

GEOTECHNICAL ENGINEERING REPORT

**MassDOT Project No. 608079
Replacement of State Bridge S-09-003
Maskwonicut Street over AMTRAK/MBTA
Sharon, Massachusetts**



May 13, 2020

Prepared for:



WSE Project No. 2150851

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May 13, 2020

Massachusetts Department of Transportation
c/o Mr. Scott Brusco, PE
Weston & Sampson
100 Foxborough Boulevard
Foxborough, Massachusetts 02035

**Re: Final Geotechnical Engineering Report
Replacement of State Bridge No. S-09-003
Maskwonicut Street over AMTRAK/MBTA
Sharon, Massachusetts**

Weston & Sampson is pleased to submit our Final Geotechnical Engineering Report for the referenced project. This report presents a description of our services, a summary of field explorations, descriptions of site and subsurface conditions, and geotechnical recommendations for design and construction of the proposed bridge replacement.

Our services were completed in general accordance with the Massachusetts Department of Transportation LRFD Bridge Manual. Our recommendations were developed in general accordance with the AASHTO LRFD Bridge Design Specifications.

We appreciate the opportunity to be of service to you. If you have questions concerning this report or require additional information, please contact us at 978-977-0110 Ext. 2324.

Very truly yours,
WESTON & SAMPSON ENGINEERS, INC.



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EXECUTIVE SUMMARY

This report summarizes our geotechnical evaluation related to the proposed replacement of State Bridge No. S-09-003 carrying Maskwonicut Street over AMTRAK/MBTA railroad tracks in Sharon, Massachusetts. The bridge was originally constructed in 1901 and was rehabilitated in 1975 and 1995. Maskwonicut Street is currently closed at the bridge as the previous timber superstructure was damaged by a fire and removed in 2013.

Currently proposed bridge replacement plans include removal of the existing abutments, wingwalls at the east abutment, and a portion of the wingwalls at the west abutment. Existing retaining walls behind the west abutment and a stone masonry arch culvert over Beaver Brook will remain. The new abutments and superstructure will provide for increased horizontal and vertical track clearances. The existing structures to remain will be modified to accommodate increases in roadway grades and widths. Lightweight foamed glass aggregate will be used as fill to reduce stress increases associated with modifications to the existing structures.

1.0	INTRODUCTION	1
1.1	EXISTING CONDITIONS.....	1
1.1.1	Roadway	1
1.1.2	Bridge Structure.....	1
1.1.3	Beaver Brook.....	2
1.1.4	Ground Surface	2
1.1.5	Utilities.....	2
1.2	BACKGROUND.....	3
1.3	PROJECT DESCRIPTION AND ALTERNATIVES.....	3
1.4	PROPOSED CONDITIONS.....	3
1.4.1	Structure Type	3
1.4.2	Dimensions and Geometry	4
1.5	PURPOSE	4
1.6	DESIGN CRITERIA	4
1.7	SURVEY, DATUM, AND UNITS OF MEASUREMENT.....	5
2.0	SUBSURFACE CONDITIONS	6
2.1	GEOLOGY.....	6
2.2	PREVIOUS SUBSURFACE INFORMATION	6
2.3	SUBSURFACE EXPLORATIONS	6
2.3.1	General.....	6
2.3.2	2016 Borings	7
2.3.3	2020 Borings	7
2.3.4	Test Pits.....	8
2.3.5	Probes.....	8
2.3.6	Pavement Borings	8
2.4	SUBSURFACE CONDITIONS.....	8
2.4.1	General.....	8
2.4.2	Pavement	9
2.4.3	Lightweight Aggregate Fill	9
2.4.4	Fill.....	9
2.4.5	Native Sand and Gravel.....	10
2.4.6	Glacial Till	10
2.4.7	Bedrock.....	10
2.4.8	Groundwater.....	10
2.5	SEISMIC DESIGN CATEGORY	10
2.6	LIQUEFACTION POTENTIAL.....	11
3.0	GEOTECHNICAL RECOMMENDATIONS	12
3.1	GENERAL.....	12
3.2	FOAMED GLASS AGGREGATE (FGA) FILL	12
3.3	STABILITY ANALYSIS OF EXISTING AND NEW STRUCTURES	13
3.3.1	General.....	13
3.3.2	Foamed Glass Aggregate (FGA) Fill.....	13
3.3.3	Lateral Earth Pressures.....	13
3.3.4	Surcharge Pressure	14
3.3.5	Resistance to Sliding	14
3.3.6	Bearing Capacity	15
3.3.7	Settlement	15
3.4	FROST PROTECTION	15
3.5	DRAINAGE	16

4.0	CONSTRUCTION RECOMMENDATIONS	17
4.1	SUBGRADE PREPARATION.....	17
4.2	BACKFILL AND PLACEMENT	17
4.3	LIGHTWEIGHT FOAMED GLASS AGGREGATE (FGA) FILL	17
4.4	EXCAVATION CONSIDERATIONS	17
4.5	RE-USE OF EXCAVATED MATERIAL	18
4.6	SLOPES	19
5.0	LIMITATIONS	20
5.1	OBSERVATION OF CONSTRUCTION.....	20
5.2	VARIABLE SUBSURFACE CONDITIONS, USE OF REPORT, AND WARRANTY ..	20

FIGURES

Figure 1	Project Locus
Figure 2	Aerial Photograph
Figure 3	Exploration Plan – Abutment Areas
Figure 4	Exploration Plan – Pavement Borings

APPENDICES

Appendix A	Site Photographs
Appendix B	Boring Logs
Appendix C	Test Pit Logs
Appendix D	Probe Logs
Appendix E	Pavement Boring Logs
Appendix F	Bedrock Core Photograph
Appendix G	1995 Rehabilitation Information
Appendix H	February 12, 2020 Design Plans by Weston & Sampson
Appendix I	Geotechnical Calculations

1.0 INTRODUCTION

This report presents a description of our services, a summary of field explorations, descriptions of site and subsurface conditions, and geotechnical recommendations for design and construction of the proposed replacement of State Bridge No. S-09-003 carrying Maskwonicut Street over AMTRAK/MBTA railroad tracks in Sharon, Massachusetts. Our Preliminary Geotechnical Recommendations & Subsurface Data Report is dated June 30, 2017.

The bridge is located approximately 1,100 feet west of the intersection of Maskwonicut Street with Route 27 as shown in *Figure 1 – Project Locus*. The roadway alignment is approximately east-west over the bridge. Beaver Brook flows from south to north beneath the western bridge approach to Sawmill Pond approximately 1,100 northeast of the bridge site. Maskwonicut Street is currently closed at the bridge as the previous timber superstructure was damaged by a fire and removed in 2013.

Project details including, but not limited to, the proposed structure type, configuration, grading, related site improvements, and proposed construction approach are described in the following sections and are based on design plans developed by Weston & Sampson dated February 12, 2020.

1.1 EXISTING CONDITIONS

Existing site conditions are described in the following sections. An aerial photo of the site and bridge (with the former timber superstructure still in place) is shown in *Figure 2*. Site photographs of the existing bridge and surrounding areas are included in *Appendix A*.

1.1.1 ROADWAY

Maskwonicut Street crosses the bridge in an east-west orientation as shown in *Figures 1 and 2*. The roadway width along the east and west approaches is approximately 26 feet. No sidewalks are present. The road in the vicinity of the bridge is surfaced with asphalt concrete (AC) pavement that appears to be generally in good condition with minor to moderate longitudinal cracking. The age of the pavement is unknown.

Timber-over-metal guard rails are present along both sides of the road at the east and west approaches. Jersey barriers and chain link security fencing were installed at each abutment following removal of the superstructure to prevent access to the bridge span. See *Photos 1 and 2*.

1.1.2 BRIDGE STRUCTURE

The single span has a horizontal clearance of approximately 27.3 ft. between the abutment faces at the railroad tracks. The abutments are skewed less than 1 degree with respect to the roadway alignment at the span. Overhead railroad electrical wires pass through the span immediately below the elevation of the bridge seats at the abutments. Some wires are supported by brackets mounted directly to the face of each abutment.

The existing abutments and retaining (wing) walls are constructed of stone masonry blocks and are assumed to be gravity structures. The tops of the abutments and retaining walls were capped with reinforced concrete as part of the 1995 rehabilitation project. The north and south retaining walls at the east abutment and the south wall at the west abutment are generally oriented perpendicular to the abutments and parallel to the roadway. The northwest retaining wall (north side, west abutment) flares approximately 9 degrees to the north away from the roadway. See *Photos 3 through 5*.

1.1.3 BEAVER BROOK

Beaver Brook flows south to north through a stone masonry arch culvert at the west end of the west abutment retaining walls. See Photo 6 and *Figure 3*. At the upstream and downstream ends of the culvert, the retaining walls turn approximately 90 degrees and retain grades along the west side of Beaver Brook. Beaver Brook continues north on the west side of the railroad tracks for about 1,000 ft. where it flows through a culvert beneath the tracks and into Sawmill Pond as shown in *Figure 1*.

1.1.4 GROUND SURFACE

The ground surface adjacent to the retaining walls slopes downward to the AMTRAK/MBTA lines and is vegetated with trees, vines, and brush. The ground surface at the northwest wall slopes downwards from Maskwonicut Street to Beaver Brook at the culvert. An earthen berm separates the brook from the rail lines. See *Photo 4, Photos 7 through 9, and Figure 3*.

1.1.5 UTILITIES

Overhead power and utilities associated with the AMTRAK/MBTA tracks extend through the bridge span below the superstructure elevation. Overhead utility poles and wires not associated with the railroad are present along the south side of Maskwonicut Street. The utility poles are not supported on the existing abutments or retaining walls.

An abandoned 8-inch diameter water main is present in the backfill behind the north retaining walls at both abutments. The water pipe penetrates the face of the north retaining walls and is capped on both sides of the span. The section of pipe between the two abutments was presumably removed at the same time as the former superstructure.

1.2 BACKGROUND

The bridge was originally constructed in 1901 and was rehabilitated in 1975 and 1995. The 1995 rehabilitation was designed by Gannett Fleming/LSTS of King of Prussia, Pennsylvania and included modifications to the abutments and retaining walls to increase the minimum vertical clearance over the western track (Track 1) from 17.63 ft. to 19.12 ft. Reinforced concrete caps and bridge seats were added to the top of the abutments and retaining walls and up to 6.5 ft. of backfill behind the abutments and retaining walls was removed and replaced with lightweight aggregate fill.

Information associated with the 1995 rehabilitation including a 1993 geotechnical report, 90% Design Submittal Drawings (dated April 1994), and Record Drawings (dated March 1997) were reviewed as part of our geotechnical evaluation. Boring logs, geotechnical laboratory test results, and select design and record drawings are included in **Appendix G**.

1.3 PROJECT DESCRIPTION AND ALTERNATIVES

Original project goals included reopening the bridge to vehicle and pedestrian traffic, increasing vertical and horizontal clearances relative to the train tracks, and roadway improvements including the addition of a sidewalk and shoulders. Desired railroad clearances included a 23.33 ft. minimum vertical clearance from the top of the rails to the underside of the superstructure and minimum 18 ft. horizontal clearance from the track centerlines to the abutment faces.

Several alternatives were evaluated by the design team and project stakeholders including re-use of the existing abutments to support a new superstructure, modification/augmentation of the existing abutments and retaining walls to support a new superstructure and roadway improvements, and complete removal and replacement of the existing abutments and retaining walls with new structures. The currently proposed alternative shown in the February 12, 2020 design plans is described in the following sections. Select sheets from the design plans showing the currently proposed conditions are included in **Appendix H**.

1.4 PROPOSED CONDITIONS

1.4.1 STRUCTURE TYPE

The currently proposed alternative will include complete removal of the existing east abutment and wingwalls and removal of the west abutment and an approximately 10-foot long section of the wingwalls immediately behind the west abutment. Portions of the wingwalls and retaining walls further (west) from the west abutment and the existing granite block arch culvert over Beaver Brook will remain. Foundations supporting the existing abutments and wingwalls will remain in-place adjacent to the existing railroad tracks.

Temporary excavation support will be required for construction of the new west abutment adjacent to the portions of the retaining walls to remain. Locations of anticipated temporary excavation support are shown in the design plans.

New abutments and wingwalls will be cast-in-place reinforced concrete cantilevered structures supported on shallow spread footings and backfilled with conventional granular earth fill materials. The proposed abutment bottom-of-footing elevation is El. 188.5. The new abutments will provide a horizontal clearance of 18.65 ft. from the track centerlines to the abutment faces and a total horizontal distance of 51 ft. between the abutments. Roadway elevations at the span will be raised to accommodate the new superstructure and suspended utilities. The proposed superstructure will consist of cast-in-place concrete deck supported by steel girders.

Roadway and sidewalk elevations above the existing retaining walls to remain will be increased by adding a concrete cap along the north retaining wall and a parapet with moment slab along the top of the south retaining wall. The parapet will slightly overhang the face of the existing retaining to facilitate widening of the roadway.

Existing backfill behind the retaining walls to remain and over the Beaver Brook culvert will be partially removed and replaced with lightweight foamed glass aggregate (FGA) fill to reduce additional stresses associated with proposed grade increases.

1.4.2 DIMENSIONS AND GEOMETRY

The new bridge and roadway will be constructed in approximately the same alignment as the existing roadway, but wider and with a slightly longer bridge span. Roadway grades will be raised up to approximately 3 ft. above existing grades.

The new bridge superstructure will have a clear span of 54.5 feet and an out-to-out width of 34.8 ft. The span will accommodate a roadway width of 26 feet, including two 10-ft. wide travel lanes, 2-ft. and 4-ft. wide shoulders, and one 6-ft. wide sidewalk. The same roadway and sidewalk configuration and widths will be constructed over the existing retaining walls and arch culvert.

1.5 PURPOSE

The purpose of our geotechnical investigations was to explore subsurface conditions, including the geometry of the existing abutments, and provide geotechnical recommendations for design and construction of the proposed bridge replacement.

1.6 DESIGN CRITERIA

Recommendations contained in this report are based on the Massachusetts Department of Transportation (MassDOT) LRFD Bridge Manual, the American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Bridge Design Specifications, and the AASHTO Guide Specifications for LRFD Seismic Bridge Design. Recommendations are also based on the MassDOT Standard Specifications for Highways and Bridges.

1.7 SURVEY, DATUM, AND UNITS OF MEASUREMENT

A topographic survey dated July 1, 2016 was completed for the site by Green International Affiliates, Inc. Elevations in the survey and this report reference the North American Vertical Datum of 1988 (NAVD88). Dimensions referenced in this report are based on the imperial (English) measurement system.

2.0 SUBSURFACE CONDITIONS

2.1 GEOLOGY

Surficial geology information available from the Massachusetts Office of Geographic Information (Mass GIS) indicates the site is mapped within an area of sand and gravel overlying glacial till and bedrock to depths up to 50 ft. There are no bedrock outcrops mapped in the immediate area.

Bedrock geology near the site is mapped as Diorite of the Proterozoic Z period. The USGS description is as follows: 'Medium-grained hornblende diorite metamorphosed in part to amphibolite and hornblende gneiss.'

2.2 PREVIOUS SUBSURFACE INFORMATION

Six borings (B56-1 through B56-6) were completed as part of a 1993 geotechnical evaluation to support the 1995 structure rehabilitation. Boring logs are included in **Appendix G**. Approximate exploration locations are shown on the 1995 drawings, also included in **Appendix G**.

Previous borings generally encountered SAND FILL with variable amounts of gravel above the bottom of the abutments. Native SAND and GRAVEL with variable amounts of silt and cobbles and boulders were generally encountered below the bottom of the abutments to the depths explored.

The existing abutments were cored in B56-3 (west abutment) and B56-4 (east abutment), presumably to assess the bottom-of-abutment elevation. Wood debris, interpreted as a railroad tie, was encountered immediately below the abutment in B56-3. B56-5 at the west abutment encountered a void from 9.5 ft. to 12 ft. Additional voids were encountered in the 2016 and 2020 borings completed at the west abutment as described in Section 2.4.1.

2.3 SUBSURFACE EXPLORATIONS

2.3.1 GENERAL

In 2016, subsurface conditions at the existing abutments and retaining walls were explored by advancing two borings (BB-1 and BB-2) to depths up to 56.0 ft., two test pits (TP-1 and TP-2) to depths up to 4.8 ft., and 28 probes to depths up to 25.0 ft. In 2020, subsurface conditions were further evaluated at the west abutment by advancing a total of seven borings (BB-101, BB-102A/B/C, and BB-103A/B/C) to depths up to 16.5 ft. Approximate locations of the explorations are shown in **Figure 3**. Pavement thickness and roadway subgrade conditions in Maskwonicut Street near the bridge were explored by advancing ten shallow borings (C-1 through C-10) at the approximate locations shown in **Figure 4**.

All explorations were completed in existing roadway areas by New England Boring Contractors of Brockton, Massachusetts. The 2016 borings, test pits, and pavement borings were completed between June 20 and June 27, 2016. Probes were completed on August 30

and 31, 2016. The additional 2020 explorations were completed on March 2 and 3, 2020.

Cased drive-and-wash drilling methods were used in all borings and involved advancing a casing to sampling depths using a 300-pound hammer and removing the material from inside the casing using a tri-cone roller bit and water prior to sampling. Inside casing diameters (ID) ranged from three to five inches. Standard penetration tests (SPT) were completed in the borings using a 24-inch long by 1-3/8-inch ID (2-inch outside diameter) split spoon sampler driven by blows from a cathead operated 140 lb. safety hammer falling 30 in. per blow. The sampler was driven a total distance of 24 inches unless sampling refusal was encountered. The number of blows required to drive the sampler the middle 12 inches is referred to as the 'SPT blow count' unless otherwise noted. SPT refusal is defined as more than 100 hammer blows for less than 6 inches of sampler penetration.

A Weston & Sampson geotechnical engineer observed exploration activities in the field, classified soil and rock samples, and prepared logs for each exploration.

2.3.2 2016 BORINGS

The purpose of the borings was to explore subsurface conditions including composition and consistency of the abutment backfill, foundation soils, depth to bedrock, and bedrock quality.

BB-1 was advanced to SPT refusal at 45.3 ft. BB-2 was advanced to SPT refusal at 44.9 ft. and rock coring was completed from 46 ft. to 56 ft. using a NX size core barrel. Four runs of rock core were required due to frequent jamming. Rock coring was not completed in BB-1 due to a damaged casing and time constraints.

Boring logs are included in **Appendix B**. A photograph of rock core samples is included in **Appendix F**.

2.3.3 2020 BORINGS

The purpose of these borings was to further explore the composition and geometry of the west abutment wingwalls and evaluate the bottom of footing elevation.

BB-101 was advanced to 16.5 ft. and terminated in the fill due to caving of the borehole. Coring using a NX-size core barrel was completed through the wingwall reinforced concrete cap from 4.0 to 9.0 ft. A second rock core was attempted at 9.0 ft. but was not completed due to the presence of an apparent void between approximately 9.5 ft. to 12.5 ft. BB-102A was advanced to a depth of 6.0 ft. before the boring was terminated due to the presence of metal and plastic cuttings in the drill wash. The borehole was offset and re-attempted two additional times (BB-102B and BB-102C). BB-103A was advanced to 8.9 ft. and terminated in the fill due to misalignment of the drill casing. Coring was completed through the wingwall reinforced concrete cap from 6.0 ft. to 6.9 ft. The borehole was offset and re-attempted two additional times (BB-103B and BB-103C). Boring logs are included in **Appendix B**.

2.3.4 TEST PITS

One test pit was excavated at each abutment to evaluate backfill materials and abutment/retaining wall geometry. The test pits were excavated on June 24, 2016 by New England Boring Contractors using a Kubota KX0574 mini excavator. Test pit logs are included in *Appendix C*.

Test pit TP-1 was completed at the top of the southeast retaining wall approximately 9 ft. east of the east abutment face. Test pit TP-2 was completed at the top of the northwest retaining wall approximately 9 ft. west of the west abutment face. Test pits could not be excavated closer to the abutments due to AMTRAK track foul time regulations and flagmen requirements.

2.3.5 PROBES

A series of drilled probes were completed at various distances behind the rear face of each of abutment and retaining wall to evaluate the geometry of the existing structures. A total of 28 probes were advanced to depths up to 25.0 ft. using 4-inch outside diameter (OD) solid stem augers at the approximate locations shown in *Figure 3*. Probe logs are included in *Appendix D* and describe probe location and refusal depth, where encountered.

2.3.6 PAVEMENT BORINGS

The existing pavement was assessed at ten locations in Maskwonicut Street at approximate 50 ft. intervals up to 250 ft. west and east of the abutments as shown in *Figure 4*. A roller-bit or solid stem auger was used to penetrate the existing AC and a SPT was used to obtain a sample and evaluate the consistency of the base and sub-base materials.

Asphalt concrete, base, and sub-base thicknesses were evaluated based on visual observations and SPT samples and blow counts. Material thicknesses are summarized in the following section. Pavement boring logs are included in *Appendix E*.

2.4 SUBSURFACE CONDITIONS

2.4.1 GENERAL

Subsurface conditions encountered in the explorations were generally consistent with the mapped surficial geology and the borings and drawings associated with the 1995 rehabilitation. The borings and pavement borings generally encountered 4 to 7 inches of asphalt concrete overlying 1 to 4 inches of gravel base. The borings encountered 10 to 11 inches of sand sub-base beneath the gravel base layer.

Below the pavement structure, the borings generally encountered 6 to 8 feet of LIGHTWEIGHT AGGREGATE FILL (LAF). The LAF was underlain by native SAND and GRAVEL in BB-1 and 5 to 8 feet of sand FILL over native SAND and GRAVEL in BB-2. GLACIAL TILL was encountered beneath the native SAND and GRAVEL at depths between 21 and 29 ft. Weathered BEDROCK was encountered at approximately 43.0 ft. in BB-1 and

46.0 ft. in BB-2. The surface of intact bedrock was interpreted as 45.3 ft. in BB-1 and 50.0 ft. in BB-2 based on SPT refusal and rock core samples.

Voids were observed at the west abutment in BB-2 (12 ft. to 14 ft.), BB-101 (9.5 ft. to 12.5 ft.), BB-102C (7.0 ft. to 8.0 ft.) and BB-103A (6.0 ft. to 6.9 ft.). Previous boring B56-5 was completed near the location of BB-2 and encountered a void between depths of 9.5 to 12 ft. Since B56-5 was completed prior to raising grades in 1995, the void was encountered in both borings at approximately the same elevation.

Detailed descriptions of the soil units encountered in the borings are provided in the following sections and the exploration logs included in the Appendices.

2.4.2 PAVEMENT

The following table summarizes the pavement boring locations and thickness of pavement components. Subgrade conditions observed at each pavement boring location are described in the logs included in *Appendix E*.

Pavement Core Number	Distance From Abutment Face (ft.)	Asphalt Thickness (in.)	Gravel Base Thickness (in.)	Sand Sub-base Thickness (in.)
C-1	50 (W)	4	2	9
C-2	100 (W)	4	2	9
C-3	150 (W)	5	1	N/O
C-4	200 (W)	5	3	N/O
C-5	250 (W)	5	4	N/O
C-6	70 (E)	4	1	N/O
C-7	100 (E)	4	2	N/O
C-8	150 (E)	5	N/O	4
C-9	200 (E)	5	3	N/O
C-10	250 (E)	7	2.5	N/O

Notes: (W) indicates west abutment face, (E) indicates east abutment face, N/O = "Not Observed"

2.4.3 LIGHTWEIGHT AGGREGATE FILL

The LIGHTWEIGHT AGGREGATE FILL (LAF) generally ranged from medium dense to dense and contained mostly gravel sized aggregate with little sand and trace silt sized aggregate.

2.4.4 FILL

The FILL encountered beneath the LAF in BB-2 included medium dense to very dense SAND FILL with trace to little gravel and little to some silt and medium stiff, SANDY SILT FILL. The void encountered in BB-2 was immediately beneath the fill. The voids encountered in the other borings (BB-101, BB-102C and BB-103A) were within the fill.

2.4.5 NATIVE SAND AND GRAVEL

The native SAND and GRAVEL generally ranged from medium dense to dense on the east abutment and from very loose to dense on the west abutment. The SAND was generally coarse to fine and contained little to some gravel and variable amounts of silt (little to silty). The GRAVEL ranged from coarse to fine and contained little to some sand and trace silt. Poor sample recovery and observations during drilling indicate the presence of cobbles and boulders in this stratum.

2.4.6 GLACIAL TILL

The GLACIAL TILL was generally very dense and consisted of fine to coarse SAND with variable amount of gravel (little to gravelly) and silt (trace to silty) and up to little clay. Poor sample recovery, SPT refusal, and observations during drilling indicate the presence of cobbles and boulders in the glacial till.

2.4.7 BEDROCK

The consistency and composition of the weathered bedrock encountered in BB-1 generally consisted of very dense gravel with trace sand and silt. Intact bedrock generally consisted of hard, slightly weathered, slightly to intensely fractured, partly to mostly healed, gray Diorite, which is consistent with the mapped USGS bedrock geology.

The rock quality was very poor from 46.0 to 50.0 ft. in BB-2, indicating a likely zone of weathered bedrock. Rock Quality Designations (RQD) increased with depth from 17% in the top 4 feet (46 to 50 ft.) to 85% in the last core run from 53.8 to 56.0 ft.

2.4.8 GROUNDWATER

Groundwater was observed at depths of approximately 25 ft. in BB-1 (El. 192.0) and 24 ft. in BB-2 (El. 189.5) based on observations following drilling. These observations should not be considered reliable due to the introduction of water into the boreholes for drilling and coring. Groundwater elevations are expected to be close to and influenced by the surface water levels of Beaver Brook. The design plans indicate the water level in Beaver Brook was observed at approximately El. 192.7 on October 31, 2017.

We anticipate that ground water levels will fluctuate with season, variations in precipitation, construction in the area, Beaver Brook water levels, and other factors. Perched ground water conditions could exist close to the ground surface, especially during and after extended periods of wet weather.

2.5 SEISMIC DESIGN CATEGORY

In accordance with the AASHTO Guide Specifications for LRFD Seismic Bridge Design and based on the subsurface conditions encountered in our explorations and our geotechnical analyses, the subject project should be evaluated using parameters associated with Site Class D (stiff soil).

2.6 LIQUEFACTION POTENTIAL

Liquefaction occurs in loose, saturated, granular soils. Strong shaking, such as that experienced during earthquakes, causes the densification and the subsequent settlement of these soils. Based on the soil types, consistencies, and groundwater levels observed in the borings and in previous explorations by others, and the proposed new foundation bearing elevations, the risk of structurally damaging liquefaction-induced ground deformations is low.

3.0 GEOTECHNICAL RECOMMENDATIONS

3.1 GENERAL

Geotechnical considerations associated with the proposed bridge replacement and modifications to existing structures include the following:

- Temporary excavation support, dewatering, and/or underpinning of the existing retaining walls to remain will be required for construction of the west abutment foundation.
- The structural integrity and condition of the existing structures to remain should be investigated. Impacts to stability from additional loads imposed by the proposed caps and parapets along the tops of these walls should be evaluated. Stability including overturning, sliding, bearing capacity, and settlement should be evaluated by the Structural Engineer considering the proposed configuration of lightweight fill and overlying materials behind the walls. Recommended geotechnical parameters and procedures for evaluating stability of existing structures are provided in Section 3.3, below.
- Existing stresses on the existing Beaver Brook arch culvert may be maintained through the proposed use of FGA lightweight fill. The actual loads imposed due to traffic loads should be evaluated based on the proposed thicknesses and elevations of lightweight fill and overlying materials.
- Voids were encountered beneath the west abutment in several borings. The voids should be filled with grout or very flowable controlled density fill (CDF) prior to construction, as collapse of the void could adversely affect the stability of the existing structures and proposed site improvements.

3.2 FOAMED GLASS AGGREGATE (FGA) FILL

Foamed glass aggregate (FGA) fill is recommended for use as lightweight backfill over the existing Beaver Brook stone arch culvert at the west abutment to reduce vertical and lateral overburden pressures resulting from the proposed grade increases. FGA is a lightweight, processed glass material created from a mixture of crushed or granulated glass and a blowing agent (chemical foaming agent). Prior to reaching the melting point of the glass, the mixture hardens into a rigid material with gas-filled closed cell pores comprising a large portion of its volume.

Engineering design considerations associated with FGA fill include buoyant (uplift) forces and seismic behavior where heavier soil masses are placed over lightweight fill. These considerations are discussed in the following sections.

FGA should be separated from adjacent materials by wrapping in a nonwoven, needle-punched, polypropylene geotextile with a minimum grab tensile strength of 160 lbs. per

ASTM D4632. The FGA should be manufactured using a dry foaming process that is non-leaching and consist of a minimum of 98 percent recycled glass.

An in-place compacted unit weight of 20 pounds per cubic foot should be used for FGA fill design and stability calculations. Stresses associated with traffic loads and the parapet moment slab should be evaluated by the Structural Engineer.

3.3 STABILITY ANALYSIS OF EXISTING AND NEW STRUCTURES

3.3.1 GENERAL

The proposed modifications will alter stresses and loads on the existing structures to remain. The proposed modifications should be evaluated for adequate stability including sliding, overturning, and bearing resistance using the parameters and procedures recommended in the following sections. External (aka global) and seismic stability should be evaluated as part of final design.

3.3.2 FOAMED GLASS AGGREGATE (FGA) FILL

We recommend the following static design parameters for FGA fill.

- FGA should meet the following gradation specifications:

Sieve Size	Total Percent Passing
4"	100
2 1/2"	85-100
3/8"	0-15

- An internal friction angle of 40 degrees.
- The as-delivered FGA should have a maximum dry bulk density of no more than 15 pcf and in-place compacted density of no more than 20 pcf. The loose bulk density of delivered FGA may be determined per ASTM C29/C29M Method C. If necessary, this value should be adjusted by the moisture content of the FGA to determine the dry, loose bulk density. Moisture content shall be determined using ASTM D2216 or ASTM D4959 or ASTM D4643.

3.3.3 LATERAL EARTH PRESSURES

Analysis of existing and new retaining walls must consider lateral loadings exerted by soil, water, and surcharge loads as appropriate. Lateral earth pressures on the existing and new structures for drained conditions and level backfill should be evaluated using the parameters included in the following table. Appropriate load Factors should be selected from AASHTO LRFD Table 3.4.1-2.

Lateral earth pressures from retained granular backfill should be applied as a triangular distribution. Additional lateral pressure due to surcharge should be applied as recommended in the following section. Passive soil resistance in front of the wall should be neglecting in evaluating stability.

Active lateral earth pressures (K_A) should be used where walls are free to rotate and deflect. At-rest lateral pressures (K_O) should be used where walls are restrained from rotation. Intermediate values may be used to reduce wall movement as appropriate for the existing structure.

	Existing Lightweight Aggregate Fill	Existing Sand Backfill	New Gravel Borrow Backfill	New Foamed Glass Aggregate
Unit Weight of soil above the water table, pcf	64	125	130	20
Soil Angle of Internal Friction, ϕ	38	32	36	40
Coefficient of Friction for Soil Against Formed Concrete ($\tan \delta$)	0.55	0.39	0.55	0.55
Coefficient of Friction for Soil Against Stone Masonry ($\tan \delta$)	0.55	0.39	0.55	0.55
Coefficient of Active Earth Pressure with level backfill, K_a	0.30*	0.36*	0.26	0.22
Coefficient of At-Rest Earth Pressure with level backfill, K_o	0.38	0.47	0.41	0.36

* - Assumes rear wall face batter of approximately 10 degrees from vertical.

3.3.4 SURCHARGE PRESSURE

Additional (surcharge) lateral pressures resulting from uniform or areal loads, such as roadway materials overlying the lightweight FGA fill, should be calculated in accordance with AASHTO LRFD Section 3.11.6.1. Surcharge pressures from areal loads should be applied as a uniform lateral pressure (rectangular distribution) added to the lateral earth pressures described above. The lateral earth pressure coefficients provided in the above table should be used as appropriate for active and at-rest conditions. Intermediate values can be used as described above.

Additional surcharge loads from dead and live point, line, and strip loads should be calculated in accordance with AASHTO LRFD Section 3.11.6.2 and added to lateral earth pressures.

3.3.5 RESISTANCE TO SLIDING

Resistance to lateral loads can be provided by friction at the base of the existing abutment and retaining wall footings and the new stub wall footings. Resistance due to passive lateral earth pressure should be neglected.

Nominal sliding resistance due to base friction should be calculated by multiplying the vertical load on the footing by a friction coefficient of 0.5. Factored sliding resistance should be calculated by multiplying the nominal resistance by 0.8 (Table 10.5.5.2.2-1 AASHTO LRFD).

3.3.6 BEARING CAPACITY

For the new and existing abutments and retaining walls, the factored bearing resistance for Strength Limit State load cases should be calculated in accordance with Section 10.6.3 of AASHTO LRFD using a soil friction angle of 35 degrees, no cohesion, and a unit weight of 120 pounds per cubic foot (pcf). Recommended net bearing resistance for proposed substructure foundations supported on the native dense (or denser) sand and gravel, glacial till or Structural Fill are provided in the table below for various effective footing widths. The factored resistance is based on a resistance factor of 0.45 for the Strength limit state, and 1.0 for the Extreme limit state in accordance with AASHTO LRFD Section 10.5.5. The values provided in the table assume a minimum footing embedment of 4.0 feet and assume the ground surface is level (not sloped) adjacent to the footings. If ground surface elevations are revised, we should be contacted to provide updated bearing resistance recommendations during final design if shallower embedment depths or sloping ground is proposed adjacent to new substructure foundations. Refer to the bearing capacity calculations provided in *Appendix I*.

Effective Footing Width, B' (ft.)	Factored Bearing Resistance (ksf)	
	Strength Limit	Extreme Limit
12.0	9.4	20.8
10.0	8.3	18.5
8.0	7.2	16.0
6.0	4.8	10.7

3.3.7 SETTLEMENT

Settlement analyses were completed for the new abutments in accordance with AASHTO LRFD Section 10.6.2.4.2. The relationship between bearing stress and estimated settlement for various effective footing widths are provided in *Appendix I* and should be used to estimate the magnitude of settlement for the proposed loads. Service limit state bearing pressures should be used when evaluating settlement. Refer to the settlement calculations provided in *Appendix I*.

We recommend that lightweight FGA fill be used to avoid increasing bearing pressures at the foundations of structures to remain. If bearing pressures can be maintained at or below existing levels, negligible additional settlement is expected.

3.4 FROST PROTECTION

The abutment and wingwall foundations should be embedded at least 4.0 feet below the nearest adjacent ground surface exposed to freezing.

3.5 DRAINAGE

The lateral earth pressures recommended above assume drained conditions. Drainage should be designed and constructed for all retaining walls in accordance with MassDOT LRFD Bridge Manual specifications for walls and abutments. Drainage of the granular road base materials overlying the lightweight FGA fill should be provided to prevent water from collecting within frost depths beneath the roadway. The surface of the load distribution slab and protective geomembrane should be sloped to promote drainage.

4.0 CONSTRUCTION RECOMMENDATIONS

4.1 SUBGRADE PREPARATION

Preparation of subgrades, including excavation and disposal of surplus material, should be completed in accordance with MassDOT Section 100. New roadway and fill areas should be cleared and grubbed of all vegetation, topsoil, organics, and loose surficial fill removed. Exposed subgrades should be proof compacted with at least four passes of an appropriately sized compactor and observed by a geotechnical engineer prior to placement of overlying fill.

Areas of loose, soft or disturbed subgrade soils should be over excavated to expose firm undisturbed soils and the resulting excavation brought back to grade using compacted granular fill or crushed stone surrounded on all sides by a non-woven geotextile filter fabric.

Equipment should not be allowed to operate on fine grained soils if encountered. Excavation in fine grained soils should be completed using a flat-bladed excavator bucket.

4.2 BACKFILL AND PLACEMENT

Backfill operations should be completed in accordance with MassDOT Section 400. Backfill should be placed in maximum 12-inch thick lifts (uncompacted thickness) and compacted to at least 95 percent of the material's maximum dry density as determined by ASTM D1557/AASHTO T-180 Method D. Fills should be benched into existing slopes, regardless of existing slope inclination such that new fill is placed in horizontal lifts.

4.3 LIGHTWEIGHT FOAMED GLASS AGGREGATE (FGA) FILL

Lightweight FGA fill should be placed and compacted in accordance with the project requirements. Construction equipment, other than for placement and compaction, shall not operate on the exposed FGA in order to minimize additional compaction and potential crushing. Geotextile should be placed as a separator between subgrade and the initial lifts of FGA fill as well as above the final lift and on side slopes as a separator between the FGA fill and capping layer.

4.4 EXCAVATION CONSIDERATIONS

Excavations will be required for site preparation, construction of the new abutment and wingwalls, and lightweight fill installation. Temporary excavation support will likely be required for excavation depths greater than 4 feet and where groundwater seepage is present. Temporary excavation support and/or underpinning should also be anticipated in areas where excavations extend within the zone-of-influence of the existing railroad tracks, beneath existing footings, structures, utilities, site features, or property lines. The zone-on-influence (ZOI) is defined by planes extending horizontally away from the outside edges of all foundations, railroad tracks, etc. for 2 ft. and then down and away at a 1H:1V slope.

The selection, design, and construction of excavation support systems should be the responsibility of the Contractor. The selection of the excavation support system will need to

consider the presence of the relatively shallow and dense glacial till soils and possible obstructions associated with backfill of the existing granite block abutments. Based on the subsurface conditions and restricted work area adjacent to the active railroad tracks, a drilled soldier pile and lagging or drilled micropile and lagging excavation support system is anticipated. Other temporary earth support alternatives include sheet piles installed using the “press-in” pile equipment technology designed to minimize vibrations adjacent to the railroad tracks. Press-in pile technology utilizes a reaction developed between a hydraulic installation machine and previously installed piles. Due to the dense site soils (i.e., glacial till and bedrock), pre-augering, pre-drilling, or other special installation methods should be anticipated to be required prior to sheet pile installation.

The excavation support system should be designed and stamped by a professional engineer licensed in the Commonwealth of Massachusetts to support lateral earth pressures, vehicle surcharges (trains), construction surcharge loads, unbalanced hydrostatic pressures, and surcharges from adjacent structures and utilities, if present. All excavations should be made in accordance with applicable OSHA safety regulations.

Recommended soil strength parameters for design of excavation support systems are provided below.

Parameter	Values for:	
	Existing Fill	Sand & Gravel
Angle of Internal Friction, ϕ	30°	35°
Unit Weight, γ (pounds per cubic foot)	125	120
Buoyant Unit Weight, γ' (pounds per cubic foot)	62.6	62.6
At-Rest Earth Pressure Coefficient, K_o	0.50	0.43
Active Earth Pressure Coefficient, K_a	0.33	0.27
Passive Earth Pressure Coefficient, K_p	3.00	3.70

Shoring systems restrained from lateral movement should be designed using at-rest lateral earth pressures. Shoring systems which can be allowed to deflect 1 to 2 percent of the exposed wall height may be designed assuming active earth pressure conditions.

4.5 RE-USE OF EXCAVATED MATERIAL

Excavated granular soils free of debris, organics, and other deleterious materials may be suitable for reuse as backfill against structures and/or roadway base materials if the materials meet the gradation requirements of MassDOT M1.03.0 (Gravel Borrow) or MassDOT M2.01.7 (Dense Graded Crushed Stone). Laboratory testing including gradation, fines content, and organic content should be completed and submitted to the geotechnical engineer for approval prior to use. Fine grained soils such as fine sand, silt, silty fill, and granular soils containing more than approximately 10 percent fines are not expected to be suitable for reuse as backfill or roadway base.

4.6 SLOPES

Permanent cut slopes up to 10 ft. high can be inclined at 2H:1V in medium dense or denser sand and glacial till provided groundwater is not encountered in the exposed slope. Permanent fill slopes should also be inclined no steeper than 2H:1V provided the fill is placed and compacted as required in the project earthwork specification. However, we recommend flatter slopes be used if possible (inclined at 3H:1V or flatter) as flatter slopes are preferred from the perspectives of maintenance and public safety. The face of fill slopes should be overbuilt and cut back into compacted materials with a smooth excavator bucket and immediately protected from erosion. If steeper fill slopes are desired Weston & Sampson should be consulted to evaluate use of grid reinforcement and/or crushed rock buttresses. Weston & Sampson should be contacted to evaluate if foundations and other permanent site features are proposed within 15 ft. of slope crests.

5.0 LIMITATIONS

5.1 OBSERVATION OF CONSTRUCTION

Satisfactory earthwork and foundation performance depend to a large degree on the quality of construction. Subsurface conditions observed during construction should be compared with those encountered during the subsurface explorations. Recognition of changed conditions often requires experience; therefore, qualified personnel should visit the site with sufficient frequency to detect whether subsurface conditions change significantly from those anticipated. In addition, sufficient monitoring of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. Construction observation and testing should be provided in accordance with the applicable MassDOT guidelines and specifications.

Our analyses are based on subsurface conditions encountered in the test borings, test pits, probes, laboratory testing, existing information, and engineering judgment. Observations and collection and analysis of field monitoring data during construction are necessary to confirm the recommendations provided in this report. Field observations during construction may indicate that modifications to design and/or construction methods or sequencing are necessary.

5.2 VARIABLE SUBSURFACE CONDITIONS, USE OF REPORT, AND WARRANTY

We have prepared this report for use by MassDOT and members of the design and construction team for the subject project only. The data and report can be used for design development and estimating purposes, but our report, conclusions, and interpretations should not be construed as a warranty of the subsurface conditions and are not applicable to other sites.

Soil borings indicate soil conditions only at specific locations and only to the depths penetrated. They do not necessarily reflect soil strata or groundwater variations that may exist between exploration locations. If subsurface conditions differing from those described are noted during the course of excavation and construction, reevaluation will be necessary.

Site plans and design details had not been finalized at the time this report was prepared. If changes are made in site grades, configuration, design loads, or type of construction, our conclusions and recommendations may not be applicable. If design changes are made, we should be contacted to review our conclusions and recommendations and provide a written evaluation or modification. Additional geotechnical engineering analyses and explorations will be necessary during final design.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, expressed or implied, is given.

