Technical Memorandum

Slope Stability Analysis and Slope Stabilization Design
Laramie Energy Nichols Pad 24-6A and 24-7

GEI Consultants, Inc. has prepared this technical memorandum to present the results of a geotechnical exploration and stability analyses of the slope between two well pads, Nichols Pad 24-6A and 24-7, owned by Laramie Energy, LLC (Laramie). This slope has shown clear evidence of instability and movement within the past two months. This memo also presents our conceptual slope stabilization design including design drawings.

At Laramie's request, GEI provided consulting engineering services to explore the nature of the observed slope movement and to develop a stabilization system that minimizes disturbance to the well pads and allows for both pads to be utilized for well drilling for oil and natural gas extraction over the next 5 years.

GEI performed a geotechnical exploration and site reconnaissance to collect data on the subsurface soil and groundwater properties at the well pads and the spatial characteristics of the visible areas of instability. We used survey data, field observations data, and laboratory data to develop an existing conditions profile of the critical slope section. As discussed below, an initial stability analysis model was conducted using the as-built slope configuration and assumed soil strength properties, which were adjusted to produce a factor of safety close to 1.0. The resulting strength parameters were then used in the design of potential stabilization modifications.

The slope stabilization design developed for this site is considered a cost-effective means of achieving an acceptable factor of safety against slope instability for the duration of drilling and extraction activities. The main components of the design include a regraded fill slope at a shallower grade, excavating and recompacting sections of fill and native clay at the slope toe, crest, and within the previously failed areas of the upper pad, and constructing a 20-foot-tall retaining wall at the toe of the slope consisting of mechanically stabilized earth (MSE) section with a soldier pile and timber lagging façade. The embedded portions of the soldier piles also provide subsurface global stabilization to inhibit the development of a larger and deeper failure surface from developing in the native clay beneath both pads.

Stability analysis of our design produced a factor of safety of 1.3 for the slope between the two well pads, which is considered acceptable for shallow, small-scale potential failures (U.S. Bureau of Reclamation 2011; U.S. Army Corps of Engineers 2003).

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Site Location and Description

The site is located approximately 500 feet south of Colorado State Highway 330, approximately 7.5 miles east of Colbran, Colorado in Mesa County. It is situated on the northern face of an east-west trending mesa. To provide level pads for drilling and extraction operations, the site was graded through cuts and fills on the order of 30 to 40 feet. The resulting configuration consisted of two level pads with a slope between. Cut slopes were to have been cut to a grade of 1.5 horizontal to 1 vertical, and fill slopes were to have been similar. As built slopes were somewhat steeper than designed.

The Grand Mesa region is prone to landslides and slope movement. An apparent landslide feature can be observed near the top of the mesa to the south of the project site. Additionally, somewhat hummocky terrain was noted immediately above the production pads.

GEI understands that in late July 2017, Laramie observed tension cracks, slumping, and minor slope movement between Nichols Pad 24-6A and 24-7. Uintah Engineering and Land Services (UELS) established monitoring points on July 27, 2017 within a few days of the first observed evidence of slope movement and surveyed all or some of the points on August 1, August 5, August 7, August 11, August 22, and September 1, 2017. The data indicates that slope movements have slowed and that the current slope configuration, modified through some excavation of fill from pad 24-7, is marginally stable. Monitoring points survey data is included as Attachment A to this memo.

Site Reconnaissance

During the geotechnical exploration, GEI performed a site reconnaissance to note conditions that may adversely affect the stability of on-site slopes. A summary of site reconnaissance observations is included below. The full photo log is provided as Attachment B.

Select photos from the field investigation that illustrate important site features and typical soil conditions are attached. The site is located north of an historic landslide scarp (Photo 1). The age of the historic slide is unknown. Several surface features are observed at the site that indicate recent slope movement including a planar slope failure surface visible in the 24-6A pad cut slope, and tension cracks on the 24-7 pad and on the bench between the two pads (Photos 2, 3, 7). The planar slide surface appears to have moved about 6 inches and includes slickensided surfaces (Photo 3). Tension cracks in the 24-7 pad exist only in the fill placed on the north side of the pad, north of the cut/fill transition line (Photos 7, 9). Immediately following the first observation of slope failure at the Site, Laramie removed a large wedge of fill from the north edge of the 24-7 pad to remove some driving force and help stabilize the slope (Photo 5). A series of photos showing typical soil conditions observed in the borings is included in Photos 10 through 16.

Geotechnical Exploration

GEI performed a limited geotechnical exploration at the site between August 5 and August 8, 2017. We drilled five borings, and installed two piezometers, and two mechanical slope indicators. The purpose of the drilling program was to characterize subsurface soil, rock, and water conditions, and to obtain samples for laboratory testing.

Drilling was performed by HRL Compliance Solutions, Inc. using 4.25-inch I.D. hollow-stem augers. Soil samples were collected using either 2.5-inch or 3-inch O.D. split spoon samplers. California barrel samples were also collected in the upper and lower half of each boring. GEI directed the drilling activities and performed the soil logging and sampling. Two borings were advanced on the south side of the 24-6A pad near the toe of the cut slope, one boring on the bench between the two pads, and two borings on the 24-7 pad towards the north-center and northwest corner. One piezometer was installed on the 24-6A pad, one piezometer was installed at the bench between the two pads, and two mechanical slope indicators were installed on the 24-7 pad. A mechanical slope indicator, also known as a "poor man's inclinometer", can only show the location of significant slope movement, but cannot measure small deformations or ground movements,

Subsurface Conditions

Based on observations of the local site geology it appears that the well pads are constructed in a historic landslide deposit. Current slope movements are likely occurring along historic planar failure surfaces that have been re-activated due to regrading and surface infiltration of precipitation. Settlement of compacted fill and slope creep may also be contributing to the observed slope movement. The broader region is characterized by abundant historical landslides occurring both in siltstone/claystone bedrock and surficial deposits.

Subsurface drilling observations indicate that the site is underlain primarily by medium plasticity, reddish brown, lean clay (CL) with small amounts of sand (typically 10 to 30 percent). Discrete coarse-grained sand and gravel layers were observed in SB-101 from about 26 to 40 feet, and in SB-103 from about 11 to 12 feet and 37 to 43 feet. Weathered sandy siltstone material was encountered in borings SB-101 and SB-102 at about 41 feet below the well pad 24-6A graded surface and is assumed to represent the top of weathered bedrock (drilling refusal). Very stiff clay was encountered in boring SB-104 at about 45 feet below the well pad 24-7 graded surface. Borings SB-103 and SB-105 were terminated in fat clay (no drilling refusal). No obvious failure surfaces were observed in the retrieved soil samples. A summary of the boring depths and geologic observations are presented in Table 1. Borelogs are included as Attachment C.

Table 1: Boring Depths, Geologic Profile, and Completion Method

Boring ID	Depth (ft.)	Simplified Geologic Profile	Completion
SB-101	40.2	0-32 ft: lean clay with 15-30% sand 32-37 ft: mostly sand with gravel (trace fines) 37-40 ft: sandy siltstone bedrock (refusal)	Completed with a piezometer screened from 20-40 feet bgs. (PZ-101)
SB-102	42.9	0-36 ft: lean clay with 10-20% sand 36-40 ft: highly weathered sandstone 40-42 ft: sandy siltstone bedrock (refusal)	Backfilled with cuttings
SB-103	50.0	0-11.5 ft: mostly medium plasticity clay with ~15-30% sand 11.5-12 ft: mostly sand with clay 12-50 ft: mostly medium to high plasticity clay with ~15-30% sand and some gravel	Completed with a piezometer screened from 10-50 feet bgs. (PZ-103)
SB-104	51.2	0-11 ft: fill placed and compacted to construct the pad (lean clay) 11-45 ft: lean clay with 20-30% sand and some gravel 45-51.2 ft: very stiff clay with low moisture content relative to the material above (refusal).	Installed mechanical slope indicator
SB-105	52.0	0-52 ft: medium to high plasticity clay with 15-25% sand	Installed mechanical slope indicator

Groundwater Conditions

Piezometers (PZ-101 and PZ-103) were installed in borings SB-101 and SB-103. PZ-101 is screened across both the clay and the sand and gravel above bedrock. PZ-103 is screened entirely within clay. PZ-101 is located on well pad 24-6A and PZ-103 is located uphill from PZ-101 on a natural grade bench formed by the steeper cut slope to the north and the steeper pad fill to the south.

The water level in PZ-101 three days after installation was 15.9 feet below ground surface. The water level in PZ-103 measured two days after installation was 20.4 feet below ground surface. Due to the low permeability of the clay soils surrounding most or all of the screened sections of the piezometers, water levels may still have been stabilizing at the time of the readings and may not represent the actual groundwater table. Perched groundwater may also be moving preferentially through more coarse-grained sandier layers interbedded within the clay.

Laboratory Testing

GEI collected fourteen soil samples (including several California Barrel samples) from the borings drilled between August 4 and August 8, 2017. GEI contracted Advanced Terra Testing, Inc. (ATT) of Lakewood, Colorado to perform materials testing of site materials. The following tests were performed:

- Moisture Content and Density (ASTM D2216 and D2397)
- Grain-size distribution/sieve analysis – 3-inch to minus No. 200 (ASTM D6913)
- Atterberg Limits (ASTM D4318)
- Direct Shear – one pass per point (ASTM D3080)

Sample classification results are provided in Table 2, physical properties results in Table 3, and direct shear results in Table 4. Laboratory test result reports from ATT are provided as Attachment D.

Table 2: Soil Classification Lab Results

Sample Boring and Depth	Particle Size			Atterberg Limit			USCS Description and Classification
	Gravel (%)	Sand (%)	Fines (%)	LL	PL	PI	
SB-101 (10'-12')	5.5	18.2	76.3	36	14	22	LEAN CLAY W/SAND (CL)
SB-101 (18'-19.5')	0.4	27.7	71.9	35	13	22	LEAN CLAY W/SAND (CL)
SB-101 (31'-32.5')	0.0	18.4	81.6	30	15	15	LEAN CLAY W/SAND (CL)
SB-101 (33.5'-35')	0.2	89.8	10.0	NP	NP	NP	POORLY GRADED SAND W/CLAY (SP-SC)
SB-102 (4'-6')	0.4	20.3	79.3	30	16	14	LEAN CLAY W/SAND (CL)
SB-102 (30'-32')	0.8	11.2	88.0	35	16	19	LEAN CLAY (CL)
SB-103 (6'-8')	0.1	16.2	83.7	38	13	25	LEAN CLAY W/SAND (CL)
SB-103 (14'-16')	11.6	29.4	59.0	46	12	34	SANDY LEAN CLAY (CL)
SB-103 (43.5'-44')	1.8	23.3	74.9	40	14	26	LEAN CLAY W/SAND (CL)
SB-104 (20'-22')	13.7	19.9	66.4	36	16	20	SANDY LEAN CLAY (CL)
SB-104 (40'-42')	0.2	29.4	70.4	30	15	15	LEAN CLAY W/SAND (CL)
SB-104 (47'-47.5')	0.0	27.0	73.0	28	12	16	LEAN CLAY W/SAND (CL)
SB-105 (14'-16')	0.0	15.2	84.8	51	16	29	FAT CLAY W/SAND (CH)
SB-105 (50'-52')	0.4	22.1	77.5	32	14	18	LEAN CLAY W/SAND (CL)

Definitions
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
USCS = Unified Soil Classification System
NP = Not performed

Table 3: Physical Properties Lab Results

Sample Boring and Depth	USCS Classification	Moisture Content (%)	Dry Density (lb/ft^3)
SB-101 (10'-12')	LEAN CLAY W/SAND (CL)	17.0	115.4[a]
SB-101 (18'-19.5')	LEAN CLAY W/SAND (CL)	16.0	115.5
SB-101 (31'-32.5')	LEAN CLAY W/SAND (CL)	17.6	112.3
SB-101 (33.5'-35')	POORLY GRADED SAND W/CLAY (SP-SC)	23.7	NP
SB-102 (4'-6')	LEAN CLAY W/SAND (CL)	13.6	120.6
SB-102 (30'-32')	LEAN CLAY (CL)	13.6	120.1
SB-103 (6'-8')	LEAN CLAY W/SAND (CL)	17.7	105.8
SB-103 (14'-16')	SANDY LEAN CLAY (CL)	19.0	109.4[a]
SB-103 (43.5'-44')	LEAN CLAY W/SAND (CL)	15.4	116.3
SB-104 (20'-22')	SANDY LEAN CLAY (CL)	18.3	109.3[a]
SB-104 (40'-42')	LEAN CLAY W/SAND (CL)	14.9	115.9[a]
SB-104 (47'-47.5')	LEAN CLAY W/SAND (CL)	7.3	122.2
SB-105 (14'-16')	FAT CLAY W/SAND (CH)	16.5	108.2
SB-105 (50'-52')	LEAN CLAY W/SAND (CL)	17.2	111.9

[a] Density calculated using samples collected in rings of known volume using a California Sampler.

Definitions

USCS = Unified Soil Classification System

NM = Not performed

Table 4: Direct Shear Lab Results

Sample Boring and Depth	USCS Classification	Peak Friction Angle (deg)	Residual Friction Angle (deg)	Peak Cohesion (lb/ft^2)	Residual Cohesion (lb/ft^2)
SB-101 (10'-12')	LEAN CLAY W/SAND (CL)	20.8	29.8	1379	193
SB-103 (14'-16')	SAND LEAN CLAY (CL)	15.1	26.6	1675	603
SB-104 (20'-22')	SANDY LEAN CLAY (CL)	18.1	26.0	988	218
SB-104 (40'-42')	LEAN CLAY W/ SAND (CL)	26.0	29.2	709	200

Slope Stability Analysis Methods

GEI performed a slope stability analysis using the Slope/W v.8.15 software program by Geo-Slope International. Inputs for engineering properties of site soils were based on field log classifications and checked against laboratory data, which was provided later. The laboratory results were found to me somewhat higher than the strength values derived through back calculation of the slope at the time of failure.

Profiles were modeled for the as-built and post-remediation conditions using effective strength parameters. The models were developed to evaluate the stability of the design and influence of groundwater on the historic landslide deposits. Results of the stability analysis are given in terms of a factor of safety, which is the ratio of forces resisting landslide movement to the forces contributing to landslide movement. A factor of safety close to 1.0 or less indicates a potential failure condition.

For each scenario, Slope/W created 2200 failure planes (slip circles) and calculated the factor of safety. The Spencer method of slope stability results in the factor of safety that is equivalent for the forces involved on each slice and the moments generated by each slice. The Spencer factor of safety correlates more closely with observations of actual slope failure, providing a realistic factor of safety. On the annotated cross-sections (Attachment E), the Spencer factor of safety is listed. Seismic conditions were not modeled.

An effective stress internal friction angle (Φ') for the native clay in the as-built condition was selected by using observed evidence of slope movement and topographic survey data to cut a critical section, assuming an average groundwater depth of 20 feet that daylights at the cut slope toe on pad 24-6A (which has been observed), and then varying the internal friction angle until the analysis produced a factor of safety close to 1.0.

The post-remediation condition assumes the same native clay effective stress internal friction angle from the as-built condition and the same groundwater depth.

The modeled engineering properties of the native clay were selected from the conservative end of values ranges typical of clays. The laboratory unit weight results (average 130 lb/ft^3) and direct shear results (Φ' between 15.1° and 26.0°) validates the conservative inputs used in the model. Modeled engineering property inputs are summarized in Table 5.

Slope Stabilization Design

The proposed slope stabilization design includes the following items:

- Excavating fill and some native clay along the northern edge of pad 24-7.
- Moisture conditioning, placing, and recompacting the cut material to a produce an engineered section of fill. The fill will be placed to create a maximum slope of 2.75 (horizontal[H]):1 (vertical [V]) with a crest 20 feet south of the current as-built pad crest.
- Locally repairing tension cracks by excavating up to 5 feet of existing pad, moisture conditioning, and recompacting to minimize infiltration of rainwater or other fluids into existing cracks as well as the slope in general.
- Excavating up to 1 foot of material from pad 24-7 as needed to generate sufficient borrow for placement of slope fill.
- Moisture conditioning, placement, and compaction of fill on the slope between pad 24-7 and 24-6A to produce a maximum slope inclination of 6H:1V between the inflection point with the 2.75H:1V slope and the top of the retaining wall on pad 24-6A.
- Installing 40 concrete-encased steel soldier piles, 8 feet-on-center, along the toe of the 6H:1V slope. The piles will extend 20 feet above the ground surface and 30 to 40 feet below the 24-6A pad. The alignment of the eastern third of the piles is slightly skewed to be parallel with the toe of the cut slope.
- Constructing a mechanically reinforced earth buttress behind the soldier piles using Tensar TriAx 140 (or equivalent) geogrids placed at a two-foot vertical spacing and tied into the timber lagging façade of the soldier pile wall.
- Cutting, moisture conditioning, placing, and compacting native clay in 1-foot-thick lifts behind the soldier pile wall.
- Placing wall drain material directly behind the lagging to fill the gap between native clay backfill and provide a drainage pathway for groundwater behind the wall. Wall drain materials shall consist mostly of washed concrete sand with coarser gravel packed around a 4-inch-diameter perforated drain pipe. Material compatibility calculations are included as Attachment F.

Slope Stability Analysis Results

The modeled profile for the as-built condition closely resembles the field conditions of the slope at or near the time of failure along the critical failure surface. After Laramie unloaded the area of the observed minor slope movement, by cutting back the fill slope north of pad 24-7 and by relocating stockpiles and equipment away from the area of concern, the monitoring points data indicates that little or no slope movement is currently occurring. We conclude that the slope is now at or slightly above a factor of safety of 1.0, and that the modeled sloped geometry, groundwater depth, and engineering properties are reasonable representations of existing conditions.

The same groundwater depth and critical material engineering properties were carried forward into the remedial analysis, with only slope geometry, sections of cut and fill, and retaining structures being changed or added. All three components were adjusted until a factor of safety against instability of 1.3 was achieved. A factor of safety of 1.3 is considered across the industry to be the minimum acceptable factor for small-scale potential slope failures (U.S. Bureau of Reclamation 2011; U.S. Army Corps of Engineers 2003).

The proposed design assists in the stabilization of the slope movement in the following ways:

- The removal, regrading, and replacement of the fill in an engineered manner removes the "residual" (lower) strength material present at critical locations within the slope, and returns the materials to a "pre-failure" condition (strengthening the materials and lessening the driving forces).
- The MSE wall and above-grade portions of the soldier pile wall creates a "buttress" effect, increasing the resisting forces acting on the toe of the slope.
- The embedded portions of the soldier piles will be terminated at or near underlying bedrock. This will provide resistance to a potential deeper failure surface.

Stability results are presented in Table 5 and profiles modeled are included as Attachment E.

Table 5: Modeled Critical Engineering Properties and Stability Results

Slope Configuration	Modeled Slope Geometry	Modeled Avg. Groundwater Depth (ft)	Modeled Engineering Properties of Native Clay			
			Total Unit Weight (pcf)[1]	Φ' (deg)[2]	c' (psf)[3]	Stability Results
As-built	Variable	20	125	16	0	0.9
Post-Remediation	6H:1V to 2.75H:1V	20	125	16	0	1.3

[1] Native clay samples collected in brass rings exhibited natural moisture contents between 14.9% and 19.0% and natural dry densities between 109 and 116 pcf.

[2] Φ' value was varied until stability analysis yielded a factor of safety of approximately 1.

[3] Assume no cohesive strength along shear surface.

Definitions

Φ' = effective stress angle of internal friction
c' = effective stress cohesion
pcf = pounds per cubic foot
psf = pounds per square foot

GEI's stabilization design provides a cost-effective solution to improve the local and global stability of the slope between pad 24-7 and 24-6A against shallow failures, allowing for short-term use of the pads for oil and gas extraction activities.

Sincerely,

GEI CONSULTANTS, INC.

Jeremy Deuto, P.E., P.G.
Project Manager/Geotechnical Engineer

James Niehoff, P.E.
Peer Reviewer/Senior Engineer

JD:bjt

Attachments: Monitoring Point Survey Data
Photo Log
Borelogs
Laboratory Test Results Reports
Slope Stability Analysis Profiles
Wall Drain Material Compatibility Calculations

References:

U.S. Army Corps of Engineers (2003). Slope Stability. EM 1110-2-1902. Washington: Department of the Army, October.

U.S. Bureau of Reclamation (2011). Embankment Dams. Design Standards No. 13, Chapter 4. Department of the Interior, October.

Attachment A

9/11/2017

LARAMIE NICHOLES 24-7 (MONITORING POINTS)

Re-shoot monitoring points on 9-1-2017

Prepared By:
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435-789-1017

Prepared For:
Laramie Energy, LLC

Location: Section 24, T9S, R93W, 6th P.M.

Shots From 7-27-17

Point Number	North Shot 7-27-17	East Shot 7-27-17	Elevation Shot 7-27-17	Point Description
Point	North	East	Elev	Desc
6359	48487.97	32788.41	7117.16	MP 1
6358	48457.75	33095.86	7097.37	MP 2
6357	48365.95	33299.41	7094.88	MP 3
6356	48279.19	33235.68	7140.27	MP 4
6349	48354.32	33038.97	7138.36	MP 5
6352	48426.00	32837.07	7138.32	MP 6
6353	48167.81	32751.57	7138.04	MP 7
6354	48046.94	32967.81	7137.37	MP 8
6355	48030.07	33139.37	7139.24	MP 9
6348	47969.01	33260.73	7146.55	MP 10
6347	47962.99	33182.46	7165.36	MP 11
6346	47928.05	33111.83	7192.83	MP 12
6345	47946.05	33013.15	7182.27	MP 13
6344	47990.93	32914.20	7169.55	MP 14
6343	48001.54	32840.50	7172.85	MP 15
6342	48039.39	32739.02	7170.62	MP 16
6341	48098.98	32713.78	7162.42	MP 17
6340	48041.94	32674.14	7171.64	MP 18
6338	48062.76	32556.96	7155.55	MP 19
6339	47988.21	32614.75	7177.60	MP 20
6336	47915.81	32712.28	7212.19	MP 21
6334	47905.12	32810.28	7212.31	MP 22
6333	47888.97	32903.49	7212.06	MP 23
6332	47871.67	33012.84	7212.24	MP 24
6331	47846.69	33139.95	7213.02	MP 25
6324	47686.18	33189.38	7190.17	MP 26
6329	47566.40	33102.28	7213.21	MP 27
6327	47567.16	32867.45	7211.68	MP 28
6326	47582.44	32662.55	7224.01	MP 29
6320	47716.77	32628.09	7211.57	MP 30
6337	47795.62	32152.99	7201.10	MP 31
6321	47487.86	32652.09	7253.40	MP 32
6322	47452.76	32861.87	7256.24	MP 33
6323	47459.31	33078.42	7237.41	MP 34

Shots From 8-1-17

Point Number	North Shot 8-1-17	East Shot 8-1-17	Elevation Shot 8-1-17	Point Description
Point	North	East	Elev	Desc
7043	48488.06	32788.42	7117.12	MP1
7042	48457.80	33095.88	7097.31	MP2
7041	48366.02	33299.47	7094.78	MP3
7040	48279.21	33235.72	7140.12	MP4
7039	48354.37	33039.06	7137.90	MP5
7044	48426.10	32837.15	7138.22	MP6
7034	48167.86	32751.57	7138.08	MP7
7035	48047.13	32967.82	7137.41	MP8
7038	48030.02	33139.43	7139.03	MP9
7021	47969.16	33260.65	7146.64	MP10
7022	47963.13	33182.38	7165.50	MP11
7023	47928.13	33111.73	7192.93	MP12
7026	47946.26	33013.15	7182.17	MP13
7027	47991.09	32914.17	7169.45	MP14
7028	48001.69	32840.51	7172.84	MP15
7029	48039.54	32738.99	7170.64	MP16
7033	48099.16	32713.77	7162.46	MP17
7030	48042.06	32674.05	7171.65	MP18
7032	48062.83	32556.88	7155.53	MP19
7031	47988.36	32614.67	7177.57	MP20
7016	47915.89	32712.28	7212.17	MP21
7017	47905.22	32810.26	7212.28	MP22
No Data				
7018	47871.64	33012.80	7212.23	MP24
7019	47846.72	33139.95	7213.02	MP25
7020	47686.25	33189.37	7190.18	MP26
7014	47566.42	33102.29	7213.19	MP27
7015	47567.09	32867.47	7211.72	MP28
7010	47582.36	32662.60	7223.98	MP29
7009	47716.78	32628.11	7211.52	MP30
7008	47795.64	32152.95	7201.00	MP31
7011	47487.83	32652.12	7253.45	MP32
7012	47452.69	32861.88	7256.15	MP33
7013	47459.33	33078.40	7237.42	MP34
7036	48035.34	33008.55	7140.05	MPA1
7037	48030.14	33027.22	7140.55	MPA2
7025	47974.96	33024.13	7183.01	MPA3
7024	47970.78	33038.42	7185.64	MPA4

Change from 7-27-17 to 8-1-17

Coordinate Change	Coordinate Change	Horizontal Shift	Coordinate Change	Movement From Last Shot
N Delta	E Delta	H Delta	Elev Delta	
+ shift north - shift south	+ shift east - shift west		+ shift up - shift down	
0.09	0.01	0.09	-0.04	NO
0.05	0.03	0.06	-0.06	NO
0.07	0.06	0.09	-0.10	NO
0.03	0.03	0.04	-0.15	YES
0.05	0.10	0.11	-0.46	YES
0.10	0.08	0.13	-0.10	YES
0.05	0.01	0.05	0.04	NO
0.19	0.00	0.19	0.03	YES
-0.05	0.06	0.08	-0.21	YES
0.15	-0.08	0.17	0.08	YES
0.14	-0.09	0.17	0.14	YES
0.08	-0.10	0.13	0.10	YES
0.21	0.00	0.21	-0.10	YES
0.16	-0.03	0.17	-0.10	YES
0.15	0.01	0.15	-0.01	YES
0.15	-0.02	0.15	0.02	YES
0.19	-0.01	0.19	0.04	YES
0.12	-0.09	0.15	0.01	YES
0.07	-0.07	0.10	-0.02	NO
0.15	-0.08	0.18	-0.03	YES
0.08	0.00	0.08	-0.02	NO
0.09	-0.02	0.10	-0.02	NO
No Data	THIS POINT WAS DESTROYED			
-0.03	-0.04	0.05	-0.02	NO
0.03	0.01	0.03	-0.01	NO
0.07	-0.02	0.07	0.01	NO
0.02	0.00	0.02	-0.02	NO
-0.07	0.02	0.07	0.05	NO
-0.07	0.06	0.09	-0.03	NO
0.02	0.01	0.02	-0.05	NO
0.02	-0.03	0.04	-0.10	NO
-0.03	0.02	0.04	0.05	NO
-0.07	0.00	0.07	-0.09	NO
0.02	-0.02	0.03	0.02	NO
Only Shot Once				
Only Shot Once				
Only Shot Once				
Only Shot Once				

Shots From 8-5-17 (While surveyor was shooting 24-06a conductors)

Point Number	North Shot 8-5-17	East Shot 8-5-17	Elevation Shot 8-5-17	Point Description
Point	North	East	Elev	Desc
				THIS POINT WAS HIT BY TRACKHOE
10002-1	47915.841	32712.24	7212.291	6336/chk MP21
10003-1	47905.226	32810.308	7212.438	6334/chk MP22
10005	47889.114	32903.598	7202.354	NEW 23A SET
10004-1	47871.559	33012.81	7212.397	6332/chk MP 24
10001-1	47716.699	32628.093	7211.741	6320/chk MP30

Shots From 8-7-17

Point Number	North Shot 8-7-17	East Shot 8-7-17	Elevation Shot 8-7-17	Point Description
Point	North	East	Elev	Desc
12037	48487.99	32788.47	7117.14	1_mp-8-7-17
12036	48457.75	33095.95	7097.40	2_mp-8-7-17
12035	48365.87	33299.48	7094.90	3_mp-8-7-17
12034	48279.10	33235.67	7140.17	4_mp-8-7-17
12033	48354.34	33039.06	7137.97	5_mp-8-7-17
12032	48425.99	32837.12	7138.26	6_mp-8-7-17
12031	48167.81	32751.61	7138.11	7_mp-8-7-17
12030	48047.04	32967.79	7137.42	8_mp-8-7-17
12027	48030.10	33139.32	7139.23	9_mp-8-7-17
12026	47969.05	33260.72	7146.63	10_mp-8-7-17
12025	47963.04	33182.50	7165.53	11_mp-8-7-17
12024	47928.07	33111.76	7192.92	12_mp-8-7-17
12021	47946.24	33013.20	7182.15	13_mp-8-7-17
12020	47991.09	32914.25	7169.42	14_mp-8-7-17
12019	48001.65	32840.60	7172.81	15_mp-8-7-17
12018	48039.56	32739.03	7170.61	16_mp-8-7-17
12017	48099.15	32713.83	7162.47	17_mp-8-7-17
12016	48042.12	32674.14	7171.63	18_mp-8-7-17
12015	48062.85	32556.96	7155.51	19_mp-8-7-17
12014	47988.37	32614.75	7177.54	20_mp-8-7-17
12013	47915.90	32712.29	7212.13	21_mp-8-7-17
12012	47905.17	32810.28	7212.27	22_mp-8-7-17
12011	47889.15	32903.57	7202.21	23a_mp-8-7-17
12010	47871.59	33012.87	7212.22	24_mp-8-7-17
12009	47846.66	33140.02	7213.06	25_mp-8-7-17
12008	47686.17	33189.50	7190.20	26_mp-8-7-17
12006	47566.34	33102.36	7213.17	27_mp-8-7-17
12007	47567.09	32867.50	7211.69	28_mp-8-7-17
12002	47582.39	32662.61	7223.98	29_mp-8-7-17
12001	47716.72	32628.15	7211.57	30_mp-8-7-17
12000	47795.59	32152.98	7201.05	31_mp-8-7-17
12003	47487.76	32652.24	7253.41	32_mp-8-7-17
12004	47452.72	32862.02	7256.11	33_mp-8-7-17
12005	47459.28	33078.49	7237.36	34_mp-8-7-17
12029	48035.27	33008.53	7140.04	a1_mp-8-7-17
12028	48030.14	33027.15	7140.64	a2_mp-8-7-17
12022	47974.93	33024.16	7183.01	a3_mp-8-7-17
12023	47970.72	33038.41	7185.63	a4_mp-8-7-17
12043	48003.93	32864.23	7171.48	p2-103-8-7-17
12045	48057.08	32986.42	7139.70	pz-101-8-7-17
12044	48093.87	32901.78	7138.05	sb-102-8-7-17

(Table Color Indicates) Change from 8-1-17 to 8-7-17
(Table Color Indicates) Change from 8-5-17 to 8-7-17

Coordinate Change	Coordinate Change	Horizontal Shift	Coordinate Change	Movement From Shot Date Indicated
N Delta	E Delta	H Delta	Elev Delta	
+ shift north - shift south	+ shift east - shift west		+ shift up - shift down	
-0.08	0.05	0.09	0.02	NO
-0.05	0.06	0.08	0.09	NO
-0.15	0.01	0.15	0.13	YES
-0.12	-0.05	0.13	0.05	YES
-0.03	-0.01	0.03	0.06	NO
-0.11	-0.02	0.11	0.04	YES
-0.05	0.04	0.07	0.03	NO
-0.09	-0.03	0.10	0.02	NO
0.08	-0.11	0.14	0.20	YES
-0.12	0.07	0.14	-0.01	YES
-0.09	0.12	0.15	0.03	YES
-0.06	0.03	0.06	-0.01	NO
-0.01	0.04	0.04	-0.02	NO
0.00	0.08	0.08	-0.02	NO
-0.04	0.09	0.10	-0.03	NO
0.02	0.04	0.05	-0.03	NO
-0.02	0.07	0.07	0.00	NO
0.06	0.09	0.11	-0.02	YES
0.01	0.08	0.08	-0.02	NO
0.00	0.08	0.08	-0.02	NO
0.06	0.05	0.08	-0.17	YES
-0.06	-0.03	0.07	-0.17	YES
0.03	-0.03	0.04	-0.15	YES
0.03	0.06	0.06	-0.18	YES
-0.07	0.07	0.10	0.04	NO
-0.08	0.13	0.15	0.02	YES
-0.07	0.07	0.10	-0.02	YES
0.01	0.03	0.03	-0.04	NO
0.03	0.01	0.03	0.00	NO
0.02	0.06	0.06	-0.17	YES
-0.05	0.02	0.06	0.05	NO
-0.07	0.12	0.14	-0.04	YES
0.03	0.14	0.14	-0.03	YES
-0.04	0.08	0.09	-0.06	NO
-0.07	-0.02	0.08	0.00	NO
0.00	-0.07	0.07	0.09	NO
-0.03	0.04	0.05	0.00	NO
-0.05	-0.01	0.05	-0.01	NO

(Table Color Indicates) Change From 7-27-17 to 8-7-17

Coordinate Change	Coordinate Change	Horizontal Shift	Coordinate Change	Movement From Shot Date Indicated
N Delta	E Delta	H Delta	Elev Delta	
+ shift north - shift south	+ shift east - shift west		+ shift up - shift down	
0.01	0.06	0.06	-0.02	NO
-0.01	0.09	0.09	0.03	NO
-0.08	0.07	0.11	0.03	YES
-0.09	-0.01	0.09	-0.10	YES
Track hoe hit after 7-27-17				
-0.01	0.06	0.06	-0.06	NO
0.00	0.04	0.04	0.07	NO
0.09	-0.03	0.10	0.05	NO
0.03	-0.05	0.06	-0.02	NO
0.03	-0.02	0.04	0.08	NO
0.05	0.04	0.06	0.17	YES
0.02	-0.07	0.08	0.09	NO
0.20	0.04	0.20	-0.12	YES
0.16	0.05	0.17	-0.13	YES
0.11	0.10	0.15	-0.04	YES
0.17	0.01	0.17	-0.01	YES
0.17	0.06	0.18	0.05	YES
0.17	0.00	0.18	-0.01	YES
0.08	0.01	0.08	-0.04	NO
0.16	0.00	0.16	-0.06	YES
0.09	0.01	0.09	-0.06	NO
0.04	0.00	0.04	-0.04	NO
No data from 7-27-17 point was re-set 8-5-17				
-0.08	0.02	0.08	-0.02	NO
-0.03	0.08	0.09	0.03	NO
-0.01	0.12	0.12	0.03	YES
-0.06	0.07	0.09	-0.04	NO
-0.07	0.05	0.08	0.01	NO
-0.04	0.07	0.08	-0.03	NO
-0.05	0.06	0.07	0.00	NO
-0.03	-0.01	0.03	-0.05	NO
-0.10	0.14	0.18	0.01	YES
-0.04	0.14	0.15	-0.12	YES
-0.03	0.06	0.07	-0.04	NO
No Data From 7-27-17 Point Was Set 8-1-17				
No Data From 7-27-17 Point Was Set 8-1-17				
No Data From 7-27-17 Point Was Set 8-1-17				
No Data From 7-27-17 Point Was Set 8-1-17				

NOTE:
The coordinate differences were flagged at "YES" if the monitoring point moved more than 0.1' horizontally and/or vertically since the last shot.
Point accuracy dependent on Trimble RTK GPS equipment spcified accuracy 0.04' horizontal and .06' vertical each measurement

Note:
Piezometer shots at top of casing

9/11/2017

LARAMIE NICHOLES 24-7 (MONITORING POINTS)

Re-shoot monitoring points on 9-1-2017

Prepared By:
UELS, LLC (Uintah Engineering & Land Surveying)
85 South 200 East, Vernal, Utah 84078
435-789-1017

Prepared For:
Laramie Energy, LLC

Location: Section 24, T9S, R93W, 6th P.M.

Shots From 8-11-17

Point Number	North Shot 8-11-17	East Shot 8-11-17	Elevation Shot 8-11-17	Point Description
Point	North	East	Elev	Desc
12042	48488.11	32788.39	7117.10	1-MP
12043	48457.86	33095.84	7097.25	2-MP
12044	48366.03	33299.39	7094.83	3-MP
12037	48279.14	33235.72	7140.39	4-MP
12039	48354.35	33039.07	7138.06	5-MP
12040	48426.01	32837.20	7138.28	6-MP
12031	48167.89	32751.55	7138.19	7-MP
12033	48047.04	32967.80	7137.42	8-MP
12036	48030.07	33139.37	7139.26	9-MP
12020	47969.06	33260.72	7146.65	10-MP
12019	47963.05	33182.45	7165.49	11-MP
12018	47928.12	33111.79	7192.91	12-MP
12023	47946.26	33013.19	7182.14	13-MP
12024	47991.12	32914.24	7169.42	14-MP
12025	48001.67	32840.57	7172.87	15-MP
12026	48039.56	32739.04	7170.63	16-MP
12030	48099.20	32713.76	7162.55	17-MP
12027	48042.11	32674.11	7171.66	18-MP
12029	48062.81	32556.84	7155.59	19-MP
12028	47988.40	32614.68	7177.51	20-MP
12013	47915.92	32712.19	7212.08	21-MP
12012	47905.21	32810.21	7212.22	22-MP
12011	47889.14	32903.54	7202.18	23A-MP
12010	47871.63	33012.81	7212.25	24-MP
12009	47846.67	33139.95	7212.98	25-MP
12008	47686.15	33189.43	7190.20	26-MP
12006	47566.41	33102.35	7213.17	27-MP
12007	47567.13	32867.44	7211.72	28-MP
12002	47582.39	32662.45	7223.98	29-MP
12001	47716.74	32628.08	7211.56	30-MP
12000	47795.62	32153.01	7201.07	31-MP
12003	47487.78	32652.02	7253.44	32-MP
12004	47452.67	32861.85	7256.17	33-MP
12005	47459.25	33078.34	7237.31	34-MP
12034	48035.18	33008.46	7140.01	A1-MP
12035	48030.04	33027.13	7140.59	A2-MP
12022	47974.94	33024.18	7182.98	A3-MP
12021	47970.69	33038.47	7185.65	A4-MP
12045	47768.64	32865.02	7214.67	PZ-104
12047	47803.37	32764.70	7214.54	PVC 2IN WELL

Note:
Piezometer shots at top of casing

Change from 8-7-17 to 8-11-17

Coordinate Change	Coordinate Change	Horizontal Shift	Coordinate Change	Movement From Last Shot
N Delta	E Delta	H Delta	Elev Delta	
+ shift north	+ shift east		+ shift up	
- shift south	- shift west		- shift down	
0.12	-0.08	0.15	-0.05	YES
0.11	-0.11	0.16	-0.14	YES
0.15	-0.09	0.18	-0.08	YES
0.04	0.05	0.06	0.22	YES
0.01	0.01	0.02	0.10	NO
0.01	0.08	0.08	0.02	NO
0.09	-0.06	0.10	0.07	YES
0.01	0.01	0.01	-0.01	NO
-0.03	0.05	0.06	0.04	NO
0.01	0.00	0.01	0.02	NO
0.01	-0.05	0.06	-0.05	NO
0.05	0.03	0.06	-0.01	NO
0.01	-0.01	0.02	-0.01	NO
0.03	0.00	0.03	0.00	NO
0.02	-0.03	0.03	0.06	NO
0.00	0.00	0.00	0.02	NO
0.05	-0.08	0.09	0.08	NO
-0.01	-0.02	0.03	0.03	NO
-0.04	-0.13	0.13	0.08	YES
0.03	-0.08	0.08	-0.04	NO
0.02	-0.10	0.10	-0.04	YES
0.04	-0.07	0.08	-0.04	NO
-0.01	-0.03	0.04	-0.03	NO
0.04	-0.06	0.07	0.02	NO
0.01	-0.07	0.07	-0.08	NO
-0.03	-0.07	0.08	0.00	NO
0.07	-0.01	0.07	0.00	NO
0.04	-0.06	0.07	0.03	NO
0.00	-0.16	0.16	0.00	YES
0.02	-0.07	0.07	-0.01	NO
0.03	0.03	0.04	0.02	NO
0.02	-0.22	0.22	0.03	YES
-0.04	-0.17	0.17	0.06	YES
-0.03	-0.14	0.15	-0.06	YES
-0.09	-0.07	0.11	-0.04	YES
-0.10	-0.01	0.10	-0.05	YES
0.01	0.02	0.03	-0.03	NO
-0.04	0.06	0.07	0.02	NO

(Table Color Indicates) Change From 7-27-17 to 8-11-17
(Table Color Indicates) Change From 8-1-17 to 8-11-17
(Table Color Indicates) Change From 8-5-17 to 8-11-17

Coordinate Change	Coordinate Change	Horizontal Shift	Coordinate Change	Movement From Shot Date Indicated
N Delta	E Delta	H Delta	Elev Delta	
+ shift north	+ shift east		+ shift up	
- shift south	- shift west		- shift down	
0.13	-0.03	0.13	-0.07	YES
0.11	-0.02	0.11	-0.12	YES
0.07	-0.03	0.08	-0.05	NO
-0.05	0.03	0.06	0.11	YES
-0.02	0.00	0.02	0.16	YES
0.00	0.13	0.13	-0.03	YES
0.08	-0.01	0.08	0.15	YES
0.10	-0.01	0.10	0.04	YES
0.00	0.00	0.00	0.02	NO
0.04	-0.01	0.05	0.10	YES
0.06	-0.02	0.07	0.13	YES
0.07	-0.04	0.08	0.08	NO
0.21	0.03	0.21	-0.13	YES
0.20	0.05	0.20	-0.13	YES
0.13	0.07	0.15	0.02	YES
0.17	0.02	0.17	0.01	YES
0.22	-0.02	0.22	0.13	YES
0.16	-0.03	0.17	0.02	YES
0.04	-0.12	0.13	0.04	YES
0.19	-0.08	0.20	-0.10	YES
0.11	-0.09	0.15	-0.10	YES
0.08	-0.07	0.11	-0.08	YES
0.03	-0.06	0.07	-0.17	YES
-0.04	-0.04	0.05	0.01	NO
-0.02	0.01	0.02	-0.05	NO
-0.04	0.05	0.06	0.03	NO
0.01	0.06	0.06	-0.04	NO
-0.03	-0.01	0.03	0.04	NO
-0.04	-0.10	0.11	-0.03	YES
-0.02	-0.01	0.03	-0.01	NO
0.00	0.02	0.02	-0.03	NO
-0.08	-0.07	0.11	0.04	YES
-0.09	-0.03	0.09	-0.06	NO
-0.06	-0.08	0.10	-0.10	NO
-0.16	-0.09	0.18	-0.04	YES
-0.10	-0.09	0.13	0.04	YES
-0.02	0.06	0.06	-0.03	NO
-0.09	0.05	0.10	0.00	YES

Shots From 8-22-17

Point Number	North Shot 8-22-17	East Shot 8-22-17	Elevation Shot 8-22-17	Point Description
Point	North	East	Elev	Desc
9472	48488.02	32788.39	7117.15	MP-1-CK 8-22
9473	48457.80	33095.88	7097.37	MP-2-CK 8-22
9474	48365.96	33299.46	7094.90	MP-3-CK 8-22
9471	48279.15	33235.71	7140.16	MP-4-CK 8-22
9465	48354.39	33039.01	7137.92	MP-5-CK 8-22
9464	48426.04	32837.12	7138.20	MP-6-CK 8-22
9466	48167.87	32751.56	7138.13	MP-7-CK 8-22
9467	48047.02	32967.83	7137.49	MP-8-CK 8-22
9470	48030.07	33139.38	7139.23	MP-9-CK 8-22
9013	47969.04	33260.68	7146.59	MP-10-CK 8-22
9014	47963.07	33182.38	7165.47	MP-11-CK 8-22
9015	47928.09	33111.75	7192.93	MP-12-CK 8-22
9454	47946.30	33013.17	7182.15	MP-13-CK 8-22
9457	47991.17	32914.20	7169.43	MP-14-CK 8-22
9458	48001.70	32840.50	7172.82	MP-15-CK 8-22
9459	48039.58	32738.97	7170.60	MP-16-CK 8-22
9460	48099.20	32713.71	7162.48	MP-17-CK 8-22
9461	48042.10	32674.03	7171.64	MP-18-CK 8-22
9463	48062.77	32556.84	7155.49	MP-19-CK 8-22
9462	47988.40	32614.62	7177.54	MP-20-CK 8-22
9006	47915.89	32712.25	7212.12	MP-21-CK 8-22
9005	47905.21	32810.23	7212.26	MP-22-CK 8-22
9475	47889.19	32903.53	7202.19	MP-23A-CK 8-22
9004	47871.62	33012.79	7212.26	MP-24-CK 8-22
9003	47846.70	33139.96	7213.09	MP-25-CK 8-22
9012	47686.20	33189.38	7190.18	MP-26-CK 8-22
9002	47566.33	33102.32	7213.22	MP-27-CK 8-22
9001	47567.00	32867.47	7211.68	MP-28-CK 8-22
9008	47582.36	32662.61	7224.02	MP-29-CK 8-22
9007	47716.76	32628.09	7211.61	MP-30-CK 8-22
9000	47795.64	32152.94	7201.07	MP-31-CK 8-22
9009	47487.85	32652.08	7253.44	MP-32-CK 8-22
9010	47452.64	32861.93	7256.18	MP-33-CK 8-22
9011	47459.28	33078.39	7237.41	MP-34-CK 8-22
9468	48035.27	33008.58	7140.09	MP-A1-CK 8-22
9469	48030.12	33027.19	7140.62	MP-A2-CK 8-22
9456	47974.96	33024.13	7183.01	MP-A3-CK 8-22
9455	47970.73	33038.40	7185.65	MP-A4-CK 8-22

Change from 8-11-17 to 8-22-17

Coordinate Change	Coordinate Change	Horizontal Shift	Coordinate Change	Movement From Last Shot
N Delta	E Delta	H Delta	Elev Delta	
+ shift north	+ shift east		+ shift up	
- shift south	- shift west		- shift down	
-0.09	0.00	0.09	0.06	NO
-0.06	0.05	0.08	0.12	YES
-0.07	0.07	0.10	0.07	NO
0.01	-0.01	0.01	-0.23	YES
0.04	-0.05	0.06	-0.15	YES
0.03	-0.07	0.08	-0.09	NO
-0.02	0.01	0.02	-0.06	NO
-0.02	0.03	0.04	0.07	NO
-0.01	0.01	0.01	-0.04	NO
-0.02	-0.04	0.04	-0.06	NO
0.02	-0.07	0.07	-0.02	NO
-0.02	-0.04	0.05	0.02	NO
0.04	-0.01	0.04	0.01	NO
0.05	-0.05	0.07	0.01	NO
0.02	-0.07	0.08	-0.05	NO
0.00	-0.05	0.05	0.02	NO
0.05	0.00	0.05	0.01	NO
-0.01	-0.01	0.02	0.01	NO
0.03	0.00	0.03	0.11	YES
0.05	-0.05	0.07	-0.02	NO
-0.08	-0.03	0.08	0.05	NO
-0.13	0.03	0.13	-0.03	YES
-0.04	0.16	0.16	0.04	YES
0.01	0.01	0.02	0.05	NO
0.01	-0.07	0.07	-0.01	NO
0.07	0.06	0.09	0.01	NO
-0.03	0.08	0.09	0.00	NO
0.03	0.04	0.05	0.10	YES
0.09	0.12	0.15	0.08	YES
0.08	0.06	0.10	0.03	YES
0.02	-0.05	0.06	0.03	NO
0.04	-0.07	0.08	0.01	NO

(Table Color Indicates) Change From 7-27-17 to 8-22-17
(Table Color Indicates) Change From 8-1-17 to 8-22-17
(Table Color Indicates) Change From 8-5-17 to 8-22-17

Coordinate Change	Coordinate Change	Horizontal Shift	Coordinate Change	Movement From Shot Date Indicated
N Delta	E Delta	H Delta	Elev Delta	
+ shift north	+ shift east		+ shift up	
- shift south	- shift west		- shift down	
0.04	-0.02	0.05	-0.01	NO
0.04	0.03	0.05	0.00	NO
0.01	0.04	0.04	0.02	NO
-0.03	0.03	0.04	-0.11	YES
0.02	0.05	0.05	0.01	NO
0.04	0.06	0.07	-0.12	YES
0.06	0.00	0.06	0.09	NO
0.08	0.01	0.08	0.12	YES
0.00	0.01	0.01	-0.01	NO
0.02	-0.05	0.06	0.04	NO
0.08	-0.08	0.12	0.11	YES
0.04	-0.08	0.09	0.10	YES
0.25	0.02	0.25	-0.12	YES
0.24	0.00	0.24	-0.12	YES
0.15	0.00	0.15	-0.03	YES
0.18	-0.05	0.19	-0.02	YES
0.22	-0.07	0.23	0.06	YES
0.16	-0.11	0.19	0.00	YES
0.01	-0.12	0.12	-0.06	YES
0.20	-0.13	0.24	-0.06	YES
0.09	-0.03	0.09	-0.06	NO
0.09	-0.05	0.10	-0.05	NO
0.07	-0.07	0.10	-0.17	YES
-0.05	-0.05	0.07	0.02	NO
0.01	0.01	0.01	0.06	NO
0.01	0.00	0.01	0.01	NO
-0.07	0.04	0.08	0.01	NO
-0.16	0.02	0.16	0.01	YES
-0.08	0.06	0.10	0.01	YES
-0.01	0.00	0.01	0.04	NO
0.01	-0.05	0.05	-0.03	NO
-0.02	-0.01	0.02	0.04	NO
-0.12	0.06	0.13	-0.06	YES
-0.03	-0.04	0.05	0.00	NO
-0.07	0.03	0.08	0.04	NO
-0.02	-0.03	0.03	0.07	NO
0.00	0.01	0.01	-0.01	NO
-0.05	-0.02	0.05	0.01	NO

9/11/2017

LARAMIE NICHOLES 24-7 (MONITORING POINTS)

Re-shoot monitoring points on 9-1-2017

Prepared By:
UELS, LLC (Uintah Engineering & Land Surveying)
85 South 200 East, Vernal, Utah 84078
435-789-1017

Prepared For:
Laramie Energy, LLC

Location: Section 24, T9S, R93W, 6th P.M.

