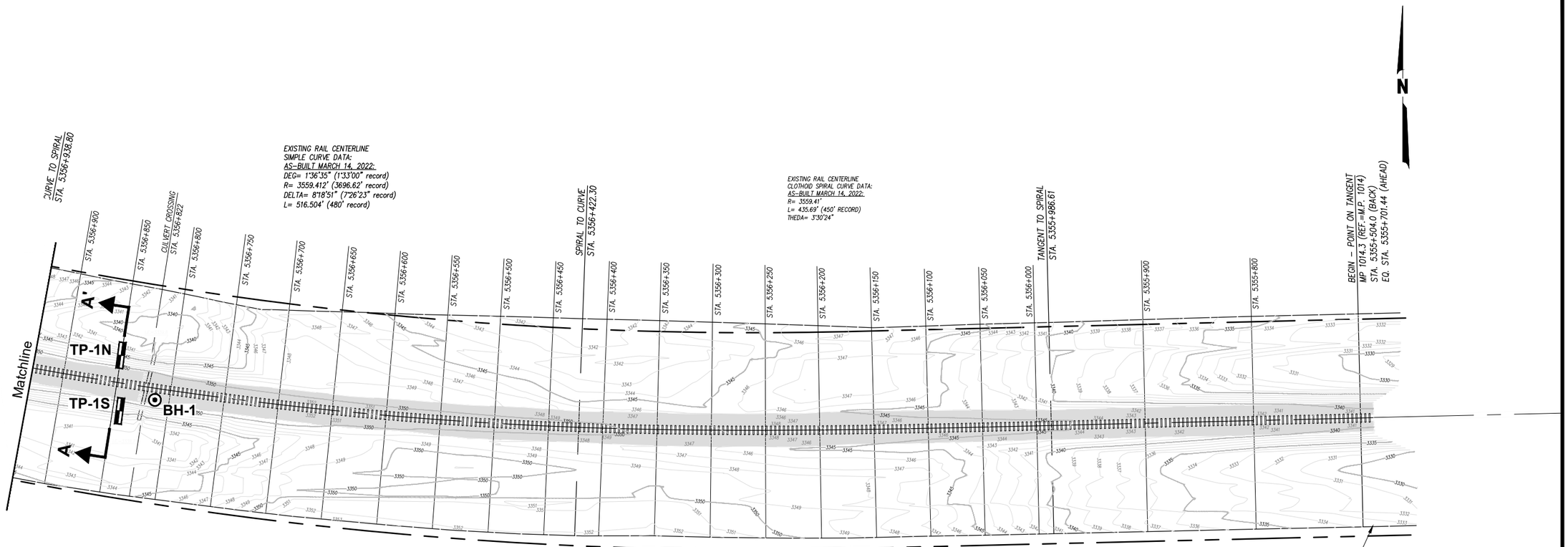


0 100 200

Scale in Feet
Contour Interval = 1 Foot

LEGEND

BH-1 ⊙ Boring Designation and Approximate Location

TP-1S ▬ Test Pit Designation and Approximate Location

A ↑ Generalized Subsurface Cross Section (See Figures A-2 and A-3)

NOTE

Figure based on Babb topographic survey performed 3-14-22.

BNSF Railway Company
Embankment Stabilization
Hi Line Subdivision, Montana

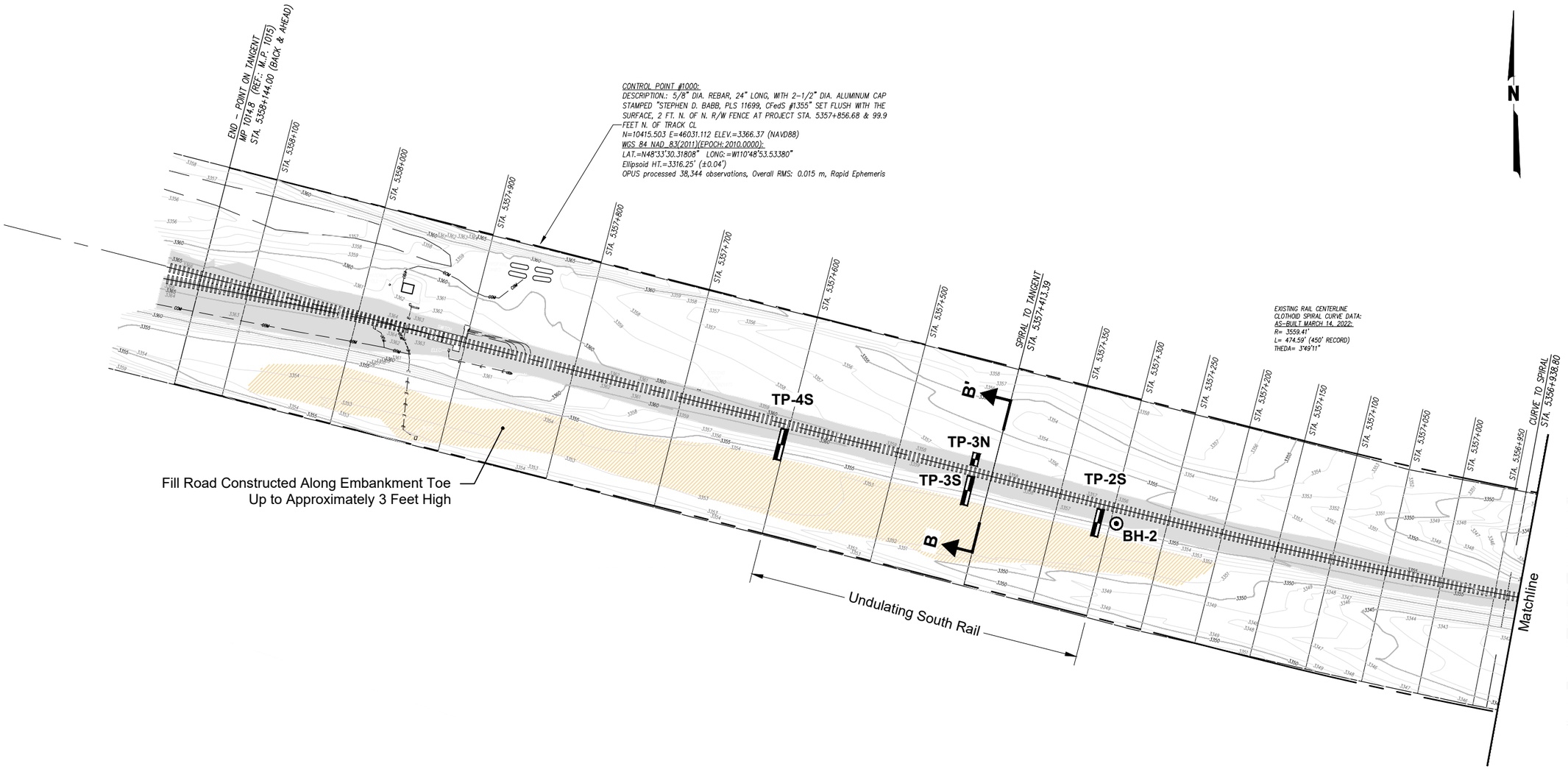
MP 1014
SITE AND EXPLORATION PLAN

September 2022 108788-001

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. A-1
Sheet 1 of 2

Filename: E:\J_SEA\108788\001\108788-001 Plans and Sections.dwg Date: 09-22-2022 Login: SAC



0 100 200

Scale in Feet
Contour Interval = 1 Foot

LEGEND

BH-1 ⊙ Boring Designation and Approximate Location

TP-1S ▬ Test Pit Designation and Approximate Location

A Generalized Subsurface Cross Section (See Figures A-2 and A-3)

NOTE

Figure based on Babb topographic survey performed 3-14-22.

BNSF Railway Company
Embankment Stabilization
Hi Line Subdivision, Montana

MP 1014
SITE AND EXPLORATION PLAN

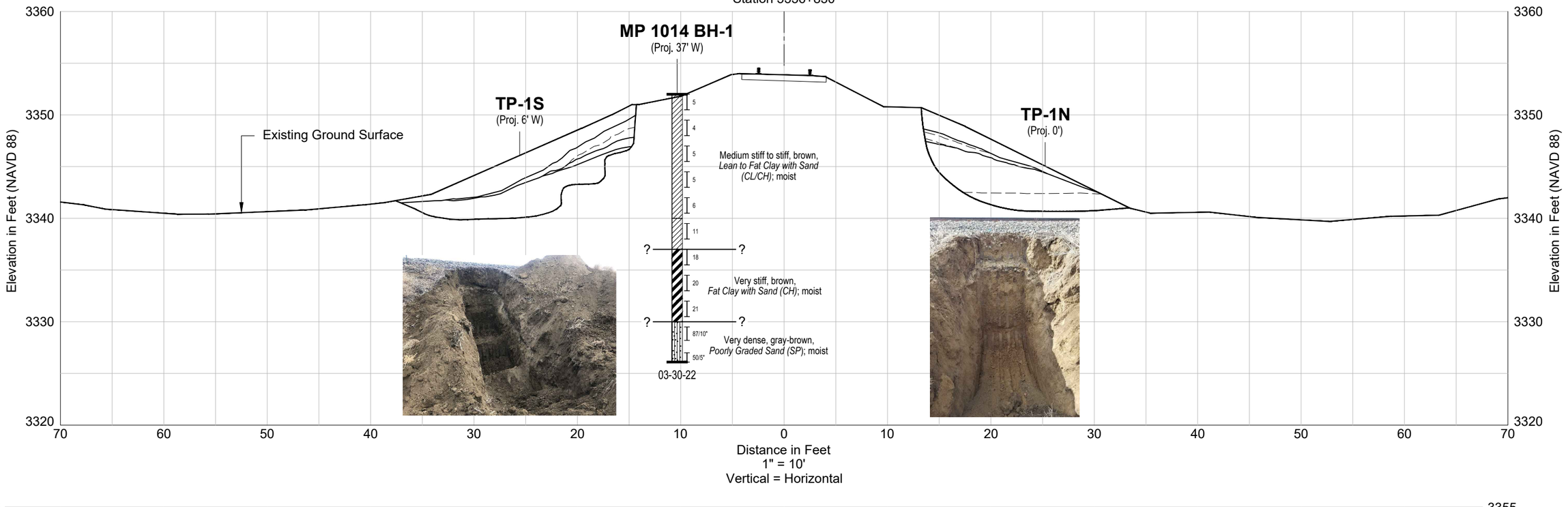
September 2022 108788-001

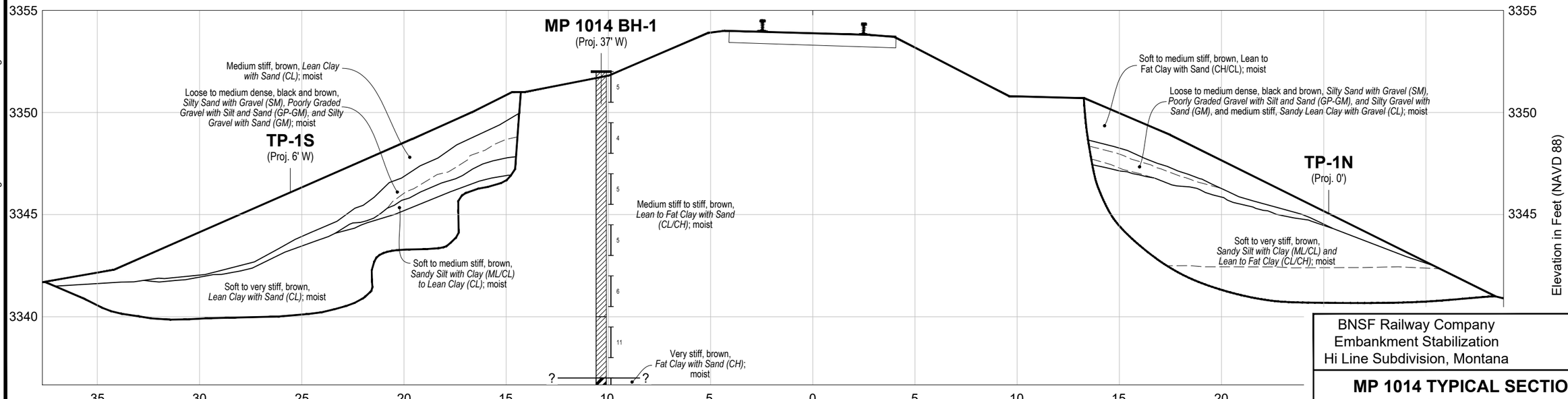
SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. A-1
Sheet 2 of 2

Filename: E:\J_SEA\108788\001\108788-001 Plans and Sections.dwg Date: 09-22-2022 Login: SAC

A South — ℄ Track Station 5356+850 — **A'** North





NOTE

See Figure 3 for notes.

