

# United States Department of the Interior

# Bureau of Indian Affairs Navajo Regional Office P. O. Box 1060 Gallup, New Mexico 87305-1060

IN REPLY REFER TO: DIVISION OF TRANSPORTATION M\C: 370

#### MEMORANDUM

February 7, 2013

To: Mr. Albert Lee, Highway Design Section Chief

From: Mr. Alfred Myron, Materials Engineer

Subject: Design Recommendation – Subgrade Stabilization, Project N7054 (1)2&3 – Pinedale, NM

- 1. This report is not necessarily based upon the recommendations contained in the geotechnical report by KLEINFELDER WEST, INC. dated May 31, 2012. Kleinfelder's geotechnical report covered 12.9 km (8.0 miles) of existing roadway alignment. Their geotechnical report covered only a recommendation for stabilization of the existing 6-inches (0 to 15cm depth) soils in the existing roadway and not necessarily a newly constructed finished subgrade.
- 2. Based upon the report, **KLEINFELDER did not clearly specify** where (no station limits) to perform the soil stabilization work as they state:
  - "5. In our opinion, the N7054 alignment is a good candidate for an NRDOT field trial of the RoadPacker Plus and RoadBond products. There are more slightly sandy, less clayey portions of the alignment, as evidenced by the laboratory tests. These sections appear to be good locations to test the RoadBond product, with the rest of the alignment apparently more suitable for RoadPacker Plus. The material vendor should be consulted for recommendations as to which product is better suited to each reach of the N7054 alignment. Some blending of soils along the alignment may be required or beneficial."
- 3. As KLEINFELDER's recommended locations for soil stabilization are very unclear; we recommend the following:
  - a. During actual construction of the roadway, the contractor shall sample the top 12-inches (304mm) of the newly finished subgrade in accordance with Section 204 of the contract supplemental specifications.
  - b. If the soil sample is classified as A-2-4 or A-4 and is non-plastic; no soil stabilization work shall be performed at this location.
  - c. If the soil sample is classified as A-6 or A-7-6 and has a PI > 10; soil stabilization can be performed. The soil stabilizing product can be RoadPacker Plus, RoadBond, RoadBond EN-1 or any other product approved by NRDOT. The contractor must follow the manufacturer's recommendations for the product he chooses to use.

<u>Section 213-Subgrade Stabilization, FP-2003</u>
The top 150 mm (6-inches) of the finished subgrade shall be soil stabilized ONLY if test data indicates that the soil is A-6 or A-7-6 with a PI > 10. This recommendation is for only the main roadway section hence the turnouts are not included. The contractor must follow the manufacturer's direction and instruction in applying the soil stabilizer.

Prepared by:	Date_ 2-08-13
Regional Materials Engineer	
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Approved by:	Date
Planning & Design Branch Chief	<u>-</u>



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JUN 1 + 2012

May 31, 2012

File No.: 126434.5-ALB12RP001

Ms. Ella M. Dempsey Contract Specialist (Contracting Officer) BIA-Navajo Regional Office Div. of Acquisition PO Box 1060 301 West Hill, Room 346 Gallup, NM 87301

Navajo Region Division of Transportation

Subject:

Task Order No.: A12PD00508, Project N7054(1)2&3

Kleinfelder Project # 126434

Dear Ms. Dempsey:

Kleinfelder West Inc. (Kleinfelder) has completed all work under this task order. This report documents the results of our field and laboratory testing programs and contains our recommendations relative to stabilizing the subgrade soils on this portion of the N7054 alignment.

#### Introduction

Kleinfelder was engaged to sample and test the near surface soils along an approximately 12.9 km (8.0 miles) portion of the N7054 road alignment northeast of Gallup, NM. This task order was performed pursuant to BIA solicitation # N0037012010 and our proposal dated March 9. 2012.

It is our understanding that the Navajo Region Division of Transportation (NRDOT) plans to improve this road by applying a stabilization product to the existing subgrade. The location of the project and of the N7054 alignment and test borings are shown on Figures 1 and 2.

# Field and Laboratory Test Programs

Kleinfelder performed sixty-two test borings along or near the centerline of the present N7054 (currently an unimproved road), to a depth of approximately 91 cm (3 feet) at the locations shown on Figure 2. The boring locations were established using a precision GPS receiver. A sample of the upper 15 cm (approximately 6 inches) of the existing subgrade soils at each boring location was obtained and returned to our laboratory for testing. An additional sample of the soils blended from a depth of 15 cm to 91 cm depth (about 6 inches to 3 feet) was also obtained from each boring and returned to our laboratory. The blended samples from 15 cm to 91 cm depth were not tested, since only the top 15 cm of subgrade soils are normally treated during construction.

Hydrometer Particle Size Analysis of Soils tests (AASHTO T-88) were performed on the shallow (0 to 15 cm depth) samples recovered from each of the test borings in order to determine the silt and clay fractions. pH tests were performed on each of the recovered shallow subgrade samples. A few Atterberg Limits (AASHTO T-89, T-90) tests were also performed as an aid in classification of the subgrade soils. These results are presented graphically along the alignment profile in Appendix A.

The original solicitation did not specify performing Cation Exchange Capacity (CEC) tests on the subgrade samples. The CEC test is used to determine how the clay particles in the soil hold or reject free water molecules, and the CEC test is a necessary prequalification procedure for use of potential stabilization agents (RoadPacker Plus and RoadBond). After discussion with Harold Riley, Director of the NRDOT, the performance of CEC tests was added to the scope of the task order, and a CEC test was performed on each recovered shallow subgrade sample. These results are also presented graphically in Appendix A.

One California Bearing Ratio (CBR) test (AASHTO T-193) was performed, at Kleinfelder's discretion, in order to evaluate the performance of a proposed subgrade treatment product, RoadPacker Plus. This test was performed on a blended sample of the shallow subgrade soils along the N7054 alignment and which was treated with the RoadPacker Plus product in accordance with the manufacturer's recommendations. The CBR results are presented in Appendix B.

# Discussion, Conclusions and Recommendations

- In general, the near surface materials to a depth of 15 cm (about 6 inches) consist of varying amounts of fine sands, silts, and medium plasticity clays. Please reference the laboratory testing section of this report to view the % minus #200 sieve particle size fractional gradations of these near-surface soils along the alignment. AASHTO classifications of the shallow subsoils are also presented along with the laboratory test results.
- 2. A stated purpose of this task order was for Kleinfelder to recommend a method of stabilizing the shallow subgrade soils on the N7054 alignment. The types of subgrade soils found on N7054 can be stabilized to some extent by the addition of lime or Portland cement. It is our understanding that the NRDOT has had only limited success with stabilizing similar types of soils using lime treatment, and, for this reason, lime and cement stabilization was not considered further in our evaluation. It is further our understanding that the desires to identify a different stabilizing method or stabilizing agent with a higher probability of long term stabilization of these soils.
- 3. The shallow subgrade soils on the N7054 alignment in general meet the criteria for use, as established by the manufacturer of one or both of the two proprietary products RoadPacker Plus or RoadBond. The soils requirements for the RoadPacker Plus and RoadBond products are sufficiently complex to preclude listing them here, but they can be obtained at the website <a href="www.roadpackers.com">www.roadpackers.com</a>. The pH of the native near-surface soils is near or at the upper limit (pH = 8.25) of the acceptable pH range for the use of the RoadPacker plus product. The RoadBond product does not have this pH limitation. Different segments of the alignment do not meet the particle size (gradation) and CEC requirements of the RoadPacker Plus product, and may be more suitable for the RoadBond product. In general, the sandier reaches have both low clay content and accompanying low CEC values. Please refer to the laboratory test results, which are organized by position along the N7054 alignment, to determine which segments are suitable for the RoadPacker Plus product and those which are suitable for RoadBond.
- 4. A one-mile test section of RoadPacker Plus-treated dirt road south of Santa Fe, NM (Spur Ranch Road) has been observed by Kleinfelder for a period of more than six months. This section of Spur Ranch Road has exhibited some surface degradation and muddiness following periods of heavy precipitation. The RoadPacker Plus vendor claims that this degradation and muddiness is because the subgrade materials for this test section of road did not fully meet the criteria for its use as noted in (3.) above.

Because of this observation of surface degradation in the presence of water, Kleinfelder elected to perform a California Bearing Ratio (CBR) test on a blended sample of the shallow subgrade soils from a selection of borings from N7054, (with the exception of a few of the most sandy samples, which were not included). The blended sample was tested after treating with the RoadPacker Plus product. This CBR test was not specified in the solicitation, but was added at our discretion, to better evaluate how the RoadPacker Plus product performed when the subgrade soils are wetted following application of RoadPacker Plus.

This laboratory CBR test consisted of blending the subgrade soils with the recommended proportion of the RoadPacker Plus product, then molding and compacting a treated CBR specimen containing the RoadPacker Plus product to an estimated 95% of AASHTO T-180 maximum dry density. The treated and compacted CBR specimen was then allowed to cure under ambient room conditions for three days, and then subsequently submerged under water for four days. Following the four day submergence period, the specimen was subjected to the CBR penetration test, with a resulting corrected CBR value of 55 at 0.1 inch penetration. 55 is a high CBR value for a subgrade material and it appears that the RoadPacker Plus performed very well under these laboratory conditions.

- 5. In our opinion, the N7054 alignment is a good candidate for an NRDOT field trial of the RoadPacker Plus and RoadBond products. There are more slightly sandy, less clayey portions of the alignment, as evidenced by the laboratory tests. These sections appear to be good locations to test the RoadBond product, with the rest of the alignment apparently more suitable for RoadPacker Plus. The material vendor should be consulted for recommendations as to which product is better suited to each reach of the N7054 alignment. Some blending of soils along the alignment may be required or beneficial.
- 6. It is important that the RoadPacker Plus and RoadBond products are thoroughly mixed with the native subgrade materials and applied in accordance with the vendor's recommendations.
- 7. For this first field trial of the RoadPacker Plus or RoadBond products, it is recommended that a single contractor be engaged to both provide the RoadPacker Plus and RoadBond products, and to also construct the road, in order that there is no question as to who is responsible for the success and performance of the installation. NRDOT should attempt to negotiate a construction contract that includes a performance bond of several years for the constructed road.

Once the RoadPacker Plus and RoadBond products have been successfully qualified in the field for the subgrade soils typically found on Navajo Nation lands and roads, then NRDOT could consider using Tribal resources to place RoadPacker products on other NRDOT projects.

## Limitations

Kleinfelder has no direct involvement with or responsibility for the selection, application and processing of the RoadPacker Plus, RoadBond, or other subgrade improvement products or methods which might be used by NRDOT on N7054 and other NRDOT roads. It remains the contractor's responsibility for the correct selection, application, and processing of these products, and for the ultimate success of the project, commensurate with the level of risk willing to be undertaken by NRDOT.

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Kleinfelder's work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee or warranty, express or implies, regarding the services, communication (oral or written), report, opinion, or instrument of service provided

The scope of our services does not include services related to construction safety precautions and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures except as specifically described in our report for consideration in design. The scope of our services for this report did not include any environmental assessment or evaluation regarding the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, air, or below or around the site.

This report may be used only by the Client and the registered design professional in charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than two (2) years from the date of the report.

The work performed was based on project information provided by the Client. If the Client does not retain Kleinfelder to review any plans and specifications, including any revisions or modifications to the plans and specifications, Kleinfelder assumes no responsibility for the suitability of our recommendations. In addition, if there are any changes in the field to the plans and specifications, the Client must obtain written approval from Kleinfelder's engineer that such changes do not affect our recommendations. Failure to do so will vitiate Kleinfelder's recommendations.

#### Closure

It has been our pleasure to be involved with NRDOT on this important project. We look forward to the performance of a field trial and the information that should be gained therefrom. Please keep us advised of the progress of a field trial, if one is undertaken.

Respectfully submitted.

KLEINFELDER WEST INC.

John S. Llovd, P.E.

Principal Engineer

Reviewed by:

Joseph P. Laird, P.E.

Senior Engineer

Appendices:

