02200 – EARTHWORK

(Last revised 6/22/10)

SELECTED LINKS TO SECTIONS WITHIN THIS SPECIFICATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Requirements and Supplementary Conditions applicable to this specification.

B. Section 02275 – TRENCHING, BACKFILLING, AND COMPACTION OF UTILITIES

C. Section 02510 – WATER DISTRIBUTION

D. Section 02530 – SANITARY SEWER

E. Section 02920 - SEEDING, SODDING, AND GROUNDCOVER

F. NCDENR Division of Land Resources, Land Quality Section's "Erosion and Sedimentation Control Planning and Design Manual"

1.2 SUMMARY

A. This section includes:

1) Site clearing and grubbing.

2) Stripping and stockpiling topsoil.

3) Excavation and embankment placement.

4) Preparing subgrade for pavements, walks, curb & gutter, and turfed areas.

B. Construction and materials related to this section but covered elsewhere:

1) Erosion Control: North Carolina Sediment Control Law.

1.3 DEFINITIONS

For the purposes of this specification, the following definitions refer to earthwork that comes under the authority of the Town of Clayton as specified within this division and other divisions of this manual.

A. **Borrow**: Borrow shall consist of approved fill material (approved by Geotechnical Engineer) imported from off-site.

B. **Clearing**: Clearing shall consist in the felling, cutting up, and satisfactory disposal of trees and other vegetation designated for removal in accordance with these specifications.

C. **Competent Person**: Competent Person means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

D. **Fill (in terms of volume)**: In terms of volume, fill is defined as a compacted post-construction volume in-place.

E. **Grubbing**: Grubbing shall consist of the removal of roots 1 ½ inch and larger, organic matter, debris and stumps and the disposal thereof.

F. **Classified Excavation (undercut)**: Classified excavation shall consist of the removal and satisfactory disposal of all unsuitable material located below subgrade elevation. Where excavation to the finished grade section results in a subgrade or slopes of muck, peat, matted roots, etc., the Contractor shall remove such material below the grade shown on the plans or as directed; and areas so excavated shall be backfilled with approved select fill or stone as ordered by the Town Engineer. See also paragraph M, Unclassified Excavation.

G. **Rock in Open Excavation**: All boulder, solid ledges, bedded deposits, unstratified masses, and conglomerations of material so firmly cemented as to possess the characteristics of solid rock. Rock in open excavations includes removal and disposal on-site of materials and obstructions encountered in general excavation other than trenches and pits that cannot be dislodged and excavated with modern, track-mounted, heavy-duty excavating equipment without drilling, blasting, or ripping. Rock is defined as material which cannot be effectively excavated during general grading with a D-8 or equivalent dozer drawing a new single-tooth ripper. Effective excavation is defined as the ability to remove 10 cubic yards or more of material after one hour of continuous ripping. Typical of materials classified as Rock in Open Excavation are boulders larger than 1-1/2 cubic yards or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.

H. **Rock Excavation for Trenches and Pits**: Rock excavation for trenches and pits includes removal and disposal off-site of materials and obstructions encountered that cannot be practically excavated with a track-mounted power excavator, equivalent to a Caterpillar Model No. 325 or equivalent equipped with a new rock teeth. Practical excavation is defined as the ability to remove at least 30 cubic yards during one hour of continuous digging. Trenches in excess of 10 feet in width and pits in excess of 30 feet in either length or width are classified as open excavation.

I. **Select Fill Material**: Nonplastic material, free of organic material, used as foundation for subbase, shoulder surfacing, fill, backfill, or other specific purposes.

J. **Structures**: Incidental buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

K. **Subgrade**: Surface or elevation remaining after completing the excavation, or top surface of a fill or backfill immediately below pavement structure, concrete or topsoil materials, as applicable.

L. **Topsoil**: See Section 02920 – *Seeding, Sodding, and Groundcover*.

M. **Unclassified Excavation**: Removal and disposal of any and all material above subgrade elevation or within the 12 inches of existing natural grade, whichever is greater, except solid rock and undercut excavation, located within the limits of construction.

1.4 SUBMITTALS

A. Submit product data and a sample of separation fabric and fully document each with specific location or stationing information, date and other pertinent information.

B. **Material Test Reports**: Provide from a qualified testing agency test results and interpretation for compliance of the following requirements indicated:

1) Classification according ASTM D2487 of each on-site or borrow soil proposed for backfill, unless otherwise directed by the Town Engineer.

2) Laboratory compaction curve according to ASTM D698 for each on-site or borrow soil material proposed for fill or backfill.

3) Laboratory compaction curve according to ASTM D1557 for each on-site borrow soil material proposed for fill and backfill.

C. **Blasting**:

1) Insurance Certificate naming the Town of Clayton as "Additional Insured." See paragraph 3.4 – Rock for other blasting insurance requirements.

2) Qualifications, proposed procedures, and schedule shall be submitted at least 2 weeks prior to commencing any blasting operations.

3) Permits from Town and local Fire Department and Town officials.

4) Blasters shall, at all times, have their license and blasting permits on the job site, and shall allow examination of same by any official that may have jurisdiction.

5) If required by the Town Engineer, seismic survey agency report, for record purposes.

D. **Product Data**:

1) Stabilization/Separation fabric

1.5 QUALITY ASSURANCE

A. **Geotechnical Testing Agency Qualifications**: An independent testing agency qualified according to ASTM E329 to conduct soil materials and rock-definition testing as documented according to ASTM D3740 and ASTM E548. Testing Lab to be AMRL (AASHTO Materials Reference Laboratory) and CCRL (Cement and Concrete Reference Laboratory) certified.

B. Comply with all codes, laws, ordinances, and regulations of governmental authorities having jurisdiction over this part of the work.

C. The Contractor shall comply with North Carolina Department of Environment and Natural Resources, "Erosion and Sedimentation Control Handbook," latest revision.

D. Comply with applicable requirements of NFPA 495, *"Explosive Materials Code."*

E. Materials and operations shall comply with the latest revision of the Codes and Standards listed below:

American Society for Testing and Materials

ASTM C33	Concrete Aggregates
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates Sieve Analysis of Fine and Coarse Aggregate
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils (for classification purposes only)
ASTM D698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (Standard Proctor).
ASTM D1556	Standard Method of Test for Density of Soil in Place by the Sand-Cone Method
ASTM D1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (Modified Proctor)
ASTM D1883	Standard Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils
ASTM D2049	Standard Method of Test for Relative Density of Cohesionless Soils
ASTM D2167	Standard Method of Test for Density of Soil in Place by the Rubber-Balloon Method
ASTM D2487	Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

ASTM D2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

ASTM D2937 Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method

ASTM D3740 Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

ASTM D4253 Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

ASTM D4254 Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

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

ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection and/or Testing

ASTM E548 Standard Guide for General Criteria Used for Evaluating Laboratory Competence

American Association of State Highway & Transportation Officials

AASHTO T99 The Moisture-Density Relations of Soils using a 5.5-pound Rammer and a 12-inch drop.

AASHTO M145 The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.

AASHTO T180 The Moisture Density Relations of Soils using a 10-pound Rammer and an 18-inch drop.

AASHTO T191 Density of Soil In-Place by the Sand-Cone Method

AASHTO T204 Density of Soil In-Place by the Drive Cylinder Method

AASHTO T205 Density of Soil In-Place by the Rubber-Balloon Method

1.6 STANDARD ABBREVIATIONS

AASHTO American Association of State Highway & Transportation Officials

ANSI American National Standards Institute

AREA American Railway Engineers Association

ASTM American Society for Testing and Materials

DWQ	Division of Water Quality
EPA	Environmental Protection Agency
MSDS	Material Safety Data Sheets
MUTCD	Manual on Uniform Traffic Control Devices
NCDENR	NC Department of Environment and Natural Resources
NCDOT	North Carolina Department of Transportation
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
USCOE	United States Army Corps of Engineers

1.7 TESTING SERVICES

A. The Testing Laboratory shall be approved by the Town Engineer and will be responsible for conducting and interpreting tests. The Testing Laboratory shall state in each report whether or not the test specimens conform to all requirements of the Contract Documents and specifically note any deviation.

B. Specific test and inspection requirements shall be as specified herein.

1.8 PROJECT CONDITIONS

A. **Demolition**: Demolish and completely remove from the site existing utilities, structures or surface features indicated on the plans to be removed. Coordinate with applicable utility companies to shut off services if lines are active.

