

Draft Remedial Action Plan



BINGHAM PARK

GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

SITE IDENTIFICATION NUMBER: NONCD0000244

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Prepared for:

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List of Acronyms

ACM	Asbestos Containing Materials
ASTM	American Society for Testing and Materials
bgs	Below Ground Surface
CDM Smith	CDM Smith Inc.
The City	The City of Greensboro
Conservation Declaration	Declarations of Conservations, Covenants, Conditions, and Restrictions
CriTek	CriTek Engineering Group, PC
cy	Cubic Yard
DEMLR	Division of Energy, Mineral and Land Resources
DPLUR	Declaration of Perpetual Land Use Restrictions
DWR	Division of Water Resources
EPA	U.S. Environmental Protection Agency
F&R	Froehling and Robertson, Inc.
Guidance Document	Special Remediation Branch's Guidelines for Addressing Pre-Regulatory Landfills and Dumps, February 2025
LFG	Landfill Gas
mg/kg	milligrams per kilogram
NC 2B	15A NCAC 02B
NC 2L	15A NCAC 02L .0202
NCDEQ	North Carolina Department of Environmental Quality
Notice	Notice of Environmental Contamination
NPDES	National Pollutant Discharge Elimination System
PIN	Parcel Identification Number
PPE	Personal Protective Equipment
ppmv	parts per million by volume
PRLF Unit	Pre-Regulatory Landfill Unit
PSRG	Preliminary Soil Remediation Goal
RAP	Remedial Action Plan
Risk Calculator	NCDEQ's Risk Calculator, January 2025

RPR	Resident Project Representative
S&ME	S&ME, Inc.
The Site	Bingham Park
USACE	U.S. Army Corps of Engineers
VCP	Vitrified Clay Pipe
VOC	Volatile Organic Compound



1.0 Introduction

This draft Remedial Action Plan (RAP) for Bingham Park (the Site) was prepared specifically for use by the City of Greensboro (the City) by CDM Smith Inc. (CDM Smith) and CriTek Engineering Group, PC (CriTek). This draft RAP is based on an executive summary of risks identified during the remedial investigation phase completed by others. Use of this document for other purposes or by other parties is at the sole risk of the user.

The Site is an unlined, pre-1983 landfill in the North Carolina Department of Environmental Quality (NCDEQ) – Special Remediation Branch – Pre-Regulatory Landfill Unit’s (PRLF Unit) Program located between Bingham Street and South English Street in Greensboro, Guilford County, North Carolina, on Parcel Identification Numbers (PINs) 7874545922, 7874559333, 7874559238, 7874559233, 7874559138, 7874641800, 7874540673, 7874542641, 7874544610, 7874545599, 7874554417, 7874458011, and 7874647410. A Site map is provided on **Figure 1-1**, and the current United States Geological Survey topographic map is provided on **Figure 1-2**.

The waste disposal area consists of surficial and buried waste and includes four separate units (i.e., Areas A through D) as shown on Figure 1-1. Area A is the largest waste disposal area and is located between Bingham Street and South English Street on PINs 7874545922 and 7874641800. Area A also extends five parcels to the north (i.e., PINs 7874554417, 7874559333, 7874559238, 7874559233, 7874559138) and four parcels to the south (i.e., PINs 7874540673, 7874542641, 7874544610, 7874545599). The smallest waste disposal area (i.e., Area B) is located on PIN 7874458011, west of Area A and Bingham Street. Areas C and D are located on PIN 7874647410, east of English Street and southeast of Area A on the western portion of the former Hampton Elementary School site.

Surficial waste at the Site is visible in the streambank and stream bed of an unnamed tributary of South Buffalo Creek, which is located along the southern boundary of Area A. Intermittent drainage features are also located in the northern and southeastern portions of Area A and flow into the unnamed tributary of South Buffalo Creek. Additionally, approximately 0.01 acres of a riparian wetland is in the northeast corner of Area A. The remainder of Area A is mostly a municipal park with a manicured grass field, basketball court, and baseball field. Maplewood Municipal Cemetery and four wooded vacant properties are located north of the park. A church and multifamily residential properties are located south of the park and an unnamed tributary of South Buffalo Creek.

Area B is located on a vacant property and is bounded by the unnamed tributary of South Buffalo Creek to the south. Areas C and D are mostly grassed fields with trees and light vegetation. The unnamed tributary of South Buffalo Creek borders Areas C and D to the northeast, with an intermittent drainage feature in between the two waste areas.

Public water and sewer utilities service the areas surrounding the Site. Underground utilities at the Site include water, sewer, fiber optic, telephone, and electric. The surrounding properties and the Site are zoned as Traditional Neighborhood (TN), Single-Family Residential (R-5), and Multi-Family Residential (RM-18) by Guilford County.

2.0 Historical Operations

The waste disposal areas encompass approximately 12.7 acres. The Site was operated from approximately the mid-1920's to the mid-1950's by the City as a disposal facility for incinerated municipal waste (Kleinfelder Southeast, Inc., 2010).

3.0 Geologic and Hydrogeologic Conditions

The Site is in the Piedmont physiographic province and Carolina Slate Belt of North Carolina (Brown and Parker, 1985). Geologic maps indicate that metamorphosed granitic rock underlies the Site (Brown and Parker, 1985).

Static groundwater level measurements collected from groundwater monitoring wells indicate groundwater flows east towards the unnamed tributaries of South Buffalo Creek as shown on **Figure 3-1**. Groundwater depth was observed to range from 3.14 feet below ground surface (bgs) to 14.44 feet bgs.

4.0 Sensitive Environments

The U.S. Army Corps of Engineers (USACE) identified three unnamed tributaries of South Buffalo Creek (i.e., Streams 1 through 3) at the Site that are considered jurisdictional waters of the U.S. (Froehling and Robertson, Inc. (F&R), 2021). Stream 1 flows east from the southern boundary of Area A, through the southern portion of Area B, and adjacent to the northern boundaries of Areas C and D. Stream 2 flows south to Stream 1 and is located along the northeast boundary of Area A. Stream 3 is located in between Areas C and D and flows north to Stream 1. Streams 1 through 3 flow into South Buffalo Creek within the Haw River arm of the Jordan Lake watershed. A 0.13-acre riparian wetland connected to Stream 2 is also located within 500 feet of the Site (F&R, 2021), of which 0.01 acres are located within the boundaries of Area A. Sensitive environments in the Site vicinity are shown on **Figure 4-1**.

5.0 Waste Disposal Boundary

Based on geophysical surveys, subsurface soil borings, and media sampling, the waste disposal area encompasses approximately 12.7 acres and consists of four units (i.e., Areas A through D) as shown on Figure 1-1. Area A includes approximately 11.0 acres of waste on PINs 7874554417, 7874545922, 7874559333, 7874559238, 7874559233, 7874559138, 7874641800, 7874540673, 7874542641, 7874544610, and 7874545599. Area B includes approximately 0.02 acres of waste on the southeast corner of PIN 7874458011. Areas C and D include approximately 1.42 and 0.26 acres of waste, respectively, on PIN 7874647410. The estimated total waste volume at the Site was calculated to be approximately 187,000 cubic yards (cys) (S&ME, 2022).

6.0 Cover Soil

Cover soil thickness was determined using soil borings and ranges from less than 6-inches to greater than 36-inches as shown on **Figure 6-1**. Cover soil samples were collected from borings with cover soil greater than 6-inches (i.e., SC-2, -6, -7, -11, -12, -13, -16, -17, -52, -54, -58, -59, -60 and -63) and analyzed for volatile organic compounds (VOCs), semi-VOCs, 1,4-dioxane, total metals (i.e., antimony, arsenic, beryllium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver,

thallium, and zinc), and general chemistry analytes (i.e., ammonia, nitrate, and sulfate). Cover soil analytical results were initially compared to the NCDEQ's Preliminary Soil Remediation Goals (PSRGs) and had the following exceedances: arsenic, iron, manganese, and benzo(a)pyrene (S&ME, 2015). A later evaluation of analytical results for soil and sediment was completed that met remedial goals for a contaminant remedy (S&ME, 2017).

Cover soil analytical results were also evaluated using the NCDEQ's Risk Calculator, January 2025 (risk calculator) to assess the risks of contamination from the Site as discussed in Section 10.

7.0 Physical Waste Hazards

Surficial waste at the Site, which includes glass, ceramic, brick, and metal, has been observed eroding from the banks of the central perennial tributary and the southeastern intermittent channel (S&ME, 2019). This waste poses a physical risk due to the possibility of slip, trip, and fall hazards. No other physical risks were identified in association with the waste disposal areas.

8.0 Natural and Anthropogenic Background

Samples were collected from background soil borings BG-1 through -6 at the locations shown on **Figure 8-1** at intervals of 6 to 12 inches bgs and analyzed for VOCs, semi-VOCs, 1,4-dioxane, total metals (i.e., antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc), hexavalent chromium, and general chemistry analytes (i.e., ammonia, nitrate, and sulfate). Background soil analytical results were initially compared to the PSRGs and had the following exceedances: arsenic, cobalt, manganese, thallium, vanadium, hexavalent chromium, and benzo(a)pyrene (S&ME, 2022).

Twelve additional background soil samples will be collected prior to implementing the remedy. The background soil borings will be advanced to a depth of 1-foot bgs, and samples will be collected and analyzed for VOCs, total metals (i.e., antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc), hexavalent chromium, and general chemistry analytes (i.e., ammonia, nitrate, and sulfate). Background soil analytical results will be used to calculate background conditions for the Site by multiplying the average concentration of a detected analyte by two.

9.0 Waste Disposal Area

Soil, groundwater, surface water, and sediment samples were collected at the locations shown on **Figure 9-1** for laboratory analyses. Aboveground and subsurface landfill gas (LFG) at the Site was screened for methane, oxygen, carbon dioxide, hydrogen sulfide, and total VOCs using field instrumentation.

Quantified sample results for each media were screened against the latest applicable regulatory criteria as indicated in the subsequent sections below, except for LFG. No LFG samples were collected during the remedial investigations.

9.1 Waste

Waste types observed during remedial investigations included glass, metal, wire, porcelain, brick, fabric, and masonry. Waste thickness at the Site ranges from 0.5- to 26.5-feet and the volume of buried waste is estimated to be approximately 187,000 cys (S&ME, 2022).

9.2 Soil

A total of 1,418 soil mixed with waste samples were collected from 397 borings up to 30 feet bgs at the Site and analyzed for lead (S&ME, 2015). Lead detections ranged from 0.18 milligrams per kilogram (mg/kg) to 43,000 mg/kg and were compared to the PSRG of 200 mg/kg.

A total of 1,277 samples were also analyzed for asbestos (S&ME, 2015). Chrysotile was detected at a concentration of two percent at five sample locations at the locations shown on **Figure 9-2**.

Two composite and 41 grab soil mixed with waste samples were collected and analyzed for VOCs, semi-VOCs, total metals (i.e., antimony, arsenic, beryllium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, and zinc), and general chemistry analytes (i.e., ammonia, nitrate, and sulfate) (S&ME, 2012, 2013). Soil analytical results were initially compared to the PSRGs and had the following exceedances: antimony, arsenic, cadmium, copper, iron, lead, manganese, nickel, mercury, selenium, silver, thallium, zinc, benzene, carbazole, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene. Soil mixed with waste samples were also evaluated using the risk calculator as summarized in Section 10.

A total of 241 native soil beneath waste samples were collected from 397 borings and analyzed for lead (S&ME, 2015). Lead detections ranged from 6.2 mg/kg to 28,000 mg/kg and were compared to the PSRG of 200 mg/kg. Lead analytical detections in samples collected from native soil beneath waste that were greater than the PSRG are shown on **Figure 9-3**.

A total of 30 native soil beneath waste samples were also collected and analyzed for VOCs, 1,4-dioxane, semi-VOCs, total metals (i.e., antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc), and general chemistry analytes (i.e., ammonia, nitrate, and sulfate). Soil analytical results were initially compared to the PSRGs and had the following exceedances: arsenic, cobalt, lead, manganese, vanadium, benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene. Native soil beneath waste samples were also evaluated using the risk calculator as summarized in Section 10.

9.3 Surface Water/Sediment

Surface water and sediment samples were collected from 16 locations in the unnamed tributaries of South Buffalo Creek and analyzed for VOCs, semi-VOCs, total metals (i.e., antimony, arsenic, beryllium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, and zinc), and general chemistry analytes (i.e., ammonia, nitrate, and sulfate) (S&ME, 2012, 2013, and 2022). Upgradient surface water (i.e., SW-5, -13, -14, and -15) analytical results were used to calculate background conditions. Downgradient surface water (i.e., SW-1, -2, -3, -4, -6, -7, -8, -9, -10, -11, Upgradient/SW-UP, and Downgradient/SW-DN) analytical results were compared to background conditions and the 15A NCAC 02B (NC 2B) Surface Water Standards. The following surface water constituents exceeded background conditions or the NC 2B Surface Water Standards (whichever is higher) as shown on **Figure 9-4**: acetone, methyl-tert-butyl ether, antimony, cadmium, lead, manganese, nickel, and ammonia.

Sediment analytical results were initially compared to the PSRGs. The following sediment constituents exceeded the PSRGs: antimony, arsenic, cadmium, iron, manganese, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, benzo(a)anthracene, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, and benzo(b)fluoranthene. Surface water and sediment samples were also evaluated using the risk calculator as summarized in Section 10.

9.4 Groundwater

Four groundwater monitoring wells were installed outside of the waste disposal area (i.e., MW-1, -2, -3, and -6) and two groundwater monitoring wells were installed within the waste disposal area (i.e., MW-4 and -5). Groundwater samples were collected and analyzed for VOCs, 1,4-dioxane, semi-VOCs, total metals (i.e., antimony, arsenic, beryllium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, and zinc), and general chemistry analytes (i.e., ammonia, nitrate, and sulfate). Upgradient groundwater (i.e., MW-1) analytical results were used to calculate background conditions. Downgradient groundwater (i.e., MW-2 through -6) quality was compared to background conditions, the 15A NCAC 02L .0202 (NC 2L) Groundwater Standards, and Interim Maximum Allowable Concentrations. The following groundwater constituents exceeded background conditions or the NC 2L Groundwater Standards (whichever is higher) as shown on **Figure 9-5**: tetrachloroethene, bis(1,2-ethylhexyl)phthalate, manganese, and selenium. Groundwater analytical detections were also evaluated using the risk calculator as summarized in Section 10.

9.5 Potable Water Supply Well Sampling

No potable water supply wells were identified within 1,000 feet of the Site.

9.6 Landfill Gas

The potential for aboveground vapors was evaluated by collecting LFG measurements at 89 locations across the Site (S&ME, 2012). Background measurements were also collected. VOCs were detected above background levels at three locations ranging from 2.71 parts per million by volume (ppmv) to 3.58 ppmv. Hydrogen sulfide was also detected at one location at a concentration of 1 ppmv. Methane was not detected at any location.

LFG probes GP-1, -4, -5, -9, and -10 were installed outside of the waste disposal area and LFG probes GP-2, -3, -6, -7, and -8 were installed inside the waste disposal area to evaluate subsurface LFG. The LFG probes were screened for methane, hydrogen sulfide, and total VOCs. Methane was detected below the 5 percent lower explosive limit in LFG probes GP-7 and -10 at 2.2 and 0.7 percent by volume, respectively. No hydrogen sulfide or total VOCs were detected in any LFG probes at the Site. Subsurface LFG screening results are provided on **Figure 9-6**. No LFG probes were sampled.

10.0 Risk Calculator and Data Reduction Results

The risk calculator and background conditions were used to evaluate potential human health risks posed by contaminants identified in soil, groundwater, surface water, and sediment. Risks identified by the risk calculator for each media are listed below. Note that surface water analytical detections did not have any cumulative risks identified.

Media	Risk Calculator – Identified Pathway Risks
Cover soil	Residential Soil
Soil mixed with waste	Resident Soil, Non-Residential Worker Soil, Construction Worker Soil, Recreator/Trespasser Soil
Native soil beneath waste	Resident Soil, Non-Residential Worker Soil
Groundwater	Resident Groundwater Use, Non-Residential Worker Groundwater Use, Resident Groundwater to Indoor Air
Sediment	Resident Soil, Construction Worker, Recreator/Trespasser Soil

Cover soil, soil mixed with waste, native soil beneath waste, and sediment risk calculator and/or background exceedance results are shown on **Figures 10-1** through **10-4**, respectively. Groundwater and surface water risk calculator and background exceedance results are shown on Figures 9-4 and 9-5, respectively.

11.0 Remedial Goals

Based on the results of the remedial investigation, the remedial goals for the Site and the approaches proposed to achieve the remedial goals are provided below.

- Limit Direct Exposure to Waste Materials - Achieved by removing surficial waste, relocating and consolidating buried waste, installing a protective cover soil system over the waste disposal area and installing permanent erosion control measures as detailed in Section 12.5.2.
- Limit Future Land and Groundwater Use - Achieved by implementing perpetual land use restrictions as detailed in Section 14.
- Remedy Implementation Health and Safety - Achieved by using personal protective equipment (PPE), best management practices by on-site remedial action workers to limit direct exposure to waste or impacted soils, using chain link fencing and signage during remedial action activities to limit direct contact exposure to the general public, air monitoring for particulate and dust control to limit inhalation exposure, and following a Site-specific health and safety plan.

12.0 Remedial Design

The Site remedy includes timbering, clearing and grubbing, erosion and sedimentation control, stormwater control, groundwater monitoring well and LFG probe abandonment, utility management, excavation and relocation or disposal of surficial and buried waste from select areas, the installation of a protective cover soil system above soil and waste (i.e., a nonwoven geotextile demarcation fabric above waste and 12-inches of fill above the demarcation fabric), streambank stabilization, grading, and institutional controls. Waste from select locations in Area A, all waste from Areas B, C, and D, and waste located in the streambanks and streambeds from the unnamed tributaries of South Buffalo Creek will be removed from the Site and disposed of at a permitted facility. Waste from the eastern and northwestern portions of Area A will also be removed and relocated to the central portion of PIN 787454922 and a Notice of Environmental Contamination (Notice) plat will be prepared for this property. The Notice Plat

will include a Declaration of Perpetual Land Use Restriction (DPLUR) that will be recorded with Guilford County's Register of Deeds as detailed in Section 14.

The Site remedy is designed to be completed in phases for erosion and sedimentation control purposes. The design drawings for the Site remedy are provided in **Appendix A**. Specific details about the work to be completed by the remedy subcontractor are provided in the technical specifications located in **Appendix B**.

12.1 Permitting

The permits listed below will be obtained prior to mobilizing to implement the remedy.

- Erosion and Sedimentation Control Permit: NCDEQ's Division of Energy, Mineral and Land Resources (DEMLR)
- General Stormwater Permit for Construction Activities (i.e., National Pollutant Discharge Elimination System [NPDES] permit): NCDEQ Division of Water Resources (DWR)
- Nationwide Permit 38: USACE
- Impacts of Wetlands or Waters 404: USACE

A Declaration of Conservations, Covenants, Conditions, and Restrictions (Conservation Declaration) for the unnamed tributaries of South Buffalo Creek was enacted by the City in 2015, prohibiting the disturbance of natural features, including grading, excavation, or the alteration of vegetation. The Conservation Declaration will be temporarily removed during the remedy. Following the completion of the remedy, the Conservation Declaration will be reinstated.

12.2 Mobilization and Site Preparation

The subcontractor implementing the remedy will be licensed in North Carolina and will mobilize after participating in a pre-construction meeting and receiving Notice to Proceed. Following mobilization, site preparation activities will begin and include setting up an administrative office area, portable sanitary facilities, equipment and material staging areas, terminating electric utilities within the waste disposal area in Area A, demolition of park features, and installing site access controls. Temporary erosion and sedimentation controls as detailed in Section 12.5.1 will also be installed prior to initiating land disturbance activities.

12.2.1 Site Access and Signage

Access to the Site will be controlled during working and nonworking hours while implementing the remedy. Temporary 8-foot chain link fencing with a dust cloth, locking vehicle access gates at all construction entrances, and appropriate signage will be installed prior to remedial activities to control access to the Site. An office trailer and portable sanitary facility will be set up outside of the waste disposal areas. All visitors and subcontractors will be required to check-in at the office trailer upon arrival. Signs directing visitors to the office trailer, material or supply deliveries to staging areas, or notifying visitors of ongoing construction will be posted. Emergency contact information for non-working hours or weekends will also be posted.

The Site will be accessed from multiple locations throughout remedial implementation as shown on the design drawings. Flaggers will be used as necessary to direct heavy equipment, supply deliveries, or for trucks leaving the Site.

12.2.2 Demolition

Landscape rocks are located at the entrances to the park within Area A along Bingham Street and South English Street. A chain link fence surrounding an existing baseball field, the southern portion of a chain link fence surrounding Maplewood Cemetery, concrete basketball court and hoop, an asphalt walking path, buried electric utility lines and light posts, a footbridge across the unnamed tributary of South Buffalo Creek, and park signage are also located within Area A. All materials will be removed by the remedy subcontractor and buried within the waste disposal area beneath the protective cover soil system or disposed offsite. Park features to be removed are shown on **Sheet C-1** of the design drawings provided in Appendix A.

12.3 Clearing and Grubbing

The limits of disturbance will be logged by harvesting mature trees at the base as necessary to install temporary erosion controls and to implement the remedy. Tree stumps will be temporarily left in place so that the underlying soil is not disturbed. Useable timber that is harvested will be temporarily stockpiled and transported to a processing facility. Unsuitable timber will be mulched on-site and hauled to a permitted facility for disposal.

Once the mature trees have been removed, clearing and grubbing will be completed in phases and in locations requiring temporary erosion and sedimentation control measures. Vegetation from clearing and grubbing each phase, including stumps and root balls, will be temporarily stockpiled and hauled off for disposal at a permitted facility. No vegetation will be burned at the Site.

After the necessary erosion and sedimentation control measures have been installed for the first phase and clearing and grubbing is complete, the subcontractor will begin work activities only in the first phase. Clearing and grubbing within each subsequent phase will commence only when work activities in the previous phase have been completed, and erosion control measures have been installed.

12.4 Groundwater Monitoring Well and LFG Probe Abandonment

Groundwater monitoring wells MW-1 through -6 and LFG probes GP-1 through -10 will be abandoned by a North Carolina licensed driller in accordance with 15A NCAC 2C.0113 Well Construction Standards. The licensed driller will submit a Well Abandonment Record (Form GW-30) for each monitoring well and LFG probe to the NCDEQ's DWR. Groundwater monitoring wells and LFG probes are shown on the attached figures and drawings.

12.5 Erosion and Sedimentation Control

Temporary erosion and sedimentation control measures will be installed, maintained, and monitored in accordance with an approved Erosion and Sedimentation Control Plan that will be permitted by the NCDEQ's DEMLR Winston-Salem regional office. Temporary and permanent erosion and sedimentation controls are shown on **Sheets C-2, C-3, C-14, and CD-2, CD-3, and CD-4** of the design drawings provided

in Appendix A. A draft Erosion and Sedimentation Control Plan is provided in **Appendix C**, and a summary of the temporary and permanent erosion controls is provided below.

12.5.1 Temporary Erosion Control Measures

Temporary erosion and sedimentation control measures will be installed following mobilization or clearing activities around the perimeter of the limits of disturbance. Temporary controls include gravel construction entrances, temporary fencing with dust cloths, wattle barriers, water bars, silt fences, super silt fences, silt fence outlets, below grade and above grade washout structures, temporary sediment traps, and temporary swales.

Gravel construction entrances will be installed along Bingham Street, South English Street, and Avalon Road at the locations shown on Sheets C-2 and C-3 to reduce track-out onto the roads. Soils tracked onto the roads while implementing the remedy will be removed by the subcontractor. Tire wash stations will be installed, if necessary, to minimize track-out by vehicles leaving the Site.

In accordance with the Erosion and Sedimentation Control permit, disturbed areas will be stabilized with temporary or permanent vegetation within 14 days of completing work. An NPDES permit for construction activities will be issued with the approved Erosion and Sedimentation Control permit. Per the NPDES permit, the erosion controls will be visually inspected by the remediation subcontractor once per seven calendar days or within 24 hours of a precipitation event greater than 1 inch. Each inspection will be documented in accordance with the permit.

Temporary erosion control measures will be removed from each phase once work is complete, and the phase has been stabilized. An inspection by DEMLR will be requested to close the Erosion and Sedimentation Control permit after establishing permanent grass and removing the perimeter temporary erosion controls along the limits of disturbance.

12.5.2 Permanent Erosion Control Measures

Permanent erosion control measures include final grades that ensure positive surface water runoff and grass vegetation for all disturbed areas. The grading plan is provided on **Sheet C-5** of the design drawings provided in Appendix A.

Permanent grass will be installed for all disturbed areas per the seeding plan provided on Sheet C-14 of the design drawings in Appendix A. The permanent seed mix consists of turf grass native to the area that includes fescue, lespedeza, and other seasonal grasses. A specific slope seed mix designed to stabilize slopes will also be used in several areas as shown on the seeding plan in the design drawings and a wetland seed mix will be used in the wetland area.

12.6 Topsoil and Cover Soil Stripping

Topsoil and cover soil above waste will be stripped and used with the protective cover soil system or as common fill. Soils removed for installed temporary erosion controls will also be reused, if possible. Excavated soils will be temporarily stockpiled and sampled to evaluate the geotechnical properties of the soils and to determine the amendments needed to establish and support permanent grass growth. Samples will also be collected to determine if the soils meet unrestricted use per the Special Remediation Branch's Guidelines for Addressing Pre-Regulatory Landfills and Dumps, February 2025

(Guidance Document). Conformance testing requirements for these soils are provided in the sub sections of Section 12.9 and the Guidance Document is provided in **Appendix D**.

Test pits will be completed within each phase to confirm the depth to waste and the thickness of the topsoil and cover soil prior to initiating excavation activities in that phase. Unsuitable soils, if encountered, will be buried with waste beneath the protective cover soil system. Based on boring data from the remedial investigations, approximately 3,400 cys of cover soils are estimated to potentially be useable with the protective cover soil system once harvested.

12.7 Waste Excavation, Relocation, and Disposal

Approximately 84,705 cys of waste will be excavated and relocated onsite or disposed of offsite at a permitted facility. Locations where waste will be removed with estimated volumes are provided below with cross sections shown on **Sheets C-4, C-10, and C-11** of the design drawings provided in Appendix A.

12.7.1 Waste Relocation Onsite

Approximately 28,555 cys of waste will be removed from the northeast and north central portions of Area A and relocated onsite beneath the protective cover soil system in the center of Area A as shown on the design drawings provided in Appendix A. Heavy equipment will be used to compact relocated waste following installation.

12.7.2 Waste Disposal Offsite

Approximately 56,150 cys of waste will be removed from Areas B through D and the northern, western, and southern portions of Area A as listed below and disposed of offsite at the Great Oak Landfill located in Randleman, North Carolina (Facility Permit No. 7607-MSWLF-2015). No waste will be disposed of at the White Street Landfill. Locations where waste will be removed with estimated volumes are provided below and shown in the design drawings provided in Appendix A.

- Area A: 42,600 cys
- Area B: 150 cys
- Area C: 10,700 cys
- Area D: 2,700 cys

Waste removed from Areas A through D will be backfilled with common fill and compacted with heavy equipment or tamper, except along the stream in Areas A, C, and D. The streambanks will be stabilized as discussed in Section 12.7.4. Leachate, if encountered during excavation activities, will be disposed of in a sump excavated within the larger waste disposal area. The leachate may be temporarily containerized or pumped directly from the excavated area from which it accumulated. Leachate will not be allowed to leave the limits of disturbance.

Once excavation activities have begun and waste is exposed, the entire area of exposed waste will be temporarily covered with a tarp or equivalent at the end of each workday. There will be no exposed waste during nonworking hours or stormwater runoff producing events.

12.7.3 Air Monitoring and Dust Control

Air monitoring will be conducted for particulates and total VOCs during waste excavation activities. Monitoring stations will be setup with respect to accessibility, wind direction, and the potential for exposure beyond the limits of disturbance or parcel boundaries as shown on Sheet C-1 of the design drawings provided in Appendix A. Upwind air monitoring stations will be used to establish baseline air quality conditions and downwind monitors will be used to detect airborne contaminants resulting from remedial activities. Dust will also be controlled by wetting dry areas with potable water. Additionally, all waste leaving the Site will be wrapped and fully covered in lined dump trucks.

If monitoring indicates elevated levels of particulates or total VOCs, work will be halted to prevent further emissions. Corrective actions will be taken (e.g., dust suppression, covering waste and stockpiles, updated PPE) and documented prior to resuming work. If detections are noted beyond the limits of disturbance, property owners will be notified, and air quality data will be provided.

12.7.4 Streambank Stabilization

Approximately 1,220 linear feet of the unnamed tributaries of South Buffalo Creek, which is also a Federal Emergency Management Agency Zone AE flood hazard area (i.e., 1 percent annual chance of a flood hazard) within a regulated floodway, are located within the waste disposal areas. Additionally, sewer and fiber optic utility lines are near the streams. After excavating waste from the unnamed tributaries of South Buffalo Creek in Area A, the existing slopes will be flattened to provide slope stability and stormwater control. Impacts to utilities will be minimized by using engineered bank stabilization and stabilization around sewer outfalls as shown on **Sheets C-7 and C-8** of the design drawings provided in Appendix A.

The streambank stabilization design re-establishes riparian buffer and stream corridor topography while constructing a channel to re-establish the stream's bankfull elevation with flatter side slopes. This will be achieved with five- to ten-foot-wide bankfull benches or regraded banks with flatter slopes to enhance hydraulic conductivity. Banks will also be reconstructed using high performance turf reinforcement, geotextile fabric, and ScourLok™ for stability that protects infrastructure. Additionally, J-hooks, rock vanes, and log vanes will be installed in-stream to redirect flow and reduce near-bank stress. Native vegetation will be installed with stone toe protection to reinforce banks and promote vegetative recovery.

12.7.5 Confirmatory Soil Sampling

Native soils located beneath waste that is removed from Areas A through D will be sampled by CDM Smith to evaluate impacts from the waste. The soil samples will be collected and managed in accordance with CDM Smith's Standard Operating Procedures and Quality Assurance Manual that was prepared to support PRLF Unit sites. A 100-foot grid will be established in areas where waste was excavated. Five soil borings will be advanced within each grid and will include one boring in the center of the grid and four offset borings located approximately 25 feet away from the center boring to the northeast, southeast, southwest, and northwest, if possible. Native soil sample locations will be modified for grids that are less than 10,000 square feet or have obstructions. Each boring will be advanced from the surface (i.e., 0 inches bgs) to 1-foot bgs. One grab sample will be collected from the center boring of each grid and analyzed for VOCs by U.S. Environmental Protection Agency (EPA) Method 8260D. One composite

sample will also be collected from each grid using the center and offset borings and will be analyzed for semi-VOCs and 1,4-dioxane by EPA Method 8270E, total metals (i.e., antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, nickel, selenium, silver, thallium, vanadium, and zinc) by EPA Method 6020B, mercury by EPA Method 7471B, hexavalent chromium by EPA Method 7199, ammonia by EPA Method 350.1, and nitrate and sulfate by EPA Method 9056A. One duplicate sample set will be collected daily for quality control. The sampling results will be provided based on a 3-day laboratory turnaround time to maintain the remedy schedule.

Analytical results from the native soil borings will be evaluated using the iterative truncation procedure per the Guidance Document provided in Appendix D to determine if the native soil meets unrestricted use. Native soil that does not meet unrestricted use will be excavated and disposed of within the waste disposal area beneath the protective cover soil system. Common fill will be installed and compacted to the design grade following the removal of impacted native soils. The Guidance Document is provided in Appendix D.

12.7.6 Tires

Tires encountered during waste excavation or surficial waste removal activities will be segregated, temporarily stockpiled, and disposed of at a permitted recycling facility. Tires will not be disposed of at a landfill.

12.7.7 Management of Suspect Asbestos Containing Materials

Buried waste at the Site has been found to include non-friable (i.e., cannot be pulverized under manual pressure) asbestos containing materials (ACM), and there is potential for additional ACM to be encountered during remedial activities. Excavation of waste will be overseen by a North Carolina accredited asbestos inspector.

An Asbestos Management Plan will be prepared by the remedy subcontractor prior to commencing waste excavation or surficial waste removal activities. The Asbestos Management Plan will be submitted to the North Carolina Department of Health and Human Services Health Hazards Control Unit for approval and will include sampling suspect materials to confirm the presence or absence of asbestos fibers and to determine where to properly dispose of the materials, keeping friable or nonfriable asbestos materials wet to limit emissions, containerizing asbestos materials, using closed-cab equipment while handling the materials, and performing air monitoring to ensure emission controls are adequate. No ACM will be buried within the waste disposal area beneath the protective cover soil system.

12.8 Utilities

12.8.1 Vitrified Clay Pipe Sanitary Sewer

A 12-inch diameter underground vitrified clay pipe (VCP) sanitary sewer line traverses the waste disposal area along the southern boundary in Area A. The VCP sanitary sewer line crosses South English Street and traverses through the center of Area C as a 12-inch diameter polyvinyl chloride sanitary sewer line. An 8-inch diameter VCP sanitary sewer line that runs north-south is also located in the center of Area D. Sanitary sewer utility locations are shown on Sheet C-1.

To ensure uninterrupted sanitary sewer service, a sanitary sewer pump-around system will be installed to pump sewage around sections of the existing sanitary sewer lines when remedial action activities are being implemented in close proximity to the sanitary sewer line. Installation and operation of the sanitary sewer pump-around system will be coordinated with the City's Department of Water Resources to obtain necessary approvals. Upon completion of the remedial action, the sanitary sewer pump-around system will be decommissioned.

Although extreme care will be exercised when working in the vicinity of the VCP sanitary sewer line, there is potential for damage to occur given the material of the pipe. Closed-circuit television video inspections of the VCP sanitary sewer line will be performed prior to initiation of the remedial action activities and upon completion of phases of the remedial action to assess visible damage that may have been caused by the remedial action. Reports documenting pre-existing damage to the VCP sanitary sewer line and potential new damage to the line caused by remedial action activities will be provided to the Department of Water Resources. If a portion of the VCP sanitary sewer line is found to have been damaged by remedial activities, the damaged portion of the VCP sanitary sewer line will be removed and replaced with ductile iron pipe.

12.8.2 Fiber Optic

An underground fiber optic utility is located in the northern portion of Area C as shown on Sheet C-1 of the design drawings in Appendix A. Following mobilization, the owner of the fiber optic utility will terminate the underground line and install a new line outside of the waste disposal area.

12.9 Protective Cover Soil System

A protective cover soil system consisting of 12-inches of fill will be installed above waste. An orange nonwoven geotextile demarcation fabric will also be installed above waste below the protective cover soil system. The 12-inches of fill may include 6-inches of common fill and 6-inches of topsoil with permanent seed, or common fill amended to support grass growth may be used for the 12-inches of soil.

Existing topsoil and cover soil above waste will be harvested and used with the protective cover soil system to the extent possible. Soils excavated to install temporary erosion controls outside of the waste disposal areas may also be used to construct the protective cover soil system. Soils from an approved borrow source will be used as necessary to support construction of the protective cover soil system.

12.9.1 Warning Layer

An orange nonwoven geotextile fabric will be installed above waste once the area has been graded and compacted. The geotextile warning layer will alert anyone performing excavation activities who may be unaware of the presence of buried waste and will serve as a visual marker for when the protective cover soil has been compromised and requires repair. An orange geotextile fabric was selected for the visual marker because of the high visibility provided by the color. The nonwoven geotextile fabric will be tested for quality control in accordance with specification Section 310519.13 provided in Appendix B. The manufacturer of the geotextile fabric will provide a 2-year warranty on a prorated basis against manufacturing defects and material degradation from the date of installation.

12.9.2 Existing Soil

Cover soil and soils excavated to install temporary erosion controls outside of the waste disposal areas will be sampled for the following geotechnical analyses to evaluate the compatibility of the soils for use with the protective cover system or common fill:

- Atterberg Limits by American Society for Testing and Materials (ASTM) D4318;
- Grain size with hydrometer by ASTM D422;
- Hydraulic Conductivity by ASTM D2434;
- Interface Friction Angle by ASTM D5321;
- Moisture-Density Relationship by ASTM D698; and
- Natural Moisture by ASTM D2216.

CDM Smith will collect the samples in accordance with the Guidance Document provided in Appendix D and analyze them for the same analytes using the same analyses as the native soil samples. Analytical results will be evaluated per the Guidance Document to determine if the soil meets unrestricted use.

Approximately 3,400 cys of soil is estimated to be harvested from the Site. The soil will be analyzed per the above list at a frequency of every 5,000 cys or change in material, except for hydraulic conductivity and the interface friction angle test. One test will be conducted for hydraulic conductivity and one test for interface friction angle. The interface friction angle test will be conducted using soil from the Site, or the borrow source, and the nonwoven geotextile warning layer to ensure stability in areas where the warning layer will be installed on slopes. The soil will have an interface friction angle of at least 28.5 degrees when tested with the nonwoven geotextile warning layer.

12.9.3 Compaction

Soils harvested from the Site or imported from a borrow source that are used to construct the protective cover soil system will be compacted to 95 percent of the standard Proctor maximum dry density. Some of the soils will be used as common fill for backfilling excavated waste areas or for grading. Common fill will be compacted to 95 percent of the standard Proctor maximum dry density. Compaction testing of the protective cover soil system and common fill will be completed at a frequency of one test per lift per 10,000 square feet.

12.9.4 Borrow Source

Approximately 9,700 cys of topsoil and 58,100 cys of common fill are estimated to be needed from an approved borrow source to support the construction of the protective cover soil system, backfilling waste removal areas, or grading. CDM Smith will collect common fill samples in accordance with the Guidance Document provided in Appendix D from a borrow source located near the Site and analyze them for the same analytes using the same analyses as the native soil samples plus iron. Analytical results from the borrow source soil samples will be evaluated using the Borrow Soil Evaluation Process per the Guidance Document to determine if the borrow source soil meets unrestricted use. Samples of the borrow source common fill will also be collected and submitted to a geotechnical laboratory for grain size, hydraulic conductivity, and Atterberg limits testing. The soil will be analyzed per the above list

at a frequency of every 5,000 cys or change in material, except for hydraulic conductivity. Three tests will be conducted for hydraulic conductivity.

12.10 Signage

Subsurface waste markers indicating the presence of contamination and restricting the disturbance of soil and/or access will be installed at select locations around the perimeter of the waste disposal areas as shown on Sheets C-5 and CD-1 of the design drawings provided in Appendix A. Markers will be flush-mounted and manufactured from granite. The markers will display the following:

NOTICE
SUBSURFACE WASTE
CONTACT THE PROPERTY OWNER
REGARDING LAND USE RESTRICTIONS
PRIOR TO DISTURBING SOIL

12.11 Permanent Fencing

The chain link fence removed from Maplewood Cemetery in Area A will be reinstalled following completion of the remedy. The fence will tie-in to the existing fence and run along the southern southeastern boundary of the property.

13.0 Demobilization

Upon completion of all work activities, temporary items, stockpiles of excess materials or supplies, and other signs of construction activities will be removed. PPE and other waste materials generated while implementing the remedy will be properly disposed of in accordance with local, state, and federal laws and regulations. Areas where waste removal activities occurred will be left in a clean and stabilized condition prior to fully demobilizing from the Site.

14.0 Institutional Controls

As part of the remedy, perpetual land use restrictions will be placed on PIN 7874545922. A draft Notice plat showing the waste disposal area will be prepared in accordance with the Special Remediation Branch's Instructions for Preparing a Survey Plat for Recordation and Guilford County's Register of Deeds requirements. A DPLUR will also be prepared by the PRLF Unit and will accompany the Notice plat during recordation with the Register of Deeds.

15.0 Budget Cost Estimate

The budget for the Site remedy is estimated to be approximately \$15,000,000, which includes \$7,000,000 from the PRLF Unit. The estimated cost will cover the implementation of the remedy, management, oversight, and confirmatory soil sampling.

16.0 Remedial Action Schedule

The estimated schedule for completing the Site remedy is presented below.

Task	Schedule
Remedy Implementation	A pre-construction meeting will be held within one month of finalizing the contract with the remedy subcontractor. Mobilization will occur shortly after the meeting. The remedy is estimated to be completed in 16 months.
Remedy Completion Report	A draft remedy completion report will be submitted to the PRLF Unit within 45 days of receiving approval from DEMLR to close the Erosion and Sedimentation Control permit.
Notice Plat and DPLUR Recordation	The Notice plat and DPLUR will be recorded following the implementation of the remedy.

17.0 References

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Figures

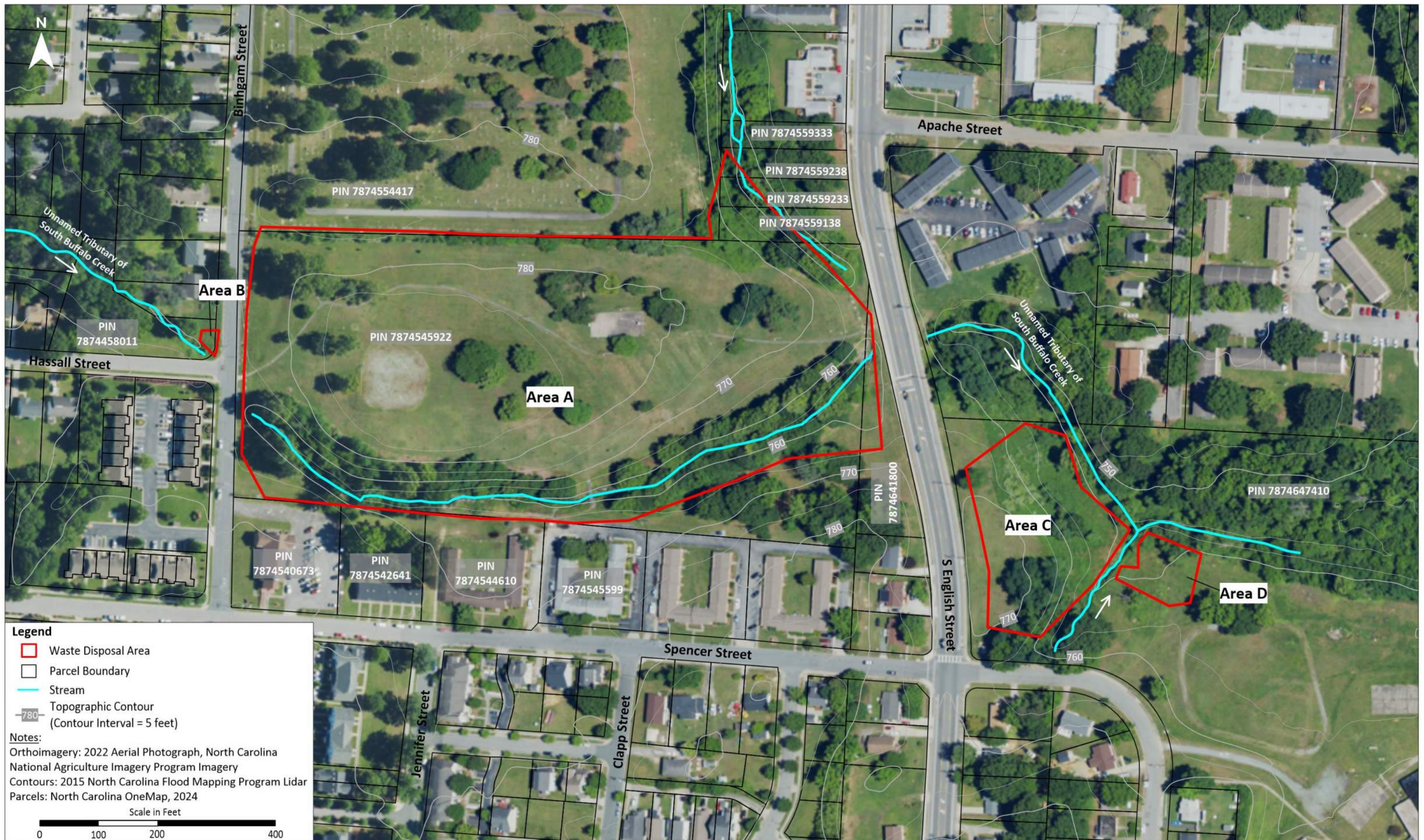


Figure 1-1 - Site Map
 Bingham Park
 Site ID: NONCD0000244
 Greensboro, Guilford County, North Carolina

