DSK

COMMONWEALTH OF MASSACHUSETTS



CONTRACT DOCUMENTS AND SPECIAL PROVISIONS

PROPOSAL NO.	616308-136880
P.V. =	$19,527,000.00
PLANS	YES

FOR

Installation of Noise Barriers along I-90 between Market and Franklin Streets (Allston Multimodal Transportation Project Early Action)

in the City of

BOSTON

In accordance with the STANDARD SPECIFICATIONS
for HIGHWAYS and BRIDGES dated 2026

This Proposal to be opened and read: **TUESDAY, NOVEMBER 17, 2026 at 2:00 P.M.**

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DOCUMENT 00010

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DOCUMENT 00102

NOTICE TO CONTRACTORS

Electronic proposals for the following project will be received through the internet using www.bidx.com until the date and time stated below and will be posted on www.bidx.com forthwith after the bid submission deadline. No paper copies of bids will be accepted. All Bidders must have a valid vendor code issued by MassDOT in order to bid on projects. Bidders need to apply for a Digital ID at least 14 days prior to a scheduled bid opening date with www.bidx.com.

TUESDAY, NOVEMBER 17, 2026 at 2:00 P.M. **
BOSTON
Installation of Noise Barriers along I-90 between Market and Franklin Streets
(Allston Multimodal Transportation Project Early Action)
****Date Subject to Change**

PROJECT VALUE = $19,527,000.00

Bidders must be pre-qualified by the Department in the HIGHWAY - CONSTRUCTION category to bid on the above project. An award will not be made to a Contractor who is not pre-qualified by the Department prior to the opening of Proposals.

All prospective Bidders who intend to bid on this project must obtain "Request Proposal Form (R109)". The blank "Request Proposal Form (R109)" can be obtained at: https://www.mass.gov/prequalification-of-horizontal-construction-firms.

All prospective Bidders must complete and e-mail an electronic copy of "Request Proposal Form (R109)" to the MassDOT Director of Prequalification for approval: prequal.r109@dot.state.ma.us.

Proposal documents for official bidders are posted on www.bidx.com. Other interested parties may receive informational Contract Documents containing the Plans and Special Provisions, free of charge.

Bids will be considered, and the contract awarded in accordance with statutes governing such contracts in accordance with Massachusetts General Laws Chapter 30 § 39M.

The Project Bids File Attachments folder for proposals at www.bidx.com shall be used for submitting at the time of bid required information such as the Bid Bond required document, and other documents that may be requested in the proposal.

NOTICE TO CONTRACTORS (Continued)

All parties who wish to have access to information plans and specification must send a "Request for Informational Documents" to MassDOTBidDocuments@dot.state.ma.us.

A Proposal Guaranty in the amount of 5% of the value of the bid is required.

This project is subject to the schedule of prevailing wage rates as determined by the Commissioner of the Massachusetts Department of Labor and Workforce Development, and the Division of Occupational Safety.

PRICE ADJUSTMENTS

This Contract contains price adjustments for hot mix asphalt and Portland cement mixtures, diesel fuel, and gasoline. For reference the base prices are as follows: liquid asphalt $712.50 per ton, Portland cement $452.13 per ton, diesel fuel $5.413 per gallon, and gasoline $3.665 per gallon, and Steel Base Price Index 384.0. MassDOT posts the **Price Adjustments** on their Highway Division's website at
https://www.mass.gov/massdot-contract-price-adjustments

This Contract contains Price Adjustments for steel. See Document 00813 - PRICE ADJUSTMENT FOR STRUCTURAL STEEL AND REINFORCING STEEL for their application and base prices.

MassDOT projects are subject to the rules and regulations of the Architectural Access Board (521 CMR 1.00 et seq.)

Prospective bidders and interested parties can access this information and more via the internet at WWW.COMMBUYS.COM.

BY: Phillip Eng, Interim MassDOT Secretary
Jonathan L. Gulliver, Undersecretary and Highway Administrator
SATURDAY, SEPTEMBER 26, 2026

DOCUMENT 00210

REQUIREMENTS OF MASSACHUSETTS GENERAL LAWS
CHAPTER 30, SECTION 39R;
CHAPTER 30, SECTION 39O

July 1, 1981, updated October 2016

M.G.L. c. 30, § 39R. Award of Contracts; Accounting Statements; Annual Financial Statements; Definitions.

(a) The words defined herein shall have the meaning stated below whenever they appear in this section:

(1) “Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to sections thirty-eight A1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A to forty-four H, inclusive, of chapter one hundred and forty-nine, which is for an amount or estimated amount greater than one hundred thousand dollars.

(2) "Contract" means any contract awarded or executed pursuant to sections thirty-eight A1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A through forty-four H, inclusive, of chapter one hundred and forty-nine, which is for amount or estimated amount greater than one hundred thousand dollars.

(3) “Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

(4) “Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.

(5) “Audit", when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

(6) "Accountant's Report", when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he has made and sets forth his opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefor shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the contractor.

(7) “Management", when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the contractor.

(8) Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

(b) Subsection (a)(2) hereof notwithstanding, every agreement or contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven, or eleven C of chapter twenty-five A, and pursuant to section thirty-nine M of chapter thirty or to section forty-four A through H, inclusive, of chapter one hundred and forty-nine, shall provide that:

(1) The contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the contractor, and

(2) Until the expiration of six years after final payment, the office of inspector general, and the commissioner of capital asset management and maintenance shall have the right to examine any books, documents, papers or records of the contractor or of his subcontractors that directly pertain to, and involve transactions relating to, the contractor or his subcontractors, and

(3) If the agreement is a contract as defined herein, the contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the awarding authority, including in his description the date of the change and reasons therefor, and shall accompany said description with a letter from the contractor's independent certified public accountant approving or otherwise commenting on the changes, and

(4) If the agreement is a contract as defined herein, the contractor has filed a statement of management on internal accounting controls as set forth in paragraph (c) below prior to the execution of the contract, and

(5) If the agreement is a contract as defined herein, the contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in paragraph (d) below.

(c) Every contractor awarded a contract shall file with the awarding authority a statement of management as to whether the system of internal accounting controls of the contractor and its subsidiaries reasonably assures that:

(1) transactions are executed in accordance with management's general and specific authorization;

(2) transactions are recorded as necessary

i. to permit preparation of financial statements in conformity with generally accepted accounting principles, and

ii. to maintain accountability for assets;

(3) access to assets is permitted only in accordance with management's general or specific authorization; and

(4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

Every contractor awarded a contract shall also file with the awarding authority a statement prepared and signed by an independent certified public accountant, stating that he has examined the statement of management on internal accounting controls, and expressing an opinion as to:

(1) whether the representations of management in response to this paragraph and paragraph (b) above are consistent with the result of management's evaluation of the system of internal accounting controls; and

(2) whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

(d) Every contractor awarded a contract by the commonwealth or by any political subdivision thereof shall annually file with the commissioner of capital asset management and maintenance during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report. Such statements shall be made available to the awarding authority upon request.

(e) The office of inspector general, the commissioner of capital asset management and maintenance and any other awarding authority shall enforce the provisions of this section. The commissioner of capital asset management and maintenance may after providing an opportunity for the inspector general and other interested parties to comment, promulgate pursuant to the provisions of chapter thirty A such rules, regulations and guidelines as are necessary to effectuate the purposes of this section. Such rules, regulations and guidelines may be applicable to all awarding authorities. A contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to section forty-four C of chapter one hundred and forty-nine.

(f) Records and statements required to be made, kept or filed under the provisions of this section shall not be public records as defined in section seven of chapter four and shall not be open to public inspection; provided, however, that such records and statements shall be made available pursuant to the provisions of clause (2) of paragraph (b).

M.G.L. c. 30, § 39O: Suspension, Delay, or Interruption or Failure to Act by Awarding Authority; Adjustment in Contract Price; Submission of Claims.

Section 39O. Every contract subject to the provisions of section thirty-nine M of this chapter or subject to section forty-four A of chapter one hundred forty-nine shall contain the following provisions (a) and (b) in their entirety and, in the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the general contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the general contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the general contractor or the subcontractor may have against each other.

(a) The awarding authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(b) The general contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the awarding authority in writing of the act or failure to act involved in the claim.

<<<<<<<<<<>>>>>>>>>>

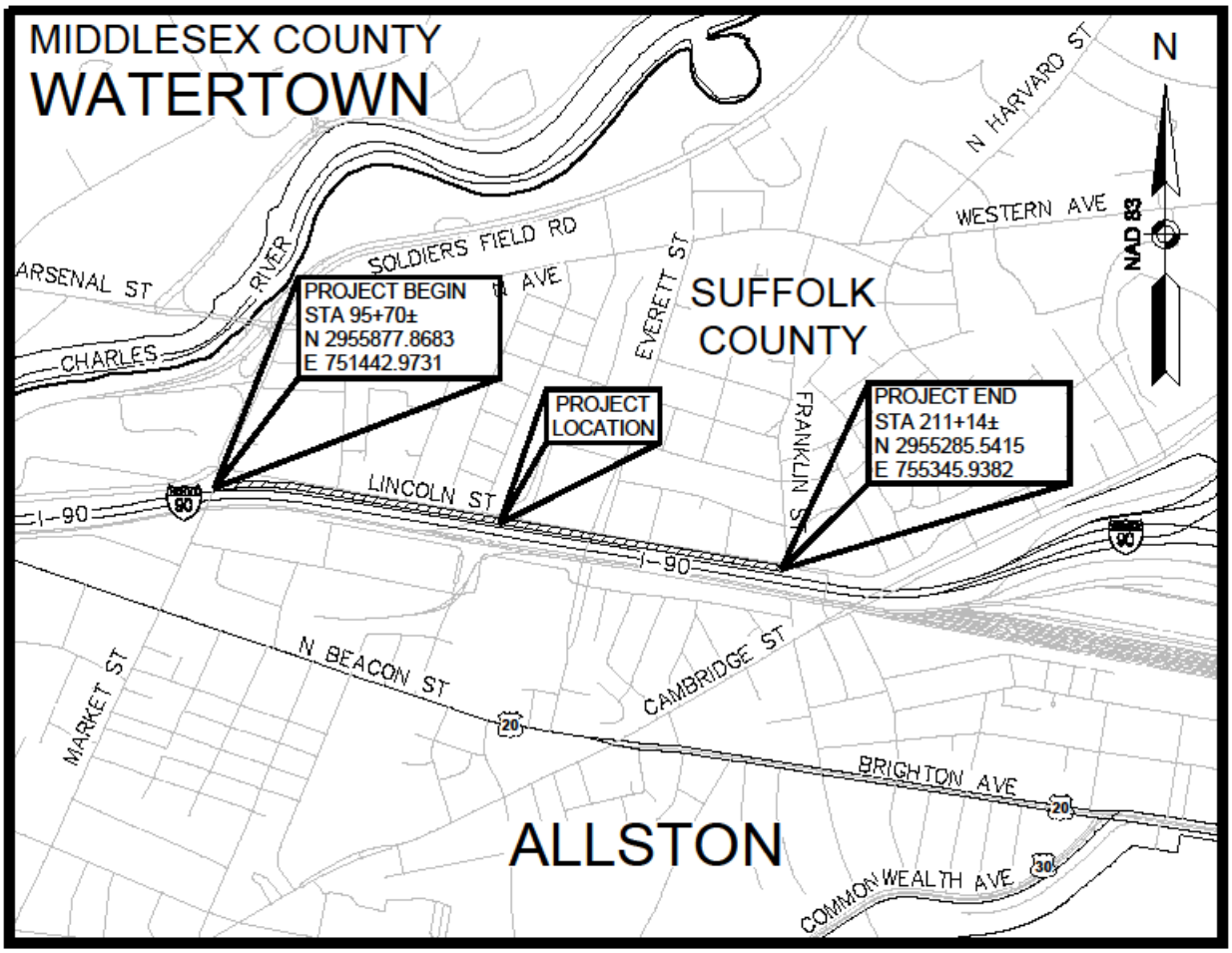
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DOCUMENT 00331

LOCUS MAP

BOSTON
Installation of Noise Barriers along I-90 between Market and Franklin Streets
(Allston Multimodal Transportation Project Early Action)



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DOCUMENT 00439

Final Report ☐

Interim Report ☐

CONTRACTOR PROJECT EVALUATION FORM

For instructions on using this form, see Engineering Directive E-10-002, Dated 4/20/2010

Date: _____

City/Town: _____ Contractor: _____

Project: _____ Address: _____

F.A. No. _____ Contract Number: _____

Bid Price: _____ Notice to Proceed: _____

Funds: State: _____ Fed Aid: _____ Current Contract Completion Date: _____

Date Work Started: _____ Date Work Completed*: _____

Contractor's Superintendent: _____

Division: (indicates class of work) Highway: _____ Bridge: _____ Maintenance: _____

*If work was NOT completed within specified time (including extensions) give reasons on following page.

	Excellent 10	Very Good 9	Average 8	7	Fair 6	5	Poor 4	% Rating
1. Workmanship								x 2=
2. Safety								x 2=
3. Schedule								x 1.5=
4. Home Office Support								x 1=
5. Subcontractors Performance								x 1=
6. Field Supervision/ Superintendent								x 1=
7. Contract Compliance								x 0.5=
8. Equipment								x 0.5=
9. Payment of Accounts								x 0.5=
(use back for additional comments)						**Overall Rating:**		

(Give explanation of items 1 through 9 on the following page in numerical order if overall rating is below 80%. Use additional sheets if necessary.)

_____ _____

District Construction Engineer's Signature/Date Resident Engineer's Signature/Date

_____

Contractor's Signature Acknowledging Report/Date

Contractor Requests Meeting with the District: No ☐ Yes ☐ Date Meeting Held: _____

Contractor's Comments/Meeting Notes (extra sheets may be added to this form and noted here if needed): _____

_____

_____

CONTRACTOR PROJECT EVALUATION FORM (Continued)

Date: _____ Contract Number:_____

INFORMATION FOR DISTRICT HIGHWAY DIRECTORS RELATING TO PREQUALIFICATION

A deduction shall be recommended for unsatisfactory performance if computed overall rating is under 80%.
A deduction may be recommended for this project being completed late due to the Contractor's fault.

RECOMMENDATIONS FOR DEDUCTIONS FROM CONTRACTORS' ASSIGNED FACTOR
(*Write Yes or No in space provided*)

I recommend a deduction for Contractor's unsatisfactory performance: _____

I recommend a deduction for project completed late:_____

Signed: _____
District Highway Director

EXPLANATION OF RATINGS 1 – 9:_____

WORK NOT COMPLETED WITHIN SPECIFIED TIME: _____

Revised: 04/28/17

*** END OF DOCUMENT ***

DOCUMENT 00440

Final Report ☐

Interim Report ☐

SUBCONTRACTOR PROJECT EVALUATION FORM

For instructions on using this form, see Engineering Directive E-10-002, Dated 4/20/2010

Date: _____

City/Town: _____ Subcontractor: _____

Project: _____ Address: _____

F.A. No.: _____ Contract Number: _____

Prime Contractor _____ Current Contract Completion Date: _____

Date Work Started: _____ Date Work Completed*: _____

Subcontractor's Superintendent: _____

Type of Work Performed by Subcontractor: _____

*If work was NOT completed within specified time (including extensions) give reasons on following page.

	Excellent 10	Very Good 9	Average 8	7	Fair 6	5	Poor 4	% Rating
1. Workmanship								x 2=
2. Safety								x 2=
3. Schedule								x 1.5=
4. Home Office Support								x 1.5=
5. Field Supervision/ Superintendent								x 1=
6. Contract Compliance								x 1=
7. Equipment								x 0.5=
8. Payment of Accounts								x 0.5=
(use back for additional comments)							**Overall Rating:**	

(Give explanation of items 1 through 8 on the following page in numerical order if overall rating is below 80%. Use additional sheets if necessary.)

_____ _____

District Construction Engineer's Signature/Date Resident Engineer's Signature/Date

_____ _____

Contractor Signature Acknowledging Report/Date Subcontractor Signature Acknowledging Report/Date

Subcontractor Requests Meeting with the District: No ☐ Yes ☐ Date Meeting Held: _____

Subcontractor's Comments / Meeting Notes (extra sheets may be added to this form and noted here if needed):

_____

_____

Contractor's Comments: _____

_____

SUBCONTRACTOR PROJECT EVALUATION FORM (Continued)

Date: _____ Contract Number:_____

INFORMATION FOR DISTRICT HIGHWAY DIRECTORS RELATING TO PREQUALIFICATION

A deduction shall be recommended for unsatisfactory performance if computed overall rating is under 80%.
A deduction may be recommended for this project being completed late due to the Contractor's fault.

RECOMMENDATIONS FOR DEDUCTIONS FROM CONTRACTORS' ASSIGNED FACTOR
(*Write Yes or No in space provided*)

I recommend a deduction for Contractor's unsatisfactory performance: _____

I recommend a deduction for project completed late:_____

Signed: _____
District Highway Director

EXPLANATION OF RATINGS 1 – 8: _____

_____

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WORK NOT COMPLETED WITHIN SPECIFIED TIME: _____

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Revised: 04/28/17

*** END OF DOCUMENT ***

DOCUMENT 00710
GENERAL CONTRACT PROVISIONS
Revised: 03-31-26

NOTICE OF AVAILABILITY

The STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES dated 2026, the SUPPLEMENTAL SPECIFICATIONS , the 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS; the 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING and the CONSTRUCTION STANDARD DETAILS are available online at https://www.mass.gov/massdot-highway-division-manuals-and-publications

SPECIAL PROVISIONS FOR RIGHT-TO-KNOW ACT REQUIREMENTS

The Contractor's attention is directed to Massachusetts General Laws, Chapter 111F, commonly known as the Right-To-Know Act, and to the regulations promulgated pursuant thereto. Among the provisions of the Right-To-Know Act is a requirement that employers make available to employees Materials Safety Data Sheets (MSDS) for any substance on the Massachusetts Substance List (MSL) to which employees are, have been, or may be exposed.

To ensure prompt compliance with these regulations and legislation, the Contractor shall:

1. Deliver to the Department, prior to the start of any work under this contract, copies of MSDS for all MSL substances to be used, stored, processed or manufactured at the worksite by the Contractor.

2. Train employees of the Department, who may be exposed to MSL substances as a result of the Contractor's work under this contract, with regard to those specific substances in accordance with requirements of the Right-To-Know Act.

3. Observe all safety precautions recommended on the MSDS for any MSL substance to be used, stored, processed, or manufactured at the worksite by the Contractor.

4. Inform the Department in writing regarding specific protective equipment recommended in the MSDS for MSL substances to which employees of the Department may be exposed as a result of the Contractor's work under this contract.

The Department shall not be liable for any delay or suspension of work caused by the refusal of its employees to perform any work due to the Contractor's failure to comply with the Right-To-Know Act. The Contractor agrees to hold the Department or the Commissioner of the Department harmless and fully indemnified for any and all claims, demands, fines, actions, complaints, and causes of action resulting from or arising out of the Contractor's failure to comply with the requirements of the Right-To-Know Act.

ALTERNATIVE DISPUTE RESOLUTION
Forum, Choice of Law and Mediations:

Any actions arising out of a contract shall be governed by the laws of Massachusetts and shall be brought and maintained in a State or federal court in Massachusetts which shall have exclusive jurisdiction thereof. MassDOT and the Contractor may both agree to mediation of any claim and will share the costs of such mediation pro rata based on the number of parties involved.

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DOCUMENT 00715

SUPPLEMENTAL SPECIFICATIONS

SEPTEMBER 30, 2026

The 2026 *Standard Specifications for Highways and Bridges* are amended by the following modifications, additions and deletions. These Supplemental Specifications prevail over those published in the Standard Specifications.

The Specifications Committee has issued these Supplemental Specifications for inclusion into each proposal until such time as they are updated or incorporated into the next Standard Specifications.

Contractors are cautioned that these Supplemental Specifications are dated and will change as they are updated.

DIVISION I

GENERAL REQUIREMENTS AND COVENANTS

SECTION 5.00: CONTROL OF WORK

Subsection 5.03: Conformity with Plans and Specifications
Change the MGL reference in the first sentence to Chapter 30, Section 39I (from Section 39L).

SECTION 7.00: LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

Subsection 7.16: Claims of Contractor for Compensation
Replace the fifth paragraph of 7.16.A: Contractor Claims Submission to the Department (Step 1), Itemized Statement of Claim, with the following:

Such notice by the Contractor and the keeping of costs by the Engineer shall not in any way be construed as providing the validity of the claim. The provisions of this subsection shall not apply to Extra Work ordered by the Engineer in writing.

Replace the third paragraph of 7.16..C Appeal to the Administrative Law Judge (Step 3) with the following:

At any time after the determination by the Claims Committee, the Contractor, at its sole discretion may pursue the matter in the Superior Court Department of the Commonwealth of Massachusetts in the County of Suffolk. The exclusive jurisdiction and venue for any legal action or proceeding, at Law or in equity, arising out of or relating to the Contract Documents or the Project, shall be the Superior Court Department of the Commonwealth of Massachusetts in the County of Suffolk. The Contractor waives all objections it might have to the jurisdiction or venue of such court and hereby consents to such jurisdiction, regardless of the Contractor's residence or domicile, for any such action or proceeding. This subsection does not relieve the Contractor's obligation to submit the dispute to Superior Court within the applicable statutes of limitations or repose and the Department does not hereby waive its rights to assert defenses based upon such statutes.

DIVISION II

CONSTRUCTION DETAILS

SECTION 100: EARTHWORK, GRADING, DEMOLITION, RODENT CONTROL AND BORINGS

SUBSECTION 119: CONTROL OF RODENTS

Subsection 119.60:A: Initial Treatment
Replace the first sentence with the following;

This phase shall start immediately after Notice to Proceed and shall be applied in all buildings to be razed and to all other buildings and areas within the limits of construction where, in the Engineer's judgment, rodents have gathered or may gather during the construction period.

SECTION 200: DRAINAGE

SUBSECTION 227: DRAINAGE SYSTEM SEDIMENT

Subsection 227.30, Method of Measurement
Change the subsection number to 227.80

Subsection 227.31, Basis of Payment
Change the subsection number to 227.81

Subsection 227.31, Payment Items
Change the subsection number to 227.82

SECTION 400: SUB-BASE, BASE COURSE, SHOULDERS, PAVEMENT AND BERMS

SUBSECTION 430: CEMENT CONCRETE BASE COURSE

Subsection 430.40: General
Change Applied Crack Sealer to Hot Applied Crack Sealer.

SUBSECTION 476: CEMENT CONCRETE PAVEMENT

Subsection 476.20: Materials
Delete Preformed Bituminous Joint Filler for Concrete - M3.05.5 and add the following in M number sequence:

Preformed Expansion Joint Filler	M9.14.0

SUBSECTION 477: MILLED RUMBLE STRIPS

Subsection 477: Milled Rumble Strips
Replace this subsection with the following:

DESCRIPTION

477.20: General

The work consists of constructing rumble strips on roadways by milling grooves into finished surfaces. Milled Rumble Strips are categorized as Type A, Type B, Type C, or Type D. Type A are rectangular milled grooves at regular intervals in the paved surface, Type B rumble strips are rectangular grooves at regular intervals with designed gaps between intervals to accommodate bicyclists, and Type C and Type D rumble strips form continuous grooves in the paved surface in the form of a vertical sinusoidal wave pattern.

CONSTRUCTION METHODS

477.61: Equipment

The equipment shall self-align with the slope of the roadway surface and/or any irregularities in the roadway surface.

The Contractor shall demonstrate to the Engineer the ability to achieve the desired groove without tearing or snagging the roadway surface prior to beginning the work.

477.62: Installation of Rumble Strips

Rumble strips shall be installed in accordance with the locations, dimensions, and Type shown on the plans.

Type A and Type B rumble strips shall be installed after the longitudinal pavement markings they supplement (typically edge lines or channelizing lines) are in place. Installation of any diagonal or chevron pavement markings that cross the Type A or Type B rumble strips shall only occur after the rumble strips are in place.

Type C rumble strips shall be installed after the location of the longitudinal pavement markings they supplement (typically center lines) has been laid out, but before the pavement markings are installed. The pavement markings shall only be installed after the Type C rumble strips are in place.

Type D rumble strips shall be installed after the longitudinal pavement markings they supplement (typically center lines) are in place.

477.63: Control of the Work Area

At the end of each working day, all equipment shall be moved to a location where it does not present a hazard to traffic. The pavement shall be cleaned by sweeping and the work area shall be reopened to traffic.

Pavement millings shall become the property of the Contractor and shall be removed and disposed of off-site.

COMPENSATION

477.80: Method of Measurement

Milled Rumble Strip (Type A), Milled Rumble Strip (Type C), and Milled Rumble Strip (Type D) will be measured per foot of installed rumble strip. Milled Rumble Strip (Type B) will be measured per foot of installed rumble strip excluding the designed gaps. Breaks at castings, bridge decks, intersections, or other breaks will not be measured for payment for all types.

477.81: Basis of Payment

Payment for Milled Rumble Strip (Type A), Milled Rumble Strip (Type B), Milled Rumble Strip (Type C), and Milled Rumble Strip (Type D) will be made at the contract unit price per foot of rumble strips, complete in place. Such payment will be full compensation for furnishing all equipment and labor for satisfactorily performing the work including cleanup and disposal of excess materials.

477.82: Payment Items

Item number	Description	Unit
477.	Milled Rumble Strip (Type A)	Foot
477.1	Milled Rumble Strip (Type B)	Foot
477.2	Milled Rumble Strip (Type C)	Foot
477.3	Milled Rumble Strip (Type D)	Foot

SUBSECTION 482: SAWCUTTING

Subsection 482.80: Method of Measurement
Replace this subsection with the following:

Sawcutting, when included in the Contract as its own bid item, will be measured for payment by the foot along the cut line, regardless of depth.

SECTION 600: HIGHWAY GUARD, FENCES AND WALLS

SUBSECTION 628: IMPACT ATTENUATORS

Subsection 628.82: Payment Items
Replace this subsection with the following:

Item number	Description	Unit
628.302	Permanent Impact Attenuator, Non-Redirective, TL-2	Each
628.303	Permanent Impact Attenuator, Non-Redirective, TL-3	Each
628.304	Temporary Impact Attenuator, Non-Redirective, TL-2	Each
628.305	Temporary Impact Attenuator, Non-Redirective, TL-3	Each
628.312	Permanent Impact Attenuator, Redirective, TL-2	Each
628.313	Permanent Impact Attenuator, Redirective, TL-3	Each
628.314	Temporary Impact Attenuator, Redirective, TL-2	Each
628.315	Temporary Impact Attenuator, Redirective, TL-3	Each
628.322	Permanent Impact Attenuator, Low-Maintenance, TL-2	Each
628.323	Permanent Impact Attenuator, Low-Maintenance, TL-3	Each

SECTION 800: TRAFFIC CONTROL DEVICES

SUBSECTION 801: Conduit, Manholes, Handholes, Pull Boxes and Foundations

Subsection 801.61.C: Pre-Cast Concrete Units
Replace this subsection with the following;

The construction methods for pre-cast concrete units shall conform to the relevant provisions of M4.09.0 Precast, Prestressed, and Prefabricated Concrete Products

SUBSECTION 813: WIRING, GROUNDING AND SERVICE CONNECTIONS

Subsection 813.20: General
Replace this subsection with the following:

This work shall consist of furnishing and installing wire and cable of the type and size indicated for traffic signals and other traffic control devices, ITS systems, highway lighting and related electrical systems, equipment grounding systems, new ground electrodes or connections to existing ground electrodes, power pedestals, and all materials and equipment necessary to deliver power to such systems.

Service points shown on the plans are approximate only. The Contractor shall determine exact locations for both overhead and underground service access points. The Contractor shall determine riser elevations or connections/routing to manhole facilities from the serving utility, and arrange to complete the service connections.

All work under this Subsection shall comply with the MEC and the National Electrical Safety Code.

Subsection 813.41: Grounding and Bonding Conductors
Replace this subsection with the following:

Grounding and bonding conductors shall conform to M8.16.10: Type 10 Grounding and Bonding Conductors (Solid or Stranded, Insulated or Bare).

Subsection 813.42: Ground Rods
Replace this subsection with the following:

Ground rods shall consist of driven rod(s) conforming to M8.17.0: Ground Rod or other devices approved for the purpose.

Subsection 813.44: Power Pedestal
Add this subsection in numerical order:

A Power Pedestal shall consist of a side-of-post mounted lockable load center enclosure, a load center with circuit breakers, an exterior-mounted electrical meter, signal post and base, equipment bonding, ground rod(s) conforming to 813.42: Ground Rods, and a cement concrete foundation. The enclosure, lock, circuit breakers, signal post and base, and foundation shall all be included in the Shop Drawing submission.

The enclosure shall be rated to meet or exceed NEMA 3R and be suitable for post-mounting and shall be sized appropriately to house the load center. The enclosure shall be capable of being secured with an integrated locking mechanism or by a Contractor-supplied padlock; regardless of locking mechanism, it shall be operated with a #2 key.

The circuit breakers shall be designed for single-phase, 3-wire, 120/240 VAC. Circuit breakers shall provide a means to manually operate a circuit and/or automatically open a circuit that is in overload or short circuit conditions. All circuit breakers shall be UL listed and have CSA certification.

The enclosure shall be furnished with a meter socket installed. The meter socket shall be approved by the servicing electrical utility.

The signal post and base shall conform to M10.05.1: Signal Posts and Bases and the Plans. The Contractor shall supply a square aluminum base with a natural or anodized finish and a Schedule 80 aluminum post with a brushed or spun finish, unless otherwise indicated in the Plans.

The Contractor shall supply mounting equipment recommended by the enclosure manufacturer to side-mount the cabinet to the post.

Bonding for the Power Pedestal shall utilize a #8 AWG or larger ASTM-B3 wire.

The cement concrete foundation shall conform to the Plans and M4.02.0: Concrete Produced by Stationary and Truck Mixers, M4.03.0: Concrete Produced by Volumetric Mixers, M4.06.1: Conventional Concrete, M4.09.0: Precast, Prestressed, and Prefabricated Concrete Products, M4.11.0: Evaporation Reducing Materials, and M4.12.0: Curing Materials, as applicable.

Subsection 813.64: Power Pedestal
Add this subsection in numerical order:

No work shall commence until Shop Drawings have been approved.

The Power Pedestal Cabinet shall be mounted side-of-post to the Signal Post, per the manufacturer's recommendations. The Power Pedestal Cabinet should be installed directly below the meter socket, per the Plans. If dissimilar metals are present, they shall be electrically insulated to prevent galvanic corrosion.

The Contractor shall supply the appropriate type (single pole or double pole) and number of circuit breakers included within the Power Pedestal Cabinet to provide the recommended AC power to each device receiving power from the Cabinet. The circuit breakers shall be clearly labeled as to which device they are powering (e.g. RRFB-1, RRFB-2, Warning Beacon, Speed Feedback Sign, etc.).

The Power Pedestal shall be grounded and bonded per 813.61: Equipment Grounding and Bonding and 813.62: Grounding Electrodes.

Subsection 813.80.E: Power Pedestal
Add this subsection in numerical order:

Power Pedestals will be measured by the number of Power Pedestals furnished and installed.

Subsection 813.81.E: Power Pedestal
Add this subsection in numerical order:

Power Pedestals will be paid for at the contract unit price per each installed in place. This includes all labor and materials required for a working system.

All costs associated with grounding and bonding of Power Pedestals shall be considered incidental to the item.

All costs associated with providing service connections to Power Pedestals shall be paid for under their respective pay items.

Subsection 813.82: Payment Items
Change the unit of measure for items 813.80 and 813.81 to Each and add the following pay item:

813.90	Power Pedestal	Each

Subsection 815.82: Payment Items
Delete payment items 818.90 to 818.94, 819.39, 819.832, 819.52, 819.53, 819.60 to 819.64, 819.70, 819.71, 819.72, 819.800, 819.801, 819.802, 819.803,:819.810, 819.811, 819.820, 819.821, 819.850, 819.851, 819.852.

SUBSECTION 815: TRAFFIC SIGNALS

Subsection 815.20: General
Replace the first sentence of the 11th paragraph with the following;

Within 30 days after Notice to Proceed, the Contractor shall submit to the Engineer for approval, a list of equipment they propose to install.

SUBSECTION 819: TRAFFIC SIGNAL DETECTION

Subsection 819: Traffic Signal Detection
Add this subsection:

DESCRIPTION

819.20: General

The work under this Subsection consists of furnishing and installing detection devices for vehicles, bicycles, pedestrians, and other road users.

MATERIALS

819.40: General

Materials shall meet the requirements specified in the following Subsections of Division III, Materials:

Material	Section
Vehicle Detection Systems	M10.08.0
Passive Stop Line Detectors	M10.08.1
Passive Advanced Detectors	M10.08.2

Pedestrian Detectors	M10.09.0
Pedestrian Pushbutton Assembly	M10.09.1
APS Pushbutton Assembly	M10.09.2

The Contractor shall furnish Vehicle Detection Systems (VDS) and Pedestrian Detectors that are listed on the QTCE.

Any software, firmware, cables, or adapters required to program, adjust, fine-tune, or monitor VDS or Pedestrian Detectors shall be provided by the Contractor. VDS and Pedestrian Detectors shall have the latest versions of software and/or firmware installed prior to inspection. Manufacturer updates to software and/or firmware shall be included at no cost for the life of the products.

819.40.A: Vehicle Detection Systems

A VDS shall consist of one or more Internet Protocol (IP) -based detector/sensor assemblies and a cabinet interface device that is installed in a Traffic Signal Controller Cabinet or similar device.

Stop Line VDS shall be capable of providing motor vehicle and bicycle detection at all locations shown on the Plans. The Contractor may furnish a VDS that utilizes a single detector/sensor or multiple, as long as all stop line motor vehicle and bicycle detection zones are encompassed and the traffic signal or other device utilizing the detection can operate per the Plans. All Passive Stop Line Detectors required to provide stop line detection at an intersection shall be included in the cost of a single Stop Line Vehicle Detection System.

If the Contractor furnishes a Stop Line VDS that does not utilize an integrated video monitoring system, a separate video monitoring system per 819.41: Video Monitoring System shall be furnished and installed at no additional cost.

Advanced VDS shall be capable of providing motor vehicle detection on a single approach, at the location shown on the Plans. The Contractor Shall furnish Passive Advanced Detectors that utilize, and are compatible with, the same interface device installed in the Traffic Signal Controller Cabinet, or similar device, as the Stop Line VDS.

All VDSs shall be furnished with manufacturer-supplied mounting hardware.

If multiple VDSs over multiple locations are supplied under a single contract, all components furnished by the Contractor shall be of the same make and model.

819.40.B: Pedestrian Detectors

Pedestrian Pushbutton Assembly and Accessible Pedestrian Signal (APS) Pushbutton Assembly shall both include a pushbutton, sign, housing, manufacturer-specified mounting hardware, and wiring. The Contractor shall review the Contract Documents to determine if one or more in-cabinet control units are required to meet the pedestrian detector type and operational requirements. In-cabinet control units shall be considered incidental to the cost of the item.

The Contractor shall provide a pushbutton housing that conforms to the shape of the pole it is mounted to or shall furnish and install a manufacturer-supplied saddle to provide a flush, secure fit, at no additional cost.

An APS Pushbutton Assembly shall include a pedestrian pushbutton sign that conforms to the Plans. If the sign is not integral to the housing, separate mounting equipment shall be furnished and installed by the Contractor. All costs associated with the sign and mounting equipment shall be considered incidental to the cost of the item.

819.41: Video Monitoring System

When required by 819.40.A: Vehicle Detection Systems, the Contractor shall furnish and install a Video Monitoring System. The Video Monitoring System shall consist of one or more IP-based 4K, 1080p, H.264 dome-type CCTV cameras; mounting hardware, including but not limited to: brackets, bands, straps, posts, plates, and pole mount adapters; power distribution and conditioning equipment including surge suppression; and all

necessary cabling and wiring.

All equipment provided for the Video Monitoring System shall be commercial, off-the-shelf products. Custom equipment designed specifically for the Contract will not be accepted. All cabling and wiring shall be recommended by the manufacturer and rated for outdoor use. Any special wiring or connectors required by the manufacturer shall be identified in the Shop Drawings.

The Video Monitoring System shall conform to National Electrical Manufactures Association (NEMA) standards, Underwriters' Laboratory (UL), and Military Standards (MIL), as applicable. All components of the Video Monitoring System shall be new and still under production by the manufacturer. Obsolete, no longer produced, and/or no longer supported components will not be accepted.

The Video Monitoring System shall be capable of operating in temperatures ranging from -29°F to +165°F.

The camera shall meet or exceed the requirements found in Table 819.41-1:

Table 819.41-1: Minimum Camera Requirements

Feature	Requirement
Zoom Ratio	The minimum zoom ratio shall be 30x Optical and 12x Digital
Camera Type	The camera shall be an IP-type CCTV camera.
Auto Focus	The camera shall include auto focus with a selection for manual override of auto focus.
Lens Aperture Ratio	Typical: F/1.6 to F/4.7 (wide to telephoto)
On-Screen Direction	The CCTV camera shall display on-screen azimuth indications.
Privacy Zones	The CCTV camera shall be programmable to blank out up to 8, four-sided areas to electronically block portions of the camera's field of view from being displayed. These privacy zones shall move and adjust sizing synchronously with camera movements and degree of lens zooming.
On-Screen Labels, Text and Titles	The CCTV camera shall display a minimum of 20 programmable characters for on-screen camera ID, preset position, sector, and alarm titles.
On-Screen Labels, Text and Title Positioning	The position of the on-screen text shall be adjustable to appear at selectable positions on the CCTV camera screen image.
Number of Pixels	The camera shall provide a minimum of 1280H x 720V effective pixels. The camera shall be capable of being configured to operate at all standard lower resolutions down to 320H x 180V effective pixels.
Image Sensor Size	The camera shall include an image sensor of 1/1.8 in., nominal.
Lens Focal Length	The camera shall include a zoom lens of 4.3 mm to 129 mm, minimum focal length.
Color and Black & White Image Selection	The camera shall have Color and Black & White video image display modes incorporating both automatic and manual override image mode selection. The camera shall transition automatically to a Black & White mode (when in automatic mode) when the luminance level reaches a user predefined threshold. At all times the camera shall provide a full motion video output at 30 frames per second.
Image Stabilization	The CCTV camera shall incorporate electronic image stabilization to reduce the effects of vibration and wind gusts on the displayed video image.

Feature	Requirement
Automatic Iris	The camera shall include both automatic iris control and an override for manual iris adjustments.
Wide Dynamic Range	The CCTV camera's wide dynamic range shall be 120 dB.
CCTV Camera Optical Sensitivity	The camera's sensitivity shall be sufficient to provide a clear, usable color video image display with a scene illumination of ≤ 0.1 lux at an aperture of F1.6, nominal.
Power Input	The power input for the CCTV camera and dome shall be PoE+.
Alarms	No alarm contacts shall be wired.

The Contractor shall mount the camera at a location that optimizes line-of-sight for all approaches. The view of each approach shall have a clear line of sight, free from obstructions from trees, overhead wires, buildings, and/or other obstructions. If the Contractor is unable to provide a clear line of sight for all approaches to the satisfaction of the Engineer, a second camera, including mounting hardware, cabling, and wiring, shall be furnished and installed on a different traffic signal structure at no additional cost.

The Contractor shall be responsible for the following items prior to installation:

- Ensure that all components are assembled and factory-tested prior to delivery to the project site.
- Fully configure the camera settings, including but not limited to: camera resolution, camera address, default settings, and pre-set and home positions, per the direction of the Engineer.
- Coordinate with the Engineer to set the camera address number to provide unique identification that is compatible with the CCTV camera addressing schema utilized by the Department.

The Contractor shall deliver the camera(s) fully assembled to the project site.

The Contractor shall provide up to 3 hard copy sets of operating manuals, service manuals, and maintenance instructions for all components of the system. At the request of the Engineer, the number of copies may be reduced if the manuals are provided in .pdf file format.

819.42: Material Warranties

All components of Vehicle Detection Systems, including Video Monitoring Systems, and Pedestrian Detectors shall include a minimum two-year manufacturer's replacement warranty that will commence upon acceptance by the Engineer. The warranty shall cover any manufacturing defects of the products.

Construction Methods

819.60: General

The Contractor shall use discretion in installing the detectors/sensors at locations that optimize the performance of the VDS and to eliminate false calls. The Contractor shall notify the Engineer if the size or location of the detection zones differs from what is shown in the Plans. At the direction of the Engineer, the Contractor will be required to readjust the location of the detection zones and/or modify the detection channels if false calls are observed or the traffic signal system is not operating per the Plans due to the performance of the VDS; this work shall be considered incidental to the cost of the item.

The Contractor shall use manufacturer-specified mounting hardware for all detectors/sensors. If mounted to mast arms or strain poles, any addition weight or wind loading from the detector/sensor shall be accounted for in the structural calculations.

The Contractor shall install the cabinet interface device in the traffic signal controller cabinet. The cabinet interface device shall be connected to the Field Monitoring Unit (FMU) or an ethernet switch in the traffic signal controller cabinet. All communication between devices shall be IP-based. Use of external communications that

are not routed through the FMU is prohibited.

The Contractor shall furnish and install low voltage power cabling surge protection equipment required for all data and power lines associated with VDS, Video Monitoring Systems, and/or Pedestrian Detection Systems entering the traffic signal controller cabinet.

The Contractor shall install the manufacturer-specified cable between the detectors/sensors to the cabinet interface device in the traffic signal controller cabinet via traffic signal structures, conduit, and/or pullboxes. This shall include all connectors, sealing tape, and incidental work to complete the connection(s). All equipment installation and wiring shall be installed in a neat and orderly manner and per the manufacturer's specifications.

The VDS shall be powered through one of the power outlets available on the FMU. The VDS shall be capable of being powered down and remotely restarted through remote control of the power outlet on the FMU.

Under the supervision of the Engineer, the Contractor shall install the VDS software that allows visual confirmation of the detection zones on Department computers.

The Contractor shall install Pedestrian Detectors at the location(s) and mounting height shown on the Plans.

The Contractor shall mount and orient the APS Pushbutton Assembly in a manner so that the vibrotactile arrow is aligned parallel to the crosswalk.

Prior to acceptance, the Contractor shall furnish all passwords for Vehicle Detection Systems and Pedestrian Detectors to the Engineer. The use of default passwords is prohibited.

819.61: Programming APS Pushbuttons

Each APS Pushbutton shall have an audible walk indication during the associated walk interval. The duration of the audible walk indication shall match the duration of the walk interval unless the pedestrian signal is programmed to rest in walk. If programmed to rest in walk, the audible walk indication shall be limited to 7 seconds in length but may be recalled by a subsequent button press during the walk interval.

The APS Pushbutton locator tone and audible walk indication shall be programmed to broadcast at volume 5 dBA louder than ambient sound, except when audible beaconing is provided in response to an extended pushbutton press. The broadcast volume shall be programmed to not exceed 100 dBA at 3 ft. from the emitter, regardless of ambient noise conditions.

The locator tone shall have a duration of 0.15 seconds or less and shall repeat at 1-second intervals.

The locator tone shall be active during all signal intervals, except for the following conditions:

- When the audible walk indication is being broadcast.
- If the signal is programmed to rest in walk, the locator tone shall resume 7 seconds after the start of the walk interval.
- The locator tone shall be disabled if the traffic control signal or pedestrian hybrid beacon is operating in an emergency or fault flashing mode.

The locator tone shall be active during the flashing yellow and alternating flashing red intervals of a pedestrian hybrid beacon phasing sequence.

Upon button press, the locator tone at that pushbutton shall be interrupted and a speech message of "Wait" shall be broadcast.

The normal status of the pilot light shall be dark. The pilot light shall illuminate upon button press and stay illuminated until the start of the walk interval, when it shall return to dark. If the associated pedestrian phase is set to pedestrian recall, the pilot light shall stay illuminated for all intervals except for the walk interval.

The audible walk indication shall an audible tone unless a speech message is called for in the Plans. The audible

tone shall repeat at 8 to 10 ticks per second, in multiple frequencies, with the dominant component at 880 Hz.

If a speech message is used, the following shall apply:

- For exclusive pedestrian phases, during the walk interval the speech message shall be: "walk sign is on for all crossings." This message shall be broadcast a single instance.
- *For concurrent pedestrian phases, during the walk interval the speech message shall be: "[STREET NAME]. Walk sign is on for [STREET NAME]." This message shall be broadcast a single instance.
- If the signal is programmed to rest in walk, the concurrent pedestrian speech message shall be repeated upon each subsequent button press.

*Note: See Plans for Street Name information.

The vibrotactile arrow shall vibrate during the walk interval.

The Contractor shall include a fault relay that will default to placing a constant pedestrian call from any pushbutton assembly that fails to communicate back to the in-cabinet control unit.

The Contractor shall connect the in-cabinet control unit to the Field Monitoring Unit (FMU) via an open ethernet port.

819.62: VDS Testing and Evaluation

After the VDS is installed, but prior to acceptance, the Contractor shall conduct an evaluation of the system in the presence of the Engineer. The purpose of the evaluation is to certify the system is operating per the requirements of M10.08.0: Vehicle Detection Systems, M10.08.1: Passive Stop Line Detectors, and M10.08.2: Passive Advanced Detectors, as applicable. The Contractor shall submit their testing and evaluation plan as a part of the Shop Drawing submittal.

The testing and evaluation shall take place for a minimum of 30 minutes under moderate live traffic conditions. Testing shall not be conducted during inclement weather.

If the Engineer determines that the system does not meet the operational requirements, the Contractor will be required to adjust the location, orientation, and/or number of detector/sensors. The Contractor may also adjust the location of the detection zones at this time. Upon completion of this work, the system shall be reevaluated in the presence of the Engineer. This process shall be repeated until the operational requirements are met.

All costs associated with testing and evaluation of the VDS, including the repositioning or addition of new materials, shall be considered incidental to the item.

Compensation

819.80: Method of Measurement

Stop Line Vehicle Detection Systems will be measured by each system furnished and installed.

Advanced Vehicle Detection Systems will be measured by each system furnished and installed.

Pedestrian Pushbuttons and APS Pushbuttons will be measured by each pushbutton furnished and installed.

819.81: Basis of Payment

Stop Line Vehicle Detection Systems will be paid for each system installed at an intersection. For the purposes of this work, an intersection shall be defined as all roadway, path, and/or trail approaches controlled by a single traffic signal controller. Where a Video Monitoring System is required per 819.40: General, it shall be included in the cost of Item 819.840.

Advanced Vehicle Detection System will be paid for each system installed on an intersection approach.

Pedestrian Pushbutton and APS Pushbutton will be paid for each pushbutton assembly installed. The pedestrian sign mounted directly above the pushbutton shall be considered incidental to the item.

The unit cost of each vehicle detection system or pushbutton item shall include all wiring, cabling, mounting hardware, software, firmware, video monitoring system (if required), testing, calibrating, Department Acceptance, training, and all other labor and materials required for the system(s) to operate per the Plans.

819.82: Payment Items

Item number	Description	Unit
819.840	Stop Line Vehicle Detection System	Each
819.845	Advanced Vehicle Detection System	Each
819.850	Pedestrian Pushbutton	Each
819.855	APS Pushbutton	Each

SUBSECTION 820: HIGHWAY LIGHTING

Subsection 820.20: General
Replace the first sentence of the 8th paragraph with the following;

Within 30 days after Notice to Proceed, the Contractor shall submit to the Engineer for approval, a list of equipment they propose to install.

SUBSECTION 850: TRAFFIC CONTROLS FOR CONSTRUCTION AND MAINTENANCE OPERATIONS

Subsection 850.25: Arrow Board
Subsection 850.45: Arrow Board
Subsection 850.65: Arrow Board
Delete these subsections.

Subsection 850.80: Method of Measurement
Delete the 7th paragraph beginning with "Arrow Board will be measured …"

Subsection 850.81: Basis of Payment
Delete the 7th paragraph beginning with "Arrow Board will be paid for …"

Subsection 850.82: Payment Items
Revise description and unit of item 852. to Safety Signing for Traffic Management / Square Foot.
Delete item number 856.

SUBSECTION 856: CONNECTED WORK ZONE NOTIFICATION SYSTEM AND ASSOCIATED DEVICES

Subsection 856: Connected Work Zone Notification System and Associated Devices
Add this new subsection.

DESCRIPTION

856.20: General

The Connected Work Zone Notification System (CWZNS) is a system of field devices that transmit real-time location-based data about work zones. CWZNS field device data is provided in a Work Zone Data Exchange (WZDx) Device Feed in accordance with the United States Department of Transportation (USDOT) WZDx Specification. The Device Feed is consumed by the MassDOT Work Zone Manager (WZM) application.

The Contractor shall be responsible for furnishing, installing, repositioning, operating, maintaining, and

removing these CWZNS devices.

MATERIALS

856.40: General

Materials shall meet the requirements specified in the following Subsections of Division III, Materials:

Material	Section
Connected Work Zone Notification System Devices	M10.18.0
Location Marker	M10.18.1
Connected Arrow Board	M10.18.2

End Location Markers shall conform to M10.18.1: Location Marker and include power and communication status lights and an on/off switch.

856.41: Arrow Board

Arrow Boards shall consist of a matrix of yellow elements that may be illuminated in flashing or sequential patterns, on a non-reflective, black background. The light output from the Arrow Board shall meet the minimum legibility distance, per the MUTCD. The elements shall be capable of at least 50% dimming from full brilliance to avoid nighttime glare. Arrow Boards that are continuously operational in both daylight and nighttime conditions shall automatically adjust the light output based upon ambient light conditions.

The mounting height of the Arrow Board, when in operation, shall be per the Plans.

The minimum dimensions and number of elements for Arrow Boards shall be per Table 856.41-1.

Table 856.41-1: Arrow Board Dimensions and Elements

Item Numbers	MUTCD Type	Minimum Dimensions (width by height)	Minimum Number of Elements
856.060, 856.160	B	60 in. by 30 in.	13
856.096, 856.196	C	96 in. by 48 in.	15

Arrow Boards shall be capable of the following operating modes, per the MUTCD:

- Four Corners Flashing Caution
- Alternating Diamond Caution
- Flashing Arrow (left or right)
- Sequential Chevron (left or right)
- Flashing Double Arrow

Arrow Boards that are categorized as “Connected Arrow Boards” (Items 856.160 and 856.196) shall meet the requirements of M10.18.2: Connected Arrow Board in addition to the requirements of an Arrow Board described in this Subsection.

856.42: Shop Drawings

Within 30 days of the Notice to Proceed, the Contractor shall submit to the Engineer for review and approval cut sheets for each model of CWZNS device to be used. The cut sheets shall document device specifications, including details of how the CWZNS device will communicate. Work that requires the use of CWZNS devices shall not commence until the submission has been approved.

CONSTRUCTION METHODS

856.60: General

At least 15 days prior to deploying CWZNS devices, the Contractor shall visit the site to verify cellular coverage.

If the devices the Contractor plans to deploy do not have coverage, the Contractor shall swap out the cellular modem, SIM card, or both to a carrier that provides coverage. If no adequate cellular coverage exists from 4G LTE or 5G providers, the Contractor shall immediately notify the Engineer.

The Contractor shall install CWZNS devices at the locations shown on the Plans.

Per the WZDx Specification Device Feed, an End Location Marker shall have a single Marked Location with the "type" property as "work-zone-end".

The Contractor shall install and power on the End Location Marker coinciding with the deployment of the temporary traffic control setup that calls for its use. The Contractor shall power down and remove the Location Marker at the conclusion of the removal of the temporary traffic control setup. If the location of the work moves during a work shift, the Contractor shall power down the Location Marker, relocate it, and then power it back on.

The operating mode for the Arrow Board or Connected Arrow Board shall be per the Plans. When activated, the minimum element on-time shall be 50% for the flashing mode, with equal intervals of 25% for each sequential phase. The flashing rate shall be not less than 25 or more than 40 flashes per minute.

If a Connected Arrow Board is being used to transmit its location without utilizing other arrow board functions, such as operating a Flashing Arrow, the arrow board shall remain dark and removed from the roadway or protected from approaching traffic while the data is being transmitted.

The Contractor shall be responsible for remediating any CWZNS device that is not operating as specified, at no additional cost to the Department.

CWZNS devices that are lost, stolen, vandalized, damaged, destroyed, or deemed unacceptable while their use is required on the project shall be replaced by the Contractor at no additional cost to the Department.

COMPENSATION

856.80: Method of Measurement

Arrow Boards and Connected Arrow Boards will be measured by the Day. Each period of up to 24 hours during which an Arrow Board or Connected Arrow Board is in use will be measured as one day, regardless of the number of times that the unit is positioned, repositioned, removed, or returned to service.

End Location Markers will be measured by the Day. Each period of up to 24 hours during which a End Location Marker is in use will be measured as one day, regardless of the number of times that the unit is positioned, repositioned, removed, or returned to service.

856.81: Basis of Payment

Arrow Boards and Connected Arrow Boards will be paid for at the contract unit price per day, which shall include full compensation for labor and materials, positioning, repositioning, and removing or returning to service.

End Location Markers will be paid for at the contract unit price per day which shall include full compensation for labor and materials, positioning, repositioning, and removing or returning to service.

If an End Location Marker is attached to another traffic control device that is not otherwise called for in the Plans or Specifications, that ancillary device shall be considered incidental to the cost of the End Location Marker.

Licenses, fees, communication costs, power costs, and access to real-time and recorded data associated with the Device Feed for CWZNS devices shall be considered incidental to the cost of the item.

The Department will not pay for CWZNS devices that fail to operate as specified.

856.82: Payment Items

Item number	Description	Unit
856.060	Arrow Board (Type B)	Day
856.096	Arrow Board (Type C)	Day
856.160	Connected Arrow Board (Type B)	Day
856.196	Connected Arrow Board (Type C)	Day
856.201	End Location Marker	Day

SECTION 900: STRUCTURES

SUBSECTION 901: CEMENT CONCRETE

Subsection 901.20: Materials
Delete Asphaltic Materials – M3, Preformed Bituminous Fiber Joint Filler – M3.05.3 and add the following in M number sequence:

Preformed Expansion Joint Filler	M9.14.0

SUBSECTION 983: REVETMENT

Subsection 983.40: General
Delete Preformed Bituminous Fiber Joint Filler – M3.05.3 and add the following in M number sequence:

Preformed Expansion Joint Filler	M9.14.0

SUBSECTION 996: NOISE BARRIER

Subsection 996.60: General
Replace the fourth paragraph with the following:

The Contractor shall submit an erection procedure in accordance with 960.67.A: Erection.

DIVISION III

MATERIALS SPECIFICATIONS

SECTION M3: ASPHALTIC MATERIALS

Subsection M3.05.5: Preformed Bituminous Joint Filler for Concrete
Delete this subsection.

SECTION M9: MISCELLANEOUS MATERIALS

Subsection M9.07.0: Plastic Waterstops
Replace this subsection with the following:

M9.07.0.A: Scope

This specification pertains to Polyvinyl chloride (PVC) Waterstops.

M9.07.0.B General Requirements

Waterstops shall be fabricated from a plastic compound, the basic resin of which shall be polyvinyl chloride.

The compound shall contain any additional resins, plasticizers, inhibitors or other materials such that when compounded it shall meet the performance requirements hereinafter specified. No reclaimed polyvinyl chloride shall be used.

Waterstops shall be extruded in such a manner that any cross section shall be dense, homogenous and free from porosity or other imperfections. The cross section of waterstops shall be as shown on the Plans.

The waterstops shall be spliced only at jointing made necessary by construction design. Where joints are required, they shall be made in accordance with the manufacturer's instructions, without appreciable loss in strength, elasticity or permeability of the material.

The waterstop material shall not engage in electrolytic action with steel, shall be resistant to mineral oils, and shall not discolor concrete.

The approved waterstop when properly installed, as in a concrete construction or expansion joint, shall be capable of maintaining a head of 75 ft of water without leakage.

M9.07.0.C: Material Requirements

The waterstops shall meet the following requirements:

Description	Requirement
Tensile Strength, Type IV, ASTM D638	Minimum 2,000 psi
Ultimate Elongation, Type IV, ASTM D638	Minimum 350%
Tear Resistance, ASTM D624	Minimum 300 lb/in
Low Temperature Brittleness, ASTM D746	No Failure at -35°F
Resistance to Alkalis, after 7 days	
Weight Change CRD-C572	-0.10% to 0.25%
Hardness Change, CRD-C572/ASTM D2240	Maximum ±5 points
Hardness Durometer (Shore A) ASTM D2240	75 to 85 points
Water Absorption (48 hr) ASTM D570	Maximum 0.15% (by mass)
Specific Gravity, ASTM D792	Maximum 1.40

M9.07.0.D: Qualification Samples

A manufacturer requesting approval of a waterstop shall furnish to Research and Materials two (2) 6"x6" plaques per lot prepared in accordance with ASTM D3182 or a 3-ft length of each lot of waterstop they intend to supply. A Certificate of Analysis (COA) shall be furnished with the samples showing test results by an Independent Testing Laboratory and subsequently qualified Quality Control (QC) test results. The QC testing laboratory shall be qualified in accordance with AASHTO R 38. The submitted COA shall state that the material furnished conforms without exception to all the requirements specified herein; and it shall also include all qualitative and quantitative test results.

Subsection M9.14.0: Preformed Expansion Joint Filler
Replace this subsection with the following:

Preformed expansion joint filler for concrete applications and structural construction shall meet the requirements specified herein. The Contractor shall provide certified test data which documents compliance with the required physical properties. The certified test data shall be submitted to the Engineer for approval.

Table M9.14.0-1: Types of Preformed Expansion Joint Filler

Specification	Type and Description
AASHTO M 153	Type I – Sponge Rubber Type II – Cork Type III – Self-Expanding Cork Type IV – Polyurethane-Bonded Recycled Rubber
AASHTO M 213	Type I – Asphalt-Saturated Cellulosic Fiber Type II – Asphalt Binder-Cork with Asphalt-Saturated or Glass Fiber Felt Type III – Polyurethane-Bonded Recycled Rubber
ASTM D1752	Type IV – Recycled PVC
ASTM D7174	Type I – Closed-Cell Polyethylene or Blended Polyethylene Foam
ASTM D8139	Type I – Closed-Cell Polypropylene Foam

Subsection M9.14.2: Closed Cell Foam Joint Filler
Delete this subsection:

SECTION M10: TRAFFIC CONTROL DEVICES

Subsection M10.03.1: Field Monitoring Unit
Add this new subsection:

M10.03.1: Field Monitoring Unit

All Field Monitoring Units (FMU) shall be compatible with the MassDOT Critical Operations Multi-jurisdictional Modular System (MCOMMS), cloud-based management system.

FMUs shall be capable of operating independently from the brand of traffic signal controller, vehicle and pedestrian detection systems, battery backup system (BBS), and any other Ethernet-based, web accessible device present in the traffic signal controller cabinet.

M10.03.1.A: Hardware

The FMU shall communicate via an Ethernet port with an RJ45 connector and have an integrated Ethernet switch with a minimum of four ports.

The FMU shall be powered via standard 120 VAC input power. The FMU shall include an integrated battery and battery charging/monitoring circuit that will allow the FMU to fully function even if all other electrical service to the cabinet has been interrupted. The battery shall continue to supply the FMU with power for a minimum of 5 hours on a single charge.

The FMU shall have an integrated GPS that will allow for automated telemetry without additional configuration. The GPS shall be capable of providing a time sync pulse to the internal clock of a connected traffic signal controller. The FMU shall utilize the integrated GPS to geolocate itself on a map via the FMU management software.

M10.03.1.B: Software

The configuration of the FMU shall be accomplished by accessing FMU management software via an internet browser. It shall be possible to configure the FMU without any special software.

The FMU shall operate without requiring a static IP address. The only configuration required at the FMU is to enter the URL to the host of the FMU management software.

The FMU shall utilize HTTPS protocols and XML data structure for communications with the FMU management software. The data shall be scalable for future expansion; proprietary protocols shall not be used.

M10.03.1.C: Wireless Connectivity

The FMU shall be supplied with an internal 4G LTE cellular modem.

The modem shall support future upgrades to 5G service, when available, and shall be compatible with SIM cards from multiple cellular carriers.

M10.03.1.D: Remote Access

Remote access to any traffic signal cabinet component that has a web interface via the FMU shall not require the end user to create a separate Virtual Private Network (VPN) connection.

Subsection M10.08.0: Vehicle Detection Systems
Subsection M10.08.1: Passive Stop Line Detectors
Subsection M10.08.2: Passive Advanced Detectors
Add theses new subsections:

M10.08.0: Vehicle Detection Systems

Vehicle Detection Systems (VDS) shall be capable of detecting the presence of all motor vehicle types and bicycles in designated areas and sending corresponding detector outputs to a traffic signal controller.

All in-cabinet components of VDS shall be compatible with the following standards:

- ATCC 5301 v02
- ATC 5201 v06
- NEMA TS2 environmental standards

Through an ethernet-based connection to the detection module and/or cabinet interface device in the field or through the internal network of the traffic signal controller cabinet, the VDS shall support remote management of motor vehicle and bicycle detection configurations and access to data including:

- The number, location, and size of detection zones.
- Configuration of the detector channel and assigned phase for each zone.
- Configuration of detection zones for signal performance measurement data collection.
- The ability to add and remove users.
- Signal performance data:
  - o Monitoring and recording the status of the phase and detector channels from the traffic signal controller through the SIU bus at a frequency of no less than 10 times per second.
  - o Estimation of the speed of vehicles at defined, user-configurable points, such as entering or exiting a detection zone.
  - o Retrieval of the signal performance data through an HTTP-based Application Programming Interface (API), or equivalent process, in .xml, .json, or .csv format.
  - o The data shall be available in a per vehicle format, be viewable in real time, and store at least 168 hours of data locally on the device.

VDS shall be capable of supporting user-based restrictions to limit functionality, including:

- The ability to make changes to the VDS settings.
- The ability to view imagery or digital video streams.
- The ability to view and download signal performance data.

VDS shall be capable of automatically determining if the system's ability to accurately detect vehicles and shall default to a constant call state if this system error is detected.

VDS shall be capable of classifying vehicles based upon length and/or number of axles.

VDS shall be capable of performing all detection, classification, and data collection functions in the absence of an internet connection.

VDS shall be capable of providing remote access to the latest images or digital video stream of all IP video units through either an HTTP request or through a Real Time Streaming Protocol compatible with RFC2326 standards. VDS that do not utilize video shall be able to display the current state of the vehicle detection zones and approximate vehicle locations in a digital twin model of the intersection.

M10.08.1: Passive Stop Line Detectors

Passive Stop Line Detectors shall demonstrate a reliability of 99% or greater for vehicle detection functions.

Passive Stop Line Detectors shall be able to track and classify turning movements for all motor vehicle types and bicycles and shall demonstrate an accuracy of 95% or greater for turning movement counts.

M10.08.2: Passive Advanced Detectors

Passive Advanced Detectors shall be capable of detecting all motor vehicle types at a minimum distance of 600 ft upstream of the stop line.

Subsection M10.09.0: Pedestrian Detectors
Subsection M10.09.1: Pedestrian Pushbutton Assembly
Subsection M10.09.2: APS Pushbutton Assembly
Add theses new subsections:

M10.09.0: Pedestrian Detectors

Pedestrian Detectors shall be capable of detecting the presence of pedestrians and placing a corresponding call for a phase in a traffic signal controller or similar device.

Pedestrian Detectors may be pushbuttons or passive detection devices.

Components of Pedestrian Detectors shall meet NEMA TS2 compliance for temperature and humidity, mechanical shock and vibration, transient voltage protection, transient suppression, and electrical reliability.

If Pedestrian Detectors include an in-cabinet control unit, it shall meet the following requirements:

- Operate on a cabinet-supplied 120 VAC power source.
- Include labelled LED indicators for each channel operation.
- Include a 10/100BaseT, RJ45 ethernet connector port.
- Capable of communication with the Pedestrian Detectors to allow for remote programming and firmware updates via the ethernet connection.
- Capable of supporting a minimum of 4 pedestrian detectors per NEMA pedestrian phase and up to 16 pushbuttons.
- Will automatically reset upon loss of internal communication.

M10.09.1: Pedestrian Pushbutton Assembly

A Pedestrian Pushbutton Assembly shall consist of a pushbutton, a sign, and a housing to mount those devices to a post.

The pushbutton shall be a minimum of 2 in. in diameter and the force to activate it shall be no greater than 5 lbs. The pushbutton must be weather-tight and tamper-resistant.

The pushbutton shall meet one of the following criteria:

- A normally open, mechanical phenolic enclosed, positive-acting, spring-loaded, audible (i.e., click) snap-action switch with single pole, single throw contacts; or

- A piezo-driven solid state switch rated for a minimum of 50 V, a minimum of 20 million cycles, and capable of providing an audible indication of actuation.

The pushbutton shall have an operating voltage range of 12 to 36 VDC.

The housing shall be yellow.

Housings that include an integral sign mount for the pedestrian pushbutton sign shall be capable of mounting a 9 in. by 12 in. or 9 in. by 15 in. sign (width by height).

M10.09.2: APS Pushbutton Assembly

An APS Pushbutton Assembly shall meet all of the requirements of M10.09.1: Pedestrian Pushbutton Assembly, and the following.

The pushbutton shall have a vibrotactile arrow. The arrow shall have high visual contrast (light on dark or dark on light).

APS Pushbutton Assembly shall be capable of the following:

- Emitting a locator tone.
- Providing two types of audible walk indications: an audible tone in multiple frequencies and a speech message. The type of audible walk indication will be programmed by Contractor per the Plans.
- Emitting sound via one or more speakers that automatically adjust to ambient noise and shall also be capable of being capped at a preprogrammed level.
- Providing three functions as a result of an extended pushbutton press: increased crossing time, audible beaconing, and speech pushbutton information. The function of the extended pushbutton press will be programmed by the Contractor per the Plans.

APS Pushbutton Assembly shall include a latching red LED pilot light.

Subsection M10.18.0: Connected Work Zone Notification System Devices
Subsection M10.18.1: Location Marker
Add these new subsections.

M10.18.0: Connected Work Zone Notification System Devices

Connected Work Zone Notification System (CWZNS) devices shall include the following:

- An internal 4G LTE or 5G cellular modem. The modem shall be compatible with SIM cards from multiple cellular carriers, or the device shall be capable of using a cellular modem from more than one cellular carrier.
- An integrated GPS that will allow for automated telemetry without additional configuration.
- A self-contained power source that can be recharged without manual intervention. The power source shall enable uninterrupted operation of the CWZNS field device.
- Mounting and supporting hardware and wiring necessary to complete a working system.

CWZNS devices shall be capable of operating in temperatures ranging from -40°F to +122°F with no degradation in operation due to rain, fog, snow, ice, darkness, dust, or road debris.

CWZNS devices shall be physically and digitally secured to prevent unauthorized access.

When powered on, real-time data from CWZNS devices shall be provided in a USDOT Work Zone Data Exchange (WZDx) Specification Device Feed version 4.2. The Device Feed shall then be able to be consumed by the MassDOT Work Zone Manager (WZM) application. The Device Feed shall meet the following requirements:

- Each manufacturer of CWZNS field devices and Smart Work Zone (SWZ) field devices shall provide a single statewide Device Feed (a single URL) that consists of that manufacturer's field devices that are used by or under the direction of the Department.
- The Device Feed shall be made available via an HTTP GET request. The response shall be the WZDx Device Feed JSON object without a wrapper or paging.

- The Device Feed shall be public or use "Basic" HTTP Authentication.
- The Device Feed shall be provided over HTTPS.
- The Device Feed shall reflect changes in CWZNS field device status (e.g., display changed or device moved) no later than 60 seconds after they occur.
- For each CWZNS field device, the "update date" property shall be no older than 60 minutes, except when it has stopped communicating or is otherwise in error.
- The "id" property of each CWZNS field device feature in the Device Feed shall stay the same for the duration of the Contract and shall be a Universally Unique Identifier (UUID) to guarantee uniqueness between feeds and over time.

M10.18.1: Location Marker

Location Markers shall meet the requirements of M10.18.0: Connected Work Zone Notification System Devices.

Location Markers may be standalone devices or an attachment to a channelizing device. Either type shall be certified to comply with the relevant minimum TL-3 testing requirements of the *Manual on Assessing Safety Hardware*.

M10.18.2: Connected Arrow Board

Connected Arrow Boards shall meet the requirements of M10.18.0: Connected Work Zone Notification System Devices.

A Connected Arrow Board shall be capable of transmitting its location, verifying the time and location of an event.

Connected Arrow Boards shall be capable of transmitting their display status.

Arrow Boards may be connected to meet these specifications either through a retrofit kit or an appurtenance that is integral to the Arrow Board.

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END OF SUPPLEMENTAL SPECIFICATIONS

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DOCUMENT 00761

SPECIAL PROVISIONS FOR CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

Revised: 02/09/16

I. Instructions for Certification - Primary Covered Transactions:

By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.

1. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the MassDOT's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

2. The certification in this clause is a material representation of fact upon which reliance was placed when the MassDOT determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available, the MassDOT may terminate this transaction for cause of default.

3. The prospective primary participant shall provide immediate written notice to the MassDOT if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the MassDOT for assistance in obtaining a copy of those regulations.

5. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the MassDOT.

6. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the MassDOT, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration and the Debarment Lists compiled by both the Massachusetts Office of the Attorney General and the Department of Capital Asset Management and Maintenance (DCAMM) and published separately in the Central Register.

8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available, the MassDOT may terminate this transaction for cause or default.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion -- Primary Covered Transactions

The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal, State or local department or agency;

2. Have not within a 3-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

3. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 2 of this certification; and

4. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

II. Instructions for Certification - Lower Tier Covered Transactions:

By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

1. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available the MassDOT may pursue available remedies, including suspension and/or debarment.

2. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

3. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the MassDOT for assistance in obtaining a copy of those regulations.

4. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the MassDOT.

5. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

6. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List and the Debarment Lists.

7. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

8. Except for transactions authorized under paragraph 4 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, the MassDOT may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions

The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal, State or local department or agency.

Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

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DOCUMENT 00811

SPECIAL PROVISIONS
MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASPHALT (HMA) MIXTURES
Revised: 02/03/2023

This provision applies to all projects using greater than 100 tons of hot mix asphalt (HMA) mixtures containing liquid asphalt cement as stipulated in the Notice to Contractors section of the bid documents.

Price Adjustments will be based on the variance in price, for the liquid asphalt component only, between the Base Price and the Period Price. They shall not include transportation or other charges. Price Adjustments will occur on a monthly basis.

Base Price
The Base Price of liquid asphalt on a project as listed in the Notice to Contractors section of the bid documents is a fixed price determined by the Department at the time of the bid using the same method as the determination of the Period Price detailed below. The Base Price shall be used in all bids.

Period Price
The Period Price is the price of liquid asphalt for each monthly period as determined by the Department using the average selling price per standard ton of PG64-28 paving grade (primary binder classification) asphalt, FOB manufacturer's terminal, as listed under the "East Coast Market - New England, Boston, Massachusetts area" section of the Poten & Partners, Inc. "Asphalt Weekly Monitor". This average selling price is listed in the issue having a publication date of the second Friday of the month and will be posted as the Period Price for that month. The Department will post this Period Price on its website at https://www.mass.gov/service-details/massdot-current-contract-price-adjustments following its receipt of the relevant issue of the "Asphalt Weekly Monitor". Poten and Partners has granted the Department the right to publish this specific asphalt price information sourced from the Asphalt Weekly Monitor.

Price Adjustment Determination, Calculation and Payment
The Contract Price of the HMA mixture will be paid under the respective item in the Contract. Price Adjustments, as herein provided, either upwards or downwards, will be made after the work has been performed using the monthly period price for the month during which the work was performed.

Price Adjustments will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

The Price Adjustment applies only to the actual virgin liquid asphalt content in the mixture placed on the job in accordance with the approved Job Mix Formula.

Price Adjustments will be separate payment items. The pay item numbers are 999.401 for a positive price adjustment (a payment) and 999.402 for a negative price adjustment (a deduction). Price Adjustments will be calculated using the following equation:

Price Adjustment = Tons of HMA Placed X Liquid Asphalt Content % X RAP Factor X (Period Price - Base Price)

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department-approved extension of time.

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DOCUMENT 00812

SPECIAL PROVISIONS
MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL AND GASOLINE –
ENGLISH UNITS
Revised: 02/01/2021

This monthly fuel price adjustment is inserted in this contract because the national and worldwide energy situation has made the future cost of fuel unpredictable. This adjustment will provide for either additional compensation to the Contractor or repayment to the Commonwealth, depending on an increase or decrease in the average price of diesel fuel or gasoline.

This adjustment will be based on fuel usage factors for various items of work developed by the Highway Research Board in Circular 158, dated July 1974. These factors will be multiplied by the quantities of work done in each item during each monthly period and further multiplied by the variance in price from the Base Price to the Period Price.

The Base Price of Diesel Fuel and Gasoline will be the price as indicated in the Department's web site https://www.mass.gov/service-details/massdot-current-contract-price-adjustments for the month in which the contract was bid, which includes State Tax.

The Period Price will be the average of prices charged to the State, including State Tax for the bulk purchases made during each month.

This adjustment will be effected only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No adjustment will be paid for work done beyond the extended completion date of any contract.

Any adjustment (increase or decrease) to estimated quantities made to each item at the time of final payment will have the fuel price adjustment figured at the average period price for the entire term of the project for the difference of quantity.

The fuel price adjustment will apply only to the following items of work at the fuel factors shown:

ITEMS COVERED	FUEL FACTORS	
	Diesel	Gasoline
Excavation: and Borrow Work: Items 120, 120.1, 121, 123, 124, 125, 127, 129.3, 140, 140.1, 141, 142, 143, 144, 150, 150.1, 151 and 151.1 (Both Factors used)	0.29 Gallons / CY.	0.15 Gallons / CY
Surfacing Work: All Items containing Hot Mix Asphalt	2.90 Gallons / Ton	Does Not Apply

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DOCUMENT 00813

SPECIAL PROVISIONS

PRICE ADJUSTMENTS FOR STRUCTURAL STEEL AND REINFORCING STEEL

September 10, 2026

This special provision applies to all projects containing the use of structural steel and/or reinforcing steel as specified elsewhere in the Contract work. It applies to all structural steel and all reinforcing steel, as defined below, on the project. Compliance with this provision is mandatory, i.e., there are no "opt-in" or "opt-out" clauses. Price adjustments will be handled as described below and shall only apply to unfabricated reinforcing steel bars and unfabricated structural steel material, consisting of rolled shapes, plate steel, sheet piling, pipe piles, steel castings and steel forgings.

Price adjustments will be variances between Base Prices and Period Prices. Base Prices and Period Prices are defined below.

Price adjustments will only be made if the variances between Base Prices and Period Prices are 5% or more. A variance can result in the Period Price being either higher or lower than the Base Price. Once the 5% threshold has been achieved, the adjustment will apply to the full variance between the Base Price and the Period Price.

Price adjustments will be calculated by multiplying the number of pounds of unfabricated structural steel material or unfabricated reinforcing steel bars on a project by the index factor calculated as shown below under Example of a Period Price Calculation.

Price adjustments will ***not*** include guardrail panels or the costs of shop drawing preparation, handling, fabrication, coatings, transportation, storage, installation, profit, overhead, fuel costs, fuel surcharges, or other such charges not related to the cost of the unfabricated structural steel and unfabricated reinforcing steel.

The weight of steel subject to a price adjustment shall not exceed the final shipping weight of the fabricated part by more than 10%.

Base Prices and Period Prices are defined as follows:

Base Prices of unfabricated structural steel and unfabricated reinforcing steel on a project are fixed prices determined by the Department and found in the table below. While it is the intention of the Department to make this table comprehensive, some of a project's unfabricated structural steel and/or unfabricated reinforcing steel may be inadvertently omitted. Should this occur, the Contractor shall bring the omission to the Department's attention so that a contract alteration may be processed that adds the missing steel to the table and its price adjustments to the Contract.

The Base Price Date is the month and year of the most recent finalized period price index at the time that MassDOT opened bids for the project. The Base Price Index for this contract is the Steel PPI listed in the Notice to Contractors.

Period Prices of unfabricated structural steel and unfabricated reinforcing steel on a project are variable prices that have been calculated using the Period Price Date and an index of steel prices to adjust the Base Price.

The Period Price Date is the date the steel was delivered to the fabricator as evidenced by an official bill of lading submitted to the Department containing a description of the shipped materials, weights of the shipped materials and the date of shipment. This date is used to select the Period Price Index.

The index used for the calculation of Period Prices is the U.S. Department of Labor Bureau of Labor Statistics Producer Price Index (PPI) Series ID WPU101702 (Not Seasonally Adjusted, Group: Metals and Metal Products, Item: Semi-finished Steel Mill Products.) As this index is subject to revision for a period of up to four (4) months after its original publication, no price adjustments will be made until the index for the period is finalized, i.e., the index is no longer suffixed with a "(P)".

Period Prices are determined as follows:

Period Price = Base Price X Index Factor
Index Factor = Period Price Index / Base Price Index

Example of a Period Price Calculation:

Calculate the Period Price for December 2009 using a Base Price from March 2009 of $0.82/Pound for 1,000 Pounds of ASTM A709 (AASHTO M270) Grade A36 Structural Steel Plate.

The Period Price Date is December 2009. From the PPI website*, the Period Price Index = 218.0.

The Base Price Date is March 2009. From the PPI website*, the Base Price Index = 229.4.

Index Factor = Period Price Index / Base Price Index = 218.0 / 229.4 = 0.950
Period Price = Base Price X Index Factor = $0.82/Pound X 0.950 = $0.78/Pound

Since $0.82 - $0.78 = $0.04 is less than 5% of $0.82, no price adjustment is required.

If the $0.04 difference shown above was greater than 5% of the Base Price, then the price adjustment would be 1,000 Pounds X $0.04/Pound = $40.00. Since the Period Price of $0.78/Pound is less than the Base Price of $0.82/Pound, indicating a drop in the price of steel between the bid and the delivery of material, a credit of $40.00 would be owed to MassDOT. When the Period Price is higher than the Base Price, the price adjustment is owed to the Contractor.

* To access the PPI website and obtain a Base Price Index or a Period Price Index, go to http://data.bls.gov/cgi-bin/srgate

End of example.

The Contractor will be paid for unfabricated structural steel and unfabricated reinforcing steel under the respective contract pay items for all components constructed of either structural steel or reinforced Portland cement concrete under their respective Contract Pay Items.

Price adjustments, as herein provided for, will be paid separately as follows:

Structural Steel
Pay Item Number 999.449 for positive (+) pay adjustments (payments to the Contractor)

Pay Item Number 999.457 for negative (-) pay adjustments (credits to MassDOT Highway Division)

Reinforcing Steel
Pay Item Number 999.466 for positive (+) pay adjustments (payments to the Contractor)

Pay Item Number 999.467 for negative (-) pay adjustments (credits to MassDOT Highway Division)

No price adjustment will be made for price changes after the Contract Completion Date, unless the MassDOT Highway Division has approved an extension of Contract Time for the Contract.

TABLE

Steel Type		Price per Pound
1	ASTM A615/A615M Grade 60 (AASHTO M31 Grade 60 or 420) Reinforcing Steel	$0.59
2	ASTM A27 (AASHTO M103) Steel Castings, H-Pile Points & Pipe Pile Shoes (See Note below.)	$0.83
3	ASTM A668 / A668M (AASHTO M102) Steel Forgings	$0.83
4	ASTM A108 (AASHTO M169) Steel Forgings for Shear Studs	$0.85
5	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Plate	$0.89
6	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Shapes	$0.84
7	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Plate	$0.89
8	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Shapes	$0.84
9	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Plate	$0.92
10	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Shapes	$0.85
11	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W 345W Structural Steel Plate	$0.92
12	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W or 345W Structural Steel Shapes	$0.85
13	ASTM A709/A709M Grade HPS 50W / AASHTO M270M/M270 Grade HPS 50W or 345W Structural Steel Plate	$0.97
14	ASTM A709/A709M Grade HPS 70W / AASHTO M270M/M270 Grade HPS 70W or 485W Structural Steel Plate	$1.04
15	ASTM A514/A514M-05 Grade HPS 100W / AASHTO M270M/M270 Grade HPS 100W or 690W Structural Steel Plate	$1.59
16	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Plate	$0.92
17	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Shapes	$0.85
18	ASTM A276 Type 316 Stainless Steel	$4.78
19	ASTM A240 Type 316 Stainless Steel	$4.78
20	ASTM A148 Grade 80/50 Steel Castings (See Note below.)	$1.64
21	ASTM A53 Grade B Structural Steel Pipe	$1.04
22	ASTM A500 Grades A, B, 36 & 50 Structural Steel Pipe	$1.04
23	ASTM A252, Grades 240 (36 KSI) & 414 (60 KSI) Pipe Pile	$0.83
24	ASTM 252, Grade 2 Permanent Steel Casing	$0.83
25	ASTM A36 (AASHTO M183) for H-piles, steel supports and sign supports	$0.87
26	ASTM A328 / A328M, Grade 50 (AASHTO M202) Steel Sheetpiling	$1.57
27	ASTM A572 / A572M, Grade 50 Sheetpiling	$1.57
28	ASTM A36/36M, Grade 50	$0.89
29	ASTM A570, Grade 50	$0.87
30	ASTM A572 (AASHTO M223), Grade 50 H-Piles	$0.89
31	ASTM A1085 Grade A (50 KSI) Steel Hollow Structural Sections (HSS), heat-treated per ASTM A1085 Supplement S1	$1.04
32	AREA 140 LB Rail and Track Accessories	$0.54

NOTE: Steel Castings are generally used only on moveable bridges. Cast iron frames, grates and pipe are not "steel" castings and will not be considered for price adjustments.

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DOCUMENT 00814

SPECIAL PROVISIONS
PRICE ADJUSTMENT FOR PORTLAND CEMENT CONCRETE MIXES

January 12, 2009

This provision applies to all projects using greater than 100 Cubic Yards (76 Cubic Meters) of Portland cement concrete containing Portland cement as stipulated in the Notice to Contractors section of the Bid Documents. This Price Adjustment will occur on a monthly basis.

The Price Adjustment will be based on the variance in price for the Portland cement component only from the Base Price to the Period Price. It shall not include transportation or other charges.

The Base Price of Portland cement on a project is a fixed price determined at the time of bid by the Department by using the same method as for the determination of the Period Price (see below) and found in the Notice to Contractors.

The Period Price of Portland cement will be determined by using the latest published price, in dollars per ton (U.S.), for Portland cement (Type I) quoted for Boston, U.S.A. in the **Construction Economics** section of *ENR Engineering News-Record* magazine or at the ENR website http://www.enr.com under **Construction Economics**. The Period Price will be posted on the MassDOT website the Wednesday immediately following the publishing of the monthly price in ENR, which is normally the first week of the month.

The Contract Price of the Portland cement concrete mix will be paid under the respective item in the Contract. The price adjustment, as herein provided, upwards or downwards, will be made after the work has been performed, using the monthly period price for the month during which the work was performed.

The price adjustment applies only to the actual Portland cement content in the mix placed on the job in accordance with the Standard Specifications for Highways and Bridges, Division III, Section M4.02.01. No adjustments will be made for any cement replacement materials such as fly ash or ground granulated blast furnace slag.

The Price Adjustment will be a separate payment item. It will be determined by multiplying the number of cubic yards of Portland cement concrete placed during each monthly period times the Portland cement content percentage times the variance in price between the Base Price and Period Price of Portland cement.

This Price Adjustment will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department-approved extension of time.

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DOCUMENT 00820

THE COMMONWEALTH OF MASSACHUSETTS SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM

I. Definitions

For purposes of this contract,

"Minority" means a person who meets one or more of the following definitions:

(a) American Indian or Native American means: all persons having origins in any of the original peoples of North America and who are recognized as an Indian by a tribe or tribal organization.
(b) Asian means: All persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian sub-continent, or the Pacific Islands, including, but Not limited to China, Japan, Korea, Samoa, India, and the Philippine Islands.
(c) Black means: All persons having origins in any of the Black racial groups of Africa, including, but not limited to, African-Americans, and all persons having origins in any of the original peoples of the Cape Verdean Islands.
(d) Eskimo or Aleut means: All persons having origins in any of the peoples of Northern Canada, Greenland, Alaska, and Eastern Siberia.
(e) Hispanic means: All persons having their origins in any of the Spanish-speaking peoples of Mexico, Puerto Rico, Cuba, Central or South America, or the Caribbean Islands.

"State construction contract" means a contract for the construction, reconstruction, installation, demolition, maintenance or repair of a building or capital facility, or a contract for the construction, reconstruction, alteration, remodeling or repair of a public work undertaken by a department, agency, board, or commission of the commonwealth.

"State assisted construction contract" means a contract for the construction, reconstruction, installation, demolition, maintenance or repair of a building or capital facility undertaken by a political subdivision of the commonwealth, or two or more political subdivisions thereof, an authority, or other instrumentality and whose costs of the contract are paid for, reimbursed, grant funded, or otherwise supported, in whole or in part, by the commonwealth.

II. Equal Opportunity, Non-Discrimination and Affirmative Action

During the performance of this Contract, the Contractor and all subcontractors (hereinafter collectively referred to as "the Contractor") for a state construction contract or a state assisted construction contract, for him/herself, his/her assignees and successors in interest, agree to comply with all applicable equal employment opportunity, non-discrimination and affirmative action requirements, including but not limited to the following:

In connection with the performance of work under this contract, the Contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability, shall not discriminate in the selection or retention of subcontractors, and shall not discriminate in the procurement of materials and rentals of equipment.

The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion, or transfer; recruitment advertising, layoff or termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship or on-the-job training opportunity. The Contractor shall comply with the provisions of chapter 151B of the Massachusetts General Laws, as amended, and all other applicable anti-discrimination and equal opportunity laws, all of which are herein incorporated by reference and made a part of this Contract.

The Contractor shall post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Massachusetts Commission Against Discrimination setting forth the provisions of the Fair Employment Practices Law of the Commonwealth (Massachusetts General Laws Chapter l51 B).

In connection with the performance of work under this contract, the Contractor shall undertake, in good faith, affirmative action measures to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability. Such affirmative action measures shall entail positive and aggressive measures to ensure nondiscrimination and to promote equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, apprenticeship and on-the-job training programs. A list of positive and aggressive measures shall include, but not be limited to, advertising employment opportunities in minority and other community news media; notifying minority, women and other community-based organizations of employment opportunities; validating all job specifications, selection requirements, and tests; maintaining a file of names and addresses of each worker referred to the Contractor and what action was taken concerning such worker; and notifying the administering agency in writing when a union with whom the Contractor has a collective bargaining agreement has failed to refer a minority or woman worker. These and other affirmative action measures shall include all actions required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability. One purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradesmen for this and future Commonwealth public construction projects.

III. Minority and Women Workforce Participation

Pursuant to his/her obligations under the preceding section, the Contractor shall strive to achieve on this project the labor participation goals contained herein. Said participation goals shall apply in each job category on this project including but not limited to bricklayers, carpenters, cement masons, electricians, ironworkers, operating engineers and those classes of work enumerated in Section 44F of Chapter 149 of the Massachusetts General Laws. The participation goals for this project shall be 15.3% for minorities and 6.9% for women. The participation goals, as set forth herein, shall not be construed as quotas or set-asides; rather, such participation goals will be used to measure the progress of the Commonwealth's equal opportunity, non-discrimination and affirmative action program. Additionally, the participation goals contained herein should not be seen or treated as a floor or as a ceiling for the employment of particular individuals or group of individuals.

IV. Liaison Committee

At the discretion of the agency that administers the contract for the construction project there may be established for the life of the contract a body to be known as the Liaison Committee. The Liaison Committee shall be composed of one representative each from the agency or agencies administering the contract for the construction project, hereinafter called the administering agency, a representative from the Office of Affirmative action, and such other representatives as may be designated by the administering agency. The Contractor (or his/her agent, if any, designated by him/her as the on-site equal employment opportunity officer) shall recognize the Liaison Committee as an affirmative action body, and shall establish a continuing working relationship with the Liaison Committee, consulting with the Liaison Committee on all matters related to minority recruitment, referral, employment and training.

V. Reports and Records

The Contractor shall prepare projected workforce tables on a quarterly basis when required by the administering agency. These shall be broken down into projections, by week, of workers required in each trade. Copies shall be furnished one week in advance of the commencement of the period covered, and also, when updated, to the administering agency and the Liaison Committee when required.

The Contractor shall prepare weekly reports in a form approved by the administering agency, unless information required is required to be reported electronically by the administering agency, the number of hours worked in each trade by each employee, identified as woman, minority, or non-minority. Copies of these shall be provided at the end of each such week to the administering agency and the Liaison Committee.

Records of employment referral orders, prepared by the Contractor, shall be made available to the administering agency on request.

The Contractor will provide all information and reports required by the administering agency on instructions issued by the administering agency and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the administering agency to effect the employment of personnel. This provision shall apply only to information pertinent to the Commonwealth's supplementary non-discrimination, equal opportunity and access and opportunity contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the administering agency and shall set forth what efforts he has made to obtain the information.

VI. Access to Work Site

A designee of the administering agency and a designee of the Liaison Committee shall each have a right to access the work site.

VII. Solicitations for Subcontracts, and for the Procurement of Materials and Equipment

In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or equipment, each potential subcontractor or supplier shall be notified in writing by the Contractor of the Contractor's obligations under this contract relative to non-discrimination and equal opportunity.

VIII. Sanctions

Whenever the administering agency believes the General or Prime Contractor or any subcontractor may not be operating in compliance with the provisions of the Fair Employment Practices Law of the Commonwealth (Massachusetts General Laws Chapter 151B), the administering agency may refer the matter to the Massachusetts Commission Against Discrimination ("Commission") for investigation.

Following the referral of a matter by the administering agency to the Massachusetts Commission Against Discrimination, and while the matter is pending before the MCAD, the administering agency may withhold payments from contractors and subcontractors when it has documentation that the contractor or subcontractor has violated the Fair Employment Practices Law with respect to its activities on the Project, or if the administering agency determines that the contractor has materially failed to comply with its obligations and the requirements of this Section. The amount withheld shall not exceed a withhold of payment to the General or Prime Contractor of 1/100 or 1% of the contract award price or $5,000, whichever sum is greater, or, if a subcontractor is in non-compliance, a withhold by the administering agency from the General Contractor, to be assessed by the General Contractor as a charge against the subcontractor, of 1/100 or 1% of the subcontractor price, or $1,000 whichever sum is greater, for each violation of the applicable law or contract requirements. The total withheld from anyone General or Prime Contractor or subcontractor on a Project shall not exceed $20,000 overall. No withhold of payments or investigation by the Commission or its agent shall be initiated without the administering agency providing prior notice to the Contractor.

If, after investigation, the Massachusetts Commission Against Discrimination finds that a General or Prime Contractor or subcontractor, in commission of a state construction contract or state-assisted construction contract, violated the provisions of the Fair Employment Practices Law, the administering agency may convert the amount withheld as set forth above into a permanent sanction, as a permanent deduct from payments to the General or Prime Contractor or subcontractor, which sanction will be in addition to any such sanctions, fines or penalties imposed by the Massachusetts Commission Against Discrimination.

No sanction enumerated under this Section shall be imposed by the administering agency except after notice to the General or Prime Contractor or subcontractor and an adjudicatory proceeding, as that term is used, under Massachusetts General Laws Chapter 30A, has been conducted.

IX. Severability

The provisions of this section are severable, and if any of these provisions shall be held unconstitutional by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the remaining provisions.

X. Contractor's Certification

After award and prior to the execution of any contract for a state construction contract or a state assisted construction contract, the Prime or General Contractor shall certify that it will comply with all provisions of this Document 00820 Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program, by executing Document 00859 Contractor/Subcontractor Certification Form.

XI. Subcontractor Requirements

Prior to the award of any subcontract for a state construction contract or a state assisted construction contract, the Prime or General Contractor shall provide all prospective subcontractors with a complete copy of this Document 00820 entitled "Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program" and will incorporate the provisions of this Document 00820 into any and all contracts or work orders for all subcontractors providing work on the Project. In order to ensure that the said subcontractor's certification becomes a part of all subcontracts under the prime contract, the Prime or General Contractor shall certify in writing to the administering agency that it has complied with the requirements as set forth in the preceeding paragraph by executing Document 00859 Contractor/Subcontractor Certification Form.

Rev'd 03/07/14

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DOCUMENT 00821

ELECTRONIC REPORTING REQUIREMENTS
CIVIL RIGHTS PROGRAMS AND CERTIFIED PAYROLL

Implemented on March 2, 2009 Revised June 04, 2019

The Massachusetts Department Of Transportation (MassDOT) has replaced the CHAMP reporting system with Equitable Business Opportunity Solution (EBO), a new web-based civil rights reporting software system. This system is capable of handling both civil rights reporting requirements and certified payrolls. The program's functions include the administration of Equal Employment Opportunity (EEO) requirements, On-The-Job Training requirements (OJT), Disadvantage Business Enterprise (DBE) and/or Minority / Women's Business Enterprise (M/WBE) subcontracting requirements, and the electronic collection of certified payrolls associated with MassDOT projects. In addition, this system is used to generate various data required as part of the American Recovery and Reinvestment Act (ARRA). Contractors are responsible for all coordination with all sub-contractors to ensure timely and accurate electronic submission of all required data.

Contractor and Sub-Contractor EBO User Certification

All contractors and sub-contractors must use the EBO software system. The software vendor, Internet Government Solutions (IGS), has developed an online EBO Training Module that is available to contractors and sub-contractors. This module is a self-tutorial which allows all users in the company to access the training, complete the tutorial, and become certified as EBO users for a one time fee of $75.00. This is the only cost to contractors and sub-contractors associated with the EBO software system. The online EBO Training Module can be accessed at www.ebotraining.com. Click the "Register My Company" button on the login page to begin your training registration. Questions regarding EBO online training should be directed to Gerry Anguilano, IGS at (440) 238-1684.

MassDOT will track contractors and sub-contractors who have successfully completed the on-line training module. All persons performing civil rights program and/or certified payroll functions should be EBO certified.

Vetting of Firms and Designated Firm Individuals

Contractors must authorize a Primary Log-In ID Holder who has completed EBO on-line training to have access to the EBO system by completing and submitting the "Request For EBO System Log-In/Password Form" located on the MassDOT website at: https://www.mass.gov/how-to/how-to-get-an-ebo-login
Contractors must also agree to comply with the EBO system user agreement located on the MassDOT website.

All subcontracts entered into on a project must include language that identifies the submission and training requirements that the sub-contractor must perform. Sub-contractors will be approved by the respective District Office of MassDOT through the existing approval process. When new sub-contractors, who have not previously worked for MassDOT, are initially selected by a general contractor, the new sub-contractor must be approved by the District before taking the EBO on-line training module.

Interim Reporting Requirements

Until MassDOT is satisfied that the EBO system is fully operational and functioning as designed, contractors and sub-contractors will be required to submit certified payrolls manually. There will be a transition period where dual reporting, through manual and electronic submission, will be required. MassDOT, however, will notify contractors and sub-contractors when they may cease manual submission of certified payrolls.

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DOCUMENT 00859

CONTRACTOR/SUBCONTRACTOR CERTIFICATION FORM ‡

The contractor shall submit this completed document 00859 to MassDOT for each subcontract.

_____ **(Contractor)** **Date:**_____

_____**(Subcontractor)** ☐ District Approved Subcontractor

Contract No: 136880 **Project No.** 616308 **Federal Aid No.:** NFA

Location: BOSTON

Project Description: Installation of Noise Barriers along I-90 between Market and Franklin Streets (Allston Multimodal Transportation Project Early Action)

PART 1 CONTRACTOR CERTIFICATION: I hereby certify, as an authorized official of this company, that to the best of my knowledge, information and belief, the company is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices, that the company will not discriminate in their employment practices, that the company will make good faith efforts to comply with the minority employee and women employee workforce participation ratio goals and specific affirmative action steps contained in Contract Document 00820 The Commonwealth of Massachusetts Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program, and that the company will comply with the special provisions and documentation indicated below (as checked).

I further hereby certify, as an authorized official of this company, that the special provisions and documentation indicated below (as checked) have been or are included in, and made part of, the Subcontractor Agreement entered into with the firm named above.

☐ **This is not a Federally-aided construction project**

Document #

☐ 00718 –Participation By Minority Or Women's Business Enterprises and SDVOBE†
☐ 00761 –Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion
☐ 00820 – MA Supplemental Equal Employment Opportunity, Non-Discrimination, and Affirmative Action Program
☐ 00821 – Electronic Reporting Requirements, Civil Rights Programs, and Certified Payroll
☐ 00859 – Contractor/Subcontractor Certification Form (this document)
☐ 00860 – MA Employment Laws
☐ 00861 – Applicable State Wage Rates in the Contract Proposal**
☐ B00842 – MA Schedule of Participation By Minority or Women Business Enterprises (M/WBEs)†
☐ B00843 – MA Letter of Intent – M/WBEs†

** Does not apply to Material Suppliers, unless performing work on-site
† Applies only if Subcontractor is a M/WBE; only include these forms for the particular M/WBE Entity

☐ B00844 - Schedule of Participation By SDVOBE
☐ B00845 - Letter of Intent – SDVOBE
☐ B00846 – M/WBE or SDVOBE Joint Check Arrangement Approval Form
☐ B00847 – Joint Venture Affidavit

☐ **This is a Federally-aided construction project (Federal Aid Number is present)**

Document #

☐ 00719 – Special Provisions for Participation by Disadvantaged Business Enterprises†
☐ 00760 - Form FHWA 1273 - Required Contract Provisions for Federal-Aid Construction Contracts
☐ 00820 – MA Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program
☐ 00821 – Electronic Reporting Requirements, Civil Rights Programs and Certified Payroll
☐ 00859 – Contractor/Subcontractor Certification Form (this document)
☐ 00860 – MA Employment Laws
☐ 00870 – Standard Federal Equal Employment Opportunity Construction Contract Specifications Executive Order 11246, (41 CFR Parts 60-4.2 and 60-4.3 (Solicitations and Equal Opportunity Clauses)*
☐ 00875 – Federal Trainee Special Provisions

☐ B00853 – Schedule of Participation by Disadvantaged Business Enterprise†
☐ B00854 – Letter of Intent – DBEs†
☐ B00855 – DBE Joint Check Arrangement Approval Form
☐ B00856 – Joint Venture Affidavit
☐ 00861/00880 - Applicable state and federal wage rates from Contract Proposal**

*Applicable only to Contracts or Subcontracts in excess of $10,000
**Does not apply to Material Suppliers, unless performing work on-site
† Applies only if Subcontractor is a DBE; only include these forms for the particular DBE Entity

Signed this _____ Day of _____, 20_____ Under The Pains And Penalties Of Perjury.

_____ _____
(Print Name and Title) (Authorized Signature)

PART 2

PART 2 SUBCONTRACTOR CERTIFICATION: I hereby certify, as an authorized official of this company, that the required documents in Part 1 above were physically incorporated in our Agreement/Subcontract with the Contractor and give assurance that this company will fully comply or make every good faith effort to comply with the same. I further certify that:

1. This company recognizes that if this is a Federal-Aid Project, then this Contract is covered by the equal employment opportunity laws administered and enforced by the United States Department of Labor ("USDOL"), Office of Federal Contract Compliance Programs ('OFCCP"). By signing below, we acknowledge that this company has certain reporting obligations to the OFCCP, as specified by 41 CFR Part 60-4.2.
2. This company further acknowledges that any contractor with fifty (50) or more employees on a Federal-aid Contract with a value of fifty-thousand ($50,000) dollars or more must annually file an EEO-1 Report (SF 100) to the EEOC, Joint Reporting Committee, on or before September 30th, each year, as specified by 41 CFR Part 60-1.7a.
3. For more information regarding the federal reporting requirements, please contact the USDOL, OFCCP Regional Office, at 1-646-264-3170 or EEO-1, Joint Reporting Committee at 1-866-286-6440.
4. This company ☐ has, ☐ has not, participated in a previous contract or subcontract subject to the Equal Opportunity clauses set forth in 41 CFR Part 60-4 and Executive Order 11246, and where required, has filed with the Joint Reporting Committee, the Director of the Office of Federal Contract Compliance Programs or the EEO Commission all reports due under the applicable filing requirements.
5. This company is in full compliance with applicable Federal and Commonwealth of Massachusetts laws, rules, and regulations and is not currently debarred or disqualified from bidding on or participating in construction contracts in any jurisdiction of the United States. See : https://www.mass.gov/service-details/contractors-and-vendors-suspended-or-debarred-by-massdot
6. This company is properly registered and in good standing with the Office of the Secretary of the Commonwealth.

Signed this _____ Day of _____, 20_____, Under The Pains And Penalties Of Perjury.

