Appendix III/IV.C
Geotechnical Report

GEOTECHNICAL REPORT

Fjord Breakneck Connector Trail
Cold Spring, New York

Prepared for:

D & B Engineers & Architects, P.C.
4 West Red Oak Lane
West Harrison, New York 10604

Issued October 17, 2016
MEG Project No. 150769

Prepared by:
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APPENDICES

1.0 INTRODUCTION

1.1 General

At the request of D & B Engineers & Architects, P.C., McLaren Engineering Group, Inc. (McLaren) has developed and implemented a Geotechnical Investigation to evaluate the underlying ground conditions at the site along Route 9D, North of the Breakneck tunnel in Cold Spring, New York. This geotechnical program consisted of soil borings, rock corings, and identification and classification of soil stratigraphy.

The proposed project is located along Route 9D in Cold Spring, New York. It will consist of a pedestrian walkway connecting the Metro North Railroad Breakneck Stop Platform to the Breakneck Ridge Trailhead in Hudson Highlands State Park Preserve. To the Southeast is the Town of Cold Spring and to the West is the Hudson River (see Site Location Map, Appendix A).

1.2 Proposed Development

The project proposes the construction of a half mile multi-use trail segment between the most northerly Metro North Railroad Breakneck Whistle Stop Platform and the Breakneck Ridge Trailhead on the west side of Route 9D in Hudson Highlands State Park. The trail will consist of an elevated platform offset from the roadway when the slope of the roadway will not allow a trail on grade.

1.3 Scope of Work

The Scope of the Preliminary Geotechnical Investigation for the project site included the following tasks:

i) Establish an investigative program to determine the depth of rock and soil properties, which included exploratory soil borings and rock corings.

ii) Evaluate the findings of the borings to define the characteristics of the underlying soil strata and bedrock.

iii) Evaluate geotechnical information to determine site-specific needs.

iv) Perform a site-specific seismic evaluation utilizing on site boring data, rock core data, and soil properties obtained throughout the site.

v) Coordinate with New York State Department of Transportation and Metro North Railroad to perform work.

2.0 FIELD INVESTIGATION

MEG retained the services of Soiltesting Inc. (90 Donovan Rd, Oxford CT 06478) to perform soil borings. The soil borings were initiated on September 6, 2016 and concluded on September 23, 2016. The borings were advanced to end depths between 5′ and 73′ (see Boring Location Plan, Appendix B). Soil samples were taken at either five (5) foot intervals or ten (10) foot intervals when possible. Due to the nature of the fill soils, sampling was difficult and several samples were skipped. Soil samples were obtained using the Standard Penetration Test (ASTM D-1586-84) using a split spoon sampler with a 2-inch O.D., $1^{3}/_{8}$-inch I.D. driven into the soil with a 140-pound hammer falling freely from a height of 30-inches (see Boring Logs, Appendix C).

The soil borings were performed under the supervision of a representative of McLaren.

3.0 EXISTING CONDITIONS

3.1 Surface Conditions

The existing site runs along Route 9D in Cold Spring, NY from mile marker 1001 to 1006. The roadway slopes to the northwest at about 3%. To the southwest of the roadway is a slope containing trees and brush which continues down to the railroad. This area has about a 30% slope and drops in elevation about 15′. At the bottom of the slope is an overgrown drainage swale.

3.2 Subsurface Conditions

The primary subsurface strata encountered are shown on the Soil Profiles in Appendix D and are described as follows:

- **Asphalt/Concrete Pavement –** Borings 1-4 encountered an asphalt/concrete layer from grade to approximately 17″ below grade. The thickness of the asphalt pavement was between 3 and 5 inches. Underneath the asphalt was about 8 to 12 inches of concrete.

- **Fill –** Borings 1-4 along the roadway encountered a fill layer below the concrete pavement which extended to a depth of 5-15 feet below grade. It consisted of coarse to medium gray gravel, little brown sand, and some gray/brown silt. Borings 5-11 encountered a fill layer at surface grade that extended to a depth of 5-10 feet below grade. This consisted of black and brown silt, asphalt, medium gravel, and medium brown sand.

- **Silt/Gravel** – Below the fill layer, Boring 2 encountered a dense silt layer that extended from a depth of approximately 15 to 20 feet below grade. This layer consisted of brown/gray silt and some medium to coarse gray gravel.

- **Clay –** Borings 5-11 encountered a clay layer beneath the fill layer. This layer extended to a depth of 11 to 65 feet below grade. It consisted of black silty clay, black clay, some brown clay, trace peat, some wood, and some fine to medium gravel. This layer is classified as a clay.

- **Sand –** Boring 9 encountered a sand layer at a depth of 20' to 35' below grade. This layer consisted of black very fine sand, some black and brown silt, and little wood.

- **Rock –** All borings were performed to weathered rock. The weathered rock in Borings 1-4 was encountered at approximately 5 to 20 feet below surface grade. The weathered rock in Borings 5-11 was encountered at approximately 9 to 73 feet below surface grade.

The boring and bedrock elevations are shown in Table 1 below.

Table 1
Boring Elevations with Depth to Weathered Bedrock

Boring Location	Boring Top Elevation (1)	Depth to Groundwater (ft)	Depth to Bedrock (ft)	Bedrock Elevation (1)
B-1	18.1	-	5.0	13.1
B-2	23.7	-	20.0	3.7
B-3	31.5	-	7.0	24.5
B-4	36.9	-	5.0	31.9
B-5	9.5	17.0	73.0	-63.5
B-6	9.4	-	11.3	-1.9
B-7	5.2	10.0	30.0	-24.8
B-8	9.7	10.0	20.0	-10.3
B-9	6.8	7.0	49.0	-42.2
B-10	5.9	6.0	9.0	-3.1
B-11	5.9	7.0	30.0	-24.1

(1) Datum: NAVD88 (estimated by a reference to the drawing Topographic Survey created by Badey and Watson Surveying & Engineering dated April 10, 2016.)

3.3 Groundwater

Groundwater was encountered in Borings B-5, B-7, B-8, B-9, B-10, and B-11. In these borings it was encountered at a depth between 6′-17′ below surface grade. Groundwater can be expected to fluctuate due to seasonal rainfalls and tidal influence of the adjacent Hudson River.

3.4 Depth of Fill

The fill soils were encountered directly below the asphalt/concrete and extended to a depth of approximately 5 to 15 feet below grade for the borings along Route 9D. The fill is a mix of soil and large stones that may have been residual material from the tunnel and road construction.

3.5 Possible Stream Bed

At Boring B-2 the rock depth increases and there is a layer of silt above the bedrock. This could be the remnants of the historical Hudson River.

4.0 ANALYSIS AND RECOMMENDATIONS

4.1 Foundation Support

For the elevated walkway foundation, McLaren recommends deep foundations that would derive their strength from drilled piles grouted into the weathered rock in the sloped areas where the path will be an elevated platform. In the area when the pathway is able to be placed at the grade level, a loading of 1 kip per square foot should be used for design bearing strength.

4.1.1 Foundation Recommendations

Based on the investigation, McLaren recommends that drilled mini piles will be required for the elevated trail sections. Sizing will be designed on final loading. The preliminary design is 9 5/8″ diameter, 0.434 inch thick mini piles that are drilled 15 feet into the weathered rock.

The preliminary design loads for the piles are an axial load of 40 tons and a shear load of 2 kips.

4.1.2 Pile Lateral Load

The safe working lateral load will be one (1) ton for the mini piles.

4.1.3 Inspection and Reporting Procedures for Pile Installation

Several near-surface obstructions are present and may need to be either excavated or pre-augered prior to installation of piles. Any subsurface utilities must be relocated prior to the start of construction.

It is recommended that a qualified inspector be on site at all times to monitor pile installation. This inspector must report size, length, number of splices, and depth for each pile. If lateral movement is observed during pile installation, testing should be used to verify capacity.

4.2 Settlement

Due to the presence of the clay, the walkway will likely have some settlement. An approach slab to account for this differential settlement is recommended.

5.0 SEISMIC DESIGN CONSIDERATIONS

The new structures shall be designed to resist stress produced by lateral forces in accordance with Section 1613 of the 2010 New York State Building Code. The material conforms to the properties that define Site Class D.

Accordingly, the following values should be used for the project:

Mapped Spectral Response Acceleration for Short Periods [Section 1613.5.1]	S_S = 0.223g
Mapped Spectral Response Acceleration for 1-Second Period [Section 1613.5.1]	S_1 = 0.068g
Site Coefficient [Table 1613.5.3(1)]	F_a = 1.60
Site Coefficient [Table 1613.5.3(2)]	F_v = 2.40
Max. Considered Earthquake Spectral Response for Short Periods [Eq. 16-47]	S_{MS} = 0.356g
Max. Considered Earthquake Spectral Response for 1-Second Period [Eq. 16-48]	S_{M1} = 0.163g
Design Spectral Response Acceleration for Short Periods [Eq. 16-49]	S_{DS} = 0.238g
Design Spectral Response Acceleration for 1-Second Period [Eq. 16-50]	S_{D1} = 0.109g

This structure is an Occupancy Category II (see Table 1604.5). Based on the above values and the 2010 New York State Building Code Tables 1613.5.6(1) and 1613.5.6(2), all structures shall be designed to Seismic Design Category "B". The

Seismic Design Category and values for design must be confirmed by the project structural engineer.

6.0 CONSTRUCTION RECOMMENDATIONS

6.1 Site Preparation

The initial site preparation should commence with removal and offsite disposal of the asphalt pavement and loose fills. All existing utilities within the proposed building footprint should be relocated prior to construction.

The Contractor shall be responsible at all times for conducting all earthwork operations in a safe and prudent manner such that all workmen and the general public will be protected from hazards. The Contractor shall observe all applicable local, State and/or Federal requirements.

6.2 Re-use of Excavated Material

In general, the in situ clay material below the fill is unsuitable to be reused as general backfill. Reused fill materials should conform to the sieve and compaction standards of Sections 6.3 and 6.4 of this report. Sand soils are suitable to be reused.

6.3 Borrow Fill

All borrow fill soil should consist of soils which are predominately sand and gravel with no more than 10% passing the 200 sieve, and have no particle greater than 4 inches, containing no deleterious material or environmental contaminants.

6.4 Compaction

Fill sections shall be constructed of acceptable material and deposited in successive lifts with a loose thickness of each lift not to be more than twelve (12) inches before compaction. The soil shall be compacted to the maximum dry density obtained in the lab (ASTM D-1557) as follows:

LOCATION	PERCENT OF MAXIMUM LABORATORY DENSITY ASTM D698
Subgrade & Fill below Pavement	95
Subgrade & Fill in All other Areas	92

We recommend for the sections that are to be built on grade that a 10 ton foot roller be used to proof roll the subsurface after the organics layer is stripped.