(Table Color Indicates) Change From 7-27-17 to 9-1-17
(Table Color Indicates) Change From 8-1-17 to 9-1-17
(Table Color Indicates) Change From 8-5-17 to 9-1-17

Shots From 9-1-17					**Change from 8-22-17 to 9-1-17**										
Point Number	North Shot 9-1-17	East Shot 9-1-17	Elevation Shot 9-1-17	Point Description	Coordinate Change	Coordinate Change	Horizontal Shift	Coordinate Change	Movement From Last Shot	Coordinate Change	Coordinate Change	Horizontal Shift	Coordinate Change	Movement From Shot Date Indicated
Point	North	East	Elev	Desc	N Delta	E Delta	H Delta	Elev Delta		N Delta	E Delta	H Delta	Elev Delta	
					+ shift north - shift south	+ shift east - shift west		+ shift up - shift down		+ shift north - shift south	+ shift east - shift west		+ shift up - shift down	
2006	48488.02	32788.409	7117.119	MP1 9-1-17	0.00	0.02	0.02	-0.03	NO	0.05	0.00	0.05	-0.04	NO
2005	48457.784	33095.873	7097.368	MP2 9-1-17	-0.01	-0.01	0.02	0.00	NO	0.03	0.02	0.04	0.00	NO
2004	48365.97	33299.441	7094.916	MP3 9-1-17	0.01	-0.02	0.02	0.02	NO	0.02	0.03	0.03	0.04	NO
2003	48279.144	33235.676	7140.186	MP4 9-1-17	-0.01	-0.03	0.03	0.03	NO	-0.04	-0.01	0.04	-0.09	NO
2002	48354.369	33039.136	7137.951	MP5 9-1-17	-0.02	0.12	0.13	0.04	YES	0.00	0.07	0.07	0.05	NO
2001	48425.953	32837.122	7138.276	MP6 9-1-17	-0.08	0.00	0.08	0.08	NO	-0.05	0.06	0.07	-0.04	NO
2011	48167.866	32751.595	7138.141	MP7 9-1-17	-0.01	0.03	0.03	0.01	NO	0.06	0.03	0.06	0.10	YES
2010	48047.095	32967.818	7137.435	MP8 9-1-17	0.07	-0.01	0.07	-0.05	NO	0.15	0.01	0.15	0.06	YES
2007	48030.064	33139.386	7139.227	MP9 9-1-17	0.00	0.01	0.01	0.00	NO	-0.01	0.02	0.02	-0.01	NO
2026	47969.064	33260.713	7146.6	MP10 9-1-17	0.03	0.03	0.04	0.01	NO	0.05	-0.02	0.06	0.05	NO
2027	47963.091	33182.421	7165.458	MP11 9-1-17	0.02	0.04	0.05	-0.01	NO	0.10	-0.04	0.11	0.10	YES
2028	47928.128	33111.798	7192.876	MP12 9-1-17	0.03	0.05	0.06	-0.06	NO	0.08	-0.03	0.08	0.05	NO
2031	47946.297	33013.158	7182.112	MP13 9-1-17	0.00	-0.02	0.02	-0.04	NO	0.25	0.00	0.25	-0.16	YES
2032	47991.196	32914.202	7169.388	MP14 9-1-17	0.03	0.01	0.03	-0.04	NO	0.27	0.01	0.27	-0.16	YES
2033	48001.715	32840.554	7172.783	MP15 9-1-17	0.02	0.06	0.06	-0.04	NO	0.17	0.06	0.18	-0.07	YES
2034	48039.611	32739.01	7170.58	MP16 9-1-17	0.04	0.04	0.06	-0.02	NO	0.22	-0.01	0.22	-0.04	YES
2035	48099.185	32713.746	7162.453	MP17 9-1-17	-0.01	0.04	0.04	-0.02	NO	0.21	-0.03	0.21	0.04	YES
2036	48042.151	32674.052	7171.626	MP18 9-1-17	0.05	0.03	0.06	-0.02	NO	0.21	-0.09	0.22	-0.01	YES
2037	48062.814	32556.844	7155.512	MP19 9-1-17	0.04	0.00	0.04	0.02	NO	0.05	-0.11	0.12	-0.04	YES
2038	47988.444	32614.655	7177.534	MP20 9-1-17	0.04	0.04	0.05	-0.01	NO	0.24	-0.10	0.26	-0.07	YES
2013	47915.97	32712.274	7212.11	MP21 9-1-17	0.08	0.02	0.08	-0.01	NO	0.17	-0.01	0.17	-0.08	YES
2014	47905.242	32810.27	7212.242	MP22 9-1-17	0.03	0.04	0.05	-0.02	NO	0.12	-0.01	0.12	-0.06	YES
2015	47889.204	32903.541	7202.192	MP23A 9-1-17	0.02	0.01	0.02	0.01	NO	0.09	-0.06	0.11	-0.16	YES
2016	47871.651	33012.855	7212.232	MP24 9-1-17	0.03	0.06	0.07	-0.03	NO	-0.02	0.01	0.02	-0.01	NO
2017	47846.702	33139.966	7213.055	MP25 9-1-17	0.00	0.01	0.01	-0.03	NO	0.01	0.02	0.02	0.03	NO
2025	47686.214	33189.395	7190.202	MP26 9-1-17	0.02	0.01	0.02	0.02	NO	0.03	0.01	0.03	0.03	NO
2018	47566.396	33102.319	7213.224	MP27 9-1-17	0.07	0.00	0.07	0.01	NO	0.00	0.04	0.04	0.02	NO
2019	47567.13	32867.425	7211.748	MP28 9-1-17	0.13	-0.05	0.14	0.06	YES	-0.03	-0.02	0.04	0.07	NO
2021	47582.393	32662.558	7224.041	MP29 9-1-17	0.04	-0.05	0.06	0.03	NO	-0.04	0.01	0.05	0.03	NO
2020	47716.759	32628.088	7211.584	MP30 9-1-17	0.00	0.00	0.00	-0.02	NO	-0.01	-0.01	0.01	0.02	NO
2012	47795.653	32152.955	7201.084	MP31 9-1-17	0.02	0.02	0.03	0.02	NO	0.03	-0.03	0.04	-0.01	NO
2022	47487.818	32652.184	7253.483	MP32 9-1-17	-0.03	0.10	0.11	0.04	YES	-0.04	0.09	0.10	0.09	YES
2023	47452.708	32861.941	7256.235	MP33 9-1-17	0.07	0.01	0.07	0.06	NO	-0.05	0.07	0.08	0.00	NO
2024	47459.282	33078.428	7237.436	MP34 9-1-17	0.00	0.04	0.04	0.03	NO	-0.03	0.01	0.03	0.03	NO
2009	48035.283	33008.588	7140.019	MPA1 9-1-17	0.01	0.01	0.01	-0.07	NO	-0.06	0.04	0.07	-0.03	NO
2008	48030.097	33027.188	7140.613	MPA2 9-1-17	-0.02	0.00	0.02	-0.01	NO	-0.04	-0.03	0.05	0.06	NO
2030	47975.004	33024.154	7182.959	MPA3 9-1-17	0.04	0.02	0.05	-0.05	NO	0.04	0.03	0.05	-0.05	NO
2029	47970.725	33038.437	7185.62	MPA4 9-1-17	0.00	0.04	0.04	-0.03	NO	-0.05	0.02	0.05	-0.02	NO

Attachment B

Nichols Pad 24-6A and 24-7 Slope Stabilization

Date: August 4-8, 2017
GEI Project No.: 1703391
Client: Laramie Energy

Photo No. 1 – View looking SE across 6A pad from NW corner. 1
Photo No. 2 – Looking S toward 6A pad cut slope and 7 pad (above). 1
Photo No. 3 – Close-up of planar slope failure surface. 2
Photo No. 4 – Looking NE from 24-7 pad across 24-6A pad. 2
Photo No. 5 – Wedge of fill removed from N edge of 24-7 pad immediately following slope failure to remove driving force. 3
Photo No. 6 – Drilling SB-103. 3
Photo No. 7 – Tension cracks in 24-7 pad looking NE. 4
Photo No. 8 – Looking NW across 24-7 pad, drilling SB-104. 4
Photo No. 9 – Looking NNW across 24-7 pad, drilling SB-105. 5
Photo No. 10 – Boring SB-101 8-10 ft depth. 5
Photo No. 11 – Boring SB-101 33-35 feet sandy layer. 6
Photo No. 12 – Boring SB-102 14-16 feet clay. 6
Photo No. 13 – Boring SB-102 38-39.5 feet, likley top of weathered bedrock. 7
Photo No. 14 – Boring SB-103 10-12 feet clay. 7
Photo No. 15 – Boring SB-104 12-14 feet clay. 8
Photo No. 16 –Boring SB-105 50-52 feet clay. 8

Nichols Pad 24-6A and 24-7 Slope Stabilization

Date: August 4-8, 2017
GEI Project No.: 1703391
Client: Laramie Energy

Photo No. 1 – View looking SE across 6A pad from NW corner.

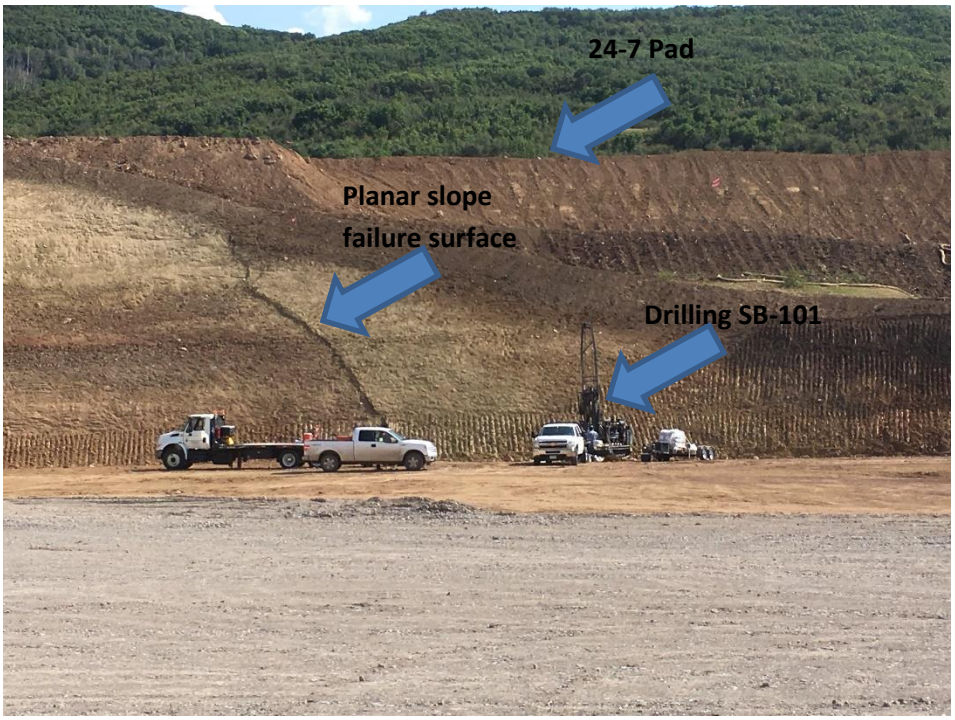

Photo No. 2 – Looking S toward 6A pad cut slope and 7 pad (above).

Photo No. 3 – Close-up of planar slope failure surface.

Photo No. 4 – Looking NE from 24-7 pad across 24-6A pad.

Photo No. 5 – Wedge of fill removed from N edge of 24-7 pad immediately following slope failure to remove driving force.

Photo No. 6 – Drilling SB-103.

Photo No. 7 – Tension cracks in 24-7 pad looking NE.

Photo No. 8 – Looking NW across 24-7 pad, drilling SB-104.

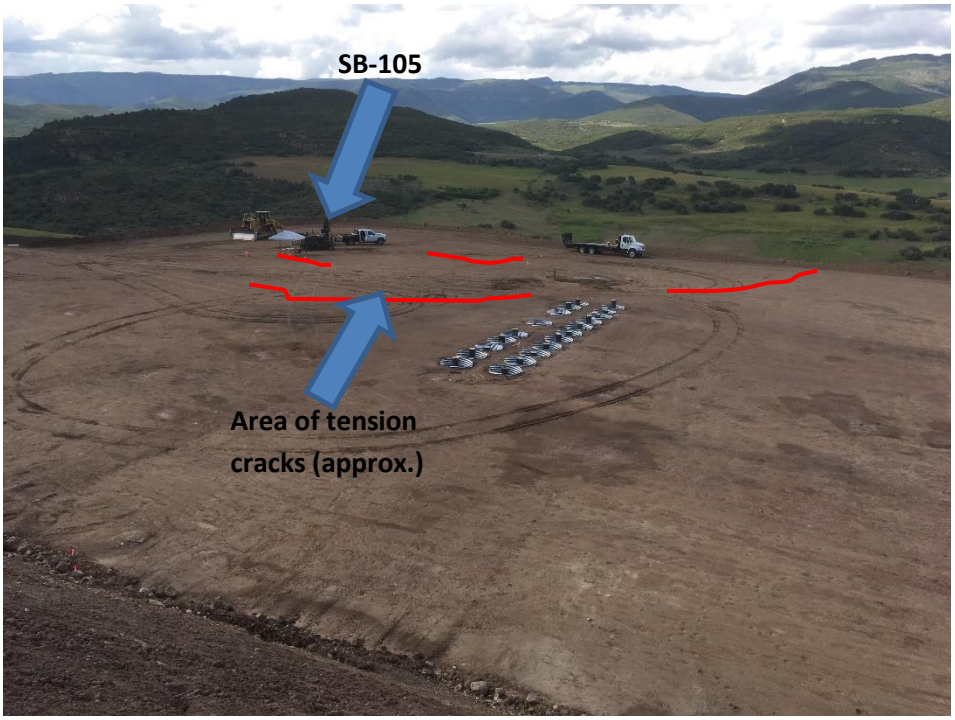

Photo No. 9 – Looking NNW across 24-7 pad, drilling SB-105.

Photo No. 10 – Boring SB-101 8-10 ft depth.

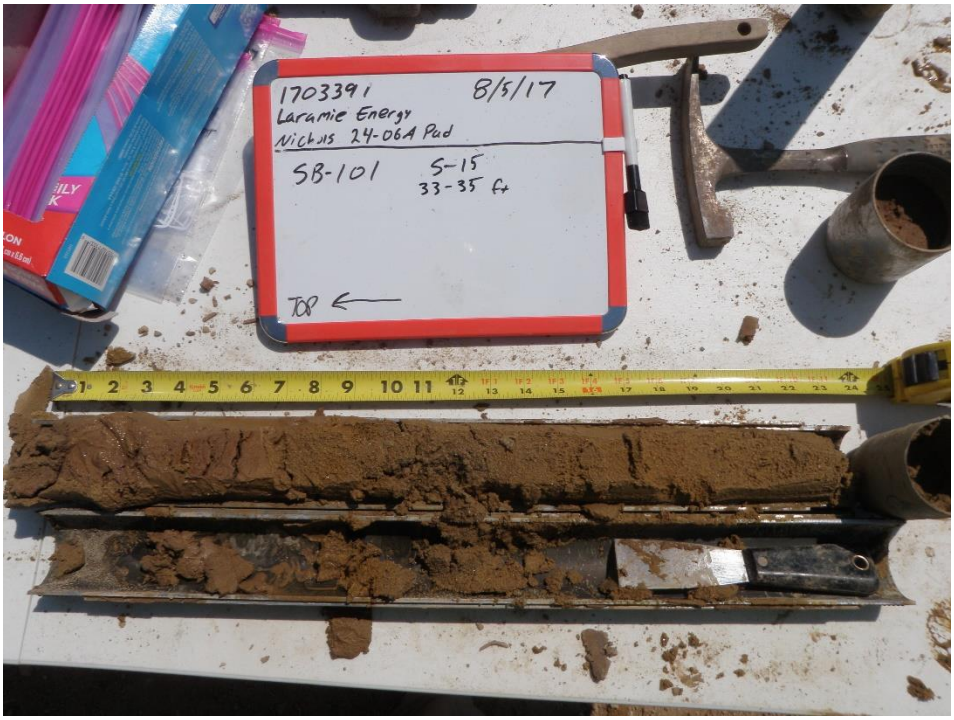

Photo No. 11 – Boring SB-101 33-35 feet, sandy layer.

Photo No. 12 – Boring SB-102 14-16 feet, clay.

Photo No. 13 – Boring SB-102 38-39.5 feet, likley top of weathered bedrock. (Relict bedrock structure noted)

Photo No. 14 – Boring SB-103 10-12 feet, clay.

Photo No. 15 – Boring SB-104 12-14 feet, clay.

Photo No. 16 –Boring SB-105 50-52 feet, clay.

Attachment C

Boring Location

NORTHING: 48057.078 **EASTING:** 32986.415 **STATION:** ~ **OFFSET:** ~

HORIZONTAL DATUM: **STATION CENTERLINE:** ~

VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7136.7

LOCATION:

BORING

SB-101

Drilling Information

DATE START / END: 8/5/2017 - 8/5/2017 **TOTAL DEPTH (FT):** 40.2

CONTRACTOR: HRL Compliance Solutions **DRILLER:** J. Suarez **LOGGED BY:** T. Daigle

EQUIPMENT: CME-55 Track Rig **BORING METHOD:** Hollow Stem Auger

AUGER ID/OD: N/A / N/A **CASING ID/OD:** N/A / N/A **CORE INFO:** HQ

HAMMER TYPE: Automatic Hammer **HAMMER WEIGHT (lbs):** 140 **HAMMER DROP (inch):** 30

WATER LEVEL DEPTHS (ft): ▼ 26.00

GENERAL NOTES:

ABBREVIATIONS: ID = Inside Diameter; OD = Outside Diameter; Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; S = Split Spoon; DP = Direct Push Sample; U = Undistrubed Tube Sample; C = Rock Core; V = Field Vane Shear; SC = Sonic Core; NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_20 Depth	Remarks
			S1		0 to 2	24.0/ 21.0	7-11-10-13			S1 (0' - 2') FAT CLAY with SAND: Mostly fines, high plasticity; 15% sand, fine grained; 5% gravel, fine, rounded; one coarse sandstone gravel; very stiff; blocky; slightly moist; 10YR 4/4, brown (CH)		
			S2		2 to 4	24.0/ 24.0	5-9-11-17			S2 (2' - 4') Similar to above (S1)		
			S3		4 to 6	24.0/ 24.0	6-9-15-21			S3 (4' - 6') FAT CLAY with GRAVEL: Mostly fines, high plasticity; 15% gravel, coarse, subrounded; 5% sand, fine grained; blocky; very stiff; moist; 10YR 4/4, brown (CH)		
7132	5											
			S4		6 to 8	24.0/ 22.0	5-8-7-18			S4 (6' - 8') Similar to above (S3) except stiff		
			S5		8 to 10	24.0/ 24.0	7-12-23-24			S5 (8' - 9.5') Similar to above (S3) except hard		
7127	10									S5 (9.5' - 10') NARROWLY GRADED SAND: Mostly sand, medium grained; 5% fines, low plasticity; occasional poorly cemented sandstone gravel; dense; moist; 10YR 5/8 (SP)		
			C1		10 to 12	24.0/ 20.0	4-8-11-15			C1 (10' - 10.5') Similar to above (S5 9.5' - 10') C1 (10.5' - 12') Similar to above (S3)		
			S6		12 to 14	24.0/ 24.0	4-8-12-17			S6 (12' - 14') FAT CLAY: Mostly fines, high plasticity; 10% gravel, fine; 5% sand, fine grained; blocky; very stiff; moist; 10YR 4/4, brown (CH)		
			S7		14 to 16	24.0/ 22.0	4-9-11-17			S7 (14' - 16') Similar to above (S6)		@14' Planar surface at 45 degrees

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

CLIENT: Laramie Energy

PROJECT NAME: Nichols Pad 24-07

CITY/STATE: Grand Junction, Colorado

GEI PROJECT NUMBER: 1703391

GEI Consultants, Inc.
4601 DTC Blvd
Suite 900
Denver, Colorado 80237

SOIL GEOTECHNICAL BORING NICHOLS 24 07.GPJ GEI DATA TEMPLATE.GDT 8/23/17

Boring Location

NORTHING: 48057.078 **EASTING:** 32986.415 **STATION:** ~ **OFFSET:** ~

HORIZONTAL DATUM: **STATION CENTERLINE:** ~

VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7136.7

LOCATION:

BORING

SB-101

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_2O Depth	Remarks
												protruding from shoe about 3 inches. Lineations but not definitive slickensides. Possible impression of sandstone cobble. Core is homogenous with no planar features. @16' S8 Full recovery plus 3 inches sticking out bottom of spoon. @19.3' No evidence of slickensides or movement. No elongation of impressions in fresh surfaces.
			S8		16 to 18	24.0/ 24.0	5-10-14-21			S8 (16' - 18) Similar to above (S6)		
			S9		18 to 20	24.0/ 24.0	5-9-13-17			S9 (18' - 19.3') Similar to above (S6) S9 (19.3' - 20') FAT CLAY: Mostly fines, high plasticity; 5% sand, fine grained; 5% gravel; blocky; very stiff; moist; 2.5YR 3/4, reddish brown		
7117	20		S10		20 to 22	24.0/ 24.0	5-9-12-18			S10 (20' - 21.75') Similar to above (S9 19.3' - 20) S10 (21.75' - 21.91') Sandstone gravel, coarse S10 (21.91' - 22') Similar to above (S9 19.3' - 20)		
			S11		22 to 24	24.0/ 24.0	7-7-13-11			S11 (22' - 23.17') Similar to above (S9 19.3' - 20) S11 (23.17' - 23.42') Sandstone gravel, coarse S11 (23.42' - 24') Similar to above (S9 19.3' - 20)		
			S12		24 to 25.41667	17.0/ 17.0	4-7-50/5"			S12 (24' - 26') Similar to above (S9 19.3' - 20) except hard		
7112	25										▼	
			S13		26 to 26.25	3.0/ .0	50/3"			S13 (26' - 28') GRAVEL, sandstone; very dense; wet; 10YR 4/6 (GP)		@28' Sand content increases with depth.
7107	30		S14		31 to 33	24.0/ 24.0	7-10-14-18			S14 (31' - 32.5') SILT: Mostly fines, low plasticity; 30% sand, fine grained; 5% gravel, fine; very dense; wet; 10YR 3/3, brown to reddish brown (MH)		
			S15		33 to 35	24.0/ 24.0	5-5-9-13			S14 (32.5' - 33') NARROWLY GRADED SAND with SILT: Mostly sand, fine to medium grained; 10% fines, low plasticity; medium dense; wet; 10YR 3/6, brown (SP-SM) S15 (33' - 33.6') Similar to above S14 (32.5' - 33')		@ 32.5' Transition from elastic silt to sand with silt is gradual over 4 inches

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

CLIENT: Laramie Energy
PROJECT NAME: Nichols Pad 24-07
CITY/STATE: Grand Junction, Colorado
GEI PROJECT NUMBER: 1703391

GEI Consultants, Inc.
4601 DTC Blvd
Suite 900
Denver, Colorado 80237

Boring Location

NORTHING: 48057.078 **EASTING:** 32986.415 **STATION:** ~ **OFFSET:** ~

HORIZONTAL DATUM: **STATION CENTERLINE:** ~

VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7136.7

LOCATION:

BORING

SB-101

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_20 Depth	Remarks
7102	35		S16		35 to 36.41667	17.0/ 17.0	5-14-50/5"			S15 (33.6' - 35') NARROWLY GRADED SAND: Mostly sand, medium grained; 5% fines, non plastic; medium dense; wet; 10YR 4/6 (SP) S16 (35' - 35.5) Similar to above (S15 ' 33.6' - 35') except very dense		
										S16 (35.5' - 36.5') WIDELY GRADED GRAVEL with SAND: Mostly gravel, coarse, sandstone and claystone; 40% sand, medium to coarse grained; very dense; 7.5YR 3/2, reddish brown to tan/brown (GP)		@36.5' Transition from sand to siltstone is gradual over 2 inches
			S17		36.5 to 37.25	9.0/ 9.0	57-50/3"			S17 (36.5' - 36.8') NARROWLY GRADED SAND: Mostly sand, medium grained; 10% gravel, fine, subrounded; 5% fines, non plastic; very dense; wet; 10YR 4/6, brown		
			S18		37.2 to 37.95	9.0/ 6.0	13-50/3"			S17 (36.8' - 37.2') SILTSTONE: Blue gray; soft to moderately hard; very thin laminations/bedding; slightly moist S18 (37.2' - 37.5') Similar to above S17 (36.8' - 37.2')		
7097	40		S19		40 to 40.25	3.0/ 3.0	50/3"			S19 (40' - 40.2') SAND, very dense		
										End of Soil Boring at 40.2 feet Installed piezometer upon completion.		
7092	45											
7087	50											

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

CLIENT: Laramie Energy

PROJECT NAME: Nichols Pad 24-07

CITY/STATE: Grand Junction, Colorado

GEI PROJECT NUMBER: 1703391

GEI Consultants, Inc.
4601 DTC Blvd
Suite 900
Denver, Colorado 80237

SOIL GEOTECHNICAL BORING NICHOLS 24 07.GPJ GEI DATA TEMPLATE.GDT 8/23/17

Boring Location

NORTHING: 48093.867 **EASTING:** 32901.775 **STATION:** ~ **OFFSET:** ~
HORIZONTAL DATUM: **STATION CENTERLINE:** ~
VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7135.1
LOCATION:

BORING

SB-102

Drilling Information

DATE START / END: 8/6/2017 - 8/6/2017 **TOTAL DEPTH (FT):** 42.9
CONTRACTOR: HRL Compliance Solutions **DRILLER:** J. Suarez **LOGGED BY:** T. Daigle
EQUIPMENT: CME-55 Track Rig **BORING METHOD:** Hollow Stem Auger
AUGER ID/OD: N/A / N/A **CASING ID/OD:** N/A / N/A **CORE INFO:** HQ
HAMMER TYPE: Automatic Hammer **HAMMER WEIGHT (lbs):** 140 **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▼ 41.50
GENERAL NOTES:

ABBREVIATIONS: ID = Inside Diameter; OD = Outside Diameter; Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; S = Split Spoon; DP = Direct Push Sample; U = Undistrubed Tube Sample; C = Rock Core; V = Field Vane Shear; SC = Sonic Core; NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_20 Depth	Remarks
			S1		0 to 2	24.0/ 24.0	6-7-13-12			S1 (0' - 2') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; 10% gravel, coarse, subrounded; blocky; very stiff; moist; 2.5YR 3/3 to 3/4, reddish brown (CH)		
			S2		2 to 4	24.0/ 24.0	5-7-10-15			S2 (2' - 4') FAT CLAY: Mostly fines, high plasticity; 5% sand, fine grained; 5% gravel, fine, subrounded; blocky; very stiff; moist; 2.5YR 3/6, reddish brown (CH) 2.5' - 3.1' is 10YR 4/4		
			S3		4 to 6	24.0/ 24.0	5-10-12-15			S3 (4' - 6') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; 5% gravel, fine, subrounded; blocky; stiff; moist; 2.5YR 3/4, reddish brown (CH)		
7130	5		S4		6 to 8	24.0/ 24.0	3-5-11-15			S4 (6' - 7.4') FAT CLAY: Mostly fines, high plasticity; 5% sand, fine grained; occasional gravel, fine, subrounded; blocky; very stiff; moist; 2.5YR 3/4, reddish brown (CH) S4 (7.4' - 8') FAT CLAY: Mostly fines, medium to high plasticity; 5% sand, fine grained; occasional gravel, fine, subrounded; blocky; very stiff; moist; 2.5YR 6/3, gray (CH)		
			S5		8 to 10	24.0/ 24.0	5-12-16-25			S5 (8' - 8.4') FAT CLAY: Mostly fines, high plasticity; 5% sand, fine grained; occasional gravel, fine, subrounded; blocky; very stiff; moist; 2.5YR 6/3, reddish brown (CH) S5 (8.4' - 10') FAT CLAY: Mostly fines, high plasticity; 5% sand, fine grained; occasional gravel, fine, subrounded; blocky; very stiff; moist; 2.5YR 6/3, reddish brown (CH)		
7125	10		S6		10 to 12	24.0/ 24.0	8-14-19-25			S6 (10' - 10.6') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; occasional gravel, fine; blocky; hard; moist; 7.5YR 3/4, reddish brown (CH) S6 (10.6' - 12') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; occasional gravel, fine; blocky; hard; moist; 2.5YR 6/4, gray (CH)		
			S7		12 to 14	24.0/ 24.0	10-14-20-37			S7 (12' - 14') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; occasional gravel, fine; blocky; hard; moist; reddish gray with gray mottling @12.9' Weathered sandstone inclusions @13.1' Weathered sandstone inclusions @13.6' Weathered sandstone inclusions		
			C1		14 to 16	24.0/ 24.0	8-13-21-30					

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

CLIENT: Laramie Energy
PROJECT NAME: Nichols Pad 24-07
CITY/STATE: Grand Junction, Colorado
GEI PROJECT NUMBER: 1703391

GEI Consultants, Inc.
4601 DTC Blvd
Suite 900
Denver, Colorado 80237

Boring Location

NORTHING: 48093.867 **EASTING:** 32901.775 **STATION:** ~ **OFFSET:** ~

HORIZONTAL DATUM: **STATION CENTERLINE:** ~

VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7135.1

LOCATION:

BORING

SB-102

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_20 Depth	Remarks
										C1 (14' - 16') FAT CLAY: Mostly fines, high plasticity; 20% sand, fine grained; occasional gravel; hard; moist; GLEY1 4/5 GY, dark gray		
			S8		16 to 18	24.0	6-10-21-31			S8 (16' - 18') FAT CLAY: Mostly fines, high plasticity; 20% sand, fine grained; occasional gravel; organic material; hard; moist; GLEY1 4/5 GY, dark gray @16.4' Weathered sandstone inclusions @16.8' Weathered sandstone inclusions		From 16' - 18' Organic material is discrete twigs and brown stains. Maximum twig is 1-inch in diameter at 17.5'. From 18' - 24' Organic material inclusions and woody fragments.
			S9		18 to 20	24.0	6-11-18-27			S9 (18' - 20') FAT CLAY: Mostly fines, high plasticity; 20% sand, fine grained; occasional gravel; weathered sandstone inclusions up to 2-inch diameter; occasional organic material; very stiff; moist; GLEY1 4/5 GY, dark gray		
7115	20		S10		20 to 22	24.0	5-12-16-23			S10 (20' - 22') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; occasional gravel; weathered sandstone inclusions up to 2-inch diameter; occasional organic material; very stiff; moist; GLEY1 3/5 GY, dark gray		
			S11		22 to 24	24.0	7-13-17-22			S11 (22' - 24') FAT CLAY: Mostly fines, high plasticity; 20% sand, fine grained; occasional gravel; sandstone inclusions up to 1.5-inch diameter; occasional organic material, brown staining; massive; blocky; homogeneous; hard; moist; GLEY1 3/5 GY, dark gray		
			S12		24 to 26	24.0/ 24.0	5-15-22-27			S12 (24' - 26') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; occasional gravel, coarse; hard; moist; 7.5YR 3/3, reddish brown with orange mottling @24.6' Sandstone, 2-inch diameter inclusion @25' - 25.5' Gray		@23.75' Less organic material.
7110	25		C2		26 to 28	24.0/ 22.0	5-9-12-17			C2 (26' - 28') Similar to above S12 (24' - 26') except very stiff		
			S13		28 to 30	24.0/ 24.0				S13 (28' - 30') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; occasional gravel, coarse; blocky; moist; 7.5YR 3/2, reddish brown with orange mottling		
7105	30		S14		30 to 32	24.0/ 24.0	12-22-35-50/6"			S14 (30' - 32') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; occasional gravel, coarse; blocky; hard; moist; 10YR 5/2 gray/brown/red (top), 2.5YR 2.5/4 reddish brown (bottom), mottled		@29.75' Failure plane. Faintly visable smooth surface, possible lineations.
			S15		32 to 34	24.0	7-17-30-47			S15 (32' - 34') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; occasional gravel; hard; slighty moist; 2.5YR 3/4, reddish brown with slight gray mottling @32.2' Sandstone, 2.5-inch thick, gray incusion		
			S16		34	24.0	10-20-			S16 (34' - 36') Similar to above S15 (32' - 34')		

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CLIENT: Laramie Energy

PROJECT NAME: Nichols Pad 24-07

CITY/STATE: Grand Junction, Colorado

GEI PROJECT NUMBER: 1703391

GEI Consultants, Inc.
4601 DTC Blvd
Suite 900
Denver, Colorado 80237

Boring Location

NORTHING: 48093.867 **EASTING:** 32901.775 **STATION:** ~ **OFFSET:** ~

HORIZONTAL DATUM: **STATION CENTERLINE:** ~

VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7135.1

LOCATION:

BORING

SB-102

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_20 Depth	Remarks
					to 36		30-41					
7100	35		S17		36 to 37	12.0/ 12.0	11-50/6"			S17 (36' - 36.4') Similar to above S16 (34' - 36') S17 (36.4' - 38') Weathered SANDSTONE, gravel, coarse; some clay matrix, red brown; GLEY2 3/5BG, gray		
			S18		38 to 39.5	18.0/ 18.0	20-41-56/6"			S18 (38' - 38.7') SANDSTONE, blue gray, massive, soft, moist S18 (38.7' - 39.1') INTERBEDDED SANDSTONE AND SHALE rock fragments, Sandstone, coarse, rounded; Shale, flat; silty sand matrix; wet		
7095	40		S19		40 to 40.83	10.0/ 10.0	24-50/4"			S18 (39.1' - 39.5') SANDSTONE, blue/gray, massive, soft, moist S19 (40' - 42') SANDSTONE / SILTSTONE, blue gray, moist, GLEY2 4/10B	▼	
			S20		42 to 42.83	10.0	24-50/4"			S20 (42' - 42.9') Similar to above S19 (40' - 42')		
7090	45									End of Soil Boring at 42.9 feet Borehole backfilled with auger cuttings upon completion.		
7085	50											

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CLIENT: Laramie Energy

PROJECT NAME: Nichols Pad 24-07

CITY/STATE: Grand Junction, Colorado

GEI PROJECT NUMBER: 1703391

GEI Consultants, Inc.
4601 DTC Blvd
Suite 900
Denver, Colorado 80237

Boring Location

NORTHING: 48003.929 **EASTING:** 32864.232 **STATION:** ~ **OFFSET:** ~
HORIZONTAL DATUM: **STATION CENTERLINE:** ~
VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7168.5
LOCATION:

BORING

SB-103

Drilling Information

DATE START / END: 8/6/2017 - 8/7/2017 **TOTAL DEPTH (FT):** 50.0
CONTRACTOR: HRL Compliance Solutions **DRILLER:** J. Suarez **LOGGED BY:** T. Daigle
EQUIPMENT: CME-55 Track Rig **BORING METHOD:** Hollow Stem Auger
AUGER ID/OD: N/A / N/A **CASING ID/OD:** N/A / N/A **CORE INFO:** HQ
HAMMER TYPE: Automatic Hammer **HAMMER WEIGHT (lbs):** 140 **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft):
GENERAL NOTES:

ABBREVIATIONS: ID = Inside Diameter; OD = Outside Diameter; Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; S = Split Spoon; DP = Direct Push Sample; U = Undistrubed Tube Sample; C = Rock Core; V = Field Vane Shear; SC = Sonic Core; NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_20 Depth	Remarks
			S1		0 to 2	24.0/ 24.0	6-8-9-11			S1 (0' - 2') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; rootlets; blocky; very stiff; slightly moist; brown; Top 1.5" is grass and thatch (CH)		
			S2		2 to 4	24.0/ 22.0	7-8-9-10			S2 (2' - 4') Similar to above S1 (0' - 2'), except occasional rootlets		
			S3		4 to 6	24.0/ 24.0	5-6-8-9			S3 (4' - 6') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; blocky; stiff; moist to wet; 10YR 3/3, reddish brown (CH)		
7164	5											
			S4		6 to 8	24.0/ 22.0	3-6-10-13			S4 (6' - 8') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; blocky; very stiff; slightly moist; 10YR 3/3, reddish brown (CH)		@6' - 8' Some very slight deformation in the blocky clay structure along some core breaks. Not a full or continuous failure plane throughthe core cross section, but very slight 'smearing' of the clay in places
			S5		8 to 10	24.0/ 24.0	5-8-21-15			@7.75' - 8' Light brown to tan mottling S5 (8' - 9.25') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; blocky/angular; very stiff; slightly moist; 10YR 3/3, reddish brown (CH); tan staining along clay fracture planes, no movement S5 (9.25' - 9.75') Weathered basalt gravel in clay matrix		
7159	10		S6		10 to 12	24.0/ 24.0	5-10-14-17			S5 (9.75' - 10') Similar to above S5 (8' - 9.25') with 5% gravel S6 (10' - 11.6') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine grained; 5% gravel, fine, subangular; occasional sandstone gravel mixed with basalt; very stiff; moist; reddish brown with orange/tan mottling (CH)		
			S7		12 to 14	24.0/ 24.0	5-4-8-12			S6 (11.6' - 11.8') SAND, wet; yellowish tan S6 (11.8' - 12) SANDY FAT CLAY: mostly fines, high plasticity; 40% sand, fine to medium grained; 5% gravel; very stiff; moist; 5Y 5/4, mottled S7 (12' - 14') FAT CLAY: Mostly fines, high plasticity; 10% sand, fine to medium grained; 5% gravel, coarse; blocky; stiff; moist; reddish brown - gray - yellowish brown - dark brown (CH)		
			C1		14 to 16	24.0/ 24.0	8-9-12-10					

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CLIENT: Laramie Energy
PROJECT NAME: Nichols Pad 24-07
CITY/STATE: Grand Junction, Colorado
GEI PROJECT NUMBER: 1703391

GEI Consultants, Inc.
4601 DTC Blvd
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Denver, Colorado 80237

SOIL GEOTECHNICAL BORING NICHOLS 24 07.GPJ GEI DATA TEMPLATE.GDT 8/23/17

Boring Location

NORTHING: 48003.929 **EASTING:** 32864.232 **STATION:** ~ **OFFSET:** ~

HORIZONTAL DATUM: **STATION CENTERLINE:** ~

VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7168.5

LOCATION:

BORING

SB-103

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_20 Depth	Remarks
										@12.6 Discontinuous yellowish orange sand layer @13 Discontinuous yellowish orange sand layer		
			S8		16 to 18	24.0/ 24.0	5-11-16-22			C1 (14' - 16') FAT CLAY: mostly fines, high plasticity; 10% sand; 10% gravel, fine, basalt and sandstone; very stiff; moist; 10YR 3/4 @14.5' Basalt gravel, 2" diameter, subangular S8 (16' - 18') FAT CLAY: Mostly fines, high plasticity; 15% gravel, coarse, subangular; 10% sand; very stiff; slightly moist; 10YR 3/4 to 5YR 3/4. brown to reddish brown (CH)		
			S9		18 to 20	24.0/ 24.0	8-18-19-20			S9 (18' - 20') FAT CLAY: Mostly fines, high plasticity; 15% gravel, coarse, subangular; 10% sand; very stiff; slightly moist; 10YR 3/4 brown (CH)		
7149	20		S10		20 to 22	24.0/ 24.0	9-12-25-23			S10 (20' - 22') Similar to above S9 (18' - 20')		
			S11		22 to 24	24.0/ 22.0	10-12-21-20			S11 (22' - 24') FAT CLAY with SAND: Mostly fines, high plasticity; 15% sand; 15% gravel, coarse, subangular; very stiff; moist; 10YR 3/4 brown (CH)		
			S12		24 to 26	24.0/ 22.0	7-10-13-39			S12 (24' - 26') Similar to above S11 (22' - 24') Rock fragments jammed in sampler		
7144	25		S13		26 to 26.42	5.0/ 3.0	50/5"			S13 (26' - 28') Basalt rock fragments jammed in sampler		
			S14		28 to 30	24.0/ 24.0	6-10-11-18			S14 (28' - 30') FAT CLAY with SAND: Mostly fines, high plasticity; 20% sand; 10% gravel, coarse, subangular; very stiff; moist; 10YR 3/4 brown (CH)		
7139	30		S15		30 to 32	24.0/ 24.0	14-17-29-20			S15 (30' - 32') SANDY FAT CLAY: Mostly fines, high plasticity; 20% gravel, coarse; 10% sand; very stiff; massive; blocky; 10YR 3/4, brown (CH)		
			S16		32 to 34	24.0/ 24.0	8-11-13-17			S16 (32' - 34') Similar to above S15 (30' - 32')		
			S17		34	12.0/	15-			S17 (34' - 36') Similar to above S15 (30' - 32')		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

CLIENT: Laramie Energy

PROJECT NAME: Nichols Pad 24-07

CITY/STATE: Grand Junction, Colorado

GEI PROJECT NUMBER: 1703391

GEI Consultants, Inc.
4601 DTC Blvd
Suite 900
Denver, Colorado 80237

SOIL GEOTECHNICAL BORING NICHOLS 24 07.GPJ GEI DATA TEMPLATE.GDT 8/23/17

Boring Location

NORTHING: 48003.929 **EASTING:** 32864.232 **STATION:** ~ **OFFSET:** ~

HORIZONTAL DATUM: **STATION CENTERLINE:** ~

VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7168.5

LOCATION:

BORING

SB-103

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_20 Depth	Remarks
					to 35	12.0	50/6"			Basalt rock fragment jammed in sampler		
7134	35											
			S18		36 to 38	24.0/ 24.0	17-11-16-23			S18 (36' - 38') Similar to above S15 (30' - 32')		
			S19		38 to 40	24.0/ 24.0	20-17-18-25			S19 (38' - 38.25') Similar to above S15 (30' - 32') S19 (38.25' - 40') FAT CLAY: Mostly fines, high plasticity; 5% sand, fine grained; 5% gravel, fine; sandstone inclusions, gray, fine to coarse gravel sized, GLEY1 6/10Y; 2.5YR 3/4, reddish brown (CH)		
7129	40		C2		40 to 42	24.0/ 22.0	10-19-25-28			C2 (40' - 41.5') Similar to above S19 (38.25' - 40') C2 (41.5' - 42') CLAYSTONE: light brown to gray, 2.5Y 5/3; high plasticity fines		
			S20		42 to 44	24.0/ 24.0	33-36-39-45			S20 (42' - 43.7') Similar to above S19 (38.25' - 40') S20 (43.7' - 44') FAT CLAY with SAND: Mostly fines, high plasticity; 15% sand; 10% gravel, coarse, subangular; blocky; hard; slightly moist; 2.5YR 3/2, gray brown (CH)		
7124	45		S21		44 to 46	24.0/ 24.0	11-21-31-44			S21 (44' - 44.7') Similar to above S20 (43.7' - 44') S21 (44.7' - 46') FAT CLAY: Mostly fines, high plasticity; 10% sand; 5% gravel, fine; blocky; homogeneous; hard; moist; 5YR 3/3, reddish brown (CH)		
			S22		46 to 48	24.0	9-11-16-20			S22 (44' - 46') Similar to above S21 (44.7' - 46')		
			S23		48 to 50	24.0/ 24.0	5-8-11-15			S23 (48' - 50') Similar to above S21 (44.7' - 46')		
7119	50									End of Soil Boring at 50 feet Installed piezometer upon completion.		

