SPECIFICATIONS

HURRICANE HELENE REPAIRS

Water Line Improvements

Cleveland County Water

Owner: Cleveland County Water

Prepared by:

TGS ENGINEERS

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02000 SPECIFICIAITIONS

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Soil Materials……...……Section 02205
Aggregate Materials…….……Section 02207
Rough Grading…….…….Section 02211
Excavating……..……..Section 02222
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SECTION 02110

SITE CLEARING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of surface debris.

B. Removal of paving, curbs, and structures.

C. Removal of trees, shrubs, and other plant life.

D. Removal of underground storage tanks.

E. Topsoil excavation.

1.2 RELATED SECTIONS

A. Section 02211 – Rough Grading.

B. Section 02229 – Rock Removal.

1.3 REGULATORY REQUIREMENTS

A. Conform to Owner, County, Department of Transportation, local fire department, and any other applicable codes for environmental requirements, disposal of debris, burning debris on site, and use of herbicides.

B. Coordinate clearing Work with applicable utility companies.

PART 2 PRODUCTS

2.1 MATERIALS

A. Herbicide: as indicated on plans.

PART 3 EXECUTION

3.1 PREPERATION

A. Verify that existing plant life designated to remain is tagged or identified.

B. Identify a waste area for placing removed materials.

3.2 PROTECTION

A. Locate, identify, and protect utilities that remain from damage.

B. Protect trees, plant growth, and features designated to remain as final landscaping.

C. Protect bench marks, and survey control points, and existing remaining structures from damage or displacement.

3.3 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove trees and shrubs as indicated on plans. Remove stumps and root systems to an adequate depth. Remove surface rocks and other debris.

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Apply herbicide to remaining stumps to inhibit growth.

3.4 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Remove demolished pavement and curb and other debris from site.

C. Excavate and remove underground storage tanks, restraining straps, associated plumbing, and other debris.

3.5 TOPSOIL EXCAVATION

A. Excavate topsoil from\marked areas in accordance with the plans without mixing with foreign materials.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on the plans to depth not exceeding 8 feet and protect from erosion.

D. Remove topsoil not intended for reuse from site to an appropriate and permitted site.

END OF SECTION

SECTION 02205

SOIL MATERIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Subsoil materials.

B. Topsoil materials.

1.2 RELATED SECTIONS

A. Section 02207 – Aggregate Materials.

B. Section 02223 – Backfilling.

C. Section 02225 – Trenching.

D. Section 02275 – Riprap.

E. Section 02936 – Seeding.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with all references, Owner requirements, and applicable state agency requirements.

1.4 REFERENCES

A. ASTM D698 – Laboratory Compaction Characterizes of Soil Using Standard Effort

B. ASTM D2487 – Classification of Soils for Engineering Purposes.

C. ASTM D4318 – Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

D. ASTM D422 – Standard Test Method for Particle-Size Analysis of Soils

E. ASTM D2974 – Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of North Carolina, Owner and the NCDOT. Maintain one copy of all approved permits on site during construction.

PART 2 PRODUCTS

2.1 SUBSOIL MATERIALS

A. Subsoil Type S1: Conforming to North Carolina Department of Transportation requirements.

B. Subsoil Type S2:

1. Excavated and re-used material, imported borrows, or select or local borrow.
2. Graded.
3. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
4. Relatively free of organic material.
5. Group symbols GM, SW, SP, SM, SC, ML, CL, MH and CH may be satisfactory with engineers' approval. OL, OH, and PT are unsatisfactory.

2.2 TOPSOIL MATERIALS

A. Topsoil Type S3: Conforming to North Carolina Department of Transportation requirements.

B. Topsoil Type S4:

1. Excavated and re-used material.
2. Graded.
3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
4. Containing a minimum of 4 percent and a maximum of 25 percent organic matter.

C. Topsoil Type S5:

1. Imported borrow.
2. Friable loam.
3. Reasonably free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds, and foreign matter.
4. Containing a minimum of 4 percent and a maximum of 25 percent organic matter.

2.3 SOURCE QUALITY CONTROL

A. Testing and Analysis of Topsoil Material: Perform testing as referenced in Section 1.4 of 02205.

B. If tests indicate materials do not meet specified requirements, change material and retest.

Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 SOIL REMOVAL

A. Excavate subsoil and topsoil from areas designated.

B. Remove lumped soil, boulders, and rock.

C. Either stockpile or removal soil as required by design plans.

D. Separate differing materials with dividers or stockpile apart to prevent mixing.

E. Prevent intermixing of soil types or contamination.

F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.2 STOCKPILE CLEANUP

A. As specified on design plans either direct surface water away from stockpile site to prevent erosion or deterioration of materials or leave unused materials in a neat, compact stockpile

B. If a borrow area is indicated, leave area in a clean and neat condition. Grade site surface to prevent freestanding surface.

END OF SECTION

SECTION 02207

AGGREGATE MATERIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aggregate materials.

1.2 RELATED SECTIONS

A. Geotechnical Report (if provided); bore hole locations and findings of subsurface materials.

B. Section 02205 – Soil Materials.

C. Section 02225 – Trenching.

D. Section 02275 – Riprap.

E. Section 02667 – Site Water Lines.

F. Section 02732 – Site Sanitary Sewerage Systems.

1.3 REFERENCES

A. AASHTO – M147 – Materials for Aggregate and Soil-Aggregate.

B. ASTM C136 – Method for Sieve Analysis of Fine and Coarse Aggregates.

C. ASTM D1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.

D. ASTM D2487 – Classification of Soils for Engineering Purposes.

E. ASTM D4318 – Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with all references, Town requirements, and applicable state agency requirements.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Coarse Aggregate Type A1: Aggregate Base Coarse (ABC) conforming North Carolina Department of Transportation Standard.

B. Coarse Aggregate Type A2 (Gravel): AASHTO M147, 35% or less passing the No. 200.

C. Coarse Aggregate Type A3 (Gravel): Washed stone; free of shale, clay, friable material and debris; graded in accordance with ASTM C136, ASTM D2487 Group Symbol GP.

D. Aggregate Type A4 (Pea Gravel): Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM C136, ASTM D2487 Group Symbol GM.

2.2 FINE AGGREGATE MATERIALS

A. Fine Aggregate Type A5: Conforming North Carolina Department of Transportation Standard.

B. Fine Aggregate Type A6 (Sand): Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM C136, ASTM D2487 Group Symbol SP.