BNSF Railway Company
Embankment Stabilization
Hi Line Subdivision, Montana

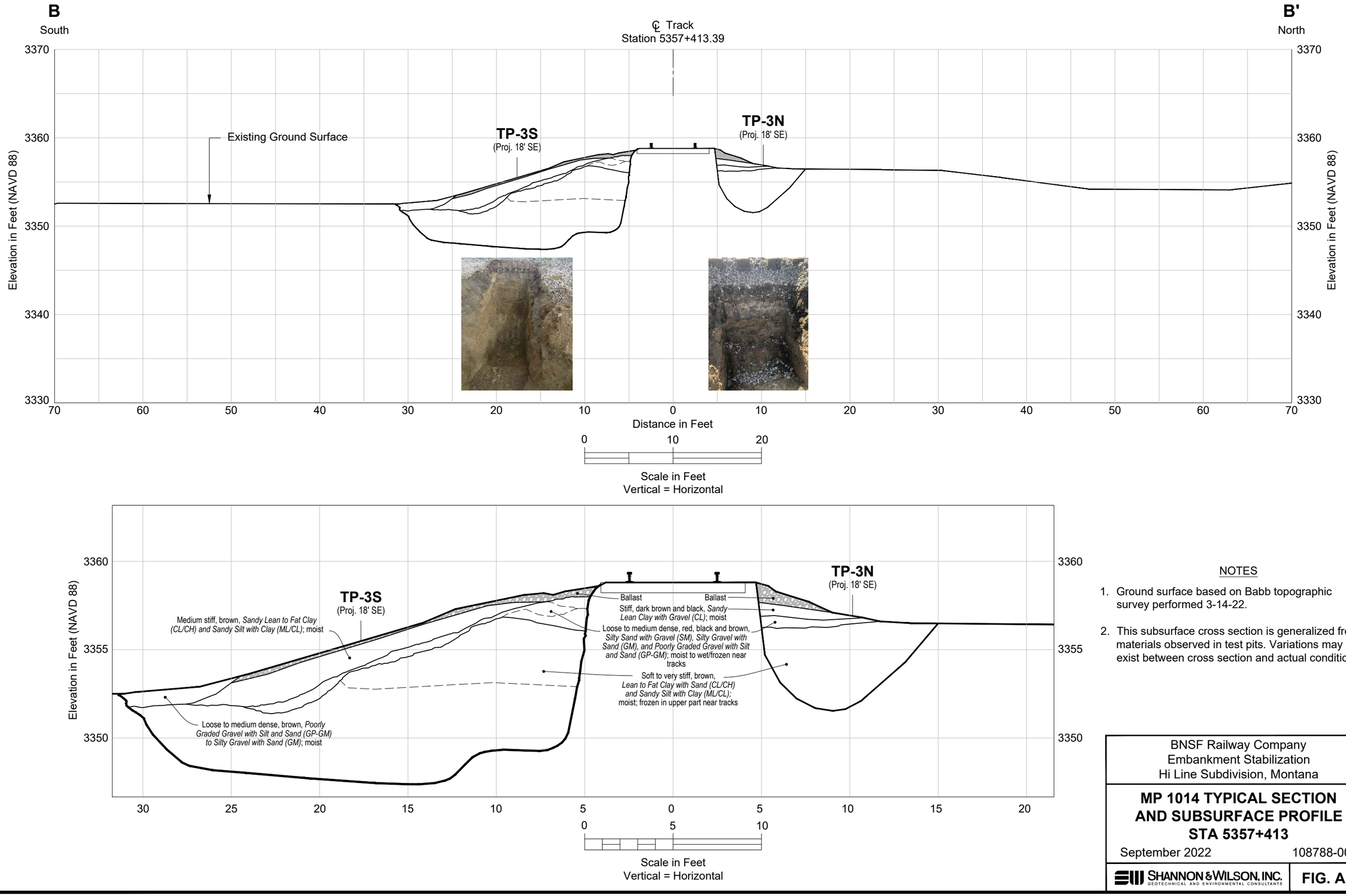
MP 1014 TYPICAL SECTION AND SUBSURFACE PROFILE STA 5356+850

September 2022 108788-001

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. A-2

Filename: E:\J_SEA\108788\001\108788-001 Plans and Sections.dwg Date: 09-22-2022 Login: SAC



NOTES

1. Ground surface based on Babb topographic survey performed 3-14-22.
2. This subsurface cross section is generalized from materials observed in test pits. Variations may exist between cross section and actual conditions.

BNSF Railway Company
Embankment Stabilization
Hi Line Subdivision, Montana

MP 1014 TYPICAL SECTION AND SUBSURFACE PROFILE STA 5357+413

September 2022 108788-001

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. A-3

Total Depth:	25.9 ft.	Latitude:	N/A	Drilling Method:	Hollow Stem Auger	Hole Diam.:	8 in.
Top Elevation:	3352.0 ft.	Longitude:	N/A	Drilling Company:	Interstate	Rod Diam.:	AWJ
Vert. Datum:	NAVD88	Station:	5356+813 ft.	Drill Rig Equipment:	Diedrich D-70	Hammer Type:	Automatic
Horiz. Datum:	NAD83	Offset:	10' S of CL Main	Other Comments:			

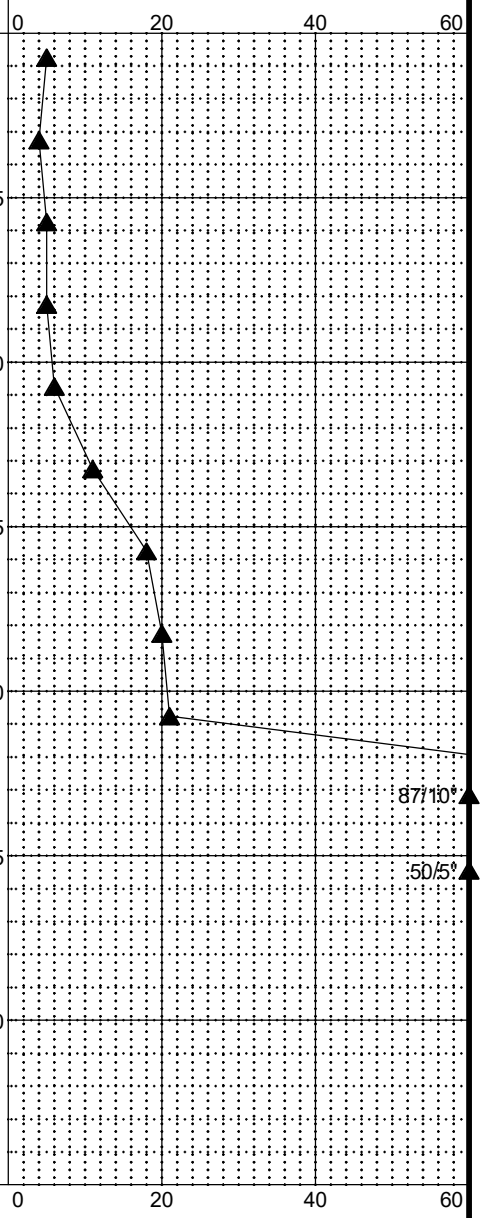
Elevation, ft.	SOIL DESCRIPTION	Depth, ft.
	Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.	
	Medium stiff, gray-brown *Lean to Fat Clay with Sand (CL/CH)*; moist; trace fine, angular to subrounded gravel; fine to coarse sand; medium to high plasticity; few coal fragments; trace organics; mottled light gray carbonate preciptate; strong reaction to HCl throughout. ***(Fill)***	
3340.0	Stiff, light gray-brown *Lean to Fat Clay with Sand (CL/CH)*; moist; trace fine, subangular to subrounded gravel; fine to coarse sand; medium to high plasticity; few coal fragments; mottled light gray carbonate precipitate and nodules; strong reaction to HCl. ***(Glacial Soil)***	12.0
3337.0	Very stiff, light gray-brown *Fat Clay with Sand (CH)*; moist; trace fine, subangular to subrounded gravel; fine to coarse sand; high plasticity; heavily weathered; some iron oxide staining; trace light gray carbonate nodules; weak reaction to HCl in matrix.	15.0
3330.0	Very dense, light gray-brown, *Silty Sand (SM)*; moist; fine sand; nonplastic to low plasticity. ***(Judith River Formation)***	22.0
3326.1	BOTTOM OF BORING COMPLETED 3/30/2022	25.9

Symbol | Samples | Ground Water | Depth, ft.

Water Level Not Determined

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



◇ % Fines (<0.075mm)

● % Water Content

LEGEND

* Sample Not Recovered

2.0" O.D. Split Spoon Sample

Screen and Sand / Gravel Filter

Bentonite-Cement Grout

Bentonite Chips/Pellets

Bentonite Grout

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

BNSF Railway Company
Embankment Stabilization
Hi Line Subdivision, Montana

LOG OF BORING MP 1014 BH-1

September 2022 108788-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-4

Log: ELM Rev: CDK Typ: LKN

MASTER LOG E MC 108788.GPJ SHAN WIL.GDT 9/22/22

Total Depth:	25.8 ft.	Latitude:	N/A	Drilling Method:	Hollow Stem Auger	Hole Diam.:	8 in.
Top Elevation:	3357.0 ft.	Longitude:	N/A	Drilling Company:	Interstate	Rod Diam.:	AWJ
Vert. Datum:	NAVD88	Station:	5357+294 ft.	Drill Rig Equipment:	Diedrich D-70	Hammer Type:	Automatic
Horiz. Datum:	NAD83	Offset:	14' S of CL Main	Other Comments:			

Elevation, ft.	SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.*	Depth, ft.
	Soft to medium stiff, olive-gray to gray-brown *Lean to Fat Clay with Sand (CL/CH)*; moist; trace fine, angular to subrounded gravel; fine to coarse sand; medium to high plasticity; few coal fragments; mottled and platy light gray carbonate precipitate; weak to strong reaction to HCl in matrix. ***(Fill)***	
3348.0	Stiff to very stiff, olive-gray to gray-brown *Lean to Fat Clay with Sand (CL/CH)*; moist; trace fine, subangular to subrounded gravel; fine to coarse sand; medium to high plasticity; few coal fragments; mottled and platy light gray carbonate precipitate and nodules; weak reaction to HCl in matrix. ***(Glacial Soil)***	9.0
3334.3	Very dense, light gray-brown, *Silty Sand (SM)*; moist; fine sand; nonplastic to low plasticity. ***(Judith River Formation)***	22.7
3331.2	BOTTOM OF BORING COMPLETED 3/30/2022	25.8