FIGURES

State Bridge No. S-09-003
Maskwonicut Street over AMTRAK/MBTA railroad tracks
Sharon, Massachusetts

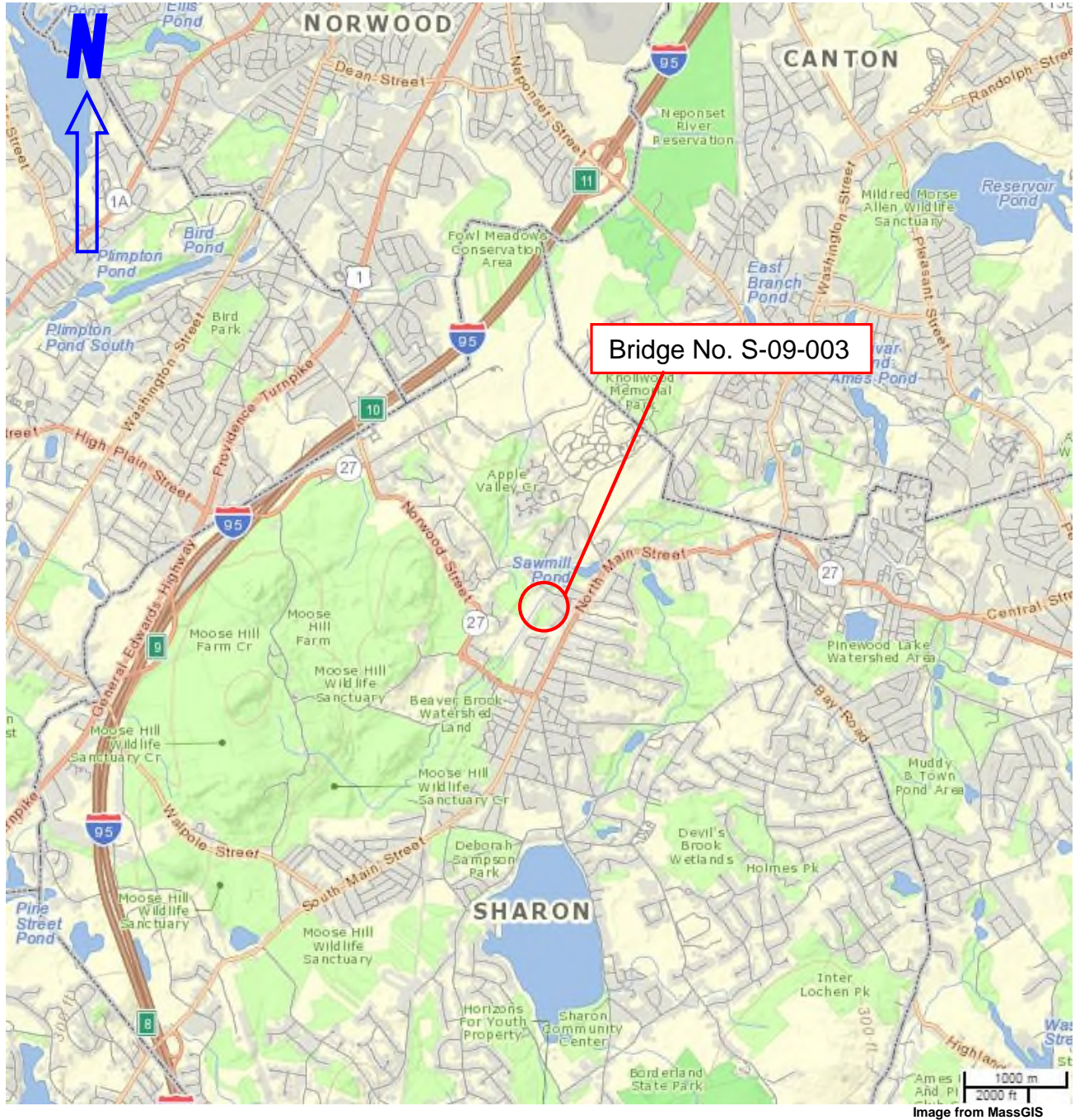
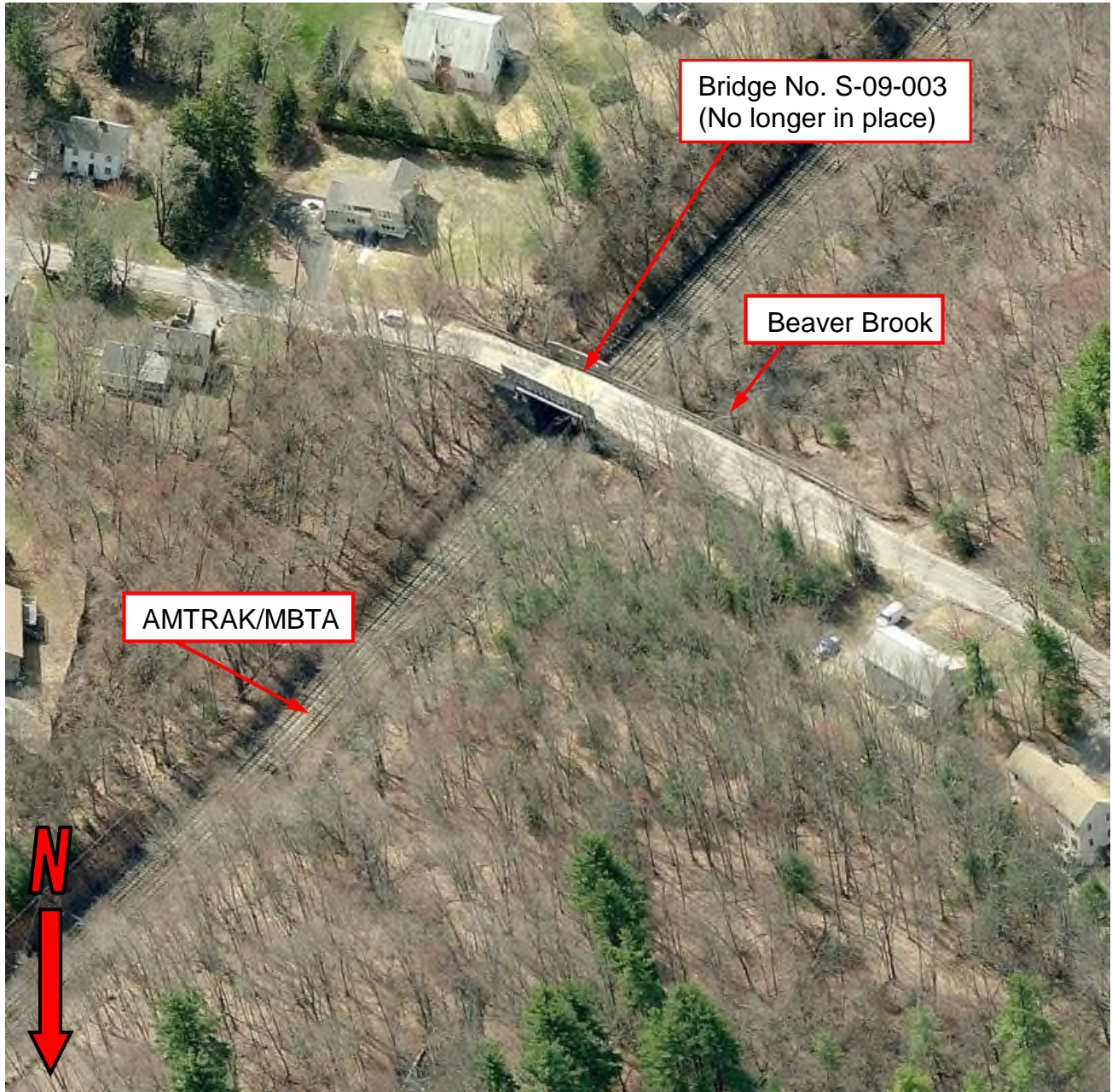


Figure 1 – Project Locus

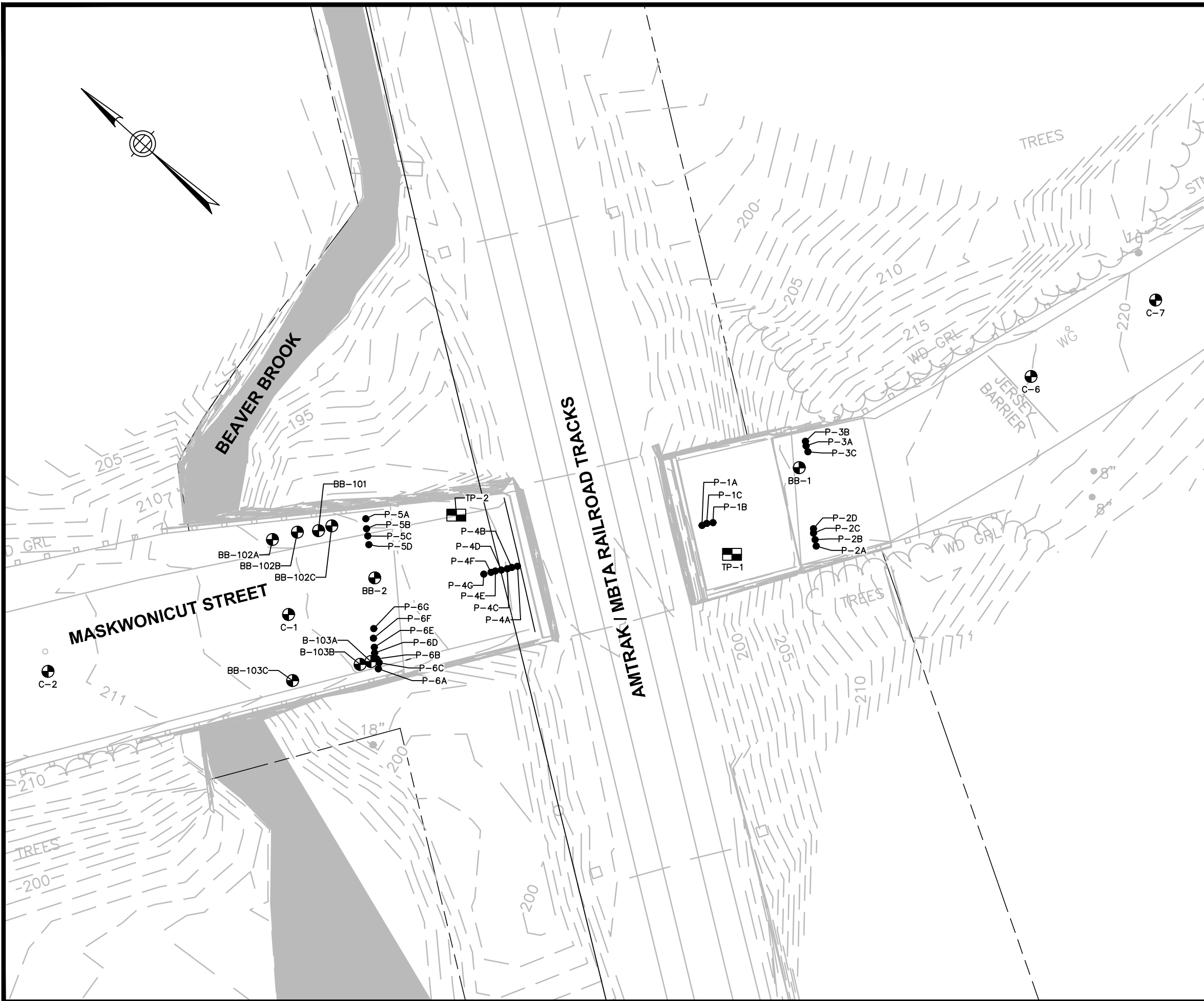
State Bridge No. S-09-003
Maskwonicut Street over AMTRAK/MBTA railroad tracks
Sharon, Massachusetts



Aerial Image from Bing.com

Figure 2 - Aerial Photo




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NOTES:

1. THIS DRAWING AND SITE LAYOUT ARE BASED ON A SURVEY PREPARED BY GREEN INTERNATIONAL AFFILIATES, INC. ON JULY 1, 2016. VERTICAL DATUM IS NAVD88.
2. BORING, PROBE, AND TEST PIT LOCATIONS SHOWN ARE BASED ON FIELD MEASUREMENTS RELATIVE TO EXISTING SITE FEATURES AND ARE APPROXIMATE.
3. BRIDGE BORINGS BB-1 AND BB-2 AND PAVEMENT BORINGS C-1 THROUGH C-10 WERE COMPLETED BY NEW ENGLAND BORING CONTRACTORS OF BROCKTON, MASSACHUSETTS ON JUNE 20 THROUGH JUNE 27, 2016.
4. BRIDGE TEST PITS TP-1 AND TP-2 WERE EXCAVATED BY NEW ENGLAND BORING CONTRACTORS OF DERRY, NEW HAMPSHIRE ON JUNE 24, 2016.
5. BRIDGE PROBES P-1 THROUGH P-6 WERE COMPLETED BY NEW ENGLAND BORING CONTRACTORS OF BROCKTON, MASSACHUSETTS ON AUGUST 30 AND 31, 2016.
6. BRIDGE BORINGS BB-101 THROUGH BB-103 WERE COMPLETED BY NEW ENGLAND BORING CONTRACTORS OF EAST TAUNTON, MASSACHUSETTS ON MARCH 2 AND 3, 2020.
7. ALL PAVEMENT BORINGS ARE SHOWN ON FIGURE 4.
8. ALL EXPLORATIONS REFERENCED HEREIN WERE OBSERVED BY WESTON & SAMPSON PERSONNEL.

LEGEND:

- 
BORING DESIGNATION AND APPROXIMATE LOCATION
 B-# or C-#
- 
PROBE DESIGNATION AND APPROXIMATE LOCATION
 P-#
- 
TEST PIT DESIGNATION AND APPROXIMATE LOCATION
 TP-#

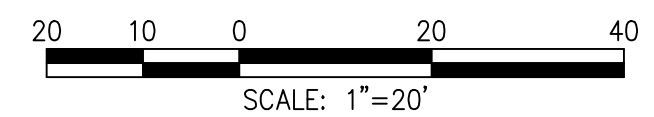


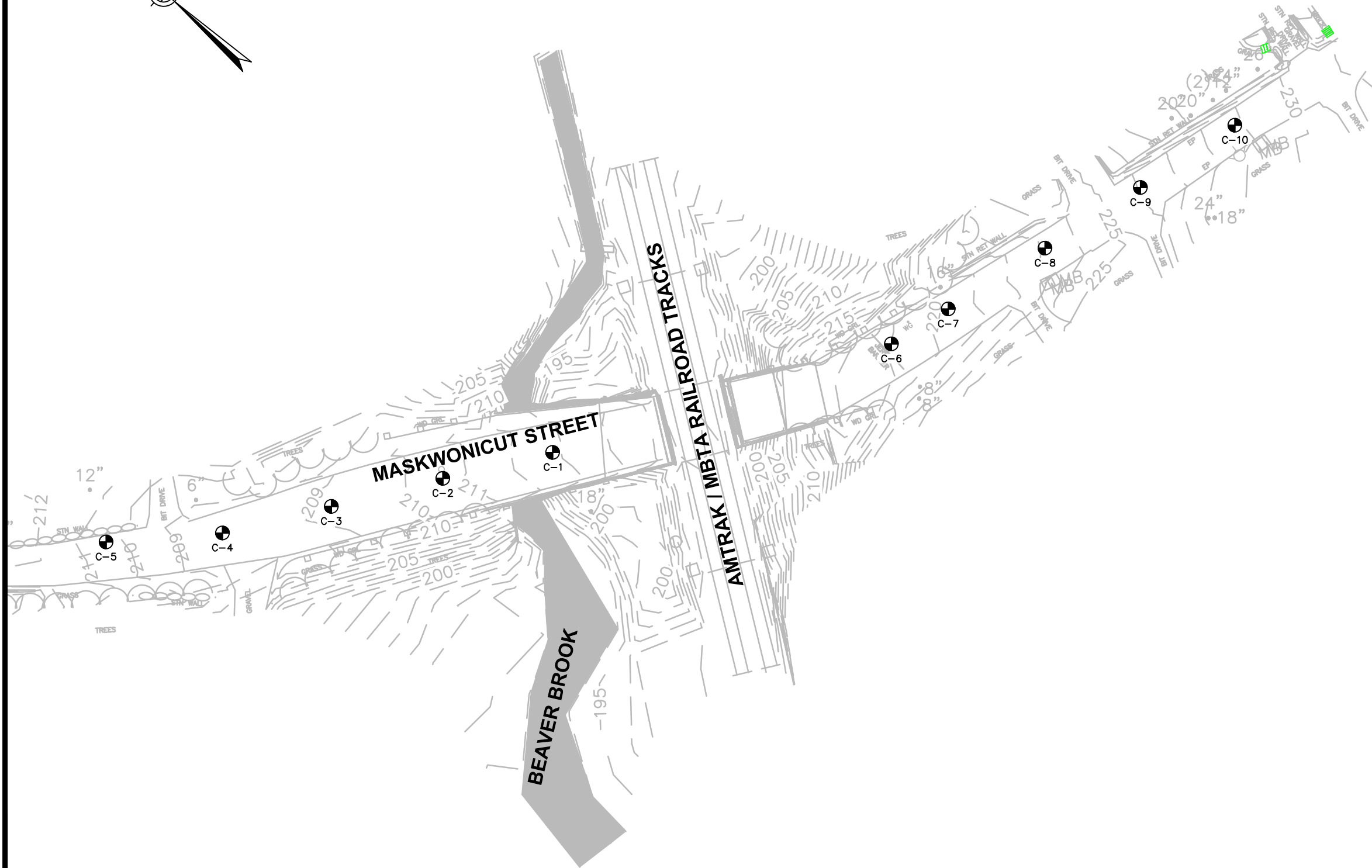
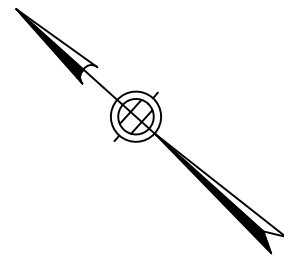
FIGURE 3

MASSDOT - MASKWONICUT ST. BRIDGE
SHARON, MA

SITE PLAN
BRIDGE EXPLORATIONS

DESIGNED BY: BDG	CHECKED BY: CJP	DATE: MAY 2020
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NOTES:

1. THIS DRAWING AND SITE LAYOUT ARE BASED ON A SURVEY PREPARED BY GREEN INTERNATIONAL AFFILIATES, INC. ON JULY 1, 2016. VERTICAL DATUM IS NAVD88.
2. BORING LOCATIONS SHOWN ARE BASED ON FIELD MEASUREMENTS RELATIVE TO EXISTING SITE FEATURES AND ARE APPROXIMATE.
3. PAVEMENT BORINGS C-1 THROUGH C-10 WERE COMPLETED BY NEW ENGLAND BORING CONTRACTORS OF BROCKTON, MASSACHUSETTS AND OBSERVED BY WESTON & SAMPSON PERSONNEL ON JUNE 20 THROUGH JUNE 27, 2016.
4. REFER TO FIGURE 3 FOR BRIDGE EXPLORATIONS.

LEGEND:

-  BORING DESIGNATION AND APPROXIMATE LOCATION
- C-#

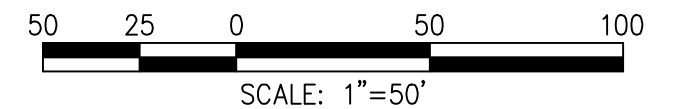


FIGURE 4

MASSDOT - MASKWONICUT ST. BRIDGE
SHARON, MA

SITE PLAN
PAVEMENT BORINGS

DESIGNED BY: BDG	CHECKED BY: CJP	DATE: MAY 2020
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APPENDIX A
Site Photographs

Appendix A
Site Photographs - Bridge No. S-09-003 in Sharon, MA



Photo 1 – Looking west from the east approach toward the west abutment.



Photo 2 – Jersey barriers and security fence at the west approach. Note the timber covered metal guard rails.



Photo 3 – View of the bridge span, abutments, and overhead wires from the MBTA tracks north of Bridge No. S-09-003 looking south.



Photo 4 – The east abutment and northeast retaining wall from the railroad tracks looking southeast.



Photo 5 – The face of the west abutment from track level. Overhead railroad wires are supported from a bracket mounted directly to the abutment.



Photo 6 – Beaver Brook and the stone arch culvert beneath the west end of the retaining walls at the west abutment. The retaining walls extend along the brook upstream and downstream of the roadway.



Photo 7 – Southwest retaining wall at the west abutment from the east side of the MBTA tracks. Grades slope upwards to Maskwonicut Street. Thick vegetation is present.



Photo 8 – Northwest retaining wall at the west abutment from the east side of the MBTA tracks. An earth berm is located between the tracks and Beaver Brook.



Photo 9 – Southeast retaining wall at the east abutment. Grades slope upwards to Maskwonicut Street. Thick vegetation is present.

APPENDIX B
Boring Logs



PROJECT
Maskwonic St. Bridge
MassDOT
Sharon, MA

REPORT OF BORING No. BB-1
SHEET 1 OF 2
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

BORING Co. New England Boring Contractors
FOREMAN Jason Stokes
WSE ENGINEER: Julie A. Eaton, EIT

BORING LOCATION See attached plan*
GROUND SURFACE ELEV. EL. 217+/- **DATUM** NAVD88
DATE START 6/20/16 **DATE END** 6/22/16

SAMPLER: 2 IN. OD SPLIT SPOON SAMPLER (SPT) DRIVEN 24 INCHES
USING A 140 LB. CAT HEAD OPERATED SAFETY HAMMER.
CASING: DRIVEN 4" CASING USING A 300 LB. HAMMER FALLING 30 IN. AND
THE DRIVE AND WASH TECHNIQUE
CASING SIZE: 4 IN. INSIDE DIAMETER. OTHER: See note 7

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
6/22/2016	7:30	25 ft. +/-	33 ft. +/-	12+ hours

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0		S-1	9/18	0.5-2	12-10-9	Medium dense, light brown, fine to medium SAND FILL, little gravel, little silt; moist.	1	5" AC PAVEMENT
		S-2	11/24	2-4	9-26-22-12	Dense, dark gray, GRAVEL FILL, little sand, trace silt, trace debris (concrete); moist. (LAF)	2	10" SAND SUB-BASE
5		S-3	17/24	4-6	10-6-9-9	Medium dense, dark gray, GRAVEL FILL, little sand, trace silt; moist. (LAF)		LIGHTWEIGHT AGGREGATE FILL (LAF)
		S-4	14/24	6-8	13-8-6-13	Medium dense, dark gray, GRAVEL FILL, little sand, trace silt; moist. (LAF)		
10		S-5	4/24	8-10	10-11-13-8	Medium dense, brown, gravelly, fine to coarse SAND, little to some silt; wet.	3	SAND AND GRAVEL
		S-6	6/24	10-12	10-14-10-9	Medium dense, brown, gravelly, fine to coarse SAND, little to some silt; wet.		
15		S-7	8/24	12-14	12-9-12-12	Medium dense, brown, fine to medium SILTY SAND, little to some gravel; wet.		
		S-8	3/24	14-16	14-15-32-18	Dense, brown, GRAVEL, some sand, some silt; wet.		
20		S-9	14/24	19-21	19-17-25-48	Dense, brown, fine to coarse SILTY SAND, little gravel; wet.		
25		S-10	13/22	24-25.8	34-70-76-100/4"	Very dense, gray, gravelly, fine to coarse SAND, little silt; wet.	5	
30		S-11	0/2	29-29.2	100/2"	Very dense, no recovery.	6	GLACIAL TILL
		S-12	0/0	33	100/0"	Very dense, no penetration.		

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. Asphalt Concrete (AC) pavement includes measurement of 1" banded gravel base observed in hole.
2. Bottom 6": grades to dark gray, fine to coarse SAND FILL, some gravel, some silt, trace debris (brick); moist. (Lightweight Aggregate Fill - LAF)
3. Possible cobble fragments in sample.
4. Sporadic roller bit grinding from 14 ft. to 19 ft. indicating presence of cobbles and/or boulders.
5. Sporadic roller bit grinding from 24 ft. to 29 ft. with gravel fragmentations observed in drill fluid.
6. Difficult to drive 4" casing from 29 to 34 ft. Open hole drilling below 34 ft. for S-13 and S-14.

* Retaining wall height was approximately 8 ft. +/- in the vicinity of BB-1.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. BB-1



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF BORING No. BB-1
SHEET 2 OF 2
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

BORING Co. New England Boring Contractors
FOREMAN Jason Stokes
WSE ENGINEER: Julie A. Eaton, EIT

BORING LOCATION See attached plan
GROUND SURFACE ELEV. EL. 217+/- **DATUM** NAVD88
DATE START 6/20/16 **DATE END** 6/22/16

SAMPLER: 2 IN. OD SPLIT SPOON SAMPLER (SPT) DRIVEN 24 INCHES
USING A 140 LB. CAT HEAD OPERATED SAFETY HAMMER.
CASING: DRIVEN 4" CASING USING A 300 LB. HAMMER FALLING 30 IN. AND
THE DRIVE AND WASH TECHNIQUE
CASING SIZE: 4 IN. INSIDE DIAMETER. **OTHER:** See note 7

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
6/22/2016	7:30	25 ft. +/-	33 ft. +/-	12+ hours

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
35							7	GLACIAL TILL
		S-13	0/0	37	60/0"	Very dense, no penetration.	8	
40		S-14	2/2	39-39.2	100/2"	Very dense, brown-gray, fine to coarse SAND, little gravel, little silt, trace clay; wet.	9	
45							10	WEATHERED BEDROCK
		S-15	2/3	45-45.3	100/3"	Very dense, light gray-brown, (weathered bedrock) GRAVEL, trace sand, trace silt; wet.	11	
50						SPT Refusal at 45.3 ft.		
55								
60								
65								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	7. 4" casing refusal at 35 ft. due to drive shoe damage. Advanced through collapsed 4" casing drive shoe with roller bit and then telescoped 3" casing. Replaced tri-cone roller bit. 8. Switch to 300 lb hammer to attempt to obtain sample. 56 blows, no penetration. Wash material in spoon was brown, fine to coarse SILTY SAND, little gravel. 9. Slow rollerbit advance and grinding from 37 ft. to 38 ft., 38.5 ft. to 39 ft., 41 ft. to 42.3 ft., and 43.3 ft. to 44 ft. indicating presence of boulders. At 42.3 ft., replaced tri-cone roller bit. 10. 3" casing refusal at 43 ft. 11. Refusal at 45.3 ft. Core not possible due to damaged 3" casing. Upon 3" casing removal, bottom 10 ft. appeared bowed and flat on one side, indicating likely damage from boulders.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG.
 FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. BB-1



PROJECT
Maskwonic St. Bridge
MassDOT
Sharon, MA

REPORT OF BORING No. BB-2
SHEET 1 OF 2
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

BORING Co. New England Boring Contractors
FOREMAN Jason Stokes
WSE ENGINEER: Julie A. Eaton, EIT

BORING LOCATION See attached plan*
GROUND SURFACE ELEV. EL. 213.5+/- DATUM NAVD88
DATE START 6/23/16 **DATE END** 6/27/16

SAMPLER: 2 IN. OD SPLIT SPOON SAMPLER (SPT) DRIVEN 24 INCHES
USING A 140 LB. CAT HEAD OPERATED SAFETY HAMMER.
CASING: DRIVEN 4" CASING USING A 300 LB. HAMMER FALLING 30 IN. AND
THE DRIVE AND WASH TECHNIQUE
CASING SIZE: 5 IN. INSIDE DIAMETER. OTHER: See note 8

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
6/27/2016	10:30	24 ft. +/-	27 ft. +/-	1.5 hours

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0		S-1	11/18	0.5-2	20-13-11	Medium dense, light brown, fine to coarse SAND FILL, little gravel, little silt; moist.	1	6" AC PAVEMENT
		S-2	19/24	2-4	12-19-21-14	Dense, gray, fine to coarse GRAVEL FILL, little sand, trace silt; moist. (LAF)		11" SAND SUB-BASE
5		S-3	13/24	4-6	15-10-13-15	Medium dense, gray, fine to coarse GRAVEL FILL, little sand, trace silt; moist. (LAF)		LIGHTWEIGHT AGGREGATE FILL (LAF)
		S-4	3/24	6-8	30-35-54-27	Very dense, gray-brown, fine to coarse SAND FILL, little gravel, little silt; moist.		
10		S-5	6/24	8-10	5-6-6-6	Medium dense, brown, fine to coarse SAND FILL, some silt, little gravel; moist.	2	FILL
		S-6	4/24	10-12	5-3-2-2 (See note 2)	Medium stiff, brown, SANDY SILT FILL, trace gravel; wet. Mild organic odor.		
15		S-7	0/24	14-16	3-4-3-2	Loose, no recovery. Used 3" O.D. spoon to recover sample. Material was brown, fine to coarse SAND, some gravel, some silt; wet.	3	VOID
		S-8	2/24	16-18	2-1-2-3	Very loose, brown, GRAVEL, little to some sand, trace silt; wet. Poor recovery.		
20		S-9	0/24	19-21	3-2-1-1	Very loose, no recovery.	4	SAND AND GRAVEL
25		S-10	0/24	24-26	13-20-21-19	Dense, no recovery. Gravel in tip of spoon. Used 3" O.D. spoon and 300 lb. hammer to recover sample (Blows 100/12"). Material was SAND and GRAVEL (3" diameter), little gravel, little silt.	6	
30		S-11	7/24	29-31	13-12-47-24	Very dense, gray, SAND, little to some gravel, little clay, trace to little silt; wet.	7	GLACIAL TILL

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:

- Asphalt Concrete (AC) pavement includes measurement of 2" banded gravel base observed in hole.
- Spoon dropped to 13 ft. on last hammer blow indicating possible void or very soft/loose material between 12 - 13ft. (Casing at 10 ft.)
- Casing advanced to 12 ft. and washed. SPT and Rod inserted to 14 ft. with no resistance indicating likely void.
- Lost drill fluid circulation at 18 ft.
- Casing blow counts increased at 22 ft. likely indicating a change in stratum. Using a mirror to look down casing, cobbles and boulders observed below 20 ft. Lost drill fluid circulation.
- Lost drill fluid circulation at 24 ft.
- Sporadic roller bit grinding below 32 ft. indicating presence of cobbles and/or boulders.

* Retaining wall height was approximately 14 ft. +/- in the vicinity of BB-2.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG.
FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. BB-2



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF BORING No. BB-2
SHEET 2 OF 2
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

BORING Co. New England Boring Contractors
FOREMAN Jason Stokes
WSE ENGINEER: Julie A. Eaton, EIT
BORING LOCATION See attached plan
GROUND SURFACE ELEV. EL. 213.5+/- DATUM NAVD88
DATE START 6/23/16 **DATE END** 6/27/16

SAMPLER: 2 IN. OD SPLIT SPOON SAMPLER (SPT) DRIVEN 24 INCHES
USING A 140 LB. CAT HEAD OPERATED SAFETY HAMMER.
CASING: DRIVEN 4" CASING USING A 300 LB. HAMMER FALLING 30 IN. AND
THE DRIVE AND WASH TECHNIQUE
CASING SIZE: 5 IN. INSIDE DIAMETER. OTHER: See note 7.

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
6/27/2016	10:30	24 ft. +/-	27 ft. +/-	1.5 hours

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
35		S-12	13/24	34-36	29-44-37-54	Very dense, brown, gravelly, fine to coarse SAND, little clay, trace silt; wet.	8	GLACIAL TILL
40		S-13	7/11	39-39.9	78-100/5"	Very dense, brown, fine to coarse SAND, some silt, little to some gravel, trace clay; wet.		
45		S-14	7/11	44-44.9	25-120/5"	Very dense, brown, fine to medium SILTY SAND, little gravel, little clay; wet.		
		C-1	41/48	46-47	6.3 minutes	RQD: 8/48 = 17%. Very poor quality, hard, slightly weathered, intensely fractured, partly healed, large-grained gray DIORITE.	9	BEDROCK
				47-48	6.5 minutes			
				48-49	7.0 minutes			
				49-50	7.5 minutes			
50		C-2	21/21	50-51	7.5 minutes	RQD: 13/21 = 62%. Same as above, becomes fair quality and moderately fractured.		
				51-51.8	8.0 minutes			
		C-3	24/24	51.8-53	11.5 minutes			
				53-53.8	7.5 minutes	RQD: 16/24 = 67%. Same as above, becomes mostly healed.		
55		C-4	27/27	53.8-55	8.4 minutes			
				55-56	6.0 minutes	RQD: 23/27 = 85%. Same as above, becomes good quality and slightly fractured.		
						Core terminated at 56.0 ft.		
60								
65								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	8. 5" casing advanced to 34 ft. then telescoped 4" casing. 9. 4" casing refusal at 46 ft. NX Core sample started at 46 ft. Core barrel jammed frequently and there were sporadic losses of drill fluid.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. BB-2

CLIENT: <u>MassDOT</u>	PROJECT: <u>Maskwonicut St. Bridge</u>	LOGGED BY: <u>A. Naslas</u>
PROJECT NUMBER: <u>2150851</u>	LOCATION: <u>Sharon, MA</u>	CHECKED BY: <u>S. Spink, PE</u>
CONTRACTOR: <u>New England Boring Contractors</u>	DRILLING METHOD: <u>Drive-and-wash</u>	BORING LOCATION: <u>See attached plan</u>
FOREMAN/DRILLER: <u>Matt Soucy</u>	CASING/AUGER SIZE: <u>4" inside diameter</u>	GROUND ELEV: <u>213.5 ft. +/- (NAVD88)</u>
DRILL RIG TYPE: <u>ATV</u>	SAMPLING METHOD: <u>Standard penetration test (SPT)</u>	DATE STARTED: <u>3/2/2020</u>
OTHER EQUIPMENT: <u>Mobile B53</u>	SAMPLER HAMMER: <u>140-lb. automatic hammer</u>	DATE COMPLETED: <u>3/2/2020</u>

Depth Scale, ft.	Sample Type	Blows on Sampler/6" Blows on Casing/12"	N-Value, Blows/ft.	Sample Recovery, in. Sampler Penetration, in.	Strata Description and Graphic Log	Sample Description		Data Plots		Remarks and Additional Tests	
						General Format: Density/consistency, color, classification name (secondary PRIMARY, additional); moisture, additional information. [UNIT NAME and/or ORIGIN]	Soil Classification Name Guide based on Constituent Percentages	Laboratory Test Data: PL = Plastic Limit, % MC = Moisture content, % LL = Liquid Limit, %	PL MC LL	WOR = Weight of rods WOH = Weight of hammer P200 = Percent passing the #200 sieve (laborator value) OC = Organic content, % (laboratory value)	
1					Topsoil - 4 inches.						Light grinding from 0.0 ft. to 4.0 ft.
2					FILL	No sampling completed in the fill.					
3											
4					CONC	Run 1: CONCRETE Minutes/ft: 6:14 - 3:03 - 3:32 - 0:37 - 0:05					
5				40/60							
6					FILL						
7					COBBLE	Run 2: COBBLE Minutes/ft: 0:05 - 0:11 - 0:15					Driller noted loose drilling conditions and possible voids from 7.0 ft. to 9.0 ft.
8					VOID						
9											
10				2/42							
11					FILL	No Recovery.					
12											
13		2		7	0/24						
14		4									
15		4			FILL	Loose, brown, fine to coarse GRAVEL, some sand, little silt; moist.					Driller noted a void between approx. 9.5 to 12.5 ft.
16		4		6							

Bottom of boring at 16.5 ft. due to caving of borehole.

END OF BORING LOG

SAMPLE LEGEND		N-VALUE RELATIONSHIPS				GENERAL NOTES	
	Standard split spoon sampler driven w/ 140-lb. hammer (24" long, 2" OD, 1-3/8" ID)	N-VALUE BLOWS/FT.	DENSITY OF GRANULAR SOILS	N-VALUE BLOWS/FT.	CONSISTENCY OF COHESIVE SOILS	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual. 2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.	
	Thin-walled tube sampler pushed w/ rig hydraulics (30" long, 3" ID)	0 - 4	Very Loose	< 2	Very Soft		
	NX rock core sampler advanced using rotary drilling methods (5' long, 3" ID)	4 - 10	Loose	2 - 4	Soft		
	Modified split spoon sampler driven w/ 140-lb. hammer (24" long, 3" OD, 2-3/8" ID)	10 - 30	Medium Dense	4 - 8	Medium Stiff		
		30 - 50	Dense	8 - 15	Stiff		
		> 50	Very Dense	15 - 30	Very Stiff		
				> 30	Hard		

W&S BORING LOG - MODIFIED - DATA TEMPLATE - WSE STANDARD LOGS.GDT - 9/12/20 11:01 - \\WSE03.LOCAL\WSE\PROJECTS\MA\MASSDOT\717888 STATEWIDE\SHARON BRIDGE - 9/12/20 11:01 - \\WSE03.GEOTECH\TECH\FIELD\2020 BORINGS\20-2020 DRAFT LOGS.GPJ

CLIENT: MassDOT PROJECT: Maskwonicut St. Bridge LOGGED BY: A. Naslas
 PROJECT NUMBER: 2150851 LOCATION: Sharon, MA CHECKED BY: S. Spink, PE
 CONTRACTOR: New England Boring Contractors DRILLING METHOD: Drive-and-wash BORING LOCATION: See attached plan
 FOREMAN/DRILLER: Matt Soucy CASING/AUGER SIZE: 4" inside diameter GROUND ELEV: 213 ft. +/- (NAVD88)
 DRILL RIG TYPE: ATV SAMPLING METHOD: No soil sampling conducted DATE STARTED: 3/2/2020
 OTHER EQUIPMENT: Mobile B53 SAMPLER HAMMER: 140-lb. automatic hammer DATE COMPLETED: 3/2/2020

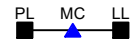


Depth Scale, ft.	Sample Type	Blows on Sampler/6" Blows on Casing/12"	N-Value, Blows/ft.	Sample Recovery, in. Sampler Penetration, in.	Strata Description and Graphic Log	Sample Description		Data Plots		Remarks and Additional Tests																		
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2						No sampling completed in the fill.																						
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4						Concrete fragments in drill wash.																						
5																												
6					Bottom of boring at 6 ft. due to metal and plastic fragments observed in the drill wash.						Casing refusal at 5 ft.																	

END OF BORING LOG





SAMPLE LEGEND		N-VALUE RELATIONSHIPS				GENERAL NOTES	
	Standard split spoon sampler driven w/ 140-lb. hammer (24" long, 2" OD, 1-3/8" ID)	N-VALUE BLOWS/FT.	DENSITY OF GRANULAR SOILS	N-VALUE BLOWS/FT.	CONSISTENCY OF COHESIVE SOILS	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual. 2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.	
	Thin-walled tube sampler pushed w/ rig hydraulics (30" long, 3" ID)	0 - 4	Very Loose	< 2	Very Soft		
	NX rock core sampler advanced using rotary drilling methods (5' long, 3" ID)	4 - 10	Loose	2 - 4	Soft		
	Modified split spoon sampler driven w/ 140-lb. hammer (24" long, 3" OD, 2-3/8" ID)	10 - 30	Medium Dense	4 - 8	Medium Stiff		
		30 - 50	Dense	8 - 15	Stiff		
		> 50	Very Dense	15 - 30	Very Stiff		
				> 30	Hard		

W&S BORING LOG - MODIFIED - DATA TEMPLATE - WSE STANDARD LOGS.GDT - 9/12/20 11:01 - \\WSE03.LOCAL\WSE\PROJECTS\MA\MASSDOT\717888 STATEWIDE\SHARON BRIDGE_S-09-003\GEGE\TECH\FIELD\2020 BORINGS\20-2020 DRAFT LOGS.GPJ

CLIENT: MassDOT PROJECT: Maskwonicut St. Bridge LOGGED BY: A. Naslas
 PROJECT NUMBER: 2150851 LOCATION: Sharon, MA CHECKED BY: S. Spink, PE
 CONTRACTOR: New England Boring Contractors DRILLING METHOD: Drive-and-wash BORING LOCATION: See attached plan
 FOREMAN/DRILLER: Matt Soucy CASING/AUGER SIZE: 4" inside diameter GROUND ELEV: 213.3 ft. +/- (NAVD88)
 DRILL RIG TYPE: ATV SAMPLING METHOD: No soil sampling conducted DATE STARTED: 3/2/2020
 OTHER EQUIPMENT: Mobile B53 SAMPLER HAMMER: 140-lb. automatic hammer DATE COMPLETED: 3/2/2020

Depth Scale, ft.	Sample Type	Blows on Sampler/6" Blows on Casing/12"	N-Value, Blows/ft.	Sample Recovery, in. Sampler Penetration, in.	Strata Description and Graphic Log	Sample Description		Data Plots		Remarks and Additional Tests																		
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GRAVEL, SAND, SILT, CLAY	> 50%	PEAT	> 50%																									
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1					Topsoil - 4 inches																							
2					 FILL No sampling completed in the fill.																							
3						 CONC. Concrete fragments in drill wash.																						
4					Bottom of boring at 5.5 ft. due to metal and plastic fragments observed in the drill wash.																							
5											Heavy Grinding at 5.0 ft.																	