2.3 SOURCE QUALTIY CONTROL

A. Coarse Aggregate Material – Testing and Analysis: Perform in accordance with ASTM D1557.

B. Fine Aggregate Material – Testing and Analysis: Perform in accordance with ASTM D1557.

C. If tests indicate materials do not meet specified requirements, change material or materials source and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 STOCKPILING

A. Stockpile materials on site at locations by designated Engineers.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

3.2 STOCKPILE CLEANUP

A. Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

B. If a borrow area is indicated, leave area in a clean and neat condition. Grade site surface to prevent freestanding surface water.

END OF SECTION

SECTION 02211

ROUGH GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of topsoil and subsoil.

B. Cutting, grading, filling, rough contouring, and compacting the site for site structures, building pads, and other required grading.

1.2 RELATED SECTIONS

A. Section 02110 – Site Clearing.

B. Section 02205 – Soil Materials.

C. Section 02207 – Aggregate Materials.

D. Section 02229 – Rock Removal.

E. Section 02222 – Excavating.

F. Section 02223 – Backfilling.

G. Section 02225 – Trenching.

H. Section 02923 – Landscape Grading.

1.3 REFERENCES

A. ASTM C136 – Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D698 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

C. ASTM D1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

D. ASTM D2419 – Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

E. ASTM D2434 – Test Method for Permeability of Granular Soils (Constant Head).

F. ASTM D3017 – Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C136, ASTM D2419, ASTM D 2434, and any other applicable local standards. Maintain one copy of all required permits on site.

1.5 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: Type S3, S4, or S5 as specified in Section 02205.

B. Subsoil Fill: Type S1 or S2 as specified in Section 02205.

C. Structural Fill: Type S1 or S2 as specified in Section 02205.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions conform to site plans.

B. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect utilities that remain, from damage.

D. Notify applicable utility company to remove and relocate utilities.

E. Protect above and below grade utilities that remain.

F. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.

G. Protect bench marks, survey control point existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded.

B. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.

C. When excavating through roots, perform work by hand and cut roots with sharp axe.

D. Remove subsoil from site or stockpile in area designated on site to depth not exceeding eight feet and protect from erosion. Remove from site, subsoil not being reused.

E. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key placed material to slope to provide firm bearing.

F. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.4 FILLING

A. Install Work in accordance with applicable local standards.

B. Fill areas to contours and elevations with unfrozen materials.

C. Place fill materials on continuous layers and compact.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slop grade away from building minimum 1.5:100 unless noted otherwise.

F. Make grade changes gradual. Blend slope into level areas.

G. Remove surplus fill materials from site.

3.5 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.6 FIELD QUALITY CONTROL

A. Testing: In accordance with ASTM D1557.

B. If test indicate Work does not meet specified requirements, remove Work, replace and retest.

i. Frequency of Test: Perform tests as required by Owner and/or Engineer.

END OF SECTION

SECTION 02222

EXCAVATING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Excavating for site structures.

1.2 RELATED SECTIONS

A. Section 02110 – Site Clearing.

B. Section 02223 – Backfilling.

C. Section 02225 – Trenching.

D. Section 02229 – Rock Removal.

E. Section 02607 – Manholes and Covers.

F. Section 02667 – Site Water Lines.

1.3 FIELD MEASUREMENTS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain from damage.

C. Notify utility company to remove and relocate utilities.

D. Protect plant life, lawns, rock outcroppings and other features remaining as a portion of final landscaping.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.2 EXCAVATING

A. Excavate subsoil to accommodate building foundations, slabs-on-grade paving and site

B. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 02223 and 02225.

C. Grade top perimeter of excavating to prevent surface water from draining into excavation.

D. Hand trim excavation. Remove loose matter.

E. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd. measured by volume. Larger material will be removed under Section 02229.

F. Notify Owner of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

G. Correct areas over excavated in accordance with Section 02223.

H. Stockpile excavated material in area designated on site in accordance with Section 02205.

3.3 FIELD QUALITY CONTROL

A. Provide for visual inspection of bearing surfaces.

3.4 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 02223

BACKFILLING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Building perimeter and site structure backfilling to subgrade elevations.

B. Site filling and backfilling.

C. Fill under slabs-on-grade and paving.

D. Fill for over-excavation.

E. Consolidation and compaction as scheduled.

1.2 RELATED SECTIONS

A. Section 02222 – Excavating.

B. Section 02225 – Trenching.

C. Section 02229 – Rock Removal.

D. Section 02275 – Riprap.

E. Section 02607 – Manholes and Covers.

F. Section 02667 – Site Water Lines.

G. Section 02923 – Landscape Grading.

1.3 REFERENCES

A. ASTM D1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Fill Type: As specified in Section 02205.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify subdrainage, dampproofing, or waterproofing installation has been inspected

B. Verify underground tanks and manholes are anchored to their own foundations to avoid flotation after backfilling.

C. Verify structural ability of unsupported walls to support imposed loads to the fill.

3.2 PREPERATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Type A3 fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify and proof roll subgrade surface to identify soft spots. Fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Employ a placement method that does not disturb or damage other work.

D. Place geotextile fabric over Type A2 fill prior to placing next lift to fill.

E. Granular Fill Type A3: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

F. Soil Fill Type S2: Place and compact material in equal continuous layers not exceeding 12 inches compacted depth.

G. Maintain optimum moisture content of backfill materials to attain required compaction density.

H. Remove surplus backfill materials from site.

I. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

A. Top surface of Backfilling under Paved Areas: Plus or Minus 0.5 inches from required elevations.

B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ASTM D1557.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

C. Proof roll compacted fill surfaces under slabs-on-grade and paving.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished work.

B. Reshape and re-compact fills subjected to vehicular traffic.

3.7 SCHEDULE

A. All fill and compaction to comply with approved design plans.

END OF SECTION

SECTION 02225

TRENCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Excavating trenches for utilities from clean out outside building to municipal utilities.

B. Compacted fill from top of utility bedding to subgrade elevations.

C. Backfilling and compaction

1.2 RELATED SECTIONS

A. Section 02110 – Site Clearing.

B. Section 02205 – Soil Materials.

C. Section 02222 – Excavating.

D. Section 02223 – Backfilling.

E. Section 02229 – Rock Removal.

F. Section 02275 – Riprap.

G. Section 02667 – Site Water Lines.

H. Section 02732 – Site Sanitary Sewerage Systems.

I. Section 02923 – Landscape Grading.

1.3 REFERENCES

A. ASTM D1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

1.4 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable

1.5 FIELD MEASUREMENTS

A. Verify that survey bench mark, control point, and intended elevations for the work are as shown on drawings.

1.6 COORDINATION

A. Verify work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Fill Type S2: As specified in Section 02205.

2.2 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable fabric in accordance with plans.

