODUCTS:

Irritating gases/vapors/fumes. Oxides of: Carbon.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS:

Wear proper personal protective equipment (see MSDS Section 8).

SPILL CLEAN-UP PROCEDURES:

Carefully sweep up and put in closed containers. Avoid making dust. Do not contaminate drainage or waterways. Repackage or recycle if possible.

7. HANDLING AND STORAGE

HANDLING PRECAUTIONS:

Avoid handling causing generation of dust. Wear full protective clothing for prolonged exposure and/or high concentrations. Eye wash and emergency shower must be available at the work place. Wash hands often and change clothing when needed. Provide good ventilation. Mechanical ventilation or local exhaust ventilation is required.

STORAGE PRECAUTIONS:

Store at moderate temperatures in dry, well ventilated area. Keep in original container.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

INGREDIENT NAME:	CAS No.:	OSHA PEL:		ACGIH TLV:		OTHER:		UNITS:
		TWA:	STEL:	TWA:	STEL:	TWA:	STEL:	
Cellulosic Polymer		15		10				mg/m3 total dust

INGREDIENT COMMENTS:

Exposure limits for Particulates Not Otherwise Classified (PNOC) apply to dust/mist/aerosol of the proprietary ingredients this product. TLV: 3 mg/m3 resp dust; PEL: 5 mg/m3 resp. dust.

PROTECTIVE EQUIPMENT:



ENGINEERING CONTROLS:

Use appropriate engineering controls such as, exhaust ventilation and process enclosure, to reduce air contamination and keep worker exposure below the applicable limits.

VENTILATION: Supply natural or mechanical ventilation adequate to exhaust airborne product and keep exposures below the applicable limits.

RESPIRATORS: Use at least a NIOSH-approved N95 half-mask disposable or reuseable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or reuseable particulate respirator.

PROTECTIVE GLOVES:

Use suitable protective gloves if risk of skin contact.

EYE PROTECTION:

Wear dust resistant safety goggles where there is danger of eye contact.

PROTECTIVE CLOTHING:

Wear appropriate clothing to prevent repeated or prolonged skin contact.

HYGIENIC WORK PRACTICES:

Wash promptly with soap and water if skin becomes contaminated. Change work clothing daily if there is any possibility of contamination.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE/PHYSICAL STATE:	Powder, dust.
COLOR:	White.
ODOR:	Odorless or no characteristic odor.
SOLUBILITY DESCRIPTION:	Soluble in water.
DENSITY/SPECIFIC GRAVITY (g/ml):	1.6
BULK DENSITY:	34.2 lb/cu ft; 548 kg/m3
VAPOR DENSITY (air=1):	N/A
VAPOR PRESSURE:	N/A
pH-VALUE, DILUTED SOLUTION:	6.5 - 8.0
	TEMPERATURE (°F): 68
	TEMPERATURE (°F):
	CONCENTRATION (%M): 1%

10. STABILITY AND REACTIVITY

STABILITY: Normally stable.

CONDITIONS TO AVOID:
Avoid heat.

HAZARDOUS POLYMERIZATION:
Will not polymerize.

POLYMERIZATION DESCRIPTION:
Not relevant.

MATERIALS TO AVOID:
Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS:
No specific hazardous decomposition products noted.

11. TOXICOLOGICAL INFORMATION

Component: Cellulosic Polymer

TOXIC DOSE - LD 50: >25,000 mg/kg (oral rat)

12. ECOLOGICAL INFORMATION

LC 50, 96 HRS, FISH, mg/l: >21,000

ACUTE AQUATIC TOXICITY:

This product is approved for use under the U.S. Environmental Protection Agency (EPA) Region IX (California) General NPDES Permit which regulates offshore discharges of drilling fluids. Contact M-I's Environmental Affairs Department for more information.

This product passes the mysid shrimp toxicity test required by the U.S. Environmental Protection Agency (EPA) Region VI (Gulf of Mexico) NPDES Permit, which regulates offshore discharge of drilling fluids, when tested in a standard drilling fluid. Contact M-I's Environmental Affairs Department for more information.

13. DISPOSAL CONSIDERATIONS

WASTE MANAGEMENT:

This product does not meet the criteria of a hazardous waste if discarded in its purchased form. Under RCRA, it is the responsibility of the user of the product to determine at the time of disposal, whether the product meets RCRA criteria for hazardous waste. This is because product uses, transformations, mixtures, processes, etc, may render the resulting materials hazardous.

DISPOSAL METHODS:

Recover and reclaim or recycle, if practical. Should this product become a waste, dispose of in a permitted industrial landfill. Ensure that containers are empty by RCRA criteria prior to disposal in a permitted industrial landfill.

14. TRANSPORT INFORMATION

U.S. DOT:
U.S. DOT CLASS: Not regulated.

CANADIAN TRANSPORT:
TDGR CLASS: Not regulated.

SEA TRANSPORT:
IMDG CLASS: Not regulated.

AIR TRANSPORT:
ICAO CLASS: Not regulated.

15. REGULATORY INFORMATION

REGULATORY STATUS OF INGREDIENTS:

NAME:	CAS No:	TSCA:	CERCLA:	SARA 302:	SARA 313:	DSL(CAN):
Cellulosic Polymer		Yes	No	No	No	Yes

US FEDERAL REGULATIONS:

WASTE CLASSIFICATION: Not a hazardous waste by U.S. RCRA criteria. See Section 13.

REGULATORY STATUS:

This Product or its components, if a mixture, is subject to following regulations (Not meant to be all inclusive - selected regulations represented):

SECTION 313: This product does not contain toxic chemical subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR Part 372.

SARA 311 Categories:

1: Immediate (Acute) Health Effects.

The components of this product are listed on or are exempt from the following international chemical registries:

TSCA (U.S.)
DSL (Canada)
ENCS (Japan)
AICS (Australia)

STATE REGULATIONS:

STATE REGULATORY STATUS:

This product or its components, if a mixture, is subject to following regulations (Not meant to be all inclusive - selected regulations represented):

None.

CANADIAN REGULATIONS:

REGULATORY STATUS:

This Material Safety Data Sheet has been prepared in compliance with the Controlled Product Regulations.

Canadian WHMIS Classification: Not a Controlled Product.

16. OTHER INFORMATION

NPCA HMIS HAZARD INDEX:	1 Slight Hazard
FLAMMABILITY:	1 Slight Hazard
REACTIVITY:	0 Minimal Hazard
NPCA HMIS PERS. PROTECT. INDEX:	E - Safety Glasses, Gloves, Dust Respirator

USER NOTES:

N/A = Not applicable N/D = Not determined

INFORMATION SOURCES:

OSHA Permissible Exposure Limits, 29 CFR 1910, Subpart Z, Section 1910.1000, Air Contaminants.

ACGIH Threshold Limit Values and Biological Exposure Indices for Chemical Substances and Physical Agents (latest edition).

Sax's Dangerous Properties of Industrial Materials, 9th ed., Lewis, R.J. Sr., (ed.), VNR, New York, New York, (1997).

Product information provided by the commercial vendor(s).

PREPARED BY:

Sam Hoskin/bb

REVISION No./Repl. MSDS of:

2/January 12, 1998

MSDS STATUS:

Approved.

DATE:

January 29, 2001

DISCLAIMER:

MSDS furnished independent of product sale. While every effort has been made to accurately describe this product, some of the data are obtained from sources beyond our direct supervision. We cannot make any assertions as to its reliability or completeness; therefore, user may rely on it only at user's risk. We have made no effort to censor or conceal deleterious aspects of this product. Since we cannot anticipate or control the conditions under which this information and product may be used, we make no guarantee that the precautions we have suggested will be adequate for all individuals and/or situations. It is the obligation of each user of this product to comply with the requirements of all applicable laws regarding use and disposal of this product. Additional information will be furnished upon request to assist the user; however, no warranty, either expressed or implied, nor liability of any nature with respect to this product or to the data herein is made or incurred hereunder.



AMERICAN COLLOID COMPANY

One North Arlington • 1500 West Shure Drive
Arlington Heights, Illinois 60004-1434 • USA
(708) 392-4600 • Telex ITT 4330321
Fax (708) 506-6199

50302
101

MATERIAL SAFETY DATA SHEET - May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

PRODUCT NAME: **PLUG-GEL**

Page 1 of 3

Section I. MANUFACTURER'S INFORMATION

Manufacturer's Name & Address:

American Colloid Company
1500 West Shure Drive
One North Arlington
Arlington Heights, Illinois 60004

Emergency Telephone Number: 708-392-4600
Telephone Number for Information: 708-392-4600
Date Prepared: July 5, 1990

Section II. HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components (Specific Chemical Identity: Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Crystalline Quartz CAS# 14808-60-7	-	-	*	2-6%
Respirable Crystalline Quartz			NIOSH	
present (TWA)	0.1mg/m ³	0.1mg/m ³ TWA	50ug/m ³ TWA	<2%
proposed (TWA)		50ug/m ³ TWA	-	-
Nuisance Dust				
- Respirable	5mg/m ³	5mg/m ³	-	-
- Total Dust	15mg/m ³	10mg/m ³	-	-

* WARNING:

This clay product contains a small amount of crystalline silica which may cause delayed respiratory disease if inhaled over a prolonged period of time. Avoid breathing dust. Use NIOSH/MSHA approved respirator where TLV for crystalline silica may be exceeded. IARC Monographs on the evaluation of the Carcinogenic Risk of Chemicals to Humans (volume 42, 1987) concludes that there is "limited evidence" of the carcinogenicity of crystalline silica to humans. IARC classification 2A.

PRODUCT IDENTIFICATION

Chemical Name: Bentonite Clay
Chemical Family: Natural Mineral, Montmorillonite
CAS No.: 1302-78-9
FORMULA: Naturally occurring hydrated aluminosilicate of sodium, calcium, magnesium, and iron
HFPA/HMIS: Health - 1, Fire - 0, Reactivity - 0, Specific Hazard - See Section VI
Dot Class: Not Regulated



AMERICAN COLLOID COMPANY

One North Arlington • 1500 West Shore Drive
Arlington Heights, Illinois 60004-1434 • USA
(708) 392-4600 • Telex ITT 4330321
Fax (708) 506-6199

50302
101

Page 2 of 3

PRODUCT NAME: PLUG-GEL

Section III PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point	- Not Applicable	Specific Gravity ($H_2O = 1$)	- 2.5
Vapor Pressure (mm Hg.)	- Not Applicable	Melting Point	- Not Applicable
Vapor Density (AIR = 1)	- Not Applicable	Evaporation Rate (Butyl Acetate = 1)	- Not Applicable
Solubility in Water	- Negligible		
Appearance and Odor	- Pale grey to buff powder or granules, odorless		

Section IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	- Not Applicable		
Flammable Limits	- Not Applicable	LEL -	UEL -
Extinguishing Media	- Not Applicable		
Special Fire Fighting Procedures	- Inorganic Mineral/Non-Flammable		
Unusual Fire and Explosion Hazards	- Not Applicable		

Section V REACTIVITY DATA

Stability	Unstable -	Conditions to Avoid - None Known
	Stable - X	
Incompatibility (Materials to Avoid)	- None Known	
Hazardous Decomposition or By-products	- None Known	
Hazardous Polymerization	May Occur -	Conditions to Avoid - None Known
	Will Not Occur - X	

Section VI HEALTH HAZARD DATA

Route(s) of Entry:	Inhalation? Yes	Skin? No	Ingestion? No
Health Hazards (Acute and Chronic) - May cause delayed respiratory disease if dust inhaled over a prolonged period of time.			
Carcinogenicity:	NTP? No	IARC Monographs? Yes	OSHA Regulated? No
IARC Monographs on the evaluation of the Carcinogenic Risk of Chemicals to Humans (Volume 42, 1987) concludes that there is "limited evidence" of the carcinogenicity of crystalline silica to humans. IARC classification 2A.			
Signs and Symptoms of Exposure - Excessive inhalation of dust may result in shortness of breath and reduced pulmonary function.			
Medical Conditions Generally Aggravated by Exposure - Individuals with pulmonary and/or respiratory disease including but not limited to asthma and bronchitis should be precluded from exposure to dust.			
Emergency and First Aid Procedures - Eyes - Flush with water.			
- Gross inhalation of dust - Remove to fresh air; give oxygen or artificial respiration if necessary; get medical attention.			



AMERICAN COLLOID COMPANY

One North Arlington • 1500 West Shure Drive
Arlington Heights, Illinois 60004-1434 • USA
(708) 392-4600 • Telox ITT 4330321
Fax (708) 506-6199

50302
101

Page 3 of 3

PRODUCT NAME: PLUG-GEL

Section VII PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled - Vacuum if possible to avoid generating airborne dust. Avoid breathing dust. Wear an approved respirator. Avoid adding water, the product will become slippery when wet.

Waste Disposal Method - Follow federal, state and local regulations for solid waste.

Precautions to Be Taken in Handling and Storing - Avoid breathing dust, use NIOSH/MSHA approved respirator where TLV limits for Crystalline Silica may be exceeded.

Other Precautions - Slippery when wet.

Section VIII CONTROL MEASURES

Respiratory Protection (Specify Type) - OSHA standard 1910.134 or ANSI Z88.2-1980 specification.

Ventilation	- Local Exhaust	- As appropriate	Special	- None
	- Mechanical (General)	- As appropriate	Other	- None
Protective Gloves	- Not Required		Eye Protection	- Recommended
Other Protective Clothing or Equipment	- None			
Work/Hygienic Practices	- Use good housekeeping practices.			

The information herein has been compiled from sources believed to be reliable and is accurate to the best of our knowledge. However, American Colloid Company cannot give any guarantees regarding information from other sources, and expressly does not make any warranties, nor assumes any liability, for its use.

drilling fluids • grouts & sealants • polymers & additives • well rehabilitation chemicals



MATERIAL SAFETY DATA SHEET

MSDS

69101/69101
Page 2 of 3

PRODUCT NAME: SUPER GEL-X®

Section IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Not Available.

Flammable Limits: Not Available. LEL - NA.

UEL - NA.

Extinguishing Media: Not Applicable.

Special Fire Fighting Procedure: Not Applicable.

Unusual Fire/Explosion Hazards: Product may pose possible dust explosion under extremely rare circumstances or conditions.

Section V REACTIVITY DATA

Stability: Stable

Conditions to Avoid - None Known.

Incompatibility (Materials to Avoid): Powerful oxidizing agents such as fluorine, chlorine trifluoride, manganese trioxide, etc.

Hazardous Decomposition or By-products: Silica will dissolve in hydrofluoric acid producing a corrosive gas, silicon tetrafluoride.

Hazardous Polymerization: Will Not Occur

Conditions to Avoid - None Known.

Section VI HEALTH HAZARD DATA

Route(s) of Entry:

Inhalation? Yes

Skin? No

Ingestion? No

Health Hazards (Acute and Chronic):

Inhalation: Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may have the following serious chronic health effects:

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness and reduced pulmonary function. Smoking exacerbates this disease. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1 - carcinogenic to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibers (published in June 1997) in conjunction with the use of these materials. The National Toxicology Program classifies respirable crystalline silica as "reasonably anticipated to be a carcinogen". For further information See: "Adverse effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, page 761-763, 1997.