END OF BORING LOG

SAMPLE LEGEND		N-VALUE RELATIONSHIPS				GENERAL NOTES	
	Standard split spoon sampler driven w/ 140-lb. hammer (24" long, 2" OD, 1-3/8" ID)	N-VALUE BLOWS/FT.	DENSITY OF GRANULAR SOILS	N-VALUE BLOWS/FT.	CONSISTENCY OF COHESIVE SOILS	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual. 2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.	
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W&S BORING LOG - MODIFIED - DATA TEMPLATE - WSE STANDARD LOGS.GDT - 9/12/20 11:01 - \\WSE03.LOCAL\WSE\PROJECTS\MA\MASSDOT\717888 STATEWIDE\SHARON BRIDGE_S-09-003\GEO\TECH\FIELD\2020 BORINGS\20-2020 DRAFT LOGS.GPJ

CLIENT: <u>MassDOT</u>	PROJECT: <u>Maskwonicut St. Bridge</u>	LOGGED BY: <u>A. Naslas</u>
PROJECT NUMBER: <u>2150851</u>	LOCATION: <u>Sharon, MA</u>	CHECKED BY: <u>S. Spink, PE</u>
CONTRACTOR: <u>New England Boring Contractors</u>	DRILLING METHOD: <u>Drive-and-wash</u>	BORING LOCATION: <u>See attached plan</u>
FOREMAN/DRILLER: <u>Matt Soucy</u>	CASING/AUGER SIZE: <u>4" inside diameter</u>	GROUND ELEV: <u>213.5 ft. +/- (NAVD88)</u>
DRILL RIG TYPE: <u>ATV</u>	SAMPLING METHOD: <u>Standard penetration test (SPT)</u>	DATE STARTED: <u>3/2/2020</u>
OTHER EQUIPMENT: <u>Mobile B53</u>	SAMPLER HAMMER: <u>140-lb. automatic hammer</u>	DATE COMPLETED: <u>3/2/2020</u>

Depth Scale, ft.	Sample Type	Blows on Sampler/6" Blows on Casing/12"	N-Value, Blows/ft.	Sample Recovery, in. Sampler Penetration, in.	Strata Description and Graphic Log	Sample Description		Data Plots		Remarks and Additional Tests																	
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1					FILL	Topsoil - 4 inches																					
2						No sampling completed in the fill.																					
3						Concrete fragments in drill wash.					Casing refusal. Rollerbit to 4.0 ft.																
4																											
5				28/36	CONC	Run 1: CONCRETE																					
6						Minutes/ft: 1:35 - 3:09 - 2:10																					
7						Two pieces of ~1/4-inch diameter reinforcement steel encountered top 12 inches.																					
8					VOID	No Recovery.					Driller noted an apparent void between approx. 7.0 to 8.0 ft.																
9		2	5	0/24																							
10		3				Loose, brown, fine to coarse SAND, some gravel, little silt; moist.																					
11		4	8	11/24	FILL																						
12		4																									
13		6	138	9/24		Very dense, brown, fine to coarse GRAVEL, some sand, little silt; moist.																					
14		21				Bottom of boring at 14.0 ft.																					
		117																									
		51																									

W&S BORING LOG - MODIFIED - DATA TEMPLATE - WSE STANDARD LOGS.GDT - 9/12/20 11:01 - \\WSE03.LOCAL\WSE\PROJECTS\MA\MASSDOT\17888 STATEWIDE\SHARON BRIDGE - 09-003\GEGE\TECH\FIELD\2020 BORINGS\20-2020 DRAFT LOGS.GPJ

END OF BORING LOG

SAMPLE LEGEND		N-VALUE RELATIONSHIPS				GENERAL NOTES	
	Standard split spoon sampler driven w/ 140-lb. hammer (24" long, 2" OD, 1-3/8" ID)	N-VALUE BLOWS/FT.	DENSITY OF GRANULAR SOILS	N-VALUE BLOWS/FT.	CONSISTENCY OF COHESIVE SOILS	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual. 2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.	
	Thin-walled tube sampler pushed w/ rig hydraulics (30" long, 3" ID)	0 - 4	Very Loose	< 2	Very Soft		
	NX rock core sampler advanced using rotary drilling methods (5' long, 3" ID)	4 - 10	Loose	2 - 4	Soft		
	Modified split spoon sampler driven w/ 140-lb. hammer (24" long, 3" OD, 2-3/8" ID)	10 - 30	Medium Dense	4 - 8	Medium Stiff		
		30 - 50	Dense	8 - 15	Stiff		
		> 50	Very Dense	15 - 30	Very Stiff		
				> 30	Hard		

CLIENT: MassDOT PROJECT: Maskwonicut St. Bridge LOGGED BY: A. Naslas
 PROJECT NUMBER: 2150851 LOCATION: Sharon, MA CHECKED BY: S. Spink, PE
 CONTRACTOR: New England Boring Contractors DRILLING METHOD: Drive-and-wash BORING LOCATION: See attached plan
 FOREMAN/DRILLER: Matt Soucy CASING/AUGER SIZE: 4" inside diameter GROUND ELEV: 213.3 ft. +/- (NAV/D88)
 DRILL RIG TYPE: ATV SAMPLING METHOD: Standard penetration test (SPT) DATE STARTED: 3/3/2020
 OTHER EQUIPMENT: Acker Soil Scout SAMPLER HAMMER: 140-lb. safety hammer DATE COMPLETED: 3/3/2020

Depth Scale, ft.	Sample Type	Blows on Sampler/6" Blows on Casing/12"	N-Value, Blows/ft.	Sample Recovery, in. Sampler Penetration, in.	Strata Description and Graphic Log	Sample Description General Format: Density/consistency, color, classification name (secondary PRIMARY, additional); moisture, additional information. [UNIT NAME and/or ORIGIN] Soil Classification Name Guide based on Constituent Percentages		Data Plots Laboratory Test Data: PL = Plastic Limit, % MC = Moisture content, % LL = Liquid Limit, % PL MC LL 	Remarks and Additional Tests WOR = Weight of rods WOH = Weight of hammer P200 = Percent passing the #200 sieve (laborator value) OC = Organic content, % (laboratory value) Groundwater Observations Date: _____ Depth: <u>Not observed</u>																			
						<table border="1"> <tr> <th>Mineral Soil</th> <th>GRAVEL, SAND, SILT, CLAY</th> <th>> 50%</th> </tr> <tr> <td>gravelly, sandy, silty, clayey</td> <td>35 - 50%</td> <td></td> </tr> <tr> <td>some</td> <td>20 - 35%</td> <td></td> </tr> <tr> <td>little</td> <td>10 - 20%</td> <td></td> </tr> <tr> <td>trace</td> <td>0 - 10%</td> <td></td> </tr> </table> <table border="1"> <tr> <th>Organic Soils</th> <th>PEAT</th> <th>> 50%</th> </tr> <tr> <td>organic (soil name)</td> <td>15 - 50%</td> <td></td> </tr> <tr> <td>(soil name) with some organics</td> <td>5 - 15%</td> <td></td> </tr> <tr> <td>trace organics</td> <td>< 5%</td> <td></td> </tr> </table>	Mineral Soil	GRAVEL, SAND, SILT, CLAY	> 50%	gravelly, sandy, silty, clayey	35 - 50%		some	20 - 35%		little	10 - 20%		trace	0 - 10%		Organic Soils	PEAT	> 50%	organic (soil name)	15 - 50%		(soil name) with some organics
Mineral Soil	GRAVEL, SAND, SILT, CLAY	> 50%																										
gravelly, sandy, silty, clayey	35 - 50%																											
some	20 - 35%																											
little	10 - 20%																											
trace	0 - 10%																											
Organic Soils	PEAT	> 50%																										
organic (soil name)	15 - 50%																											
(soil name) with some organics	5 - 15%																											
trace organics	< 5%																											

1					Asphalt - 4 inches. No sampling completed in the fill.				
2					CONC Concrete fragments in drill wash.				
3									
4									
5									
6									
7				10/10	Run 1: CONCRETE Minutes/ft: 6:14				
8				12/21	Loose to dense, brown, fine to coarse SAND, some gravel, little silt; moist. Rapid water loss and slower advance of rollerbit observed at 8.5 ft. Boring terminated at 8.9 ft. due to misalignment of the borehole.			41	

W&S BORING LOG - MODIFIED - DATA TEMPLATE - WISE STANDARD LOGS.GDT - 9/12/20 11:01 - \\WSE03.LOCAL\WSE\PROJECTS\MA\MASSDOT\77888 STATEWIDE\SHARON BRIDGE_S-09-003\GEGE\TECH\FIELD\2020 BORINGS\20-2020 DRAFT LOGS.GPJ

END OF BORING LOG





SAMPLE LEGEND		N-VALUE RELATIONSHIPS				GENERAL NOTES
	Standard split spoon sampler driven w/ 140-lb. hammer (24" long, 2" OD, 1-3/8" ID)	N-VALUE BLOWS/FT.	DENSITY OF GRANULAR SOILS	N-VALUE BLOWS/FT.	CONSISTENCY OF COHESIVE SOILS	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual. 2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
	Thin-walled tube sampler pushed w/ rig hydraulics (30" long, 3" ID)	0 - 4	Very Loose	< 2	Very Soft	
	NX rock core sampler advanced using rotary drilling methods (5' long, 3" ID)	4 - 10	Loose	2 - 4	Soft	
	Modified split spoon sampler driven w/ 140-lb. hammer (24" long, 3" OD, 2-3/8" ID)	10 - 30	Medium Dense	4 - 8	Medium Stiff	
		30 - 50	Dense	8 - 15	Stiff	
		> 50	Very Dense	15 - 30	Very Stiff	
				> 30	Hard	

CLIENT: MassDOT PROJECT: Maskwonicut St. Bridge LOGGED BY: A. Naslas
 PROJECT NUMBER: 2150851 LOCATION: Sharon, MA CHECKED BY: S. Spink, PE
 CONTRACTOR: New England Boring Contractors DRILLING METHOD: Drive-and-wash BORING LOCATION: See attached plan
 FOREMAN/DRILLER: Matt Soucy CASING/AUGER SIZE: 4" inside diameter GROUND ELEV: 213.3 ft. +/- (NAVD88)
 DRILL RIG TYPE: ATV SAMPLING METHOD: No soil sampling conducted DATE STARTED: 3/3/2020
 OTHER EQUIPMENT: Acker Soil Scout SAMPLER HAMMER: 140-lb. safety hammer DATE COMPLETED: 3/3/2020

Depth Scale, ft.	Sample Type	Blows on Sampler/6" Blows on Casing/12"	N-Value, Blows/ft.	Sample Recovery in Sampler Penetration, in.	Strata Description and Graphic Log	Sample Description		Data Plots		Remarks and Additional Tests	
						General Format: Density/consistency, color, classification name (secondary PRIMARY, additional); moisture, additional information. [UNIT NAME and/or ORIGIN]	Soil Classification Name Guide based on Constituent Percentages	Laboratory Test Data: PL = Plastic Limit, % MC = Moisture content, % LL = Liquid Limit, %	PL MC LL	WOR = Weight of rods WOH = Weight of hammer P200 = Percent passing the #200 sieve (laborator value) OC = Organic content, % (laboratory value)	Groundwater Observations
1					Asphalt - 4 inches						
2					FILL No sampling completed in the fill.						
3											


Boring terminated at 3.5 ft. due to misalignment of the casing.

END OF BORING LOG

SAMPLE LEGEND		N-VALUE RELATIONSHIPS				GENERAL NOTES
	Standard split spoon sampler driven w/ 140-lb. hammer (24" long, 2" OD, 1-3/8" ID)	N-VALUE BLOWS/FT.	DENSITY OF GRANULAR SOILS	N-VALUE BLOWS/FT.	CONSISTENCY OF COHESIVE SOILS	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual. 2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
	Thin-walled tube sampler pushed w/ rig hydraulics (30" long, 3" ID)	0 - 4	Very Loose	< 2	Very Soft	
	NX rock core sampler advanced using rotary drilling methods (5' long, 3" ID)	4 - 10	Loose	2 - 4	Soft	
	Modified split spoon sampler driven w/ 140-lb. hammer (24" long, 3" OD, 2-3/8" ID)	10 - 30	Medium Dense	4 - 8	Medium Stiff	
		30 - 50	Dense	8 - 15	Stiff	
		> 50	Very Dense	15 - 30	Very Stiff	
				> 30	Hard	





W&S BORING LOG - MODIFIED - DATA TEMPLATE - WISE STANDARD LOGS.GDT - 9/12/20 11:01 - \\WSE03.LOCAL\WSE\PROJECTS\MA\MASSDOT\717888 STATEWIDE\SHARON BRIDGE_S-09-003\GEGE\TECH\FIELD\2020 BORINGS\20-2020 DRAFT LOGS.GPJ

CLIENT: MassDOT PROJECT: Maskwonicut St. Bridge LOGGED BY: A. Naslas
 PROJECT NUMBER: 2150851 LOCATION: Sharon, MA CHECKED BY: S. Spink, PE
 CONTRACTOR: New England Boring Contractors DRILLING METHOD: Drive-and-wash BORING LOCATION: See attached plan
 FOREMAN/DRILLER: Matt Soucy CASING/AUGER SIZE: 4" inside diameter GROUND ELEV: 212.5 ft. +/- (NAVD88)
 DRILL RIG TYPE: ATV SAMPLING METHOD: No soil sampling conducted DATE STARTED: 3/3/2020
 OTHER EQUIPMENT: Acker Soil Scout SAMPLER HAMMER: 140-lb. safety hammer DATE COMPLETED: 3/3/2020

Depth Scale, ft.	Sample Type	Blows on Sampler/6" Blows on Casing/12"	N-Value, Blows/ft.	Sample Recovery, in. Sampler Penetration, in.	Strata Description and Graphic Log	Sample Description		Data Plots		Remarks and Additional Tests																																						
						Soil Classification Name Guide based on Constituent Percentages		Laboratory Test Data:		Groundwater Observations																																						
						General Format: Density/consistency, color, classification name (secondary PRIMARY, additional); moisture, additional information. [UNIT NAME and/or ORIGIN] Soil Classification Name Guide based on Constituent Percentages <table border="1"> <tr> <td>Mineral Soil</td> <td>GRAVEL, SAND, SILT, CLAY</td> <td>> 50%</td> <td></td> <td>Organic Soils</td> <td>PEAT</td> <td>> 50%</td> <td></td> </tr> <tr> <td></td> <td>gravelly, sandy, silty, clayey</td> <td>35 - 50%</td> <td></td> <td></td> <td>organic (soil name)</td> <td>15 - 50%</td> <td></td> </tr> <tr> <td></td> <td>some</td> <td>20 - 35%</td> <td></td> <td></td> <td>(soil name) with some organics</td> <td>5 - 15%</td> <td></td> </tr> <tr> <td></td> <td>little</td> <td>10 - 20%</td> <td></td> <td></td> <td>trace organics</td> <td>< 5%</td> <td></td> </tr> <tr> <td></td> <td>trace</td> <td>0 - 10%</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	Mineral Soil	GRAVEL, SAND, SILT, CLAY	> 50%		Organic Soils	PEAT	> 50%			gravelly, sandy, silty, clayey	35 - 50%			organic (soil name)	15 - 50%			some	20 - 35%			(soil name) with some organics	5 - 15%			little	10 - 20%			trace organics	< 5%			trace	0 - 10%						PL = Plastic Limit, % MC = Moisture content, % LL = Liquid Limit, % PL MC LL  In-Situ Test Data ● SPT N-Value 10 20 30 40	WOR = Weight of rods WOH = Weight of hammer P200 = Percent passing the #200 sieve (laborator value) OC = Organic content, % (laboratory value) Groundwater Observations Date: _____ ▼ Depth: <u>Not observed</u>
Mineral Soil	GRAVEL, SAND, SILT, CLAY	> 50%		Organic Soils	PEAT	> 50%																																										
	gravelly, sandy, silty, clayey	35 - 50%			organic (soil name)	15 - 50%																																										
	some	20 - 35%			(soil name) with some organics	5 - 15%																																										
	little	10 - 20%			trace organics	< 5%																																										
	trace	0 - 10%																																														
1					Asphalt - 4 inches																																											
2					No sampling completed in the fill.																																											
3																																																
4					Slow water loss at 5 ft. 10 in. Boring terminated at 6.0 ft. due to excessive water loss.																																											
5																																																
6											Casing refusal and moderate rollerbit grinding at 4.0 ft.																																					

W&S BORING LOG - MODIFIED - DATA TEMPLATE - WSE STANDARD LOGS.GDT - 9/12/20 11:01 - \\WSE03.LOCAL\WSE\PROJECTS\MA\MASSDOT\17888 STATEWIDE\SHARON BRIDGE_S-09-003\GEGE\TECH\FIELD\2020 BORINGS\20-2020 DRAFT LOGS.GPJ

END OF BORING LOG

SAMPLE LEGEND		N-VALUE RELATIONSHIPS				GENERAL NOTES	
	Standard split spoon sampler driven w/ 140-lb. hammer (24" long, 2" OD, 1-3/8" ID)	N-VALUE BLOWS/FT.	DENSITY OF GRANULAR SOILS	N-VALUE BLOWS/FT.	CONSISTENCY OF COHESIVE SOILS	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual. 2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.	
	Thin-walled tube sampler pushed w/ rig hydraulics (30" long, 3" ID)	0 - 4	Very Loose	< 2	Very Soft		
	NX rock core sampler advanced using rotary drilling methods (5' long, 3" ID)	4 - 10	Loose	2 - 4	Soft		
	Modified split spoon sampler driven w/ 140-lb. hammer (24" long, 3" OD, 2-3/8" ID)	10 - 30	Medium Dense	4 - 8	Medium Stiff		
		30 - 50	Dense	8 - 15	Stiff		
		> 50	Very Dense	15 - 30	Very Stiff		
				> 30	Hard		

APPENDIX C
Test Pit Logs

TEST PIT LOG


PROJECT NAME/NO. <u>Maskwonicut St. Bridge/2150851</u>	TEST PIT NUMBER TP-1
LOCATION <u>Sharon, Massachusetts</u>	
CLIENT <u>MassDOT</u>	GROUND SURFACE
CONTRACTOR <u>New England Boring Contractors</u> FOREMAN: <u>Dave Thompson</u>	ELEVATION <u>EL. 216.5+/- (NAVD88)</u>
OBSERVED BY <u>Julie A. Eaton, EIT</u> DATE <u>6/24/16</u>	DEPTH TO GROUNDWATER
CHECKED BY <u>Christopher J. Palmer, PE</u> DATE <u>6/29/16</u>	<u>Not Encountered</u>


DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Asphalt Concrete (AC) Pavement	
	2" AC Pavement	AC PAVEMENT
	3" Gravel Base (binded with asphalt)	GRAVEL BASE
	9" Sand Sub-base (Light brown, Sand Fill, trace gravel, trace silt; moist.)	SAND SUB-BASE
1		
	Dark gray, GRAVEL FILL, little sand, trace silt; moist. (Lightweight Aggregate Fill)	
2		
	Top of concrete behind stone masonry wall encountered at 31" bgs. Concrete debris (up to 12" diameter) observed approximately 32" bgs overlying yellow caution tape.	LIGHTWEIGHT AGGREGATE FILL
3		
4		
	Test pit terminated due to caving of lightweight aggregate fill and undermining of adjacent pavement.	
5		
6		
7		
8		
9		
10		

NOTES: Test pit was excavated with moderate difficulty using a KX0574 Excavator and toothed bucket. Severe caving was observed below 2 ft. +/-	TEST PIT NUMBER TP-1
--	--

TEST PIT LOG

PROJECT NAME/NO.	Maskwonicut St. Bridge/2150851	TEST PIT NUMBER
LOCATION	Sharon, Massachusetts	TP-2
CLIENT	MassDOT	GROUND SURFACE
CONTRACTOR	New England Boring Contractors	FOREMAN: Dave Thompson
OBSERVED BY	Julie A. Eaton, EIT	DATE 6/24/16
CHECKED BY	Christopher J. Palmer, PE	DATE 6/29/16
		ELEVATION EL. 215+/- (NAVD88)
		DEPTH TO GROUNDWATER
		Not Encountered

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Asphalt Concrete (AC) Pavement	
1	7" AC Pavement 10" Sand Sub-base (Light brown, Sand Fill, trace gravel, trace silt; moist.)	AC PAVEMENT
2	Dark gray, GRAVEL FILL, little sand, trace silt; moist. (Lightweight Aggregate Fill) Top of concrete behind stone masonry wall encountered at 20" bgs.	SAND SUB-BASE
3	Layer of concrete debris (up to 3" diameter) observed approximately 40"-45" bgs overlying yellow caution tape.	LIGHTWEIGHT AGGREGATE FILL
4		
5	Layer of black, non-woven geotextile encountered ct. 57" bgs.	
6	Test Pit terminated at 4.8 ft. due to exposure of buried water line.	
7		CONCRETE
8		
9		
10		

NOTES: Test pit was excavated with moderate difficulty using a KX0574 Excavator and toothed bucket. Moderate caving was observed below 3 ft. +/-	TEST PIT NUMBER TP-2 
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APPENDIX D
Probe Logs



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-1A
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors PROBE LOCATION See attached plan and note 1
FOREMAN Matt Vanheusen GROUND SURFACE ELEV. EL. 216 +/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT DATE START 8/30/16 DATE END 8/30/16

SAMPLER: _____
CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
CASING SIZE: _____ OTHER: _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1,2	
5								
10							3	
15								
20						Auger refusal at 18.5 ft.	4	
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-1A



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-1B
SHEET 1 **OF** 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors **PROBE LOCATION** See attached plan and note 1
FOREMAN Matt Vanheusen **GROUND SURFACE ELEV.** EL. 216 +/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 8/30/16 **DATE END** 8/30/16

SAMPLER: _____
CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1,2	
5							3	
10								
15								
20							4	
25						Probe terminated at 25.0 ft.	5	
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	1. Probe was located approximately 52" behind east abutment back face of wall. 2. Abutment wall height was approximately 20.0 ft. at probe location. 3. Solid stem auger drilling methods to 5.0 ft. Switch to driving rods (probe) using 140 lb. cat head operated hammer. 4. Change noticed in driving from 21.0 ft. to 22.0 ft. 5. Probe terminated at 25.0 ft.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-1B



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-1C
SHEET 1 **OF** 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors **PROBE LOCATION** See attached plan and note 1
FOREMAN Matt Vanheusen **GROUND SURFACE ELEV.** EL. 216 +/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 8/30/16 **DATE END** 8/30/16

SAMPLER: _____
CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1,2	
5							3	
10								
15								
20						Probe refusal at 18.0 ft.	4	
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	1. Probe was located approximately 32" behind east abutment back face of wall. 2. Abutment wall height was approximately 20.0 ft. at probe location. 3. Solid stem auger drilling methods to 5.0 ft. Switch to driving rods (probe) using 140 lb. cat head operated hammer. 4. Driven rod refusal (50 blows, no penetration) at 18.0 ft.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-1C



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-2B
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors PROBE LOCATION See attached plan and note 1
FOREMAN Matt Vanheusen GROUND SURFACE ELEV. EL. 217+/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT DATE START 8/30/16 DATE END 8/30/16

SAMPLER: _____
CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
CASING SIZE: _____ OTHER: _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0								
5						Auger refusal at 3.2 ft.		
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. Probe was located approximately 51" from south edge of pavement and approximately 4.0 ft. east of chain link security fence.
2. Abutment wall height was approximately 7.0 ft. at probe location.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-2B



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-2C
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors **PROBE LOCATION** See attached plan and note 1
FOREMAN Matt Vanheusen **GROUND SURFACE ELEV.** EL. 217+/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 8/30/16 **DATE END** 8/30/16

SAMPLER: _____
CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1	
							2	
							3	
5								
10								
15								
20						Probe terminated at 18.0 ft.		
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	1. Probe was located approximately 68" from south edge of pavement and approximately 4.0 ft. east of chain link security fence. 2. Solid stem auger refusal at 3.0 ft. Switched to driving rods (probe) with 140 lb. cat head operated hammer. 3. Rods were observed to be tilting towards center of roadway. 4. Abutment wall height was approximately 7.0 ft. at probe location.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-2C



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-2D
SHEET 1 **OF** 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors **PROBE LOCATION** See attached plan and note 1
FOREMAN Matt Vanheusen **GROUND SURFACE ELEV.** EL. 217+/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 8/30/16 **DATE END** 8/30/16

SAMPLER: _____
CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1	
							2	
5								
10								
15								
20						Probe terminated at 18.0 ft.		
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-2D



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-3A
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors PROBE LOCATION See attached plan and note 1
 FOREMAN Matt Vanheusen GROUND SURFACE ELEV. EL. 217+/- DATUM NAVD88
 WSE ENGINEER: Julie A. Eaton, EIT DATE START 8/30/16 DATE END 8/30/16

SAMPLER:	GROUNDWATER READINGS				
	DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
CASING:	SOLID STEM AUGER (4" OUTER DIAMETER).				
CASING SIZE:	OTHER:				
Groundwater not observed.					

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1	
5							2,3	
10						Probe refusal at 7.2 ft.		
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	1. Probe was located approximately 40" from north edge of pavement and approximately 6.5 ft. east of chain link security fence. 2. Solid stem auger drilling methods to 5.0 ft. Switch to driving rods (probe) using 140 lb. cat head operated hammer. 3. Rods were observed to be tilting towards center of roadway. 4. Abutment wall height was approximately 4.0 ft. at probe location.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-3A



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-3B
SHEET 1 **OF** 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors **PROBE LOCATION** See attached plan and note 1
FOREMAN Matt Vanheusen **GROUND SURFACE ELEV.** EL. 217+/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 8/30/16 **DATE END** 8/30/16

SAMPLER: _____
CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0								
5						Auger refusal at 3.2 ft.		
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	1. Probe was located approximately 40" from north edge of pavement and approximately 6.5 ft. east of chain link security fence. 2. Abutment wall height was approximately 4.0 ft. at probe location.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-3B



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-3C
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors **PROBE LOCATION** See attached plan and note 1
FOREMAN Matt Vanheusen **GROUND SURFACE ELEV.** EL. 217+/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 8/30/16 **DATE END** 8/30/16

SAMPLER: _____
CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1	
5							2	
10								
15								
20						Probe terminated at 16.0 ft.		
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-3C



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-4A
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors PROBE LOCATION See attached plan and note 1
 FOREMAN Matt Vanheusen GROUND SURFACE ELEV. EL. 215 +/- DATUM NAVD88
 WSE ENGINEER: Julie A. Eaton, EIT DATE START 8/31/16 DATE END 8/31/16

SAMPLER: _____

 CASING: SOLID STEM AUGER (4" OUTER DIAMETER).

 CASING SIZE: _____ OTHER: _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1,2	
5						Auger refusal 4.2 ft.		
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
 1. Probe was located approximately 6" behind west abutment back face of wall.
 2. Abutment wall height was approximately 19.0 ft. at probe location.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-4A



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-4B
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors PROBE LOCATION See attached plan and note 1
 FOREMAN Matt Vanheusen GROUND SURFACE ELEV. EL. 215 +/- DATUM NAVD88
 WSE ENGINEER: Julie A. Eaton, EIT DATE START 8/31/16 DATE END 8/31/16

SAMPLER: _____
 CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
 CASING SIZE: _____ OTHER: _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1,2	
5							3,4	
10						Auger refusal at 7.4 ft.		
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	1. Probe was located approximately 21" behind west abutment back face of wall. 2. Abutment wall height was approximately 19.0 ft. at probe location. 3. Auger was observed to be tilting towards chain link security fence below 5.0 ft. 4. Auger grinding was observed from 5.0 ft. to refusal at 7.4 ft.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-4B



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-4C
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors PROBE LOCATION See attached plan and note 1
 FOREMAN Matt Vanheusen GROUND SURFACE ELEV. EL. 215 +/- DATUM NAVD88
 WSE ENGINEER: Julie A. Eaton, EIT DATE START 8/31/16 DATE END 8/31/16

SAMPLER: _____

 CASING: SOLID STEM AUGER (4" OUTER DIAMETER).

 CASING SIZE: _____ OTHER: _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1,2	
5							3	
10						Auger refusal at 7.4 ft.		
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
 1. Probe was located approximately 30" behind west abutment back face of wall.
 2. Abutment wall height was approximately 19.0 ft. at probe location.
 3. Auger grinding was observed from 7.0 ft. to refusal at 7.4 ft.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-4C



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-4D
SHEET 1 **OF** 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors **PROBE LOCATION** See attached plan and note 1
FOREMAN Matt Vanheusen **GROUND SURFACE ELEV.** EL. 215 +/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 8/31/16 **DATE END** 8/31/16

SAMPLER: _____
CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1,2	
5							3	
10						Auger refusal at 7.2 ft.		
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	1. Probe was located approximately 45" behind west abutment back face of wall. 2. Abutment wall height was approximately 19.0 ft. at probe location. 3. Auger grinding was observed from 7.0 ft. to refusal at 7.2 ft.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-4D



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-4E
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors **PROBE LOCATION** See attached plan and note 1
FOREMAN Matt Vanheusen **GROUND SURFACE ELEV.** EL. 215 +/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 8/31/16 **DATE END** 8/31/16

SAMPLER: _____

CASING: SOLID STEM AUGER (4" OUTER DIAMETER).

CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1,2	
5								
10							3	
15						Auger refusal at 11.9 ft.		
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. Probe was located approximately 59" behind west abutment back face of wall.
2. Abutment wall height was approximately 19.0 ft. at probe location.
3. Auger grinding was observed from 11 ft. to refusal at 11.9 ft.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-4E



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-4F
SHEET 1 **OF** 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors **PROBE LOCATION** See attached plan and note 1
FOREMAN Matt Vanheusen **GROUND SURFACE ELEV.** EL. 215 +/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 8/31/16 **DATE END** 8/31/16

SAMPLER: _____

CASING: SOLID STEM AUGER (4" OUTER DIAMETER).

CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1,2	
5								
10								
15								
20						Auger refusal at 16.0 ft.		
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. Probe was located approximately 73" behind west abutment back face of wall.
2. Abutment wall height was approximately 19.0 ft. at probe location.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-4F



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-4G
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors **PROBE LOCATION** See attached plan and note 1
FOREMAN Matt Vanheusen **GROUND SURFACE ELEV.** EL. 215 +/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 8/31/16 **DATE END** 8/31/16

SAMPLER: _____

CASING: SOLID STEM AUGER (4" OUTER DIAMETER).

CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1,2	
5								
10								
15								
20							3	
25						Probe terminated at 24.5 ft.		
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. Probe was located approximately 73" behind west abutment back face of wall.
2. Abutment wall height was approximately 19.0 ft. at probe location.
3. Auger grinding observed from 21.0 ft. to 24.5 ft.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-4G



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-5B
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors PROBE LOCATION See attached plan and note 1
FOREMAN Matt Vanheusen GROUND SURFACE ELEV. EL. 214 +/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT DATE START 8/31/16 DATE END 8/31/16

SAMPLER: _____ _____ _____	GROUNDWATER READINGS				
	DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
	Groundwater not observed.				
CASING: <u>SOLID STEM AUGER (4" OUTER DIAMETER).</u> _____ _____					
CASING SIZE: _____ OTHER: _____					

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1	
5							2	
10						Auger refusal at 7.0 ft.		
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	1. Probe was located approximately 50" from north edge of pavement and approximately 5.5 ft. west of chain link security fence. 2. Auger was observed to be tilting towards center of the roadway. 3. Abutment wall height was approximately 14.0 ft. at probe location.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-5B



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-5D
SHEET 1 **OF** 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors **PROBE LOCATION** See attached plan and note 1
FOREMAN Matt Vanheusen **GROUND SURFACE ELEV.** EL. 214 +/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 8/31/16 **DATE END** 8/31/16

SAMPLER: _____

CASING: SOLID STEM AUGER (4" OUTER DIAMETER).

CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1	
5								
10								
15						Probe terminated at 15.0 ft.		
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. Probe was located approximately 65" from north edge of pavement and approximately 5.5 ft. west of chain link security fence.
2. Abutment wall height was approximately 14.0 ft. at probe location.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-5D



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-6B
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors PROBE LOCATION See attached plan and note 1
 FOREMAN Matt Vanheusen GROUND SURFACE ELEV. EL. 213 +/- DATUM NAVD88
 WSE ENGINEER: Julie A. Eaton, EIT DATE START 8/31/16 DATE END 8/31/16

SAMPLER: _____
 CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
 CASING SIZE: _____ OTHER: _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0								
5								
10								
15								
20								
25								
30								

Probe terminated at 5.0 ft.

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	1. Probe was located approximately 52.5" from south edge of pavement and approximately 4.9 ft. west of chain link security fence. 2. Auger tilting towards center of roadway below 3.0 ft., terminated probe at 5.0 ft. 3. Abutment wall height was approximately 14.0 ft. at probe location.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-6B



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-6C
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors **PROBE LOCATION** See attached plan and note 1
FOREMAN Matt Vanheusen **GROUND SURFACE ELEV.** EL. 213 +/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 8/31/16 **DATE END** 8/31/16

SAMPLER:	GROUNDWATER READINGS				
	DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
CASING:	SOLID STEM AUGER (4" OUTER DIAMETER).				
CASING SIZE:	OTHER:				
Groundwater not observed.					

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0								
							1	
							2	
5						Probe terminated at 5.0 ft.		
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	1. Probe was located approximately 40" from south edge of pavement and approximately 4.9 ft. west of chain link security fence. 2. Auger appeared to kickoff at 1.5 ft. and tilted towards center of roadway until probe terminated at 5.0 ft. 3. Abutment wall height was approximately 14.0 ft. at probe location.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-6C



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-6D
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors PROBE LOCATION See attached plan and note 1
 FOREMAN Matt Vanheusen GROUND SURFACE ELEV. EL. 213 +/- DATUM NAVD88
 WSE ENGINEER: Julie A. Eaton, EIT DATE START 8/31/16 DATE END 8/31/16

SAMPLER: _____
 CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
 CASING SIZE: _____ OTHER: _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0								
5						Auger refusal at 6.6 ft.		
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-6D



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-6E
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors PROBE LOCATION See attached plan and note 1
 FOREMAN Matt Vanheusen GROUND SURFACE ELEV. EL. 213 +/- DATUM NAVD88
 WSE ENGINEER: Julie A. Eaton, EIT DATE START 8/31/16 DATE END 8/31/16

SAMPLER: _____
 CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
 CASING SIZE: _____ OTHER: _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1	
5							2	
10						Auger refusal at 9.1 ft.		
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	1. Probe was located approximately 81.5" from south edge of pavement and approximately 4.9 ft. west of chain link security fence. 2. Auger grinding observed from 8.0 ft. to refusal at 9.1 ft. 3. Abutment wall height was approximately 14.0 ft. at probe location.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-6E



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-6F
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors PROBE LOCATION See attached plan and note 1
FOREMAN Matt Vanheusen GROUND SURFACE ELEV. EL. 213 +/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT DATE START 8/31/16 DATE END 8/31/16

SAMPLER: _____
CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
CASING SIZE: _____ OTHER: _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1	
5							2	
10						Auger refusal at 10.0 ft.		
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. Probe was located approximately 103.5" from south edge of pavement and approximately 4.9 ft. west of chain link security fence.
2. Auger grinding observed from 8.0 ft. to refusal at 10.0 ft.
3. Abutment wall height was approximately 14.0 ft. at probe location.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-6F



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF PROBE No. P-6F
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

PROBE Co. New England Boring Contractors PROBE LOCATION See attached plan and note 1
 FOREMAN Matt Vanheusen GROUND SURFACE ELEV. EL. 213 +/- DATUM NAVD88
 WSE ENGINEER: Julie A. Eaton, EIT DATE START 8/31/16 DATE END 8/31/16

SAMPLER: _____
 CASING: SOLID STEM AUGER (4" OUTER DIAMETER).
 CASING SIZE: _____ OTHER: _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not observed.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0							1	
5							2	
10						Probe terminated at 10.0 ft.		
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	1. Probe was located approximately 128" from south edge of pavement and approximately 4.9 ft. west of chain link security fence. 2. Auger grinding observed from 8.0 ft. to refusal at 10.0 ft. 3. Abutment wall height was approximately 14.0 ft. at probe location.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
 ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS PROBE LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

PROBE No. P-6F

APPENDIX E
Pavement Boring Logs



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF BORING No. C-1
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

BORING Co. New England Boring Contractors **BORING LOCATION** See attached plan
FOREMAN Jason Stokes **GROUND SURFACE ELEV.** EL. 212.5+/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 6/27/16 **DATE END** 6/27/16

SAMPLER: 2 IN. OD SPLIT SPOON SAMPLER (SPT) DRIVEN 24 INCHES
USING A 140 lb. CAT HEAD OPERATED SAFETY HAMMER.
CASING: _____
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not encountered.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0		S-1	17/24	0.5-2.5	10-11-15-19	Medium dense, dark gray, GRAVEL FILL, little sand, trace to little silt; moist. (LAF)	1, 2	4" ACP/2" GRAVEL BASE
							3	9" SAND SUB-BASE
								LAF
5								
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. ACP - asphalt concrete pavement. ACP and Gravel Base thickness measured in hole.
2. Top 3": light brown, fine to coarse SAND FILL, trace gravel, trace silt; moist.
3. LAF - lightweight aggregate fill.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. C-1



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF BORING No. C-2
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

BORING Co. New England Boring Contractors **BORING LOCATION** See attached plan
FOREMAN Jason Stokes **GROUND SURFACE ELEV.** EL. 210.5+/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 6/27/16 **DATE END** 6/27/16

SAMPLER: 2 IN. OD SPLIT SPOON SAMPLER (SPT) DRIVEN 24 INCHES
USING A 140 lb. CAT HEAD OPERATED SAFETY HAMMER.
CASING: _____
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not encountered.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0		S-1	17/24	0.5-2.5	9-10-10-11	Medium dense, dark gray, GRAVEL FILL, little sand, trace to little silt; moist. (LAF)	1, 2 3	4" ACP/2" GRAVEL BASE 9" SAND SUB-BASE LAF
5								
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. ACP - asphalt concrete pavement. ACP and Gravel Base thickness measured in hole.
2. Top 7": light brown, fine to coarse SAND FILL, little gravel, little silt, trace debris (asphalt); moist.
3. LAF - lightweight aggregate fill.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. C-2



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF BORING No. C-3
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

BORING Co. New England Boring Contractors **BORING LOCATION** See attached plan
FOREMAN Jason Stokes **GROUND SURFACE ELEV.** EL. 209+/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 6/27/16 **DATE END** 6/27/16

SAMPLER: 2 IN. OD SPLIT SPOON SAMPLER (SPT) DRIVEN 24 INCHES
USING A 140 lb. CAT HEAD OPERATED SAFETY HAMMER.
CASING: _____
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not encountered.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0		S-1	14/24	0.5-2.5	35-23-16-12	Dense, brown, fine to coarse SAND FILL, little gravel, little silt, trace debris (asphalt); moist.	1	5" ACP/1" GRAVEL BASE SAND FILL
5								
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. ACP - asphalt concrete pavement. ACP and Gravel Base thickness measured in hole.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. C-3



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF BORING No. C-4
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

BORING Co. New England Boring Contractors **BORING LOCATION** See attached plan
FOREMAN Jason Stokes **GROUND SURFACE ELEV.** EL. 209.5+/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 6/27/16 **DATE END** 6/27/16

SAMPLER: 2 IN. OD SPLIT SPOON SAMPLER (SPT) DRIVEN 24 INCHES
USING A 140 lb. CAT HEAD OPERATED SAFETY HAMMER.
CASING: _____
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not encountered.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0		S-1	14/24	0.5-2.5	21-19-17-19	Dense, dark brown, fine to coarse SAND FILL, little to some gravel, little silt, trace debris (asphalt, metal, fabric); moist.	1	5" ACP/3" GRAVEL BASE
							2	SAND FILL
5								
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. ACP - asphalt concrete pavement. ACP and Gravel Base thickness measured in hole.
2. Bottom 3": Grades to light brown, fine to medium, little gravel, without debris.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. C-4



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF BORING No. C-5
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

BORING Co. New England Boring Contractors **BORING LOCATION** See attached plan
FOREMAN Jason Stokes **GROUND SURFACE ELEV.** EL. 210.5+/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 6/27/16 **DATE END** 6/27/16

SAMPLER: 2 IN. OD SPLIT SPOON SAMPLER (SPT) DRIVEN 24 INCHES
USING A 140 lb. CAT HEAD OPERATED SAFETY HAMMER.
CASING: _____
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not encountered.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0		S-1	1/24	0.5-2.5	31-13-7-8	Medium dense, dark brown, GRAVEL FILL, some debris (asphalt), trace sand, trace silt; moist.	1	5" ACP/4" GRAVEL BASE
							2	SAND FILL
5								
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. ACP - asphalt concrete pavement. ACP and Gravel Base thickness measured in hole.
2. Sand Fill observed below gravel base in borehole.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. C-5



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF BORING No. C-6
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

BORING Co. New England Boring Contractors **BORING LOCATION** See attached plan
FOREMAN Jerry Voight **GROUND SURFACE ELEV.** EL. 219+/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 6/27/16 **DATE END** 6/27/16

SAMPLER: 2 IN. OD SPLIT SPOON SAMPLER (SPT) DRIVEN 24 INCHES
USING A 140 lb. CAT HEAD OPERATED HAMMER ON SOIL SCOUT RIG.
CASING: _____
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not encountered.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0		S-1	7/24	0.5-2.5	12-18-29-16	Dense, brown, fine to coarse SAND FILL, little gravel, trace to little silt, trace debris (asphalt); moist.	1	4" ACP/1" GRAVEL BASE
								SAND FILL
5								
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	1. ACP - asphalt concrete pavement. ACP and Gravel Base thickness measured in hole.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. C-6



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF BORING No. C-7
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

BORING Co. New England Boring Contractors **BORING LOCATION** See attached plan
FOREMAN Jerry Voight **GROUND SURFACE ELEV.** EL. 220+/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 6/27/16 **DATE END** 6/27/16

SAMPLER: 2 IN. OD SPLIT SPOON SAMPLER (SPT) DRIVEN 24 INCHES
USING A 140 lb. CAT HEAD OPERATED HAMMER ON SOIL SCOUT RIG.
CASING: _____
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not encountered.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0		S-1	15/24	0.5-2.5	15-24-40-100/6"	Very dense, brown, fine to coarse SAND FILL, some gravel, trace to little silt, trace debris (asphalt); moist.	1	4" ACP/2" GRAVEL BASE
								SAND FILL
5								
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. ACP - asphalt concrete pavement. ACP and Gravel Base thickness measured in hole.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. C-7



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF BORING No. C-8
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

BORING Co. New England Boring Contractors **BORING LOCATION** See attached plan
FOREMAN Jason Stokes **GROUND SURFACE ELEV.** EL. 223+/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 6/20/16 **DATE END** 6/20/16

SAMPLER: 2 IN. OD SPLIT SPOON SAMPLER (SPT) DRIVEN 24 INCHES
USING A 140 lb. CAT HEAD OPERATED SAFETY HAMMER.
CASING: _____
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not encountered.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0		S-1	13/24	0.5-2.5	33-45-20-13	Very dense, dark brown, gravelly, fine to coarse SAND FILL, little silt, little debris (fabric, brick, asphalt); moist. Bottom 10" grades to some gravel.	1	5" ACP/4" SAND SUB-BASE
							2	SAND FILL
5								
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. ACP - asphalt concrete pavement. ACP and Sand Sub-base thickness measured in hole.
2. Light brown sand base overlying a layer of fabric 9" bgs.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. C-8



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF BORING No. C-9
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

BORING Co. New England Boring Contractors **BORING LOCATION** See attached plan
FOREMAN Jason Stokes **GROUND SURFACE ELEV.** EL. 226+/- DATUM NAVD88
WSE ENGINEER: Julie A. Eaton, EIT **DATE START** 6/23/16 **DATE END** 6/23/16

SAMPLER: 2 IN. OD SPLIT SPOON SAMPLER (SPT) DRIVEN 24 INCHES
USING A 140 lb. CAT HEAD OPERATED SAFETY HAMMER.
CASING: _____
CASING SIZE: _____ **OTHER:** _____

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not encountered.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0		S-1	11/24	0.5-2.5	12-14-19-39	Dense, brown, gravelly, fine to coarse SAND FILL, little silt; moist.	1	5" ACP/3" GRAVEL BASE SAND FILL
5								
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS		NOTES:
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	
0-4	V. LOOSE	0-2	V. SOFT	1. ACP - asphalt concrete pavement. ACP and Gravel Base thickness measured in hole.
4-10	LOOSE	2-4	SOFT	
10-30	M. DENSE	4-8	M. STIFF	
30-50	DENSE	8-15	STIFF	
> 50	V. DENSE	15-30	V. STIFF	
		> 30	HARD	

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. C-9



PROJECT
Maskwonicut St. Bridge
MassDOT
Sharon, MA

REPORT OF BORING No. C-10
SHEET 1 OF 1
Project No. 2150851
CHKD BY Christopher J. Palmer, PE

BORING Co. New England Boring Contractors
FOREMAN Jerry Voight
WSE ENGINEER: Julie A. Eaton, EIT
BORING LOCATION See attached plan
GROUND SURFACE ELEV. EL. 229+/- **DATUM** NAVD88
DATE START 6/27/16 **DATE END** 6/27/16

SAMPLER: 2 IN. OD SPLIT SPOON SAMPLER (SPT) DRIVEN 24 INCHES
USING A 140 lb. CAT HEAD OPERATED HAMMER ON SOIL SCOUT RIG.
CASING:
CASING SIZE: OTHER:

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
Groundwater not encountered.				

DEPTH (feet)	CASING (blows/ft)	SAMPLE				SAMPLE DESCRIPTION	NOTES	STRATUM DESCRIPTION
		No.	REC/PEN (in)	DEPTH (ft)	BLOWS/6"			
0		S-1	2/24	0.5-2.5	17-94-56-38	Very dense, brown, fine to coarse SAND FILL, little silt, trace gravel; moist.	1	7" ACP/2.5" GRAVEL BASE
								SAND FILL
5								
10								
15								
20								
25								
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY
0-4	V. LOOSE	0-2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

NOTES:
1. ACP - asphalt concrete pavement. ACP and Gravel Base thickness measured in hole.