B. **Environmental** - Wetlands: Before crossing or entering into any jurisdictional wetlands, Contractor shall verify whether or not a wetlands permit has been obtained for the encroachment and whether special restrictions have been imposed. Care shall be taken to prevent draining or otherwise destroying non-permitted wetlands. Restore as stated on either the project drawings, the contract documents, and/or as noted in the permit. All crossings, disturbance, and encroachments into wetlands shall be subject to US COE and NCDENR Division of Water Quality approval and permitting requirements and conditions.

C. **Environmental - Buffer Crossing Requirements**: Before crossing streams or ditches or working within 50 feet of ponds, lakes, or rivers, the Contractor shall verify whether the project is exempt or if a permit has been obtained to encroach into such buffers or other such regulated waters, and to what extent work is permitted to occur. Unless otherwise permitted, shown on the contract drawings, or exempted by NCDENR, roadways crossing stream, river, pond, or lake buffers are to be as near perpendicular as possible (the crossing is considered to be perpendicular if it intersects the stream or surface water between an angle of 75 and 105 degrees). Do not disturb more than 40 linear feet (longitudinal) of riparian buffer without approval from NCDENR. When permitted to encroach into zone one of a buffer (the lower 30 feet beside the

stream or water), adhere to all of the following Best Management Practices during construction.

1) Woody vegetation is cleared by hand. No grading allowed.
2) Stumps to remain except in trench where trees are cut. Minimize disturbance to roots in buffer zone.
3) Backfill trench with the excavated soil immediately following installation.
4) Do not use fertilizer except for the one-time application to reestablish vegetation.
5) Minimize removal of woody vegetation, the amount of disturbed area, and the time the disturbed area remains disturbed.
6) Take measures to ensure diffuse flow of water through the buffer after construction.
7) In wetland areas, use crane mats to minimize soil disturbance.

D. **Safety**

The Contractor shall keep the surface over and along the roadways and other excavation in a safe and satisfactory condition during the progress of the work.

E. **Geotechnical Investigation**

1) Where a Geotechnical report has been provided to the Contractor by the Town of Clayton, the data on sub-surface soil conditions is not intended as a representation or warranty of the continuity of such conditions between borings or indicated sampling locations. It shall be expressly understood that the Town of Clayton will not be responsible for any interpretations or conclusions drawn there from by the Contractor. The data is made available for the convenience of the Contractor.

2) In addition to any report that may be made available to the Contractor, the Contractor is responsible for performing any other soil investigations felt necessary for proper evaluation of the site for the purposes of planning and/or bidding the project, at no additional cost to the Town of Clayton.

F. **Protection of pavement**

Debris from the site shall be removed in such a manner as to prevent spillage. Keep pavement and area adjacent to site clean and free from mud, dirt, dust, and debris at all times.

1.9 SERVICE INTERRUPTION

Contact the Town of Clayton to coordinate interruption of service, operation of valves, line cut-ins, or placement of a tapping sleeve and valve. If interruption is necessary, the interruption shall be arranged to occur at such a time to cause the least disruption and minimize loss of service. At the direction of the Town Engineer, temporary service may be required to be provided. Provide a minimum of 72 hours notice of the proposed utility interruption or necessary operation of valves.

1.10 COORDINATION

A. Coordinate tie-in to municipal water mains with the Town Engineer. Except as needed for fire suppression purposes, the Town of Clayton will be the sole operator of all valves and hydrants on the Town's water distribution system. Adequate notifications to water customers will be given by the Contractor prior to any interruption of service. Service is to be continuously maintained to customers in the project areas except for the minimum amount of time required to make connections with the existing system. Only in the case of an emergency may a valve be closed by a Contractor. Records shall be kept of any valves closed during an emergency and the Town Engineer shall be notified of the specific valves closed at the earliest reasonable time following such valve closure.

   Before shutting off any main, residents are to be notified by the Town of Clayton's representative in writing at least 24 hours in advance of cut off. The Contractor shall provide assistance to the Town in notification distribution. The Town shall be notified at least 48 hours in advance of request for operation of valves and making either a wet tap or cut-in.

B. Coordinate tie-ins to municipal roadway system with the Town of Clayton.

C. At the direction of the Town Engineer, temporary bypass pumping of sewerage flow may be required to be provided. See Section 02530 – Sanitary Sewer for bypass pumping requirements and procedures.

D. When traffic signals, loops, or their appurtenances are likely to be damaged or interfere as a result of the construction, coordinate temporary operation with the applicable agency having jurisdiction of the signals. Provide a minimum of 1 weeks' notice prior to anticipated disturbance or interruption. At the discretion of the Town Engineer, the notice may be required to be published in the newspaper.

E. **Repair of pavement markings**: When cuts are made through any paved surface and the cuts extend through the pavement markings, the replaced pavement shall be marked to match the existing.

F. **Benchmark/Monument Protection**: Protect and maintain benchmarks, monuments or other established reference points and property corners. If disturbed or destroyed, they must be replaced at own expense by a Licensed Professional Surveyor to full satisfaction of Owner/Town of Clayton.

G. **Water Service Shut-off**

   The Town of Clayton requires adherence to the following procedures prior to shutting off water service on any existing Town line:

   1) The Contractor must receive approval for shut-off from the Town Engineer. Generally, shut-offs must occur from 9:00 AM to 11:00 AM and 2:00 PM to 4:00 PM on weekdays.

   2) After receiving approval, Contractor shall notify affected residents in writing 48 hours in advance of beginning operation.

H. Before Digging, contact ***"NC One Call"*** at 811 and the Town of Clayton at 919-553-1530 for location services.

1.11 PUBLIC CONVENIENCE

The contractor shall at all times so conduct his work as to ensure the least possible inconvenience to the general public and the residents in the vicinity of the work. Fire hydrants on or adjacent to the work shall be kept accessible to firefighting equipment at all times. Temporary provisions shall be made by the Contractor to ensure the proper functioning of all gutters, sewer inlets, drainage ditches, and irrigation ditches, which shall not be obstructed except as approved by the Town Engineer.

1.12 TRAFFIC CONTROL

A. When working within any NCDOT System road or highway, conform to the *Manual on Uniform Traffic Control Devices*, latest revision (MUTCD) as well as the NCDOT Standard Specifications for Roads and Structures, latest revision.

B. Traffic Maintenance shall comply with the latest revision of the NCDOT Standard Specifications for Roads and Structures, Division 9 – *Signing* and Division 11 – *Work Zone Traffic Control*, as well as other applicable sections.

C. A traffic control plan shall be submitted to the Town of Clayton Police Department and NCDOT (if applicable) for approval.

D. When traffic signals or their appurtenances are likely to be damaged or interfere as a result of the construction, coordinate temporary operation with the NCDOT or the Town Engineer. Provide 1 weeks' notice prior to anticipated disturbance or interruption.

E. Whenever it becomes necessary to leave a section of trench open after completion of the day's work, the contractor shall provide barricades and lights to protect the public. Operate warning lights during hours from dusk to dawn each day and as otherwise required for inclement weather and visibility.

1.13 EROSION AND SEDIMENTATION CONTROL AND NPDES MONITORING, CONTROLS, AND LIMITATIONS FOR PERMITTED DISCHARGES

The Project Engineer shall submit a sedimentation and erosion control plan to the appropriate authority and obtain all necessary construction permits. The Contractor shall follow all local and state requirements regarding sedimentation and erosion control. Construction methods shall minimize sedimentation and erosion.

It is the Contractor's responsibility to periodically monitor the Stormwater Discharge Outfall points at the specified frequency and maintain reports as outlined in these specifications.

A. **Final Limitations and Controls for Stormwater Discharges**

During the period beginning on the effective date of the permit and lasting until expiration, the Owner (Permittee) is allowed and authorized to discharge stormwater associated with construction activity. Such discharges shall be controlled, limited, and monitored as specified below.

1) The Contractor shall implement the Erosion & Sedimentation Control plan, which has been approved by the approval authority. The approved plan is considered a requirement or condition of the general NPDES permit. Deviation from the approved plan, or approved amendment to the plan, shall constitute a violation of the terms and conditions of this general permit except that deviation from the approved plan will be allowed:

   a. To correct an emergency situation where sediments are being discharged off the site, or

   b. When minor modifications have been made for the purpose of improving the performance of the erosion and sedimentation control measures and notification of the minor modification has been made to the Division of Land Resources (or approved local program).

