SECTION 01 11 00: SUMMARY OF WORK

PART 1 – GENERAL

1.01 LOCATION

A. Trail and floating dock construction

1.02 GENERAL REQUIREMENTS

A. The General Conditions, Supplementary Conditions and applicable parts of Division 01 General Requirements are all included as part of this Section. The Contractor is required to examine all other sections of the specifications for requirements that may affect the work of this Section. The Contractor is also required to coordinate the Work with that of all trades affecting or affected by the Work of this Section, and to cooperate with such trades to assure the continued progress of the Work.

B. The intent of the Contract Documents is to require that the Contractor provide all material, labor and equipment needed in order to furnish a complete Project, and that all of the material, labor and equipment be furnished complete in every respect.

1.03 SCOPE OF WORK

A. Work covered by this contract includes but may not be limited to site-work; construction; re-construction; alterations; remodeling or repair of the public works Project described in this paragraph 1.03 including the following major work:

1. Tree protection
2. Vegetation removal and management
3. Timber walls
4. Aluminum gangway
5. Floating dock and railing
6. Seeding

1.04 DOCUMENTATION

A. Contractor shall cooperate with the Owner and Landscape Architect to record any and all changes to existing conditions or proposed work that deviate from the Contract Documents. The Contractor shall furnish all recorded changes to the Landscape Architect to be used for As-Built documents.

1.05 NOISE CONTROL

A. The Contractor shall adhere to the Town Bylaws for Noise Control throughout the construction period. Noise control will be strictly enforced by the Town.

B. No construction shall occur between 7pm to 7am Monday through Saturday, or any time on Sunday. Any exemption to prohibited construction hours must be authorized by a Town representative.

C. Contractor shall not permit engine idling on the job site. This shall be enforced through random, unannounced periodic inspections.

END OF SECTION

SECTION 01 33 00: SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SCOPE OF WORK

A. The work to be performed under this Section shall include the compilation and submittal of all required shop drawings, manufacturer's cuts, specifications, and certifications of all materials and equipment for the Owner’s Representative’s approval. Actual product samples may also be required as stipulated in the technical specifications sections.

B. All submittals shall be submitted within four (4) weeks after the award of the contract and may be made and distributed digitally with the approval of the Owner via email.

1.03 GENERAL SUBMITTAL PROCEDURES

A. The Owner’s Representative has 10 days to review the submittals and return them to the Contractor, also in PDF format.

B. Transmittal: Include a transmittal with each submittal identifying the item clearly. All transmittals shall coordinate with these Specifications.

PART 2 – PRODUCTS

2.01 REQUIREMENTS

A. References are made throughout the Specifications and Drawings where submittals are required. All finishes, colors, and patterns are to be reviewed and approved by submittal or field sample.

B. Where the Contractor's intention is to furnish the materials or equipment as specified, a list of all such elements, by Specification section, shall accompany the submittals so that the entire submittal is complete for the project.

PART 3 – EXECUTION

3.01 SUBMISSIONS

A. Submit all documents digitally with the approval of the Owner. Include a Table of Contents of the material for reference. The submittal is to be entire and complete, addressing all furnishings and installation.

B. Submit all required product or material samples concurrent with the materials/equipment information manuals described above. Each submittal shall reference its appropriate specification section, part and paragraph.

END OF SECTION

SECTION 01 56 00: TEMPORARY BARRIERS & ENCLOSURES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 GENERAL REQUIREMENTS

A. All references to products by manufacturer, trade name, or performance specifications bearing the connotation "or approved equal" shall be as determined by the Owner's Representative and the Town, per MGL c. 30 s. 39M, Part b, Criteria 1.

1.02 WORK INCLUDED

A. Provide all labor, equipment, implements and materials required to furnish, install, construct and perform all site improvements complete as shown on the Contract Drawings and specified herein; to include, but not be limited to the following:

1. Temporary Construction Perimeter Fencing
2. Tree or Plant Protection Fencing as indicated on the Contract Drawings
3. All other temporary barriers and controls needed for protection of the public during construction.

1.03 REFERENCES

A. Examine all other Sections of the Specifications and all Drawings for the relationship of the work under this Section and the work of other trades. Cooperate with all trades and all departments of the Town and coordinate all work under this Section therewith.

B. The following related items are included under the Sections listed below:

1. Division 01 Section: TEMPORARY EROSION & SEDIMENT CONTROL
2. Division 01 Section: PROJECT SIGNS
3. Division 02 Section: SITE PREPARATION & DEMOLITION
4. Division 31 Section: EARTH MOVING
5. Division 31 Section: SITE CLEARING
6. Division 32 Section: PLANTING
7. Division 32 Section: TURF & GRASSES

1.04 SUBMITTALS

A. Shop Drawings and Samples

1. Provide complete Shop Drawings and/or samples and catalog cuts for all items called for on the Drawings and as specified and in accordance with applicable requirements under Division 01.

1.05 PRODUCT DELIVERY, STORAGE & HANDLING

A. Deliver materials in manufacturer's original unopened and undamaged packages with labels legible and intact.

B. Store materials in unopened packages in a manner to prevent damage from the environment and construction operations.

C. Handle in accordance with manufacturer's instructions.

D. The Contractor shall be solely responsible for all materials stored on the site once delivered. Any materials left unsecured at the job site shall be solely at the contractor's own risk.

1.06 DEFINITIONS

A. The following items are included herein and shall mean:

1. NCLMA: National Chain Link Manufacturers' Association
2. OSHA: Occupational Safety and Health Act.

PART 2 – MATERIALS

2.01 BARRIERS AND BARRICADES

A. Provide barriers to prevent unauthorized entry to construction areas to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations.

1. Comply with standards and code requirements for erection of structurally adequate barriers.
2. Install barriers of a neat and uniform appearance.
3. Provide graphics and signs warning of the hazard being protected against.
4. Where appropriate and needed provide lighting, including flashing red or amber lights.
5. Provide barriers at public rights-of-way and for public access to existing buildings when adjacent to construction operations.

B. Provide barricades with blinking beacon light at all open trenches and other excavations.

C. Provide protection as specified in Division 32 Section, PLANTING for plants designated to remain.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

2.02 TEMPORARY CONSTRUCTION FENCING

A. Prior to any excavation work the Contractor shall provide temporary construction fencing as shown on the Drawings and/or as required to completely protect the work area and injury to persons or property.

B. The Contractor shall furnish and install temporary fencing of the following type in all areas where existing fencing lengths are inadequate to enclose the construction.

1. Chain link fencing, six feet high minimum, fabricated from No. 9 gauge galvanized wire woven in a 2-inch diamond mesh with top salvage and having galvanized steel H or pipe intermediate and terminal posts. Post spacing shall not exceed eight feet on center. Cross bracing, reinforcing gates and other parts of fencing shall conform to standard Specifications of the National Chain Link Manufacturers Association. All posts shall be set into temporary concrete footings or on temporary chain link fencing stands as approved by the Owner's Representative.

C. The contractor shall furnish and install matching gates equipped with suitable locks, other hardware, and, where necessary, provide access for construction apparatus or fire-fighting equipment. The Owner shall be provided with a copy of the key used for all locks.

2.03 TEMPORARY WORK IN PUBLIC WAYS

A. Prior to commencing any work in public ways and other areas which are legally used by vehicles or pedestrians, the Contractor shall submit in writing the proposed methods of protection to the Official. Work shall not be commenced in these areas until written approval is received from the Official.

B. In general, all excavations in public ways shall be protected by substantial barriers which will offer complete protection against accidents for pedestrian and vehicular traffic without interrupting the normal flow of traffic. All barriers must be properly lighted with electric- or battery-powered safety lights and must be maintained in good working order by the Contractor for the duration of the time

such barriers are required.

C. Trenches across sidewalks shall be completely covered with a temporary walkway, comprised of properly supported nominal 2-inch thick lumber laid with butt joints and covered with exterior grade plywood, one-half of an inch minimum thickness. Provide continuous 2 inch by 4 inch (nominal) rails and posts secured to the temporary walkway conforming to the requirements of the Occupational Safety and Health Act (OSHA).

D. Wherever temporary chutes are to be extended over sidewalks or other pedestrian or vehicular traffic areas, the bottom and sides of the chutes shall be provided with continuous dustproof and weatherproof lining, applied to the exterior surfaces.

E. The Contractor will be required to furnish, install, and maintain in good condition, at no increase in Contract Price or Contract Time, all other safety measures which in the judgment of the Official are required to protect the public from accidents due to work performed under this Contract. This requirement is supplementary to the Contractor's rights and obligations to provide and employ safety measures as s/he may deem necessary or as may be required by law or standard safety practices.

2.04 TREE PROTECTION FENCING

A. See Division 31 Section, SITE CLEARING for tree protection fencing requirements.

1. Stake or spray layout of all proposed work under the driplines of existing trees for approval before beginning construction. Install fencing over the greatest extent feasible within the driplines of the trees, allowing for the work.
2. Maintain fencing in sound condition until project completion. Do not relocate installed fencing without the express approval of the Owner’s Representative or Owner.

PART 3 – EXECUTION

3.01 BARRIERS, BARRICADES & ENCLOSURES

A. Install temporary items as specified herein and in the Drawings or, where not specified, to level of quality suitable for the intended purpose as judged by the Owner’s Representative.

3.02 REMOVAL OF TEMPORARY BARRIERS, ENCLOSURES & PROTECTIONS

A. Remove temporary barriers, barricades, fencing, enclosures and protections as warranted by the progress of the Work and prior to Substantial Completion.

B. Remove in-ground elements of all temporary barrier installations (if any) completely. Grade site as noted.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition at start of work or as specified elsewhere in the Contract Documents.

END OF SECTION

SECTION 01 57 13: TEMPORARY EROSION & SEDIMENT CONTROL

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SUMMARY

A. Provide all work and take all measures to control soil erosion resulting from construction operations, prevent flow of sediment from construction site, and contain construction materials (including excavation and backfill) within protected working area as to prevent damage to any stream or wetlands.

1. Compost filter sock
2. Drain inlet protection
3. Dust control
4. Erosion control blankets for graded slopes of 3:1 and steeper

1.03 REFERENCE

A. The Contractor is responsible for ensuring that all work conducted at the Site, including but not limited to sediment and erosion control, complies with the Town Regulations. In addition, all work shall be conducted in accordance with "Processes, Procedures and Methods to Control Pollution Resulting from all Construction Activity", published by the United States Environmental Protection Agency.

1.04 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Division 01 Section, SUBMITTAL PROCEDURES:

1. Two weeks prior to the start of the work, submit to Owner’s Representative, for review, a plan with detailed sketches showing the proposed methods to be used for controlling erosion during construction.

1.05 QUALITY ASSURANCE

A. Use acceptable procedures, including use of water diversion structures, diversion ditches, settling basins, and sediment traps.

B. Operations restricted to areas of work indicated on drawings and area which must be entered for construction of temporary or permanent facilities.

C. If construction materials are washed away during construction, remove materials from fouled areas.

D. Stabilize diversion outlets by means acceptable to Owner’s Representative.

E. Owner’s Representative has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations and to direct immediate permanent or temporary pollution control measures to prevent contamination of any stream or wetlands, including construction of temporary berms, dikes, dams, sediment basins, sediment traps, slope drains, and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion.

PART 2 – PRODUCTS

2.01 FILTER TUBE

A. Filter tube shall consist of biodegradable mesh tube filled with wood chips or compost. Filter tube shall be 12-inch diameter. Tubes shall be manufactured by Filtrexx, Silt Sock, or an approved equal.

1. Stakes shall be hardwood.

2.02 INLET PROTECTION

A. Inlet protection for catch basin protection shall be Silt Sack or an approved equal.

2.03 DUST CONTROL MEASURES

A. If the Owner's Representative or Owner decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed herein.

B. Calcium Chloride

1. Calcium chloride shall conform to the requirements of AASHTO-M 144, Type I or Type II and Specification for Calcium Chloride, ASTM D98. The calcium chloride shall be packaged in moisture proof bags or in airtight drums with the manufacturer, name of product, net weight, and percentage of calcium chloride guaranteed by the manufacturer legibly marked on each container.

2. Calcium chloride failing to meet the requirements of the aforementioned specifications or that which has become caked or sticky in shipment, may be rejected by the Owner's Representative.

C. Water shall not be brackish and shall be free from oil, acid, and injurious alkali or vegetable matter.

2.04 EROSION CONTROL BLANKETS

A. Erosion control blankets shall be used on newly graded slopes that are equal to or steeper than a 3:1 slope.

B. Blankets shall be 100% biodegradable woven from machine-twisted bristle coir twines. Blankets shall be BioD-Mat 40, as manufactured by RoLanka International, Inc. of Stockbridge, Georgia, or an approved equal.

PART 3 – EXECUTION

3.01 GENERAL

A. Do not discharge chemicals, fuels, lubricants, bitumen, raw sewage, and other harmful waste into or alongside any body of water or into natural or man-made channels.

3.02 GENERAL INSTALLATION PROCEDURES

A. In the event that sedimentation or siltation prevention measures used by the Contractor prove to be inadequate the Contractor shall be required to adjust their operations to the extent necessary to prevent such sedimentation or siltation from occurring. Any damage or degradation caused by inadequate controls must be restored by the Contractor at no additional cost to the Owner.

B. All sedimentation and erosion control measures shall be in accordance with all permits, regulatory requirements, plans and specifications.

C. Straw wattle and inlet protection shall be installed prior to the start of construction activities. Locate sedimentation barriers, surrounding stored material, approximately 6 feet from material.

D. The Contractor shall keep all drains clear of mud, silt, debris, or other objectionable materials resulting

from construction operations.

E. The Contractor shall minimize the amount of bare earth exposed at any one-time during construction and minimize the length of time bare earth is exposed.

F. Baled hay and filter materials shall be placed to form temporary water stops, dams, diversions, dikes, berms, and for other uses connected with water pollution control. As directed by the Owner's Representative bales may be disposed by the Contractor as best suits field conditions and requirements.

G. Additional erosion control in the form of hay bales, filter tube, silt fence, etc. shall be employed by the Contractor as required to prevent erosion of topsoil or other materials.

H. Install sedimentation barriers in all locations as directed, surrounding base of all deposits of stored excavated material outside of disturbed area, and where directed by the Owner's Representative.

I. Construct earth berms or diversions to intercept and divert runoff water from critical areas.

J. Protect catch basins from sedimentation by installing straw wattle around the basin or siltation fabric under grating casting.

K. Discharge silt-laden water from excavations onto filter fabric mat and/or straw wattle or sediment traps to ensure that only sediment-free water is returned to waterways.

L. Do not place excavated soil material adjacent to waterway in manner that will cause it to wash away by high water or runoff.

M. Prevent damage to vegetation by excessive watering or silt accumulation in the discharge area.

N. Do not dump spoiled material into any salt marsh, streams, wetlands, surface waters, or unspecified locations.

O. Prevent indiscriminate, arbitrary, or capricious operation of equipment in streams, wetlands, or surface waters.

P. Do not pump silt-laden water from trenches or excavations into salt marsh, surface waters, streams, wetlands, or natural or man-made channels leading thereto.

Q. Prevent damage to vegetation adjacent to or outside of construction area limits.

R. Do not dispose of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, wash-water from concrete trucks or hydroseeders, or any other pollutant in streams, wet-lands, surface waters, or natural or man-made channels leading thereto, or unspecified locations.

S. Do not alter flow line of any stream unless indicated or specified.

T. Erosion control shall be reviewed regularly to keep in good condition especially following any rain events.

U. Clean and dispose of debris from sedimentation barriers on a weekly basis.

V. Upon completion of work and upon approval of Owner's Representative, remove and dispose of sedimentation barriers.

3.03 FILTER TUBE INSTALLATION

A. Compost filter tube may be place on bare soil, grass, erosion control blankets, or paved surface.

B. Install perpendicular to storm water flow, across slope, swale, ditch, or channel.

C. Anchor to the ground using a 2-inch by 2-inch (nominal) 36-inch long hardwood post every 10 feet on center. Under concentrated flow conditions stake posts every 5 ft. on center.

D. Stakes shall be driven through the center of the Filter Tube and installed a minimum of 12 inches into the existing soil.

E. Edges of the Filter Tube shall be turned upslope to prevent flow around the ends of the Filter Tube.

F. For 2:1 slopes additional Tubes may be placed every 20-50 feet along the slope to further reduce erosion.

G. 12-inch Filter Tubes may be used for stormwater ditch checks and small channels (additional staking required, every 4 feet on center).

H. Installed height of the Filter Tube in the field shall be 12-inch diameter equals effective height of 9.5 inches.

I. Routinely inspect Compost Filter Tube after installation and runoff events to ensure adequate hydraulic flow-through, proper function and performance. Sediment should be removed once it reaches half the height of the Filter Tube.

J. Contractor shall removal Filter Tube only upon Substantial Completion or approval by Owner's Representative. Unless otherwise directed by Owner's Representative or Owner, compost tubes can be emptied, compost spread on site, and tube disposed of offsite.

3.03 INLET PROTECTION

A. Follow manufacturer's directions for installation.

3.04 EROSION CONTROL BLANKET

A. Follow manufacturer's directions for installation.

3.05 DUST CONTROL MEASURES

A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Owner's Representative or Owner decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed herein.

B. Application

1. Calcium chloride shall be applied when ordered by the Owner's Representative or Owner's Representative and only in areas which will not be adversely affected by the application.

2. Calcium chloride shall be uniformly applied at the rate of 1-1/2 pounds per square yard or at any other rate as directed by the Owner's Representative. Application shall be by means of a mechanical spreader, or other approved methods. The number and frequency of applications shall be determined by the Owner's Representative and Owner's Representative.

3. Water may be sprinkler applied with equipment including a tank with gauge- equipped pressure pump and a nozzle-equipped spray bar.

4. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

END OF SECTION

SECTION 01 71 23: CONSTRUCTION LAYOUT

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SCOPE OF WORK

A. The work under this section shall consist of field staking the horizontal and vertical alignment of all essential features and proposed work, including trails, steps, boardwalk and other related features as shown on the plans, by a Massachusetts-registered Professional Engineer or Land Surveyor. The Contractor shall familiarize himself with the existing conditions and shall be responsible for locating or re-establishing survey field ties, property lines, and benchmarks indicated on the plans.

PART 2 – MATERIALS

2.01 LAYOUT & STAKING

A. The Contractor shall be responsible for furnishing all stakes, pins, and grade markings as required to implement the work of layout and staking and shall make all field adjustments ordered by the Owner's Representative at no extra cost to the Owner.

B. Upon request by the Owner's Representative, the Contractor shall make available to the Owner survey instruments and operator necessary to check the proposed vertical and horizontal alignments at no extra cost.

PART 3 – EXECUTION

3.01 SURVEY LAYOUT

A. The Contractor shall use the alignments shown on the plans to establish the layout of all proposed features and shall perform field adjustments as ordered by the Owner's Representative.

B. All layout shall be by the dimensions noted on the Contract Drawings. Do not scale directly from the plans. If clarification regarding a dimension or intended layout procedure is required, contact the Owner's Representative.

C. All dimensions marked on the Drawings with "+/-" or "(Confirm)" or "Verify in Field" are intended for confirmation of conformance to the expected conditions and (where applicable) that acceptable slopes and clearances are provided. Once layout has been established using other dimensions, the Contractor shall verify these dimensions (to within a tolerance of 1/2") and report any discrepancy to the Owner's Representative for acceptance or instruction regarding adjustment. These confirmation dimensions should not be used to layout elements.

D. The Surveyor shall lay out the essential or necessary grades and locations of site furnishings, footings, pavements, utilities, structures, and other proposed elements. The surveyor shall verify the location of any existing spikes, stakes, pipes, drill holes, etc. and shall be responsible for their accuracy. Proposed features shall be located in relation to dimensions shown on the drawings and as adjusted by the Owner's Representative.

E. The Contractor shall inform the Owner's Representative when the general layout is completed and shall not begin excavation until the Owner's Representative approves the various alignments. Any discrepancies encountered in field conditions shall be reported to the Owner's Representative immediately and shall be adjusted as directed.

F. The Contractor shall be responsible for maintaining the correct vertical and horizontal alignment of all elements, which responsibility shall not be waived by the Owner’s Representative's approval of basic layout and stakeout.

END OF SECTION

SECTION 01 78 00: CLOSEOUT DOCUMENTATION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SCOPE OF WORK

A. The work to be performed under this Section shall include the compilation and submittal of all required maintenance manuals, maintenance and repair products, warranty information, detailed procedures, product information, submittal records, as-built drawings, and certifications of all materials and equipment for the Owner's Representative's approval. Additional submissions may also be required as stipulated in the technical specification sections.

B. Upon Final Completion of all construction, the contractor shall submit: PDF of the as-built drawings and maintenance manual for floating boardwalk.

C. The Town will not issue the final check for park retainage until the submittal and approval of the maintenance manual and as-built drawings.

PART 2 – SUBMITTALS

2.01 MAINTENANCE MANUAL

A. The Maintenance shall be in the form of a PDF file organized, and tabbed into appropriate sections, and shall include the following items:

1. Floating boardwalk

2.02 AS-BUILT DRAWINGS

A. As-Built drawing shall be a complete and accurate record that incorporate any and all changes to the construction plan set issued at the time of contract initiation. As- built drawings shall be clearly marked and annotated and shall include but not be limited to all field changes, change orders, and supplemental drawings provided by the Owner's Representative.

B. As-Built Drawings shall include complete records of all water, drainage, and electric utilities installed, including sizing, location, and inverts of all drainage pipes and structures, and sizing and location of all water service lines and electrical conduits.

PART 3 – EXECUTION

3.01 SUBMISSIONS

A. Submit all documents and data in a collated, manual format. Include a Table of Contents of the material for reference. The submittal is to be entire and complete, addressing all requirements listed above.

END OF SECTION

SECTION 02 41 00: SITE PREPARATION & DEMOLITION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SUMMARY

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to prepare the site, complete, as indicated on the Contract Documents, as specified, and as follows:

1. Protection of existing structures and utilities
2. Protection of sidewalks and park pathways
3. Salvage, stockpile on-site, and reuse materials
4. Salvage materials and stockpile off-site
5. Removal and disposal of materials
6. Temporary construction fencing

1.03 RELATED WORK UNDER OTHER SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:

1. Division 01 Section: TEMPORARY EROSION & SEDIMENT CONTROL
2. Division 31 Section: EARTH MOVING
3. Division 31 Section: SITE CLEARING

1.04 REFERENCES

A. The following standards shall apply to the work of this Section.

1. Massachusetts Department of Transportation (MassDOT): Standard Specifications for Highways and Bridges

1.05 PROTECTION

A. Do not interfere with use of adjacent residences or facilities. Maintain free and safe passage to and from adjacent buildings and facilities or both and between them and the public way.

B. The Contractor shall be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the discontinuance or interruption of all public and private utilities or services.

C. Cease operations and notify Owner immediately if safety of adjacent structures, workers, or the general public appears to be endangered. Take precautions to properly support structures and protect workers and general public. Do not resume operations until safety is restored.

D. Prevent movement, settlement or collapse of adjacent services, sidewalks, driveways, and trees. Assume liability for such movement, settlement, or collapse. Promptly repair damage at no cost to the Owner. Furnish, erect, and maintain fences, planking, bracing, shoring, sheathing, lights barricades, warning signs, and guards as necessary for the protection of streets, sidewalks, and adjoining property.

E. Trees that are damaged during construction shall be removed by the Contractor at their expense if instructed to do so by the Owner's Representative, and the Contractor shall pay the Town of Natick for each tree judged by a Massachusetts Certified Arborist to be significantly damaged or injured, whether or not it is removed.

1.06 GENERAL REQUIREMENTS

A. The Contractor shall secure a DIG SAFE permit number for the project to certify notification of gas, electrical and telephone utilities. All other affected utilities shall be contacted by the Contractor who shall secure notification receipts in accordance with requirements of Massachusetts law. The phone number is 811. Contractors shall notify "Dig Safe" of contemplated excavation, demolition, or explosive work in public or private ways, and utility company right-of-way or easement. This notification shall be made at least 72 hours prior to the work, but not more than sixty days before the contemplated work. Such notice shall set forth the name of the street or the route number of said way and an accurate description of the location and nature of the proposed work. The Owner's Representative requires that the notification be sent to "Dig Safe" by certified mail, with copies to the Owner. The Architect requires a copy of the signed receipt of the delivery. "Dig Safe" is required to respond to the notice within 72 hours from the time said notice is received by designating at the locus the location of pipes, mains, wires, and conduits. Contractor shall not commence work until "Dig Safe" has responded as noted above. The work shall then be performed in such a manner, and with reasonable precaution taken to avoid damage to utilities under the surface in said areas of the work.

1. See Division 01 Section: PERMITS and Division 01 Section: ADMINISTRATIVE AND PROCEDURAL PROVISIONS FOR ADDITIONAL REQUIREMENTS.

B. The Contractor shall, prior to any removal of rubbish or debris from the site, furnish written evidence satisfactory to the Owner's Representative that he has an approved dumping location for debris and/or spoil form his removals and excavation activities.

C. On-site cleaning of materials for the purpose of salvage on the site shall not be permitted.

D. The Contractor shall secure all necessary permits from the Town of Natick before starting this project.

E. The Town of Natick shall have the right of first refusal on all removed materials, at the direction of the Owner's Representative. All materials refused by the Town shall become the property of the Contractor.

F. For all earthwork, excavation, and removals within the driplines of protected trees (not limited to areas within designated tree protection fencing), the Owner's Representative must be present on the site or have specifically waived that obligation. Provide 48 hours' notice prior to commencement of all such work.

PART 2 – PRODUCTS

2.01 TEMPORARY CONSTRUCTION FENCING

A. Temporary construction fencing shall be provided and paid for under as specified under Division 01 Section, TEMPORARY BARRIERS & ENCLOSURES.

B. Site protection fencing shall include installation and maintenance. Installation shall be suitable to withstand the duration of the project. The Contractor shall be responsible for maintaining the site protection fence in good order and if necessary, must make any adjustments immediately to ensure site safety. The Contractor shall be responsible for maintaining a clean work site including debris, trash, and vegetative material removal along the temporary fence line throughout the duration of the project.

PART 3 – EXECUTION

3.01 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. Existing structures, monuments, vegetation, fencing, and utilities not designated to be removed shall be suitably protected from damage, including but not limited to existing pavements and curbs, site walls, lighting, fencing, concrete vault, manholes, and utility lines.

B. Provide and install erosion and sedimentation control at all existing catch basins, manholes and all other utility structures as identified on the drawings. Protect public right-of-way from the entry of erosion and construction debris.

3.02 REMOVAL AND DISPOSAL OF MATERIALS

A. Materials indicated on the Contract Documents or designated by the Owner's Representative in the field to be removed shall be dismantled, removed, and legally disposed of off-site as indicated on the Contract Documents and as specified, performed, and paid for in this SECTION, SITE PREPARATION. Removals include but are not limited to the following:

1. Existing logs, cribbing, and brush, as directed by Owner's Representative

B. Material resulting from the site preparation work and not scheduled to be salvaged and which is unsuitable for reuse on the project, shall become the property of the Contractor and shall be legally disposed of off-site.

C. Debris, rubbish, and other material shall be disposed of promptly and shall not be left until final cleanup of site.

D. Existing site structures indicated on the Contract Documents to be removed, shall be completely dismantled and removed from the site.

E. Sawcut pavements at the limits shown on the drawings prior to demolition.

F. Removal of concrete walkways shall include subbase material. Park pathways may have varying "subbase" materials (ex. asphalt over concrete, which may be reinforced with rebar, over gravel) as some pathways were previously overlaid. Contractor shall be responsible for removing materials to stable subbase.

3.03 EROSION CONTROL

A. The Contractor shall comply with Town of Natick regulations and shall plan and execute all operations, particularly those associated with excavation and backfilling, in such a manner as to prohibit excavated and exposed fill or other foreign material to be washed or otherwise carried into streets, drains, or waterways. The water quality of storm drains shall not be degraded due to construction operations.

B. In the event that sedimentation or siltation prevention measures used by the Contractor provide to be inadequate the Contractor shall be required to adjust their operations to the extent necessary to prevent such sedimentation or siltation from occurring. Any damage or degradation caused by inadequate controls must be restored by the Contractor at no additional cost to the Owner.

C. The Contractor shall keep all drains clear of mud, silt, debris, or other objectionable materials resulting from construction operations.

D. The Contractor shall minimize the amount of bare earth exposed at any one time during construction and minimize the length of time bare earth is exposed.

E. Baled hay and filter materials shall be placed to form temporary water stops, dams, diversions, dikes, berms, and for other uses connected with water pollution control. As directed by the Owner's Representative bales may be disposed by the Contractor as best suits field conditions and requirements.

F. Sediment-laden water that is being pumped from trenches or excavations shall not be pumped directly into storm drains or water courses. Sedimentation tanks or other means acceptable to the Owner's Representative shall be used for this purpose.

G. All sedimentation and erosion control measures shall be in accordance with all permits, regulatory requirements, plans and specifications.

H. Inlet protection shall be installed prior to the start of construction activities.

I. Additional erosion control in the form of hay bales, filter tube, silt fence, etc. shall be employed by the Contractor as required to prevent erosion of topsoil or other materials.

J. Erosion control shall be reviewed regularly to keep in good condition especially following any rain events.

3.04 PROTECTION OF EXISTING TREES & VEGETATION

A. The Contractor shall make every effort not to damage existing plant materials to remain. The Contractor is required to install protection as necessary to assure undamaged plant material and adjacent conditions.

B. Vehicles shall not be parked within the dripline or where damage may result to trees to be saved. Construction materials shall not be stored beneath trees to be saved.

C. Repair/replace vegetation that is damaged at no additional cost to Owner. Employ certified arborist to repair damaged trees.

D. No dumping of any kind shall occur under the dripline of trees or shrubs to remain.

END OF SECTION

SECTION 05 05 13: FACTORY-APPLIED COATINGS FOR METAL

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 REFERENCES

A. The following standards shall apply to the work of this Section.

1. American Society for Testing and Materials (ASTM):
   - A90/A90M Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc Alloy Coatings
   - A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   - A153/A153M Standard Specification for Zinc Coating (Hot-dip) on Iron and Steel Hardware
   - A307 Standard Specification for Carbon Steel Bolts, Studs and Threaded Rod 60,000 PSI Tensile Strength
   - A385 Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
   - A 500/A500M Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
   - A780 Standard Practice for Repair of Damaged and Uncoated Areas of hot-Dip Galvanized Coatings
   - A900/A900M Standard Test Method for Lamination Factor of Amorphous Magnetic Strips
   - A1011/A1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Allow, High Strength Low-Alloy with Improved Formability and Ultra-High Strength
   - B6 Standard Specification for Zinc
   - B117 Standard Practice for Operating Salt Spray (Fog) Apparatus
   - D522 Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings
   - D523 Standard Test Method for Specular Gloss
   - D2244 Standard Practice for Calculation of Color Tolerances and Color Differences form Instrumentally Measured Color Coordinates
   - D2794 Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
   - D3359 Standard Test Methods for Rating Adhesion by Tape Test
   - D3363 Standard Test Method Film Hardness by Pencil Test
   - D4214 Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
   - D4585 Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation
   - D4798 Standard Practice for Accelerated Weathering Text Conditions and Procedures for Bituminous Materials (Xenon-Arc Method)
   - F1083 Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
2. Society for Protective Coatings (SSPC):
   - QP 3 Qualification Procedure: Paint Shops
   - PA 2 Paint Application: Determining Compliance to Required DFT
   - SP 1 Surface Preparation: Solvent Cleaning
   - SP 7 Surface Preparation: Brush-off Blast Cleaning
   - SP 8 Surface Preparation: Pickling
3. Federal Standard 595B: U.S. Government Federal Standard Paint Colors
4. American Welding Society (AWS):
   - D1.1 Structural Welding Code

5. Massachusetts Department of Transportation (MassDOT): Standard Specifications for Highways and Bridges

1.03 SECTION INCLUDES

A. This Section specifies factory-applied metal coatings including the following:

1. Hot-dip galvanizing for exterior steel fabrications:
a. Steel handrails

1.03 RELATED WORK UNDER OTHER SECTIONS

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Division 32 Section: SITE IMPROVEMENTS

1.04 SUBMITTALS

A. Product Literature: Submit galvanizer’s product literature for coatings specified in this Section indicating type of product and performance criteria.

B. Submit manufacturer's product data and certification for the following:

1. Galvanizing certification

C. Verification Samples: Submit two (2) 3-inch x 6-inch samples of factory-applied coatings and colors proposed for use for approval prior to coating application.

