Technical Design Memo

Client:	Ohio Department of Transportation, District 10		
Project:	**NOB-77-12.36 (Task Order 10-KK)** **PID 119893**		
HDR Project No:	10381931	Rev:	0
Calculation No:	1	Page:	1 of 86
Title:	Landslide Remediation Analyses and Design		
Purpose:	Perform slope stability analyses for the design of a landslide repair of the embankment slope located below the northbound travel lane of Interstate 77 (I-77) in Noble County, Ohio.		
Originator:	MM	Date:	1/03/2024
Checked by:	AKB	Date:	1/05/2024
QC Review by:	DMV	Date:	1/25/2024

Summary

1. A landslide has occurred on the slope below I-77 near mile marker 12.36 in Noble County, Ohio. The project location is shown on the attached Site Vicinity and Topographic Map. Based on observations gathered during the site reconnaissance performed on August 30, 2023, coupled with the findings from the geotechnical explorations performed from November 6 to 9, 2023, the slope instability may be mitigated by excavation of the failed slide mass and reconstruction of the slope. The slope reconstruction is anticipated to include the construction of a shear key at the toe of the slope and the installation of slope drains along the benched excavation to create a stable configuration. The recommended repair also allows for continued vehicle use of the northbound lanes of US 33 during construction. Presented herein are the discussion and evaluation of the existing conditions at the site, as well as the proposed geometry of the shear key and benching required to stabilize the slope. This design assumes that the topography and slope geometry as presented in the surveyed cross sections are representative of the current field conditions.

2. The geotechnical exploration program consisted of a series of 3 test borings (designated as Borings B-001-0-23, B-001-1-23, and B-001-2-23) to characterize the subsurface profile in the vicinity of the existing landslide and develop the repair. One test boring (B-001-0-23) was drilled

in the northbound shoulder of I-77, while the remaining two borings were drilled on the embankment slope below the roadway at the locations shown on the attached Boring Location Plan. The typed boring logs are also included in the attachments. The soil profile, as encountered in the borings, generally consisted of a thick upper layer of stiff to very stiff embankment fill, underlain by a thin layer of very stiff to hard residuum. The embankment fill appears to consist mainly of shale and claystone presumably from nearby cuts and borrow sources, which would account for the shale and stone fragments noted throughout the fill, as well as the elevated consistencies of the encountered materials. These overburden soils were underlain by moderately strong sandstone bedrock. The recovery rates for the sandstone were 100% in all three borings, with the rock quality designation (RQD) ranging from 52% to 93%. This sandstone is also present in outcrops found at lower elevations along the slope at and below the existing headwall for two 36-inch diameter corrugated metal pipe (CMP) culverts which pass beneath I-77 within the project location. Representative photographs of these outcrops as well as other areas of interest are included in the attachments.

Free water was not encountered in any of the borings during drilling. As the borings were backfilled upon completion given their locations in proximity to the roadway and challenging steep slopes, delayed water level readings were not obtained. However, small ditches with flowing and stagnant water were observed within and adjacent to the slide mass during both the site reconnaissance and the subsurface exploration program. The ground surface was also noted to be soft and saturated, with hydrophilic vegetation observed just above the head scarp. This observation corresponds with the existing wetland between about El. 845 and El. 853 as noted in the survey basemaps.

3. Noble County is located within the Marietta Plateau region of the Allegheny (Kanawha) Plateaus section of the unglaciated and dissected Appalachian Plateaus province, which is described as dissected, high-relief terrain prone to landslide activity and mainly composed of fine-grained rocks, red shales, and red residual soils. The soils in the Marietta Plateau region are typically identified as Pleistocene (Teays)-age Minford clays and/or red and brown colluvial silty-clay loam landslide deposits. The surficial materials within Noble County itself largely consist of colluvium and residuum derived from the underlying sedimentary bedrock, with lesser amounts of alluvial soils found alongside the various streams.

Noble County primarily consists of steep hills and ridges with intervening valleys, with the central part of the county further characterized by broad, gently sloping, loess covered ridgetops at slightly lower elevations than those ridges situated in the northern reaches of the county. The central portion of Noble County is primarily drained by the West Fork of Duck Creek and its tributaries. The project site itself is drained directly by an unnamed tributary of Wolf Run. This tributary is conveyed under I-77 by two 36-inch diameter CMPs and drains into Wolf Run Lake approximately 200 feet east of the culverts' outlet.

4. The bedrock at the project site is mapped as Pennsylvanian-age Conemaugh Group as shown in the attachments. The Conemaugh Group consists of mudstone, sandstone, shale, and siltstone, with minor amounts of limestone and coal. The main coal seams of note within the Conemaugh

Group are the Upper Freeport No. 7 and Middle Kittanning No. 6. Several abandoned underground mines are located within 2 miles west and south of the project site. The nearest abandoned underground mine is located 0.25 mile south of the project site. Documentation from the Ohio Department of Natural Resources (ODNR) indicates that the coal seam associated with this mine is the Upper Freeport No. 7, with the elevation of the coal seam being 570 feet. No significant mining activity is mapped at the project site itself according to information from the ODNR.

5. Review of FEMA flood maps for the area indicate that the project site is located in an area of minimal flood hazard (Zone X). The flood plain of Wolf Run Lake, located approximately 140 feet southeast of the project site, is designated as Zone A, which does not have a base flood elevation. However, based on elevations along the emergency spillway at the Wolf Run Lake Dam, a maximum flood elevation of approximately 803 feet is assumed.

6. A search of the available records on ODOT's Transportation Information Mapping System (TIMS) revealed one prior geotechnical exploration program with borings performed within the limits of the NOB-77-12.36 project site. These historic borings were performed in 1964 as part of the NOB-77-10.80 project. As this project entailed the construction of I-77, the historic geotechnical profile sheets indicate the current project site was formerly a small valley that was subsequently filled to an approximate height of 67 feet above the original groundline. The graphical logs for the three historic borings drilled within this valley at Sta. 653+50, Sta. 658+00, 90' left, and Sta. 658+20 along with the published laboratory test results identified the native soils as Silt and Clay (A-6a), Silty Clay (A-6b), and Clay (A-7-6) extending to refusal ranging from 7 to 13 feet below the original groundline. A rock section is also shown on the historic geotechnical profile sheets at Sta. 657+00, at offsets from 20 feet left to 135 feet right. This section as mapped indicates weak siliceous shale near El. 830, transitioning to shaly sandstone near El. 825, underlain by thick bedded sandstone below El. 820.

7. A generalized soil profile was developed for the selected design cross section at Sta. 655+50 based on the findings from Borings B-001-0-23, B-001-1-23, and B-001-2-23, as well as the field observations gathered over the course of our site reconnaissance and subsurface exploration program. Additionally, the historic cross-sections from the NOB-77-10.80 project were compared to the recent survey data to aid in reestablishing the slope geometry and original ground surface at Sta. 655+00 prior to the slope failure. (See the attached historic cross-section information.) The soil layering and top of rock profile are assumed to be depicted as shown graphically on the attached Slope/W output plots. As such, the locations of Borings B-001-0-23, B-001-1-23, and B-001-2-23 have been superimposed on the design section for illustrative purposes and ease of reference.

Limited groundwater information was available from the borings and published sources. However, elevated moisture contents were noted within the embankment fill, which may be a result of run-off infiltration and/or perched water conditions. These elevated moisture contents, encountered at El. 853.4 in Boring B-001-0-23 and from El. 847.2 to El. 844.2 in Boring B-001-1-23, roughly corresponded to the elevations of the noted hydrophilic vegetation on the slope.

Based on this information and the on-site observations, groundwater was modeled from the level of the elevated moisture contents in Borings B-001-0-23 and B-001-1-23, and extended along the ground surface from the head scarp to the toe of slope.

8. In accordance with ODOT Geotechnical Design Manual (GDM) recommendations, an initial set of soil strength parameters for the soil layers depicted on the output plots were selected based on the boring logs, laboratory tests, and published correlations of soil strength with SPT N_{60} values. A statistical basis for selecting the initial soil parameters was performed and is included in the attached printed spreadsheets entitled "Soil Strength Parameter Determination."

These initial parameters were then entered into the Slope/W slope stability modeling software to re-create the landslide observed in the field by simulating a series of trial searches to determine the critical mode of failure based on a Morgenstern-Price stability model. Additionally, the Slope/W optimization feature was utilized, which generates a hybrid circular and translational failure shape. Recognizing that a landslide had already occurred, the strength parameters within the existing soil layers were then adjusted to generate a reasonable slip surface (FS < 1.0) that is consistent with the field observations and engineering judgment. The back-calculated SLOPE/W output plots of the existing conditions are included, which illustrate the shapes of the generated failure surfaces.

The top of the critical failure surface generated by Slope/W (Factor of Safety = 0.99) intersected the ground surface at approximately 30 feet right of the observed/surveyed head scarp location at Station 655+75. As such, a second analysis was performed limiting the slip surface entry extents to the top of the existing scarp. This analysis indicated a Factor of Safety (FS) = 1.03, which is only slightly higher than the overall slope FS of 0.99. As such, the location of the critical failure surface appears plausible at Station 655+50 given the likely progressive nature of the slip. Each slope movement that occurs will promote additional movement uphill of the most recent failure due to the loss of passive resistance below, resulting in the propagation of the slope failure up the hillside.

9. Excavation and removal of the failed soil materials along the lower portion of the slope, construction of a shear key along the toe, and reconstruction of the slope using a stability berm constructed of dumped rock fill are recommended to stabilize the slope below I-77. As shown on the design cross-section in the attachments, the benched excavation is not anticipated to impact traffic along I-77 as there is an approximate 3.5-foot clearance between the edge of the paved shoulder and the crest of the temporary 1H:1V slope. However, a shoulder closure will be required given the limited distance between the edge of pavement and the top of the excavation, and possibly the use of temporary pavement should it be desired to keep both northbound lanes open during construction.

The temporary 1H:1V slope extends from near the crest of the embankment slope to an initial 6-foot-wide construction bench located at El. 875. Additional 6-foot-wide construction benches are spaced below this initial bench at 10-foot vertical intervals with 1H:1V backslopes until El. 855. The vertical spacing increases to 12 feet below this elevation and the bench width increases to 8

feet until the last bench located at EI. 809. A 1H:1V slope extends from this last bench to the bottom of the 35-foot wide shear key at approximate El. 804 (a minimum of 2 feet into sandstone bedrock given the weathered/augerable condition of the rock as encountered at Boring B-001-0-23) to key the reconstructed embankment into competent material. This benching scheme was developed in general accordance with Section 800 of the ODOT Geotechnical Design Manual (GDM), with all of the existing slide mass anticipated to be removed as part of the excavation process.

The embankment is to be reestablished utilizing a stability berm consisting of Type C dumped rock fill from the bottom of the shear key (approximate El. 804) to a 10-foot wide bench at El. 833. The face of the berm is to be constructed at an approximate 2H:1V slope angle from the toe of the slope, with some variation as needed to tie into the existing grades of the adjacent stable slopes. Above the bench at El. 833, the embankment is to be reconstructed at a 2H:1V slope utilizing Item 203 Embankment Fill. The stability analyses for this slope configuration indicate a FS > 1.30 for both short term (undrained) and long term (drained) conditions. Details of the shear key and excavation benching are shown on the attached design cross-sections.

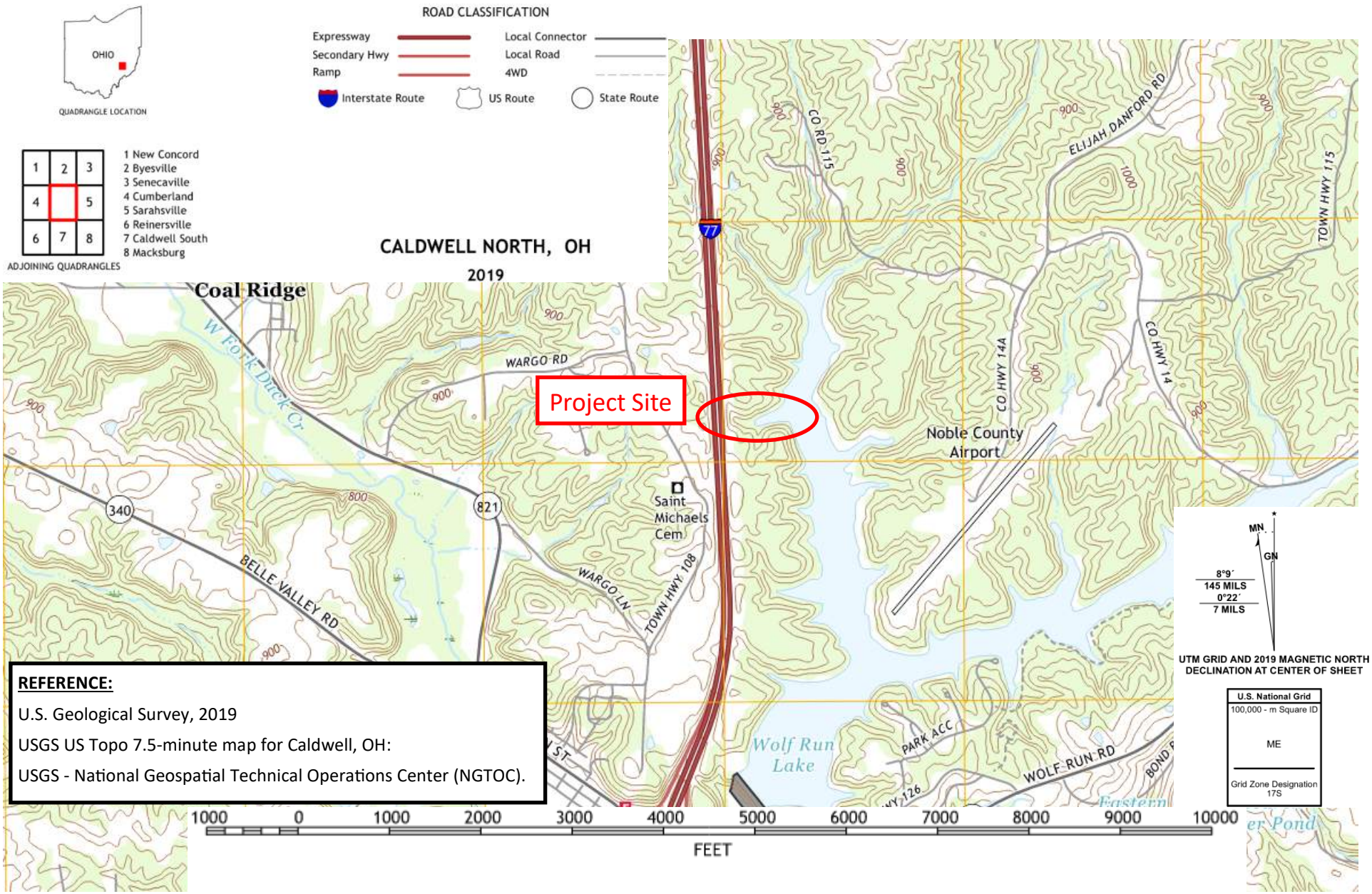
In addition to the cross-sections, a preliminary plan view has also been provided to aid in transitioning to the existing grade beyond the edges of the slip. Construction access is proposed from the north end of the site given the existing rock channel protection located on the slope along the south end of the project. Construction of a drainage gallery is proposed to drain the rock shear key into the existing creek bed below the site and ultimately into Wolf Run Lake. Slope drains should also be established on the back of each bench to assist with internal drainage of the embankment.

10. Upon establishing the criteria remediating the slope, analyses were performed to evaluate the constructability of the shear key and temporary benching scheme. The Factors of Safety were determined to be greater than the target Factor of Safety of 1.20 under short term (undrained) conditions for the temporary slopes. However, a Factor of Safety below 1.0 was obtained under long term (drained) conditions for the temporary slopes if the slope was to be left open for an extended period of time. As such, this temporary excavation shall not be left exposed any longer than necessary, with reconstruction of the slope to begin shortly after the excavation has been made. It is also recommended that when excavating for the shear key, no more than 50 feet along the back of the key be excavated without replacing with dumped rock fill. Finally, drainage and run-off should also be diverted away from the excavation during construction.

Should a higher factor of safety be required during construction, other cut-slope stability measures/configurations or sheet piling may be needed to maintain the slope during construction of the shear key and sidehill benches. Determination of temporary shoring (if necessary) is to be determined by the contractor.

Site Vicinity and Topographic Map

Site Vicinity and Topographic Map



REFERENCE:

U.S. Geological Survey, 2019

USGS US Topo 7.5-minute map for Caldwell, OH:

USGS - National Geospatial Technical Operations Center (NGTOC).

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

Boring Location Plan

BORING LOCATION PLAN

HORIZONTAL SCALE IN FEET
0 10 20 40

653 654 655 656 657 658

℄ EX. R/W I-77

I-77 (NORTH)

B-001-0-23

B-001-1-23

B-001-2-23

EX. STORM SEWER

EX 36" STORM

EX. RIP RAP

EX. WETLAND

EDGE OF SLIP

EX. RIP RAP

Ex LA

Ex LA

Ex LA

Ex LA

Ex LA

885′ 880′ 875′ 870′ 865′ 860′ 855′ 850′ 845′ 840′ 835′ 830′ 825′ 820′ 815′ 810′

890′

NOB-77-12.36

MODEL: CLX_RW_I77 - Plan 1 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 1/8/2024 TIME: 9:24:12 AM USER: CWAHLBRI
pw:\\ohiodot-pw.bentley.com:ohiodot-pw-02\Documents\01 Active Projects\District 10\Noble\119893\401-Engineering_HDR\Geotechnical\Sheets\119893_YP901.dgn

DESIGN AGENCY

HDR

DESIGNER
MM

REVIEWER
AKB 01/05/24

PROJECT ID
119893

SHEET 1 | TOTAL 1

Boring Logs
and
Rock Core Photos

PROJECT: NOB-77-12.36	DRILLING FIRM / OPERATOR: CS / M. JAMISON	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 655+83, 61' RT.	EXPLORATION ID B-001-0-23
TYPE: LANDSLIDE	SAMPLING FIRM / LOGGER: HDR / M. MOHAMMED	HAMMER: CME AUTOMATIC	ALIGNMENT: I 77	
PID: 119893 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 3/7/22	ELEVATION: 888.4 (MSL) EOB: 82.1 ft.	PAGE 1 OF 3
START: 11/9/23 END: 11/9/23	SAMPLING METHOD: SPT / ST / NQ2	ENERGY RATIO (%): 83.4	LAT / LONG: 39.804349, -81.549073	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	888.4																	
ASPHALT (5")	888.0																	
CONCRETE (7")	887.4																	
AGGREGATE BASE (6")	886.9																	
MEDIUM DENSE, BROWN, **STONE FRAGMENTS WITH SAND**, TRACE SILT, TRACE CLAY, DAMP (FILL)	885.9	1	5 7 10	24	56	SS-1A	-	36	33	21	7	3	NP	NP	NP	7	A-1-b (0)	
						SS-1B	4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
VERY STIFF TO HARD, GRAY, **SILT AND CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, DAMP (FILL)	883.9	2	11 5 12	24	50	SS-2	4.5+	15	13	14	30	28	29	18	11	11	A-6a (5)	
VERY STIFF, GRAY, **SILT AND CLAY**, TRACE STONE FRAGMENTS, TRACE SAND, DAMP (FILL)	882.4	3	6 8 11	26	61	SS-3	3.00	8	4	5	49	34	38	24	14	12	A-6a (10)	
VERY STIFF TO HARD, RED BROWN, **SANDY SILT**, SOME STONE FRAGMENTS, LITTLE CLAY, DAMP (FILL)	880.2	4	18 10 50/4"	-	63	SS-4	3.75	26	13	23	24	14	25	17	8	8	A-4a (1)	
		5	50/3"	-	0	SS-5	-	-	-	-	-	-	-	-	-	-		
DENSE, GRAY, **STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, DRY (FILL)	877.9	6	24 14 12	36	28	SS-6	-	68	9	7	9	7	24	16	8	4	A-2-4 (0)	
VERY STIFF, BROWN AND GRAY, **SILT AND CLAY**, SOME STONE FRAGMENTS, LITTLE SAND, DAMP (FILL)	873.4	7	10 8 5	18	44	SS-7	2.00	-	-	-	-	-	-	-	-	13	A-6a (V)	
		8	5 5 6	15	67	SS-8	2.00	22	9	9	37	23	34	20	14	14	A-6a (7)	
		9	6 9 12	29	56	SS-9	2.75	-	-	-	-	-	-	-	-	20	A-6a (V)	
VERY STIFF TO HARD, BROWN, **CLAY**, "AND" SILT, SOME SAND, LITTLE STONE FRAGMENTS, DAMP (FILL)	871.9	10	5 6 10	22	72	SS-10	4.25	15	14	8	37	26	43	24	19	17	A-7-6 (10)	
STIFF TO VERY STIFF, GRAY, **SILTY CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, DAMP (FILL) @ 17.0' - 17.5' : Qu = 3,007 psf	867.9	11			58	ST-11	2.75	20	23	11	27	19	38	22	16	14	A-6b (4)	
		12	5 6 8	19	56	SS-12	4.5+	-	-	-	-	-	-	-	-	14	A-6b (V)	
		13	6	18	83	SS-13A	2.50	-	-	-	-	-	-	-	-	12	A-6b (V)	
STIFF TO VERY STIFF, GRAY, **SILTY CLAY**, SOME STONE FRAGMENTS, LITTLE SAND, DAMP (FILL)	866.9	14	6 7			SS-13B	3.75	28	7	5	39	21	38	22	16	12	A-6b (7)	
@ 20.5' : Noted Severely Weathered Shale Fragments		15	4 6 11	24	100	SS-14	3.50	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
VERY STIFF TO HARD, BROWN AND GRAY, **CLAY**, "AND" SILT, TRACE STONE FRAGMENTS, TRACE SAND, DAMP (FILL) @ 22.0' : Noted Tree Root Hairs		16	5 6 8	19	100	SS-15	2.50	9	5	4	46	36	43	23	20	17	A-7-6 (13)	
		17	6 8 10	25	100	SS-16	2.00	-	-	-	-	-	-	-	-	17	A-7-6 (V)	
@ 26.0' - 27.5' : Noted Shale Fragments, Mottled Red-Brown	860.9	18	7 10 14	33	100	SS-17	2.75	-	-	-	-	-	-	-	-	10	A-7-6 (V)	
VERY STIFF TO HARD, BROWN AND GRAY, **CLAY**, "AND" STONE FRAGMENTS, SOME SILT, LITTLE SAND, DAMP (FILL) @ 27.5' - 35.0' : Noted Shale Fragments		19	9 9 11	28	61	SS-18	4.5+	36	6	5	33	20	42	23	19	10	A-7-6 (7)	
		20	7 10	32	100	SS-19	3.00	-	-	-	-	-	-	-	-	9	A-7-6 (V)	

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PW\WORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

PID: 119893	SFN:	PROJECT: NOB-77-12.36	STATION / OFFSET: 655+83, 61' RT.	START: 11/9/23	END: 11/9/23	PG 2 OF 3	B-001-0-23

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	858.4																	
	857.9		13															
VERY STIFF, GRAY TRACE BROWN, **SILT AND CLAY**, SOME STONE FRAGMENTS, LITTLE SAND, DAMP (FILL)		31	8 9 12	29	83	SS-20	3.00	-	-	-	-	-	-	-	-	9	A-6a (V)	
		32																
		33	7 6 6	17	89	SS-21	4.00	25	7	5	40	23	35	21	14	10	A-6a (7)	
		34	6 7 8	21	100	SS-22	3.00	-	-	-	-	-	-	-	-	12	A-6a (V)	
	853.4	35																
VERY STIFF, BROWN MOTTLED GRAY, **CLAY**, SOME SILT, TRACE SAND, DAMP (FILL)		36	6 7 9	22	100	SS-23	2.00	0	1	2	21	76	78	29	49	29	A-7-6 (20)	
@ 35.0' - 36.5' : Noted Tree Root Hairs	851.9																	
VERY STIFF, BROWN MOTTLED GRAY, **CLAY**, SOME SILT, LITTLE STONE FRAGMENTS, LITTLE SAND, DAMP (FILL)		37			100	ST-24	4.5+	15	9	7	28	41	51	27	24	21	A-7-6 (14)	
@ 36.9' - 37.4' : Qu = 4,182 psf		38																
@ 38.0' - 40.0' : Noted Shale Fragments		39	10 7 9	22	83	SS-25	2.75	-	-	-	-	-	-	-	-	22	A-7-6 (V)	
	848.4	40																
VERY STIFF TO HARD, RED-BROWN, BROWN AND TRACE GRAY, **SILTY CLAY**, LITTLE STONE FRAGMENTS, LITTLE SAND, DAMP (FILL)		41	7 8 11	26	67	SS-26	4.25	-	-	-	-	-	-	-	-	17	A-6b (V)	
		42	8 8 11	26	100	SS-27	3.50	11	7	8	44	30	39	22	17	14	A-6b (11)	
		43																
		44	5 8 11	26	50	SS-28	3.25	-	-	-	-	-	-	-	-	18	A-6b (V)	
	843.9	45																
VERY STIFF TO HARD, RED-BROWN MOTTLED GRAY, **SILT AND CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, DAMP (FILL)		46	8 11 14	35	83	SS-29	4.25	16	12	12	34	26	37	22	15	13	A-6a (7)	
		47	4 9 13	31	100	SS-30	3.50	-	-	-	-	-	-	-	-	15	A-6a (V)	
@ 47.0' - 47.5' Noted Light Brown and Gray	840.9	48																
VERY STIFF TO HARD, LIGHT BROWN TO RED-BROWN AND GRAY, **CLAY**, "AND" SILT, TRACE STONE FRAGMENTS, TRACE SAND, DAMP (FILL)		49	6 7 10	24	100	SS-31	4.5+	6	4	6	42	42	47	25	22	18	A-7-6 (14)	
		50	6 12 10	31	100	SS-32	3.50	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
@ 50.5' - 53.5' Noted Shale Fragments		51	5 9 14	32	100	SS-33	2.75	3	3	6	46	42	44	25	19	18	A-7-6 (12)	
		52																
		53	10 10 11	29	61	SS-34	3.75	-	-	-	-	-	-	-	-	14	A-7-6 (V)	
		54	6 11 14	35	94	SS-35	3.75	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
@ 55.0' : Added Water to Aid With Drilling		55																
		56	7 10 13	32	100	SS-36	2.00	3	3	6	42	46	41	24	17	20	A-7-6 (11)	
		57	5 9 13	31	100	SS-37	2.00	-	-	-	-	-	-	-	-	23	A-7-6 (V)	
		58																
		59	4 10 15	35	94	SS-38	3.75	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
		60	7 9 12	29	100	SS-39	2.75	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
	827.4	61																
@ 61.0' - 62.5' : Noted Tree Root Hairs			5 8	28	89	SS-40	2.00	1	3	3	35	58	62	26	36	24	A-7-6 (20)	

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PWWORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

PID: 119893	SFN:	PROJECT: NOB-77-12.36	STATION / OFFSET: 655+83, 61' RT.	START: 11/9/23	END: 11/9/23	PG 3 OF 3	B-001-0-23

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
VERY STIFF TO HARD, LIGHT BROWN TO RED-BROWN AND GRAY, **CLAY**, SOME SILT, TRACE STONE FRAGMENTS, TRACE SAND, DAMP (FILL) *(continued)* @ 63.5' - 64.0' : Qu = 5,199 psf	826.3	63	12		100	ST-41	4.5+	1	0	2	24	73	72	27	45	26	A-7-6 (20)	
VERY STIFF TO HARD, LIGHT BROWN TO RED-BROWN MOTTLED GRAY, **CLAY**, "AND" SILT, TRACE STONE FRAGMENTS, TRACE SAND, DAMP @ 64.5' - 70.5' : Noted Mottled Black Small Coal Fragments	823.9	64																
		65	5 13 15	39	100	SS-42	3.25	-	-	-	-	-	-	-	-	25	A-7-6 (V)	
		66																
		67	8 14 15	40	89	SS-43	3.50	4	3	4	39	50	50	24	26	21	A-7-6 (16)	
		68																
		69	4 8 17	35	83	SS-44	3.25	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
	818.6	70																
HARD, DARK GRAY, **SILT**, SOME CLAY, TRACE STONE FRAGMENTS, TRACE SAND, DAMP @ 70.33' - 70.5' : Bottom 2" of Spoon, Noted Hard, Dark Black Piece of Wood, Possibly Coal Fragment	817.9 817.4	TR	8 15 27	58	100	SS-45A	3.50	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
						SS-45B	4.5+	2	4	6	63	25	30	22	8	20	A-4b (8)	
	816.3	71	12 50/2"	-	100	SS-46A	2.75	3	5	6	39	47	46	24	22	21	A-7-6 (14)	
						SS-46B	-	-	-	-	-	-	-	-	-	12	Rock (V)	
VERY STIFF TO HARD, BROWN AND GRAY, **CLAY**, "AND" SILT, LITTLE SAND, TRACE STONE FRAGMENTS, DAMP @ 70.5' - 71.0' : Noted Dark Black Tree Root Hairs		72	50/1"	-	100	SS-47	-	-	-	-	-	-	-	-	-	6	Rock (V)	
	813.9	73																
SANDSTONE, GRAY, SEVERELY WEATHERED, VERY WEAK.		74																
		75	65		100	NQ2-1											CORE	
SANDSTONE, DARK GRAY (BROWN SURFACE), MODERATELY WEATHERED, MODERATELY STRONG TO STRONG, VERY FINE TO MEDIUM GRAINED, VERY THIN TO THIN BEDDED, FERRIFEROUS, JOINT DISCONTINUITIES, MODERATELY FRACTURED, NARROW TO OPEN APERTURE WIDTH, SLIGHTLY ROUGH SURFACE, BLOCKY STRUCTURE, FAIR SURFACE; RQD 52%, REC 100%.		76																
		77																
		78																
		79	93		100	NQ2-2											CORE	
SANDSTONE, LIGHT GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG, FINE TO MEDIUM GRAINED, THIN BEDDED, JOINT DISCONTINUITIES, SLIGHTLY TO MODERATELY FRACTURED, NARROW TO OPEN APERTURE WIDTH, SLIGHTLY ROUGH SURFACE, BLOCKY STRUCTURE, GOOD SURFACE; RQD 88%, REC 100%. @ 75.6' - 75.8' : Gray Clay Seam @ 76.6' - 77.0' : Qu = 4,286 psi	806.3	80																
		EOB 81																
		82																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 25 LB. BENTONITE POWDER; MIXED 94 LB. CEMENT MIXED WITH 75 GAL WATER; SURFACE PATCHED WITH QUICKCRETE

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PWWORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

PROJECT: NOB-77-12.36	DRILLING FIRM / OPERATOR: CS / M. JAMISON	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 655+85, 131' RT.	EXPLORATION ID B-001-1-23
TYPE: LANDSLIDE	SAMPLING FIRM / LOGGER: HDR / M. MOHAMMED	HAMMER: CME AUTOMATIC	ALIGNMENT: I 77	
PID: 119893 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 3/7/22	ELEVATION: 856.2 (MSL) EOB: 64.3 ft.	PAGE 1 OF 3
START: 11/7/23 END: 11/7/23	SAMPLING METHOD: SPT / ST / NQ2	ENERGY RATIO (%): 83.4	LAT / LONG: 39.804364, -81.548824	