Figure 1 - Site Location Map

Figure 2 – Borehole Location Map

Appendix A – Graphical Profile of Laboratory Test Results

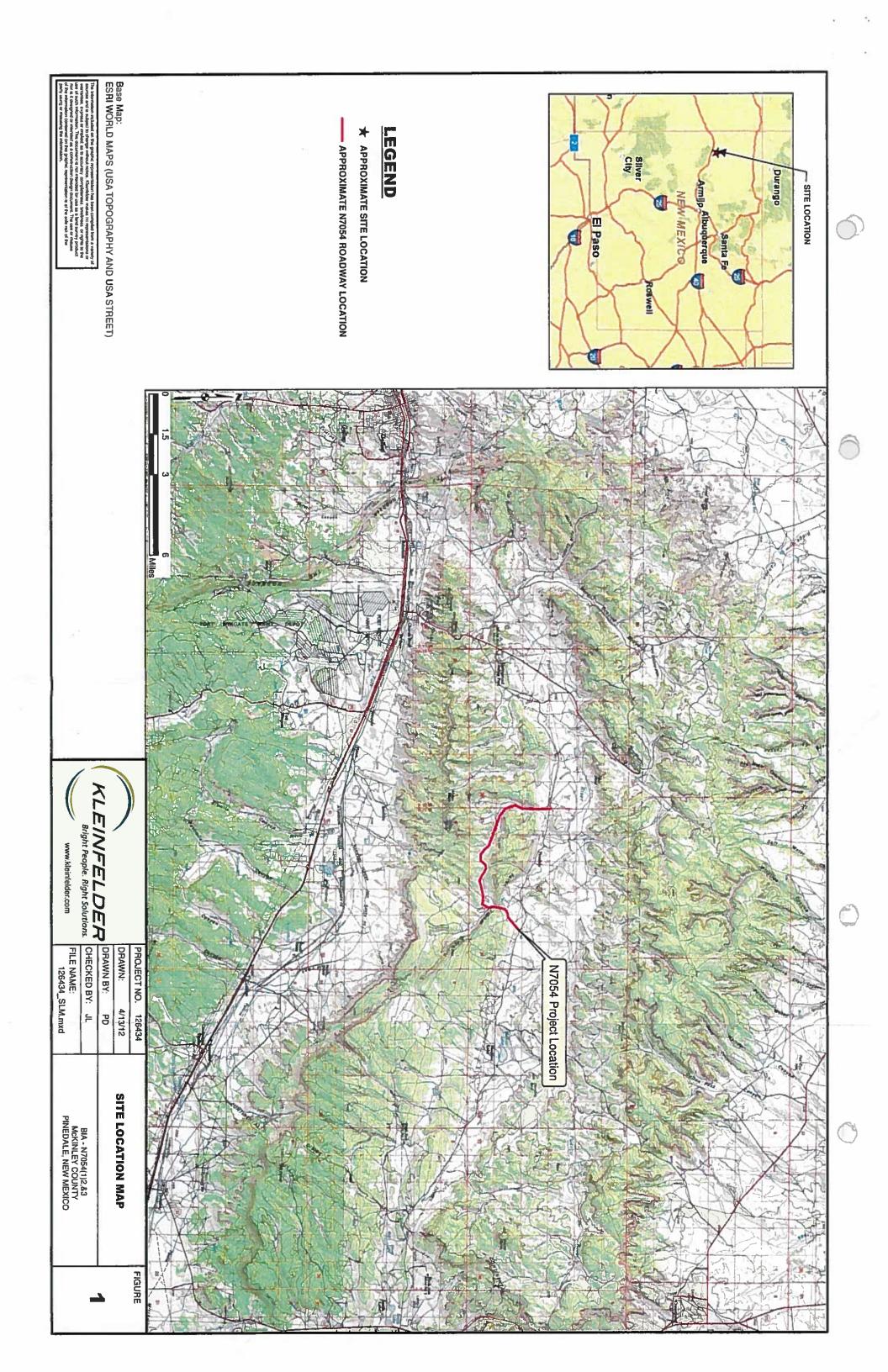
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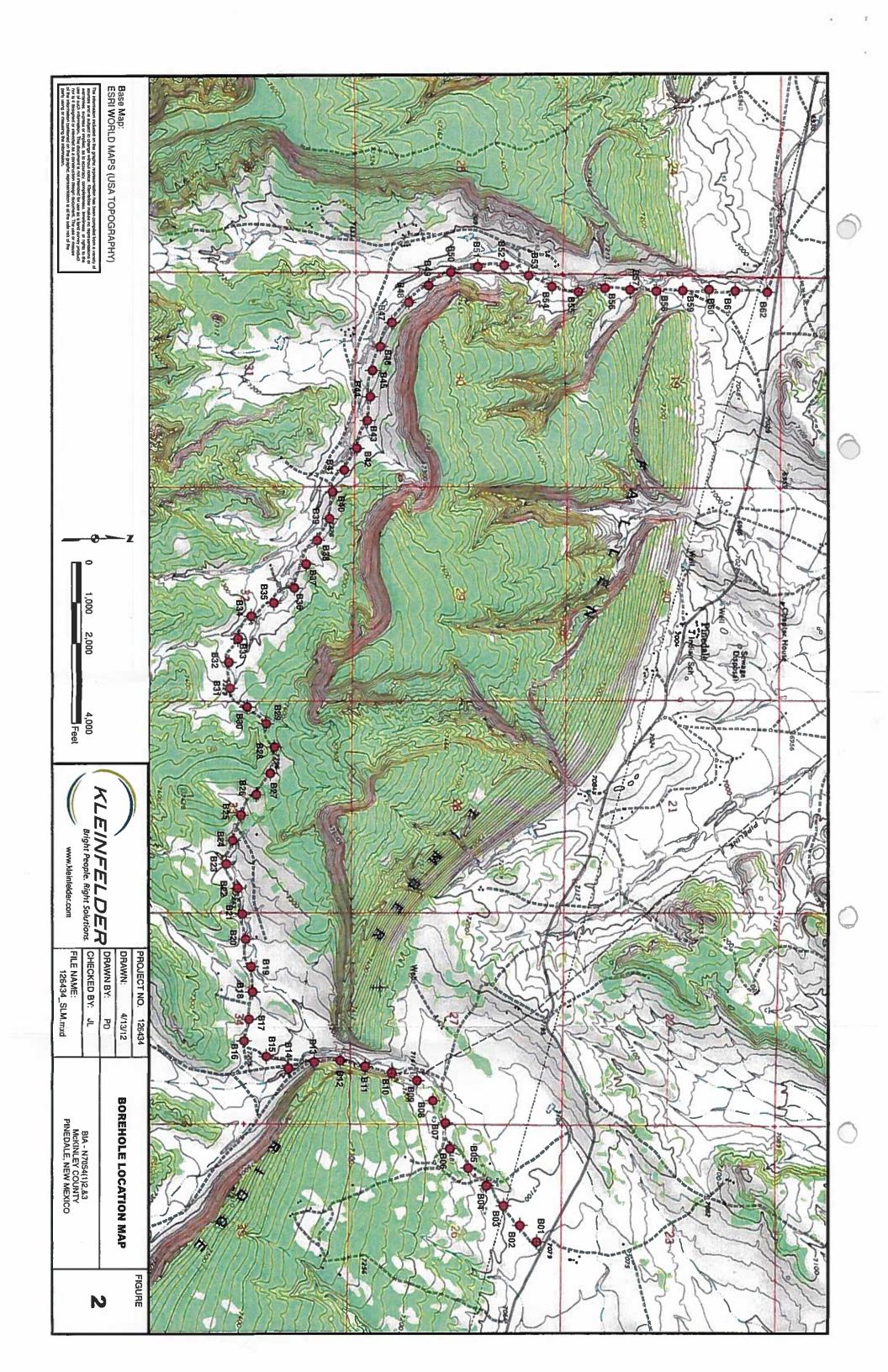
Appendix B - California Bearing Ratio of Laboratory - Compacted Soils

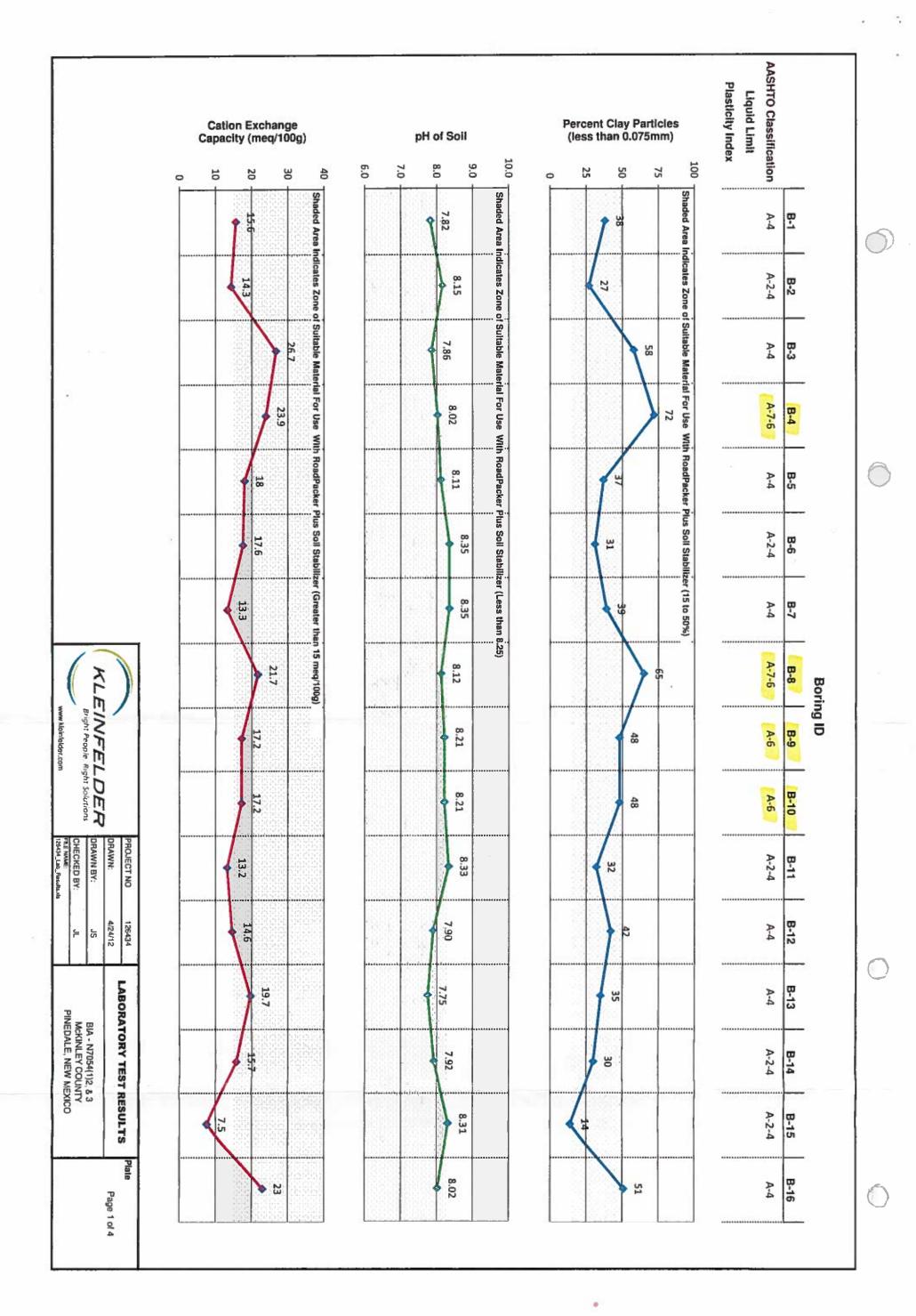
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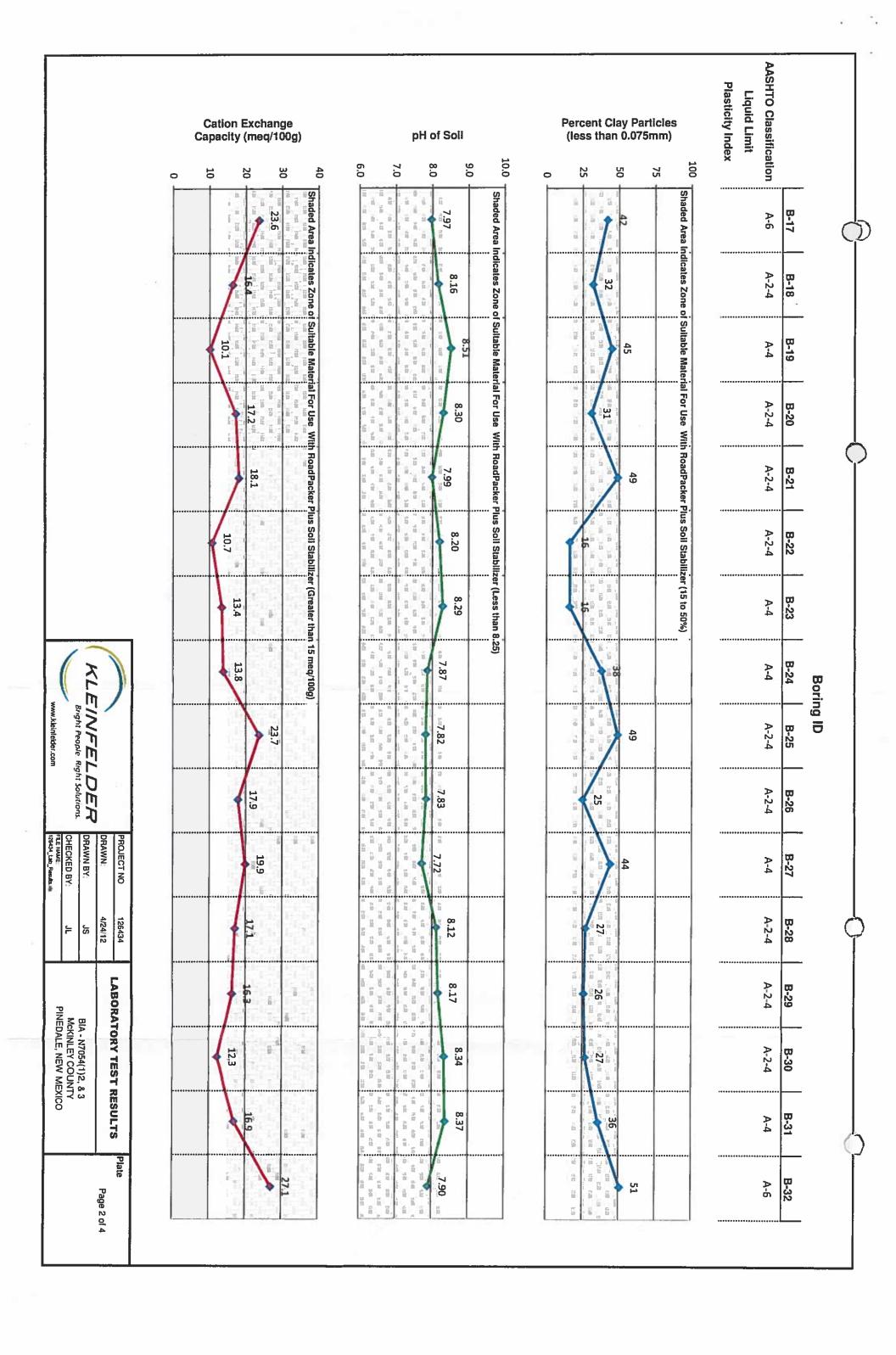
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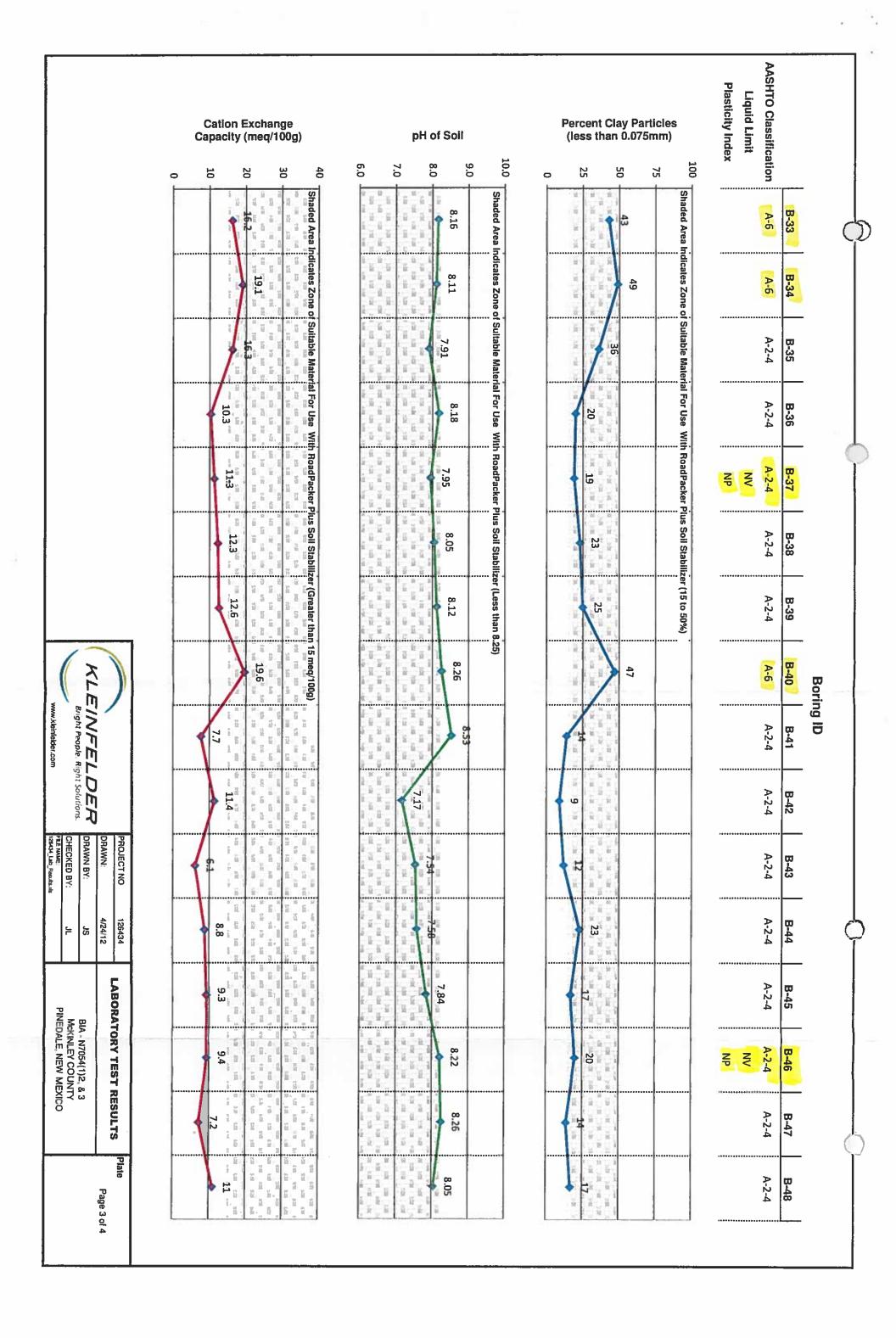