D. Certificate of Compliance for Items Coated by Galvanizer: If requested, submit notarized Certificate of Compliance with application for payment for galvanizing, signed by the galvanizer, indicating compliance with requirements of specifications. Include scope of services provided, and quantity and itemized description of items processed.

E. Certificate of Compliance for Shop Drawing Review by Galvanizer: If requested, submit galvanizer's certification that shop drawings for metal fabrications to receive metal coatings have been reviewed and that fabrications are acceptable to galvanizer for proper application of galvanizing and metal coatings. All drawings should be signed by the galvanizer to indicate acceptance of design for galvanizing.

F. Certificate of Compliance of Item Identification by Galvanizer: The galvanizer shall mark all lots of material with a clearly visible tag indicating the name of the galvanizer, the type and weight of the coating, and the applicable ASTM Specification Numbers. If requested, submit certification of compliance that items have been tagged.

G. Galvanizer/applicator shall supply a certificate of compliance that all coatings have been performed in accordance with SSPC Qualification Procedure Standard QP 3: Qualification of Paint Shops.

1.05 QUALITY ASSURANCE

A. Galvanizer: Engage the services of a qualified galvanizer who has demonstrated a minimum of ten years’ experience in the successful application of galvanized coatings specified in this specification in the facility where the work is to be performed and who will apply the coatings within the same facility.

B. Coordination between Fabricator and Galvanizer: Prior to fabrication and final submittal of shop drawings to Architect, direct fabricators to submit shop drawings to the galvanizer for all metal fabrications to receive factory-applied metal coatings. Direct galvanizer to review fabricator's shop drawings for suitability of materials for galvanizing and coatings and coordinate any required modifications to fabrications required to be performed by the fabricator.

C. Rugosity: Factory-applied metal coatings shall exhibit a rugosity (smoothness) not greater than 4 rug (16-20 microns of variation) when measured by a profilometer over a 1 inch straight line on the surface of architectural and structural elements that are less than 24 pounds per running foot. Profilometer shall be capable of operating in 1 micron increments. Surface blasting prior to application of factory-applied post galvanizing wet coatings will produce a high rugosity and not be acceptable.

D. Galvanizing shall be performed by a company with a minimum of ten years' experience in the successful application of hot-dip galvanizing utilizing the dry kettle process.

1.06 GUARANTEE

A. The Contractor shall furnish and deliver standard written manufacturer's guarantee in Owner's name covering all materials and workmanship under this Section, SITE METAL FURNISHINGS.

1. The warranties shall be as follows:
   a. Galvanization: 20-year warranty against rust

PART 2 – PRODUCTS

2.01 COATING APPLICATOR

A. Coating Applicator: For the purpose of establishing a standard of quality and performance, provide factory-applied metal coatings by Duncan Galvanizing, 69 Norman Street, Everett, MA, (617) 389-8440, www.duncangalvanizing.com; or, approved equal.

2.02 GALVANIZING – GENERAL

A. All site improvements, hardware, attachments or other specified steel elements to be galvanized shall conform to the following specifications.

B. Prior to galvanizing, all specified metal items shall be cleaned (pickled) in accordance with SSPC-SP 8: Paint Shops. Cleaning shall remove all rust, scale, and coating surface must be clean, dry, undamaged and free of all loose rust, dirt, grease, or other contaminants including salt deposits. Specified metal items calling for galvanizing shall be hot-dipped galvanized after fabrication and chromated after galvanizing by dipping in a 0.15 percent chromic acid solution. Galvanizing bath shall contain 0.05 – 0.09 percent nickel. Galvanize all ferrous fasteners, clips, sleeves, anchors and accessories in contact with galvanized items.

C. Galvanizing shall comply with ASTM A123M, A153/A153M, A385 as applicable.

D. All galvanized materials shall be inspected for compliance with these specifications and marked with a stamp indicating the name of the galvanizer, the ASTM Specification and the weight of the zinc coating in ounces per square foot.

E. Items to be galvanized shall be galvanized after fabrication. Where size of assembly is too large for complete unit galvanizing, these assemblies shall be galvanized prior to fabrication, in as large sections as practical and then only with the written approval of the Architect.

F. Touch-Up and Repair: For damaged and field welded zinc-coated surfaces, clean welds, bolted connections and abraded areas.

G. Following galvanizing, each item shall receive surface grinding to remove lumps, sags or spikes resultant from the galvanizing process. The finished surface following grinding shall be hand smooth and without irregularities. Take care not to damage the galvanized surface coating.

PART 3 – EXECUTION

3.01 APPLICATION OF FACTORY-APPLIED METAL COATINGS

A. Galvanizing Application: Galvanize materials in accordance with specified standards and this specification. Galvanizing shall provide an acceptable substrate for applied coatings. The dry kettle process shall be used to eliminate any flux inclusions on the surface of the galvanized material.

B. Prior to galvanizing, the steel shall be immersed in a pre-flux solution (zinc ammonium chloride). The pre flux tank must be 12 to 14 Baumé and contain less than 0.4 percent iron. The wet kettle process shall be prohibited.

A. To provide the galvanized surface required, the following procedures shall be implemented:

1. A monitoring recorder shall be utilized and inspected regularly to observe any variances in the galvanizing bath temperature.
2. The pickling tanks shall contain hydrochloric acid with an iron content less than 8 percent and zinc content less than 3 percent. Titrations shall be taken weekly at a minimum.
3. All chemicals and zinc shall be tested at least once a week to determine compliance with ASTM standards. All testing shall be done using atomic absorption spectrometry or x-ray fluorescence (XRF) equipment at a lab in the galvanizing plant.

3.02 INSTALLATION

A. Installation: Comply with fabricator's and galvanizer's requirements for installation of materials and fabrications, including use of nylon slings or padded cables for handling factory-coated materials.

B. Touch-Up and Repair: For damaged and field-welded metal coated surfaces, clean welds, bolted connections and abraded areas.

1. For galvanized surfaces, apply organic zinc repair paint complying with requirements of ASTM A 780, modified to 95 percent zinc in dry film. Galvanizing repair paint shall have 95 percent zinc by weight, ZiRP by Duncan Galvanizing. Thickness of applied galvanizing repair paint shall be not less than coating thickness required by ASTM A 123 or A 153 as applicable. Touch-up of galvanized surfaces with silver paint, brite paint, or aluminum paints is not acceptable.

3.03 ACCEPTANCE

A. Rails shall form a continuous smooth line parallel with the grade unless otherwise described on the Contract Documents.

B. All posts shall be plumb and cut to the same height above grade.

C. Railings will be rejected by the Owner’s Representative for the following reasons:

1. Welders were not qualified under or did not perform work in accordance with AWS "Standard Qualification Procedure".
2. Fabricated items show metal pieces that were not accurately saw cut and were not fitted together. Gaps, spaces, voids, breaks and crooks in arris lines, humps, bumps, sags, and saddles are present.
3. Sections are not well formed and do not meet the shapes and sizes indicated on the Contract Documents.
4. Horizontal or vertical curves do not meet the shapes and profiles shown on the Contract Documents. Curves that have broken backs, sags, saddles, tangents or kinks shall be rejected.
5. Exposed surfaces do not have a smooth finish and show surface differentiation and variation. Edges show nicks, grind marks or machine marks.
6. Welds are not continuous extending for the entire length of the joints.
7. Welds are not ground smooth.
8. The presence of flux deposits.
9. Welds are not water tight.
10. Connections are not full seam welded, not ground flush and smooth.

END OF SECTION

SECTION 05 60 00: SITE METAL FURNISHINGS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SUMMARY

A. The work of this Section consists of providing all shop drawings, labor, equipment, materials, incidental work, and construction methods necessary to furnish and install all site metal fabrications and related items as indicated on the Contract Documents, as specified in this Section, and includes, but is not limited to, the following:

1. Galvanized steel handrails

1.03 RELATED WORK UNDER OTHER SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:

1. Division 05 Section: FACTORY-APPLIED COATINGS FOR METALS
2. Division 32 Section: SITE IMPROVEMENTS

1.04 REFERENCES

A. The following standards shall apply to the work of this Section:

1. Massachusetts Department of Transportation (MassDOT): Standard Specifications for Highways and Bridges
2. ASTM: American Society for Testing and Materials

A 36/36M	Carbon Structural Steel
A 53/53M	Pipe, Steel, Black and Hot-dipped, Zinc-coated
A 108	Steel Bars, Carbon cold Finished, Standard Quantity
A 123/123M	Zinc (Hot-dip galvanized) Coatings on Iron and Steel Products
A 153/153M	Zinc Coating (Hot-dip) on Iron and Steel Hardware
A 193/193M	Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service
A 276	Stainless Steel Bars and Shapes.
A 307	Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength
A 312/312M	Seamless and Welded Austenitic Stainless Steel Pipes
A 385	Standard Practice for Providing High-Quality Zinc Coatings (Hot- Dip)
A 500	Cold-formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
A 536	Standard Specification for Ductile Iron Castings
A 510	Wire rods and coarse Round Wire, Carbon Steel

3. AISI: American Iron and Steel Institute

AISI 304	Stainless Steel Alloy Designation
AISI 316	Stainless Steel Alloy Designation
AISI M1020	Merchant Quality Steel
AISI BS 1449, Part 4	Standard Mill Surface Finished

4. AWS: American Welding Society

D1.1	Structural Welding Code: Steel

1.05 SUBMITTALS

A. At least 30 days prior to intended use; the Contractor shall provide the following samples and submittals to the Owner's Representative for review. Contractor shall not order materials until the

Owner’s Representative's review of samples, certifications or test results has been obtained. Delivered materials shall closely match the approved samples. Approval of samples shall not constitute final acceptance. The Owner’s Representative reserves the right to reject, on or after delivery, and material which does not meet these Specifications.

B. All submittals included herein shall follow specifications established under provisions of Division 01 Section, SUBMITTAL PROCEDURES

1. Shop Drawings: Submit complete shop drawings of all miscellaneous metals work required under this Section, SITE METAL FURNISHINGS for Owner’s Representative’s approval. Include plans, sections and details as required to show all materials, layout, dimensions, jointing and connections for all items required.
2. Shop drawings required are as follows:
   a. Steel handrails
3. Shop drawings for site metal items requiring accurate dimensional relationships to newly built or as-built construction, shall be prepared following a review and confirmation of existing conditions to remain. Provide same for existing or as-built measurements and conditions for areas scheduled to receive miscellaneous metal items by the installer.
   a. Coordinate the location of all galvanizing vent holes with the galvanizer. Show locations of all vent holes on the Shop Drawings for approval by the Owner’s Representative.

C. A notarized statement of compliance with specifications shall be furnished to the Owner’s Representative by the galvanizer with the initial shipment of galvanized metal items. The notarized statement shall indicate that the galvanized metal items comply with the ASTM Standard and that the dry kettle method with zinc-nickel alloy was used. Stamp a representative number of pieces of galvanized metal work. The notarized statement shall declare the day each piece was galvanized. The stamp shall indicate the ASTM Standard and the coating weight.

1.06 QUALITY STANDARDS

A. The current issue of Standard Code of Arc and Gas Welding in Building Construction shall apply to this Section, SITE METAL FURNISHINGS, as though written out in full. Welding shall be in accordance with the Structural Welding Code of the American Welding Society.

B. Where structural joints are made by welding, the details of all joints, techniques of welding employed, the appearance and quality of welds made, and the methods used to correct defective work shall conform to requirements of the AISC and AWS codes.

C. Welds shall be made only by welders who have previously been qualified by tests as prescribed in AWS "Standard Qualification Procedure" for the type of work required.

D. All dissimilar metals shall be insulated to prevent bimetallic interaction.

E. Workmanship and finish shall be equal to the best practice of modern shops for each item of work. Metal fabrication shall be accomplished using the highest standards of workmanship. All work shall be executed by experienced metal workers, shall conform to the requirements of the Contract Documents, and meet the following requirements.

1. Individual metal pieces shall be saw cut and carefully fitted together.
2. Sections shall be well formed to shape and size with sharp lines and angles; curved work shall be sprung evenly to curves.
3. Exposed surfaces shall have a smooth finish and sharp, well defined lines and arrises.
4. Grind all edges of bars and plates completely free from nicks and machine marks, prior to galvanizing or shop priming.
5. All surfaces and connections of metal items shall be without visible grinding marks, surface differentiation or variation.
6. All fabricated metal items shall be fine sanded throughout to produce a high standard of surface smoothness.
7. Square and rectangular steel tubing shall have sharp 90 degree corners and edges. Metal furnishings with rounded corners and edges arriving to the Project site or having been installed on the Project site will be rejected, removed and discarded. Replacement of all metal furnishings so rejected shall be entirely at the Contractor’s expense.

8. Welding shall be continuous and shall extend for the entire length of the joints except where specifically indicated on the Contract Documents. All exposed welds shall be ground smooth.
9. Weld with uncoated wire to prevent flux deposits. If coated wire is used, all flux residue shall be thoroughly removed and bare white metal exposed, prior to galvanization, if applicable. Where overlapping surfaces are welded, seal off contact area by welding all edges around contact area.
10. All welds shall be water tight.
11. All shop connections shall be full seam welded and ground flush and smooth. Field connections bolted unless otherwise permitted as indicated in this Section, SITE METAL FURNISHINGS. Draw up all threaded connections tightly, after buttering same with pipe joint compound, to exclude water. Deform threads to prevent loosening for all exposed connections subject to vandalism.

F. Where the work of this Section, SITE METAL FURNISHINGS, must be attached to other materials or where it must be assembled and installed in the field, Contractor shall cut, drill, punch and ream, countersink and tap, or otherwise provide the required holes in the shop, unless such connections are to be welded. The sizes and locations of all such holes shall be shown on the Shop drawings.

G. Metalwork to be built in with concrete or masonry shall be of the form required for anchorage or shall be provided with suitable anchors or expansion shields.

H. All materials and workmanship under this Section, SITE METAL FURNISHINGS, shall be subject to inspection in the mill, shop or field by the Owner's Representative, or by qualified inspectors retained by the Owner. Inspection shall be without expense to the Contractor. However, such inspection, wherever conducted, shall not relieve Contractor of his responsibility to furnish materials and workmanship in accordance with Contract requirements.

1.07 DELIVERY, STORAGE & HANDLING

A. Deliver and store work as specified under this Section, SITE METAL FURNISHINGS, in a manner to prevent damage to surface finishes of metal items, wracking or stress of components, and to prevent mechanical damage or damage by the elements. All stored materials and items shall be protected from weather, careless handling and vandalism.

B. Items which become rusted or damaged because of non-compliance with these conditions will be rejected and shall be replaced without additional cost to the Owner.

C. Deliver work to the site in sufficient time to avoid delay in job progress and at such times as to permit proper coordination of the various parts. The Contractor shall be responsible for scheduling the delivery of all items so as to minimize on-site storage time prior to installation.

D. Deliver bolts and other small items required for erection of work under this Section, SITE METAL FURNISHINGS, bundled with their respective items.

1.08 COORDINATION

A. The work of this Section, SITE METAL FURNISHINGS, shall be completely coordinated with the work of other Sections. Verify dimensions and work of other trades which adjoin materials of this Section, SITE METAL FURNISHINGS, before installing items specified.

1.09 GUARANTEE

A. The Contractor shall furnish and deliver standard written manufacturer's guarantee in Owner's name covering all materials and workmanship under this Section, SITE METAL FURNISHINGS.

B. Contractor shall pay for repairs of any damage to any part of the project caused by defects in the work of the miscellaneous metals fabricator and for any repair to the materials or equipment caused by replacement. All repairs are to be done to the satisfaction of the Owner's Representative.

PART 2 – PRODUCTS

2.01 MATERIAL REQUIREMENTS

A. Provide only new materials, free from defects impairing strength, durability or appearance and of the quality specified.

B. Standard products meeting the detailed requirements specified in this Section, SITE METAL FURNISHINGS, will be considered for approval by the Owner's Representative.

C. Furnish all supplemental parts necessary to complete each item whether or not such parts are shown or specified. Furnish all fastenings for securing the work required in this Section, SITE METAL FURNISHINGS, to the work of other trades. Furnish, deliver, and pay for the costs of furnishing and delivery under the work of this Section, SITE METAL FURNISHINGS. Installation of all fastening devises on the job site shall be paid for under the work of other Sections.

D. Provide fastenings of the same material, color and finish as the metal to which applied unless otherwise indicated.

2.02 METALS – GENERAL

A. Steel for galvanization shall be fashioned from hot-rolled mild carbon steel and shall be in conformance with the following:

1. ASTM A36/A36M requirements for flat bar stock.
2. AISI M1020 requirements for steel round bar stock.
3. Steel tubing shall be in accordance with ASTM A500 Grade B requirements. Steel sections for tubing shall be one-quarter inch wall thickness.
4. All steel sections shall be fillet welded and ground smooth prior to galvanizing to the sizes and dimensions as shown on Drawings.

B. All steel shall be galvanized in accordance with the requirements of this Division 05 Section, FACTORY-APPLIED COATINGS FOR METAL, after fabrication.

2.03 STEEL HANDRAIL

A. Steel for fabrication shall be in conformance with ASTM A36/A36M or AISI M1020 requirements for flat bar stock and solid squares, and ASTM A500 Grade B requirements for steel tubing. Steel sections for tubing shall be one-quarter inch wall thickness. All steel sections shall be fillet welded and ground smooth prior to galvanizing, and priming and shop painting, to the sizes and dimensions as shown on Contract Documents.

B. All hardware shall conform to ASTM A307 requirements and shall be galvanized per ASTM A153/A153M.

C. Steel pipe for handrails shall be schedule 40 circular seamless steel pipe in accordance with ASTM A53/A53M, Type F. Sizes shall be as shown on the Contract Documents.

D. Steel pipe for all sections of handrails formed with bends or curves shall be schedule 40, circular steel pipe in accordance with ASTM A53/A53M, Type E, Grade B. Sizes and bends are as shown on the Contract Documents

E. Flat bar stock shall conform to ASTM A36/A36M or AISI M1020.

F. Welding shall be in conformance with AWS codes. All connections shall be formed with "fish-mouthed" joints full seam welded, ground smooth and sanded.

G. Hardware shall be fabricated of steel meeting ASTM A307 requirements per ASTM A153/A153M.

PART 3 – EXECUTION

3.01 METAL FABRICATION – GENERAL

A. Take all measurements required at the work site. Check measurements, compare dimensions

and other data with various trades installing adjoining work to assure proper coordination.

B. Fabricate fences, rails, posts and similar items such that when installed posts and pickets are plumb and rails follow grade

C. Do all shop drilling, shop fitting, shop cutting, shop welding, and bolting required to erect, install and fit metal work to adjoining work. Conform to AISI Code for Steel or Stainless Steel as applicable. Furnish all screws, bolts, anchors, etc., required to attach metal work securely to adjoining work.

C. Welding shall be continuous except where tack welding is specifically permitted. Tack welding will not be permitted on exposed surfaces. All exposed welds shall be ground smooth.

E. Do not enlarge unfair holes by burning and forcing, but correct by reaming.

F. Install all supports and anchors for metal work except those to be cast into concrete or built into masonry as indicated.

A. Furnish all required metal inserts, anchor slots, anchors, anchor bolts, fastenings, etc., for attachment of work of all trades to cast-in-place concrete and unit masonry, except where otherwise specified or obviously included under other Sections of the Specifications.

I. Weld with uncoated wire to prevent flux deposits. If coated wire is used, all flux residue shall be thoroughly removed and bare white metal exposed. Where overlapping surfaces are welded, seal off contact area by welding all edges around contact area.

3.02 INSTALLATION

A. All metal items fabricated under this Section, SITE METAL FURNISHINGS, shall be transported to the construction site and installed in accordance with the requirements of this Section, SITE METAL FURNISHINGS. Cost of transportation of all metal items fabricated under this Section shall be paid for under this Section.

B. Install fabricated site metal in conformance to the Contract Documents and approved Shop Drawings. Set all posts and pickets plumb. Rails shall follow grade.

C. Core drill all holes in concrete and site masonry in precise locations established in the field with fabricated site metal furnishings on hand.

D. Set posts in cored holes with non-shrink grout, recessed 0.75 inches to receive sealant. All care shall be taken to prevent cracks, chips, or scratches to the accepting materials surface during the core drilling process.

3.04 ACCEPTANCE STANDARDS

A. In accordance with the requirements for Quality Standards noted in this Section and for installation as follows, site metal furnishings will be accepted only if they meet the following requirements:

1. Posts are set plumb. Rails follow grade.
2. Rails are set at a constant height, meeting the requirements of the Contract Documents, and all applicable codes.
3. Rail alignments are straight and true in locations shown on the contract documents.

END OF SECTION

SECTION 31 11 00: SITE CLEARING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SUMMARY

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to prepare the site, complete, as indicated on the Contract Documents, as specified, and as follows:

1. Clearing and grubbing of existing vegetation
2. Tree protection

1.03 RELATED SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:

1. Division 02 Section: SITE PREPARATION & DEMOLITION
2. Division 32 Section: SITE IMPROVEMENTS

PART 2 – PRODUCTS

2.01 TREE PROTECTION FENCE

A. Tree protection fencing shall be one of the following, at the Contractor's option.

1. Galvanized chain link fencing: Posts for fencing shall be nominal 2-1/2 inches diameter, galvanized steel posts, driven a minimum of 3 feet into the ground. Posts shall be spaced 8 feet on center maximum. Fence fabric shall be 2-inch mesh, 11-gauge minimum.
2. Wire bound wood roll snow fence with 3/8 of an inch x 1-1/2-inch wide pickets, spaced approximately 2 inches apart and bound together with at least 13-gauge galvanized steel wire with brightly painted top edge. Stakes for fencing shall be steel or wood posts. Posts shall be spaced 8 feet maximum.
3. Polypropylene barricade fencing manufactured by Forestry Suppliers (formerly Ben Meadows Co.), 3589 Broad Street, Atlanta, GA. Stakes for fencing shall be 2-inch x 4-inch wood posts, driven a minimum of 3 feet into the ground. Posts shall be spaced 8 feet maximum.
4. Plastic polymer safety fence, Model BX2050 Safety Grid, manufactured by the Tensar Corporation, Morrow, GA, or approved equal. Color shall be high visibility orange. Stakes for fencing shall be 2-inch x 4-inch wood posts, driven a minimum of 3 feet into the ground. Posts shall be spaced 8 feet on center maximum.
4. Unless otherwise indicated, height of fencing shall be 4 feet.

2.02 TREE PROTECTION – WOOD BOARD WRAPPING

A. Tree protection lumber, as designated, shall consist of 2-inch by 4-inch (nominal) lumber wired together in close spacing with 16 gauge galvanized steel wire to form a protective enclosure around tree trunks.

B. Wood lath snow fencing shall be new 4 feet high wood lath snow fencing.

PART 3 – EXECUTION

3.01 CLEARING

A. No tree or shrub clearing work (pruning or removals) shall occur prior to a site walk and meeting with the Town representatives and Owner's Representative.

B. All work included herein shall conform to the Conservation Commission Order of Conditions; see Appendix.

C. Trees, shrubs, stumps, brush, grasses, turf, herbaceous plants, downed timber, rubbish, organic matter, miscellaneous vegetation, or extraneous debris not indicated on the Contract Documents or designated in the field by the Owner's Representative to remain shall be cleared.

D. Clearing shall include the felling, cutting, and satisfactory disposal of all trees, stumps, and vegetative debris produced through the clearing operations.

E. Fell trees in such a way as to not injure trees to be saved. Excavation or grading within the branch spread of trees to be saved shall be performed only under the direction of the Owner's Representative unless otherwise directed.

F. Clearing includes felling of individual trees and removal of areas of other vegetation.

G. Select trees that are to be felled, only as directed by the Owner's Representative, will not be removed from site, but are to be stockpiled for reuse.

H. Stumps shall be remain.

1. Cut trees directed to be removed flush to grade and treat stumps with herbicide tinted with green dye. The dye allows for easy visual metering during application and proof that work has been completed. Stumps shall be coated with herbicide within 1 hour of cutting.

2. Provide herbicide that will inhibit re-sprouting or re-growth of the plant. All chemicals and herbicides shall be approved by federal Environmental Protection Agency and the Massachusetts Department of Food and Drug Agriculture for the intended uses and application rates. Herbicide shall be glyphosate specifically formulated for use for application and vegetation type within this scope of work. Submit for approval by Owner's Representative.

3. Spraying or other application of herbicide shall be completed State-licensed professionals. Submit proof of applicator's license for herbicide application to Owner's Representative. Before commencing with vegetation removal in this area and herbicide application, hold on-site conference with Owner's Representative and Town Arborist to review the scope of work, herbicide to be used, application methods, and schedule.

3.02 PROTECTION OF EXISTING TREES

A. The Contractor shall make every effort not to damage existing plant materials to remain. The Contractor is required to install protection as necessary to assure undamaged plant material and adjacent conditions.

B. Trees designated to remain (all that are not noted to be removed on Contract Documents) shall be protected by the placement of a tree protection fence. The Contractor shall provide tree protection enclosure fence at the drip line of trees noted on Contract Drawings. All other trees noted to be protected shall have fence protecting the trunks and critical root zones from damage.

C. Place tree protection additionally at all other locations where trees and/or shrubs may be jeopardized by construction activities. Tree protection fencing shall be supported with specified stakes at maximums established in Part 2 of this Division 31 Section.

D. Tree protection shall remain in place and be maintained in working condition by the Contractor until directed for removal by the Owner's Representative. All tree protection devices shall be removed from the site by the Contractor at the completion of the work.

E. Vehicles shall not be parked within the dripline or where damage may result to trees to be saved. No construction materials shall be stored beneath the dripline of trees to be saved.

END OF SECTION

SECTION 31 20 00: EARTH MOVING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SUMMARY

A. The work of this Section consists of providing labor, equipment, materials, incidental work, and construction methods necessary to complete the work included in this Division 31 Section, EARTH MOVING, as indicated in the Contract Documents, and as specified.

B. Provide all labor, equipment, materials, incidental work, and construction methods necessary to complete the work included in this Division 31 Section, EARTH MOVING which includes, but is not necessarily limited to the following:

1. Unclassified excavation
2. Common trench excavation for piping and structures
3. Excavating and backfilling
4. Fill materials, fill and compaction
5. Trench backfill
6. Drainage and dewatering as necessary to perform work in the dry
7. Rough grading
8. Removal of surplus or unsuitable materials
9. Frost protection
10. Preparation of subgrade for footings, foundations, slabs, pavements, and landscaping

1.03 RELATED WORK UNDER OTHER SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:

1. Division 01 Section: TEMPORARY EROSION & SEDIMENT CONTROL
2. Division 02 Section: SITE PREPARATION

1.04 REFERENCES

A. The following standards shall apply to the work of this Section.

1. Associated General Contractors of America, Inc. (AGC):
   Manual of Accident Prevention in Construction
2. American Society for Testing and Materials (ASTM):

D 422	Particle - Size Analysis of Soils
D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))
D 1556	Density of Soil In-Place by the Sand Cone Method
D 1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Method Effort
D 2167	Density and Unit Weight of Soil In-Place by the Rubber Balloon Method
D 2487	Classification of Soils for Engineering Purposes (Unified Soil Classification System)
D 2922	Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth)
D 2937	Density of Soil In-Place by the Drive-Cylinder Method
D 3017	Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
D 4491	Test Methods for Water Permeability of Geotextiles by Permittivity

D 4632	Test Method for Grab Breaking Load and Elongation of Geotextiles
D 4751	Test Method for Determining the Apparent Opening Size of a Geotextile
D 4759	Practice for Determining the Specification Conformance of Geosynthetics

3. Massachusetts Department of Transportation (MassDOT): Standard Specifications for Highways and Bridges
4. American Association of State Highway and Transportation Officials (AASHTO):

T11	Material Finer than 75 um (No. 200) Sieve in Mineral Aggregates by Washing
T27	Sieve Analysis of Fine and Course Aggregates

1.05 SUBMITTALS

A. Provide submittals a minimum of 7 days prior to delivery of materials.

B. Soil Samples: A 70-pound sample of each off-site material proposed for use, and of any on-site material when so requested by the Owner's Representative or testing laboratory, shall be submitted for approval.

1. Samples shall be delivered to office the Owner's testing laboratory, as directed.
2. Samples required in connection with compaction tests will be taken by and transported to the testing laboratory.

C. Product Data: Submit product data for the following:

1. Each type of plastic warning tape.

D. Test Reports: In addition to test reports required under the Paragraph, Quality Control Testing Requirements of Part 1, submit the following:

1. Mechanical gradation (sieve analysis) of each soil material proposed for fill and backfill from on-site materials and off-site borrow sources. Mechanical gradation shall be performed on off-site sources of fill and backfill materials using the same sieves as the materials specified. Mechanical gradation shall be performed on on-site fill and backfill materials using the same sieves or testing procedures as would be required for off-site borrow materials for which the on-site materials are proposed to replace.
2. One optimum moisture-maximum density curve for each soil material.
3. Report of actual unconfined compressive strength and/or results of bearing tests of each stratum tested.

1.06 QUALITY CONTROL TESTING REQUIREMENTS

A. Contractor shall select, and the Owner's Representative shall approve, a qualified independent geotechnical engineering testing agency to perform testing during the following phases of the construction operations. Independent geotechnical engineering testing agency shall be paid directly by the Contractor. All test results shall be available to the Owner's Representative.

1. Classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.
2. Observation during excavation and replacement of existing fill under paved areas.
3. Observation of compaction of excavation subgrade and paved area subgrade.
4. Observation during placement and compaction of fills.
5. Laboratory testing and analysis of fill and bedding materials specified, as required by the Owner's Representative.
6. Observe construction and perform water content, gradation, and compaction tests at a frequency and at locations determined by the testing laboratory and approved by the Owner. The results of these tests will be submitted to the Owner's Representative, copy to the Contractor, on a timely basis so that the Contractor can take such action as is required to remedy indicated deficiencies. During the course of construction, the testing laboratory will advise the Owner's Representative in writing with copy to Contractor if, at any time, in his opinion, the work is not in substantial conformity with the Contract Documents.
7. Observation of fills following interruptions by rains or other inclement weather.

B. Contractor shall perform field in-place density tests according to ASTM D 1556, ASTM D 2167, or ASTM D 2937, as applicable. Testing laboratory shall submit test results directly to the Owner's Representative for review and acceptance.

1. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.
2. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gauges at beginning of work, on each different type of material encountered, and at intervals as directed by the Owner's Representative.
3. Footing Subgrade: At footing subgrade, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to the Owner's Representative.
4. Paved Areas: At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 sq. ft. or less of paved area, but in no case fewer than three tests as directed by the Owner's Representative.
5. Fills and Embankments: For each 500 cubic yards or fraction thereof per shift, perform at least one field in-place density test as directed by the Owner's Representative.

C. When subgrade, fills or backfills are below specified density, scarify, and moisten or aerate, or remove and replace soil to the depth required, re-compact and retest until required density is obtained.

D. Testing of soils shall be in accordance with the following:

Property	ASTM Test Method
Particle - Size Analysis	D 422
Liquid Limit	D 4318
Plasticity Index	D 4318

E. The testing laboratory's presence does not include supervision or direction of the actual work by the Contractor, his/her employees, or agents. Neither the presence of the testing laboratory, nor any observations and testing performed by the testing laboratory shall excuse the Contractor from defects discovered in his work.

F. The Owner reserves the right to modify or waive testing laboratory services.

1.07 QUALITY ASSURANCE

A. Codes and Standards: Perform the work included in this Division 31 Section, EARTH MOVING complying with requirements of authorities having jurisdiction.

B. Comply with applicable requirements of NFPA 495.

C. Pre-installation Conference: Conduct conference at Project site.

1. Before commencing work included in this Division 31 Section, EARTH MOVING, meet with representatives of the governing authorities, Owner, Owner's Representative, consultants, geotechnical engineer, independent testing agency, and other concerned entities. Review work included in this Division 31 Section, EARTH MOVING procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least three working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

D. Compliance: Comply with local safety regulations and with provisions of "Accident Prevention in Construction" published by the Associated General Contractors of America, Inc.

1.08 EXAMINATION OF EXISTING CONDITIONS

A. The Contractor shall become thoroughly familiar with the existing conditions of the site, consult records and drawings of adjacent structures and of existing utilities and their connections, and note all conditions which may influence the work of this Section, work included in this Division 31 Section, EARTH MOVING.

1. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Owner's Representative and then only after acceptable temporary utility services have been provided.
2. Provide a minimum 48-hours' notice to the Owner's Representative and receive written notice to proceed before interrupting any utility.
3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.

B. By submitting a bid, the Contractor affirms that he has carefully examined the site and all conditions affecting work under this Division 31 Section, EARTH MOVING. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.