      Such a deviation from the approved plan shall be noted on the approved plan maintained at the job site. During active construction, a copy of the approved plan shall be maintained on the site.

2) Equipment utilized during the construction activity on a site must be operated and maintained in such a manner as to prevent the potential or actual pollution of the surface or ground waters of the state. Fuels, lubricants, coolants, and hydraulic fluids, or any other petroleum products, shall not be discharged onto the ground or into surface waters. Spent fluids shall be disposed of in a manner so as not to enter the waters, surface, or ground, of the state and in accordance with applicable state and federal disposal regulations. Any spilled fluids shall be cleaned up to the extent practicable and disposed of in a manner so as not to allow their entry into the waters, surface or ground, of the state.

3) Herbicide, pesticide, and fertilizer usage during the construction activity shall be consistent with the Federal Insecticide, Fungicide, and Rodenticide Act and shall be in accordance with label restrictions.

4) All wastes composed of building materials shall be disposed of in accordance with North Carolina General Statutes, Chapter 130A, Article 9 – Solid Waste Management, and rules governing the disposal of solid waste (North Carolina Administrative Code Section 15A NCAC 13B).

5) The Contractor, for the Permittee, shall control the management and disposal of litter and sanitary waste from the site such that no adverse impacts to water quality occur.

B. **Minimum Monitoring and Reporting Requirements**

Minimum monitoring and reporting requirements are as follows unless otherwise approved in writing by the Director of the Division of Water Quality.

1) All erosion and sedimentation control facilities shall be inspected by or under the direction of the permittee (the Owner and his/her Contractor). Inspections shall be made:

   a. At least once every seven calendar days (at least twice every seven days for those facilities discharging to waters of the State listed on the latest EPA approved 303(d) list[1] for construction related indicators of impairment such as turbidity or sedimentation),

   b. And within 24 hours after any storm event of greater than 0.5 inches of rain per 24-hour period.

      A rain gauge shall be maintained on the site by the Contractor and a record of the rainfall amounts and dates shall be kept by the Contractor.

2) Once land disturbance has begun on the site, stormwater runoff discharges shall be inspected by observation for stormwater discharge characteristics as defined below at the frequency stated above to evaluate the effectiveness of the pollution control facilities or practices. If any visible sedimentation is leaving the disturbed limits of the site, corrective action shall be taken immediately to control the discharge of sediments outside the disturbed limits.

Stormwater Discharge Characteristics	Monitoring Type[1]	Monitoring Location[2]
Clarity	By observation	SDO
Floating Solids	By observation	SDO
Suspended Solids	By observation	SDO
Oil Sheen	By observation	SDO
Other obvious indicators of stormwater pollution	By observation	SDO

Footnotes:
[1] Monitoring Type: The monitoring requires a qualitative observation of each stormwater outfall. **No analytical testing or sampling is required**.
[2] Sample (observation) location: **SDO**= **S**tormwater **D**ischarge **O**utfall

3) The operator (Contractor) shall keep a record of inspections and forward copies of these reports to the Town Engineer. Visible sedimentation found outside of the disturbed limits shall be recorded and a brief explanation kept with the records as to the measures taken to control future releases. Any measures taken to clean up the sediment that has left the disturbed limits shall also be recorded. These records shall also be made available to DWQ or an authorized agent upon request. If the Town Engineer discovers sedimentation outside the limits of disturbance,

[1] *The latest approved list may be obtained from the Division of Water Quality, or from the following website location: http://h2o.enr.state.nc.us/su/construction303d.*

the Contractor will be notified in writing and requested to remediate the situation.

4) All records of monitoring shall be turned over to the Town along with the "red lined" record water and/or sewer drawings.

C. **Schedule of Compliance**

1) The Contractor shall comply with Final Limitations and Controls specified for stormwater discharges once disturbance has begun on the site and until completion of construction or development and the establishment of a permanent ground cover.

2) During construction and until the completion of a construction or development and the establishment of a permanent ground cover, the Contractor shall provide the operation and maintenance necessary to operate the stormwater controls at optimum efficiency.

PART 2 – PRODUCTS

2.1 SOIL MATERIALS

General: Provide borrow material when sufficient satisfactory soil material is not available from excavations.

2.1.1 MATERIAL CLASSIFICATION

A. **Excavation**: All excavation material shall be classified as Undercut Excavation, Unclassified Earth Excavation, or Rock.

B. **Off-site Borrow** shall be select fill material approved by the Town Engineer from an off-site borrow source. See section 1.3 of this specification for the definition of select fill material.

Rip Rap and Rip Rap Bedding: Rip Rap and Rip Rap Bedding shall conform to Section 1042 – *Rip Rap Materials* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision for Class A, B, 1 and 2 rip rap.

C. **Structures, Backfill around**: Backfill shall be approved by the Town Engineer and shall be free from large or frozen lumps, wood, or rocks more than 3 inches in their greatest dimension or other extraneous material. Porous backfill shall be #57 or #67 clean stone.

D. **Topsoil**: Topsoil meeting the definition prescribed in section 1.3 obtained either from on-site or an off-site source.

2.1.2 SOIL CLASSIFICATION

A. **Satisfactory Soils**: ASTM D2487 soil classification group (Unified Soil Classification System) GC, SM, SC, ML, CL, CH and MH or a combination of these group symbols. However CH and MH are permitted provided the soils

have a Liquid Limit (LL) of ≤ 60 and a Plasticity Index (PI) of ≤ 30. Soils shall be free of rock or gravel larger than 3 inches in any dimension, debris, organic matter, waste, frozen materials, muck, roots, vegetation, and other deleterious matter.

B. **Unsatisfactory soils**: ASTM D2487 soil classification group (Unified Soil Classification System) CH and MH soils having a LL of > 60 and a PI of > 30, OH, OL, and PT; soils which contain rock or gravel larger than 3 inches in any dimension, debris, organic matter, waste frozen materials, vegetation, and other deleterious matter. Unsatisfactory soils also include satisfactory soils not maintained within +/- 3% of optimum moisture content at time of compaction, unless otherwise approved by the Town Engineer.

2.2 MISCELLANEOUS

2.2.1 GEOTEXTILE FABRIC:

Geotextile fabric shall be protected from mud, dirt, dust, sunlight, and debris during transport and storage. Material shall be inert to commonly encountered chemicals; resistant to mildew, rot, insects, and rodents; and biologically and thermally stable. Geotextile fabric for subsurface installation shall not be exposed to direct sunlight for more than 24 hours before or during installation. All geo-fabric to be used within the right-of-way of a Town street must be approved by the Town Engineer.

A. **Filter Fabric for Rip Rap**: Filter Fabric for Rip Rap and Rip Rap Beddings shall conform to Section 1056 – *Engineering Fabrics* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision for Type 2 engineering fabric.

B. **Soil Stabilization Fabric**: Generally, soil stabilization fabric shall conform to the requirements of Section 1056 – *Engineering Fabrics* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision for Type 4 engineering fabric. However, provide fabric meeting Geotechnical Engineers recommendations for the application and use intended.

C. **Fabric for Subsurface Drains**: Non-woven needle-punched fabric shall conform to Section 1056 – *Engineering Fabrics* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision for Type 1 engineering fabric.

D. **Silt Fence Fabric**: Silt fence fabric shall conform to Section 1056 – *Engineering Fabrics* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision for Type 3 engineering fabric, Class A or B as specified or shown on the plans.

PART 3 – EXECUTION

3.1 GENERAL

3.1.1 GENERAL REQUIREMENTS APPLYING TO ALL AREAS

A. Contractor shall plan construction to minimize disturbance to properties adjacent to the project site and be within the construction limits shown on the plans.

B. The Town Engineer reserves the right to limit the width of land to be disturbed and to designate on the drawings or in the field certain areas or items within this width to be protected from damage.

C. **Access and/or Haul Roads**: Any grading or excavation required for equipment travel during the course of construction as well as erosion control, access or haul road removal, restoration, seeding and ground cover shall be provided by the Contractor.

D. The Contractor shall be responsible for damage to areas or items designated by the Town Engineer to be protected. Repairs to, replacement of, or reparations for areas or items damaged shall be made at the Contractor's expense and to the satisfaction of the Town Engineer before acceptance of the completed project.

E. The Contractor shall protect all existing buildings or structures.

F. Any fences disturbed by the Contractor shall be repaired with new materials to a condition equal to or better than their original condition or to the satisfaction of the Town Engineer at no additional cost.