Firm: _____
Address: _____
_____
_____
Telephone Number:_____
Federal I.D. Number:_____
Estimated Start Date:_____
Estimated Completion Date:_____
Estimated Dollar Amount:_____

_____
(Print Name and Title)

_____
(Authorized Signature)

_____
(Date)

Rev'd 09/02/22

*** END OF DOCUMENT ***

DOCUMENT 00860

COMMONWEALTH OF MASSACHUSETTS PUBLIC EMPLOYMENT LAWS

Revised February 20, 2019

The Contractor's attention is directed to Massachusetts General Laws, Chapter 149, Sections 26 through 27H, and 150A. This contract is considered to fall within the ambit of that law, which provides that in general, the Prevailing Rate or Total Rate must be paid to employees working on projects funded by the Commonwealth of Massachusetts or any political subdivision including Massachusetts Department of Transportation (MassDOT).

A Federal Aid project is also subject to the Federal Minimum Wage Rate law for construction. When comparing a state minimum wage rate, monitored by the Massachusetts Attorney General, versus federal minimum wage rate, monitored by the U.S. Department of Labor Wage and Hour Division, for a particular job classification the higher wage is at all times to be paid to the affected employee.

Every contractor or subcontractor engaged in this contract to which sections twenty-seven and twenty-seven A apply will keep a true and accurate record of all mechanics and apprentices, teamsters, chauffeurs and laborers employed thereon, showing the name, address and occupational classification of each such employee on this contract, and the hours worked by, and the wages paid to, each such employee, and shall furnish to the MassDOT's Resident Engineer, on a weekly basis, a copy of said record, in a form approved by MassDOT and in accordance with M.G.L. c. 149, § 27B, signed by the employer or his/her authorized agent under the penalties of perjury.

Each such contractor or subcontractor shall preserve its payroll records for a period of three years from the date of completion of the contract.

The Prevailing Wage Rate generally includes the following:

Minimum Hourly Wage + Employer Contributions to Benefit Plans = Prevailing Wage Rate or Total Rate

Any employer who does not make contributions to Benefit Plans must pay the total Prevailing Wage Rate directly to the employee.

Any deduction from the Prevailing Wage Rate or Total Rate for contributions to benefit plans can only be for a Health & Welfare, Pension, or Supplementary Unemployment plan meeting the requirements of the Employee Retirement Income Security Act (ERISA) of 1974. The maximum allowable deduction for these benefits from the prevailing wage rate cannot be greater than the amount allowed by Executive Office of Labor (EOL) for the specified benefits. Any additional expense of providing benefits to the employees is to be borne by the employer and cannot be deducted from the Minimum Hourly Wage. If the employer's benefit expense is less than that so provided by EOL the difference will be paid directly to the employee. The rate established must be paid to all employees who perform work on the project.

When an employer makes deductions from the Minimum Hourly Wage for an employee's contribution to social security, state taxes, federal taxes, and/or other contribution programs, allowed by law, the employer shall furnish each employee a suitable pay slip, check stub or envelope notifying the employee of the amount of the deductions.

No contractor or subcontractor contracting for any part of the contract week shall require or permit any laborer or mechanic to be employed on such work in excess of forty hours in any workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times his basic rate of pay for all hours worked in excess of forty hours in such workweek, whichever is the greater number of overtime hours.

Apprentice Rates are permitted only when there is an Apprentice Agreement registered with the Massachusetts Division of Apprentice Training in accordance with M.G.L. c. 23, § 11E-11L.

The Prevailing Wage Rates issued for each project shall be the rates paid for the entire project. The Prevailing Wage Rates must be posted on the job site at all times and be visible from a public way.

In addition, each such contractor and subcontractor shall furnish to the MassDOT's Resident Engineer, within fifteen days after completion of its portion of the work, a statement, executed by the contractor or subcontractor or by any authorized officer or employee of the contractor or subcontractor who supervises the payment of wages, in the following form:

STATEMENT OF COMPLIANCE

Date: _____

I , _____do hereby state:
(Name of signatory party) (Title)

That I pay or supervise the payment of the persons employed by:

_____
(Contractor or Subcontractor)

on the _____
(MassDOT Project Location and Contract Number)

and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of sections twenty-six and twenty-seven of chapter one hundred and forty-nine of the General Laws.

Signature _____

Title _____

The above-mentioned copies of payroll records and statements of compliance shall be available for inspection by any interested party filing a written request to the MassDOT's Resident Engineer for such inspection and copying.

Massachusetts General Laws c. 149, §27, requires annual updates to prevailing wage schedules for all public construction contracts lasting longer than one year. MassDOT will request the required updates and furnish them to the Contractor. The Contractor is required to pay no less than the wage rates indicated on the annual updated wage schedules.

MassDOT will request the updates no later that two week before the anniversary of the Notice to Proceed date of the contract to allow for adequate processing by the Department of Labor Standards (DLS). The effective date for the new rates will be the anniversary date of the contract (i.e. the notice to proceed date), regardless of the date of issuance on the schedule from DLS.

All bidders are cautioned that the aforementioned laws require that employers pay to covered employees no less than the applicable minimum wages. In addition, the same laws require that the applicable prevailing wages become incorporated as part of this contract. The prevailing minimum wage law establishes serious civil and criminal penalties for violations, including imprisonment and exclusion from future public contracts. Bidders are cautioned to carefully read the relevant sections of the Massachusetts General Laws.

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DOCUMENT 00861

STATE PREVAILING WAGE RATES

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THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS
Prevailing Wage Rates

MAURA HEALEY
Governor
KIM DRISCOLL
Lt. Governor

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

LAUREN JONES
Secretary
MICHAEL FLANAGAN
Director

Awarding Authority:	Massachusetts Highway	**City/Town:**	BOSTON
Wage Request No:	20260929142402	**Job Location:**	Along I-90 between Market and Franklin Streets
Description of Work:	BOSTON - Installation of Noise Barriers along I-90 between Market and Franklin Streets (Allston Multimodal Transportation Project Early Action)		
Contract Number:	136880		

§§ 26-27D Construction Project

This Prevailing Wage Schedule establishes the minimum wage rates that employees on this public works construction project must be paid. The project's Wage Request Number is listed above and on all pages of this Schedule. This schedule applies **only** to this specific project.

Awarding Authority Responsibilities

- You must include this Prevailing Wage Schedule (PWS) or an appropriate reference to it in all advertisements and calls for bids.
- The PWS must be incorporated in its entirety into all contracts for this project (G.L. c. 149, § 27).
- The wage rates on this PWS will remain in effect for the duration of the project. **Exception:** You must request an updated schedule for any multi-year construction project no later than 2 weeks before the project's yearly anniversary date.
  - For CM AT RISK projects, the anniversary date is the earlier of the signing date of: (a) the GMP Amendment; or (b) the first amendment to permit procurement of construction services.
  - For all other construction projects, the anniversary date is the date the contract was signed by the Awarding Authority and the General Contractor.
- You must also request an updated PWS if you have not opened bids or selected a contractor within 90 days of the date of issuance on this PWS.
  - For CM AT RISK projects, the earlier of (a) the signing date of the GMP Amendment; or (b) the bid for the first construction scope of work must be within 90 days of the date of issuance on this Schedule.
- You must provide any updated PWS to all contractors working on the project, including general and sub-contractors.
- You must keep the contractors' weekly certified payroll records and Statements of Compliance on file for **3 years.**
- Awarding authorities have other prevailing wage responsibilities not listed above. Learn more at: **[Prevailing wage: for awarding authorities | Mass.gov]** and G.L. c. 149, §§ 26-27D.

Contractor Responsibilities

- You must pay all employees who perform construction work on this project at least the wage rate listed on this PWS. **Warning!** If you do not follow this requirement, you can face civil fines, criminal charges, or private lawsuits.
- You must post this PWS at the worksite where it can be easily seen. (G.L. c. 149, § 27)
- You must file weekly payroll reports and a Statement of Compliance with the awarding authority (**not** DLS). You can file payroll reports by mail or email and must keep them on file for 3 years. Each weekly payroll report must include each employees' name, address, occupational classification(s), hours worked, and wages paid. Find a sample report at: mass.gov/dols/pw.
- You cannot pay any employees at the apprentice rates listed on this PWS unless they are registered with the Massachusetts Division of Apprentice Standards (DAS). Qualifying apprentices must be paid at the applicable step rate and must carry their apprentice ID card during all work hours on the project. Apprentices **not** registered with DAS must be paid at the listed journeyworker's rate, even if they are registered with a different federal/state public agency or private entity. For every week in which apprentice rates are paid, a copy of each apprentice's apprentice ID card issued by DAS shall be attached to the certified payroll records.
- If you don't know what classification or rate applies to the work being performed, you must ask DLS; paying the wrong rate subjects you to enforcement.
- Please contact DLS if you have any questions about the Prevailing Wage Schedule: (617) 626-6953 or **DLS.Feedback@mass.gov**

Employees who are **not** paid the wage listed on the Prevailing Wage Schedule (PWS) may file a complaint with the Attorney General's Fair Labor

Division: **www.mass.gov/ago/fld**; **(617) 727-3465.**

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
(2 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	8/1/2026	$43.05	$15.91	$21.78	$0.00	$0.00	$80.74
	12/1/2026	$43.05	$15.91	$23.52	$0.00	$0.00	$82.48
(3 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	8/1/2026	$43.12	$15.91	$21.78	$0.00	$0.00	$80.81
	12/1/2026	$43.12	$15.91	$23.52	$0.00	$0.00	$82.55
(4 & 5 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	8/1/2026	$43.24	$15.91	$21.78	$0.00	$0.00	$80.93
	12/1/2026	$43.24	$15.91	$23.52	$0.00	$0.00	$82.67
ADS/SUBMERSIBLE PILOT PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1) For apprentice rates see "Apprentice- PILE DRIVER"	1/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
AIR TRACK OPERATOR LABORERS LABORERS - ZONE 1 For apprentice rates see "Apprentice- LABORER"	6/1/2026	$49.15	$10.90	$9.75	$9.65	$0.00	$79.45
	12/1/2026	$51.40	$10.90	$9.75	$9.65	$0.00	$81.70
	6/1/2027	$53.00	$10.90	$9.75	$9.65	$0.00	$83.30
	12/1/2027	$54.60	$10.90	$9.75	$9.65	$0.00	$84.90
	6/1/2028	$56.28	$10.90	$9.75	$9.65	$0.00	$86.58
	12/1/2028	$57.95	$10.90	$9.75	$9.65	$0.00	$88.25
AIR TRACK OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 1 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"	6/1/2026	$50.00	$10.90	$9.75	$9.65	$0.00	$80.30
	12/1/2026	$51.50	$10.90	$9.75	$9.65	$0.00	$81.80
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (BOSTON)	12/1/2025	$44.80	$14.50	$4.30	$6.75	$0.00	$70.35
ASPHALT RAKER LABORERS LABORERS - ZONE 1 For apprentice rates see "Apprentice- LABORER"	6/1/2026	$49.40	$10.90	$9.75	$9.65	$0.00	$79.70
	12/1/2026	$50.90	$10.90	$9.75	$9.65	$0.00	$81.20
	6/1/2027	$52.50	$10.90	$9.75	$9.65	$0.00	$82.80
	12/1/2027	$54.10	$10.90	$9.75	$9.65	$0.00	$84.40
	6/1/2028	$55.78	$10.90	$9.75	$9.65	$0.00	$86.08
	12/1/2028	$57.45	$10.90	$9.75	$9.65	$0.00	$87.75
ASPHALT RAKER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 1 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"	6/1/2026	$49.50	$10.90	$9.75	$9.65	$0.00	$79.80
	12/1/2026	$51.00	$10.90	$9.75	$9.65	$0.00	$81.30
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	6/1/2026	$59.38	$17.05	$13.35	$3.25	$0.00	$93.03
	12/1/2026	$60.83	$17.05	$13.35	$3.25	$0.00	$94.48
BACKHOE/FRONT-END LOADER	6/1/2026	$59.38	$17.05	$13.35	$3.25	$0.00	$93.03

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.83	$17.05	$13.35	$3.25	$0.00	$94.48
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
BARCO-TYPE JUMPING TAMPER LABORERS LABORERS - ZONE 1	6/1/2026	$49.40	$10.90	$9.75	$9.65	$0.00	$79.70
	12/1/2026	$50.90	$10.90	$9.75	$9.65	$0.00	$81.20
	6/1/2027	$52.50	$10.90	$9.75	$9.65	$0.00	$82.80
	12/1/2027	$54.10	$10.90	$9.75	$9.65	$0.00	$84.40
	6/1/2028	$55.78	$10.90	$9.75	$9.65	$0.00	$86.08
	12/1/2028	$57.45	$10.90	$9.75	$9.65	$0.00	$87.75
For apprentice rates see "Apprentice- LABORER"							
BLOCK PAVER, RAMMER / CURB SETTER LABORERS LABORERS - ZONE 1	6/1/2026	$49.15	$10.90	$9.75	$9.65	$0.00	$79.45
	12/1/2026	$51.40	$10.90	$9.75	$9.65	$0.00	$81.70
	6/1/2027	$53.00	$10.90	$9.75	$9.65	$0.00	$83.30
	12/1/2027	$54.60	$10.90	$9.75	$9.65	$0.00	$84.90
	6/1/2028	$56.28	$10.90	$9.75	$9.65	$0.00	$86.58
	12/1/2028	$57.95	$10.90	$9.75	$9.65	$0.00	$88.25
For apprentice rates see "Apprentice- LABORER"							
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 1 (HEAVY & HIGHWAY)	6/1/2026	$50.00	$10.90	$9.75	$9.65	$0.00	$80.30
	12/1/2026	$51.50	$10.90	$9.75	$9.65	$0.00	$81.80
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
BOILER MAKER BOILERMAKERS LOCAL 29 BOILERMAKERS LOCAL 29	1/1/2024	$48.12	$7.07	$14.60	$6.00	$0.00	$75.79

Apprentice: BOILER MAKER

Effective Date: 1/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
2	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
3	70.00	$33.68	$7.07	$10.03	$4.20	$0.00	$54.98
4	75.00	$36.09	$7.07	$10.74	$4.50	$0.00	$58.40
5	80.00	$38.50	$7.07	$11.45	$4.80	$0.00	$61.82
6	85.00	$40.90	$7.07	$12.18	$5.10	$0.00	$65.25
7	90.00	$43.31	$7.07	$12.88	$5.40	$0.00	$68.66
8	95.00	$45.71	$7.07	$13.62	$5.70	$0.00	$72.10

Apprentice to Journeyworker Ratio: 1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (BOSTON)	8/1/2026	$70.15	$12.84	$15.57	$8.02	$0.00	$106.58
	2/1/2027	$71.55	$12.84	$15.57	$8.02	$0.00	$107.98

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 8/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$35.08	$12.84	$15.57	$8.02	$0.00	$71.51
2	60.00	$42.09	$12.84	$15.57	$8.02	$0.00	$78.52
3	70.00	$49.11	$12.84	$15.57	$8.02	$0.00	$85.54
4	80.00	$56.12	$12.84	$15.57	$8.02	$0.00	$92.55
5	90.00	$63.14	$12.84	$15.57	$8.02	$0.00	$99.57

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 2/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$35.78	$12.84	$15.57	$8.02	$0.00	$72.21
2	60.00	$42.93	$12.84	$15.57	$8.02	$0.00	$79.36
3	70.00	$50.09	$12.84	$15.57	$8.02	$0.00	$86.52
4	80.00	$57.24	$12.84	$15.57	$8.02	$0.00	$93.67
5	90.00	$64.40	$12.84	$15.57	$8.02	$0.00	$100.83

Apprentice to Journeyworker Ratio: 1:5

BULLDOZER/GRADER/SCRAPER OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
CAISSON & UNDERPINNING BOTTOM MAN LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2026	$50.40	$10.90	$9.75	$9.80	$0.00	$80.85
	12/1/2026	$51.90	$10.90	$9.75	$9.80	$0.00	$82.35
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING LABORER LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2026	$49.25	$10.90	$9.75	$9.80	$0.00	$79.70
	12/1/2026	$50.75	$10.90	$9.75	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING TOP MAN LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2026	$49.58	$10.90	$9.75	$9.80	$0.00	$80.03
	12/1/2026	$51.08	$10.90	$9.75	$9.80	$0.00	$81.53
For apprentice rates see "Apprentice- LABORER"							
CARBIDE CORE DRILL OPERATOR LABORERS LABORERS - ZONE 1	6/1/2026	$49.40	$10.90	$9.75	$9.65	$0.00	$79.70
	12/1/2026	$50.90	$10.90	$9.75	$9.65	$0.00	$81.20
	6/1/2027	$52.50	$10.90	$9.75	$9.65	$0.00	$82.80
	12/1/2027	$54.10	$10.90	$9.75	$9.65	$0.00	$84.40
	6/1/2028	$55.78	$10.90	$9.75	$9.65	$0.00	$86.08
	12/1/2028	$57.45	$10.90	$9.75	$9.65	$0.00	$87.75
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
CARPENTER	9/1/2026	$63.69	$10.58	$11.47	$8.50	$0.00	$94.24
CARPENTERS	3/1/2027	$65.19	$10.58	$11.47	$8.50	$0.00	$95.74
CARPENTERS -ZONE 1 (Metro Boston)							

Apprentice: CARPENTER

Effective Date: 9/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$28.66	$11.08	$0.00	$1.73	$0.00	$41.47
2	45.00	$28.66	$11.08	$0.00	$1.73	$0.00	$41.47
3	55.00	$35.03	$11.08	$0.00	$3.40	$0.00	$49.51
4	55.00	$35.03	$11.08	$0.00	$3.40	$0.00	$49.51
5	70.00	$44.58	$11.08	$11.41	$5.10	$0.00	$72.17
6	70.00	$44.58	$11.08	$11.41	$5.10	$0.00	$72.17
7	80.00	$50.95	$11.08	$11.44	$6.80	$0.00	$80.27
8	80.00	$50.95	$11.08	$11.44	$6.80	$0.00	$80.27

Apprentice: CARPENTER

Effective Date: 3/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$29.34	$10.58	$0.00	$1.73	$0.00	$41.65
2	45.00	$29.34	$10.58	$0.00	$1.73	$0.00	$41.65
3	55.00	$35.85	$10.58	$0.00	$3.40	$0.00	$49.83
4	55.00	$35.85	$10.58	$0.00	$3.40	$0.00	$49.83
5	70.00	$45.63	$10.58	$11.41	$5.10	$0.00	$72.72
6	70.00	$45.63	$10.58	$11.41	$5.10	$0.00	$72.72
7	80.00	$52.15	$10.58	$11.44	$6.80	$0.00	$80.97
8	80.00	$52.15	$10.58	$11.44	$6.80	$0.00	$80.97

Apprentice to Journeyworker Ratio: 1:5

CARPENTER WOOD FRAME	10/1/2026	$40.19	$8.29	$4.47	$5.00	$0.00	$57.95
CARPENTERS	4/1/2027	$40.99	$8.29	$4.47	$5.00	$0.00	$58.75
CARPENTERS -ZONE 1 (Wood Frame)							

All Aspects of New Wood Frame Work

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$20.10	$8.29	$0.00	$0.00	$0.00	$28.39
2	50.00	$20.10	$8.29	$0.00	$0.00	$0.00	$28.39
3	55.00	$22.10	$8.29	$0.00	$2.00	$0.00	$32.39
4	55.00	$22.10	$8.29	$0.00	$2.00	$0.00	$32.39
5	70.00	$28.13	$8.29	$4.47	$3.00	$0.00	$43.89
6	70.00	$28.13	$8.29	$4.47	$3.00	$0.00	$43.89

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: CARPENTER WOOD FRAME							
Effective Date: 10/1/2026							
Step / Percent		**Apprentice Base Wage**					
7 / 80.00		$32.15	$8.29	$4.47	$4.00	$0.00	$48.91
8 / 80.00		$32.15	$8.29	$4.47	$4.00	$0.00	$48.91
Apprentice to Journeyworker Ratio: 1:5							
CEMENT MASONRY/PLASTERING	7/1/2026	$54.49	$13.35	$16.43	$7.78	$1.80	$93.85
PLASTERERS AND CEMENT MASONS LOCAL 534	1/1/2027	$55.94	$13.35	$16.43	$7.78	$1.80	$95.30
Plasterers and Cement Masons - Zone 1	7/1/2027	$57.29	$13.35	$16.43	$7.78	$1.80	$96.65
	1/1/2028	$58.64	$13.35	$16.43	$7.78	$1.80	$98.00
Apprentice: CEMENT MASONRY/PLASTERING							
Effective Date: 7/1/2026							
Step / Percent		**Apprentice Base Wage**					
1 / 50.00		$27.25	$13.35	$16.43	$0.00	$0.00	$57.03
2 / 60.00		$32.69	$13.35	$16.43	$7.78	$1.80	$72.05
3 / 65.00		$35.42	$13.35	$16.43	$7.78	$1.80	$74.78
4 / 70.00		$38.14	$13.35	$16.43	$7.78	$1.80	$77.50
5 / 75.00		$40.87	$13.35	$16.43	$7.78	$1.80	$80.23
6 / 80.00		$43.59	$13.35	$16.43	$7.78	$1.80	$82.95
7 / 90.00		$49.04	$13.35	$16.43	$7.78	$0.00	$86.60
Apprentice: CEMENT MASONRY/PLASTERING							
Effective Date: 1/1/2027							
Step / Percent		**Apprentice Base Wage**					
1 / 50.00		$27.97	$13.35	$16.43	$0.00	$0.00	$57.75
2 / 60.00		$33.56	$13.35	$16.43	$7.78	$1.80	$72.92
3 / 65.00		$36.36	$13.35	$16.43	$7.78	$1.80	$75.72
4 / 70.00		$39.16	$13.35	$16.43	$7.78	$1.80	$78.52
5 / 75.00		$41.96	$13.35	$16.43	$7.78	$1.80	$81.32
6 / 80.00		$44.75	$13.35	$16.43	$7.78	$1.80	$84.11
7 / 90.00		$50.35	$13.35	$16.43	$0.00	$0.00	$80.13
Apprentice to Journeyworker Ratio: 1:5							
CHAIN SAW OPERATOR	6/1/2026	$49.40	$10.90	$9.75	$9.65	$0.00	$79.70
LABORERS	12/1/2026	$50.90	$10.90	$9.75	$9.65	$0.00	$81.20
LABORERS - ZONE 1	6/1/2027	$52.50	$10.90	$9.75	$9.65	$0.00	$82.80
	12/1/2027	$54.10	$10.90	$9.75	$9.65	$0.00	$84.40
	6/1/2028	$55.78	$10.90	$9.75	$9.65	$0.00	$86.08
	12/1/2028	$57.45	$10.90	$9.75	$9.65	$0.00	$87.75

For apprentice rates see "Apprentice- LABORER"

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.61	$17.05	$13.35	$3.25	$0.00	$94.26
	12/1/2026	$62.09	$17.05	$13.35	$3.25	$0.00	$95.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
COMPRESSOR OPERATOR OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$37.63	$17.05	$13.35	$3.25	$0.00	$71.28
	12/1/2026	$38.58	$17.05	$13.35	$3.25	$0.00	$72.23
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
DELEADER (BRIDGE) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 1	1/1/2026	$59.56	$10.35	$12.00	$12.60	$0.00	$94.51

Apprentice: DELEADER (BRIDGE)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.78	$10.35	$0.00	$0.00	$0.00	$40.13
2	55.00	$32.76	$10.35	$0.00	$6.93	$0.00	$50.04
3	60.00	$35.74	$10.35	$0.00	$7.56	$0.00	$53.65
4	65.00	$38.71	$10.35	$0.00	$8.19	$0.00	$57.25
5	70.00	$41.69	$10.35	$12.00	$8.82	$0.00	$72.86
6	75.00	$44.67	$10.35	$12.00	$9.45	$0.00	$76.47
7	80.00	$47.65	$10.35	$12.00	$10.08	$0.00	$80.08
8	90.00	$53.60	$10.35	$12.00	$11.34	$0.00	$87.29

Apprentice to Journeyworker Ratio: 1:1

DEMO: ADZEMAN LABORERS LABORERS - ZONE 1	6/1/2026	$49.30	$10.90	$9.75	$9.65	$0.00	$79.60
	12/7/2026	$50.80	$10.90	$9.75	$9.65	$0.00	$81.10
	6/7/2027	$52.40	$10.90	$9.75	$9.65	$0.00	$82.70
	12/6/2027	$54.00	$10.90	$9.75	$9.65	$0.00	$84.30
	6/5/2028	$55.68	$10.90	$9.75	$9.65	$0.00	$85.98
	12/4/2028	$57.35	$10.90	$9.75	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS LABORERS - ZONE 1	6/1/2026	$50.30	$10.90	$9.75	$9.65	$0.00	$80.60
	12/7/2026	$51.80	$10.90	$9.75	$9.65	$0.00	$82.10
	6/7/2027	$53.40	$10.90	$9.75	$9.65	$0.00	$83.70
	12/6/2027	$55.00	$10.90	$9.75	$9.65	$0.00	$85.30
	6/5/2028	$56.68	$10.90	$9.75	$9.65	$0.00	$86.98
	12/4/2028	$58.35	$10.90	$9.75	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BURNERS LABORERS LABORERS - ZONE 1	6/1/2026	$50.05	$10.90	$9.75	$9.65	$0.00	$80.35
	12/7/2026	$51.55	$10.90	$9.75	$9.65	$0.00	$81.85
	6/7/2027	$53.15	$10.90	$9.75	$9.65	$0.00	$83.45
	12/6/2027	$54.75	$10.90	$9.75	$9.65	$0.00	$85.05
	6/5/2028	$56.43	$10.90	$9.75	$9.65	$0.00	$86.73
	12/4/2028	$58.10	$10.90	$9.75	$9.65	$0.00	$88.40

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"							
DEMO: CONCRETE CUTTER/SAWYER LABORERS LABORERS - ZONE 1	6/1/2026	$50.30	$10.90	$9.75	$9.65	$0.00	$80.60
	12/7/2026	$51.80	$10.90	$9.75	$9.65	$0.00	$82.10
	6/7/2027	$53.40	$10.90	$9.75	$9.65	$0.00	$83.70
	12/6/2027	$55.00	$10.90	$9.75	$9.65	$0.00	$85.30
	6/5/2028	$56.68	$10.90	$9.75	$9.65	$0.00	$86.98
	12/4/2028	$58.35	$10.90	$9.75	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: JACKHAMMER OPERATOR LABORERS LABORERS - ZONE 1	6/1/2026	$50.05	$10.90	$9.75	$9.65	$0.00	$80.35
	12/7/2026	$51.55	$10.90	$9.75	$9.65	$0.00	$81.85
	6/7/2027	$53.15	$10.90	$9.75	$9.65	$0.00	$83.45
	12/6/2027	$54.75	$10.90	$9.75	$9.65	$0.00	$85.05
	6/5/2028	$56.43	$10.90	$9.75	$9.65	$0.00	$86.73
	12/4/2028	$58.10	$10.90	$9.75	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							
DEMO: WRECKING LABORER LABORERS LABORERS - ZONE 1	6/1/2026	$49.30	$10.90	$9.75	$9.65	$0.00	$79.60
	12/7/2026	$50.80	$10.90	$9.75	$9.65	$0.00	$81.10
	6/7/2027	$52.40	$10.90	$9.75	$9.65	$0.00	$82.70
	12/6/2027	$54.00	$10.90	$9.75	$9.65	$0.00	$84.30
	6/5/2028	$55.68	$10.90	$9.75	$9.65	$0.00	$85.98
	12/4/2028	$57.35	$10.90	$9.75	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DIRECTIONAL DRILL MACHINE OPERATOR OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
DIVER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	$78.11	$10.08	$11.62	$10.04	$0.00	$109.85
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Diver wage 70/80/90 2A $69.83, 3A $91.79,4A $102.14 Total Rate							
DIVER TENDER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	$55.79	$10.08	$11.62	$12.67	$0.00	$90.16
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Piledriver wage 70/80/90 2A $54.20, 3A $73.93,4A $82.05 Total Rate							
DIVER TENDER (EFFLUENT) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	$83.69	$10.08	$11.62	$12.67	$0.00	$118.06
For apprentice rates see "Apprentice- PILE DRIVER"							
DIVER/SLURRY (EFFLUENT) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
For apprentice rates see "Apprentice- PILE DRIVER"							
DRAWBRIDGE OPERATOR (Construction) DRAWBRIDGE - SEIU LOCAL 888	7/1/2020	$26.77	$6.67	$3.93	$0.00	$0.16	$37.53

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
DRAWBRIDGE - SEIU LOCAL 888							
ELECTRICIAN	9/1/2026	$68.78	$13.00	$14.69	$9.00	$0.00	$105.47
ELECTRICIANS LOCAL 103	3/1/2027	$69.97	$13.00	$14.73	$9.00	$0.00	$106.70
ELECTRICIANS LOCAL 103	9/1/2027	$71.88	$13.00	$14.79	$9.00	$0.00	$108.67
	3/1/2028	$73.08	$13.00	$14.82	$9.00	$0.00	$109.90

Apprentice: ELECTRICIAN

Effective Date: 9/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$27.51	$13.00	$0.83	$0.00	$0.00	$41.34
2	40.00	$27.51	$13.00	$0.83	$0.00	$0.00	$41.34
3	45.00	$30.95	$13.00	$13.56	$4.05	$0.00	$61.56
4	45.00	$30.95	$13.00	$13.56	$4.05	$0.00	$61.56
5	50.00	$34.39	$13.00	$13.66	$4.50	$0.00	$65.55
6	55.00	$37.83	$13.00	$13.76	$4.95	$0.00	$69.54
7	60.00	$41.27	$13.00	$13.87	$5.40	$0.00	$73.54
8	65.00	$44.71	$13.00	$13.97	$5.85	$0.00	$77.53
9	70.00	$48.15	$13.00	$14.07	$6.30	$0.00	$81.52
10	75.00	$51.59	$13.00	$14.18	$6.75	$0.00	$85.52

Apprentice: ELECTRICIAN

Effective Date: 3/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$27.99	$13.00	$0.84	$0.00	$0.00	$41.83
2	40.00	$27.99	$13.00	$0.84	$0.00	$0.00	$41.83
3	45.00	$31.49	$13.00	$13.57	$4.05	$0.00	$62.11
4	45.00	$31.49	$13.00	$13.57	$4.05	$0.00	$62.11
5	50.00	$34.99	$13.00	$13.68	$4.50	$0.00	$66.17
6	55.00	$38.48	$13.00	$13.78	$4.95	$0.00	$70.21
7	60.00	$41.98	$13.00	$13.89	$5.40	$0.00	$74.27
8	65.00	$45.48	$13.00	$13.99	$5.85	$0.00	$78.32
9	70.00	$48.98	$13.00	$14.10	$6.30	$0.00	$82.38
10	75.00	$52.48	$13.00	$14.20	$6.75	$0.00	$86.43

Apprentice Notes

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Apprentice to Journeyworker Ratio: 2:3

ELEVATOR CONSTRUCTOR	1/1/2026	$77.26	$16.38	$11.06	$10.70	$0.00	$115.40
ELEVATOR CONSTRUCTORS LOCAL 4	1/1/2027	$80.55	$16.48	$11.16	$11.00	$0.00	$119.19
ELEVATOR CONSTRUCTORS LOCAL 4							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$38.63	$0.00	$0.00	$0.00	$0.00	$38.63
2	55.00	$42.49	$16.38	$11.06	$10.70	$0.00	$80.63
3	65.00	$50.22	$16.38	$11.06	$10.70	$0.00	$88.36
4	70.00	$54.08	$16.38	$11.06	$10.70	$0.00	$92.22
5	80.00	$61.81	$16.38	$11.06	$10.70	$0.00	$99.95

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$40.28	$0.00	$0.00	$0.00	$0.00	$40.28
2	55.00	$44.30	$16.48	$11.16	$11.00	$0.00	$82.94
3	65.00	$52.36	$16.48	$11.16	$11.00	$0.00	$91.00
4	70.00	$56.39	$16.48	$11.16	$11.00	$0.00	$95.03
5	80.00	$64.44	$16.48	$11.16	$11.00	$0.00	$103.08

Apprentice to Journeyworker Ratio: 1:1

ELEVATOR CONSTRUCTOR HELPER	1/1/2026	$54.08	$16.38	$11.06	$10.07	$0.00	$91.59
ELEVATOR CONSTRUCTORS LOCAL 4	1/1/2027	$56.39	$16.48	$11.16	$11.00	$0.00	$95.03
ELEVATOR CONSTRUCTORS LOCAL 4							
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"							
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY)	6/1/2026	$49.50	$10.90	$9.75	$9.65	$0.00	$79.80
LABORERS	12/1/2026	$51.00	$10.90	$9.75	$9.65	$0.00	$81.30
LABORERS - ZONE 1 (HEAVY & HIGHWAY)							
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY	5/1/2026	$54.40	$16.55	$13.35	$3.25	$0.00	$87.55
OPERATING ENGINEERS LOCAL 4	11/1/2026	$55.69	$16.55	$13.35	$3.25	$0.00	$88.84
OPERATING ENGINEERS LOCAL 4	5/1/2027	$57.12	$16.55	$13.35	$3.25	$0.00	$90.27
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY	5/1/2026	$56.02	$16.55	$13.35	$3.25	$0.00	$89.17
OPERATING ENGINEERS LOCAL 4	11/1/2026	$57.32	$16.55	$13.35	$3.25	$0.00	$90.47
OPERATING ENGINEERS LOCAL 4	5/1/2027	$58.77	$16.55	$13.35	$3.25	$0.00	$91.92
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY	5/1/2026	$26.28	$16.55	$13.35	$3.25	$0.00	$59.43
OPERATING ENGINEERS LOCAL 4	11/1/2026	$27.04	$16.55	$13.35	$3.25	$0.00	$60.19
OPERATING ENGINEERS LOCAL 4	5/1/2027	$27.89	$16.55	$13.35	$3.25	$0.00	$61.04
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIRE ALARM INSTALLER	9/1/2026	$68.78	$13.00	$14.69	$9.00	$0.00	$105.47

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
ELECTRICIANS LOCAL 103	3/1/2027	$69.97	$13.00	$14.73	$9.00	$0.00	$106.70
ELECTRICIANS LOCAL 103	9/1/2027	$71.88	$13.00	$14.79	$9.00	$0.00	$108.67
	3/1/2028	$73.08	$13.00	$14.82	$9.00	$0.00	$109.90
For apprentice rates see "Apprentice- ELECTRICIAN"							
FIRE ALARM REPAIR / MAINTENANCE	9/1/2026	$55.02	$13.00	$14.28	$7.20	$0.00	$89.50
/ COMMISSIONING	3/1/2027	$55.98	$13.00	$14.31	$7.20	$0.00	$90.49
ELECTRICIANS LOCAL 103	9/1/2027	$57.50	$13.00	$14.36	$7.20	$0.00	$92.06
ELECTRICIANS LOCAL 103	3/1/2028	$58.46	$13.00	$14.38	$7.20	$0.00	$93.04
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"							
FIREMAN (ASST. ENGINEER)	6/1/2026	$47.55	$17.05	$13.35	$3.25	$0.00	$81.20
OPERATING ENGINEERS LOCAL 4	12/1/2026	$48.73	$17.05	$13.35	$3.25	$0.00	$82.38
OPERATING ENGINEERS LOCAL 4							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FLAGGER & SIGNALER (HEAVY & HIGHWAY)	6/1/2026	$29.21	$10.90	$9.75	$9.65	$0.00	$59.51
LABORERS	12/1/2026	$29.21	$10.90	$9.75	$9.65	$0.00	$59.51
LABORERS - ZONE 1 (HEAVY & HIGHWAY)							
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
FLOORCOVERER	9/1/2026	$60.74	$10.33	$11.47	$8.80	$0.00	$91.34
FLOORCOVERERS LOCAL 2168	3/1/2027	$62.24	$10.33	$11.47	$8.80	$0.00	$92.84
FLOORCOVERERS LOCAL 2168 ZONE I							

Apprentice: FLOORCOVERER

Effective Date: 9/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$27.33	$10.33	$0.00	$1.76	$0.00	$39.42
2	45.00	$27.33	$10.33	$0.00	$1.76	$0.00	$39.42
3	55.00	$33.41	$10.33	$0.00	$3.52	$0.00	$47.26
4	55.00	$33.41	$10.33	$0.00	$3.52	$0.00	$47.26
5	70.00	$42.52	$10.33	$11.47	$5.28	$0.00	$69.60
6	70.00	$42.52	$10.33	$11.47	$5.28	$0.00	$69.60
7	80.00	$48.59	$10.33	$11.47	$7.04	$0.00	$77.43
8	80.00	$48.59	$10.33	$11.47	$7.04	$0.00	$77.43

Apprentice: FLOORCOVERER

Effective Date: 3/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$28.01	$10.33	$0.00	$1.76	$0.00	$40.10
2	45.00	$28.01	$10.33	$0.00	$1.76	$0.00	$40.10
3	55.00	$34.23	$10.33	$0.00	$3.52	$0.00	$48.08
4	55.00	$34.23	$10.33	$0.00	$3.52	$0.00	$48.08
5	70.00	$43.57	$10.33	$11.47	$5.28	$0.00	$70.65
6	70.00	$43.57	$10.33	$11.47	$5.28	$0.00	$70.65
7	80.00	$49.79	$10.33	$11.47	$7.04	$0.00	$78.63

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: FLOORCOVERER

Effective Date: 3/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
8	80.00	$49.79	$10.33	$11.47	$7.04	$0.00	$78.63

Apprentice Notes

Steps are 750 hrs.

Apprentice to Journeyworker Ratio: 1:1

FORK LIFT/CHERRY PICKER	6/1/2026	$59.38	$17.05	$13.35	$3.25	$0.00	$93.03
OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.83	$17.05	$13.35	$3.25	$0.00	$94.48
OPERATING ENGINEERS LOCAL 4							

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GENERATOR/LIGHTING PLANT/HEATERS	6/1/2026	$37.63	$17.05	$13.35	$3.25	$0.00	$71.28
OPERATING ENGINEERS LOCAL 4	12/1/2026	$38.58	$17.05	$13.35	$3.25	$0.00	$72.23
OPERATING ENGINEERS LOCAL 4							

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)	1/1/2026	$54.85	$10.35	$12.00	$12.60	$0.00	$89.80
GLAZIERS LOCAL 35							
GLAZIERS LOCAL 35 (ZONE 1)							

Apprentice: GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.43	$10.35	$0.00	$0.00	$0.00	$37.78
2	55.00	$30.17	$10.35	$0.00	$6.88	$0.00	$47.40
3	60.00	$32.91	$10.35	$0.00	$7.50	$0.00	$50.76
4	65.00	$35.65	$10.35	$0.00	$8.13	$0.00	$54.13
5	70.00	$38.40	$10.35	$11.95	$8.75	$0.00	$69.45
6	75.00	$41.14	$10.35	$11.95	$9.38	$0.00	$72.82
7	80.00	$43.88	$10.35	$11.95	$10.00	$0.00	$76.18
8	90.00	$49.37	$10.35	$11.95	$11.25	$0.00	$82.92

Apprentice to Journeyworker Ratio: 1:1

HOISTING ENGINEER/CRANES/GRADALLS	6/1/2026	$59.38	$17.05	$13.35	$3.25	$0.00	$93.03
OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.83	$17.05	$13.35	$3.25	$0.00	$94.48
OPERATING ENGINEERS LOCAL 4							

Apprentice: HOISTING ENGINEER/CRANES/GRADALLS

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: HOISTING ENGINEER/CRANES/GRADALLS

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$32.66	$0.00	$0.00	$0.00	$0.00	$32.66
2	60.00	$35.63	$17.05	$13.35	$3.25	$0.00	$69.28
3	65.00	$38.60	$17.05	$13.35	$3.25	$0.00	$72.25
4	70.00	$41.57	$17.05	$13.35	$3.25	$0.00	$75.22
5	75.00	$44.54	$17.05	$13.35	$3.25	$0.00	$78.19
6	80.00	$47.50	$17.05	$13.35	$3.25	$0.00	$81.15
7	85.00	$50.47	$17.05	$13.35	$3.25	$0.00	$84.12
8	90.00	$53.44	$17.05	$13.35	$3.25	$0.00	$87.09

Apprentice: HOISTING ENGINEER/CRANES/GRADALLS

Effective Date: 12/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$33.46	$0.00	$0.00	$0.00	$0.00	$33.46
2	60.00	$36.50	$17.05	$13.35	$3.25	$0.00	$70.15
3	65.00	$39.54	$17.05	$13.35	$3.25	$0.00	$73.19
4	70.00	$42.58	$17.05	$13.35	$3.25	$0.00	$76.23
5	75.00	$45.62	$17.05	$13.35	$3.25	$0.00	$79.27
6	80.00	$48.66	$17.05	$13.35	$3.25	$0.00	$82.31
7	85.00	$51.71	$17.05	$13.35	$3.25	$0.00	$85.36
8	90.00	$54.75	$17.05	$13.35	$3.25	$0.00	$88.40

Apprentice to Journeyworker Ratio: 1:6

HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 17 SHEETMETAL WORKERS LOCAL 17 - A	2/1/2026	$62.93	$14.91	$18.74	$9.53	$2.98	$109.09
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 103 ELECTRICIANS LOCAL 103	9/1/2026	$68.78	$13.00	$14.69	$9.00	$0.00	$105.47
	3/1/2027	$69.97	$13.00	$14.73	$9.00	$0.00	$106.70
	9/1/2027	$71.88	$13.00	$14.79	$9.00	$0.00	$108.67
	3/1/2028	$73.08	$13.00	$14.82	$9.00	$0.00	$109.90
For apprentice rates see "Apprentice- ELECTRICIAN"							
HVAC (TESTING AND BALANCING - AIR) SHEETMETAL WORKERS LOCAL 17 SHEETMETAL WORKERS LOCAL 17 - A	2/1/2026	$62.93	$14.91	$18.74	$9.53	$2.98	$109.09
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (TESTING AND BALANCING -WATER) PIPEFITTERS LOCAL 537 PIPEFITTERS LOCAL 537	9/1/2026	$71.71	$14.20	$14.25	$10.00	$0.00	$110.16
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
HVAC MECHANIC PIPEFITTERS LOCAL 537 PIPEFITTERS LOCAL 537	9/1/2026	$71.71	$14.20	$14.25	$10.00	$0.00	$110.16
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HYDRAULIC DRILLS LABORERS LABORERS - ZONE 1	6/1/2026	$49.15	$10.90	$9.75	$9.65	$0.00	$79.45
	12/1/2026	$51.40	$10.90	$9.75	$9.65	$0.00	$81.70
	6/1/2027	$53.00	$10.90	$9.75	$9.65	$0.00	$83.30
	12/1/2027	$54.60	$10.90	$9.75	$9.65	$0.00	$84.90
	6/1/2028	$56.28	$10.90	$9.75	$9.65	$0.00	$86.58
	12/1/2028	$57.95	$10.90	$9.75	$9.65	$0.00	$88.25
For apprentice rates see "Apprentice- LABORER"							
HYDRAULIC DRILLS (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 1 (HEAVY & HIGHWAY)	6/1/2026	$50.00	$10.90	$9.75	$9.65	$0.00	$80.30
	12/1/2026	$51.50	$10.90	$9.75	$9.65	$0.00	$81.80
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
INSULATOR (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (BOSTON)	9/1/2026	$59.02	$16.15	$11.46	$11.49	$0.00	$98.12

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.51	$16.15	$11.21	$5.75	$0.00	$62.62
2	60.00	$35.41	$16.15	$11.26	$6.89	$0.00	$69.71
3	70.00	$41.31	$16.15	$11.31	$8.04	$0.00	$76.81
4	80.00	$47.22	$16.15	$11.36	$9.19	$0.00	$83.92

Apprentice to Journeyworker Ratio: 1:4

IRONWORKER/WELDER IRONWORKERS LOCAL 7 IRONWORKERS LOCAL 7 (BOSTON AREA)	3/16/2026	$58.65	$9.25	$12.75	$15.00	$0.00	$95.65

Apprentice: IRONWORKER/WELDER

Effective Date: 3/16/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	70.00	$41.06	$9.25	$12.75	$5.00	$0.00	$68.06
2	80.00	$46.92	$9.25	$12.75	$5.00	$0.00	$73.92
3	90.00	$52.79	$9.25	$12.75	$5.00	$0.00	$79.79
4	0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
5	0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
6	0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Apprentice to Journeyworker Ratio: 1:4

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
JACKHAMMER & PAVING BREAKER OPERATOR	6/1/2026	$49.40	$10.90	$9.75	$9.65	$0.00	$79.70
LABORERS	12/1/2026	$50.90	$10.90	$9.75	$9.65	$0.00	$81.20
LABORERS - ZONE 1	6/1/2027	$52.50	$10.90	$9.75	$9.65	$0.00	$82.80
	12/1/2027	$54.10	$10.90	$9.75	$9.65	$0.00	$84.40
	6/1/2028	$55.78	$10.90	$9.75	$9.65	$0.00	$86.08
	12/1/2028	$57.45	$10.90	$9.75	$9.65	$0.00	$87.75

For apprentice rates see "Apprentice- LABORER"

LABORER	6/1/2026	$49.15	$10.90	$9.75	$9.65	$0.00	$79.45
LABORERS	12/1/2026	$50.65	$10.90	$9.75	$9.65	$0.00	$80.95
LABORERS - ZONE 1	6/1/2027	$52.25	$10.90	$9.75	$9.65	$0.00	$82.55
	12/1/2027	$53.85	$10.90	$9.75	$9.65	$0.00	$84.15
	6/1/2028	$55.53	$10.90	$9.75	$9.65	$0.00	$85.83
	12/1/2028	$57.20	$10.90	$9.75	$9.65	$0.00	$87.50

Apprentice: LABORER

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$29.49	$10.90	$9.75	$9.65	$0.00	$59.79
2	70.00	$34.41	$10.90	$9.75	$9.65	$0.00	$64.71
3	80.00	$39.32	$10.90	$9.75	$9.65	$0.00	$69.62
4	90.00	$44.24	$10.90	$9.75	$9.65	$0.00	$74.54

Apprentice: LABORER

Effective Date: 12/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$30.39	$10.90	$9.75	$9.65	$0.00	$60.69
2	70.00	$35.46	$10.90	$9.75	$9.65	$0.00	$65.76
3	80.00	$40.52	$10.90	$9.75	$9.65	$0.00	$70.82
4	90.00	$45.59	$10.90	$9.75	$9.65	$0.00	$75.89

Apprentice to Journeyworker Ratio: 1:5

LABORER (HEAVY & HIGHWAY)	6/1/2026	$49.25	$10.90	$9.75	$9.65	$0.00	$79.55
LABORERS	12/1/2026	$50.75	$10.90	$9.75	$9.65	$0.00	$81.05
LABORERS - ZONE 1 (HEAVY & HIGHWAY)							

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$29.55	$10.90	$9.75	$9.65	$0.00	$59.85
2	70.00	$34.48	$10.90	$9.75	$9.65	$0.00	$64.78
3	80.00	$39.40	$10.90	$9.75	$9.65	$0.00	$69.70
4	90.00	$44.33	$10.90	$9.75	$9.65	$0.00	$74.63

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 12/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$30.45	$10.90	$9.75	$9.65	$0.00	$60.75
2	70.00	$35.53	$10.90	$9.75	$9.65	$0.00	$65.83
3	80.00	$40.60	$10.90	$9.75	$9.65	$0.00	$70.90
4	90.00	$45.68	$10.90	$9.75	$9.65	$0.00	$75.98

Apprentice to Journeyworker Ratio: 1:5

LABORER: CARPENTER TENDER LABORERS LABORERS - ZONE 1	6/1/2026	$49.15	$10.90	$9.75	$9.65	$0.00	$79.45
	12/1/2026	$50.65	$10.90	$9.75	$9.65	$0.00	$80.95
	6/1/2027	$52.25	$10.90	$9.75	$9.65	$0.00	$82.55
	12/1/2027	$53.85	$10.90	$9.75	$9.65	$0.00	$84.15
	6/1/2028	$55.53	$10.90	$9.75	$9.65	$0.00	$85.83
	12/1/2028	$57.20	$10.90	$9.75	$9.65	$0.00	$87.50
For apprentice rates see "Apprentice- LABORER"							
LABORER: CEMENT FINISHER TENDER LABORERS LABORERS - ZONE 1	6/1/2026	$49.15	$10.90	$9.75	$9.65	$0.00	$79.45
	12/1/2026	$50.65	$10.90	$9.75	$9.65	$0.00	$80.95
	6/1/2027	$52.25	$10.90	$9.75	$9.65	$0.00	$82.55
	12/1/2027	$53.85	$10.90	$9.75	$9.65	$0.00	$84.15
	6/1/2028	$55.53	$10.90	$9.75	$9.65	$0.00	$85.83
	12/1/2028	$57.20	$10.90	$9.75	$9.65	$0.00	$87.50
For apprentice rates see "Apprentice- LABORER"							
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER LABORERS LABORERS - ZONE 1	6/1/2026	$49.30	$10.90	$9.75	$9.65	$0.00	$79.60
	12/7/2026	$50.80	$10.90	$9.75	$9.65	$0.00	$81.10
	6/7/2027	$52.40	$10.90	$9.75	$9.65	$0.00	$82.70
	12/6/2027	$54.00	$10.90	$9.75	$9.65	$0.00	$84.30
	6/5/2028	$55.68	$10.90	$9.75	$9.65	$0.00	$85.98
	12/4/2028	$57.35	$10.90	$9.75	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER LABORERS LABORERS - ZONE 1	6/1/2026	$49.40	$10.90	$9.75	$9.65	$0.00	$79.70
	12/1/2026	$50.90	$10.90	$9.75	$9.65	$0.00	$81.20
	6/1/2027	$52.50	$10.90	$9.75	$9.65	$0.00	$82.80
	12/1/2027	$54.10	$10.90	$9.75	$9.65	$0.00	$84.40
	6/1/2028	$55.78	$10.90	$9.75	$9.65	$0.00	$86.08
	12/1/2028	$57.45	$10.90	$9.75	$9.65	$0.00	$87.75
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 1 (HEAVY & HIGHWAY)	6/1/2026	$49.50	$10.90	$9.75	$9.65	$0.00	$79.80
	12/1/2026	$51.00	$10.90	$9.75	$9.65	$0.00	$81.30
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
LABORER: MULTI-TRADE TENDER	6/1/2026	$49.15	$10.90	$9.75	$9.65	$0.00	$79.45

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS LABORERS - ZONE 1	12/1/2026	$50.65	$10.90	$9.75	$9.65	$0.00	$80.95
	6/1/2027	$52.25	$10.90	$9.75	$9.65	$0.00	$82.55
	12/1/2027	$53.85	$10.90	$9.75	$9.65	$0.00	$84.15
	6/1/2028	$55.53	$10.90	$9.75	$9.65	$0.00	$85.83
	12/1/2028	$57.20	$10.90	$9.75	$9.65	$0.00	$87.50
For apprentice rates see "Apprentice- LABORER"							
LABORER: TREE REMOVER LABORERS LABORERS - ZONE 1	6/1/2026	$49.15	$10.90	$9.75	$9.65	$0.00	$79.45
	12/1/2026	$50.65	$10.90	$9.75	$9.65	$0.00	$80.95
	6/1/2027	$52.25	$10.90	$9.75	$9.65	$0.00	$82.55
	12/1/2027	$53.85	$10.90	$9.75	$9.65	$0.00	$84.15
	6/1/2028	$55.53	$10.90	$9.75	$9.65	$0.00	$85.83
	12/1/2028	$57.20	$10.90	$9.75	$9.65	$0.00	$87.50
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"							
LASER BEAM OPERATOR LABORERS LABORERS - ZONE 1	6/1/2026	$49.40	$10.90	$9.75	$9.65	$0.00	$79.70
	12/1/2026	$50.90	$10.90	$9.75	$9.65	$0.00	$81.20
	6/1/2027	$52.50	$10.90	$9.75	$9.65	$0.00	$82.80
	12/1/2027	$54.10	$10.90	$9.75	$9.65	$0.00	$84.40
	6/1/2028	$55.78	$10.90	$9.75	$9.65	$0.00	$86.08
	12/1/2028	$57.45	$10.90	$9.75	$9.65	$0.00	$87.75
For apprentice rates see "Apprentice- LABORER"							
LASER BEAM OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 1 (HEAVY & HIGHWAY)	6/1/2026	$49.50	$10.90	$9.75	$9.65	$0.00	$79.80
	12/1/2026	$51.00	$10.90	$9.75	$9.65	$0.00	$81.30
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
MARBLE & TILE FINISHERS BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 - MARBLE & TILE	8/1/2026	$53.84	$12.84	$15.57	$5.78	$0.00	$88.03
	2/1/2027	$54.96	$12.84	$15.57	$5.78	$0.00	$89.15

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 8/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$26.92	$12.84	$15.57	$5.78	$0.00	$61.11
2	60.00	$32.30	$12.84	$15.57	$5.78	$0.00	$66.49
3	70.00	$37.69	$12.84	$15.57	$5.78	$0.00	$71.88
4	80.00	$43.07	$12.84	$15.57	$5.78	$0.00	$77.26
5	90.00	$48.46	$12.84	$15.57	$5.78	$0.00	$82.65

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 2/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.48	$12.84	$15.57	$5.78	$0.00	$61.67

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: MARBLE & TILE FINISHERS							
Effective Date: 2/1/2027							
Step / Percent		**Apprentice Base Wage**					
2 / 60.00		$32.98	$12.84	$15.57	$5.78	$0.00	$67.17
3 / 70.00		$38.47	$12.84	$15.57	$5.78	$0.00	$72.66
4 / 80.00		$43.97	$12.84	$15.57	$5.78	$0.00	$78.16
5 / 90.00		$49.46	$12.84	$15.57	$5.78	$0.00	$83.65
Apprentice to Journeyworker Ratio: 1:5							
MARBLE MASONS,TILELAYERS & TERRAZZO MECH	8/1/2026	$70.17	$12.84	$15.57	$7.99	$0.00	$106.57
BRICKLAYERS LOCAL 3	2/1/2027	$71.57	$12.84	$15.57	$7.99	$0.00	$107.97
BRICKLAYERS LOCAL 3 - MARBLE & TILE							
Apprentice: MARBLE MASONS,TILELAYERS & TERRAZZO MECH							
Effective Date: 8/1/2026							
Step / Percent		**Apprentice Base Wage**					
1 / 50.00		$35.09	$12.84	$15.57	$7.99	$0.00	$71.49
2 / 60.00		$42.10	$12.84	$15.57	$7.99	$0.00	$78.50
3 / 70.00		$49.12	$12.84	$15.57	$7.99	$0.00	$85.52
4 / 80.00		$56.14	$12.84	$15.57	$7.99	$0.00	$92.54
5 / 90.00		$63.15	$12.84	$15.57	$7.99	$0.00	$99.55
Apprentice: MARBLE MASONS,TILELAYERS & TERRAZZO MECH							
Effective Date: 2/1/2027							
Step / Percent		**Apprentice Base Wage**					
1 / 50.00		$35.79	$12.84	$15.57	$7.99	$0.00	$72.19
2 / 60.00		$42.94	$12.84	$15.57	$7.99	$0.00	$79.34
3 / 70.00		$50.10	$12.84	$15.57	$7.99	$0.00	$86.50
4 / 80.00		$57.26	$12.84	$15.57	$7.99	$0.00	$93.66
5 / 90.00		$64.41	$12.84	$15.57	$7.99	$0.00	$100.81
Apprentice to Journeyworker Ratio: 1:5							
MECH. SWEEPER OPERATOR (ON CONST. SITES)	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
OPERATING ENGINEERS LOCAL 4							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
MECHANICS MAINTENANCE	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
OPERATING ENGINEERS LOCAL 4							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
MILLWRIGHT (Zone 1)	1/5/2026	$52.47	$10.58	$11.47	$10.25	$0.00	$84.77
MILLWRIGHTS LOCAL 1121							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
MILLWRIGHTS LOCAL 1121 - Zone 1							

Apprentice: MILLWRIGHT (Zone 1)

Effective Date: 1/5/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$28.86	$10.58	$0.00	$5.64	$0.00	$45.08
2	65.00	$34.11	$10.58	$0.00	$6.66	$0.00	$51.35
3	75.00	$39.35	$10.58	$11.47	$7.69	$0.00	$69.09
4	85.00	$44.60	$10.58	$11.47	$8.71	$0.00	$75.36

Apprentice Notes

Step 1&2 Appr. indentured after 1/6/2020 receive no pension,

Apprentice to Journeyworker Ratio: 1:4

MORTAR MIXER LABORERS LABORERS - ZONE 1	6/1/2026	$49.40	$10.90	$9.75	$9.65	$0.00	$79.70
	12/1/2026	$50.90	$10.90	$9.75	$9.65	$0.00	$81.20
	6/1/2027	$52.50	$10.90	$9.75	$9.65	$0.00	$82.80
	12/1/2027	$54.10	$10.90	$9.75	$9.65	$0.00	$84.40
	6/1/2028	$55.78	$10.90	$9.75	$9.65	$0.00	$86.08
	12/1/2028	$57.45	$10.90	$9.75	$9.65	$0.00	$87.75
For apprentice rates see "Apprentice- LABORER"							
OILER (OTHER THAN TRUCK CRANES,GRADALLS) OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$25.07	$17.05	$13.35	$3.25	$0.00	$58.72
	12/1/2026	$25.74	$17.05	$13.35	$3.25	$0.00	$59.39
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OILER (TRUCK CRANES, GRADALLS) OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$31.17	$17.05	$13.35	$3.25	$0.00	$64.82
	12/1/2026	$31.97	$17.05	$13.35	$3.25	$0.00	$65.62
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OTHER POWER DRIVEN EQUIPMENT - CLASS II OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PAINTER (BRIDGES/TANKS) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 1	1/1/2026	$59.56	$10.35	$12.00	$12.60	$0.00	$94.51

Apprentice: PAINTER (BRIDGES/TANKS)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.78	$10.35	$0.00	$0.00	$0.00	$40.13
2	55.00	$32.76	$10.35	$0.00	$6.93	$0.00	$50.04

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: PAINTER (BRIDGES/TANKS)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
3	60.00	$35.74	$10.35	$0.00	$7.56	$0.00	$53.65
4	65.00	$38.71	$10.35	$0.00	$8.19	$0.00	$57.25
5	70.00	$41.69	$10.35	$12.00	$8.82	$0.00	$72.86
6	75.00	$44.67	$10.35	$12.00	$9.45	$0.00	$76.47
7	80.00	$47.65	$10.35	$12.00	$10.08	$0.00	$80.08
8	90.00	$53.60	$10.35	$12.00	$11.34	$0.00	$87.29

Apprentice to Journeyworker Ratio: 1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	1/1/2026	$56.25	$10.35	$12.00	$12.60	$0.00	$91.20

* If 30% or more of surfaces to be painted are new construction,
NEW paint rate shall be used.
PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 1

Apprentice: PAINTER (SPRAY OR SANDBLAST, NEW) *

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$28.13	$10.35	$0.00	$0.00	$0.00	$38.48
2	55.00	$30.94	$10.35	$0.00	$6.93	$0.00	$48.22
3	60.00	$33.75	$10.35	$0.00	$7.56	$0.00	$51.66
4	65.00	$36.56	$10.35	$0.00	$8.19	$0.00	$55.10
5	70.00	$39.38	$10.35	$12.00	$8.92	$0.00	$70.65
6	75.00	$42.19	$10.35	$12.00	$9.45	$0.00	$73.99
7	80.00	$45.00	$10.35	$12.00	$10.08	$0.00	$77.43
8	90.00	$50.63	$10.35	$12.00	$11.34	$0.00	$84.32

Apprentice to Journeyworker Ratio: 1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)	1/1/2026	$54.31	$10.35	$12.00	$12.60	$0.00	$89.26

PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 1

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.16	$10.35	$0.00	$0.00	$0.00	$37.51
2	55.00	$29.87	$10.35	$0.00	$6.93	$0.00	$47.15
3	60.00	$32.59	$10.35	$0.00	$7.56	$0.00	$50.50
4	65.00	$35.30	$10.35	$0.00	$8.19	$0.00	$53.84
5	70.00	$38.02	$10.35	$12.00	$8.82	$0.00	$69.19
6	75.00	$40.73	$10.35	$12.00	$9.45	$0.00	$72.53

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
7	80.00	$43.45	$10.35	$12.00	$10.08	$0.00	$75.88
8	90.00	$48.88	$10.35	$12.00	$11.34	$0.00	$82.57

Apprentice to Journeyworker Ratio: 1:1

PAINTER / TAPER (BRUSH, NEW) *	1/1/2026	$54.85	$10.35	$12.00	$12.60	$0.00	$89.80

* If 30% or more of surfaces to be painted are new construction,
NEW paint rate shall be used.
PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 1

Apprentice: PAINTER / TAPER (BRUSH, NEW) *

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.43	$10.35	$0.00	$0.00	$0.00	$37.78
2	55.00	$30.17	$10.35	$0.00	$6.93	$0.00	$47.45
3	60.00	$32.91	$10.35	$0.00	$7.56	$0.00	$50.82
4	65.00	$35.65	$10.35	$0.00	$8.19	$0.00	$54.19
5	70.00	$38.40	$10.35	$12.00	$8.82	$0.00	$69.57
6	75.00	$41.14	$10.35	$12.00	$9.45	$0.00	$72.94
7	80.00	$43.88	$10.35	$12.00	$10.08	$0.00	$76.31
8	90.00	$49.37	$10.35	$12.00	$11.34	$0.00	$83.06

Apprentice to Journeyworker Ratio: 1:1

PAINTER / TAPER (BRUSH, REPAINT)	1/1/2026	$52.91	$10.35	$12.00	$12.60	$0.00	$87.86

PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 1

Apprentice: PAINTER / TAPER (BRUSH, REPAINT)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$26.46	$10.35	$0.00	$0.00	$0.00	$36.81
2	55.00	$29.10	$10.35	$0.00	$6.93	$0.00	$46.38
3	60.00	$31.75	$10.35	$0.00	$7.56	$0.00	$49.66
4	65.00	$34.39	$10.35	$0.00	$8.19	$0.00	$52.93
5	70.00	$37.04	$10.35	$12.00	$8.82	$0.00	$68.21
6	75.00	$39.68	$10.35	$12.00	$9.45	$0.00	$71.48
7	80.00	$42.33	$10.35	$12.00	$10.08	$0.00	$74.76
8	90.00	$47.62	$10.35	$12.00	$11.34	$0.00	$81.31

Apprentice to Journeyworker Ratio: 1:1

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) LABORERS LABORERS - ZONE 1 (HEAVY & HIGHWAY)	6/1/2026	$49.25	$10.90	$9.75	$9.65	$0.00	$79.55
	12/1/2026	$50.75	$10.90	$9.75	$9.65	$0.00	$81.05
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
PANEL & PICKUP TRUCKS DRIVER TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	8/1/2026	$42.88	$15.91	$21.78	$0.00	$0.00	$80.57
	12/1/2026	$42.88	$15.91	$23.52	$0.00	$0.00	$82.31
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	$55.79	$10.08	$11.62	$12.67	$0.00	$90.16
For apprentice rates see "Apprentice- PILE DRIVER"							
PILE DRIVER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 1)	8/1/2024	$55.79	$10.08	$11.62	$12.67	$0.00	$90.16

Apprentice: PILE DRIVER

Effective Date: 8/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$25.11	$10.08	$0.00	$2.53	$0.00	$37.72
2	55.00	$30.68	$10.08	$0.00	$5.07	$0.00	$45.83
3	70.00	$39.05	$10.08	$11.62	$7.60	$0.00	$68.35
4	80.00	$44.63	$10.08	$11.62	$10.14	$0.00	$76.47

Apprentice to Journeyworker Ratio: 1:5

PIPEFITTER & STEAMFITTER PIPEFITTERS LOCAL 537 PIPEFITTERS LOCAL 537	9/1/2026	$71.71	$14.20	$14.25	$10.00	$0.00	$110.16

Apprentice: PIPEFITTER & STEAMFITTER

Effective Date: 9/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$28.68	$14.20	$14.25	$10.00	$0.00	$67.13
2	45.00	$32.27	$14.20	$14.25	$10.00	$0.00	$70.72
3	60.00	$43.03	$14.20	$14.25	$10.00	$0.00	$81.48
4	70.00	$50.20	$14.20	$14.25	$10.00	$0.00	$88.65
5	80.00	$57.37	$14.20	$14.25	$10.00	$0.00	$95.82

Apprentice to Journeyworker Ratio: 1:3

PIPELAYER LABORERS LABORERS - ZONE 1	6/1/2026	$49.40	$10.90	$9.75	$9.65	$0.00	$79.70
	12/1/2026	$50.90	$10.90	$9.75	$9.65	$0.00	$81.20
	6/1/2027	$52.50	$10.90	$9.75	$9.65	$0.00	$82.80
	12/1/2027	$54.10	$10.90	$9.75	$9.65	$0.00	$84.40
	6/1/2028	$55.78	$10.90	$9.75	$9.65	$0.00	$86.08

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/1/2028	$57.45	$10.90	$9.75	$9.65	$0.00	$87.75
For apprentice rates see "Apprentice- LABORER"							
PIPELAYER (HEAVY & HIGHWAY)	6/1/2026	$49.50	$10.90	$9.75	$9.65	$0.00	$79.80
LABORERS LABORERS - ZONE 1 (HEAVY & HIGHWAY)	12/1/2026	$51.00	$10.90	$9.75	$9.65	$0.00	$81.30
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
PLUMBERS & GASFITTERS	8/31/2026	$74.79	$15.32	$12.61	$8.00	$0.00	$110.72
PLUMBERS & GASFITTERS LOCAL 12 PLUMBERS & GASFITTERS LOCAL 12	3/1/2027	$76.94	$15.32	$12.61	$8.00	$0.00	$112.87
	8/30/2027	$79.09	$15.32	$12.61	$8.00	$0.00	$115.02
	2/28/2028	$81.29	$15.32	$12.61	$8.00	$0.00	$117.22
	9/4/2028	$83.49	$15.32	$12.61	$8.00	$0.00	$119.42
	3/5/2029	$85.69	$15.32	$12.61	$8.00	$0.00	$121.62
	9/3/2029	$87.89	$15.32	$12.61	$8.00	$0.00	$123.82
	3/4/2030	$89.84	$15.32	$12.61	$8.00	$0.00	$125.77

Apprentice: PLUMBERS & GASFITTERS

Effective Date: 8/31/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	35.00	$26.18	$15.32	$4.61	$2.80	$0.00	$48.91
2	40.00	$29.92	$15.32	$5.22	$3.20	$0.00	$53.66
3	55.00	$41.13	$15.32	$7.07	$5.20	$0.00	$68.72
4	65.00	$48.61	$15.32	$8.30	$5.20	$0.00	$77.43
5	75.00	$56.09	$15.32	$9.53	$6.00	$0.00	$86.94

Apprentice: PLUMBERS & GASFITTERS

Effective Date: 3/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	35.00	$26.93	$15.32	$4.61	$2.80	$0.00	$49.66
2	40.00	$30.78	$15.32	$5.22	$3.20	$0.00	$54.52
3	55.00	$42.32	$15.32	$7.07	$4.40	$0.00	$69.11
4	65.00	$50.01	$15.32	$8.30	$5.20	$0.00	$78.83
5	75.00	$57.71	$15.32	$9.53	$6.00	$0.00	$88.56

Apprentice to Journeyworker Ratio: 1:2

PNEUMATIC CONTROLS (TEMP.) PIPEFITTERS LOCAL 537 PIPEFITTERS LOCAL 537	9/1/2026	$71.71	$14.20	$14.25	$10.00	$0.00	$110.16
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
PNEUMATIC DRILL/TOOL OPERATOR LABORERS LABORERS - ZONE 1	6/1/2026	$49.40	$10.90	$9.75	$9.65	$0.00	$79.70
	12/1/2026	$50.90	$10.90	$9.75	$9.65	$0.00	$81.20
	6/1/2027	$52.50	$10.90	$9.75	$9.65	$0.00	$82.80
	12/1/2027	$54.10	$10.90	$9.75	$9.65	$0.00	$84.40
	6/1/2028	$55.78	$10.90	$9.75	$9.65	$0.00	$86.08

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/1/2028	$57.45	$10.90	$9.75	$9.65	$0.00	$87.75
For apprentice rates see "Apprentice- LABORER"							
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY)	6/1/2026	$49.50	$10.90	$9.75	$9.65	$0.00	$79.80
LABORERS LABORERS - ZONE 1 (HEAVY & HIGHWAY)	12/1/2026	$51.00	$10.90	$9.75	$9.65	$0.00	$81.30
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
POWDERMAN & BLASTER	6/1/2026	$50.15	$10.90	$9.75	$9.65	$0.00	$80.45
LABORERS LABORERS - ZONE 1	12/1/2026	$51.65	$10.90	$9.75	$9.65	$0.00	$81.95
	6/1/2027	$53.25	$10.90	$9.75	$9.65	$0.00	$83.55
	12/1/2027	$54.85	$10.90	$9.75	$9.65	$0.00	$85.15
	6/1/2028	$56.53	$10.90	$9.75	$9.65	$0.00	$86.83
	12/1/2028	$58.20	$10.90	$9.75	$9.65	$0.00	$88.50
For apprentice rates see "Apprentice- LABORER"							
POWDERMAN & BLASTER (HEAVY & HIGHWAY)	6/1/2026	$50.25	$10.90	$9.75	$9.65	$0.00	$80.55
LABORERS LABORERS - ZONE 1 (HEAVY & HIGHWAY)	12/1/2026	$51.75	$10.90	$9.75	$9.65	$0.00	$82.05
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
POWER SHOVEL/DERRICK/TRENCHING MACHINE	6/1/2026	$59.38	$17.05	$13.35	$3.25	$0.00	$93.03
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.83	$17.05	$13.35	$3.25	$0.00	$94.48
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PUMP OPERATOR (CONCRETE)	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PUMP OPERATOR (DEWATERING, OTHER)	6/1/2026	$37.63	$17.05	$13.35	$3.25	$0.00	$71.28
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$38.58	$17.05	$13.35	$3.25	$0.00	$72.23
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
READY MIX CONCRETE DRIVERS after 4/30/12 (Drivers Hired After 4/30/2012) TEAMSTERS 25 (Metro) - Aggregate TEAMSTERS 25 (Metro) - Aggregate	8/1/2022	$30.40	$11.91	$15.25	$0.00	$0.00	$57.56
READY-MIX CONCRETE DRIVER TEAMSTERS 25 (Metro) - Aggregate TEAMSTERS 25 (Metro) - Aggregate	8/1/2022	$34.41	$11.91	$15.25	$0.00	$0.00	$61.57
RECLAIMERS	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
RIDE-ON MOTORIZED BUGGY OPERATOR	6/1/2026	$49.40	$10.90	$9.75	$9.65	$0.00	$79.70
LABORERS LABORERS - ZONE 1	12/1/2026	$50.90	$10.90	$9.75	$9.65	$0.00	$81.20
	6/1/2027	$52.50	$10.90	$9.75	$9.65	$0.00	$82.80
	12/1/2027	$54.10	$10.90	$9.75	$9.65	$0.00	$84.40

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	6/1/2028	$55.78	$10.90	$9.75	$9.65	$0.00	$86.08
	12/1/2028	$57.45	$10.90	$9.75	$9.65	$0.00	$87.75
For apprentice rates see "Apprentice- LABORER"							
ROLLER/SPREADER/MULCHING MACHINE	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
OPERATING ENGINEERS LOCAL 4							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)	8/1/2026	$55.25	$14.53	$12.67	$9.03	$0.00	$91.48
ROOFERS LOCAL 33	2/1/2027	$57.00	$14.53	$12.67	$9.03	$0.00	$93.23
ROOFERS LOCAL 33	8/1/2027	$58.75	$14.53	$12.67	$9.03	$0.00	$94.98
	2/1/2028	$60.50	$14.53	$12.67	$9.03	$0.00	$96.73
	8/1/2028	$62.25	$14.53	$12.67	$9.03	$0.00	$98.48
	2/1/2029	$64.00	$14.53	$12.67	$9.03	$0.00	$100.23
	8/1/2029	$65.65	$14.53	$12.67	$9.03	$0.00	$101.88
	2/1/2030	$67.40	$14.53	$12.67	$9.03	$0.00	$103.63

Apprentice: ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)

Effective Date: 8/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	0.00	$0.00	$14.53	$6.34	$0.00	$0.00	$20.87
2	0.00	$0.00	$14.53	$12.67	$9.03	$0.00	$36.23
3	0.00	$0.00	$14.53	$12.67	$9.03	$0.00	$36.23
4	0.00	$0.00	$14.53	$12.67	$9.03	$0.00	$36.23
5	0.00	$0.00	$14.53	$12.67	$9.03	$0.00	$36.23

Apprentice: ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)

Effective Date: 2/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	0.00	$0.00	$14.53	$6.34	$0.00	$0.00	$20.87
2	0.00	$0.00	$14.53	$12.67	$9.03	$0.00	$36.23
3	0.00	$0.00	$14.53	$12.67	$9.03	$0.00	$36.23
4	0.00	$0.00	$14.53	$12.67	$9.03	$0.00	$36.23
5	0.00	$0.00	$14.53	$12.67	$9.03	$0.00	$36.23

Apprentice Notes

** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1

Apprentice to Journeyworker Ratio: 1:5

ROOFER SLATE / TILE / PRECAST CONCRETE	8/1/2026	$55.50	$14.53	$12.67	$9.03	$0.00	$91.73
ROOFERS LOCAL 33	2/1/2027	$57.25	$14.53	$12.67	$9.03	$0.00	$93.48
ROOFERS LOCAL 33	8/1/2027	$59.00	$14.53	$12.67	$9.03	$0.00	$95.23
	2/1/2028	$60.75	$14.53	$12.67	$9.03	$0.00	$96.98
	8/1/2028	$62.50	$14.53	$12.67	$9.03	$0.00	$98.73

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	2/1/2029	$64.25	$14.53	$12.67	$9.03	$0.00	$100.48
	8/1/2029	$65.90	$14.53	$12.67	$9.03	$0.00	$102.13
	2/1/2030	$67.65	$14.53	$12.67	$9.03	$0.00	$103.88
For apprentice rates see "Apprentice- ROOFER"							
SHEETMETAL WORKER SHEETMETAL WORKERS LOCAL 17 SHEETMETAL WORKERS LOCAL 17 - A	2/1/2026	$62.93	$14.91	$18.74	$9.53	$2.98	$109.09

Apprentice: SHEETMETAL WORKER

Effective Date: 2/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	42.00	$26.43	$14.91	$6.19	$0.00	$0.00	$47.53
2	42.00	$26.43	$14.91	$6.19	$0.00	$0.00	$47.53
3	47.00	$29.58	$14.91	$10.93	$1.25	$1.62	$58.29
4	47.00	$29.58	$14.91	$10.93	$1.25	$1.62	$58.29
5	52.00	$32.72	$14.91	$11.66	$1.50	$1.74	$62.53
6	52.00	$32.72	$14.91	$11.66	$1.75	$1.75	$62.79
7	60.00	$37.76	$14.91	$12.84	$2.00	$1.93	$69.44
8	65.00	$40.90	$14.91	$13.58	$2.25	$2.04	$73.68
9	75.00	$47.20	$14.91	$15.06	$2.75	$2.28	$82.20
10	85.00	$53.49	$14.91	$16.53	$2.75	$2.49	$90.17

Apprentice to Journeyworker Ratio: 1:4

SPECIALIZED EARTH MOVING EQUIP < 35 TONS	8/1/2026	$43.34	$15.91	$21.78	$0.00	$0.00	$81.03
TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	12/1/2026	$43.34	$15.91	$23.52	$0.00	$0.00	$82.77
SPECIALIZED EARTH MOVING EQUIP > 35 TONS	8/1/2026	$43.63	$15.91	$21.78	$0.00	$0.00	$81.32
TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	12/1/2026	$43.63	$15.91	$23.52	$0.00	$0.00	$83.06
SPRINKLER FITTER	10/1/2026	$73.30	$13.55	$7.45	$20.30	$0.00	$114.60
SPRINKLER FITTERS LOCAL 550 SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1	1/1/2027	$73.30	$14.80	$7.50	$19.00	$0.00	$114.60

Apprentice: SPRINKLER FITTER

Effective Date: 10/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	0.00	$25.66	$13.55	$14.56	$2.50	$0.00	$56.27
2	0.00	$29.32	$13.55	$15.57	$2.50	$0.00	$60.94
3	0.00	$32.99	$13.55	$16.59	$2.50	$0.00	$65.63
4	0.00	$36.65	$13.55	$17.60	$2.50	$0.00	$70.30
5	0.00	$40.32	$13.55	$18.62	$2.50	$0.00	$74.99
6	0.00	$43.98	$13.55	$19.63	$4.00	$0.00	$81.16
7	0.00	$47.65	$13.55	$20.65	$4.00	$0.00	$85.85
8	0.00	$51.31	$13.55	$21.66	$4.00	$0.00	$90.52

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: SPRINKLER FITTER

Effective Date: 10/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
9	0.00	$54.98	$13.55	$22.68	$4.00	$0.00	$95.21
10	0.00	$58.64	$13.55	$23.69	$4.00	$0.00	$99.88

Apprentice: SPRINKLER FITTER

Effective Date: 1/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	0.00	$25.66	$14.80	$14.16	$2.50	$0.00	$57.12
2	0.00	$29.32	$14.80	$15.10	$2.50	$0.00	$61.72
3	0.00	$32.99	$14.80	$16.06	$2.50	$0.00	$66.35
4	0.00	$36.65	$14.80	$17.00	$2.50	$0.00	$70.95
5	0.00	$40.32	$14.80	$17.96	$2.50	$0.00	$75.58
6	0.00	$43.98	$14.80	$18.90	$4.00	$0.00	$81.68
7	0.00	$47.65	$14.80	$19.86	$4.00	$0.00	$86.31
8	0.00	$51.31	$14.80	$20.29	$4.00	$0.00	$90.40
9	0.00	$54.98	$14.80	$21.76	$4.00	$0.00	$95.54
10	0.00	$58.64	$14.80	$22.70	$4.00	$0.00	$100.14

Apprentice Notes

Apprentice entered prior 9/30/10:

Apprentice to Journeyworker Ratio: 1:3

STEAM BOILER OPERATOR	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
OPERATING ENGINEERS LOCAL 4							

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
OPERATING ENGINEERS LOCAL 4							

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TELECOMMUNICATION TECHNICIAN	9/1/2026	$55.02	$13.00	$14.28	$7.20	$0.00	$89.50
TELECOMMUNICATION TECHNICIAN	3/1/2027	$55.98	$13.00	$14.31	$7.20	$0.00	$90.49
ELECTRICIANS LOCAL 103	9/1/2027	$57.50	$13.00	$14.36	$7.20	$0.00	$92.06
ELECTRICIANS LOCAL 103	3/1/2028	$58.46	$13.00	$14.38	$7.20	$0.00	$93.04

For apprentice rates and ratios see "Apprentice- ELECTRICIAN"

Apprentice: TELECOMMUNICATION TECHNICIAN

Effective Date: 9/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: TELECOMMUNICATION TECHNICIAN

Effective Date: 9/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$24.76	$13.00	$0.74	$0.00	$0.00	$38.50
2	45.00	$24.76	$13.00	$0.74	$0.00	$0.00	$38.50
3	50.00	$27.51	$13.00	$13.46	$3.60	$0.00	$57.57
4	50.00	$27.51	$13.00	$13.46	$3.60	$0.00	$57.57
5	55.00	$30.26	$13.00	$13.54	$3.96	$0.00	$60.76
6	60.00	$33.01	$13.00	$13.62	$4.32	$0.00	$63.95
7	65.00	$35.76	$13.00	$13.70	$4.68	$0.00	$67.14
8	70.00	$38.51	$13.00	$13.79	$5.04	$0.00	$70.34
9	75.00	$41.27	$13.00	$13.87	$5.40	$0.00	$73.54
10	80.00	$44.02	$13.00	$13.96	$5.76	$0.00	$76.74

Apprentice: TELECOMMUNICATION TECHNICIAN

Effective Date: 3/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$25.19	$13.00	$0.76	$0.00	$0.00	$38.95
2	45.00	$25.19	$13.00	$0.76	$0.00	$0.00	$38.95
3	50.00	$27.99	$13.00	$13.47	$3.60	$0.00	$58.06
4	50.00	$27.99	$13.00	$13.47	$3.60	$0.00	$58.06
5	55.00	$30.79	$13.00	$13.55	$3.96	$0.00	$61.30
6	60.00	$33.59	$13.00	$13.64	$4.32	$0.00	$64.55
7	65.00	$36.39	$13.00	$13.72	$4.68	$0.00	$67.79
8	70.00	$39.19	$13.00	$13.81	$5.04	$0.00	$71.04
9	75.00	$41.99	$13.00	$13.89	$5.40	$0.00	$74.28
10	80.00	$44.78	$13.00	$13.97	$5.76	$0.00	$77.51

Apprentice to Journeyworker Ratio: 1:1

TERRAZZO FINISHERS	8/1/2026	$69.09	$12.84	$15.57	$8.02	$0.00	$105.52
BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 - MARBLE & TILE	2/1/2027	$70.49	$12.84	$15.57	$8.02	$0.00	$106.92

Apprentice: TERRAZZO FINISHERS

Effective Date: 8/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$34.55	$12.84	$15.57	$8.02	$0.00	$70.98
2	60.00	$41.45	$12.84	$15.57	$8.02	$0.00	$77.88
3	70.00	$48.36	$12.84	$15.57	$8.02	$0.00	$84.79
4	80.00	$55.27	$12.84	$15.57	$8.02	$0.00	$91.70
5	90.00	$62.18	$12.84	$15.57	$8.02	$0.00	$98.61

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: TERRAZZO FINISHERS

Effective Date: 2/1/2027

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$35.25	$12.84	$15.57	$8.02	$0.00	$71.68
2	60.00	$42.29	$12.84	$15.57	$8.02	$0.00	$78.72
3	70.00	$49.34	$12.84	$15.57	$8.02	$0.00	$85.77
4	80.00	$56.39	$12.84	$15.57	$8.02	$0.00	$92.82
5	90.00	$63.44	$12.84	$15.57	$8.02	$0.00	$99.87

Apprentice to Journeyworker Ratio: 1:5

TEST BORING DRILLER	6/1/2026	$53.25	$10.90	$9.75	$9.80	$0.00	$83.70
LABORERS LABORERS - FOUNDATION AND MARINE	12/1/2026	$54.75	$10.90	$9.75	$9.80	$0.00	$85.20
For apprentice rates see "Apprentice- LABORER"							
TEST BORING DRILLER HELPER	6/1/2026	$49.37	$10.90	$9.75	$9.80	$0.00	$79.82
LABORERS LABORERS - FOUNDATION AND MARINE	12/1/2026	$50.87	$10.90	$9.75	$9.80	$0.00	$81.32
For apprentice rates see "Apprentice- LABORER"							
TEST BORING LABORER	6/1/2026	$49.25	$10.90	$9.75	$9.80	$0.00	$79.70
LABORERS LABORERS - FOUNDATION AND MARINE	12/1/2026	$50.75	$10.90	$9.75	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
TRACTORS/PORTABLE STEAM GENERATORS	6/1/2026	$58.70	$17.05	$13.35	$3.25	$0.00	$92.35
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.14	$17.05	$13.35	$3.25	$0.00	$93.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
TRAILERS FOR EARTH MOVING EQUIPMENT	8/1/2026	$43.92	$15.91	$21.78	$0.00	$0.00	$81.61
TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	12/1/2026	$43.92	$15.91	$23.52	$0.00	$0.00	$83.35
TUNNEL WORK - COMPRESSED AIR	6/1/2026	$61.48	$10.90	$9.75	$10.25	$0.00	$92.38
LABORERS LABORERS (COMPRESSED AIR)	12/1/2026	$62.98	$10.90	$9.75	$10.25	$0.00	$93.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)	6/1/2026	$63.48	$10.90	$9.75	$10.25	$0.00	$94.38
LABORERS LABORERS (COMPRESSED AIR)	12/1/2026	$64.98	$10.90	$9.75	$10.25	$0.00	$95.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR	6/1/2026	$53.55	$10.90	$9.75	$10.25	$0.00	$84.45
LABORERS LABORERS (FREE AIR TUNNEL)	12/1/2026	$55.05	$10.90	$9.75	$10.25	$0.00	$85.95
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR (HAZ. WASTE)	6/1/2026	$55.55	$10.90	$9.75	$10.25	$0.00	$86.45

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS LABORERS (FREE AIR TUNNEL)	12/1/2026	$57.05	$10.90	$9.75	$10.25	$0.00	$87.95
For apprentice rates see "Apprentice- LABORER"							
VAC-HAUL	8/1/2026	$43.34	$15.91	$21.78	$0.00	$0.00	$81.03
TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	12/1/2026	$43.34	$15.91	$23.52	$0.00	$0.00	$82.77
WAGON DRILL OPERATOR	6/1/2026	$49.40	$10.90	$9.75	$9.65	$0.00	$79.70
LABORERS LABORERS - ZONE 1	12/1/2026	$50.90	$10.90	$9.75	$9.65	$0.00	$81.20
	6/1/2027	$52.50	$10.90	$9.75	$9.65	$0.00	$82.80
	12/1/2027	$54.10	$10.90	$9.75	$9.65	$0.00	$84.40
	6/1/2028	$55.78	$10.90	$9.75	$9.65	$0.00	$86.08
	12/1/2028	$57.45	$10.90	$9.75	$9.65	$0.00	$87.75
For apprentice rates see "Apprentice- LABORER"							
WAGON DRILL OPERATOR (HEAVY & HIGHWAY)	6/1/2026	$49.50	$10.90	$9.75	$9.65	$0.00	$79.80
LABORERS LABORERS - ZONE 1 (HEAVY & HIGHWAY)	12/1/2026	$51.00	$10.90	$9.75	$9.65	$0.00	$81.30
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
WASTE WATER PUMP OPERATOR	6/1/2026	$59.38	$17.05	$13.35	$3.25	$0.00	$93.03
OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2026	$60.83	$17.05	$13.35	$3.25	$0.00	$94.48
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
WATER METER INSTALLER	8/31/2026	$74.79	$15.32	$12.61	$8.00	$0.00	$110.72
PLUMBERS & GASFITTERS LOCAL 12 PLUMBERS & GASFITTERS LOCAL 12	3/1/2027	$76.94	$15.32	$12.61	$8.00	$0.00	$112.87
	8/30/2027	$79.09	$15.32	$12.61	$8.00	$0.00	$115.02
	2/2/2028	$81.29	$15.32	$12.61	$8.00	$0.00	$117.22
	9/4/2028	$83.49	$15.32	$12.61	$8.00	$0.00	$119.42
	3/5/2029	$85.69	$15.32	$12.61	$8.00	$0.00	$121.62
	9/3/2029	$87.89	$15.32	$12.61	$8.00	$0.00	$123.82
	3/4/2030	$89.84	$15.32	$12.61	$8.00	$0.00	$125.77

For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"

Additional Apprentice Information

All apprentices must be registered with the Division of Apprenticeship Training(DAS) in accordance with M.G.L.c. 23, §§ 11E-11L. Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the hourly prevailing wage rate established by the Commissioner under the provisions of M.G.L.c. 149, §§ 26-27D.

Apprentice ratios are established by DAS pursuant to M.G.L.c. 23, §§ 11E-11L. Ratios are expressed as the allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified. The ratios listed herein have been taken from relevant private collective bargaining agreements(CBAs) and are provided for illustrative purposes only. They have not been independently verified as being accurate or continuing to be accurate.

Parties having questions regarding what ratio to use should contact DAS.

DOCUMENT A00801

SPECIAL PROVISIONS

BOSTON
Installation of Noise Barriers along I-90 between Market and Franklin Streets (Allston Multimodal Transportation Project Early Action)

Labor participation goals for this Project shall be 15.3% for minorities and 6.9% for women for each job category. The goals are applicable to both Contractor's and Subcontractor's on-site construction workforce. Refer to Document 00820 for details.

SCOPE OF WORK

All work under this Contract shall be done in conformance with the *2026 Standard Specifications for Highways and Bridges, the Supplemental Specifications* contained in this book, the *Construction Standard Details* in effect as of July 2026, the *1990 Standard Drawings for Signs and Supports*, the 2015 *Overhead Signal Structure and Foundation Standard Drawings*, the *11th Edition of the Manual on Uniform Traffic Control Devices (MUTCD)* and the *January 2026 Massachusetts Amendments to the MUTCD*, *the 1968 Standard Drawings for Traffic Signals and Highway Lighting*, the latest edition of The *American Standard for Nursery Stock*, the Plans and these Special Provisions.

The work under this Contract consists of the construction of two noise barrier segments along the Massachusetts Turnpike (I-90) Westbound in the Allston neighborhood in the City of Boston, Massachusetts. The first proposed segment of noise barrier along I-90 Westbound begins at Noise Barrier Segment 1 construction baseline STA 97+60 (I-90 Turnpike Record Baseline STA 363+41±) and extends approximately 1,968 feet to Noise Barrier Segment 1 construction baseline STA 117+28 (I-90 Turnpike Record Baseline STA 382+97±). The second proposed segment of noise barrier along I-90 Westbound begins at Noise Barrier Segment 2 construction baseline STA 199+96 (I-90 Turnpike Record Baseline STA 389+73±) and extends approximately 1,088 feet to Noise Barrier Segment 2 construction baseline STA 210+84 (I-90 Turnpike Record Baseline STA 400+65±).

The work also includes drilled shaft excavation, drilled shaft foundations, ground mounted noise barrier system, earth excavation, prefabricated modular gravity wall construction, communications duct bank relocation, chain link fencing, highway guard remove and reset, wing wall demolition, loam and seed, removing and resetting ground mounted signs and posts, and other incidental work.

WORK ACCESS – DISTRICT 6

These procedures shall reestablish the District's guidelines regarding the submission and administration of Access Work Requests and meetings within the District. All parties requesting access to the District 6 Right of Way (including MHS), shall adhere to the following procedures (whether an in-house or out-house request.) All out-house or third-party requests shall be submitted under an active Contract; Permit, or other approved document allowing or requiring the need to request access. Access Work Requests will be approved on a weekly basis.

To schedule each instance of work, the contractor is required to complete an "Access Work Request" form and submit the completed form by email to District6AWRequest@dot.state.ma.us by noontime Wednesday of the week preceding the work (unless otherwise noted). Forms which are incorrectly filled out, submitted beyond this time or outside this email address will not be accepted.

Access Work Requests shall be initialed by the respective DOT representative where applicable. The "Representative" shall refer to the person who is responsible for overseeing the respective operation(s) requestion access. (i.e. Resident Engineer, Bridge/Tunnel Inspector, etc.) This person should also be responsible to ensure requests are submitted in line with any access constraints in the Contract, Permit, etc.

Each Thursday at 9 am, the District will host an in-person AWR meeting (no virtual option) at the District 6 office (185 Kneeland St.) with parties requesting access (roadway or other) for the following week. Attendance is recommended. The weekly Access Work meeting will provide the opportunity to review requests, establish priorities, discuss and sort out potential conflicts, etc. as well as highlight potential long-term Access needs. After the weekly meeting, the District will meet internally to review requests, confirm priorities and finalize a schedule for the following week. MassDOT notifications (approvals and denials) and a final schedule, will be delivered via email by noon on Friday.

Cancellations shall be submitted to the email; District6AWRequest@dot.state.ma.us at least 2 hours prior to the end of the most recent day shift (i.e., 7am- 3:30pm). Failure to notify the District within the specified time may result in back-charges for any costs incurred. Excessive cancellations or no-shows will be addressed at the District's discretion.

The District will make every effort to provide as much advanced notice as possible for any necessary cancellations or restrictions due to scheduled or emergency events (i.e. weather, special events, etc.).

The District reserves the right to provide traffic setups. During these situations, the MassDOT District 6 Operations will take responsibility for the traffic management. Where this is the case, the Contractor will only be compensated for additional traffic control work that is specifically requested by the District.

Weekly Schedule revisions will be handled on a case-by-case basis and not guaranteed. Any revisions to the established schedule will be at the District's discretion.

WORK ACCESS – DISTRICT 6 – CASTING PROTOCOLS

The Work may require opening or performing work on roadway castings. The Contractor shall not access or perform work on any MassDOT casting without MassDOT written authorization through the Access Work Program. Prior to seeking authorization, the Contractor shall inspect and aforementioned castings and shall note the condition of any locking mechanism, bolt down status and/or any deficiencies on the AWR request.

Prior to reopening the work area to traffic, the Contractor and Resident Engineer, or designee, shall inspect each casting and document via Diary and photo that the cover/gate has been secured per the AWR. The Contractor is advised that castings that do not meet the requirements of "Engineering Directive E-16-003 for the Manholes and Catch Basins approved on May 18,2016" will require tapping of new bolts or welding prior to reopening to traffic. Tapping and welding shall be in accordance with Contractor's approved submittals. Gas welding is prohibited in tunnels. Full payment for this work shall be considered incidental to the respective bid items.

Castings Protocol(s) – Contractors (AWR Requirements)

Contractor shall not access or perform work on any MassDOT casting without written authorization through the Access Work Program.

1. MassDOT castings to be accessed shall be inspected by the requester prior to AWR request. Contractor shall note any deficiencies and or issues on the AWR request.
2. A note shall be made in the Daily Diary noting structure#, station, or other identifying marker (along w/photo). The time casting was opened and time it was secured shall be noted as well as the work performed.
3. Type of manhole being opened (electric, drainage, etc.) – if electric, MassDOT Electrical Engineer shall be notified prior to access and all electrical circuits shall be locked out per Lock Out Tag Out (LOTO) procedures.
4. All castings shall be secure, free of movement and have 100% of bolts installed prior to opening to traffic. All bolts shall be coated with a MassDOT approved anti-seize prior to reinstallation. MHs that exhibit movement shall be welded.
5. In order to address bolts that cannot be re-secured, the contractor should have at all times either a:
    a. Welder capable of welding covers back (electric welding only in tunnel) (Ref Approved Welding Detail)
    b. Means to drill and tap new bolt of same length and dimension of existing
6. MassDOT personnel shall inspect and sign off on casting prior to contractor leaving location (along w/photo)
7. All MassDOT roadway castings shall comply with "Engineering Directive E-16-003 for Manholes and Catch Basins approved on May 18, 2016." Castings encountered that do not comply shall be reported in writing the District Construction Engineer or Maintenance Engineer, as appropriate - provide photos.

WORK ACCESS – DISTRICT 6 – CASTING PROTOCOLS (Continued)

Castings Protocol(s) – MassDOT

Any time a casting is removed by MassDOT staff the following protocols shall be followed:

1. Castings shall be inspected by the foreman performing the work before removing.
2. MassDOT foreman performing the work shall inspect and ensure that the casting is secured before opening to traffic.
3. All bolt-down manholes covers shall have 50% of bolts installed (minimum 3 bolts installed) prior to opening to traffic. All bolts shall be coated with a MassDOT approved anti-seize prior to reinstallation. Castings that exhibit movement shall be welded.
4. All casting deficiencies shall be reported to D6 Maintenance Engineer ASAP (provide Photos).

CONTRACTOR QUESTIONS AND ADDENDUM ACKNOWLEDGEMENTS

Prospective bidders are required to submit all questions to the Construction Contracts Engineer by 3:00 P.M. on the Tuesday of the previous week before the scheduled bid opening date. Any questions received after this time will not be considered for review by the Department.

Contractors should email questions and addendum acknowledgements to the following email address massdotspecifications@dot.state.ma.us The MassDOT proposal number and municipality is to be placed in the subject line.

NONCONFORMING COMPRESSIVE STRENGTH OF CEMENT CONCRETE

Concrete with compressive strength test results failing to attain the limits specified in Table 901.64-3 of 901.64.B: Acceptance Testing shall be evaluated for structural adequacy and serviceability at the Contractors' expense. The Department will review all production records, the concrete test records, petrographic analysis report, field notes, and the placement records for the concrete in question. If the Engineer determines the material is found to be adequate to remain in place, payment shall be adjusted in accordance with the following formula:

$$P = \frac{2(fc - f'c)(UP)(Q)}{f'c}$$

Where:

P = pay adjustment for substandard concrete
$f'c$ = specified minimum compressive strength at 28 days
fc = substandard concrete cylinder compressive strength at 56 days
Q = quantity of concrete represented by the acceptance cylinders tested
UP = unit contract price or the lump sum breakdown price per cubic yard for the class of concrete involved complete in place

HOLIDAY WORK RESTRICTIONS

(Supplementing Subsection 7.09)

The District Highway Director (DHD) may authorize work to continue during these specified time periods if it is determined by the District that the work will not negatively impact the traveling public. DHD may allow work in those areas on a case by case basis and where work is behind barrier and will not impact traffic

Below are the holiday work restrictions:

New Years Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day. No work on local roadways on the holiday without permission by the DHD and the local police chief.

Martin Luther King's Birthday (Federal Holiday)
No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

President's Day (Federal Holiday)
No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

Evacuation Day (Suffolk County State Holiday)
No work restrictions due to traffic concerns.

Patriot's Day (State Holiday)
Work restrictions will be in place for Districts 3 and 6 along the entire Boston Marathon route and any other locations that the DHD in those districts determine are warranted so as not to impact the marathon. All other districts work restrictions will be as per DHD.

Mother’s Day
No work on Western Turnpike and Metropolitan Highway System from 5:00 AM on the Friday before, until the normal start of business on the following day.

Memorial Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the Friday before, until the normal start of business on the following day.

Bunker Hill Day (Suffolk County State Holiday)
No work restrictions due to traffic concerns.

Juneteenth
No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

HOLIDAY WORK RESTRICTIONS (Continued)

Independence Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day. No work on local roadways on the holiday without permission by the DHD and the local police chief.

Labor Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the Friday before, until the normal start of business on the following day.

Columbus Day (Federal Holiday)
No work on major arterials from 5:00 AM on the Friday before, until the normal start of business on the following day

Veterans' Day (Federal Holiday)
No work restrictions due to traffic concerns.

Thanksgiving Day (Federal Holiday)
No work on major arterials from 5:00 AM two days before until the normal start of business on the following Monday.

Christmas Day (Federal Holiday)
No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day.

SOIL STOCKPILING DIRECTIVE P-22-001

Any stockpiling of soil must be performed in compliance with Policy Directive P-22-001, Off-Site Stockpiling of Soil from MassDOT Construction Projects. This directive limits the allowable locations for off-site stockpiling of soil generated during MassDOT projects and includes various requirements that must be satisfied by the contractor prior to off-site stockpiling. The Contractor is responsible for identifying a suitable stockpile location.

TRUCK SAFETY DEVICES
(Supplementing Subsection 7.04: Motor Vehicles)

All motor vehicles subject to Section 7 of Chapter 90 to be operated under this Contract shall be equipped with safety devices as provided therein and in 540 CMR 4.00.

The Contractor shall certify to the Registry of Motor Vehicles, in a manner prescribed by the Registrar, that all applicable vehicles are equipped with Lateral Protective Devices, Convex Mirrors, Cross Over Mirror(s) and Back Up Cameras in accordance with the requirements of 540 CMR 4.00.

The Contractor shall provide evidence satisfactory to the Department to demonstrate compliance with the above certification requirement for all applicable vehicles operated under this Contract by the Contractor and its subcontractors and vendors in a manner set forth by the Department. Thereafter, the Contractor shall have an affirmative obligation to continue to provide such evidence of compliance on an ongoing basis and no later than 7 days after certification with the Registry of Motor Vehicles of any additional vehicles operated under this Contract by the Contractor and its subcontractors and vendors.

Non-compliance with respect to a vehicle that is subject to 540 CMR 4.00 may subject the Contractor to statutory fines as established in M.G.L. c. 90, § 7 and/or contractual remedies up to and including termination of the Contract.

SUBSECTION 8.02 SCHEDULE OF OPERATIONS
Replace this subsection with the following:

An integrated cost and schedule controls program shall be implemented by the Contractor to track and document the progress of the Work from Notice to Proceed (NTP) through the Contractor Field Completion (CFC) Milestone. The Contractor's schedules will be used by the Engineer to monitor project progress, plan the level-of-effort required by the Department's work force and consultants and as a critical decision-making tool. Accordingly, the Contractor shall ensure that it complies fully with the requirements specified herein and that its schedules are both accurate and updated as required by the specification throughout the life of the project. Detailed requirements are provided in Division II, Section 722 Construction Scheduling.