C. The Contractor may, at his own expense, conduct additional subsurface testing as required for his own information with permission from Owner.

1.09 PROJECT CONDITIONS

A. Protection: Ensure the safe passage of persons and traffic around the areas of earthwork. Provide bracing as may be required to support sides of excavation.

B. Dust control: Take effective measures to minimize and control windblown dust. Do not create ice hazards by water spraying in freezing weather.

C. Erosion control: Take effective action to control erosion and runoff from site. Prevent siltation of drainage systems and pollution of waterways and water bodies. Install erosion controls prior to beginning site clearing and earthwork.

D. Utilities: Locate all utilities and maintain and keep utilities in service and protected from damage, except utilities indicated to be removed and relocated. Excavation and uncover all utilities requiring work or service.

1.10 INFORMATION NOT GUARANTEED

A. Information in the Contract Documents relating to subsurface conditions, natural phenomena, and existing utilities and structures is from the best sources presently available. Such information is furnished only for the information and convenience of the Contractor, and the accuracy or completeness of this information is not guaranteed.

B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall examine them for himself during the bidding period. Compensation for unforeseen subsurface conditions shall be in accordance with the general provisions of contract, including:

1. General and Supplementary Conditions and Division 01 Specification Sections

1.11 PERMITS, CODES & SAFETY REQUIREMENTS

A. Comply with all rules, regulations, laws and bylaws of the Town and State, and all other authorities having jurisdiction over the project site. All labor, materials, equipment, and services necessary to make the work comply with such requirements shall be provided by the Contractor without additional cost to the Owner.

B. Comply with the provisions of the Manual for Accident Prevention in Construction of the Associated General Contractors of America, Inc., and the requirements of the Occupational Safety and Health Administration, United States Department of Labor.

C. The Contractor shall procure and pay for all permits and licenses required for the complete work specified herein and shown on the Contract Drawings.

D. Obtain all inspection certificates required and deliver to Owner's Representative.

E. The Contractor shall not close or obstruct any street, sidewalk, or passageway without written permission from authorities having jurisdiction. The Contractor shall so conduct his operations as to

interfere as little as possible with the use ordinarily made of roads, driveways, or other facilities near enough to the work to be affected thereby.

F. The Contractor shall secure a DIG SAFE permit number for the project to certify notification of gas, electrical and telephone utilities. All other affected utilities shall be contacted by the Contractor who shall secure notification receipts in accordance with requirements of Massachusetts law. The phone number is 811. Contractors shall notify "Dig Safe" of contemplated excavation, demolition or explosive work in public or private ways, and utility company right-of-way or easement. This notification shall be made at least 72 hours prior to the work, but not more than sixty days before the contemplated work. Such notice shall set forth the name of the street or the route number of said way and an accurate description of the location and nature of the proposed work. The Owner's Representative requires that the notification be sent to "Dig Safe" by certified mail, with copies to the Owner. The Architect requires a copy of the signed receipt of the delivery. "Dig Safe" is required to respond to the notice within 72 hours from the time said notice is received by designating at the locus the location of pipes, mains, wires and conduits. Contractor shall not commence work until "Dig Safe" has responded as noted above. The work shall then be performed in such a manner, and with reasonable precaution taken to avoid damage to utilities under the surface in said areas of the work.

G. Contractor shall contact all utility companies whose utilities might be affected by the work included in this Division 31 Section, EARTH, and notify these utility companies of contemplated excavation, demotion or explosive work in public or private ways, and utility right-of-way easement. This notification shall be made at least 72 hours prior to the work, but not more than sixty days before the contemplated work. Such notice shall set forth the name of the street or the route number of said way and an accurate description of the location and nature of the proposed work. Contractor shall secure notification receipts for submission to the Owner's Representative prior to the start of the contemplated work. Contractor shall not commence work until all utility companies have responded and provided the necessary receipts. The work shall then be performed in such a manner, and with reasonable precaution taken to avoid damage to utilities under the surface in said areas of the work.

1.12 LAYOUT & GRADES

A. Benchmarks: The Contractor shall maintain and/or reestablish benchmarks and survey monuments necessary for the work of these Contract Documents and as shown in the Contract Documents or found to exist on the site to provide a base reference for the construction. Replace any which may become destroyed or disturbed. The Contractor shall employ and pay all costs for a registered Civil Engineer or Surveyor who is licensed within the jurisdiction of the project site to lay out all lines and grades in accordance with the Drawings and as directed by the Owner's Representative, and as necessary or required for the construction. The selection of the registered Civil Engineer or Surveyor shall be subject to the Owner's Representative's approval.

1.13 PROTECTION OF EXISTING STRUCTURES & UTILITIES

A. Observe all rules and regulations governing the respective utilities in executing work included in this Division 31 Section, EARTH MOVING. The work shall be executed in such manner as to prevent any damage to adjacent property and any other property and existing improvements such as, but not limited to streets, curbs, paving, utility lines and structures, monuments, benchmarks and other public and private property. Protect existing structures and foundations from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by work included in this Division 31 Section, EARTH MOVING operations.

B. In case of any damage or injury caused in the performance of the work, the Contractor shall, at his own expense, make good such damage or injury to the satisfaction of, and without cost to the Owner. Existing roads, sidewalks, and curbs damaged during the project work shall be repaired or replaced to their original condition at the completion of operations. The Contractor shall replace, at his own cost, existing benchmarks, monuments, and other reference points which are disturbed or destroyed.

C. Buried structures, utility lines, and the like, including those which project less than 18 inches above grade, which are subject to damage from construction equipment shall be clearly marked to indicate the hazard. Markers shall indicate limits of danger areas, by means which will be clearly visible to operators of trucks and other construction equipment and shall be maintained at all times until completion of Project.

D. Locate and mark underground utilities to remain in service before beginning the work. Protect all existing utilities to remain during operations. Do not interrupt existing utilities except when authorized in writing by authorities having jurisdiction.

E. When an active utility line is exposed during construction its location and elevation shall be plotted on the Record Drawing by the Contractor and both the Owner's Representative and the Utility Owner notified in writing.

F. Provide barricades, fences, lights, signs, and all other safety devices required for the protection of the public.

1.14 DEFINITIONS

A. Base Course: The layer placed between the subbase course and surface pavement in a paving system.

B. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.

C. Drainage Fill: Course of washed granular material supporting slab-on-grade placed to cut off upward capillary flow of pore water.

D. Embankment: Any area on the site where the Contractor is required to raise grades to proposed subgrade elevations. Embankments are placed in layers to a predetermined elevation and cross section.

E. Excavation: The removal of material encountered to subgrade elevations and the reuse of the material on site as Backfill, Fill or Ordinary Borrow material as it conforms to these specifications or disposal of materials removed.

F. Finish Grade: Final grade elevations indicated on the Drawings. Spot elevations shall govern over proposed contours. Where not otherwise indicated, project site areas shall be given uniform slope between points for which finished grades are indicated or between such points and existing established grades. Spot elevations shall govern over proposed contours. No ponding of surfaces shall be allowed due to lack of improper pitches across surfaces that will not allow proper drainage to occur.

G. Rock: A sound and solid mass, layer, or ledge of mineral matter in place of such hardness and texture that it:

1. Mechanical Definition of Rock: Cannot be effectively loosened or broken down by ripping in a single pass with a late model tractor-mounted hydraulic ripper equipped with one digging point of standard manufacturer's design adequately sized for use with and propelled by a crawler type tractor rated between 210- and 240-net flywheel horsepower, operating in low gear.
2. Manual Definition of Rock: In areas where the use of the ripper described above is impracticable, rock defined as sound material of such hardness and texture that it cannot be loosened or broken by a 6-pound drifting pick. The drifting pick shall have a handle not less than 34 inches in length.

H. Rough grade: The top surface of subbase or base courses such as gravel, crushed stone, ordinary fill, and the like, ready to receive the final surface material application. Unless stated otherwise, all rough grades shall represent compacted material depths, as specified herein.

I. Soil: All earth materials, organic or inorganic, which have resulted from natural processes such as weathering, decay, and chemical action of in situ rock or the deposition of unconsolidated material in which more than 35 percent by weight will pass a No. 200 sieve.

J. Surplus Materials: On-site materials not used during the course of construction.

K. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

L. Structural Backfill: The designated material as indicated in the Contract Documents to attain the proposed grades abutting or adjacent to site structures.

M. Subbase Course: The layer placed between the subgrade and base course in a paving system, or the layer placed between the subgrade and surface of a pavement or walk.

N. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase course, drainage fill, or topsoil materials.

O. Topsoil: The upper layer of the soil profile which is supporting the growth of vegetation as evidenced by the existence therein of numerous roots and other organic matter.

P. Unauthorized excavation: Removing materials beyond indicated subgrade elevations or dimensions without direction by the Owner's Representative. Unauthorized excavation, as well as remedial work directed by the Owner's Representative, shall be at the Contractor's expense.

Q. Unclassified excavation: Removal of materials encountered when establishing required grade elevations to the depths and extents shown on the Contract Documents. Unclassified excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, material of any classification indicated in data on subsurface conditions.

R. Unsuitable Material: Material that is classified as "unsuitable" shall be material having at least one of the following properties:

1. Material with a maximum unit dry weight per cubic foot less than 90 pounds as determined by ASTM D 1557.
2. Material containing visible organic matter, topsoil, organic silt, peat, construction debris, frozen material, roots, and stumps.
3. Material which has a Liquid Limit greater than 55 when tested in accordance with ASTM D 4318.
4. Material designated in the field by the Owner's Representative or the testing laboratory.

S. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

T. Utility Trench Backfill: The area bounded by the proposed finished subgrade and the cover material over the respective pipe or conduit. This material shall conform with applicable requirements for embankment or structural backfill depending on the area or zone into which the utility is installed.

1.15 COORDINATION

A. Prior to start of EARTH MOVING the Contractor shall arrange an on-site meeting with the Owner's Representative for the purpose of establishing Contractor's schedule of operations and scheduling inspection procedures and requirements.

B. As construction proceeds, the Contractor shall be responsible for notifying the Owner's Representative prior to start of EARTH MOVING operations requiring inspection and/or testing.

In the event that the Contractor does not notify the Owner's Representative prior to the start of EARTH MOVING operations and inspections and tests are not made or performed by the Owner's testing agents, the Owner's Representative may require the Contractor to remove all EARTH MOVING performed without the necessary inspections and replaced under the required supervision, review, inspections or tests at no additional cost to the Owner.

C. The Contractor shall be responsible for obtaining test samples of soil materials proposed to be used and transporting them to the site sufficiently in advance of time planned for use of these materials for testing of materials to be completed. Use of these proposed materials by the Contractor prior to testing and approval or rejection, shall be at the Contractor's risk.

PART 2 – PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations. Gradation requirements shall be determined by AASHTO T11 and T27.

1. Borrow material shall from on-site or off-site sources shall contain salt levels less than 1.0 milliohms/cm as measured by electrical conductivity (EC2) of a 1:2 soil-water suspension (Test minus sieve #4 material.). Borrow material with levels of salt in excess of this level will be considered unsuitable material and shall be removed from the site by the Contractor at no additional cost to the Owner.
2. Borrow material from on-site and off-site sources shall contain levels of heavy metals or PCB less than the currently mandated levels, as established by the Massachusetts Contingency Plan Toxic elements included therein are:

   Toxic Elements
   a. Arsenic
   b. Boron
   c. Cadmium
   d. Chromium
   e. Copper
   f. Lead
   g. Mercury
   h. Molybdenum
   i. Nickel
   j. Selenium
   k. Zinc
   l. PCBs

   Borrow material with levels of heavy metals and PCBs in excess of these levels will be considered unsuitable material and shall be removed by the Contractor from the site and disposed of legally at no additional cost to the Owner.
3. Satisfactory Soil Materials: ASTM D 2487 soil classification groups GW, GP, SW, and SP; free of rock or gravel larger than 2 in. in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.
4. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups GC, GM, SC, SM, ML, MH, CL, CH, OL, OH, and PT.

B. Backfill and Fill Materials: Satisfactory soil materials as described above. On-site material for use in compacted backfill shall be natural, inorganic, granular soil, taken from areas of excavation after stripping of topsoil and removal of unsatisfactory soil materials as described above.

1. Use only backfill materials meeting the requirements of satisfactory soil materials that are free from rocks greater than 4 inches in diameter or length that have largest dimension no greater than three-quarters of the lift thickness or are no greater than ½ $ft.^3$ in volume. Do not use any foreign matter, such as construction debris, trash, wood, roots, leaves, sod, organic matter, or soft clay and silt. Sound pieces of building stone, masonry, and concrete from on-site sources subject to the same size limitations as stone, may be employed in backfill. Individual pieces shall be mixed into general backfill material, leaving no voids between pieces. Backfill shall be clean, non-organic material, of non-swelling character, capable of being readily compacted to form a solid, stable embankment. Pieces of bituminous pavement shall be excluded from the backfill unless their use is expressly permitted by the Owner's Representative, in which case they shall be broken up as directed. Materials containing ice or frozen lumps shall not be employed.
2. Backfill and fill materials for use under turf, seeded, and planted areas shall be free draining materials that drain at a rate greater than or equal to one inch per hour after compaction to the specified levels.
3. Suitable Excavated Material:
   a. Free from clods, silt lumps or balls of clay
   b. Free from stones or rock fragments over 50 pounds
   c. Free from organics, peat, etc.
4. Frozen Material:
   a. Do not backfill with or on frozen materials
   b. Remove, or otherwise treat as necessary, previously placed material that has frozen prior to placing backfill.
5. Wet Material:
   a. Do not mechanically or hand compact material that is, in the opinion of the Engineer, too wet.

b. Do not continue backfilling until the previously placed and new materials have dried sufficiently to permit proper compaction.

C. Ordinary borrow shall conform to ASTM D2487 soil classification groups GW, GP, SW, and SP, and be well graded, natural inorganic soil, meeting the following requirements:

1. It shall be free of organic or other weak or compressible materials, of frozen materials, and of stones larger than 4 inches maximum dimension.
2. It shall be of such nature and character that it can be placed to form embankments and compacted to the specified densities in a reasonable length of time.
3. It shall be free from highly plastic clays, from all materials subject to decay, decomposition, or dissolution and from cinders or other materials which will corrode piping or other metal.
4. It shall have a maximum dry density of not less than 100 lbs. per cubic foot.
5. Material from excavation on the site may be used as ordinary fill if it meets the above requirements and is approved by the Owner's Representative.

D. Gravel borrow shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials. Gradation shall conform to the following:

Sieve No.	% Passing by Weight
1/2" (12.5mm)	50 – 85
#4 (4.75mm)	40 – 75
#50 (300um)	8 – 28
#200 (75 um)	0 – 8

E. Dense graded crushed stone shall consist of inert angular material derived from a stone quarry that is hard, durable stone and stone screenings, free from loam and clay, surface coatings, and plastic materials. Gradation shall conform to the following:

Sieve No.	% Passing by Weight
2" (50 mm)	100
1-1/2" (37.5 mm)	70 – 100
3/4" (19.0 mm)	50 – 85
No. 4 (4.75 mm)	30 – 55
No. 50 (300 um)	8 – 24
No.#200 (75 um)	3 – 10

F. Processed Gravel shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials. Gradation shall conform to the following:

Sieve No.	% Passing by Weight
3" (75 mm)	100
1-1/2" (37.5 mm)	70 – 100
3/4" (19 mm)	50 – 85
No. 4 (4.75um)	30 – 60
No. 200 (75 um)	0 – 10

G. Three-quarter of an inch crushed stone shall consist of inert angular material derived from a stone quarry that is hard, durable, washed stone, free of deleterious materials. Gradation shall conform to the following:

Sieve Size	% Passing by Weight
1" (25 mm)	100
3/4" (19 mm)	90 – 100
1/2" (12.5 mm)	10 – 50
3/8" (9.5 mm)	0 – 20
No. 4 (4.75 mm)	0 – 5

H. Structural fill shall be gravel, sandy gravel, or gravelly sand, free form organic material. Loam, trash. Snow, ice, frozen soil, and other objectionable material and well-graded with the following limits:

Sieve Size	% Passing by Weight
3” (75 mm)	100
No. 4 (4.75 mm)	30 – 90
No. 40 (425 um)	10 – 50
No. 200 (75 um)	0 – 8

I. Crushed stone shall be clean, washed, crushed stone, free of fine materials and graded within the following limits:

Sieve Size	% Passing by Weight
1” (25 mm)	100
3/4” (19 mm)	90 – 100
1/2” (12.5 mm)	10 – 50
No. 4 (4.75 mm)	0 – 5
No. 40 (425 um)	0 – 5
No. 200 (75 um)	0 – 5

J. Sand shall be clean, washed sand, free of silt and clay components and graded within the following limits:

Sieve Size	% Passing by Weight
No. 4 (4.75 mm)	100
No. 8 (2.36 mm)	95 – 100
No. 16 (1.18 mm)	70 – 100
No. 30 (600 um)	40 – 75
No. 50 (300 um)	10 – 35
No. 100 (150 um)	2 – 15

2.02 USES OF MATERIALS

A. Uses of Fill Materials: Fill materials listed above shall be utilized as follows and as otherwise indicated on the Drawings, specified, or directed.

1. Gravel Borrow:
   a. Subbase for bituminous concrete road and parking lot pavements.
   b. Backfill for footings and structures.
   c. As shown on the Contract Documents.

2. Dense Graded Crushed Stone:
   a. Base for bituminous concrete road and parking lot pavements.
   b. As shown on the Contract Documents.

3. Processed Gravel:
   a. Drainpipe bedding and backfill.
   b. Backfill for drainage and utility structures.
   c. As shown on the Contract Documents.

4. Crushed Stone:
   a. Drainage layer under pavement slab.
   b. Underdrain filter aggregate.
   c. Structural fill for footings and structures.
   d. As shown on the Contract Documents.

5. Ordinary Borrow:
   a. For footings and structures.
   b. For backfill of utility trenches
   c. General site fills.
   d. As shown on the Contract Documents.

6. Backfill and Fill Materials:
   a. For footings and structures.
   b. For backfill of utility trenches
   c. General site fills.
   d. As shown on the Contract Documents.

2.03 FILTER FABRIC

A. Filter fabric shall be Nonwoven, needle-punched continuous filament with flow rate range from 110 to 330 gpm/square feet when tested according to ASTM D 4491.

PART 3 – EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by the work included in this Division 31 Section, EARTH MOVING operations.

B. Protect subgrade and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

3.02 GRADES AND ELEVATIONS

A. The Contract Documents indicate, in general, alignments, grade elevations and invert elevations. Establish the lines and grades in conformity with the Contract Documents. The Owner's Representative, however, may make such adjustments in the field in grades and alignments as are found necessary in order to avoid interference with any special conditions encountered.

B. Spot elevations shall govern over proposed contours. Where not otherwise indicated, project site areas shall be given uniform slopes between points for which finished grades are indicated or between such points and existing established grades.

C. Establish and maintain suitable stakes over all areas to be graded as directed, specified, or required. Maintain sufficient reference points at all times during construction to properly perform the contract installation.

3.03 UNCLASSIFIED EXCAVATION

A. The work of excavation shall be conducted at such locations, at such rates of progress and in such a manner as will ensure the continued progress of the work, with a minimum inconvenience to the general public.

B. All material encountered during excavation shall be unclassified excavation and shall include the removal of boulders up to 3 cubic yards, earth, rock, concrete, covered pavements, abandoned utilities, abandoned foundations and all miscellaneous materials encountered as required for excavation. Boulders and rock over 3 cubic yards shall be covered under "Rock Excavation" in this Division 31 Section, EARTH MOVING. The sequence of all excavation operations shall be such as to ensure the most efficient reuse of acceptable excavated borrow materials for particular improvement application. Acceptable materials shall be used or stockpiled for later use in backfill and subgrade preparation.

C. Excavate all materials to the elevations, dimensions and form as shown in the Contract Documents and as specified for the construction of drainage structures, utilities, turf, and site improvements necessary for the completion of the utilities and site work. Excavate to elevations indicated or required within a tolerance of plus or minus 0.10 foot and as will allow footings to rest on firm, undisturbed earth or rock, free of loose materials, and as will permit rough grades to be at indicated or specified depths. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

D. Unauthorized Excavation: Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation.

1. Any excavation which has been carried, through error, beyond specified depths or dimensions, shall be backfilled by the Contractor at his own expense with compacted gravel borrow, with concrete, or with other material as directed by the Owner's Representative.

E. Hand Excavation: In general, machine excavation will be permitted with the exception of work in the vicinity of trees to remain, existing utilities and excavation of pipe bells which will be hand work. Excavate to 6 inches below the bottom of pipe or as shown on Drawings. Excavation to final grade shall be made in such a manner as to maintain the undisturbed bearing character of the soil exposed at the excavation level.

F. Inspection: After completion of the excavation and prior to commencement of foundation footings, pavements and concrete slab construction, the excavation will be inspected by the Owner's Representative to ensure that foundation elevations have been reached.

3.04 TRENCH EXCAVATION

A. Trench Excavation: If the Contractor encounters unsuitable soils materials at the specified depths during trench excavation, he shall contact the Owner's Representative and request instructions from the Geotechnical Engineer before proceeding further.

1. Excavate trenches to indicated slopes, lines, depths, and invert elevations.
   a. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line and to meet the inverts noted on the Drawings.
2. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
   a. Clearance: 12 inches each side of pipe or conduit.
3. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove stones and sharp objects to avoid point loading.
   a. For pipes or conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
   b. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
   c. Where encountering rock or another unyielding bearing surface, carry trench excavation 6 inches below invert elevation to receive bedding course.

3.05 STOCKPILING

A. Stockpiling: No excavation shall be deposited or stockpiled at any time so as to endanger portions of the new or an existing structure, either by direct pressure or indirectly by overloading banks contiguous to the operation. Stockpile soil materials away from edge of excavations. Material, if stockpiled, shall be stored so as not to interfere with the established sequence of the construction. If there is not sufficient area available for stockpiling within the limits of the project, the Contractor will be required to furnish his own area for stockpiling, and for moving the material back and forth from the storage area, at no additional cost to the Owner. No excavation shall be deposited within existing tree protection zones. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water away from existing drainage structures, ponds, basins, or wetland areas. Cover stockpiles to prevent wind-blown dust. The Contractor shall provide and install all erosion control specified under the Division 01 Section, EROSION & SEDIMENTATION CONTROL and receive payment for this work under this Division 31 Section, EARTH MOVING.

B. Throughout the course of the work the Contractor shall provide and maintain all erosion control systems for stockpiled materials as specified in the Division 01 Section, EROSION & SEDIMENTATION CONTROL and paid for under the work of this Division 31 Section, EARTH MOVING.

3.06 FILLING, BACKFILLING & COMPACTION

A. Placing Fills and Compacting:

1. Preparation: All areas to be filled or backfilled shall be free of vegetation, topsoil, wet materials, unsatisfactory soil materials, obstructions, deleterious materials, construction debris, refuse, compressible or decayable materials and standing water from ground surface prior to placing fills. Do not place fill when fill materials or material below it are frozen. No fill materials containing ice or frozen lumps shall be used.
   a. Plow, furrow, till or break up sloped surfaces steeper than 1 vertical to 4 horizontal (1:4) so fill material will bond with existing surface.
2. Remove all concrete formwork, temporary shoring, bracing, and sheeting prior to inspection by Owner's Representative. If approved in writing by the Owner's Representative, leave concrete formwork, temporary shoring, bracing, or sheeting in place.
3. The Contractor shall notify the Owner's Representative when excavation is ready for formal inspection. Filling and backfilling shall not be started until conditions have been approved by the Owner's Representative.
4. At the completion of excavation and before placing any fills, proof-roll compact subgrades to the same compaction levels required for placed fills as required hereinafter. Compaction procedure shall be approved by the Owner's Representative.
   a. Notify Owner's Representative when excavations have reached required subgrade.
   b. When test results determines that unforeseen unsatisfactory soil is present, stop excavation work immediately and contact the Owner's Representative to determine whether or not to continue excavation work and replace the unsatisfactory soil material with compacted backfill or fill material as directed by the Owner's Representative.
5. Unforeseen additional excavation and replacement material will be paid according to the Contract provisions for changes in Work.
6. Reconstruct subgrade damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Owner's Representative.
7. Subgrade compaction shall be tested by the testing laboratory before proceeding further.
8. All fill is to be placed "in-the-dry", to which end dewatering may be required. Spreading and drying of each layer may also be required. Dewatering, as necessary, shall be a part of the work of this Section, EARTH MOVING, and shall be done at no additional cost to the Owner
9. Conversely, if the testing laboratory determines that the fill is too dry for proper compaction, water shall be added to provide the specified optimum moisture content, as necessary for proper compaction.
10. Compaction of each lift shall be as specified herein and as determined by ASTM Test, Designation D1556. Fill shall be placed in successive horizontal lifts no thicker than 6 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers. Compact fill to the required density as specified in this Section, EARTH MOVING. Maximum dry density shall be determined in accordance with ASTM D1557, Method D. The following percentages of minimum to maximum dry densities shall be achieved for fill materials or prepared subgrades.
    a. Under structures, footings, paved surfaces, drainage piping, utilities, and other improvements:

	Minimum	Maximum
All fills	95%	98%
Top twelve inches of subgrades in cut	95%	98%
Fills within turf, seeded, and planting areas to within eighteen inches of finished subgrade	85%	90%

    Maximum dry density for topsoil and loam shall be determined in accordance with ASTM D698. The following percentages of minimum to maximum dry densities shall be achieved for fill materials or prepared subgrades.

    b. In turf, seeded areas, and plant beds:

	Minimum	Maximum
Fills within turf areas and planting areas in top eighteen inches of finished grade	80%	85%

11. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each structure.

12. In the case of turf and planting areas, compaction requirements for subgrades and fills shall be considered minimums and maximums within the density percentages called for, and any over-compaction of subgrades or fills which would be detrimental to turf, seeded areas, or planting objectives shall be corrected by loosening subgrades or fills through tilling or other means and re-compacting to specified compaction limits.
13. The Contractor shall notify the Owner's Representative three days in advance when the rough grades are established and ready for formal inspection. No loam shall be placed on rough grades before inspection by the Owner's Representative.

3.07 AGGREGATE BASE COURSE FOR PAVEMENTS

A. Aggregate subbase and base courses for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:

1. MassDOT Specifications Section 100

B. Compaction of aggregate base courses shall be to 95 percent of maximum density as determined by ASTM D 1557, Method D. Stone greater than two inches shall be excluded from course.

C. Width of base courses shall be greater than or equal to the width of pavement surface, if continuous lateral support is provided during rolling, and shall extend a distance of at least twice the base thickness beyond edge of the course above, if not so supported.

D. Aggregate material shall be applied in lifts less than or equal to 6 inches thick, compacted measure. Each lift shall be separately compacted to specified density.

1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.
2. Rolling shall begin at sides and progress to center of crowned areas and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
3. Surface irregularities which exceed 1/2 inches measured by means of a 10-foot long straightedge shall be replaced and properly compacted.

E. Subgrade, subbase course and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel or dense graded crushed stone. Materials spilled outside pavement lines shall be removed and area repaired.

F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.08 BACKFILLING OF TRENCHES & STRUCTURES

A. All requirements for description, placement, compaction and spreading of fill materials as specified in this Division 31 Section, EARTH MOVING, shall be applicable to backfilling operations for trenches and structures. If the Contractor encounters unsuitable soils materials at the specified depths during trench excavation, he shall contact the Owner's Representative and request instructions before proceeding further.

B. Backfill materials as specified in this Division 31 Section, EARTH MOVING, shall be used as bedding and backfill around drainage pipes, around structures and for other uses as shown on the Contract Documents.

C. Approvals Prior to Backfilling: Do not commence backfilling operations for trenches and structures until all piping and other underground utilities or structures have been installed, tested, and approved, and the locations of all pipe and appurtenances have been recorded.

D. Placement in Trenches: Bedding materials as specified shall be placed to the full width of the trench as indicated on the Drawings. Place and compact bedding course on rock and other unyielding bearing surfaces. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. After a pipe is bedded, the trench shall be filled to the centerline of the pipe with additional bedding material as specified except at the joint. After the

joint is inspected, that portion shall be filled in. Material under and around the pipe shall be carefully and thoroughly compacted to the densities specified in this Division 31 Section, EARTH MOVING.

E. From the centerline of the pipe to a point 12 inches above the top of the pipe place additional bedding material as backfill by hand and compacted with mechanical tampers to not less than 95% of maximum density at optimum moisture content of the material. Above this point, backfill shall be placed by machine or by hand in layers 6 inches deep and compacted to the densities specified in this Division 31 Section, EARTH MOVING. This backfill shall be extended as shown in the Contract Documents. Backfill simultaneously on all sides of pipe or structure. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

F. Place concrete backfill in all utility trenches that pass under concrete footing or within 18 inches of footings. Place concrete to level of bottom of footings.

G. Provide four-inch thick concrete base slab support for piping or conduit less than two feet-three inches below surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of four inches of concrete before backfilling or placing roadway subbase course

H. Coordinate backfilling with utilities testing.

I. Fill voids with approved backfill materials as shoring and bracing, and sheeting is removed.

J. Place and compact final backfill of satisfactory soil material to final subgrade.

K. Install warning tape directly above utilities, twelve inches below finished grade, except six inches below subgrade under pavements and slabs.

3.09 ROUGH GRADING

A. Rough grading shall include the shaping, trimming, rolling, and refinishing of all surfaces of the subbase and base courses, shoulders, and earth slopes in preparation for final, finish grading of pavements, loams and site improvements as shown on the Contract Drawings. The rough grading of shoulders and sloped areas may be done by machine methods. All ruts shall be eliminated. Traffic of men and equipment across soil subgrade areas shall be prohibited following excavation to the required lines and grades.

1. Shape subbase and base courses to required crown elevations and cross-slope grades.
2. When thickness of compacted subbase or base course is 6 inches or less, place materials in a single layer.
3. When thickness of compacted subbase or base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

B. If, during the progress of the Work, any pipe, drain or other construction is damaged due to operations under this Contract, the Contractor shall repair all damage at no additional cost to the Owner and restore damaged areas to their original conditions.

C. Do all other cutting, filling, and grading to the lines and grades indicated on the Drawings. Grade evenly to within the dimensions required for grades shown in the Contract Documents and as specified herein. No stones larger than 3 inches in largest dimension shall be placed in upper 6 inches of the subgrade. Fill shall be left in a compacted state at the end of the workday and sloped to drain.

D. Slope grades to direct water away from buildings and to prevent ponding. Rough grade to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus/minus 0.10 foot.
2. Paved Areas: Plus/minus 0.05 foot.

E. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders at least twelve inches wide of acceptable soil materials and compact simultaneously with each subbase course and base course layer.

F. The Contractor shall bring all areas to grades as shown in the Contract Documents and in the details. The Owner's Representative, however, may make such adjustments in grades and alignments as are found necessary to avoid special conditions encountered.

G. No rubbish of any description shall be allowed to enter fill material. Such material shall be removed from the site.

H. Wherever streets, turf or seeded areas, or sidewalks or other items contained within or outside the Limit of Contract lines have been excavated in fulfilling the work required under this Contract, the Contractor shall furnish and install all materials necessary to bring finish surfaces level with the existing adjacent surfaces. All work shall be installed to match the existing conditions in accordance with the governing authority. Notify the proper authorities prior to restoring surfaces outside the Contract Limit Lines.

I. Placed fill materials that become disturbed shall be regraded and re-compacted. Fill materials that become contaminated shall be removed and replaced, as directed by the Owner's Representative.

J. Contractor shall clean the subgrade of all stones greater than two inches and all debris and rubbish. Such material shall be removed from the site, not raked to the edges and buried. Notify the Owner's Representative that the subsoil has been cleaned and request his/her attendance on site to review and approve subgrade conditions prior to spreading additional specified material over the subgrade.

3.10 REMOVAL OF SURPLUS & UNSUITABLE MATERIALS

A. Surplus excavated or surplus off-site borrow materials not required to complete site construction and unsuitable excavated materials shall, unless directed otherwise by the Owner's Representative, become the property of the Contractor who shall remove such materials from the site and legally dispose of it at no additional cost to the Owner.

3.11 DRAINAGE & DEWATERING

A. The Contractor shall control the grading in areas under construction on the site so that the surface of the ground will properly slope to prevent accumulation of water in excavated areas and adjacent properties. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrade, and from flooding Project site and surrounding area. The Contractor shall grade and ditch the site as necessary to direct surface runoff away from open excavations and subgrade surfaces. Positive drainage (minimum 1.0 percent slope) shall be maintained at all times.