G. The Contractor shall obtain written permission from property owners for use of any access other than ones located within rights-of-way or easements. Written permission shall contain conditions for use and restoration agreements between the property owner and the Contractor.

H. All areas disturbed shall be restored to a condition equal to or better than their original condition and shall be graded to drain.

I. The Contractor shall replace or repair all damaged or destroyed hedgerows and property corners using the services of a licensed Professional Surveyor.

3.1.2 CONSTRUCTION LIMITS

A. The Contractor shall not disturb any areas outside the limits contained in this section without express written permission from the Town Engineer.

B. Except as indicated on the plans, no "clear cutting" of timber shall be permitted within the construction limits. The Contractor shall make select cutting of trees, taking smallest trees first, that are mandatory for the construction. The decision of the Town Engineer shall be final on the determination of which trees are to be cut.

C. Should it become necessary to move the position of any underground structure, the Contractor may be required to do such work and shall be paid on a force account basis or on an extra work basis as directed by the Town Engineer. Method of payment shall be agreed upon by the Town Engineer and the Contractor prior to commencing work.

D. If existing utilities are found to interfere with the permanent facilities being constructed under this section, immediately notify the Town Engineer and secure

instructions. Do not proceed with permanent relocation of utilities until instructions are received from the Town Engineer.

E. **Specific requirements applying to developed subdivision/lots**

1) Unless directed otherwise by the Town Engineer, all trees, shrubs, hedges, or other ornamental plantings located outside of the construction limits, easements, or public rights-of-way shall be protected by the Contractor. The Town Engineer reserves the right to designate certain trees located within the construction limits for protection where deemed desirable.

2) The Contractor shall protect septic systems or springs located outside the construction limits.

3) Excavated or blasted rock shall be removed from the site unless otherwise ordered by the Town Engineer.

F. **Specific requirements applying to undeveloped areas**

1) In wooded areas, the clearing shall be limited to the easement or right-of-way limits unless indicated otherwise on the Town of Clayton approved construction drawings, in which case, the work shall be confined to the limits defined on the plans. All permanent easements and rights-of-way shall be fully cleared. The Town Engineer reserves the right to designate certain trees located within the construction limits for protection where deemed desirable.

3.1.3 PROTECTION OF EXISTING UTILITIES AND STRUCTURES

A. **Subsurface obstructions**

1) **Subsurface obstructions**: Take necessary precautions to protect existing utilities from damage due to any construction activity. The Contractor shall locate existing utilities, culverts, and structures (above or below ground), before any excavation starts and coordinate work with utility companies. The Contractor shall be responsible for notifying utility companies when working within the vicinity of the existing utilities. Omission from or inclusion of located utility items on plans do not constitute non-existent or definite location. Even though for convenience, the utility may be shown on the plans, the Contractor is responsible for and shall call for utility location a minimum of 48 hours prior to excavations. Contact underground damage protection services NC One Call or current locator service at 800-632-4949 and the Town of Clayton at 919-553-1530. Secure and examine local utility surveyor records for available location data including building service lines.

2) Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to excavation. In excavating, care must be taken not to remove or injure any subsurface structure. All existing gas pipes, water pipes, steam pipes, telephone lines, cable TV lines, electrical conduits, sewers, drains, fire hydrants, and other structures which, in the opinion of the utility company, do not require relocation shall be carefully supported, shored up, the flow

maintained, if applicable, and the line/main protected from damage by the Contractor. If damaged, the Contractor shall give immediate notice to the proper authorities. The utility shall be restored, at the Contractor's expense, by the appropriate utility to original or better condition. Where pipes, conduits, or sewers are removed leaving dead ends in the ground, such ends shall be carefully plugged or bulkheaded by the Contractor at the Contractor's expense. The Contractor shall be responsible for any damage to persons or property caused by such breaks.

3) The Contractor shall be responsible for anticipating and locating underground utilities and obstructions. When construction appears to be in close proximity to existing utilities, test pits shall be made a sufficient distance ahead of the work to verify the exact locations and inverts of the utility to allow for changes in grade or utility relocation.

4) If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.

5) Should it become necessary to move the position of any underground structure, when approved by the Town Engineer, the Contractor may be required to do such work and shall be paid on a force account basis or on an extra work basis.

6) If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Town Engineer and secure his instructions. Do not proceed with permanent relocation of utilities until written instructions are received from the Town Engineer.

B. **Protection of Surface Features**

1) Whenever construction is to take place on or near a paved street, the Contractor shall provide pads or take necessary precautions to protect the pavement from damage by the construction equipment. Pavement damaged by cleated or tracked equipment, or by any other means, shall be repaired by the Contractor at his expense to the satisfaction of the Town Engineer.

2) Where joining existing pavements, the Contractor shall use care to cut the existing pavement in sharp, neat lines. If the existing road to be cut is located within another jurisdiction other than the Town of Clayton or within NCDOT rights of way, the Contractor is responsible for contacting the person or persons responsible for said road about pavement repair/replacement.

3) Avoid overloading or surcharge a sufficient distance back from edge of excavation or fill to prevent sloughing, slides, or caving. Maintain and trim excavated materials in such manner to be as little inconvenience as possible to public and adjoining property.

4) Provide full access to public and private premises, to fire hydrants, at street crossings, sidewalks and other points as designated by the Town Engineer to prevent serious interruption of travel.

5) Protect and maintain benchmarks, monuments, or other established points and reference points and if disturbed or destroyed, items shall be replaced by a Licensed Land Surveyor to full satisfaction of the Town Engineer and the jurisdictional agency.

6) See 1.10 Coordination, paragraph D regarding traffic signal conflicts.

C. **Procedures for repairing damaged utility services**

1) If a located service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Town.

2) **House services**: If a service pipe supplying water or sewer service to an adjoining house is broken, the Contractor shall repair it at once and at his expense. The Town may, at the Contractor's expense, repair any such service without prior notice to the Contractor.

3.1.4 PROTECTION OF PERSONS AND PROPERTY

A. Barricade open holes and depressions occurring as part of the work, and post warning lights on property adjacent to or part of public access.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this or other related sections.

C. **Protection and Restoration of Property:** The Contactor shall not enter upon private property for any purpose without first obtaining written permission. He shall use every precaution necessary to prevent damage or injury to any public or private property, trees, fences, monuments, and underground structures, etc., on and adjacent to the site of the work. He shall protect from disturbance or damage all land monuments and property markers until an authorized agent has witnessed or otherwise referenced their locations, and shall not remove them until directed.

The Contractor shall be responsible for all damage or injury to property of any character resulting from any act, omission, neglect, or misconduct in his manner or method or executing said work, from his nonexecution of work, or from defective work or materials, and he shall not be released from said responsibility until the work shall have been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, he shall restore such property, at his own expense, to a condition equal to or better than that existing before such damage or injury was done, by repairing, rebuilding, or otherwise restoring, and may be directed or he may make good such damage or injury in an acceptable manner.

The Contractor shall, at his own expense, sustain in their places and protect from direct or indirect injury all pipes, poles, conduits, walls, roadways, buildings, and other structures, utilities and property in the vicinity of his work. Such

sustaining and supporting shall be carefully done by the Contractor and as required by the Company or party owning the structures or Agency controlling it. The Contractor shall take all risks attending the presence or proximity of pipes, poles, conduits, walls, thereof and any costs associated will be deducted from any monies due the Contractor. **Failure of the Town Engineer or his/her authorized representative to direct the correction of unsafe conditions or practices shall not relieve the Contractor of his responsibility hereunder**.

3.2 CLEARING AND GRUBBING

A. **Description**: This work shall consist of clearing, grubbing, removing, and disposing of all vegetation and debris within the limits of construction, as designated on the plans or as required by the Town Engineer. The work shall also include the preservation from injury or defacement of all vegetation or objects designated to remain. Clearing shall consist of cutting, removal, and satisfactory disposal of all trees, down timber, brush, rocks, projected roots, stumps, rubbish, laps, and other material within easement.

B. A preconstruction meeting shall be held with appropriate forestry personnel (if applicable) and the Town prior to any clearing, if required. The Town Engineer may require tree protection fencing in sensitive areas, where specifically identified trees are desired to be protected, and when required by the landscape ordinance.