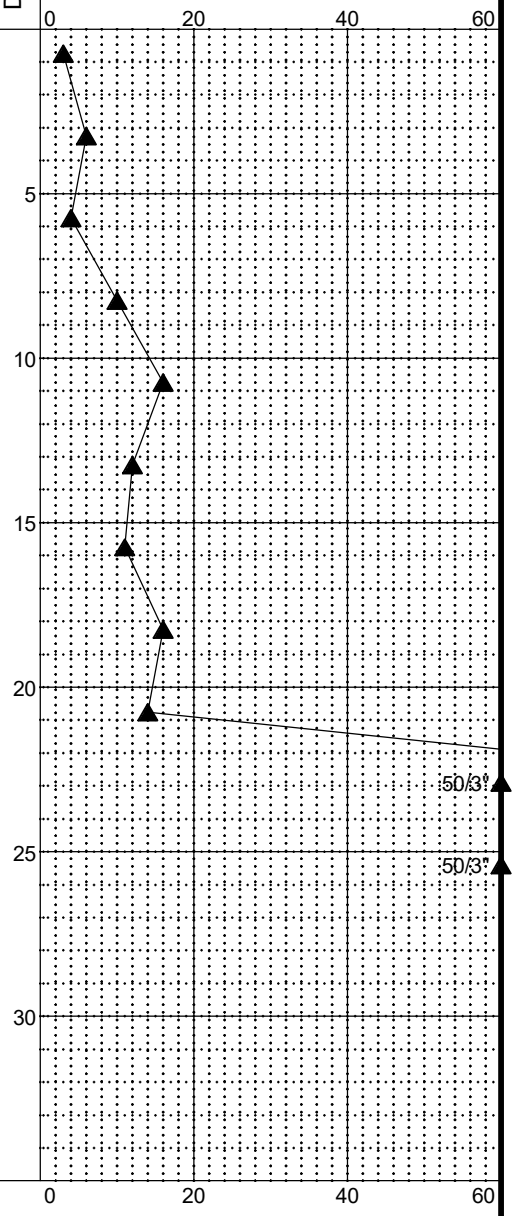
Symbol

Samples: 1 *, 2 *, 3, 4 *, 5, 6, 7, 8, 9, 10, 11

Ground Water: Water Level Not Determined

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

* Sample Not Recovered

2.0" O.D. Split Spoon Sample

Screen and Sand / Gravel Filter

Bentonite-Cement Grout

Bentonite Chips/Pellets

Bentonite Grout

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

BNSF Railway Company
Embankment Stabilization
Hi Line Subdivision, Montana

LOG OF BORING MP 1014 BH-2

September 2022 108788-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-5

Log: ELM Rev: CDK Typ: LKN

MASTER LOG E MC 108788.GPJ SHAN WIL.GDT 9/22/22

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

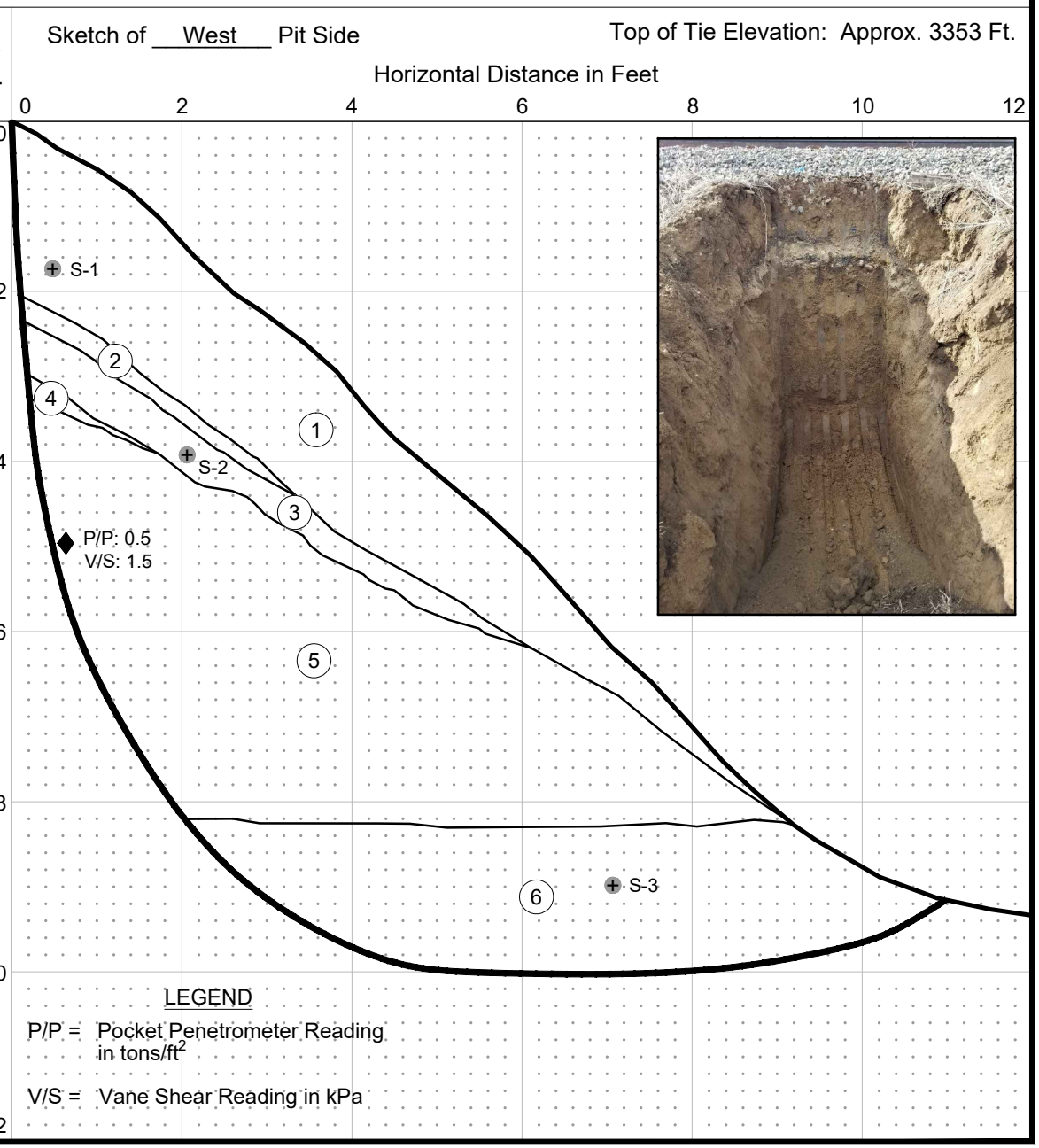
LOG OF TEST PIT TP-1N

JOB NO: 108788-001 DATE: 3-29-22 LOCATION: MP 1014

PROJECT: BNSF Hi Line Sub

Sketch of West Pit Side

Top of Tie Elevation: Approx. 3353 Ft.



SOIL DESCRIPTION	Ground Water	% Water Content	Samples
(1) Soft to medium stiff, gray-brown, *Lean to Fat Clay with Sand (CL/CH)*; moist; trace fine to coarse, angular to subrounded gravel; fine sand; low to medium plasticity; strong reaction to HCl. (Fill)	None Observed		S-1
(2) Loose to medium dense, black, *Poorly Graded Gravel with Silt and Sand (GP-GM) to Silty Gravel with Sand (GM)*; moist; fine to coarse gravel and sand; nonplastic to low plasticity; coal and ash. (Fill)			S-2
(3) Medium stiff, brown, *Sandy Lean Clay with Gravel (CL)*; moist; fine to coarse gravel and sand; low to medium plasticity. (Fill)			
(4) Loose to medium dense, black, *Silty Sand with Gravel (SM)*; moist; fine to coarse, angular to subrounded gravel; fine to coarse sand; low plasticity; coal, ash, wood. (Fill)			
(5) Soft to medium stiff, gray-brown, *Sandy Silt (ML) and Lean Clay (CL)*; moist; few fine to coarse, subangular to subrounded gravel; fine to medium sand; low to medium plasticity; strong reaction to HCl. (Glacial Soil)			S-3
(6) Stiff to very stiff, brown, *Lean to Fat Clay (CL/CH) and Sandy Silt with Clay (ML/CL)*; moist; fine sand; low to high plasticity; few clay clasts; weak reaction to HCl. (Glacial Soil)			

FIG. A-6

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-1S

JOB NO: 108788-001 DATE: 3-29-22 LOCATION: MP 1014

PROJECT: BNSF Hi Line Sub

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Medium stiff, brown, *Lean Clay with Sand (CL)*; moist; trace fine sub-angular gravel; fine sand; trace coal fragments; low to medium plasticity. (Fill)	None Observed		S-1	0
(2) Loose to medium dense, gray- brown, *Silty Sand with Gravel (SM)*; moist; fine to coarse, angular to subangular gravel; fine to coarse sand; nonplastic to low plasticity; metal, coal, ash, and cinder fragments; strong reaction to HCl. (Fill)			S-2	4
(3) Loose to medium dense, brown, *Poorly Graded Gravel with Silt and Sand (GP-GM) to Silty Gravel with Sand (GM)*; moist; fine to coarse, subangular to subrounded gravel; fine to coarse sand; nonplastic to low plasticity. (Fill)				6
(4) Soft to medium stiff, dark brown, *Sandy Silt with Clay (ML/CL)* to *Sandy Lean Clay (CL)*; moist; fine to coarse sand; low to medium plasticity. (Fill)				8
(5) Soft to very stiff, brown, *Lean to Fat Clay with Sand (CL/CH)*; moist; fine to coarse, subangular to subrounded gravel; fine to coarse sand; low to medium plasticity; blocky soil structure with iron-oxide staining on fracture faces; coal clasts. (Glacial Soil)			S-3	10
				12

Sketch of West Pit Side

Top of Tie Elevation: Approx. 3354 Ft.