Other Data with Possible Relevance to Human Health: The small quantities of crystalline silica (quartz) found in this product are, under normal conditions, naturally coated with an unremovable layer of amorphous silica and/or bentonite clay. IARC (Vol. 68, 1997, pg. 191-192) has stated that crystalline silica (quartz) can differ in toxicity depending on the minerals with which it is combined, citing studies in IARC (Vol. 42, 1987 pg. 86) which stated that the toxic effect of crystalline silica (quartz) is reduced by the "protective effect...due mainly to clay minerals..."

Carcinogenicity:

NTP? No

IARC Monographs? Yes

OSHA Regulated? No

Signs and Symptoms of Exposure: Excessive inhalation of generated dust may result in shortness of breath and reduced pulmonary function.

Medical Conditions Generally Aggravated by Exposure: Individuals with respiratory disease, including but not limited to, asthma and bronchitis, or subject to eye irritation should not be exposed to respirable crystalline silica (quartz) dust.

Emergency and First Aid Procedures:

Eyes & Skin: Flush with water.

Gross Inhalation of Dust: Remove to fresh air; give oxygen or artificial respiration if necessary; seek medical attention.

Ingestion: If large amounts are swallowed, get immediate medical attention.

Section VII PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Vacuum if possible to avoid generating airborne dust. Avoid breathing dust. Wear an approved respirator. Avoid adding water; product will become slippery when wet.

Waste Disposal Method: Bury in an approved sanitary landfill, in accordance with federal, state and local regulations.

Precautions to Be Taken in Handling and Storing: Avoid breathing dust, use NIOSH/MSHA approved respirator where TLV limits for Crystalline Silica may be exceeded.

Other Precautions: Slippery when wet.

drilling fluids • grouts & sealants • polymers & additives • well rehabilitation chemicals



MATERIAL SAFETY DATA SHEET

MSDS

MATERIAL SAFETY DATA SHEET

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200.
Standard must be consulted for specific requirements.

69101/69101

Page 1 of 3

PRODUCT NAME: SUPER GEL-X®

Section I MANUFACTURER'S INFORMATION

MANUFACTURER'S NAME & ADDRESS:

Date Prepared: June 1, 2002

CETCO - Drilling Products Group
1500 West Shore Drive
Arlington Heights, IL 60004

Telephone Number: 847-392-5800 Fax 847-506.6150
EMERGENCY CONTACT: CHEMTREC 800-424-9300
E-mail: www.cetco.com

Section II HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

HAZARDOUS COMPONENTS:

(Specific Chemical Identity: Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Crystalline Quartz: CASH 14808-60-7				
Respirable Crystalline Quartz:			NIOSH	< 6%
Present (TWA)	0.1 mg/m ³	0.1 mg/m ³		< 2%
Proposed (TWA)		50.0 ug/m ³		
Nuisance Dust:				
Respirable	5 mg/m ³	5 mg/m ³		
Total Dust	15 mg/m ³	10 mg/m ³		

*** WARNING:** This product contains a small amount of crystalline silica, which may cause delayed respiratory disease if inhaled over a prolonged period of time. Avoid breathing dust. Use NIOSH/MSHA approved respirator where TLV for crystalline silica (Quartz) may be exceeded. IARC Monographs on the evaluation of the Carcinogenic Risk of Chemicals to Humans (volume 68, 1997) concludes that crystalline silica is carcinogenic to humans in the form of quartz. IARC classification 1.

The small quantities of crystalline silica (quartz) found in this product are, under normal conditions, naturally coated with an unremovable layer of amorphous silica and/or bentonite clay. IARC (vol. 68, 1997, pg. 191-192) has stated that crystalline silica (quartz) can differ in toxicity depending on the minerals with which it is combined, citing studies in IARC (vol. 42, 1987, p. 86) which stated that the toxic effect of crystalline silica (quartz) is reduced by the "protective effect...due mainly to clay minerals..."

National Institute for Occupational Safety and Health (NIOSH) has recommended that the permissible exposure limit be changed to 50 micrograms respirable free silica per cubic meter of air (0.05 mg/m³) as determined by a full shift sample up to a 10 hour working day, 40 hours per week. See: 1974 NIOSH criteria for a recommended Standard for Occupational Exposure to Crystalline Silica should be consulted for more detailed information.

PEL - OSHA Permissible Exposure Limit

TLV - American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value.

TWA - 8 hour time weighted average

Note: The Permissible Exposure Limits (PEL) reported above are the pre - 1989 limits that were reinstated by OSHA June 30, 1993 following a decision by the United States Circuit Court of Appeals for the 11th Circuit. Federal OSHA is now enforcing these PELs. More restrictive exposure limits may be enforced by some other jurisdictions.

PRODUCT IDENTIFICATION:

Chemical Name: Dry Mixture of Inorganic Mineral Compounds.

NFPA/HMIS: Health - 2, Fire - 0, Reactivity - 0, Specific Hazard - See Section VI.

Shipping Class: Not Regulated (DOT / 49CFR, IMDG, ICAO / IATA).

Section III PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Applicable.

Specific Gravity (H₂O = 1): 2.5

Vapor Pressure (mm Hg.): Not Applicable.

Melting Point: 1400°F

Vapor Density (AIR = 1): Not Applicable.

Evaporation Rate (Butyl Acetate = 1): Not Applicable.

Solubility in Water: Negligible.

Appearance and Odor: Tan or beige to light gray colored powder to fine granules, odorless.

drilling fluids • grouts & sealants • polymers & additives • well rehabilitation chemicals



MATERIAL SAFETY DATA SHEET

MSDS

69101/69101

Page 3 of 3

PRODUCT NAME: SUPER GEL-X®

Section VIII CONTROL MEASURES

Respiratory Protection: Use appropriate respiratory protection for respirable particulate based on consideration of airborne workplace concentration and duration of exposure arising from intended end use. Refer to the most recent standards of ANSI (Z88.2) OSHA (29 CFR 1910.134), MSHA (30 CFR Parts 56 and 57) and NIOSH Respirator Decision Logic.

Ventilation: Use local exhaust as required to maintain exposures below applicable occupational exposure limits (See Section II). See also ACGIH "Industrial Ventilation - A Manual for Recommended Practice", (current edition).

Protective Gloves: Not Required.

Eye Protection: Recommended.

Other Protective Clothing or Equipment: None. **Work/Hygiene Practices:** Use good housekeeping practices.

Section IX REGULATORY INFORMATION

SARA 311/312: Hazard Categories for SARA Section 311/312 Reporting: Chronic Health

SARA 313: This product contains the following chemicals subject to annual release reporting requirements under the SARA section 313 (40 CFR 372): None

CERCLA section 103 Reportable Quantity: None

California Proposition 65: This product contains the following substances known to the state of California to cause cancer and/or reproductive harm: This product contains crystalline silica (respirable); however, the user should note that the small quantities of crystalline silica (quartz) found in this product are, under normal conditions, naturally coated with an unremovable layer of amorphous silica and/or bentonite clay. IARC (Vol. 68, 1997, pg. 191-192) has stated that crystalline silica (quartz) can differ in toxicity depending on the minerals with which it is combined. Citing studies in IARC (Vol. 42, 1987, p. 86) which stated that the toxic effect of crystalline silica (quartz) is reduced by the "protective effect...due mainly to clay minerals..."

Toxic Substances Control Act: All of the components of this product are listed on the EPA TSCA Inventory or are exempt from notification requirements.

Canadian Environmental Protection Act: All the components of this product are listed on the Canadian Domestic Substances List or exempt from notification requirements.

European Inventory of Commercial Chemical Substances: All the components of this product are listed on the EINECS Inventory or exempt from notification requirements. (The EINECS number for Quartz: 231-545-5)

European Community Labeling Classification: Harmful (Xn)

European Community Risk and Safety Phrases: R40, R48, S22

Japan MITI: All the components of this product are existing chemical substances as defined in the Chemical Substance Control Law.

Australian Inventory of Chemical Substances: All the components of this product are listed on the AICS Inventory or exempt from notification requirements.

Canadian WHMIS Classification: Class D, Division 2, Subdivision A (Very Toxic Material causing other Toxic Effects)

NF-PA Hazard Rating:

Health: 2

Fire: 0

Reactivity: 0

HMIS Hazard Rating:

Health: *

Fire: 0

Reactivity: 0

***Warning - Chronic health effect possible - Inhalation of silica dust may cause lung injury/disease (silicosis). Take appropriate measures to avoid breathing dust. See Section II.**

REFERENCES:

Registry for Toxic Effects of Chemical Substances (RTECS), 1995.

Patty's Industrial Hygiene and Toxicology.

NTP Seventh Annual Report on Carcinogens, 1994.

IARC Monograph Volume 68, Silica. Some Silicates and Organic Fibers, 1997.

The information herein has been compiled from sources believed to be reliable and is accurate to the best of our knowledge. However, CETCO cannot give any guarantees regarding information from other sources, and expressly does not make any warranties, nor assumes any liability, for its use.

ATTACHMENT MU1 2-1
(under separate cover)

LOST CREEK HYDROLOGIC TESTING
MINE UNIT 1
NORTH AND SOUTH TESTS

LOST CREEK PROJECT
SWEETWATER COUNTY, WY
OCTOBER 2009

Attachment MU1 3-1

**Lost Creek Project - Mine Unit One
Order 1 Soil Survey**

**Lost Creek ISR, LLC
July 2009**

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.....	3
3.1	Soil Survey	3
3.2	Laboratory Analysis.....	4
4.0	Evaluation of Soil Suitability	5

FIGURES

Figure A3-1-1 Detailed Soil Survey Map, Mine Unit 1

TABLES

Table A3-1-1 Soil Sampling Locations

Table A3-1-2 Laboratory Analytical Results

ADDENDA

Addendum MU1 A3-1-1	E-mail Correspondence with WDEQ-LQD
Addendum MU1 A3-1-2	Field Data Sheets
Addendum MU1 A3-1-3a	Soil Pit Photographs
Addendum MU1 A3-1-3b	Soil Profile Photographs
Addendum MU1 A3-1-4	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 in Mine Unit 1 (MU1) of the Lost Creek Permit Area (**Figure MU1 A3-1-1**).

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 MU1 (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 Attachments OP-5a and OP-5b to the Operations Plan in the main permit document. The results of the survey of MU1 are included in this addendum to the MU1 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 MU1 A3-1-1**.

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 MU1 A3-1-2**.

Due to the irregular shape of MU1, the study area was defined and mapped as a geometric block for easier reference. The MU1 study area includes the MU1 pattern area and connecting roadways (**Figure MU1 A3-1-1**). Mine Unit 1 has an anticipated disturbance area of about 50 acres. The Mine Unit 1 study area includes approximately 140 acres. The exact boundaries of Mine Unit 1 depend on delineation drilling, which is still underway; hence, the 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 Ethan Brown and 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 MU1 study area and visually examining the surface variations. Soils were examined in more detail at 28 locations, 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 MU1 A3-1-3a**. In addition to the 28 pit locations, observations were also made at several of the mud pits excavated for Project-related drilling in the Permit Area. Pits from the MU1 study area were also compared to pits at the Plant site, which were excavated during the same field session in September 2008 (Attachment OP-5a to the Operations Plan in the main permit document).

Based on the soil pit and the mud pit observations, ten soil "profile" locations were selected to describe and sample. Three soil mapping units (SMUs) were described and sampled: the Poposhia Loam, the Teagulf Sandy Loam, and the Pepal Sandy Loam. In the Poposhia Loam mapping unit, two locations were described and sampled. In the Teagulf Sandy Loam mapping unit, three locations were described and sampled. Five locations were described and sampled in the Pepal Sandy Loam mapping unit, which comprises the largest areal extent in the MU1 study area.

Some 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 from September 8 through 10, 2008. Soil samples were collected from September 8 through 11, 2008. Between three 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 all the soil profiles are included in **Addendum MU1 3-1-3b**. A preliminary soil map was developed based on observations from the soil pits, profiles, and mud pits.

Four additional pits were excavated on September 12, 2008, to verify and fine-tune the soil map. **Table MU1 A3-1-1** lists all the pits and profiles in the MU1 study area.

2.2 Laboratory Analysis

After examining the soil profile descriptions, samples from four of the eight soil profiles 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 1**. **Table 2** lists the sampling locations and depths. Samples from MU1PR23 (MU1PIT23) were selected for laboratory analysis. MU1PR23 occurs near the soil boundary between the Teagulf SMU and the Pepal SMU. However, examination of the soil profile indicated that MU1PR23 is representative of the Teagulf SMU.

3.0 Results and Discussion

3.1 Soil Survey

Three SMUs were identified in the MU1 study area: the Poposhia Loam, the Teagulf Sandy Loam, and the Pepal Sandy Loam as described 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.

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.

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 next layer 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.

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.

3.2 Laboratory Analysis

The laboratory report is included as **Addendum MU1 A3-1-4**, and the laboratory results are summarized in **Table MU1 A3-1-2**. 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 MU1 A3-1-2**).

The analyzed topsoil samples had textures of loam and clay loam. The topsoil depths generally ranged from six to 12 inches, with the exception of one sample depth of 24 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 and sandy loams, with depths ranging from six to 60 inches. Their organic matter content ranged from 0.3 to 1.2 percent. The organic matter in subsoil samples taken outside the Poposhia Loam unit ranged from 0.3 to 0.5 percent. These values are low, and are not favorable to vegetation establishment. The percent saturation (ranging from 31 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 all three 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 about 19 to 24 inches of topsoil material favorable for plant growth. The Teagulf Sandy Loam provides about six to 12 inches of topsoil material favorable for plant growth. The Pepal Sandy Loam provides 14 to 18 inches of topsoil material favorable for plant growth.