C. The area within the limits of construction or as designated shall be cleared and grubbed of all trees, stumps, roots, brush, undergrowth, hedges, heavy growth of grasses or weeds, debris and rubbish of any nature that, in the opinion of the Town Engineer, is unsuitable for foundation material. Nonperishable items that are not deleterious to the project and will be a minimum of 5 feet below the finish elevation of the earthwork or slope of the embankment may be left in place.

D. The Contractor shall provide barricades, fences, coverings, or other types of protection necessary to prevent damage to existing improvements, not indicated to be removed, and improvements on adjoining property. All improvements damaged by this work shall be restored to their original condition to a condition acceptable to the owner or other parties or authorities having jurisdiction. Trees and shrubs that are to remain within the construction limits will be indicated on the drawings or conspicuously marked on site. Unless otherwise noted, trees within the construction limits shall become the property of the Contractor and shall be removed from the site.

E. Contractor shall protect existing trees and other vegetation indicated by the Town Engineer to remain in place against limb, bark or root damage such as cutting, breaking, or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. When such damage does occur, all rough edges of scarred areas shall be removed in accordance with accepted horticultural practices.

F. Carefully and cleanly, cut roots and branches of trees indicated to remain where the roots and branches obstruct construction of a proposed utility line. If directed by the Town Engineer, the Contractor shall provide protection for roots and branches over 1 ½ inches diameter that is cut during construction

operations. Coat the cut faces with emulsified asphalt, or other coating especially formulated for horticultural use on cut or damaged plant tissues. Temporarily cover all exposed roots with wet burlap to prevent roots from drying out. Provide earth cover as soon as possible.

G. Trees and vegetation designated to remain shall be repaired or replaced at Contractor's expense in a manner acceptable to the Town Engineer if they are damaged by construction operations. Repair tree damage as directed by a qualified tree surgeon.

H. Debris from the site shall be removed in such a manner as to prevent spillage. Keep pavement and area adjacent to site clean and free from mud, dirt, dust, and debris at all times.

I. The method of stripping, clearing, and grubbing the site shall be at the discretion of the Contractor. However, all stumps, roots and other debris protruding through the ground surface or in excavated areas shall be completely removed and disposed of off the site by the Contractor.

J. **Marginal Areas**: In marginal areas, with the Town Engineer's permission, remove trees where the following conditions exist.

1) **Root Cutting**: When clearing up to the "clearing limits," the Contractor shall also remove any tree which is deemed marginal such that when the roots are cut and the tree could be rendered unstable by the affects of high winds and in danger of toppling into either the right-of-way or onto private property.

2) **Slender Bending Trees**: Where young, tall, thin trees are left unsupported by the clearing operation, and are likely to bend over into the right-of-way, the Contractor, during the clearing operation, shall selectively remove those trees which are located outside and adjacent to the clearing limits and Town right-of-way or easement as well. During the course of construction and during the one-year warranty period, the Contractor shall remove such young trees that overhang into the right-of-way or cleared area.

K. **Stripping of Topsoil**: Remove the existing topsoil to a depth of 6 inches or to the depth encountered from all areas in which excavation will occur. The topsoil shall either be stored in stockpiles separate from the excavated trench material if the topsoil is to be respread or otherwise disposed of off-site. Topsoil stockpiles shall be graded to freely drain surface water, and shall have a silt fence placed around the base of the stockpile.

L. **Disposal**: All brush, treetops, stumps, and debris shall be hauled away and disposed of in accordance with all applicable laws and regulations. The Contactor shall clean up debris resulting from clearing operations continuously with the progress of the work and remove promptly all salvageable material that becomes his property and is not to be reused in construction. Sale of material on the site is prohibited.

Disposal of cleared material shall be in accordance with all local and state laws. Trees cut down on the construction site will be hauled away from the site for proper disposal unless instructed otherwise by the Town. Stumps of trees cut down outside of the excavation area will be removed. Perishable material shall not be disposed of at the construction site. Brush, limbs, roots, and stumps from

trees shall be disposed of in a NCDENR approved and permitted land clearing and inert debris type landfill. The Contractor will be responsible for obtaining all applicable permits and paying all fees for the disposal of excess material.

3.3 UNCLASSIFIED EXCAVATION, UNDERCUTTING, BORROW, EMBANKMENT:

3.3.1 DESCRIPTION

Prior to beginning grading or embankment operations in any area, all necessary clearing and grubbing in that area shall have been performed in accordance with these specifications.

Should the Contractor, through negligence or other fault, excavate below the designated grades, he shall replace the excavation with approved satisfactory materials, in an approved method, at his own expense. All material determined unsatisfactory shall be disposed of in waste areas as directed. Topsoil shall not be used in embankments but shall be handled and placed as directed.

The Contractor shall satisfy himself as to the character, quantity, and distribution of all materials to be excavated. No payment will be made for any excavated material that is used for purposes other than those designated.

3.3.2 CONSTRUCTION METHODS

A. **Excavation**: Excavation shall be performed as indicated on the plans or as directed by the Town Engineer to the lines, grades, and elevations, and shall be finished to a reasonable smooth and uniform surface. During the process of excavation, the grade shall be maintained and surface shall be shaped and rolled so that it will be well drained at all times.

When solid rock is incurred in the excavation, the rock shall be removed to a minimum depth of 12 inches below the surface of the subgrade. Material unsatisfactory for subgrade foundation shall be removed to a depth specified to provide a satisfactory foundation. The portion so excavated shall be refilled with suitable material obtained from the grading operations or borrow area and thoroughly compacted by rolling. The Town Engineer must approve material obtained from on site grading operation. For areas that do not require fill, scarify and compact to a depth of 6 inches.

Any removal, manipulation, aeration, replacement, and recompaction of suitable materials necessary to obtain the required density shall be considered as incidental to the construction operations, and shall be performed by the Contractor at no additional cost to the Town.

No rock, stone, or rock fragments, larger than 3 inches in their greatest dimension will be permitted in the top 12 inches of the subgrade. No rock, stone, or rock fragments larger than 8 inches in their greatest dimension will be permitted in the remainder of the fill.

B. **Stabilization of soft subgrade with Geotextile**: The use of Geotextile material for subgrade stabilization shall be approved by the Town Engineer (or a Geotechnical Engineer if required) and shall meet the requirements of paragraphs 2.2.1.B – *Soil Stabilization Fabric* and 3.9 – *Placement of Soil Stabilization Fabric.*

C. **Borrow**: Borrow shall not be used until all suitable, on-site, excavated material has been placed in the embankment, unless authorized by the Town Engineer. Unless otherwise designated on the plans and contract documents, the Contractor shall make his own arrangements for obtaining select fill material for borrow and pay all costs involved. If the Contractor places more borrow than is required, and thereby causes a waste of excavation, the amount of such waste, unless authorized, will not be included for payment.

D. **Embankments**:

1) **Evaluation of Subgrade**: Prior to placement of compacted fill, the Town Engineer or his representative shall carefully inspect the exposed subgrade.

2) **Evaluation of Subgrade**: Prior to placement of compacted fill, the Town Engineer or his representative shall carefully inspect the exposed subgrade. The Contractor shall then proof roll the exposed subgrade, in the presence of the Town Engineer or his representative. The inspection shall include, but not be limited to, proofrolling the prepared subgrade with a rubber-tired fully loaded dump truck that has a minimum gross weight of at least 30,000 pounds (15 tons). No other method will be acceptable. Any unsatisfactory materials thus exposed shall be removed and replaced with satisfactory select material as approved by the Town Engineer. Provide the necessary amount of select fill compacted to the density requirements outlined in this specification.

3) **Preparation of Ground Surface for Embankments or Fills**. Before fill is placed, scarify existing grade to a minimum depth of 6 inches. In areas where the existing or proposed ground surface is steeper than one vertical to four horizontal (4:1), plow surface in a manner to bench and break up surface so that fill material will bind with the existing surface.

4) Embankments shall be made of satisfactory soil material and shall be built in successive horizontal layers of not more than 8 inches in loose depth for the full width of the cross sections.

The material entering the embankment in each of the layers shall be within a tolerance of plus or minus +/- 20% of the optimum moisture content before rolling to obtain the prescribed density. Wetting or drying of the material and manipulation when necessary to secure uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on the embankment shall be delayed until the material has dried to the required moisture content. If high moisture is due to negligence of Contractor due to improper drainage, the Town Engineer may require removal and replacement of material.

Fill material shall not be placed on frozen ground or areas covered with ice and/or snow or areas with a moisture content above optimum.