LEGEND

P/P = Pocket Penetrometer Reading in tons/ft^2

V/S = Vane Shear Reading in kPa

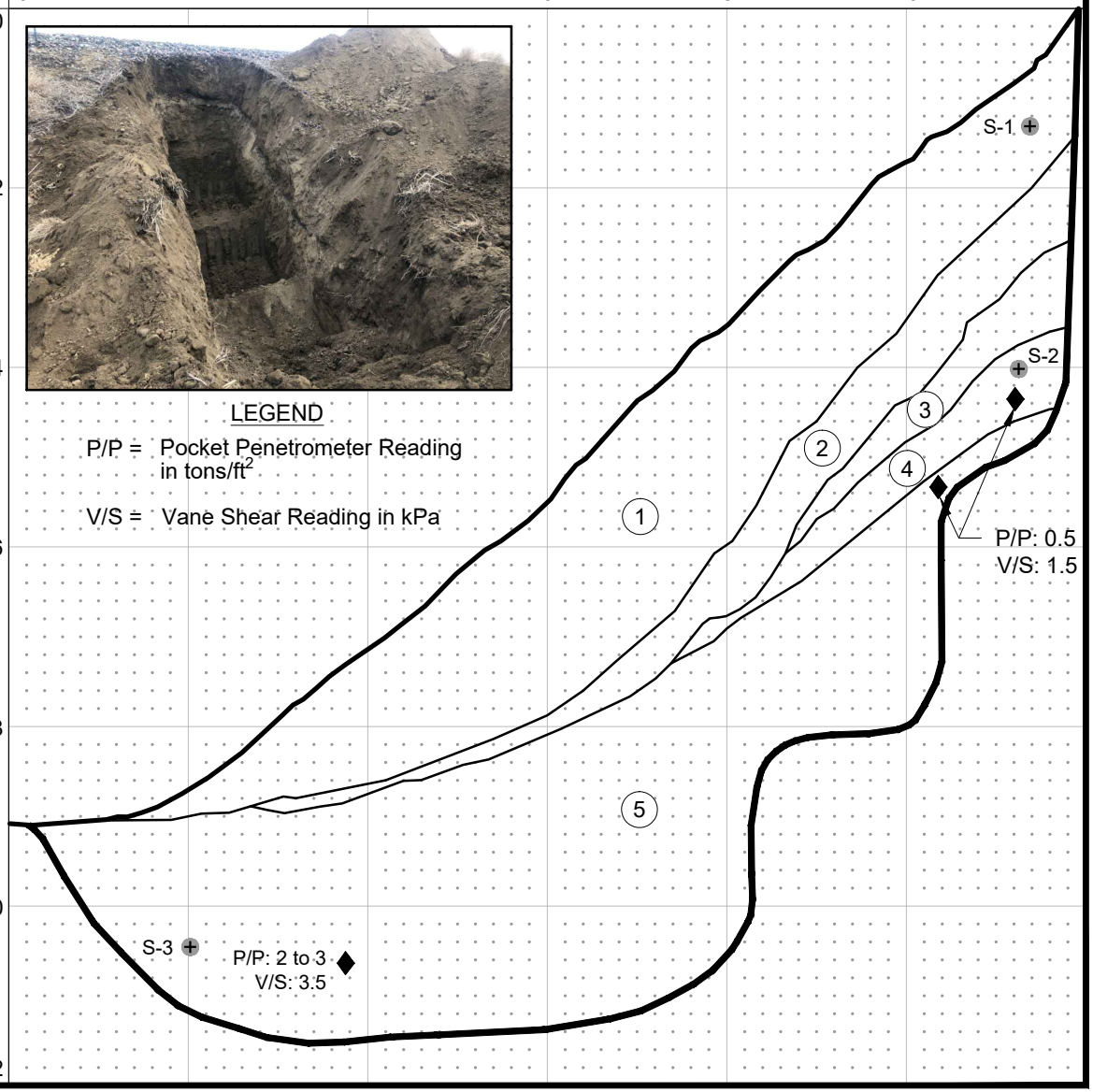


FIG. A-7

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-2S

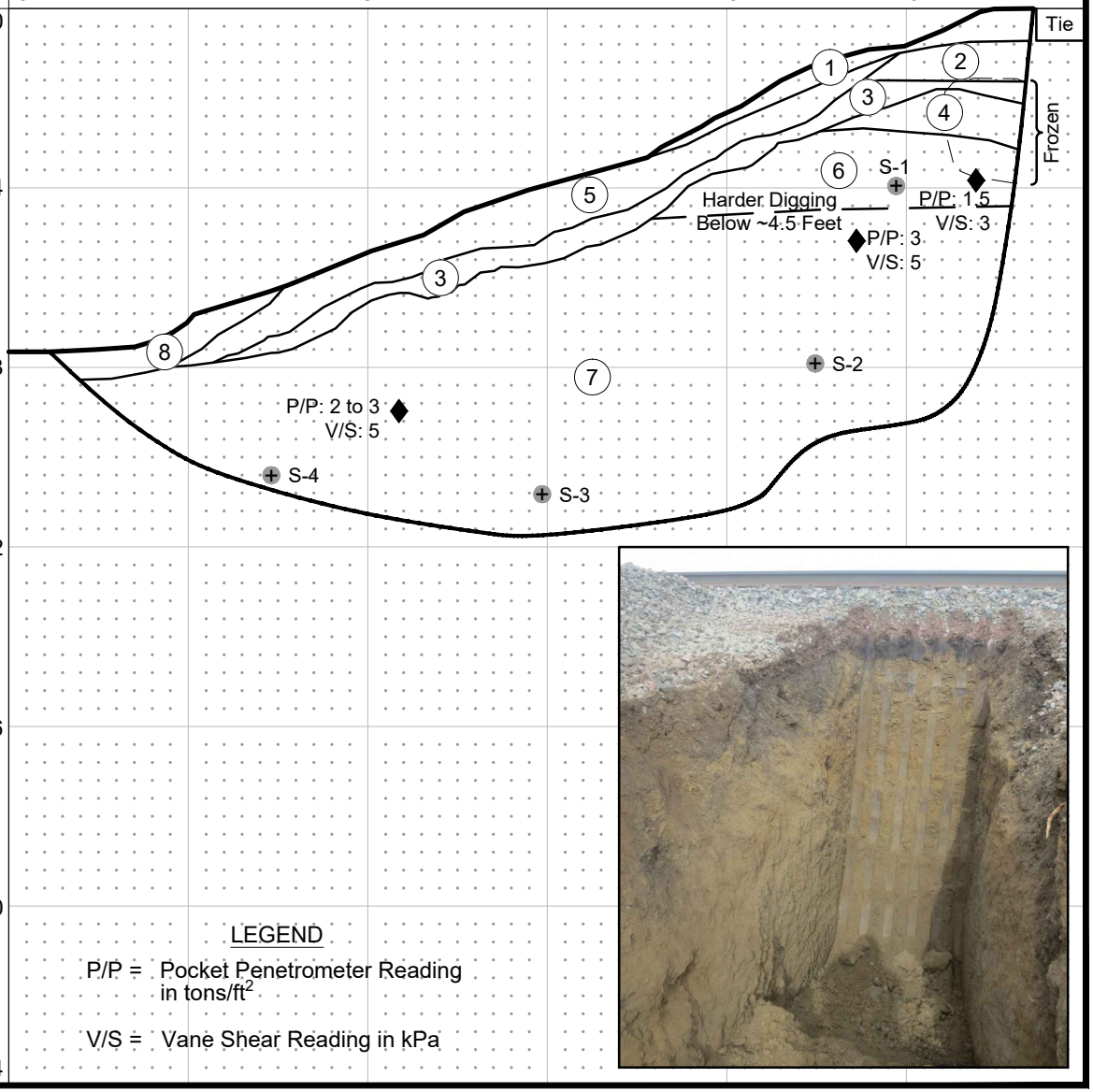
JOB NO: 108788-001 DATE: 3-28-22 LOCATION: MP 1014

PROJECT: BNSF Hi Line Sub

Sketch of West Pit Side

Top of Tie Elevation: Approx. 3357 Ft.

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Gray Ballast.	None Observed			0
(2) Loose to medium dense, red, *Silty Gravel with Sand (GM)*; moist; fine to coarse, angular gravel and sand nonplastic to low plasticity. (Fill)				
(3) Loose to medium dense, black, *Silty Sand with Gravel (SM)*; moist; fine to coarse, subangular to subrounded gravel; fine to coarse sand; nonplastic to low plasticity; coal, cinders, and ash; frozen near track. (Fill)			S-1	4
(4) Loose to medium dense, brown, *Poorly Graded Gravel with Silt and Sand (GP-GM)* to *Silty Gravel with Sand (GM)* and *Silty Sand with Gravel (SM)*; moist to wet; fine to coarse, subangular to subrounded gravel; fine to coarse sand; nonplastic to low plasticity; frozen near track. (Fill)			S-2	8
(5) Medium stiff, brown, *Sandy Lean to Fat Clay (CL/CH)*; moist; few fine to coarse gravel; fine to medium sand; medium to high plasticity; ffrozen near track at ~3.5 feet below top of tie. (Fill)			S-3	12
(6) Stiff to very stiff, gray-brown, *Clayey Silt with Sand (ML/CL)* and *Lean Clay with Sand (CL)*; moist; fine to trace medium and coarse sand; low to medium plasticity. (Glacial Soil)				16
(7) Very stiff to hard, light gray-brown to gray-brown, *Lean to Fat Clay with Sand (CL/CH)* to *Sandy Fat Clay (CH)* and *Clayey Silt with Sand (ML/CL)*; moist; few fine to coarse, subangular to subrounded gravel; fine to coarse sand; low to high plasticity; coal fragments; blocky texture; scattered iron-oxide staining; strong reaction to HCl . (Glacial Soil)				20
(8) - White spots ~4.5 to 5.5 feet below top of tie. Loose to medium dense, brown to gray, *Silty Gravel with Sand (GM)* to *Poorly Graded Gravel with Silt and Sand (GP-GM)*; moist; fine to coarse, subangular to subrounded gravel; fine to coarse sand; nonplastic low plasticity. (Fill)				24



LEGEND

P/P = Pocket Penetrometer Reading in tons/ft^2

V/S = Vane Shear Reading in kPa

FIG. A-8

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-3N

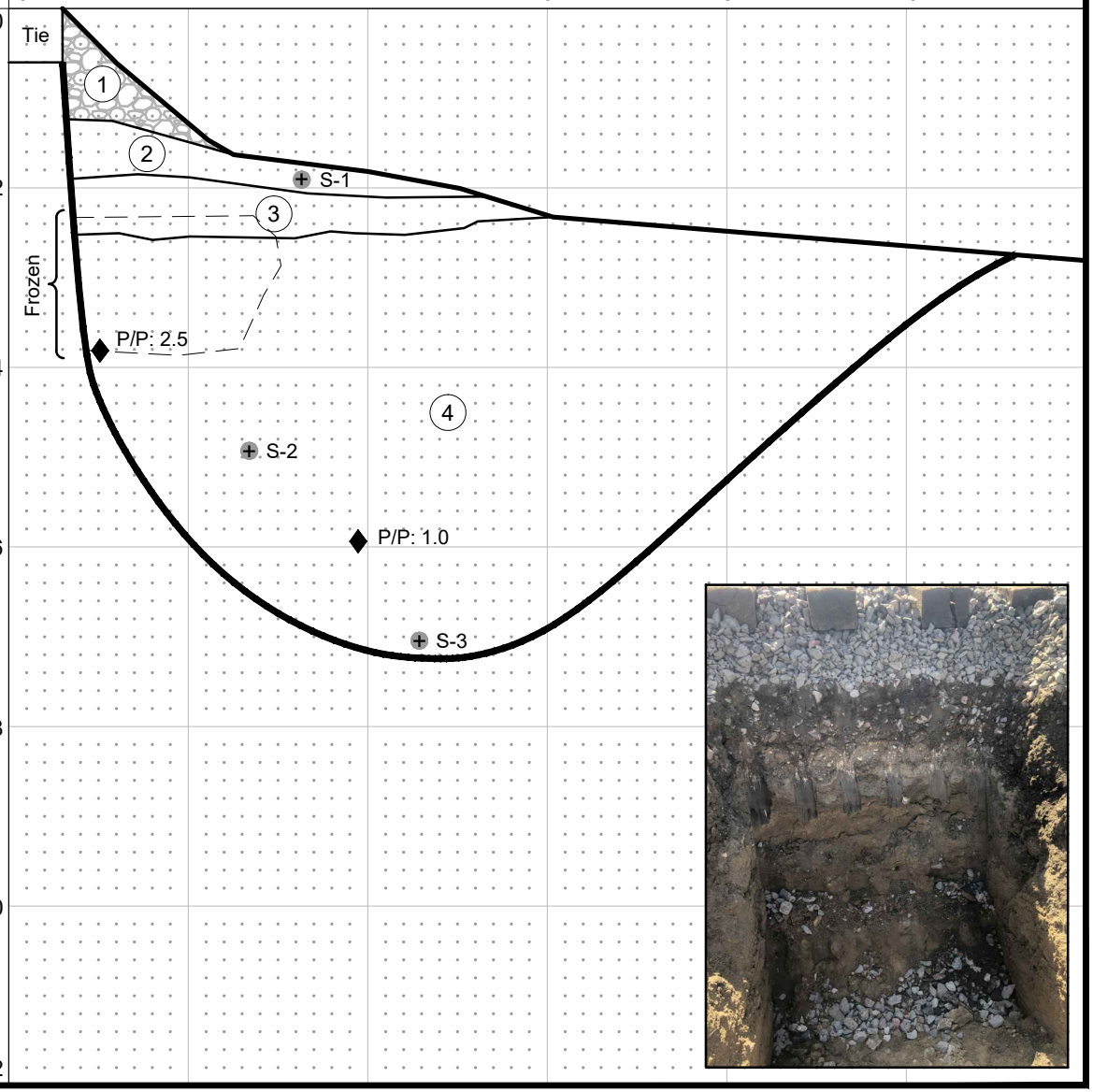
JOB NO: 108788-001 DATE: 3-29-22 LOCATION: MP 1014

PROJECT: BNSF Hi Line Sub

Sketch of West Pit Side

Top of Tie Elevation: Approx. 3357 Ft.

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Gray Ballast (2) Medium stiff, dark brown and black, *Sandy Lean Clay with Gravel (CL)*; moist; fine to coarse, angular to subrounded gravel; fine to coarse sand; low to medium plasticity. (Fouled Ballast/Fill) (3) Loose to medium dense, brown, gray and black, *Silty Sand with Gravel (SM) to Silty Gravel with Sand (GM)*; moist; fine to coarse, angular to subrounded gravel; fine to coarse sand; low plasticity; coal, ash; frozen near track at ~2.5 feet below top of tie. (Fill) (4) Stiff to very stiff, dark brown to brown, *Lean Clay with Sand (CL) and Sandy Silt with Clay (ML/CL)*; moist; fine sand; low to medium plasticity; frozen near track at ~2.5 to 3.5 feet below top of tie. (Glacial Soil) -Dark brown in upper ~1.5 feet	None Observed		S-1 S-2 S-3	0 2 4 6 8 10 12



LEGEND

P/P = Pocket Penetrometer Reading in tons/ft^2

V/S = Vane Shear Reading in kPa

FIG. A-9

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-3S

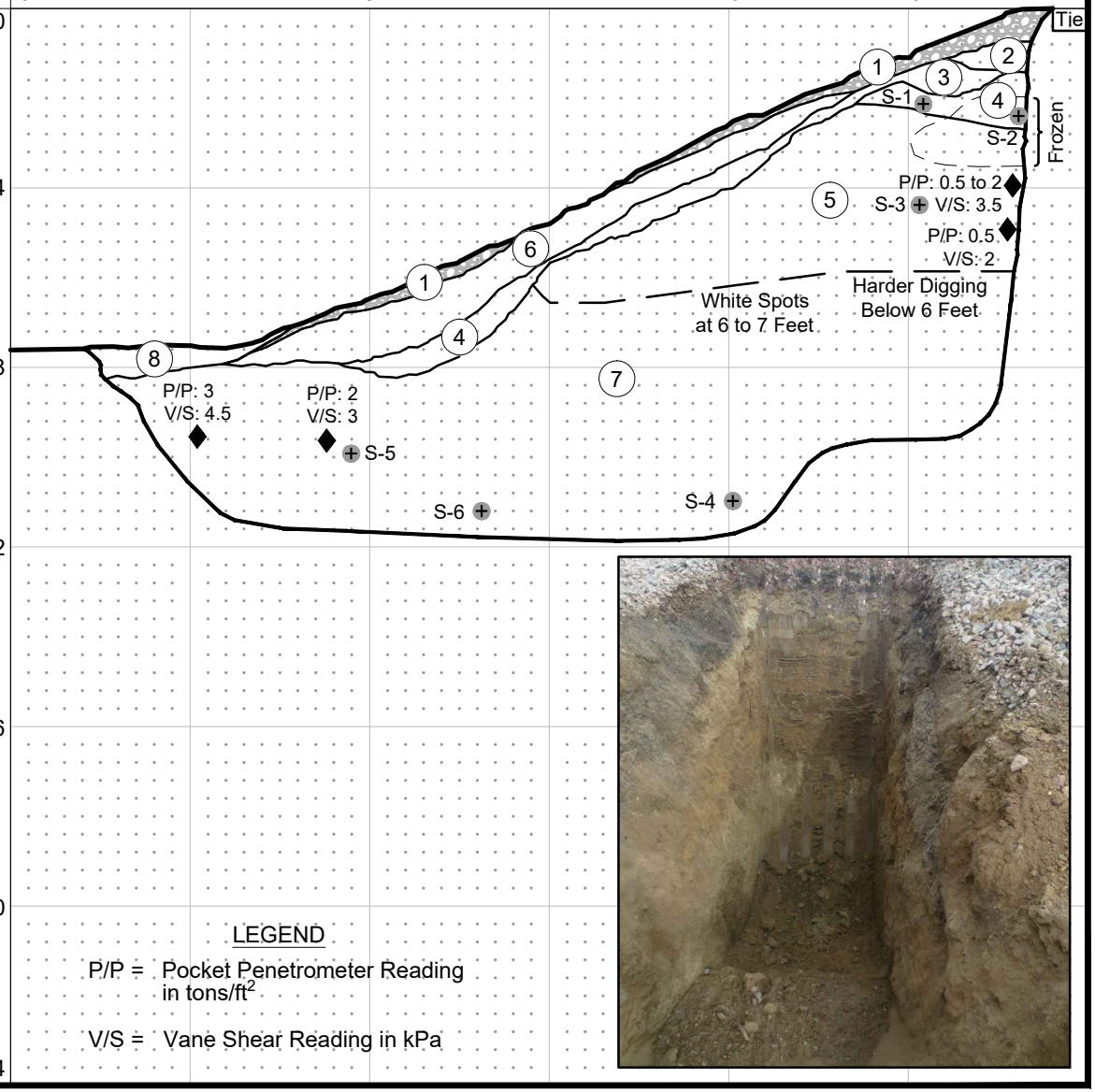
JOB NO: 108788-001 DATE: 3-28-22 LOCATION: MP 1014