SUBSECTION 8.14 UTILITY COORDINATION, DOCUMENTATION, AND MONITORING RESPONSIBILITIES

A. GENERAL

In accordance with the provisions of Section 8.00 Prosecution and Progress, utility coordination is a critical aspect to this Contract. This section defines the responsibility of the Contractor and MassDOT, with regard to the initial utility relocation plan and changes that occur as the prosecution of the Work progresses. The Engineer, with assistance from the Contractor shall coordinate with Utility companies that are impacted by the Contractor's operations. To support this effort, the Contractor shall provide routine and accurate schedule updates, provide notification of delays, and provide documentation of the steps taken to resolve any conflicts for the temporary and/or permanent relocations of the impacted utilities. The Contractor shall provide copies to the Engineer of the Contractor communication with the Utility companies, including but not limited to:

- Providing advanced notice, for all utility-related meetings initiated by the Contractor.
- Providing meeting minutes for all utility-related meetings that the Contractor attends.
- Providing all test pit records.
- Request for Early Utility work requirements of this section (see below).
- Notification letters for any proposed changes to Utility start dates and/or sequencing.
- Written notification to the Engineer of all apparent utility delays within seven (7) Calendar Days after a recognized delay to actual work in the field – either caused by a Utility or the Contractor.
- Any communication, initiated by the Contractor, associated with additional Right-of-Way needs in support of utility work.
- Submission of completed Utility Completion Forms.

- **This Contract requires the relocation of a MassDOT owned utility duct bank occupied by Lumen (WilTel), AT&T, and Verizon. The Contractor will be responsible for installing the new duct bank. and shall maintain constant communication with each utility provider to provide a minimum 60 days acvanced notice to each utility provider for the transfer of cables to the new duct bank.**

B. PROJECT UTILITY COORDINATION (PUC) FORM

The utility schedule and sequence information provided in the Project Utility Coordination Form (if applicable) is the best available information at the time of the bid and has been considered in setting the contract duration. The Contractor shall use all of this information in developing the bid price and the Baseline Schedule Submission, inclusive of the individual utility durations sequencing requirements, and any work that has been noted as potentially concurrent utility installations.

C. INITIATION OF UTILITY WORK

The Engineer will issue all initial notice-to-proceed dates to each Utility company based on either the:

1) Contractor's accepted Baseline Schedule
2) An approved Early Utility Request in the form of an Early Utility sub-net schedule (in accordance with the requirements of this Subsection)
3) An approved Proposal Schedule

SUBSECTION 8.14 (Continued)

C.1 - BASELINE SCHEDULE – UTILITY BASIS
The Contractor shall provide a Baseline Schedule submission in accordance with the requirements of Subsection 8.02 and inclusive of all of the information provided in the PUC Form that has been issued in the Contract documents. This is to include the utility durations, sequencing of work, allowable concurrent work, and all applicable considerations that have been depicted on the PUC Form.

C.2 – EARLY UTILITY REQUEST – (aka SUBNET SCHEDULE) PRIOR TO THE BASELINE
All early utility work is defined as any anticipated/required utility relocations that need to occur prior to the Baseline Schedule acceptance. In all cases of proposed early utility relocation, the Contractor shall present all known information at the pre-construction conference in the form of a 'sub-net' schedule showing when each early utility activity needs to be issued a notice-to-proceed. The Contractor shall provide advance notification of this intent to request early utility work in writing at or prior to the Pre-Construction meeting. Prior to officially requesting approval for early utility work, the Contractor shall also coordinate with MassDOT and all utility companies (private, state or municipal) which may be impacted by the Contract. If this request is acceptable to the Utilities and to MassDOT, the Engineer will issue a notice-to-proceed to the affected Utilities, based on these accepted dates.

C.3 – PROPOSAL SCHEDULE - CHANGES TO THE PUC FORM
If the Contractor intends to submit a schedule (in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02) that contains durations or sequencing that vary from those provided in the Project Utility Coordination (PUC) Form, the Contactor must submit this as an intended change, in the form of a Proposal Schedule and in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02. These proposed changes are subject to the approval of the Engineer and the impacted utilities, in the form of this Proposal Schedule and a proposed revision to the PUC form. The Contractor shall not proceed with any changes of this type without written authorization from the Engineer, that references the approved Proposal Schedule and PUC form changes. The submission of the Baseline Schedule should not include any of these types of proposed utility changes and should not delay the submission of the Baseline Schedule. As a prerequisite to the Proposal Schedule submission, and in advance of the utility notification(s) period, the Contractor shall coordinate the proposed utility changes with the Engineer and the utility companies, to develop a mutually agreed upon schedule, prior to the start of construction.

D. UTILITY DELAYS
The Contractor shall notify the Engineer upon becoming aware that a Utility owner is not advancing the work in accordance with the approved utility schedule. Such notice shall be provided to the Engineer no later than seven (7) calendar days after the occurrence of the event that the Contractor believes to be a utility delay. After such notice, the Engineer and the Contractor shall continue to diligently seek the Utility Owner's cooperation in performing their scope of Work.

In order to demonstrate that a critical path delay has been caused by a third-party Utility, the Contractor must demonstrate, through the requirements of the monthly Progress Schedule submissions and the supporting contract records associated with Subsection 8.02, 8.10 and 8.14, that the delays were beyond the control of the Contractor.

SUBSECTION 8.14 (Continued)

All documentation provided in this section is subject to the review and verification of the Engineer and, if required, the Utility Owner. In accordance with MassDOT Specifications, Division I, Subsection 8.10, a Time Extension will be granted for a delay caused by a Utility, only if the actual duration of the utility work is in excess of that shown on the Project Utility Coordination Form, and only if;

1) proper Notification of Delay was provided to MassDOT in accordance with the time requirements that are specified in this Section
2) the utility delay is a critical path impact to the Baseline Schedule (or most recently approved Progress Schedule)

E. LOCATION OF UTILITIES

The locations of existing utilities are shown on the Contract drawings as an approximation only. The Contractor shall perform a pre-construction utility survey, including any required test pits, to determine the location of all known utilities no later than thirty (30) calendar days before commencing physical site work in the affected area.

F. POST UTILITY SURVEY – NOTIFICATION

Following completion of a utility survey of existing locations, the Contractor will be responsible to notify the Engineer of any known conflicts associated with the actual location of utilities prior to the start of the work. The Engineer and the Contractor will coordinate with any utility whose assets are to be affected by the Work of this Contract. A partial list of utility contact information is provided in the Project Utility Coordination Form.

G. MEETINGS AND COOPERATION WITH UTILITY OWNERS

The Contractor shall notify the Engineer in advance of any meeting they initiate with a Utility Owner's representative to allow MassDOT to participate in the meeting if needed.

Prior to the Pre-Construction Meeting, the Contractor should meet with all Utility Owners who will be required to perform utility relocations within the first 6 months of the project, to update the affected utilities of the Project Utility Coordination Form and all other applicable Contract requirements that impact the Utilities. The Contractor shall copy the Engineer on any correspondence between the Utility Owner and the Contractor.

H. FORCE ACCOUNT / UTILITY MONITORING REQUIREMENTS

The Engineer will be responsible for recording daily Utility work force reports. The start, suspension, re-start, and completion dates of each of the Utilities, within each phase of the utility relocation work, will be monitored and agreed to by the Engineer and the Contractor as the work progresses.

I. ACCESS AND INSPECTION

The Contractor shall be responsible for allowing Utility owners access to their own utilities to perform the relocations and/or inspections. The Contractor shall schedule their work accordingly so as not to delay or prevent each utility from maintaining their relocation schedule.

COMPLIANCE WITH THE NATIONAL DEFENSE AUTHORIZATION ACT

(Supplementing Subsection 7.01)

On all projects, the "Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment" Regulation (2 CFR 200.216) prohibits the Contractor from using or furnishing the following telecommunications equipment or services:

- Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
- For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- Telecommunications or video surveillance services provided by such entities or using such equipment.
- Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

This prohibition applies to all products manufactured by the aforementioned companies, including any individual components or parts.

By submitting a bid on a project, the Contractor certifies that all work will be in compliance with the terms of 2 CFR 200.216. The Contractor shall submit a COC indicating compliance with the above provisions for all telecommunications equipment or services included in the Contract.

Payment for the item in which the materials are incorporated may be withheld until these COCs are received. Any cost involved in furnishing the certificate(s) shall be borne by the Contractor.

NOTICE TO OWNERS OF UTILITIES

(Supplementing Subsection 7.13)

Written notice shall be given by the Contractor to all public service corporations or municipal and State officials owning or having charge of publicly or privately owned utilities at least one week in advance of the commencement of operations that will affect the utilities. The Contractor shall, at the same time, file a copy of such notice with the Engineer.

Before commencing work on service connections, the Contractor shall be responsible for contacting the Electric Company servicing the area to obtain construction requirements, standards, and to give adequate notice of commencement of work. The Contractor's attention is further directed to the requirements of Work in the Immediate Vicinity of Certain Underground Structures and Poles herein included in these Special Provisions.

The following are the names of owners and representatives of the principal utilities affected, but completeness of this list is not guaranteed by the Department:

NOTICE TO OWNERS OF UTILITIES (Continued)

CITY OF BOSTON

Fire Department District 11
138 Chestnut Hill Avenue
Brighton, MA 02135

Commissioner and Chief Paul F. Burke
Phone:(617) 343-3550

Police Department D14(Brighton)
301 Washington Street
Brighton, MA 02135

Commander Captain Wayne F. Lanchester
Phone:(617) 343-4260

Boston Fire Alarm
59 The Fenway
Boston, MA 02115

Sean McGonagle
Phone:(617) 343-2897
Email: sean.mcgonagle@boston.gov

Boston Engineering Department
1 City Hall Room 710
Boston, MA 02201

Julia Campbell
Phone:(978) 744-3302
Email: Julia.campbell@boston.gov

WATER

Boston Water & Sewer Department
980 Harrison Avenue
Boston, MA 02119

Jodi Dobay
Phone: (617) 989-7259
Email: beginj@bwsc.org

MWRA
2 Griffin Way
Chelsea, MA 02150

Ralph Francesconi
Phone: (617) 461-3573
Email: Ralph.Francesconi@mwra.com

SEWER

Boston Water & Sewer Department
980 Harrison Avenue
Boston, MA 02119

Jodi Dobay
Phone: (617) 989-7259
Email: beginj@bwsc.org

MWRA
2 Griffin Way
Chelsea, MA 02150

Kevin McKenna
Phone: (617) 605-5956
Email: Kevin.McKenna@mwra.com

ELECTRIC

Eversource Electric “A”
1165 Massachusetts Avenue
Dorchester, MA 02125

Ned Sadowski
Phone:
Email: ned.sadowski@eversource.com

Boston DPW Street Lighting
400 Frontage Road
Boston, MA 02118

Tristan Harvey
Phone: (617) 635-3789
Email: tristan.harvey@boston.gov

TELEPHONE

Verizon
385 Myles Standish Blvd.
Taunton, MA 02780

Paul Diamantopoulos
Phone: (978) 323-0282
Email: paul.e.diamantopoulos@verizon.com

NOTICE TO OWNERS OF UTILITIES (Continued)

GAS

National Grid Gas
170 Data Drive
Waltham, MA 02451

Melissa Owens
Phone: (781) 907-2845
Email: melissa.owens@nationalgrid.com

Eversource Gas
157 Cordaville Road, 3113
Southborough, MA 01772

Jeffrey Evans-Mongeon
Phone: (508) 305-6970
Email: Jeffrey.Evans-Mongeon
@eversource.com

CABLE

Astound
956 Massachusetts Avenue
Arlington, MA 02476

Alex Ortiz
Phone: (781) 316-8878
Email: alex.ortiz@astound.com

Comcast Cable Corporation
PO Box 6505, 5 Omni Way
Chelmsford, MA 01824

Wendy Brown
Phone: (978) 848-5163
Email: wendy_brown@comcast.com

AT&T / Teleport Communications America,
c/o Siena Engineering Group
50 Mall Road – Suite 203
Burlington, MA 01803

Erica Hudson
Phone: (781) 221-8400 Ext 7041
Email: erica.hudson
@sienaengineeringgroup.com

FirstLight
359 Corporate Drive
Portsmouth, NH 03801

FirstLight Fiber Infrastructure
Phone:
Email: FirstLight_MA@firstlight.net

Crown Castle
80 Central Street
Boxborough, MA 01719

Mark Bonanno
Phone: (508) 616-7818
Email: mark.bonanno@crowncastle.com

Eversource Fiber
247 Station Drive, Mail Stop: SUM SE 320
Westwood, MA 01824

Bechir Khoury
Phone: (781) 441-3864
Email: bechir.khoury@eversource.com

Lightpath
100 Quannapowitt Pkwy
Wakefield, MA 01880

Jeff Harrington
Phone: (617) 999-5371
Email: jeff.harrington@lightpathfiber.com

The Contractor shall make his own investigation to assure that no damage to existing structures, drainage lines, traffic signal conduits, and other utilities will occur as a result of construction operations.

NATIONAL GRID EMERGENCY TELEPHONE NUMBERS

GAS:
Emergency: 1-800-233-5325
New Service: 1- 877-696-4743
Customer Support: 1-800-732-3400

EVERSOURCE EMERGENCY TELEPHONE NUMBERS

GAS:
Outage/ Emergency: 800-592-2000
New Service: 866-678-2744
Customer Support: 800-592-2000

ELECTRIC:
Outage/ Emergency: 800-592-2000 or 844-726-7562
New Service: 1-888-633-3797 (1-888-need pwr)
Customer Support: 1-800-340-9822

EMERALD ASH BORER ADVISORY

To the extent possible, all trees and brush shall be disposed on site, typically chipped and spread in place. When trees or brush must be removed, such as in urban, or otherwise populated areas, Contractor shall identify proposed location for disposal, and provide written notification to the Engineer for approval. Disposal shall be in city or town of project, or at minimum, within county, of construction operations.

ENVIRONMENTAL PERMITTING

Environmental permits have not been obtained, as no work (either temporary or permanent) is proposed to occur in water or wetland resource areas. If Contractor erection, demolition, storage, or other procedures require work to occur in or otherwise impact water, wetland resource areas, buffer zones, etc., the Contractor is advised that no associated work can occur until all required environmental permits have been obtained. The Contractor must notify the District 6 Highway Director and Resident Engineer in writing at least 60 days prior to desired commencement of the proposed activity. All environmental submittals, including any contact with Local, State, or Federal environmental agencies, must be coordinated through the District 6 Environmental Engineer. The Contractor is expected to fully cooperate with requests for information and provide same in a timely manner. The Contractor is further advised that the Department will not entertain a delay claim due to the time required to obtain the envirnmental permits. As a supplement to Section 7.00 of the Standard Specifications, the Contractor is reminded that no debris of any type shall be allowed to enter water or wetland resource areas, either temporarily or permanently.

NORTHERN LONG-EARED BAT AND TRICOLORED BAT PROTECTION

The northern long-eared bat (*Myotis septentrionalis*; NLEB) and tricolored bat (*Perimyotis subflavus*; TCB) are listed as federally endangered or proposed endangered, respectfully, under the Endangered Species Act (ESA). The U.S. Fish and Wildlife Service (USFWS) developed this guidance to address ESA compliance and promote conservation of NLEB and TCB. As there is no Federal nexus (Federal funding or permits) for this project, Section 7 consultation was not required or conducted. However, Section 9 of the ESA prohibits anyone from "taking" or harming an endangered species, and the below language shall be adhered to in order to maintain compliance with the ESA.

The following Avoidance and Minimization Measures (AMMs) must be strictly adhered to in order to protect NLEB and TCB and to be in compliance with the ESA. Contact MassDOT Environmental Services - Wildlife & Endangered Species Unit Supervisor (David Paulson, david.j.paulson@dot.state.ma.us, 857-262-3378) for questions about project limits, restrictions, or conservation measures.

Required AMM for all projects:

- The Contractor shall ensure all personnel working in on the project site are aware of all environmental commitments related to NLEB and TCB, including all applicable AMMs. NLEB Bat information (https://www.fws.gov/midwest/endangered/mammals/nleb/ and https://www.fws.gov/species/tricolored-bat-perimyotis-subflavus) shall be made available to all personnel.

If temporary lighting is proposed within the project scope, the following AMM is applicable:
Lighting AMM:

- Direct temporary lighting away from suitable habitat during the active season: **April 15 to October 31.**

If the Removal of Trees and/or Woody Vegetation >3-inch in diameter is proposed within the project scope, the following AMMs are applicable:
Tree AMMs:

- If additional cutting is proposed by the Contractor that is outside the scope of this contract, additional review is required by the MassDOT Highway Division's Environmental Services Section, and additional review and restrictions may be required by the USFWS.
- Ensure tree removal is limited to that specified in project plans and ensure that contractors understand clearing limits and how they are marked in the field (e.g., install bright colored flagging/fencing prior to any tree clearing to ensure contractors stay within clearing limits).
- In order to protect northern long-eared bats and their young during their active season, **no tree cutting shall be conducted during the Time of Year (TOY) restriction of April 15 to October 31**.
- Do not remove **documented** or NLEB roosts that are still suitable for roosting, or trees within 0.25 miles of roosts, or **documented** foraging habitat any time of year (http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/species-information-and-conservation/rare-mammals/northern-long-eared-bat.html).
- The Contractor shall ensure all personnel working in on the project site are aware of all environmental commitments related to NLEB and TCB, including the **TOY** restriction.

PRESERVATION OF STREET ART

The Contractor shall be aware that the Lower Allston neighborhood if a vibrant local artist community. The Contractor shall preserve and protect public art pieces, specifically the *Black Lives Matter* guerilla art piece affixed to the fence near the base of the Franklin Street pedestrian bridge opposite Franklin Street. If Contractor activities will impact portions of the fence where this artwork is attached, the Contractor shall immediately inform the MassDOT Resident Engineer so that the art piece can be preserved and relocated if necessary.

VALUE ENGINEERING CHANGE PROPOSAL

This Subsection defines the conditions and requirements which apply to Value Engineering Change Proposals ("VECPs"). The purpose of this provision is to encourage the Contractor to propose changes in certain project requirements that will maintain the project's functional requirements at a savings in contract time, contract price, or both. The net savings obtained by using a VECP that meets the conditions and requirements set forth here will be shared by the Contractor and MassDOT.

VECP's under this provision are to be initiated, developed and submitted to MassDOT by the Contractor. The VECP must show the contemplated changes to the Drawings, Specifications and other requirements in the Contract. When a VECP submitted pursuant to this section is fully accepted by MassDOT, the VECP will be implemented by the Contractor and paid using the current cost and resource loaded schedule. Contractor shall demonstrate that the VECP is equal to, or better than, the original design or material; that there is an interest in public safety within the VECP; that there is a life-cycle cost benefit; and/or that end users will benefit from the shortened schedule. VECPs shall be consistent with the MassHighway/MassDOT Standard Specifications for Highways and Bridges and other applicable reference documents and directives. Any proposed deviation from these documents will need to be clearly identified in the VECP Proposal Documents, and must be approved by MassDOT's Chief Engineer before accepting this VECP.

A. In order to be considered for MassDOT review each VECP shall:
   1. Be clearly labeled pursuant to this Subsection;
   2. Yield a net savings at least two hundred and fifty thousand (250,000.00) Dollars and/or a net saving of contract completion duration of at least three (3) months;
   3. The proposed changes to contract items must:
      a. maintain the specified items' required functions (service life, reliability);
      b. meet applicable safety regulations and codes;
      c. material substitutions must be in accordance with DOT prequalified/preapproved products and must be tested in accordance with standard material specs/testing methods (and considering all relevant environmental, load, and other relevant factors).
      d. show economy of operation, ease of maintenance, ease of construction, and necessary standardized features and appearance; and
   4. Shall not require an extension of Contract Time or Contract Milestones, with the exception of cases when there are anticipated significant cost saving.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

The thresholds above are considered to be a general guideline. MassDOT will consider VECPs outside of these thresholds if a significant benefit is demonstrated. Additionally, notwithstanding this VECP process, MassDOT will consider minor revisions in the form of a Contract Modification.

Further, any VECP submitted shall be in sufficient detail to clearly define the proposed change. The Contractor's failure to provide information of the type, detail and in a format to facilitate the MassDOT's review, may be grounds for rejection of the VECP. Additionally, the Contractor will not be entitled to any equitable adjustment or increased Time, due to any aspect of any of the proposed VECP including permitting, right of way, utility coordination or delayed responses by MassDOT. If, after the progression of the work associated with the executed Contract Modification for the VECP, any additional costs are realized by the Contractor or any of the sub- consultants, sub-contractors, or suppliers, the Contractor shall be obligated to pay for any and all costs.

B. The following initial items shall be provided by the Contractor for MassDOT's review. *Items 1-6 need to be submitted prior to the start of MassDOT's review of the VECP and item 7 is an important consideration for the pricing of the VECP and the timeline of the proposed VECP schedule.*

1. ***VECP Description***: A description of the difference between the existing and the proposed Contract requirements, and the comparative advantages and disadvantages of each;

2. ***VECP Change Listing***: A listing of the Contract requirements that will need to be changed, modified, or reviewed as well as the proposed Contract document changes in the Instructions to Bidders, Contract, Standard Specifications, General Requirements and Special Provisions required by the VECP.

3. ***Construction Schedule Update*:** Any changes in the Contract Time(s) or Contract Milestone(s), that will result from acceptance of the VECP, shall be accompanied by a contemporaneous schedule analysis *(i.e., the Contractor's baseline schedule submission, all past/required monthly schedule updates, a detailed assessment of all past delays, and a resource loaded Critical Path Method schedule as specified in Section 8.0 / Subsection 8.02 of this Contract)* of the projected Work that remains including the proposed VECP related schedule changes *(inclusive of the timeline to review accept the VECP and the timeline for implementing the design changes)* in the remaining work. This shall be submitted in the form of a Proposal Schedule until the VECP has been formally accepted. Note: All of this information is to be updated, recertified, and formally accepted by MassDOT before final acceptance of this this VECP is issued.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

4. ***Date for MassDOT's Acceptance***: A statement that clearly justifies the date by which the VECP must be accepted to obtain the maximum price reduction, noting any effect upon the Contract Time(s) and/or Contract Milestone(s). This statement must include a narrative that demonstrates the most recent construction schedule has been utilized to justify that proposed acceptance date *(e.g. "in order to start to fabricate critical materials, authorization must be provided to work on the shop drawings by no later than [date]").* The Contractor should allow for at least sixty (60) to ninety (90) days for acceptance by MassDOT once all of the VECP documentation has been provided. Acceptance shall mean that MassDOT has received a finalized and executed contract modification. However, this is a proposed Contract change.

   The Contractor is fully obligated to progress the Work of the original Contract and MassDOT is not liable for any delays or costs that may occur in the review phase of any VECP proposal.

5. ***Cost and Savings Estimates***: A detailed estimate of the anticipated net savings, calculated as follows:

   a. ***Original Scope:*** Isolate the cost of performing the original contract construction activities, in accordance with the original Contract Documents, as originally bid by the Contractor, that are anticipated to be superseded by the VECP. *This cost is to include any original contract scope that is anticipated to be altered or eliminated by the VECP such as, shop drawing preparation, inspection work, testing, maintenance of traffic, or any other original contract costs, that have yet to have been performed at the time of this VECP submission.*

   b. ***New VECP Scope:*** Calculate the cost of performing the comparable construction activities associated with the VECP.

   c. ***Contractor's Engineer & Inspection***: Calculate the cost of engineering, inspection, and design work by the Contractor's Engineer/Designer. This should be a realistic estimate of the costs of any required engineering, design and review work by the Contractor's Engineer.

   d. ***MassDOT's Costs:*** MassDOT's estimate of costs to perform engineering/design reviews, cost estimate reviews, schedule reviews, and any other administrative costs to review and recommend implementation of the proposed VECP. *(including all anticipated increased costs to MassDOT on other Contracts and all anticipated follow-on increased costs to MassDOT, if any)* as provided by MassDOT. MassDOT's estimated costs must be included in the VECP calculation and will be provided by MassDOT in support of the VECP evaluation process.

   e. ***Other Costs:*** Estimated costs associated with any revisions to other project-related costs, such as Environmental Permits or Right of Way acquisitions, including other agency or municipality costs, as provided by MassDOT.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

Net Savings:
The net savings to be split between MassDOT and the Contractor shall be calculated using the items above as follows: a - (b+c+d+e) = net savings

6. *The Contractor shall also provide:*

   a. A proposed Change Order, which explains and justifies any required Equitable Adjustment in the Contract Price.

   b. The Contractor's actual costs expended for developing the VECP as of the date of the VECP submission;

***7. Design Changes and Drawings*:** The costs that are outlined above should be inclusive of the following design and engineering responsibilities.

   a. Design changes shall be prepared and stamped by the Contractor's professional designer and/or engineer. In addition, in the development of the VECP; the Contractor is responsible for anticipating and managing all aspects associated with any VECP design work that must be performed by a licensed Engineer.

   b. The Contractor's engineer must analyze and stamp all components of any aspect of the project that has been redesigned, changed, or altered as a result of this VECP.

   c. The Contractor's engineer shall provide all calculations and supporting design/engineering documentation that was utilized to develop the changes and stamped drawings. These will be used by MassDOT's Designer-of-Record to review the VECP changes. The Contractor is limited to selecting only those engineer's that have been pre-qualified by MassDOT's A&E Board.

   d. MassDOT's Designer-of-Record will review and respond to all completed design submissions related to this VECP within thirty (30) calendar days, unless determined to be a non-critical path item.

   e. MassDOT will be responsible for estimating and managing MassDOT's Designer-of-Record during the VECP review and implementation. Should any significant conflicts arise between the Contractor's Engineer and MassDOT's Designer-of-Record, the DOT and the Contractor will work expeditiously to resolve the conflict. Should this type of conflict continue for greater than five (5) days, the Contractor is to bear all financial and time related impacts of such delay and must seek to resolve the design conflict, in an acceptable manner to MassDOT. The resolution of this conflict will be funded at the Contractor's expense – exclusive of the net saving that was agreed to at the execution of the contract modification for this VECP.

   f. The Contractor's Engineer may also be required to inspect the construction work. The Contractor is to include such anticipated inspection costs in the initial VECP.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

g. MassDOT's Designer of Record will remain the Designer-of-Record for the entire Project. Any costs incurred in the use of MassDOT's Designer-of-Record by MassDOT or Contractor associated with the review of a VECP are to be included in the calculated net savings.

C. Approval of the VECP shall not occur until a Contract Modification, incorporating the VECP, is issued by MassDOT and properly executed by the Contractor. MassDOT may accept or reject part or all of any VECP at any time prior to an executed Contract Modification for the applicable VECP. The decision of MassDOT, concerning acceptance or rejection of any VECP, shall be final and shall not be subject to dispute resolution.

It is expected that several weeks may go by before the final VECP documentation has been executed with a Contract Modification. Therefore, MassDOT intends to make certain that the initial cost estimate information has not changed before entering into a Contract Modification. As the VECP evaluation process is finalized, and prior to the signed Contract Modification for the VECP, the Contractor and MassDOT must re-certify the current status of the originally proposed cost and/or schedule savings.

Until a contract modification is issued and schedule and cost/savings re-certification is complete and accepted by MassDOT, the Contractor shall remain obligated to perform the Work in accordance with the terms and conditions of the original Contract Documents.

Upon completion of the work associated with the VECP, MassDOT may require verification that the VECP savings has been achieved.

D. VECPs will be processed (distributed, reviewed, commented upon, accepted or rejected) expeditiously (pursuant to M.G.L. c. 30, § 39R); however, as this is an elective modification to the contract, MassDOT shall not be liable for any delay or cost in the review and acceptance of the VECP. During the review of the VECP, the Contractor remains obligated to progress the original Contract scope, and schedule, as planned; until a Contract Modification, accepting the Contractor re-certified VECP, has been executed by MassDOT.

The Contractor has the right to withdraw part, or all of any VECP, prior to acceptance by MassDOT. Such withdrawal shall be made in writing to the Engineer. The Contractor shall state the period of time, from the date of the initial VECP submittal, that the VECP shall remain valid and feasible. Revision of this validity and feasibility period shall be allowed only by mutual agreement of the Contractor and the Engineer in writing.

If the Contractor desires to withdraw the proposal prior to the expiration of this period for non-technical reason, MassDOT reserves the right to recover all actual costs that have been incurred to MassDOT.

VALUE ENGINEERING CHANGE PROPOSAL (Continued)

If the Contractor withdraws the VEC Proposal, MassDOT reserves the right to proceed with the VECP or any portion of the VECP as a normal change and the Contractor waives any right it may have had to share in net savings thereunder.

For purposes of this provision, expiration of the time established by the Contractor for approval shall be considered as withdrawal by the Contractor if MassDOT requests an extension of that time and the Contractor does not provide a written extension.

E. With regard to unknown conditions or sub-surface work, in general, the expectation is that the Contractor and MassDOT will strive to gain enough knowledge about the risks in order to provide a forward-priced Change Proposal. Therefore, any costs to fully evaluate the proposal, such as additional borings and/or test pits, must be considered in the cost evaluation of whether the VECP is worth pursuing. However, if it is impractical to gather conclusive exploratory information, before the VECP is executed, MassDOT may consider provisions in the VECP that clearly identifies the risk sharing (cost and time) related specifically to the unknown/sub-surface conditions. If these VECP provisions are acceptable to MassDOT they are to include supplemental language to provide a determination of the final savings/cost, and time impacts, no later than 45 days after the sub-surface work is completed. All other aspects of the VECP, unrelated to these Provisions, will be binding upon execution of the VECP.

ITEM 100.99 CONSTRUCTION MONITORING OF EXISTING STRUCTURES LUMP SUM

The work under this Item includes monitoring of the Market Street bridge. Monitoring includes, but is not limited to, preconstruction surveying, furnishing, installing, protecting, reading, reporting, and maintaining instrumentation required during construction.

A monitoring program shall be approved by the Engineer and installed at least 30 days prior to any excavation, dewatering, ground improvement, installation of temporary/permanent support of excavation, pile, shaft, fill compaction, or activity which could cause significant ground vibrations, herein called Monitored Construction Activities.

If vibrations or movements of specified locations exceed the values specified herein, the Contractor shall stop work and modify construction methods at no additional cost.

The Contractor shall be responsible for the repair of any damage to the existing structure caused by the Contractor's failure to comply with the requirements of this Section. The Department or Engineer may require the Contractor to take steps to control movements to levels which are lower, if in the opinion of the Engineer the measured or observed movements are detrimental or damaging.

General Contractor Responsibilities

- Layout and subsequent verification of all instrument locations. Temporary monuments and benchmarks, as necessary.

- Access as necessary for the Engineer to inspect the instruments and to obtain confirmation readings.

- Protection and security for all surface components of the construction monitoring system that are to be maintained. Replacement of failed equipment within 72 hours.

- Taking immediate remedial action when a response value is reached; meeting with the Engineer to review current field conditions and further steps to be taken, as necessary, before the recorded movement exceeds the limiting value.

- Removal and final disposal of all components of the construction monitoring system, as specified herein, or as required by the Engineer.

Preconstruction and Post-Construction Surveys

Photographs or videotape, sufficiently detailed, of conditions of existing elements. The surveys shall include existing elements within a minimum of 100 feet beyond the limit of work. Existing elements shall include the Market Street bridge. If a portion of a building falls within this limit the entire building shall be surveyed.

ITEM 100.99 (Continued)

Preconstruction and Post-Construction Surveys shall each produce reports documenting plumbness, levelness, crack widths and spall dimensioned etc. with photographs and/or video documentation of cracks, spalls, and other relevant defects, signed and sealed by a Professional Engineer licensed in the Commonwealth of Massachusetts.

Movement Monitoring Locations and Limits

Install Deformation Monitoring Points (DMPs) at locations proposed by the Contractor and approved by the Engineer along the exterior face of the existing structure within fifty (50) feet of construction limits.

General:

The Engineer reserves the right to modify the DMP layout as is deemed necessary to monitor the impact of a Contractor proposed method of construction that has been approved. The DMPs shall be arranged so that monitoring can continue until completion without interruption. Adequate access for maintenance and reading of the DMPs shall be provided.

Movement Monitoring Methods

Perform two baseline elevation surveys before the start of Monitored Construction Activities. Survey both vertical and lateral positions.

Perform daily survey of monitoring points during Monitored Construction Activities within 50 feet of a given structure monitoring point or 100 feet of a given track monitoring point.

Upon completion of these specific Monitored Construction Activities, the Contractor shall continue to monitor these survey points every two (2) days for a period of at least ten (10) days.

All survey points shall be monitored weekly from start of the first Monitored Construction Activity until the final Monitored Construction Activity on the entire project.

The Contractor shall submit the results of the settlement point readings to the Engineer in draft form at the end of each working day. All monitoring data shall be reported to the Department and Engineer within twenty-four (24) hours of measurement in tabular format, allowing comparison of current data to previous data, including baseline, and showing a complete history of movement versus time.

Movement Monitoring Tolerances

- Establish the initial coordinates of each DMP installation to 3 mm or less, horizontal and vertical.

- Establish the initial elevation of DMPs to 3 mm.

ITEM 100.99 (Continued)

Movement Monitoring Instrumentation

Survey instruments used for vertical deformation monitoring shall have a minimum accuracy of ±0.05 inch and a minimum setting accuracy of ±1.0 arc seconds. Leveling staffs shall be non-telescopic in design (i.e. 'Chicago' style leveling staff). A bull's eye bubble shall be used to plumb the leveling rod.

Survey instruments used for horizontal deformation monitoring shall have a minimum accuracy of ±3.0 arc seconds and a minimum display reading less than or equal to the accuracy. Distances less than 30 feet shall be measured with a standardized steel tape used in conjunction with a tension handle. Distances greater than 30 feet shall be measured with an Electro-Optical Distance Measuring Instrument (EDM). Distances between 30 and 100 feet shall be verified with a standardized steel tape in conjunction with a tension handle. Electronic pointing shall be used to minimize error due to possible misalignment of the EDM axis and telescope. Centering shall be accomplished using high precision optical plummets or mechanical centering devices.

EDM equipment used for lateral deformation monitoring shall, after calibration, have a minimum accuracy of ±0.02 in plus 5 parts per million.

Movement Limits and Response Actions

The Response and Limiting Values are in Table 1 below. The Contractor shall respond to the monitored readings from instrumentation as follows.

If the Response Value is reached, the Contractor shall:

- Meet with the Engineer to discuss response actions.

- If the response value is reached on a track or structure supporting track: the Railroad shall be notified by the Contractor, copying the Engineer on the communication.

- Submit, receive approval of, and implement a plan of action, which includes, but is not limited to: limiting the pile hammer energy and/or pre-drilling while increasing the frequency of monitoring on adjacent structures and; resetting all rail, track ties, and ballast to original profile grade prior to the return of the railroad track back to the scheduled active operation as required to the satisfaction of the Engineer and the Railroad.

If readings approach the Limiting Values (after these readings have exceeded the Response Values), the Contractor shall:

- Take all necessary steps so that the limiting value is not exceeded. The Contractor may be required to suspend activities in the affected area with the exception of those actions necessary to avoid exceeding the limiting value.

ITEM 100.99 (Continued)

TABLE 1 – MOVEMENT READING LIMITS (VERTICAL AND HORIZONTAL)		
INSTRUMENT	RESPONSE VALUE	LIMITING VALUE
Deformation monitoring points at existing adjacent structures	¼ inch	½ inch
Deformation monitoring points at railroad track locations	¼ inch	3/8 inch

Engineer will be the sole judge of work stoppage due to exceedance of the response or limiting value, or detected damaged or unusable DMP at no additional cost to the State.

Vibration Monitoring

The Contractor shall monitor vibration through the installation of seismographs located at the nearest building or structure within fifty (50) feet of any Monitored Construction Activity during such activity.

Vibration limits are as follows:

- Response Value: 0.5 inch per second
- Limiting Value: 1.0 inch per second

Materials

Deformation Monitoring Points (DMPs) are to be used as targets in monitoring by conventional survey methods. Materials and methods of DMPs shall be submitted for approval as part of the Work Plan. Track DMPs are subject to approval by the MBTA.

All DMPs shall be installed in the presence of the Engineer. All DMPs shall be securely fixed at the approval locations and positions, so that the instruments are capable of resisting disturbance from vandalism.

Submittals

Pre-construction Submittals: These shall be approved at least 30 calendar days prior to the commencement of any Monitored Construction Activity.

- Monitoring and Instrumentation Work Plan including all monitoring locations, equipment specifications, means and methods for completing the work under this Item.
- Pre-Construction Survey Report
- DMP Baseline Readings Reports

ITEM 100.99 (Continued)

BASIS OF PAYMENT

Item 100.99 will be paid for at the Contract unit price per lump sum, which price shall include all labor, materials, equipment, pre- and post-construction surveys, monitoring during construction, all submittals and required reports, and all incidental costs required to complete the work.

1. The first payment of one-third of the lump sum price for the Construction Monitoring of Existing Structures or 1 percent of the total bid price, whichever is less, will be made on the first estimate.
2. The second payment of one-third of the lump sum price for Construction Monitoring of Existing Structures or 1 percent of the total bid price, whichever is less, will be made following the completion of 50 percent of total Contractor price.

Upon completion of all work on the project, payment of all amount bid for Construction Monitoring of Existing Structures in excess of the total amount of previously paid will be paid.

ITEM 102.511 TREE PROTECTION – ARMORING AND PRUNING EACH

The work under this item shall conform to the relevant provisions of Sections 771 of the Standard Specifications and the following:

Tree protection – armoring and pruning shall be used for instances where construction activity (the use of heavy equipment), comes within proximity to potentially damage tree trunk(s) or limbs.

The work shall include the furnishing and installing of temporary tree trunk protection, minor limb pruning, or removal of lower tree limbs to prevent injury to the tree from construction equipment and activities; as shown on the Drawings; and/or as required by the Engineer.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the latest edition of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance: Part 1-Pruning and Part 5-Construction Management Standard. Provision of reference shall be incidental to this item.

MATERIALS

Trunk armoring shall be such that it prevents damage to the trunk from construction equipment. Material used for trunk armoring or mounting shall be such that installation and removal shall not damage the trunk.

Acceptable trunk armoring materials shall include two by four (2x4) wood cladding, mounted with wire or metal strapping, or when duration of construction activities is less than three months, slotted corrugated plastic pipe, mounted with duct tape. Eight (8) once untreated burlap shall be used to wrap the tree trunk prior to installation of cladding.

Alternative armoring methods or materials may be acceptable if approved by the Engineer.

The height of tree trunk cladding shall be measured from the base of the tree (including root flare) to the bottom of the first branch, or to a height of eight (8) feet, or as may be required by the Engineer.

METHODS OF WORK

Prior to construction activities, the Engineer, Contractor, and the Arborist (if item is included in the contract), shall review trees noted on the Drawings to be protected. Final decision and selection of trees to be armored and/or pruned shall be per the Engineer.

Care shall be taken to avoid damage to the bark during installation and removal of armoring. Trunk armoring shall be maintained such that it is effective for as long as required or replaced when materials are found to be damaged or ineffective, as determined by the Engineer. Replacement, if required, shall be incidental to the work. Armoring shall be removed immediately upon completion of work activities adjacent to the protected tree(s).

Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.

ITEM 102.511 (Continued)

DAMAGES OR LOSS

If trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense, secure the services of an Arborist. The Arborist shall be approved by MassDOT.

If, based on the recommendation of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury; soil compaction remediation; pruning; soil injection fertilization; and/or watering; the damage shall be repaired as soon as possible, within the appropriate season for such work and according to industry standards.

If, based on the recommendation of the Arborist, the Engineer determines that damages are irreparable, or that the damages are such that the tree is sufficiently compromised to pose a future safety hazard, the tree shall be removed. Tree removal shall include cleanup of all wood, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil. Such tree removal(s), grinding, debris removal, and topsoil filling, shall be at the Contractor's expense.

Tree removal from improper or inadequate tree protection shall result in the Engineer assessing the Contractor monetary damages consistent with industry standards for assessed value and/or replacement.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.511 will be measured and paid at the contract unit price per EACH tree to be armored and pruned. This will include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract or as required by the Engineer.

Payment for work under this item will be scheduled as follows:

40% of the value shall be paid upon installation of trunk armoring and completion of pruning work, if required.

60% of the value shall be paid at the end of construction operations that would potentially damage the tree and after protection materials have been removed and properly disposed of by the Contractor. In the event of repairable damages, payment shall be made after the completion of remediation measures.

No separate payment will be made for costs of remedial actions, including Arborist services, tree removal, but all costs in connection therewith shall be included in the Contract unit price bid.

Tree damages assessed, due to lack of or improper tree and plant protective measures being taken, shall be deducted from the contract price of the work.

ITEM 119.5 CONSTRUCTION NOISE CONTROL LUMP SUM

The work under this item shall minimize construction noise within construction areas, lay-down areas, and communities adjacent to the construction site. As such, the Contractor and all subcontractors, suppliers, and vendors, are required to comply with all applicable noise regulations, specification requirements, and the noise level limits specified herein.

This item specifies requirements for response to community complaints. All requirements of this Section, if needed during performance of the Work, shall be overseen by an approved Acoustical Engineer employed by the Contractor.

The Contractor shall use equipment with efficient noise-suppression devices and employ other noise abatement measures such as enclosures and barriers necessary for the protection of the public. In addition, the Contractor should schedule and conduct operations in a manner that will minimize, to the greatest extent feasible, the disturbance to the public in areas adjacent to the Work and to occupants of buildings in the vicinity of the Work.

In no case shall the restrictions identified in this Section limit the Contractor's responsibility for compliance with all Federal, state, and local safety ordinances and regulations.

Terms Used

Noise is any audible sound which has the potential to annoy or disturb humans, or to cause an adverse psychological or physiological effect on humans.

Daytime refers to the period from 7 AM to 6 PM local time daily, except Sundays and Federal holidays.

Evening refers to the period from 6 PM to 10 PM local time daily, except Sundays and Federal holidays.

Nighttime refers to the period from 10 PM to 7 AM local time daily, as well as all day Sunday and Federal holidays.

Noise-Sensitive Locations shall mean locations where particular sensitivities to noise exist, such as residential areas, institutions, hospitals, and parks.

Nuisance Noise refers to sound levels that annoy or disturb a reasonable person of normal sensitivities, but do not exceed the noise limits specified herein.

Lot-line refers to the line separating a parcel of land from another parcel or from the street

Background Noise shall be defined as the measured ambient noise level associated with all existing environmental, transportation, and community noise sources in the absence of any audible construction activity.

ITEM 119.5 (Continued)

dBA shall be defined as the sound level (in decibels referenced to 20 micro-pascals) as measured using the A-weighting network on a sound level meter, in accordance with ANSI S1.4 Standards.

Lmax shall be defined as the maximum measured sound level at any instant in time.

Leq shall be defined as the equivalent sound level, or the continuous sound level that represents the same sound energy as the varying sound levels, over a specified monitoring period.

L10 shall be defined as the sound level exceeded 10 percent of the time for a specified monitoring period.

Slow specifies a time constant or 1 second for the root-mean-square (RMS) detector used by a sound level meter, in accordance with ANSI S1.4 Standards.

Impact noise is noise produced from impact or devices with discernible separation in sound pressure maxima. Examples for impact equipment include, but are not limited to; blasting, clam shovel or chisel drops, pavement breakers, jackhammers, hoe rams, mounted impact hammers, and impact pile drivers (but not vibratory pile drivers). Table 3 specifies types of equipment which are considered to emit impact or continuous noise.

Submittals

Submit the name, address, and qualifications of the Acoustical Engineer, as specified for review and acceptance.

Develop and submit for approval, a noise control plan for each phase of construction that outlines in detail, the measures to be implemented by the Contractor to comply with this item. Any modifications to the approved noise control plan must be submitted for review and approval prior to implementation.

Submit shop and working drawings, computations, material data, and other descriptions for abatement measures used as Temporary Noise Barriers, Acoustical Barrier Enclosures, or Noise Control Curtains as specified. Drawings and computations shall be stamped by a Registered Professional Engineer of the Commonwealth of Massachusetts.

CONSTRUCTION LIMITATIONS

Noise Levels

Daytime, evening, and nighttime construction noise levels at noise-sensitive locations and other noise monitoring locations shall not exceed the limits specified in Tables 1 and 2, unless the noise exceedances occur when mitigation consistent with this specification is utilized, as determined by the Engineer. The lot-line criteria shall apply to all points on a given lot-line of an affected receptor.

ITEM 119.5 (Continued)

Equipment and associated equipment operating under full load shall not exceed the Lmax noise limits specified in Table 3, unless noise exceedances occur when mitigation consistent with this specification is utilized, as determined by the Engineer. The 50-feet noise emission limits specified in Table 3 shall apply to the entire operation in which the equipment is engaged.

Table 3 also provides distinction as to which equipment is considered to emit impact or continuous noise.

Work shall be performed in a manner to prevent nuisance conditions such as noise which exhibits a specific audible frequency or tone (e.g., backup alarms, unmaintained equipment, brake squeal) or impact noise (e.g., jackhammers, hoe rams). The Engineer will make any final interpretation concerning whether or not nuisance noise conditions exist. The Engineer has the authority to stop the Work until nuisance noise conditions are resolved, without additional time or compensation for the Contractor.

Equipment Operations

The use of impact pile drivers shall be prohibited during evening and nighttime hours (i.e. , 6 PM to 7 AM as defined in Article 1.02).

Vibratory pile driving shall be prohibited during the nighttime period (i.e., 10 PM to 7 AM as defined in Article 1.02).

All jackhammers, chainsaws, and pavement breakers used on the construction site shall be enclosed with shields, acoustical barrier enclosures, or noise barriers.

The use of all impact devices, including hoe rams, jackhammers, chiseling devices, and pavement breakers, shall be prohibited during the nighttime hours (i.e., 10 PM to 7 AM). Any necessary use of impact devices between 10 PM and 7 AM shall be reviewed by the Engineer in advance and allowed as an exception only upon sufficient justification.

Contractors shall use haul routes approved by the Engineer and the City to minimize noise at residential and other sensitive noise receptor sites.

All equipment with backup alarms operated during the hours of 6 PM to 10 PM by the Contractor, vendors, suppliers, and subcontractors on the construction site shall be equipped with either audible self-adjusting ambient-sensitive backup alarms or manually-adjustable alarms. The ambient-sensitive alarms shall automatically adjust to a maximum of 5 dBA over the surrounding background noise levels. The manually-adjustable alarms shall be set at the lowest setting required to be audible above the surrounding noise. Installation and use of the alarms shall be consistent with the performance requirements of the current revisions of Society of Automotive Engineering (SAE) J994, J1446, and OSHA regulations.

ITEM 119.5 (Continued)

If work is allowed by the Engineer between the hours of 10 PM to 7 AM, the Contractor shall use in lieu of audible backup alarms an appropriate alternative safety method in accordance with OSHA regulations (29 CFR Part 1926, Subpart "O", 1926.601.b.4 and 1926.602.a.9.) and accepted Health and Safety Plan that is to be submitted by the Contractor. This applies to all vehicles and equipment operated by the Contractor, vendors, suppliers, and subcontractors on the construction site.

Per State regulation, engine idling for trucks is limited to 5 minutes maximum.

Acoustical Engineer

The Acoustical Engineer identified in this Article shall oversee all requirements of this Section.

The Acoustical Engineer shall have the following minimal qualifications:

1. Bachelor of Science or higher degree from a qualified program in engineering, physics, or architecture offered by an accredited university or college, and five years experience in noise control engineering and construction noise analysis; or current enrollment as a full Member or Board-certified Member in the Institute of Noise Control Engineering (INCE).

2. Demonstrated substantial and responsible experience in preparing and implementing construction noise controls and monitoring plans on construction projects conducted in an urban setting, calculating construction noise levels, and designing and overseeing the implementation of construction noise abatement measures.

If at any point, in the judgment of the Engineer, the quality of the Acoustical Engineer's submittals proves to be repeatedly unacceptable, then the Engineer can require the submittal and selection of an alternative Acoustical Engineer meeting the requirements.

MATERIALS

All equipment and materials specified in this part will remain the property of the Contractor or Contractor's subcontractors, vendors, and suppliers, as applicable.

Noise Reduction Materials and Equipment

Noise reduction materials may be new or used. Used materials shall be of a quality and condition to perform their designed function. Noise reduction equipment and materials may include, but not be limited to:

1. Shields, shrouds, or intake and exhaust mufflers.
2. Noise-deadening material to line hoppers, conveyor transfer points, storage bins, or chutes.
3. Noise barriers using materials consistent with the Temporary Noise Barrier materials specified in Article 2.03 of this Section.
4. Noise curtains using materials consistent with the Noise Control Curtains materials specified in Article 2.05 of this Section.

ITEM 119.5 (Continued)

All equipment used on the construction site, including jackhammers and pavement breakers, shall have exhaust systems and mufflers that have been recommended by the manufacturer as having the lowest associated noise.

The local power grid shall be used wherever feasible to limit generator noise. Where a generator is necessary, it shall have the maximum noise muffling capability recommended by the manufacturer to meet the noise emission limits specified in Table 3.

Temporary Noise Barriers

Materials

Temporary barriers shall be constructed of 3/4-inch Medium Density Overlay (MDO) plywood sheeting, or other material of equivalent utility and appearance having a surface weight of two pounds per square foot (2 lbs/sq.ft.) or greater. The temporary noise barriers shall have a Sound Transmission Class of STC-30, or greater, based on certified sound transmission loss data taken according to ASTM Test Method E90.

The temporary barriers shall be lined on one side with glass fiber, mineral wool, or other similar noise curtain type noise-absorbing material at least 2-inches thick and have a Noise Reduction Coefficient rating of NRC-0.85, or greater, based on certified sound absorption coefficient data taken according to ASTM Test Method C423.

The materials used for temporary barriers shall be sufficient to last through the duration of construction for this Contract, and shall be maintained in good repair.

Construction Details

Barrier panels shall be attached to support frames constructed in sections to provide a moveable barrier utilizing the standard "Temporary Precast Concrete Median Barrier" for the Project, or other supports designed to withstand 80 mph wind loads plus a 30 percent gust factor.

When barrier units are joined together, the mating surfaces of the barrier sides shall be flush with each other. Gaps between barrier units, and between the bottom edge of the barrier panels and the ground, shall be closed with material that will completely fill the gaps, and be dense enough to attenuate noise.

The barrier height shall be designed to break the line-of-sight and provide at least a 5 dBA insertion loss between the noise producing equipment and the upper-most story of the receptor(s) requiring noise mitigation. If for practicality or feasibility reasons, which are subject to the review and approval of the Engineer, a barrier can not be built to provide noise relief to all stories, then it must be built to the tallest achievable height.

Prefabricated acoustic barriers are available from various vendors. An equivalent barrier design can be submitted as specified in Paragraph 1.03.C. in lieu of the plywood barrier described above.

ITEM 119.5 (Continued)

Acoustical Barrier Enclosures

Materials

The acoustical barrier enclosure shall consist of durable, flexible composite material featuring a noise barrier layer bonded to sound-absorptive material on one side.

The noise barrier layer shall consist of rugged, impervious material with a surface weight of at least one pound per square foot (1 lbs/sq.ft.). The sound absorptive material shall include a protective face and be securely attached to one side of the flexible barrier over the entire face.

The acoustical material used shall be weather and abuse resistant, and exhibit superior hanging and tear strength during construction. The material shall have a minimum breaking strength of 120 lb/in. per FTMS 191 A-M5102 and minimum tear strength of 30 lb/in. per ASTM D117. Based on the same test procedures, the absorptive material facing shall have a minimum breaking strength of 100 lb/in. and a minimum tear strength of 7 lb/in.

The acoustical material shall be corrosion resistant to most acids, mild alkalies, road salts, oils, and grease.

The acoustical material shall be fire retardant and be approved by the applicable Fire Department(s) prior to procurement. It shall also be mildew resistant, vermin proof, and non-hygroscopic.

The acoustical material shall have a Sound Transmission Class of STC-25 or greater, based on certified sound transmission loss data taken according to ASTM Test Method E90. It shall also have a Noise Reduction Coefficient rating of NRC-0.70 or greater, based on certified sound absorption coefficient data taken according to ASTM Test Method C423.

The Contractor shall submit the name of the manufacturer, properties of the material to be furnished, and two one-foot square samples to the Engineer for review prior to submittal of design and detailed engineering as specified above.

Construction Details

The acoustical barrier enclosure shall be designed to effectively cover a noise producing source to reduce noise affecting nearby noise-sensitive receptors.

The acoustical material shall be installed in vertical and horizontal segments with the vertical segments extending the full enclosure height. All seams and joints shall have a minimum overlap of 2 inches and be sealed using double grommets. Construction details shall be performed according to the manufacturer's recommendations.

The Contractor shall be responsible for the design, detailing, and adequacy of the framework and supports, ties, attachment methods, and other appurtenances required for the proper construction of the acoustical barrier enclosure.

ITEM 119.5 (Continued)

The design and details for the acoustical noise barrier enclosure framework and supports shall be prepared and stamped by a Professional Engineer licensed in the Commonwealth of Massachusetts. The Contractor shall submit the design and detailed engineering drawings to the Engineer as specified in Paragraph 1.03.C.

Noise Control Curtains

Materials

The noise control curtain shall consist of durable, flexible composite material featuring a noise barrier layer bonded to sound-absorptive material on one side. The noise barrier layer shall consist of a rugged, impervious material with a surface weight of at least one pound per square foot (1 lbs/sq.ft). The sound absorptive material shall include a protective face and be securely attached to one side of the flexible barrier over the entire face.

The noise curtain material used shall be weather and abuse resistant, and exhibit superior hanging and tear strength during construction. The curtain's noise barrier layer material shall have a minimum breaking strength of 120 lb/in. per FTMS 191 A-M5102 and minimum tear strength of 30 lb/in. per ASTM D117.

Based on the same test procedures, the noise curtain absorptive material facing shall have a minimum breaking strength of 100 lb/in. and a minimum tear strength of 7 lb/in.

The noise curtain material shall be corrosion resistant to most acids, mild alkalies, road salts, oils, and grease. It also shall be mildew resistant, vermin proof, and non-hygroscopic.

The noise curtain material shall be fire retardant and be approved by the City and/or Town Fire Departments prior to procurement.

Noise control curtain shall have a Sound Transmission Class of STC-30 or greater, based on certified sound transmission loss data taken according to ASTM Test Method E90. It shall also have a Noise Reduction Coefficient rating of NRC-0.85 or greater, based on certified sound absorption coefficient data taken according to ASTM Test Method C423.

The Contractor shall submit the name of the manufacturer, properties of the material to be furnished, and two one-foot square samples to the Engineer for review prior to submittal of the design and detailed engineering drawings as specified above.

Construction Details

The noise control curtains shall be designed to effectively reduce noise affecting nearby noise-sensitive receptors. The curtains shall be secured above, at the ground, and at intermediate points by framework and supports designed to withstand 80 mph wind loads plus a 30 percent gust factor.

ITEM 119.5 (Continued)

The curtains shall be installed in vertical and horizontal segments with the vertical segments extending the full curtain height to the ground. All seams and joints shall have a minimum overlap of 2 inches and be sealed using Velcro or double grommets spaced 12 inches on center. Curtains shall be fastened to framework and guardrails with wire cable 12 inches on center. Construction details shall be performed according to the manufacturer's recommendations.

The curtain height shall be designed to break the line-of-sight and provide at least a 5 dBA insertion loss between the noise producing equipment and the upper-most story of the receptor(s) requiring noise mitigation. If for practicality or feasibility reasons, which are subject to the review and approval of the Engineer, a curtain system can not be built to provide noise relief to all stories, then it must be built to the tallest achievable height.

The Contractor shall be responsible for the design, detailing, and adequacy of the framework and supports, ties, attachment methods, and other appurtenances required for the proper installation of the noise control curtains.

The design and details for the noise control curtains framework and supports shall be prepared and stamped by a Professional Engineer licensed in the Commonwealth of Massachusetts. The Contractor shall submit the design and detailed engineering drawings to the Engineer as specified in Paragraph 1.03.C.

CONSTUCTION METHODS

Noise Reduction Methods

The Contractor shall use all reasonable efforts to implement noise reduction methods listed below to minimize construction noise emission levels. Noise reduction methods shall include, but not be limited to:

1. Use of: 1) concrete crushers or pavement saws for concrete deck removal, demolitions, or similar construction activity; 2) pre-auguring equipment to reduce the duration of impact or vibratory pile driving; 3) local power grid to reduce the use of generators.
2. Attaching: 1) intake and exhaust mufflers, shields, or shrouds; 2) noise-deadening material to inside of hoppers, conveyor transfer points, or chutes.
3. Maintaining: 1) equipment mufflers and lubrication; 2) precast decking or plates; 3) surface irregularities on construction sites to prevent unnecessary noise.
4. Limiting: 1) the number and duration of equipment idling on the site; 2) the use of annunciators or public address systems; 3) the use of air or gasoline-driven hand tools.
5. Configuring, to the extent feasible: 1) the construction site in a manner that keeps loud equipment and activities as far as possible from noise-sensitive locations; 2) barrels or signage to detour traffic away from plated trenches.
6. Scheduling of construction events and limiting usage times to minimize noise, especially during nighttime hours and near sensitive abutters.
7. Constructing noise barriers and/or noise curtain systems.

ITEM 119.5 (Continued)

8. Minimizing noise from the use of backup alarms using measures that meet OSHA regulations. This includes use of self-adjusting ambient-sensitive backup alarms, manually-adjustable alarms on low setting, use of observers, and scheduling of activities so that alarm noise is minimized.
9. Where practical and feasible, configuring construction sites to minimize backup alarm noise. For example, construction site access should be designed such that delivery and dump trucks move through the site in a forward manner without the need to back up.
10. Preventing nuisance noise conditions such as from squealing equipment, backup alarms, radios and public address systems, etc.
11. Using only variable message and sign boards that are solar powered or connected to the local power grid.

Complaint Procedure

The objective of the complaint procedure is to ensure that public and agency complaints are addressed and resolved consistently and expeditiously.

If the Contractor receives a complaint regarding construction noise, the Contractor shall immediately notify the Engineer and the Acoustical Engineer.

In the event that measured noise levels exceed allowable limits as specified under this item, or is resulting in nuisance conditions, the Contractor shall immediately use noise reduction materials and methods such as, but not limited to, those described in above to reduce noise levels or to alleviate the nuisance conditions.

Temporary Noise Barriers

The Contractor shall erect temporary noise barriers to mitigate construction noise at locations as directed by the Engineer.

The temporary noise barriers shall be readily moveable so that they may be re-positioned, as necessary, to provide noise abatement for non-stationary, as well as stationary, processes.

The barriers shall be installed such that the noise-absorptive surfaces face the construction noise source.

The Contractor shall maintain the temporary noise barriers and repair all damage that occurs, including, but not limited to, keeping barriers clean and free from graffiti and maintaining structural integrity. Gaps, holes, and weaknesses in the barriers, and openings between or under the units, shall be repaired promptly or replaced by the Contractor with new material.

The Contractor shall remove and dispose of the temporary noise barriers at the end of the Contract or sooner at the direction of the Engineer.

ITEM 119.5 (Continued)

Acoustical Barrier Enclosures

The Contractor shall erect acoustical barrier enclosures to mitigate construction noise at locations as required in construction drawings, or as directed by the Engineer.

The acoustical barrier enclosures shall be readily moveable so that they may be repositioned, as necessary, to provide noise abatement for non-stationary equipment (e.g., jackhammers, chain saws, compressors).

The acoustical enclosure shall be installed such that the noise-absorptive surfaces face the construction noise source.

The Contractor shall maintain the acoustical barrier enclosures and repair all damage that occurs, including, but not limited to, keeping barriers clean and free from graffiti and maintaining structural integrity. Gaps, holes, and weaknesses in the acoustical enclosure, and openings between or under the panels, shall be repaired promptly or replaced by the Contractor with new material. Construction work shall not proceed until repairs are made.

The Contractor shall remove and dispose of the acoustical enclosure at the end of the Contract or sooner at the direction of the Engineer.

Noise Control Curtains

The Contractor shall erect noise control curtains to mitigate construction noise at locations specified in construction drawings, or as directed by the Engineer.

Noise control curtains shall particularly be used for short-term operations (e.g., less than 3 months), or where vehicular or pedestrian access is required during the day, or as directed by the Engineer.

The noise control curtains shall be installed without any gaps such that the sound-absorptive side faces the construction activity to be shielded. The curtains shall be supported by the existing elevated Expressway, ramps, or other methods identified by the Contractor.

The Contractor shall maintain the noise control curtains and repair all damage that occurs, including, but not limited to, keeping barriers clean and free from graffiti and maintaining structural integrity. Gaps, holes, and weaknesses in the noise control curtains, and openings between or under the panels, shall be repaired promptly or replaced by the Contractor with new material. Construction work shall not proceed until such repairs are made.

The Contractor shall remove and dispose of the noise control curtains at the end of the Contract or sooner at the direction of the Engineer.

ITEM 119.5 (Continued)

TABLE 1. Noise Barrier 1 – Market Street to Everett Street Area Construction Noise Lot-Line Limits in dBA

Period of			Non-Impact Equipment			Impact Equipment		
the Day	Hours	Land-use	Leq	L10	Lmax	Leq	L10	Lmax
Daytime	7:00 am to 6:00 pm	Noise-sensitive	n/a	77 (a)	86 (a)	n/a	n/a	90
		Commercial	n/a	80 (a)	--	n/a	n/a	--
		Industrial	n/a	85 (a)	--	n/a	n/a	--
Evening	6:00 to 10:00 pm	Noise-sensitive	n/a	75	85	n/a	n/a	85
Nighttime	10:00 pm to 7:00 am	Noise-sensitive:						
		BL = 63	n/a	68	80	n/a	n/a	n/a

NOTES:

(a) Noise from impact equipment is exempt from the L10 requirement, however is still subject to a lot-line Lmax limit.

(b) All measurements shall be taken at the affected lot-line. In situations where the work site is within 50 feet of a lot-line, the measurement shall be taken from a point along the lot-line such that a distance of 50 feet is maintained between the sound level meter and the construction activity being monitored.

(c) Lot-line noise limits shall apply to all points along the receptor's lot-line.

(d) L10 noise readings are averaged over 20 minute intervals. Lmax noise readings occur instantaneously.

(e) BL is the average baseline or background measured in L10.

TABLE 2. Noise Barrier 2 – Everett Street to Franklin Street Area Construction Noise Lot-Line Limits in dBA

Period of			Non-Impact Equipment			Impact Equipment		
the Day	Hours	Land-use	Leq	L10	Lmax	Leq	L10	Lmax
Daytime	7:00 am to 6:00 pm	Noise-sensitive	n/a	77 (a)	85 (a)	n/a	n/a	90
		Commercial	n/a	80 (a)	--	n/a	n/a	--
		Industrial	n/a	85 (a)	--	n/a	n/a	--
Evening	6:00 to 10:00 pm	Noise-sensitive	n/a	77	85	n/a	n/a	85
Nighttime	10:00 pm to 7:00 am	Noise-sensitive:						
		BL = 67 BL < 70 dBA	n/a	72	80	n/a	n/a	n/a

NOTES:

(a) Noise from impact equipment is exempt from the L10 requirement, however is still subject to a lot-line Lmax limit.

(b) All measurements shall be taken at the affected lot-line. In situations where the work site is within 50 feet of a lot-line, the measurement shall be taken from a point along the lot-line such that a distance of 50 feet is maintained between the sound level meter and the construction activity being monitored.

(c) Lot-line noise limits shall apply to all points along the receptor's lot-line.

(d) L10 noise readings are averaged over 20 minute intervals. Lmax noise readings occur instantaneously.

(f) BL is the average baseline or background measured in L10.

ITEM 119.5 (Continued)

TABLE 3. Construction Equipment 50-Feet Noise Emission Limits (a), (b)

Equipment Category	**Lmax Noise Limit at 50 ft, dBA, slow**	**Is Equipment an Impact Device?** (c)	Acoustic **Usage Factor**(d)
All other equipment > 5 HP	85	No	50 %
Auger Drill Rig	84	No	20 %
Backhoe	78	No	40 %
Bar Bender	80	No	20 %
Blasting	94	Yes	1 %
Boring Jack Power Unit	80	No	50 %
Chain Saw	84	No	20 %
Clam Shovel	87	Yes	20 %
Compactor (ground)	80	No	20 %
Compressor (air)	78	No	40 %
Concrete Batch Plant	83	No	15 %
Concrete Mixer Truck	79	No	40 %
Concrete Pump Truck	81	No	20 %
Concrete Saw	90	No	20 %
Crane (mobile or stationary)	81	No	20 %
Dozer	82	No	40 %
Drill Rig Truck	79	No	20 %
Drum Mixer	80	No	50 %
Dump Truck	76	No	40 %
Excavator	81	No	40 %
Flat Bed Truck	74	No	40 %
Front End Loader	79	No	40 %
Generator (25 KVA or less)	73	No	50 %
Generator (more than 25 KVA)	81	No	50 %
Gradall	83	No	40 %
Grader	85	No	40 %
Grapple (on backhoe)	85	No	40 %
Horizontal Boring Hydraulic Jack	80	No	25 %
Hydra Break Ram	90	Yes	20 %
Impact Pile Driver (diesel or drop)	95	Yes	20 %
Insitu Soil Sampling Rig	84	No	20 %
Jackhammer	85	Yes	20 %
Man Lift	75	No	20 %
Mounted Impact Hammer (hoe ram)	90	Yes	20 %
Paver	77	No	50 %
Pavement Scarifier	85	No	20 %
Pickup Truck	75	No	40 %
Pneumatic Tools	85	No	50 %
Pumps	77	No	50 %
Refrigerator Unit	73	No	100 %
Rivet Buster / Chipping Gun	79	Yes	20 %
Rock Drill	81	No	20 %
Roller	80	No	20 %
Sand Blasting	90	No	20 %
Scraper	84	No	40 %
Shears (on backhoe)	90	No	40 %
Slurry Plant	78	No	100 %
Slurry Trenching Machine	80	No	50 %
Soil Mix Drill Rig	80	No	50 %
Tractor	84	No	40 %
Vacuum Excavator (vac-truck)	85	No	40 %
Vacuum Street Sweeper	80	No	10 %
Ventilation Fan	79	No	100 %
Vibrating Hopper	85	No	50 %
Vibratory Concrete Mixer	80	No	20 %
Vibratory Pile Driver	95	No	20 %
Warning Horn	83	No	5 %
Welder / Torch	73	No	40 %

ITEM 119.5 (Continued)

NOTES:
(a) Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.
(b) Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.
(c) "Impact" equipment is assumed to produce separate discernable sound pressure maxima.
(d) "Acoustic Usage Factor" represents the percent of time that equipment is assumed to be running at full power while working on site.

BASIS OF PAYMENT

Item 119.5 will be paid for at the Contract unit price per Lump Sum, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

Payment of 20% of the lump sum bid price of this item will be made after MassDOT acceptance of the Contractor's Noise Plan.

Payment of 70% of the lump sum bid price of this item will be broken down per completion of each milestone completed..

The remaining 10% of the Lump Sum bid price of this Item will be paid upon substantial completion of construction

ITEM 180.01 ENVIRONMENTAL HEALTH AND SAFETY PROGRAM LUMP SUM

The work shall consist of ensuring the health and safety of the Contractor's employees and subcontracting personnel, the Engineer, their representatives, the environment, and public welfare from any on-site chemical contamination present in air, soil, water and sediment.

The Contractor shall prepare and implement a site-specific Environmental Health and Safety Plan (EHASP) which has been approved and stamped by a Certified Industrial Hygienist (CIH) and includes the preparer's name and work experience. The EHASP shall include appropriate components required by OSHA Standard 29 CFR 1910.120(b) and the Massachusetts Contingency plan (MCP) 310 CMR 40.0018 and must comply with all applicable state and federal laws, regulations, standards and guidelines, and provide a degree of protection and training appropriate for implementation on the project. The EHASP shall be a dynamic document with provision for change to reflect new information, new practices or procedures, changing site environmental conditions or other situations which may affect site workers and the public. The EHASP shall be developed and implemented independently from the standard construction HASP required to work on all MassDOT construction projects.

Health and safety procedures provided by the Contractor shall comply with all the appropriate regulations that address employee working conditions, including but not limited to standards established by OSHA and National Institute for Occupational Safety and Health (NIOSH). Equipment used for the purpose of health and safety shall be approved by and meet pertinent standards and specifications of the appropriate regulatory agencies.

A copy of the most up-to-date version of the EHASP shall be maintained on-site at all times by the Contractor. The on-site copy shall contain the signature of the Engineer and each on-site employee of the MassDOT, Contractor, and Subcontractors involved with on-site activities. The employee's signature on the EHASP shall be deemed prima facie evidence that the employee has read and understands the plan. Updated copies of signature sheets shall be submitted to the Engineer.

The EHASP shall specify a Contractor Site Safety and Health Officer responsible for implementation of the EHASP and to oversee all construction activities, including handling, storage, sampling and transport, which require contact with or exposure to potentially hazardous materials.

The level of protection, required to ensure the health and safety of on-site personnel will be stipulated in the EHASP. The Site Safety and Health Officer shall implement the EHASP based on changing site and weather conditions, type of operation or activity, chemical compounds identified on-site, concentration of the chemicals, air monitoring data, physical state of the hazardous materials, potential duration of exposure to hazardous materials, dexterity required to perform work, decontamination procedures, necessary personnel and type of equipment to be utilized.

ITEM 180.01 (Continued)

During implementation of the EHASP, a daily log shall be kept by the Site Safety and Health Officer and a copy shall be provided weekly to the Engineer. This log shall be used to record a description of the weather conditions, levels of personal protection being employed, screening data and any other information relevant to on-site environmental safety conditions. The Site Safety and Health Officer shall sign and date the daily log.

Method of Measurement and Basis of Payment

Preparation and implementation of the Environmental Health and Safety Program, including the monitoring, protection and storage of all contaminated materials, as well as subsequent modifications to the EHASP, will be measured and paid for at the Lump Sum Bid Price.

Payment of 50% of the Environmental Health and Safety Program contract price will be made upon the initial acceptance of the EHASP by the Engineer. Payment of the remaining 50% of the Environmental Health and Safety Program contract price will be made upon completion of the work. The bid price shall include preparation and implementation of the EHASP as well as the cost for its enforcement by the Site Safety and Health Officer along with any necessary revisions and updates. The work of implementing the Environmental Health and Safety Program includes work involving, but not limited to, the monitoring, protection, and storage of all contaminated materials.

ITEM 180.02 PERSONAL PROTECTION LEVEL C UPGRADE HOUR

The work shall consist of providing appropriate personal protective equipment (PPE) for all personnel in an area either containing or suspected of containing a hazardous environment.

Contingencies for upgrading the level of protection for on-site workers will be identified in the EHASP and the Contractor shall have the capability to implement the personal protection upgrade in a timely manner. The protective equipment and its use shall be in compliance with the EHASP and all appropriate regulations and/or standards for employee working conditions.

Personal Protection Level C Upgrade will be measured and paid only upon upgrade to Level C and will be at the contract unit price, per hour, per worker, required in Level C personal protection. No payment will be made to the Contractor to provide Level D PPE.

ITEM 180.03 LICENSED SITE PROFESSIONAL SERVICES HOUR

Within limited areas of the project site, media (i.e. soils, sediments, surface water and/or groundwater) requiring evaluation and/or management under the Massachusetts Contingency Plan (MCP) may be encountered. A Licensed Site Professional (LSP) shall be required to provide the services necessary to comply with the requirements of the MCP. These services may include a site walk, field screening, sampling, analysis and characterization of potentially contaminated media, preparation and implementation of Immediate Response Action (IRA) Plans, Utility-Related Abatement Measure (URAM) and Release Abatement Measure (RAM) Plans, Imminent Hazard Evaluations, status reports, transmittal forms, release notification forms, risk assessments, completion statements, and related documents required pursuant to the MCP. LSP services shall also be necessary to temporarily move material generated on the project to an off-site storage location.

The name and qualifications of the LSP and all environmental technicians to be assigned to the project shall be submitted to the Engineer for approval at least four weeks prior to initial site activities. The LSP shall have a current, valid license issued by the Massachusetts Board of Registration of Hazardous Waste Site Cleanup Professionals. The LSP shall have significant experience in the oversight of MCP activities at active construction sites. Qualification packages for the LSP and each technician shall include a resume, all recent work assignments with responsibilities identified (previous 5 years), and applicable training and certifications. A list of all Notices of Noncompliance, Notice of Audit Findings and Enforcement Orders issued by the Massachusetts Department of Environmental Protection (DEP) shall be submitted for all work assignments listed for the LSP and environmental technicians. Upon approval of the LSP Qualifications, the LSP will be designated as the LSP of Record unless MassDOT designates in writing otherwise. The LSP of Record will serve as the primary point of contact for all hazardous material matters on the project.

The LSP shall evaluate soil and/or sediment with discoloration, odor, elevated field screening results, presence of petroleum liquid or sheen on the groundwater surface, or any abnormal gas or materials in the ground which are known or suspected to be oil or hazardous materials. Excavated soil and sediment which is suspected of petroleum contamination shall be field screened using the jar headspace procedures according to established DEP Guidance. All field screening equipment must be pre-approved by the Engineer. The LSP shall ensure proper on-site calibration of all field screening instrumentation.

The Engineer shall be contacted immediately when observations or any field screening results verify contamination requiring further analysis, and/or enhanced management of suspect media. Any enhanced management of contaminated soil to ensure proper stockpiling and storage is incidental to the LSP Services item. The LSP shall evaluate the need for confirmatory sampling prior to backfill in areas where contaminated material has been excavated and disposed off-site for compliance with applicable regulatory requirements. The Engineer shall approve the locations of the testing sites prior to the sampling.

ITEM 180.03 (Continued)

Contaminated media shall be handled in accordance with all applicable state and federal statutes, regulations, and policies. The LSP shall adequately evaluate contaminated media for compliance with the requirements of the MCP and Department Policies.

The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations and both shall be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations. The LSP shall maintain written records in a clear and concise tabular format which tracks the excavation, stockpiling, analysis and reuse/disposal of all known/suspect contaminated media. These records shall be up-to-date and submitted to the Engineer on a bi-weekly basis. The LSP shall review and summarize the laboratory data from any analyses performed on contaminated media in a tabular format and compare the results to applicable reporting thresholds. A report shall be delivered to the Engineer outlining the material sampling methods, laboratory analysis results, evaluation of applicable regulatory exemptions, reporting obligations, and proposed course of action. The laboratory report together with Chain of Custody forms for all analytical results shall be submitted to the Engineer within 14 days after completion of such analyses.

The LSP and Contractor shall be held responsible for the submission of all MCP-related documents to the Engineer at least 14 days in advance of any timeframe specified in the MCP and for the timely submission of data and tracking information as noted within this Item. All documents prepared under this Item must be reviewed and signed by the approved LSP. The Contractor and LSP shall be responsible for all fines, damages, and enforcement requirements imposed by applicable regulatory agencies for failure to meet regulatory and contract timeframes. No compensation will be provided for such fines, damages, and enforcement actions.

The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations and shall both be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations.

If the Contractor causes a release of OHM, the Contractor shall be responsible for assessing and remediating the release in accordance with all pertinent State and Federal regulations, including securing the services of a LSP, at his own expense.

The LSP shall coordinate all activities involving both MassDOT and the DEP through the Engineer. Any notification of release shall be approved by the Engineer before submittal to the DEP, except if an imminent hazard condition exists as defined in 309 CMR 4.03(4)(b).

ITEM 180.03 (Continued)

LABORATORY TESTING IN SUPPORT OF LSP SERVICES

Laboratory testing provides for analytical testing in support of LSP services related to maintaining MCP compliance, such as delineating the extent and type of contamination present. Sampling and testing for disposal purposes are not included and are incidental to Items 181.11-181.14.

In order to maintain compliance with the MCP and Department Policies or other regulatory requirements, the LSP shall request approval from the Engineer to obtain samples from various locations and depths within the project area and to perform laboratory analyses on those samples. No sampling shall be conducted without prior approval from the Engineer. The samples shall be delivered to a DEP-certified laboratory using proper chain-of-custody documentation for analyses which, depending upon site conditions and suspected and/or identified contaminants of concern, may include, but are not limited to, metals, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polycyclic aromatic hydrocarbons (PAHs), extractable petroleum hydrocarbons (EPHs) and volatile petroleum hydrocarbons (VPHs). Subsequent testing, depending upon initial results, may be required for Toxicity Characteristic Leaching Procedure (TCLP) analyses (EPA Method 1311) for metals.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

LSP Services for work under this item will be measured per person, per hour of service provided by LSP, Environmental Technicians and other approved personnel. Travel time shall not be included in the billable hours.

The quantity and type of laboratory tests must be approved by the Engineer beforehand. The Contractor will be reimbursed upon satisfactory written evidence of payment. The Contractor may be required to obtain cost estimates from three DEP certified laboratories for the Engineer to choose the service provider.

LSP Services will be paid at the Contractor bid price for each hour, or fraction thereof, spent to perform the work as described above. The bid price shall be a blended rate that includes the cost of the LSP, environmental technicians and other personnel, the performance of all work tasks and field screening, including required equipment, materials and instrumentation, and production of all documentation described above. All requests for payment must be accompanied by the following information: the names of the personnel associated with the work charged under LSP Services, dates and hours worked, work conducted, including, where appropriate, locations as identified on the construction plans, and a copy of the field diary for the dates submitted.

Laboratory testing will be reimbursed upon receipt of paid invoices for testing approved by the Engineer.

ITEM 181.11	**DISPOSAL OF UNREGULATED SOIL**	**TON**
ITEM 181.12	**DISPOSAL OF REGULATED SOIL – IN-STATE FACILITY**	**TON**
ITEM 181.13	**DISPOSAL OF REGULATED SOIL - OUT-OF-STATE FACILITY**	**TON**
ITEM 181.14	**DISPOSAL OF HAZARDOUS WASTE**	**TON**

General

The work under these Items shall include the transportation and disposal of contaminated material excavated, or excavated and stockpiled. It shall also include the cost of any additional laboratory analyses required by a particular disposal facility beyond the standard disposal test set.

Excavation of existing subsurface materials may include the excavation of contaminated soils. The Contractor shall be responsible for the proper coordination of characterization, transport and disposal, recycling or reuse of contaminated soils. Disposal, recycling or reuse will be referred to as "disposal" for the purposes of this specification. However, regardless of the use of the term herein, there will be no compensation under these items for reuse within the project limits. The Contractor will be responsible for coordinating the activities necessary for characterization, transport and disposal of contaminated soils. Such coordination will include the Engineer and his/her designee overseeing management of contaminated materials. Contaminated soils must be disposed of in a manner appropriate for the soil classification as described below and in accordance with the applicable laws of local, state and federal authorities. The Contractor shall be responsible for identifying disposal facility (ies) licensed to accept the class of contaminated soils to be managed and assure that the facility can accept the anticipated volume of soil contemplated by the project. The Contractor shall be responsible for hiring a Licensed Site Professional (LSP) and all ancillary professional services including laboratories as needed for this work. The Contractor will be responsible for obtaining all permits, approvals, manifests, waste profiles, Bills of Lading, etc. subject to the approval of the Engineer prior to the removal of the contaminated soil from the site. The Contractor and LSP shall prepare and submit to the Engineer for approval all documents required under the Massachusetts Contingency Plan (MCP) and related laws and environmental regulations to conduct characterization, transport, and disposal of contaminated materials.

Classes Of Contaminated Soils

The Contractor and its LSP shall determine if soil excavated or soil to be excavated is unregulated soil or contaminated soil as defined in this section. Such materials shall be given a designation for purposes of reuse or disposal based on the criteria of the MCP. Soils and sediments which are not suitable for reuse will be given a designation for purposes of off-site disposal based on the characterization data and disposal facility license requirements. The Classes of Contaminated Soils are defined as follows:

ITEMS 181.11 through 181.14 (Continued)

Unregulated Soil consists of soil, fill and dredged material with measured levels of oil and hazardous material (OHM) contamination at concentrations below the applicable Reportable Concentrations (RCs) presented in the MCP. Unregulated soil consists of material which may be reused (or otherwise disposed) as fill within the Commonwealth of Massachusetts subject to the non-degradation criteria of the MCP (310 CMR 40.0032(3), in a restricted manner, such that they are sent to a location with equal or higher concentrations of similar contaminants. Disposal areas include licensed disposal facilities, approved industrial settings in areas which will be capped or covered with pavement or loamed and seeded, and for purposes of this project should be reused as fill within the project site construction corridor whenever possible. The material cannot be placed in residential and/or environmentally sensitive (e.g. wetlands) areas. Under no circumstances shall contaminated soils be placed in an uncontaminated or less contaminated area (including the area above the groundwater table if this area shows no sign of contamination).

The Contractor shall submit to MassDOT the proposed disposal location for unregulated soils for approval. If such a disposal location is not a licensed disposal facility, the Contractor shall submit to the Engineer analytical data to characterize the disposal area sufficiently to verify that the unregulated material generated within the MassDOT construction project limits is equal to or less than the contaminant levels at the disposal site and meets the non-degradation requirements of the MCP. In addition, the Contractor shall provide written confirmation from the owner of the proposed disposal location that they have been provided with the analytical data for both the materials to be disposed as well as the disposal site characterization and that s/he agrees to accept this material. A Material Shipping Record or Bill of Lading, as appropriate, shall be used to track the off-site disposal of unregulated soil and a copy, signed by the disposal facility or property owner, shall be provided to the Engineer in order to document legal disposal of the unregulated material.

The cost of on-site disposal of unregulated soil within the project area will be considered incidental to the item of work to which it pertains.

ITEMS 181.11 through 181.14 (Continued**)**

Regulated Soil consists of materials containing measurable levels of OHM that are equal to or exceed the applicable Reportable Concentrations for the site as defined by the MCP, 310 CMR 40.0000. Regulated soil which meets the MCP reuse criteria of the applicable soil/groundwater category for this project area may be reused on site provided that it meets the appropriate geotechnical criteria established by the Engineer. Regulated Soil may be reused (as daily or intermediate cover or pre-cap contouring material) or disposed (as buried waste) at lined landfills within the Commonwealth of Massachusetts or at an unlined landfill that is approved by the Massachusetts Department of Environmental Protection (DEP) for accepting such material, in accordance with DEP Policy #COMM-97-001, or at a similar out-of-state facility. It should be noted that soils which exceed the levels and criteria for disposal at in-state landfills, as outlined in COMM-97-001, may be shipped to an in-state landfill, but require approval from the DEP Division of Solid Waste Management and receiving facility. An additional management alternative for this material is recycling into asphalt. Regulated Soils may also be recycled at a DEP approved recycling facility possessing a Class A recycling permit subject to acceptance by the facility and compliance with DEP Policy #BWSC-94-400. Regulated Soil removed from the site for disposal or treatment must be removed via an LSP approved Bill of Lading, Manifest or applicable material tracking form. This type of facility shall be approved/permitted by the State in which it operates to accept the class of contaminated soil in accordance with all applicable local, state and federal regulations.

Hazardous Waste consists of materials which must be disposed of at a facility permitted and operated in full compliance with Federal Regulation 40 CFR 260-265, Massachusetts Regulation 310 CMR 30.000, Toxic Substances Control Act (TSCA) regulations, or the equivalent regulations of other states, and all other applicable local, state, and federal regulations. All excavated materials classified as hazardous waste shall be disposed of at an out-of-state permitted facility. This facility shall be a RCRA hazardous waste or TSCA facility, or RCRA hazardous waste incinerator. This type of facility shall be approved/permitted by the State in which it operates to accept hazardous waste in accordance with all applicable local, state and federal regulations and shall be permitted to accept all contamination which may be present in the soil excavate. The Contractor shall ensure that, when needed, the facility can accept TSCA waste materials i.e. polychlorinated biphenyls (PCBs). Hazardous waste must be removed from the site for disposal or treatment via an LSP approved Manifest.

Monitoring/Sampling/Testing Requirements

The Contractor shall be responsible for monitoring, sampling and testing during and following excavation of contaminated soils to determine the specific class of contaminated material. Monitoring, sampling and testing frequency and techniques should be performed in accordance with Item 180.03 – LSP Services. Additional sampling and analysis may be necessary to meet the requirements of the disposal facility license. The cost of such additional sampling and analysis shall be included in the bid cost for the applicable disposal items. The Contractor shall obtain sufficient information to demonstrate that the contaminated soil meets the disposal criteria set by the receiving facility that will accept the material.

ITEMS 181.11 through 181.14 (Continued**)**

No excavated material will be permanently placed on-site or removed for off-site disposal until the results of chemical analyses have been received and the materials have been properly classified. The Contractor shall submit to the Engineer results of field and laboratory chemical analyses tests within seven days after their completion, accompanied by the classification of the material determined by the Contractor, and the intended disposition of the material. The Contractor shall submit to the Engineer for review all plans and documents relevant to LSP services, including but not limited to, all documents that must be submitted to the DEP.

Waste Tracking:
Copies of the fully executed Weight Slips/Bills of Lading/ Manifests/Material Shipping Records or other material tracking form received by the Contractor from each disposal facility and for each load disposed of at that facility, shall be submitted to Engineer and the Contractor's LSP within three days of receipt by the Contractor. The Contractor is responsible for preparing and submitting such documents for review and signature by the LSP or other appropriate person with signatory authority, three days in advance of transporting soil off-site. The Contractor shall furnish a form attached to each manifest or other material tracking form for all material removed off-site, certifying that the material was delivered to the site approved for the class of material. If the proposed disposition of the material is for reuse within the project construction corridor, the Contractor shall cooperate with MassDOT to obtain a suitable representative sample(s) of the material to establish its structural characteristics in order to meet the applicable structural requirements as fill for the project.

All material transported off-site shall be loaded by the Contractor into properly licensed and permitted vehicles and transported directly to the selected disposal or recycling facility and be accompanied by the applicable shipping paper. At a minimum, truck bodies must be structurally sound with sealed tail gates, and trucks shall be lined and loads covered with a liner, which shall be placed to form a continuous waterproof tarpaulin to protect the load from wind and rain.

Decontamination Of Equipment
Tools and equipment which are to be taken from and reused off site shall be decontaminated in accordance with applicable local, state and federal regulations. This requirement shall include, but not be limited to, all tools, heavy machinery and excavating and hauling equipment used during excavation, stockpiling and handling of contaminated material. Decontamination of equipment is considered incidental to the applicable excavation item.

ITEMS 181.11 through 181.14 (Continued**)**

Regulatory Requirements

The Contractor shall be responsible for adhering to regulations, specifications and recognized standard practices related to contaminated material handling during excavation and disposal activities. MassDOT shall not be responsible at any time for the Contractor's violation of pertinent State or Federal regulations or endangerment of laborers and others. The Contractor shall comply with all rules, regulations, laws, permits and ordinances of all authorities having jurisdiction including, but not limited to, Massachusetts DEP, the U.S. Environmental Protection Agency (EPA), Federal Department of Transportation (DOT), Massachusetts Water Resources Authority (MWRA), the Commonwealth of Massachusetts and other applicable local, state and federal agencies governing the disposal of contaminated soils.

All labor, materials, equipment and services necessary to make the work comply with such regulations shall be provided by the Contractor without additional cost to MassDOT. Whenever there is a conflict or overlap within the regulations, the most stringent provisions shall apply. The Contractor shall reimburse MassDOT for all costs it incurs, including penalties and/or for fines, as a result of the Contractor's failure to adhere to the regulations, specifications, recognized standard practices, etc., that relate to contaminated material handling, transportation and disposal.

SUBMITTALS

I. Summary of Sampling Results, Classification of Material and Proposed Disposal Option.

The following information, presented in tabular format, must be submitted to the Engineer for review and approval prior to any reuse on-site or disposal off-site. This requirement is on-going throughout the project duration. At least two weeks prior to the start of any excavation activity, the Contractor shall submit a tracking template to be used to present the information as stipulated below. Excavation will not begin until the format is acceptable to MassDOT.

Characterization Reports will be submitted for all soil, sediment, debris and groundwater characterized through the sampling and analysis program. Each report will include a site plan which identifies the sampling locations represented in the Report. The Construction Plan sheets may be used as a baseplan to record this information.

The Sampling Results will be presented in tabular format. Each sample will be identified by appropriate identification matching the sample identification shown on the Chain of Custody Record. The sample must also be identified by location (e.g. grid number or stockpile number).

For each sample, the following information must be listed: the classification (unregulated, regulated, etc.), proposed disposal option for the stockpile or unit of material represented, and, all analytical results.

ITEMS 181.11 through 181.14 (Continued**)**

Each Characterization Report will include the laboratory analytical report and Chain of Custody Record for the samples included in the Report.

II. Stockpiling, Transport, and Disposal.

At least two weeks prior to the start of any excavation activity, the Contractor shall submit, in writing, the following for review and shall not begin excavation activity until the entire submittal is acceptable to MassDOT.

Excavation and Stockpiling Protocol:
Provide a written description of the management protocols for performing excavation and stockpiling and/or direct loading for transport, referencing the locations and methods of excavating and stockpiling excavated material.

Disposal and Recycling Facilities:

1. Provide the name, address, applicable licenses and approved waste profile for disposal and/or recycling location(s) where contaminated soil will be disposed. Present information substantiating the suitability of proposed sites to receive classifications of materials intended to be disposed there, including the ability of the facility to accept anticipated volumes of material.

2. Provide a summary of the history of compliance actions for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. Material should not be sent to facilities which are actively considered by the DEP, USEPA or other responsible agency to be in violation of federal, state or local hazardous waste or hazardous material regulations. MassDOT reserves the right to reject any facility on the basis of poor compliance history.

Transportation:
The name, address, applicable license and insurance certificates of the licensed hauler(s) and equipment and handling methods to be used in excavation, segregation, transport, disposal or recycling.

III. Material Tracking and Analytical Documentation for Reuse/Disposal.

The following documents are required for all excavation, reuse and disposal operations and shall be in the format described. At least two weeks prior to the start of any excavation or demolition activity, the Contractor shall submit the tracking templates required to present the information as stipulated below. Excavation or demolition will not begin until the format is acceptable to MassDOT.

ITEMS 181.11 through 181.14 (Continued**)**

All soils, sediments and demolition debris must be tracked from the point of excavation to stockpiling to onsite treatment/processing operations to off-site disposal or onsite reuse as applicable.

Demolition Debris:
Demolition debris must be tracked if the debris is stockpiled at a location other than the point of origin or if treatment or material processing is conducted. Identification of locations will be based on the station-offset of the location. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations/comments, quantity, and stockpile ID/processing operation location. For each unit of material tracked, the table will also track reuse of the material on-site, providing reuse date, location of reuse as defined by start and end station, width of reuse location by offset, the fill elevation range, quantity, and finish grade for said location. For demolition debris which is not reused on site, the table will also track disposal of the material as defined by disposal date, quantity and disposal facility. The table must provide a reference to any analytical data generated for the material.

Soil/Sediment:
Soil excavation will be identified based on the station-offset of the excavation location limits. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations, quantity, and stockpile number/location. For each unit of material tracked, the table will also track reuse of the material on-site and disposal of the material off-site using the same categories identified for demolition debris above.

Method Of Measurement And Basis Of Payment
Disposal of contaminated soil shall be measured for payment by the Ton of actual and verified weight of contaminated materials removed and disposed of. The quantities will be determined only by weight slips issued by and signed by the disposal facility. The most cost-effective, legal disposal method shall be used. The work of the LSP for disposal under all of these items shall be incidental to the work with no additional compensation.

ITEM 181.11 Measurement for Disposal of Unregulated Soil shall be under the Contract Unit Price by the weight, in tons, of contaminated materials removed from the site and transported to and disposed of at an approved location or licensed facility, and includes any and all costs for approvals, permits, fees and taxes, additional testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.12 Measurement for Disposal of Regulated Soil – In-State Facility shall be under the Contract Unit Price by the weight in tons of contaminated materials removed from the site and transported to and disposed of at an approved in-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEMS 181.11 through 181.14 (Continued)

ITEM 181.13 Measurement for Disposal of Regulated Soil - Out-of-State Facility shall be under the Contract Unit Price by the weight in tons of contaminated materials removed from the site and transported to and disposed of at an approved out-of-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.14 Measurement for Disposal of Hazardous Waste shall be under the Contract Unit Price by the weight in tons of hazardous waste removed from the site and transported to and disposed of at the licensed hazardous waste facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 184.1 DISPOSAL OF TREATED WOOD PRODUCTS TON

Work under this item shall include the transportation and disposal of all treated existing wood product as directed by the Engineer.

The timber components of the existing structure are suspected to be treated with creosote, pentachlorophenol and/or CCA. This item shall include all costs for sampling, laboratory testing, loading, transportation and disposal of the treated wood. The Contractor is required to submit disposal manifests to the Engineer prior to the completion of the project. All aspects of this Item are to be completed in accordance with state and federal regulations.

Compensation

Measurement and payment will be by the weight, in tons, of treated timber transported and accepted at a licensed facility. The work shall be considered full compensation for all labor, tools, equipment, materials, testing, loading, transportation, approvals, and permits necessary for the completion of the work.

ITEM 697.1 SILT SACK EACH

Work under this item shall conform to the relevant provisions of Subsections 227 and 670 of the Standard Specifications and the following:

The work under this item includes the furnishing, installation, maintenance and removal of a reusable fabric sack to be installed in drainage structures for the protection of wetlands and other resource areas and the prevention of silt and sediment from the construction site from entering the storm water collection system. Devices shall be ACF Environmental (800)-448-3636; Reed & Graham, Inc. Geosynthetics (888)-381-0800; The BMP Store (800)-644-9223; or approved equal.

CONSTRUCTION

Silt sacks shall be installed in retained existing catch basins and drop inlets within the project limits and as required by the Resident Engineer.

The silt sack shall be as manufactured to fit the opening of the drainage structure under regular flow conditions, and shall be mounted under the grate. The insert shall be secured from the surface such that the grate can be removed without the insert discharging into the structure. The filter material shall be installed and maintained in accordance with the manufacturer's written literature and as directed by the Engineer.

Silt sacks shall remain in place until the placement of the pavement overlay or top course and the graded areas have become permanently stabilized by vegetative growth. All materials used for the filter fabric will become the property of the Contractor and shall be removed from the site.

The Contractor shall inspect the condition of silt sacks after each rainstorm and during major rain events. Silt sacks shall be cleaned periodically to remove and disposed of accumulated debris as required. Silt sacks, which become damaged during construction operations, shall be repaired or replaced immediately at no additional cost to the Department.

When emptying the silt sack, the contractor shall take all due care to prevent sediment from entering the structure. Any silt or other debris found in the drainage system at the end of construction shall be removed at the Contractors expense. The silt and sediment from the silt sack shall be legally disposed of offsite. Under no condition shall silt and sediment from the insert be deposited on site and used in construction.

All curb openings shall be blocked to prevent stormwater from bypassing the device.

All debris accumulated in silt sacks shall be handled and disposed of as specified in Section 227 of the Standard Specifications

COMPENSATION

Silt sacks will be measured and paid at the Contract unit price per each, complete in place, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for removal and disposal of the sediment from the insert, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 698.3 GEOTEXTILE FABRIC FOR SEPARATION SQUARE YARD

The work under this item shall consist of placing a geotextile fabric in the construction of the noise barrier and retaining walls as shown on the plans to separate the crushed stone from the gravel borrow and the loam and seed.

The geotextile fabric shall conform to Department Material Specification M9.50.0 Geotextile Fabric Separation.

Methods

Fabric shall be placed in intimate contact with the crushed stone. Seams shall be overlapped by at least two feet. If the Contractor elects to sew seams instead of overlap, colored thread must be used. The Contractor shall take care not to allow more than two weeks of exposure to direct sunlight. Fabric rolls shall not be dropped more than two feet.

The geotextile fabric shall be installed smooth with no puckers, ridges or similar irregularities on a prepared graded surface having no sharp projections. The fabric shall not be staked but shall be secured in place with stones to prevent movement when backfill is placed against it. Fabric shall be completely covered with backfill material of the type and minimum cover required at each installation. The backfill material shall be placed and spread to provide a workable surface that will not damage fabric and backfill material already placed. Torn or displaced fabric shall be replaced and reinstalled at no additional compensation.

METHOD OF MEASUREMENT

Item 698.3 will be measured for payment by the Square Yard of Geotextile Fabric for Separation, complete in place. No additional payment will be made for overlapping material.

BASIS OF PAYMENT

Item 698.3 will be paid for at the Contract unit price per Square Yard of Geotextile fabric for separation, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 740. ENGINEER'S FIELD OFFICE AND EQUIPMENT (TYPE A) MONTH

The work under this Item shall conform to the relevant provisions of Subsection 740 of the Standard Specifications and the following:

Three computer systems and printer system meeting minimum requirements set forth below including installation, maintenance, power, paper, dsks, and other supplies shall be provided at the Resident Engineer's Office:

All equipment shall be UL approved and Energy Star compliant.

The Computer System shall meet the following minimum criteria or better:

Processor:	Intel, 3.5 GHz
System Memory (RAM):	12 GB
Hard Drive:	500 GB
Optical Drive:	DVD-RW/DVD+RW/CD-RW/CD+RW
Graphics Card:	8 GB
Network Adapter:	10/100 Mbit/s
USB Ports:	6 USB 3.0 ports
Keyboard:	Generic
Mouse:	Optical mouse with scroll, MS-Mouse compliant
Video/Audio	the computer system shall be capable of allow video calling and recording:
Video camera	shall be High Definition 1080p widescreen capable video calling and recording with built in microphone. The microphone system shall capture natural audio while filtering out background noise.
Audio	shall be stereo multimedia speaker system delivering premium sound.
OS:	Latest Windows Professional with all security updates
Web Browser:	Latest Internet Explorer with all security updates
Applications:	Latest MS Office Professional with all security updates Latest Adobe Acrobat Professional with all security updates Latest Autodesk AutoCAD LT Antivirus software with all current security updates maintained through the life of the contract.
Monitors:	Two 27" LED with Full HD resolution. Max. resolution 1920 x 1080
Flash drives:	2 (two) - 128GB USB 3.0
Internet access:	High Speed (min. 24 mbps) internet access with wireless router.

ITEM 740. (Continued)

The Multifunction Printer System shall meet the following minimum criteria or better:

Color laser printer, fax, scanner, email and copier all in one with the following minimum capabilities:

- Estimated volume 8,000 pages per month
- LCD touch panel display
- 50 page reversing automatic document feeder (RADF) (not including the bypass tray)
- Reduction/enlargement capability
- Ability to copy and print 11" x 17" paper size
- email and network pc connectivity
- Microsoft and Apple compatibility
- ability to overwrite latent images on hard drive
- 600 x 600 dpi capability
- 30 pages per minute print speed (color),
- 4 Paper Trays Standard
- Automatic duplexing
- Finisher with staple functions
- Standard Ethernet. Print Controller
- Scan documents to PDF, PC and USB
- ability to print with authenticated access protection

The Contractor shall supply a maintenance contract for next day service, and all supplies (toner, staples, paper) necessary to meet estimated monthly usage.

The Engineer's Field Office and the equipment included herein including the computer systems, and printer shall remain the property of the Contractor at the completion of the project. Disks, flash drives, and card readers with cards shall become the property of the Department.

Compensation for this work will be made at the contract unit price per month which price includes full compensation for all services and equipment, and incidentals necessary to provide equipment, maintenance, insurance as specified and as directed by the Engineer.

ITEM 756. NPDES STORM WATER POLLUTION PREVENTION PLAN LUMP SUM

This Item addresses the preparation and implementation of a Storm Water Pollution Prevention Plan required by the National Pollutant Discharge Elimination System (NPDES) and applicable Construction General Permit (CGP) issued by the U.S. Environmental Protection Agency (EPA).

Pursuant to the Federal Clean Water Act, construction activities which disturb one acre or more are required to apply to the EPA for coverage under the NPDES General Permit for Storm Water Discharges from Construction Activities. The Contractor shall be fully responsible for compliance with the most recently issued CGP and any subsequent revisions. Should a fine or damages be assessed against it, or MassDOT, as a result of a local, state, or federal enforcement action due to non-compliance with the CGP, the Contractor shall take full responsibility.

The NPDES CGP requires the submission of a Notice of Intent (NOI) to the EPA prior to the start of construction (defined as any activity which disturbs land, including clearing and grubbing). There is a fourteen (14) day review period commencing from the date on which EPA enters the Notice into their database. Based on the review of the NOI, EPA may require additional information, including but not limited to, the submission of the Storm Water Pollution Prevention Plan (SWPPP) for review. Work may not commence on the project until final authorization has been granted by EPA. Any additional time required by EPA for review of submittals will not constitute a basis for claim of delay.

In addition, if the project discharges to an Outstanding Resource Water, vernal pool, or is within a coastal ACEC as identified by the Massachusetts Department of Environmental Protection (DEP), a separate notification to DEP is required. DEP may also require submission of the Storm Water Pollution Prevention Plan for review and approval. Filing fees associated with the notification to DEP and, if required, the SWPPP filing to DEP shall be paid by the Contractor.

