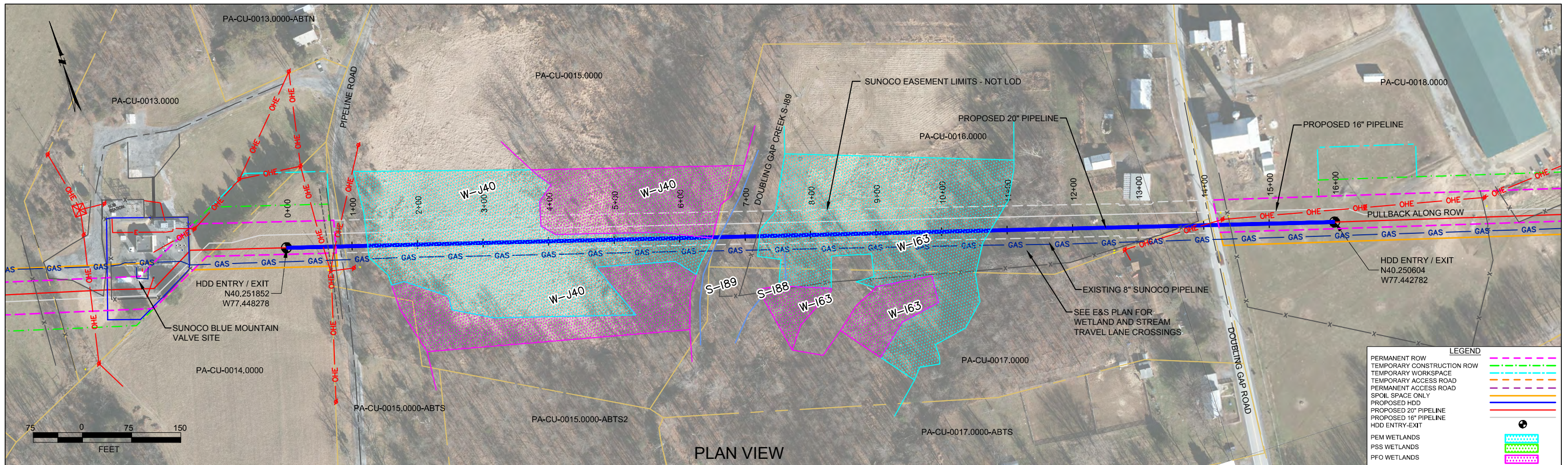


***HDD PA-CU-0015.0000-RD (PEM-J40, S-189, PEM-I63)***

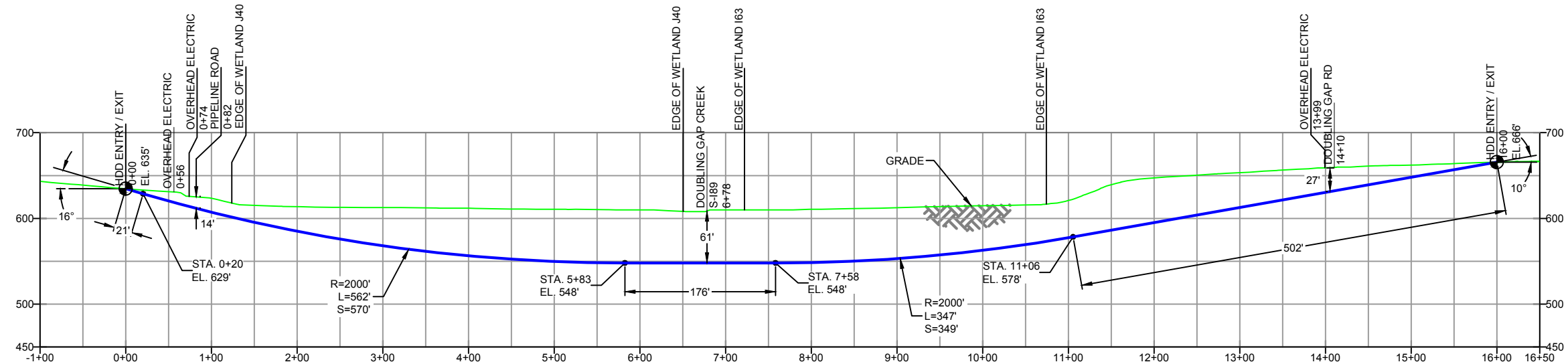
Given the design, the threat of inadvertent return has been reduced to the maximum extent practicable and in this case that threat is considered to be low. Implementing this design, along with adherence to the Pennsylvania Pipeline Project Inadvertent Return Contingency Plan will ensure inadvertent impacts, if they were to occur, are also minimized to the maximum extent.