B. Protect subgrade and foundation soils from softening and damage by rain or water accumulation.

C. Should surface, rain or ground water be encountered during the operations, the Contractor shall furnish and operate pumps or other equipment and provide all necessary piping to keep all excavation clear of water at all times and shall be responsible for any damage to work or adjacent properties from such water. All piping exposed above surface for this use shall be properly covered to allow foot traffic and vehicles to pass without obstruction.

D. Water from trenches and excavations shall be disposed of in such a manner as will not cause injury to public health nor to public or private property, nor to existing work, nor to the work completed or in progress, nor to the surface of roads, walks, and streets, nor cause any interference with the use of the same by the public. Methods of disposal of pumped effluent shall not cause erosion or siltation.

1. Provide and install all erosion and sedimentation control as specified on the Contract Drawings and be paid for this work under the scope of this Division 31 Section, EARTH MOVING.

E. There shall be sufficient pumping equipment, in good working order, available at all times to remove water.

F. Presence of ground water in soil will not constitute a condition for which an increase in the Contract price may be made. Do not place concrete fill, lay piping, or install appurtenance under any circumstances in excavation containing free water.

G. Under no circumstances place fills, pour concrete, or install piping and appurtenances in excavations containing free water.

H. Where, in the opinion of the Owner's Representative, pumping of excavations is not effective in maintaining a dry firm subgrade, provide other dewatering methods acceptable to the Owner's Representative.

3.12 FROST PROTECTION

A. Do not excavate to full indicated depth when freezing temperatures may be expected unless footings or slabs can be poured immediately after the excavation has been completed. Protect the excavation from frost if placing of concrete is delayed.

B. Completed foundations that have not been backfilled shall be protected from freezing by temporary additional earth cover, insulating blankets, heaters, or other methods acceptable to the Owner's Representative.

C. Frozen material shall not be placed as fill or backfill.

D. No work shall be installed on frozen ground.

E. Should protection fail, remove frozen materials, and replace with concrete or gravel borrow as directed by the Owner's Representative at no additional cost to the Owner.

3.13 DUST CONTROL

A. During the construction period, the Contractor shall take special measures including, but not limited to, wetting down to control dust on site, in order to prevent annoyance/and or damage to adjacent property, whether public or private. Calcium chloride or any other chemical material may not be used on subgrades of areas to be seeded or planted.

B. The Contractor shall take all necessary measures to keep streets, over which equipment, and service for project travel, clean and free from dirt, dust, mud and debris resulting from construction operations. The actions taken shall meet the requirements of all authorities having jurisdiction.

3.14 CLEANUP

A. At the end of all excavation, filling, and grading operations and before acceptance of the work, the Contractor shall remove all debris, rubbish, garbage, trash, and discarded material, from the site. He shall dispose of them in a manner satisfactory to the Owner's Representative. The premises shall be left clean, presentable, and satisfactory.

END OF SECTION

SECTION 32 30 00: SITE IMPROVEMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SUMMARY

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to furnish and install designated Site Improvements and related items as indicated on the Contract Documents, as specified in this Section, and includes, but is not limited to, the following:
   1. Floating dock
   2. Gangway
   3. Timber walls

1.03 RELATED WORK UNDER OTHER SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:

   1. Division 32 Section: STONEDUST PAVING

1.04 REFERENCES

A. The following standards shall apply to the work of this Section:

   1. Massachusetts Department of Transportation (MassDOT):
      Specifications Standard Specifications for Highways and Bridges
   2. ASTM: American Society for Testing and Materials

1.05 SUBMITTALS

A. Shop Drawings and Manufacturer's Product Literature

   1. Floating dock: shop drawings (plan and cross section) showing entire installation with all components listed. Manufacturer's literature on floating dock, color, connectors, handrails.
   2. Gangway: shop drawings showing length, width, railings and hinge connector. Manufacturer's literature for aluminum materials
   3. Anchors: manufacturer's literature
   4. Pressure treated wood: manufacturer's literature

1.06 QUALITY ASSURANCE

A. Warranty:
   1. Flotation: 8 years-warranty against cracks, breakage, leaks, and ultraviolet degradation.
   2. Hardware: 1 year-warrange against defects in material or manufacturing

1.07 DELIVERY, STORAGE & HANDLING

A. Do not deliver site amenities to the site, until all specified submittals have been submitted to, and

approved by, the Landscape Architect.

B. Store products inside, under cover, and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes.

PART 2 – PRODUCTS

2.01 FLOATING DOCK

A. Float and Deck Design Standard

1. The individual dock section shall consist of decking surface and the float structure, which are to be constructed as a single, integrated component. Each section shall provide for the support of the dead load plus a specified live load of 62.5 pounds per square foot (lb/ft2). This shall be accomplished without the use of foam for either structural integrity or flotation. The dock sections shall be manufactured by a rotational molding process and each dock section shall be subject to the specific parameters of the particular model.
2. The individual dock section shall consist of a specified number of interior, air filler pylons. These pylons shall provide for flotation in the event of a breach of an exterior wall of the dock section; as well as the structural support for the deck portion of the float. Each pylon shall support the dead load plus a live load of 55 pounds (lb). The volume of each pylon shall be no less than 1540 cubic inches (in3).
3. The individual dock sections shall be constructed of the following materials with the following general properties:

    a. Virgin Polymer, Thermoplastic, Rotational Molding Grade Compounded Medium Density Polyethylene-(MDPE)
    b. An ultraviolet inhibitor system (UV-16) or better spectrometer specification. Laboratory testing conducted for 8000 hours yielded a 6.5% decrease in mechanical properties. The chart to the right shows the UV degradation trend line in relationship to mechanical property decrease over time. After the first 8000 hours the rate of decay is reduced significantly. Theoretical data indicated that the period of time between 8000 and 16000 hours yields an additional 0.7% decrease in mechanical properties.
    c. A color of brown colorant in accordance with rotomolding standards.
    d. The density of the section shall be approximately .935 grams per cubic centimeter (g/cm3) or .0338 pounds per cubic inch (lbs/in3), per ASTM 792-00.
    e. The dock section shall have a cold brittleness temperature equal to, or less than, -130^{o} Fahrenheit (F), per ASTM D-746.

4. The properties of the exterior wall thickness of the dock sections shall be as follows:
    a. The mean exterior material thickness shall be no less that .30 inches (in).
    b. The corners shall be no less than .60 inches (in).
    c. The exterior edge thickness shall be no less than 0.50 inches (in) at any particular point.
    d. The walls of the dock sections shall resist a shear of no less that 1900 pounds per square inch (lb/in2), per ASTM D-732, as well as having the capability of resisting a mean minimum impact of no less than 207 foot pounds (ft-lb), per ASTM D5420.
    e. The tensile strength at average failure shall be no less than 2400 pounds per square inch (lb/in2) with 14% elongation at yield, per ASTM D-638-03.

5. The decking surface shall be composed of a textured or “orange peel” surface with a grid pattern for added adhesion during dry conditions. Drainage of the decking surface shall be accomplished through the use of troughs, which shall have a width of no more than 0.5 inches (in) and a depth of no more than 0.5 inches (in). The drainage troughs shall extend over the width of the dock and shall be positioned at intervals of no less that 4.5 inches (in) and no greater than 6.5 inches (in) over the entire length of the deck

   The properties of the decking surface shall be as follows:

   a. The mean deck thickness shall be no less that 0.3 inches (in).
   b. The deck thickness shall be no less than 0.290 inches (in) at any particular point.
   c. The deck shall resist a punching shear which is no less that 1900 pounds per square inch (lb/in2), per ASTM D-732.
   d. The deck shall resist a minimum impact of no less that 120 foot pounds (ft-lb) near the center, or at the point where the deck is thinnest, per ASTM D-3029.
   e. The deck shall resist a minimum impact of no less that 150 foot pounds (ft-lb) within 16 inches (in) of the outside of the dock, per ASTM D-3029.

B. Connections of Dock Sections

1. Each dock section shall have molded-in female-type pockets spaced symmetrically along the top and bottom edges, around the entire perimeter of the dock section. These pockets shall be spaced at 19.5 inch (in) intervals, center line to center line, from each other. All un-used pockets are to be filled with supplied EZ Dock pocket filler (PN # 201030).
2. The molded-in female-type pockets shall accept a male-type coupler which shall be secured into the female pocket with the use of a 0.5 inch (in) X 13 inch (in) coupler bolt and nut.
3. The purpose of such connections is to provide for simple assembly and disassembly, as well as providing for the securing of one section to another. The connection will also provide for the ability to attach EZ Dock accessories to the dock sections.
4. Each connection point shall allow for some slippage in the event that an extreme stress is applied. This slippage will allow for disconnection without causing damage either to the male-type couplers or the female-type pockets.
5. The dock sections shall be connected at increments of 19.5 inches (in), in relation to each other. These connections may be made from any one side of any dock section to any other side of another dock section. These connections may also be used to connect dock sections of differing dimensions and shall provide for ease of assembly, whether the sections are to be assembled on land or in the water.
6. The male-type coupler shall be constructed of recycled post/pre-consumer recycled tire rubber.
7. Each male-type coupler shall withstand a pullout force of no less than 2500 pounds (lb) before failure of coupler occurs.
8. Each of the molded in female connection pockets shall provide for a pullout strength of no less than 3500 pounds (lb), before damage is caused to the dock section.
9. The accessories shall be connected to the dock system through the use of molded in coupler pockets around the perimeter of the dock sections by the use of either male or female type half-couplers. The male-type half-coupler (hardware connector, PN # S21140SS) shall have a 3.625 inch “T”–bolt embedded within it. The female type half-coupler (hardware connector, PN # S21141SS) shall have a 3.625 inch “T”–nut embedded within it Both types of half-coupler shall withstand a pullout force of no less that 2600 pounds (lb) before failure occurs.

C. Hand Railing Attachment

1. The dock structure shall have the ability to accept railing which is constructed to meet the standards established by the Americans with Disabilities Act (ADA), States Organization for

Boating Access Constructed of 1.5” OD X 1/8” aluminum tubing.

D. Gangways and Access

1. All construction is to be accordance with the minimum provisions of States Organizations for Boating Access (SOBA) and the guidelines stated by, “Marinas and Small Craft Harbors”. Gangways will be offered in several different material options but the offerings for loads, handrails, guardrails, transition plates, float mounts, shore mounts, and general designs will remain constant. Environmental conditions will influence the accessibility. Design layouts and advice can be supplied at request.
2. Gangways and Access Ramps shall be designed to support 90 pounds per linear foot (lbs/ftln). The deck and structural components shall be designed to support a concentrated load of 400 applied to any 12 inch X 12inch square. Lateral designed wind loads shall not exceed 77MPH.
3. Handrails shall be continuous along both sides of the of the walking surface and shall extend 12 inch past the walking surface on both ends. The top rail portion shall not be less than 34 inches nor more than 38 inches above the walking surface. The ends of the handrails shall be returned into the handrail body or terminate with no sharp or catching edges. The mounting and components of the handrails shall be capable of withstanding a lateral load of 50 pounds per linear foot.
4. Decking shall be aluminum and be skid resistant and made from marine grade appropriate materials.

E. Load Design

1. Dead Load
   a. The dead load shall consist of the entire dock system plus any additional attachments to the dock system.
   b. Each dock section, without additional attachments, shall provide a freeboard of approximately12.75” inches (in).
   c. The surfaces of adjacent deck surfaces shall have an elevation difference of no more than 0.125 inches (in).
   d. The ends of the fingers shall have an elevation of no more that 1 inch (in) above that of the main dock.
   e. The deck surface of each dock section shall not slope more than 0.5 inches (in) over the 10 foot (ft) length of the dock section.
   f. The deck surface of each 80 inch (in) X 10 foot (ft) dock section shall not slope more that 0.35 inches (in) over the width of the dock section.
   g. The deck surface of each 60 inch (in) X 10 foot (ft) dock section shall not slope more than 0.25 inches (in) over the width of the dock.
   h. The deck surface of each 40 inch (in) X 10 foot (ft) dock section shall not slope more than 0.15 inches (in) over the width of the dock section.
2. Live Load Due to Vertical Loads
   a. Under dead load conditions plus an additional 30 pounds per square foot (lb/ft2) of uniform live load, flotation shall provide for a minimum of 7 inches (in) of freeboard.
   b. The dock structure shall support a concentrated vertical load of up to 400 pounds (lb) at any particular point on the surface of the deck. The structure shall accomplish this while maintaining flotation.
3. Live Load Due to Horizontal Loads
   a. The dock system shall sustain the stated design loads applied by normal current and/or debris which are normal to a particular location. (In extreme conditions other

procedures such as additional anchorage, anchorage release, and/or dock system removal may be necessary.)

b. The dock system shall be capable of sustaining continuous wave action of up to 1 foot and occasional wave action not in excess of 3 feet during storm conditions.

c. The dock sections shall sustain any loads applied by non-moving ice without damage.

d. The dock system shall be compatible for the use of any boat or vessel size with a properly designed anchorage/mooring system. Boats or vessels over 35ft should be moored directly to the anchorage system.

e. The dock system and anchorage shall be capable of withstanding sustained wind loads of 77 miles per hour (mph), or 15 pounds per square foot (lb/ft2), at 100% boat occupancy, unless otherwise specified.

f. The dock system shall be capable of withstanding the impact force caused by a 35 foot boat striking the end of a finger at a speed of 2 miles per hour (mph) and at an angle of 10 degrees off center.

4. Designing for Layout

a. The dock system, anchorage, and connections shall be designed according to the recommendations of the American Society of Civil Engineers Manual and Report on Engineering Practice Number 50, “Planning and Design Guidelines for Small Craft Harbors”, the revised edition.

F. Basis of Design

1. Basis of design is floating dock manufactured by EZ Dock, Monett, MO. Local sales presentative is Mike Barry, FWM Docks, EZ Dock Northeast, Hudson, NH.

G. Anchors

1. 200 pound precast concrete pyramid anchors
2. Galvanized steel chain: Chain lengths at 3 to 4 times the water depth, utilizing live or engineered weights with a theoretical hold of 2,000 lbs. per anchor point.

2.02 PRESSURE TREATED LUMBER

A. Pressure treated wood shall be pressure treated southern yellow pine uniform in treatment and appearance, sizes as noted on the Drawings. All wood shall be from a single source.

B. Grade Certification: Each piece of wood shall bear grade mark applicable in accordance with the latest edition of Rules and Southern Pine Inspection Bureau or certified as to grade by a licensed subscriber or SPIB.

1. Grade: Grade shall conform to Southern Pine SPIB Standards, latest edition. Grade for all wood shall be No.1 and better.
2. Size: Standard dressing in accordance with American Lumber Standard SPR-16-53.
3. Moisture Content: Wood shall be air dried for 90-120 days to the maximum moisture content specified below to prevent excessive surface checking prior to preservative treatment.
4. Timber larger than (2x) nominal dimension: 25% maximum moisture content.
5. Wood (2x) nominal thickness dimension and smaller: 19% maximum moisture content.
    a. Pressure Treatment: Wood shall be preservative-treated by pressure methods and each piece so marked in accordance with the AWPA and AWPB Standards. Wood shall be pressure-treated with water-borne preservative conforming in all respects to AWPA Standard P5 for ACQ-Type C Treatment and Federal Specifications TT-4-571 and TT-W-550G (for type III treating solution). Minimum retention of preservative shall be in accordance with AWPB Standard C1 through C9. Field cuts shall be treated in accordance with AWPA- M4 Standards.

PART 3 – EXECUTION

3.01 FLOATING DOCK

A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.

B. Beginning of installation means acceptance of existing project conditions.

C. Installation to follow manufacturer's instructions “EZ Dock Installation Instructions”

D. Representative from dock manufacturer to attend pre-construction meeting and to review completed installation.

END OF SECTION

SECTION 32 92 00: TURF & GRASSES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SUMMARY

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all installation of seeded areas and fine grading work and related items as indicated on the Contract Documents and/or as specified in this Section and includes, but is not necessarily limited to, the following:
   1. Conservation seed mix
   2. Maintenance & protection

1.03 REFERENCES

A. Not Applicable

1.04 SUBMITTALS

A. Submit proof of landscape contractor's experience to the Owner’s Representative in accordance with Quality Assurance paragraph of this Section.

B At least 30 days prior to intended use, the Contractor shall provide the following samples and submittals for approval in conformance with the requirements of Section, Submittals. Do not order materials until Owner’s Representative’s approval of samples, certifications or test results has been obtained. Delivered materials shall closely match the approved samples. Acceptance shall not constitute final acceptance. The Owner’s Representative reserves the right to reject on or after delivery any material that does not meet these Specifications.

   1. Material Sampling and Testing of Loam Borrow from Off-Site Sources shall be specified, performed, and paid for under Section, PLANTING SOIL, of this Specification.
   2. Fertilizer:
      a. Submit product literature of seeding fertilizer and certificates showing composition and analysis.
      b. Submit the purchasing receipt showing the total quantity purchased for the project prior to installation.
   3. Seed: Submit a manufacturer's Certificate of Compliance to the Specifications with each shipment of each type of seed. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates.
   4. Hydroseeding: Prior to the start of hydroseeding, submit a certified statement for approval as to the number of pounds of materials to be used per 100 gallons of water.
   5. Wood Cellulose Fiber Mulch: Submit copies of manufacturer's literature and one material sample.
   6. Limestone: Submit supplier's certification that the limestone being supplied conforms to these Specifications.
   7. All additives needed to amend a specific soil in order to meet these specifications based on results of required testing.

1.05 EXAMINATION OF CONDITIONS

A. All areas to be improved shall be inspected by the Contractor before starting work and any defects

such as incorrect grading, or drainage problems shall be reported to the Owner's Representative prior to beginning this work. The commencement of work by the Contractor shall indicate his acceptance of the areas to be improved, and he shall assume full responsibility for the work of this Section, Seeding.

B. The Contractor shall be solely responsible for judging the full extent of work requirements involved.

1.06 QUALITY ASSURANCE

A. Qualification of Landscape Contractor: The work of this Section, Seeding, shall be performed by a landscape contracting firm which has successfully installed work of a similar quality, schedule requirement, and construction detailing with a minimum of five years' experience. Proof of this experience shall be submitted per Submittals paragraph of this Section, Seeding.

B. Qualification of Foreman or Crew Leader: All work of seeding shall be supervised by a foreman or crew leader who is a certified landscape professional or a certified horticulturist.

1. Certification shall be current. Proof of certification shall be submitted per Submittals paragraph of this Section, Seeding.

PART 2 – PRODUCTS

2.01 CONSERVATION SEED MIXES

A. The Contractor shall provide Conservation Seed mix. Basis of design is New England Conservation/Wildlife Mix by New England Wetland Plants, Amherst, MA. Seed mix to include the following species.

Virginia Wild Rye (Elymus virginicus), Little Bluestem (Schizachyrium scoparium), Big Bluestem (Andropogon gerardii), Red Fescue (Festuca rubra), Switch Grass (Panicum virgatum), Partridge Pea (Chamaecrista fasciculata), Panicledleaf Tick Trefoil (Desmodium paniculatum), Indian Grass (Sorghastrum nutans), Blue Vervain (Verbena hastata), Butterfly Milkweed (Asclepias tuberosa), Black Eyed Susan (Rudbeckia hirta), Common Sneezeweed (Helenium autunale), Heath Aster (Asterpilosus/Symphyotrichum pilosum), Early Goldenrod (Solidago juncea), Upland Bentgrass (Agrostis perennans)

Seeding rate: 1750 sq ft/lb

B. Conservation Seed shall be spread with a nurse crop. The nurse crop shall be comprised of the following:

a. If planted January through July: *Avena sativa* (grain oats) at a rate of 30 pounds per acre
b. If planted in August through December: *Secale cereal* (grain rye) at a rate of 30 pounds per acre
c. After establishment, nurse crop shall be cut back to a height of 8 inches.

C. Immediately after plant installation, all conservation seeding shall be protected with a barrier, as specified in Division 32 Section, PLANTING.

2.02 WOOD CELLULOSE FIBER MULCH

A. Mulch to cover hydroseeded areas with slopes less than 3 to one shall be fiber processed from whole wood chips and clean recycled newsprint in a 1:1 proportion manufactured specifically for standard hydraulic mulching equipment. Fiber shall not be produced from recycled material such as sawdust, paper, or cardboard.

B. Moisture content shall not exceed 10 percent, plus or minus 3 percent as defined by the pulp and

paper industry standards. Fiber shall have a water holding capacity of not less than 900 grams water per 100 grams fiber.

C. The mulch shall be of such character that the fiber will be dispersed into a uniform slurry when mixed with water. It shall be nontoxic to plant life or animal life.

D. The mulch shall contain a non-petroleum based organic tackifier and a green dye to allow for easy visual metering during application but shall be non-injurious to plant growth.

2.03 WATER

A. The Contractor shall be responsible to furnish his own supply of water to the site at no extra cost. If possible, the Owner shall furnish the Contractor upon request with an adequate source and supply of water at no charge. However, if the Owner's water supply is not available or not functioning, the Contractor shall be responsible to furnish adequate supplies at his own cost. All work injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor's responsibility to correct. Water shall be free from impurities injurious to vegetation.

B. Contractor shall keep log of watering schedule and volume applied. Log shall be signed by Foreman and submitted to Owner’s Representative.

PART 3 – EXECUTION

3.01 FINE GRADING

A. Fine grading shall be specified, performed, and paid for under the work of the Division 32 Section, PLANTING SOIL, of this Specification.

3.02 SEEDING

A. Contractor shall obtain Owner’s Representative’s written approval of fine grading and bed preparation before doing any seeding.

B. Limit of grading and earthwork shall be limit of seeding unless otherwise indicated on the Contract Documents. All areas disturbed outside the limit of seeding shall be prepared and seeded as specified herein at no additional cost.

C. The season for seeding shall be from April 1 to June 1 and from August 15 to September 30.

1. The actual planting of seed shall be done only during periods within this season which are normal for such work as determined by weather conditions and by accepted practice in this locality. To prevent loss of soil via water and wind erosion and to prevent the flow of sediment, fertilizer, and pesticides onto roadways, sidewalks, and into catch basins, seed loam areas within 5 days of spreading the loam.

D. Seed only when the bed is in a friable condition, not muddy or hard.

E. Seeding shall be by Hydroseeding Method specified as follows:

1. Prior to the start of work, furnish a certified statement as to the number of pounds of materials to be used per 100 gallons of water. This statement shall also specify the number of square feet of hydroseeding that can be covered with the quantity of solution in the hydroseeder.
2. Hydroseed with wood cellulose fiber mulch at a rate of 46 pounds per 1,000 square feet or 2000 pounds per acre.
3. For the hydroseeding process, a mobile tank with a capacity of at least 500 gallons shall be filled with water and the mixture noted above in the specified proportions. The resulting slurry shall be thoroughly mixed by means of positive agitation in the tank. Apply the slurry by a centrifugal pump using the hose application techniques from the mobile tank. Only hose application shall be permitted. At no time shall the mobile tank or tank truck be allowed onto the prepared hydroseed

beds. The hose shall be equipped with a nozzle of a proper design to ensure even distribution of the hydroseeding slurry over the area to be hydroseeded and shall be operated by a person thoroughly familiar with this type of seeding operation.

4. Contractor shall obtain Owner's Representative's written approval of fine grading and bed preparation before doing any hydroseeding.
5. Limit of grading and earthwork shall be limit of hydroseeding unless otherwise indicated on the Contract Documents. All areas disturbed outside the limit of hydroseeding shall be hydroseeded.
6. Seed only when the bed is in a friable condition, not muddy or hard. Construction methods shall conform to hydraulic method requirements specified in the Standard Specification.
7. Hydroseeding shall be a two-step process.
    a. Step one shall consist of spreading 100 percent of the required seed uniformly over the prepared loam bed so that the seed comes into direct contact with the soil. To mark the progress of the hydroseeding operation the Contractor may add 10 percent of the wood cellulose fiber mulch to the slurry.
    b. Step two shall consist of a separate application of wood cellulose fiber mulch immediately following the first step of hydroseeding noted above. Apply the wood cellulose fiber mulch at a rate of 2,000 pounds per acre.

3.03 CONSERVATION SEEDING MAINTENANCE

A. Maintenance shall begin immediately after any area is seeded and shall continue for a 90 day active growing period for seeded areas past Final Acceptance.

A. Maintenance shall include mowing, weed management, reseeding, and watering.

B. Mowing: During the maintenance period mow conservation seed area when height reaches 8 inches and before the cover crop produces seed. Cut to a height of 4 inches. Contractor to mow every time the growth reaches 8 inches. Mowing to avoid damage to trees, shrubs and perennials planted per Section PLANTING.

D. Weeding: Contractor shall have staff trained in identification of weeds and native seedlings. Spot application of 50% strength herbicide to emerged weed species or manual removal.

E. During the maintenance period, any decline in the condition of seeded areas shall require immediate action to identify potential problems and to undertake corrective measures.

F. Watering shall be performed during 90 maintenance period as follows:

1. The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable seeded area.
2. After seeding water the conservation seed area with one inch of water.
3. Apply another one inch of water one week after seeding.
4. Apply an additional one inch of water every week. Watering can be delayed whenever a one inch rain event occurs.

G. After the seed has germinated, reseed all areas and parts of areas that fail to show a uniform stand. Reseed such areas and parts of areas repeatedly until all areas are covered with a satisfactory growth of the desired species.

3.04 ACCEPTANCE OF CONSERVATION SEEDING

A. Following the minimum required maintenance periods for construction, the Contractor shall request the Owner's Representative in writing for a formal inspection of the completed work. Request for inspection shall be received by the Owner's Representative at least 10 Days before anticipated date of inspection.

B. Acceptance Requirements

1. At the end of the maintenance period, seeded areas shall show complete germination of specified species such that:

a. No weeds present.
b. No bare spots greater than 12 inches in diameter over greater than 10% of overall seeded area.

C. At least 90 percent of the grass and forbs established shall be permanent grass and forb species. If seeded areas are deficient, the Contractor's responsibility for maintenance of all seeded areas shall be extended until deficiencies are corrected. Seeded areas to be corrected shall be prepared and reseeded in accordance with the requirements of this Section.

D. Owner’s Representative’s inspection shall determine whether maintenance shall continue in any part.

3.05 CLEAN UP

B. Absolutely no debris may be left on the site. Excavated material shall be removed as directed. Repair any damage to site or structures to restore them to their original condition, as directed by the Owner’s Representative, at no cost to the Owner.

C. Clean wheels of vehicles before leaving site.

END OF SECTION

APPENDIX

1. Order of Conditions

   Note: Contractor is responsible for the requirements of Order of Conditions as noted.

2. Geotechnical Report: includes geotechnical borings results

Natick Community & Economic Development

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NATICK CONSERVATION COMMISSION

February 26, 2026

Claire Rundelli, Conservation Agent
Town of Natick Conservation Office
13 East Central Street
Natick, MA 01760

RE: Order of Conditions – DEP #233-932 – 0 Bradford Rd END/60 Harwood Rd (Pickerel Pond)

Enclosed please find the Order of Conditions (the Order) issued pursuant to the Wetlands Protection Act, General Laws, Ch. 131, Sec. 40 for the above-referenced project.

Please comply with the following requirements immediately:

- Read through and be sure you understand the enclosed Order. It is the responsibility of the owner/applicant to ensure that all conditions and approved plans are compiled with before, during and after construction. Deviation from the approved plans or conditions may result in a stop work order or further enforcement, as well as the inability to obtain a Certificate of Compliance at project completion.
- Record this Order at the Middlesex South Registry of Deeds and forward proof of recording to the Conservation Commission. The Order is not valid until it is properly recorded.
- Schedule a Pre-Construction Meeting with the Conservation Agent before construction commencement.
- Once the project is completed, the owner is required to obtain a Certificate of Compliance (COC) in order to officially close out the permit process. A COC will not be issued for Orders that have not been properly recorded at the Registry.

If you have any questions, please don't hesitate to contact us at crundelli@natickma.org.

Sincerely,

TOWN OF NATICK
Conservation Commission

cc: Massachusetts DEP - Northeast Regional Office

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
233-932
MassDEP File #

eDEP Transaction #

Natick
City/Town

A. General Information

Please note: this form has been modified with added space to accommodate the Registry of Deeds Requirements

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

1. From: Natick
Conservation Commission

2. This issuance is for (check one): a. ☒ Order of Conditions b. ☐ Amended Order of Conditions

3. To: Applicant:

Claire
a. First Name

Rundelli
b. Last Name

Town of Natick
c. Organization

13 East Central Street
d. Mailing Address

Natick
e. City/Town

MA
f. State

01760
g. Zip Code

4. Property Owner (if different from applicant):

a. First Name

b. Last Name

Town of Natick Conservation Commission
c. Organization

13 East Central Street
d. Mailing Address

Natick
e. City/Town

MA
f. State

01760
g. Zip Code

5. Project Location:

0 Bradford Rd END / 60 Harwood Rd (R)
a. Street Address

Natick
b. City/Town

14
c. Assessors Map/Plat Number

78 / 16A
d. Parcel/Lot Number

Latitude and Longitude, if known: d m s
d. Latitude

d m s
e. Longitude

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
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Natick
City/Town

A. General Information (cont.)

6. Property recorded at the Registry of Deeds for (attach additional information if more than one parcel):

Middlesex South
a. County

b. Certificate Number (if registered land)

LC 534 / 81365
c. Book

30 / 243
d. Page

7. Dates: 01/15/2026 (a. Date Notice of Intent Filed) 02/19/2026 (b. Date Public Hearing Closed) 02/26/2026 (c. Date of Issuance)

8. Final Approved Plans and Other Documents (attach additional plan or document references as needed):

Pickerel Pond Boardwalk, Natick, MA - Notice of Intent Submission (9 Sheets)
a. Plan Title

Kyle Zick Landscape Architecture, Inc.
b. Prepared By

Kyle Zick, R.L.A
c. Signed and Stamped by

February 9, 2026
d. Final Revision Date

varies
e. Scale

See attached Findings and Special Conditions
f. Additional Plan or Document Title

g. Date

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act:

Following the review of the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act (the Act). Check all that apply:

a. ☒ Public Water Supply b. ☐ Land Containing Shellfish c. ☒ Prevention of Pollution

d. ☒ Private Water Supply e. ☐ Fisheries f. ☒ Protection of Wildlife Habitat

g. ☒ Groundwater Supply h. ☒ Storm Damage Prevention i. ☒ Flood Control

2. This Commission hereby finds the project, as proposed, is: (check one of the following boxes)

Approved subject to:

a. ☒ the following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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Natick
City/Town

B. Findings (cont.)

Denied because:

b. ☐ the proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**

c. ☐ the information submitted by the applicant is not sufficient to describe the site, the work, or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the Act's interests, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**

3. ☐ Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310 CMR 10.02(1)(a) _____ a. linear feet

Inland Resource Area Impacts: Check all that apply below. (For Approvals Only)

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. ☒ Bank	30 a. linear feet	30 b. linear feet	20 c. linear feet	20 d. linear feet
5. ☒ Bordering Vegetated Wetland	135 a. square feet	135 b. square feet	135 c. square feet	135 d. square feet
6. ☒ Land Under Waterbodies and Waterways	251 a. square feet	251 b. square feet	0 c. square feet	0 d. square feet
	0 e. c/y dredged	0 f. c/y dredged		
7. ☒ Bordering Land Subject to Flooding	0 a. square feet	0 b. square feet	0 c. square feet	0 d. square feet
Cubic Feet Flood Storage	0 e. cubic feet	0 f. cubic feet	0 g. cubic feet	0 h. cubic feet
8. ☐ Isolated Land Subject to Flooding	a. square feet	b. square feet		
Cubic Feet Flood Storage	c. cubic feet	d. cubic feet	e. cubic feet	f. cubic feet
9. ☒ Riverfront Area	5600 a. total sq. feet	5600 b. total sq. feet		
Sq ft within 100 ft	234 perm 1291 temp	234 perm 1291 temp	560 e. square feet	560 f. square feet
Sq ft between 100-200 ft	4075 (temp) g. square feet	4075 (temp) h. square feet	4075 i. square feet	4075 j. square feet

Massachusetts Department of Environmental Protection
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City/Town

B. Findings (cont.)

Coastal Resource Area Impacts: Check all that apply below. (For Approvals Only)

	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
10. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. ☐ Land Under the Ocean	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
12. ☐ Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. ☐ Coastal Beaches	a. square feet	b. square feet	c. nourishment (cu yd)	d. nourishment (cu yd)
14. ☐ Coastal Dunes	a. square feet	b. square feet	c. nourishment (cu yd)	d. nourishment (cu yd)
15. ☐ Coastal Banks	a. linear feet	b. linear feet		
16. ☐ Rocky Intertidal Shores	a. square feet	b. square feet		
17. ☐ Salt Marshes	a. square feet	b. square feet	c. square feet	d. square feet
18. ☐ Land Under Salt Ponds	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
19. ☐ Land Containing Shellfish	a. square feet	b. square feet	c. square feet	d. square feet
20. ☐ Fish Runs	Indicate size under Coastal Banks, Inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
	a. c/y dredged	b. c/y dredged		
21. ☐ Land Subject to Coastal Storm Flowage	a. square feet	b. square feet		
22. ☐ Riverfront Area	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	g. square feet	h. square feet	i. square feet	j. square feet

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
233-932
MassDEP File #

eDEP Transaction #

Natick
City/Town

B. Findings (cont.)

* **#23**. If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.5.c (BVW) or B.17.c (Salt Marsh) above, please enter the additional amount here.