The CGP also requires the preparation and implementation of a SWPPP in accordance with the afore-mentioned statutes and regulations. The Plan will include the CGP conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction. The contractor shall prepare the SWPPP and update it as necessary. The Contractor shall submit the Plan to the Engineer for approval at least four (4) weeks prior to any site activities. It is the responsibility of the Contractor to comply with the CGP conditions and the conditions of any state Wetlands Protection Act Order, Water Quality Certification, Corps of Engineers Section 404 Permit and other environmental permits applicable to the project and to include in the SWPPP the methods and means necessary to comply with applicable conditions of said permits.

It is the responsibility of the Contractor to complete the SWPPP in accordance with the EPA CGP, provide all information required, and obtain any and all certifications as required by the CGP. Any amendments to the SWPPP required by site conditions, schedule changes, revised work, regulations, construction methodologies, and the like are the responsibility of the Contractor. Amendments will require the approval of the Engineer prior to implementation.

ITEM 756. (Continued)

In addition to the CGP requirements for inspections, MassDOT requires inspection of all erosion controls and site conditions on a weekly basis. Inspections are also required at portions of sites that discharge to sediment or nutrient impaired or high quality waters per the CGP when each incidence of rainfall exceeding 0.25 inches in twenty-four hours or after snowmelt discharge from a storm event that produces 3.25 inches or more of snow within twenty-four hours occurs. The CGP requires that inspections be performed by a qualified individual as outlined in the CGP. MassDOT requires proof of completion of a 4 hour minimum sedimentation and erosion control training class current to the latest CGP. This individual can be, but not limited to, someone that is either a certified inspector, certified professional, or certified storm water inspector. The documentation shall be included as an appendix in the SWPPP. The inspector's qualifications shall be submitted to the Engineer for approval prior to beginning any work. This individual shall be on-site during construction to perform these inspections. In addition, if the Engineer determines at any time that the inspector's performance is inadequate, the Contractor shall provide an alternate inspector. Written weekly inspection forms, storm event inspection forms, and Monthly Summary Reports must be completed and provided to the Engineer. Monthly Summary Reports must include a summary of construction activities undertaken during the reporting period, general site conditions, erosion control maintenance and corrective actions taken, the anticipated schedule of construction activities for the next reporting period, any SWPPP amendments, and representative photographs.

The Contractor is responsible for preparation of the Plan, all SWPPP certifications, inspections, reports and any and all corrective actions necessary to comply with the provisions of the CGP. The Standard Specifications require adequate erosion control for the duration of the Contract. All control measures must be properly selected, installed, and maintained in accordance with manufacturer specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately or is no longer adequate, it is the responsibility of the Contractor to replace or modify the control for site conditions at no additional cost to the Department. Contractor must maintain all control measures and other protective measures in effective operating conditions and shall consider replacement of erosion controls for each construction season.

The work under this item shall also include the preparation, submission and implementation of a Flood Contingency Plan. The plan shall address the potential need for the temporary relocation of construction and auxiliary equipment situated within the 1% annual chance of flooding zone to designated upland locations above the Base Flood Elevation during flood events. The Flood Contingency Plan shall address any additional MassDEP-required information requirements, as applicable. The Flood Contingency Plan shall be submitted to the Engineer for review and approval at the same time as the SWPPP.

This Item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, preparation of monthly reports and Flood Contingency Plan. In addition, any erosion controls beyond those specified in bid items which are selected by the

ITEM 756. (Continued)

Contractor to facilitate and/or address the Contractor's schedule, methods and prosecution of the work shall be considered incidental to this item.

The CGP provides specific requirements for temporary and final stabilization. This shall be incorporated into the project schedule. The permit defines specific deadline requirements for Initial Stabilization ("immediately", i.e., no later than the end of the next work day following the day when earth-disturbing activities have temporarily or permanently ceased) and for Complete Stabilization Activities (no later than 14 calendar days after the initiation of stabilization). Stabilization criteria for vegetative and non-vegetative measures are provided in the CGP.

The CGP requires the submission of a Notice of Termination (NOT) from all operators when final stabilization has been achieved, as well as removal and proper disposal of all construction materials, waste and waste handling devices, removal of all equipment and construction vehicles, removal of all temporary stormwater controls, etc. Approval of final stabilization by the Engineer and confirmation of submission of the NOT will be required prior to submission of the Resident Engineer's Final Estimate. The permittee shall use EPA's website to prepare and submit the NOT.

BASIS OF PAYMENT

Item 756 will be paid for at the Contract unit price Lump Sum, which price shall include all labor, materials, equipment, SWPPP & Flood Contingency Plan preparation, revisions/addenda during construction, monthly reports, filing fees, and all incidental costs required to complete the work.

Payment of 50% of the Lump Sum price of this item will be made upon acceptance of the NPDES Stormwater Pollution Prevention Plan & Flood Contingency Plan.

Payment of 40% of the Lump Sum price of this item will be will be paid in equal monthly installments distributed across the time remaining in the accepted baseline schedule until substantial completion.

The remaining 10% of the Lump Sum price of this Item will be paid following accepted submission of a Notice of Termination (NOT) when final stabilization has been achieved.

ITEM 765. SEEDING SQUARE YARD

The work under this item shall conform to the relevant provisions of Subsection 765 of the Standard Specifications, and the following:

Loam for use for Seeding shall be M1.05.0 Loam for Roadsides

Seed mix shall meet the requirements of Table M6.03.0-2: Grass Seed Requirements for Slopes and Shoulders

METHOD OF MEASUREMENT

Item 765 will be measured for payment by the, square yards based on actual measurements made over the general contour of the areas seeded, complete in place and accepted.

BASIS OF PAYMENT

Item 765. will be paid for at the Contract unit price per Square Yard Payment for Seeding and Seeding for Short Term Erosion Control, including all mowing, which price shall include all labor, materials, equipment and all incidental costs required to complete the work. When a satisfactory stand of grass has not been established at the time of acceptance, no payment for seeding shall be allowed at the time of acceptance. At the time the final estimate is ready to be forwarded to the Contractor the seeded areas will again be inspected by the Engineer and the seeded areas with a satisfactory stand of grass will be included for payment.

ITEM 769.62 PAVEMENT MILLING MULCH SQUARE FOOT

The work under this item shall consist of placing a geotextile fabric on top of subgrade and within proposed reset guardrail locations and placing 4 inches of pavement millings on top of the fabric, and shall conform to the relevant provisions of Subsection 769 of the Standard Specifications, and the following:

The mulched area will start at the back of the berm, sloped edging, curb or edge of roadway pavement and extend to the face of the retaining wall or noise barrier as shown on the plans. In areas beyond the limits of the retaining wall or noise barrier, the mulched area will generally be 3 feet wide and start at the back of the berm, sloped edging, curb or edge of roadway pavement to the back of the guardrail posts.

METHOD OF MEASUREMENT

Item 769.62 will be measured by the square foot of Pavement milling mulch, comp[lete in place conforming to the length, width and depth required by the plans or as directed by the Engineer.

BASIS OF PAYMENT

Item 769.62 will be paid for at the contract unity price per square foot, which price includes the geotextile fabric, pavement millings, all related excavation, borrow and grading and all incidental costs required to complete the work.

ITEM 796.041 PARTHENOCISSUS TRICUSPIDATA - BOSTON IVY #2 EACH

The work under this item shall conform to the relevant provisions of Subsection 771 of the Standard Specifications, and the following:

Loam for use for planting mix shall be M01.05.0 Loam for Roadsides.

METHOD OF MEASUREMENT

Item 796.041 will be measured for payment by the EACH as called out on the plans, complete in place, and will be paid for

BASIS OF PAYMENT

Item 769.62 will be paid for at the Contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

No separate payment will be made for plant pit excavation, soil preparation, soil amendments, planting mix preparation, loam for planting mix, soil wetting agents, mycorrhizal fungi planting, plant protection, bark mulch (including placement), watering, tree watering bags, maintenance, disposal of unsuitable soils, and all other incidentals required for furnishing and installing the plantings, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 804.8 8 INCH ELECTRICAL CONDUIT TYPE NM – PLASTIC – (UL) FOOT

The work under this item shall conform to the relevant provisions of Section 800 of the Standard Specifications, LUMEN's National Implementation Construction Guidelines and the following:

The trench shall be excavated to the width and depth shown on the plans. All construction of duct banks including trench, excavation, and backfill shall conform to LUMEN's details and specifications. All work shall be performed by a LUMEN approved Contractor.

The work under this item shall consist furnishing and installing three 8-inch high density polyethylene (HDPE) pipes each with eight 1-1/2 inch PVC interducts to relocate the three 8-inch fiber optic ducts located between Lincoln Street and I-90. The fiber optic ducts shall be stacked in a 3-bank configuration to allow for the construction of retaining walls and noise barriers along the south side of Lincoln Street and encased in concrete. All conduit encased in concrete shall be rigidly held in proper position during placement. Concrete for encasement shall conform with Section M4 of the Standard Specifications and be 3,000 PSI, 1.5 Inch, 470 Cement Concrete. The Contractor shall furnish all labor, equipment, tools, pipe, fittings, couplings and appurtenances as indicated on the drawings and as specified herein, or as directed by the Engineer. The Contractor shall coordinate the work with Siena Engineering. A representative from Phoenix Communications shall be present for all telecommunications conduit installed.

All trench excavation activities shall comply with all appropriate OSHA standards. Excavation of 4 feet or more in depth within 4 feet laterally of any utility pole will undermine the pole. The Contractor shall coordinate with the owner of the utility pole to support the pole during excavation. Pole holds longer than 24 hours will need to be coordinated with the pole owner and alternate methods of securing the pole must be considered.

Duct bank shall have 6-inch orange warning tape installed above the concrete encasement as shown on the plans.

Conduits shall be blown clean using compressed air. Run mandrel thru each conduit to confirm viable pathway.

Woven polyester mule tape with minimum strength of 2500 lb. tensile strength to be installed within each conduit.

Borrow material used for backfill of the electrical conduit shall meet the requirements of Gravel Borrow Type d.

METHOD OF MEASUREMENT

Item 804.8 will be measured by the foot between end terminals along the center line of the conduit as actually installed, complete in place..

For measurement purposes, the end of pipe in closed structures shall be considered at the inside face of the wall.

ITEM 804.8 (Continued)

BASIS OF PAYMENT

Item 804.8 will be paid for at the contract unit price per foot; which shall be considered full compensation for all labor, equipment, and materials necessary to complete the work, including, but not limited to, installation of 1-1/2 inch PVC interducts, excavation, concrete encasement, backfill, conduit, and warning tape.

Utility pole holds that are a direct result of excavation for this duct bank shall be incidental to this item.

ITEM 811.361 ELECTRIC MANHOLE REMOVED AND DISCARDED EACH
ITEM 811.91 TELECOMM MANHOLE REMOVED AND DISCARDED EACH

The work under these items consists of removing abandoned electric and telephone manholes and shall conform to the relevant provisions of Subsection 140 of the Standard Specifications, and the following:

Prior to commencing excavation to remove existing electric and telecommunications manhole structures, the Contractor shall confirm with the respective utility purveyors that the existing structures are abandoned and that there are no live connections passing through the structures. The work shall consist of the removal and disposal of existing castings. The structures shall be removed in their entirety to accommodate the relocation of existing duct banks and construction of retaining walls and noise barriers. The existing fiber optic duct bank shall be relocated prior to removing the existing telecommunications manhole.

The present castings shall be carefully removed and shall be satisfactorily stored and protected by the Contractor until they are removed from the project by the respective utility owners. Castings that are not desired by the utility owners shall become the property of the Contractor, and the Contractor shall be responsible for proper disposal.

The existing masonry of the structures to be removed shall be completely removed and disposed. Concrete structures shall be removed and backfilled with selected excavated borrow material in 6-inch layers and thoroughly compacted.

METHOD OF MEASUREMENT

Items 811.361 and 811.91 will be measured for payment by the each by the respective structure removed and discarted.

BASIS OF PAYMENT

Items 811.361 and 811.91 will paid for at the respective contract unit price per each. Masonry plugs for abandoned conduit shall be incidental to the work.

Backfilling, when not obtained from excavation, will be paid for at the contract unit price for the kind of material used.

TEM 859.1 REFLECTORIZED DRUMS WITH SEQUENTIAL FLASHING WARNING LIGHTS DAY

The work under this Item shall conform the relevant provisions of Subsection 850 of the Standard Specifications and the following:

Work under this item consists of furnishing, installing, maintaining in proper operating conditions, and removing reflectorized drums, and any necessary ballast, equipped with sequential flashing warning lights.

MATERIALS

Reflectorized drums shall be listed on the MassDOT Qualified Traffic Control Equipment List. Reflective sheeting on drums shall meet or exceed ASTM D4956 Type VIII. All drums shall be maintained in a satisfactory manner including the removal of oils, dirt, and debris that may cause reduced retroreflectivity.

The Contractor shall use one of the following sequential flashing warning light systems unless otherwise approved by the Engineer:

1. Empco-Lite LWCSD.
2. pi-Lit® Sequential Barricade-Style Lamp; or
3. Unipart Dorman SynchroGUIDE.

Sequential flashing warning lights shall be secured to reflectorized drums per the light manufacturer's specifications.

CONSTRUCTION METHODS

The first ten (10) drums in any merging or shifting taper as designated in the Temporary Traffic Control Plan shall be equipped with sequential flashing warning lights. These lights shall be operating, at a minimum, between dusk and dawn when the taper is deployed.

The successive flashing of the sequential warning lights shall occur from the upstream end of the merging or shifting taper to the downstream end of the taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55, nor more than 75 times per minute.

Warning lights shall be powered off when drums are not deployed in a taper.

METHOD OF MEASUREMENT

A group of ten (10) reflectorized drums with sequential flashing warning lights is considered one (1) unit and will be measured by the day. Each period of up to 24 hours during which this unit is in use will be measured as one day regardless of the number of times that the drums are positioned, repositioned, removed, or returned to service.

BASIS OF PAYMENT

Reflectorized Drums with Sequential Flashing Warning Lights will be paid for at the contract unit price per day, which shall include full compensation for furnishing, positioning, repositioning, and removing the group of ten (10) drums as directed by the Engineer.

ITEM 874.2 TRAFFIC SIGN REMOVED AND RESET EACH

The work under this Item shall conform to the applicable provisions of Subsections 828 and 840 of the Standard Specifications and the following:

The work shall include the removing and resetting of existing 0.080 inch (Type A) sheet aluminum OM1-3 object marker and 'HIGHWAY ASSISTANCE CALL 911" sign panels onto new breakaway P5 post assemblies at new locations, as indicated on the plans or as directed by the Engineer.

METHOD OF MEASUREMENT

Item 874.2 will be measured for payment by EACH traffic sign removed and reset.

BASIS OF PAYMENT

Item 874.2 will be paid for at the Contract unit price per EACH traffic sign removed and reset, which the price shall constitute full compensation for all materials, labor, equipment, tools, appurtenances, and incidentals including excavation and removal of exisitng foundations and installation of new foundations, backfilling and area restoration necessary to complete the work. Should any sign panels or posts be damaged while in temporary storage or during the resetting process, they shall be replaced at the Contractor's expense.

Existing posts determined by the Engineer to be unsuitable for removing and resetting will be replaced by new P5 posts and hardware and will be paid for under Item 847.1 for a single post assembly and Item 848.1 for a two post assembly.

Removal and discarding of existing P5 post assemblies being replaced shall be incidental to the work under this item.

ITEM 874.21	**GROUND MOUNT SIGN AND POST REMOVED AND RESET - 511 TRAVEL INFO**	**LUMP SUM**
ITEM 874.22	**GROUND MOUNT SIGN AND POST REMOVED AND RESET - EMERGENCY STOPPING ONLY/STAY WITH VEHICLE**	**LUMP SUM**
ITEM 874.23	**GROUND MOUNT SIGN AND POST REMOVED AND RESET - NO LITTERING**	**LUMP SUM**
ITEM 874.24	**GROUND MOUNT SIGN AND POST REMOVED AND RESET - NEED A TRANSPONDER?**	**LUMP SUM**
ITEM 874.25	**GROUND MOUNT SIGN AND POST REMOVED AND RESET - TOLL RATES**	**LUMP SUM**
ITEM 874.26	**GROUND MOUNT SIGN AND POST REMOVED AND RESET - ELECTRONIC TOLLING**	**LUMP SUM**

The work under these Items shall conform to the applicable provisions of Subsections 828 and 840 of the Standard Specifications and the following:

The work shall include the removing and resetting of existing ground-mounted traffic sign panels and support posts onto new breakaway stub posts in 4000 psi concrete foundations at new locations, as indicated on the plans or as directed by the Engineer. Either poured or precast foundations may be used, at the Contractor's discretion.

The existing supports to be reset on new foundations are presumed to be S5X10 posts, however, the Contractor shall verify the exact post weight for each support prior to fabrication and installation of the new stub bases and foundations.

Where applicable, work shall also include the excavation (including Class "B" rock) of any existing foundations to be removed to a depth of at least 6 inches below grade and the restoration of the surface area to proper condition.

BASIS OF PAYMENT

Items 874.21, 874.22, 874.23, 874.24, 874.25 and 874.26 will be paid per LUMP SUM for each location, which shall include new stub posts and foundations, hardware, backfilling, Area restoration, incidental materials, labor and equipment necessary to install the reset sign panels at the new locations.

Should any sign panels or posts be damaged while in temporary storage or during the resetting process, they shall be replaced at the Contractor's expense.

ITEM 945.101	**DRILLED SHAFT EXCAVATION 3.0 FOOT DIAMETER**	**FOOT**
ITEM 945.301	**OBSTRUCTION EXCAVATION 3.0 FOOT DIAMETER**	**FOOT**
ITEM 945.501	**DRILLED SHAFT 3.0 FOOT DIAMETER**	**FOOT**
ITEM 945.602	**PERMANENT CASING 3.5 FOOT DIAMETER**	**FOOT**

The work under these items shall conform to the relevant provisions of Subsections 1140, 901, and 945 of the Standard Specifications and the following:

The work under these items shall include furnishing all equipment, labor, materials, and incidental work required to excavate and construct drilled shafts for foundations of the diameter specified above and below ground as shown on the plans based on the type of soil. The work includes furnishing and installing shaft reinforcing and concrete. The work also includes temporary formwork or sonotubes for placing sections of the drilled shafts above grade.

Permanent isolation casings shown for the drilled shafts behind retaining walls shall be furnished and installed in accordance with Items 996.33 and 996.34 and paid under Item 945.602.

Site Conditions and Subsurface Data
Existing soil boring logs are included in the Geotechnical Subsurface Exploration and Design Recommendations dated September 18th, 2026, prepared by GEI Consultants, Inc., (Document A00871) and included in the plans for the Contractor's information. The Contractor shall become completely familiar with the existing conditions at the site.

Depths of noise barrier foundations have been provided on the Plans for the foundation layout and top of noise barrier/top of shaft elevations shown. Any alteration to the post layout and/or noise barrier elevations will require the Contractor to submit an updated layout and associated calculations for shaft depth.

Test pits shall be performed to accurately locate existing underground utilities, only as noted on the plans and as required by the Engineer.

Submittals
The contractor shall submit the following to MassDOT for review, signed and sealed by a Professional Structural/Civil Engineer registered in the Commonwealth of Massachusetts:

- Detailed layout drawings for drilled shaft foundations and depths
- Fabrication drawings for shaft reinforcing steel
- Design computations for any Alternative Designs proposed by the Contractor

METHOD OF MEASUREMENT

Items 945.101, 945.301, 945.501, and 945.602 will be measured for payment respectively by the foot, in accordance with subsection 945.80 of the Standard Specifications.

ITEMS 945.101 thru 945.602 (Continued)

BASIS OF PAYMENT

Items 945.101, 945.301, 945.501, and 945.602 will be paid for at the contract unit bid price per foot, in accordance with subsection 945.81 of the Standard Specifications. Test pits will be paid for separately under Item 141.1, Test Pits for Exploration.

Payment for Drilled Shaft 3.0 Foot Diameter will include all earth support, water control, grouting of pre-cast foundations concrete, reinforcing steel, anchor bolts, and any and all incidental work necessary to construct the foundations complete in place and ready to accept the posts.

ITEM 950.501	**TEMPORARY EARTH SUPPORT SYSTEM, RETAINING WALL NO. 1**	**SQUARE FOOT**
ITEM 950.502	**TEMPORARY EARTH SUPPORT SYSTEM, RETAINING WALL NO. 2**	**SQUARE FOOT**

The work under these Items shall conform to the relevant provisions of Subections 140 and 950 of the Standard Provisions and the following:

The Contractor shall furnish, install, maintain and remove a temporary earth support system as required based upon the actual site conditions, for the excavation and construction of the proposed retaining walls along the noise barrier alignment as shown on the plans. This earth support system shall be designed by the Contractor and shall provide sufficient space for construction of the retaining walls, while protecting the fiber optic duct bank to be relocated along Lincoln Street prior to construction.

The temporary earth support system shall consist of sheet piling, soldier piling and lagging, or any other system that satisfies the design criteria contained herein. The temporary earth support system must be capable of supporting all loads applied during any stage of construction. Where constructed to support soil behind the permanent wall structure, the temporary wall system will be cut off 2 feet below grade and left in place.

All material used for the temporary earth support system shall be sound and free from strength impairing defects. Steel sheeting (if used) shall conform to the applicable requirements of Section 950.

The Contractor shall submit to the Engineer for approval a temporary earth support system design that is designed to carry all applicable AASHTO loads, including, but not limited to, earth pressure and surcharge due to HL-93 truck loading or drilled shaft installation equipment as required. The temporary earth support system must be designed and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. Prior to any excavation, the Engineer must approve complete detailed drawings and complete calculations for the temporary earth support system in writing.

ITEMS 950.501, 950.502 (Continued)

The Contractor shall accurately locate all utility lines and structures to ensure that the proposed temporary earth support system will not interfere with any existing utilities and structures.

The Contractor shall also note that existing fiber-optic conduits are proposed to be relocated underground prior to construction of the retaining walls and noise barriers. Temporary Earth Support Systems for the wall section between Market Street and Everett Street shall be placed prior to the relocation of the fiber-optic lines to avoid disturbance of the new duct bank. A portion of the existing fiber-optic duct bank may need to be supported as part of the Temporary Earth Support System for demolition for a portion of the Market Street bridge wingwall. The Contractor shall locate the existing duct bank to remain near the Market Street bridge wingwall prior to installing the Temporary Earth Support System.

METHOD OF MEASUREMENT

Items 950.501 and 950.502 will be will be measured for payment respectively by the square foot of vertical surface area supported. The payment limits shall be bound by the top existing grade, the bottom of the required excavation, and the length of the proposed retaining walls.

BASIS OF PAYMENT

Item 950.501 and 950.502 will be paid for at the respective contract unit price per square foot of vertical surface area supported. Such price shall be considered full compensation for all labor, equipment, materials and tools necessary to complete the work.

Payment will be made based upon the following percentages: 60 percent upon complete installation, and 40 percent upon removal.

ITEM 996.1 NOISE BARRIER STRUCTURE SQUARE FOOT
ITEM 996.2 WEEP HOLES FOR NOISE BARRIER STRUCTURE EACH

The work under these items shall conform to the relevant provisions of Subsection 901, 960, and 996 of the Standard Specifications and the following:

General
The work under these items consists of the design, manufacture, delivery and erection of a concrete noise barrier system as shown on the plans, exclusive of foundations, complete in place.

The concrete noise barrier system shall consist of concrete panels placed between steel posts spaced as shown on the plans.

Approval of Noise Barrier System Suppliers
Noise barrier system suppliers shall be approved by the Massachusetts Department of Transportation (MassDOT) upon submittal of information satisfying the requirements set forth herein. The noise barrier system supplier must identify the manufacturer (name and location) of the materials to be supplied. The manufacturer must have the capacity to perform the required work within the time constraints of the project. A noise barrier system supplier may also be the manufacturer.

General Requirements
The Contractor shall construct the noise barrier to the alignment shown on contract plans. The plans provide a post layout as well as top of noise barrier and top of foundation elevations corresponding to that layout. The noise barrier system supplier shall prepare a detailed noise barrier layout, including elevations of the top and bottom of barrier panels and top of the foundations.

Ground mounted noise barrier panel, post, and ancillary hardware may be selected based on the proposed details on the contract plans (see Highway Plans), for Exposure Category D (Allston). Design Wall Height (H) shall be set equal to the design wall height shown on the plans. Any deviation from the post layout or noise barrier elevations shown on the Plans, will require that the Contractor submit updated layout drawings and design calculations in accordance with the "Alternative Design Requirements" provided below.

Unless otherwise shown on the plans or approved by MassDOT, the top of the noise barrier shall be horizontal and a minimum of 6 inches above the Proposed Acoustical Profile Line shown on the profiles within the plan set. The bottom of the noise barrier shall be 6 inches minimum below grade due to slope conditions. Changes in elevation shall be accomplished by stepping sections at posts. Steps shall not exceed 24 inches in height without prior approval from the Engineer. If panel steps in excess of 24 inches are required, the Contractor shall submit a design detail for a post bracket attachment that supports the noise barrier panel. All joints shall be horizontal or vertical, shall be aligned with adjacent panels and shall be as indicated on the Drawings.

All horizontal joints between abutting noise barrier panels and vertical joints at posts shall be sealed and/or keyed to prevent noise penetration.

The noise barrier panels shall have no grips or handholes that would encourage scaling or climbing of the surface.

ITEMS 996.1, 996.2 (Continued)

All appurtenances passing through the barrier such as drainage holes or other appurtenances shown on the plans shall be accounted for in the design of the barrier.

Submittals

The contractor shall submit the following to MassDOT for review, signed and sealed by a Professional Structural/Civil Engineer registered in the Commonwealth of Massachusetts:

- Fabrication drawings for structural steel posts and ancillary hardware
- Detailed layout and fabrication drawings for precast concrete panels
- Design for Panels at door openings
- Design computations for any Alternative Designs proposed by the Contractor

Shop Drawings and Product Literature

The Contractor shall provide manufacturers' product literature and shop drawings for the following:

- Finish coating manufacturer's product literature and color samples for each finish color
- Formliners Textures A, B, and C
- Formliners for Oakleaf Patterns Planks 01 through 06: provide shop drawings for each pattern, including an overview showing patterns matching at adjacent panels.
- Manufacturer's product literature for Anti-graffiti coatings
- Joint sealants

Samples:

Concrete barrier panel samples: Prior to manufacture of noise barrier panel units, the Contractor shall provide samples and mock-ups of the facing barrier panel units for color and finish. The sample panels provided must be made at the plant that will be providing the panels under this contract.

Preliminary Color and Acoustic Material Samples: The Contractor shall deliver three 2 ft x 2 ft x 2 inch min thick sample panels indicating the range of expected variations in the color of the acoustic concrete and specified finish color to the MassDOT field office for color and finish approval. The color of the barrier panel mock-ups shall be colors indicated in the approved submittals.

Steel post finish color sample: Provide one sample of steel posts with finish coat and anti-graffiti coating, minimum length of post shall be 2 feet.

Joint sealants: Provide samples for each color proposed.

ITEMS 996.1, 996.2 (Continued)

Noise Barrier Panel Mock-Ups

Prior to manufacture of noise barrier panel units, the Contractor shall provide mock-ups of the facing barrier panel units for formwork, color, and finish. All Mock-ups will be viewed and approved by MassDOT representative The sample panels provided must be made at the plant that will be providing the panels under this contract.

Mock-up Series One:
Upon approval of Preliminary color and acoustic material samples, the Contractor shall provide mock up panels sized 3 feet wide by 6 feet in length of each of the approved formliner texture patterns, including finish color indicated in the approved submittals . Provide two panels for each texture pattern. Mock up shall include treatment of joint between panels. The preliminary 3' x 6' mock up for the oak leaf patterns shall be comprised of 6' sections of two adjacent patterns. Mock-up panels shall be delivered to the project site and displayed as representative samples until the noise barrier is erected. The sample and the noise barrier shall be judged by MassDOT from a distance of 100 feet..

Mock-up Series Two: Full size panels of all 6 Oak Leaf Plank Patterns, showing the approved color and surface finishes:
Upon approval of Mock-up series One by the Engineer, full size mock-up panels of each of the six Oakleaf Plank Patterns shall be provided, complete with color and jointing. With the Engineer's approval, the full sized panel mock-ups may be installed in place and accepted to become part of the finished work.

The mock-up noise barrier panel units shall be maintained and protected throughout the work of this Item to serve as criteria for acceptance of this work. The approved mock-up noise barrier panel units shall also be available at the casting plant and the Engineer's office to establish acceptance criteria for the approved finished surface and color of the noise barrier panel units.

All sample submittals must be accepted by the Engineer for the visual qualities prior to proceeding with the next submittal or casting of the noise barrier panel units

Materials

The Contractor shall make his own arrangements to purchase the materials covered by this section of the specifications, and all necessary incidentals from one of the approved noise barrier system suppliers. The Contractor, or the supplier as his agent, shall furnish MassDOT a Certificate of Compliance certifying that the applicable materials comply with this section of the specifications. Materials not conforming to this section of the specifications shall not be used without the written consent of MassDOT.

Steel Posts
Steel posts shall be designed in accordance with the AASHTO Guide Specifications for Structural Design of Sound Barriers. Steel posts shall be fabricated of ASTM A709, Grade 50 Steel, galvanized in accordance with ASTM A123, with a color coating. Post deflection shall be limited to L/100.

ITEMS 996.1, 996.2 (Continued)

Steel noise barrier posts shall be considered main load carrying members, in tension, and thus subject to the additional testing requirements specified in Standard Specifications Section M8.05.0.

Access Doors

Access doors shall be stainless steel and 36-inches wide by 80-inches high. Access door and door frame shall have a minimum STC rating of 35. Door/frame finish shall match noise barrier post. Access door shall have a lock set, and the contractor shall furnish keys to MassDOT and the local police and fire departments.

Access doors shall be designed and constructed according to the manufacturer's recommendations.

Color Coating over Galvanized Steel

Prior to painting, the galvanizer shall ensure that all posts, base plates, angles and hardware are smooth and have a suitable surface for accepting the paint.

The galvanized surface shall be prepared for painting by one of the following methods:

Method 1: The two-coat paint system shall be applied within twelve hours of galvanizing. The surface shall be blast cleaned immediately before painting (maximum of eight hours) in accordance with requirements of SSPC SP7 "Brush-Off Blast Cleaning" or other method producing equivalent results and uniform profile, to achieve a 1.0 to 1.5 mils anchor profile as indicated by Keane Tator Surface Profile Comparator or similar device. All detrimental material i.e. dirt, grease other foreign matter, shall be removed prior to blasting.

Method 2: The two-coat paint system shall be applied within 15 days of galvanizing. In preparation for the two coat painting system, the surface shall be blast cleaned in accordance with requirements of SSPC SP7 Brush-Off Blast Cleaning or other method producing equivalent results and uniform profile, to achieve a 1.0 to 1.5 mils anchor profile as indicated by an approved surface profile comparator tool. All detrimental material i.e. dirt, grease other foreign matter, shall be removed prior to blast cleaning. The blast cleaning shall be performed prior to the formation of white rust on the galvanizing surface. If white rust is detected, the steel shall be stripped and re-galvanized in accordance with these specifications.

This shall be followed by a pretreatment of zinc or iron phosphate. The phosphate shall be applied to the blast cleaned material within eight hours of blast cleaning. Phosphating shall be applied in accordance with the manufacturer's recommendations. The material shall be painted within twelve hours of phosphating. The applicator shall submit the procedure for phosphating to MassDOT for review prior to performing the work.

The phosphating applicator shall maintain a record of in-process quality checks on the solutions.

ITEMS 996.1, 996.2 (Continued)

The prime coat material shall be a polyamide epoxy applied to a minimum dry film thickness of 3 mils and force cured as given below for finish coat.

The finish coat material shall be a two component, catalyzed aliphatic urethane applied by airless spray to a minimum dry film thickness of 3 mils.

Paint Color for Steel Posts shall match Federal AMS 595 A Color Chart 26521 Tan, as provided by:

1. Sherwin Williams, Cleveland, OH, (800) 474−3794
2. PPG Industries, (800) 441-9695
3. AksoNobel N.V.
   Or approved equal.

Paint Finish for steel posts shall be semi-gloss.

The fabricator shall submit to MassDOT for approval, paint chips of the intended color prior to any work being done under this heading.
All finish coat material shall be applied under conditions within the following tolerances:

A.	Air Temperature:	50° F min.,	90° F max.
B.	Surface Temperature	50° F min.,	100° F max.
C.	Surface temperature must be at least 3° F above the dew point.		
D.	Maximum Humidity: 65%		

The finish coat shall be cured in a booth capable of maintaining 150° F for two to four hours.

Should the coating system fail within one year after the project has been accepted, the damaged coating shall be repaired by the Contractor at no cost to MassDOT. The method of repair shall be acceptable to MassDOT.

Anti-Graffiti Coating for Metal Items
All galvanized steel shall receive Anti-graffiti coating as described in this section. The surface preparation, application rate and application procedures shall be as specified by the coating manufacturer.

Touch-up Repairs
The surface painting of the barriers and posts shall be examined and approved by the Engineer upon delivery to the site. Should any damage occur to the galvanized coating during shipping or handling at the job site, the Contractor shall repair and touch-up any damaged areas to the satisfaction of MassDOT and the following:

Touch-up of galvanizing before the finish coat is applied shall be accomplished by applying a galvanizing repair paint in accordance with the Section M7.04.11. The dry film thickness of the applied repair paint shall not be less than 3 mils. Applications shall be in accordance with the manufacturer's instructions.

ITEMS 996.1, 996.2 (Continued)

Field touch-up procedures shall conform to the recommendations of the company that performed the initial painting. Touch-up of the finish coat shall be by applying a coating of a two-part urethane, as supplied by the painting company, to achieve a dry film thickness of at least 3 mils.

Prior to the application of the paint, remove all damaged coatings down to a solidly adhered coating and apply galvanizing repair paint as a primer. Allow to dry for at least four hours prior to top coating.

The Contractor shall also use the touch-up paint material and procedures to paint the galvanized hardware used in the field erection of the posts that has not been finish coated previously.

Concrete Panels

The noise barrier panel shall be designed to have a Noise Transmission Loss equal to or greater than 20dB at each 1/3 Center Octave Band from 125 Hz to 4,000 Hz when tested in accordance with ASTM E-90.

The noise barrier panel shall be tested in accordance with ASTM C423, mounting type A (sample laid directly against the test surface) per ASTM E795 to determine the Noise Reduction Coefficient (NRC) of the panel. The panel shall have a minimum NRC of 0.70 on both the roadway and residential sides. If a surface applied stain is to be used on the noise barrier panels, the Tests shall be performed with stain applied.

The panel thickness as shown in the details may be revised to meet the noise reduction coefficient listed above and/or the architectural finish. In this case and if the standard post dimensions cannot be met, the Contractor shall furnish and submit for review and approval all calculations for panels, posts, foundations and post/foundation connection prior to fabrication.

Concrete panels at access door openings shall be designed by the manufacture. The design shall be in accordance with the relevant AASHTO LRFD specifications as noted in the plans for a wind speed of 130 MPH.

After design requirements are resolved, the contractor shall show proof of ordering within 10 days.

All precast concrete panels shall be color-conditioned with a colored admixture. The Colored Admixture shall be available in both normal-set and retarded-set forms and be interchangeable without color variance. All products in this system shall be manufactured by the same manufacturer and used in accordance with his printed instructions. Prior to the use of these materials, the manufacturer shall submit a certification to MassDOT covering all materials in the color-conditioned system before the mix design is made, the cement intended for use shall be checked to determine that its lightness/darkness is similar to the cement used in the original approved sample. The Colored Admixture shall be added in the standard proportion specified by the manufacturer.

Color for concrete noise barrier panels shall match Federal Standard AMS 595A Color 37150

ITEMS 996.1, 996.2 (Continued)

The Sound Absorption Cladding shall have a factory applied anti-graffiti coating that is compatible with the noise barrier system as specified by the noise barrier system manufacturer. In addition, the anti-graffiti coating shall be:

- One component
- 100% silicone
- Non-sacrificial (permanent)
- Clear drying
- Tested according to ASTM D7089
- Capable of achieving a rating of "Cleanability Level 1" after cleaning
- Applied in accordance with the anti-graffiti coating manufacturer's written instructions at the precast manufacturer. No anti-graffiti coating shall be field applied to the noise barrier panels.

Noise barrier panels shall meet the sound absorption test requirements specified herein after treatment with the anti-graffiti coating.

Acceptability of the precast panels shall be determined on the basis of compressive strength tests, visual inspection, color and surface finish.

Panels cast with wet cast concrete shall be cast in level forms supported on a flat working surface. The Portland cement concrete in each panel unit shall be placed without interruption and shall be consolidated by the use of vibration to prevent the formation of stone pockets or cleavage planes. Non-staining form oil or release agent shall be used where release agents are necessary.

All precast panels shall be manufactured within the following tolerances with respect to the dimension shown on the shop drawings:

a. Panel Dimension-All panel dimensions shall be within ¼ inch. All hardware embedded in the panel shall be within ¼ inch.

b. Panel Squareness -, as determined by the difference between the two diagonals, shall not exceed 1/2 inch.

Acceptance of the precast concrete panels, with respect to compressive strength, shall be determined on the basis of production lots. A production lot is defined as a group of panels that shall be represented by a single set of compressive strength samples and shall consist of not more than 120 panels or a single day's production, whichever is less.

Compressive strength tests shall be performed on minimum 4 inch diameter by 8 inch cylinders prepared in accordance with AASHTO R 100. During the production of the concrete panels, the manufacturer shall randomly sample the concrete in accordance with AASHTO T-141. A single set of compressive strength samples, consisting of minimum of four (4) cylinders, shall be made for every production lot.

For every compressive strength sample, a minimum of two (2) cylinders shall be cured in the same manner as the panels and tested at seven (7) days or less. The average compressive strength of

ITEMS 996.1, 996.2 (Continued)

these cylinders, when tested in accordance with AASHTO T-22, will determine the initial strength of the concrete. In addition, a minimum of two cylinders shall be cured in accordance with

AASHTO R 100 and tested at 28 days. The average compressive strength of these cylinders, when tested in accordance with AASHTO T-22, will determine the compressive strength of the production lot.

Precast panels shall be accepted for use in the noise barrier construction provided the concrete strength meets or exceeds the minimum compressive strength requirement, the color and finish requirements and the panel dimensions are within tolerances and any chipping, cracks, honeycomb or other defects are within acceptable standards for precast concrete as determined by MassDOT.

All precast panels shall be handled, stored and shipped in such a manner as to minimize the danger of chipping, cracks, fractures and excessive bending stresses.

Bearing pads for concrete panels shall be non-reinforced, elastomeric pads in accordance with the Standard Specification for Highways and Bridges Section M9.14.5. The thickness of pads is to be determined by Noise Barrier manufacturer, unless specified on the Plans.

Concrete reinforcement shall be deformed bars meeting the requirements of ASTM A615, Grade 60, or steel wire reinforcement meeting the requirements of ASTM A496, deformed for concrete. All reinforcing shall be epoxy coated or galvanized.

Posts, base plates, connection plates, and support angles shall be of the sizes and shapes as approved on the shop drawings. Steel for structural support of noise barrier system shall meet the requirements of ASTM A709, Grade 50 and galvanized in accordance with ASTM A123. All structural steel shall be fabricated in accordance with Section 960 of the standard specifications.

The paint finish for steel for structural supports shall match the color and finish specified for steel posts.

Flashing shall be provided according to the noise barrier manufacturer's recommendation for their system. This flashing is to fill the gap between the face of the noise barrier and the top of the bridge traffic barrier.

Anchor bolts connecting the posts to the foundations shall conform to ASTM F1554 Grade 55. The anchor bolts and hardware shall be galvanized in accordance with ASTM A153.

Polyurethane joint sealer shall be in accordance with the Standard Specifications for Highways and Bridges Section M9.14.3.

The instructions provided here are guidelines and do not relieve the contractor of the responsibility for final design and construction.

ITEMS 996.1, 996.2 (Continued)

Noise Barrier Erection

Procedures and Submittals: Within 60 days of the date of the Notice to Proceed, the Contractor shall submit an erection plan in accordance with Subsection 960.67 A of the Standard Specifications.

Layout and Site Preparation: Excavation and grading shall be completed to plan elevations and profiles prior to the start of noise barrier construction. The ground elevations as shown on the approved noise barrier shop drawings shall be verified by the contractor, and discrepancies corrected prior to material fabrication. Underground utilities shall be located and marked to verify adequate clearance from circular foundation shafts. Overhead obstructions such as electric and telephone wires should be considered by the contractor prior to noise barrier erection.

Post Installation: Circular foundation shaft concrete shall be placed entirely against undisturbed soil or in forms and vibrated as the filling of the hole or form is complete. Steel posts shall be bolted down to anchor bolts projecting from the surface of the foundation shaft or set into the wet concrete as shown in the plans. Anchor bolts shall be furnished with and set by template into the fresh concrete. Concrete posts shall be installed within foundation shaft in accordance with approved procedures or shall be bolted down. Posts shall be installed plumb to within ½ inch of vertical for every 15 feet of height and to within ½ inch of the station and offset as specified on the drawings. The top surface of the foundation shaft shall be shaped and leveled to provide for full bearing of the bottom panels and the remaining surface shall be sloped to drain water. See Items 996.33 and 996.34 for placement of isolation casing over the drilled shafts and pre-set posts.

Concrete panels shall be handled with care so as not to stain, mark, chip, or spall the concrete surface.

Panels shall be lowered into position between the post flanges. The bottom concrete panel shall be placed directly upon the concrete footing and checked for level.

If problems associated with lack of access to the back side of the noise barrier are anticipated, it is recommended that finish grading be accomplished with heavy equipment by reaching over the in-place concrete panels after bottom concrete panels are in place and prior to placing middle or top panels. The finish grading shall be conducted to ensure that there are no gaps between the bottom panels and finish grade.

Access Door Locations
Access door locations shall be constructed as shown on the plans. Alternate locations for access doors shall be approved by the Engineer.

Weep Holes
Drainage holes shall be cored in the field as shown on the plans and as required by the Engineer in order to provide positive drainage of stormwater run-off on either side of the noise barrier system. The Contractor shall locate the reinforcing using non-destructive methods prior to coring.

ITEMS 996.1, 996.2 (Continued)

Damage to the reinforcing or panels caused during coring with be the responsibility of the Contractor

Crushed stone and geotextile fabric shall be installed at each drainage hole in accordance with the details on the plans.

METHOD OF MEASUREMENT

Items 996.1 will be measured for payment by the square foot, one face in accordance with Subsection 996.80 of the Standard Specifications.

Items 996.2 will be measured for payment by each hole in accordance with Subsection 996.80 of the Standard Specifications.

BASIS OF PAYMENT

Items 996.1 will be paid for by the square foot, in accordance with Subsection 996.81 of the Standard Specifications.

Items 996.2 will be measured for payment by each hole installed complete in place, in accordance with Subsection 996.81 of the Standard Specifications.

Additionally: Payment for noise barrier foundation including all earth support, water control, grouting of pre-cast foundations concrete, reinforcing steel, anchor bolts, and any and all incidental work necessary to construct the foundations complete in place and ready to accept the posts will be paid for under Item 945.501 Drilled Shaft 3.0 Foot Diameter.

Costs associated with the furnishing and installation of the isolation casing will be paid for under Item 945.602 Permanent Casing 3.5 Foot Diameter.

No separate payment will be made for excavation for Noise Barrier Structure in areas of proposed embankment.

ITEM 996.33 PREFABRICATED MODULAR GRAVITY RETAINING WALL NO. 1 SQUARE YARD

ITEM 996.34 PREFABRICATED MODULAR GRAVITY RETAINING WALL NO. 2 SQUARE YARD

The work under these items shall conform to the relevant provisions of Subsections 120, 140, 150, and 901 of the Standard Specifications and Supplemental Specifications and the following.

The work under this Item shall consist of design, fabrication, furnishing, transportation, and erection of prefabricated modular (PM) retaining wall system of the required type, including foundation excavation, leveling pad, drainage, isolation casing around drilled shafts where shown on the plans. backfill, vehicular barrier system, and miscellaneous items necessary for a complete installation.

The PM wall system shall be a gravity wall system consisting of architectural precast concrete monolithic face panel and stem or bin-type units supported on cast-in place concrete leveling pads and select backfill. The wall structures shall be dimensioned to achieve the design criteria shown on the Plans and specified herein. The PM wall design shall follow the general dimensions of the wall envelope shown in the contract plans.

Prefabricated modular (PM) gravity retaining wall system shall be designed and constructed as specified herein. The design shall be subject to review and acceptance by the Engineer. Acceptability of the PM gravity wall design shall be at the sole discretion of the Engineer. Any additional design, construction or other costs arising as a result of rejection of a retaining wall design shall be borne by the Contractor.

Also included are the final detailing, fabrication, furnishing, and transportation, as shown on the Plans.

Acceptable PM gravity retaining wall systems are:

T-Wall Retaining Wall System® by Fort Miller Company
T-Wall Retaining Wall System® by The Reinforced Earth Company
Doublewal II by United Concrete Products, Inc.
Or approved equal.

Alternative PM gravity wall systems [precast concrete monolithic face panel and stem or bin-type walls] wall systems shall be an accepted equal upon approval of the Engineer.

An anti-graffiti coating shall be applied to all exposed concrete surfaces of the retaining walls.

Value engineering is not applicable to the work of this Item.

ITEMS 996.33, 996.34 (Continued)

Quality Assurance
Quality Assurance shall conform to the requirements of all relevant Sections of the Standard Specifications and Supplemental Specifications and the following.

Fabricator Quality Control
Precast concrete requirements regarding the precast concrete Fabricator's Quality Control (QC), the fabrication plant, personnel, laboratory, testing equipment, inspection, temperature monitoring of the concrete, sampling and testing of concrete, certificate of compliance, and QC documentation shall conform to all applicable subsection of Section M4 Cement Concrete and Related Materials of the Standard Specifications.

Contractor Quality Control
The Contractor installing the PM retaining wall shall have a minimum of 5 years' experience constructing the chosen prefabricated wall system and shall use personnel having demonstrated experience in the installation procedures recommended by the manufacturer and as specified herein.

A qualified representative (minimum 2 years demonstrated experience) from the wall design-supplier shall be present during construction of the PM walls. The services of the qualified representative shall be at no additional cost to the project. The Contractor shall make the necessary arrangements with the wall supplier to have the technical representative on the project. The qualified experienced technical representative will advise the Contractor and Engineer concerning proper installation procedures. The services of a qualified technical representative shall be incidental to this item.

Quality control and testing shall comply with all applicable subsections of Section M4 Cement Concrete and Related Materials of the Standard Specifications. The sublot size for prefabricated modular wall units shall be a group of PM wall units represented by a single compressive strength sample and shall consist of the lesser of either 40 modular wall units or a single day's production.

Acceptance
Final Acceptance for the prefabricated modular wall system shall be determined by MassDOT.

MassDOT will perform Acceptance inspection and sampling and testing in accordance with all applicable subsections of Section M4 Cement Concrete and Related Materials of the Standard Specifications.

Before proceeding with production, precast sample units shall be provided for the Engineer's acceptance. These samples shall be kept at the plant to be used for comparison purposes during production.

Materials
All materials used in the construction of the prefabricated retaining walls shall meet the relevant requirements as specified in Division III, Materials Specifications of the MassDOT Standard and Supplemental Specifications, and as specified herein.

ITEMS 996.33, 996.34 (Continued)

Materials not conforming to requirements of the referenced specifications or from sources not listed in the Contract Documents shall not be used without written consent from the Engineer.

The PM wall units shall be fabricated in accordance with all applicable subsections of Section M4 Cement Concrete and Related Materials of the Standard Specifications and Section 901. with the following exceptions and additions:

The PM wall units shall be manufactured of 5,000 psi, 3/4 inch, 705, air-entrained cement concrete, from a MassDOT approved precaster.

Finishing, Protection, and Curing of Precast Concrete

Unless otherwise indicated on the Plans, the concrete surfaces shall be finished, protected, and cured in accordance to relevant requirements of all applicable subsections of Section M4 Cement Concrete and Related Materials and Section 901 of the Standard and Supplemental Specification and as modified herein.

The panels shall be cast on a flat area. Each panel shall be cast as a unit. No horizontal joints are permitted in a panel. Provide patterns on the wall panels as shown on the Drawings.

Provide integral color admixture to all panels.

Acceptable Admixture Manufacturer

A. SikaColor, Aurora, IL (800) 800-9900 or the Local Massachusetts Rep: Amy Harling, harling.amy@us.sika.com, (717) 847- 4599

B. Solomon Colors, Springfield, IL (800) 624-026. Local Massachusetts Rep: Rick McNamara, rmcnamara@solomoncolors.com, (315) 607-0117

C. Davis Colors, Los Angeles, CA (844) 341-4780, x 1 or the Local Massachusetts Rep: George Happe, george.happe@oxerra.com, (973) 831-7987

Or approved equal.

Materials

A. *Color Admixture for Integrally Colored Concrete*:
    a. Admixture shall be a colored admixture containing no calcium chloride with coloring agents that are lime proof and UV resistant.
    b. Colored admixture shall conform to the requirements of ASTM C979.

Curing and Sealing Compound: Curing and sealing compound shall comply with ASTM C309 and be of same manufacturer as colored admixture, for use with integrally colored concrete.

ITEMS 996.33, 996.34 (Continued)

B. *SUBSTITUTIONS*: The use of products other than those specified will be considered providing that the Contractor requests its use in writing within 14-days prior to bid date. This request shall be accompanied by the following:
   a. A certificate of compliance from the material manufacturer stating that proposed products meet or exceed requirements of this Section, including standards ASTM C979..
   b. Documented proof that proposed materials have a 10-year proven record of performance for imprinting concrete substrates, confirmed by at least 5 local projects that Engineer can examine.

Colors And Patterns

A. Pattern: As shown on the drawings.

B. Concrete Color: Provide cement, sand, aggregate and colored admixture as required to match Federal Standard AMS 595A Color 26306 Sand Gray, or nearest color match as provided by:
   a. SikaColor – 120G Granular Integral Colors C14 French Gray
   b. Solomon Colors Granular 600 Fog
   c. Davis Colors: Granular 677 Mesquite

Steel Reinforcement

Steel Reinforcement for PM wall units shall be furnished in accordance with the relevant requirements of Section M8 of the Standard and Supplemental Specifications.

All steel reinforcing shall be epoxy coated and shall conform to the requirements of AASHTO M31 Grade 60.

Steel reinforcement manufacturer shall be listed on the MassDOT Qualified Construction Materials List (QCML).

Joint Materials

Joint material shall be either preformed EPDM rubber pads conforming to ASTM D2000 for 4AA, 812 rubbers or neoprene elastomeric pads having a Durometer Hardness of 55 ±5.

Shear Keys

Precast shear keys shall be made of the same concrete mix as the prefabricated modular units and cured in the same manner. The shear keys are to be designed and detailed by the prefabricated wall manufacturer.

ITEMS 996.33, 996.34 (Continued)

Backfill

All backfill materials used for PM walls shall be borrow material and shall conform to Section 150 of the Standard Specifications. Slurry, if used in the excavation for drilled shafts, shall not be considered as acceptable backfill material. Backfill material used in PM walls shall also meet the quality of material and gradation requirements of the PM manufacturer. Additional backfill requirements:

A. Soundness: The material shall be substantially free of shale or other soft, poor durability particles. The materials shall have a magnesium sulfate soundness loss, as determined by AASHTO T104 (ASTM C88), of less than 30 percent after four cycles.

Limits of backfill included under this Item shall be from the wall panels to a vertical plane 12 inches beyond the rear most edge of the PM walls. See Plans for diagrammatic details of the payment limits.

Where shown on the plans, crushed stone shall be placed at the drilled shaft locations. Crushed Stone shall be provide and placed in accordance with Section 150 of the Standard Specifications.

Isolation Casing

Isolation casing placed over drilled shafts behind the retaining wall shall be corrugated metal pipe conforming to AASHTO M36, or corrugated plastic pipe in accordance with AASHTO M294, Type S.

Anti-Graffiti Coating

Two coats of anti-graffiti coating shall be applied by airless spray, brush, or roller to all exposed concrete surfaces of the prefabricated retaining walls. The Contractor may not proceed with any production coating operations until the samples and mock- ups are approved. All manufacturer's recommendations and procedures shall be strictly adhered to. Approved manufacturer's authorized representatives shall provide additional job site training in the proper mixing and application procedures of the anti-graffiti coating. The cost for sufficient involvement of the authorized representatives shall be considered incidental to this Item. All State, Federal and local safety and environmental protection requirements shall be strictly adhered to.

The anti-graffiti coating shall be a clear, non-yellowing, chemical and scratch resistant, fast curing, water-based, one-component silicone elastomer specifically formulated to protect surfaces subject to repeated graffiti attacks. It shall have no effect on the color of the concrete.

Leveling Pad

The leveling pad shall be constructed of 3000 psi, ¾ inch, 425 pound cement concrete approved mix as specified in Section M4, or other foundation material as approved by the Engineer. Leveling pad shall have minimum dimensions of 6 inches thickness and 12-inches width and be placed at the design elevation shown on the plans within a 1/8-inch tolerance.

ITEMS 996.33, 996.34 (Continued)

Weep Holes

Drainage weep holes shall be cast into the modular wall units during the fabrication process as shown on the plans and as required by the Engineer in order to provide positive drainage of stormwater run-off on either side of the noise barrier system.

Crushed stone and geotextile fabric shall be installed at each drainage hole in accordance with the details on the plans.

Acceptance Of Materials

The Contractor shall furnish to the Engineer a Certificate of Compliance certifying that the above materials comply with the applicable contract specifications. A copy of all test results performed by the Contractor necessary to assure contract compliance shall also be furnished to the Engineer. Acceptance will be based on the Certificate of Compliance, accompanying test reports, and visual inspection by the Engineer.

Design Requirements

The PM gravity wall system shall be designed to provide a prefabricated modular retaining wall system that acts as a gravity wall without the need for external reinforcing straps, grids, mesh, tiebacks, deadmen, etc. behind the wall system to provide external stability that would conflict with existing and proposed utilities and drainage structures, including future maintenance and repair of utilities. For this reason, MSE type wall systems will not be considered. Prefabricated modular gravity wall systems that provide stability within the wall envelope limits as shown on the Plans are permitted.

Modular wall panels shall be designed and furnished by the modular wall manufacturer to accommodate all utility duct bank penetrations indicated on the drawings, including wall protrusions and blockouts required for duct banks crossing the wall at non-perpendicular angles. The manufacturer's scope includes design of protrusion geometry, reinforcement, blockouts, embedded items, fire-resistant and watertight penetration details, and tolerance envelopes.

Design Specifications

The PM retaining walls shall be designed to provide the grade separation shown on the Plans with a service life of not less than 100 years.

All calculations and Shop Drawings shall be signed and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts and experienced in prefabricated retaining wall design and construction.

The PM gravity wall system shall be designed in accordance with:

1. The manufacturer's requirements.
2. The Contract Plans.
3. The requirements as specified herein.

ITEMS 996.33, 996.34 (Continued)

4. AASHTO LRFD Bridge Design Specification, current edition. Herein referenced as AASHTO LRFD.
5. AASHTO LRFD Bridge Construction Specifications, current edition.
6. MassDOT Bridge Manual – Hundredth Anniversary Edition

Where conflicting requirements occur, the more stringent shall govern. Design shall consider Service, Strength, and Extreme Limit- States, and external and internal stability.

I If stated on the Contract Drawings, the wall shall be designed for seismic forces according to the AASHTO Guide Specifications for LRFD Seismic Bridge Design, 3rd Edition, 2023.

The PM wall shall be dimensioned so that the bearing pressure does not exceed the factored bearing resistance of the foundation soils, as noted in the geotechnical memorandum specified in the design plans. The factored bearing pressure stated assumes a uniform pressure distribution.

The prefabricated retaining wall design shall follow the general dimensions of the wall envelopes shown on the Plans. Top of leveling pad or footing elevations shall be as shown on the Plans, or may be lower. All wall elements shall be within the right-of-way limits shown on the Plans. The PM wall units shall be placed so as not to interfere with guardrail posts, drainage or other utilities, or other potential obstructions.

PM wall units shall have tongue and groove, shiplap or similar approved connections along all joints, both vertical and horizontal.

All appurtenances behind, in front of, over, under, mounted upon or passing through the wall (such as drainage structures), or other appurtenances shown on the Plans shall be accounted for in the stability design of the prefabricated retaining wall system.

The PM retaining wall system shall be supported on cast-in-place leveling pad, or other foundation materials as approved by the Engineer. The top of the leveling pad shall be located at or below the theoretical leveling pad elevation. The minimum wall embedment shall be 4.0 feet as measured to the top of the leveling pad, or as shown on the Plans, whichever is greater. The leveling pads are incidental to this item.

If steps at the bottom of the wall are required, they shall be kept at or below the footing elevation shown on the Contract Drawings. Steps in addition to those shown on the Contract Drawings will be permitted at no additional cost to the Department. The height of each step shall not exceed 3 feet.

The top of the face panels shall be at or above the top of the panel elevation shown on the Plans. If additional soils information is required by the Contractor's designer, it must be obtained by the Contractor and will not be reimbursed by the Department.

ITEMS 996.33, 996.34 (Continued)

Concrete Panel Mock-Up

Prior to manufacture of PM wall units, the Contractor shall provide samples and mock-ups of the facing modular wall units for color and finish. The color of the wall mock-up shall be concrete gray and the wall surface shall have the "Ashlar" form finish. The first sample submittal shall consist of a minimum of two 12-inch x 12-inch x 2-inch samples indicating the range of expected variations in the color of concrete and specified finish.

Upon selection of the desired color by the Engineer a second sample submittal shall be made. The second sample submittal shall consist of a minimum of two mock-up facing wall units, 5 feet x 5 feet in size, indicating the desired color with the desired finish. Upon approval of the second sample submittal, the approved mock-up PM wall units shall be available at the casting plant and the Engineer's office to establish acceptance criteria for the approved finished surface and color of the PM wall units. All sample submittals must be accepted by the Engineer for the visual qualities prior to proceeding with the next submittal or casting of the PM wall units.

The mock-up PM wall units shall be maintained and protected throughout the work of this Item to serve as criteria for acceptance of this work.

Mock-up will be viewed and approved by MassDOT representative.

Pre-Construction Submittals

Design computations demonstrating compliance with the criteria specified herein and shown on the Plans shall be prepared, signed, and stamped by a registered professional engineer licensed in the Commonwealth of Massachusetts and with a minimum of 5 years of experience in the design and construction of prefabricated retaining walls.

A. The design calculations shall include:

1. Statement of all assumptions made, and copies of all references used in the calculations. Calculations shall be performed in English units.

2. Analyses demonstrating compliance with all applicable earth, water, surcharges, seismic, or other applicable loads, as specified herein and required by the reference AASHTO LRFD. The design calculations shall include all applicable references to the LRFD code.

3. Analyses or studies demonstrating durability and corrosion resistance of the prefabricated retaining wall system for the proposed location and environment. The Contractor/Designers shall provide all corrosion protection devices necessary for the retaining wall to have a minimum service life of 75 years in the proposed location and environment.

ITEMS 996.33, 996.34 (Continued)

4. Analyses demonstrating adequacy of design for external stability of the PM wall system. Sliding, overturning, and bearing pressures shall be evaluated for conformance with stipulated design requirements.

B. A detailed resume of the wall designer shall be provided, listing similar projects and demonstrating necessary experience to perform the retaining wall designs, including a brief description of each project that is similar in scope shall be provided for acceptance. A reference shall be included for each project listed. As a minimum, the reference shall include an individual's name, address, and current phone number.

C. A detailed listing of the relevant type of PM retaining walls that the Contractor has constructed shall be provided, including a brief description of each project and a listing of personnel who will construct the walls demonstrating their experience in construction of PM retaining walls. A reference shall be included for each project listed. As a minimum, the reference shall include an individual's name, address, and current phone number.

D. Manufacturer's product data for the PM retaining wall system shall be provided, including material, manufacture and erection specifications, all specified erection equipment, details of buried wall elements, structures design properties, type of backfill, and details for connections between wall units.

E. Concrete mix design shall be in accordance with Section M4.

F. Provide Shop Drawings showing the configuration and all details, dimensions, quantities and cross-sections necessary to construct the prefabricated retaining walls, including but not limited to the following:

1. A plan view of the wall, which shall include contract limits, stations and offsets, and the face of wall line as shown on the Plans.

2. An elevation view of the wall, which shall include the elevation at the top of the wall at all horizontal and vertical break points and at least every 25-feet along the face of the wall, all steps in the wall footings, the designation as to the type of retaining wall system, and an indication of the final ground line and maximum calculated bearing pressures. The theoretical face of wall as shown on the Plans shall be indicated.

3. A typical cross section or cross sections showing the elevation relationship between existing ground conditions and proposed grades, and the proposed wall configuration. The sections shall also indicate the location of the theoretical face of wall as shown on the Plans.

4. General notes pertaining to design criteria and wall construction.

5. A listing of the summary of material quantities for each wall.

ITEMS 996.33, 996.34 (Continued)

6. Details of sleeves and pipes and other embedded items to be installed through the walls, if applicable. Annular space around the pipe shall be filled and sealed with closed cell foam.

7. Clearly indicate details for construction of walls or reinforcing elements around drainage, foundations, isolation casing, utility duct banks or any other potential obstructions, where applicable.

8. Details of the finished surface treatment for the face of PM wall units.

9. Drainage design detail and design scheme, where applicable.

10. Location of utilities, where applicable.

11. Sequence and schedule of construction, including overall construction schedule, and sequencing coordinated with the isolation casing and drilled shaft placement.

12. Method for installing isolation casings.

13. Methods of excavation and backfill.

14. Method of maintaining stability of excavated trenches, where applicable.

15. Method of monitoring plumbness and deviation of wall.

16. Any acceptance testing and frequency.

17. Details and location of all necessary construction and expansion joints.

18. Details of impermeable membrane connection to PM wall units and to runoff collection system.

19. Details of maintaining the stability, rigidity and alignment of the wall during construction, prior to wall construction completion, and prior to backfilling behind the top of the wall and roadway/moment slab construction at the top of the wall.

20. Groundwater elevation.

G. Within 60 days of the date of the Notice to Proceed, the Contractor shall submit a hoisting and erection plan in accordance with Subsection 960.67 A of the Standard Specifications.

    1. The erection plan shall detail the Contractor's approach to installing the proposed retaining walls and backfill relative to noise barrier foundations and permanent isolation casings.

ITEMS 996.33, 996.34 (Continued)

Methods – Plant Fabrication

Fabrication of the precast concrete wall elements shall conform to all relevant subsections of Section M4 Cement Concrete and Related Materials with the following additions.

All provided walls shall be from one single manufacturer. The same PM wall system shall be used for all prefabricated retaining walls on this project.

The date of manufacture, production lot number, and the piece mark shall be clearly scribed on an unexposed face of each PM wall unit.

PM Wall Unit Fabrication Tolerances

Dimensions shall conform to the following tolerances:

1. Position of modular wall unit connection devices within 1 inch, except for coils and loop imbeds, which shall be 3/16-inch. All other dimensions within 3/16-inch.

2. Squareness of face of modular wall units, as determined by the difference between the two diagonals, shall not exceed 3/8-inch for precast units up to 10-feet wide and ½-inch for larger units.

3. Surface defects on smooth-formed surfaces measured over a length of 10- feet shall not exceed ¼-inch. Surface defects on textured-finished surfaces measured over a length of 10-feet shall not exceed ½-inch.

4. Length or height of modular wall units shall not exceed +/- 1/8-inch.

Architectural Form Liners

Exposed PM wall unit face panel shall be cast using custom architectural form liners. The unit face panel rustication shall be Ashlar Stone surface.

Form liners shall be manufactured by one of the following form liner manufacturers, or other manufacturers as approved by MassDOT :

1. Greenstreak Form Liners, by Greenstreak, St. Louis, Missouri.
2. Symons Form Liner, by Symons Corp., Des Plaines, Illinois.
3. Lithotex Formliner, by L.M. Scofield Co., Los Angeles, California.
4. Custom Rock Form Liners, by Custom Rock, St. Paul, Minnesota.

ITEMS 996.33, 996.34 (Continued)

Lifting Devices and Threaded Inserts

Lifting sleeves and inserts shall be provided for the purpose of handling and placing. Care shall be taken during storage, transporting, hoisting, and handling to prevent cracking or damaging the precast units.

Repairs and replacement of PM wall units shall be in accordance with all relevant subsections of Section M4 Cement Concrete and Related Materials. Variations in the exposed face that substantially deviate from the approved architectural model unit as to color, texture, and reveal will be considered a Category 3 Rejectable Defect.

Storage and Shipping

The precast units shall be stored, shipped, and installed as specified in all relevant subsections of Section M4 Cement Concrete and Related Materials.

METHODS

Prefabricated modular gravity retaining walls shall be built in accordance with the Plans and accepted Shop Drawings for the proposed wall system.

The PM retaining walls shall be constructed in accordance with these specifications and in reasonably close conformance with the lines, grades, design criteria, and dimensions shown on the Plans or as established by the Engineer. The Contractor is responsible for coordination with installation of guardrail and sidewalks.

The Contractor shall be responsible for the purchase or manufacture of the concrete modular wall units of the PM walls, plus all other necessary components, aggregate backfills, joint fillers, geotextile fabric, bearing pads, and membranes for a complete installation.

Wall Penetrations

Utility penetrations through the PM wall system shall be considered incidental to this Item. See Plans for details of pipe sleeves and stipulated requirements for coordination with the utility owner.

Delivery, Storage, and Handing

The Contractor shall check the material upon delivery to assure that the proper material has been received. A product certification should be provided with each shipment.

All wall materials and PM wall units shall be stored elevated from the ground and protected to prevent all mud, wet cement, epoxy and like substances, which may affix themselves to the PM wall units. For storage exceeding 30 days in duration, all materials shall be stored in or beneath a trailer or covered with a colored tarpaulin to prevent long-term exposure.

Wall Excavation

Earth excavations shall be in accordance with the requirements of Section 120 and in close conformity to the limits shown on the Plans. Sections 120.80, 120.81, and 120.82 do not apply to the work covered in this section. Excavation and incidentals to complete the excavation for prefabricated retaining walls shall be included in the Prefabricated Modular Gravity Retaining Wall Item.

ITEMS 996.33, 996.34 (Continued)

Foundation Preparation

The foundation for prefabricated retaining walls shall be graded level for a width equal to the width/depth of each course of wall unit plus 1-foot. Prior to wall construction, the foundation shall be compacted with at least 10 passes of an appropriate roller, weighing a minimum of 10,000 lbs. Compact the foundation area to provide a hard and level surface to support wall units. Any foundation soils found to be unsuitable shall be removed and replaced with Gravel Borrow for Bridge Foundation per Sections 120, 140, and 170. The soil foundation for the structure shall be approved by the Engineer before erection is started.

In areas below the existing groundwater level, backfill shall consist of crushed stone for bridge foundations as per Section 150.

Wall Erection

The precast modular wall units shall be installed in accordance with approved manufacturer's recommendations. Special care shall be taken in setting the bottom course of units to true line and grade. While erecting each subsequent course, line and grade shall be examined and deviations shall be corrected to prevent accumulative inaccuracies in alignment. Joint filler and rubber pads shall be installed. Joints at corners or angle points shall be closed.

All wall units above the first course shall interlock with the lower courses. Vertical joints shall be staggered with each successive course or as approved on the Shop Drawings. The vertical joint opening in the front face of the wall shall not exceed 3/8 inches. All vertical joints between units shall be covered on the back side of the front face of the wall by a filter fabric, 12 inches in width, unless approved otherwise on the Shop Drawings.

The overall vertical tolerance of the wall (top to bottom) shall not exceed ½ inch per 10 feet of wall height.

Joints

Joints shall be installed to the dimensions and thickness in accordance with the Plans or approved shop drawings.

All joints between panels shall be covered on the back side of the wall with a geotextile fabric. The geotextile fabric shall conform to the requirements of M9.50.0 for the intended application. Slit film and multifilament woven geotextile fabrics are not allowed for this application. The minimum width of the fabric shall be 12 inches. Fabric shall be lapped at least 4 inches where splices are required.

Isolation Casing

Placement of the isolation casing shall be installed as the backfill is placed up to the level of the finished grade in front of the wall as shown in the plans. Isolation casing shall be set in place with blocking or shims to provide the minimum clearance and consistent annular space equally around the circumference. Where the steel noise wall posts have been installed prior to setting the casing, the casing shall be lifted and installed over the posts and drilled shaft without damaging or impacting the alignment of the posts.

ITEMS 996.33, 996.34 (Continued)

Backfill Placement

Backfill placement for PM walls shall follow erection of each course of modular wall units. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials or misalignment of the modular wall units and isolation casing at drilled shaft locations. Where backfilling at isolation casings, place and compact granular borrow material behind the casing as close to the casing as practical, place the crushed stone behind the concrete panel and around the isolation casing. Crushed stone around isolation casings shall meet the requirements of M2.01.4.

Any wall materials, which become damaged or disturbed during backfill placement, shall be removed and replaced at the Contractor's expense. Any misalignment or distortion of the modular units due to placement of backfill outside specified limits shall be corrected.

Compaction of backfill material shall adhere to the following criteria unless approved otherwise on the Shop Drawings:

A. Backfill material conforming to the requirements specified herein shall be placed and compacted simultaneously with the placement of the modular units.

B. Backfill lift shall be a maximum of 12 inches, uniform in thickness and compacted within the limits shown on the Plans. The Contractor shall decrease this lift thickness, if necessary, to obtain the specified density.

C. Placement and compaction shall be accomplished without distortion or displacement of the modular units.

D. At each panel level the backfill material shall be roughly leveled to an elevation approximately 2 inches above the level of the next course of modular units, but not more than 12 inches thick.

E. The compaction shall take place in a direction that is parallel to the wall.

F. The specified compaction of the backfill material shall be accomplished by use of large, smooth drum, vibratory rollers with the exception of the 5-foot zone directly behind the wall face of the modular units.

G. Backfill shall be compacted to 95 percent of the maximum density as determined by AASHTO T 99, Method C or D (with oversize corrections as outlined in Note 7 of that test).

H. The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Backfill materials shall have a placement moisture content less than or equal to the optimum moisture content. Backfill material with a placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniformly acceptable throughout the entire lift.

ITEMS 996.33, 996.34 (Continued)

I. Within 5 feet of the wall face, small, single or double drum, hand operated, walk-behind vibratory rollers, or walk-behind vibrating plate compactors shall be used, and at least three passes shall be made.

J. When there is evidence of wall displacement or disturbance, compaction shall be accomplished by use of a smooth drum static roller.

K. At the end of each day's operation, the Contractor shall slope the last placed level of backfill away from the wall face to rapidly direct runoff of rainwater from the wall face. The Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

METHOD OF MEASUREMENT

Items 996.33 and 996.34 will be measured for payment by the vertical unit of square yard of retaining wall structure, according to the dimensions shown on the Plans. The vertical area of retaining wall structure is defined as the area, measured at the wall face, bounded by the top of leveling pad or footing directly under the wall, ends of wall, and top of wall.

BASIS OF PAYMENT

Items 996.33 and 996.34 will be paid at the Contract Unit Bid Price per vertical square yard for design, fabrication, transportation, erection, and installation of prefabricated retaining wall, including backfill from excavated borrow conforming with M1.03.0 and miscellaneous items required for a complete installation, which price and payment will be full compensation for all labor, tools, equipment, materials and incidental expense necessary to complete this Item and accepted by the Engineer.

Excavation for prefabricated retaining walls will be paid for under Item 141. Class A Trench Excavation.

Crushed stone for backfill around noise barrier foundations will be paid for under Item 156. Crushed Stone

The unit price for Prefabricated Retaining Wall will include costs for:

A. All design work, preparation of written submittals and detailed construction drawings, revision of submittals, sample submittals and any other necessary preliminary work prior to and after acceptance of the retaining wall system by the Engineer.

B. All materials, including transportation, for the PM retaining walls. For PM walls this, includes concrete modular units, bearing blocks and shims, joint materials, cement concrete, reinforcing steel, backfill with suitable borrow material, anti-graffiti coating, and incidentals.

ITEMS 996.33, 996.34 (Continued)

C. All labor and equipment required to prepare the wall foundation; erect the retaining walls to the lines and grades shown on the Plans; install the joint materials; install wall drainage; provide and install steel pipe sleeves for utility penetrations; provide, place, and compact

   backfill within wall units or backfill behind the wall units; and design, detail and construct any other items necessary to complete the prefabricated retaining walls.

D. As required and approved by the Engineer, excavation and replacement of any unsuitable materials beyond the retaining wall payment limits shown on the Plans will be measured and paid for as defined in Subsection 140 and paid for under Item 141. Class A Trench Excavation.

E. PM Wall Representative will be incidental to this line Item.

F. Anti- Graffiti Coating will be incidental to this line item.

G. Weepholes will be incidental to this item.

Design, installation, and removal of temporary earth supports are paid for separately under Item 950.501 and 950.502, Temporary Earth Support System, respectively.

*****END OF DOCUMENT*****

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DOCUMENT A00802

DETAIL SHEETS

THE COMMONWEALTH OF MASSACHUSETTS
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
TEN PARK PLAZA - BOSTON, MA

– PRELIMINARY ESTIMATE OF QUANTITIES – DETAIL SHEET –

CITY: **Boston**
YEAR: **2026**
STATION: **95+70 To 211+14**
ROAD: **Lincoln Street**

TYPE OF PROJECT: NOISE WALL-CONSTRUCTION

Unclassified Excavation	2,060	Cubic Yards
Class "A" Trench Excav	4,250	Cubic Yards
Test Pit For Exploration	50	Cubic Yards

ITEM 101. **CLEARING AND GRUBBING**

All vegetation and trees located from existing edge of pavement to the limits of grading, limit of clearing and grubbing, limit noise wall or retaining wall will be cleared and grubbed.

Lincoln Streetreet – Segment 1
Sta. 95+80 to Sta. 115+35 LT

Lincoln Streetreet – Segment 2
Sta. 200+64 to Sta. 211+14 LT

And as required by the Engineer.

ITEM 102.511 **TREE PROTECTION – ARMORING AND PRUNING**

Lincoln Streetreet – Segment 1

Sta. 103+58, 14.42' LT	Sta. 104+89, 13.23' LT
Sta. 105+87,13.13', LT	Sta. 108+55, 14.3' LT

Lincoln Streetreet – Segment 2

Sta. 211+05, 18.05' RT	Sta. 211+12, 17.72' RT
Sta. 211+19, 17.72' LT	

And as required by the Engineer.

ITEM 141. **CLASS A TRENCH EXCAVATION**

Excavation for installation of walls, demolition of existing wingwalls, and as directed, except for Class B Rock Excavation.

ITEM 156. CRUSHED STONE

For placement around shaft foundations, between retaining wall stems, and as required by the Engineer.

ITEM 184.1 DISPOSAL OF TREATED WOOD PRODUCTS

To be used for an abandoned utility pole at station 109+34 RT.

ITEM 220. DRAINAGE STRUCTURE ADJUSTED

Type	Station	Offset
CB	113+33	10’ LT
CB	113+42	10’ LT

ITEM 227.4 MASONRY PLUG

For pipe ends in abandoned and removed structures are considered incidental to the respective work.

Type	Station	Offset
Swale Inlet	104+33	7’ LT
Swale Inlet	104+83	7’ LT
Swale Inlet	106+3	5’ RT

ITEM 443. WATER FOR ROADWAY DUST CONTROL

To be used to control dust during construction of the retaining walls.

ITEM 628.305 TEMPORARY IMPACT ATTENUATOR, NON-REDIRECTIVE, TL-3

To be used as a temporary attenuator for I-90 WB.

ITEM 630. HIGHWAY GUARD REMOVED AND RESET

Lincoln Street – Segment 1
Sta. 97+00 to Sta. 117+28 RT

Lincoln Street – Segment 2
Sta. 200+00 to Sta. 211+08 RT

ITEM 630.2 HIGHWAY GUARD REMOVED AND DISCARDED

For existing guardrail not suitable to be reset.

ITEM 632. GUARDRAIL POST - STEEL

To be used as required for proposed guardrail posts where existing guardrail posts are not suitable to be reset.

ITEM 633.1 GUARDRAIL OFFSET BLOCK – THRIE BEAM

To be used as required for proposed guardrail offset blocks where existing guardrail offset blocks are not suitable to be reset.

ITEM 634.1 THRIE BEAM GUARD PANEL

To be used as required for proposed guardrail thrie beam guardrail panels.

ITEM 645.172 72 INCH CHAIN LINK FENCE (PIPE TOP RAIL) VINYL COATED (LINE POST OPTION)

Lincoln Street – Segment 1 and 2
Sta. 95+70 LT to Sta. 97+58 LT
Sta. 199+83 LT to Sta. 199+96 LT

ITEM 697.1 SILT SACK

To be installed in retained existing catch basins and drop inlets within the project limits and as required by the engineer.

ITEM 698.3 GEOTEXTILE FABRIC FOR SEPARATION

For use under crushed stone between retaining wall stems and around shaft foundations.

ITEM 751. LOAM FOR ROADSIDES

To be used for lawns, shoulders and slopes up to 2:1 slope, as shown on the plans and directed by the engineer.

ITEM 765. SEEDING

To be used for lawns, shoulders and slopes up to 2:1 slope, as shown on the plans and directed by the engineer.

ITEM 767.6 AGED PINE BARK MULCH

To be used for landscaping, as shown on the plans and directed by the engineer.

ITEM 769.62 PAVEMENT MILLING MULCH

To be used in front of retaining wall and noise barrier areas as well as guardrail.

ITEM 796.041 PARTHENOCISSUS TRICUSPIDATA - BOSTON IVY #2

To be planted along the Lincoln Street side of the noise barriers at 4' spacing on center.

ITEM 804.8 8 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC -(UL)

Lincoln Street – Segment 1
Sta. 96+90, LT to Sta. 119+26, RT

Lincoln Street – Segment 2
Sta. 198+90, 1’ RT to Sta. 209+65, 5’ RT

ITEM 811.12 ELECTRIC MANHOLE - SD2.012

Lincoln Street – Segment 1
Sta. 96+85, 9' LT
Sta. 96+95, 7' LT
Sta. 97+05, 7' LT
Sta. 118+96, RT
Sta. 119+12, RT

Lincoln Street – Segment 2
Sta. 199+05, 5' LT
Sta. 200+10, 7' LT
Sta. 210+81, 3' RT
Sta. 210+98, 3' RT
Sta. 211+10, 3' RT

ITEM 811.361 ELECTRIC MANHOLE REMOVED AND DISCARDED

Lincoln Street – Segment 1
Sta. 109+20, 10' LT

ITEM 811.91 TELECOMM MANHOLE REMOVED AND DISCARDED

Lincoln Street – Segment 1
Sta. 109+05, 10' RT

ITEM 847.1 SIGN SUP (NOT GUIDE)+RTE MKR W/1 BRKWY POST ASSEMBLY – STEEL

To be used for proposed warning – regulatory and route marker –signs, special signs, street name signs, and existing traffic signs with posts that are not acceptable for reuse, and as directed by the Engineer.

ITEM 848.1 SIGN SUP (NOT GUIDE)+RTE MKR W/2 BRKWY POST ASSEMBLIES – STEEL

To be used for proposed warning – regulatory and route marker –signs, special signs, street name signs, and existing traffic signs with posts that are not acceptable for reuse, and as directed by the Engineer.

ITEM 852. SAFETY SIGNING FOR TRAFFIC MANAGEMENT

Sign Type	Description
W20-1a	Road Work Ahead – 1000 FT
W20-1c	Road Work Ahead – 500 FT
MA-R2-10a(M)	Work Zone Speeding Fines Doubled (M)
MA-R2-10a(S)	Work Zone Speeding Fines Doubled (S)
MA-R2-10e(M)	End Road Work Double Fines End (M)
MA-R2-10e(S)	End Road Work Double Fines End (S)
W21-5aR	Right Shoulder Closed
W21-5bbR	Right Shoulder Closed Ahead
W20-4c	One Lane Road Ahead
W20-5bR	Right Lane Closed Ahead
W5-1	Road Narrows
W8-9	Low Shoulder
W4-2R	Lane Ends
W1-4R	Reverse Curve Right
W1-4L	Reverse Curve Left
MA-W20-7b	Police Officer Ahead
BTD-T-23D	No Stopping Anytime Bi-Directional
BTD-T-23L	No Stopping Anytime Left
BTD-T-23R	No Stopping Anytime Right

ITEM 945.301 OBSTRUCTION EXCAVATION - 3.0 FOOT DIAMETER

To be used for impenetrable objects that cannot be removed or excavated using conventional drilling methods.

END OF DOCUMENT

DOCUMENT A00811

WATERING LOG
for
MassDOT Plantings

Watering Log for MassDOT Plantings

Project Description:

Contract No:

Project No:

Plant Locations/s: (Attach planting plan/s as necessary)

Notes:

	Separate logs shall be kept to track areas or plants with different watering schedules. Trees shall receive a minimum of 10 gallons with each watering and shrubs a minimum of 5 gallons. Provide note that if watering is not performed as scheduled due to rain. Record date of rainfall and amount.												
Date Watered													
Landscape Contractor Initial													
Prime Contractor Initial													
Date Watered													
Landscape Contractor Initial													
Prime Contractor Initial													

Each week, following watering, Log shall be submitted to the MassDOT Engineer.
6/15/2018

DOCUMENT A00820

Massachusetts Department of Transportation
Conditions of Custody

REQUEST FOR RELEASE OF MASSDOT AUTOCAD FILES FORM
(Only to be used following award of contract)

City/Town: BOSTON Project File Number: 616308

Contract Number: 136880

Project Description: Installation of Noise Barriers along I-90 between Market and Franklin Streets

(Allston Multimodal Transportation Project Early Action)

All AutoCAD files are provided solely as a courtesy to facilitate public access to information. MassDOT attempts to provide current and accurate information but cannot guarantee so. MassDOT provides such documents, files or other data "as is" without any warranty of any kind, either expressed or implied, including but not limited to, accuracy, reliability, omissions, completeness and currentness. The Commonwealth of Massachusetts and its Consultants shall not be liable for any claim for damages, including lost profits or other consequential, exemplary, incidental, indirect or special damages, relating in any way to the documents, files or other data accessible from this file, including, but not limited to, claims arising out of or related to electronic access or transmission of data or viruses. Because data stored on electronic media can deteriorate undetected or be modified without our knowledge, MassDOT cannot be held liable for its completeness or correctness. MassDOT makes no representation as to the compatibility of these files beyond the version of the stated CAD software.

By signing this form, I agree that it shall be my responsibility to reconcile this electronic data with the conformed contract documents, and that only the conformed contract documents shall be regarded as legal documents for this Project. I understand that this authorization does not give me the right to distribute the files. I agree to the terms above and wish to receive the AutoCAD files.

This signed form shall be emailed to the Highway Design Engineer at the MassDOT -Highway Division at the following email address:

DOTHighwayDesign@dot.state.ma.us
Attn: AutoCAD Files

Name of person requesting AutoCAD files: _____

Affiliation/Company: _____

Address: _____

_____

Telephone number: _____

Email address: _____

Signature/Date: _____

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DOCUMENT A00860

MASSACHUSETTS HISTORICAL COMMISSION

PROJECT NOTIFICATION FORM AND NO ADVERSE EFFECT LETTER

Maura Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Phillip Eng, Interim MassDOT Secretary
Jonathan L. Gulliver, Undersecretary and Highway Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

July 16, 2026

RE: BOSTON – I-90/Lincoln St. Noise Barriers (MassDOT #616308)
Project Notification Form

Ms. Brona Simon, Executive Director
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125

Dear Ms. Simon:

Enclosed please find a Project Notification Form for the proposed construction of noise barriers between Interstate 90 and Lincoln Street in the Allston and North Brighton neighborhoods of Boston. The project is supported entirely with state funds and requires no federal approval, oversight, or permits.

MassDOT initially proposed to construct noise barriers at this location in conjunction with the federal aid Allston Multimodal Transportation Project (AMTP) due to the proximity of the Lincoln Street neighborhood to that project. The need for the barriers, however, exists independently of the AMTP. MassDOT is now advancing the construction of the noise barriers as a stand-alone non-federal aid noise-mitigation project to address a long-standing traffic noise condition affecting the neighborhood. The noise barriers have independent utility because they will provide a stand-alone noise-reduction benefit irrespective of future transportation actions in the area. The project has logical limits and defined termini associated with the warranted noise barrier locations and will not restrict alternatives or pre-determine decisions for other reasonably foreseeable transportation improvements, including the AMTP project.

All proposed construction will be limited to the existing State Highway Layout. No additional right of way acquisition is required.

If you should have any questions, please feel free to contact me at 781.854.2371.

Sincerely,

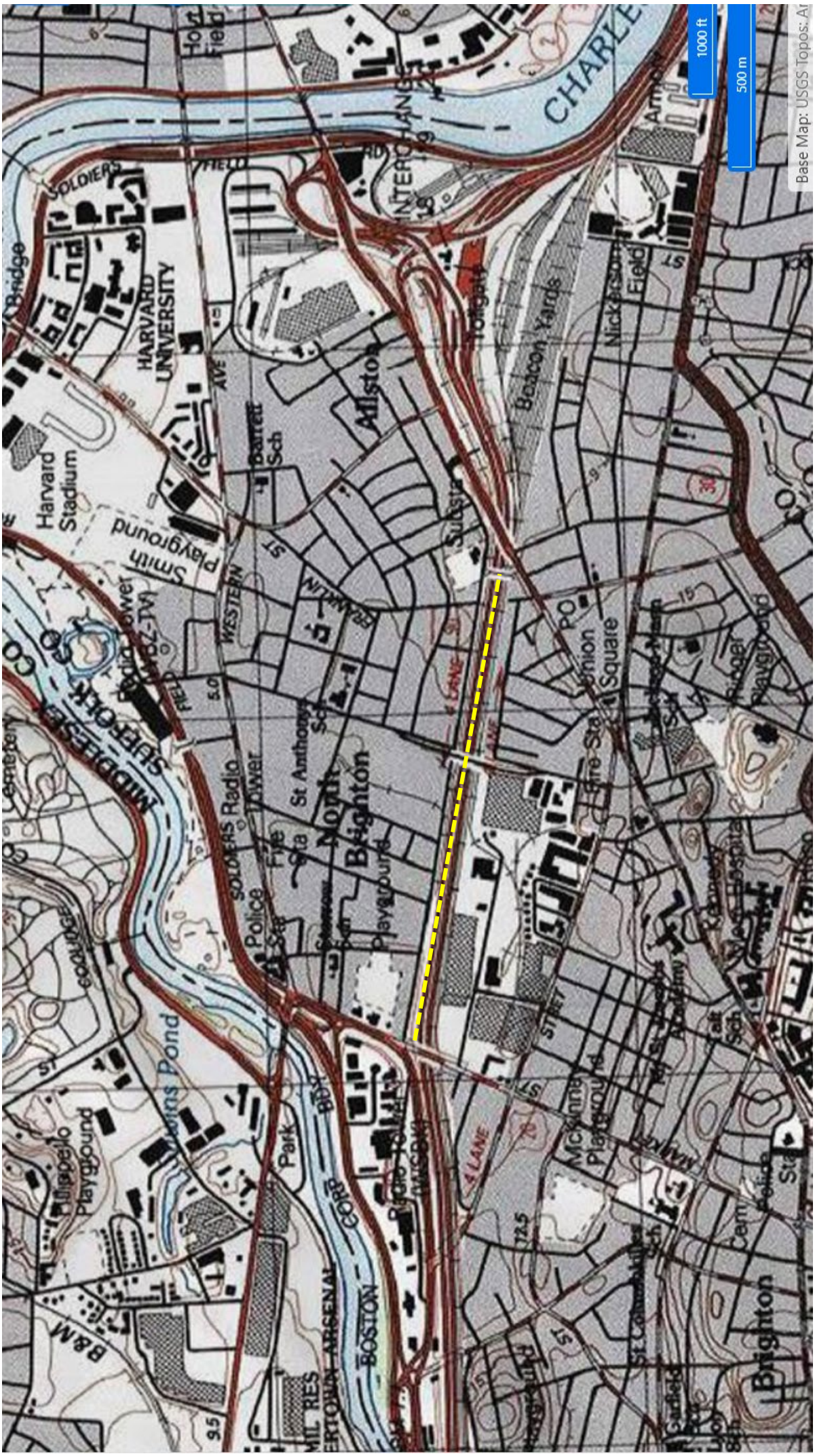
Stacey Donahoe

Stacey Donahoe
Cultural Resources Coordinator for Major Projects
Environmental Services

cc: Kenneth S. Miller, P.E., FHWA
Boston Landmarks Commission
encs: Project Notification Form / Locus Map / Construction Plans / Photo sheet

Ten Park Plaza, Suite 7130, Boston, MA 02116
Tel: 857-368-4636, TTY: 857-368-0655
mass.gov/massdot

Boston: I-90/Lincoln St. Noise Barriers (MassDOT #616308)
USGS Locus Map



950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

RECEIVED
JUL 16 2026
MASS. HIST. COMM
RC 78661

APPENDIX A
MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: I-90/Lincoln Street Noise Barriers (MassDOT #616308)

Location /Address: I-90/Lincoln Street

City/Town: Boston

Project Proponent

Name: Massachusetts Department of Transportation

Address: 10 Park Plaza, Room 7130

City/Town/Zip/Telephone: Boston, MA 02116

After review of the MHC's files and the materials you submitted, the MHC has determined that the proposed project will have "no adverse effect" on significant historic or archaeological properties.

Brona Simon 8/13/26

Brona Simon Date
Executive Director
State Historic Preservation Officer
Massachusetts Historical Commission

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name	Type of License or funding (specify)
MassDOT	State funding

Project Description (narrative):

The Massachusetts Department of Transportation proposes to construct a noise barrier between I-90 and Lincoln Street in the Allston and North Brighton neighborhoods of Boston. Segment 1 of the noise barrier will begin approximately 175 feet east of Market Street and extend approximately 1,968 feet east to a point east of Antwerp Street where an existing brick wall is located between Lincoln Street and I-90. Segment 2 of the noise barrier begins at the east end of the brick wall, just east of Everett Street, and extends 1,114 feet east to Franklin Street. The noise barrier will vary in height from 12 to 28 feet. A prefabricated modular gravity retaining wall will be constructed to support the retaining wall between Market Street and Portsmouth Street in Segment 1 and for the majority of Segment 2. Tree clearing and grubbing will take place in the area between I-90 and Lincoln Street. An existing chain link fence will be removed and existing signs will be removed and reset. Loam and seed will be applied and new vegetation planted. Existing telecom ducts will be relocated. All project work will be confined to the Interstate layout.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

N/A

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.

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APPENDIX A (continued)

N/A

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

See plans

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify.

A review of MACRIS revealed one State Register-listed property in the vicinity of the project area: the Charles River Reservation Parkways Historic District (BOS.YK). Project work will be located outside of the boundary of the historic district and will be shielded from view of the parkway by buildings and the topography of the area. A review of MACRIS also revealed one inventoried building -- the Denvir Tenement at 46-50 Lincoln St (BOS.19000) -- and two inventoried areas -- the Franklin Street, 51-168 Area (BOS.LB) and the Saint Anthony's Area (BOS.JM) -- within the vicinity of the project area. The Denvir Tenement and the two inventoried areas are all located outside the project limits and a shadow study of the noise barriers revealed no shadow impacts on any of the inventoried properties at any time of the year.

A review of the MHC's archaeological maps revealed no State Register-listed or recorded sites in the vicinity of the project area. All project work will be confined to disturbed areas within the existing interstate layout. It is the opinion of the MassDOT Archaeologist that there is low archaeological potential based on past disturbance due to roadway construction, roadside development and underground utilities.

What is the total acreage of the project area?

			Productive Resources:		
Woodland	_____	acres			
Wetland	_____	acres	Agriculture	_____	acres
Floodplain	_____	acres	Forestry	_____	acres
Open Space	_____	acres	Mining/Extraction	_____	acres
Developed	_____	acres	Total Project Acreage	_____	acres

What is the acreage of the proposed new construction? _____ acres

What is the present land use of the project area?

Roadways and landscaped buffer areas.

Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of person submitting this form: Stacey Donahoe **Date:** 7/16/26

Name: Stacey Donahoe

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A (continued)

Address:	10 Park Plaza, Room 7130
City/Town/Zip:	Boston, MA 02116
Telephone:	781.854.2371

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

CC:

DOCUMENT A00870

UNITED STATES DEEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVISE

NEW ENGLAND ECOLOGICAL SERVICE FIELD OFFICE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 3301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To: 06/11/2026 15:05:17 UTC
Project Code: 2026-0101910
Project Name: Lincoln Street Noise Barrier

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

Updated 4/12/2023 - Please review this letter each time you request an Official Species List, we will continue to update it with additional information and links to websites may change.

About Official Species Lists

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Federal and non-Federal project proponents have responsibilities under the Act to consider effects on listed species.

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested by returning to an existing project's page in IPaC.

Endangered Species Act Project Review

Please visit the "**New England Field Office Endangered Species Project Review and Consultation**" website for step-by-step instructions on how to consider effects on listed

species and prepare and submit a project review package if necessary:

https://www.fws.gov/office/new-england-ecological-services/endangered-species-project-review

NOTE Please do not use the **Consultation Package Builder** tool in IPaC except in specific situations following coordination with our office. Please follow the project review guidance on our website instead and reference your **Project Code** in all correspondence.

Northern Long-eared Bat - (**Updated 4/12/2023**) The Service published a final rule to reclassify the northern long-eared bat (NLEB) as endangered on November 30, 2022. The final rule went into effect on March 31, 2023. You may utilize the **Northern Long-eared Bat Rangewide Determination Key** available in IPaC. More information about this Determination Key and the Interim Consultation Framework are available on the northern long-eared bat species page:

https://www.fws.gov/species/northern-long-eared-bat-myotis-septentrionalis

For projects that previously utilized the 4(d) Determination Key, the change in the species' status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective. If your project was not completed by March 31, 2023, and may result in incidental take of NLEB, please reach out to our office at newengland@fws.gov to see if reinitiation is necessary.

Additional Info About Section 7 of the Act
Under section 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to determine whether projects may affect threatened and endangered species and/or designated critical habitat. If a Federal agency, or its non-Federal representative, determines that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Federal agency also may need to consider proposed species and proposed critical habitat in the consultation. 50 CFR 402.14(c)(1) specifies the information required for consultation under the Act regardless of the format of the evaluation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/service/section-7-consultations

In addition to consultation requirements under Section 7(a)(2) of the ESA, please note that under sections 7(a)(1) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Please contact NEFO if you would like more information.

Candidate species that appear on the enclosed species list have no current protections under the ESA. The species' occurrence on an official species list does not convey a requirement to

consider impacts to this species as you would a proposed, threatened, or endangered species. The ESA does not provide for interagency consultations on candidate species under section 7, however, the Service recommends that all project proponents incorporate measures into projects to benefit candidate species and their habitats wherever possible.

Migratory Birds

In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see:

https://www.fws.gov/program/migratory-bird-permit

https://www.fws.gov/library/collections/bald-and-golden-eagle-management

Please feel free to contact us at **newengland@fws.gov** with your **Project Code** in the subject line if you need more information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat.

Attachment(s): Official Species List

Attachment(s):

- Official Species List

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 3301-5094
(603) 223-2541

PROJECT SUMMARY

Project Code: 2026-0101910
Project Name: Lincoln Street Noise Barrier
Project Type: Road/Hwy - Maintenance/Modification
Project Description:
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@42.3580975,-71.14240912176766,14z



Counties: Suffolk County, Massachusetts

ENDANGERED SPECIES ACT SPECIES

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-Eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

IPAC USER CONTACT INFORMATION

Agency: Watertown Town city
Name: Matthew Dowding
Address: 260 Arsenal Place #2
City: Watertown
State: MA
Zip: 02472-4026
Email mdowding@vhb.com
Phone: 6179241770

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Newton city

To: Stacey Donahoe, MassDOT

Date: June 18, 2026

Project #: R015592.039

From: Katie Young, Meredith Avery

Re: Lincoln Street Noise Barriers

The Lincoln Street Noise Barrier Project (the "Project") is being advanced as a stand-alone noise-mitigation project along the I-90 corridor in Brighton, Massachusetts. The Project includes the construction of noise barriers and associated retaining walls (see **Attachment A**), is included on MassDOT's Type II noise-barrier priority list and is intended to address an existing traffic noise condition affecting the Lincoln Street neighborhood. The barriers were proposed to be built in conjunction with the larger Allston Multimodal Transportation Project (AMTP) due to their proximity to that project, however the need for the barriers exists independently of Allston Multimodal Transportation Project.

Consistent with the principles set forth in 23 CFR § 771.111(f), the Project has independent utility because it will provide a stand-alone noise-reduction benefit irrespective of future transportation actions in the area being taken. The Project has logical limits and defined termini associated with the warranted noise-barrier locations and related retaining wall work and will not restrict alternatives or pre-determine decisions for other reasonably foreseeable transportation improvements, including the larger AMTP. Therefore, advancing the Project ahead of AMTP does not constitute improper segmentation.

The Project is proposed to be undertaken without federal funding, and no federal approval, federal land involvement, or other federal participation that would constitute a major federal action have been identified. Therefore, based on the information currently available, review under the National Environmental Policy Act (NEPA) is not required. NEPA applies to major federal actions, and the Project is being advanced as a non-federal-aid undertaking. Accordingly, the Project may proceed without NEPA review, provided it continues to be implemented with no or minimal federal involvement.

On June 11, 2026, an official U.S. Fish and Wildlife Service Information for Planning and Consultation (IPaC) species list was obtained for the Project Area (**Attachment B)**. The list identifies the federally endangered northern long-eared bat (*Myotis septentrionalis*), the proposed endangered tricolored bat (*Perimyotis subflavus*), and the proposed threatened monarch butterfly (*Danaus Plexippus*) and indicates that the Project Area does not occur within designated critical habitat or proposed monarch butterfly critical habitat.

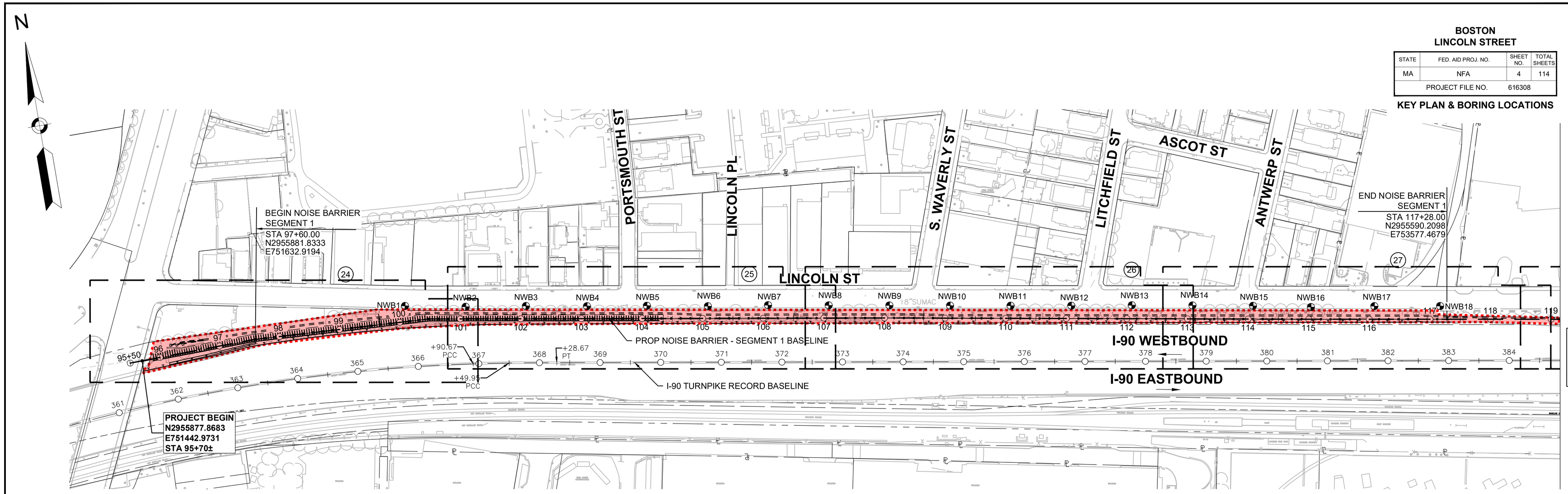
Based on the current design and the lack of habitat, no take under ESA Section 9, 16 U.S.C. § 1538 of any federally listed species is anticipated. The work consists of construction of the noise barriers, retaining walls, related restoration, and clearing of trees within an existing interstate right-of-way. The Project does not involve identified impacts to designated critical habitat, does not require in-water work, and does not otherwise indicate activities likely to result in direct injury, mortality, or prohibited habitat impacts to listed wildlife. As a result, and absent a change in scope or site conditions, the Project would not be expected to result in an unauthorized take under Section 9 and no further consultation is warranted. Because an incidental take permit is not required under ESA Section 10(a)(1)(B), NEPA review is not triggered under the U.S. Department of the Interior's NEPA Implementing Procedures. Informal ESA Section 7 consultation via IPaC is not considered a final agency action nor is it a major federal action requiring NEPA review.