MATERIAL DESCRIPTION AND NOTES	ELEV. 856.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (5")	855.8	1	2 2 5	10	50	SS-1	3.50	-	-	-	-	-	-	-	-	12	A-6a (V)	
STIFF TO VERY STIFF, BROWN AND GRAY, **SILT AND CLAY**, LITTLE STONE FRAGMENTS, LITTLE SAND, DAMP (FILL) @ 0.4' - 3.0' : Noted Tree Root Hairs		2	5 5 5	14	72	SS-2	4.00	20	7	5	44	24	36	21	15	12	A-6a (9)	
	852.7	3	5 5 6	15	89	SS-3A	3.50	-	-	-	-	-	-	-	-	21	A-6a (V)	
						SS-3B	-	-	-	-	-	-	-	-	-	13	A-7-6 (V)	
STIFF, BROWN AND GRAY, **CLAY**, SOME STONE FRAGMENTS, SOME SILT, TRACE SAND, DAMP (FILL)		4	3 3 4	10	33	SS-4	-	35	6	4	31	24	42	25	17	13	A-7-6 (7)	
	850.2	5	3 3 4	10	78	SS-5	3.50	11	9	6	37	37	44	24	20	20	A-7-6 (13)	
STIFF TO VERY STIFF, BROWN AND GRAY, **CLAY**, "AND" SILT, LITTLE STONE FRAGMENTS, LITTLE SAND, DAMP (FILL)		6	4 5 5	14	67	SS-6	3.50	-	-	-	-	-	-	-	-	15	A-7-6 (V)	
	847.2	7	4 5 6	15	78	SS-7	3.50	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
STIFF TO VERY STIFF, RED BROWN, **CLAY**, "AND" SILT, LITTLE SAND, TRACE STONE FRAGMENTS, DAMP (FILL)		8	2 3 5	11	50	SS-8	1.75	3	4	8	41	44	49	25	24	22	A-7-6 (15)	
		9	4 7 9	22	78	SS-9	2.00	-	-	-	-	-	-	-	-	19	A-7-6 (V)	
		10			100	ST-10	3.50	8	6	5	46	35	46	26	20	19	A-7-6 (13)	
@ 14.6' - 15.1' : Qu = 1,951 psf @ 15.5' : Noted Stone Fragments at Bottom of Shelby Tube		11	4 5 5	14	28	SS-11	2.00	-	-	-	-	-	-	-	-	10	A-7-6 (V)	
	839.2	12	4 5 7	17	72	SS-12	3.25	19	6	6	39	30	39	23	16	14	A-6b (9)	
STIFF TO VERY STIFF, RED BROWN, **SILTY CLAY**, LITTLE STONE FRAGMENTS, LITTLE SAND, DAMP (FILL)		13	4 5 6	15	44	SS-13	2.00	-	-	-	-	-	-	-	-	16	A-6b (V)	
		14	5 6 7	18	56	SS-14	2.25	-	-	-	-	-	-	-	-	16	A-6b (V)	
@ 19.75' : Noted Shale Fragments		15	3 4 6	14	56	SS-15	2.25	-	-	-	-	-	-	-	-	18	A-6b (V)	
	832.2	16	6 12 9	29	72	SS-16A	2.00	-	-	-	-	-	-	-	-	16	A-6b (V)	
VERY STIFF, GRAY, **CLAY**, "AND" SILT, TRACE SAND, DAMP (FILL)	831.7					SS-16B	-	0	1	3	43	53	42	26	16	9	A-7-6 (11)	
STIFF TO VERY STIFF, RED BROWN, **CLAY**, SOME SILT, TRACE STONE FRAGMENTS, TRACE SAND, DAMP (FILL)		17	4 6 8	19	50	SS-17	2.25	-	-	-	-	-	-	-	-	15	A-7-6 (V)	
		18	3 5 6	15	100	SS-18	1.50	2	3	5	35	55	46	24	22	21	A-7-6 (14)	
		19	3 5 8	18	100	SS-19	1.50	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
		20	4 7	19	100	SS-20	1.50	-	-	-	-	-	-	-	-	21	A-7-6 (V)	

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PW\WORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

PID: 119893	SFN:	PROJECT: NOB-77-12.36	STATION / OFFSET: 655+85, 131' RT.	START: 11/7/23	END: 11/7/23	PG 2 OF 3	B-001-1-23

MATERIAL DESCRIPTION AND NOTES	ELEV. 826.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	825.7		7															
VERY STIFF, RED BROWN MOTTLED GRAY, **CLAY**, SOME SILT, TRACE STONE FRAGMENTS, TRACE SAND, DAMP (FILL)		31	4 7 10	24	100	SS-21	2.50	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
		32	5 8 8	22	100	SS-22	2.50	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
		33	4 6 9	21	100	SS-23	2.75	-	-	-	-	-	-	-	-	22	A-7-6 (V)	
		34	5 7 9	22	100	SS-24	2.00	-	-	-	-	-	-	-	-	24	A-7-6 (V)	
		35	4 8 9	24	100	SS-25	2.75	6	4	5	34	51	52	27	25	20	A-7-6 (16)	
		36	5 8 12	28	72	SS-26	2.00	-	-	-	-	-	-	-	-	22	A-7-6 (V)	
		37	5 8 8	22	50	SS-27	2.75	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
		38	6 8 11	26	100	SS-28	3.00	-	-	-	-	-	-	-	-	19	A-7-6 (V)	
	813.7	39																
HARD, RED-BROWN AND GRAY, **SILT AND CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, DAMP	813.0	TR 40	12 50/3"	-	100	SS-29	4.5+	18	12	16	28	26	35	21	14	14	A-6a (5)	
@ 43.0' - 43.25' : Noted Sandstone and Red Weathered Claystone at Bottom 3"	811.9	41	50/3"	-	100	SS-30	-	-	-	-	-	-	-	-	-	8	Rock (V)	
SANDSTONE, GRAY, SEVERELY WEATHERED, VERY WEAK.		42																
SANDSTONE, LIGHT GRAY TO GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG, FINE TO MEDIUM GRAINED, THIN TO MEDIUM BEDDED, JOINT DISCONTINUITIES, SLIGHTLY TO MODERATELY FRACTURED, NARROW TO OPEN APERTURE WIDTH, SLIGHTLY ROUGH SURFACE, BLOCKY STRUCTURE, FAIR TO GOOD SURFACE; RQD 93%, REC 100%. @ 44.3' - 44.4' : 1.5 Inch Stone Fragment @ 44.4' - 44.6' : 2.5 Inch Part of Intact Sandstone, Brown Iron Stains Surface, Ferriferous @ 45.4' - 45.8' : Qu = 4,147 psi		43	85		100	NQ2-1											CORE	
		44																
		45																
		46																
		47																
		48	100		100	NQ2-2											CORE	
		49																
		50																
		51																
		52																
		53																
		54																
		55	100		100	NQ2-3											CORE	
		56																
		57																
		58																
		59																
		60	80		100	NQ2-4											CORE	
		61																

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PWWORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

PID: 119893	SFN:	PROJECT: NOB-77-12.36	STATION / OFFSET: 655+85, 131' RT.	START: 11/7/23	END: 11/7/23	PG 3 OF 3	B-001-1-23

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
@ 62.3' - 64.3' : Petroliferous with Natural Smell	794.1																	
	791.9	63	100		100	NQ2-5											CORE	
		EOB 64																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 12.5 LB. BENTONITE POWDER; MIXED 47 LB. CEMENT MIXED WITH 50 GAL WATER

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PWWORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

PROJECT: NOB-77-12.36	DRILLING FIRM / OPERATOR: CS / M. JAMISON	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 655+75, 201' RT.	EXPLORATION ID B-001-2-23
TYPE: LANDSLIDE	SAMPLING FIRM / LOGGER: HDR / M. MOHAMMED	HAMMER: CME AUTOMATIC	ALIGNMENT: I 77	
PID: 119893 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 3/7/22	ELEVATION: 826.7 (MSL) EOB: 44.7 ft.	PAGE 1 OF 2
START: 11/6/23 END: 11/7/23	SAMPLING METHOD: SPT / ST / NQ2	ENERGY RATIO (%): 83.4	LAT / LONG: 39.804346, -81.548575	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	826.7																	
SOFT TO MEDIUM STIFF, GRAY AND RED BROWN, **CLAY**, "AND" SILT, LITTLE STONE FRAGMENTS, LITTLE SAND, DAMP (SLIDE MATERIAL)	825.2	1	1 1 0	1	28	SS-1	2.25	11	9	7	37	36	46	27	19	21	A-7-6 (12)	
SOFT TO MEDIUM STIFF, GRAY AND RED BROWN, **CLAY**, "AND" SILT, LITTLE SAND, TRACE STONE FRAGMENTS, DAMP (SLIDE MATERIAL)	823.7	2	1 1 2	4	44	SS-2	2.00	6	5	6	43	40	46	26	20	23	A-7-6 (13)	
@ 1.5' - 3.0' : Noted Gray and Red Shale Fragments		3	2 3 3	8	56	SS-3	2.00	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
MEDIUM STIFF TO STIFF, GRAY AND RED BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE STONE FRAGMENTS, DAMP (FILL)		4	3 3 4	10	56	SS-4	1.50	-	-	-	-	-	-	-	-	19	A-7-6 (V)	
@ 3.0' - 6.0' : Noted Tree Root Hairs		5	3 4 5	13	61	SS-5	2.75	5	7	6	30	52	56	26	30	23	A-7-6 (19)	
		6	4 2 3	7	61	SS-6	2.25	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
		7	3 5 4	13	56	SS-7	2.00	-	-	-	-	-	-	-	-	14	A-7-6 (V)	
		8	3 5 6	15	39	SS-8	2.50	-	-	-	-	-	-	-	-	17	A-7-6 (V)	
	814.7	9																
STIFF, GRAY AND RED BROWN, **CLAY**, SOME STONE FRAGMENTS, SOME SAND, SOME SILT, DAMP (FILL)	813.2	10	3 5 4	13	56	SS-9	1.50	24	15	8	29	24	43	24	19	17	A-7-6 (7)	
MEDIUM STIFF TO STIFF, GRAY AND BROWN, **SILTY CLAY**, SOME SAND, TRACE STONE FRAGMENTS, MOIST (FILL)		11			71	ST-10	1.75	8	9	16	32	35	39	20	19	21	A-6b (10)	
@ 14.0' - 14.5' : Qu = 1,726 psf	811.2	12																
MEDIUM DENSE, LIGHT GRAY AND BROWN, **STONE FRAGMENTS WITH SAND AND SILT**, LITTLE CLAY, DAMP (FILL)	809.7	13	4 5 7	17	39	SS-11	-	30	11	32	16	11	NP	NP	NP	11	A-2-4 (0)	
VERY STIFF, BROWN, **SILT AND CLAY**, SOME STONE FRAGMENTS, SOME SAND, DAMP (FILL)	808.2	14	11 11 10	29	61	SS-12	2.25	28	9	22	25	16	28	17	11	15	A-6a (1)	
MEDIUM DENSE, BROWN, **STONE FRAGMENTS WITH SAND AND SILT**, LITTLE CLAY, DAMP (FILL)	808.0	15	4 3 15	25	67	SS-13A	-	25	9	31	21	14	23	17	6	13	A-2-4 (0)	
	806.5	16				SS-13B	3.50	5	9	24	41	21	34	24	10	25	A-4a (5)	
VERY STIFF, DARK GRAY, **SANDY SILT**, SOME CLAY, TRACE STONE FRAGMENTS, DAMP	805.7	17	36 50/3"	-	100	SS-14	-	-	-	-	-	-	-	-	-	7	Rock (V)	
SANDSTONE, GRAY AND BROWN, SEVERELY WEATHERED, WEAK.		18	50/4"	-	100	SS-15	-	-	-	-	-	-	-	-	-	6	Rock (V)	
SANDSTONE, BROWN, SEVERELY WEATHERED, WEAK, VERY FINE TO FINE GRAINED.	803.7	19	50/4"	-	100	SS-16	-	-	-	-	-	-	-	-	-	7	Rock (V)	
SANDSTONE, GRAY AND BROWN, SEVERELY WEATHERED, WEAK, VERY FINE TO FINE GRAINED.	802.0	20	50/2"	-	100	SS-17	-	-	-	-	-	-	-	-	-	8	Rock (V)	
SANDSTONE, LIGHT GRAY TO GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG, FINE TO MEDIUM GRAINED, THIN TO MEDIUM BEDDED, PETROLIFEROUS, JOINT DISCONTINUITIES, MODERATELY FRACTURED, NARROW TO OPEN APERTURE WIDTH, SLIGHTLY ROUGH SURFACE, BLOCKY STRUCTURE, FAIR TO GOOD SURFACE; RQD 89%, REC 100%.		21	64		100	NQ2-1											CORE	
@ 25.3' : 0.25 Inch Soft Light Gray Clay Seam		22																
		23																
		24																
		25																
		26																
		27																
		28																
		29																

TR

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PW\WORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

PID: 119893	SFN:	PROJECT: NOB-77-12.36	STATION / OFFSET: 655+75, 201' RT.	START: 11/6/23	END: 11/7/23	PG 2 OF 2	B-001-2-23

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
@ 26.9' : 0.25 Inch Soft Light Gray Clay Seam @ 28.8' : 0.25 Inch Soft Light Gray Clay Seam **SANDSTONE**, LIGHT GRAY TO GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG, FINE TO MEDIUM GRAINED, THIN TO MEDIUM BEDDED, PETROLIFEROUS, JOINT DISCONTINUITIES, MODERATELY FRACTURED, NARROW TO OPEN APERTURE WIDTH, SLIGHTLY ROUGH SURFACE, BLOCKY STRUCTURE, FAIR TO GOOD SURFACE; RQD 89%, REC 100%. *(continued)* @ 31.3' - 31.7' : Qu = 6,060 psi @ 35.3' : 0.25 Inch Soft Light Gray Clay Seam	796.7	31 32 33 34 35 36 37 38 39 40 41 42 43 44	90		100	NQ2-2											CORE	
			88		100	NQ2-3											CORE	
			100		100	NQ2-4											CORE	
	782.0	EOB	100		100	NQ2-5											CORE	

NOTES: ENDED SPLIT SPOON AND STARTED ROCK CORING AT 24.7' DUE TO UNSTABLE SLOPE AND CRIBBING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 7 LB. BENTONITE POWDER; MIXED 24 LB. CEMENT MIXED WITH 25 GAL WATER

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PW\WORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

B-001-0-23



Run #	Depth (ft)		Recovery		RQD	
NQ2-1	72.1	77.1	60 in. / 60 in.	100%	39 in. / 60 in.	65%
NQ2-2	77.1	82.1	60 in. / 60 in.	100%	56 in. / 60 in.	93%

NOB-77-12.36 PID 119893

B-001-1-23



Run #	Depth (ft)		Recovery		RQD	
NQ2-1	44.3	47.6	40 in. / 40 in.	100%	34 in. / 40 in.	85%
NQ2-2	47.6	52.6	60 in. / 60 in.	100%	60 in. / 60 in.	100%
NQ2-3	52.6	57.6	60 in. / 60 in.	100%	60 in. / 60 in.	100%

NOB-77-12.36 PID 119893

B-001-1-23



Run #	Depth (ft)		Recovery		RQD	
NQ2-3	52.6	57.6	60 in. / 60 in.	100%	60 in. / 60 in.	100%
NQ2-4	57.6	62.6	60 in. / 60 in.	100%	48 in. / 60 in.	80%
NQ2-5	62.6	64.3	20 in. / 20 in.	100%	20 in. / 20 in.	100%

NOB-77-12.36 PID 119893

B-001-2-23



Run #	Depth (ft)		Recovery		RQD	
NQ2-1	24.7	27.7	36 in. / 36 in.	100%	23 in. / 36 in.	64%
NQ2-2	27.7	32.7	60 in. / 60 in.	100%	54 in. / 60 in.	90%
NQ2-3	32.7	37.7	60 in. / 60 in.	100%	53 in. / 60 in.	88%

NOB-77-12.36 PID 119893

B-001-2-23

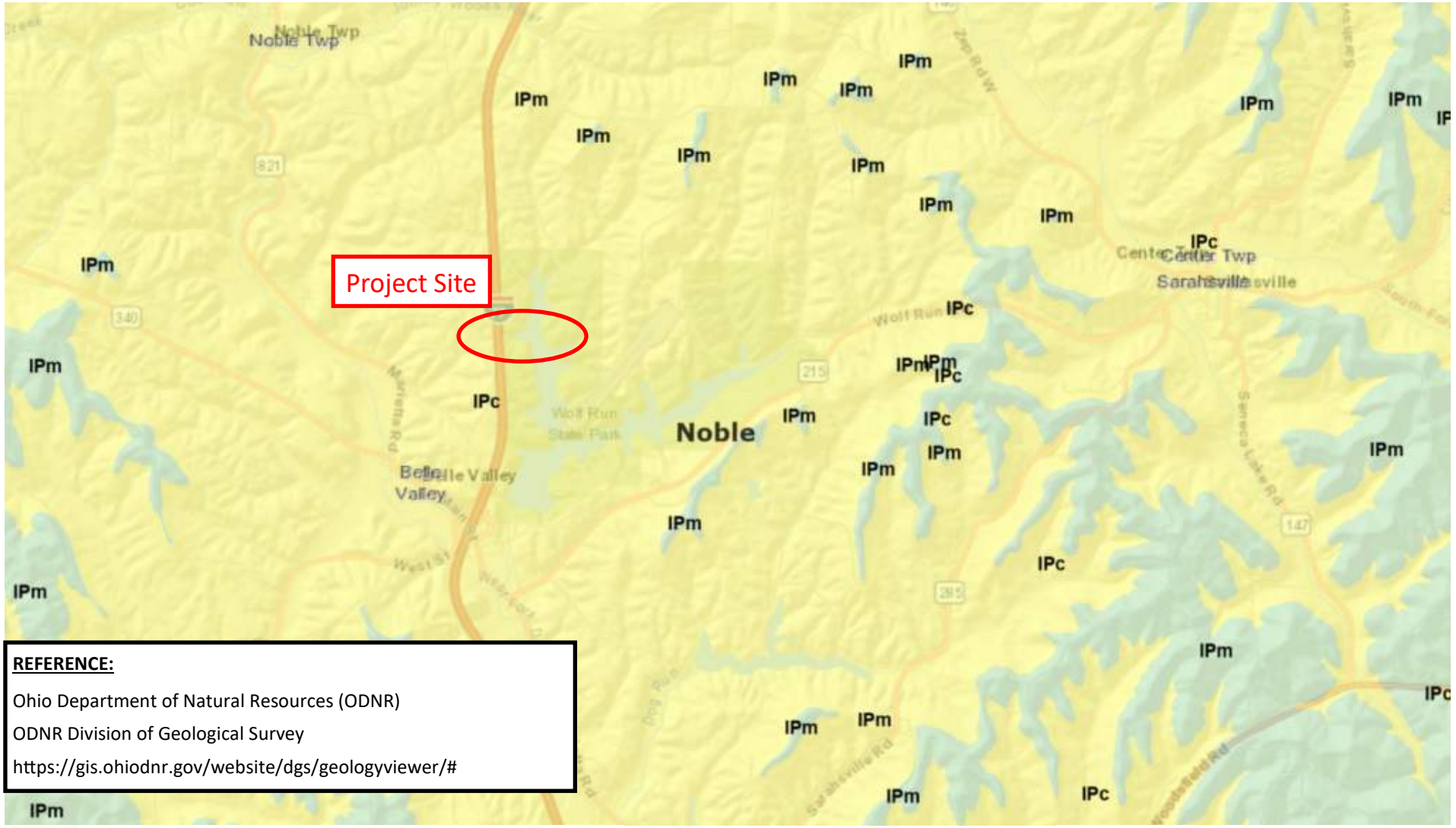


Run #	Depth (ft)		Recovery		RQD	
NQ2-3	32.7	37.7	60 in. / 60 in.	100%	53 in. / 60 in.	88%
NQ2-4	37.7	42.7	60 in. / 60 in.	100%	60 in. / 60 in.	100%
NQ2-5	42.7	44.7	24 in. / 24 in.	100%	24 in. / 24 in.	100%

NOB-77-12.36 PID 119893

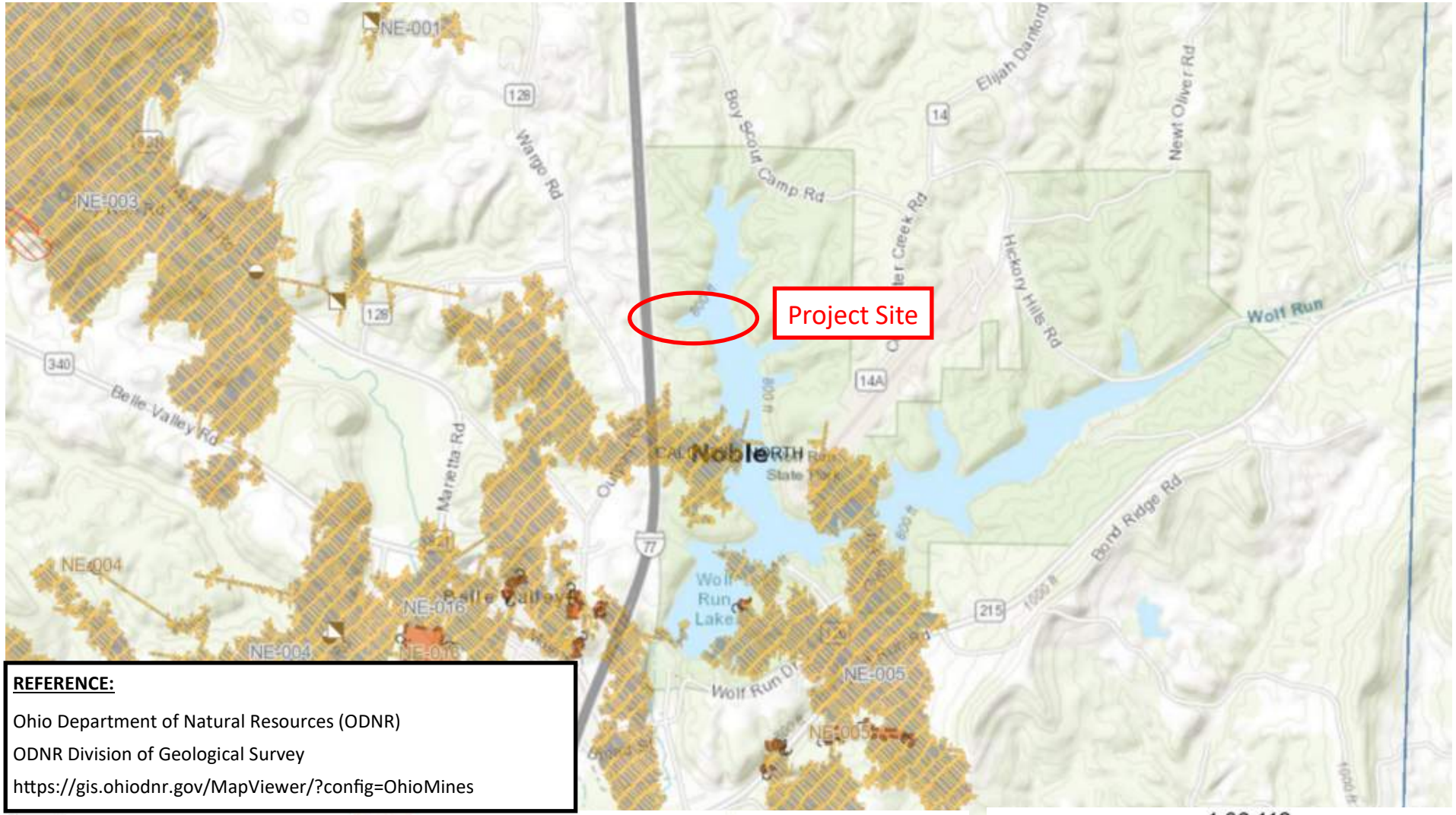
Bedrock Geology Map

Bedrock Geology Map



Mine Map

Mines of Ohio Map



REFERENCE:

Ohio Department of Natural Resources (ODNR)

ODNR Division of Geological Survey

https://gis.ohiodnr.gov/MapViewer/?config=OhioMines

Quadrangle 24K (7.5 min)

Known

Partially Known

Historic - From Topo Maps

Past

Air Shaft

Drift Entry

Vertical Mine Shaft

1:36,112

0 0.23 0.45 0.9 mi

0 0.38 0.75 1.5 km

West Virginia GIS, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, USDA

FEMA Flood Map

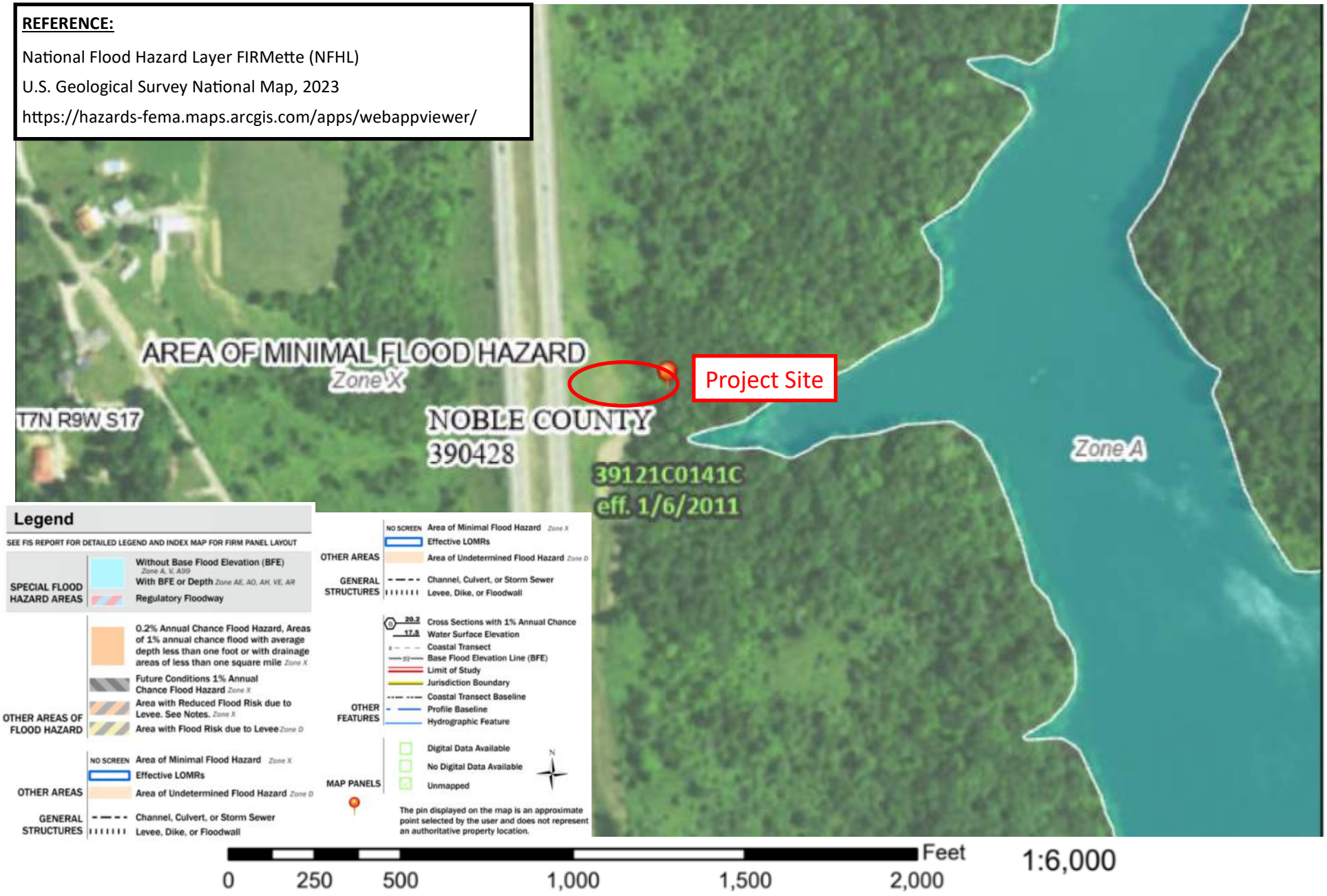
FEMA Flood Map

REFERENCE:

National Flood Hazard Layer FIRMette (NFHL)

U.S. Geological Survey National Map, 2023

https://hazards-fema.maps.arcgis.com/apps/webappviewer/



Site Photos


Hydrophilic vegetation (cattails)
Slide Mass
Rockfill South of the landslide


Hydrophilic vegetation (cattails)
B-001-1-23
Scarp
B-001-2-23


Hydrophilic vegetation (cattails)
B-001-1-23
Scarp
Rockfill South of the Slide


Ponded water within/on top of slide mass


Hydrophilic vegetation (cattails)
Sandstone slabs/boulders
Double 36" CMP w/ concrete headwall
Slide mass
Covered CMP with slide mass


Sandstone outcrop downstream
of the culvert outlet.

Historical Records

NOB-77-10.80

9999 Carver Road, Suite 210, Cincinnati, OH 45242-5583
(513) 984-7500
hdrinc.com

GENERAL INFORMATION

INTRODUCTION

The project consists of the construction of 3.4 miles of IR 77, beginning immediately south of Belle Valley, extending northward, and terminating 750 feet south of Co. Rd. 37.

Proposed grade indicates cuts, maximum 54 feet in depth, and fill embankments, maximum 75 feet in height.

GEOLOGY AND OBSERVATIONS OF THE PROJECT

The project is located on the dissected Allegheny Plateau, where the alignment inceptson, and traverses the floodplain of West Fork Duck Creek, ascends the east valley wall, and traverses a portion of the uplands to the northeast of the creek. Moderately deep valley fill and shallow to thin residual soils overlie coal, indurated clay, shale, sandstone and limestone bedrock, of the Conemaugh Series, Pennsylvanian age. Several rock outcrops were noted and measured, as well as several areas of sloughing and areas of poor surface drainage.

EXPLORATION

Exploratory borings were made by means of truck-mounted mechanical soil auger, hand auger (in areas of difficult access), and rotary-type drill rig, between October 15 and November 4, 1964.

INVESTIGATIONAL FINDINGS

Materials occurring immediately below proposed grade consist of bedrock and some silt clays (A-6a) and clays (A-7-6).

Bedrock is anticipated in the excavations in the following areas:

Stations 601+20 to 606+25 - shale and sandstone at both grades and in the ditches and backslopes.

Stations 606+25 to 606+75 - shale and sandstone at left grade and in the left ditch and backslope.

Stations 606+75 to 622+00 - sandstone, shale, and coal (stations 621+00 to 622+00) at both grades and in the ditches and backslopes.

Stations 622+00 to 623+30 - shale and sandstone at left grade and in the left ditch and left backslope.

Stations 624+90 to 625+60 - sandstone at left grade and in the left ditch; sandstone and shale in the left backslope.

Stations 628+00 to 628+40 - shale at right grade and in the right ditch and lower portion of the right backslope.

Stations 628+40 to 633+25 - shale at both grades and in the ditches and backslopes.

Stations 634+00 to 635+90 - shale at left grade and in the left ditch and the backslope.

Stations 635+90 to 636+60 - shale at left grade and in both ditches and backslopes.

Stations 636+60 to 649+50 - shale at both grades and in the ditches and backslopes; some indurated clay in the backslopes.