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CLIENT: Laramie Energy

PROJECT NAME: Nichols Pad 24-07

CITY/STATE: Grand Junction, Colorado

GEI PROJECT NUMBER: 1703391

GEI Consultants, Inc.
4601 DTC Blvd
Suite 900
Denver, Colorado 80237

Boring Location

NORTHING: 47768.639 **EASTING:** 32865.022 **STATION:** ~ **OFFSET:** ~
HORIZONTAL DATUM: **STATION CENTERLINE:** ~
VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7211.7
LOCATION:

BORING

SB-104

Drilling Information

DATE START / END: 8/7/2017 - 8/8/2017 **TOTAL DEPTH (FT):** 51.2
CONTRACTOR: HRL Compliance Solutions **DRILLER:** J. Suarez **LOGGED BY:** T. Daigle
EQUIPMENT: CME-55 Track Rig **BORING METHOD:** Hollow Stem Auger
AUGER ID/OD: N/A / N/A **CASING ID/OD:** N/A / N/A **CORE INFO:** HQ
HAMMER TYPE: Automatic Hammer **HAMMER WEIGHT (lbs):** 140 **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft):
GENERAL NOTES:

ABBREVIATIONS: ID = Inside Diameter; OD = Outside Diameter; Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; S = Split Spoon; DP = Direct Push Sample; U = Undistrubed Tube Sample; C = Rock Core; V = Field Vane Shear; SC = Sonic Core; NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_20 Depth	Remarks
7207	5											
			S1		6.5 to 8.5	24.0/ 23.0	6-6-19-20			S1 (6.5' - 7.75') FAT CLAY: Mostly fines, high plasticity; 5% sand; 5% gravel, fine; hard; slightly moist; 5YR 4/4, reddish brown (CH) [FILL] S1 (7.75' - 8.5') FAT CLAY: Mostly fines, high plasticity; 5% sand; trace gravel, fine; hard; organics, twigs, roots, grass; slightly moist; 10YR 2/1, dark brown to black (CH) [FILL]		
			S2		8.5 to 10	18.0/ 18.0	5-7-6			S2 (8.5' - 10') FAT CLAY: Mostly fines, high plasticity; 10% sand; trace gravel, fine; stiff; organics, roots, grass; slightly moist; 10YR 2/1, black (CH) [FILL]		
7202	10		S3		10 to 12	24.0/ 24.0	6-15-13-14			S3 (10' - 12') FAT CLAY: Mostly fines, high plasticity; 10% sand; trace gravel, fine; stiff; organics, roots, grass; slightly moist; 10YR 2/1, black (CH) [FILL]		@10.8' Suspect native fill surface, due to proper oreintation of root material
			S4		12 to 14	24.0/ 24.0	5-7-9-14			S4 (12' - 14') Similar to above S3 (10' - 12') except inplace, very stiff		
			S5		14 to 16	24.0/ 22.0	5-8-13-19			S5 (14' - 16') Similar to above S3 (10' - 12') except inplace; very stiff; less organics, roots		

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CLIENT: Laramie Energy
PROJECT NAME: Nichols Pad 24-07
CITY/STATE: Grand Junction, Colorado
GEI PROJECT NUMBER: 1703391

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SOIL GEOTECHNICAL BORING NICHOLS 24 07.GPJ GEI DATA TEMPLATE.GDT 8/23/17

Boring Location

NORTHING: 47768.639 **EASTING:** 32865.022 **STATION:** ~ **OFFSET:** ~

HORIZONTAL DATUM: **STATION CENTERLINE:** ~

VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7211.7

LOCATION:

BORING

SB-104

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_20 Depth	Remarks
										@15.5' - 16' 5YR 4/4		
			S6		16 to 18	24.0/ 18.0	14-14-18-18			S6 (16' - 17.5') FAT CLAY: Mostly fines, high plasticity; 10% sand; trace gravel; hard; moist; 5YR 4/4, reddish brown (CH) S6 (17.5' - 18') Basalt rock fragments		
			S7		18 to 20	24.0/ 24.0	5-10-14-24			S7 (18' - 20') FAT CLAY: Mostly fines, high plasticity; 10% sand; 10% gravel, coarse; very stiff; blocky; moist; 5YR 3/4, reddish brown (CH)		
7192	20		C1		20 to 20.25	3.0/ 21.0	65-24-24-30			C1 (20' - 20.7') Basalt rock fragments C1 (20.7' - 22') FAT CLAY: Mostly fines, high plasticity; 10% sand; 10% gravel, coarse; hard; blocky; moist; 5YR 3/4, reddish brown (CH)		
			S8		22 to 24	24.0/ 3.0	50/3"			S8 (22' - 22.3') Clay and Basalt rock fragments		
7187	25		S9		24 to 26	24.0/ 22.0	6-11-17-20			S9 (24' - 26') FAT CLAY: Mostly fines, high plasticity; 10% sand; 5% gravel, coarse; very stiff; moist; 2.5YR 3/4, reddish brown (CH)		
			S10		26 to 28	24.0/ 24.0	6-10-14-19			S10 (26' - 28') Similar to above S9 (24' - 26') except olive gray mottling @26.7' Sandstone gravel, 2-inch diameter, weathered		
7182	30		S11		30 to 32	24.0	6-9-12-15			S11 (30' - 32') FAT CLAY: Mostly fines, high plasticity; 5% sand; trace gravel, fine; very stiff; blocky; moist; 2.5YR 3/6, reddish brown with olive gray mottling (CH)		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

CLIENT: Laramie Energy
PROJECT NAME: Nichols Pad 24-07
CITY/STATE: Grand Junction, Colorado
GEI PROJECT NUMBER: 1703391

GEI Consultants, Inc.
4601 DTC Blvd
Suite 900
Denver, Colorado 80237

Boring Location

NORTHING: 47768.639 **EASTING:** 32865.022 **STATION:** ~ **OFFSET:** ~

HORIZONTAL DATUM: **STATION CENTERLINE:** ~

VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7211.7

LOCATION:

BORING

SB-104

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_20 Depth	Remarks
7177	35		S12		35 to 37	24.0/ 24.0	8-15-20-30			S12 (35' - 37') FAT CLAY: Mostly fines, high plasticity; 5% sand; trace gravel, fine; very stiff; blocky; occasional sandstone inclusion, up to 1" diameter; moist; 2.5YR 3/6, reddish brown with olive gray mottling (CH)		
7172	40		C2		40 to 42	24.0/ 14.0	8-20-25-40			C2 (40' - 42') Similar to above S12 (35' - 37')		
7167	45		S13		45 to 45.83	10.0/ 10.0	25-50/4"			S13 (45' - 45.9') FAT CLAY: Mostly fines, high plasticity; 5% sand; trace gravel, fine; hard; blocky; occasional sandstone inclusion, up to 1" diameter; dry; 2.5YR 3/6, reddish brown with olive gray mottling (CH)		
			S14		47 to 47.5	6.0/ 6.0	50/6"			S14 (47' - 47.5') Similar to above S13 (45' - 45.9')		
7162	50		S15		50 to 51.25	15.0	17-38-50/3"			S15 (50' - 51.5') Similar to above S13 (45' - 45.9')		
										End of Soil Boring at 51.2 feet Installed inclinometer casing upon completion.		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

CLIENT: Laramie Energy

PROJECT NAME: Nichols Pad 24-07

CITY/STATE: Grand Junction, Colorado

GEI PROJECT NUMBER: 1703391

GEI Consultants, Inc.
4601 DTC Blvd
Suite 900
Denver, Colorado 80237

Boring Location

NORTHING: 47803.368 **EASTING:** 32764.703 **STATION:** ~ **OFFSET:** ~

HORIZONTAL DATUM: **STATION CENTERLINE:** ~

VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7211.5

LOCATION:

BORING

SB-105

Drilling Information

DATE START / END: 8/8/2017 - 8/8/2017 **TOTAL DEPTH (FT):** 52.0

CONTRACTOR: HRL Compliance Solutions **DRILLER:** J. Suarez **LOGGED BY:** T. Daigle

EQUIPMENT: CME-55 Track Rig **BORING METHOD:** Solid Stem Auger

AUGER ID/OD: N/A / N/A **CASING ID/OD:** N/A / N/A **CORE INFO:** HQ

HAMMER TYPE: Automatic Hammer **HAMMER WEIGHT (lbs):** 140 **HAMMER DROP (inch):** 30

WATER LEVEL DEPTHS (ft):

GENERAL NOTES:

ABBREVIATIONS: ID = Inside Diameter; OD = Outside Diameter; Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; S = Split Spoon; DP = Direct Push Sample; U = Undistrubed Tube Sample; C = Rock Core; V = Field Vane Shear; SC = Sonic Core; NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_20 Depth	Remarks
7207	5											
			S1		6 to 8	24.0/ 24.0	8-8-8-10			S1 (6' - 8') FAT CLAY: Mostly fines, high plasticity; 5% sand; 5% gravel, fine; very stiff; homogeneous; blocky; moist; 5YR 3/4, reddish brown (CH) [FILL]		
			S2	X	8 to 10	24.0/ 21.0	2-2-3-6			S2 (8' - 8.6') Similar to above S1 (6' - 8')		
										S2 (8.6' - 9.75') FAT CLAY: Mostly fines, high plasticity; 5% sand; trace gravel; medium stiff; dry; organics, roots; 10YR 3/2, reddish brown (CH)		@8.6' Suspect native fill surface, due to proper oreintation of root material
7202	10		S3		10 to 12	24.0/ 24.0	8-9-8-9			S3 (10' - 12') Similar to above S2 (8.6' - 9.75')		@10.7' Possible linear slide plane
			S4	X	12 to 14	24.0/ 24.0	4-7-9-13			S4 (12' - 14') Similar to above S2 (8.6' - 9.75') except very stiff; dark brown to black		
			S5		14 to 16	24.0/ 24.0	8-13-13-16			S5 (14' - 16') FAT CLAY: Mostly fines, high plasticity; 5% sand; trace gravel; very stiff; moist; light brown mottling along angular		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

CLIENT: Laramie Energy
PROJECT NAME: Nichols Pad 24-07
CITY/STATE: Grand Junction, Colorado
GEI PROJECT NUMBER: 1703391

GEI Consultants, Inc.
4601 DTC Blvd
Suite 900
Denver, Colorado 80237

Boring Location

NORTHING: 47803.368 **EASTING:** 32764.703 **STATION:** ~ **OFFSET:** ~

HORIZONTAL DATUM: **STATION CENTERLINE:** ~

VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7211.5

LOCATION:

BORING

SB-105

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_20 Depth	Remarks
										pathways; 10YR 3/2, reddish brown (CH) @15.3' - 15.7' Dark brown, 7.5YR 3/4		@15' - 15.5' Possible high angle planar slide surface
			S6		16 to 18	24.0/ 22.0	4-7-10-12			S6 (16' - 18) FAT CLAY: Mostly fines, high plasticity; 5% sand; 5% gravel, fine; very stiff; rough; very moist; 5YR 3/4, reddish brown (CH) Slight lineations from 16' to 16.5'		
			S7		18 to 18.42	5.0/ 5.0	50/5"			S7 (18' - 20') No recovery		
7192	20		S8		20 to 22	24.0/ 22.0	4-7-12-13			S8 (20' - 22') FAT CLAY: Mostly fines, high plasticity; 10% sand; trace gravel, fine; very stiff; blocky; moist; 2.5YR 5/3, olive gray to yellowish orange (CH) @21.2' - 21.3' Possible small planar slide surface		
			S9		22 to 24	24.0/ 24.0	10-11-12-21			S9 (22' - 24') Similar to above S8 (20' - 22')		
7187	25											
7182	30		S10		30 to 32	24.0/ 24.0	8-15-13-17			S10 (30' - 31.1') FAT CLAY: Mostly fines, high plasticity; 10% sand; trace gravel, fine; very stiff; blocky; moist; 2.5YR 5/3, olive gray; yellowish orange @ 30.5' to 30.8' (CH) S10 (31.1' - 32') FAT CLAY: Mostly fines, high plasticity; 10% sand; trace gravel, fine; very stiff; rough; sandstone inclusions, coarse sand sized; moist; 5YR 4/4, reddish brown (CH) @31.2 Sandstone rock fragment 2 inch.		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

CLIENT: Laramie Energy
PROJECT NAME: Nichols Pad 24-07
CITY/STATE: Grand Junction, Colorado
GEI PROJECT NUMBER: 1703391

GEI Consultants, Inc.
4601 DTC Blvd
Suite 900
Denver, Colorado 80237

Boring Location

NORTHING: 47803.368 **EASTING:** 32764.703 **STATION:** ~ **OFFSET:** ~

HORIZONTAL DATUM: **STATION CENTERLINE:** ~

VERTICAL DATUM: **GROUND SURFACE ELEVATION (FT):** 7211.5

LOCATION:

BORING

SB-105

Elev. (ft)	Depth (ft)	Casing Pen. (bpf) or Core Rate (mpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blows Count or RQD	Field Test Data	GRAPHIC LOG	Sample Description & Classification	H_20 Depth	Remarks
7177	35		S11		35 to 37	24.0/ 24.0	7-10-13-20			S11 (35' - 37') Similar to above S10 (31.1' - 32') except some olive mottling and linear/angular sandy inclusions; roots (less than 1 mm thick) from 36.7' - 37'		
7172	40		S12		40 to 42	24.0/ 24.0	9-14-18-25			S12 (40' - 42') Similar to above S10 (31.1' - 32')		
7167	45											
7162	50		S13		50 to 52	24.0/ 24.0	11-18-27-36			S13 (50' - 52') FAT CLAY, Mostly fines, high plasticity; 10% sand; 5% gravel, fine; hard; massive; slighlty blocky; moist; 5YR 4/4, reddish brown (CH) @52' - 52.5' 1-mm thick laminations		
										End of Soil Boring at 52 feet Installed inclinometer casing upon completion.		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

CLIENT: Laramie Energy

PROJECT NAME: Nichols Pad 24-07

CITY/STATE: Grand Junction, Colorado

GEI PROJECT NUMBER: 1703391

GEI Consultants, Inc.
4601 DTC Blvd
Suite 900
Denver, Colorado 80237

Attachment D

Moisture & Density Determinations
ASTM D 4531 (Modified)

CLIENT: GEI Consultants JOB NO.: 2076-245
LOCATION: Laramie Energy Nichols Pad

BORING	SB-104	SB-103	SB-102	SB-105
SAMPLE DEPTH	47-47.5'	43.5-44'	30-32'	50.52'
SAMPLE NO.	S14	S20	S14	S13
DATE SAMPLED	08/08/17	08/07/18	08/06/17	08/08/17
DATE TESTED	08/30/17	08/30/17	08/30/17	08/30/17
TECHNICIAN	SKS	SKS	SKS	SKS
DENSITY DETERMINATIONS				
Weight of Sample in air (g):	52.87	45.62	81.86	39.47
Weight of specimen W/ Paraffin in air (g):	56.96	50.19	87.67	43.68
Weight of specimen W/ Paraffin in Water (g):	27.21	23.84	43.72	20.17
Specific Gravity of Paraffin:	0.89	0.89	0.89	0.89
Temperature of Water (Deg. C):	24.8	24.8	24.8	24.8
Temperature Correction Factor (20 deg.C):	0.998888	0.998888	0.998888	0.998888
Wet Density (pcf):	131.07	134.10	136.41	131.07
Dry Density (pcf):	122.21	116.25	120.10	111.85
MOISTURE DETERMINATIONS				
Wt. of Wet Soil & Dish (gms)	129.09	79.35	251.28	463.59
Wt. of Dry Soil & Dish (gms)	120.81	69.68	222.03	396.63
Net Loss of Moisture (gms)	8.28	9.67	29.25	66.96
Wt. of Dish (gms)	6.63	6.71	6.68	6.97
Wt. of Dry Soil (gms)	114.18	62.97	215.35	389.66
Moisture Content (%)	7.3	15.4	13.6	17.2

BORING	SB-102	SB-101	SB-101	SB-103
SAMPLE DEPTH	4-6'	18-19.5'	31-32.5'	6-8'
SAMPLE NO.	S3	S9	S14	S4
DATE SAMPLED	08/06/17	08/05/17	08/05/17	08/06/17
DATE TESTED	08/30/17	08/30/17	08/30/17	08/30/17
TECHNICIAN	SKS	SKS	SKS	SKS
DENSITY DETERMINATIONS				
Weight of Sample in air (g):	60.32	53.65	65.44	29.87
Weight of specimen W/ Paraffin in air (g):	64.60	58.38	70.30	32.56
Weight of specimen W/ Paraffin in Water (g):	32.34	28.09	33.95	14.58
Specific Gravity of Paraffin:	0.89	0.89	0.89	0.89
Temperature of Water (Deg. C):	24.8	24.8	24.8	24.8
Temperature Correction Factor (20 deg.C):	0.998888	0.998888	0.998888	0.998888
Wet Density (pcf):	137.03	133.96	132.11	124.53
Dry Density (pcf):	120.59	115.47	112.31	105.82
MOISTURE DETERMINATIONS				
Wt. of Wet Soil & Dish (gms)	475.82	173.27	420.74	251.09
Wt. of Dry Soil & Dish (gms)	419.52	150.32	358.72	214.41
Net Loss of Moisture (gms)	56.30	22.95	62.02	36.68
Wt. of Dish (gms)	6.61	6.97	7.01	6.93
Wt. of Dry Soil (gms)	412.91	143.35	351.71	207.48
Moisture Content (%)	13.6	16.0	17.6	17.7

Data entered by: CAL Date: 09/08/2017
Data checked by: BDF Date: 9/12/17
FileName: MDPARFN1.WK4

Moisture & Density Determinations
ASTM D 4531 (Modified)

CLIENT: GEI Consultants
LOCATION: Laramie Energy Nichols Pads

JOB NO.: 2076-245

BORING	SB-105	SB-101
SAMPLE DEPTH	14-16'	33.5-35'
SAMPLE NO.	S5	S15
DATE SAMPLED	08/08/17	08/05/17
DATE TESTED	08/30/17	08/30/17
TECHNICIAN	SKS	SKS
DENSITY DETERMINATIONS		
Weight of Sample in air (g):	72.260	NOT
Weight of specimen W/ Paraffin in air (g):	77.850	POSSIBLE
Weight of specimen W/ Paraffin in Water (g):	35.82	
Specific Gravity of Paraffin:	0.89	
Temperature of Water (Deg. C):	24.8	
Temperature Correction Factor (20 deg c):	0.998890	
Wet Density (pcf):	126.05	
Dry Density (pcf):	108.21	
MOISTURE DETERMINATIONS		
Wt. of Wet Soil & Dish (gms)	226.79	264.85
Wt. of Dry Soil & Dish (gms)	195.69	215.49
Net Loss of Moisture (gms)	31.10	49.36
Wt. of Dish (gms)	7.00	6.79
Wt. of Dry Soil (gms)	188.69	208.70
Moisture Content (%)	16.5	23.7

Data entered by:
Data checked by: BDF
FileName:

CAL Date: 09/08/2017
Date: 9/12/17
MDPARFN2.WK4

print macro

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{SELECT DATA B3}

Particle Size Distribution (Gradation) of Soil Using Sieve Analysis
ASTM D 6913

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-101
Depth: 10-12'
Sample Number: C-1
Sampled Date: --
(+) Wash Date: 9/9/17
(-) Wash Date: 9/13/17

Sampled By: --
Technician: BDF
Technician: WAR

Grain Size Data

Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 471.72
Weight of Dry Soil & Pan (g): 466.14
Weight of Water (g): 5.58
Weight of Pan (g): 240.28
Weight of Dry Soil (g): 225.86
Moisture (%): 2.5

Total Wet Weight of Sample (g): 1,031.37
Total Dry Weight of Sample (g): 1,007.83
Calculated Weight Plus #200 (g): 239.24
Moisture of Total Sample (%): 2.3
Percent Retained #200 Sieve (%): 23.7

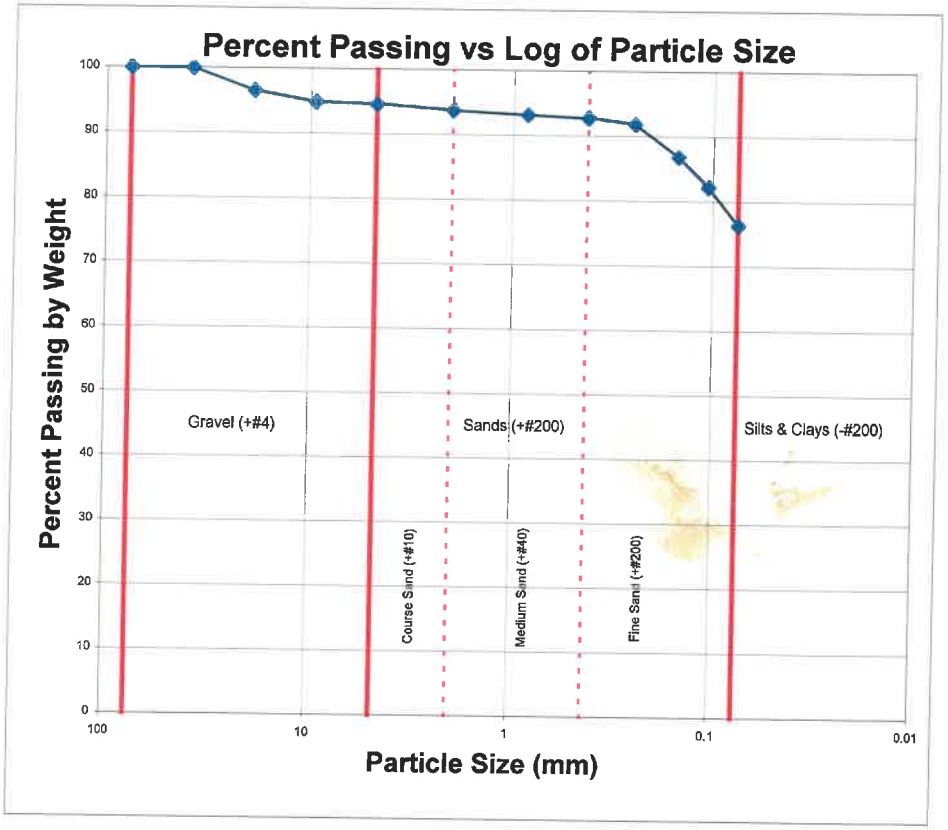
Plus Split Data

Original Weight of +#4 (g): 57.78
Calculated Weight of +#4 (g): 55.10

Minus Split Data

Original Weight of -#4 (g): 973.59
Calculated Dry Weight of -#4 (g): 952.73

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	34.82	0.00	34.82	34.82	96.5
3/8"	**9.525**	17.03	0.00	17.03	17.03	94.9
#4	**4.750**	3.25	0.00	3.25	3.25	94.5
231.44g split out of -#4 material.						
#10	**2.000**	5.14	3.13	2.01	8.48	93.7
#20	**0.850**	4.45	3.16	1.29	5.43	93.2
#40	**0.425**	4.20	3.14	1.06	4.47	92.7
#60	**0.250**	5.20	3.12	2.08	8.78	91.8
#100	**0.150**	15.12	3.16	11.96	50.43	86.8
#140	**0.106**	14.24	3.14	11.10	46.80	82.2
#200	**0.075**	17.30	3.14	14.16	59.75	76.3



Data Entered By: DPM
Date: 9/14/2017
File Name: 2076_245_grainSize-ASTM-C33-D1140-D6319-D2487-R6_12.xls

Checked By: CAL
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soil Using Sieve Analysis
ASTM D 6913

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-101
Depth: 18.0-19.5'
Sample Number: S9
Sampled Date: --
(+) Wash Date: 9/7/17
(-) Wash Date: 9/11/17

Sampled By: --
Technician: CKP
Technician: SKS

Grain Size Data

Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 1055.47
Weight of Dry Soil & Pan (g): 1049.95
Weight of Water (g): 5.52
Weight of Pan (g): 843.12
Weight of Dry Soil (g): 206.83
Moisture (%): 2.7

Total Wet Weight of Sample (g): 1,055.63
Total Dry Weight of Sample (g): 1,028.29
Calculated Weight Plus #200 (g): 289.31
Moisture of Total Sample (%): 2.7
Percent Retained #200 Sieve (%): 28.1

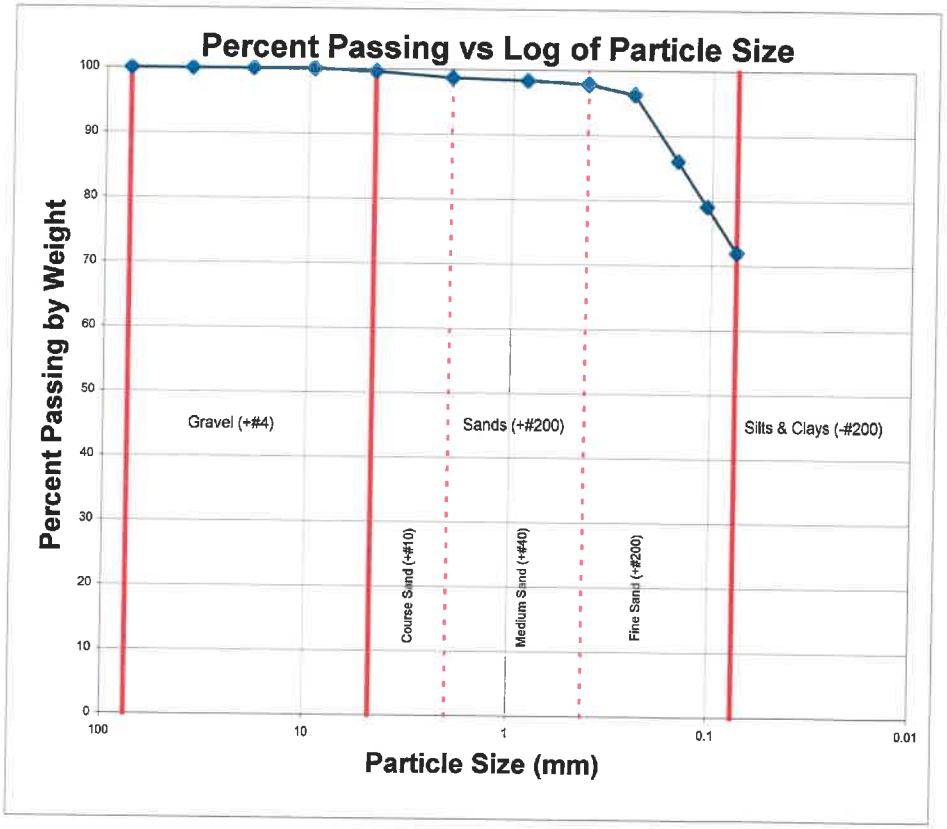
Plus Split Data

Original Weight of +#4 (g): 4.62
Calculated Weight of +#4 (g): 4.00

Minus Split Data

Original Weight of -#4 (g): 1,051.01
Calculated Dry Weight of -#4 (g): 1,024.29

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	0.00	0.00	0.00	0.00	100.0
3/8"	**9.525**	0.00	0.00	0.00	0.00	100.0
#4	**4.750**	4.00	0.00	4.00	4.00	99.6
212.35g split out of -#4 material.						
#10	**2.000**	5.01	3.14	1.88	9.30	98.7
#20	**0.850**	3.82	3.11	0.71	3.52	98.4
#40	**0.425**	4.27	3.11	1.16	5.74	97.8
#60	**0.250**	6.44	3.13	3.31	16.39	96.2
#100	**0.150**	24.21	3.11	21.10	104.51	86.0
#140	**0.106**	17.63	3.09	14.53	71.96	79.1
#200	**0.075**	18.02	3.10	14.92	73.90	71.9



Data Entered By: SKS
Date: 9/12/2017
File Name: 2076_245_grainSize-ASTM-C33-D1140-D6319-D2487-R6_3.xls

Checked By: WAR
Date: 9/13/17

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soil Using Sieve Analysis
ASTM D 6913

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-101
Depth: 31-32.5'
Sample Number: S 14
Sampled Date: --
(+) Wash Date: 9/12/17
(-) Wash Date: 9/12/17

Sampled By: --
Technician: CKP
Technician: CKP

Grain Size Data

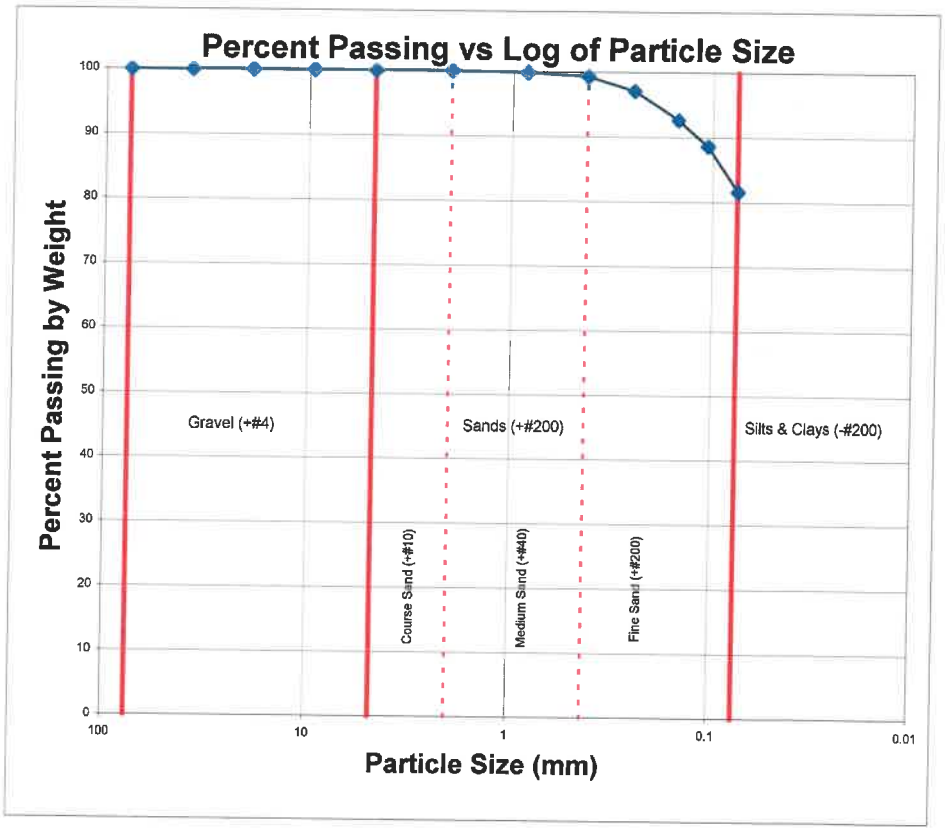
Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 1099.99
Weight of Dry Soil & Pan (g): 1094.19
Weight of Water (g): 5.80
Weight of Pan (g): 843.04
Weight of Dry Soil (g): 251.15
Moisture (%): 2.3

Total Wet Weight of Sample (g): 256.95
Total Dry Weight of Sample (g): 251.15
Calculated Weight Plus #200 (g): 46.29
Moisture of Total Sample (%): 2.3
Percent Retained #200 Sieve (%): 18.4

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	0.00	0.00	0.00	0.00	100.0
3/8"	**9.525**	0.00	0.00	0.00	0.00	100.0
#4	**4.750**	0.00	0.00	0.00	0.00	100.0
#10	**2.000**	0.00	0.00	0.00	0.00	100.0
#20	**0.850**	3.570	3.107	0.463	0.463	99.8
#40	**0.425**	4.336	3.103	1.233	1.233	99.3
#60	**0.250**	8.676	3.134	5.542	5.542	97.1
#100	**0.150**	14.325	3.098	11.227	11.227	92.6
#140	**0.106**	13.176	3.061	10.115	10.115	88.6
#200	**0.075**	20.842	3.129	17.713	17.713	81.6

Wet Weight of Soil (g): 256.95
Dry Weight of Soil (g): 251.15



Data Entered By: CAL
Date: 9/14/2017
File Name: 2076_245_grainSize-ASTM-C33-D1140-D6319-D2487-R6_9.xls

Checked By: 9/14/17 BKL
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soil Using Sieve Analysis
ASTM D 6913

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-101
Depth: 33.5-35'
Sample Number: S15
Sampled Date: --
(+) Wash Date: 8/31/17
(-) Wash Date: 8/31/17

Sampled By: --
Technician: AJE
Technician: AJE

Grain Size Data

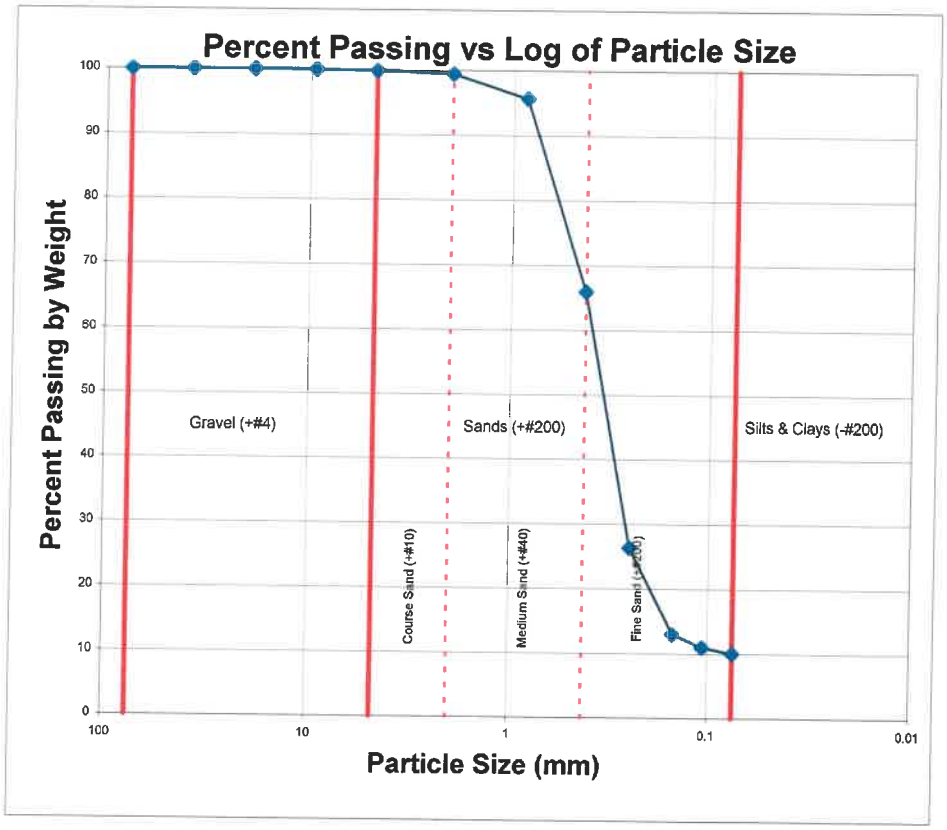
Hygroscopic Moisture of Fines
Weight of Wet Soil & Pan (g): 197.11
Weight of Dry Soil & Pan (g): 180.25
Weight of Water (g): 16.87
Weight of Pan (g): 6.54
Weight of Dry Soil (g): 173.71
Moisture (%): 9.7

Total Wet Weight of Sample (g): 760.84
Total Dry Weight of Sample (g): 693.61
Calculated Weight Plus #200 (g): 623.94
Moisture of Total Sample (%): 9.7
Percent Retained #200 Sieve (%): 90.0

Plus Split Data
Original Weight of +#4 (g): 1.41
Calculated Weight of +#4 (g): 1.22

Minus Split Data
Original Weight of -#4 (g): 759.43
Calculated Dry Weight of -#4 (g): 692.39

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	0.00	0.00	0.00	0.00	100.0
3/8"	**9.525**	0.00	0.00	0.00	0.00	100.0
#4	**4.750**	1.22	0.00	1.22	1.22	99.8
213.62g split out of -#4 material.						
#10	**2.000**	3.93	3.09	0.84	2.98	99.4
#20	**0.850**	10.47	3.14	7.33	26.07	95.6
#40	**0.425**	61.07	3.04	58.03	206.34	65.9
#60	**0.250**	80.18	3.08	77.10	274.17	26.4
#100	**0.150**	29.29	3.22	26.07	92.72	13.0
#140	**0.106**	6.96	3.07	3.89	13.84	11.0
#200	**0.075**	4.93	3.07	1.86	6.60	10.0



Data Entered By: CAL
Date: 9/8/2017
File Name: 2076_245_grainSize-ASTM-C33-D1140-D6319-D2487-R6_0.xls

Checked By: SKS
Date: 9/12/17

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soil Using Sieve Analysis
ASTM D 6913

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-102
Depth: 4.0-6.0
Sample Number: S3
Sampled Date: --
(+) Wash Date: 9/12/17
(-) Wash Date: 9/12/17

Sampled By: --
Technician: BDF
Technician: BDF

Grain Size Data

Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 1051.25
Weight of Dry Soil & Pan (g): 1046.09
Weight of Water (g): 5.16
Weight of Pan (g): 856.14
Weight of Dry Soil (g): 189.95
Moisture (%): 2.7

Total Wet Weight of Sample (g): 1,681.01
Total Dry Weight of Sample (g): 1,636.73
Calculated Weight Plus #200 (g): 338.16
Moisture of Total Sample (%): 2.7
Percent Retained #200 Sieve (%): 20.7

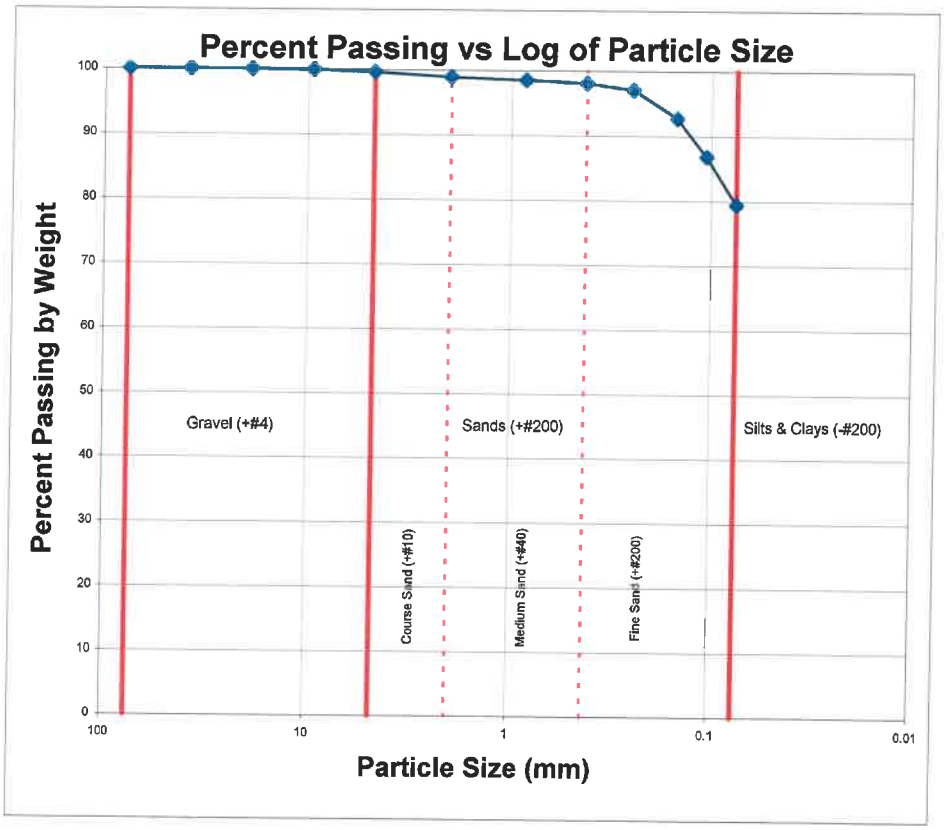
Plus Split Data

Original Weight of +#4 (g): 7.21
Calculated Weight of +#4 (g): 6.70

Minus Split Data

Original Weight of -#4 (g): 1,673.80
Calculated Dry Weight of -#4 (g): 1,630.03

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	0.00	0.00	0.00	0.00	100.0
3/8"	**9.525**	1.67	0.00	1.67	1.67	99.9
#4	**4.750**	5.03	0.00	5.03	5.03	99.6
195.11g split out of -#4 material.						
#10	**2.000**	4.43	3.17	1.26	10.80	98.9
#20	**0.850**	3.96	3.12	0.83	7.15	98.5
#40	**0.425**	3.96	3.12	0.84	7.17	98.1
#60	**0.250**	5.09	3.11	1.99	17.03	97.0
#100	**0.150**	11.44	3.13	8.31	71.32	92.7
#140	**0.106**	14.33	3.12	11.21	96.18	86.8
#200	**0.075**	17.27	3.08	14.19	121.80	79.3



Data Entered By: WAR
Date: 9/13/2017
File Name: 2076_245_grainSize-ASTM-C33-D1140-D6319-D2487-R6_6.xls

Checked By: BDF
Date: 9/13/17

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soil Using Sieve Analysis
ASTM D 6913

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-102
Depth: 30-32'
Sample Number: S14
Sampled Date: --
(+) Wash Date: --
(-) Wash Date: 9/7/17

Sampled By: --
Technician: --
Technician: SKS

Grain Size Data

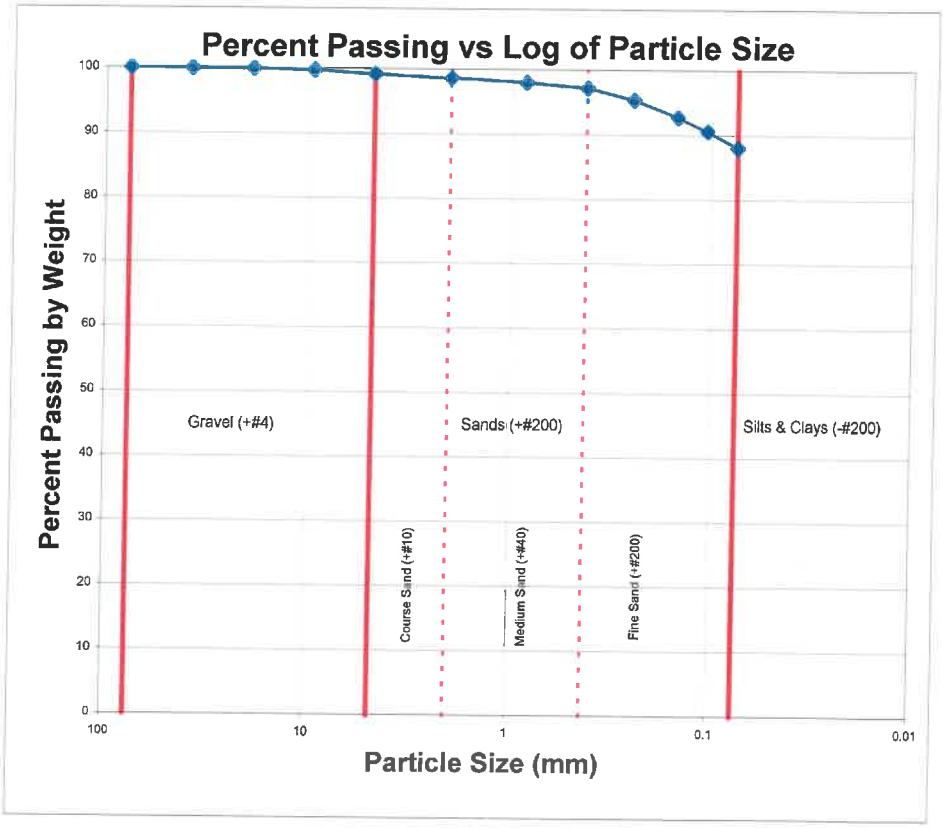
Hygroscopic Moisture of Fines
Weight of Wet Soil & Pan (g): 191.65
Weight of Dry Soil & Pan (g): 185.40
Weight of Water (g): 6.25
Weight of Pan (g): 6.61
Weight of Dry Soil (g): 178.79
Moisture (%): 3.5

Total Wet Weight of Sample (g): 1,447.9
Total Dry Weight of Sample (g): 1,399.4
Calculated Weight Plus #200 (g): 168.16
Moisture of Total Sample (%): 3.5
Percent Retained #200 Sieve (%): 12.0

Plus Split Data
Original Weight of +#4 (g): 20.34
Calculated Weight of +#4 (g): 11.01

Minus Split Data
Original Weight of -#4 (g): 1,427.6
Calculated Dry Weight of -#4 (g): 1,388.4

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	0.00	0.00	0.00	0.00	100.0
3/8"	**9.525**	2.44	0.00	2.44	2.44	99.8
#4	**4.750**	8.57	0.00	8.57	8.57	99.2
198.87g split out of -#4 material.						
#10	**2.000**	4.29	3.15	1.14	8.24	98.6
#20	**0.850**	4.38	3.11	1.26	9.13	98.0
#40	**0.425**	4.77	3.13	1.64	11.81	97.1
#60	**0.250**	6.54	3.10	3.44	24.88	95.3
#100	**0.150**	8.18	3.06	5.12	36.99	92.7
#140	**0.106**	7.24	3.08	4.16	30.03	90.6
#200	**0.075**	8.12	3.13	4.99	36.06	88.0



Data Entered By: CAL
Date: 9/8/2017
File Name: 2076_245_grainSize-ASTM-C33-D1140-D6319-D2487-R6_1.xls

Checked By: SKS
Date: 9/8/17

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soil Using Sieve Analysis
ASTM D 6913

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-103
Depth: 6-8'
Sample Number: S4
Sampled Date: --
(+) Wash Date: 9/8/17
(-) Wash Date: 9/8/17

Sampled By: --
Technician: SKS
Technician: SKS

Grain Size Data

Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 1046.07
Weight of Dry Soil & Pan (g): 1039.19
Weight of Water (g): 6.88
Weight of Pan (g): 843.52
Weight of Dry Soil (g): 195.67
Moisture (%): 3.5

Total Wet Weight of Sample (g): 1,074.85
Total Dry Weight of Sample (g): 1,038.36
Calculated Weight Plus #200 (g): 169.21
Moisture of Total Sample (%): 3.5
Percent Retained #200 Sieve (%): 16.3

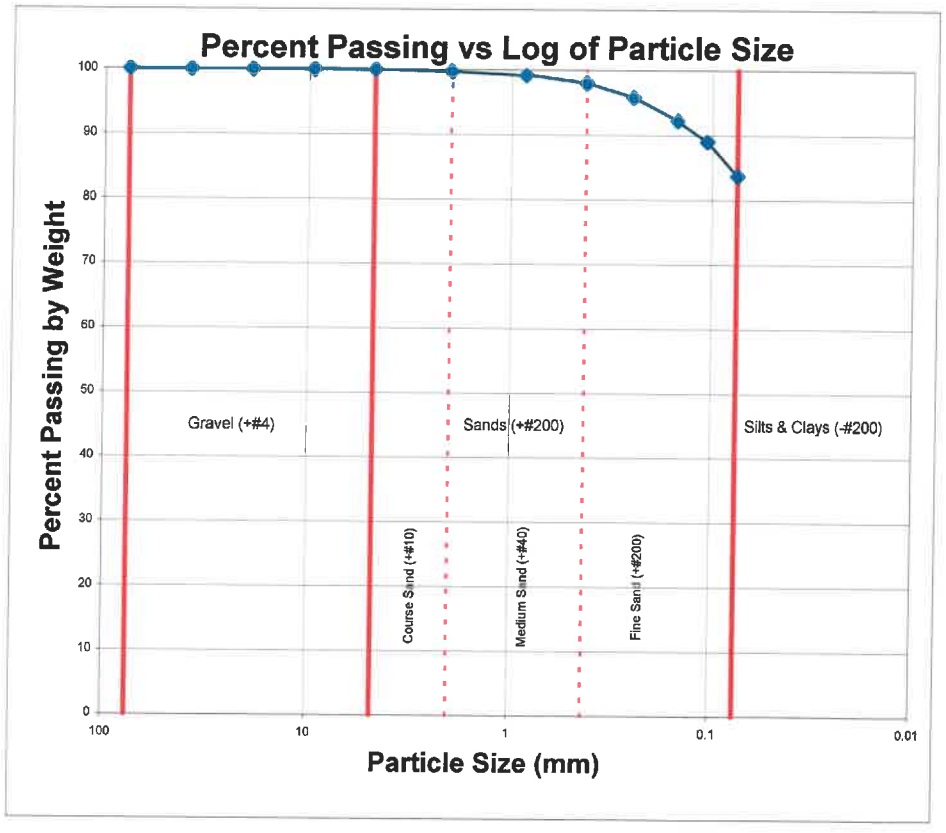
Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	0.00	0.00	0.00	0.00	100.0
3/8"	**9.525**	0.00	0.00	0.00	0.00	100.0
#4	**4.750**	0.64	0.00	0.64	0.64	99.9
202.55g split out of -#4 material.						
#10	**2.000**	3.54	3.12	0.43	2.25	99.7
#20	**0.850**	4.21	3.10	1.12	5.92	99.2
#40	**0.425**	5.64	3.22	2.42	12.82	97.9
#60	**0.250**	7.38	3.14	4.23	22.45	95.8
#100	**0.150**	10.05	3.15	6.90	36.61	92.2
#140	**0.106**	9.39	3.12	6.27	33.26	89.0
#200	**0.075**	13.52	3.09	10.42	55.27	83.7

Plus Split Data

Original Weight of +#4 (g): 0.68
Calculated Weight of +#4 (g): 0.64

Minus Split Data

Original Weight of -#4 (g): 1,074.17
Calculated Dry Weight of -#4 (g): 1,037.72



Data Entered By: BDF
Date: 9/11/2017
File Name: 2076_245_grainSize-ASTM-C33-D1140-D6319-D2487-R6_2.xls

Checked By: SKS
Date: 9/11/17

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soil Using Sieve Analysis
ASTM D 6913

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-103
Depth: 14-16'
Sample Number: C-1
Sampled Date: 8/6/17
(+) Wash Date: 9/9/17
(-) Wash Date: 9/12/17

Sampled By: --
Technician: BDF
Technician: CKP

Grain Size Data

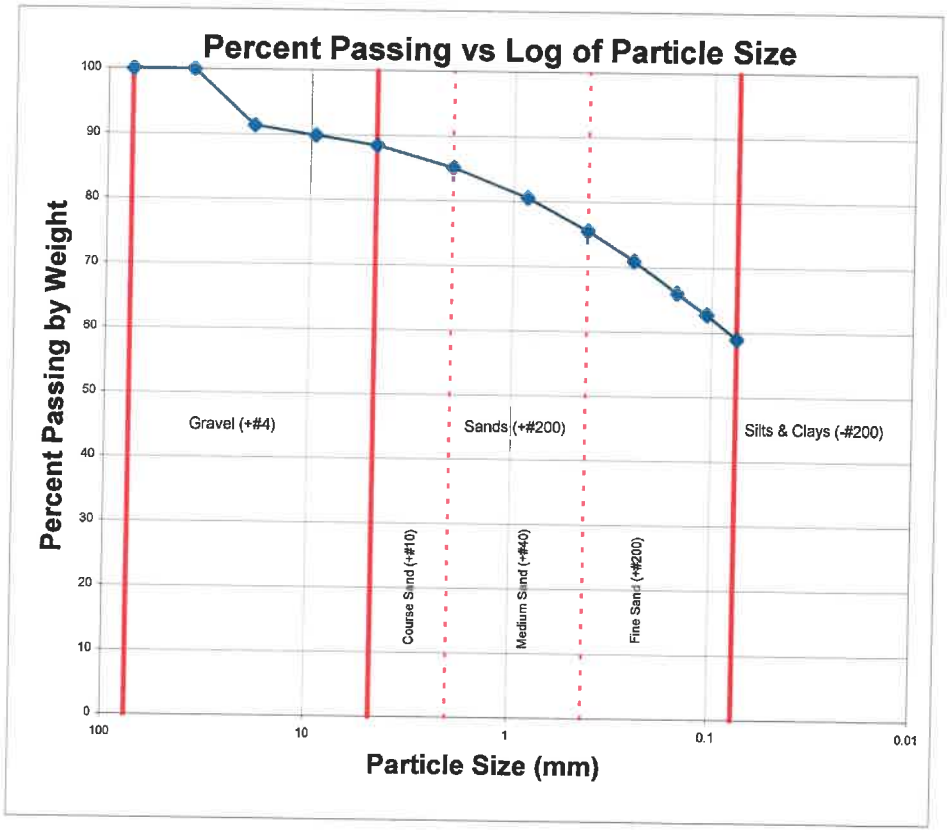
Hygroscopic Moisture of Fines
Weight of Wet Soil & Pan (g): 191.96
Weight of Dry Soil & Pan (g): 184.73
Weight of Water (g): 7.23
Weight of Pan (g): 7.00
Weight of Dry Soil (g): 177.73
Moisture (%): 4.1

Total Wet Weight of Sample (g): 1,520.37
Total Dry Weight of Sample (g): 1,467.59
Calculated Weight Plus #200 (g): 601.54
Moisture of Total Sample (%): 3.6
Percent Retained #200 Sieve (%): 41.0

Plus Split Data
Original Weight of +#4 (g): 177.16
Calculated Weight of +#4 (g): 170.06

Minus Split Data
Original Weight of -#4 (g): 1,343.21
Calculated Dry Weight of -#4 (g): 1,297.53

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	126.66	0.00	126.66	126.66	91.4
3/8"	**9.525**	21.74	0.00	21.74	21.74	89.9
#4	**4.750**	21.66	0.00	21.66	21.66	88.4
183.08g split out of -#4 material.						
#10	**2.000**	9.699	3.080	6.62	48.82	85.1
#20	**0.850**	12.237	3.186	9.05	66.76	80.5
#40	**0.425**	13.187	3.131	10.06	74.17	75.5
#60	**0.250**	12.250	3.135	9.12	67.23	70.9
#100	**0.150**	12.893	3.200	9.69	71.49	66.0
#140	**0.106**	9.645	3.088	6.56	48.36	62.7
#200	**0.075**	10.510	3.099	7.41	54.66	59.0



Data Entered By: CAL
Date: 9/14/2017
File Name: 2076_245_grainSize-ASTM-C33-D1140-D6319-D2487-R6_10.xls

Checked By: BKL
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soil Using Sieve Analysis
ASTM D 6913

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-103
Depth: 43.5-44'
Sample Number: S20
Sampled Date: 1/0/00
(+) Wash Date: 9/7/17
(-) Wash Date: 9/11/17

Sampled By: --
Technician: CKP
Technician: SKS

Grain Size Data

Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 1032.50
Weight of Dry Soil & Pan (g): 1027.43
Weight of Water (g): 5.07
Weight of Pan (g): 843.25
Weight of Dry Soil (g): 184.18
Moisture (%): 2.8

Total Wet Weight of Sample (g): 395.94
Total Dry Weight of Sample (g): 385.51
Calculated Weight Plus #200 (g): 96.75
Moisture of Total Sample (%): 2.7
Percent Retained #200 Sieve (%): 25.1

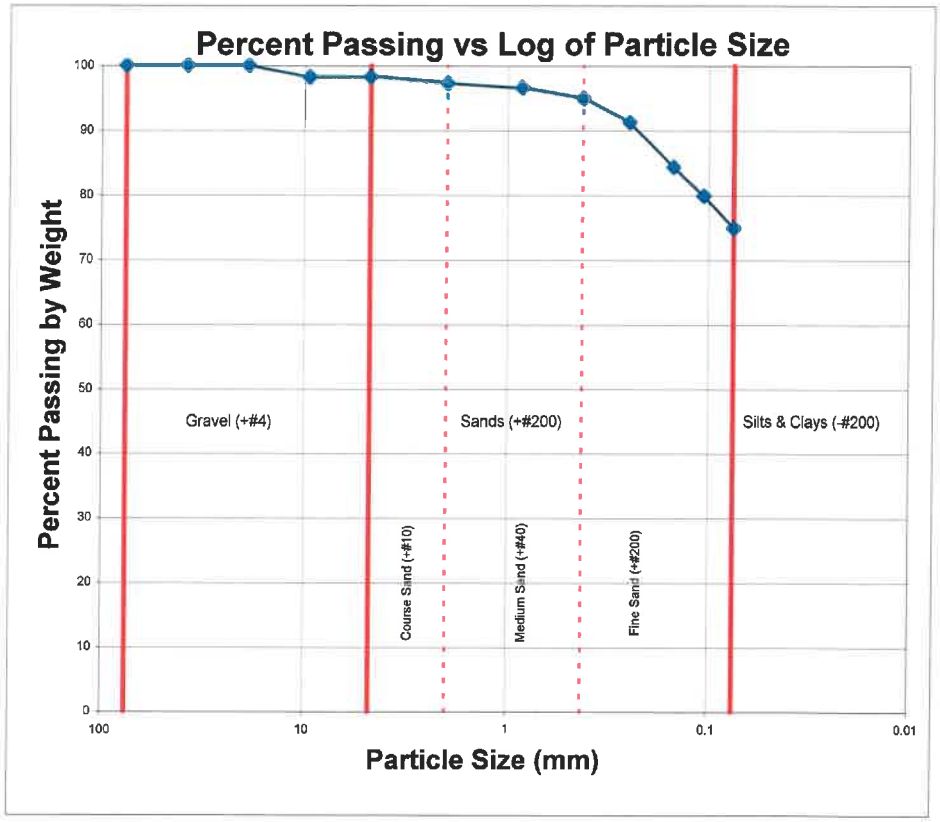
Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	0.00	0.00	0.00	0.00	100.0
3/8"	**9.525**	6.89	0.00	6.89	6.89	98.2
#4	**4.750**	0.00	0.00	0.00	0.00	98.2
189.25g split out of -#4 material.						
#10	**2.000**	4.85	3.12	1.74	3.57	97.3
#20	**0.850**	4.48	3.11	1.38	2.83	96.6
#40	**0.425**	6.34	3.20	3.14	6.44	94.9
#60	**0.250**	9.94	3.10	6.84	14.06	91.2
#100	**0.150**	16.03	3.15	12.88	26.47	84.4
#140	**0.106**	11.47	3.11	8.36	17.19	79.9
#200	**0.075**	12.50	3.12	9.39	19.30	74.9