PROJECT: BNSF Hi Line Sub

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Gray Ballast.	None Observed		S-1 S-2	0
(2) Loose to medium dense, red, *Silty Gravel with Sand (GM)*; moist; fine to coarse, angular gravel; fine to coarse sand; nonplastic to low plasticity. (Fowled Ballast)				
(3) Loose to medium dense, black, *Silty Sand with Gravel (GM)*; moist; fine to coarse, subangular to subrounded gravel; fine to coarse sand; low plasticity; coal, ash, and cinder fragments. (Fill)			S-3	4
(4) Loose to medium dense, brown, *Poorly Graded Gravel with Silt and Sand (GP-GM) to Silty Gravel with Sand (GM)*; moist to wet; fine to coarse, subangular to rounded gravel; fine to coarse sand; trace gray clay; nonplastic to medium plasticity; trace coal fragments; frozen near track. (Fill)				8
(5) Medium stiff to very stiff, dark brown, *Sandy Silt (ML)* and *Sandy Lean Clay (CL)*; moist; low to medium plasticity; frozen in upper part near track. (Fill)			S-5 S-4 S-5	12
(6) Medium stiff, yellow brown, *Sandy Lean to Fat Clay (CL/CH)* and *Sandy Silt with Clay (ML/CL)*; moist; few fine to coarse gravel, fine to medium sand; nonplastic to high plasticity. (Fill)				16
(7) Medium stiff to hard, brown to brown-gray, *Lean Clay with Sand (CL) to Fat Clay with Sand (CH)*; moist; few fine to coarse, subangular gravel; fine to coarse sand; medium to high plasticity; blocky texture; coal and highly weathered sandstone fragments; iron-oxide staining; strong reaction to HCl. (Glacial Soil)				20
(8) - scattered sand pockets - harder digging below 6 feet				
Loose to medium dense, brown, *Poorly Graded Gravel with Silt and Sand (GP-GM) to Silty Gravel with Sand (GM)*; moist; nonplastic to low plasticity. (Fill)				24

Sketch of West Pit Side

Top of Tie Elevation: Approx. 3359 Ft.



LEGEND

P/P = Pocket Penetrometer Reading in tons/ft^2

V/S = Vane Shear Reading in kPa

FIG. A-10

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-4S

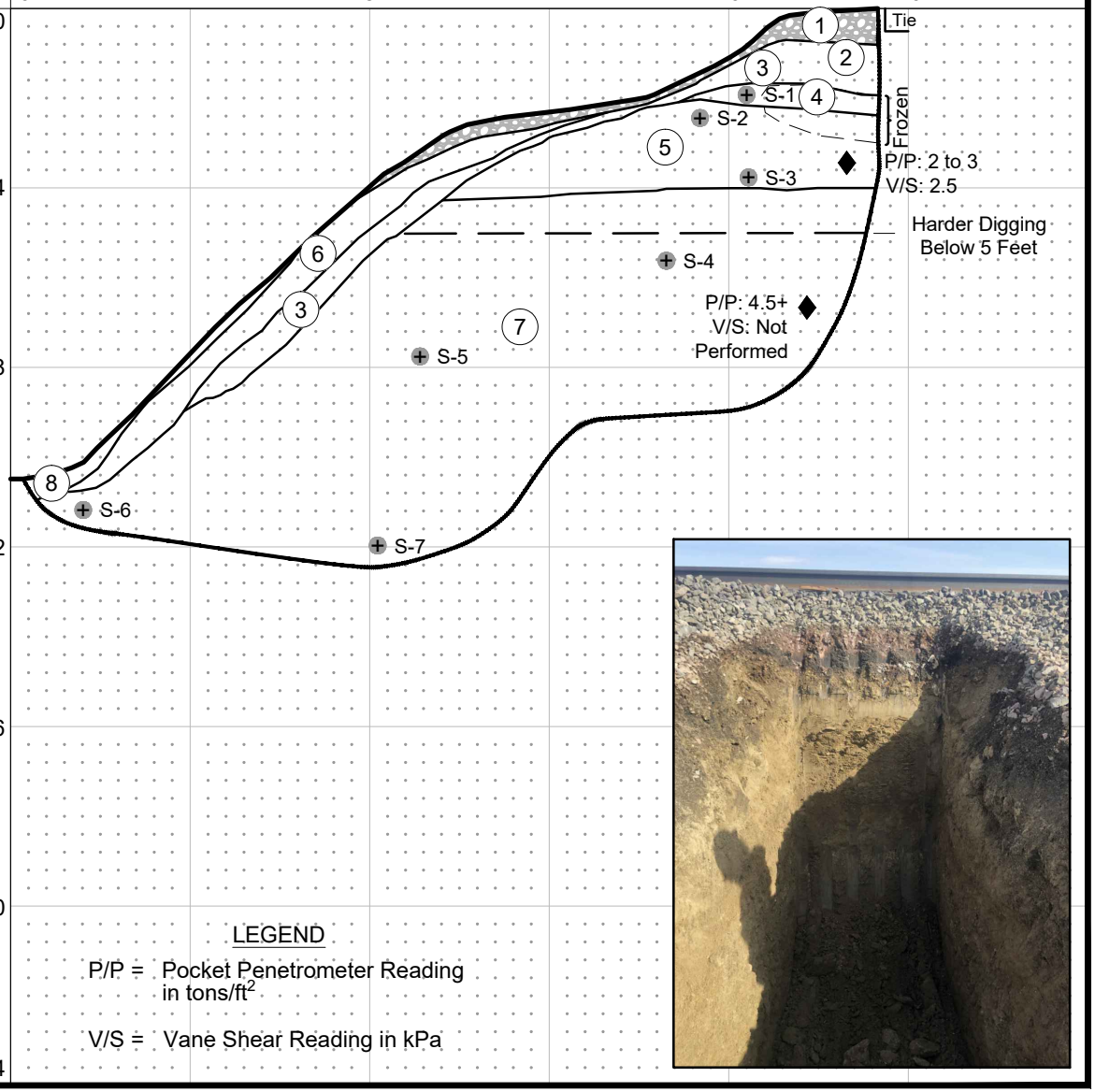
JOB NO: 108788-001 DATE: 3-28-22 LOCATION: MP 1014

PROJECT: BNSF Hi Line Sub

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Gray Ballast.	None Observed			0
(2) Loose to medium dense, red-gray, *Silty Gravel with Sand (GM)*; moist; fine to coarse, angular gravel and sand; nonplastic to low plasticity. (Fouled Ballast/Fill)			S-1, S-2	
(3) Loose to medium dense, black, *Silty Sand with Gravel (SM)*; moist; fine to coarse gravel and sand; low plasticity; coal and ash. (Fill)			S-3	4
(4) Loose to medium dense, gray-brown, *Poorly Graded Gravel with Silt and Sand (GP-GM) to Silty Gravel with Sand (GM)*; moist to wet; fine to coarse, subangular to subrounded gravel; fine to coarse sand; nonplastic to low plasticity; frozen near track. (Fill)			S-4, S-5	8
(5) Stiff to medium stiff, dark brown, *Silt with Sand (ML)* and *Sandy Lean Clay (CL)*; moist; few fine to coarse, subangular to subrounded gravel; fine to medium sand; low to medium plasticity; few coal fragments; frozen near track. (Glacial Soil)			S-6, S-7	12
(6) Medium stiff, brown, *Sandy Lean to Fat Clay (CL/CH)*; moist; few fine to coarse, subangular to subrounded gravel, fine to coarse sand; medium to high plasticity. (Fill)				16
(7) Stiff to hard, brown, *Lean to Fat Clay (CL/CH) and Sandy Lean Clay (CL)*; moist; few fine to coarse, subangular to subrounded gravel; fine to coarse sand; medium to high plasticity; blocky texture with iron-oxide staining on fracture faces; weak to strong reaction to HCl; coal fragments; . (Glacial Soil) - White spots from 5 to 6 feet below top of tie.				20
(8) Loose to medium dense, brown-gray, *Silty Gravel with Sand (GM)*; moist; fine to coarse gravel and sand; nonplastic to low plasticity. (Fill)				24

Sketch of West Pit Side

Top of Tie Elevation: Approx. 3360 Ft.



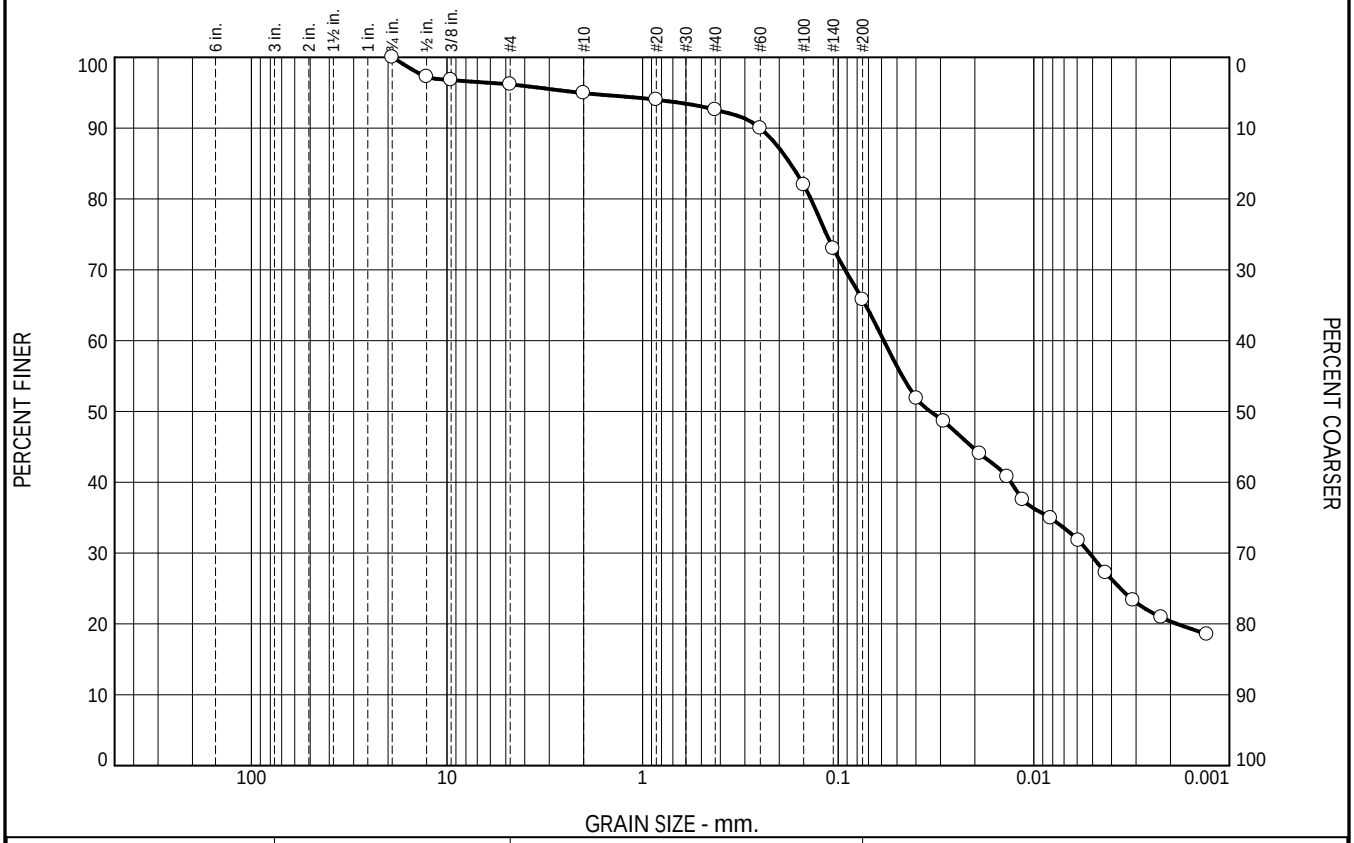
LEGEND

P/P = Pocket Penetrometer Reading in tons/ft^2

V/S = Vane Shear Reading in kPa

FIG. A-11

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.8	1.3	2.3	26.8	45.4	20.4

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	97.3		
.375	96.8		
#4	96.2		
#10	94.9		
#20	94.0		
#40	92.6		
#60	90.0		
#100	82.0		
#140	73.0		
#200	65.8		
0.0398 mm.	51.8		
0.0288 mm.	48.6		
0.0189 mm.	44.0		
0.0136 mm.	40.8		
0.0114 mm.	37.5		
0.0082 mm.	34.9		
0.0059 mm.	31.8		
0.0043 mm.	27.2		
0.0031 mm.	23.3		
0.0022 mm.	20.9		
0.0013 mm.	18.5		