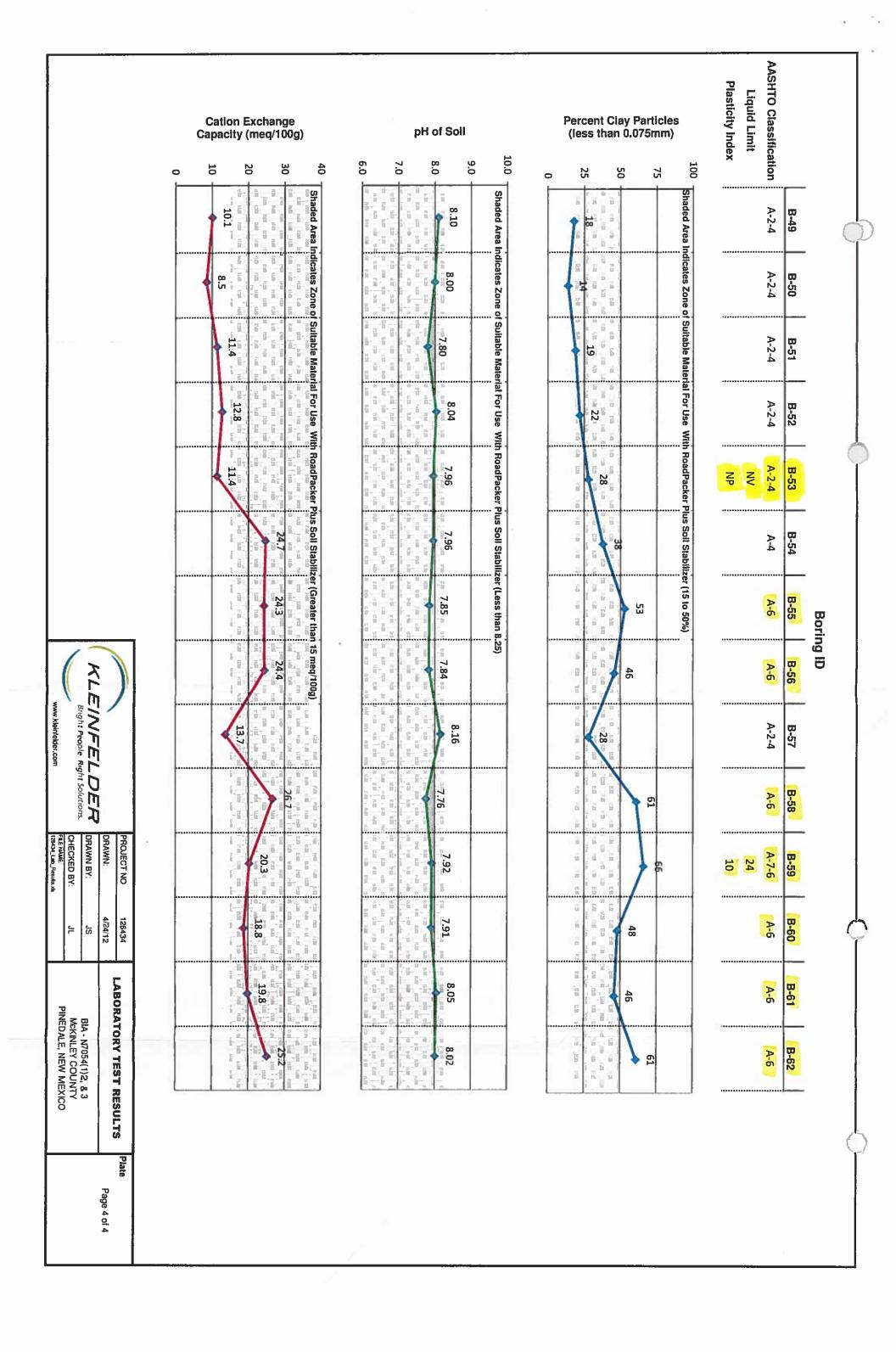
















Dry Density, pcf

# California Bearing Ratio of Laboratory-Compacted Soils

## ASTM D-1883/AASHTO T-193

Tested By: J. Menezes

Lab No.: 12173 Reviewed By: T. Grover

Source: Blended Shallow Surface Samples except B3, B4, & B8

Material Description: Blended Material with Roadpacker Male! Inc.

123.9

Compaction Information	
Method:	T-180
Maximum Dry Density, pcf:	132.0
Optimum Moisture Content, percent:	7.5

•		
Select weight units, g for gr	ams, lb for pounds	ПЬ
	Before Test	After Test
Mold Wt., Ib	16.0	16.0
Wet Wt. + Mold, lb	25.9	26.4
Wet Soil, Ib	9,9	10.4
Wet Departy not	132.32	138 58

124.7

	Before	After	After	Sonking
	Compaction	Compaction	Top 1"	Bottom 1"
Tare Wt., g	0	0	0	0
Wet Wt. + Tare, g	121.8	1104.6	144.7	145.3
Dry Wt. + Tare. g	114.8	1000.3	129.6	129.9
Wt. Of Water, g	7	104.3	15.1	15.4
Wt. Of Dry Soil, g	114.8	1000.3	129.6	129.9
Moisture, %	6.1	10.4	11.7	11.9

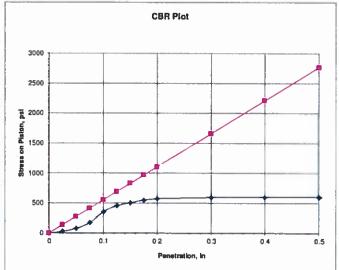
Select Points for Corrected CBR Value	Penetration, in	Lond, 15	Stress, psi	Corrected CBR Value Points
	0	0	0.0	0.00
	0.025	87	29.0	138.42
	0.050	240	80.0	276.83
10.0	0.075	530	176.6	415.25
2	0.100	1071	356.8	553.67
	0.125	1370	456.4	692.08
	0.150	1520	506.4	830.50
	0.175	1650	549.7	968.91
	0.200	1723	574.0	1107.33
	0.300	1795	598.0	1661.00
	0.400	1810	603.0	2214.66
	0.500	1814	604.3	2768.33
	0.600			3321.99

Swell Data		Dial	Swell	Percent
Date	Time	Reading, in	Inches	Swell, %
5 21	1.30	0.384	0	0.00%
5-22	12:33	0.442	0.058	1.26%
5-25	1.32	0.443	0.059	1.29%

Mold Inf	ormation
Mold ID.:	
Mold Volume, ft3;	0.0751
Height of Mold, in:	4.5910

Piston Inform	stion
Piston Diameter, in:	
Piston Area, in <sup>2</sup> :	3.002
•	

LAB SPECIMEN			
CBR DD Before, pcf	124.7	CON	SOL
CBR DD After, Pef	123,9	1000	
CBR Percent Compaction, %	94.5%	STRESS	STRAIN
CBR WC Before, %	6.1%	0.0	0.000
CBR WC Top, %	11.7%	29.0	0.025
CBR WC Ave, %	11.8%	80.0	0.050
CBR Surcharge, lbs	10	176.6	0.075
CBR Soaking Period, hr.	96	356.8	0.100
CBR Percent Swell, %	1.29%	456.4	0.125
CBR Value @ 0.1 inches	35.7	506.4	0.150
Corrected CBR Value @ 0.1 inches	55.4	549.7	0.175
Corrected CBR Value @ 0.2 inches	38.3	574.0	0.200
		598.0	0.300
		603.0	0.400
		604.3	0.500



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Dat	e Be	gin/Enc	l: 04-11	-12/	04-	11-12	Top of Boring												
Sur	face	Condit	ions: U	npavi	ed R	oadw	ay Coordinate Da	ita Source: GPS					Hamn	ner Ty	pe/M	ethod:			_
WL	Mea	sureme	nt Poin	t:			Depth to Grou	ndwater Initial/Time: Not obs	served				Hamn	ner Dr	op/W	eight:			Jan Jan
Log	ged	By: J.	Stoken				Depth to Grou	ndwater Final/Time;					Angle	From	Vert	ical/B	earing: -	·90°	
							Field	Soil Description & Classifica	tion				Lat	orato	ry	***************************************			
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	S ASTM Symbol	and limitations.	are an integral part of these logs. All are subject to those stated explan Description brown, dry, fine grained	I data an ations	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes	
2							Completed at a dept grade.	th of 1.0 m below existing site											
3-						. :		Project Number: 126434	4			L	OG	В-(	 30			Plate	
	ĺ	/		\ 				Date: 05-11-12						***************************************	nintininiskani, ministra			_	
	Stillen	K					.DER	Entry By: K. Knights				Mills.	Die .	lyne			23		
		The same of the sa	and the second	Brigh	t Peo	pie. Ri	ght Solutions.	Checked By: J. Stoken	-			Piner	BIA N Iale, N	17054 lew M	exico				
			The same of the sa					File Name: 126434_N7	054.dp	i									

Bor	ing l	Number	: B-59			*******	Location:			T	Drillir	ig Met	hod:	Hollo	w-sten	n auger
·		Total De		) m			Coordinates (X/Y, Lat/Long): 35.60359° /	08.47545	ů		Drillir					***************************************
*****		Rock:		************	as Er	ncoun	······································			~,~~~~~		·····		~~~~	cision	Sampling Inc.
~~~		gin/End					Top of Boring Elevation:				Bit Si					
-	*	Conditi	*************	******				***************************************		*********	Hamn	~~~		ethod:		***************************************
		sureme					Depth to Groundwater Initial/Time: Not obs	erved			Hamr	*************	-	************		***************************************
	*****	By: J.				····	Depth to Groundwater Final/Time:	9,550,000,000,000,000,000,000	***************************************			····			earing:	-90°
		1					Field Soil Description & Classifica	ion		<u> </u>		oorato	•••••		Ť	
	Symbol	ē	<u></u>	sf)		_	The report and log key are an integral part of these logs. All interpretations in this log are subject to those stated explanand limitations.	data and		×		Ī	<del></del>			
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Description	Consistency / Annarant Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	assing 4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and
ă	čŏ	<i>i</i> 3 B-59	m	ų.	5	<b>₹</b>	Description Sandy Lean Clay (CL): brownish gray, dry, fine	ŭ 4		10	24	3	ā	玩装	豆蒜	Field Notes
2							Completed at a depth of 1.0 m below existing site grade.									
		All Park					Project Number: 12643				LOG	. p	50			Plate
							Date: 05-11-12					, D-	JJ			*******
		K	CLE	=//	VF	E	DER Entry By: K. Knights	<del>-</del>				***********			***************************************	
							ght Solutions. Checked By: J. Stoken	The state of the s		ni-		N705		_		and the first of t
		1					File Name: 126434_N7	························		rine	edale,	INSW I	viexic	U		

Bai	ring I	Viimba	r: B-58			. ,		Los	ation							**********			Deillio	aa Ma	thad:	Halla	u oto	m auge	
			epth: 1.	n m			nuvuuuvuinin		atrimitismetum.	·····	(/Y. 1.4	t/Long	: 35 6	0179°	108.4	7541°			***************************************	ng Eqi	ildoniiiiluorend		****31C	auyt	
*********		~~~~~	No Ro		15 F	ncoun	tered	<b>_</b>			***************************************	ystem:	. 00.00		100.7	10-71			-				cisior	Samp	lina Inc
********			1: 04-1	itaabelemiikus kistin					rmendudmen	oring E						***************************************			***************************************	ze/Ty	militar advantas	, , , , ,			<u>9</u> 1111
	~~~~	<del></del>	ions: U	~				ļ			**********	ırce: G	PS		-15		***************************************			ner Ty	·	ethod	······································	***************************************	
		**********	ent Poin	**********	***************************************			<u> </u>	***************************************	-	minutamida	nietrotheristmombus	nterminische der komisent	Not of	serve					ner D	***********			internal maintanni	
Log	ged	By: J.	Stoken	i		• : .	- , :	. <del></del>		~~~~~		er Final	~				···			-	*************		earing:	-90°	
	П			<u> </u>		····	l	<u></u>						Classific	ation			T		borato	***********				
	ymbol	<b>.</b>	_	ę;			The r interp and h	report e pretatio imitatio	and log ons in t						All data a nations	Į			Ī	Γ	Ţ				
(m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol				*:::- *:-		-323-1	***************************************		***************************************	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	iing ieve (%)	Passing #200 Sieve (%)	Oth	er Test:
Dept	Sam	Sam	Blow	Poc	Grap	ASTI			•		Des	cription				Cons	Plas	Plas	Liqu	Wate	امر	Pass #4 Si	Pass #200	Fiel	and d Notes
1-							Corgra		ed at a	a depth	h of 1	.0 m bel	ow exis	ating site											
3				\	٠.,						Da	te: 05	-11-12		34			1	LOG	B-	58			Pla	te
		X	(LE			ple. Ri		olutio			Ch		By: J.	Stoke	n 7054.g	oi .		Pine	BIA dale,	N7054 New N		) •			