The drill will enter/exit 160 feet from the western edge of Grassy Wetland J40 (PEM-J40) and enter/exit 970 feet from the eastern edge. The drill will enter/exit 700 feet from the western edge of Doubling Gap Creek (S-189) and enter/exit 950 feet from the eastern edge. The drill will also enter/exit 760 feet from the western edge of Grassy Wetland (I63) and enter/exit 550 feet from the eastern edge. The drill will pass below PEM-J40 starting at 25 feet (western edge) peaking at a depth of 60 feet. It will continue 60 feet below Doubling Gap Creek and rise up to 45 feet along the eastern edge of PEM-I63. The geotechnical results, as well as other data points, were used to determine the entry/exit angles, and depths to pass through the best substrates while maintaining the pipe integrity (e.g., no large bends). According to the geotechnical report primary substrates being drilled through are silty sands (west end of drill) and clay with silt (east end of drill) and fractured shale rock below 30 feet. Based on the geotechnical report and the drill profile minimal inadvertent returns are expected.



CUMBERLAND COUNTY PENNSYLVANIA, LOWER MIFFLIN TOWNSHIP  
S2-0160

**PROFILE VIEW**



**DESIGN AND CONSTRUCTION:**

- CONTRACTOR SHALL FIELD VERIFY DEPTH OF ALL EXISTING UTILITIES SHOWN OR NOT SHOWN ON THIS DRAWING.
- THE MINIMUM SEPARATION DISTANCE FROM EXISTING SUBSURFACE UTILITIES SHALL NOT BE LESS THAN 10 FEET AS MEASURED FROM THE OUTSIDE EDGE OF THE UTILITY TO OUTSIDE OF PROPOSED PIPELINE.
- DESIGNED IN ACCORDANCE WITH CFR 49 195 & ASME B31.4
- CROSSING PIPE SPECIFICATION:  
HDD HORZ. LENGTH (L=): 1600'  
HDD PIPE LENGTH (S=): 1618'  
20" x 0.456" W.T., X-65, API5L, PSL2, ERW, BFW  
COATING: 14-16 MILS FBE WITH 30-35 MIL ARO (POWERCRETE R95)
- INTERNAL DESIGN PRESSURE 1480 PSIG (SEAM FACTOR 1.0, DESIGN FACTOR 0.50).
- INSTALLATION METHOD: HORIZONTAL DIRECTIONAL DRILL (HDD).
- PIPELINE WARNING MARKERS SHALL BE INSTALLED ON BOTH SIDES OF ALL ROAD, RAILWAY, AND STREAM CROSSINGS.
- CARRIER PIPE NOT ENCASED
- PIPE / AMBIENT TEMPERATURE MUST BE NO LESS THAN 30°F DURING PULLBACK WITHOUT PRIOR WRITTEN APPROVAL FROM THE ENGINEER
- CONDUCT 4-HOUR PRE-INSTALLATION HYDROTEST OF HDD PIPE STRING TO MINIMUM 1850 PSIG.
- SEE SUNOCO PENNSYLVANIA PIPELINE PROJECT ESRI WEBMAP FOR ACCESS ROAD ALIGNMENT.
- SUNOCO PIPELINE, L.P.'S HORIZONTAL DIRECTIONAL DRILL INADVERTENT RETURN CONTINGENCY PLAN WILL BE IMPLEMENTED AT ALL TIMES.
- SUNOCO PIPELINE, L.P.'S EROSION AND SEDIMENTATION CONTROL PLAN WILL BE IMPLEMENTED AT ALL TIMES.

**NOTES**

- ALL COORDINATES SHOWN ARE IN LATITUDE AND LONGITUDE. ALL MSL ELEVATIONS ARE NAD83
- STATIONING IS BASED ON HORIZONTAL DISTANCES
- ROONEY ENGINEERING, INC. AND SUNOCO PIPELINE, L.P. ARE NOT RESPONSIBLE FOR LOCATION OF FOREIGN UTILITIES SHOWN IN PLOT PLAN OR PROFILE. THE INFORMATION SHOWN HEREON IS FURNISHED WITHOUT LIABILITY ON THE PART OF ROONEY ENGINEERING, INC. AND SUNOCO PIPELINE, L.P. FOR ANY DAMAGES RESULTING FROM ERRORS OR OMISSIONS THEREIN.
- CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UTILITIES. CONTACT ONE CALL AT 811 PRIOR TO DIGGING.
- SUNOCO EMERGENCY HOTLINE NUMBER IS #1-800-786-7440.