23. ☐ Restoration/Enhancement *:

a. square feet of BVW | b. square feet of salt marsh

24. ☐ Stream Crossing(s):

a. number of new stream crossings | b. number of replacement stream crossings

C. General Conditions Under Massachusetts Wetlands Protection Act

The following conditions are only applicable to Approved projects.

1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
   a. The work is a maintenance dredging project as provided for in the Act; or
   b. The time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
   c. If the work is for a Test Project, this Order of Conditions shall be valid for no more than one year.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order. An Order of Conditions for a Test Project may be extended for one additional year only upon written application by the applicant, subject to the provisions of 310 CMR 10.05(11)(f).
6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not extend the issuance date of the original Final Order of Conditions and the Order will expire on 02/26/2029 unless extended in writing by the Department.
7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.

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C. General Conditions Under Massachusetts Wetlands Protection Act

8. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.

9. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work.

10. A sign shall be displayed at the site not less then two square feet or more than three square feet in size bearing the words,

    "Massachusetts Department of Environmental Protection" [or, "MassDEP"]

    "File Number 233-932 "

11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before MassDEP.

12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.

13. The work shall conform to the plans and special conditions referenced in this order.

14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.

15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.

16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.

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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.

18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

19. The work associated with this Order (the "Project")
    (1) ☒ is subject to the Massachusetts Stormwater Standards
    (2) ☐ is NOT subject to the Massachusetts Stormwater Standards

    If the work is subject to the Stormwater Standards, then the project is subject to the following conditions:

    a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Construction General Permit as required by Stormwater Condition 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.

    b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that:

    i. all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures;

    ii. as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized;

    iii. any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10;

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

iv. all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition;

v. any vegetation associated with post-construction BMPs is suitably established to withstand erosion.

c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 18(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement) for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following:

i.) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and

ii.) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.

d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Multi-Sector General Permit.

e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 18(f) through 18(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 18(f) through 18(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.

f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.

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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

g) The responsible party shall:
1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and
3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.

h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.

i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.

j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.

k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.

l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions (if you need more space for additional conditions, please attach a text document):

See attached Special Conditions

20. For Test Projects subject to 310 CMR 10.05(11), the applicant shall also implement the monitoring plan and the restoration plan submitted with the Notice of Intent. If the conservation commission or Department determines that the Test Project threatens the public health, safety or the environment, the applicant shall implement the removal plan submitted with the Notice of Intent or modify the project as directed by the conservation commission or the Department.

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D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? ☒ Yes ☐ No

2. The Natick (Conservation Commission) hereby finds (check one that applies):

   a. ☐ that the proposed work cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw, specifically:

   _____ (1. Municipal Ordinance or Bylaw) _____ (2. Citation)

   Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order of Conditions is issued.

   b. ☒ that the following additional conditions are necessary to comply with a municipal ordinance or bylaw:

   Natick Wetlands Protection Bylaw (1. Municipal Ordinance or Bylaw) Art 79 (2. Citation)

3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.

   The special conditions relating to municipal ordinance or bylaw are as follows (if you need more space for additional conditions, attach a text document):

   If yes above, see attached Special Conditions

Natick Conservation Commission

Special Conditions 1-36
Pickerel Pond Floating Boardwalk
DEP # 233-932

Site: 0 Bradford Rd END and 60 Harwood Rd (R)

Owner/Applicant Town of Natick Conservation Commission
13 East Central Street, Natick, MA 01760
508-647-6452 crundelli@natickma.org

Date of Issuance 02/26/2026

Existing Conditions: Existing conservation parcel with naturally surfaced trails for passive recreation

Approved Project Summary:

- Install limit of work demarcation, erosion controls and tree protection
- Clear vegetation
- Construct stairs and landing structure
- Install gangway and floating boardwalk sections
- Stabilize exposed soils along stairs
- Plant restoration vegetation

Final Approved Plans and Documents:

1. Pickerel Pond Boardwalk, Natick, MA - Notice of Intent Submission (9 Sheets), prepared by Kyle Zick Landscape Architecture, Inc., signed and stamped by Kyle Zick, R.L.A., last revised 2/9/26.
2. Pickerel Pond Boardwalk: Project Narrative, prepared by Claire Rundelli, last revised 2/10/2026
3. Bordering Land Subject to Flooding Memorandum – Pickerel Pond, Natick, MA, prepared by Samiotes Consultants, Inc., signed and stamped by Mark Pricer, P.E., dated 9/16/25

Findings of Fact

The proposed project permitted under this Order of Conditions (OOC) (DEP #233-932) consists of construction of a new trail connection comprised of two (2) crib box stairs (stone dust surfacing), two (2) landing platforms, two (2) gangways connected to the landings via piano hinges, and 195' of floating boardwalk secured via pyramid anchors. The site is located within areas subject to the jurisdiction under the Natick Wetlands Protection Bylaw and the state Wetlands Protection Act including: Inland Bank, Land Under Waterbodies and Waterway, Riverfront Area, Bordering Land Subject to Flooding, and Bordering Vegetated Wetland.

The Conservation Commission has determined that the proposed floating boardwalk and trail improvements will not result in the loss of wetland resource areas or significantly alter the wetlands functional performance. The Massachusetts Wetlands Protection Regulations identify performance standards for work located within state jurisdictional wetlands, the performance standards for Inland Bank, Land Under Waterbodies and Waterways, Riverfront Area, Bordering Land Subject to Flooding and Bordering Vegetated Wetland are presented below.

Inland Bank (310 CMR 10.54)

Section 10.54 of 310 CMR regulations reads, *"... any proposed work on a Bank shall not impair the following:*

1. *the physical stability of the Bank;*
2. *the water carrying capacity of the existing channel within the Bank;*
3. *ground water and surface water quality;*
4. *the capacity of the Bank to provide breeding habitat, escape cover, and food for fisheries;*
5. *the capacity of the Bank to provide important wildlife habitat functions. "*

- Proposed work is designed to limit impacts to the bank, but some activities anticipated including hand removal of nuisance vegetation, vegetation clearing and grubbing, and the landing construction to connect the stairs to the gangway.
- Work impacting the bank includes landing construction and the gangway installation. The landings will result in disturbance mostly through vegetation clearing of the bank which is proposed to be restored through native tubeling plantings and restoration seed mix. Some minor soil disturbance may occur during the construction of the landing but all areas will be restored and revegetated. The gangway itself is raised over the bank and will have no direct impact on the bank performance standards.
- No work will be performed that will decrease the physical stability of the Bank. The landing is proposed to set back slightly from the bank, and the proposed gangway will sit over the bank with no contact. Erosion controls are proposed along the delineated bank to ensure areas remain stable and restoration plantings are proposed to ensure the stability provided by vegetative cover is reestablished.
- No work will impact the water carrying capacity of the bank. The landing construction is designed to ensure there is no loss of water carrying capacity of the bank.
- Maintenance activities will have no effect (positive or negative) on the bank's ability to provide ground water or surface water quality protection. Erosion control measures are proposed to protect water quality during the work.
- During the work period wildlife will be minorly disrupted. Removal of existing vegetation will occur in a small area of bank. However, no long-term adverse impacts to wildlife habitat are anticipated as restoration plantings are proposed to ensure there is no loss of wildlife habitat benefit under final conditions.

The Commission has determined that the project does meet the performance standards of 10.54(4) and that the inland bank impacted by the project will not result in any permanent impacts to the stability of the bank or water carrying capacity of the channel. It has also been determined that there will be no adverse impacts to water quality (surface and ground) or the capacity of the bank to provide important wildlife habitat functions as a result of the proposed restoration plantings.

Bordering Vegetated Wetlands (BVW) (310 CMR 10.55)

310 CMR 10.55 (4)(b) reads: *"...Notwithstanding the provisions of 310 CMR 10.55 (4)(a), the issuing authority may issue an Order of Conditions permitting work which results in the loss of up to 5,000 square feet of Bordering Vegetated Wetland when said area is replaced in accordance with the following general conditions and any additional, specific conditions the issuing authority deems necessary to ensure that the replacement area will function in a manner similar to the area that will be lost:*

1. *the surface of the replacement area to be created ("the replacement area") shall be equal to that of the area that will be lost ("the lost area");*
2. *the ground water and surface elevation of the replacement area shall be approximately equal to that of the lost area;*
3. *The overall horizontal configuration and location of the replacement area with respect to the bank shall be similar to that of the lost area;*
4. *The replacement area shall have an unrestricted hydraulic connection to the same water body or waterway associated with the lost area;*
5. *the replacement area shall be located within the same general area of the water body or reach of the waterway as the lost area;*
6. *at least 75% of the surface of the replacement area shall be reestablished with indigenous wetland plant species within two growing seasons, and prior to said vegetative reestablishment any exposed soil in the replacement area shall be temporarily stabilized to prevent erosion in accordance with standard US. Soil Conservation Service methods; and*
7. *The replacement area shall be provided in a manner which is consistent with all other General Performance Standards for each resource area in Part 111 of 310 CMR 10.00*

310 CMR 10.55 (4)(c) reads: "*Notwithstanding the provisions of 310 CMR 10.55(4)(a), the issuing authority may issue an Order of Conditions permitting work which results in the loss of a portion of Bordering Vegetated Wetland when;*

1. *said portion has a surface area less than 500 square feet;*
2. *said portion extends in a distinct linear configuration ("finger-like") into adjacent uplands; and*
3. *in the judgment of the issuing authority it is not reasonable to scale down, redesign or otherwise change the proposed work so that it could be completed without loss of said wetland.*

310 CMR 10.55 (4)(d) and (e) relate to impacts on rare vertebrate or invertebrate species habitat and/or Areas of Critical Environmental Concern.

- Only minimal work is proposed within the limits of BVW on site and this consists of landing construction to connect the stairs to the gangway and the removal of some wetland vegetation. The total area of BVW within the project area is limited to a small section of delineated wetland upland of the delineated bank. Due to the slopes of the surrounding area, there is limited BVW in this location and the landscape is primarily characterized by an upland slope leading down to the bank (identified as the Mean Annual High Water limit).
- The proposed work within BVW is limited to an impact area of 135 square feet on the northern side of the pond. BVW mapped on the southern edge of the pond is outside the limit of work area
- Restoration plantings, including wetland plants, are proposed within disturbed areas with the exception of the area that will fall under the gangway and the landing location (less than 50 square feet). Additional planting areas have been identified within the BVW to ensure 1:1 restoration of disturbed BVW area.
- The proposed impacts to BVW are unavoidable due to the nature of the proposed work.
- Restoration is proposed within the same horizontal and vertical extent of the disturbed areas and restoration of disturbed BVW will occur in the same location as disturbed BVW. Restoration within disturbed BVW will total 135 s.f. to meet the 1:1 restoration requirement,

along with additional restoration plantings in the surrounding upland.

- The hydraulic connection to the adjacent waterway will remain unrestricted.
- The disturbed BVW area will be seeded with an appropriate seed mixture to ensure dense herbaceous plant cover within 2 growing seasons with required monitoring and reporting noted in the below conditions.
- All general performance standards will be met.

The Commission has determined that the project does meet the performance standards of 10.55(4) and that the Bordering Vegetative Wetland impacted by the project will be replaced through restoration plantings equal to a 1:1 square footage ratio of the area disturbed (135 s.f.). Restoration areas shall be monitored for at least 2 years and reports regarding restoration area status shall be provided to the Commission per approved project narrative.

Land Under Waterbodies and Waterways (310 CMR 10.56)

As regulated within 310 CMR 10.56 (4)(a), *"any work proposed within Land Under a Waterbodies and Waterways (LUWW) must not result in adverse impacts to the following:*

1. *"the water carrying capacity within the defined channel, which is provided by said land in conjunction with the banks;*
2. *ground and surface water quality.*
3. *the capacity of said land to provide breeding habitat, escape cover and food for fisheries; and*
4. *the capacity of said land to provide important wildlife habitat functions. "*

- Approximately 200 s.f. of aquatic and semi-aquatic vegetation is required to be removed from within LUWW. This impact is unavoidable due to the nature of the proposed work and project purpose. Due to the significant wetland and LUWW areas (over 160 acres) surrounding the project area, the Commission has determined that the proposed work will not result in any loss of capacity of said land to provide important wildlife habitat functions.
- Additional work within LUWW includes the placement of the anchors for the floating boardwalk structure.
- The shape and small footprint of the proposed anchors means that there is no impact to the water carrying capacity of the channel. The majority of the anchor mass will settle into the sediment at the bottom of the water body.
- Proposed anchors will not impact the ability of the LUWW to provide ground water or surface water quality protection.
- The type of anchor (pyramid) was selected to minimize any impacts to the ability for the land to provide important wildlife habitat functions including breeding habitat, escape cover, and food production.

The Commission has determined that the project does meet the performance standards of 10.56(4) and that the Land Under Waterbodies and Waterways impacted by the project will not result in any adverse impacts to the water carrying capacity of the channel as the anchors will not restrict flow, on water quality, or the capacity of said land to provide important wildlife habitat functions.

Bordering Land Subject to Flooding (BLSF) (310 CMR 10.57)

The general performance standards for BLSF are found in 310 CMR 10.57 (4)(a) and read as follows:

5. *Compensatory storage shall be provided for all flood storage volume that will be lost as the*

results of a proposed project within Bordering Land Subject to Flooding, when in the judgment of the issuing authority said loss will cause an increase or will contribute incrementally to an increase in the horizontal extent and level of flood waters during peak flows. Compensatory storage shall mean a volume not previously used for flood storage and shall be incrementally equal to the theoretical volume of flood water at each elevation, up to and including the I 00-year flood elevation, which would be displaced by the proposed project. Such compensatory volume shall have an unrestricted hydraulic connection to the same waterway or water body. Further, with respect to waterways, such compensatory volume shall be provided within the same reach of river, stream or creek.

6. *Work with Bordering Land Subject to Flooding, including that work required to provide the above specified compensatory storage, shall not restrict flows so as to cause an increase in flood stage or velocity.*
7. *Work in those portions of bordering land subject to flooding found to be significant to the protection of wildlife habitat shall not impair its capacity to provide important wildlife habitat functions. "*

- Proposed work within the BLSF area, with a base flood elevation of 134.4 as determined per the requirements of 10.57(2)a(3), will not result in a loss of flood storage and is designed to minimize any obstructions or blockages to flood waters.
- Compensatory flood storage is not required based on the design of the floating boardwalk, gangway, and stairs. The proposed landing structure falls above the determined flood zone elevation and the raised gangway will not fall within the 100-year flood zone.
- No work proposed will restrict flows throughout the identified floodplain.
- Restoration is proposed for disturbed areas, which are identified above the Base Flood Elevation, to ensure no impacts to wildlife habitat function.

The Commission has determined that the project does meet the performance standards of 10.57(4) and that the Bordering Land Subject to Flooding will not be impacted during construction and there will be no loss of flood storage on the site.

Riverfront Area (RFA) (310 CMR 10.58)

Work within the Riverfront Area under this project would qualify under the 10.58(4) performance standards. 10.58(4)a and b are met as the work does comply with all performance standards for other identified resource areas and no work is proposed within identified or estimated rare species habitat.

Total Riverfront Area between the 2 subject parcels is over 1,200,000 s.f. of area. Within the defined limit of work, the Riverfront Area totals roughly 39,633.8 s.f.

As regulated within 310 CMR 10.58(4)(c), *"There must be no practicable and substantially equivalent economic alternative to the proposed project with less adverse effects on the interests identified in M.G.L. c. 131 § 40."*

- The Town of Natick did explore a number of alternatives for the proposed trail connection, including alternate methods of construction and access points.
  - Project purpose is to construct a recreational connection between two existing trail systems over a stretch of open water.
  - There are no methods of connection between the two trail systems that do not require an open water crossing. Alternate access points to connect the trails results in additional

wetlands disturbance over the proposed project. As the open water pond is surrounded almost entirely by Bordering Vegetative Wetland, the selected project location results in the minimal level of disturbance.

- Alternate types of connections (traditional pier supported boardwalk and prefabricated boardwalk) at the selected crossing location were quoted at significantly increased costs when compared to the floating boardwalk structure, and would result in additional disturbance of Land Under Waterbodies and Waterways due to the number of piers that would be required to span the length of the proposed connection. A traditional stick build boardwalk was quoted at $604,368.66 and a prefabricated boardwalk was quoted at $530,881.67. These increased costs are prohibitive as the project is fully supported by grant funding, and appropriated mitigation funds. The floating boardwalk was quoted at $352, 727.56. While the alternate boardwalk styles would also accomplish the project purpose, the increase in cost and additional wetland disturbance associated with construction of the alternate types of connection result in the floating boardwalk being the most financial reasonable and would result in the least amount of wetlands impact.
- Alternatives explored were limited to the parcels under care and custody of the Natick Conservation Commission in the Pickerel Pond/Sunkaway area, as the trail systems to be connected are specific to this location.

As regulated within 310 CMR 10.58(4)(d), "*The work, including proposed mitigation measures, must have no significant adverse impact on the riverfront area to protect the interests…*"

1. *Within 200 foot riverfront areas, the issuing authority may allow the alteration of up to 5000 square feet or 10% of the riverfront area within the lot, whichever is greater …, provided that:*
    a. *At a minimum, a 100' wide area of undisturbed vegetation is provided… preserved or extended to the max. extent feasible….*
    b. *Stormwater is managed in according to standards …*
    c. *Proposed work does not impair the capacity of the riverfront area to provide important wildlife habitat functions. …*
    d. *… incorporating erosion and sedimentation controls and other measures to attenuate nonpoint source pollution.*

- Permanent impacts to RFA are below the 10% or 5000 s.f. threshold so work may be allowed by the Conservatio Commission.
- Total impacts to RFA equal 5,600 s.f. but most of these are temporary impacts. The only permanent impacts to RFA include the constructed crib stairs, landing, and portions of the gangway. All other RFA land disturbed will be restored through native plantings.
- Vegetated buffers shall be retained to the extent feasible through the erosion control placement and limit of work flagging proposed. Additional plantings shall be installed, along with conservation seed mix application, to ensure all temporarily impacted areas are restored to 100% vegetative cover. The permanent impacts are only slightly larger than the existing trail pathway which does not support vegetation.
- As no impervious area is proposed, no stormwater management infrastructure is proposed beyond best practice for trail construction. Final grading will be such that runoff follows existing drainage patterns, and no additional runoff will be generated as a result of the proposed work. Gravel and stone dust used for stair construction will be permeable (no binders proposed) and will allow for stormwater that falls on the stairs to infiltrate in place. Vegetation along either side of the proposed stairs will reduce erosion potential under final conditions.
- Proposed work does not impair the wildlife habitat functions of the RFA as all areas surrounding the new trail connection will be restored with native buffer zone and wetland

vegetation.

- Erosion and sediment controls are proposed around all areas of disturbance and shall be inspected on a regular basis.
- Total permanent impacts to the Riverfront Area (footprint of stairs, landing platform and gangway) are equal to 243 s.f..

The Commission has determined that the project does meet the performance standards of 10.58(4) and that the Riverfront Area will continue to provide undisturbed vegetated buffers through the protected vegetation to the maximum extent feasible. Any areas requiring disturbance shall be revegetated through restoration plantings to ensure no loss or impairment of the capacity to provide important wildlife habitat functions. Nonpoint source pollution will be attenuated through erosion controls.

Buffer Zone (and local bylaw 25' No Disturb Zone and 40' No Build Zone)

Proposed work within the 100' buffer zone is minimized to only the extent necessary to construct the proposed trail improvements and stairs and remove nuisance vegetation. Erosion controls are proposed to minimize any adverse impacts to the adjacent resource areas (inland bank and BVW) and all disturbed areas are proposed to be stabilized and restored. Work is proposed within the 40' No Build Zone but proposed work does comply with the local regulations. Work is also proposed within the 25' No Disturb Zone but proposes a benefit to the wildlife habitat with increased native plantings, and recreational benefit for the local community through the creation of a new trail connection.

General Conditions

1. The Commission reserves the right to impose additional conditions or require the submittal of additional information as necessary to protect the interests of the Massachusetts Wetlands Protection Act, M.G.L. c. 131, 40 ("Act") and the Town of Natick Wetland Bylaw.

2. If any change is made or intended to be made in the plans, the applicant shall inquire in writing of the Commission whether the change necessitates a new Notice of Intent filing or Amended Order of Conditions. When plans are updated it is the responsibility of the applicant to provide all City Departments involved in the permitting and approval process complete and consistent plans.

3. The Natick Conservation Commission and the Commission's agents shall have the right to enter and inspect the premises to evaluate compliance with this OOC, and may require the submittal of any data necessary for such evaluation.

Conditions Prior to Construction

4. Within thirty (30) days of the issuance of this OOC and prior to commencement of work, the original copy of the OOC must be recorded with the Registry of Deeds (Middlesex). Proof of recording must be submitted to the Conservation Commission prior to the commencement of work. Failure to comply with this condition shall be cause to revoke this OOC.

5. Prior to the commencement of any activity on site, the applicant shall inform the Conservation Agent in writing of the names, addresses, email addresses, and telephone numbers of the project's supervisor(s) and alternate(s) who will be responsible for ensuring compliance with this OOC, and who will have the authority to (a) receive comments from the Commission, (b) direct the contractor to take measures of erosion and sedimentation control, and (c) order work to be stopped, if necessary.

6. The applicant shall notify the Conservation Agent in writing of any changes in personnel under the above condition.

7. This OOC shall be incorporated in all construction contracts for this project. All contractors working at the site shall be made aware of the provisions contained within this OOC and shall adhere to all

conditions contained herein.

8. Prior to the start of work, and if the project involves work adjacent to Bordering Vegetated Wetland (BVW), the boundary of the wetland and inland bank in the vicinity of the proposed work area shall be marked by wooden stakes, poles or flagging. Once in place, the wetland boundary markers shall be maintained until the Conservation Commission has issued a Certificate of Compliance.

9. Prior to the commencement of any activity on site, if deemed necessary, a concrete washout plan designed to limit and control any adverse on the wetlands resource area(s) must be presented to the Conservation Commission for review and approval.

10. Prior to the commencement of erosion control installation, a site walk shall be scheduled with the selected contractor and the Conservation Agent to locate the limit of work in the field and mark it in such a manner that it is clearly visible. This walk can also be used to mark out areas of vegetation removal (upland and wetland).

11. Final method and means for site access, equipment parking, and boardwalk launching shall be provided by the selected contractor to the Conservation Agent for review and approval. Any material revisions to the approved plans may require an amended Order of Conditions prior to the start of work.

12. Prior to the commencement of any activity on site, other than the placement of erosion and sedimentation controls and marking of BVW, there shall be a Pre-construction Meeting between the project supervisor, the contractor responsible for the work, and the Conservation Agent. Please contact the Conservation Commission office at 508-647-6452 at least seventy-two (72) hours prior to any activity to arrange for the Pre-construction Meeting. This meeting shall:

    a. Ensure the requirements of the OOC are understood by all parties;
    b. Check certain requirements have been met (installation of DEP file number sign, submittal of proof of recording, installation of applicable erosion controls, marking of BVW, contact information provided, etc.);
    c. Tree protection;
    d. Adjust erosion controls, if deemed necessary by the Conservation Agent.

Conditions During Construction

13. This OOC and a copy of the approved plans must be kept on the project site during construction at all times.

14. Erosion and sediment control measures shall follow the specifications in the final approved plans under this OOC.

15. The Natick Conservation Commission and the Commission's agents shall have the authority to inform the applicant or the applicant's representative of violations of the erosion and sediment control measures of this OOC. Upon such notification, the owners shall take immediate action to correct the violation.

16. All erosion and sediment control measures shall be maintained in continuous functioning order until all disturbed areas are re-vegetated and stabilized. This shall include periodic clean out of catch basins (where applicable) and replacement of filter fabric and hay bales. Erosion and sediment controls should be inspected on a weekly basis and after every storm event of a ½ inch of rain or more. Erosion and sediment controls must be repaired, reinforced or replaced as necessary.

17. An adequate stockpile of erosion control materials shall be on site at all times for emergency or routine replacement and shall include materials to repair silt fences, or any other devices planned for use during construction.

18. If de-watering is required, water shall be pumped into a filter bag or settling basin constructed of straw bales or silt fence which will be located in suitable areas outside of the wetland resource areas. The basin and all accumulated sediment will be removed following de-watering operations, and the area seeded and mulched.

19. A general policing of the entire wetland area must be performed in which all manufactured items and debris are to be removed from the wetland resource areas and buffer zones.

20. The areas of construction shall remain in a stable condition at the close of each construction day.

21. As soon as possible during construction, all disturbed areas shall be brought to final finished grade, and either loamed or seeded, or stabilized in another way approved by the Commission. Bare ground that cannot be permanently stabilized within thirty (30) days shall be stabilized by temporary measures acceptable to the Commission.

22. Materials and equipment shall be stored in a manner and location, which will minimize the compaction of soils and the concentration of runoff. Equipment fuel storage and refueling operations shall be situated in an upland area at a horizontal distance greater than 100' from the boundaries of the resource areas. If a spill occurs, contaminated soils shall be removed according to guidelines established by MassDEP.

23. Equipment shall be maintained to prevent leakage or discharge of pollutants. Any leakage of oil, hydraulic fluid, or other pollutant shall be cleaned up immediately upon discovery and the equipment shall be immediately removed from the site. Adequate sized spill kits depending on size of equipment must be kept on-site at all times.

24. If any unforeseen problem occurs during construction which affects any of the statutory interests of the Wetlands Protection Act, Chapter 131, Section 40 and/or the Natick Wetland Bylaw, upon discovery, the applicant shall notify the Commission, and an immediate meeting shall be held between the Commission, the applicant, the engineer, contractor, and other concerned parties to determine the corrective measures to be employed. The applicant shall then act to correct the problem using the corrective measures agreed upon.

25. The removal of aquatic vegetation within the LUWW resource area shall be coordinated with the Conservation Agent to ensure work is appropriately supervised. Only vegetation required for the installation of the gangway and boardwalk sections is approved for removal. Removal shall occur through cutting of vegetation and hand removal of cut material and any sediment above the water surface.

26. If any trees not approved for removal within the wetland or buffer zone associated with the project area (e.g., inside the limit of work) die within 2 years of the start of construction or have been demonstrably harmed by construction activities, they shall be replaced at a ratio of 2:1 with native canopy saplings (of roughly 2 caliper inches).

27. Horticultural best practices must be followed including, plantings shall not be allowed to be planted in their mesh or wire baskets.

28. The installation of landscape and restoration plants as shown on the approved plans shall occur under the supervision of the Conservation Agent or Registered Landscape Architect associated

with the project to ensure the 1:1 restoration of areas within the delineated Bordering Vegetative Wetland.

29. No pesticides, herbicides, or fertilizers shall be applied within wetland resource areas including Riverfront Area, and within any buffer zones.

Conditions After Construction

30. Once the site is stabilized, all erosion controls shall be removed and properly disposed of utilizing the least invasive means possible.

31. Monitoring of restoration areas shall occur per the approved narrative and continue for a minimum of 2 years following plant installation. Reports shall be provided every 6 months (minimum 4 reports) following installation to the Conservation Commission. No Certificate of Compliance shall be issued prior to the completion of the required monitoring.

32. As soon as the work described in this OOC is completed, the applicant must submit to the Commission a written request for a Certificate of Compliance. The following documents shall accompany the request:

    a. A completed Request for Certificate of Compliance form (WPA Form 8A).
    b. Site photos documenting the completed stairs, landing, gangway, boardwalk, and restoration plantings.
    c. A written statement from a Registered Landscape Architect registered in Massachusetts certifying that the work has been completed in substantial compliance with this Order of Conditions and the approved plans referenced herein (or approved revisions). If the completed work differs from that in the approved plans and conditions, the report must specify how the project differs.

Special Conditions in Perpetuity

The following conditions are perpetual and do not expire with the issuance of a Certificate of Compliance. They shall continue in force beyond the Certificate of Compliance and shall be referred to in all future deeds to this property:

33. No pesticides, herbicides, or fertilizers shall be applied within wetland resource areas including Riverfront Area, and within any buffer zones.

34. Bordering vegetative wetland restoration plantings shall be maintained in a naturalized state in perpetuity.

35. This OOC shall apply to any successor in control or successor in interest of the property described in the Notice of Intent and accompanying plans. These obligations shall be expressed in covenants in all deeds to succeeding owners of portions of the property so as to apprise future owners that the conditions provided herein will apply to this property in perpetuity.

36. No new disturbance (including leaf litter dumping, disturbance of vegetation, etc.) is allowed within 25 feet from all wetland resource area boundaries. No new structures are allowed within 40 feet from all wetland resource area boundaries. Please contact the Conservation Commission to conduct *any* additional disturbance and work outside of the scope of this OOC.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
233-932
MassDEP File #

eDEP Transaction #

Natick
City/Town

E. Signatures

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

2/26/26
1. Date of Issuance

Please indicate the number of members who will sign this form.
This Order must be signed by a majority of the Conservation Commission.

5
2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

I, Claire Rundelli, Conservation Agent and Open Space Planner of the Town of Natick, am authorized to execute on behalf of the members of the Town of Natick Conservation Commission all Determinations of Applicability, Orders of Condition, and Certificates of Compliance pursuant to the Commission's vote dated September 16, 2021, and recorded with the Middlesex South District Registry of Deeds in Book 78795, Page 102.

Signature	Matthew Gardner Printed Name
Signature	George Bain Printed Name
Signature	Michael Downey Printed Name
Signature	Jeffrey Richards Printed Name
Signature	James Fitzgerald Printed Name
Signature	Printed Name
Signature	Printed Name
Signature	Printed Name Claire Rundelli, Conservation Agent
Signature	Printed Name

☒ by hand delivery on
02/26/26
Date

☐ by certified mail, return receipt requested, on
Date

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
233-932
MassDEP File #

eDEP Transaction #

Natick
City/Town

F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
233-932
MassDEP File #

eDEP Transaction #

Natick
City/Town

G. Recording Information

Prior to commencement of work, this Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

Conservation Commission

Please be advised that the Order of Conditions for the Project at:

Project Location | MassDEP File Number

Has been recorded at the Registry of Deeds of:

County | Book | Page

for: Property Owner

and has been noted in the chain of title of the affected property in:

Book | Page

In accordance with the Order of Conditions issued on:

Date

If recorded land, the instrument number identifying this transaction is:

Instrument Number

If registered land, the document number identifying this transaction is:

Document Number

Signature of Applicant

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

Request for Departmental Action Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number:

Provided by DEP

A. Request Information

1. Location of Project

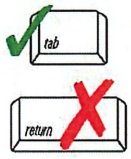
a. Street Address

b. City/Town, Zip

c. Check number

d. Fee amount

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



2. Person or party making request (if appropriate, name the citizen group's representative):

Name

Mailing Address

City/Town

State

Zip Code

Phone Number

Fax Number (if applicable)

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

Name

Mailing Address

City/Town

State

Zip Code

Phone Number

Fax Number (if applicable)

4. DEP File Number:

B. Instructions

1. When the Departmental action request is for (check one):

☐ Superseding Order of Conditions – Fee: $120.00 (single family house projects) or $245 (all other projects)

☐ Superseding Determination of Applicability – Fee: $120

☐ Superseding Order of Resource Area Delineation – Fee: $120

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

Request for Departmental Action Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number:

Provided by DEP

B. Instructions (cont.)

Send this form and check or money order, payable to the *Commonwealth of Massachusetts,* to:

Department of Environmental Protection
Box 4062
Boston, MA 02211

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see https://www.mass.gov/service-details/massdep-regional-offices-by-community).