GENERAL NOTES: i) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
ii) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. C-10

APPENDIX F
Bedrock Core Photograph

Appendix F. Rock Core Photos - Bridge No. C-09-003 in Sharon, MA



Top Row: Boring B-2, Core C-1 & C-2
Second Row: Boring B-2, Core C-3 & C-4

APPENDIX G
1995 Rehabilitation Information

STRUCTURAL FOUNDATION GEOTECHNICAL REPORT
PI 56 - MASKWONICUT STREET / CONRAIL
OVERHEAD BRIDGE NO. 211.62 ~~AMTRAK~~

NORFOLK COUNTY
SHARON, MASSACHUSETTS

S-9.3

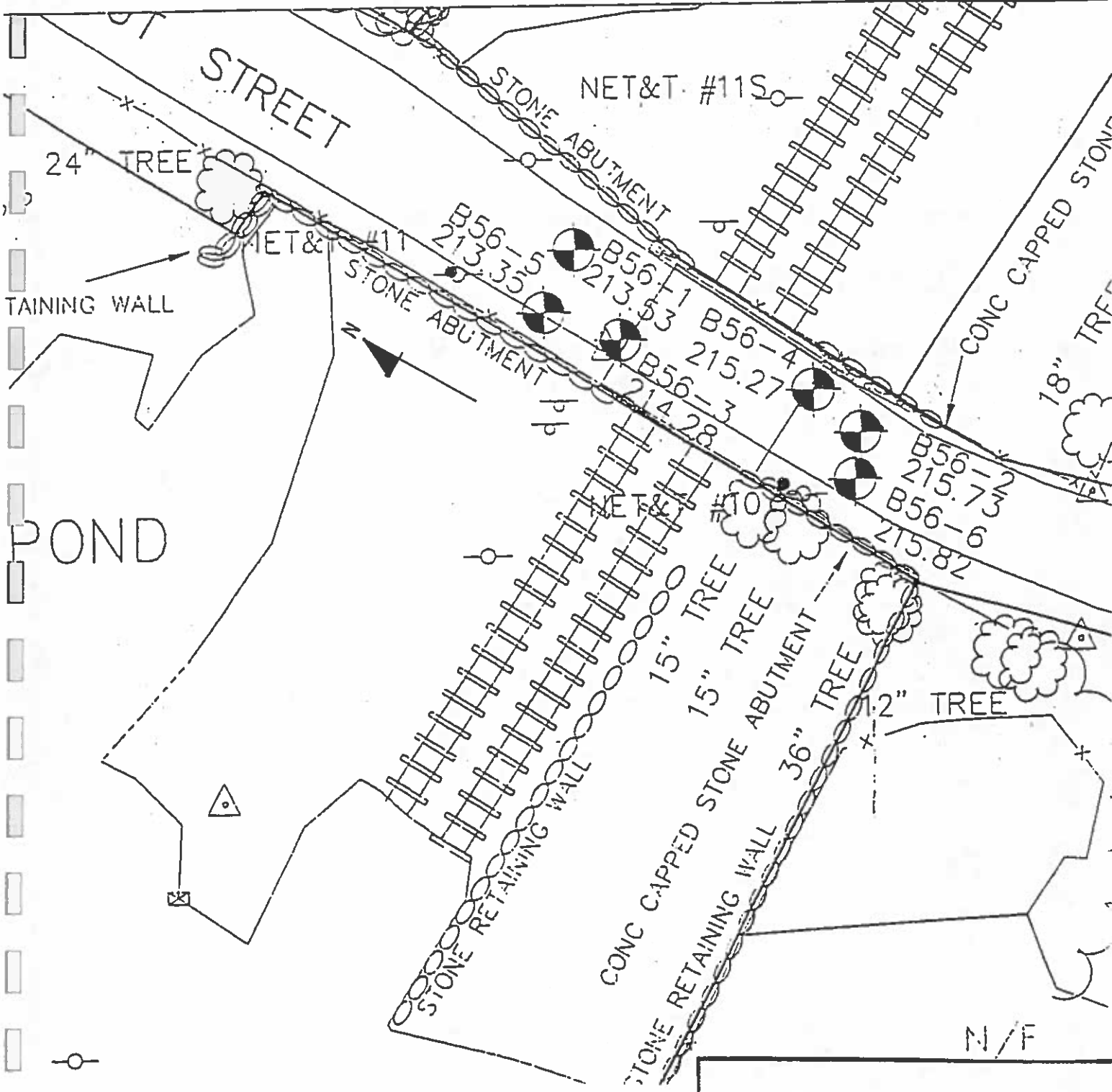
Prepared for:

NATIONAL RAILROAD PASSENGER CORPORATION (AMTRAK)

Prepared by:

GANNETT FLEMING, INC./LSTS, JOINT VENTURE

AUGUST 1993



N/F

BORING LOCATION MAP

**STRUCTURAL FOUNDATION GEOTECHNICAL REPORT
PI 56 - MASKWONICUT STREET
OVERHEAD BRIDGE NO. 211.62**

**APPENDIX B
TYPED BORING LOGS**

Date Started	6-2-93	DRILLING LOG GANNETT FLEMING, INC. Harrisburg, PA 17105	Hole No.	B56-1
Date Finished	6-2-93		Sheet	1 of 2
Soil Sampling	36.5 Ft.		Line & Station	14+32
Rock Sampling	3.5 Ft.	Project	AMTRAK - PI 56 Maskwonicut St.	
Total Depth of Hole	40.0 Ft.	Drilling Agency	General Borings, Inc.	
No. of Undist. Sample	0	Driller	John Muccino	
Total Number of Core Boxes	1	Size and Bit Type	Casing Size 3 in. I. D. Spoon Size 2 in. O.D.	
Groundwater Observations At 22.1 Ft. After 0* Hrs. At Ft. After Hrs. *w/casing Elev. After Hrs.		Hollow-Stem	Hammer Wt. 140 lbs.	
		Drilling Fluid	Hammer Drop 30 in.	
		Inspector	R. Bunting	
			Elev. Top of Hole	213.53
			Direction of Hole	
			<input checked="" type="checkbox"/> Vertical	<input type="checkbox"/> Inclined
			_____ Deg. From Vertical	

Elev. Depth	Legend	Description of Materials	Sample Depth	Blows or RQD	Recovery	Box or Sample No.	Remarks
0.3		PAVEMENT					
		Black, white, brown MF GRAVEL, some MF Sand, dry	0.5-2.5	14-23	12"	S-1	
		Brown MF SAND, trace MF Gravel, dry (FILL)		14-13			
			2.5-4.5	7-6	3"	S-2	
5		SAME, except Dark brown, damp.		5-5			
			4.5-6.5	11-5	3"	S-3	
				5-4			
			6.5-8.5	1-2	8"	S-4	
10		SAME, except Dark brown, damp.		3-5			
			8.5-10.5	4-4	3"	S-5	
				3-5			
		SAME, except Dark brown, damp.	10.5-12.5	5-4	5"	S-6	
				4-4			
15		Same, except some MF Gravel.					
			15.0-17.0	11-5	12"	S-7	
				5-6			
20		COBBLE, and C GRAVEL	20.0-20.5	0	0.3/0.5	R-1	
				0%	60%		
		Brown Silty CLAY, some CMF Sand, trace F Gravel, wet.	23.0-25.0	9-11	7"	S-8	
25					10-8		

REMARKS:

- Hole moved due to 8" A.C. (water).
- Backfilled w/sand and blacktop patch placed.

DRILLING LOG (Continuation Sheet)		GANNETT FLEMING, INC.		Hole No. 856-1	
		Project ANTRAK - PI 56 Maskwonicut St.		Sheet 2 of 2	
				Elev. Top of Hole 213.53	

Elev. Depth	Legend	Description of Materials	Sample Depth	Blows or RQD	Recovery	Box or Sample No.	Remarks
		Gray Silty CLAY, little MF Gravel, little MF Sand, wet.	25.0-27.0	7-6	5"	S-9	
				18-12			
30		Same w/trace F Gravel, trace MF Sand.	30.0-32.0	28-20	10"	S-10	
				22-46			
35		C GRAVEL	33.5-36.5	0	0.6/3.0	R-2	
				0%	20%		
40		Brown MF GRAVEL, little CMF Sand, wet.	40.0-40.1	100/1"	1"	S-11	
		Bottom of Hole = 40.0 ft.					
45							
50							
55							
60							

Date Started	6-4-93	DRILLING LOG GANNETT FLEMING, INC. Harrisburg, PA 17105	Hole No.	856-2	
Date Finished	6-4-93		Sheet	1	of 2
Soil Sampling	35.5 Ft.		Line & Station	14+98	
Rock Sampling	5.0 Ft.	Project	AMTRAK - PI 56 Maskwonicut St.		
Total Depth of Hole	40.5 Ft.	Drilling Agency	General Borings, Inc.		
No. of Undist. Sample	0	Driller	Eldin Kennedy		
Total Number of Core Boxes	1	Size and Bit Type	Casing Size 3 in. I.D. Spoon Size 2 in. O.D.		
Groundwater Observations		Hollow-Stem	Hammer Wt. 140 lbs.		
At 18.3 Ft. After 1 Hrs.		Drilling Fluid	Hammer Drop 30 in.		
At 19.0 Ft. After 2 Hrs.		Inspector	R. Bunting		
Elev. After Hrs.		Elev. Top of Hole		215.73	
			Direction of Hole		
			x_Vertical		___Inclined
			___Deg. From Vertical		

Elev. Depth	Legend	Description of Materials	Sample Depth	Blows or RQD	Recovery	Box or Sample No.	Remarks
0.25		PAVEMENT					
		Black MF SAND, little MF Gravel, dry.	1.0-3.0	5-5	10"	S-1	
				7-5			
		Brown CMF SAND, some MF Gravel, little silt, dry.	3.0-5.0	4-4	14"	S-2	
				5-4			
			5.0-7.0	3-3	14"	S-3	
				4-5			
			7.0-9.0	4-4	12"	S-4	
				6-7			
		Brown SILT, and CMF Sand, little F Gravel, wet.	15.0-17.0	10-3	12"	S-5	
				2-4			
		MC GRAVEL, trace MF Sand, trace Silt, wet.	20.0-22.0	38-32	3"	S-6	
				24-17			

REMARKS: • Hole backfilled w/gravel and cold blacktop patch placed.

DRILLING LOG (Continuation Sheet)		GANNETT FLEMING, INC.			Hole No. 856-2		
		Project AMTRAK - PI 56 Maskwonicut St.			Sheet 2 of 2		
					Elev. Top of Hole 215.73		
Elev. Depth	Legend	Description of Materials	Sample Depth	Blows or RQD	Recovery	Box or Sample No.	Remarks
		Brown CMF GRAVEL, trace MF Sand, trace Silt, wet	25.0-27.0	34-59	10"	S-7	
				34-100/6"			
		Boulder (used roller bit)					
		CMF GRAVEL, washed					
30			30.0-30.3	100/3"	1"	S-8	
		Boulder (used rolled bit)					
		Advanced with roller bit					
		Cobble (used roller bit)					
35		Brown CMF Gravel, trace Silt, trace MF Sand, wet	35.0-35.5	100/5"	5"	S-9	
		COBBLES, and C GRAVEL					
40			35.5-40.5	0	0.3/5.0	R-1	
		Bottom of Hole = 40.5 ft.		0%	6%		
45							
50							
55							
60							

Date Started	6-3-93	DRILLING LOG GANNETT FLEMING, INC. Harrisburg, PA 17105		Hole No.	B56-3
Date Finished	6-3-93			Sheet	1 of 2
Soil Sampling	5.0 Ft.			Line & Station	14+48
Rock Sampling	24.0 Ft.	Project	AMTRAK - PI 56 Maskwonicut Street	Offset	6.5 Ft. Rt.
Total Depth of Hole	29.0 Ft.	Drilling Agency	General Borings, Inc.	N Coordinate	
No. of Undist. Sample	0	Driller	John Muccino	E Coordinate	
Total Number of Core Boxes	1	Size and Bit Type	Casing Size 3 in. I.D.	Elev. Top of Hole	214.28
Groundwater Observations		Hollow-Stem	Spoon Size 2 in. O.D.	Direction of Hole	
At N/O	Ft. After	Hrs.	Drilling Fluid	Hammer Wt. 140 lbs.	<input checked="" type="checkbox"/> Vertical <input type="checkbox"/> Inclined
At	Ft. After	Hrs.	Inspector	Hammer Drop 30 in.	Deg. From Vertical
Elev.	After	Hrs.	R. Bunting		

Elev. Depth	Legend	Description of Materials	Sample Depth	Blows or RQD	Recovery	Box or Sample No.	Remarks
0.5		PAVEMENT					
		Black CMF SAND, little MF Gravel, damp	0.5-2.5	10-7	14"	S-1	
		Brown MF SAND, little MF Gravel, dry		10-15			
5		Pink GRANITE, close joint spacing, very hard, slightly weathered, mortar (Abutment)	3.0-4.0	0.35/1.0	1.0/1.0	R-1	
			4.0-5.0	0	1.0/1.0	R-2	
				0%	100%		
10			5.0-10.0	3.1/5.0	3.4/5.0	R-3	
				62%	68%		
15			10.0-15.0	1.5/5.0	2.9/5.0	R-4	
				30%	58%		
		Drop in rods					
20		Pink GRANITE	15.0-20.0	2.1/5.0	3.6/5.0	R-5	
				42%	72%		
		Drop in rods	20.0-24.0	0	1.0/4.0	R-6	
25		Pink GRANITE	24.0-24.5	0	0.5/0.5	R-7	
		Railroad tie, C Gravel	24.5-26.0	0	0.5/1.5	R-8	

REMARKS: • Pavement Core 5.5 inches
• Hole backfilled w/gravel and cold blacktop patch placed

DRILLING LOG (Continuation Sheet)		GANNETT FLEMING, INC.			Hole No. 856-3		
		Project AMTRAK - PI 56 Maskwonicut St.			Sheet 2 of 2		
					Elev. Top of Hole 214.28		
Elev. Depth	Legend	Description of Materials	Sample Depth	Blows or RQD	Recovery	Box or Sample No.	Remarks
		Brown, gray MF SAND, some Silt, some MF Gravel, wet	27.0-29.0	17-33	12"	S-2	
				43-82			
30		Bottom of Hole = 29.0 ft.					
35							
40							
45							
50							
55							
60							

Date Started	6-4-93	DRILLING LOG GANNETT FLEMING, INC. Harrisburg, PA 17105	Hole No.	856-4	
Date Finished	6-4-93		Sheet	1 of 2	
Soil Sampling	4.5 Ft.		Line & Station	14+85.5	
Rock Sampling	24.0 Ft.	Project	AMTRAK - PI 56 Maskwonicut St.	Offset	4.5 Ft. Lt.
Total Depth of Hole	28.5 Ft.	Drilling Agency	General Borings, Inc.	N Coordinate	
No. of Undist. Sample	0	Driller	John Muccino	E Coordinate	
Total Number of Core Boxes	1	Size and Bit Type		Elev. Top of Hole	215.27
Groundwater Observations		Casing Size	3 in I.D.	Direction of Hole	
At N/O Ft. After Hrs.		Hollow-Stem		_x Vertical ___ Inclined	
At Ft. After Hrs.		Drilling Fluid		_____ Deg. From Vertical	
Elev. After Hrs.		Inspector	R. Bunting		
		Spoon Size	2 in. O.D.		
			Hammer Wt. 140 lbs.		
			Hammer Drop 30 in.		

Elev. Depth	Legend	Description of Materials	Sample Depth	Blows or RQD	Recovery	Box or Sample No.	Remarks	
0.5		PAVEMENT		10				
		Brown, black MF SAND, little MF Gravel, damp (C GRAVEL seen in hole)	0.5-2.0	15-100/6"	9"	S-1		
		Pink GRANITE, close joint spacing, very hard, slightly weathered, rough fracture surface, mortar (ABUTMENT)						
5								
				2.0-7.0	3.0/5.0	4.4/5.0	R-1	
					60%	88%		
				7.0-9.0	0.4/2.0	1.2/2.0	R-2	
10					20%	60%		
				9.0-14.0	0.7/5.0	2.1/5.0	R-3	
					14%	42%		
15								
				14.0-19.0	3.8/5.0	4.5/5.0	R-4	
20					76%	90%		
			19.0-24.0	1.5/5.0	4.6/5.0	R-5		
25		Advanced with core barrel		30%	92%			

REMARKS: • Bad coring from 24.5 ft. to 26.0 ft.
 • Hole backfilled w/gravel and cold blacktop patch placed.

DRILLING LOG (Continuation Sheet)		GANNETT FLEMING, INC.			Hole No. B56-4		
		Project AMTRAK - PI 56 Maskwonicut St.			Sheet 2 of 2		
					Elev. Top of Hole 215.27		
Elev. Depth	Legend	Description of Materials	Sample Depth	Blows or RQD	Recovery	Box or Sample No.	Remarks
			24.0-26.0	0.5/2.0	1.2/2.0	R-6	
		Bottom of ABUTMENT = 26.0 ft.		25%	60%		
		Brown MF SAND, little MF Gravel, trace Clayey Silt, wet	27.0-28.5	27-35	14"	S-2	
		Bottom of Hole = 28.5 ft.		100/6"			
30							
35							
40							
45							
50							
55							
60							

Date Started	06/01/93	DRILLING LOG GANNETT FLEMING, INC. Harrisburg, PA 17105		Hole No.	B56-5		
Date Finished	06/01/93			Sheet	1 of 1		
Soil Sampling	20.0 Ft.			Line & Station	14+34.5		
Rock Sampling	6.0 Ft.	Project		Offset	9 Ft. Rt.		
Total Depth of Hole	26.0 Ft.	AMTRAK - PI 56 Maskwonicut St.		N Coordinate			
No. of Undist. Sample	0	Drilling Agency		E Coordinate			
Total Number of Core Boxes	1	Driller		Elev. Top of Hole	213.35		
Groundwater Observations		Size and Bit Type		Direction of Hole <input checked="" type="checkbox"/> Vertical <input type="checkbox"/> Inclined _____ Deg. From Vertical			
At N/O	Ft. After	Hrs.	Casing Size			Spoon Size	2 in. O.D.
At	Ft. After	Hrs.	Hollow-Stem 4 1/4 in I.D.			Hammer Wt.	140 lbs.
		Drilling Fluid		Hammer Drop	30 in.		
Elev.	After	Hrs.	Inspector	R. Bunting			

Elev. Depth	Legend	Description of Materials	Sample Depth	Blows or ROD	Recovery	Box or Sample No.	Remarks
0.3		Pavement	0.5-2.5	9-10	7"	S-1	
		Brown MF SAND, some MF Gravel, dry Same, except little MF Gravel		9-5			
			2.5-4.5	8-5	8"	S-2	
				5-4			
			4.5-6.5	4-3	9"	S-3	
				1-3			
			6.5-8.5	5-5	0"	S-4	
				5-5			
			8.5-10.0	5-4	0"	S-5	
				1/12"			
		VOID					
		Brown MF SAND, and CMF Gravel, dry	12-13.5	5-4	2"	S-6	
				5			
		Brown MC GRAVEL, trace MF Sand, organics, wet	15-17	4-2	3"	S-7	
				82-17			
		Brown MF SAND, little MF Gravel, trace Silt, wet					
		White, black, GNEISS (Abutment)	20-20.1	100/1"	1"	S-8	
		Bottom of Hole = 26.0 Ft.	20-26		1.4/6.0	R-1	
					23%		

REMARKS: • Hole moved due to OHE.
 • Hole backfilled w/sand and covered w/blacktop patch.

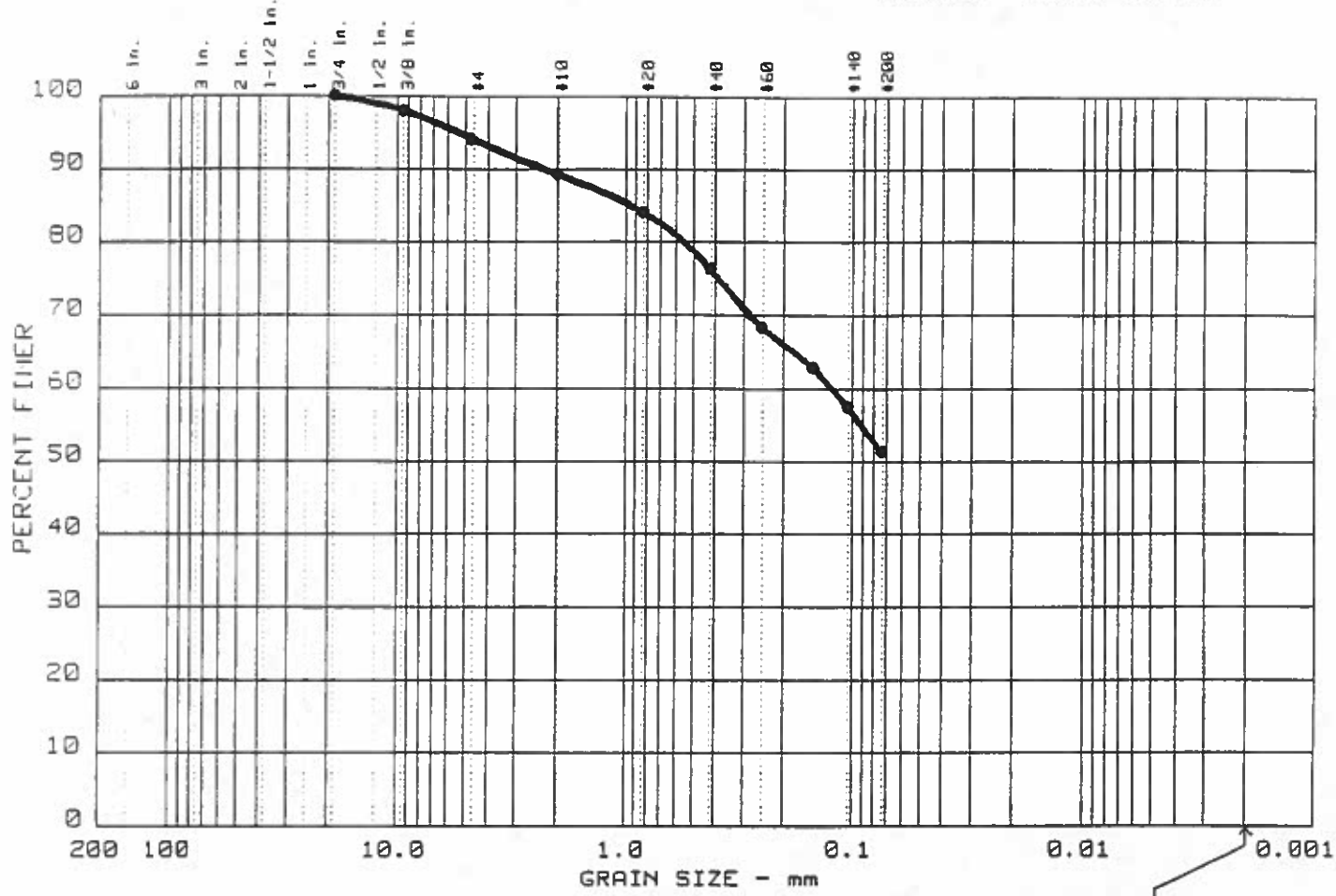
Date Started	06/03/93	DRILLING LOG GANNETT FLEMING, INC. Harrisburg, PA 17105	Hole No.	856-6
Date Finished	06/03/93		Sheet	1 of 2
Soil Sampling	30.0 Ft.		Line & Station	15+00.5
Rock Sampling	10.0 Ft.	Project	Offset	4.5 Ft. Rt.
Total Depth of Hole	40.0 Ft.	AMTRAK - PI 56 Maskwonicut St.		N Coordinate
No. of Undist. Sample	0	Drilling Agency	General Borings, Inc.	
Total Number of Core Boxes	1	Driller	Eldin Kennedy	
Groundwater Observations At 9.9 Ft. After 0 Hrs. At 18.8 Ft. After 14 Hrs.		Size and Bit Type		Elev. Top of Hole 215.82
		Casing Size 3 in. I.D.	Spoon Size 2 in O.D.	
		Hollow-Stem	Hammer Wt. 140 lbs.	
		Drilling Fluid	Hammer Drop 30 in.	Direction of Hole
Elev. After Hrs.		Inspector	R. Bunting	<input checked="" type="checkbox"/> Vertical <input type="checkbox"/> Inclined
				_____ Deg. From Vertical

Elev. Depth	Legend	Description of Materials	Sample Depth	Blows or ROD	Recovery	Box or Sample No.	Remarks
0.3		Pavement					
		Black, CM SAND, some MF Gravel, dry	0.5-2.5	10-12	13"	S-1	
		Brown CMF SAND, and MF Gravel, little silt, dry Dk. brown MF SAND, and M Gravel, little silt, dry		12-18			
			2.5-4.5	13-9	2"	S-2	
5		Same, except lt. brown		6-6			
			4.5-6.5	9-10	2"	S-3	
		Same except orange		14-21			
			6.5-8.5	15-7	2"	S-4	
		Same, except white		6-16			
10			8.5-10.5	9-8	1"	S-5	
			10.5-12.5	8-9	1"	S-6	
				11-10			
15		MF GRAVEL	15-17	8-13	1"	S-7	
				15-21			
		Casing Refusal					
20		Used roller bit					
		COBBLES, little					
		C Gravel					
25		Brown MF (+) SAND, little MF Gravel, trace Silt, wet	20-25	0	1.5/5.0	R-1	
			25-26	38-100/6"	12"	S-8	

REMARKS: • Hole backfilled w/gravel and cold blacktop patch placed.

DRILLING LOG (Continuation Sheet)		GANNETT FLEMING, INC.			Hole No. B56-6		
		Project ANTRAK - PI 56 Maskwonicut St.			Sheet 2 of 2		
					Elev. Top of Hole 215.82		
Elev. Depth	Legend	Description of Materials	Sample Depth	Blows or RQD	Recovery	Box or Sample No.	Remarks
30		MF GRAVEL, and C Sand, wet (washed)	30-30.5	100/5"	2"	S-9	
35		Boulder					
		COBBLES and C Gravel	35-40	0	1.4/5.0	R-2	
				0%	28%		
40		Bottom of Hole = 40.0 Ft.					
45							
50							
55							
60							

GRAIN SIZE DISTRIBUTION TEST REPORT



% +3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	6.0	42.7	51.3	

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
	N/P	0.97	0.12						

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN SANDY SILT	ML	A-4(0)

Project No.: 28656.040
 Project: AMTRAK ELECTRIFICATION SYSTEM
 ● Location: BORING NO. B56-2 / S-5

 Date: JULY 20, 1993

Remarks:
 SAMPLE DEPTH 15.0'-17.0'
 NAT. WATER CONTENT 26.5%

 TESTED BY: KAA

GRAIN SIZE DISTRIBUTION TEST REPORT
GANNETT FLEMING, INC.

Figure No. _____

THE COMMONWEALTH OF MASSACHUSETTS
HIGHWAY DEPARTMENT

PLAN AND PROFILE FOR
RAISING

MASKWONICUT STREET
BRIDGE

IN THE TOWN OF

SHARON
NORFOLK COUNTY

THE 1988 STANDARD SPECIFICATIONS FOR HIGHWAYS
AND BRIDGES, THE 1977 CONSTRUCTION STANDARDS,
THE 1988 MANUAL ON UNIFORM TRAFFIC
CONTROL DEVICES FOR STREETS AND HIGHWAYS,
THE 1990 STANDARD DRAWINGS FOR SIGNS AND
SUPPORTS WILL GOVERN.

INDEX

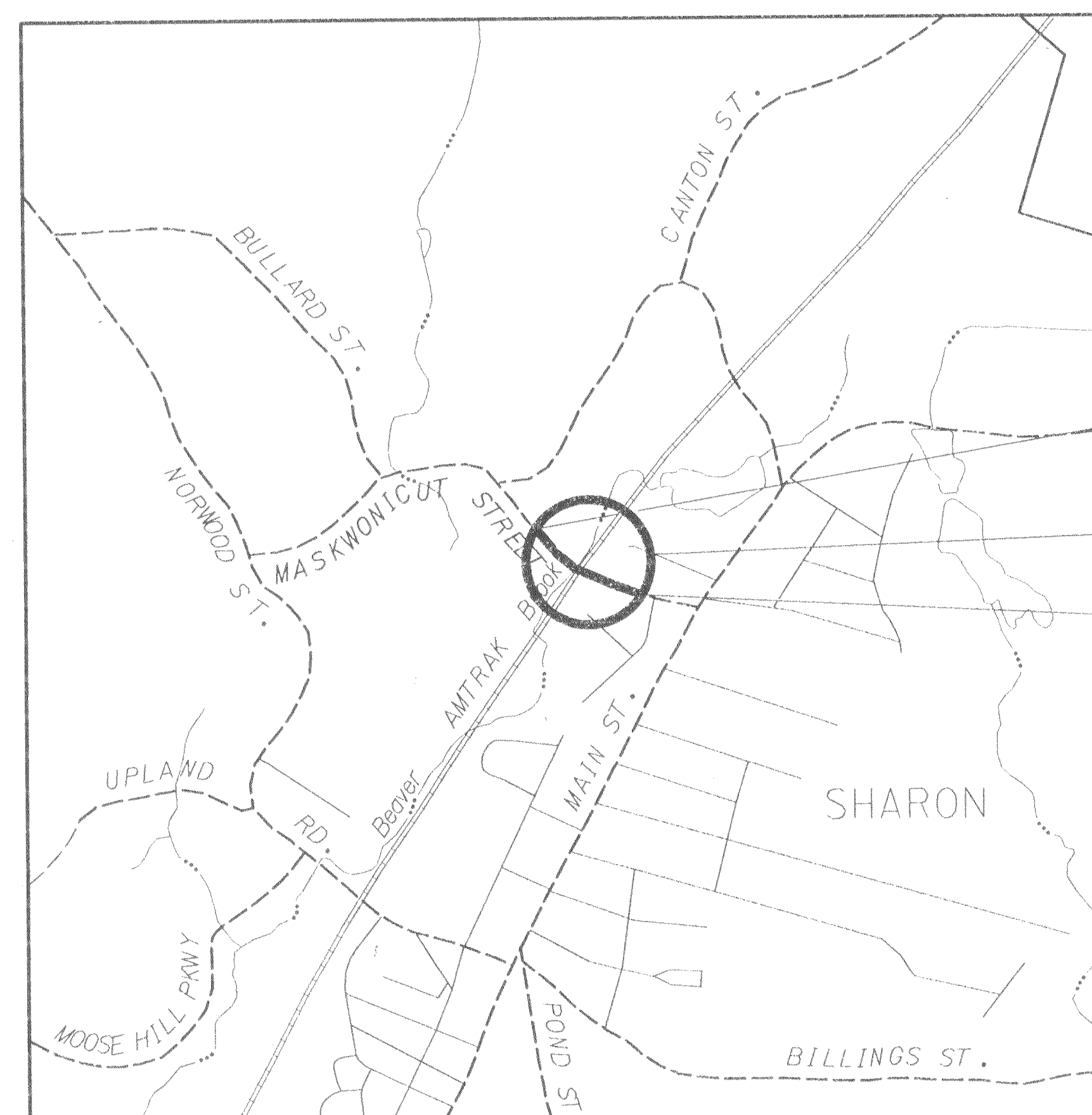
SHEET NO.	DESCRIPTION
1	TITLE SHEET AND INDEX
2	TYPICAL SECTIONS
3	GENERAL NOTES
4	WATER SYSTEM DETAILS
5	DRAINAGE AND EROSION CONTROL DETAILS
6	PLAN
7	TRAFFIC CONTROL PLAN
8	PROFILE
9-12	CROSS SECTIONS
13	GENERAL PLAN
14	GENERAL NOTES AND QUANTITIES
15	NEAR ABUTMENT PLAN
16	FAR RETAINING WALL PLAN
17	RETAINING WALLS A & C
18	RETAINING WALLS B & D
19	RETAINING WALL E AND TYPICAL DETAILS
20	FRAMING PLAN
21	GUARD RAIL AND POST DETAILS
22	PROTECTION BARRIER DETAILS - 1
23	PROTECTION BARRIER DETAILS - 2
24	REINFORCEMENT BAR SCHEDULE

DESIGN DESIGNATION

FUNCT. CLASSIF. = URBAN COLLECTOR
DESIGN SPEED = 30 MPH
ADT (1990) = 1200

90% SUBMISSION

PREPARED BY: **Gannett Fleming/LSTS**
A Joint Venture
KING OF PRUSSIA, PA



BEGINNING OF PROJECT
STA. 11+00

BRIDGE NO. S-9-3

END OF PROJECT
STA. 17+00

LOCATION PLAN

CONVENTIONAL SIGNS

STATE BOUNDARY LINE	---
COUNTY COMM., CITY, TOWN OR R.R. LAYOUT LINE	---
COUNTY, CITY OR TOWN BOUNDARY LINE	---
STATE HIGHWAY LAYOUT LINE	---
ON MYLAR	---
ON CONSTRUCTION PLANS	---
PROPERTY LINES	---
FENCE LINE	---
BASE LINE OR SURVEY LINE	---
PROFILE	---
PROPOSED GRADE	---
PRESENT GRADE	---
ELEVATIONS	---

PRES.
20.66
PROP.
22.48
16+00

PREPARED BY: **Gannett Fleming/LSTS**
A Joint Venture
KING OF PRUSSIA, PENNSYLVANIA

RECOMMENDED FOR APPROVAL

CHIEF ENGINEER _____ DATE _____

APPROVED

COMMISSIONER OF THE
MASSACHUSETTS HIGHWAY DEPARTMENT

ASSOCIATE COMMISSIONER _____

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED

DIVISION ADMINISTRATOR _____ DATE _____

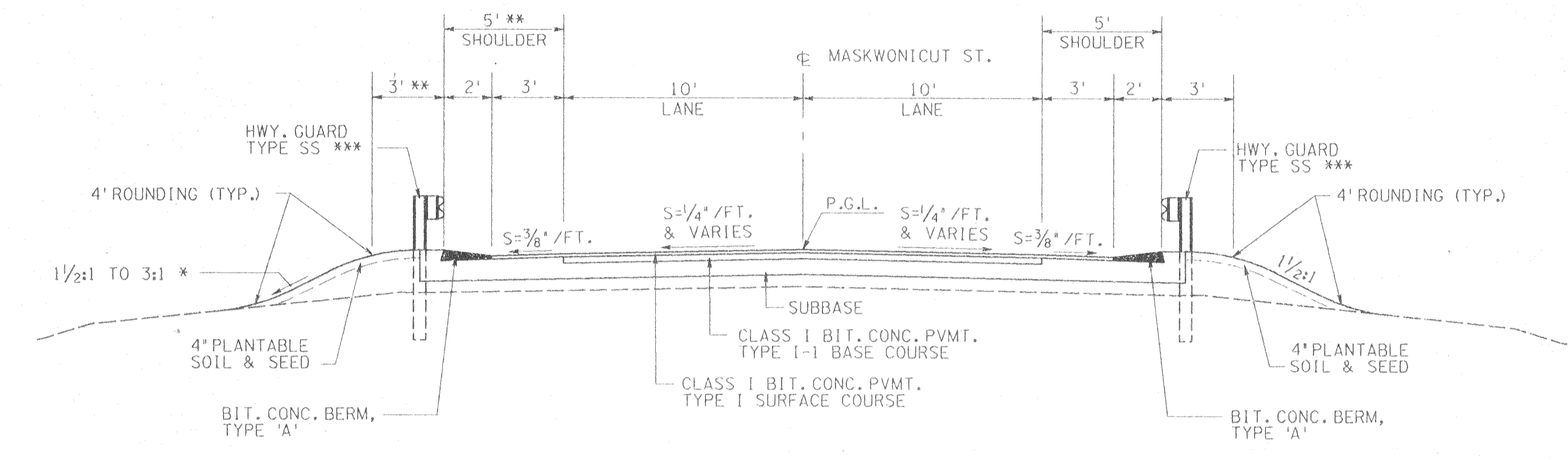
NOTE
LENGTH OF PROJECT = 400.00 FT. = 0.076 MILES ☺

SUPERELEVATION TRANSITION TABLE

STA. 12+40	MATCH EXIST.	MATCH EXIST.
STA. 13+00	1/4"/FT.	1/4"/FT.
STA. 14+20	1/4"/FT.	1/4"/FT.
STA. 14+50	LEVEL	
STA. 14+85	LEVEL	
STA. 15+15	1/4"/FT.	1/4"/FT.
STA. 15+63.34	1/4"/FT.	1/4"/FT.
STA. 16+23.34	1/4"/FT.	1/4"/FT.
STA. 16+50	MATCH EXIST.	MATCH EXIST.

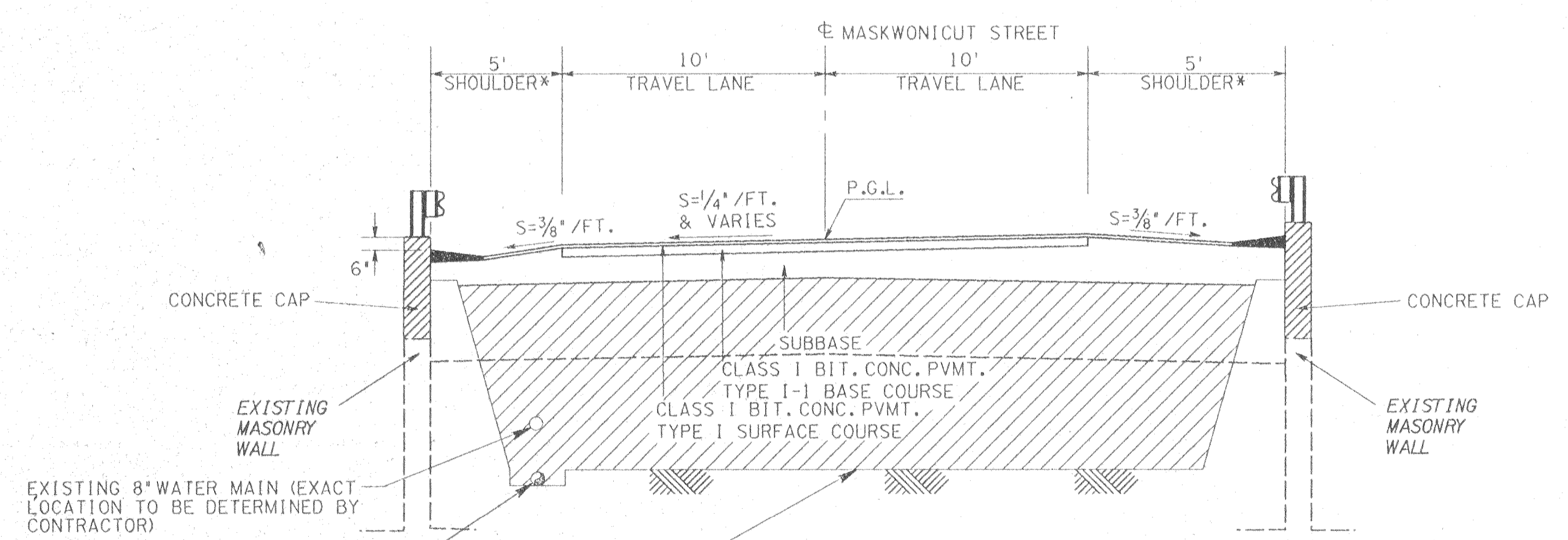
PAVEMENT FOR MASKWONICUT STREET

- SURFACE COURSE: 1 1/2" DEPTH CLASS I BITUMINOUS CONCRETE PAVEMENT TYPE I-1, PLACED IN 1 LAYER, 1 1/2" TOP COURSE MATERIAL.
- BASE COURSE: 3" DEPTH CLASS I BITUMINOUS CONCRETE PAVEMENT TYPE I-1 BASE COURSE MATERIAL, PLACED IN 2 LAYERS, 1 1/2" EACH.
- SUBBASE: 8" DEPTH GRAVEL BORROW SUBBASE COURSE.

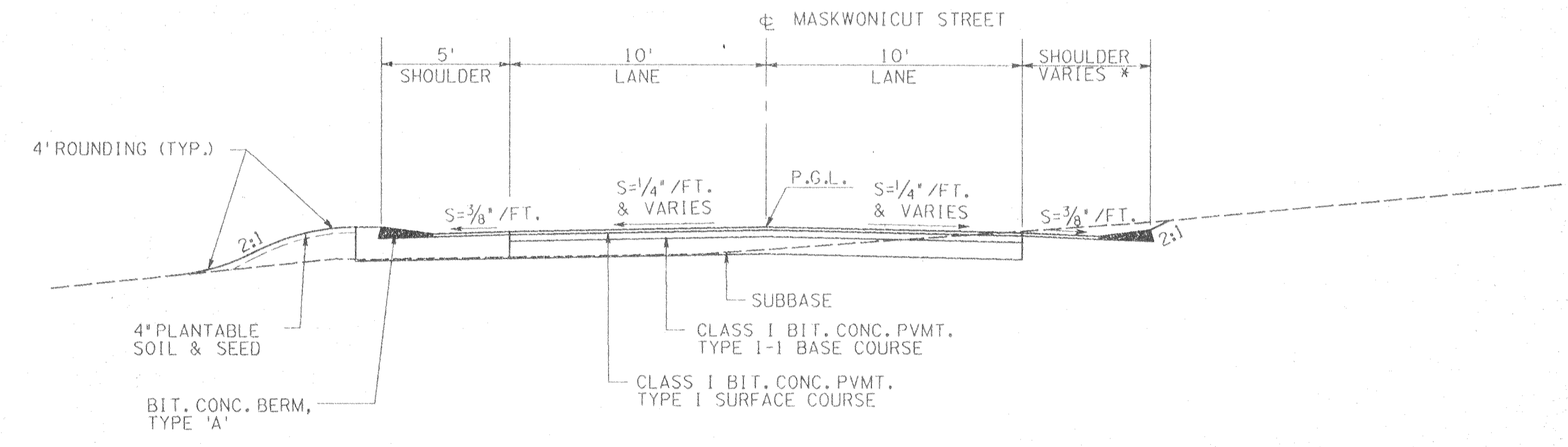


TYPICAL SECTION
 STA. 12+40.00 TO STA. 13+65.00
 STA. 15+19.00 TO STA. 16+00.00
 SCALE: 1/4" = 1'-0"

* SEE CROSS SECTIONS FOR SLOPE
 ** WIDTH VARIES - SEE PLAN
 *** FOR HWY. GUARD LOCATIONS - SEE PLAN



TYPICAL SECTION
 STA. 13+65.00 TO STA. 14+50.28
 STA. 14+84.28 TO STA. 15+19.95
 SCALE: 1/4" = 1'-0"



TYPICAL SECTION
 STA. 16+00.00 TO STA. 16+50.00
 SCALE: 1/4" = 1'-0"

* WIDTH VARIES - SEE PLAN

PUB. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
	MASS.			3	24

GENERAL NOTES

LIST OF PUBLIC UTILITIES

UTILITY	ADDRESS
NEW ENGLAND TELEPHONE & TELEGRAPH CO. MR. MICHAEL BERGERON (508) 820-3555	146 LELAND STREET FRAMINGHAM, MA 01701
BOSTON EDISON MR. JACK RYAN (508) 660-5200	740 MAIN STREET WALPOLE, MA 02081
U.S. SPRINT MR. BRAVA HENSON	3065 CUMBERLAND PARKWAY ATLANTA, GA 30339
MA. CABLE VISIONS MR. BRIAN JOYCE	85 E. BELCHER ROAD FOXBORO, MA 02035
PUBLIC WORKS CITY OF SHARON MR. DAVID MASCIALLELLI	P.O. BOX 517 SHARON, MA 02067

LEGEND

EXISTING	PROPOSED
GUY ANCHOR	HAY BALES
METAL POST	GUARD RAIL - TYPE SS
WATER VALVE	SILT FENCE
SIGN	ROCK CONSTR. ENTRANCE
GAS VALVE	ROCK ENERGY DISSIPATER
MAIL BOX	SOIL TYPE - UDORTHERENTS, SANDY
CATCH BASIN	
MANHOLE	
UTILITY POLLE	
WATER HYDRANT	
WOOD POST	
RAILROAD TRACKS	
FENCE LINE	
EXISTING GUARD RAIL	
STONE WALL	
HEDGE - SHRUBS	
EVERGREEN TREE	
SHRUB	
DECIDUOUS TREE	

GENERAL NOTES:

THE LEGAL LAYOUT LINE ON MASKWONICUT STREET FROM STA. 11+00 TO STA. 17+00 VARIES FROM FIFTY (50) FEET TO TWENTY-EIGHT (28) FEET. THIS IS BASED ON TAX MAP NO.'S 111 AND 119, DATED AUG. 29, 1990.

ALL CURVE DATA IS BASED ON THE ARC DEFINITION UNLESS OTHERWISE INDICATED.