REF. DRAWING		REVISIONS	
ES-4.04	TO ES-4.05	NO.	DESCRIPTION
SHEET 3	TO SHEET 4	EP2	REVISED PER PADEP COMMENTS RECEIVED 09-06-16
		EP1	REVISED PER PADEP COMMENTS
		EP	
		B	ISSUED FOR BID
		A	ISSUED FOR REVIEW
DWG NO	DWG NO	NO.	DESCRIPTION

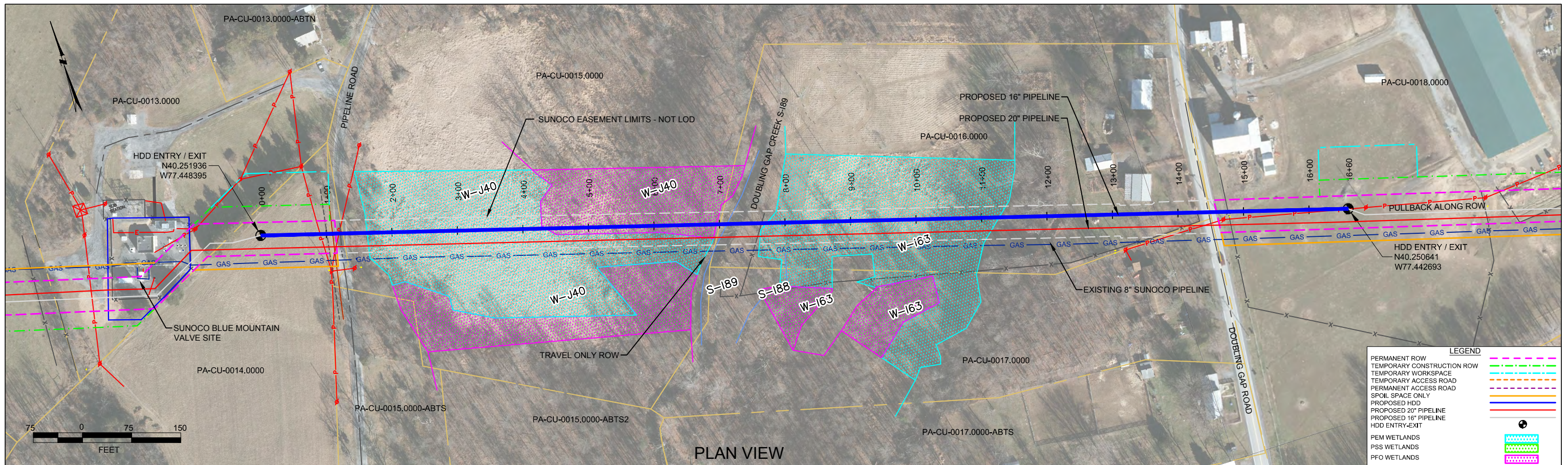
**Sunoco Logistics Partners L.P.**

**TETRA TECH ROONEY**  
(303) 792-5911

**SUNOCO PIPELINE, L.P.**

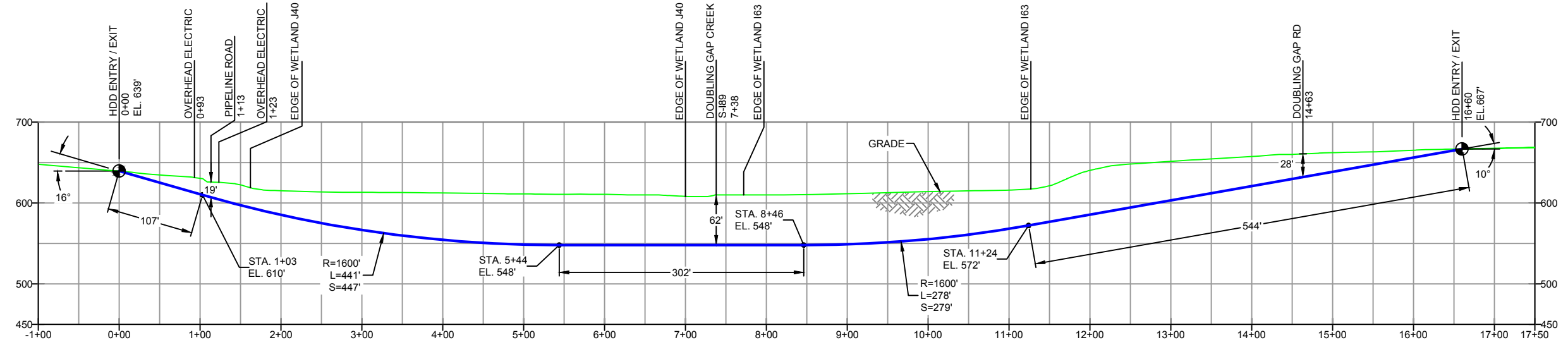
20-INCH HORIZONTAL DIRECTIONAL DRILL  
PIPELINE ROAD  
PENNSYLVANIA PIPELINE PROJECT