6.5 Excavation & Temporary Soil Support

It may be necessary to perform the required foundation excavations via earth support provisions such as sheeting and bracing. Areas which are not restricted by space constraints, may, in all likelihood, be performed within open excavations in conformance with applicable local, state and federal OSHA safety regulations.

For excavations that are required to be sheeted and shored, the contractor shall submit working drawings and calculations for the design of the sheeting and shoring. The drawings and calculations shall be certified by an Engineer registered in the State of New York.

6.6 Dewatering

Groundwater was encountered at an elevation of 5'-7' in all borings. Should any dewatering be necessary, The Contractor is responsible for means and methods for dewatering.

This report has been respectfully submitted in accordance with the request of D & B Engineers & Architects, P.C., and is, to the best of our knowledge, accurate and complete. Any questions regarding its content should be addressed to: McLaren Engineering Group, 100 Snake Hill Road, West Nyack, New York 10994.

Respectfully submitted,

The Office of
McLaren Engineering Group
M.G. McLAREN, P.C.

Luke Daur, P.E.
Senior Project Engineer

MGMcL/SLG/LAD/rjk

cc: File 150769

Appendix A
Site Location Map

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PROJECT

BREACKNECK RIDGE
CONNECTOR TRAIL

BEACON, NEW YORK

SHEET TITLE

SITE LOCATION PLAN

PROJECT NO.	150769
SCALE	N.T.S.
DATE	09-28-2016
DRAWN BY	BMH
CHECKED BY	LAD

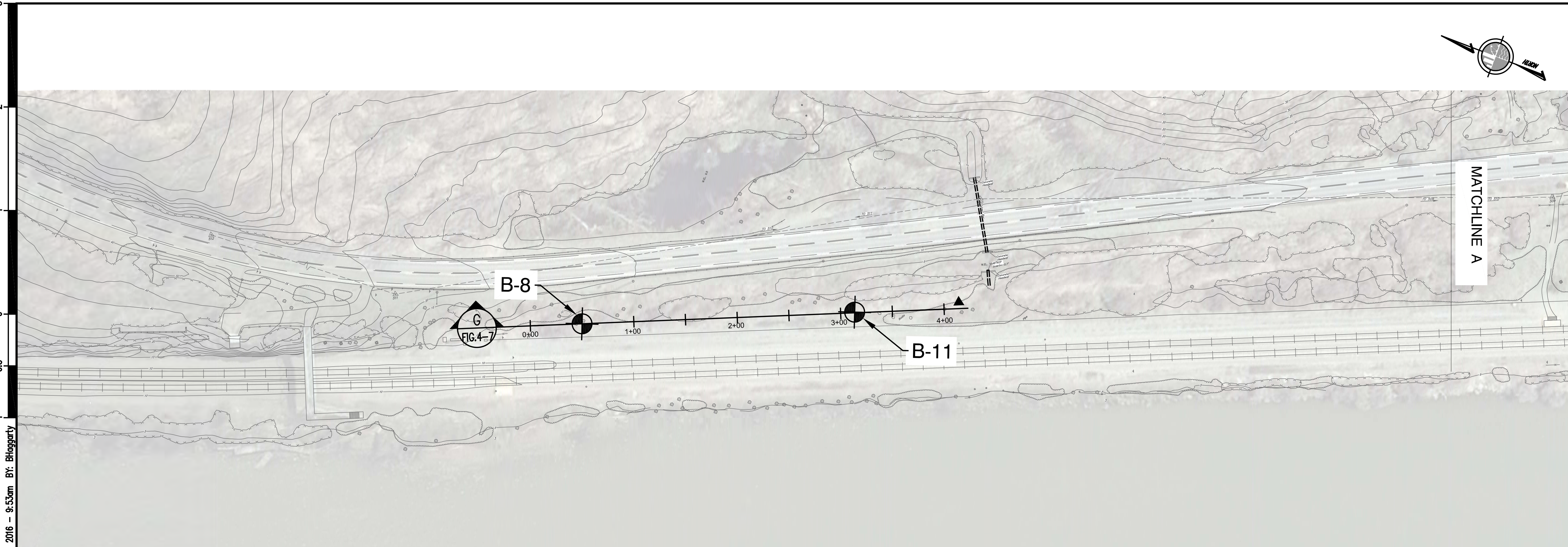
DRAWING NO.

FIG 1

1 OF 12 SHTS

FILE NAME: P:\Proj\150\150769\10_Dwgs\CADD\Boring Location Plan.dwg PLOT TIME: Wed, 28 Sep 2016 - 4:48pm LAST SAVE: Wed, 28 Sep 2016 - 4:47pm BY: Bhoggarty

Appendix B
Boring Location Plan



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PROJECT

BREACKNECK CONNECTOR TRAIL

BEACON, NEW YORK

SHEET TITLE

BORING LOCATION PLAN (SHEET 1 OF 3)

PROJECT NO.	150769
SCALE	1"=100'
DATE	09-28-2016
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DRAWING NO.	FIG 2-1

2 OF 12 SHTS

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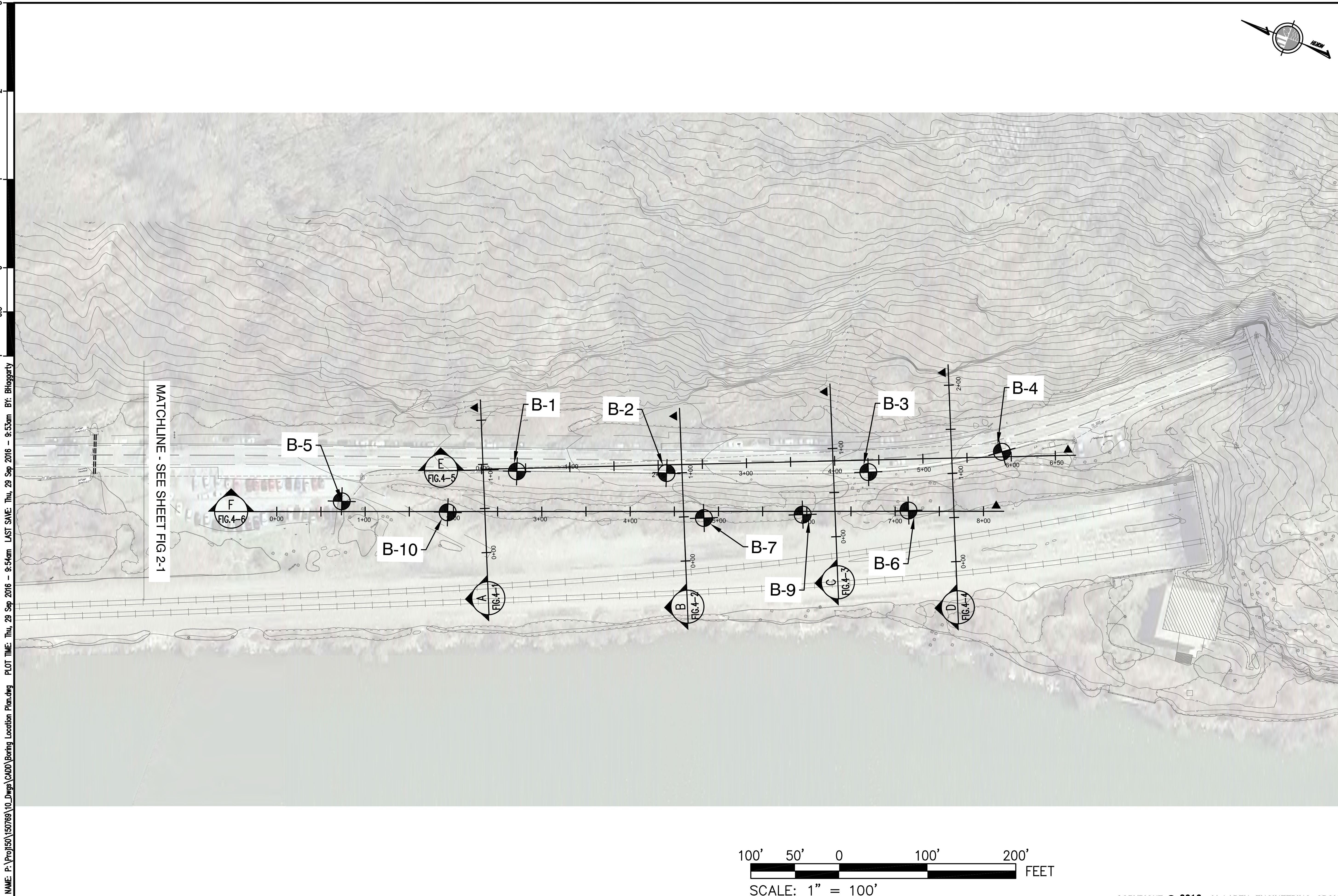

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PROJECT

BREACKNECK
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SHEET TITLE

BORING LOCATION PLAN
(SHEET 2 OF 3)

PROJECT NO.	150769
SCALE	1"=100'
DATE	09–28–2016
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FIG 2-2

3 OF 12 SHTS

Appendix C
Soil Profiles

1 0.5 0 1 2 3

UNIFIED SOIL CLASSIFICATION

SOIL GROUPS	TYPICAL NAMES AND SOIL SYMBOLS
GW	WELL GRADED GRAVELS, GRAVEL SAND MIXTURES, LITTLE OR NO FINES.
GP	POORLY GRADED GRAVELS, GRAVEL SAND MIXTURES, LITTLE OR NO FINES.
GM	SILTY GRAVELS, GRAVEL–SAND–CLAY MIXTURES
GC	CLAYEY GRAVELS, GRAVEL AND SILT MIXTURES
SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SM	SILTY SANDS, SAND–SILT MIXTURES
SC	CLAYEY SANDS, SAND–CLAY MIXTURES
ML	INORGANIC SILTS, VERY FINE SANDS, CLAYEY SILTS, SLIGHT PLASTICITY
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY, SANDY OR SILTY CLAYS
OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
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
Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS
FILL	BORROW MATERIAL FROM PREVIOUS CONSTRUCTION, GENERALLY SAND/LOAM CONTAINING BRICK, CONC, & OTHER MISC. MAN–MADE MATERIALS
ROCK	BEDROCK/WEATHERED ROCK
WATER	RECORDED LEVEL OF STATIC GROUNDWATER AT TIME OF INVESTIGATION

ALLOWABLE SOIL BEARING PRESSURES
(N.Y.C. BUILDING CODE C26-1103)

