SECTION 02315 - EXCAVATION AND FILL

PART 1 - GENERAL

1.01 SUMMARY

A. Bidding requirements, conditions of the contract and pertinent portions of sections in Division 1 of these specifications and MaineDOT Standard of Specifications (current version – as revised), Items 202 – Removing Structures and Obstructions, 203 – Excavation and Embankment, 206 – Structural Excavation, 304 – Aggregate Base and Subbase Course, apply to the section as fully as though repeated herein.

B. Work under this section includes

1. Removals - The Contractor shall perform all work necessary for clearing and grubbing and/or removal, backfill and disposal of all existing materials noted on the Drawings, as well as temporary structures installed for construction.

2. Limit of Work - Take special care to keep all operations within the Limit of Work as shown on the Drawings. The Contractor shall take all necessary precautions to protect existing site elements to remain.

3. Grade and Elevation

   a. The Drawings indicate, in general, the alignment and finished grade elevations. The Owner's Authorized Representative, Engineer or Landscape Architect, however, may make such adjustments in grades and alignment as are found necessary in order to avoid interference or to adapt piping to other special conditions encountered.

   b. The Contractor shall establish the lines and grades in conformity with the Drawings and maintain by means of suitable stakes placed in the field.

4. Protection of Existing Structures and Utilities

   a. Barricade open excavations occurring as part of this work and post with warning signs. Backfilling or secured covering of excavations shall be required.

   b. Provide necessary supports, bracing and covering to protect existing and new structures and utilities during all phases of excavation and backfill.

   c. Notify appropriate owners before excavating adjacent to poles, cables, pipes, and other utilities.

   d. Note that location of existing underground utilities on Drawings is approximate and may be incomplete. Responsibility for exact locations and protection of all utilities rest with the Contractor.

e. Conflicts between existing and new utilities and/or structures to be built under this contract shall be reported to the Owner's Authorized Representative, Engineer or Landscape Architect.

C. Related work:
1. Erosion Control: Section 02370
2. Storm Drainage: Section 02630

1.02 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Tests for soil density and/or gradations as herein designated shall be taken at the option of the Architect, Engineer and or Landscape Architect. Costs of testing shall be paid by the Owner.

2. Soil samples representative of the borrow source and suitable laboratory testing shall be furnished by the Contractor for each material listed in Section 2.1. Test results shall be submitted at least two (2) weeks prior to their proposed use or placement on the site. In the event a proposed material does not meet the specified gradation requirements, the material type shall not be placed on-site until an alternative borrow source is selected and the laboratory test results indicate the material meets the specified gradation requirements.

3. Compaction tests shall be determined on the basis of laboratory Proctor tests (ASTM D.1557, Modified Proctor).

4. Field density tests not specified on a comparative basis shall be to the percent density specified in this Section for both earth excavation and earth and granular type fills. Tests shall be in accordance with ASTM D.1556, ASTM D.2167, ASTM D.2922 OR ASTM D.3017.

1.03 QUALITY ASSURANCE:

A. Conform to all applicable city, county and state codes for excavation, earthwork and disposal of debris.

B. Conform to all applicable standards of the various utility companies.

C. References - Where MaineDOT appears it shall be taken to mean the State of Maine Department of Transportation, Standard Specifications, Highways and Bridges - (current version -as revised).

D. Reference Standards

1. All work shall be performed in accordance with Stonecrest Senior Apartments Specifications, Drawings and MaineDOT Standard Specifications (current version-as

revised). Any conflict between the Specifications shall be resolved by the Engineer or Owner's Representative.

2. The following most current publications form part of this specification to the extent indicated by references thereto and shall be followed for all construction testing:

a. American Society for Testing and Materials (ASTM):

i. D 422 Method for Particle Size Analysis of Soils
ii. D 698 Test for Moisture-Density Relations of Soils Using 5.5 lb. hammer and 12-inch Drop (Standard Proctor)
iii. D 1556 Test for Density of Soil in Place by the Sand Cone Method
iv. D 1557 Test for Moisture-Density Relations of Soils Using 10-lb hammer and 18-inch Drop (Modified Proctor)
v. D 1559 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
vi. D 2167 Test for Density of Soil in Place by the Rubber Balloon Method
vii. D 2216 Laboratory Determination of Moisture Content of Soil
viii. D 2487 Classification of Soils for Engineering Purposes
ix. D 2922 Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
x. D 3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
xi. D 4318 Test for Plastic Limit, Liquid Limit, & Plasticity Index of Soils
xii. C 25 Chemical Analysis of Limestone, Quicklime and Hydrated Lime
xiii. C 110 Physical Testing for Quicklime and Hydrated Lime, Wet Sieve Method
xiv. C 618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