Stations 649+50 to 650+00 - shale at right grade and in the right ditch and lower portions of the right backslope.

Stations 668+00 to 668+50 - shale in the right ditch and backslope.

Stations 668+50 to 670+85 - shale at right grade and in the right ditch and backslope.

Stations 670+85 to 673+60 - shale at both grades and in the ditches and backslopes.

Stations 673+60 to 676+75 - shale at left grade and in the left ditch and lower portion of the left backslope.

Stations 692+00 to 692+50 - indurated clay at left grade and in the left ditch and left backslope.

Stations 692+50 to 699+00 - indurated clay at both grades and in the ditches and backslopes; some shale in the upper portions of the backslopes.

699+00 to 699+25 - indurated clay at right grade and in the right ditch and lower portion of the right backslope.

Stations 700+50 to 701+00 - shale and indurated clay in the right ditch and lower portion of the right backslope.

Stations 701+00 to 703+75 - shale and indurated clay at right grade and in the right ditch and backslope.

Stations 703+75 to 716+75 - shale at both grades and in the ditches and backslopes.

Stations 716+75 to 717+00 - shale at both grades and in the right ditch and backslopes.

Stations 717+00 to 717+70 - shale at left grade and in the left ditch and lower portion of the left backslope.

Stations 717+70 to 718+30 - shale in the left ditch and backslope.

Stations 720+30 to 721+30 - shale at right grade and in the right ditch and lower portions of the right backslope.

Stations 721+30 to 722+75 - shale at both grades and in the ditches and backslopes.

Stations 722+75 to 723+10 - shale at right grade and in the right ditch and lower portions of the right backslope.

Stations 723+10 to 723+30 - shale in the right ditch.

Frost susceptible silt was encountered within three feet below proposed grade at stations 623+10.

Embankment foundation materials comprise moderately deep sandy silts and silts (A-4a and A-4b), silt clays (A-6a), and clays (A-7-5 and A-7-6), in the valley, and generally shallow to thin silt clays (A-6a) and clays (A-7-6) in the uplands. Wet and/or organic materials were encountered in the valley between approximately stations 578+00 and 599+00.

It is noted that portions of the embankment foundation comprise shallow soils overlying sloping bedrock surface.

LEGEND FOR SOIL PROFILE

								139			
	Gravel with sand	A-1-b	A-1-b	61	13	9	9	8	25	5	16	1
	Gravel with sand and silt	A-2-4(0)	A-2-4	47	15	5	18	15	NP	NP	17	1
	Sandy silt	A-4(5)	A-4a	27	6	17	25	25	30	8	27	7
	Silt	A-4(8)	A-4b	6	1	3	54	36	32	6	23	7
	Silt and clay	A-6(8)	A-6a	23	2	3	35	37	35	12	21	32
	Silty clay	A-6(11)	A-6b	11	3	8	34	44	39	17	23	3
	Elastic clay	A-7-5(16)	A-7-5	27	1	4	31	37	67	25	42	4
	Clay	A-7-6(11)	A-7-6	31	2	2	26	39	46	20	21	32
	Coal			VISUAL CLASSIFICATION								-
	Clay bedrock			VISUAL CLASSIFICATION								1
	Weathered indurated clay			VISUAL CLASSIFICATION								22
	Weathered shale			VISUAL CLASSIFICATION								22
	Weathered sandstone			VISUAL CLASSIFICATION								1
	Shale			VISUAL CLASSIFICATION								6
	Sandstone			VISUAL CLASSIFICATION								-
	Limestone			VISUAL CLASSIFICATION								-
	Various other materials			VISUAL CLASSIFICATION								-

Sod and/or Topsoil =X'= Approximate depth.

Auger boring - plan view.

Drive sample and/or core boring - plan view.

Auger boring plotted to vertical scale only

Drive sample and/or core boring plotted to vertical scale only.

● Water content nearly equal to or greater than liquid limit.

——W Free water.

——▼ Static water level.

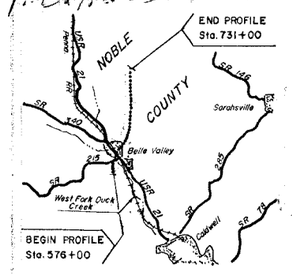
Number of blows for "Standard Penetration" test.
X=number of blows for first 6 inches.
Y=number of blows for second 6 inches.

B Indicates broken rock interval.

NOTE: Figures beside borings indicate water content in percent. e.g. 15

NOBLE COUNTY 1
NOB-IR 77-10.80 13

F.A.P. REQ. NO. I-77-1



Recon - J.S.M. : 9/17/64
Drilling - Auger :
C.M.C., L.D.M., B.D.L.
10/15/64 : to 10/21/64
Core :
C.V., C.P. :
10/21/64 : to 11/4/64
Drafting - A.F., E.V.S., R.L.M. - 11/30/64

SOIL PROFILE

NOBLE COUNTY

NOB-IR 77-10.80

OHIO STATE HIGHWAY TESTING LABORATORY
1620 W. BROAD ST. COLUMBUS 23, OHIO

2
13

SUMMARY OF SOIL TEST DATA

NOTE: NP shown in Liquid Limit and Plasticity Index columns indicates that the material is non-plastic.
( ) Denotes sample taken at or near grade.

STATION & OFFSET		DEPTH FROM-TO	% AGG.	% C.S.	% F.S.	% SILT	% CLAY	L.L.	P.I.	% W.C.	SHTL CLASS.
576+00	CL	0.4-5.0	46	5	4	27	18	36	11	15	A-6a
		5.0-10.0	41	3	6	26	26	36	11	14	A-6a
576+00	110'Rt	0.4-4.0	0	2	4	32	62	45	13	22	A-7-6
		4.0-7.0	50	5	4	20	21	35	11	15	A-6a
		7.0-10.0	Gray Weathered Indurated Clay							8	Visual
578+00	CL	0.4-5.0	0	0	1	53	46	37	9	36	A-4b
		5.0-11.0	34	5	14	24	23	34	10	31	A-4a
		11.0-13.0	60	0	5	12	23	134	59	74	A-7-5
		13.0-18.0	0	0	0	40	60	43	18	28	A-7-6
		18.0-21.0	Gray Weathered Indurated Clay							10	Visual
581+50	CL	0.4-6.0	0	1	4	49	46	35	11	24	A-6a
		6.0-12.0	0	0	8	55	37	132	9	33	A-4b
		12.0-17.5	0	1	8	34	57	37	14	30	A-6a
		17.5-20.0	Gray Weathered Indurated Clay							13	Visual
586+50	CL	0.4-5.0	20	2	5	34	39	45	11	24	A-7-5
		5.0-7.0	0	0	1	63	36	126	7	27	A-4b
		7.0-14.0	0	2	33	31	34	133	6	32	A-4a
		14.0-19.0	32	9	15	18	26	131	9	26	A-4a
		19.0-20.0	30	16	14	21	19	25	5	13	A-4a
590+50	CL	0.6-6.0	0	0	5	50	45	39	14	20	A-6a
		6.0-11.0	0	1	6	45	48	136	11	23	A-6a
		11.0-15.0	0	2	6	49	43	49	19	39	A-7-5
		15.0-19.5	47	15	5	18	15	-	-	17	A-2-4
		19.5-28.0	Red Weathered Indurated Clay							10	Visual
594+75	CL	0.0-3.0	0	4	4	35	57	44	20	18	A-7-6
		3.0-9.0	46	0	2	22	30	48	28	24	A-7-6
		9.0-11.0	0	0	0	45	54	48	16	36	A-7-6
		11.0-14.0	45	5	12	18	20	31	10	26	A-4a
		14.0-19.0	61	13	9	9	8	28	5	16	A-1-b
599+00	CL	0.0-2.0	40	3	5	45	52	46	14	22	A-7-6
		2.0-7.0	45	0	1	22	32	41	29	27	A-7-6
		7.0-12.0	33	0	16	23	28	36	17	24	A-6b
		12.0-16.0	60	0	1	17	22	118	24	35	A-7-6
		16.0-19.0	0	0	1	56	43	33	12	26	A-6a
		19.0-23.0	0	3	24	36	37	30	8	32	A-4a
		23.0-25.0	44	4	4	24	24	31	11	14	A-6a
601+10	CL	0.0-1.5	22	7	4	35	32	35	12	8	A-6a *
		1.5-3.0	Light-Brown Weathered Sandstone							6	Visual *
611+75	CL	0.0-3.0	21	2	3	52	22	NP	NP	15	A-4b
620+00	CL	0.0-4.0	0	2	3	63	32	35	11	20	A-6a
		4.0-9.0	Brown Weathered Siliceous Shale							14	Visual
		9.0-13.0	Brown Weathered Siliceous Shale							14	Visual
623+10	CL	0.0-2.0	22	5	3	50	20	NP	NP	17	A-4b *
		2.0-5.5	22	6	4	41	27	35	11	16	A-6a *
624+00	CL	0.2-2.5	25	3	4	39	29	39	11	31	A-6a
		2.5-4.0	Brown Weathered Shale							10	Visual
624+00	90'Rt	0.0-3.0	0	2	3	56	39	29	4	13	A-4b
		3.0-4.0	Brown Broken Clay Shale							10	Visual
625+25	CL	0.0-4.0	25	3	3	33	37	63	38	13	A-7-6 *
626+00	60'Lt	0.2-4.0	21	2	3	27	47	45	17	20	A-7-6
626+00	90'Rt	1.0-5.0	33	0	2	31	34	35	11	16	A-6a

STATION & OFFSET		DEPTH FROM-TO	% AGG.	% C.S.	% F.S.	% SILT	% CLAY	L.L.	P.I.	% W.C.	SHTL CLASS.
627+95	CL	0.0-4.5	24	0	2	38	36	36	12	13	A-6a *
633+40	CL	0.2-5.0	Brown Weathered Siliceous Shale							6	Visual
		5.0-7.0	Brown Weathered Siliceous Shale							9	Visual
633+75	CL	0.0-4.0	Brown Weathered Shale							15	Visual
635+42	23'Rt	0.0-5.0	Brown Weathered Siliceous Shale							6	Visual *
		5.0-8.0	Brown Weathered Siliceous Shale							9	Visual
635+50	120'Lt	0.2-4.0	0	1	2	51	46	35	10	20	A-4b
		4.0-6.0	25	1	1	26	47	41	14	17	A-7-6
		6.0-9.0	Brown Broken Clay Shale							9	Visual
638+55	10'Rt	0.0-4.0	37	0	0	21	42	44	17	25	A-7-6
		4.0-9.0	36	2	2	26	34	46	21	15	A-7-6
		9.0-11.0	Reddish-Brown Weathered Indurated Clay							13	Visual
		11.0-14.0	Red Weathered Indurated Clay							12	Visual
		14.0-19.0	Brown Weathered Shale							8	Visual
		19.0-24.0	Gray Weathered Shale							6	Visual
		24.0-27.5	Gray Weathered Shale							-	Visual
649+60	CL	0.2-2.0	15	9	5	30	41	38	11	19	A-6a *
		2.0-4.0	Light-Brown Weathered Siliceous Shale							11	Visual *
653+50	CL	0.4-5.0	0	3	2	38	57	46	19	31	A-7-6
		5.0-9.0	0	0	1	46	53	40	13	17	A-6a
658+00	90'Lt	0.4-5.0	47	2	1	17	33	50	25	18	A-7-6
		5.0-7.0	Brown Weathered Indurated Clay							11	Visual
658+20	CL	0.4-7.0	0	9	4	40	47	40	17	24	A-6b
		7.0-13.0	30	3	2	27	38	41	19	16	A-7-6
663+00	CL	0.4-4.0	0	2	2	44	52	37	12	19	A-6a
		4.0-6.0	Brown Weathered Siliceous Shale							10	Visual
669+25	CL	0.4-6.0	0	3	3	38	56	44	15	22	A-7-6 *
		6.0-9.0	40	3	3	27	27	42	15	19	A-7-6
672+25	CL	0.4-3.0	0	2	2	38	58	44	22	19	A-7-5
		3.0-8.0	Brown Weathered Siliceous Shale							13	Visual
		8.0-12.0	Brown Weathered Shale							13	Visual
		12.0-15.0	Brown Weathered Siliceous Shale							12	Visual
673+95	CL	0.4-4.0	46	4	2	22	26	47	21	16	A-7-6 *
		4.0-10.0	32	2	4	33	29	45	18	16	A-7-6
676+00	CL	0.4-4.0	0	1	3	39	57	40	17	20	A-6b *
		4.0-8.0	Brown Weathered Siliceous Shale							13	Visual
678+90	CL	0.3-3.0	Red Broken Clay Shale							15	Visual
681+00	CL	0.4-3.0	26	6	3	32	33	35	11	17	A-6a
		3.0-7.0	53	7	3	17	20	44	21	24	A-7-5
681+00	130'Rt	0.4-4.0	0	7	6	40	47	32	11	18	A-6a
		4.0-9.0	Brown Weathered Siliceous Shale							12	Visual
687+50	CL	0.3-3.5	Light-Brown Weathered Indurated Clay							6	Visual
691+90	CL	0.3-3.0	66	2	3	9	20	41	14	15	A-7-6 *
		3.0-9.0	Light-Brown Weathered Indurated Clay							9	Visual
695+85	80'Lt	0.3-5.0	Red Broken Clay Shale							15	Visual
		5.0-10.0	Red Broken Clay Shale							15	Visual
		10.0-16.0	Reddish-Gray Weathered Indurated Clay							15	Visual
		15.0-21.0	Red Weathered Indurated Clay							13	Visual

STATION & OFFSET		DEPTH FROM-TO	% AGG.	% C.S.	% F.S.	% SILT	% CLAY	L.L.	P.I.	% W.C.	SHTL CLASS.
696+00	CL	0.3-5.0	44	0	3	22	31	43	17	16	A-7-6
		5.0-10.0	Brown Broken Clay Shale							13	Visual
		10.0-15.0	Red Weathered Indurated Clay							12	Visual
		15.0-20.0	Red Weathered Indurated Clay							17	Visual
		20.0-26.0	Gray Weathered Indurated Clay							12	Visual
		26.0-30.0	Red Weathered Indurated Clay							4	Visual *
606+00	150'Rt	0.3-5.0	0	1	1	36	62	(88)	12	21	A-6a
		5.0-12.0	31	1	2	26	40	30	11	10	A-6a
		12.0-16.0	44	2	1	20	33	45	17	14	A-7-6
697+00	60'Lt	0.3-5.0	59	0	2	14	25	-	-	17	A-7-5
		5.0-10.0	Red Weathered Indurated Clay							14	Visual *
		10.0-14.0	Reddish-Gray Weathered Indurated Clay							11	Visual
697+00	160'Rt	0.3-5.0	0	1	3	44	52	35	13	10	A-6a
		5.0-10.0	26	2	2	36	34	33	12	14	A-6a
		10.0-15.0	Reddish-Gray Weathered Indurated Clay							12	Visual
		15.0-18.0	Brown and Gray Clay Bedrock							17	Visual
700+05	CL	0.3-5.0	27	2	5	31	35	36	13	15	A-6a
		5.0-10.0	63	0	1	18	18	34	12	13	A-6a
701+85	CL	0.3-3.0	44	1	2	21	32	51	24	25	A-7-6
		3.0-10.0	27	1	1	29	42	41	11	32	A-7-5
		10.0-14.0	Red Weathered Indurated Clay							19	Visual *
703+55	CL	0.3-6.0	37	3	5	22	33	41	15	13	A-7-6 *
		6.0-10.0	Brown Weathered Shale							-	Visual
707+30	CL	0.3-7.0	50	1	1	22	26	32	11	14	A-6a
		7.0-11.0	Brown Weathered Indurated Clay							15	Visual
712+00	CL	0.3-7.0	34	1	1	27	37	35	13	14	A-6a
		7.0-10.0	56	1	2	15	26	47	18	20	A-7-6
717+00	80'Lt	0.3-5.0	52	2	3	14	29	44	16	19	A-7-6
717+00	CL	0.3-2.0	26	1	3	38	32	38	13	18	A-6a
		2.0-9.0	59	0	1	18	22	39	14	17	A-6a
719+00	CL	0.3-3.0	39	1	3	22	35	51	22	22	A-7-6
		3.0-7.0	Brown Weathered Shale							11	Visual
722+00	60'Rt	0.3-7.0	46	0	8	24	22	28	8	14	A-4a
		7.0-9.0	Brown Weathered Siliceous Shale							9	Visual
723+75	CL	0.3-6.0	40	0	1	19	40	49	21	23	A-7-6
		6.0-10.0	41	1	2	29	27	34	11	14	A-6a
730+65	CL	0.3-6.0	Red Weathered Indurated Clay							14	Visual
		6.0-9.0	Reddish-Gray Weathered Indurated Clay							10	Visual

DRIVE SAMPLE SOIL TEST DATA

618+76	CL	5.0-6.0	44	2	5	27	22	36	12	17	A-6a
615+25	CL	5.0-6.0	Brown Extremely Weathered Shale							17	Visual
		10.0-10.5	Brown Extremely Weathered Shale							15	Visual
		15.0-15.5	Brownish-Red Extremely Weathered Shale							17	Visual

REVISED 7/20/65

SOIL PROFILE
NOBLE COUNTY
NOB-IR 77-10.80
OHIO STATE HIGHWAY TESTING LABORATORY
1600 W. BROAD ST. COLUMBUS 23, OHIO

5
13

Weeds | Cultivated | Weeds | Cultivated | Pasture

640 645 650 655 660 665 670 672

℄ Proposed IR 77

Top of bank

Cross-section on next sheet.

CROSS SECTION INDEX	
STATION	SHEET
645+00	10
653+00	10

STA 655+50

REVISED GRADE

Original grade

67 ft

930 920 910 900 890 880 870 860 850 840 830 820 810 800

℄ Brown silty clay
Top of Rock
17 (50)
15 (50)
17 (50)
A
B
C
*= Refusal
NOTE: For complete log of boring, see sheet 10

℄ Sod=0.4'
19
17
Refusal
(Hand auger)

℄ Sod=0.4'
31
17
Refusal

Rock Section
20' Lt. to 135' Rt.
Weak siliceous shale
Shaly sandstone
Thick bedded sandstone

℄ Sod=0.4'
24
16
Refusal

℄ Sod=0.4'
19
10
Refusal

℄ Sod=0.4'
22
19
Refusal
Weak siliceous clay shale

Rock Section
15' Lt. to 60' Rt.
Siliceous shale
Sandy shale
Thin bedded sandstone with sandy shale layers.

640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672

SOIL PROFILE

10
13

NOBLE COUNTY
NOB-IR77-10.80

OHIO STATE HIGHWAY TESTING LABORATORY
1520 W. BROAD ST. COLUMBUS 12, OHIO

REVISED 7/20/65

Sta. 658+00

Proposed Section

(Sta 658+20)
Sod-0.4'
24
16
Refusal

Spd-0.4'
18
11
Refusal

Sta. 645+00

(Sta 645+25)

Brown silty clay
Top of Rock

17 (37)
15 (52/4")
17 (52/4")

A. Shale, brown to gray, fissile, argillaceous, soft to medium-firm, slightly to extremely weathered. Core loss 19%.

B. Indurated Clay, reddish-brown, soft to medium-firm, calcareous (in bottom 2.0'), badly broken and moderately weathered. Core loss 57%.

C. Shale, gray, poorly-fissile, medium-firm to firm, with limestone and clay seams, broken intervals. Core loss 23%.

*= Refusal

Proposed Section

Soil Strength Parameter Determination

9999 Carver Road, Suite 210, Cincinnati, OH 45242-5583 **hdrinc.com**
(513) 984-7500

ODOT District 10
NOB-77-12.36

Soil Strength Parameter Determination

Computed By = MM
Checked By = AKB

Layer		Undrained Shear Strength (Su) (psf)				Dry Unit Weight (pcf)		Moist Unit Wt. (pcf)		Adopted Short Term Parameters		Long-Term Strength Values						Adopted Long Term Strength Parameters (Back-Calculated from SlopeW)	
		PPR	N-values		Tested							N_{60} Value	ODOT GB-7 Correlations		Tested				
			Sowers	T and P	Values	Correlation	Tested	Correlation	Tested				Cohesion (psf)	phi (deg)	Cohesion (psf)	phi (deg)			
Layer 1 COHESIVE FILL (STIFF TO VERY STIFF)	Max	4500	4000	3857	1504	120	121	135	137			Max	29	197	26				
	Min	1500	2450	1729	863	105	107	125	130	S_u = 1400	psf	Min	13	136	23			c' = 180	psf
	Average	2707	3510	2559	1114	114	113	129	133	Φ = 0	deg	Average	19	163	25			Φ' = 26	deg
	Std Dev	1013	536	647	342	5	7	4	3			Std Dev	5	17	1				
										Y_{dry} = 115	pcf							Y_{dry} = 115	pcf
	Avg + Std	3720	4045	3206	1456	119	120	133	137	Y_{moist} = 135	pcf	Avg + Std	24	181	25			Y_{moist} = 135	pcf
	Avg - Std	1693	2974	1911	772	109	106	125	130			Avg - Std	14	146	24				
Layer 2 COHESIVE FILL (VERY STIFF TO HARD)	Max	4500	4000	4000	2600	135	109	145	132			Max	35	200	27				
	Min	1500	2975	2261	2091	115	102	130	127	S_u = 2350	psf	Min	17	157	24			c' = 200	psf
	Average	3039	3963	3446	2345	125	106	138	129	Φ = 0	deg	Average	27	186	26			Φ' = 27	deg
	Std Dev	851	178	522	360	6	5	4	4			Std Dev	5	13	1				
										Y_{dry} = 105	pcf							Y_{dry} = 105	pcf
	Avg + Std	3891	4140	3968	2705	131	111	143	133	Y_{moist} = 135	pcf	Avg + Std	32	199	26			Y_{moist} = 135	pcf
	Avg - Std	2188	3785	2924	1986	119	101	134	125			Avg - Std	22	173	25				
Layer 3 COHESIVE FILL (STIFF)	Max	4000	3750	1995		110		125				Max	15	150	24				
	Min	1500	1750	931		95		110		S_u = 1100	psf	Min	7	88	22			c' = 150	psf
	Average	2750	2746	1535		102		122		Φ = 0	deg	Average	12	125	23			Φ' = 24	deg
	Std Dev	880	701	350		4		4				Std Dev	3	20	1				
										Y_{dry} = 105	pcf							Y_{dry} = 105	pcf
	Avg + Std	3630	3447	1885		106		126		Y_{moist} = 130	pcf	Avg + Std	14	144	24			Y_{moist} = 130	pcf
	Avg - Std	1870	2045	1184		98		117				Avg - Std	9	105	22				
Layer 4 RESIDUUM (VERY STIFF TO HARD)	Max	4500	4000	4000		135		145				Max	58	250	28				
	Min	2750	1875	3325		115		130		S_u = 3600	psf	Min	25	183	25			c' = 250	psf
	Average	3607	3575	3865		131		142		Φ = 0	deg	Average	39	226	27			Φ' = 28	deg
	Std Dev	659	950	302		9		7				Std Dev	12	30	1				
										Y_{dry} = 130	pcf							Y_{dry} = 130	pcf
	Avg + Std	4266	4525	4167		140		149		Y_{moist} = 140	pcf	Avg + Std	51	256	28			Y_{moist} = 140	pcf
	Avg - Std	2948	2625	3563		122		135				Avg - Std	27	196	26				
Layer 5 SLIDE MATERIAL (SOFT TO MEDIUM STIFF)	Max	2250	1000	532		90		105				Max	4	50	20				
	Min	2000	250	133		85		105		S_u = 350	psf	Min	1	15	15			c' = N/A	psf
	Average	2125	625	333		88		105		Φ = 0	deg	Average	3	33	18			Φ' = N/A	deg
	Std Dev	177	530	282		4		0				Std Dev	2	25	4				
										Y_{dry} = 90	pcf							Y_{dry} = 90	pcf
	Avg + Std	2302	1155	615		91		105		Y_{moist} = 105	pcf	Avg + Std	5	57	21			Y_{moist} = 105	pcf
	Avg - Std	1948	95	50		84		105				Avg - Std	0	8	14				

Increased unit weight based on lab tests in other embankment fill layers and saturated soil conditions.

ODOT District 10
NOB-77-12.36

Soil Strength Parameter Determination

Computed By = MM
Checked By = AKB

Values for Soil Strength Correlation	
Reference	Value
HI PI (Sowers)	0.25
MD PI (Sowers)	0.175
LO PI (Sowers)	0.075
T&P	0.133

Layer 1

	N_{60}	% Rec	HP	% Gr	% CS	% FS	% Silt	% Clay	LL	PL	PI	% WC		Short-Term Cohesion (psf) N-values PPR	Sowers	T & P	Correlated LT Cohesion (psf) per GB-7	phi (deg)	Midpoint Sample Depth (ft.)	Midpoint Sample Elevation (ft.)	Correlated Dry Unit Wt. (pcf) per GB-7	Correlated Moist Unit Wt. (pcf) per GB-7	Correlated C_c	Assumed Specific Gravity (G_s)	Computed Void Ratio (e)	Strength Testing Dry Unit Wt (pcf)	Moist Unit Wt (pcf)	Qu/UU Su (psf)
Max	29	100	4.5	28	23	16	49	55	46	26	22	21	Max	4500	4000	3857	197	26	28.0	885.4	120	135	0.324	2.72	0.616	121	137	1504
Min	13	28	1.5	0	1	3	27	19	29	18	11	9	Min	1500	2450	1729	136	23	3.0	811.7	105	125	0.171	2.65	0.378	107	130	863
Average	19	64	2.7	14	9	8	37	32	40	23	17	16	Average	2707	3510	2559	163	25	16.3	849.7	114	129	0.266	2.68	0.478	113	133	1114
Std Dev	5	19	1.0	9	6	4	7	12	5	2	3	3	Std Dev	1013	536	647	17	1	6.7	24.4	5	4	0.044	0.03	0.075	7	3	342
Avg + Std	24	82	3.7	23	15	12	44	44	44	25	20	19	Avg + Std	3720	4045	3206	181	25	23.0	874.0	119	133	0.310	2.71	0.553	120	137	1456
Avg - Std	14	45	1.7	5	3	4	30	20	35	20	14	12	Avg - Std	1693	2974	1911	146	24	9.6	825.3	109	125	0.222	2.65	0.403	106	130	772

Alignment	Surface Elevation	Exploration ID	From		To	Sample ID	N_{60}	% Rec	HP	% Gr	% CS	% FS	% Silt	% Clay	LL	PL	PI	% WC	ODOT Class.	Soil Type	Layer	Short-Term Cohesion (psf) N-values PPR	Sowers	T & P	Correlated LT Cohesion (psf) per GB-7	phi (deg)	Midpoint Sample Depth (ft.)	Midpoint Sample Elevation (ft.)	Correlated Dry Unit Wt. (pcf) per GB-7	Correlated Moist Unit Wt. (pcf) per GB-7	Correlated C_c	Assumed Specific Gravity (G_s)	Computed Void Ratio (e)	Strength Testing Dry Unit Wt (pcf)	Moist Unit Wt (pcf)	Qu/UU Su (psf)
NOB-77-12.36	888.4	B-001-0-23	2.5	-	3	SS-1B	24	56	4.5	-	-	-	-	-	-	-	15	A-6A	Cohesive	1	4500	4000	3192	180	25	3.0	885.4	105	125		2.72	0.616			
NOB-77-12.36	888.4	B-001-0-23	3	-	4.5	SS-2	24	50	4.5	15	13	14	30	28	29	18	11	11	A-6A	Cohesive	1	4500	4000	3192	180	25	4.0	884.4	105	125	0.171	2.72	0.616			
NOB-77-12.36	888.4	B-001-0-23	4.5	-	6	SS-3	26	61	3	8	4	5	49	34	38	24	14	12	A-6A	Cohesive	1	3000	4000	3458	187	25	5.0	883.4	105	125	0.252	2.72	0.616			
NOB-77-12.36	888.4	B-001-0-23	10.5	-	12	SS-7	18	44	2	-	-	-	-	-	-	-	-	13	A-6A	Cohesive	1	2000	3150	2394	160	24	11.0	877.4	115	130		2.72	0.476			
NOB-77-12.36	888.4	B-001-0-23	12	-	13.5	SS-8	15	67	2	22	9	9	37	23	34	20	14	14	A-6A	Cohesive	1	2000	2625	1995	150	24	13.0	875.4	110	125	0.216	2.72	0.543			
NOB-77-12.36	888.4	B-001-0-23	13.5	-	15	SS-9	29	56	2.75	-	-	-	-	-	-	-	-	20	A-6A	Cohesive	1	2750	4000	3857	197	26	14.0	874.4	115	130		2.72	0.476			
NOB-77-12.36	888.4	B-001-0-23	15	-	16.5	SS-10	22	72	4.25	15	14	8	37	26	43	24	19	17	A-7-6	Cohesive	1	4250	4000	2926	173	25	16.0	872.4	115	130	0.297	2.65	0.438			
NOB-77-12.36	888.4	B-001-0-23	16.5	-	18.5	ST-11	ST	58	2.75	20	23	11	27	19	38	22	16	14	A-6B	Cohesive	1	2750	N/A	N/A			18.0	870.4			0.252	2.70		120.5	136.8	1503.5
NOB-77-12.36	888.4	B-001-0-23	18.5	-	20	SS-12	19	56	4.5	-	-	-	-	-	-	-	-	14	A-6B	Cohesive	1	4500	3325	2527	163	25	19.0	869.4	115	130		2.70	0.465			
NOB-77-12.36	888.4	B-001-0-23	20.5	-	21.5	SS-13B	18	83	3.75	28	7	5	39	21	38	22	16	12	A-6B	Cohesive	1	3750	3150	2394	160	24	21.0	867.4	120	135	0.252	2.70	0.404			
NOB-77-12.36	856.2	B-001-1-23	12	-	13.5	SS-9	22	78	2	-	-	-	-	-	-	-	-	19	A-7-6	Cohesive	1	2000	4000	2926	173	25	13.0	843.2	115	130		2.65	0.438			
NOB-77-12.36	856.2	B-001-1-23	13.5	-	15.5	ST-10	ST	100	3.5	8	6	5	46	35	46	26	20	19	A-7-6	Cohesive	1	3500	N/A	N/A			15.0	841.2			0.324	2.65		113.2	132.7	975.5
NOB-77-12.36	856.2	B-001-1-23	15.5	-	17	SS-11	14	28	2	-	-	-	-	-	-	-	-	10	A-7-6	Cohesive	1	2000	3500	1862	143	24	16.0	840.2	110	125		2.65	0.503			
NOB-77-12.36	856.2	B-001-1-23	17	-	18.5	SS-12	17	72	3.25	19	6	6	39	30	39	23	16	14	A-6B	Cohesive	1	3250	2975	2261	157	24	18.0	838.2	115	130	0.261	2.70	0.465			
NOB-77-12.36	856.2	B-001-1-23	18.5	-	20	SS-13	15	44	2	-	-	-	-	-	-	-	-	16	A-6B	Cohesive	1	2000	2625	1995	150	24	19.0	837.2	110	125		2.70	0.532			
NOB-77-12.36	856.2	B-001-1-23	20	-	21.5	SS-14	18	56	2.25	-	-	-	-	-	-	-	-	16	A-6B	Cohesive	1	2250	3150	2394	160	24	21.0	835.2	120	135		2.70	0.404			
NOB-77-12.36	856.2	B-001-1-23	21.5	-	23	SS-15	14	56	2.25	-	-	-	-	-	-	-	-	18	A-6B	Cohesive	1	2250	2450	1862	143	24	22.0	834.2	115	130		2.70	0.465			
NOB-77-12.36	856.2	B-001-1-23	24	-	24.5	SS-16B	29	72	-	0	1	3	43	53	42	26	16	9	A-7-6	Cohesive	1	N/A	4000	3857	197	26	24.0	832.2	120	135	0.288	2.65	0.378			
NOB-77-12.36	856.2	B-001-1-23	24.5	-	26	SS-17	19	50	2.25	-	-	-	-	-	-	-	-	15	A-7-6	Cohesive	1	2250	4000	2527	163	25	25.0	831.2	120	135		2.65	0.378			
NOB-77-12.36	856.2	B-001-1-23	26	-	27.5	SS-18	15	100	1.5	2	3	5	35	55	46	24	22	21	A-7-6	Cohesive	1	1500	3750	1995	150	24	27.0	829.2	115	130	0.324	2.65	0.438			
NOB-77-12.36	856.2	B-001-1-23	27.5	-	29	SS-19	18	100	1.5	-	-	-	-	-	-	-	-	21	A-7-6	Cohesive	1	1500	4000	2394	160	24	28.0	828.2	120	135		2.65	0.378			
NOB-77-12.36	826.7	B-001-2-23	10.5	-	12	SS-8	15	39	2.5	-	-	-	-	-	-	-	-	17	A-7-6	Cohesive	1	2500	3750	1995	150	24	11.0	815.7	110	125		2.65	0.503			
NOB-77-12.36	826.7	B-001-2-23	12	-	13.5	SS-9	13	56	1.5	24	15	8	29	24	43	24	19	17	A-7-6	Cohesive	1	1500	3250	1729	136	23	13.0	813.7	110	125	0.297	2.65	0.503			
NOB-77-12.36	826.7	B-001-2-23	13.5	-	15.5	ST-10	ST	71	1.75	8	9	16	32	35	39	20	19	21	A-6B	Cohesive	1	1750	N/A	N/A			15.0	811.7			0.261	2.70		106.6	130.1	863