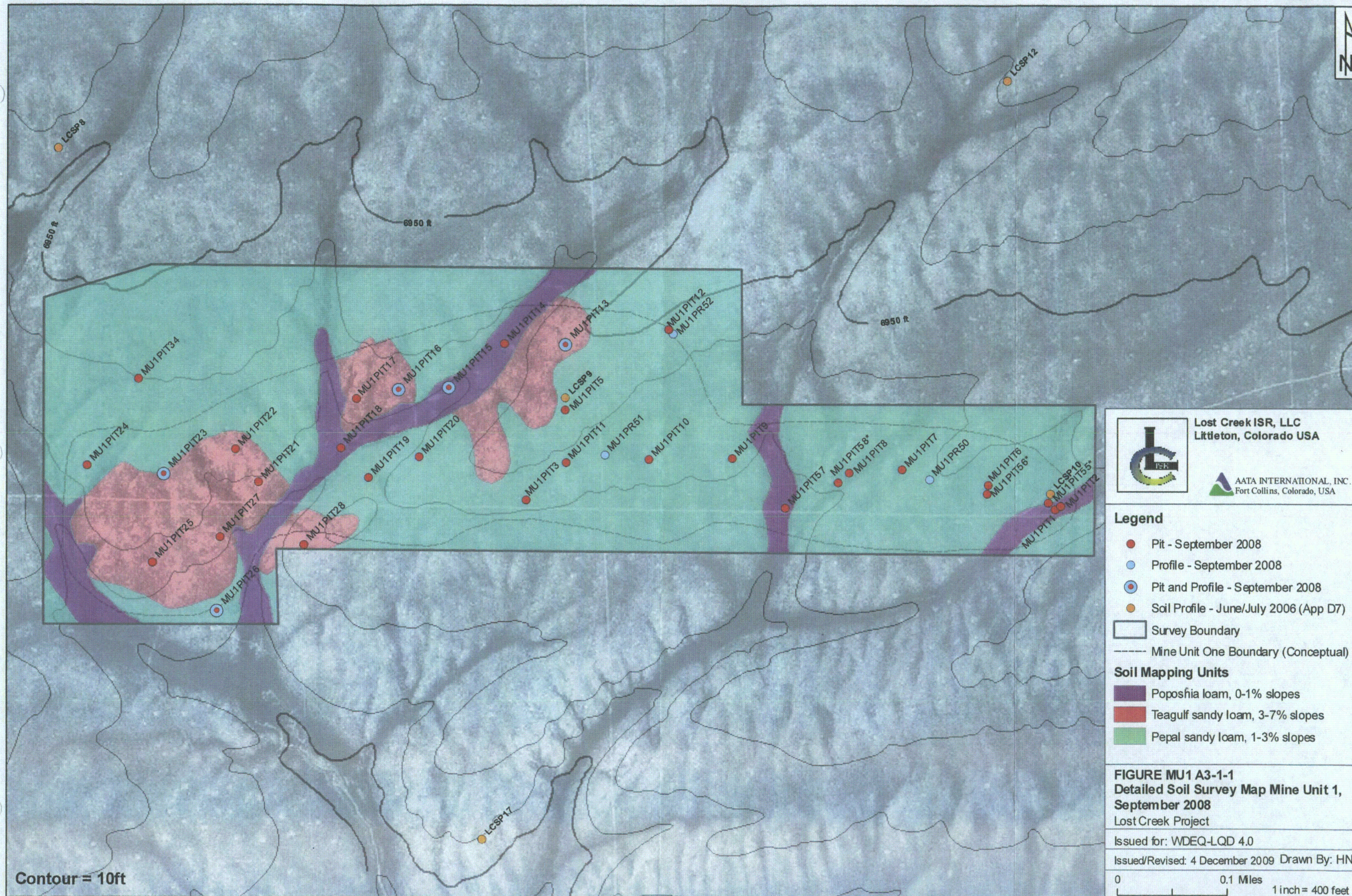
REFERENCES

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).

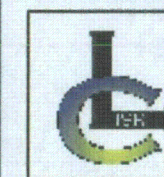
Munn LC, Arneson CS. 1999. Soils of Wyoming: A digital statewide map at 1:100,000 scale. Agr. Expt. Sta. Rpt. B-1071. University of Wyoming, College of Agriculture, Laramie (WY).

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
- Mine Unit One Boundary (Conceptual)

Soil Mapping Units

- Poposhia loam, 0-1% slopes
- Teagulf sandy loam, 3-7% slopes
- Pepal sandy loam, 1-3% slopes

FIGURE MU1 A3-1-1
Detailed Soil Survey Map Mine Unit 1,
September 2008
Lost Creek Project

Issued for: WDEQ-LQD 4.0

Issued/Revised: 4 December 2009 Drawn By: HN

0 0.1 Miles 1 inch = 400 feet

Table MU1 3a-1-1 Soil Sampling Locations (Page 1 of 2)

Pit or Profile Number ⁽¹⁾	Location	Soil Designation	Date Excavated
MU1PIT1	East end of Mine Unit 1. Near 2006 LCSP10.	Poposhia loam	9/2/08
MU1PIT2	East end of Mine Unit 1. Near 2006 LCSP10.	Poposhia loam	9/2/08
MU1PIT3	South central portion of Mine Unit 1.	Pepal sandy loam	9/2/08
MU1PIT5	Central portion of Mine Unit 1. Near 2006 LCSP9.	Pepal sandy loam	9/2/08
MU1PIT6	East portion of Mine Unit 1.	Pepal sandy loam	9/3/08
MU1PIT7	East portion of Mine Unit 1.	Pepal sandy loam	9/3/08
MU1PIT8	East portion of Mine Unit 1.	Pepal sandy loam	9/3/08
MU1PIT9	East portion of Mine Unit 1.	Pepal sandy loam	9/3/08
MU1PIT10	Central portion of Mine Unit 1.	Pepal sandy loam	9/3/08
MU1PIT11	Central portion of Mine Unit 1.	Pepal sandy loam	9/3/08
MU1PIT12	Northeast portion of Mine Unit 1.	Pepal sandy loam	9/3/08
MU1PIT13	North central portion of Mine Unit 1. Expanded to soil profile. Sampled for laboratory analyses.	Teagulf sandy loam	9/3/08 (Expanded 9/11/08; Sampled 9/11/08)
MU1PIT14	North central portion of Mine Unit 1.	Poposhia loam	9/3/08
MU1PIT15	Central portion of Mine Unit 1. Expanded to soil profile. Sampled for laboratory analyses.	Poposhia loam	9/3/08 (Expanded 9/11/08; Sampled 9/11/08)
MU1PIT16	Central portion of Mine Unit 1. Expanded to soil profile.	Teagulf sandy loam	9/3/08 (Expanded 9/8/08)
MU1PIT17	Central portion of Mine Unit 1.	Teagulf sandy loam	9/4/08
MU1PIT18	Central portion of Mine Unit 1.	Poposhia loam	9/4/08
MU1PIT19	Central portion of Mine Unit 1.	Pepal sandy loam	9/4/08

Table MU1 A3-1-1 Soil Sampling Locations (Page 2 of 2)

Pit or Profile Number ⁽¹⁾	Location	Soil Designation	Date Excavated
MU1PIT20	Central portion of Mine Unit 1.	Pepal sandy loam	9/4/08
MU1PIT21	West portion of Mine Unit 1.	Teagulf sandy loam	9/4/08
MU1PIT22	West portion of Mine Unit 1.	Teagulf sandy loam	9/4/08
MU1PIT23	West portion of Mine Unit 1. Expanded to soil profile. Sampled for laboratory analyses.	Teagulf sandy loam	9/4/08 (Expanded 9/11/08; Sampled 9/11/08)
MU1PIT24	West end of Mine Unit 1.	Pepal sandy loam	9/4/08
MU1PIT25	Southwest portion of Mine Unit 1.	Teagulf sandy loam	9/4/08
MU1PIT26	Southwest portion of Mine Unit 1. Expanded to soil profile.	Pepal sandy loam	9/4/08 (Expanded 9/11/08)
MU1PIT27	West portion of Mine Unit 1.	Teagulf sandy loam	9/4/08
MU1PIT28	Southwest portion of Mine Unit 1.	Teagulf sandy loam	9/4/08
MU1PIT34	West end of Mine Unit 1.	Pepal sandy loam	9/5/08
MUIPR50	East portion of Mine Unit 1. Sampled for laboratory analyses.	Pepal sandy loam	9/11/2008 (Sampled 9/11/08)
MUIPR51	Central portion of Mine Unit 1.	Pepal sandy loam	9/11/08
MUIPR52	Northeast portion of Mine Unit 1. Near MU1PIT12.	Pepal sandy loam	9/10/08
MU1PIT55	East end of Mine Unit 1. Near 2006 LCSP10.	Poposhia loam	9/12/08
MU1PIT56	East portion of Mine Unit 1.	Pepal sandy loam	9/12/08
MU1PIT57	Central portion of Mine Unit 1.	Poposhia loam	9/12/08
MU1PIT58	Central portion of Mine Unit 1.	Pepal sandy loam	9/12/08

⁽¹⁾ Pit/Profile Numbers 4 and 29 through 35 were located at the Plant site (see Attachment OP-5a in the main permit document). Pit/Profile Numbers 36 through 49 were not assigned to any sampling locations.

Table MU1 A3-1-2 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 10% of Study Area)																	
MU1PR15	0-24	A, B	7.6	0.52	37.0	0.26	0.003	0.63	1.0	4.02	1.85	0.44	2.4	42	38	20	L
	24-60	C	6.9	0.57	31.6	0.34	0.004	0.29	0.7	4.14	1.69	0.58	0.9	52	28	20	L
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
Pepal Sandy Loam (about 75% of Study Area)																	
MU1PR50	0-6	A, B	7.8	0.47	41.5	0.84	0.007	<0.20	1.0	2.54	1.13	1.13	1.5	72	10	18	SL
	6-60	C	7.7	0.47	35.1	0.48	0.005	<0.20	0.7	2.94	1.30	0.70	0.5	80	6	14	SL
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 MU1 3-1-1

E-Mail Correspondence with WDEQ-LQD

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

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

Addendum MU1 3-1-2

Field Data Sheets

Soil Description: Location MULBURYSite No. _____ Date 9/2 Time 12:55p 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	LS			SL	SIC						
0-3 0-6	A	10YR 3/3		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk abk	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 po br co cobr	a o g d	a w i b	
6-15	B	10YR 4/4		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk abk	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 po br co cobr	a o g d	a w i b	
15-34	C	10YR 5/4		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk abk	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 po br co cobr	a o g d	a w i b	Violent
		-----		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk abk	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 po br co cobr	a o g d	a w i b	
		-----		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk abk	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 po br co cobr	a o g d	a w i b	
		-----		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk abk	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 po br co cobr	a o g d	a w i b	

Soil Description: Location MULPITZ Comments - similar to MULPITZ

Site No. _____ Date 9/2 Time 1:30 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									
0-12 0-12		10YR 3/3		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 50 <10 75 10 >75 25 prob coarse sand	so ss 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 po mk br co cobr	a o g d	e w i b	
1273 1273		7.5YR 4/4		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 50 <10 75 10 >75 25	so ss 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 po mk br co cobr	a o g d	e w i b	
		-----		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 50 <10 75 10 >75 25	so ss 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 po mk br co cobr	a o g d	e w i b	
		-----		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 50 <10 75 10 >75 25	so ss 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 po mk br co cobr	a o g d	e w i b	
		-----		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 50 <10 75 10 >75 25	so ss 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 po mk br co cobr	a o g d	e w i b	
		-----		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 50 <10 75 10 >75 25	so ss 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 po mk br co cobr	a o g d	e w i b	
		-----		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk sbk	0 50 <10 75 10 >75 25	so ss 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 po mk br co cobr	a o g d	e w i b	

Soil Description: Location MULPIT 3Site No. _____ Date 9/2 Time 2:30 Vegetation <50% < 1' tall sage/grass

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		%		Wet	Moist	Dry			Wet	Moist	Dry					
0-6		10YR 3/3		m ag 1 2 3	vf f m o vo	gr pl pr opr abk abk	0 50 75 40 25	<10 >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 mk co cobr	a o g d	s w i b	10-15% gravel on surface
6-18		10YR 4/3		m ag 1 2 3	vf f m o vo	gr pl pr cpr abk abk	0 50 75 10 25	<10 >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 mk co cobr	a o g d	s w i b	
-31		10YR 4/4		m ag 1 2 3	vf f m o vo	gr pl pr cpr abk abk	0 50 75 10 25	<10 >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 mk co cobr	a o g d	s w i b	18-21-V 21-31 SI due to sand content
* notes				m ag 1 2 3	vf f m o vo	gr pl pr opr abk abk	0 50 75 10 25	<10 >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 mk co cobr	a o g d	s w i b	18-31 horizon is coarse sandy <2mm
				m ag 1 2 3	vf f m o vo	gr pl pr cpr abk abk	0 50 75 10 25	<10 >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 mk co cobr	a o g d	s w i b	
				m ag 1 2 3	vf f m o vo	gr pl pr cpr abk abk	0 50 75 10 25	<10 >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 mk co cobr	a o g d	s w i b	

Soil Description: Location MUIPETS

Site No. _____

Date 9/2Time 4:10Vegetation Same

Elevation _____

Slope _____

Aspect _____

Geomorphic Surface Near LCSP9

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		10YR 3/3 -----		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo ss ps vfr s p fr vs vp fl vll vh ell eh	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	a w i b	3/3 3/3 4/4		
6-15		10YR 4/4 -----		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo ss ps vfr s p fr vs vp fl vll vh ell eh	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	a w i b	φ		
15-21		10YR 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		so po lo ss ps vfr s p fr vs vp fl vll vh ell eh	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	a w i b	φ		
21-33		10YR 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		so po lo ss ps vfr s p fr vs vp fl vll vh ell eh	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	a w i b	51		
		-----		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo ss ps vfr s p fr vs vp fl vll vh ell eh	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	a w i b	No gravel of signif. throughout		
		-----		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo ss ps vfr s p fr vs vp fl vll vh ell eh	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	a w i b			

Soil Description: Location MU1 PIT6 Texture H = heavy
 Site No. _____ Date _____ Time 10:07 Vegetation _____
 Elevation _____ Slope 0-1 Aspect _____ Geomorphic Surface C = coarse
 Parent Material(s) _____ Described by Clprg

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence				Texture		Clay films		Boundaries		notes			
		moist	dry		%		Wet	Moist	Dry											
0-6		10YR 3/3 All 10YR ↓		m ag 1 2 3	vf f m c vo	gr pl pr cpr abk abk	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 po mk br co cobr	a o g d	s w i b	very (coarse) sandy
6-12		4/4		m ag 1 2 3	vf f m c vo	gr pl pr cpr abk abk	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 po mk br co cobr	a o g d	s w i b	
12-18		4/4		m ag 1 2 3	vf f m c vo	gr pl pr cpr abk abk	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 po mk br co cobr	a o g d	s w i b	495/
18-36		5/4 4/6 4/6		m ag 1 2 3	vf f m c vo	gr pl pr cpr abk abk	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 po mk br co cobr	a o g d	s w i b	
				m ag 1 2 3	vf f m c vo	gr pl pr cpr abk abk	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 po mk br co cobr	a o g d	s w i b	
				m ag 1 2 3	vf f m c vo	gr pl pr cpr abk abk	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 po mk br co cobr	a o g d	s w i b	

Soil Description: Location MU4 PIT 7 TBE - #4
 Site No. _____ Date _____ Time 10:50 Vegetation 30% - 35
 Elevation _____ Slope 5% Aspect NW Geomorphic Surface _____
 Parent Material(s) _____ Described by _____

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence			Texture	pH	Clay films			Boundaries	notes
		moist	dry		%		Wet	Moist	Dry							
0-6		10YR 4/4		m vi gr sg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo ss ps vlr s p fr va vp fl vll vh ell eh	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	a w i b	eff = sil L/vt sil		
6-12		10YR 5/4 Bits of soft shale		m vi gr sg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo ss ps vlr s p fr va vp fl vll vh ell eh	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	a w i b	ef-m sil floury		
12-18 24		10YR 5/4		m vi gr sg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo ss ps vlr s p fr va vp fl vll vh ell eh	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	a w i b	Floury		
24-36 (Cr) at 30"		10YR 5/4 9/26 SC wrong		m vi gr sg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo ss ps vlr s p fr va vp fl vll vh ell eh	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	a w i b	m vt sil		
36+ 42-48		10YR 5/4 6/4		m vi gr sg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo ss ps vlr s p fr va vp fl vll vh ell eh	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	a w i b	φ		
			m vi gr sg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo ss ps vlr s p fr va vp fl vll vh ell eh	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	a w i b			