E. Drawings do not intend to show all existing above and below ground objects on site. The Contractor shall visit site and acquaint himself with all observable conditions as they exist before submitting Bid.

PART 2 - PRODUCTS

2.01 MATERIAL:

A. Fill Materials: Backfill and ordinary fill materials shall be as follows:

1. Materials from excavation: Excavated material which can be readily spread and compacted, and consists of mineral soil, substantially free of organic materials, loam, wood, rubbish or other perishable substance may be used for common fill. Boulders (rocks over eight (8) inches) shall be removed from excavated material before using for fill.

2. Backfill over drainage pipes shall be free of stones over one (1) inch diameter for first one (1) foot over pipes.

3. Aggregate Base, Crushed - MaineDOT 703.06, (a) Type B (No rocks larger than four inches). - Compaction of each layer shall continue until a density of not less than 95% of the maximum density (AASHTO T180 Method C or D, AASHTO T191) has been achieved for the full width and depth of the layer. ASTM D-1557; depth per Drawings.

4. Aggregate Subbase Gravel, MaineDOT 703.06 (b) Type D (no stone larger than six inches – Compaction of each layer shall continue until a density of not less than 95% of the maximum density (AASHTO T180 Method C or D, AASHTO T191) has been achieved for the full width and depth of the layer. ASTM D-1557; depth per Drawings.

5. Structural Fill - MaineDOT 703.06, (a), Type C. Size of stone no larger than six (6) inches, and further limited to a maximum particle size equal to three (3) inches within twelve (12) inches of slab grade. Compacted at 95% ASTM D-1557

6. Aggregate for Foundation Backfill: MaineDOT 703.6 (a) Type B. Size of stone no larger than four (4) inches.

7. Gravel Borrow - MDOT 703.20. Size of stone no larger than six (6) inches. Compacted at 95% ASTM D-1557.

B. Pipe Bedding Material:

1. Granular Pipe Bedding Material: Shall be clean and free of organic matter, silt, or clay lumps, and deleterious materials. The material shall meet the following gradation requirements:

Sieve Designation	% by Weight Passing Square Mesh Sieve
1/2”	100
#4	95-100
#40	20-45
#200	0-5

2. Stone Pipe Bedding Material: Shall be screened or crushed stone free of organic matter, silt, or clay lumps, and deleterious material. The material shall meet the following graduation requirements: 100% passing a 1-inch square mesh sieve and not more than 5% passing a ¼-inch square mesh sieve.

C. Suitable Backfill Material

1. Structural fill or natural material excavated during the course of construction, excluding debris, pieces of pavement, organic matter, topsoil, all wet or soft muck, peat, or clay, all excavated ledge material, and all rocks over six (6) inches in largest dimension, or any material which will not provide sufficient support or maintain the completed construction in a stable condition, all approved by the Owner’s Authorized Representative or Engineer.

D. Geotextile Materials

1. Acceptable Geotextiles and Geogrids:

    a. Mirafi 600x or approved equal

2. Filter/Drainage Geotextiles:

    a. Mirafi 160N or approved equal

PART 3 - EXECUTION

3.01 EXECUTION:

A. Earth Excavation - Removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, any material indicated in the data on subsurface conditions, and other materials encountered that are not classified as rock excavation or unauthorized excavation.

B. Rock Excavation - 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.

1. Typical Materials: Boulders 2 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementious aggregate deposits.

2. Intermittent drilling performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

C. Unauthorized Excavation

1. Removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Architect, Engineer and/or Owner’s Representative.

2. Under footings or foundation bases, fill unauthorized excavation by filling with Structural Fill and compacting to 95 percent of ASTM D-1557 without altering top elevation.