Plus Split Data

Original Weight of +#4 (g): 6.98
Calculated Weight of +#4 (g): 6.89

Minus Split Data

Original Weight of -#4 (g): 388.96
Calculated Dry Weight of -#4 (g): 378.62



Data Entered By: SKS
Date: 9/12/2017
File Name: 2076_245_grainSize-ASTM-C33-D1140-D6319-D2487-R6_4.xls

Checked By: MAR
Date: 9/13/17

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soil Using Sieve Analysis
ASTM D 6913

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-104
Depth: 20-22'
Sample Number: C1
Sampled Date: --
(+) Wash Date: 9/9/17
(-) Wash Date: 9/13/17

Sampled By: --
Technician: BDF
Technician: WAR

Grain Size Data

Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 449.21
Weight of Dry Soil & Pan (g): 443.01
Weight of Water (g): 6.20
Weight of Pan (g): 242.95
Weight of Dry Soil (g): 200.06
Moisture (%): 3.1

Total Wet Weight of Sample (g): 1,212.67
Total Dry Weight of Sample (g): 1,181.08
Calculated Weight Plus #200 (g): 397.42
Moisture of Total Sample (%): 2.7
Percent Retained #200 Sieve (%): 33.6

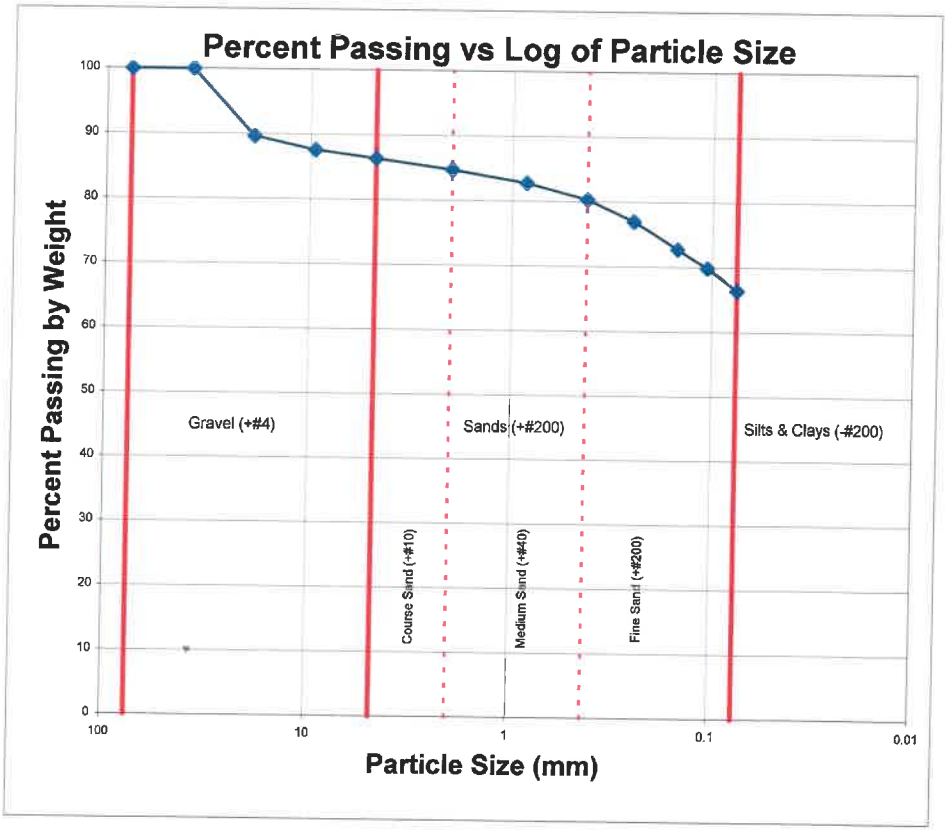
Plus Split Data

Original Weight of +#4 (g): 175.28
Calculated Weight of +#4 (g): 161.59

Minus Split Data

Original Weight of -#4 (g): 1,037.39
Calculated Dry Weight of -#4 (g): 1,019.49

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	122.35	0.00	122.35	122.35	89.6
3/8"	**9.525**	24.69	0.00	24.69	24.69	87.6
#4	**4.750**	14.55	0.00	14.55	14.55	86.3
206.26g split out of -#4 material.						
#10	**2.000**	6.83	3.09	3.74	19.07	84.7
#20	**0.850**	7.56	3.08	4.48	22.80	82.8
#40	**0.425**	8.84	3.13	5.71	29.11	80.3
#60	**0.250**	10.91	3.13	7.78	39.66	77.0
#100	**0.150**	12.86	3.12	9.74	49.62	72.7
#140	**0.106**	9.87	3.13	6.74	34.36	69.8
#200	**0.075**	11.21	3.12	8.09	41.21	66.4



Data Entered By: DPM
Date: 9/14/2017
File Name: 2076_245_grainSize-ASTM-C33-D1140-D6319-D2487-R6_13.xls

Checked By: CMC
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soil Using Sieve Analysis
ASTM D 6913

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-104
Depth: 40-42'
Sample Number: C-2
Sampled Date: 8/8/17
(+) Wash Date: 9/7/17
(-) Wash Date: 9/12/17

Sampled By: --
Technician: CKP
Technician: CKP

Grain Size Data

Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 990.20
Weight of Dry Soil & Pan (g): 985.63
Weight of Water (g): 4.57
Weight of Pan (g): 792.55
Weight of Dry Soil (g): 193.08
Moisture (%): 2.4

Total Wet Weight of Sample (g): 786.58
Total Dry Weight of Sample (g): 768.43
Calculated Weight Plus #200 (g): 227.73
Moisture of Total Sample (%): 2.4
Percent Retained #200 Sieve (%): 29.6

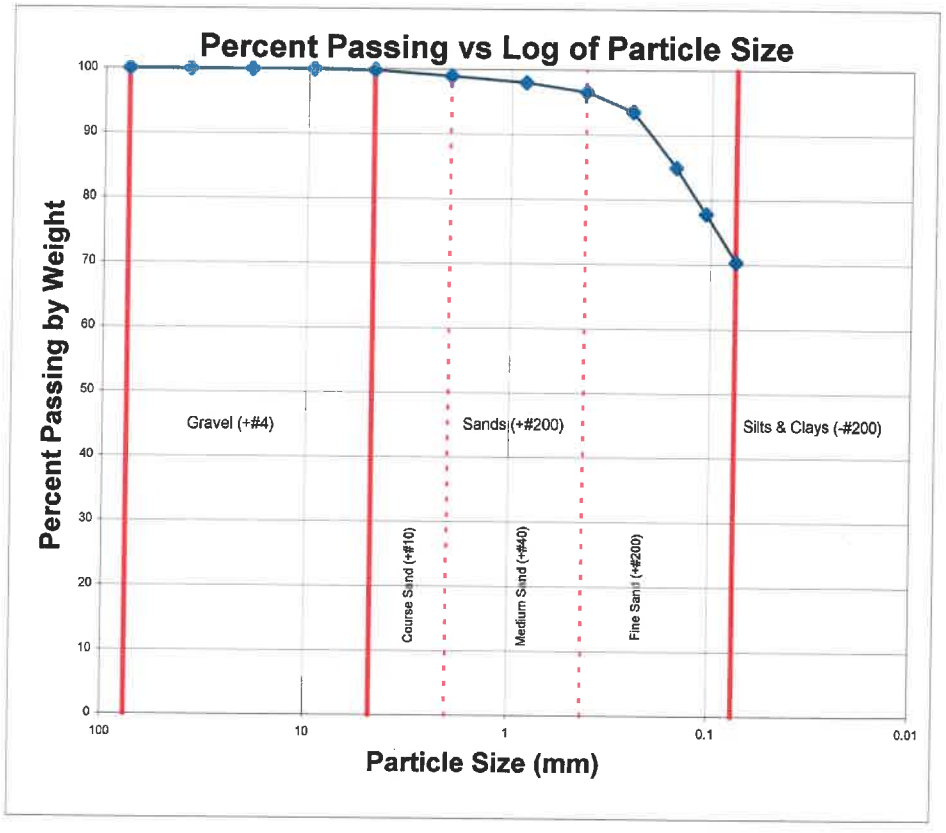
Plus Split Data

Original Weight of +#4 (g): 1.57
Calculated Weight of +#4 (g): 1.53

Minus Split Data

Original Weight of -#4 (g): 785.01
Calculated Dry Weight of -#4 (g): 766.90

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	0.00	0.00	0.00	0.00	100.0
3/8"	**9.525**	0.00	0.00	0.00	0.00	100.0
#4	**4.750**	1.53	0.00	1.53	1.53	99.8
197.65g split out of -#4 material.						
#10	**2.000**	4.783	3.133	1.650	6.55	98.9
#20	**0.850**	5.025	3.187	1.838	7.30	98.0
#40	**0.425**	5.893	3.166	2.727	10.83	96.6
#60	**0.250**	8.966	3.069	5.897	23.42	93.5
#100	**0.150**	19.628	3.106	16.522	65.62	85.0
#140	**0.106**	16.952	3.107	13.845	54.99	77.8
#200	**0.075**	17.558	3.087	14.471	57.48	70.4



Data Entered By: CAL
Date: 9/14/2017
File Name: 2076_245_grainSize-ASTM-C33-D1140-D6319-D2487-R6_11.xls

Checked By: BKL
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soil Using Sieve Analysis
ASTM D 6913

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-104
Depth: 47-47.5'
Sample Number: S 14
Sampled Date: --
(+) Wash Date: 9/12/17
(-) Wash Date: 9/12/17

Sampled By: --
Technician: CKP
Technician: CKP

Grain Size Data

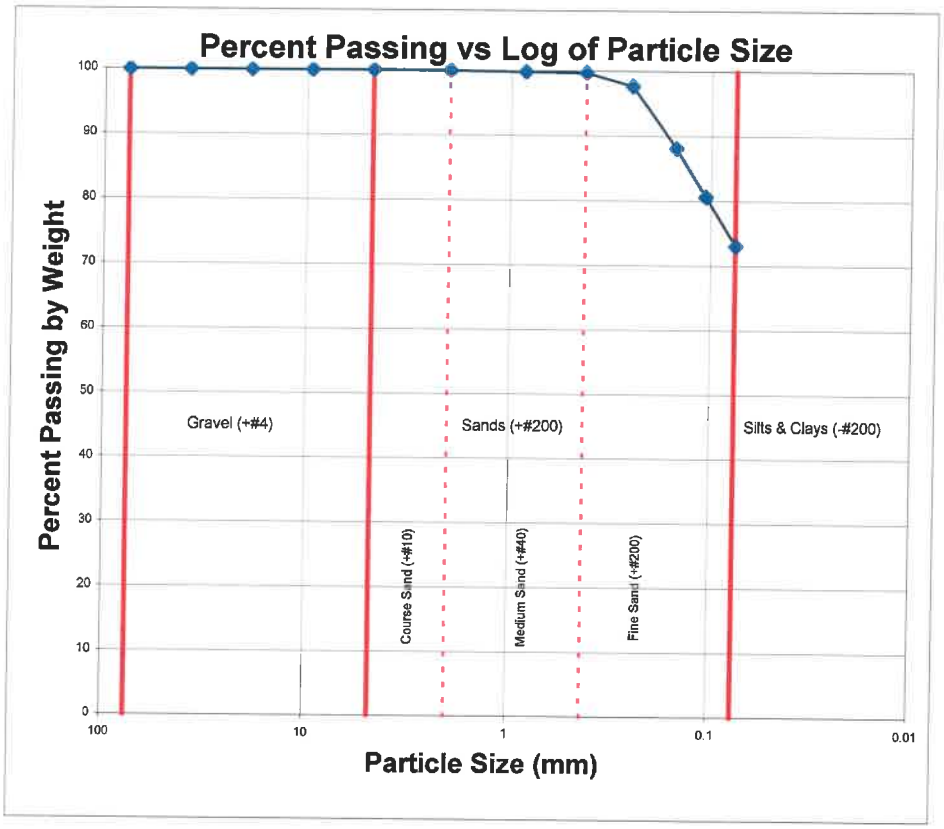
Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 1000.52
Weight of Dry Soil & Pan (g): 995.02
Weight of Water (g): 5.50
Weight of Pan (g): 770.65
Weight of Dry Soil (g): 224.37
Moisture (%): 2.5

Total Wet Weight of Sample (g): 229.87
Total Dry Weight of Sample (g): 224.37
Calculated Weight Plus #200 (g): 60.61
Moisture of Total Sample (%): 2.5
Percent Retained #200 Sieve (%): 27.0

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	76.2	0.00	0.00	0.00	0.00	100.0
1.5"	38.10	0.00	0.00	0.00	0.00	100.0
3/4"	19.05	0.00	0.00	0.00	0.00	100.0
3/8"	9.525	0.00	0.00	0.00	0.00	100.0
#4	4.750	0.00	0.00	0.00	0.00	100.0
#10	2.000	3.223	3.153	0.070	0.070	100.0
#20	0.850	3.317	3.094	0.223	0.223	99.9
#40	0.425	3.489	3.109	0.380	0.380	99.7
#60	0.250	7.682	3.126	4.556	4.556	97.7
#100	0.150	24.537	3.146	21.391	21.391	88.1
#140	0.106	19.968	3.124	16.844	16.844	80.6
#200	0.075	20.259	3.118	17.141	17.141	73.0

Wet Weight of Soil (g): 229.87
Dry Weight of Soil (g): 224.37



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Date: 9/14/2017
File Name: 2076_245_grainSize-ASTM-C33-D1140-D6319-D2487-R6_8.xls

Checked By: BKL
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soil Using Sieve Analysis
ASTM D 6913

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-105
Depth: 14-16'
Sample Number: S5
Sampled Date: --
(+) Wash Date: 9/12/17
(-) Wash Date: 9/12/17

Sampled By: --
Technician: SKS
Technician: SKS

Grain Size Data

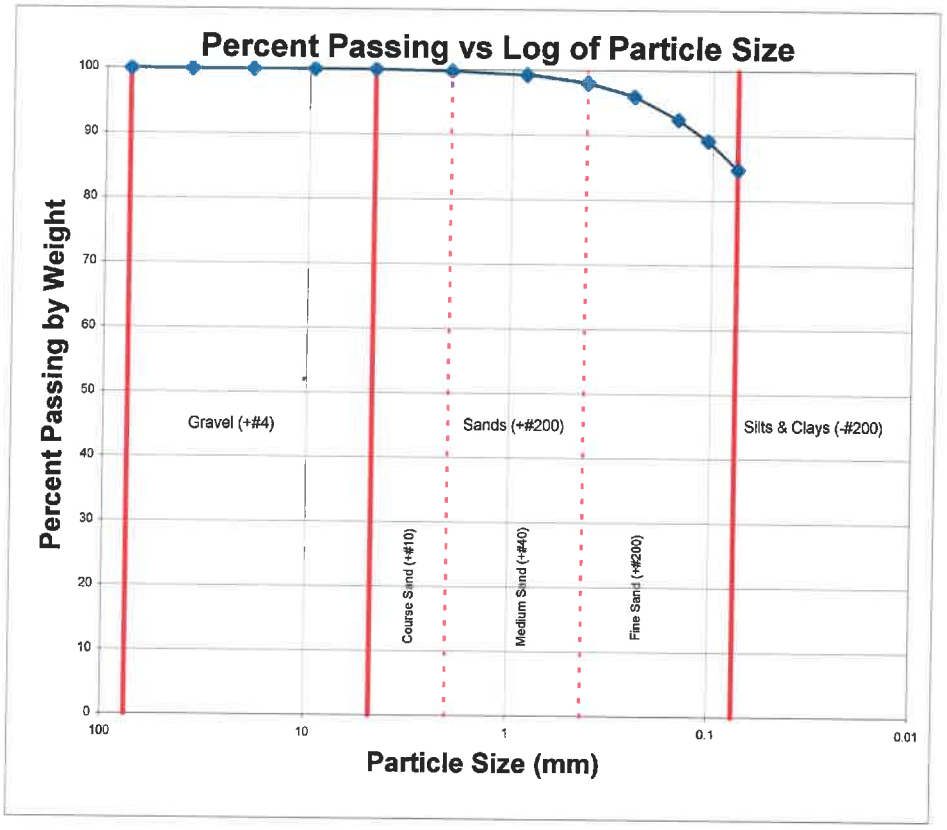
Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 479.60
Weight of Dry Soil & Pan (g): 469.97
Weight of Water (g): 9.63
Weight of Pan (g): 237.37
Weight of Dry Soil (g): 232.60
Moisture (%): 4.1

Total Wet Weight of Sample (g): 242.23
Total Dry Weight of Sample (g): 232.60
Calculated Weight Plus #200 (g): 35.47
Moisture of Total Sample (%): 4.1
Percent Retained #200 Sieve (%): 15.2

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	0.00	0.00	0.00	0.00	100.0
3/8"	**9.525**	0.00	0.00	0.00	0.00	100.0
#4	**4.750**	0.00	0.00	0.00	0.00	100.0
#10	**2.000**	3.680	3.119	0.561	0.561	99.8
#20	**0.850**	4.332	3.207	1.125	1.125	99.3
#40	**0.425**	6.308	3.222	3.086	3.086	97.9
#60	**0.250**	7.764	3.195	4.569	4.569	96.0
#100	**0.150**	11.306	3.124	8.182	8.182	92.5
#140	**0.106**	10.643	3.078	7.565	7.565	89.2
#200	**0.075**	13.479	3.096	10.383	10.383	84.8

Wet Weight of Soil (g): 242.23
Dry Weight of Soil (g): 232.60



Data Entered By: CAL
Date: 9/14/2017
File Name: 2076_245_grainSize-ASTM-C33-D1140-D6319-D2487-R6_7.xls

Checked By: BKL
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soil Using Sieve Analysis
ASTM D 6913

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-105
Depth: 50-52'
Sample Number: S13
Sampled Date: --
(+) Wash Date: 9/7/17
(-) Wash Date: 9/11/17

Sampled By: --
Technician: CKP
Technician: SKS

Grain Size Data

Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 993.99
Weight of Dry Soil & Pan (g): 988.20
Weight of Water (g): 5.79
Weight of Pan (g): 790.94
Weight of Dry Soil (g): 197.26
Moisture (%): 2.9

Total Wet Weight of Sample (g): 2,532.99
Total Dry Weight of Sample (g): 2,461.05
Calculated Weight Plus #200 (g): 554.72
Moisture of Total Sample (%): 2.9
Percent Retained #200 Sieve (%): 22.5

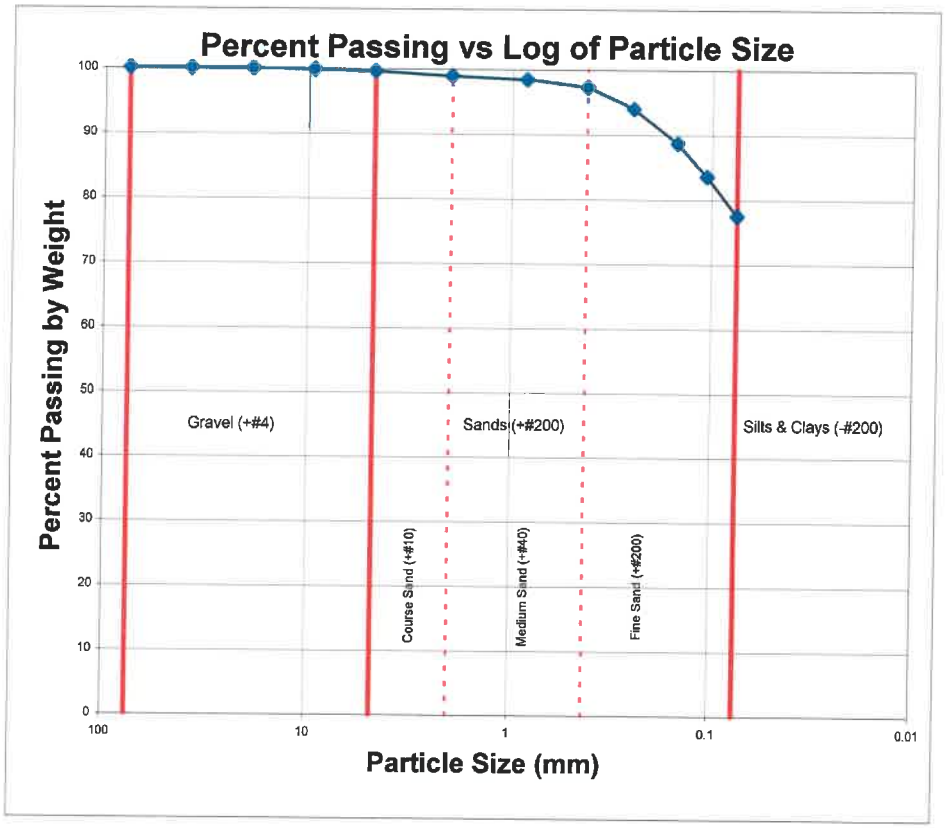
Plus Split Data

Original Weight of +#4 (g): 10.59
Calculated Weight of +#4 (g): 10.19

Minus Split Data

Original Weight of -#4 (g): 2,522.40
Calculated Dry Weight of -#4 (g): 2,450.86

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	0.00	0.00	0.00	0.00	100.0
3/8"	**9.525**	3.82	0.00	3.82	3.82	99.8
#4	**4.750**	6.37	0.00	6.37	6.37	99.6
203.05g split out of -#4 material.						
#10	**2.000**	4.40	3.10	1.30	16.09	98.9
#20	**0.850**	4.17	3.12	1.05	13.03	98.4
#40	**0.425**	5.43	3.08	2.35	29.21	97.2
#60	**0.250**	9.58	3.11	6.47	80.39	93.9
#100	**0.150**	13.65	3.13	10.52	130.72	88.6
#140	**0.106**	13.31	3.20	10.11	125.59	83.5
#200	**0.075**	15.15	3.11	12.03	149.50	77.5



Data Entered By: SKS
Date: 9/12/2017
File Name: 2076_245_grainSize-ASTM-C33-D1140-D6319-D2487-R6_5.xls

Checked By: WAR
Date: 9/13/17

ATT
ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-101
Depth: 10-12'
Sample Number: C-1
Test Date: 9/13/2017
Technician: CAL
Sampled Date: 8/5/2017
Sampled By: --
Method: Method A

Test Configuration

Liquid Limits Device: 1080
Material Size of Fines: -#40

Plastic Limits

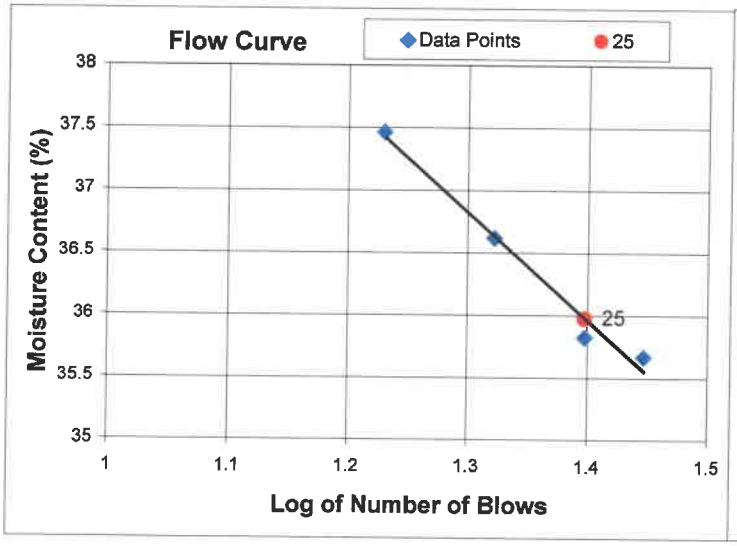
	Sample 1	Sample 2
Weight of Wet Soil & Pan (g):	6.166	6.294
Weight of Dry Soil & Pan (g):	5.552	5.665
Weight of Water (g):	0.614	0.629
Weight of Pan (g):	1.138	1.141
Moisture Content (%):	13.9	13.9

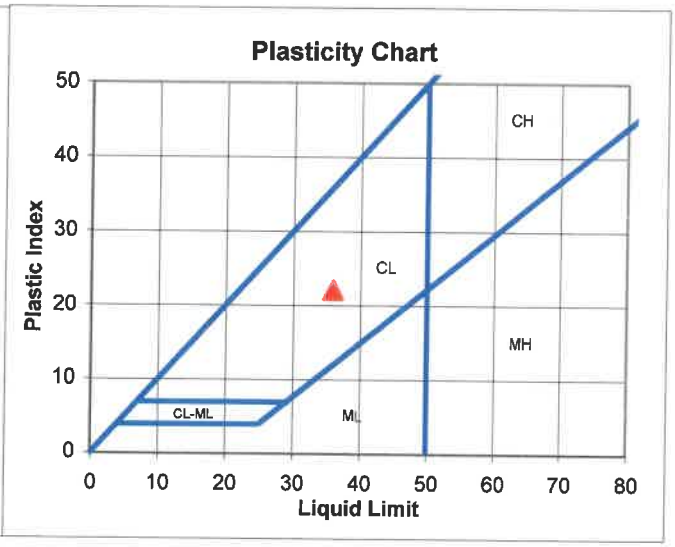
Average: 13.9%
Standard Deviation: 0.0%

Liquid Limits

	Sample 1	Sample 2	Sample 3	Sample 4
Number of Blows:	17	21	28	25
Weight of Wet Soil & Pan (g):	9.071	8.910	9.779	9.485
Weight of Dry Soil & Pan (g):	6.898	6.815	7.519	7.285
Weight of Water (g):	2.173	2.095	2.260	2.200
Weight of Pan (g):	1.098	1.094	1.183	1.144
Moisture Content (%):	37.5	36.6	35.7	35.8

Plastic Limit: 14
Liquid Limit: 36
Plastic Index: 22
Atterberg Classification CL





Data Entered By: CAL
Date: 9/14/2017
File Name: 2076_245_atterberg-ASTMD-4318-R8_3.xls

Data Checked By: BKL
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-101
Depth: 18-19.5'
Sample Number: S9
Test Date: 9/13/2017
Technician: BDF
Sampled Date: --
Sampled By: --
Method: Method A

Test Configuration

Liquid Limits Device: 1075
Material Size of Fines: -#40

Plastic Limits

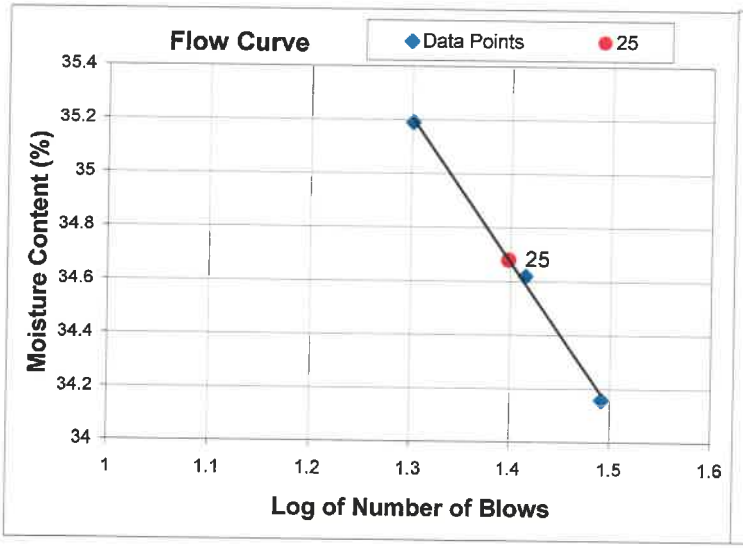
	Sample 1	Sample 2
Weight of Wet Soil & Pan (g):	7.370	7.556
Weight of Dry Soil & Pan (g):	6.666	6.842
Weight of Water (g):	0.704	0.714
Weight of Pan (g):	1.139	1.122
Moisture Content (%):	12.7	12.5

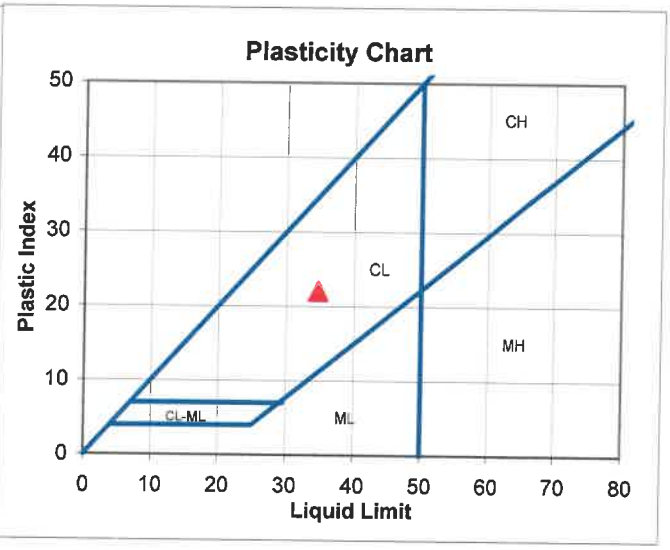
Average: 12.6%
Standard Deviation: 0.2%

Liquid Limits

	Sample 1	Sample 2	Sample 3
Number of Blows:	26	31	20
Weight of Wet Soil & Pan (g):	11.884	12.741	10.490
Weight of Dry Soil & Pan (g):	9.122	9.790	8.059
Weight of Water (g):	2.762	2.951	2.431
Weight of Pan (g):	1.144	1.151	1.151
Moisture Content (%):	34.6	34.2	35.2

Plastic Limit: 13
Liquid Limit: 35
Plastic Index: 22
Atterberg Classification CL





Data Entered By: DPM
Date: 9/14/2017
File Name: 2076_245_atterberg-ASTMD-4318-R8_5.xls

Data Checked By: CM
Date: 9/15/17

ATT
ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-101
Depth: 31-32.5'
Sample Number: S14
Test Date: 9/13/2017
Technician: BDF
Sampled Date: --
Sampled By: --
Method: Method A

Test Configuration

Liquid Limits Device: 1075
Material Size of Fines: -#40

Plastic Limits

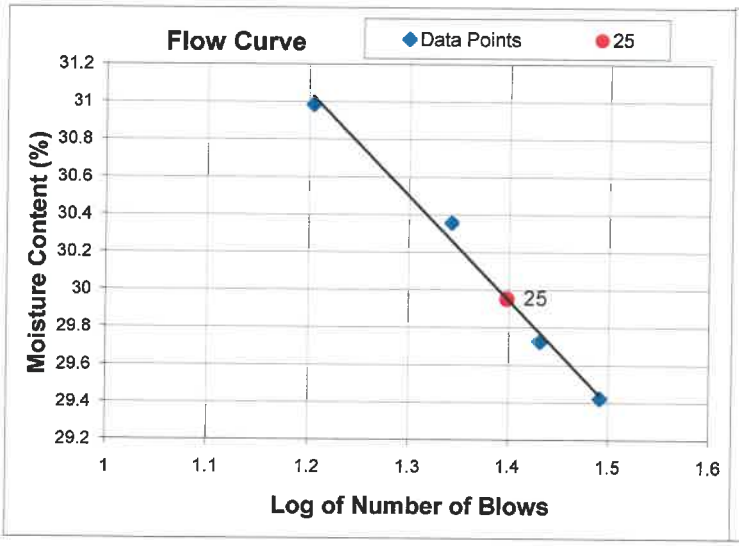
	Sample 1	Sample 2
Weight of Wet Soil & Pan (g):	7.607	7.567
Weight of Dry Soil & Pan (g):	6.749	6.745
Weight of Water (g):	0.858	0.822
Weight of Pan (g):	1.134	1.148
Moisture Content (%):	15.3	14.7

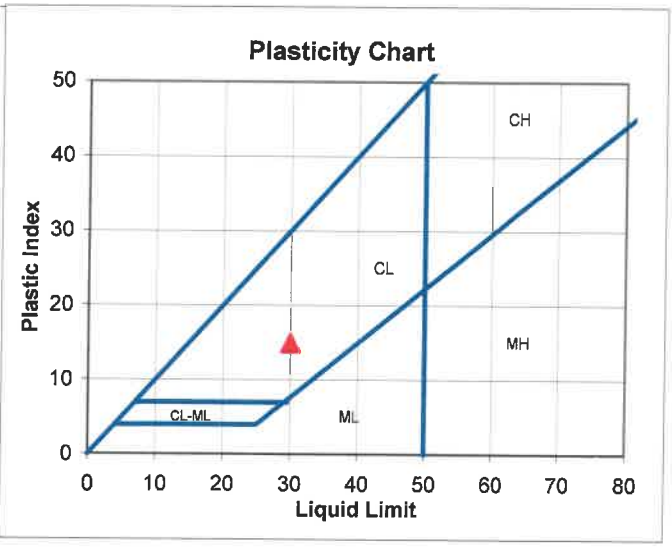
Average: 15.0%
Standard Deviation: 0.4%

Liquid Limits

	Sample 1	Sample 2	Sample 3	Sample 4
Number of Blows:	16	27	22	31
Weight of Wet Soil & Pan (g):	14.908	14.208	15.313	14.002
Weight of Dry Soil & Pan (g):	11.651	11.199	12.019	11.076
Weight of Water (g):	3.257	3.009	3.294	2.926
Weight of Pan (g):	1.140	1.077	1.168	1.132
Moisture Content (%):	31.0	29.7	30.4	29.4

Plastic Limit: 15
Liquid Limit: 30
Plastic Index: 15
Atterberg Classification CL





Data Entered By: DPM
Date: 9/14/2017
File Name: 2076_245_atterberg-ASTMD-4318-R8_8.xls

Data Checked By: CHL
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-101
Depth: 33.5-35'
Sample Number: S15
Test Date: 9/13/2017
Technician: BDF
Sampled Date: --
Sampled By: --
Method: Method A

Test Configuration

Liquid Limits Device: 1075
Material Size of Fines: -#40

Plastic Limits

Non-Plastic

Liquid Limits

Non-Plastic

Atterberg Classification NP

Data Entered By: CAL Date: 9/14/2017
File Name: 2076_245_atterberg-ASTMD-4318-R8_4.xls

Data Checked By: BKL
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-102
Depth: 4.0-6.0'
Sample Number: S3
Test Date: 9/12/2017
Technician: BDF
Sampled Date: --
Sampled By: --
Method: Method A

Test Configuration

Liquid Limits Device: 1075
Material Size of Fines: -#40

Plastic Limits

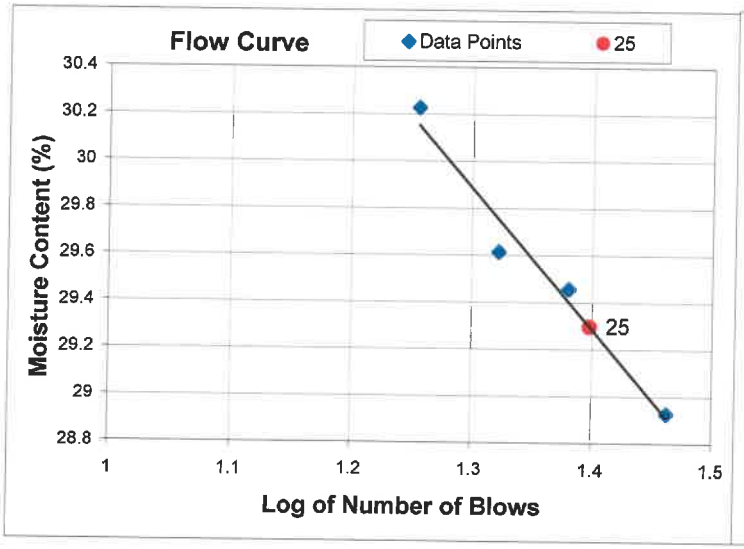
	Sample 1	Sample 2
Weight of Wet Soil & Pan (g):	7.605	7.713
Weight of Dry Soil & Pan (g):	6.731	6.817
Weight of Water (g):	0.874	0.896
Weight of Pan (g):	1.075	1.147
Moisture Content (%):	15.5	15.8

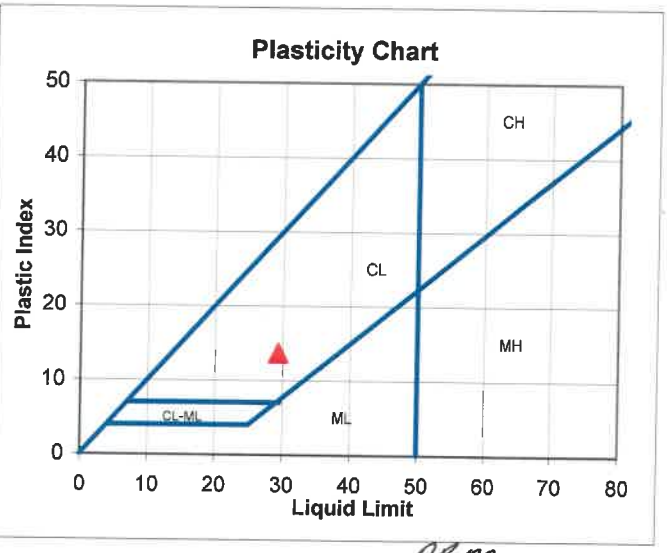
Average: 15.6%
Standard Deviation: 0.2%

Liquid Limits

	Sample 1	Sample 2	Sample 3	Sample 4
Number of Blows:	18	21	29	24
Weight of Wet Soil & Pan (g):	9.428	10.881	10.273	12.002
Weight of Dry Soil & Pan (g):	7.502	8.663	8.222	9.526
Weight of Water (g):	1.926	2.218	2.051	2.476
Weight of Pan (g):	1.130	1.173	1.131	1.120
Moisture Content (%):	30.2	29.6	28.9	29.5

Plastic Limit: 16
Liquid Limit: 30
Plastic Index: 14
Atterberg Classification CL





Data Entered By: WAR
Date: 9/13/2017
File Name: 2076_245_atterberg-ASTMD-4318-R8_2.xls

Data Checked By: DBM
Date: 9/13/17

ATT
ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-102
Depth: 30-32'
Sample Number: S14
Test Date: 9/13/2017
Technician: BDF
Sampled Date: --
Sampled By: --
Method: Method A

Test Configuration

Liquid Limits Device: 1075
Material Size of Fines: #40

Plastic Limits

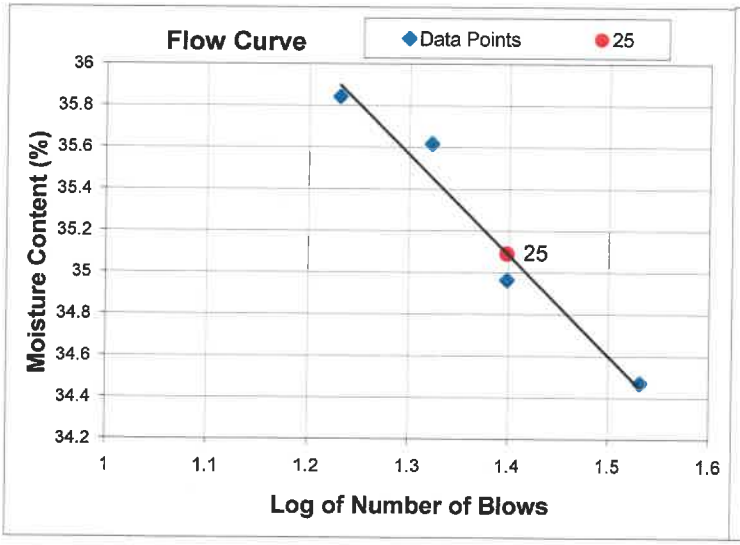
	Sample 1	Sample 2
Weight of Wet Soil & Pan (g):	7.397	7.404
Weight of Dry Soil & Pan (g):	6.525	6.542
Weight of Water (g):	0.872	0.862
Weight of Pan (g):	1.153	1.133
Moisture Content (%):	16.2	15.9

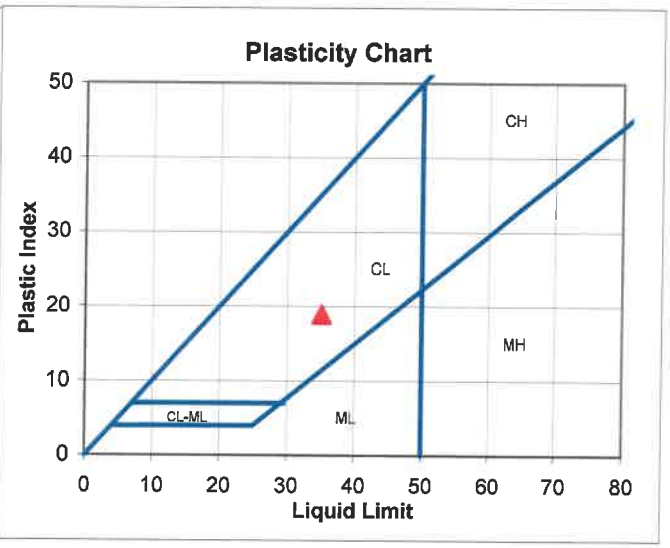
Average: 16.1%
Standard Deviation: 0.2%

Liquid Limits

	Sample 1	Sample 2	Sample 3	Sample 4
Number of Blows:	17	21	25	34
Weight of Wet Soil & Pan (g):	12.104	13.452	13.857	13.245
Weight of Dry Soil & Pan (g):	9.215	10.211	10.563	10.135
Weight of Water (g):	2.889	3.241	3.294	3.110
Weight of Pan (g):	1.155	1.112	1.142	1.113
Moisture Content (%):	35.8	35.6	35.0	34.5

Plastic Limit: 16
Liquid Limit: 35
Plastic Index: 19
Atterberg Classification CL





Data Entered By: DPM
Date: 9/14/2017
File Name: 2076_245_atterberg-ASTMD-4318-R8_9.xls

Data Checked By: CRC
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-103
Depth: 6-8'
Sample Number: S4
Test Date: 9/13/2017
Technician: BDF
Sampled Date: --
Sampled By: --
Method: Method A

Test Configuration

Liquid Limits Device: 1075
Material Size of Fines: -#40

Plastic Limits

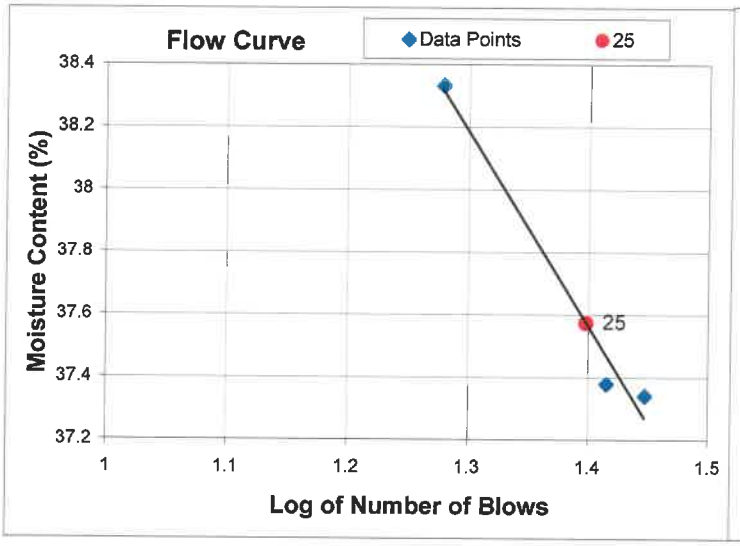
	Sample 1	Sample 2
Weight of Wet Soil & Pan (g):	6.952	7.186
Weight of Dry Soil & Pan (g):	6.265	6.486
Weight of Water (g):	0.687	0.700
Weight of Pan (g):	1.138	1.134
Moisture Content (%):	13.4	13.1

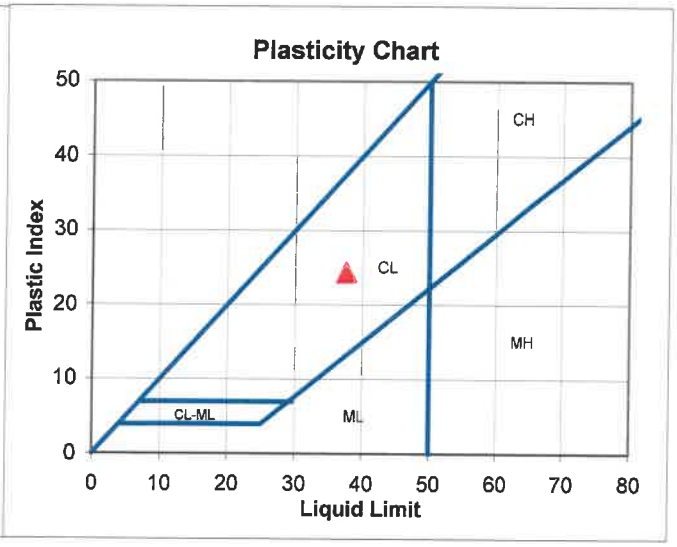
Average: 13.2%
Standard Deviation: 0.2%

Liquid Limits

	Sample 1	Sample 2	Sample 3
Number of Blows:	19	28	26
Weight of Wet Soil & Pan (g):	14.014	11.279	11.799
Weight of Dry Soil & Pan (g):	10.436	8.528	8.902
Weight of Water (g):	3.578	2.751	2.897
Weight of Pan (g):	1.102	1.161	1.152
Moisture Content (%):	38.3	37.3	37.4

Plastic Limit: 13
Liquid Limit: 38
Plastic Index: 25
Atterberg Classification CL





Data Entered By: DPM
Date: 9/14/2017
File Name: 2076_245_atterberg-ASTMD-4318-R8_10.xls

Data Checked By: CMC
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-103
Depth: 14.0-16.0'
Sample Number: C-1
Test Date: 9/12/2017
Technician: BDF
Sampled Date: 8/6/2017
Sampled By: --
Method: Method A

Test Configuration

Liquid Limits Device: 1075
Material Size of Fines: #40

Plastic Limits

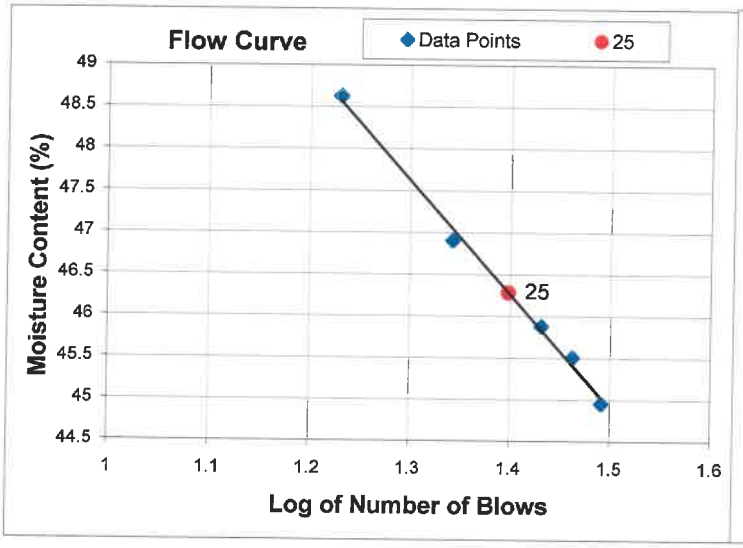
	Sample 1	Sample 2
Weight of Wet Soil & Pan (g):	6.980	6.938
Weight of Dry Soil & Pan (g):	6.330	6.301
Weight of Water (g):	0.650	0.637
Weight of Pan (g):	1.095	1.169
Moisture Content (%):	12.4	12.4

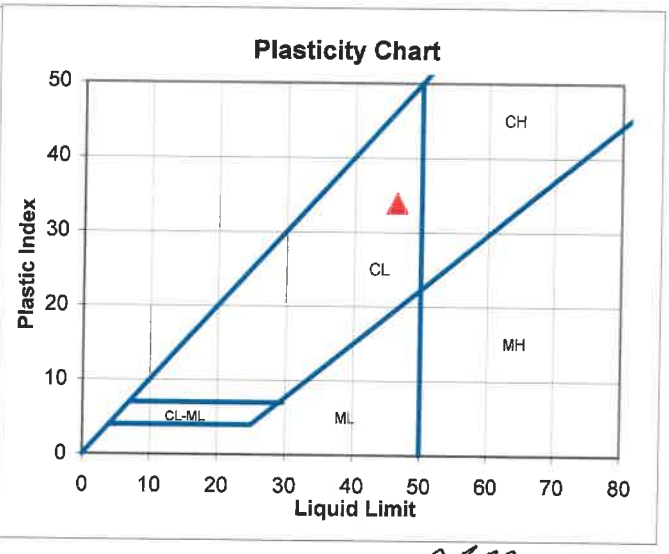
Average: 12.4%
Standard Deviation: 0.0%

Liquid Limits

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Number of Blows:	17	22	31	29	27
Weight of Wet Soil & Pan (g):	9.804	11.241	12.098	12.622	11.685
Weight of Dry Soil & Pan (g):	6.925	8.024	8.704	9.031	8.369
Weight of Water (g):	2.879	3.217	3.394	3.591	3.316
Weight of Pan (g):	1.004	1.165	1.154	1.140	1.141
Moisture Content (%):	48.6	46.9	45.0	45.5	45.9