CLASS OF MATERIAL	DESCRIPTION	ALLOWABLE BEARING TONS/SQ.FT.
1a	HARD SOUND ROCK	60
1b	MEDIUM HARD ROCK	40
1c	INTERMEDIATE ROCK	20
1d	SOFT ROCK	8
2	GRAVEL AND GRAVEL SOILS (SOIL GROUPS GW, GP GM & GC AND GROUPS SW, SP, & SM CONTAINING MORE THAN 10% GRAVEL)	6–10
3	SANDS (OTHER THAN FINE SANDS) (SOIL GROUPS SW, SP & SM BUT CONTAINING NOT MORE THAN 10% GRAVEL)	3–6
4	CLAYS AND CLAY SOILS (SOIL GROUPS SC, CL & CH)	
	HARD	(5 MAX)
	MEDIUM	(2 MAX)
	SOFT	BY TEST
5	SILTS AND SILT SOILS (SOIL GROUPS ML & MH)	
	DENSE	3
	MEDIUM	1.5
	LOOSE	BY TEST
6	NOMINALLY UNSATISFACTORY BEARING MATERIALS	BY TEST
7	CONTROLLED & UNCONTROLLED FILLS	BY TEST

COMPACTION RELATED TO SPOON BLOWS/FOOT

SAND & SILT		CLAY	
LOOSE	LESS THAN 10	SOFT	LESS THAN 4
MEDIUM	10 TO 30	MEDIUM	4 TO 8
DENSE	30 OR MORE	STIFF	8 TO 30
		HARD	30 OR MORE

	ROTARY CASTING	X–HEAVY CASTING	SPOON
SIZE, INCHES	2.5		2.5
HAMMER WEIGHT, LBS.	–		140
HAMMER FALL, INCHES	–		30

"N"

6 8 9 12 N=17 BLOWS PER FOOT

STANDARD PENETRATION TEST
(2"SPOON, 140lb HAMMER, 30" FALL)

SPOON BLOW COUNT IS GENERALLY SHOWN IN 6" INCREMENTS FOR 2' DRIVE, TO OBTAIN BLOWS PER FOOT (N) USE 2ND & 3RD 6" INCREMENT.

CB – CASTING BLOWS PER 1 FOOT DRIVE

SB – SPOON BLOWS PER 6 INCH DRIVE

P – PUSH BY WEIGHT OF HAMMER

UD – UNDISTURBED SOIL SAMPLE

NO – SAMPLE NUMBER

FEET – DEPTH FROM GND. SUR. NOTED AT EACH 5'

DRAWING NO. FIG 3 — 5 OF 12 SHTS

CHECKED BY LAD | DRAWN BY BMH | DATE 09-28-2016 | SCALE N.T.S. | PROJECT NO. 150769

SHEET TITLE: SOIL PROFILES LEGEND

PROJECT: BREACKNECK CONNECTOR TRAIL — BEACON, NEW YORK

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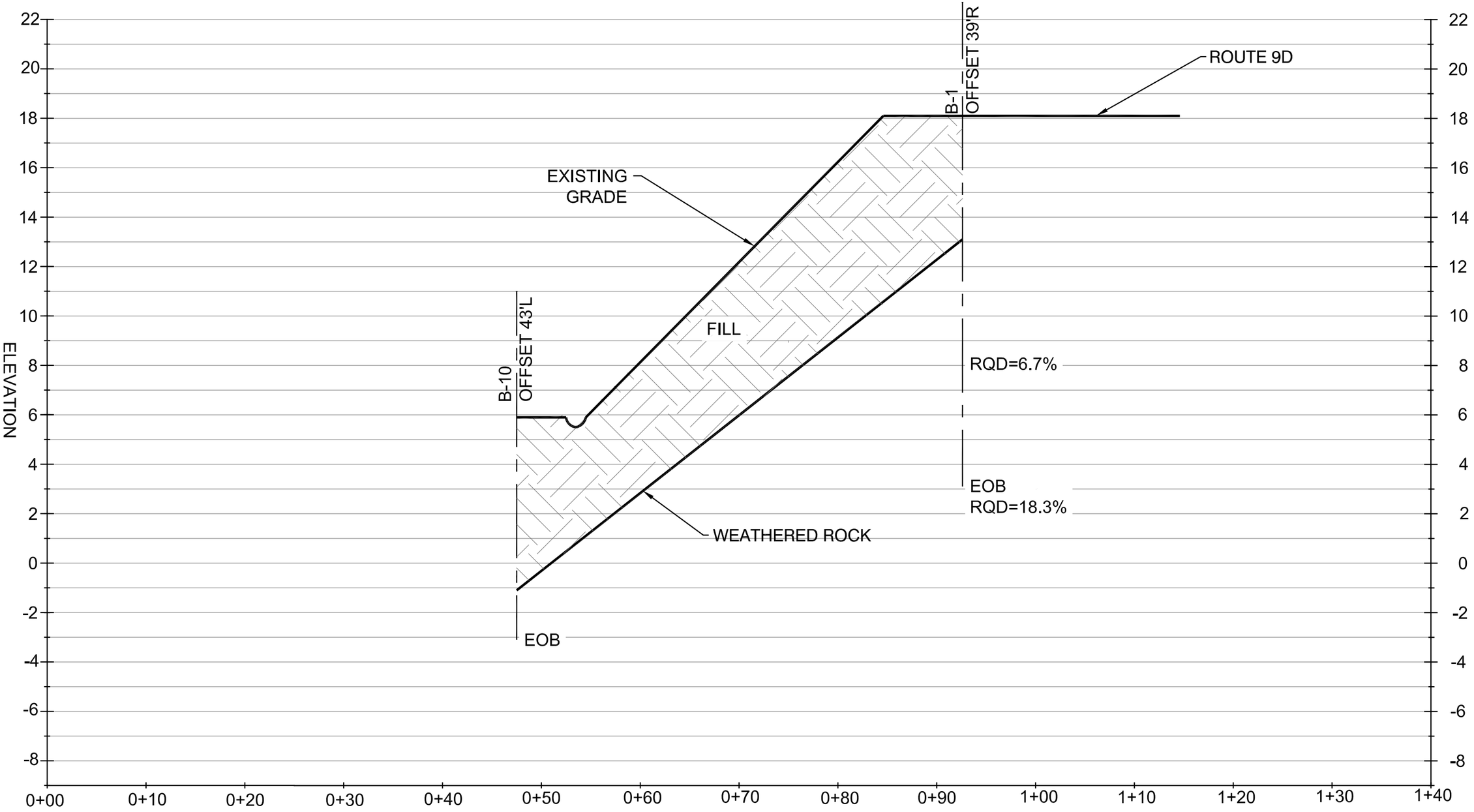
NO.	DATE	REVISION	BY



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1"=4' VERT.

NOTE: (1) SOIL AND BEDROCK LAYERS/STRATA SHOWN IN PROFILE INTERPOLATED BASED ON SOIL DATA ENCOUNTERED AT BORING LOCATIONS. ACTUAL SOIL CONDITIONS MAY VARY.

NO.	DATE	REVISION	BY

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PROJECT
BREACKNECK CONNECTOR TRAIL
BEACON, NEW YORK

SHEET TITLE
SOIL PROFILES
PROFILE A

PROJECT NO.	150769
SCALE	AS SHOWN
DATE	09-28-2016
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DRAWING NO.
FIG 4-1
6 OF 12 SHTS

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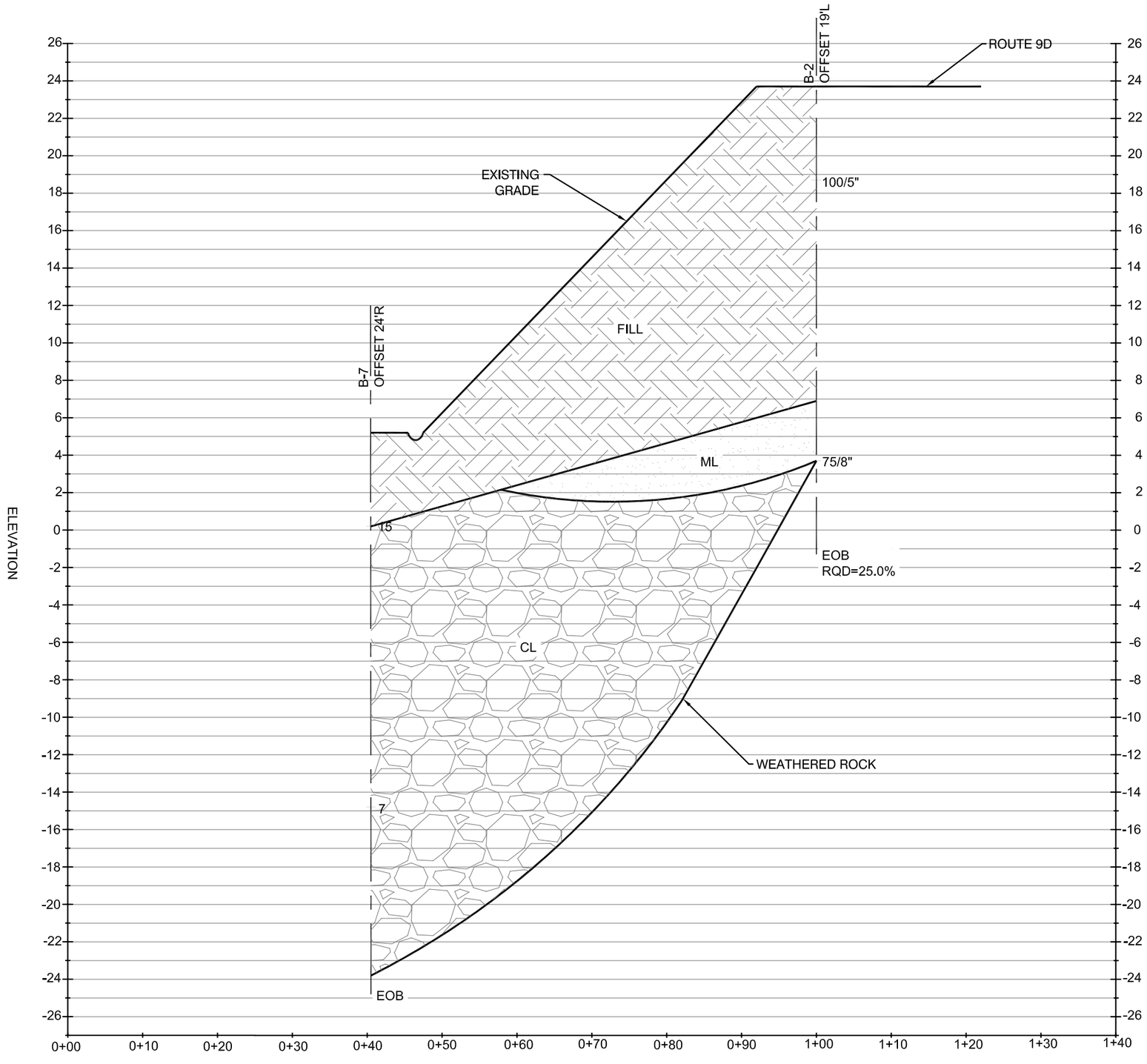

SCALE: 1"=15' HORIZ.

1"=6' VERT.