Bori	ng N	lumber	: B-57				Location:		<del></del>	*******		1	Drillin	g Met	hod:	Hollo	w-ster	n auger
*****			pth: 1.0	) m		***************************************		(X/Y, Lat/Long): 35.60001° / 10	8.4755	ò	<del></del>			g Equ	**********			·····
	********		No Ro		as Er	ncoun		***************************************	elembala elembilando elemba								cision	Sampling Inc
***************************************	~~~~~~		1: 04-11	***************************************			Top of Boring							zе∕Тур	~~~~~	*******************		~
	***************************************		ons: U					ata Source: GPS	***************************************		***********					thod:	· · · · · · · · · · · · · · · · · · ·	Sandra (1980)
		***********	nt Poin			***************************************		undwater Initial/Time: Not obse	ved	***************************************		~~~~		ner Dr	-		***************************************	
			Stoken		00-0	were removed the second		undwater Final/Time:							***************		aring:	-90°
	Ť	-						d Soil Description & Classification	n			<u>.,l</u>		orato			Ī	
(L	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	The report and log key interpretations in this lo and limitalions.	are an integral part of these logs. Alt d. g are subject to those stated explanation	Consistency /	nt Density	Ŋ	Plasticity Index	.imit	Water Content (%)	Dry Unit Weight (pcf)	(%)	Passing #200 Sieve (%)	
Depth (m)	mple	mple	d sac	cket	P. isi	ZW.			nsist	pare	Plasticity	sticil	Liquid Limit	iter C	'n.	Ssing	ssino 30 Si	Other Test: and
De	Sal	Sai	풉	g	5	SC AS		Description : dark brown, dry, fine grained	පි	AB	풉	꿆	Ë	Wa	- 등	2.2	E Z	Field Note:
2							Completed at a degrade.	pth of 1.0 m below existing site										
3		·			-			Project Number: 126434								1		Plate
			-					Date: 05-11-12				I.	.OG	B-:	57			
	-	/ L	(	~/^	JE		DER	Entry By: K, Knights				**************************************	***************************************	~~~~~	***************************************	~~~~~	~~~~~~~~	
	•		. <i>L</i> C				ght Solutions.	***************************************						N7054				
		X		_				Checked By: J. Stoken	1			Pine	dala	New 1	/lexic	3		1

Boring	Numbe	r: B-56				Location:					Drillir	ng Met	hod:	Hollo	w-stem	auger
Boring	Total D	epth: 1.	) m			Coordinates (X/Y, Lat	/Long): 35.59832° / 108.4	7566°			Drillir	ıg Eqı	iipme	nt:	*****************	en en verst de ministrative de la servicio de la filosoficia de la servicio de la servicio de la servicio de l
Depth t	lo Rock	: No Ro	ck wa	as Ei	ncoun		erististististerimineus unmenemeseereereeristististes ori eestemmeere usumasse		,		Drillir	ıg Cor	npan	<i>r</i> : Рге	cision :	Sampling In
		d: 04-11				Top of Boring Elevation		helandimienendusseha				ze/Typ		***************************************		etistete mendelsenskildelsensusenn
	~~~~~~	tions: U	*****				iministradistratoriamente in accesa a accesa a accesa de minimistra de manera de manera de manera de manera de					ner Ty		thod:		· · · · · · · · · · · · · · · · · · ·
-	nontral resident services.	ent Poin			hanne el de escriberce		r Initial/Time: Not observed	 J		intridict of professional materials		ner Dr		···		
		Stoken				Depth to Groundwate	++++++++++++++++++++++++++++++++++++++							***********	earing: -	- Caranal de Maria de Maria de Carana de Caran
	THE REPORT OF THE PERSON				·		scription & Classification	. :			~~~~	orato	**********			<del> </del>
Depth (m) Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	The report and log key are an interpretations in this log are subj and limitations.	egral part of these logs. All data at ect to those stated explanations ription	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	(bct)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Test and Field Note
				1/2	SC	Clayey Sand (SC): brownis	h gray, dry, fine grained		1.74							
2					CL	Sandy Lean Clay (CL.): ligh grained sand  Completed at a depth of 1.0 grade.										
3 · 14.5		\(\text{LE}	\ ://\	JF		DER Entry	ect Number: 126434 : 05-11-12 y By: K. Knights cked By: J. Stoken	etarasimai sebermi isbirit dari.	diribidi kalimada da ka		BIAI	N7054	.3. 3			Plate

Boi	ring I	lumber	: B-55	: .			Lo	ocation:					] [	Orillin	g Met	hod: l	Hollo	w-sten	n auger
Bor	ring 1	otal De	otal Depth: 1.0 m C Rock: No Rock was Encountered E in/End: 04-11-12 / 04-11-12 T Conditions: Unpaved Roadway C urement Point: E			C	oordinates (X	/Y, Lat/Long): 35.5965° / 1	08.47534			<u> </u>	Drillin	g Equ	ipme	nt:			
Dep	oth to	Rock:	No Ro	ck wa	as Er	ncoun	tered Da	atum/Coordin	nate System:				1	Drillin	g Cor	npany	ı: Pre	cision	Sampling Inc
Dat	e Be	gin/Enc	onditions: Unpaved Roadway Curement Point: E			To	op of Boring (	Elevation:				E	Bit Siz	ze/Typ	e:			APANTANINA NA PANTANINA NA PANTA	
Sur	face	Condit	ions: U	npave	ed R	oadwa	ay C	oordinate Dat	ta Source: GPS				ł	lamn	er Ty	pe/Me	thod:		
WL	Mea	sureme	ent Poin	;	***************************************	***************************************	D	epth to Grour	ndwater Initial/Time: Not ob	served			ł	lamn	ier Dr	орЮі	eight:		
Log	gged	By: J.	Staken				D	epth to Grour	ndwater Final/Time:				1	Angle	From	Verti	cal/Be	aring:	-90"
								Field	Soil Description & Classifica	tion				Lab	orato	гу			
	Symbol	Jer.	e.	tsf)			The repo interpreta and limits	ort and log key a ations in this log ations.	re an integral part of these logs. A are subject to those stated explar	l data and ations	sity		×		ıt (%)	tht (pcf)		G	
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol			Description	Consistency	Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
1						CL	grained	d sand	CL): brownish gray, dry, fine th of 1.0 m below existing site										
3	<u>'I I</u>			<u> </u>	<u> </u>	-	1		Project Number: 1264	34					L	<u></u>	1		Plate
		A Prince of the Paris of the Pa							Date: 05-11-12	***************************************			I.	.UG	B-	ວວ			
	ļ	H	CLF	<i>[//</i>	VF	E	LDE	ΞR	Entry By: K. Knights					***********	********	***************************************	,		
		1					light Solu		Checked By: J. Stoke	1					N7054				
		1	20						THOUSENESS OF CHANCE	.			Pine	dale.	New N	<b>Aexic</b>	3		1

Bor	ring l	Numbei	: B-54				Ti	Locatio	n:			***************************************						Drillir	ıa Mei	hod:	Hollo	w-ster	n auger	
		********	epth: 1.	0 m				Coordin	nates ()	ζΥ, La	at/Lona	: 35,59	9471°/	108.47	7577°	***************************************			ıg Eqi		ettiminalir namina			***************************************
***********		*	No Ro		as Eı	ncour		Datum/(				***************************************				-						cision	Sampl	na In
	************	************	l: 04-1	neletrolonesleetron	~~~~~			Top of I				************************	District School School And Street, Co.	Historiii obaalii obaalaa	darannalarareren.	*************			ze/Ty	************	***************************************			
~~~~	-		ions: U								urce: G	PS	<u>.</u>						ner Ty	~=~~~	thad			***************************************
	~~~~~		ent Poin										Not ob	served	***************************************	idiliridandanimai			ner Dr	·	*****************	Materian militaria (hadalaria	notidiskandiologiskaskistas	
			Stoker		··············						er Final	***************************************	NOC OD	301700	 				***********	-	***************************************	aring:	กกๆ	
	T	D). 0.	CONC		· I	····	T	D-C-\$2411 F		*********	UNION MANAGEMENT	***************************************	lassifica	tion	······		T	V-10431142-4340	borato		CAND	enny.	-30	
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	S ASTM Symbol	and lim.	italions.	og key a n this log	pre an i	ntegral pa bject to t	rt of the	se logs. A led explan	ll data an ations	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sleve (%)	Othe Field	r Test and I Note
1							Comp		t a dept	h of 1	.0 m bel	ow exis	ting site											
3				-/x		· · · · · · · · · · · · · · · · · · ·	LDE			Dat	e: 05	-11-12	12643	4	Sellin Andrews and Andrews	and the substitute for the	L	.OG	B-:				Plat	e
	al and a second						ight Solu			Che		y: J.	ignts Stoken 134_N7		oi.	# N. D.	Pine		17054 New M	exico				

Boring l	Number	: B-53			***************************************	Location:					Drillin	g Met	hod:	Hollo	w-ster	n auger
Boring '	Total De	epth: 1.0	) m			Coordinates (X/	Y, Lat/Long): 35.59313° / 108.	47669°		_	Drillin	g Equ	ilpme	nt:		
Depth to	o Rock:	No Ro	ck wa	as Ei	ncoun	tered Datum/Coordin	ate System:				Drillin	g Cor	npany	: Pre	cision	Sampling Inc.
Date Be	gin/Enc	l: 04-11	-12/	04-	11-12	Top of Boring E	levation:				Bit Si	ze/Typ	)e:			
Surface	Condit	ions: Ur	npave	ed R	oadwa	ay Coordinate Data	a Source: GPS				Hamn	ner Ty	pelMe	ethod:		ner gegräfikkelik krisiskelen er konstituen krisiskelen krisiskelen krisiskelen krisiskelen krisiskelen krisis
WL Mea	sureme	ent Point	t;			Depth to Groun	dwater Initial/Time: Not observe	ed			Hamn	ner Dr	oplW	eight:		
Logged	By: J.	Stoken				Depth to Groun	dwater Final/Time:				Angle	From	ı Verti	cal/Be	aring:	-90°
					***************************************	Field S	Soil Description & Classification				Lat	orato	ry			
Depth (m) Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	The report and log key an interpretations in this log ( and limitations.	e an integral part of these logs, All data are subject to those stated explanations  Description	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sleve (%)	Other Tests and Field Notes
1	B-53				SM	medium grained	dish brown, dry to moist, fine to			NP	NP					
3			\	<u></u>	<u> </u>		Project Number: 126434  Date: 05-11-12			1	LOG	B-	53	<u> </u>		Plate
	Tables Comment	(LE				LDER ight Solutions.	Entry By: K. Knights Checked By: J. Stoken File Name: 126434_N7054	4704		Pine	BIA edale,	N7054 New I		)		

Boi	ring	Numbe	r: B-52				Location:						Drillin	g Met	hod:	Hollo	w-stem	auger	
Boi	ring `	Total D	epth: 1.	0 m			Coordinates (	X/Y, Lat/Long): 35.59146° /	108.477	52°		*****	-	ig Equ		·			*****
Dej	oth to	Rock:	No Ro	ck wa	as Ei	ncoun			trining and a state of the stat				Drillin	g Cor	npany	ı: Pre	cision :	Sampling I	 n
**********			d: 04-1	********			Top of Boring		***************************************	***************		melle Martiniscom reloca		ze/Ty					
			ions: U			~~~~		ata Source: GPS	and the state of the second					*********	***********	ethod:			~-
WL.	Mea	surem	ent Poin	t;			Depth to Grou	ındwater İnitial/Time: Not ob	served					ner Dr	Linial Lambariania	Non-riamine vincine in a	***************************************		-
Log	gged	By: J.	Stoker	······				ındwater Final/Time:	:				***************************************				aring: -	90°	*990
	П	*************					Field	I Soil Description & Classific	ation				Lal	orato	ry				_
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	The report and log key interpretations in this logand limitations.	are an integral part of these logs. A g are subject to those stated expla	All data and nations	Apparent Density	icity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	OtherTes	a f
)eptl	ушы	запр	Slows	ock	irap!	STIN		Description	Suo	B	Plasticity	lasti	iqui	Vater	יג נ	assi 4 Sie	assi 200	and Field Not	''.
1						SM	medium grained	eddish brown, dry to moist, fine											
3	and district.	K	(LE				DER	Project Number: 12643 Date: 05-11-12 Entry By: K. Knights		MACALITY CONTRACTOR OF THE CON	All polytopic and a second sec	***************************************	***************************************	<b>B-</b> :		netokala dekisiri.		Plate	
*****			~	Brigh	t Peo		ght Solutions.	Checked By: J. Stoker File Name: 126434_N						N7054 New IV				2	

Bor	ing N	Vumber	: B-51				Location:					Drillin	g Met	hod:	Hollo	w-ster	n auger
	·····		epth: 1.0	) m		***************************************	Coordinates	(X/Y, Lat/Long): 35.58967° / 108.4	7741°	DAY ON CHARLES AND		Drillin					
	*****		No Ro		as Er	ncour	***************************************	alstalandeleteranianianianianianianianianianianianiania	······································				*********		************	cision	Sampling Inc
			1: 04-11	***********	*************	*****	~:		**************************************	***************************************	***********	Bit Si					
	*********		ions: U					ata Source: GPS				Hamn		**********	ethod:	Samoomidikoni	
		Principal animatics had as	nt Poin	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				undwater Initial/Time: Not observe	d	(testemenene		Hamn	·····				**************************************
	·····		Stoken	*******	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			undwater Final/Time:		***************************************						earing:	-90°
	ĬΤ					***************************************		d Soil Description & Classification			<u>_</u>	Lal	orato	ory		1	<del></del>
	Symbol	ber	, <b>e</b> i	(ts1)		-j-	<b>\$</b>	are an integral part of these logs. All data a g are subject to those stated explanations	ا اrsity		lex			(bct)		(%	
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol		December 1999	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	assing 1 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
۵	ကိ	တ္တ	ā	8	Ö	SM.	City Cand (City)	Description prown, dry to moist, fine to medium	ŏ₹	ō.	ā.	Ē	3	ā	<u>2, #</u>	5.3	Field Notes
1							Completed at a de grade.	pth of 1.0 m below existing site									Dista
								Project Number: 126434	-		1	LOG	B-	51			Plate
			•	1				Date: 05-11-12	ļ	000000000000000000000000000000000000000	***************************************						
		F	<b>(LE</b>				LDER	Entry By: K. Knights	***************************************			P	<b>.</b>				
		1		Brigh	it Pe	opie. R	light Solutions.	Checked By: J. Stoken	***************************************		Pine	BIA dale,	N705/ New I		0		
								File Name: 126434_N7054.	dpj			,					

Boi	ring	Numbe	r: B-50			·	Location	on:					Dr	llina	Meth	rod: I	-Inlin	v-stem	auger	····
	-	-	epth: 1.		ina a la suria mesta bre			***************************************	Long): 35.58785° / 10	08.4769	4*	***************************************	*************	***	~~~~	pmei			***************************************	north-tune un
			: No Ro		as Ei	ncour		/Coordinate Sy	·					<u>-</u>	<u> </u>	·	-	cision :	Sampling	Inc
-	-	Himbletonium	d: 04-1					Boring Elevati	tribritativitribide communicativa and a securitaria and a facilitative and a securitaria and a securitaria and a		**********		********************	Size	*					
			tions: U					inate Data Sour								***************************************	thod:		inannandian/sitesenannasias.	: .
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Log	gged	By: J.	Stoker	1		***************************************		to Groundwate	***************************************					***************************************	~~~~	<u> </u>		aring: -	90°	
	П	*		<u> </u>				Field Soil De	scription & Classificati	on		T		Labo			***********			
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	and limitations.	Desci	•	Consistency /	Apparent Density	Plasticity	Plasticity Index	בולמות דוונוו	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other T and Field No	est l ote
1						SM	medium grai	ined	m below existing site											
3	i ind			<b>\</b>		11 1.11		Date	ect Number: 126434 : 05-11-12				LO	G I	B-5	0			Plate	
		1	(LE		t Peo		DER	Chec	By: K. Knights ked By: J. Stoken Name: 126434_N70	EA cmi			BI Pinedal	A N7 e, Ne		exico				•

Bor	ing l	Numbei	r: B-49				Location:			·····		Drillin	g Met	hod:	Hollo	w-ste	n auger
			epth: 1.0	) m			Coordinates (X/)	', Lat/Long): 35.58635° / 108.47	'583°	<del>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</del>		Drillin	g Equ	ilpme	nt:		
Dep	oth to	o Rock:	No Ro	ck wa	ıs Eı	ncoun	tered Datum/Coordina	te System:				Drillin	g Cor	npany	ı: Pre	cision	Sampling Inc
~~~~		******	1: 04-11		-	************	Top of Boring El		***************************************	***************************************		Bit Si:					
***************************************			ions: U							***************************************		Hamn	*********	-	thod:		***************************************
			ent Poin					water Initial/Time: Not observed				Натп					
			Stoken	**********		P-14-4-001-001-001-001-001-001-001-001-00		water Final/Time:								earing:	-90°
					T			oil Description & Classification					orato				1. 11.1.
	e Symbol	nber	Ë	. (tsf)	-	ool		an integral part of these logs. All data an e subject to these stated explanations	y / ensity		фех			,		(%)	
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol		Description	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	assing 4 Sieve (%	Passing #200 Sieve (%)	Other Tests and Field Notes
1						SM	medium grained	of 1.0 m below existing site									
3								Project Number: 126434  Date: 05-11-12				LOG	B-	49		avavavasas	Plate
		* *	(LE				LDER ight Solutions.	Entry By: K. Knights  Checked By: J. Stoken  File Name: 126434_N7054.g	pj		Pine	BIA edale,	N7054 New N		•		