Plastic Limit: 12
Liquid Limit: 46
Plastic Index: 34
Atterberg Classification CL





Data Entered By: WAR
Date: 9/13/2017
File Name: 2076_245_atterberg-ASTMD-4318-R8_0.xls

Data Checked By: DLM
Date: 9/13/17

ATT
ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-103
Depth: 43.5-44'
Sample Number: S20
Test Date: 9/13/2017
Technician: CRP
Sampled Date: --
Sampled By: --
Method: Method A

Test Configuration

Liquid Limits Device: 1080
Material Size of Fines: -#40

Plastic Limits

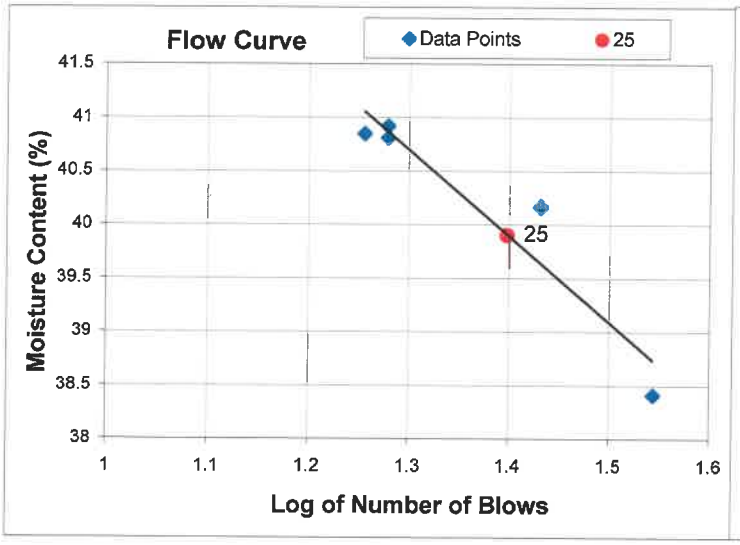
	Sample 1	Sample 2	Sample 3
Weight of Wet Soil & Pan (g):	7.215	6.878	7.363
Weight of Dry Soil & Pan (g):	6.454	6.203	6.609
Weight of Water (g):	0.761	0.675	0.754
Weight of Pan (g):	1.130	1.145	1.166
Moisture Content (%):	14.3	13.3	13.9

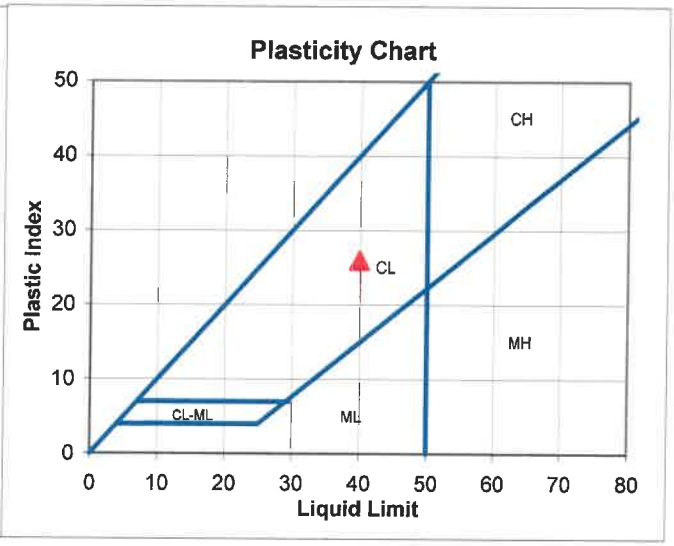
Average: 13.8%
Standard Deviation: 0.5%

Liquid Limits

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Number of Blows:	18	19	19	35	27
Weight of Wet Soil & Pan (g):	12.675	12.111	9.766	13.282	14.205
Weight of Dry Soil & Pan (g):	9.379	8.980	7.325	9.961	10.458
Weight of Water (g):	3.296	3.131	2.441	3.321	3.747
Weight of Pan (g):	1.310	1.308	1.360	1.316	1.129
Moisture Content (%):	40.8	40.8	40.9	38.4	40.2

Plastic Limit: 14
Liquid Limit: 40
Plastic Index: 26
Atterberg Classification CL





Data Entered By: DPM
Date: 9/14/2017
File Name: 2076_245_atterberg-ASTMD-4318-R8_13.xls

Data Checked By:_____
Date:_____

ATT
ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-104
Depth: 20-22'
Sample Number: C1
Test Date: 9/13/2017
Technician: WAR
Sampled Date: --
Sampled By: --
Method: Method A

Test Configuration

Liquid Limits Device: 0966
Material Size of Fines: -#40

Plastic Limits

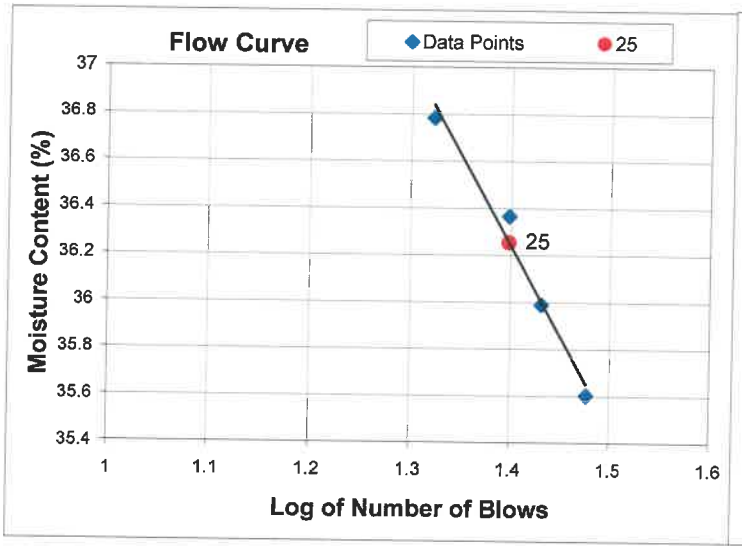
	Sample 1	Sample 2
Weight of Wet Soil & Pan (g):	7.405	7.448
Weight of Dry Soil & Pan (g):	6.547	6.597
Weight of Water (g):	0.858	0.851
Weight of Pan (g):	1.106	1.142
Moisture Content (%):	15.8	15.6

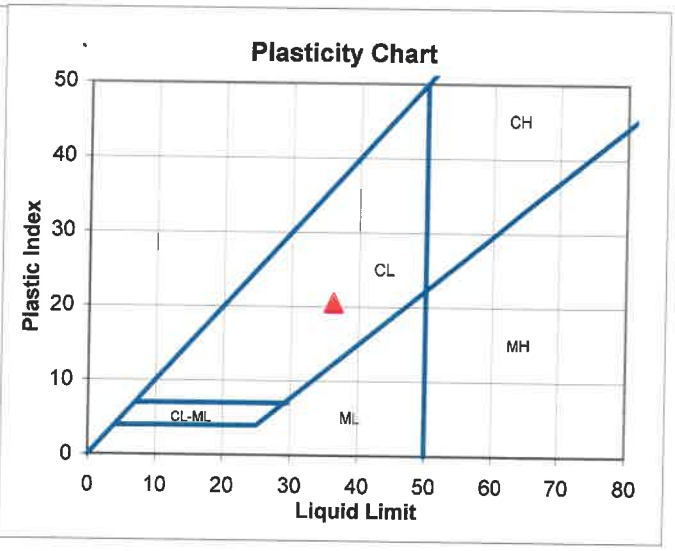
Average: 15.7%
Standard Deviation: 0.1%

Liquid Limits

	Sample 1	Sample 2	Sample 3	Sample 4
Number of Blows:	30	27	25	21
Weight of Wet Soil & Pan (g):	19.388	19.843	18.454	19.279
Weight of Dry Soil & Pan (g):	14.594	14.876	13.822	14.400
Weight of Water (g):	4.794	4.967	4.632	4.879
Weight of Pan (g):	1.129	1.075	1.085	1.136
Moisture Content (%):	35.6	36.0	36.4	36.8

Plastic Limit: 16
Liquid Limit: 36
Plastic Index: 20
Atterberg Classification CL





Data Entered By: DPM
Date: 9/14/2017
File Name: 2076_245_atterberg-ASTMD-4318-R8_12.xls

Data Checked By: CJC
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-104
Depth: 40-42'
Sample Number: C-2
Test Date: 9/13/2017
Technician: WAR
Sampled Date: --
Sampled By: --
Method: Method A

Test Configuration

Liquid Limits Device: 0966
Material Size of Fines: -#40

Plastic Limits

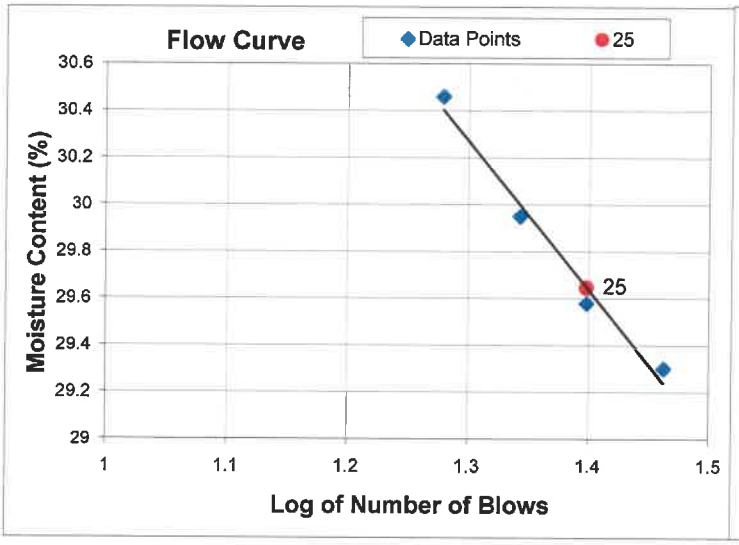
	Sample 1	Sample 2
Weight of Wet Soil & Pan (g):	6.566	8.005
Weight of Dry Soil & Pan (g):	5.847	7.065
Weight of Water (g):	0.719	0.940
Weight of Pan (g):	1.048	1.125
Moisture Content (%):	15.0	15.8

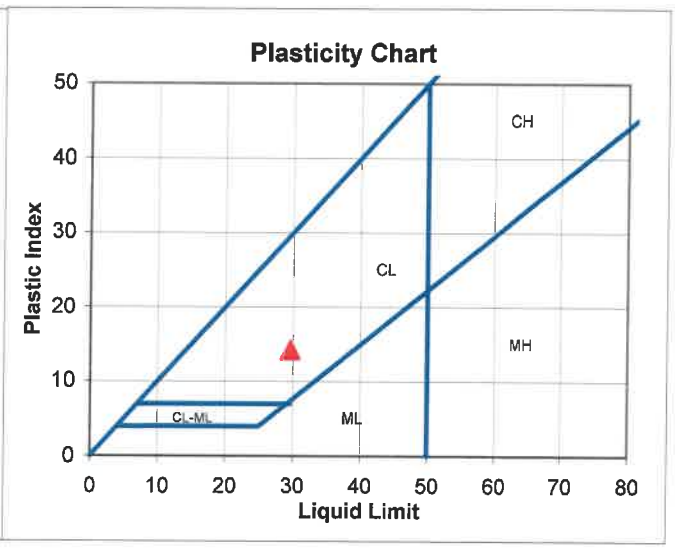
Average: 15.4%
Standard Deviation: 0.6%

Liquid Limits

	Sample 1	Sample 2	Sample 3	Sample 4
Number of Blows:	29	25	22	19
Weight of Wet Soil & Pan (g):	20.363	16.745	18.396	20.675
Weight of Dry Soil & Pan (g):	16.004	13.185	14.419	16.115
Weight of Water (g):	4.359	3.560	3.977	4.560
Weight of Pan (g):	1.128	1.150	1.140	1.145
Moisture Content (%):	29.3	29.6	29.9	30.5

Plastic Limit: 15
Liquid Limit: 30
Plastic Index: 15
Atterberg Classification CL





Data Entered By: DPM
Date: 9/14/2017
File Name: 2076_245_atterberg-ASTMD-4318-R8_11.xls

Data Checked By: CMC
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-104
Depth: 47-47.5'
Sample Number: S14
Test Date: 9/13/2017
Technician: BDF
Sampled Date: --
Sampled By: --
Method: Method A

Test Configuration

Liquid Limits Device: 1075
Material Size of Fines: -#40

Plastic Limits

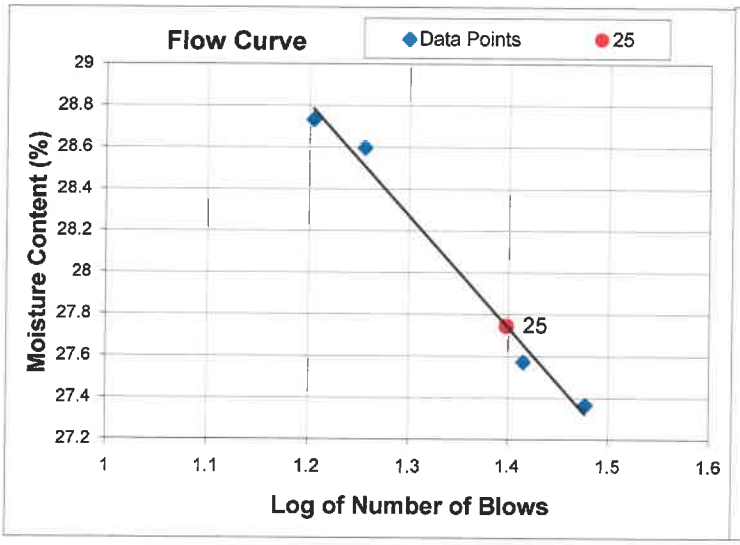
	Sample 1	Sample 2
Weight of Wet Soil & Pan (g):	7.573	7.553
Weight of Dry Soil & Pan (g):	6.882	6.859
Weight of Water (g):	0.691	0.694
Weight of Pan (g):	1.181	1.142
Moisture Content (%):	12.1	12.1

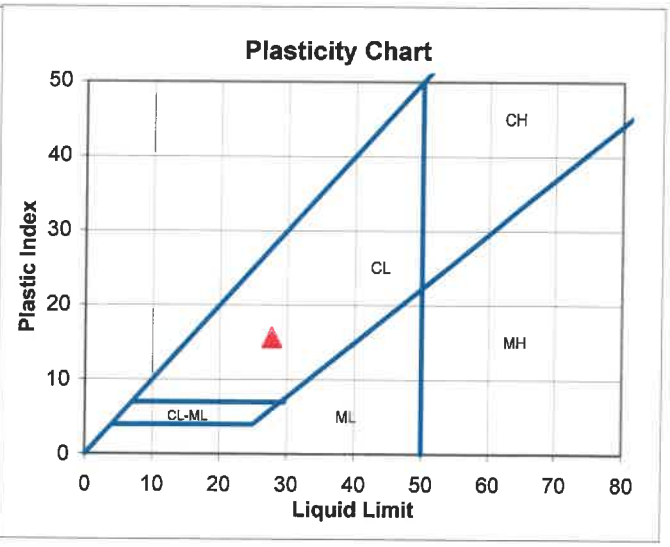
Average: 12.1%
Standard Deviation: 0.0%

Liquid Limits

	Sample 1	Sample 2	Sample 3	Sample 4
Number of Blows:	16	18	26	30
Weight of Wet Soil & Pan (g):	10.059	10.705	13.709	17.132
Weight of Dry Soil & Pan (g):	8.073	8.567	10.993	13.705
Weight of Water (g):	1.986	2.138	2.716	3.427
Weight of Pan (g):	1.161	1.091	1.143	1.183
Moisture Content (%):	28.7	28.6	27.6	27.4

Plastic Limit: 12
Liquid Limit: 28
Plastic Index: 16
Atterberg Classification CL





Data Entered By: DPM
Date: 9/14/2017
File Name: 2076_245_atterberg-ASTMD-4318-R8_7.xls

Data Checked By: CH
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-105
Depth: 14.0-16.0
Sample Number: S5
Test Date: 9/12/2017
Technician: BDF
Sampled Date: --
Sampled By: --
Method: Method A

Test Configuration

Liquid Limits Device: 1075
Material Size of Fines: -#40

Plastic Limits

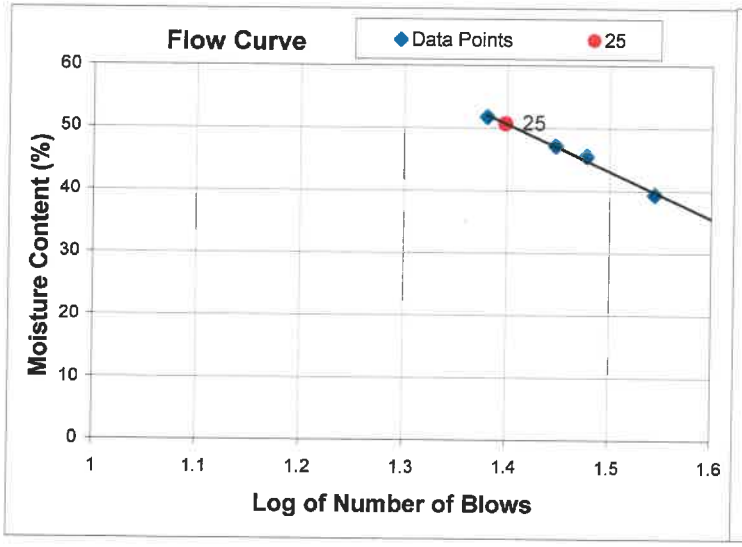
	Sample 1	Sample 2
Weight of Wet Soil & Pan (g):	6.888	6.854
Weight of Dry Soil & Pan (g):	6.116	6.083
Weight of Water (g):	0.772	0.771
Weight of Pan (g):	1.111	1.136
Moisture Content (%):	15.4	15.6

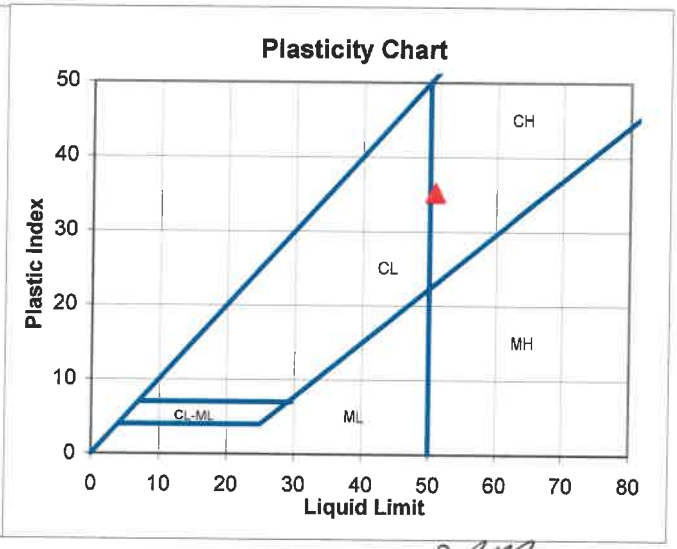
Average: 15.5%
Standard Deviation: 0.1%

Liquid Limits

	Sample 1	Sample 2	Sample 3	Sample 4
Number of Blows:	30	24	35	28
Weight of Wet Soil & Pan (g):	11.708	11.325	11.485	12.048
Weight of Dry Soil & Pan (g):	8.405	8.056	8.556	8.215
Weight of Water (g):	3.303	3.475	2.929	3.833
Weight of Pan (g):	1.136	1.136	1.113	1.151
Moisture Content (%):	45.4	51.8	39.4	54.3

Plastic Limit: 16
Liquid Limit: 51
Plastic Index: 29
Atterberg Classification CH





Data Entered By: WAR
Date: 9/13/2017
File Name: 2076_245_atterberg-ASTMD-4318-R8_1.xls

Data Checked By: DPW
Date: 9/13/17

ATT
ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: GEI Consultants Inc.
Job Number: 2076-245
Project: Laramie Energy Nichols Pads
Location: Collbran Colorado
Project Number: 1703391

Boring Number: SB-105
Depth: 50-52
Sample Number: S13
Test Date: 9/13/2017
Technician: WAR
Sampled Date: --
Sampled By: --
Method: Method A

Test Configuration

Liquid Limits Device: 1080
Material Size of Fines: -#40

Plastic Limits

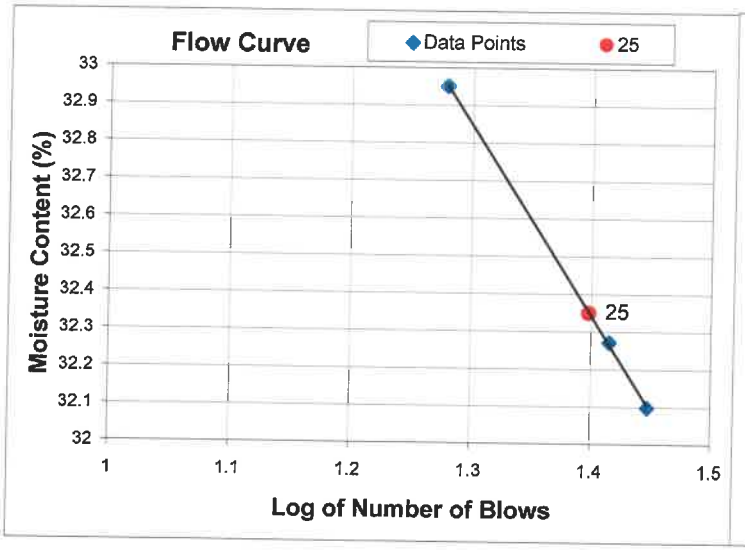
	Sample 1	Sample 2
Weight of Wet Soil & Pan (g):	6.624	6.717
Weight of Dry Soil & Pan (g):	5.915	6.022
Weight of Water (g):	0.709	0.695
Weight of Pan (g):	1.101	1.130
Moisture Content (%):	14.7	14.2

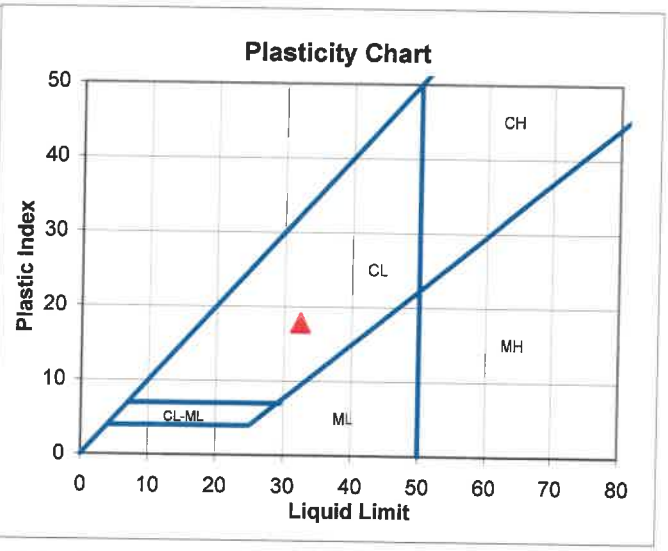
Average: 14.5%
Standard Deviation: 0.4%

Liquid Limits

	Sample 1	Sample 2	Sample 3
Number of Blows:	19	26	28
Weight of Wet Soil & Pan (g):	18.287	20.567	18.535
Weight of Dry Soil & Pan (g):	14.029	15.814	14.305
Weight of Water (g):	4.258	4.753	4.230
Weight of Pan (g):	1.107	1.086	1.127
Moisture Content (%):	33.0	32.3	32.1

Plastic Limit: 14
Liquid Limit: 32
Plastic Index: 18
Atterberg Classification CL





Data Entered By: DPM
Date: 9/14/2017
File Name: 2076_245_atterberg-ASTMD-4318-R8_6.xls

Data Checked By: CHL
Date: 9/14/17

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D3080

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Test Start Date: 08/30/17 By: DPM
Test Finish Date: 08/30/17 By: DPM

Raw Data Files: GIDS110A.DAT,
GIDS110B.DAT,
GIDS110C.DAT

Sample Information

Boring: SB-101
Depth: 10-12'
Sample Number: C-1
Sampled Date: 08/05/17
Soil Description: Califonia Liner

Test Configuration

Continuous, Increasing, Deflection Control
Shear Rate (in./min.): 0.0058
Normal Stress Point A (psf): 4330
Normal Stress Point B (psf): 2900
Normal Stress Point C (psf): 1430

	Point A 4330 psf		Point B 2900 psf		Point C 1430 psf	
	Before	After	Before	After	Before	After
Wt. Wet Soil & Ring (g):	132.84	133.39	132.03	133.19	131.73	133.07
Wt of Ring (g):	27.97	27.97	27.90	27.90	27.16	27.16
Wt. Wet Soil (g):	104.87	105.42	104.13	105.29	104.57	105.91
Wt. Wet Soil & Pan (g):	111.48	112.03	110.66	111.82	111.08	112.43
Wt. Dry Soil & Pan(g):	96.21	96.21	95.78	95.78	95.75	95.75
Wt. Water (g):	15.26	15.81	14.88	16.04	15.34	16.68
Wt. of Pan (g):	6.61	6.61	6.53	6.53	6.52	6.52
Wt. of Dry Soil (g):	89.61	89.61	89.25	89.25	89.23	89.23
Percent Moisture:	17.03%	17.65%	16.67%	17.97%	17.19%	18.69%
Diameter (in):	1.938	1.938	1.938	1.938	1.938	1.938
Area (in²):	2.950	2.950	2.950	2.950	2.950	2.950
Height (in):	1.000	0.983	1.000	0.989	1.000	0.997
Volume (ft^3):	0.00171	0.00168	0.00171	0.00169	0.00171	0.00170
Wet Density (pcf):	135.43	138.44	134.48	137.53	135.05	137.21
Dry Density (pcf):	115.72	117.68	115.26	116.58	115.24	115.60

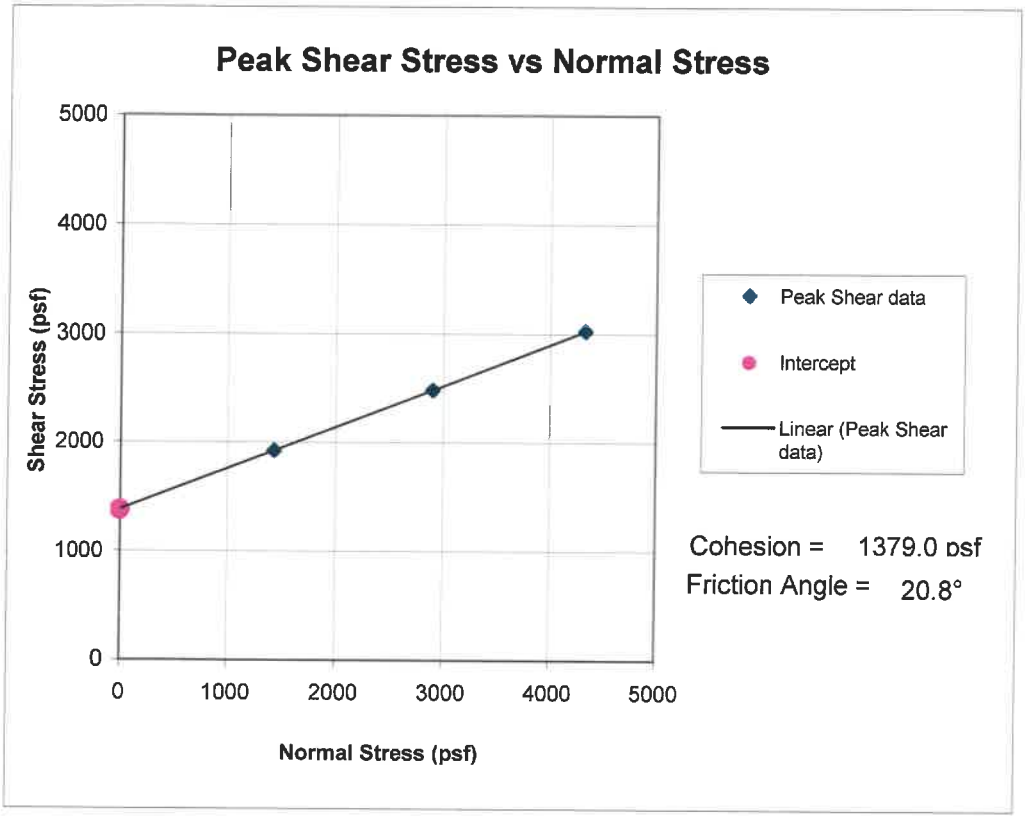
	Point A 4330 psf	Point B 2900 psf	Point C 1430 psf
Peak Strength (psf)	3021.0	2480.0	1921.0
Ultimate Strength(psf)	2648.0	1902.0	988.0

	Peak	Ultimate
Friction Angle °	20.8	29.8
Cohesion (psf)	1379.0	193.0

Data Entered By: DPM
Entry Date: 08/31/17
File Name: 2076_245_directShear-ASTMD3080-R3_3.xls

Data Checked By CAL
Date 09/5/17

ATT
ADVANCED TERRA TESTING



Client Data

Client: GEI Consultants Inc.

Job Number.: 2076-245

Location: Laramie Energy Nichols Pads

Project Number: 1703391

Project: Collbran Colorado

Sample Information

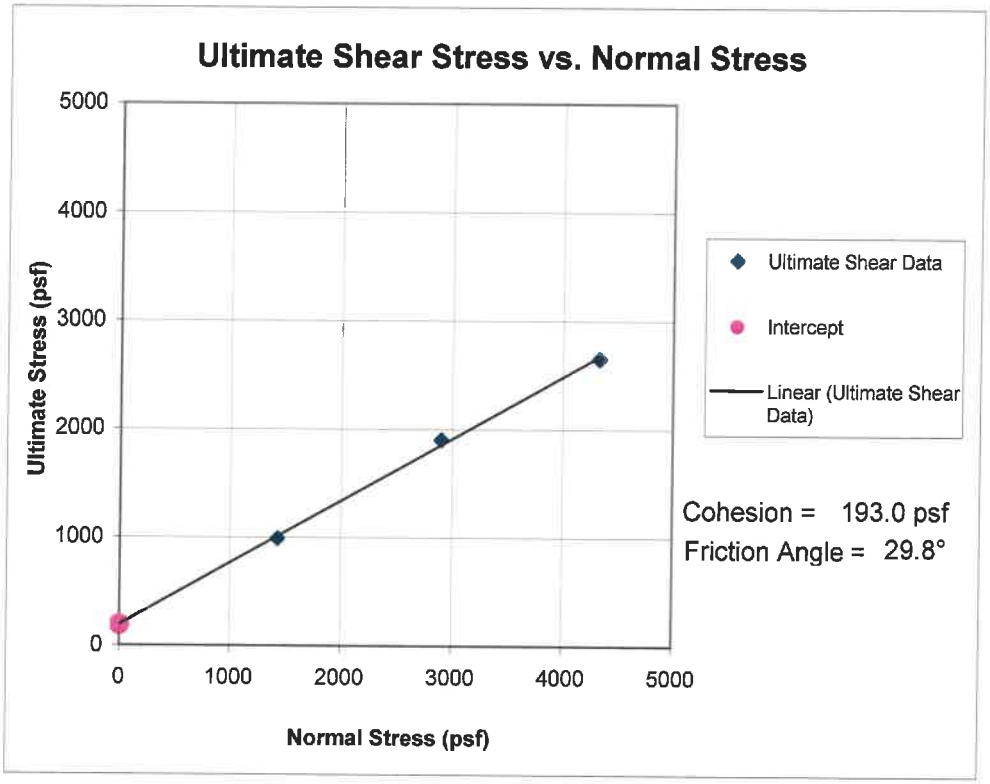
Boring: SB-101

Depth: 10-12'

Sample Number: C-1

Sampled Date: 08/05/17

Soil Description: Califonia Liner



Data Entered By: DPM

Entry Date: 08/31/17

File Name: 2076_245_directShear-ASTMD3080-R3_3.xls

Data Checked By CK

Date 09/5/17

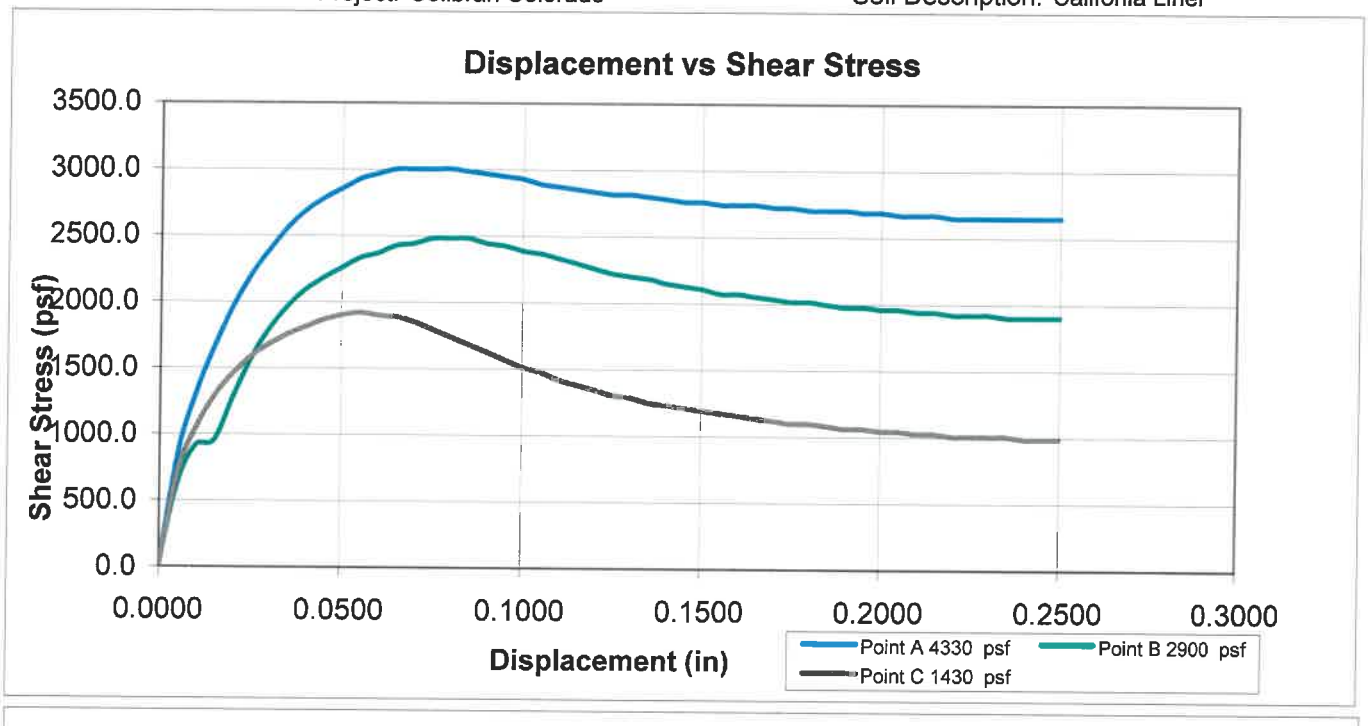
ATT
ADVANCED TERRA TESTING

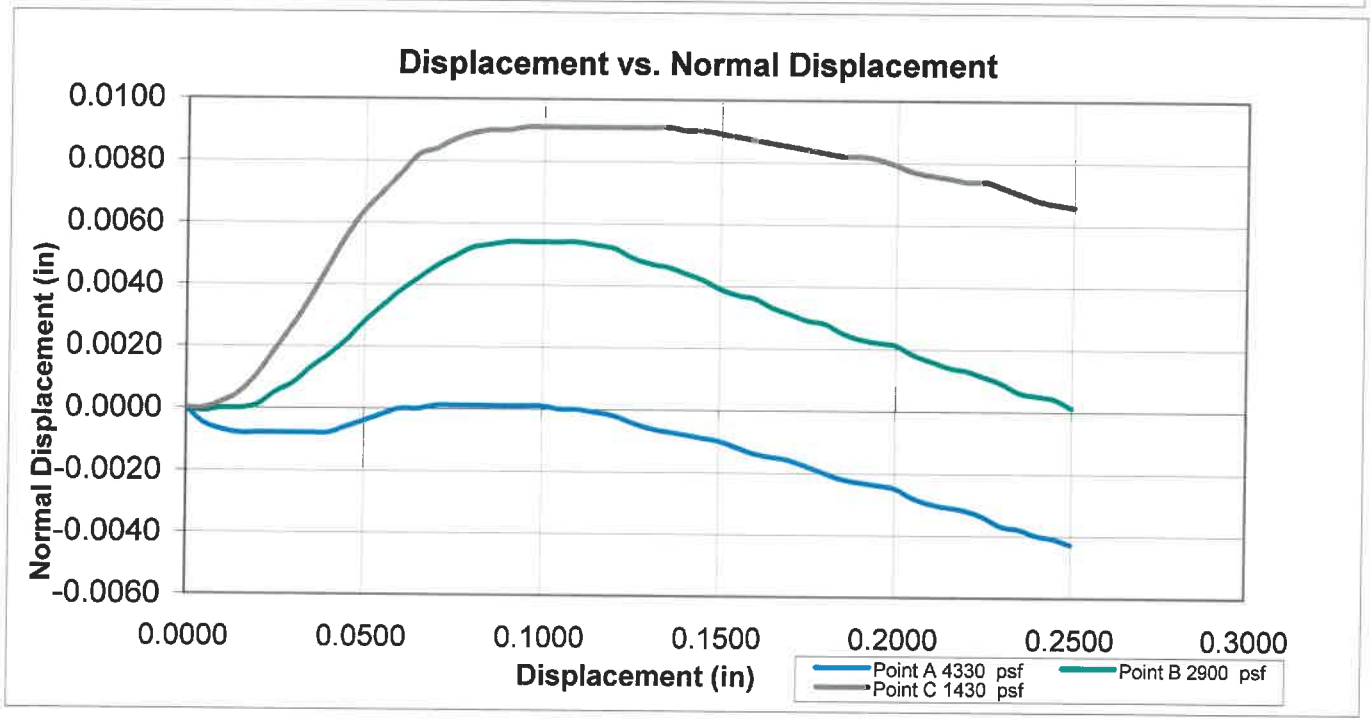
Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Sample Information

Boring: SB-101
Depth: 10-12'
Sample Number: C-1
Sampled Date: 08/05/17
Soil Description: Califonia Liner





Data Entered By: DPM
Entry Date: 08/31/17
File Name: 2076_245_directShear-ASTMD3080-R3_3.xls

Data Checked By CHL
Date 09/05/17

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-101
Depth: 10-12'
Sample Number: C-1
Sampled Date: 08/05/17
Soil Description: Califonia Liner

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.0000	0.0	0.0000	0.0000	19.0	0.0000	0.0000	0.0	0.0000
0.0050	839.0	-0.0005	0.0050	634.0	-0.0001	0.0050	709.0	0.0000
0.0100	1305.0	-0.0007	0.0100	914.0	0.0000	0.0100	1044.0	0.0002
0.0150	1660.0	-0.0008	0.0150	951.0	0.0000	0.0150	1287.0	0.0005
0.0200	1958.0	-0.0008	0.0200	1268.0	0.0001	0.0200	1455.0	0.0011
0.0250	2200.0	-0.0008	0.0250	1566.0	0.0005	0.0250	1585.0	0.0019
0.0300	2387.0	-0.0008	0.0300	1790.0	0.0008	0.0300	1678.0	0.0027
0.0350	2555.0	-0.0008	0.0350	1958.0	0.0013	0.0350	1753.0	0.0036
0.0400	2685.0	-0.0008	0.0400	2089.0	0.0017	0.0400	1809.0	0.0046
0.0450	2779.0	-0.0006	0.0450	2182.0	0.0022	0.0450	1865.0	0.0056
0.0500	2853.0	-0.0004	0.0500	2256.0	0.0028	0.0500	1902.0	0.0064
0.0550	2928.0	-0.0002	0.0550	2331.0	0.0033	0.0550	1921.0	0.0070
0.0600	2965.0	0.0000	0.0600	2368.0	0.0038	0.0600	1902.0	0.0076
0.0650	3002.0	0.0000	0.0650	2424.0	0.0042	0.0650	1883.0	0.0082
0.0700	3002.0	0.0001	0.0700	2443.0	0.0046	0.0700	1846.0	0.0084
0.0750	3002.0	0.0001	0.0750	2480.0	0.0049	0.0750	1790.0	0.0087
0.0800	3002.0	0.0001	0.0800	2480.0	0.0052	0.0800	1734.0	0.0089
0.0850	2984.0	0.0001	0.0850	2480.0	0.0053	0.0850	1678.0	0.0090
0.0900	2965.0	0.0001	0.0900	2443.0	0.0054	0.0900	1622.0	0.0090
0.0950	2946.0	0.0001	0.0950	2424.0	0.0054	0.0950	1566.0	0.0091
0.1000	2928.0	0.0001	0.1000	2387.0	0.0054	0.1000	1510.0	0.0091
0.1050	2890.0	0.0000	0.1050	2368.0	0.0054	0.1050	1473.0	0.0091
0.1100	2872.0	0.0000	0.1100	2331.0	0.0054	0.1100	1417.0	0.0091
0.1150	2853.0	-0.0001	0.1150	2294.0	0.0053	0.1150	1380.0	0.0091
0.1200	2834.0	-0.0002	0.1200	2256.0	0.0052	0.1200	1343.0	0.0091
0.1250	2816.0	-0.0004	0.1250	2219.0	0.0049	0.1250	1305.0	0.0091
0.1300	2816.0	-0.0006	0.1300	2200.0	0.0047	0.1300	1287.0	0.0091
0.1350	2797.0	-0.0007	0.1350	2182.0	0.0046	0.1350	1249.0	0.0091
0.1400	2779.0	-0.0008	0.1400	2144.0	0.0044	0.1400	1231.0	0.0090
0.1450	2760.0	-0.0009	0.1450	2126.0	0.0042	0.1450	1212.0	0.0090
0.1500	2760.0	-0.0010	0.1500	2107.0	0.0039	0.1500	1193.0	0.0089
0.1550	2741.0	-0.0012	0.1550	2070.0	0.0037	0.1550	1175.0	0.0088
0.1600	2741.0	-0.0014	0.1600	2070.0	0.0036	0.1600	1156.0	0.0087
0.1650	2741.0	-0.0015	0.1650	2051.0	0.0033	0.1650	1138.0	0.0086
0.1700	2723.0	-0.0016	0.1700	2033.0	0.0031	0.1700	1119.0	0.0085
0.1750	2723.0	-0.0018	0.1750	2014.0	0.0029	0.1750	1100.0	0.0084
0.1800	2704.0	-0.0020	0.1800	2014.0	0.0028	0.1800	1100.0	0.0083
0.1850	2704.0	-0.0022	0.1850	1995.0	0.0025	0.1850	1082.0	0.0082
0.1900	2704.0	-0.0023	0.1900	1977.0	0.0023	0.1900	1063.0	0.0082

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-101
Depth: 10-12'
Sample Number: C-1
Sampled Date: 08/05/17
Soil Description: Califonia Liner

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.1950	2685.0	-0.0024	0.1950	1977.0	0.0022	0.1950	1063.0	0.0081
0.2000	2685.0	-0.0025	0.2000	1958.0	0.0021	0.2000	1044.0	0.0079
0.2050	2667.0	-0.0028	0.2050	1958.0	0.0018	0.2050	1044.0	0.0077
0.2100	2667.0	-0.0030	0.2100	1939.0	0.0016	0.2100	1026.0	0.0076
0.2150	2667.0	-0.0031	0.2150	1939.0	0.0014	0.2150	1026.0	0.0075
0.2200	2648.0	-0.0032	0.2200	1921.0	0.0013	0.2200	1007.0	0.0074
0.2250	2648.0	-0.0034	0.2250	1921.0	0.0011	0.2250	1007.0	0.0074
0.2300	2648.0	-0.0037	0.2300	1921.0	0.0009	0.2300	1007.0	0.0072
0.2350	2648.0	-0.0038	0.2350	1902.0	0.0006	0.2350	1007.0	0.0070
0.2400	2648.0	-0.0040	0.2400	1902.0	0.0005	0.2400	988.0	0.0068
0.2450	2648.0	-0.0041	0.2450	1902.0	0.0004	0.2450	988.0	0.0067
0.2500	2648.0	-0.0043	0.2500	1902.0	0.0001	0.2500	988.0	0.0066

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D3080

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Test Start Date: 08/28/17 By: DPM
Test Finish Date: 08/29/17 By: DPM

Raw Data Files: GIDS420A.DAT,
GIDS420B.DAT,
GIDS420C.DAT

Sample Information

Boring: SB-104
Depth: 20-22'
Sample Number: C-1
Sampled Date: 08/07/17
Soil Description: California Liner

Test Configuration

Continuous, Increasing, Deflection Control
Shear Rate (in./min.): 0.0026
Normal Stress Point A (psf): 4330
Normal Stress Point B (psf): 2900
Normal Stress Point C (psf): 1430

	Point A 4330 psf		Point B 2900 psf		Point C 1430 psf	
	Before	After	Before	After	Before	After
Wt. Wet Soil & Ring (g):	127.47	128.86	127.48	129.54	129.05	131.07
Wt of Ring (g):	27.90	27.90	27.90	27.90	27.90	27.90
Wt. Wet Soil (g):	99.57	100.96	99.58	101.64	101.15	103.17
Wt. Wet Soil & Pan (g):	106.21	107.60	106.22	108.27	107.79	109.81
Wt. Dry Soil & Pan(g):	90.71	90.71	91.03	91.03	91.97	91.97
Wt. Water (g):	15.50	16.89	15.19	17.24	15.82	17.84
Wt. of Pan (g):	6.64	6.64	6.64	6.64	6.64	6.64
Wt. of Dry Soil (g):	84.07	84.07	84.39	84.39	85.33	85.33
Percent Moisture:	18.44%	20.09%	18.00%	20.43%	18.54%	20.90%
Diameter (in):	1.938	1.938	1.938	1.938	1.938	1.938
Area (in²):	2.950	2.950	2.950	2.950	2.950	2.950
Height (in):	1.000	0.980	1.000	0.988	1.000	0.998
Volume (ft^3):	0.00171	0.00167	0.00171	0.00169	0.00171	0.00170
Wet Density (pcf):	128.60	133.05	128.61	132.85	130.63	133.50
Dry Density (pcf):	108.58	110.79	108.99	110.32	110.20	110.42

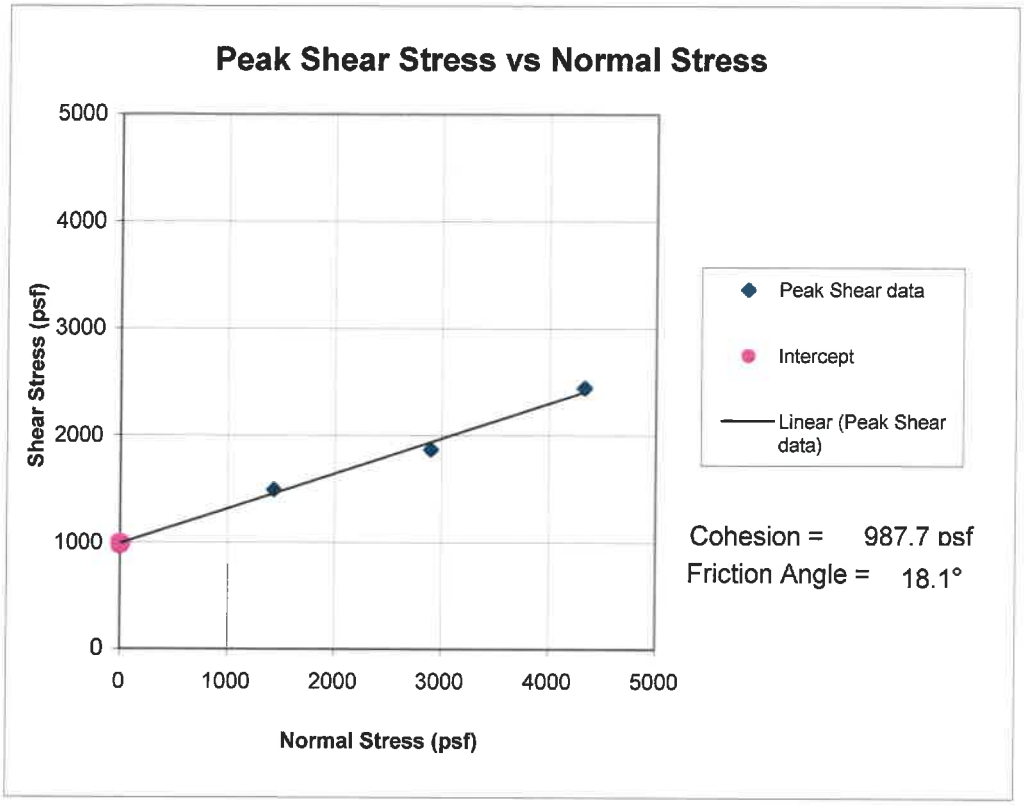
	Point A 4330 psf	Point B 2900 psf	Point C 1430 psf
Peak Strength (psf)	2443.0	1865.0	1492.0
Ultimate Strength(psf)	2331.0	1641.0	914.0

	Peak	Ultimate
Friction Angle °	18.1	26.0
Cohesion (psf)	987.7	218.1

Data Entered By: DPM
Entry Date: 08/31/17
File Name: 2076_245_directShear-ASTMD3080-R3_2.xls