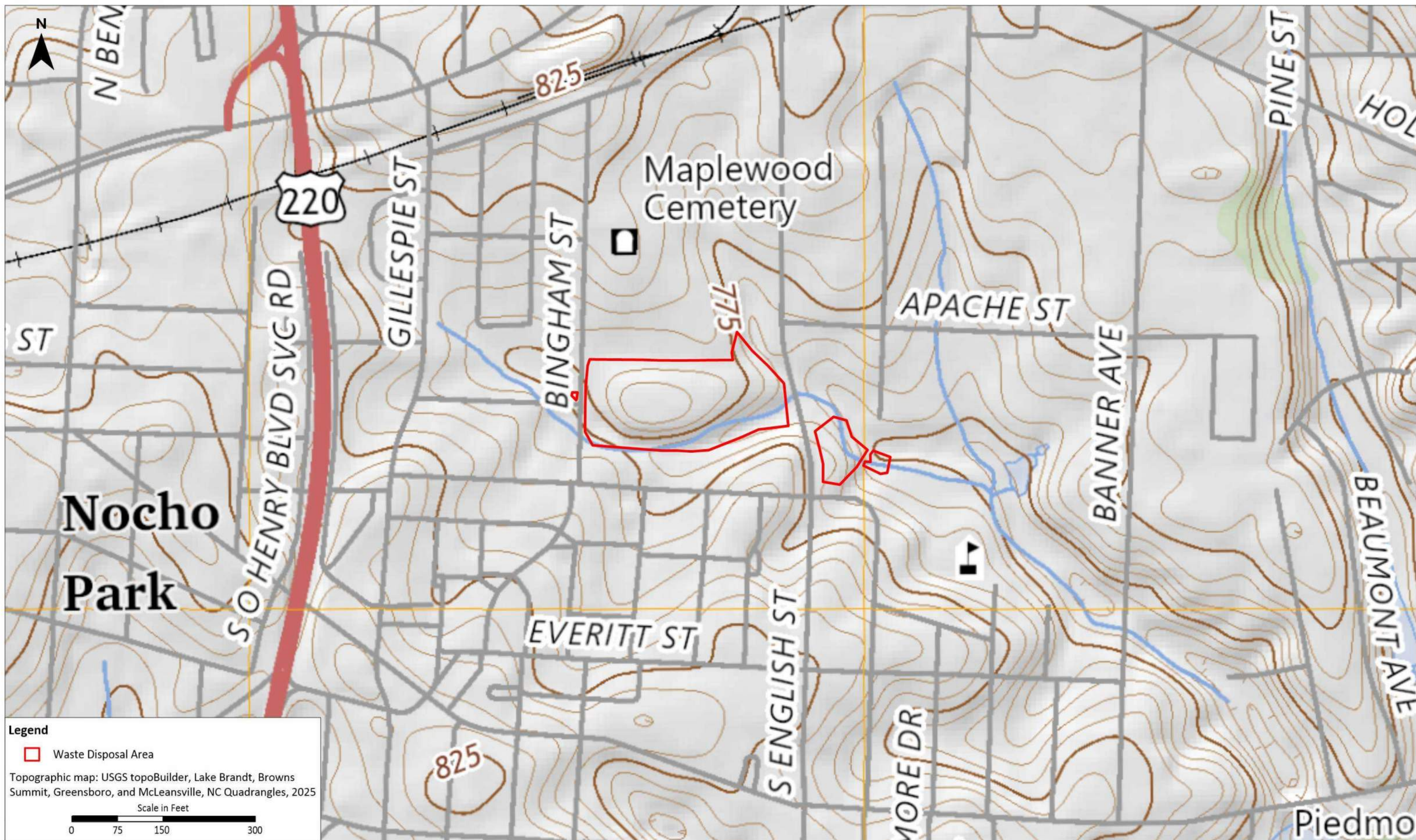


Figure 1-2 - United States Geological Survey Topographic Map

Bingham Park

Site ID: NONCD0000244

Greensboro, Guilford County, North Carolina

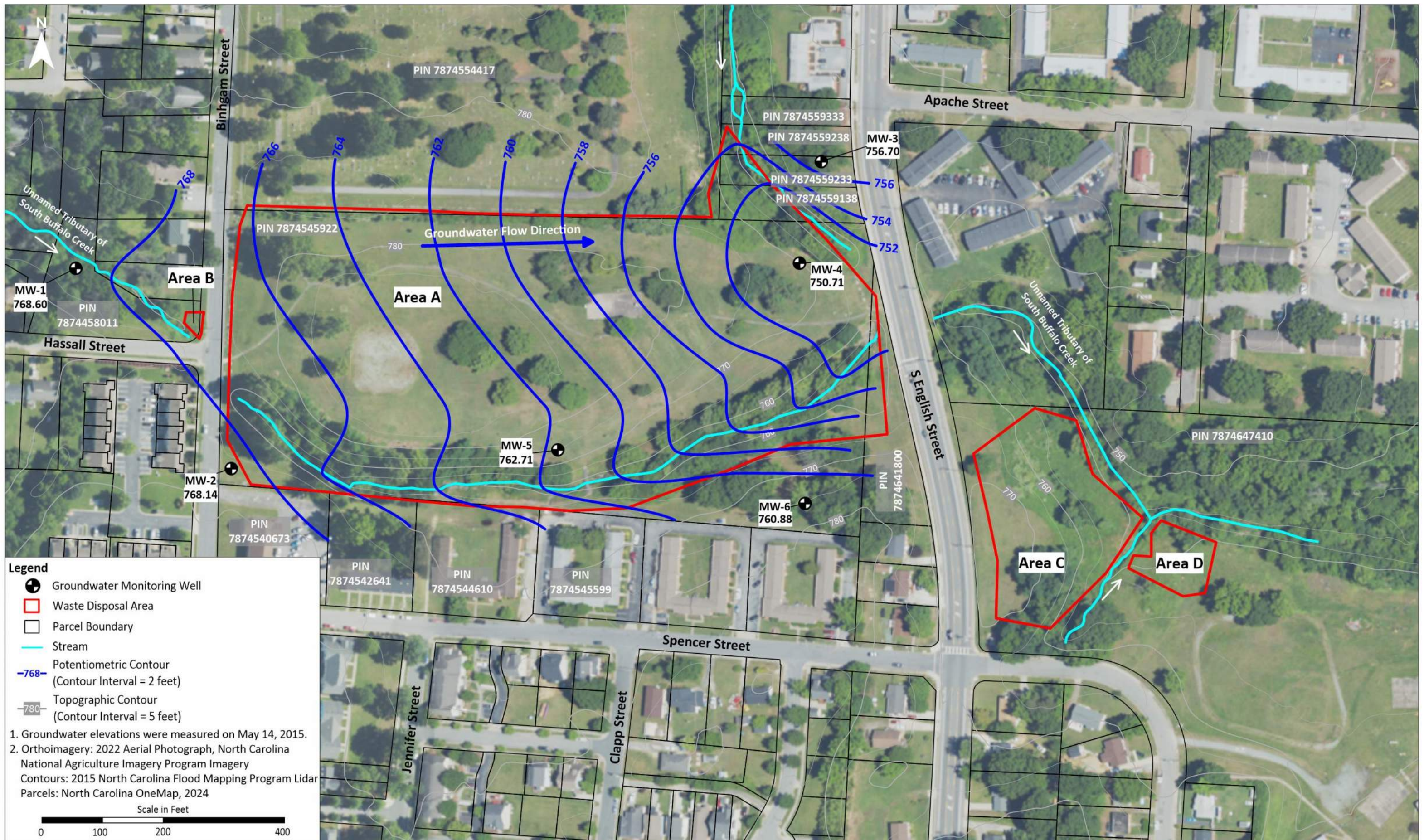


Figure 3-1 - Potentiometric Surface Map

Bingham Park
 Site ID: NONCD0000244
 Greensboro, Guilford County, North Carolina



Figure 4-1 - Sensitive Environments Map

Bingham Park
 Site ID: NONCD0000244
 Greensboro, Guilford County, North Carolina

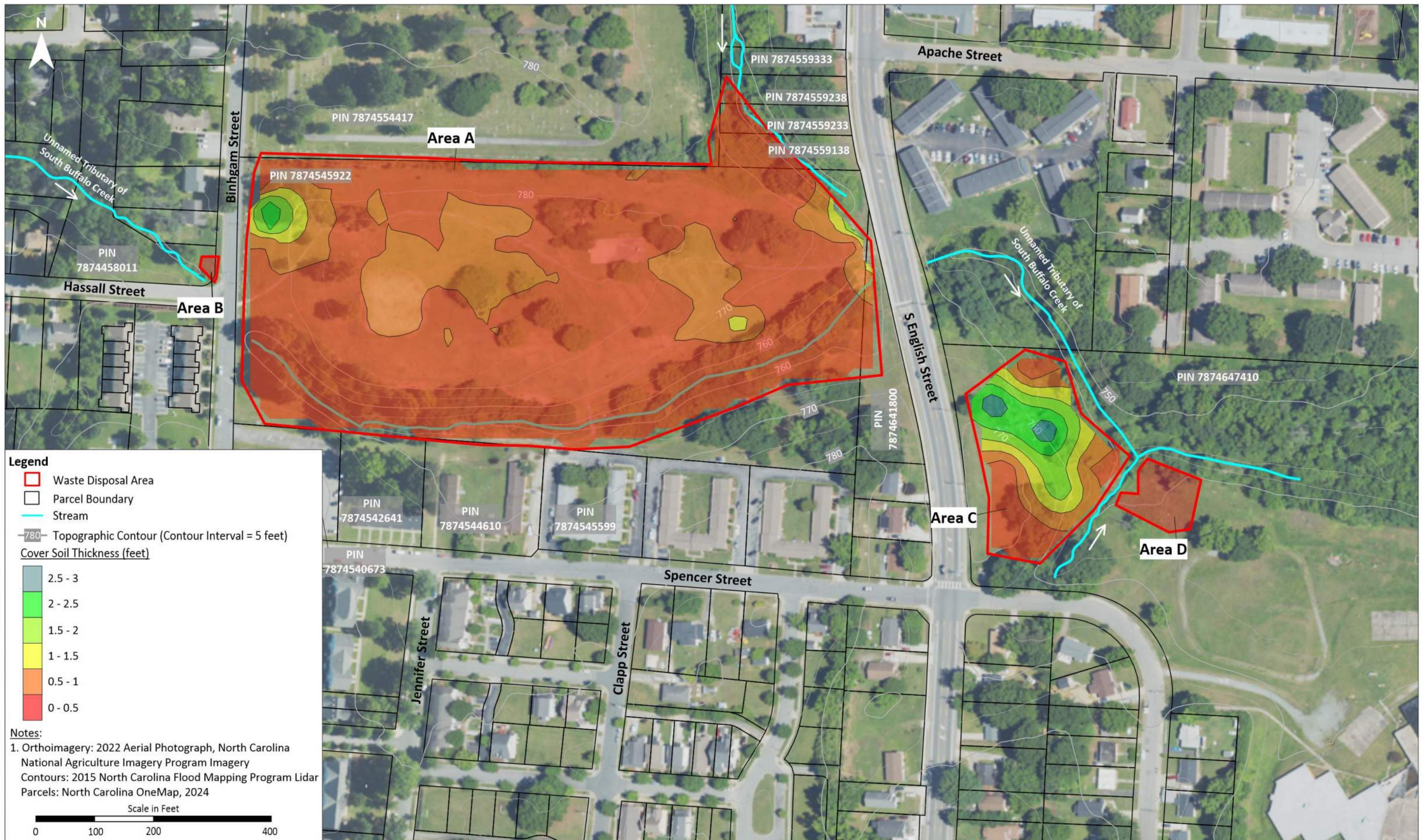


Figure 6-1 - Cover Soil Thickness Map

Bingham Park
 Site ID: NONCD0000244
 Greensboro, Guilford County, North Carolina



Figure 8-1 Background Soil Boring Locations

Bingham Park
 Site ID: NONCD0000244
 Greensboro, Guilford County, North Carolina

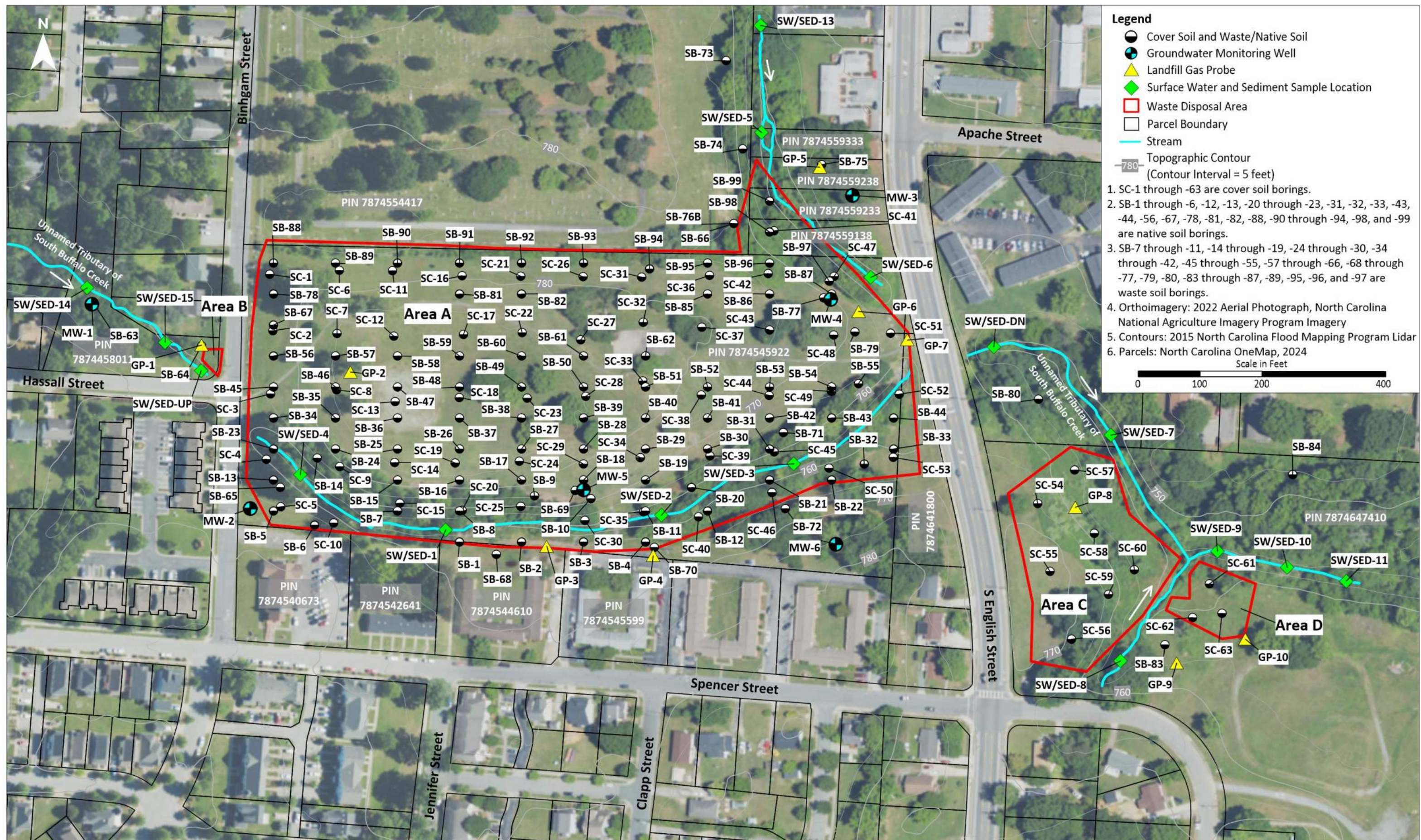


Figure 9-1 - Media Sample Locations

Bingham Park

Site ID: NONCD0000244

Greensboro, Guilford County, North Carolina

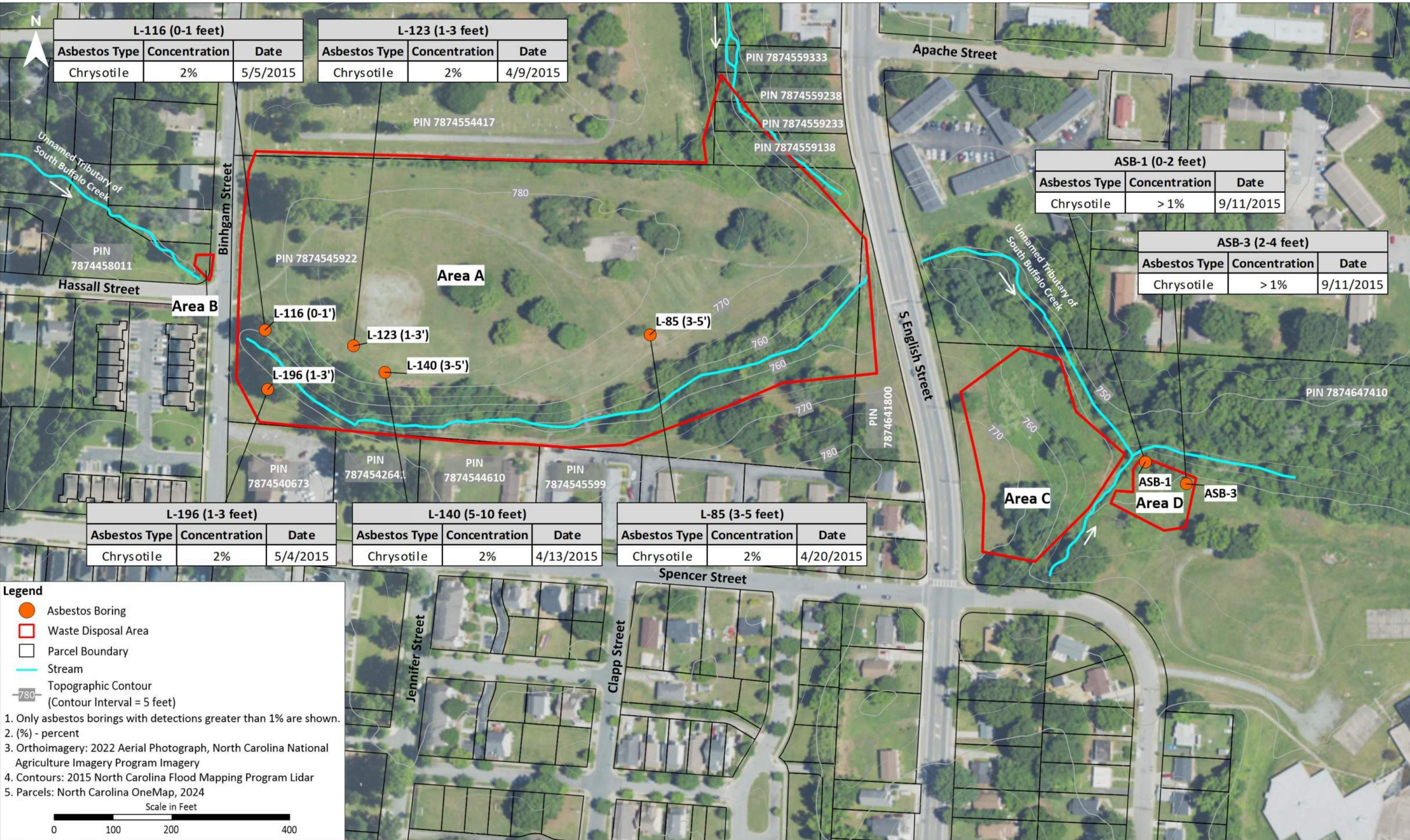


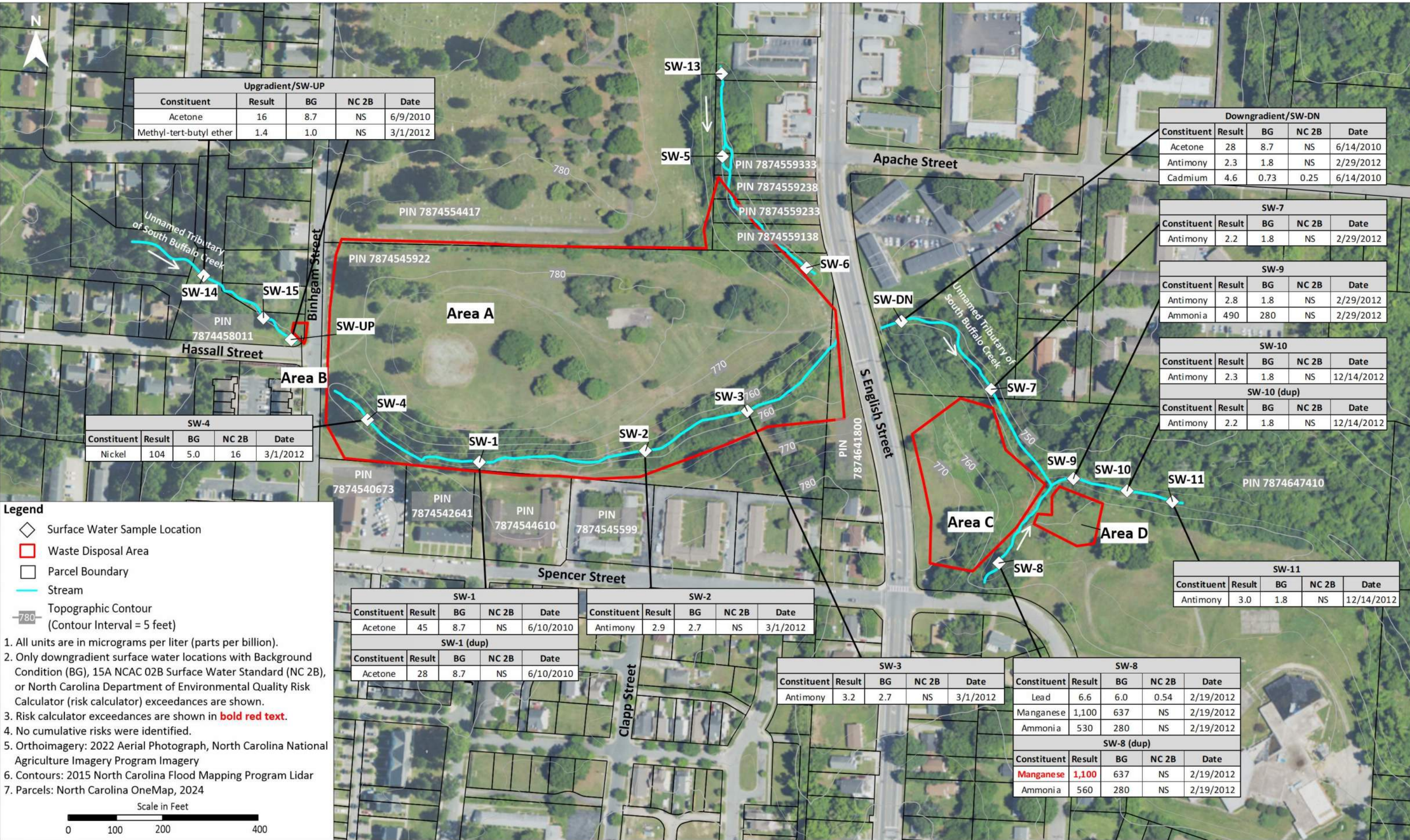
Figure 9-2 - Asbestos Detections Map

Bingham Park
Site ID: NONCD0000244
Greensboro, Guilford County, North Carolina



Figure 9-3 - Native Soil Beneath Waste Lead Analytical Exceedances Map

Bingham Park
 Site ID: NONCD0000244
 Greensboro, Guilford County, North Carolina



Upgradient/SW-UP				
Constituent	Result	BG	NC 2B	Date
Acetone	16	8.7	NS	6/9/2010
Methyl-tert-butyl ether	1.4	1.0	NS	3/1/2012

Downgradient/SW-DN				
Constituent	Result	BG	NC 2B	Date
Acetone	28	8.7	NS	6/14/2010
Antimony	2.3	1.8	NS	2/29/2012
Cadmium	4.6	0.73	0.25	6/14/2010

SW-7				
Constituent	Result	BG	NC 2B	Date
Antimony	2.2	1.8	NS	2/29/2012

SW-9				
Constituent	Result	BG	NC 2B	Date
Antimony	2.8	1.8	NS	2/29/2012
Ammonia	490	280	NS	2/29/2012

SW-10				
Constituent	Result	BG	NC 2B	Date
Antimony	2.3	1.8	NS	12/14/2012

SW-10 (dup)				
Constituent	Result	BG	NC 2B	Date
Antimony	2.2	1.8	NS	12/14/2012

SW-11				
Constituent	Result	BG	NC 2B	Date
Antimony	3.0	1.8	NS	12/14/2012

SW-1				
Constituent	Result	BG	NC 2B	Date
Acetone	45	8.7	NS	6/10/2010
SW-1 (dup)				
Constituent	Result	BG	NC 2B	Date
Acetone	28	8.7	NS	6/10/2010

SW-2				
Constituent	Result	BG	NC 2B	Date
Antimony	2.9	2.7	NS	3/1/2012

SW-3				
Constituent	Result	BG	NC 2B	Date
Antimony	3.2	2.7	NS	3/1/2012

SW-8				
Constituent	Result	BG	NC 2B	Date
Lead	6.6	6.0	0.54	2/19/2012
Manganese	1,100	637	NS	2/19/2012
Ammonia	530	280	NS	2/19/2012
SW-8 (dup)				
Constituent	Result	BG	NC 2B	Date
Manganese	1,100	637	NS	2/19/2012
Ammonia	560	280	NS	2/19/2012

- Legend**
- ◇ Surface Water Sample Location
 - Waste Disposal Area
 - Parcel Boundary
 - Stream
 - Topographic Contour (Contour Interval = 5 feet)
1. All units are in micrograms per liter (parts per billion).
 2. Only downgradient surface water locations with Background Condition (BG), 15A NCAC 02B Surface Water Standard (NC 2B), or North Carolina Department of Environmental Quality Risk Calculator (risk calculator) exceedances are shown.
 3. Risk calculator exceedances are shown in **bold red text**.
 4. No cumulative risks were identified.
 5. Orthoimagery: 2022 Aerial Photograph, North Carolina National Agriculture Imagery Program Imagery
 6. Contours: 2015 North Carolina Flood Mapping Program Lidar
 7. Parcels: North Carolina OneMap, 2024



Figure 9-4 - Surface Water Analytical Exceedances Results Map

Bingham Park

Site ID: NONCD0000244

Greensboro, Guilford County, North Carolina

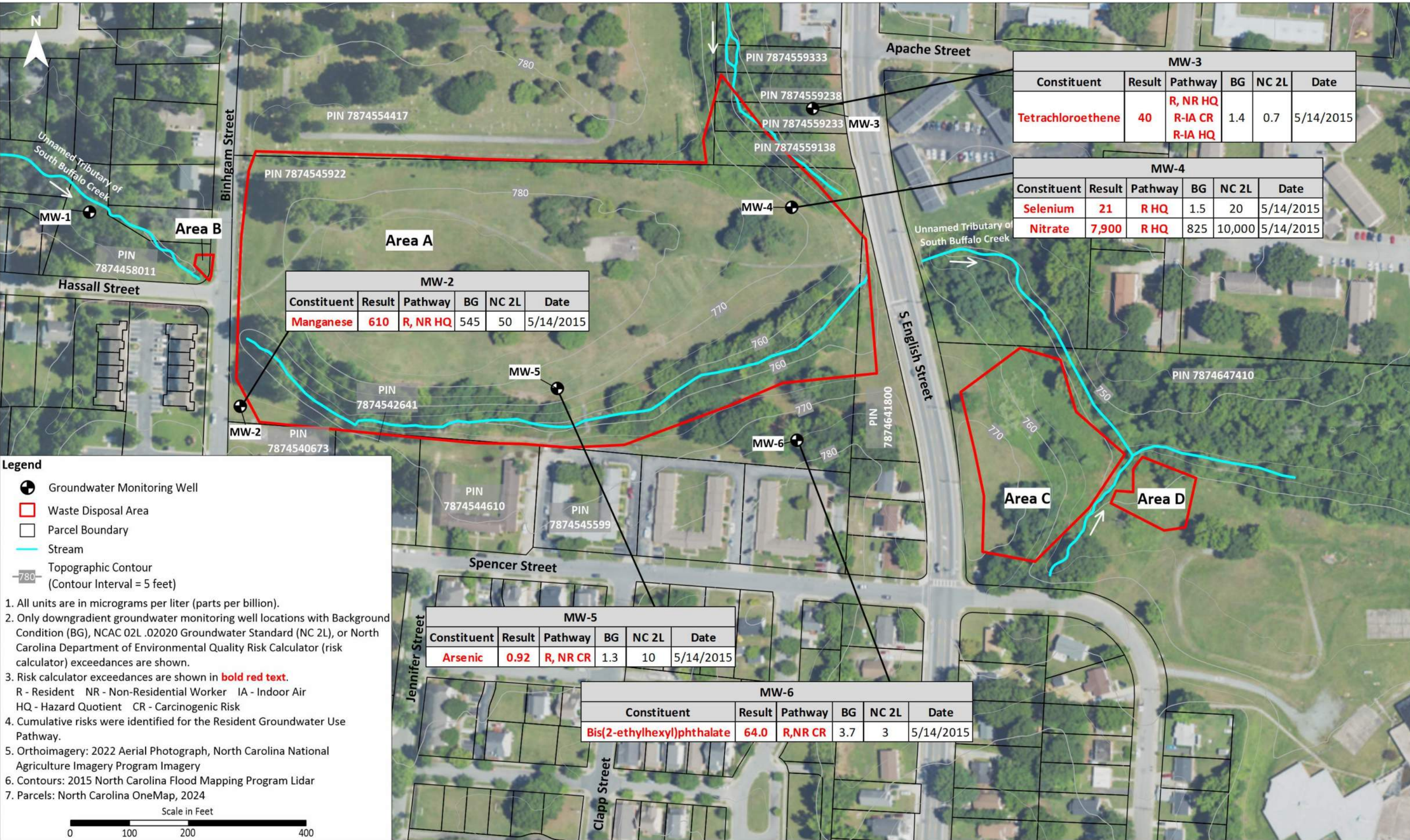


Figure 9-5 - Groundwater Analytical Exceedances Results Map

Bingham Park
Site ID: NONCD0000244
Greensboro, Guilford County, North Carolina

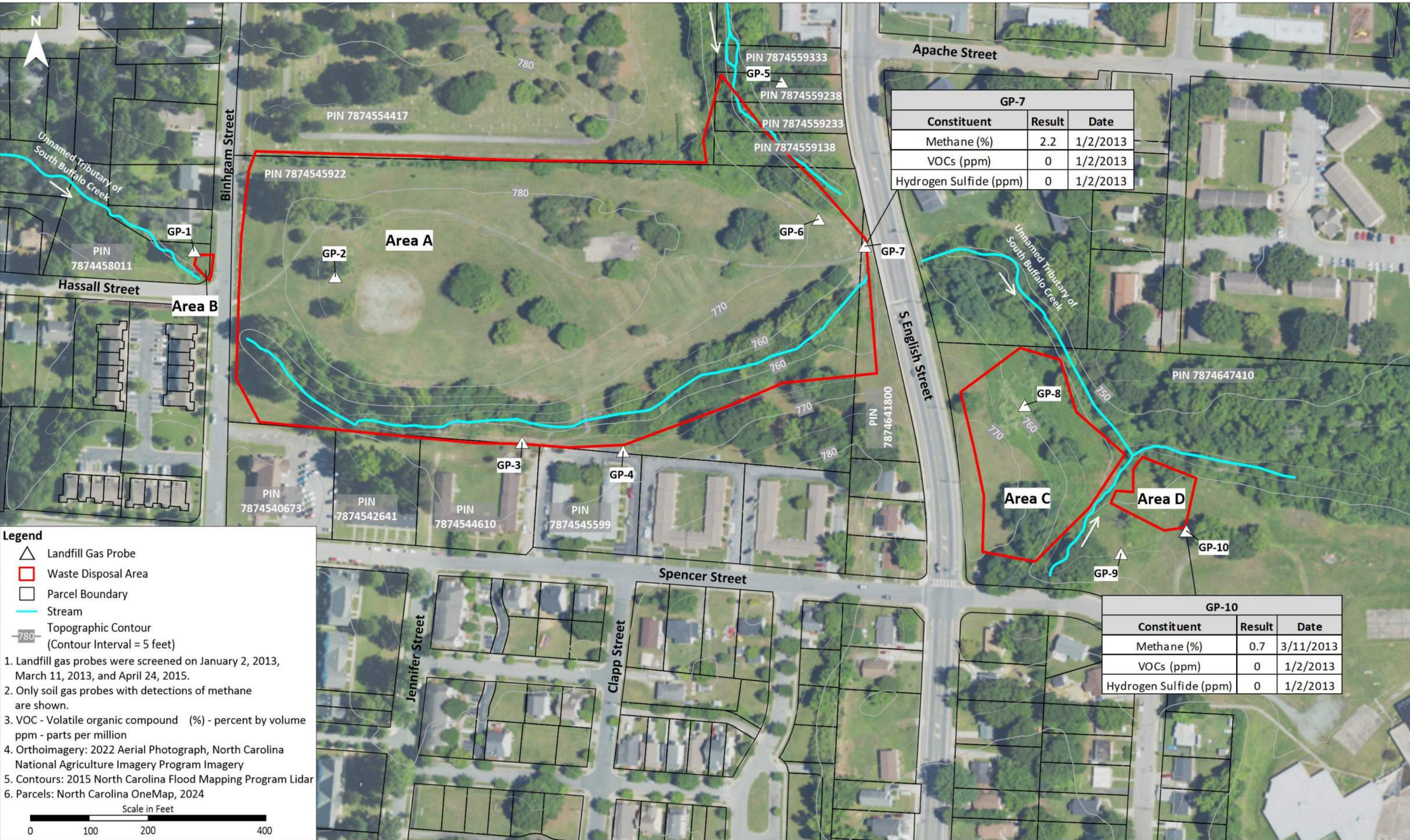


Figure 9-6 - Subsurface Landfill Gas Screening Results Map

Bingham Park
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Greensboro, Guilford County, North Carolina

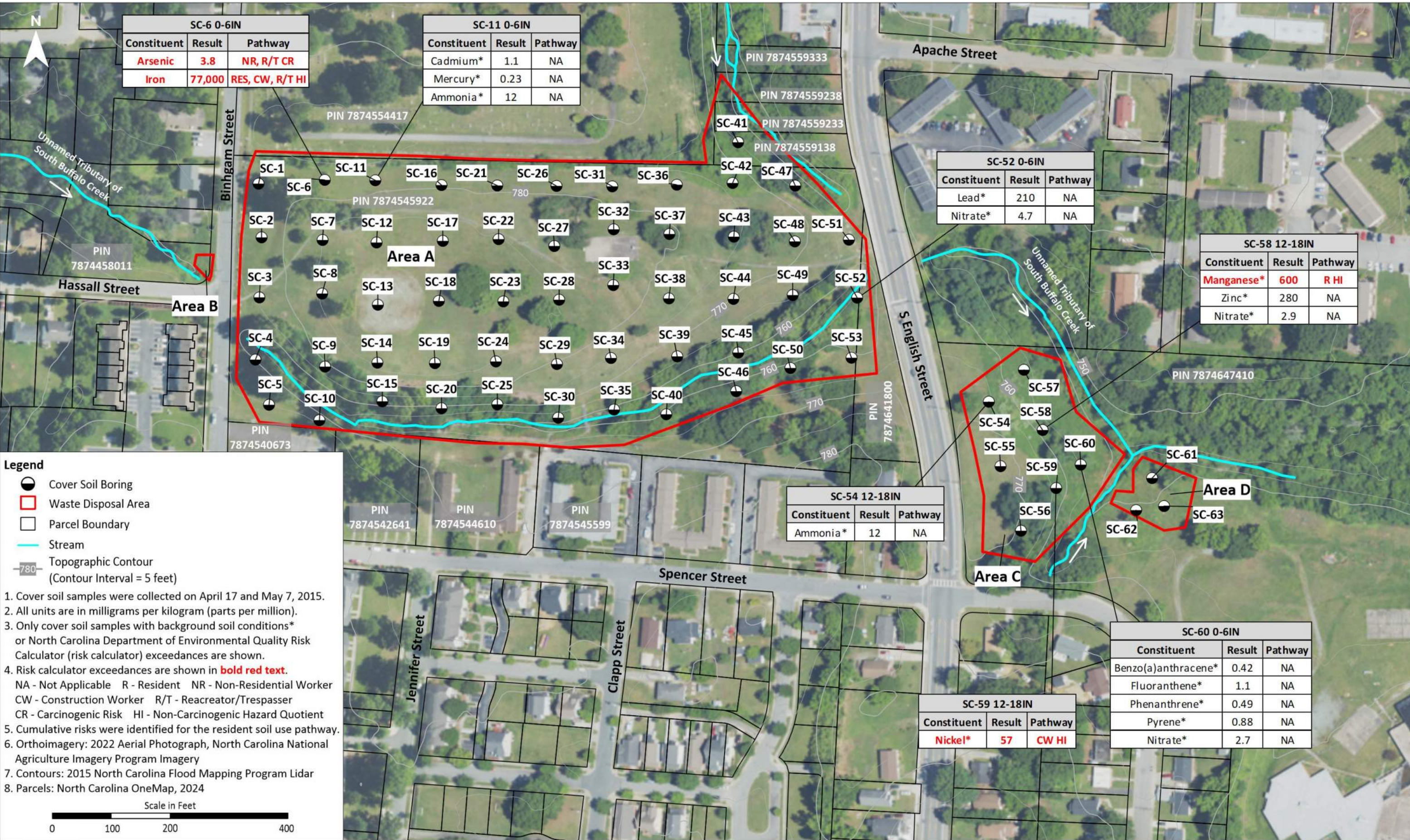


Figure 10-1 - Cover Soil Analytical Exceedances Results Map

Bingham Park

Site ID: NONCD0000244

Greensboro, Guilford County, North Carolina

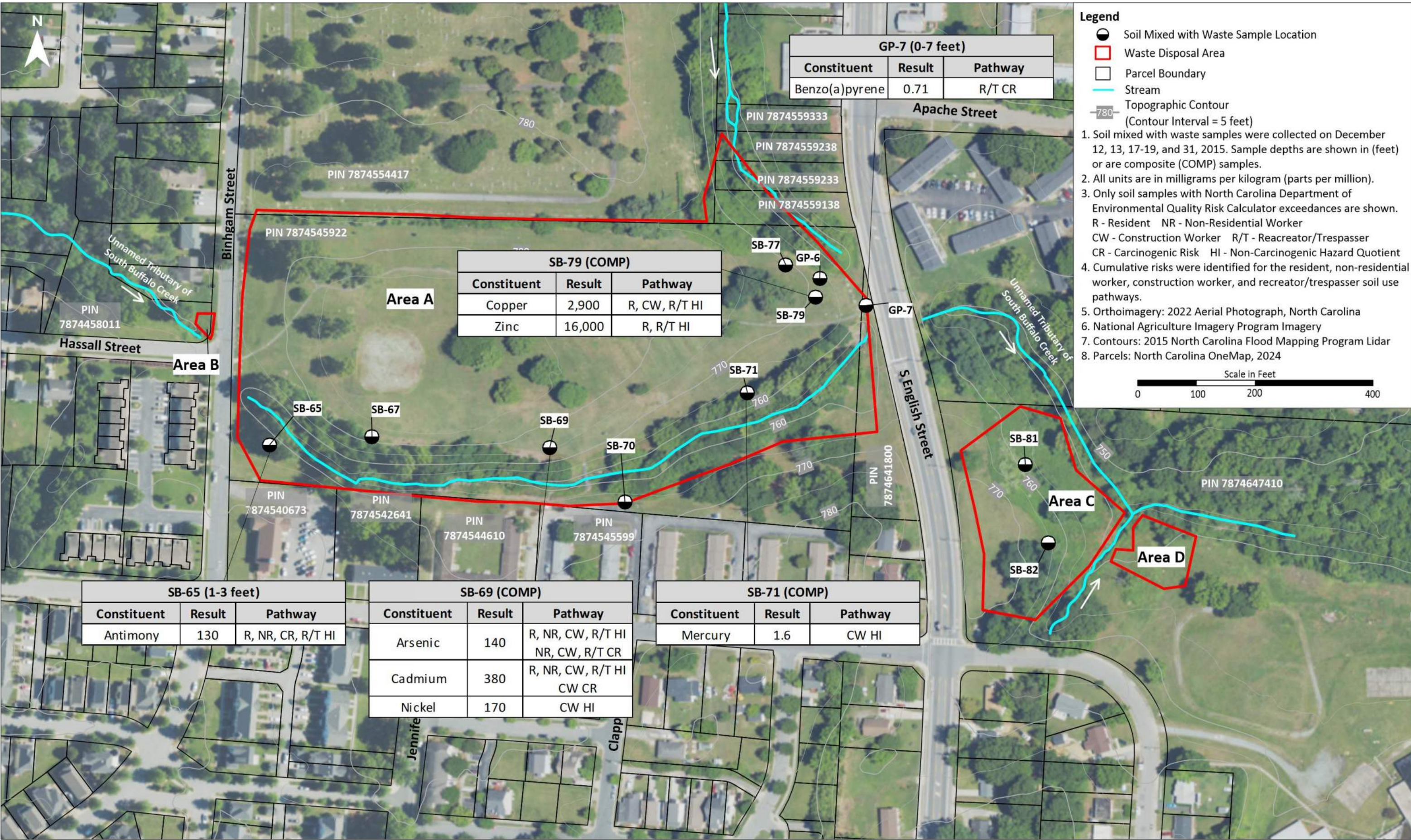


Figure 10-2 - Soil Mixed with Waste Analytical Exceedances Results Map

Bingham Park

Site ID: NONCD0000244

Greensboro, Guilford County, North Carolina

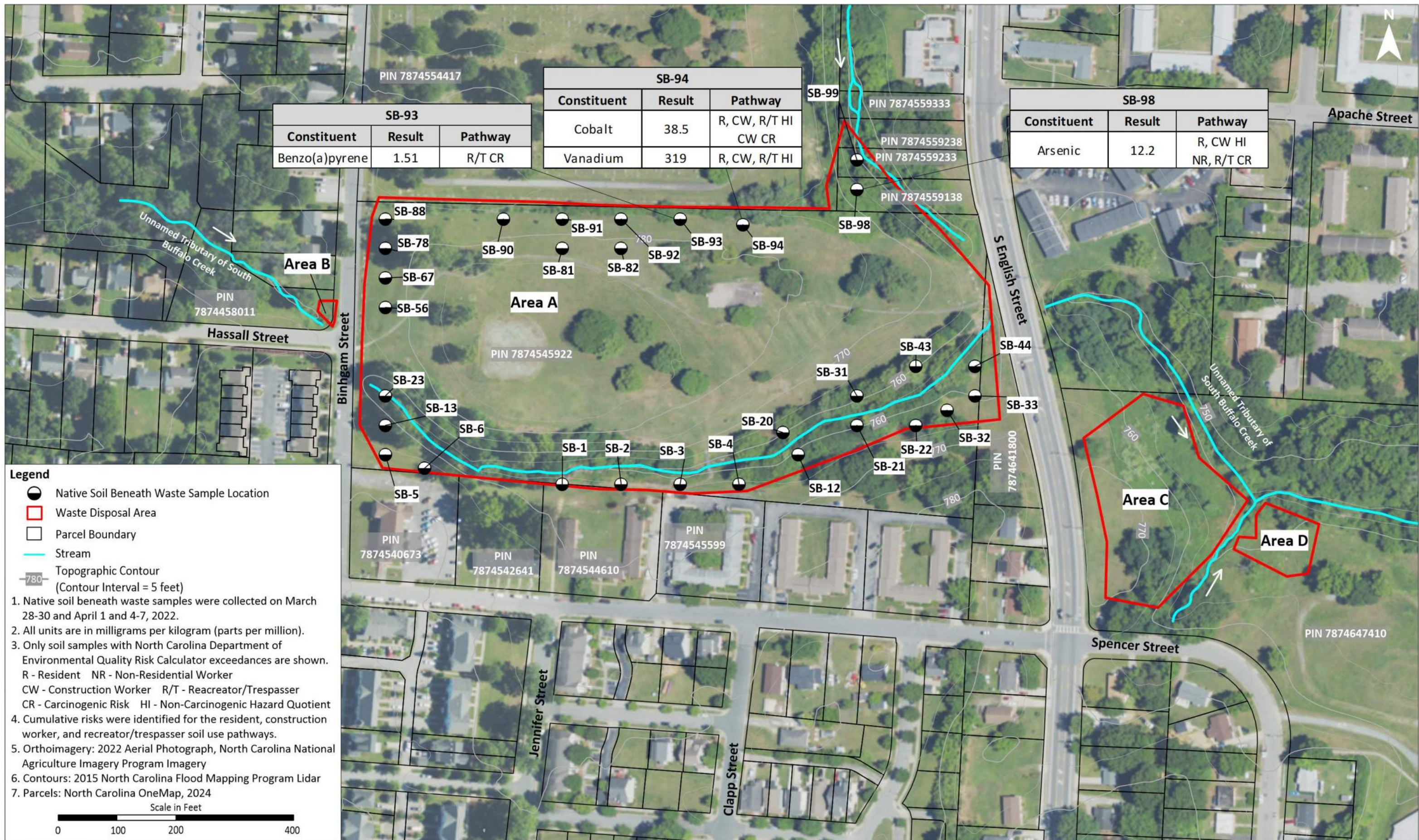


Figure 10-3 - Native Soil Beneath Waste Analytical Exceedances Results Map

Bingham Park
 Site ID: NONCD0000244
 Greensboro, Guilford County, North Carolina

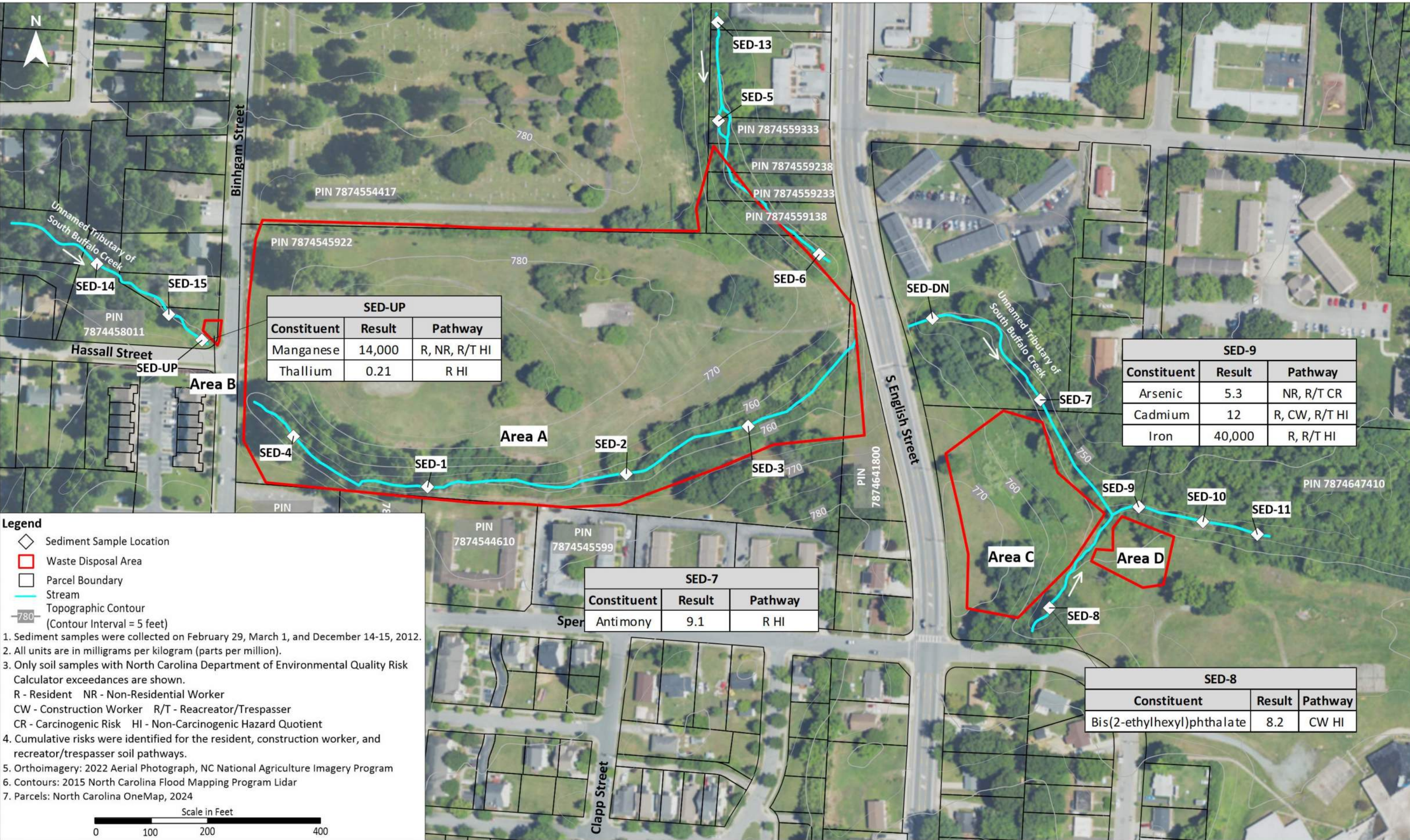


Figure 10-4 - Sediment Analytical Exceedances Results Map

Bingham Park
Site ID: NONCD0000244
Greensboro, Guilford County, North Carolina



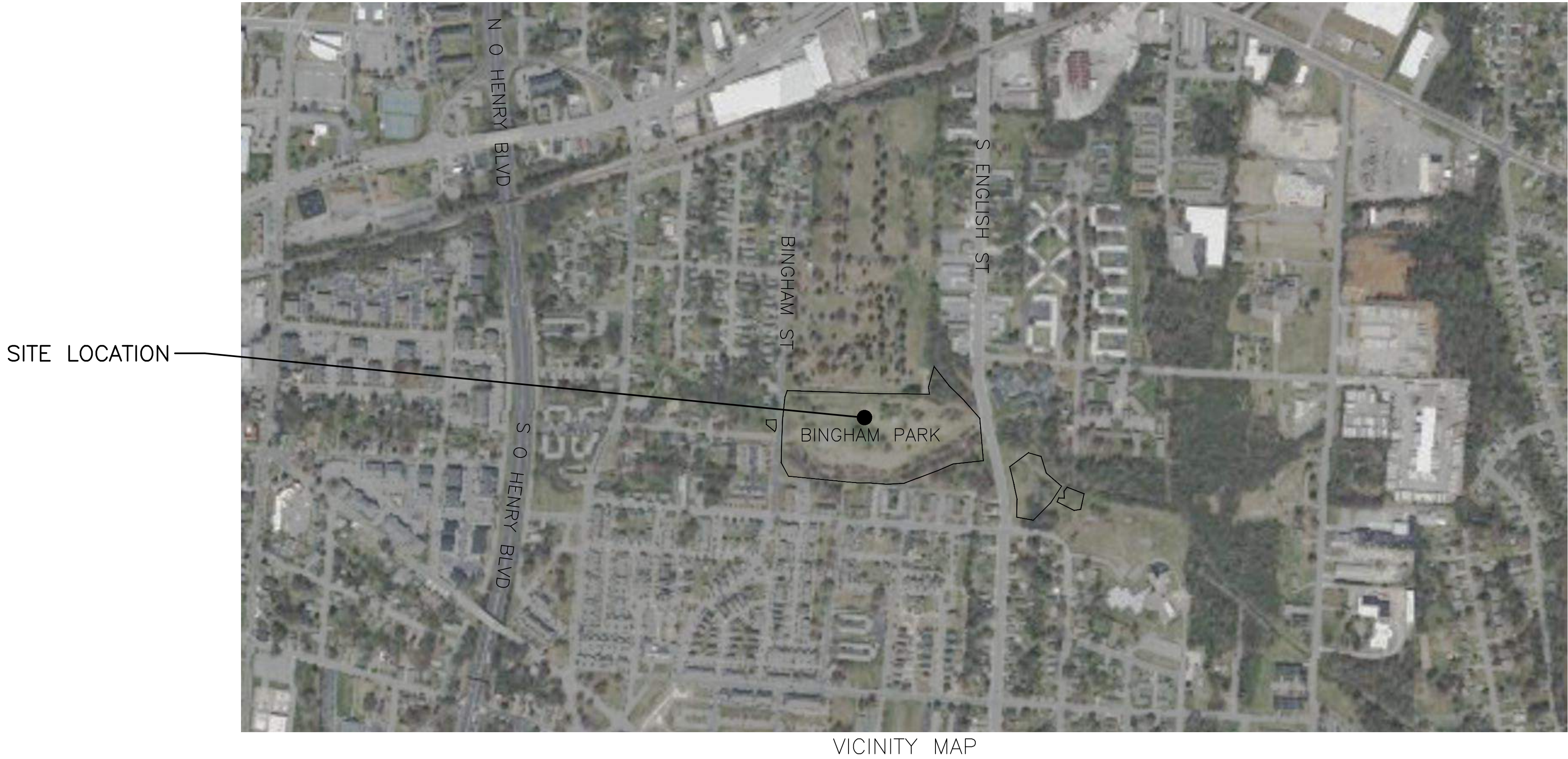
Appendix A Remedial Design Drawings

BINGHAM PARK
SITE IDENTIFICATION NUMBER: NONCD0000244
GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
DRAFT REMEDIAL ACTION PLAN
DECEMBER 2025

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G-2	SITE AERIAL
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CD-5	NCG01 REQUIREMENTS