B. Filter Fabric: Non-biodegradable fabric in accordance with plans.

PART 3 EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.

C. Protect bench marks, existing structures, paving, and curbs from excavating equipment and vehicular traffic.

D. Maintain and protect above and below grade utilities that are to remain.

E. Cut out soft areas of subgrade not capable of compaction in place. Backfill and compact to density equal to or greater than requirements for subsequent backfill material.

3.2 EXCAVATING

A. Excavate subsoil required for municipal utilities.

B. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

C. Do not interfere with 45 degree bearing splay of foundations.

D. In trenches where water is present or where dewatering is required, the trench bottom shall be undercut and stabilized with No. 67 stone, having a minimum depth of 8 inches.

E. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

F. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd., measured by volume. Larger material will be removed under Section 02229.

G. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

3.3 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Place geotextile fabric over Fill Type A2 prior to placing next lift to fill.

D. Granular Fill Type A6: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

E. Soil Fill Type S2: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

F. Employ a placement method that does not disturb or damage foundation perimeter drainage, utilities in trench, or any other existing structures.

G. Maintain optimum moisture content of backfill materials to attain required compaction density.

H. Remove surplus backfill materials from site.

I. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

A. Top surface of Backfilling under Paved Areas: Plus or Minus 0.5 inches from required elevations.

B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ASTM D1557.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

C. Frequency of Tests: Compaction tests will be conducted as required by Owner's Representative.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished work.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

3.7 SCHEDULE

A. All fill and compaction to comply with approved design plans.

END OF SECTION

SECTION 02229

ROCK REMOVAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of discovered rock during excavation.

B. Explosives to assist rock removal.

1.1 RELATED SECTIONS

A. Section 02225 – Trenching: Trenching and backfilling for utilities.

B. Section 02275 – Riprap.

1.2 REFERENCES

A. NFPA 495 – Code for Manufacture, Transportation, Storage, and Use of Explosive Materials.

1.3 DEFINITIONS

A. Rock Excavation: Any material that cannot be excavated with a single tooth ripper drawn by a crawler tractor having a minimum flywheel power rated at not less than 310 horse power (Caterpillar D-8T or equivalent), occupying an original volume of at least one cubic yard or more, and requires blasting.

B. Trench Excavation: Any Material which cannot be excavated with a Caterpillar 345C with flywheel power of 345 horse power or equivalent occupying an original volume of at least ½ cubic yard or more, and which requires blasting or other rock excavation methods.

1.4 SUBMITTALS FOR REVIEW

A. Shop Drawings: Indicate the proposed method of blasting, delay pattern, explosive types, type of blasting mat or cover, and intended rock removal method. Owner's Representative must approve prior to any blasting.

1.5 QUALITY ASSURANCE

A. Seismic Survey Firm: Company specializing in seismic surveys with five years experience or approval by Owner's Representative.

B. Explosives Firm: Company specializing in explosives for disintegration of rock, with five years documented experience or approval by Owner's Representative.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable safety codes for explosive disintegration of rock and to NFPA 495 for handling explosive materials.

B. Blasting Procedures shall conform to all applicable local, state, and Federal laws and ordinances. The Contractor shall take all necessary precautions to protect life and property, including the use of an approved blasting mat where there exists the danger of throwing rock or overburden.

C. Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.

1.7 PROJECT CONDITIONS

A. The Contractor shall keep explosive materials that are needed on the job site in specially constructed boxes provided with locks. These boxes shall be painted red and plainly identified as their contents. After working hours, the boxes containing explosive materials shall be removed from the job site. Failure to comply with this specification shall be grounds for suspension of blasting operations until full compliance is made.

B. Conduct survey and document conditions of buildings near locations of rock removal, prior to blasting and photograph existing conditions identifying existing irregularities.

C. Advise owners of adjacent buildings or structures in writing, prior to executing seismographic survey. Explain planned blasting and seismic operations.

D. Where blasting takes place within 500 feet of a utility, structure, or property which could be damaged by vibration, concussion, or falling rock, the Contractor shall be required to keep a blasting log containing the following information for each and every shot:

1. Date of shot.
2. Time of shot.
3. Foreman’s name.
4. Number and depth of holes.
5. Approximate depth overburden.
6. Amount and type of explosive used in each hole.
7. Types of caps used (instant or delay).

8. The weather.

E. Blasting log shall be made available to the Owner's Representative upon request and shall be kept in an orderly manner. Compliance by the Contractor with these specifications does in no way relieve him of legal liabilities relative to blasting operations.

F. Obtain a seismic survey prior to rock excavation to determine maximum charges that can be used at different locations in area of excavation without damaging adjacent properties or other work.

G. No blasting shall be allowed unless a galvanometer is employed to check cap circuits.

H. The Owner reserves the right to require removal of rock by means other than blasting where any utility, residence, structure, etc. is either too close to, or so situated with respect to the basting as to make blasting hazardous.

1.8 SCHEDULING

A. Schedule Work to avoid disruption to occupied buildings nearby.

PART 2 PRODUCTS

2.1 MATERIALS

A. Explosives: Type recommended by explosive firm following seismic survey and required by authorities having jurisdiction.

B. Delay Device: Type recommended by explosives firm.

C. Blast Mat Materials: Type recommended by explosives firm.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions and note subsurface irregularities affecting work of this section.

3.2 PREPERATION

A. Identify required lines, levels, contours, and datum.

3.3 ROCK REMVOAL BY A MECHANICAL METHOD

A. Excavate and remove rock by the mechanical method.

B. Drill holes and utilize wedges or mechanical disintegration compound to fracture rock.

C. Cut away rock at bottom of excavation to form level bearing.

D. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

E. Remove excavated materials from site or reuse for site landscaping.

F. Correct unauthorized rock removal to directions of Owner's Representative.

3.4 ROCK REMOVAL BY EXPLOSIVE METHODS

A. If rock is uncovered requiring the explosives method for rock disintegration, notify the Owner.

B. Provide seismographic monitoring during progress of blasting operations.

C. Drill blasting holes within 12 feet of finished slope.

D. Disintegrate rock and remove from excavation.

E. Remove rock at excavation bottom to from level bearing.

F. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

G. Remove excavated material from site or reuse for site landscaping.

H. Correct unauthorized rock removal to directions of Owner's Representative.

3.5 FIELD QUALITY CONTROL

A. Provide for visual inspection of foundation bearing surfaces and cavities formed by removed rock.

END OF SECTION

SECTION 02231

AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aggregate base course.