In sum, the Project may be advanced as an independent, non-federal-aid project without NEPA review, provided that no federal funding, reimbursement, permit, approval, federal land involvement, or other federal action trigger is introduced. This conclusion should be revisited if the Project scope, design, impacts and associated permits, project limits, schedule, or funding approach changes. Separate state, local, and resource-specific environmental compliance requirements remain applicable, as appropriate.

BOSTON
LINCOLN STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	NFA	4	114
PROJECT FILE NO.	616308		

KEY PLAN & BORING LOCATIONS



LEGEND

- (XX) GENERAL PLANS & PROFILES
- GEI AS-DRILLED BORING (2024)
- AS-DRILLED BORINGS (THROUGH 2020) (OW) INDICATES OBSERVATION WELL INSTALLED

0 80 200 300
SCALE: 1" = 80'

NOTES:

1. SEE GEOTECHNICAL MEMORANDUM (ATTACHED TO THE SPECIFICATIONS) FOR BORING LOGS AND ADDITIONAL INFORMATION ON EXISTING SOIL CONDITIONS.

606475_HDIKEY).DWG Plotted on 8-Jun-2026 9:49 AM
Proposal No. 616308-136080
A08870-10

DOCUMENT A00871

GEI GEOTECHNICAL SUBSURFACE EXPLORATION AND DESIGN RECOMMENDATIONS

SEPTEMBER 18, 2026

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Geotechnical Subsurface Exploration and Design Recommendations

Technical Memorandum

100 Quannapowitt Parkway, Suite 300 ● Wakefield, MA 01880 ● 781.721.4000

To: Richard Lenox, P.E., WSP USA
From: Richard F. Tobin, P.E., Jeanne LeFebvre, P.E., Mustaki Ahmed, P.E.
cc: Mark Shamon, P.E., Kristofer Kretsch, P.E., VHB
Date: Revised September 18, 2026
Re: Subsurface Exploration and Design Recommendations
Lincoln Street Noise Barrier and Retaining Wall
Allston I-90 Multimodal Project
Allston, Massachusetts
Project No.: 1903324

This memorandum presents the results of our subsurface exploration program and our recommendations for design of a proposed noise barrier wall and adjacent retaining wall along I-90 and Lincoln Street as part of the Allston I-90 Multimodal Project. This revised memorandum includes additional explorations performed in 2026 along the extended western limit of the project.

Project Understanding

As part of the Allston I-90 Multimodal Project, VHB has been retained by MassDOT to design a noise barrier wall along the north side of I-90 westbound along Lincoln Street between Market Street and Cambridge Street. Preliminary plans prepared by VHB indicate that the noise barrier wall will consist of steel posts spaced every 16 feet that will be infilled with noise attenuation panels and are supported by drilled shafts. The proposed wall will be constructed in the strip of land between I-90 westbound and Lincoln Street and will consist of two segments that abut an existing brick wall that separates I-90 from Lincoln Street. To accommodate a future shared use path along Lincoln Street, a retaining wall will be included adjacent to the noise wall. The preliminary design of the retaining wall is a prefabricated modular gravity T-wall.

Exploration Program

Our initial subsurface exploration program for the noise wall, completed in 2024 for the original wall alignment, consisted of a series of 29 borings between Lincoln Street and I-90 and laboratory testing on some of the samples. The borings were spaced about every 100 feet along the wall alignment. During the subsurface exploration program planning, the proposed borings were relocated about 25 feet from the proposed wall alignment to the south curb line of Lincoln Street, due to access limitations consisting of steep sloping ground, a request by MassDOT to not trim trees, the ease of permitting and traffic control, and the proximity to an underground fiber optic cable conduit.

In 2024 we engaged Northern Drill Service, Inc. (Northern) of Northborough, MA to drill 29 borings, designated NWB1 through NWB29, along the south curb line of Lincoln Street. Each boring was vacuum

excavated to a depth of about 5 to 9 feet prior to drilling from August 26, 2024, to September 12, 2024. The borings were then drilled during the period of September 13, 2024, through October 24, 2024. A GEI engineer observed and coordinated the vacuum excavation and drilling procedures and classified the recovered samples.

The borings were advanced with a Mobile Drill B-46 truck-mounted drill rig or a Diedrich D-25 track-mounted drill rig using wet rotary drilling techniques with 4-inch diameter driven flush joint steel casing. The borings were to be advanced to a nominal depth of 30 feet. In some cases, if the soils observed at a depth of 30 feet appeared to be 50 percent or more silt, clay, or organics, the boring was extended 10 feet deeper. In summary, 29 borings were completed to depths ranging from 29.1 feet to 41 feet below ground surface.

Standard Penetration Tests (SPTs) were performed and split-spoon samples were collected in general accordance with ASTM D1586. SPTs were performed with an automatic hammer. Samples were taken continuously from the bottom of the vacuum excavation depth to approximately 10 feet, and then in 5-foot intervals to the bottom of each boring.

Upon completion, the borings were backfilled with drill cuttings, filter sand and gravel, concrete, and topped with a temporary cold patch. The roadway surface at each boring location was repaired with hot mixed asphalt following the completion of the boring program. The as-drilled boring locations were surveyed by WSP, and the coordinates and elevations were provided to GEI.

In 2026, GEI engaged Northern to drill 4 additional borings (NWB30 through NWB33) immediately to the west of the previous borings at the new western limit of the project on the north side of I-90 westbound. The borings were spaced at approximately 100-foot intervals along the extended wall alignment. The borings were drilled along the I-90 westbound side behind the guardrail using the Diedrich D-25 track-mounted drill rig and the same procedures as NWB1 through NWB29, except that no vacuum excavation was performed to clear utilities. The borings were completed to depths ranging from 41 to 46 feet below ground surface. Drilling was performed during the period of March 23, 2026, through March 27, 2026. A GEI engineer observed and coordinated the drilling procedures and classified the recovered samples.

Two borings (IC-BB-104 and IC-BB-105) were previously drilled in June of 2018 at the east end of the proposed second wall segment, near the intersection of Franklin Street and Lincoln Street. These borings were drilled to depths of 89 and 64 feet, respectively. The as-drilled boring locations were located with a handheld GPS unit.

The as-drilled locations of all of the borings are shown on the boring location plans in Appendix A, and the boring logs are included in Appendix B.

Laboratory Testing

We performed nine mechanical grain size distribution analyses in general accordance with ASTM D6913/D7928. Grain size distribution analyses were performed on soil samples to confirm field classifications and to estimate engineering properties. Atterberg limits tests were performed on seven

samples to confirm soil classification and plasticity. The grain size distribution curves and Atterberg limits plots are presented in Appendix C.

Subsurface Conditions

The soil layers encountered in the borings are described below in order of increasing depth. Conditions are only known at the boring locations, and conditions between borings may differ from those indicated below.

The soil descriptions below refer to N_{60} corrected N values. N_{60} is the measured field N value corrected to an equivalent energy of 60 percent efficiency, which is the standard energy assumed in most SPT correlations. The two drill rigs used during the exploration had automatic hammer efficiencies of 83 percent and 69 percent.

Sand and Gravel (Possible Fill) – Fill was encountered below asphalt. Fill generally consisted of sand and gravel with varying amounts of silt and cobbles. N_{60} values ranged from 5 to 60 blows per foot (bpf) with an average of 28 bpf, indicating typically a medium dense material.

Sand and Gravel – A layer of sand and gravel was encountered below the existing fill in NWB1 through NWB4, NWB27 through NWB29, and NWB30 through NWB33. This material primarily consisted of fine to coarse sand and gravel, with varying amounts of silt. N_{60} values in this layer ranged from 6 bpf to 95 bpf with an average of 35 bpf, indicating a typically dense material.

Silt – A layer of silt was encountered in NWB4 through NWB7 and NWB10 and NWB11 below possible fill, and in NWB 27 below the sand and gravel layer. The main constituent of this layer was inorganic silt with varying amounts of gravel, sand, and clay. In this layer, N_{60} values ranged from 17 bpf to 72 bpf with an average of 30 bpf, indicating a predominantly dense material.

Sand – A layer of fine to coarse sand with varying amounts of silt and gravel was encountered below the existing fill and above clay and glacial till in NWB15 through NWB18 and NWB22 through NWB26. N_{60} values ranged from 7 bpf to 59 bpf with an average of 24 bpf, indicating a mostly medium dense material.

Clay – Clay was encountered below existing fill, the silt layer, and the sand layer in NWB5 through NWB 21 and NWB25, NWB26. N_{60} values ranged from 0 bpf and 44 bpf with an average of 10 bpf, indicating a mostly stiff material.

Glacial Till – Glacial till was encountered in NWB19 through NWB27 below the clay, sand, and silt layers and consisted of varying amounts of sand, gravel, and silt with some lean clay. N_{60} values for this material ranged from 8 bpf to 100 bpf with an average of 57 bpf, indicating a typically very dense material.

Weathered Rock – Conditions interpreted to be weathered rock were encountered in IC-BB-104 and IC-BB-105 below fill, clay, sand and gravel layer at depths of 60 to 70 feet below ground surface. The samplers encountered refusal with minimal sample recovery, indicating a very dense material.

Groundwater Levels

Groundwater levels were measured at the boring locations during drilling. Groundwater depth varied from 6 feet to 20.5 feet below ground surface. The borings were drilled with water, and it is possible that these measurements do not reflect the equalized groundwater level. The groundwater level measurements in Table 1 represent conditions at the times and locations indicated. Significantly different groundwater levels may occur at other times and locations.

Geotechnical Recommendations

A summary of the subsurface conditions encountered in the borings is included in Table 1. Recommended soil properties are included in Table 2. Supporting data and our calculations are included in Appendix D. We selected these values and developed our recommendations based on published correlations to SPT N-values, our review of the soil descriptions, AASHTO LRFD Bridge Design Specification (10th edition), and our engineering judgment.

Noise Wall Foundation Design

We understand the noise barrier wall will be supported by 3-foot-diameter drilled shafts designed by VHB. We have developed four representative soil profiles and corresponding soil parameters for analyzing the lateral response of the drilled shafts for the proposed noise wall foundation in the program LPILE (Appendix D). These profiles, which have been previously provided to VHB, were used by VHB in their lateral loading analyses for developing their design plans.

Because the noise wall is so close to the retaining wall, movement of the drilled shafts has the potential to add lateral loads that would need to be considered in the design of the retaining wall. To isolate the retaining wall from movement of the noise wall, we recommend that an isolation casing around the drilled shaft be included in the design. Between the elevations of the final ground surfaces at the low side and the high side of the retaining wall, an outer isolation casing (corrugated steel or plastic) with an open annular space should be included around the drilled shaft to permit movement of the noise wall foundations without impacting the wall. The drilled shaft design will include no soil resistance in this zone. We recommend including a minimum 3-inch open annulus around the drilled shaft. We recommend using plastic or metal cap to cover the annular space instead of using a compressible filler. The isolation casing does not need to be continued below the final ground surface on the low side of the retaining wall, provided that the soil at toe of the wall be maintained to provide passive pressure.

Retaining Wall Foundation Design

We understand that the retaining walls will have exposed heights ranging from 3 to 10 feet. We recommend that the proposed T-walls be supported on the sand and gravel layer (possible fill) or on Gravel Borrow (MassDOT Standard Specification No. M1.03 Type b) compacted per the MassDOT Standard Specifications. The wall facing should be provided with a leveling pad in accordance with the manufacturer's recommendations.

The retaining wall should founded a minimum of 4 feet below the lowest final exterior grade for frost protection. Any unsuitable soil encountered during subgrade preparation should be removed and replaced with Gravel Borrow.

For the design of the retaining wall foundation, we recommend using the factored bearing resistance versus effective footing width curves in Fig. 1, for the Strength Limit and Extreme Limit States. In consideration of the proposed sloping ground surface in front of the wall, our bearing resistance calculations are based on an effective embedment of 3 feet. Calculations supporting these recommendations are presented in Appendix D.

Based on the geotechnical conditions, we estimate that total and differential settlements of the wall will be less than 1 inch. We anticipate most of this settlement will occur during construction.

To reduce the potential for hydrostatic pressures to build up behind the T-wall, we recommend that the proposed wall include an internal drainage system with weepholes or geotextile-filtered open joints between the wall panels in the face at as low an elevation as practical. The weepholes should be connected to a drainage system located at the back of the wall stems that will keep groundwater levels in the wall backfill at approximately the elevation of the weepholes. If the wall backfill is clean, permeable, granular fill, then the drainage zone may not be necessary. The wall designer can evaluate the potential need for these drainage features.

Where the noise barrier supports are located, crushed stone may be a more practical backfill. However, because of the limited space between the isolation casings and the wall panels and stems, spreading and compaction of backfill, even crushed stone, may be difficult. For those cases we recommend controlled low strength material (CLSM) as backfill around the isolation casing adjacent to the retaining wall.

Construction Considerations

All excavations should be made in accordance with OSHA standards. Surface water should be diverted away from excavations. Groundwater may be encountered during the retaining wall leveling pad excavation. Section 140.60.E of the MassDOT Standard Specifications includes requirements for control of water in foundation areas.

Excavation for the retaining wall may be performed using an open cut. However, some portion of the excavation may require temporary excavation support, depending on the contractor's means and methods, depths of excavations, location of the groundwater table, and the need to avoid impacts to nearby roadways, utilities, and other structures.

Where the work is directly adjacent to the building at 100 Leo M. Birmingham Parkway, and the excavation support extends into soil supporting the adjacent building, the excavation support sheeting should be cut off and left in place. Supporting soil is defined as all soil directly below the footing contained within a series of planes that originate at the perimeter of the bottom of the footing and project down and away from the footing at an angle of 45° from the horizontal.

Any necessary excavation support system should be designed in conjunction with a dewatering system by a Massachusetts-registered professional engineer experienced in excavation support design. The engineer should be engaged by the contractor and submit the designs for review before installation.

Drilled Shafts

We recommend using cased construction methods to prevent hole collapse during excavation and concrete placement. Where necessary, concrete should be placed using tremie methods to fill the excavation from the bottom while displacing slurry or groundwater. The temporary casing can be removed slowly as concrete is pumped into the excavation.

Retaining Wall

Prior to wall construction, compact the subgrade with at least 10 passes of an appropriate roller, weighing a minimum of 10,000 lbs. In confined areas, proof compact with a vibratory plate compactor that weighs at least 200 lbs and imparts an impact load of at least 2.5 tons. Compact the foundation area to provide a hard and level surface to support wall units. Any foundation soils found to be unsuitable shall be removed and replaced with Gravel Borrow for Bridge Foundation per Sections 120, 140, and 170.

The T-wall system should be supported on a cast-in-place leveling pad, or other foundation materials as approved by the Engineer. The minimum wall embedment shall be 4.0 feet as measured to the top of the leveling pad. The leveling pad should have minimum dimensions of 6 inches thickness and 12-inches width and be placed at the design elevation within a 1/8-inch tolerance.

All subgrades should be free of frost before foundation construction. Frost-susceptible soils that have frozen should be removed and replaced. Foundation and the soil adjacent to foundations should be insulated to protect them from freezing until they are backfilled. Soil placed as fill should be free of frost, as should the ground on which it is placed.

Backfilling

Where placement and compaction of soil backfill are impractical, backfill the areas around the drilled shaft isolation casings with crushed stone meeting the requirements of M. 2.01. Alternatively, controlled low strength material meeting the requirements of M4.08.0 Controlled Low-Strength Material may be used, except directly behind the front face of the wall, here crushed stone should be used for drainage.

Where compaction equipment can access, compact the soil backfill using a smooth drum vibratory compactor to 95 percent of the maximum density as determined by AASHTO T 99, Method C or D (with oversize corrections as outlined in Note 7 of that test). We recommend that compaction in areas too small for a smooth drum vibratory compactor, within 5 feet of walls less than 15 feet high, or within 10 feet of walls greater than 15 feet high, should be performed using a vibratory walk behind roller or plate compactor (weighing at least 200 lbs imparting an impact load of at least 2.5 tons), with soil placed in maximum 6 inch loose lifts. Backfill materials shall have a placement moisture content less than or equal to the optimum moisture content. Backfill material with a placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniformly acceptable throughout the entire lift.

Limitations

This memo was prepared for the exclusive use of VHB, WSP, and MassDOT. Our recommendations are based on the project information provided to us at the time of this report and may require modification if there are any changes in the nature, design, or location of the proposed structure.

The recommendations in this memo are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report. We therefore recommend that GEI be engaged to make site visits during construction described above to observe the subsurface conditions.

Our professional services for this project have been performed in accordance with generally accepted engineering practices; no warranty, express or implied, is made.

B:\Working\WSP\1903324 Allston Interchange\24_Noise Wall\9. Report\REV 2\1903324_Noise Barrier Wall_ TM R2 2026-6-18.docx

Attachments:

Table 1 – Subsurface Conditions
Table 2 – Soil Properties
Fig. 1 – Factored Bearing Resistance vs. Effective Footing Width
Appendix A Boring Location Plans
Appendix B GEI Boring Logs
Appendix C Laboratory Data Test Results
Appendix D Geotechnical Calculations
- D.1. Soil Properties
- D.2. Bearing Capacity
- D.3 Settlement
- D.4 Lateral Pile Analysis Parameters
- D.5 Lateral Earth Pressure

Table 1. Subsurface Conditions
Lincoln Street Noise Barrier Wall
Allston I-90 Multimodal Project
Boston, Massachusetts

Boring	Northing[2]	Easting[2]	Total Depth (ft)	Groundwater Depth (ft)	Elevations (feet, Datum - NAVD 88)						
					Ground Surface	Top of Silt/Sand/ Sand & Gravel	Top of Clay	Top of Glacial Till	Top of Weathered Rock	Bottom of Boring	Groundwater
NWB-1	2955896.2	751887.1	31.0	7.0	30.8	18.3	NE	NE	NE	-0.2	23.8
NWB-2	2955878.5	751988.3	31.0	10.7	30.2	17.7	NE	NE	NE	-0.8	19.5
NWB-3	2955863.4	752081.9	31.0	13.6	29.8	17.3	NE	NE	NE	-1.2	16.2
NWB-4	2955845.6	752190.7	31.0	13.1	28.7	21.7	NE	NE	NE	-2.3	15.6
NWB-5	2955833.7	752286.4	41.0	10.1	27.9	18.6	13.9	NE	NE	-13.1	17.8
NWB-6	2955808.9	752404.8	41.0	6.1	27.2	17.9	14.7	NE	NE	-13.8	21.1
NWB-7	2955801.5	752480.6	41.0	7.4	26.9	19.1	15.5	NE	NE	-14.1	19.5
NWB-8	2955783.2	752579.2	41.0	6.9	26.5	NE	14.0	NE	NE	-14.5	19.6
NWB-9	2955770.4	752670.3	41.0	8.4	25.9	NE	15.4	NE	NE	-15.1	17.5
NWB-10	2955748.8	752772.4	41.0	7.6	25.2	16.4	13.2	NE	NE	-15.9	17.6
NWB-11	2955730.8	752874.1	41.0	9.1	24.3	15.6	12.3	NE	NE	-16.7	15.2
NWB-12	2955717.0	752960.0	41.0	9.0	23.7	NE	12.7	NE	NE	-17.3	14.7
NWB-13	2955698.4	753070.8	41.0	8.6	23.1	NE	10.6	NE	NE	-18.0	14.5
NWB-14	2955685.3	753168.4	41.0	9.0	23.3	NE	5.8	NE	NE	-17.8	14.3
NWB-15	2955673.3	753241.6	41.0	9.0	23.4	10.9	5.9	NE	NE	-17.6	14.4
NWB-16	2955650.6	753351.2	41.0	9.0	23.1	10.1	0.6	NE	NE	-17.9	14.1
NWB-17	2955636.3	753461.1	31.0	6.0	23.8	10.8	6.8	NE	NE	-7.2	17.8
NWB-18	2955614.9	753571.8	41.0	11.4	23.4	10.9	5.9	NE	NE	-17.6	12.0
NWB-19	2955510.5	754199.8	31.0	6.7	23.2	NE	16.2	2.7	NE	-7.8	16.5
NWB-20	2955498.2	754275.1	31.0	15.9	22.5	NE	13.8	0.0	NE	-8.5	6.6
NWB-21	2955477.2	754394.1	29.2	9.9	21.7	NE	11.7	4.2	NE	-7.5	11.8
NWB-22	2955459.6	754502.4	29.1	13.7	21.0	8.0	NE	-1.6	NE	-8.2	7.3
NWB-23	2955444.4	754592.0	29.8	14.1	21.0	13.0	NE	3.5	NE	-8.8	6.9
NWB-24	2955427.8	754686.8	31.0	14.4	21.4	12.4	NE	2.4	NE	-9.6	7.0
NWB-25	2955410.9	754789.6	36.0	15.6	22.1	13.1	-5.4	-10.4	NE	-13.9	6.5
NWB-26	2955395.3	754885.5	36.0	8.2	22.8	12.8	2.2	-9.7	NE	-13.2	14.6
NWB-27	2955377.8	754988.0	36.0	13.8	23.4	14.4	NE	-9.2	NE	-12.7	9.6
NWB-28	2955360.7	755089.7	31.0	15.2	24.0	14.0	NE	NE	NE	-7.0	8.8
NWB-29	2955343.2	755189.1	31.0	14.5	24.5	15.5	NE	NE	NE	-6.5	10.0
NWB-30	2955869.9	751785.5	46.0	15.3	23.9	10.9	NE	NE	NE	-22.1	8.6
NWB-31	2955873.9	751686.3	46.0	20.5	23.8	10.8	NE	NE	NE	-22.2	3.3
NWB-32	2955871.7	751590.8	43.0	7.6	23.3	10.3	NE	NE	NE	-19.7	15.7
NWB-33	2955866.1	751504.9	41.0	8.1	23.1	10.1	NE	NE	NE	-17.9	15.0
IC-BB-105	2955328.7	755216.3	64.0	19.0	25.0	2.5	NE	NE	-32.5	-39.0	6.0
IC-BB-104	2955306.4	755302.4	89.0	18.5	26.1	8.6	-24.0	NE	-43.4	-62.9	7.6

Notes:

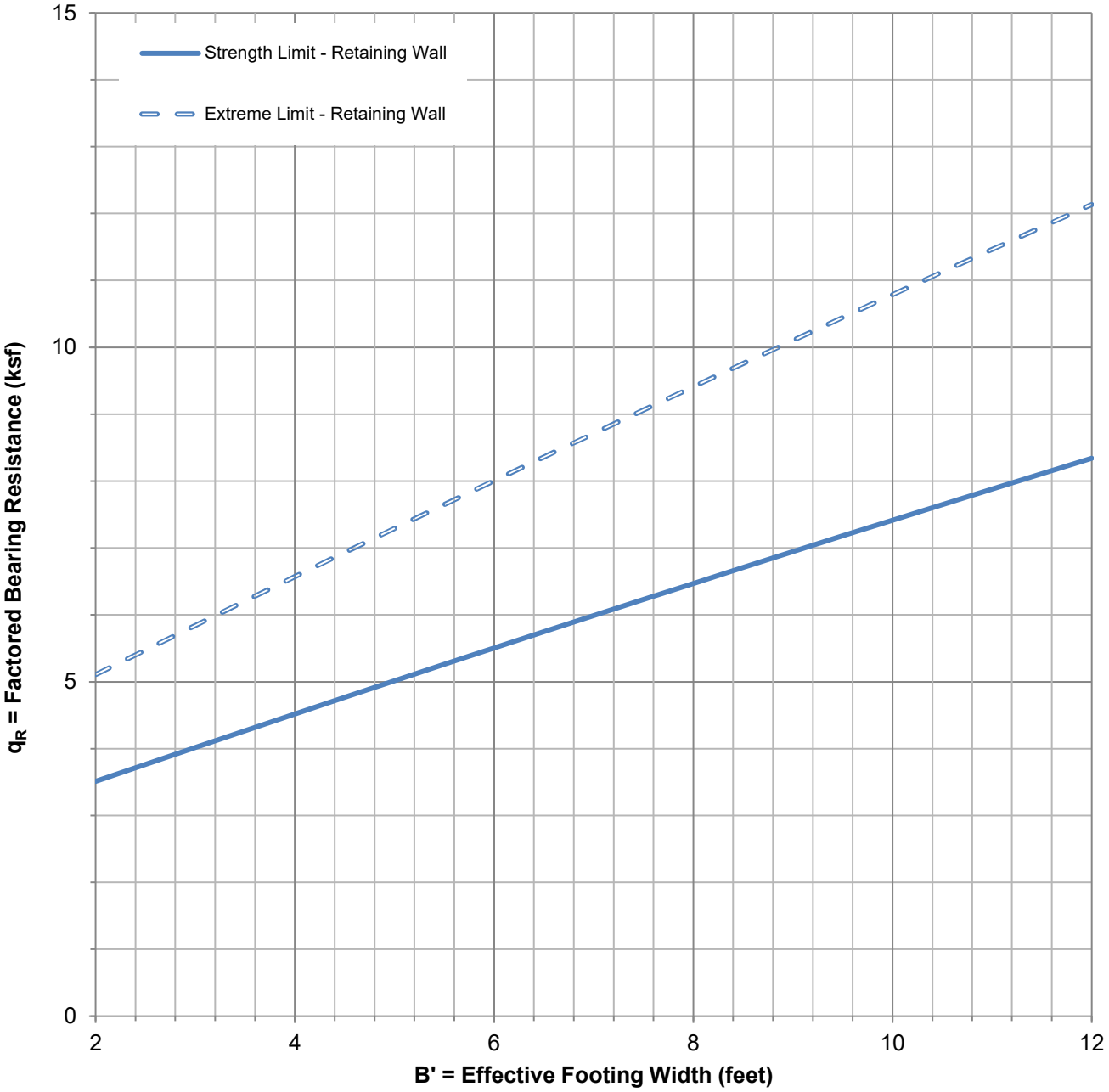
1. NE - Not encountered in the boring during drilling; NM - Not measured.
2. Coordinates are listed in U.S. Feet and reference Massachusetts State Plane Coordinate System, Mainland Zone, NAD83.

Table 2. Soil Properties
Lincoln Street Noise Barrier and Retaining Wall
Allston I-90 Multimodal Project
Allston, Massachusetts

Layer/Soil Type	Unit Weight, γ (pcf)[1]	Friction Angle, ϕ (deg)	Undrained Shear Strength (psf)	LPILE Parameters			Earth Pressure Coefficients[3,4,5]		
				p-y Modulus, k (pci) [2]	Strain Factor, ε_{50}	LPILE model for p-y curve	Active, K_a	At Rest, K_0	Passive, K_p
Sand and Gravel (Possible Fill) and Imported Fill	120 [130][1]	32	-	80 [55]	-	Sand (Reese)	0.28	0.47	5.7
Sand and Gravel	125 [135][1]	34	-	120 [75]	-	Sand (Reese)	0.26	0.44	6.3
Clay	105 [115][1]	-	1000	-	0.010 (medium stiff)	Stiff Clay w/o Free Water (Reese)	0.33[4]	0.53[4]	3.9[4]
Silt	115 [125][1]	30	-	45 [35]	-	Sand (Reese)	0.30	0.5	4.9
Sand	120 [130][1]	32	-	80 [55]	-	Sand (Reese)	0.28	0.47	5.7
Glacial Till	135	38	-	[120]	-	Sand (Reese)	0.22	0.38	8.8

Notes:

1. Values below the water table are included in brackets [ ]. If above the water table, use the lower unit weight to represent the moist condition; if below water table, use the larger unit weight to represent the saturated condition.
2. LPILE v2022 Technical Manual. If above the water table, use larger value; if below water table, use lower value.
3. Recommended earth pressure coefficients are associated with vertical wall face and horizontal ground both in front and behind the wall.
4. K values in clay are provided for drained analyses. For undrained analyses, refer to Fig. 3.11.5.6-5 and Fig. 3.11.5.6-7 in Article 3.11.5.6 of the AASHTO LRFD Bridge Design Specifications for simplified earth pressure distributions for cohesive soils.
5. Passive earth pressures are not intended for use where there is a potential for future excavation in front of the structure.



Notes:
1. The above resistances are based on methods provided in the 2024 AASHTO LRFD Bridge Design Specifications.
2. The resistances above are based on 3 feet of embedment and level ground in front and behind the wall.
3. Groundwater was conservatively assumed to be at ground surface in front of wall.
4. The Strength Limit values above are based on a Resistance factor of 0.55 for gravity or prefabricated modular wall. The extreme Limit values above are based on a Resistance Factor of 0.8.

Proposed Lincoln St. Noise Wall/Retaining Wall Allston Interchange Project Boston, Massachusetts	GEI Consultants	FACTORED BEARING RESISTANCE VS. EFFECTIVE FOOTING WIDTH - LINCOLN ST. RETAINING WALL
WSP Worcester, MA	Project No. 1903324	September 2026 Fig. 1

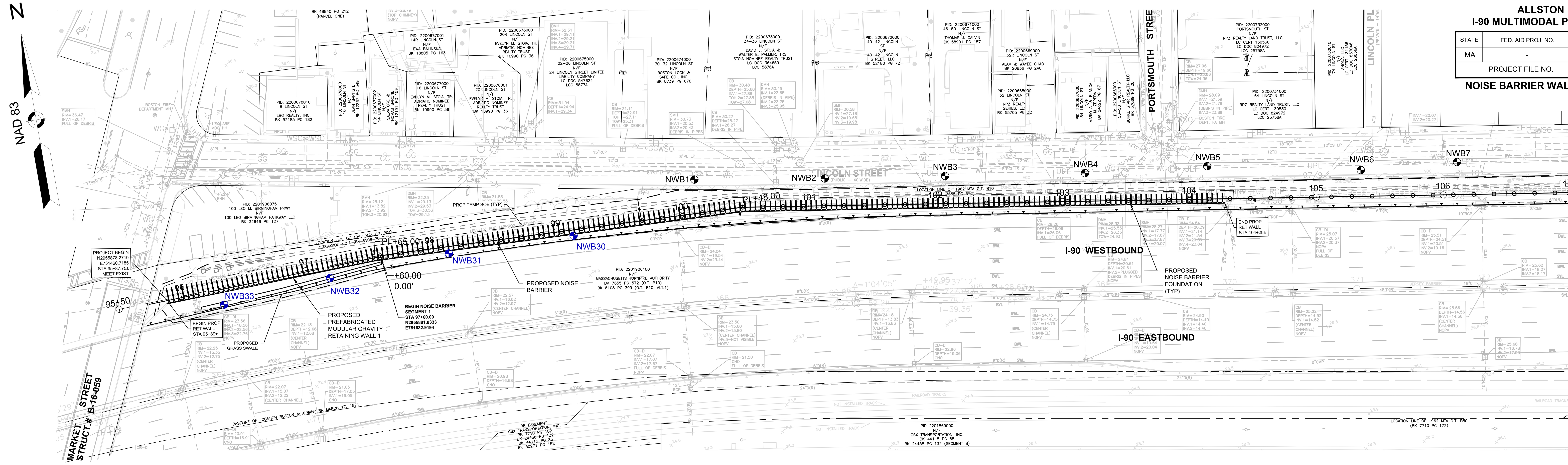
Appendix A Boring Location Plans

ALLSTON
I-90 MULTIMODAL PROJECT

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	3
	PROJECT FILE NO.	606475	

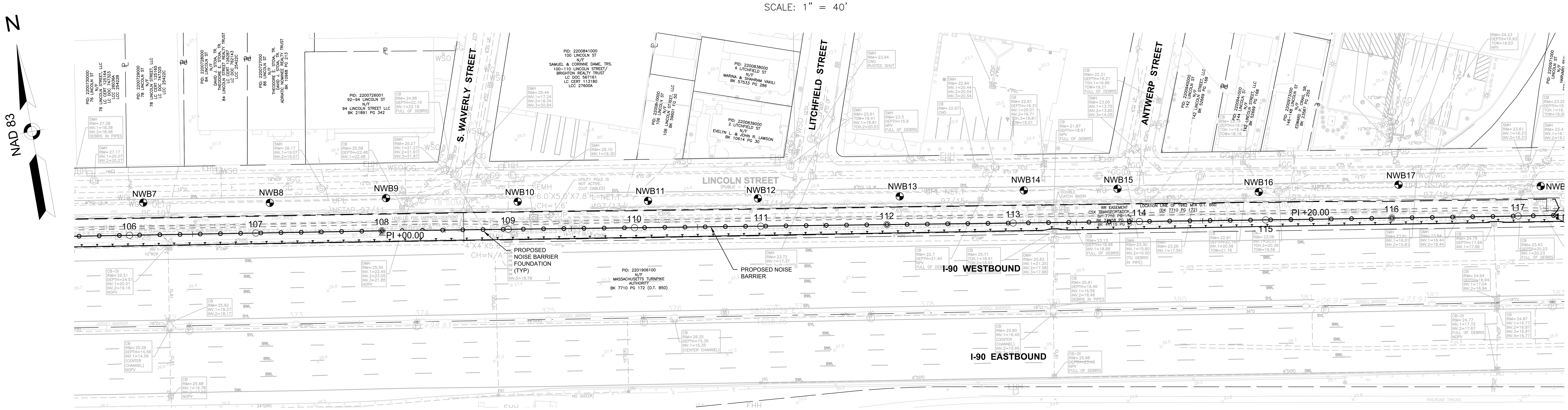
NOISE BARRIER WALLS 1 OF 2

606475_BR(BORINGS) (AS-DRILLED).DWG Plotted on 18-May-2026 1:49 PM



NOISE BARRIER WALL PLAN

SCALE: 1" = 40'



NOISE BARRIER WALL PLAN

SCALE: 1" = 40'

LEGEND:

- BORING PERFORMED BY GEI 2026
- BORING PERFORMED BY GEI 2024
- BORING PERFORMED BY GEI 2018

NOTES:

1. FOR BORING NOTES AND LOCATIONS, SEE SHEET 3.
2. WALL ALIGNMENT RECEIVED FROM VHB ON 05/12/2026.

0 40 100 160

SCALE: 1" = 40'

############ ISSUED FOR CONSTRUCTION

massDOT Massachusetts Department of Transportation Highway Division

BORING PLAN OF PROPOSED NOISE BARRIER

ALLSTON

I–90 MULTIMODAL PROJECT

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

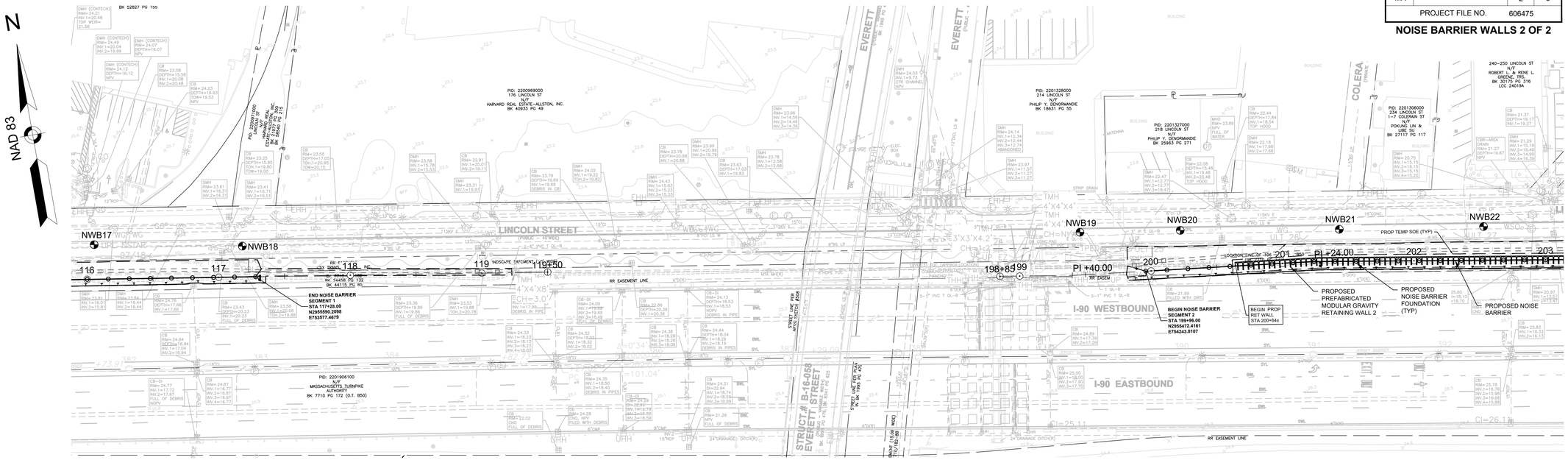
vhb

STATE BRIDGE ENGINEER | CHIEF ENGINEER

ALLSTON
I-90 MULTIMODAL PROJECT

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	3
PROJECT FILE NO.	606475		

NOISE BARRIER WALLS 2 OF 2



NOISE BARRIER WALL PLAN
SCALE: 1" = 40'

NOISE BARRIER WALL PLAN
SCALE: 1" = 40'

LEGEND:

- BORING PERFORMED BY GEI 2026
- BORING PERFORMED BY GEI 2024
- BORING PERFORMED BY GEI 2018

NOTES:

1. FOR BORING NOTES AND LOCATIONS, SEE SHEET 3.
2. WALL ALIGNMENT RECEIVED FROM VHB ON 05/12/2026.

0 40 100 160
SCALE: 1" = 40'

606475_BR(BORINGS)(AS-DRILLED).DWG Plotted on 18-May-2026 2:04 PM

ALLSTON
I-90 MULTIMODAL PROJECT

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	3
PROJECT FILE NO.	606475		

BORING LOCATIONS

BORING LOG DATA POINTS					
BORING NUMBER	STATION	OFFSET	NORTHING	EASTING	SURFACE ELEVATION
WALL 1					
NWB1	100+13	27 L	2955896.18	751887.09	30.79
NWB2	101+13	21 L	2955878.50	751988.26	30.19
NWB3	102+08	22 L	2955863.40	752081.90	29.83
NWB4	103+18	22 L	2955845.64	752190.70	28.70
NWB5	104+15	26 L	2955833.74	752286.41	27.90
NWB6	105+35	21 L	2955808.92	752404.83	27.17
NWB7	106+11	26 L	2955801.49	752480.55	26.88
NWB8	107+12	24 L	2955783.24	752579.15	26.53
NWB9	108+04	26 L	2955770.35	752670.34	25.92
NWB10	109+08	22 L	2955748.79	752772.41	25.15
NWB11	110+11	21 L	2955730.84	752874.08	24.33
NWB12	110+98	22 L	2955717.01	752960.04	23.71
NWB13	112+10	22 L	2955698.37	753070.84	23.05
NWB 14	113+09	26 L	2955685.31	753168.42	23.25
NWB15	113+83	26 L	2955673.25	753241.59	23.44
NWB16	114+95	22 L	2955650.56	753351.21	23.06
NWB17	116+06	26 L	2955636.26	753461.14	23.78
NWB18	117+18	23 L	2955614.87	753571.75	23.43
NWB30	99+13	5 R	2955869.91	751785.51	23.86
NWB31	98+14	5 R	2955873.88	751686.34	23.78
NWB32	97+18	10 R	2955871.66	751590.84	23.29
NWB33	96+32	13 R	2955866.13	751504.92	23.05
WALL 2					
NWB19	199+48	32 L	2955510.52	754199.83	23.17
NWB20	200+24	30 L	2955498.22	754275.08	22.50
NWB21	201+43	24 L	2955477.20	754394.12	21.66
NWB22	202+53	26 L	2955459.56	754502.36	20.95
NWB23	203+44	26 L	2955444.35	754592.00	21.01
NWB24	204+40	26 L	2955427.81	754686.81	21.42
NWB25	205+44	27 L	2955410.86	754789.56	22.14
NWB26	206+42	29 L	2955395.26	754885.52	22.83
NWB27	207+46	29 L	2955377.78	754987.99	23.35
NWB28	208+49	30 L	2955360.65	755089.72	23.98
NWB29	209+50	30 L	2955343.22	755189.10	24.47
IC-BB-105	209+79	20 L	2955328.67	755216.32	25.00
IC-BB-104	210+67	13 L	2955306.40	755302.40	26.10

BORING NOTES

1. COORDINATES REFERENCE THE MASSACHUSETTS STATE PLANE SYSTEM (NAD83)
2. ELEVATIONS, IN U.S. SURVEY FEET, ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
3. BORINGS ARE LOCATED FROM THE BASELINE OF THE PROPOSED NOISE BARRIER.

606475_BR(BORINGS) (AS-DRILLED).DWG Plotted on 18-May-2026 1:54 PM

Appendix B GEI Boring Logs

BORING INFORMATION

NORTHING (ft): 2,955,896 **EASTING (ft):** 751,887
GROUND SURFACE EL. (ft): 30.79 **DATE START/END:** 9/13/2024 - 9/13/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 31.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING
NWB1
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 7.0 9/13/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
30		G1	0 to 7	84			SAND & GRAVEL (POSSIBLE FILL)	0-7": ASPHALT G1 (7"-7'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
	5	S1	7 to 9	24/11	16-15-15-11			S1: Moist, medium dense, brown with orange at 9", FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
		S2	9 to 11	24/5	12-11-17-16			S2: Moist, medium dense, brown, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt.
20	10							
		S3	14 to 16	24/11	8-8-9-10		SAND & GRAVEL	S3: Moist, medium dense, brown, FINE TO COARSE SAND, trace of fine gravel, trace of inorganic silt.
	15							
		S4	19 to 21	24/12	21-26-20-11			S4: Moist, dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
10	20							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,896 **EASTING (ft):** 751,887
GROUND SURFACE EL. (ft): 30.79 **DATE START/END:** 9/13/2024 - 9/13/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB1

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/5	9-8-11-17		SAND & GRAVEL	S5: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, some inorganic silt.
	30	S6	29 to 31	24/10	10-13-12-12			S6: Moist, medium dense, brown, FINE TO COARSE SAND, trace of fine to medium gravel, trace of inorganic silt.
0								Bottom of boring at depth 31 ft. Boring backfilled with cuttings and topped with temporary cold patch and then patched with hot mixed asphalt.
	35							
	40							
-10								
	45							
	50							
-20								
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,879 **EASTING (ft):** 751,988
GROUND SURFACE EL. (ft): 30.19 **DATE START/END:** 9/16/2024 - 9/16/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 31.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING
NWB2
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 10.7 9/16/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
30		G1	0 to 7	84			SAND & GRAVEL (POSSIBLE FILL)	0"-9": ASPHALT G1 (9"-7'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
	5	S1	7 to 9	24/9	18-19-12-16			S1: Moist, dense, brown, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, trace of inorganic silt.
20	10	S2	9 to 11	24/6	16-19-14-15			S2: Moist, dense, brown, FINE TO COARSE GRAVEL, some fine to coarse sand, some inorganic silt. w.c.=11% grav=52%, sand=28%, fines=21%
	15	S3	14 to 16	24/9	8-10-10-10		SAND & GRAVEL	S3: Moist, medium dense, brown, FINE TO COARSE SAND, trace of fine to medium gravel, trace of inorganic silt.
10	20	S4	19 to 21	24/9	9-8-9-9			S4: Similar to S3.

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,879 **EASTING (ft):** 751,988
GROUND SURFACE EL. (ft): 30.19 **DATE START/END:** 9/16/2024 - 9/16/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB2

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/14	7-10-18-24		SAND & GRAVEL	S5: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
0	30	S6	29 to 31	24/10	8-8-10-13			S6: Moist, medium dense, brown, FINE TO COARSE SAND, trace of fine gravel, trace of inorganic silt.
								Bottom of boring at depth 31 ft. Boring backfilled with cuttings and topped with temporary cold patch and then patched with hot mixed asphalt.
	35							
-10	40							
	45							
-20	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,863 **EASTING (ft):** 752,082
GROUND SURFACE EL. (ft): 29.83 **DATE START/END:** 9/17/2024 - 9/17/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 31.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING

NWB3

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 13.6 9/17/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		G1	0 to 7	84			SAND & GRAVEL (POSSIBLE FILL)	0-9": ASPHALT G1 (9"-7'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
	5	S1	7 to 9	24/12	16-22-13-12			S1: Moist, dense, brown, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt.
20	10	S2	9 to 11	24/10	9-12-13-17			S2: Moist, medium dense, brown, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt. w.c.=9% grav=59%, sand=32%, fines=8%
	15	S3	14 to 16	24/5	15-16-17-20		SAND & GRAVEL	S3: Moist, dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
10	20	S4	19 to 21	24/11	14-14-14-19			S4: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,863 **EASTING (ft):** 752,082
GROUND SURFACE EL. (ft): 29.83 **DATE START/END:** 9/17/2024 - 9/17/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB3

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/10	12-12-17-24		SAND & GRAVEL	S5: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
0	30	S6	29 to 31	24/7	11-11-13-11			S6: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
								Bottom of boring at depth 31 ft. Boring backfilled with cuttings and topped with temporary cold patch and then patched with hot mixed asphalt.
	35							
-10	40							
	45							
-20	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,846 **EASTING (ft):** 752,191
GROUND SURFACE EL. (ft): 28.7 **DATE START/END:** 9/18/2024 - 9/18/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 31.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING
NWB4
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 13.1 9/18/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		G1	0 to 7	84			SAND & GRAVEL (POSS. FILL)	0-9": ASPHALT G1 (9"-7'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
20	5	S1	7 to 9	24/14	8-14-17-17		SILT	S1 (0"-9"): Moist, hard, light brown, INORGANIC SILT, some fine to coarse sand, trace of medium to coarse gravel. S1 (9"-14"): Moist, dense, light brown, FINE TO COARSE SAND, some inorganic silt.
	10	S2	9 to 11	24/12	12-16-9-12			S2 (0"-7"): Moist, medium dense, light brown, FINE TO COARSE SAND, some inorganic silt, trace of fine gravel. S2 (7"-12"): Moist, very stiff, light brown, INORGANIC SILT, some fine sand.
	15	S3	14 to 16	24/24	4-6-8-12			S3: Moist, stiff, light brown, INORGANIC SILT, some fine sand.
10	20	S4	19 to 21	24/13	7-10-13-14			S4: Moist, medium dense, light brown, FINE TO COARSE SAND, some lean clay, trace of fine gravel. w.c.=17% grav=1%, sand=66%, fines=34%

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,846 **EASTING (ft):** 752,191
GROUND SURFACE EL. (ft): 28.7 **DATE START/END:** 9/18/2024 - 9/18/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB4

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/13	12-19-23-24		SAND & GRAVEL	S5: Moist, medium dense, brown with orange at 8", FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
0								
	30	S6	29 to 31	24/8	10-14-10-12			S6: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
								Bottom of boring at depth 31 ft. Boring backfilled with cuttings and topped with temporary cold patch and then patched with hot mixed asphalt.
	35							
-10								
	40							
	45							
-20								
	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,834 **EASTING (ft):** 752,286
GROUND SURFACE EL. (ft): 27.9 **DATE START/END:** 9/19/2024 - 9/19/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 41.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING
NWB5
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 10.1 9/19/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		G1	0 to 9	108			SAND & GRAVEL (POSSIBLE FILL)	0-6": ASPHALT G1 (6"-9.3'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
20	5							
	10	S1	9 to 11	24/13	6-5-7-9		SILT	S1 (0"-5"): Moist, medium dense, light brown, FINE TO COARSE SAND, some inorganic silt. S1 (5"-13"): Moist, stiff, light brown, INORGANIC SILT, some fine sand.
	15	S2	14 to 16	24/17	4-8-7-9	Qp = 2.0 tsf, Sv = 0.4 tsf	CLAY	S2: Moist, stiff, gray, LEAN CLAY, trace of fine sand.
10								
	20	S3	19 to 21	24/9	3-4-4-5	Qp = 0 tsf, Sv = 0 tsf		S3: Moist, medium stiff, gray, LEAN CLAY, trace of fine sand.

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,834 **EASTING (ft):** 752,286
GROUND SURFACE EL. (ft): 27.9 **DATE START/END:** 9/19/2024 - 9/19/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB5

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S4	24 to 26	24/24	2-4-4-6	Qp = 2.0 tsf, Sv = 0.3 tsf	CLAY	S4: Moist, medium stiff, gray, LEAN CLAY, trace of fine sand.
0								
	30	S5	29 to 31	24/24	3-3-4-6	Qp = 1.5 tsf, Sv = 0.15 tsf		S5: Moist, medium stiff, gray, LEAN CLAY, trace of fine sand.
	35	S6	34 to 36	24/13	7-9-7-3	Qp = 0.15 tsf, Sv = 0.2 tsf		S6: Moist, very stiff, gray, LEAN CLAY, some fine sand, trace of fine to coarse gravel.
-10								
	40	S7	39 to 41	24/24	7-5-9-15	Qp = 0.15 tsf, Sv = 0.25 tsf		S7 (0"-18"): Moist, stiff, gray, LEAN CLAY, some fine sand.
							SAND	S7 (18"-24"): Moist, medium dense, brown, FINE TO COARSE SAND, some fine gravel, trace of inorganic silt.
								Bottom of boring at depth 41 ft. Boring backfilled with cuttings and topped with temporary cold patch and then patched with hot mixed asphalt.
	45							
-20								
	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,809 **EASTING (ft):** 752,405
GROUND SURFACE EL. (ft): 27.17 **DATE START/END:** 9/20/2024 - 9/20/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 41.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING
NWB6
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 6.1 9/20/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		G1	0 to 7	84			SAND & GRAVEL (POSSIBLE FILL)	0-8": ASPHALT G1 (8"-7"): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
20	5	S1	7 to 9	24/13	10-15-13-12			S1: Dry, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
	10	S2	9 to 11	24/18	8-5-7-12		SILT	S2 (0"-3"): Moist, medium dense, brown, FINE TO COARSE SAND, some inorganic silt. S2 (3"-18"): Moist stiff, light brown, INORGANIC SILT, trace of fine sand.
	15	S3	14 to 16	24/23	5-3-10-13	Qp = 3.0 tsf, Sv = 0.2 tsf	CLAY	S3: Moist, stiff, gray, LEAN CLAY, trace of fine sand.
10								
	20	S4	19 to 21	24/24	9-4-5-5	Qp = 1.5 tsf, Sv = 0.15 tsf		S4: Similar to S3.

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,809 **EASTING (ft):** 752,405
GROUND SURFACE EL. (ft): 27.17 **DATE START/END:** 9/20/2024 - 9/20/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB6

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/24	2-3-3-3	Qp = 1.5 tsf, Sv = 0.15 tsf	CLAY	S5: Moist, medium stiff, gray, LEAN CLAY, some fine sand.
0								
	30	S6	29 to 31	24/24	WOR-1-3-4	Qp = 1.0 tsf, Sv = 0.1 tsf		S6: Moist, soft, gray, LEAN CLAY, trace of fine sand.
	35	S7	34 to 36	24/24	3-2-1-3	Qp = 0.5 tsf, Sv = 0.1 tsf		S7: Similar to S6.
-10								
	40	S8	39 to 41	24/24	WOR/18"-2	Qp = 0.5 tsf, Sv = 0.05 tsf		S8: Similar to S6, except very soft.
	45							Bottom of boring at depth 41 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
-20								
	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,802 **EASTING (ft):** 752,481
GROUND SURFACE EL. (ft): 26.88 **DATE START/END:** 9/23/2024 - 9/23/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 41.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING

NWB7

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 7.4 9/23/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		G1	0 to 7.4	89			SAND & GRAVEL (POSSIBLE FILL)	0-6": ASPHALT. G1 (6"-7.4'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
20	5	S1	7.4 to 9.4	24/12	8-13-11-13		SILT	S1 (0"-5"): Dry, medium dense, brown, FINE TO COARSE SAND, trace of fine gravel, trace of inorganic silt. S1 (5"-12"): Dry, very stiff, brown, INORGANIC SILT, some fine sand.
	10	S2	9.4 to 11.4	24/15	9-7-5-10			S2: Moist, stiff, brown/gray, INORGANIC SILT, trace of fine sand.
	15	S3	14 to 16	24/20	5-7-8-8	Qp = 4.5 tsf, Sv = 0.4 tsf	CLAY	S3: Moist, stiff, gray, LEAN CLAY, trace of fine sand.
10								
	20	S4	19 to 21	24/20	5-8-14-11	Qp = 4.5 tsf, Sv = 0.4 tsf		S4: Moist, very stiff, gray, INORGANIC SILT, trace of fine sand. w.c.=21%, LL=NV, PL=NP, PI=NP

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,802 **EASTING (ft):** 752,481
GROUND SURFACE EL. (ft): 26.88 **DATE START/END:** 9/23/2024 - 9/23/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB7

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/24	1-1-2-4	Qp = 0.5 tsf, Sv = 0.15 tsf	CLAY	S5: Moist, soft, gray, LEAN CLAY, trace of fine sand.
0								
	30	S6	29 to 31	24/24	WOH-1-2-3	Qp = 0.5 tsf, Sv = 0.1 tsf		S6: Similar to S5.
	35	S7	34 to 36	24/24	WOH-1-4-3	Qp = 0.25 tsf, Sv = 0.05 tsf		S7: Similar to S6, except medium stiff
-10								
	40	S8	39 to 41	24/24	WOH/12"-1-2	Qp = 0.5 tsf, Sv = 0.05 tsf		S8: Similar to S6, except very soft.
								Bottom of boring at depth 41 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	45							
-20								
	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,783 **EASTING (ft):** 752,579
GROUND SURFACE EL. (ft): 26.53 **DATE START/END:** 9/24/2024 - 9/24/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 41.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING

NWB8

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 6.9 9/24/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		G1	0 to 7.5	90			SAND & GRAVEL (POSSIBLE FILL)	0-7": ASPHALT G1 (7"-7.5'): Dry, brown, FINE TO COARSE SAND,some fine to coarse gravel, trace of inorganic silt, cobbles present.
20	5	S1	7.5 to 9.5	24/11	8-8-8-7			S1: Moist, medium dense, gray, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
	10	S2	9.5 to 11.5	24/10	6-9-5-7			S2: Moist, medium dense, brown/gray, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
		S3	14 to 16	24/21	3-4-8-10	Qp = 2.0 tsf, Sv = 0.25 tsf	CLAY	S3: Moist, stiff, gray, LEAN CLAY, trace of fine sand.
10	15							
	20	S4	19 to 21	24/21	1-5-5-4	Qp = 1.0 tsf, Sv = 0.25 tsf		S4: Similar to S3.

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,783 **EASTING (ft):** 752,579
GROUND SURFACE EL. (ft): 26.53 **DATE START/END:** 9/24/2024 - 9/24/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB8

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/19	8-3-2-3	Qp = 3.5 tsf, Sv = 0.1 tsf	CLAY	S5: Similar to S3.
0								
	30	S6	29 to 31	24/24	WOH-1-1-3	Qp = 0.75 tsf, Sv = 0.05 tsf		S6: Moist, soft, gray, LEAN CLAY, trace of fine sand.
	35	S7	34 to 36	24/24	WOH-2-2-2	Qp = 0.5 tsf, Sv = 0.05 tsf		S7: Similar to S6.
-10								
	40	S8	39 to 41	24/24	WOH-1-1-3	Qp = 0.5 tsf, Sv = 0.05 tsf		S8: Similar to S6.
	45							Bottom of boring at depth 41 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
-20								
	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,770 **EASTING (ft):** 752,670
GROUND SURFACE EL. (ft): 25.92 **DATE START/END:** 9/25/2024 - 9/25/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 41.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING

NWB9

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 8.4 9/25/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		G1	0 to 7.8	93			SAND & GRAVEL (POSSIBLE FILL)	0-9": ASPHALT G1 (9"-7.75'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
20	5							
		S1	8 to 10	24/11	8-9-8-10			S1: Moist, medium dense, gray, FINE TO COARSE SAND, some fine gravel, trace of inorganic silt.
	10	S2	10 to 12	24/12	7-8-5-11	Qp = 2.0 tsf, Sv = 0.2 tsf		S2 (0"-6"): Moist, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt. S2 (6"-12"): Moist, stiff, brown and gray, LEAN CLAY, trace of fine sand.
		S3	14 to 16	24/20	8-15-11-14	Qp = 2.0 tsf, Sv = 0.2 tsf	CLAY	S3: Moist, very stiff, gray, LEAN CLAY, trace of fine sand. w.c.=25%, LL=35, PL=17, PI=18
10	15							
		S4	19 to 21	24/24	1-2-5-3	Qp = 1.25 tsf, Sv = 0.05 tsf		S4: Similar to S3, except medium stiff.
	20							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,770 **EASTING (ft):** 752,670
GROUND SURFACE EL. (ft): 25.92 **DATE START/END:** 9/25/2024 - 9/25/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB9

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/24	1-2-5-6	Qp = 3.75 tsf, Sv = 0.05 tsf	CLAY	S5: Similar to S3, except medium stiff.
0								
	30	S6	29 to 31	24/24	WOH-1-1-1	Qp = 1.0 tsf, Sv = 0 tsf		S6: Moist, soft, gray, LEAN CLAY, trace of fine sand.
	35	S7	34 to 36	24/24	WOH/12"-1-2	Qp = 0.75 tsf, Sv = 0.05 tsf		S7: Similar to S6, except very soft.
-10								
	40	S8	39 to 41	24/24	WOH/12"-1-2	Qp = 0.5 tsf, Sv = 0.05 tsf		S8: Similar to S6, except very soft.
	45							Bottom of boring at depth 41 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
-20								
	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,749 **EASTING (ft):** 752,772
GROUND SURFACE EL. (ft): 25.15 **DATE START/END:** 9/26/2024 - 9/26/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 41.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING

NWB10

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 7.6 9/26/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		G1	0 to 7.5	90			SAND & GRAVEL (POSSIBLE FILL)	0-7": ASPHALT G1 (7"-7.5'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
20	5							
		S1	8 to 10	24/12	4-4-5-11		SILT	S1 (0"-5"): Moist, loose, brown, FINE TO COARSE SAND, trace of fine gravel, trace of inorganic Silt. S1 (5"-12"): Moist, stiff, brown, INORGANIC SILT, some fine sand.
	10	S2	10 to 12	24/15	8-13-12-15			S2: Moist, very stiff, gray, INORGANIC SILT, trace of fine sand.
		S3	14 to 16	24/24	6-12-8-10	Qp = 2.0 tsf, Sv = 0.2 tsf	CLAY	S3: Moist, very stiff, gray, LEAN CLAY, trace of fine sand.
10	15							
		S4	19 to 21	24/24	1-1-2-3	Qp = 2.5 tsf, Sv = 0.1 tsf		S4: Similar to S3, except soft.
	20							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,749 **EASTING (ft):** 752,772
GROUND SURFACE EL. (ft): 25.15 **DATE START/END:** 9/26/2024 - 9/26/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB10

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
0	25	S5	24 to 26	24/18	8-10-5-12	Qp = 4.5 tsf, Sv = 0.15 tsf	CLAY	S5 (0"-14"): Similar to S3. S5 (14"-18"): Moist, medium dense, FINE TO MEDIUM SAND, trace of inorganic silt.
	30	S6	29 to 31	24/24	1-1-1-3	Qp = 1.0 tsf, Sv = 0.1 tsf		S6: Moist, soft, gray, LEAN CLAY, trace of fine sand.
-10	35	S7	34 to 36	24/24	WOH/12"-1-3	Qp = 1.0 tsf, Sv = 0.05 tsf		S7: Similar to S6, except very soft.
	40	S8	39 to 41	24/24	WOH-2-2-4	Qp = 0.75 tsf, Sv = 0.1 tsf		S8: Similar to S6.
-20	45							Bottom of boring at depth 41 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,731 **EASTING (ft):** 752,874
GROUND SURFACE EL. (ft): 24.33 **DATE START/END:** 9/27/2024 - 9/27/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 41.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING

NWB11

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 9.1 9/27/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		G1	0 to 6	72			SAND & GRAVEL (POSSIBLE FILL)	0-9": ASPHALT G1 (9"-6'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbes present.
20	5	S1	6 to 8	24/10	8-5-4-4			S1: Moist, loose, brown, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
		S2	8 to 10	24/12	4-4-6-11			S2 (0"-9"): Moist, loose, brown, FINE TO COARSE SAND, trace of inorganic silt.
	10	S3	10 to 12	24/15	7-9-8-17		SILT	S2 (9"-12"): Dry, stiff, brown, INORGANIC SILT, trace of fine sand.
							CLAY	S3: Dry, very stiff, brown, INORGANIC SILT, trace of fine sand.
10	15	S4	14 to 16	24/20	8-17-15-10	Qp = 3.5 tsf, Sv = 0.2 tsf		S4 (0"-5"): Moist, hard, gray, LEAN CLAY. S4 (5"-14"): Moist, hard, gray, INORGANIC SILT. S4 (14"-20"): Moist, hard, gray, LEAN CLAY.
	20	S5	19 to 21	24/24	WOH-1-1-2	Qp = 1.0 tsf, Sv = 0.1 tsf		S5: Moist, soft, gray, LEAN CLAY, trace of fine sand.

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,731 **EASTING (ft):** 752,874
GROUND SURFACE EL. (ft): 24.33 **DATE START/END:** 9/27/2024 - 9/27/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB11

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
0	25	S6	24 to 26	24/24	1-2-4-2	Qp = 0.5 tsf, Sv = 0.5 tsf	CLAY	S6 (0"-12"): Moist, medium stiff, gray, LEAN CLAY. S6 (12"-14"): Moist, loose, gray, FINE SAND, trace of inorganic silt. S6 (14"-24"): Similar to S5, except medium stiff.
	30	S7	29 to 31	24/24	WOH-1-1-2	Qp = 0.5 tsf, Sv = 0.05 tsf		S7: Moist, soft, gray, LEAN CLAY, trace of fine sand.
-10	35	S8	34 to 36	24/24	WOH-1-2-2	Qp = 1.0 tsf, Sv = 0.05 tsf		S8: Moist, soft, gray, LEAN CLAY. w.c.=27%, LL=32, PL=18, PI=14
	40	S9	39 to 41	24/24	WOH-1-1-3	Qp = 0.5 tsf, Sv = 0.05 tsf		S9: Similar to S8.
-20	45							Bottom of boring at depth 41 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	50							
-30	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,717 **EASTING (ft):** 752,960
GROUND SURFACE EL. (ft): 23.71 **DATE START/END:** 9/30/2024 - 9/30/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 41.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Diedrich D-25 Track Rig

BORING
NWB12
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 9.0 9/30/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	5	G1	0 to 8	96			SAND & GRAVEL (POSSIBLE FILL)	0-9": ASPHALT G1 (9"-8'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
		S1	8 to 10	24/5	3-2-2-4			S1: Moist, very loose, brown, FINE TO COARSE SAND, trace of fine gravel, some inorganic silt.
	10	S2	10 to 12	24/20	6-6-5-8			S2 (0"-12"): Similar to S1, except medium dense.
10							CLAY	S2 (12"-20"): Moist, stiff, gray, LEAN CLAY, trace of fine sand.
	15	S3	14 to 16	24/21	8-11-7-8	Qp = 2.0 tsf, Sv = 0.1 tsf		S3 (0"-14"): Moist, very stiff, gray, INORGANIC SILT, trace of fine sand. S3 (14"-21"): Moist, very stiff, gray, LEAN CLAY, trace of fine sand.
	20	S4	19 to 21	24/24	WOH/18"-1	Qp = 0.5 tsf, Sv = 0.05 tsf		S4: Moist, very soft, gray, LEAN CLAY, trace of fine sand.
0								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,717 **EASTING (ft):** 752,960
GROUND SURFACE EL. (ft): 23.71 **DATE START/END:** 9/30/2024 - 9/30/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB12

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/24	WOH/12"-3-4	Qp = 1.0 tsf, Sv = 0.05 tsf	CLAY	S5 (0"-12"): Similar to S4. S5 (12"-15"): Moist, very soft, gray, LEAN CLAY, some fine sand. S5 (15"-24"): Similar to S4.
	30	S6	29 to 31	24/24	WOH/12"-2-1	Qp = 0.5 tsf, Sv = 0.075 tsf		S6: Moist, soft, gray, LEAN CLAY.
-10	35	S7	34 to 36	24/24	2-2-2-4	Qp = 0.5 tsf, Sv = 0.1 tsf		S7: Similar to S6, except soft.
	40	S8	39 to 41	24/24	1-2-1-4	Qp = 0.5 tsf, Sv = 0.075 tsf		S8: Similar to S6, except soft.
-20	45							Bottom of boring at depth 41 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
-30	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,698 **EASTING (ft):** 753,071
GROUND SURFACE EL. (ft): 23.05 **DATE START/END:** 10/2/2024 - 10/2/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 41.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Diedrich D-25 Track Rig

BORING
NWB13
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 8.6 10/2/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	0	G1	0 to 7	84			SAND & GRAVEL (POSSIBLE FILL)	0-6": ASPHALT G1 (6"-7'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
	5	S1	7 to 9	24/10	3-3-4-4			S1: Moist, loose, brown, FINE TO MEDIUM GRAVEL, some fine to coarse sand, trace of inorganic silt.
		S2	9 to 11	24/8	3-3-5-5			S2: Similar to S1.
10	10							
		S3	14 to 16	24/18	6-5-2-8		CLAY	S3: Moist, medium stiff, gray, FINE SAND AND INORGANIC SILT.
	15							
		S4	19 to 21	24/24	1-4-2-2	Qp = 1.0 tsf, Sv = 0.1 tsf		S4: Moist, medium stiff, gray, LEAN CLAY, trace of fine sand.
0	20							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,698 **EASTING (ft):** 753,071
GROUND SURFACE EL. (ft): 23.05 **DATE START/END:** 10/2/2024 - 10/2/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB13

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/24	2-2-2-3	Qp = 1.0 tsf, Sv = 0.1 tsf	CLAY	S5: Similar to S4, except soft.
	30	S6	29 to 31	24/24	2-2-3-4	Qp = 1.0 tsf, Sv = 0.1 tsf		S6: Moist, medium stiff, gray, LEAN CLAY.
-10								
	35	S7	34 to 36	24/23	WOH/24"	Qp = 1.0 tsf, Sv = 0.05 tsf		S7 (0"-14"): Similar to S6, except very soft. S7 (14"-23"): Moist, very soft, gray, LEAN CLAY, some fine sand.
	40	S8	39 to 41	24/24	WOH/18"-2	Qp = 0.5 tsf, Sv = 0.05 tsf		S8: Moist, very soft, gray, LEAN CLAY.
-20	45							Bottom of boring at depth 41 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
-30	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,685 **EASTING (ft):** 753,168
GROUND SURFACE EL. (ft): 23.25 **DATE START/END:** 10/3/2024 - 10/3/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 41.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Diedrich D-25 Track Rig

BORING
NWB14
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 9.0 10/3/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		G1	0 to 6.8	81			SAND & GRAVEL (POSSIBLE FILL)	0-6": ASPHALT G1(6"-6.75'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
20	5	S1	7 to 9	24/10	6-8-9-14			S1: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
	10	S2	9 to 11	24/10	8-9-11-11			S2: Similar to S1.
10								
	15	S3	14 to 16	24/9	4-9-7-8			S3: Similar to S1
	20	S4	19 to 21	24/17	9-8-8-11		CLAY	S4: Moist, very stiff, gray, INORGANIC SILT, trace of fine sand.
0								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,685 **EASTING (ft):** 753,168
GROUND SURFACE EL. (ft): 23.25 **DATE START/END:** 10/3/2024 - 10/3/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB14

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/24	2-2-3-7	Qp = 1.5 tsf, Sv = 0.1 tsf	CLAY	S5 (0"-19"): Moist, medium stiff, gray, LEAN CLAY. S5 (19"-24"): Moist, medium stiff, gray, LEAN CLAY, some fine sand.
	30	S6	29 to 31	24/24	WOH-1-2-2	Qp = 0.5 tsf, Sv = 0.05 tsf		S6: Moist, soft, gray, LEAN CLAY.
-10	35	S7	34 to 36	24/24	2-2-3-3	Qp = 0.5 tsf, Sv = 0.05 tsf		S7: Moist, medium stiff, gray, LEAN CLAY, trace of fine sand.
	40	S8	39 to 41	24/24	1-1-2-3	Qp = 0 tsf, Sv = 0 tsf		S8: Similar to S6.
-20	45							Bottom of boring at depth 41 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	50							
-30	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,673 **EASTING (ft):** 753,242
GROUND SURFACE EL. (ft): 23.44 **DATE START/END:** 10/4/2024 - 10/4/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 41.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Diedrich D-25 Track Rig

BORING

NWB15

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 9.0 10/4/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	5	G1	0 to 7	84			SAND & GRAVEL (POSSIBLE FILL)	0-6": ASPHALT G1 (6"-7'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
		S1	7 to 9	24/9	4-5-5-6			S1: Moist, loose, brown, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
	10	S2	9 to 11	24/8	2-4-5-6			S2: Similar to S1.
10								
	15	S3	14 to 16	24/0	4-5-3-6	No recovery. Redrive with 3" spoon.	SAND	S3: No Recovery. S3 [Redrive]: Moist, loose, gray, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
	20	S4	19 to 21	24/22	2-3-5-6	Qp = 1.75 tsf, Sv = 0.3 tsf	CLAY	S4: Moist, medium stiff, gray, LEAN CLAY, trace of fine sand. w.c.=21%, LL=28, PL=15, PI=13
0								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,673 **EASTING (ft):** 753,242
GROUND SURFACE EL. (ft): 23.44 **DATE START/END:** 10/4/2024 - 10/4/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB15

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/24	2-3-3-4	Qp = 1.5 tsf, Sv = 0.15 tsf	CLAY	S5: Moist, medium stiff, gray, LEAN CLAY.
	30	S6	29 to 31	24/24	2-2-3-4	Qp = 1.25 tsf, Sv = 0.15 tsf		S6: Similar to S5.
-10	35	S7	34 to 36	24/24	2-3-3-4	Qp = 1.0 tsf, Sv = 0.1 tsf		S7: Similar to S5.
	40	S8	39 to 41	24/24	1-2-3-4	Qp = 1.0 tsf, Sv = 0.1 tsf		S8: Similar to S5.
-20	45							Bottom of boring at depth 41 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
-30	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,651 **EASTING (ft):** 753,351
GROUND SURFACE EL. (ft): 23.06 **DATE START/END:** 10/7/2024 - 10/7/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 41.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING
NWB16
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 9.0 10/7/2024 1:18 pm

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		G1	0 to 7.5	90			SAND & GRAVEL (POSSIBLE FILL)	0-9": ASPHALT G1 (9"-7.5'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
20	5							
		S1	8 to 10	24/8	2-4-4-3			S1: Moist, loose, brown, FINE TO COARSE SAND, some fine gravel, trace of inorganic silt.
	10	S2	10 to 12	24/9	1-2-3-4			S2: Moist, loose, brown, FINE TO COARSE SAND, trace of fine gravel, trace of inorganic silt.
10								
		S3	14 to 16	24/10	3-7-7-8		SAND	S3: Moist, medium dense, gray, FINE TO COARSE SAND, trace of inorganic silt.
	15							
		S4	19 to 21	24/8	5-8-7-6			S4: Similar to S3.
	20							
0							CLAY	

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,651 **EASTING (ft):** 753,351
GROUND SURFACE EL. (ft): 23.06 **DATE START/END:** 10/7/2024 - 10/7/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB16

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/24	2-2-3-3	Qp = 1.0 tsf, Sv = 0.15 tsf	CLAY	S5: Moist, medium stiff, gray, LEAN CLAY.
	30	S6	29 to 31	24/24	1-2-3-4	Qp = 1.5 tsf, Sv = 0.15 tsf		S6: Similar to S5.
-10								
	35	S7	34 to 36	24/24	2-3-3-4	Qp = 1.5 tsf, Sv = 0.2 tsf		S7: Similar to S5.
	40	S8	39 to 41	24/24	1-2-2-3	Qp = 0.5 tsf, Sv = 0.075 tsf		S8: Similar to S5, except soft.
-20								Bottom of boring at depth 41 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	45							
	50							
-30								
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,636 **EASTING (ft):** 753,461
GROUND SURFACE EL. (ft): 23.78 **DATE START/END:** 10/8/2024 - 10/8/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 31.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING

NWB17

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 6.0 10/8/2024 2:15 pm

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	5	G1	0 to 8	96			SAND & GRAVEL (POSSIBLE FILL)	0-7: ASPHALT G1 (7"-8'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
	10	S1	8 to 10	24/12	5-5-6-7			S1: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
		S2	10 to 12	24/12	5-6-6-5			S2: Similar to S1.
10	15	S3	14 to 16	24/0	7-8-6-8	No recovery. Redrive with 3" spoon.	SAND	S3: No Recovery S3 [Redrive]: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
	20	S4	19 to 21	24/23	2-3-4-4	Qp = 2.5 tsf, Sv = 0.2 tsf	CLAY	S4: Moist, medium stiff, gray, LEAN CLAY, trace of fine sand.
0								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,636 **EASTING (ft):** 753,461
GROUND SURFACE EL. (ft): 23.78 **DATE START/END:** 10/8/2024 - 10/8/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB17

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/24	1-1-3-3	Qp = 0.5 tsf, Sv = 0.075 tsf	CLAY	S5: Similar to S4, except soft.
	30	S6	29 to 31	24/24	1-3-3-4	Qp = 1.0 tsf, Sv = 0.1 tsf		S6: Moist, medium stiff, gray, LEAN CLAY.
-10	35							Bottom of boring at depth 31 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
-20	40							
	45							
-30	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,615 **EASTING (ft):** 753,572
GROUND SURFACE EL. (ft): 23.43 **DATE START/END:** 10/9/2024 - 10/9/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 41.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING

NWB18

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 11.4 10/9/2024 1:04 pm

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	5	G1	0 to 7	84			SAND & GRAVEL (POSSIBLE FILL)	0-7": ASPHALT G1 (7"-7'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
		S1	7 to 9	24/10	4-5-7-6			S1: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
	10	S2	9 to 11	24/10	4-6-9-11	Light rig chatter at ~10'.		S2: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
10							SAND	
	15	S3	14 to 16	24/13	7-6-8-12			S3 (0-7"): Moist, medium dense, brown, FINE TO COARSE SAND, trace of fine to medium gravel, trace of inorganic silt. S3 (7-13"): Moist, medium dense, gray, FINE SAND, trace of inorganic silt.
	20	S4	19 to 21	24/21	1-2-3-4	Qp = 3.25 tsf, Sv = 0.25 tsf	CLAY	S4: Moist, medium stiff, gray, LEAN CLAY.
0								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,615 **EASTING (ft):** 753,572
GROUND SURFACE EL. (ft): 23.43 **DATE START/END:** 10/9/2024 - 10/9/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB18

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/24	5-3-4-6	Qp = 1.75 tsf, Sv = 0.25 tsf	CLAY	S5: Moist, medium stiff, gray, LEAN CLAY, trace of fine sand.
	30	S6	29 to 31	24/23	1-3-3-5	Qp = 1.5 tsf, Sv = 0.175 tsf		S6: Moist, medium stiff, gray, FAT CLAY. w.c.=41%, LL=60, PL=24, PI=36
-10								
	35	S7	34 to 36	24/24	1-1-2-2	Qp = 1.0 tsf, Sv = 0.1 tsf		S7: Similar to S6, except soft.
	40	S8	39 to 41	24/24	WOH/12"-3-4	Qp = 0.5 tsf, Sv = 0.05 tsf		S8 (0-15"): Similar to S6, except soft. S8 (15-24"): Moist, soft, gray, LEAN CLAY, some fine sand.
-20	45							Bottom of boring at depth 41 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	50							
-30	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,511 **EASTING (ft):** 754,200
GROUND SURFACE EL. (ft): 23.17 **DATE START/END:** 10/1/2024 - 10/1/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 31.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Diedrich D-25 Track Rig

BORING
NWB19
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 6.7 10/1/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		G1	0 to 7	84			SAND & GRAVEL (POSS. FILL)	0-7": ASPHALT G1 (7"-7'): dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
20	5	S1	7 to 9	24/21	4-7-7-10	Qp = 1.5 tsf, Sv = 0.1 tsf	CLAY	S1: Moist, stiff, brown and gray, LEAN CLAY, trace of fine sand.
	10	S2	9 to 11	24/24	3-3-5-6	Qp = 3.0 tsf, Sv = 0.1 tsf		S2: Moist, stiff, gray, LEAN CLAY.
10								
	15	S3	14 to 16	24/22	9-9-6-6	Qp = 2.0 tsf, Sv = 0.1 tsf		S3 (0"-16"): Moist, very stiff, gray, INORGANIC SILT, trace of fine sand. S3 (16"-17"): Moist, medium dense, gray, FINE TO MEDIUM SAND, some inorganic silt. S3 (17"-22"): Moist, very stiff, gray, LEAN CLAY, trace of fine to coarse sand.
	20	S4	19 to 21	24/15	11-10-9-7	Qp = 0.5 tsf, Sv = 0.05 tsf		S4 (0"-7"): Moist, very stiff, gray, LEAN CLAY, trace of fine sand.
0							GLACIAL TILL	S4 (7"-15"): Moist, medium dense, brown, FINE TO COARSE SAND, some inorganic silt.

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,511 **EASTING (ft):** 754,200
GROUND SURFACE EL. (ft): 23.17 **DATE START/END:** 10/1/2024 - 10/1/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB19

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/5	18-72-45-27	Light rig chatter.	GLACIAL TILL	S5: Moist, very dense, gray, FINE TO COARSE GRAVEL, some fine to coarse sand, some lean clay. w.c.=9% grav=36%, sand=34%, fines=30%
	30	S6	29 to 31	24/6	15-14-13-14			S6: Moist, medium dense, gray, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
-10	35							Bottom of boring at depth 31 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	40							
-20	45							
	50							
-30	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,498 **EASTING (ft):** 754,275
GROUND SURFACE EL. (ft): 22.5 **DATE START/END:** 10/10/2024 - 10/10/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 31.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING
NWB20
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 15.9 10/10/2024 1:11 pm

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	0	G1	0 to 7.5	90			SAND & GRAVEL (POSSIBLE FILL)	0-6": ASPHALT G1 (6"-7.5'): Dry, brown, FINE TO COARSE SAND, some fine gravel, trace of inorganic silt, cobbles present.
	5	S1	8 to 10	24/13	3-4-6-7	Qp = 3.5 tsf, Sv = 0.45 tsf		S1 (0-8"): Moist, loose, brown, FINE TO COARSE SAND, trace of inorganic silt.
	10	S2	10 to 12	24/21	5-9-7-10	Qp = 3.75 tsf, Sv = 0.35 tsf	CLAY	S1 (8-13"): Moist, stiff, grayish brown, LEAN CLAY, trace of fine sand. S2 (0-3"): Moist, very stiff, gray, LEAN CLAY, trace of fine sand. S2 (3-9"): Moist, medium dense, gray, FINE TO COARSE SAND, some clay. S2 (9-21"): Moist, very stiff, gray, LEAN CLAY, trace of fine to coarse sand.
10	15	S3	14 to 16	24/23	2-4-5-6	Qp = 2.0 tsf, Sv = 0.3 tsf		S3: Moist, stiff, gray, LEAN CLAY.
	20	S4	19 to 21	24/21	3-4-5-7	Qp = 0.75 tsf, Sv = 0.05 tsf		S4: Moist, stiff, gray, LEAN CLAY AND INORGANIC SILT, some fine gravel, trace of fine to coarse sand. w.c.=10%, LL=16, PL=11, PI=5
0								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,498 **EASTING (ft):** 754,275
GROUND SURFACE EL. (ft): 22.5 **DATE START/END:** 10/10/2024 - 10/10/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB20

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/6	17-11-10-12		GLACIAL TILL	S5: Moist, medium dense, gray, FINE TO MEDIUM GRAVEL, some inorganic silt, some fine to coarse sand.
	30	S6	29 to 31	24/11	11-12-8-12			S6: Moist, medium dense, gray, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt.
-10	35							Bottom of boring at depth 31 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
-20	40							
-30	45							
	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,477 **EASTING (ft):** 754,394
GROUND SURFACE EL. (ft): 21.66 **DATE START/END:** 10/11/2024 - 10/11/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 29.2 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING
NWB21
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 9.9 10/11/2024 12:20 pm

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	0	G1	0 to 8	96			SAND & GRAVEL (POSSIBLE FILL)	0-8": ASPHALT G1 (8"-8'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
	5	S1	8 to 10	24/12	8-9-9-9			S1: Brown, medium dense, moist, FINE SAND, trace of inorganic silt.
	10	S2	10 to 12	24/20	3-6-8-14	Qp = 3.0 tsf, Sv = 0.25 tsf	CLAY	S2: Moist, stiff, gray, LEAN CLAY, trace of fine sand.
10								
	15	S3	14 to 16	24/20	4-7-12-44	Qp = 4.75 tsf, Sv = 0.425 tsf		S3 (0-17"): Moist, very stiff, gray, LEAN CLAY. S3 (17-20"): Moist, very stiff, gray, LEAN CLAY, some fine to medium gravel.
	20	S4	19 to 21	24/15	17-30-48-40		GLACIAL TILL	S4 (0-12"): Moist, very dense, gray, FINE TO MEDIUM GRAVEL, some fine to coarse sand, trace of inorganic silt. S4 (12-15"): Moist, very dense, gray, FINE TO COARSE GRAVEL, trace of fine to coarse sand, trace of inorganic silt, rock fragments.
0								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,477 **EASTING (ft):** 754,394
GROUND SURFACE EL. (ft): 21.66 **DATE START/END:** 10/11/2024 - 10/11/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB21

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/7	9-2-4-9		GLACIAL TILL	S5: Moist, loose, gray, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt.
	30	S6	29 to 29.2	2/2	100/2"			S6: Moist, very dense, gray, FINE GRAVEL, trace of fine to coarse sand, trace of inorganic silt.
-10								Bottom of boring at depth 29.2 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	35							
	40							
-20								
	45							
	50							
-30								
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,460 **EASTING (ft):** 754,502
GROUND SURFACE EL. (ft): 20.95 **DATE START/END:** 10/15/2024 - 10/15/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 29.1 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING

NWB22

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 13.7 10/15/2024 1:09 pm

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20		G1	0 to 7.5	90			SAND & GRAVEL (POSSIBLE FILL)	0-9": ASPHALT G1 (9"-7.5'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
	5							
		S1	8 to 10	24/9	10-16-13-15			S1: Moist, medium dense, gray, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
	10	S2	10 to 12	24/12	9-11-12-13			S2: Moist, medium dense, gray, FINE TO COARSE SAND, some fine gravel, trace of inorganic silt.
10								
		S3	14 to 16	24/12	7-9-11-12		SAND	S3: Moist, medium dense, gray, FINE SAND, trace of inorganic silt.
	15							
		S4	19 to 21	24/11	6-11-19-10			S4: Moist, dense, grayish brown, FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt, moderate petroleum odor.
	20							
0								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,460 **EASTING (ft):** 754,502
GROUND SURFACE EL. (ft): 20.95 **DATE START/END:** 10/15/2024 - 10/15/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB22

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/15	15-17-32-27		GLACIAL TILL	S5: Moist, dense, gray. FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt, rock fragments.
	30	S6	29 to 29.1	1/1	100/1"			S6: Moist, very dense, gray, FINE TO MEDIUM GRAVEL, trace of fine to coarse sand, trace of inorganic silt.
-10								Bottom of boring at depth 29.1 ft.
	35							Boring backfilled with cuttings and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	40							
-20								
	45							
	50							
-30								
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,444 **EASTING (ft):** 754,592
GROUND SURFACE EL. (ft): 21.01 **DATE START/END:** 10/16/2024 - 10/16/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 29.8 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING

NWB23

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 14.1 10/16/2024 1:02 pm

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	0	G1	0 to 6	72		Vacuum excavated performed with Ditch Witch FX60 on 9/10/2024	SAND & GRAVEL (POSSIBLE FILL)	0-7": ASPHALT G1 (7"-6'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
	5	S1	6 to 8	24/8	9-11-10-7			S1: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
		S2	8 to 10	24/10	7-7-6-6		SAND	S2: Moist, medium dense, brown, FINE TO COARSE SAND, trace of fine to medium gravel, trace of inorganic silt.
	10	S3	10 to 12	24/11	4-3-4-3			S3: Moist, loose, brown, FINE TO COARSE SAND, trace of inorganic silt.
10								
	15	S4	14 to 16	24/12	3-4-6-8			S4: Similar to S3.
	20	S5	19 to 21	24/12	9-6-9-8		GLACIAL TILL	S5: Moist, stiff, gray/black, INORGANIC SILT AND LEAN CLAY, some fine to medium gravel, trace of fine sand. w.c.=10%, LL=16, PL=12, PI=4
0								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,444 **EASTING (ft):** 754,592
GROUND SURFACE EL. (ft): 21.01 **DATE START/END:** 10/16/2024 - 10/16/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB23

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S6	24 to 26	24/8	15-13-14-16		GLACIAL TILL	S6: Moist, medium dense, gray/black, FINE TO COARSE GRAVEL AND FINE TO COARSE SAND, some inorganic silt. w.c.=8% grav=43%, sand=41%, fines=16%
	30	S7	29 to 29.8	10/4	13-100/4"			S7: Moist, very dense, gray, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt. S7 (TIP OF SPOON): Moist, very dense, FINE TO MEDIUM GRAVEL, rock fragments.
-10								Bottom of boring at depth 29.8 ft. Boring backfilled with cuttings and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	35							
	40							
-20								
	45							
	50							
-30								
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,428 **EASTING (ft):** 754,687
GROUND SURFACE EL. (ft): 21.42 **DATE START/END:** 10/17/2024 - 10/17/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 31.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING

NWB24

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 14.4 10/17/2024 1:01 pm

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	5	G1	0 to 6.5	78			SAND & GRAVEL (POSSIBLE FILL)	0-6": ASPHALT G1 (6"-6.5'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
		S1	7 to 9	24/10	8-9-7-7			S1: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
	10	S2	9 to 11	24/9	6-4-5-4		SAND	S2: Moist, loose, brown, FINE TO COARSE SAND, trace of fine gravel, trace of inorganic silt.
10								
	15	S3	14 to 16	24/10	5-6-6-6			S3: Similar to S2, except medium dense.
	20	S4	19 to 21	24/8	1-2-3-4			S4: Moist, soft, gray, INORGANIC SILT, some fine to coarse gravel, some fine to coarse sand.
0							GLACIAL TILL	

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,428 **EASTING (ft):** 754,687
GROUND SURFACE EL. (ft): 21.42 **DATE START/END:** 10/17/2024 - 10/17/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB24

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/11	13-12-18-20		GLACIAL TILL	S5: Moist, medium dense, gray, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
	30	S6	29 to 31	24/10	12-15-27-12			S6: Moist, dense, gray, FINE TO MEDIUM GRAVEL, some fine to coarse sand, trace of inorganic silt, rock fragments.
-10								Bottom of boring at depth 31 ft. Boring backfilled with cuttings and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	35							
	40							
-20								
	45							
	50							
-30								
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,411 **EASTING (ft):** 754,790
GROUND SURFACE EL. (ft): 22.14 **DATE START/END:** 10/18/2024 - 10/18/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 36.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING
NWB25
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 15.6 10/18/2024 1:20 pm

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	5	G1	0 to 6.7	80			SAND AND GRAVEL (POSSIBLE FILL)	0-7": ASPHALT G1 (7"-6.67'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
		S1	7 to 9	24/12	10-19-19-18			S1: Moist, dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
	10	S2	9 to 11	24/11	11-14-10-12		SAND	S2: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
10								
	15	S3	14 to 16	24/6	10-17-26-29			S3: Moist, dense, brown, FINE TO COARSE SAND, trace of fine gravel, trace of inorganic silt.
	20	S4	19 to 21	24/11	9-10-10-10			S4: Moist, medium dense, brown, FINE TO COARSE SAND, trace of fine to medium gravel, trace of inorganic silt.
0								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,411 **EASTING (ft):** 754,790
GROUND SURFACE EL. (ft): 22.14 **DATE START/END:** 10/18/2024 - 10/18/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB25

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/14	6-8-10-12		SAND	S5: Moist, medium dense, brown with some orange, FINE SAND, trace of inorganic silt.
	30	S6	29 to 31	24/6	6-7-7-11	Qp = 1.0 tsf Sv = 0.1 tsf	CLAY	S6: Moist, stiff, gray, LEAN CLAY, trace of fine gravel.
-10								
	35	S7	34 to 36	24/14	24-28-42-47		GLACIAL TILL	S7 (0-7"): Moist, hard, gray, INORGANIC SILT AND FINE TO COARSE SAND, some fine to medium gravel. S7 (7-14"): Moist, very dense, brown/gray, FINE TO COARSE GRAVEL, trace of fine sand, trace of inorganic silt.
								Bottom of boring at depth 36 ft. Boring backfilled with cuttings and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	40							
-20								
	45							
	50							
-30								
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,395 **EASTING (ft):** 754,886
GROUND SURFACE EL. (ft): 22.83 **DATE START/END:** 10/21/2024 - 10/21/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 36.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING
NWB26
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 8.2 10/21/2024 1:16 pm

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	5	G1	0 to 7.5	90			SAND & GRAVEL (POSSIBLE FILL)	0-7": ASPHALT G1 (7"-7.5'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
		S1	8 to 10	24/13	18-19-14-12			S1: Moist, dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
	10	S2	10 to 12	24/11	9-12-10-9		SAND	S2: Moist, medium dense, black/brown/orange, FINE TO COARSE SAND, trace of fine gravel, trace of inorganic silt.
10	15	S3	14 to 16	24/11	4-5-7-8			S3: Moist, medium dense, brown, FINE TO COARSE SAND, trace of inorganic silt.
	20	S4	19 to 21	24/23	9-6-7-9	Qp = 2.0 tsf Sv = 0.2 tsf		S4 (0-20"): Moist, medium dense, gray, FINE SAND, some inorganic silt.
0							CLAY	S4 (20-23"): Moist, stiff, gray, LEAN CLAY, trace of fine sand.

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,395 **EASTING (ft):** 754,886
GROUND SURFACE EL. (ft): 22.83 **DATE START/END:** 10/21/2024 - 10/21/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB26

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/11	14-21-19-20	Qp = 2.0 tsf Sv = 0.15 tsf		S5 (0-6"): Moist, hard, gray, LEAN CLAY, trace of fine gravel.
							SAND	S5 (6-11"): Moist, dense, gray and brown, FINE TO MEDIUM SAND, some lean clay, trace of fine sand.
	30	S6	29 to 31	24/16	8-4-1-2	Qp = 1.0 tsf Sv = 0.15 tsf		S6 (0-3"): Moist, loose, brown, FINE TO COARSE SAND, some fine gravel, trace of inorganic silt.
-10							CLAY	S6 (3-16"): Moist, medium stiff, gray, LEAN CLAY, trace of fine sand.
	35	S7	34 to 36	24/6	14-22-34-29		GLACIAL TILL	S7 (0-2"): Moist, hard, gray, INORGANIC SILT, trace of fine gravel. S7 (2-6"): Moist, very dense, gray, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt.
								Bottom of boring at depth 36 ft. Boring backfilled with sand/gravel and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	40							
-20								
	45							
	50							
-30								
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,378 **EASTING (ft):** 754,988
GROUND SURFACE EL. (ft): 23.35 **DATE START/END:** 10/22/2024 - 10/22/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 36.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING

NWB27

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 13.8 10/22/2024 1:20 pm

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	5	G1	0 to 7	84			SAND AND GRAVEL (POSSIBLE FILL)	0-7": ASPHALT G1 (7"-7'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
		S1	7 to 9	24/12	9-14-14-12			S1: Moist, medium dense, brown/black/orange, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
	10	S2	9 to 11	24/11	11-8-7-9		SAND AND GRAVEL	S2: Moist, medium dense, brown, FINE TO COARSE SAND, trace of fine gravel, trace of inorganic silt.
10								
	15	S3	14 to 16	24/12	5-7-11-20			S3: Moist, medium dense, brown, FINE TO COARSE SAND, trace of inorganic silt.
	20	S4	19 to 21	24/9	12-7-13-12			S4: Moist, medium dense, gray, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt. w.c.=7% grav=74%, sand=21%, fines=6%
0								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,378 **EASTING (ft):** 754,988
GROUND SURFACE EL. (ft): 23.35 **DATE START/END:** 10/22/2024 - 10/22/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB27

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/11	16-19-11-12			S5 (0-8"): Moist, medium dense, gray, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
							INORGANIC SILT	S5 (8-11"): Moist, very stiff, brown, INORGANIC SILT, some fine gravel, some fine to coarse sand.
	30	S6	29 to 31	24/7	48-34-18-7			S6 (0-4"): Moist, very dense, gray, FINE TO MEDIUM GRAVEL. S6 (4-7"): Moist, hard, brown, INORGANIC SILT, some fine gravel.
-10							GLACIAL TILL	
	35	S7	34 to 36	24/9	18-15-23-16			S7: Moist, dense, brown and gray, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt.
								Bottom of boring at depth 36 ft. Boring backfilled with cuttings and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	40							
-20								
	45							
	50							
-30								
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,361 **EASTING (ft):** 755,090
GROUND SURFACE EL. (ft): 23.98 **DATE START/END:** 10/23/2024 - 10/23/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 31.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: D. Blanchard **RIG TYPE:** Mobile B-46 Truck

BORING
NWB28
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 15.2 10/23/2024 12:50 pm

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	5	G1	0 to 7.5	90			SAND AND GRAVEL (POSSIBLE FILL)	0-7": ASPHALT G1 (7"-7.5'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
	10	S1	8 to 10	24/14	12-16-21-29			S1: Moist, dense, black/brown, FINE TO COARSE SAND, some fine to medium gravel, some inorganic silt.
		S2	10 to 12	24/14	16-25-19-14		SAND AND GRAVEL	S2: Moist, dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
10	15	S3	14 to 16	24/13	14-20-16-15	Light rig chatter at 12-13'.		S3: Moist, dense, brown, FINE TO COARSE GRAVEL, some fine to coarse sand, some inorganic silt. w.c.=13% grav=47%, sand=40%, fines=13%
	20	S4	19 to 21	24/10	9-10-11-11			S4: Moist, medium dense, brown, FINE TO COARSE SAND, some medium to medium gravel, trace of inorganic silt.

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,361 **EASTING (ft):** 755,090
GROUND SURFACE EL. (ft): 23.98 **DATE START/END:** 10/23/2024 - 10/23/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB28

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/9	8-10-9-10		SAND AND GRAVEL	S5: Moist, medium dense, brown, FINE TO COARSE SAND, some fine gravel, trace of inorganic silt.
	30	S6	29 to 31	24/8	8-8-9-11			S6: Moist, medium dense, brown, FINE TO COARSE SAND AND FINE TO MEDIUM GRAVEL, trace of inorganic silt.
-10	35							Bottom of boring at depth 31 ft. Boring backfilled with cuttings and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
-20	45							
-30	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,343 **EASTING (ft):** 755,189
GROUND SURFACE EL. (ft): 24.47 **DATE START/END:** 10/24/2024 - 10/24/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 31.0 **DRILLER NAME:** T. Kennedy
LOGGED BY: G. McAneny **RIG TYPE:** Mobile B-46 Truck

BORING
NWB29
PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 14.5 10/24/2024

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		G1	0 to 8.5	102			SAND AND GRAVEL (POSSIBLE FILL)	0-7": ASPHALT G1 (7"-8.5'): Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt, cobbles present.
20	5							
	10	S1	9 to 11	24/10	10-16-12-12		SAND AND GRAVEL	S1: Moist, medium dense, brown/gray, FINE TO COARSE SAND, trace of fine gravel, trace of inorganic silt.
		S2	11 to 13	24/11	7-10-17-19			S2: Moist, medium dense, brown, FINE TO COARSE SAND, trace of inorganic silt.
10	15	S3	14 to 16	24/9	11-20-19-15			S3: Wet, dense, brown/gray, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
	20	S4	19 to 21	24/12	8-7-13-18			S4: Wet, medium dense, brown, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt.