* (no specification provided)

Soil Description

Sandy Lean Clay

Atterberg Limits

PL= 15 LL= 33 PI= 18

Coefficients

D_{90}= 0.2502 D_{85}= 0.1754 D_{60}= 0.0584
D_{50}= 0.0339 D_{30}= 0.0052 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

Location: Milepost 1014, TP-1N, S-2
Sample Number: Y0464 Depth: 4'

Date: 4/28/22

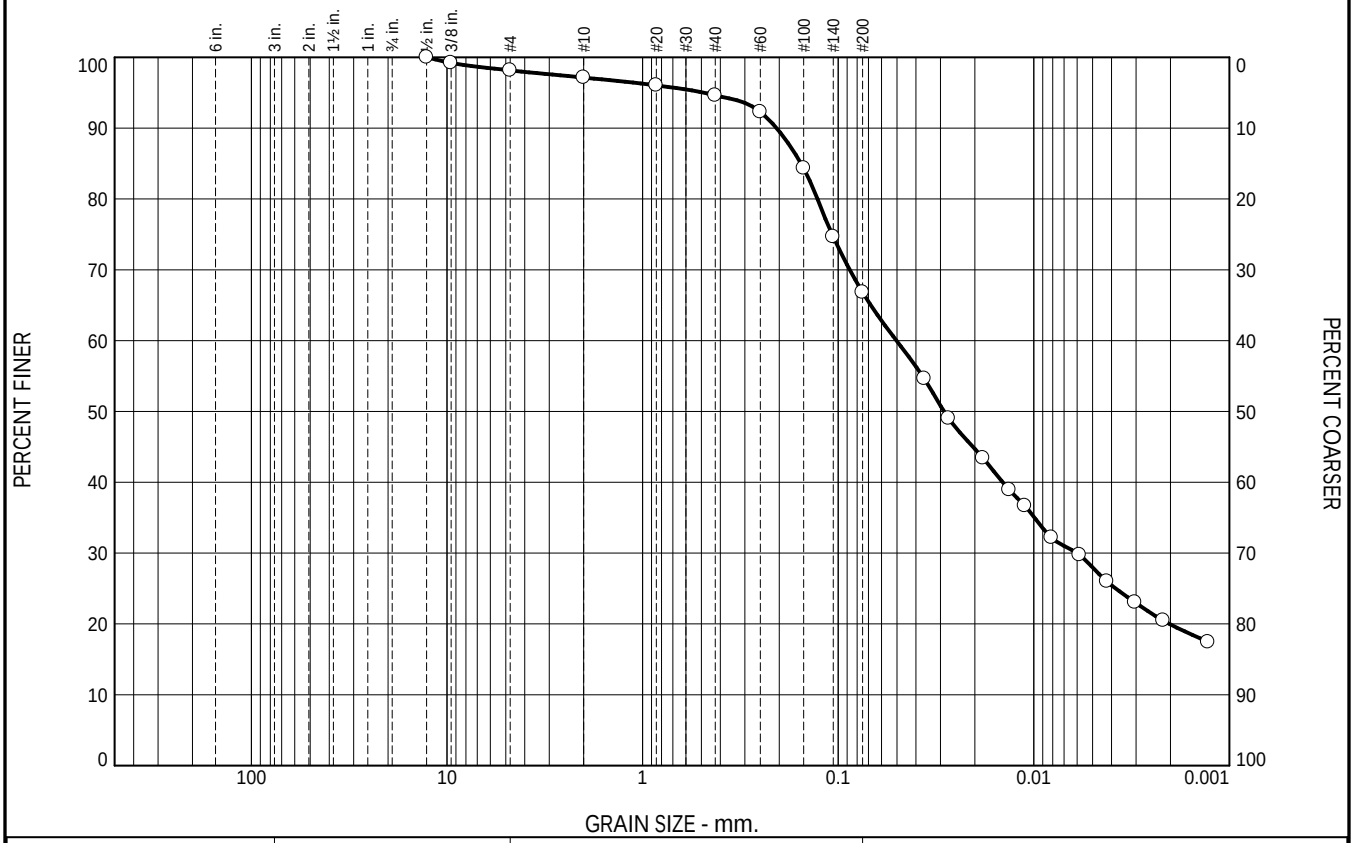
Krazan

Client: Shannon & Wilson Inc.
Project: BNSF Hi-Line Sub

Project No: 10622087 Figure

Tested By: K.O'Connell Checked By: K.O'Connell

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.8	1.1	2.5	27.8	46.9	19.9

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100.0		
.375	99.2		
#4	98.2		
#10	97.1		
#20	96.0		
#40	94.6		
#60	92.3		
#100	84.3		
#140	74.7		
#200	66.8		
0.0363 mm.	54.6		
0.0272 mm.	49.0		
0.0181 mm.	43.4		
0.0133 mm.	38.9		
0.0111 mm.	36.7		
0.0081 mm.	32.2		
0.0058 mm.	29.7		
0.0042 mm.	26.0		
0.0030 mm.	23.0		
0.0022 mm.	20.5		
0.0013 mm.	17.4		

* (no specification provided)

Soil Description

Sandy Lean Clay

Atterberg Limits

PL= 15 LL= 29 PI= 14

Coefficients

D_{90}= 0.2064 D_{85}= 0.1547 D_{60}= 0.0503
D_{50}= 0.0288 D_{30}= 0.0060 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(7)

Remarks

Location: Mileposte 1014, TP-1S, S-2
Sample Number: Y0465 Depth: 4'

Date: 4/28/22

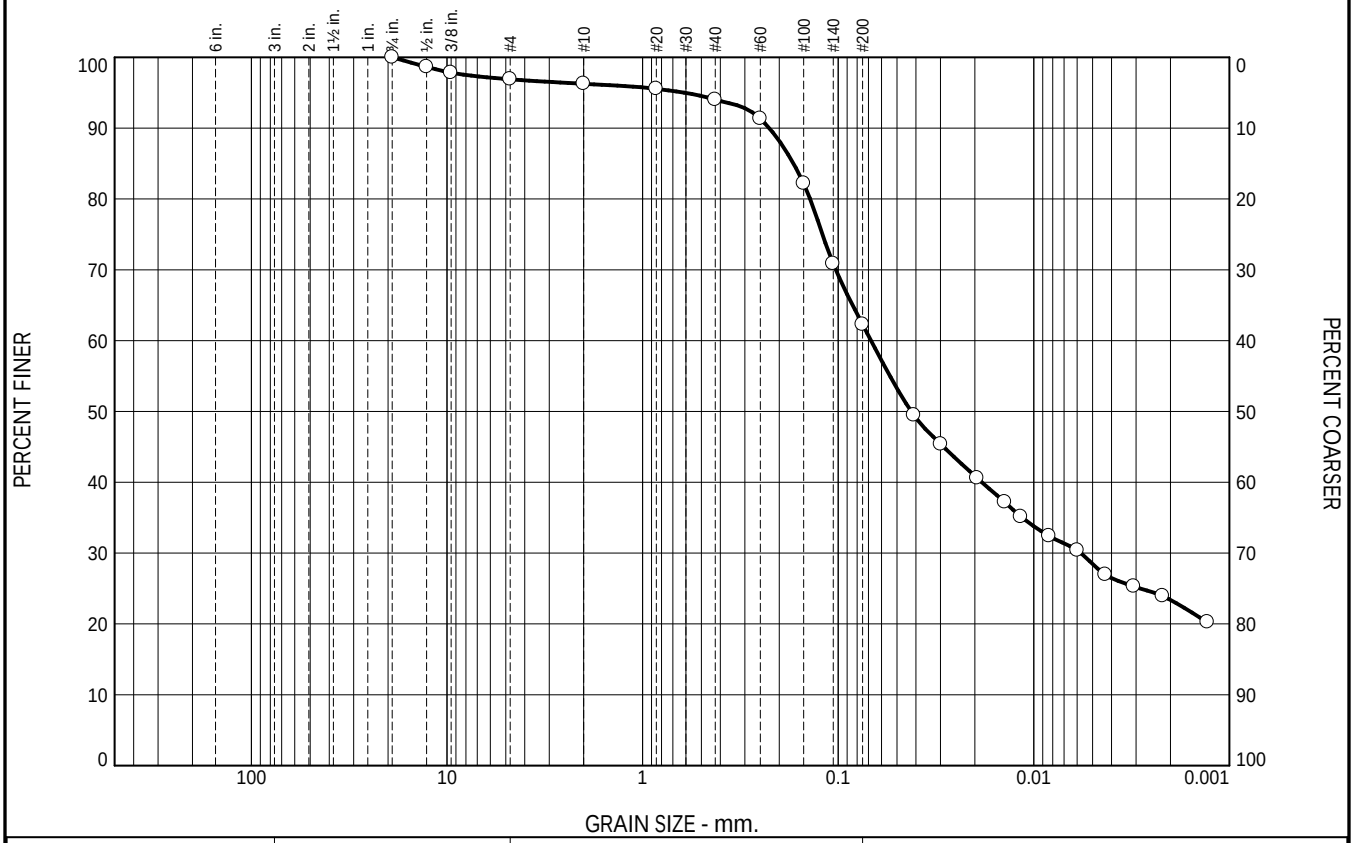
Krazan

Client: Shannon & Wilson Inc.
Project: BNSF Hi-Line Sub

Project No: 10622087 Figure

Tested By: K.O'Connell Checked By: K.O'Connell

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.1	0.6	2.3	31.7	38.9	23.4

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.5	98.7		
.375	97.8		
#4	96.9		
#10	96.3		
#20	95.5		
#40	94.0		
#60	91.3		
#100	82.2		
#140	70.8		
#200	62.3		
0.0410 mm.	49.5		
0.0298 mm.	45.4		
0.0195 mm.	40.6		
0.0141 mm.	37.2		
0.0116 mm.	35.2		
0.0084 mm.	32.4		
0.0060 mm.	30.4		
0.0043 mm.	27.0		
0.0031 mm.	25.3		
0.0022 mm.	23.9		
0.0013 mm.	20.3		

* (no specification provided)

Soil Description

Sandy Lean Clay

Atterberg Limits

PL= 16 LL= 32 PI= 16

Coefficients

D_{90}= 0.2250 D_{85}= 0.1692 D_{60}= 0.0679
D_{50}= 0.0423 D_{30}= 0.0057 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(7)

Remarks

Location: Milepost 1014, TP-3N, S-2
Sample Number: Y0466 Depth: 5'