Por	-in a	Number	· D 4Ω				Location:				Т	Dailtia		h = 4.	Lielle			
	*************	************	pth: 1.	n m	on accommendation of the second	Kellenbroedhellebet.		Y, Lat/Long): 35.58501° / 108	17110				ід імец ід Еqц		*	w-ster	n auger	
*********		****	No Ro		ae Fi	ncoun			.4/442	· · · · · · · · · · · · · · · · · · ·			***************************************		***********	cicion	Sampling	Ina
	*****		l: 04-11	Charleston brown	District and Control of Street		Top of Boring E			m!			ze/Typ		/. Fie	CISIOH	Sampling	IIIC.
		_	ions: U									Hamn			thad			
			nt Poin			OCCUV		dwater Initial/Time: Not observ	od.	***************************************	isianasisianaimen.	····	ner Dr	·				trinnenin inerimerere
	**********		Stoken		imolobilishmine	rindusina eristena a mu		dwater Final/Time:								aring:	OO.	
	,gcu	Ly. U.	Otonca					Soil Description & Classification					orato		canbe	anny.	-30	T
	ᅙ							e an integral part of these logs. All data are subject to those stated explanation:		T			JOIALO	,	***************************************	***************************************		
	Sample Type Symbol	er.		St			interpretations in this log a and limitations.	are subject to those stated explanation:	Consistency / Annarent Density		×		(%)	Dry Unit Weight (pcf)				
	уре	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Đ.	ASTM Symbol		PET THE CONTRACT OF THE CONTRACT AND THE CONTRACT AND THE CONTRACT	750		Plasticity Index	崔	Water Content (%)	Veig	Passing #4 Sieve (%)	%) a		
Depth (m)	pe T	ple	s be	ret P	Graphic Log	M Sy			siste	Plasticity	icity	Liquid Limit	rCo	III.	ing	Siev	Other Te	
Dept	Sam	Sam	Blow	Poc	Grap	AST		Description	Cons	Plas	Plast	Liqui	Wate	Dry	Pass #4 Si	Pass #200	and Field No	tes
	X					SM		k brown, dry to moist, fine to		+=-		_	-					
	M						medium grained											:
-	X																	
	M								***************************************									٠.
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							grade.	TOT 1,0 to below existing site										
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	1. 1				٠.		e.	Project Number: 126434			L	.og	B-4	18			Plate	
	4	No.	`					Date: 05-11-12		v++0+110100000000000	-	derinderstament.					Name.	
	N. C.	K					.DER	Entry By: K. Knights			\$ h	<u>.</u>	<u>a</u> . 4.		l			
		The same of the sa		Brigh	t Peo	ple. Ri	ght Salutians.	Checked By: J. Stoken			Pine	BIA I dale, I	17054 lew M	exico	-			
								File Name: 126434_N7054	.gpj				141					
								, —	1 -									

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER GINT LIBRARY VER 2.GLB 126434.GPJ 7/18/12

Bor	ing N	lumber	r: B-47	······································		************	Lo	cation:							T	Drillin	g Met	hod: I	Hollor	v-ster	n auger		
Bor	ing T	otal De	epth: 1.0	) m			Co	oordinat	tes (X/Y	, Lat/Long)	: 35.58386	/ 108.47	′275°			Drilling Equipment:							
Dep	oth to	Rock:	No Ro	ck wa	as E	ncoun	tered Da	atum/Co	ordinat	le System:		janar jafafa jinijane jarjamaniju je aka a anam	************			Drillin	Sampling Inc						
Dat	e Be	gin/Enc	1: 04-11	-12/	04-	11-12	To	Top of Boring Elevation:							T	Bit Si:							
Sur	face	Condit	ions: U	npave	ed R	oadwa	ay Co	Coordinate Data Source: GPS							Hamn	allantinionen erandlier fonelle er fonelen er erann							
WL	Mea	sureme	ent Poin	t;	***************************************		De	epth to (	Ground	water Initia	l/Time: Not	bserved				Hamn							
Log	ged	By: J.	Stoken				De	epth to (	Ground	water Final	Пime:					Angle	-90"						
									Field Sc	il Descript	on & Classi	ication				Lat							
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	The repor interpreta and limita	icy / Dens					Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	assing 4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes			
1						SP-SM	fine gra	eined			P-SM): brow												
3	<u>'</u>							Project No	ımber: 126	6434	<u> </u>		<u></u>				<u></u>	<u></u>	Plate				
										Date: 05			LOG B-47										
		Managaran L	CI F	-//	VF		LDE				K. Knight	s		***************************************	**************************************	***************************************		**********					
		†	7. Zum Sm				ight Solu				By: J. Stol	~~~~~			ш.		N7054						
		No.									*******************	N7054.g			Pine	edale, New Mexico							

Boring Number: B-46			Location:					Drillir	ng Me	thod:	Hollo	w-sterr	auger			
Boring Total Depth: 1.	) m		Coordinates	(X/Y, Lat/Long): 35.5831° / 108.4	7074°			Drillir	ıg Eqı	ıipme	nt:	***************************************	in media in distribution de la company d			
Depth to Rock: No Ro	ck was E	ncour	tered Datum/Coord	linate System:	Nillrodd Ciliabated enamene ar ar			Drillir	ıg Coı	npan	y: Pre	cision	Sampling	Inc.		
Date Begin/End: 04-1	I <b>-</b> 12 / 04	-11-12	Top of Boring	g Elevation:		Allel St.	tinintubiru	Bit Si	ze/Ty	oe:	***************************************		undrenen) aufernianeauere urfar ar am un er a	. :		
Surface Conditions: U	npaved F	Roadw	ay Coordinate D	ata Source: GPS		***************************************		Hamr	ner Ty	pe/M	ethod			:		
WL Measurement Poin	<del>*************************************</del>		Depth to Grou	undwater Initial/Time: Not observ	ed			Hamr	ner Di	op/W	eight:		ninttaaninintaa katalon oo o	etitumetend		
Logged By: J. Stoker		***************************************	Depth to Gro	undwater Final/Time:				Angle	Fron	ı Vert	ical/B	earing: -	90°	:		
			Field	Field Soil Description & Classification						Laboratory						
Symbol er	st)		The report and log key interpretations in this to and limitations.	are an integral part of these logs. All data g are subject to those stated explanations	and Als		×		(%)	nt (pcd)						
Depth (m) Sample Type Symbol Sample Number Blows per 6 in.	Pocket Pen. (tsf) Graphic Log	ASTM Symbol			Consistency / Apparent Density	city	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Te			
Sample Ty Sample N Sample N	ocke raph	STM		Description	onsi	Plasticity	lastic	dnig	ater	η	assir 1 Sie	assir 200 S	and Field No	515		
1		SC	medium grained	thrown, dry to moist, fine to the state of 1.0 m below existing site			P. P.	NP .								
3	<b>`</b>		.DER	Project Number: 126434  Date: 05-11-12  Entry By: K. Knights				.og	/ B-4				Plate			

	T	Drilli	ng Me	thod:	: Hollo	ow-ste	m auger						
76°		Drilling Equipment:											
		Drilli	Sampling Inc.										
Top of Boring Elevation:						Bit Size/Type:							
		Hamı	mer T										
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Hami	mer D	***************************************									
		Angl	e Froi	: -90°									
	*********	La	borat	огу									
sity	×		t (%)	ht (pcf)	:								
Apparent Density Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing	Passing #200 Sieve (%)	Other Tests and Field Notes						
	<u> </u>	LOC	G B	 -45			Plate						
oonidahasiiriririinis eeroogiaa oo o	Pine				co								
500A037433FFFFFFFFF		00 <del>01005570********************************</del>	BIA	BIA N70	BIA N7054	LOG B-45  BIA N7054 Pinedale, New Mexico	BIA N7054						

Bor	ina l	Numbe	r: B-44					Loca	ation.		·····								Drillie	ın Mai	fhadi	Hollo	weto	m auger			
rotesinous			epth: 1.				*************			***************************************	ίγ. La	t/Lona\	: 35.5	8243°	/ 108.4	6657°		intermentations	***************************************	ig Equ	*************	***************************************		, uugu			
			No Ro	***************************************	as F	псоиг	itered		-	~~~~		ystem:		~								******	ecisio	n Samnlin	n Inc		
******	-		d; 04-1				~~~~~~			oring E	contributation (and an		**********	***************************************		**************	***************************************	Normal Insulativa de Calendaria	Drilling Company: Precision Sampling Inc Bit Size/Type:								
			tions: U	************								irce: G	PS		00-00 <del>0-00-00-00-0</del>				Hami								
*********	*****		ent Poir		·····			Depti	h to C	Grour	ndwat	er Initia	I/Time	Not o	bserve	d			Hami					*******************************			
Log	ged	By: J.	Stoker	<b>1</b>		***************************************	***************************************			***************************************		er Final					ntinicomuninistra.				**********	**********	earing	: -90°			
	Ī						T	L						lassific	ation			T		borato	·//	***************************************	~~~~~		·		
	e Symbol	ber	Ė.	(tsf)	The state of the s	<del>,</del>	The n interp and li	eport ar retation mitation	nd log ns in th						All data a anations	nsity		lex		<u> </u>	· <del>y</del>	T*************************************	(%				
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol					D	tat				Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other	d		
4		<i>w</i>		6.	9	SM	med	npletec	grained	d	rk bro		to mois	it, fine to		O	<u>d</u>	<u>a.</u>				<b>₫</b>	Q.#	Field	Notes		
2	Wilden.										Dat	e: 05-	-11-12		34				-OG	B-4	44			Plate			
		K	(LE			EL ple. Ri					Che	************	y: J.	Stoke	n 7054.g	pj		Pine	BIA I dale, I	N7054 New M							