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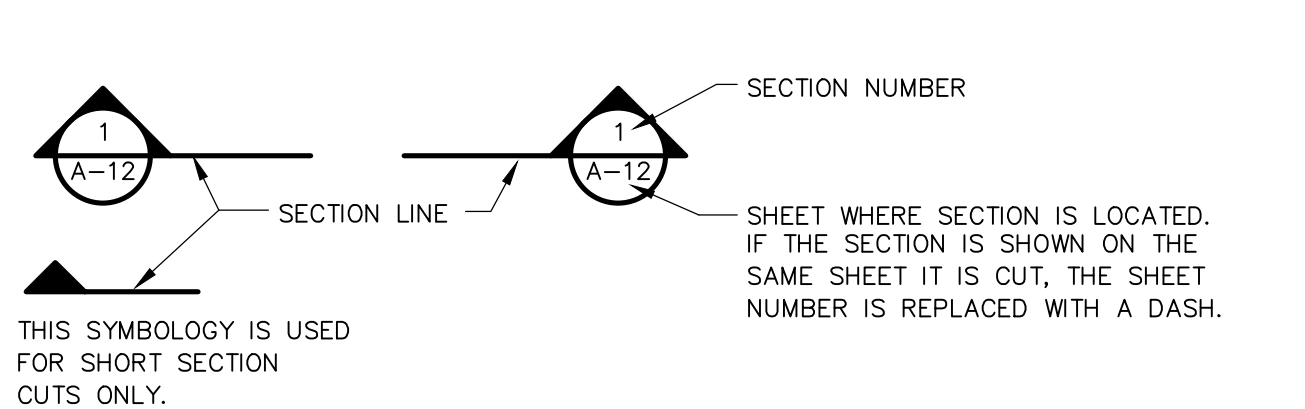
BOUNDARY AND MARKER SYMBOLS

SYMBOL	FEATURE
	LIMITS OF DISTURBANCE
	PROPERTY LINE
	MONITORING WELL
	WATER SUPPLY WELL
	GAS PROBE
	UTILITY POLE
	LIMITS OF WETLAND
	LIMITS OF BURIED WASTE
	UNDERGROUND TELEPHONE LINE
	OVERHEAD ELECTRIC
	SITE FENCE
	FIBER OPTIC LINE
	TELEPHONE UTILITY BOX
	RIPRAP AREA
	SURFICIAL WASTE AREA
	TEMPORARY CONSTRUCTION ENTRANCE
	SOIL BORING

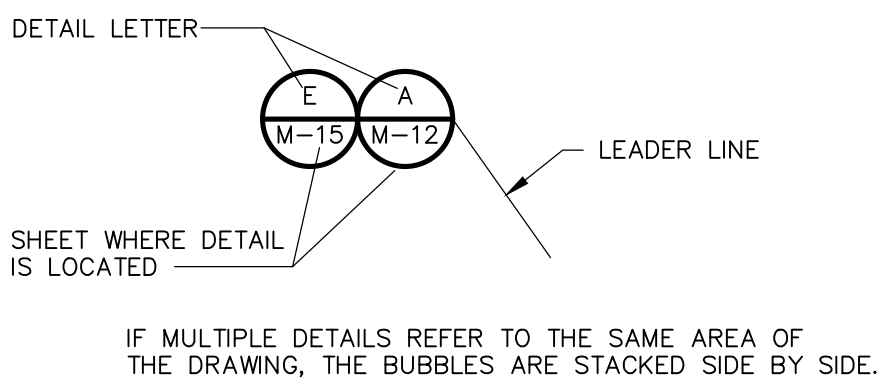
STRUCTURE AND DRAINAGE SYMBOLS

SYMBOL	FEATURE
	BUILDING OR STRUCTURE FOOTPRINT
	TREE LINE
	PROPOSED MAJOR CONTOUR
	PROPOSED MINOR CONTOUR
	EXISTING MAJOR CONTOUR
	EXISTING MINOR CONTOUR
	EXISTING SEWER LINE
	EXISTING WATER LINE
	EXISTING STORM WATER LINE
	SILT FENCE OUTLET
	STONE CHECK DAM

SECTION CUT SYMBOLS



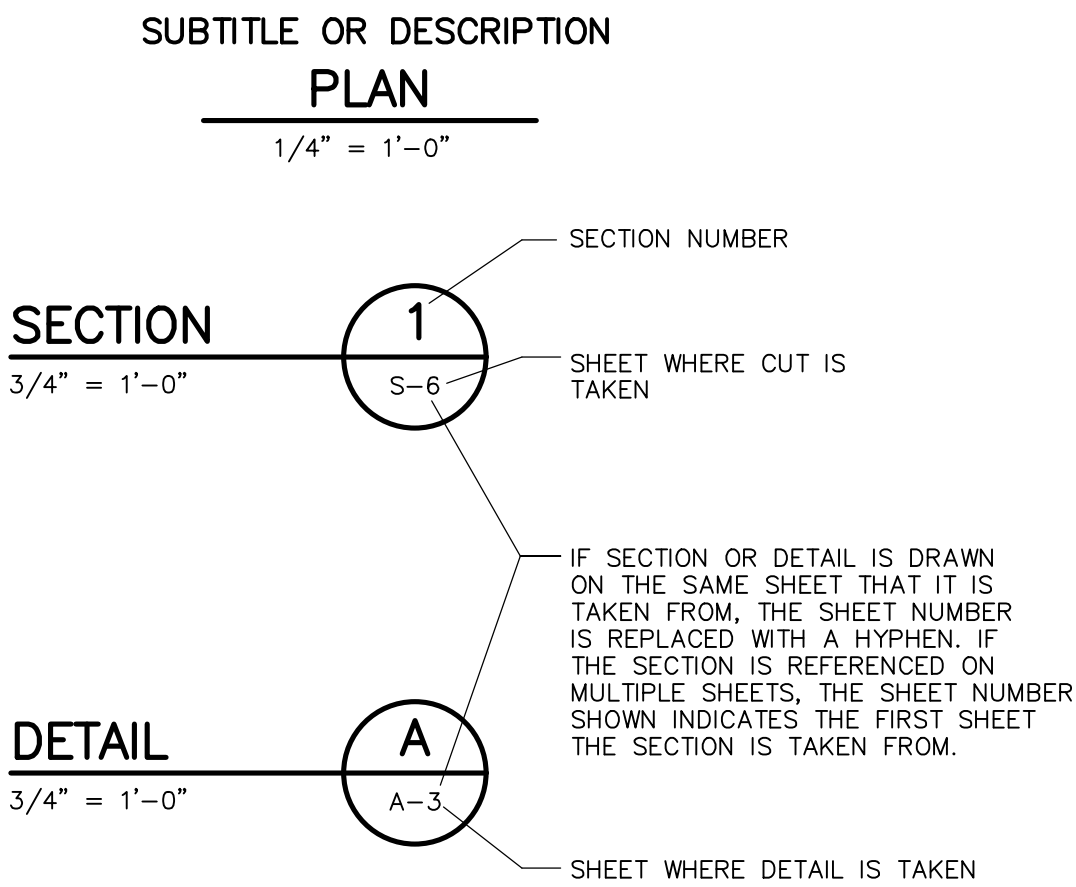
DETAIL CALL OUT SYMBOLS



ABBREVIATIONS

#	NUMBER
&	AND
ø	DIAMETER
@	AT
ACM	ASBESTOS CONTAINING MATERIAL
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
BGS	BELOW GROUND SURFACE
CMP	CORRUGATED METAL PIPE
CY	CUBIC YARDS
CONC	CONCRETE
CPP	CORRUGATED HDPE PIPE
DIP	DUCTILE IRON PIPE
EL	ELEVATION
EIP	IRON PIPE BOUNDARY MARKER
LLDPE	LINEAR LOW-DENSITY POLYETHYLENE
NCDOT	NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
FM	FORCE MAIN
FT	FEET/FOOT
GC	GEOCOMPOSITE
GCL	GEOCOMPOSITE CLAY LINER
GPS	GLOBAL POSITIONING SYSTEM
H	HORIZONTAL
HDPE	HIGH DENSITY POLYETHYLENE
HPTRM	HIGH-PERFORMANCE TURF REINFORCEMENT MAT
HP	HIGH POINT
INV	INVERT
LB	POUND
LP	LOW POINT
MAX	MAXIMUM
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MON	MONUMENT
MOT	MAINTENANCE OF TRAFFIC
NAD	NORTH AMERICAN DATUM
NAVD	NORTH AMERICAN VERTICAL DATUM
NC	NORTH CAROLINA
NTS	NO POINT SET
NTS	NOT TO SCALE
OC	ON CENTER
OHE	OVERHEAD ELECTRIC
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
PC	POINT OF CURVE
PERF	PERFORATED
PIN	PARCEL IDENTIFICATION NUMBER
PT	POINT
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
R/W	RIGHT-OF-WAY
RCP	REINFORCED CONCRETE PIPE
REQ'D	REQUIRED
S	SECONDARY LINER
SB	STONE MONUMENT BOUNDARY
SDR	STANDARD DIAMETER RATIO
SCH	SCHEDULE
SS	STAINLESS STEEL OR SANITARY SEWER
SY	SQUARE YARD
TEL	TELEPHONE
TEMP	TEMPORARY
TRM	TURF REINFORCED MATTING
TYP	TYPICAL
V	VERTICAL
VCP	VITRIFIED CLAY PIPE
W	WIDTH
W/	WITH
WWF	WELDED WIRE FABRIC
WV	WATER VALVE

DRAWING, SECTION AND DETAIL TITLES



SURVEY CONTROL NOTES:

- SURVEY DATA FOR THE PROJECT AREA WAS COMPILED FROM MULTIPLE SOURCES, INCLUDING GUILFORD COUNTY GIS (JULY 2011), A SITE SURVEY CONDUCTED BY MA ENGINEERING (NOVEMBER 2015), AND A TOPOGRAPHIC SURVEY OF AREA B PERFORMED BY RLS SURVEYING AND CONSULTING IN JUNE 2025. THE CONTRACTOR IS ADVISED THAT ACTUAL CONDITIONS MAY VARY AND IS TO MAKE THEIR OWN DETERMINATION OF EXISTING CONDITIONS PRIOR TO STARTING WORK. CDM SMITH IS NOT RESPONSIBLE FOR CLAIMS, DAMAGES, OR LIABILITY ARISING FROM THE USE OF THE EXISTING CONDITIONS PROVIDED IN THIS DRAWING SET.
- THE CONTRACTOR SHALL CONFIRM THE ACCURACY OF ANY BENCHMARKS/COORDINATES PROVIDED WITHIN THESE DRAWINGS.
- HORIZONTAL COORDINATES (NORTHINGS AND EASTINGS) SHOWN HEREIN ARE REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83). THE COORDINATES ARE NORTH CAROLINA STATE PLANE COORDINATES UNLESS OTHERWISE NOTED. ELEVATIONS AND CONTOURS SHOWN HEREIN ARE BASED ON THE NATIONAL VERTICAL DATUM OF 1988 (NAVD88).
- PRIOR TO CONSTRUCTION, THE CONTRACTOR IS TO NOTIFY ALL UTILITY OWNERS WHOSE FACILITIES WILL BE AFFECTED TO DETERMINE UTILITY LOCATIONS. THE CONTRACTOR MUST PROTECT ALL UTILITIES FROM DAMAGE CAUSED BY THEIR OPERATIONS OR THOSE OF THEIR AGENTS. THE CONTRACTOR WILL HOLD THE OWNER AND ENGINEER HARMLESS FOR ANY THIRD-PARTY INCONVENIENCE CREATED BY WORK OF HIS OWN FORCES OR THAT OF THEIR AGENTS.
 - FOR UTILITY LOCATIONS CALL NORTH CAROLINA ONE-CALL @ 1-800-632-4949.
 - FOR LOCATION OF UTILITIES NOT MEMBERS OF NORTH CAROLINA ONE-CALL CONTACT UTILITY OWNER.

GENERAL NOTES:

- THE CONTRACTOR IS ADVISED OF THE POTENTIAL FOR THE PRESENCE OF LANDFILL GAS IN THE PROJECT AREA. THESE GASES ARE EMITTED FROM THE SURFACE OF THE LANDFILL AND CAN ACCUMULATE IN STRUCTURES. THE CONTRACTOR IS RESPONSIBLE FOR BEING AWARE OF THE DANGERS OF WORKING IN THE PRESENCE OF THESE GASES AND FOR PROVIDING PROPER SAFETY TRAINING AND EQUIPMENT FOR THE WORK FORCE.
- AN AIR MONITORING PLAN AND ASBESTOS MANAGEMENT PLAN SHALL BE PREPARED BY THE CONTRACTOR AND APPROVED PRIOR TO COMMENCING ON-SITE ACTIVITIES.
- CONTRACTOR IS RESPONSIBLE FOR PROTECTING, MAINTAINING, AND RESTORING ALL SITE UTILITIES, PRESERVATION AREAS, AND FACILITY SERVICES.
- NO SMOKING IS ALLOWED ON THE JOB SITE.
- CONTRACTOR MUST PROTECT AND NOT DISTURB SURROUNDING ADJACENT PROPERTIES.
- CONTRACTOR IS RESPONSIBLE FOR OBTAINING DETAILED PRECONSTRUCTION PHOTOS, VIDEO, AND/OR SURVEY PRIOR TO COMMENCING WORK.
- PER THE CONTRACT, THE CONTRACTOR IS TO PERFORM ALL WORK WITHIN THE AREAS NOTED ON THE DRAWINGS.
- NO MORE THAN 1/2 ACRE OF WASTE SHALL BE UNCOVERED AND EXPOSED AT ANY ONE TIME.
- THERE MUST NOT BE ANY EXPOSED WASTE DURING NON-WORKING HOURS OR RUNOFF PRODUCING EVENTS. WASTE ON SITE DURING THESE TIMES MUST BE COVERED WITH TEMPORARY MEASURES.
- CONTRACTOR TO NOTIFY ENGINEER IF HAZARDOUS MATERIALS ARE ENCOUNTERED. HAZARDOUS MATERIALS TO BE PROPERLY DISPOSED OFF-SITE AT AN APPROVED FACILITY.
- RUBBER TIRES ARE TO BE REMOVED DURING EXCAVATION, STOCKPILED SEPARATELY, AND DISPOSED OF IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL REQUIREMENTS.
- LARGE RECYCLABLE METALS ARE TO BE SEPARATED, STOCKPILED, AND HAULED OFF-SITE AND DISPOSED OF AT AN APPROVED RECYCLING FACILITY.
- CONTRACTOR IS RESPONSIBLE FOR THE SAFETY OF ALL EXCAVATION TRENCHES AND COMPLIANCE WITH O.S.H.A. REGULATIONS AND STANDARDS. NO DISTURBED SLOPE MAY BE STEEPER THAN 2H:1V UNLESS OTHERWISE APPROVED BY THE ENGINEER.
- THE CONTRACTOR MUST NOT ALLOW LEACHATE TO ESCAPE FROM THE PROJECT SITE. ANY LEACHATE MUST BE CONTAINED AND MANAGED IN PLACE. IN THE EVENT OF A LEACHATE SEEP, THE CONTRACTOR IS TO:
 - EXCAVATE A MINIMUM OF 3 FEET INTO THE SOLID WASTE, AT LEAST 5 FEET IN DIAMETER, CENTERED AROUND THE SOURCE OF THE SEEP.
 - FILL THE EXCAVATION WITH A MINIMUM OF 2 FEET OF NCDOT NO. 5 STONE AND COVER WITH A MINIMUM OF 12 INCHES OF COMPACTED SOIL TO MATCH EXISTING GRADE.
 - WORKER SAFETY AND PROTECTION MUST BE EXERCISED AT ALL TIMES. WORKERS ARE TO CONTINUOUSLY MONITOR LANDFILL GAS.
 - THE EXCAVATED WASTE IS TO BE EITHER HAULED OFF-SITE OR USED ON-SITE AS FILL IN AN APPROPRIATE AREA BELOW THE FINAL COVER SYSTEM.

SEQUENCE OF CONSTRUCTION:

- THE FOLLOWING REPRESENTS ONE LOGICAL SEQUENCE OF WORK THAT WAS USED DURING THE PLANNING AND PREPARATION OF THE CONSTRUCTION PLANS AND PERMITS. THE CONTRACTOR MAY PETITION THE ENGINEER AND PERMITTING AGENCY TO REVISE THIS PLAN IF IT CONFLICTS WITH THE CONTRACTOR'S PROPOSED WORK PLAN, AT NO ADDITIONAL COST TO THE OWNER.
- HOLD PRE-CONSTRUCTION CONFERENCE WITH CITY, NCDEQ, ENGINEER, AND ALL MAJOR SUBCONTRACTORS.
 - ENSURE ALL PERMITS NECESSARY FOR THE WORK ARE MAINTAINED ONSITE.
 - IDENTIFY LIMITS OF DISTURBANCE, PROJECT PHASE AREAS, AND STAGING/STOCKPILING AREAS.
 - FOLLOW SEQUENCE OF CONSTRUCTION FOR EROSION AND SEDIMENT CONTROLS AS LISTED ON SHEET CD-4.
 - ESTABLISH SOIL AND WASTE STOCKPILE AREAS.
 - CLEAR AND GRUB AREA A. REMOVE AND STOCKPILE CLEAN COVER SOIL MATERIAL FOR FUTURE USE. CONTRACTOR MAY STRIP AND STOCKPILE ONLY CLEAN MATERIAL AS VERIFIED BY ENGINEER AND REQUIRED SOIL TESTING PER SPECIFICATIONS.
 - EXCAVATE WASTE FROM DESIGNATED AREAS AS SHOWN ON SHEET C-4 AND STOCKPILE.
 - NO MORE THAN 1/2 ACRE OF WASTE SHALL BE EXPOSED AT ANY ONE TIME. CONTRACTOR SHALL COVER ANY EXPOSED WASTE. STOCKPILES AND EXPOSED WASTE TO BE COVERED WITH TARPS OR PROTECTIVE COVER DURING RAIN EVENTS OR AT THE END OF THE DAY.
 - RELOCATE AND/OR DISPOSE OF EXCAVATED WASTE MATERIAL AS SHOWN ON SHEET C-4.
 - REGRADE AREA A IN ACCORDANCE WITH SHEET C-5.
 - INSTALL FINAL COVER SYSTEM CONSISTING OF NONWOVEN GEOTEXTILE WARNING LAYER, 6-INCH COVER FILL, AND 6-INCH TOPSOIL. NONWOVEN GEOTEXTILE WARNING LAYER IS ONLY REQUIRED WITHIN THE LIMITS OF THE WASTE BOUNDARY.
 - HYDROSEED AREA A PRIOR TO BEGINNING ANY OTHER AREAS.
 - REPEAT STEPS 6-12 TO COMPLETE AREAS B, C, AND D.
 - TRANSPORT AND PROPERLY DISPOSE OF TIRES AND RECYCLABLE METALS, IF ENCOUNTERED.
 - REMOVE ALL TEMPORARY EROSION CONTROL MEASURES ONCE SITE IS STABILIZED.
 - COMPLETE ALL MISCELLANEOUS WORK AND CLEAN-UP.
 - REMOVE ALL EQUIPMENT AND UNUSED MATERIALS FROM THE SITE AND STABILIZE ANY AREAS DISTURBED AS PART OF THE FINAL WORK.
 - ENSURE COMPLETION AND PROPER FUNCTION OF PERMANENT EROSION AND SEDIMENT CONTROL MEASURES.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:	G. ASHWIN
DRAWN BY:	V. RANJITH
SHEET CHK'D BY:	D. FORBES
CROSS CHK'D BY:	K. WESTERLUND
APPROVED BY:	A. WEISPFENNING
DATE:	DECEMBER 2025

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GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

GENERAL NOTES AND LEGEND

PROJECT NO. 6145-304550 FILE NAME: G001GNLG.DWG
SHEET NO. G-1

XREFS: [CDMS_2234, CEP000ST, CEP001ST, SOIL BORING BASEMAP, CEP002ST] Images: []
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DESIGNED BY: G. ASHWIN
DRAWN BY: V. RANJITH
SHEET CHK'D BY: D. FORBES
CROSS CHK'D BY: K. WESTERLUND
APPROVED BY: A. WEISPFENNING
DATE: DECEMBER 2025

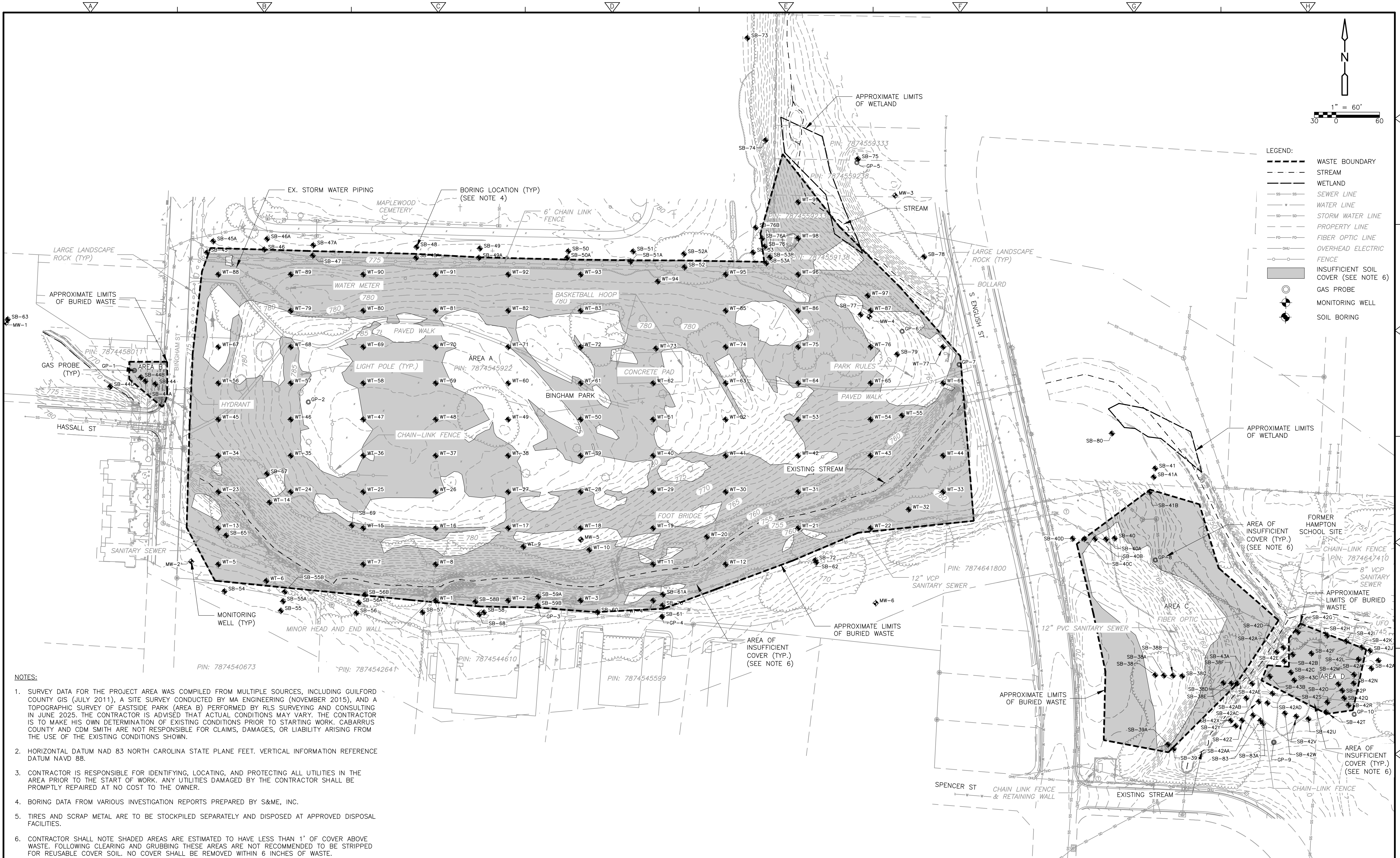
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GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

SITE AERIAL

PROJECT NO. 6145-304550
FILE NAME: G002GNLG.DWG
SHEET NO.
G-2



					DESIGNED BY: <u>G. ASHWIN</u>	 CDM Smith 4130 Parklake Avenue, Suite 350 Raleigh, NC 27612 Tel: (919) 325-9500 NC F-0412	GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA	BINGHAM PARK (NONCD0000244)	EXISTING CONDITIONS PLAN	PROJECT NO. 6145-304550
					DRAWN BY: <u>V. RANJITH</u>					FILE NAME: G003GNLG.DWG
					SHEET CHK'D BY: <u>D. FORBES</u>					
					CROSS CHK'D BY: <u>K. WESTERLUND</u>					
					APPROVED BY: <u>A. WEISPFENNING</u>					
REV. NO.	DATE	DRWN	CHKD	REMARKS	DATE: <u>OCTOBER 2025</u>					SHEET NO. G-3

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CONTRACTOR MAY UTILIZE EXISTING TEMPORARY FENCING ON THE EAST SIDE OF BINGHAM PARK SUBJECT TO INSTALLATION OF AN EFFECTIVE DUST CLOTH BARRIER. IF THE FENCING IS NOT SUITABLE FOR USE, CONTRACTOR SHALL DISASSEMBLE AND WORK WITH OWNER TO ARRANGE FOR REMOVAL.

REMOVE EX. STORM PIPING WITHIN THE LIMITS OF BURIED WASTE

CONTRACTOR MAY UTILIZE EXISTING TEMPORARY FENCING ON THE EAST SIDE OF BINGHAM PARK SUBJECT TO INSTALLATION OF AN EFFECTIVE DUST CLOTH BARRIER. IF THE FENCING IS NOT SUITABLE FOR USE, CONTRACTOR SHALL DISASSEMBLE AND WORK WITH OWNER TO ARRANGE FOR REMOVAL.

APPROXIMATE LIMITS OF WETLAND

REMOVE EX. CHAIN LINK FENCE WITHIN LIMITS OF WASTE AND REPLACE

PROPOSED DOWNWIND MONITORING LOCATION FOR EXAMPLE AIR MONITORING SCENARIO (SEE NOTE 7)

CONTRACTOR TO REMOVE AND STOCKPILE EX. LARGE LANDSCAPE ROCKS. REINSTALL AT SIMILAR LOCATION AFTER CONSTRUCTION. CONFIRM WITH OWNER.

REMOVE EX. WATER METER

REMOVE EX. PAVED WALK

REMOVE EX. BASKETBALL HOOP

REMOVE EX. PARK RULES

REMOVE EX. CONCRETE PAD

REMOVE EX. PAVED WALK SIGNAGE

REMOVE EX. FOOT BRIDGE

REMOVE EX. LIGHT POLE (TYP 10)

REMOVE ALL EX. TREES AND BRUSH WITHIN THE LIMITS OF BURIED WASTE

REMOVE EX. CHAIN-LINK FENCE

EXCAVATION AREA (NO MORE THAN 1/2 ACRE) FOR EXAMPLE AIR MONITORING SCENARIO (SEE NOTE 7)

WIND DIRECTION FOR EXAMPLE AIR MONITORING SCENARIO

PROPOSED UPWIND MONITORING LOCATION FOR EXAMPLE AIR MONITORING SCENARIO (SEE NOTE 7)

REMOVE EX. MONITORING WELL (SEE NOTE 6) (TYP 6)

MINOR HEAD AND END WALL

REMOVE EX. GAS PROBE (SEE NOTE 6) (TYP 10)

PROTECT EX. 12" SANITARY SEWER (SEE NOTE 5)

PROTECT 12" PVC SANITARY SEWER (SEE NOTE 5)

REMOVE ALL EX. TREES AND BRUSH WITHIN THE LIMITS OF BURIED WASTE

PROTECT EXISTING FIBER OPTIC CABLE DURING CONSTRUCTION. IF DAMAGED, COORDINATE WITH UTILITY OWNER AND REPLACE EXISTING FIBER OPTIC CABLE AT NO ADDITIONAL EXPENSE WITH A NEW FIBER OPTIC CABLE W/ HANDHOLES FOLLOWING DIRECTION FROM THE UTILITY OWNER.

PROTECT EX. 8" VCP SANITARY SEWER (SEE NOTE 5)

FORMER HAMPTON SCHOOL SITE

APPROXIMATE LIMITS OF BURIED WASTE

APPROXIMATE LIMITS OF BURIED WASTE

STREAM

NOTES:

- DIMENSIONS, ELEVATIONS AND LOCATIONS SHOWN ON THE DRAWINGS FOR EXISTING PIPING SHALL BE FIELD-VERIFIED BY THE CONTRACTOR. BASED ON THESE FIELD INVESTIGATIONS, CONTRACTOR SHALL PREPARE PIPE LAYOUT DRAWINGS TO BE SUBMITTED TO ENGINEER FOR REVIEW PRIOR TO BEGINNING OF CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING PIPE LOCATIONS AND CONNECTIONS WITH EXISTING OR PROPOSED PIPING AND/OR EQUIPMENT.
- ALL LOCATIONS SHOWN ARE BASED ON RECORD DRAWINGS. WHILE ATTEMPTS HAVE BEEN MADE TO PROVIDE ACCURATE DATA, THE CONTRACTOR SHALL CONSIDER ALL LOCATIONS APPROXIMATE IN NATURE. CONTRACTOR SHALL PERFORM TEST PITS TO VERIFY LOCATIONS AND CHECK FOR UNKNOWN UTILITIES/STRUCTURES.
- COORDINATE WITH UTILITY OWNERS TO MINIMIZE DOWNTIME OF SYSTEMS WHEN CONNECTING NEW UTILITY TO EXISTING UTILITY.
- EXCAVATE AND LOCATE EXISTING PIPE CONNECTION POINTS PRIOR TO TRENCHING AND INSTALLING NEW PIPING.
- CONTRACTOR SHALL CCTV ALL EXISTING SANITARY SEWER LINES WITHIN THE PROJECT LIMITS BEFORE AND AFTER CONSTRUCTION TO DOCUMENT CONDITIONS. LINES SHALL BE PROTECTED TO ALL EXTENTS POSSIBLE DURING CONSTRUCTION. IF PIPING IS DAMAGED DURING CONSTRUCTION, SECTION OF PIPE FROM MANHOLE TO MANHOLE SHALL BE REPLACED WITH SAME SIZED DUCTILE IRON PIPE. NEW PIPING SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF GREENSBORO SANITARY SEWER STANDARD DRAWINGS AND SPECIFICATIONS FOR UTILITY CONSTRUCTION, LATEST EDITIONS. SEE SHEETS C-12 & C-13 FOR ADDITIONAL INFORMATION.
- CONTRACTOR IS TO ABANDON ALL LANDFILL GAS PROBES AND GROUNDWATER MONITORING WELLS IN ACCORDANCE WITH 15A NCAC 2C.0113. GAS PROBE AND MONITORING WELL MATERIALS TO BE HAULED AND DISPOSED OF OFF-SITE.
- CONTRACTOR SHALL SET UP APPROPRIATE AMBIENT AIR MONITORING EQUIPMENT DAILY PRIOR TO ANY CONSTRUCTION ACTIVITIES. AMBIENT AIR MONITORING FOR VARIOUS COMPOUNDS SHALL BE PERFORMED BY THE CONTRACTOR IN ACCORDANCE WITH THE APPROVED AIR MONITORING AND ASBESTOS MANAGEMENT PLANS. UPWIND AND DOWNWIND AMBIENT AIR MONITORING STATION LOCATIONS SHALL BE CHOSEN WITH RESPECT TO ACCESSIBILITY, WIND DIRECTION (INCLUDING FOR POTENTIAL VARIABILITY THROUGHOUT THE DAY), AND THE POTENTIAL FOR PUBLIC EXPOSURE OUTSIDE THE PROJECT BOUNDARIES. REFER TO SECTION 013529 FOR ADDITIONAL INFORMATION.

EXISTING LANDFILL GAS PROBES AND GROUNDWATER MONITORING WELLS TO BE ABANDONED

ID	NORTHING	EASTING	TOTAL DEPTH (FT BGS)
GP-1	845019.41	1774930.51	9.00
GP-2	844975.84	1775170.48	11.00
GP-3	844694.73	1775487.00	7.00
GP-4	844679.56	1775658.56	11.00
GP-5	845306.30	1775927.36	8.50
GP-6	845073.49	1775989.85	11.00
GP-7	845027.51	1776068.45	10.00
GP-8	844757.74	1776339.26	7.00
GP-9	844506.24	1776502.63	8.00
GP-10	844544.76	1776613.67	7.00
MW-1	845085.35	1774753.39	9.50
MW-2	844755.67	1775008.84	40.35
MW-3	845260.85	1775980.03	18.80
MW-4	845093.33	1775944.64	31.50
MW-5	844785.91	1775546.56	52.00
MW-6	844698.26	1775953.50	31.80

TABLE NOTES:

- GP - GAS PROBE, MW - MONITORING WELL, FT BGS - FEET BELOW GROUND SURFACE.
- CONTRACTOR SHALL ABANDON ALL MONITORING WELLS AND GAS PROBES IN PLACE.

1" = 60'

- LEGEND:
- WASTE BOUNDARY
 - LIMITS OF DISTURBANCE
 - STREAM
 - WETLAND
 - SEWER LINE
 - WATER LINE
 - STORM WATER LINE
 - PROPERTY LINE
 - FIBER OPTIC LINE
 - OVERHEAD ELECTRIC
 - SITE FENCE
 - GAS PROBE
 - MONITORING WELL

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: G. ASHWIN
DRAWN BY: V. RANJITH
SHEET CHK'D BY: D. FORBES
CROSS CHK'D BY: K. WESTERLUND
APPROVED BY: A. WEISPFENNING
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GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

DEMOLITION, UTILITIES, AND AIR MONITORING PLAN

PROJECT NO. 6145-304550
FILE NAME: C001DMPL.DWG

SHEET NO.

C-1

100% SUBMITTAL

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EROSION CONTROL LEGEND

LOD

—

LIMITS OF DISTURBANCE

SF

—

SILT FENCE

SSF

—

SILT FENCE OUTLET

SSF

—

SUPER SILT FENCE

D

—

TEMPORARY SEDIMENT TRAP

WB

→

WATER BAR

CONSTRUCTION ENTRANCE

—

CONSTRUCTION ENTRANCE

—

—

DRAINAGE BASIN DELINEATION

—

—

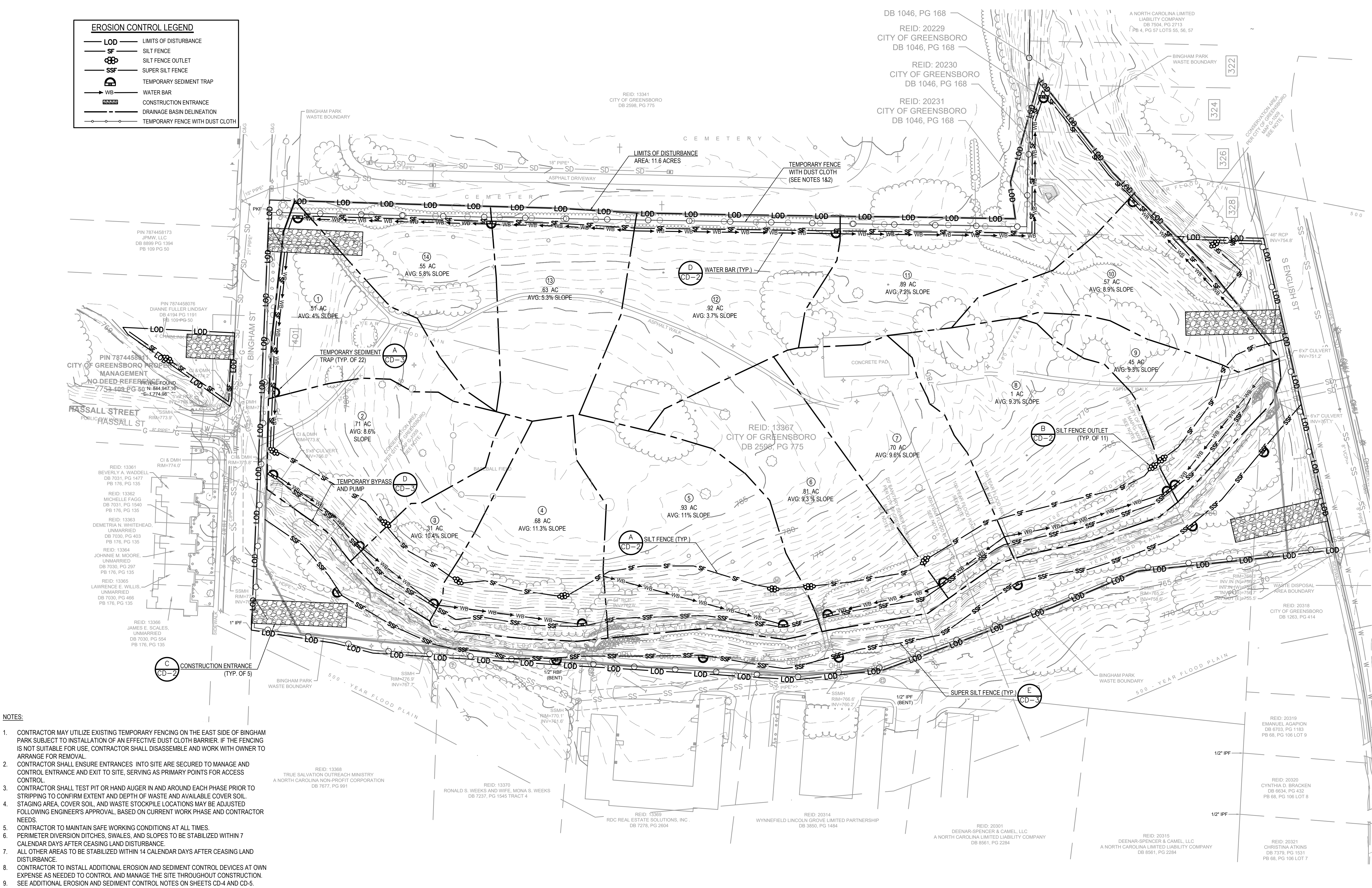
TEMPORARY FENCE WITH DUST CLOTH

1" = 50'

25 0 50

N

↑



- NOTES:
1. CONTRACTOR MAY UTILIZE EXISTING TEMPORARY FENCING ON THE EAST SIDE OF BINGHAM PARK SUBJECT TO INSTALLATION OF AN EFFECTIVE DUST CLOTH BARRIER. IF THE FENCING IS NOT SUITABLE FOR USE, CONTRACTOR SHALL DISASSEMBLE AND WORK WITH OWNER TO ARRANGE FOR REMOVAL.

2. CONTRACTOR SHALL ENSURE ENTRANCES INTO SITE ARE SECURED TO MANAGE AND CONTROL ENTRANCE AND EXIT TO SITE, SERVING AS PRIMARY POINTS FOR ACCESS CONTROL.

3. CONTRACTOR SHALL TEST PIT OR HAND AUGER IN AND AROUND EACH PHASE PRIOR TO STRIPPING TO CONFIRM EXTENT AND DEPTH OF WASTE AND AVAILABLE COVER SOIL. STAGING AREA, COVER SOIL, AND WASTE STOCKPILE LOCATIONS MAY BE ADJUSTED FOLLOWING ENGINEER'S APPROVAL, BASED ON CURRENT WORK PHASE AND CONTRACTOR NEEDS.

4. CONTRACTOR TO MAINTAIN SAFE WORKING CONDITIONS AT ALL TIMES.

5. PERIMETER DIVERSION DITCHES, SWALES, AND SLOPES TO BE STABILIZED WITHIN 7 CALENDAR DAYS AFTER CEASING LAND DISTURBANCE.

6. ALL OTHER AREAS TO BE STABILIZED WITHIN 14 CALENDAR DAYS AFTER CEASING LAND DISTURBANCE.

7. CONTRACTOR TO INSTALL ADDITIONAL EROSION AND SEDIMENT CONTROL DEVICES AT OWN EXPENSE AS NEEDED TO CONTROL AND MANAGE THE SITE THROUGHOUT CONSTRUCTION.

8. SEE ADDITIONAL EROSION AND SEDIMENT CONTROL NOTES ON SHEETS CD-4 AND CD-5.

DESIGNED BY: JAM	CDM Smith 4130 Parklake Avenue, Suite 350 Raleigh, NC 27612 Tel: (919) 325-3500 NC F-412	GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA BINGHAM PARK (NONCD0000244)	EROSION CONTROL PLAN - AREAS A & B	PROJECT NO. 6145-304550
DRAWN BY: LKW				FILE NAME:
SHEET CHK'D BY: AMW				SHEET NO.
CROSS CHK'D BY: KKW				C-2
APPROVED BY: JAM				
DATE: DECEMBER 2025				
REV. NO.	DATE	DRWN	CHKD	REMARKS

100% SUBMITTAL

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EROSION CONTROL LEGEND

LOD

SF

SSF

LIMITS OF DISTURBANCE

SILT FENCE

SILT FENCE OUTLET

SUPER SILT FENCE

TEMPORARY SEDIMENT TRAP

WATER BAR

CONSTRUCTION ENTRANCE

DRAINAGE BASIN DELINEATION

TEMPORARY FENCE WITH DUST CLOTH

- NOTES:
1.

CONTRACTOR SHALL INSTALL TEMPORARY FENCING WITH DUST CLOTH BARRIER. CONTRACTOR SHALL ENSURE ENTRANCES INTO SITE ARE SECURED TO MANAGE AND CONTROL ENTRANCE AND EXIT TO SITE, SERVING AS PRIMARY POINTS FOR ACCESS CONTROL.
2.

CONTRACTOR SHALL TEST PIT OR HAND AUGER IN AND AROUND EACH PHASE PRIOR TO STRIPPING TO CONFIRM EXTENT AND DEPTH OF WASTE AND AVAILABLE COVER SOIL.
3.

STAGING AREA, COVER SOIL, AND WASTE STOCKPILE LOCATIONS MAY BE ADJUSTED FOLLOWING ENGINEER'S APPROVAL, BASED ON CURRENT WORK PHASE AND CONTRACTOR NEEDS.
4.

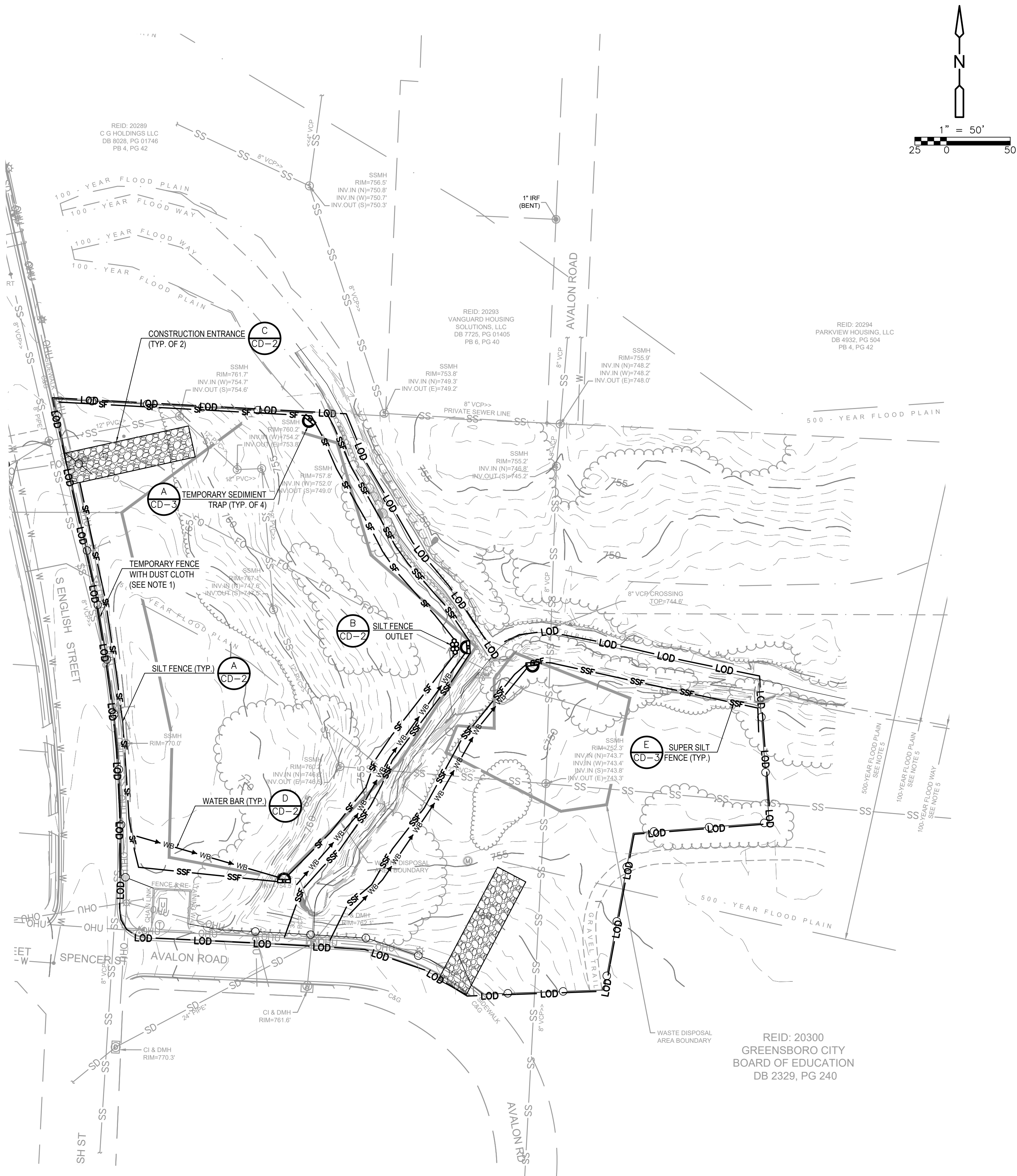
CONTRACTOR TO MAINTAIN SAFE WORKING CONDITIONS AT ALL TIMES.
5.

PERIMETER DIVERSION DITCHES, SWALES, AND SLOPES TO BE STABILIZED WITHIN 7 CALENDAR DAYS AFTER CEASING LAND DISTURBANCE.
6.

ALL OTHER AREAS TO BE STABILIZED WITHIN 14 CALENDAR DAYS AFTER CEASING LAND DISTURBANCE.
7.

CONTRACTOR TO INSTALL ADDITIONAL EROSION AND SEDIMENT CONTROL DEVICES AT OWN EXPENSE AS NEEDED TO CONTROL AND MANAGE THE SITE THROUGHOUT CONSTRUCTION.
8.

SEE ADDITIONAL EROSION AND SEDIMENT CONTROL NOTES ON SHEETS CD-4 AND CD-5.