SCALE: 1"=150'  
DWG. NO. PA-CU-0015.0000-RD



CUMBERLAND COUNTY PENNSYLVANIA, LOWER MIFFLIN TOWNSHIP  
S2-0160-16

PROFILE VIEW



- DESIGN AND CONSTRUCTION:
- CONTRACTOR SHALL FIELD VERIFY DEPTH OF ALL EXISTING UTILITIES SHOWN OR NOT SHOWN ON THIS DRAWING.
  - THE MINIMUM SEPARATION DISTANCE FROM EXISTING SUBSURFACE UTILITIES SHALL NOT BE LESS THAN 10 FEET AS MEASURED FROM THE OUTSIDE EDGE OF THE UTILITY TO OUTSIDE OF PROPOSED PIPELINE.
  - DESIGNED IN ACCORDANCE WITH CFR 49 195 & ASME B31.4
  - CROSSING PIPE SPECIFICATION:  
HDD HORZ. LENGTH (L): 1660'  
HDD PIPE LENGTH (S): 1660'  
16" x 0.438" W.T., X-70, API5L, PSL2, ERW, BFW  
COATING: 14-16 MILS FBE WITH 30-35 MIL ARO (POWERCRETE R95)
  - INTERNAL DESIGN PRESSURE 1480 PSIG (SEAM FACTOR 1.0, DESIGN FACTOR 0.50).
  - INSTALLATION METHOD: HORIZONTAL DIRECTIONAL DRILL (HDD).
  - PIPELINE WARNING MARKERS SHALL BE INSTALLED ON BOTH SIDES OF ALL ROAD, RAILWAY, AND STREAM CROSSINGS.
  - CARRIER PIPE NOT ENCASED
  - PIPE / AMBIENT TEMPERATURE MUST BE NO LESS THAN 30°F DURING PULLBACK WITHOUT PRIOR WRITTEN APPROVAL FROM THE ENGINEER
  - CONDUCT 4-HOUR PRE-INSTALLATION HYDROTEST OF HDD PIPE STRING TO MINIMUM 1850 PSIG.
  - SEE SUNOCO PENNSYLVANIA PIPELINE PROJECT ESRI WEBMAP FOR ACCESS ROAD ALIGNMENT.
  - SUNOCO PIPELINE, L.P.'S HORIZONTAL DIRECTIONAL DRILL INADVERTENT RETURN CONTINGENCY PLAN WILL BE IMPLEMENTED AT ALL TIMES.
  - SUNOCO PIPELINE, L.P.'S EROSION AND SEDIMENTATION CONTROL PLAN WILL BE IMPLEMENTED AT ALL TIMES.

NOTES	
1.	ALL COORDINATES SHOWN ARE IN LATITUDE AND LONGITUDE. ALL MSL ELEVATIONS ARE NAD83
2.	STATIONING IS BASED ON HORIZONTAL DISTANCES
3.	ROONEY ENGINEERING, INC. AND SUNOCO PIPELINE, L.P. ARE NOT RESPONSIBLE FOR LOCATION OF FOREIGN UTILITIES SHOWN IN PLOT PLAN OR PROFILE. THE INFORMATION SHOWN HEREON IS FURNISHED WITHOUT LIABILITY ON THE PART OF ROONEY ENGINEERING, INC. AND SUNOCO PIPELINE, L.P. FOR ANY DAMAGES RESULTING FROM ERRORS OR OMISSIONS THEREIN.
4.	CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UTILITIES. CONTACT ONE CALL AT 811 PRIOR TO DIGGING.
5.	SUNOCO EMERGENCY HOTLINE NUMBER IS #1-800-786-7440.

REF. DRAWING		REVISIONS	
ES-4.04	TO ES-4.05	EROSION & SEDIMENT PLAN	
SHEET 3	TO SHEET 4	AERIAL SITE PLAN	
		EP2	REVISED PER PADEP COMMENTS RECEIVED 09-06-16
		EP1	REVISED PER PADEP COMMENTS
		EP	
		A	ISSUED FOR BID
DWG NO	DWG NO	DESCRIPTION	NO.