Date: 4/28/22

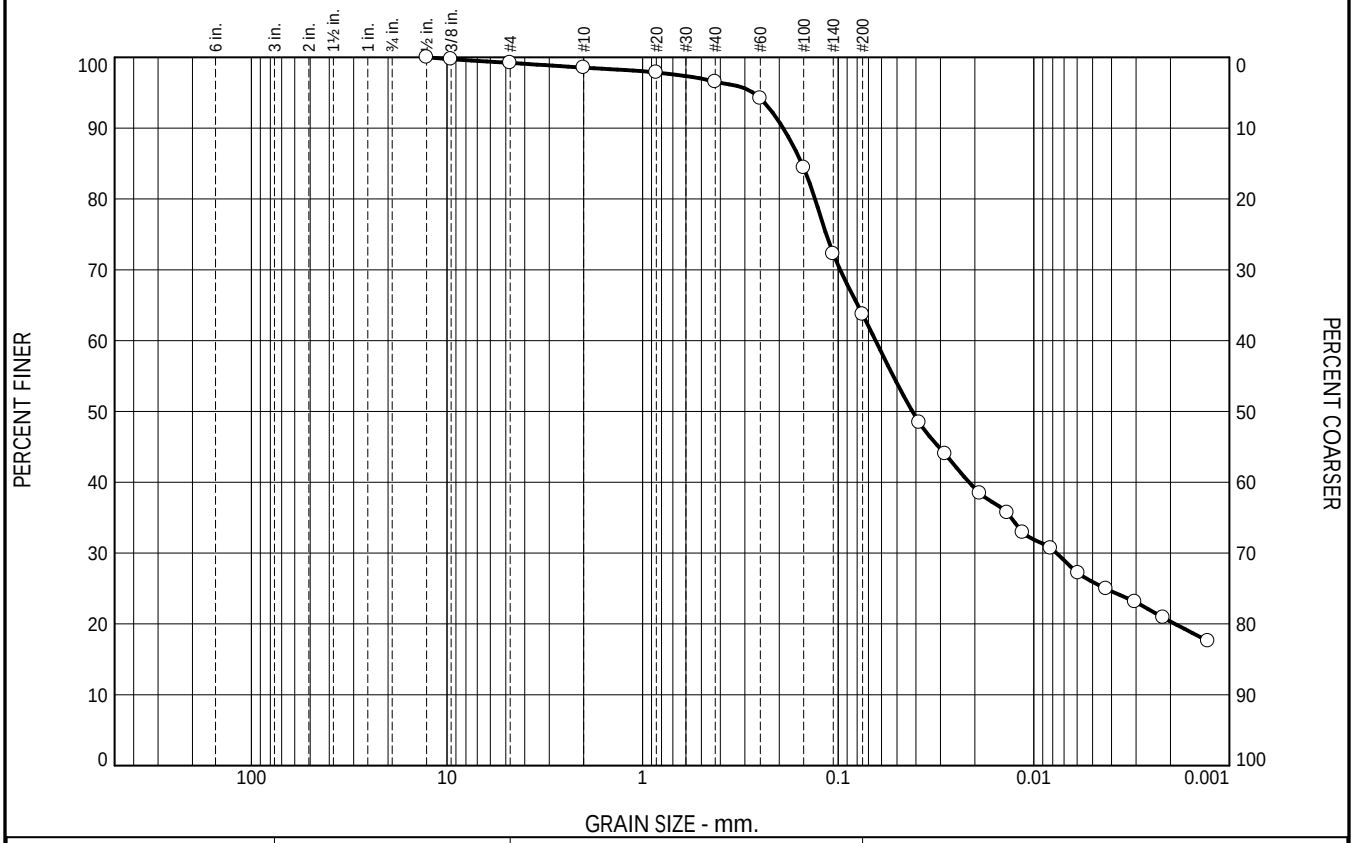
Krazan

Client: Shannon & Wilson Inc.
Project: BNSF Hi-Line Sub

Project No: 10622087 Figure

Tested By: K.O'Connell Checked By: K.O'Connell

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.8	0.7	1.9	32.9	43.3	20.4

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100.0		
.375	99.7		
#4	99.2		
#10	98.5		
#20	97.8		
#40	96.6		
#60	94.2		
#100	84.4		
#140	72.3		
#200	63.7		
0.0385 mm.	48.4		
0.0284 mm.	44.0		
0.0189 mm.	38.4		
0.0136 mm.	35.7		
0.0114 mm.	32.9		
0.0082 mm.	30.7		
0.0059 mm.	27.2		
0.0043 mm.	24.9		
0.0030 mm.	23.1		
0.0022 mm.	20.9		
0.0013 mm.	17.6		

* (no specification provided)

Soil Description

Sandy Lean Clay

Atterberg Limits

PL= 15 LL= 29 PI= 14

Coefficients

D_{90}= 0.1909 D_{85}= 0.1533 D_{60}= 0.0643
D_{50}= 0.0417 D_{30}= 0.0076 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(6)

Remarks

Location: Milepost 1014, TP-3S, S-3
Sample Number: Y0467 Depth: 5'

Date: 4/28/22

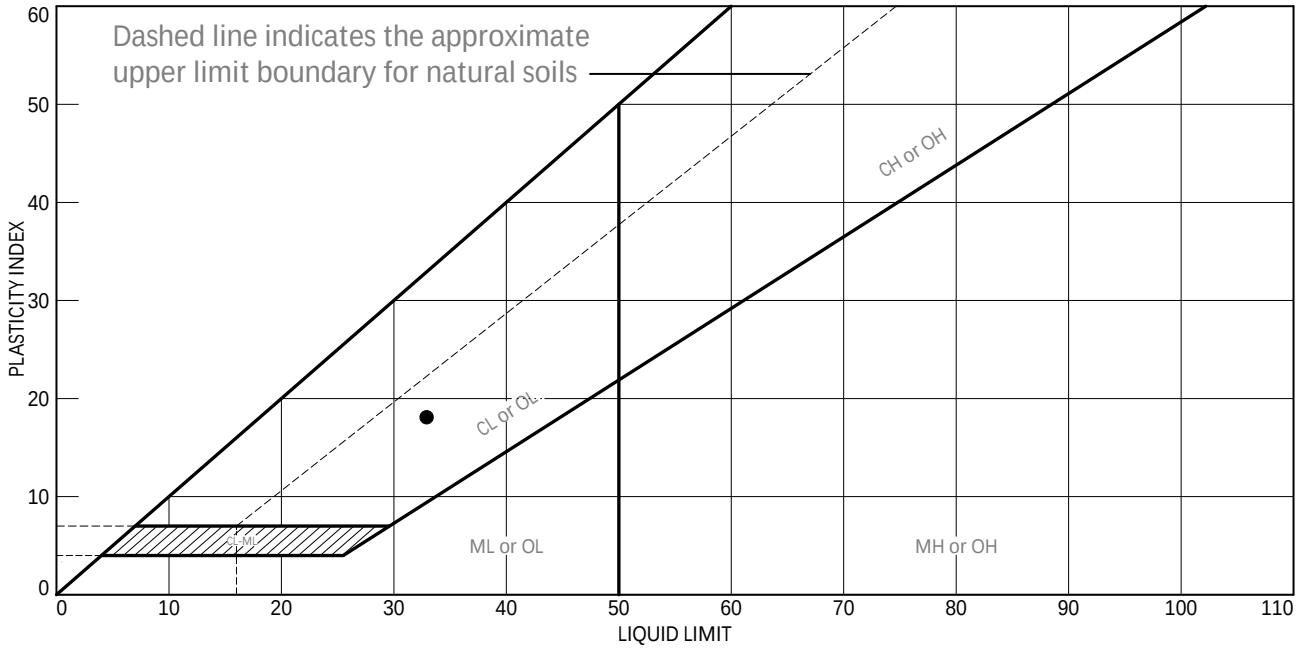
Krazan

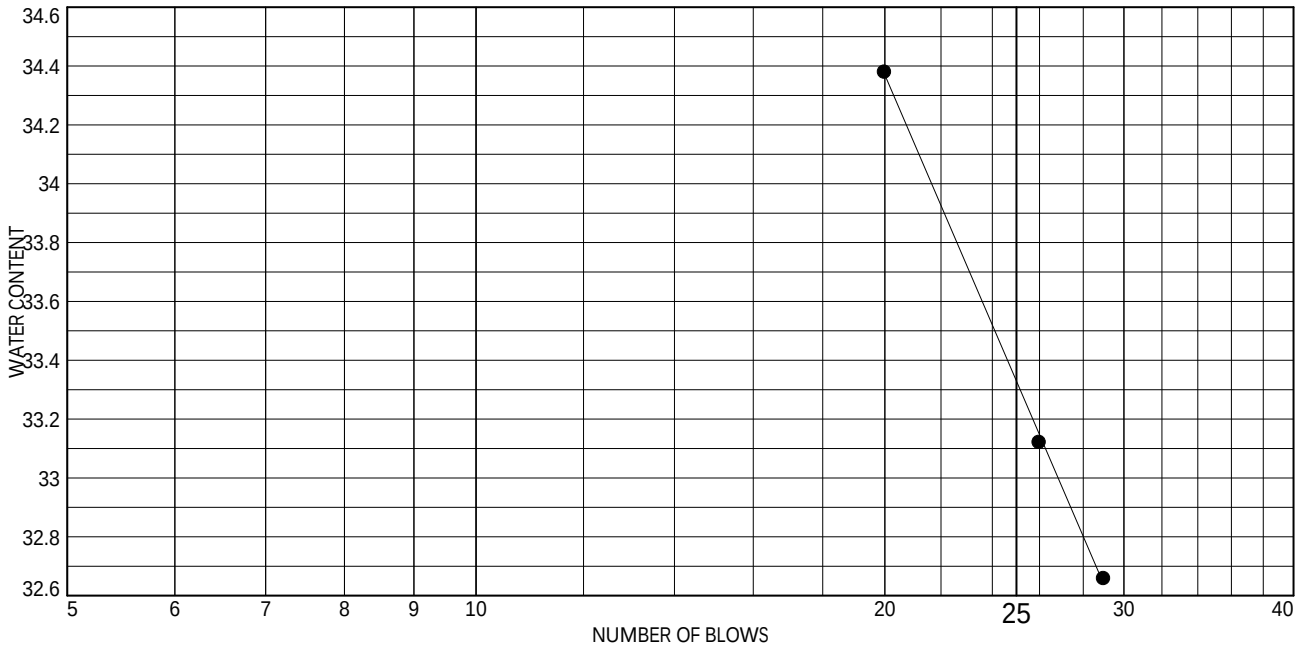
Client: Shannon & Wilson Inc.
Project: BNSF Hi-Line Sub

Project No: 10622087 Figure

Tested By: K.O'Connell Checked By: K.O'Connell

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy Lean Clay	33	15	18	92.6	65.8	CL

Project No. 10622087 Client: Shannon & Wilson Inc.

Project: BNSF Hi-Line Sub

Location: Milepost 1014, TP-1N, S-2
Sample Number: Y0464 Depth: 4'