D. General Excavation

1. Grades, Dimensions - excavate where indicated and as necessary to obtain subgrades as shown on the Drawings and hereinafter specified. All excavation shall include the satisfactory removal of all materials of whatever substance encountered within the indicated limits. Only suitable materials shall be used or stockpiled for later use in backfill preparation. Disturbed subgrade material shall be removed prior to pouring of footings and replaced with either compacted structural fill or thickened footing concrete. All footing subgrades shall be approved by the owner’s representative prior to pouring concrete for footings.

2. The Contractor shall provide temporary drains, ditches and the necessary equipment, as required, to maintain the site of work and adjacent areas in a well drained condition. Keep all excavations free of both ground and surface water at all times. All water pumped or drained from the work shall be disposed of so as not to endanger public health, property or any portion of the work under construction or completed.

3. The Contractor shall provide shoring, sheeting and bracing as may be required to maintain excavations and trenches secure and safe from collapse and to protect adjacent structures.

4. Excavation shall not be made below specified subgrades except where rock or unstable material is encountered. If suitable bearing is not found at levels shown on the Drawings, the Architect, Engineer and/or the Owner's Representative shall be notified in writing immediately so that adjustments or changes may be made. Material removed below specified subgrade without the approval of the Engineer and or Owner's Representative shall be replaced and compacted with an approved gravel at the Contractor's expense.

5. All work shall be carried out in a manner consistent with the regulations of such Federal, State and Local authorities, as may have jurisdiction over such activities.

E. Summary of Utility Installation

1. Set all lines, elevations and grades for utility and drainage system work and control system for duration of work, including careful maintenance of bench marks, property corners, monuments or other reference points.

2. Perform all excavation for underground piping and utility systems to the depths indicated on the Drawings or as otherwise specified. Trenches shall be excavated by open cut.

3. Maintain in operating condition existing utilities, active utilities and drainage systems encountered in utility installation. Repair any surface or subsurface improvements shown on Drawings.

4. Verify location, size, elevation and other pertinent data required to make connections to existing utilities and drainage systems as indicated on Drawings. Contractor shall comply with local codes and regulations.

5. Inspection of stormwater system excavation, utility excavation and backfilling subject to review by utility company, city engineer, if necessary, by Engineer and or Owner's Representative.

F. Excavation, Trenching and Backfilling

1. Perform excavation as indicated for specified depths. During excavation, stockpile materials suitable for backfilling in an orderly manner far enough from bank of trench to avoid overloading, slides or cave-ins.

2. Remove excavated materials not required or not suitable for backfill or embankments and waste as specified. Any structures discovered during excavation shall be disposed of as specified.

3. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches or other excavations by pumping or other acceptable methods.

4. Open cut excavation with trenching machine or backhoe. Where machines other than ladder or wheel-type trenching machines are used, do not use clods for backfill. Dispose of unsuitable material and provide other suitable material at no additional cost to Owner.

5. Excavations for all foundation work shall be backfilled with structural fill meeting specifications set forth herein.

G. Trench Excavation

1. The Contractor shall contact the local utility companies, if necessary, before excavation begins. Dig trench at proper width and depth for laying pipe, conduit or cable. Cut trench banks as nearly vertical as practical and remove stones as necessary to avoid point bearing. Over-excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous and uniform bedding.

2. All trench excavation side walls greater than five (5) feet in depth shall be sloped, shored, sheeted, braced or otherwise supported by means of the sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to an exit ladder or steps shall not be greater than 25 feet in trenches four (4) feet or deeper.

3. Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material at every point along entire length, except where necessary to excavate for bell holes, proper sealing of pipe joints or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer or wider than needed to make joint connection properly.

4. Trench width requirements below the top of the pipe shall not be less than 12 inches nor more than 18 inches wider than outside surface of any pipe or conduit that is to be installed to designated elevations and grades. All other trench width requirements for pipe, conduit or cable shall be least practical width that will allow for proper compaction of trench backfill.

5. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances:

   a. Water Mains: 66 inches to top of pipe barrel.

b. Sanitary Sewer: Elevations and grades as indicated on Drawings. Note: Pipe with less then five (5) feet of cover in pavement areas or four (4) feet in landscaped areas, provide two (2) inches of rigid insulation as shown on detail.

c. Electrical Conduits: 40 inches minimum to top of conduit for primary and 30 inches to top of conduit for secondary or as required by NEC 300-5, NE 710-36 codes, or the local utility company requirements, whichever is deeper.

d. Telephone Conduits: 18 inches minimum to top of conduit, or as required by the local utility company, whichever is deeper.

H. Sheeting and Bracing - Provide sheeting and bracing, when necessary, in trenches and other excavations where protection of workmen is required. Sheeting may be removed after sufficient backfilling to protect against damaging or injurious caving.

I. Pipe Bedding - Accurately cut trenches for pipe or conduit that is to be installed to designated elevations and grades to line and grade as specified below bottom of pipe and to width as specified. Place specified depth of bedding material, compact in bottom of trench, and accurately shape to conform to low portion of pipe barrel. After pipe installation, place select bedding material in accordance with details and compact as required

J. Trench Backfilling

1. Criteria: Trenches shall not be backfilled until required tests are performed and the utility systems comply with and are accepted by applicable governing authorities. Backfill trenches as specified. If improperly backfilled, reopen to depth required to obtain proper compaction. Backfill and compact as specified, to properly correct condition in an acceptable manner.

2. Backfilling: After pipe or conduit has been installed, bedded, and tested as specified, backfill trench or structure excavation with specified material placed in eight (8) inch maximum loose lifts.

3. Fill shall not be placed on a surface of frozen material, nor shall snow, ice, frozen earth or debris be incorporated in the fill. Compact to minimum density of 95% of maximum dry density in accordance with ASTM D 698 (or 92% of maximum dry density in accordance with ASTM D1557). For utility trenches located in pavement and sidewalk areas, place backfill in eight (8) inch maximum loose lifts and compaction to 95% of ASTM D.1557 maximum dry density.

K. Structural Excavation

1. Earth shall be excavated to the depth and sections required for installation of all footings, floor slabs or other appurtenant facilities to the extent indicated on the Drawings. Care shall be taken that the foundation areas of structures are not excavated below subgrade or are disturbed so as to lessen their bearing capacity.

2. All excavations for structures shall be sheeted, braced, sloped, or otherwise protected in the same manner and meeting the safety requirements and conditions specified above under paragraph Section 3.6 (B). Any excess excavated material shall be removed from the site.

L. Drainage

1. The Contractor shall provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) with which to intercept and/or remove promptly and dispose of properly all water entering excavations. Such excavations shall be kept dry until the structures and appurtenances to be built therein, have been completed to such extent that they will not be damaged.

2. Dewatering shall be accomplished in a manner that will preserve the undisturbed state of the foundation soils. All water pumped or drained from the work shall be disposed of in a suitable manner without undue interference with other work, other surfaces, or property. Suitable temporary pipes, flumes or channels shall be provided for water that may flow along or across the site of the work.

3. Temporary underdrains, if used, shall be laid in trenches beneath the grade of the structure. Trenches shall be of suitable dimensions to provide room for the chosen size of underdrain and its surrounding screened gravel.

4. Temporary underdrains, if used, shall be laid at an approved distance below the bottom of the normal excavation and entirely surrounded by screened gravel. The distance between the bottom of the pipe or structure and the top of the bell of the underdrain pipe shall be at least three (3) inches, unless otherwise permitted. The space between the underdrain and the pipe or structure shall be filled with sand meeting the requirements of ASTM Designation C-33 which shall be rammed if necessary and left with a surface suitable for laying the pipe or building structure. Following their use, underdrains shall be plugged as directed by the Engineer and or Owner’s Representative.

M. Compaction

1. Compaction densities specified herein shall be the percentage of the maximum dry density obtainable at optimum moisture content as determined and controlled in accordance with ASTM D.1557. Field density tests shall be made in accordance with ASTM D.1556, D.2167 or D.2922. Each layer of backfill shall be moistened or dried as required, and shall be compacted to the required densities unless otherwise specified in the project specifications.

2. Fills placed under footings, floor slabs, roads, parking areas and walks shall be compacted to not less than 95 percent of the ASTM D - 1557 maximum dry density.

3. The subbase material placed under the road gravel base in fill areas shall be compacted to not less than 95 percent of the ASTM D1557 maximum density.