Data Checked By CAL
Date 8/31/17

ATT
ADVANCED TERRA TESTING

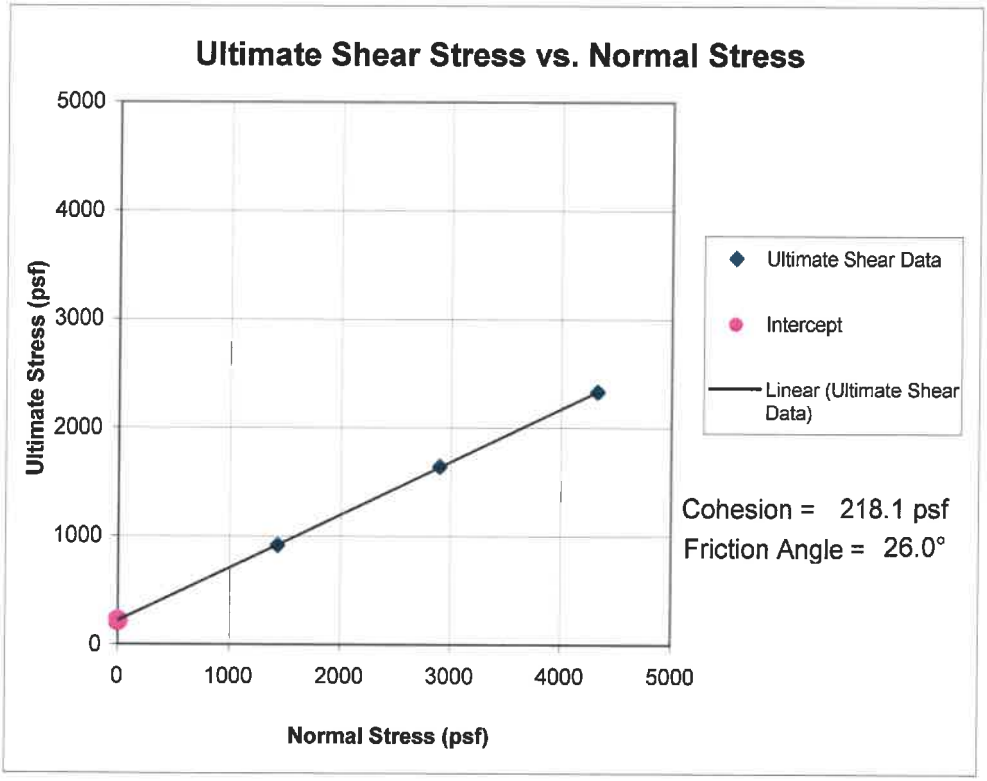


Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Sample Information

Boring: SB-104
Depth: 20-22'
Sample Number: C-1
Sampled Date: 08/07/17
Soil Description: California Liner



Data Entered By: DPM
Entry Date: 08/31/17
File Name: 2076_245_directShear-ASTMD3080-R3_2.xls

Data Checked By CAL
Date 8/31/17

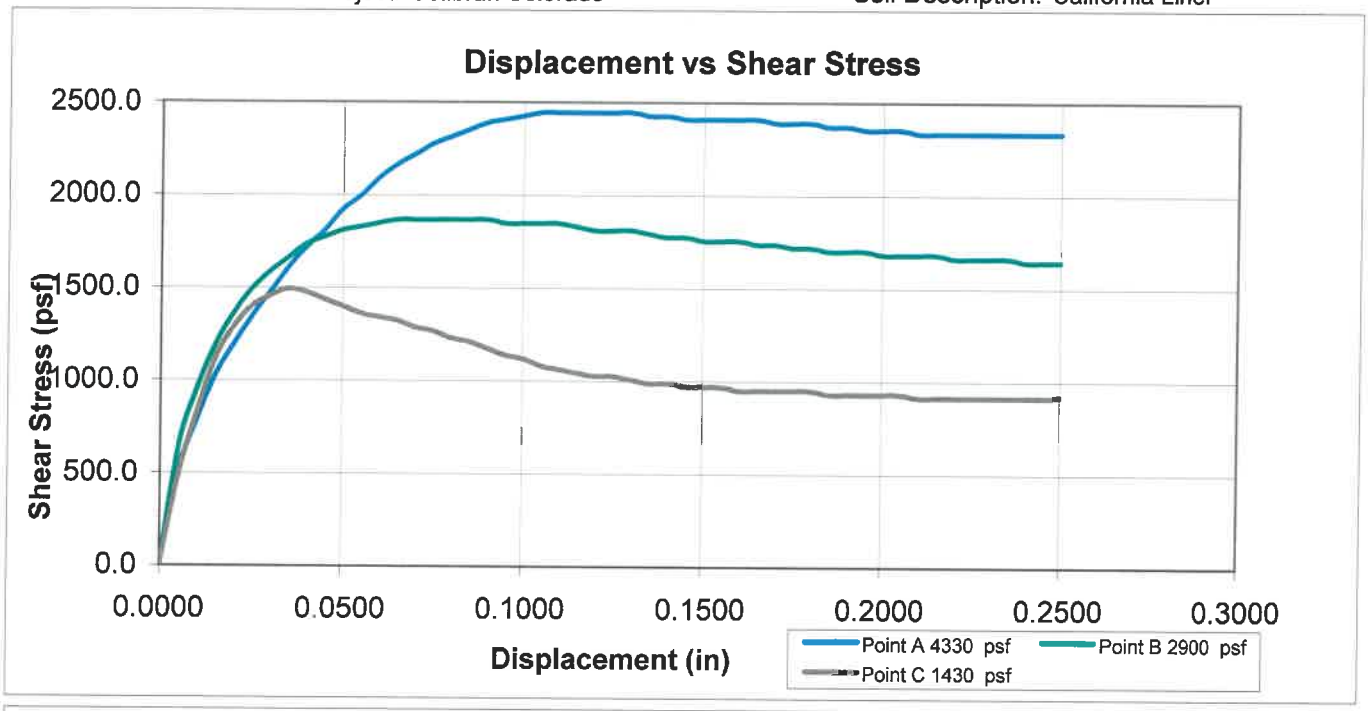
ATT
ADVANCED TERRA TESTING

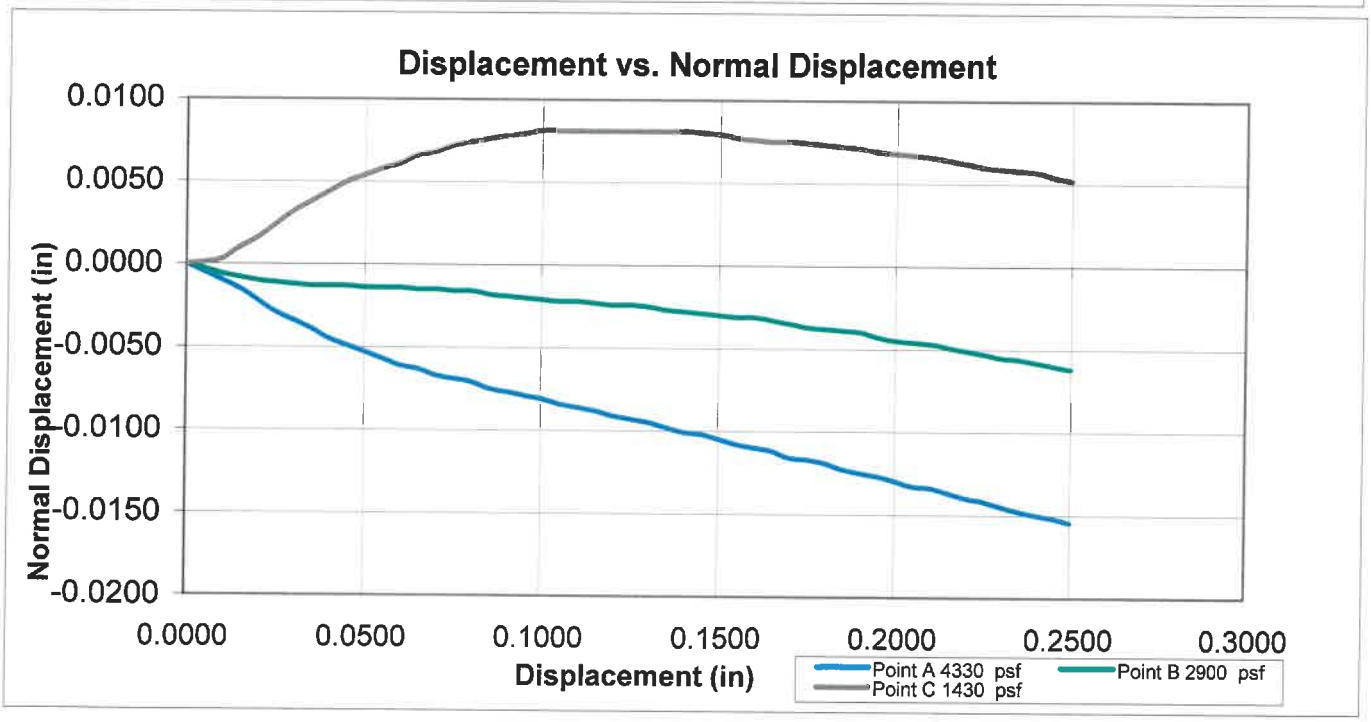
Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Sample Information

Boring: SB-104
Depth: 20-22'
Sample Number: C-1
Sampled Date: 08/07/17
Soil Description: California Liner





Data Entered By: DPM
Entry Date: 08/31/17
File Name: 2076_245_directShear-ASTMD3080-R3_2.xls

Data Checked By CAL
Date 8/31/17

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-104
Depth: 20-22'
Sample Number: C-1
Sampled Date: 08/07/17
Soil Description: California Liner

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.0000	0.0	0.0000	0.0000	0.0	0.0000	0.0000	0.0	0.0000
0.0050	503.0	-0.0005	0.0050	634.0	-0.0003	0.0050	485.0	0.0001
0.0100	783.0	-0.0010	0.0100	951.0	-0.0006	0.0100	821.0	0.0003
0.0150	1026.0	-0.0015	0.0150	1193.0	-0.0008	0.0150	1119.0	0.0010
0.0200	1193.0	-0.0022	0.0200	1361.0	-0.0010	0.0200	1287.0	0.0016
0.0250	1343.0	-0.0029	0.0250	1492.0	-0.0011	0.0250	1399.0	0.0024
0.0300	1473.0	-0.0034	0.0300	1585.0	-0.0012	0.0300	1455.0	0.0032
0.0350	1604.0	-0.0039	0.0350	1660.0	-0.0013	0.0350	1492.0	0.0038
0.0400	1716.0	-0.0045	0.0400	1734.0	-0.0013	0.0400	1473.0	0.0044
0.0450	1809.0	-0.0049	0.0450	1772.0	-0.0013	0.0450	1436.0	0.0050
0.0500	1921.0	-0.0053	0.0500	1809.0	-0.0014	0.0500	1399.0	0.0054
0.0550	1995.0	-0.0057	0.0550	1827.0	-0.0014	0.0550	1361.0	0.0058
0.0600	2089.0	-0.0061	0.0600	1846.0	-0.0014	0.0600	1343.0	0.0061
0.0650	2163.0	-0.0063	0.0650	1865.0	-0.0015	0.0650	1324.0	0.0066
0.0700	2219.0	-0.0067	0.0700	1865.0	-0.0015	0.0700	1287.0	0.0068
0.0750	2275.0	-0.0069	0.0750	1865.0	-0.0016	0.0750	1268.0	0.0072
0.0800	2312.0	-0.0071	0.0800	1865.0	-0.0016	0.0800	1231.0	0.0074
0.0850	2350.0	-0.0075	0.0850	1865.0	-0.0018	0.0850	1212.0	0.0076
0.0900	2387.0	-0.0077	0.0900	1865.0	-0.0019	0.0900	1175.0	0.0078
0.0950	2406.0	-0.0079	0.0950	1846.0	-0.0020	0.0950	1138.0	0.0079
0.1000	2424.0	-0.0081	0.1000	1846.0	-0.0021	0.1000	1119.0	0.0081
0.1050	2443.0	-0.0084	0.1050	1846.0	-0.0022	0.1050	1082.0	0.0081
0.1100	2443.0	-0.0086	0.1100	1846.0	-0.0022	0.1100	1063.0	0.0081
0.1150	2443.0	-0.0088	0.1150	1827.0	-0.0023	0.1150	1044.0	0.0081
0.1200	2443.0	-0.0091	0.1200	1809.0	-0.0024	0.1200	1026.0	0.0081
0.1250	2443.0	-0.0093	0.1250	1809.0	-0.0024	0.1250	1026.0	0.0081
0.1300	2443.0	-0.0095	0.1300	1809.0	-0.0025	0.1300	1007.0	0.0081
0.1350	2424.0	-0.0098	0.1350	1790.0	-0.0027	0.1350	988.0	0.0081
0.1400	2424.0	-0.0101	0.1400	1772.0	-0.0028	0.1400	988.0	0.0081
0.1450	2406.0	-0.0102	0.1450	1772.0	-0.0029	0.1450	970.0	0.0080
0.1500	2406.0	-0.0105	0.1500	1753.0	-0.0030	0.1500	970.0	0.0079
0.1550	2406.0	-0.0108	0.1550	1753.0	-0.0031	0.1550	970.0	0.0077
0.1600	2406.0	-0.0110	0.1600	1753.0	-0.0031	0.1600	951.0	0.0076
0.1650	2406.0	-0.0112	0.1650	1734.0	-0.0033	0.1650	951.0	0.0075
0.1700	2387.0	-0.0116	0.1700	1734.0	-0.0035	0.1700	951.0	0.0075
0.1750	2387.0	-0.0117	0.1750	1716.0	-0.0037	0.1750	951.0	0.0074
0.1800	2387.0	-0.0119	0.1800	1716.0	-0.0038	0.1800	951.0	0.0073
0.1850	2368.0	-0.0123	0.1850	1697.0	-0.0039	0.1850	932.0	0.0072
0.1900	2368.0	-0.0125	0.1900	1697.0	-0.0040	0.1900	932.0	0.0071

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-104
Depth: 20-22'
Sample Number: C-1
Sampled Date: 08/07/17
Soil Description: California Liner

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.1950	2350.0	-0.0127	0.1950	1697.0	-0.0043	0.1950	932.0	0.0069
0.2000	2350.0	-0.0130	0.2000	1678.0	-0.0045	0.2000	932.0	0.0068
0.2050	2350.0	-0.0133	0.2050	1678.0	-0.0046	0.2050	932.0	0.0067
0.2100	2331.0	-0.0134	0.2100	1678.0	-0.0047	0.2100	914.0	0.0066
0.2150	2331.0	-0.0137	0.2150	1678.0	-0.0049	0.2150	914.0	0.0064
0.2200	2331.0	-0.0140	0.2200	1660.0	-0.0051	0.2200	914.0	0.0062
0.2250	2331.0	-0.0142	0.2250	1660.0	-0.0053	0.2250	914.0	0.0060
0.2300	2331.0	-0.0145	0.2300	1660.0	-0.0055	0.2300	914.0	0.0059
0.2350	2331.0	-0.0148	0.2350	1660.0	-0.0056	0.2350	914.0	0.0058
0.2400	2331.0	-0.0150	0.2400	1641.0	-0.0058	0.2400	914.0	0.0057
0.2450	2331.0	-0.0152	0.2450	1641.0	-0.0060	0.2450	914.0	0.0054
0.2500	2331.0	-0.0155	0.2500	1641.0	-0.0062	0.2500	914.0	0.0052

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D3080

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Test Start Date: 08/24/17 By: DPM
Test Finish Date: 08/25/17 By: DPM

Raw Data Files: GIDS440A.DAT,
GIDS440B.DAT,
GIDS440C.DAT

Sample Information

Boring: SB-104
Depth: 40-42'
Sample Number: C-2
Sampled Date: 08/08/17
Soil Description: --

Test Configuration

Continuous, Increasing, Deflection Control
Shear Rate (in./min.): 0.0070
Normal Stress Point A (psf): 4330
Normal Stress Point B (psf): 2900
Normal Stress Point C (psf): 1430

	Point A 4330 psf		Point B 2900 psf		Point C 1430 psf	
	Before	After	Before	After	Before	After
Wt. Wet Soil & Ring (g):	130.66	131.90	130.43	132.63	131.28	133.71
Wt of Ring (g):	27.97	27.97	27.16	27.16	27.98	27.98
Wt. Wet Soil (g):	102.69	103.93	103.28	105.47	103.31	105.73
Wt. Wet Soil & Pan (g):	109.48	110.72	109.89	112.08	109.93	112.36
Wt. Dry Soil & Pan(g):	96.01	96.01	96.94	96.94	96.33	96.33
Wt. Water (g):	13.48	14.72	12.95	15.15	13.60	16.03
Wt. of Pan (g):	6.80	6.80	6.61	6.61	6.63	6.63
Wt. of Dry Soil (g):	89.21	89.21	90.33	90.33	89.71	89.71
Percent Moisture:	15.11%	16.50%	14.34%	16.77%	15.16%	17.87%
Diameter (in):	1.938	1.938	1.938	1.938	1.938	1.938
Area (in²):	2.950	2.950	2.950	2.950	2.950	2.950
Height (in):	1.000	0.973	1.000	0.987	1.000	0.996
Volume (ft^3):	0.00171	0.00166	0.00171	0.00169	0.00171	0.00170
Wet Density (pcf):	132.62	137.99	133.38	137.97	133.41	137.11
Dry Density (pcf):	115.21	118.45	116.65	118.15	115.85	116.33

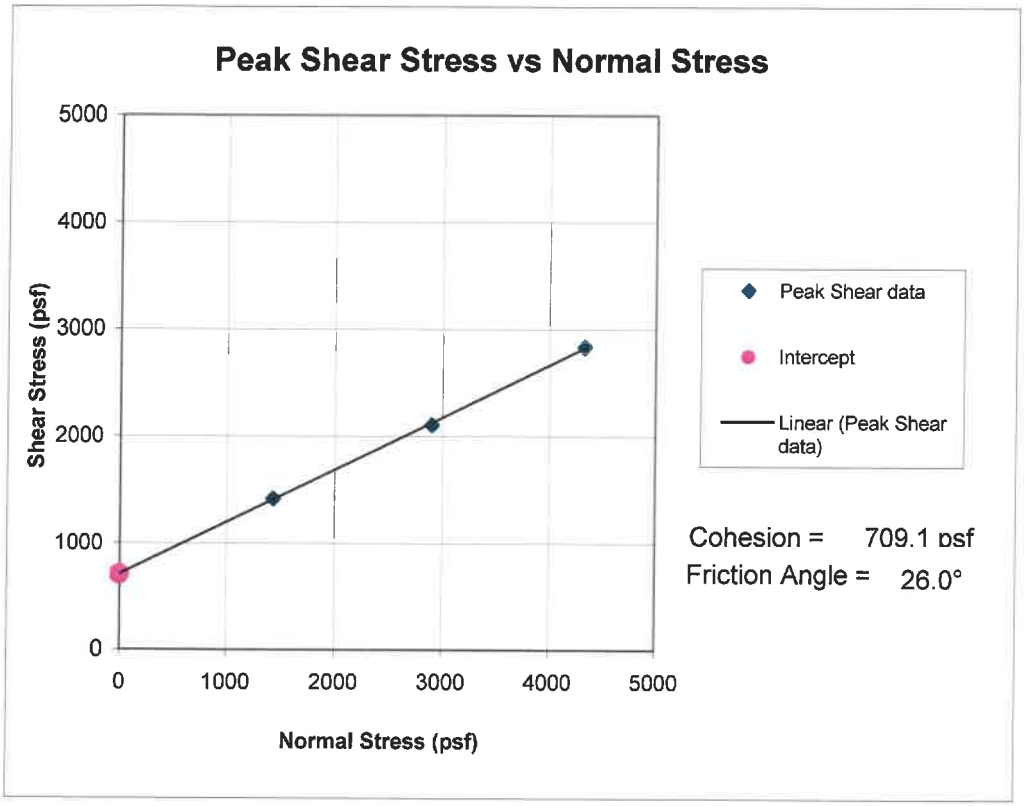
	Point A 4330 psf	Point B 2900 psf	Point C 1430 psf
Peak Strength (psf)	2834.0	2107.0	1417.0
Ultimate Strength(psf)	2592.0	1883.0	970.0

	Peak	Ultimate
Friction Angle °	26.0	29.2
Cohesion (psf)	709.1	199.6

Data Entered By: DPM
Entry Date: 08/29/17
File Name: 2076_245_directShear-ASTMD3080-R3_1.xls

Data Checked By CJL
Date 8/29/17

ATT
ADVANCED TERRA TESTING

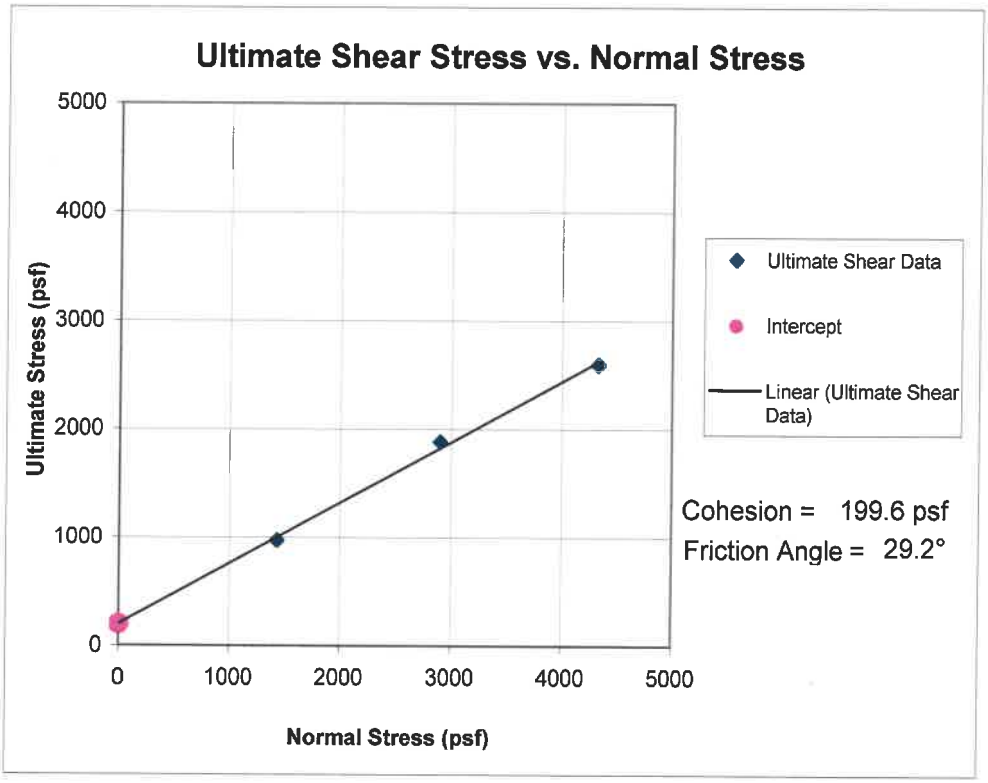


Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Sample Information

Boring: SB-104
Depth: 40-42'
Sample Number: C-2
Sampled Date: 08/08/17
Soil Description: --



Data Entered By: DPM
Entry Date: 08/29/17
File Name: 2076_245_directShear-ASTMD3080-R3_1.xls

Data Checked By CK
Date 8/29/17

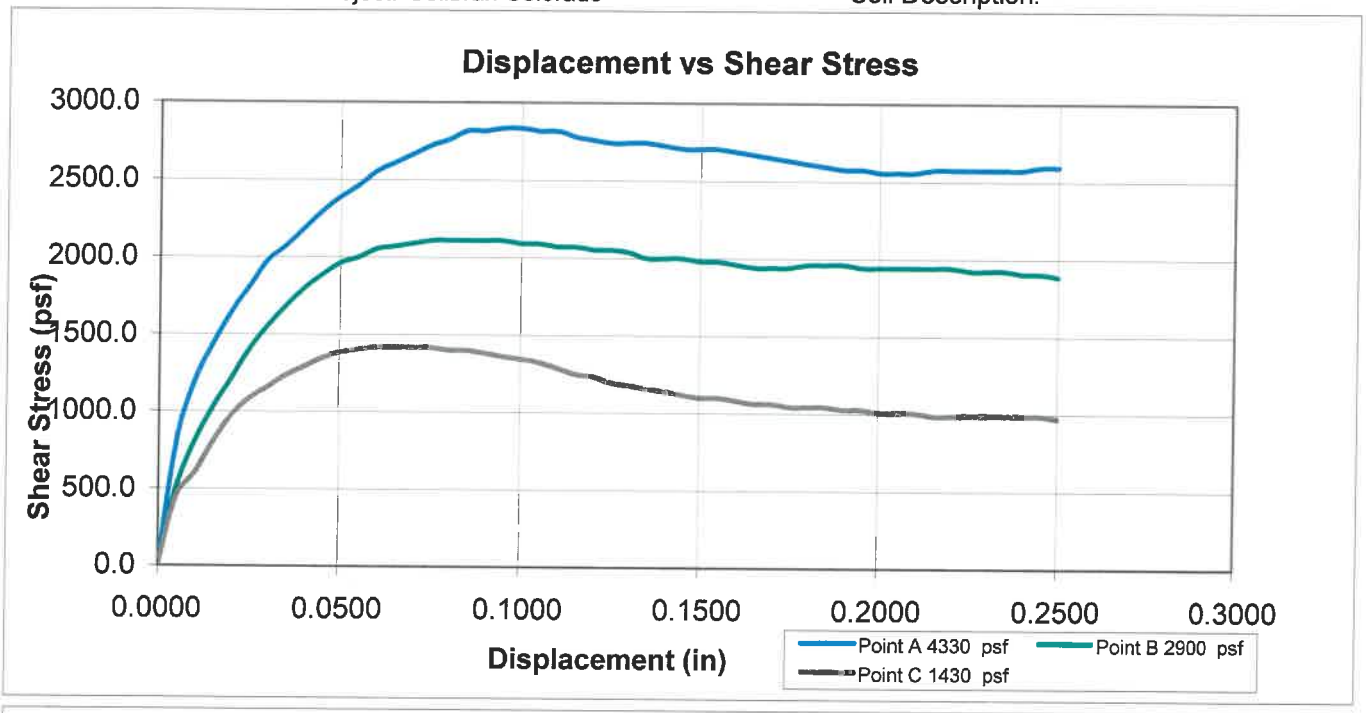
ATT
ADVANCED TERRA TESTING

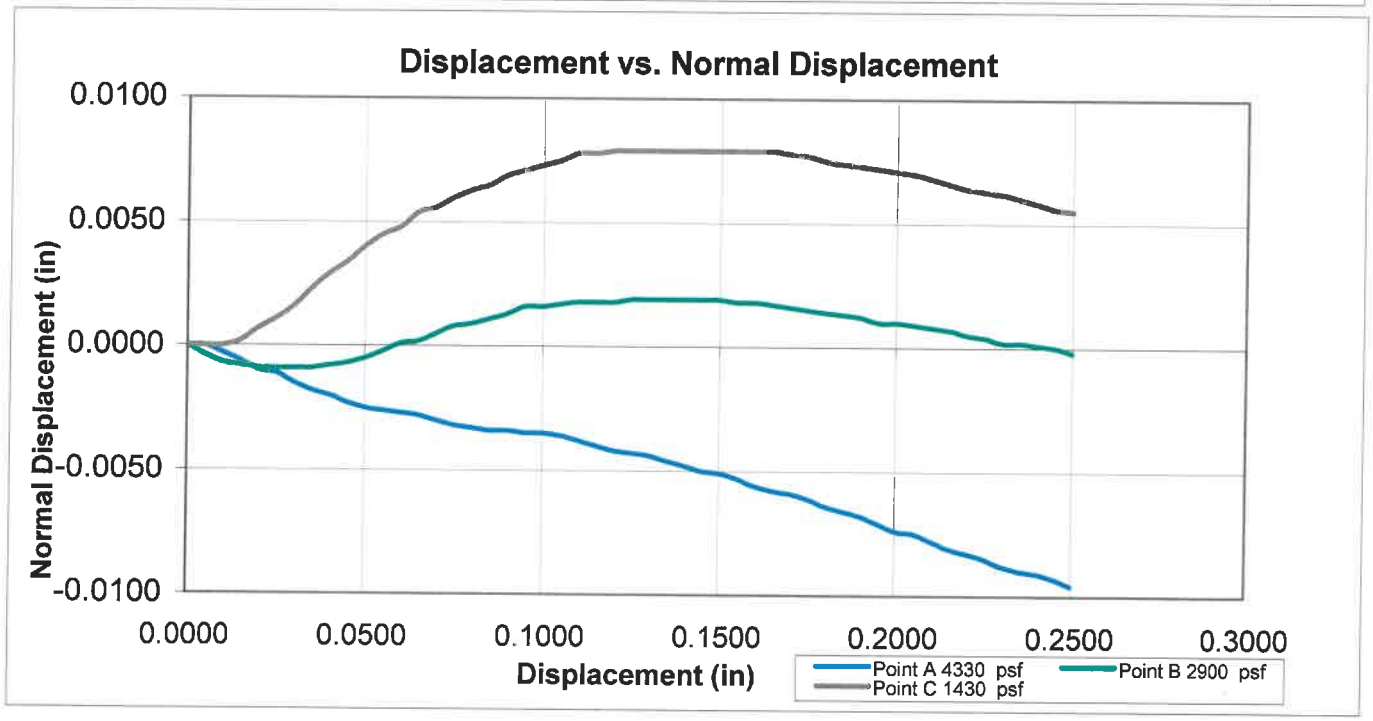
Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Sample Information

Boring: SB-104
Depth: 40-42'
Sample Number: C-2
Sampled Date: 08/08/17
Soil Description: --





Data Entered By: DPM
Entry Date: 08/29/17
File Name: 2076_245_directShear-ASTMD3080-R3_1.xls

Data Checked By CM
Date 8/29/17

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-104
Depth: 40-42'
Sample Number: C-2
Sampled Date: 08/08/17
Soil Description: --

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.0000	0.0	0.0000	0.0000	0.0	0.0000	0.0000	0.0	0.0000
0.0050	802.0	0.0000	0.0050	503.0	-0.0004	0.0050	448.0	0.0000
0.0100	1193.0	-0.0003	0.0100	802.0	-0.0007	0.0100	597.0	0.0000
0.0150	1436.0	-0.0006	0.0150	1026.0	-0.0008	0.0150	802.0	0.0002
0.0200	1641.0	-0.0010	0.0200	1212.0	-0.0009	0.0200	970.0	0.0007
0.0250	1809.0	-0.0011	0.0250	1399.0	-0.0009	0.0250	1082.0	0.0011
0.0300	1977.0	-0.0015	0.0300	1548.0	-0.0009	0.0300	1156.0	0.0016
0.0350	2070.0	-0.0018	0.0350	1678.0	-0.0009	0.0350	1231.0	0.0023
0.0400	2182.0	-0.0020	0.0400	1790.0	-0.0008	0.0400	1287.0	0.0029
0.0450	2294.0	-0.0023	0.0450	1883.0	-0.0007	0.0450	1343.0	0.0034
0.0500	2387.0	-0.0025	0.0500	1958.0	-0.0005	0.0500	1380.0	0.0040
0.0550	2462.0	-0.0026	0.0550	1995.0	-0.0002	0.0550	1399.0	0.0045
0.0600	2555.0	-0.0027	0.0600	2051.0	0.0001	0.0600	1417.0	0.0048
0.0650	2611.0	-0.0028	0.0650	2070.0	0.0002	0.0650	1417.0	0.0054
0.0700	2667.0	-0.0030	0.0700	2089.0	0.0005	0.0700	1417.0	0.0056
0.0750	2723.0	-0.0032	0.0750	2107.0	0.0008	0.0750	1417.0	0.0060
0.0800	2760.0	-0.0033	0.0800	2107.0	0.0009	0.0800	1399.0	0.0063
0.0850	2816.0	-0.0034	0.0850	2107.0	0.0011	0.0850	1399.0	0.0065
0.0900	2816.0	-0.0034	0.0900	2107.0	0.0013	0.0900	1380.0	0.0069
0.0950	2834.0	-0.0035	0.0950	2107.0	0.0016	0.0950	1361.0	0.0071
0.1000	2834.0	-0.0035	0.1000	2089.0	0.0016	0.1000	1343.0	0.0073
0.1050	2816.0	-0.0036	0.1050	2089.0	0.0017	0.1050	1324.0	0.0075
0.1100	2816.0	-0.0038	0.1100	2070.0	0.0018	0.1100	1287.0	0.0078
0.1150	2779.0	-0.0040	0.1150	2070.0	0.0018	0.1150	1249.0	0.0078
0.1200	2760.0	-0.0042	0.1200	2051.0	0.0018	0.1200	1231.0	0.0079
0.1250	2741.0	-0.0043	0.1250	2051.0	0.0019	0.1250	1193.0	0.0079
0.1300	2741.0	-0.0044	0.1300	2033.0	0.0019	0.1300	1175.0	0.0079
0.1350	2741.0	-0.0046	0.1350	1995.0	0.0019	0.1350	1156.0	0.0079
0.1400	2723.0	-0.0048	0.1400	1995.0	0.0019	0.1400	1138.0	0.0079
0.1450	2704.0	-0.0050	0.1450	1995.0	0.0019	0.1450	1119.0	0.0079
0.1500	2704.0	-0.0051	0.1500	1977.0	0.0019	0.1500	1100.0	0.0079
0.1550	2704.0	-0.0053	0.1550	1977.0	0.0018	0.1550	1100.0	0.0079
0.1600	2685.0	-0.0056	0.1600	1958.0	0.0018	0.1600	1082.0	0.0079
0.1650	2667.0	-0.0058	0.1650	1939.0	0.0017	0.1650	1063.0	0.0079
0.1700	2648.0	-0.0059	0.1700	1939.0	0.0016	0.1700	1063.0	0.0078
0.1750	2629.0	-0.0061	0.1750	1939.0	0.0015	0.1750	1044.0	0.0077
0.1800	2611.0	-0.0064	0.1800	1958.0	0.0014	0.1800	1044.0	0.0075
0.1850	2592.0	-0.0066	0.1850	1958.0	0.0013	0.1850	1044.0	0.0074
0.1900	2573.0	-0.0068	0.1900	1958.0	0.0012	0.1900	1026.0	0.0073

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-104
Depth: 40-42'
Sample Number: C-2
Sampled Date: 08/08/17
Soil Description: --

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.1950	2573.0	-0.0071	0.1950	1939.0	0.0010	0.1950	1026.0	0.0072
0.2000	2555.0	-0.0074	0.2000	1939.0	0.0010	0.2000	1007.0	0.0071
0.2050	2555.0	-0.0075	0.2050	1939.0	0.0009	0.2050	1007.0	0.0070
0.2100	2555.0	-0.0078	0.2100	1939.0	0.0008	0.2100	1007.0	0.0068
0.2150	2573.0	-0.0081	0.2150	1939.0	0.0007	0.2150	988.0	0.0066
0.2200	2573.0	-0.0083	0.2200	1939.0	0.0005	0.2200	988.0	0.0064
0.2250	2573.0	-0.0085	0.2250	1921.0	0.0004	0.2250	988.0	0.0063
0.2300	2573.0	-0.0088	0.2300	1921.0	0.0002	0.2300	988.0	0.0062
0.2350	2573.0	-0.0090	0.2350	1921.0	0.0002	0.2350	988.0	0.0060
0.2400	2573.0	-0.0091	0.2400	1902.0	0.0001	0.2400	988.0	0.0058
0.2450	2592.0	-0.0093	0.2450	1902.0	0.0000	0.2450	988.0	0.0056
0.2500	2592.0	-0.0096	0.2500	1883.0	-0.0002	0.2500	970.0	0.0055

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D3080

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Test Start Date: 08/23/17 By: DPM
Test Finish Date: 08/24/17 By: DPM

Raw Data Files: GIDS314A.DAT,
GIDS314B.DAT,
GIDS314C.DAT

Sample Information

Boring: SB-103
Depth: 14-16'
Sample Number: C-1
Sampled Date: 08/06/17
Soil Description: Cal Tube

Test Configuration

Continuous, Increasing, Deflection Control
Shear Rate (in./min.): 0.0056
Normal Stress Point A (psf): 4330
Normal Stress Point B (psf): 2900
Normal Stress Point C (psf): 1430

	Point A 4330 psf		Point B 2900 psf		Point C 1430 psf	
	Before	After	Before	After	Before	After
Wt. Wet Soil & Ring (g):	127.25	128.68	128.71	128.60	129.38	131.59
Wt of Ring (g):	27.91	27.91	27.16	27.16	27.97	27.97
Wt. Wet Soil (g):	99.34	100.78	101.55	101.44	101.41	103.62
Wt. Wet Soil & Pan (g):	106.35	107.78	108.19	108.08	108.05	110.26
Wt. Dry Soil & Pan(g):	90.87	90.87	91.95	91.95	91.59	91.59
Wt. Water (g):	15.48	16.91	16.24	16.13	16.46	18.67
Wt. of Pan (g):	7.01	7.01	6.64	6.64	6.64	6.64
Wt. of Dry Soil (g):	83.86	83.86	85.31	85.31	84.95	84.95
Percent Moisture:	18.46%	20.17%	19.04%	18.91%	19.37%	21.98%
Diameter (in):	1.938	1.938	1.938	1.938	1.938	1.938
Area (in²):	2.950	2.950	2.950	2.950	2.950	2.950
Height (in):	1.000	0.985	1.000	0.994	1.000	0.998
Volume (ft^3):	0.00171	0.00168	0.00171	0.00170	0.00171	0.00170
Wet Density (pcf):	128.30	132.10	131.15	131.86	130.97	134.04
Dry Density (pcf):	108.30	109.93	110.17	110.89	109.71	109.89

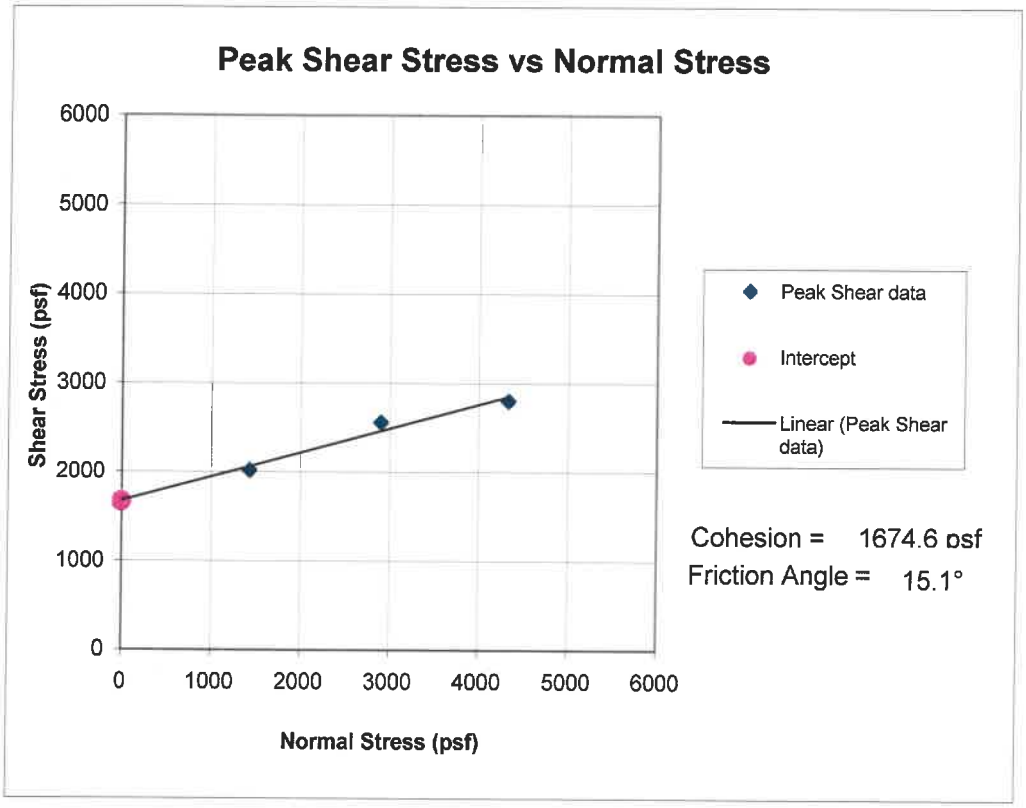
	Point A 4330 psf	Point B 2900 psf	Point C 1430 psf
Peak Strength (psf)	2797.0	2555.0	2014.0
Ultimate Strength(psf)	2779.0	2051.0	1324.0

	Peak	Ultimate
Friction Angle °	15.1	26.6
Cohesion (psf)	1674.6	603.1

Data Entered By: DPM
Entry Date: 08/25/17
File Name: 2076_245_directShear-ASTMD3080-R3_0.xls

Data Checked By cm
Date 8/29/17

ATT
ADVANCED TERRA TESTING

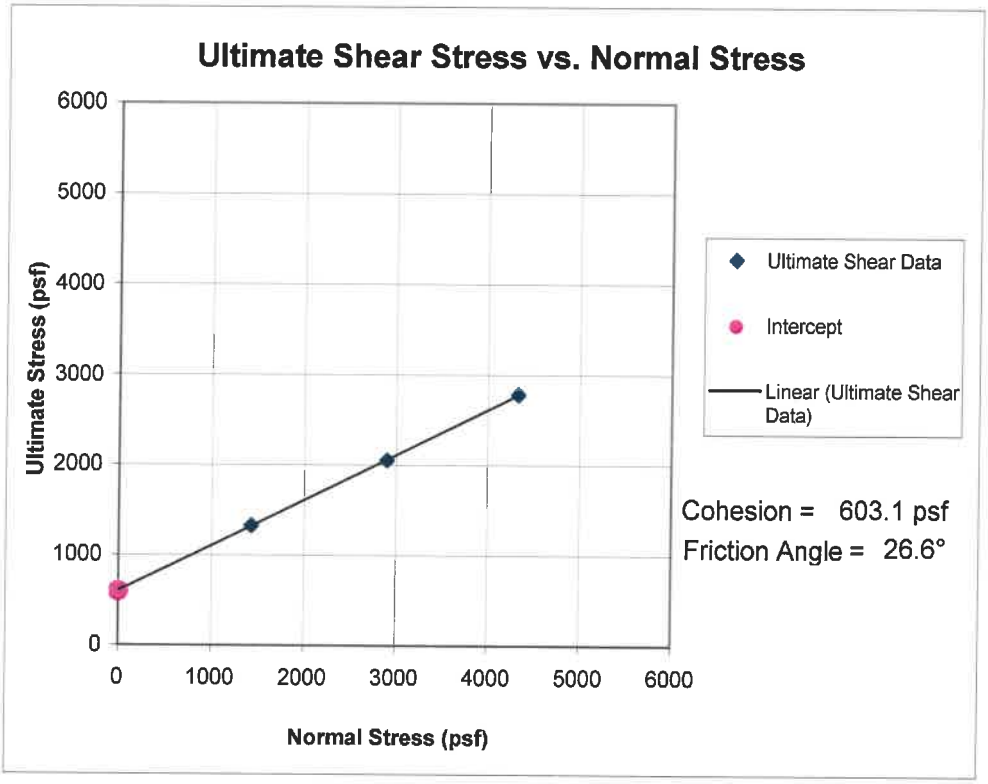


Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Sample Information

Boring: SB-103
Depth: 14-16'
Sample Number: C-1
Sampled Date: 08/06/17
Soil Description: Cal Tube



Data Entered By: DPM
Entry Date: 08/25/17
File Name: 2076_245_directShear-ASTMD3080-R3_0.xls

Data Checked By CJL
Date 8/29/17

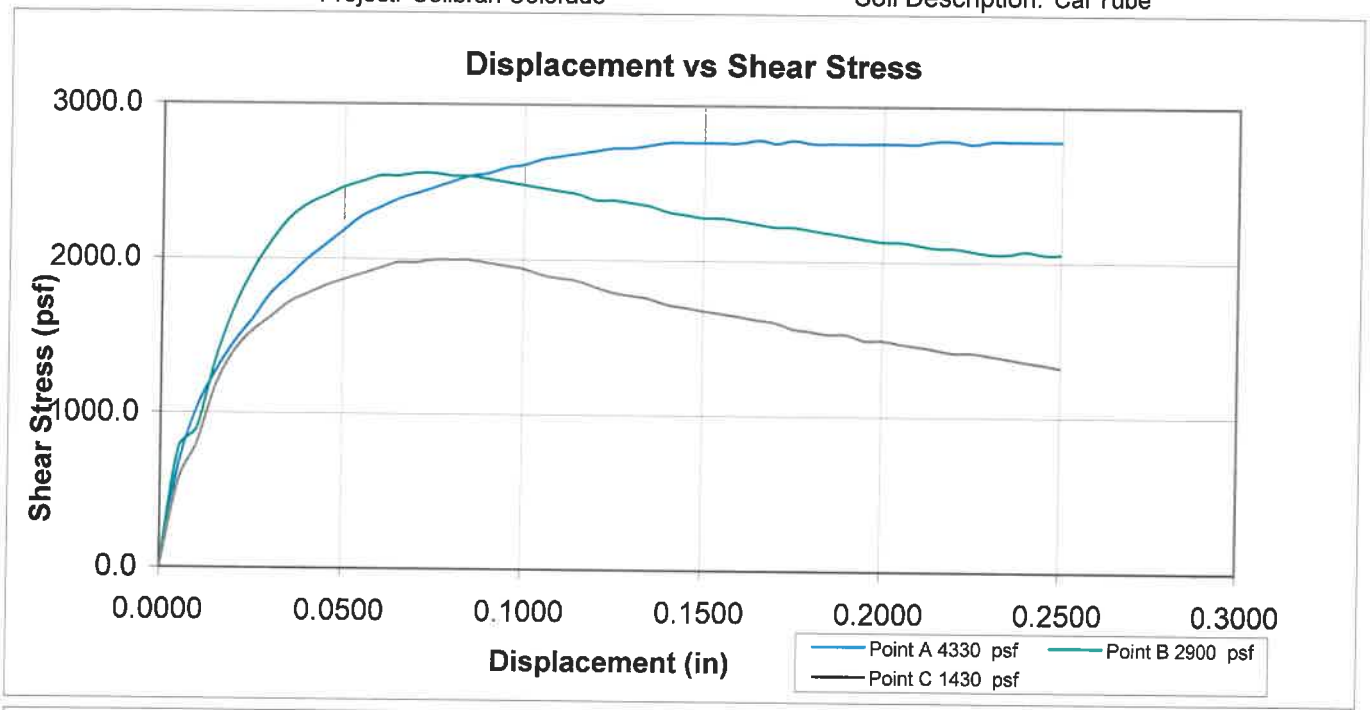
ATT
ADVANCED TERRA TESTING

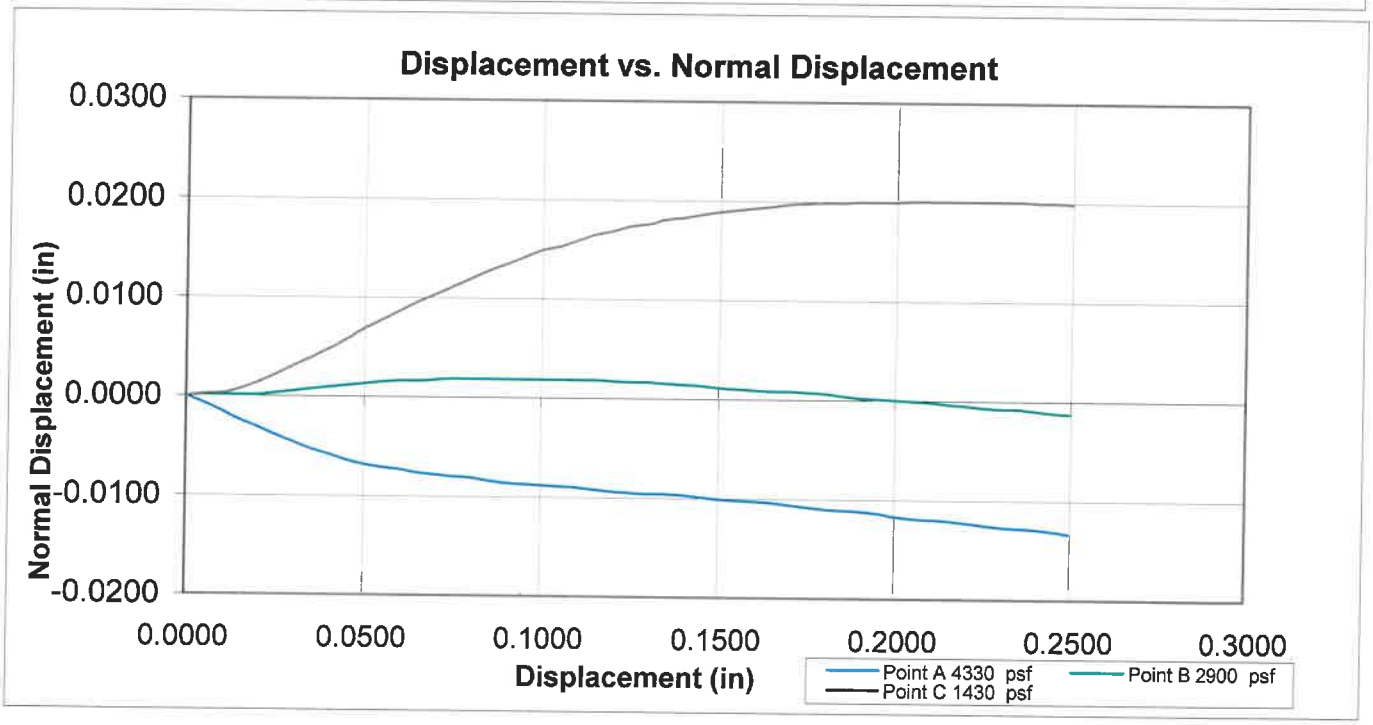
Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Sample Information

Boring: SB-103
Depth: 14-16'
Sample Number: C-1
Sampled Date: 08/06/17
Soil Description: Cal Tube





Data Entered By: DPM
Entry Date: 08/25/17
File Name: 2076_245_directShear-ASTMD3080-R3_0.xls

Data Checked By CAL
Date 8/29/17

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-103
Depth: 14-16'
Sample Number: C-1
Sampled Date: 08/06/17
Soil Description: Cal Tube