Values for Soil Strength Correlation	
Reference	Value
HI PI (Sowers)	0.25
MD PI (Sowers)	0.175
LO PI (Sowers)	0.075
T&P	0.133

Layer 2

	N_{60}	% Rec	HP	% Gr	% CS	% FS	% Silt	% Clay	LL	PL	PI	% WC		Short-Term Cohesion (psf) N-values PPR	Sowers	T & P	Correlated LT Cohesion (psf) per GB-7	phi (deg)	Midpoint Sample Depth (ft.)	Midpoint Sample Elevation (ft.)	Correlated Dry Unit Wt. (pcf) per GB-7	Correlated Moist Unit Wt. (pcf) per GB-7	Correlated C_c	Assumed Specific Gravity (G_s)	Computed Void Ratio (e)	Strength Testing Dry Unit Wt (pcf)	Moist Unit Wt (pcf)	Qu/UU Su (psf)
Max	35	100	4.5	36	12	22	46	76	78	29	49	29	Max	4500	4000	4000	200	27	64.0	866.4	135	145	0.612	2.72	0.476	109	132	2600
Min	17	50	1.5	0	0	2	21	16	28	17	11	9	Min	1500	2975	2261	157	24	18.0	808.7	115	130	0.162	2.65	0.225	102	127	2091
Average	27	90	3.0	11	5	7	35	41	48	24	24	18	Average	3039	3963	3446	186	26	40.5	838.6	125	138	0.341	2.67	0.335	106	129	2345
Std Dev	5	16	0.9	11	3	5	8	18	14	3	12	5	Std Dev	851	178	522	13	1	12.0	16.1	6	4	0.127	0.03	0.067	5	4	360
Avg + Std	32	106	3.9	23	9	12	44	60	62	27	35	23	Avg + Std	3891	4140	3968	199	26	52.5	854.8	131	143	0.469	2.69	0.403	111	133	2705
Avg - Std	22	75	2.2	0	2	2	27	23	34	21	12	13	Avg - Std	2188	3785	2924	173	25	28.6	822.5	119	134	0.214	2.64	0.268	101	125	1986

Alignment	Surface Elevation	Exploration ID	From		To	Sample ID	N_{60}	% Rec	HP	% Gr	% CS	% FS	% Silt	% Clay	LL	PL	PI	% WC	ODOT Class.	Soil Type	Layer	Short-Term Cohesion (psf) N-values PPR	Sowers	T & P	Correlated LT Cohesion (psf) per GB-7	phi (deg)	Midpoint Sample Depth (ft.)	Midpoint Sample Elevation (ft.)	Correlated Dry Unit Wt. (pcf) per GB-7	Correlated Moist Unit Wt. (pcf) per GB-7	Correlated C_c	Assumed Specific Gravity (G_s)	Computed Void Ratio (e)	Strength Testing Dry Unit Wt (pcf)	Moist Unit Wt (pcf)	Qu/UU Su (psf)
NOB-77-12.36	888.4	B-001-0-23	21.5	-	23	SS-14	24	100	3.5	-	-	-	-	-	-	-	-	18	A-7-6	Cohesive	2	3500	4000	3192	180	25	22.0	866.4	120	135		2.65	0.378			
NOB-77-12.36	888.4	B-001-0-23	23	-	24.5	SS-15	19	100	2.5	9	5	4	46	36	43	23	20	17	A-7-6	Cohesive	2	2500	4000	2527	163	25	24.0	864.4	120	135	0.297	2.65	0.378			
NOB-77-12.36	888.4	B-001-0-23	24.5	-	26	SS-16	25	100	2	-	-	-	-	-	-	-	-	17	A-7-6	Cohesive	2	2000	4000	3325	183	25	25.0	863.4	120	135		2.65	0.378			
NOB-77-12.36	888.4	B-001-0-23	26	-	27.5	SS-17	33	100	2.75	-	-	-	-	-	-	-	-	10	A-7-6	Cohesive	2	2750	4000	4000	200	27	27.0	861.4	130	140		2.65	0.272			
NOB-77-12.36	888.4	B-001-0-23	27.5	-	29	SS-18	28	61	4.5	36	6	5	33	20	42	23	19	10	A-7-6	Cohesive	2	4500	4000	3724	193	26	28.0	860.4	120	135	0.288	2.65	0.378			
NOB-77-12.36	888.4	B-001-0-23	29	-	30.5	SS-19	32	100	3	-	-	-	-	-	-	-	-	9	A-7-6	Cohesive	2	3000	4000	4000	200	26	30.0	858.4	130	140		2.65	0.272			
NOB-77-12.36	888.4	B-001-0-23	30.5	-	32	SS-20	29	83	3	-	-	-	-	-	-	-	-	9	A-6A	Cohesive	2	3000	4000	3857	197	26	31.0	857.4	120	135		2.72	0.414			
NOB-77-12.36	888.4	B-001-0-23	32	-	33.5	SS-21	17	89	4	25	7	5	40	23	35	21	14	10	A-6A	Cohesive	2	4000	2975	2261	157	24	33.0	855.4	120	135	0.225	2.72	0.414			
NOB-77-12.36	888.4	B-001-0-23	33.5	-	35	SS-22	21	100	3	-	-	-	-	-	-	-	-	12	A-6A	Cohesive	2	3000	3675	2793	170	25	34.0	854.4	120	135		2.72	0.414			
NOB-77-12.36	888.4	B-001-0-23	35	-	36.5	SS-23	22	100	2	0	1	2	21	76	78	29	49	29	A-7-6	Cohesive	2	2000	4000	2926	173	25	36.0	852.4	120	135	0.612	2.65	0.378			
NOB-77-12.36	888.4	B-001-0-23	36.5	-	38.5	ST-24	ST	100	4.5	15	9	7	28	41	51	27	24	21	A-7-6	Cohesive	2	4500	N/A	N/A			38.0	850.4			0.369	2.65		109.3	132	2091
NOB-77-12.36	888.4	B-001-0-23	38.5	-	40	SS-25	22	83	2.75	-	-	-	-	-	-	-	-	22	A-7-6	Cohesive	2	2750	4000	2926	173	25	39.0	849.4	120	135		2.65	0.378			
NOB-77-12.36	888.4	B-001-0-23	40	-	41.5	SS-26	26	67	4.25	-	-	-	-	-	-	-	-	17	A-6B	Cohesive	2	4250	4000	3458	187	25	41.0	847.4	125	140		2.70	0.348			
NOB-77-12.36	888.4	B-001-0-23	41.5	-	43	SS-27	26	100	3.5	11	7	8	44	30	39	22	17	14	A-6B	Cohesive	2	3500	4000	3458	187	25	42.0	846.4	125	140	0.261	2.70	0.348			
NOB-77-12.36	888.4	B-001-0-23	43	-	44.5	SS-28	26	50	3.25	-	-	-	-	-	-	-	-	18	A-6B	Cohesive	2	3250	4000	3458	187	25	44.0	844.4	125	140		2.70	0.348			
NOB-77-12.36	888.4	B-001-0-23	44.5	-	46	SS-29	35	83	4.25	16	12	12	34	26	37	22	15	13	A-6A	Cohesive	2	4250	4000	4000	200	27	45.0	843.4	135	145	0.243	2.72	0.257			
NOB-77-12.36	888.4	B-001-0-23	46	-	47.5	SS-30	31	100	3.5	-	-	-	-	-	-	-	-	15	A-6A	Cohesive	2	3500	4000	4000	200	26	47.0	841.4	135	145		2.72	0.257			
NOB-77-12.36	888.4	B-001-0-23	47.5	-	49	SS-31	24	100	4.5	6	4	6	42	42	47	25	22	18	A-7-6	Cohesive	2	4500	4000	3192	180	25	48.0	840.4	125	140	0.333	2.65	0.323			
NOB-77-12.36	888.4	B-001-0-23	49	-	50.5	SS-32	31	100	3.5	-	-	-	-	-	-	-	-	21	A-7-6	Cohesive	2	3500	4000	4000	200	26	50.0	838.4	135	145		2.65	0.225			
NOB-77-12.36	888.4	B-001-0-23	50.5	-	52	SS-33	32	100	2.75	3	3	6	46	42	44	25	19	18	A-7-6	Cohesive	2	2750	4000	4000	200	26	51.0	837.4	135	145	0.306	2.65	0.225			
NOB-77-12.36	888.4	B-001-0-23	52	-	53.5	SS-34	29	61	3.75	-	-	-	-	-	-	-	-	14	A-7-6	Cohesive	2	3750	4000	3857	197	26	53.0	835.4	125	140		2.65	0.323			
NOB-77-12.36	888.4	B-001-0-23	53.5	-	55	SS-35	35	94	3.75	-	-	-	-	-	-	-	-	18	A-7-6	Cohesive	2	3750	4000	4000	200	27	54.0	834.4	135	145		2.65	0.225			
NOB-77-12.36	888.4	B-001-0-23	55	-	56.5	SS-36	32	100	2	3	3	6	42	46	41	24	17	20	A-7-6	Cohesive	2	2000	4000	4000	200	26	56.0	832.4	135	145	0.279	2.65	0.225			
NOB-77-12.36	888.4	B-001-0-23	56.5	-	58	SS-37	31	100	2	-	-	-	-	-	-	-	-	23	A-7-6	Cohesive	2	2000	4000	4000	200	26	57.0	831.4	135	145		2.65	0.225			
NOB-77-12.36	888.4	B-001-0-23	58	-	59.5	SS-38	35	94	3.75	-	-	-	-	-	-	-	-	18	A-7-6	Cohesive	2	3750	4000	4000	200	27	59.0	829.4	135	145		2.65	0.225			
NOB-77-12.36	888.4	B-001-0-23	59.5	-	61	SS-39	29	100	2.75	-	-	-	-	-	-	-	-	18	A-7-6	Cohesive	2	2750	4000	3857	197	26	60.0	828.4	125	140		2.65	0.323			
NOB-77-12.36	888.4	B-001-0-23	61	-	62.5	SS-40	28	89	2	1	3	3	35	58	62	26	36	24	A-7-6	Cohesive	2	2000	4000	3724	193	26	62.0	826.4	125	140	0.468	2.65	0.323			
NOB-77-12.36	888.4	B-001-0-23	62.5	-	64.5	ST-41	ST	100	4.5	1	0	2	24	73	72	27	45	26	A-7-6	Cohesive	2	4500	N/A	N/A			64.0	824.4			0.558	2.65		102.4	126.6	2599.5
NOB-77-12.36	856.2	B-001-1-23	29	-	30.5	SS-20	19	100	1.5	-	-	-	-	-	-	-	-	21	A-7-6	Cohesive	2	1500	4000	2527	163	25	30.0	826.2	120	135		2.65	0.378			
NOB-77-12.36	856.2	B-001-1-23	30.5	-	32	SS-21	24	100	2.5	-	-	-	-	-	-	-	-	20	A-7-6	Cohesive	2	2500	4000	3192	180	25	31.0	825.2	120	135		2.65	0.378			
NOB-77-12.36	856.2	B-001-1-23	32	-	33.5	SS-22	22	100	2.5	-	-	-	-	-	-	-	-	18	A-7-6	Cohesive	2	2500	4000	2926	173	25	33.0	823.2	120	135		2.65	0.378			
NOB-77-12.36	856.2	B-001-1-23	33.5	-	35	SS-23	21	100	2.75	-	-	-	-	-	-	-	-	22	A-7-6	Cohesive	2	2750	4000	2793	170	25	34.0	822.2	120	135		2.65	0.378			
NOB-77-12.36	856.2	B-001-1-23	35	-	36.5	SS-24	22	100	2	-	-	-	-	-	-	-	-	24	A-7-6	Cohesive	2	2000	4000	2926	173	25	36.0	820.2	120	135		2.65	0.378			
NOB-77-12.36	856.2	B-001-1-23	36.5	-	38	SS-25	24	100	2.75	6	4	5	34	51	52	27	25	20	A-7-6	Cohesive	2	2750	4000	3192	180	25	37.0	819.2	120	135	0.378	2.65	0.378			
NOB-77-12.36	856.2	B-001-1-23	38	-	39.5	SS-26	28	72	2	-	-	-	-	-	-	-	-	22	A-7-6	Cohesive	2	2000	4000	3724	193	26	39.0	817.2	120	135		2.65	0.378			
NOB-77-12.36	856.2	B-001-1-23	39.5	-	41	SS-27	22	50	2.75	-	-	-	-	-	-	-	-	21	A-7-6	Cohesive	2	2750	4000	2926	173	25	40.0	816.2	120	135		2.65	0.378			
NOB-77-12.36	856.2	B-001-1-23	41	-	42.5	SS-28	26	100	3	-	-	-	-	-	-	-	-	19	A-7-6	Cohesive	2	3000	4000	3458	187	25	42.0	814.2	125	140		2.65	0.323			
NOB-77-12.36	826.7	B-001-2-23	17	-	18.5	SS-12	29	61	2.25	28	9	22	25	16	28	17	11	15	A-6A	Cohesive	2	2250	4000	3857	197	26	18.0	808.7	115	130	0.162	2.72	0.476			

ODOT District 10
NOB-77-12.36

Soil Strength Parameter Determination

Computed By = MM
Checked By = AKB

Values for Soil Strength Correlation	
Reference	Value
HI PI (Sowers)	0.25
MD PI (Sowers)	0.175
LO PI (Sowers)	0.075
T&P	0.133

Layer 3

	N_{60}	% Rec	HP	% Gr	% CS	% FS	% Silt	% Clay	LL	PL	PI	% WC		Short-Term Cohesion (psf) N-values PPR	Sowers	T & P	Correlated LT Cohesion (psf) per GB-7	phi (deg)	Midpoint Sample Depth (ft.)	Midpoint Sample Elevation (ft.)	Correlated Dry Unit Wt. (pcf) per GB-7	Correlated Moist Unit Wt. (pcf) per GB-7	Correlated C_c	Assumed Specific Gravity (G_s)	Computed Void Ratio (e)
Max	15	89	4.0	35	9	8	44	52	56	26	30	23	Max	4000	3750	1995	150	24	11.0	855.2	110	125	0.414	2.72	0.741
Min	7	33	1.5	3	4	4	30	24	36	21	15	12	Min	1500	1750	931	88	22	1.0	816.7	95	110	0.234	2.65	0.503
Average	12	62	2.8	15	7	6	37	36	45	24	21	17	Average	2750	2746	1535	125	23	6.3	838.6	102	122	0.319	2.66	0.632
Std Dev	3	15	0.9	13	2	1	6	12	8	2	6	4	Std Dev	880	701	350	20	1	3.1	15.7	4	4	0.068	0.03	0.074
Avg + Std	14	77	3.6	28	8	7	43	49	53	26	27	21	Avg + Std	3630	3447	1885	144	24	9.4	854.2	106	126	0.386	2.69	0.706
Avg - Std	9	47	1.9	2	5	4	30	24	38	22	15	13	Avg - Std	1870	2045	1184	105	22	3.2	822.9	98	117	0.251	2.63	0.557

Alignment	Surface Elevation	Exploration ID	From		To	Sample ID	N_{60}	% Rec	HP	% Gr	% CS	% FS	% Silt	% Clay	LL	PL	PI	% WC	ODOT Class.	Soil Type	Layer	Short-Term Cohesion (psf) N-values PPR	Sowers	T & P	Correlated LT Cohesion (psf) per GB-7	phi (deg)	Midpoint Sample Depth (ft.)	Midpoint Sample Elevation (ft.)	Correlated Dry Unit Wt. (pcf) per GB-7	Correlated Moist Unit Wt. (pcf) per GB-7	Correlated C_c	Assumed Specific Gravity (G_s)	Computed Void Ratio (e)
NOB-77-12.36	856.2	B-001-1-23	0	-	1.5	SS-1	10	50	3.5	-	-	-	-	-	-	-	-	12	A-6A	Cohesive	3	3500	1750	1330	114	23	1.0	855.2	100	120		2.72	0.697
NOB-77-12.36	856.2	B-001-1-23	1.5	-	3	SS-2	14	72	4	20	7	5	44	24	36	21	15	12	A-6A	Cohesive	3	4000	2450	1862	143	24	2.0	854.2	100	120	0.234	2.72	0.697
NOB-77-12.36	856.2	B-001-1-23	3.5	-	4.5	SS-3B	15	89	-	-	-	-	-	-	-	-	-	13	A-7-6	Cohesive	3	N/A	3750	1995	150	24	4.0	852.2	100	120		2.65	0.654
NOB-77-12.36	856.2	B-001-1-23	4.5	-	6	SS-4	10	33	-	35	6	4	31	24	42	25	17	13	A-7-6	Cohesive	3	N/A	2500	1330	114	23	5.0	851.2	100	120	0.288	2.65	0.654
NOB-77-12.36	856.2	B-001-1-23	6	-	7.5	SS-5	10	78	3.5	11	9	6	37	37	44	24	20	20	A-7-6	Cohesive	3	3500	2500	1330	114	23	7.0	849.2	105	125	0.306	2.65	0.575
NOB-77-12.36	856.2	B-001-1-23	7.5	-	9	SS-6	14	67	3.5	-	-	-	-	-	-	-	-	15	A-7-6	Cohesive	3	3500	3500	1862	143	24	8.0	848.2	105	125		2.65	0.575
NOB-77-12.36	856.2	B-001-1-23	9	-	10.5	SS-7	15	78	3.5	-	-	-	-	-	-	-	-	21	A-7-6	Cohesive	3	3500	3750	1995	150	24	10.0	846.2	105	125		2.65	0.575
NOB-77-12.36	856.2	B-001-1-23	10.5	-	12	SS-8	11	50	1.75	3	4	8	41	44	49	25	24	22	A-7-6	Cohesive	3	1750	2750	1463	121	23	11.0	845.2	110	125	0.351	2.65	0.503
NOB-77-12.36	826.7	B-001-2-23	3	-	4.5	SS-3	8	56	2	-	-	-	-	-	-	-	-	21	A-7-6	Cohesive	3	2000	2000	1064	100	22	4.0	822.7	95	110		2.65	0.741
NOB-77-12.36	826.7	B-001-2-23	4.5	-	6	SS-4	10	56	1.5	-	-	-	-	-	-	-	-	19	A-7-6	Cohesive	3	1500	2500	1330	114	23	5.0	821.7	100	120		2.65	0.654
NOB-77-12.36	826.7	B-001-2-23	6	-	7.5	SS-5	13	61	2.75	5	7	6	30	52	56	26	30	23	A-7-6	Cohesive	3	2750	3250	1729	136	23	7.0	819.7	105	125	0.414	2.65	0.575
NOB-77-12.36	826.7	B-001-2-23	7.5	-	9	SS-6	7	61	2.25	-	-	-	-	-	-	-	-	18	A-7-6	Cohesive	3	2250	1750	931	88	22	8.0	818.7	95	120		2.65	0.741
NOB-77-12.36	826.7	B-001-2-23	9	-	10.5	SS-7	13	56	2	-	-	-	-	-	-	-	-	14	A-7-6	Cohesive	3	2000	3250	1729	136	23	10.0	816.7	105	125		2.65	0.575

ODOT District 10
NOB-77-12.36

Soil Strength Parameter Determination

Computed By = MM
Checked By = AKB

Values for Soil Strength Correlation	
Reference	Value
HI PI (Sowers)	0.25
MD PI (Sowers)	0.175
LO PI (Sowers)	0.075
T&P	0.133

Layer 4

	N_{60}	% Rec	HP	% Gr	% CS	% FS	% Silt	% Clay	LL	PL	PI	% WC		Short-Term Cohesion (psf) N-values PPR	Sowers	T & P	Correlated LT Cohesion (psf) per GB-7	phi (deg)	Midpoint Sample Depth (ft.)	Midpoint Sample Elevation (ft.)	Correlated Dry Unit Wt. (pcf) per GB-7	Correlated Moist Unit Wt. (pcf) per GB-7	Correlated C_c	Assumed Specific Gravity (G_s)	Computed Void Ratio (e)
Max	58	100	4.5	18	12	24	63	50	50	24	26	25	Max	4500	4000	4000	250	28	71.0	823.4	135	145	0.360	2.72	0.476
Min	25	67	2.8	2	3	4	28	21	30	21	8	14	Min	2750	1875	3325	183	25	19.0	807.7	115	130	0.180	2.65	0.225
Average	39	91	3.6	6	7	11	42	34	39	23	16	21	Average	3607	3575	3865	226	27	57.6	817.4	131	142	0.261	2.68	0.282
Std Dev	12	13	0.7	7	4	9	13	14	9	1	8	4	Std Dev	659	950	302	30	1	19.5	5.4	9	7	0.077	0.04	0.110
Avg + Std	51	104	4.3	13	10	20	55	47	48	24	24	25	Avg + Std	4266	4525	4167	256	28	77.1	822.8	140	149	0.338	2.72	0.391
Avg - Std	27	79	2.9	0	3	3	29	20	30	22	8	17	Avg - Std	2948	2625	3563	196	26	38.0	812.1	122	135	0.184	2.64	0.172

Alignment	Surface Elevation	Exploration ID	From		To	Sample ID	N_{60}	% Rec	HP	% Gr	% CS	% FS	% Silt	% Clay	LL	PL	PI	% WC	ODOT Class.	Soil Type	Layer	Short-Term Cohesion (psf) N-values PPR	Sowers	T & P	Correlated LT Cohesion (psf) per GB-7	phi (deg)	Midpoint Sample Depth (ft.)	Midpoint Sample Elevation (ft.)	Correlated Dry Unit Wt. (pcf) per GB-7	Correlated Moist Unit Wt. (pcf) per GB-7	Correlated C_c	Assumed Specific Gravity (G_s)	Computed Void Ratio (e)
NOB-77-12.36	888.4	B-001-0-23	64.5	-	66	SS-42	39	100	3.25	-	-	-	-	-	-	-	-	25	A-7-6	Cohesive	4	3250	4000	4000	200	28	65.0	823.4	135	145		2.65	0.225
NOB-77-12.36	888.4	B-001-0-23	66	-	67.5	SS-43	40	89	3.5	4	3	4	39	50	50	24	26	21	A-7-6	Cohesive	4	3500	4000	4000	250	28	67.0	821.4	135	145	0.36	2.65	0.225
NOB-77-12.36	888.4	B-001-0-23	67.5	-	69	SS-44	35	83	3.25	-	-	-	-	-	-	-	-	20	A-7-6	Cohesive	4	3250	4000	4000	200	27	68.0	820.4	135	145		2.65	0.225
NOB-77-12.36	888.4	B-001-0-23	69.8	-	70.5	SS-45B	58	100	4.5	2	4	6	63	25	30	22	8	20	A-4B	Cohesive	4	4500	4000	4000	250	28	70.0	818.4	135	145	0.18	2.72	0.257
NOB-77-12.36	888.4	B-001-0-23	70.5	-	71	SS-46A	Refusal	100	2.75	3	5	6	39	47	46	24	22	21	A-7-6	Cohesive	4	2750	N/A	N/A	250	28	71.0	817.4			0.324	2.65	
NOB-77-12.36	856.2	B-001-1-23	42.5	-	43.25	SS-29	Refusal	100	4.5	18	12	16	28	26	35	21	14	14	A-6A	Cohesive	4	4500	N/A	N/A	250	28	43.0	813.2			0.225	2.72	
NOB-77-12.36	826.7	B-001-2-23	18.75	-	20	SS-13B	25	67	3.5	5	9	24	41	21	34	24	10	25	A-4A	Cohesive	4	3500	1875	3325	183	25	19.0	807.7	115	130	0.216	2.72	0.476

Values for Soil Strength Correlation	
Reference	Value
HI PI (Sowers)	0.25
MD PI (Sowers)	0.175
LO PI (Sowers)	0.075
T&P	0.133

Layer 5

	N_{60}	% Rec	HP	% Gr	% CS	% FS	% Silt	% Clay	LL	PL	PI	% WC		Short-Term Cohesion (psf) N-values PPR	Sowers	T & P	Correlated LT Cohesion (psf) per GB-7	phi (deg)	Midpoint Sample Depth (ft.)	Midpoint Sample Elevation (ft.)	Correlated Dry Unit Wt. (pcf) per GB-7	Correlated Moist Unit Wt. (pcf) per GB-7	Correlated C_c	Assumed Specific Gravity (G_s)	Computed Void Ratio (e)
Max	4	44	2.3	11	9	7	43	40	46	27	20	23	Max	2250	1000	532	50	20	2.0	825.7	90	105	0.324	2.65	0.945
Min	1	28	2.0	6	5	6	37	36	46	26	19	21	Min	2000	250	133	15	15	1.0	824.7	85	105	0.324	2.65	0.837
Average	3	36	2.1	9	7	7	40	38	46	27	20	22	Average	2125	625	333	33	18	1.5	825.2	88	105	0.324	2.65	0.891
Std Dev	2	11	0.2	4	3	1	4	3	0	1	1	1	Std Dev	177	530	282	25	4	0.7	0.7	4	0	0.000	0.00	0.076
Avg + Std	5	47	2.3	12	10	7	44	41	46	27	20	23	Avg + Std	2302	1155	615	57	21	2.2	825.9	91	105	0.324	2.65	0.968
Avg - Std	0	25	1.9	5	4	6	36	35	46	26	19	21	Avg - Std	1948	95	50	8	14	0.8	824.5	84	105	0.324	2.65	0.815

Alignment	Surface Elevation	Exploration ID	From		To	Sample ID	N_{60}	% Rec	HP	% Gr	% CS	% FS	% Silt	% Clay	LL	PL	PI	% WC	ODOT Class.	Soil Type	Layer	Short-Term Cohesion (psf) N-values PPR	Sowers	T & P	Correlated LT Cohesion (psf) per GB-7	phi (deg)	Midpoint Sample Depth (ft.)	Midpoint Sample Elevation (ft.)	Correlated Dry Unit Wt. (pcf) per GB-7	Correlated Moist Unit Wt. (pcf) per GB-7	Correlated C_c	Assumed Specific Gravity (G_s)	Computed Void Ratio (e)
NOB-77-12.36	826.7	B-001-2-23	0	-	1.5	SS-1	1	28	2.25	11	9	7	37	36	46	27	19	21	A-7-6	Cohesive	5	2250	250	133	15	15	1.0	825.7	85	105	0.324	2.65	0.945
NOB-77-12.36	826.7	B-001-2-23	1.5	-	3	SS-2	4	44	2	6	5	6	43	40	46	26	20	23	A-7-6	Cohesive	5	2000	1000	532	50	20	2.0	824.7	90	105	0.324	2.65	0.837

PROJECT: NOB-77-12.36	DRILLING FIRM / OPERATOR: CS / M. JAMISON	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 655+83, 61' RT.
TYPE: LANDSLIDE	SAMPLING FIRM / LOGGER: HDR / M. MOHAMMED	HAMMER: CME AUTOMATIC	ALIGNMENT: I 77
PID: 119893 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 3/7/22	ELEVATION: 888.4 (MSL) EOB: 82.1 ft.
START: 11/9/23 END: 11/9/23	SAMPLING METHOD: SPT / ST / NQ2	ENERGY RATIO (%): 83.4	LAT / LONG: 39.804349, -81.549073