E. **Undercut Excavation**:

Undercut Excavation: Undercut excavation shall consist of the removal and satisfactory disposal of all unsuitable material located below subgrade elevation. Where excavation to the finished grade section results in a subgrade or slopes of muck, peat, matted roots, etc., the Contractor shall remove such material below the grade shown on the plans or as directed; and areas so excavated shall be backfilled with approved select borrow as ordered by the Town Engineer.

For definition of undercut excavation, see *paragraph 1.3 F – Unclassified Excavation (Undercut)*.

F. **Preparation of areas to receive asphalt pavement or concrete**:

1) **Areas to be paved**: After all excavation, undercutting, and backfilling has been completed, the subgrade shall be properly shaped and thoroughly compacted. The compactive effort shall include all areas beneath pavement and shall extend at least a minimum of 1 foot behind the paving limits. Compaction shall be in accordance with Table 02200-2.

2) The Contractor shall then proof roll the exposed subgrade, in the presence of the Town Engineer or his representative. The inspection shall include, but not be limited to, proofrolling the prepared subgrade with a rubber-tired fully loaded dump truck that has a minimum gross weight of at least 30,000 pounds (15 tons). Proofrolling shall be performed in lengths of not less than one block as measured from center of intersection to center of intersection, from center of intersection to end of cul-de-sac, or 750 linear feet. **No other method will be acceptable**. Any unsatisfactory materials thus exposed shall be removed and replaced with satisfactory select material as approved by the Town Engineer. Provide the necessary amount of select fill compacted to the density requirements outlined in this specification.

Areas that rut or pump excessively under the wheels of the proof-roller shall be repaired by the Contractor before any work continues.

3) **Curb and gutter, sidewalks and driveway aprons**: The subgrade shall be constructed true to grade and cross section as may be shown on the drawings or standard details. Compaction shall be in accordance with Table 02200-2.

All subgrade shall be graded and protected as to prevent an accumulation of standing water, and consequent subgrade saturation, in the event of rain.

G. **Grading tolerances of finished surface**: Earthwork shall conform to the lines, grades, and typical cross sections shown on the plans, standard details, or as established by the Town Engineer. Changes in grade shall be accomplished by smooth curves.

1) Shape subgrade under pavement and curb and gutter to within ½ inch of required subgrade elevations.

2) Finish pavement and curb and gutter to within ¼ inch of required finish elevations.

3) Shape subgrade under sidewalks to within 0.10 foot of required subgrade elevations.

4) Finish sidewalks to within 0.10 foot of required finish elevations.

5) For all other areas, subgrade and finish elevations shall be within 0.10 foot of required corresponding elevations.

H. **Backfill of Curb and Gutter and sidewalks**: Immediately after the removal of forms for curb and gutter, sidewalks and driveways, the space between the back of the curb, sidewalks, and driveways shall be backfilled and smoothed off in a manner to prevent the accumulation of standing water.

3.4 ROCK:

3.4.1 GENERAL

A. Blasting procedures shall conform to all applicable local, state, and federal laws and ordinances and shall be performed in accordance with OSHA *Standard 29 CFR part 1910.109*, NCDOT Rules for Transporting Explosives, and local Fire Department Regulations. Prior to any blasting, a blasting permit shall be obtained. The approval of the Town Engineer shall be obtained before any blasting takes place and the Town Engineer may fix the hours of blasting if he/she deems it necessary. The use of explosives shall be in accordance with approved methods that safeguard lives and property. Explosives shall only be handled, placed, and detonated by persons licensed in this work. It is the responsibility of the Contractor to provide proper notification to appropriate parties.

B. **Rock Excavation – Definition**: See paragraph 1.3 G for definition of rock excavation in open excavation.

C. The minimum insurance coverage for blasting shall be as specified by the Town Engineer. The coverage shall include explosion and collapse. If blasting occurs within 200 feet of any underground structure or utility, underground coverage will be required. The Town and the property owners shall be named as “additional insured.”

D. **Storage**: Store explosives in accordance with the Occupational Safety and Health Act and with other Federal, State and Local ordinances and regulations. The Contractor shall keep explosive materials that are on the job site in special constructed boxes provided with locks. These boxes shall be plainly identified as to their contents. Failure to comply with this specification shall be grounds for suspension of blasting operations until full compliance is made. No blasting shall be allowed unless a galvanometer is employed to check cap circuits.

E. The Town may prohibit blasting when the method of detonation or the means of protection provided is inadequate. Blasting conducted with or without direct supervision of the Town will not relieve the Contractor of the responsibilities stipulated herein.

F. Blasters shall not explode or attempt to explode blasting powder or high explosives unless it is performed with a suitable electric blasting machine.

Electric current from batteries, telephone, or power lines shall not be used for detonation.

G. A minimum of 3 minutes prior to the detonation, the blaster shall inform competent flagmen, equipped with red flags, stationed at reasonable distances from the blast area at every avenue of approach, to warn all persons.

H. Immediately after the loading and tamping of the drill hole and before fixing the blast, the material to be blasted shall be covered on all exposed sides with blasting mats, or other approved protective material. After the protection has been applied, the blast shall be fired without unnecessary delay.

3.4.2 BLASTING PROCEDURE

A. The Contractor shall provide a blast warning signal system. The blast warning signal system shall consist of one or more air horns located at the blast site. The air horn(s) shall be audible a minimum of 1 mile from the blast site. The signals shall be one long horn five minutes prior to the blast, one short horn 1 minute prior to the blast, and one long horn after the blast to signal all clear. The Contractor shall erect two clear and legible blast warning signal signs at locations determined by the Town Engineer. The signs shall list the blast warning signal system, the Contractor Superintendent's name and telephone number, and the Town representative's name and telephone number.

B. The Contractor shall establish test pits at up to two representative locations along the alignment and up to three locations adjacent to the site proposed to be blasted to determine if the rock is "rippable" with a D-8 or equivalent dozer drawing a new single-tooth ripper (see paragraph 1.3 G for definition of rock excavation in open trenches). If these procedures do not offer reasonable production for rock excavation, then blasting will be allowed unless otherwise indicated.

C. The Contractor shall notify in writing all property Owners within 250 feet of the proposed blast at least 1 week prior to the proposed blast and verbally on the day of the scheduled blast.

D. Blasting shall be limited to mid-morning hours on days of clear-to-partly cloudy skies with increasing surface temperature and light wind. The Contractor shall provide monitoring equipment to monitor all blasting. A copy of monitor record shall be given to the Town daily.

E. The use of unconfined explosives shall be prohibited.

F. Unless otherwise stipulated in Title 13 of the NC Administrative Code, chapter 7, the maximum allowable peak particle velocity shall be 1.25 inches per second for all structures located 0 to 300 feet from the blasting site. The maximum allowable peak particle velocity shall be 1.00 inch per second for all structures located 301 to 5,000 feet from the blasting site. The maximum allowable peak particle velocity shall be 0.75 inch per second for all structures located 5,001 feet and beyond from the blasting site.

G. To minimize vibration, minimum-scaled distance (SD) of 50 shall be used to determine maximum explosive weight per delay. A test blast shall be conducted to verify the scaled distance. The maximum explosive weight per delay shall not

exceed the distance from the blast to the nearest structure divided by 50 squared. Maximum explosive weight per delay may be revised pending outcome of test blast. The recommendations indicated for blasting criteria in no way relieves the Contractor of his liability.

H. The peak overpressure of air blast shall not exceed 0.015 pound per square inch or 138 decibels.

I. Preblast meetings may be scheduled with the Town Engineer to document hole depths and spacing, charge weight per delay, shot scheduling, and weather conditions. The Contractor shall obtain accurate measured distances from structures to center of blast area prior to determining the safe maximum charge-weight per delay and loading blast holes.

J. Preblast and post blast surveys will be performed by the Contractor. The Contractor may review this data and supplement it as he sees fit or conduct separate survey after written permission is obtained from the property Owners. In this event, the written permission shall be submitted to the Town Engineer prior to entering upon private property. The preblast and post blast surveys will include all occupied buildings within 250 feet of blasting areas. The Contractor is strongly encouraged to have a representative present during these surveys. The preblast and post blast surveys performed by the Town or the property owner in no way relieve the Contractor of his liability.

K. The Town reserves the right to monitor production blasting. In this event, the Contractor shall provide the Town Engineer ample notice of scheduled blasts to allow set-up of monitoring equipment.