4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

GEOTECHNICAL REPORT

PICKEREL POND PEDESTRIAN BRIDGE
PICKEREL POND CONSERVATION AREA
NATICK, MASSACHUSETTS

August 23, 2024
Revised September 5, 2024

GSI Project No. 224231

Prepared for:

Mr. Kyle S. Zick, ASLA
Principal
Kyle Zick Landscape Architecture, Inc.
4228 Washington Street, Boston, MA 02131

Prepared by:

Harry K. Wetherbee, P.E.
Geotechnical Services, Inc.
55 North Stark Highway
Weare, NH 03281

Geotechnical Services Inc.
Geotechnical Engineering ◣ Environmental Studies ◣ Materials Testing ◣ Construction Monitoring

August 23, 2024
Revised September 5, 2024

Kyle S. Zick, ASLA
Principal
Kyle Zick Landscape Architecture, Inc.
4228 Washington Street, Boston, MA 02131

RE: Geotechnical Report
Pickerel Pond Pedestrian Bridge
Pickerel Pond Conservation Area
Natick, Massachusetts **GSI Project No. 224231**

This report presents the results of a geotechnical investigation completed by Geotechnical Services, Inc. (GSI) for the construction of the proposed pedestrian bridge in Natick, Massachusetts. The objective of the geotechnical investigation was to explore subsurface conditions within the proposed development area and formulate geotechnical engineering recommendations for the design and construction of the proposed bridge abutments. Included are the findings of our subsurface exploration program and an engineering evaluation of the subsurface conditions encountered. The contents of this report are subject to the **Limitations** included in Appendix A.

PURPOSE AND SCOPE

The scope of services performed by GSI to meet the above-stated objectives for geotechnical engineering services included the following:

1. Coordination and observation of two (2) test borings at the locations illustrated on the attached Figure 2;

2. Formulation of design parameters for bridge abutment footing foundation construction, including allowable bearing pressure and prediction of long-term settlement values;

3. Formulation of earthwork and foundation construction procedures to be followed during the construction phase of this project;

4. Establishment of seismic design parameters and liquefaction potential based on the subsurface profile and the proposed structure;

5. Preparation of this geotechnical engineering report which summarizes our findings and recommendations.

SITE AND PROJECT INFORMATION

The project involves the construction of the proposed development within the Pickerel Pond Conservation Area in Natick, Massachusetts. The property is located west of Harwood Road and contains the entirety of Pickerel Pond, as well as a large forested conservation area. The area of development is accessed via a walking path and is located at the southwestern corner of Pickerel Pond.

The proposed development consists of improvements to the trail system, which will include a new pedestrian boardwalk and a bridge crossing over a portion of the southwest side of the lake. Design documents for the bridge were not available at the time of this writing, however, it is assumed that the bridge will be of wood or steel-framed construction with concrete abutments.

SUBSURFACE INVESTIGATION

Two (2) test borings designated GSI-1 and GSI-2 were advanced for the purpose of evaluating the geotechnical properties of the existing soils. The test borings were advanced in the vicinity of the proposed abutments to a depth of 32 feet below existing grade. The subsurface explorations classified the on-site soils according to their color, grain size, and other material properties. The test boring program was conducted by New England Boring Contractors, Inc. utilizing a track mounted drill rig.

Soil explorations were performed in accordance with methods prescribed by ASTM D1586. Soil samples were obtained at the surface and at two to five-foot intervals with a 1⅜ inch diameter split-spoon sampler. Standard Penetration Tests (SPTs) were performed at the sampling intervals in accordance with ASTM D1586. Field descriptions of the soils encountered, observed depth to groundwater while drilling when observed, and other pertinent observations are contained in the attached test boring logs. The test boring locations are illustrated on Figure 2 of this report. GSI test boring logs are presented in Appendix B.

SUBSURFACE CONDITIONS

Surficial Materials/Fill

The test borings were advanced within forested areas in the vicinity of the proposed abutments. At ground surface, 3 inches of topsoil and forest mat was observed over variable amounts of Silty Sand subsoils laden with roots. Sand and Gravel was present beneath the subsoils.

Sand and Gravel

Sand and Gravel was observed from the initial soil sampling interval to depths of 23 to 25 feet below existing grade. The Sand and Gravel was visually classified as olive brown or tan, fine to medium or fine to coarse Sand, and Gravel, trace to some Silt. SPT “N” values within the Sand and Gravel varied from 6 to 51 blows per foot. At GSI-1, Sand and Gravel was present at the termination of the test boring at 30 to 32 feet.

Sand (GSI-2)

At test boring GSI-2, at depths of 23 to 25 feet, the Sand and Gravel transitioned to Sand consisting of medium dense, tan or olive brown, fine to medium Sand, some Silt. The Sand continued beyond test boring termination at 32 feet.

GROUNDWATER

Groundwater was observed at depths of 10 to 12-feet during the subsurface investigation. Groundwater observations should not be considered long-term, equilibrated groundwater levels, but rather an approximate indication of the likely groundwater elevation during construction. Groundwater levels should be anticipated to fluctuate from those measured during drilling operations in response to differences in equilibrated time, rainfall, snowmelt, and seasonal changes.

FOUNDATION DESIGN RECOMMENDATIONS

Conventional Concrete Abutments

The proposed structural elements may be supported by reinforced concrete footings bearing directly upon the native soils described above. An allowable bearing pressure of 2 tons per square foot (4,000psf) may be assumed for design. The abutment footings should be founded at least 4 feet below exterior grade to obviate frost action in the bearing strata. Crushed stone may be necessary to protect the subgrade during excavation.

Any organic soils encountered during subgrade excavation shall be removed within the foundation zone of influence extending at a 1 horizontal to 1 vertical angle from the outside edge of the proposed footing. Concrete abutments will require continuous dewatering during foundation construction to ensure the subgrades remain dry and stable.

At the recommended bearing pressures, we anticipate that the total settlement of individual footings under static loading conditions and constructed as recommended herein, will not exceed 1 in., with differential settlements between adjacent footings not exceeding ¾ in. Most of the settlement will likely occur elastically during construction as structure dead loads are placed on the foundations. The live load contribution to foundation settlement is expected to be less than 50% of the dead load thus post construction settlements are not expected to be problematic.

Helical Pile Foundation Support

Alternatively, a support system composed of helical piles may be utilized to support the proposed bridge. Helical piles consist of small diameter cylindrical or steel shaft with a series of spiral plates or flytes affixed to the lower section. Pile sections can be hollow or solid steel, and may be grouted in place for added strength. The pile is advanced into the ground with the use of a torque motor, which spins the assembly to depth. The pile shaft transfers the loads to the pile itself. The helical obtains its capacity by the bearing of the flytes directly upon the bearing strata. In order for a helical pile to properly develop its full capacity, the bearing plates must all be fully engaged within competent load bearing soils.

Recent experience with pedestrian bridges supported by helical piles suggests that a helical pile consisting of a 10 and 12-inch diameter flyte configuration affixed to 3-1/2 diameter pile shafts may be appropriate for this application. The pipe should have a minimum wall thickness of at least 0.30 inches and be hot-dipped. For such a helical assembly we estimate an allowable load of 25 kips per pile, however, actual bridge loads will vary and must be confirmed by the bridge designer. The helical pile capacity should be confirmed in the field with a "quick method" load test in accordance with ASTM D 1143 and correlated with the installation torque in the bearing strata. All piles installed should be observed for proper depth and installation torque by a qualified engineering technician. A stamped pile design must be provided by the designer prior to installation.

ENGINEERING PARAMETERS OF ON-SITE SOILS

Based on results of our subsurface exploration program, the following engineering properties of soils that will be supporting foundation elements are estimated as follows:

TABLE ONE
SOIL ENGINEERING DESIGN PARAMETERS

Soil Type	Friction Angle φ, (degrees)	Cohesion c, (psf)	Unit Weight γ, (pcf)	Coeff. of Sliding Friction Soil to Concrete (tan δ)
Sand and Gravel	32	0	125	0.40
Sand	31	0	110	0.30

SEISMIC DESIGN PARAMETERS

The seismic design parameters have been reviewed with respect to the 9th Edition of the Massachusetts Building Code. Upon review of the subsurface soils data and considering information gathered from projects with similar subsurface profiles, the site is to be associated with Site Class "D" and the design of structural elements should reflect this distinction. The subsurface conditions are also not deemed susceptible to earthquake induced "liquefaction." A Summary of USGS Design Maps are included as Appendix D.

EARTHWORK RECOMMENDATIONS

Foundation Subgrade Preparation

Prior to foundation construction, any topsoil, subsoil, or loose soils encountered should be removed. Foundation and floor slab subgrades should be proof compacted using a heavy vibratory plate or drum roller, as described below, prior to foundation construction or placing additional fill in order to densify disturbed soils resulting from excavation and preload the subgrade.

Recommended proof compaction should include 4 coverages (2 in each orthogonal direction) with a minimum of a 10-ton vibratory roller. During the proof rolling process, the subgrade should be observed by a qualified Geotechnical Engineer to identify areas exhibiting weaving or excessive reaction. Any soils exhibiting excessive reaction should be locally excavated and replaced with free-draining structural fill or crushed stone. In addition, crushed stone may be required to raise subgrades during dewatering operations and ensure a dry, stable subgrade surface.

Protection of Foundation Subgrades

The contractor should be required to maintain stable, dewatered subgrades for foundations, pavement areas, and utility trenches. Subgrades may be disturbed by improper excavation methods, moisture, precipitation, groundwater control, and construction activities. The contractor should take precautions to protect the bearing subgrade against disturbance from construction traffic and weathering. If necessary, dewatering can be accomplished via open pumping utilizing submersible pumps and temporary stone lined sump pits.

A lift of compacted crushed stone may be utilized to protect the subgrade surface from wear and disturbance should water be present within the excavation. The subgrade must still be verified for competency prior to the placement of concrete or backfill materials within the building footprint. If construction activities are to take place during winter months, the contractor should protect the work area from freezing, which may necessitate the use of soil blankets or tents and heaters to protect the subgrade surface.

Construction Dewatering

The site contractor should be prepared to remove any standing water from foundation excavations. Stormwater runoff developed from storm events should be diverted away from excavation areas to minimize any impoundment in the excavation or disturbance to the foundation subgrades. It is anticipated that groundwater and stormwater may be controlled by localized dewatering efforts employing sumps and pumps.

The groundwater elevation should be maintained at least 12 inches below the foundation grade until backfilling is complete. A lift of crushed stone or free draining structural fill at foundation grade may be utilized to facilitate dewatering and provide a dry and stable subgrade during construction.

Backfilling

Backfill should be placed and compacted in lifts immediately after final excavation to limit disturbance to the subgrade surface. Except for zones requiring special backfill such as directly beneath pavements or exterior slabs, other site areas may be backfilled with Common Fill.

Placement of compacted fills should proceed with caution when air temperatures are low enough (approximately 30°F, or below) to cause freezing of the moisture in the fill during or before placement. Fill materials should not be placed on snow, ice or uncompacted frozen soil. Compacted fill should not be placed on frozen soil.

No fill should be allowed to freeze prior to compaction. At the end of each day's operations, the last lift of fill, after compaction, should be rolled by a smooth-wheeled roller to eliminate ridges of uncompacted soil.

Minimum compaction requirements for all fill materials are as follows:

TABLE TWO
MINIMUM COMPACTION REQUIREMENTS

Location or Area	Standard Proctor Density ASTM698	Modified Proctor Density ASTM D1557	Testing Frequency One Test Per Lift Per
Structures and Walkways	95%	92%	2,000 ft^2
Retaining Walls	95%	92%	1,000 ft^2
Pavements below 18 inches of Subgrade	95%	92%	5,000 ft^2
Trenches	95%	92%	150 lineal feet
Lawns and Unimproved Areas	92%	90%	20,000 ft^2
Building and Pavement Subgrades	100%	95%	1,000 ft^2

Structural Fill

Structural Fill should consist of clean sand and gravel free of organic material, snow, ice, or other objectionable materials and should be well-graded within the following limits:

Sieve Size	Percent Finer by Weight
6 in.	100
No. 4	30-70
No. 40	10-50
No. 200	0-10

Structural Fill should be placed in lift thickness not exceeding 12 in. loose measure. Cobbles and boulders having a size exceeding 2/3 of the loose lift thickness should be removed prior to compaction. Compaction in open areas should consist of self-propelled vibratory rollers such as a BoMag BW-60S or equivalent. In confined areas, hand guided equipment such as a large vibratory plate compactor, should be used and the loose lift thickness should not exceed 6 in. A minimum of four systematic passes of the compaction equipment should be used to compact each lift. Compaction effort should be verified by field density testing.

Common Fill

Common fill may be used to raise grades in paved and landscaped areas, subject to pavement design criteria and landscape planting or drainage requirements. Common fill should be granular mineral soil free from organic materials, loam, wood, trash, snow, ice, frozen soil, and other compressible materials. Common fill should not contain stones larger than 2/3 of the placement lift thickness, and have a maximum 80 percent passing the No. 40 sieve, and a maximum of 30 percent passing the No. 200 sieve. These soils typically would require moisture control during placement and compaction.

CONSTRUCTION MONITORING

It is strongly recommended that GSI be retained to provide construction monitoring and testing services in conformance with the requirements of the IBC. GSI has the Geotechnical Engineering staff and Technicians trained and experienced in all facets of monitoring earthwork excavation and construction materials testing, as well as a full-service soils and materials laboratory.

These services may include:

- Construction Materials Testing of Soils, Aggregates, Concrete, Steel, and Asphalt.
- Design Phase engineering services including preparation of final earthwork specifications, review of contractor submittals, and plan review.
- Construction Phase engineering services on Geotechnical issues and/or differing conditions encountered during construction.

CLOSURE

We trust that you find this report consistent with your needs. Should you have any questions with regard to this report, please do not hesitate to contact our office.

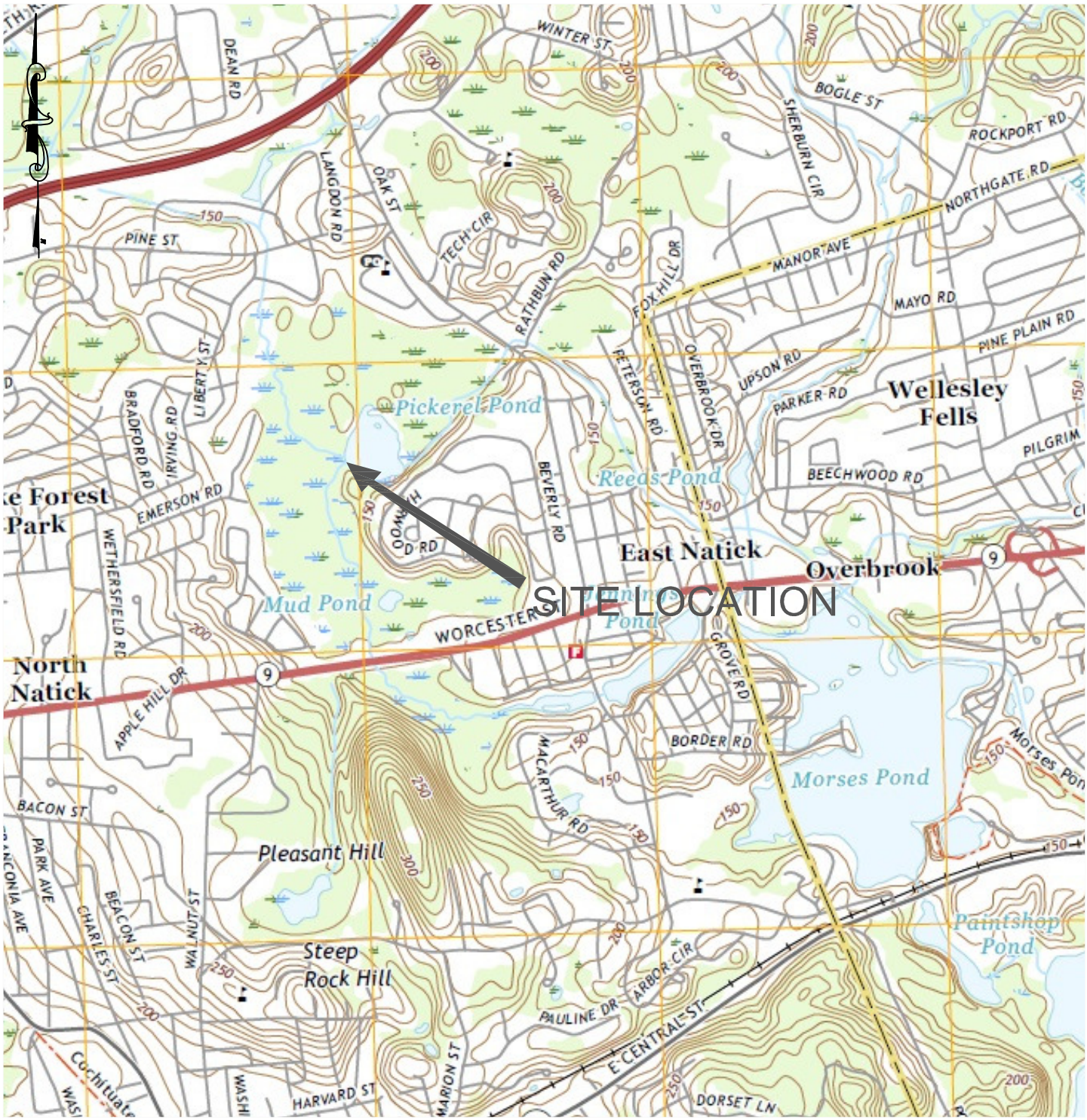
Very truly yours,

GEOTECHNICAL SERVICES, INC.

Harry K. Wetherbee, P.E.
Principal Engineer

Attachments:
Figure 1: Locus Plan
Figure 2: Exploration Location Plan
Figure 3: Foundation Zone of Influence

Appendix A: Limitations
Appendix B: Exploration Logs
Appendix C: Subsurface Exploration Key
Appendix D: USGS Seismic Design Maps
Appendix E: Draft Earthwork Specifications



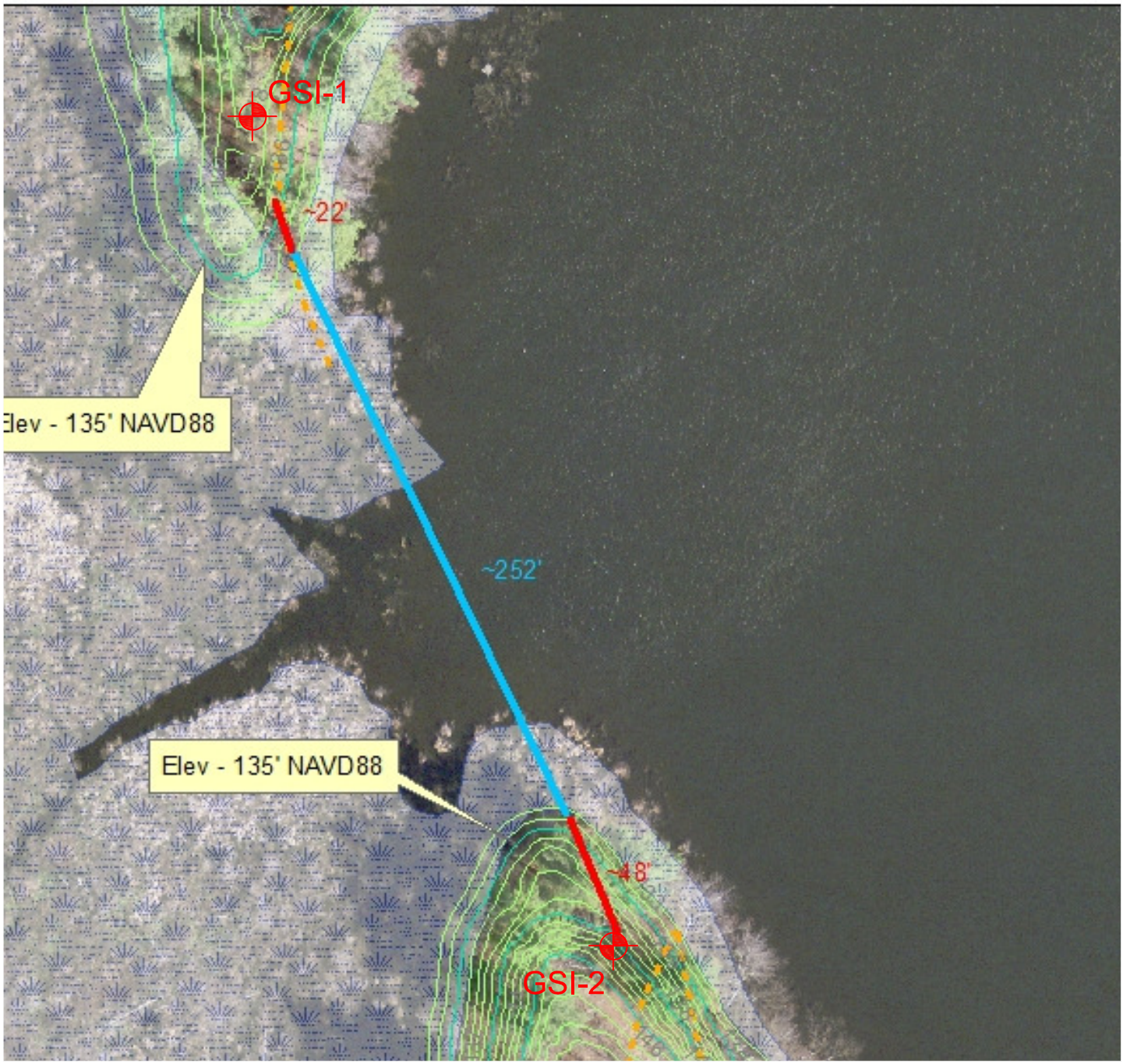
LOCUS MAP

GEOTECHNICAL SERVICES INC.
55 NORTH STARK HIGHWAY, WEARE, NH 03281
TEL. (603) 529-7766 FAX. (603) 529-7780

Pickerel Pond Pedestrian Bridge
Natick, Massachusetts

DRAWN BY: KJM	DATE: August 2024
CHECKED BY: HKW	SCALE: 1" = @1500'
FILE NAME: Pickerel Pond Bridge.dwg	PROJECT NO.: 224231

FIGURE NO. 1



GSI-1 GSI Test Boring Location (Approximate)

TP-1 Test Pit Location (Approximate)

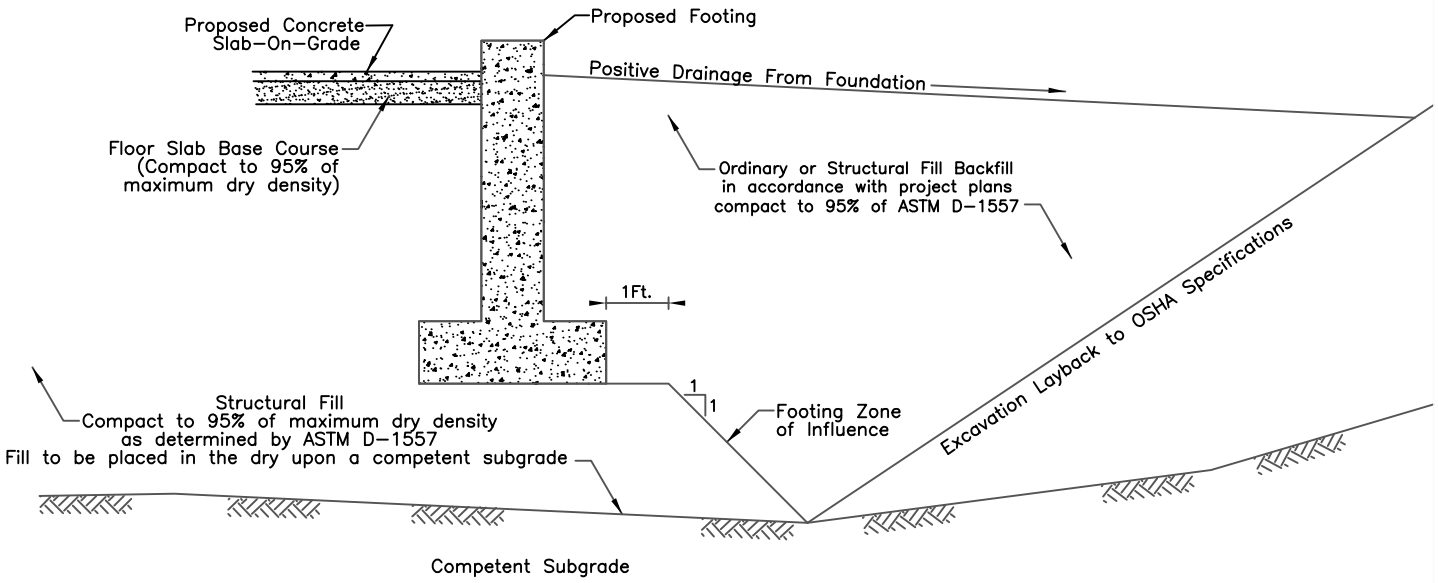
EXPLORATION LOCATION PLAN

GEOTECHNICAL SERVICES INC.
55 NORTH STARK HIGHWAY, WEARE, NH 03281
TEL. (603) 529-7766 FAX. (603) 529-7780

Pickerel Pond Pedestrian Bridge
Natick, Massachusetts

DRAWN BY: KJM	DATE: August 2024
CHECKED BY: HKW	SCALE: NTS
FILE NAME: Pickerel Pond Bridge.dwg	PROJECT NO.: 224231

FIGURE NO. 2



FOUNDATION ZONE OF INFLUENCE

GEOTECHNICAL SERVICES INC.
55 NORTH STARK HIGHWAY, WEARE, NH 03281
TEL. (603) 529-7766 FAX. (603) 529-7780

Pickerel Pond Pedestrian Bridge
Natick, Massachusetts

DRAWN BY: KJM	DATE: August 2024
CHECKED BY: HKW	SCALE: NTS
FILE NAME: Pickerel Pond Bridge.dwg	PROJECT NO.: 224231

FIGURE NO. 3

APPENDIX A

LIMITATIONS

LIMITATIONS

Explorations

1. The analyses, recommendations, and designs submitted in this report are based in part upon the data obtained from preliminary subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the individual test pit and/or boring logs.

3. Water level readings have been made in the test pits and/or test borings under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time the measurements were made.

Review

4. It is recommended that this firm be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the recommendations provided herein.

5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by Geotechnical Services, Inc.

Construction

6. It is recommended that this firm be retained to provide geotechnical engineering services during the earthwork phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

Use of Report

7. This report has been prepared for the exclusive use of the above and their assigns, in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

8. This report has been prepared for this project by Geotechnical Services, Inc. This report was completed for preliminary design purposes and may be limited in its scope to complete an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to evaluation considerations only.

APPENDIX B

EXPLORATION LOGS

Geotechnical Services, Inc. 55 North Stark Highway, Weare, NH 03281 Phone 603/529-7766 Fax 603/5297080 - 30 Newbury St. 3rd Floor, Boston, MA 02116 Phone 617/455-4248 Fax 617/745-4308

TEST BORING LOG

Boring No. GSI-1

Project	Pickerel Pond Ped. Bridge	GSI Project No.	224231	Elevation	E.G.
Location	Natick, Massachusetts	Project Mgr.	HKW	Datum	-
Client	Kyle Zick Landscape Architects	Inspector	KJM	Date Started	8/22/2024
Contractor	New England Boring Contractors	Checked By	HKW	Date Finished	8/22/2024
Driller	Ken Smith	Rig Make & Model	Geoprobe	Rig Model	-

Item:	Auger	Casing	Sampler	Core Barrel
Type	HSA		SS	
Inside Diameter (in.)	3-1/2"		1-3/8"	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

☐ Truck ☐ Skid
☐ Track ☐ ATV
☐ Bomb. ☑ Geoprobe
☐ Tripod ☐ Other

Hammer Type:
☐ Safety Hammer
☐ Doughnut
☑ Automatic

☑ Winch ☐ Cat Head ☐ Roller Bit ☑ Cutting Head

Depth (ft)	Casing (Blows/ft)	Sample No.	Sample Depth (ft)	Rec (in.)	SPT (Bl./ 6-in.)	"N" Value	PID Rdg. (ppm)	Stratum Change (ft)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
0		S-1	0-2	6	1 5 5 9	10			3" Forest mat/loam Medium dense, tan, fine to medium Sand, and Gravel, trace to little Silt
5		S-2	5-7	8	29 31 20 13	51			Very dense, olive brown/tan, fine to medium Sand, and Gravel, some Silt
10		S-3	10-12	8	9 13 9 14	21			Medium dense, olive brown, fine to coarse Sand, and Gravel, some Silt
15		S-4	15-17	6	5 6 3 3	9			Loose, tan/brown, fine to coarse Sand and Gravel, little Silt
20		S-5	20-22	6	5 7 5 4	12			Medium dense, tan, medium to coarse Sand, and Gravel, trace to little Silt

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
8/22	E.O.D	-	32'	10'

Sample Identification
O = Open Ended Rod
U = Undisturbed Sampl
S = Split Spoon
C = Rock Core
G = Geoprobe

Cohesive Soils N-Value
0 to 2: Very Soft
2 to 4: Soft
4 to 8: Medium Stiff
8 to 15: Stiff
15 to 30 Very Stiff
Over 30: Hard

Granular Soils N- Value
0 to 4: Very Loose
4 to 10: Loose
11 to 30: Medium Dense
31 to 50: Dense
Over 50: Very Dense

Trace (0 to 10%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes:

Geotechnical Services, Inc. 55 North Stark Highway, Weare, NH 03281 Phone 603/529-7766 Fax 603/5297080 - 30 Newbury St. 3rd Floor, Boston, MA 02116 Phone 617/455-4248 Fax 617/745-4308

TEST BORING LOG

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Client	Kyle Zick Landscape Architects	Inspector	KJM	Date Started	8/22/2024
Contractor	New England Boring Contractors	Checked By	HKW	Date Finished	8/22/2024
Driller	Ken Smith	Rig Make & Model	Geoprobe	Rig Model	-

Item:	Auger	Casing	Sampler	Core Barrel
Type	HSA		SS	
Inside Diameter (in.)	3-1/2"		1-3/8"	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

☐ Truck ☐ Skid
☐ Track ☐ ATV
☐ Bomb. ☑ Geoprobe
☐ Tripod ☐ Other

Hammer Type:
☐ Safety Hammer
☐ Doughnut
☑ Automatic

☑ Winch ☐ Cat Head ☐ Roller Bit ☑ Cutting Head

Depth (ft)	Casing (Blows/ft)	Sample Data No.	Depth (ft)	Rec (in.)	SPT (Bl./ 6-in.)	"N" Value	PID Rdg. (ppm)	Stratum Change (ft)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
25		S-6	25-27	8	5 3 4 5	8			Loose, dark tan, fine to medium Sand, trace to little Silt
30		S-7	30-32	3	7 6 7 8	13			Medium dense, olive brown, Gravel, and fine to coarse Sand, trace Silt Test boring terminated at 32 feet
35									
40									
45									

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
8/22	E.O.D	-	32'	10'

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Trace (0 to 10%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes:

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TEST BORING LOG

Boring No. GSI-2

Project	Pickerel Pond Ped. Bridge	GSI Project No.	224231	Elevation	E.G.
Location	Natick, Massachusetts	Project Mgr.	HKW	Datum	-
Client	Kyle Zick Landscape Architects	Inspector	KJM	Date Started	8/23/2024
Contractor	New England Boring Contractors	Checked By	HKW	Date Finished	8/23/2024
Driller	Ken Smith	Rig Make & Model	Geoprobe	Rig Model	-

Item:	Auger	Casing	Sampler	Core Barrel
Type	HSA		SS	
Inside Diameter (in.)	3-1/2"		1-3/8"	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

☐ Truck ☐ Skid
☐ Track ☐ ATV
☐ Bomb. ☑ Geoprobe
☐ Tripod ☐ Other

Hammer Type:
☐ Safety Hammer
☐ Doughnut
☑ Automatic

☑ Winch ☐ Cat Head ☐ Roller Bit ☑ Cutting Head

Depth (ft)	Casing (Blows/ft)	Sample No.	Sample Depth (ft)	Rec (in.)	SPT (Bl./ 6-in.)	"N" Value	PID Rdg. (ppm)	Stratum Change (ft)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
0		S-1	0-2	6	2 2 4 4	6			3" Forest mat/loam Loose, dark brown, fine to medium Sand, some Silt, roots
5		S-2	5-7	12	7 13 12 12	25			Medium dense, tan, fine to coarse Sand, and Gravel, trace to little Silt
10		S-3	10-12	10	6 11 7 17	18			Medium dense, tan/olive brown, fine to coarse Sand, some Gravel, trace to little Silt
15		S-4	15-17	0	31 24 21 16	45			No recovery, rock in spoon tip
20		S-5	20-22	6	14 9 8 8	17			Medium dense, olive brown, fine to coarse Sand, and Gravel, little Silt

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
8/23	E.O.D	-	32'	12'

Sample Identification
O = Open Ended Rod
U = Undisturbed Sampl
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4 to 10: Loose
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31 to 50: Dense
Over 50: Very Dense

Trace (0 to 10%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

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TEST BORING LOG

Boring No. GSI-2

Project	Pickerel Pond Ped. Bridge	GSI Project No.	224231	Elevation	E.G.
Location	Natick, Massachusetts	Project Mgr.	HKW	Datum	-
Client	Kyle Zick Landscape Architects	Inspector	KJM	Date Started	8/23/2024
Contractor	New England Boring Contractors	Checked By	HKW	Date Finished	8/23/2024
Driller	Ken Smith	Rig Make & Model	Geoprobe	Rig Model	-

Item:	Auger	Casing	Sampler	Core Barrel
Type	HSA		SS	
Inside Diameter (in.)	3-1/2"		1-3/8"	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

☐ Truck ☐ Skid
☐ Track ☐ ATV
☐ Bomb. ☑ Geoprobe
☐ Tripod ☐ Other

Hammer Type:
☐ Safety Hammer
☐ Doughnut
☑ Automatic

☑ Winch ☐ Cat Head ☐ Roller Bit ☑ Cutting Head

Depth (ft)	Casing (Blows/ft)	Sample Data No.	Depth (ft)	Rec (in.)	SPT (Bl./ 6-in.)	"N" Value	PID Rdg. (ppm)	Stratum Change (ft)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
25		S-6	25-27	4	6 5 5 7	10			Medium dense, gray/olive brown, fine to medium Sand, some Silt
30		S-7	30-32	0	3 5 6 6	11			No recovery Test boring terminated at 32 feet
35									
40									
45									

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
8/23	E.O.D	-	32'	12'

Sample Identification
O = Open Ended Rod
U = Undisturbed Sampl
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0 to 4: Very Loose
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11 to 30: Medium Dense
31 to 50: Dense
Over 50: Very Dense

Trace (0 to 10%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

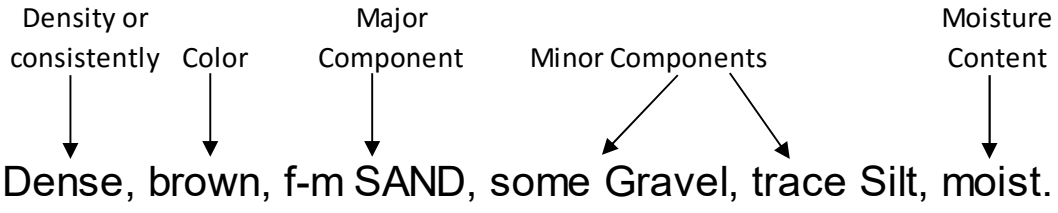
Notes:

APPENDIX C

SUBSURFACE EXPLORATION KEY

FIELD DESCRIPTION AND CLASSIFICATION OF SOIL - Burmister System

Soil descriptions indicated on the test boring logs are based on Standard Penetration Test (SPT) results and observation of the soil samples obtained. Soil samples generally described and classified as illustrated in the following example:



1.0 DENSITY OR CONSISTENCY – The density or consistency is determined from the Standard Penetration Test (ASTM 1586), which corresponds to the number of blows required to drive a standard 2-inch outside diameter split-spoon sampler from the 6 to 18-inch depth of a 24-inch sample using a 140-pound weight falling freely for 30 inches.