1.2 RELATED SECTIONS

A. Section 02207 – Aggregate Materials.

B. Section 02225 – Trenching.

C. Section 02275 – Riprap.

D. Section 02510 – Asphaltic Concrete Paving.

E. Section 02520 – Portland Cement Concrete Paving.

F. Section 02607 – Manholes and Covers.

G. Section 02923 – Landscape Grading.

1.3 REFERENCES

A. AASHTO T180 – Moisture-Density Relations of Soils Using a 10-lb. Rammer and an 18-in. Drop.

B. ASTM D1557 – Test methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using a 10-lb. Rammer and an 18-in. Drop.

PART 2 PRODUCTS

2.1 MATERIALS

A. Coarse Aggregate Fill Type A1: As specified in Section 02207.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGTE PLACEMENT

A. Spread aggregate over prepared substrate to a total compacted thickness as indicated on design plans and in accordance with North Carolina Department of Transportation, Requirements.

B. Place aggregate in maximum 6 inch layers and roller compact to specified density.

C. Level and contour surfaces to elevations and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Flatness: Maximum variation of ½ inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within ¼ inch.

C. Variation From Design Elevation: Within ½ inch.

3.5 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with AASHTO T180.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.6 SCHEDULES

A. Under Asphalt Pavement

1. Compact placed aggregate materials to achieve compaction of 95 percent.

B. Under Concrete Pavement:

1. Compact placed aggregate materials to achieve compaction of 95 percent.

END OF SECTION

SECTION 02510

ASPHALTIC CONCRETE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Asphaltic concrete paving, wearing binder or base course.

B. Surface sealer.

C. Aggregate base course.

1.2 RELATED SECTIONS

A. Section 02231 – Aggregate Base Course

B. Section 02607 – Manholes and Covers.

1.3 REFERENCES

A. ASTM D946 – Penetration-Graded Asphalt Cement for Use in Pavement Construction.

B. TAI – (The Asphalt Institute) 0 MS-2 Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.

1.4 PERFORMANCE REQUIREMENTS

A. Paving: Designed in accordance with Owner Requirements and/or North Carolina Department of Transportation.

B. Patching: Designed in accordance with approved design plans. Patching in Owner streets or DOT roads must meet appropriate requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Owner and/or North Carolina Department of Transportation standard.

B. Mixing Plant: Conform to Owner and/or North Carolina Department of Transportation standard.

C. Obtain materials from same source throughout.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for paving work on public property.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F or surface is wet or frozen.

PART 2 PRODUCTS

2.1 MATERIALS

A. Asphalt Cement: ASTM D946. In accordance with Owner Requirements and/or North Carolina Department of Transportation

B. Aggregate Base Course Mix: In accordance with Section 02207 Type A1.

C. Aggregate for Binder Course mix: In accordance with North Carolina Department of Transportation standards.

D. Aggreegate for Wearing Course Mix: In accordance with North Carolina Department of Transportation standards.

E. Fine Aggregate: In accordance with Section 02207 Type A5.

F. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.

G. Primer: In accordance with North Carolina Department of Transportation standards.

H. Tack Coat: In accordance with North Carolina Department of Transportation standards.

I. Seal Coat: In accordance with North Carolina Department of Transportation standards.

2.2 APHALT PAVING MIX

A. Use dry material to avoid foaming. Mix uniformly.

B. Base Course: 3.0 to 6.0 percent of asphalt cement by weight in mixture in accordance with North Carolina Department of Transportation standards.

C. Binder Course: 4.5 to 6.0 percent of asphalt cement by weight in mixture in accordance with North Carolina Department of Transportation standards.

D. Wearing Course: 5.0 to 7.0 percent of asphalt cement by weight in mixture in accordance with North Carolina Department of Transportation standards.

2.3 SOURCE QUALITY CONTROL AND TESTS

A. Submit proposed mix design of each class of mix for review prior to beginning of work.

B. Test samples in accordance with TAI MS-2.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify base conditions satisfactory.

B. Verify that compacted granular base is dry and ready to support paving and imposed loads.

C. Verify gradients and elevations of base are correct.

3.2 SUBBASE

A. Section 02231 – Aggregate Base Course forms the base construction for work of this section.

3.3 PREPARATION – PRIMER

A. Apply primer in accordance with North Carolina Department of Transportation standards

3.4 PREPARATION – TACK COAT

A. Apply tack coat in accordance with North Carolina Department of Transportation standards

3.5 PLACING ASPHALT PAVEMENT – SINGLE COURSE

A. Install work in accordance with North Carolina Department of Transportation standards

B. Place asphalt within 24 hours of applying primer or tack coat.

C. Place asphalt to thickness shown on approved design plans.

D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.6 SEAL COAT

A. Apply seal coat to surface course in accordance with North Carolina Department of Transportation standards.

3.7 TOLERANCES

A. Flatness: Maximum variation of ¼ inch measured with 10 foot straight edge.

B. Schedule Compacted Thickness: Within ¼ inch.

C. Variation from True Elevation: Within ½ inch.

3.8 FIELD QUALITY CONTROL

A. Take samples and perform tests in accordance with TAI MS-2.

3.9 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 02667

SITE WATER LINES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, fittings, and thrust restraint for site water lines.

B. Valves, blowoffs, and fire hydrants.

C. Pressure and leakage tests.

1.2 RELATED SECTIONS

A. Section 02207 – Aggregate Materials.

B. Section 02222 – Excavating.

C. Section 02223 – Backfilling.

D. Section 02225 – Trenching.

E. Section 02675 – Disinfection of Water Distribution Systems.

1.3 REFERENCES

A. ASTM D1557 – Test methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using a 10-lb. Rammer and an 18-in. Drop.

B. ASTM D2241 – Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).

C. ASTM D2855 – Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

D. ASTM D3017 – Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

E. ASTM D3035 – Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.

F. AWWA C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fillings for Water.

G. AWWA C105 – Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.

H. AWWA C111 – Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.

I. AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

J. AWWA C500 – Gate Valves, 3 inch through 48 inch NPS, for Water and Sewage Systems.

K. AWWA C502 – Dry Barrel Fire Hydrants.

L. AWWA C504 – Rubber Seated Butterfly Valves.

M. AWWA C508 – Swing-Check valves for Waterworks Service, 2 inch through 24 inch NPS.

N. AWWA C509 – Resilient Seated Gate Valves 3 inch through 12 inch NPS, for Water and Sewage Systems.

O. AWWA C600 – Installation of Ductile-Iron Water Mains and Appurtenances.

P. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.