NOTE: (1) SOIL AND BEDROCK LAYERS/STRATA SHOWN IN PROFILE INTERPOLATED BASED ON SOIL DATA ENCOUNTERED AT BORING LOCATIONS. ACTUAL SOIL CONDITIONS MAY VARY.

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PROJECT

BREAKNECK CONNECTOR TRAIL

BEACON, NEW YORK

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SOIL PROFILES
PROFILE B

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DRAWING NO.

FIG 4-2

7 OF 12 SHTS

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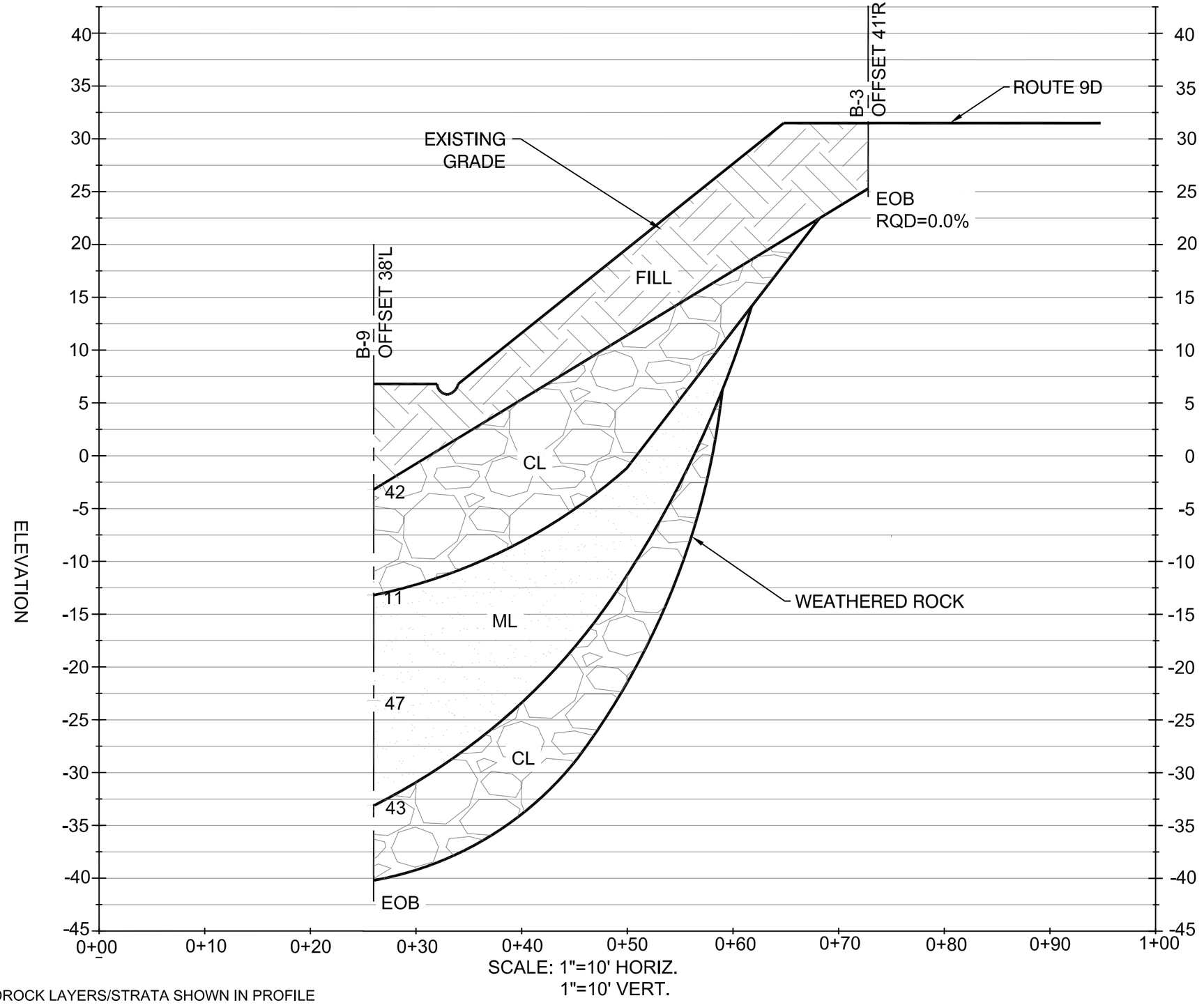

NOTE: (1) SOIL AND BEDROCK LAYERS/STRATA SHOWN IN PROFILE INTERPOLATED BASED ON SOIL DATA ENCOUNTERED AT BORING LOCATIONS. ACTUAL SOIL CONDITIONS MAY VARY.

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PROJECT
BREACKNECK
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NEW YORK
BEACON.

SHEET TITLE
SOIL PROFILES
PROFILE C

PROJECT NO.	150769
SCALE	AS SHOWN
DATE	09-12-2016
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DRAWING NO.
FIG 4-3
8 OF 12 SHTS

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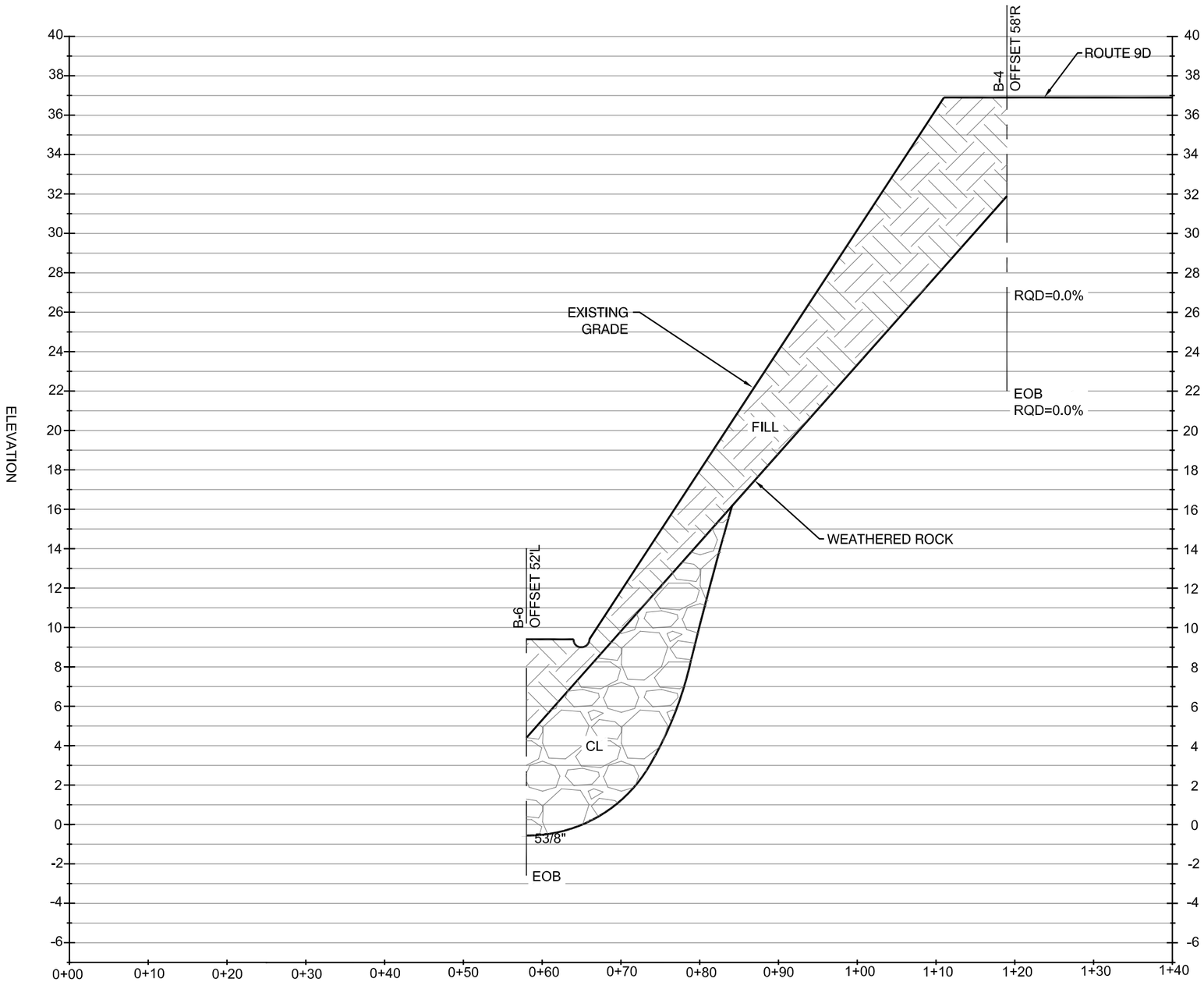

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1"=6' VERT.

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PROJECT
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BEACON, NEW YORK

SHEET TITLE
SOIL PROFILES
PROFILE D

PROJECT NO.	150769
SCALE	AS SHOWN
DATE	09-12-2016
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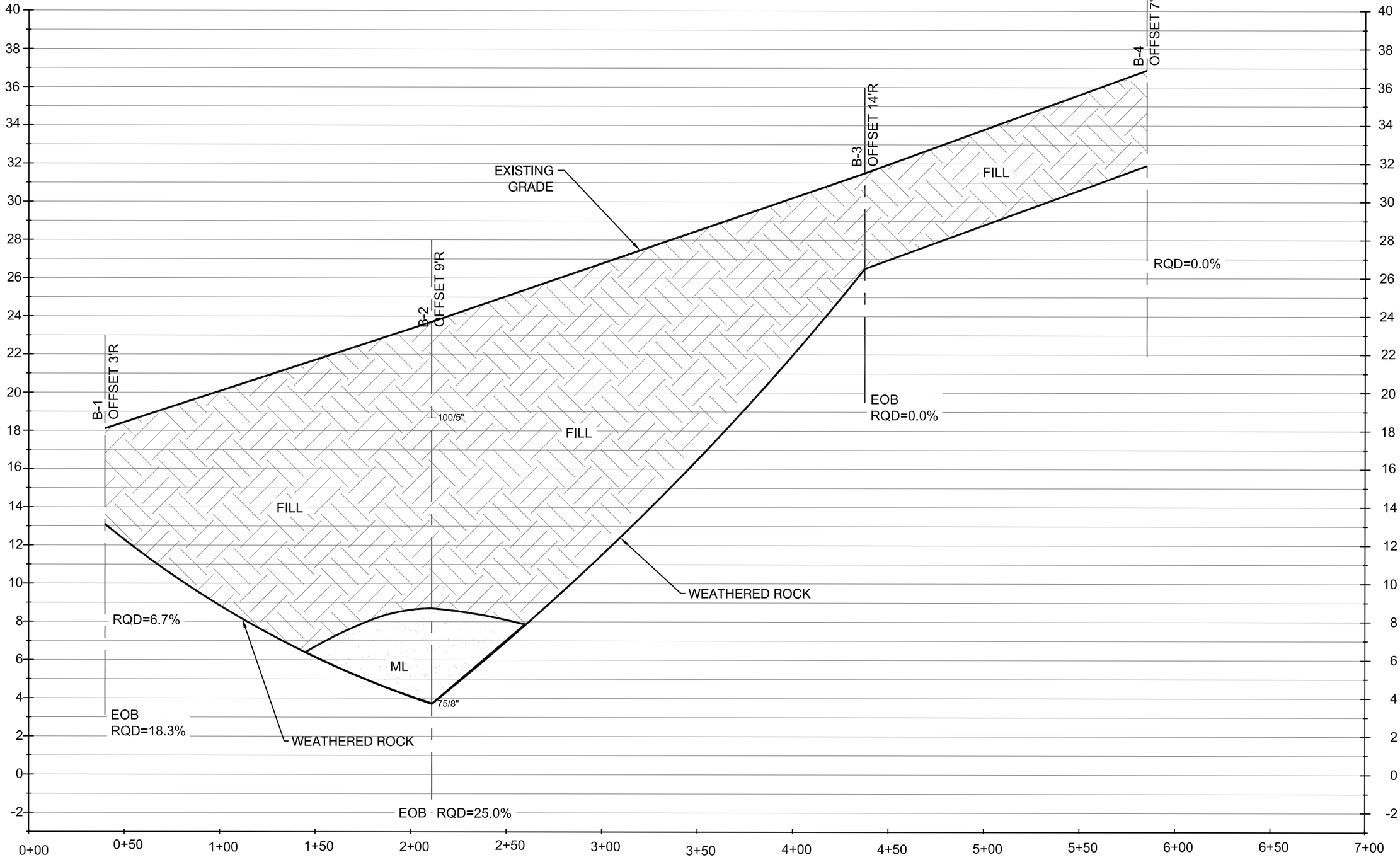
DRAWING NO.
FIG 4-4
9 OF 12 SHTS