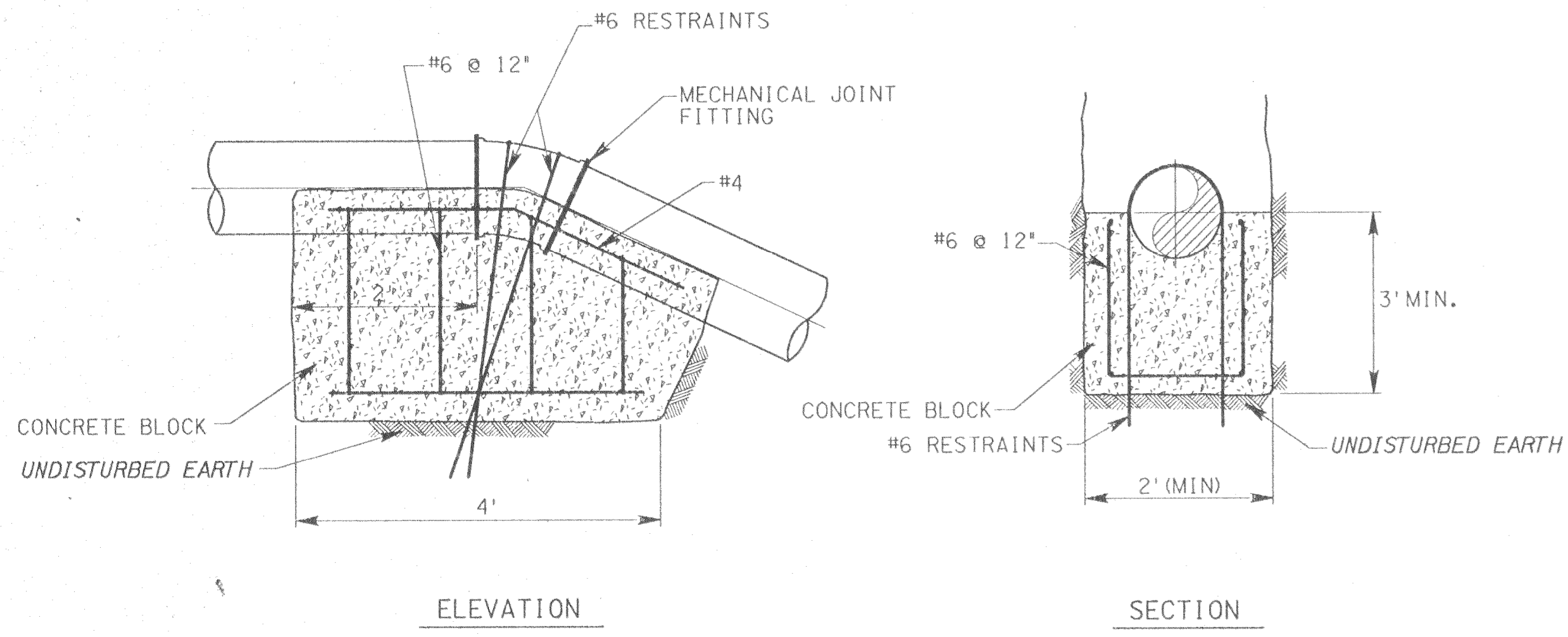
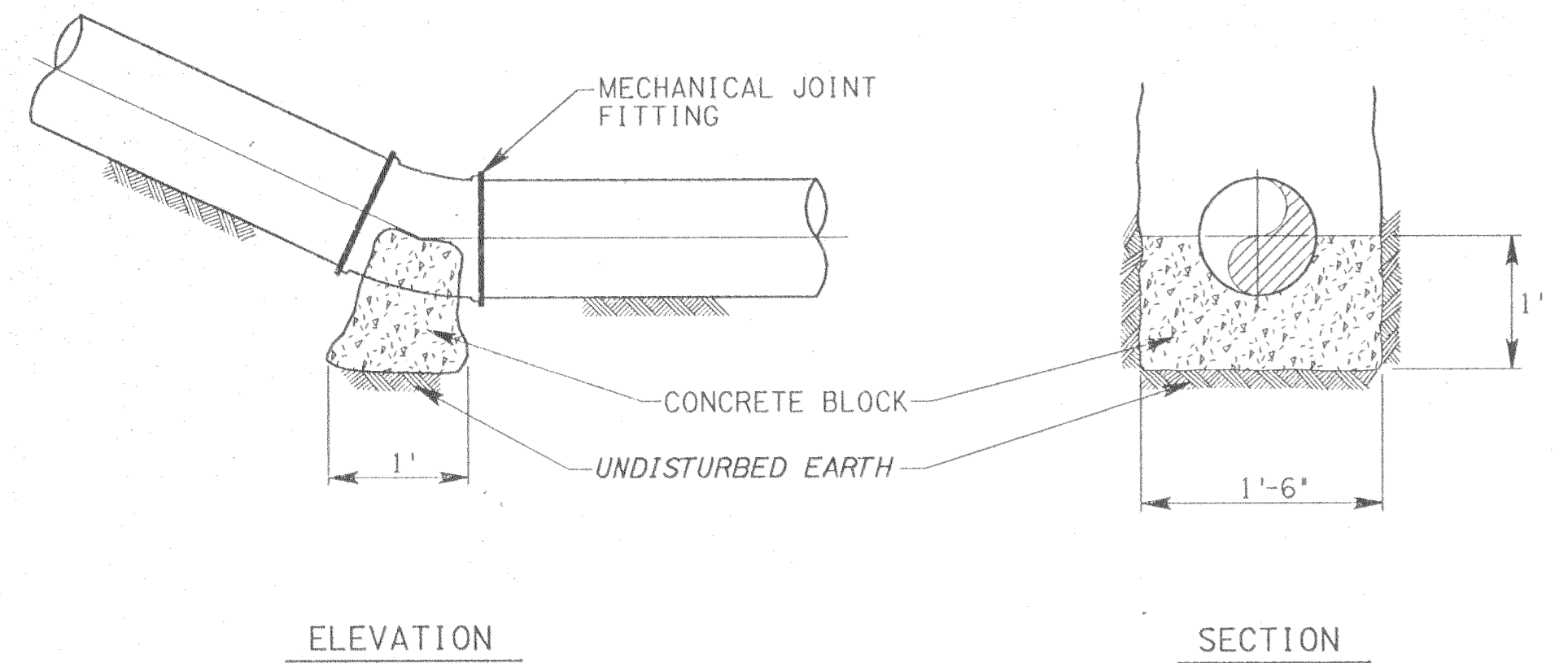
CONSTRUCT PROJECT IN ACCORDANCE WITH THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, DATED 1988.

TOPOGRAPHIC SURVEY AND BASEMAPPING PERFORMED BY DIVERSIFIED TECHNOLOGIES CORPORATION, NORTH HAVEN, CONNECTICUT.

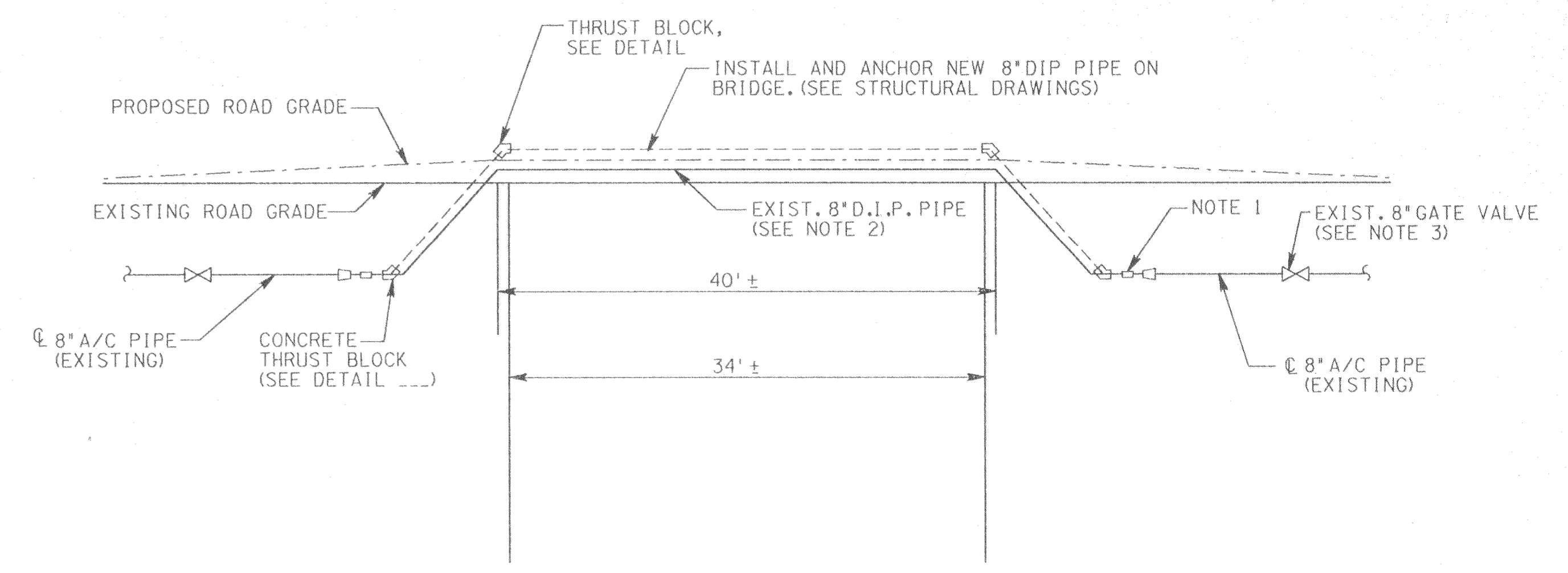
HORIZONTAL AND VERTICAL CONTROL BASED ON NORTH AMERICAN DATUM, 1983.

LIST OF M. H. D. CONSTRUCTION STANDARDS

PLATE NO.	DESCRIPTION
106.1.0	BERM - TYPE A, BITUMINOUS CONCRETE
104.1.0	BITUMINOUS CONCRETE LAYERS - METHOD OF STEPPING
103.1.0	SLOPES - METHOD OF ROUNDING
401.7.0	STEEL BEAM HIGHWAY GUARD - TYPE SS
401.1.0	STEEL BEAM HIGHWAY GUARD - TYPE SS
401.8.0	STEEL BEAM HIGHWAY GUARD - TYPE SS
210.1.0	EROSION CONTROL



VERTICAL REACTION BACKINGS
N.T.S.



- NOTES:
1. TIE-INTO EXISTING WATER MAIN WITH 8" SIZE, LONG PATTERN, MECHANICAL JOINT SLEEVES. CONTRACTOR SHALL VERIFY DEPTH, SIZE AND MATERIAL TYPE OF UNDERGROUND WATER MAIN BEFORE CUTTING EXISTING PIPE AND BEFORE ORDERING THE SLEEVES.
 2. CONTRACTOR SHALL REMOVE AND DISPOSE OF EXISTING 8-INCH DI PIPE ON BRIDGE. EXISTING INSULATION SHALL BE REMOVED AND STORED FOR REPLACEMENT ON THE NEW, RELOCATED 8-INCH PIPE.
 3. CONTRACTOR SHALL CONTACT OWNER FOR OPERATION OF GATE VALVES FOR SHUTDOWN. CONTACT ENGINEER FOR RESTRAINT DESIGN BEFORE CUTTING PIPE IF ANY VALVE IS LOCATED LESS THAN 10 FEET FROM A CUT-POINT. PIPE ENDS SHALL BE CAPPED AND BLOCKED FOR DURATION OF PIPE REMOVAL UNTIL REPLACEMENT IS TIED IN.

8" WATER MAIN - BRIDGE CROSSING
N.T.S.

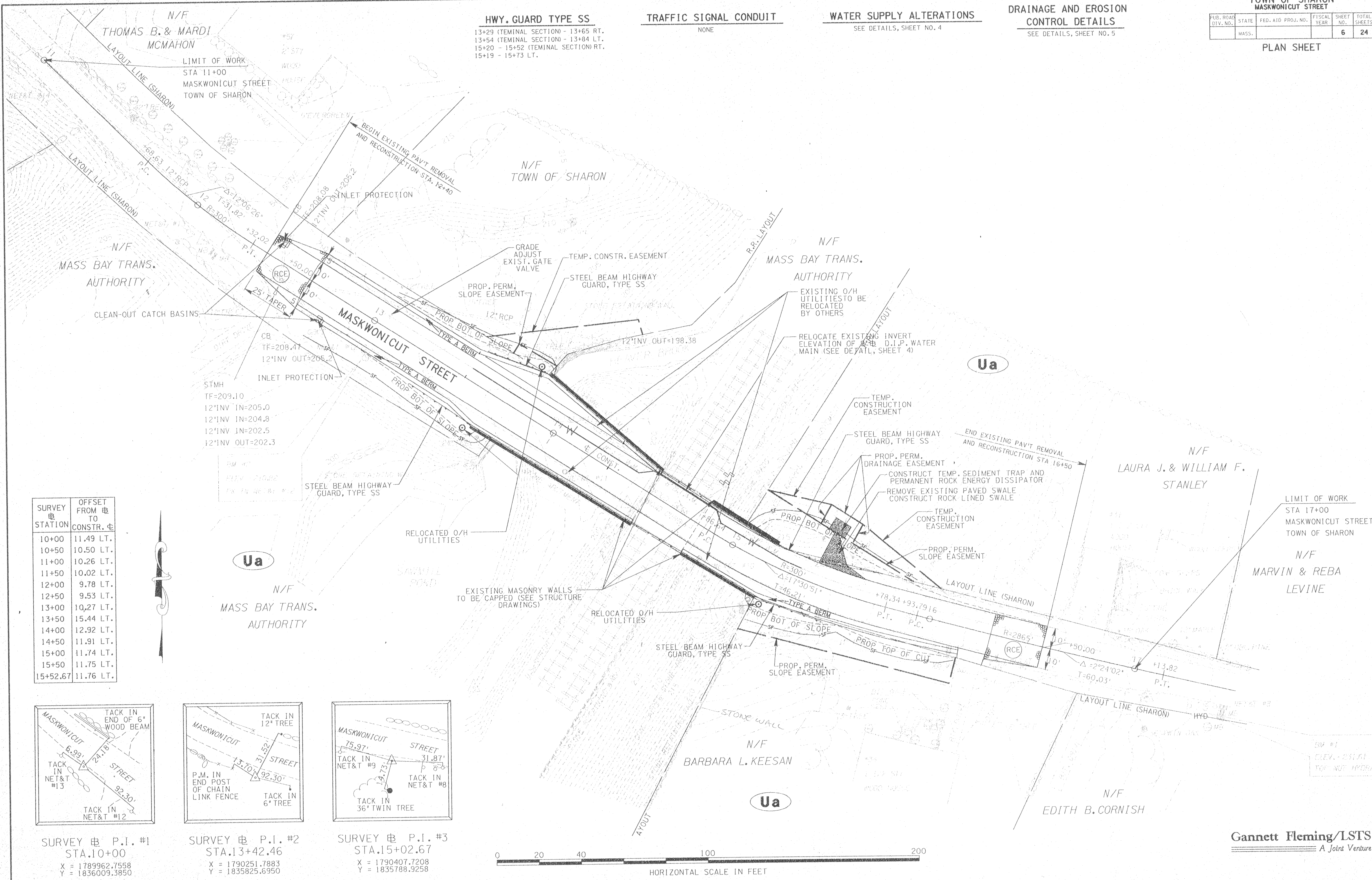
PUB. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
	MASS.			6	24

HWY. GUARD TYPE SS
13+29 (TERMINAL SECTION) - 13+65 RT.
13+54 (TERMINAL SECTION) - 13+84 LT.
15+20 - 15+52 (TERMINAL SECTION) RT.
15+19 - 15+73 LT.

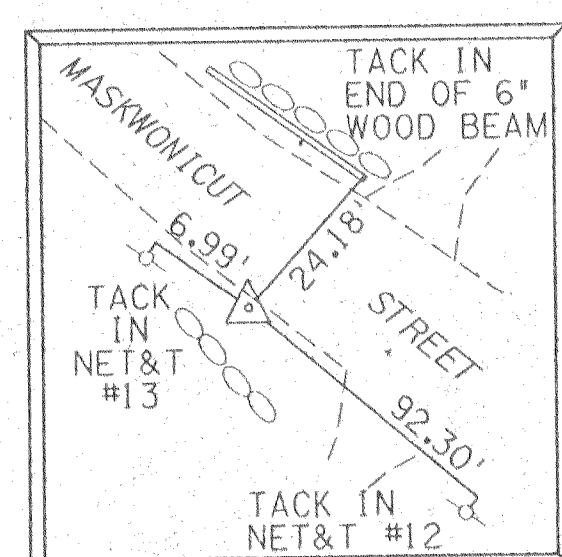
TRAFFIC SIGNAL CONDUIT
NONE

WATER SUPPLY ALTERATIONS
SEE DETAILS, SHEET NO. 4

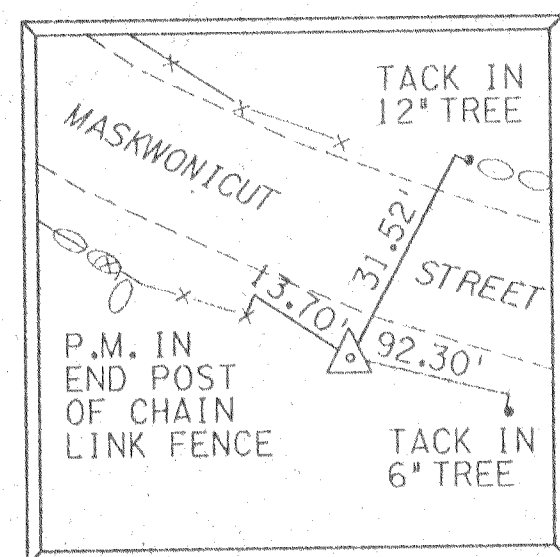
DRAINAGE AND EROSION CONTROL DETAILS
SEE DETAILS, SHEET NO. 5



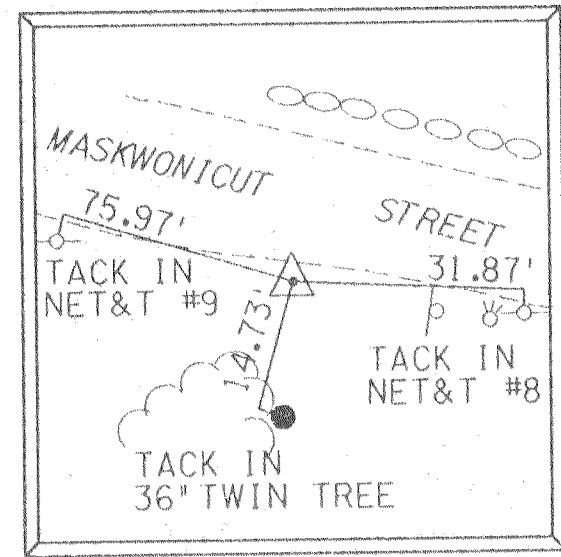
SURVEY STATION	OFFSET FROM ELECT TO CONSTR. C
10+00	11.49 LT.
10+50	10.50 LT.
11+00	10.26 LT.
11+50	10.02 LT.
12+00	9.78 LT.
12+50	9.53 LT.
13+00	10.27 LT.
13+50	15.44 LT.
14+00	12.92 LT.
14+50	11.91 LT.
15+00	11.74 LT.
15+50	11.75 LT.
15+52.67	11.76 LT.



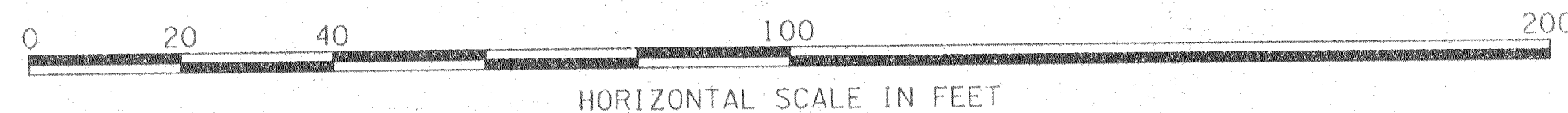
SURVEY P.I. #1
STA. 10+00
X = 1789962.7558
Y = 1836009.3850



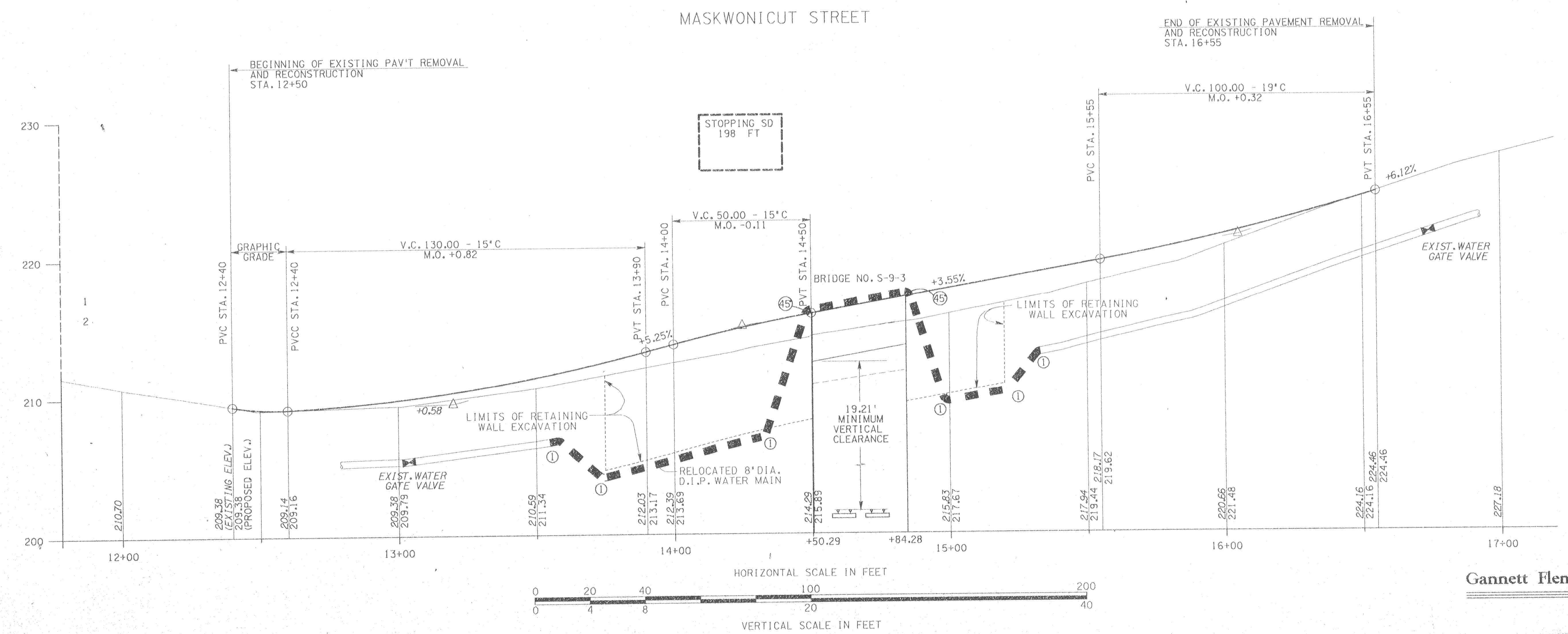
SURVEY P.I. #2
STA. 13+42.66
X = 1790251.7883
Y = 1835825.6950



SURVEY P.I. #3
STA. 15+02.67
X = 1790407.7208
Y = 1835788.9258



- ① TO DETERMINE ANGLE OF BENDS IN FIELD.
- ② CONTRACTOR TO LOCATE EXISTING 8" PIPELINE IN GROUND BY TEST EXCAVATION AND VERIFY LOCATION, DEPTH, AND OUTSIDE DIAMETER PRIOR TO ANY DEMOLITION OR RELOCATION WORK.

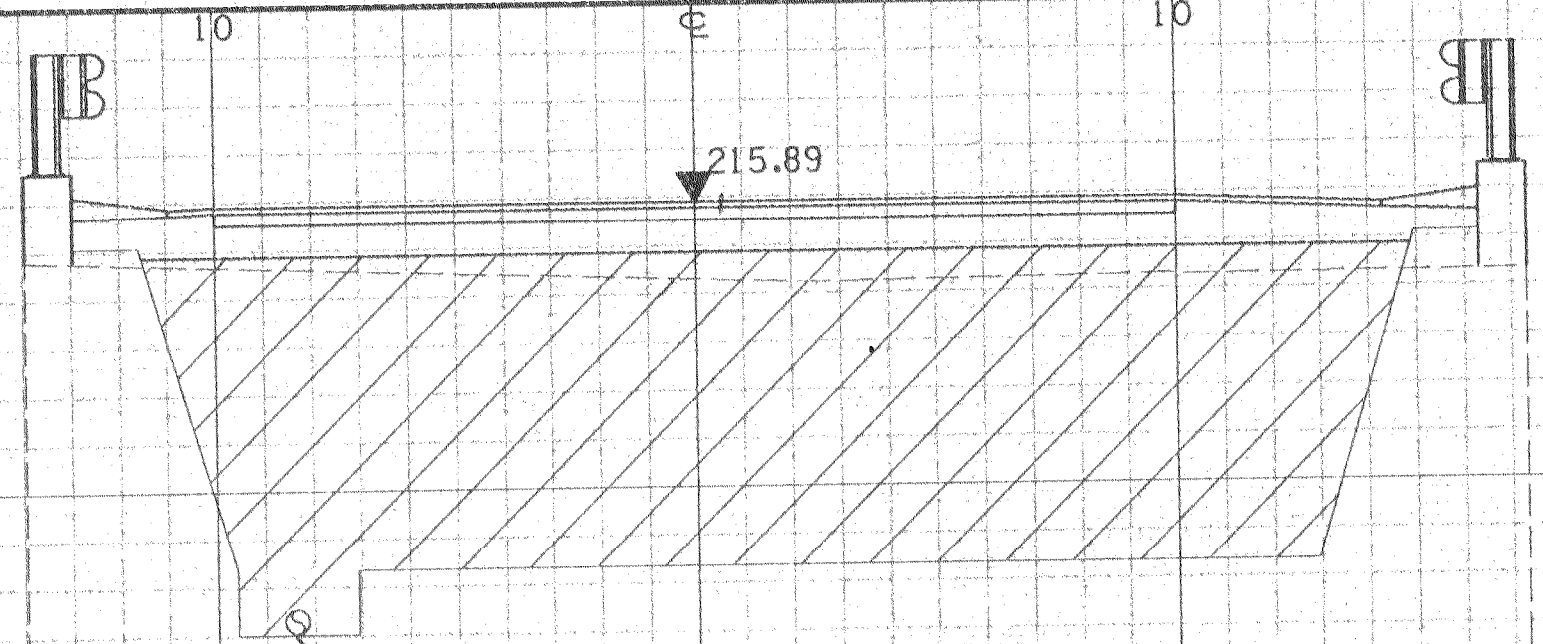


TOWN OF SHARON
MASKWONICUT STREET

PUB. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEET
	MASS.			10	24

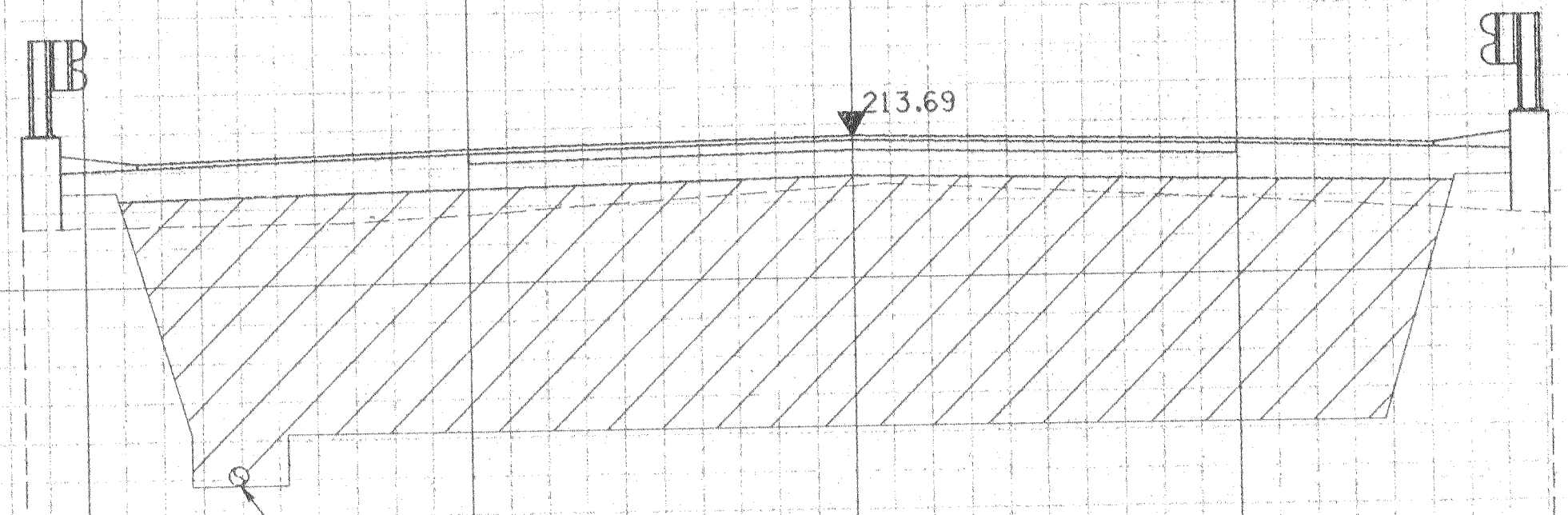
CROSS SECTION
STA. 13+50 TO STA. 14+50

PRELIMINARY	
C. 3	F. 13
FINAL	
C. 0	F. 14
T.C.	T.F.



PROPOSED LOCATION OF
8'D. I.P. IN TRENCH
(AREA = 3.3 SQ. FT.)

14+50



PROPOSED LOCATION OF
8'D. I.P. IN TRENCH
(AREA = 3.3 SQ. FT.)

14+00

STA 13+84
BEGIN LIMITS OF BRIDGE EXCAVATION AND
LIGHTWEIGHT FILL

STA 13+84
END STEEL BEAM HIGHWAY GUARD TYPE SS
AT RETAINING WALL

STA 13+65
BEGIN LIMITS OF BRIDGE EXCAVATION AND
LIGHTWEIGHT FILL

STA 13+65
END STEEL BEAM HIGHWAY GUARD TYPE SS
AT RETAINING WALL

PRELIMINARY	
C. 5	F. 29
FINAL	
C. 0	F. 21
T.C.	T.F.

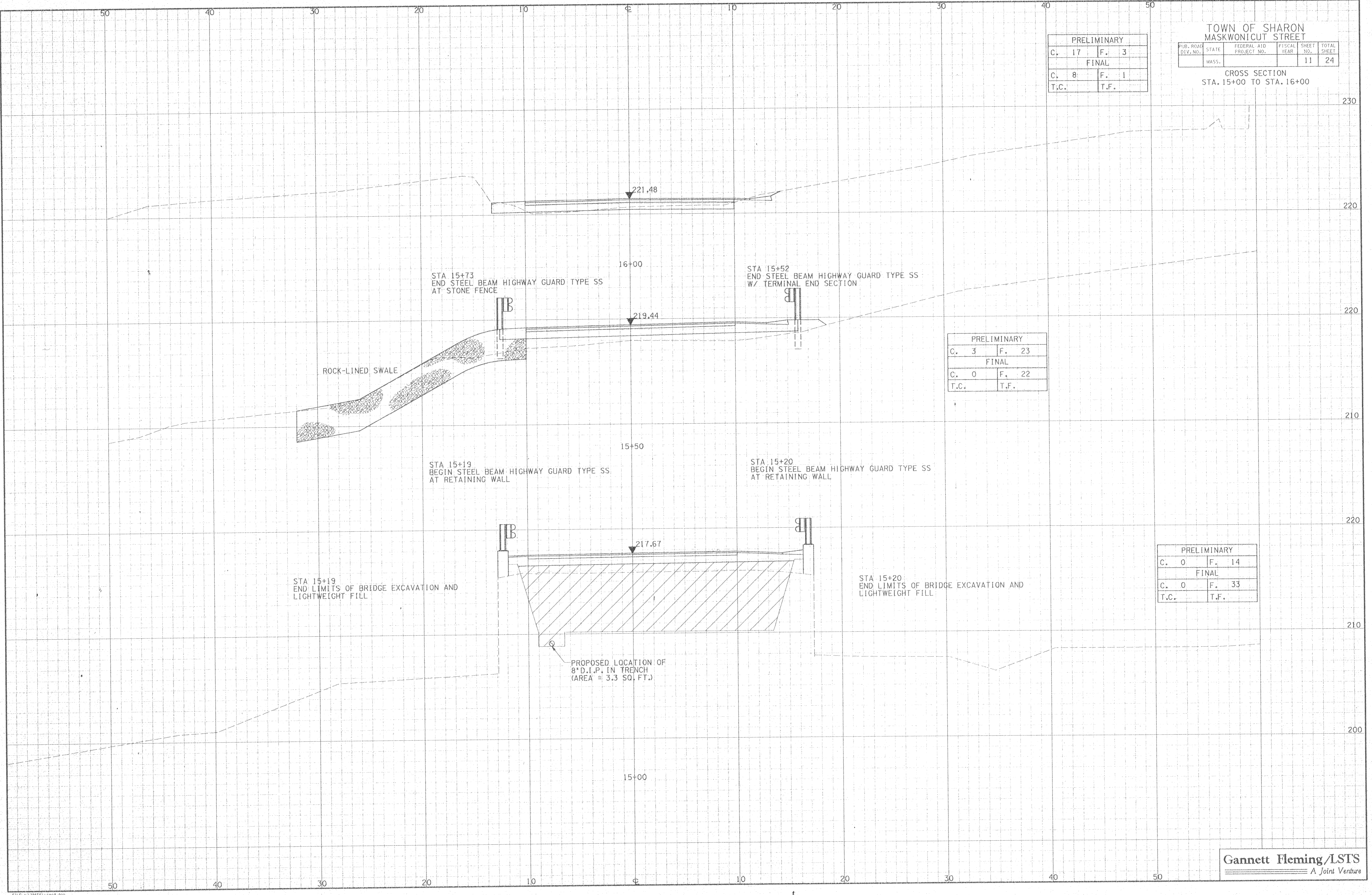
STA 13+54
BEGIN STEEL BEAM HIGHWAY GUARD TYPE SS
W/ TERMINAL END SECTION

STA 13+29
BEGIN STEEL BEAM HIGHWAY GUARD TYPE SS
W/ TERMINAL END SECTION

211.34

13+50

PRELIMINARY	
C. 17	F. 11
FINAL	
C. 6	F. 8
T.C.	T.F.



PRELIMINARY			
C.	17	F.	3
FINAL			
C.	8	F.	1
T.C.		T.F.	

TOWN OF SHARON MASKWONICUT STREET				
PUB. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	FISCAL YEAR	TOTAL SHEET
	MASS.			11
CROSS SECTION STA. 15+00 TO STA. 16+00				24

PRELIMINARY			
C.	3	F.	23
FINAL			
C.	0	F.	22
T.C.		T.F.	

PRELIMINARY			
C.	0	F.	14
FINAL			
C.	0	F.	33
T.C.		T.F.	

GENERAL NOTES

DESIGN

IN ACCORDANCE WITH THE 1983 SPECIFICATIONS OF THE AMERICAN ASSOCIATION OF STATE HIGHWAYS & TRANSPORTATION OFFICIALS AND INTERIM SPECIFICATION TO 1992, EXCEPT STRUCTURE HAS A WEIGHT LIMIT OF 9 TONS.

VERIFY ALL DIMENSIONS AND GEOMETRY OF THE EXISTING STRUCTURE IN THE FIELD AS NECESSARY FOR PROPER FIT OF THE PROPOSED CONSTRUCTION.

ALL DIMENSIONS ARE HORIZONTAL, EXCEPT AS NOTED, AND ARE MEASURED AT 68°F.

SCALES

SCALES AS NOTED ON PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS.

CONCRETE MIXES

	(1)	(2)	(3)
CLASS A DENOTES:	4000	1 1/2	565
CLASS D DENOTES:	4000	3/4	610

- (1) 28 - DAY COMPRESSIVE STRENGTH (P.S.I.)
- (2) MAXIMUM AGGREGATE SIZE (INCHES)
- (3) CEMENT CONTENT (LB/C.Y.)

CEMENT SHALL CONFORM TO AASHTO DESIGNATION M85

CLASS A CONCRETE SHALL BE USED IN THE ABUTMENTS, BRIDGE SEATS AND RETAINING WALLS.

CLASS D CONCRETE SHALL BE USED IN THE BACKWALLS AND CHEEKWALLS.

CEMENT CONCRETE BACKWALLS AND CHEEKWALLS SHALL BE POURED AFTER THE SUPERSTRUCTURE HAS BEEN RESET IN PLACE.

CHAMFER EXPOSED CONCRETE EDGES 3/4", EXCEPT AS NOTED.

REINFORCEMENT

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF ASTM DESIGNATION A615, GRADE 60.

UNLESS OTHERWISE SHOWN ON THE PLANS, ALL #4 BARS SHALL BE LAPPED 24" AND ALL #5 BARS SHALL BE LAPPED 39" FOR HORIZONTAL BARS WITH 12" OR MORE OF CONCRETE BELOW THE BAR. THE LAP LENGTHS SHALL BE 33" FOR #4 BARS AND 44" FOR #5 BARS. IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON PLANS.

REINFORCEMENT SHALL BE PLACED TO CLEAR ANCHOR BOLTS.

PROVIDE TWO (2) INCHES OF COVER TO REINFORCING STEEL EXCEPT AS NOTED.

ALL REINFORCEMENT IS TO BE EPOXY COATED WITH THE EXCEPTION OF DOWEL BARS.

REINFORCEMENT BAR SCHEDULE IS FOR INFORMATION ONLY, AND MUST BE VERIFIED PRIOR TO BIDDING AND FABRICATION.

BENCH MARK

SEE ROADWAY CONTRACT DRAWINGS

FOUNDATIONS

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

THE APPROXIMATE ELEVATION OF BOTTOM OF EXISTING FOOTINGS IS 189.30'.

UNSUITABLE MATERIAL

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

TIMBER

NEW TIMBER SHALL BE DOUGLAS-FIR LARCH SELECT STRUCTURAL DENSE NO.1 AND CONFORM TO THE REQUIREMENTS OF AASHTO M168.

MASONRY

ALL MASONRY RESTORATION SHALL BE DONE PRIOR TO REMOVAL OF EXISTING BRIDGE SEATS, BACKWALLS AND PORTIONS OF RETAINING WALLS.

STRUCTURAL STEEL

STRUCTURAL STEEL SHALL CONFORM TO THE REQUIREMENTS OF ASTM A709, GRADE 36 (AASHTO M270), EXCEPT AS NOTED. ASTM A709, GRADE 36 AND AASHTO M270 IS EQUIVALENT TO ASTM A36 AND AASHTO M183, RESPECTIVELY.

ALL POSTS SHALL BE FABRICATED AND ERECTED SO AS TO BE VERTICAL AND PARALLEL TO EACH OTHER. POSTS SHALL GENERALLY BE DETAILED, FABRICATED AND ERECTED TO FOLLOW THE LOCAL SLOPE OF THE BRIDGE.

ALL BOLTS SHALL BE ASTM A325 EXCEPT AS NOTED.

LAG SCREWS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A307.

ALL STRUCTURAL STEEL, FASTENERS, BOLTS, NUTS AND WASHERS SHALL BE GALVANIZED, EXCEPT AS NOTED.

SET ANCHOR BOLTS TO TEMPLATE. DO NOT DRILL HOLES UNLESS SPECIFICALLY INDICATED ON PLANS.

ALUMINUM

ALL POSTS SHALL BE FABRICATED AND ERECTED SO AS TO BE VERTICAL AND PARALLEL TO EACH OTHER. FILLER MEMBERS BETWEEN POSTS SHALL GENERALLY BE DETAILED, FABRICATED AND ERECTED TO FOLLOW THE LOCAL SLOPE OF THE BRIDGE.

ALL NEW STRUCTURAL SHAPES TO BE ALUMINUM DESIGNATION 6061-76, EXCEPT AS NOTED.

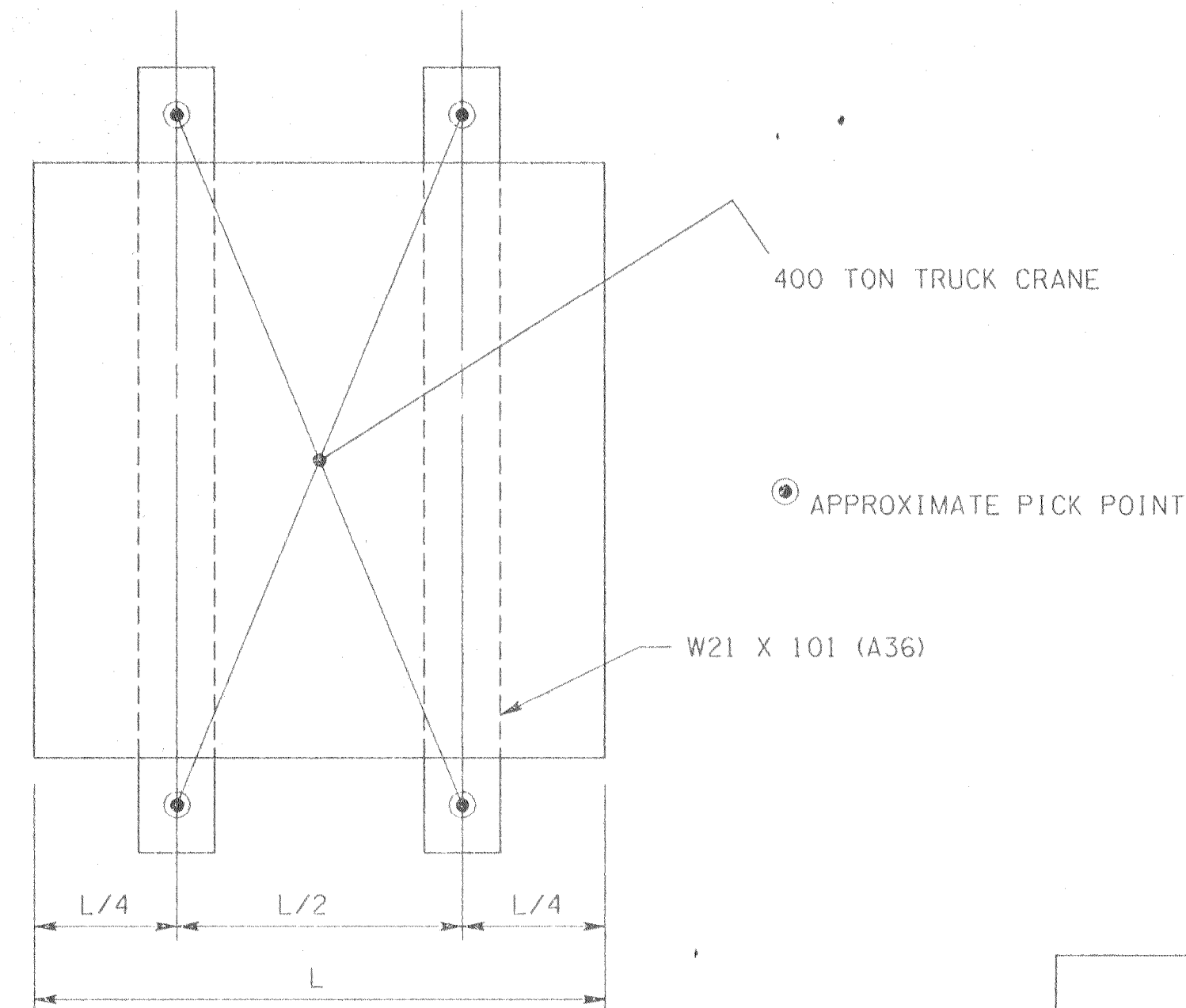
ALUMINUM BOLTS, NUTS AND WASHERS SHALL BE OF ALUMINUM ALLOY 2024-T4 AND/OR 6061-76, UNLESS OTHERWISE NOTED.

STAINLESS STEEL FASTENER HARDWARE WHICH IS TO BE IN CONTACT WITH ALUMINUM SHALL BE ASTM A320., UNLESS OTHERWISE NOTED.

UTILITY NOTES

COORDINATE THE REQUIREMENTS FOR PROTECTION AND/OR RELOCATION OF UTILITIES WITH THE UTILITY OWNER PRIOR TO STARTING WORK.

VERIFY AND LOCATE ALL EXISTING UTILITIES PRIOR TO STARTING WORK; CONDUCT OPERATIONS IN A MANNER WHICH ENSURES THAT THE UTILITIES WILL NOT BE DISTURBED OR ENDANGERED, AND ASSUME FULL RESPONSIBILITY FOR ANY DAMAGE TO UTILITIES DURING CONSTRUCTION. THE DEPARTMENT DOES NOT ASSUME RESPONSIBILITY FOR REIMBURSEMENT PARTICIPATION IN DESIGN AND/OR REVISIONS OR LIABILITY FOR ACCURACY OF TYPE, SIZE AND LOCATION OF ANY UTILITY.



NOTES:

1. ABOVE SCHEME IS CONCEPTUAL. BRACING FOR BEAMS NOT SHOWN. CONTRACTOR MUST VERIFY AND PROVIDE ADEQUATE BEAM SIZE, BRACING, CRANE SIZE AND RELATED LIFTING ITEMS TO ACCOMMODATE THE LOADS GIVEN AND AN ALLOWABLE DEFLECTION OF 3/4" PER BEAM.
2. CONTRACTOR SHALL COORDINATE LIFTING PROCEDURES WITH THE UTILITY OWNERS.
3. CONTRACTOR SHALL WORK WITHIN THE TIME LIMITS AND THE REQUIREMENTS OF AMTRAK.
4. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
5. APPROXIMATE ACTUAL TOTAL WEIGHT OF SUPERSTRUCTURE= 92 KIPS.
6. APPROXIMATE ACTUAL PICK POINT LOAD IS 23 KIPS.

CONCEPTUAL SUPERSTRUCTURE LIFTING PROCEDURE

N.T.S.