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: JAM

DRAWN BY: LKW

SHEET CHK'D BY: AMW

CROSS CHK'D BY: KKW

APPROVED BY: JAM

DATE: DECEMBER 2025

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GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

EROSION CONTROL PLAN - AREAS C & D

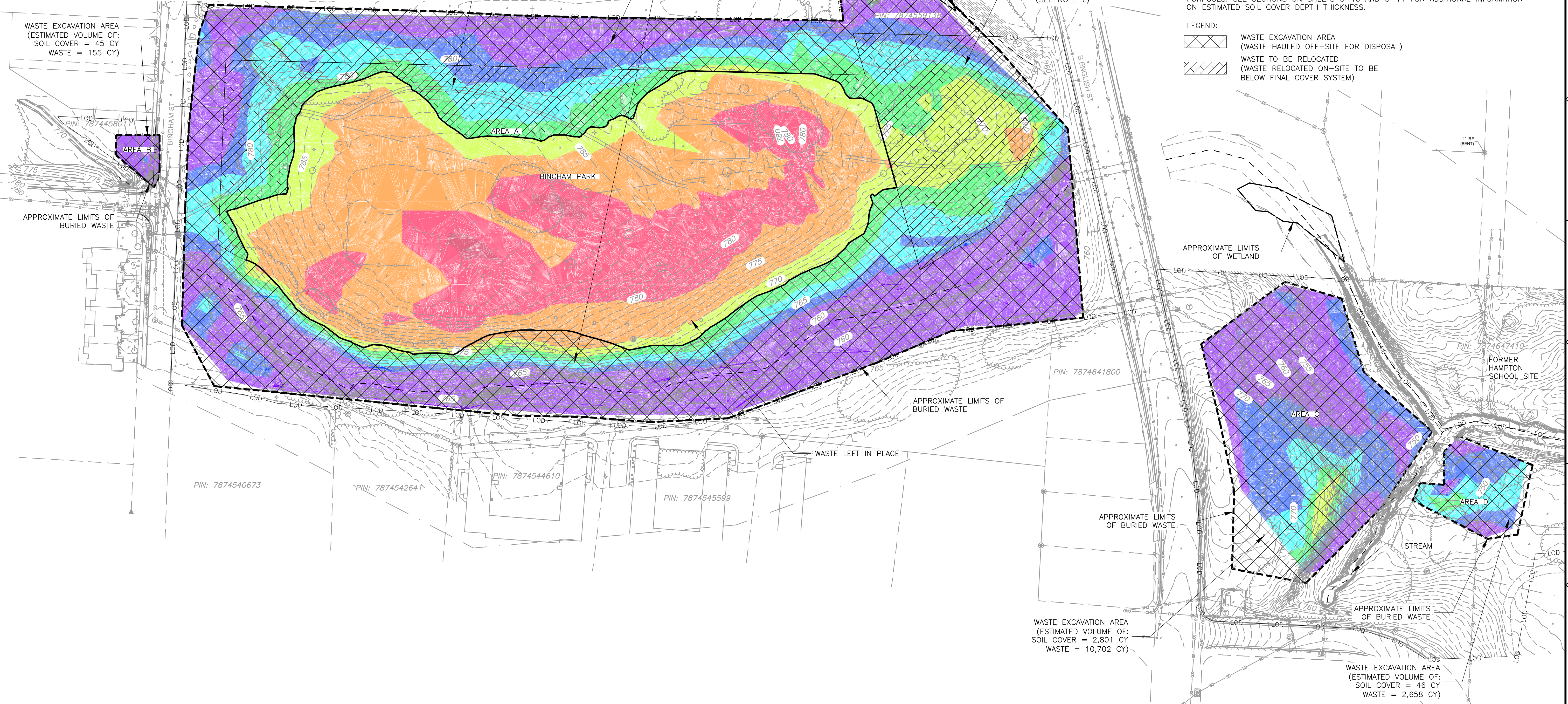
PROJECT NO. 6145-304550
FILE NAME:
SHEET NO.
C-3

100% SUBMITTAL

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NOTES:

- ALL WASTE MATERIALS TO BE REMOVED FROM THE FOLLOWING AREAS AND PROPERTIES:
 - AREAS B, C, & D
 - PROPERTY ID NUMBERS (IN AREA A): 7874554417, 7874559138, 7874559233, 7874559238, 7874559333, 7874540673, 7874542641, 7874544610, 7874545599, & 7874641800.
 - ADDITIONAL AREAS IN AREA A AS INDICATED ON THIS SHEET.
- EXCAVATE AREAS SHOWN TO COMPLETELY REMOVE ALL WASTE DOWN TO CLEAN AND COMPETENT SUBGRADE. SUBGRADE IS TO BE APPROVED BY ENGINEER PRIOR TO BACKFILLING WITH REMOVED SOIL COVER MATERIAL AND THEN IMPORTED COMMON FILL, AS REQUIRED.
- EXCAVATION SHALL ALLOW NO MORE THAN 1/2 ACRE OF WASTE TO BE EXPOSED AT ANY TIME. ANY EXPOSED WASTE IS TO BE COVERED DURING RAIN EVENTS OR AT THE END OF THE DAY.
- EXCAVATED WASTE IS TO BE EITHER HAULED OFF-SITE FOR DISPOSAL OR STOCKPILED PRIOR TO BEING USED ON-SITE AS FILL IN AN APPROPRIATE AREA BELOW THE FINAL COVER SYSTEM. WASTE TRANSPORTED OFF-SITE SHALL BE PROPERLY DISPOSED OF AT THE GREAT OAK LANDFILL. THE CITY HAS A NEGOTIATED TIPPING FEE WITH THE LANDFILL FOR THIS PROJECT.
- ANY TIRES ENCOUNTERED ARE TO BE STOCKPILED SEPARATELY AND DISPOSED OFF-SITE AT AN APPROVED FACILITY.
- IF GROUNDWATER IS ENCOUNTERED DURING WASTE EXCAVATION IT IS CONSIDERED LEACHATE. LEACHATE IS TO BE HANDLED BY EXCAVATING A SUMP WITHIN THE FINAL WASTE LIMITS BOUNDARY AND PUMPING LEACHATE FROM THE EXCAVATION AREA INTO THE SUMP.
- AN ESTIMATED 28,555 CY OF WASTE IS TO BE RELOCATED FROM AROUND BINGHAM PARK TO THE WESTERN AREA (WHERE WASTE IS TO BE LEFT IN PLACE BELOW THE FINAL COVER SYSTEM). IT IS ESTIMATED THAT THE TOTAL VOLUME OF MATERIAL REQUIRED TO BE DISTURBED (SOIL COVER AND WASTE) IS 31,250 CY. ONCE WASTE IS REMOVED, REINSTALL SOIL COVER MATERIAL AND PLACE ADDITIONAL IMPORTED COMMON FILL, AS REQUIRED.



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: G. ASHWIN
DRAWN BY: V. RANJITH
SHEET CHK'D BY: D. FORBES
CROSS CHK'D BY: K. WESTERLUND
APPROVED BY: A. WEISPFENNING
DATE: DECEMBER 2025

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GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

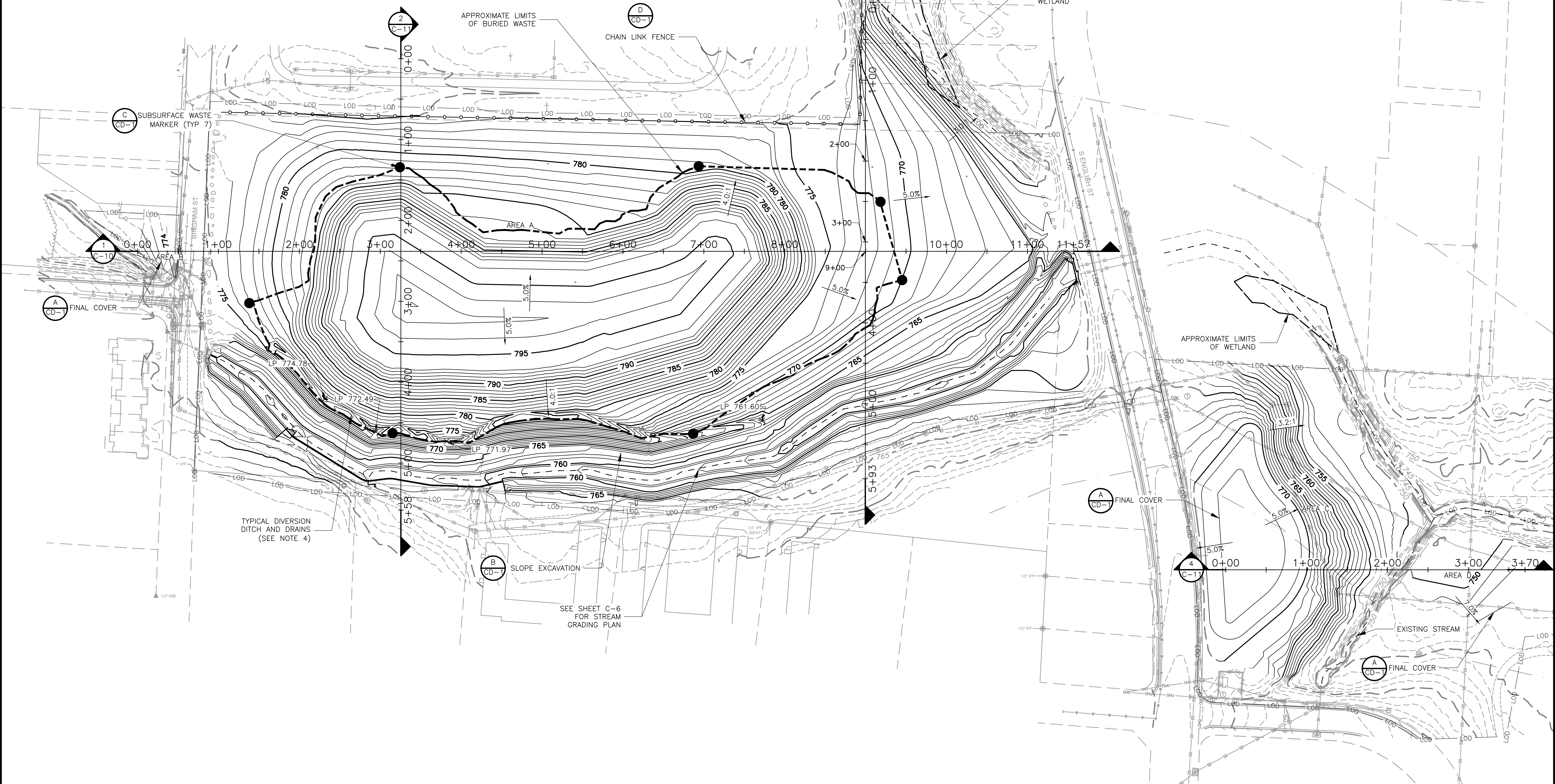
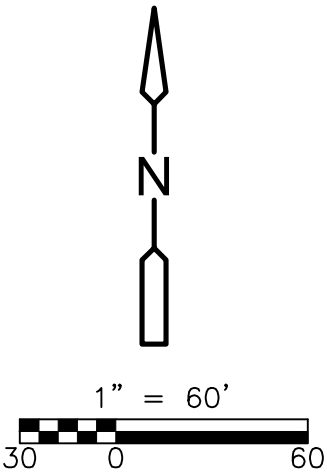
WASTE EXCAVATION PLAN

PROJECT NO. 6145-304550
FILE NAME: C004WSPL_A.DWG
SHEET NO.
C-4

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NOTES:

1. CONTOURS SHOWN REPRESENT TOP OF FINAL COVER. TOP OF WASTE IS A MINIMUM OF 1' BELOW GRADE. SEE DETAIL A ON SHEET CD-1.
2. LIMITS OF FINAL COVER WITH GEOTEXTILE WARNING LAYER SHALL EXTEND TO ALL AREAS WITH BURIED WASTE.
3. MARKERS ARE TO BE INSTALLED APPROXIMATELY 2 FEET OUTSIDE THE REMAINING WASTE DISPOSAL BOUNDARY IN BINGHAM PARK AS SHOWN. CONFIRM FINAL LOCATIONS WITH OWNER AND ENGINEER PRIOR TO INSTALLING.
4. A DIVERSION DITCH IS TO BE INSTALLED BETWEEN THE REMAINING WASTE AND STREAM GRADING AREAS. A CATCHBASIN SHALL BE INSTALLED AT EACH LOW POINT (LP) LOCATION ALONG THE DITCH AS SHOWN ON THIS SHEET TO CONVEY STORM WATER TO THE STREAM. SEE DETAIL B ON SHEET C-9 FOR TYPICAL DITCH AND DRAIN DETAILS.



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: G. ASHWIN
DRAWN BY: V. RANJITH
SHEET CHK'D BY: D. FORBES
CROSS CHK'D BY: K. WESTERLUND
APPROVED BY: A. WEISPFENNING
DATE: DECEMBER 2025

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GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

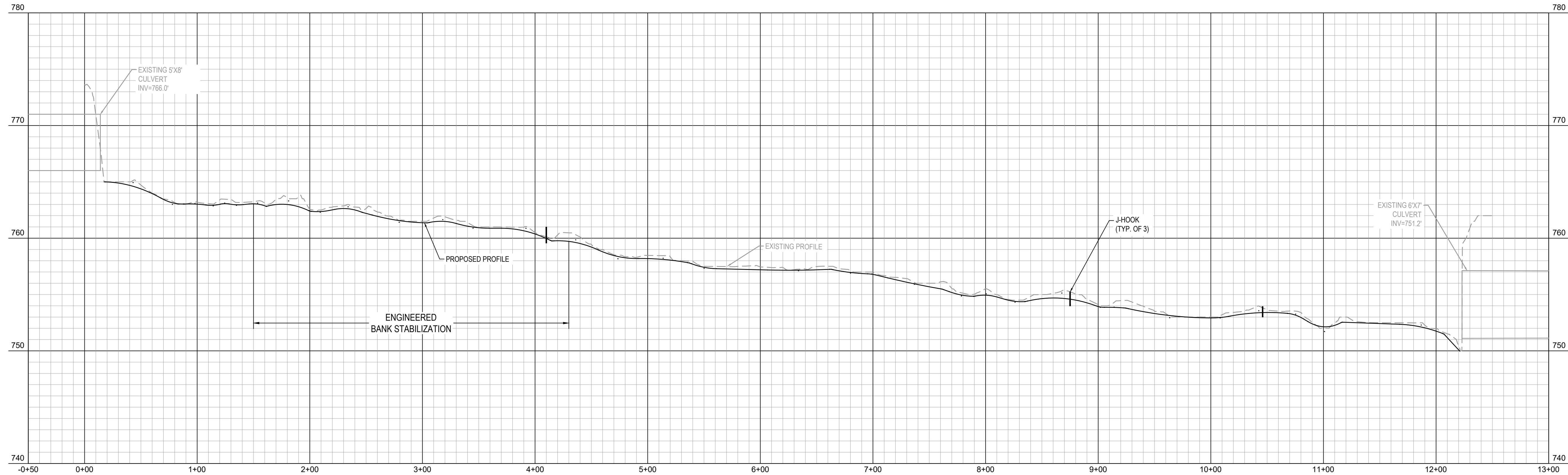
BINGHAM PARK
(NONCD0000244)

FINAL GRADING PLAN

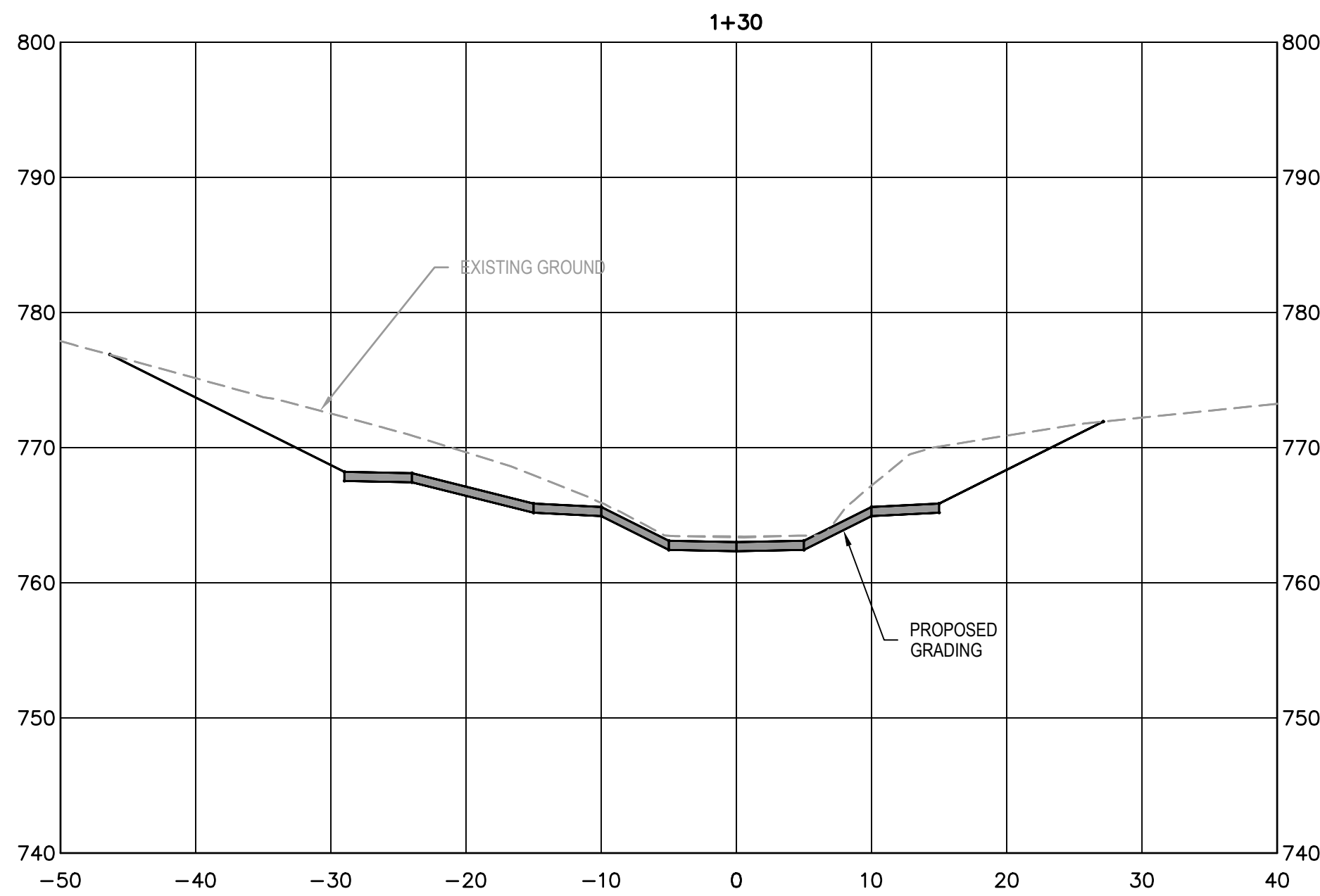
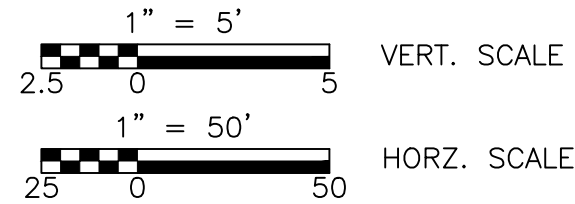
PROJECT NO. 6145-304550
FILE NAME: C005STPL_A.DWG
SHEET NO.
C-5

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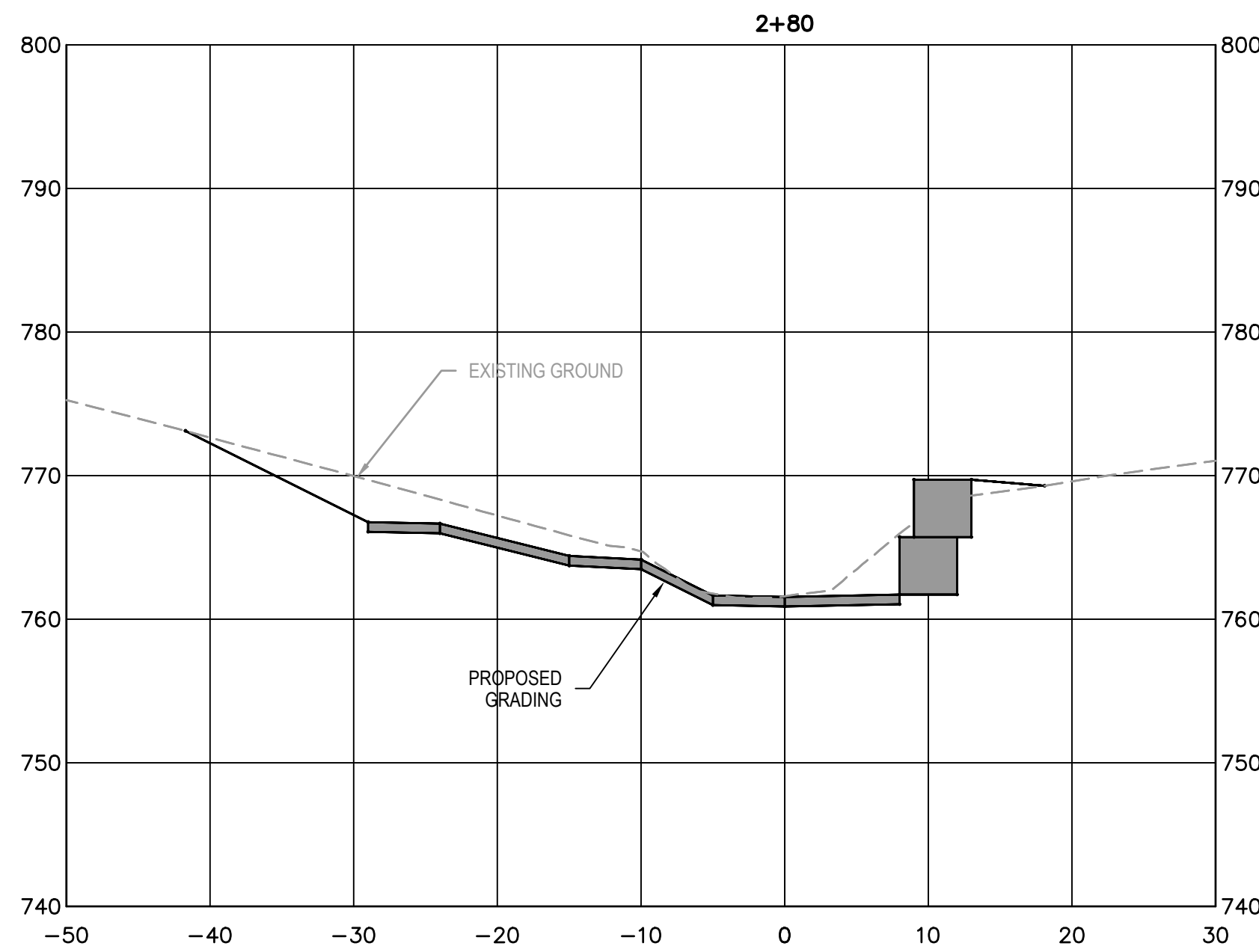
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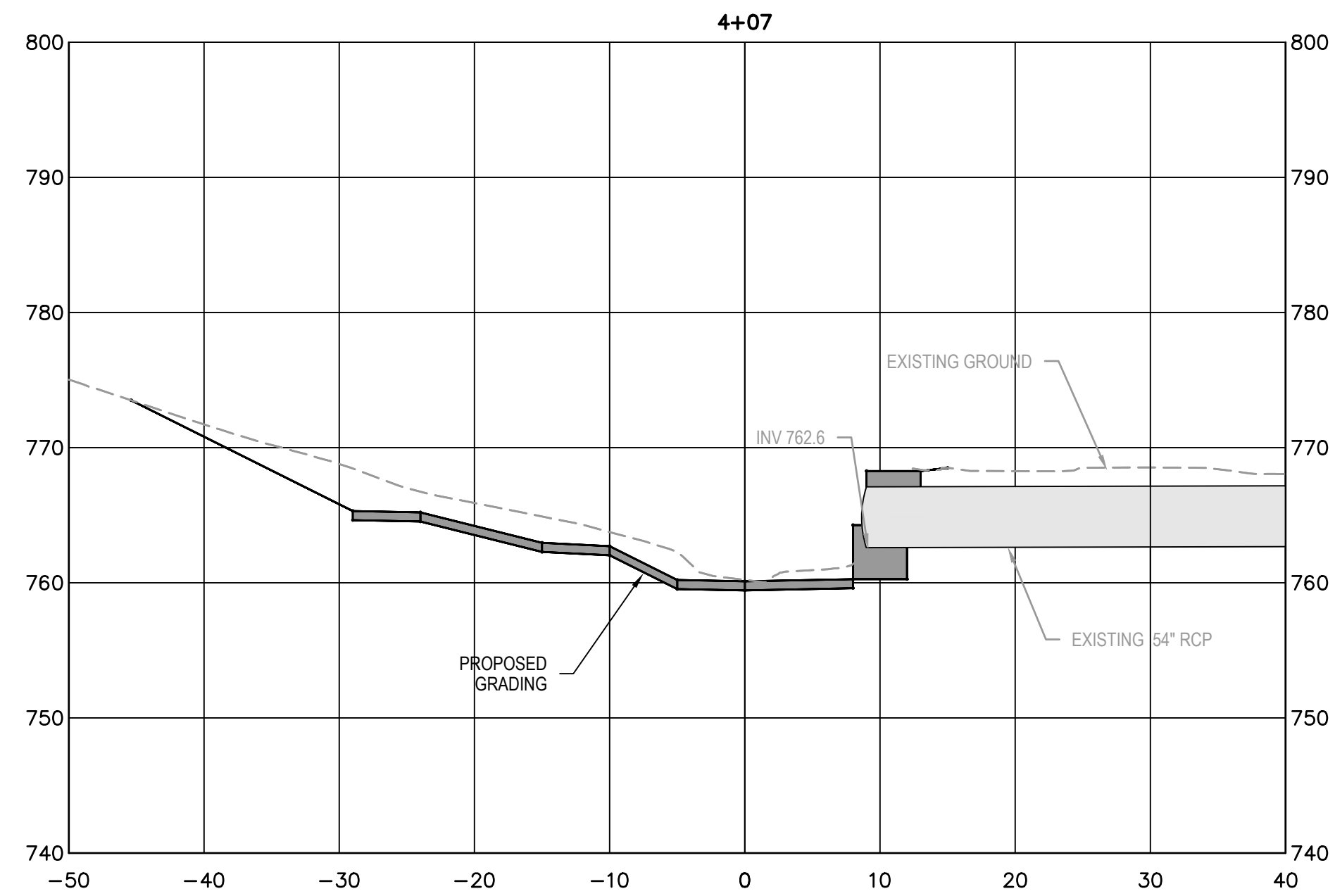
AREA A STREAM PROFILE



SECTION 1
1"=10'



SECTION 2
1"=10'



SECTION 3
1"=10'

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: JAM
DRAWN BY: LKW
SHEET CHK'D BY: AMW
CROSS CHK'D BY: KKW
APPROVED BY: JAM
DATE: DECEMBER 2025

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GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

STREAM PROFILE AND SECTIONS

PROJECT NO. 6145-304550

FILE NAME:

SHEET NO.

C-7

100% SUBMITTAL

Engineering drawing showing details for Stream Restoration, including Typical Stream Section, Engineered Bank Stabilization, and details around a 54" RCP Culvert.

TYP. CHANNEL DETAIL SECTION 1 - SHEET C-7
STA: 0+28 TO 1+50; STA: 4+30 TO 11+75
NTS

NOTE:

- BEDDING MATERIAL TO BE NCDOT COURSE AGGREGATE NO. 5.
- GEOTEXTILE WILL BE A NONWOVEN FABRIC MEETING THE CITY CRITERIA.
- HPTRM SHALL BE INSTALLED ON SLOPES NO GREATER THAN 2:1 OR OTHERWISE SPECIFIED. CONTRACTOR COORDINATION WITH MANUFACTURER WILL BE DONE TO DETERMINE ANCHORING REQUIREMENTS.
- STREAM EXCAVATIONS: WELL GRADED MIX CONSISTING OF EITHER SALVAGED CHANNEL BED MATERIAL OR FURNISHED CHANNEL BED MATERIAL; 3 INCH NOMINAL SIZE, MINIMUM OF 0.5 INCHES TO MAXIMUM 9 INCHES. CONTRACTOR OVER-EXCAVATIONS SHALL NOT EXTEND BEYOND PARTIALLY WEATHERED ROCK IN STREAM.

TYPICAL STREAM SECTION

DETAIL A
NTS

ENGINEERED BANK STABILIZATION

DETAIL B
NTS

ENGINEERED BANK STABILIZATION AROUND 54" CULVERT

DETAIL C
NTS

NOTE:

- RIPRAP ROCK UNITS TO BE CHINKED AND INTERLOCKED TO MINIMIZE AND ELIMINATE MOVEMENT AND INSTABILITY OF ROCK.
- OUTFALL OF CULVERT RIPRAP TO HAVE A D50 OF 18" AND A THICKNESS OF 3'.
- BEDDING MATERIAL TO BE NCDOT COURSE AGGREGATE NO. 5.
- GEOTEXTILE WILL BE A NONWOVEN FABRIC MEETING THE CITY CRITERIA.

GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

STREAM RESTORATION DETAILS I

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: JAM	DATE: DECEMBER 2025
DRAWN BY: LKW	
SHEET CHK'D BY: AMW	
CROSS CHK'D BY: KKW	
APPROVED BY: JAM	

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CRI TEK

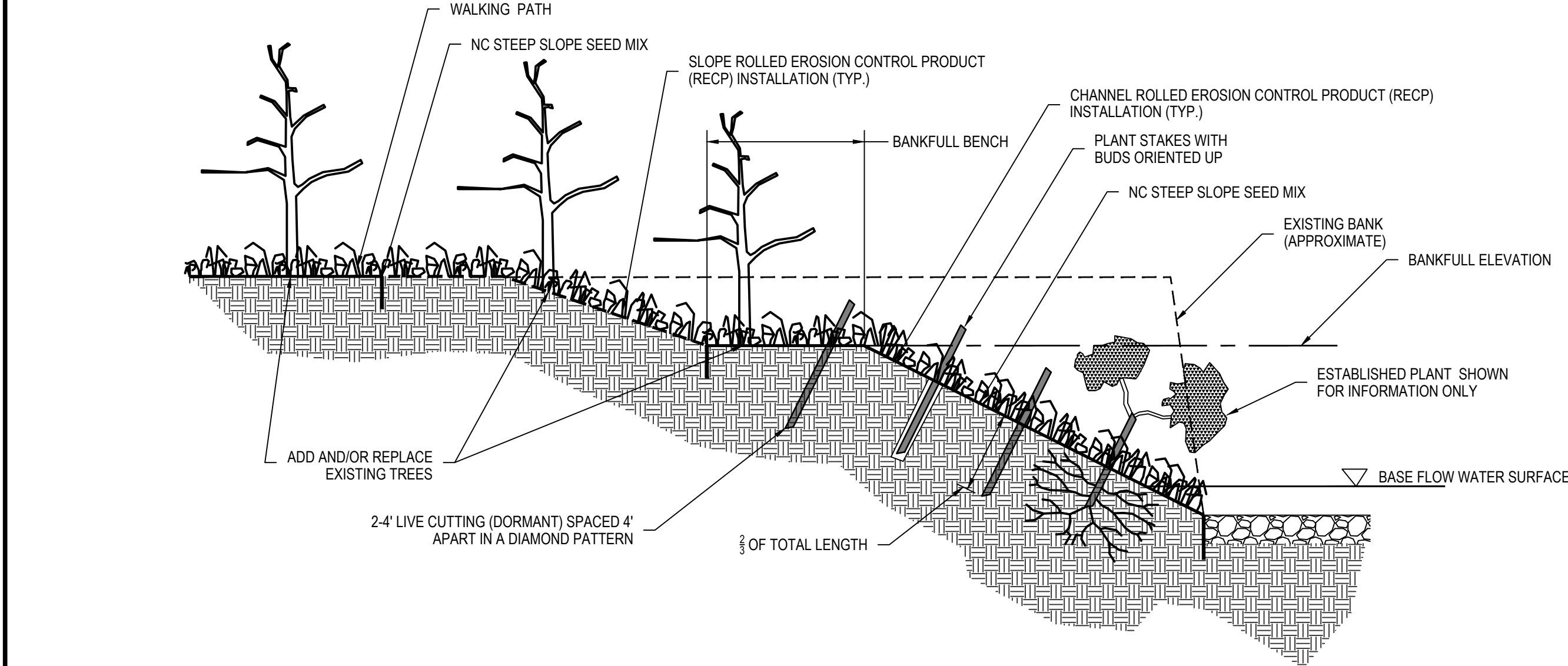
600 KODER BLVD., SUITE 100, GREENSBORO, NC 27407
Raleigh, NC 27612
Tel: (919) 325-3500 | WWW.CRI TEKGROUP.COM | LICENSE C-4091

PROJECT NO. 6145-304550
FILE NAME:

SHEET NO.

C-8

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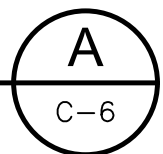
NC STEEP SLOPE SEED MIX (HERBACEOUS BUFFER PLANTING ZONE)	
A.	FROM AUGUST 1 THROUGH JUNE 1: 120 POUNDS PER ACRE KY. 31 TALL FESCUE OR FESCUE 500 POUNDS PER ACRE FERTILIZER 4,000 POUNDS PER ACRE LIMESTONE
B.	FROM MAY 1 THROUGH SEPTEMBER 1: 70 POUNDS PER ACRE KY. 31 TALL FESCUE OR FESCUE 50 POUNDS PER ACRE KOBE OR KOREAN LESPEDEZA 500 POUNDS PER ACRE FERTILIZER 4,000 POUNDS PER ACRE LIMESTONE
C.	SEED: 98 PERCENT PURE; 85 PERCENT GERMINATION; CONTAIN NO NOXIOUS WEEDS
D.	BETWEEN MAY 1 AND AUGUS 15, ADD 15 POUNDS PER ACRE SUDON GRASS OR 10 POUNDS PER ACRE GERMAN MILLET
E.	BEFORE MAY 1 OR AFTER AUGUST 15, ADD 40 POUNDS PER ACRE RYE (GRAIN)

NOTE:
CONTRACTOR TO REPAIR AND REPLANT ALL DISTURBED AREAS RELATED TO THE PROJECT INCLUDING BUT NOT LIMITED TO THE STAGING AREA, ACCESS AREAS, AND THE AREAS IDENTIFIED ON SHEET C-6
IF CERTAIN DISTURBED LAWNS ARE OF BETTER QUALITY THAN THE SPECIFIED SEED WILL PRODUCE AS DETERMINED BY THE ENGINEER, FURNISH SEED FOR SUCH SPECIFIC LAWNS THAT WILL PRODUCE A LAWN OF EQUAL QUALITY. EXTRA COST FOR THE BETTER SEED QUALITY WILL BE THE ACTUAL INVOICE PRICE DIFFERENTIAL BETWEEN THE SEEDS.

BANK MATERIAL REMOVAL AND PLANTING SECTION (TYP.)

DETAIL

NTS



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: JAM
DRAWN BY: LKW
SHEET CHK'D BY: AMW
CROSS CHK'D BY: KKW
APPROVED BY: JAM
DATE: DECEMBER 2025

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GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

STREAM RESTORATION DETAILS II

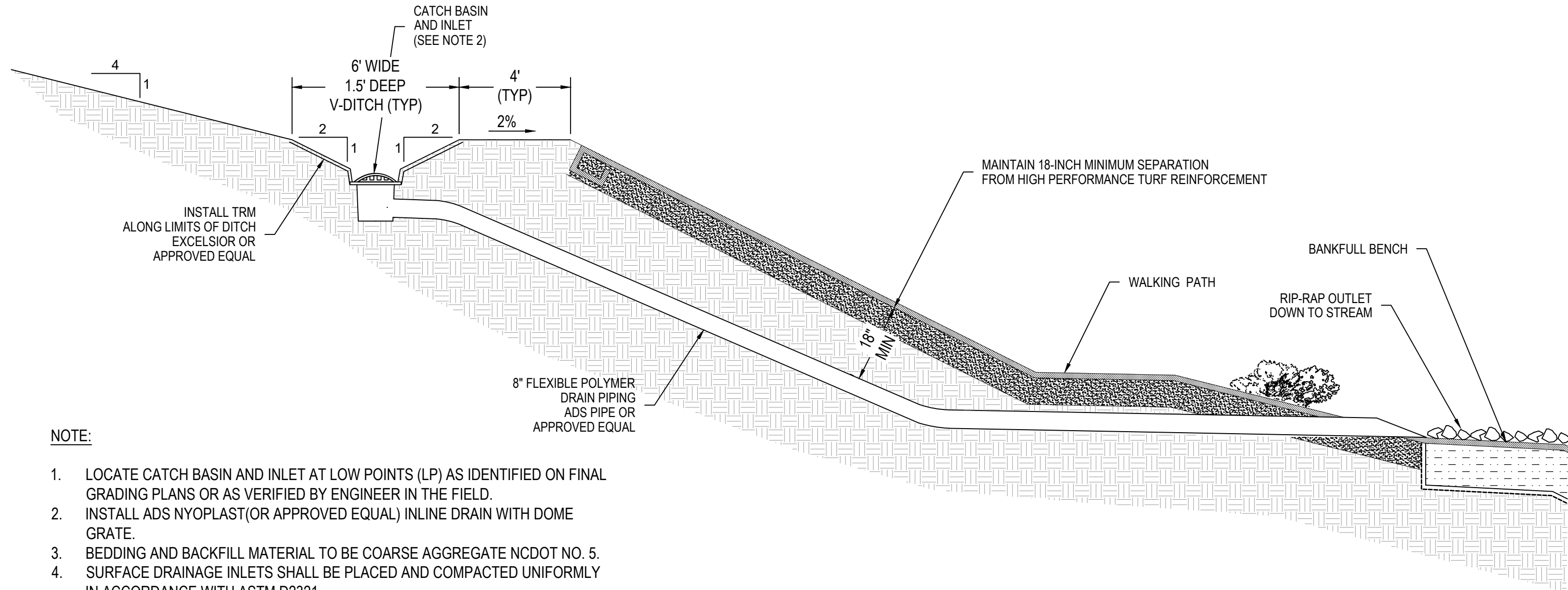
PROJECT NO. 6145-304550

FILE NAME:

SHEET NO.

C-9

100% SUBMITTAL



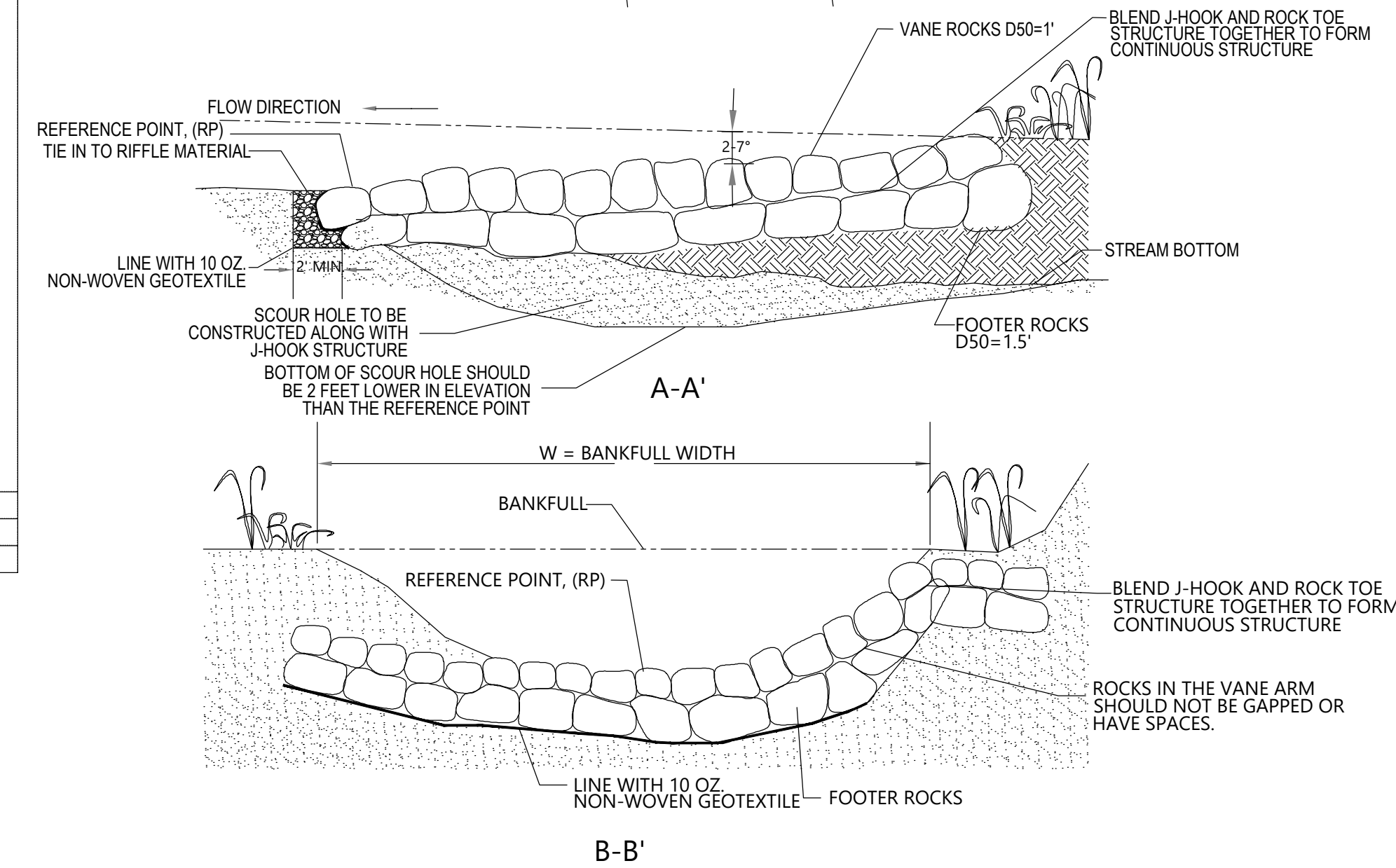
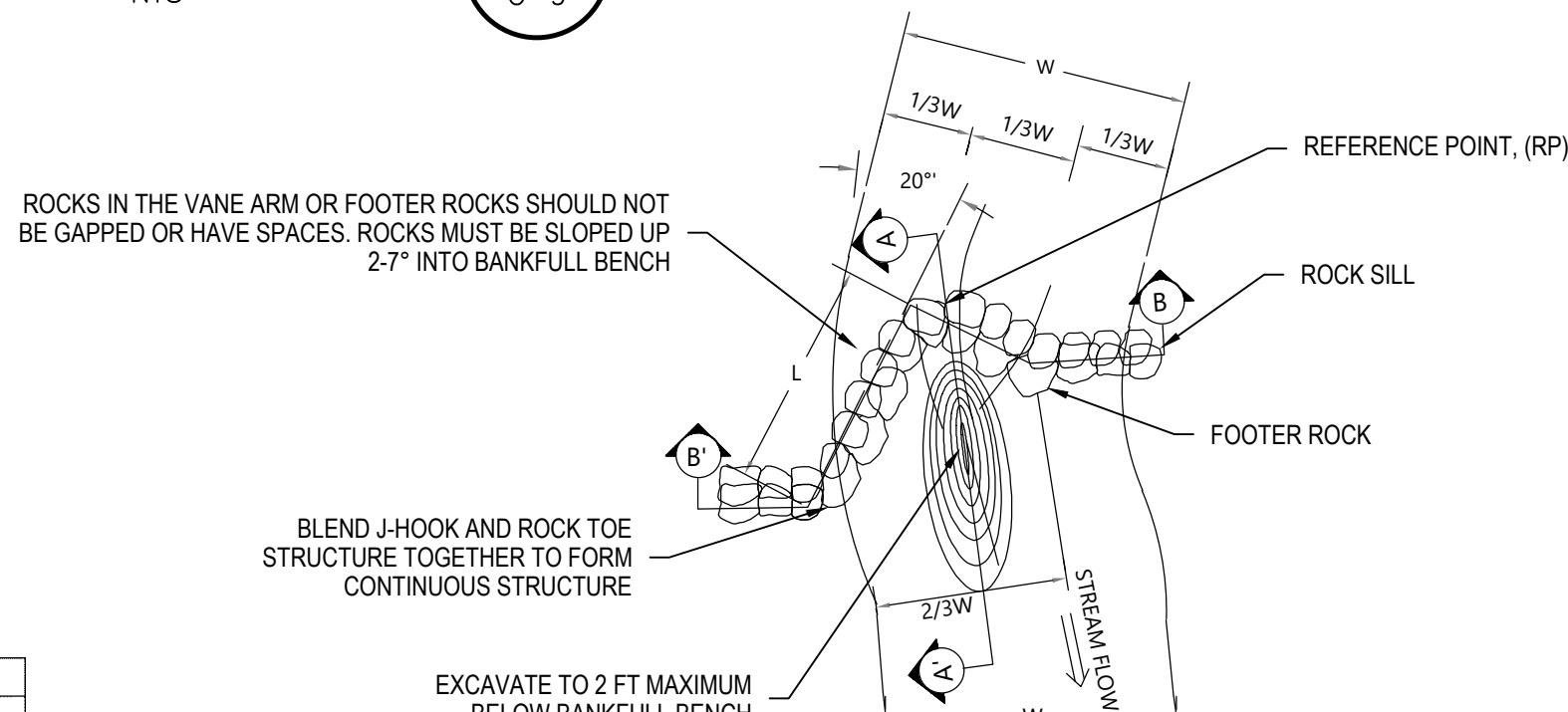
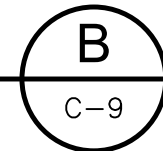
NOTE:

- LOCATE CATCH BASIN AND INLET AT LOW POINTS (LP) AS IDENTIFIED ON FINAL GRADING PLANS OR AS VERIFIED BY ENGINEER IN THE FIELD.
- INSTALL ADS NYOPLAST(OR APPROVED EQUAL) INLINE DRAIN WITH DOME GRATE.
- BEDDING AND BACKFILL MATERIAL TO BE COARSE AGGREGATE NCDOT NO. 5.
- SURFACE DRAINAGE INLETS SHALL BE PLACED AND COMPACTED UNIFORMLY IN ACCORDANCE WITH ASTM D2321.
- RIP RAP TO BE MIN OF 0.5 INCHES TO MAX OF 9 INCHES.

TYPICAL DIVERSION DITCH AND DRAIN

DETAIL

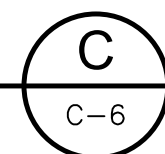
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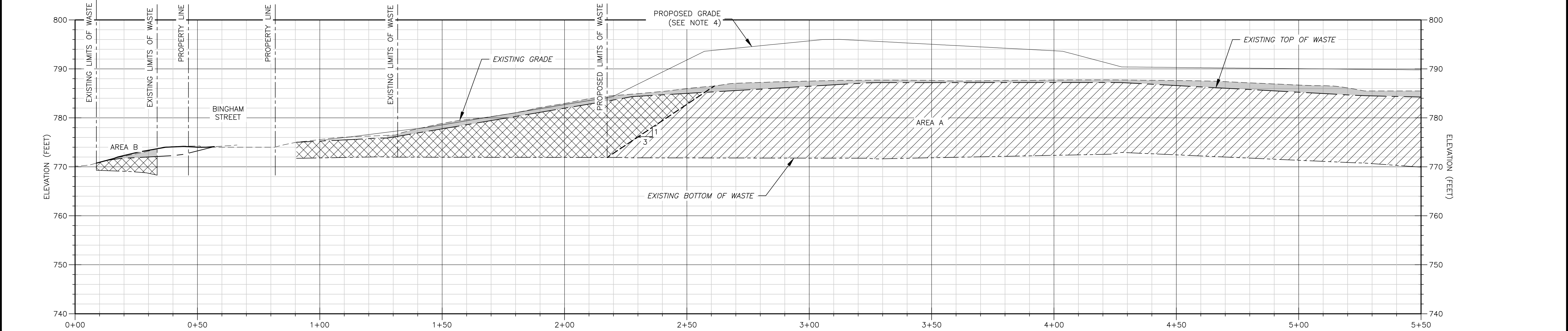
J-HOOK STRUCTURE

DETAIL

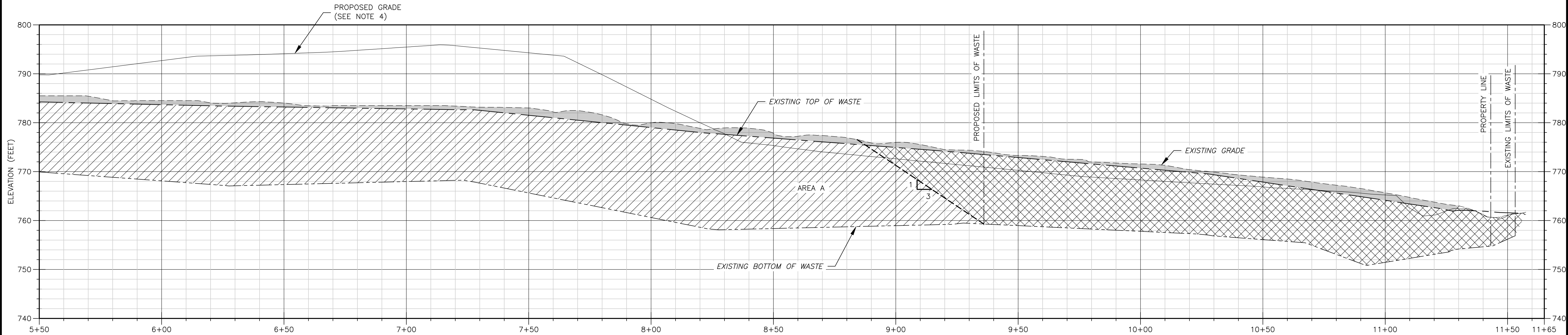
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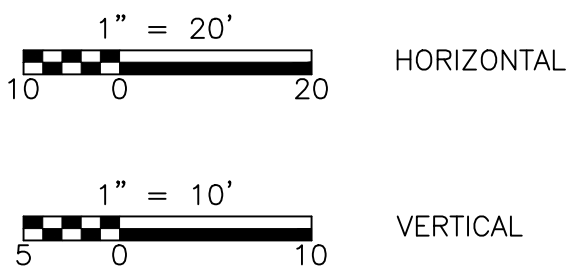
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SECTION 1
1" = 20'
C-5



SECTION 1
1" = 20'
C-5



LEGEND:

- SOIL COVER
- WASTE LEFT IN PLACE
- WASTE EXCAVATION (SEE SHEET C-4)
- PROPOSED GRADE
- SOIL COVER
- BOTTOM OF WASTE
- EXISTING GRADE

NOTES:

- BOTTOM OF WASTE DEPTH AND EXCAVATION LIMITS ARE APPROXIMATED BASED ON BORING DATA. ACTUAL DEPTH OF WASTE MAY VARY. CONTRACTOR IS REQUIRED TO REMOVE ALL WASTE AT WASTE EXCAVATION AREAS.
- IF GROUNDWATER IS ENCOUNTERED DURING WASTE EXCAVATION THIS IS CONSIDERED LEACHATE AND IS TO BE HANDLED BY EXCAVATING A SUMP WITHIN THE FINAL WASTE LIMITS BOUNDARY AND PUMPING LEACHATE FROM THE EXCAVATION AREA INTO THE SUMP.
- WASTE IS TO BE REMOVED IN AREAS B, C, & D AND PROPERTY ID NUMBERS (IN AREA A): 7874554417, 7874559138, 7874559233, 7874559238, 7874559333, 7874540673, 7874542641, 7874544610, 7874545599, & 7874641800.
- PROPOSED GRADES SHOWN REPRESENT TOP OF FINAL COVER. TOP OF WASTE IS A MINIMUM OF 1' BELOW GRADE. SEE DETAIL A ON SHEET CD-1.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: G. ASHWIN
DRAWN BY: V. RANJITH
SHEET CHK'D BY: D. FORBES
CROSS CHK'D BY: K. WESTERLUND
APPROVED BY: A. WEISPFENNING
DATE: DECEMBER 2025

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NC F-0412

GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

PROPOSED SECTIONS I

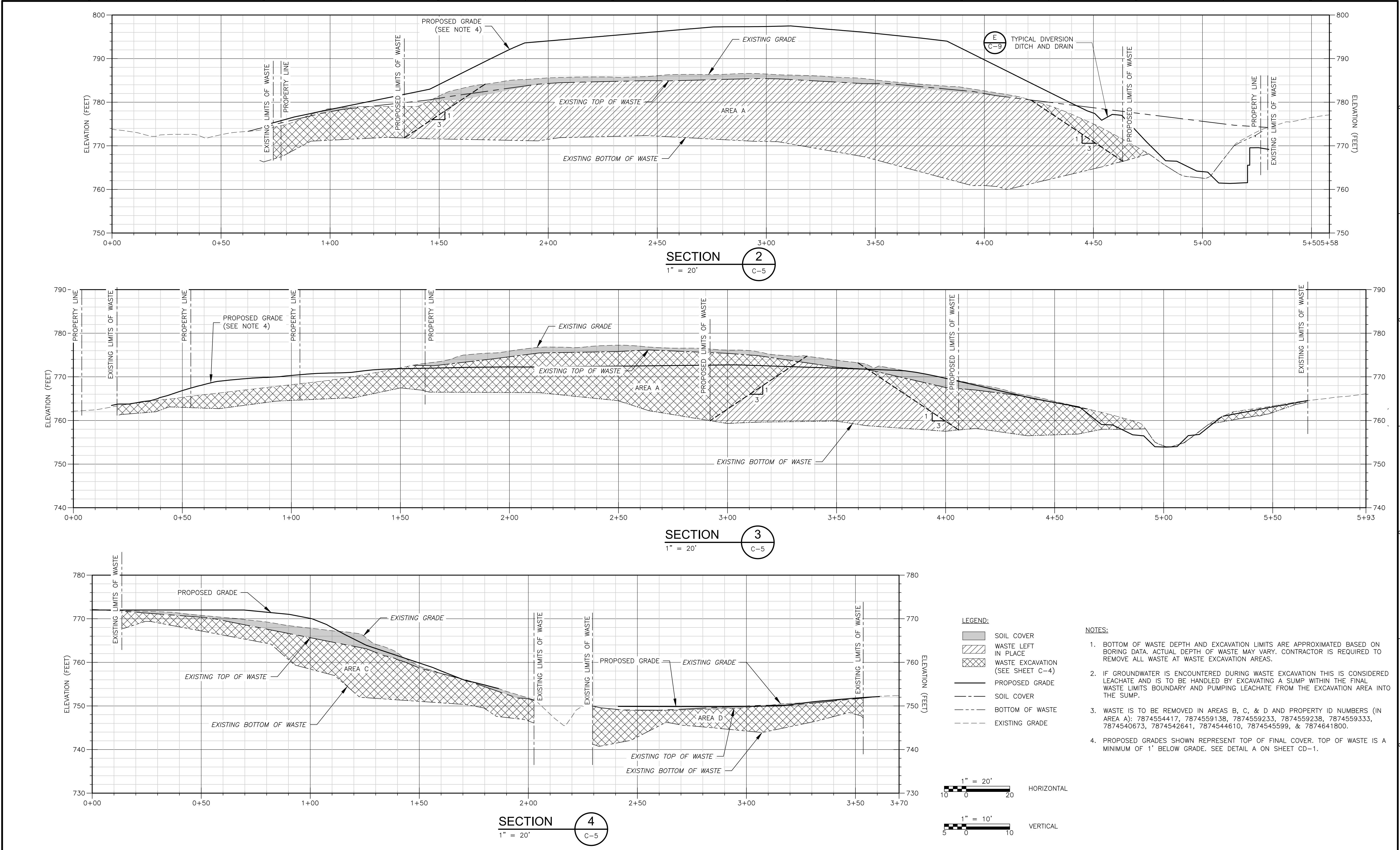
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FILE NAME: C010STPL.DWG

SHEET NO.