Soil Description: Location MULPIT 8 (70 m) coarse
 Site No. _____ Date 9/3 Time 11:30 Vegetation _____
 Elevation _____ Slope _____ Aspect _____ Geomorphic Surface _____
 Parent Material(s) _____ Described by _____
typical sandy sub stratum

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence				Texture	pH	Clay films			Bound- aries		notes
		moist	dry		%		Wet	Moist	Dry									
0-6		3/3		m vf gr sg f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo ss ps vfr so s p fr sh vs vp fl h vll vh ell 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	a w i b						
6-18		6-12 3/4 12-18 3/4		m vf gr sg f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo ss ps vfr so s p fr sh vs vp fl h vll vh ell 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	a w i b						
18-24		10YR 4/4		m vf gr sg f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo ss ps vfr so s p fr sh vs vp fl h vll vh ell eh	S SICL LS SIL SL SI SCL SIC L H C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b						
24-30		10YR 4/4		m vf gr sg f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo ss ps vfr so s p fr sh vs vp fl h vll vh ell 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	a w i b						
30-36		10YR 4/4		m vf gr sg f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo ss ps vfr so s p fr sh vs vp fl h vll vh ell 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	a w i b						
36-42		10YR 5/4		m vf gr sg f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo ss ps vfr so s p fr sh vs vp fl h vll vh ell 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	a w i b						

Soil Description: Location MURPIT9 SSC s/s sticky
 Site No. Date 9/3 Time 12:38 Vegetation S = sticky
 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	vi			n	pl	a	s		
0-6		3/3		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po lo lo sa ps vfr so s ps fr sh s p fl h vs vp vll vh ell eh	S SICL LS SIL SL SI SCL SIC L C CL SC	CH	vi n pl 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	ef φ					
6-12 12-18		4/4 4ff		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po lo lo sa ps vfr so s ps fr sh s p fl h vs vp vll vh ell eh	S SICL LS SIL SL SI SCL SIC L C CL SC	C	vi n pl 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	ef φ					
18-24 24-36 36-42	Coarse s.s	4/4		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po lo lo sa ps vfr so s ps fr sh s p fl h vs vp vll vh ell eh	S SICL LS SIL SL SI SCL SIC L C CL SC		vi n pl 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	ef-s					
				m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po lo lo sa ps vfr so s ps fr sh s p fl h vs vp vll vh ell eh	S SICL LS SIL SL SI SCL SIC L C CL SC		vi n pl 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	S-V					
				m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po lo lo sa ps vfr so s ps fr sh s p fl h vs vp vll vh ell eh	S SICL LS SIL SL SI SCL SIC L C CL SC		vi n pl 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	ef-S-V					
				m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk sbk	0 50 <10 75 10 >75 25	so po lo lo sa ps vfr so s ps fr sh s p fl h vs vp vll vh ell eh	S SICL LS SIL SL SI SCL SIC L C CL SC		vi n pl 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b						

Soil Description: Location MU 1 PIT 10
 Site No. _____ Date _____ 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		%	Wet	Moist	Dry								
0-6 6-12		4/3		m vi gr eg i pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo as ps vfr so s p fr sh vs vp fl h vfl vh eff 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 s o w g l d b					
12-18 18-24		5/4		m vi gr eg i pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo as ps vfr so s p fr sh vs vp fl h vfl vh eff 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 s o w g l d b		very sandy & loose			
18-24 24-30 30-36	- chunks of hard p. aty rock	5/4 4/4 4/4		m vi gr eg i pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo as ps vfr so s p fr sh vs vp fl h vfl vh eff eh	S SICL LS SIL SL SI SCL SIC L C CL SC	H	v1 n pl 1 po 2 mk br 3 co 4 k cobr	a s o w g l d b		Possibly silt stone pm infl.			
36+	can be auger- ed Cr	5/4		m vi gr eg i pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo as ps vfr so s p fr sh vs vp fl h vfl vh eff 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 s o w g l d b					
				m vi gr eg i pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo as ps vfr so s p fr sh vs vp fl h vfl vh eff 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 s o w g l d b					
				m vi gr eg i pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo as ps vfr so s p fr sh vs vp fl h vfl vh eff 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 s o w g l d b					

Soil Description: Location MUL PTH
 Site No. _____ Date _____ Time _____ 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										
D-6 6-12	A Bt ? 9/26	4/3		m ag 1 2 3	vf f m c vo	gr pl pr cpr abk abk	0 50 (10) 75 10 >75 25	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 po mk co cobr	a o g d	s w i b	ef-φ
12-18 18-24	B3 ? 9/26 What	4/3 5/4		m ag 1 2 3	vf f m c vo	gr pl pr cpr abk abk	0 50 (10) 75 10 >75 25	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 po mk co cobr	a o g d	s w i b	ef-φ
24-36		5/4		m ag 1 2 3	vf f m c vo	gr pl pr cpr abk abk	0 50 (10) 75 10 >75 25	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 po mk co cobr	a o g d	s w i b	ef-v 30-36 ls-s
	NOTE 12-36 nearly gravelly v. coarse sandy loam to			m ag 1 2 3	vf f m c vo	gr pl pr cpr abk abk	0 50 (10) 75 10 >75 25	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 po mk co cobr	a o g d	s w i b	
	to- loamy sand			m ag 1 2 3	vf f m c vo	gr pl pr cpr abk abk	0 50 (10) 75 10 >75 25	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 po mk co cobr	a o g d	s w i b	
				m ag 1 2 3	vf f m c vo	gr pl pr cpr abk abk	0 50 (10) 75 10 >75 25	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 po mk co cobr	a o g d	s w i b	

Soil Description: Location MU1 PIT 12 *m = medium*
 Site No. _____ Date 9/3 Time 2:30 Vegetation _____
 Elevation _____ Slope _____ Aspect _____ Geomorpho 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		10YR 3/3 ----- 10YR 4/3		m vf gr eg ① pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo sa pa vlr so s p fr sh vs vp fl h vfl vh eff eh			S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pf 1 po 2 mk br 3 co 4 k cohr	a e o w g i d b	ef-φ ef-φ		
12-18 18-24	Bt	10YR 4/4 - ----- 10YR 5/4		m vf gr eg ① pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo sa pa vlr so s p fr sh vs vp fl h vfl vh eff eh			S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pf 1 po 2 mk br 3 co 4 k cohr	a e o w g i d b	ef-s/		
24-30 30-36	Cr1 Cr2	5YR 4/4 ----- 10YR 6/3		m vf gr eg ① pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo sa pa vlr so s p fr sh vs vp fl h vfl vh eff eh			S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pf 1 po 2 mk br 3 co 4 k cohr	a e o w g i d b	ef-✓		
		-----		m vf gr eg ① pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo sa pa vlr so s p fr sh vs vp fl h vfl vh eff eh			S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pf 1 po 2 mk br 3 co 4 k cohr	a e o w g i d b			
		-----		m vf gr eg ① pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo sa pa vlr so s p fr sh vs vp fl h vfl vh eff eh			S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pf 1 po 2 mk br 3 co 4 k cohr	a e o w g i d b			
		-----		m vf gr eg ① pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo sa pa vlr so s p fr sh vs vp fl h vfl vh eff eh			S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pf 1 po 2 mk br 3 co 4 k cohr	a e o w g i d b			

Soil Description: Location M41 PIT 13
 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	Molal	Dry								
0-6 6-12		9/13 ----- 4/4		m vf gr ag f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo as ps vfr so e p fr sh vs vp fl h vfl vh eff eh			S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pl 1 po 2 mk br 3 co 4 k cobr	a e o w g l d b	ef = p Loom ef = sl H. Loom		
12-18 18-24		10 YR 5/4 ----- 10 YR 5/4		m vf gr ag f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo as ps vfr so e p fr sh vs vp fl h vfl vh eff eh			S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pl 1 po 2 mk br 3 co 4 k cobr	a e o w g l d b	ef = XV		
		-----		m vf gr ag f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo as ps vfr so e p fr sh vs vp fl h vfl vh eff eh			S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pl 1 po 2 mk br 3 co 4 k cobr	a e o w g l d b			
		-----		m vf gr ag f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo as ps vfr so e p fr sh vs vp fl h vfl vh eff eh			S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pl 1 po 2 mk br 3 co 4 k cobr	a e o w g l d b			
		-----		m vf gr ag f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo as ps vfr so e p fr sh vs vp fl h vfl vh eff eh			S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pl 1 po 2 mk br 3 co 4 k cobr	a e o w g l d b			
		-----		m vf gr ag f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo as ps vfr so e p fr sh vs vp fl h vfl vh eff eh			S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pl 1 po 2 mk br 3 co 4 k cobr	a e o w g l d b			

Soil Description: Location MU1 PIT 14 (MU1 PIT 15 was profile 2 will be profile 14 moved to 15)

Site No. _____ Date _____ 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			Wet	Moist	Dry						
	0-6	10YR 3/3		m vf gr	0 50	so po	lo	lo	S SICL		v1 n pl	a a		heavy sticky sandy loam
				sg f pl	<10 75	ss ps	vfr	so	LS SIL		1 po	a o	w	
				1 m pr	10 >75	s p	fr	sh	SL SI		2 mk br	o g	i	
	6-12	10YR 3/4		2 e cpr	25	vs vp	fl	h	SOL SIO		3 co	d b		
				3 vo abk			vll	vh	L C		4 k cobr			heavy loam
				abk			ell	eh	CL SO					
	12-18	10YR 4/4		m vf gr	0 50	so po	lo	lo	S SICL		v1 n pf	a a		very heavy sticky loam
				sg f pl	<10 75	ss ps	vfr	so	LS SIL		1 po	a o	w	
				1 m pr	10 >75	s p	fr	sh	SL SI		2 mk br	o g	i	
				2 e cpr	25	vs vp	fl	h	SOL SIO		3 co	d b		
				3 vo abk			vll	vh	L C		4 k cobr			
				abk			ell	eh	CL SO					
	18-24	10YR 5/4		m vf gr	0 50	so po	lo	lo	(S) SICL		v1 n pf	a a		xgr cos
				sg f pl	<10 75	ss ps	vfr	so	LS SIL		1 po	a o	w	
				1 m pr	10 >75	s p	fr	sh	SL SI		2 mk br	o g	i	
				2 e cpr	25	vs vp	fl	h	SOL SIO		3 co	d b		
				3 vo abk			vll	vh	L C		4 k cobr			
				abk			ell	eh	CL SO					
	24-30	10YR 5/3		m vf gr	0 50	so po	lo	lo	S SICL		v1 n pf	a a		possible top soil - 12"
				sg f pl	<10 75	ss ps	vfr	so	LS SIL		1 po	a o	w	
				1 m pr	10 >75	s p	fr	sh	SL SI		2 mk br	o g	i	
				2 e cpr	25	vs vp	fl	h	SOL SIO		3 co	d b		
	30-36	10YR 3/3		3 vo abk			vll	vh	L C		4 k cobr			
				abk			ell	eh	CL SO					
	36+	10YR 5/3		m vf gr	0 50	so po	lo	lo	S SICL		v1 n pf	a a		
				sg f pl	<10 75	ss ps	vfr	so	LS SIL		1 po	a o	w	
				1 m pr	10 >75	s p	fr	sh	SL SI		2 mk br	o g	i	
				2 e cpr	25	vs vp	fl	h	SOL SIO		3 co	d b		
				3 vo abk			vll	vh	L C		4 k cobr			
				abk			ell	eh	CL SO					
				m vf gr	0 50	so po	lo	lo	S SICL		v1 n pf	a a		
				sg f pl	<10 75	ss ps	vfr	so	LS SIL		1 po	a o	w	
				1 m pr	10 >75	s p	fr	sh	SL SI		2 mk br	o g	i	
				2 e cpr	25	vs vp	fl	h	SOL SIO		3 co	d b		
				3 vo abk			vll	vh	L C		4 k cobr			
				abk			ell	eh	CL SO					

Soil Description: Location MU 1 PITA #6 GPS Recheck 9/4 point OK = 16 location
 Site No. _____ Date 9/3 Time 4:45 pm Vegetation sparse sage & grasses
 Elevation _____ Slope 5% Aspect SE Geomorpho Surface _____
 Parent Material(s) wind + water reworked alluvial fan Described by C. pra

Depth (cm)	Horizon	Color		Structure	Gravel %		Consistence				Texture	pH	Clay films	Boundaries		notes			
		moist	dry				Wet	Moist	Dry										
0-6 B		10YR 3/3		m ag 1 2 3	vl f m o vo	gr pl pr cpr abk abk	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 po br co cobr	a o g d	a w l b	cf-φ
6-12		10YR 5/4		m ag 1 2 3	vl f m o vo	gr pl pr cpr abk abk	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 po br co cobr	a o g d	a w l b	cf=φ
12-18 YB		10YR 5/4		m ag 1 2 3	vl f m o vo	gr pl pr cpr abk abk	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 po br co cobr	a o g d	a w l b	cf-5L
18-24 B		7.5YR 5/3		m ag 1 2 3	vl f m o vo	gr pl pr cpr abk abk	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 po br co cobr	a o g d	a w l b	cf-V
				m ag 1 2 3	vl f m o vo	gr pl pr cpr abk abk	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 po br co cobr	a o g d	a w l b	Note 9/8 P.M. is probably not alluvial
				m ag 1 2 3	vl f m o vo	gr pl pr cpr abk abk	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 po br co cobr	a o g d	a w l b	rather sandstone- coarse grained

Soil Description:

Location

MUD PIT 17

picture Mud 1 - 32 m NE of pit 18

Site No. _____

Date

9/4

Time

9:15

Vegetation

Very sparse - disturbed + eroded

Elevation _____

Slope _____

Aspect _____

Geomorpho Surface

Perhaps a nose ?