Bor	ina N	Jumhar	: B-43				Location		<del></del>				Т	Drillin	g Met	hod:	Hallo	v-ster	n auger :			
*********	····		epth: 1.0	] m					Lat/Longl: 35 f	58224° / 108.46	3459°				g Equ	***************************************	************					
			No Ro	~~~~	ıs Fı	ngnun	***************************************	oordinate				***************************************	~>>	Drilling Company: Precision Sampling In								
	***************************************		1: 04-11	***************************************	**********	*****************		Top of Boring Elevation:						Bit Size/Type:								
		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	ions: U				***************************************	Coordinate Data Source: GPS						Hammer Type/Method:								
			ent Poin				·····	******************************		: Not observed	<u>.</u>			Hammer Drop/Weight:								
-		~~~~	Stoker		***************************************		ancono manda	~~~~	ater Final/Time		papery normana a a a cocca co	***************************************		Angle	-90°							
			o rokoi		7	<del></del>	1		Description &		<i>-</i>			<del></del>	orato							
	ymbol	L		<u>_</u>			The report and lo interpretations in and limitations.			ese logs. All data ar ated explanations	ij.					(bcl)						
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol			venenen en	er aller det de aller alle de la	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Sieve (%)	Passing #200 Sieve (%)	Other Test			
o D	SS.	တ္တ	m	8	Ö	SP-SM	n l		escription Fith Silt (SP-SM	V. California	25	<u> </u>	百	ž	3	٥	5.2	유유	Field Notes			
1						SC		(SC): brov	vn, dry to moist,													
3	3					<u></u>		[ !	Project Numbe	: 126434			<u> </u>	LOG	B-	43	<u> </u>		Plate			
				<u>\</u>					Date: 05-11-	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						- <b>T</b>	**************************************	and the second s				
		1	<i><b>(LE</b></i>				DER	F	Entry By: K. I	***************************************				DIV	N7054	4						
		1	Management of the state of	Brigi	it Pei	opie. R	ight Solutions.		Checked By:	J. Stoken			Pine		New I		0					
ı		~	THE REAL PROPERTY AND ADDRESS OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TO THE PERSON NAMED IN COLUM					ļį	File Name: 12	.6434_N7054.g	pj								***************************************			

Bo	ing l	Numbe	r: B-42				Loc	cation:						***************************************		Drillir	ig Met	hod:	Hollo	w-sten	n auger		
********			epth: 1.	0 m	***********		Co	ordinates	(X/Y, La	at/Long): 35	.58154° / 10	08.46	225°	***************************************			ig Equ	+					
		***********	: No Ro		as E	ncoun		tum/Coor					·							cision	Sampling	g Inc	
····		***************************************	d: 04-1					p of Borin	***********								ze/Typ		eremines) eessess	***************************************			
	·		tions: U		**********					urce: GPS		***************************************	******************				ner Ty		thod:				
WL	Mea	surem	ent Poin	t:	·	:	Dej	pth to Gro	oundwat	ter Initial/Tin	e: Not obse	erved	**************			Hamn	ner Dr	op/W	eight:	tring the tring and the second second	uinneelelelemennelesiiinessessel	irmrenirm	
Log	ged	By: J.	Stoker	}			Dej	pth to Gro	oundwat	ter Final/Tim	e:							······	·······	aring:	-90°		
		***************************************						Fiel	ld Soil C	Description 8	Classification	on		***************************************		Lal		***************************************					
	s Symbol	iber	į.	(tst)		ol	The report interpretati and limitati	and log key ions in this l ions.	key are an integral part of these logs. All da his log are subject to those stated explanation		lata an ions	, f		lex		nt (%)	ght (pcf)		(%)				
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol			D	cription			Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other 1 and Field N	Γest:	
1.						SP-SM	dry to m	oist, fine t	o mediu	h Silt (SP-Sim grained	A): dark brow	η,											
3						i Ei					r: 126434					.og	B-4	<b></b>			Plate		
	į				<b>u</b>	,				te: 05-11-			ministeriorainteriora						**************	www.nneware.w			
	200	H	(LE				DE		-	try By: K.				- 1		DIA.	tyor.			31			
		No.	Mariana de La Caración de C	erigh	t Pec	pie. Ri	ght Solutic	ans.	Ch	ecked By:	J. Stoken				Piner		17054 1ew M						
			-						File	Name: 12	26434_N70	54.gp	j			•							

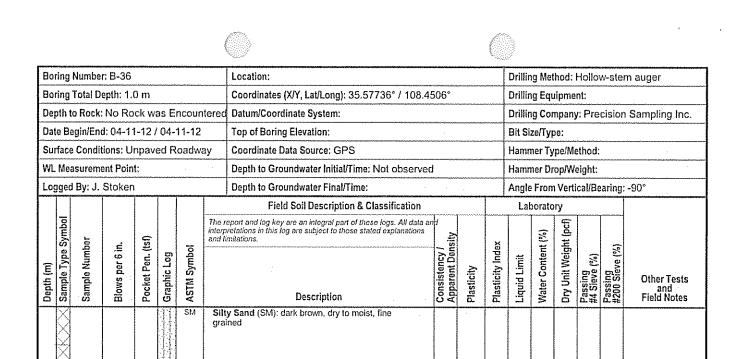
Boi	ing i	lumber	: B-41				Location:	**************************************				Drillin	g Met	hod:	Hollo	w-ster	n auger
Bor	ing 1	Total De	epth: 1.0	) m			Coordinates (	X/Y, Lat/Long): 35.5807° / 108.46	043°			Drillin	g Equ	iipme	nt:		
Dep	th to	Rock:	No Ro	ck wa	as E	псоип	tered Datum/Coordi	nate System:				Drillin	g Cor	npany	/: Pre	cision	Sampling Inc.
Dat	e Be	gin/Enc	1: 04-11	-12/	04-	11-12	Top of Boring	Elevation:				Bit Si:	ze/Typ	)e:			***************************************
Sur	face	Condit	ions: U	npave	ed R	oadwa	ay Coordinate Da	ata Source: GPS				Hamn	ner Ty	pelMe	ethod:	W1004-AND-000-6-A-	
WL	Mea	sureme	nt Poin	t:	***************************************	W.C. 004030	Depth to Grou	ındwater Initial/Time: Not observe	3	***************************************		Hamn	ner Dr	op/W	eight:		
Log	ged	By; J.	Stoken				Depth to Grou	ındwater Final/Time:			l	Angle	From	ı Verti	cal/Be	aring:	-90°
***********							Field	Soil Description & Classification				Lat	orato	гу			······································
	logm.			_			The report and log key interpretations in this log and limitations.	are an integral part of these logs. All data a g are subject to those stated explanations	nd -2s				(%	(pcd)			
	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	ĝo:	ASTM Symbol	ara mintavaria.	######################################	Consistency / Apparent Density		Plasticity Index	Jit.	Water Content (%)	Dry Unit Weight (pcf)	(%)	Passing #200 Sieve (%)	
Depth (m)	ple T	ple N	ed S	cet P	Graphic Log	Sy.	****		siste	Plasticity	ticity	Liquid Limit	S Co	Ë	ing ieve	Sie	Other Tests
Dept	Sam	Sam	Blow	Poct	Grap	AST		Description	Con	Plas	Plas	Liqu	Wate	2	Pas:	Pas:	and Field Notes
1							Completed at a deg grade.	oth of 1.0 m below existing site									
2												A CONTRACTOR OF THE CONTRACTOR					
	J	<u></u>		<u> </u>	<u> </u>	1	.1	Project Number: 126434	<u> </u>	1	٠	. ~ ~		<u> </u>	<u> </u>		Plate
		A Property of the Parks						Date: 05-11-12			'	LOG	, K.	47			
		L H	(LF	-//	√F		LDER	Entry By: K. Knights			~~~~~~	**************	*****	-			
							ight Solutions.	Checked By: J. Stoken	1				N7054				
		1							1		Pine	edale,	New f	Vexic	0		

*******	~~~		r: B-40			erenirorestrumoru.	Location:		k de medita de de sa cuma suna suma meneral el sencionen k eskatik di kisa par sendana su se				***************************************		*************	heldsmeded annumb	w-sten	n auger	
-			epth: 1.					s (X/Y, Lat/Long): 3	5.57992° / 108.45	5862°		~~~	Drillin		-				************
	******		No Ro					ordinate System:	el amatiliarmel a minia em el alcunia la el alcunia una laciando un lacunida anual						************	/: Pre	cision	Sampling	g Inc
			d: 04-1					ing Elevation:					Bit Si						
			lions: U	************************	ed R	oadw	minet rett vital and selve a transfer and selve a transfer and selve a transfer and selve a transfer and selve	Data Source: GPS	***************************************	dientrientiedietuus	omakeiseeeee		Hamn			*******	Militaria de la compositiva della compositiva de	anum min managan managa Managan managan managa	
	**********		ent Poin				Depth to Gr	roundwater Initial/Ti	me: Not observed				Hamn	ner Dr	op/W	eight:			
Log	ged	By: J.	Stoker	1			Depth to Gr	roundwater Final/Ti	ne:	:			Angle	From	ı Verti	cal/B	earing:	-90°	
			4				Fie	eld Soll Description	& Classification				Lat	orato	гу				
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	The report and log ke interpretations in this and limitations.	ey are an integral part o s log are subject to those	I these logs. All data an estated explanations	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other 1	Fests
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Boring Total Depth: 1.0 m  Depth to Rock: No Rock was Er  Date Begin/End: 04-11-12 / 04-  Surface Conditions: Unpaved R  WL Measurement Point:  Logged By: J. Stoken  Blows bet 8: u  Blows bet 9: u  Blows be	1-12 Top of Boring Elevation:	/ed	Drill Bit S Harr Harr Ang	Size/Tyl	mpany pe: ype/Mi rop/W n Verti	y: Precis lethod: /eight: lical/Bear	sion Sampl	
Date Begin/End: 04-11-12 / 04- Surface Conditions: Unpaved R WL Measurement Point: Logged By: J. Stoken    Ogged By: J. Stoken   Ui (st)   Ui (st)	Top of Boring Elevation:  Coordinate Data Source: GPS  Depth to Groundwater Initial/Time: Not observed be perfectly to Groundwater Final/Time:  Field Soil Description & Classification The report and log key are an integral part of these logs. All data interpretations in this log are subject to those stated explanation and limitations.  Description  SM Silty Sand (SM): dark brown, dry to moist, fine to medium grained  Completed at a depth of 1.0 m below existing site	/ed	Plasticity Index Harr Ang Lidnid Limit	Size/Tyl nmer Ty nmer Di nle Fron aborato	pe: rop/W rop/W n Verti ory loory Dry (bd) theight (bd)	ethod: /eight: ical/Bear	ring: -90°	er Tests
Surface Conditions: Unpaved R WL Measurement Point: Logged By: J. Stoken  Laguer (1st) u 60	Depth to Groundwater Initial/Time: Not observed by Depth to Groundwater Final/Time:    Depth to Groundwater Final/Time:	/ed	Ham Ham Ang Li Hamit Fidniq Fimit	nmer Ty nmer Di le Fron aborato	ypelMi rop/W n Verti Dry (lod) typeight (lod)	lethod: /eight: .ical/Bear	ring: -90°	er Tests
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pe Symbol Imber 6 in. n. (tsf)	Field Soil Description & Classification  The report and log key are an integral part of these logs. All dat interpretations in this log are subject to those stated explanation and limitations.  Description  Silty Sand (SM): dark brown, dry to moist, fine to medium grained  Completed at a depth of 1.0 m below existing site	a and	Plasticity Index Liquid Limit	aborato	Dry Unit Weight (pcf)			er Tests
Depth (m) Sample Type Symbol Sample Number Blows per 6 in. Pocket Pen. (1sf) Graphic Log	The report and log key are an integral part of these logs. All dat interpretations in this log are subject to those stated explanation and limitations.  Description  Silty Sand (SM): dark brown, dry to moist, fine to medium grained  Completed at a depth of 1.0 m below existing site	a and	Plasticity Index Liquid Limit	T	Dry Unit Weight (pcf)	Passing #4 Sieve (%) Passing	(%) Other Size Field	er Tests and d Notes
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Completed at a depth of 1.0 m below existing site

*KLEINFELDER* Bright People, Right Solutions.

SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER, GINT LIBRARY VER, 2.GLB 126434,GPJ 7/18/12

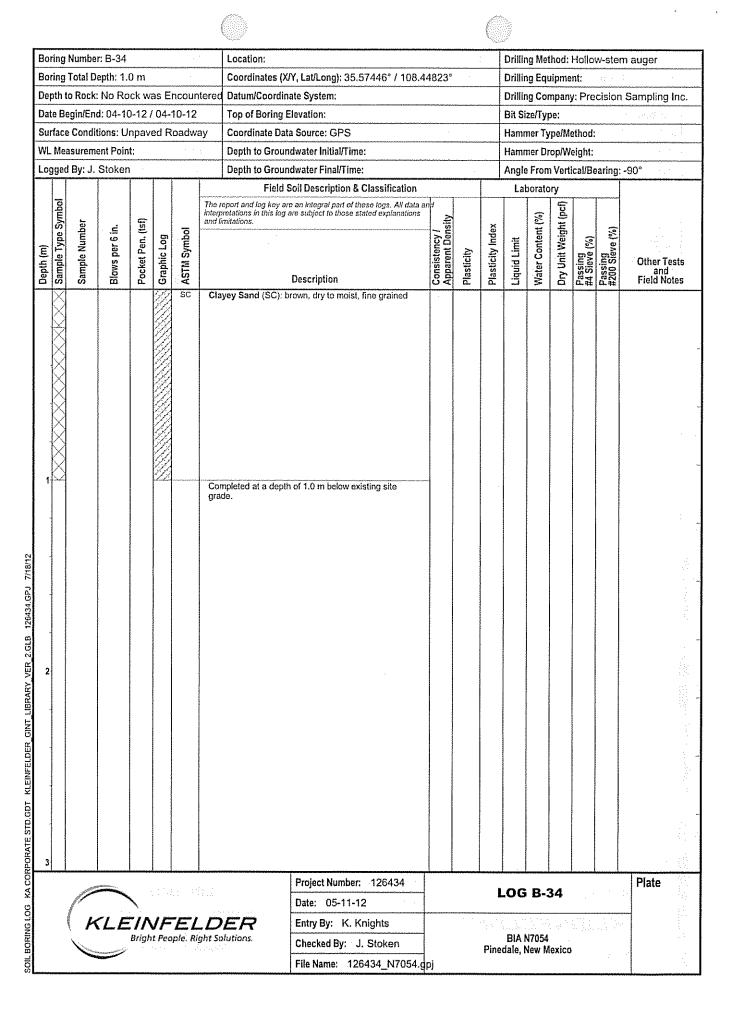
Project Number: 126434 **LOG B-36** Date: 05-11-12 Entry By: K. Knights BIA N7054 Checked By: J. Stoken

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Pinedale, New Mexico

Plate

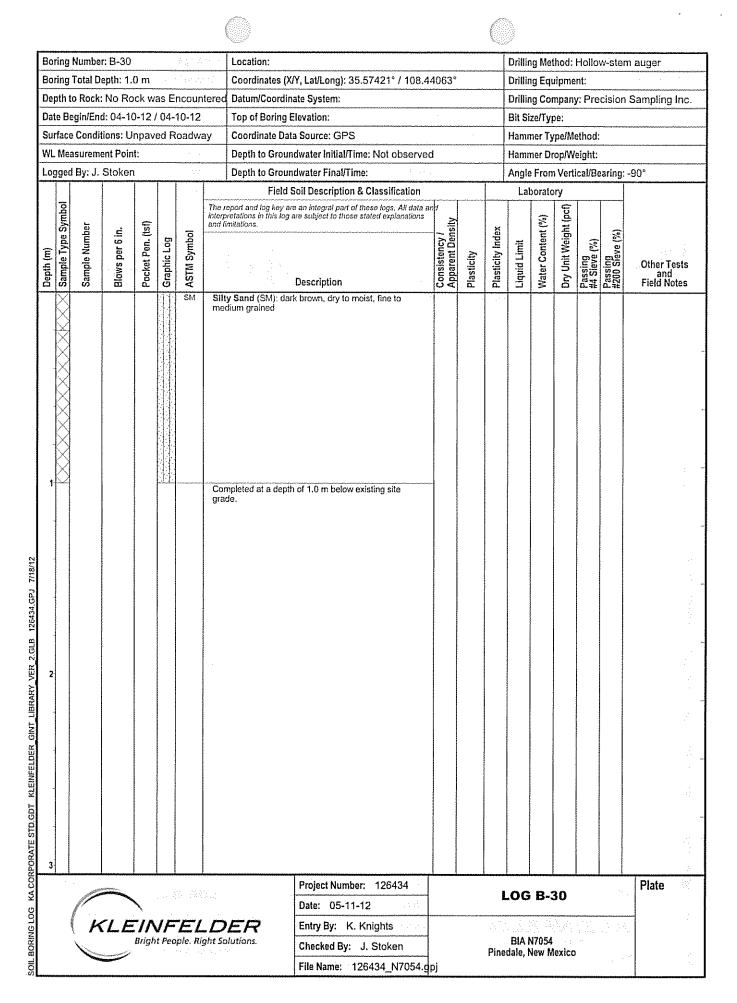
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Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol		Description	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sleve (%)	Other Tests and Field Notes
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3	<u> </u>							Project Number: 126434		<u> </u>		LOG	B-	<u> </u> 29	<u> </u>		Plate
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	Sample Type Symbol	Jumber	ar 6 in.	en, (tsf)	Log	mbol	The report and log key are an integral part of those logs. A interpretations in this log are subject to those stated explar and limitations.	l data and ations	Apparent Density		/ Index	ĨĮ,	Water Content (%)	Dry Unit Weight (pcf)	(%)	ve (%)	
Depth (m)	Sample 1	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	S ASTM Symbol	Description Silty Sand (SM): brown, dry to moist, fine grained		Apparen	Plasticity	Plasticity Index	Liquid Limit	Water Co	Dry Unit	Passing #4 Sieve	Passing #200 Sieve (%)	Other Tests and Field Notes
2							Completed at a depth of 1.0 m below existing site grade.										
	<del></del>			_	<u>, , , , , , , , , , , , , , , , , , , </u>	<u> </u>	Project Number: 12643  Date: 05-11-12	14			L	.og	В-	25			Plate
		Antonios Antonios	(LE				Entry By: K. Knights  Checked By: J. Stoker  File Name: 126434_N	***********			Pine		N7054 New M		9		

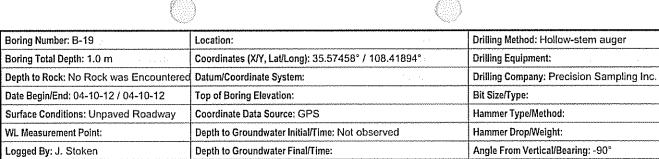
Boi	inn i	Numbe	r: B-24					Loca	tion:							······································		V455375	Drillin	na Mai	bod	Hollo	w-sta	m auge	or.
*****	**********	****	epth: 1.	) m					***************************************	s IXN	Y. Lat/I	Long): 3	5.573	328° / 1	108.42	948°		www.		ıg Eqi			310	iii augi	≠ f virmlarkaladistisvikuvimi
			No Ro		as Fi	ncoun	tered		m/Coo			***************************************											cisior	n Samp	ling In
		ir naminististina minuminta	d: 04-10	m,,,,,,,,,,,					of Bori		***************************************			************************	e&eemist************	***************************************	Ottorical ambientialiata			ze/Ty:					
			ions: U									e: GPS	 }	danamianaknaldadara						ner Ty	***************************************	ethod	***************************************	~~~~	~~~~~
		*********	ent Poin	***************	. :	esten mátrostanan	nimimiramiran	************				Initial/T		lot obs	erved				***************************************	ner Dr		***************************************			
***********	-	and an alternative of the	Stoker								~~~~	Final/Ti	**************			***************************************	deletat ni internesse						earing:	:-90°	
			····				<u> </u>		THE RESERVE AND ADDRESS OF THE PERSONS ASSESSED.	775KH144444	D2000000000000000000000000000000000000	scription	***********	ssificat	lion				-	oorato				**********	····
=	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (Isf)	Graphic Log	ASTM Symbol	The n interp and li	eport ar retation mitation	nd log k ns in this			gral part o	->:->>		->	Consistency / Topparent Density	>	Plasticity Index		Water Content (%)	Dry Unit Weight (pcf)	(%)	Passing #200 Sieve (%)		
Depth (m)	ed u	uble	ws n	ket	phic	Š ≅				:						siste	Plasticity	sticit	Liquid Limit	D To	Ē	sing	sing 0 Sie	Oth	er Test
Cep	San	San	98	P. P.	Gra	AST				ı	Descri	ption				Ap G	Plas	Plas	Liq.	Wat	Dry	Pas #4.5	Pas #201	Fie	and Id Note
1							Corr	mpletec de,	d at a d	depīh	of 1.0	m below	existir	ng site											
3		(K	\(\alpha\)	\ ://\	IF	EL ple. Ri	.D			-	Date: Entry Chec	ct Numb 05-11 By: K ked By: lame:	1-12 . Knig J. S	ghts stoken					BIA	<b>B-</b> 2 N7054 New M				Pla	ite

Boring Number: B-23	Location:		*6.2,147	Drilli	ng Me	thod:	Hollo	w-sten	n auger
Boring Total Depth: 1.0 m	Coordinates (X/Y, Lat/Long): 35.57286° / 108.42	 275°			ng Eqi		~~~~~		
Depth to Rock: No Rock was Enco	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	***************************************					***********	cision	Sampling Inc
Date Begin/End: 04-10-12 / 04-10-					ize/Ty				
Surface Conditions: Unpaved Road	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		*********		mer Ty		ethod	00000000000000000000000000000000000000	an panggaggaan nganggangan na an an an an an an an an an an an a
WL Measurement Point:	Depth to Groundwater Initial/Time: Not observed	······		~~	mer D				***************************************
Logged By: J. Stoken	Depth to Groundwater Final/Time:				**********			earing:	-90°
	Field Soil Description & Classification			La	borate	эгу		T	
Sample Type Symbol Sample Number Blows per 6 in. Pocket Pen. (tsf) Graphic Log	The report and log key are an integral part of these logs. All data are interpretations in this log are subject to those stated explanations and limitations.  Description  Silty Sand (SM): dark brown, dry to moist, fine to medium grained	icy / Densit	Plasticity	riasucity maex Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
2	Completed at a depth of 1.0 m below existing site grade.								
3	Project Number: 126434  Date: 05-11-12			LO	G B-	-23			Plate

Bor	ina l	Numbe	: B-22		٠.		Location:						Drillin	n Mei	hod:	Hollo	w.cte	n auger	
**********	desirable securion	umlumin markeni miritari	epth: 1.	) m				X/Y, Lat/Long): 35.57365°	/ 108.425	44°	***************************************	***********		ıg Equ	***************************************	··········			****
			No Ro		as Fı	ncoun										*****	cision	Sampling In	 ۱۲
******	erinonina.	rianeamineahmanim	1: 04-10				Top of Boring	telli til tellet mitteri samilaren i sere erimen samarinen eri semen eri semen eri semen eri semen eri semen e					*******	ze/Typ	-		. :	- Camping B	g t
		<u> </u>	ions: U					ita Source: GPS				-	*****	ner Ty		thod.			-4
		**************************************	nt Poin	***********	ininininnun			indwater Initial/Time: Not o	bserved	***************************************				ner Dr	-	-		**************************************	-
*************			Stoken					indwater Final/Time:			***************		**********	-	····		aring:	-90°	400
	Ī							Soil Description & Classifi	cation					orato					•
	Sample Type Symbol	ımber	e in.	n. (tsf)	og	loqu		are an integral part of these logs. g are subject to those stated expl	All data and	Density		ndex	minet of security mails on		(bct)	(%	(%)		
Depth (m)	Sample Ty	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol		Description	Consisten	Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit W	Passing #4 Sieve (*	Passing #200 Sieve (%)	Other Test and Field Note	
2								th of 1.0 m below existing sit											
3	The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s				/F		DER	Project Number: 1264 Date: 05-11-12 Entry By: K. Knights	34				***************************************	B-2				Plate	
				angn	reo	μie. Ki	ght Solutions.	Checked By: J. Stoke File Name: 126434_N						17054 lew M				-	

Bori	ina l	Vumber	: B-21			24	Location:				Т	Drillin	g Met	hod:	Hollor	w-ster	n auger
			pth: 1.0		*****	***********	Coordinates (X	/Y, Lat/Long): 35.57398° / 108.42	233°			Drillin		**********			
	~~~~		No Ro	-	as Er	coun				oruniceneonon						cision	Sampling Inc
			l; 04-10			**********	Top of Boring E					Bit Siz		***************************************			
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			ions: U	***************************************				a Source: GPS	***************************************			Hamn			ethod:	************	and the state of t
	***********		nt Poin		*************			dwater Initial/Time: Not observed				Hamn		-			·····
		***************************************	Stoken		~			dwater Final/Time:	m (3 r), (m) g m (4 m) r r r r r r r r r r r r r r r r r r					***************************************	**********	aring:	-90°
Ī	T			l				Soil Description & Classification					orato				MARKET
(-	Sample Type Symbol	Number	er 6 in.	en. (tsf)	Log	/mbol	The report and log key ar interpretations in this log and limitations.	e an integral part of these logs. Alf data ar are subject to those stated explanations	Consistency / Apparent Density	<b>-</b>	y Index	imit	Water Content (%)	Dry Unit Weight (pcf)	(%)	ive (%)	
Depth (m)	Sample 1	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol		Description	Consiste Apparen	Plasticity	Plasticity Index	Liquid Limit	Water Co	Dry Unit	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
2								wn, dry to moist, fine grained  h of 1.0 m below existing site									
,	1		<u> </u>	Project Number: 126434  Date: 05-11-12	<u> </u>	1	<u>ا ۔ ۔ ۔ ۔ ا</u>	LOG	В-	21	1	1	Plate				
		The Contract of the Contract o	(LE				LDER ight Solutions.	Entry By: K. Knights Checked By: J. Stoken File Name: 126434_N7054.c	ia	oreniero comen	Pine	BIA edale,	N7054 New M		9		