ELEVATION



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SCALE: 1"=50' HORIZ.
1"=5' VERT.

NO.	DATE	REVISION	BY

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PROJECT
BREACKNECK CONNECTOR TRAIL
BEACON, NEW YORK

SHEET TITLE
SOIL PROFILES
PROFILE E

PROJECT NO.	150769
SCALE	AS SHOWN
DATE	09-27-2016
DRAWN BY	BMH
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FIG 4-5
10 OF 12 SHTS

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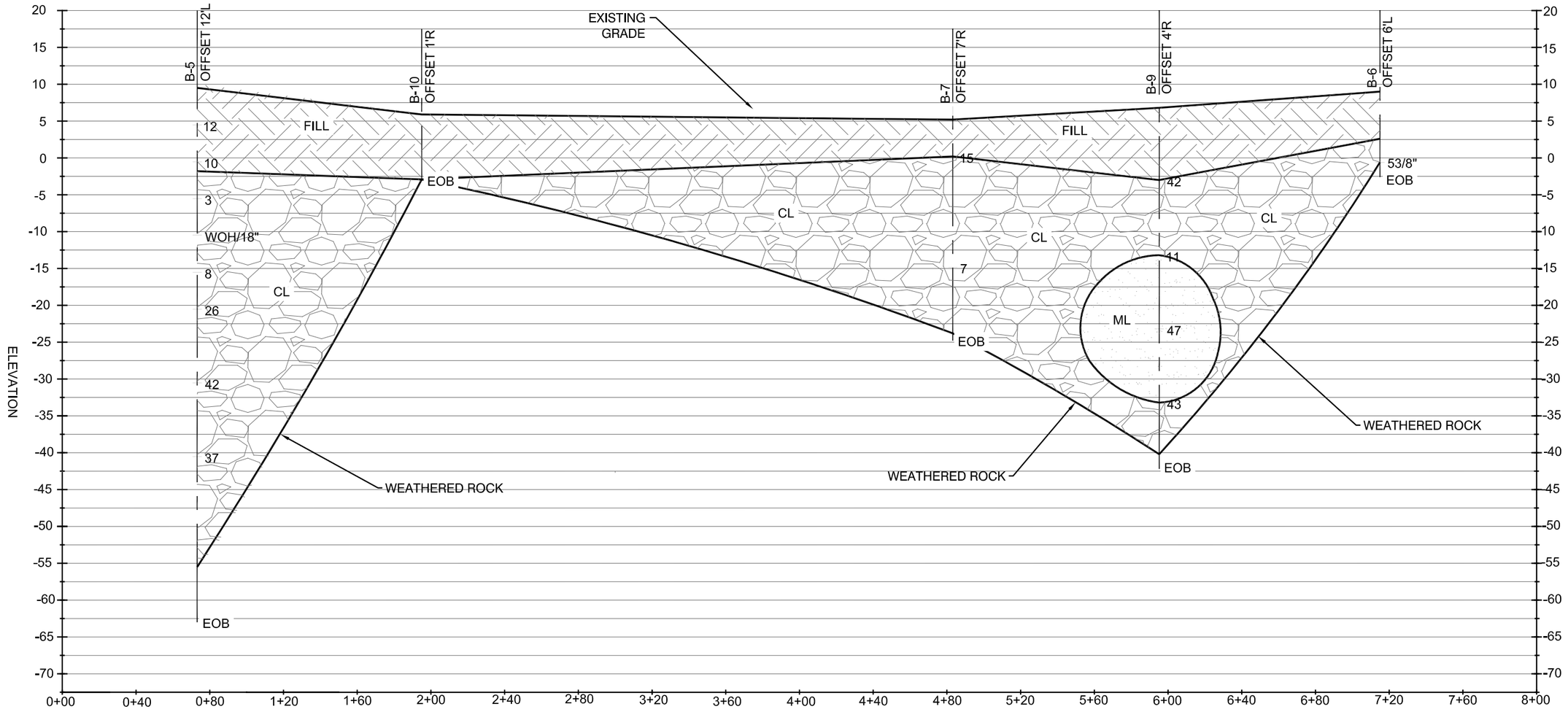


SCALE: 1"=60' HORIZ.

1"=15' VERT.

NOTE: (1) SOIL AND BEDROCK LAYERS/STRATA SHOWN IN PROFILE INTERPOLATED BASED ON SOIL DATA ENCOUNTERED AT BORING LOCATIONS. ACTUAL SOIL CONDITIONS MAY VARY.

NO.	DATE	REVISION	BY

McLaren Engineering Group
applied ingenuity
McLaren Engineering Group, Inc.
100 Snake Hill Road, West Nyack, NY 10994
Tel. (845) 353-6400 Fax. (845) 353-6509
www.mgmclaren.com

PROJECT

BREACKNECK
CONNECTOR TRAIL

NEW YORK

BEACON.

SHEET TITLE

SOIL PROFILES
PROFILE F

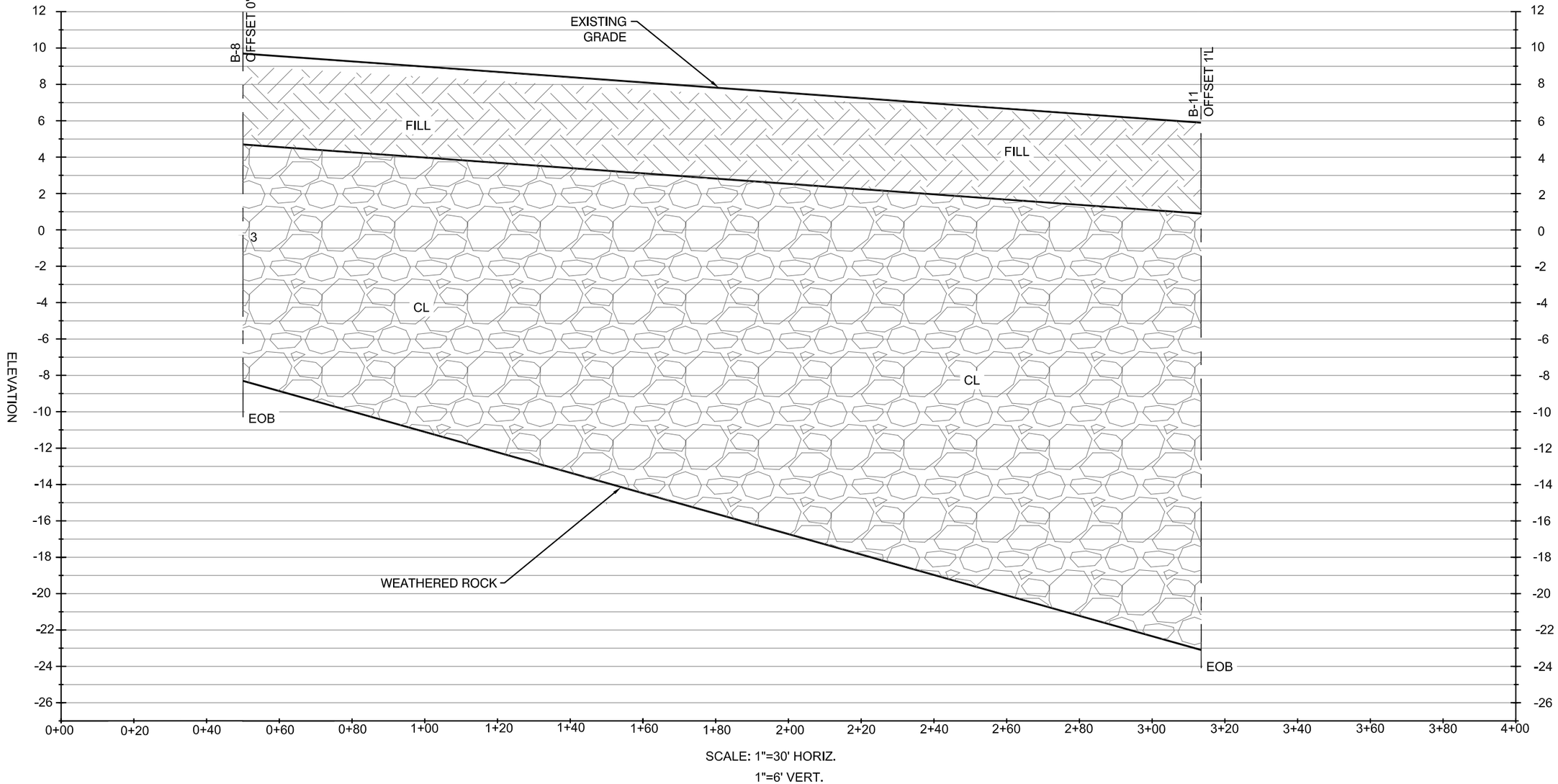
PROJECT NO.	150769
SCALE	AS SHOWN
DATE	09-27-2016
DRAWN BY	BMH
CHECKED BY	LAD

DRAWING NO.