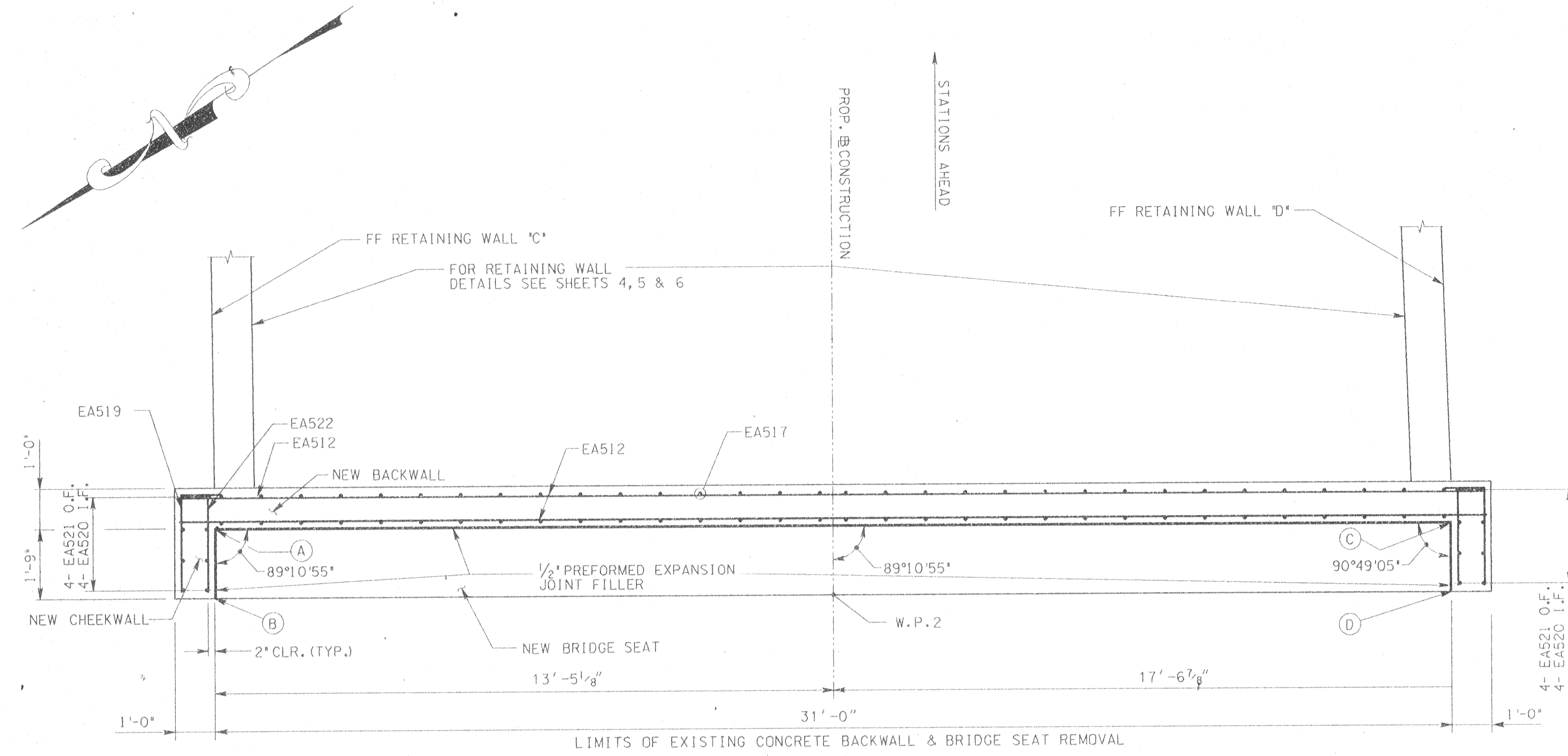
ESTIMATE OF QUANTITIES

DESCRIPTION	UNIT	QUANTITY
RAISE EXISTING SUPERSTRUCTURE	L.S.	L.S.
BRIDGE EXCAVATION	C.Y.	1,086
LIGHTWEIGHT FILL	C.Y.	872
DEMOLITION	L.S.	L.S.
DRILLING DOWEL HOLES (1 5/8 IN.)	L.F.	524
CLASS D 4000 PSI, 3/4", 610 CONC.	C.Y.	6
CLASS A 4000 PSI, 1 1/2", 565 CONC.	C.Y.	79
REPOINTING MASONRY	S.F.	3,704
MASONRY CONSOLIDATION	C.Y.	6
STEEL REINFORCEMENT FOR STRUCTURES	LBS.	1,140
EPOXY COATED STEEL REINFORCEMENT FOR STRUCTURES	LBS.	10,180
PREFORMED EXPANSION JOINT FILLER	S.F.	230
GRAVEL BORROW	C.Y.	15
BITUMINOUS DAMP-PROOFING	S.Y.	255
STRUCTURAL STEEL	LBS.	13,337
TIMBER BEAM	MBM	0.4
HIGHWAY GUARD (STRUCTURE)	L.F.	571
PROTECTIVE BARRIER	L.F.	68

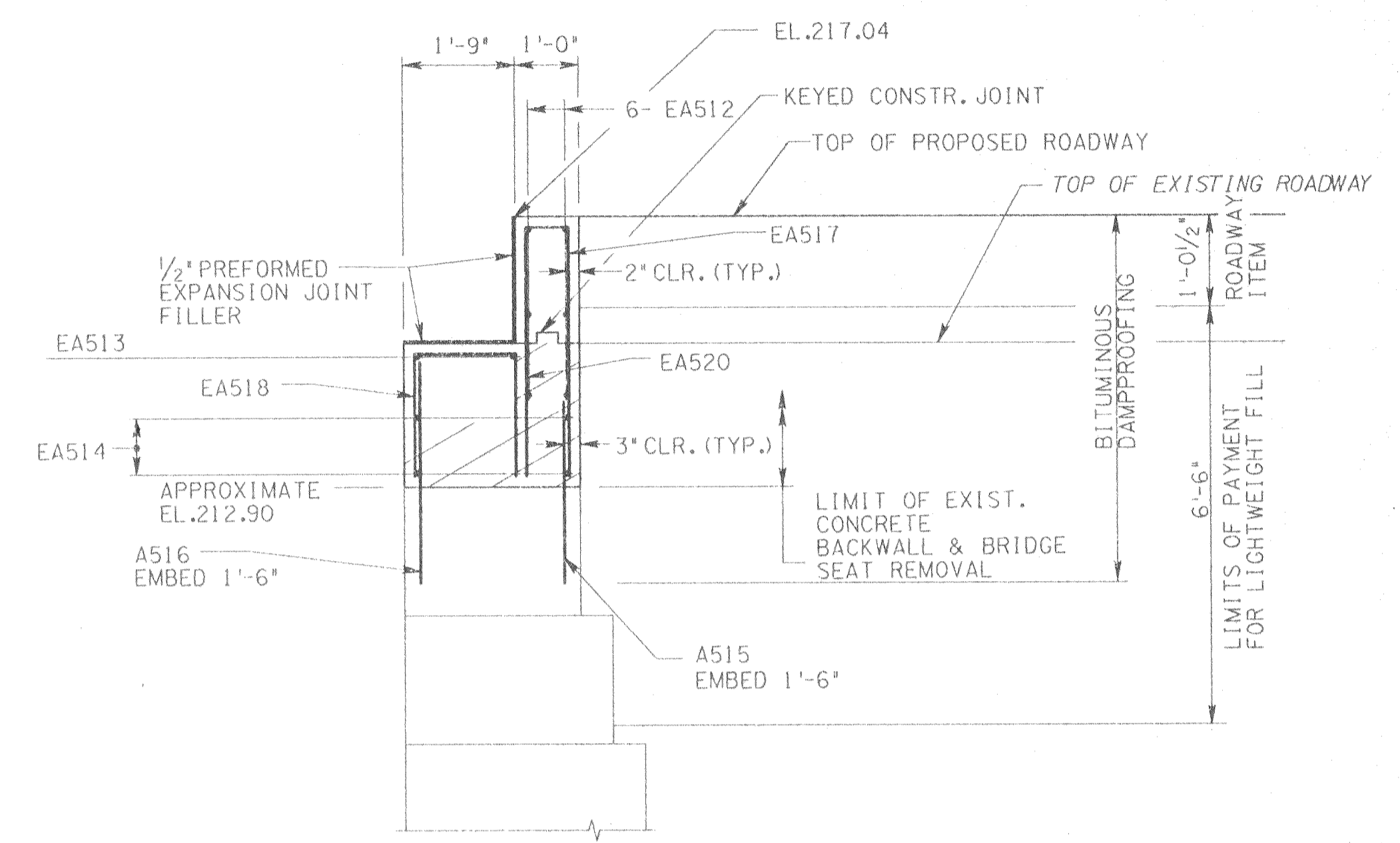
NOTES:

1. THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS AND IS IN NO WAY WARRANTED TO INDICATE THE TRUE CONDITIONS OF ACTUAL QUANTITIES OR DISTRIBUTION OF QUANTITIES OF WORK WHICH WILL BE REQUIRED

<table border="1"> <tr> <th colspan="3">REVISIONS</th> </tr> <tr> <th>NO.</th> <th>DATE</th> <th>BY</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>	REVISIONS			NO.	DATE	BY																									MASSACHUSETTS HIGHWAY DEPARTMENT	
	REVISIONS																															
	NO.	DATE	BY																													
RECONSTRUCTION OF MASSACHUSETTS BRIDGE NO. S-9-3 R.R. O.H. BRIDGE NO. 211.62 MASKWONICUT STREET SHARON MASSACHUSETTS																																
GENERAL NOTES & QUANTITIES STA. 13+65 THRU STA. 15+20 SHEET 2 OF 12																																
CHECKED BY <u>RCK</u> DATE <u>4/94</u> SCALE <u>NONE</u>																																

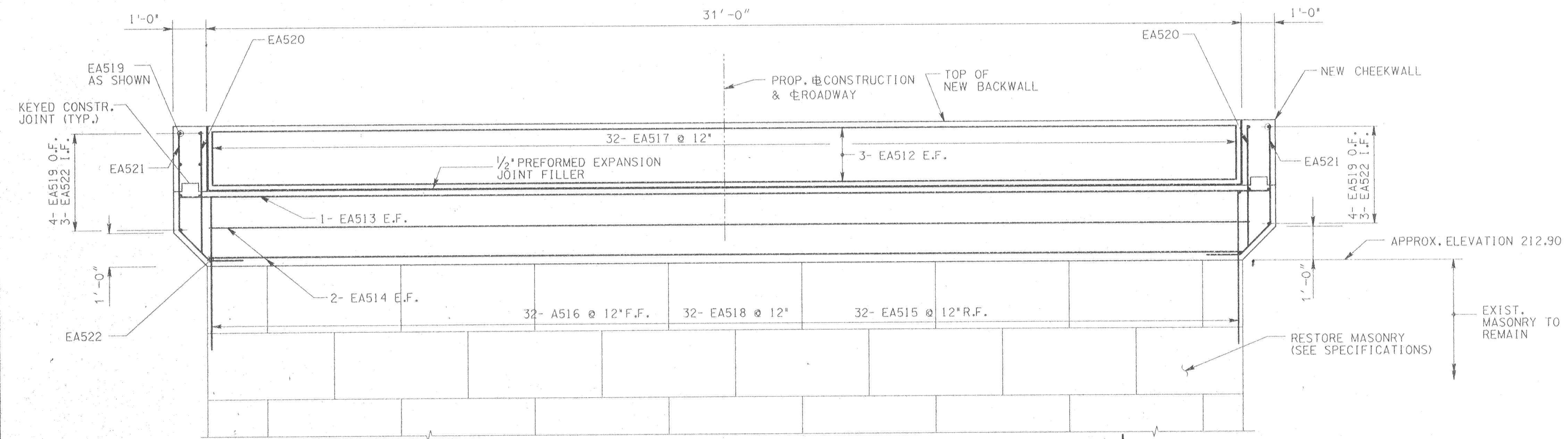


FAR ABUTMENT PLAN (BRIDGE SEAT REINFORCING STEEL NOT SHOWN)
SCALE: 1/2" = 1'-0"



SECTION B-B
SCALE: 1/4" = 1'-0"

CONCRETE BRIDGE SEAT ELEVATIONS	
LOC.	EL.
A	215.08
B	215.02
C	215.08
D	215.02



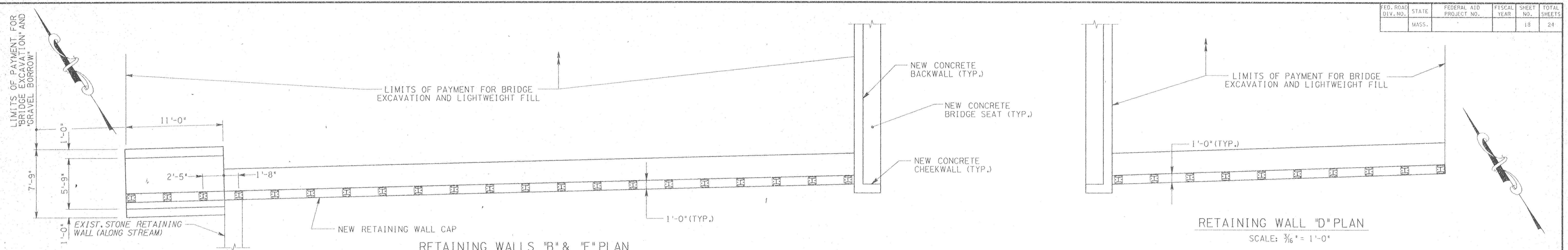
FAR ABUTMENT ELEVATION
SCALE: 1/2" = 1'-0"

- NOTES:
- FOR GENERAL NOTES, SEE SHEET 2.
 - THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS AND IS IN NO WAY WARRANTED TO INDICATE THE TRUE CONDITIONS OF ACTUAL QUANTITIES OR DISTRIBUTION OF QUANTITIES OF WORK WHICH WILL BE REQUIRED.
 - CEMENT CONCRETE IN BACKWALL AND CHEEKWALLS SHALL BE POURED AFTER THE SUPERSTRUCTURE HAS BEEN RESET IN PLACE.
 - BACKWALL AND CHEEKWALLS SHALL BE CLASS D CEMENT CONCRETE. BRIDGE SEAT SHALL BE CLASS A CEMENT CONCRETE.
 - DOWEL HOLES ARE TO BE DRILLED 1 5/8" AND FILLED WITH NON-SHRINK GROUT.
 - FOR KEYED CONSTRUCTION JOINT DETAIL SEE SHEET 7.

*PROVIDE ADDITIONAL PREFORMED EXPANSION JOINT FILLER AS REQUIRED TO PROVIDE FULL CONTACT BEARING SURFACE UNDER IRREGULARLY NOTCHED BEAMS.

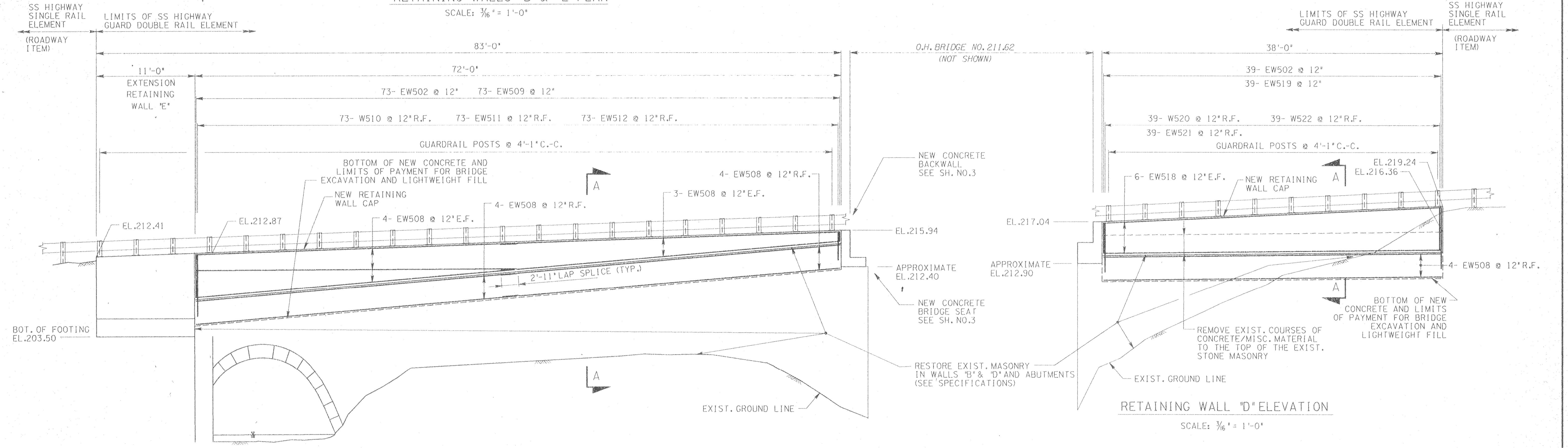
Gannett Fleming/LSTS
A Joint Venture

REVISIONS			MASSACHUSETTS HIGHWAY DEPARTMENT	
NO.	DATE	BY		
			RECONSTRUCTION OF MASSACHUSETTS BRIDGE NO. S-9-3 R.R. O.H. BRIDGE NO. 211.62 MASKWONICUT STREET SHARON MASSACHUSETTS	
			FAR ABUTMENT	
			STA. 13+65 THRU STA. 15+20	
			SHEET 4 OF 12	
			CHECKED BY	RCK DATE 4/94 SCALE AS NOTED



RETAINING WALLS "B" & "E" PLAN
SCALE: 3/16" = 1'-0"

RETAINING WALL "D" PLAN
SCALE: 3/16" = 1'-0"



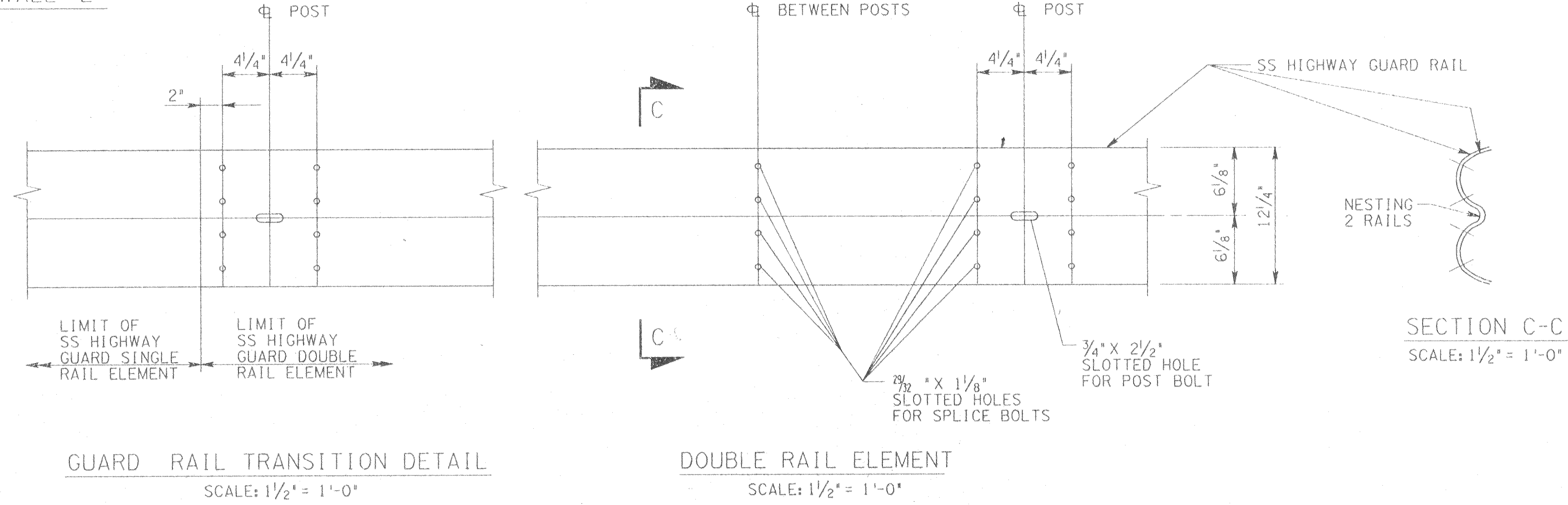
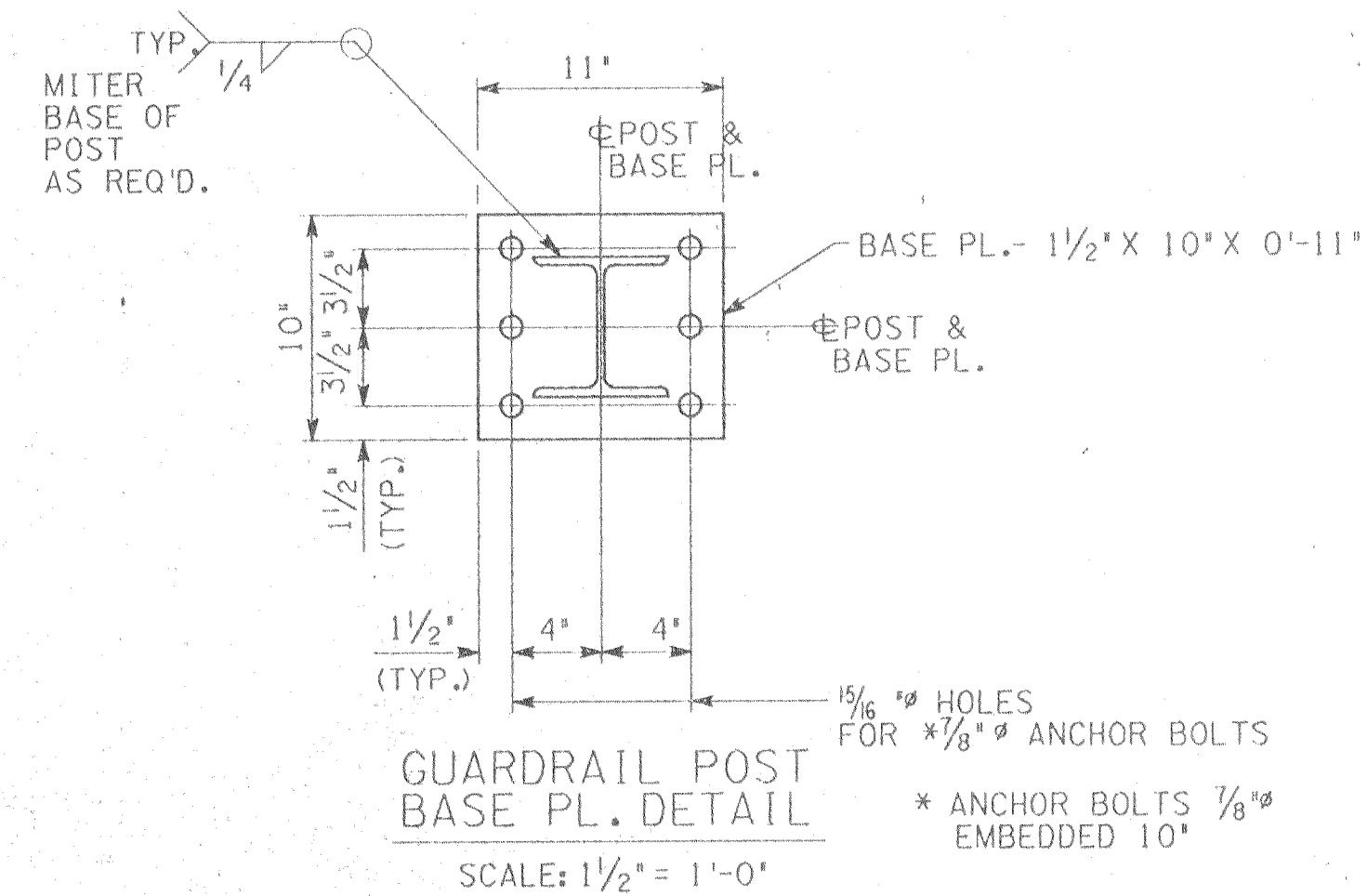
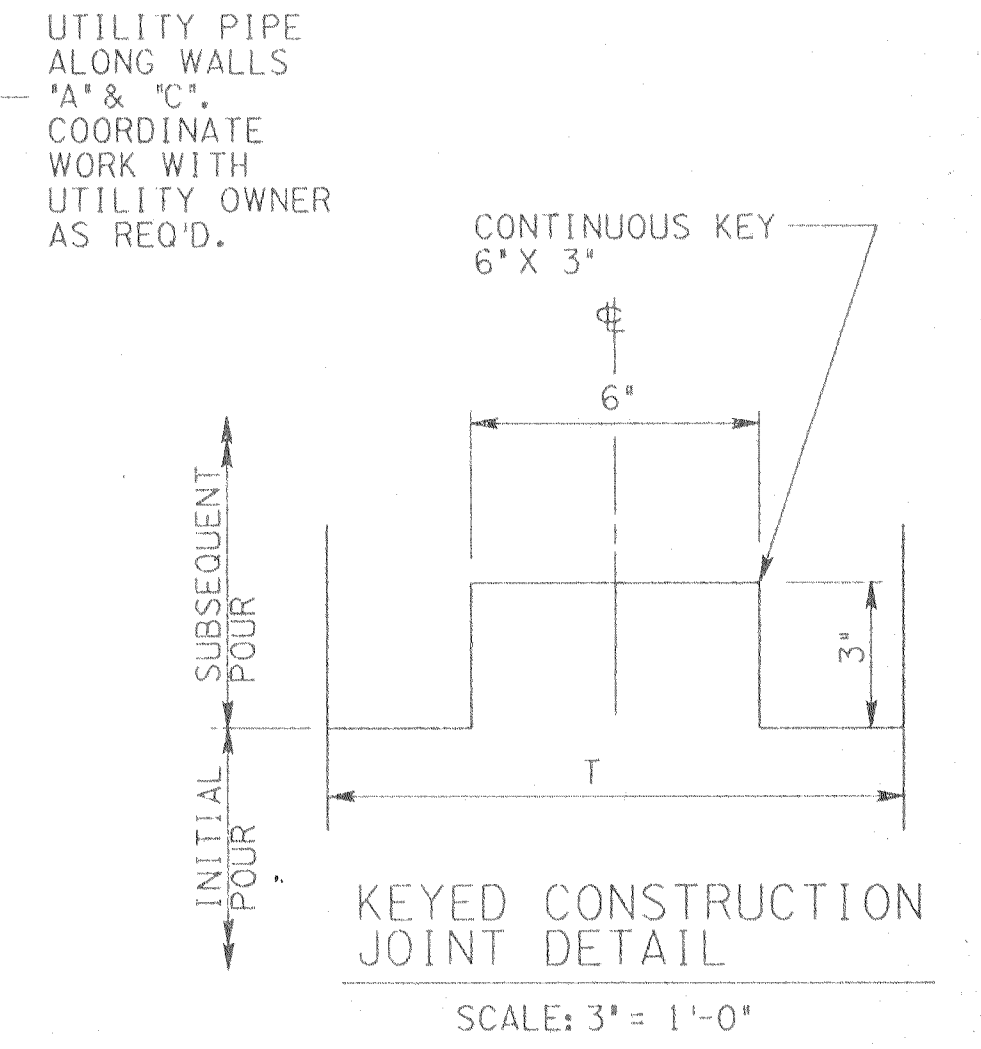
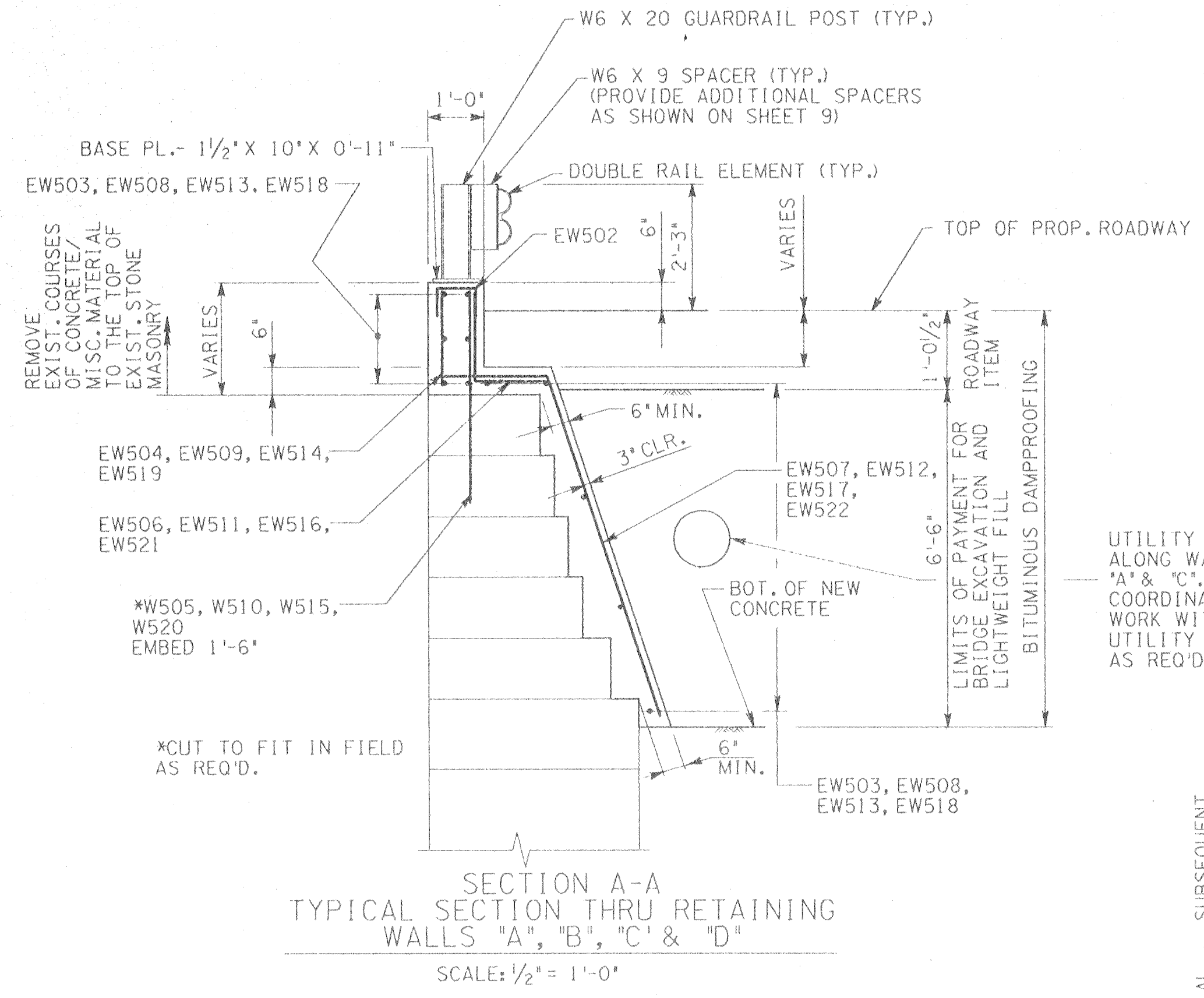
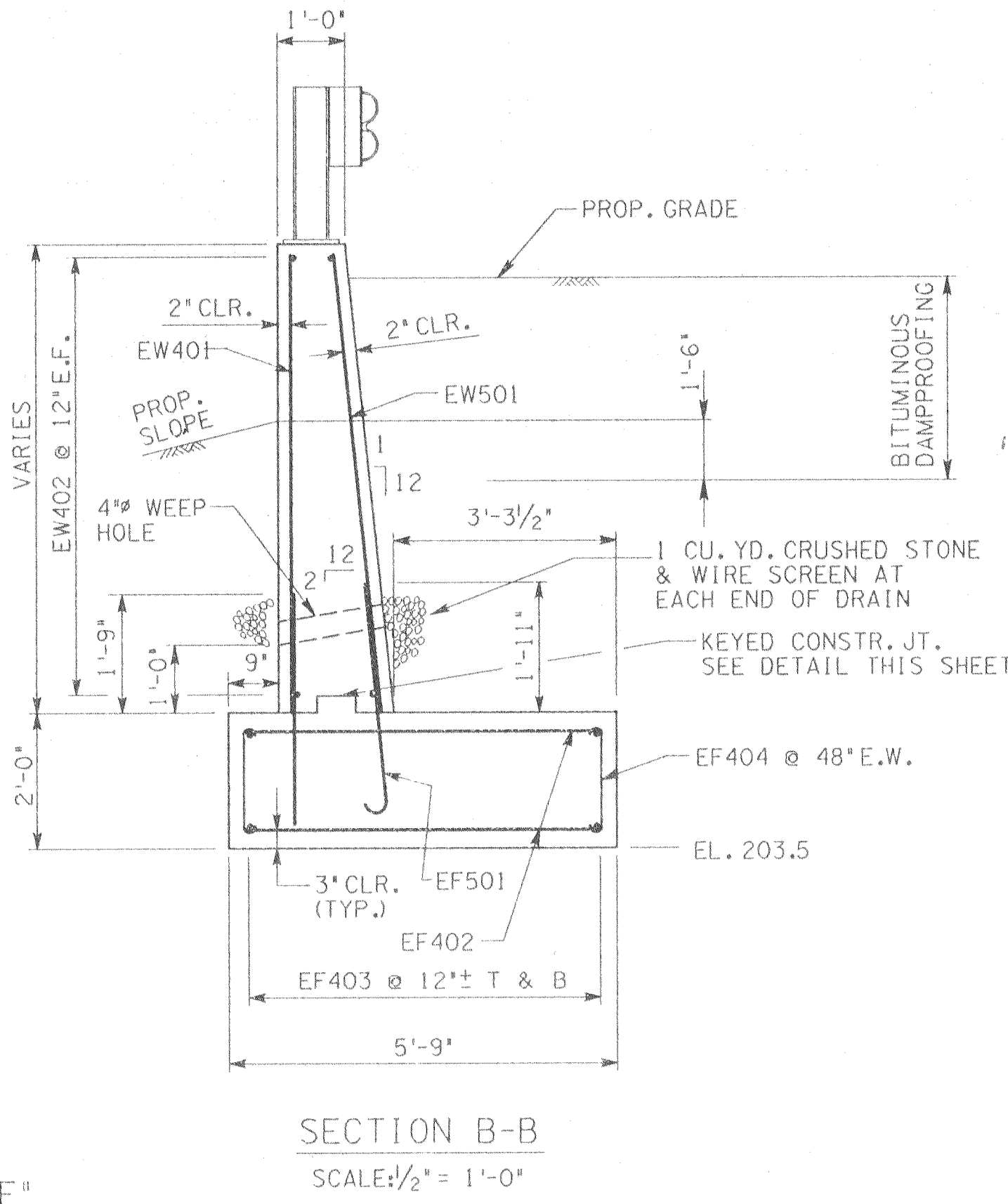
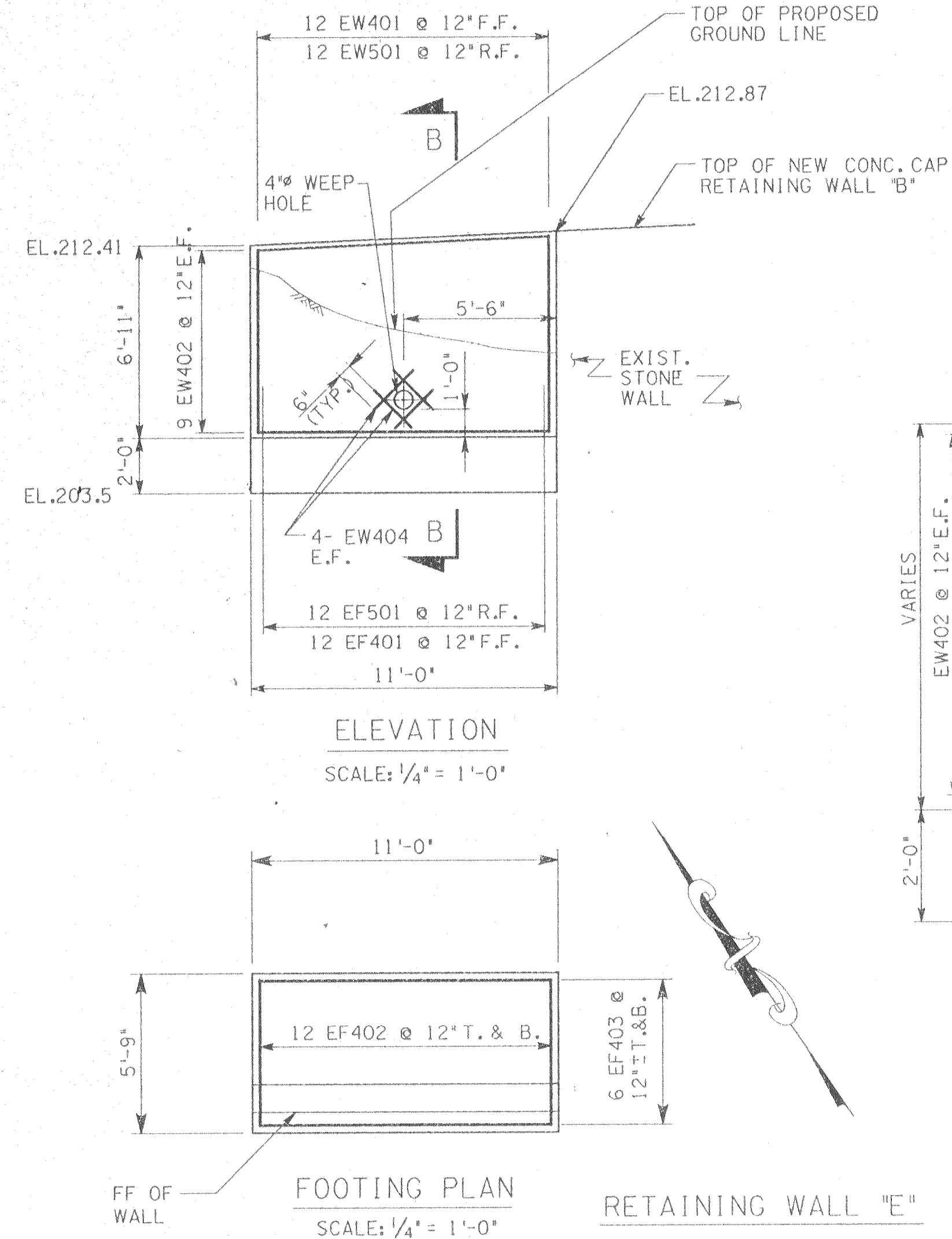
RETAINING WALL "B" ELEVATION
SCALE: 3/16" = 1'-0"

RETAINING WALL "D" ELEVATION
SCALE: 3/16" = 1'-0"

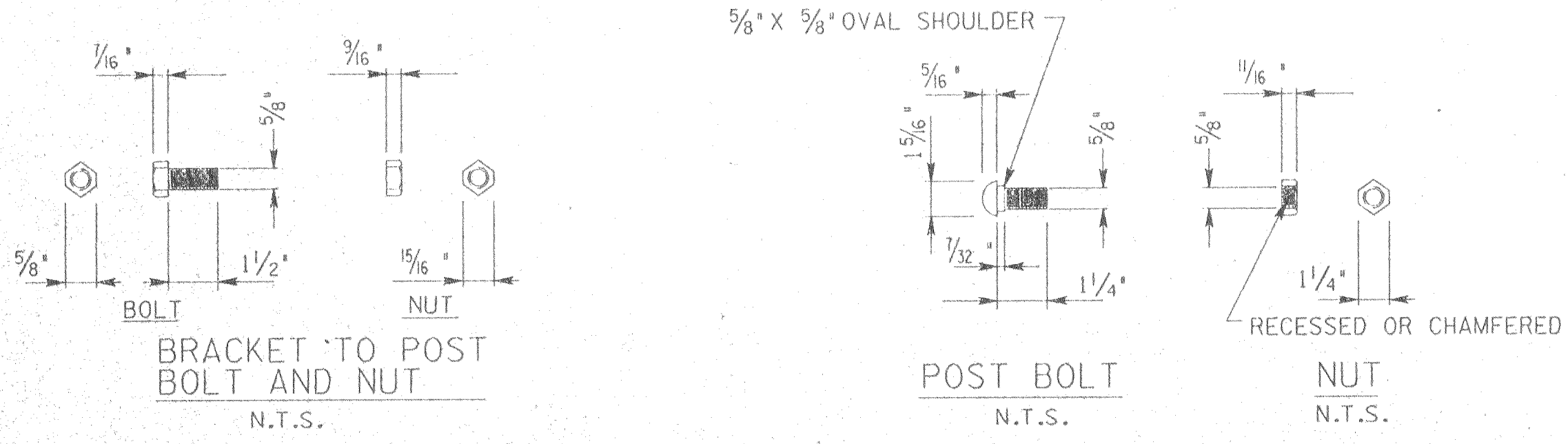
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 - FOR SECTION A-A SEE SHEET 7.

Gannett Fleming/LSTS
A Joint Venture

REVISIONS			MASSACHUSETTS HIGHWAY DEPARTMENT	
NO.	DATE	BY		
			RECONSTRUCTION OF MASSACHUSETTS BRIDGE NO. S-9-3 R.R. O.H. BRIDGE NO. 211.62 MASKWONICUT STREET SHARON MASSACHUSETTS	
			RETAINING WALLS "B" & "D" STA. 13+65 THRU STA. 15+20 SHEET 6 OF 12	
			CHECKED BY	RCK DATE 4/94 SCALE AS NOTED



- NOTES:**
- FOR GENERAL NOTES, SEE SHEET 2.
 - THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS AND IS IN NO WAY WARRANTED TO INDICATE THE TRUE CONDITIONS OF ACTUAL QUANTITIES OR DISTRIBUTION OF QUANTITIES OF WORK WHICH WILL BE REQUIRED.
 - THE DOUBLE RAIL ELEMENT SHALL CONSIST OF NESTING TWO (2) 12 GAGE RAIL ELEMENTS FOR THE LENGTH OF THE ENTIRE STRUCTURE MOUNTED RAIL.
 - DOWEL HOLES ARE TO BE DRILLED 1 5/8" AND FILLED WITH NON-SHRINK GROUT.
 - COST OF THE WEEP HOLE CRUSHED STONE AND WIRE SCREEN SHALL BE INCIDENTAL TO THE COST OF THE CONCRETE AND SHALL CONFORM TO SECTION 3310 OF THE SPECIFICATIONS.
 - ALL CONCRETE IN RETAINING WALLS AND CAPS SHALL BE CLASS A CEMENT CONCRETE.
 - GUARDRAIL POSTS ARE TO BE SET TRULY VERTICAL.



- BOLT NOTES:**
- SLIGHTLY NOTCH ROUND HEADS OF POST AND SPLICE BOLTS TO PROVIDE FOR WRENCH, WHEN REQUIRED.

Gannett Fleming/LSTS
A Joint Venture

REVISIONS			MASSACHUSETTS HIGHWAY DEPARTMENT	
NO.	DATE	BY		
			RECONSTRUCTION OF MASSACHUSETTS BRIDGE NO. S-9-3 R.R. O.H. BRIDGE NO. 211.62 MASKWONICUT STREET SHARON MASSACHUSETTS	
			RETAINING WALL "E" AND TYPICAL DETAILS	
			STA. 13+65 THRU STA. 15+20 SHEET 7 OF 12	
			CHECKED BY RCK DATE 4/94 SCALE AS NOTED	

THE COMMONWEALTH OF MASSACHUSETTS
HIGHWAY DEPARTMENT.