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,343 **EASTING (ft):** 755,189
GROUND SURFACE EL. (ft): 24.47 **DATE START/END:** 10/24/2024 - 10/24/2024
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB29

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
0	25	S5	24 to 26	24/10	15-17-15-18		SAND AND GRAVEL	S5: Wet, dense, brown, FINE TO COARSE GRAVEL, some fine to coarse sand, some inorganic silt. w.c.=11% grav=54%, sand=36%, fines=10%
	30	S6	29 to 31	24/7	22-36-33-30			S6: Wet, very dense, brown, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt.
-10	35							Bottom of boring at depth 31 ft. Boring backfilled with cuttings and concrete. Topped with temporary cold patch and then patched with hot mixed asphalt.
	40							
-20	45							
	50							
-30	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,870 **EASTING (ft):** 751,786
GROUND SURFACE EL. (ft): 23.86 **DATE START/END:** 3/26/2026 - 3/27/2026
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 46.0 **DRILLER NAME:** J. Flemming
LOGGED BY: D. Blanchard **RIG TYPE:** Diedrich D-25 Track Rig

BORING

NWB30

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 15.3 3/27/2026 9:30 am

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	5	S1	0 to 2	24/12	3-4-5-8		SAND AND GRAVEL (POSSIBLE FILL)	S1: Dry, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel up to 1", trace of inorganic silt, top 4" is top soil.
		S2	2 to 4	24/8	14-20-31-18			S2: Dry, very dense, brown, FINE TO COARSE SAND, trace of fine gravel, trace of inorganic silt.
		S3	4 to 6	24/10	22-17-13-12			S3: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to coarse gravel up to 1.25", trace of inorganic silt.
		S4	6 to 8	24/11	9-10-7-9			S4: Moist, medium dense, brown, FINE TO COARSE SAND, trace of fine to medium gravel, trace of inorganic silt.
	10	S5	8 to 10	24/10	11-11-14-17			S5: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel up to 1", trace of inorganic silt.
		S6	10 to 12	24/11	20-17-29-30			S6: Moist, dense, brown with traces of orange, FINE TO COARSE GRAVEL, gravel up to 1.25", some fine to coarse sand, trace of inorganic silt, increased gravel content in bottom 4".
10	15	S7	14 to 16	24/7	10-9-7-10		SAND AND GRAVEL	S7: Moist, medium dense, brown, FINE TO COARSE SAND, trace of fine gravel.
	20	S8	19 to 21	24/5	12-11-10-11			S8: Wet, medium dense, brown, FINE TO COARSE SAND, trace of fine gravel.
0								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,870 **EASTING (ft):** 751,786
GROUND SURFACE EL. (ft): 23.86 **DATE START/END:** 3/26/2026 - 3/27/2026
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB30

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S9	24 to 26	24/11	9-10-10-12		SAND AND GRAVEL	S9: Wet, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel up to 1".
	30	S10	29 to 31	24/9	10-12-16-10			S10: Wet, medium dense, brown, FINE TO COARSE SAND, trace of fine gravel.
-10	35	S11	34 to 36	24/5	12-11-15-13			S11: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel up to 1", some inorganic silt.
	40	S12	39 to 41	24/10	8-14-15-15			S12: Moist, medium dense, brown with traces of orange, FINE TO COARSE SAND, some fine gravel up to 0.75", trace of inorganic silt.
-20	45	S13	44 to 46	24/12	13-17-22-23			S13: Moist, dense, brown with red at 8", FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, gravel up to 1.25", trace of inorganic silt.
								Bottom of boring at depth 46 ft. Boring backfilled with drill cuttings.
-30	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,874 **EASTING (ft):** 751,686
GROUND SURFACE EL. (ft): 23.78 **DATE START/END:** 3/25/2026 - 3/26/2026
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 46.0 **DRILLER NAME:** J. Flemming
LOGGED BY: D. Blanchard **RIG TYPE:** Diedrich D-25 Track Rig

BORING

NWB31

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 20.5 3/26/2026 9:40 am

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
						Concrete swale 0 to 8".	SAND AND GRAVEL (POSSIBLE FILL)	
		S1	0.7 to 2.7	24/10	6-15-14-20	Used roller bit to advance through concrete swale from 0 to 8".		S1: Dry, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel up to 1", trace of inorganic silt.
20		S2	3 to 5	24/9	12-12-12-15			S2: Wet, medium dense, brown, FINE TO COARSE GRAVEL up to 1.5", some fine to coarse sand, trace of inorganic silt.
	5	S3	5 to 7	24/11	16-16-17-22	Rig chatter at ~5.5'.		S3: Wet, dense, brown, FINE TO COARSE SAND, some fine to coarse gravel up to 1.5", trace of inorganic silt.
		S4	7 to 9	24/10	10-13-12-14			S4: Moist, medium dense, brown, FINE TO COARSE GRAVEL, gravel up to 1.25", some fine to coarse sand, trace of inorganic silt.
	10	S5	9 to 11	24/8	17-15-16-27			S5: Moist, dense, brown, FINE TO COARSE SAND, some fine to medium gravel up to 0.75", trace of inorganic silt.
10							SAND AND GRAVEL	
	15	S6	14 to 16	24/8	12-13-15-12			S6: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel up to 0.75", trace of inorganic silt.
		S7	19 to 21	24/8	8-14-15-29			S7: Moist, medium dense, brown, FINE TO COARSE GRAVEL, gravel up to 1.25", some fine to coarse sand, trace of inorganic silt, increase in volume of angular gravel in bottom 3".
0	20							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,874 **EASTING (ft):** 751,686
GROUND SURFACE EL. (ft): 23.78 **DATE START/END:** 3/25/2026 - 3/26/2026
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB31

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S8	24 to 26	24/10	9-7-8-10		SAND AND GRAVEL	S8: Wet, medium dense, brown, FINE TO COARSE GRAVEL up to 1.5", some fine to coarse sand.
						Driller indicated likely cobbles from ~27-28'.		
	30	S9	29 to 31	24/0	10-11-2-35	No recovery with 2" split-spoon. Obtained recovery with 3" split-spoon.		S9: Moist, medium dense, gray, FINE TO COARSE SAND, trace of inorganic silt, likely drill wash.
-10								
	35	S10	34 to 36	24/0	7-6-4-8	Hard drilling from ~32-34'. No recovery with 2" split-spoon. Obtained recovery with 3" split-spoon.		S10: No Recovery.
		S11	36 to 38	24/3	6-8-5-9			S11: Moist, medium dense, brown, FINE TO COARSE GRAVEL up to 1.25", some fine to coarse sand.
	40	S12	39 to 41	24/0	6-3-2-3	No recovery with 2" split-spoon. Obtained recovery with 3" split-spoon.		S12: Moist, loose, gray, MEDIUM TO COARSE GRAVEL up to 1.25", trace of fine to coarse sand, mostly clean coarse gravel. possibly fractured cobbles.
-20								
	45	S13	44 to 46	24/0	13-15-10-11	No recovery with 2" split-spoon. Obtained recovery with 3" split-spoon.		S13: Moist, medium dense, brown, FINE TO COARSE SAND, trace of fine to medium gravel.
								Bottom of boring at depth 46 ft. Boring backfilled with drill cuttings. Put down new concrete to repair swale.
	50							
-30								
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,872 **EASTING (ft):** 751,591
GROUND SURFACE EL. (ft): 23.29 **DATE START/END:** 3/24/2026 - 3/25/2026
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 43.0 **DRILLER NAME:** J. Flemming
LOGGED BY: D. Blanchard **RIG TYPE:** Diedrich D-25 Track Rig

BORING

NWB32

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 7.6 3/25/2026 7:15 am

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	5	S1	0 to 2	24/16	3-6-27-36		SAND AND GRAVEL (POSSIBLE FILL)	S1: Dry, dense, brown, FINE TO COARSE SAND, some fine to coarse gravel up to 1.25", trace of inorganic silt, top 4" are top soil, roots present.
		S2	2 to 4	24/14	34-28-24-28			S2: Dry, very dense, brown with traces of orange, FINE TO COARSE SAND, some fine to coarse gravel up to 1.5", trace of inorganic silt.
		S3	4 to 6	24/13	16-17-17-27			S3: Moist, dense, brown, FINE TO COARSE SAND, some fine to medium gravel up to 1", trace of inorganic silt.
		S4	6 to 8	24/18	18-15-17-16			S4: Moist, dense, brown, FINE TO COARSE SAND, some fine to medium gravel up to 1", trace of inorgainc silt.
	10	S5	8 to 10	24/9	11-15-12-12			S5: Moist, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel up to 1", trace of inorganic silt.
		S6	10 to 12	24/11	14-14-22-23			S6: Moist, dense, brown, FINE TO COARSE SAND, some fine to medium gravel up to 1", trace of inorganic silt.
10							SAND AND GRAVEL	
	15	S7	14 to 16	24/8	26-18-14-11			S7: Moist, dense, brown, FINE TO COARSE GRAVEL up to 1.5", some fine to coarse sand, trace of inorganic silt.
	20	S8	19 to 21	24/10	6-12-14-15			S8: Moist, medium dense, brown, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, gravel up to 1.5", trace of inorganic silt.
0								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,872 **EASTING (ft):** 751,591
GROUND SURFACE EL. (ft): 23.29 **DATE START/END:** 3/24/2026 - 3/25/2026
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB32

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S9	24 to 26	24/7	11-13-14-16		SAND AND GRAVEL	S9: Wet, medium dense, brown, FINE TO COARSE SAND AND FINE TO MEDIUM GRAVEL, gravel up to 1", trace of inorganic silt.
	30	S10	29 to 31	24/7	14-13-10-11			S10: Moist, medium dense, brown, FINE TO COARSE SAND, trace of fine gravel, trace of inorganic silt.
-10	35	S11	34 to 36	24/5	15-28-14-7			S11: Moist, dense, brown, FINE TO COARSE SAND, some fine to medium gravel up to 1", trace of inorganic silt.
	40	S12	39 to 41	24/4	11-12-15-15	Low recovery on S12.		S12: Wet, medium dense, brown, FINE TO COARSE SAND, some inorganic silt, trace of fine gravel.
		S13	41 to 43	24/6	12-14-15-14			S13: Moist, medium dense, brown, FINE TO COARSE SAND, some inorganic silt.
-20	45							Bottom of boring at depth 43 ft. Boring backfilled with drill cuttings.
-30	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,866 **EASTING (ft):** 751,505
GROUND SURFACE EL. (ft): 23.05 **DATE START/END:** 3/23/2026 - 3/24/2026
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.
TOTAL DEPTH (ft): 41.0 **DRILLER NAME:** J. Flemming
LOGGED BY: D. Blanchard **RIG TYPE:** Diedrich D-25 Track Rig

BORING

NWB33

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: Rotary Wash with Casing
WATER LEVEL DEPTHS (ft): ▼ 8.1 3/24/2026 9:15 am

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
20	0	S1	0 to 2	24/17	6-6-5-7		SAND AND GRAVEL (POSSIBLE FILL)	S1: Dry, medium dense, light brown to brown, FINE TO COARSE SAND, trace of fine to coarse gravel, trace of inorganic silt, roots and wood in top 3".
		S2	2 to 4	24/15	5-5-7-6			S2: Dry, medium dense, light brown, FINE SAND, trace of inorganic silt.
	5	S3	4 to 5.3	15/9	5-6-50/3"			S3: Dry, very dense, light brown, FINE SAND, trace of fine gravel, trace of inorganic silt.
						Hard refusal at ~5.25'.		
						Rig chatter from ~6 to 6.5'.		
		S4	8 to 10	24/9	18-22-14-9	Driller indicated likely cobbles from ~5.25 to 8'.		S4: Moist, dense, light brown, FINE TO COARSE GRAVEL, gravel up to 1.5", some fine to coarse sand, trace of inorganic silt, fractured cobbles.
	10	S5	10 to 12	24/16	11-11-10-11			S5: Moist, medium dense, light brown with orange staining, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, gravel up to 1.25", trace of inorganic silt.
10							SAND AND GRAVEL	
	15	S6	14 to 16	24/6	26-22-19-23			S6: Moist, dense, brown, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, gravel up to 1.25", trace of inorganic silt.
	20	S7	19 to 21	24/11	15-19-20-15			S7: Moist, dense, light brown, FINE TO COARSE SAND, some fine to coarse gravel up to 1.5", trace of inorganic silt.
0								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,866 **EASTING (ft):** 751,505
GROUND SURFACE EL. (ft): 23.05 **DATE START/END:** 3/23/2026 - 3/24/2026
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING NWB33

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S8	24 to 26	24/10	10-8-10-9		SAND AND GRAVEL	S8: Moist, medium dense, light brown, FINE TO COARSE SAND, some fine to medium gravel up to 0.75", trace of inorganic silt.
	30	S9	29 to 31	24/7	12-40-20-12			S9: Wet, very dense, brown, FINE TO COARSE SAND, some fine to coarse gravel up to 1.25", trace of inorganic silt.
-10						Harder drilling, light rig chatter at ~33'.		
	35	S10	34 to 36	24/9	17-18-21-25			S10: Wet, dense, brown, FINE TO COARSE GRAVEL, gravel up to 1.25", some fine to medium sand, trace of inorganic silt.
	40	S11	39 to 41	24/12	13-19-22-25			S11: Moist, dense, brown, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, gravel up to 1.25", trace of inorganic silt.
-20	45							Bottom of boring at depth 41 ft. Boring backfilled with cuttings.
-30	50							
	55							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,306 **EASTING (ft):** 2,955,306
GROUND SURFACE EL. (ft): 26.1 **DATE START/END:** 6/13/2018 - 6/14/2018
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** GeoLogic Earth Exploration, Inc.
TOTAL DEPTH (ft): 89.0 **DRILLER NAME:** P. Fisher
LOGGED BY: C. Burford **RIG TYPE:** Rotary Wash with Casing

BORING

IC-BB-104

PAGE 1 of 4

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: CME 75 Truck
WATER LEVEL DEPTHS (ft): ▼ 18.5 6/14/2018

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		VAC	0 to 5	60		Vacuum excavated to 5 ft on 6/13/18.	SAND AND GRAVEL (POSSIBLE FILL)	0-5': Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, some inorganic silt.
	5	S1	5 to 7	24/12	2-8-13-18	Advance 5" dia. casing while drilling/sampling to a depth of 20 ft.		S1: Dry, medium dense, tan, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt.
20								
	10	S2	9 to 11	24/10	11-12-17-22			S2: Dry, medium dense, tan, FINE TO COARSE SAND, trace of fine gravel, trace of inorganic silt.
	15	S3	14 to 16	24/11	10-15-14-10			S3: Moist, medium dense, tan with orange, black band at tip, FINE TO COARSE SAND, some fine gravel, trace of inorganic silt.
10								
	20	S4	19 to 21	24/11	11-11-13-22	Telescope 4" dia. casing to a depth of 20 ft. Advance 4" dia. casing while drilling/sampling to a depth of 60 ft.	SAND AND GRAVEL	S4: Wet, medium dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,306 **EASTING (ft):** 2,955,306
GROUND SURFACE EL. (ft): 26.1 **DATE START/END:** 6/13/2018 - 6/14/2018
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** GeoLogic Earth Exploration, Inc.

BORING IC-BB-104

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S5	24 to 26	24/0	4-11-16-21	No recovery. Redrive with 3" spoon.	SAND AND GRAVEL	S5: No Recovery. Cobbles encountered. S5 [Redrive]: Wet, medium dense, brown, FINE TO COARSE SAND, some fine gravel, trace of inorganic silt.
0								
	30	S6	29 to 31	24/12	7-10-14-15			S6: Similar to S5.
	35	S7	34 to 36	24/10	15-20-20-19			S7: Wet, dense, tan-brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
-10								
	40	S8	39 to 41	24/11	12-16-17-12			S8: Wet, dense, tan-brown, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt. w.c.=8% grav=65%, sand=29%, fines=6%
	45	S9	44 to 46	24/8	9-12-12-12			S9: Wet, medium dense, tan-brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
-20								
	50	S10	49 to 51	24/19	7-5-11-13			S10 (0"-13"): Wet, medium dense, tan, FINE SAND, some inorganic silt.
								S10 (13"-19"): Wet, medium dense, gray, FINE TO COARSE SAND, some inorganic clay, some fine gravel.
	55	S11	54 to 56	24/24	7-12-14-11			S11 (0"-6"): Wet, very stiff, gray, INORGANIC CLAY, trace of fine sand.

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,306 **EASTING (ft):** 2,955,306
GROUND SURFACE EL. (ft): 26.1 **DATE START/END:** 6/13/2018 - 6/14/2018
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** GeoLogic Earth Exploration, Inc.

BORING IC-BB-104

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
-30							CLAY WITH FINE SAND LAYERS	S11 (6"-24"): Wet, medium dense. gray, FINE SAND, some inorganic clay. w.c.=21%
	60	S12	59 to 61	24/24	7-8-12-10			S12 (0"-13"): Similar to S11 (6"-24"). S12 (13"-24"): Wet, very stiff, gray, INORGANIC CLAY, trace of fine sand. w.c.=29%
						Open hole while drilling/sampling to a depth of 65 ft.		
	65	S13	64 to 66	24/13	10-11-13-11		SAND AND GRAVEL	S13: Wet, medium dense, gray, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt.
-40						Advance 4" dia. casing while drilling/sampling to a depth of 70 ft.		
	70	S14	69 to 70.3	15/8	32-19-100/3"			S14 (0"-7"): Wet, very dense, gray, FINE TO COARSE SAND, some fine to medium gravel, some inorganic silt. S14 (7"-8"): Wet, very dense, gray, FINE TO COARSE GRAVEL, trace of fine to coarse sand, trace of inorganic clay, looks like weathered rock.
						Telescope 3" dia. casing to a depth of 70 ft.		
	75	S15	74 to 74	0/0	100/0"		WEATHERED ROCK	S15: No Recovery.
-50						Loss of water while drilling due to highly weathered/fractured rock.		
	80	S16	79 to 79	0/0	100/0"			S16: No Recovery. Weathered rock in tip.
	85	S17	84 to 84	0/0	100/0"			S17: No Recovery. Weathered rock in drill cuttings.
-60								

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,306 **EASTING (ft):** 2,955,306
GROUND SURFACE EL. (ft): 26.1 **DATE START/END:** 6/13/2018 - 6/14/2018
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** GeoLogic Earth Exploration, Inc.

BORING IC-BB-104

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	90	S18	89 to 89	0/0	100/0"			S18: No Recovery. Bottom of boring at depth 89 ft. Borehole backfilled with cuttings and sand.
-70	95							
	100							
-80	105							
	110							
-90	115							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

BORING INFORMATION

NORTHING (ft): 2,955,329 **EASTING (ft):** 755,216
GROUND SURFACE EL. (ft): 25.0 **DATE START/END:** 6/18/2018 - 6/27/2018
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** GeoLogic Earth Exploration, Inc.
TOTAL DEPTH (ft): 64.0 **DRILLER NAME:** P. Fisher
LOGGED BY: C. Burford/J. Giampa **RIG TYPE:** Rotary Wash with Casing

BORING

IC-BB-105

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** Not used
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** NA / NA
DRILLING METHOD: CME 75 Truck
WATER LEVEL DEPTHS (ft): ▼ 19.0 6/27/2018

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		VAC	0 to 5	60		Vacuum excavated to 5 ft on 6/18/2018.	SAND AND GRAVEL (POSSIBLE FILL)	0-5': Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, some inorganic silt.
20	5	S1	5 to 7	24/10	6-7-8-9	Advance 5" dia. casing while drilling/sampling to a depth of 20 ft.		S1: Dry, medium dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
	10	S2	9 to 11	24/10	9-16-17-21			S2: Wet, dense, light brown, FINE TO COARSE SAND, some fine to coarse gravel, trace of inorganic silt.
10	15	S3	14 to 16	24/10	8-8-10-9			S3: Wet, medium dense, light brown, FINE TO COARSE SAND, trace fine gravel, trace of inorganic silt.
	20	S4	19 to 21	24/10	7-17-15-14	Telescope 4" dia. casing to 20 ft. Advance 4" dia. casing while drilling/sampling to a depth of 50 ft.		S4: Wet, dense, brown, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt.

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,329 **EASTING (ft):** 755,216
GROUND SURFACE EL. (ft): 25.0 **DATE START/END:** 6/18/2018 - 6/27/2018
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** GeoLogic Earth Exploration, Inc.

BORING IC-BB-105

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
0	25	S5	24 to 26	24/12	16-13-12-19		SAND AND GRAVEL	S5: Wet, medium dense, brown with orange, FINE TO COARSE GRAVEL, some fine to coarse sand, trace of inorganic silt.
	30	S6	29 to 31	24/13	16-18-17-17			S6: Similar to S5, except dense, and brown, black, and orange.
-10	35	S7	34 to 36	24/9	19-26-24-20			S7: Wet, dense, brown, FINE TO COARSE GRAVEL, some fine to coarse sand, some inorganic silt.
	40	S8	39 to 41	24/3	12-10-7-5			S8: Wet, medium dense, brown with orange, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, trace of inorganic silt.
-20	45	S9	44 to 46	24/7	7-8-9-7			S9: Wet, medium dense, brown, FINE SAND, trace of inorganic silt.
	50	S10	49 to 51	24/19	8-14-18-25	Open hole drilling/sampling to a depth of 55 ft.		S10: Wet, dense, gray, FINE SAND, some fine to coarse gravel (looks like fractured rock), some inorganic clay.
-30	55	S11	54 to 56	24/9	11-11-10-11			S11: Wet, medium dense, gray, FINE TO COARSE GRAVEL, some fine to coarse sand, some inorganic silt.

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

NORTHING (ft): 2,955,329 **EASTING (ft):** 755,216
GROUND SURFACE EL. (ft): 25.0 **DATE START/END:** 6/18/2018 - 6/27/2018
VERT./HORIZ. DATUMS: NAVD 88/NAD 1983 **DRILLING COMPANY:** GeoLogic Earth Exploration, Inc.

BORING IC-BB-105

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
						Advance 4" dia. casing while drilling/sampling to a depth of 60 ft.		
	60	S12	59 to 59	0/0	100/0"	Driller notes that fracture/weathered rock in cuttings. Open hole drilling/sampling to a depth of 64 ft.	POSSIBLE WEATHERED ROCK	S12: No Recovery.
-40	65	S13	64 to 64	0/0	100/0"	Driller notes that fracture/weathered rock in cuttings.		S12: No Recovery. Bottom of boring at depth 64 ft. Borehole backfilled with cuttings and sand.
	70							
-50	75							
	80							
-60	85							

NOTES:
1. Location: Lincoln Street noise barrier.
2. Where no change in drilling action or cuttings was observed, the strata change depth was interpreted based on data from nearby borings and engineering judgement.

PROJECT NAME: Allston Multimodal Project
CLIENT: WSP / PINFO 616308 BRIDGE NO: N/A
CITY/STATE: Boston, MA
GEI PROJECT NUMBER: 1903324

GEI Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1903324 NOISE WALL BORINGS 08-26-2026.GPJ 8/26/26

Appendix C Laboratory Data Test Results

C.1. Grain Size Distribution Reports

C.2. Atterberg Limits Reports

C.1. Grain Size Distribution Reports

Particle Size Distribution Report



	% Boulders	% +3"	% Gravel			% Sand		% Fines
			Coarse	Medium	Fine	Coarse	Fine	
○	0.0	0.0	6.0	18.4	27.2	14.8	12.8	20.8

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			15.1524	4.3407	2.2614	0.2622				

Material Description	USCS	AASHTO
○ FINE TO COARSE GRAVEL, some fine to coarse sand, some inorganic silt	SM	

Project No. 1903324 **Client:** WSP

Project: Allston Interchange

○ **Source of Sample:** NWB2 **Depth:** 9-11 ft **Sample Number:** S2

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400 Unicorn Park Drive
Woburn, MA 01801

Remarks:

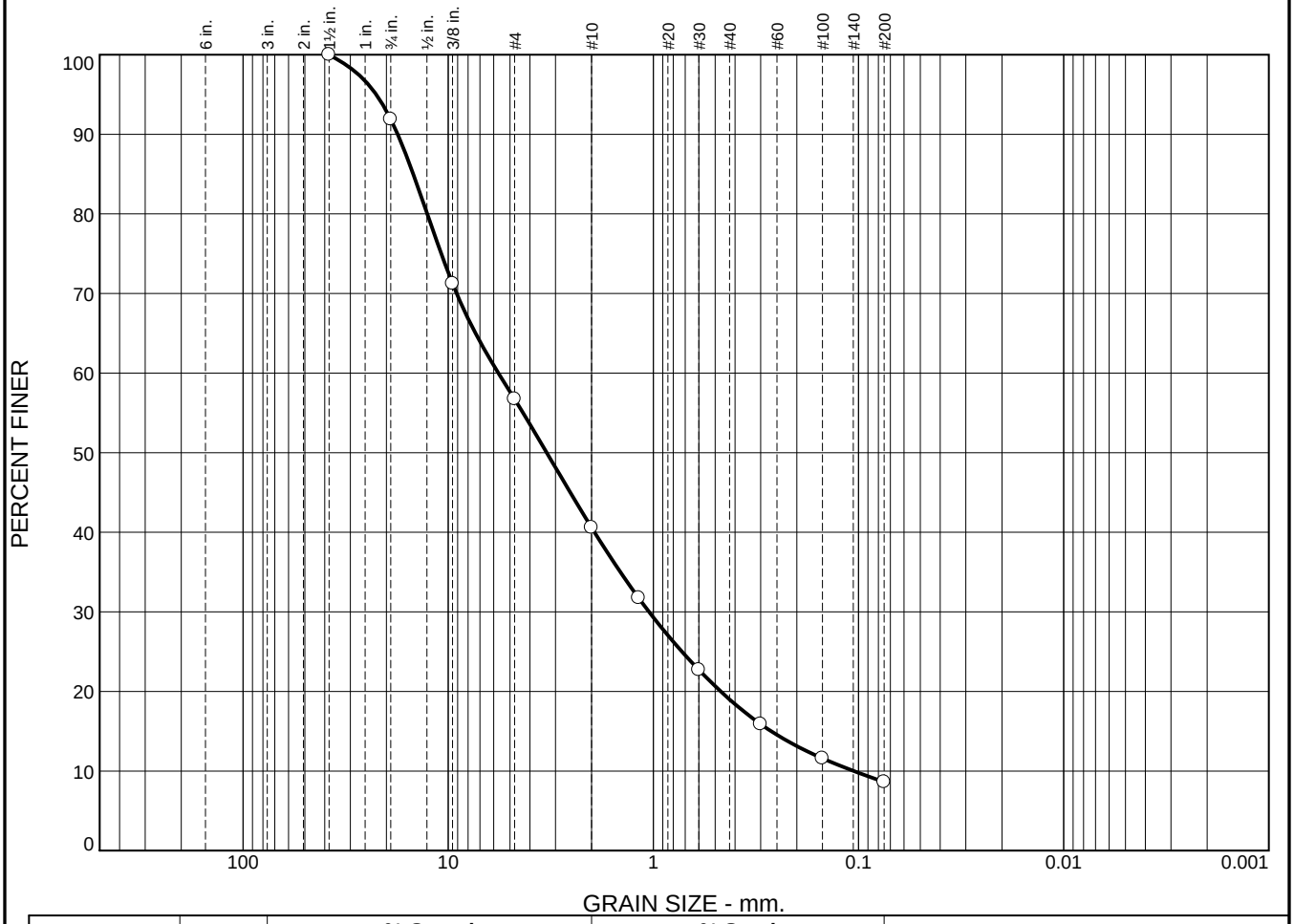
○As Received WC=10.8%

Fines classified visually

Figure

Tested By: M. Alstede 11/21/24 **Checked By:** W. Lukas 11/21/24

Particle Size Distribution Report



	% Boulders	% +3"	% Gravel			% Sand		% Fines
			Coarse	Medium	Fine	Coarse	Fine	
○	0.0	0.0	3.3	25.5	30.6	21.6	10.4	8.6

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			14.8076	5.6937	3.3088	1.0497	0.2664	0.1052	1.84	54.11

Material Description	USCS	AASHTO
○ FINE TO COARSE GRAVEL, some fine to coarse sand, trace inorganic silt	SW-SM	

Project No. 1903324 **Client:** WSP

Project: Allston Interchange

○ **Source of Sample:** NWB3 **Depth:** 9-11 ft **Sample Number:** S2

Remarks:

○As Received WC=8.9%

Fines classified visually

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Figure

Tested By: M. Alstede 11/21/24 **Checked By:** W. Lukas 11/21/24

Particle Size Distribution Report



	% Boulders	% +3"	% Gravel			% Sand		% Fines
			Coarse	Medium	Fine	Coarse	Fine	
○	0.0	0.0	0.0	0.0	0.8	5.3	60.4	33.5

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.2723	0.1473	0.1153					

Material Description	USCS	AASHTO
○ FINE TO COARSE SAND, some clay, trace fine gravel	SM	

Project No. 1903324 **Client:** WSP

Project: Allston Interchange

○ **Source of Sample:** NWB4 **Depth:** 19-21 ft **Sample Number:** S4

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Remarks:

○As Received WC=17.1%

Fines classified visually

Figure

Tested By: M. Alstede 11/21/24 **Checked By:** W. Lukas 11/21/24

Particle Size Distribution Report



	% Boulders	% +3"	% Gravel			% Sand		% Fines
			Coarse	Medium	Fine	Coarse	Fine	
○	0.0	0.0	0.0	16.8	19.5	16.0	17.6	30.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			10.4134	1.4107	0.5192					

Material Description	USCS	AASHTO
○ FINE TO COARSE GRAVEL, some fine to coarse sand, some clay	SC	

Project No. 1903324 **Client:** WSP

Project: Allston Interchange

○ **Source of Sample:** NWB19 **Depth:** 24-26 ft **Sample Number:** S5

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Remarks:

○As Received WC=9.2%

Fines classified visually

Figure

Tested By: M. Alstede 11/21/24 **Checked By:** W. Lukas 11/21/24

Particle Size Distribution Report



	% Boulders	% +3"	% Gravel			% Sand		% Fines
			Coarse	Medium	Fine	Coarse	Fine	
○	0.0	0.0	8.3	15.0	19.8	18.7	21.8	16.4

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			17.3722	2.5428	1.1776	0.2270				

Material Description	USCS	AASHTO
○ FINE TO COARSE GRAVEL AND FINE TO COARSE SAND, some inorganic silt	SM	

Project No. 1903324 **Client:** WSP

Project: Allston Interchange

○ **Source of Sample:** NWB23 **Depth:** 24-26 ft **Sample Number:** S6

Remarks:

○As Received WC=8.1%

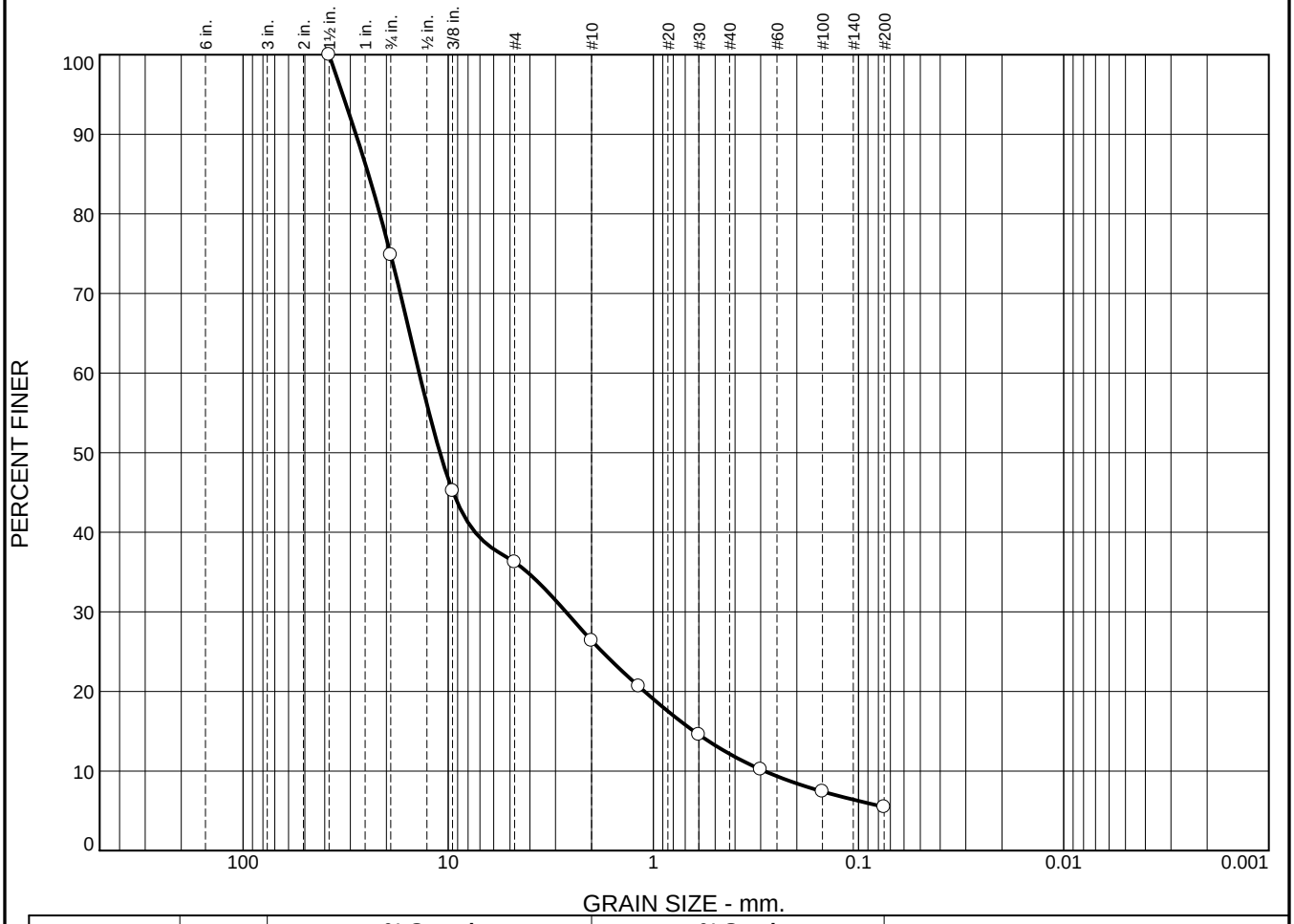
Fines classified visually

GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801

Figure

Tested By: M. Alstede 11/21/24 **Checked By:** W. Lukas 11/21/24

Particle Size Distribution Report



	% Boulders	% +3"	% Gravel			% Sand		% Fines
			Coarse	Medium	Fine	Coarse	Fine	
○	0.0	0.0	13.7	41.1	18.8	14.2	6.7	5.5

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			24.5029	13.8475	10.9778	2.6684	0.6339	0.2880	1.79	48.09

Material Description	USCS	AASHTO
○ FINE TO COARSE GRAVEL, some fine to coarse sand, trace inorganic silt	GW-GM	

Project No. 1903324 **Client:** WSP

Project: Allston Interchange

○ **Source of Sample:** NWB27 **Depth:** 19-21 ft **Sample Number:** S4

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Woburn, MA 01801

Remarks:

○As Received WC=6.8%

Fines classified visually

Figure

Tested By: M. Alstede 11/21/24 **Checked By:** W. Lukas 11/21/24

Particle Size Distribution Report



	% Boulders	% +3"	% Gravel			% Sand		% Fines
			Coarse	Medium	Fine	Coarse	Fine	
○	0.0	0.0	5.1	19.2	23.0	21.6	18.2	12.9

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			14.7008	3.4229	1.6408	0.3915	0.0970			

Material Description	USCS	AASHTO
○ FINE TO COARSE GRAVEL, some fine to coarse sand, some inorganic silt	SM	

Project No. 1903324 **Client:** WSP

Project: Allston Interchange

○ **Source of Sample:** NWB28 **Depth:** 14-16 ft **Sample Number:** S3

Remarks:

○As Received WC=9.8%

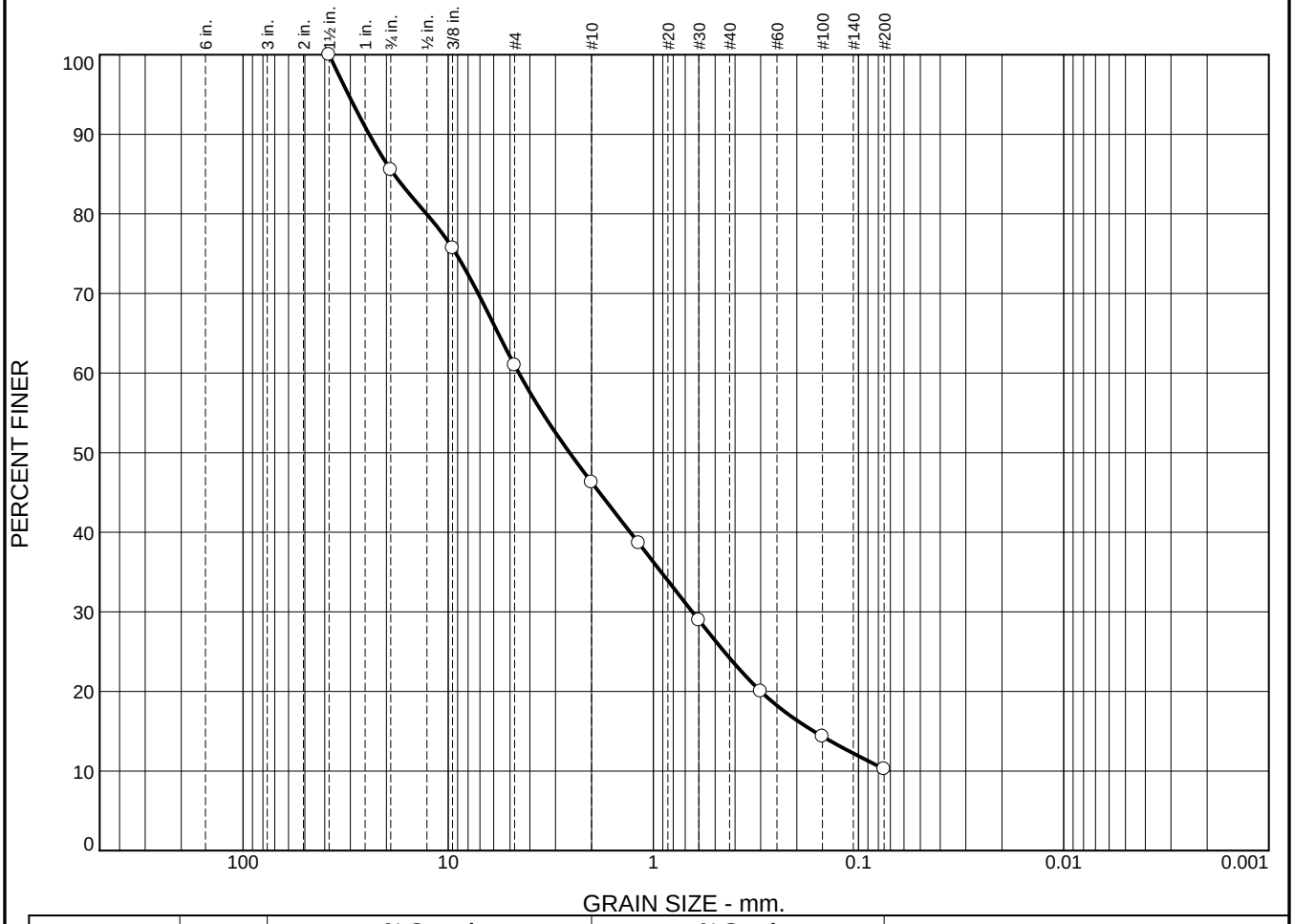
Fines classified visually

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Woburn, MA 01801

Figure

Tested By: M. Alstede 11/21/24 **Checked By:** W. Lukas 11/21/24

Particle Size Distribution Report



	% Boulders	% +3"	% Gravel			% Sand		% Fines
			Coarse	Medium	Fine	Coarse	Fine	
○	0.0	0.0	9.1	15.2	29.4	22.1	13.9	10.3

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			18.4075	4.5249	2.5602	0.6460	0.1652			

Material Description	USCS	AASHTO
○ FINE TO COARSE GRAVEL, some fine to coarse sand, some inorganic silt	SP-SM	

Project No. 1903324 **Client:** WSP

Project: Allston Interchange

○ **Source of Sample:** NWB29 **Depth:** 24-26 ft **Sample Number:** S5

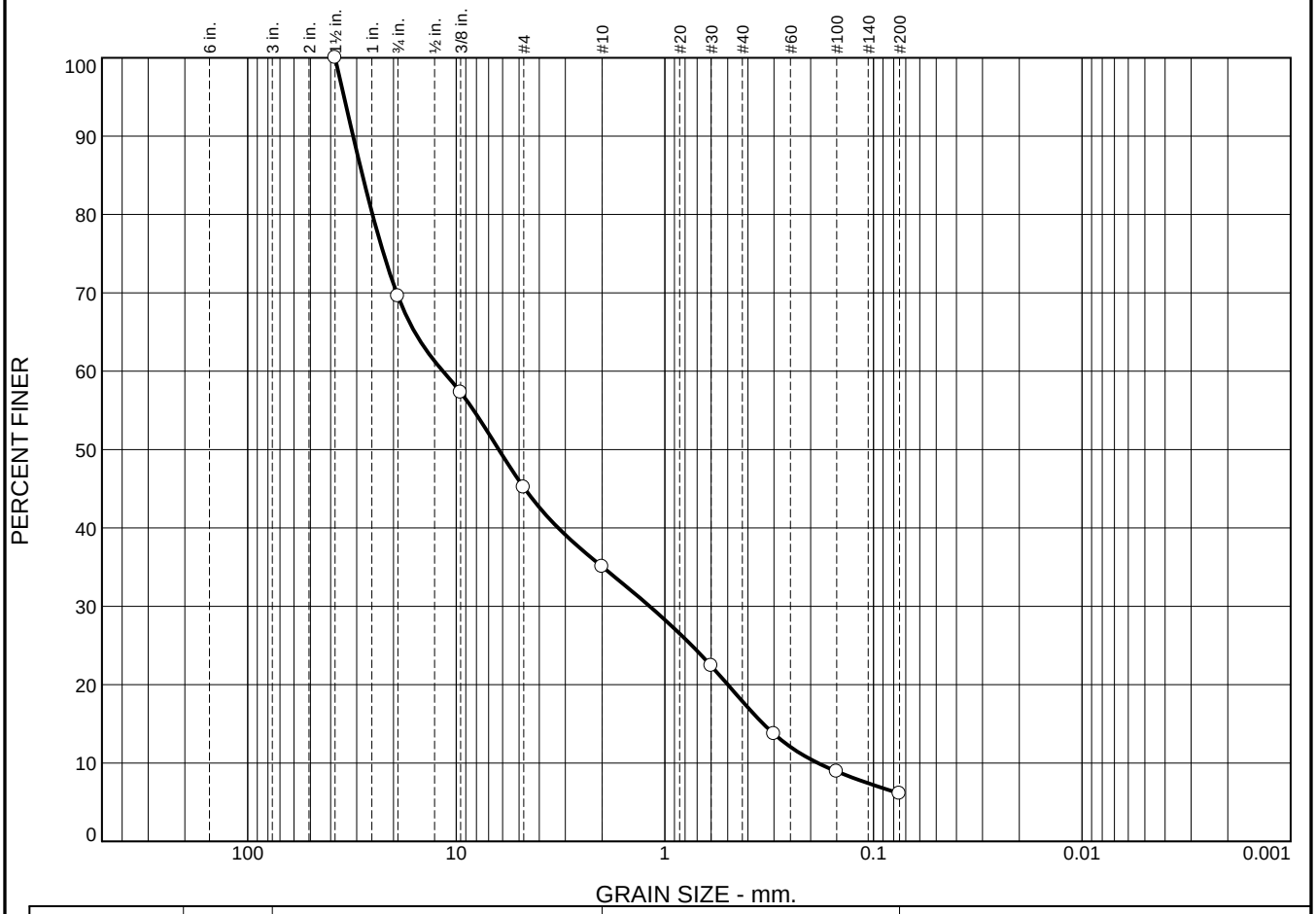
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Remarks:
○As Received WC=10.4%
Fines classified visually

Figure

Tested By: M. Alstede 11/21/24 **Checked By:** W. Lukas 11/21/24

Particle Size Distribution Report



	% Boulders	% +3"	% Gravel			% Sand		% Fines
			Coarse	Medium	Fine	Coarse	Fine	
○	0.0	0.0	19.7	23.0	22.2	17.2	11.8	6.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	-	-	28.1574	11.5817	6.2532	1.1829	0.3372	0.1848	0.65	62.67

Material Description	USCS	AASHTO
○ Wet, tan, dense, FINE TO COARSE GRAVEL, some fine to coarse sand, trace inorganic silt.	GP-GM	-

Project No. 1400820 **Client:** WSP

Project: MassDOT Allston Viaduct I-90

○ **Source of Sample:** IC-BB-104 **Depth:** 39-41 ft. **Sample Number:** S8

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Remarks:

○As Rec'd WC = 7.6%

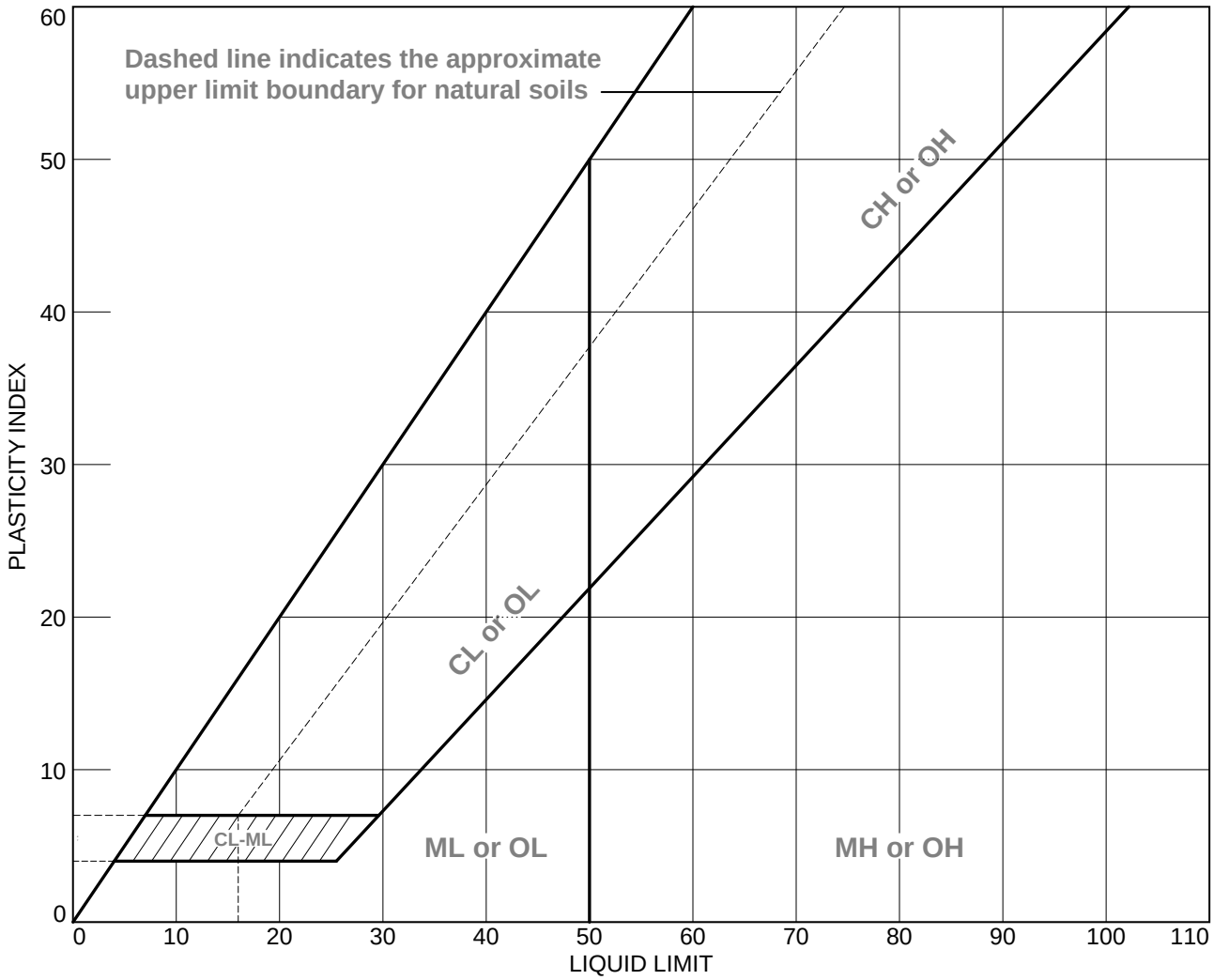
Material description based on MassDOT soil classification system.

Figure

Tested By: JF **Checked By:** EF

C.2. Atterberg Limits Reports

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

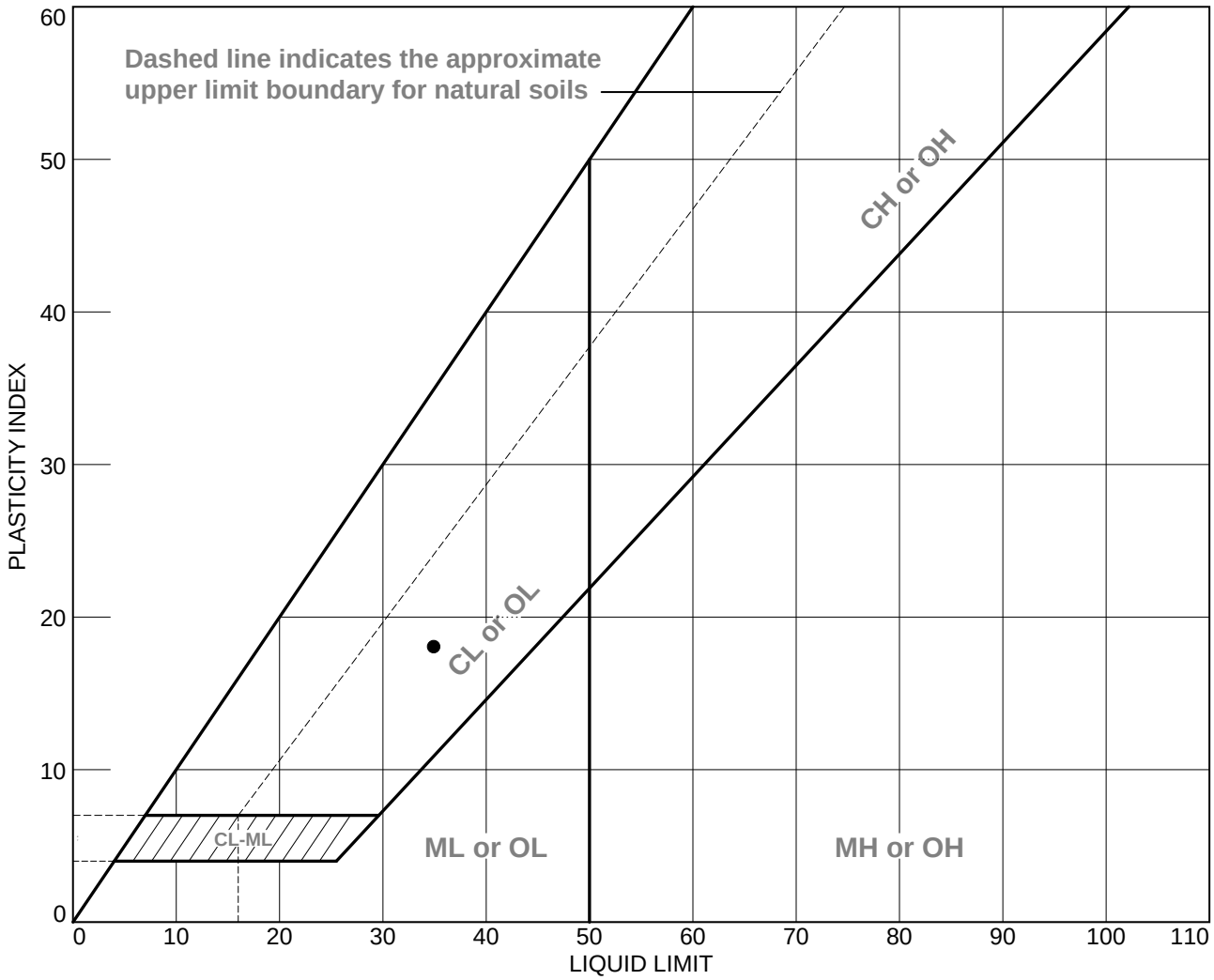
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	NWB7	S4	19-21 ft	21.0	NP	NV	NP	ML

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Client: WSP
Project: Allston Interchange
Project No.: 1903324 **Figure**

Tested By: M. Alstede 11/21/24 **Checked By:** W. Lukas 11/21/24

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

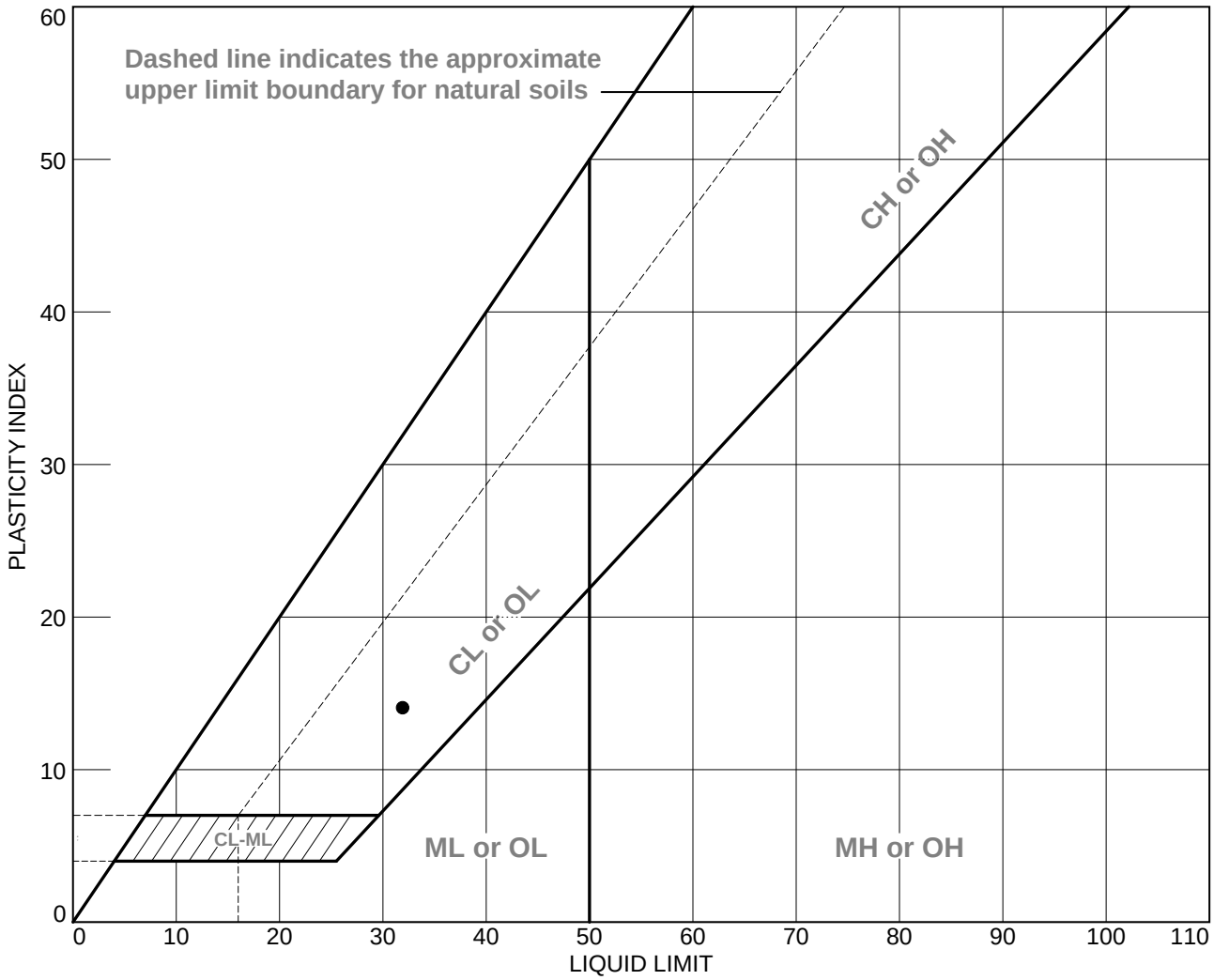
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	NWB9	S3	14-16 ft	25.1	17	35	18	CL

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Client: WSP
Project: Allston Interchange
Project No.: 1903324 **Figure**

Tested By: M. Alstede 11/22/24 **Checked By:** W. Lukas 11/26/24

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

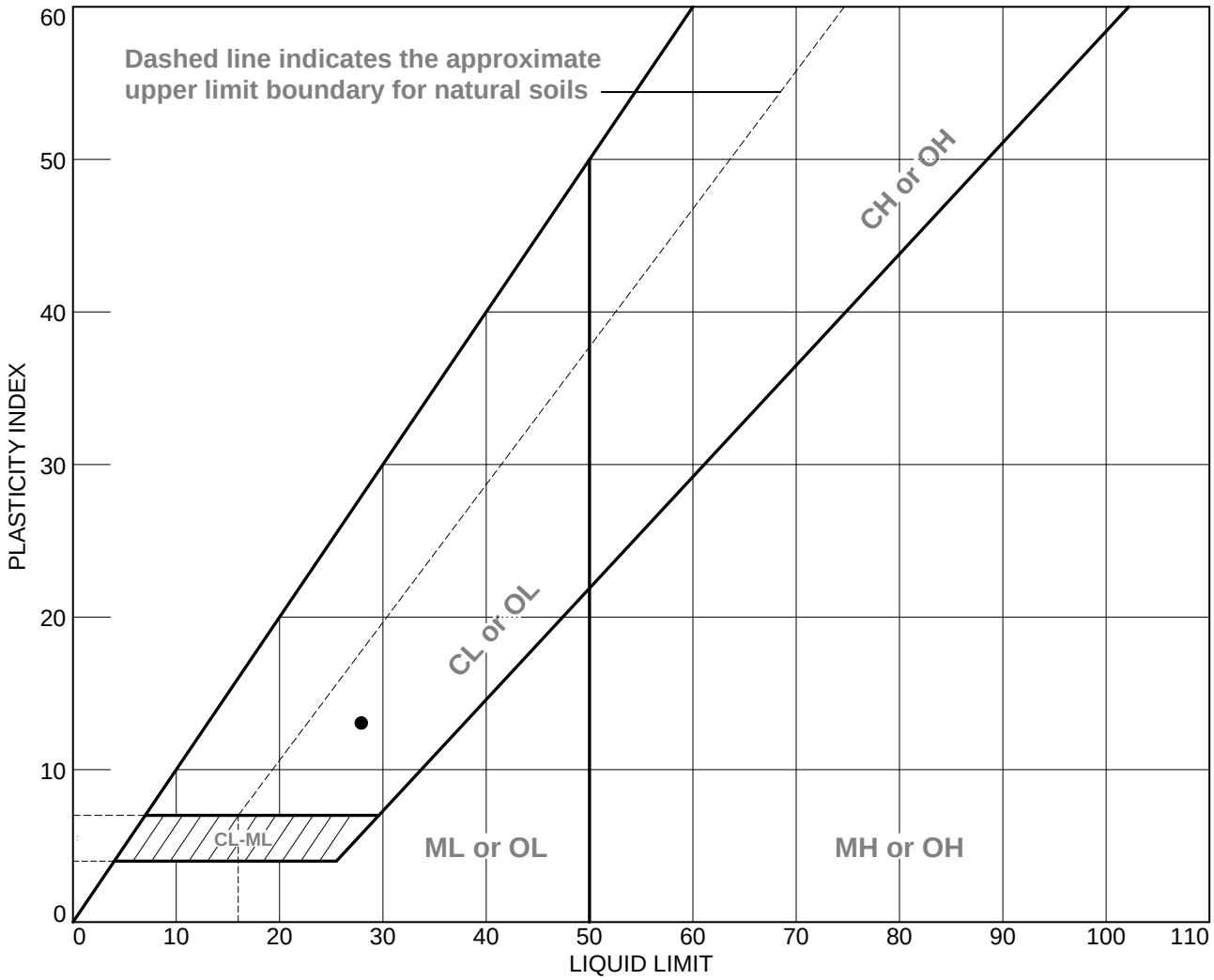
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	NWB11	S8	34-36 ft	26.7	18	32	14	CL

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Client: WSP
Project: Allston Interchange
Project No.: 1903324 **Figure**

Tested By: M. Alstede 12/3/24 **Checked By:** W. Lukas 12/3/24

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

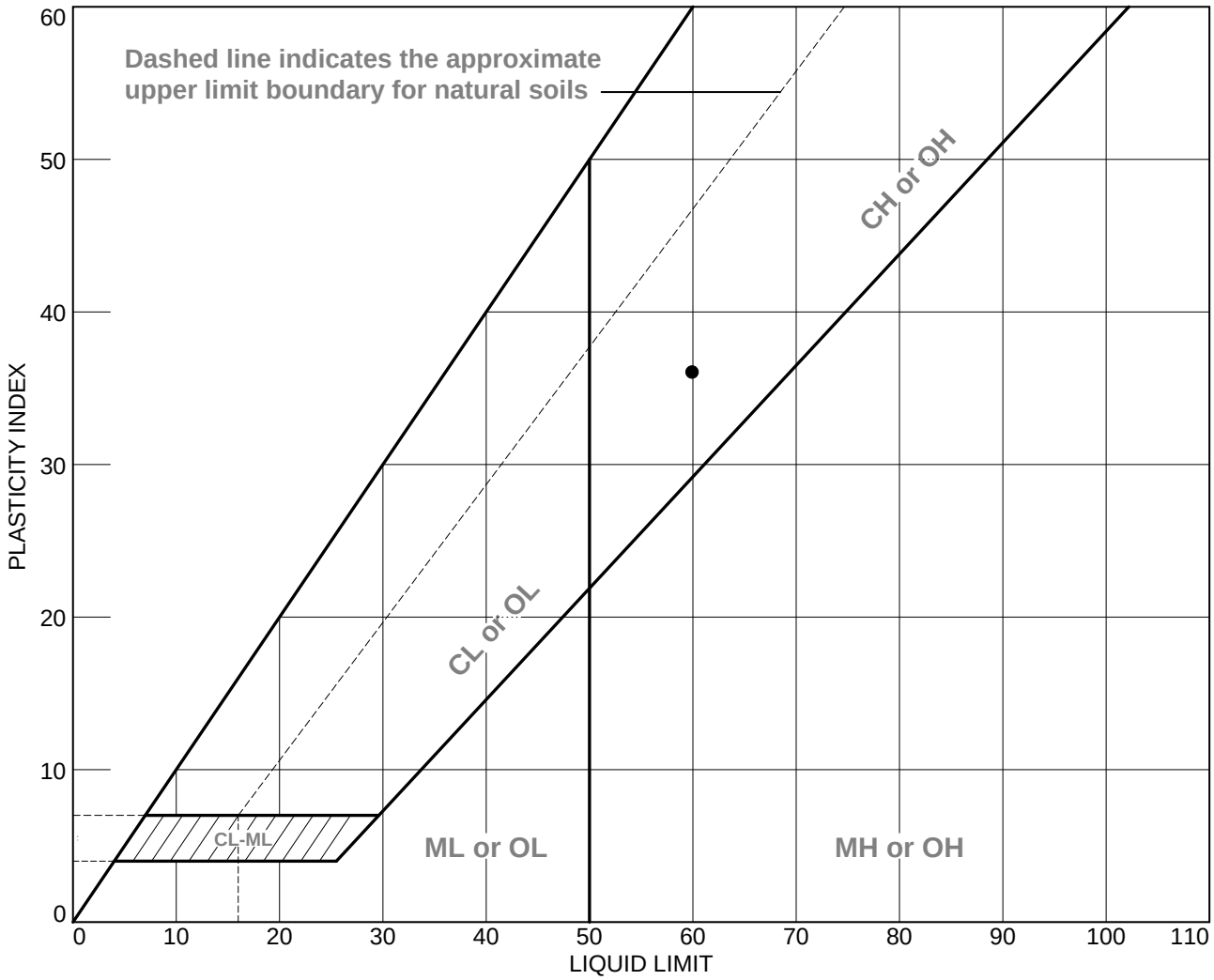
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	NWB15	S4	19-21 ft	21.1	15	28	13	CL

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Woburn, MA 01801

Client: WSP
Project: Allston Interchange
Project No.: 1903324 **Figure**

Tested By: M. Alstede 12/3/24 **Checked By:** W. Lukas 12/3/24

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

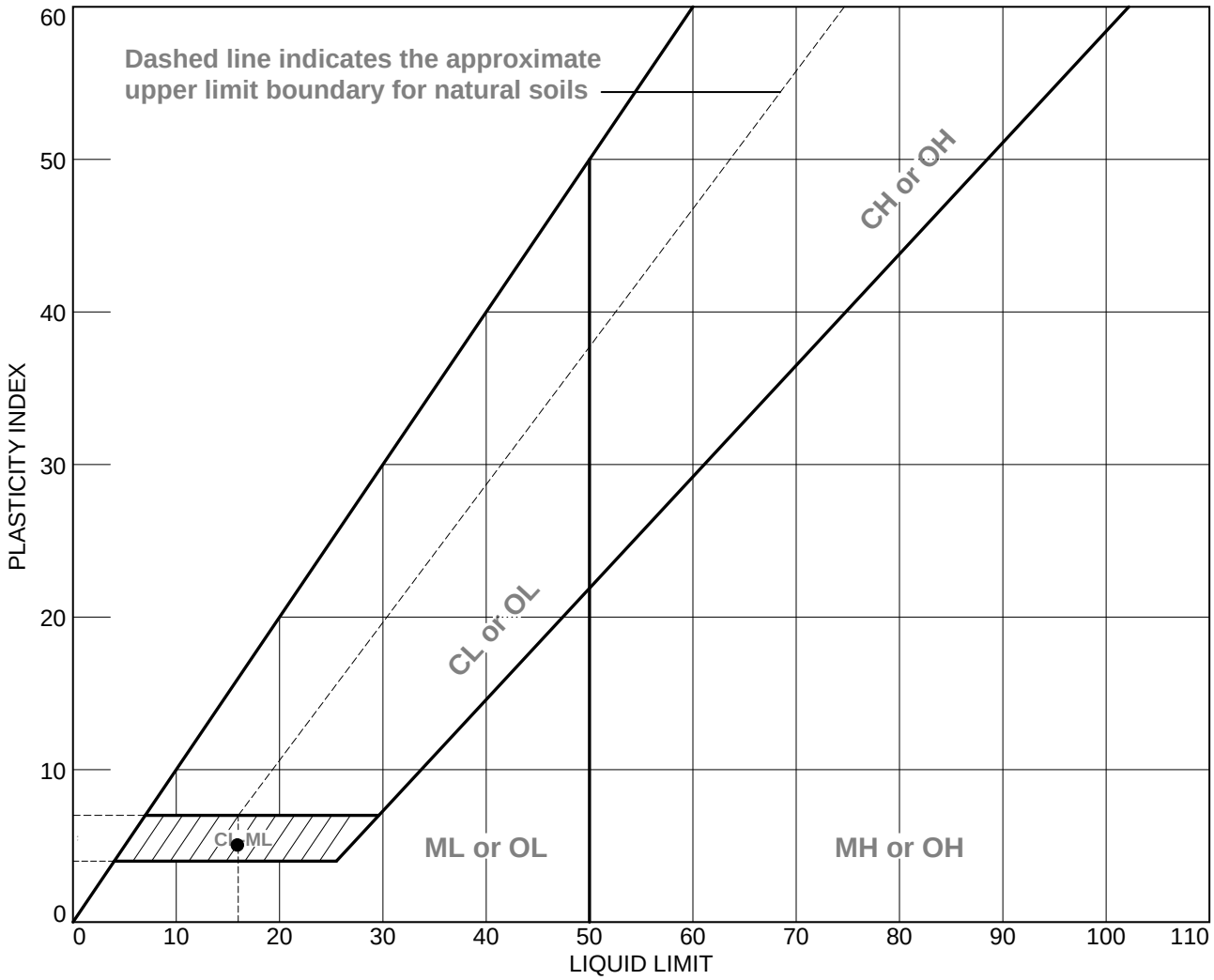
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	NWB18	S6	29-31 ft	40.5	24	60	36	CH

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Woburn, MA 01801

Client: WSP
Project: Allston Interchange
Project No.: 1903324 **Figure**

Tested By: M. Alstede 12/3/24 **Checked By:** W. Lukas 12/3/24

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

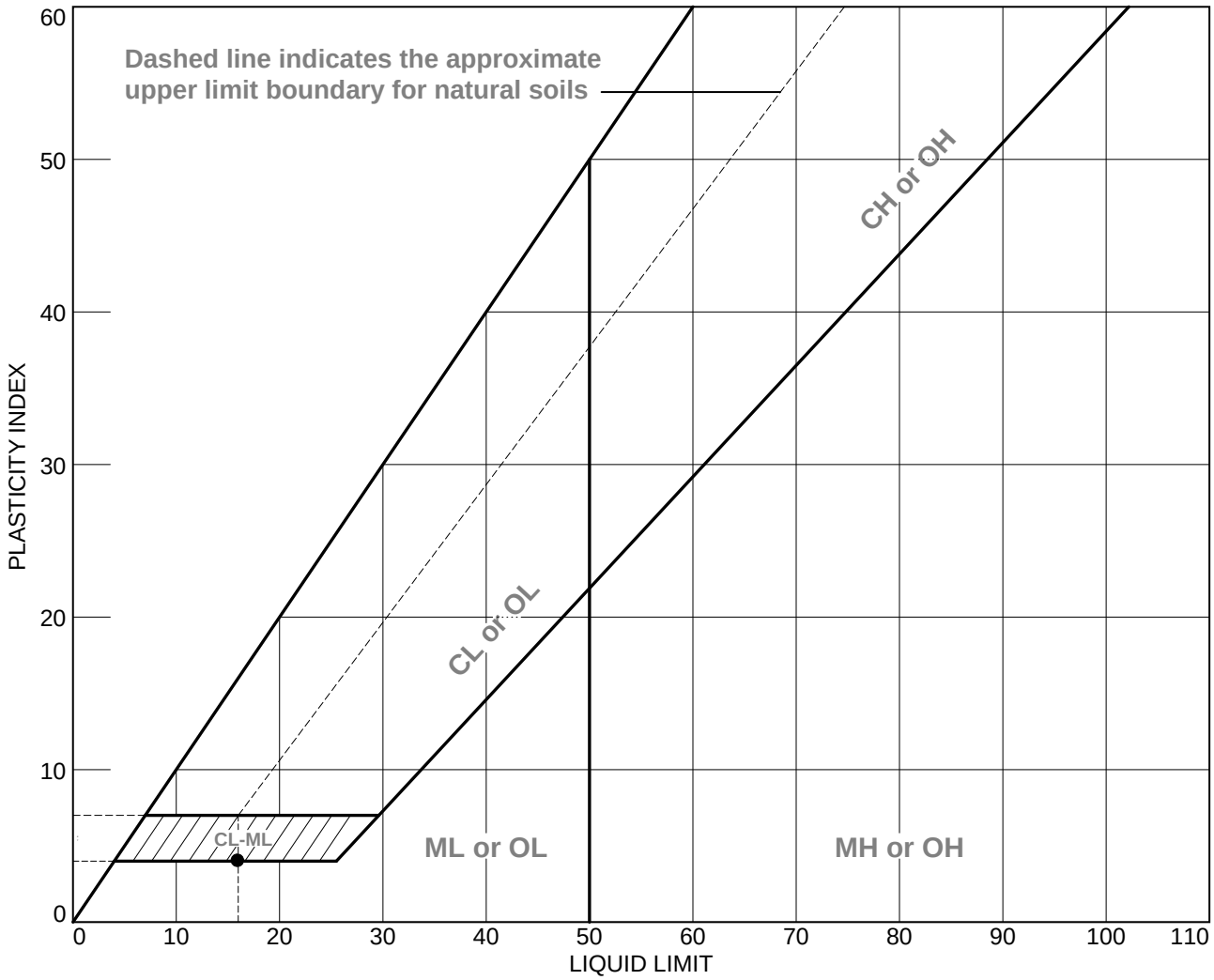
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	NWB20	S4	19-21 ft	9.7	11	16	5	CL-ML

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Client: WSP
Project: Allston Interchange
Project No.: 1903324 **Figure**

Tested By: M. Alstede 12/5/24 **Checked By:** W. Lukas 12/5/24

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	NWB23	S5	19-21 ft	9.6	12	16	4	CL-ML

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Woburn, MA 01801

Client: WSP
Project: Allston Interchange
Project No.: 1903324 **Figure**

Tested By: M. Alstede 12/5/24 **Checked By:** W. Lukas 12/5/24

Appendix D Geotechnical Calculations

D.1. Soil Properties

D.2. Bearing Capacity

D.3. Settlement

D.4. Lateral Pile Analysis Parameters

D.5. Lateral Earth Pressure

D.1. Soil Properties

Client:	WSP	**Prepared By:**	A.B.-Crane
Project:	Allston I-90 Interchange Noise Wall	**Date:**	9-24-25
Project No.:	1903324	**Checked By:**	M.Ahmed
		Date:	05-27-26

Recommended Soil Properties

Purpose:

The purpose of this evaluation is to select representative soil properties for the noise wall design at the Allston I-90 Interchange in Allston, Massachusetts, for use in engineering analyses.

Approach:

We selected values for unit weight and angle of internal friction of soils. Values were selected for the general soil layers observed in the borings and for proposed fills to be used during construction.

Unit Weight

We selected a total or saturated unit weight in pounds per cubic foot (pcf), as appropriate. The buoyant unit weight can then be determined by subtracting the unit weight of water (62.4 pcf) from the saturated unit weight.

Angle of Internal Friction

We selected an angle of internal friction (ϕ) in degrees. We used Mohr-Coulomb's drained properties for each soil.

Cohesion

We selected a cohesion in pounds per square foot (psf). We used correlation of cohesion and SPT N value from Unified Facilities Criteria DM 7.1 (see attached excerpt) to obtain undrained shear strength for design.

Proposed Fills

We selected properties for gravel borrow and gravel borrow for foundations based on the required material gradations and compaction requirements per MassDOT.

Subsurface Investigation and SPT Correlations for Observed Soil Layers:

We reviewed Standard Penetration Test (SPT) N-Values obtained during our subsurface investigations. We estimated angles of internal friction for soils based on average N_{60} and $N_{1\,60}$. Our N-Value correction calculations are attached.

A summary of corrected N-Values based on general soil type is shown below. We did not include refusals due to cobbles or boulders, and we limited the uncorrected (field) N-value to a maximum of 120 blows per foot, which MassDOT considers "practical refusal." We capped the N_{60} values to 100 blows and the $(N_1)_{60}$ values to 70 blows to estimate friction angles.

Table 1. Corrected SPT N-Values

Soil Layer	$N_{60,avg}$	$(N_1)_{60,avg}$
Sand and Gravel (Possible Fill)	28	36
Sand and Gravel	35	33
Clay	10	10
Silt	30	33
Sand	24	25
Glacial Till	57	55

GEI Consultants

Client:	WSP	**Prepared By:**	A.B.-Crane
Project:	Allston I-90 Interchange Noise Wall	**Date:**	9-24-25
Project No.:	1903324	**Checked By:**	M.Ahmed
		Date:	05-27-26

Selected Soil Properties:

Soil properties, including the unit weight and friction angle, for each soil layer encountered in the borings were estimated using the corrected SPT N-Values in Table 1. Four references were used to estimate the friction angle of each layer.

Table 2. Estimated Friction Angles from References

	References*				
Soil Layer	**1**	**2**	**3**	**4**	**Value for Design**
Sand and Gravel (Possible Fill)	36	40	38	38	32
Sand and Gravel	36	40	37	37	34
Clay	-	-	-	-	-
Silt	36	32	36	35	30
Sand	34	34	34	37	32
Glacial Till	38	50	39	40	38

*Associated References:

1. AASHTO LRFD Bridge Design Specifications, Ninth Edition, 2020.
2. Terzaghi, K., Peck, R.B., 1968. Soil Mechanics in Engineering Practice, 2nd Edition, John Wiley & Sons, New York.
3. Kulhawy, F.H. and Mayne, P.W, 1990. Manual on Estimating Soil Properties for Foundation Design, Cornell University, Ithaca, New York.
4. Caltrans Geotechnical Manual, March 2014.

We selected the following soil properties for design for each layer/soil type based on the references provided in the following pages and our engineering judgment.

Table 3. Soil Properties Values for Design

Layer/Soil Type	Unit Weight, γ (pcf)	Friction Angle, ϕ' (deg)	Undrained Shear Strength (psf)
Sand and Gravel (Possible Fill)	120 [130][1]	32	-
Sand and Gravel	125 [135][1]	34	-
Clay	105 [115][1]	-	1000[2]
Silt	115 [125][1]	30	-
Sand	120 [130][1]	32	-
Glacial Till	135	38	-
Gravel Borrow	125 [135][1]	35	-
Retained Backfill (Ordinary Borrow)	120	32	-

Notes:

1. If above the water table, use the lower unit weight to represent the moist condition; if below water table, use the larger unit weight to represent the saturated condition.
2. Unified Facilities Criteria (UFC), Soil Mechanics (DM 7.1).

Client:	WSP	**Prepared By:**	A.B.-Crane
Project:	Allston I-90 Interchange Noise Wall	**Date:**	9-24-25
Project No.:	1903324	**Checked By:**	M.Ahmed
		Date:	05-27-26

References:

- AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024.
- Terzaghi, K., Peck, R.B., 1968. Soil Mechanics in Engineering Practice, 2nd Edition, John Wiley & Sons, New York.
- Kulhawy, F.H. and Mayne, P.W, 1990. Manual on Estimating Soil Properties for Foundation Design, Cornell University, Ithaca, New York.
- Caltrans Geotechnical Manual, March 2014.
- NAVFAC Design Manual 7.01 Soil Mechanics, Naval Facilities Engineering Command, September 1986.
- AASHTO Standard Specifications for Highway Bridges: 17th Edition, 2002.
- Unified Facilities Criteria (UFC), Soil Mechanics (DM 7.1).
- LPILE v2022 Technical Manual

[1] AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024
Table 10.4.6.2.4-1 recommends using the following correlation to select friction angles of granular soils:

Table 10.4.6.2.4-1—Correlation of *SPT* $N1_{60}$ Values to Drained Friction Angle of Granular Soils (modified after Bowles, 1977)

$N1_{60}$	ϕ_f
<4	25–30
4	27–32
10	30–35
30	35–40
50	38–43

GEI Consultants

Client:	WSP	**Prepared By:**	A.B.-Crane
Project:	Allston I-90 Interchange Noise Wall	**Date:**	9-24-25
Project No.:	1903324	**Checked By:**	M.Ahmed
		Date:	05-27-26

[2] Soil Mechanics in Engineering Practice

Karl Terzaghi and Ralph Peck compiled various parameters of soils into the table below:

Table 6.3
Porosity, Void Ratio, and Unit Weight of Typical Soils in Natural State

Description	Porosity, n (%)	Void ratio, e	Water content, w (%)	Unit weight grams/cm³ γ_d	grams/cm³ γ	lb/ft³ γ_d	lb/ft³ γ
1. Uniform sand, loose	46	0.85	32	1.43	1.89	90	118
2. Uniform sand, dense	34	0.51	19	1.75	2.09	109	130
3. Mixed-grained sand, loose	40	0.67	25	1.59	1.99	99	124
4. Mixed-grained sand, dense	30	0.43	16	1.86	2.16	116	135
5. Glacial till, very mixed-grained	20	0.25	9	2.12	2.32	132	145
6. Soft glacial clay	55	1.2	45	–	1.77	–	110
7. Stiff glacial clay	37	0.6	22	–	2.07	–	129
8. Soft slightly organic clay	66	1.9	70	–	1.58	–	98
9. Soft very organic clay	75	3.0	110	–	1.43	–	89
10. Soft bentonite	84	5.2	194	–	1.27	–	80

w = water content when saturated, in per cent of dry weight.
γ^d = unit weight in dry state.
γ = unit weight in saturated state.

Additionally, Terzaghi and Peck offer the following table, listing representative values for ϕ' for various materials under effective pressures less than about 5 kg/cm².

Table 17.1
Representative Values of ϕ for Sands and Silts

Material	*Degrees* Loose	*Degrees* Dense
Sand, round grains, uniform	27.5	34
Sand, angular grains, well graded	33	45
Sandy gravels	35	50
Silty sand	27–33	30–34
Inorganic silt	27–30	30–35

Client:	WSP	**Prepared By:**	A.B.-Crane
Project:	Allston I-90 Interchange Noise Wall	**Date:**	9-24-25
Project No.:	1903324	**Checked By:**	M.Ahmed
		Date:	05-27-26

[3] Manual on Estimating Soil Properties for Foundation Design

Kulhawy and Mayne presented the following N value relationships based on Peck, Hanson, and Thornburn and Meyerhof.

N Value (blows/ft or 305 mm)	Relative Density	Approximate $\bar{\phi}_{tc}$ (degrees) (a)	(b)
0 to 4	very loose	< 28	< 30
4 to 10	loose	28 to 30	30 to 35
10 to 30	medium	30 to 36	35 to 40
30 to 50	dense	36 to 41	40 to 45
> 50	very dense	> 41	> 45

a - Source: Peck, Hanson, and Thornburn (12), p. 310.
b - Source: Meyerhof (13), p. 17.

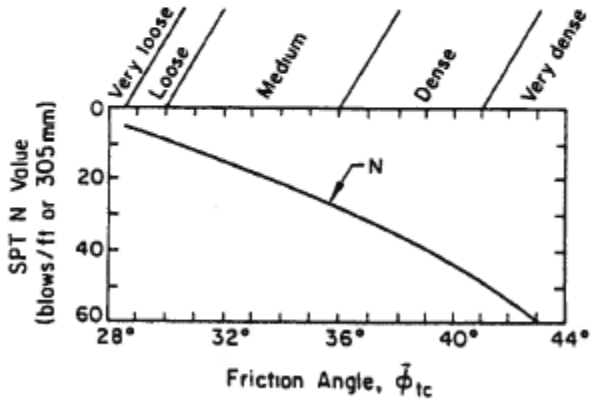


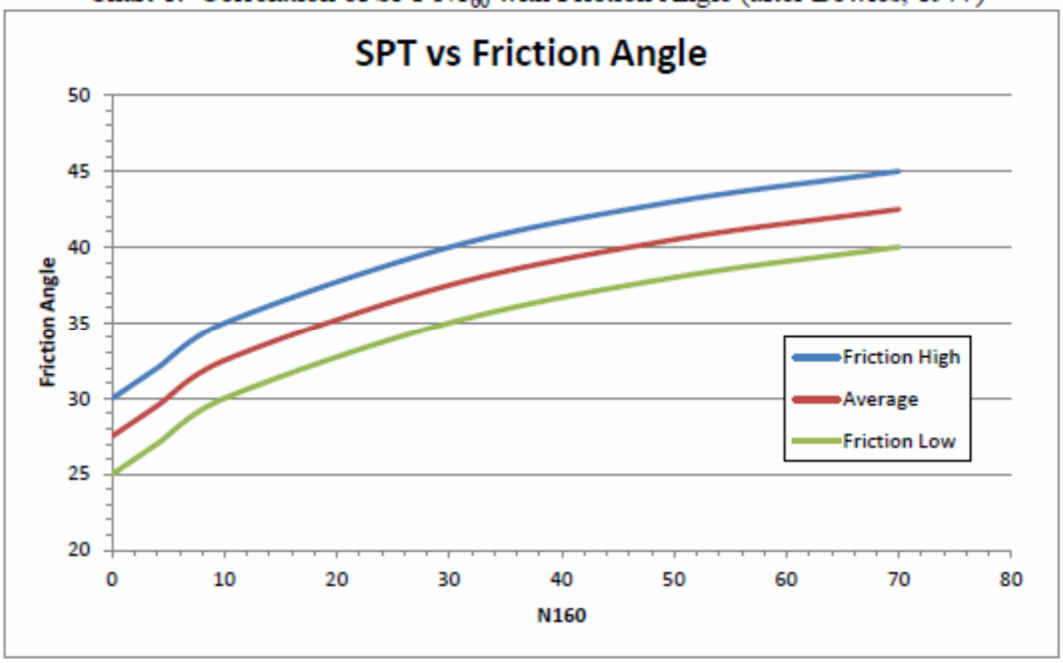
Figure 4-12. N versus $\bar{\phi}_{tc}$

Source: Peck, Hanson, and Thornburn (12), p. 310.

Client:	WSP	**Prepared By:**	A.B.-Crane
Project:	Allston I-90 Interchange Noise Wall	**Date:**	9-24-25
Project No.:	1903324	**Checked By:**	M.Ahmed
		Date:	05-27-26

[4] Caltrans Geotechnical Manual (March 2014)

Chart 1: Correlation of SPT $N1_{60}$ with Friction Angle (after Bowles, 1977)



Choose the friction angle (expressed to the nearest degree) based upon the soil type, particle size(s), and rounding or angularity. Experience should be used to select specific values within the ranges. In general, finer materials or materials with significant (about 30+ %) silt-sized material will fall in the lower portion of the range. Coarser materials with less than 5% fines will fall in the upper portion of the range. The extreme range of phi angles for any $N1_{60}$ is five degrees, so the adjustment factors for particle size and roundness should be only a degree or two. The following bullets provide help in determining which value to select for a given $N1_{60}$ and soil type:

- Use the maximum value for GW
- Use the average for GM and SP
- Use the minimum for SC
- Use the minimum + 0.5 for ML
- Use the average +1 for SW
- Use the average -1 for GC
- Use the Maximum -1 for GP

Values may also be increased with increasing grain size and/or particle angularity, and decreased with decreasing grain size and/or increasing roundness. For example, an SP with $N1_{60}$ = 30 could be assigned phi angles of 37, 38 or 39 degrees for fine, medium and coarse grain sizes respectively.

GEI Consultants

Client: WSP
Project: Allston I-90 Interchange Noise Wall
Project No.: 1903324

Prepared By: A.B.-Crane
Date: 9-24-25
Checked By: M.Ahmed
Date: 05-27-26

[5] NAVFAC Design Manual 7.01 Soil Mechanics

TABLE 6
Typical Values of Soil Index Properties

	Particle Size and Gradation				Voids(1)					Unit Weight(2) (lb./cu.ft.)						
	Approximate Size Range (mm)		Approx. D_{10} (mm)	Approx. Range Uniform Coefficient C_u	Void Ratio			Porosity (%)		Dry Weight			Wet Weight		Submerged Weight	
	D_{max}	D_{min}			e_{max} loose	e_{cr}	e_{min} dense	n_{max} loose	n_{min} dense	Min loose	100% Mod. AASHO	Max dense	Min loose	Max dense	Min loose	Max dense
GRANULAR MATERIALS																
Uniform Materials																
a. Equal spheres (theoretical values)	-	-	-	1.0	0.92	-	0.35	47.6	26	-	-	-	-	-	-	-
b. Standard Ottawa SAND	0.84	0.59	0.67	1.1	0.80	0.75	0.50	44	33	92	-	110	93	131	57	69
c. Clean, uniform SAND (fine or medium)	-	-	-	1.2 to 2.0	1.0	0.80	0.40	50	29	83	115	118	84	136	52	73
d. Uniform, inorganic SILT	0.05	0.005	0.012	1.2 to 2.0	1.1	-	0.40	52	29	80	-	118	81	136	51	73
Well-graded Materials																
a. Silty SAND	2.0	0.005	0.02	5 to 10	0.90	-	0.30	47	23	87	122	127	88	142	54	79
b. Clean, fine to coarse SAND	2.0	0.05	0.09	4 to 6	0.95	0.70	0.20	49	17	85	132	138	86	148	53	86
c. Micaceous SAND	-	-	-	-	1.2	-	0.40	55	29	76	-	120	77	138	48	76
d. Silty SAND & GRAVEL	100	0.005	0.02	15 to 300	0.85	-	0.14	46	12	89	-	146(3)	90	155(3)	56	92
MIXED SOILS																
Sandy or Silty CLAY	2.0	0.001	0.003	10 to 30	1.8	-	0.25	64	20	60	130	135	100	147	38	85
Skip-graded Silty CLAY with stones or rk fgmts	250	0.001	-	-	1.0	-	0.20	50	17	84	-	140	115	151	53	89
Well-graded GRAVEL, SAND, SILT & CLAY mixture	250	0.001	0.002	25 to 1000	0.70	-	0.13	41	11	100	140	148(4)	125	156(4)	62	94
CLAY SOILS																
CLAY (30%-50% clay sizes)	0.05	0.5μ	0.001	-	2.4	-	0.50	71	33	50	105	112	94	133	31	71
Colloidal CLAY (-0.002 mm: 50%)	0.01	10 Å	-	-	12	-	0.60	92	37	13	90	106	71	128	8	66
ORGANIC SOILS																
Organic SILT	-	-	-	-	3.0	-	0.55	75	35	40	-	110	87	131	25	69
Organic CLAY (30% - 50% clay sizes)	-	-	-	-	4.4	-	0.70	81	41	30		100	81	125	18	62

GEI Consultants

Client:	WSP	**Prepared By:**	A.B.-Crane
Project:	Allston I-90 Interchange Noise Wall	**Date:**	9-24-25
Project No.:	1903324	**Checked By:**	M.Ahmed
		Date:	05-27-26

[6] UFC (Soil Mechanic (DM 7.1)

Table 8-10 Approximate Undrained Shear Strength for Cohesive Soils Based on SPT N

Soil Consistency	SPT N Value	Undrained Shear Strength (psf)		
		Parcher and Means (1968)	Tschebotarioff (1973)	Terzaghi et al. (1996)
Very soft	< 2	300	-	< 250
Soft	2 – 4	300 – 600	250 – 500	250 – 500
Medium	4 – 8	600 – 1200	500 – 1000	500 – 1000
Stiff	8 – 15	1200 – 2400	1000 – 2000	1000 – 2000
Very stiff	15 – 30	2400	2000 – 4000	2000 – 4000
Hard	> 30	> 4500	> 4000	> 4000

GEI Consultants

Client: WSP
Project: Allston I-90 Interchange Proj.
Project No.: 1400820/1903324
Subject: Corrected Blow Counts

Prepared By: A.Burrows-Crane
Date: 8-18-2025
Checked By: M.Ahmed
Date: 5/6/2026

Summary of Corrected Blow Counts by Layer

SAND AND GRAVEL (POSSIBLE FILL)

Boring	No.	N_{60}			$N1_{60}$		
	Values	Avg.	Max.	Min.	Avg.	Max.	Min.
NWB1	2	41	42	39	51	53	48
NWB2	2	45	46	43	54	54	53
NWB3	2	42	48	35	51	60	41
NWB6	1	39	39	39	50	50	50
NWB8	2	21	22	19	26	28	24
NWB9	1	24	24	24	29	29	29
NWB11	2	13	14	12	17	17	16
NWB12	2	9	13	5	11	15	6
NWB13	2	9	9	8	11	11	10
NWB14	3	20	23	18	24	27	20
NWB15	2	11	11	10	13	14	12
NWB16	2	9	11	7	11	13	8
NWB17	2	16	17	15	20	20	19
NWB18	2	19	21	17	23	24	21
NWB21	1	25	25	25	30	30	30
NWB22	2	36	40	32	42	48	36
NWB23	1	29	29	29	38	38	38
NWB24	1	22	22	22	28	28	28
NWB25	1	53	53	53	66	66	66
NWB26	1	46	46	46	56	56	56
NWB27	1	39	39	39	48	48	48
NWB28	1	51	51	51	62	62	62
NWB30	5	30	58	10	44	92	20
NWB31	4	32	38	27	47	59	36
NWB32	5	41	60	31	62	94	38
NWB33	4	23	41	13	32	51	22
IC BB 104	3	32	35	26	37	41	34
IC BB 105	4	30	40	18	33	47	23

Average N_{60}: 28 **Average $N1_{60}$:** 36
Median $N1_{60}$: 36

SAND AND GRAVEL

Boring	No.	N_{60}			$N1_{60}$		
	Values	Avg.	Max.	Min.	Avg.	Max.	Min.
NWB1	4	37	64	24	39	69	27
NWB2	4	29	39	24	29	38	23
NWB3	4	40	46	33	39	48	30
NWB4	2	46	58	33	44	56	31
NWB27	4	29	42	21	30	40	24
NWB28	5	38	61	24	39	69	21
NWB29	5	51	95	28	51	87	27
NWB30	8	32	53	18	31	60	19
NWB31	9	21	35	6	20	42	5
NWB32	8	35	48	26	35	49	26
NWB33	7	43	69	21	43	66	21
IC BB 104	8	32	49	19	27	41	15
IC BB 105	7	34	61	21	28	51	16

Average N_{60}: 35 **Average $N1_{60}$:** 33
Median $N1_{60}$: 30

SAND

Boring	No.	N_{60}			$N1_{60}$		
	Values	Avg.	Max.	Min.	Avg.	Max.	Min.
NWB15	1	9	9	9	10	10	10
NWB16	2	20	21	19	22	22	22
NWB17	1	19	19	19	23	23	23
NWB18	1	19	19	19	21	21	21
NWB22	1	42	42	42	42	42	42
NWB23	3	14	18	10	16	22	11
NWB24	3	12	17	7	13	17	7
NWB25	4	36	59	25	38	62	23
NWB26	4	30	55	17	33	56	19

Average N_{60}: 24 **Average $N1_{60}$:** 25
Median $N1_{60}$: 22

CLAY

Boring	No.	N_{60}			$N1_{60}$		
	Values	Avg.	Max.	Min.	Avg.	Max.	Min.
NWB5	6	16	22	10	15	23	9
NWB6	6	8	18	0	9	21	0
NWB7	6	11	30	1	12	33	1
NWB8	6	8	17	3	9	19	2
NWB9	7	11	36	1	12	40	1
NWB12	6	6	21	0	6	23	0
NWB15	5	7	9	6	7	10	5
NWB16	4	7	8	6	7	8	5
NWB17	3	8	10	6	8	11	6
NWB18	5	7	10	4	6	9	4
NWB20	4	15	22	12	17	25	12
NWB21	2	23	26	19	26	29	22
NWB25	1	19	19	19	17	17	17
NWB26	1	7	7	7	7	7	7
NWB10	6	11	28	1	11	31	1
NWB11	6	11	44	3	12	49	2
NWB13	6	4	8	0	4	9	0
NWB14	5	7	18	3	7	19	3
NWB19	3	14	17	9	17	20	11

Average N_{60}: 10 **Average $N1_{60}$:** 10
Median $N1_{60}$: 7

SILT

Boring	No.	N_{60}			$N1_{60}$		
	Values	Avg.	Max.	Min.	Avg.	Max.	Min.
NWB5	1	17	17	17	19	19	19
NWB6	1	17	17	17	21	21	21
NWB7	2	25	33	17	31	42	20
NWB27	1	72	72	72	66	66	66
NWB4	4	32	43	19	37	53	21
NWB10	2	24	35	12	28	41	15
NWB11	1	24	24	24	28	28	28

Average N_{60}: 30 **Average $N1_{60}$:** 33
Median $N1_{60}$: 30

GLACIAL TILL

Boring	No.	N_{60}			$N1_{60}$		
	Values	Avg.	Max.	Min.	Avg.	Max.	Min.
NWB19	3	51	100	22	51	100	24
NWB20	2	29	29	28	26	27	25
NWB21	2	54	100	8	54	100	8
NWB22	2	84	100	68	83	100	65
NWB23	3	53	100	21	52	100	21
NWB24	2	50	58	42	46	53	39
NWB25	1	97	97	97	84	84	84
NWB26	1	77	77	77	72	72	72
NWB27	1	53	53	53	46	46	46

Average N_{60}: 57 **Average $N1_{60}$:** 55
Median $N1_{60}$: 46

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/28/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	30.79	ft
Depth to Groundwater:	7.0	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB1***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
7	8	22.8	D AND GRAVEL (POSSIBLE	30	42	53	41	51	960	62	898	0.898	1.27	Mobile B-46 Truck	83	1.38
9	10	20.8	D AND GRAVEL (POSSIBLE	28	39	48			1,200	187	1,013	1.013	1.23	Mobile B-46 Truck	83	1.38
14	15	15.8	SAND AND GRAVEL	17	24	27			1,800	499	1,301	1.301	1.15	Mobile B-46 Truck	83	1.38
19	20	10.8	SAND AND GRAVEL	46	64	69	37	39	2,400	811	1,589	1.589	1.08	Mobile B-46 Truck	83	1.38
24	25	5.8	SAND AND GRAVEL	19	26	27			3,000	1,123	1,877	1.877	1.02	Mobile B-46 Truck	83	1.38
29	30	0.8	SAND AND GRAVEL	25	35	34			3,600	1,435	2,165	2.165	0.98	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/28/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	30.19	ft
Depth to Groundwater:	10.7	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB2***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
7	8	22.2	SAND AND GRAVEL (POSSIBLE FILL)	31	43	53	45	54	960	0	960	0.960	1.25	Mobile B-46 Truck	83	1.38
9	10	20.2	SAND AND GRAVEL (POSSIBLE FILL)	33	46	54			1,200	0	1,200	1.200	1.17	Mobile B-46 Truck	83	1.38
14	15	15.2	SAND AND GRAVEL	20	28	30			1,800	268	1,532	1.532	1.09	Mobile B-46 Truck	83	1.38
19	20	10.2	SAND AND GRAVEL	17	24	24	29	29	2,400	580	1,820	1.820	1.03	Mobile B-46 Truck	83	1.38
24	25	5.2	SAND AND GRAVEL	28	39	38			3,000	892	2,108	2.108	0.98	Mobile B-46 Truck	83	1.38
29	30	0.2	SAND AND GRAVEL	18	25	23			3,600	1,204	2,396	2.396	0.94	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client: WSP
Project: Allston I-90 Interchange Proj.
Allston I-90 Interchange 1400820/1903324
Subject: Corrected Blow Counts

Prepared By: L. Sugrue
Date: 7/28/2025
Checked By: M. Cramer
Date: 7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	29.83	ft
Depth to Groundwater:	13.6	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB3***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
7	8	21.8	SAND AND GRAVEL (POSSIBLE FILL)	35	48	60	42	51	960	0	960	0.960	1.25	Mobile B-46 Truck	83	1.38
9	10	19.8	SAND AND GRAVEL (POSSIBLE FILL)	25	35	41			1,200	0	1,200	1.200	1.17	Mobile B-46 Truck	83	1.38
14	15	14.8	SAND AND GRAVEL	33	46	48			1,800	87	1,713	1.713	1.05	Mobile B-46 Truck	83	1.38
19	20	9.8	SAND AND GRAVEL	28	39	39	40	39	2,400	399	2,001	2.001	1.00	Mobile B-46 Truck	83	1.38
24	25	4.8	SAND AND GRAVEL	29	40	38			3,000	711	2,289	2.289	0.96	Mobile B-46 Truck	83	1.38
29	30	-0.2	SAND AND GRAVEL	24	33	30			3,600	1,023	2,577	2.577	0.92	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/28/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ [$C_N < 2.0$]
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	28.7	ft
Depth to Groundwater:	13.1	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB4***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
7	8	20.7	SILT	31	43	53			960	0	960	0.960	1.25	Mobile B-46 Truck	83	1.38
9	10	18.7	SILT	25	35	41	32	37	1,200	0	1,200	1.200	1.17	Mobile B-46 Truck	83	1.38
14	15	13.7	SILT	14	19	21			1,800	119	1,681	1.681	1.06	Mobile B-46 Truck	83	1.38
19	20	8.7	SILT	23	32	32			2,400	431	1,969	1.969	1.01	Mobile B-46 Truck	83	1.38
24	25	3.7	SAND AND GRAVEL	42	58	56			3,000	743	2,257	2.257	0.96	Mobile B-46 Truck	83	1.38
29	30	-1.3	SAND AND GRAVEL	24	33	31	46	44	3,600	1,055	2,545	2.545	0.92	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/28/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft) ER = hammer efficiency expressed as percent of theoretical free fall energy N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft) $C_N = 0.77 * \log_{10}(40/\sigma'_v)$ [$C_N < 2.0$] σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	27.9	ft
Depth to Groundwater:	10.1	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB5***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Corrected Blow Counts Avg. N_{60}	Corrected Blow Counts Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
9	10	17.9	SILT	12	17	19	17	19	1,200	0	1,200	1.200	1.17	Mobile B-46 Truck	83	1.38
14	15	12.9	CLAY	15	21	23			1,800	306	1,494	1.494	1.10	Mobile B-46 Truck	83	1.38
19	20	7.9	CLAY	8	11	12			2,400	618	1,782	1.782	1.04	Mobile B-46 Truck	83	1.38
24	25	2.9	CLAY	8	11	11	16	15	3,000	930	2,070	2.070	0.99	Mobile B-46 Truck	83	1.38
29	30	-2.1	CLAY	7	10	9			3,600	1,242	2,358	2.358	0.95	Mobile B-46 Truck	83	1.38
34	35	-7.1	CLAY	16	22	20			4,200	1,554	2,646	2.646	0.91	Mobile B-46 Truck	83	1.38
39	40	-12.1	CLAY	14	19	17			4,800	1,866	2,934	2.934	0.87	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/28/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	27.17	ft
Depth to Groundwater:	6.1	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB6***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
7	8	19.2	SAND AND GRAVEL (POSSIBLE FILL)	28	39	50	39	50	960	119	841	0.841	1.29	Mobile B-46 Truck	83	1.38
9	10	17.2	SILT	12	17	21	17	21	1,200	243	957	0.957	1.25	Mobile B-46 Truck	83	1.38
14	15	12.2	CLAY	13	18	21			1,800	555	1,245	1.245	1.16	Mobile B-46 Truck	83	1.38
19	20	7.2	CLAY	9	12	14			2,400	867	1,533	1.533	1.09	Mobile B-46 Truck	83	1.38
24	25	2.2	CLAY	6	8	9	8	9	3,000	1,179	1,821	1.821	1.03	Mobile B-46 Truck	83	1.38
29	30	-2.8	CLAY	4	6	5			3,600	1,491	2,109	2.109	0.98	Mobile B-46 Truck	83	1.38
34	35	-7.8	CLAY	3	4	4			4,200	1,803	2,397	2.397	0.94	Mobile B-46 Truck	83	1.38
39	40	-12.8	CLAY	0	0	0			4,800	2,115	2,685	2.685	0.90	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/28/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	26.88	ft
Depth to Groundwater:	7.4	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB7***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
7.4	8.4	18.5	SILT	24	33	42	25	31	1,008	62	946	0.946	1.25	Mobile B-46 Truck	83	1.38
9.4	10.4	16.5	SILT	12	17	20			1,248	187	1,061	1.061	1.21	Mobile B-46 Truck	83	1.38
14	15	11.9	CLAY	15	21	24			1,800	474	1,326	1.326	1.14	Mobile B-46 Truck	83	1.38
19	20	6.9	CLAY	22	30	33			2,400	786	1,614	1.614	1.07	Mobile B-46 Truck	83	1.38
24	25	1.9	CLAY	3	4	4	11	12	3,000	1,098	1,902	1.902	1.02	Mobile B-46 Truck	83	1.38
29	30	-3.1	CLAY	3	4	4			3,600	1,410	2,190	2.190	0.97	Mobile B-46 Truck	83	1.38
34	35	-8.1	CLAY	5	7	6			4,200	1,722	2,478	2.478	0.93	Mobile B-46 Truck	83	1.38
39	40	-13.1	CLAY	1	1	1			4,800	2,034	2,766	2.766	0.89	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/28/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft) ER = hammer efficiency expressed as percent of theoretical free fall energy N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft) $C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$ σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	26.53	ft
Depth to Groundwater:	6.9	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring:			***NWB8***		**Corrected Blow Counts**				**Overburden Correction**					**Hammer Efficiency Correction Automatic Hammer**		
Depth to Top of Sample (ft)	**Depth to Middle 12" (ft)**	**El. of Middle 12" (ft)**	**Layer Name**	**N**	**N_{60}**	**$N1_{60}$**	**Avg. N_{60}**	**Avg. $N1_{60}$**	**σ_v (psf)**	**u (psf)**	**σ'_v (psf)**	**σ'_v (ksf)**	**C_N**	**Rig Type**	**ER (%)**	**C_E**
7.5	8.5	18.0	SAND AND GRAVEL (POSSIBLE FILL)	16	22	28	21	26	1,020	100	920	0.920	1.26	Mobile B-46 Truck	83	1.38
9.5	10.5	16.0	SAND AND GRAVEL (POSSIBLE FILL)	14	19	24			1,260	225	1,035	1.035	1.22	Mobile B-46 Truck	83	1.38
14	15	11.5	CLAY	12	17	19			1,800	505	1,295	1.295	1.15	Mobile B-46 Truck	83	1.38
19	20	6.5	CLAY	10	14	15			2,400	817	1,583	1.583	1.08	Mobile B-46 Truck	83	1.38
24	25	1.5	CLAY	5	7	7	8	9	3,000	1,129	1,871	1.871	1.02	Mobile B-46 Truck	83	1.38
29	30	-3.5	CLAY	2	3	3			3,600	1,441	2,159	2.159	0.98	Mobile B-46 Truck	83	1.38
34	35	-8.5	CLAY	4	6	5			4,200	1,753	2,447	2.447	0.93	Mobile B-46 Truck	83	1.38
39	40	-13.5	CLAY	2	3	2			4,800	2,065	2,735	2.735	0.90	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client: WSP
Project: Allston I-90 Interchange Proj.
Allston I-90 Interchange 1400820/1903324
Subject: Corrected Blow Counts