EXPLORATION ID B-001-0-23

PAGE 1 OF 3

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	888.4																	
ASPHALT (5")	888.0																	
CONCRETE (7")	887.4																	
AGGREGATE BASE (6")	886.9																	
MEDIUM DENSE, BROWN, **STONE FRAGMENTS WITH SAND**, TRACE SILT, TRACE CLAY, DAMP (FILL)	885.9	Omitted	5 7 10	24	56	SS-1A	-	36	33	21	7	3	NP	NP	NP	7	A-1-b (0)	
						SS-1B	4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
VERY STIFF TO HARD, GRAY, **SILT AND CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, DAMP (FILL)	883.9		11 5 12	24	50	SS-2	4.5+	15	13	14	30	28	29	18	11	11	A-6a (5)	
VERY STIFF, GRAY, **SILT AND CLAY**, TRACE STONE FRAGMENTS, TRACE SAND, DAMP (FILL)	882.4		6 8 11	26	61	SS-3	3.00	8	4	5	49	34	38	24	14	12	A-6a (10)	
VERY STIFF TO HARD, RED BROWN, **SANDY SILT**, SOME STONE FRAGMENTS, LITTLE CLAY, DAMP (FILL)	880.2	Omitted	18 10 50/4"		63	SS-4	3.75	26	13	23	24	14	25	17	8	8	A-4a (1)	
			50/3"	-	0	SS-5	-	-	-	-	-	-	-	-	-	-		
DENSE, GRAY, **STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, DRY (FILL)	877.9		24 14 12	36	28	SS-6	-	68	9	7	9	7	24	16	8	4	A-2-4 (0)	
VERY STIFF, BROWN AND GRAY, **SILT AND CLAY**, SOME STONE FRAGMENTS, LITTLE SAND, DAMP (FILL)			10 8 5	18	44	SS-7	2.00	-	-	-	-	-	-	-	-	13	A-6a (V)	
Layer 1			5 5 6	15	67	SS-8	2.00	22	9	9	37	23	34	20	14	14	A-6a (7)	
			6 9 12	29	56	SS-9	2.75	-	-	-	-	-	-	-	-	20	A-6a (V)	
	873.4																	
VERY STIFF TO HARD, BROWN, **CLAY**, "AND" SILT, SOME SAND, LITTLE STONE FRAGMENTS, DAMP (FILL)	871.9		5 6 10	22	72	SS-10	4.25	15	14	8	37	26	43	24	19	17	A-7-6 (10)	
STIFF TO VERY STIFF, GRAY, **SILTY CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, DAMP (FILL) @ 17.0' - 17.5' : Qu = 3,007 psf					58	ST-11	2.75	20	23	11	27	19	38	22	16	14	A-6b (4)	
		Omitted	5 6 8	19	56	SS-12	4.5+	-	-	-	-	-	-	-	-	14	A-6b (V)	
	867.9					SS-13A	2.50	-	-	-	-	-	-	-	-	12	A-6b (V)	
STIFF TO VERY STIFF, GRAY, **SILTY CLAY**, SOME STONE FRAGMENTS, LITTLE SAND, DAMP (FILL)	866.9		6 6 7	18	83	SS-13B	3.75	28	7	5	39	21	38	22	16	12	A-6b (7)	
@ 20.5' : Noted Severely Weathered Shale Fragments			4 6 11	24	100	SS-14	3.50	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
VERY STIFF TO HARD, BROWN AND GRAY, **CLAY**, "AND" SILT, TRACE STONE FRAGMENTS, TRACE SAND, DAMP (FILL) @ 22.0' : Noted Tree Root Hairs			5 6 8	19	100	SS-15	2.50	9	5	4	46	36	43	23	20	17	A-7-6 (13)	
Layer 2			6 8 10	25	100	SS-16	2.00	-	-	-	-	-	-	-	-	17	A-7-6 (V)	
@ 26.0' - 27.5' : Noted Shale Fragments, Mottled Red-Brown	860.9		7 10 14	33	100	SS-17	2.75	-	-	-	-	-	-	-	-	10	A-7-6 (V)	
VERY STIFF TO HARD, BROWN AND GRAY, **CLAY**, "AND" STONE FRAGMENTS, SOME SILT, LITTLE SAND, DAMP (FILL) @ 27.5' - 35.0' : Noted Shale Fragments			9 9 11	28	61	SS-18	4.5+	36	6	5	33	20	42	23	19	10	A-7-6 (7)	
			7 10	32	100	SS-19	3.00	-	-	-	-	-	-	-	-	9	A-7-6 (V)	

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PWWORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

PID: 119893	SFN:	PROJECT: NOB-77-12.36	STATION / OFFSET: 655+83, 61' RT.	START: 11/9/23	END: 11/9/23	PG 2 OF 3	B-001-0-23

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	858.4																	
	857.9		13															
VERY STIFF, GRAY TRACE BROWN, **SILT AND CLAY**, SOME STONE FRAGMENTS, LITTLE SAND, DAMP (FILL)		31	8 9 12	29	83	SS-20	3.00	-	-	-	-	-	-	-	-	9	A-6a (V)	
Elevated moisture content		32																
		33	7 6 6	17	89	SS-21	4.00	25	7	5	40	23	35	21	14	10	A-6a (7)	
		34	6 7 8	21	100	SS-22	3.00	-	-	-	-	-	-	-	-	12	A-6a (V)	
	853.4	35																
VERY STIFF, BROWN MOTTLED GRAY, **CLAY**, SOME SILT, TRACE SAND, DAMP (FILL)		36	6 7 9	22	100	SS-23	2.00	0	1	2	21	76	78	29	49	29	A-7-6 (20)	
@ 35.0' - 36.5' : Noted Tree Root Hairs	851.9																	
VERY STIFF, BROWN MOTTLED GRAY, **CLAY**, SOME SILT, LITTLE STONE FRAGMENTS, LITTLE SAND, DAMP (FILL)		37			100	ST-24	4.5+	15	9	7	28	41	51	27	24	21	A-7-6 (14)	
@ 36.9' - 37.4' : Qu = 4,182 psf		38																
@ 38.0' - 40.0' : Noted Shale Fragments		39	10 7 9	22	83	SS-25	2.75	-	-	-	-	-	-	-	-	22	A-7-6 (V)	
	848.4	40																
VERY STIFF TO HARD, RED-BROWN, BROWN AND TRACE GRAY, **SILTY CLAY**, LITTLE STONE FRAGMENTS, LITTLE SAND, DAMP (FILL)		41	7 8 11	26	67	SS-26	4.25	-	-	-	-	-	-	-	-	17	A-6b (V)	
		42	8 8 11	26	100	SS-27	3.50	11	7	8	44	30	39	22	17	14	A-6b (11)	
Layer 2		43																
		44	5 8 11	26	50	SS-28	3.25	-	-	-	-	-	-	-	-	18	A-6b (V)	
	843.9	45																
VERY STIFF TO HARD, RED-BROWN MOTTLED GRAY, **SILT AND CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, DAMP (FILL)		46	8 11 14	35	83	SS-29	4.25	16	12	12	34	26	37	22	15	13	A-6a (7)	
		47	4 9 13	31	100	SS-30	3.50	-	-	-	-	-	-	-	-	15	A-6a (V)	
@ 47.0' - 47.5' Noted Light Brown and Gray	840.9	48																
VERY STIFF TO HARD, LIGHT BROWN TO RED-BROWN AND GRAY, **CLAY**, "AND" SILT, TRACE STONE FRAGMENTS, TRACE SAND, DAMP (FILL)		49	6 7 10	24	100	SS-31	4.5+	6	4	6	42	42	47	25	22	18	A-7-6 (14)	
		50	6 12 10	31	100	SS-32	3.50	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
@ 50.5' - 53.5' Noted Shale Fragments		51	5 9 14	32	100	SS-33	2.75	3	3	6	46	42	44	25	19	18	A-7-6 (12)	
		52																
		53	10 10 11	29	61	SS-34	3.75	-	-	-	-	-	-	-	-	14	A-7-6 (V)	
		54	6 11 14	35	94	SS-35	3.75	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
		55																
@ 55.0' : Added Water to Aid With Drilling		56	7 10 13	32	100	SS-36	2.00	3	3	6	42	46	41	24	17	20	A-7-6 (11)	
		57	5 9 13	31	100	SS-37	2.00	-	-	-	-	-	-	-	-	23	A-7-6 (V)	
		58																
		59	4 10 15	35	94	SS-38	3.75	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
		60	7 9 12	29	100	SS-39	2.75	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
	827.4	61																
@ 61.0' - 62.5' : Noted Tree Root Hairs			5 8	28	89	SS-40	2.00	1	3	3	35	58	62	26	36	24	A-7-6 (20)	

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PWWORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

PID: 119893	SFN:	PROJECT: NOB-77-12.36	STATION / OFFSET: 655+83, 61' RT.	START: 11/9/23	END: 11/9/23	PG 3 OF 3	B-001-0-23

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
VERY STIFF TO HARD, LIGHT BROWN TO RED-BROWN AND GRAY, **CLAY**, SOME SILT, TRACE STONE FRAGMENTS, TRACE SAND, DAMP (FILL) *(continued)* @ 63.5' - 64.0' : Qu = 5,199 psf	826.3	Layer 2 63	12		100	ST-41	4.5+	1	0	2	24	73	72	27	45	26	A-7-6 (20)	
VERY STIFF TO HARD, LIGHT BROWN TO RED-BROWN MOTTLED GRAY, **CLAY**, "AND" SILT, TRACE STONE FRAGMENTS, TRACE SAND, DAMP @ 64.5' - 70.5' : Noted Mottled Black Small Coal Fragments	823.9	64 65 66 67	5 13 15	39	100	SS-42	3.25	-	-	-	-	-	-	-	-	25	A-7-6 (V)	
Layer 4			8 14 15	40	89	SS-43	3.50	4	3	4	39	50	50	24	26	21	A-7-6 (16)	
		68	4 8 17	35	83	SS-44	3.25	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
	818.6	69	8 15 27	58	100	SS-45A	3.50	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
HARD, DARK GRAY, **SILT**, SOME CLAY, TRACE STONE FRAGMENTS, TRACE SAND, DAMP	817.9					SS-45B	4.5+	2	4	6	63	25	30	22	8	20	A-4b (8)	
@ 70.33' - 70.5' : Bottom 2" of Spoon, Noted Hard, Dark Black Piece of Wood, Possibly Coal Fragment	817.4	TR 71	12 50/2"	-	100/	SS-46A SS-46B	2.75 -	3 -	5 -	6 -	39 -	47 -	46 -	24 -	22 -	21 12	A-7-6 (14) Rock (V)	
VERY STIFF TO HARD, BROWN AND GRAY, **CLAY**, "AND" SILT, LITTLE SAND, TRACE STONE FRAGMENTS, DAMP @ 70.5' - 71.0' : Noted Dark Black Tree Root Hairs	816.3	72	50/1"	-	100/	SS-47	-	-	-	-	-	-	-	-	-	6	Rock (V)	
SANDSTONE, GRAY, SEVERELY WEATHERED, VERY WEAK.	813.9	73 74 75 76 77	65		100	NQ2-1											CORE	
SANDSTONE, DARK GRAY (BROWN SURFACE), MODERATELY WEATHERED, MODERATELY STRONG TO STRONG, VERY FINE TO MEDIUM GRAINED, VERY THIN TO THIN BEDDED, FERRIFEROUS, JOINT DISCONTINUITIES, MODERATELY FRACTURED, NARROW TO OPEN APERTURE WIDTH, SLIGHTLY ROUGH SURFACE, BLOCKY STRUCTURE, FAIR SURFACE; RQD 52%, REC 100%.		78 79 80	93		100	NQ2-2											CORE	
SANDSTONE, LIGHT GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG, FINE TO MEDIUM GRAINED, THIN BEDDED, JOINT DISCONTINUITIES, SLIGHTLY TO MODERATELY FRACTURED, NARROW TO OPEN APERTURE WIDTH, SLIGHTLY ROUGH SURFACE, BLOCKY STRUCTURE, GOOD SURFACE; RQD 88%, REC 100%. @ 75.6' - 75.8' : Gray Clay Seam @ 76.6' - 77.0' : Qu = 4,286 psi	806.3	EOB 82																

Omitted

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 25 LB. BENTONITE POWDER; MIXED 94 LB. CEMENT MIXED WITH 75 GAL WATER; SURFACE PATCHED WITH QUICKCRETE

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PWWORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

PROJECT: NOB-77-12.36	DRILLING FIRM / OPERATOR: CS / M. JAMISON	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 655+85, 131' RT.	EXPLORATION ID B-001-1-23
TYPE: LANDSLIDE	SAMPLING FIRM / LOGGER: HDR / M. MOHAMMED	HAMMER: CME AUTOMATIC	ALIGNMENT: I 77	
PID: 119893 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 3/7/22	ELEVATION: 856.2 (MSL) EOB: 64.3 ft.	PAGE 1 OF 3
START: 11/7/23 END: 11/7/23	SAMPLING METHOD: SPT / ST / NQ2	ENERGY RATIO (%): 83.4	LAT / LONG: 39.804364, -81.548824	

MATERIAL DESCRIPTION AND NOTES	ELEV. 856.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (5")	855.8	1	2 2 5	10	50	SS-1	3.50	-	-	-	-	-	-	-	-	12	A-6a (V)	
STIFF TO VERY STIFF, BROWN AND GRAY, **SILT AND CLAY**, LITTLE STONE FRAGMENTS, LITTLE SAND, DAMP (FILL) @ 0.4' - 3.0' : Noted Tree Root Hairs		2	5 5 5	14	72	SS-2	4.00	20	7	5	44	24	36	21	15	12	A-6a (9)	
	852.7	3	5	15	89	SS-3A	3.50	-	-	-	-	-	-	-	-	21	A-6a (V)	
STIFF, BROWN AND GRAY, **CLAY**, SOME STONE FRAGMENTS, SOME SILT, TRACE SAND, DAMP (FILL)		4	5 6			SS-3B	-	-	-	-	-	-	-	-	-	13	A-7-6 (V)	
	850.2	5	3 4	10	33	SS-4	-	35	6	4	31	24	42	25	17	13	A-7-6 (7)	
STIFF TO VERY STIFF, BROWN AND GRAY, **CLAY**, "AND" SILT, LITTLE STONE FRAGMENTS, LITTLE SAND, DAMP (FILL) Layer 3		6	3 4	10	78	SS-5	3.50	11	9	6	37	37	44	24	20	20	A-7-6 (13)	
	847.2	7	4 5 5	14	67	SS-6	3.50	-	-	-	-	-	-	-	-	15	A-7-6 (V)	
STIFF TO VERY STIFF, RED BROWN, **CLAY**, "AND" SILT, LITTLE SAND, TRACE STONE FRAGMENTS, DAMP (FILL)		8	4 5 6	15	78	SS-7	3.50	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
Elevated moisture content		9	2 3 5	11	50	SS-8	1.75	3	4	8	41	44	49	25	24	22	A-7-6 (15)	
Layer 1		10	4 7 9	22	78	SS-9	2.00	-	-	-	-	-	-	-	-	19	A-7-6 (V)	
@ 14.6' - 15.1' : Qu = 1,951 psf		11			100	ST-10	3.50	8	6	5	46	35	46	26	20	19	A-7-6 (13)	
@ 15.5' : Noted Stone Fragments at Bottom of Shelby Tube		12	4 5 5	14	28	SS-11	2.00	-	-	-	-	-	-	-	-	10	A-7-6 (V)	
	839.2	13	4 5 7	17	72	SS-12	3.25	19	6	6	39	30	39	23	16	14	A-6b (9)	
STIFF TO VERY STIFF, RED BROWN, **SILTY CLAY**, LITTLE STONE FRAGMENTS, LITTLE SAND, DAMP (FILL)		14	4 5 6	15	44	SS-13	2.00	-	-	-	-	-	-	-	-	16	A-6b (V)	
@ 19.75' : Noted Shale Fragments		15	5 6 7	18	56	SS-14	2.25	-	-	-	-	-	-	-	-	16	A-6b (V)	
		16	3 4 6	14	56	SS-15	2.25	-	-	-	-	-	-	-	-	18	A-6b (V)	
	832.2	17	6 12 9	29	72	SS-16A	2.00	-	-	-	-	-	-	-	-	16	A-6b (V)	
	831.7					SS-16B	-	0	1	3	43	53	42	26	16	9	A-7-6 (11)	
VERY STIFF, GRAY, **CLAY**, "AND" SILT, TRACE SAND, DAMP (FILL)		18	4 6 8	19	50	SS-17	2.25	-	-	-	-	-	-	-	-	15	A-7-6 (V)	
STIFF TO VERY STIFF, RED BROWN, **CLAY**, SOME SILT, TRACE STONE FRAGMENTS, TRACE SAND, DAMP (FILL)		19	3 5 6	15	100	SS-18	1.50	2	3	5	35	55	46	24	22	21	A-7-6 (14)	
		20	3 5 8	18	100	SS-19	1.50	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
		21	4 7	19	100	SS-20	1.50	-	-	-	-	-	-	-	-	21	A-7-6 (V)	

Omitted

Omitted

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PW\WORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

PID: 119893	SFN:	PROJECT: NOB-77-12.36	STATION / OFFSET: 655+85, 131' RT.	START: 11/7/23	END: 11/7/23	PG 2 OF 3	B-001-1-23

MATERIAL DESCRIPTION AND NOTES	ELEV. 826.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	825.7		7															
VERY STIFF, RED BROWN MOTTLED GRAY, **CLAY**, SOME SILT, TRACE STONE FRAGMENTS, TRACE SAND, DAMP (FILL)		31	4 7 10	24	100	SS-21	2.50	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
Layer 2		32	5 8 8	22	100	SS-22	2.50	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
		33	4 6 9	21	100	SS-23	2.75	-	-	-	-	-	-	-	-	22	A-7-6 (V)	
		34	5 7 9	22	100	SS-24	2.00	-	-	-	-	-	-	-	-	24	A-7-6 (V)	
		35	4 8 9	24	100	SS-25	2.75	6	4	5	34	51	52	27	25	20	A-7-6 (16)	
		36	5 8 12	28	72	SS-26	2.00	-	-	-	-	-	-	-	-	22	A-7-6 (V)	
		37	5 8 8	22	50	SS-27	2.75	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
Layer 4		38	6 8 11	26	100	SS-28	3.00	-	-	-	-	-	-	-	-	19	A-7-6 (V)	
	813.7	39																
HARD, RED-BROWN AND GRAY, **SILT AND CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, DAMP	813.0	40	12 50/3"	-	100	SS-29	4.5+	18	12	16	28	26	35	21	14	14	A-6a (5)	
@ 43.0' - 43.25' : Noted Sandstone and Red Weathered Claystone at Bottom 3"		41																
	811.9	42	50/3"	-	100	SS-30	-	-	-	-	-	-	-	-	-	8	Rock (V)	
SANDSTONE, GRAY, SEVERELY WEATHERED, VERY WEAK.		43																
		44	85		100	NQ2-1											CORE	
SANDSTONE, LIGHT GRAY TO GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG, FINE TO MEDIUM GRAINED, THIN TO MEDIUM BEDDED, JOINT DISCONTINUITIES, SLIGHTLY TO MODERATELY FRACTURED, NARROW TO OPEN APERTURE WIDTH, SLIGHTLY ROUGH SURFACE, BLOCKY STRUCTURE, FAIR TO GOOD SURFACE; RQD 93%, REC 100%.		45																
@ 44.3' - 44.4' : 1.5 Inch Stone Fragment		46																
@ 44.4' - 44.6' : 2.5 Inch Part of Intact Sandstone, Brown Iron Stains Surface, Ferriferous		47																
@ 45.4' - 45.8' : Qu = 4,147 psi		48	100		100	NQ2-2											CORE	
		49																
		50																
		51																
		52																
		53	100		100	NQ2-3											CORE	
		54																
		55																
		56																
		57																
		58	80		100	NQ2-4											CORE	
		59																
		60																
		61																

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STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PWWORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

PID: 119893	SFN:	PROJECT: NOB-77-12.36	STATION / OFFSET: 655+85, 131' RT.	START: 11/7/23	END: 11/7/23	PG 3 OF 3	B-001-1-23

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
@ 62.3' - 64.3' : Petroliferous with Natural Smell	794.1																	
	791.9	63	100		100	NQ2-5											CORE	
		EOB 64																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 12.5 LB. BENTONITE POWDER; MIXED 47 LB. CEMENT MIXED WITH 50 GAL WATER

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PWWORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

PROJECT: NOB-77-12.36	DRILLING FIRM / OPERATOR: CS / M. JAMISON	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 655+75, 201' RT.	EXPLORATION ID B-001-2-23
TYPE: LANDSLIDE	SAMPLING FIRM / LOGGER: HDR / M. MOHAMMED	HAMMER: CME AUTOMATIC	ALIGNMENT: I 77	
PID: 119893 SFN:	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 3/7/22	ELEVATION: 826.7 (MSL) EOB: 44.7 ft.	PAGE 1 OF 2
START: 11/6/23 END: 11/7/23	SAMPLING METHOD: SPT / ST / NQ2	ENERGY RATIO (%): 83.4	LAT / LONG: 39.804346, -81.548575	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	826.7																	
SOFT TO MEDIUM STIFF, GRAY AND RED BROWN, **CLAY**, "AND" SILT, LITTLE STONE FRAGMENTS, LITTLE SAND, DAMP (SLIDE MATERIAL)	825.2	1	1 1 0	1	28	SS-1	2.25	11	9	7	37	36	46	27	19	21	A-7-6 (12)	
SOFT TO MEDIUM STIFF, GRAY AND RED BROWN, **CLAY**, "AND" SILT, LITTLE SAND, TRACE STONE FRAGMENTS, DAMP (SLIDE MATERIAL)	823.7	2	1 1 2	4	44	SS-2	2.00	6	5	6	43	40	46	26	20	23	A-7-6 (13)	
@ 1.5' - 3.0' : Noted Gray and Red Shale Fragments		3	2 3 3	8	56	SS-3	2.00	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
MEDIUM STIFF TO STIFF, GRAY AND RED BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE STONE FRAGMENTS, DAMP (FILL)		4	3 3 4	10	56	SS-4	1.50	-	-	-	-	-	-	-	-	19	A-7-6 (V)	
@ 3.0' - 6.0' : Noted Tree Root Hairs		5	3 4 5	13	61	SS-5	2.75	5	7	6	30	52	56	26	30	23	A-7-6 (19)	
		6	4 2 3	7	61	SS-6	2.25	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
		7	3 5 4	13	56	SS-7	2.00	-	-	-	-	-	-	-	-	14	A-7-6 (V)	
		8	3 5 6	15	39	SS-8	2.50	-	-	-	-	-	-	-	-	17	A-7-6 (V)	
	814.7	9																
STIFF, GRAY AND RED BROWN, **CLAY**, SOME STONE FRAGMENTS, SOME SAND, SOME SILT, DAMP (FILL)	813.2	10	3 5 4	13	56	SS-9	1.50	24	15	8	29	24	43	24	19	17	A-7-6 (7)	
MEDIUM STIFF TO STIFF, GRAY AND BROWN, **SILTY CLAY**, SOME SAND, TRACE STONE FRAGMENTS, MOIST (FILL)		11			71	ST-10	1.75	8	9	16	32	35	39	20	19	21	A-6b (10)	
@ 14.0' - 14.5' : Qu = 1,726 psf	811.2	12																
MEDIUM DENSE, LIGHT GRAY AND BROWN, **STONE FRAGMENTS WITH SAND AND SILT**, LITTLE CLAY, DAMP (FILL)	809.7	13	4 5 7	17	39	SS-11	-	30	11	32	16	11	NP	NP	NP	11	A-2-4 (0)	
VERY STIFF, BROWN, **SILT AND CLAY**, SOME STONE FRAGMENTS, SOME SAND, DAMP (FILL)	808.2	14	11 11 10	29	61	SS-12	2.25	28	9	22	25	16	28	17	11	15	A-6a (1)	
MEDIUM DENSE, BROWN, **STONE FRAGMENTS WITH SAND AND SILT**, LITTLE CLAY, DAMP (FILL)	808.0	15	4 3 15	25	67	SS-13A	-	25	9	31	21	14	23	17	6	13	A-2-4 (0)	
	806.5	16				SS-13B	3.50	5	9	24	41	21	34	24	10	25	A-4a (5)	
VERY STIFF, DARK GRAY, **SANDY SILT**, SOME CLAY, TRACE STONE FRAGMENTS, DAMP	805.7	17	36 50/3"	-	100	SS-14	-	-	-	-	-	-	-	-	-	7	Rock (V)	
SANDSTONE, GRAY AND BROWN, SEVERELY WEATHERED, WEAK.		18	50/4"	-	100	SS-15	-	-	-	-	-	-	-	-	-	6	Rock (V)	
SANDSTONE, BROWN, SEVERELY WEATHERED, WEAK, VERY FINE TO FINE GRAINED.	803.7	19	50/4"	-	100	SS-16	-	-	-	-	-	-	-	-	-	7	Rock (V)	
SANDSTONE, GRAY AND BROWN, SEVERELY WEATHERED, WEAK, VERY FINE TO FINE GRAINED.	802.0	20	50/2"	-	100	SS-17	-	-	-	-	-	-	-	-	-	8	Rock (V)	
SANDSTONE, LIGHT GRAY TO GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG, FINE TO MEDIUM GRAINED, THIN TO MEDIUM BEDDED, PETROLIFEROUS, JOINT DISCONTINUITIES, MODERATELY FRACTURED, NARROW TO OPEN APERTURE WIDTH, SLIGHTLY ROUGH SURFACE, BLOCKY STRUCTURE, FAIR TO GOOD SURFACE; RQD 89%, REC 100%.		21	64		100	NQ2-1											CORE	
@ 25.3' : 0.25 Inch Soft Light Gray Clay Seam		22																
		23																
		24																
		25																
		26																
		27																
		28																
		29																

Layer 5
Layer 3
Layer 1
Omitted
Layer 2
Layer 4
TR

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PW\WORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

PID: 119893	SFN:	PROJECT: NOB-77-12.36	STATION / OFFSET: 655+75, 201' RT.	START: 11/6/23	END: 11/7/23	PG 2 OF 2	B-001-2-23

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
@ 26.9' : 0.25 Inch Soft Light Gray Clay Seam @ 28.8' : 0.25 Inch Soft Light Gray Clay Seam **SANDSTONE**, LIGHT GRAY TO GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG, FINE TO MEDIUM GRAINED, THIN TO MEDIUM BEDDED, PETROLIFEROUS, JOINT DISCONTINUITIES, MODERATELY FRACTURED, NARROW TO OPEN APERTURE WIDTH, SLIGHTLY ROUGH SURFACE, BLOCKY STRUCTURE, FAIR TO GOOD SURFACE; RQD 89%, REC 100%. *(continued)* @ 31.3' - 31.7' : Qu = 6,060 psi @ 35.3' : 0.25 Inch Soft Light Gray Clay Seam	796.7	31 32 33 34 35 36 37 38 39 40 41 42 43 44	90		100	NQ2-2											CORE	
			88		100	NQ2-3											CORE	
			100		100	NQ2-4											CORE	
	782.0	EOB	100		100	NQ2-5											CORE	

NOTES: ENDED SPLIT SPOON AND STARTED ROCK CORING AT 24.7' DUE TO UNSTABLE SLOPE AND CRIBBING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 7 LB. BENTONITE POWDER; MIXED 24 LB. CEMENT MIXED WITH 25 GAL WATER

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/11/23 12:11 - C:\PW\WORKING\EAST01\D3491736\20231113_NOB-77-12.36 BORING LOG.GPJ

Laboratory Testing

NEAS
National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, OH 43213
614-892-0162

Unconfined Compressive Strength of Cohesive Soil (ASTM D2166)

(Project: NOB-77-12.36, Boring Location: B-001-0-23, ST-11, Depth: 17.0 - 17.5ft)

Tested Date: 11/14/2023

Specimen Properties

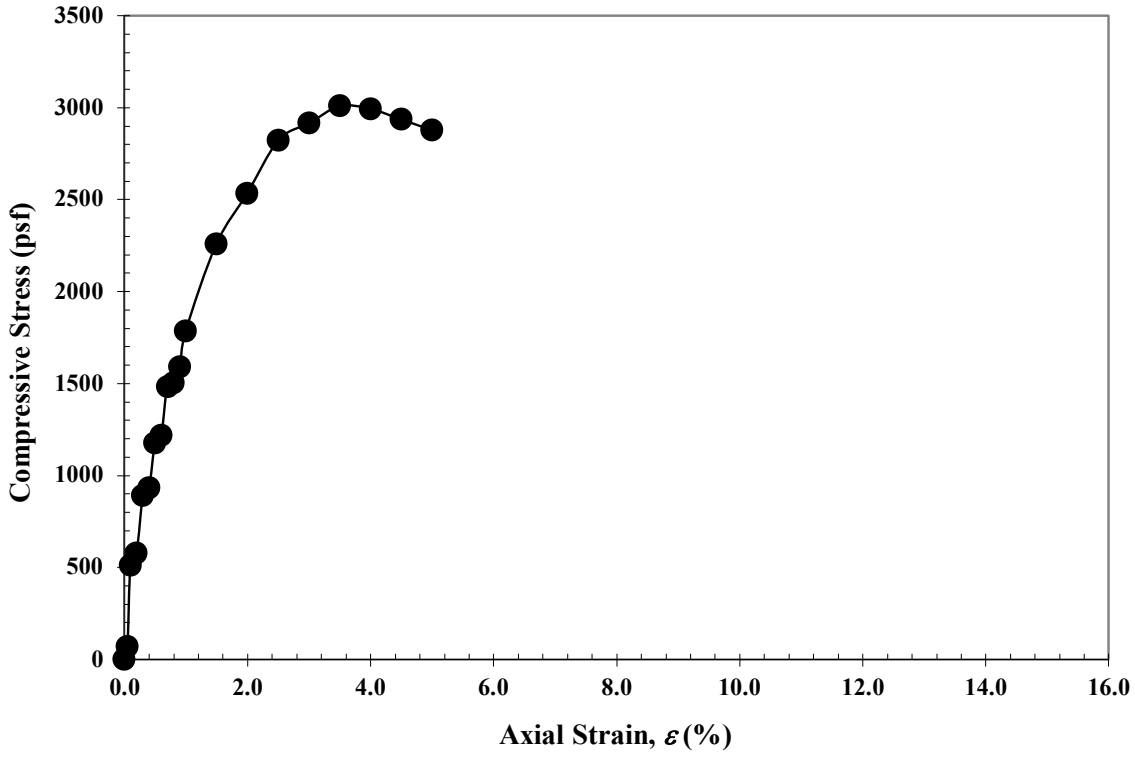
Average Dia., D_{avg} (in):	2.87
Average Height, H_{avg} (in):	5.74
Area, A (in^2):	6.47
Volume, V (in^3):	37.16
Wet Mass of Specimen (lb):	2.9
Moisture Content (%):	13.6
Dry Mass of Specimen (lb):	2.6
Wet Unit Weight, γ (lb/ft^3):	136.8
Dry Unit Weight, γ_d (lb/ft^3):	120.5

Final Specimen Figure



Results

Unconfined Compressive Strength (psf):	**3007**
Strain (%):	**3.5**



Notes: Stiff, brown, SILTY CLAY, some sand, little gravel, damp. Specimen contains gravel >1/6 specimen diameter. Results reported may differ from a specimen that meets the maximum particle size allowance of D2166.

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Unconfined Compressive Strength of Cohesive Soil (ASTM D2166)

(Project: NOB-77-12.36, Boring Location: B-001-0-23, ST-24, Depth: 36.9 - 37.4ft)

Tested Date: 11/14/2023

Specimen Properties

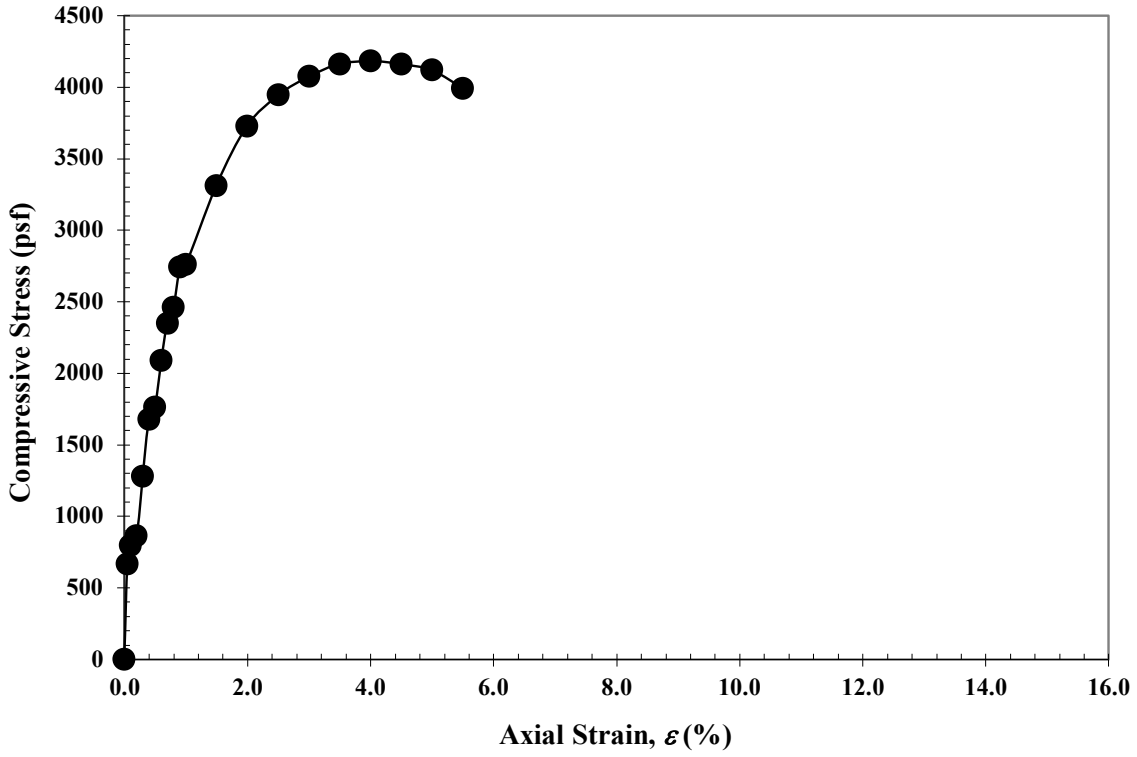
Average Dia., D_{avg} (in):	2.88
Average Height, H_{avg} (in):	5.74
Area, A (in^2):	6.51
Volume, V (in^3):	37.36
Wet Mass of Specimen (lb):	2.9
Moisture Content (%):	20.8
Dry Mass of Specimen (lb):	2.4
Wet Unit Weight, γ (lb/ft^3):	132.0
Dry Unit Weight, γ_d (lb/ft^3):	109.3

Final Specimen Figure



Results

Unconfined Compressive Strength (psf):	**4182**
Strain (%):	**4.0**



Notes: Very stiff, brown mottled with gray, CLAY, some silt, little sand, little gravel, damp.