FIG 4-6

11 OF 12 SHTS

FILE NAME: P:\Proj\150\150769\10_Dwgs\CADD\Boring Location Plan.dwg PLOT TIME: Fri, 14 Oct 2016 - 1:19pm LAST SAVE: Fri, 14 Oct 2016 - 1:08pm BY: Bfloggerty



SCALE: 1"=30' HORIZ.
1"=6' VERT.

NOTE: (1) SOIL AND BEDROCK LAYERS/STRATA SHOWN IN PROFILE INTERPOLATED BASED ON SOIL DATA ENCOUNTERED AT BORING LOCATIONS. ACTUAL SOIL CONDITIONS MAY VARY.

NO.	DATE	REVISION	BY

McLaren Engineering Group
applied ingenuity
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100 Snake Hill Road, West Nyack, NY 10994
Tel. (845) 353-6400 Fax. (845) 353-6509
www.mgmclaren.com

PROJECT
BREACKNECK CONNECTOR TRAIL
BEACON, NEW YORK

SHEET TITLE
SOIL PROFILES
PROFILE G

PROJECT NO.	150769
SCALE	AS SHOWN
DATE	09-27-2016
DRAWN BY	BMH
CHECKED BY	LAD
DRAWING NO.	FIG 4-7
	12 OF 12 SHTS

Appendix D
Boring Logs

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: McLaren Engineering Group	SHEET 1 OF 1 HOLE NO. B-1
	PROJECT NO. G190-0492-16	
	PROJECT NAME Route 9D	BORING LOCATIONS per Plan
FOREMAN - DRILLER BD/ms	LOCATION Cold Spring, NY	
INSPECTOR		

	CASING	SAMPLER	CORE BAR
TYPE	HSA/FW	SS	NWD4
SIZE I.D.	3¼"/3"	1 3/8"	2⅛"
HAMMER WT.		140#	BIT
HAMMER FALL		30"	dia

OFFSET	
DATE START	9/9/16
DATE FINISH	9/9/16
SURFACE ELEV.	
GROUND WATER ELEV.	

GROUND WATER OBSERVATIONS
AT none FT AFTER 0 HOURS
AT __FT AFTER __HOURS

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE Type	SAMPLE PEN	SAMPLE REC.	SAMPLE DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 6 - 12 12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
										2'0"	6" ASPHALT 18" CONCRETE
									dry		COBBLES or fractured BEDOCK (poss fill)
5										5'0"	AUGER REFUSAL
		1	c	60"	32"	10'0"	RQD = 7%	2			BEDROCK
								3			
								2			
								3			
10								2			
		2	c	60"	23"	15'0"	RQD = 17%	3			
								2			
								3			
								2			
15								3		15'0"	
											E.O.B. 15'0"
20											
25											
30											
35											
40											

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-1**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: McLaren Engineering Group	SHEET 1 OF 1 HOLE NO. B-2
	PROJECT NO. G190-0492-16	
	PROJECT NAME Route 9D	BORING LOCATIONS per Plan
FOREMAN - DRILLER BD/ms	LOCATION Cold Spring, NY	
INSPECTOR		

	CASING	SAMPLER	CORE BAR
TYPE	HSA/FW	SS	NWD4
SIZE I.D.	3¼"/3"	1 3/8"	2⅛"
HAMMER WT.		140#	BIT
HAMMER FALL		30"	dia

OFFSET	
DATE START	9/6/16
DATE FINISH	9/7/16
SURFACE ELEV.	
GROUND WATER ELEV.	

GROUND WATER OBSERVATIONS
AT none FT AFTER 0 HOURS
AT __FT AFTER __HOURS

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
										1'4"	4" ASPHALT / 12" CONCRETE
											BOULDERS & COBBLES
5									dry	5'0"	AUGER REFUSAL
		1	ss	5"	2"	5'5"	100/5"	2	v dense		BOUDLERS & COBBLES (fill)
		1	c	60"	20"	10'0"		3			
								2			
								3			
10								2			
		2	c	60"	18"	15'0"	RQD = 0%	1			
								2			
								1			
								2			
15								1		15'0"	
		3	c	60"	18"	20'0"	RQD = 0%	2			
								1			
								2			
								1			
20								2			
		2	ss	8"	1"	20'8"	25 / 50/2"		moist	20'8"	Brn FMC SAND, lit F gravel
		4	c	60"	45"	25'8"	RQD = 45%	2			BEDROCK
								3			
								3			
25								2			
								3		25'8"	
											E.O.B. 25'8"
30											
35											
40											

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-2**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: McLaren Engineering Group	SHEET 1 OF 1 HOLE NO. B-3
	PROJECT NO. G190-0492-16	
	PROJECT NAME Route 9D	BORING LOCATIONS per Plan
FOREMAN - DRILLER BD/bk	LOCATION Cold Spring, NY	
INSPECTOR		

	CASING	SAMPLER	CORE BAR
TYPE	HSA/FW	SS	NWD4
SIZE I.D.	3¼"/3"	1 3/8"	2⅛"
HAMMER WT.		140#	BIT
HAMMER FALL		30"	dia

OFFSET	
DATE START	9/7/16
DATE FINISH	9/8/16
SURFACE ELEV.	
GROUND WATER ELEV.	

GROUND WATER OBSERVATIONS
AT none FT AFTER 0 HOURS
AT __FT AFTER __HOURS

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 | 6 - 12 | 12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
									dry/moist	1'4"	4" ASPHALT / 12" CONCRETE
											COBBLES & BOULDERS
5										5'0"	AUGER REFUSAL
										5'6"	COBBLES & BOULDERS (fill)
										7'0"	poss partially decomposed BEDROCK
		1	c	60"	22"	12'0"	RQD = 7%	2			BEDROCK
								3			
10								2			
								3			
								2		12'0"	
											E.O.B. 12'0"
15											
20											
25											
30											
35											
40											

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-3**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST
WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS
SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER
PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: McLaren Engineering Group	SHEET 1 OF 1 HOLE NO. B-4
	PROJECT NO. G190-0492-16	
	PROJECT NAME Route 9D	BORING LOCATIONS per Plan
FOREMAN - DRILLER BD/bk	LOCATION Cold Spring, NY	
INSPECTOR		

	CASING	SAMPLER	CORE BAR
TYPE	HSA/FW	SS	NWD4
SIZE I.D.	3¼"/3"	1 3/8"	2⅛"
HAMMER WT.		140#	BIT
HAMMER FALL		30"	dia

OFFSET	
DATE START	9/8/16
DATE FINISH	9/8/16
SURFACE ELEV.	
GROUND WATER ELEV.	

GROUND WATER OBSERVATIONS
AT none FT AFTER 0 HOURS
AT __FT AFTER __HOURS

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE Type	SAMPLE PEN	SAMPLE REC.	SAMPLE DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
										2'0"	6" ASPHALT / 18" CONCRETE
									dry/moist	4'0"	COBBLES, BOULDERS and/or fractured BEDROCK (poss fill)
5										5'0"	BEDROCK or BOULDERS AUGER REFUSAL
		1	c	60"	15"	10'0"	RQD = 0%	2			BEDROCK (fractured)
								3			
								2			
								3			
10								2			
		2	c	60"	18"	15'0"	RQD = 7%	3			
								2			
								3			
								2			
15								3		15'0"	
											E.O.B. 15'0"
20											
25											
30											
35											
40											

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-4**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST
WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS
SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER
PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: McLaren Engineering Group	SHEET 1 OF 2 HOLE NO. B-5
	PROJECT NO. G190-0492-16	
	PROJECT NAME Route 9D	BORING LOCATIONS per Plan
FOREMAN - DRILLER BD/ms	LOCATION Cold Spring, NY	
INSPECTOR		OFFSET

	CASING	SAMPLER	CORE BAR
TYPE	HSA	SS	
SIZE I.D.	3¼"	1 3/8"	
HAMMER WT.		140#	BIT
HAMMER FALL		30"	

DATE START	9/21/16
DATE FINISH	9/21/16
SURFACE ELEV.	
GROUND WATER ELEV.	

GROUND WATER OBSERVATIONS
AT 17 FT AFTER 0 HOURS
AT __FT AFTER __HOURS

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
											Brn FMC SAND & FC GRAVEL, COBBLES, RUBBLE
5										5'0"	
		1	ss	24"	6"	7'0"	5 / 5 6 / 21		moist stiff		Blk SILT, tr asphalt
10		2	ss	24"	10"	12'0"	3 / 5 5 / 7		moist stiff		Lt Brn SILTY CLAY, sm F gravel, C sand
15		3	ss	24"	20"	17'0"	1 / 1 2 / 2		moist soft		Gry SILTY CLAY, tr peat (organics)
20		4	ss	24"	24"	22'0"	WOH / 18" 2		wet v soft		SAME
25		5	ss	24"	24"	27'0"	3 / 2 6 / 8		wet stiff		SAME; lit wood Gry SILTY CLAY, tr peat (organics)
30		6	ss	24"	18"	32'0"	5 / 10 10 / 20		wet v stiff		Gry SILTY CLAY
35											
40											

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-5**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST
WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE
SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM
PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: McLaren Engineering Group	SHEET 2 OF 2 HOLE NO. B-5
	PROJECT NO. G190-0492-16	
	PROJECT NAME Route 9D	BORING LOCATIONS per Plan
FOREMAN - DRILLER BD/ms	LOCATION Cold Spring, NY	
INSPECTOR		OFFSET
GROUND WATER OBSERVATIONS AT 17 FT AFTER 0 HOURS AT __FT AFTER __HOURS	TYPE: CASING HSA, SAMPLER SS, CORE BAR SIZE I.D.: CASING 3¼", SAMPLER 1 3/8" HAMMER WT.: SAMPLER 140#, CORE BAR BIT HAMMER FALL: SAMPLER 30"	DATE START 9/21/16 DATE FINISH 9/21/16 SURFACE ELEV. GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE Type	SAMPLE PEN	SAMPLE REC.	SAMPLE DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		7	ss	24"	18"	42'0"	9	19			wet		Gry SILTY CLAY, tr F gravel
							23	24			hard		
45													
50													
		8	ss	24"	18"	52'0"	14	20			wet		Gry Brn SILT, tr clay
							17	23			hard		(50' switched to tri cone roller bit & water)
55													
60													
65												65'0"	
													poss weathered BEDROCK
70													
												73'0"	AUGER REFUSAL
75													E.O.B. 73'0"
80													

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-5**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE

M = MEDIUM

F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: McLaren Engineering Group	SHEET 1 OF 1 HOLE NO. B-6
	PROJECT NO. G190-0492-16	
	PROJECT NAME Route 9D	BORING LOCATIONS per Plan
FOREMAN - DRILLER BD/ms	LOCATION Cold Spring, NY	
INSPECTOR		OFFSET

	CASING	SAMPLER	CORE BAR
TYPE	HSA	SS	
SIZE I.D.	3¾"	1 3/8"	
HAMMER WT.		140#	BIT
HAMMER FALL		30"	

DATE START	9/22/16
DATE FINISH	9/22/16
SURFACE ELEV.	
GROUND WATER ELEV.	