Prepared By: L. Sugrue
Date: 7/28/2025
Checked By: M. Cramer
Date: 7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ [$C_N < 2.0$]
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	25.92	ft
Depth to Groundwater:	8.4	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB9***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts: N_{60}	$N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	Overburden Correction: σ_v (psf)	u (psf)	σ'_v (psf)	σ'_v (ksf)	C_N	Hammer Efficiency Correction Automatic Hammer: Rig Type	ER (%)	C_E
8	9	16.9	SAND AND GRAVEL (POSSIBLE FILL)	17	24	29	24	29	1,080	37	1,043	1.043	1.22	Mobile B-46 Truck	83	1.38
10	11	14.9	CLAY	13	18	21			1,320	162	1,158	1.158	1.18	Mobile B-46 Truck	83	1.38
14	15	10.9	CLAY	26	36	40			1,800	412	1,388	1.388	1.12	Mobile B-46 Truck	83	1.38
19	20	5.9	CLAY	7	10	10			2,400	724	1,676	1.676	1.06	Mobile B-46 Truck	83	1.38
24	25	0.9	CLAY	7	10	10	11	12	3,000	1,036	1,964	1.964	1.01	Mobile B-46 Truck	83	1.38
29	30	-4.1	CLAY	2	3	3			3,600	1,348	2,252	2.252	0.96	Mobile B-46 Truck	83	1.38
34	35	-9.1	CLAY	1	1	1			4,200	1,660	2,540	2.540	0.92	Mobile B-46 Truck	83	1.38
39	40	-14.1	CLAY	1	1	1			4,800	1,972	2,828	2.828	0.89	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/28/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	25.15	ft
Depth to Groundwater:	7.6	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB10***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Corrected Blow Counts Avg. N_{60}	Corrected Blow Counts Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
8	9	16.2	SILT	9	12	15	14	15	1,080	87	993	0.993	1.24	Mobile B-46 Truck	83	1.38
10	11	14.2	SILT	25	35	41			1,320	212	1,108	1.108	1.20	Mobile B-46 Truck	83	1.38
14	15	10.2	CLAY	20	28	31			1,800	462	1,338	1.338	1.14	Mobile B-46 Truck	83	1.38
19	20	5.2	CLAY	3	4	4			2,400	774	1,626	1.626	1.07	Mobile B-46 Truck	83	1.38
24	25	0.1	CLAY	15	21	21			3,000	1,086	1,914	1.914	1.02	Mobile B-46 Truck	83	1.38
29	30	-4.9	CLAY	2	3	3			3,600	1,398	2,202	2.202	0.97	Mobile B-46 Truck	83	1.38
34	35	-9.9	CLAY	1	1	1			4,200	1,710	2,490	2.490	0.93	Mobile B-46 Truck	83	1.38
39	40	-14.9	CLAY	4	6	5			4,800	2,022	2,778	2.778	0.89	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/28/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	24.33	ft
Depth to Groundwater:	9.1	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB11***

					Corrected Blow Counts				Overburden Correction					Hammer Efficiency Correction Automatic Hammer		
Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	N_{60}	$N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	σ_v (psf)	u (psf)	σ'_v (psf)	σ'_v (ksf)	C_N	Rig Type	ER (%)	C_E
6	7	17.3	SAND AND GRAVEL (POSSIBLE FILL)	9	12	16	13	17	840	0	840	0.840	1.29	Mobile B-46 Truck	83	1.38
8	9	15.3	SAND AND GRAVEL (POSSIBLE FILL)	10	14	17			1,080	0	1,080	1.080	1.21	Mobile B-46 Truck	83	1.38
10	11	13.3	SILT	17	24	28			1,320	119	1,201	1.201	1.17	Mobile B-46 Truck	83	1.38
14	15	9.3	CLAY	32	44	49			1,800	368	1,432	1.432	1.11	Mobile B-46 Truck	83	1.38
19	20	4.3	CLAY	2	3	3			2,400	680	1,720	1.720	1.05	Mobile B-46 Truck	83	1.38
24	25	-0.7	CLAY	6	8	8	13	14	3,000	992	2,008	2.008	1.00	Mobile B-46 Truck	83	1.38
29	30	-5.7	CLAY	2	3	3			3,600	1,304	2,296	2.296	0.96	Mobile B-46 Truck	83	1.38
34	35	-10.7	CLAY	3	4	4			4,200	1,616	2,584	2.584	0.92	Mobile B-46 Truck	83	1.38
39	40	-15.7	CLAY	2	3	2			4,800	1,928	2,872	2.872	0.88	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client: WSP
Project: Allston I-90 Interchange Proj.
Allston I-90 Interchange 1400820/1903324
Subject: Corrected Blow Counts

Prepared By: L. Sugrue
Date: 7/28/2025
Checked By: M. Cramer
Date: 7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ [$C_N < 2.0$]
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	23.71	ft
Depth to Groundwater:	9.0	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83.0	1.38	2021001	

Boring: ***NWB12***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
8	9	14.7	SAND AND GRAVEL (POSSIBLE FILL)	4	5	6			1,080	0	1,080	1.080	1.21	Diedrich D-25	68.7	1.15
10	11	12.7	SAND AND GRAVEL (POSSIBLE FILL)	11	13	15	9	11	1,320	125	1,195	1.195	1.17	Diedrich D-25	68.7	1.15
14	15	8.7	CLAY	18	21	23			1,800	374	1,426	1.426	1.12	Diedrich D-25	68.7	1.15
19	20	3.7	CLAY	0	0	0			2,400	686	1,714	1.714	1.05	Diedrich D-25	68.7	1.15
24	25	-1.3	CLAY	3	3	3	6	6	3,000	998	2,002	2.002	1.00	Diedrich D-25	68.7	1.15
29	30	-6.3	CLAY	2	2	2			3,600	1,310	2,290	2.290	0.96	Diedrich D-25	68.7	1.15
34	35	-11.3	CLAY	4	5	4			4,200	1,622	2,578	2.578	0.92	Diedrich D-25	68.7	1.15
39	40	-16.3	CLAY	3	3	3			4,800	1,934	2,866	2.866	0.88	Diedrich D-25	68.7	1.15

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client: WSP
Project: Allston I-90 Interchange Proj.
Allston I-90 Interchange 1400820/1903324
Subject: Corrected Blow Counts

Prepared By: L. Sugrue
Date: 7/28/2025
Checked By: M. Cramer
Date: 7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ [$C_N < 2.0$]
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	23.05	ft
Depth to Groundwater:	8.6	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83.0	1.38	2021001	

Boring: ***NWB13***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Corrected Blow Counts Avg. N_{60}	Corrected Blow Counts Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
7	8	15.1	SAND AND GRAVEL (POSSIBLE FILL)	7	8	10			960	0	960	0.960	1.25	Diedrich D-25	68.7	1.15
9	10	13.1	SAND AND GRAVEL (POSSIBLE FILL)	8	9	11	9	11	1,200	87	1,113	1.113	1.20	Diedrich D-25	68.7	1.15
14	15	8.1	CLAY	7	8	9			1,800	399	1,401	1.401	1.12	Diedrich D-25	68.7	1.15
19	20	3.1	CLAY	6	7	7			2,400	711	1,689	1.689	1.06	Diedrich D-25	68.7	1.15
24	25	-2.0	CLAY	4	5	5	4	4	3,000	1,023	1,977	1.977	1.01	Diedrich D-25	68.7	1.15
29	30	-7.0	CLAY	5	6	5			3,600	1,335	2,265	2.265	0.96	Diedrich D-25	68.7	1.15
34	35	-12.0	CLAY	0	0	0			4,200	1,647	2,553	2.553	0.92	Diedrich D-25	68.7	1.15
39	40	-17.0	CLAY	0	0	0			4,800	1,959	2,841	2.841	0.88	Diedrich D-25	68.7	1.15

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/28/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	23.25	ft
Depth to Groundwater:	9.0	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83.0	1.38	2021001	

Boring: ***NWB14***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	ER (%)	C_E
7	8	15.3	SAND AND GRAVEL (POSSIBLE FILL)	17	19	24			960	0	960	0.960	1.25	Diedrich D-25	68.7	1.15
9	10	13.3	SAND AND GRAVEL (POSSIBLE FILL)	20	23	27			1,200	62	1,138	1.138	1.19	Diedrich D-25	68.7	1.15
14	15	8.3	SAND AND GRAVEL (POSSIBLE FILL)	16	18	20	20	24	1,800	374	1,426	1.426	1.12	Diedrich D-25	68.7	1.15
19	20	3.3	CLAY	16	18	19			2,400	686	1,714	1.714	1.05	Diedrich D-25	68.7	1.15
24	25	-1.8	CLAY	5	6	6			3,000	998	2,002	2.002	1.00	Diedrich D-25	68.7	1.15
29	30	-6.8	CLAY	3	3	3	7	7	3,600	1,310	2,290	2.290	0.96	Diedrich D-25	68.7	1.15
34	35	-11.8	CLAY	5	6	5			4,200	1,622	2,578	2.578	0.92	Diedrich D-25	68.7	1.15
39	40	-16.8	CLAY	3	3	3			4,800	1,934	2,866	2.866	0.88	Diedrich D-25	68.7	1.15

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/28/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft) ER = hammer efficiency expressed as percent of theoretical free fall energy N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft) $C_N = 0.77 * \log_{10}(40/\sigma'_v)$ [$C_N < 2.0$] σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	23.44	ft
Depth to Groundwater:	9.0	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB15***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Corrected Blow Counts Avg. N_{60}	Corrected Blow Counts Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
7	8	15.4	SAND AND GRAVEL (POSSIBLE FILL)	10	11	14			960	0	960	0.960	1.25	Diedrich D-25	68.7	1.15
9	10	13.4	SAND AND GRAVEL (POSSIBLE FILL)	9	10	12	11	13	1,200	62	1,138	1.138	1.19	Diedrich D-25	68.7	1.15
14	15	8.4	SAND	8	9	10	9	10	1,800	374	1,426	1.426	1.12	Diedrich D-25	68.7	1.15
19	20	3.4	CLAY	8	9	10			2,400	686	1,714	1.714	1.05	Diedrich D-25	68.7	1.15
24	25	-1.6	CLAY	6	7	7			3,000	998	2,002	2.002	1.00	Diedrich D-25	68.7	1.15
29	30	-6.6	CLAY	5	6	5			3,600	1,310	2,290	2.290	0.96	Diedrich D-25	68.7	1.15
34	35	-11.6	CLAY	6	7	6			4,200	1,622	2,578	2.578	0.92	Diedrich D-25	68.7	1.15
39	40	-16.6	CLAY	5	6	5	7	7	4,800	1,934	2,866	2.866	0.88	Diedrich D-25	68.7	1.15

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/29/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft) ER = hammer efficiency expressed as percent of theoretical free fall energy N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft) $C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$ σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	23.06	ft
Depth to Groundwater:	9.0	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring:	***NWB16***			**Corrected Blow Counts**				**Overburden Correction**					**Hammer Efficiency Correction Automatic Hammer**		
Depth to Top of Sample (ft)	**Depth to Middle 12" (ft)**	**El. of Middle 12" (ft)**	**Layer Name**	**N**	**N_{60}**	**$N1_{60}$**	**Avg. N_{60}**	**Avg. $N1_{60}$**	**σ_v (psf)**	**u (psf)**	**σ'_v (psf)**	**σ'_v (ksf)**	**C_N**	**Rig Type**	**ER (%)**	**C_E**
8	9	14.1	SAND AND GRAVEL (POSSIBLE FILL)	8	11	13			1,080	0	1,080	1.080	1.21	Mobile B-46 Truck	83	1.38
10	11	12.1	SAND AND GRAVEL (POSSIBLE FILL)	5	7	8	9	11	1,320	125	1,195	1.195	1.17	Mobile B-46 Truck	83	1.38
14	15	8.1	SAND	14	19	22			1,800	374	1,426	1.426	1.12	Mobile B-46 Truck	83	1.38
19	20	3.1	SAND	15	21	22	20	22	2,400	686	1,714	1.714	1.05	Mobile B-46 Truck	83	1.38
24	25	-1.9	CLAY	5	7	7			3,000	998	2,002	2.002	1.00	Mobile B-46 Truck	83	1.38
29	30	-6.9	CLAY	5	7	7			3,600	1,310	2,290	2.290	0.96	Mobile B-46 Truck	83	1.38
34	35	-11.9	CLAY	6	8	8			4,200	1,622	2,578	2.578	0.92	Mobile B-46 Truck	83	1.38
39	40	-16.9	CLAY	4	6	5	7	7	4,800	1,934	2,866	2.866	0.88	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/29/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft) ER = hammer efficiency expressed as percent of theoretical free fall energy N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft) $C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$ σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	23.78	ft
Depth to Groundwater:	6.0	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB17***

					Corrected Blow Counts				Overburden Correction					Hammer Efficiency Correction Automatic Hammer		
Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	N_{60}	$N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	σ_v (psf)	u (psf)	σ'_v (psf)	σ'_v (ksf)	C_N	Rig Type	ER (%)	C_E
8	9	14.8	SAND AND GRAVEL (POSSIBLE FILL)	11	15	19			1,080	187	893	0.893	1.27	Mobile B-46 Truck	83	1.38
10	11	12.8	SAND AND GRAVEL (POSSIBLE FILL)	12	17	20	16	20	1,320	312	1,008	1.008	1.23	Mobile B-46 Truck	83	1.38
14	15	8.8	SAND	14	19	23			1,800	562	1,238	1.238	1.16	Mobile B-46 Truck	83	1.38
19	20	3.8	CLAY	7	10	11	15	17	2,400	874	1,526	1.526	1.09	Mobile B-46 Truck	83	1.38
24	25	-1.2	CLAY	4	6	6			3,000	1,186	1,814	1.814	1.03	Mobile B-46 Truck	83	1.38
29	30	-6.2	CLAY	6	8	8	7	7	3,600	1,498	2,102	2.102	0.99	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/29/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	23.43	ft
Depth to Groundwater:	11.4	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB18***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Corrected Blow Counts Avg. N_{60}	Corrected Blow Counts Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
7	8	15.4	SAND AND GRAVEL (POSSIBLE FILL)	12	17	21			960	0	960	0.960	1.25	Mobile B-46 Truck	83	1.38
9	10	13.4	SAND AND GRAVEL (POSSIBLE FILL)	15	21	24	19	23	1,200	0	1,200	1.200	1.17	Mobile B-46 Truck	83	1.38
14	15	8.4	SAND	14	19	21	19	21	1,800	225	1,575	1.575	1.08	Mobile B-46 Truck	83	1.38
19	20	3.4	CLAY	5	7	7			2,400	537	1,863	1.863	1.03	Mobile B-46 Truck	83	1.38
24	25	-1.6	CLAY	7	10	9			3,000	849	2,151	2.151	0.98	Mobile B-46 Truck	83	1.38
29	30	-6.6	CLAY	6	8	8	7	6	3,600	1,161	2,439	2.439	0.94	Mobile B-46 Truck	83	1.38
34	35	-11.6	CLAY	3	4	4			4,200	1,473	2,727	2.727	0.90	Mobile B-46 Truck	83	1.38
39	40	-16.6	CLAY	3	4	4			4,800	1,785	3,015	3.015	0.86	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client: WSP
Project: Allston I-90 Interchange Proj.
Allston I-90 Interchange 1400820/1903324
Subject: Corrected Blow Counts

Prepared By: L. Sugrue
Date: 7/29/2025
Checked By: M. Cramer
Date: 7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	23.17	ft
Depth to Groundwater:	6.7	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB19***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	N_{60}	$N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	σ_v (psf)	u (psf)	σ'_v (psf)	σ'_v (ksf)	C_N	Rig Type	ER (%)	C_E
7	8	15.2	CLAY	14	16	20			960	81	879	0.879	1.28	Diedrich D-25	68.7	1.15
9	10	13.2	CLAY	8	9	11	14	17	1,200	206	994	0.994	1.24	Diedrich D-25	68.7	1.15
14	15	8.2	CLAY	15	17	20			1,800	518	1,282	1.282	1.15	Diedrich D-25	68.7	1.15
19	20	3.2	GLACIAL TILL	19	22	24			2,400	830	1,570	1.570	1.08	Diedrich D-25	68.7	1.15
24	25	-1.8	GLACIAL TILL	117	100	100	51	51	3,000	1,142	1,858	1.858	1.03	Diedrich D-25	68.7	1.15
29	30	-6.8	GLACIAL TILL	27	31	30			3,600	1,454	2,146	2.146	0.98	Diedrich D-25	68.7	1.15

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/29/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft) ER = hammer efficiency expressed as percent of theoretical free fall energy N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft) $C_N = 0.77 * \log_{10}(40/\sigma'_v)$ [$C_N < 2.0$] σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	22.5	ft
Depth to Groundwater:	15.9	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB20***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	N_{60}	$N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	σ_v (psf)	u (psf)	σ'_v (psf)	σ'_v (ksf)	C_N	Rig Type	ER (%)	C_E
8	9	13.5	CLAY	10	14	17	14	17	1,080	0	1,080	1.080	1.21	Mobile B-46 Truck	83	1.38
10	11	11.5	CLAY	16	22	25			1,320	0	1,320	1.320	1.14	Mobile B-46 Truck	83	1.38
14	15	7.5	CLAY	9	12	13			1,800	0	1,800	1.800	1.04	Mobile B-46 Truck	83	1.38
19	20	2.5	CLAY	9	12	12	15	17	2,400	256	2,144	2.144	0.98	Mobile B-46 Truck	83	1.38
24	25	-2.5	GLACIAL TILL	21	29	27			3,000	568	2,432	2.432	0.94	Mobile B-46 Truck	83	1.38
29	30	-7.5	GLACIAL TILL	20	28	25	29	26	3,600	880	2,720	2.720	0.90	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client: WSP
Project: Allston I-90 Interchange Proj.
Allston I-90 Interchange 1400820/1903324
Subject: Corrected Blow Counts

Prepared By: L. Sugrue
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Checked By: M. Cramer
Date: 7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ [$C_N < 2.0$]
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	21.66	ft
Depth to Groundwater:	9.9	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB21***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts: N_{60}	$N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	Overburden Correction: σ_v (psf)	u (psf)	σ'_v (psf)	σ'_v (ksf)	C_N	Hammer Efficiency Correction Automatic Hammer: Rig Type	ER (%)	C_E
8	9	12.7	SAND AND GRAVEL (POSSIBLE FILL)	18	25	30	25	30	1,080	0	1,080	1.080	1.21	Mobile B-46 Truck	83	1.38
10	11	10.7	CLAY	14	19	22			1,320	69	1,251	1.251	1.16	Mobile B-46 Truck	83	1.38
14	15	6.7	CLAY	19	26	29	23	26	1,800	318	1,482	1.482	1.10	Mobile B-46 Truck	83	1.38
19	20	1.7	GLACIAL TILL	78	100	100			2,400	630	1,770	1.770	1.04	Mobile B-46 Truck	83	1.38
24	25	-3.3	GLACIAL TILL	6	8	8	69	69	3,000	942	2,058	2.058	0.99	Mobile B-46 Truck	83	1.38
29	29.1	-7.4	GLACIAL TILL (REFUSAL)	100	100	100			3,492	1,198	2,294	2.294	0.96	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/29/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft) ER = hammer efficiency expressed as percent of theoretical free fall energy N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft) $C_N = 0.77 * \log_{10}(40/\sigma'_v)$ [$C_N < 2.0$] σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	20.95	ft
Depth to Groundwater:	13.7	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB22***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Corrected Blow Counts Avg. N_{60}	Corrected Blow Counts Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
8	9	12.0	SAND AND GRAVEL (POSSIBLE FILL)	29	40	48			1,080	0	1,080	1.080	1.21	Mobile B-46 Truck	83	1.38
10	11	10.0	SAND AND GRAVEL (POSSIBLE FILL)	23	32	36	36	42	1,320	0	1,320	1.320	1.14	Mobile B-46 Truck	83	1.38
14	15	6.0	SAND	20	28	29			1,800	81	1,719	1.719	1.05	Mobile B-46 Truck	83	1.38
19	20	0.9	SAND	30	42	42	35	36	2,400	393	2,007	2.007	1.00	Mobile B-46 Truck	83	1.38
24	25	-4.1	GLACIAL TILL	49	68	65			3,000	705	2,295	2.295	0.96	Mobile B-46 Truck	83	1.38
29	29.05	-8.1	GLACIAL TILL	100	100	100	84	83	3,486	958	2,528	2.528	0.92	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	L. Sugrue
Project:	Allston I-90 Interchange Proj.	**Date:**	7/29/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	21.01	ft
Depth to Groundwater:	14.1	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB23***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts: N_{60}	$N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	Overburden Correction: σ_v (psf)	u (psf)	σ'_v (psf)	σ'_v (ksf)	C_N	Hammer Efficiency Correction Automatic Hammer: Rig Type	ER (%)	C_E
6	7	14.0	SAND AND GRAVEL (POSSIBLE FILL)	21	29	38	29	38	840	0	840	0.840	1.29	Mobile B-46 Truck	83	1.38
8	9	12.0	SAND	13	18	22			1,080	0	1,080	1.080	1.21	Mobile B-46 Truck	83	1.38
10	11	10.0	SAND	7	10	11	14	16	1,320	0	1,320	1.320	1.14	Mobile B-46 Truck	83	1.38
14	15	6.0	SAND	10	14	14			1,800	56	1,744	1.744	1.05	Mobile B-46 Truck	83	1.38
19	20	1.0	GLACIAL TILL	15	21	21			2,400	368	2,032	2.032	1.00	Mobile B-46 Truck	83	1.38
24	25	-4.0	GLACIAL TILL	27	37	36	53	52	3,000	680	2,320	2.320	0.95	Mobile B-46 Truck	83	1.38
29	29.4	-8.4	GLACIAL TILL	100	100	100			3,528	955	2,573	2.573	0.92	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

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Project: Allston I-90 Interchange Proj.
Allston I-90 Interchange 1400820/1903324
Subject: Corrected Blow Counts

Prepared By: L. Sugrue
Date: 7/29/2025
Checked By: M. Cramer
Date: 7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ [$C_N < 2.0$]
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	21.42	ft
Depth to Groundwater:	14.4	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB24***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	N_{60}	$N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	σ_v (psf)	u (psf)	σ'_v (psf)	σ'_v (ksf)	C_N	Rig Type	ER (%)	C_E
7	8	13.4	SAND AND GRAVEL (POSSIBLE FILL)	16	22	28	22	28	960	0	960	0.960	1.25	Mobile B-46 Truck	83	1.38
9	10	11.4	SAND	9	12	15			1,200	0	1,200	1.200	1.17	Mobile B-46 Truck	83	1.38
14	15	6.4	SAND	12	17	17			1,800	37	1,763	1.763	1.04	Mobile B-46 Truck	83	1.38
19	20	1.4	SAND	5	7	7	12	13	2,400	349	2,051	2.051	0.99	Mobile B-46 Truck	83	1.38
24	25	-3.6	GLACIAL TILL	30	42	39			3,000	661	2,339	2.339	0.95	Mobile B-46 Truck	83	1.38
29	30	-8.6	GLACIAL TILL	42	58	53	50	46	3,600	973	2,627	2.627	0.91	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

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Project:	Allston I-90 Interchange Proj.	**Date:**	7/29/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft) ER = hammer efficiency expressed as percent of theoretical free fall energy N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft) $C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$ σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	22.14	ft
Depth to Groundwater:	15.6	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB25***

					Corrected Blow Counts				Overburden Correction					Hammer Efficiency Correction Automatic Hammer		
Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	N_{60}	$N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	σ_v (psf)	u (psf)	σ'_v (psf)	σ'_v (ksf)	C_N	Rig Type	ER (%)	C_E
7	8	14.1	SAND AND GRAVEL (POSSIBLE FILL)	38	53	66	53	66	960	0	960	0.960	1.25	Mobile B-46 Truck	83	1.38
9	10	12.1	SAND	24	33	39			1,200	0	1,200	1.200	1.17	Mobile B-46 Truck	83	1.38
14	15	7.1	SAND	43	59	62	36	38	1,800	0	1,800	1.800	1.04	Mobile B-46 Truck	83	1.38
19	20	2.1	SAND	20	28	27			2,400	275	2,125	2.125	0.98	Mobile B-46 Truck	83	1.38
24	25	-2.9	SAND	18	25	23			3,000	587	2,413	2.413	0.94	Mobile B-46 Truck	83	1.38
29	30	-7.9	CLAY	14	19	17	19	17	3,600	899	2,701	2.701	0.90	Mobile B-46 Truck	83	1.38
34	35	-12.9	GLACIAL TILL	70	97	84	97	84	4,200	1,211	2,989	2.989	0.87	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

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Project:	Allston I-90 Interchange Proj.	**Date:**	7/29/2025
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References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft) ER = hammer efficiency expressed as percent of theoretical free fall energy N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft) $C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$ σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	22.83	ft
Depth to Groundwater:	8.2	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB26***

					Corrected Blow Counts				Overburden Correction					Hammer Efficiency Correction Automatic Hammer		
Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	N_{60}	$N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	σ_v (psf)	u (psf)	σ'_v (psf)	σ'_v (ksf)	C_N	Rig Type	ER (%)	C_E
8	9	13.8	SAND AND GRAVEL (POSSIBLE FILL)	33	46	56	46	56	1,080	50	1,030	1.030	1.22	Mobile B-46 Truck	83	1.38
10	11	11.8	SAND	22	30	36			1,320	175	1,145	1.145	1.19	Mobile B-46 Truck	83	1.38
14	15	7.8	SAND	12	17	19			1,800	424	1,376	1.376	1.13	Mobile B-46 Truck	83	1.38
19	20	2.8	SAND	13	18	19	22	25	2,400	736	1,664	1.664	1.06	Mobile B-46 Truck	83	1.38
24	25	-2.2	SAND	40	55	56			3,000	1,048	1,952	1.952	1.01	Mobile B-46 Truck	83	1.38
29	30	-7.2	CLAY	5	7	7	31	32	3,600	1,360	2,240	2.240	0.96	Mobile B-46 Truck	83	1.38
34	35	-12.2	GLACIAL TILL	56	77	72	77	72	4,200	1,672	2,528	2.528	0.92	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

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Project:	Allston I-90 Interchange Proj.	**Date:**	7/29/2025
Allston I-90 Interchange	1400820/1903324	**Checked By:**	M. Cramer
Subject:	Corrected Blow Counts	**Date:**	7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft) ER = hammer efficiency expressed as percent of theoretical free fall energy N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft) $C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$ σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	23.35	ft
Depth to Groundwater:	13.8	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB27***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Corrected Blow Counts Avg. N_{60}	Corrected Blow Counts Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
7	8	15.4	SAND AND GRAVEL (POSSIBLE FILL)	28	39	48	39	48	960	0	960	0.960	1.25	Mobile B-46 Truck	83	1.38
9	10	13.4	SAND AND GRAVEL	15	21	24	29	30	1,200	0	1,200	1.200	1.17	Mobile B-46 Truck	83	1.38
14	15	8.4	SAND AND GRAVEL	18	25	26			1,800	75	1,725	1.725	1.05	Mobile B-46 Truck	83	1.38
19	20	3.4	SAND AND GRAVEL	20	28	28			2,400	387	2,013	2.013	1.00	Mobile B-46 Truck	83	1.38
24	25	-1.7	SAND AND GRAVEL	30	42	40			3,000	699	2,301	2.301	0.95	Mobile B-46 Truck	83	1.38
29	30	-6.7	SILT	52	72	66	72	66	3,600	1,011	2,589	2.589	0.92	Mobile B-46 Truck	83	1.38
34	35	-11.7	GLACIAL TILL	38	53	46	53	46	4,200	1,323	2,877	2.877	0.88	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client: WSP
Project: Allston I-90 Interchange Proj.
Allston I-90 Interchange 1400820/1903324
Subject: Corrected Blow Counts

Prepared By: L. Sugrue
Date: 7/29/2025
Checked By: M. Cramer
Date: 7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft) ER = hammer efficiency expressed as percent of theoretical free fall energy N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft) $C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$ σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	23.98	ft
Depth to Groundwater:	15.2	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB28***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Corrected Blow Counts Avg. N_{60}	Corrected Blow Counts Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
8	9	15.0	SAND AND GRAVEL (POSSIBLE FILL)	37	51	62	51	62	1,080	0	1,080	1.080	1.21	Mobile B-46 Truck	83	1.38
10	11	13.0	SAND AND GRAVEL	44	61	69			1,320	0	1,320	1.320	1.14	Mobile B-46 Truck	83	1.38
14	15	9.0	SAND AND GRAVEL	36	50	52			1,800	0	1,800	1.800	1.04	Mobile B-46 Truck	83	1.38
19	20	4.0	SAND AND GRAVEL	21	29	29	38	39	2,400	300	2,100	2.100	0.99	Mobile B-46 Truck	83	1.38
24	25	-1.0	SAND AND GRAVEL	19	26	25			3,000	612	2,388	2.388	0.94	Mobile B-46 Truck	83	1.38
29	30	-6.0	SAND AND GRAVEL	17	24	21			3,600	924	2,676	2.676	0.90	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client: WSP
Project: Allston I-90 Interchange Proj.
Allston I-90 Interchange 1400820/1903324
Subject: Corrected Blow Counts

Prepared By: L. Sugrue
Date: 7/29/2025
Checked By: M. Cramer
Date: 7-30-2025

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation	
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft) ER = hammer efficiency expressed as percent of theoretical free fall energy N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where: $N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft) $C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$ σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	24.47	ft
Depth to Groundwater:	14.5	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB29***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts: N_{60}	$N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	Overburden Correction: σ_v (psf)	u (psf)	σ'_v (psf)	σ'_v (ksf)	C_N	Hammer Efficiency Correction Automatic Hammer: Rig Type	ER (%)	C_E
9	10	14.5	SAND AND GRAVEL	28	39	45	39	45	1,200	0	1,200	1.200	1.17	Mobile B-46 Truck	83	1.38
11	12	12.5	SAND AND GRAVEL	27	37	42			1,440	0	1,440	1.440	1.11	Mobile B-46 Truck	83	1.38
14	15	9.5	SAND AND GRAVEL	39	54	56			1,800	31	1,769	1.769	1.04	Mobile B-46 Truck	83	1.38
19	20	4.5	SAND AND GRAVEL	20	28	27	52	51	2,400	343	2,057	2.057	0.99	Mobile B-46 Truck	83	1.38
24	25	-0.5	SAND AND GRAVEL	32	44	42			3,000	655	2,345	2.345	0.95	Mobile B-46 Truck	83	1.38
29	30	-5.5	SAND AND GRAVEL	69	95	87			3,600	967	2,633	2.633	0.91	Mobile B-46 Truck	83	1.38

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client: WSP
Project: Allston I-90 Interchange Proj.
Allston I-90 Interchange 1400820/1903324
Subject: Corrected Blow Counts

Prepared By: A. Burrows-Crane
Date: 4/17/2026
Checked By: A. Roshan
Date: 5/6/2026

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	23.75	ft
Depth to Groundwater:	15.3	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB30***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Corrected Blow Counts Avg. N_{60}	Corrected Blow Counts Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
0	1	22.8	SAND AND GRAVEL (POSSIBLE FILL)	9	10	20			120	0	120	0.120	1.94	Diedrich D-25	68.7	1.15
2	3	20.8	SAND AND GRAVEL (POSSIBLE FILL)	51	58	92			360	0	360	0.360	1.58	Diedrich D-25	68.7	1.15
4	5	18.8	SAND AND GRAVEL (POSSIBLE FILL)	30	34	48	30	44	600	0	600	0.600	1.40	Diedrich D-25	68.7	1.15
6	7	16.8	SAND AND GRAVEL (POSSIBLE FILL)	17	19	25			840	0	840	0.840	1.29	Diedrich D-25	68.7	1.15
8	9	14.8	SAND AND GRAVEL (POSSIBLE FILL)	25	29	35			1,080	0	1,080	1.080	1.21	Diedrich D-25	68.7	1.15
10	11	12.8	SAND AND GRAVEL	46	53	60			1,320	0	1,320	1.320	1.14	Diedrich D-25	68.7	1.15
14	15	8.8	SAND AND GRAVEL	16	18	19			1,800	0	1,800	1.800	1.04	Diedrich D-25	68.7	1.15
19	20	3.8	SAND AND GRAVEL	21	24	24			2,400	293	2,107	2.107	0.98	Diedrich D-25	68.7	1.15
24	25	-1.3	SAND AND GRAVEL	20	23	22	32	31	3,000	605	2,395	2.395	0.94	Diedrich D-25	68.7	1.15
29	30	-6.3	SAND AND GRAVEL	28	32	29			3,600	917	2,683	2.683	0.90	Diedrich D-25	68.7	1.15
34	35	-11.3	SAND AND GRAVEL	26	30	26			4,200	1,229	2,971	2.971	0.87	Diedrich D-25	68.7	1.15
39	40	-16.3	SAND AND GRAVEL	29	33	28			4,800	1,541	3,259	3.259	0.84	Diedrich D-25	68.7	1.15
44	45	-21.3	SAND AND GRAVEL	39	45	36			5,400	1,853	3,547	3.547	0.81	Diedrich D-25	68.7	1.15

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	A. Burrows-Crane
Project:	Allston I-90 Interchange Proj.	**Date:**	4/17/2026
Allston I-90 Interchange	1400820/1903324	**Checked By:**	A. Roshan
Subject:	Corrected Blow Counts	**Date:**	5/6/2026

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	23.52	ft
Depth to Groundwater:	20.5	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB31***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Corrected Blow Counts Avg. N_{60}	Corrected Blow Counts Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
0.7	1.7	21.8	SAND AND GRAVEL (POSSIBLE FILL)	29	33	59			204	0	204	0.204	1.77	Diedrich D-25	68.7	1.15
3	4	19.5	SAND AND GRAVEL (POSSIBLE FILL)	24	27	41	32	47	480	0	480	0.480	1.48	Diedrich D-25	68.7	1.15
5	6	17.5	SAND AND GRAVEL (POSSIBLE FILL)	33	38	51			720	0	720	0.720	1.34	Diedrich D-25	68.7	1.15
7	8	15.5	SAND AND GRAVEL (POSSIBLE FILL)	25	29	36			960	0	960	0.960	1.25	Diedrich D-25	68.7	1.15
9	10	13.5	SAND AND GRAVEL	31	35	42			1,200	0	1,200	1.200	1.17	Diedrich D-25	68.7	1.15
14	15	8.5	SAND AND GRAVEL	28	32	33			1,800	0	1,800	1.800	1.04	Diedrich D-25	68.7	1.15
19	20	3.5	SAND AND GRAVEL	29	33	31			2,400	0	2,400	2.400	0.94	Diedrich D-25	68.7	1.15
24	25	-1.5	SAND AND GRAVEL	15	17	15			3,000	281	2,719	2.719	0.90	Diedrich D-25	68.7	1.15
29	30	-6.5	SAND AND GRAVEL	13	15	13	21	20	3,600	593	3,007	3.007	0.87	Diedrich D-25	68.7	1.15
34	35	-11.5	SAND AND GRAVEL	10	11	10			4,200	905	3,295	3.295	0.83	Diedrich D-25	68.7	1.15
36	37	-13.5	SAND AND GRAVEL	13	15	12			4,440	1,030	3,410	3.410	0.82	Diedrich D-25	68.7	1.15
39	40	-16.5	SAND AND GRAVEL	5	6	5			4,800	1,217	3,583	3.583	0.81	Diedrich D-25	68.7	1.15
44	45	-21.5	SAND AND GRAVEL	25	29	22			5,400	1,529	3,871	3.871	0.78	Diedrich D-25	68.7	1.15

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client: WSP
Project: Allston I-90 Interchange Proj.
Allston I-90 Interchange 1400820/1903324
Subject: Corrected Blow Counts

Prepared By: A. Burrows-Crane
Date: 4/17/2026
Checked By: A. Roshan
Date: 5/6/2026

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	23.47	ft
Depth to Groundwater:	7.6	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB32***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Corrected Blow Counts Avg. N_{60}	Corrected Blow Counts Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
0	1	22.5	SAND AND GRAVEL (POSSIBLE FILL)	33	38	73			120	0	120	0.120	1.94	Diedrich D-25	68.7	1.15
2	3	20.5	SAND AND GRAVEL (POSSIBLE FILL)	52	60	94			360	0	360	0.360	1.58	Diedrich D-25	68.7	1.15
4	4.6	18.9	SAND AND GRAVEL (POSSIBLE FILL)	34	39	56	41	62	552	0	552	0.552	1.43	Diedrich D-25	68.7	1.15
6	7	16.5	SAND AND GRAVEL (POSSIBLE FILL)	32	37	47			840	0	840	0.840	1.29	Diedrich D-25	68.7	1.15
8	9	14.5	SAND AND GRAVEL (POSSIBLE FILL)	27	31	38			1,080	87	993	0.993	1.24	Diedrich D-25	68.7	1.15
10	11	12.5	SAND AND GRAVEL	36	41	49			1,320	212	1,108	1.108	1.20	Diedrich D-25	68.7	1.15
14	15	8.5	SAND AND GRAVEL	32	37	42			1,800	462	1,338	1.338	1.14	Diedrich D-25	68.7	1.15
19	20	3.5	SAND AND GRAVEL	26	30	32			2,400	774	1,626	1.626	1.07	Diedrich D-25	68.7	1.15
24	25	-1.5	SAND AND GRAVEL	27	31	31	35	35	3,000	1,086	1,914	1.914	1.02	Diedrich D-25	68.7	1.15
29	30	-6.5	SAND AND GRAVEL	23	26	26			3,600	1,398	2,202	2.202	0.97	Diedrich D-25	68.7	1.15
34	35	-11.5	SAND AND GRAVEL	42	48	45			4,200	1,710	2,490	2.490	0.93	Diedrich D-25	68.7	1.15
39	40	-16.5	SAND AND GRAVEL	27	31	28			4,800	2,022	2,778	2.778	0.89	Diedrich D-25	68.7	1.15
41	42	-18.5	SAND AND GRAVEL	29	33	29			5,040	2,147	2,893	2.893	0.88	Diedrich D-25	68.7	1.15

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	A. Burrows-Crane
Project:	Allston I-90 Interchange Proj.	**Date:**	4/17/2026
Allston I-90 Interchange	1400820/1903324	**Checked By:**	A. Roshan
Subject:	Corrected Blow Counts	**Date:**	5/6/2026

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	22.74	ft
Depth to Groundwater:	8.1	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	Diedrich D-25	68.7	1.15	170	
2	Mobile B-46 Truck	83	1.38	2021001	

Boring: ***NWB33***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	N_{60}	$N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	σ_v (psf)	u (psf)	σ'_v (psf)	σ'_v (ksf)	C_N	Rig Type	ER (%)	C_E
0	1	21.7	SAND AND GRAVEL (POSSIBLE FILL)	11	13	24			120	0	120	0.120	1.94	Diedrich D-25	68.7	1.15
2	3	19.7	SAND AND GRAVEL (POSSIBLE FILL)	12	14	22	23	32	360	0	360	0.360	1.58	Diedrich D-25	68.7	1.15
4	4.6	18.1	SAND AND GRAVEL (POSSIBLE FILL)	REF	-	-			552	0	552	0.552	1.43	Diedrich D-25	68.7	1.15
8	9	13.7	SAND AND GRAVEL (POSSIBLE FILL)	36	41	51			1,080	56	1,024	1.024	1.23	Diedrich D-25	68.7	1.15
10	11	11.7	SAND AND GRAVEL	21	24	29			1,320	181	1,139	1.139	1.19	Diedrich D-25	68.7	1.15
14	15	7.7	SAND AND GRAVEL	41	47	53			1,800	431	1,369	1.369	1.13	Diedrich D-25	68.7	1.15
19	20	2.7	SAND AND GRAVEL	39	45	48			2,400	743	1,657	1.657	1.06	Diedrich D-25	68.7	1.15
24	25	-2.3	SAND AND GRAVEL	18	21	21	43	43	3,000	1,055	1,945	1.945	1.01	Diedrich D-25	68.7	1.15
29	30	-7.3	SAND AND GRAVEL	60	69	66			3,600	1,367	2,233	2.233	0.96	Diedrich D-25	68.7	1.15
34	35	-12.3	SAND AND GRAVEL	39	45	41			4,200	1,679	2,521	2.521	0.92	Diedrich D-25	68.7	1.15
39	40	-17.3	SAND AND GRAVEL	41	47	42			4,800	1,991	2,809	2.809	0.89	Diedrich D-25	68.7	1.15

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	C. Burford
Project:	Allston I-90 Interchange Proj.	**Date:**	6/19/2018
Allston I-90 Interchange	1400820/1903324	**Checked By:**	K. Gleichauf
Subject:	Corrected Blow Counts	**Date:**	6/22/2018

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft) ER = hammer efficiency expressed as percent of theoretical free fall energy N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft) $C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$ σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	26.1	ft
Depth to Groundwater:	18.5	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	CME 75 Truck	73	1.22	93264	

Boring: ***IC BB 104***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	Overburden Correction σ_v (psf)	Overburden Correction u (psf)	Overburden Correction σ'_v (psf)	Overburden Correction σ'_v (ksf)	Overburden Correction C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	Hammer Efficiency Correction Automatic Hammer ER (%)	Hammer Efficiency Correction Automatic Hammer C_E
5	6	20.1	SAND AND GRAVEL (POSSIBLE FILL)	21	26	34			720	0	720	0.720	1.34	CME 75 Truck	73	1.22
9	10	16.1	SAND AND GRAVEL (POSSIBLE FILL)	29	35	41	32	37	1,200	0	1,200	1.200	1.17	CME 75 Truck	73	1.22
14	15	11.1	SAND AND GRAVEL (POSSIBLE FILL)	29	35	37			1,800	0	1,800	1.800	1.04	CME 75 Truck	73	1.22
19	20	6.1	SAND AND GRAVEL	24	29	28			2,400	94	2,306	2.306	0.95	CME 75 Truck	73	1.22
24	25	1.1	SAND AND GRAVEL	27	33	30			3,000	406	2,594	2.594	0.91	CME 75 Truck	73	1.22
29	30	-3.9	SAND AND GRAVEL	24	29	26			3,600	718	2,882	2.882	0.88	CME 75 Truck	73	1.22
34	35	-8.9	SAND AND GRAVEL	40	49	41	33	28	4,200	1,030	3,170	3.170	0.85	CME 75 Truck	73	1.22
39	40	-13.9	SAND AND GRAVEL	33	40	33			4,800	1,342	3,458	3.458	0.82	CME 75 Truck	73	1.22
44	45	-18.9	SAND AND GRAVEL	24	29	23			5,400	1,654	3,746	3.746	0.79	CME 75 Truck	73	1.22
49	50	-23.9	SAND AND GRAVEL	16	19	15			6,000	1,966	4,034	4.034	0.77	CME 75 Truck	73	1.22
54	55	-28.9	CLAY WITH FINE SAND LAYERS	26	32	24	28	21	6,600	2,278	4,322	4.322	0.74	CME 75 Truck	73	1.22
59	60	-33.9	CLAY WITH FINE SAND LAYERS	20	24	18			7,200	2,590	4,610	4.610	0.72	CME 75 Truck	73	1.22
64	65	-38.9	SAND AND GRAVEL	24	29	21	29	21	7,800	2,902	4,898	4.898	0.70	CME 75 Truck	73	1.22
69	69.65	-43.6	WEATHERED ROCK	119/9"	-	-			8,358	3,192	5,166	5.166	0.68	CME 75 Truck	73	1.22
74	74	-47.9	WEATHERED ROCK	100/0"	-	-			8,880	3,463	5,417	5.417	0.67	CME 75 Truck	73	1.22
79	79	-52.9	WEATHERED ROCK	100/0"	-	-	-	-	9,480	3,775	5,705	5.705	0.65	CME 75 Truck	73	1.22
84	84	-57.9	WEATHERED ROCK	100/0"	-	-			10,080	4,087	5,993	5.993	0.63	CME 75 Truck	73	1.22
89	89	-62.9	WEATHERED ROCK	100/0"	-	-			10,680	4,399	6,281	6.281	0.62	CME 75 Truck	73	1.22

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

GEI Consultants

Client:	WSP	**Prepared By:**	J. Giampa
Project:	Allston I-90 Interchange Proj.	**Date:**	6/28/2018
Allston I-90 Interchange	1400820/1903324	**Checked By:**	E. Winter
Subject:	Corrected Blow Counts	**Date:**	11/11/2020

References: 1) American Association of State Highway and Transportation Officials (AASHTO) "AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024"

Equations:

Ref. 1 Eqn. No.	Equation		
10.4.6.2.4-2	$N_{60} = (ER / 60\%) * N$	where:	N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
			ER = hammer efficiency expressed as percent of theoretical free fall energy
			N = Uncorrected SPT blow count (blows/ft)
10.4.6.2.4-3	$N1_{60} = C_N * N_{60}$	where:	$N1_{60}$ = SPT blow count corrected for overburden and hammer efficiency (blows/ft)
			$C_N = 0.77 * \log_{10}(40/\sigma'_v)$ $[C_N < 2.0]$
			σ'_v = vertical effective stress (ksf)

Assumptions:

Ground Surface El.:	25	ft
Depth to Groundwater:	19.0	ft
Average Total Unit Weight of Soil:	120	pcf

	Rig Type	ER (%)	C_E = ER / 60%	Serial No.	Notes
1	CME 75 Truck	73	1.22	93264	

Boring: ***IC BB 105***

Depth to Top of Sample (ft)	Depth to Middle 12" (ft)	El. of Middle 12" (ft)	Layer Name	N	Corrected Blow Counts N_{60}	Corrected Blow Counts $N1_{60}$	Avg. N_{60}	Avg. $N1_{60}$	Overburden Correction σ_v (psf)	u (psf)	σ'_v (psf)	σ'_v (ksf)	C_N	Hammer Efficiency Correction Automatic Hammer Rig Type	ER (%)	C_E
5	6	19.0	SAND AND GRAVEL (POSSIBLE FILL)	15	18	25			720	0	720	0.720	1.34	CME 75 Truck	73	1.22
9	10	15.0	SAND AND GRAVEL (POSSIBLE FILL)	33	40	47			1,200	0	1,200	1.200	1.17	CME 75 Truck	73	1.22
14	15	10.0	SAND AND GRAVEL (POSSIBLE FILL)	18	22	23	30	33	1,800	0	1,800	1.800	1.04	CME 75 Truck	73	1.22
19	20	5.0	SAND AND GRAVEL (POSSIBLE FILL)	32	39	37			2,400	62	2,338	2.338	0.95	CME 75 Truck	73	1.22
24	25	0.0	SAND AND GRAVEL	25	30	28			3,000	374	2,626	2.626	0.91	CME 75 Truck	73	1.22
29	30	-5.0	SAND AND GRAVEL	35	43	37			3,600	686	2,914	2.914	0.88	CME 75 Truck	73	1.22
34	35	-10.0	SAND AND GRAVEL	50	61	51			4,200	998	3,202	3.202	0.84	CME 75 Truck	73	1.22
39	40	-15.0	SAND AND GRAVEL	17	21	17	34	28	4,800	1,310	3,490	3.490	0.82	CME 75 Truck	73	1.22
44	45	-20.0	SAND AND GRAVEL	17	21	16			5,400	1,622	3,778	3.778	0.79	CME 75 Truck	73	1.22
49	50	-25.0	SAND AND GRAVEL	32	39	30			6,000	1,934	4,066	4.066	0.76	CME 75 Truck	73	1.22
54	55	-30.0	SAND AND GRAVEL	21	26	19			6,600	2,246	4,354	4.354	0.74	CME 75 Truck	73	1.22
59	59	-34.0	POSSIBLE WEATHERED ROCK	100/0"	-	-	-	-	7,080	2,496	4,584	4.584	0.72	CME 75 Truck	73	1.22
64	64	-39.0	POSSIBLE WEATHERED ROCK	100/0"	-	-			7,680	2,808	4,872	4.872	0.70	CME 75 Truck	73	1.22

Notes:
1. For N_{60} and $N1_{60}$ values greater than 100 blows/ft, we input the value 100 blows/ft.
2. N-Values from SPT's that encountered refusal prior to a penetration of 12 inches were not included in the averages.

D.2. Bearing Capacity

GEI Consultants

Project: Allston I-90 Interchange Noise Wall
Allston, Massachussets
GEI Project No.: 1903324

By: M.Chea
Date: 05/26/2026
Checked By: M. Ahmed
Date: 5/27/2026

FACTORED BEARING RESISTANCE CALCULATIONS - Prefabricated Modular Wall

The following calculation provides bearing resistance calculations for the proposed retaining wall associated with the noise wall planned along Lincoln St and I-90 in Allston, MA. The resistances were calculated based on the method, equations, and appropriate parameters provided in the 2024 AASHTO LRFD Bridge Design Specifications.

References utilized for these calculations (including those pertaining to resistance factors) are provided at the back of this calculation.

Bearing resistances were calculated with the following formula:

$$q_n = cN_{cm} + \gamma D_f N_{qm} C_{wq} + 0.5\gamma \quad BN_{\gamma m} C_{w\gamma} \qquad (10.6.3.1.2a\text{-}1)$$

in which:

$$N_{cm} = N_c s_c i_c \qquad (10.6.3.1.2a\text{-}2)$$

$$N_{qm} = N_q s_q d_q i_q \qquad (10.6.3.1.2a\text{-}3)$$

$$N_\gamma m = N_\gamma s_\gamma i_\gamma \qquad (10.6.3.1.2a\text{-}4)$$

where:

c = cohesion, taken as undrained shear strength (ksf)

N_c = cohesion term (undrained loading) bearing capacity factor as specified in Table 10.6.3.1.2a-1 (dim)

N_q = surcharge (embedment) term (drained or undrained loading) bearing capacity factor as specified in Table 10.6.3.1.2a-1 (dim)

N_γ = unit weight (footing width) term (drained loading) bearing capacity factor as specified in Table 10.6.3.1.2a-1 (dim)

γ_q = total (moist) unit weight of soil above the bearing depth of the footing (kcf)

γ_f = total (moist) unit weight of soil below the bearing depth of the footing (kcf)

D_f = footing embedment depth (ft)

B = footing width (ft)

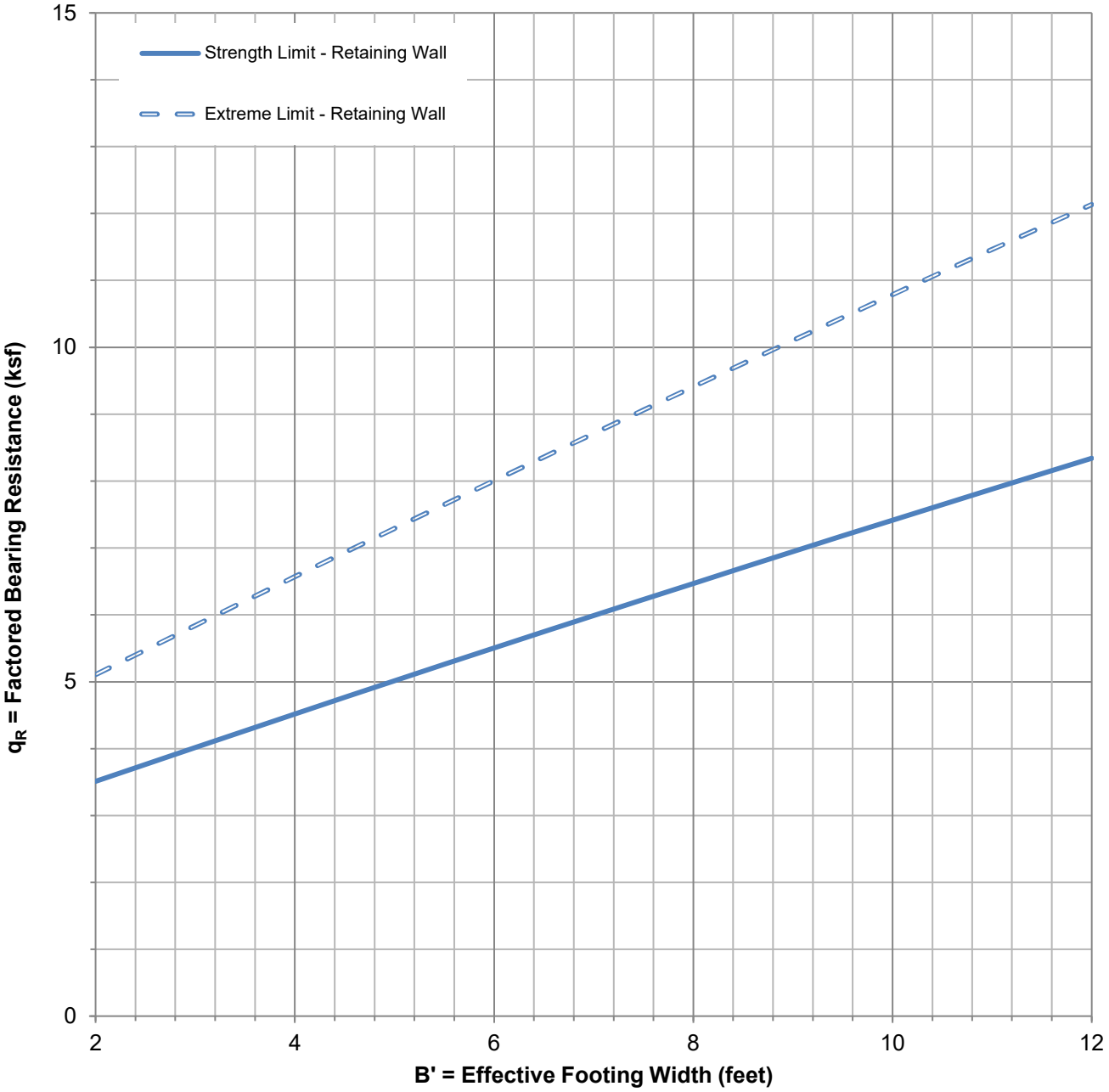
$C_{wq}, C_{w\gamma}$ = correction factors to account for the location of the groundwater table as specified in Table 10.6.3.1.2a-2 (dim)

s_c, s_γ, s_q = footing shape correction factors as specified in Table 10.6.3.1.2a-3 (dim)

d_q = depth correction factor to account for the shearing resistance along the failure surface passing through cohesionless material above the bearing elevation determined from Eq. 10.6.3.1.2a-10 (dim)

i_c, i_γ, i_q = load inclination factors determined from Eqs. 10.6.3.1.2a-5 or 10.6.3.1.2a-6, and 10.6.3.1.2a-7 and 10.6.3.1.2a-8 (dim)

Additional formulas for correction factors are provided at the back of this calculation packet.
We assumed all load inclination factors to be 1.0, rather than use the provided formulas.



Notes:
1. The above resistances are based on methods provided in the 2024 AASHTO LRFD Bridge Design Specifications.
2. The resistances above are based on 3 feet of embedment and level ground in front and behind the wall.
3. Groundwater was conservatively assumed to be at ground surface in front of wall.
4. The Strength Limit values above are based on a Resistance factor of 0.55 for gravity or prefabricated modular wall. The extreme Limit values above are based on a Resistance Factor of 0.8.

Proposed Lincoln St. Noise Wall/Retaining Wall Allston Interchange Project Boston, Massachussets	GEI Consultants	FACTORED BEARING RESISTANCE VS. EFFECTIVE FOOTING WIDTH - LINCOLN ST. RETAINING WALL
WSP Worcester, MA	Project No. 1903324	June 2026 Fig. 1

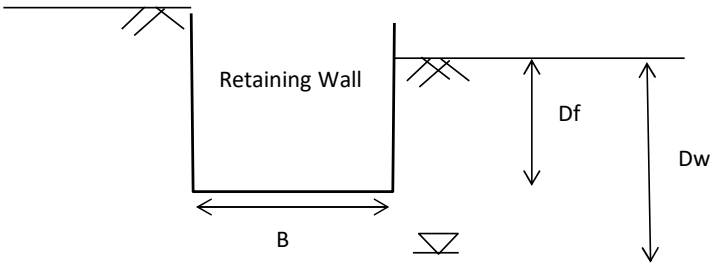
GEI Consultants

Project: Allston I-90 Interchange Noise Wall
Allston, Massachussets
GEI Project No.: 1903324

By: M.Chea
Date: 05/26/2026
Checked By: M. Ahmed
Date: 5/27/2026

FACTORED BEARING RESISTANCE CALCULATIONS - Concrete Retaining Wall

Note: All references are to AASHTO LRFD Bridge Design Specifications, unless otherwise noted. See attached sheets with applicable table and equation references.



RESISTANCE FACTORS

Strength Limit	0.55	Retaining Wall	AASHTO, Table 11.5.7-1
Extreme I Limit	0.8		AASHTO 11.5.8

BEARING SOIL PROPERTIES/SUBSURFACE INFORMATION

Bearing Soil Type		Existing Fill (Sand & Gravel)	Based on borings NWB1-NWB8 (Sta 100+00 to Sta 106+50 & NWB19-NWB29 (Sta 200+00 to Sta 210+50)
Unit Weight of Bearing Soil (γ)	pcf	120	
Unit Weight of Surcharge Soil (γ)		130	
Cohesion of Bearing Soil (c)	psf	0	
Friction Angle of bearing Soil (ϕ')	°	32	
Es, Modulus of Elasticity	ksi	4.4	
ν, poissons ratio		0.3	
Depth to Groundwater, Dw	ft	0.0	Conservative; GW is below proposed bearing elevations.
Bearing Capacity Factor (N_c)		35.5	
Bearing Capacity Factor (N_q)		23.2	
Bearing Capacity Factor ($N_γ$)		30.2	

FOOTING GEOMETRY

Bottom of Footing Elevation (NAVD88)	ft	Varies	Based on cross section at Sta. 16+50 and concept plan provided
Minimum Footing Depth (D_f)	ft	3.0	
Footing Length (L)	ft	80.0	model as continuous footing

Effective Width, B' (B' = B - 2e)	ft	2.0	4.0	6.0	8.0	10.0	12.0
Effective Length, L' =L	ft	80.0	80.0	80.0	80.0	80.0	80.0
L'/B'		40.0	20.0	13.3	10.0	8.0	6.7
Df/B'		1.50	0.75	0.50	0.38	0.30	0.25
A'	sf	160	320	480	640	800	960
βz		1.40	1.40	1.40	1.41	1.34	1.29

GEI Consultants

Project: Allston I-90 Interchange Noise Wall
Allston, Massachussets
GEI Project No.: 1903324

By: M.Chea
Date: 05/26/2026
Checked By: M. Ahmed
Date: 5/27/2026

BEARING RESISTANCE EQUATION FACTORS/COEFFICIENTS

Effective Width, B' (B' = B - 2e)	ft	2.0	4.0	6.0	8.0	10.0	12.0
N_{cm}		36.1	36.6	37.2	37.8	38.4	39.0
Shape Correction Factor (s_c)		1.02	1.03	1.05	1.07	1.08	1.10
Load Inclination Factor (i_c)		1.0	1.0	1.0	1.0	1.0	1.0
N_{qm}		23.5	23.9	24.3	24.6	25.0	25.3
Shape Correction Factor (s_q)		1.02	1.03	1.05	1.06	1.08	1.09
Load Inclination Factor (i_q)		1.0	1.0	1.0	1.0	1.0	1.0
Depth Correction Factor (d_q)		1.0	1.0	1.0	1.0	1.0	1.0
$N_{\gamma m}$		29.9	29.6	29.3	29.0	28.7	28.4
Shape Correction Factor (s_γ)		0.99	0.98	0.97	0.96	0.95	0.94
Load Inclination Factor (i_γ)		1.0	1.0	1.0	1.0	1.0	1.0
Groundwater Coefficient, C_{wq}		0.50	0.50	0.50	0.50	0.50	0.50
Groundwater Coefficient, $C_{w\gamma}$		0.50	0.50	0.50	0.50	0.50	0.50

CALCULATED BEARING RESISTANCES

Nominal Bearing Resistance (q_n, ksf)	6.4	8.2	10.0	11.8	13.5	15.2
Strength Limit Factored Bearing Resistance: q_R (ksf)	**3.5**	**4.5**	**5.5**	**6.5**	**7.4**	**8.3**
Extreme Limit Factored Bearing Resistance: q_R (ksf)	**5.1**	**6.6**	**8.0**	**9.4**	**10.8**	**12.1**

GEI Consultants

Project: Allston I-90 Interchange Noise Wall
Allston, Massachussets
GEI Project No.: 1903324

By: M.Chea
Date: 05/26/2026
Checked By: M. Ahmed
Date: 5/27/2026

Table 10.4.6.2.4-1—Correlation of SPT $N1_{60}$ Values to Drained Friction Angle of Granular Soils (modified after Bowles, 1977)

$N1_{60}$	ϕ_f
<4	25–30
4	27–32
10	30–35
30	35–40
50	38–43

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

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

Soil Type	Typical Range of Young's Modulus Values, E_s (ksi)	Poisson's Ratio, ν (dim)
Clay:		
Soft sensitive	0.347–2.08	0.4–0.5 (undrained)
Medium stiff to stiff	2.08–6.94	
Very stiff	6.94–13.89	
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	0.25
Medium dense	1.67–2.78	
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

Estimating E_s from *SPT N* Value	
Soil Type	E_s (ksi)
Silts, sandy silts, slightly cohesive mixtures	$0.056\ N1_{60}$
Clean fine to medium sands and slightly silty sands	$0.097\ N1_{60}$
Coarse sands and sands with little gravel	$0.139\ N1_{60}$
Sandy gravel and gravels	$0.167\ N1_{60}$
Estimating E_s from q_c (static cone resistance)	
Sandy soils	$0.028q_c$

GEI Consultants

Project: Allston I-90 Interchange Noise Wall
Allston, Massachussets
GEI Project No.: 1903324

By: M.Chea
Date: 05/26/2026
Checked By: M. Ahmed
Date: 5/27/2026

Table 10.6.3.1.2a-3—Shape Correction Factors s_c, s_γ, s_q

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
	$\phi_f > 0$	$1+\left(\frac{B}{L}\right)\left(\frac{N_q}{N_c}\right)$	$1-0.4\left(\frac{B}{L}\right)$	$1+\left(\frac{B}{L}\tan\phi_f\right)$

$$d_q = 1 + 2\tan\phi_f(1-\sin\phi_f)^2 \arctan\left(\frac{D_f}{B}\right) \quad \text{(10.6.3.1.2a-10)}$$

Eq. 10.6.3.1.2a-10 has been verified to cover a range of friction angle, ϕ_f, of 32 degrees to 42 degrees, and a range of D_f/B of 1 to 8. Depth correction factor values beyond this range have not been verified at this time.

where:

d_q = depth correction factor to account for the shearing resistance along the failure surface passing through cohesionless material above the bearing elevation(dim)
ϕ_f = angle of internal friction of soil (degrees)
D_f = footing embedment depth (ft)
B = footing width (ft)

Arctan (D_f/B) is in radians.

The depth correction factor should be used only when the soils above the footing bearing elevation are as competent as the soils beneath the footing level; otherwise, the depth correction factor should be taken as 1.0. The depth correction factor, d_q, shall not exceed 1.4.

Table 10.6.2.4.4-1—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

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

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
		Plate Load Test	0.55
Sliding	φ_τ	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

10.5.5.3—Extreme Event Limit States

10.5.5.3.1—General

Design of foundations at extreme limit states shall be consistent with the expectation that structure collapse is prevented and that life safety is protected.

10.5.5.3.2—Scour

The provisions of Article 2.6.4.4.4 shall apply to the changed foundation conditions resulting from scour. Resistance factors at the extreme event shall be taken as 1.0 except that for uplift resistance of piles and shafts, the resistance factor shall be taken as 0.80 or less.

The foundation shall resist not only the loads applied from the structure but also any debris loads occurring during the flood event.

C10.5.5.3.2

The specified resistance factors should be used provided that the method used to compute the nominal resistance does not exhibit bias that is unconservative. See Article C10.7.3.6 for guidance regarding bias values for pile resistance prediction methods.

Design for scour is discussed in Hannigan et al. (2016).

10.5.5.3.3—Other Extreme Limit States

Resistance factors for extreme limit state, including the design of foundations to resist earthquake, ice, vehicle or vessel impact loads, shall be taken as 1.0. For uplift resistance of piles and shafts, the resistance factor shall be taken as 0.80 or less.

C10.5.5.3.3

The difference between compression skin friction and tension skin friction should be taken into account through the resistance factor, to be consistent with how this is done for the strength limit state (see Article 10.5.5.2.3).

10.5.5—Resistance Factors

10.5.5.1—Service Limit States

Resistance factors for the service limit states shall be taken as 1.0.

A resistance factor of 1.0 shall be used to assess the ability of the foundation to meet the specified deflection criteria after soil removal due to the scour design flood.

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Table 11.5.7-1—Strength Limit State Resistance Factors for Permanent Retaining Walls

Wall-Type and Condition		Resistance Factor
Nongravity Cantilevered and Anchored Walls		
Axial compressive resistance of vertical elements		Article 10.5 applies
Passive resistance of vertical elements		0.75
Pullout resistance of anchors [1]	• Cohesionless (granular) soils • Cohesive soils • Rock	0.65 [1] 0.70 [1] 0.50 [1]
Pullout resistance of anchors [2]	• Where proof tests are conducted	1.0 [2]
Tensile resistance of anchor tendon	• Mild steel (e.g., ASTM A615 bars) • High-strength steel (e.g., ASTM A722 bars)	0.90 [3] 0.80 [3]
Overall stability, soil failure		Article 11.6.3.7 applies
Flexural capacity of vertical elements		0.90
Mechanically Stabilized Earth Walls, Gravity Walls, and Semigravity Walls		
Bearing resistance	• Gravity and semigravity walls • MSE walls	0.55 0.65
Sliding	• Soil shear component • Passive component	1.0 0.50
Tensile resistance of metallic reinforcement and connectors	Strip reinforcements [4] Grid reinforcements [4] [5]	0.75 0.65
Tensile resistance of geosynthetic reinforcement and connectors	• Geotextile and geogrid reinforcements • Geostrip reinforcements	0.80 0.55
Pullout resistance of metallic reinforcement	• Steel strip reinforcements • Steel grid reinforcements	0.90 0.90
Pullout resistance of geosynthetic reinforcement	• Geotextiles and geogrids • Geostrip reinforcements	0.70 0.70
Service Limit, for soil failure using stiffness method		1.0
Overall and compound stability	• Soil failure	Article 11.6.3.7 applies
• Tensile Resistance	• Metallic reinforcement (steel strips) [4] • Metallic reinforcement (steel grid) [4] [5] • Geosynthtic reinforcement (geotextiles, geogrids, and geostrips)	0.75 0.65 0.90
• Pullout resistance	• All reinforcements	0.90
Prefabricated Modular Walls		
Bearing resistance		0.55
Sliding	• Soil shear component • Passive component	1.0 0.50
Overall stability, soil failure		Article 11.6.3.7 applies
Soil Nail Walls [6]		
Lateral sliding		1.00

11.5.7—Resistance Factors—Service and Strength

Resistance factors for the service limit states shall be taken as 1.0.

For the strength limit state, the resistance factors provided in Table 11.5.7-1 shall be used for wall design, unless region-specific values or substantial successful experience is available to justify higher values. Resistance factors for geotechnical design of foundations that may be needed for wall support, unless specifically identified in Table 11.5.7-1, are as specified in Tables 10.5.5.2.2-1, 10.5.5.2.3-1, and 10.5.5.2.4-1.

If methods other than those prescribed in these Specifications are used to estimate resistance, the resistance factors chosen shall provide the same reliability as those given in Tables 10.5.5.2.2-1, 10.5.5.2.3-1, 10.5.5.2.4-1, and Table 11.5.7-1.

11.5.8—Resistance Factors—Extreme Event Limit State

Unless otherwise specified, all resistance factors shall be taken as 1.0 when investigating the extreme event limit state.

For overall stability of the retaining wall when earthquake loading is included, a resistance factor, ϕ, of 0.9 shall be used. For bearing resistance, a resistance factor of 0.8 shall be used for gravity and semigravity walls and 0.9 for MSE walls.

For tensile resistance of metallic reinforcement and connectors, when earthquake loading is included, the following resistance factors shall be used:

- Strip reinforcements, $\phi = 1.0$
- Grid reinforcement, $\phi = 0.85$

Table 11.5.7-1 Notes 4 and 5 also apply to these resistance factors for metallic reinforcements.

For tensile and pullout resistance of geosynthetic reinforcement and connectors, a resistance factor, ϕ, of 1.0 shall be used.

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Overall and Compound stability, soil failure		Article 11.6.3.7 applies
Tensile resistance of nail tendon	Mild steel bars (Grade 75) High resistance bars (Grades 95 and 150)	0.75 0.65
Pullout resistance of nail		0.65
Facing flexure	Initial and final facing	0.90
Facing punching shear	Initial and final facing	0.90
Tensile resistance of headed stud	A307 steel bolt [7] A325 steel bolt	0.70 0.80

anchor.

[3] Apply to maximum proof test load for the anchor. For mild steel, apply resistance factor to F_y. For high-strength steel, apply the resistance factor to guaranteed ultimate tensile strength.

[4] Apply to gross cross-section less sacrificial area. For sections with holes, reduce gross area in accordance with Article 6.8.3 and apply to net section less sacrificial area.

[5] Applies to grid reinforcements connected to a rigid facing element, e.g., a concrete panel or block. For grid reinforcements connected to a flexible facing mat or which are continuous with the facing mat, use the resistance factor for strip reinforcements.

[6] Additional, special cases of limit states, as well as corresponding resistance factors, for soil nail walls are presented in FHWA-NHI-14-007/FHWA GEC 7 (Lazarte et al. 2015).

[7] Equivalent to AWS D1.1 Type B studs, with f_y = 60 ksi.

For pullout resistance of metallic reinforcement, a resistance factor, ϕ, of 1.20 shall be used.

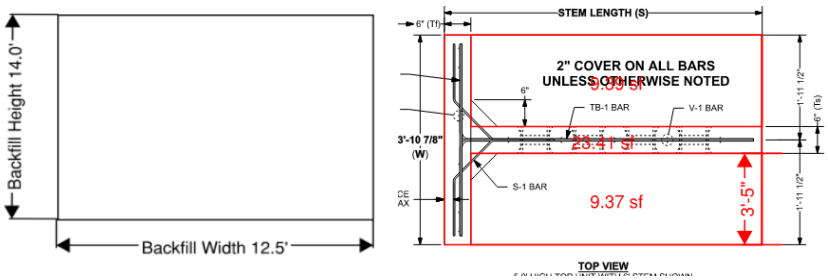
D.3 Settlement

Retaining Wall Settlement Summary

Granular Soil profile

	Footing Size (ft)		Settlement (in)	
	Length	Effective Width	Schmertmann	Recommended Range
RT Wall (STA 103+50 to STA 107+00)	80	12.5	0.39	< 1
RT Wall (STA 95+89 through STA 103+50, STA 203+00 through 210+84)	80	12.5	0.51	< 1

RT Wall Load on Footing



Unit weight of backfill	120	pcf
Backfill height	14	ft
Backfill width	12.5	ft
Pressure due to backfill	1680	psf
Unit weight of concrete	150	pcf
Height of wall	18.5	ft
Concrete Wall Area	20	%
Soil Area	80	%
Average unit weight	126	pcf
Additional pressure, ΔP	2.3	Ksf

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Date: 6/3/2026

Calculation of Es for RT Wall (STA 103+50 to STA 107+00)

Existing ground Elevation: EL 26
Footing Bearing Elevation: EL 22
Bedrock Elevation: EL Unknown

Layer Name	Boring		Hammer Efficiency = 83%			
		Elevation	N_{1-60}	Avg^2	E (ksi)/N^3	E, tsf
SAND AND GRAVEL (POSSIBLE FILL)	NWB4	22.0	32	32	0.139	**320**
SILT		21	53	37	0.056	**148**
SILT		19	41			
SILT		14	21			
SILT		9	32			
SAND AND GRAVEL		4	56	44	0.139	**435**
SAND AND GRAVEL		-1	31			

Notes:

1. Boring NWB4 was advanced by GEI Consultants in October 2024. Boring NWB was advanced at the proposed location of the retaining wall. A hammer efficiency of 83% was assumed for the NWB series borings from STA 100+00 to STA 106+50. $N_{1,60}$ values capped at 100 blows per foot.
2. Since the footing is proposed to be bearing at EL 22, N_{1-60} values above the bearing elevation are ignored when calculating Average value.
3. E/N value of 0.139 is assumed for the sand and gravel (Possible Fill), sand and gravel (native layer) layer considering the soil type consists of coarse sands and little gravel. E/N value of 0.056 is assumed for the silt layer consider the soil type consists of silt and fine sand.

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Calculation of Es for RT Wall (STA 95+89 through STA 103+50 and STA 203+00 through 210+84)

Existing ground Elevation: EL 22
Footing Bearing Elevation: EL 18
Bedrock Elevation: EL Unknown

Layer Name	Boring		Hammer Efficiency = 68.7%			
		Elevation	N_{1-60}	Avg[2]	E (ksi)/N[3]	E, tsf
SAND AND GRAVEL (POSSIBLE FILL)	NWB24	18.5	32	30	0.139	**300**
SAND AND GRAVEL (POSSIBLE FILL)		13	28			
SAND		11	15	13	0.097	**91**
SAND		6	17			
SAND		1	7			
GLACIAL TILL		-4	39	46	0.167	**553**
GLACIAL TILL		-9	53			

Notes:

1. Boring NWB19 was advanced by GEI Consultants in October 2024. Boring NWB was advanced at the proposed location of the retaining wall. A hammer efficiency of 68.7% was assumed for the NWB series borings from STA 200+00 to STA 210+50. $N_{1,60}$ values capped at 100 blows per foot.
2. Since the footing is proposed to be bearing at EL 19, N_{1-60} values above the bearing elevation are ignored when calculating Average value.
3. E/N value of 0.139 is assumed for the sand and gravel (Possible Fill) layer considering the soil type consists of coarse sands and little gravel. E/N value of 0.097 is assumed for the sand layer considering the soil type consists of fine to corase sand. E/N value of 0.167 is assumed for the glacial till layer. (FHWA NHI-06-088, Table 5-16).

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Settlement Calculation - Schmertmann - RT Walls

$$S = C_1 \times C_2 \times \Delta p \qquad \sum_{i=0}^{n} \Delta H_i$$

Where $\Delta H_i = H_c \left(\frac{I_z}{XE}\right)$

$I_z = From\ Fig. 8-21(a)$

$$I_{zp} = 0.5 + 0.1\left(\frac{\Delta p}{p_{op}}\right)^{0.5}$$

$Depth\ to\ I_{zp} = B'/2 \qquad where\ B' = effective\ footing\ width\ in\ El.$

$C_1 = 1 - 0.5\left(\frac{p_o}{\Delta p}\right) \geq 0.5$

$C_2 = 1.0\ for\ cohesionless\ soils$

$p_o = Existing\ stress\ at\ elevation\ of\ footing$

$p_{op} = Existing\ stress\ at\ depth\ of\ B'/2$

RT (STA 103+50 to STA 107+00)

Existing ground El.	26 ft		
Footing El.	22 ft		
Overburden unit weight	120 pcf		
Groundwater El.	22 ft		
Footing length (L)	80 ft		
Footing width (B)	12.5 ft		
p_o	480 psf	0.24 tsf	
Effective footing length (L')	80 ft		
Effective footing width (B')	12.5 ft		
Footing load (p)	2.3 ksf	1.17 tsf	
Δp	0.93 tsf		
C_1	0.87		
C_2	1.0		
L/B=	6.40		
Bottom of profile depth=	3.2 B	=	40.0 ft
Depth below footing for peak Iz =	0.8 B	=	10.0 ft
Elev of I_{zp} =	12.0		
p_{op}	0.53 tsf	1056.0 psf	
I_{zp}	0.63		
X (Ref. 2)	1.55		

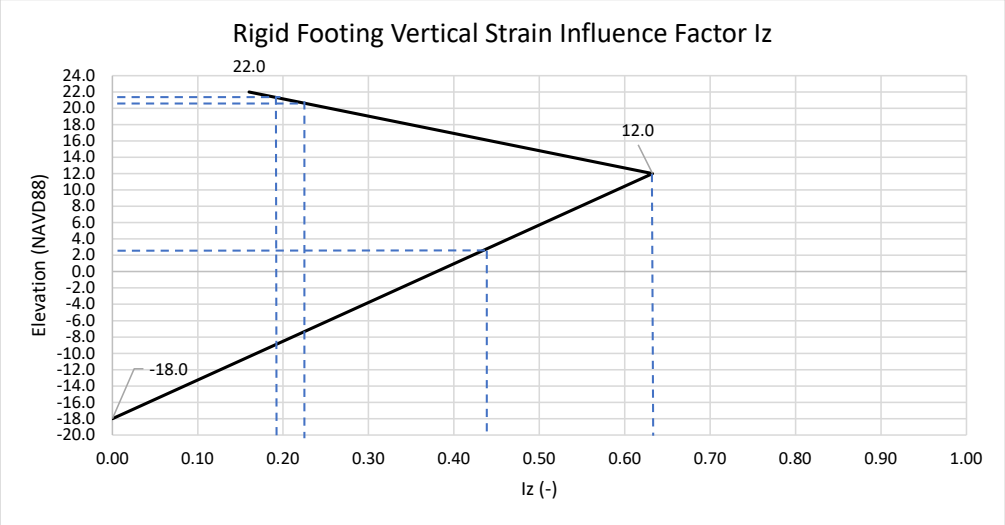
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See Plot for Values of I_z

Elev.	I_z
22.0	0.16
12.0	0.63
-18.0	0.00



Soil Layer	Bottom of layer El.	Depth from bottom of footing to the bottom of soil layer (ft)
Bottom of Footing	22.0	0.0
Sand and Gravel (Possible Fill)	21.7	0.3
Silt	6.2	15.8
Sand and Gravel	-18.0	40.0

Elev.	I_z
22.0	0.16
21.7	0.17
12.0	0.63
6.2	0.51
-18.0	0.00

Soil	Hc (ft)	El. to mid layer (ft)	I_z at center of strata	E (tsf)	H_1 (ft/tsf)
Sand and Gravel (Possible Fill)	0.3	21.9	0.17	320	0.0001
Silt	9.7	16.9	0.40	148	0.0170
Silt	5.8	9.1	0.57	148	0.0144
Sand and Gravel	24.2	-5.9	0.26	435	0.0091
				∑H= 0.041	ft/tsf

Settlement = 0.39 in

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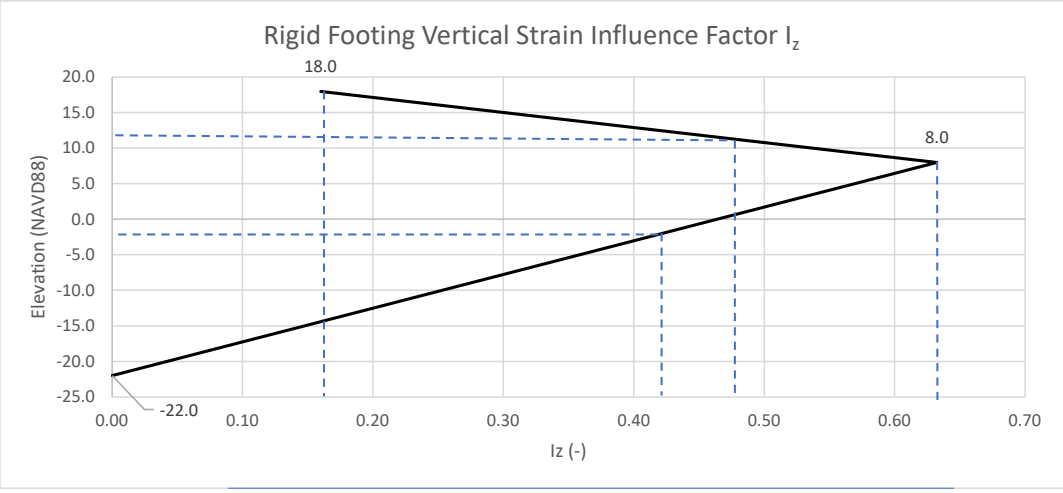
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RT (STA 95+89 through STA 103+50, STA 203+00 through 210+84)

Existing ground El.	22 ft		
Footing El.	18 ft		
Overburden unit Weight	120 pcf		
Groundwater El.	18 ft		
Footing Length (L)	80.0 ft		
Footing width (B)	12.5 ft		
p_o	480 psf	0.24 tsf	
Effective footing length (L')	80.0 ft		
Effective footing width (B')	12.5 ft		
Footing load (p)	2.33 ksf	1.17 tsf	
Δp	0.93 tsf		
C_1	0.87		
C_2	1.0		
L/B=	6.40		
Bottom of profile depth=	3.2 B	=	40.0 ft
Depth below footing for peak Iz =	0.8 B	=	10.0 ft
Elev of I_{zp} =	8.0		
p_{op}	0.53 tsf	1056 psf	
I_{zp}	0.63		
X (Ref. 2)	1.55		

See Plot for Values of I_z

Elev.	I_z
18.0	0.16
8.0	0.63
-22.0	0.00



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Soil Layer	Bottom of layer El.	Depth from bottom of footing to the bottom of soil layer (ft)
Bottom of Footing	18.0	0.0
Sand and Gravel (Possible Fill)	12.3	5.8
Sand	0.5	17.5
Glacial Till	-35.3	53.3

Elev.	I_z
18.0	0.16
12.3	0.43
8.0	0.632
0.5	0.47
-22.0	0.00

Soil	Hc (ft)	El. to mid layer (ft)	I_z at center of strata	E (tsf)	H_1 (ft/tsf)
Sand and Gravel (Possible Fill)	5.8	15.1	0.30	300	0.0037
Sand	4.3	10.1	0.53	91	0.0161
Sand	7.5	4.3	0.55	91	0.0295
Glacial Till	11.8	-5.4	0.24	553	0.0033
				∑H=	0.0525 ft/tsf

Settlement = **0.51 in**

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References:

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

Soil Type	Typical Range of Young's Modulus Values, E_s (ksi)	Poisson's Ratio, ν (dim)
Clay:		
Soft sensitive	0.347–2.08	0.4–0.5 (undrained)
Medium stiff to stiff	2.08–6.94	
Very stiff	6.94–13.89	
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	0.25
Medium dense	1.67–2.78	
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
Estimating E_s from *SPT N* Value		
Soil Type	E_s (ksi)	
Silts, sandy silts, slightly cohesive mixtures	$0.056\ N1_{60}$	
Clean fine to medium sands and slightly silty sands	$0.097\ N1_{60}$	
Coarse sands and sands with little gravel	$0.139\ N1_{60}$	
Sandy gravel and gravels	$0.167\ N1_{60}$	
Estimating E_s from q_c (static cone resistance)		
Sandy soils	$0.028q_c$	

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6.4.2.2 Method Based on RQD

An alternate empirical method for evaluating the in situ rock mass modulus has been developed by Carter and Kulhawy (1988) and is widely used in practice to establish reliable estimates. This method uses the RQD value, an estimate of the intact rock modulus, E_R, and a determination of whether the rock joints are open or closed to evaluate the rock mass modulus, E_M (see table 42). In using table 42, values intermediate between tabulated entry values may be obtained by linear interpolation. It is necessary to estimate E_R (see section 6.4.1) to establish a specific value of E_M.

Table 42. Estimation of E_M based on RQD (modified after Carter and Kulhawy, 1988).

RQD (in percent)	E_M/E_R	
	Closed Joints	Open Joints
100	1.00	0.60
70	0.70	0.10
50	0.15	0.10
20	0.05	0.05

Schmertmann Method

8.5.1.1 Schmertmann's Modified Method for Calculation of Immediate Settlements

An estimate of the immediate settlement, S_i, of spread footings can be made by using Equation 8-16 as proposed by Schmertmann, *et al.* (1978).

$$S_i = C_1 C_2 \Delta p \sum_{i=1}^{n} \Delta H_i \quad \text{where} \quad \Delta H_i = H_c \left(\frac{I_z}{XE} \right) \qquad 8\text{-}16$$

where: I_z = strain influence factor from Figure 8-21a. The dimension B_f represents the least lateral dimension of the footing after correction for eccentricities, i.e. use least lateral effective footing dimension. The strain influence factor is a function of depth and is obtained from the strain influence diagram. The strain influence diagram is easily constructed for the axisymmetric case ($L_f/B_f = 1$) and the plane strain case ($L_f/B_f \geq 10$) as shown in Figure 8-21a. The strain influence diagram for intermediate conditions can be determined by simple linear interpolation.

n = number of soil layers within the zone of strain influence (strain influence diagram).

Δp = ***net*** uniform applied stress (load intensity) at the foundation depth (see Figure 8-21b).

E = elastic modulus of layer i based on guidance provided in Table 5-16 in Chapter 5.

X = a factor used to determine the value of elastic modulus. If the value of elastic modulus is based on correlations with $N1_{60}$-values or q_c from Table 5-16 in Chapter 5, then use X as follows.

X = 1.25 for axisymmetric case ($L_f/B_f = 1$)
X = 1.75 for plane strain case ($L_f/B_f \geq 10$)

Use interpolation for footings with $1 < L_f/B_f \leq 10$

If the value of elastic modulus is estimated based on the range of elastic moduli in Table 5-16 or other sources use X = 1.0.

C_1 = a correction factor to incorporate the effect of strain relief due to embedment where:

$$C_1 = 1 - 0.5 \left(\frac{p_o}{\Delta p} \right) \geq 0.5 \qquad 8\text{-}17$$

where p_o is effective in-situ overburden stress at the foundation depth and Δp is the net foundation pressure as shown in Figure 8-21b

C_2 = a correction factor to incorporate time-dependent (creep) increase in settlement for t (years) after construction where:

$$C_2 = 1 + 0.2 \log_{10} \left(\frac{t(\text{years})}{0.1} \right) \qquad 8\text{-}18$$

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Schmertmann Method (Cont.)

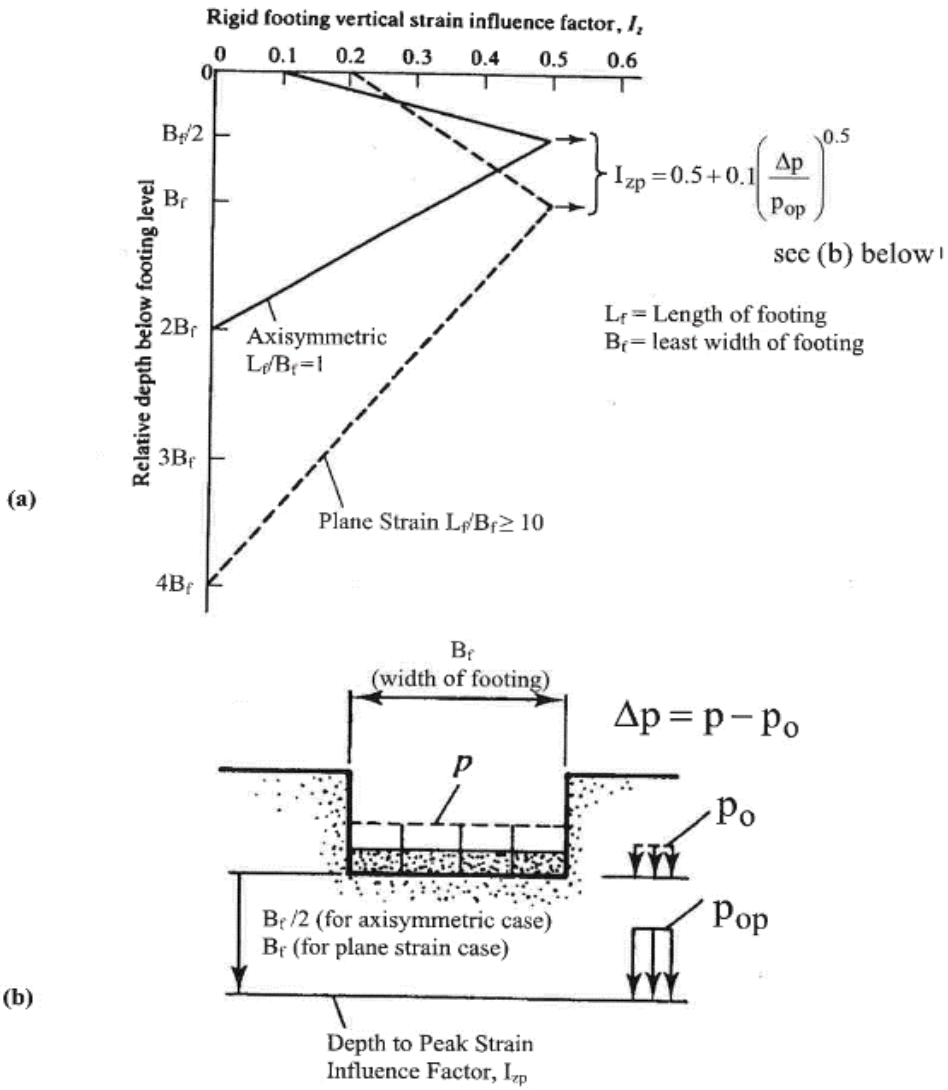


Figure 8-21. (a) Simplified vertical strain influence factor distributions, (b) Explanation of pressure terms in equation for I_{zp} (after Schmertmann, *et al.*, 1978).

GEI Consultants

Client: WSP
Project: Allston Multimodal
Project No.: 1903324
Subject: Consolidation Parameter

Prepared By: M. Ahmed
Date: 9/15/25
Checked By: J.LeFebvre
Date: 12/18/2025

Test Location	Sample	Sample Depth (ft)	Mid Depth	USCS Classification	Moisture Content (%)	Atterberg Limits		Soil Layer	Compression Index, Cc	Recompression Index, Cr (10 %)	Recompression Index, Cr (20 %)	Coefficient of Consoldation, Cv (m^2/s)_Virgin Compression
						LL	PI					
NWB9	S3	14-16	15.0	CL	25.1	35	18	Clay	0.23	0.02	0.05	4.00E-07
NWB11	S8	34-36	35.0	CL	26.7	32	14	Clay	0.20	0.02	0.04	4.20E-07
NWB15	S4	19-21	20.0	CL	21.1	28	13	Clay	0.16	0.02	0.03	6.00E-07
NWB18	S6	29-31	30.0	CH	40.5	60	36	Clay	0.45	0.05	0.09	1.00E-07
NWB20	S4	19-21	20.0	CL-ML	9.7	16	5	Clay	0.05	0.01	0.01	6.00E-07
NWB23	S5	19-21	20.0	CL-ML	9.6	16	4	Clay	0.05	0.01	0.01	6.00E-07
								Max	0.45	0.05	0.09	6.00E-07
								Min	0.05	0.01	0.01	1.00E-07
								Average	0.19	0.02	0.04	4.53E-07

Compart to Typical Values for Marine Clay in Boston Area
Based on CA/T and other projects (see below):

CR	0.12
RR	0.013
convert using void ratio of	0.53
Cc	0.18
Cr	0.02

Values are similar to Average values from limits calculation. Use Average values calculated above.

Table 1 – Engineering Properties of Soil
East Boston Branch Sewer Relief Project
MWRA Contract No. 6257
East Boston, Massachusetts

Stratum	Total Unit Weight	Effective Friction Angle	Undrained Shear Strength	Hydraulic Conductivity	Compression Ratio	Recompression Ratio
		Range/Design Value	Range/Design Value	Range/Design Value	Range/Design Value	Range/Design Value
	γ_t (pcf)	Φ (degrees)	S_u (psf)	k (cm/sec)	CR[2)]	RR[2)]
Fill	120	30-34 / 32	---	10^{-5} to 10^{-1} / 1 x 10^{-3}	---	---
Organic Deposits	110	---	400-800 / 600	10^{-6} to 10^{-5} / 5 x 10^{-5}	0.2	0.02
Sand and Gravel	125	32-42 / 36	---	10^{-4} to 10^{-1} / 1 x 10^{-2}	---	---
Marine Clay	120	---	600-3400 / 1000	10^{-7} to 10^{-5} / 1 x 10^{-5}	0.075-0.17 / 0.12	0.012-0.014 / 0.013
Sand and Clay	120	30[3)]	1500[4)]	10^{-6} to 10^{-5} / 1 x 10^{-5}	0.1	0.01
Glaciomarine Deposits	130	---	2000-8000 / 2000	10^{-7} to 10^{-3} / 5 x 10^{-5}	0.13	0.02
Glacial Till	145	35-45 / 40	16000[5)]/---	10^{-6} to 10^{-3} / 5 x 10^{-5}	0.1	0.015

1. The values of soil properties in this table are based on site-specific field and laboratory test results (where available), empirical correlations using the results of standard penetration tests and laboratory index tests, and data from other projects in the Boston area.
2. Units for Compression Ratio and Recompression Ratio are strain per log cycle of stress.
3. The value of effective friction angle is provided for the sand layers in the Sand and Clay stratum.
4. The value of undrained shear strength is provided for the clay layers in the Sand and Clay stratum.
5. The Glacial Till undrained shear strength is based on unconfined compression test (Su = qu/2) data for a till sample tested for the Chelsea River Crossing Project.

GEI Consultants

Client: WSP
Project: Allston Multimodal
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Date: 12/18/2025

FHWA IF-02-034 GEC No. 5

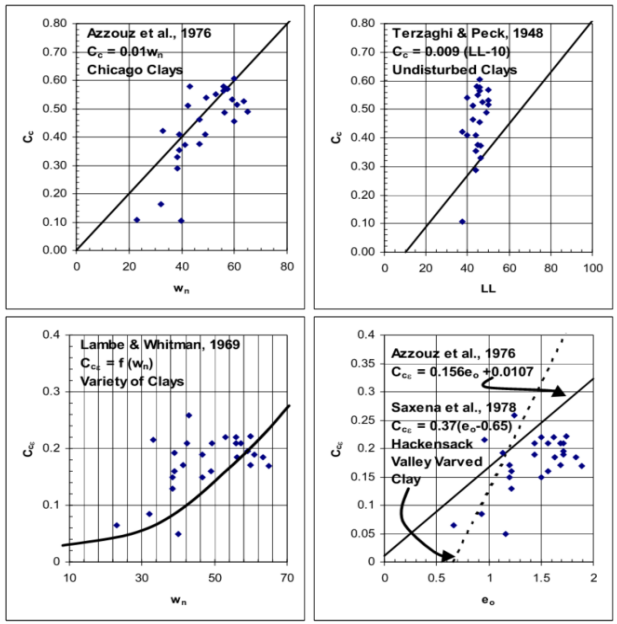


Figure A-14. Empirical correlations of C_c and $C_{c\varepsilon}$.

Table 26. Summary of correlations for C_c (modified from Holtz and Kovacs, 1986).

Equation	Applicable Soils
$C_c = 0.009$ (LL –10)	Undisturbed clays of low to medium sensitivity
$C_c = 0.007$ (LL - 7)	Remolded clays
$C_c = 0.01\ w_n$	Chicago clays

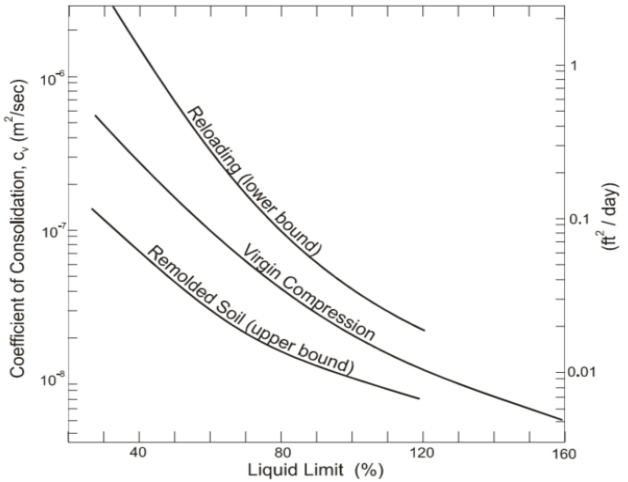


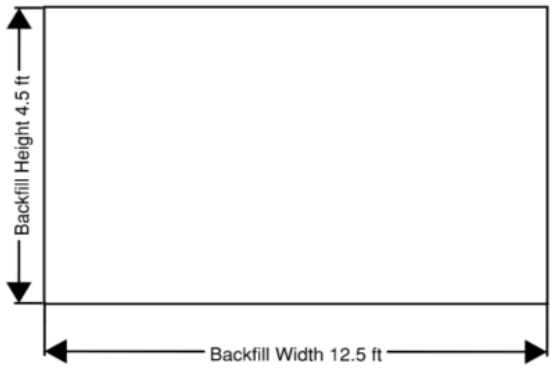
Figure 62. Correlation of c_v to LL.

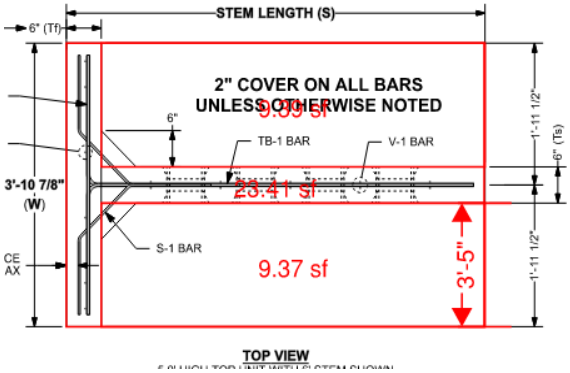
5.4.2.5 Evaluation of C_c and C_r

Compression parameters can be estimated by correlation or by direct laboratory-measurement. The compression index, C_c, and recompression index, C_r, are index values required for primary consolidation settlement predictions. These parameters have been defined in figure 47. The value of C_c is evaluated by drawing a best-fit tangent line to data on an e-log σ_{vc}' representation of consolidation data along the virgin (i.e., part of curve where stresses are greater than σ_p') portion of the curve. The modified compression index, $C_{c\varepsilon}$, is evaluated similarly on a plot of ε_v-log σ_{vc}'. The line drawn to evaluate C_c (or $C_{c\varepsilon}$) should include the stress range defined by the calculated σ_p' and the final effective stresses in the ground. Typically, values of C_r (or $C_{r\varepsilon}$) are 10 to 20 percent of the value of C_c (or $C_{c\varepsilon}$).

Numerous correlations relating simple soil classification properties (e.g., LL, w_n) to C_c and $C_{c\varepsilon}$ are available in the literature for silts and clays. These correlations can be used to make first-order predictions of settlements, but should not be relied upon for final design, unless the correlation has been developed using site-specific laboratory consolidation test data. These correlations may be of limited value, however, for highly structured soils that are sensitive. Several correlations that are based on relatively large databases are provided in table 26. Other correlations are presented as part of Soil Property Selection Example No. 1 in appendix A.