C-10

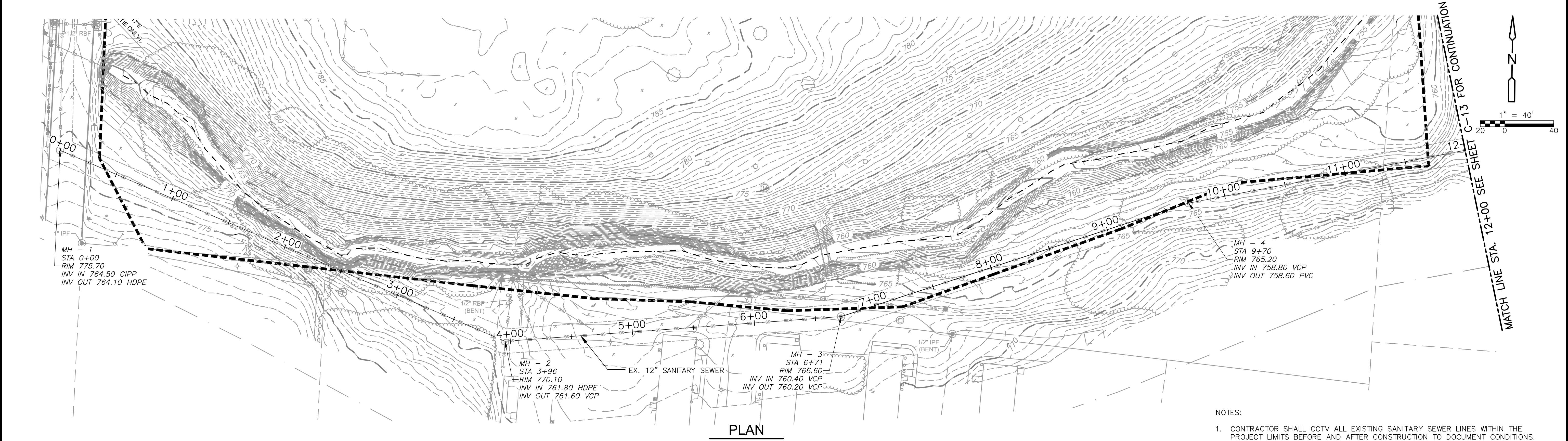
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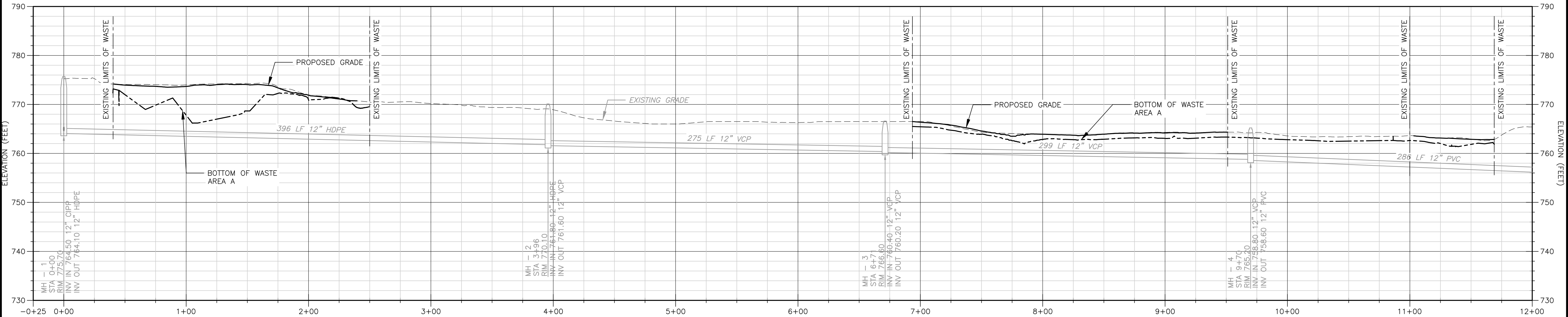
						DESIGNED BY: G. ASHWIN	 4130 Parklake Avenue, Suite 350 Raleigh, NC 27612 Tel: (919) 325-3500 NC F-0412	GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA	BINGHAM PARK (NONCD0000244)	PROPOSED SECTIONS II	PROJECT NO. 6145-304550
					DRAWN BY: V. RANJITH	FILE NAME: C011STPL.DWG					
					SHEET CHK'D BY: D. FORBES	SHEET NO.					
					CROSS CHK'D BY: K. WESTERLUND	C-11					
					APPROVED BY: A. WEISPFENNING						
REV. NO.	DATE	DRWN	CHKD		REMARKS	DATE: DECEMBER 2025					

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PLAN

- NOTES:
- CONTRACTOR SHALL CCTV ALL EXISTING SANITARY SEWER LINES WITHIN THE PROJECT LIMITS BEFORE AND AFTER CONSTRUCTION TO DOCUMENT CONDITIONS. REFER TO SECTION 012200 FOR ADDITIONAL INFORMATION.
 - EXISTING SANITARY SEWER SHALL BE PROTECTED TO ALL EXTENTS POSSIBLE DURING CONSTRUCTION. IF PIPING IS DAMAGED DURING CONSTRUCTION, IT WILL BE EVALUATED AT THAT TIME. THE SECTION OF PIPE FROM MANHOLE TO MANHOLE SHALL BE REPLACED WITH SAME SIZED DUCTILE IRON PIPE. NEW PIPING SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF GREENSBORO SANITARY SEWER STANDARD DRAWINGS AND SPECIFICATIONS FOR UTILITY CONSTRUCTION, LATEST EDITIONS.



PROFILE - A

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:	G. ASHWIN
DRAWN BY:	V. RANJITH
SHEET CHK'D BY:	D. FORBES
CROSS CHK'D BY:	K. WESTERLUND
APPROVED BY:	A. WEISPFENNING
DATE:	DECEMBER 2025

CDM Smith
4130 Parklake Avenue, Suite 350
Raleigh, NC 27612
Tel: (919) 325-3500
NC F-0412

GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

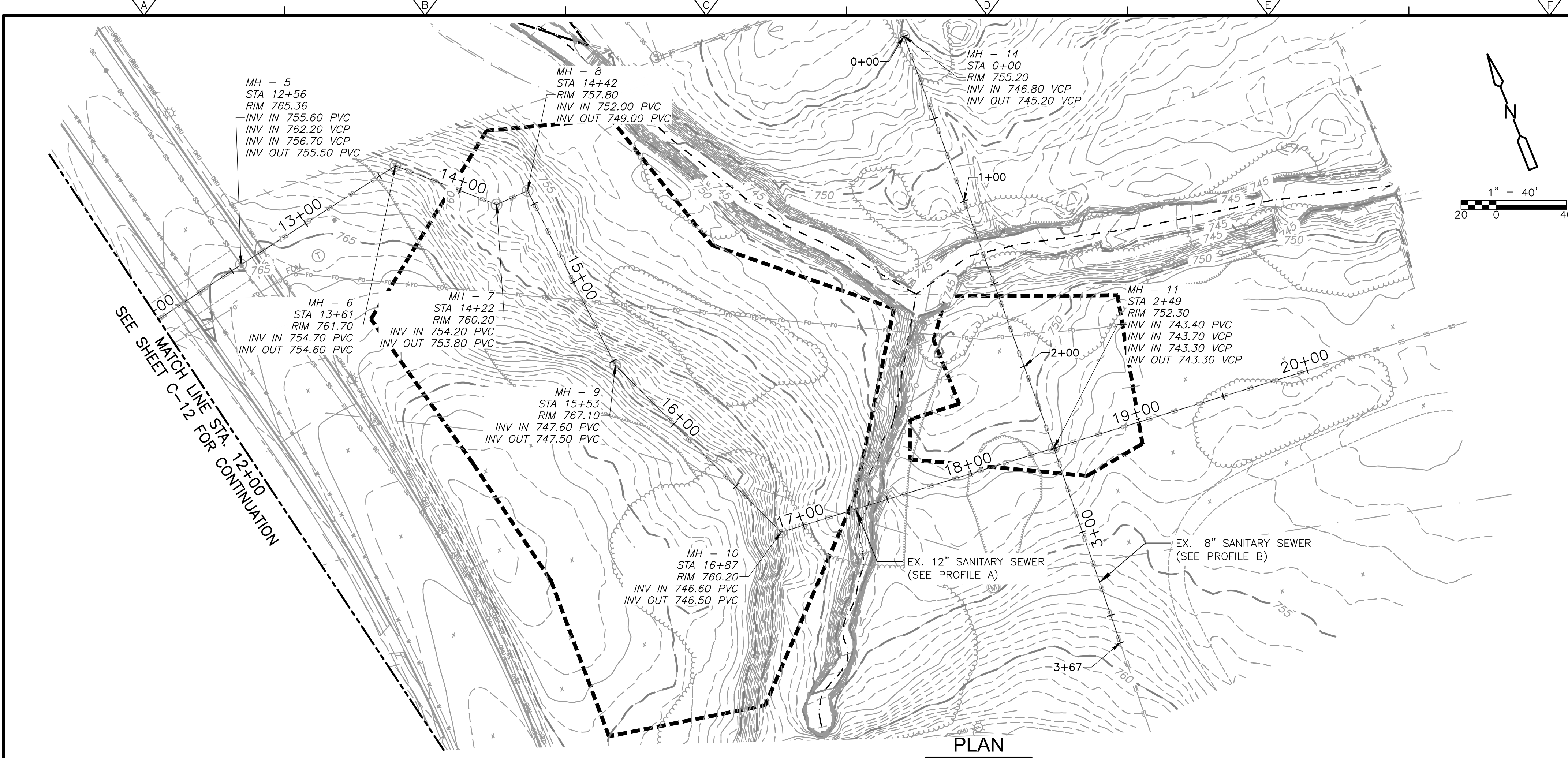
BINGHAM PARK
(NONCD0000244)

EXISTING SANITARY SEWER PLAN AND PROFILE
- AREA A

PROJECT NO. 6145-304550
FILE NAME: C012PLPF.DWG
SHEET NO.
C-12

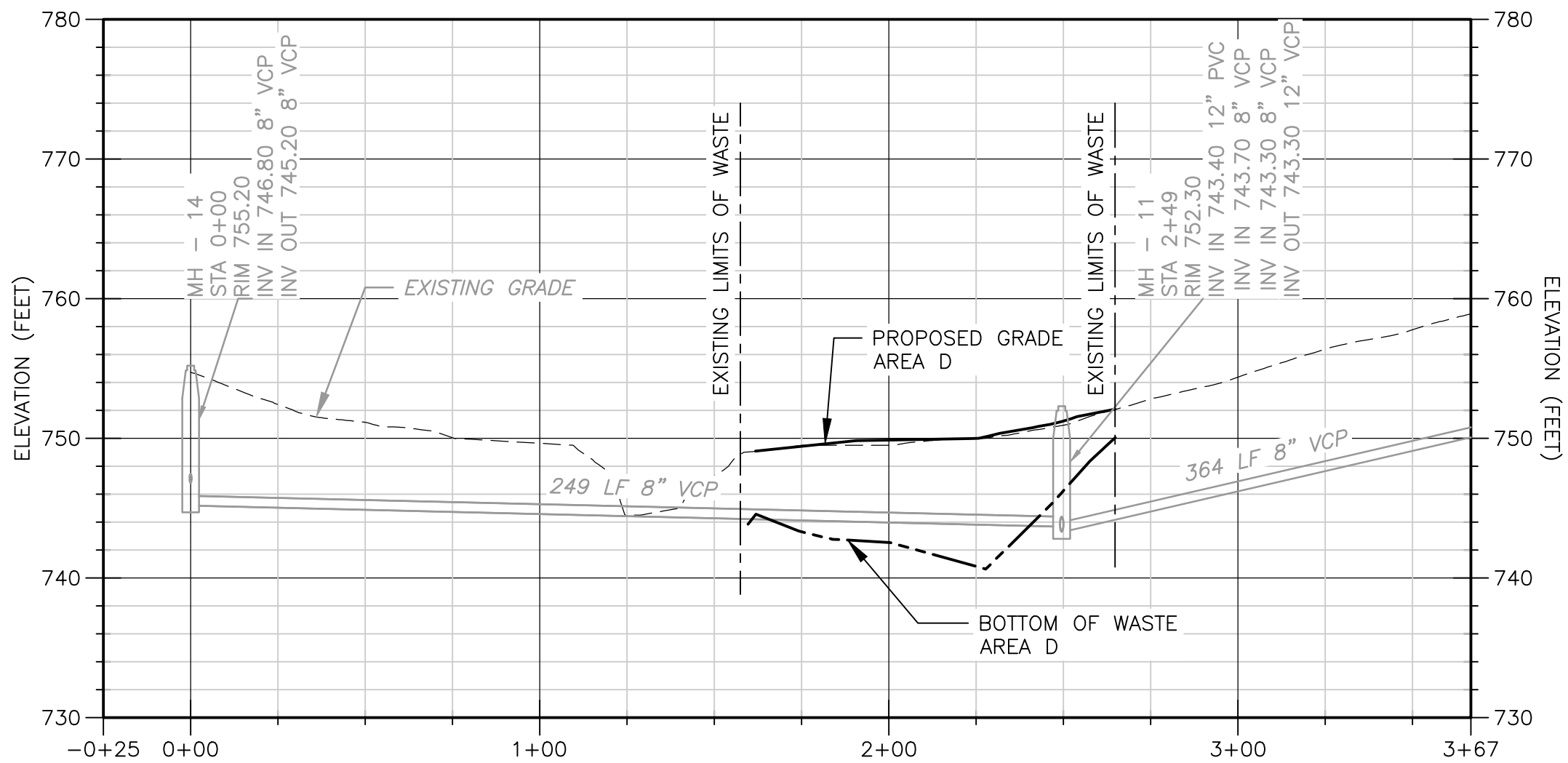
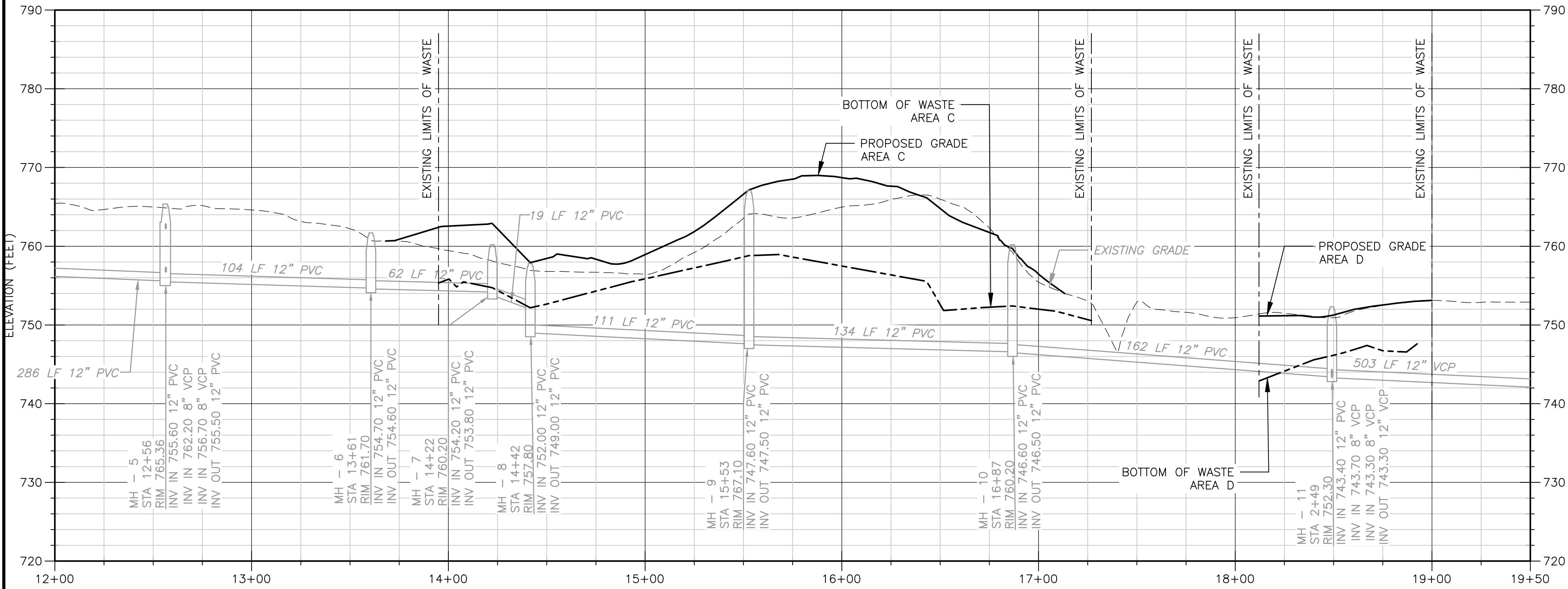
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NOTES:

- CONTRACTOR SHALL CCTV ALL EXISTING SANITARY SEWER LINES WITHIN THE PROJECT LIMITS BEFORE AND AFTER CONSTRUCTION TO DOCUMENT CONDITIONS. REFER TO SECTION 012200 FOR ADDITIONAL INFORMATION.
- EXISTING SANITARY SEWER SHALL BE PROTECTED TO ALL EXTENTS POSSIBLE DURING CONSTRUCTION. IF PIPING IS DAMAGED DURING CONSTRUCTION, IT WILL BE EVALUATED AT THAT TIME. THE SECTION OF PIPE FROM MANHOLE TO MANHOLE SHALL BE REPLACED WITH SAME SIZED DUCTILE IRON PIPE. NEW PIPING SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF GREENSBORO SANITARY SEWER STANDARD DRAWINGS AND SPECIFICATIONS FOR UTILITY CONSTRUCTION, LATEST EDITIONS.



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:	G. ASHWIN
DRAWN BY:	V. RANJITH
SHEET CHK'D BY:	D. FORBES
CROSS CHK'D BY:	K. WESTERLUND
APPROVED BY:	A. WEISPFENNING
DATE:	DECEMBER 2025

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4130 Parklake Avenue, Suite 350
Raleigh, NC 27612
Tel: (919) 325-3500
NC F-0412

GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

EXISTING SANITARY SEWER PLAN AND PROFILE
- AREAS C & D

PROJECT NO. 6145-304550
FILE NAME: C013PLPF.DWG

SHEET NO.

C-13

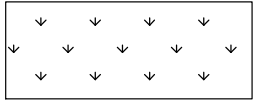
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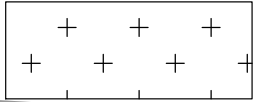


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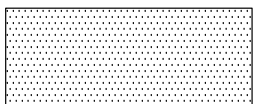
1. ANY DISTURBED AREAS SHALL BE TEMPORARILY SEEDED PER NOTES ON SHEET CD-4 AND PERMANENTLY SEEDED UPON COMPLETION OF REMEDY.
2. SEE SHEET CD-4 AND SECTION 329300 FOR SPECIFIC SEEDING MIXES AND PLANTING DETAILS.



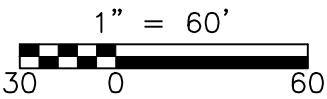
TYPICAL PERMANENT SEEDED (TURF GRASS)



NORTH CAROLINA STEEP SLOPE MIX



WETLAND SEED MIX



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:	G. ASHWIN
DRAWN BY:	V. RANJITH
SHEET CHK'D BY:	D. FORBES
CROSS CHK'D BY:	K. WESTERLUND
APPROVED BY:	A. WEISPFENNING
DATE:	DECEMBER 2025

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4130 Parklake Avenue, Suite 350
Raleigh, NC 27612
Tel: (919) 325-3500
NC F-0412

GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

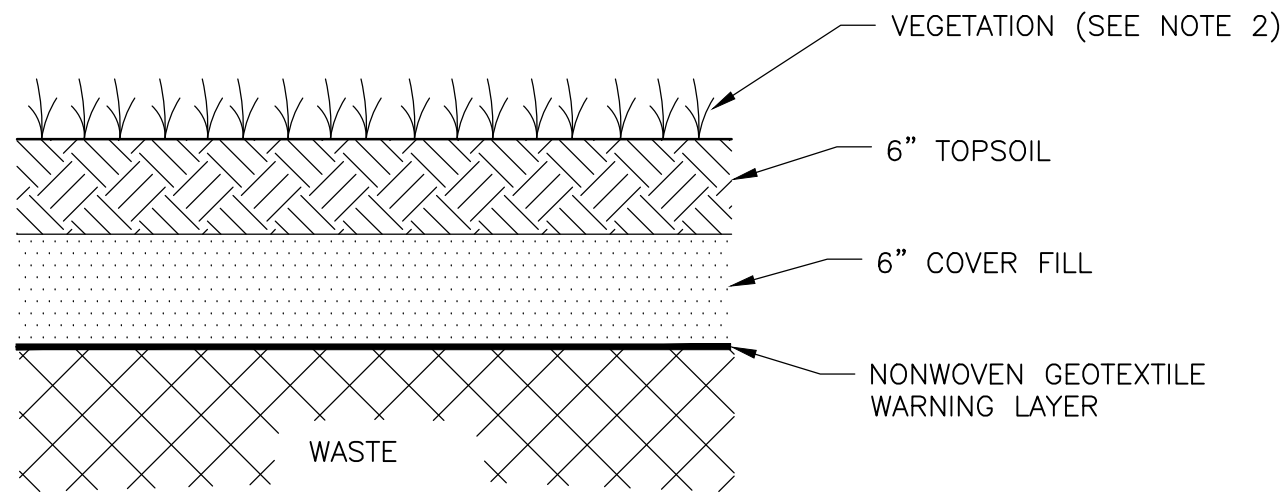
BINGHAM PARK
(NONCD0000244)

SEEDING PLAN

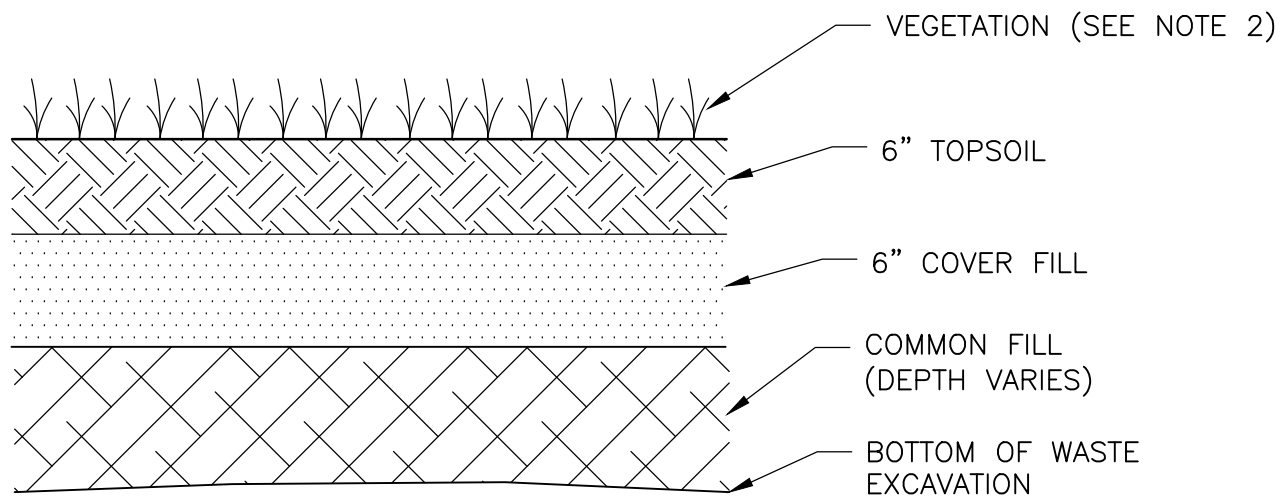
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FILE NAME: C014SDPL.DWG
SHEET NO.

C-14

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AREA WITH WASTE



AREA WITH FULL WASTE EXCAVATION

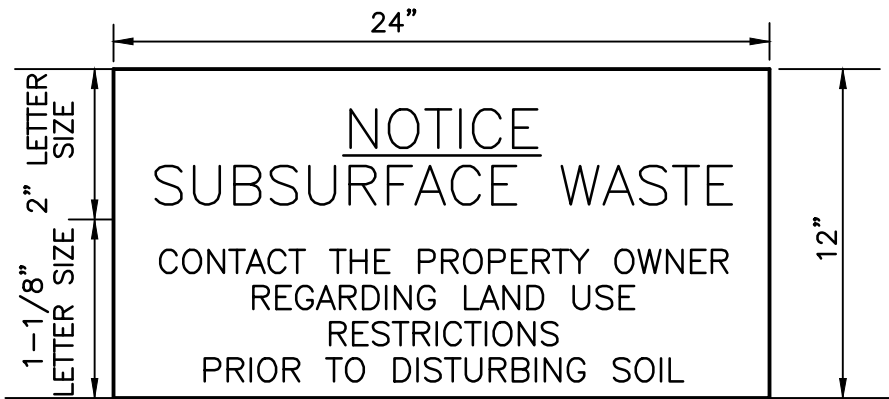
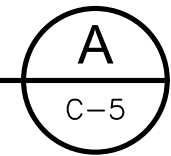
NOTES:

1. WARNING LAYER TO BE INSTALLED ONLY WITHIN THE LIMITS OF WASTE.
2. REFER TO SPECIFICATION SECTION 329300: PLANTINGS FOR SEEDING INFORMATION AND REQUIREMENTS.

FINAL COVER

DETAIL

NTS



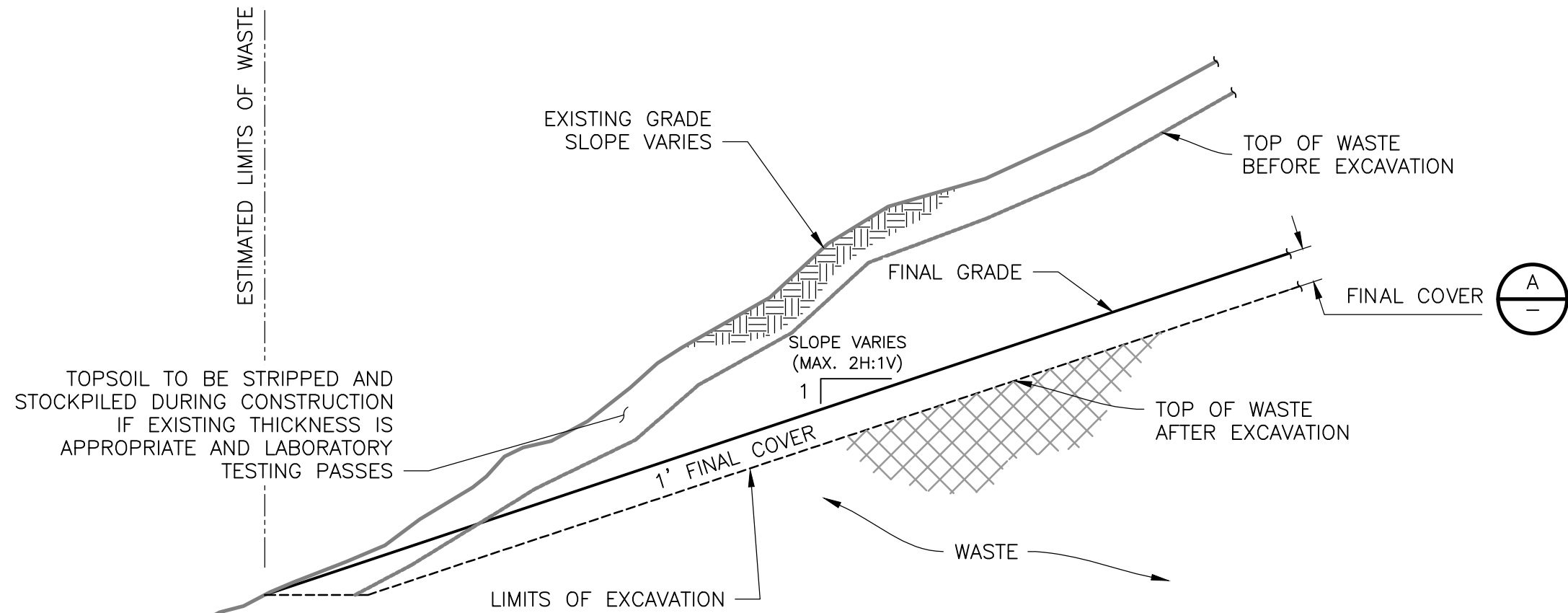
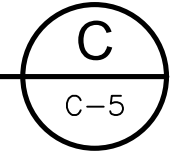
NOTES:

1. MARKERS SHALL BE MANUFACTURED FROM GRANITE.
2. MARKERS SHALL BE POSTED AS SHOWN ON THE PLANS WITH WORDS FACING AWAY FROM THE REMAINING WASTE BOUNDARY.
3. MARKERS SHALL BE ANCHORED SECURELY IN GROUND AND PLACED SURFICIALLY AT SUCH A HEIGHT AS NOT TO IMPEDE MOWING OPERATIONS.
4. CONTRACTOR SHALL INSTALL TRACER WIRE ADJACENT TO THE WASTE MARKER TO ENSURE DETECTABILITY USING STANDARD ELECTROMAGNETIC LOCATING EQUIPMENT. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH WITH ENGINEER PRIOR TO BACKFILLING.

SUBSURFACE WASTE MARKER

DETAIL

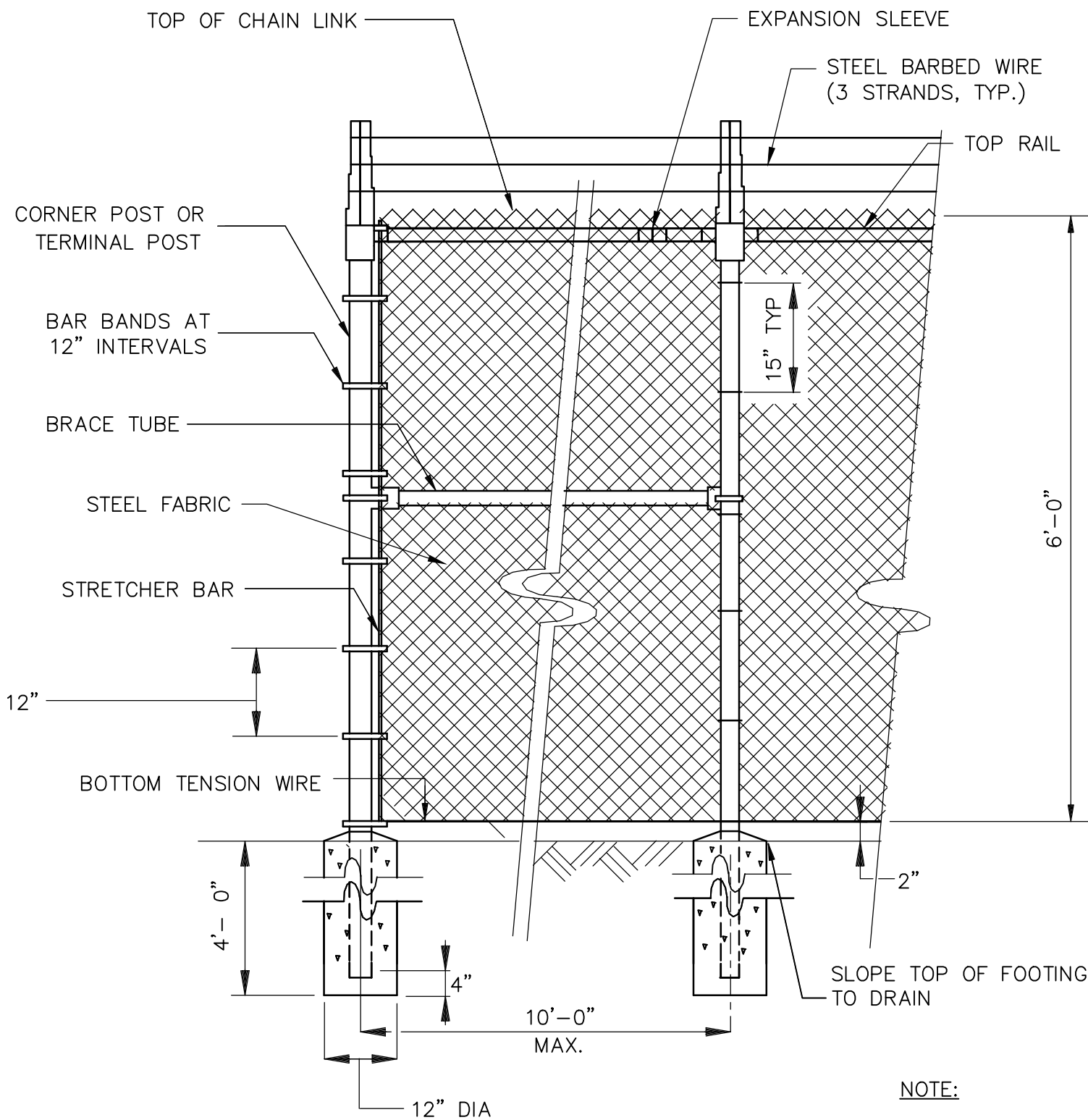
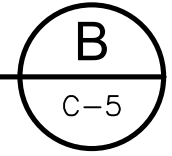
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SLOPE EXCAVATION

DETAIL

NTS



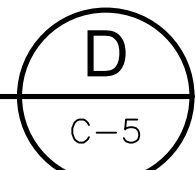
NOTE:

1. ALL RAILS, POSTS, HARDWARE, AND CHAIN LINK FENCING SHALL BE GALVANIZED. SEE SECTION 323113 FOR ADDITIONAL DETAILS.

CHAIN LINK FENCE

DETAIL

NTS



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY:	G. ASHWIN
DRAWN BY:	V. RANJITH
SHEET CHK'D BY:	D. FORBES
CROSS CHK'D BY:	K. WESTERLUND
APPROVED BY:	A. WEISPFENNING
DATE:	DECEMBER 2025

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NC F-0412

GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

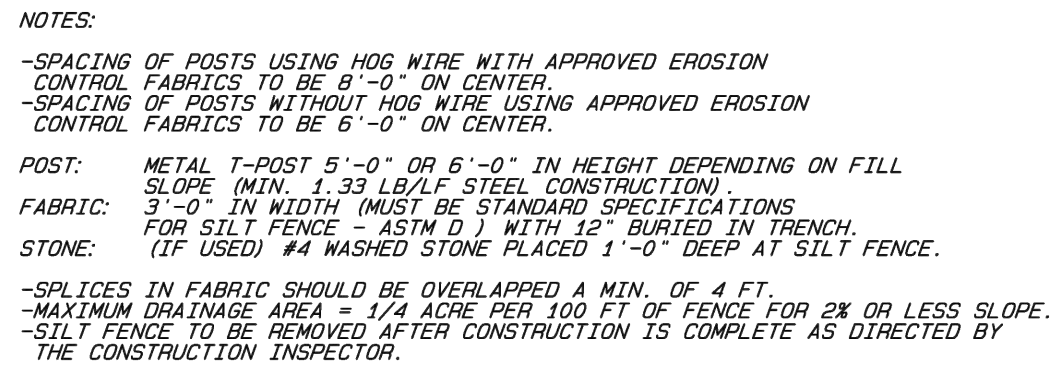
DETAILS AND TYPICAL SECTIONS

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FILE NAME: CD01STD1.DWG

SHEET NO.

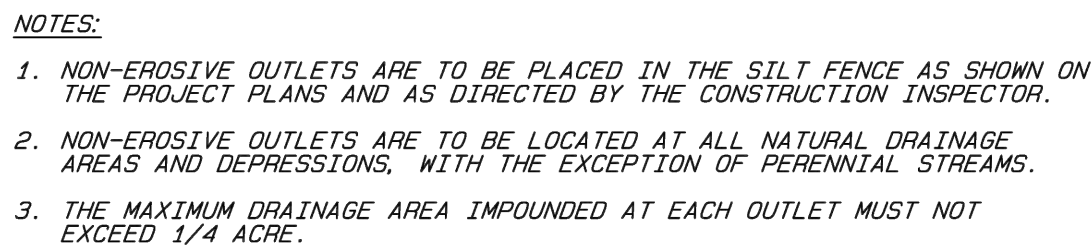
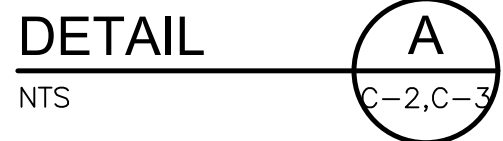
CD-1

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CITY OF GREENSBORO

15. Standard 16. Detail 17. Section 18. Elevation 19. Plan 20. Profile 21. Cross-section 22. Elevation 23. Plan 24. Profile 25. Cross-section 26. Elevation 27. Plan 28. Profile 29. Cross-section 30. Elevation 31. Plan 32. Profile 33. Cross-section 34. Elevation 35. Plan 36. Profile 37. Cross-section 38. Elevation 39. Plan 40. Profile 41. Cross-section 42. Elevation 43. Plan 44. Profile 45. Cross-section 46. Elevation 47. Plan 48. Profile 49. Cross-section 50. Elevation 51. Plan 52. Profile 53. Cross-section 54. Elevation 55. Plan 56. Profile 57. Cross-section 58. Elevation 59. Plan 60. Profile 61. Cross-section 62. Elevation 63. Plan 64. Profile 65. Cross-section 66. Elevation 67. Plan 68. Profile 69. Cross-section 70. Elevation 71. Plan 72. Profile 73. Cross-section 74. Elevation 75. Plan 76. Profile 77. Cross-section 78. Elevation 79. Plan 80. Profile 81. Cross-section 82. Elevation 83. Plan 84. Profile 85. Cross-section 86. Elevation 87. Plan 88. Profile 89. Cross-section 90. 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Cross-section 994. Elevation 995. Plan 996. Profile 997. Cross-section 998. Elevation 999. Plan 1000. Profile	SILT FENCE DETAIL	STD. NO. 430	REV. 12/06 03/08 03/09
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CITY OF GREENSBORO

SILT FENCE DETAIL	STD. NO.	REV.
	430	12/06
		03/08
		03/09



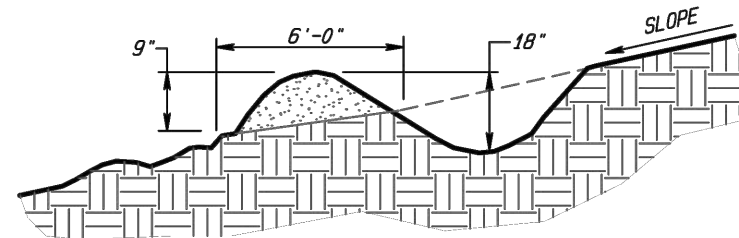
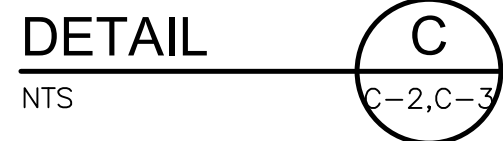
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NOTE:
IN ADDITION THIS TEMPORARY GRAVEL ENTRANCE WILL REDUCE IMPACT OF STREET FLUSHING FEE
EFFECTIVE JULY 1, 1997. CITY OF GREENSBORO ORDINANCE SECT. 26-27, "STREET FLUSHING FEES"

CITY OF GREENSBORO

TEMPORARY CONSTRUCTION ENTRANCE DETAIL (CITY REQUIREMENTS)	STD. NO. 436	REV. 9/06 3/09
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SECTION VIEW OF WATER BAR

1. INSTALL WATER BARS IMMEDIATELY AFTER CLEARING OPERATIONS.
2. DISK OR ROUGHEN THE SURFACE PRIOR TO PLACEMENT OF FILL FOR THE BERM.
3. TAMP AND TIGHTEN FILL TO COMPACT IT TO THE SAME DENSITY AS THE SECTION.
4. DIVERSIONS SHOULD BE INSTALLED SUCH THAT THE SLOPE IN THE CHANNEL SECTION DOES NOT EXCEED 2:1.
5. LOCATE THE OUTLET OF WATER BARS TO UNDISTURBED AREAS. IF THE AREA IS NOT ADEQUATE TO RESIST EROSION, STABILIZE THE AREA WITH RIP-RAP (REFER TO CGO STD. #429).
6. LOCATE THE INLET OF WATER BARS TO UNDISTURBED AREAS. IF THE AREA IS NOT ADEQUATE TO RESIST TRAFFIC, IF EQUIPMENT WILL BE CROSSING THE DIVERSION, STABILIZE WITH STONE OF ADEQUATE SIZE TO WITHSTAND THE TRAFFIC.
7. LOCATE THE DIVERSION STORAGE AND CGO STD. #432 DITCH CHECK AT THE OUTLET OF DIVERSIONS UNTIL DISTURBED AREAS ARE ADEQUATELY STABILIZED. 3,600 CU. FT. OF STORAGE IS REQUIRED TO BE ADEQUATE FOR A 10' WIDE DIVERSION.
8. PERIODICALLY INSPECT RIGHT-OF-WAY DIVERSIONS FOR WEAR AND AFTER EVERY RAINFALL OF ONE HALF INCH OR GREATER. IMMEDIATELY REMOVE SEDIMENT FROM THE FLOW AREA AND REPAIR ANY EROSION AREAS.
9. WHEN ALL AREAS ABOVE THE DIVERSION HAVE BEEN ADEQUATELY STABILIZED, REMOVE THE BERM AND REPAIR ANY EROSION AREAS. THE BERM SHOULD BE BLENDED WITH THE NATURAL GROUND. SEED AND MULCH ALL REMAINING DISTURBED AREAS.