GROUND WATER OBSERVATIONS
AT none FT AFTER 0 HOURS
AT __FT AFTER __HOURS

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE Type	SAMPLE PEN	SAMPLE REC.	SAMPLE DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
0											moist		Blk SILT, sm FM sand
5											moist		Brn SILT, sm FM sand, tr F gravel
10		1	ss	11"	4"	10'11"	3	50/5"			moist	10'9"	Gry/Brn SILTY CLAY
											hard		weathered BEDROCK frags
												11'4"	AUGER REFUSAL
15													E.O.B. 11'4"
20													
25													
30													
35													
40													

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. HOLE NO. B-6

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC.	CLIENT: McLaren Engineering Group	SHEET 1 OF 1
90 DONOVAN RD.		HOLE NO. B-7
OXFORD, CT 06478	PROJECT NO. G190-0492-16	
CT (203) 262-9328	PROJECT NAME	BORING LOCATIONS
NY (914) 946-4850	Route 9D	per Plan
FOREMAN - DRILLER	LOCATION Cold Spring, NY	
BD/ms		
INSPECTOR		OFFSET

	CASING	SAMPLER	CORE BAR		
TYPE	HSA	SS		DATE START	9/22/16
SIZE I.D.	3¾"	1 3/8"		DATE FINISH	9/22/16
HAMMER WT.		140#	BIT	SURFACE ELEV.	
HAMMER FALL		30"		GROUND WATER ELEV.	

GROUND WATER OBSERVATIONS
AT 10 FT AFTER 0 HOURS
AT __FT AFTER __HOURS

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18			CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
												1'0"	C GRAVEL
											moist		Blk SILT, sm FM sand, F gravel
5													
10													
		1	ss	24"	14"	12'0"	4	6			moist		Brn SILTY CLAY
							9	10			stiff		
15													
20													
		2	ss	24"	24"	22'0"	WOH	3			moist		Gry SILTY CLAY, tr peat
							4	8			stiff		
25													
												29'0"	
30												30'0"	poss weathered BEDROCK AUGER REFUSAL
													E.O.B. 30'0"
35													
40													

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. HOLE NO. B-7

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST
WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS
SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER
PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: McLaren Engineering Group	SHEET 1 OF 1 HOLE NO. B-8
	PROJECT NO. G190-0492-16	
	PROJECT NAME Route 9D	BORING LOCATIONS per Plan
FOREMAN - DRILLER BD/ms	LOCATION Cold Spring, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR	OFFSET
	TYPE: HSA / SS	DATE START 9/22/16
GROUND WATER OBSERVATIONS AT 10 FT AFTER 0 HOURS AT __FT AFTER __HOURS	SIZE I.D.: 3¾" / 1 3/8"	DATE FINISH 9/22/16
	HAMMER WT.: 140# / BIT	SURFACE ELEV.
	HAMMER FALL: 30"	GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE Type	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
											moist	0'9"	C GRAVEL
													Brn SILTY CLAY, sm FM sand, tr F gravel
5													
10		1	ss	24"	1"	12'0"	5	2			wet		Gry CLAY
							1	1			soft		
15												18'0"	
20												20'0"	poss weathered BEDROCK AUGER REFUSAL
													E.O.B. 20'0"
25													
30													
35													
40													

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. HOLE NO. B-8

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE

M = MEDIUM

F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: McLaren Engineering Group	SHEET 1 OF 2 HOLE NO. B-9
	PROJECT NO. G190-0492-16	
	PROJECT NAME Route 9D	BORING LOCATIONS per Plan
FOREMAN - DRILLER BD/ms	LOCATION Cold Spring, NY	
INSPECTOR		OFFSET

	CASING	SAMPLER	CORE BAR
TYPE	HSA	SS	
SIZE I.D.	3¾"	1 3/8"	
HAMMER WT.		140#	BIT
HAMMER FALL		30"	

DATE START	9/23/16
DATE FINISH	9/23/16
SURFACE ELEV.	
GROUND WATER ELEV.	

GROUND WATER OBSERVATIONS
AT 23 FT AFTER 0 HOURS
AT __FT AFTER __HOURS

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
												1'0"	C GRAVEL
											moist		Blk SILT, sm FMC sand
5													
10													
		1	ss	24"	8"	12'0"	5	24			moist		Gry SILTY CLAY
							13	11			hard		
		1	st	30"	8"	14'0"							
15													
20												20'0"	
		3	ss	24"	20"	22'0"	3	4			moist		Gry VF-F SAND & SILT
							7	11			compact		
25													
30												30'0"	
		4	ss	24"	1"	32'0"	8	17			wet		Gry SILT & FM SAND, tr C sand
							30	50			hard		
35													
40													

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. HOLE NO. B-9

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: McLaren Engineering Group	SHEET 2 OF 2 HOLE NO. B-9
	PROJECT NO. G190-0492-16	
	PROJECT NAME Route 9D	BORING LOCATIONS per Plan
FOREMAN - DRILLER BD/ms	LOCATION Cold Spring, NY	
INSPECTOR		OFFSET
GROUND WATER OBSERVATIONS AT 23 FT AFTER 0 HOURS AT __ FT AFTER __ HOURS	TYPE: CASING HSA, SAMPLER SS, CORE BAR SIZE I.D.: 3¾", 1 3/8" HAMMER WT.: 140#, BIT HAMMER FALL: 30"	DATE START 9/23/16 DATE FINISH 9/23/16 SURFACE ELEV. GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		5	ss	24"	18"	42'0"	8 / 18		wet / hard		Brn SILTY CLAY, tr F gravel
							25 / 30				
45										47'0"	
										49'0"	poss weathered BEDROCK AUGER REFUSAL
50											E.O.B. 49'0"
55											
60											
65											
70											
75											
80											

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. HOLE NO. B-9

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: McLaren Engineering Group	SHEET 1 OF 1 HOLE NO. B-10
	PROJECT NO. G190-0492-16	
	PROJECT NAME Route 9D	BORING LOCATIONS per Plan
FOREMAN - DRILLER BD/ms	LOCATION Cold Spring, NY	
INSPECTOR		

	CASING	SAMPLER	CORE BAR
TYPE	HSA	SS	
SIZE I.D.	3¾"	1 3/8"	
HAMMER WT.		140#	BIT
HAMMER FALL		30"	

OFFSET	
DATE START	9/23/16
DATE FINISH	9/23/16
SURFACE ELEV.	
GROUND WATER ELEV.	

GROUND WATER OBSERVATIONS
AT none FT AFTER 0 HOURS
AT __FT AFTER __HOURS

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE Type	SAMPLE PEN	SAMPLE REC.	SAMPLE DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 6 - 12 12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
									moist	1'0"	C GRAVEL
											Blk FMC SAND & COBBLES
5										8'0"	
										9'0"	pos weathered BEDROCK AUGER RREFUSAL
10											E.O.B. 9'0"
15											
20											
25											
30											
35											
40											

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. HOLE NO. B-10

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST
WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE
SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM
PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: McLaren Engineering Group	SHEET 1 OF 1 HOLE NO. B-11
	PROJECT NO. G190-0492-16	
	PROJECT NAME Route 9D	BORING LOCATIONS per Plan
FOREMAN - DRILLER BD/ms	LOCATION Cold Spring, NY	
INSPECTOR		

	CASING	SAMPLER	CORE BAR
TYPE	HSA	SS	
SIZE I.D.	3¾"	1 3/8"	
HAMMER WT.		140#	BIT
HAMMER FALL		30"	

OFFSET	
DATE START	9/23/16
DATE FINISH	9/23/16
SURFACE ELEV.	
GROUND WATER ELEV.	

GROUND WATER OBSERVATIONS
AT 10 FT AFTER 0 HOURS
AT __FT AFTER __HOURS

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE Type	SAMPLE PEN	SAMPLE REC.	SAMPLE DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 6 - 12 12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
0											C GRAVEL
											Blk SILT & FMC SAND
5									moist		Brn SILT, sm FMC sand
10										10'0"	
											Gry SILTY CLAY
15		1	st	24"	24"	17'0"			wet		
20											
25											
30										30'0"	AUGER REFUSAL
											E.O.B. 30'0"
35											
40											

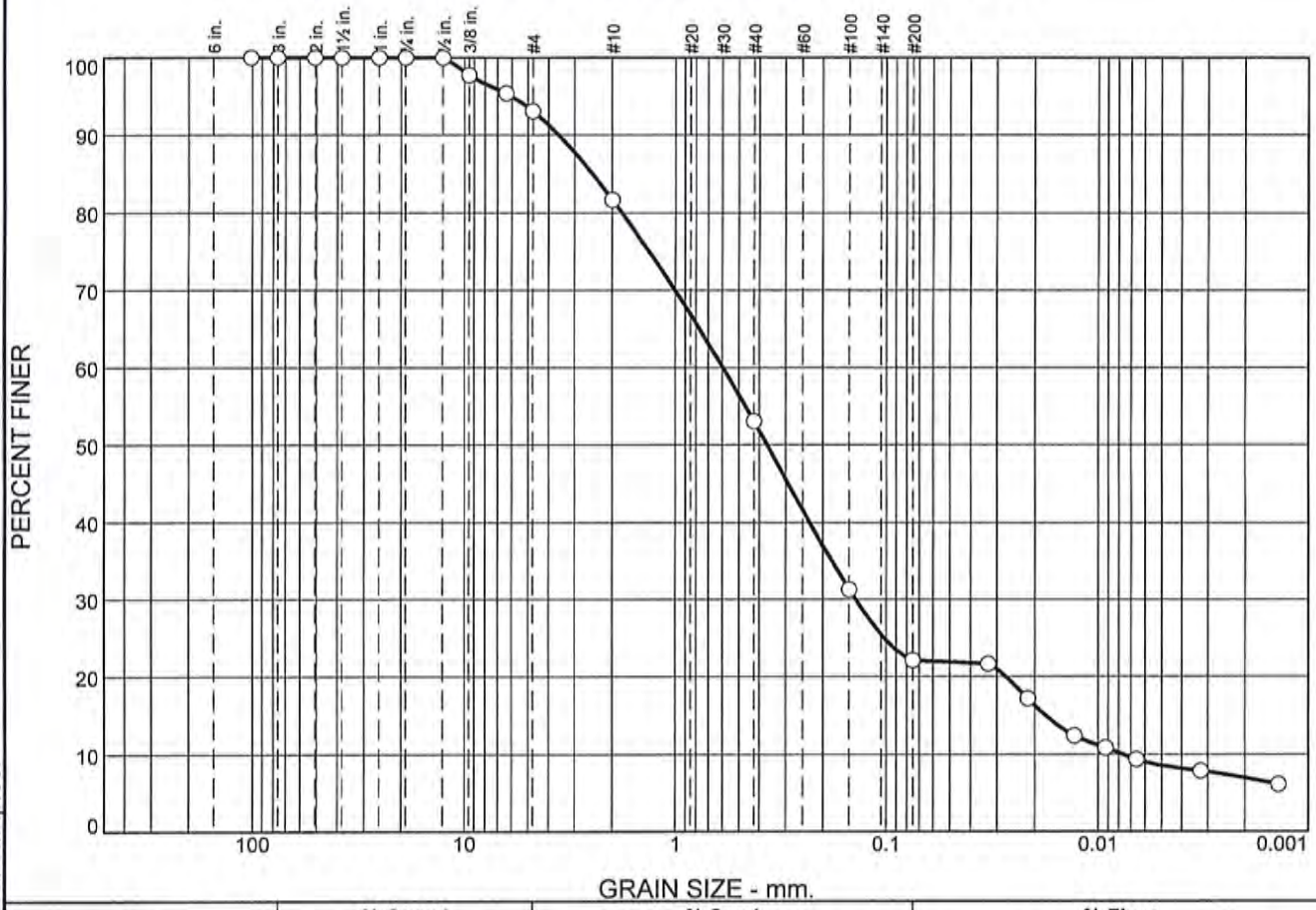
NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-11**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST
WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE
SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM
PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