(pic 100-2802)

Parent Material(s) _____

Described by _____

2803
2804

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence			Texture	pH	Clay films	Bound- aries	notes					
		moist	dry		%	Wet	Moist	Dry											
0-3 3-6		4/3 ----- 4/4		m ag 1 2 3	vf f m o vo	gr pl pr opr abk abk	0 50 60 75 10 25 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 mk co k	pl po br co cobr	a o g d	a w i b	
12-18 6-12 18-24		5/4 -----		m ag 1 2 3	vf f m o vo	gr pl pr cpr abk abk	0 50 60 75 10 25 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 mk co k	pl po br co cobr	a o g d	a w i b	12" ref
24-30 12-15 30-36		6/4 -----		m ag 1 2 3	vf f m o vo	gr pl pr cpr abk abk	0 50 60 75 10 25 75 n/a	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 mk co k	pl po br co cobr	a o g d	a w i b	shale/ss PM some "silky"
		-----		m ag 1 2 3	vf f m o vo	gr pl pr opr abk abk	0 50 60 75 10 25 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 mk co k	pl po br co cobr	a o g d	a w i b	
		-----		m ag 1 2 3	vf f m o vo	gr pl pr opr abk abk	0 50 60 75 10 25 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 mk co k	pl po br co cobr	a o g d	a w i b	
		-----		m ag 1 2 3	vf f m o vo	gr pl pr opr abk abk	0 50 60 75 10 25 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 mk co k	pl po br co cobr	a o g d	a w i b	

Soil Description: Location MUL PIT 18 Buried soil Bi-sequal profile
 Site No. Date Time 10:50 Vegetation Dense Sage 10' west of deep gully (10 x 10')
 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	pl	n			pl	a	w				
0-6	sil	10YR 3/3		m eg 1 2 3	vf 1 m o vo	gr pl pr opr abk abk	0 50 50 10 25	so ss s vs	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 pl po mk br co cobr	a o g d	a w i b	Buried A or B, very dark occur at 36"	
12-18	SCL	4/4		m eg 1 2 3	vf 1 m o vo	gr pl pr cpr abk abk	0 50 50 10 25	so ss s vs	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 pl po mk br co cobr	a o g d	a w i b		
18-24	SI	5/4																	
24-30	CI	4/3		m eg 1 2 3	vf 1 m o vo	gr pl pr cpr abk abk	0 50 50 10 25	so ss s vs	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 pl po mk br co cobr	a o g d	a w i b	30" is end of modern soil	
30-36	sil	4/2																	
36-42	SICL	10YR 3/1		m eg 1 2 3	vf 1 m o vo	gr pl pr opr abk abk	0 50 50 10 25	so ss s vs	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 pl po mk br co cobr	a o g d	a w i b		
42-48	sil	10YR 5/4																	
48-60	SI	10YR 5/4		m eg 1 2 3	vf 1 m o vo	gr pl pr cpr abk abk	0 50 50 10 25	so ss s vs	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 pl po mk br co cobr	a o g d	a w i b		
				m eg 1 2 3	vf 1 m o vo	gr pl pr cpr abk abk	0 50 50 10 25	so ss s vs	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 pl po mk br co cobr	a o g d	a w i b		

Soil Description: Location MU 4 PIT 19
 Site No. _____ Date 9/4 Time 11:43 Vegetation Very sparse Sage-hilltop appears severely eroded
 Elevation _____ Slope 4-5% Aspect WNW Geomorphic Surface Shale or siltstone
 Parent Material(s) 5/2/8 Described by JG/EB Revised 9/12

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence			Texture	pH	Clay films	Boundaries	notes					
		moist	dry		%		Wet	Moist	Dry										
0-6	A	3/3-4/3 9/12		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk abk	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 O SC	v1 1 2 3 4	n po mk co cobr	a o g d	a e w i b	Shale ~24" to siltstone
6-12 12-18	B?	4/3-4/4 4/3 4/4		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk abk	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 O SC	v1 1 2 3 4	n po mk co cobr	a o g d	a e w i b	(maroon perhaps) not (def)
18-27		5/4		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk abk	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 O SC	v1 1 2 3 4	n po mk co cobr	a o g d	a e w i b	
24-30 CY		10YR 5/3 4/4-5/4		m eg 1 2 3	vf f m o vo	gr pl pr cpr abk abk	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 O SC	v1 1 2 3 4	n po mk co cobr	a o g d	a e w i b	
				m eg 1 2 3	vf f m o vo	gr pl pr cpr abk abk	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 O SC	v1 1 2 3 4	n po mk co cobr	a o g d	a e w i b	
				m eg 1 2 3	vf f m o vo	gr pl pr cpr abk abk	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 O SC	v1 1 2 3 4	n po mk co cobr	a o g d	a e w i b	

Soil Description: Location MUJIT #20
 Site No. _____ Date _____ Time 12:00 Vegetation Sparse grass & sage
 Elevation _____ Slope 5°D Aspect NW Geomorphic Surface hill crest - shoulder
 Parent Material(s) Sandy/silty shale ~20-30" Described by Cipra / Brown

Depth (cm)	Horizon	Color		Structure	Gravel %	Consistence			Texture	pH	Clay films	Boundaries	notes	
		moist	dry			Wet	Moist	Dry						
0-6		10YR 9/3		m vi gr sg l pl 1 m pr 2 o cpr 3 ve 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 SIG 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	Potential profile
6-12		10YR 4/3		m vi gr sg l pl 1 m pr 2 o cpr 3 ve 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 SIG 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	
12-18		" 4/4		m vi gr sg l pl 1 m pr 2 o cpr 3 ve 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 SIG 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	18-36 EF = V
18-24		" 6/4		m vi gr sg l pl 1 m pr 2 o cpr 3 ve 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 SIG L C CL SC	CH	v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	s w i b	18-36 un
24-36	Cr	" 6/4		m vi gr sg l pl 1 m pr 2 o cpr 3 ve 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 SIG L C CL SC	C	v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	s w i b	flowy dus
				m vi gr sg l pl 1 m pr 2 o cpr 3 ve 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 SIG 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	

Soil Description: Location MU/PIT 21
 Site No. _____ Date 9/4 Time 1:00 Vegetation Very sparse sage/grass - wind-eroded hilltop
 Elevation _____ Slope 5-7% Aspect SE Geomorphologic Surface _____
 Parent Material(s) _____ Described by _____

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence				Texture	pH	Clay films			Boundaries	notes		
		moist	dry		%		Wet	Moist	Dry										
0-6		4/3		m eg 1 2 3	vl f m c ve	gr pl pr cpr abk abk	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 SIO C SC	v1 1 2 3 4	n po br co cobr	a o g d	e w i b	possible profile
6-12		5/4		m eg 1 2 3	vl f m c ve	gr pl pr cpr abk abk	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 SIO C SC	v1 1 2 3 4	n po br co cobr	a o g d	e w i b	ef = φ
12-18	Evidence of shale at 12" - 10YR 6/4			m eg 1 2 3	vl f m c ve	gr pl pr cpr abk abk	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 SIO C SC	v1 1 2 3 4	n po br co cobr	a o g d	e w i b	ef = V
18-24		7/3		m eg 1 2 3	vl f m c ve	gr pl pr cpr abk abk	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 SIO C SC	v1 1 2 3 4	n po br co cobr	a o g d	e w i b	maybe 7/2
24-30	Cr shale silt-stone	7/3		m eg 1 2 3	vl f m c ve	gr pl pr cpr abk abk	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 SIO C SC	v1 1 2 3 4	n po br co cobr	a o g d	e w i b	
				m eg 1 2 3	vl f m c ve	gr pl pr cpr abk abk	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 SIO C SC	v1 1 2 3 4	n po br co cobr	a o g d	e w i b	

Soil Description: Location MU/PIT 22Site No. _____ Date 9/4 Time _____ Vegetation (denuded) eroded (hill top) - very sparse

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		10YR 4/3	4/3	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 eff	lo so sh h vh eh	S LS SL SCL L CL SC		v1 1 2 3 4	n po mk co k	pf br co cobr	a o g d	a w i b	ef
6-12		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 eff	lo so sh h vh eh	S LS SL SCL L CL SC		v1 1 2 3 4	n po mk co k	pf br co cobr	a o g d	a w i b	ef = 51
12-18		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 eff	lo so sh h vh eh	S LS SL SCL L CL SC	H	v1 1 2 3 4	n po mk co k	pf br co cobr	a o g d	a w i b	f/loamy ef = V
18-24		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 eff	lo so sh h vh eh	S LS SL SCL L CL SC		v1 1 2 3 4	n po mk co k	pf br co cobr	a o g d	a w i b	
24-36		6/4		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 eff	lo so sh h vh eh	S LS SL SCL L CL SC		v1 1 2 3 4	n po mk co k	pf br co cobr	a o g d	a w i b	
36-48		6/4		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 eff	lo so sh h vh eh	S LS SL SCL L CL SC		v1 1 2 3 4	n po mk co k	pf br co cobr	a o g d	a w i b	ef = V

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											ef = 0
				ag	f	pl	0	50	so	po	lo	lo	S	SICL			
				1	m	pr	<10	75	ss	ps	vfr	so	LS	SIL			
6-12		4/4		2	c	cpr	10	>75	s	p	fl	h	(SL)	SI			
				3	vo	abk	25		vs	vp	vfl	vh	SCL	SIC			ef = 0
						sbk					eff	eh	L	C			
													CL	SC			
12-18		5/4		m	vf	gr	0	50	so	po	lo	lo	S	SICL			ef = v
				ag	f	pl	<10	75	ss	ps	vfr	so	LS	SIL			
				1	m	pr	10	>75	s	p	fl	h	(SL)	SI			
18-24		10YR 6/4		2	c	cpr	25		vs	vp	vfl	vh	SCL	SIC			v
				3	vo	abk					eff	eh	L	C			
						sbk							CL	SC			
24-30	gr	10YR 7/4		m	vf	gr	0	50	so	po	lo	lo	S	SICL			sl
				ag	f	pl	<10	75	ss	ps	vfr	so	(LS)	SIL			
				1	m	pr	10	>75	s	p	fl	h	SL	SI			
				2	c	cpr	(10)		vs	vp	vfl	vh	SCL	SIC			
				3	vo	abk	25				eff	eh	L	C			
						sbk							CL	SC			
30-36	vgr			m	vf	gr	0	50	so	po	lo	lo	S	SICL			vgr sl
				ag	f	pl	<10	75	ss	ps	vfr	so	LS	SIL			
				1	m	pr	10	>75	s	p	fl	h	SL	SI			gr
36-42	vgr	2.5Y 6/4		2	c	cpr	(10)		vs	vp	vfl	vh	SCL	SIC			
				3	vo	abk	25				eff	eh	L	C			
						sbk							CL	SC			
				m	vf	gr	0	50	so	po	lo	lo	S	SICL			
				ag	f	pl	<10	75	ss	ps	vfr	so	LS	SIL			
				1	m	pr	10	>75	s	p	fl	h	SL	SI			
				2	c	cpr	10		vs	vp	vfl	vh	SCL	SIC			
				3	vo	abk	25				eff	eh	L	C			
						sbk							CL	SC			
				m	vf	gr	0	50	so	po	lo	lo	S	SICL			
				ag	f	pl	<10	75	ss	ps	vfr	so	LS	SIL			
				1	m	pr	10	>75	s	p	fl	h	SL	SI			
				2	c	cpr	10		vs	vp	vfl	vh	SCL	SIC			
				3	vo	abk	25				eff	eh	L	C			
						sbk							CL	SC			

Soil Description: Location MUL PIT 24 Pit desc 0-364
 Site No. _____ Date 9/4 Time 2225 Vegetation Very sparse sagebrush
 Elevation _____ Slope 0% Aspect - Geomorphic Surface Flat inter fluvial - sim. to 23
 Parent Material(s) _____ Described by JCEB

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence			Texture	pH	Clay films	Boundaries	Notes
		moist	dry		%		Wet	Moist	Dry					
0-6	SL	4/3		m vf gr	0 50		so po lo	lo		S SICL		v1 n pl	a e	✓
				eg f pl	<10 75		ss ps vfr	so		LS SIL		1 po	a e	
				1 m pr	10 >75		s p fl	sh		SL SI		2 mk br	o w	
				2 c cpr	25		vs vp vll	h		SCL SIO		3 co	g d	
6-12	SL	4/4		3 vo abk				eh		L C		4 k cobr	b	✓
										CL SC				
12-18	SL (heavy)	5/4		m vf gr	0 50		so po lo	lo		S SICL		v1 n pf	a e	✓
	>15% gravel			eg f pl	<10 75		ss ps vfr	so		LS SIL		1 po	a e	
				1 m pr	10 >75		s p fl	sh		SL SI		2 mk br	o w	
				2 c cpr	25		vs vp vll	h		SCL SIO		3 co	g d	
18-24	LS	5/4		3 vo abk				eh		L C		4 k cobr	b	✓
										CL SC				
24-30	sand	5		m vf gr	0 50		so po lo	lo		S SICL		v1 n pf	a e	✓
				eg f pl	<10 75		ss ps vfr	so		LS SIL		1 po	a e	
				1 m pr	10 >75		s p fl	sh		SL SI		2 mk br	o w	
				2 c cpr	25		vs vp vll	h		SCL SIO		3 co	g d	
30-36	sand	6/3		3 vo abk				eh		L C		4 k cobr	b	sl
										CL SC				
36-42				m vf gr	0 50		so po lo	lo		S SICL		v1 n pf	a e	Note -
				eg f pl	<10 75		ss ps vfr	so		LS SIL		1 po	a e	
				1 m pr	10 >75		s p fl	sh		SL SI		2 mk br	o w	
				2 c cpr	25		vs vp vll	h		SCL SIO		3 co	g d	
42-48				3 vo abk				eh		L C		4 k cobr	b	
										CL SC				
				m vf gr	0 50		so po lo	lo		S SICL		v1 n pf	a e	
				eg f pl	<10 75		ss ps vfr	so		LS SIL		1 po	a e	
				1 m pr	10 >75		s p fl	sh		SL SI		2 mk br	o w	
				2 c cpr	25		vs vp vll	h		SCL SIO		3 co	g d	
				3 vo abk				eh		L C		4 k cobr	b	
										CL SC				

Soil Description: Location

PIT 25

Multi colored horizons due to shale

Site No.