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.0000	0.0	0.0000	0.0000	0.0	0.0000	0.0000	0.0	0.0000
0.0050	653.0	-0.0007	0.0050	765.0	0.0001	0.0050	559.0	0.0002
0.0100	1026.0	-0.0015	0.0100	895.0	0.0001	0.0100	802.0	0.0003
0.0150	1268.0	-0.0024	0.0150	1343.0	0.0001	0.0150	1175.0	0.0007
0.0200	1455.0	-0.0031	0.0200	1678.0	0.0001	0.0200	1399.0	0.0014
0.0250	1604.0	-0.0039	0.0250	1921.0	0.0003	0.0250	1529.0	0.0022
0.0300	1772.0	-0.0046	0.0300	2107.0	0.0005	0.0300	1622.0	0.0031
0.0350	1883.0	-0.0053	0.0350	2256.0	0.0007	0.0350	1716.0	0.0039
0.0400	1995.0	-0.0058	0.0400	2350.0	0.0009	0.0400	1772.0	0.0048
0.0450	2089.0	-0.0064	0.0450	2406.0	0.0011	0.0450	1827.0	0.0058
0.0500	2182.0	-0.0068	0.0500	2462.0	0.0013	0.0500	1865.0	0.0069
0.0550	2275.0	-0.0071	0.0550	2499.0	0.0015	0.0550	1902.0	0.0078
0.0600	2331.0	-0.0073	0.0600	2536.0	0.0016	0.0600	1939.0	0.0087
0.0650	2387.0	-0.0076	0.0650	2536.0	0.0016	0.0650	1977.0	0.0096
0.0700	2424.0	-0.0078	0.0700	2555.0	0.0017	0.0700	1977.0	0.0104
0.0750	2462.0	-0.0080	0.0750	2555.0	0.0018	0.0750	1995.0	0.0112
0.0800	2499.0	-0.0081	0.0800	2536.0	0.0018	0.0800	1995.0	0.0120
0.0850	2536.0	-0.0084	0.0850	2536.0	0.0018	0.0850	1995.0	0.0128
0.0900	2555.0	-0.0086	0.0900	2517.0	0.0018	0.0900	1977.0	0.0135
0.0950	2592.0	-0.0087	0.0950	2499.0	0.0018	0.0950	1958.0	0.0142
0.1000	2611.0	-0.0088	0.1000	2480.0	0.0018	0.1000	1939.0	0.0149
0.1050	2648.0	-0.0089	0.1050	2462.0	0.0018	0.1050	1902.0	0.0153
0.1100	2667.0	-0.0090	0.1100	2443.0	0.0018	0.1100	1883.0	0.0159
0.1150	2685.0	-0.0092	0.1150	2424.0	0.0018	0.1150	1865.0	0.0165
0.1200	2704.0	-0.0094	0.1200	2387.0	0.0017	0.1200	1827.0	0.0169
0.1250	2723.0	-0.0095	0.1250	2387.0	0.0016	0.1250	1790.0	0.0174
0.1300	2723.0	-0.0096	0.1300	2368.0	0.0016	0.1300	1772.0	0.0176
0.1350	2741.0	-0.0096	0.1350	2350.0	0.0015	0.1350	1753.0	0.0181
0.1400	2760.0	-0.0097	0.1400	2312.0	0.0014	0.1400	1716.0	0.0183
0.1450	2760.0	-0.0099	0.1450	2294.0	0.0013	0.1450	1697.0	0.0186
0.1500	2760.0	-0.0101	0.1500	2275.0	0.0011	0.1500	1678.0	0.0189
0.1550	2760.0	-0.0102	0.1550	2275.0	0.0010	0.1550	1660.0	0.0191
0.1600	2760.0	-0.0103	0.1600	2256.0	0.0009	0.1600	1641.0	0.0193
0.1650	2779.0	-0.0104	0.1650	2238.0	0.0008	0.1650	1622.0	0.0195
0.1700	2760.0	-0.0106	0.1700	2219.0	0.0008	0.1700	1604.0	0.0197
0.1750	2779.0	-0.0108	0.1750	2219.0	0.0007	0.1750	1566.0	0.0198
0.1800	2760.0	-0.0110	0.1800	2200.0	0.0006	0.1800	1548.0	0.0199
0.1850	2760.0	-0.0111	0.1850	2182.0	0.0004	0.1850	1529.0	0.0199
0.1900	2760.0	-0.0112	0.1900	2163.0	0.0002	0.1900	1529.0	0.0200

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-103
Depth: 14-16'
Sample Number: C-1
Sampled Date: 08/06/17
Soil Description: Cal Tube

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.1950	2760.0	-0.0114	0.1950	2144.0	0.0001	0.1950	1492.0	0.0200
0.2000	2760.0	-0.0117	0.2000	2126.0	0.0000	0.2000	1492.0	0.0200
0.2050	2760.0	-0.0119	0.2050	2126.0	-0.0001	0.2050	1473.0	0.0201
0.2100	2760.0	-0.0120	0.2100	2107.0	-0.0002	0.2100	1455.0	0.0201
0.2150	2779.0	-0.0121	0.2150	2089.0	-0.0004	0.2150	1436.0	0.0201
0.2200	2779.0	-0.0123	0.2200	2089.0	-0.0005	0.2200	1417.0	0.0201
0.2250	2760.0	-0.0125	0.2250	2070.0	-0.0007	0.2250	1417.0	0.0201
0.2300	2779.0	-0.0127	0.2300	2051.0	-0.0008	0.2300	1399.0	0.0201
0.2350	2779.0	-0.0128	0.2350	2051.0	-0.0008	0.2350	1380.0	0.0201
0.2400	2779.0	-0.0129	0.2400	2070.0	-0.0010	0.2400	1361.0	0.0200
0.2450	2779.0	-0.0131	0.2450	2051.0	-0.0012	0.2450	1343.0	0.0200
0.2500	2779.0	-0.0134	0.2500	2051.0	-0.0013	0.2500	1324.0	0.0199

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D3080

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Test Start Date: 08/30/17 By: DPM
Test Finish Date: 08/30/17 By: DPM

Raw Data Files: GIDS110A.DAT,
GIDS110B.DAT,
GIDS110C.DAT

Sample Information

Boring: SB-101
Depth: 10-12'
Sample Number: C-1
Sampled Date: 08/05/17
Soil Description: Califonia Liner

Test Configuration

Continuous, Increasing, Deflection Control
Shear Rate (in./min.): 0.0058
Normal Stress Point A (psf): 4330
Normal Stress Point B (psf): 2900
Normal Stress Point C (psf): 1430

	Point A 4330 psf		Point B 2900 psf		Point C 1430 psf	
	Before	After	Before	After	Before	After
Wt. Wet Soil & Ring (g):	132.84	133.39	132.03	133.19	131.73	133.07
Wt of Ring (g):	27.97	27.97	27.90	27.90	27.16	27.16
Wt. Wet Soil (g):	104.87	105.42	104.13	105.29	104.57	105.91
Wt. Wet Soil & Pan (g):	111.48	112.03	110.66	111.82	111.08	112.43
Wt. Dry Soil & Pan(g):	96.21	96.21	95.78	95.78	95.75	95.75
Wt. Water (g):	15.26	15.81	14.88	16.04	15.34	16.68
Wt. of Pan (g):	6.61	6.61	6.53	6.53	6.52	6.52
Wt. of Dry Soil (g):	89.61	89.61	89.25	89.25	89.23	89.23
Percent Moisture:	17.03%	17.65%	16.67%	17.97%	17.19%	18.69%
Diameter (in):	1.938	1.938	1.938	1.938	1.938	1.938
Area (in²):	2.950	2.950	2.950	2.950	2.950	2.950
Height (in):	1.000	0.983	1.000	0.989	1.000	0.997
Volume (ft^3):	0.00171	0.00168	0.00171	0.00169	0.00171	0.00170
Wet Density (pcf):	135.43	138.44	134.48	137.53	135.05	137.21
Dry Density (pcf):	115.72	117.68	115.26	116.58	115.24	115.60

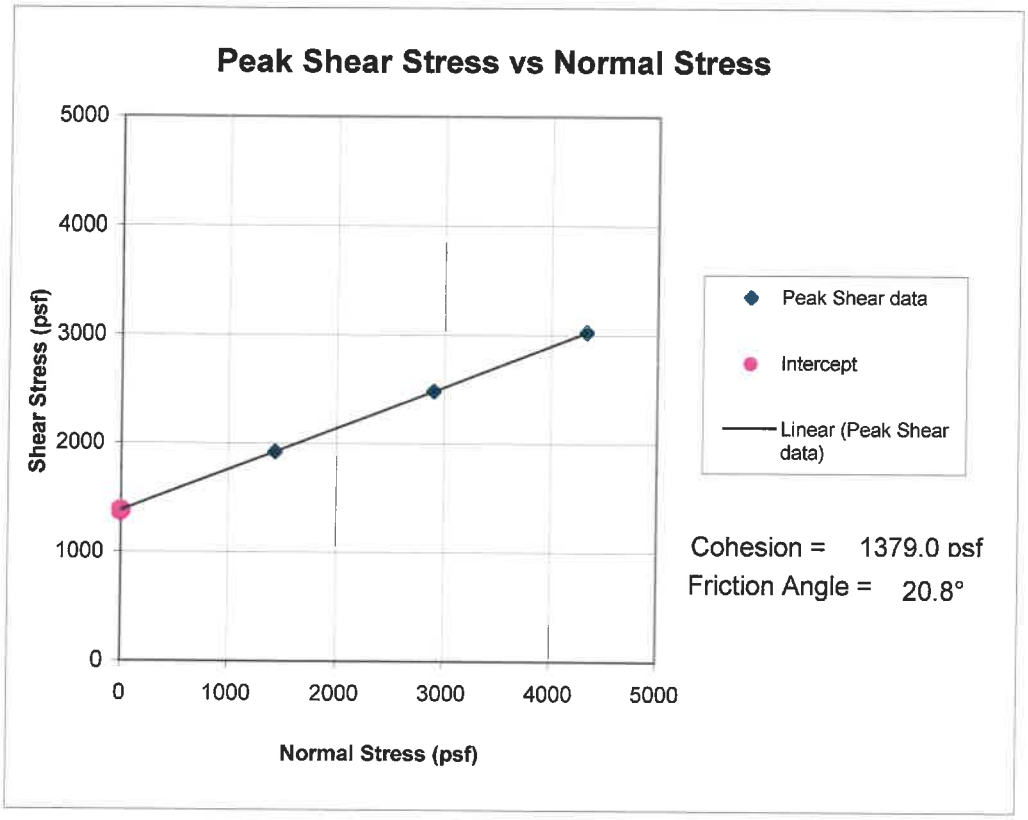
	Point A 4330 psf	Point B 2900 psf	Point C 1430 psf
Peak Strength (psf)	3021.0	2480.0	1921.0
Ultimate Strength(psf)	2648.0	1902.0	988.0

	Peak	Ultimate
Friction Angle °	20.8	29.8
Cohesion (psf)	1379.0	193.0

Data Entered By: DPM
Entry Date: 08/31/17
File Name: 2076_245_directShear-ASTMD3080-R3_3.xls

Data Checked By CAC
Date 09/5/17

ATT
ADVANCED TERRA TESTING



Client Data

Client: GEI Consultants Inc.

Job Number.: 2076-245

Location: Laramie Energy Nichols Pads

Project Number: 1703391

Project: Collbran Colorado

Sample Information

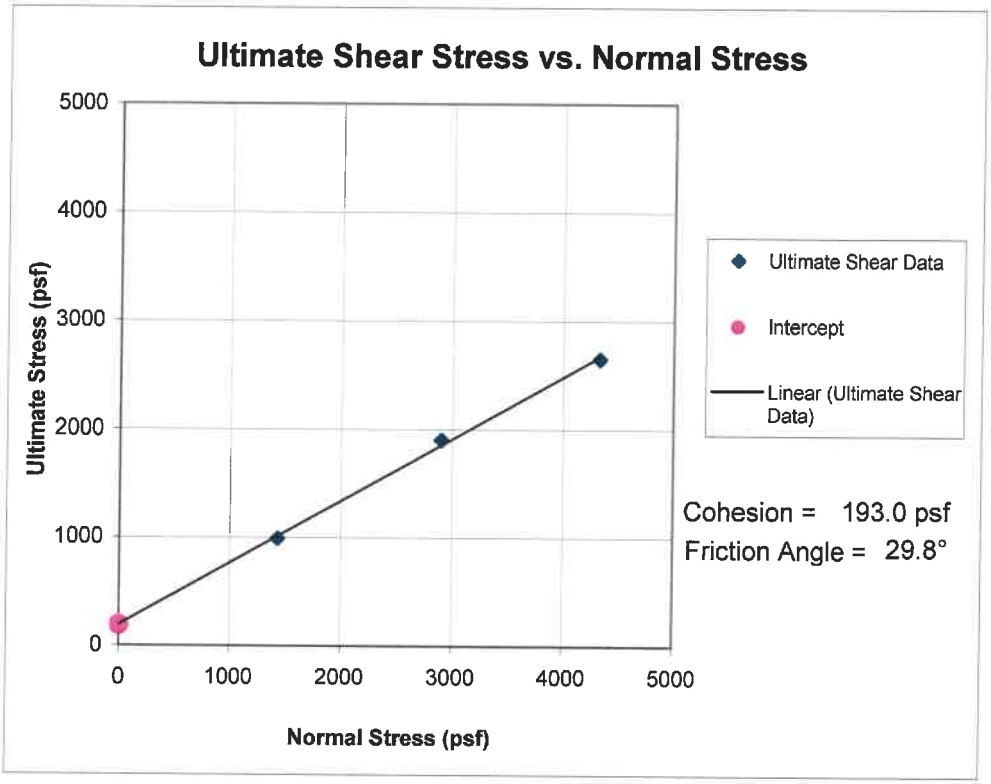
Boring: SB-101

Depth: 10-12'

Sample Number: C-1

Sampled Date: 08/05/17

Soil Description: Califonia Liner



Data Entered By: DPM

Entry Date: 08/31/17

File Name: 2076_245_directShear-ASTMD3080-R3_3.xls

Data Checked By CAL

Date 09/5/17

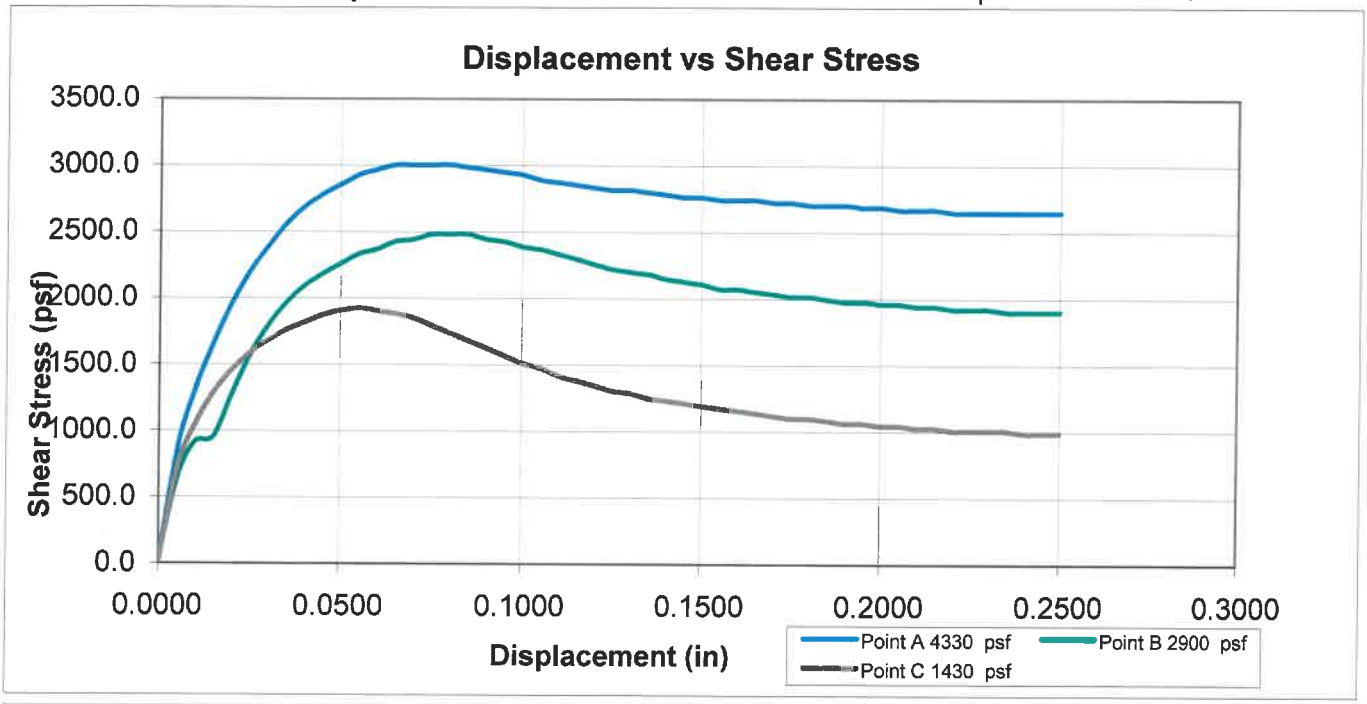
ATT
ADVANCED TERRA TESTING

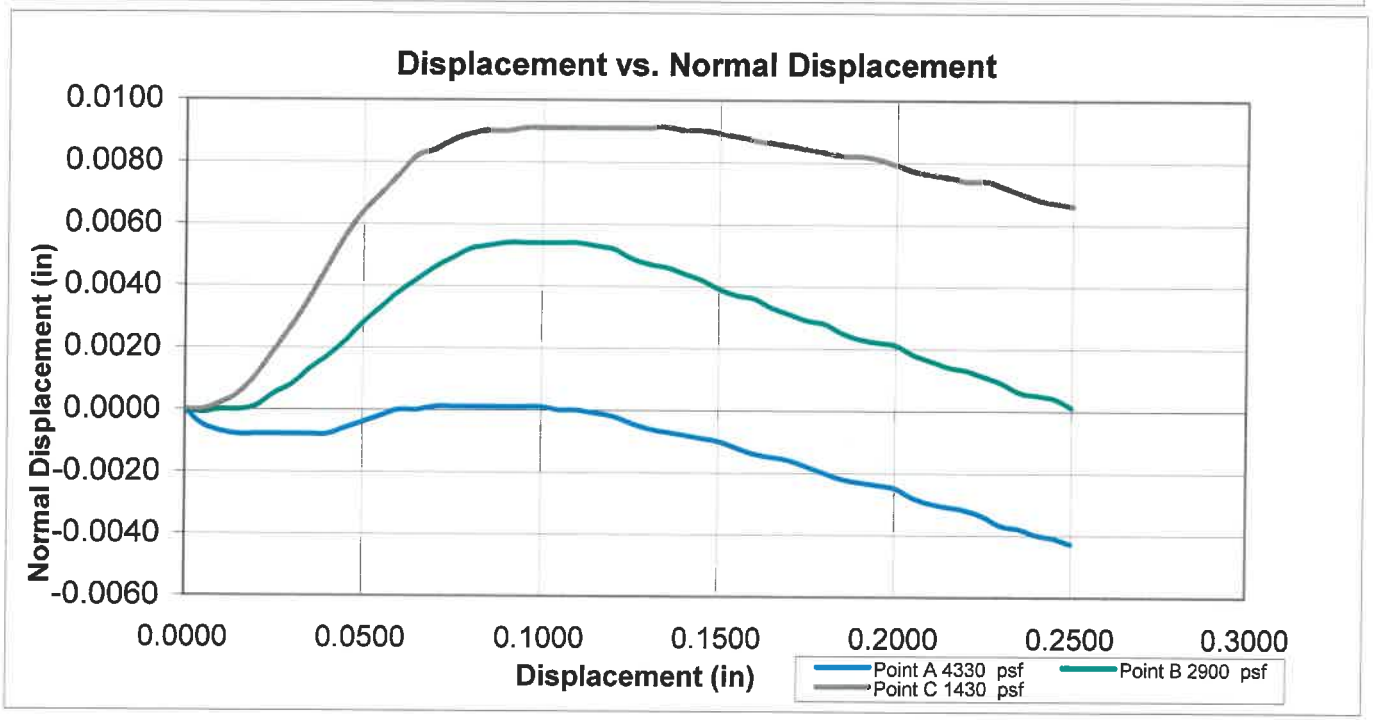
Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Sample Information

Boring: SB-101
Depth: 10-12'
Sample Number: C-1
Sampled Date: 08/05/17
Soil Description: Califonia Liner





Data Entered By: DPM
Entry Date: 08/31/17
File Name: 2076_245_directShear-ASTMD3080-R3_3.xls

Data Checked By CHC
Date 09/05/17

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-101
Depth: 10-12'
Sample Number: C-1
Sampled Date: 08/05/17
Soil Description: Califonia Liner

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.0000	0.0	0.0000	0.0000	19.0	0.0000	0.0000	0.0	0.0000
0.0050	839.0	-0.0005	0.0050	634.0	-0.0001	0.0050	709.0	0.0000
0.0100	1305.0	-0.0007	0.0100	914.0	0.0000	0.0100	1044.0	0.0002
0.0150	1660.0	-0.0008	0.0150	951.0	0.0000	0.0150	1287.0	0.0005
0.0200	1958.0	-0.0008	0.0200	1268.0	0.0001	0.0200	1455.0	0.0011
0.0250	2200.0	-0.0008	0.0250	1566.0	0.0005	0.0250	1585.0	0.0019
0.0300	2387.0	-0.0008	0.0300	1790.0	0.0008	0.0300	1678.0	0.0027
0.0350	2555.0	-0.0008	0.0350	1958.0	0.0013	0.0350	1753.0	0.0036
0.0400	2685.0	-0.0008	0.0400	2089.0	0.0017	0.0400	1809.0	0.0046
0.0450	2779.0	-0.0006	0.0450	2182.0	0.0022	0.0450	1865.0	0.0056
0.0500	2853.0	-0.0004	0.0500	2256.0	0.0028	0.0500	1902.0	0.0064
0.0550	2928.0	-0.0002	0.0550	2331.0	0.0033	0.0550	1921.0	0.0070
0.0600	2965.0	0.0000	0.0600	2368.0	0.0038	0.0600	1902.0	0.0076
0.0650	3002.0	0.0000	0.0650	2424.0	0.0042	0.0650	1883.0	0.0082
0.0700	3002.0	0.0001	0.0700	2443.0	0.0046	0.0700	1846.0	0.0084
0.0750	3002.0	0.0001	0.0750	2480.0	0.0049	0.0750	1790.0	0.0087
0.0800	3002.0	0.0001	0.0800	2480.0	0.0052	0.0800	1734.0	0.0089
0.0850	2984.0	0.0001	0.0850	2480.0	0.0053	0.0850	1678.0	0.0090
0.0900	2965.0	0.0001	0.0900	2443.0	0.0054	0.0900	1622.0	0.0090
0.0950	2946.0	0.0001	0.0950	2424.0	0.0054	0.0950	1566.0	0.0091
0.1000	2928.0	0.0001	0.1000	2387.0	0.0054	0.1000	1510.0	0.0091
0.1050	2890.0	0.0000	0.1050	2368.0	0.0054	0.1050	1473.0	0.0091
0.1100	2872.0	0.0000	0.1100	2331.0	0.0054	0.1100	1417.0	0.0091
0.1150	2853.0	-0.0001	0.1150	2294.0	0.0053	0.1150	1380.0	0.0091
0.1200	2834.0	-0.0002	0.1200	2256.0	0.0052	0.1200	1343.0	0.0091
0.1250	2816.0	-0.0004	0.1250	2219.0	0.0049	0.1250	1305.0	0.0091
0.1300	2816.0	-0.0006	0.1300	2200.0	0.0047	0.1300	1287.0	0.0091
0.1350	2797.0	-0.0007	0.1350	2182.0	0.0046	0.1350	1249.0	0.0091
0.1400	2779.0	-0.0008	0.1400	2144.0	0.0044	0.1400	1231.0	0.0090
0.1450	2760.0	-0.0009	0.1450	2126.0	0.0042	0.1450	1212.0	0.0090
0.1500	2760.0	-0.0010	0.1500	2107.0	0.0039	0.1500	1193.0	0.0089
0.1550	2741.0	-0.0012	0.1550	2070.0	0.0037	0.1550	1175.0	0.0088
0.1600	2741.0	-0.0014	0.1600	2070.0	0.0036	0.1600	1156.0	0.0087
0.1650	2741.0	-0.0015	0.1650	2051.0	0.0033	0.1650	1138.0	0.0086
0.1700	2723.0	-0.0016	0.1700	2033.0	0.0031	0.1700	1119.0	0.0085
0.1750	2723.0	-0.0018	0.1750	2014.0	0.0029	0.1750	1100.0	0.0084
0.1800	2704.0	-0.0020	0.1800	2014.0	0.0028	0.1800	1100.0	0.0083
0.1850	2704.0	-0.0022	0.1850	1995.0	0.0025	0.1850	1082.0	0.0082
0.1900	2704.0	-0.0023	0.1900	1977.0	0.0023	0.1900	1063.0	0.0082

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-101
Depth: 10-12'
Sample Number: C-1
Sampled Date: 08/05/17
Soil Description: Califonia Liner

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.1950	2685.0	-0.0024	0.1950	1977.0	0.0022	0.1950	1063.0	0.0081
0.2000	2685.0	-0.0025	0.2000	1958.0	0.0021	0.2000	1044.0	0.0079
0.2050	2667.0	-0.0028	0.2050	1958.0	0.0018	0.2050	1044.0	0.0077
0.2100	2667.0	-0.0030	0.2100	1939.0	0.0016	0.2100	1026.0	0.0076
0.2150	2667.0	-0.0031	0.2150	1939.0	0.0014	0.2150	1026.0	0.0075
0.2200	2648.0	-0.0032	0.2200	1921.0	0.0013	0.2200	1007.0	0.0074
0.2250	2648.0	-0.0034	0.2250	1921.0	0.0011	0.2250	1007.0	0.0074
0.2300	2648.0	-0.0037	0.2300	1921.0	0.0009	0.2300	1007.0	0.0072
0.2350	2648.0	-0.0038	0.2350	1902.0	0.0006	0.2350	1007.0	0.0070
0.2400	2648.0	-0.0040	0.2400	1902.0	0.0005	0.2400	988.0	0.0068
0.2450	2648.0	-0.0041	0.2450	1902.0	0.0004	0.2450	988.0	0.0067
0.2500	2648.0	-0.0043	0.2500	1902.0	0.0001	0.2500	988.0	0.0066

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D3080

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Test Start Date: 08/28/17 By: DPM
Test Finish Date: 08/29/17 By: DPM

Raw Data Files: GIDS420A.DAT,
GIDS420B.DAT,
GIDS420C.DAT

Sample Information

Boring: SB-104
Depth: 20-22'
Sample Number: C-1
Sampled Date: 08/07/17
Soil Description: California Liner

Test Configuration

Continuous, Increasing, Deflection Control
Shear Rate (in./min.): 0.0026
Normal Stress Point A (psf): 4330
Normal Stress Point B (psf): 2900
Normal Stress Point C (psf): 1430

	Point A 4330 psf		Point B 2900 psf		Point C 1430 psf	
	Before	After	Before	After	Before	After
Wt. Wet Soil & Ring (g):	127.47	128.86	127.48	129.54	129.05	131.07
Wt of Ring (g):	27.90	27.90	27.90	27.90	27.90	27.90
Wt. Wet Soil (g):	99.57	100.96	99.58	101.64	101.15	103.17
Wt. Wet Soil & Pan (g):	106.21	107.60	106.22	108.27	107.79	109.81
Wt. Dry Soil & Pan(g):	90.71	90.71	91.03	91.03	91.97	91.97
Wt. Water (g):	15.50	16.89	15.19	17.24	15.82	17.84
Wt. of Pan (g):	6.64	6.64	6.64	6.64	6.64	6.64
Wt. of Dry Soil (g):	84.07	84.07	84.39	84.39	85.33	85.33
Percent Moisture:	18.44%	20.09%	18.00%	20.43%	18.54%	20.90%
Diameter (in):	1.938	1.938	1.938	1.938	1.938	1.938
Area (in²):	2.950	2.950	2.950	2.950	2.950	2.950
Height (in):	1.000	0.980	1.000	0.988	1.000	0.998
Volume (ft^3):	0.00171	0.00167	0.00171	0.00169	0.00171	0.00170
Wet Density (pcf):	128.60	133.05	128.61	132.85	130.63	133.50
Dry Density (pcf):	108.58	110.79	108.99	110.32	110.20	110.42

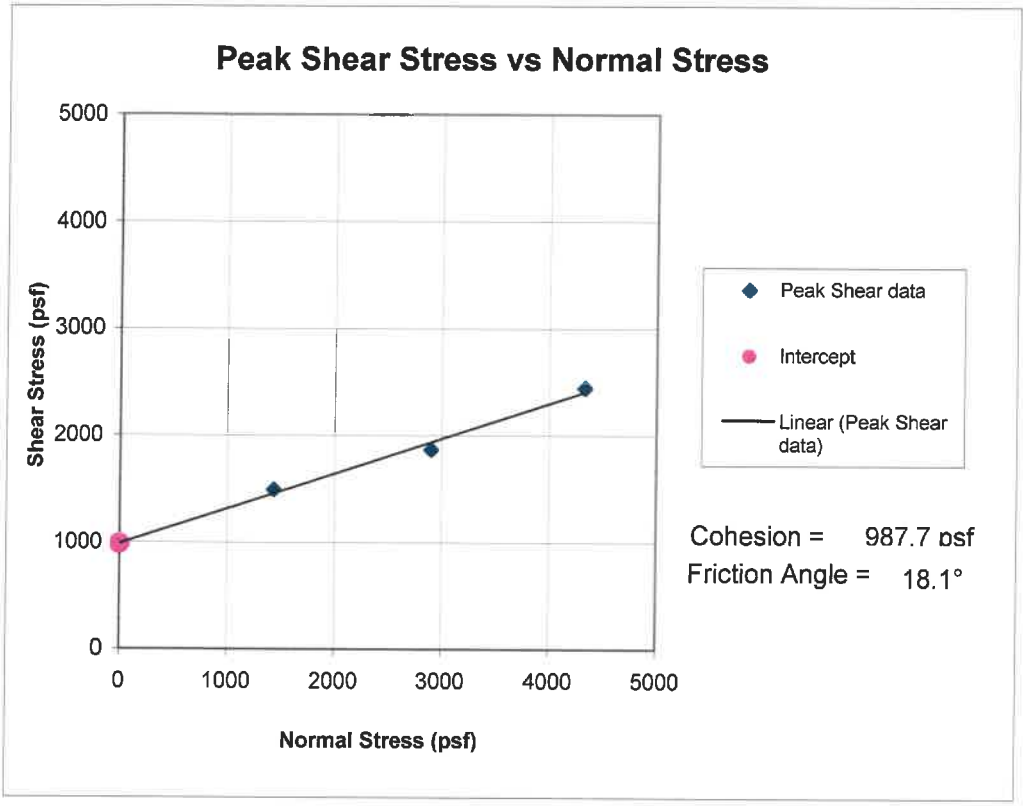
	Point A 4330 psf	Point B 2900 psf	Point C 1430 psf
Peak Strength (psf)	2443.0	1865.0	1492.0
Ultimate Strength(psf)	2331.0	1641.0	914.0

	Peak	Ultimate
Friction Angle °	18.1	26.0
Cohesion (psf)	987.7	218.1

Data Entered By: DPM
Entry Date: 08/31/17
File Name: 2076_245_directShear-ASTMD3080-R3_2.xls

Data Checked By CAL
Date 8/31/17

ATT
ADVANCED TERRA TESTING

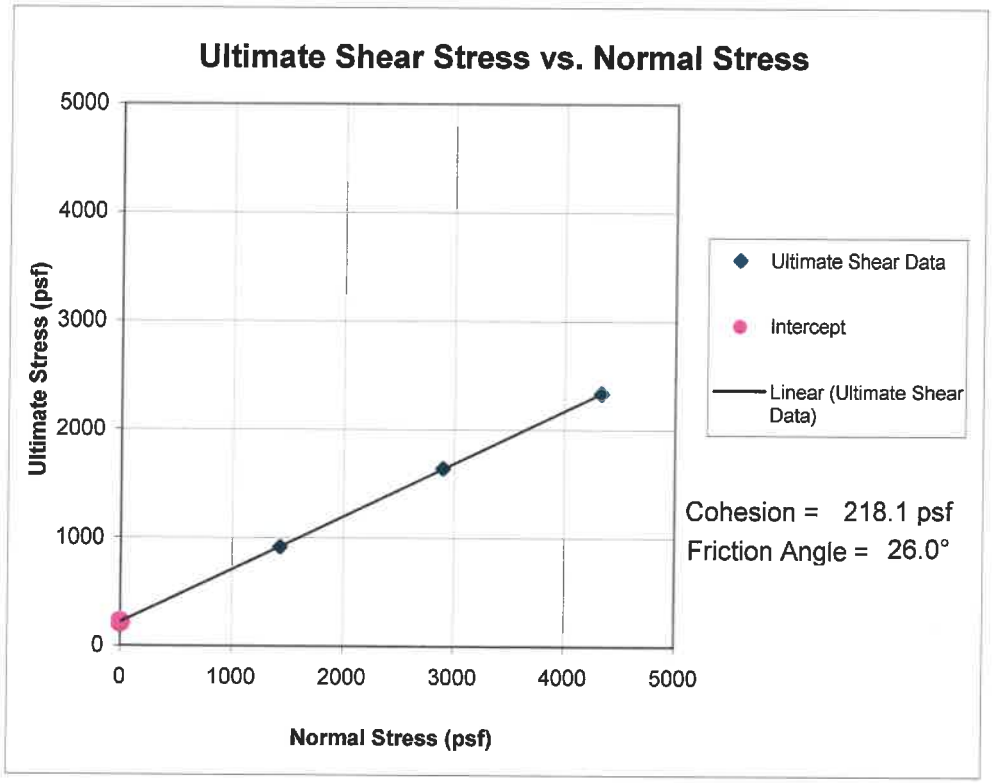


Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Sample Information

Boring: SB-104
Depth: 20-22'
Sample Number: C-1
Sampled Date: 08/07/17
Soil Description: California Liner



Data Entered By: DPM
Entry Date: 08/31/17
File Name: 2076_245_directShear-ASTMD3080-R3_2.xls

Data Checked By CAC
Date 8/31/17

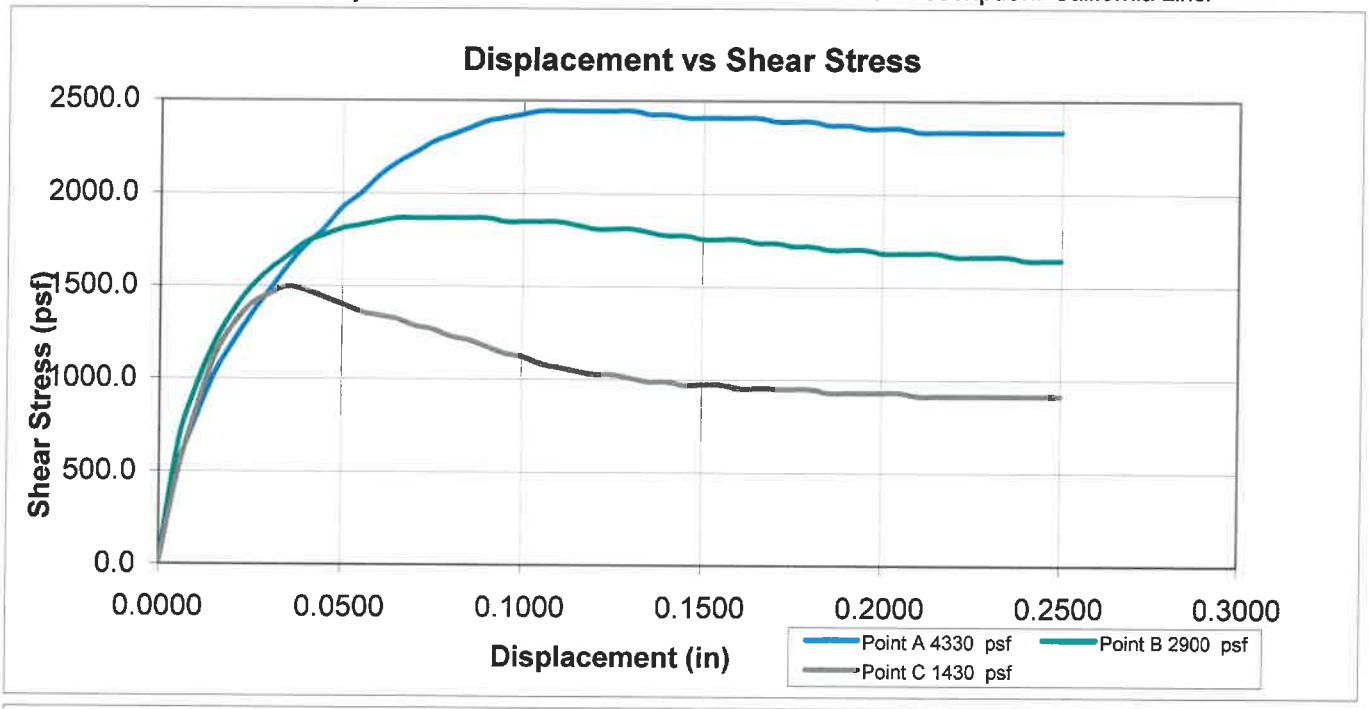
ATT
ADVANCED TERRA TESTING

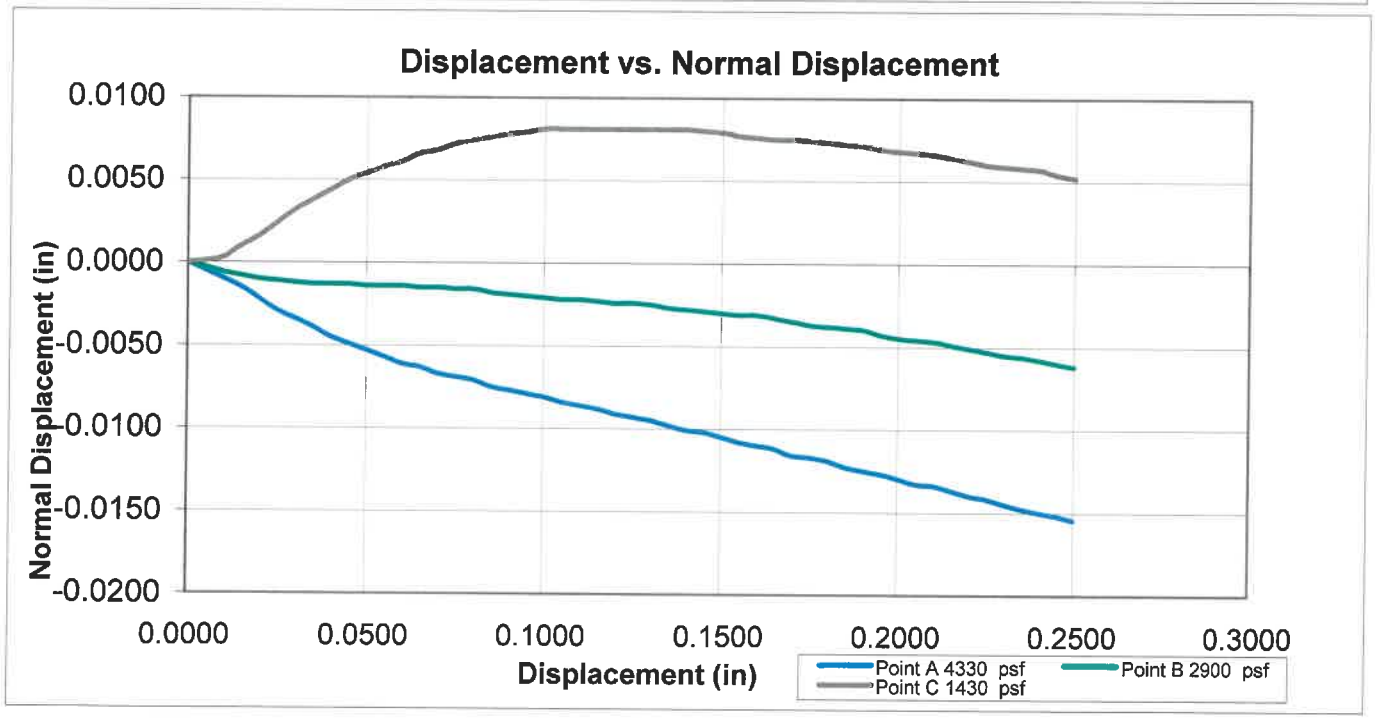
Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Sample Information

Boring: SB-104
Depth: 20-22'
Sample Number: C-1
Sampled Date: 08/07/17
Soil Description: California Liner





Data Entered By: DPM
Entry Date: 08/31/17
File Name: 2076_245_directShear-ASTMD3080-R3_2.xls

Data Checked By CAL
Date 8/31/17

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-104
Depth: 20-22'
Sample Number: C-1
Sampled Date: 08/07/17
Soil Description: California Liner

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.0000	0.0	0.0000	0.0000	0.0	0.0000	0.0000	0.0	0.0000
0.0050	503.0	-0.0005	0.0050	634.0	-0.0003	0.0050	485.0	0.0001
0.0100	783.0	-0.0010	0.0100	951.0	-0.0006	0.0100	821.0	0.0003
0.0150	1026.0	-0.0015	0.0150	1193.0	-0.0008	0.0150	1119.0	0.0010
0.0200	1193.0	-0.0022	0.0200	1361.0	-0.0010	0.0200	1287.0	0.0016
0.0250	1343.0	-0.0029	0.0250	1492.0	-0.0011	0.0250	1399.0	0.0024
0.0300	1473.0	-0.0034	0.0300	1585.0	-0.0012	0.0300	1455.0	0.0032
0.0350	1604.0	-0.0039	0.0350	1660.0	-0.0013	0.0350	1492.0	0.0038
0.0400	1716.0	-0.0045	0.0400	1734.0	-0.0013	0.0400	1473.0	0.0044
0.0450	1809.0	-0.0049	0.0450	1772.0	-0.0013	0.0450	1436.0	0.0050
0.0500	1921.0	-0.0053	0.0500	1809.0	-0.0014	0.0500	1399.0	0.0054
0.0550	1995.0	-0.0057	0.0550	1827.0	-0.0014	0.0550	1361.0	0.0058
0.0600	2089.0	-0.0061	0.0600	1846.0	-0.0014	0.0600	1343.0	0.0061
0.0650	2163.0	-0.0063	0.0650	1865.0	-0.0015	0.0650	1324.0	0.0066
0.0700	2219.0	-0.0067	0.0700	1865.0	-0.0015	0.0700	1287.0	0.0068
0.0750	2275.0	-0.0069	0.0750	1865.0	-0.0016	0.0750	1268.0	0.0072
0.0800	2312.0	-0.0071	0.0800	1865.0	-0.0016	0.0800	1231.0	0.0074
0.0850	2350.0	-0.0075	0.0850	1865.0	-0.0018	0.0850	1212.0	0.0076
0.0900	2387.0	-0.0077	0.0900	1865.0	-0.0019	0.0900	1175.0	0.0078
0.0950	2406.0	-0.0079	0.0950	1846.0	-0.0020	0.0950	1138.0	0.0079
0.1000	2424.0	-0.0081	0.1000	1846.0	-0.0021	0.1000	1119.0	0.0081
0.1050	2443.0	-0.0084	0.1050	1846.0	-0.0022	0.1050	1082.0	0.0081
0.1100	2443.0	-0.0086	0.1100	1846.0	-0.0022	0.1100	1063.0	0.0081
0.1150	2443.0	-0.0088	0.1150	1827.0	-0.0023	0.1150	1044.0	0.0081
0.1200	2443.0	-0.0091	0.1200	1809.0	-0.0024	0.1200	1026.0	0.0081
0.1250	2443.0	-0.0093	0.1250	1809.0	-0.0024	0.1250	1026.0	0.0081
0.1300	2443.0	-0.0095	0.1300	1809.0	-0.0025	0.1300	1007.0	0.0081
0.1350	2424.0	-0.0098	0.1350	1790.0	-0.0027	0.1350	988.0	0.0081
0.1400	2424.0	-0.0101	0.1400	1772.0	-0.0028	0.1400	988.0	0.0081
0.1450	2406.0	-0.0102	0.1450	1772.0	-0.0029	0.1450	970.0	0.0080
0.1500	2406.0	-0.0105	0.1500	1753.0	-0.0030	0.1500	970.0	0.0079
0.1550	2406.0	-0.0108	0.1550	1753.0	-0.0031	0.1550	970.0	0.0077
0.1600	2406.0	-0.0110	0.1600	1753.0	-0.0031	0.1600	951.0	0.0076
0.1650	2406.0	-0.0112	0.1650	1734.0	-0.0033	0.1650	951.0	0.0075
0.1700	2387.0	-0.0116	0.1700	1734.0	-0.0035	0.1700	951.0	0.0075
0.1750	2387.0	-0.0117	0.1750	1716.0	-0.0037	0.1750	951.0	0.0074
0.1800	2387.0	-0.0119	0.1800	1716.0	-0.0038	0.1800	951.0	0.0073
0.1850	2368.0	-0.0123	0.1850	1697.0	-0.0039	0.1850	932.0	0.0072
0.1900	2368.0	-0.0125	0.1900	1697.0	-0.0040	0.1900	932.0	0.0071

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-104
Depth: 20-22'
Sample Number: C-1
Sampled Date: 08/07/17
Soil Description: California Liner

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.1950	2350.0	-0.0127	0.1950	1697.0	-0.0043	0.1950	932.0	0.0069
0.2000	2350.0	-0.0130	0.2000	1678.0	-0.0045	0.2000	932.0	0.0068
0.2050	2350.0	-0.0133	0.2050	1678.0	-0.0046	0.2050	932.0	0.0067
0.2100	2331.0	-0.0134	0.2100	1678.0	-0.0047	0.2100	914.0	0.0066
0.2150	2331.0	-0.0137	0.2150	1678.0	-0.0049	0.2150	914.0	0.0064
0.2200	2331.0	-0.0140	0.2200	1660.0	-0.0051	0.2200	914.0	0.0062
0.2250	2331.0	-0.0142	0.2250	1660.0	-0.0053	0.2250	914.0	0.0060
0.2300	2331.0	-0.0145	0.2300	1660.0	-0.0055	0.2300	914.0	0.0059
0.2350	2331.0	-0.0148	0.2350	1660.0	-0.0056	0.2350	914.0	0.0058
0.2400	2331.0	-0.0150	0.2400	1641.0	-0.0058	0.2400	914.0	0.0057
0.2450	2331.0	-0.0152	0.2450	1641.0	-0.0060	0.2450	914.0	0.0054
0.2500	2331.0	-0.0155	0.2500	1641.0	-0.0062	0.2500	914.0	0.0052

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D3080

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Test Start Date: 08/24/17 By: DPM
Test Finish Date: 08/25/17 By: DPM

Raw Data Files: GIDS440A.DAT,
GIDS440B.DAT,
GIDS440C.DAT

Sample Information

Boring: SB-104
Depth: 40-42'
Sample Number: C-2
Sampled Date: 08/08/17
Soil Description: --

Test Configuration

Continuous, Increasing, Deflection Control
Shear Rate (in./min.): 0.0070
Normal Stress Point A (psf): 4330
Normal Stress Point B (psf): 2900
Normal Stress Point C (psf): 1430

	Point A 4330 psf		Point B 2900 psf		Point C 1430 psf	
	Before	After	Before	After	Before	After
Wt. Wet Soil & Ring (g):	130.66	131.90	130.43	132.63	131.28	133.71
Wt of Ring (g):	27.97	27.97	27.16	27.16	27.98	27.98
Wt. Wet Soil (g):	102.69	103.93	103.28	105.47	103.31	105.73
Wt. Wet Soil & Pan (g):	109.48	110.72	109.89	112.08	109.93	112.36
Wt. Dry Soil & Pan(g):	96.01	96.01	96.94	96.94	96.33	96.33
Wt. Water (g):	13.48	14.72	12.95	15.15	13.60	16.03
Wt. of Pan (g):	6.80	6.80	6.61	6.61	6.63	6.63
Wt. of Dry Soil (g):	89.21	89.21	90.33	90.33	89.71	89.71
Percent Moisture:	15.11%	16.50%	14.34%	16.77%	15.16%	17.87%
Diameter (in):	1.938	1.938	1.938	1.938	1.938	1.938
Area (in²):	2.950	2.950	2.950	2.950	2.950	2.950
Height (in):	1.000	0.973	1.000	0.987	1.000	0.996
Volume (ft^3):	0.00171	0.00166	0.00171	0.00169	0.00171	0.00170
Wet Density (pcf):	132.62	137.99	133.38	137.97	133.41	137.11
Dry Density (pcf):	115.21	118.45	116.65	118.15	115.85	116.33