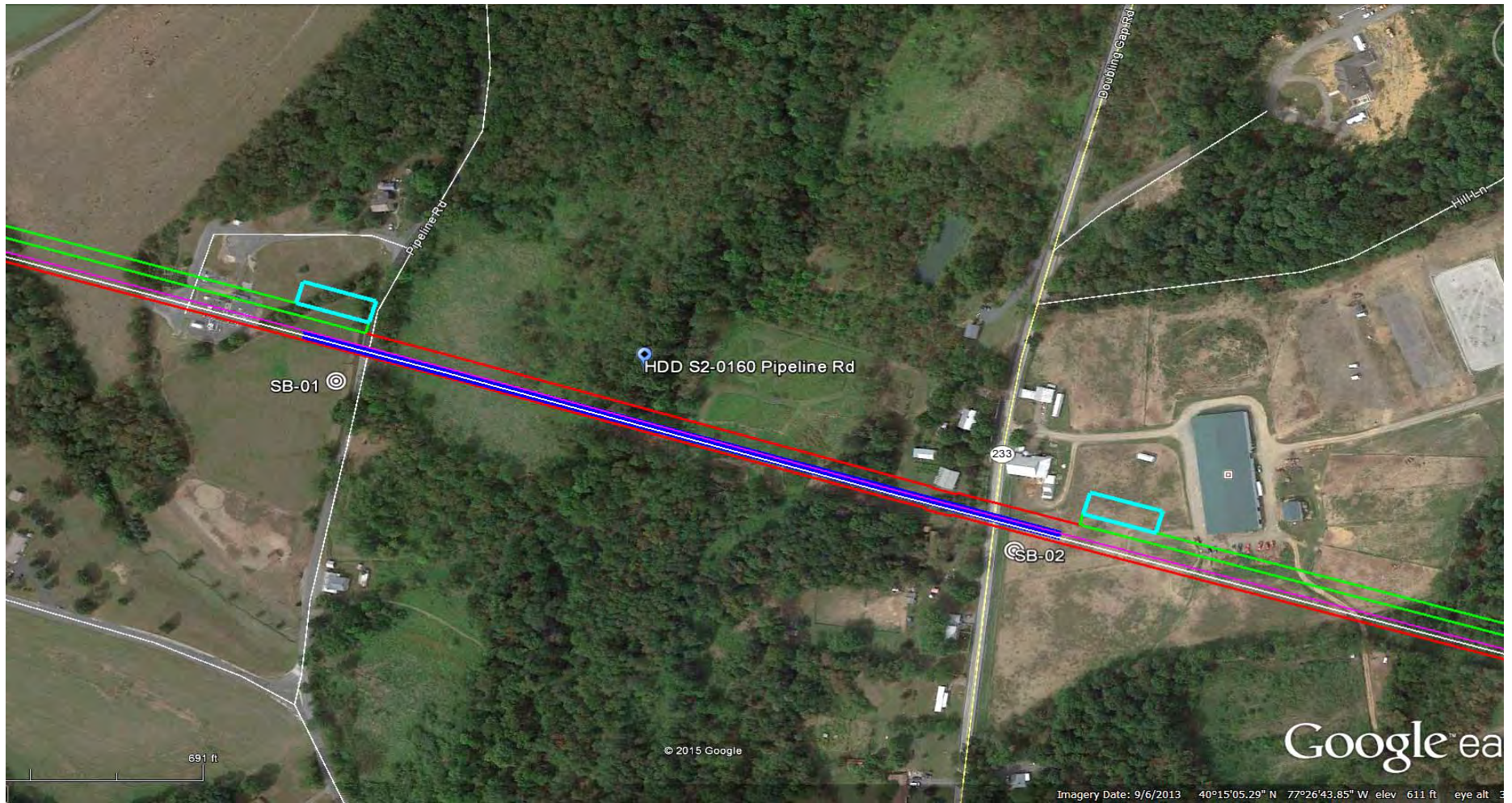
**Sunoco Logistics Partners L.P.**

**TETRA TECH ROONEY**  
(303) 792-5911

**SUNOCO PIPELINE, L.P.**

16-INCH HORIZONTAL DIRECTIONAL DRILL  
PIPELINE ROAD  
PENNSYLVANIA PIPELINE PROJECT

SCALE: 1"=150'    DWG. NO: PA-CU-0015.0000-RD-16



**LEGEND:**

⊙ Geotechnical Soil Boring (SB) Locations



**GEOTECHNICAL BORING LOCATIONS**  
 HDD S2-0160  
 CUMBERLAND COUNTY, LOWER MIFFLIN TOWNSHIP, PA  
 SUNOCO PENNSYLVANIA PIPELINE PROJECT