Date

9/4

Time

Vegetation

Sparse sage/grass

Elevation

Slope

5%

Aspect

SE

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	7.5YR 4/3 -----		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 lo lo ss ps vfr so s p fr sh vs vp fl h vll vh eff 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 l b		
	6-12 pH ~ disregard	10YR 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 lo lo ss ps vfr so s p fr sh vs vp fl h vll vh eff 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 l b		
	12-78 maroon shale	5YR 4/3 -----		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 lo lo ss ps vfr so s p fr sh vs vp fl h vll vh eff 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 l b		
	18-24 Cr - whitish gray shale			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 lo lo ss ps vfr so s p fr sh vs vp fl h vll vh eff 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 l b		
	24-30 dark gray/ maroon shale 10YR 4/2			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 lo lo ss ps vfr so s p fr sh vs vp fl h vll vh eff 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 l b		
		-----		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 lo lo ss ps vfr so s p fr sh vs vp fl h vll vh eff 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 l b		

Soil Description:

Location

MUL PIT 26

Alfredo - 33" (recall)

Site No. _____

Date

9/4

Time

3:20

Vegetation _____

Elevation _____

Slope

30%

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		10YR 4/3		m vf gr sg f pl 1 m pr 2 o cpr 3 vo abk sbk	0 50 <10 75 10 >75 25		so po lo lo ss ps vlr so s p fr sh vs vp fl h ell 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	Should be a profile	
6-12		4/4		m vf gr sg f pl 1 m pr 2 o cpr 3 vo abk sbk	0 50 <10 75 10 >75 25		so po lo lo ss ps vlr so s p fr sh vs vp fl h ell 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	here	
12-18		4/4		m vf gr sg f pl 1 m pr 2 o cpr 3 vo abk sbk	0 50 <10 75 10 >75 25		so po lo lo ss ps vlr so s p fr sh vs vp fl h ell 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		
18-24		4/4		m vf gr sg f pl 1 m pr 2 o cpr 3 vo abk sbk	0 50 <10 75 10 >75 25		so po lo lo ss ps vlr so s p fr sh vs vp fl h ell 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		
24-30		sil 10YR 4/4		m vf gr sg f pl 1 m pr 2 o cpr 3 vo abk sbk	0 50 <10 75 10 >75 25		so po lo lo ss ps vlr so s p fr sh vs vp fl h ell 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	24-30 U	
30-36 C		5/4		m vf gr sg f pl 1 m pr 2 o cpr 3 vo abk sbk	0 50 <10 75 10 >75 25		so po lo lo ss ps vlr so s p fr sh vs vp fl h ell 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	30-36 U	
			m vf gr sg f pl 1 m pr 2 o cpr 3 vo abk sbk	0 50 <10 75 10 >75 25		so po lo lo ss ps vlr so s p fr sh vs vp fl h ell 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		

Soil Description: Location NVA PIT 28 Very shallow-very disturbed,
 Site No. _____ Date _____ Time _____ Vegetation but not stripped
 Elevation _____ Slope _____ Aspect _____ Geomorphic Surface _____
 Parent Material(s) _____ Described by JC/EB & Confirmed shallow 9/12

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence			Texture	pH	Clay films			Boundaries	Notes
		moist	dry		%	Wet	Moist	Dry	Wet			Moist	Dry			
0-6	A1 + Bt	10YR 4/4 -----		m vf gr eg f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo es ps vlr so s p fr sh va vp fl h vll vh ell 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	a w l b	Note - A horizon generally	
6-12	Cv	10YR 5/4 -----		m vf gr eg f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25 N/A		so po lo lo es ps vlr so s p fr sh va vp fl h vll vh ell 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	a w l b	10YR 4/4, and 6-12 so this	
12-18		10YR 5/4 -----		m vf gr eg f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25 N/A		so po lo lo es ps vlr so s p fr sh va vp fl h vll vh ell 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	a w l b	site is shallower and lower	
		-----		m vf gr eg f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo es ps vlr so s p fr sh va vp fl h vll vh ell 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	a w l b	in OMg 9/1 than typical	
		-----		m vf gr eg f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo es ps vlr so s p fr sh va vp fl h vll vh ell 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	a w l b		
		-----		m vf gr eg f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo es ps vlr so s p fr sh va vp fl h vll vh ell 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	a w l b		

Soil Description: Location M41 PT 34 (Last pit week of Sep 2-5) (Entire site
 Site No. _____ Date 9/5 Time 11:30 Vegetation _____ has been
 Elevation _____ Slope _____ Aspect _____ Geomorphic Surface _____ visited and
 Parent Material(s) _____ Described by _____ pits described.

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence				Texture	pH	Clay films	Bound- aries	notes				
		moist	dry		%	Wet	Moist	Dry											
0-6		10YR	3/3	m vg 1 2 3	vf f m c vo	gr pl pr cpr abk abk	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 po mk co cobr	a o g d	e w i b	φ
6-12			4/3	m vg 1 2 3	vf f m c vo	gr pl pr cpr abk abk	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 po mk co cobr	a o g d	e w i b	φ
12-18			4/4	m vg 1 2 3	vf f m c vo	gr pl pr cpr abk abk	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 po mk co cobr	a o g d	e w i b	✓
18-24			5/4	m vg 1 2 3	vf f m c vo	gr pl pr cpr abk abk	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 po mk co cobr	a o g d	e w i b	✓
24-42			5/4	m vg 1 2 3	vf f m c vo	gr pl pr cpr abk abk	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 po mk co cobr	a o g d	e w i b	material cannot be brought
				m vg 1 2 3	vf f m c vo	gr pl pr cpr abk abk	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 po mk co cobr	a o g d	e w i b	

Soil Description: Location 50 - near PIT 1 + PIT 2
 Site No. Date 9/12 Time 12:30 Vegetation
 Elevation Slope Aspect Geomorphic Surface
 Parent Material(s) alluvial sands, muds Described by UAE
all get GPS data 44 - call me mech

Ahmed Jodeh
 Field eng

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence			Texture	pH	Clay films			Bound- aries	notes
		moist	dry		%	Wet	Moist	Dry								
	0-3	3/3		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po sa pa s p vs vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	clay loam	
	3-6	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	so po sa pa s p vs vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	clay loam heavy	
	6-9	4/3-4/4		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po sa pa s p vs vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	cl	
	9-12	4/3-4/4		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po sa pa s p vs vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	cl	
	12-15	4/4		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po sa pa s p vs vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	note - no much sand mostly sil	
	15-18	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	so po sa pa s p vs vp	lo vfr fr fl vfl ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIO L C CL SC			v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	prob not sil coarse sand	

Soil Description: Location

56 #PT (MARK-D) mud pit 20' Verifies

Site No. P.T. 0

Date

9-17

Time

1:45

Vegetation

1" crack near

Elevation

Slope

1/2

Aspect

SE

Geomorphic Surface

mud pit - part

Parent Material(s)

alluvial

fan - from ancestral

Described by

J.C.

1-3' away

slumping off

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence			Texture	pH	Clay films	Bound- aries	notes
		moist	dry		%	Wet	Moist	Dry						
	0-3	3/3		m vf gr ag f pl 1 m pr 2 o opr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo ss ps vfr so s p fr sh vp fl h vll vh ell eh	S SICL LS SIL SL SI SCL SIO L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b		
	3-6	3/3 4/3		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 lo lo ss ps vfr so s p fr sh vp fl h vll vh ell 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	a w i b	Note white coarse sand below	
	6/9	4/3		m vf gr ag f pl 1 m pr 2 o opr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo ss ps vfr so s p fr sh vp fl h vll vh ell 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	a w i b	16	
	9-12	4/4		m vf gr ag f pl 1 m pr 2 o opr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo ss ps vfr so s p fr sh vp fl h vll vh ell 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	a w i b	30% COS	
	12-15	5/4		m vf gr ag f pl 1 m pr 2 c cpr 3 vo abk abk	0 50 <10 75 10 >75 25		so po lo lo ss ps vfr so s p fr sh vp fl h vll vh ell eh	S SICL LS SIL SL SI SCL SIO L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	COS 30% COS	
	15-18	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 lo lo ss ps vfr so s p fr sh vp fl h vll vh ell 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	a w i b	COS	

Soil Description: Location Between 8+9 ⁵⁷ ~~55~~ ~~55+56~~ silty site
 Site No. no pit Date 9/12 Time 1536 Vegetation Tall sage no gravel - no sand
 Elevation _____ Slope _____ Aspect _____ Geomorphic Surface (swale) - good example
 Parent Material(s) alluvial Described by JC (equip landown area (SWALE))

Depth (cm)	Horizon	Color		Structure	Gravel %	Consistence			Texture	pH	Clay films			Bound- aries	seems flatter notes
		moist	dry			Wet	Moist	Dry			Clay films				
	0-5?	3/3		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po lo es ps vfr s p fr vs vp fl eff eh	lo	lo	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 a w i b		1/2 duff shallower swale than	
	5-12	3/3 - 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	so po lo es ps vfr s p fr vs vp fl eff eh	lo	lo	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 a w i b		14, 15, 35 This swale soil seems	
	12-18	4/3 - 4/4		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po lo es ps vfr s p fr vs vp fl eff eh	lo	lo	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 a w i b		same as other 2 15, 35	
	18-24	4/3 - 4/4		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po lo es ps vfr s p fr vs vp fl eff eh	lo	lo	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 a w i b		not much sand - almost < 3% none	
	24-30	4/3 - 4/4		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po lo es ps vfr s p fr vs vp fl eff eh	lo	lo	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 a w i b			
quite not digging bottom	30-36	4/3 - 4/4 Prob more topsoil, i.e. < 4% below 36		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po lo es ps vfr s p fr vs vp fl eff eh	lo	lo	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 a w i b		extr. stky heavy silt loam	

Soil Description: Location

58

Same PM

Site No. PETS

Date

9/12

Time

11:30 AM

Vegetation

tall highland sage

Elevation

Slope

n/a

Aspect

SW

Geomorphic Surface

Same profile

Parent Material(s)

Described by

JCEB

Depth (cm)	Horizon	Color		Structure	Gravel %	Consistency				Texture	pH	Clay films	Boundaries		notes
		moist	dry			Wet	Moist	Dry	a				s		
0-6		3/3 - 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	so po lo lo es ps vfr so s p fl h vs vp vll vh ell eh	S SCL LS SIL SL SI SCL SIC L C CL SO		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b				
6-12		4/4		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po lo lo es ps vfr so s p fl h vs vp vll vh ell eh	S SCL LS SIL SL SI SCL SIC L C CL SO		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	40% Sand			
12-18		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	so po lo lo es ps vfr so s p fl h vs vp vll vh ell eh	S SCL LS SIL SL SI SCL SIC L C CL SO		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	40% Sand			
18-24		4/3 - 4/4		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po lo lo es ps vfr so s p fl h vs vp vll vh ell eh	S SCL LS SIL SL SI SCL SIC L C CL SO		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b				
24-28 (30)		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	so po lo lo es ps vfr so s p fl h vs vp vll vh ell eh	S SCL LS SIL SL SI SCL SIC L C CL SO		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	40% Coarse			
30-36 (30)		prob		m vf gr eg f pl 1 m pr 2 o cpr 3 vo abk abk	0 50 <10 75 10 >75 25	so po lo lo es ps vfr so s p fl h vs vp vll vh ell eh	S SCL LS SIL SL SI SCL SIC L C CL SO		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	40% Sand			

Soil Description: Location MU 1 PR 13 Picture 100-2859 2860
 Site No. _____ Date 9-11-08 Time 12:49 Vegetation <1A grasses and some cane
 Elevation _____ Slope 1% Aspect W-NW Geomorphologic Surface _____ Position Hill crest
 Parent Material(s) _____ Described by JL + EB

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence				Texture	pH	Clay films			Bound-aries	notes
		moist	dry		%		Wet	Moist	Dry								
0-3"	A ₁	10YR 4/4		m eg 1 2 3	0 <10 10 25	50 75 >75	so ss e va	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 po mk co k	pf br co cobr	a o g d	s w l b i r = irregular * Braking to med. vfr
3-10"	B _{1T}	10YR 4/4		m eg 1 2 3	0 <10 10 25	50 75 >75	so ss e va	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 po mk co k	pf br co cobr	a o g d	s w l b i r = nearly massive
10-12"	C _R	9/16 12-15-5 Not found for shipping JC		m eg 1 2 3 None	0 <10 10 25	50 75 >75	so ss e va	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 po mk co k	pf br co cobr	a o g d	s w l b i r
				m eg 1 2 3	0 <10 10 25	50 75 >75	so ss e va	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 po mk co k	pf br co cobr	a o g d	s w l b i r
				m eg 1 2 3	0 <10 10 25	50 75 >75	so ss e va	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 po mk co k	pf br co cobr	a o g d	s w l b i r
				m eg 1 2 3	0 <10 10 25	50 75 >75	so ss e va	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 po mk co k	pf br co cobr	a o g d	s w l b i r

Soil Description: Location MU1RR15 picture 100-2856/57/58
 Site No. Date 9-11-08 Time P.00pm Vegetation Sage to 2'
 Elevation Slope 1-2% Aspect South Geomorphic Surface Position - Swale
 Parent Material(s) Described by JC+EB

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence				Texture	pH	Clay films	Bound- aries	notes
		moist	dry		%	Wet	Moist	Dry							
0-6"	A ₁	10YR 4/3		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk W abk	0 50 <10 75 10 >75 25	so po ss ps p vs vp	lo vfr fr fl vll eff	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 d	s w i b - Heavy loam * platy	
6-12"	B _{1T}	10YR 4/4		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk W abk	0 50 <10 75 10 >75 25	so po ss ps p vs vp	lo vfr fr fl vll eff	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 d	s w i b	
12-24"	B _{3T}	7.5YR 5/4		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk W abk	0 50 <10 75 10 >75 25	so po ss ps p vs vp	lo vfr fr fl vll eff	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 d	s w i b - In lenses * less 10% gravel	
24-36"	C	10YR 5/3		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk W abk	0 50 <10 75 10 >75 25	so po ss ps p vs vp	lo vfr fr fl vll eff	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 d	s w i b - Silty * Massive	
36-60"	C	10YR 5/3		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk W abk	0 50 <10 75 10 >75 25	so po ss ps p vs vp	lo vfr fr fl vll eff	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 d	s w i b reactivity: V * Massive	
				m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk W abk	0 50 <10 75 10 >75 25	so po ss ps p vs vp	lo vfr fr fl vll eff	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 d	s w i b	

u

photo 100-1870

Soil Description: Location MULPRIB

Site No. _____ Date 9/8/03 Time 15:30 Vegetation grass 100-1870

Elevation _____ Slope 7% Aspect SE Geomorphic Surface Position - Foot slope

Parent Material(s) sp. Interbedded ss/shale 20+ Described by TC

Depth (cm)	Horizon	Color ^{cons} cons		Structure	Gravel %	Consistence			Texture	pH	Clay films			Bound- aries	notes
		moist	dry			Wet	Moist	Dry			Cl	n	pf			a	e	w	i	b
0-3	A	10 YR 3/3		m vl gr sg i pl 1 m pr 2 o cpr 3 vo abk abk	50 <10 75 10 >75 25	so po ss ps p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIO L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	EF = ϕ	
3-8	B?	10 YR 4/4		m vl gr sg i pl 1 m pr 2 o cpr 3 vo abk abk	50 <10 75 10 >75 25	so po ss ps p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIO L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	EF = ϕ	
8-20	Cr1	7.5 YR 5/3		m vl gr sg i pl 1 m pr 2 o cpr 3 vo abk abk	50 <10 75 10 >75 25	so po ss ps p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIO L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	EF = V	
20-32	Cr2	5 YR 5/3		m vl gr sg i pl 1 m pr 2 o cpr 3 vo abk abk	50 <10 75 10 >75 25	so po ss ps p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIO L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	EF = V Lcos - loamy coarse sand	
32-60	Cr3	7.5 YR 4/4		m vl gr sg i pl 1 m pr 2 o cpr 3 vo abk abk	50 <10 75 10 >75 25	so po ss ps p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIO L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	EF = V	
				m vl gr sg i pl 1 m pr 2 o cpr 3 vo abk abk	50 <10 75 10 >75 25	so po ss ps p vs vp	lo vfr fr fl vll ell	lo so sh h vh eh	S SICL LS SIL SL SI SCL SIO L C CL SC		v1 n pf 1 po 2 mk br 3 co 4 k cobr	a o g d	a w i b	All sand is coarse to very coarse in every hor	

Soil Description: Location MU1PR23 Picture 100-2864/65
 Site No. _____ Date 9-11-08 Time 3:00pm Vegetation Very sparse Sagebrush
 Elevation _____ Slope 0 Aspect maybe south Geomorpho Surface Hillcrest
 Parent Material(s) _____ Described by JC + EB