Density of Granular Soil	Penetration Resistance (N-blows/ft)		Consistency of Composite Clay Soil
Very Loose	0 - 4	< 2	Very soft
Loose	4 - 10	2 - 4	Soft
Medium Dense	10 - 30	4 - 8	Medium soft
Dense	30 - 50	8 - 15	Stiff
Very Dense	> 50	15 - 30	Very stiff
		> 30	Hard

2.0 COLOR – Visual

3.0 SOIL COMPONENTS – The description and classification is based on the following criteria.

3.1 DESCRIPTION – The components of a soil sample are described by visually estimating the percentage of each component by weight of the total sample.

Major Component – The major component (>50%) is written with upper case letters for granular soil (SAND, GRAVEL), and a combination of upper and lower case letters for composite soil (Silty CLAY, Clayey SILT).

Minor Component – The minor soil components (≤50%) are written with the first letter of each material in upper case, and the remaining letters in lower case (Gravel, Silt). The minor components are identified and prefaced in the description based on the following percentages:

Description	Percentage
and	35 - 50%
some	20 - 35%
little	10 - 20%
trace	0 - 10%

Other Components – The other components within the soil which may be encountered include glass, bricks, trash, etc. The other components are identified and follow the major and minor soil components.

3.2 CLASSIFICATION

Granular Soil by Sieve Size – A granular soil sample is classified by visually estimating the particle size as referenced to a Standard Sieve.

Material*		Standard Sieve Limit Upper	Lower
GRAVEL	- coarse	3-inch	3/4-inch
	- fine	3/4-inch	No. 4
SAND	- coarse	No. 4	No. 10
	- medium	No. 10	No. 40
	- fine	No. 40	No. 200
SILT		No. 200	

Granular Soil by Visual Identification

Material	Visual ID
Silts and Clays	Too small to see.
Fine Sand	Finest visible grain.
Medium Sand	1/64” to 1/16”
Coarse Sand	1/16” to 1/4”
Fine Gravel	1/4" to 3/4"
Coarse Gravel	3/4" to 3”
Cobbles	3” to 6”
Boulders	Greater than 6”

*The Gravel/Sand portions of a granular soil are further divided based on the following proportions:

Gravel/Sand	Proportion
fine to coarse	> 10% all factions
coarse	< 10% fine and medium
medium to coarse	< 10% fine
medium	< 10% fine and coarse
fine to medium	< 10% coarse
fine	< 10% medium and coarse

Composite Clay Soil – A composite clay soil sample is classified by determining the smallest diameter thread that can be rolled manually.

Material	Smallest Thread Diameter	Degree of Plasticity
SILT	None	Nonplastic
Clayey SILT	1/4-inch	Slight
SILT & CLAY	1/8-inch	Low
CLAY & SILT	1/16-inch	Medium
Silty CLAY	1/32-inch	High
CLAY	1/64-inch	Very High

Organic Soil – An organic soil sample is classified by observation of the sample structure.

Material		
Topsoil	-	surficial soils that support plant life and which contain a high percentage of organic matter.
Fibrous Peat	-	deposits of plant remains in which the original plant fibers are still visible.
Amorphous Peat	-	deposits of plant remains in which the original plant fibers have been destroyed. Usually found underlying fibrous peat.
Organic Silt	-	fine grained marine soils which have been transported due to erosion and deposited in still water below the zone of wave action. May contain shell fragments, organic odor, high sand content, nonplastic.
Clayey Organic Silt	-	similar to Organic Silt, low sand content, plastic.

4.0 ADDITIONAL DETAILS AND DISCRIPTIVE TERMS

SOIL STRUCTURE – produced by deposition of sediments.

Stratified	-	random soil deposits of varying components or color.
Varved	-	alternating soil deposits of varying thickness (i.e. clays or silts).
Stratum	-	soil deposit greater than 12 inches thick.
Layer	-	soil deposit 3 inches to 12 inches thick.
Seam	-	soil deposit 1/8 inch to 3 inches thick.
Parting/lens	-	soil deposit less than 1/8 inch thick.

MOISTURE CONTENT

Dry	-	moisture not apparent, dusty, dry to the touch.
Moist	-	damp, but no visible water.
Wet	-	visible free water.

5.0 UNIFIED SOIL CLASSIFICATION SYMBOL AND DISCRIPTION

CL	Lean Clay	GW	Well Graded Gravel
ML	Silt	GP	Poorly Graded Gravel
OL	Organic Silt/ Clay Low Plasticity	GM	Silty Gravel
CH	Fat Clay	GC	Clayey Gravel
MH	Plastic Silt	SW	Well Graded Sand
OH	Organic Silt/Clay High Plasticity	SP	Poorly Graded Sand
PT	Peat	SM	Silty Sand
		SC	Clayey Sand

GUIDELINES TO CLASSIFICATION AND IDENTIFICATION OF ROCK

A. WEATHERING

Fresh	Fresh rock, crystals bright, few joints, may show slight staining. Rock rings under hammer if crystalline.
Slightly Weathered	Rock generally fresh, joints stained and discoloration extends into rock up to 1 inch. Joints may contain clay or gouge. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderately Weathered	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some look clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Highly Weathered	All rock is discolored or stained. In granitoid rocks all feldspars are dull and discolored and majority shows kaolinization. Rock shows severe loss of strength and can be excavated with a geologists pick. A clunking sound when struck with a hammer.
Disintegrate Rock	Rock texture clear and evident, but reduced in strength to strong soil. Some fragments of strong rock usually left.

B. FRACTURING AND BEDDING

Spacing	Fracturing	Bedding and Foliation
More than 3 feet	Massive	Thick
1 foot – 3 feet	Slightly Fractured	Medium
2 inches – 1 foot	Moderately Fractured	Thin
Less than 2 inches	Highly fractured	Very Thin

C. GRAIN SIZE

Fine	Visible to naked eye to 1/16-inch diameter.
Medium	1/16-inch to 1/4-inch diameter.
Coarse	Greater than 1/4-inch diameter.

D. HARDNESS

Very Hard	Cannot be scratched with a knife or sharp pick. Breaking of hand specimens requires several hard blows with a geologists pick.
Hard	Can be scratched with a knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately Hard	Can be scratched with a knife or pick. Gouges or grooves to ¼ inch deep can be excavated with hard blows of a geologists pick. Hand specimens can be detached by a moderate blow.
Medium	Can be grooved to a 1/16-inch deep by firm pressure on a knife or pick point. Can be excavated in small chips to pieces approximately 1-inch maximum size by hard blows of the point of a geologists pick.
Soft	Can be gouged or grooved easily with a knife or pick point. Can be excavated in chips to pieces several inches in size. Small thin pieces can be broken by finger pressure.
Very Soft	Can be carved with a knife. Can be excavated easily with the point of a pick. Pieces 1 inch or more in thickness can be broken with finger pressure.

E. ROCK QUALITY DESIGNATION (RQD)

RQD (Percent)	Diagnostic Description
Exceeding 90	Excellent
75 – 90	Good
50 – 75	Fair
25 – 50	Poor
0 – 25	Very Poor

Comments: RQD is applicable to NX core only. The diameter of an NX core is 2.16 inches. RQD is expressed as a percentage and is determined by dividing the length of the run by the total length of the recovered cores pieces measuring 4-inches or greater. Core recovery is reported as a percentage and is determined by dividing the length of the core recovered (all pieces) by the length of the run.

APPENDIX D

USGS SEISMIC DESIGN MAPS

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.

Pickerel Pond Pedestrian Bridge

Latitude, Longitude: 42.30821474, -71.34216448

Date	8/23/2024, 12:51:35 PM
Design Code Reference Document	NEHRP-2015
Risk Category	I
Site Class	D - Stiff Soil

Type	Value	Description
S_S	0.251	MCE_R ground motion. (for 0.2 second period)
S_1	0.064	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.402	Site-modified spectral acceleration value
S_{M1}	0.153	Site-modified spectral acceleration value
S_{DS}	0.268	Numeric seismic design value at 0.2 second SA
S_{D1}	0.102	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	B	Seismic design category
F_a	1.599	Site amplification factor at 0.2 second
F_v	2.4	Site amplification factor at 1.0 second
PGA	0.146	MCE_G peak ground acceleration
F_{PGA}	1.507	Site amplification factor at PGA
PGA_M	0.221	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
SsRT	0.251	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.269	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.064	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.069	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)

Type	Value	Description
PGA_{UH}	0.146	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.935	Mapped value of the risk coefficient at short periods
C_{R1}	0.928	Mapped value of the risk coefficient at a period of 1 s
C_V	0.802	Vertical coefficient

APPENDIX E

DRAFT EARTHWORK SPECIFICATIONS

PICKEREL POND PEDESTRIAN BRIDGE
PICKEREL POND CONSERVATION AREA
NATICK, MASSACHUSETTS

SECTION 02200
EARTHWORK

PART I- GENERAL

1.01 GENERAL REQUIREMENTS

1. Include GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS as part of this Section.

2. Examine all other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

3. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

1. Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:

    1. Excavation, filling, grading and compaction
    2. Supplying of fill materials
    3. Construction Dewatering
    4. Sheeting, shoring and bracing
    5. Rock excavation/blasting

1.03 RELATED WORK UNDER OTHER SECTIONS

1. Erosion and Sediment Control
2. Site Preparation
3. Bituminous Concrete Paving
4. Site Water Lines
5. Storm Drainage System
6. Sanitary Sewer System
7. Site Furnishings
8. Site Irrigation
9. Lawns
10. Planting

1.04 SUBMITTALS

1. Issue submittals in accordance with Division 1. Submittals under this Section shall include manufacturer's specifications and installation instructions.

1.05 SAMPLES AND TESTING

1. A 50 lb. sample of each off-site material proposed for use, and of any on-site material when so requested by the Architect or Geotechnical Engineer, shall be submitted for approval.

    1. Samples shall be delivered to office of the Geotechnical Engineer, as directed.
    2. Samples required in connection with compaction tests will be taken and transported by the Geotechnical Engineer.

3. Product Data: Submit location of pits for all borrow material.

1.06 COORDINATION

1. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to assure the steady progress of all work of the Contract.

2. Prior to the start of earthwork, the Contractor shall arrange an on-site meeting with the Architect and Geotechnical Engineer for the purpose of establishing Contractor's schedule of operations and scheduling inspection procedures and requirements.

3. As construction proceeds, the Contractor shall be responsible for notifying the Architect prior to start of earthwork operations requiring inspection and/or testing.

1.09 INFORMATION

1. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.

2. Plans, surveys, measurements and dimensions, under which the work is to be performed, are believed to be correct to the best of the Architect's knowledge, but the Contractor shall have examined them for himself during the bidding period, as no allowance will be made for any errors or inaccuracies that may be found herein.

3. Information on the Drawings, Reference Drawings, and in the Specifications relating to subsurface conditions, natural phenomena, and existing utilities and structures is from the best sources presently available. Such information is furnished only for the information and convenience of the Contractor, and the accuracy or completeness of this information is not guaranteed.

1.10 EXISTING CONDITIONS

1. The Contractor shall become thoroughly familiar with the site, consult records and drawings of adjacent structures and of existing utilities, and note all conditions, which may influence the work of this Section.

2. By submitting a bid, the Contractor affirms that he has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.

3. The Contractor may, at his own expense, conduct additional subsurface testing as required for his own information after approval by the Owner.

1.11 SUBSURFACE CONDITIONS AND SPECIAL SITE CONSIDERATIONS

1. Soil borings have been made by a qualified Contractor prior to this Contract. This information shall be made available to bidders as specified under other Sections. The final results of these subsurface explorations were prepared by Geotechnical Services, Inc., consulting geotechnical engineers, and are hereby attached to this specification for information only. Procedures for dewatering, areas to receive special fill and other methods and procedures specified herein shall be supplemented by this information. For purposes of this specification, this information will be referred to as the report. Where procedures within the report vary from procedures as specified herein, this specification shall override. The results and recommendations are available in the geotechnical report prepared by Geotechnical Services. Copies of this report are available from the Architect. Soil samples may be examined at the office of the Geotechnical Engineer.

2. It is the responsibility of the Contractor under this Contract to do the excavation, filling, grading

and rough grading to bring the existing grades to subgrade and parallel to finished grades as specified herein and as shown on the Drawings for this Work. The Contractor shall visit the site prior to submitting a bid to become familiar with the extent of the work to be done under this Contract. The Contractor shall be responsible for determining the quantities of earth materials necessary to complete the work under this Section. All earth materials shall be included in the Contractor's base bid.

3. Site Information - data on indicated subsurface conditions are not representations or warrants of continuity of such conditions between subsurface explorations. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn there from by the Contractor. Data are made available for the convenience of the Contractor. Neither the Owner nor the Geotechnical Engineer assumes responsibility for accuracy of the data other than at the particular locations and at the time the explorations were made.

4. The subsurface data was gathered and report prepared by Geotechnical Services, Inc. The elevations indicated on the drill holes, borings and test pits refer to existing conditions. A copy of this report may be seen at the office of the Architect during normal working hours.

1.12 QUALITY ASSURANCE

1. The Owner will retain a Geotechnical Engineer to perform on-site observations and testing during the following phases of the construction operations. The services of the Geotechnical Engineer may include, but not be limited to the following:

    1. Observation during excavation and dewatering of building areas, parking areas and controlled fill areas.
    2. Observation and testing during placement and compaction of fills within the building area, parking area, and controlled fill areas.
    3. Laboratory testing and analysis of fill and bedding materials specified, as required.
    4. Observation, construction and performance of water content, gradation, and compaction tests at a frequency and at locations to assure conformance of this Specification. The results of these tests will be submitted to the Architect; copy to the Contractor, on a timely basis so that the Contractor can take such action as is required to remedy indicated deficiencies. During the course of construction, the Geotechnical Engineer will advise the Architect, in writing, with copy to Contractor if, at any time, in his opinion, the work is not in substantial conformity with the Contract Documents.

2. The Geotechnical Engineer's presence does not include supervision or direction of the actual work by the Contractor, his employees or agents. Neither the presence of the Geotechnical Engineer, nor any observations and testing performed by him, nor any notice or failure to give notice shall excuse the Contractor from defects discovered in his work.

3. The Owner reserves the right to modify or waive Geotechnical Engineer services.

1.13 PERMITS, CODES AND SAFETY REQUIREMENTS

1. All work shall conform to the Drawings and Specifications and shall comply with applicable codes and regulations.

2. Comply with the rules, regulations, laws and ordinances of the City of Natickp, Massachusetts appropriate agencies of the Commonwealth of massachusetts and all other authorities having jurisdiction. Coordinate all work done within town and State rights of way with the appropriate agencies. Provide all required traffic control and safety measures, including uniformed police officers per town and State requirements. All labor, materials, equipment and services necessary to make the work comply with such requirements shall be provided without additional cost to the Owner.

3. Comply with the provisions of the Manual of Accident Prevention in Construction of the Associated General Contractors of America, Inc. and the requirements of the Occupational

Safety and Health Administration (OSHA), United States Department of Labor.

4. The Contractor shall procure and pay for all permits and licenses required for the complete work specified herein and shown on the Drawings.

5. The Contractor shall not close or obstruct any street, sidewalk, or passageway unless authorized in writing by the Architect. The Contractor shall so conduct his operations as to interfere as little as possible with the use ordinarily made of roads, driveways, sidewalks or other facilities near enough to the work to be affected hereby. The Contractor shall comply with the time limits established by the terms for trucking onto and off of the site.

6. Any apparent conflict between the Drawings and Specifications and the applicable codes and regulations shall be referred to the Architect in writing, for resolution before the work is started.

1.14 LAYOUTS AND GRADES

1. All line and grade work not presently established at the site shall be laid out by a survey team under the supervision of a Registered Land Surveyor or Professional Engineer employed by the Contractor in accordance with Drawings and Specifications. The Contractor shall establish permanent benchmarks and replace as directed any which are destroyed or disturbed.

2. The words "finished grades" as used herein shall mean final grade elevations indicated on the Drawings. Spot elevations shall govern over proposed contours. Where not otherwise indicated, project site areas outside of the building shall be given uniform slopes between points for which finished grades are indicated or between such points and existing grades.

3. The word "subgrade" as used herein, means the required surface of excavated area, subsoil, borrow fill or compacted fill. This surface is immediately beneath the site improvements; fill materials as dimensioned on the Drawings, or other proposed surface material.

1.15 DISPOSITION OF EXISTING UTILITIES

1. Active utilities existing on the site and work areas shall be carefully protected from damage and relocated or removed as required by the work. When an active utility line is exposed during construction, its location and elevation shall be plotted on the record drawings as described in this Section and both Architect and Utility Owner notified in writing.

2. Inactive or abandoned utilities encountered during construction shall be removed if within the building area or grouted, plugged or capped. The location of such utilities shall be noted on the record drawings and reported in writing to the Architect.

3. The Contractor shall notify "Dig Safe" and local utility companies prior to the start of construction. The "Dig Safe" number shall be submitted by the Contractor in writing to the Architect prior to construction.

1.16 SHORING, SHEETING, AND BRACING

1. Provide shoring, sheeting, and/or bracing at excavations, as required, to ensure complete safety against collapse of earth at sides of excavations.

2. If, at any place, sufficient or proper supports have not been provided, additional supports shall be placed at the expense of the Contractor. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and compacted.

3. All sheeting and bracing not ordered left in place shall be carefully removed in such a manner as not to endanger the construction of other structures, utilities or property whether public or private. All voids left after withdrawal of sheeting shall be immediately refilled with sand and rammed with tools especially adapted to that purpose or otherwise compacted as directed to achieve the

required density.

4. Shoring or sheeting shall not constitute a condition for which an increase may be made in the contract price with the exception that if the Architect directs in writing that certain shoring or sheeting shall be left in place, the contract price will be adjusted in accordance with General Conditions.

5. Excavation support systems shall be designed to support the earth pressures, hydrostatic pressures, surcharge loads and other forces from existing site conditions, stored material and construction equipment.

6. Shoring and bracing of trenches and other excavations shall, at a minimum, be in accordance with the latest requirements of the Department of Labor and Industries Bulletin No. 12, Section 10, and all subsequent amendments.

7. Shoring and sheeting shall be designed by a Registered Professional Engineer in the Commonwealth of massachusetts and paid for by the Contractor. The contractor shall submit an earth shoring and bracing plan to the Architect for review by the Geotechnical Engineer at least 2 weeks prior to installation. The submittal shall include calculations and plans drawn to scale.

1.17 DRAINAGE

1. The Contractor shall control the grading in areas under construction on the site so that the surface of the ground will properly slope to prevent accumulation of water in excavated areas and adjacent properties.

2. The Contractor shall excavate interceptor swales and ditches where shown on the Drawings and as otherwise necessary prior to the start of major earthmoving operations to ensure minimal erosion and to keep areas as free from surface water as possible.

3. Should surface, rain or ground water be encountered during the operations, the Contractor shall furnish and operate pumps or other equipment, and provide all necessary piping to keep all excavations clear of water at all times and shall be responsible for any damage to work or adjacent properties for such water. All piping exposed above surface for this use, shall be properly covered to allow foot traffic and vehicles to pass without obstruction.

4. Presence of ground water in soil will not constitute a condition for which an increase in the contract price may be made. Under no circumstances place concrete fill, soil fill, lay piping or install appurtenances in excavation containing free water. Keep utility trenches free of water until pipe joint material has hardened and backfilled to prevent flotation.

1.18 FROST PROTECTION

1. Do not excavate to full-indicated depth when freezing temperatures may be expected, unless work can be completed to subgrade or piping can be installed and backfilled the same day. Protect the excavation from frost if placing of concrete or piping is delayed.

2. The Contractor shall keep the operations under this Contract clear and free of accumulation of snow within the limits of Contract Lines as required to carry out the work.

3. No work shall be installed on frozen ground.

4. Provide heat and/or insulation to slab, footings, foundation walls, and other elements during freezing conditions to prevent damage from frost heaving.

1.19 DISTURBANCE OF EXCAVATED AND FILLED AREAS DURING CONSTRUCTION

1. The Contractor shall take the necessary steps to avoid disturbance of subgrade and underlying natural soils/compacted fill during excavation and filling operations. Methods of excavation and filling operations shall be revised as necessary to avoid disturbance of the subgrade and underlying natural soils/compacted fill, including restricting the use of certain types of construction equipment and their movement over sensitive or unstable materials. The Contractor shall coordinate with the Architect or Geotechnical Engineer to modify his operations as necessary to minimize disturbance and protect bearing soils.

2. All excavated or filled areas disturbed during construction, all loose or saturated soil, and other areas that will not meet compaction requirements as specified herein shall be removed and replaced with compacted structural fill or crushed stone. Fill that cannot be compacted within 48 hours because of excess moisture shall be removed and replaced with compacted structural fill or crushed stone. Costs of removal of disturbed material and replacement with gravel fill or crushed stone shall be borne by the Contractor.

3. If requested by the Architect, the Contractor shall place a six-inch layer of crushed stone or 4-inch concrete mudmat over natural underlying soil to stabilize areas disturbed during construction. The placement of crushed stone layer or mudmat as well as material costs shall be borne by the Contractor.

4. Material that is not within +\- 3% optimum moisture for compaction as determined by the Modified Proctor Test of the particular material in place as determined by the Architect or the Geotechnical Engineer, and is disturbed by the Contractor during construction operations so that proper compaction cannot be reached, shall be construed as unsuitable bearing materials. This material shall be removed and replaced with crushed stone or structural fill as directed by the Architect or Geotechnical Engineer at no additional cost to the Owner.

1.20 PROTECTION OF BEARING SUBGRADES

1. The Contractor shall be required to maintain stable, dewatered, and frost fee subgrades for foundations, pavement areas, utility trenches, and other areas as directed by the Architect or Geotechnical Engineer.

2. The Contractor shall take precautions to reduce subgrade disturbance. Such precautions may include diverting storm water runoff away from construction areas, reducing traffic in sensitive areas, thermal protection during cold weather periods, and maintaining an effective dewatering operation.

3. Soils exhibiting weaving/instability or which become frozen, as determined by the Geotechnical Engineer, shall be over-excavated (removed) to competent bearing material and replaced with compacted gravel fill or lean concrete at no additional cost to the Owner.

1.21 DEWATERING

1. Based on subsurface investigations conducted prior to this Contract, it is anticipated that excavation will be carried out below existing groundwater levels. The Contractor shall be required to implement ground water control measures to maintain the ground water level a minimum of one foot below all final excavation levels or to propose alternative methods for placement of fill over existing undisturbed material with ground water at or near the surface in such a manner that the existing materials will not be disturbed. The Contractor will be required to implement ground water control measures adequate to maintain the excavation sufficiently dry to allow efficient use of normal excavation equipment and to provide a borrow material suitable for placement and compaction as specified or as directed by the Geotechnical Engineer. The moisture content shall not exceed 3% above the optimum moisture content as determined by modified Proctor test (ASTM DI557). The Contractor shall furnish all labor, equipment and materials in connection with handling ground water and surface water encountered during construction and placement of compacted granular fill or other material as specified.

2. Not less than 14 days prior to the scheduled start of work, the Contractor shall submit his proposed method of dewatering and maintaining dry conditions, to the Geotechnical Engineer for review. The submittal shall include calculations, plans, sketches, pump curves, method of sediment control, and disposal. The dewatering plan shall be prepared by a licensed Civil Engineer registered in the Commonwealth of massachusetts. Review by the Architect of the Contractor's proposed method of dewatering shall not relieve the Contractor of responsibility for the satisfactory performance of the dewatering system. The Contractor is responsible for correcting any disturbance of natural bearing soils or damage to structures caused by an inadequate dewatering system or by interruption of the continuous operation of the system as specified.

3. The Contractor shall make the entire excavation for this work in the dry. The water level is to be maintained continuously one foot below bottom of excavation for the length of time to complete the work. The Contractor shall place all fill materials and proposed improvements in the dry.

4. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of properly, all water entering excavations and keep such excavations dry so as to obtain a satisfactory undisturbed bottom of excavation or subgrade condition. Dewatering shall be in operation until the fill or the proposed surface condition has been completed to such extent that it will not be floated or otherwise damaged by allowing water levels to return to natural elevations.

5. In excavations below the ground water level, it is expected that dewatering trenches or deep sumps will be required for predrainage of the soils prior to final excavation, and for maintaining the lowered groundwater level until construction has been completed to such an extent that floating, slumping or damage to excavations or materials placed does not occur. Monitoring of adjacent ground water levels by observation wells or other satisfactory means may be required.

6. The Contractor shall discharge all pumped water away from the work area, and in accordance with all applicable local codes and laws. Requirements specified herein for Erosion and Siltation Control shall be met during this process.

7. All fill material shall be placed and compacted in the dry. The Contractor shall dewater excavated areas as required to perform the work and in such a manner as to preserve the undisturbed State of the natural inorganic or other subgrade soils.

8. The Contractor shall verify that the construction and/or operation of his dewatering system will not adversely affect any well, pond, stream structure, utility, etc., on or adjacent to the area being dewatered.

1.22 RESTORATION OF DRAINAGE SWALES, DETENTION BASINS AND WATER BODIES

1. In addition to other work specified and prior to substantial completion, the Contractor shall repair all erosion in all areas and excavate and remove accumulations of silt, debris or other material occurring from work under this Contract in the water bodies, detention areas and in all drainage swales to remain and as shown on Drawings. Water bodies and detention areas will be drained or pumped, if necessary, to properly remove all accumulations of silt and debris and to achieve a smooth bottom. If it is necessary to drain or pump water bodies and detention areas, the Contractor shall be required to implement ground water control measures to maintain the ground water level at a level to eliminate floating or slumping materials. The water level is to be maintained continuously at or below this level for the length of time that the pond water level is lowered. During filling of the water bodies to achieve previous or proposed water levels, the water level should be at or above the water level in the adjacent ground. Water bodies shall be filled with fresh water prior to securing the dewatering system. For further- information on dewatering, refer to DEWATERING as specified herein.

PART 2 - PRODUCTS

2.01 MATERIALS

1. Fill material shall be obtained from required on-site cut to the extent suitable material is available and off-site to the extent suitable material is not available from on-site cuts.

2. On-site material for use in compacted fill shall be natural inorganic granular soil taken from areas of cut after removal of pavement, topsoil, or other unsuitable materials.

3. Fill materials shall be well-graded within specified gradation limits. Gradation of backfill materials shall be determined in accordance with ASTM D-422.

4. Crushed Stone: Crushed stone processed from a stone quarry, washed, graded, free of organic materials. Gradation is as follows:

1. 1/2" Crushed Stone

U. S. SIEVE NO.	% PASSING BY WEIGHT
2"	100
1/2"	85-100
3/8"	15-45
#4	0-15
#8	0-5

2. 3/4" Crushed Stone

U.S. SIEVE NO.	% PASSING BY WEIGHT
1"	100
3/4"	90-100
1/2"	10-50
3/8"	0-20
# 4	0-5

3. 1-1/2" Crushed Stone

U.S. SIEVE NO.	% PASSING BY WEIGHT
2"	100
1-1/2"	95-100
l"	35-70
3/4"	0-25

4. Modified Rockfill

U.S. SIEVE NO.	% PASSING BY WEIGHT
8"	100
4"	0-25
2-1/2"	0-5

5. Structural Fill: Well-graded, hard, durable, natural sand and gravel, free from ice and snow, roots, sod, rubbish, and other deleterious or organic matter. Material shall conform to the following gradation requirements:

U.S. SIEVE NO.	% PASSING BY WEIGHT
4"*	100
#4	40-70
#200	0-12

- Four inches where placed as base below concrete floor slab and pavement or within 12 inches of walls; elsewhere 2/3 the lift thickness.

6. Ordinary Fill: Well-graded, natural, inorganic soil approved by the Architect and meeting the following requirements:

1. It shall have less than 3% organic matter, free from weak, compressible, or frozen materials, and of stones larger than eight inches in dimension. It shall not contain granite block, concrete, masonry rubble, roots, stumps or other similar materials.

2. It shall be of such nature and character that it can be compacted to the specified densities.

3. Topsoil and the zone directly below the topsoil indicated on the borings as "subsoil" shall not be considered Ordinary Fill nor shall topsoil or subsoil stockpiled on the site. Where subsoil is encountered, it shall be stripped separately from the topsoil and the granular material directly beneath the subsoil. This excavated material shall only be utilized in lawn areas, playfield areas or other non-structural areas, and shall be placed in these areas at distances away from adjacent site improvements as specified herein or as directed by the Architect.

4. It shall have a minimum dry density of not less than 100 pounds per cubic foot.

5. Material from excavations on the site may be used as Ordinary Fill if it is deemed acceptable by the Geotechnical Engineer.

7. Unsuitable material which is classified as "unsuitable" shall be material having at least one of the following properties:

1. Material with a maximum unit dry weight per cubic foot less than 90 lbs., as determined by ASTM D1557.
2. Material containing greater than 5% organic matter by weight, organic silt, peat, construction debris, roots and stumps.
3. Material deemed unsuitable by the Geotechnical Engineer based on its inherent inability to perform satisfactorily as a bearing stratum.
4. Soil, which is allowed to become frozen, saturated, or unstable because of the contractor's failure to employ appropriate dewatering, excavation methods, or weather protection is not deemed unsuitable soil but rather represents a condition in which the subgrade was not adequately prepared and/or protected.