**TETRA TECH**

240 Continental Drive, Suite 200  
 Newark, Delaware 19713  
 302.738.7551  
 fax: 302.454.5988

**TEST BORING LOG**

Project Name: SUNOCO PENNSYLVANIA PIPELINE PROJECT			Project No.: 103IP3406		
Project Location: PIPELINE ROAD, NEWVILLE, PA			Page 1 of 1		
HDD No.: S2-0160		Dates(s) Drilled: 10-21-14		Inspector: E. WATT	
Boring No.: SB-01		Drilling Method: SPT - ASTM D1586		Driller: S. HOFFER	
Drilling Contractor: HAD DRILLING		Groundwater Depth (ft): 15.5/7.0		Total Depth (ft): 32.8	
Boring Location Coordinates:			40°15'5.78"N		77°26'53.49"W

Sample No.	Sample Depth (ft)		Strata Depth (ft)		Recov. (ft)	Strata (USCS)	Description of Materials	6" Increment Blows *			N	
	From	To	From	To								
			0.0	0.3			TOPSOIL (3")					
1	3.0	4.7	0.3		9	SM/ GM	BROWN AND ORANGE BROWN FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, WITH SOME SILT.	3	50	50/3"	>50	
2	8.0	9.2			10		DR FISSILE SHALE WEATHERED TO A GRAY F-C SAND AND F-C GRAVEL, WITH A LITTLE SILT (WHEN DISTURBED).	2	33	50/3"	>50	
3	13.0	13.8			7		DR SHALE WEATHERED TO A GRAY F-C SAND AND F-C GRAVEL, WITH A LITTLE SILT (WHEN DISTURBED).	3	50/4"		>50	
4	18.0	18.8			10		DR SHALE WEATHERED TO A GRAY F-C SAND AND F-C GRAVEL, WITH A LITTLE SILT (WHEN DISTURBED).	10	50/4"		>50	
				20.0								
5	23.0	23.2	20.0		2		PARTIALLY WEATHERED GRAY TO DARK GRAY SHALE.	50/2"			>50	
6	25.0	25.3		25.3	4		PARTIALLY WEATHERED GRAY TO DARK GRAY SHALE.	50/4"			>50	
							AUGER REFUSAL AT 25'.					
							ROCK CORING					
RUN 1	25.3	28.3	25.3		32	ROCK	HIGHLY FRACTURED GRAY TO DARK GRAY SHALE WITH CALCITE DEPOSITS.	TCR: 89%, SCR: 19%, RQD: 0%				
RUN 2	28.3	32.8		32.8	39		SAME.	TCR: 72%, SCR: 17%, RQD: 11%				
							CORE TESTING RESULTS (DEPTH 32.2'):					
							COMPRESSIVE STRENGTH: 530 PSI					
							UNIT WEIGHT: 165.0 PCF					
							WET ON SPOON AT 13.2'.					
							WATER LEVEL THROUGH AUGERS AT 15.5'.					
							WATER LEVEL PRIOR TO CORING AT 7'.					
							CAVED AT 21'.					

Notes/Comments: Pocket Pentrometer Testing DR: DECOMPOSED ROCK

Strata (USCS) Designations are approximated based on visual review, except where indicated in Description of Materials.

\* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.  
 N: Number of blows to drive spoon from 6" to 18" interval.



**TETRA TECH**  
 240 Continental Drive, Suite 200  
 Newark, Delaware 19713  
 302.738.7551  
 fax: 302.454.5988

# TEST BORING LOG

Project Name: SUNOCO PENNSYLVANIA PIPELINE PROJECT			Project No.: 103IP3406	
Project Location: BOUBLING GAP ROAD (RT 233), NEWVILLE, PA			Page 1 of 1	
HDD No.: S2-0160	Dates(s) Drilled: 10-21-14		Inspector: E. WATT	
Boring No.: SB-02	Drilling Method: SPT - ASTM D1586		Driller: S. HOFFER	
Drilling Contractor: HAD DRILLING	Groundwater Depth (ft): NOT ENCOUNTERED		Total Depth (ft): 28.8	
Boring Location Coordinates:			40°15'2.04"N 77°26'35.77"W	

Sample No.	Sample Depth (ft)		Strata Depth (ft)		Recov. (ft)	Strata (USCS)	Description of Materials	6" Increment Blows *				N
	From	To	From	To								
			0.0	0.4			TOPSOIL (5 ")					
1	3.0	5.0	0.4		12	CL/ ML	DR WEATHERED TO A VARI-COLORED CLAY/SILT AND FINE SAND, TRACE FINE GRAVEL.	3	8	10	17	18
2	8.0	10.0			14		DR WEATHERED TO A VARI-COLORED CLAY AND SILT WITH A LITTLE FINE SAND, TRACE FINE GRAVEL. (USCS: CL/ML)	3	6	7	8	13
3	13.0	15.0			20		DR WEATHERED TO A VARI-COLORED CLAY AND SILT WITH A LITTLE FINE SAND, TRACE FINE GRAVEL.	1	9	17	17	26
				17.0			DR WEATHERED TO A FINE TO MEDIUM SAND AND CLAY/SILT, TRACE F-GRAVEL.	2	9	5	20	14
4	18.0	20.0	17.0		18	SC/ SM	DR WEATHERED TO A FINE TO MEDIUM SAND AND CLAY/SILT, TRACE F-GRAVEL.	1	14	50/5"		>50
5	23.0	24.4			14		DR WEATHERED TO A FINE TO MEDIUM SAND AND CLAY/SILT, TRACE F-GRAVEL. (USCS: SC/SM)	8	50/3"			>50
6	28.0	28.8	23.5		6	SM/ GM	DR WEATHERED TO A LIGHT BROWN TO GRAY F-C AND F-C GRAVEL (UNWEATHERED SHALE) WITH SOME SILT.					
				28.8								