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Unconfined Compressive Strength of Cohesive Soil (ASTM D2166)

(Project: NOB-77-12.36, Boring Location: B-001-0-23, ST-41, Depth: 63.5 - 64.0ft)

Tested Date: 11/14/2023

Specimen Properties

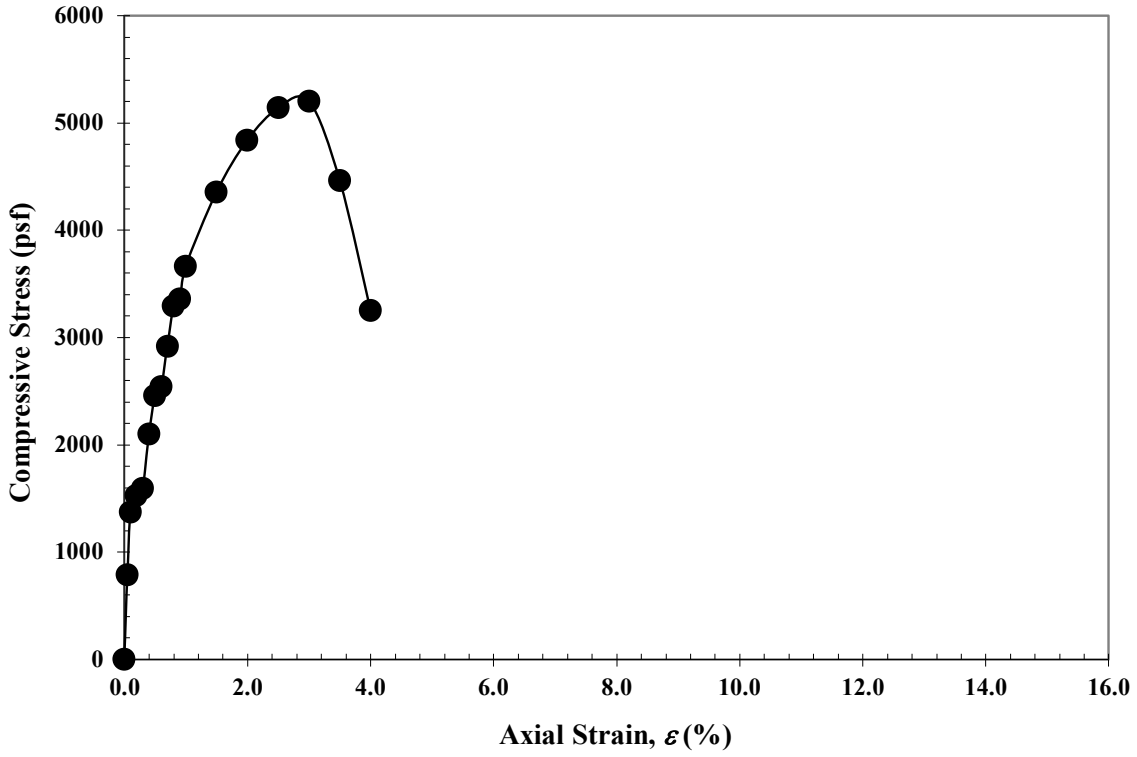
Average Dia., D_{avg} (in):	2.86
Average Height, H_{avg} (in):	5.73
Area, A (in^2):	6.42
Volume, V (in^3):	36.79
Wet Mass of Specimen (lb):	2.7
Moisture Content (%):	23.6
Dry Mass of Specimen (lb):	2.2
Wet Unit Weight, γ (lb/ft^3):	126.6
Dry Unit Weight, γ_d (lb/ft^3):	102.4

Final Specimen Figure



Results

Unconfined Compressive Strength (psf):	**5199**
Strain (%):	**3.0**



Notes: Very stiff, brown and light brown, CLAY, some silt, trace sand, trace gravel, damp.

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Unconfined Compressive Strength of Cohesive Soil (ASTM D2166)

(Project: NOB-77-12.36, Boring Location: B-001-1-23, ST-10, Depth: 14.6 - 15.1ft)

Tested Date: 11/17/2023

Specimen Properties

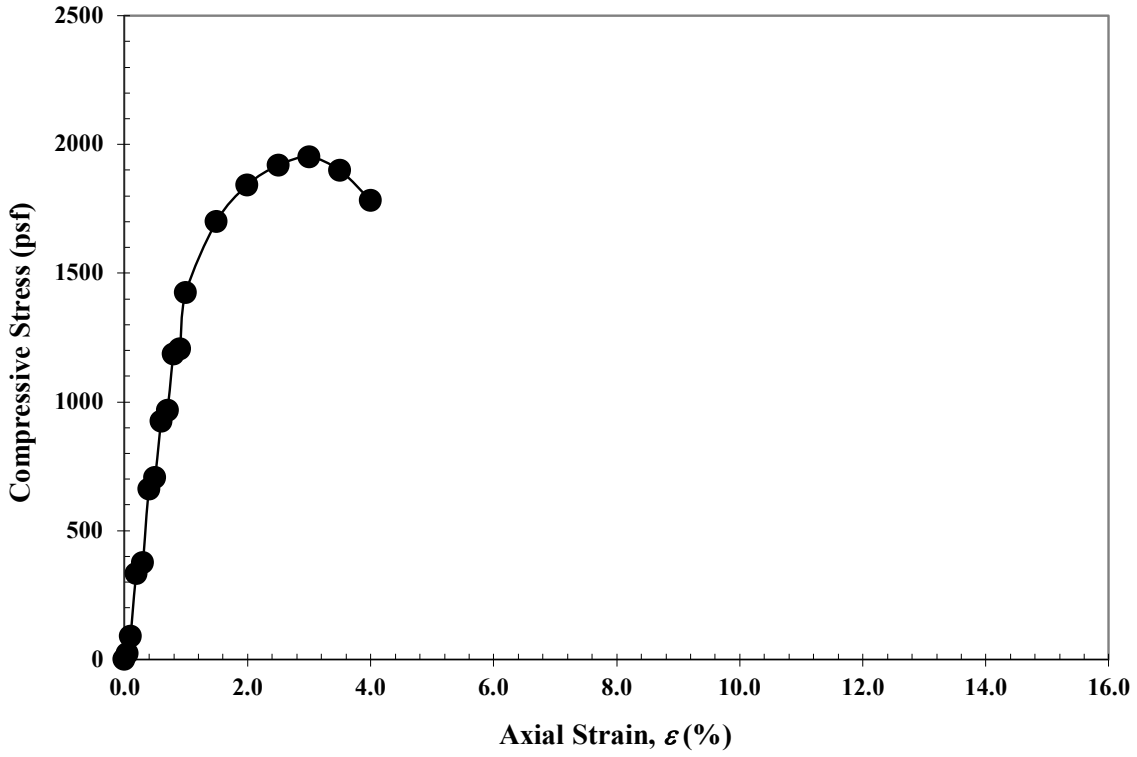
Average Dia., D_{avg} (in):	2.88
Average Height, H_{avg} (in):	5.73
Area, A (in^2):	6.52
Volume, V (in^3):	37.35
Wet Mass of Specimen (lb):	2.9
Moisture Content (%):	17.1
Dry Mass of Specimen (lb):	2.4
Wet Unit Weight, γ (lb/ft^3):	132.7
Dry Unit Weight, γ_d (lb/ft^3):	113.2

Final Specimen Figure



Results

Unconfined Compressive Strength (psf):	**1951**
Strain (%):	**3.0**



Notes: Medium stiff, brown and maroonish brown, CLAY, "and" silt, little sand, trace gravel, damp. Specimen contains gravel >1/6 specimen diameter. Results reported may differ from a specimen that meets the maximum particle size allowance of D2166.

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Unconfined Compressive Strength of Cohesive Soil (ASTM D2166)

(Project: NOB-77-12.36, Boring Location: B-001-2-23, ST-10, Depth: 14.0 - 14.5ft)

Tested Date: 11/20/2023

Specimen Properties

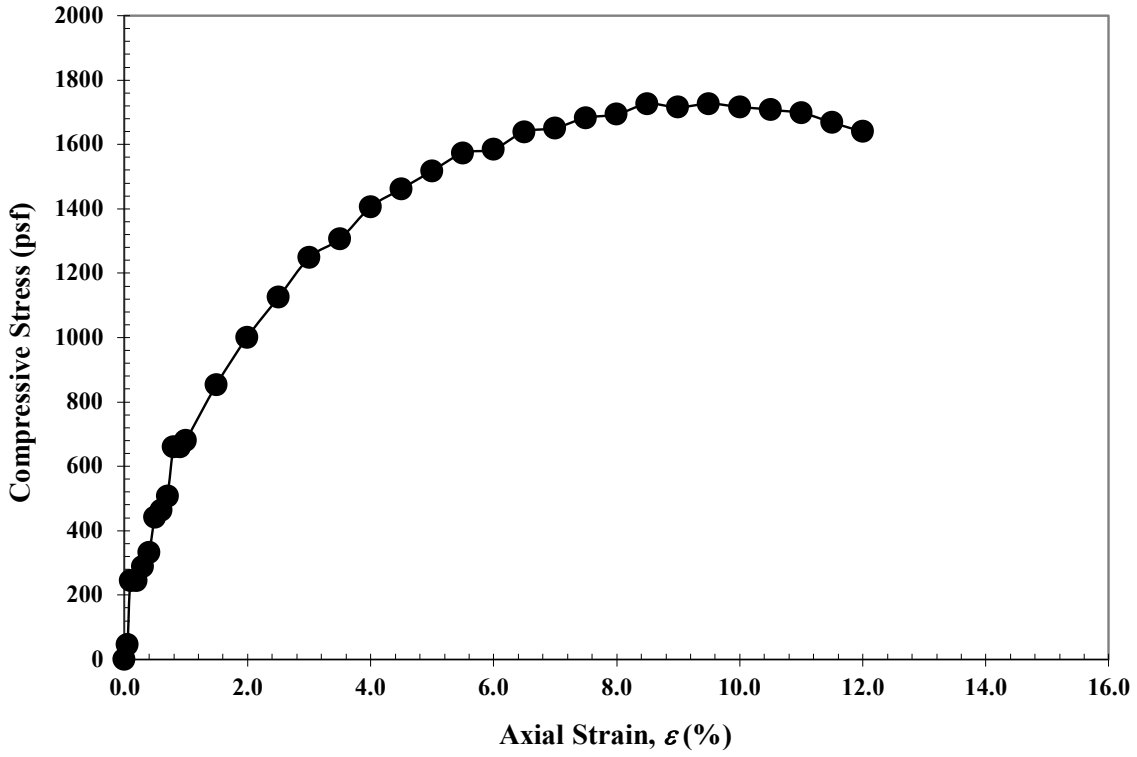
Average Dia., D_{avg} (in):	2.88
Average Height, H_{avg} (in):	5.74
Area, A (in^2):	6.49
Volume, V (in^3):	37.25
Wet Mass of Specimen (lb):	2.8
Moisture Content (%):	22.0
Dry Mass of Specimen (lb):	2.3
Wet Unit Weight, γ (lb/ft^3):	130.1
Dry Unit Weight, γ_d (lb/ft^3):	106.6

Final Specimen Figure



Results

Unconfined Compressive Strength (psf):	**1726**
Strain (%):	**9.5**



Notes: Medium stiff, brown mottled with maroonish brown and gray, SILTY CLAY, some sand, trace gravel, moist. Specimen contains gravel >1/6 specimen diameter. Results reported may differ from a specimen that meets the maximum particle size allowance of D2166.

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Unconfined Compressive Strength of Rock Core (ASTM D7012 Method C)

(Project: NOB-77-12.36, Boring Location: B-001-0-23, NQ2-1, Depth: 76.6 - 77.0ft)

Tested Date: 11/16/23

Specimen Properties

Average Dia., D_{avg} (in):	1.97
Average Height, H_{avg} (in):	4.52
Length to Diameter Ratio:	2.29
Area, A (in^2):	3.06
Volume, V (in^3):	13.85
Wet Mass of Specimen (lb):	1.2
Moisture Content (%):	6.5
Dry Mass of Specimen (lb):	1.1
Wet Unit Weight, γ (lb/ft^3):	148.4
Dry Unit Weight, γ_d (lb/ft^3):	139.3

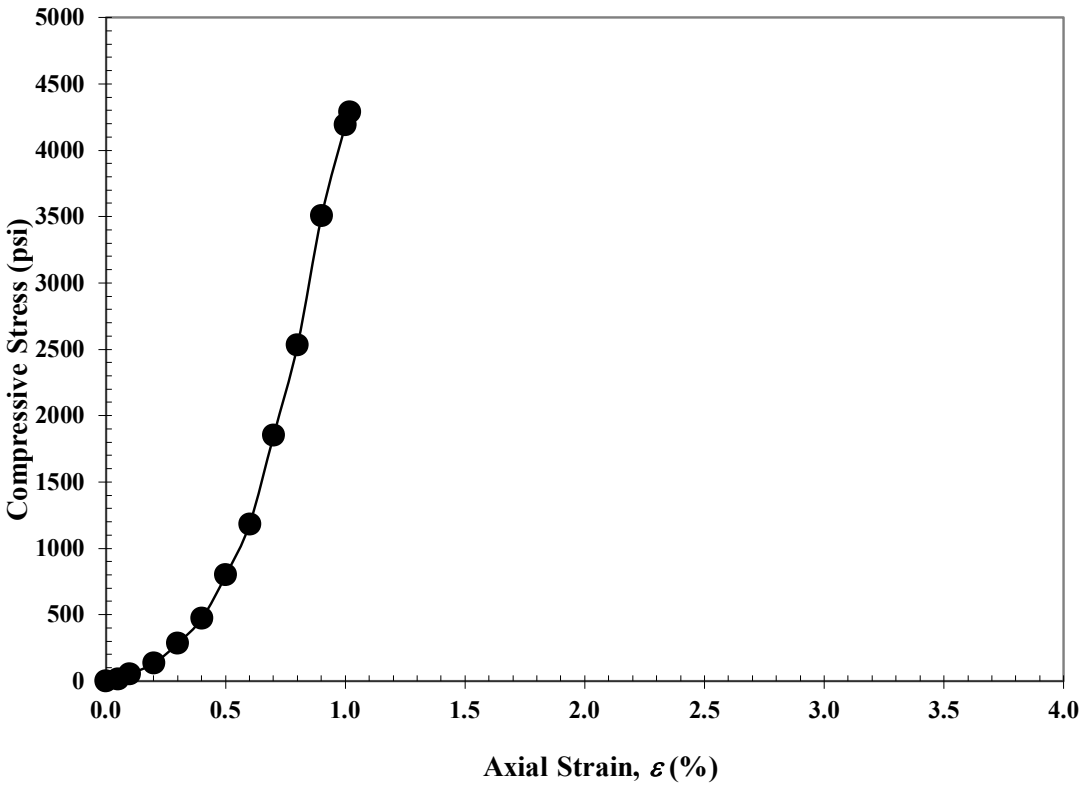
Final Specimen Figure



Results

Unconfined Compressive Strength (psi): **4286** **30** (MPa)

Strain (%): **1.0**



Notes: Sandstone, gray, slightly weathered, moderately strong, fine to medium grained.

Sample trimming procedure does not conform to ASTM D4543 and the results reported may differ from the results obtained from a test specimen that meets the requirements of Practice D4543.

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Unconfined Compressive Strength of Rock Core (ASTM D7012 Method C)

(Project: NOB-77-12.36, Boring Location: B-001-1-23, NQ2-1, Depth: 45.4 - 45.8ft)

Tested Date: 11/16/23

Specimen Properties

Average Dia., D_{avg} (in):	1.98
Average Height, H_{avg} (in):	4.65
Length to Diameter Ratio:	2.35
Area, A (in^2):	3.08
Volume, V (in^3):	14.31
Wet Mass of Specimen (lb):	1.3
Moisture Content (%):	4.5
Dry Mass of Specimen (lb):	1.2
Wet Unit Weight, γ (lb/ft^3):	153.4
Dry Unit Weight, γ_d (lb/ft^3):	146.8

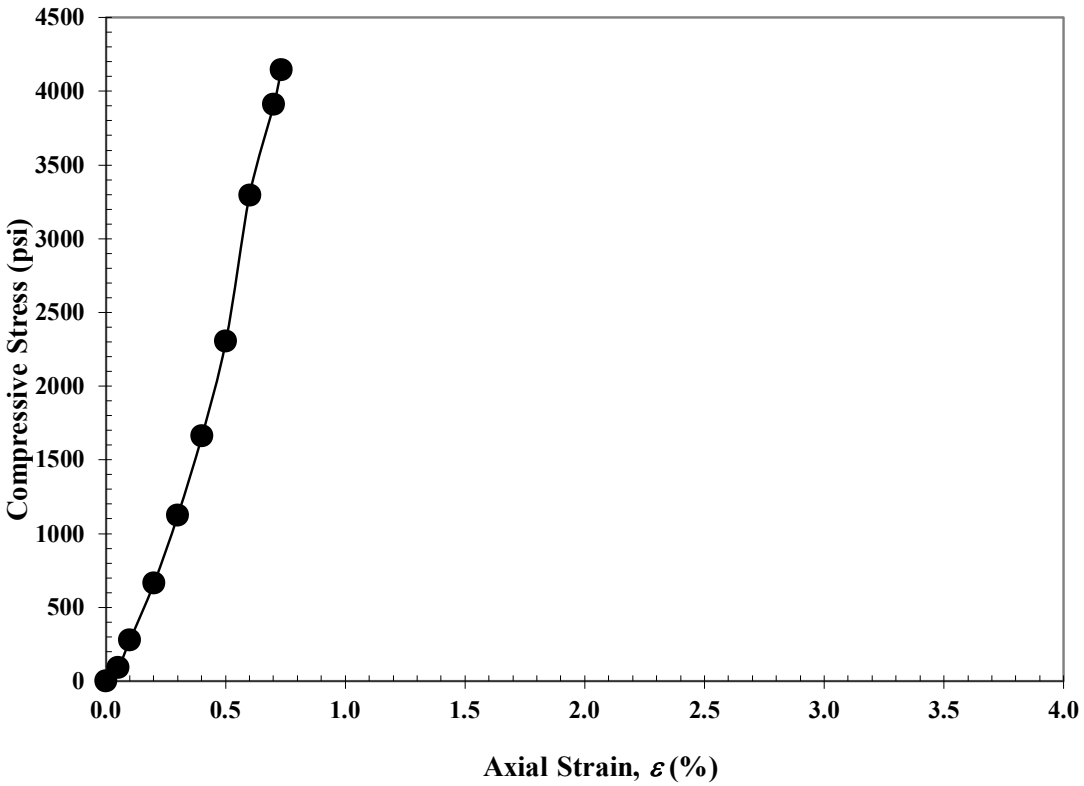
Final Specimen Figure



Results

Unconfined Compressive Strength (psi): **4147** **29** (MPa)

Strain (%): **0.7**



Notes: Sandstone, gray, slightly weathered, moderately strong, fine to medium grained.

Sample trimming procedure does not conform to ASTM D4543 and the results reported may differ from the results obtained from a test specimen that meets the requirements of Practice D4543.

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Unconfined Compressive Strength of Rock Core (ASTM D7012 Method C)

(Project: NOB-77-12.36, Boring Location: B-001-2-23, NQ2-2, Depth: 31.3 - 31.7ft)

Tested Date: 11/16/23

Specimen Properties

Average Dia., D_{avg} (in):	1.97
Average Height, H_{avg} (in):	4.61
Length to Diameter Ratio:	2.34
Area, A (in^2):	3.05
Volume, V (in^3):	14.06
Wet Mass of Specimen (lb):	1.3
Moisture Content (%):	3.0
Dry Mass of Specimen (lb):	1.3
Wet Unit Weight, γ (lb/ft^3):	158.3
Dry Unit Weight, γ_d (lb/ft^3):	153.7

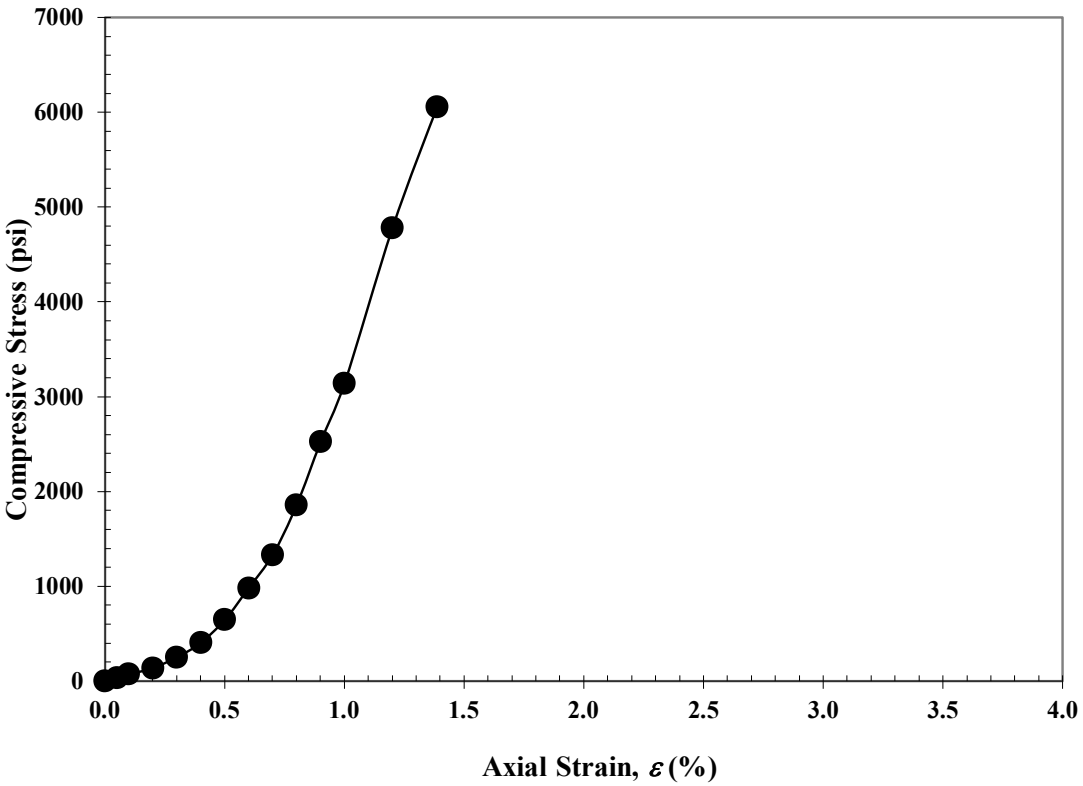
Final Specimen Figure



Results

Unconfined Compressive Strength (psi): **6060** **42** (MPa)

Strain (%): **1.4**



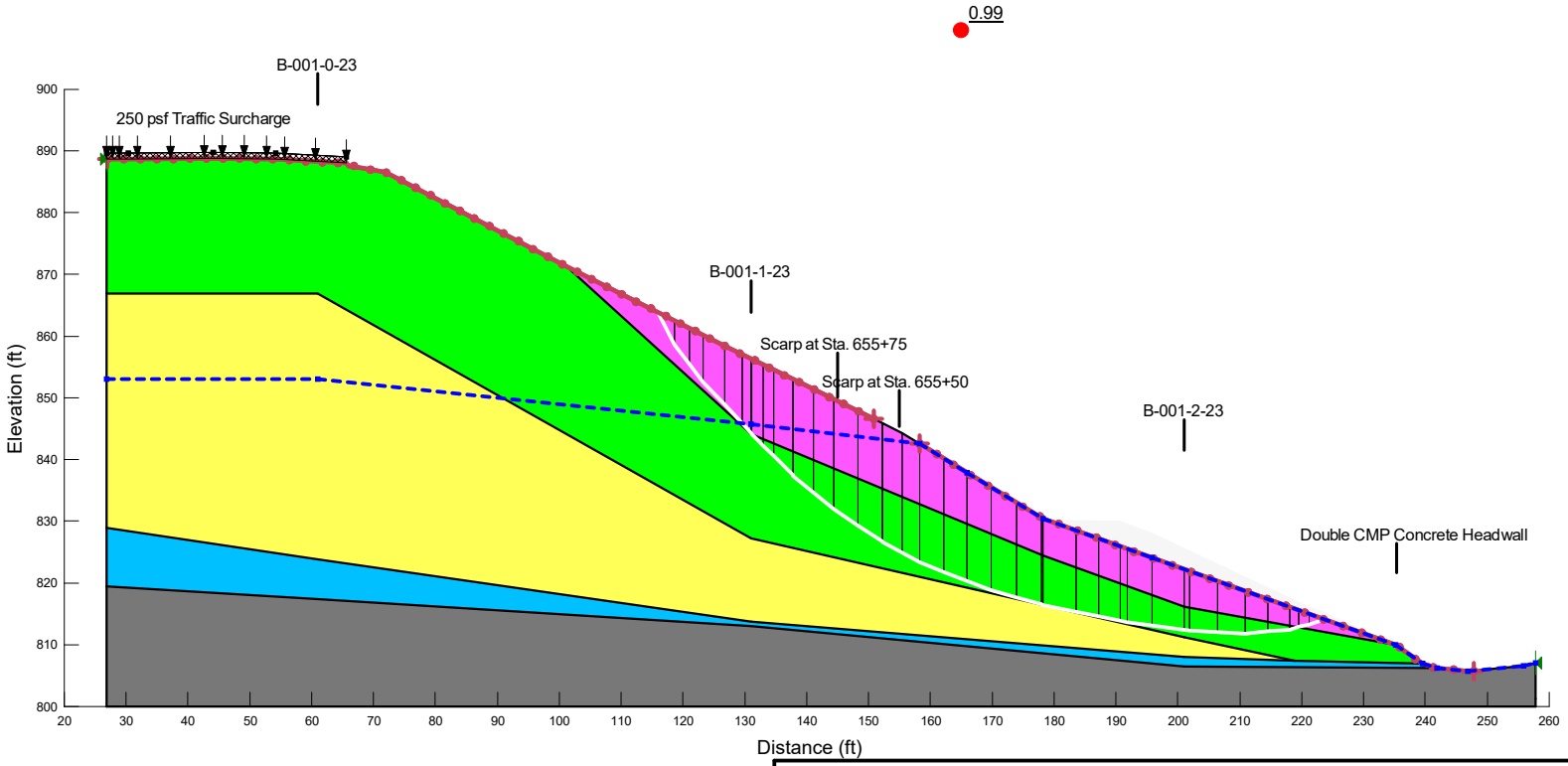
Notes: Sandstone, gray, slightly weathered, moderately strong, very fine to fine grained, contains a petroliferous odor.

Sample trimming procedure does not conform to ASTM D4543 and the results reported may differ from the results obtained from a test specimen that meets the requirements of Practice D4543.