CITY OF GREENSBORO

WATER BAR DETAIL (RIGHT-OF-WAY DIVERSION)	STD. NO.	REV.
	454	06/09



DESIGNED BY: JAM
DRAWN BY: LKW
SHEET CHK'D BY: AMW
CROSS CHK'D BY: KKW
APPROVED BY: JAM
DATE: DECEMBER 2025



GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

EROSION CONTROL DETAILS I

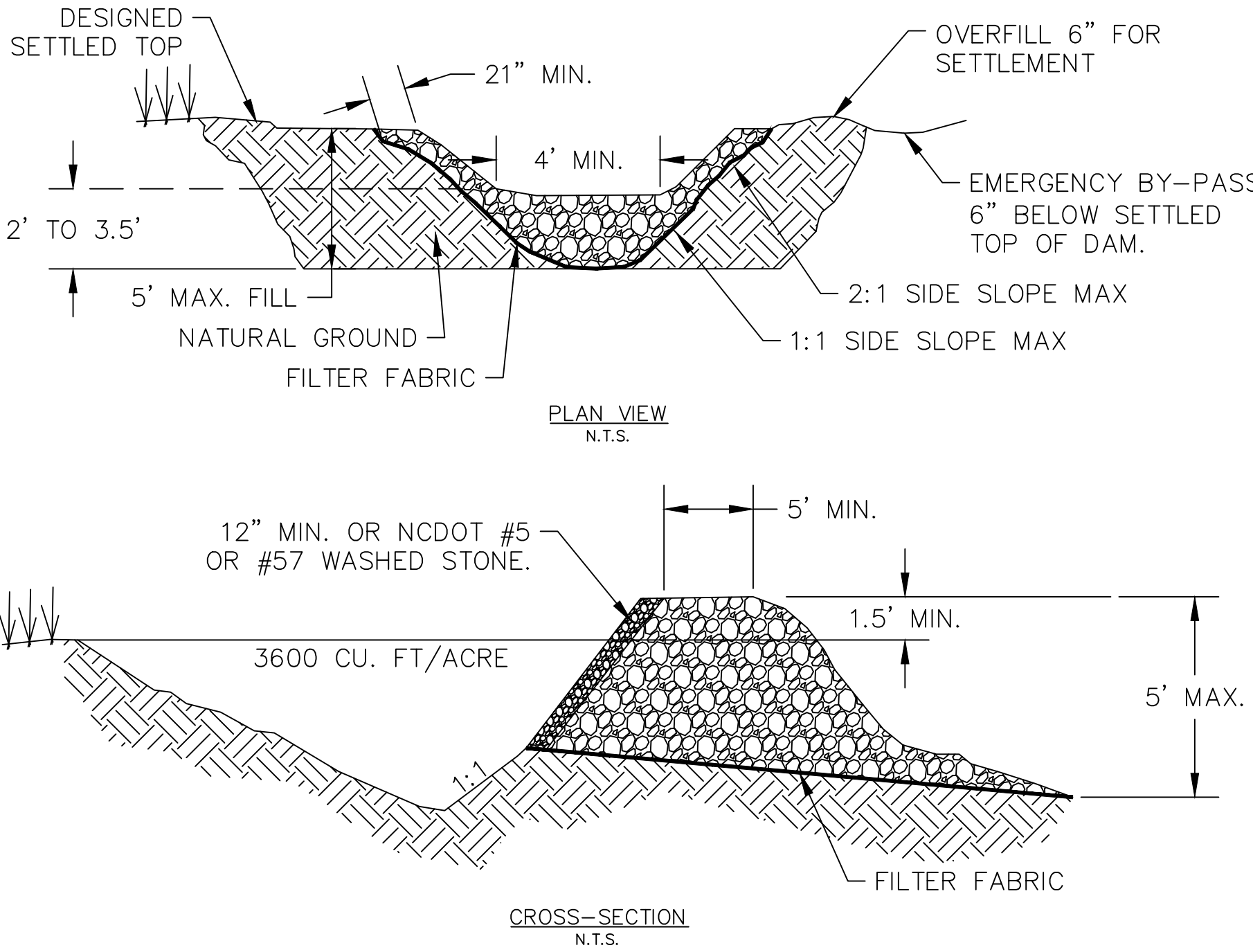
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FILE NAME

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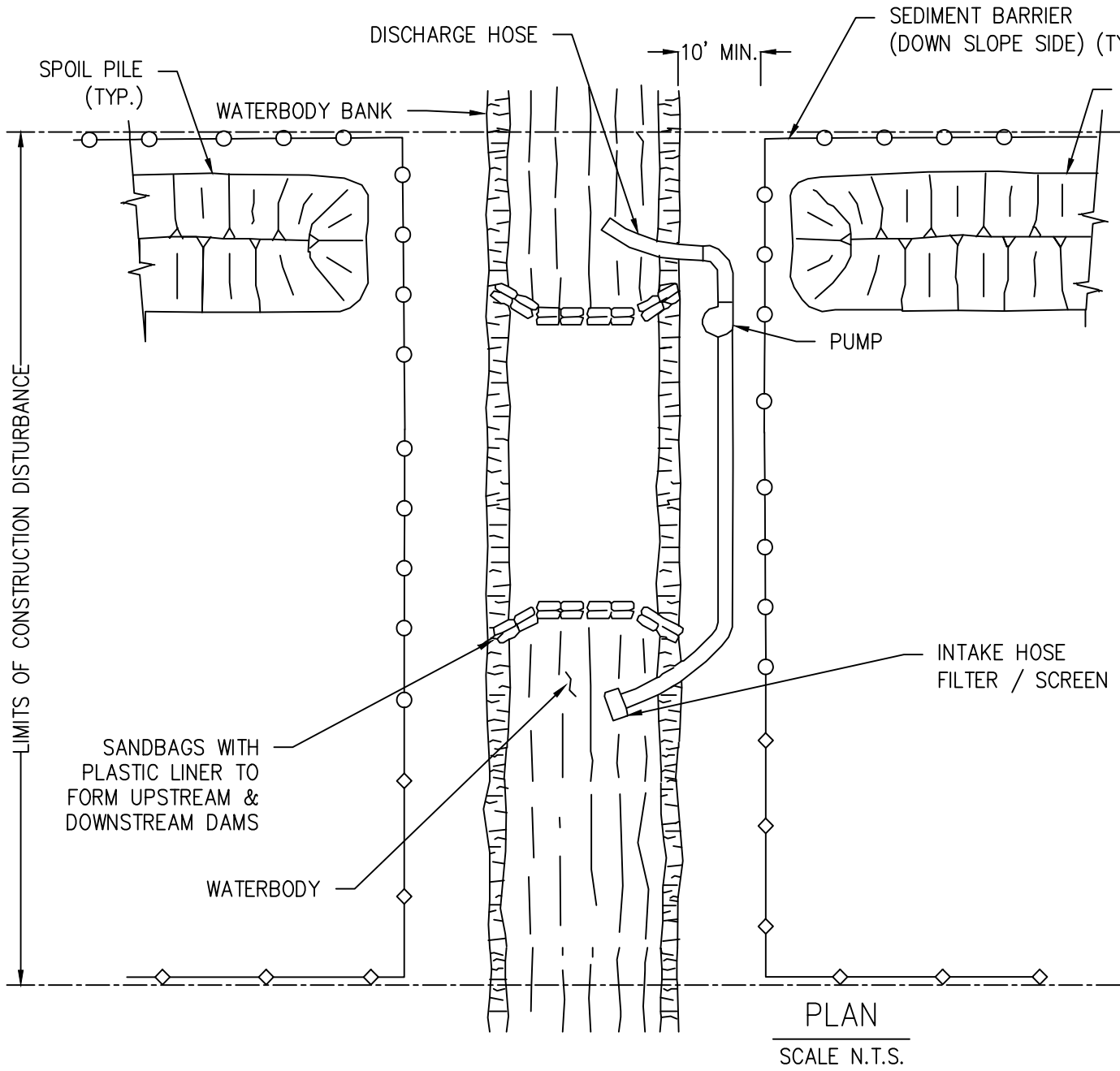
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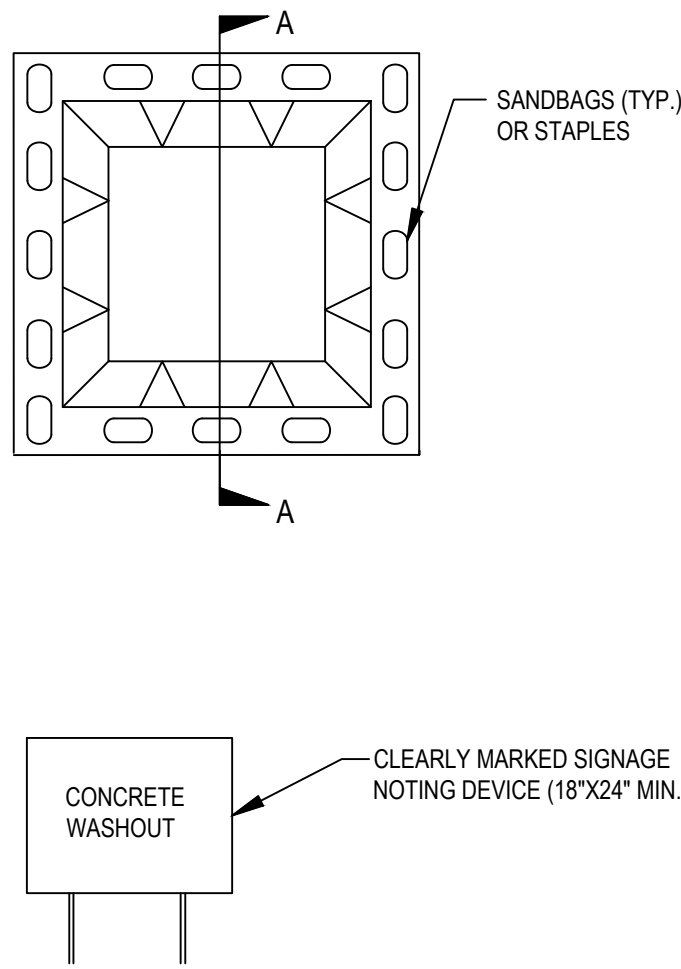
TEMPORARY SEDIMENT TRAP

DETAIL A
NTS
C-2, C-3



TEMPORARY BYPASS AND PUMP

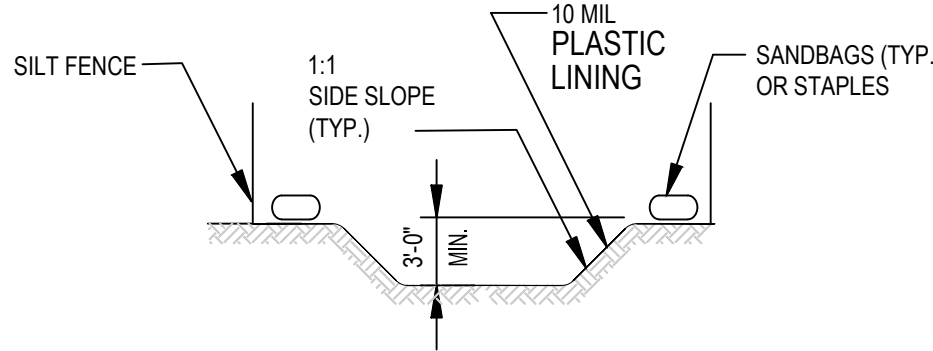
DETAIL D
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C-2



PLAN

BELOW GRADE WASHOUT STRUCTURE

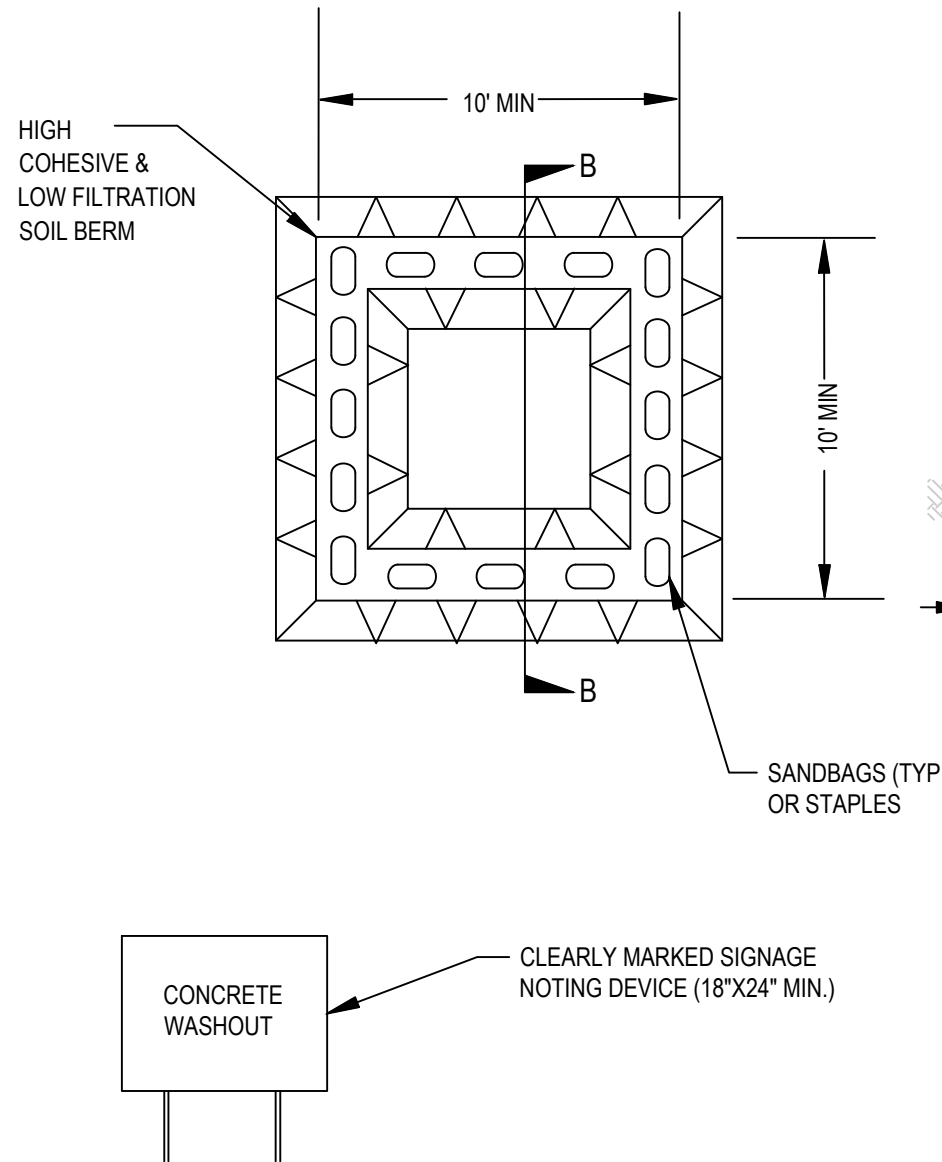
DETAIL B
NTS
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SECTION A-A

- NOTES:
1. ACTUAL LOCATION DETERMINED IN FIELD
 2. THE CONCRETE WASHOUT STRUCTURES SHALL BE MAINTAINED WHEN THE LIQUID AND/OR SOLID REACHES 75% OF THE STRUCTURES CAPACITY.
 3. CONCRETE WASHOUT STRUCTURE NEEDS TO BE CLEARLY MARKED WITH SIGNAGE NOTING DEVICE.

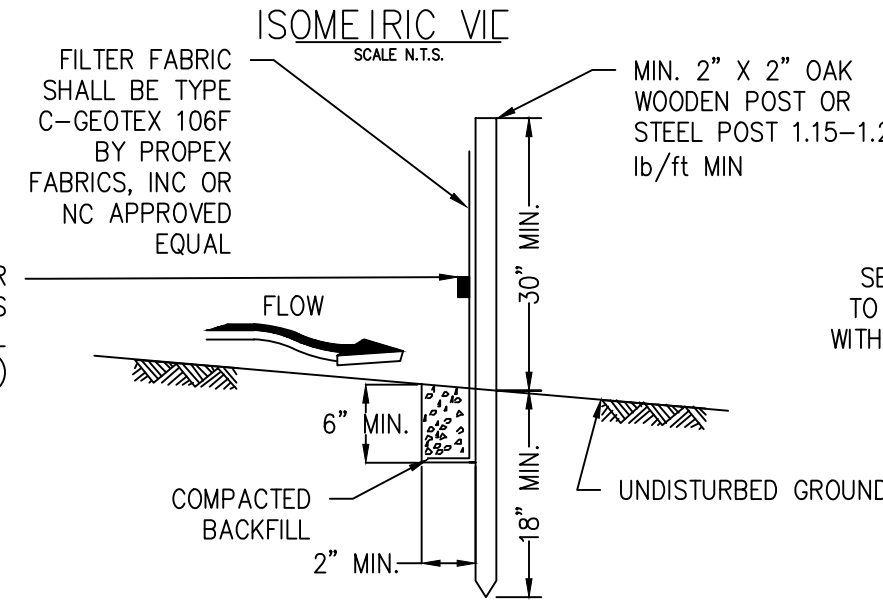
ONSITE CONCRETE WASHOUT
STRUCTURE WITH LINER



PLAN

ABOVE GRADE WASHOUT STRUCTURE

DETAIL C
NTS
-



VERTICAL SECTION - TRENCH DETAIL
SCALE: N.T.S.

NOTES:

1. TYPE S SEDIMENT BARRIERS SHALL BE INSTALLED IN ALL SENSITIVE AREAS. THESE AREAS INCLUDE, BUT ARE NOT LIMITED TO, STATE WATERS, WETLANDS, OR ANY OTHER AREAS DESIGNATED ON THE PLANS.
2. ALONG ALL STATE WATER AND OTHER SENSITIVE AREAS, TWO ROWS OF TYPE S SEDIMENT BARRIERS SHALL BE USED. THE TWO ROWS SHALL BE PLACED A MINIMUM OF 36 INCHES APART.
3. INSTALLATIONS SHALL BE PERIODICALLY CHECKED, THE SEDIMENT SHALL BE REMOVED WHEN IT REACHES ONE-THIRD THE HEIGHT OF THE FABRIC FENCE.
4. REINFORCED SEDIMENT BARRIER SHALL BE LEFT IN PLACE UNTIL PERMANENT VEGETATIVE COVER IS ESTABLISHED. ALL SEDIMENT ACCUMULATED AT THE BARRIER SHALL BE REMOVED AND PROPERLY DISPOSED OF BEFORE BARRIER IS REMOVED.
5. REINFORCED SEDIMENT BARRIER SHALL BE REPLACED WHENEVER IT HAS DETERIORATED TO SUCH AN EXTENT THAT IT REDUCES THE EFFECTIVENESS OF THE REINFORCED SEDIMENT BARRIER OR THE HEIGHT OF THE PRODUCT IS NOT MAINTAINING 80% OF ITS PROPERLY INSTALLED HEIGHT.
6. AREA DISTURBED AS A RESULT OF REMOVING THE REINFORCED SEDIMENT BARRIER SHALL BE RESTABILIZED BY SEEDING IN ACCORDANCE WITH THE REVEGETATION PLAN.
7. TYPE S SEDIMENT BARRIER SHALL BE PLACED PARALLEL TO THE CONTOURS.
8. IF SEDIMENT BARRIER CANNOT BE INSTALLED PARALLEL TO CONTOURS, J-HOOKS SHALL BE INSTALLED AND SPACED ACCORDINGLY. SEE SEDIMENT BARRIER J-HOOK DETAIL FOR FURTHER INFORMATION.
9. ON UPSLOPE INSTALLATIONS, BOTH ENDS OF THE REINFORCED SEDIMENT BARRIER SHALL BE TURNED AND EXTENDED UPSLOPE.
10. SEDIMENT BARRIER FILTER FABRIC SHALL BE CONSTRUCTED OF PROPEX FABRICS, INC. TYPE C GEOTEX 106F OR NC APPROVED EQUAL, THAT MEETS THE REQUIREMENTS OF TABLE 6.62B FOR SEDIMENT FENCE FABRIC FOR THE NCDOT EROSION AND SEDIMENT CONTROL FIELD MANUAL.

SUPER SILT FENCE

DETAIL E
NTS
C-2, C-3

NOTES:

1. SEDIMENT BARRIERS SHALL BE INSTALLED AS DEPICTED AND ALONG DOWN GRADIENT SIDES OF WORK AREAS AND STAGING AREAS SUCH THAT NO HEAVY SILT LADEN WATER ENTERS THE WATERBODY OR LEAVES THE CONSTRUCTION RIGHT-OF-WAY
2. EQUIPMENT OPERATING IN THE WATERBODY SHALL BE LIMITED TO THAT NEEDED TO PERFORM CONSTRUCTION. IF OTHER TYPES OF EQUIPMENT MUST CROSS THE WATERBODY, CONTRACTOR SHALL PROVIDE AND USE A TEMPORARY STREAM CROSSING.
3. IMPLEMENTATION OF THE DAM-AND-PUMP CROSSING METHOD MUST MEET THE FOLLOWING PERFORMANCE CRITERIA:
 - (A) USE SUFFICIENT PUMPS, INCLUDING ON-SITE BACKUP PUMPS, TO MAINTAIN DOWNSTREAM FLOWS.
 - (B) CONSTRUCT DAMS WITH MATERIALS THAT PREVENT SEDIMENT AND OTHER POLLUTANTS FROM ENTERING THE WATERBODY (E.G., SANDBAGS OR CLEAN GRAVEL WITH PLASTIC LINER).
 - (C) SCREEN PUMP INTAKES;
 - (D) PREVENT STREAMBED SCOUR AT PUMP DISCHARGE.
 - (E) MONITOR THE DAM AND PUMPS TO ENSURE PROPER OPERATION THROUGHOUT THE WATERBODY CROSSING.
4. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED DAILY AND REPAIRED IF NECESSARY.
5. CHEMICALS, FUELS AND LUBRICATING OILS SHALL NOT BE STORED AND EQUIPMENT SHALL NOT BE REFUELED WITHIN 100 FEET OF THE WATERBODY.
6. CONTRACTOR SHALL POSTPONE GRADING ADJACENT TO WATERBODY UNTIL STAGING AREA IS PREPARED AND WORK IN THE WATERBODY IS READY TO COMMENCE.

CONSTRUCTION SEQUENCE:

1. ISOLATE THE WORKING AREA NEAR THE STREAM WITH SAND BAGS PER THE DETAIL.
2. CONTINUE PUMPING OF THE STREAM AS NEEDED TO MAINTAIN A DRY WORKING AREA FOR WASTE REMOVAL.
3. COMPLETE WASTE REMOVAL FROM THE STREAM IN A TIMELY MANNER.
4. RESTORE AND RE-VEGETATE THE WORKING AREA IMMEDIATELY AFTER WASTE REMOVAL HAS BEEN COMPLETED.
5. CONTINUE THIS PROCESS ALONG PARTS OF THE STREAM WHERE WASTE REMOVAL IS NECESSARY FOR THE DURATION OF THE PROJECT.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: JAM
DRAWN BY: LKW
SHEET CHK'D BY: AMW
CROSS CHK'D BY: KKW
APPROVED BY: JAM
DATE: DECEMBER 2025

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4130 Parklake Avenue, Suite 350
Raleigh, NC 27612
Tel: (919) 325-3500
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ENGINEERING & CONSTRUCTION
4900 KODER BLVD., SUITE 160, GREENSBORO, NC 27407
TEL: (336) 545-1050 | WWW.CRI-TEKGROUP.COM | LICENSE: C-4091

GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

EROSION CONTROL DETAILS II

PROJECT NO. 6145-304550
FILE NAME:

SHEET NO.

CD-3

100% SUBMITTAL

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EROSION AND SEDIMENT CONTROL NOTES

1.

PROVISIONS TO PREVENT EROSION OF THE SOIL FROM THE SITE SHALL CONFORM TO THE REQUIREMENTS OF THE "NORTH CAROLINA SEDIMENTATION POLLUTION CONTROL ACT OF 1973" AS SHOWN HEREIN AND STIPULATED IN THE "EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL" BY VARIOUS AGENCIES WITHIN THE STATE OF NORTH CAROLINA. INSTALLATION SHALL BE IN A MANNER SO AS TO MINIMIZE EROSION OF THE DISTURBED AREAS AND PREVENT SEDIMENT FROM LEAVING THE SITE.

2.

TEMPORARY VEGETATIVE COVER SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF CHAPTER 6, SECTION 10 AND 11 OF THE "PLANNING AND DESIGN MANUAL" AS DESCRIBED IN NOTE NO. 1 ABOVE.

3.

EROSION CONTROL INSPECTOR CAN BE REACHED AT THE NCDENR WINSTON-SALEM REGIONAL OFFICE AT 336-771-5000.

4.

EROSION CONTROL DEVICES ARE TO BE INSTALLED IN ACCORDANCE WITH THE APPROVED PLANS. THE PLANS AND DETAILS ARE BASED ON THE NC EROSION AND SEDIMENT PLANNING DRAWINGS, AND THE PROJECT SPECIFICATIONS.

5.

ALL SEDIMENT AND EROSION CONTROL MEASURES ARE TO BE INSPECTED BY THE CONTRACTOR AT LEAST ONCE EVERY SEVEN (7) DAYS AND AFTER ANY STORM EVENT OF 1" OR GREATER PRECIPITATION DURING 24 HOUR PERIOD. THE CONTRACTOR SHALL PROVIDE THE ENGINEER AND OWNER WITH COPIES OF HIS INSPECTION REPORT AND SHALL HAVE FIVE (5) DAYS TO REPAIR AND/OR CORRECT DEFICIENCIES. DAMAGED OR INEFFECTIVE DEVICES SHALL BE REPAIRED OR REPLACED AS NECESSARY.

6.

ALL DISTURBED AREAS WHERE CONSTRUCTION HAS TEMPORARILY OR PERMANENTLY CEASED SHALL BE STABILIZED WITH GRASSING AS SOON AS PRACTICABLE AND IN NO CASE EXCEED THE TIME AS DESCRIBE IN THE "STABILIZATION TIMEFRAME", ON SHEET CD-5 (PER NPDES STORMWATER GENERAL PERMIT NCGO10000).

7.

ALL CONSTRUCTION WORK SHALL BE IN COMPLIANCE WITH REGULATIONS OF THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORM WATER GENERAL PERMIT (NCGO10000). THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONDUCTING, RECORDING, AND SUBMITTING THE REQUIRED SELF-INSPECTION REPORTS TO THE APPROPRIATE AGENCIES. PERMIT DOCUMENTATION CAN BE FOUND IN THE PROJECT SPECIAL CONDITIONS.

8.

ALL EROSION CONTROL DEVICES SHALL BE PROPERLY MAINTAINED DURING ALL PHASES OF CONSTRUCTION UNTIL THE COMPLETION OF ALL CONSTRUCTION ACTIVITIES AND ALL DISTURBED AREAS HAVE BEEN STABILIZED. ADDITIONAL CONTROL DEVICES MAY BE REQUIRED DURING CONSTRUCTION IN ORDER TO CONTROL EROSION AND/OR OFFSITE SEDIMENTATION, AS DETERMINED BY THE ENGINEER OR EROSION CONTROL INSPECTOR.

9.

THE CONTRACTOR SHALL TAKE NECESSARY ACTION TO MINIMIZE TRACKING OF MUD ONTO PAVED ROADWAY SURFACE FROM CONSTRUCTION AREAS, INCLUDING BUT NOT LIMITED TO EXTENDING THE MUD MAT. THE CONTRACTOR SHALL REMOVE MUD AND SOIL FROM THE PAVEMENT ON A DAILY BASIS. NO ADDITIONAL PAYMENT WILL BE MADE.

10.

THE CONTRACTOR SHALL SCHEDULE AND PERFORM A CONTINUOUS CONSTRUCTION OPERATION AT ALL DRAINAGE DITCHES AND STREAM CROSSINGS IN ORDER TO MINIMIZE THE TIME WORKING IN THE DRAINAGE OR STREAM.

11.

ANY OFF-SITE BORROW AND WASTE REQUIRED FOR THIS PROJECT MUST COME FROM A SITE WITH AN APPROVED EROSION CONTROL PLAN, A SITE REGULATED UNDER THE MINING ACT OF 1971, OR A LANDFILL REGULATED BY THE DIVISION OF SOLID WASTE MANAGEMENT. TRASH/DEBRIS FROM DEMOLITION ACTIVITIES ON SITE MUST BE DISPOSED OF AT A FACILITY REGULATED BY THE DIVISION OF SOLID WASTE MANAGEMENT OR PER DIVISION OF SOLID WASTE MANAGEMENT OR DIVISION OF WATER RESOURCES RULES AND REGULATIONS.

12.

SILT FENCE OUTLETS AND TEMPORARY SEDIMENT TRAPS SHALL BE CONSTRUCTED IN LOW LYING AREAS AND AREAS OF CONCENTRATED FLOW ALONG THE LENGTH OF TEMPORARY SILT FENCING. IF LOCATIONS ARISE DURING THE COURSE OF CONSTRUCTION WHERE THE TEMPORARY SILT FENCE BECOMES OVERWHELMED WITH FLOW AND FAILS, THE CONTRACTOR SHALL REPAIR THESE AREAS WITH SILT FENCE OUTLETS.

13.

WHERE SEDIMENT IS TRANSPORTED ONTO A PAVED OR PUBLIC ROAD SURFACE, THE ROAD SURFACE SHALL BE CLEANED IMMEDIATELY AND CLEANED THOROUGHLY AT THE END OF EACH DAY. SEDIMENT SHALL BE REMOVED FROM THE ROADS BY SHOVELING OR SWEEPING AND TRANSPORTED TO A SEDIMENT CONTROL DISPOSAL AREA. STREET WASHING SHALL BE ALLOWED ONLY AFTER SEDIMENT IS REMOVED IN THIS MANNER.

SEQUENCE OF CONSTRUCTION FOR EROSION AND SEDIMENT CONTROL

1.

OBTAIN PLAN APPROVAL AND OTHER APPLICABLE PERMITS.

2.

THE CONTRACTOR SHALL CONTACT THE NCDEQ LAND QUALITY SECTION, AT 336-776-9800, PRIOR TO ANY LAND DISTURBANCE ACTIVITY, TO SCHEDULE A PRE-CONSTRUCTION MEETING WITH REPRESENTATIVES FROM NCDEQ, CONTRACTOR, ENGINEER, AND OWNER.

3.

FLAG THE WORK LIMITS AND MARK ITEMS TO BE PROTECTED, SUCH AS TREES AND EXISTING UTILITIES THAT ARE TO REMAIN.

4.

HOLD PRECONSTRUCTION CONFERENCE AT LEAST ONE WEEK PRIOR TO STARTING CONSTRUCTION.

5.

NO MAJOR GRADING ACTIVITIES ARE TO TAKE PLACE DURING WET WEATHER OR PERIODS OF PREDICTED WET WEATHER, I.E. HURRICANES.

6.

INSTALL TEMPORARY CONSTRUCTION ENTRANCES AS SHOWN.

7.

INSTALL TEMPORARY FENCING WITH DUST CLOTH.

8.

LIMIT DISTURBED AREAS TO SECTION OF SEWER UNDER CONSTRUCTION TO THE FULLEST EXTENT POSSIBLE. ANY DISTURBED AREAS THAT ARE NOT UNDER CONSTRUCTION MUST BE STABILIZED WITH PERMANENT OR TEMPORARY SEEDING AND MULCH.

9.

REMOVE TREES AND OTHER VEGETATION, AS NECESSARY, FOR THE INSTALLATION OF PERIMETER MEASURES.

10.

INSTALL SEDIMENT FENCE AND STONE OUTLETS AS NEEDED.

11.

INSTALL HEAVY EQUIPMENT MAT WETLAND CROSSINGS, WATER BARS AND TIMBER BRIDGES AS NECESSARY TO ACCESS WORK. MATS AND BRIDGES ARE TO BE UTILIZED TO THE FULLEST EXTENT POSSIBLE TO LIMIT DISRUPTION TO WETLANDS AND STREAMS.

12.

BEGIN SANITARY SEWER INSTALLATION ONLY AFTER ALL EROSION CONTROL DEVICES ARE INSTALLED AND AREAS DOWNSTREAM OF WORK LIMITS ARE PROTECTED.

13.

EXISTING GRADE IS TO BE MAINTAINED FOR THE SITE UNLESS OTHERWISE NOTED ON THE PLANS. WITHIN 7 DAYS OF COMPLETING A SECTION OF THE PROJECT WHERE NO FURTHER LAND DISTURBANCE IS NECESSARY, CLOSE OUT, SEED AND STABILIZE AREA TO PREVENT FURTHER EROSION. SEED AREAS ACCORDING TO THE SEED SPECIFICATIONS.

14.

SITE MUST BE "STORM READY" BEFORE ANY EXTENDED BREAKS IN CONSTRUCTION ACTIVITIES, INCLUDING WEEKENDS.

15.

ALL EROSION AND SEDIMENT CONTROL PRACTICES WILL BE INSPECTED WEEKLY AND AFTER EACH RAINFALL EVENT OF 1 INCH OR MORE. NEEDED REPAIRS WILL BE MADE IMMEDIATELY.

16.

AFTER SITE IS STABILIZED, REMOVE ALL TEMPORARY MEASURES, SEED AND MULCH REMAINING DISTURBED AREAS.

17.

NOTIFY NCDEQ LQS INSPECTOR WHEN PROJECT IS READY FOR CLOSE OUT INSPECTION. FILE FOR NPDES NCGO10000 ENOTICE OF TERMINATION WHEN FINAL CLOSE OUT INSPECTION REPORT IS RECEIVED FROM NCDEQ LQS.

EROSION AND SEDIMENT CONTROL MAINTENANCE:

1.

EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED CONTINUALLY, RELOCATED WHEN AND AS REQUIRED AND SHALL BE CHECKED AFTER EACH RAINFALL EVENT OF 1 INCH OR MORE. SEEDED AREAS SHALL BE CHECKED REGULARLY AND SHALL BE WATER, FERTILIZED AND MULCHED AS REQUIRED TO OBTAIN A DENSE STAND OF GRASS. ANY REPAIRS WILL BE MADE IMMEDIATELY TO MAINTAIN ALL PRACTICES AS DESIGNED.

2.

ALL DRAINAGE INLETS DOWN SLOPE OF THE CONSTRUCTION WORK AREA SHALL PROTECTED FROM SILTATION. INEFFECTIVE PROTECTION DEVICES SHALL BE LAID IN SUCH A WAY THAT GOOD CONTACT WITH THE GROUND IS ESTABLISHED.

3.

SEDIMENT SHALL BE REMOVED FROM BEHIND THE SILT FENCE WHEN IT REACHED 0.5 FEET DEEP AT THE SILT FENCE. SHOULD THE SILT FENCE FABRIC COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE. REPLACE IT PROMPTLY AND REMOVE SEDIMENT DEPOSITS AS NECESSARY TO REDUCE PRESSURE ON THE FENCE. AVOID UNDERMINING SILT FENCE DURING CLEAN OUT.

4.

CHECK STONE SILT FENCE OUTLETS FOR EROSION, PIPING AND ROCK DISPLACEMENT WEEKLY AND AFTER EACH RAINFALL EVENT OF 1 INCH OR MORE. REMOVE SEDIMENT DEPOSITS, STRAW, LIMBS AND DEBRIS FROM BEHIND TEMPORARY SEDIMENT TRAPS AND TEMPORARY ROCK SILT CHECK AS NECESSARY TO PREVENT CHANNEL CLOGGING. ADD STONES AS NECESSARY TO MAINTAIN DESIGN HEIGHT.

5.

ALL IMPERVIOUS DIKES SHALL BE CONSTRUCTED FROM NON-ERODIBLE MATERIALS (E.G. RIP RAP, SANDBAGS, PRECAST CONCRETE BARRIERS, PLASTIC SHEETING, ETC.) IN ACCORDANCE WITH DETAILS PROVIDED. DAMAGED MATERIALS WILL BE REPAIRED OR REPLACED IMMEDIATELY. ADDITIONAL MATERIALS MAY BE REQUIRED IF UNDERMINING OR WASHOUT OF STREAM BANKS OCCURS.

6.

SEDIMENT REMOVED FOR ANY TEMPORARY SOIL EROSION AND SEDIMENT CONTROL MEASURE DURING REGULAR MAINTENANCE SHALL BE REMOVED FROM SITE AND DISPOSED OF IN AN OFF-SITE FACILITY WITH PROPER PERMITTING FOR DISPOSAL OF SAID MATERIALS.

7.

AFFECTED ROADS SHALL BE CLEANED DAILY OR MORE FREQUENTLY IF OTHERWISE REQUIRED BY THE E&SC INSPECTOR, ENGINEER, OWNER, OR THEIR REPRESENTATIVE(S).

8.

CONSTRUCTION EQUIPMENT AND VEHICLES WITHIN THE WORK AREA SHALL BE PROPERLY MAINTAINED AND INSPECTED, PARTICULARLY FOR IDENTIFICATION AND REPAIR OF VEHICLES LEAKING PETROLEUM PRODUCTS THAT COULD ENTER ADJACENT STORMWATER DRAINAGE FACILITIES.

9.

ALL SEEDED AREA SHALL BE FERTILIZED, RESEEDED, AND MULCHED AS NECESSARY TO MAINTAIN A VIGOROUS, DENSE VEGETATIVE COVER, THROUGH THE ONE-YEAR WARRANTY PERIOD.

PLANNED EROSION AND SEDIMENT CONTROL MEASURES

1.

TEMPORARY FENCING WITH DUST CLOTH: SHALL BE OUTFITTED ALONG THE EXISTING TEMPORARY FENCE AND INSTALLED AND LOCATED ALONG THE PROPOSED LIMITS OF DISTURBANCE.

2.

SILT FENCE: SILT FENCE SHALL BE INSTALLED AND LOCATED ALONG THE PROPOSED LIMITS OF DISTURBANCE, AROUND THE SOIL STOCKPILE AREAS AND AS DIRECTED BY THE ENGINEER.

3.

SURFACE STABILIZATION: SURFACE STERILIZATIONS WILL BE ACCOMPLISHED WITH VEGETATION, AND MULCH, MATTING, AND EROSION CONTROL STONE AS INDICATED ON THE PLANS.

4.

WATTLE BARRIERS: WATTLES SHALL BE INSTALLED AND LOCATED ALONG THE PROPOSED LIMITS OF DISTURBANCE AS INDICATED ON THE PLANS.

5.

TEMPORARY SWALES: TEMPORARY SWALES SHALL BE INSTALLED AS NECESSARY TO DIRECT RUNOFF FROM DISTURBED AREAS TO THE SEDIMENT TRAPS OR OTHER EROSION AND SEDIMENT CONTROL MEASURES.

6.

STAGING AND LAYDOWN AREAS: STAGING AND LAYDOWN AREAS FOR VEHICLES, EQUIPMENT, AND CONSTRUCTION MATERIALS, SHALL BE LOCATED ON STABILIZED PORTIONS OF THE SITE. VEHICLES AND EQUIPMENT SHALL BE WASHED DOWN IN STABILIZED AREAS PRIOR TO EXISTING THE SITE.

7.

DUST CONTROL: SHOULD EXCESSIVE DUST BE GENERATED, IT SHALL BE CONTROLLED BY SPRINKLING.

8.

DEWATERING: TEMPORARY DEWATERING PRACTICES SHALL BE USED TO PREVENT PONDING OF RAIN WATER OR GROUNDWATER DURING CONSTRUCTION OF EXCAVATED AREA SUCH AS LAUNCH PITS, RECEIVING PITS, AND OTHER AREAS WHERE THE WATER TABLE IS EXPOSED DUE TO EXCAVATION.

LITTER, BUILDING MATERIAL AND LAND CLEARING WASTE

1.

NEVER BURY OR BURN WASTE. PLACE LITTER AND DEBRIS IN APPROVED WASTE CONTAINERS.

2.

PROVIDE A SUFFICIENT NUMBER AND SIZE OF WASTE CONTAINERS (E.G. DUMPSTER, TRASH RECEPTACLE) ON SITE TO CONTAIN CONSTRUCTION AND DOMESTIC WASTES.

3.

LOCATE WASTE CONTAINERS AT LEAST 50 FEET AWAY FROM STORM DRAIN INLETS AND SURFACE WATERS UNLESS NO OTHER ALTERNATIVES ARE REASONABLY AVAILABLE.

4.

LOCATE WASTE CONTAINERS ON AREAS THAT DO NOT RECEIVE SUBSTANTIAL AMOUNTS OF RUNOFF FROM UPLAND AREAS AND DOES NOT DRAIN DIRECTLY TO A STORM DRAIN, STREAM OR WETLAND.

5.

COVER WASTE CONTAINERS AT THE END OF EACH DAY WORKDAY AND BEFORE STORM EVENTS OR PROVIDE SECONDARY CONTAINMENT. REPAIR OR REPLACE DAMAGED WASTE CONTAINERS.

6.

ANCHOR ALL LIGHTWEIGHT ITEMS IN WASTE CONTAINERS DURING TIMES OF HIGH WINDS.

7.

EMPTY WASTE CONTAINERS AS NEEDED TO PREVENT OVERFLOW. CLEAN UP IMMEDIATELY IF CONTAINERS OVERFLOW.

8.

DISPOSE WASTE OFF-SITE AT AN APPROVED DISPOSAL FACILITY.

9.

ON BUSINESS DAYS, CLEAN UP AND DISPOSE OF WASTE IN DESIGNATED WASTE CONTAINERS.

PORTABLE TOILETS

1.

INSTALL PORTABLE TOILETS ON LEVEL GROUND, AT LEAST 50 FEET AWAY FROM STORM DRAINS, STREAMS OR WETLANDS UNLESS THERE IS NO ALTERNATIVE REASONABLY AVAILABLE. IF 50 FOOT OFFSET IS NOT ATTAINABLE, PROVIDE RELOCATION OF PORTABLE TOILET BEHIND SILT FENCE OR PLACE ON A GRAVEL PAD AND SURROUND WITH SAND BAGS.

2.

PROVIDE STAKING OR ANCHORING OF PORTABLE TOILETS DURING PERIODS OF HIGH WINDS OR HIGH FOOT TRAFFIC AREAS.

3.

MONITOR PORTABLE TOILETS FOR LEAKING AND PROPERLY DISPOSE IF ANY LEAKED MATERIAL. UTILIZE A LICENSED SANITARY WASTE HAULER TO REMOVE LEAKING PORTABLE TOILERS AND REPLACE WITH PROPERLY OPERATING UNIT.

ZONE 2

20' RIPARIAN BUFFER

ZONE 1

30' UNDISTURBED BUFFER

ZONE 1

30' UNDISTURBED BUFFER

ZONE 2

20' RIPARIAN BUFFER

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: JAM
DRAWN BY: LKW
SHEET CHK'D BY: AMW
CROSS CHK'D BY: KKW
APPROVED BY: JAM
DATE: DECEMBER 2025

CDM Smith

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GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

EROSION CONTROL NOTES

CD-4

TEMPORARY SEEDING SCHEDULES FOR THE PIEDMONT AREAS ARE AS FOLLOWS:					
APPLICATION RATES(LB/AC)	RECOMMENDED SEEDING DATES	SPECIES	SEED FERTILIZER	10-10-10 LIMESTONE	AGRICULTURAL STRAW
JAN 1 -- MAY 1	RYEGRAIN ANNUAL LESPEOEZA (KOBÉ)	120 50	750	2000	4,000 4,000
MAY 1 -- AUG 15	GERMAN MILLET	40	750	2000	4,000
AUG 15 -- DEC 30	RYEGRAIN	120	1000	2000	4,000

MAINTENANCE AND RESEEDING

THE CONTRACTOR SHALL MAINTAIN ALL SEEDED AREAS UNTIL ACCEPTANCE OF THE WORK, BY WATERING, MOWING, AND WEEDING. ANY AREAS WHICH FAIL TO SHOW A SATISFACTORY STAND, FOR ANY REASON WHATSOEVER, SHALL BE RETREATED FOLLOWING THE GRASSING PROCEDURE SPECIFIED HEREIN. DAMAGE, RESULTING FROM EROSION, GULLIES, WASHOUTS, OR OTHER CAUSES PRIOR TO ACCEPTANCE, SHALL BE REPAIRED BY REFILLING WITH TOPSOIL AND RETREATED FOLLOWING THE GRASSING PROCEDURE SPECIFIED HEREIN.

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GROUND STABILIZATION AND MATERIALS HANDLING PRACTICES FOR COMPLIANCE WITH THE NCG01 CONSTRUCTION GENERAL PERMIT
Implementing the details and specifications on this plan sheet will result in the construction activity being considered compliant with the Ground Stabilization and Materials Handling sections of the NCG01 Construction General Permit (Sections E and F, respectively). The permittee shall comply with the Erosion and Sediment Control plan approved by the delegated authority having jurisdiction. All details and specifications shown on this sheet may not apply depending on site conditions and the delegated authority having jurisdiction.

SECTION E: GROUND STABILIZATION		
Required Ground Stabilization Timeframes		
Site Area Description	Stabilize within this many calendar days after ceasing land disturbance	Timeframe variations
(a) Perimeter dikes, swales, ditches, and perimeter slopes	7	None
(b) High Quality Water (HQW) Zones	7	None
(c) Slopes steeper than 3:1	7	If slopes are 10' or less in length and are not steeper than 2:1, 14 days are allowed
(d) Slopes 3:1 to 4:1	14	-7 days for slopes greater than 50' in length and with slopes steeper than 4:1 -7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed
(e) Areas with slopes flatter than 4:1	14	-7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed unless there is zero slope

Note: After the permanent cessation of construction activities, any areas with temporary ground stabilization shall be converted to permanent ground stabilization as soon as practicable but in no case longer than 90 calendar days after the last land disturbing activity. Temporary ground stabilization shall be maintained in a manner to render the surface stable against accelerated erosion until permanent ground stabilization is achieved.

GROUND STABILIZATION SPECIFICATION	
Stabilize the ground sufficiently so that rain will not dislodge the soil. Use one of the techniques in the table below.	
Temporary Stabilization	Permanent Stabilization
• Temporary grass seed covered with straw or other mulches and tackifiers • Hydroseeding • Rolled erosion control products with or without temporary grass seed • Appropriately applied straw or other mulch • Plastic sheeting	• Permanent grass seed covered with straw or other mulches and tackifiers • Geotextile fabrics such as permanent soil reinforcement matting • Hydroseeding • Shrubs or other permanent plantings covered with mulch • Uniform and evenly distributed ground cover sufficient to restrain erosion • Structural methods such as concrete, asphalt or retaining walls • Rolled erosion control products with grass seed

POLYACRYLAMIDES (PAMS) AND FLOCCULANTS	
1. Select flocculants that are appropriate for the soils being exposed during construction, selecting from the <i>NC DWR List of Approved PAMS/Flocculants</i> .	
2. Apply flocculants at or before the inlets to Erosion and Sediment Control Measures.	
3. Apply flocculants at the concentrations specified in the <i>NC DWR List of Approved PAMS/Flocculants</i> and in accordance with the manufacturer's instructions.	
4. Provide ponding area for containment of treated Stormwater before discharging offsite.	
5. Store flocculants in leak-proof containers that are kept under storm-resistant cover or surrounded by secondary containment structures.	

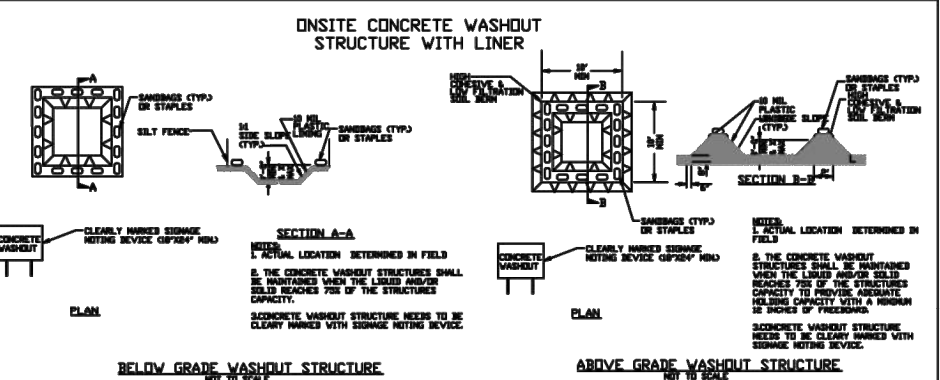
- EQUIPMENT AND VEHICLE MAINTENANCE**
1. Maintain vehicles and equipment to prevent discharge of fluids.
 2. Provide drip pans under any stored equipment.
 3. Identify leaks and repair as soon as feasible, or remove leaking equipment from the project.
 4. Collect all spent fluids, store in separate containers and properly dispose as hazardous waste (recycle when possible).
 5. Remove leaking vehicles and construction equipment from service until the problem has been corrected.
 6. Bring used fuel, lubricants, coolants, hydraulic fluids and other petroleum products to a recycling or disposal center that handles these materials.

- LITTER, BUILDING MATERIAL AND LAND CLEARING WASTE**
1. Never bury or burn waste. Place litter and debris in approved waste containers.
 2. Provide a sufficient number and size of waste containers (e.g. dumpster, trash receptacle) on site to contain construction and domestic wastes.
 3. Locate waste containers at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
 4. Locate waste containers on areas that do not receive substantial amounts of runoff from upland areas and does not drain directly to a storm drain, stream or wetland.
 5. Cover waste containers at the end of each workday and before storm events or provide secondary containment. Repair or replace damaged waste containers.
 6. Anchor all lightweight items in waste containers during times of high winds.
 7. Empty waste containers as needed to prevent overflow. Clean up immediately if containers overflow.
 8. Dispose waste off-site at an approved disposal facility.
 9. On business days, clean up and dispose of waste in designated waste containers.

- PAINT AND OTHER LIQUID WASTE**
1. Do not dump paint and other liquid waste into storm drains, streams or wetlands.
 2. Locate paint washouts at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
 3. Contain liquid wastes in a controlled area.
 4. Containment must be labeled, sized and placed appropriately for the needs of site.
 5. Prevent the discharge of soaps, solvents, detergents and other liquid wastes from construction sites.

- PORTABLE TOILETS**
1. Install portable toilets on level ground, at least 50 feet away from storm drains, streams or wetlands unless there is no alternative reasonably available. If 50 foot offset is not attainable, provide relocation of portable toilet behind silt fence or place on a gravel pad and surround with sand bags.
 2. Provide staking or anchoring of portable toilets during periods of high winds or in high foot traffic areas.
 3. Monitor portable toilets for leaking and properly dispose of any leaked material. Utilize a licensed sanitary waste hauler to remove leaking portable toilets and replace with properly operating unit.

- EARTHEN STOCKPILE MANAGEMENT**
1. Show stockpile locations on plans. Locate earthen-material stockpile areas at least 50 feet away from storm drain inlets, sediment basins, perimeter sediment controls and surface waters unless it can be shown no other alternatives are reasonably available.
 2. Protect stockpile with silt fence installed along toe of slope with a minimum offset of five feet from the toe of stockpile.
 3. Provide stable stone access point when feasible.
 4. Stabilize stockpile within the timeframes provided on this sheet and in accordance with the approved plan and any additional requirements. Soil stabilization is defined as vegetative, physical or chemical coverage techniques that will restrain accelerated erosion on disturbed soils for temporary or permanent control needs.