Q. AWWA C606 – Grooved and Shouldered Type Joints.

R. AWWA C900 – Standard for Polyvinyl Chloride (PVC) Pressure Pip, 4 inch through 12 inch, for Water.

S. AWWA C901 – Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, ½ inch through 3 inch, for Water.

T. UL 246 – Hydrants for Fire – Protection Service.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with Owner's requirements.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.5 DELIVERY, STORAGE, AND HANDLING

A. The unloading and loading of pipe, fittings, valves and related accessories shall be performed with care so as to avoid any damage to these materials. All such materials should not be stored directly on the ground, but shall be on pallets, or other suitable supports, so as to prevent the entry of mud and debris into the pipe or other materials. Contractors shall also endeavor to store these materials in accordance with any special practices as may be recommended by the manufacturer.

B. Deliver and store values in shipping containers with labeling in place.

PART 2 PRODUCTS

2.1 WATER PIPE

A. Ductile Iron Pipe (4-inches and larger):

All ductile iron pipe shall conform to the requirements of AWWA Standard C-151 and ASTM A-746 with thickness design conforming to the procedures outlined in AWWA C-150. Unless otherwise shown on the construction plans, all ductile iron pipe shall be furnished with push-on joints in accordance with AWWA C-111 and a cement mortar lining of standard or double thickness in accordance with AWWA C-104, NSF/ANSI 61. The minimum cement mortar lining thickness shall be:

Standard Thickness Cement Mortar Lining	
Pipe and Fitting Diameter Inches	Thickness of Lining (Min.) Inches
3-12	1/16
16-24	3/32
30-64	1/8

B. PVC Pipe

All PVC pipe shall be integral bell, iron pipe O.D., 20-foot length, with an elastomeric gasketed compression joint PVC pipe shall be as furnished by Jones-Manville, Clow, Robin-Tech, or equal as may be approved the Owner's Representative. PVC pipe shall bearthe National Sanitation Foundation (NSF) potable water logo.

1. PVC Pipe (4-inches and larger):

   Unless amended on the Construction Drawings or elsewhere in these specifications, all water main pipe 4-inches and larger shall conform to AWWA C-900. The pipe shall be minimum Pressure Class 200 with a SDR of 18 or less.

2. PVC Pipe (Less than 4-inches):

   Unless amended on the Construction Drawings or elsewhere in these specifications, all water main pipe less than 4-inches shall be in accordance with ASTM D-2241.The pipe shall be minimum Pressure Class 200 with a SDR of 21 or less.

2.2 HYDRANTS

Fire hydrants shall be of the compression type meeting AWWA Standard C502, designed for a minimum working pressure of 150 psi and a hydrostatic pressure of 300 psi with the valve in both the open and closed positions.

All hydrants shall be equipped with two 2 ½-inch nozzles and one 4 ½-inch pumper nozzle.

Each nozzle shall be bronze with cast iron caps secured thereto with a suitable steel chain. Nozzles shall have National Standard threads.

The hydrants shall be open-left and equipped with a pentagon-type operating not (National Standard) measuring 1-½ inches from point to flat. Hydrants shall be of the "dry top" type with the upper rod threads completely enclosed in a sealed grease or oil chamber, equipped with "O" ring seals and Teflon thrust bearing.

The hydrant valve opening shall be of sufficient size to insure such flows and corresponding minimum losses as set for by the American Water Works Association. The valve opening shall be 5 ¼ - inches.

The hydrants shall have a six inch shoe or boot, mechanical joint. Hydrants shall have a bronze-to-bronze threads provided between the hydrant seat or seat ring and the seat attaching assembly. The hydrant shall be of the safety type so that, if the upper barrel is broken off, the hydrant valve will remain closed and reasonably tight. All hydrants shall be finished with barrel and stem extensions as required by the final field location to provide a nominal minimum bury of three feet, six inches (3'-6"), or greater if indicated on the drawings.

Hydrants shall be the following:

Mueller, Super centurion 200, CAT. # A-423, 5 ¼" Main Valve Opening, 6" J.J. Inlet Connection, 3 ½ ft. Bury, 2 ½" Hose Nozzles, 1-4 ½" Pumper Nozzle, National Standard Nozzle Threads, National Standard Operating Nut, Open Left, Color Yellow.

Clow, Medallion, F-2545, 5 ¼" Main Valve Opening, 6" M.J. Inlet Connection, 3 ½ ft. Bury, 2-2 ½" Hose Nozzles, 1-4 ½" Pumper Nozzle, National Standard Nozzle Threads, National Standard Operating Nut, Open Left, Color Yellow.

American Darling, B-84-B, 5 ¼" Main Valve Opening, 6" M.J. Inlet Connection, 3 ½ ft. Bury, 2-2 ½" Hose Nozzles, 1-4 ½" Pumper Nozzle, National Standard Nozzle Threads, National Standard Operating Nut, Open Left, Color Yellow.

2.3 GATE VALVES

All gate valves shall have a cast iron body, fully bronze mounted, double disk, parallel seat valves with mechanical joint hubs.

Gate valves shall, open counterclockwise (left), shall be a non-rising stem type with 2-inch square operating nut and shall be AWWA C-500 standard design for 200 psi working pressure for 12” and smaller.

Gate valves for 14-inch or larger diameter pipes shall be bevel geared with gear case and indicator, grease packed, and shall include a 3-inch by-pass and valve (unless AWWA specifies a larger bypass for the size valve), for horizontal installation. As per AWWA spec., all such valves shall include rollers, scrapers, and tracks, and shall be AWWA C-500 standard design for 150 psi for all 14” and larger; unless specified otherwise in the Special Provisions or Proposal.

Gate valves shall be those manufactured by M & H Valve and Fittings Company, American-Darling (American Flow Control) Valve and Manufacturing Company, Kennedy & Clow or an approved equal, all valves shall be AWWA Standard. 2" gate valves may also include Grinnell Fig. 3050 Bronze and Hammond No. IB646 (threaded; hand wheel operator required). All resilient seated gate valves shall comply with AWWA C-509 latest revision.

2.5 BALL VALVES UP TO 2 INCHES

Brass body, Teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, IPS inlet end, IPS outlet, with control rod, extension body and valve key .