Slope Stability Analyses

Station 655+50
Existing Conditions

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. Cohesive Fill Stiff to Very Stiff (LT)	135	180	26
	2. Cohesive Fill Very Stiff to Hard (LT)	135	200	27
	3. Cohesive Fill Medium Stiff to Stiff (LT)	130	150	24
	4. Cohesive Very Stiff to Hard (LT)	140	250	28
	Bedrock			

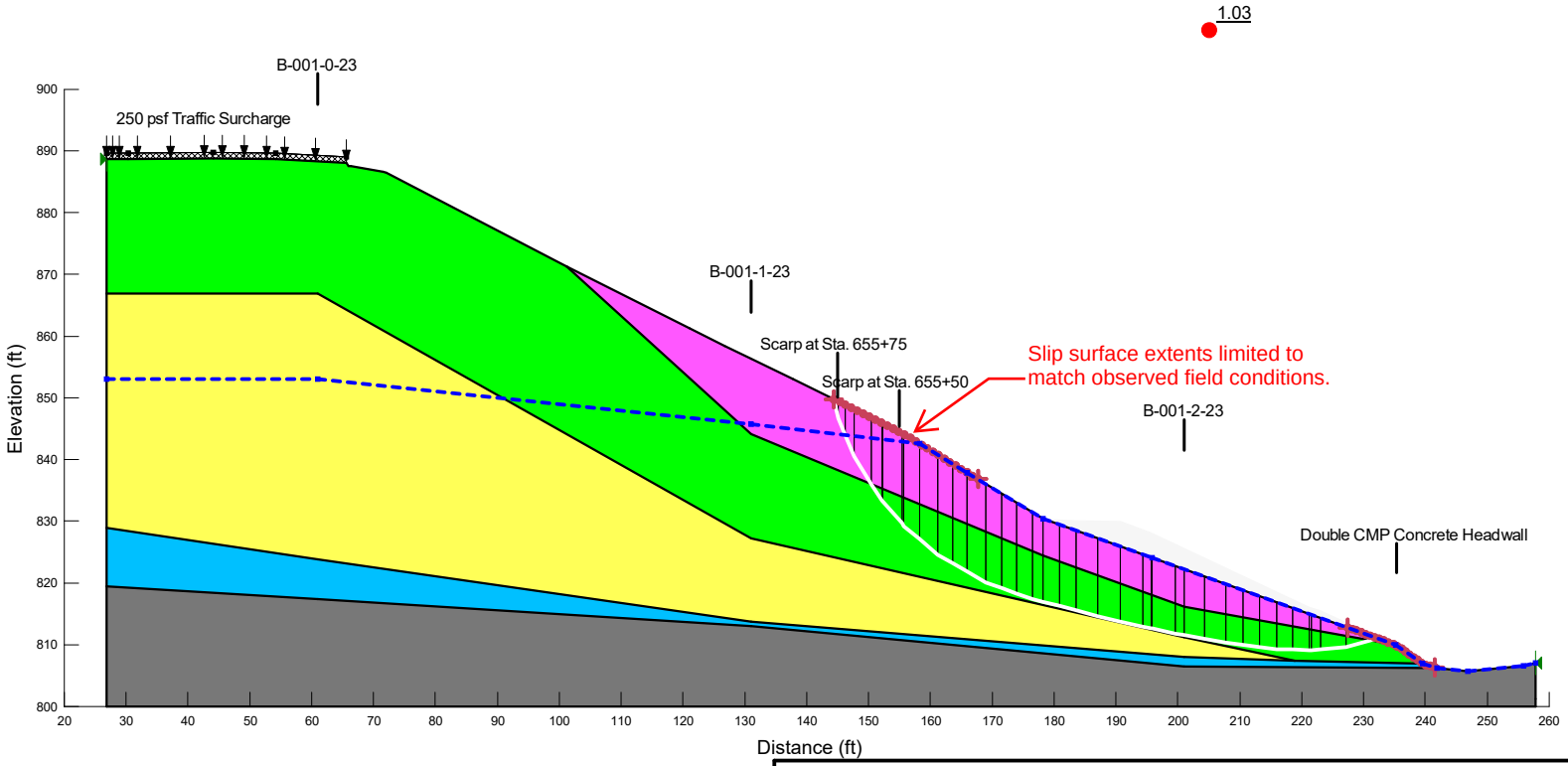


1. Existing Condition (LT)

NOB-77-12.36.gsz

12/21/2023 1:370

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. Cohesive Fill Stiff to Very Stiff (LT)	135	180	26
	2. Cohesive Fill Very Stiff to Hard (LT)	135	200	27
	3. Cohesive Fill Medium Stiff to Stiff (LT)	130	150	24
	4. Cohesive Very Stiff to Hard (LT)	140	250	28
	Bedrock			



2. Existing Condition (Scarp) (LT)

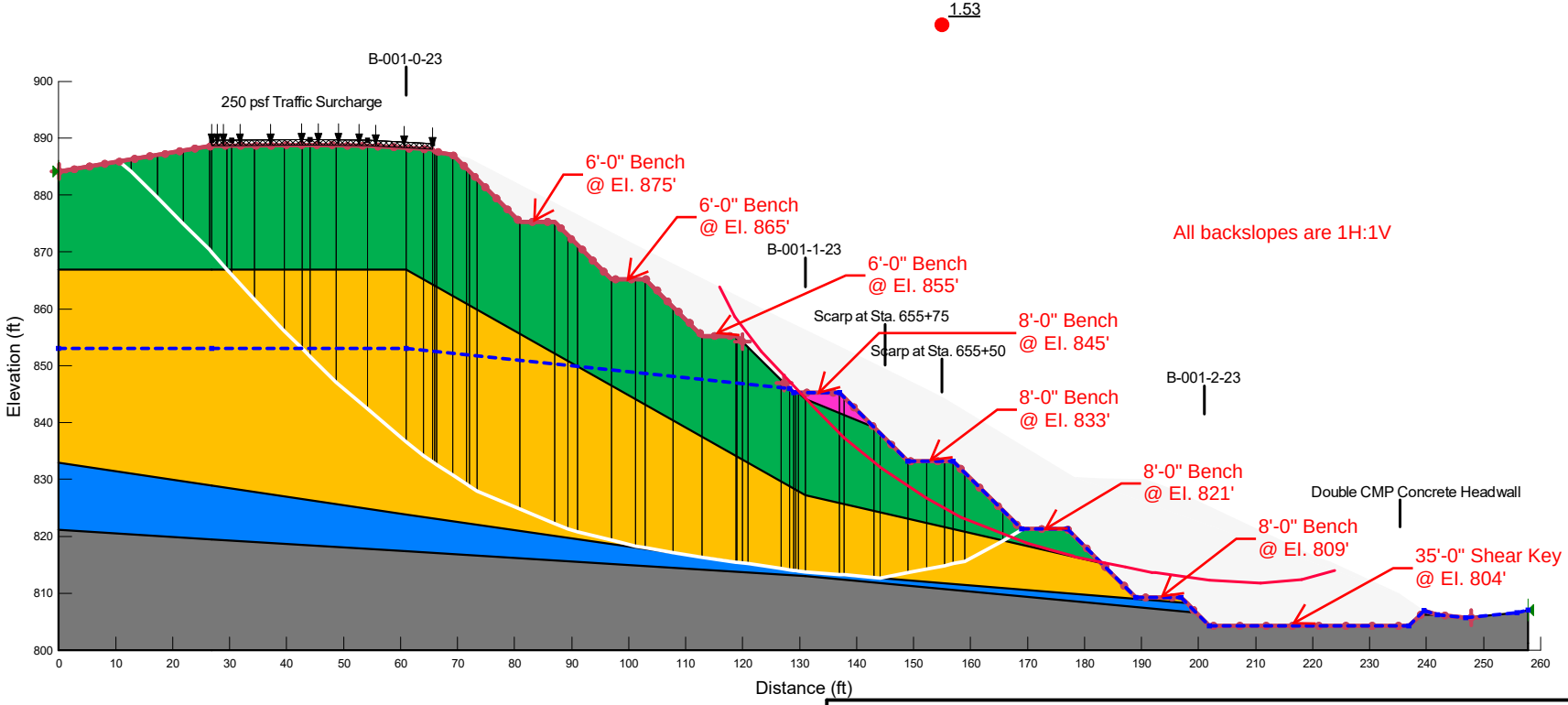
NOB-77-12.36.gsz

12/21/2023 1:370

Station 655+50
Constructability

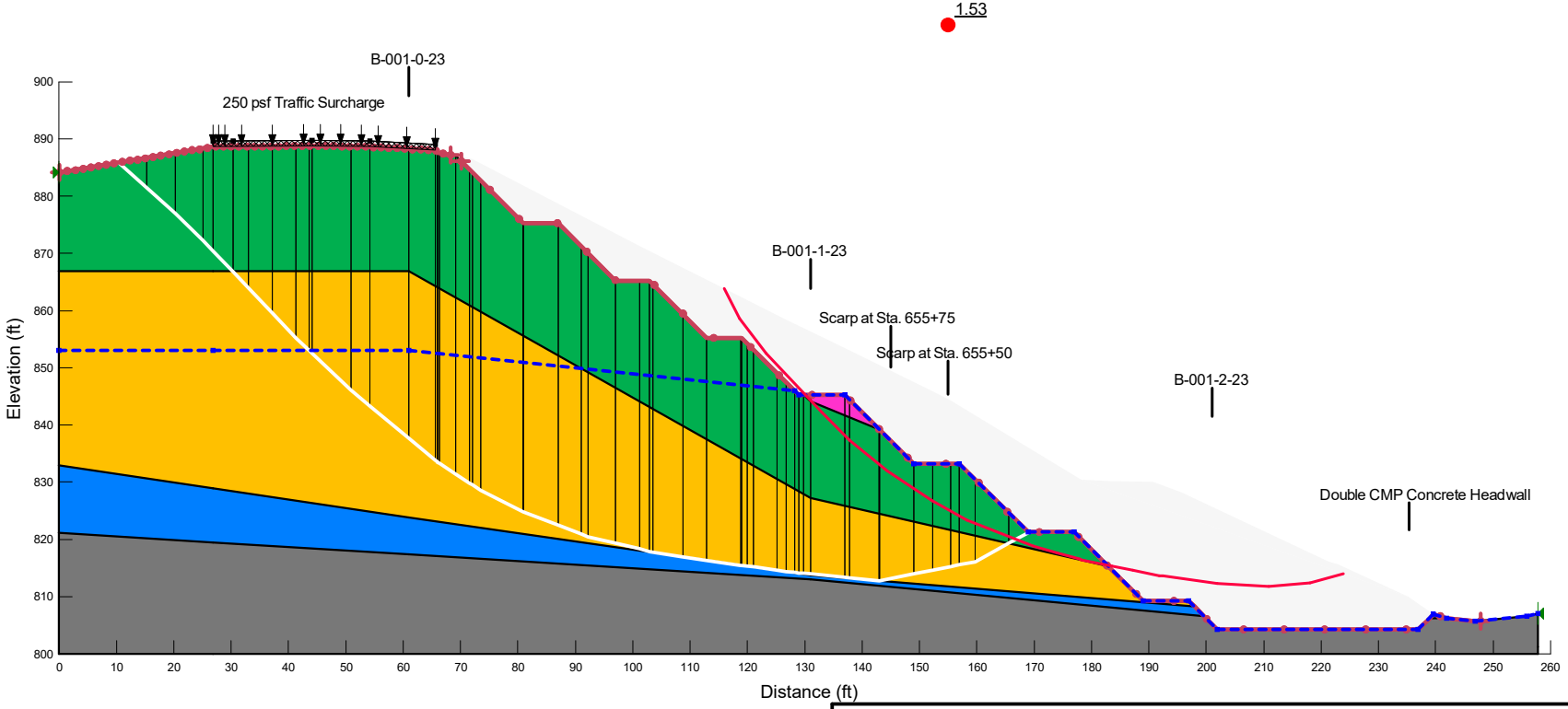
9999 Carver Road, Suite 210, Cincinnati, OH 45242-5583
(513) 984-7500
hdrinc.com

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. Cohesive Fill Stiff to Very Stiff (ST)	135	1,400	0
	2. Cohesive Fill Very Stiff to Hard (ST)	135	2,350	0
	3. Cohesive Fill Medium Stiff to Stiff (ST)	130	1,100	0
	4. Cohesive Very Stiff to Hard (ST)	140	3,600	0
	Bedrock			



1. Constructability Mid-Bench (ST)	
NOB-77-12.36.gsz	
01/05/2024	1:370

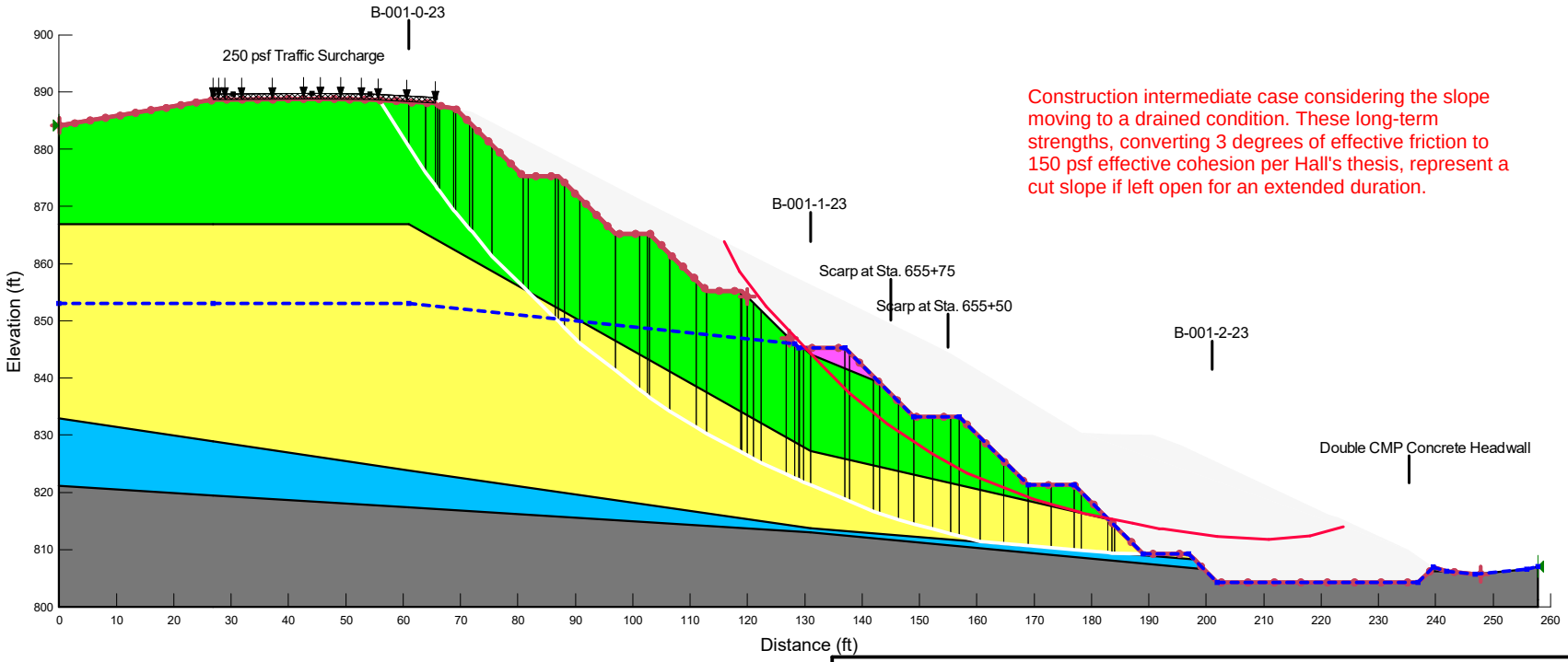
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. Cohesive Fill Stiff to Very Stiff (ST)	135	1,400	0
	2. Cohesive Fill Very Stiff to Hard (ST)	135	2,350	0
	3. Cohesive Fill Medium Stiff to Stiff (ST)	130	1,100	0
	4. Cohesive Very Stiff to Hard (ST)	140	3,600	0
	Bedrock			



2. Constructability Upper Bench (ST)	
NOB-77-12.36.gsz	
01/05/2024	1:370

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. Cohesive Fill Stiff to Very Stiff (LT)	135	330	23
	2. Cohesive Fill Very Stiff to Hard (LT)	135	350	24
	3. Cohesive Fill Medium Stiff to Stiff (LT)	130	300	21
	4. Cohesive Very Stiff to Hard (LT)	140	400	25
	Bedrock			

0.88



Construction intermediate case considering the slope moving to a drained condition. These long-term strengths, converting 3 degrees of effective friction to 150 psf effective cohesion per Hall's thesis, represent a cut slope if left open for an extended duration.

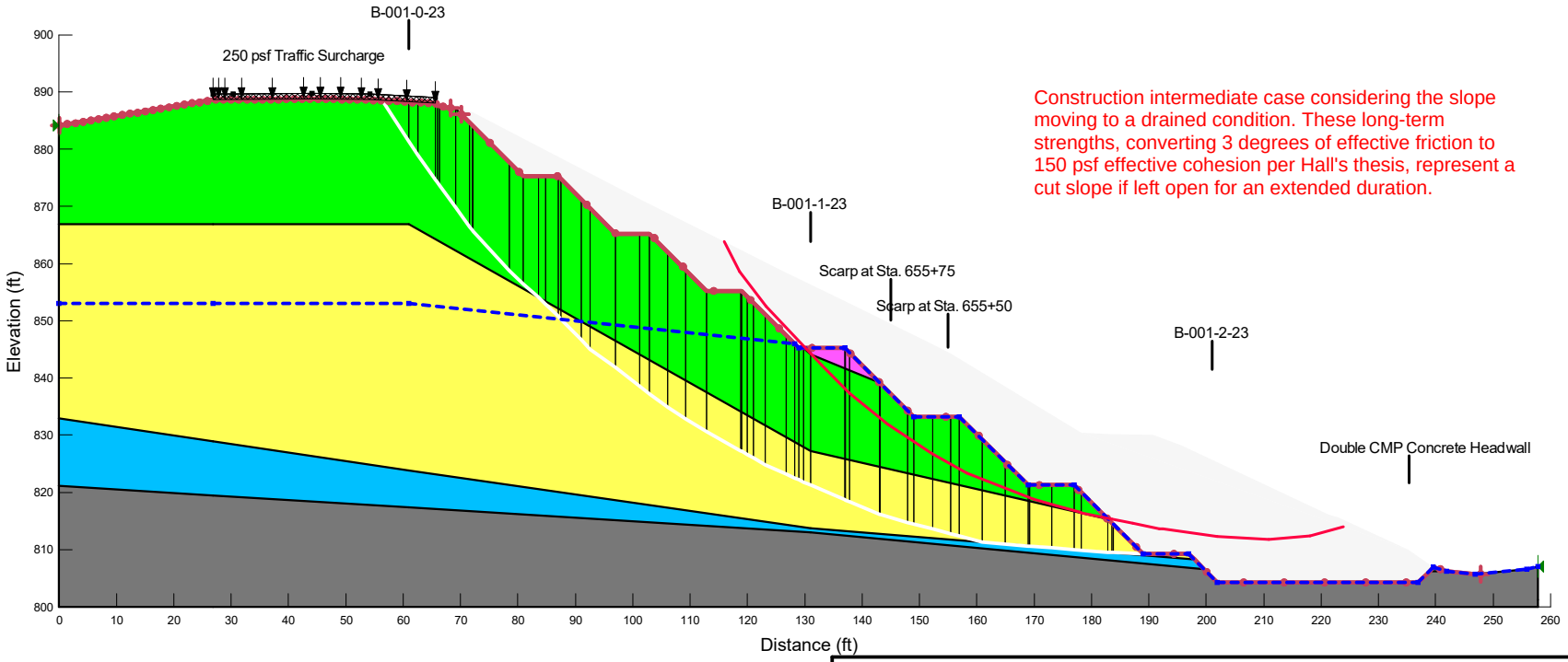
3. Constructability Mid-Bench (LT)

NOB-77-12.36.gsz

01/05/2024 1:370

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. Cohesive Fill Stiff to Very Stiff (LT)	135	330	23
	2. Cohesive Fill Very Stiff to Hard (LT)	135	350	24
	3. Cohesive Fill Medium Stiff to Stiff (LT)	130	300	21
	4. Cohesive Very Stiff to Hard (LT)	140	400	25
	Bedrock			

0.88



Construction intermediate case considering the slope moving to a drained condition. These long-term strengths, converting 3 degrees of effective friction to 150 psf effective cohesion per Hall's thesis, represent a cut slope if left open for an extended duration.

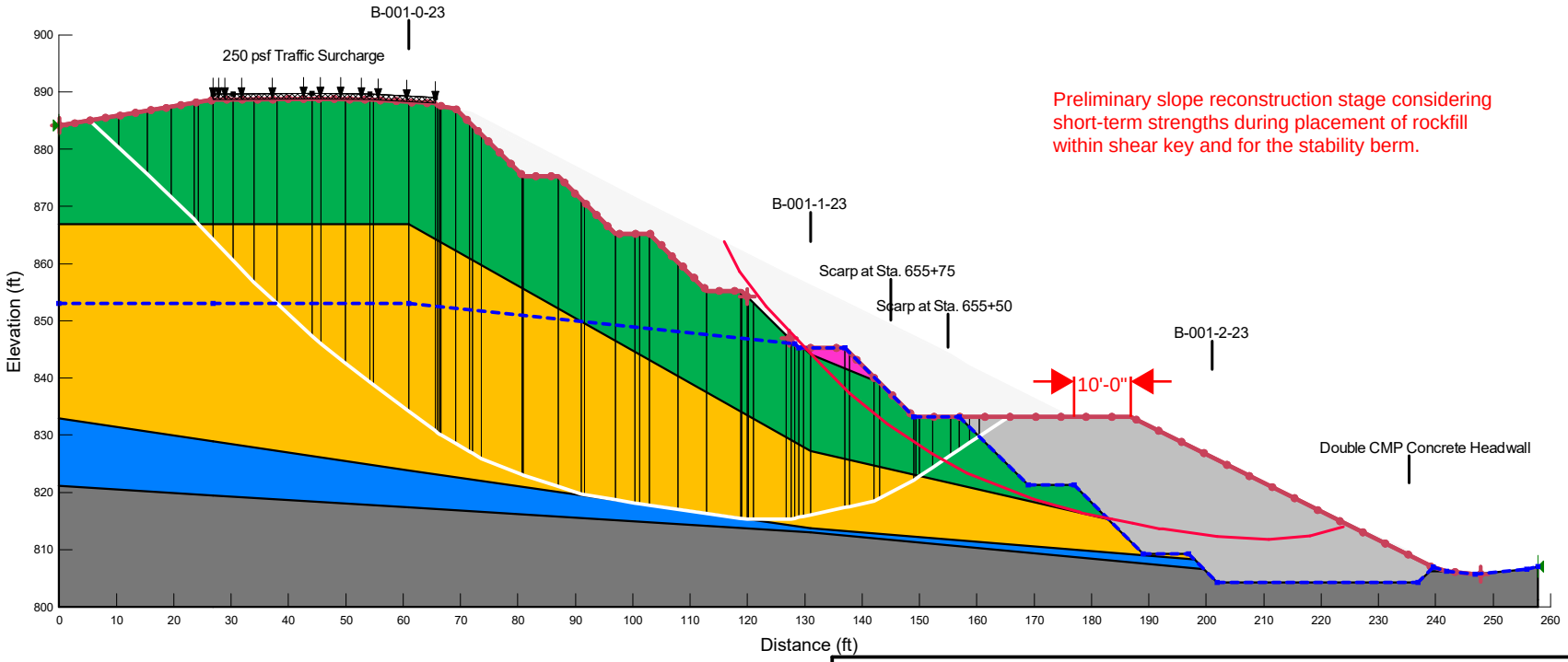
4. Constructability Upper Bench (LT)

NOB-77-12.36.gsz

01/05/2024 1:370

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. Cohesive Fill Stiff to Very Stiff (ST)	135	1,400	0
	2. Cohesive Fill Very Stiff to Hard (ST)	135	2,350	0
	3. Cohesive Fill Medium Stiff to Stiff (ST)	130	1,100	0
	4. Cohesive Very Stiff to Hard (ST)	140	3,600	0
	Bedrock			
	Rockfill	135	0	40

1.63



Preliminary slope reconstruction stage considering short-term strengths during placement of rockfill within shear key and for the stability berm.

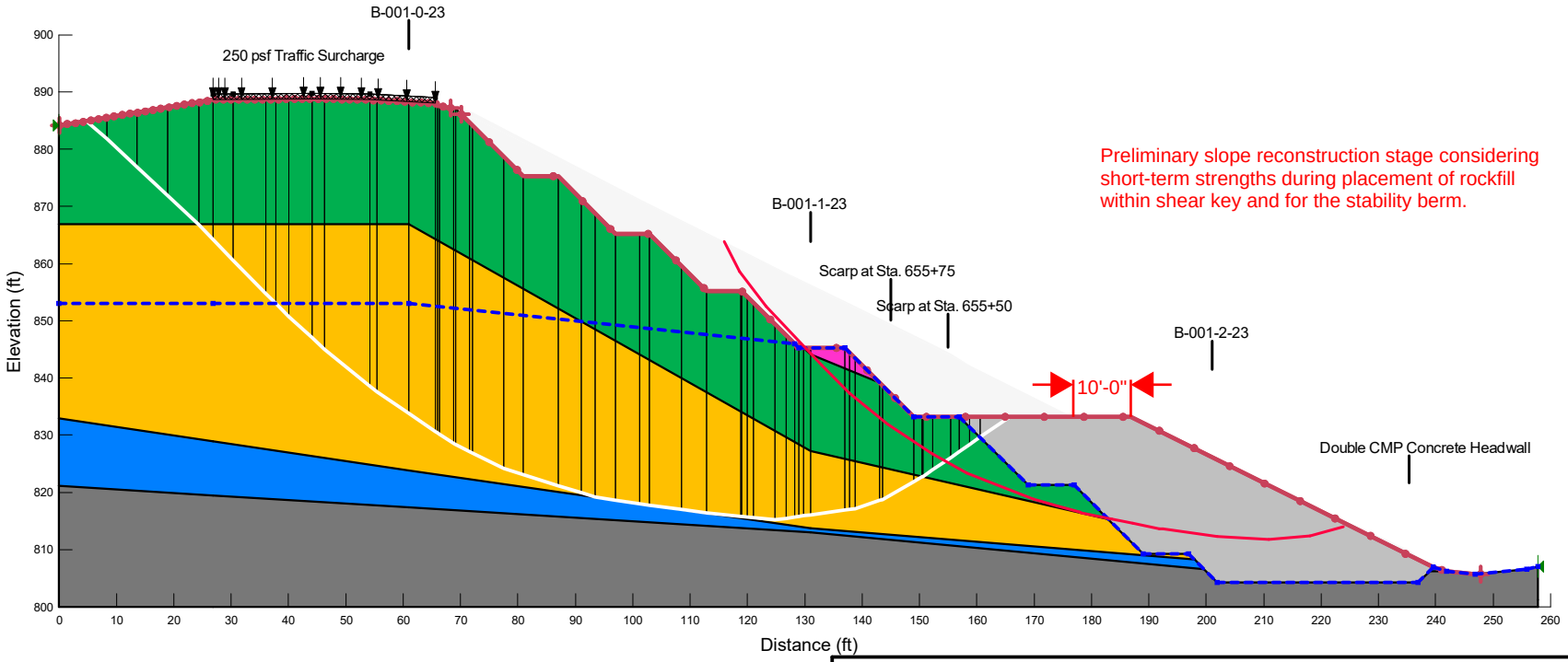
1. Constructability Mid-Bench (ST) (2)

NOB-77-12.36.gsz

01/05/2024 1:370

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. Cohesive Fill Stiff to Very Stiff (ST)	135	1,400	0
	2. Cohesive Fill Very Stiff to Hard (ST)	135	2,350	0
	3. Cohesive Fill Medium Stiff to Stiff (ST)	130	1,100	0
	4. Cohesive Very Stiff to Hard (ST)	140	3,600	0
	Bedrock			
	Rockfill	135	0	40

1.63

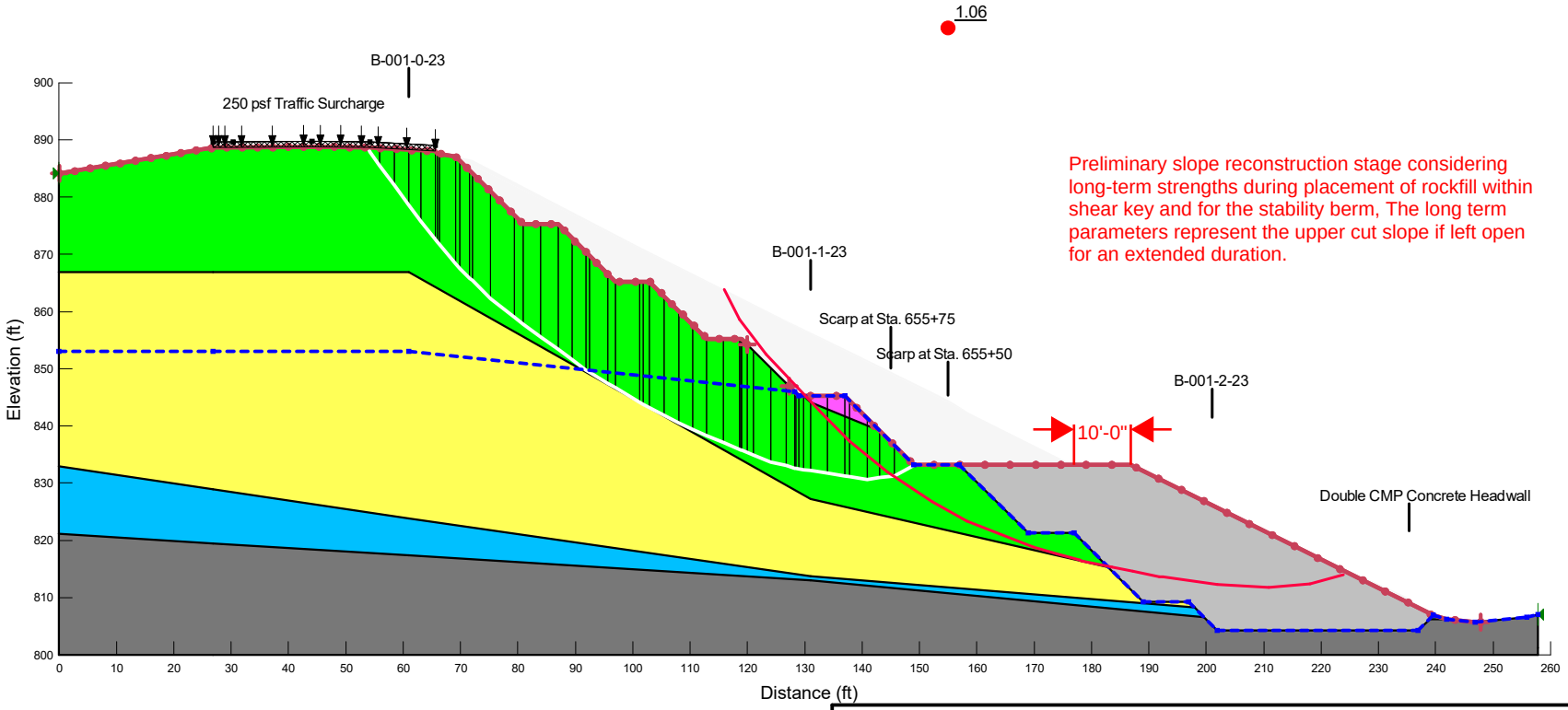


2. Constructability Upper Bench (ST) (2)

NOB-77-12.36.gsz

01/05/2024 1:370

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. Cohesive Fill Stiff to Very Stiff (LT)	135	330	23
	2. Cohesive Fill Very Stiff to Hard (LT)	135	350	24
	3. Cohesive Fill Medium Stiff to Stiff (LT)	130	300	21
	4. Cohesive Very Stiff to Hard (LT)	140	400	25
	Bedrock			
	Rockfill	135	0	40



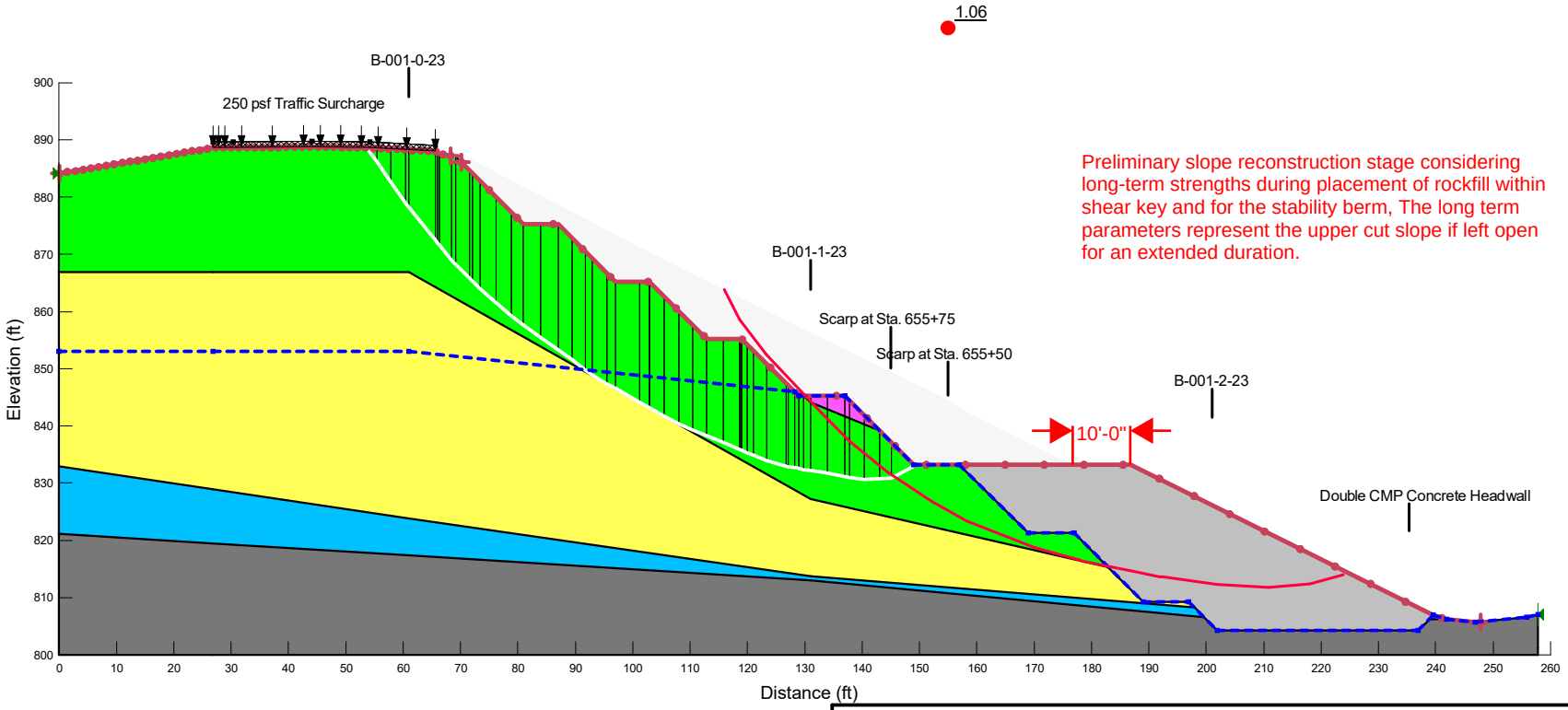
Preliminary slope reconstruction stage considering long-term strengths during placement of rockfill within shear key and for the stability berm, The long term parameters represent the upper cut slope if left open for an extended duration.