- CONCRETE WASHOUTS**
1. Do not discharge concrete or cement slurry from the site.
 2. Dispose of, or recycle settled, hardened concrete residue in accordance with local and state solid waste regulations and at an approved facility.
 3. Manage washout from mortar mixers in accordance with the above item and in addition place the mixer and associated materials on impervious barrier and within lot perimeter silt fence.
 4. Install temporary concrete washouts per local requirements, where applicable. If an alternate method or product is to be used, contact your approval authority for review and approval. If local standard details are not available, use one of the two types of temporary concrete washouts provided on this detail.
 5. Do not use concrete washouts for dewatering or storing defective curb or sidewalk sections. Stormwater accumulated within the washout may not be pumped into or discharged to the storm drain system or receiving surface waters. Liquid waste must be pumped out and removed from project.
 6. Locate washouts at least 50 feet from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available. At a minimum, install protection of storm drain inlet(s) closest to the washout which could receive spills or overflow.
 7. Locate washouts in an easily accessible area, on level ground and install a stone entrance pad in front of the washout. Additional controls may be required by the approving authority.
 8. Install at least one sign directing concrete trucks to the washout within the project limits. Post signage on the washout itself to identify this location.
 9. Remove leavings from the washout when at approximately 75% capacity to limit overflow events. Replace the tarp, sand bags or other temporary structural components when no longer functional. When utilizing alternative or proprietary products, follow manufacturer's instructions.
 10. At the completion of the concrete work, remove remaining leavings and dispose of in an approved disposal facility. Fill pit, if applicable, and stabilize any disturbance caused by removal of washout.

- HERBICIDES, PESTICIDES AND RODENTICIDES**
1. Store and apply herbicides, pesticides and rodenticides in accordance with label restrictions.
 2. Store herbicides, pesticides and rodenticides in their original containers with the label, which lists directions for use, ingredients and first aid steps in case of accidental poisoning.
 3. Do not store herbicides, pesticides and rodenticides in areas where flooding is possible or where they may spill or leak into wells, stormwater drains, ground water or surface water. If a spill occurs, clean area immediately.
 4. Do not stockpile these materials onsite.

- HAZARDOUS AND TOXIC WASTE**
1. Create designated hazardous waste collection areas on-site.
 2. Place hazardous waste containers under cover or in secondary containment.
 3. Do not store hazardous chemicals, drums or bagged materials directly on the ground.

PART III SELF-INSPECTION, RECORDKEEPING AND REPORTING		
SECTION A: SELF-INSPECTION		
Self-inspections are required during normal business hours in accordance with the table below. When adverse weather or site conditions would cause the safety of the inspection personnel to be in jeopardy, the inspection may be delayed until the next business day on which it is safe to perform the inspection. In addition, when a storm event of equal to or greater than 1.0 inch occurs outside of normal business hours, the self-inspection shall be performed upon the commencement of the next business day. Any time when inspections were delayed shall be noted in the Inspection Record.		
Inspect	Frequency (during normal business hours)	Inspection records must include:
(1) Rain gauge maintained in good working order	Daily	Daily rainfall amounts. If no daily rain gauge observations are made during weekend or holiday periods, and no individual-day rainfall information is available, record the cumulative rain measurement for those unattended days (and this will determine if a site inspection is needed). Days on which no rainfall occurred shall be recorded as "zero." The permittee may use another rain-monitoring device approved by the Division.
(2) E&SC Measures	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	1. Identification of the measures inspected, 2. Date and time of the inspection, 3. Name of the person performing the inspection, 4. Indication of whether the measures were operating properly, 5. Description of maintenance needs for the measure, 6. Description, evidence, and date of corrective actions taken.
(3) Stormwater discharge (SDCs)	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	1. Identification of the discharge outfalls inspected, 2. Date and time of the inspection, 3. Name of the person performing the inspection, 4. Evidence of indicators of stormwater pollution such as oil sheen, floating or suspended solids or discoloration, 5. Indication of visible sediment leaving the site, 6. Description, evidence, and date of corrective actions taken.
(4) Perimeter of site	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	If visible sedimentation is found outside site limits, then a record of the following shall be made: 1. Actions taken to clean up or stabilize the sediment that has left the site limits, 2. Description, evidence, and date of corrective actions taken, and 3. An explanation as to the actions taken to control future releases.
(5) Streams or wetlands onsite or offsite (where accessible)	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	If the stream or wetland has increased visible sedimentation or a stream has visible increased turbidity from the construction activity, then a record of the following shall be made: 1. Description, evidence and date of corrective actions taken, and 2. Records of the required reports to the appropriate Division Regional Office per Part II, Section C, Item 2(f) of this permit.
(6) Ground stabilization measures	After each phase of grading	1. The phase of grading (installation of perimeter E&SC measures, clearing and grubbing, installation of storm drainage facilities, completion of all land-disturbing activity, construction or redevelopment, permanent ground cover). 2. Documentation that the required ground stabilization measures have been provided within the required timeframe or an assurance that they will be provided as soon as possible.
NOTE: The rain inspection resets the required 7 calendar day inspection requirement.		

PART II, SECTION G, ITEM (4) DRAW DOWN OF SEDIMENT BASINS FOR MAINTENANCE OR CLOSE OUT	
Sediment basins and traps that receive runoff from drainage areas of one acre or more shall use outlet structures that withdraw water from the surface when these devices need to be drawn down for maintenance or close out unless this is infeasible. The circumstances in which it is not feasible to withdraw water from the surface shall be rare (for example, times with extended cold weather). Non-surface withdrawals from sediment basins shall be allowed only when all of the following criteria have been met:	
(a)	The E&SC plan authority has been provided with documentation of the non-surface withdrawal and the specific time periods or conditions in which it will occur. The non-surface withdrawal shall not commence until the E&SC plan authority has approved these items,
(b)	The non-surface withdrawal has been reported as an anticipated bypass in accordance with Part III, Section C, Item 2(c) and (d) of this permit,
(c)	Dewatering discharges are treated with controls to minimize discharges of pollutants from stormwater that is removed from the sediment basin. Examples of appropriate controls include properly sited, designed and maintained dewatering tanks, weir tanks, and filtration systems,
(d)	Vegetated, upland areas of the sites or a properly designed stone pad is used to the extent feasible at the outlet of the dewatering treatment devices described in item (c) above,
(e)	Velocity dissipation devices such as check dams, sediment traps, and riprap are provided at the discharge points of all dewatering devices, and
(f)	Sediment removed from the dewatering treatment devices described in item (c) above is disposed of in a manner that does not cause deposition of sediment into waters of the United States.

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION B: RECORDKEEPING

1. E&SC Plan Documentation

The approved E&SC plan as well as any approved deviation shall be kept on the site. The approved E&SC plan must be kept up-to-date throughout the coverage under this permit. The following items pertaining to the E&SC plan shall be kept on site and available for inspection at all times during normal business hours.

Item to Document	Documentation Requirements
(a) Each E&SC measure has been installed and does not significantly deviate from the locations, dimensions and relative elevations shown on the approved E&SC plan.	Initial and date each E&SC measure on a copy of the approved E&SC plan or complete, date and sign an inspection report that lists each E&SC measure shown on the approved E&SC plan. This documentation is required upon the initial installation of the E&SC measures or if the E&SC measures are modified after initial installation.
(b) A phase of grading has been completed.	Initial and date a copy of the approved E&SC plan or complete, date and sign an inspection report to indicate completion of the construction phase.
(c) Ground cover is located and installed in accordance with the approved E&SC plan.	Initial and date a copy of the approved E&SC plan or complete, date and sign an inspection report to indicate compliance with approved ground cover specifications.
(d) The maintenance and repair requirements for all E&SC measures have been performed.	Complete, date and sign an inspection report.
(e) Corrective actions have been taken to E&SC measures.	Initial and date a copy of the approved E&SC plan or complete, date and sign an inspection report to indicate the completion of the corrective action.

2. Additional Documentation to be Kept on Site

In addition to the E&SC plan documents above, the following items shall be kept on the site and available for inspectors at all times during normal business hours, unless the Division provides a site-specific exemption based on unique site conditions that make this requirement not practical:

- (a) This General Permit as well as the Certificate of Coverage, after it is received.
- (b) Records of inspections made during the previous twelve months. The permittee shall record the required observations on the Inspection Record Form provided by the Division or a similar inspection form that includes all the required elements. Use of electronically-available records in lieu of the required paper copies will be allowed if shown to provide equal access and utility as the hard-copy records.

3. Documentation to be Retained for Three Years

All data used to complete the e-NOI and all inspection records shall be maintained for a period of three years after project completion and made available upon request. [40 CFR 122.41]

PART III

SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION C: REPORTING

1. Occurrences that Must be Reported

Permittees shall report the following occurrences:

- (a) Visible sediment deposition in a stream or wetland.
- (b) Oil spills if:
 - They are 25 gallons or more,
 - They are less than 25 gallons but cannot be cleaned up within 24 hours,
 - They cause sheen on surface waters (regardless of volume), or
 - They are within 100 feet of surface waters (regardless of volume).
- (c) Releases of hazardous substances in excess of reportable quantities under Section 311 of the Clean Water Act (Ref: 40 CFR 110.3 and 40 CFR 117.3) or Section 102 of CERCLA (Ref: 40 CFR 302.4) or G.S. 143-215.85.
- (d) Anticipated bypasses and unanticipated bypasses.
- (e) Noncompliance with the conditions of this permit that may endanger health or the environment.

2. Reporting Timeframes and Other Requirements

After a permittee becomes aware of an occurrence that must be reported, he shall contact the appropriate Division regional office within the timeframes and in accordance with the other requirements listed below. Occurrences outside normal business hours may also be reported to the Department's Environmental Emergency Center personnel at (800) 858-0568.

Occurrence	Reporting Timeframes (After Discovery) and Other Requirements
(a) Visible sediment deposition in a stream or wetland	• Within 24 hours, an oral or electronic notification. • Within 7 calendar days, a report that contains a description of the sediment and actions taken to address the cause of the deposition. Division staff may waive the requirement for a written report on a case-by-case basis. • If the stream is named on the NC 203(d) list as impaired for sediment-related causes, the permittee may be required to perform additional monitoring. Inspections or apply more stringent practices if staff determine that additional requirements are needed to assure compliance with the federal or state impaired-waters conditions.
(b) Oil spills and release of hazardous substances per Item 1(b)(c) above	• Within 24 hours, an oral or electronic notification. The notification shall include information about the date, time, nature, volume and location of the spill or release.
(c) Anticipated bypasses [40 CFR 122.41(m)(3)]	• A report at least ten days before the date of the bypass, if possible. The report shall include an evaluation of the anticipated quality and effect of the bypass.
(d) Unanticipated bypasses [40 CFR 122.41(m)(3)]	• Within 24 hours, an oral or electronic notification. • Within 7 calendar days, a report that includes an evaluation of the quality and effect of the bypass.
(e) Noncompliance with the conditions of this permit that may endanger health or the environment [40 CFR 122.41(i)(7)]	• Within 24 hours, an oral or electronic notification. • Within 7 calendar days, a report that contains a description of the noncompliance, and its causes; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time noncompliance is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. [40 CFR 122.41(i)(8). • Division staff may waive the requirement for a written report on a case-by-case basis.



NCG01 GROUND STABILIZATION AND MATERIALS HANDLING

EFFECTIVE: 04/01/19

NCG01 SELF-INSPECTION, RECORDKEEPING AND REPORTING

EFFECTIVE: 04/01/19

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: <u>JAM</u>
DRAWN BY: <u>LKW</u>
SHEET CHK'D BY: <u>AMW</u>
CROSS CHK'D BY: <u>KKW</u>
APPROVED BY: <u>JAM</u>
DATE: <u>DECEMBER 2025</u>

CDM Smith
4130 Parklake Avenue, Suite 350
Raleigh, NC 27612
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NC F-0412



GREENSBORO, GUILFORD COUNTY, NORTH CAROLINA

BINGHAM PARK
(NONCD0000244)

NCG01 REQUIREMENTS

PROJECT NO. 6145-304550

FILE NAME:

SHEET NO.

CD-5

100% SUBMITTAL



Appendix B Technical Specifications

SECTION 025242 – TEMPORARY BYPASS PUMPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Provide labor, materials, tools, equipment and incidentals shown, specified and required for temporary bypassing and handling of fluids during the Work. Provide all materials, labor, equipment, power, maintenance, etc. to implement a temporary bypass system for the purpose of diverting the low stream flow for the duration of the proposed Work.
2. Design and provide temporary pumping and bypass systems, including plugs, bulkheads, and line stops as required; pumps; piping, supports, and valves; temporary instrumentation and control system; fuel and electricity as required; personnel; and appurtenances. Conform to laws and regulations and requirements of authorities having jurisdiction. System will be suitable for its service and operating environment.
3. Capacity, General:
 - a. Provide the temporary bypass including a pumping system as needed of required capacity and specific for application. Provide redundancy and/or alarms.
 - b. Pay costs associated with repairing damage to property, including cleaning costs, caused by undersized or inadequate temporary bypass system.
 - c. Engineer's acceptance of temporary pumping and bypass submittals does not relieve Contractor from responsibility for the temporary bypass system in accordance with Contract Documents.
4. Temporary Bypass Capacity for Stream Flow:
 - a. Required capacity of temporary bypass system will be determined by Contractor.
 - b. Temporary pumping system, if used, will be adequate to pump the low stream flow conveyed through the existing channel or pipe. Temporary bypass system will not result in flow back-ups into buildings and structures, overflows to storm sewers or receiving waters, and adverse effects on Owner's system.
 - c. Basis of capacity of temporary bypass system will consider nature of drainage area tributary to the pipe or stream being rerouted, weather, and other factors.
5. Location of temporary bypass system will be located immediately upstream of the work area and will not affect Owner's operations, public access to streets and drives, or access to private property, unless approved by authorities having jurisdiction.
6. Provide electricity and fuel as required for temporary pumping systems. Secondary containment for fuel tanks will be in accordance with laws and regulations.
7. Obtain Engineer's acceptance of each temporary bypass system.
8. Leakages from temporary pumping systems or improper discharge are not allowed.
9. Outflow from the pumping device will be directed through an adequately sized silt bag prior to release to the stream or pipe system below the work area.

B. Coordination:

Coordinate Work that must be performed for temporary bypass and if required, notify Engineer and Owner prior to beginning pumping.

C. Informational Submittals: Submit the following:

1. Temporary Pumping and other Bypass System Submittals: Submit the following for each temporary bypass system:
 - a. Basis for the capacity of the system proposed.
 - b. Manufacturer's data and specifications on each type and size of pump proposed and its capacity, including pump curves. Provide manufacturer's data and specifications for generators and other equipment required for temporary pumping system.
 - c. Technical information and specifications on noise controls for noise-generating equipment.
 - d. Technical data on temporary piping, pipe joints, valves, pipe supports, controls, flow meter, secondary containment for fuel tanks, and other information pertinent to the temporary pumping system.
 - e. Layout Drawings:
 - 1) Sketches showing proposed layout of temporary pumping system, including locations of temporary plugs, fish screens, bulkheads, and line stops, suction and discharge locations, location of the pumps and associated piping and valves, and source of power for temporary pumping system.
 - 2) Details of system suction and discharge locations.
 - 3) Where it is necessary to bury temporary lines, submit details of temporary lines.
 - f. Temporary Plugs, Bulkheads, and Line Stops: Manufacturer's literature and fabrication drawings showing type of plug, bulkhead or line stop as applicable, materials, and hydrostatic head the plug, bulkhead, or line stop is designed to withstand. Submit complete technical information for Contractor-proposed line stops, installation procedures, name of proposed line stop installer, and documentation of experience on at least five similar projects.
 - g. Narrative on temporary pumping system operation, including who will operate system, staffing, planned frequency of fueling, contingency plan in event of pump failure, and statement of existing systems that may be affected during operation of temporary pumping system.

PART 2 - PRODUCTS

2.1 TEMPORARY BYPASS SYSTEMS

A. Temporary Pumping System, if needed:

1. System components will be suitable for continuous operation with the fluid pumped.
2. Provide noise controls for temporary pumping system. Noise emissions from temporary

pumping system will conform to laws and regulations and will not exceed 70 decibels at a distance of thirty feet from noise source.

3. Fuel consuming temporary pumping system components intended for use when Contractor is not present will include fuel tanks sized for at least 24 hours of uninterrupted operation at system's operating capacity and means to automatically notify Contractor of pump failure.
4. Instrumentation and Controls: Provide adequate controls, as needed, for temporary pumping system.

B. Temporary Piping System:

1. Hoses in good condition and suitable for system pressures can be used where accepted by Engineer.
2. Piping system will have watertight joints of the following types: fused joints, restrained couplings, flanged coupling adapters, quick-connects by Camlok or equal, flanged joints, grooved and shouldered end-type couplings, and other watertight joints accepted by Engineer.
3. Size discharge piping adequate to handle the stream low flow without overtopping the temporary dam structure.
4. Provide valves as needed.
5. Discharge from temporary bypass system will not adversely affect stream, collection system structures, pipe or conduits, Owner's operations, private property, and will not result in flow backups, flooding, or damage.

PART 3 - EXECUTION

3.1 PREPARATION

A. General:

1. Temporary piping will be located off roads, driveways, and sidewalks. Piping will not be located in environmentally sensitive areas such as wetlands.
2. Perform successful testing of temporary piping system to ensure no leakage.
3. Verify that entire temporary pumping system is ready for operation before commencing temporary pumping. Verify that controls and flow meter are properly connected and functional.

3.2 TEMPORARY PUMPING

A. During Operation of the Temporary Pumping System:

1. Temporary pumping system will operate continuously. In the event of equipment failure, immediately make repairs or replace equipment. Provide spare parts and redundant units as necessary for continuous operation.

3.3 DEMOBILIZATION

A. Upon Conclusion of Temporary Bypass:

1. Flush out temporary bypass system with clean water discharged into receiving stream or pipe system.
2. Remove temporary bypass system and appurtenances from site.

END OF SECTION 025242

SECTION 025613.16 - LEACHATE CONTAINMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Leachate may be encountered while excavating waste. The waste may be saturated based on existing conditions or stormwater may collect in an excavated waste area following a precipitation event and/or from the drainage of surface runoff from surrounding material. Thus, excavating wet waste and the management of leachate from within the excavated waste area prior to backfilling may be necessary. No additional compensation will be provided for handling wet waste.
- B. The scope of work covered by this specification section includes the containment, conveyance, storage, treatment, and disposal of all leachate.
- C. All leachate will be disposed of in a sump excavated by Contractor within a waste disposal area at a location selected by Engineer. The leachate may be temporarily containerized or pumped directly from an excavated area from which it accumulated.
- D. Related Requirements:
 - 1. Section 312000 "Earthwork" for excavation and other earth-related work.

1.3 ACTION SUBMITTALS

- A. A management plan for the control, transmission, storage, and disposal of leachate will be prepared by Contractor for review and approval by Engineer prior to excavating waste. The plan must also address the modification of the management plan in response to progression in the excavation work.

PART 2 - PRODUCTS

2.1 LEACHATE STORAGE TANKS

- A. Temporary leachate storage tanks will be portable steel or plastic storage tanks (e.g., Frac tank, Rain for Rent, or equal), with an adequate capacity range (e.g., 1,000 to 20,000 gallons).

2.2 PIPING

- A. Piping may consist of hose or hard pipe with the appropriate protection and durability to resist breakage under heavy equipment traffic.
- B. Contractor will install piping or hose in heavy traffic areas within sleeves, trenches, or beneath protective covers of some type to eliminate the potential for pipe or hose damage and failure due to heavy equipment traffic.
- C. The length, size, and configuration of the piping in the vicinity of a water meter must meet the conditions specified by the meter manufacturer for optimal performance.

2.3 WATER METER

- A. Contractor will provide a water meter with indicator and totalizer capabilities that is of sufficient quality and accuracy to verify the gallons of leachate managed as required for pay application documentation. After installation and prior to pumping any leachate, Contractor will demonstrate that the meter is accurate to within plus or minus two percent of the actual volume pumped. This will be performed by pumping to a container of known volume and comparing the volume in the container against the total volume recorded by the meter. Contractor will also calibrate the meter regularly using this method and methods recommended by the manufacturer (if different).

2.4 ELECTRICAL AND INSTRUMENTATION

- A. All electrical and instrumentation components, if necessary, will meet applicable local, state and federal codes and regulations for the proposed use and conditions.

PART 3 - EXECUTION

3.1 GENERAL

- A. Design of the leachate handling and disposal will include detailed planning for temporary containment, conveyance, and disposal of all leachate. The plan will address required system modifications and adjustments for each work phase. The plan must be approved by Engineer and resubmitted in final form by Contractor prior to managing leachate.
- B. Leachate handling materials must be onsite prior to beginning any excavation work.
- C. The location of leachate handling and management areas, if required, must be approved by Engineer.
- D. Provide all labor, materials, equipment and incidentals required to complete the installation of all components for leachate handling and disposal.

- E. Provide all labor, materials, equipment and incidentals required to complete the disassembly, decontamination, and removal of all components for leachate handling and disposal.
- F. Solids removed during maintenance and/or final disassembly and decontamination for leachate handling and disposal will be buried on-site with waste beneath the protective cover soil system by Contractor.

3.2 STORAGE, TREATMENT, AND DISPOSAL OF LEACHATE

- A. Contractor is responsible for temporarily storing and disposing of leachate within the waste limits.
- B. Contractor is responsible for providing sufficient leachate storage capacity to allow unimpeded excavation progress.
- C. If the volume of storage capacity provided by Contractor is not sufficient to allow appropriate dewatering of the excavation, all excavation, leachate pumping, and other site activities will be suspended until Contractor rectifies the situation.
- D. All accumulated solids in the temporary storage tanks will be handled as described in Section 3.1 F.
- E. All work performed per this specification will be done in accordance with Contractor's Leachate Management and Health and Safety Plans.

END OF SECTION 025613.16

SECTION 310515 - SOILS AND AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Soils: Soil and topsoil materials.
 - 2. Aggregates: Coarse aggregate materials and fine aggregate materials.
- B. Related Sections:
 - 1. Section 312000 "Earthwork."
 - 2. Section 312500 "Erosion and Sedimentation Controls."
 - 3. Section 329300 "Plantings."

1.3 ACTION SUBMITTALS

- A. Quality Control Testing: Submit conformance testing performed by a certified independent laboratory engaged by Contractor for all fill materials. Perform additional conformance testing as specified in Section 2.4.

1.4 INFORMATIONAL SUBMITTALS

- A. Materials Source: Submit the name, location, history, and analytical results for the borrow source(s) to be used for imported materials (common fill and topsoil) prior to on-site installation for Engineer to confirm the quality of the borrow source soils if Contractor wants to use a borrow source(s) other than what has been approved by Engineer. Analytical testing and frequency requirements are provided in Sections 1.5 C and 2.4. Preferred borrow sources for clean soil are those that were previously undeveloped or used solely for agricultural or residential purposes. The following list of sources are considered undesirable as soil fill material and will not be utilized.
 - 1. Locations on or within 1,000 feet of a site that the Division of Waste Management manages, permits, or has inventoried.
 - 2. Dredged material from a marine environment.
 - 3. Soils from below the groundwater table.
 - 4. Soils containing construction or demolition debris or reclaimed asphalt pavement.

5. Soils from recycling operations that collect, sort, reprocess or manufacture new products.
 6. Soils from transfer stations that collect, consolidate, temporarily store, sort, or recover refuse or used materials from off site.
 7. Soils from a contaminant cleanup or removal.
 8. Commercial or industrial sites where hazardous materials were used, handled or stored.
 9. Coal and wood ash.
- B. Source's Certificate: Certify materials meet or exceed specified requirements.
- C. Material Test Reports for Contractor Selected In Situ or Stockpiled Borrow Source: Contractor will submit analytical results from the proposed borrow source(s). The samples will be analyzed for volatile organic compounds (VOCs) by U.S. Environmental Protection Agency (EPA) Method 8260D, semi-VOCs by EPA Method 8270E, 1,4-dioxane by EPA Method 8260D selective ion monitoring, total metals (i.e., antimony, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, silver, thallium, vanadium, and zinc) by EPA Method 6020B, mercury by EPA Method 7471B, hexavalent chromium by EPA Method 7199, ammonia by EPA Method 350.1, nitrate and sulfate by EPA Method 300.0, and pesticides by EPA Method 8081B (the pesticide analysis is only required if the borrow source was used for agricultural purposes). Discrete samples at different depth horizons will be collected according to the following:
1. Up to 1,000 cubic yards (cys): One sample per 250 cys;
 2. 1,000 cys to 5,000 cys: Four samples for the first 1,000 cys plus one sample per each additional 500 cys; or
 3. Greater than 5,000 cys: 12 samples for the first 5,000 cys plus one sample per each additional 1,000 cys.
- D. Owner of a stockpiled borrow source will sign an affidavit attesting that the stockpiled material originated from the same source location and not from a different off-site source. The stockpiled material that is sampled and tested must be the same material that is purchased and imported for use as clean fill.
- E. Existing cover soils that will be used for fill may be subject to the same analytical testing and frequency as noted in Section 1.5C. Engineer will collect and analyze samples of the on-site cover soils, including those that may be used for topsoil, in accordance with Section 1.5C. Contractor will provide equipment necessary to assist Engineer with collecting soil samples from stockpiled cover soils.

1.5 QUALITY ASSURANCE

- A. Engineer may subcontract soil testing and inspection services to a quality assurance laboratory for quality assurance testing prior to or during earthwork activities beyond Contractor's requirements. Contractor will cooperate fully with all quality assurance testing.
- B. Contractor is solely responsible for quality control.

- C. The percent compaction requirements for earthwork will be evaluated as follows: The in-place density as compacted by Contractor will be determined by the field density test using the drive cylinder or nuclear methods. The maximum dry density of the fill at the location of the in-place density test will be estimated using a one-point compaction test and full-curve compaction tests (family of curves) of representative fill materials. Both the one-point compaction test and the full-curve compaction tests will be performed according to American Society for Testing and Materials (ASTM) D698. The one-point compaction data will be used in conjunction with the representative compaction curves to estimate the maximum dry density of the compacted fill at the location of the in-place density test. The percent compaction in-place will be calculated as the ratio (in percent) of the in-place dry density to the estimated maximum dry density of the compacted fill at the location of the in-place density test.

1.6 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Tree and Plant Protection Zones: Comply with requirements and measures specified in Section 311000 "Site Clearing."

PART 2 - PRODUCTS

2.1 Soil Materials:

- A. Contractor will notify Engineer of the source of each fill material used for the project. Fill materials must be furnished as required from approved off-site sources and hauled to the site.
- B. Common Fill - Common fill will be approved on-site excavated material or imported fill material that is composed of durable soil free of debris, organic matter, or other deleterious materials. Common fill will not contain stones larger than three inches in largest diameter, a maximum of 60 percent passing the No. 200 sieve, and a maximum plasticity index of 30 percent. Common fill will not contain granite blocks, broken concrete, masonry rubble, or other similar materials and will have physical properties such that it can be readily spread and compacted during filling. Snow, ice, and frozen soil will not be permitted.
- C. Cover fill: As specified above for common fill, except cover fill has a maximum liquid limit of 50 percent.
1. Cover fill for the 3:1 slopes will have a hydraulic conductivity of 0.01 cm/sec or lower (ASTM D2434) at 95 percent of the standard proctor maximum dry density as determined by ASTM D698. Cover fill installed in any area will also be compacted to 95 percent of

the standard proctor maximum dry density. Contractor will collect one sample of the existing cover soil and three samples from Engineer's or Contractor's approved borrow source(s) for hydraulic conductivity testing. Additional hydraulic conductivity testing may be required if there are changes in the material.

2. Cover fill for 3:1 slopes will have an interface friction angle of at least 26.5 degrees when tested with the nonwoven geotextile fabric in accordance with Section 310519.13 "Geotextiles for Earthwork." Contractor will submit for approval the results of interface shear testing of the nonwoven geotextile with the cover fill material in accordance with ASTM D5321. The normal stress will be 1, 2, and 4 psi. The interface friction angle under saturated condition will be at least 26.5 degrees.

2.2 TOPSOIL MATERIALS

- A. Topsoil will consist of topsoil meeting the requirements in Section 329113 "Soil Preparation" and containing not less than three percent and more than eight percent organic content. It must be capable of supporting vegetative growth and will be free of roots and sticks greater than 1/2 inch in diameter and stones greater than two inches in diameter. Topsoil will not contain waste, granite or rock blocks, broken concrete, masonry rubble, or other similar materials.

2.3 COARSE AGGREGATE MATERIALS

- A. Coarse Aggregate - Crushed stone for rock check dams: will meet the requirements of North Carolina Department of Transportation (NCDOT) No. 57 stone.
- B. Coarse Aggregate - Crushed stone for the construction entrance: will meet the requirements of Class A stone.
- C. Coarse Aggregate - Crushed stone for temporary sediment trap: will meet the requirements of NCDOT No. 5 or No. 57 washed stone.
- D. Coarse Aggregate – Riprap: will meet the requirements of NCDOT and be the size indicated on Drawings.
- E. Coarse Aggregate - Bedding material for streams: will meet the requirements of NCDOT No. 5 stone.

2.4 SOURCE QUALITY CONTROL

- A. Testing and inspection services. Periodic conformance testing will be conducted by Contractor on the common fill, cover fill, and topsoil prior to installation and during the project. Testing will be conducted for each material per below at the indicated frequencies. The sampling frequency for the geotechnical tests includes on-site and borrow source soils and the environmental tests only include borrow source soils.

<u>Test</u>	<u>Method</u>	<u>Frequency</u>
Grain Size	ASTM D244	Every 5,000 cy or change in material
Atterberg Limits	ASTM D4318	Every 5,000 cy or change in material
Moisture/Density	ASTM D698	Every 5,000 cy or change in material
Natural Moisture	ASTM D2216	Every 5,000 cy or change in material
Hydraulic Conductivity	ASTM D2434	Three tests
Interface Friction Angle	ASTM D5321	One test
VOCs	US EPA 8260D	Every 10,000 cy or change in material
Semi-VOCs	US EPA 8270E	Every 10,000 cy or change in material
1,4-Dioxane	US EPA 8270E	Every 10,000 cy or change in material
Total Metals	US EPA 7471B	Every 10,000 cy or change in material
Mercury	US EPA 7471B	Every 10,000 cy or change in material

B. The following tests will be conducted on topsoil at the indicated frequencies:

<u>Test</u>	<u>Method</u>	<u>Frequency</u>
Natural Moisture	ASTM D2216	Every 5,000 cy or change in material
Organic Content	ASTM D2974 – 07a	Every 5,000 cy or change in material
VOCs	US EPA 8260D	Every 5,000 cy or change in material
Semi-VOCs	US EPA 8270E	Every 5,000 cy or change in material

1,4-Dioxane	US EPA 8270E	Every 5,000 cy or change in material
Total Metals	US EPA 6020B	Every 5,000 cy or change in material
Mercury	US EPA 7471B	Every 5,000 cy or change in material

Additional topsoil testing requirements are provided in Section 329113 "Soil Preparation." Engineer reserves the right to reject material based on the results of these conformance tests and/or independent quality assurance testing. Rejected materials will be removed from the site at no cost to Engineer.

PART 3 - EXECUTION

3.1 EXCAVATION - SOILS

- A. Excavate to the grades shown on Drawings. The bottom of excavations must be rendered firm, dry, and acceptable to Engineer.

3.2 STOCKPILING

- A. Stockpile materials onsite at locations designated by Engineer.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate different soil and aggregate materials with dividers or stockpile individually to prevent mixing. Prevent intermixing of soil types or contamination.
- D. Stockpile topsoil to a maximum height that is manageable and will not cause a release beyond the limits of the stockpile area following a precipitation event.
- E. Direct surface water away from stockpile area to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

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

END OF SECTION 310515

SECTION 310519.13 - GEOTEXTILES FOR EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Nonwoven geotextile material, to be used for the construction entrance, sediment traps, silt fence outlets, rock check dams, stream channel, j-hook structures, and warning layer as shown on Contract Drawings.
- B. Related Requirements:
 - 1. Section 310515 "Soils and Aggregates for Earthwork" for fill and grading materials.
 - 2. Section 312000 "Earthwork" for excavation and backfilling procedures.
 - 3. Section 312500 "Erosion and Sedimentation Controls" for erosion and sedimentation control devices.

1.3 ACTION SUBMITTALS

- A. Submit items in this specification at least 20 days prior to installation.
- B. Product Data: Submit certified test results from the manufacturer including tensile strength, elongation, thickness, ultraviolet resistance, and other material properties.
- C. Submit soil-geotextile interface shear strength test results.
- D. Shop Drawings: Indicate fabric layout, seam locations, and overlap details in installation Drawings. Provide installation schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Within 15 calendar days following the effective date of the Agreement, submit the following information for the nonwoven geotextile fabric that will be used as the warning layer:
 - 1. Manufacturer's background information.

2. Manufacturer's Certificate: List of material properties of geotextiles with attached certified test results.
3. Shop drawing, including details of overlap, seaming, anchoring, connections, and other construction details.
4. Installation schedule.
5. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures and quality control and quality assurance.
6. Manufacturer's quality control and quality assurance program and manual during installation, including a description of laboratory facilities.
7. Source Quality-Control Submittals: Provide results of factory tests and inspections, including test results that indicate materials meet the requirements of Part 2.

1.5 REFERENCE STANDARDS

A. American Society for Testing Materials (ASTM):

1. ASTM D4355 - Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
2. ASTM D4491 - Test Method for Water Permeability of Geotextiles by Permittivity.
3. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
4. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
5. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
6. ASTM D4759 - Standard Practice for Determining the Specification Conformance of Geosynthetics
7. ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
8. ASTM D4873 - Standard Guide for Identification, Storage and Handling of Geosynthetic Rolls and Samples.
9. ASTM D5199 - Standard Test Method for Measuring Nominal Thickness of Geosynthetics.
10. ASTM D5261 - Standard Test Method for Mass Per Unit Area of Geotextiles.
11. ASTM D6241 - Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe
12. ASTM D5321 - Standard Test Method for Determining the Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear

- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening will apply.

1.6 QUALITY ASSURANCE

- A. The quality control and quality assurance consist of conformance testing of the material delivered to the site and field quality control during installation.

- B. Conformance testing requirements are discussed in Paragraph 2.2 below. The purpose of conformance testing is to assure that the supplied material conforms to this Section and to the manufacturer's quality control certificates.
- C. Field quality control requirements are discussed in Paragraph 3.3 below. The purpose of field quality control procedures is to assure that the geotextile material has been installed in accordance with this Section and the manufacturer's recommendations.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: Accept materials in manufacturer's original packaging that identifies the manufacturer/supplier's name, style, and roll number. Inspect for damage.
- B. Geotextile labeling, shipment, and storage will comply with ASTM D4873.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Each geotextile material roll will be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.
 - 2. The protective wrapping will be maintained during periods of shipment and storage. If the wrapping is damaged prior to installation, the outer wrap(s) of geotextile material must be discarded before installation.
 - 3. Protect materials from moisture, dust, chemicals, ultraviolet radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperatures in excess of 71 degrees C (160 degrees F), or other environmental conditions that might damage the geotextile by storing at least three inches off the ground in a clean, dry location remote from construction operations areas.
 - 4. Provide additional protection according to manufacturer instructions.

1.8 WARRANTY

- A. Special Warranty: Contractor will furnish Owner a written warranty from the manufacturer that warrants the warning layer geotextile, on a prorated basis, against manufacturing defects and material degradation. Should a defect occur, which is covered under warranty, the warrantor agrees to repair or replace geotextile related products that do not comply with requirements or that fail in materials or workmanship within the specified warranty period.
 - 1. Warranty Period: Two years from date of installation.

1.9 GUARANTEE

- A. Contractor will guarantee the warning layer geotextile against defects in installation and workmanship for the period of one year commencing with the date of final completion. The

guarantee will include the services of qualified service technicians, and all materials and labor required for the repairs at no expense to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS – NONWOVEN GEOTEXTILES

A. Manufacturers:

1. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration.

B. Description:

1. Non-biodegradable, non-reactive (for pH of three to twelve), ultraviolet-resistant, insect/rodent-resistant nonwoven needle punched polypropylene fabric material consisting of filaments formed into a stable network.
2. For the erosion and stormwater control devices, a nonwoven fabric such as Mirafi® or equal may be used.

C. The nonwoven geotextile fabric used for the warning layer will be Mirafi® 140ML/O (Orange) as manufactured by TenCate Geosynthetics or equal. Performance and Design Criteria:

1. When tested in accordance with ASTM D4759, test results from any sampled roll in the lot will meet or exceed the values listed in Table 1. Strength values are in the weaker principal direction.

TABLE 1: NONWOVEN GEOTEXTILE MINIMUM AVERAGE ROLL VALUES

PROPERTIES	TEST METHOD	UNIT	VALUE
Mass per Unit Area	ASTM D5261	oz/yd ²	3.5
Grab Strength	ASTM D4632	lbs	90
Grab Elongation	ASTM D4632	percent	50
Trapezoid Tear Strength	ASTM D4533	lbs	40
Puncture Strength	ASTM D4833/ D6241	lbs	265
Water Flow Rate	ASTM D4491	gpm/ft ²	150
Permittivity	ASTM D4491	sec ⁻¹	2.0
Apparent Opening Size	ASTM D4751	inch U.S. Std. Sieve	50
UV Resistance Percent Re- tained After 500 Hours	ASTM D4355	percent hours	70/500

2.2 SOURCE QUALITY CONTROL

- A. Prior to installation of the warning layer geotextile fabric, provide Engineer the following information certified by the manufacturer for the delivered geotextile.
 - 1. Each roll delivered to the site will have the following identification information:
 - a. Manufacturer's name.
 - b. Product identification.
 - c. Thickness.
 - d. Roll number.
 - e. Roll dimensions.
 - 2. Quality control certificates signed by the manufacturer's quality assurance manager. Each certificate will have lot and roll identification number, sampling procedures, testing procedures and test results. At a minimum, the geotextile test results will be provided for every 10,000 square yards of delivered geotextile in accordance with test requirements specified in Paragraph 2.1 above, except for ultraviolet resistance testing. For ultraviolet resistance testing, test results should be submitted for every 250,000 square yards.
 - 3. Shear strength of soil-geotextile interface strength by direct shear test in accordance with ASTM D5321/D5321M for the geotextile and cover fill for slopes.
 - 4. All quality control certificates will be reviewed by Engineer and accepted, prior to the deployment of the fabric.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Engineer will inspect subgrade to verify that underlying surface is smooth and free of ruts or protrusions that could damage geotextile material, and that subgrade has been properly prepared.
- B. Subgrade Material and Compaction Requirements: As specified in 312000 "Earthwork".
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's published installation instructions. Do not install damaged materials. Geotextile will be cut with approved tools and anchored when deployed on slopes.
- B. All geotextile installation will be completely covered at the end of each workday unless otherwise approved by Engineer.

- C. No mechanical or construction equipment will be driven directly on top of the geotextile unless permitted by Engineer. Damage to geotextile occurring during placement will be repaired immediately.
- D. Geotextile will be overlapped by a minimum of 12 inches or per the manufacturer's specification, whichever is greater.
- E. Repairing Damaged Geotextiles:
 - 1. Repair torn or damaged geotextile by placing patch of same type of geotextile over damaged area minimum of 12 inches beyond edge of damaged area and fasten as recommended by geotextile manufacturer. Repairs will be made at no additional expense to Engineer.
 - 2. Remove and replace geotextile rolls which cannot be repaired.
- F. Fill and Cover:
 - 1. Cover fill materials will be installed in accordance with Section 312000 "Earthwork."
 - 2. Contractor will maintain the minimum thickness of cover in accordance with Section 312000 "Earthwork."
 - 3. Place fill to prevent tensile stress or wrinkles in geotextile.
 - 4. Soil cover will be brought to the work area with earth-carrying equipment, deposited on the previously spread soil cover, and then pushed onto the uncovered portion of the geotextile. This operation will be repeated until the total area is covered.
 - 5. Place fill from bottom of side-slopes upward.
 - 6. Do not drop fill from height greater than three feet.

3.3 FIELD QUALITY CONTROL

- C. Acceptance:
 - 1. Prior to placement of the soil cover and the geotextile, Engineer will inspect and identify repairs or modifications necessary for the performance of cover system. All work for the system therein being inspected will be complete, clean, and ready for use. All work will meet the requirements as to line, grade, cleanliness, and workmanship, as determined by Engineer.
 - 2. All discrepancies will be noted and repaired at no additional cost.
 - 3. Make final adjustments and repairs under direction of Engineer or manufacturer's representative.

3.4 DISPOSAL OF WASTE MATERIAL

- A. Upon completion of installation, Contractor will remove and dispose, in a proper manner approved by Engineer, all trash, waste material, and equipment used in connection with the performed work and will leave the premises in a neat and acceptable condition.

END OF SECTION 310519

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Temporary erosion and sedimentation control.

- B. Related Requirements:

1. Section 312500 "Erosion and Sedimentation Controls" for temporary protection of erosion and sedimentation.
2. Section 312000 "Earthwork" for earthwork activities.
3. Section 329113 "Soil Preparation" for planting soils preparation.
4. Section 329300 "Plantings" for seeding and planting soils placement.

1.3 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than one percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.
- D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and directed by Engineer.

- E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials will become Contractor's property and will be removed from the Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or video recordings.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

- A. Conform to the North Carolina Department of Environmental Quality for environmental requirements, including debris disposal, and permitting.

1.7 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed roadways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing on areas not within the limits of disturbance as indicated on Drawings will be obtained by Owner before proceeding.
 - 1. Do not proceed with work on adjoining property until directed by Engineer.
- C. Utility Locator Service: Notify "Call Before You Dig" for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.
- E. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earthwork."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed.
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.
- D. Call Local Utility Line Information service not less than seven working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion and sedimentation control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. Protect trees, plants, and wetlands remaining on-site as directed by Engineer by erecting suitable barriers, guards, and enclosures, or by other approved means. Clearing operations will be conducted in a manner to prevent falling trees from damaging trees and vegetation designated to remain and to the work being constructed and so as to provide for the safety of employees and others.
- B. Protection will be maintained until all work in the vicinity of the work being protected has been completed.
- C. Heavy equipment operation or stockpiling of materials will not be permitted within the branch spread of existing trees.
- D. Any damage to existing tree crowns, trunks, or root systems will be repaired immediately. Roots exposed and/or damaged during the work will immediately be cut off cleanly inside the exposed or damaged area. Cut surfaces will be treated with acceptable tree wound paint, and topsoil spread over exposed root area.
- E. When work is completed, all dead and downed trees will be removed. Live trees will be trimmed of all dead and diseased limbs and branches. All cuts will be cleanly made at their juncture with the trunk or preceding branch without injury to the will or remaining branches. Cuts over 1-inch in diameter will be treated with acceptable tree wound paint.
- F. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.
- G. Restrict construction activities to areas within the limits of construction designated on Drawings, within public rights-of-way, and within easements provided by Engineer. Adjacent properties and improvements thereon, public or private, which become damaged by construction operations, will be promptly restored to their original conditions, to the full satisfaction of the Engineer.

3.4 EXISTING UTILITIES

- A. This item includes work required in crossing culverts, water courses, including brooks and drainage ditches, storm drains, gas mains, water mains, electric, telephone, gas and water services, and other utilities. This work includes but is not limited to the following: bracing, hand excavation and backfill (except screened gravel) and any other work required for crossing the utility or obstruction not included for payment in other items of this specification.
- B. In locations where existing utilities cannot be crossed without interfering with the construction work as shown on Drawings, Contractor will remove and relocate the utility as directed by Engineer or cooperate with the utility companies concerned if they relocate their own utility.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

- D. At pipe crossings and where designated by Engineer, Contractor will furnish and place screened gravel bedding so that the existing utility or pipe is firmly supported for its entire exposed length. The bedding will extend to the mid diameter of the pipe crossed.
- E. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Engineer not less than seven days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Engineer's written permission.
- F. Excavate and remove underground utilities indicated to be removed or relocated.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, brush, stumps, roots, grass, weeds, rubbish, and other objectionable material resting on or protruding through the surface of the ground to permit installation of new construction at the designated areas shown on Drawings.
 - 1. Do not remove trees, shrubs, wetlands, and other vegetation indicated to remain or to be relocated as shown on Drawings.
 - 2. The limits of construction are indicated on Drawings as a broad boundary around the work area. All Work must be completed within the limits of construction unless approved by Engineer.
 - 3. Removal of mature trees (trunk diameter 6-inches or greater) will be accomplished as follows:
 - a. Cut the tree approximately two feet above ground leaving well-defined stump that can be used in the rootball removal process.
 - b. Remove the stump and rootball by pulling the stump or use equipment to loosen the stump and then extract the stump and rootball all together.
 - c. Remove the remaining root system and loose soil from the rootball cavity by excavating the sides of the cavity slopes no steeper than 1:1 (horizontal:vertical) and the bottom of the cavity approximately horizontal.
 - d. Grind down stumps and remove roots larger than 1.5-inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
 - e. Use only hand methods or air spade for grubbing within protection zones.
 - f. Chip removed tree branches and dispose of offsite at an approved facility.
 - 4. For smaller trees and other vegetation, grub and remove roots in excess of 1-1/2-inches diameter, matted roots, brush, timber, and logs to a depth of 18 inches below original grade.
- B. Grub and remove all stumps, roots, matted roots, brush, timber, and logs to a minimum of 18 inches below subgrade elevation, or as directed by Engineer.
- C. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil. Remove all topsoil and vegetation within the limits of construction as shown on Drawings.
- B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
 1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2-inches in diameter; trash, debris, weeds, roots, and other waste materials.
 2. Waste encountered will be removed as necessary to complete site clearing or covered with a minimum of six inches of cover material, until excavation and backfill activities can be accomplished.
 3. All grubbing holes and depressions excavated below the original ground surface will be backfilled and compacted to a density conforming to the surrounding ground surface.
 4. Contractor will dispose of all materials and debris from the clearing and grubbing operation by hauling such material and debris to an approved facility.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
 1. Do not stockpile topsoil within protection zones.
 2. Stockpile surplus topsoil to allow for re-spreading deeper topsoil.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Demolished materials and waste materials, including existing trash and debris but excluding vegetative debris, may be incorporated in waste fill areas underneath the final cover system.
- B. All material and debris from the clearing and grubbing operation will be disposed of by hauling to an approved facility by Contractor. The approved facility must be permitted to receive the debris. Vegetative debris may be mulched on-site before being hauled offsite for disposal.
- C. Open-air burning or any burning at the Project site will not be allowed.
- D. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.
- E. Topsoil and clean cover fill meeting the requirements for site restoration or construction will be stockpiled in locations approved by Engineer for use within the protective cover soil system or fill.

END OF SECTION 311000

SECTION 312000 – EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. General: Earthwork includes clearing and stripping; procurement of on-site and imported fill material; excavating, placing, and compacting fill and backfill; transportation and storage of excess earthwork materials; disposal of unsuitable soil, waste, and surplus materials; restoration of excavation and trench surfaces; and subsidiary work necessary to complete the grading of developed areas to conform with required lines, grades, and slopes.
- B. Work includes but is not necessarily limited to: waste excavation, regrading slopes, subgrade, installation of the protective cover soil system, grading of the final/temporary cover, disposal of waste and surplus materials, and all related work such as sheeting, bracing, and dewatering.
- C. Provide services of a licensed Professional Engineer to prepare temporary excavation support system, dewatering system designs, and submittals.
- D. Provide temporary excavation support systems, including sheeting, shoring, and bracing, to ensure the safety of personnel and protect adjacent structures, piping, and other materials in accordance with federal, state and local laws, regulations, and requirements.
- E. Provide temporary dewatering, surface water control systems, and operate to dewater and maintain excavations in a dry condition. Control drainage into excavations and remove seepage water and rainwater. Dewatering and surface water control are specified in Section 312319 “Dewatering.”
- F. Examine the site and review available investigation reports prior to submitting a proposal, taking into consideration project conditions that may affect the work. Owner and Engineer do not assume responsibility for variations of subsurface conditions at locations other than places shown and at the time investigations were made.
- G. Do not initiate extra work without written notification to Engineer and receiving Engineer’s written approval in response. Payment will not be provided for unauthorized work.
- H. Protect existing structures and utilities that remain.
- I. Related Requirements:
 - 1. Section 025613.16 “Leachate Containment” for leachate management.

2. Section 310515 "Soils and Aggregates for Earthwork" for fill materials.
3. Section 310519.13 "Geotextiles for Earthwork" for geotextile materials.
4. Section 311000 "Site Clearing" for site preparation work, including stripping, grubbing, stripping and stockpiling soil, and removal of above and below grade improvements and utilities.
5. Section 312319 "Dewatering" for controlling surface and groundwater and disposing of water during construction.
6. Section 312500 "Erosion and Sedimentation Controls" for temporary stated work.
7. Section 329113 "Soil Preparation" for soils.