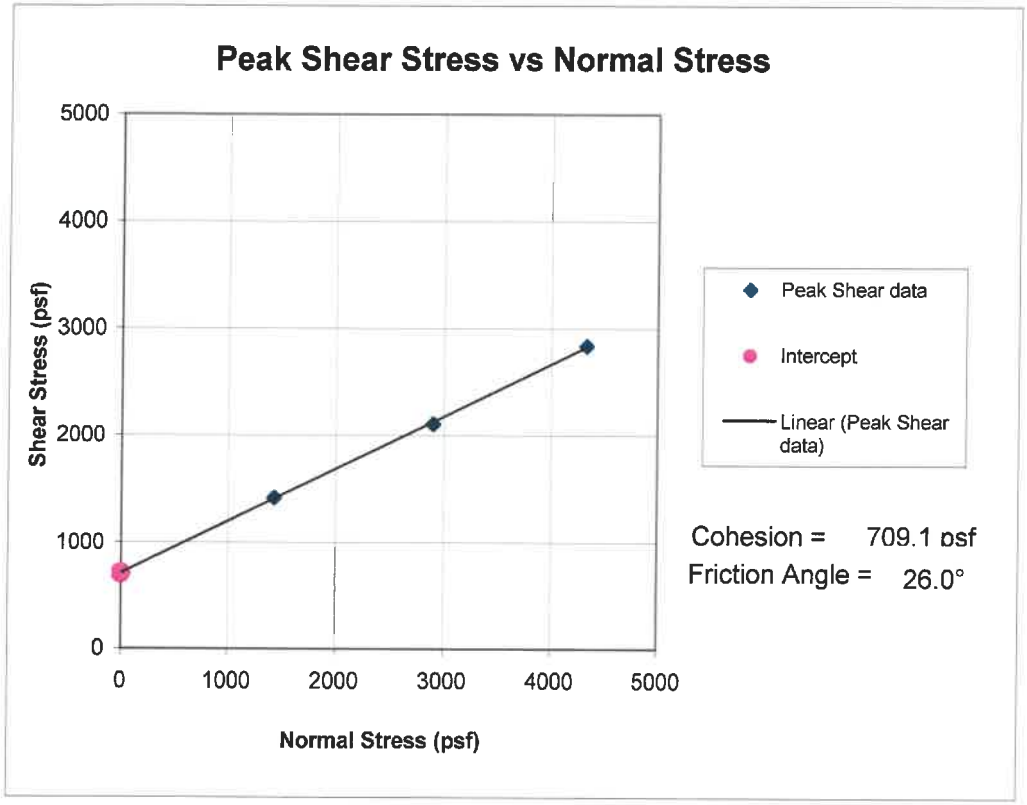
	Point A 4330 psf	Point B 2900 psf	Point C 1430 psf
Peak Strength (psf)	2834.0	2107.0	1417.0
Ultimate Strength(psf)	2592.0	1883.0	970.0

	Peak	Ultimate
Friction Angle °	26.0	29.2
Cohesion (psf)	709.1	199.6

Data Entered By: DPM
Entry Date: 08/29/17
File Name: 2076_245_directShear-ASTMD3080-R3_1.xls

Data Checked By GK
Date 8/29/17

ATT
ADVANCED TERRA TESTING

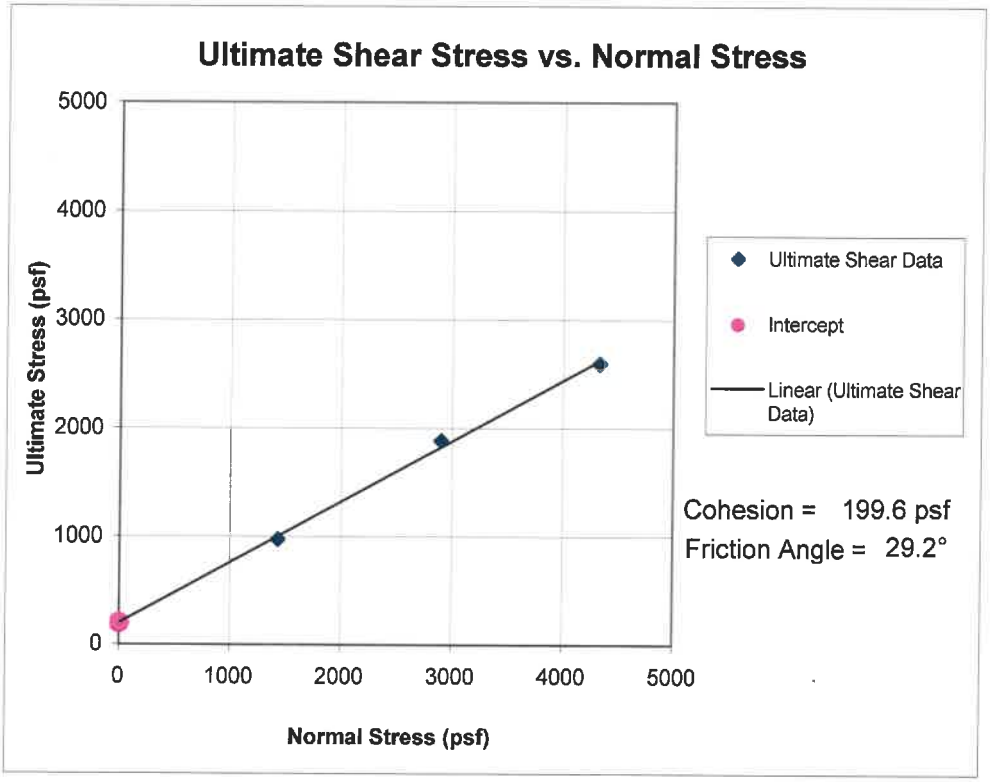


Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Sample Information

Boring: SB-104
Depth: 40-42'
Sample Number: C-2
Sampled Date: 08/08/17
Soil Description: --



Data Entered By: DPM
Entry Date: 08/29/17
File Name: 2076_245_directShear-ASTMD3080-R3_1.xls

Data Checked By CK
Date 8/29/17

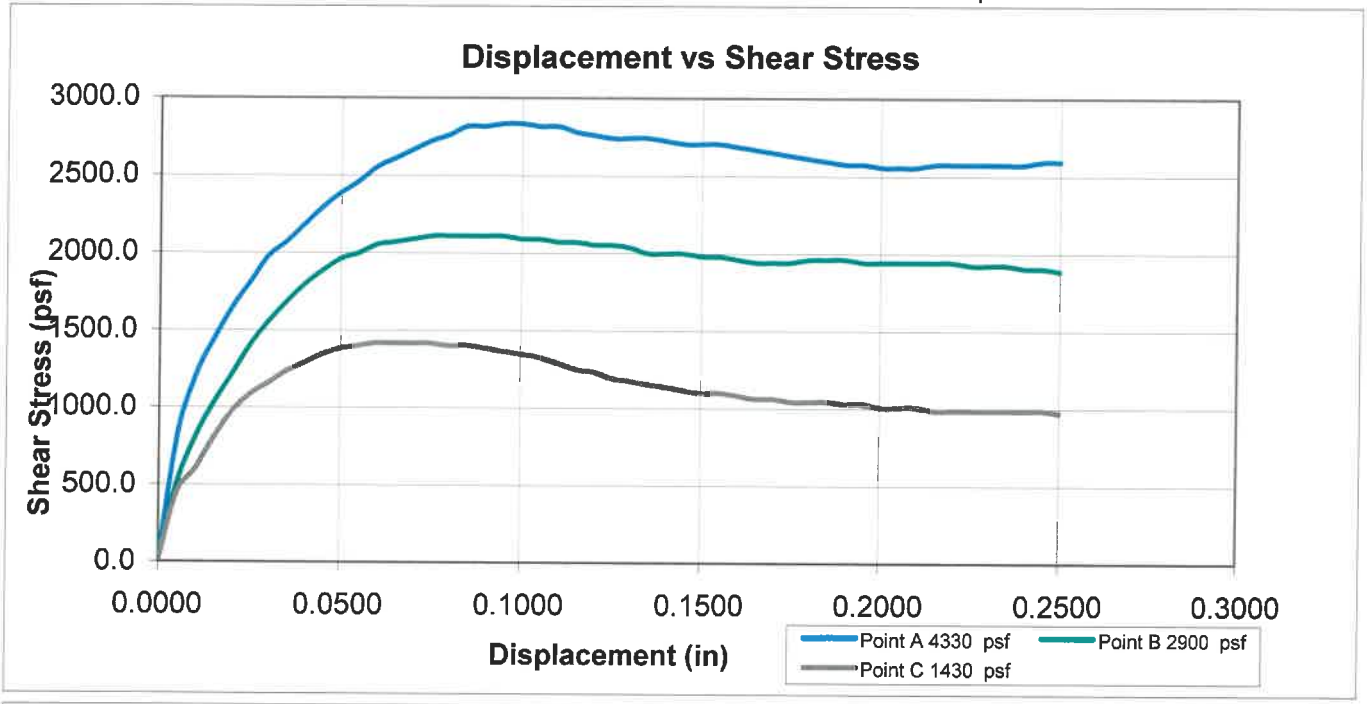
ATT
ADVANCED TERRA TESTING

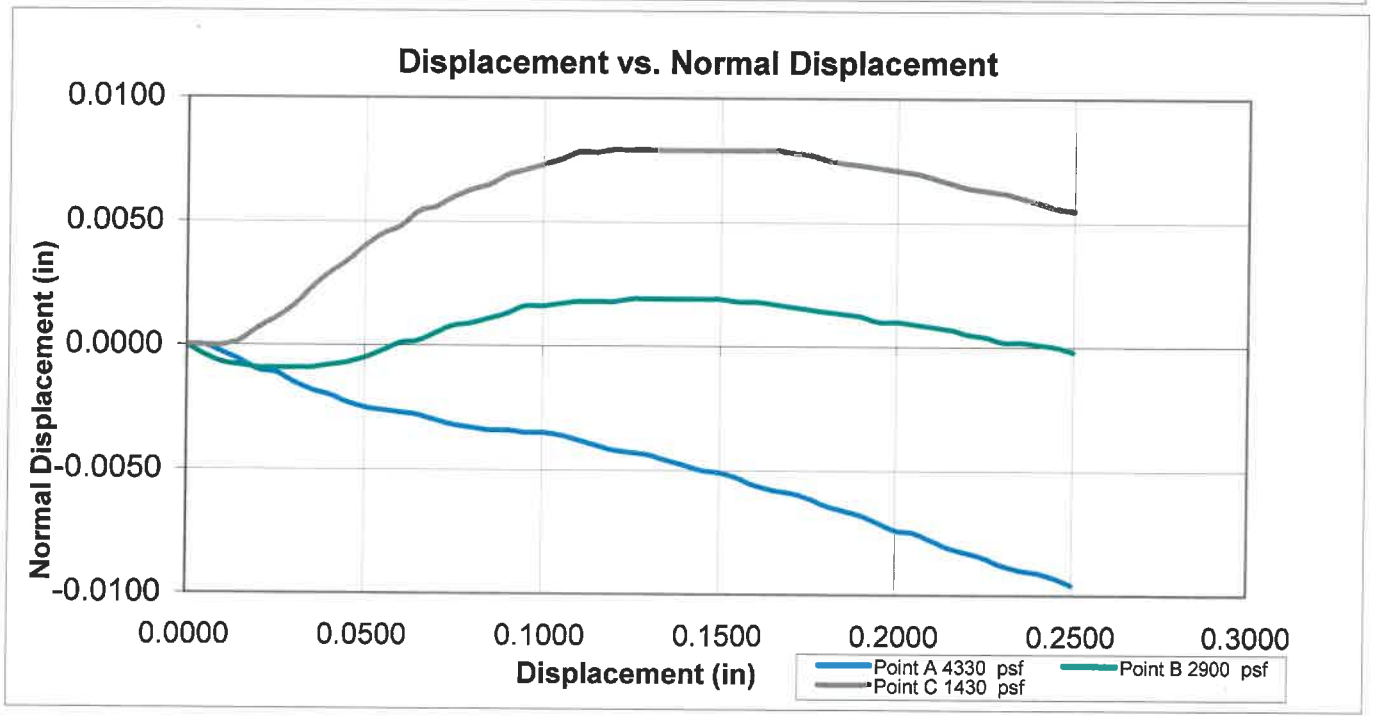
Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Sample Information

Boring: SB-104
Depth: 40-42'
Sample Number: C-2
Sampled Date: 08/08/17
Soil Description: --





Data Entered By: DPM
Entry Date: 08/29/17
File Name: 2076_245_directShear-ASTMD3080-R3_1.xls

Data Checked By CAK
Date 8/29/17

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-104
Depth: 40-42'
Sample Number: C-2
Sampled Date: 08/08/17
Soil Description: --

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.0000	0.0	0.0000	0.0000	0.0	0.0000	0.0000	0.0	0.0000
0.0050	802.0	0.0000	0.0050	503.0	-0.0004	0.0050	448.0	0.0000
0.0100	1193.0	-0.0003	0.0100	802.0	-0.0007	0.0100	597.0	0.0000
0.0150	1436.0	-0.0006	0.0150	1026.0	-0.0008	0.0150	802.0	0.0002
0.0200	1641.0	-0.0010	0.0200	1212.0	-0.0009	0.0200	970.0	0.0007
0.0250	1809.0	-0.0011	0.0250	1399.0	-0.0009	0.0250	1082.0	0.0011
0.0300	1977.0	-0.0015	0.0300	1548.0	-0.0009	0.0300	1156.0	0.0016
0.0350	2070.0	-0.0018	0.0350	1678.0	-0.0009	0.0350	1231.0	0.0023
0.0400	2182.0	-0.0020	0.0400	1790.0	-0.0008	0.0400	1287.0	0.0029
0.0450	2294.0	-0.0023	0.0450	1883.0	-0.0007	0.0450	1343.0	0.0034
0.0500	2387.0	-0.0025	0.0500	1958.0	-0.0005	0.0500	1380.0	0.0040
0.0550	2462.0	-0.0026	0.0550	1995.0	-0.0002	0.0550	1399.0	0.0045
0.0600	2555.0	-0.0027	0.0600	2051.0	0.0001	0.0600	1417.0	0.0048
0.0650	2611.0	-0.0028	0.0650	2070.0	0.0002	0.0650	1417.0	0.0054
0.0700	2667.0	-0.0030	0.0700	2089.0	0.0005	0.0700	1417.0	0.0056
0.0750	2723.0	-0.0032	0.0750	2107.0	0.0008	0.0750	1417.0	0.0060
0.0800	2760.0	-0.0033	0.0800	2107.0	0.0009	0.0800	1399.0	0.0063
0.0850	2816.0	-0.0034	0.0850	2107.0	0.0011	0.0850	1399.0	0.0065
0.0900	2816.0	-0.0034	0.0900	2107.0	0.0013	0.0900	1380.0	0.0069
0.0950	2834.0	-0.0035	0.0950	2107.0	0.0016	0.0950	1361.0	0.0071
0.1000	2834.0	-0.0035	0.1000	2089.0	0.0016	0.1000	1343.0	0.0073
0.1050	2816.0	-0.0036	0.1050	2089.0	0.0017	0.1050	1324.0	0.0075
0.1100	2816.0	-0.0038	0.1100	2070.0	0.0018	0.1100	1287.0	0.0078
0.1150	2779.0	-0.0040	0.1150	2070.0	0.0018	0.1150	1249.0	0.0078
0.1200	2760.0	-0.0042	0.1200	2051.0	0.0018	0.1200	1231.0	0.0079
0.1250	2741.0	-0.0043	0.1250	2051.0	0.0019	0.1250	1193.0	0.0079
0.1300	2741.0	-0.0044	0.1300	2033.0	0.0019	0.1300	1175.0	0.0079
0.1350	2741.0	-0.0046	0.1350	1995.0	0.0019	0.1350	1156.0	0.0079
0.1400	2723.0	-0.0048	0.1400	1995.0	0.0019	0.1400	1138.0	0.0079
0.1450	2704.0	-0.0050	0.1450	1995.0	0.0019	0.1450	1119.0	0.0079
0.1500	2704.0	-0.0051	0.1500	1977.0	0.0019	0.1500	1100.0	0.0079
0.1550	2704.0	-0.0053	0.1550	1977.0	0.0018	0.1550	1100.0	0.0079
0.1600	2685.0	-0.0056	0.1600	1958.0	0.0018	0.1600	1082.0	0.0079
0.1650	2667.0	-0.0058	0.1650	1939.0	0.0017	0.1650	1063.0	0.0079
0.1700	2648.0	-0.0059	0.1700	1939.0	0.0016	0.1700	1063.0	0.0078
0.1750	2629.0	-0.0061	0.1750	1939.0	0.0015	0.1750	1044.0	0.0077
0.1800	2611.0	-0.0064	0.1800	1958.0	0.0014	0.1800	1044.0	0.0075
0.1850	2592.0	-0.0066	0.1850	1958.0	0.0013	0.1850	1044.0	0.0074
0.1900	2573.0	-0.0068	0.1900	1958.0	0.0012	0.1900	1026.0	0.0073

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-104
Depth: 40-42'
Sample Number: C-2
Sampled Date: 08/08/17
Soil Description: --

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.1950	2573.0	-0.0071	0.1950	1939.0	0.0010	0.1950	1026.0	0.0072
0.2000	2555.0	-0.0074	0.2000	1939.0	0.0010	0.2000	1007.0	0.0071
0.2050	2555.0	-0.0075	0.2050	1939.0	0.0009	0.2050	1007.0	0.0070
0.2100	2555.0	-0.0078	0.2100	1939.0	0.0008	0.2100	1007.0	0.0068
0.2150	2573.0	-0.0081	0.2150	1939.0	0.0007	0.2150	988.0	0.0066
0.2200	2573.0	-0.0083	0.2200	1939.0	0.0005	0.2200	988.0	0.0064
0.2250	2573.0	-0.0085	0.2250	1921.0	0.0004	0.2250	988.0	0.0063
0.2300	2573.0	-0.0088	0.2300	1921.0	0.0002	0.2300	988.0	0.0062
0.2350	2573.0	-0.0090	0.2350	1921.0	0.0002	0.2350	988.0	0.0060
0.2400	2573.0	-0.0091	0.2400	1902.0	0.0001	0.2400	988.0	0.0058
0.2450	2592.0	-0.0093	0.2450	1902.0	0.0000	0.2450	988.0	0.0056
0.2500	2592.0	-0.0096	0.2500	1883.0	-0.0002	0.2500	970.0	0.0055

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D3080

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Test Start Date: 08/23/17 By: DPM
Test Finish Date: 08/24/17 By: DPM

Raw Data Files: GIDS314A.DAT,
GIDS314B.DAT,
GIDS314C.DAT

Sample Information

Boring: SB-103
Depth: 14-16'
Sample Number: C-1
Sampled Date: 08/06/17
Soil Description: Cal Tube

Test Configuration

Continuous, Increasing, Deflection Control
Shear Rate (in./min.): 0.0056
Normal Stress Point A (psf): 4330
Normal Stress Point B (psf): 2900
Normal Stress Point C (psf): 1430

	Point A 4330 psf		Point B 2900 psf		Point C 1430 psf	
	Before	After	Before	After	Before	After
Wt. Wet Soil & Ring (g):	127.25	128.68	128.71	128.60	129.38	131.59
Wt of Ring (g):	27.91	27.91	27.16	27.16	27.97	27.97
Wt. Wet Soil (g):	99.34	100.78	101.55	101.44	101.41	103.62
Wt. Wet Soil & Pan (g):	106.35	107.78	108.19	108.08	108.05	110.26
Wt. Dry Soil & Pan(g):	90.87	90.87	91.95	91.95	91.59	91.59
Wt. Water (g):	15.48	16.91	16.24	16.13	16.46	18.67
Wt. of Pan (g):	7.01	7.01	6.64	6.64	6.64	6.64
Wt. of Dry Soil (g):	83.86	83.86	85.31	85.31	84.95	84.95
Percent Moisture:	18.46%	20.17%	19.04%	18.91%	19.37%	21.98%
Diameter (in):	1.938	1.938	1.938	1.938	1.938	1.938
Area (in²):	2.950	2.950	2.950	2.950	2.950	2.950
Height (in):	1.000	0.985	1.000	0.994	1.000	0.998
Volume (ft^3):	0.00171	0.00168	0.00171	0.00170	0.00171	0.00170
Wet Density (pcf):	128.30	132.10	131.15	131.86	130.97	134.04
Dry Density (pcf):	108.30	109.93	110.17	110.89	109.71	109.89

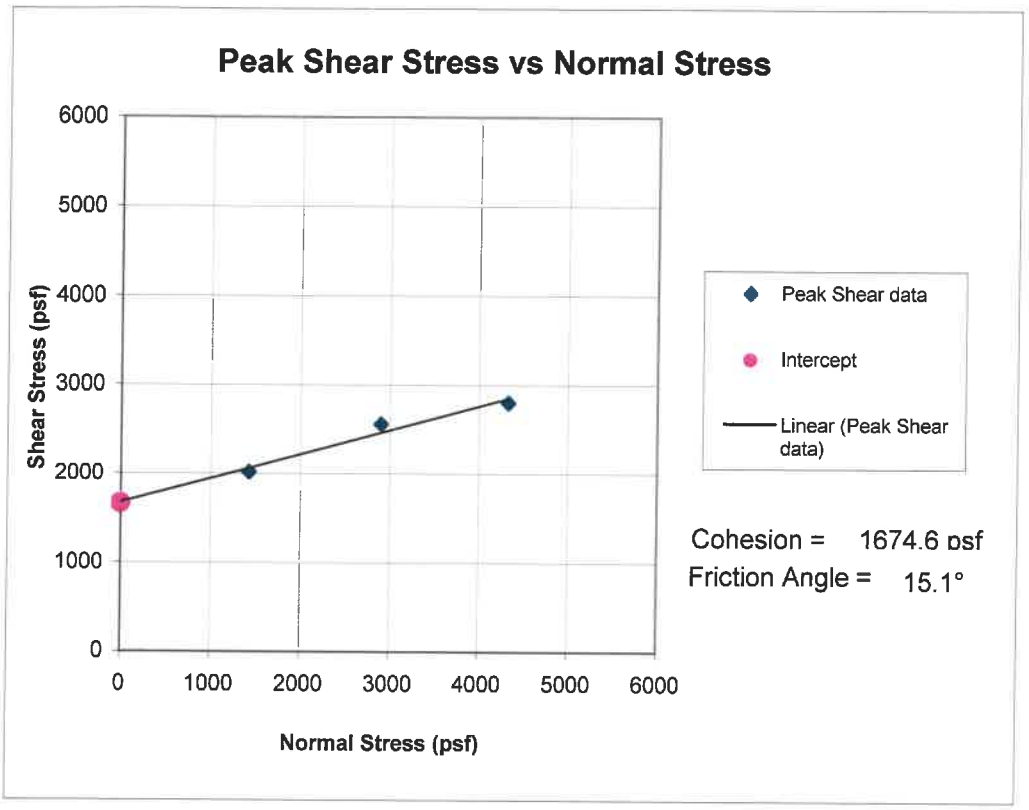
	Point A 4330 psf	Point B 2900 psf	Point C 1430 psf
Peak Strength (psf)	2797.0	2555.0	2014.0
Ultimate Strength(psf)	2779.0	2051.0	1324.0

	Peak	Ultimate
Friction Angle °	15.1	26.6
Cohesion (psf)	1674.6	603.1

Data Entered By: DPM
Entry Date: 08/25/17
File Name: 2076_245_directShear-ASTMD3080-R3_0.xls

Data Checked By: CM
Date: 8/29/17

ATT
ADVANCED TERRA TESTING



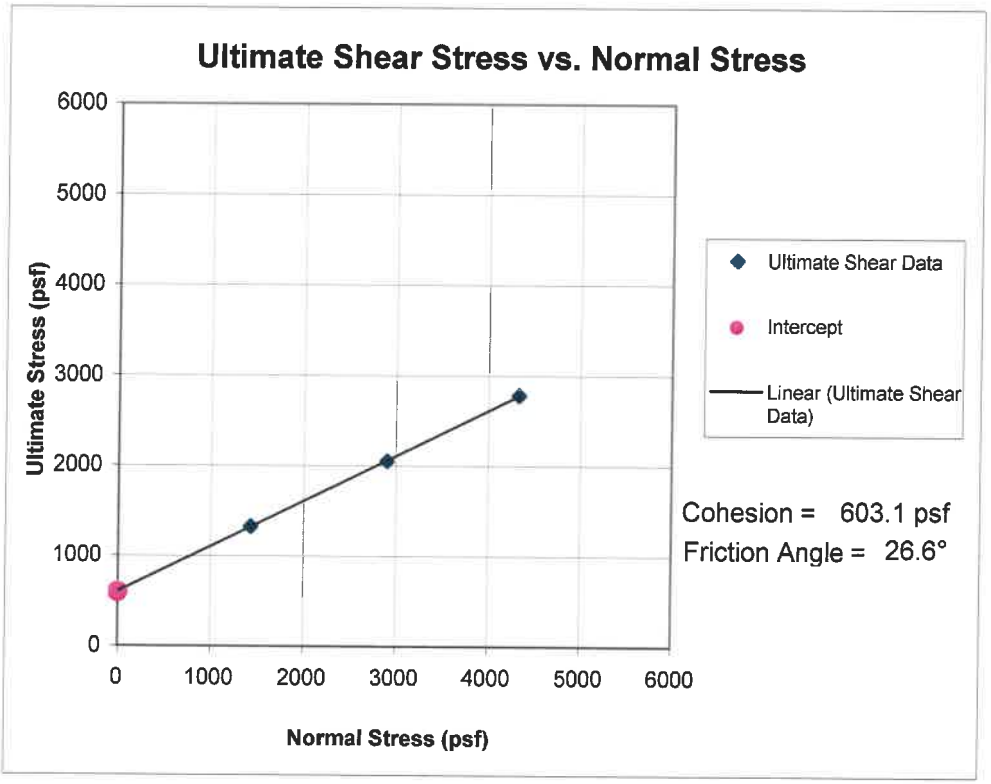
Cohesion = 1674.6 psf
Friction Angle = 15.1°

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Sample Information

Boring: SB-103
Depth: 14-16'
Sample Number: C-1
Sampled Date: 08/06/17
Soil Description: Cal Tube



Cohesion = 603.1 psf
Friction Angle = 26.6°

Data Entered By: DPM
Entry Date: 08/25/17
File Name: 2076_245_directShear-ASTMD3080-R3_0.xls

Data Checked By CJL
Date 8/29/17

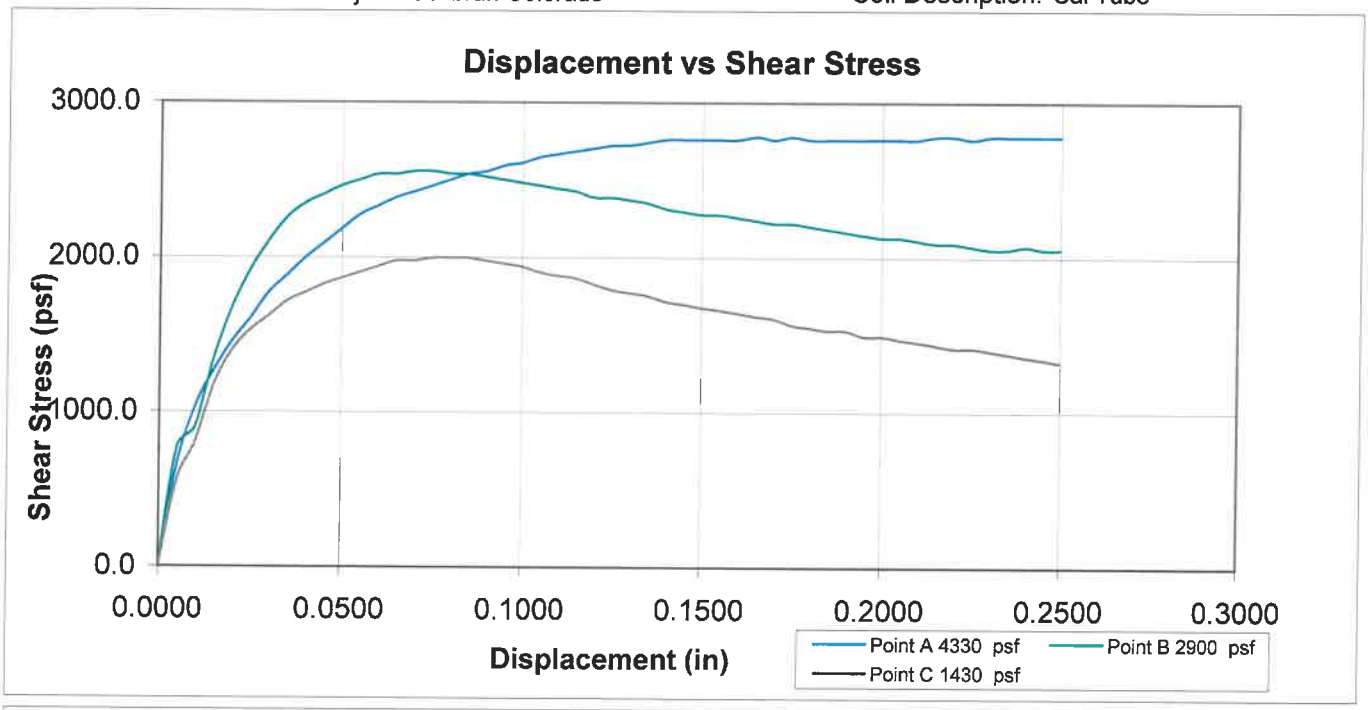
ATT
ADVANCED TERRA TESTING

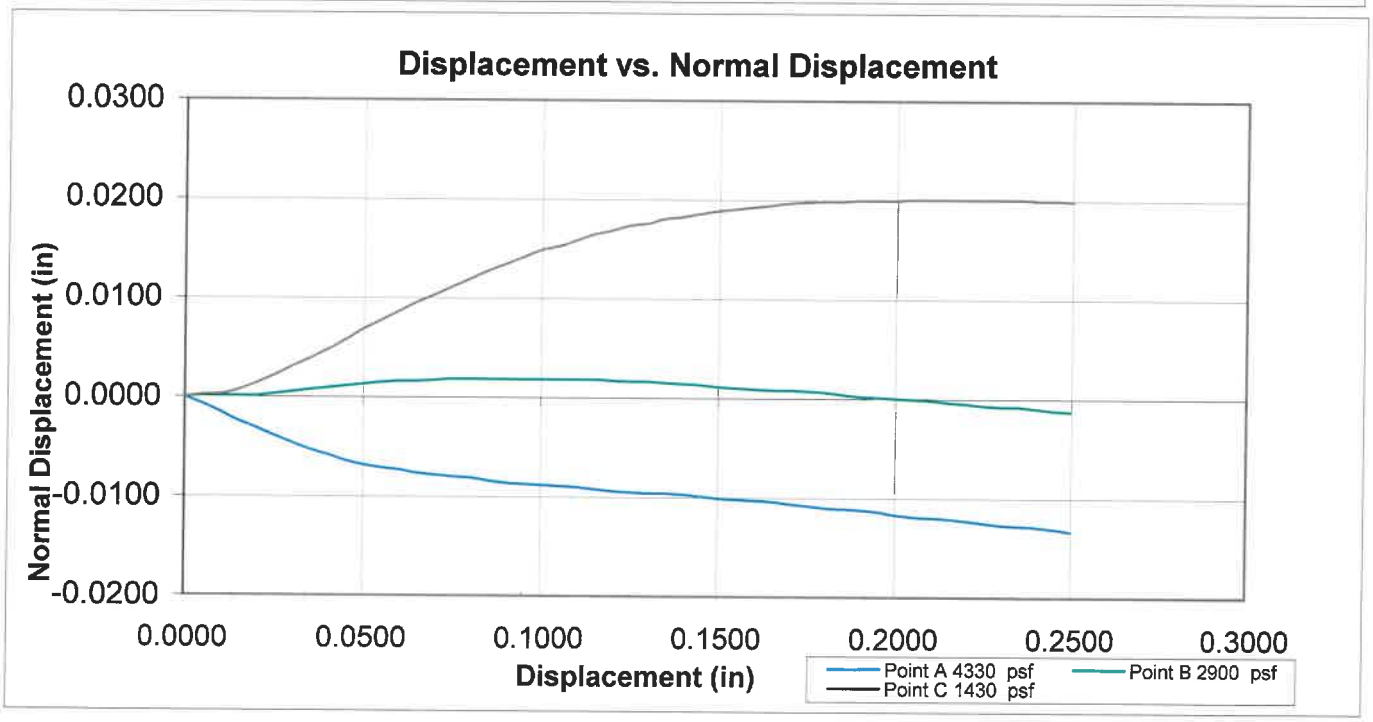
Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391
Project: Collbran Colorado

Sample Information

Boring: SB-103
Depth: 14-16'
Sample Number: C-1
Sampled Date: 08/06/17
Soil Description: Cal Tube





Data Entered By: DPM
Entry Date: 08/25/17
File Name: 2076_245_directShear-ASTMD3080-R3_0.xls

Data Checked By CHL
Date 8/29/17

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-103
Depth: 14-16'
Sample Number: C-1
Sampled Date: 08/06/17
Soil Description: Cal Tube

Raw Data

Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.0000	0.0	0.0000	0.0000	0.0	0.0000	0.0000	0.0	0.0000
0.0050	653.0	-0.0007	0.0050	765.0	0.0001	0.0050	559.0	0.0002
0.0100	1026.0	-0.0015	0.0100	895.0	0.0001	0.0100	802.0	0.0003
0.0150	1268.0	-0.0024	0.0150	1343.0	0.0001	0.0150	1175.0	0.0007
0.0200	1455.0	-0.0031	0.0200	1678.0	0.0001	0.0200	1399.0	0.0014
0.0250	1604.0	-0.0039	0.0250	1921.0	0.0003	0.0250	1529.0	0.0022
0.0300	1772.0	-0.0046	0.0300	2107.0	0.0005	0.0300	1622.0	0.0031
0.0350	1883.0	-0.0053	0.0350	2256.0	0.0007	0.0350	1716.0	0.0039
0.0400	1995.0	-0.0058	0.0400	2350.0	0.0009	0.0400	1772.0	0.0048
0.0450	2089.0	-0.0064	0.0450	2406.0	0.0011	0.0450	1827.0	0.0058
0.0500	2182.0	-0.0068	0.0500	2462.0	0.0013	0.0500	1865.0	0.0069
0.0550	2275.0	-0.0071	0.0550	2499.0	0.0015	0.0550	1902.0	0.0078
0.0600	2331.0	-0.0073	0.0600	2536.0	0.0016	0.0600	1939.0	0.0087
0.0650	2387.0	-0.0076	0.0650	2536.0	0.0016	0.0650	1977.0	0.0096
0.0700	2424.0	-0.0078	0.0700	2555.0	0.0017	0.0700	1977.0	0.0104
0.0750	2462.0	-0.0080	0.0750	2555.0	0.0018	0.0750	1995.0	0.0112
0.0800	2499.0	-0.0081	0.0800	2536.0	0.0018	0.0800	1995.0	0.0120
0.0850	2536.0	-0.0084	0.0850	2536.0	0.0018	0.0850	1995.0	0.0128
0.0900	2555.0	-0.0086	0.0900	2517.0	0.0018	0.0900	1977.0	0.0135
0.0950	2592.0	-0.0087	0.0950	2499.0	0.0018	0.0950	1958.0	0.0142
0.1000	2611.0	-0.0088	0.1000	2480.0	0.0018	0.1000	1939.0	0.0149
0.1050	2648.0	-0.0089	0.1050	2462.0	0.0018	0.1050	1902.0	0.0153
0.1100	2667.0	-0.0090	0.1100	2443.0	0.0018	0.1100	1883.0	0.0159
0.1150	2685.0	-0.0092	0.1150	2424.0	0.0018	0.1150	1865.0	0.0165
0.1200	2704.0	-0.0094	0.1200	2387.0	0.0017	0.1200	1827.0	0.0169
0.1250	2723.0	-0.0095	0.1250	2387.0	0.0016	0.1250	1790.0	0.0174
0.1300	2723.0	-0.0096	0.1300	2368.0	0.0016	0.1300	1772.0	0.0176
0.1350	2741.0	-0.0096	0.1350	2350.0	0.0015	0.1350	1753.0	0.0181
0.1400	2760.0	-0.0097	0.1400	2312.0	0.0014	0.1400	1716.0	0.0183
0.1450	2760.0	-0.0099	0.1450	2294.0	0.0013	0.1450	1697.0	0.0186
0.1500	2760.0	-0.0101	0.1500	2275.0	0.0011	0.1500	1678.0	0.0189
0.1550	2760.0	-0.0102	0.1550	2275.0	0.0010	0.1550	1660.0	0.0191
0.1600	2760.0	-0.0103	0.1600	2256.0	0.0009	0.1600	1641.0	0.0193
0.1650	2779.0	-0.0104	0.1650	2238.0	0.0008	0.1650	1622.0	0.0195
0.1700	2760.0	-0.0106	0.1700	2219.0	0.0008	0.1700	1604.0	0.0197
0.1750	2779.0	-0.0108	0.1750	2219.0	0.0007	0.1750	1566.0	0.0198
0.1800	2760.0	-0.0110	0.1800	2200.0	0.0006	0.1800	1548.0	0.0199
0.1850	2760.0	-0.0111	0.1850	2182.0	0.0004	0.1850	1529.0	0.0199
0.1900	2760.0	-0.0112	0.1900	2163.0	0.0002	0.1900	1529.0	0.0200

ATT
ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

Client Data

Client: GEI Consultants Inc.
Job Number.: 2076-245
Location: Laramie Energy Nichols Pads
Project Number: 1703391

Sample Information

Boring: SB-103
Depth: 14-16'
Sample Number: C-1
Sampled Date: 08/06/17
Soil Description: Cal Tube

Raw Data

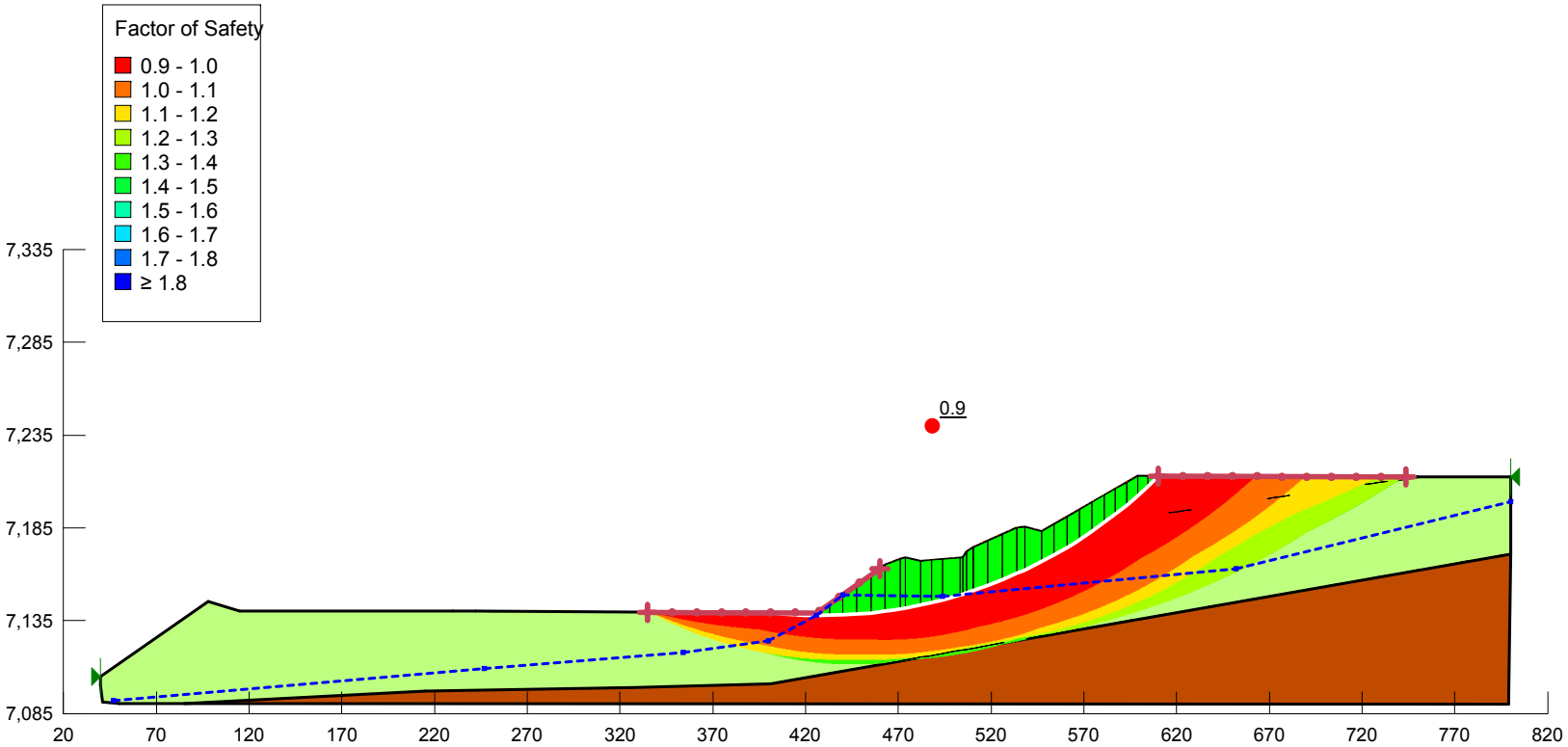
Point A 4330 psf			Point B 2900 psf			Point C 1430 psf		
Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)	Displacement (in)	Shear Stress (psf)	Vertical Displacement (in)
0.1950	2760.0	-0.0114	0.1950	2144.0	0.0001	0.1950	1492.0	0.0200
0.2000	2760.0	-0.0117	0.2000	2126.0	0.0000	0.2000	1492.0	0.0200
0.2050	2760.0	-0.0119	0.2050	2126.0	-0.0001	0.2050	1473.0	0.0201
0.2100	2760.0	-0.0120	0.2100	2107.0	-0.0002	0.2100	1455.0	0.0201
0.2150	2779.0	-0.0121	0.2150	2089.0	-0.0004	0.2150	1436.0	0.0201
0.2200	2779.0	-0.0123	0.2200	2089.0	-0.0005	0.2200	1417.0	0.0201
0.2250	2760.0	-0.0125	0.2250	2070.0	-0.0007	0.2250	1417.0	0.0201
0.2300	2779.0	-0.0127	0.2300	2051.0	-0.0008	0.2300	1399.0	0.0201
0.2350	2779.0	-0.0128	0.2350	2051.0	-0.0008	0.2350	1380.0	0.0201
0.2400	2779.0	-0.0129	0.2400	2070.0	-0.0010	0.2400	1361.0	0.0200
0.2450	2779.0	-0.0131	0.2450	2051.0	-0.0012	0.2450	1343.0	0.0200
0.2500	2779.0	-0.0134	0.2500	2051.0	-0.0013	0.2500	1324.0	0.0199

ATT
ADVANCED TERRA TESTING

Attachment E

Name: Nichols Pad Existing
Date: 9/13/2017

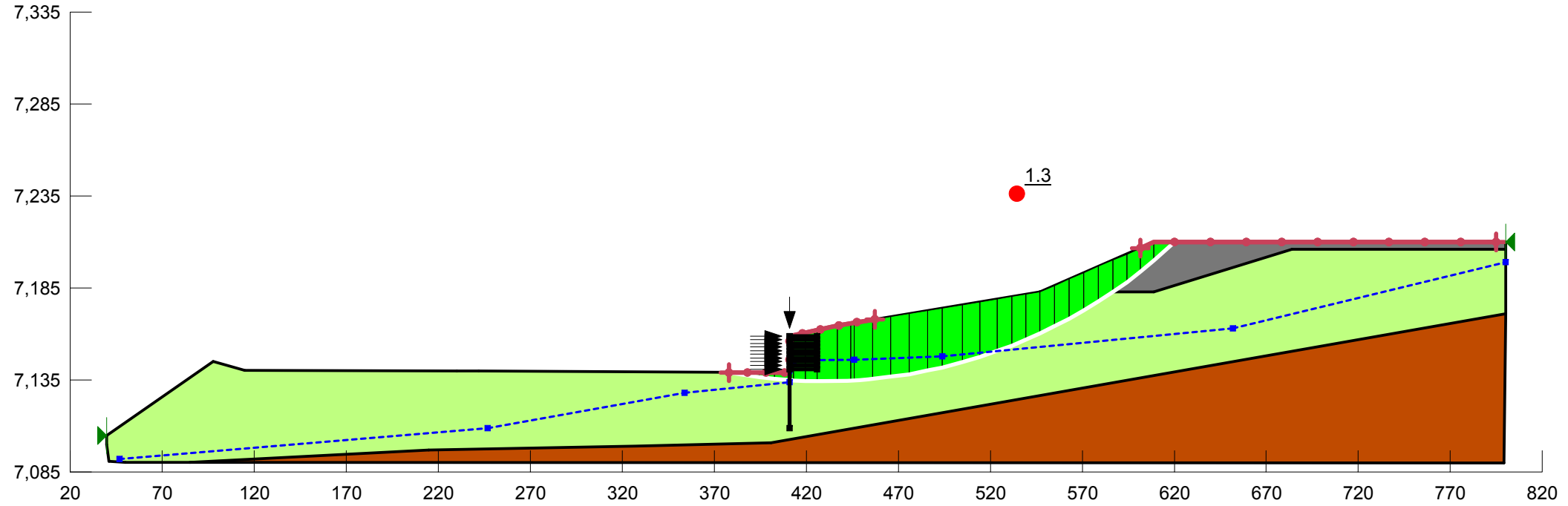
Name: Fill Unit Weight: 125 pcf Cohesion': 150 psf Phi': 30 °
Name: Native Clay Unit Weight: 130 pcf Cohesion': 0 psf Phi': 16 °
Name: Claystone Unit Weight: 130 pcf Cohesion': 1,000 psf Phi': 20 °



Name: Nichols Pad Final
Date: 9/13/2017

Factor of Safety
- 1.3 - 1.4
- 1.4 - 1.5
- 1.5 - 1.6
- 1.6 - 1.7
- 1.7 - 1.8
- 1.8 - 1.9
- 1.9 - 2.0
- 2.0 - 2.1
- 2.1 - 2.2
- ≥ 2.2

Name: Fill Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 150 psf Phi': 30 ° Phi-B: 0 °
Name: Native Clay Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 16 ° Phi-B: 0 °
Name: Claystone Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 1,000 psf Phi': 20 ° Phi-B: 0 °



Attachment F

Project: Laramie Energy Oil Pad Stabilization
Project No.: 1703391

Date: 9/8/2017
Engineer: NCJ

Filter Design (Embankment Material to Filter Sand)

Based on NRCS, Part 663 National Engineering Handbook - Ch 26 Gradation Design of Sand and Gravel Filters

Step 1	Base Soil = Lean Clay With Sand	See Gradation Curves			
	Identify FINEST GRADATION - Controls Filter Requirements	SB-102 (30-32 ft)			
	Identify COARSEST GRADATION - Controls Permeability Requirements	SB-101 (33.5-.5 ft)			
Step 2	Material Larger than No. 4 (4.75 mm) Sieve - Gravel (FINEST Gradation)?	No	Proceed to Step 4		
Step 3	Regrade FINEST Gradation for 100% Passing No. 4 (4.75 mm) Sieve	N/A	----------	Regrading Factor =	1.11
Step 4	Determine Base Soil Category (Table 26-1)				
	A = Percent Passing No. 200 (0.075 mm) Sieve After Regrading	88%			
	Base Soil Category 1: Percent Passing No. 200 Sieve	> 85%	(Fine Silt and Clays)		
	Base Soil Category 2: Percent Passing No. 200 Sieve	40 - 85%	(Sands, Silts, Clays, and Silty & Clayey Sands)		
	Base Soil Category 3: Percent Passing No. 200 Sieve	15 - 39%	(Silty & Clayey Sands and Gravel)		
	Base Soil Category 4: Percent Passing No. 200 Sieve	< 15%	(Sands and Gravel)		
	Base Soil Category	1	(Fine Silt and Clays)		
Step 5	Maximum $D_{15\ (filter)}$ for Filter Requirements (Table 26-2)				
	(FINEST Gradation, Regraded) $d_{85\ (base)}$	0.03	mm		
	Base Soil Category 1 Max $D_{15\ (filter)}$	0.27	mm		
	Base Soil Category 2 Max $D_{15\ (filter)}$	0.70	mm		
	Base Soil Category 3 Max $D_{15\ (filter)}$	0.70	mm		
	Base Soil Category 4 Max $D_{15\ (filter)}$	0.12	mm		
	(from Table 26-2) Maximum Allowable $D_{15\ (filter)}$	0.27	mm		
Step 6	Minimum $D_{15\ (filter)}$ for Permeability Requirements (Table 26-3)				
	(COARSEST Gradation, Before Regrading) $d_{15\ (base)}$	0.01	mm		
	(from Table 26-3) Minimum Allowable $D_{15\ (filter)}$	0.10	mm		
Step 7	To Avoid Gap-Graded Filters, Maximum D_{15} / Minimum $D_{15} \leq 5$	2.70	OK	Critical Design Function (Filter or Drain)?	Drain
	Step 7A - Filter Controlled - Max D_{15} = Min D_{15} *5	0.50	mm		
	Step 7B - Permeability Controlled - Min D_{15} = Max D_{15} /5	0.05	mm		
	Control Point 1 (Maximum D_{15})	0.27	mm		
	Control Point 2 (Minimum D_{15})	0.05	mm		
Step 8	To Avoid Gap-Graded Filters, $C_U = D_{60} / D_{10} \leq 6$				
	Max D_{10} = Max D_{15} / 1.2	0.23	mm		
	Control Point 3 (Maximum D_{60} = Max D_{10} * 6)	1.35	mm		
	Control Point 4 (Minimum D_{60} = Max D_{60} / 5)	0.27	mm		
Step 9	Maximum and Minimum Sizes for Filter (Table 26-5)				
	Control Point 5 (Minimum D_5)	0.075	mm		
	Control Point 6 (Maximum D_{100})	75	mm		
Step 10	To Minimize Segregation:				
	Preliminary Minimum D_{10} = Min D_{15} / 1.2	0.04	mm		
	Control Point 7 (Maximum D_{90} - from Table 26-6)	20	mm		

Step 11 CALCULATED FILTER BAND

Minimum Grading (Permeability Criteria)

	Grain Size (mm)	Percent Passing (%)
Extrapolate to $D_{100\ (min)}$	2.5	100
Point 4 ($D_{60\ (min)}$)	0.27	60
Point 2 ($D_{15\ (min)}$)	0.14	15
Point 5 ($D_{5\ (min)}$)	0.075	5

Maximum Grading (Filter Criteria)

	Grain Size (mm)	Percent Passing (%)	
Point 6 ($D_{100\ (max)}$)	30	100	(adjust as necessary)
Point 7 ($D_{90\ (max)}$)	20	90	
Point 3 ($D_{60\ (max)}$)	1.35	60	
Point 1 ($D_{15\ (max)}$)	0.27	15	
Extrapolate to $D_{0\ (max)}$	0.20	0