3. Constructability Mid-Bench (LT) (2)

NOB-77-12.36.gsz

01/05/2024 1:370

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. Cohesive Fill Stiff to Very Stiff (LT)	135	330	23
	2. Cohesive Fill Very Stiff to Hard (LT)	135	350	24
	3. Cohesive Fill Medium Stiff to Stiff (LT)	130	300	21
	4. Cohesive Very Stiff to Hard (LT)	140	400	25
	Bedrock			
	Rockfill	135	0	40



Preliminary slope reconstruction stage considering long-term strengths during placement of rockfill within shear key and for the stability berm, The long term parameters represent the upper cut slope if left open for an extended duration.

4. Constructability Upper Bench (LT) (2)

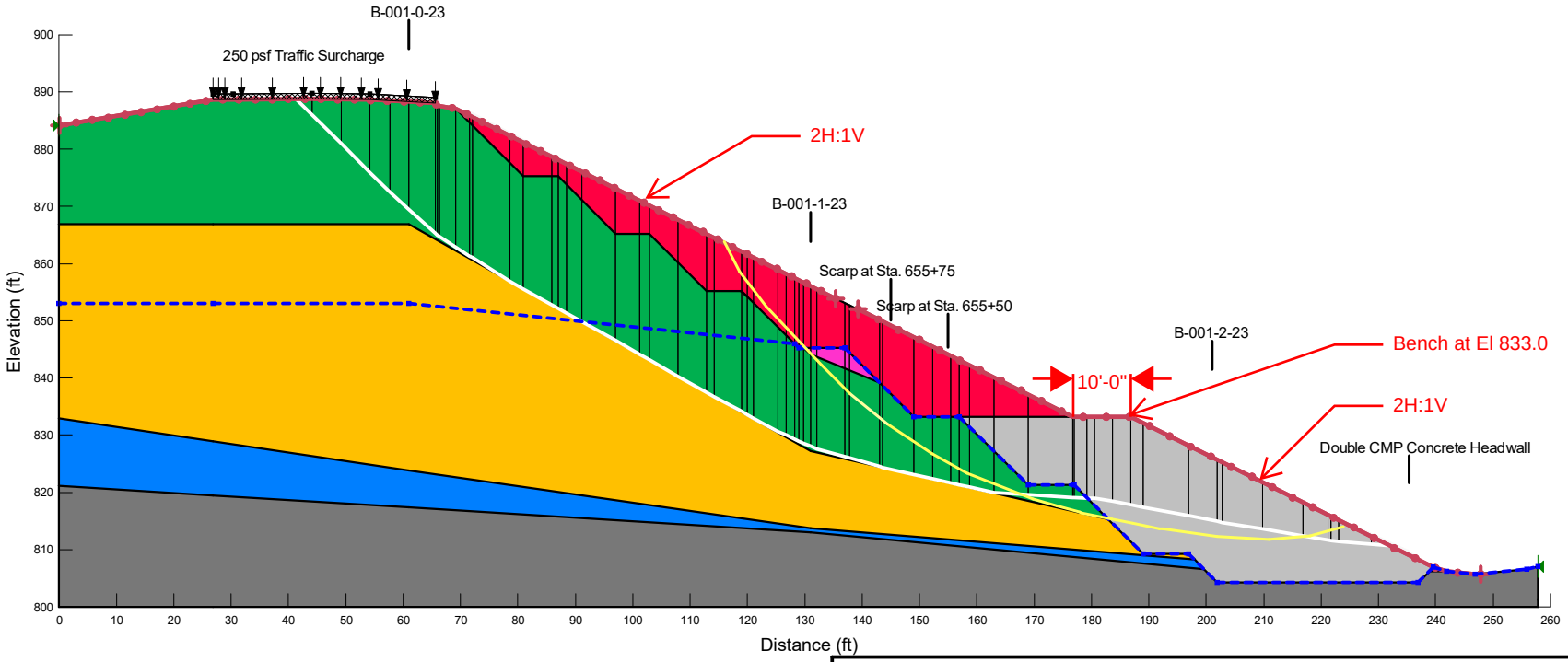
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01/05/2024 1:370

Station 655+50
Post-Construction

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. Cohesive Fill Stiff to Very Stiff (ST)	135	1,400	0
	2. Cohesive Fill Very Stiff to Hard (ST)	135	2,350	0
	3. Cohesive Fill Medium Stiff to Stiff (ST)	130	1,100	0
	4. Cohesive Very Stiff to Hard (ST)	140	3,600	0
	Bedrock			
	Item 203 Embankment Material (ST)	120	2,000	0
	Rockfill	135	0	40

1.53

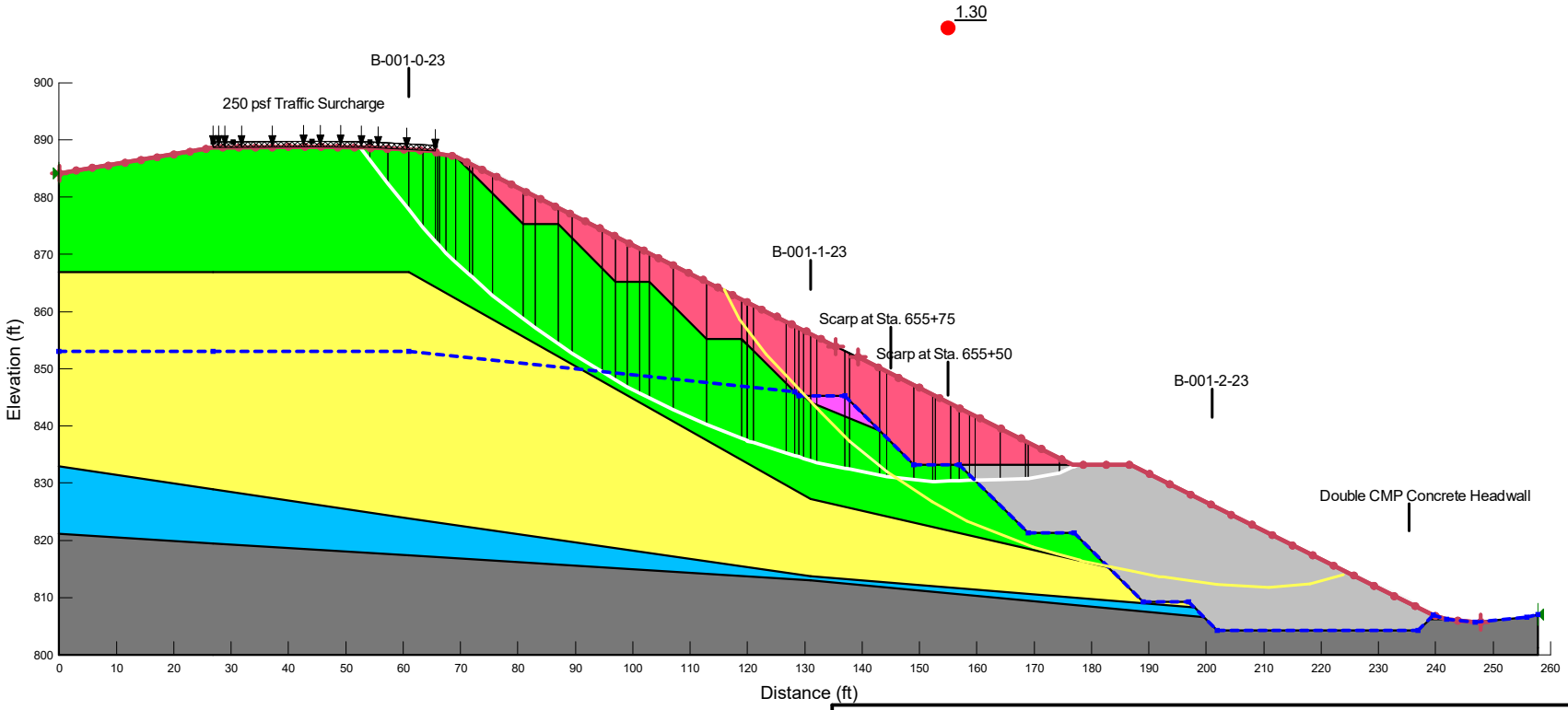


1. Post-Construction (ST)

NOB-77-12.36.gsz

01/05/2024 1:370

Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. Cohesive Fill Stiff to Very Stiff (LT)	135	180	26
	2. Cohesive Fill Very Stiff to Hard (LT)	135	200	27
	3. Cohesive Fill Medium Stiff to Stiff (LT)	130	150	24
	4. Cohesive Very Stiff to Hard (LT)	140	250	28
	Bedrock			
	Item 203 Embankment Material (LT)	120	200	28
	Rockfill	135	0	40



2. Post-Construction (LT)

NOB-77-12.36.gsz

01/05/2024 1:370

Slope Excavation and Replacement Details

9999 Carver Road, Suite 210, Cincinnati, OH 45242-5583 **hdrinc.com**
(513) 984-7500

653 654 655 656 657 658

℄ EX. R/W I-77

EX 36" STORM

I-77 (NORTH)

EX. STORM SEWER

890'

B-001-0-23

885' 880' 875' 870' 865' 860' 855' 850' 845' 840' 835' 830' 825' 820' 815' 810'

6' BENCH (EL. 875.0)

6' BENCH (EL. 865.0)

6' BENCH (EL. 855.0)

8' BENCH (EL. 845.0)

8' BENCH (EL. 833.0)

8' BENCH (EL. 821.0)

8' BENCH (EL. 809.0)

35' SHEAR KEY (EL. 804.0)

2H:1V

4H:1V

1H:1V

3H:1V

1.75H:1V

1.5H:1V

EX. RIP RAP

EX. WETLAND

B-001-1-23

B-001-2-23

EDGE OF SLIP

Ex LA

4H:1V IS AN ASSUMED SLOPE FOR ACCESS. ACTUAL SLOPE MAY VARY BASED ON THE CONTRACTORS MEANS AND METHODS.

1H:1V SLOPES ARE PRESENTED TO REDUCE THE AMOUNT OF EXCAVATION INTO AND DISTURBANCE OF THE EXISTING ROCK FILL UPON THE SLOPE. IF THE AMOUNT OF DISTURBANCE IS NOT LIMITED, IT IS RECOMMENDED THAT THESE SLOPES BE FLATTENED TO 2H:1V

THE EXTENTS OF THE SHEAR KEY MAY BE ADJUSTED BASED UPON THE LIMITS AND COMPETENCY OF THE SANDSTONE BEDROCK AS ENCOUNTERED DURING EXCAVATION.

APPROXIMATE LOCATION OF DRAINAGE GALLERY

HORIZONTAL SCALE IN FEET
0 10 20 40

EXCAVATION DETAILS - PLAN

NOB-77-12.36

MODEL: CLX_RW_I77 - Plan 1 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 2/1/2024 TIME: 4:35:36 PM USER: CWAHLBRI
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DESIGN AGENCY

DESIGNER MM

REVIEWER DMV 02/01/23

PROJECT ID 119893

SHEET 1 TOTAL 4

BENCHING OF FOUNDATION SLOPES

ALTHOUGH CROSS-SECTIONS INDICATE SPECIFIC DIMENSIONS FOR PROPOSED BENCHING OF THE EMBANKMENT FOUNDATIONS IN CERTAIN AREAS, NO WAIVER OF THE SPECIFICATIONS IS INTENDED. BENCH ALL OTHER SLOPED EMBANKMENT AREAS AS SET FORTH IN 203.05. NO ADDITIONAL PAYMENT WILL BE MADE FOR BENCHING REQUIRED UNDER THE PROVISIONS OF 203.05.

FIELD VERIFICATION OF QUANTITIES

DUE TO THE NATURE OF THE PROJECT BEING A SLIDE REPAIR, THE CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFICATION OR QUANTITIES PRIOR TO BIDDING AND THEN PRIOR TO CONSTRUCTION. THE ACTUAL WORK LOCATIONS AND QUANTITIES PERFORMED SHALL BE INCORPORATED INTO THE FINAL CHANGE ORDER GOVERNING COMPLETION OF THIS PROJECT.

ITEM 601 - DUMPED ROCK FILL, TYPE C, AS PER PLAN

WHEN EXCAVATING FOR THE SHEAR KEY, NO MORE THAN 50 LINEAR FEET ALONG THE BACK OF THE KEY SHALL BE EXCAVATED WITHOUT REPLACING WITH DUMPED ROCK FILL, TYPE C, AS PER PLAN. THE ENGINEER MAY VARY THE 50 LINEAR FT BASED ON SITE CONDITIONS (STABILITY). NO EXCAVATION SHALL BE LEFT OPEN OVERNIGHT. SCHEDULE WORK SO AS TO HAVE THE SHEAR KEY BACKFILLED AND STABILIZED PRIOR TO LEAVING THE SITE.

IN THIS AREA BETWEEN STATIONS "X" TO "Y" DUMPED ROCK FILL, TYPE C, AS PER PLAN, AS SHOWN ON THE CROSS-SECTIONS, MAY BE PLACED BY THE METHOD OF END DUMPING IF SURFACE WATER IS PRESENT AT THE TIME OF CONSTRUCTION. END DUMPING METHODS MAY BE USED UP TO EN ELEVATION 2 FEET ABOVE THE WATER LEVEL. ABOVE THIS ELEVATION, EMBANKMENT CONSTRUCTION METHODS WILL BE IN ACCORDANCE WITH 203.05 AND 203.07 INCLUSIVE. DURING NORMAL CLEARING AND GRUBBING, WHERE END DUMPING IS PERMITTED, THE REQUIREMENTS OF 201.04 FOR SCALPING SHALE BE WAIVED.

EXCAVATE THE BOTTOM OF THE SHEAR KEY A MINIMUM OF TWO FOOT INTO ROCK, WITH THE TOP OF ROCK AS INDICATED ON THE PLANS.

SPRING DRAINS

THE FOLLOWING ESTIMATED QUANTITIES HAVE BEEN CARRIED TO THE GENERAL SUMMARY FOR USE AS DIRECTED BY THE ENGINEER FOR DRAINING ANY SPRINGS SHOWN IN THE PLAN OR ENCOUNTERED DURING CONSTRUCTION. THE FOLLOWING TYPES OF PIPES MAY BE USED: 707.33, 707.41, 707.42 or 707.45 PERFORATED PER 707.31.

SPRING DRAINS SHALL BE CONSTRUCTED AS SHOWN ON STANDARD CONSTRUCTION DRAWING DM-1.1 AND PAID FOR AT THE CONTRACT PRICE FOR:

605, 6" UNCLASSIFIED PIPE UNDERDRAINS FOR SPRINGS
_____ FT.

605, AGGREGATE DRAINS FOR SPRINGS
_____ FT.

611, PRECAST REINFORCED CONCRETE OUTLET
_____ EACH

ITEM 203 - EMBANKMENT, AS PER PLAN

IN ADDITION TO THE REQUIREMENTS OF CMS ITEM 203, THIS ITEM SHALL INCLUDE ITEM 203, EXCAVATION REQUIRED TO BLEND THE EXISTING SLOPES TO THE NEWLY CONSTRUCTED SLOPE AT EACH END OF THE SITE. THIS SHALL BE INCIDENTAL TO ITEM 203, EMBANKMENT, AS PER PLAN.

ITEM 203 - GRANULAR EMBANKMENT, AS PER PLAN (NO. 8 AGGREGATE)

FURNISH DURABLE, NATURAL AGGREGATE NO. 8 SIZE. PLACE THE AGGREGATE AT THE THICKNESS AND SLOPE AS SHOWN ON THE CROSS-SECTIONS AND THE SPECIAL BENCHING SLOPE DRAINS DETAIL.

ITEM 204 - GEOTEXTILE FABRIC, AS PER PLAN

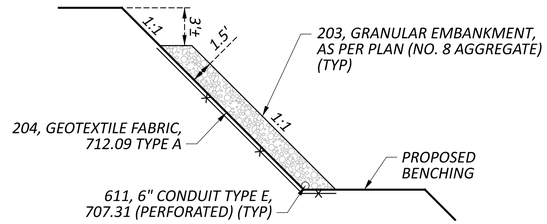
IN ADDITION TO THE REQUIREMENTS OF CMS ITEM 204, THIS ITEM SHALL BE 712.09 TYPE D FABRIC.

PAYMENT FOR THE ABOVE WORK SHALL BE MADE AT THE UNIT PRICE BID FOR ITEM 204, GEOTEXTILE FABRIC, AS PER PLAN AND SHALL INCLUDE ALL LABOR, TOOLS, EQUIPMENT AND MATERIALS NECESSARY TO INSTALL THE FABRIC.

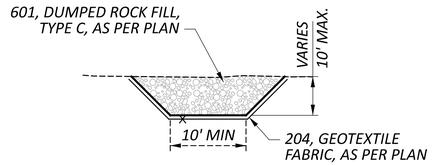
SPECIAL BENCHING SLOPE DRAINS

PLACE SPECIAL BENCHING SLOPE DRAINS AT THE LOCATIONS SHOWN ON THE PLAN AND PROFILE AND CROSS SECTION SHEETS. THESE DRAINS SHALL CONSIST OF ITEM 204, GEOTEXTILE FABRIC, 712.09 TYPE A, AND ITEM 611, CONDUIT TYPE E, 707.31 (PERFORATED). THE TYPE E CONDUIT SHALL BE PERFORATEED AS PER CONDUIT FOR ITEM 605, UNCLASSIFIED PIPE UNDERDRAINS. TRANSVERSE OUTLET DRAINS SHALL BE PROVIDED AT THE LOCATIONS SHOWN ON THE PLAN & PROFILE AND CROSS SECTION SHEETS. THESE OUTLET DRAINS SHALL CONSIST OF ITEM 611 CONDUIT TYPE F, 707.33 WITH ITEM 611 PRECAST REINFORCED CONCRETE OUTLETS AND A TIED CONCRETE BLOCK MAT TYPE 1 GROUTED ACCORDING TO 601.12.

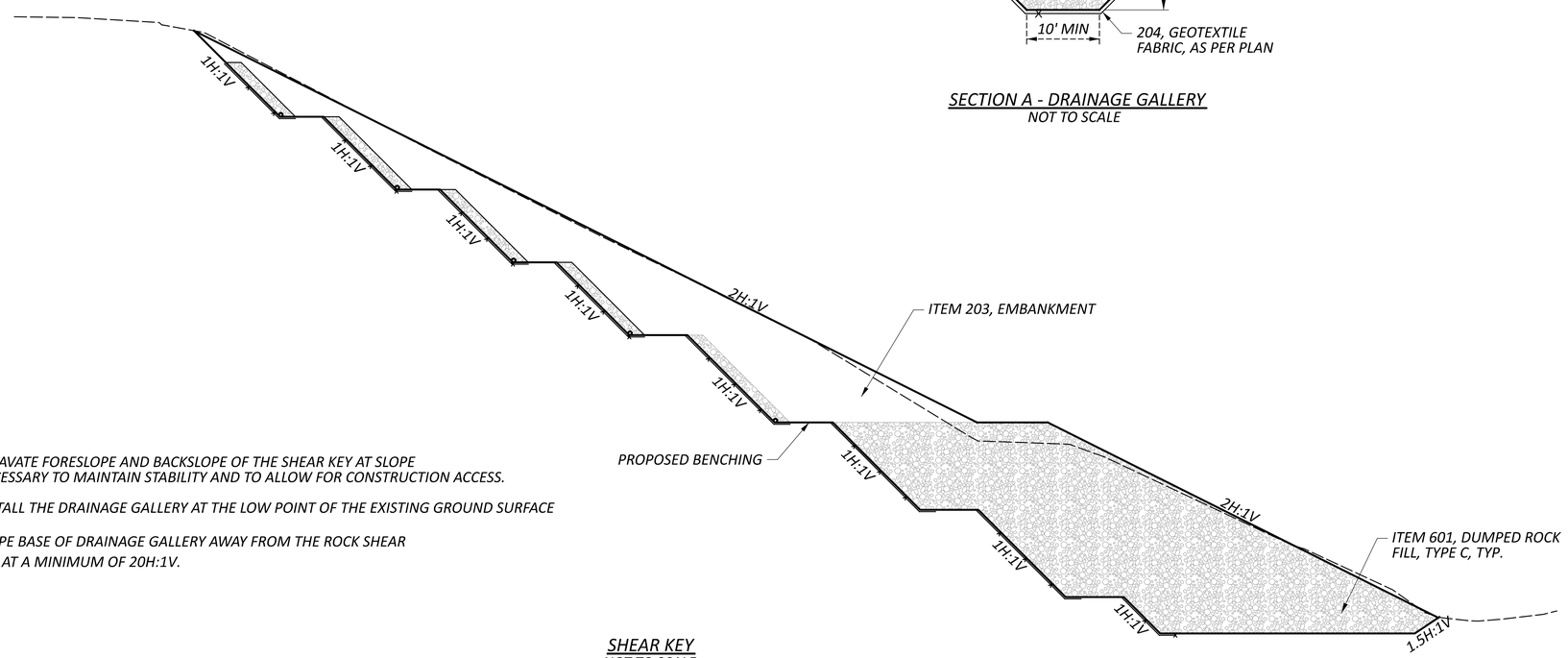
SEE SPECIAL BENCHING SLOPE DRAINS DETAIL ON THIS SHEET FOR ADDITIONAL INFORMATION.



SPECIAL BENCHING SLOPE DRAINS DETAIL
NOT TO SCALE



SECTION A - DRAINAGE GALLERY
NOT TO SCALE



NOTES:

1. EXCAVATE FORESLOPE AND BACKSLOPE OF THE SHEAR KEY AT SLOPE NECESSARY TO MAINTAIN STABILITY AND TO ALLOW FOR CONSTRUCTION ACCESS.
2. INSTALL THE DRAINAGE GALLERY AT THE LOW POINT OF THE EXISTING GROUND SURFACE
3. SLOPE BASE OF DRAINAGE GALLERY AWAY FROM THE ROCK SHEAR KEY AT A MINIMUM OF 20H:1V.

SHEAR KEY
NOT TO SCALE

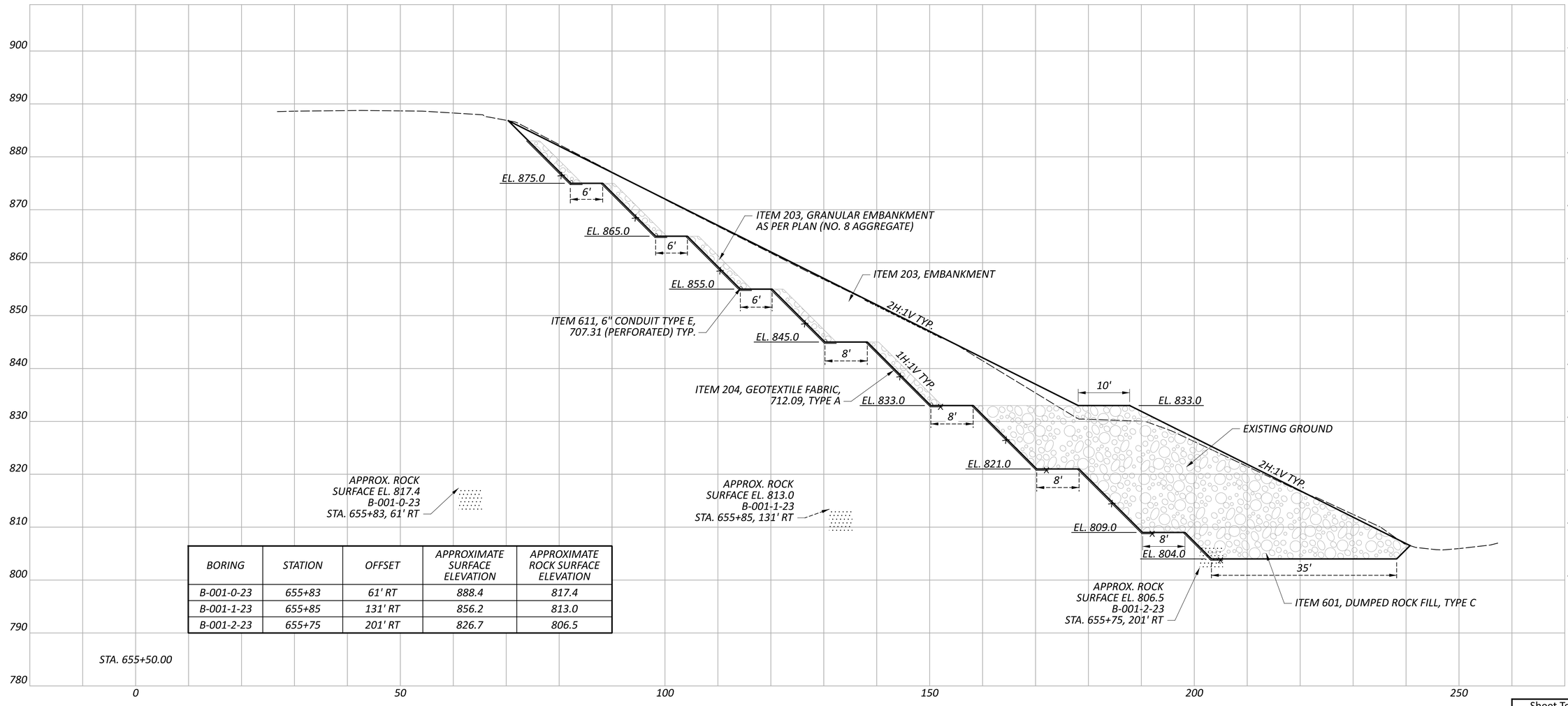
GENERAL NOTES

DESIGN AGENCY
HDR

DESIGNER MM
REVIEWER DMV 02/01/23
PROJECT ID 119893
SHEET 2 TOTAL 4

NOB-77-12.36

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BORING	STATION	OFFSET	APPROXIMATE SURFACE ELEVATION	APPROXIMATE ROCK SURFACE ELEVATION
B-001-0-23	655+83	61' RT	888.4	817.4
B-001-1-23	655+85	131' RT	856.2	813.0
B-001-2-23	655+75	201' RT	826.7	806.5

DESIGN CROSS SECTION STA. 655+50

NOB-77-12.36

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DESIGN AGENCY

DESIGNER MM

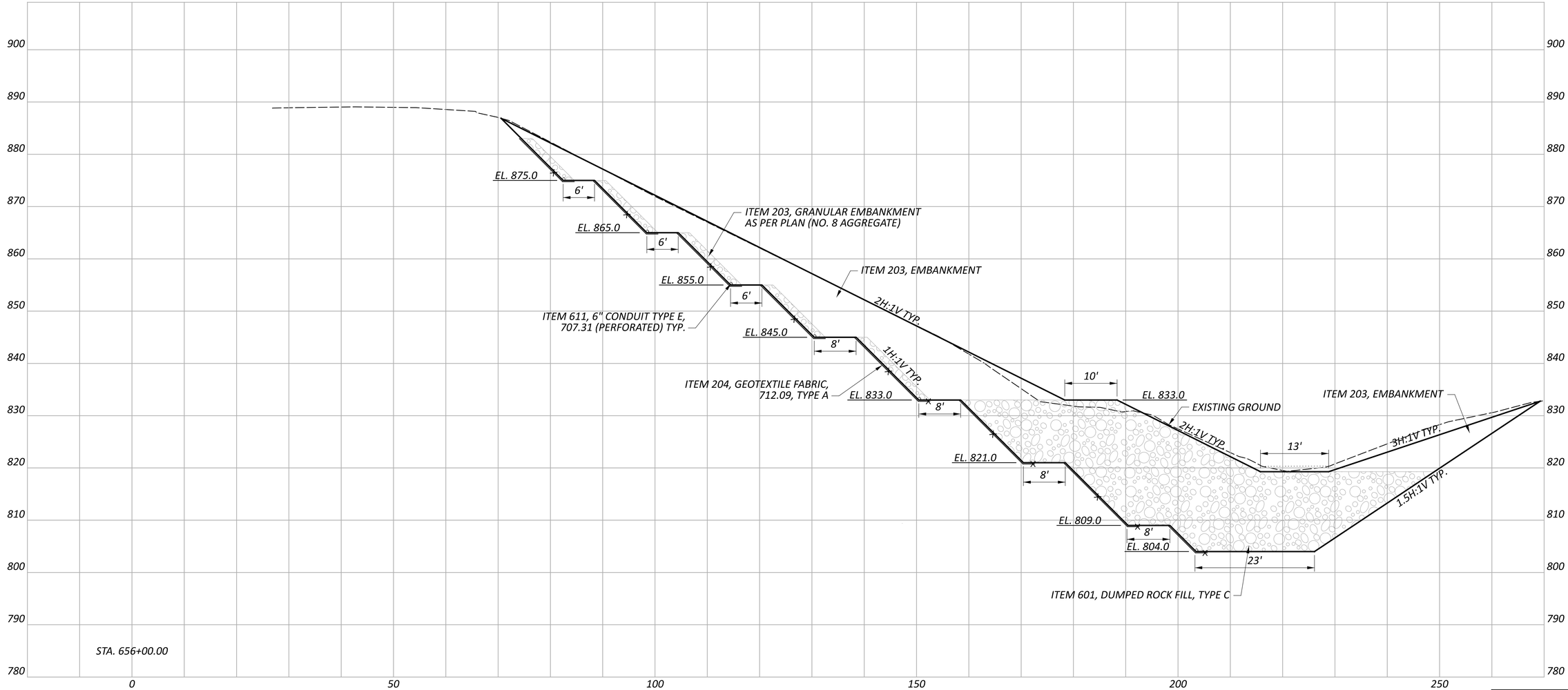
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PROJECT ID 119893

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Seeding	Cut	Fill

SHEET	TOTAL
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CROSS SECTION
STA. 656+00



Sheet Totals		
Seeding	Cut	Fill

DESIGN AGENCY

HDR

DESIGNER	MM
REVIEWER	DMV 02/01/23
PROJECT ID	119893
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