Notes/Comments:  
Pocket Pentrometer Testing DR: DECOMPOSED ROCK  
 S1: >4 TSF  
 S2: >4 TSF  
 S3: > 4 TSF

Strata (USCS) Designations are approximated based on visual review, except where indicated in Description of Materials.

\* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.  
 N: Number of blows to drive spoon from 6" to 18" interval.

**GEOTECHNICAL LABORATORY TESTING SUMMARY  
SUNOCO PENNSYLVANIA PIPELINE PROJECT  
HDD S2-0160**

HDD No.	Test Boring No.	Sample No.	Depth of Sample (ft.)		Water Content, % (ASTM D2216)	Percent Silts/Clays, % (ASTM D1140)	Atterburg Limits (ASTM D4318)			USCS Classif. (ASTM D2487)
			From	To			Liquid Limit, %	Plastic Limit, %	Plasticity Index, %	
S2-0160	SB-01	1	3.0	4.7	7.7	29.9	-	-	-	-
		2	8.0	9.2	7.5	20.1	-	-	-	-
		4	18.0	18.8	9.8	16.6	-	-	-	-
		5	23.0	23.2	6.5	14.1	-	-	-	-
		6	25.0	25.3	6.5	9.8	-	-	-	-
	SB-02	1	3.0	5.0	18.5	65.1	-	-	-	-
		2	8.0	10.0	24.2	80.6	42	26	16	CL/ML
		4	18.0	20.0	16.4	47.9	-	-	-	-
		5	23.0	24.4	12.3	45.3	31	23	8	SC/SM
		6	28.0	28.8	7.7	32.2	-	-	-	-

Rock Core Testing Results				
Boring No.	Core Run	Approximate Depth (ft)	Compressive Strength (psi)	Unit Weight (pcf)
SB-01	2	32.2	530	165.0

**Notes:**

- 1) Sample depths based on feet below grade at time of exploration.

**REGIONAL GEOLOGY SUMMARY  
SUNOCO PENNSYLVANIA PIPELINE PROJECT  
HDD S2-0160**

HDD No.	NAME	BORING NO.	REGIONAL GEOLOGY DESCRIPTION	GENERAL TOPOGRAPHIC SETTING	BEDROCK FORMATION	GENERAL ROCK TYPE	APPROX MAX FM THICKNESS (FT)	DEPTH TO ROCK (Ft bgs) based on nearby well drilling logs	NOTES / COMMENTS
S2-0160	Pipeline Rd	SB-01	<b>Martinsburg Fm</b> - buff-weathering, dark-gray to purple shale and slate with thin interbeds of siltstone, metabentonite, and fine-grained sandstone.	Valley	Martinsburg Fm	Shale and slate with interbedded siltstone		20-50	
		SB-02							

*Note : Source of well log data - <http://www.dcnr.state.pa.us/topogeo/groundwater/pagwis/records/index.htm>. All other sources as referenced in comments section.*



**ROCK CORE DESCRIPTION SUMMARY  
SUNOCO PENNSYLVANIA PIPELINE PROJECT  
HDD S2-0160**

Location	Boring No.	Core Run	Core Depth (ft)		TCR (%)	SCR (%)	RQD (%)	Depth (ft)		Weathering	Classification	Bedding Thickness (ft)	Color	Discontinuity Data
			From	To				From	To					
S2-0160	SB-1	1	25	28	89	19	0	25	32.5	Moderate	Dolostone	Massive	Gray	Heavily fractured, Avg. Dip 65° (0° - 90°), calcite filling of minor fractures
S2-0160	SB-1	2	28	32.5	72	17	11							

# FIELD DESCRIPTION AND LOGGING SYSTEM FOR SOIL EXPLORATION

## GRANULAR SOILS

(Sand, Gravel & Combinations)