3.4.3 DISPOSAL OF ROCK

Excavated rock shall be hauled off the site at the Contractor's expense. Borrow required to replace excavated rock shall be provided by the Contractor and shall be included in the unit price bid for rock excavation in open trenches. No rocks or boulders shall be used as backfill in any part of the site unless otherwise approved by the Town Engineer. Where rock has scattered over adjoining property as a result of blasting, the Contractor shall remove the rock and restore the area to its original condition at no cost to the Town.

3.5 SUBGRADE COMPACTION TESTING AND CONTROL

A. **Testing**

Testing of embankment/borrow shall be performed by an independent laboratory approved by the Town and the Contractor. The Contractor shall be responsible for excavation for testing if required.

Quality Assurance vs. Quality Control:

Quality Assurance (QA) testing, and the associated cost, is the responsibility of the Town. Quality Assurance testing by the Town is used to confirm that the Contractor is generally performing his/her work in compliance with these specifications.

Quality Control (QC) testing is the necessary and required testing that is to be performed by the Contractor to assure that he/she is meeting and complying with the requirements of these specifications. The associated cost for QC testing is the Contractor's responsibility. The Contractor is also responsible for "re-testing" costs incurred by the Town when the Town tests results (tests for Quality Assurance) results in a "failure."

Quality Control (QC) testing for Town funded projects: The Town shall pay for the cost of Quality Control by having the Contractor include the cost for testing in the unit cost of the project; not as a separate pay item. The Contractor shall pay for all costs associated with re-testing.

B. **Quality Assurance (QA):**

In the course of placement of embankment fill/borrow or in utility trench backfill, the Town Engineer may require additional "Field Density Determinations" or compaction tests. Such tests will be at the Town's expense. When compaction tests are called for by the Town, the Town Engineer will determine the location of the tests and the Town shall engage a qualified testing firm to perform the test. A representative of the Town will observe tests and a copy of the test results and inspection report will be submitted by the testing firm directly to the Town Engineer. When the tests indicate that the density failed to meet the requirements of Tables 02200.2A and 2200.2B, the Contractor shall comply with paragraph 3.6 D, Failure of Compactive Efforts.

Payment for failed QA density tests: For Town funded projects, payment for failed in-place density tests shall be made by the Contractor by deducting the testing cost from the forthcoming retainage. For other projects in which the Town will ultimately assume ownership and maintenance, the testing costs for failed in-place density tests shall be billed directly to the Contractor.

C. **Quality Control (QC):** The Contractor shall perform in-field density tests in accordance with Table 02200-1. Inspection reports shall be submitted by the testing firm directly to the Town Engineer. See paragraph 3.6 C, Passing Test.

1) All test results shall be provided to the Town Engineer as they become available from the testing agency.

2) The Geotechnical testing firm is to perform laboratory tests (ASTM D698, Standard Proctor) to establish a moisture-density relationship for all materials that are proposed to be used as fill.

3) Contractor shall give a 24-hour notice to Geotechnical testing firm for subgrade testing, subgrade confirmation, or inspections.

4) **Minimum Compaction Testing Frequency**:

The following testing frequency shall be employed on both City funded projects and projects proposed to be turned over to the City for maintenance and/or ownership.

Table 02200-1
Testing Frequency

Location	Frequency
Buildings and structures	1 test group[a] for every 5,000 square feet
Road	1 test group for every 300 feet of road
Parking Lots	1 test group for every 10,000 square feet
Unpaved areas	1 test group for every 20,000 square feet
Pipe Trenches in Roadways	1 test group for every 100 feet 1 test in each lateral (not to be taken at surface of trench)
Proof Roll	Entire surface area to be paved
Exception: Where additional tests are required to determine the extent of unacceptable compaction (having been determined by the initial QA/QC test.	

[a] One test group consists of compaction tests on each layer of fill and backfill material.

D. **Site access for testing:** Ensure Town, at all times, has immediate access to the site for the testing of all soils related work. Ensure excavations are in a safe condition for testing personnel.

3.6 SUBGRADE PREPARATION AND COMPACTION REQUIREMENTS

A. **Confirmation of Initial Geotechnical Report/Design Assumptions** *(for roadway projects to be turned over to the Town)*: Prior to placement of stone base over the subgrade, the Geotechnical Engineer or his representative shall confirm the initial test results and design assumptions by visual classification and hand augur borings. If the visual findings are at variance with the initial testing and design assumptions, recommendations for modifications to the subgrade shall be provided to the designer, the Grading Contractor, and the Town Engineer. The Town Engineer shall approve the proposed recommendations prior to incorporation of the measures.

B. **Minimum Compaction Requirements**: Compaction percentages are percentages of maximum dry density as determined by indicated ASTM Standards. Unless noted otherwise on drawings or more stringently by other sections of these specifications, place and ensure degree of compaction of embankment and borrow materials does not fall below the following percentages of the maximum density at optimum moisture content.

C. **Passing Test:** Average of 3 test results meeting the applicable provisions of tables 2200.2A and 2200.2B (below) with no one test failing by more than -3 percentage points. Moisture content tolerance is to be within +/- 3 percentage points of the optimum moisture content unless otherwise specified by the Town Engineer or Geotechnical Engineer.

Table 2200.2A
Minimum Compaction Limits

Location	Density	
Site and Public Roadways		
Embankment/borrow under roadway pavement surfaces, sidewalks, and curb and gutter	Top 12 inches	100% of the maximum dry density by ASTM D698 (Standard Proctor), AASHTO T99.
	Up to within 12 inches	95% of the maximum dry density by ASTM D698 (Standard Proctor), AASHTO T99.
Roadway Shoulders	95% of the maximum dry density by ASTM D698 (Standard Proctor), AASHTO T99.	
Under turf, sodded, planted, or seeded non-traffic areas	90% of the maximum dry density by ASTM D698 (Standard Proctor), AASHTO T99.	
Stone Base	100% of the maximum dry density by ASTM D698 (Standard Proctor), AASHTO T99.	

Table 2200.2B

Location	Density	
Building Structures		
Embankment/borrow beneath and within 5 feet of buildings, under foundations, and scarified existing subgrade beneath buildings.	Top 12 inches	100% of the maximum dry density by ASTM D698 (Standard Proctor)
	Up to within 12 inches	95% of the maximum dry density by ASTM D698 (Standard Proctor)
Outside structures next to walls and any other structural exterior member	90% of the maximum dry density by ASTM D698 (Standard Proctor)	
Backfill less than 10 feet from exterior retaining walls	90% of the maximum dry density by ASTM D698 (Standard Proctor)	

D. **Failure of compactive efforts**: If compaction efforts should fail to provide a stable subgrade in accordance with the requirements in paragraph 3.6 C, Passing Test after subgrade materials have been shaped and brought to optimum moisture, such unstable materials shall be removed to the extent directed by the Geotechnical Engineer and/or the Town Engineer and replaced and compacted using new material and must pass compaction test prior to proceeding to the next stage of construction and at no expense to the Town.

The costs associated with excavation and re-compaction of areas that have failed will be the Contractors responsibility.

E. **Compaction Lifts**:

Table 2200.3
Compaction Lift Thickness of

Lift Thickness (inches)	Location
6	Inside street rights-of-way
12	Outside street rights-of-way

F. In-place testing of soils shall be tested based on the following:

Table 02200.4	
In-Place Density Tests	
Soil Type/Classification	**Reference Standard**
GW, GP, GM, GC, SW, SP	• Sand Cone Method (ASTM D1556) • Nuclear Method ASTM D2922) [by percentage of Standard Proctor Density according to ASTM D 698]
SM, SC, ML, CL	• Sand Cone Method (ASTM D1556) • Rubber Balloon Method (ASTM D2167) • Nuclear Method ASTM D2922) • Drive-Tube Method (ASTM D2937) [by percentage of Standard Proctor Density according to ASTM D 698]

G. **Field Testing Limitations:**

1) When field density testing is incorporated according to Table 02200-1, subgrade adequacy is to be confirmed by proof rolling in the presence of the Town Engineer or his representative. In-place field density testing of the street or pad subgrade will not be required.

2) In-place field density tests of the roadway or pad subgrade in cut sections (excavation) is not required.

3) Testing/adequacy of intermittent undercut areas and repair areas (e.g. around manholes and boxes) that have been backfilled with select fill and compacted will be confirmed by proof rolling.

3.7 STRUCTURES: EXCAVATION, FILLING, AND BACKFILLING

A. **General**

See Section 02275 - *Trenching, Backfilling, and Compaction of Utilities* for excavation and backfilling for structures (manholes, catch basins, etc.). See NCDOT *Standard Specifications for Roads and Structures, latest revision* for excavation and backfilling for retaining walls.