2.6 SWING CHECK VALVES – FROM 2 INCHES TO 24 INCHES

AWWA C508, iron body, bronze trim, 45-degree swing disc, renewable disc and seat, flanged ends.

2.7 BUTTERFLY VALVES – FROM 2 INCHES TO 24 INCHES

AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, infinite position lever handle.

2.8 TAPPING VALVE

All tapping valves shall conform to the Standard Specification for gate valves as noted above, except that the inlet end shall be flanged, faced, and drilled per ANSI B16.1 for 125 lb. Standard. The outlet end shall be of the mechanical joint type capable of receiving a standard tapping machine.

2.9 BEDDING AND COVER MATERIALS

A. Bedding:

The barrel of the pipe shall bear uniformly upon the supporting trench bottom at all times. Bedding type will be specified on the Detail Drawings and in accordance with Section 02222 Excavating.

B. Cover:

All water mains shall be backfilled in accordance with the Standard Details and Section 02223 Backfilling as applicable.

2.10 ACCESSORIES

A. Concrete for Thrust Restraints: Utilize 3000 psi batched concrete approved the Engineer. As an alternate, the concrete may be job mixed, subject to approval by the Engineer.

B. Backflow Preventer: See Water Line Details in Plans.

C. Meter: See Water Line Details in Plans.

D. Manhole and Cover: Refer to Section 025607 and Water Line Details in Plans.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that all existing utilities are as specified on Plans. Contractor to verify location of all utilities prior to construction. Any damaged existing utilities will be the responsibility of the contractor to repair.

3.2 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.

B. Remove scale and dirt on inside and outside of pipe before assembly.

C. Prepare pip connections to equipment with flanges or unions.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 02225 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Provide thrust restraint bearing as indicated on Water Line Details in Plans. Install restrain joint pipe or form and place concrete for pipe thrust restraints at any

change of pipe direction. Place concrete to permit full access to pipe and pipe accessories.

C. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth; compact to 95 percent.

D. Backfill around sides and to top of pipe with cover fill, temp in place and compact to 95 percent.

E. Maintain optimum moisture content or bedding material to attain required compaction density.

3.4 INSTALLATION – PIPE

A. Parallel Installation – Water mains shall be laid at least 10 feet horizontally from any sanitary sewer, storm sewer, or sewer manhole, whenever possible; the distance shall be measured from the outside diameters of the pipes. If conditions prevent a 10-foot lateral separation either: (a) the water main can be laid in a separate trench, with the elevation of the bottom of the water main at least 18 inches above the top of the sewer or (b) the water main is laid in the same trench as the sewer with the water main located at one side on a bench of undisturbed earth, and with the elevation of the bottom of the water main at least 18 inches above the top of the sewer.

B. Crossings – Sewers crossing water mains shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints.

C. Sewer manholes – No water pipe shall pass through or come into contact with any part of a sewer or sewer manhole.

D. Install ductile iron piping and fittings to AWWA C600. Care should be used not to exceed the maximum joint deflection in accordance with manufacturer's requirements.

E. Install AWWA C900 pipe in accordance with AWWA C605. The maximum horizontal deflection for PVC pipe shall be in accordance with the manufacturer's recommendations.

F. Open ends of the pipe shall be plugged at all times that pipe laying is not in progress.

G. Water main trenches shall be excavated to such depth that the pipe will have a minimum cover of three feet. Where water mains are installed in new subdivision streets, the depth of cover shall be measured from the finished subgrade. If three feet of cover cannot be maintained, ductile iron pipe must be used. A minimum of 30 inches is required over Ductile Iron Pipe.

H. Trench width shall be a minimum of 16 inches plus the outside diameter of the pip and a maximum of 24 inches plus the outside diameter of the pipe, unless the Owner's Representative grants approval for deviation from this requirement.

I. Where water main trench excavation is in rock, the rock shall be excavated to a minimum depth of 6 inches below the bottom of the pipe. This space shall be filled with No. 67 stone or other material approved by the Owner's Representative.

J. In trenches where water is present or where dewatering is required, the trench bottom shall be stabilized with No. 67 stone. When material of poor supporting value (i.e. "muck") is encountered in the trench, it shall be removed and replaced with No. 67 stone or other material approved by Owner's Representative.

K. All water main trenched shall be protected from the entrance of surface water. Any water observed in the trench shall be promptly removed by pumping, provided that water pumped from trenches is directed to suitable erosion control devices to prevent disposition of sediment into nearby streams, ponds, etc. The Contractor shall use all means necessary to prevent the entrance of water, including the construction of temporary berms or dikes.

L. All water main pipes shall be clean before installation. Any dirty pipe shall be thoroughly swabbed by the Contractor. Pipe showing evidence of oil or grease contamination shall not be used.

M. Install pipe to allow for expansion and contraction without stressing pipe or joints

N. Install access fittings to permit disinfection of water system performed under Section 02675.

O. Slope water pipe and position drains at low points.

P. All PVC pipe shall be installed with a metallic detector wire in accordance with the Standard Detail.

Q. Backfill trench in accordance with Section 02225.

R. In backfilling PVC water mains, care shall be taken to ensure that the material in the "haunching" zone (up to the spring-line of the pipe) is carefully placed and compacted so that the pipe is properly supported in accordance with the pipe manufacturer's recommendations.

S. Should any water line trench exhibit settlement, the Contractor shall correct the deficiency to the complete satisfaction of the Owner.

T. Where a water line crosses existing NCDOT roads or other publicly maintained roads, the backfill shall be compacted to at least 95% standard density as measured by AASHTO Method T-99. Where deemed necessary, the Owner may require compaction tests to be performed (at the Contractor's expense) on backfill placed in trenches across such roads.

3.5 INSTALLATION – VALVES AND HYDRANTS

A. Valves shall be set at locations shown on the plans with care being taken to support the valve properly and to accurately position the valve box over the operating nut of the valve.

B. All valves used on PVC pipe shall be set on a solid concrete block. The blocks shall be 4-inch thick; width shall be the nominal pipe size, plus 4 inches. Length shall be the length of the valve, plus 4 inches. Minimum block size shall be 8" x 16" x 4".

C. Where pavement exists, the box shall be adjusted to finished street grade.

D. When valves are located in street right-of-way, but out of pavement, the boxes shall be adjusted to finish grade and a concrete collar 2 feet square and 6 inches thick shall be poured around the box ½ inch from the top of the casting. In lieu of the poured in place concrete, a pre-cast concrete collar may be used such as manufactured by Brooks, Inc. or Buckhorn Products or Owner approved equal.