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence			Texture	pH	Clay films			Boundaries	notes
		moist	dry		%		Wet	Moist	Dry							
0-3"	A ₁	10YR 4/3		m eg 1 2 3	0 <10 10 25	50 75 >75	so ss s va	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL L CL	SI SIL SI SIC C SC	v1 1 2 3 4	n po mk co cobr	a o g d	React = \emptyset combined is Br for sample
3"-6"	B _T	10YR 4/4		m eg 1 2 3 W	0 <10 10 25	50 75 >75	so ss s va	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL L CL	SI SIL SI SIC C SC	v1 1 2 3 4	n po mk co cobr	a o g d	React = \emptyset Prismatic Heavy 40% sand
6-10"	B ₃	10YR 4/4		m eg 1 2 3 W	0 <10 10 25	50 75 >75	so ss s va	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL L CL	SI SIL SI SIC C SC	v1 1 2 3 4	n po mk co cobr	a o g d	React = \emptyset Heavy 40% sand
10-60"	C _{RL}	? prob 9/12 variable grey to red		m eg 1 2 3	0 <10 10 25	50 75 >75	so ss s va	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL L CL	SI SIL SI SIC C SC	v1 1 2 3 4	n po mk co cobr	a o g d	Reactivity = 4 Highly variable coarse sandstone with lenses and iron pans
				m eg 1 2 3	0 <10 10 25	50 75 >75	so ss s va	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL L CL	SI SIL SI SIC C SC	v1 1 2 3 4	n po mk co cobr	a o g d	? Varies from sand to sandy loam from bottom to top
				m eg 1 2 3	0 <10 10 25	50 75 >75	so ss s va	po ps p vp	lo vfr fr fl vll ell	lo so sh h vh eh	S LS SL SCL L CL	SI SIL SI SIC C SC	v1 1 2 3 4	n po mk co cobr	a o g d	

Ethan says broad valley Lost Creek
 Soil Description: Location MU 1 PR 26 100' W of swale (cypress)
 Site No. _____ Date 9/10/08 Time 13:03 Vegetation deep 30" top soil
 Elevation _____ Slope Est - 2+% Aspect SSE Geomorphic Surface CaCO₃ at 24"
 Parent Material(s) two - sandy coarse alluvial over shale/SS - no Described by JC DE photo 100-1830

Depth (cm)	Horizon	Color		Structure	Gravel %	Consistence			Texture	pH	Clay films	Boundaries	notes						
		moist	dry			Wet	Moist	Dry											
0-4	A ₁	4/3 10 YR		m ag 1 2 3	vf f m o vo	gr pl pr opr abk abk	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 po mk br co cobr	a o g d	a w i b	40% sand heavy form
4-12	B _{2t}	4/4 10 YR		m ag 1 2 3	vf f m o vo	gr pl pr opr abk abk	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 po mk br co cobr	a o g d	a w i b	* note - bagged 0-12 (A ₁ + B _{2t}) together
12-27	B _{3t} (calc)	4/4 10 YR		m ag 1 2 3	vf f m o vo	gr pl pr opr abk abk	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 po mk br co cobr	a o g d	a w i b	B _{3t} is only calc at 24-27 90% sand
27-60	C _{ra} shaly, fine sandy	6/3 highly var		m ag 1 2 3	vf f m o vo	gr pl pr opr abk abk	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 po mk br co cobr	a o g d	a w i b	* ef = U in top part; ef = m. lower part; fractured
				m ag 1 2 3	vf f m o vo	gr pl pr opr abk abk	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 po mk br co cobr	a o g d	a w i b	Note - Alfred took (more) top soil than subsoil as I recall
				m ag 1 2 3	vf f m o vo	gr pl pr opr abk abk	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 po mk br co cobr	a o g d	a w i b	ie, till he was sure he had shale

Soil Description: Location MU1 PR50 Pic 100-2861/62/63
 Site No. Date 9-11-08 Time 1:22 PM Vegetation < 1ft Sage brush + grasses
 Elevation Slope 0 Aspect ✓ Geomorphic Surface Knobby surface Hillcrest
 Parent Material(s) Described by JK + EB

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence			Texture	pH	Clay films			Boundaries	notes
		moist	dry		%		Wet	Moist	Dry							
0-3"	A ₁	10YR 3/3		m ag 1 2 3	0 <10 10 25	50 75 >75	so ss s vs	po ps p vp	lo 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 po mk co cobr	a o g d	* med. platy almost massive COSL Heavy
3-6	B _T	10YR 4/4 9/18 during prep = xh platy		m ag 1 2 3 W	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 po mk co cobr	a o g d	* 40% sand coarse breaking to med. fine sub-ang. blk
6-16	B ₃	10YR 5/4		m ag 1 2 3 W	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 po mk co cobr	a o g d	* COSL - Angular iron stone fragments (iron pan)
16-60	C ₁			m ag 1 2 3	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 po mk co cobr	a o g d	Mixed sandstones and shales, interbedded tongues - reactive in upper portion
				m ag 1 2 3	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 po mk co cobr	a o g d	No reactivity on any soil horizon?
				m ag 1 2 3	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 po mk co cobr	a o g d	

Soil Description: Location MU1PR51 Picture 100-2866 67/68
 Site No. Date 9-11-08 Time 4:00pm Vegetation <1 ft sage + grasses
 Elevation Slope 1% Aspect South East Geomorphic Surface Sideslope
 Parent Material(s) Described by JC + EB

Depth (cm)	Horizon	Color		Structure	Gravel		Consistence			Texture	pH	Clay films			Bound- aries	notes
		moist	dry		%		Wet	Moist	Dry							
0-3 3	A ₁	10YR 4/3		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 sa ps s p vs vp None	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	a w i b	reactive = \emptyset #16604	
3-10 3-10"	B _T	10YR 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 sa 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	a w i b	reactive = \emptyset	
10-16 10-16"	B ₃	10YR 4/3		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk W abk	0 50 <10 75 10 >75 25		so po sa 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	a w i b	-30% sand reactive = slight	
16-60 16-60"	C _R	10YR 5/6		m vf gr ag f pl 1 m pr 2 o cpr 3 vo abk Structure less abk	0 50 <10 75 10 >75 25		so po sa 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	a w i b	coarse sand reactive = \emptyset	
		-----		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 sa 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	a w i b		
		-----		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 sa 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	a w i b		

Soil Description: Location

MUZPR 52

Visited at 3PM 9/12

Alfredo-20" (Fg 15")

P1075-#

20
19
13

Site No.

Date

9/10/08

Time

14:58

Vegetation

sparse grass, sparse

100-1882

Elevation

Slope

25% 40%

Aspect

SE

Geomorphic Surface

FR1(E)

100-1883

Parent Material(s)

alluvium diff than everything

Described by

JSC DE (10th)

Depth (cm)	Horizon	Color		Structure	Gavel		Consistence			Texture	pH	Clay films			Bound- aries	notes	
		moist	dry		%	Wet	Moist	Dry									
0-4	A ₁	10YR 3/3		m 1 2 3	0 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 po mk co cobr	a o g d	a w i b	EF = 0
4-15	B _{2t}	10YR 4/4		m 1 2 3	0 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 po mk co cobr	a o g d	a w i b	Light, 40% sand coarse h v. coarse sand EF = 0
15-24	B _{3x}	7.5YR 5/3		m 1 2 3	0 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 po mk co cobr	a o g d	a w i b	coarse / v. coarse sand coarse EF = 0
24-60	C _{1ca}	7.5YR 5/3		m 1 2 3	0 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 po mk co cobr	a o g d	a w i b	coarse sandy loam fractured shale C _{1ca} EF = 0
		.....		m 1 2 3	0 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 po mk co cobr	a o g d	a w i b	mudstone etc some cemented ss etc
		.....		m 1 2 3	0 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 po mk co cobr	a o g d	a w i b	

what is it? Topsoil or not

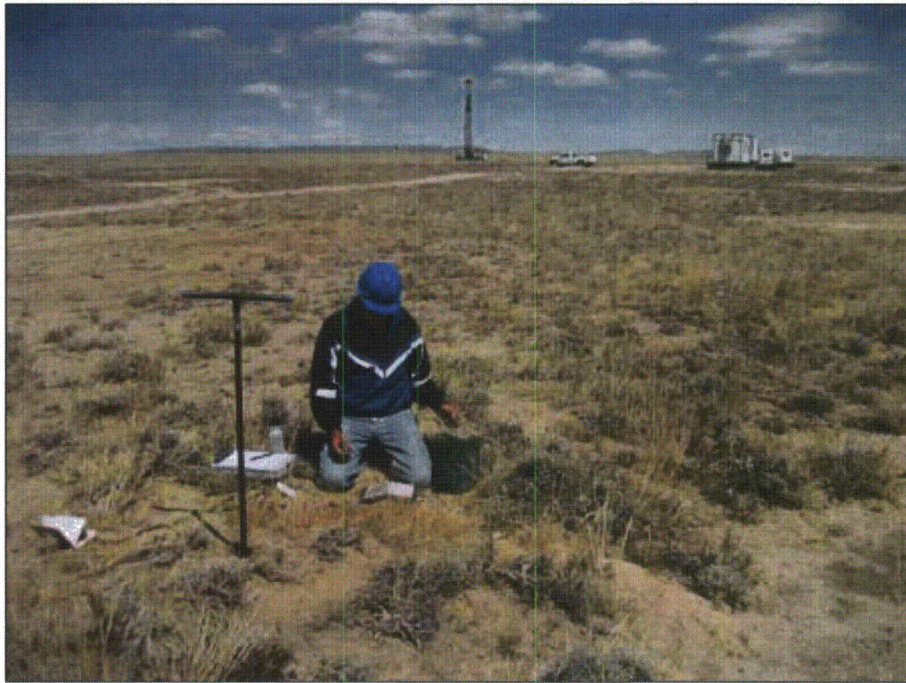
Notice Page

The IMC memory full error had occurred,
a normal output was not able to be executed.

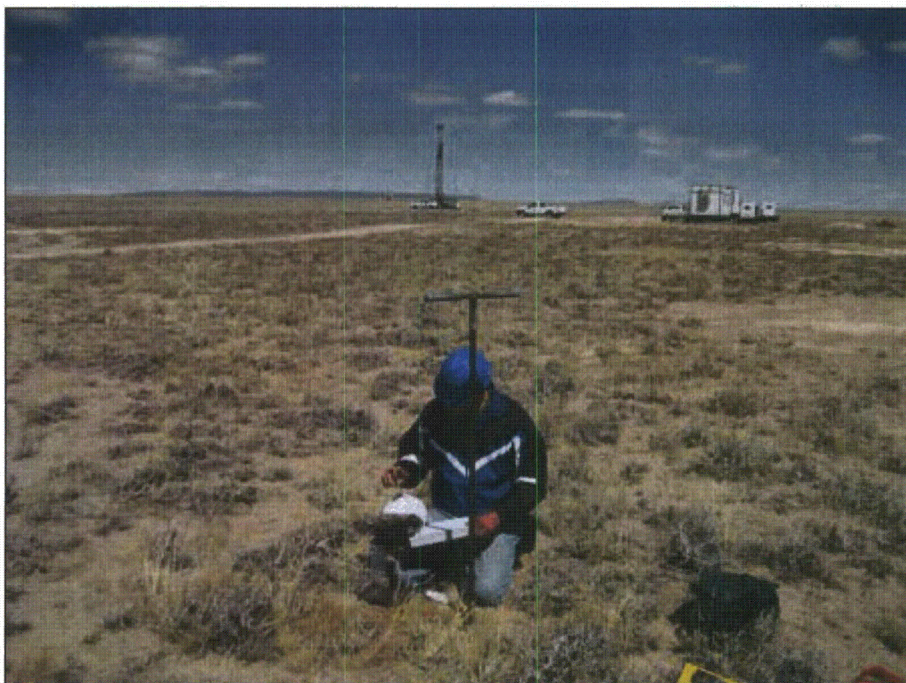
Please refer to the operation manual for
the solution method.

Addendum MU1 3-1-3a

Soil Pit Photographs



Mine Unit 1 Pit 1. East end of Mine Unit 1. Drilled to depth of 34 in.



Mine Unit 1 Pit 2 which is approximately 25 ft north of Mine Unit 1 Pit 1. Vegetation on site had 50% ground cover, including 30% sage, 15% grasses & 5% other cover. Drilled to depth of 23 in.



Mine Unit 1 Pit 3. Central portion of Mine Unit 1. Vegetation covers 50% of ground with grass up to 1 ft. Site is near three old drill sites which are a year old. This site is approximately 25 ft north of major E-W access road. Drilled to depth of 31 in.



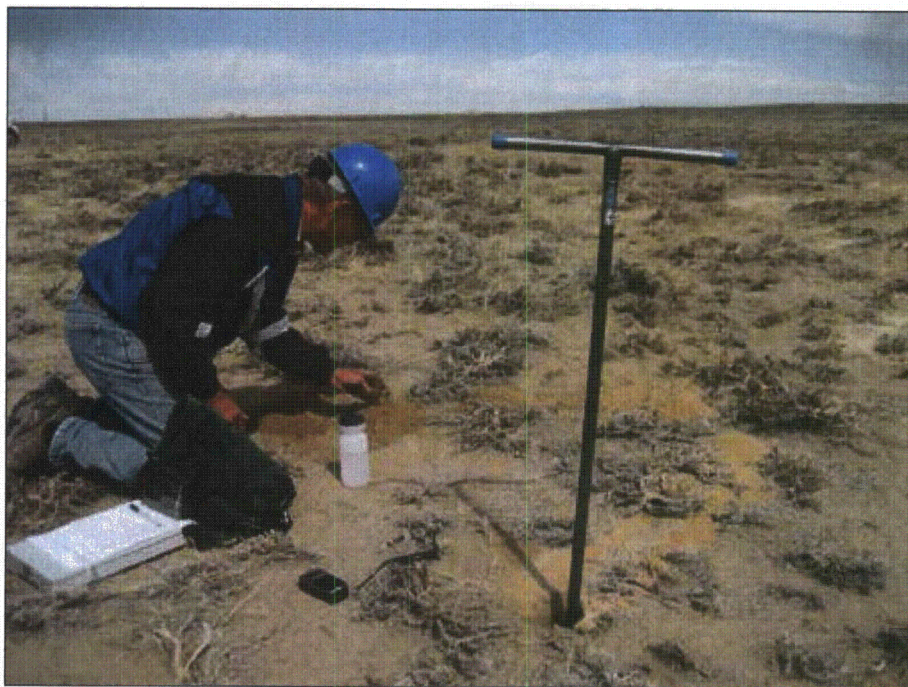
Mine Unit 1 Pit 5. Central portion of Mine Unit 1. Vegetation on site had 50% ground cover, including 30% sage, 15% grass & 5% litter & other cover. Drilled to depth of 33 in.