Bor	ina I	Numbe	r: B-20			5 to 1	Location:					1	Drillin	ıq Met	hod:	Hollo	w-sten	ı auger	
	*******		epth: 1.	n m	w.n			s (X/Y, Lat/Long): 3	5.57421° / 108.43	2121°		-	minimization militaris	ıg Equ					
			No Ro		as F	100ur		rdinate System:								***************************************	cision	Sampling	In
-	-		d: 04-10			~~~~~		ing Elevation:			· .	-		ze/Typ		, , , , , ,	5,5,011	-2011km/A	.11
			lions: U	***************				Data Source: GPS	med distribution of within the last and distributed to obtain a summarise to a surface which is a surface when the surface wh					ner Ty		thod:		***************************************	
*********	*********		ent Poin					roundwater Initial/Ti	me: Not observed				***************************************	ner Dr	-	Lamaiumanim			
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	Symbol	ber		tsf)		~		ey are an integral part o s log are subject to those		) tisty		×ə		T	~		(5)		
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol				Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Te	st
Ö	Sar	Sar	. <b>6</b>	<u>۳</u>	Gra	SM Si	·	Description brown, dry to moist,		S &	D s	Pla	5	Wa	D	Pas #	Pas #20	and Field No	te
1							Completed at a digrade.	tepth of 1.0 m below	existing site										
3																			
				1		9 ali		Project Numb Date: 05-11	-12	<u> </u>	24/2004	***************************************		B-2				Plate	
	-				t Peo	ple. Ri	DER ght Solutions.	Entry By: K. Checked By:		n <del>i</del>			BIAI	N7054 New M					



Project Number: 126434 Date: 05-11-12  Plate	L	Log	ged	By: J.	Stoken				Depth to Groun	dwater Final/Time:				Angle	From	Verti	cal/Be	aring:	-90°
Completed at a depth of 1.0 m below existing site grade [weight   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)   Mater Content (%)														Lat	orato	гу			
SM Silty Sand (SM): brown, dry to moist, fine grained  Completed at a depth of 1.0 m below existing site grade.		Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	and limitations,		Consistency /	Apparent Density Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
Project Number: 126434  Date: 05-11-12  Entry Ry: K Knights	RPORATE STD.GDT KLEINFELDER GINT LIBRARY VER 2.GLB 126434.GPJ 7/18/12	2						SM	Completed at a depth	n of 1.0 m below existing site									
Bright People. Right Solutions.  Checked By: J. Stoken  BIA N7054  Pinedale, New Mexico	BORING LOG KACC		!	(		E// Brigh	VF	E L	DER ight Solutions.	Date: 05-11-12 Entry By: K. Knights		······································	100 <del>11-111</del> 00-11100	BIA	N7054				Plate