E. When valves are located outside of street right-of-way, the boxes shall be adjusted 6 inches above the finished grade, and a concrete collar 2 feet square and 6 inches thick shall be poured around the casting.

F. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.

G. Set hydrants to grade, with nozzle height as indicated on Standard Details.

H. Locate control valve 4 inches away from hydrant.

I. Paint hydrants in accordance with Owner's requirements.

3.6 INSTALLATION – FITTINGS

A. Fittings shall be installed at the location indicated on the drawings with care taken to insure that joints are fully homed and that the fittings are fully and properly supports.

3.7 INSTALLATION – REACTION BLOCKING

A. All bends, tees and plugs shall be blocked with 3,000 psi concrete to undisturbed ground to the dimensions shown on the plans. The concrete shall be cured for 24 hours before backfilling.

B. If the existing ground is soft, the Owner may require restrained joint fittings.

C. Restrained joint fittings will be required on all 16 inch ductile iron pipe and larger.

3.8 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 02675

3.9 SERVICE CONNECTIONS

A. Provide water service as indicated.

3.10 PRESSURE AND LEAKAGE TESTS

A. No valve in the existing system shall be operated without giving a minimum of 4 hours notice to the owner.

B. After the pipe has been laid and back filled or partially backfilled, each valved section of pipeline shall be subjected to hydrostatic and leakage tests in accordance with the applicable requirements of AWWA C600 for ductile-iron pipe and AWWA C605 for PVC pipe.

C. Before applying the test, all air shall be expelled from the pipe. Each valved section of the pipe shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. The Owner's Representative shall witness all tests.

D. Test pressure for the pipeline shall be 200 psi as measured at the lowest elevation, if the material used is ductile iron pipe. For pipelines constructed of PVC pipe or a mixture of PVC pipe and ductile iron pipe, the test pressure for the pipelines shall be 160 psi. in neither case shall the test pressure be less than 1.5 times the working pressure within the system. Test pressures shall be applied for a minimum duration of 2 hours.

E. The pressure gauge used in the hydrostatic test shall be calibrated in increments of 10 psi or less.

F. At the end of the test period, the leakage shall be measured with an accurate water meter.

G. The formula to be used for calculating the maximum allowable leakage per hour for ductile iron or pvc shall be:

$$W = [L*D(P)^{0.5}]/148{,}000$$

W = allowable leakage (gallons per hour)
L = length of pipeline tested (ft)
D = nominal pipe diameter (in)
P = average test pressure (psi)

H. No pipe installation shall be accepted if leakage is greater than that determined for mechanical and push-on joint pipe AWWA C600, Section 4.1.6. Defective pipe, joints, fittings, valves, accessories, or workmanship shall be removed or corrected. Tests shall be repeated until satisfactory to the Engineer.

3.11 FIELD QUALITY CONTROL

A. If tests indicate work does not meet specified requirements, remove, replace, and retest.

3.12 FINAL CLEANUP

A. After completion of the installation the contractor shall remove all refuse and debris from the site. The site will be cleaned to the satisfaction of the Owner. The Contractor shall remove all surplus materials, tools, vehicles, equipment, and temporary structures from the site.

B. Site will be landscaped and seeded to Owner's satisfaction prior to final site approval.

END OF SECTION

SECTION 02675

DISINFECTION OF WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Disinfection of potable water distribution system.

1.2 RELATED SECTIONS

A. Section 02667 – Site Water Lines.

1.3 REFERENCES

A. AWWA B300 – Hypochlorites.
B. AWWA B301 – Liquid Chloride.
C. AWWA B302 – Ammonium Sulfate.
D. AWWA B303 – Sodium Chlorite.
E. AWWA C651 – Disinfecting Water Mains.

1.4 SUBMITTALS FOR INFORMATION

A. Test Reports: Indicate results comparative to specified requirements.
B. Certificate: Certify that cleanliness of water distribution system meets or exceeds specific requirements.

1.5 PROJECT RECORD DOCUMENTS

A. Disinfection report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.
   4. Initial and 24 hour disinfectant residuals (quality in treated water) in ppm for each outlet tested.
   5. Date and time of flushing started and completion.
   6. Disinfectant residual after flushing in ppm for each outlet tested.
B. Bacteriological report:
   1. Date issued, project name, and testing laboratory name, address, and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
   6. Coliform bacteria test results for each outlet tested.
   7. Certification that water conforms, or fails to conform, to bacterial standards of NCDENR.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA C651.

B. Testing Firm: Company specializing in testing potable water systems, certified by the State of North Carolina.

C. Submit bacteriologist's signature and authority associated with testing.

1.7 REGULATORY REQUIREMENTS

A. Before being placed in service and after the hydrostatic tests are completed, all pipe and fittings shall be sterilized.

B. Conform to applicable code or regulation for performing the work of this Section.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of water system.

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite, AWWA B301 and Liquid Chlorine, AWWA B302.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that piping system has been thoroughly flushed, inspected, and pressure tested. Each valved section of newly laid pipe shall be flushed independently.

B. Preliminary Flushing: Prior to chlorination the main shall be filled to eliminate air pockets and flushed to remove particulates. The minimum flushing velocity in the main shall be 3.0 feet per second unless the Design Engineer determines that conditions do not permit the required flow to be discharged to waste. The following table gives approximate velocities in gallons per minute to maintain 3.0 ft/s.

Pipe Diameter (in.)	Flow Required In gpm (approx.)
4	100
6	200
8	400
10	600
12	900
16	1600

Note that flushing is not a substitute for maintaining pipe interior cleanliness during construction. Every effort will be made to ensure contaminates do not entire the pipe.

C. Perform scheduling and disinfecting activity with start-up, testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 EXECUTION

A. Disinfection of all new mains shall be conducted in accordance with AWWA C651-86 Section 5.2 before being placed into service.

B. Chlorination must take place under the supervision of a Owner's Representative.

C. The Contractor performing the chlorination of the main shall be responsible for any health or environmental damage that might occur as a result of his operations.

D. Add Chlorine bleach until a chlorine concentration of 50 ppm is achieved.

E. Introduce treatment into piping system. The rate of chlorine gas-water mixture flow shall be in such proportion to the rate of water flowing through the pipe that the treated water entering the newly laid pipe shall have a concentration of residual chlorine of at least 50 milligrams per liter (or ppm).

F. Solution shall be circulated in the main by opening the control valve and systematically manipulating hydrants and tops at the line extremities.