B. **Protective Measures for Structures**

1) **Drainage**: Control grading around structures so that the ground is pitched to prevent water from running into excavated areas or damaging structures. Maintain excavations where foundations, floor slabs, equipment support pads or fill material are to be placed free of water. Provide pumping required, keeping excavated spaces clear of water during construction. Should any water be encountered in the excavation, notify Town Engineer. Provide free

discharge of water by trenches, wells, or other means as necessary and drain to point of disposal.

2) **Frost Protection**: Do not place foundations, footings, or fill material on frozen ground. When freezing temperatures may be expected, do not excavate to full depth indicated, unless foundations, footings or fill material can be placed immediately after excavation has been completed and approved. Protect excavation from frost if placing of concrete or fill is delayed.

3) **Protection of Structure:** Prevent new and existing structures from becoming damaged due to construction operations or other reasons. For catch basins, provide temporary weep holes with a non-woven filter fabric to relieve hydrostatic pressure on walls.

3.8 RIP RAP AND RIP RAP BEDDING PLACEMENT

Placement of Rip Rap and Rip Rap Bedding shall conform to Section 876 – *Rip Rap* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision.

3.9 PLACEMENT OF SOIL STABILIZATION FABRIC

Placement of soil stabilization fabric shall conform to the requirements of Section 270 – *Fabric for Soil Stabilization* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision and in accordance with the recommendations and directions of the Town Engineer and/or a Geotechnical Engineer for the application and use intended.

3.10 SUBSURFACE DRAINAGE SYSTEMS

See Section 2630 – *Storm Drainage* and Section 02275 – *Trenching, Backfilling, and Compaction of Utilities* for both materials and construction requirements regarding subsurface drainage systems

3.11 METHOD OF VOLUME MEASUREMENT

Contractors are required to furnish accurate counts of all excavation and/or fill moved which is to be paid for under a Contract unit price. The volumes shall be measured by either “truck tally” or by “cross-sectioning,” whichever method is approved by the Town Engineer or stated in the proposal and/or bid documents. When a truck count is used, the Town Engineer or their representative shall verify the count independently.

A. **Truck Tally Method:**

Excavation: When unclassified excavation or undercut volumes are to be counted by the truck tally method, "swell" is to be incorporated into the truck volume in the amount of 15%. Unless otherwise agreed to or justified by a Geotechnical Engineer, the following pay volumes are to be used for either unclassified or undercut excavation:

Tandem:	13 CY
Tri-axle:	15 CY

Borrow: When either off-site or on-site borrow is to be counted by the truck tally method, "shrinkage" is to be incorporated into the truck volume in the amount of 15% (shrinkage of truck volume placed compared to compacted fill volume) utilizing the following pay volumes:

Tandem:	10 CY
Tri-axle:	12 CY

Loading Truck: A qualified truckload is one that is loaded up to within approximately 6" of the top of the dump bed, prior to dumping.

B. **Average-End-Method:**

Excavation and fill can be computed using the average-end-method. When used, this method is to be employed using the existing contours shown on the Contract Drawings and the Contractors actual surveyed finished contours (surveyed by a licensed Professional Surveyor). In so doing, the finished contours are to be plotted at the same scale as the original drawing and a transparency furnished to the Engineer for comparison to design grades. The volume computations are also to be submitted along with the Surveyors seal and a certification as to the volumes measured.

The Contractor, at his discretion and with the prior approval of the Engineer, may survey the "stripped" site (the site after topsoil has been removed) and compute the volumes based on the stripped site and the "designed" finished grade as shown on the Contract Drawings. As before, a transparency to the same scale and the Surveyors computations and certification are to be submitted to the Engineer for comparison and verification.

C. **Volume Formulas:**

Unless otherwise approved, the following formulas are to be used in computing cut and fill:

Fill Formula

Net Fill = Raw Fill Vol. – Unclassified Excavation X (1 - Shrink Factor) + Strip Vol. - Undercut or waste Fill placed in Fill Slopes X (1 - Shrink Factor) - Pavement Section or Building Floor Pad

Cut Formula

Net Cut = Raw Cut - Strip Vol. + Pavement Section or Building Floor Pad

3.12 CLEANUP AND RESTORATION OF SITE

A. During the progress of the work, the Contractor shall keep the premises and the vicinity of the work clear from unsightly and disorderly piles of debris. Suitable locations shall be specified for the various construction materials and for debris. The materials shall be kept in their storage locations, except as needed for the work and debris shall be promptly and regularly collected and deposited in the specified location.

B. Upon completion of grading operations, the Contractor shall fine grade the site, removing all surplus excavated material, leaving the area free from surface irregularities. He shall dispose of all surplus material, dirt, and rubbish from the site and shall keep the site free of mud and dust to the satisfaction of the Town Engineer. The Contractor may be required to flush or sprinkle the street to prevent dust nuisance.

C. When working on the shoulders of paved roads, the Contractor shall keep the pavement clean of all loose earth, dust, mud, grave, etc., and shall restore roadway shoulders and ditches as required by either the NCDOT or the right-of-way owner.

D. After all work is completed, the Contractor shall remove all tools and other equipment, leaving the site free, clean, and in good condition.

E. The Contractor shall keep the surface over and along the roadways and other graded areas in a safe and satisfactory condition during the progress of the work and for a period of one year after the work has been completed. He shall be held responsible for any accidents that may occur on the account of the defective condition of such surface.

3.13 SEEDING, SODDING, AND GROUNDCOVER

3.13.1 GENERAL

A. Seeding, Sodding, and Groundcover shall comply with the applicable provisions and requirements of Section 02920, *Seeding, Sodding and Groundcover*.

B. Seeding and groundcover includes seedbed preparation, liming, fertilizing, seeding, and mulching of all disturbed areas. Areas inside or outside the limits of construction that are disturbed by the Contractor's operation and activity shall be seeded and mulched.

Unless called for otherwise on the Erosion and Sedimentation Control Plan, in areas where natural sod or vegetation has been disturbed, the area shall be seeded in accordance with **Standard Detail 350.01**.

If the construction activity disturbed a landscaped lawn, the seeding shall be modified to restore ground cover comparable to the existing lawn.

C. Seeding shall be carried out as soon as practical after the construction in any one area, and shall be maintained against erosion through the completion of the project. Seeding shall be accomplished as work progresses.

The Contractor shall be responsible for proper care of the seeded area during the period that vegetation is being established. In the event of an erosive rain before an adequate stand of vegetation has been established, damaged areas shall be repaired, fertilized, seeded, and mulched at the Contractor's expense.

Seeding on rights of way of NCDOT maintained roads shall be in accordance with NCDOT specifications and the requirements of the approved encroachment permit.

D. **Temporary Seeding**: Denuded areas to be graded during the construction phases that are not to be brought to final grade within 30 days shall receive temporary seeding and mulching within 15 days of completing initial earthwork. Note that the time for establishment of permanent ground cover is 15 working days or 30 calendar days whichever is shorter. Temporary seeding shall also be used to stabilize finished grade areas if the time of year is outside the specified permanent seeding periods.

E. **Stockpile Area**: The Contractor is responsible for securing equipment storage, material lay down, and stockpile storage area for his work. As such, the Contractor is responsible for the necessary erosion control measures, including but not necessarily limited to, a construction entrance, silt fence, protection of streams/buffers, clean up and restoration of site to the satisfaction of the Town and the NCDENR, Department of Water Quality, Land Quality Section. Stockpile and/or waste areas must be maintained within the limits of the areas protected by the proposed measures and otherwise temporarily seeded if to be left stockpiled over 30 days.

3.14 MISCELLANEOUS

3.14.1 DUST CONTROL

The Contractor shall be required to sprinkle with water or to apply dust-allaying materials to ensure that dust is held to an absolute minimum. Dust control is considered incidental and shall be carried out at the Contractor's expense.

3.14.2 SALVAGE OF USEABLE MATERIALS

All materials such as iron castings, paving blocks, brick, pipe and etc., removed during excavation that is useable on this project shall be used after approval of its use by the Town Engineer or the applicable owner of the street right-of-way. Such material shall be stockpiled on site. Unnecessary abuse and damage to these items shall be the Contractors responsibility and the cost of replacement may be deducted from the retainage.

End of Section 02200

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