PLAN AND PROFILE FOR
RAISING

MASKWONICUT STREET
BRIDGE

IN THE TOWN OF

SHARON
NORFOLK COUNTY

SHARON MASKWONICUT STREET				
NO. PROJ. DIV. NO.	STATE	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
	MASS.		1	25

DOCUMENT REF. NO. 3025
DWG. NO. HSR3-07

DESIGN DESIGNATION

FUNCTIONAL CLASSIFICATION = URBAN-COLLECTOR
DESIGN SPEED = 30 MPH
ADT (1990) = 1200

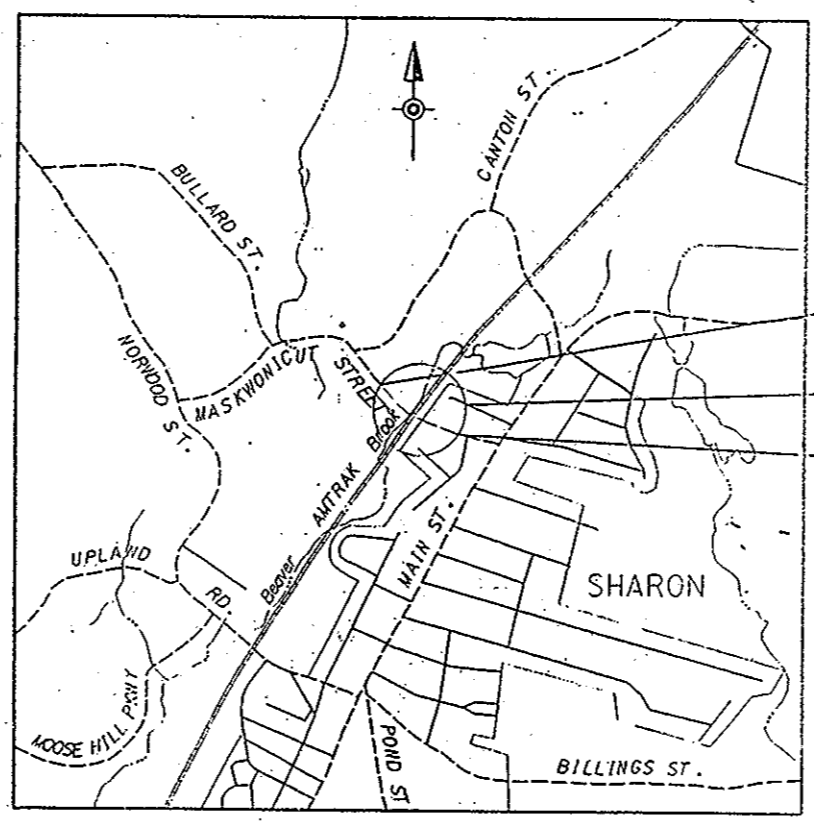
INDEX

SHEET NO.	DESCRIPTION
1	TITLE SHEET AND INDEX
2	TYPICAL SECTIONS
3	GENERAL NOTES AND DETAILED ESTIMATE
4	WATER SYSTEM DETAILS
5	DRAINAGE AND EROSION CONTROL DETAILS
6	PLAN
7	LANDSCAPING PLAN
8	TRAFFIC CONTROL PLAN
9	PROFILE
10-13	CROSS SECTIONS
14	GENERAL PLAN
15	GENERAL NOTES AND QUANTITIES
16	WEST ABUTMENT
17	EAST ABUTMENT
18	RETAINING WALLS 'A', 'B', 'C'
19	RETAINING WALLS 'B', 'D'
20	RETAINING WALL 'E' AND TYPICAL DETAILS
21	FRAMING PLAN
22	GUARDRAIL AND POST DETAILS
23	PROTECTIVE BARRIER DETAILS - 1
24	PROTECTIVE BARRIER DETAILS - 2
25	REINFORCEMENT BAR SCHEDULE
25A - 25D	TIMBER FACING DETAILS 1-4

CONVENTIONAL SIGNS

STATE BOUNDARY LINE	_____
COUNTY, COMM., CITY, TOWN OR R.R. LAYOUT LINE	_____
COUNTY, CITY OR TOWN BOUNDARY LINE	_____
STATE HIGHWAY LAYOUT LINE	_____
ON MYLAR	_____
ON CONSTRUCTION PLANS	_____
PROPERTY LINES	_____
FENCE LINE	_____
BASE LINE OR SURVEY LINE	_____
PROFILE	_____
PROPOSED GRADE	_____
PRESENT GRADE	_____
ELEVATIONS	_____

PRES. 20.86
PROP. 22.48
16+00

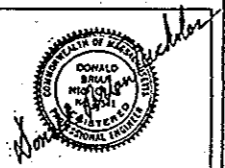


LOCATION PLAN

"Record Drawing"
The "Record" information used in this drawing has been supplied by the contractor. The GBC does not assume responsibility for its accuracy relative to the design concept and general adequacy of the "Record" information to the best of the GBC's knowledge.

S-09-003

PREPARED BY: **Gannett Fleming/LSTS**
A Joint Venture
KING OF PRUSSIA, PENNSYLVANIA



NOTE
LENGTH OF PROJECT = 600.00 FT. = 0.114 MILES ±

NO.	REVISIONS	BY	DATE
1	CONSTRUCTION UPDATE	H.P.	3-97

S09003

GENERAL NOTES

DESIGN

IN ACCORDANCE WITH THE 1992 AMERICAN ASSOCIATION OF STATE HIGHWAYS & TRANSPORTATION OFFICIALS STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES FIFTEENTH EDITION AND INTERIM SPECIFICATIONS THROUGH 1993, EXCEPT FOR THE FOLLOWING:

- (1) STRUCTURE HAS A WEIGHT LIMIT OF 9 TONS.
- (2) LIGHTWEIGHT FILL IS USED, WITH AN EQUIVALENT FLUID PRESSURE OF 15 PSF AND A DENSITY OF 55 PSF.
- (3) THE EXISTING STABILITY OF EXISTING MASONRY ABUTMENTS (UNKNOWN) IS MAINTAINED.

INFORMATION ON EXISTING MASONRY ABUTMENTS IS APPROXIMATE AND IS BASED ON LIMITED FIELD INVESTIGATION. THE ACTUAL SIZE, ARRANGEMENT AND LIMIT OF MASONRY STONE MAY DIFFER FROM THE INFORMATION SHOWN IN THESE PLANS. VERIFY EXISTING CONDITIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BETWEEN THE CONDITIONS SHOWN ON THESE PLANS AND ACTUAL FIELD CONDITIONS.

VERIFY ALL DIMENSIONS AND GEOMETRY OF THE EXISTING STRUCTURE IN THE FIELD AS NECESSARY FOR PROPER FIT OF THE PROPOSED CONSTRUCTION.

ALL DIMENSIONS ARE HORIZONTAL, EXCEPT AS NOTED, AND ARE MEASURED AT 68°F.

SCALES

SCALES AS NOTED ON PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS.

CONCRETE MIXES

	(1)	(2)	(3)
CLASS A DENOTES:	4000	1 1/2	565
CLASS D DENOTES:	4000	3/4	610

(1) 28 - DAY COMPRESSIVE STRENGTH (P.S.I.)

(2) MAXIMUM AGGREGATE SIZE (INCHES)

(3) CEMENT CONTENT (LB./C.Y.)

CEMENT SHALL CONFORM TO AASHTO DESIGNATION M85

CLASS A CONCRETE SHALL BE USED IN THE ABUTMENTS, BRIDGE SEATS AND RETAINING WALLS.

CLASS D CONCRETE SHALL BE USED IN THE BACKWALLS AND CHEEKWALLS.

CEMENT CONCRETE BACKWALLS AND CHEEKWALLS SHALL BE POURED AFTER THE SUPERSTRUCTURE HAS BEEN RESET IN PLACE.

CHAMFER EXPOSED CONCRETE EDGES 3/4", EXCEPT AS NOTED.

REINFORCEMENT

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31, GRADE 60.

UNLESS OTHERWISE SHOWN ON THE PLANS, ALL #4 BARS SHALL BE LAPPED 24" AND ALL #5 BARS SHALL BE LAPPED 39" FOR HORIZONTAL BARS WITH 12" OR MORE OF CONCRETE BELOW THE BAR. THE LAP LENGTHS SHALL BE 33" FOR #4 BARS AND 44" FOR #5 BARS. IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON PLANS.

REINFORCEMENT SHALL BE PLACED TO CLEAR ANCHOR BOLTS.

PROVIDE TWO (2) INCHES OF COVER TO REINFORCING STEEL EXCEPT AS NOTED.

ALL REINFORCEMENT IS TO BE EPOXY COATED WITH THE EXCEPTION OF DOWEL BARS.

REINFORCEMENT BAR SCHEDULE IS FOR INFORMATION ONLY, AND MUST BE VERIFIED PRIOR TO BIDDING AND FABRICATION.

BENCH MARK

SEE ROADWAY CONTRACT DRAWINGS

FOUNDATIONS

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

THE APPROXIMATE ELEVATION OF BOTTOM OF EXISTING FOOTINGS IS 189.30'.

UNSUITABLE MATERIAL

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

TIMBER

NEW TIMBER SHALL BE DOUGLAS-FIR LARCH SELECT STRUCTURAL DENSE NO.1 WITH FB = 1900 PSI AND CONFORM TO THE REQUIREMENTS OF AASHTO M168.

MASONRY

ALL MASONRY RESTORATION SHALL BE DONE PRIOR TO THE TEMPORARY REMOVAL OF EXISTING SUPERSTRUCTURE, REMOVAL OF EXISTING BRIDGE SEATS, BACKWALLS AND PORTIONS OF RETAINING WALLS.

STRUCTURAL STEEL

STRUCTURAL STEEL SHALL CONFORM TO THE REQUIREMENTS OF ASTM A709, GRADE 36 (AASHTO M270), EXCEPT AS NOTED. (ASTM A709, GRADE 36 AND AASHTO M270 IS EQUIVALENT TO ASTM A36 AND AASHTO M183, RESPECTIVELY), EXCEPT AS NOTED.

ALL POSTS SHALL BE FABRICATED AND ERECTED SO AS TO BE VERTICAL AND PARALLEL TO EACH OTHER. POSTS SHALL GENERALLY BE DETAILED, FABRICATED AND ERECTED TO FOLLOW THE LOCAL SLOPE OF THE BRIDGE.

STRUCTURAL TUBING IN RAIL IS ASTM A500, GRADE C, 50 KSI.

ALL BOLTS SHALL BE ASTM A449 EXCEPT AS NOTED.

LAG SCREWS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A307.

ALL STRUCTURAL STEEL, FASTENERS, BOLTS, NUTS AND WASHERS SHALL BE GALVANIZED, EXCEPT AS NOTED.

SET ANCHOR BOLTS TO TEMPLATE. DO NOT DRILL HOLES UNLESS SPECIFICALLY INDICATED ON PLANS.

ALUMINUM

ALL POSTS SHALL BE FABRICATED AND ERECTED SO AS TO BE VERTICAL AND PARALLEL TO EACH OTHER. FILLER MEMBERS BETWEEN POSTS SHALL GENERALLY BE DETAILED, FABRICATED AND ERECTED TO FOLLOW THE LOCAL SLOPE OF THE BRIDGE.

ALL NEW STRUCTURAL SHAPES TO BE ALUMINUM DESIGNATION 6061-T6, EXCEPT AS NOTED.

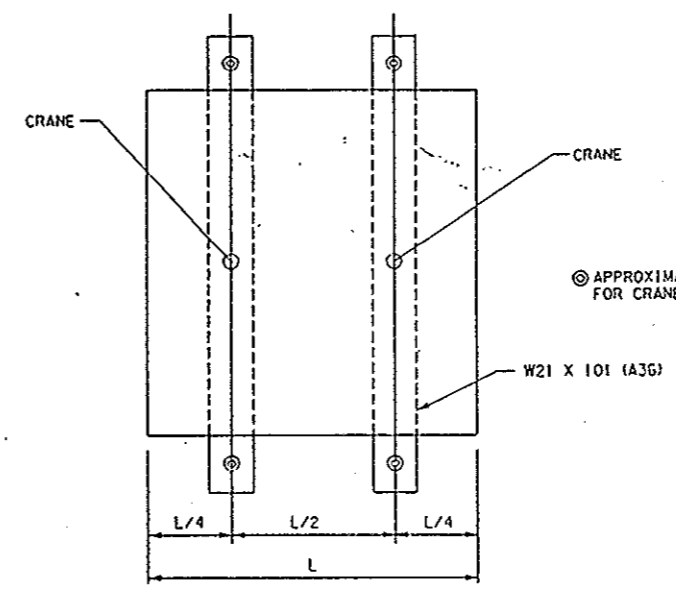
ALUMINUM BOLTS, NUTS AND WASHERS SHALL BE OF ALUMINUM ALLOY 2024-T4 AND/OR 6061-T6, UNLESS OTHERWISE NOTED.

STAINLESS STEEL FASTENER HARDWARE WHICH IS TO BE IN CONTACT WITH ALUMINUM SHALL BE ASTM A316, UNLESS OTHERWISE NOTED.

UTILITY NOTES

COORDINATE THE REQUIREMENTS FOR PROTECTION AND/OR RELOCATION OF UTILITIES WITH THE UTILITY OWNER PRIOR TO STARTING WORK.

VERIFY AND LOCATE ALL EXISTING UTILITIES PRIOR TO STARTING WORK. CONDUCT OPERATIONS IN A MANNER WHICH ENSURES THAT THE UTILITIES WILL NOT BE DISTURBED OR ENDANGERED, AND ASSUME FULL RESPONSIBILITY FOR ANY DAMAGE TO UTILITIES DURING CONSTRUCTION. AMTRAK DOES NOT ASSUME RESPONSIBILITY FOR REIMBURSEMENT PARTICIPATION IN DESIGN AND/OR REVISIONS OR LIABILITY FOR ACCURACY OF TYPE, SIZE AND LOCATION OF ANY UTILITY.



NOTES:

- 1. ABOVE SCHEME IS CONCEPTUAL. BRACING FOR BEAMS NOT SHOWN. CONTRACTOR MUST VERIFY AND PROVIDE ADEQUATE BEAM SIZE, BRACING, CRANE SIZE AND RELATED LIFTING ITEMS TO ACCOMMODATE 150% OF THE LOADS GIVEN AND AN ALLOWABLE DEFLECTION OF 3/4" PER BEAM.
- 2. CONTRACTOR SHALL COORDINATE LIFTING PROCEDURES WITH THE UTILITY OWNERS.
- 3. CONTRACTOR SHALL WORK WITHIN THE TIME LIMITS AND THE REQUIREMENTS OF AMTRAK.
- 4. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
- 5. APPROXIMATE TOTAL WEIGHT OF SUPERSTRUCTURE = 92 KIPS.
- 6. APPROXIMATE TOTAL WEIGHT OF SUPERSTRUCTURE AT SHOWN PICK POINT IS 23 KIPS.

CONCEPTUAL SUPERSTRUCTURE LIFTING PROCEDURE

N.T.S.

"Record Drawing"
The "Record" information added to this drawing has been supplied by the contractor. The E.C. does not assume responsibility for its accuracy other than conformity with the design concept and general intention of the "Record" information to the best of the E.C.'s knowledge.

ESTIMATE OF QUANTITIES		
DESCRIPTION	UNIT	QUANTITY
RAISE EXISTING SUPERSTRUCTURE	L.S.	L.S.
BRIDGE EXCAVATION	C.Y.	1100
LIGHTWEIGHT FILL	C.Y.	887
DEMOLITION	L.S.	L.S.
DRILLING DOWEL HOLES, 1 1/2 IN.	L.F.	524
CLASS D CEMENT CONCRETE MASONRY	C.Y.	6
CLASS A CEMENT CONCRETE MASONRY	C.Y.	97
REPOINTING MASONRY	S.F.	3704
MASONRY CONSOLIDATION	C.Y.	6
REINFORCEMENT BARS	LB.	1140
REINFORCEMENT BARS, EPOXY COATED	LB.	10460
PREFORMED EXPANSION JOINT FILLER	S.F.	230
BITUMINOUS DAMP-PROOFING	S.Y.	255
STRUCTURAL STEEL	LB.	16845
STRUCTURAL TIMBER	MBM	0.5
HIGHWAY GUARD (STRUCTURE)	L.F.	297 - 286
PROTECTIVE BARRIER	L.F.	94

NOTES:

- 1. THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS AND IS IN NO WAY WARRANTED TO INDICATE THE TRUE CONDITIONS OF ACTUAL QUANTITIES OR DISTRICT OF QUANTITIES OF WORK WHICH WILL BE REQUIRED.

REVISIONS		
NO.	DATE	BY
1	11-93	RK

MASSACHUSETTS HIGHWAY DEPARTMENT

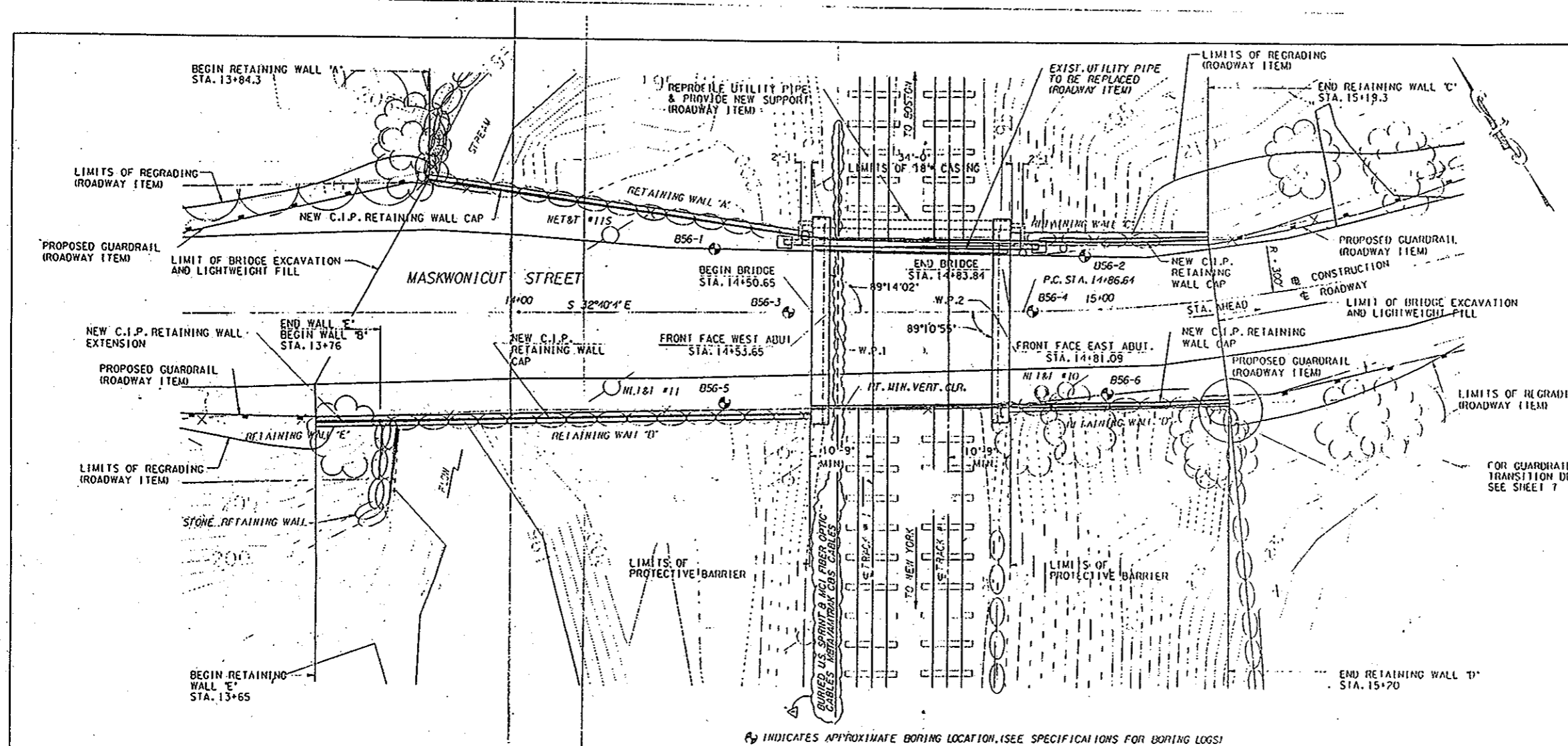
RECONSTRUCTION OF MASSACHUSETTS BRIDGE NO. 3 R.R. O.H. BRIDGE NO. 211.6 MASKWONICUT STREET SHARON MASSACHUSETTS

GENERAL NOTES & QUANTITIES
STA. 13+65 THRU STA. 15+20

CHECKED BY RCX DATE 8/94 SCALE _____
DRAFTED BY RJC STRUCTURE SHEET NO. 3

FD. ROAD DIST. NO.	STATE	FISCAL YEAR
	MA	

DOCUMENT REF. NO. 3025
DWG. NO. HSRB-07



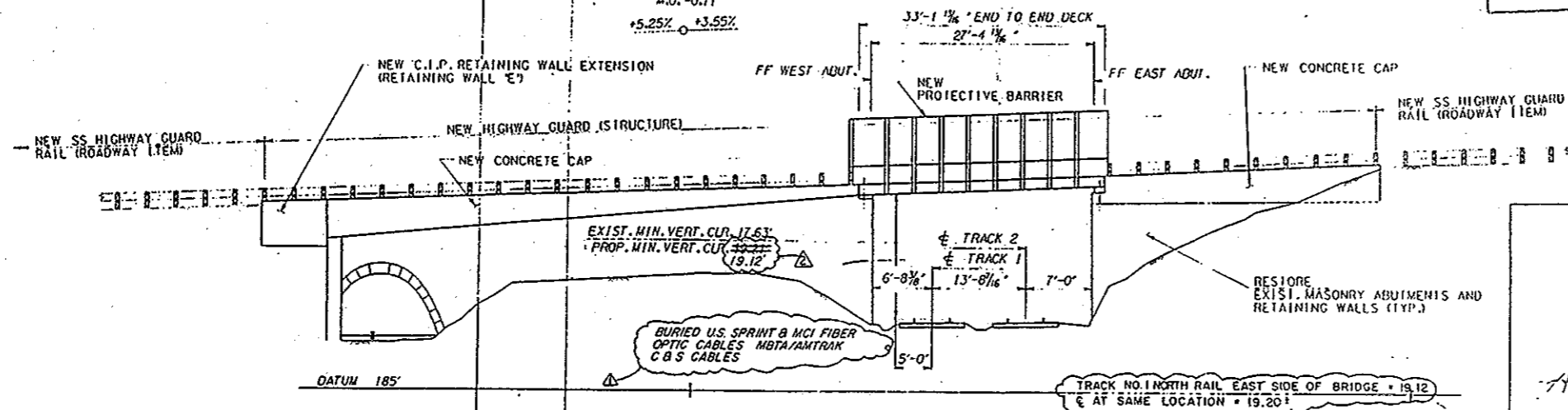
GENERAL PLAN
SCALE: 1" = 10'-0"

PVI STA. 14+25
ELEV. 215.00
V.C. 50.00
H.O. -0.11
+5.25% -+3.55%

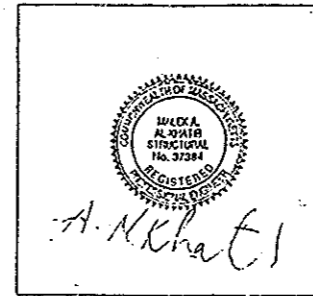
"Record Drawing"
The "Record" information added to this drawing has been supplied by the contractor. The GEC does not assume responsibility for its accuracy other than conformity with the design concept and general adequacy of the "Record" information to the best of the GEC's knowledge.

INDEX OF DRAWINGS	
DWG. NO.	DESCRIPTION
1	GENERAL PLAN
2	GENERAL NOTES & QUANTITIES
3	WEST ABUTMENT
4	EAST ABUTMENT
5	RETAINING WALLS 'A' & 'C'
6	RETAINING WALLS 'B' & 'D'
7	RETAINING WALL 'E' & TYPICAL DETAILS
8	FRAMING PLAN
9	GUARDRAIL & POST DETAILS
10	PROTECTIVE BARRIER DETAILS-1
11	PROTECTIVE BARRIER DETAILS-2
12	REINFORCEMENT BAR SCHEDULE
12A-12D	TIMBER FACING DETAILS 1-4

- NOTES:
- FOR GENERAL NOTES, SEE SHEET 2.
 - THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS AND IS IN NO WAY WARRANTED TO INDICATE THE TRUE CONDITIONS OF ACTUAL QUANTITIES OR DISTRIB OF QUANTITIES OF WORK WHICH WILL BE REQUIRED.



ELEVATION
SCALE: 1" = 10'-0"

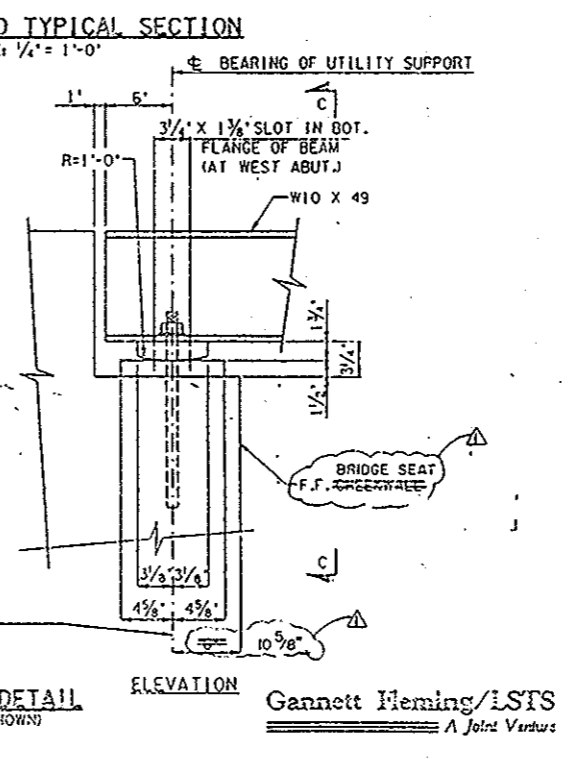
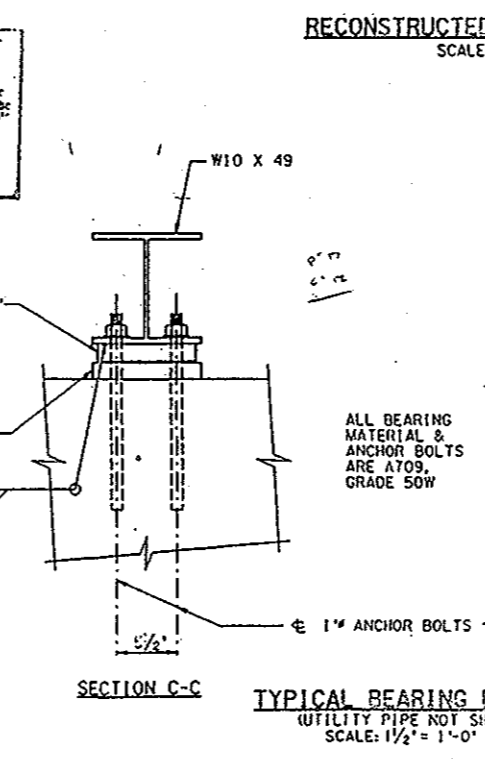
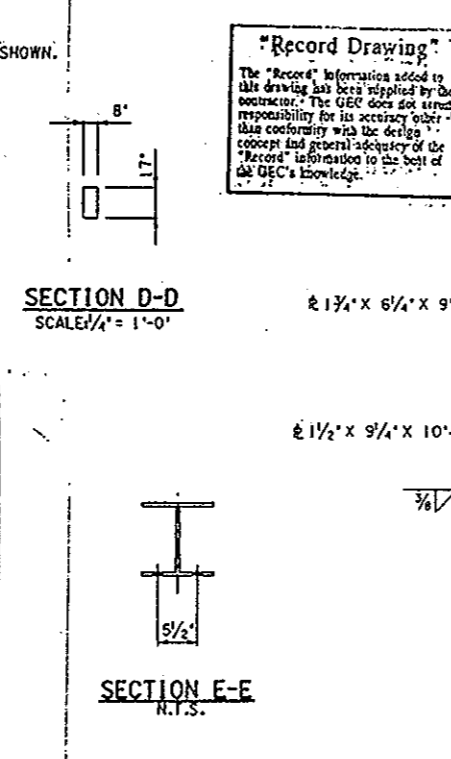
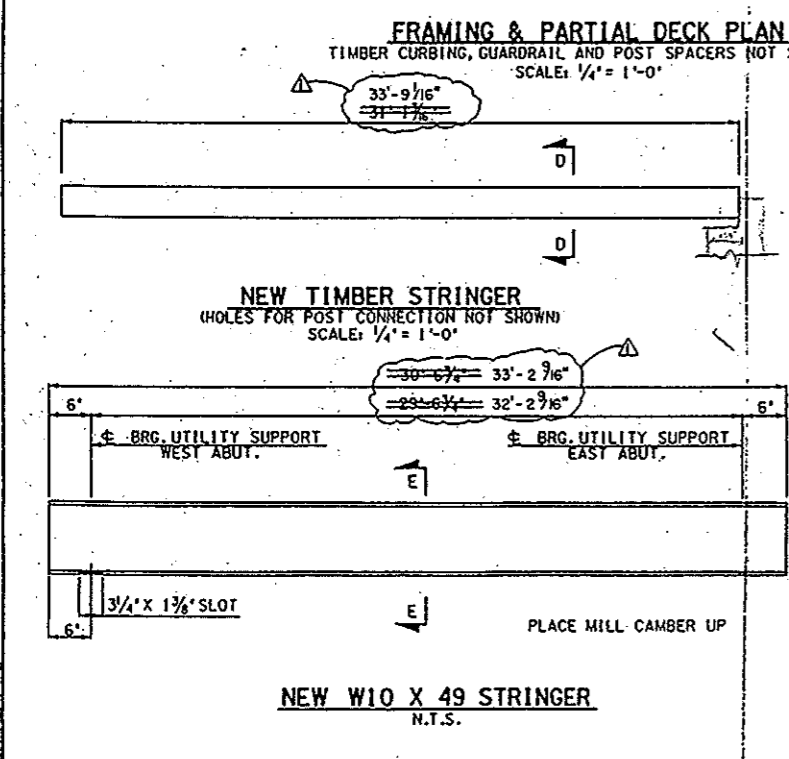
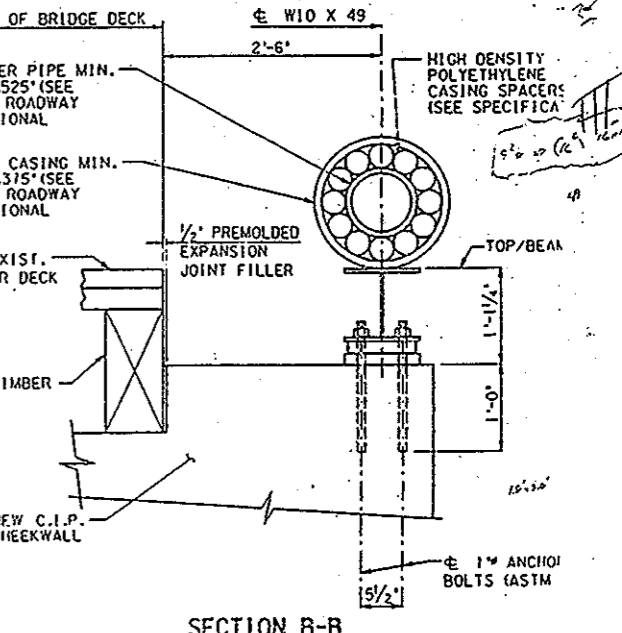
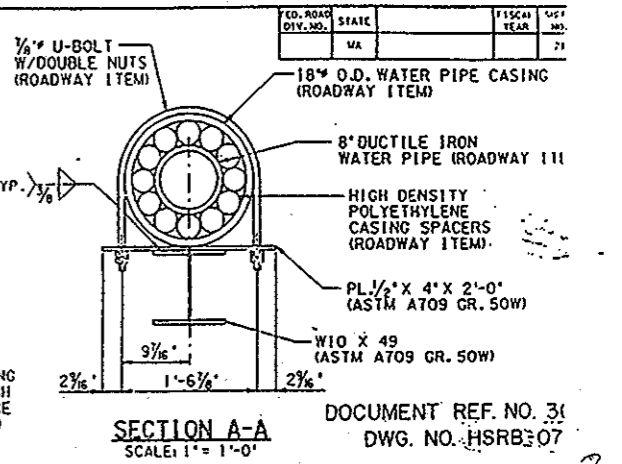
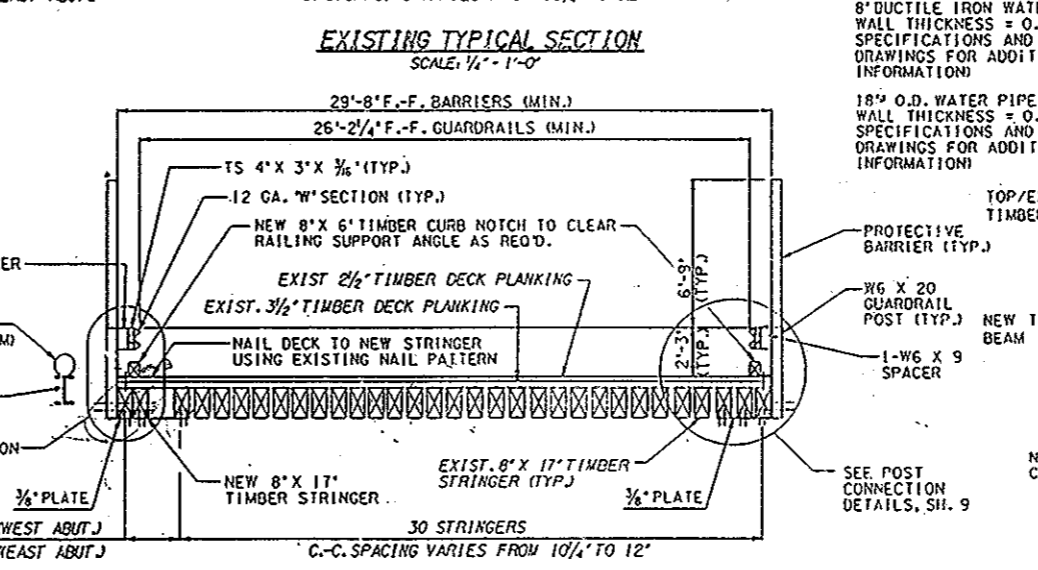
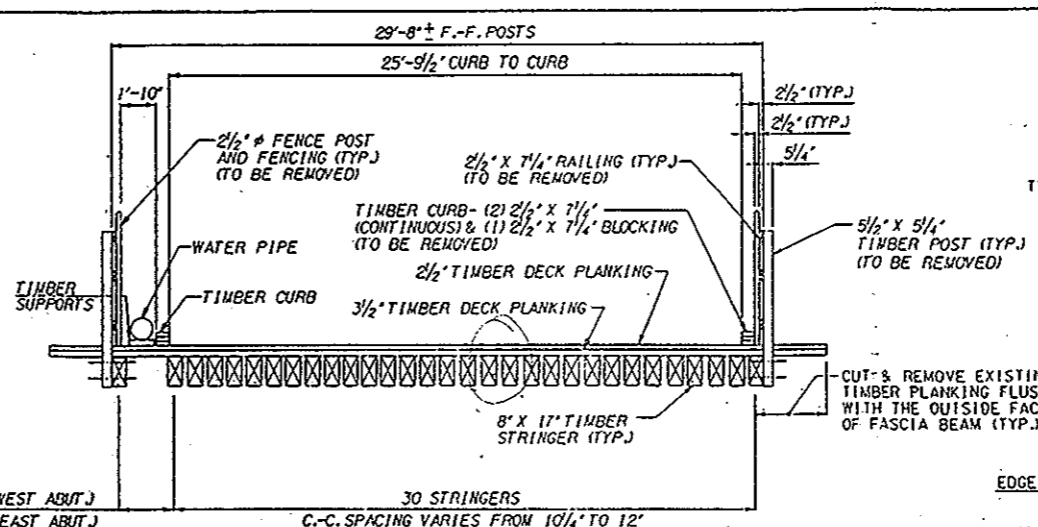
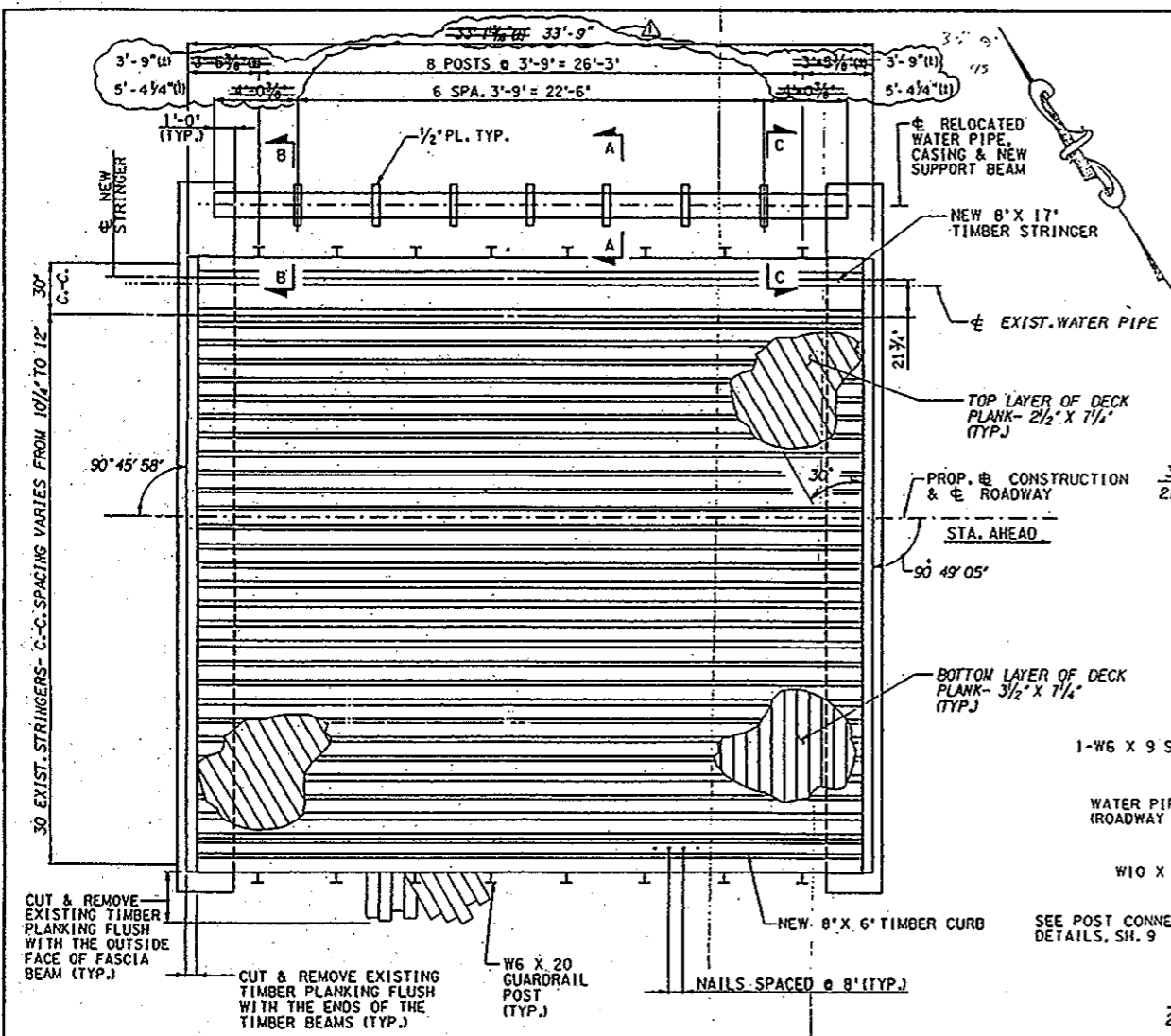


Gannett Fleming/LSTS
A Joint Venture

REVISIONS			DATE	BY
NO.	DESCRIPTION	DATE		
1		11-95	R.P.	
2		3-97	R.P.	

MASSACHUSETTS HIGHWAY DEPARTMENT	
RECONSTRUCTION OF MASSACHUSETTS BRIDGE NO. 5 R.R. O.H. BRIDGE NO. 211.6 MASKWONICUT STREET SHARON MASSACHUSETTS	
GENERAL PLAN	
STA. 13+65 THRU STA. 15+20	
CHECKED BY: RCK	DATE: 8/94
DRAWN BY: RAYLEE	STRUCTURE SHEET NO. 1

FD. ROAD DIV. NO.	STATE	FISCAL YEAR	DATE
MA	MA		



NOTES:

- FOR GENERAL NOTES, SEE SHEET 2.
- THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS AND IS IN NO WAY WARRANTED TO INDICATE THE TRUE CONDITIONS OF ACTUAL QUANTITIES OR DISTRIBUTION OF QUANTITIES OF WORK WHICH WILL BE REQUIRED.
- FIELD DRILL HOLES IN NEW AND EXIST. TIMBER STRINGERS CONCURRENTLY FOR CONNECTION OF NEW POSTS AFTER NEW STRINGER IS PROPERLY FIT AGAINST EXISTING STRINGER.
- EXISTING SUPERSTRUCTURE IS TO BE LIFTED OUT AND REFER TO SHEET 2 CONCEPTUAL LIFTING PROCEDURE AND ROADWAY DRAWINGS FOR CONSTRUCTION STAGING AREAS.

REVISIONS		
NO.	DATE	BY
1	3-97	R.P.

MASSACHUSETTS HIGHWAY DEPARTMENT

RECONSTRUCTION OF MASSACHUSETTS BRIDGE NO. S R.R. O.H. BRIDGE NO. 211.6 MASKWONICUT STREET SHARON MASSACHUSETTS

FRAMING PLAN

STA. 13+65 THRU STA. 15+20

CHECKED BY: RCK DATE: 8/94 SCALE: 1/4" = 1'-0"

DRAFTED BY: RJR/LEF STRUCTURE SHEET NO. 1

Gannett Fleming/ISTS
A Joint Venture

"Record Drawing"

The "Record" information added to this drawing has been supplied by the contractor. The GEC does not assume responsibility for its accuracy other than conformity with the design concept and general adequacy of the "Record" information to the best of the GEC's knowledge.