8. Blast Rock Fill: Shall be broadly graded blasted rock with a maximum size of 12 inches, 25% smaller than six inches and 10% finer than 3/4 inch. Occasional boulders up to 18 inches will be permitted near the base of the fill.

1. General site rock fill (outside the building area) may be placed up to within 42 inches of finish grade in pavement areas and to within 18 inches of inverts of utility lines. First lift over the top of rock fill shall be a choke stone layer 18 inches thick. Compaction shall be by minimum of four coverages of a self-propelled vibratory drum roller in each direction (i.e. north-south and east-west). The minimum weight of the drum shall be 10,000 lbs. Compaction may also be by four coverages of heavy track equipment such as a CAT D8 Bulldozer or other heavy track equipment approved by the Geotechnical Engineer.
2. Rock shall not be placed within a five-foot horizontal distance on either side of any proposed utility line. The intent is to leave a zone of granular fill that can later be excavated for installation of utilities. Also, large rock fragments shall be kept away from utility pipes.

9. Choke Stone: Shall have a maximum rock size of nine inches and shall have 50% finer than 1-1/2 inch and 25% finer than 3/4 inch.

10. Sand Fill: Shall consist of well-graded natural sand, free from organic, other weak or compressible materials, or frozen materials, Conforming to the following gradation:

U.S. SIEVE NO.	% PASSING BY WEIGHT
#8	100
#50	15-40
#100	2-10
#200	0-5

11. Slab Base Course: Shall be hard, durable, natural sand and gravel, free from ice and snow, roots, sod, rubbish, or organic matter. Material shall conform to the following gradation requirements:

U.S. SIEVE NO.	% PASSING BY WEIGHT
2"	100
3/4"	20-90
#4	15-70
#40	10-50
#200	0-8

PART 3 - EXECUTION

3.01 GENERAL EXCAVATION

1. Excavate all materials encountered to allow construction of the proposed building and structures, utilities and site work as shown on the Drawings and as hereinafter specified.

2. Excavate to levels shown for footings and structures, as required to provide working clearance and to allow adequate inspection and to subgrades outside of buildings and structures as specified herein and as shown on Drawings.

3. In planted areas, remove ledge, boulders and other obstructions to a depth of at least two feet below finished grade.

4. Remove from the site and legally dispose of all debris and other excavated material not needed for, or suitable for, fill except as otherwise specified herein. Remove all materials subject to rot or attack by termites.

5. In general, the Contractor will be permitted to use machine excavation to the bottom of fill under concrete slabs on grade. The final three inches under footings and foundations shall be excavated using a straight blade bucket. If the final three inches cannot be satisfactorily excavated using a straight blade bucket without disturbing subgrades, the Contractor shall use alternative methods, including hand excavations. Alternative methods shall be subject to approval by the Architect or Geotechnical Engineer.

6. Unsuitable Soil Conditions:

   a. If unsuitable bearing materials are encountered at the specified subgrade depths, the Contractor shall notify the Architect. The Contractor shall carry excavation deeper and replace the excavated material with compacted fill or concrete as directed by the Architect or Geotechnical Engineer. Soil subgrades, which are unstable due to inadequate construction dewatering or excessive subgrade disturbance, are not deemed unsuitable soils.
   b. Removal of such material and its replacement as directed will be paid for as extra compensation in quantity approved by the Architect. Only changes in the work authorized in

advance by the Architect in writing shall constitute an adjustment in the Contract Price.

c. Material that is not within +\- 3% optimum moisture for compaction of the particular material in place as determined by the Architect or the Geotechnical Engineer and is disturbed by the Contractor during construction operations so that proper compaction cannot be reached shall not be construed as unsuitable bearing materials. This material shall be removed and replaced with lean concrete or structural fill as directed by the Architect or Geotechnical Engineer at no additional cost to the Owner.

d. The Contractor shall follow a construction procedure, which permits visual identification of firm natural ground.

e. The volume of unsuitable material shall be measured by profiling the in-place topography and calculation by the average-end-area method or other method deemed acceptable by the Geotechnical Engineer. The contractor's Licensed Surveyor or Professional Engineer shall prepare the calculations. Payment limits shall be as for rock excavation.

7. Excessive Excavation: If any part of the general or trench excavation is carried, through error, beyond the depth and the dimensions indicated on the Drawings or called for in the Specifications, the Contractor at his own expense, shall furnish and install compacted gravel fill, concrete, or take other remedial measures as directed by the Architect to bring fill material up to the required level.

3.02 TRENCH EXCAVATION

1. Excavate as necessary for all footings, structures, pipes, storm and sanitary drainage, electrical, gas, water, related structures and appurtenances, and for any other trenching necessary to complete the work. Unless otherwise indicated, provide separate trench for each utility.

2. Definitions:

   1. "Trench excavation" shall be defined as an excavation in which the bottom width does not exceed seven feet and the top width does not exceed twice the depth or where footings are excavated by backhoe. Refer to Drawings for any special trenching conditions for utilities, structures, etc.

   2. The words "invert" or "invert elevation" as used herein mean the elevation at the inside bottom of pipe or channel.
   3. The words "bottom of the pipe" as used herein means the elevation at the base of the pipe at its outer surface.

3. In general, machine excavation of trenches will be permitted with the exception of preparation of pipe beds, which will be handwork. Excavate by hand or machine methods at least six inches below the bottom of all utilities.

4. Trench excavation shall include the removal of all materials encountered. During excavation, materials determined to be suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or unsuitable for backfill shall be removed and legally disposed off the site. The banks of trenches shall be cut as near vertical as practicable to the extent allowed by OSHA.

5. The Contractor shall provide, at his own expense, suitable bridges over trenches where required for accommodation and safety of the traveling public and as necessary to satisfy the required permits and codes.

6. Trenches shall be excavated to the necessary width and depth for proper laying of pipe or other utility and shall have vertical sides or slopes as required by codes. Minimum width of trenches shall provide clearance between the sides of the trench and the outside face of the utility. Maximum trench sizes are as shown on the Drawings or as specified herein. The depth of the

trench shall be six inches below the bottom of the pipe barrel or respective utility. If the existing soil is found not suitable, the Architect or Geotechnical Engineer may approve removal and replacement of material. Costs for removal and replacement materials will be based on Unit Prices.

7. Coordinate all utility and trench backfilling with the trades involved.

3.03 ROCK EXCAVATION

1. Definitions and Classifications: The following classifications of excavation will be made only when rock excavation is required.

    1. "Earth Excavation" consists of removal and disposal of pavement and other obstructions visible on ground surface; underground structures and utilities indicated to be demolished and removed; material of any classification indicated in data on subsurface conditions; and other materials encountered that are not classified as rock excavation.
    2. "Rock Excavation" consists of removal and disposal of materials encountered that cannot be excavated without continuous and systematic drilling and blasting or continuous use of a ripper or other special equipment, except such materials that are classed as earth excavation. Typical of materials classified as rock excavation are as follows:

        1. Consolidated Bedrock.
        2. Boulders on site, outside trench limits, exceeding two cubic yards in volume.
        3. Boulders within trench limits, exceeding one cubic yard in volume.

    3. Should highly fractured or weathered bedrock be encountered during excavation, the following shall apply:

        1. When the material is encountered in trenching operations or under footings, it shall be excavated or ripped with a hydraulic backhoe equal to or larger than a Caterpillar 235 excavator, and will be classified as Earth Excavation. When it is demonstrated to the satisfaction of the Architect and the Geotechnical Engineer that this material can no longer be removed with a hydraulic backhoe and requires drilling and blasting, this material shall be classified as Rock Excavation. - For excavation procedures when this material is encountered under footings, refer to paragraph below.

    4. Intermittent drilling and ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as Earth Excavation.

    5. Allowance for Rock Excavation: The Contractor shall carry in the Base Bid an allowance for xxx cubic yards of rock encountered in trench excavation removed from the site. The Contractor shall also carry in the Base Bid an allowance of xxx cubic yards of open rock excavation removed from the site. The Base Bid shall cover all costs relating to such rock excavation, including blasting, removal and placement of the excavated material, overhead and profit. The Owner for excavation herein defined will pay no amount other than that herein specified.

        1. If the total quantity of Rock Excavation, open and/or trench, exceeds the amount of Rock Excavation included in the Contract as listed above, the Owner shall pay the excess excavation at the unit prices as indicated in the contract.
        2. If the total quantity of Rock Excavation, open and/or trench, is less than the amount of Rock Excavation included in the Contract as listed above, the Contract sum will be decreased by the difference in Rock Excavation multiplied by the unit prices as listed in the contract.

2. Measurements:

    1. When, during the process of excavation, rock is encountered, such material shall be

uncovered and exposed in such a manner that the unbroken ledge surface is clearly visible, and the Contractor shall notify the Architect, before proceeding further. The areas in question shall then be cross-sectioned as hereinafter specified.

2. Failure on the part of the Contractor to uncover such material and to notify the Architect and proceeding by the Contractor with the rock excavation before cross-sections are taken, will forfeit the Contractor's right of claim towards the stated allowance or additional payment over and above the stated allowance at the quoted unit price.
3. The Contractor shall employ and pay for a licensed Registered Civil Engineer or Land Surveyor to take cross-sections of rock before removal and to make computations of volume of rock encountered within the Payment Lines. Cross-sections shall be taken in the presence of the Geotechnical Engineer and the computations approved by the Architect. The volume calculations shall be by the average end area method. The Owner has the option to perform independent cross-sections and computations of rock quantities.
4. Where removal of boulder or ledge is required outside the established payment lines, the Architect shall determine the extent of this removal and basis of payment.

3. Blasting: Obtain written permission and approval of method from local authorities before proceeding with rock excavation. Explosives shall be stored, handled, and employed in accordance with state and local regulations or, in the absence of such, in accordance with the provisions of the "Manual of Accident Prevention of Construction" of the Associated General Contractors of America, Inc.

    1. Notify the Architect at least 48 hours before any intended blasting and do no blasting without his specific approval of each blasting operation.
    2. Contractor shall present evidence that his insurance includes coverage for blasting operations before doing any blasting work. A preblast survey shall be performed for all buildings and utilities within a radius of 150 feet from the blasting zone or conforming to the ordinance governing blasting and the Fire Department regulations.
    3. All rock blasting shall be well covered with heavy mats or timbers chained together and the Contractor shall take great care to do no damage to existing structures, utility lines and trees to remain.
    4. Any damage caused by the work of this Contractor shall be repaired to the full satisfaction of the Architect at no additional cost to the Owner.
    5. Any rock fragments or loose material from blasting operations shall be removed. All voids shall be filled with a leveling mat of structural fill or lean concrete as directed by the Geotechnical Engineer.
    6. At least 2 weeks prior to blasting the contractor shall submit a blasting plan indicating blasting agent to be used, drill hole depths and spacing, powder factors, personnel, vibration limits and method of measurement, for review by the Geotechnical Engineer.

4. Complaints:

    1. Report all blasting complaints to the Architect within 24 hours of receipt thereof. Include the name, address, date, time received, date and time of blast complained about, and a brief description of the alleged damages or other circumstances upon which the complaint is predicated. Assign each complaint a number, and number all complaints consecutively in order of receipt.
    2. Submit a summary report to the Architect each month which indicates the date, time and name of person investigating the complaint, and the amount of settlement, if any.
    3. When settlement of a claim is made, furnish the Architect with a copy of the release of claim by the claimant.
    4. Immediately notify the Architect, throughout the statutory period of liability, of any formal claim or demands made by attorneys on behalf of claimants, or of serving of any notice, summons, subpoena, or other legal documents incidental to litigation, and of any out-of-court settlement or court verdict resulting from litigation.
    5. Immediately notify the Architect of any investigations, hearings, or orders received from any governmental agency, board or body claiming to have authority to regulate blasting operations.

5. If ledge is encountered within the limits of the Proposed Building Area, the Contractor shall excavate this material 18 inches below subgrade of footings and 12 inches below subgrade of slabs unless otherwise directed by the Architect or Geotechnical Engineer. All loose or shaken rock shall be removed and replaced with compacted gravel fill or lean concrete as specified herein.

6. Rock excavation for foundations outside of the Building Area: Remove rock to foundation or footing subgrade. All rock bottoms for foundations shall be carefully examined. Loose or shaken rock shall be removed to solid bearing, and the rock surface leveled, or shelved to a slope not exceeding one inch per two feet, or as directed.

7. Excavate rock encountered in grading under paved areas, lawns and plant beds to subgrade as specified herein and shown on the Drawings. All boulders or protruding rock outcrops shall remain undisturbed at lawns and plant beds when so directed by the Architect. Rock shall be fractured six inches below subgrade of paved areas but this six-inch layer shall remain in place.

8. If any part of the rock excavation at footings be carried beyond the depth and the dimensions indicated on the Drawings or called for in the Specifications, the Contractor shall, at his own expense, furnish and install concrete of same strength as footings to the required subgrade level of the footings as shown on the Drawings. Doweling or other corrective structural measures as directed by the Architect may also be required to properly anchor or reinforce the concrete. If rock excavation is carried beyond the depth and dimensions to subgrade in other areas, the Contractor shall, at his own expense, furnish and install compacted gravel fill to subgrade as directed by the Architect.

9. Basis of Payment: The total amount of rock excavation will be based upon the volume of rock excavated within and/or above the lines referred to in the next paragraph as "Payment Lines". The payment lines are only to be used as a basis of payment, and are not to be used as limits of excavation. Limits of excavation area as shown on the Drawings and as specified herein.

10. Payment Lines for Rock Excavation:

    1. Payment lines for columns and footings within the building shall be a vertical line one foot from the toe of the footings; the depth shall be measured at 24 inches below the bottom elevations shown on the Drawings. If rock is to remain directly below the bottom of the footings within the Building Area, payment lines shall be six inches below the bottom elevation of the footing as shown on the Drawings. Payment lines for walls to be damp-proofed shall be a vertical line two feet outside the walls. Payment lines for footings outside of the building shall be six inches below the bottom of footings. Vertical payment lines shall be as specified hereinafter.
    2. Payment lines for manholes and catch basins shall be one foot outside of the outer wall and six inches below subgrade beneath the structure.
    3. Payment lines for rock excavation under slabs on grade shall be six inches below the bottom elevation of the specified gravel base course outside of the building and 12 inches below subgrade for slabs within the building.
    4. Payment lines for rock excavation at paved areas and lawns shall be six inches below respective subgrades.
    5. Payment lines for rock excavation under pipes within the building and for utility trenches outside the building lines shall in no case be calculated as greater in width than the outside diameter of the pipe plus two feet for pipes up to 18 inches. For pipes 18 inches and larger payment lines shall in no case be calculated as greater in width than the outside diameter of the pipe plus three feet. Payment lines at bottom of all pipe and utility trenches shall be six inches below subgrade.

3.04 PROOF-ROLLING

1. Contractor shall be required to proofroll foundation and pavement subgrades prior to foundation construction or the placement and compaction of fill materials.

2. Proofrolling of foundation subgrades shall include at least ten passes of a small vibratory plate compactor for trench excavations or six passes of a heavy vibratory roller for open areas.

3. Proofrolling of pavement subgrades shall include four passes of a heavy vibratory roller.

4. If groundwater is located within one foot of foundation or pavement subgrade, proofrolling may be eliminated. However, the Contractor shall demonstrate care during excavation so as to minimize subgrade disturbance.

5. The Geotechnical Engineer shall visually observe Proofrolling. Foundation construction or replacement of fill materials shall not commence until the Geotechnical Engineer has witnessed subgrade conditions and proofrolling operations.

6. Soils which exhibit weaving or instability during the proofrolling operations as determined by the Geotechnical Engineer shall be removed and replaced with compacted Structural Fill or Crushed Stone at no additional cost to the Owner.

3.05 FILLING AND GRADING

1. Samples and Testing:

    1. All fill materials, and their placement shall be subject to quality control testing. The Owner shall pay for all testing except that the Contractor will bear cost of testing materials, which fail to conform to Specifications. Test results and laboratory recommendations will be available to Contractor. All sieve analyses for conformance of on-site and off-site fill materials to be used in the work shall be done by means of a mechanical wet sieve analysis and in accordance with ASTM D-422.
    2. The Owner will retain a Geotechnical Engineer to provide personnel, qualified by training and experience, to be at the site to observe preparation for the placement of compacted fills, to observe excavation and dewatering required for the work, and to observe earthwork operations and report on the conformity of operations with these Specifications. All service and approvals given by the Geotechnical Engineer shall not relieve the Contractor of his responsibility for performing the work in accordance with these Specifications. The Contractor agrees to accept as final the results of field and laboratory tests performed by the above representatives. As stated hereinbefore, the Owner reserves the right to modify or waive Geotechnical Engineer's services.
    3. Excavated material taken directly from on-site cuts that will meet these Specifications may be used as Ordinary Fill or Structural Fill provided the Contractor obtains written approval from the Architect. No such fill material shall be put in place until approved for use by the Architect in writing.
    4. Field density tests will be made by the Geotechnical Engineer in accordance with the Method of Test for ASTM Designation D1556 or D2944, to determine the adequacy of compaction; the location and frequency of such field tests shall be at the Geotechnical Engineer's discretion.
    5. The Contractor shall notify the Architect or the Geotechnical Engineer when an area is ready for compaction testing. This notification shall be 48 hours in advance of placing or final compaction so that the Geotechnical Engineer has adequate time to take compaction tests.
    6. The Architect or his designated representative shall have the right to observe the installation of all controlled compacted fills.
    7. Testing of materials as delivered may be made from time to time. Materials in question may not be used, pending test results. Tests of compacted materials will be made regularly. Remove rejected materials and replace with new, whether in stockpiles or in place.
    8. Cooperate with the Geotechnical Engineer in obtaining field samples of in-place materials after compaction. Furnish incidental field labor in connection with these tests. The Contractor will be informed by the Geotechnical Engineer of areas of unsatisfactory density which may require improvement by removal and replacement, or by scarifying,

aerating, sprinkling (as needed), and re-compaction prior to the placement of the new lift. No additional compensation shall be paid for work required to achieve proper compaction.

9. The Geotechnical Engineer's presence does not include supervision or direction of the actual work by the Contractor, his employees, or agents. Neither the presence of the Geotechnical Engineer nor any observations and testing performed by him shall excuse the Contractor from defects discovered in his work.
10. In no case will frozen material be allowed for use in fill, backfill, or rough grading material.
11. Stones or rock fragments larger than four inches in their greatest dimension shall not be permitted within the top six inches of subgrade of any fills or embankments.

2. Placing, Spreading and Compacting Fill Material:

1. Fill materials are to be placed as designated herein and as indicated on the Contract Drawings.

1. Crushed Stone shall be placed as follows and compacted as specified herein:

1.) Under and around utility structures and around foundation drains and underdrains, (use 1/2" stone).
2.) Behind retaining walls, and under rip rap.
3.) Where otherwise shown on Drawings or as directed by the Architect.

2. Structural Fill shall be placed as follows and compacted in lifts to a minimum of 95% maximum dry density per the Modified Proctor Test (ASTM D 1557) as specified herein: (Refer to table specified herein for compaction methods and lift requirements.)

1.) Within building pad areas.
2.) As a subgrade fill for all material to be placed in controlled compacted fills under exterior concrete slabs, foundations, on grade stairs, and other soil bearing situations.
3.) Wherever a structural fill is called for or shown on the Drawings.

3. Ordinary Fill shall be placed as follows and compacted as specified herein:

1.) In general fill areas such as lawn or in parking islands except where Structural Fill is shown.
2.) Wherever Ordinary Fill is called for and as specified hereinbefore.
3.) Wherever Structural Fill, Crushed Stone, Sand Fill or Topsoil is not required herein or on the Drawings.

4. Blast Rock Fill may be placed up to within three feet of finish grade in pavement areas and within two feet of finish grade in lawns, and to within 30 inches of inverts of utility lines and proposed utility routes. First lift over the top of rock fill shall be choked stone layer 18 inches thick which shall be a well-graded mixture of sand, gravel, and blasted rock with maximum stone size less than nine inches. Compaction shall be by minimum of six coverages of a self-propelled vibratory drum roller in each direction (i.e. north-south and east-west). The minimum weight of the drum shall be 1 0,000 lbs. Compaction may also be by four coverages of heavy track machinery such as a Caterpillar D8 or other track machinery approved by the Geotechnical Engineer.

1.) Blast Rock Fill shall not be placed within 30 inches vertically of exterior concrete slabs (i.e. sidewalks, loading docks, etc.
2.) Rock shall not be placed within a five-foot horizontal distance on either side of any proposed utility line. The intent is to leave a zone of granular fill that can later be excavated for installation of utilities. Also keep large rock

fragments away from any utility lines.
3.) Place woven filter fabric (Mirafi 500X or equivalent) over Blast Rock Fill.

5. Sand Fill shall be placed as follows and compacted as specified for the particular item:

1.) As a bedding material for PVC electrical conduit where concrete is not required, telephone-cable, primary electric service and gas pipe.
2.) Where otherwise specified or shown on the Drawings.

6. Slab Base Fill shall be placed in minimum 6-inch lift under concrete floor slabs.

7. Subsoil shall be used only under lawn areas and athletic fields. This material shall not be placed closer to areas being otherwise prepared than a 1:1 angle of repose x depth of fill for the particular area. For instance, if a fill is four feet deep, subsoil may not be placed closer than four feet to the area being otherwise prepared.

1.) Unsuitable Earth Materials shall be removed from the site.
2.) The fill material shall be placed in uniform horizontal layers and compacted as specified herein.

8. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to obtain uniformity of material in each layer. So far as practicable, each layer of material shall extend the entire length and width of the area being filled plus two additional feet horizontally along each side for every one foot of fill required.

3. All fill material shall be placed and compacted in the dry. The Contractor shall dewater excavated areas as required to perform the work, and in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils. In freezing weather, a layer of fill shall not be left in an uncompacted state at the close of a day's operation. Prior to terminating operations for the day, the final layer of fill, after compaction, shall be rolled with a smooth-wheeled roller to eliminate ridges of soil left by tractors, trucks and compaction equipment.
4. The Contractor shall not place a layer of compacted fill on soil that was permitted to freeze prior to compaction or on snow or ice. Removal of these unsatisfactory materials will be required as directed by the Owner.
5. When the moisture content of the fill material is below optimal moisture necessary for compaction as specified herein, water shall be added until the moisture content is as specified.
6. When the moisture content of the fill material is above the optimal moisture necessary for compaction as specified herein, the fill material shall be aerated by blending, mixing, or other satisfactory methods until the moisture content is as specified.
7. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to the specified density. Compaction shall be continuous over the entire area and the equipment shall make sufficient passes to ensure that the desired density is obtained. A minimum of four coverages with acceptable compaction equipment described hereinafter is a requirement. These coverages are to be provided as systematic compactive effort; incidental coverages due to construction vehicle traffic through the area will not be included.

3. Structural Fill: All fills within the building area shall be made with Structural Fill as defined herein and shown on the Footing Zone of Influence detail included herein. No excavated on-site material will be acceptable as Structural Fill unless specifically approved by testing as specified herein.

4. Allowance for Unsuitable Materials and replacement with Structural Fill: The Contractor shall account for in his base bid for the removal of Unsuitable Materials and Structural Fill in place and graded as specified herein to be used as directed by the Architect or the Geotechnical Engineer. This quantity of Structural Fill is in addition to the requirements for Structural Fill in areas as specified herein, and as shown on the Contract Documents and is to be used at the discretion of the Architect or the Geotechnical Engineer.

5. Backfilling of Trenches, Structures and Foundations:

    1. Areas to be backfilled shall be free of construction debris, refuse, compressible or decayable materials and standing water. Do not place fill when temperature is below 30 degrees F and when fill materials or layers below it is frozen unless specifically approved by the Geotechnical Engineer.
    2. Requirement of description, placement, compaction and spreading of fill materials as specified herein shall be applicable to backfilling operations.
    3. Structural Fill shall be used as Backfill around manholes and other structures. Excavated material may be used if approved by the Architect or Geotechnical Engineer.
    4. Backfilling of foundations, structures and retaining walls shall not commence until construction finish grade has been approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall not be placed against walls until they are braced or have cured sufficiently to develop the strength necessary to withstand, without damage, the pressure that will result from backfilling and compacting operations. If fill is required on both sides of a wall, it shall be brought up simultaneously and evenly on both sides. Avoid damage to the walls and to damp-proofing and waterproofing and other work in place. Allow seven days from the date of application of waterproofing before backfilling. Stones larger than four inches maximum dimension shall not be permitted in the upper six inches of fill or horizontally within 12 inches of walls.
    5. Do not commence backfilling operations of utility trenches until all piping, conduits, etc. have been installed, tested and approved and the locations of all pipe and appurtenances have been recorded. Backfill carefully by hand around pipe to depth of one foot above top of pipe using material specified herein, and tamping firmly in layers not exceeding six-inch layers, compacting by hand rammers or mechanical tampers. When a manufacturer of utility line materials suggests backfill materials and methods other than those specified herein, such requirements shall govern providing the finished work equals or exceeds the result obtained by the materials and methods specified herein. Water mains shall be hand backfilled to a minimum cover of 18 inches before mechanical equipment can be used to backfill trench.
    6. Sand Bedding will be required below all pipe unless otherwise shown on the Drawings or specified herein. Crushed Stone is required under utility structures where shown on the Drawings. Gravel Bedding, Sand Bedding or Crushed Stone shall be placed to the full width of the trench and under utility structure foundations as indicated on the Drawings. After a pipe is bedded, the trench shall be filled to the centerline of the pipe with Gravel Fill or Sand Bedding except at the joint. After the joint is inspected, that portion shall be filled in with Sand Bedding. Material under and around the pipe shall be carefully and thoroughly tamped.
    7. From the centerline of the pipe to a point 12 inches above the top of the pipe the backfill shall be Structural Fill or Sand Fill placed by hand and hand tamped. Above this point, backfill shall be placed in layers six inches deep and each layer shall be compacted with mechanical tampers to not less than 95% of maximum density at optimum moisture of the material. This backfill shall be carried up to the bottom of materials specified to be placed for surfacing requirements.
    8. Utilities shall not be laid directly on ledge, boulders or other hard material. This material shall be removed as specified herein within trench limits, and within vertical planes one foot outside of structure walls. Backfill will be placed in eight-inch lifts and thoroughly compacted. If hand guided compaction equipment is used, fill shall be placed in six-inch lifts. All rock excavation shall be considered unsuitable for backfill around utilities. Ordinary fill may be used as backfill in areas as specified herein.
    9. Coordinate all utility and trench backfilling with the trades involved.

6. Compaction Equipment:

   1. Compaction shall be accomplished by vibratory rollers, multiple wheel pneumatic tired rollers or other types of approved compacting equipment. Loaded trucks, low beds, water wagons and the like shall not be considered as acceptable compaction equipment unless specifically approved by the Architect or Geotechnical Engineer for a particular location. Equipment shall be of any such design that it will be able to compact the fill to the specified density in a reasonable length of time. All compaction equipment shall be subject to the approval of the Geotechnical Engineer.

7. Compaction Requirements:

   1. The following table lists minimum compactive efforts and lift weights which are required for all fill materials. Compaction of each lift shall be completed before compaction of the next lift is started. The compaction equipment shall make an equal number of transverse and longitudinal coverages of each lift. Allow the Geotechnical Engineer sufficient time to make necessary observations and tests. The degree of compaction for fill placed in various areas shall be as follows:

      Relative Compaction

      1. Within buildings and structures:
         -Under footings 95%
         -under slab 95%

      2. Outside building areas:
         -within paved areas 95%
         -within lawn areas and playing fields 85%

      - Percent of maximum dry density of the material at optimum moisture content as determined by methods or tests for ASTM designation D 1557.

8. Methods: The compaction alternatives given below are stated to provide minimum compaction standards only and in no way relieves the Contractor of his obligation to achieve the specified degree of compaction by whatever additional effort is necessary.

   1. All fill to be placed "in-the-dry" with the exception specified hereinafter. If, in the opinion of the Architect or the Geotechnical Engineer, the Contractor has followed a logical sequence of construction procedures, has employed the proper and necessary equipment, and has otherwise conducted himself in a workmanlike manner, but still cannot effectively dewater the excavation, the Architect or the Geotechnical Engineer may permit the Contractor to place a first lift of Gravel or Crushed Stone fill "in-the-wet". Fill placed in-the-wet must meet the gradation and placement requirements specified herein. The quantity of fill placed in-the-wet must be no greater than deemed necessary by the Architect and must be limited to the lowermost lift.

9. Moisture Control:

   1. Variation of moisture content in fill and backfill materials shall be limited to Optimum Moisture (-l% to +2%). Moisture content shall be as uniformly distributed as practicable within each lift, and shall be adjusted as necessary to obtain the specified compaction.
   2. Material which does not contain sufficient moisture to be compacted to the specified densities shall be moisture conditioned by sprinkling, discing, windrowing, or other method approved by the Geotechnical Engineer.

1. Material conditioned by sprinkling shall have water added before compaction. Uniformly apply water to surface of subgrade or layer of soil material to obtain sufficient moisture content. The Contractor shall maintain sufficient hoses and/or water distributing equipment at the site for this purpose.

3. Material containing excess moisture shall be dried to required Optimum Moisture before it is placed and compacted. Excessively moist soils shall be removed and replaced and shall be scarified by use of plows, discs, or other approved methods, and air-dried to meet the above requirements.
4. Materials, which are within the moisture requirements specified above, but which display pronounced elasticity or deformation under the action of earthmoving and compaction equipment, shall be reduced to Optimum Moisture Content, or below, to secure stability.
5. In the event of sudden downpours or other inclement weather, exposed subgrades and fills which, in the opinion of the Geotechnical Engineer become inundated or excessively moistened shall have excess water removed and soil dried as specified above.

3.06 ROUGH GRADING

1. Rough grading shall include the shaping, trimming, rolling and finishing the surface of the sub-base, shoulders, and earth slopes, and the preparation of the sub-base for loam, seeding and paved surfaces. The grading of shoulders and sloped areas may be done by machine methods. Up to two inches in 100" tolerance will be permitted on slopes and one inch in 100" on lawn areas provided the slopes are uniform in appearance and without abrupt changes. All ruts shall be eliminated. Grading of subgrades for paved areas shall be finished at the required depth below and parallel to the proposed surface within 3/8 inch in 100" tolerance.

2. If, during the progress of rough grading work, water pipe, sewer conduit, drain, or other construction is damaged due to operations under this Contract, the Contractor shall repair all such damage at no additional cost to the Owner and restore damaged areas to their original condition.

3. Do all other cutting, filling and rough grading to the lines and grades indicated on the Drawings. Grade evenly to within the dimensions required for finished grades shown on the Drawings. No stone larger than three inches in largest dimension shall be placed in upper 12 inches of fill.

4. Grades shall be brought below finished grades in accordance with the various depths specified below:

    1. Under slabs-on-grade, as specified herein and as shown on the Drawings.
    2. Under paved areas, bottom of base course as shown on Drawings.
    3. Under seeded areas, six inches.
    4. Under cattail marsh area and pond bottom, 12 inches.

5. No rubbish of any description shall be allowed to enter fill material. Such material shall be removed from the site.

6. Complete the grading operations after the building has been finished, the utilities installed, site improvements constructed, and all materials, rubbish and debris removed from the site. Leave subgrade for lawns clean at required grades. There must be sufficient grade staking to provide correct lines and grades.

3.07 DEFICIENCY OF FILL MATERIAL

1. Provide required additional fill material from offsite sources to complete the work if a sufficient quantity of suitable material is not available from the required excavation on the project site.

3.08 SURPLUS OF FILL MATERIAL

1. Surplus fill which is not required to fulfill the requirements of the Contract shall be removed from

the site and legally disposed of.

3.09 DUST AND EROSION CONTROL

1. The Contractor shall take all necessary measures and provide equipment and/or materials to minimize dust from rising and blowing across the site and also to control surface water throughout the operation so that it does not run onto paved ways without being filtered. In addition, the Contractor shall control all dust created by construction operations and movement of construction vehicles, both on the site and on paved ways. Provide additional crushed stone where necessary to provide traps or pads for construction vehicles carrying sediment. Provide temporary swales and interceptor ditches to control surface runoff water where necessary.

2. If dust control is required off-site due to work under this Contract, in addition to watering, sweeping and other methods, the Contractor shall apply calcium chloride in the required amounts to properly control dust. These amounts shall be approved by the Town Engineer prior to application.

3.10 RESTORATION OF SITE ITEMS

1. Wherever streets, lawns or other items within the Contract Limit Lines have been excavated in fulfilling the work required under the Contract, the Contractor shall furnish and install all material at no cost to the Owner to bring finish surface level with the existing adjacent conditions. All work shall be installed to match the existing conditions.

END OF SECTION 02200