RT Wall Load on Footing (STA 200+64 through STA 203+00)





Unit weight of backfill	120	pcf
Backfill height	4.5	ft
Backfill width	12.5	ft
Pressure due to backfill	540	psf
Unit weight of concrete	150	pcf
Height of wall	7.5	ft
Concrete Wall Area	20	%
Soil Area	80	%
Average unit weight	126	pcf
Additional pressure, ΔP	0.9	Ksf

rocscience



1903324 Allston Multimodal
GEI Consultants
Report Creation Date: 2026/05/29, 09:13:32

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Settle3 Analysis Information

1903324 Allston Multimodal

Project Settings

Document Name	1903324_ Settlement Calculation_Noise Wall- Clay
Project Title	1903324 Allston Multimodal
Analysis	Settlement_Noise Wall
Author	Mustaki Ahmed
Company	GEI Consultants
Date Created	9/15/2025, 9:15:50 AM
Last saved with Settle3 version	5.023
Stress Computation Method	Boussinesq
Stress Units	Imperial, stress as ksf
Settlement Units	inches
Time-dependent Consolidation Analysis	
Time Units	seconds
Permeability Units	feet/second

Advanced Settings

Start of secondary consolidation (% of primary)	95
Min. stress for secondary consolidation (% of initial)	1
Reset time when load changes for secondary consolidation	No
Include buoyancy effect when material settles below water table	
Minimum settlement ratio for subgrade modulus	0.9
Use average poisson's ratio to calculate layered stresses	
Update Cv in each time step (improves consolidation accuracy)	
Ignore negative effective stresses in settlement calculations	
Add field points to load edges	
Poisson ratio for Boussinesq stress computation	0.2

Soil Profile

Layer Option	Non-Horizontal Layers
Interpolation Method	TIN Triangulation
Use Non-Horizontal Ground Surface	No
Vertical Axis	Depth below ground surface

Stage Settings

Stage #	Name	Time [seconds]
1	Existing condition	0
2	Wall Construction and Loading	0
3	Stage 3	100

Results

Time taken to compute: 0.169599 seconds

Stage: Existing condition = 0 s

Data Type	Minimum	Maximum
Total Settlement [in]	0	0
Total Consolidation Settlement [in]	0	0
Virgin Consolidation Settlement [in]	0	0
Recompression Consolidation Settlement [in]	0	0
Immediate Settlement [in]	0	0
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0	0
Loading Stress XX [ksf]	0	0
Loading Stress YY [ksf]	0	0
Effective Stress ZZ [ksf]	0	2.50685
Effective Stress XX [ksf]	0	2.50685
Effective Stress YY [ksf]	0	2.50685
Total Stress ZZ [ksf]	0	4.53221
Total Stress XX [ksf]	0	4.53221
Total Stress YY [ksf]	0	4.53221
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0
Total Strain	0	0
Pore Water Pressure [ksf]	0	2.02536
Excess Pore Water Pressure [ksf]	0	0
Degree of Consolidation [%]	0	0
Pre-consolidation Stress [ksf]	0.0072	2.50617
Over-consolidation Ratio	1	1
Void Ratio	0	0.53
Permeability [ft/s]	0	1.4738e-08
Coefficient of Consolidation [ft^2/s]	0	4.88e-06
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	100
Undrained Shear Strength	0	1000

Stage: Wall Construction and Loading = 0 s

Data Type	Minimum	Maximum
Total Settlement [in]	0	0.67985
Total Consolidation Settlement [in]	-0.00204085	1.88932e-05
Virgin Consolidation Settlement [in]	0	1.88932e-05
Recompression Consolidation Settlement [in]	-0.00205974	0
Immediate Settlement [in]	0	0.681891
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.100218	1
Loading Stress XX [ksf]	-0.0184809	0.459205
Loading Stress YY [ksf]	0.0132953	0.940795
Effective Stress ZZ [ksf]	0	2.5069
Effective Stress XX [ksf]	0.214891	2.50417
Effective Stress YY [ksf]	0.414769	2.52014
Total Stress ZZ [ksf]	0.5	4.69006
Total Stress XX [ksf]	0.714891	4.67149
Total Stress YY [ksf]	0.875091	4.70411
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	18.347
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	18.2878
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	-5879.9	0
Total Strain	0.000480978	0.0026353
Pore Water Pressure [ksf]	0.416915	2.19565
Excess Pore Water Pressure [ksf]	0.100218	1
Degree of Consolidation [%]	0	0.0490462
Pre-consolidation Stress [ksf]	0.0072	2.50621
Over-consolidation Ratio	1	1.00357
Void Ratio	0	0.529264
Permeability [ft/s]	0	1.4738e-08
Coefficient of Consolidation [ft^2/s]	0	4.88e-06
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	1000

Stage: Stage 3 = 100 s

Data Type	Minimum	Maximum
Total Settlement [in]	0	0.687504
Total Consolidation Settlement [in]	-0.00199662	0.00561324
Virgin Consolidation Settlement [in]	0	0.00762906
Recompression Consolidation Settlement [in]	-0.00201582	0
Immediate Settlement [in]	0	0.681891
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.100218	1
Loading Stress XX [ksf]	-0.0184809	0.459205
Loading Stress YY [ksf]	0.0132953	0.940795
Effective Stress ZZ [ksf]	0.5	2.50684
Effective Stress XX [ksf]	0.714891	2.50411
Effective Stress YY [ksf]	0.850324	2.52008
Total Stress ZZ [ksf]	0.5	4.69007
Total Stress XX [ksf]	0.714891	4.67149
Total Stress YY [ksf]	0.875091	4.70411
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	18.1305
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	18.2878
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	2137.8
Total Strain	0.000480811	0.0135686
Pore Water Pressure [ksf]	0	2.19578
Excess Pore Water Pressure [ksf]	0	0.550691
Degree of Consolidation [%]	0	0.189799
Pre-consolidation Stress [ksf]	0.507199	2.50621
Over-consolidation Ratio	1	1.0018
Void Ratio	0	0.529264
Permeability [ft/s]	0	1.4738e-08
Coefficient of Consolidation [ft^2/s]	0	4.88e-06
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0.162384
Undrained Shear Strength	0	1000

Loads

1. Rectangular Load: "Rectangular Load 1"

Length	80 ft
Width	12.5 ft
Rotation angle	0 degrees
Load Type	Flexible
Area of Load	1000 ft2
Load	1 ksf
Depth	0 ft
Installation Stage	Wall Construction and Loading = 0 s

Coordinates

X [ft]	Y [ft]
8.47	-34.602
88.47	-34.602
88.47	-22.102
8.47	-22.102

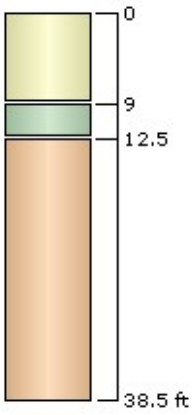
Soil Layers

Ground Surface Drained: Yes

Borehole 1 (NWB7)

XY Location: Borehole 1 (NWB7): (0, 0)

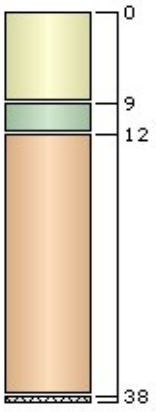
Layer #	Type	Thickness [ft]	Depth [ft]	Drained at Bottom
1	Possible Fill	9	0	No
2	Silt	3.5	9	No
3	Clay	26	12.5	No



Borehole 2 (NWB6)

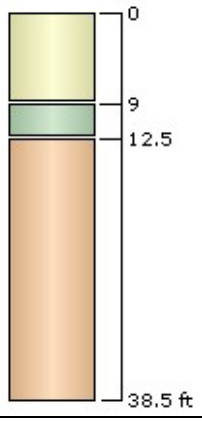
XY Location: Borehole 2 (NWB6): (100, 0)

Layer #	Type	Thickness [ft]	Depth [ft]	Drained at Bottom
1	Possible Fill	9	0	No
2	Silt	3	9	No
3	Clay	26	12	No



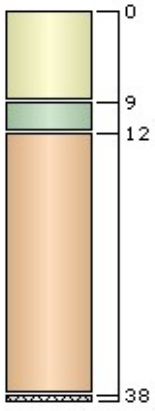
Borehole 3 (NWB7)

XY Location:		Borehole 3 (NWB7): (0, -50)		
Layer #	**Type**	**Thickness [ft]**	**Depth [ft]**	**Drained at Bottom**
1	Possible Fill	9	0	No
2	Silt	3.5	9	No
3	Clay	26	12.5	No



Borehole 4(NWB6)

XY Location:		Borehole 4(NWB6): (100, -50)		
Layer #	**Type**	**Thickness [ft]**	**Depth [ft]**	**Drained at Bottom**
1	Possible Fill	9	0	No
2	Silt	3	9	No
3	Clay	26	12	No



Soil Properties

Property	Possible Fill	Silt	Clay
Color			
Unit Weight [kips/ft3]	0.12	0.115	0.105
Saturated Unit Weight [kips/ft3]	0.13	0.125	0.115
K0	0.47	0.5	1
Immediate Settlement	Enabled	Enabled	Enabled
Es [ksf]	716	316	208.9
Esur [ksf]	716	316	208.9
Primary Consolidation	Disabled	Disabled	Enabled
Material Type			Non-Linear
Cc	-	-	0.19
Cr	-	-	0.04
e0	-	-	0.53
OCR	-	-	1
Cv [ft2/s]	-	-	4.88e-06
Cvr [ft2/s]	-	-	4.88e-06
B-bar	-	-	1
Secondary Consolidation	Disabled	Disabled	Mesri
Ca/Cc	-	-	0.04
Undrained Su A [kips/ft2]	0	0	1000
Undrained Su S	0	0	0
Undrained Su m	0	0	1
Piezo Line ID	1	1	1

Groundwater

Groundwater method	Piezometric Lines
Water Unit Weight	0.0624 kips/ft3
Generating excess pore pressure above water table	

Piezometric Line Entities

ID	Depth (ft)
1	6 ft

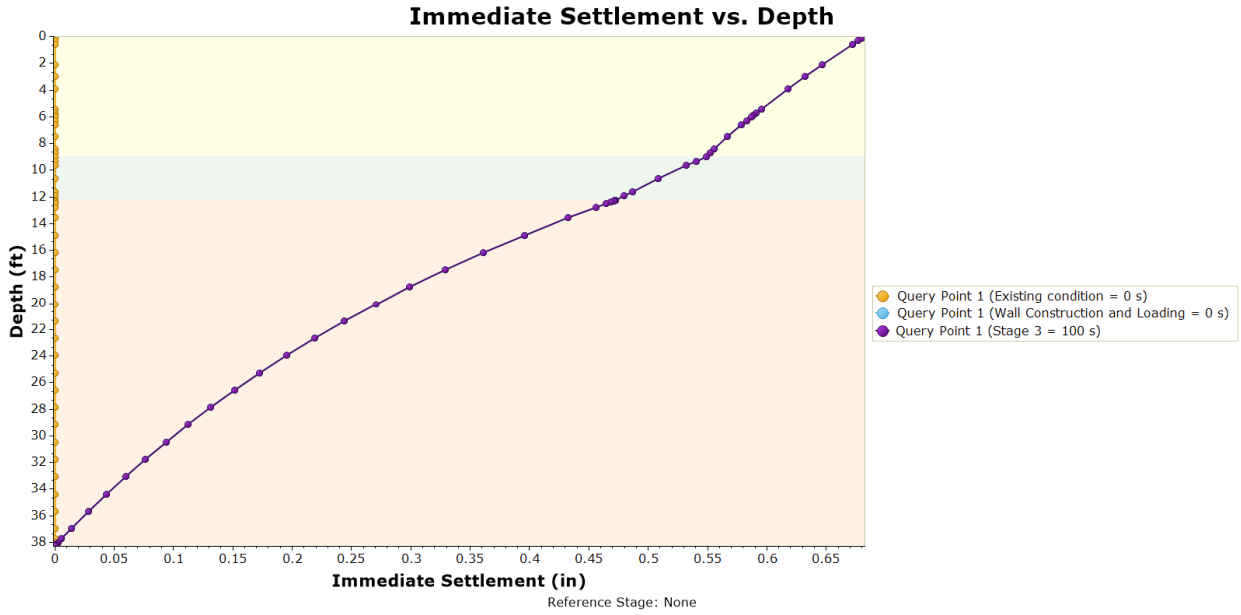
Query

Query Points

Point #	Query Point Name	(X,Y) Location	Number of Divisions
1	Query Point 1	48.47, -28.352	Auto: 53
2	Query Point 2	8.47, -28.1544	Auto: 53
3	Query Point 3	88.47, -28.3624	Auto: 53

Report Views

Chart View 1 1



D.4 Lateral Pile Analysis Parameters

GEI Consultants

Client:	WSP	**Prepared By:**	M. Ahmed
Project:	Allston I-90 Interchange Noise Wall	**Date:**	5-27-2026
Project No.:	1903324	**Checked By:**	A. Roshan
		Date:	5-28-2026

Recommended LPile Parameters

Purpose:

The purpose of this evaluation is to select representative engineering properties for use in LPile analyses of the drilled shaft foundations for the noise wall at the Allston I-90 Interchange in Allston, Massachusetts.

Approach:

We selected values for unit weight, angle of internal friction and cohesion of soils. Values were selected for the general soil layers observed in the borings and for proposed fills to be used during construction.

Unit Weight

We selected a total or saturated unit weight in pounds per cubic foot (pcf), as appropriate. The buoyant unit weight can then be determined by subtracting the unit weight of water (62.4 pcf) from the saturated unit weight.

Angle of Internal Friction

We selected an angle of internal friction (ϕ) in degrees. We used Mohr-Coulomb's drained properties for each soil.

Cohesion

We selected a cohesion in pounds per square foot (psf). We used correlation of cohesion and SPT N value from Unified Facilities Criteria DM 7.1 (see attached excerpt) to obtain undrained shear strength for design.

Subgrade Modulus

We selected a subgrade modulus for cohesionless soils in pounds per cubic inch (pci). We used LPILE v2022 technical manual (Fig. 3.34) to determine subgrade modulus (k) of soils above and below the water table.

Strain Factor

We selected a strain factor (ε_{50}) for cohesive soil. We used LPILE v2022 technical manual (Table 3.2) to determine strain factors.

Proposed Fills

We selected properties for gravel borrow and gravel borrow for foundations based on the required material gradations and compaction requirements per MassDOT.

Soil Profiles:

We developed four profiles for LPile analyses of the proposed drilled shaft foundations supporting the noise wall.

At all locations, the length of the drilled shaft that is behind a retaining wall or above the lowest final ground surface elevation does not provide geotechnical resistance for the applied loads.

Soil Profile 1:

We selected soil profile 1 between STA 97+50 and 98+00. We developed soil layers using Boring NWB1 where we encountered sand and gravel layer below the possible fill. Soil Profile 1 represents the subsurface conditions from STA 95+89 through STA 103+50 and STA 208+00 through 210+84. We assumed ground water table a foot below the I-90 WB edge of pavement elevation at selected cross section.

Soil Profile 2

We selected soil profile 2 on west side of the proposed noise wall between STA 104+00 and 104+50. We developed the soil layer using Boring NWB5. Soil Profile 2 represents the subsurface conditions from STA 103+50 through STA 107+00. We used highest ground water table encountered during field investigation of noise wall borings in between specified stations.

GEI Consultants

Client: WSP
Project: Allston I-90 Interchange Noise Wall
Project No.: 1903324

Prepared By: M. Ahmed
Date: 5-27-2026
Checked By: A. Roshan
Date: 5-28-2026

Soil Profile 3:
We selected soil profile 3 between STA 112+00 and 112+50. We developed the soil layer using Boring NWB13 where we encountered very soft to medium stiff clay layer. Soil Profile 3 represents the subsurface conditions from STA 107+00 through STA 202+00. We used highest ground water table encountered during field investigation of noise wall borings in between specified stations.

Soil Profile 4:
We selected soil profile 4 between STA 206+00 and 206+50. We developed soil layers using Boring NWB26 where we encountered intermediate clay layers in sand below the possible fill. Soil Profile 4 represents the subsurface conditions from STA 202+00 through STA 208+00. We used highest ground water table encountered during field investigation of noise wall borings in between specified stations.

Selected Soil Properties:

Table 1. Soil Properties Values for Design

Layer/Soil Type	Unit Weight, γ (pcf)[1]	Friction Angle, ϕ' (deg)	Undrained Shear Strength (psf)	p-y Modulus, k (pci) [2]	Strain Factor, ε_{50}	LPILE model for p-y curve
Sand and Gravel (Possible Fill) and Imported Fill	120 [130][1]	32	-	80 [55]	-	Sand (Reese)
Sand and Gravel	125 [135][1]	34	-	120 [75]	-	Sand (Reese)
Clay	105 [115][1]	-	1000	-	0.010 (medium stiff)	Stiff Clay w/o Free Water (Reese)
Silt	115 [125][1]	30	-	45 [35]	-	Sand (Reese)
Sand	120 [130][1]	32	-	80 [55]	-	Sand (Reese)
Glacial Till	135	38	-	[120]	-	Sand (Reese)

Notes:

1. Values below the water table are included in brackets [ ]. If above the water table, use the lower unit weight to represent the moist condition; if below water table, use the larger unit weight to represent the saturated condition.
2. Values below the water table are included in brackets [ ]. LPILE v2022 Technical Manual. If above the water table, use larger value; if below water table, use lower value.

Client:	WSP	**Prepared By:**	M. Ahmed
Project:	Allston I-90 Interchange Noise Wall	**Date:**	5-27-2026
Project No.:	1903324	**Checked By:**	A. Roshan
		Date:	5-28-2026

References:

- AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024.
- Terzaghi, K., Peck, R.B., 1968. Soil Mechanics in Engineering Practice, 2nd Edition, John Wiley & Sons, New York.
- Kulhawy, F.H. and Mayne, P.W, 1990. Manual on Estimating Soil Properties for Foundation Design, Cornell University, Ithaca, New York.
- Caltrans Geotechnical Manual, March 2014.
- NAVFAC Design Manual 7.01 Soil Mechanics, Naval Facilities Engineering Command, September 1986.
- AASHTO Standard Specifications for Highway Bridges: 17th Edition, 2002.
- Unified Facilities Criteria (UFC), Soil Mechanics (DM 7.1).
- LPILE v2022 Technical Manual.

[1] AASHTO LRFD Bridge Design Specifications, 10th Edition, 2024

Table 10.4.6.2.4-1 recommends using the following correlation to select friction angles of granular soils:

Table 10.4.6.2.4-1—Correlation of *SPT* $N1_{60}$ Values to Drained Friction Angle of Granular Soils (modified after Bowles, 1977)

$N1_{60}$	ϕ_f
<4	25–30
4	27–32
10	30–35
30	35–40
50	38–43

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Client:	WSP	**Prepared By:**	M. Ahmed
Project:	Allston I-90 Interchange Noise Wall	**Date:**	5-27-2026
Project No.:	1903324	**Checked By:**	A. Roshan
		Date:	5-28-2026

[2] Soil Mechanics in Engineering Practice

Karl Terzaghi and Ralph Peck compiled various parameters of soils into the table below:

Table 6.3
Porosity, Void Ratio, and Unit Weight of Typical Soils in Natural State

Description	Porosity, n (%)	Void ratio, e	Water content, w (%)	Unit weight grams/cm³ γ_d	grams/cm³ γ	lb/ft³ γ_d	lb/ft³ γ
1. Uniform sand, loose	46	0.85	32	1.43	1.89	90	118
2. Uniform sand, dense	34	0.51	19	1.75	2.09	109	130
3. Mixed-grained sand, loose	40	0.67	25	1.59	1.99	99	124
4. Mixed-grained sand, dense	30	0.43	16	1.86	2.16	116	135
5. Glacial till, very mixed-grained	20	0.25	9	2.12	2.32	132	145
6. Soft glacial clay	55	1.2	45	–	1.77	–	110
7. Stiff glacial clay	37	0.6	22	–	2.07	–	129
8. Soft slightly organic clay	66	1.9	70	–	1.58	–	98
9. Soft very organic clay	75	3.0	110	–	1.43	–	89
10. Soft bentonite	84	5.2	194	–	1.27	–	80

w = water content when saturated, in per cent of dry weight.
γ^d = unit weight in dry state.
γ = unit weight in saturated state.

Additionally, Terzaghi and Peck offer the following table, listing representative values for ϕ' for various materials under effective pressures less than about 5 kg/cm².

Table 17.1
Representative Values of ϕ for Sands and Silts

Material	*Degrees* Loose	*Degrees* Dense
Sand, round grains, uniform	27.5	34
Sand, angular grains, well graded	33	45
Sandy gravels	35	50
Silty sand	27–33	30–34
Inorganic silt	27–30	30–35

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		Date:	5-28-2026

[3] Manual on Estimating Soil Properties for Foundation Design

Kulhawy and Mayne presented the following N value relationships based on Peck, Hanson, and Thornburn and Meyerhof.

N Value (blows/ft or 305 mm)	Relative Density	Approximate $\bar{\phi}_{tc}$ (degrees) (a)	(b)
0 to 4	very loose	< 28	< 30
4 to 10	loose	28 to 30	30 to 35
10 to 30	medium	30 to 36	35 to 40
30 to 50	dense	36 to 41	40 to 45
> 50	very dense	> 41	> 45

a - Source: Peck, Hanson, and Thornburn (12), p. 310.
b - Source: Meyerhof (13), p. 17.

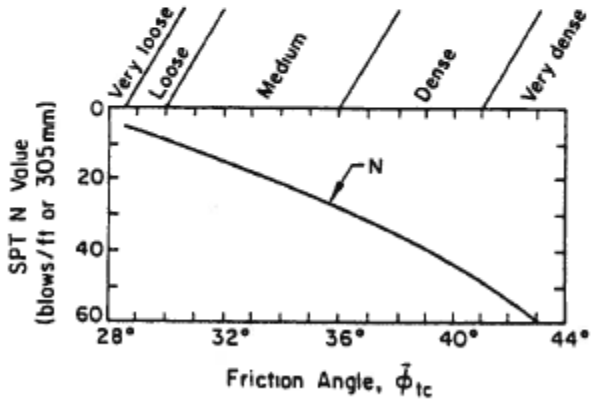


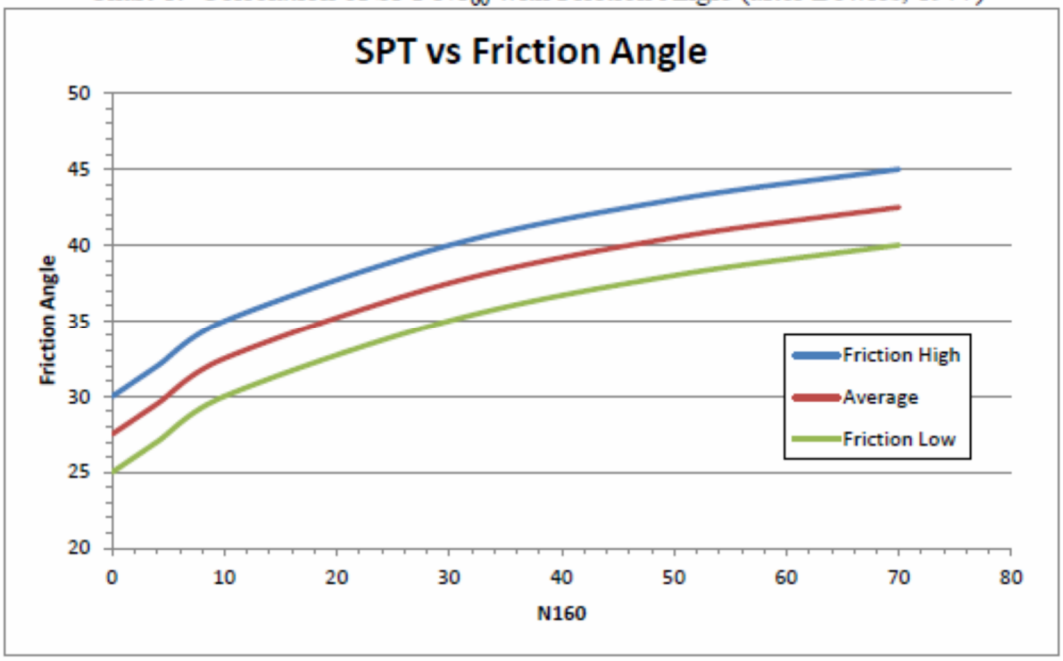
Figure 4-12. N versus $\bar{\phi}_{tc}$

Source: Peck, Hanson, and Thornburn (12), p. 310.

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[4] Caltrans Geotechnical Manual (March 2014)

Chart 1: Correlation of SPT $N1_{60}$ with Friction Angle (after Bowles, 1977)



Choose the friction angle (expressed to the nearest degree) based upon the soil type, particle size(s), and rounding or angularity. Experience should be used to select specific values within the ranges. In general, finer materials or materials with significant (about 30+ %) silt-sized material will fall in the lower portion of the range. Coarser materials with less than 5% fines will fall in the upper portion of the range. The extreme range of phi angles for any $N1_{60}$ is five degrees, so the adjustment factors for particle size and roundness should be only a degree or two. The following bullets provide help in determining which value to select for a given $N1_{60}$ and soil type:

- Use the maximum value for GW
- Use the average for GM and SP
- Use the minimum for SC
- Use the minimum + 0.5 for ML
- Use the average +1 for SW
- Use the average -1 for GC
- Use the Maximum -1 for GP

Values may also be increased with increasing grain size and/or particle angularity, and decreased with decreasing grain size and/or increasing roundness. For example, an SP with $N1_{60}$ = 30 could be assigned phi angles of 37, 38 or 39 degrees for fine, medium and coarse grain sizes respectively.

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Project No.: 1903324

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Date: 5-28-2026

[5] NAVFAC Design Manual 7.01 Soil Mechanics

TABLE 6
Typical Values of Soil Index Properties

	Particle Size and Gradation				Voids(1)					Unit Weight(2) (lb./cu.ft.)						
	Approximate Size Range (mm)		Approx. D_{10} (mm)	Approx. Range Uniform Coefficient C_u	Void Ratio			Porosity (%)		Dry Weight			Wet Weight		Submerged Weight	
	D_{max}	D_{min}			e_{max} loose	e_{cr}	e_{min} dense	n_{max} loose	n_{min} dense	Min loose	100% Mod. AASHO	Max dense	Min loose	Max dense	Min loose	Max dense
GRANULAR MATERIALS																
Uniform Materials																
a. Equal spheres (theoretical values)	-	-	-	1.0	0.92	-	0.35	47.6	26	-	-	-	-	-	-	-
b. Standard Ottawa SAND	0.84	0.59	0.67	1.1	0.80	0.75	0.50	44	33	92	-	110	93	131	57	69
c. Clean, uniform SAND (fine or medium)	-	-	-	1.2 to 2.0	1.0	0.80	0.40	50	29	83	115	118	84	136	52	73
d. Uniform, inorganic SILT	0.05	0.005	0.012	1.2 to 2.0	1.1	-	0.40	52	29	80	-	118	81	136	51	73
Well-graded Materials																
a. Silty SAND	2.0	0.005	0.02	5 to 10	0.90	-	0.30	47	23	87	122	127	88	142	54	79
b. Clean, fine to coarse SAND	2.0	0.05	0.09	4 to 6	0.95	0.70	0.20	49	17	85	132	138	86	148	53	86
c. Micaceous SAND	-	-	-	-	1.2	-	0.40	55	29	76	-	120	77	138	48	76
d. Silty SAND & GRAVEL	100	0.005	0.02	15 to 300	0.85	-	0.14	46	12	89	-	146(3)	90	155(3)	56	92
MIXED SOILS																
Sandy or Silty CLAY	2.0	0.001	0.003	10 to 30	1.8	-	0.25	64	20	60	130	135	100	147	38	85
Skip-graded Silty CLAY with stones or rk fgmts	250	0.001	-	-	1.0	-	0.20	50	17	84	-	140	115	151	53	89
Well-graded GRAVEL, SAND, SILT & CLAY mixture	250	0.001	0.002	25 to 1000	0.70	-	0.13	41	11	100	140	148(4)	125	156(4)	62	94
CLAY SOILS																
CLAY (30%-50% clay sizes)	0.05	0.5μ	0.001	-	2.4	-	0.50	71	33	50	105	112	94	133	31	71
Colloidal CLAY (-0.002 mm: 50%)	0.01	10 Å	-	-	12	-	0.60	92	37	13	90	106	71	128	8	66
ORGANIC SOILS																
Organic SILT	-	-	-	-	3.0	-	0.55	75	35	40	-	110	87	131	25	69
Organic CLAY (30% - 50% clay sizes)	-	-	-	-	4.4	-	0.70	81	41	30		100	81	125	18	62

Client:	WSP	**Prepared By:**	M. Ahmed
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		Date:	5-28-2026

[6] LPILE v2022 Technical Manual

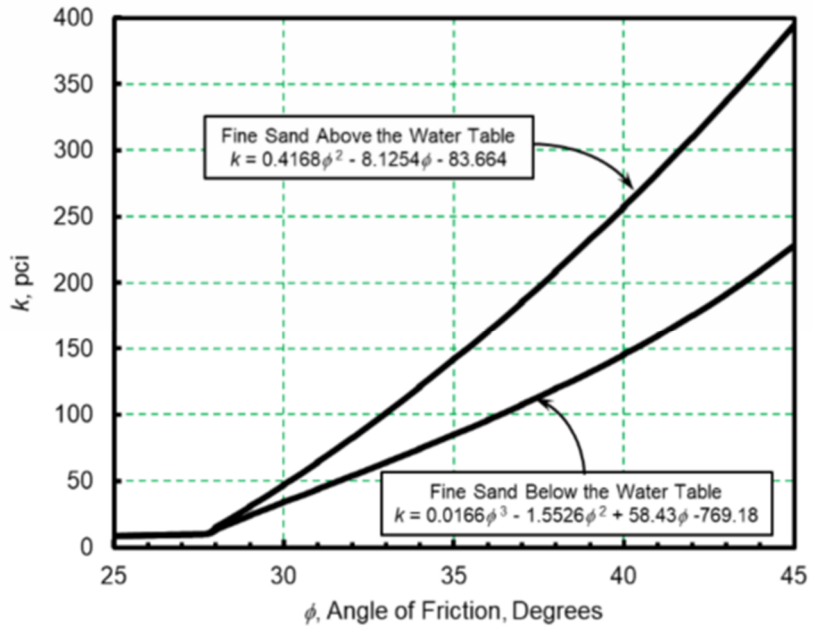


Figure 3.34 Value of k versus Friction Angle for Fine Sand Used in LPile

Table 3.2 Representative Values of ε_{50} for Soft to Stiff Clays

Consistency of Clay	ε_{50}
Soft	0.020
Medium	0.010
Stiff	0.005

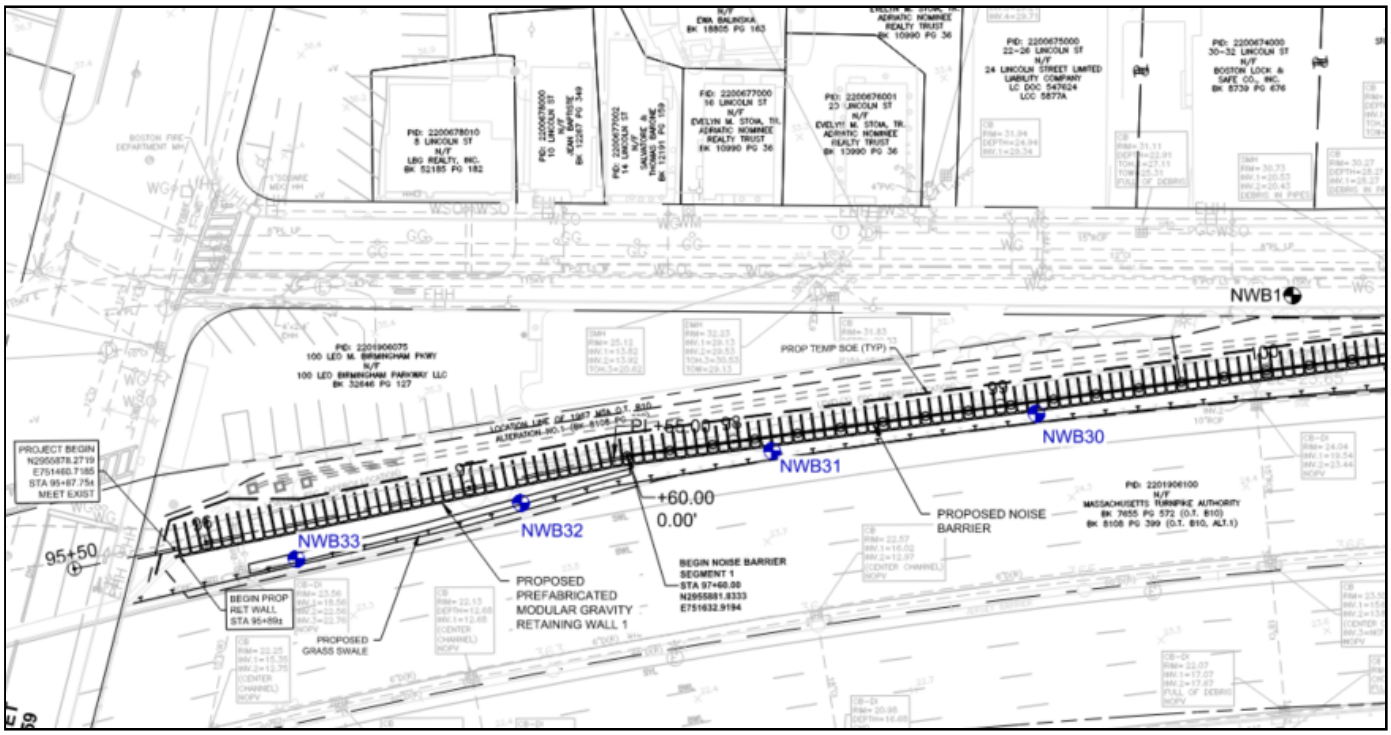
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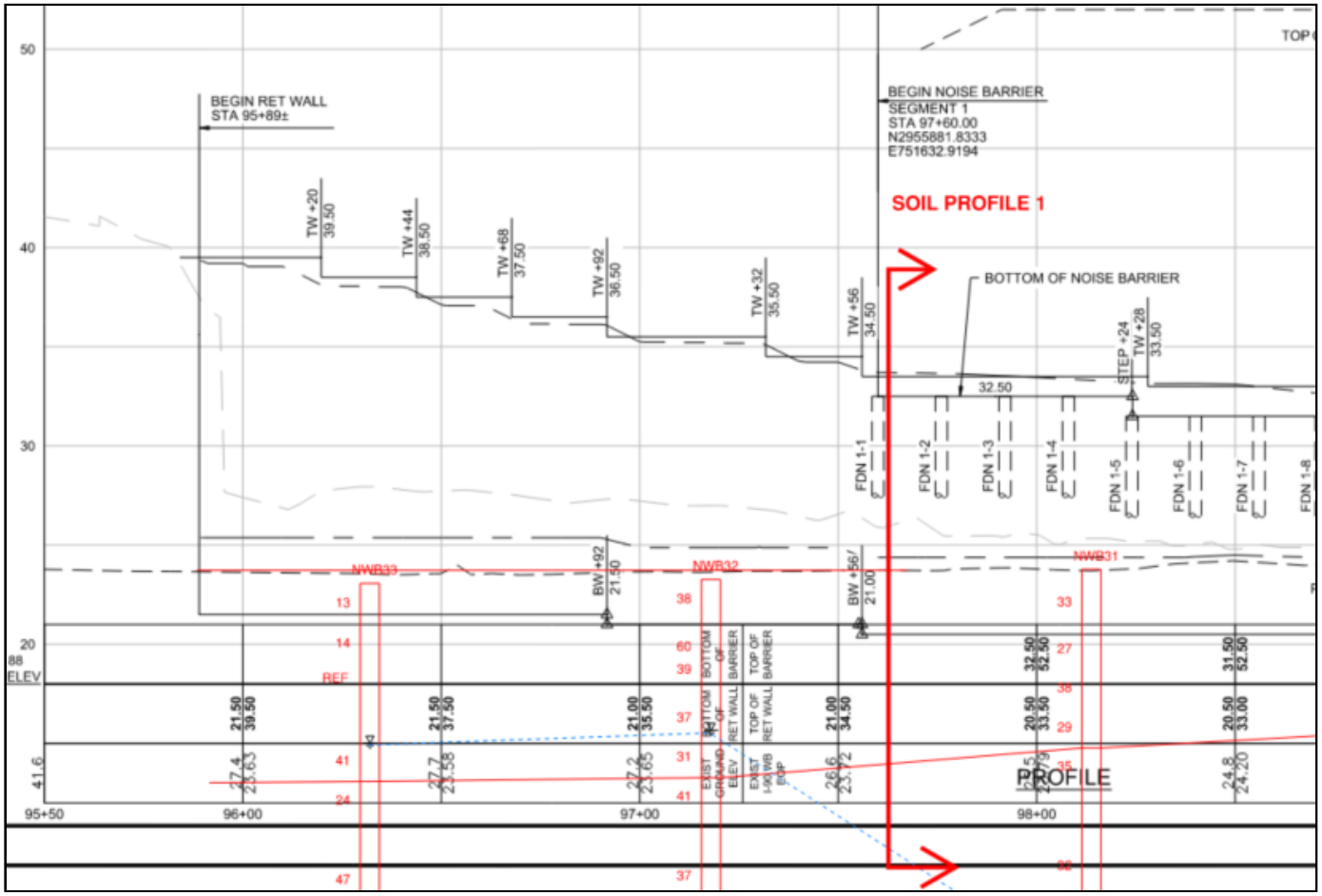
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Project:	Allston I-90 Interchange Noise Wall	**Date:**	5-27-2026
Project No.:	1903324	**Checked By:**	A. Roshan
		Date:	5-28-2026

[7] UFC (Soil Mechanic (DM 7.1)

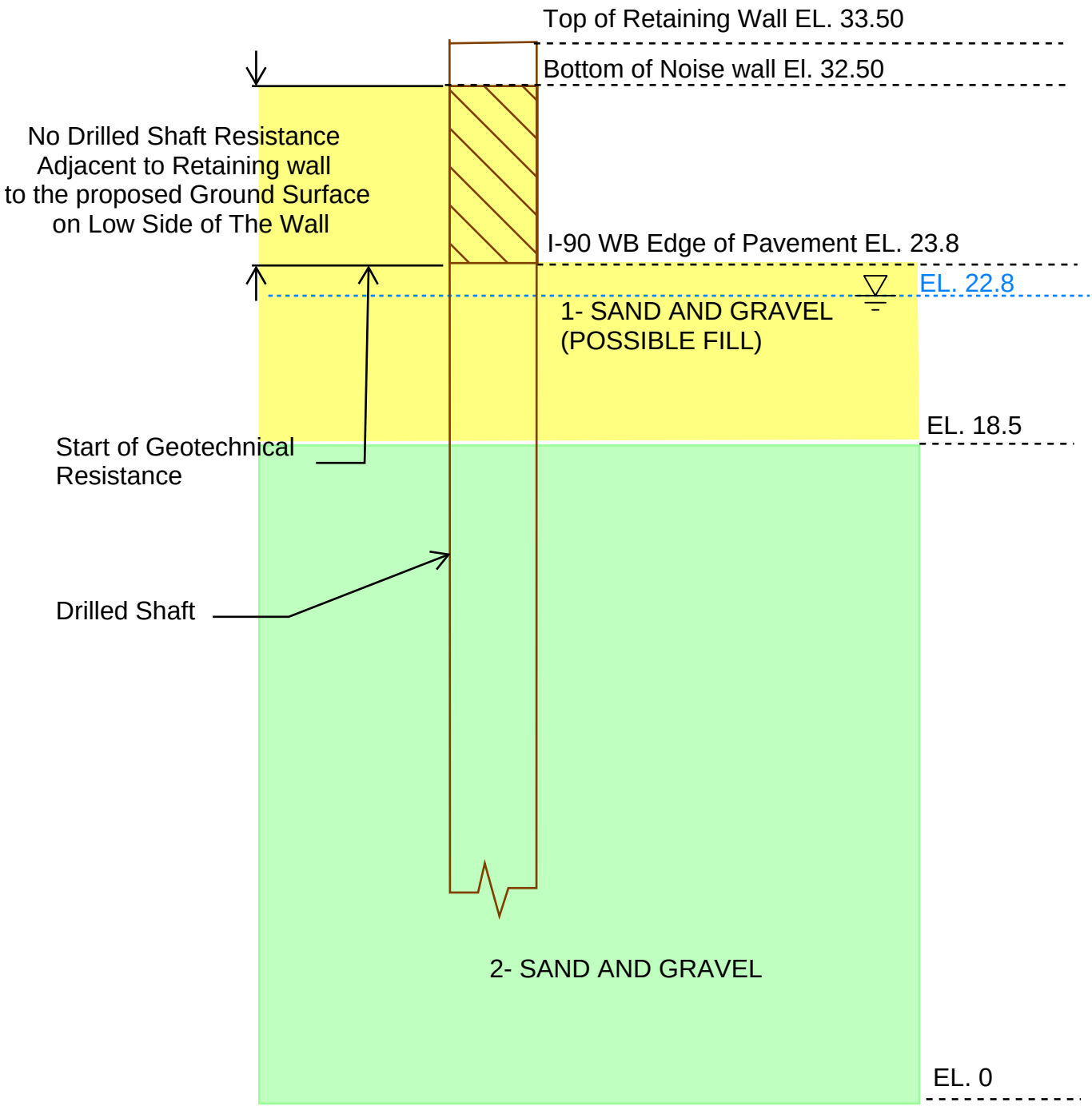
Table 8-10 Approximate Undrained Shear Strength for Cohesive Soils Based on SPT N

Soil Consistency	SPT N Value	Undrained Shear Strength (psf)		
		Parcher and Means (1968)	Tschebotarioff (1973)	Terzaghi et al. (1996)
Very soft	< 2	300	-	< 250
Soft	2 – 4	300 – 600	250 – 500	250 – 500
Medium	4 – 8	600 – 1200	500 – 1000	500 – 1000
Stiff	8 – 15	1200 – 2400	1000 – 2000	1000 – 2000
Very stiff	15 – 30	2400	2000 – 4000	2000 – 4000
Hard	> 30	> 4500	> 4000	> 4000

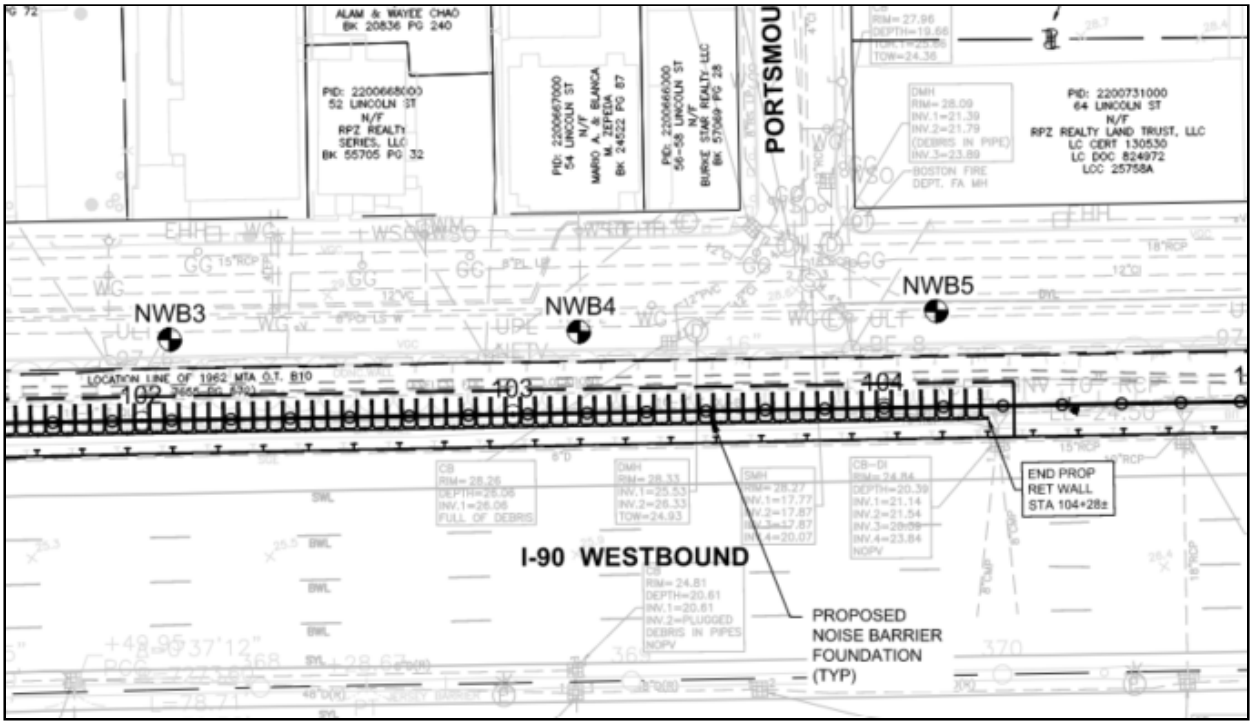


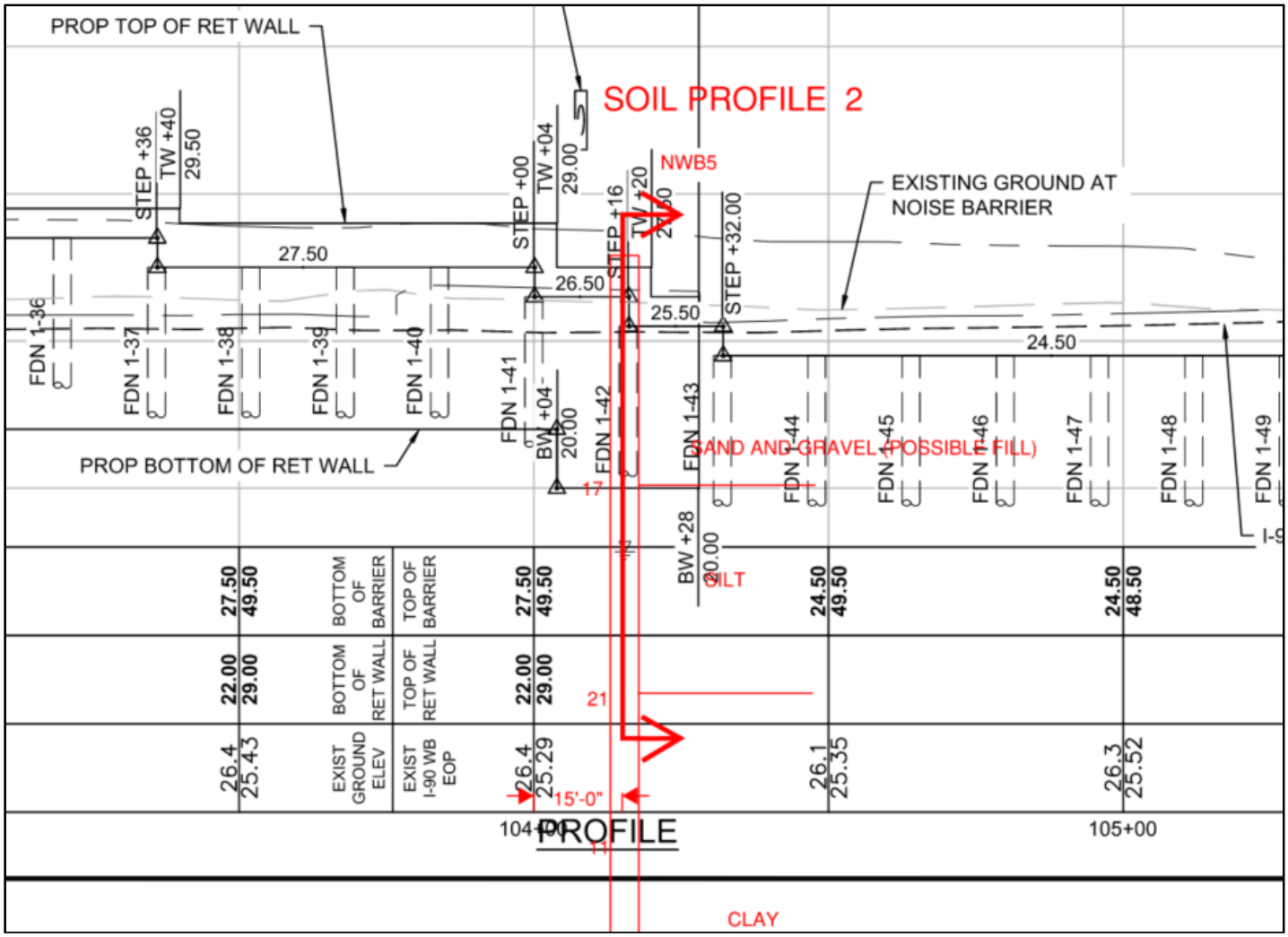


Cross Section Location - Soil Profile 1

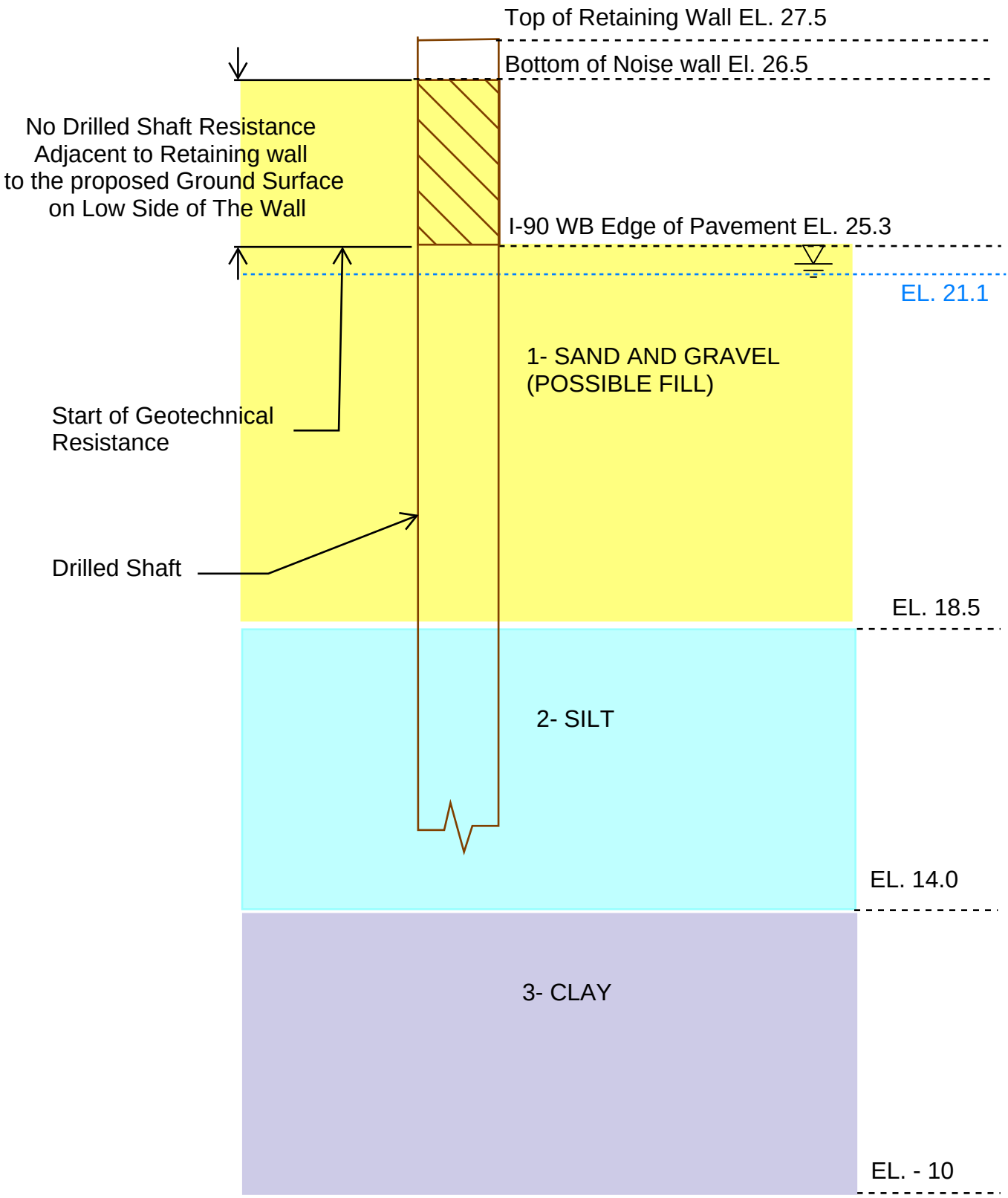


SOIL PROFILE 1 - BORING NWB 1
(NOT TO SCALE)

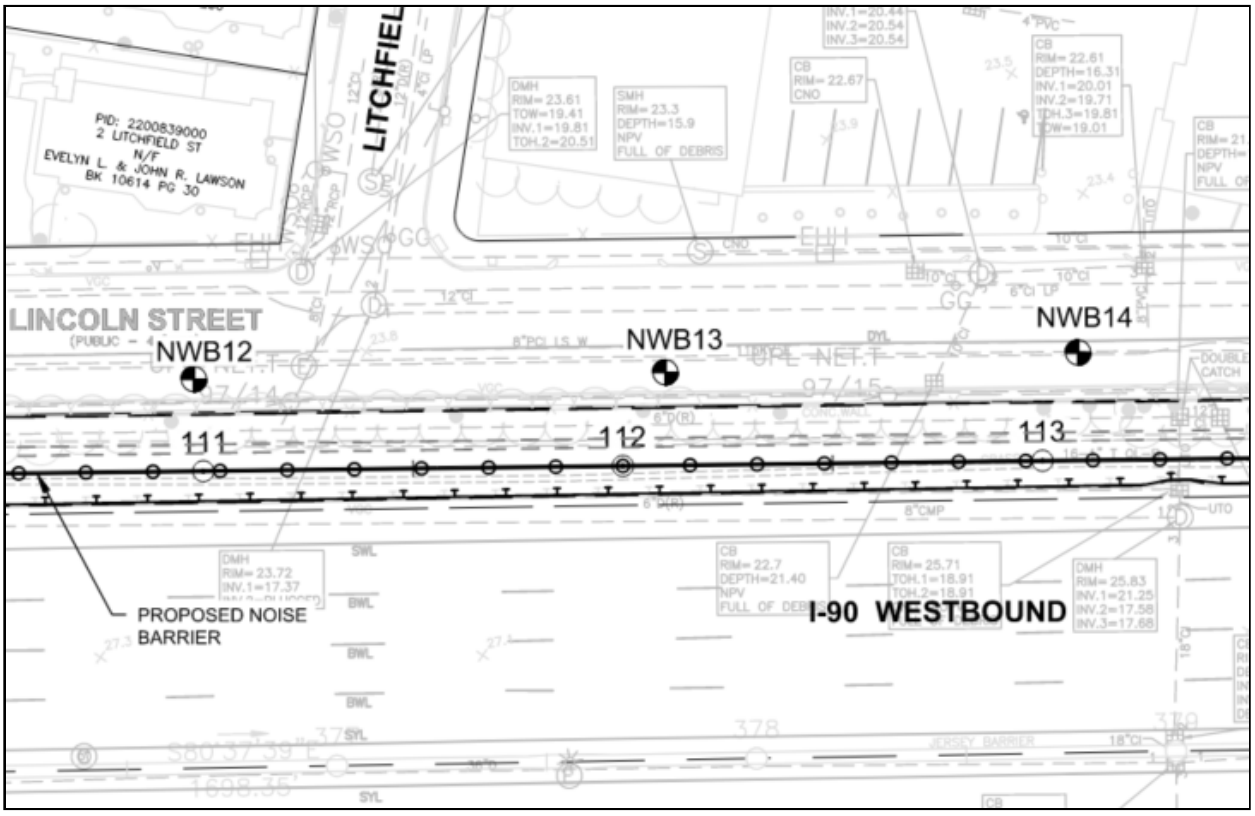


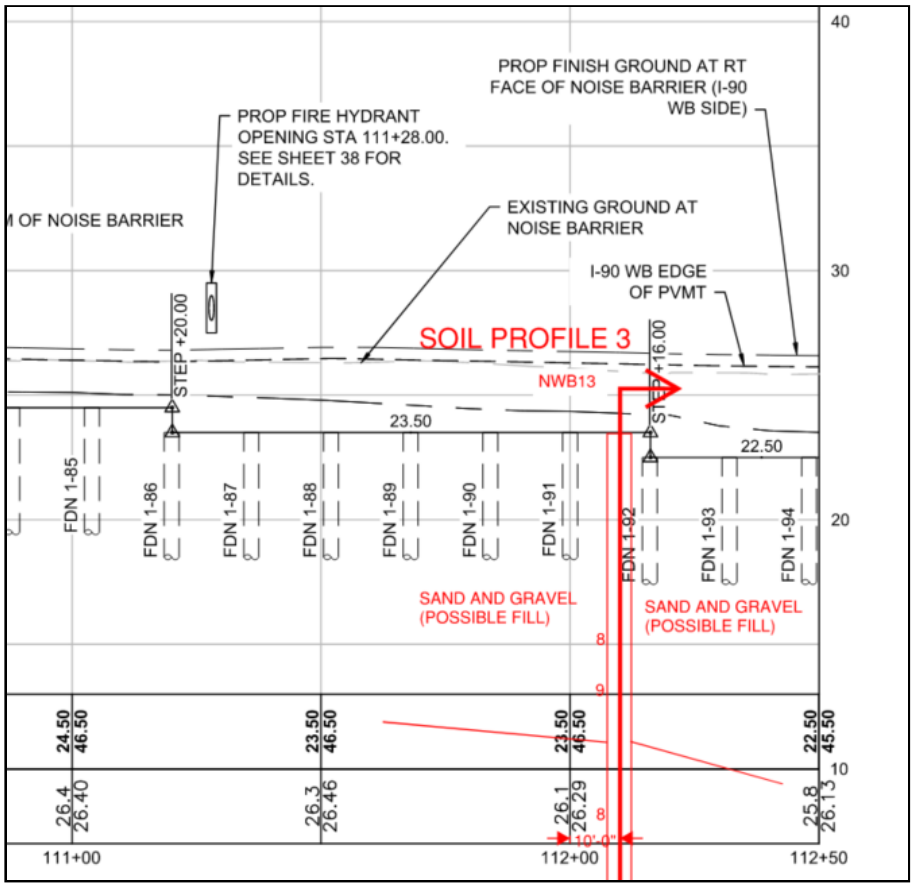


Cross Section Location - Soil Profile 2

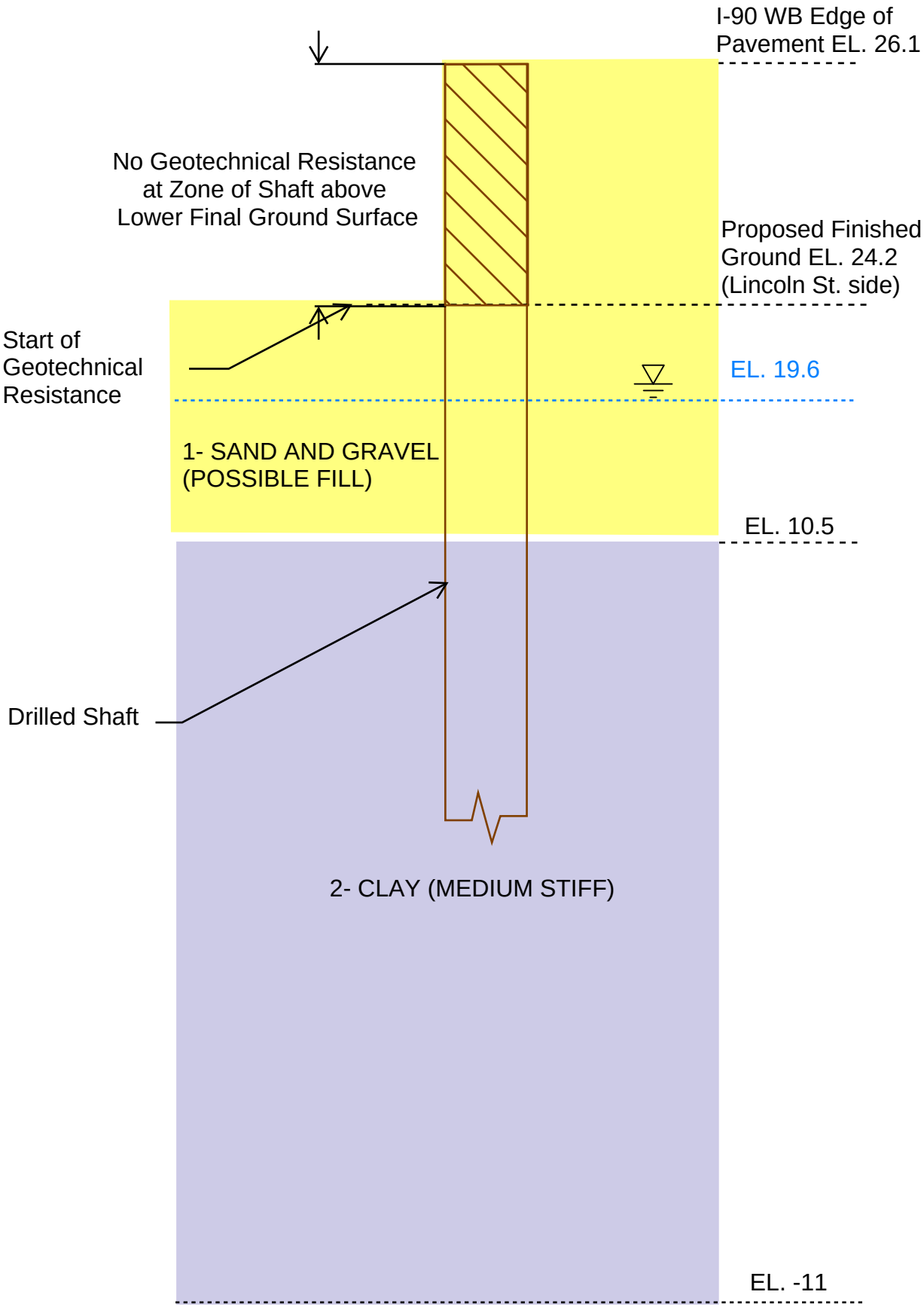


SOIL PROFILE 2- BORING NWB-5
(NOT TO SCALE)

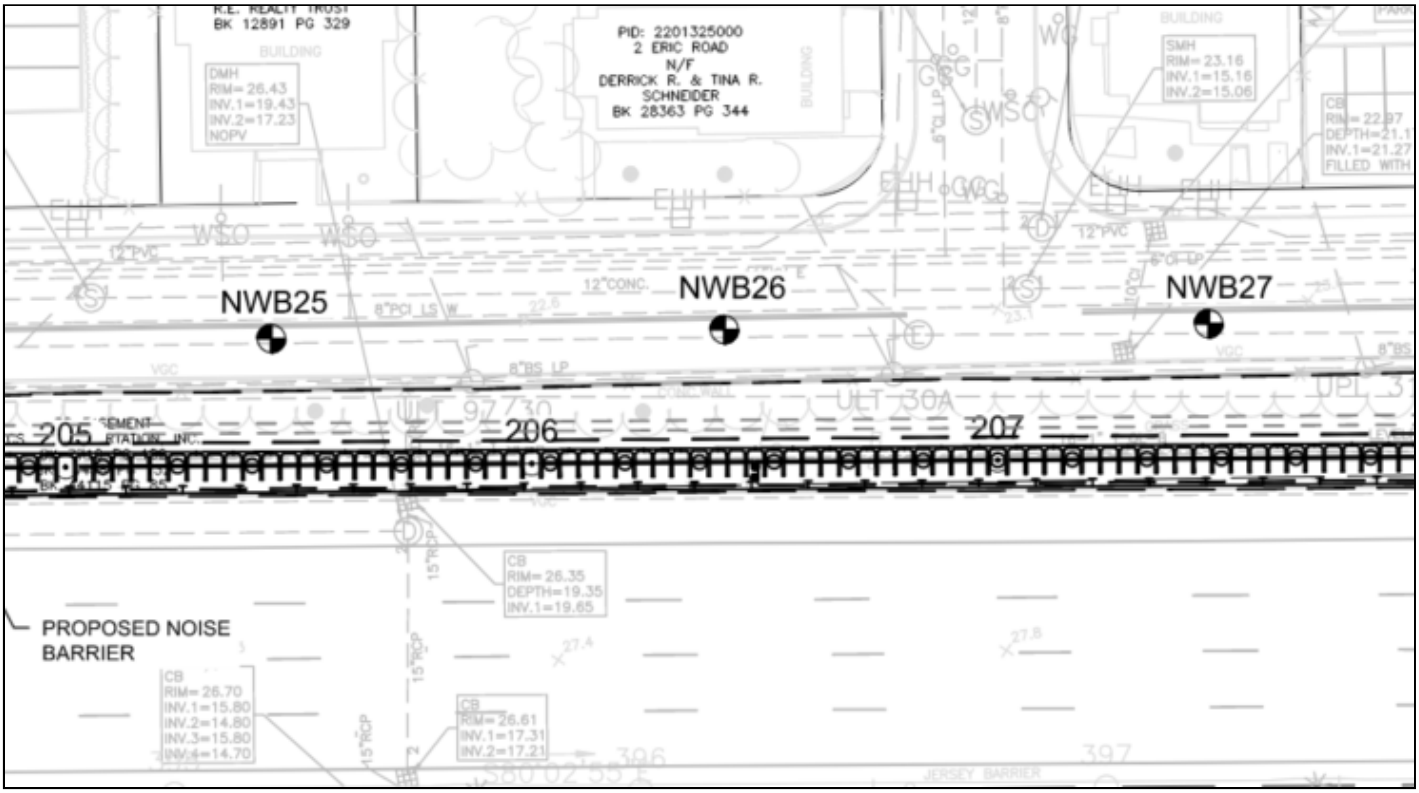


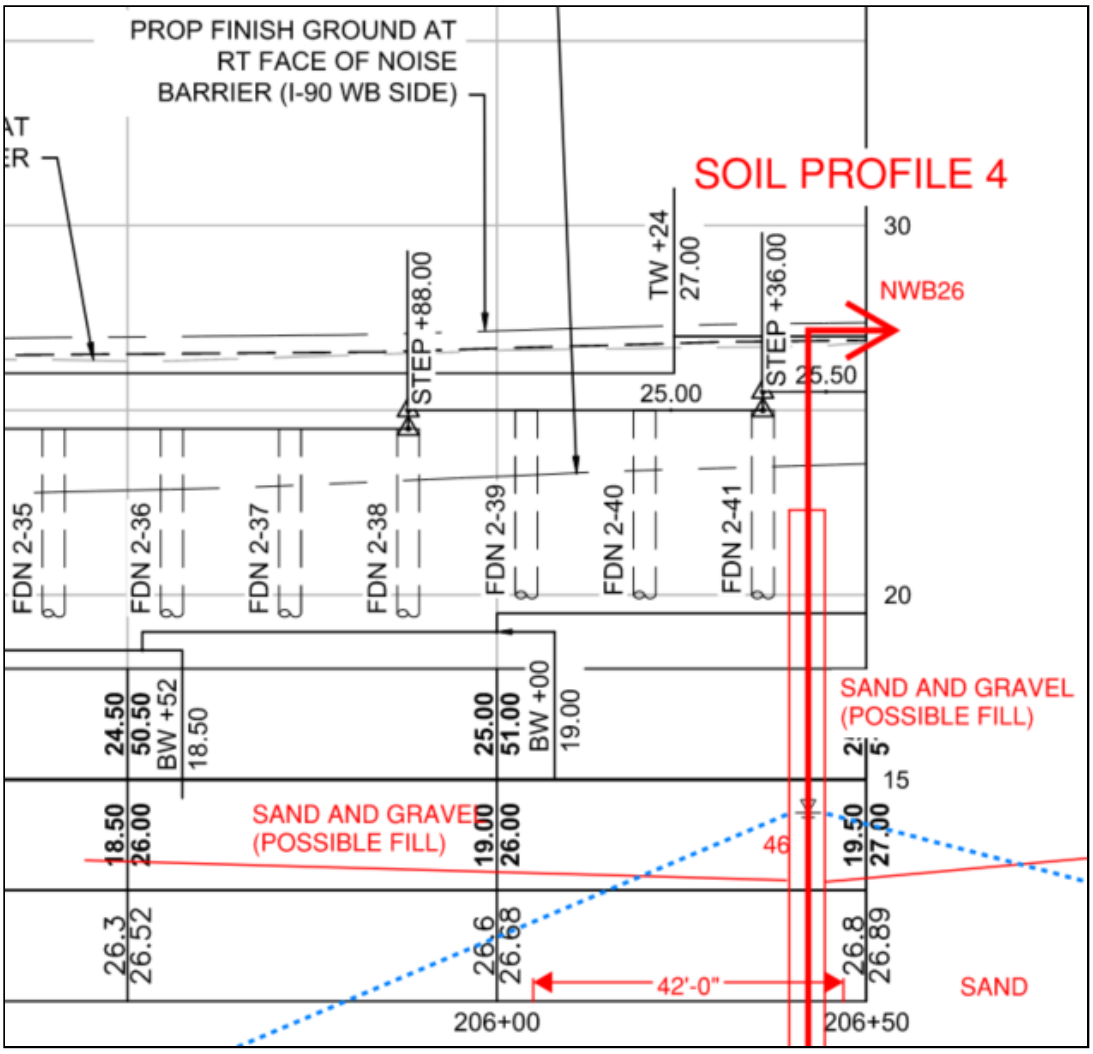


Cross Section Location - Soil Profile 3

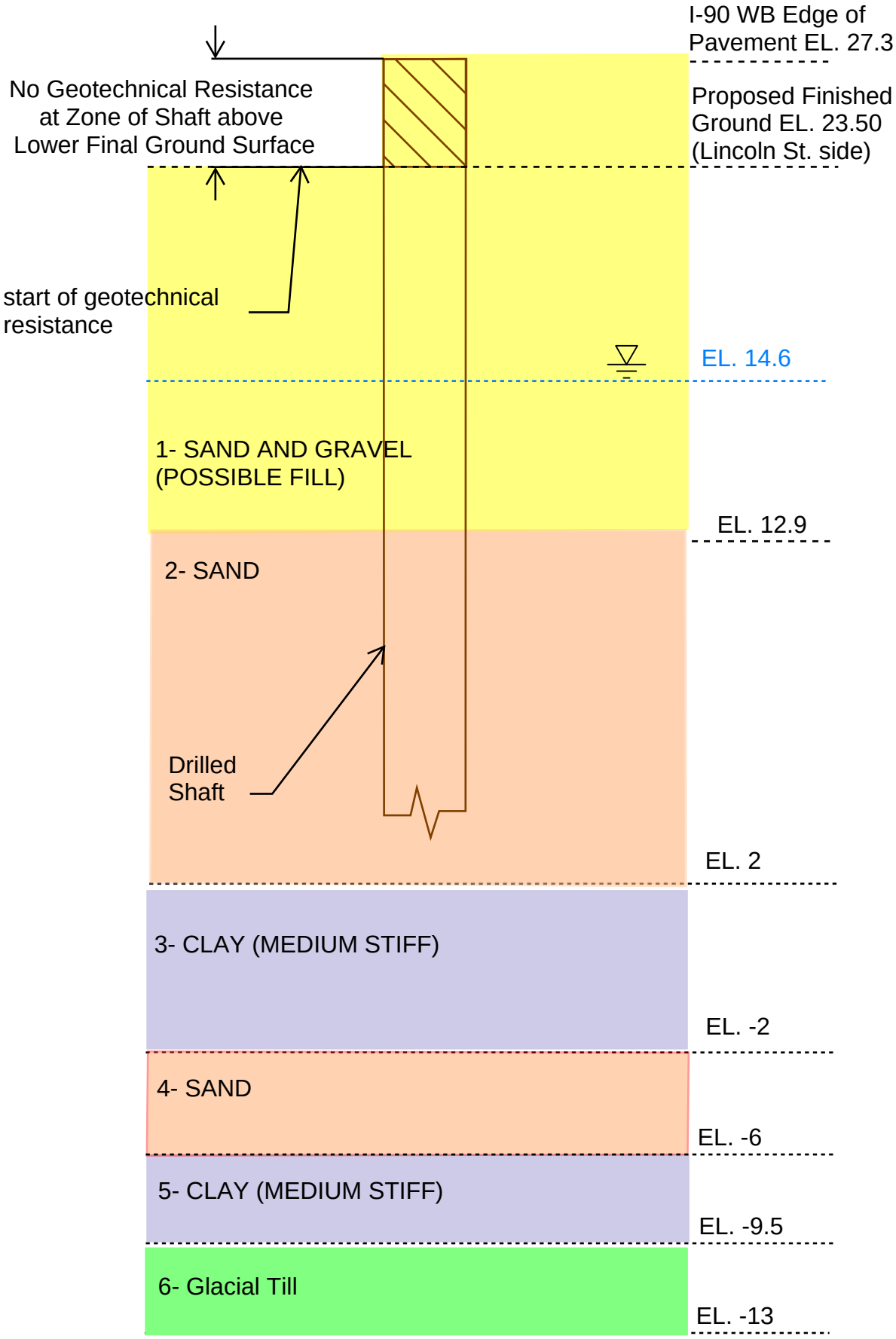


SOIL PROFILE 3 - BORING NWB 13
(NOT TO SCALE)





Cross Section Location - Soil Profile 4



SOIL PROFILE 4 - BORING NWB 26
(NOT TO SCALE)

D.5 Lateral Earth Pressure

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Project: Allston I-90 Interchange
Noise Wall
GEI Project No.: 1903324

By: A. Burrows-Crane
Date: 8/19/2025
Checked By: M.Ahmed
Date:12/22/2025

CALCULATE EARTH PRESSURE COEFFICIENTS

Calculations of earth pressure coefficients assigned to soils listed in Soil Properties table of the report are provided in this packet. Active, at-rest, and passive pressures were determined for different soils.

Use equivalent friction angle for drained analyses of marine clay pressures.

Equations/references utilized for these calculations are provided at the back of this calculation.

	Existing Fill/ Ordinary Borrow	Sand and Gravel	Silt	Sand	Glacial Till	Gravel Borrow	Marine Clay
Friction angle, ϕ (deg)	32	34	30	32	38	35	28
Angle of friction between soil and wall, δ (deg)	16	17	15	16	19	17.5	14
Slope of backfill behind wall, β (deg)	0	0	0	0	0	0	0
Slope of backfill in front of wall, α (deg) (for passive - enter as neg)	0	0	0	0	0	0	0
Angle of back face of wall to horz, θ (deg)	90	90	90	90	90	90	90
δ/ϕ	0.5	0.5	0.5	0.5	0.5	0.5	0.5
β/ϕ	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Γ	2.69	2.80	2.58	2.69	3.02	2.86	2.46
Active earth pressure coefficient (Coloumb method), Ka	0.28	0.26	0.30	0.28	0.22	0.25	0.33
At-rest earth pressure coefficient, Ko	0.47	0.44	0.50	0.47	0.38	0.43	0.53
Passive earth pressure coefficient, Kp (Log spiral) - see reference for chart	5.7	6.3	4.9	5.7	8.8	6.7	3.9

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By: A. Burrows-Crane
Date: 8/19/2025
Checked By: M.Ahmed
Date: 12/22/2025

3.11.5.2—At-Rest Lateral Earth Pressure Coefficient, k_o

For normally consolidated soils, vertical wall, and level ground, the coefficient of at-rest lateral earth pressure may be taken as:

$$k_o = 1 - \sin \phi'_f \qquad (3.11.5.2\text{-}1)$$

where:

ϕ'_f = effective friction angle of soil

k_o = coefficient of at-rest lateral earth pressure

REDUCTION FACTOR (R) OF k_p FOR VARIOUS RATIOS OF $-\delta/\Phi_f$

Φ_f \ δ/Φ_f	−0.7	−0.6	−0.5	−0.4	−0.3	−0.2	−0.1	0.0
10	.978	.962	.946	.929	.912	.898	.881	.864
15	.961	.934	.907	.881	.854	.830	.803	.775
20	.939	.901	.862	.824	.787	.752	.716	.678
25	.912	.860	.808	.759	.711	.666	.620	.574
30	.878	.811	.746	.686	.627	.574	.520	.467
35	.836	.752	.674	.603	.536	.475	.417	.362
40	.783	.682	.592	.512	.439	.375	.316	.262
45	.718	.600	.500	.414	.339	.339	.221	.174

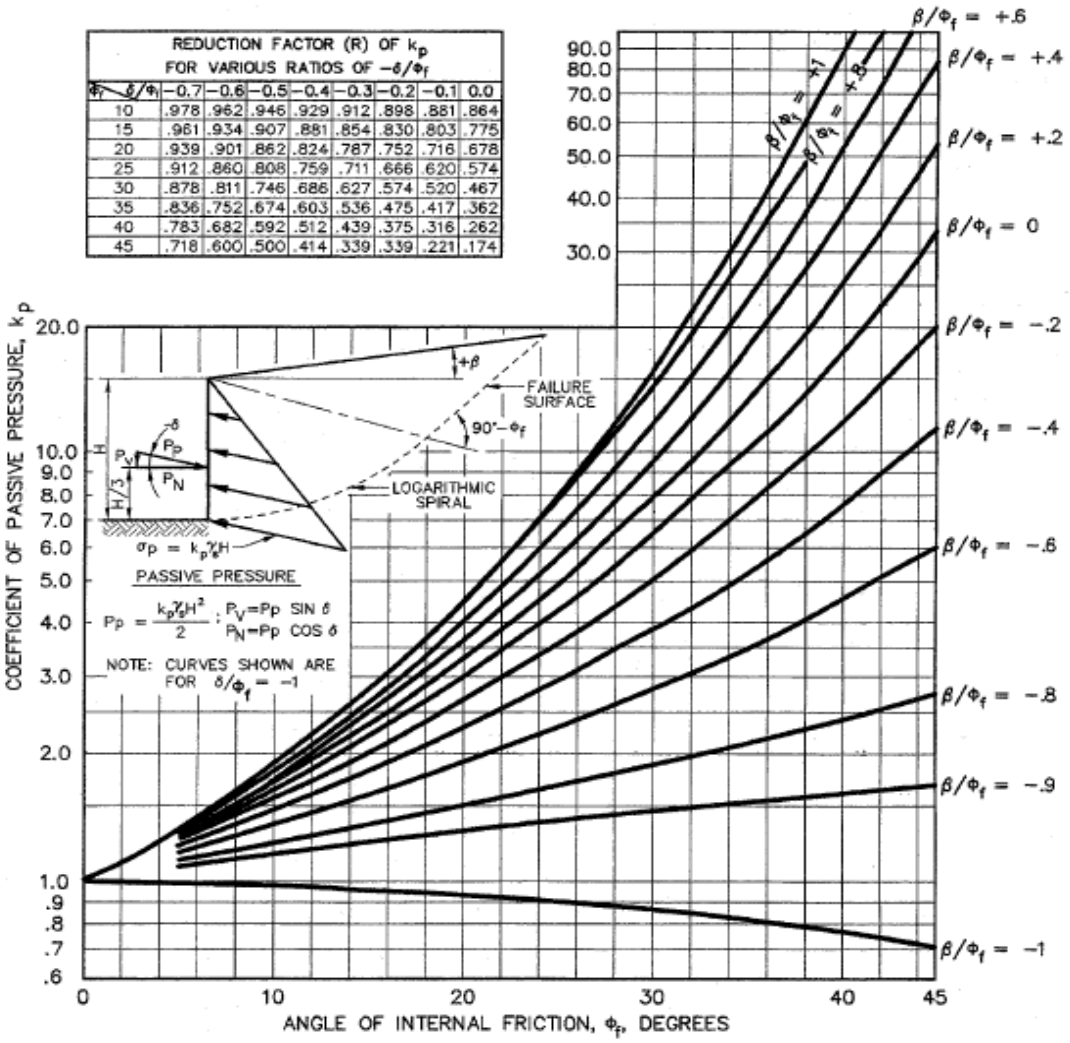


Figure 3.11.5.4-2—Computational Procedures for Passive Earth Pressures for Vertical Wall with Sloping Backfill (U.S. Department of the Navy, 1982a)

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Noise Wall
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Date: 8/19/2025
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Date: 12/22/2025

3.11.5.3—Active Lateral Earth Pressure Coefficient, k_a

Values for the coefficient of active lateral earth pressure may be taken as:

$$k_a = \frac{\sin^2(\theta+\phi'_f)}{\Gamma\,[\sin^2\theta\sin(\theta-\delta)]} \qquad (3.11.5.3\text{-}1)$$

in which:

$$\Gamma = \left[1+\sqrt{\frac{\sin(\phi'_f+\delta)\sin(\phi'_f-\beta)}{\sin(\theta-\delta)\sin(\theta+\beta)}}\right]^2 \qquad (3.11.5.3\text{-}2)$$

where:

δ = friction angle between fill and wall taken as specified in Table 3.11.5.3-1 (degrees)

C3.11.5.3

The values of k_a by Eq. 3.11.5.3-1 are based on the Coulomb earth pressure theories. The Coulomb theory is necessary for design of retaining walls for which the back face of the wall interferes with the development of the full sliding surfaces in the backfill soil assumed in Rankine theory (Figure C3.11.5.3-1 and Article C3.11.5.8). Either Coulomb or Rankine wedge theory may be used for long heeled cantilever walls shown in Figure C3.11.5.3-1a. In general, Coulomb wedge theory applies for gravity, semigravity and prefabricated modular walls with relatively steep back faces, and concrete cantilever walls with short heels.

For the cantilever wall in Figure C3.11.5.3-1b, the earth pressure is applied to a plane extending vertically up from the heel of the wall base, and the weight of soil to the left of th
weight.

β = angle of fill to the horizontal as shown in Figure 3.11.5.3-1 (degrees)

θ = angle of back face of wall to the horizontal as shown in Figure 3.11.5.3-1 (degrees)

ϕ'_f = effective angle of internal friction (degrees)

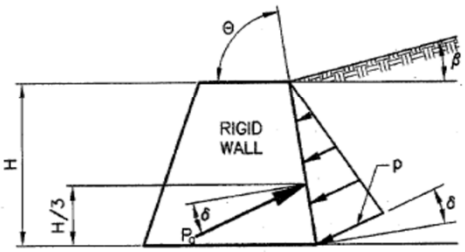


Figure 3.11.5.3-1—Notation for Coulomb Active Earth Pressure

Equilibrium considerations of the soil wedge behind the abutment, as shown in Figure A11.1.1.1-1, then lead to a value, E_{AE}, of the active force exerted on the soil mass by the abutment and vice versa. When the abutment is at the point of failure E_{AE} is given by the expression:

$$E_{AE} = \frac{1}{2}\,\gamma H^2\,(1-k_v)\,K_{AE} \qquad (A11.1.1.1\text{-}1)$$

where the seismic active pressure coefficient K_{AE} is:

$$K_{AE} = \frac{\cos^2(\phi-\theta-\beta)}{\cos\theta\cos^2\beta\cos(\delta+\beta+\theta)} \times \left[1+\sqrt{\frac{\sin(\phi+\delta)\sin(\phi-\theta-i)}{\cos(\delta+\beta+\theta)\cos(i-\beta)}}\right]^{-2} \qquad (A11.1.1.1\text{-}2)$$

and where:

γ = unit weight of soil (kcf)

H = height of soil face (ft)

ϕ = angle of friction of soil (degrees)

θ = arc tan $(k_h/(1-k_v))$ (degrees)

δ = angle of friction between soil and abutment (degrees)

k_h = horizontal acceleration coefficient (dim.)

k_v = vertical acceleration coefficient (dim.)

i = backfill slope angle (degrees)

β = slope of wall to the vertical, negative as shown (degrees)

Project: Allston I-90 Interchange
Noise Wall
GEI Project No.: 1903324

By: A. Burrows-Crane
Date: 8/19/2025
Checked By: M.Ahmed
Date: 12/22/2025

3.1.6 Earth Pressure Computations

Earth pressure coefficient estimates are dependent on the magnitude and direction of wall movement. Unless documented otherwise in the approved Geotechnical Report, the following earth pressure coefficients shall be used in design:

- Cantilever walls not founded on rock or piles that are greater than 5' in height or any spread footing-supported gravity wall shall use K_a.
- Cantilever walls not founded on rock or piles that are less or equal to 5' in height shall use $0.5(K_o + K_a)$.
- Counterfort walls, cantilever walls of any height, or gravity walls that are founded on rock or piles shall use K_o.

Where:
K_a = Active earth pressure coefficient;
K_o = At-rest earth pressure coefficient;

Active earth pressure coefficients (K_a) shall be estimated using Coulomb Theory. Passive earth pressure coefficients (K_p) shall be estimated using Rankine or Log Spiral Theory. Current MassDOT practice is to use the unit earth weight of 120 pcf in the calculation of earth pressures where more specific data is not available.

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POLICY DIRECTIVE P-22-001
AND
POLICY DIRECTIVE P-22-002

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massDOT Massachusetts Department of Transportation Highway Division

Number: P-22-001
Date: 9/23/22

POLICY DIRECTIVE

Jonathan Gulliver (signature on original)
HIGHWAY ADMINISTRATOR

Off-Site Stockpiling of Soil from MassDOT Construction Projects

Purpose

The purpose of this Policy Directive is to formally establish a policy and procedures for managing and stockpiling soil generated and transported from MassDOT construction projects. This Policy Directive does not supersede any Federal, State, or Local regulations.

Date of Effect

This Policy Directive is effective immediately for all projects, including active construction projects.

For active construction projects and for other projects advertised prior to October 15, 2022, changes to the contract documents needed to implement the requirements of this Policy Directive will be considered on a case-by-case basis and shall be approved by the District Highway Director, as necessary.

For projects advertised on or after October 15, 2022, MassDOT will include the requirements and implementation procedures of this Policy Directive in the construction contract documents.

Policy Requirements

This policy is intended to prevent the off-site relocation of excavated soil generated from MassDOT projects to areas near residential receptors and to control potential fugitive dusts and/or contaminants. To that end, excavated soil may not be moved from the project site without knowledge of the content of the material. Knowledge may include visual field observations for presence of staining, odor, and/or debris, screening with a photoionization detector (PID), laboratory analysis, and/or site history. Pavement millings and other non-soil materials are not subject to the requirements of this Policy Directive.

Moving soil from a MassDOT project site to a temporary off-site storage location must be approved in writing by the District Highway Director.

The Contractor must select a storage location that is at least 500 feet away from residential receptors, as defined herein to include, but not be limited to, residential dwellings, residentially

zoned property, schools, daycare facilities, playgrounds, parks, recreational areas, hospitals, elderly housing and convalescent facilities.

Temporary off-site storage of excavated soil from a MassDOT project is only permissible at a location approved and permitted by MassDOT. The temporary storage location should be located within the same municipality where the soil was excavated, where possible. Stockpiled soil must be securely covered, and appropriate measures must be taken to minimize fugitive dust and erosion.

Signs indicating the source of the soil, the date the soil was generated, and contact information must be erected and maintained until the stockpiled soils are transported to a disposal facility or reused on the project site.

Implementation Procedures

To ensure that off-site storage of excavated soils is managed properly on MassDOT projects, this policy requires the following:

1. **Off-Site Stockpile Storage Locations**
    a. The Contractor shall provide proposed off-site storage locations to the Engineer for approval at least 30 days prior to transporting soil off site. Off-site storage locations should be in the same municipality as the work site.
    b. The Contractor shall keep excavated soil on site until adequately characterized to the satisfaction of the Engineer.
    c. The Contractor shall provide notification of the approved off-site storage location to the local Board of Health and the Town Manager's/Mayor's Office at least 7-days prior to transporting soil off site.
    d. The Contractor shall provide the Engineer with at least 3-days' notice prior to transporting soil off site.
    e. For off-site storage locations on MassDOT property, the Contractor is required to obtain an Access Permit through the District Permits Office prior to storage of soil or other materials. MassDOT will issue these permits at no cost to the Contractor. Information to be submitted by the Contractor as part of the permit application shall include:
        i. A description of material to be stored off-site, including available analytical data;
        ii. A figure of the location with distances to residences and residential receptors; and
        iii. Anticipated duration of temporary storage.
    f. Stockpile locations should not be within 500 feet of residential receptors (e.g., residential dwellings, residentially zoned property, schools, daycare facilities, playgrounds, parks, recreational areas, hospitals, elderly housing and convalescent facilities).
        i. If the stockpile location must be within 500 feet of residential receptors, then soil must be less than RCS-1 (per 310 CMR 40.1600) and free of potentially hazardous or regulated items.

g. For off-site storage locations on non-MassDOT property, the Contractor must notify the property owner(s) at least 7 days prior to transporting material.
h. Exceptions to these rules will be reviewed by MassDOT and may be approved by the District Highway Director on a case-by-case basis.

2. Off-Site Stockpile Management

a. The Contractor shall keep soil stockpiles on impermeable surfaces (e.g., asphalt or concrete) or on 10-mil polyethylene sheeting.
b. The Contractor shall cover soil stockpiles with 10-mil polyethylene sheeting and surround with a berm made of hay bales, straw wattles, or similar.
    i. Piles that are actively being worked on must be covered and re-secured at the end of the work shift.
c. The Contractor shall label stockpiles with signs, including:
    i. Location of origin (including any Release Tracking Numbers)
    ii. Stockpile ID number (including MassDOT District office-assigned tracking ID, if different)
    iii. Date of initial accumulation
    iv. Applicable telephone numbers for the Contractor and MassDOT.
d. The Contractor shall mitigate fugitive dust at storage locations under the direction of an appropriately trained/certified environmental professional.
e. The Contractor shall remedy noncompliance with this policy within 48 hours.
f. The Contractor shall remedy noncompliance with this policy on the SAME DAY for potentially hazardous material, as determined by the Engineer.
g. The Contractor shall handle excavated soil according to federal, state, and local regulations.
h. The Contractor shall use appropriate shipping documents for all movements of excavated soil on public roadways (e.g., Bill of Lading, Material Shipping Record, Manifest, Asbestos Waste Shipment Record, etc.).

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massDOT Massachusetts Department of Transportation Highway Division

Number: P-22-002
Date: 9/23/22

POLICY DIRECTIVE

Jonathan Gulliver (signature on original)
HIGHWAY ADMINISTRATOR

Use of MassDOT Property for Staging and other Construction-Related Operations

Purpose

This Policy Directive is intended to address the use of MassDOT property by MassDOT Contractors for construction staging and other construction-related operations that are not specifically defined in the construction contract. Such use of MassDOT property will only be allowed if permitted by the District Office in accordance with 700 CMR 13.00, Approval of Access to MassDOT Highways and Other Property. This includes the use of MassDOT property for staging, laydown, and storage of equipment and materials, including soil excavated from a project site.

This Policy Directive requires the Contractor/applicant to obtain a Non-Vehicular Access Permit from MassDOT to use MassDOT property for these purposes.

This Policy Directive is effective immediately and applies to all MassDOT construction projects.

General Permit Considerations and Conditions

In addition to other normal MassDOT Access Permit procedures, MassDOT shall consider the following during the application, review, implementation and monitoring processes of Access Permits required by this Policy Directive:

- Storage and placement of the Contractor's equipment and materials should not be allowed within the clear zone of the roadway.
- Stockpiled soils should not be located within 500 feet of residential receptors, as defined herein to include, but not be limited to, residential dwellings, residentially zoned property, schools, daycare facilities, playgrounds, parks, recreational areas, hospitals, elderly housing and convalescent facilities.
- The Contractor/applicant shall identify the access/egress locations of the proposed storage areas. MassDOT will only approve locations determined to be safe for roadway users, construction workers and the general public.
- The Contractor may be required to submit a Traffic Management Plan and/or Lighting Plan for MassDOT review and approval as part of the permit application, depending on the proposed use of the area.

- The Contractor shall submit the permit application through MassDOT's online State Highway Access Permit System (SHAPS).
- MassDOT will waive the permit application fee for any application received from a MassDOT Contractor for any permit required by this Policy Directive and will waive any subsequent amendment and extension fees that may otherwise be required.
- MassDOT will review the permit application in accordance with applicable standard procedures and will apply standard permit terms and conditions, as necessary.
- The Resident Engineer will verify that the permit is approved before allowing the Contractor to use the affected area for the requested purpose.
- Areas permitted are for use by the approved applicant only and are not to be shared with or used by other vendors. Subcontractors specifically engaged with the applicant working on the specific MassDOT project will be allowed to use the area in accordance with the terms of the permit.
- Permits are issued on an annual basis and will require the Contractor to file for an extension each year to continue use.

Exemptions from Permit Requirements

Equipment and materials being used for active construction operations and located within the work zone of the construction contract are exempt from this permit requirement, provided they do not interfere with the safety or operation of the roadway or the work zone. Examples of these types of exempt uses are:

- Equipment and materials parked or stored within a protected (barriered) work zone.
- Materials placed in the work zone prior to same-day installation or use.
- Soils excavated temporarily and scheduled to be replaced, such as for trenching operations or for installation of drainage structures.

DOCUMENT B00420

PROPOSAL

BOSTON

For: **Installation of Noise Barriers along I-90 between Market and Franklin Streets (Allston Multimodal Transportation Project Early Action)**

COMMONWEALTH OF MASSACHUSETTS

LOCATION

The work referred to herein is in the City of BOSTON in Suffolk County, in the Commonwealth of Massachusetts, and is shown by the locus map (Document 00331) in the Proposal Pamphlet, the work locations extend as follows:

I-90

Beginning – Station 95+70.00 +/-
Ending –Station 211+14.00 +/-

The contract prices shall include the furnishing of all materials (except as otherwise herein specified), the performing of all the labor requisite or proper, the providing of all necessary machinery, tools, apparatus and other means of construction, the doing of all the abovementioned work in the manner set forth, described and shown in the specifications and on the drawings for the work, and in the form of contract, and the completion thereof within **674 CALENDAR DAYS** upon receipt of a Notice to Proceed, except that if the completion date falls between December 1 and March 15 then the same number of days beyond December 1st will be extended after March 15th.

The Work of this project is described by the following Items and quantities.

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Project # 616308 **Contract # 136880**

Location : BOSTON

Description : Installation of Noise Barriers along I-90 between Market and Franklin Streets (Allston Multimodal Transportation Project Early Action)

ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
100.99	1	CONSTRUCTION MONITORING OF EXISTING STRUCTURES AT _____ LUMP SUM		
101.	1.1	CLEARING AND GRUBBING AT _____ PER ACRE		
102.511	8	TREE PROTECTION - ARMORING AND PRUNING AT _____ EACH		
119.5	1	CONSTRUCTION NOISE CONTROL AT _____ LUMP SUM		
120.1	2,060	UNCLASSIFIED EXCAVATION AT _____ PER CUBIC YARD		
141.	4,250	CLASS A TRENCH EXCAVATION AT _____ PER CUBIC YARD		
141.1	50	TEST PIT FOR EXPLORATION AT _____ PER CUBIC YARD		
156.	2,100	CRUSHED STONE AT _____ PER TON		
180.01	1	ENVIRONMENTAL HEALTH AND SAFETY PROGRAM AT _____ LUMP SUM		

Project # 616308 Contract # 136880				
Location : BOSTON				
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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
180.02	80	PERSONAL PROTECTION LEVEL C UPGRADE AT _____ PER HOUR		
180.03	40	LICENSED SITE PROFESSIONAL SERVICES AT _____ PER HOUR		
181.11	760	DISPOSAL OF UNREGULATED SOIL AT _____ PER TON		
181.12	305	DISPOSAL OF REGULATED SOIL - IN-STATE FACILITY AT _____ PER TON		
181.13	310	DISPOSAL OF REGULATED SOIL - OUT-OF-STATE FACILITY AT _____ PER TON		
181.14	160	DISPOSAL OF HAZARDOUS WASTE AT _____ PER TON		
184.1	1	DISPOSAL OF TREATED WOOD PRODUCTS AT _____ PER TON		
220.	2	DRAINAGE STRUCTURE ADJUSTED AT _____ EACH		
227.3	5	REMOVAL OF DRAINAGE STRUCTURE SEDIMENT AT _____ PER CUBIC YARD		

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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
227.4	5	MASONRY PLUG AT _____ PER SQUARE FOOT		
443.	100	WATER FOR ROADWAY DUST CONTROL AT _____ PER 1000 GALLONS		
628.305	2	TEMPORARY IMPACT ATTENUATOR, NON-REDIRECTIVE, TL-3 AT _____ EACH		
630.	2,500	HIGHWAY GUARD REMOVED AND RESET AT _____ PER FOOT		
630.2	830	HIGHWAY GUARD REMOVED AND DISCARDED AT _____ PER FOOT		
632.	140	GUARDRAIL POST - STEEL AT _____ EACH		
633.1	270	GUARDRAIL OFFSET BLOCK - THRIE BEAM AT _____ EACH		
634.1	70	THRIE BEAM GUARD PANEL AT _____ EACH		
645.172	220	72 INCH CHAIN LINK FENCE (PIPE TOP RAIL) VINYL COATED (LINE POST OPTION) AT _____ PER FOOT		

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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
697.1	20	SILT SACK AT _____ EACH		
698.3	4,600	GEOTEXTILE FABRIC FOR SEPARATION AT _____ PER SQUARE YARD		
722.2	1	SCHEDULE OF OPERATIONS (TYPE B) - FIXED PRICE $100000 AT One Hundred Thousand Dollars LUMP SUM	$100,000.00	$100,000.00
740.	23	ENGINEER'S FIELD OFFICE AND EQUIPMENT (TYPE A) AT _____ PER MONTH		
748.	1	MOBILIZATION AT _____ LUMP SUM		
751.	690	LOAM FOR ROADSIDES AT _____ PER CUBIC YARD		
756.	1	NPDES STORMWATER POLLUTION PREVENTION PLAN AT _____ LUMP SUM		
765.	5,000	SEEDING AT _____ PER SQUARE YARD		
767.6	50	AGED PINE BARK MULCH AT _____ PER CUBIC YARD		

Project # 616308 Contract # 136880				
Location : BOSTON				
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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
769.62	15,940	PAVEMENT MILLING MULCH AT _____ PER SQUARE FOOT		
796.041	317	PARTHENOCISSUS TRICUSPIDATA - BOSTON IVY #2 AT _____ EACH		
804.8	10,800	8 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC - (UL) AT _____ PER FOOT		
811.12	10	ELECTRIC MANHOLE - SD2.012 AT _____ EACH		
811.361	1	ELECTRIC MANHOLE REMOVED AND DISCARDED AT _____ EACH		
811.91	1	TELECOMM MANHOLE REMOVED AND DISCARDED AT _____ EACH		
847.1	1	SIGN SUP (NOT GUIDE)+RTE MKR W/1 BRKWAY POST ASSEMBLY - STEEL AT _____ EACH		
848.1	1	SIGN SUP (NOT GUIDE)+RTE MKR W/2 BRKWAY POST ASSEMBLIES-STEEL AT _____ EACH		
851.1	30	TRAFFIC CONES FOR TRAFFIC MANAGEMENT AT _____ PER DAY		

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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
852.	460	SAFETY SIGNING FOR TRAFFIC MANAGEMENT AT _____ PER SQUARE FOOT		
853.1	2	PORTABLE BREAKAWAY BARRICADE TYPE III AT _____ EACH		
853.23	3,800	TEMPORARY BARRIER (TL-3) AT _____ PER FOOT		
853.8	600	TEMPORARY ILLUMINATION FOR WORK ZONE AT _____ PER DAY		
859.	25,000	REFLECTORIZED DRUM AT _____ PER DAY		
859.1	700	REFLECTORIZED DRUMS WITH SEQUENTIAL FLASHING WARNING LIGHTS AT _____ PER DAY		
874.2	2	TRAFFIC SIGN REMOVED AND RESET AT _____ EACH		
874.21	1	GROUND MOUNT SIGN AND POST REMOVED AND RESET - 511 TRAVEL INFO AT _____ LUMP SUM		
874.22	1	GROUND MOUNT SIGN AND POST REMOVED AND RESET - EMERGENCY STOPPING ONLY/STAY WITH VEHICLE AT _____ LUMP SUM		

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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
874.23	1	GROUND MOUNT SIGN AND POST REMOVED AND RESET - NO LITTERING AT _____ LUMP SUM		
874.24	1	GROUND MOUNT SIGN AND POST REMOVED AND RESET - NEED A TRANSPONDER? AT _____ LUMP SUM		
874.25	1	GROUND MOUNT SIGN AND POST REMOVED AND RESET - TOLL RATES AT _____ LUMP SUM		
874.26	1	GROUND MOUNT SIGN AND POST REMOVED AND RESET - ELECTRONIC TOLLING AT _____ LUMP SUM		
945.101	3,450	DRILLED SHAFT EXCAVATION 3.0 FOOT DIAMETER AT _____ PER FOOT		
945.301	110	OBSTRUCTION EXCAVATION 3.0 FOOT DIAMETER AT _____ PER FOOT		
945.501	3,200	DRILLED SHAFT 3.0 FOOT DIAMETER AT _____ PER FOOT		
945.602	400	PERMANENT CASING 3.5 FOOT DIAMETER AT _____ PER FOOT		
950.501	15,200	TEMPORARY EARTH SUPPORT SYSTEM, RETAINING WALL NO. 1 AT _____ PER SQUARE FOOT		

Project # 616308 Contract # 136880				
Location : BOSTON				
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ITEM #	**QUANTITY**	**ITEM WITH UNIT BID PRICE WRITTEN IN WORDS**	**UNIT PRICE**	**AMOUNT**
950.502	5,800	TEMPORARY EARTH SUPPORT SYSTEM, RETAINING WALL NO. 2 AT _____ PER SQUARE FOOT		
986.	130	MODIFIED ROCKFILL AT _____ PER TON		
996.1	73,300	NOISE BARRIER STRUCTURE AT _____ PER SQUARE FOOT		
996.2	300	WEEP HOLE FOR NOISE BARRIER STRUCTURE AT _____ EACH		
996.33	1,110	PREFABRICATED MODULAR GRAVITY RETAINING WALL NO. 1 AT _____ PER SQUARE YARD		
996.34	620	PREFABRICATED MODULAR GRAVITY RETAINING WALL NO. 2 AT _____ PER SQUARE YARD		
Total Qty:	185,949.1			