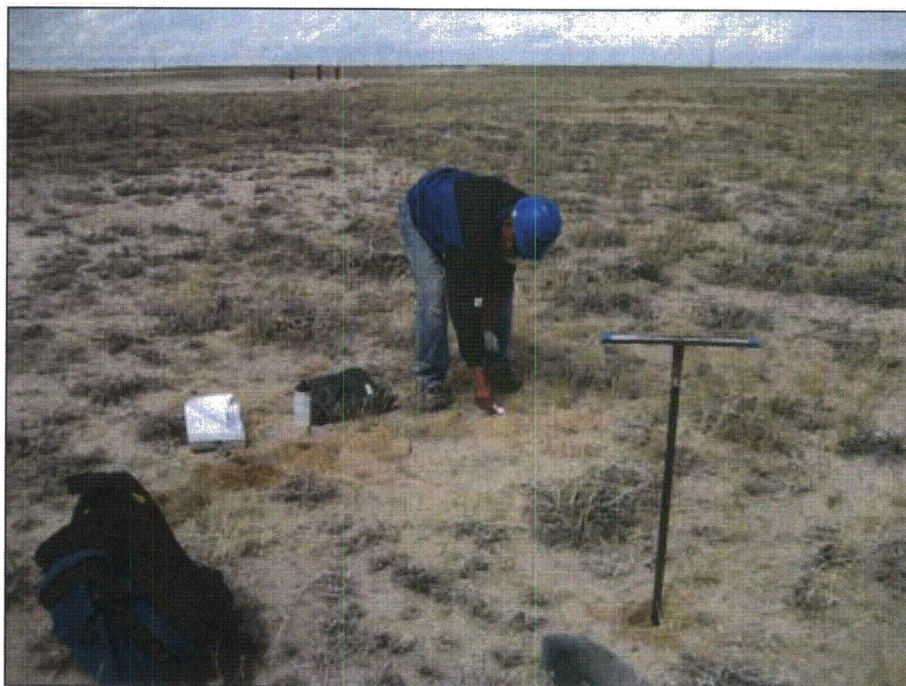
Mine Unit 1 Pit 6. East portion of Mine Unit 1. Elevation 6960 ft. Vegetation on site had 30% surface cover, including 35% sage roots & 5% grass & other cover. Drilled to depth of 35 in.



Mine Unit 1 Pit 7. East portion of Mine Unit 1. Elevation 6949 ft. Vegetation on site had 30% surface cover, including 25% sage roots & 5% grasses and other cover. Site was disturbed. Drilled to depth of 48 in.



Mine Unit 1 Pit 8. East portion of Mine Unit 1. Elevation 6952. Vegetation on site had 35% ground cover, including 30% crushed/live sage & 5% grasses & other cover. Site was disturbed. Drilled to depth of 42 in.



Mine Unit 1 Pit 9. East portion of Mine Unit 1. Elevation 6962 ft. Vegetation on site included 25% sage & 5% other cover. Site was disturbed. Drilled to a depth of 42 in.



Mine Unit 1 Pit 10. Elevation 6968 ft. Vegetation on site had 60% ground cover, including 40% sage, 10% grasses & 10% lichens & other vegetation. Drilled to depth of 36 in.



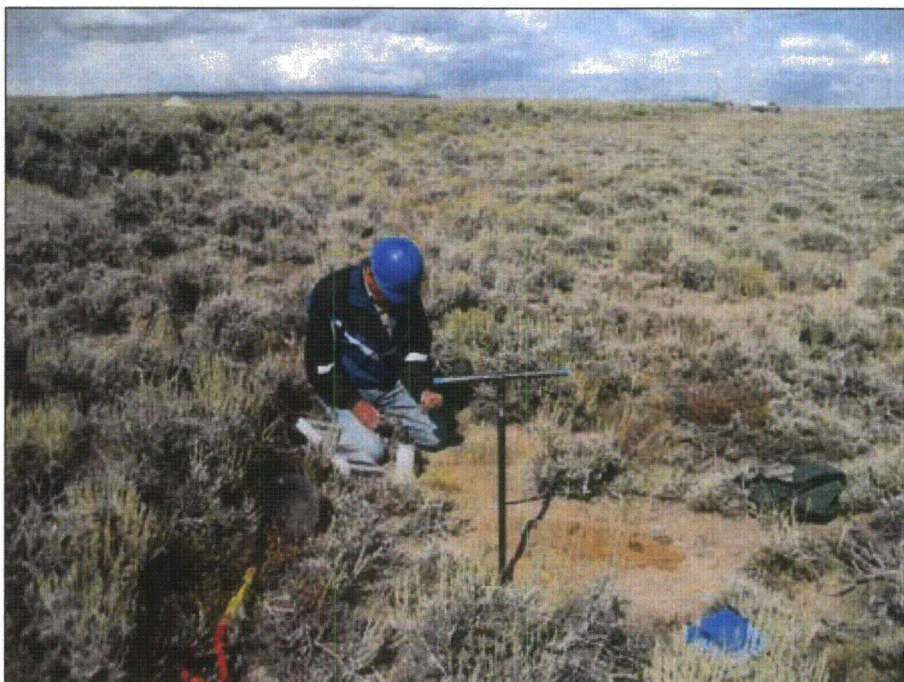
Mine Unit 1 Pit 11. Central portion of Mine Unit 1. Elevation 6965 ft. Vegetation on site had 65% ground cover, including 40% sage, 20% grass & 5% other cover. Drilled to depth of 36 in.



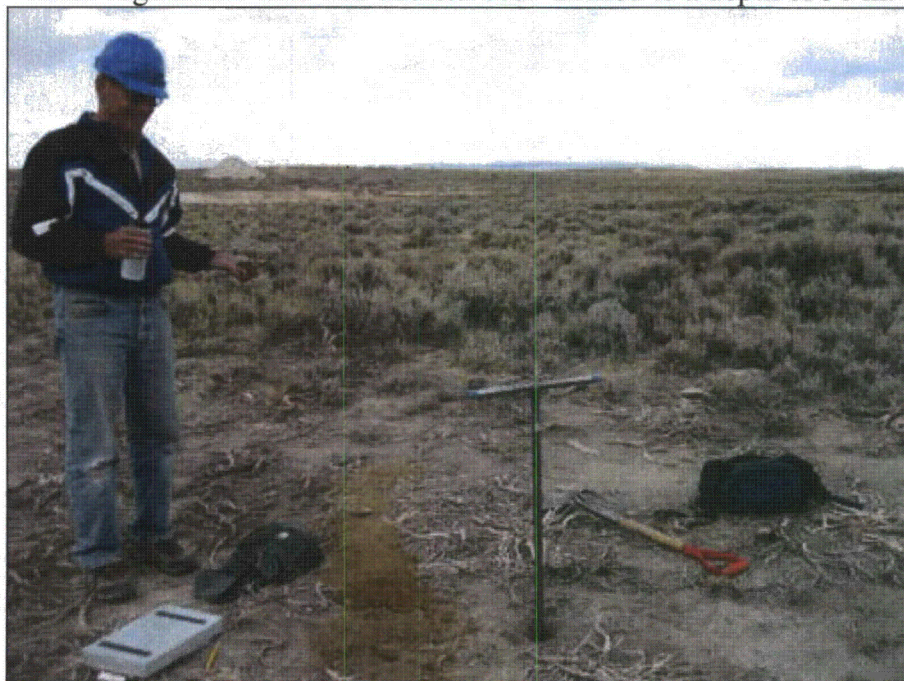
Mine Unit 1 Pit 12. Northeast portion of Mine Unit 1. Elevation 6972 ft. Vegetation on site had 50% ground cover, including 45 to 50% sage & 5% grasses & other vegetation. Drilled to depth of 36 in.



Mine Unit 1 Pit 13 (Expanded to soil profile & sampled, see Attachment 3b). North central portion of Mine Unit 1. Elevation 6952 ft. Vegetation on site had 15% ground cover, including 10% sage & 5% grasses. Site was disturbed. Drilled to depth of 24 in.



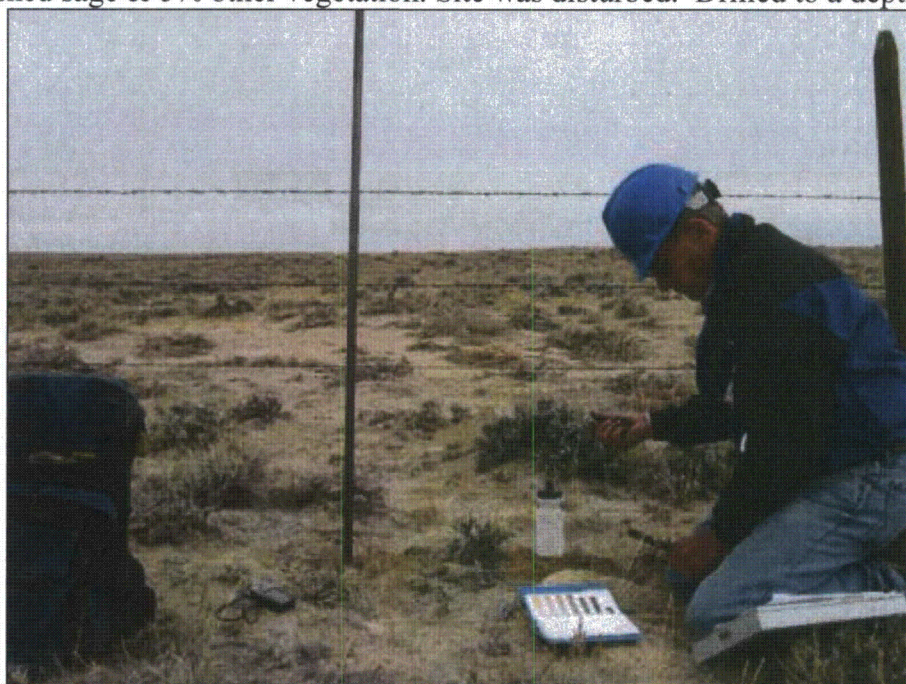
Mine Unit 1 Pit 14. North central portion of Mine Unit 1. Elevation 6955 ft. . Vegetation on site had 75% ground cover, including 60% sage, 10% grasses & 5% prickly pear & other vegetation. Site was undisturbed. Drilled to a depth of 36 in.



Mine Unit 1 Pit 15 (Expanded to soil profile & sampled, see Attachment 3b). Central portion of Mine Unit 1. Elevation 6952 ft. Vegetation on site had 50% ground cover, including 40% dead sage & 10% litter. Site was roadway. Drilled to a depth of 42 in.



Mine Unit 1 Pit 16. (Expanded to soil profile, see Attachment 3b.) Central portion of Mine Unit 1. Elevation 6949 ft. Vegetation on site had 25% ground cover, including 20% crushed sage & 5% other vegetation. Site was disturbed. Drilled to a depth of 24 in.



Mine Unit 1 Pit 17. Central portion of Mine Unit 1. Elevation 6955 ft. Vegetation on site had 30% ground cover, including 25% sage & 5% other vegetation. Drilled to a depth of 15 in. (to rock). The picture was taken between the fence line & road.



Mine Unit 1 Pit 18. Central portion of Mine Unit 1. Elevation 6942 ft. Vegetation on site had 50% ground cover, including 45% crunched sage & 5% other vegetation. Drilled to depth of 48 in.



Mine Unit 1 Pit 19. Central portion of Mine Unit 1. Elevation 6952 ft. Vegetation on site had 20% ground cover, including 15% sage & 5% other cover. Site was disturbed. Drilled to depth of 26 in. (to rock).



Mine Unit 1 Pit 20. West portion of Mine Unit 1. Elevation 6955 ft. Vegetation on site had 30% ground cover, including 15% sage & 15% grasses. Site was relatively undisturbed. Drilled to depth of 36 in.



Mine Unit 1 Pit 21. West portion of Mine Unit 1. Elevation 6962 ft.
Drilled to depth of 30 in.



Mine Unit 1 Pit 22. West portion of Mine Unit 1. Elevation 6962 ft. Vegetation on site had 25% ground cover, including 20% sage & 5% other vegetation. Site was disturbed, between two mud pits. Drilled to depth of 48 in.



Mine Unit 1 Pit 23 (Expanded to soil profile & sampled, see Attachment 3b). West portion of Mine Unit 1. Elevation 6946 ft. Vegetation on site had 20% ground cover, including 15% sage & 5% other. Site was disturbed, next to a mud pit. Drilled to depth of 42 in.



Mine Unit 1 Pit 24. West end of Mine Unit 1. Elevation 6962 ft. Vegetation on site had 20% ground cover, including 20% sage. Drilled to depth of 36 in.



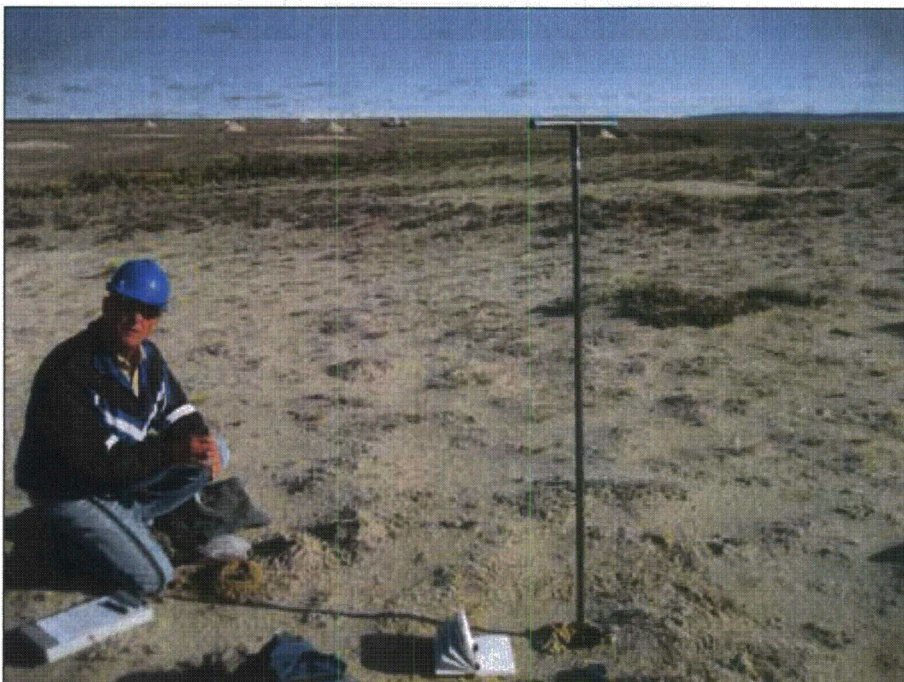
Mine Unit 1 Pit 25. Southwest portion of Mine Unit 1. Elevation 6949 ft.
Vegetation on site had 40% ground cover, including 30% sage & 10% other vegetation.
The site had mild disturbance. Drilled to depth of 30 in.



Mine Unit 1 Pit 26 (Expanded to soil profile, see Attachment 3b). Elevation 6936 ft.
Vegetation on site had 50% ground cover, including 45% sage & 5% other. The site had
mild disturbance. Drilled to depth of 36 in.



Mine Unit 1 Pit 27. West portion of Mine Unit 1. Elevation 6942 ft. Vegetation on site had 40% ground cover, including 35% sage & 5% grasses/other. Site was disturbed. Drilled to depth of 48 in.



Mine Unit 1 Pit 28. Southwest portion of Mine Unit 1. Elevation 6936 ft. Vegetation on site had 10 to 15% ground cover, including 5 % sage roots & 5% grass roots or other. Drilled to depth of 18 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.

Numbers 36 through 50 were not assigned to any sampling locations.
See Attachment 3b for photographs of the soil profiles.
No pictures were taken at Mine Unit 1 Pits 55 through 58.