APPENDIX H
February 12, 2020 Design Plans by Weston & Sampson

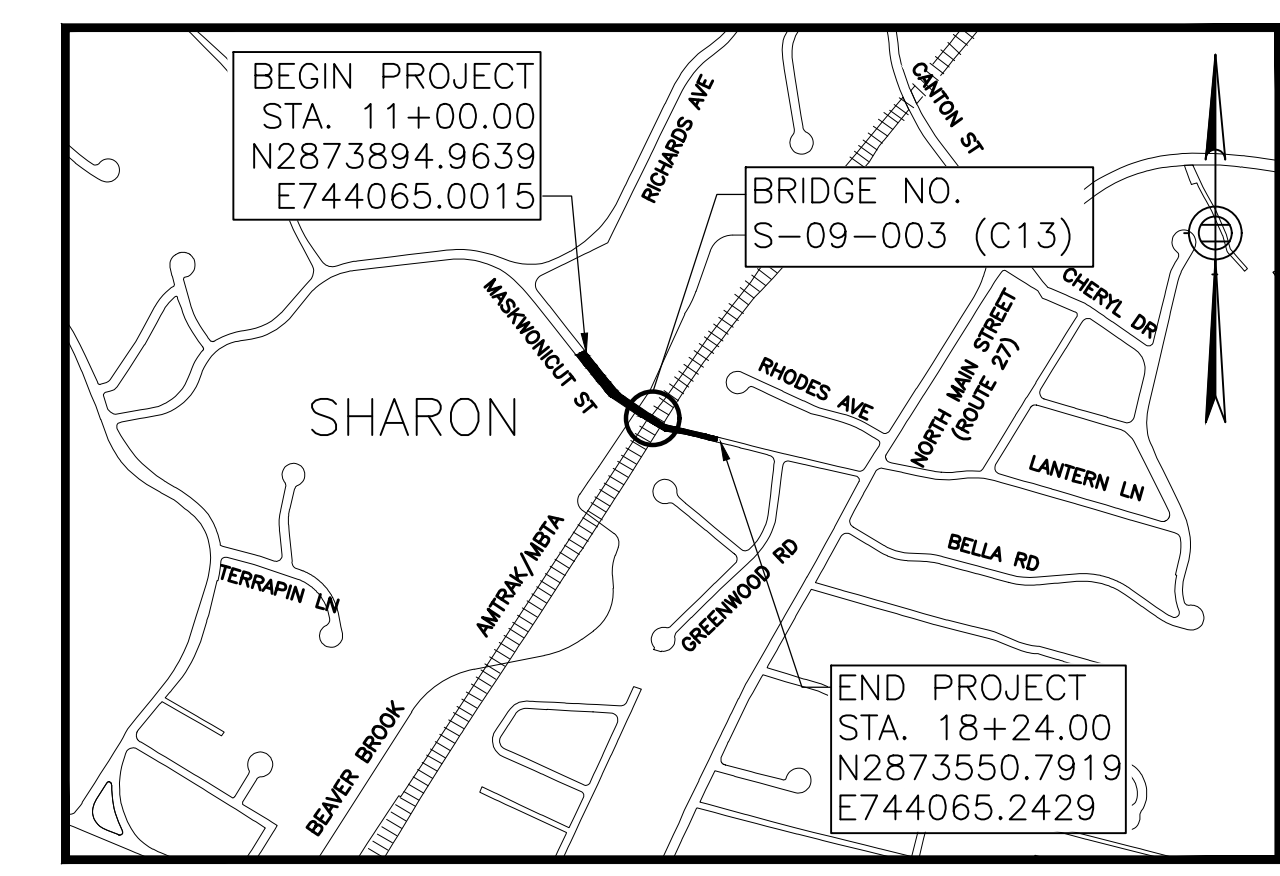
**SHARON
MASKWONICUT STREET**

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MA	-	53	83
PROJECT FILE NO.		608079	

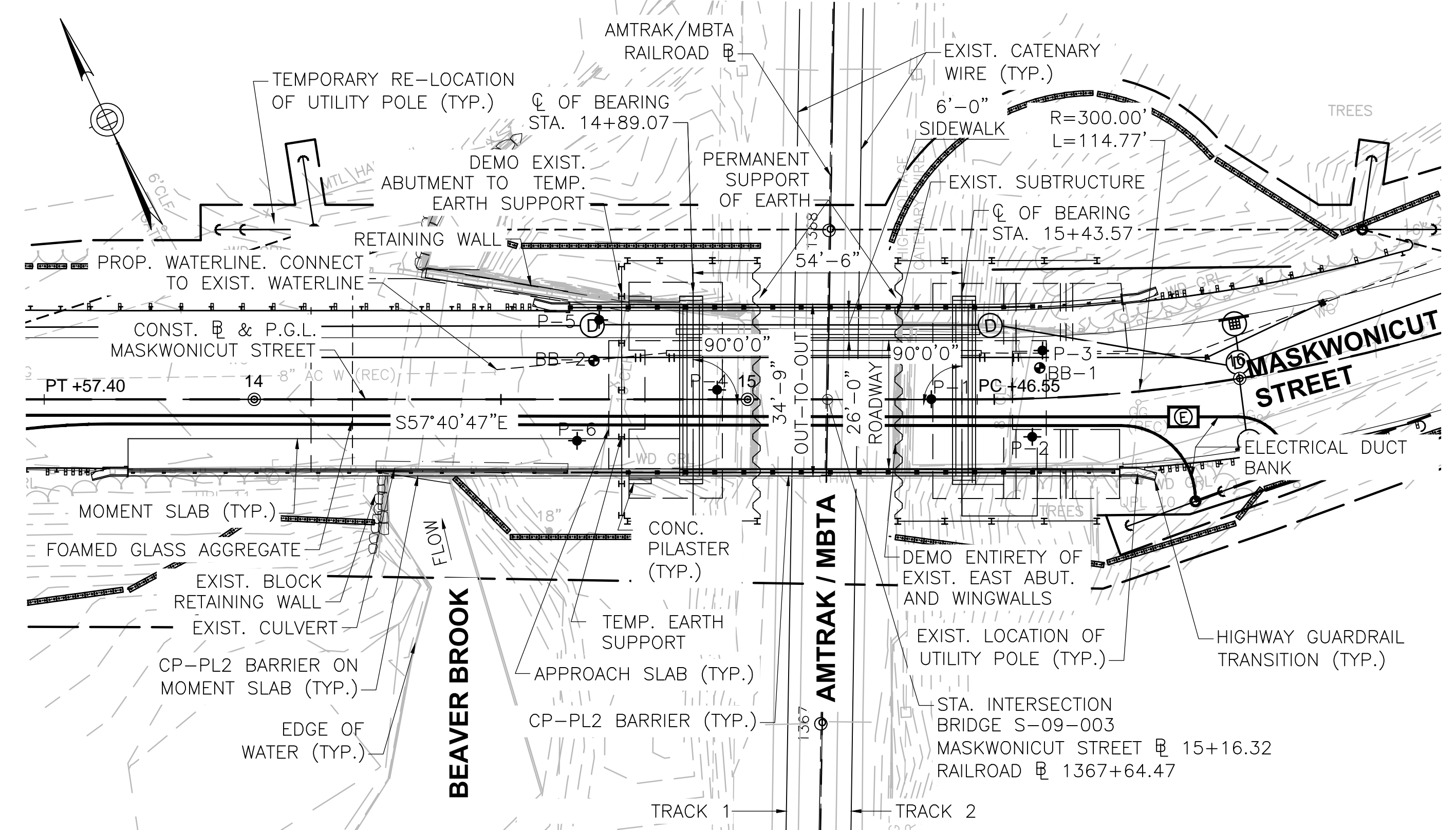
KEY PLAN AND PROFILE

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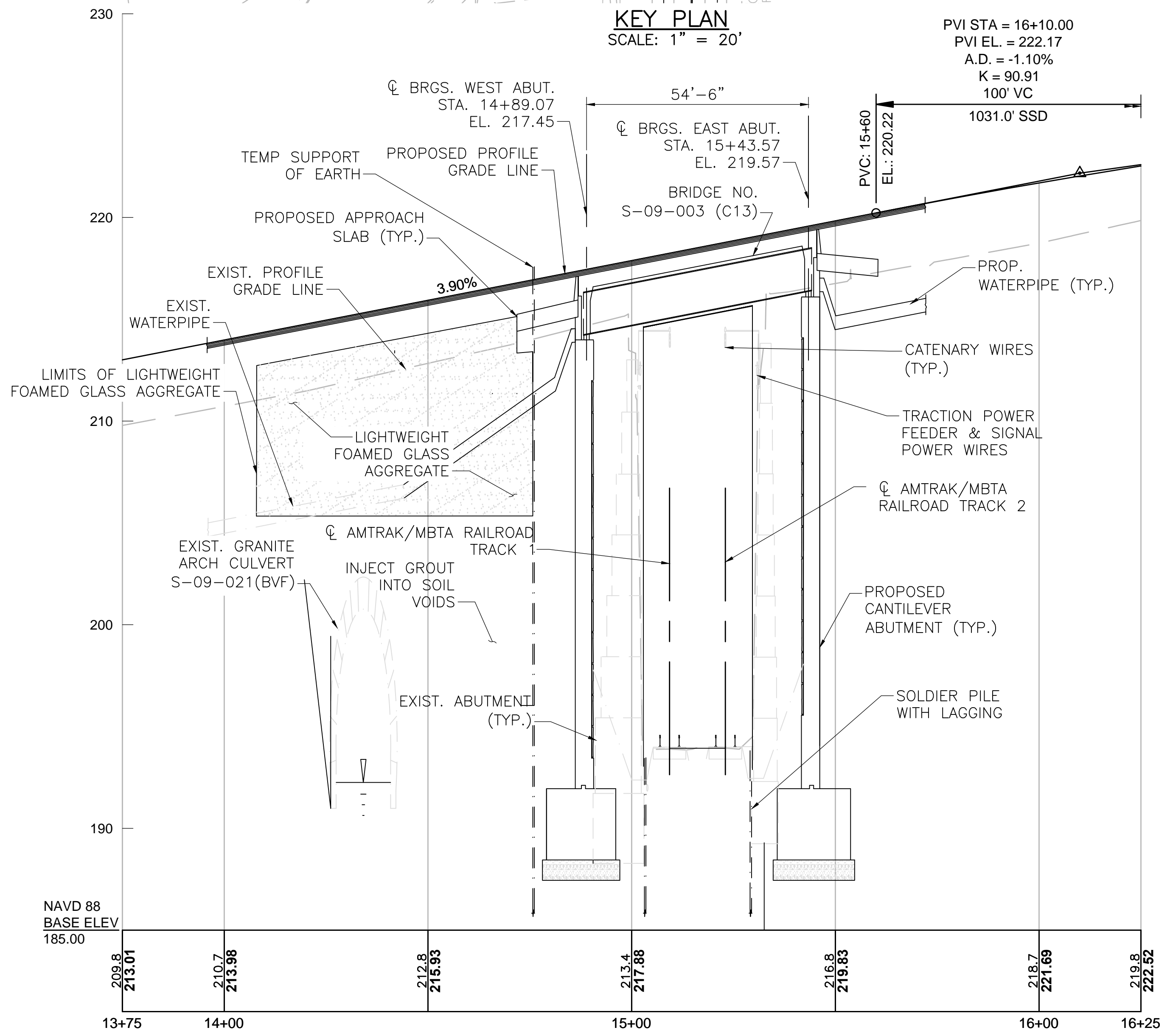
- 1.....KEY PLAN AND PROFILE
- 2.....GENERAL NOTES, HYDRAULIC DATA, AND ESTIMATED QUANTITIES.
- 3.....BORING LOGS (SHEET 1 OF 10)
- 4.....BORING LOGS (SHEET 2 OF 10)
- 5.....BORING LOGS (SHEET 3 OF 10)
- 6.....BORING LOGS (SHEET 4 OF 10)
- 7.....BORING LOGS (SHEET 5 OF 10)
- 8.....BORING LOGS (SHEET 6 OF 10)
- 9.....BORING LOGS (SHEET 7 OF 10)
- 10.....BORING LOGS (SHEET 8 OF 10)
- 11.....BORING LOGS (SHEET 9 OF 10)
- 12.....BORING LOGS (SHEET 10 OF 10)
- 13.....GENERAL PLAN AND SOUTH ELEVATION
- 14.....LONGITUDINAL SECTION
- 15.....ABUTMENT PLANS AND ELEVATIONS
- 16.....ABUTMENT SECTION AND DETAILS
- 17.....CURTAIN WALL DETAILS
- 18.....WINGWALL ELEVATIONS
- 19.....END DIAPHRAGM PLAN ELEVATION AND DETAILS
- 20.....PRECAST GUARDRAIL TRANSITION DETAILS
- 21.....FRAMING PLAN INTERMEDIATE DIAPHRAGM DETAILS
- 22.....TYPICAL BEAM AND BEARING DETAILS
- 23.....PRECAST DECK PLAN
- 24.....DECK DETAILS (SHEET 1 OF 2)
- 25.....DECK DETAILS (SHEET 2 OF 2)
- 26.....APPROACH SLAB AND WINGWALL DETAILS
- 27.....S3TL4 RAILING SHEET
- 28.....TRANSITION SHEET
- 29.....RAIL DETAILS (SHEET 1 OF 2)
- 30.....RAIL DETAILS (SHEET 2 OF 2)
- 31.....PRECAST DECK SLAB TOLERANCE



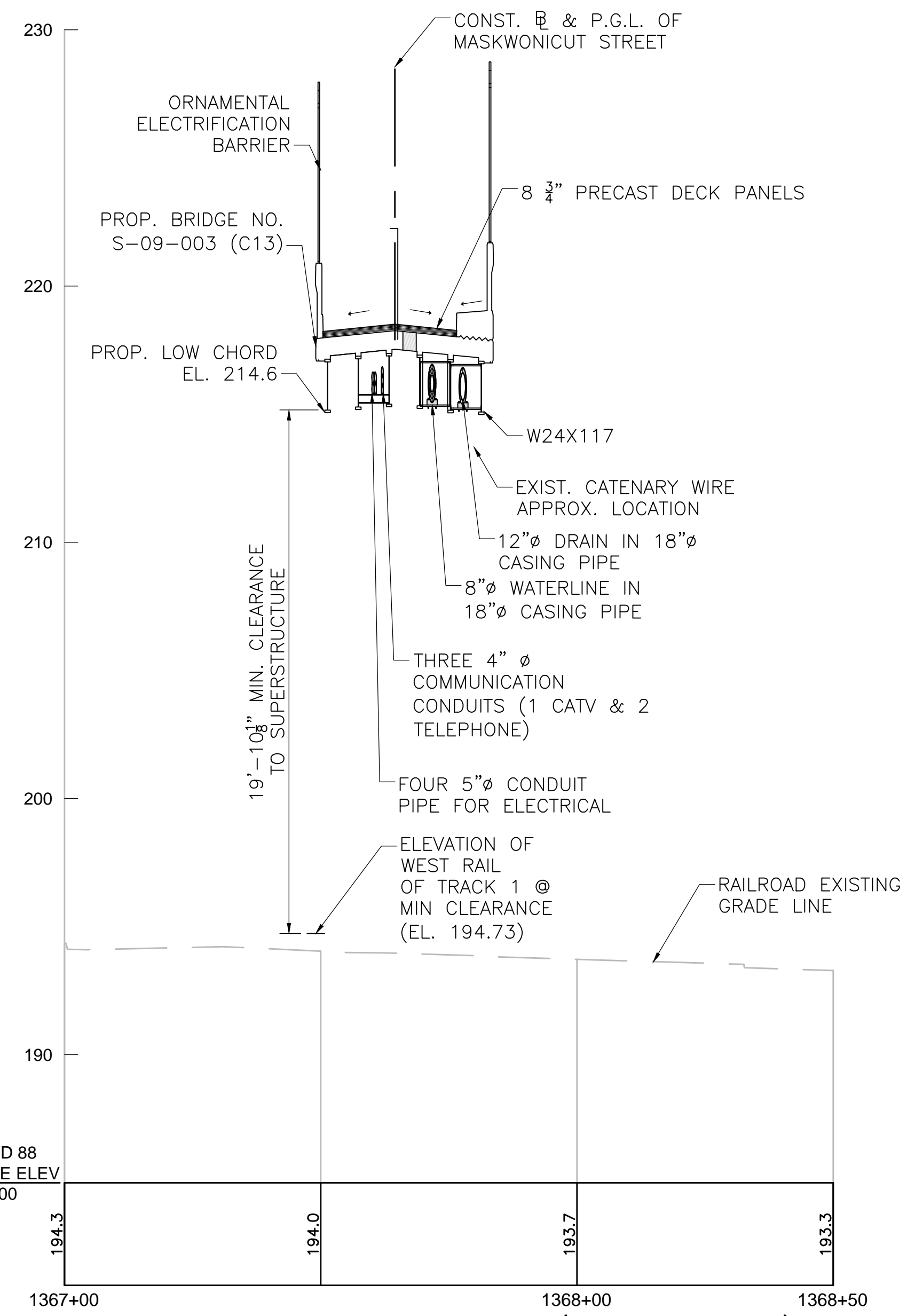
LOCUS
SCALE: 1" = 1000'



KEY PLAN
SCALE: 1" = 20'



PROFILE ALONG CONST. & P.G.L. MASKWONICUT STREET
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 4'



PROFILE ALONG RAILROAD (LOOKING WEST)
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 4'

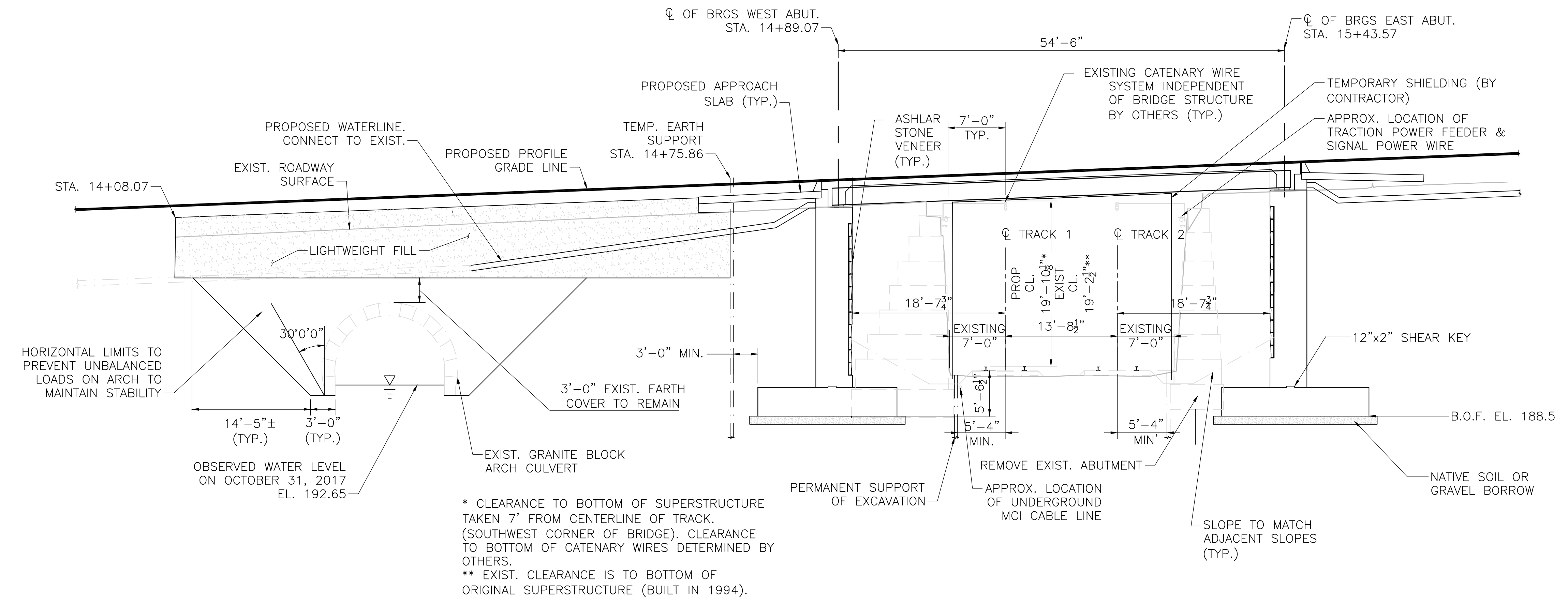
MONTH DD, YYYY		ISSUED FOR CONSTRUCTION	
PROPOSED BRIDGE SHARON MASKWONICUT STREET BRIDGE OVER MBTA/AMTRAK RAILROAD MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION 10 PARK PLAZA BOSTON, MASS			
WESTON & SAMPSON WESTON & SAMPSON ENGINEERS, INC. 55 WALKERS BROOK DR #100, READING, MA 01867 978.532.1900 800.SAMPSON WWW.WESTONANDSAMPSON.COM		TITLE: _____ CHIEF ENGINEER	

608079_BRI(S09003).DWG Plotted on 13-Feb-2020 4:01 PM 12-FEBRUARY-2020

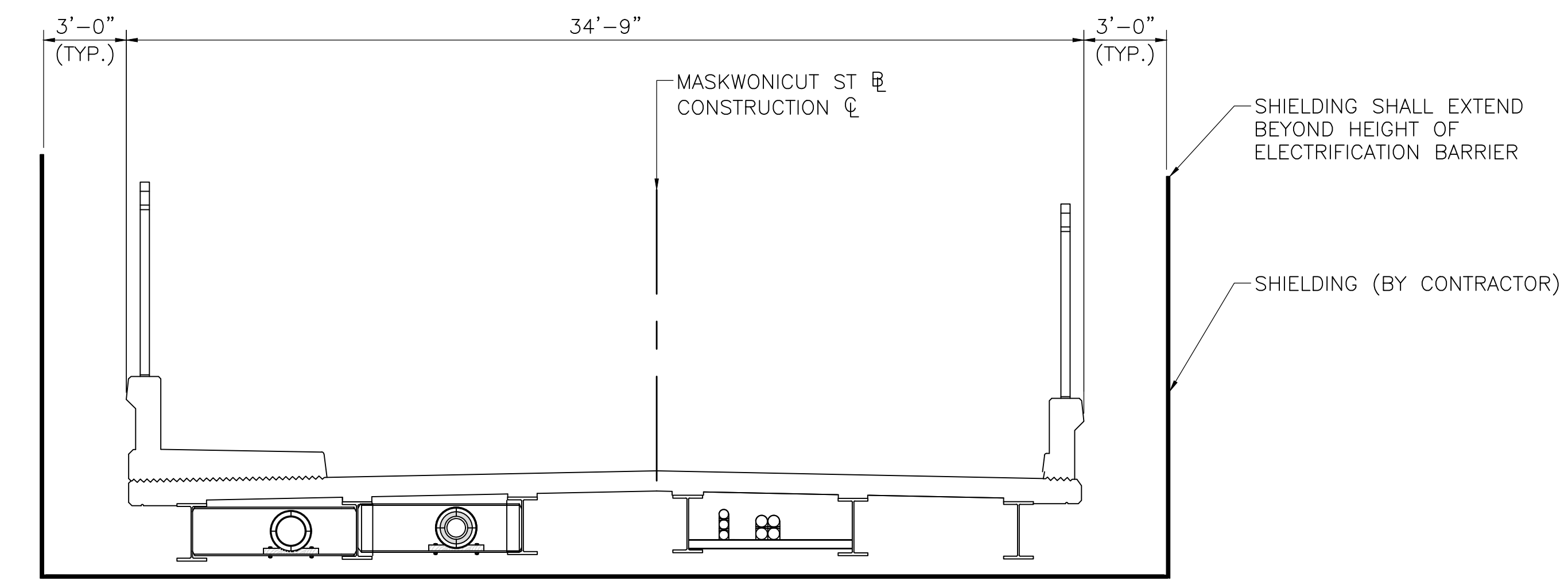
**SHARON
MASKWONICUT STREET**

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	66	83
PROJECT FILE NO.		608079	

LONGITUDINAL SECTION



LONGITUDINAL SECTION
SCALE: 1/8" = 1'-0"



SHIELDING CLEARANCE DETAIL
SCALE: 1/4" = 1'-0"

608079_BR14(S09003).DWG Plotted on 15-Feb-2020 3:39 PM 608079 First Structural Submittal (S1) 12-FEBRUARY-2020

APPENDIX I
Geotechnical Calculations

Project: Maskwonicut Street Bridge S-09-003
 Location: Sharon, MA
 WSE Project No: 2150851
 Calculation: Shallow Foundation Bearing Resistance

Weston & Sampson
 55 Walkers Brook Drive, Suite 100, Reading MA, 01867
 Tel: 978.532.1900

Calculation By: RJV Date: 7/3/2019
 Checked By: STS Date: 7/8/2019
 Revised By: STS Date: 5/12/2020

OBJECTIVE: Estimate the factored bearing resistance for the abutment and wingwall footings at the above referenced site for the Strength Limit and Extreme Limit states for varying load eccentricities.

REFERENCES:
 1) AASHTO LRFD Bridge Design Specifications, 7th Edition, 2017.
 2) Boring Logs BB-1 and BB-2 (refer to report Appendix).
 3) Das, Braja M. (2002), "Principles of Geotechnical Engineering." Pacific Grove, CA. 5th Ed.

DESIGN BASIS AND ASSUMPTIONS:
 - Bearing resistance factors presented in AASHTO (2017) are used in the analysis.
 - Shape, depth, and water factors are included in the analysis; inclination factors are ignored.
 - Assumed abutment and wingwall geometry based on available information.
 - Assume ground surface in front of abutment is relatively flat, and therefore modifications for sloping ground are not used.
 - Bearing resistance equation for strip footing applies
 - Abutments bear within dense to very dense native granular soils.

INPUTS

Abutment Geometry:

Proposed Footing Embedment Depth, D_f = 4.0 ft
 Footing Length, L = 34 ft
 Depth to Groundwater, D_w = 0 ft

Basis / Reference

Based on embedment depth shown on Sketch Plans.
 Conservatively estimated based on current proposed bridge dimensions.
 Conservatively assume groundwater is at or above bearing elevation.

Soil Parameters:

Overburden Soil Unit Weight, g = 120 pcf
 Friction Angle (for bearing soils), f = 35 degrees
 Cohesion (for bearing soils), c = 0 psf
 Cohesion Bearing Capacity Factor, N_c = 46.1
 Embedment Bearing Capacity Factor, N_{q_e} = 33.3
 Unit Weight Bearing Capacity Factor, N_{γ_e} = 48.0

Basis / Reference

AASHTO Table 10.6.3.1.2a-1
 AASHTO Table 10.6.3.1.2a-1
 AASHTO Table 10.6.3.1.2a-1

Resistance Factors:

Strength Limit, $\phi_{b_strength}$ = 0.45
 Extreme Limit, $\phi_{b_extreme}$ = 1.00

Basis / Reference

AASHTO Table 10.5.5.2.2-1
 AASHTO Section 10.5.5.3.3

- Factored Bearing Resistance, q_r , estimated using equation 10.6.3.1.1-1:

$q_r = \phi_b q_n$

CALCULATIONS

DETERMINE FACTORED BEARING RESISTANCE, q_r

- Nominal Bearing Resistance, q_n , determined using equation 10.6.3.1.2a-1

$$q_n = cN_{cm} + gD_f N_{qm} C_{wq} + 0.5gB' N_{gm} C_{wg}$$

where:

$$N_{qm} = N_c s_c i_q$$

$$N_{gm} = N_{\gamma} s_{\gamma} i_{\gamma}$$

$$N_{cm} = N_c s_c i_c$$

Eccentricity and Effective Footing Width (See Note 1)			B'/L	Groundwater Modifications (see Note 2)		Slope Modifications (See Note 3)		Shape Factors (See Note 4)			D _f /B'	Depth Factor (see Note 5)
B (ft.)	e (ft.)	B' (ft.)		C _{wq}	C _{wg}	N _{cq}	N _{cγ}	s _c	s _γ	s _q		d _q
20	3.33	13.3	0.392	0.5	0.5			1.283	0.843	1.275	0.300	1.2
19	3.17	12.7	0.373	0.5	0.5			1.269	0.851	1.261	0.316	1.2
18	3.00	12.0	0.353	0.5	0.5			1.255	0.859	1.247	0.333	1.2
17	2.83	11.3	0.333	0.5	0.5			1.241	0.867	1.233	0.353	1.2
16	2.67	10.7	0.314	0.5	0.5			1.227	0.875	1.220	0.375	1.2
15	2.50	10.0	0.294	0.5	0.5			1.212	0.882	1.206	0.400	1.2
14	2.33	9.3	0.275	0.5	0.5			1.198	0.890	1.192	0.429	1.2
13	2.17	8.7	0.255	0.5	0.5			1.184	0.898	1.178	0.462	1.2
12	2.00	8.0	0.235	0.5	0.5			1.170	0.906	1.165	0.500	1.2
11	1.83	7.3	0.216	0.5	0.5			1.156	0.914	1.151	0.545	1.2
10	1.67	6.7	0.196	0.5	0.5			1.142	0.922	1.137	0.600	1.2
9	1.50	6.0	0.176	0.5	0.5			1.127	0.929	1.124	0.667	1.2
8	1.33	5.3	0.157	0.5	0.5			1.113	0.937	1.110	0.750	1.2
7	1.17	4.7	0.137	0.5	0.5			1.099	0.945	1.096	0.857	1.2
6	1.00	4.0	0.118	0.5	0.5			1.085	0.953	1.082	1.000	1.2
5	0.83	3.3	0.098	0.5	0.5			1.071	0.961	1.069	1.200	1.2
4	0.67	2.7	0.078	0.5	0.5			1.057	0.969	1.055	1.500	1.2
3	0.50	2.0	0.059	0.5	0.5			1.042	0.976	1.041	2.000	1.2

Project: Maskwonicut Street Bridge S-09-003
 Location: Sharon, MA
 WSE Project No: 2150851
 Calculation: Shallow Foundation Bearing Resistance

Weston & Sampson
 55 Walkers Brook Drive, Suite 100, Reading MA, 01867
 Tel: 978.532.1900

Calculation By: RJV Date: 7/3/2019
 Checked By: STS Date: 7/8/2019
 Revised By: STS Date: 5/12/2020

B (ft.)	B' (ft.)	N_{qm}	N_{pm}	N_{cm}	Nominal Bearing Resistance, q_n [psf]	Factored Bearing Resistance- Strength Limit, $q_{r_strength}$ [psf]	Factored Bearing Resistance- Extreme Limit, $q_{r_extreme}$ [psf]
20.0	13.3	25.5	40.5	59.2	22,300	10,035	22,300
19.0	12.7	25.2	40.8	58.5	21,568	9,706	21,568
18.0	12.0	24.9	41.2	57.9	20,821	9,369	20,821
17.0	11.3	24.6	41.6	57.2	20,058	9,026	20,058
16.0	10.7	24.4	42.0	56.5	19,281	8,676	19,281
15.0	10.0	24.1	42.4	55.9	18,489	8,320	18,489
14.0	9.3	23.8	42.7	55.2	17,681	7,957	17,681
13.0	8.7	23.5	43.1	54.6	16,859	7,586	16,859
12.0	8.0	23.3	43.5	53.9	16,021	7,209	16,021
11.0	7.3	23.0	43.9	53.3	15,168	6,826	15,168
10.0	6.7	22.7	44.2	52.6	14,301	6,435	14,301
9.0	6.0	22.4	44.6	52.0	13,418	6,038	13,418
8.0	5.3	22.2	45.0	51.3	12,520	5,634	12,520
7.0	4.7	21.9	45.4	50.7	11,607	5,223	11,607
6.0	4.0	21.6	45.7	50.0	10,679	4,806	10,679
5.0	3.3	21.4	46.1	49.4	9,736	4,381	9,736
4.0	2.7	21.1	46.5	48.7	8,778	3,950	8,778
3.0	2.0	20.8	46.9	48.1	7,805	3,512	7,805

Notes:

- (1) Effective footing width B' determined based on AASHTO Section 10.6.1.3.
- (2) Groundwater modification based on factors C_{wg} and C_{we} from AASHTO Table 10.6.3.1.2a-2.
- (3) Where applicable, replace N_q and N_g with factors N_{cq} and N_{cg} to account for sloping ground in accordance with Section 10.6.3.1.2c.
- (4) Shape Correction Factors s_c , s_g , and s_q determined using equation in AASHTO Table 10.6.3.1.2a-3.
- (5) Depth Correction Factor d_q interpolated using AASHTO Table 10.6.3.1.2a-4.

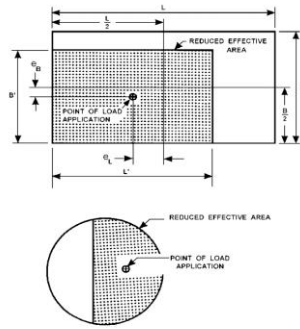
References (From AASHTO 2017)

Resistance Factors:

Table 10.5.5.2.2-1—Resistance Factors for Geotechnical Resistance of Shallow Foundations at the Strength Limit State

Resistance Type	Method/Soil/Condition	Resistance Factor	
Bearing Resistance	ϕ_b	Theoretical method (Munfakh et al., 2001), in clay	0.50
		Theoretical method (Munfakh et al., 2001), in sand, using CPT	0.50
		Theoretical method (Munfakh et al., 2001), in sand, using SPT	0.45
		Semi-empirical methods (Meyerhof, 1957), all soils	0.45
		Footings on rock	0.45
Sliding	ϕ_s	Plate Load Test	0.55
		Precast concrete placed on sand	0.90
		Cast-in-Place Concrete on sand	0.80
		Cast-in-Place or precast Concrete on Clay	0.85
		Soil on soil	0.90
	ϕ_{ep}	Passive earth pressure component of sliding resistance	0.50

Eccentricity and Effective Footing Dimensions:



$$B' = B - 2e_b \quad (10.6.1.3-1)$$

$$L' = L - 2e_L$$

where:

- e_b = eccentricity parallel to dimension B (ft)
- e_L = eccentricity parallel to dimension L (ft)

10.6.3.3—Eccentric Load Limitations

The eccentricity of loading at the strength limit state, evaluated based on factored loads shall not exceed:

- One-third of the corresponding footing dimension, B or L , for footings on soils, or 0.45 of the corresponding footing dimensions B or L , for footings on rock.

C10.6.3.3

A comprehensive parametric study was conducted for cantilevered retaining walls of various heights and soil conditions. The base widths obtained using the LRFD load factors and eccentricity of $B/3$ were comparable to those of ASD with an eccentricity of $B/6$. For foundations on rock, to obtain equivalence with ASD specifications, a maximum eccentricity of $B/2$ would be needed for LRFD. However, a slightly smaller maximum eccentricity has been specified to account for the potential unknown future loading that could push the resultant outside the footing dimensions.

Figure C10.6.1.3-1—Reduced Footing Dimensions

Bearing Capacity Factors

Table 10.6.3.1.2a-1—Bearing Capacity Factors N_c (Prandtl, 1921), N_q (Reissner, 1924), and N_γ (Vesic, 1975)

ϕ_f	N_c	N_q	N_γ	ϕ_f	N_c	N_q	N_γ
0	5.14	1.0	0.0	23	18.1	8.7	8.2
1	5.4	1.1	0.1	24	19.3	9.6	9.4
2	5.6	1.2	0.2	25	20.7	10.7	10.9
3	5.9	1.3	0.2	26	22.3	11.9	12.5
4	6.2	1.4	0.3	27	23.9	13.2	14.5
5	6.5	1.6	0.5	28	25.8	14.7	16.7
6	6.8	1.7	0.6	29	27.9	16.4	19.3
7	7.2	1.9	0.7	30	30.1	18.4	22.4
8	7.5	2.1	0.9	31	32.7	20.6	26.0
9	7.9	2.3	1.0	32	35.5	23.2	30.2
10	8.4	2.5	1.2	33	38.6	26.1	35.2
11	8.8	2.7	1.4	34	42.2	29.4	41.1
12	9.3	3.0	1.7	35	46.1	33.3	48.0
13	9.8	3.3	2.0	36	50.6	37.8	56.3
14	10.4	3.6	2.3	37	55.6	42.9	66.2
15	11.0	3.9	2.7	38	61.4	48.9	78.0
16	11.6	4.3	3.1	39	67.9	56.0	92.3
17	12.3	4.8	3.5	40	75.3	64.2	109.4
18	13.1	5.3	4.1	41	83.9	73.9	130.2
19	13.9	5.8	4.7	42	93.7	85.4	155.6
20	14.8	6.4	5.4	43	105.1	99.0	186.5
21	15.8	7.1	6.2	44	118.4	115.3	224.6
22	16.9	7.8	7.1	45	133.9	134.9	271.8

Shape Factors

Factor	Friction Angle	Cohesion Term (s_c)	Unit Weight Term (s_γ)	Surcharge Term (s_q)
Shape Factors s_c, s_γ, s_q	$\phi_f = 0$	$1 + \left(\frac{B}{5L}\right)$	1.0	1.0
	$\phi_f > 0$	$1 + \left(\frac{B}{L}\right)\left(\frac{N_q}{N}\right)$	$1 - 0.4\left(\frac{B}{L}\right)$	$1 + \left(\frac{B}{L} \tan \phi_f\right)$

Depth Correction

Table 10.6.3.1.2a-4—Depth Correction Factor d_s

Friction Angle, ϕ_f (degrees)	D_f/B	d_s
32	1	1.20
	2	1.30
	4	1.35
37	1	1.20
	2	1.25
	4	1.30
42	1	1.15
	2	1.20
	4	1.25
	8	1.30

Groundwater Modification

Table 10.6.3.1.2a-2—Coefficients C_{wq} and $C_{w\gamma}$ for Various Groundwater Depths

D_w	C_{wq}	$C_{w\gamma}$
0.0	0.5	0.5
D_f	1.0	0.5
$>1.5B + D_f$	1.0	1.0

(interpolation is used for intermediate values)

Project Number: 2150851
Project Name: Maskwonicut Street Bridge S-09-003
Calculation: Settlement Analysis of Shallow Foundations

Calc. By: RJV, 7/3/19
Check By: STS, 7/8/19
Revised By: STS, 5/12/20

Objective: Estimate the maximum service limit bearing pressures to limit the abutment settlement to 0.25 to 1.0 inch.

Reference: AASHTO LRFD Bridge Design Specifications, Eighth Edition, September 2017

Assumptions: Based on borings BB-1 and BB-2 and our understanding of the bearing elevation for the abutment footings, the foundation soils generally consisted of dense to very dense gravelly fine to coarse SAND with little silt. For this calculation, assume an average N_{160} of 40 b.p.f.

Inputs:

Abutment Geometry:

L =	34 ft	footing length
Df =	4.0 ft	depth of footing
Dw =	0 ft	depth to groundwater

Soil Properties

$g_w =$	62.4 pcf	Unit weight of water
$g =$	120 pcf	unit weight of dry soil
$g' =$	57.6 pcf	effective unit weight of soil
$\phi_f' =$	35 °	Friction angle of foundation soils
N_{160}	40	Conservatively assumed.
$\nu =$	0.35	Poisson's ratio (Based on AASHTO Table C10.4.6.3-1)

Estimate Young's Modulus based on N-value Correlations:

$E_s = 0.167 \cdot N_{160}$ (Based on AASHTO Table C10.4.6.3.1 correlations with N_{160} value for sandy gravel)
 $E_s = 6.7$ ksi

Table C10.4.6.3-1—Elastic Constants of Various Soils (modified after U.S. Department of the Navy, 1982; Bowles, 1988)

Estimating E_s from SPT N Value	
Soil Type	E_s (ksi)
Silts, sandy silts, slightly cohesive mixtures	$0.056 N_{160}$
Clean fine to medium sands and slightly silty sands	$0.097 N_{160}$
Coarse sands and sands with little gravel	$0.139 N_{160}$
Sandy gravel and gravels	$0.167 N_{160}$
Estimating E_s from q_c (static cone resistance)	
Sandy soils	$0.028 q_c$

Soil Type	Typical Range of Young's Modulus Values, E_s (ksi)	Poisson's Ratio, ν (dim)
Clay:		
Soft sensitive		
Medium stiff to stiff	0.347–2.08	0.4–0.5 (undrained)
Very stiff	2.08–6.94	
Loess	2.08–8.33	0.1–0.3
Silt	0.278–2.78	0.3–0.35
Fine Sand:		
Loose	1.11–1.67	
Medium dense	1.67–2.78	0.25
Dense	2.78–4.17	
Sand:		
Loose	1.39–4.17	0.20–0.36
Medium dense	4.17–6.94	
Dense	6.94–11.11	0.30–0.40
Gravel:		
Loose	4.17–11.11	0.20–0.35
Medium dense	11.11–13.89	
Dense	13.89–27.78	0.30–0.40

Calculations:

Interpolate Rigidity Factor from AASHTO (2017) Table 10.6.2.4.2-1

$\beta_z = 1.13$

L/B = 2.5

L/B =	2	2.5	3
$\beta_z =$	1.10	1.13	1.15

Table 10.6.2.4.2-1 Elastic Shape and Rigidity Factors, EPRI (1983).

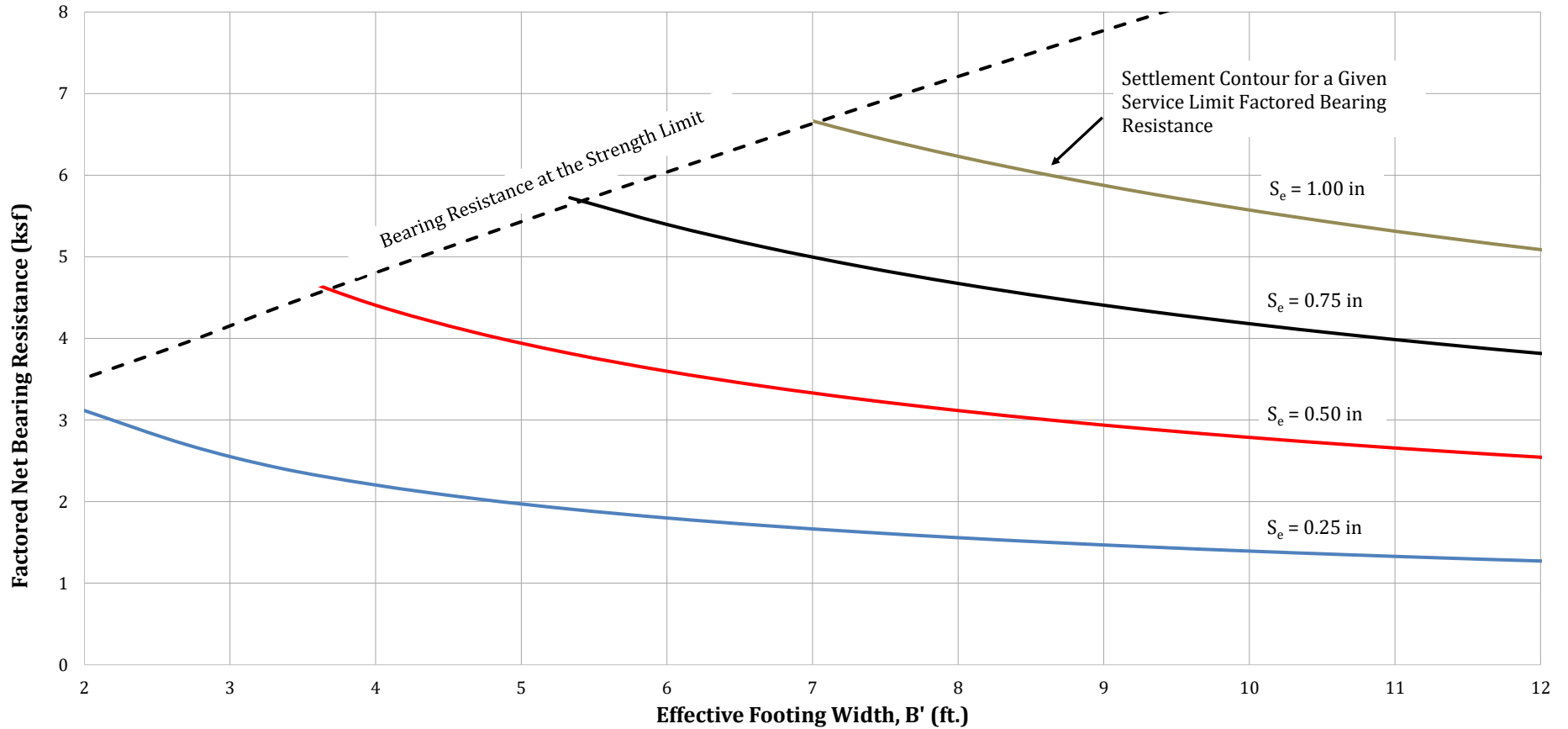
L/B	Flexible, β_z (average)	β_z Rigid
Circular	1.04	1.13
1	1.06	1.08
2	1.09	1.10
3	1.13	1.15
5	1.22	1.24
10	1.41	1.41

Estimate the vertical stress increase (q_0) for various magnitude settlement, using elastic half space method in accordance with AASHTO Section 10.6.2.4.2

$$S_e = \frac{\left[q_o (1 - \nu^2) \sqrt{A'} \right]}{144 E_s \beta_z} \quad (10.6.2.4.2-1)$$

Eccentricity and Effective Footing Width (1)			Effective Footing Area (L*B')	q_0 for various amounts of settlement			
				$S_e = 0.25$ in q0 (ksf)	$S_e = 0.50$ in q0 (ksf)	$S_e = 0.75$ in q0 (ksf)	$S_e = 1.00$ in q0 (ksf)
B (ft.)	e (ft)	B' (ft)	A' (ft ²)				
20	3.33	13.3	453	1.2	2.4	3.6	4.8
19	3.17	12.7	431	1.2	2.5	3.7	5.0
18	3.00	12.0	408	1.3	2.5	3.8	5.1
17	2.83	11.3	385	1.3	2.6	3.9	5.2
16	2.67	10.7	363	1.3	2.7	4.0	5.4
15	2.50	10.0	340	1.4	2.8	4.2	5.6
14	2.33	9.3	317	1.4	2.9	4.3	5.8
13	2.17	8.7	295	1.5	3.0	4.5	6.0
12	2.00	8.0	272	1.6	3.1	4.7	6.2
11	1.83	7.3	249	1.6	3.3	4.9	6.5
10	1.67	6.7	227	1.7	3.4	5.1	6.8
9	1.50	6.0	204	1.8	3.6	5.4	7.2
8	1.33	5.3	181	1.9	3.8	5.7	7.6
7	1.17	4.7	159	2.0	4.1	6.1	8.2
6	1.00	4.0	136	2.2	4.4	6.6	8.8
5	0.83	3.3	113	2.4	4.8	7.2	9.7
4	0.67	2.7	91	2.7	5.4	8.1	10.8
3	0.50	2.0	68	3.1	6.2	9.3	12.5

Shallow Foundation Factored Bearing Resistances & Estimated Settlements



NOTE (1) Estimated settlement is based on a 34 ft. long abutment footing bearing on medium to very dense native soils.



**Maskwonicut Street Bridge S-09-003
Sharon, MA**

WSE Project No.: 2150851
 Drawn By: STS
 Checked By: CJP
 Date: 5/12/2020

Figure 5 - Estimated Settlement of Shallow Fdns.