Appendix E
Soil Laboratory Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.9	11.4	28.7	30.9	13.5	8.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	100.0		
3/8	97.7		
1/4	95.4		
#4	93.1		
#10	81.7		
#40	53.0		
#100	31.3		
#200	22.1		

* (no specification provided)

Material Description

B5 S1
silty sand

Atterberg Limits

PL= NP LL= 10 PI= NP

Coefficients

D_{90}= 3.5827 D_{85}= 2.4810 D_{60}= 0.5976
D_{50}= 0.3690 D_{30}= 0.1398 D_{15}= 0.0178
D_{10}= 0.0076 C_u= 78.81 C_c= 4.32

Classification

USCS= AASHTO=

Remarks

ASTM D421/422

Source of Sample: Boring Samples **Depth:** 5'-7'
Sample Number: 01-092616 **Date:** 09-26-16

FAIRWAY TESTING CO., INC.

Client: McLaren Engineering Group
Project: Fjord Trail Breakneck Connector
Project No: **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

9/29/2016

Client: McLaren Engineering Group
Project: Fjord Trail Breakneck Connector
Location: Boring Samples
Depth: 5'-7'
Sample Number: 01-092616
Material Description: B5 S1
silty sand
Date: 09-26-16
PL: NP
Testing Remarks: ASTM D421/422

Sieve Test Data

Sieve Opening Size	Percent Finer
4	100.0
3	100.0
2	100.0
1.5	100.0
1	100.0
3/4	100.0
1/2	100.0
3/8	97.7
1/4	95.4
#4	93.1
#10	81.7
#40	53.0
#100	31.3
#200	22.1

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 81.7
Weight of hydrometer sample =87.3
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = 0
Meniscus correction only = 0.0
Specific gravity of solids = 2.65
Hydrometer type = 151H
Hydrometer effective depth equation: L = 16.294964 - 0.2645 x Rm

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer
2.00	23.0	1.0140	1.0144	0.0132	14.0	12.6	0.0330	21.7
5.00	23.0	1.0110	1.0114	0.0132	11.0	13.4	0.0215	17.2
15.00	22.0	1.0080	1.0083	0.0133	8.0	14.2	0.0129	12.4
30.00	22.0	1.0070	1.0073	0.0133	7.0	14.4	0.0092	10.9
60.00	22.0	1.0060	1.0063	0.0133	6.0	14.7	0.0066	9.4
250.00	22.0	1.0050	1.0053	0.0133	5.0	15.0	0.0033	7.9
1440.00	21.0	1.0040	1.0041	0.0135	4.0	15.2	0.0014	6.2

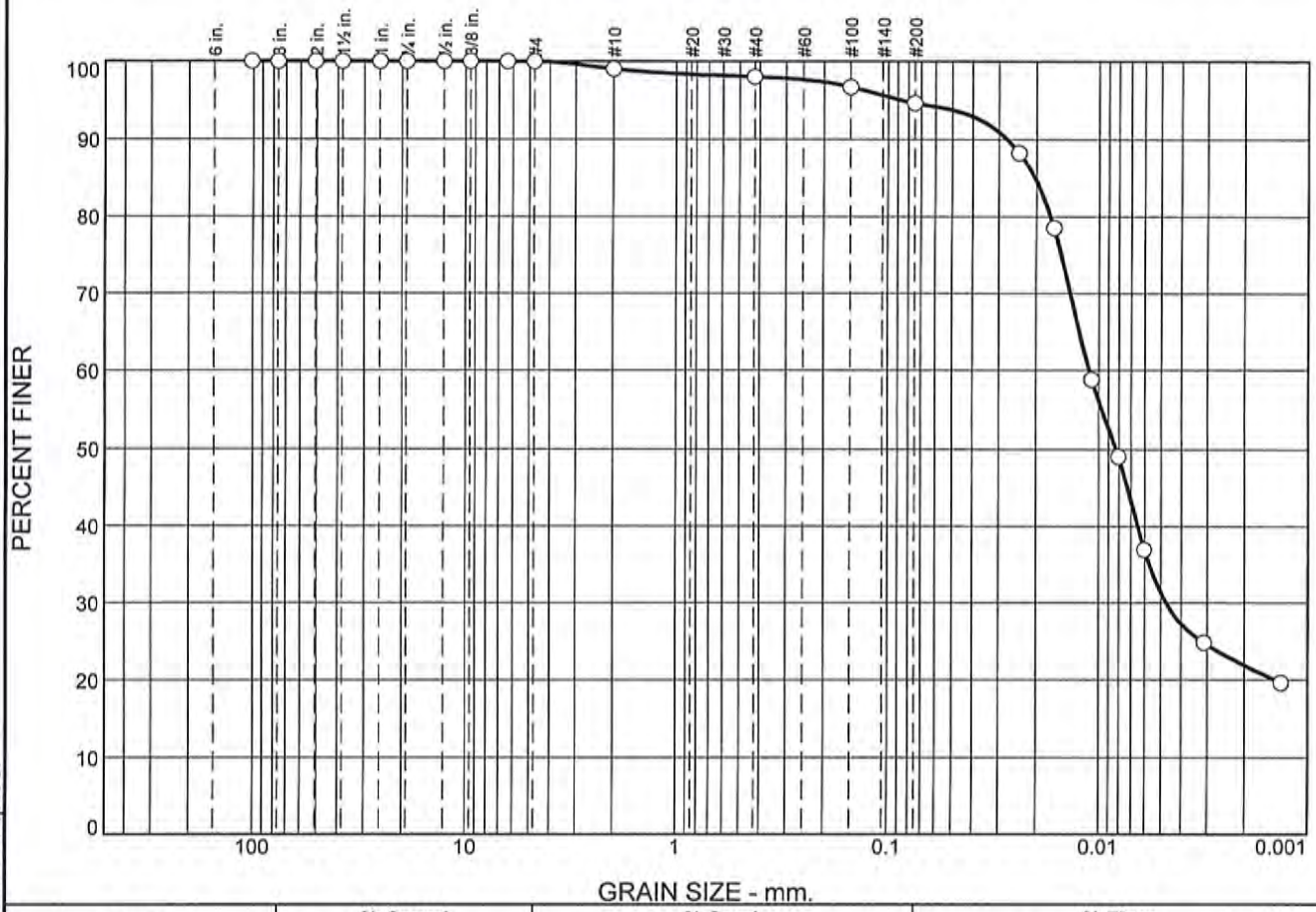
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	6.9	6.9	11.4	28.7	30.9	71.0	13.5	8.6	22.1

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.0076	0.0178	0.0273	0.1398	0.2313	0.3690	0.5976	1.7982	2.4810	3.5827	5.9692

Fineness Modulus	C_u	C_c
2.15	78.81	4.32

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.0	1.0	3.4	63.4	31.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	100.0		
3/8	100.0		
1/4	100.0		
#4	100.0		
#10	99.0		
#40	98.0		
#100	96.7		
#200	94.6		

* (no specification provided)

Material Description

B5 S4
lean clay

Atterberg Limits

PL= 22 LL= 49 PI= 27

Coefficients

D_{90}= 0.0276 D_{85}= 0.0203 D_{60}= 0.0112
D_{50}= 0.0083 D_{30}= 0.0047 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-7-6(28)

Remarks

ASTM D421/422

Source of Sample: Boring Samples **Depth:** 20'-22'
Sample Number: 02-092616 **Date:** 09-26-16

FAIRWAY TESTING CO., INC.

Client: McLaren Engineering Group
Project: Fjord Trail Breakneck Connector
Project No: **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

9/29/2016

Client: McLaren Engineering Group
Project: Fjord Trail Breakneck Connector
Location: Boring Samples
Depth: 20'-22' **Sample Number:** 02-092616
Material Description: B5 S4
lean clay
Date: 09-26-16 **PL:** 22 **LL:** 49 **PI:** 27
AASHTO Classification: A-7-6(28)
Testing Remarks: ASTM D421/422

Sieve Test Data

Sieve Opening Size	Percent Finer
4	100.0
3	100.0
2	100.0
1.5	100.0
1	100.0
3/4	100.0
1/2	100.0
3/8	100.0
1/4	100.0
#4	100.0
#10	99.0
#40	98.0
#100	96.7
#200	94.6

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 99.0
Weight of hydrometer sample =65.6
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = 0
Meniscus correction only = 0.0
Specific gravity of solids = 2.65
Hydrometer type = 151H
Hydrometer effective depth equation: L = 16.294964 - 0.2645 x Rm

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer
2.00	23.0	1.0360	1.0364	0.0132	36.0	6.8	0.0242	88.3
5.00	23.0	1.0320	1.0324	0.0132	32.0	7.8	0.0165	78.6
15.00	22.0	1.0240	1.0243	0.0133	24.0	9.9	0.0108	58.8
30.00	22.0	1.0200	1.0203	0.0133	20.0	11.0	0.0081	49.1
60.00	22.0	1.0150	1.0153	0.0133	15.0	12.3	0.0060	37.0
250.00	22.0	1.0100	1.0103	0.0133	10.0	13.6	0.0031	24.8
1440.00	21.0	1.0080	1.0081	0.0135	8.0	14.2	0.0013	19.7

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	1.0	1.0	3.4	5.4	63.4	31.2	94.6

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
			0.0014	0.0047	0.0065	0.0083	0.0112	0.0171	0.0203	0.0276	0.0871

Fineness Modulus
0.10