<u>Density</u>	<u>N (blows)*</u>
Very Loose	5 or less
Loose	6 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	51 or more

### Particle Size Identification

Boulders	8 in. diameter or more
Cobbles	3 to 8 in. diameter
Gravel	Coarse (C) 3 in. to ¾ in. sieve
	Fine (F) ¾ in. to No. 4 sieve
Sand	Coarse (C) No. 4 to No. 10 sieve (4.75mm-2.00mm)
	Medium (M) No. 10 to No. 40 sieve (2.00mm – 0.425mm)
	Fine (F) No. 40 to No. 200 sieve (0.425 – 0.074mm)
Silt/Clay	Less Than a No. 200 sieve (<0.074mm)

### Relative Proportions

<u>Description Term</u>	<u>Percent</u>
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

## COHESIVE SOILS

(Silt, Clay & Combinations)

<u>Consistency</u>	<u>N (blows)*</u>
Very Soft	3 or less
Soft	4 to 5
Medium Stiff	6 to 10
Stiff	11 to 15
Very Stiff	16 to 30
Hard	31 or more

### Plasticity

<u>Degree of Plasticity</u>	<u>Plasticity Index</u>
None to Slight	0 - 4
Slight	5 - 7
Medium	8- 22
High to Very High	> 22

## ROCK

(Rock Cores)

<u>Rock Quality Designation (RQD), %</u>	<u>Rock Quality Description</u>
0-25	Very Poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

**\*N - Standard Penetration Resistance.** Driving a 2.0" O.D., 1-3/8" I.D. sampler a distance of 18 inches into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. The number of hammer blows to drive the sampler through each 6 inch interval is recorded; the number of blows required to drive the sampler through the final 12 inch interval is termed the Standard Penetration Resistance (SPR) N-value. For example, blow counts of 6/8/9 (through three 6-inch intervals) results in an SPR N-value of 17 (8+9).

**Groundwater** observations were made at the times indicated. Groundwater elevations fluctuate throughout a given year, depending on actual field porosity and variations in seasonal and annual precipitation.

**UNIFIED SOIL CLASSIFICATION SYSTEM [Casagrande (1948)]**

Major Divisions		Group Symbols	Typical Descriptions	Laboratory Classifications				
Coarse Grained Soils (More than half of material is larger than No. 200 sieve)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravel (Little or no fines)	GW Well-graded gravels, gravel-sand mixtures, little or no fines	Determine Percentage of sand and gravel from grain size curve. Depending on Percentage of fines (fraction smaller than No. 200 sieve), coarse-grained soils are classified as follows:  Less than 5 percent GW, GP, SW, SP More than 12 percent GM, GC, SM, SC 5 to 12 percent Borderline cases requiring dual symbols <sup>(1)</sup>	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4: $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3			
		GP Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting $C_u$ or $C_c$ requirements for GW					
		Gravel with fines (Appreciable amount of fines)	GM Silty gravels, gravel-sand-silt mixtures		Atterberg limits below A Line or $I_p$ less than 4	Limits plotting in hatched zone with $I_p$ between 4 and 7 are borderline cases requiring use of dual symbols		
			GC Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above A line with $I_p$ greater than 7			
	Sands (More than half of coarse fraction is smaller than No. 4 Sieve)	Clean sands (Little or no fines)	SW Well graded sands, gravelly sands, little or no fines		$C_u = \frac{D_{60}}{D_{10}}$ greater than 6: $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3			
			SP Poorly graded sands, gravelly sands, little or no fines		Not meeting $C_u$ or $C_c$ requirements for SW			
		Sands with fines (Appreciable amount of fines)	SM Silty sands, sand-silt mixtures		Atterberg limits below A Line or $I_p$ less than 4	Limits Plotting in hatched zone with $I_p$ between 4 and 7 are borderline cases requiring use of dual symbols		
			SC Clayey sands, sand-clay mixtures		Atterberg limits above A line with $I_p$ greater than 7			
						For soils plotting nearly on A line use dual symbols i.e., $I_p = 29.5$ , $w_L = 60$ gives CH-MH. When $w_L$ is near 50 use CL-CH or ML-MH. Take near as $\pm 2$ percent.		
		Fine-grained soils (More than half of material is smaller than No. 200 sieve)	Silt and clays (Liquid limit less than 50)		ML Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity			
CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays								
OL Organic silts and organic silty clays of low plasticity								
Silt and Clays (Liquid limit greater than 50)	MH Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts							
	CH Inorganic clays of high plasticity, fat clays							
	OH Organic clays of medium to high plasticity, organic silts							
Highly organic soils	Pt Peat and other highly organic soils							

(1) Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC. well-graded gravel-sand mixture with clay binder.