4. Fills adjacent to building walls from the exterior face of the building and/or retaining walls to a point not less than 10'-0" from the exterior face of the wall shall be compacted to not less than 92 percent of the ASTM D. 698 maximum compaction dry densities as herein before specified.

    a. Bedding material and trench sand under pavement: 95%

    b. Bedding material and trench sand non-pavement areas: 92%

    c. Loam areas: 90%

    d. All other areas: 85%

5. Methods and equipment proposed for compaction shall be subject to the prior acceptance by Engineer and or the Owner's Representative. Compaction generally shall be done with vibrating equipment. Displacement of, or injury to the pipe and structure shall be avoided. Movement of in-place pipe or structures shall be at the Contractor's risk. Any pipe or structure damaged thereby shall be replaced or repaired as directed by the Engineer and or Owner’s Representative and at the expense of the Contractor.

N. Filling and Subgrade Preparation

1. All materials shall be placed and compacted to conform to the lines, elevations and cross-sections indicated on the Drawings. Do not start fills until the area has been inspected and approved by the Engineer and or Owner’s Representative.

2. Fill shall not be placed on a surface of frozen material, nor shall snow, ice, frozen earth or debris be incorporated in the fill. All materials shall be approved by the Engineer and or Owner’s Representative before being placed.

3. Unless specifically stated otherwise on the Drawings, areas exposed by excavation, removal of structural foundations or stripping and on which subgrade preparations are to be performed, shall be compacted to a minimum of 95% of maximum dry density, in accordance with ASTM D 1557. Subgrades consisting of native sands or silty sands shall be compacted with a 15-ton highway roller. These areas shall then be proof-rolled to detect any areas of insufficient compaction. Proof rolling shall be accomplished by making a minimum of two (2) complete passes with a fully loaded tandem-axle dump truck, or approved equivalent, in each of the two perpendicular directions. Areas of failure shall be excavated and re-compacted as stated above.

4. If sufficient suitable fill material is not available from excavations under this Contract, additional fill, suitable for use, shall be brought to the site from other sources. Subgrade fill in pavement areas shall consist of Gravel Borrow (MaineDOT 703.20) or Structural Fill (MaineDOT 703.06 (a) Type C. Place in maximum 12 inch layers and compact to 92 percent of maximum density in accordance with ASTM D 1557. Each layer shall be free from ruts and shall meet compaction requirements before next layer is placed. Maintain layers with crown or other practical means of drainage.

5. Stones in fills shall be well distributed. Do not have stones over six (6) inches in diameter within twelve (12) inches of subgrade.

O. Finish Grading

1. Grade all areas where finish grade elevations or contours are indicated on Drawings, other than paved areas and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Finished subgrade surface shall not be more than 0.10 feet above or below established finished subgrade elevation, and all ground surfaces shall vary uniformly between indicated elevations. Ditches and swales shall be graded to allow for proper drainage without ponding and in a manner that will minimize erosion potential. For topsoil application, refer to Section 02330.

2. Correct all settlement and eroded areas within one year after date of completion at no additional expense to Owner. Bring grades to proper elevation. Replant or replace any grass, shrubs, trees or other vegetation disturbed by construction using corrective measures.

3.02 INSPECTION:

A. If Owner elects to test, an independent testing laboratory selected and paid by the Owner shall be retained to perform construction testing on site.

B. If compaction requirements are not complied with at any time during the construction process, remove and re-compact deficient areas until proper compaction is obtained at no additional expense to Owner.

C. The independent testing laboratory shall prepare test reports that indicate test location, elevation data and test results. The Owner, Architect and Contractor shall be provided with copies of reports within 72 hours of time test was performed. In the event that any test performed fails to meet these Specifications, the independent testing laboratory shall notify the Owner’s Representative and Contractor immediately.

D. All costs related to retesting due to failures shall be paid for by the Contractor at no additional expense to the Owner. The Owner reserves the right to employ an independent testing laboratory and to direct any testing that is deemed necessary. Contractor shall provide free access to site for testing activities.

3.03 CLEAN-UP:

A. The Contractor shall remove all debris, construction equipment, and material from the areas to be loamed and seeded.

END OF SECTION 02315