Project Number: 126434  Date: 05-11-12	LOG B-19	Plate
Entry By: K. Knights		
Checked By: J. Stoken	BIA N7054 Pinedale, New Mexico	
File Name: 126434_N7054.gpj	·	

Boring Number: E Boring Total Dept Boring Total Dept Depth to Rock: N Date Begin/End: C Surface Condition WL Measurement Logged By: J. St  applies Number  applies Number  Logged By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  applies Number  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J. St  By: J.	th: 1.0 lo Rod 04-10 ns: Un t Point token	ck wa )-12 / npave t:	04-	10-12	Pred Datum/Coordinate Syst Top of Boring Elevation		1686°			Drillin	ıg Equ	ıipme	nt:	0.000	auger Sampling Ir
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pe Symbol Imber		***************************************			Depth to Groundwater F	***************************************		***************************************			-	************	·	earing: -	-90°
m) Type Symbol Number	<u>.e</u>					ription & Classification			T		oorato				SENER
Sample Ty Sample Ty	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	The report and log key are an integ interpretations in this log are subject and limitations.  Descrip		Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tes and Field Note
2					Clayey Sand (SC): reddish be grained  Completed at a depth of 1.0 m grade.										
3 KL			/F		DER Entry E	Number: 126434 05-11-12 By: K. Knights	ASS and a residence of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the sec		i Ala	BIA N	17054	***************************************	***************************************		Plate

Bor	ing I	Vumber	: B-17				Location:					Drillin	g Met	hod:	Hollor	v-ster	n auger
Bor	ing 1	Total De	epth: 1.(	) m			Coordinates (X	/Y, Lat/Long): 35.57445° / 108.4	1458°	mp.cmm.com/vapusco		Drillin	g Equ	ilpme	nt:		
Dep	th to	Rock:	No Ro	ck wa	as Er	ncoun	tered Datum/Coordin	ate System:	-			Drillin	g Cor	npany	r: Pre	cision	Sampling Inc.
Dat	e Be	gin/Enc	l; 04 <b>-</b> 10	-12/	04-1	10-12	Top of Boring E	Elevation:		macha line la mainte de la color de la color de la color de la color de la color de la color de la color de la	~~~~~	Bit Siz				0#0/# <b>4</b> /##0000040	
Sur	face	Condit	lons: Ui	npave	ed R	oadw	ay Coordinate Dat	a Source: GPS				Hamn	**********	-			
WL	Mea	sureme	nt Poin	:			Depth to Groun	idwater Initial/Time: Not observe	d	ananiliaaniliaana		Hamn			**********		2000-200-200-200-200-200-200-200-200-20
Log	ged	By: J.	Stoken				Depth to Groun	ndwater Final/Time:				Angle	Fron	ı Verti	cal/Be	aring:	-90°
							.,	Soil Description & Classification				Lat	orato	<del>,</del>	<del></del>		
	/mpol			r)			The report and log key ar interpretations in this log and limitations.	re an integral part of these logs. All data a are subject to those stated explanations	anit <u>z</u>				(%)	t (pcf)			
Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	aru sintaluris.	Description	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
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3		<le< td=""><td></td><td></td><td></td><td>DER ight Solutions.</td><td>Project Number: 126434  Date: 05-11-12  Entry By: K. Knights  Checked By: J. Stoken  File Name: 126434_N708</td><td></td><td>The state of the s</td><td></td><td></td><td>BIA edale,</td><td>N7054</td><td>4</td><td>0</td><td></td><td>Plate</td></le<>				DER ight Solutions.	Project Number: 126434  Date: 05-11-12  Entry By: K. Knights  Checked By: J. Stoken  File Name: 126434_N708		The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s			BIA edale,	N7054	4	0		Plate

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SOIL BORING LOG KA CORPORATE STD.GDT KLEINFELDER, GINT LIBRARY VER 2,GLB 128434,GPJ 7/18/12

Bor	ing N	lumbe	r: B-13			***********	Location:					T	Drillin	g Met	hod:	Hollo	w-ster	n auger
		~~~~~	epth: 1.6	) m	***************************************	***************************************	Coordinates (X	/Y, Lat/Long): 35.57887° / 108.	1108	3°			Drillin	g Equ	ipme	nt:	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
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WL	Mea	surem	ent Poin	t:	***************************************		Depth to Groun	dwater Initial/Time: Not observe	ed				Hamn	ıer Dr	op/W	eight:		
Log	ged	By: J.	Stoken			www.eauconom	Depth to Groun	dwater Final/Time:					Angle	From	Verti	cal/Be	aring:	-90°
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Depth (m)	Sample Ty	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol		Description	Consistency /	Apparent	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit V	Passing #4 Sieve (	Passing #200 Sieve (%)	Other Tests and Field Notes
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Bor	ing	Numbe	r: B-12	:			Location:					Drilli	ng Mei	thod:	Hollo	w-stei	n auger
Bor	ing	Total D	epth: 1.	0 m		·	Coordinates	(X/Y, Lat/Long): 35.58064° / 108.4	11°	whitelished nitrates and		Drillin	ng Equ	uipme	nt:	***************************************	+ March (Charles) (colored and the Alice allerance are as a security a selection of the least of the Alice allerance and the Alice allerance are a security as a selection of the Alice allerance are a security as a selection of the Alice allerance are a security as a selection of the Alice allerance are a security as a selection of the Alice allerance are a security as a selection of the Alice allerance are a security as a selection of the Alice allerance are a security as a selection of the Alice allerance are a security as a selection of the Alice allerance are a security as a selection of the Alice allerance are a security as a selection of the Alice allerance are a security as a selection of the Alice allerance are a security as a selection of the Alice allerance are a security as a selection of the Alice allerance are a security as a selection of the Alice allerance are a security as a selection of the Alice allerance are a security as
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Depth (m)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol			Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	sing Seve (%)	Passing #200 Sieve (%)	Other Tests
	San	San	Blo	Poc	Gra			Description	Con	Plas	Plass	Liq	Wat	Day	Pas #4.9	Pas #20	and Field Notes
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۵	က္မ	လွ	m	<u>6</u> .	5	SM		Description dark brown, dry to moist, fine	88	ä	<u>a</u>	=======================================	3	₽.	<u>7</u> .#	Pa #28	Field No	tes
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Por	ine F	Viimbo	B⁻U3					Loca	tion				·····				***********		Drillir	g Mai	thod	Hollo	w-ster	n auger
Boring Number: B-03 Location: Drilling Method: Hollow-stem Boring Total Depth: 1.0 m Coordinates (X/Y, Lat/Long): 35.5918° / 108.39901° Drilling Equipment:																								
Depth to Rock: No Rock was Encountered Datum/Coordinate System: Drilling Company: Precisio						cision	Sampling In																	
··········	Date Begin/End: 04-10-12 / 04-10-12 Top of Boring Elevation: Bit Size/Type:						r Camping m																	
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# **United States Department of the Interior**

Bureau of Indian Affairs Navajo Region P. O. Box 1060 Gallup, New Mexico 87305 32 th flee

JUN 2 7 2017

#### **MEMORANDUM**

TO:

Mr. Harold J. Riley, Planning & Design Branch Chief

Attention: Mr. Albert Lee, Design Engineer

FROM:

Mr. Christopher Becenti, Materials Design Section Engineer

**SUBJECT:** Project No. N7054(1)1,2&3 – FP-14-Mainline Station 0+000,000 to 12+201.808

### **Project Scope**

Performed a field review on Route N7054, attached are the recommendations concerning the first materials report design. This memo presents the results of the boring test analysis performed on Route N7054 by BIA NRDOT's Architect and Engineering Consultant, Klienfelder.

Route N7054 (1)1,2&3 Project section is approximately 12.201-Kilometers long and located in the Eastern Navajo Agency. The Project location is a primary loop in Pinedale, NM, with concern for the residents along the route. This route is situated within land jurisdiction commonly known as checkerboard land, comprising of state, trust, and allotted. The roadway alignment largely follows the existing alignment. Currently, the existing alignment is a dirt roadway crossing a couple of incised drainage locations. The Project scope plans are to construct a two lane rural roadway with drainage and signage.

Note: Geotechnical Report conclusion poorly summarizes treatment locations.

#### **DESIGN ANALYSIS AND DISCUSSIONS**

#### N7054 (1)1,2&4 Pinedale, NM

In Klienfelder's designing of the roadway pavement section, the design traffic was based on the existing traffic analysis provided by Mr. Albert Lee, NRDOT Planning Engineer, and projected for a design period of 20 years. A geotechnical report was then initiated by a geotechnical investigation for the N7054(1)1,2&3 Project, providing boring logs and R values. information provided included the location of borings, and soil classification.

Table I below shows the parameters used for the design of the construction structural section for N7054 (1)1, 2 & 3.

#### Structural Number for Future Traffic

Parameter	N7054 (1)1,2&4 ABC Section
Design Life (years) (2037)	25
18-Kip ESALs (One Way)	13,000
Initial Serviceability (Po)	4.0
Terminal Serviceability (Pt)	2.0
Reliability Level	50%
Overall Standard Deviation (So)	0.45
RoadBed Soil Resilient Modulus	83,426.596 kPa
Required SN (per AASHTO 1993 Guide)	27 mm

Description	Drainage Coef	Thickness (mm)
Future HACP	1	63.5
Future Double Chip Seal *	N/A	19
ABC	1	152.4
	total	216
* Surface does not provide any	strength	

Typical Section N7054 (1)1, 2 & 3, Station 0+000,000 TO 12+201.808

Cross Slope 2%

- 1 (Future)63.5 mm Hot Asphaltic Concrete Pavement,
- 1 (Future)19 mm Double Chip Seal,
- 1 152 mm ABC topped with Prime Coat.

Klienfelder GEOTECHNICAL REPORT available

## SECTION I – FLAT BOTTOM BORROW DITCH & SUBGRADE ACCEPTANCE

Subgrade construction control R-value is 20. It is recommended that soil within 1 meter of the final subgrade elevation meet this construction control value. Thereby, all soils not meeting this value are considered unsuitable soils for strength. Inspection can use the NMDOT method of R-value estimate 60% confidence.

The Earthwork Factor is not provided in the geotechnical report.

Off-site borrow shall meet the requirements set in the FP-14 704.06 unclassified borrow.

#### **SECTION II - SUBGRADE, AND BASES**

#### Item 1 - AGGREGATE BASE COURSE (ALTERED GRADATION)

The Aggregate Base Course shall be an altered gradation, and shall be as specified in SUPPLEMENTAL Section 703.05 of the Specifications. The thickness of the Surface Course Aggregate layer shall be 152 mm.

## 703.05 Subbase, Base, and Surface Course Aggregate

The Section (b) of this section is superseded with the following:

- b) Subbase or base aggregate
  - 1) Gradation

Table 703-2

Table 703-2 Aggregate Base Gradation Special

Sieve Size Percent by Mass Passing Designated Sieve (AASHTO T27 & T11) 37.5 mm 100 25 mm 80-100 19 mm 65-80 9.5 mm 40-65 4.75 mm 30-50 425 um 8-30 75 um 2-12

## **SECTION III - SURFACE TREATMENTS AND PAVEMENTS**

N7054 (1) is considered a low volume road with existing ADT around 267. Normally, low volume roads, ADT less than 400, are designed with a gravel surface. However, an all-weather surface is encouraged by the locale and two future upgrades are recommended. An alternative to Hot Asphaltic Concrete Pavement would be Asphalt Treated Surfaces (AST). AST structural design is based primarily on strength attained in the gravel layer. The AST itself has no strength value assigned. The typical section reflects a designed strength section for a 7 year projected ADT. The choice of a 7 year projection is based on the presumed design life of 7 years of the chip seal. The use of AST is a common practice in a few states for low volume roads. After the life of the AST is consumed it is recommended to place Hot Asphaltic Concrete.

ITEM 1 - PRIME COAT: The prime coat shall be as specified in Section 411 of the FP-14 Standard Specifications and Supplemental Specification for Penetrating Emulsified Prime (PEP).

ITEM 2 – DOUBLE COURSE SURFACE TREATMENT DESIGNATION Type 2B CRS-2P. (previous report called for Microsurfacing)

1<sup>st</sup> APPPLICATION ASPHALT SURFACE TREATMENT – CRS-2P, GRADE B – Initial application rate of 2.1 L/m<sup>2</sup> is suggested, adjustment shall be at Construction Engineers assessment at test strip. The asphalt surface treatment shall be as specified in Section 407 of the FP-14 Standard and Supplemental Specifications. 18-24 kg/m<sup>2</sup> aggregate application rate

2<sup>ND</sup> APPLICATION ASPHALT SURFACE TREATMENT – CRS-2P, GRADE C – Initial application rate of 2.4 L/m<sup>2</sup> is suggested, adjustment shall be at Construction Engineers assessment at test strip. The asphalt surface treatment

shall be as specified in section 407 of the FP-14 Standard and Supplemental Specifications.  $12-14 \text{ kg/m}^2$  aggregate application rate

	BASIS OF ESTIMATED QUANTITIES							
Item No.	Description	Grade	Unit Weight	Application				
30103-0500	Untreated Aggregate Base Course (Special)	Special (703-2)	2164 kg/m <sup>3</sup>	178 mm – mainline, 152mm turnout				
40701-1300	Chip seal, type 2B, grading B(future)	В	-	21 kg/ m <sup>2</sup> application rate				
40701-1400	Chip seal, type 2B, grading C(future)	C		24 kg/ m <sup>2</sup> application rate				
40702-0800	Emulsified Asphalt(future)	CRS-2P	1.001 L/Kg	2.1 L/m <sup>2</sup> 1st application rate 2.4 L/m <sup>2</sup> application				
40601-0000	Fog Seal(future)	CQS-1H	1.001 L/Kg	0.35 L/m <sup>2</sup> Application rate Applied as seal coat to				
	·			Chipseal.				
41101-5000	Prime Coat (future)	PEP	993 L/t	1.36 L/m <sup>2</sup> Application rate				

## SECTION IV – GEOTECHNICAL REPORT AVAILABILITY

The General Notes in the Planset referring to Geotechnical Investigation Report, shall be accompanied with "for informational purpose only"

Alfred Myron/

BIA NRDOT Materials Engineer

Christopher Becenti P. E.

BIA NRODT Assistant Materials Engineer

Approval

Harold Riley P. E.

BIA NRODT Planning and Design Branch Chief