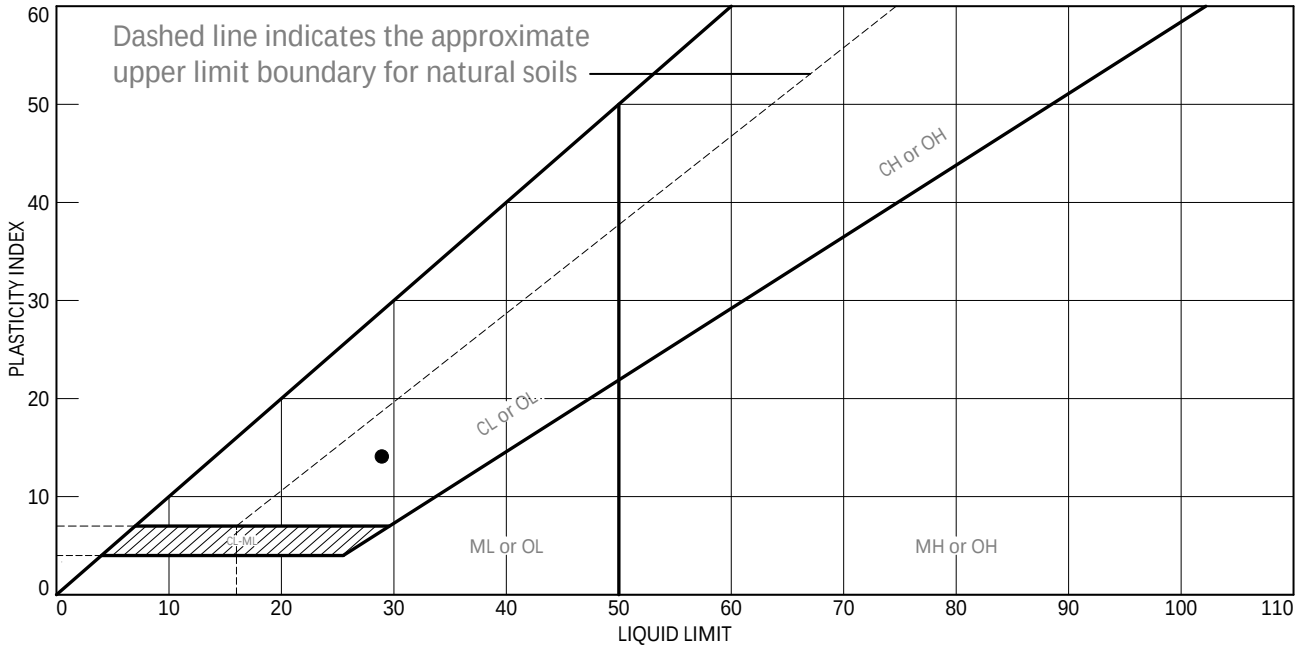
Krazan

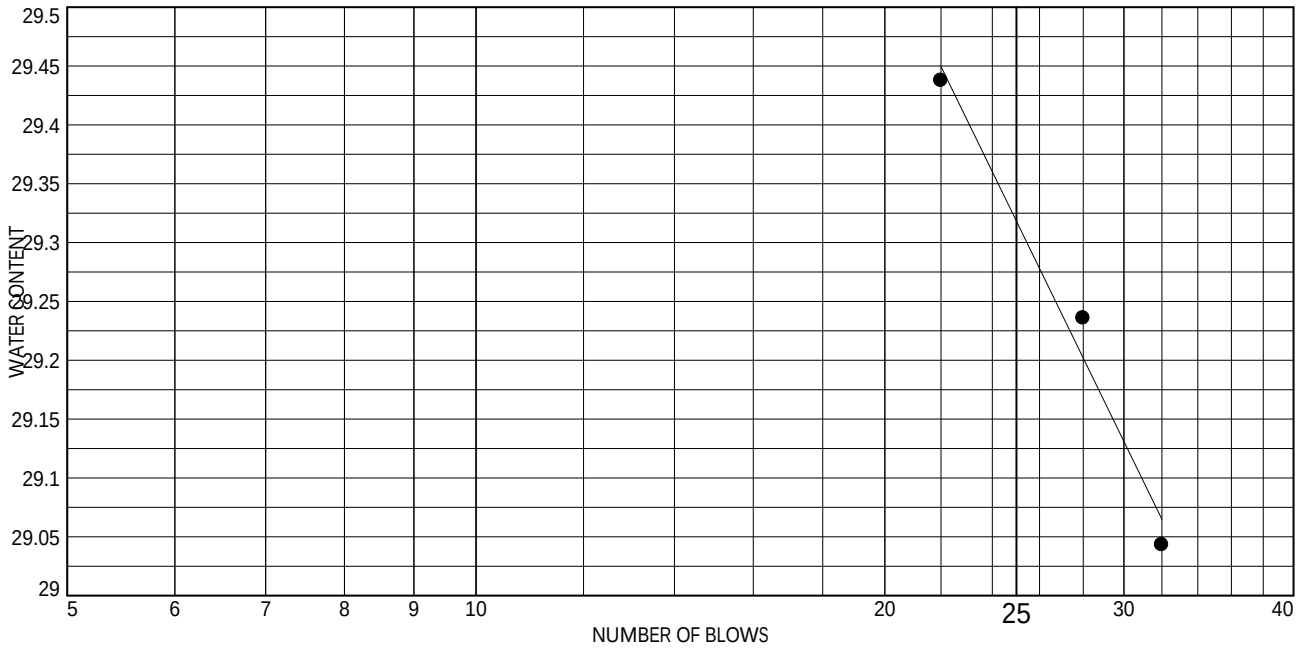
Remarks:

●As-Received Moisture Content: 17.9%

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy Lean Clay	29	15	14	94.6	66.8	CL

Project No. 10622087 Client: Shannon & Wilson Inc.

Project: BNSF Hi-Line Sub

Location: Mileposte 1014, TP-1S, S-2
Sample Number: Y0465 Depth: 4'

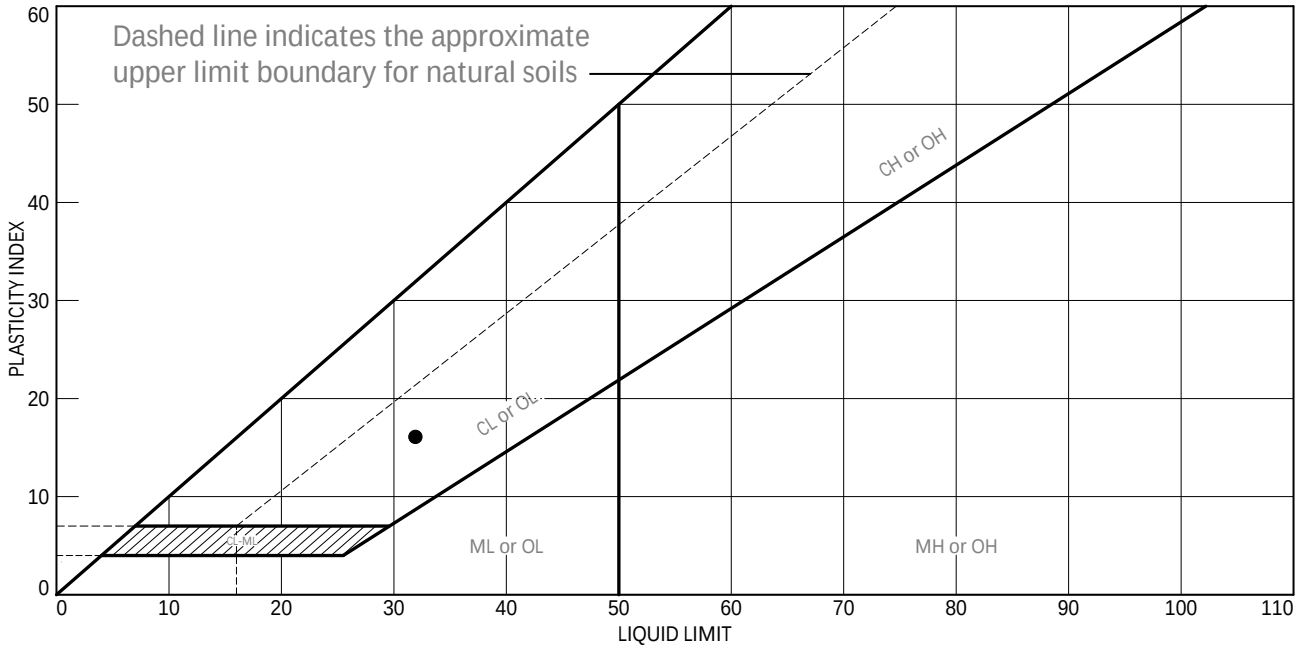
Krazan

Remarks:

●As-Received Moisture Content: 16.2%

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy Lean Clay	32	16	16	94.0	62.3	CL

Project No. 10622087 Client: Shannon & Wilson Inc.

Project: BNSF Hi-Line Sub

Location: Milepost 1014, TP-3N, S-2
Sample Number: Y0466 Depth: 5'

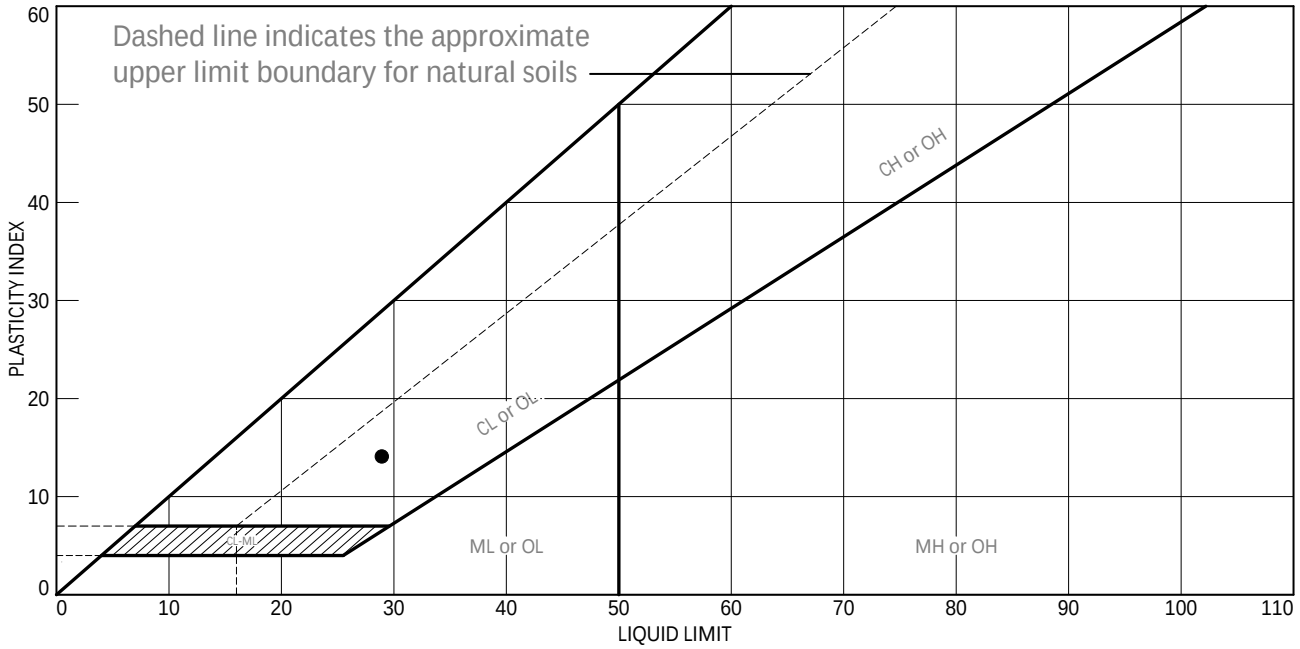
Krazan

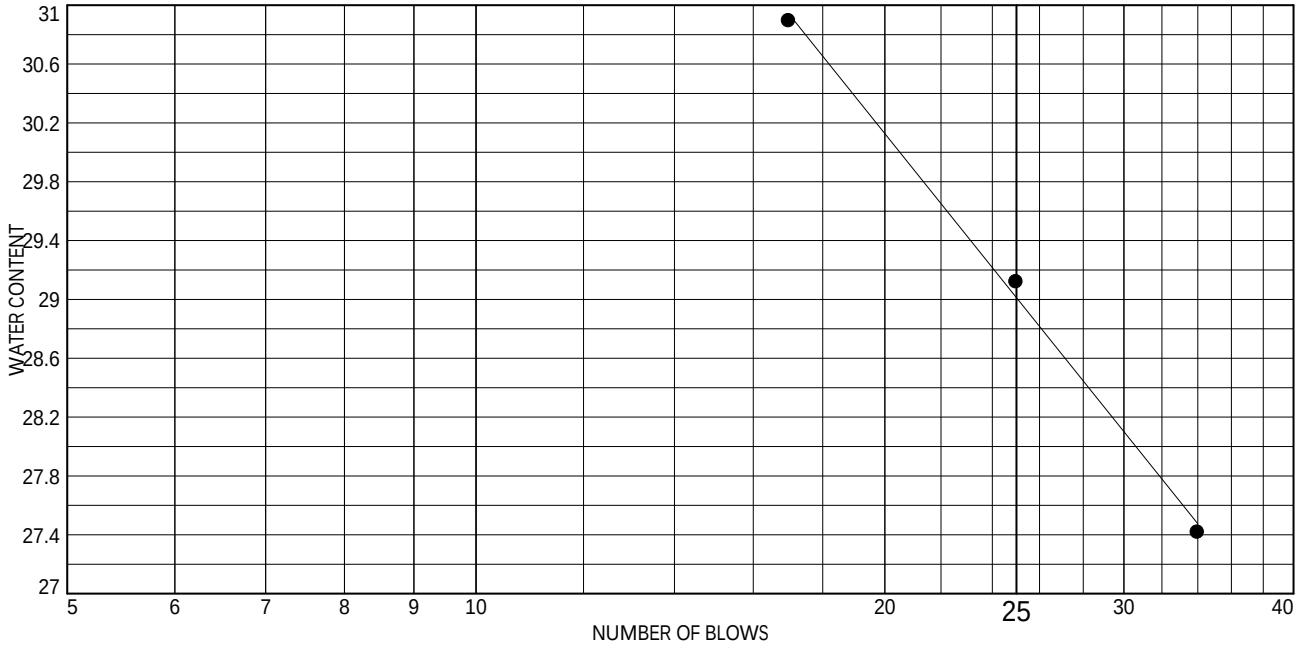
Remarks:

●As-Received Moisture Content: 16.7%

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy Lean Clay	29	15	14	96.6	63.7	CL

Project No. 10622087 Client: Shannon & Wilson Inc.

Project: BNSF Hi-Line Sub

Location: Milepost 1014, TP-3S, S-3
Sample Number: Y0467 Depth: 5'

Krazan

Remarks:

●As-Received Moisture Content: 17.3%

Figure