G. Samples will be required at various locations using appropriate chlorine test kits to ensure the required dosage of 50 mg/l (or ppm) is obtained.

H. Maintain disinfectant in system for no less than 24 hours, but longer than 24 hours if so directed by the Owner's Representative.

I. At the end of the 24-hour period, the treated water in all portions of the main must have a residual of not less than 10 ppm free chlorine or the Owner will require that the lines be rechlorinated.

J. The highly chlorinated water should remain in the line until the residual chlorine drops below 10 ppm, or a minimum of 96 hours, whichever is first. After this period the remaining water will be wasted by pumping it into the air to dissipate the residual chlorine. Pumping shall not exceed 25 gpm. Pressure and nozzle size shall be such as to produce an 8 foot vertical spray. In lieu of spraying, if the line is located near a sewer manhole, chlorinated water maybe pumped into it.

K. The lines should be flushed with potable water until only normal chlorine levels are obtained. Chlorine levels must be below 10 ppm and the Owner's Representative must approve it.

L. Within 24 hours after flushing is complete, the Contractor shall collect samples for bacteriological analysis under direct observation of the Owner's Representative. Sampling shall be taken every 5,000 feet of line and include all dead-end lines. At each site, a minimum of two satisfactory bacteriological samples taken at least 24 hours apart shall be obtained. Also at each site, minimum chlorine residual at time of sampling must be measured and reported. If the membrane filter method of coliform analysis is used, non-coliform growth must also be reported. Contractor is responsible for the delivery of the sample to the Owner's Representative or a testing laboratory certified by the North Carolina Departemnt of Heatlerh and Human Services, Division of Public Health, State Laboratory of Public Health, Environmental Sciences Branch. The Contractor shall furnish the Engineer with a copy of the results.

M. In the event that three successive bacteriological test fail, that section of the main shall be rechlorinated by the Contractor and new tests performed prior to moving to the next section of the main.

N. Replace permanent system devices removed for disinfection.

O. Pressure test system to 150 psi. Repair leaks and retest.

3.3 FIELD QUALITY CONTROL

A. Test samples in accordance with AWWA C651.

END OF SECTION

SECTION 02923

LANDSCAPE GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Final grade topsoil for landscaping.

1.2 RELATED SECTIONS

A. Section 02205 – Soil Materials.

B. Section 02211 – Rough Grading.

C. Section 02223 – Backfilling.

D. Section 02225 – Trenching.

E. Section 02936 – Seeding.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: fill Type S3, S4, or S5 as specified in Section 02205.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify building and trench backfilling have been inspected.

B. Verify substrate base has been contoured and compacted.

3.2 SUBSTRATE PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches, stones, in excess of 1 inch in size. Remove subsoil contaminated with petroleum products.

C. Scarify surface to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.3 PLACING TOPSOIL

A. Place topsoil in areas where seeding is required. Place topsoil during dry weather.

B. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.

C. Remove roots, weeds, rocks, and foreign material while spreading.

D. Manually spread topsoil close to plant life, buildings and other structures to prevent damage.
E. Lightly compact placed topsoil.
F. Remove surplus subsoil and topsoil from site.
G. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.4 TOLERANCES

A. Top of Topsoil: Plus or minus 12 inch.

3.5 PROTECTION

A. Protect landscaping and other features remaining as final work.
B. Protect existing structures, fences, sidewalks, utilities, paving, and curbs.

END OF SECTION

SECTION 02936

SEEDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Seeding, Hydroseeding, mulching and fertilizer.

D. Maintenance.

1.2 RELATED SECTIONS

A. Section 02205 – Soil Materials: Topsoil Material.

B. Section 02223 – Backfilling: Rough grading of site.

C. Section 02225 – Trenching: Rough grading over cut.

1.3 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Grassed Areas:

1. Basis of Measurement: By the acre.
2. Basis of Payment: Includes preparation of topsoil, and seeding, and maintenance until full growth achieved.

1.4 REFERENCES

A. FS O-F-241 – Fertilizers, Mixed, Commercial

1.5 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quick grass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambs quarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.6 MAINTENACE DATA

A. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height, types, application frequency, and recommended coverage of fertilizer.

1.7 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.8 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

B. Deliver fertilized waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.10 COORDINATION

A. Coordinate with installation of underground sprinkler system piping and watering heads.

1.11 MAINTENANCE SERVICE

A. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition cuttings.

PART 2 PRODUCTS

2.1 SEED REQUIREMENTS

A. Tall Fescue: 200 lbs/acre.

B. Kentucky Blue Grass: 20 lbs/acre.

C. Rye: 40 lbs/acre.

2.2 SOIL MATERIALS

A. Topsoil: Excavated from site and free of weeds.

2.3 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable. Use 400 lbs/acre.

B. Fertilizer: Recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil. Use 1200 lbs/acre.

C. Lime: Use 4000 lbs/acre.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.2 PREPARATION OF SUBSOIL

A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Removed contaminated sub-soil.

C. Scarify surface to depth of 3 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.3 PLACING TOPSOIL

A. Spread topsoil to a minimum depth of 8 inches over area to be seeded. Rake until smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

E. Install edging at periphery of seeded areas in straight lines to consistent depth.

3.4 FERTILIZING

A. Apply fertilizer at a rate of 4000 lbs/acre.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at the same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.5 SEEDING

A. Apply seed, at the rates identified in Part 2.2 of this section, in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Do nto sow immediately following rain, when ground is too dry, or during windy periods.

D. Roll seeded area with roller not exceeding 112 lbs.

E. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.

F. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.6 HYDROSEEDING

A. Apply seeded shurry with a hydraulic seeder at a rate to be approved by Engineer evenly in two intersecting directions.

B. Immediately following seeding, apply multch to a thickness of 1/8 inches. Maintain clear shrubs and trees.

C. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.7 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery. Set string height to 6 inches.

B. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

C. Lay fabric smoothly on surface, bury on top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls.

D. Secure outside edges and overlaps at 36 inch intervals with stakes.

E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

F. At sides of ditches, lay fabric labs in direction of water flow. Lap ends and edges minimum 6 inches.

3.8 MAINTENANCE

A. Mow grass at regular intervals to maintain a maximum height of 2 ½ inches. Do not cut more than 1/3 of grass blade at any one moving.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after moving and trimming.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds. Apply herbicides in accordance with manufacturer’s instruction. Remedy damage resulting from improper use of herbicides.

G. Immediately reseed areas which show bare spots.

H. Protect sealed areas with warning signed during maintenance period.

END OF SECTION