1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
- B. Borrow Soil: Satisfactory soil imported from offsite for use as fill or backfill.
- C. Coverage: Pass of compaction equipment over the complete surface area of exposed lift or subgrade to receive compaction.
- D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
- E. Finished Grade: Required final grade elevation indicated on Drawings. Spot elevations take precedent over proposed contours.
- F. In-the-Dry: An excavation subgrade where the groundwater level has been lowered to at least twelve (12) inches below the bottom of the final grade; is stable with no ponded water, mud, or muck; is able to support construction equipment without rutting or disturbance; and is suitable for placement and compaction of fill material, pipe, or concrete foundations.
- G. Objectionable Material: Includes topsoil, organic matter, contaminated soil, construction debris, perishable materials, snow, ice, frozen earth, and rocks or lumps of cemented soils over 6-inches in maximum dimension.
- H. Optimum Moisture Content: Moisture content (percent by dry weight) corresponding to maximum dry density of the same material as determined by American Society for Testing and Materials (ASTM) Test Method D698.
- I. Overexcavation: Removal of unsuitable soil or objectionable material at or below the normal grade of excavation or subgrade as indicated on Drawings.
- J. Percent Compaction: Required in-place dry density of the material, expressed as a percentage of the maximum dry density of the same material, as determined in the laboratory by ASTM Test Method D698.
- K. Structures: Buildings, wet wells, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, manholes and vaults, or other man-made stationary features constructed above or below the ground surface.

- L. Subgrade: Required surface of subsoil, borrow fill, or compacted fill that is immediately beneath site improvements, especially dimensioned fill, paving, or other surfacing material.
- M. Unsuitable Soil: Includes existing fill materials, organic soils, weak native soils, or clays with a plasticity index of greater than 30, and any materials that cannot be properly placed and compacted as specified.
- N. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.
- O. Professional Engineer: Registered Professional Engineer meeting project qualifications and who is hired by Contractor.
- P. Engineer: Engineer or designated representative hired by Owner.
 - 1. Approval given by Engineer will not relieve Contractor of its responsibilities for performing the work in accordance with Contract Document requirements.

1.4 REFERENCE STANDARDS

- A. ASTM:
 - 1. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³).
- B. Where reference is made to the above standard, the revision in effect at the time of bid opening will apply.

1.5 ACTION SUBMITTALS

- A. Coordinate various submittal types required by this Section with requirements of dewatering, submittals specified in other Sections.
- B. Site Characterization Data: Submit offsite borrow source geotechnical and environmental testing results as specified in Section 310515 “Soils and Aggregates for Earthwork.” Submit quality control material conformance test results for soil materials as specified in Section 310515 “Soils and Aggregates for Earthwork.”
- C. Prepare excavation support system designs by a licensed Professional Engineer, registered in the State of North Carolina in which the work is located and having a minimum of five years of professional experience in design and construction of excavation support systems.
 - 1. Submit an original and three copies of licensed Professional Engineer's certification, on a form stating excavation support systems designs have been prepared by Professional Engineer, are consistent with the proposed dewatering and drainage systems, and that Professional Engineer is responsible for their execution. Do not submit excavation support system designs unless requested in writing by Engineer.

- D. Contractor will be responsible for identifying permitted facilities for the disposal of tires and large metal, including white goods, and will provide Engineer with the proposed disposal facilities prior to beginning work. Tires and large metal will be separated from the waste mass and disposed of at a permitted facility.

1.6 INFORMATIONAL SUBMITTALS

- A. Submit copies of daily field reports by the soil testing technician at the end of each workday that earthwork and grading operations occur.

1.7 QUALITY ASSURANCE

- A. Excavation, trenching, sheeting, bracing, and similar work will comply with requirements of Occupational Safety and Health Administration (OSHA) excavation safety standards, 29 Code of Federal Regulations Part 1926.650 Subpart P and State and local authorities having jurisdiction. Where conflict between OSHA, State and local regulations exists, apply most stringent requirements.
- B. Contractor to provide Health and Safety Plan per the Agreement.
- C. Contractor is solely responsible for quality control.
- D. At least seven working days prior to starting any excavation, notify the appropriate regional notification center for underground utilities and underground utility owners who are not members of notification center. To obtain area specific information for project site, refer to www.call811.com.
- E. Quality Control Testing for Offsite Borrow Materials:
 - 1. The percent compaction requirements for earthwork will be evaluated as follows: in-place density as compacted by Contractor will be determined by the field density test using the drive cylinder method or the nuclear method. The maximum dry density of the fill at the location of the in-place density test will be estimated using a one-point compaction test and full-curve compaction tests (family of curves) of representative fill materials. Both the one-point compaction test and the full-curve compaction tests will be performed according to ASTM D698. The one-point compaction data will be used in conjunction with the representative compaction curves to estimate the maximum dry density of the compacted fill at the location of the in-place density test. The percent compaction in-place will be calculated as the ratio (in percent) of the in-place dry density to the estimated maximum dry density of the compacted fill at the location of the in-place density test.

1.8 FIELD CONDITIONS

- A. Be responsible for construction layout and reference staking necessary for proper control and satisfactory completion of structures, cutting, filling, grading, drainage, fencing, embankment improvements, curbing, and other appurtenances.

- B. Perform construction layout and staking by a Professional Surveyor or Professional Engineer registered in the State of North Carolina where Project occurs, experienced and skilled in construction layout and staking requirements.
- C. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earthwork operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- D. Improvements on Adjoining Property: Authority for performing earthwork indicated on property adjoining the Project site will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Engineer.
- E. Utility Locator Service: Notify "Call Before You Dig" for area where Project is located before beginning earthwork operations.
- F. Do not commence earthwork operations until temporary site fencing and erosion and sedimentation control measures specified in Section 311000 "Site Clearing" are in place.
- G. Do not commence earthwork operations until plant-protection measures are in place.
- H. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- I. Do not direct vehicle or equipment exhaust towards protection zones.
- J. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Fill materials designated for use in this Section are specified in Section 310515 "Soils and Aggregates for Earthwork."

- B. Common fill, cover fill, and topsoil will be furnished as required from approved offsite sources and hauled to the Project site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, fencing, landscaping, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
 - 1. If necessary, remove and restore or replace curbing, driveway aprons, and fencing after performing backfilling work.
 - 2. Replace existing facilities damaged by construction with new material fully equal to existing without additional compensation.
- B. Prior to and During Earthwork Operations:
 - 1. Protect and maintain erosion and sedimentation controls; coordinate with Section 312500 "Erosion and Sedimentation Controls."
 - 2. Provide, monitor, and maintain excavation support (if required):
 - a. Furnish, install, and maintain such sheeting and bracing as may be required by Federal, State, and local safety requirements to support the sides of excavations; to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction; and to protect adjacent improvements (structures, utilities, embankment, landfill, etc.) from undermining or other damage. If Engineer is of the opinion that at any location sufficient or proper supports have not been provided, he/she may order additional supports put in, and compliance with such order will not relieve or release Contractor from his/her responsibility for the sufficiency of such supports. Care will be taken to prevent voids outside of the sheeting, but if voids are formed, they will be immediately filled and rammed. Where soil cannot be properly compacted to fill a void, lean concrete will be used as backfill. All voids will be filled to the satisfaction of Engineer.
 - b. Construct the sheeting outside the neat lines of the foundation, unless indicated otherwise, to the extent deemed desirable for the method of operation. Sheeting will be plumb and securely braced and tied in position. Sheeting and bracing will be adequate to withstand all pressures to which the structure or trench will be subjected. Any movement or bulging which may occur will be corrected to provide the necessary clearances and dimensions.
 - c. All sheeting and bracing will be carefully removed in such manner as not to endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting will be immediately refilled with sand, which must be approved by Engineer, by ramming with tools especially adapted to that purpose, or otherwise as may be directed.

- d. The right of Engineer to order sheeting and bracing left in place will not be construed as creating any obligation on his/her part to issue such orders and his/her failure to exercise his/her right to do so will not relieve Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.
- 3. Provide, monitor, and maintain dewatering and drainage systems; coordinate with Section 312319 "Dewatering."
 - a. Leachate management will be performed as specified in Section 025613.16 "Leachate Containment" during the excavation of waste.
 - b. Dewatering of wetlands or ditches filled with water will be performed in such a manner as to control discharge water by use of sediment basins and/or check dams or other erosion control structures approved by the North Carolina Department of Environmental Quality's Division of Energy, Mineral and Land Resources.
 - c. Take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects to groundwater or surface water quality.
- 4. Slope Stability:
 - a. The site contains uncontrolled waste fill. Contractor will take all necessary precautions to avoid a slope stability issue during excavation, waste processing, stockpiling materials, or any other construction activities.
 - b. Contractor is solely responsible for the stability of all roadway embankments, cut slopes, unbalanced fills, stockpiles, and all other construction operations.

3.2 EXCAVATION

- A. Includes material of every description and of whatever substance encountered as an unclassified excavation.
- B. Excavation equipment will be satisfactory for carrying out the work in accordance with the specifications. Do not plough, scrape, or dig earth with machinery so near to finished subgrade to result in excavation of or disturbance of below grade material.
- C. Make excavations to grades indicated on Drawings. The bottom of the excavations will be rendered firm and dry, and in all respects, acceptable to Engineer.
- D. Perform excavation in-the-dry and accomplished by methods which preserve the natural undisturbed condition of subgrade soils.
- E. Dewatering will lower the groundwater to at least 1-foot below excavation subgrade and prevent "boiling" condition or detrimental underseepage at the base of the excavation as specified herein.

- F. If excavation bottom is removed below the design grade limits shown on Drawings, specified, or directed by Engineer, refill with 8-inch-thick layers of compacted common fill or other material satisfactory to Engineer without additional compensation.
- G. When excavation has reached prescribed depths, notify Engineer who will observe the conditions. If materials and conditions are not satisfactory, Engineer will issue instructions for corrective procedures. Engineer will be the sole judge as to whether the work has been accomplished satisfactorily.
- H. Subgrade soils that have become soft, loose, quick, or otherwise unsatisfactory due to inadequate excavation, dewatering, or other construction methods in the opinion of Engineer, existing soil will be removed and replaced as acceptable to Engineer at Contractor's expense.
- I. Replace overexcavation beyond the limits and depths required by Contract Documents using 8-inch-thick layers of common fill or other material satisfactory to Engineer without additional compensation.

3.3 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated soil materials without intermixing unless approved by Engineer. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust. Protect from precipitation.
 - 1. Stockpile soil materials away from edge of excavations in locations approved by Engineer. Do not store within drip line of remaining trees.

3.4 WASTE EXCAVATION

- A. See Drawings for location of waste fill area and instructions.
- B. Prevent waste from being blown off the Project site at all times. Cover all areas with exposed waste at the end of each workday and prior to a precipitation event with a tarp or similar method to control odors, limit infiltration into the waste, prevent leachate migration, and prevent erosion or other transport of waste to outside the limits of construction as shown on Drawings.
- C. Waste encountered during excavation activities may be wet or saturated. No additional compensation or schedule extension will be provided to Contractor for excavating, grading, or disposing of wet or saturated waste.
- D. Wet or saturated waste will be temporarily stockpiled and allowed to dry or conditioned by Contractor prior to final placement. No additional compensation will be provided for stockpiling, covering, managing, or conditioning wet or saturated waste.

3.5 FILL PLACEMENT AND COMPACTION PROCEDURES

- A. Fill and Backfill: Place materials in lifts to suit specified compaction requirements to required lines and grades shown on Drawings, making allowances for settlement and placement of the material. Unless otherwise specified, common fill will be used for backfill.
- B. Material conforming to the requirements of common fill and cover fill will be placed in layers having a maximum of 8-inches measured before compaction.
- C. Waste material will be placed in layers having a maximum thickness of 8-10 inches measured before compaction and will be compacted at a minimum of four passes using heavy equipment.
- D. Do not compact when materials are covered with frost or is frozen or are too wet to properly compact. At such times, work will be suspended until the previously placed and new materials have thawed and/or dried sufficiently to permit proper compaction.
- E. Construct to required lines and grades approved by Engineer, making allowances for settlement and placement of cover materials, such as topsoil and sod. Correct soft spots or uncompacted areas.
- F. Fill material will be free of snow, ice, frost, and frozen earth. Do not place fill materials on frozen surfaces or surfaces covered by snow, ice, or frost.
- G. Place the cover materials to the thickness and areal extents as shown on Drawings after waste is excavated and the subgrade obtained. Moisture conditioning and compaction will likely be difficult during rainy or freezing weather due to the high fines content of the material. Moisture conditioning along with sorting and processing of the cover soils will be performed as necessary by Contractor. No sorting, processing, or moisture conditioning will be permitted on slopes.
- H. Fill thickness will be determined by certified survey. Contractor will add material to maintain a minimum 12-inch depth of fill (i.e., 6-inches of common fill and 6-inches of topsoil) above waste and the geotextile warning layer. Topsoil will not be placed until the thickness of the 6-inch fill layer is verified to the satisfaction of Engineer unless 12-inches of fill will be used and amended to support permanent vegetation.
- I. During the placement of the fill materials, no construction equipment will be allowed directly on the nonwoven geotextile warning layer. Any damage to the nonwoven geotextile warning layer will be repaired immediately by Contractor in accordance with the specifications.
- J. Cover fill and topsoil will be placed on slopes starting at toe of the slope and spreading toward top of the slope.
- K. Topsoil may be placed in a single 6-inch lift after the thickness of the underlying fill has been verified by Contractor and approved by Engineer. Contractor will avoid compacting vegetative cover material to the extent possible. The surface of the vegetative cover material will be picked clean of stones, roots, sticks, and other debris such as to provide a neat, even appearance suitable for seeding.

- L. The total soil thickness must be at least 12-inches above the geotextile warning layer as verified by certified survey. The thickness will be determined by surveying eight locations per acre before and after the placement of cover soils.

3.6 COMPACTION REQUIREMENTS

- A. Quality control field density testing will be conducted at a minimum testing frequency of one test lift per 10,000 square feet or as directed by Engineer in irregular shaped fill areas.
- B. Material conforming to the requirements of common fill and cover fill will be placed in layers having a maximum thickness of 8-inches measured before compaction and will be compacted as follows:
 - 1. Common fill: Will be compacted to 95 percent of the standard Proctor (ASTM D698) maximum dry density, or as otherwise shown in Drawings. Since soils are moisture sensitive with respect to achieving proper compaction, particular care should be taken to control the moisture content during placement and compaction. The soils will be wetted or dried as necessary so that the moisture content during compaction is within three percent of the optimum moisture content as determined by ASTM D698 to consistently achieve target compaction. Moisture conditioning and compaction will likely be difficult during rainy or freezing weather due to the high fines content of the material.
 - 2. Cover fill: Will be compacted to 95 percent of the standard Proctor (ASTM D698) maximum dry density, or as otherwise shown in Drawings. Since soils are moisture sensitive with respect to achieving proper compaction, particular care should be taken to control the moisture content during placement and compaction. The soils will be wetted or dried as necessary so that the moisture content during compaction is within four percent of the optimum moisture content as determined by ASTM D698 to consistently achieve target compaction. Moisture conditioning and compaction will likely be difficult during rainy or freezing weather due to the high fines content of the material.

3.7 GRADING

- A. Perform grading to lines and grades shown on Drawings. Grading in preparation of placing cover material will be performed as directed by Engineer following Contractor's submission of top of waste and existing grade surveys. Completely and continuously drain and dewater subgrades throughout the grading process as necessary. Install temporary drains and drainage ditches to intercept or divert surface water that may affect the execution or condition of grading work.
- B. If it is not possible at the time of grading to place material in its proper section of the Work, stockpile it in approved areas for later use. Stockpiled material will be placed, compacted, and smooth-rolled at the end of each day to deter water infiltration. No additional compensation will be made for stockpiling or double handling of excavated materials. All stockpiled areas will be temporarily seeded per the erosion and sedimentation control permit or as directed by Engineer.
- C. Engineer reserves the right to make minor adjustments in lines or grades if deemed necessary as the Work progresses, in order to obtain satisfactory construction.

- D. In cut areas, remove loose or protruding rocks in slopes to the line or finished grade of the slope. Uniformly dress, cut, and fill slopes to slope cross section and alignment shown on Drawings, unless otherwise directed by Engineer.

END OF SECTION 312000

SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes temporary construction dewatering and surface water control and incorporates the design, equipment, materials, installation, operation, protection, monitoring and removal of dewatering and drainage system. Provide dewatering system sufficient to lower groundwater and collect surface water, regardless of groundwater level or rainfall at any time during the work.
- B. Obtain and pay for permits required for dewatering and drainage systems. Implement measurements to comply with dewatering and discharge permits requirements.
- C. Related Requirements:
 - 1. Section 025613.16 "Leachate Containment" for controlling leachate and excess site water.
 - 2. Section 310515 "Soils and Aggregates for Earthwork" for filter sand.
 - 3. Section 310519.13 "Geotextiles for Earthwork" for filter fabric materials.
 - 4. Section 312000 "Earthwork" for excavating and backfilling.
 - 5. Section 312500 "Erosion and Sedimentation Controls" for controlling surface water runoff and ponding.
 - 6. Division 32 "Exterior Improvements" for various Sections relating to civil and landscape related work.

1.3 DEFINITIONS

- A. In-the-Dry: An excavation subgrade where all of the following are met:
 - 1. Groundwater level has been lowered to at least 12 inches below final grade.
 - 2. Subgrade is stable with no ponded water, mud, or muck.
 - 3. Subgrade is able to support construction equipment without rutting or disturbance.
 - 4. Subgrade is suitable for placement and compaction of fill material, pipe, or concrete foundations.
- B. Contractor's Engineered Design: Design prepared on behalf of Contractor by a registered Professional Engineer.
- C. Professional Engineer: Registered Professional Engineer meeting project qualifications and who is hired by Contractor.

D. Engineer: Engineer hired by Owner.

1. Approvals given by Engineer will not relieve Contractor of its responsibilities for performing the work in accordance with Contract Document requirements.

1.4 ACTION SUBMITTALS

A. Design Plan: Contractor will submit a written dewatering and drainage system design plan, prepared by a qualified Professional Engineer, that includes:

1. Description of proposed dewatering system as necessary to lower and control water levels below subgrades of excavations to permit construction in-the-dry.
2. Dewatering system design calculations demonstrating that the proposed system meets all requirements herein and elsewhere.
3. Identification of anticipated area influenced by dewatering system and address impacts to adjacent existing and proposed structures.
4. Coordinate dewatering and drainage submittals with excavation and support of excavation submittals.

B. Shop Drawings: For dewatering system, prepared by a qualified Professional Engineer.

1. Include plans, elevations, sections, and details for surface water control and excavation dewatering.
2. Show areas and depths of excavation to be dewatered and adjacent structures or facilities within the anticipated area influence.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in installation of dewatering systems and dewatering work and having a minimum of 5 years' experience.

B. Professional Engineer Qualifications: Licensed Professional Engineer registered in the State of North Carolina where project is located; having a minimum of 5 years' experience in design and construction of dewatering and drainage systems; and having completed not less than 5 successful dewatering and drainage projects of equal type, size, and complexity to that required for the work.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of surface and ground water and permit excavation and construction to proceed in-the-dry in accordance with the requirements herein and elsewhere.

1. Design dewatering system, including comprehensive engineering analysis by Contractor's Design Engineer.
 2. Continuously monitor and maintain dewatering operations to ensure required groundwater lowering, erosion control, stability of excavations, excavation support, and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
 3. Prevent surface water from entering excavations by grading, dikes, or other means.
 4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
 5. Design review and field monitoring activities by Engineer will not relieve Contractor of his responsibilities for ensuring that dewatering and drainage systems work properly.
- B. Primary Purpose of Work: Preserve natural undisturbed condition of subgrade soils in areas of proposed excavations.
- C. Design dewatering system to prevent damage to adjacent properties, buildings, structures, utilities, and facilities from dewatering operations. Contractor is responsible for damage to properties, buildings or structures, sewers and other utility installations, pavements, and work that may result from dewatering or surface water control operations.
- D. Regulatory Requirements: Comply with governing federal or state notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

2.2 MATERIALS

- A. Pipe for Observation Wells: American Society for Testing and Materials (ASTM) D1785, polyvinyl chloride Schedule 80 with a minimum interior diameter of 1-inch and machine slotted having a maximum slot size of 0.020-inch. Onsite materials may be used within the limits of construction to construct temporary dams and berms provided that they meet the provisions of Section 312000 "Earthwork." Materials such as plastic sheeting and piping may also be used if desired by Contractor.

PART 3 - EXECUTION

3.1 GENERAL

- A. Control surface water and groundwater such that:
1. Excavation to final grade is made in-the-dry.
 2. Natural undisturbed conditions of subgrade soils are maintained.
 3. Softening, instability, or disturbance due to presence or seepage of water does not occur.
 4. Construction and backfilling proceeds in-the-dry.
 5. Floatation of completed portions of work will be prohibited.

- A. For all excavation, Contractor will provide suitable equipment and labor to remove water and will keep the excavation dewatered so that construction can be performed in-the-dry. Water control will be accomplished such that no damage is done to adjacent channel banks or structures. Contractor is responsible for investigating and familiarizing himself with all site conditions that may affect the Work including surface water, potential flooding conditions, level of groundwater, and the time of year the work is to be done. All excavations made as part of dewatering operations will be backfilled with the same type of material as was removed and compacted to 95 percent of the maximum dry density according to ASTM D698, except where replacement by other materials and/or methods are required and approved by Engineer.
1. Contractor will conduct his operation in such a manner that storm or other waters may proceed uninterrupted along their existing drainage courses. By submitting a bid, Contractor acknowledges that he has investigated the risk arising from such waters and has prepared his bid accordingly and assumes all of said risk.
 2. At no time during construction will Contractor affect existing surface or subsurface drainage patterns of adjacent property. Any damage to adjacent property resulting from Contractor's alteration of surface or subsurface drainage patterns will be repaired by Contractor at no additional cost to Engineer.
 3. Contractor will remove all temporary water control facilities when they are no longer needed or at the completion of the project.
 4. Pumps and generators used for dewatering and water control will be quiet equipment enclosed in sound-deadening devices
- B. Contractor will control surface water and groundwater such that excavation to final grade is made in-the-dry, and bearing soils are maintained undisturbed. Maintain groundwater a minimum of 12 inches below the bottom of final grade to prevent softening and/or instability or disturbance to the subgrade due to water seepage. All construction and backfilling will proceed in-the-dry and flotation of completed portions of work will be prohibited.
- C. Provide against protection against flotation for all work.
- D. The impact of anticipated subsurface soil/water conditions will be considered when selecting methods of excavation and temporary dewatering and drainage systems. Where groundwater levels are above the proposed bottoms of excavations, a pumped dewatering system is expected for pre-drainage of the soils prior to excavation to final grade and for maintenance of the lowered groundwater level until construction has been completed to such an extent that the fill will not be floated or otherwise damaged. Type of dewatering system, spacing of dewatering units and other details of the work are expected to vary with soil/water conditions at a particular location.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways, if required by authorities having jurisdiction.
- C. Provide temporary grading to facilitate dewatering and control of surface water.
- D. Protect and maintain temporary erosion and sedimentation controls during dewatering operations. Provide vegetative cover to prevent erosion. If weather does not allow vegetative cover to be established, provide protection from erosion using other materials.

3.3 SURFACE WATER CONTROL

- A. Surface water control generally falls into the following categories:
1. Normal low flows along the channel.
 2. Storm/flood flows along the channel.
 3. Flows from existing storm drain pipelines.
 4. Local surface water inflows not conveyed by pipelines.
- B. Contractor will coordinate, evaluate, design, construct, and maintain temporary water conveyance systems. These systems will not worsen flooding, alter major flow paths, or worsen flow characteristics during construction. Contractor is responsible to ensure that any such worsening of flooding does not occur. Contractor is solely responsible for determining the methods and adequacy of water control measures.
- C. At a minimum, Contractor will be responsible for diverting the quantity of surface flow around the construction area so that the excavations will remain free of surface water for the time it takes to install these materials, and the time required for curing of any concrete or grout. It will be Contractor's responsibility to determine the quantity of water that will be diverted to protect his work from damage caused by stormwater.
- D. Contractor will, at all times, maintain a flow path for all channels. Temporary structures such as berms, sandbags, pipeline diversions, etc., may be permitted for the control of channel flow, as long as such measures are not a major obstruction to flood flows, do not worsen flooding, or alter historic flow routes.

3.4 EXCAVATION DEWATERING

- A. Provide and maintain equipment and facilities to promptly remove and properly dispose of water entering excavations. Excavations will be kept dry, so as to obtain a satisfactory undisturbed subgrade foundation condition. Any water removed from excavations with exposed waste or dewatering within the waste disposal area will be considered leachate and will be collected and disposed of per the specifications in Section 025613.16 "Leachate Containment."
- B. Contractor will evaluate the impact of the anticipated subsurface soil/water conditions on his proposed method of excavation and removal of water.
- C. Where groundwater level is above the proposed bottom of excavation level, it is expected that some type of pumped dewatering system will be required for pre-drainage of the soils prior to final excavation, and for maintaining the lowered groundwater level until construction has been completed. It is further expected that the type of system, spacing of dewatering units and other details of the work will have to be varied depending on soil/water conditions at a particular location.
- D. If trench subgrade or excavation bottom becomes disturbed due to inadequate dewatering or drainage, excavate below normal grade as directed by Engineer and refill with structural fill, screened gravel, or other material as approved by Engineer without additional compensation.
- E. It is expected that initial dewatering plan may be modified to suit variable soil and water conditions encountered. Dewater and excavate in a manner without causing loss of ground.
- F. If methods do not properly dewater excavation, Contractor will install groundwater observation wells as directed by Engineer. Do not place pipe or structure until readings obtained from observation wells indicate that groundwater has been lowered to a minimum of 12 inches below bottom of the final excavation within the trench or excavation limits.
- G. Surround dewatering units with suitable filter sand with no fines being removed by pumping. Pump continuously from dewatering system until pipe or structure is adequately backfilled. Provide stand-by pumps.
- H. Collect water entering excavations from precipitation or surface runoff in shallow ditches around excavation perimeter, drained to a sump, and pump from excavation to maintain a bottom free from standing water. Any water that comes into contact with waste is considered leachate and will be collected and disposed of per the specifications in Section 025613.16 "Leachate Containment."
- I. Dispose of drainage to an approved area as specified by Engineer. Do not use existing or new sanitary sewers to dispose of drainage.
- J. At least two weeks prior to the start of construction in any areas of anticipated dewatering, submit to Engineer for review a proposed initial plan for removal of water. Do not proceed with construction in any of these areas until the initial plan has been reviewed and commented upon by Engineer. It is expected that the initial plan may have to be modified to suit the variable

soil/water conditions to be encountered across the site. Dewater and excavate, at all times, in a manner, which does not cause loss of ground or disturbance to adjacent structures.

END OF SECTION 312319

SECTION 312500 – EROSION AND SEDIMENTATION CONTROLS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. The approved North Carolina Department of Environmental Quality (NCDEQ) - Erosion and Sedimentation Control Plan will be transferred to Contractor prior to commencing the Project. Contractor will notify Engineer and request a permit amendment if any deviation to the plan is proposed prior to site implementation of the modified methods.
2. Contractor will provide and maintain methods, equipment, and temporary construction as required to control environmental conditions at the site and adjacent areas.
3. Maintain controls until no longer required.
4. Temporary controls include, but are not limited to, the following:
 - a. Erosion and sediment controls.
 - 1) Temporary sediment traps.
 - 2) Temporary diversion ditches.
 - 3) Straw wattle.
 - 4) Temporary seeding and mulching.
 - 5) Temporary construction entrance.
 - 6) Matting.
 - 7) Inlet protection.
 - 8) Temporary silt fence.
 - 9) Stone ditch check.
 - 10) Stone filter outlet.
 - 11) Temporary soil stabilizer.
 - 12) Temporary wind/dust/privacy screen.
5. Noise controls.
6. Dust control.
7. Pest and rodent control.
8. Water control.
9. Pollution control.

B. Related Sections:

1. Section 312513 “High Performance Turf Reinforcement Mat”.
2. Section 313700 “Riprap”.
3. Section 311000 “Site Clearing”.
4. Section 312000 “Earthwork”.

1.2 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable provisions and recommendations of the following:
 - 1. State of North Carolina Erosion and Sediment Control Planning and Design Manual.
- B. Be responsible for the timely installation of all sedimentation control devices necessary to prevent the movement of sediment from the construction site to offsite areas via surface runoff or underground drainage systems. Measures in addition to those shown on Drawings necessary to prevent the movement of sediment offsite will be installed, maintained, removed, and cleaned up at the expense of Contractor. Notice of Violations issued by NCDEQ's Division of Energy, Mineral, and Land Resources (DEMLR) due to a release from the site will be responded to by Contractor. Any fine associated with a Notice of Violation will be paid by Contractor.

1.3 ACTION SUBMITTALS

- A. Submit the following:
 - 1. Shop drawings for temporary pump around and diversion plan.
 - 2. Product Data:
 - a. Silt fencing materials.
 - b. Stone materials.
 - c. Filter fabric material.
 - d. Channel liner material.
 - e. Straw wattle material.
 - f. Any other product material.
 - 3. Submit rain gauge data and all inspection records with every payment application.

1.4 INFORMATIONAL SUBMITTALS

- A. Submit the following:
 - 1. Procedural Submittals:
 - a. Proposed dust control measures, when submittal is requested by Engineer.

1.5 INSPECTIONS

- A. Initial Inspection: Inspect existing site conditions and note irregularities affecting Work of this Section. Report irregularities to Engineer prior to beginning Work. Initiation of Work described in this Section implies acceptance of existing conditions.
- B. In-Progress Inspection: Give Owner at least 3 working days' notice to schedule an in-progress inspection. This inspection will occur when all temporary structural erosion control measures are completed and in-place but prior to the start of any other construction activities. Engineer will notify Contractor of any deficiencies that exist. Correct such deficiencies before other

construction activities begin. In addition to this inspection, Contractor will inform the DEMLR Winston Salem regional office, that erosion control measures are installed and in-place. A representative from the DEMLR may schedule an additional inspection with Contractor to ensure adequacy of installation.

- C. **Monitoring:** All sedimentation and erosion control devices or measures will be inspected weekly and within 24 hours after any storm event greater than one inch. Utilize the DEMLR Monitoring Form located at <https://www.deq.nc.gov/energy-mineral-and-land-resources/land-quality/combined-construction-stormwater-monitoring-form/demlr-monitoring-form-rev-07012020/download>. Maintain all records onsite and make available during inspections.
- D. **Self-Inspection:** All sediment and erosion control devices or measures will be inspected after each phase of the Project and the inspection documented in writing. Utilize the DEMLR Monitoring Form.
- E. **Final Inspection:** Give Engineer at least three working days' notice to schedule the final inspection. All temporary structural erosion control measures will be removed and all affected areas re-graded as described in this Section prior to final acceptance. Engineer will notify Contractor of any deficiencies that exist. Contractor will also inform the DEMLR Winston Salem regional office that construction is complete. A representative from the office may schedule an additional inspection with Contractor to ensure adequacy of completion. Final acceptance will not be given until all deficiencies are corrected.
- F. Take immediate correction action for any device failure discovered during inspections.

PART 2 – PRODUCTS

2.1 MATERIALS FOR TEMPORARY EROSION AND SEDIMENT CONTROLS

- A. **General:** Materials utilized for erosion and sediment controls will be in accordance with the applicable regulatory requirements indicated in Article 1.2 of this Section, unless otherwise shown or indicated in Contract Documents.
- B. **Stones for Sediment Erosion Control:**
 - 1. **Coarse Aggregate:** No. 5 or No. 57; comply with North Carolina Department of Transportation (NCDOT) Section 1005.
 - 2. **Plain Riprap:** Class A or Class B; comply with NCDOT Section 1042.
- C. **Riprap:** Class 1 and Class 2; comply with NCDOT Section 1042.
- D. **Silt Fence:** Refer to City of Greensboro (COG) Standard 216.
- E. **Filter Fabric:** Type 2 and Type 3, Class A; comply with NCDOT Section 1056.
- F. **Posts:** Steel; comply with NCDOT Section 1605.

G. Woven Wire Fence:

1. Comply with NCDOT Section 1605.

H. Erosion Control Matting for Temporary Stabilization:

1. Straw Wattle:

- a. For excelsior matting refer to U.S. Federal Highway Administration Section 713.17 Type 4 matting, comply with NCDOT Section 1631.

2. Straw with Net Lining:

- a. Straw fiber matrix sewn between two photo-degradable nets.
- b. Wire staples machine made of No. 11 gage new steel wire formed into a “U” shape; not less than 6 inches long with not less than a 1-inch-wide throat.

I. Aggregate Base Course: Type A Aggregate; comply with NCDOT Section 1010.

J. Temporary Soil Stabilizer: TerraTack III, Curasol AE, Aerospray 70.

K. Dust/Privacy/Wind Screen:

1. Provide fabric screen (polypropylene 6-8 oz, UV stabilized, 100 percent lead-free and phthalate free) to full height of fence. Visibility blockage 80-90 percent. Color (black, green or blue, to be selected by Owner).
2. Perimeter edge binding with grommets. Connect to fence with manufacturer connectors or galvanized rings. Maintain all components in good condition throughout Project duration as stated above. Use zip ties to attach to temporary/construction fencing.

PART 3 – EXECUTION

3.1 NOISE CONTROL

A. Noise Control – General:

1. Contractor’s vehicles and equipment will minimize noise emissions to greatest degree practicable. Provide mufflers, silencers, and sound barriers when necessary.
2. Noise levels will comply with laws and regulations, including Occupational Safety and Health Administration requirements and local ordinances.
3. Noise emissions will not interfere with the work of Owner or others.

3.2 DUST CONTROL

A. Dust Control – General:

1. Control objectionable dust caused by Contractor's operation of vehicles and equipment, clearing, and other actions. To minimize airborne dust, apply water or use other methods subject to acceptance by Engineer and approval of authorities having jurisdiction.
2. A dust control fabric will be securely attached to all temporary perimeter protection fencing. The material will be a minimum of five feet in height with a minimum blockage of 50 percent. Information placed on the fabric will be limited to identification of responsible Contractor, emergency contact information, and any information required by law.
3. Contractor will prevent blowing and movement of dust from exposed soil surfaces and access roads to reduce on and offsite damage, nuisances, and health hazards associated with dust emissions. Control may be achieved by irrigation in which the site will be sprinkled with water until the surface is moist. Apply dust controls as frequently as required without creating nuisances such as excessive mud and ponding of water at the site.
4. Remove dust from roadways and access roads at maximum intervals of seven days by mechanical brooming or other method acceptable to Engineer.

3.3 PEST AND RODENT CONTROL

A. Pest and Rodent Control – General:

1. Provide rodent and pest control as required to prevent infestation of the site and storage areas.
2. Employ methods and use materials that do not adversely affect conditions at the site or on adjoining properties.
3. In accordance with laws and regulations, promptly and properly dispose of pests and rodents trapped or otherwise controlled.

3.4 WATER CONTROL

A. Water Control – General:

1. Provide methods to control surface water and water from excavations and structures to prevent damage to the Work, the site, and adjoining properties.
2. Control fill, grading, and ditching to direct water away from excavations, pits, tunnels and other construction areas and to direct drainage to proper runoff courses to prevent erosion, damage, or nuisance.

B. Equipment and Facilities for Water Control: Provide, operate, and maintain equipment and facilities of adequate size to control surface water.

C. Discharge and Disposal: Dispose of drainage water in manner to prevent flooding, erosion, and other damage to any and all parts of the site and adjoining areas, and that complies with laws and regulations.

3.5 POLLUTION CONTROL

A. Pollution Control – General:

1. Provide means, methods, and facilities required to prevent contamination of soil, water, and atmosphere caused by discharge of noxious substances from construction operations.
2. Equipment used during construction will comply with laws and regulations.

B. Spills and Contamination:

1. Provide equipment and personnel to perform emergency measures required to contain spills and to remove contaminated soils and liquids.
2. Excavate contaminated material and properly dispose of offsite and replace with suitable compacted fill and topsoil.

C. Protection of Surface Waters: Implement special measures to prevent harmful substances from entering surface waters. Prevent disposal of wastes, effluents, chemicals, and other such substances in or adjacent to surface waters and open drainage routes, in sanitary sewers, or in storm sewers.

D. Atmospheric Pollutants:

1. Provide systems for controlling atmospheric pollutants related to the Work.
2. Prevent toxic concentrations of chemicals and vapors.
3. Prevent harmful dispersal of pollutants into atmosphere.

E. Solid Waste:

1. Provide systems for controlling and managing solid waste related to the Work.
2. Prevent solid waste from becoming airborne, and from discharging to surface waters and drainage routes.
3. Properly handle and dispose of solid waste.

3.6 EROSION AND SEDIMENT CONTROL

A. Installation and Maintenance of Erosion and Sediment Controls – General:

1. General:
 - a. Provide erosion and sediment controls as shown and indicated on Drawings and elsewhere in Contract Documents. Provide erosion and sediment controls as the Work progresses into previously undisturbed areas.
 - b. Installation of erosion and sediment controls will be in accordance with the applicable regulatory requirements indicated in Article 1.2 of this Section, unless otherwise shown or indicated in Contract Documents.
 - c. Use necessary methods to successfully control erosion and sedimentation, including ecology-oriented construction practices, vegetative measures, and mechanical controls. Use best management practices in accordance with laws and regulations, and regulatory requirements indicated in Article 1.2 of this Section, to control erosion and sedimentation during the Project.
 - d. Plan and execute construction, disturbances of soils and soil cover, and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste

- disposal areas, to prevent erosion and sedimentation. Provide temporary measures for controlling erosion and sedimentation, as indicated in Contract Documents and as required for the Project.
- e. Where areas must be cleared for storage of materials or equipment, or for temporary facilities, provisions will be made for regulating drainage and controlling erosion and sedimentation, subject to Engineer's approval.
 - f. Provide erosion and sediment controls, including stabilization of soils, at the end of each workday.
2. Preparation: Clear only as required for erosion control measures to be installed prior to commencing activities that will disturb soil or soil cover.
 3. Coordination:
 - a. Coordinate erosion and sediment controls with this Section's requirements on water control.
 - b. Coordinate temporary erosion and sediment controls with construction of permanent drainage facilities and other Work to the extent necessary for economical, effective, and continuous erosion and sediment control.
 4. Before commencing activities that will disturb soil or soil cover at the site, provide all erosion and sediment control measures required by Contract Documents for the areas where soil or soil cover will be disturbed.
 5. In general, implement construction procedures associated with, or that may affect, erosion and sediment control to ensure minimum damage to the environment during construction. Contractor will implement any and all additional measures required to comply with laws and regulations.
 6. Vegetation Removal: Remove only those shrubs, grasses, and other vegetation that must be removed for construction. Protect remaining vegetation.
 7. Access Roads and Parking Areas: When possible, access roads and temporary roads will be located and constructed to avoid adverse effects on the environment. Provisions will be made to regulate drainage, avoid erosion and sedimentation, and minimize damage to vegetation.
 8. Earthwork and Temporary Controls:
 - a. Perform excavation, fill, and related operations.
 - b. Control erosion to minimize transport of silt from the site into existing waterways and surface waters. Such measures will include, but are not limited to, using berms, silt fencing, baled straw silt barriers, gravel or crushed stone, mulching and soil stabilization, slope drains, and other methods. Apply such temporary measures to erodible materials exposed by activities associated with the construction of the Project.
 - c. Hold to a minimum the areas of bare soil exposed at one time.
 - d. Construct fills and waste areas by selectively placing fill and waste materials to eliminate surface silts and clays that will erode.
 - e. In performing earthwork, eliminate depressions that could serve as mosquito pools.
 - f. Contractor will provide special care in areas with steep slopes, where disturbance of vegetation will be minimized to maintain soil stability.

9. Inspection and Maintenance:

- a. Periodically inspect areas of earthwork and areas where soil or soil cover are disturbed to detect evidence of the start of erosion and sedimentation; apply corrective measures as required to control erosion and sedimentation. Continue inspections and corrective measures until soils are permanently stabilized and permanent vegetation has been established
- b. Repair or replace damaged erosion and sediment controls within 24 hours of Contractor becoming aware of such damage.
- c. Periodically remove silt and sediment that has accumulated in or behind sediment and erosion controls. Properly dispose of silt and sediment.

10. Duration of Erosion and Sediment Controls:

- a. Maintain erosion and sediment controls in effective working condition until the associated drainage area has been permanently stabilized.
 - b. Maintain erosion and sediment controls until the site is restored and site improvements including landscaping, if any, are complete with underlying soils permanently stabilized.
11. Work Stoppage: If the Work is temporarily stopped or suspended for any reason, Contractor will provide additional temporary controls necessary to prevent environmental damage to the site and adjacent areas while the Work is stopped or suspended.
12. Failure to Provide Adequate Controls: In the event Contractor repeatedly fails to satisfactorily control erosion and siltation, Owner reserves the right to employ outside assistance or to use Owner's own forces for erosion and sediment control. Cost of such work, plus engineering and inspection costs, will be deducted from monies due Contractor.

B. Temporary Silt Fence:

1. Refer to COG Standard 216.
2. Comply with NCDOT Section 1605.

C. Straw Wattle:

1. Install straw wattle in accordance with COG Standard 223 where shown or indicated, including in swales, along contours, and along toe of slopes.
2. Frequently inspect bales and repair or replace as required. Remove accumulated silt and debris from behind straw bales.

D. Seeding and Mulching:

1. Temporary Ground Cover:

- a. Refer to Contract Drawings for ground coverage requirements and timeframes for disturbed land.
- b. Seeding and mulching or proper ground cover will be provided for disturbed areas at least every 1,000 linear feet of utility line construction.

2. Use mulching to temporarily stabilize exposed soil and fill material.
 - a. Immediately following final grading, provide mulch and stabilize with mats or netting, or sprayed soil stabilization emulsion with fiber additive.
 - b. Application of mulching for soil stabilization will be as follows.
 - 1) Unrotted Straw or Salt Hay: 1.5 to two tons per acre.
 - 2) Soil stabilization emulsions, when used, will be applied in accordance with manufacturer's instructions, and will be applied with mulch or stabilization fibers.
 - 3) Wood-fiber or Paper-fiber Application: 1,500 pounds per acre, installed by hydroseeding.
 - c. Matting is to be used in locations where ditch slope is 2 percent or greater. Where mats or netting are used:
 - 1) Cover entire area to be stabilized with mats or netting.
 - 2) Provide anchoring trenches at the top and bottom of slopes to receive mats or netting. Bury at least the top and bottom ends of mat or netting, four inches or more wide, at top and bottom of slope. Tamp trench full of soil. Four inches from trench, secure mat or netting with appropriate staples spaced at intervals of 10 inches.
 - 3) Overlap adjacent strips of mat or netting by at least four inches.

E. Protection of Storm Water Drainage Inlets and Catch Basins:

1. Protect each drainage inlet and catch basin that has the potential to receive storm water runoff from exposed soils and does not discharge into a storm water settlement basin.
2. Install stormwater inlet protection per Roadway Standard No. 431 Standard Stormwater Inlet Protection Measures.

F. Temporary Sediment Traps.

1. For constructing embankments comply with requirements in Division 31 Sections on earthwork, embankments, excavation, and fill.
2. Overflow Weir:
 - a. Install overflow weirs at elevations on shown or indicated on Drawings or approved shop drawings, as applicable, to avoid overtopping and overfilling of settlement basin without short-circuiting the settlement basin's hydraulics.
 - b. Wrap geotextile material specified for silt fencing around discharge structures of temporary settlement basins.
3. Crushed Stone and Riprap: Install in accordance with Division 31 Sections on crushed stone and riprap. Provide in areas of temporary settlement basin subject to erosion, and at upstream and downstream ends of discharge piping.
4. Remove sediment when required based on accumulation of material.

5. When temporary settlement trap is no longer required, remove the temporary settlement trap discharge weir, and spillway, fill the temporary sediment trap to required grade in accordance with requirements of Division 31 Section on excavation and fill, and provide landscaping in accordance with Division 32 Sections on landscaping.

G. Silt Bag on Dewatering Pump Discharge:

1. Provide dewatering of excavations in compliance with Division 31 Sections on earthmoving, excavation, and fill.
2. Locate filter bags and temporary pump discharge lines to avoid interfering with the public, use of private property, and Owner's operations. Relocate filter bags and appurtenances when required.
3. Filter bag discharge will be directed to appropriate storm water drainage route. Do not discharge into roadways, driveways, access roads, and overland. When temporary settlement basin is used, locate filter bags to discharge to temporary settlement basin when practicable.
4. Provide filter bag on discharge of each dewatering pump drawing from an excavation.
5. Securely attach filter bag to pump discharge pipe or hose.
6. Maintain, clean out, and replace filter bags as required.

H. Construction Entrance:

1. Install geotextile liner and Class A stone to minimum 8 inches thick to the dimensions and in the location shown on Drawings; comply with NCDOT Section 520 except that the requirement for a sand seal will not apply. Refer to COG Standards 217 and 217-A.
2. Installation:
 - a. Ensure that subgrade under temporary stone construction entrance is suitably dense for the intended purpose. Suitably prepare subgrade as required for temporary construction entrance.
 - b. Provide on subgrade a layer of geotextile fabric, installed in accordance with geotextile manufacturer's recommendations for separation.
 - c. Provide stone on installed geotextile. Grade stone for passage of vehicles.
3. Maintenance:
 - a. Maintain temporary stone construction entrance at not less than the minimum required thickness. Add stone as required to maintain thickness.
 - b. When upper layer of temporary stone construction entrance becomes contaminated with soil, remove contaminated material and replace with clean stone.
 - c. Using water to wash down temporary construction entrance or paved areas onto which soil material has been tracked is not allowed.

I. Drainage Areas: Install erosion control matting.

J. Inlet Protection: Refer to COG Standard 431.

K. Temporary Stone Ditch Check or Stone Filter Outlet: Refer to COG Standard 215.

3.7 REMOVAL OF TEMPORARY CONTROLS

A. Removals - General:

1. Upon completion of the Work and approval from regulatory agency, remove temporary controls and restore site to specified condition; if condition is not specified, restore site to pre-construction condition.
2. After soils are permanently stabilized, remove from the site temporary erosion and sediment controls.
3. Sediment collected behind control structures will be excavated and transported to an approved location for disposal. Replace topsoil which was stripped and stockpiled when erosion control measures were installed.

END OF SECTION 312500

SECTION 312513 – HIGH PERFORMANCE TURF REINFORCEMENT MAT

PART 1 - GENERAL

1.1 SUMMARY

- A. This section's work shall consist of furnishing all materials, equipment, and labor necessary for installing a high-performance turf reinforcement mat (HPTRM) as a solution for erosion control and protection of channels.

1.2 RELATED SECTIONS

- A. Section 312000 “Earthwork”.
- B. Section 310519.13 “Geotextiles for Earthwork”.
- C. Section 312500 “Erosion and Sedimentation Controls”.
- D. Section 329300 “Plantings”.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. D4354 – Standard Practice for Sampling of Geosynthetics and Rolled Erosion Control Products (RECPs) for Testing.
 - 2. D4355 – Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
 - 3. D4439 - Standard Terminology for Geosynthetics.
 - 4. D4759 – Standard Practice for Determining the Specification Conformance of Geosynthetics.
 - 5. D4873 – Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
 - 6. D6524 – Standard Test Method for Measuring the Resiliency of Turf Reinforcement Mats (TRMs).
 - 7. D6525 – Standard Test Method for Measuring Nominal Thickness of RECPs.
 - 8. D6567 – Standard Test Method for Measuring the Light Penetration of a RECP.
 - 9. D6575 – Standard Test Method for Determining Stiffness of Geosynthetics Used as Turf Reinforcement Mats (TRMs).
 - 10. D6818 – Standard Test Method for Ultimate Tensile Properties of RECPs.
- B. Geosynthetic Accreditation Institute - Laboratory Accreditation Program (GAI-LAP).
- C. Greenhouse Gas (GHG) Protocol.
- D. International Standards Organization (ISO):

1. 9001:2015 – Quality Management System Certification.
 2. 14001:2015 – Environmental Management System Certification.
 3. 14064-3:2006 – Environmental Management – Life Cycle Assessment.
 4. 17025:2005 – Laboratory Testing and Calibration.
- E. Publicly Available Specification (PAS) 2050:2011 – Specification for the assessment of the life cycle GHG emissions.
- F. Federal Motor Vehicle Safety Standard (FMVSS) 302 – Specification for the assessment of the material's burn resistance capabilities.

1.4 DEFINITIONS

- A. Certificate of Compliance (COC): An official document certified by an authorized representative within the manufacturer's company that the manufactured synthetic turf reinforcement mat product(s) meet designated property values as manufactured in a facility having achieved ISO 9001:2015 certification and tested in accordance with GAI-LAP procedures.
- B. HPTRM: A long-term, non-degradable RECP composed of ultraviolet (UV) stabilized, non-degradable, synthetic fibers, nettings and/or filaments processed into three-dimensional reinforcement matrices designed for immediate and permanent protection for erosion control applications where design flows exert velocities and shear stresses that exceed the limits of mature natural vegetation. The HPTRM minimum average roll value (MARV) tensile strength per ASTM D6818 is 3000 lbs/ft in the weakest principal direction.
- C. Manufacturer: Entity that produces synthetic HPTRM products through a process directly utilizing obtained raw materials, in a facility owned and operated by said entity, using equipment and assemblies owned and operated by said entity, subject to a certified Manufacturing Quality Control (MQC) Program. Upon completion of production, the manufacturer may sell the HPTRM product(s) directly to the customer, or through a vendor entity.
- D. MQC Program: A certified and documented program initiated and operated by the manufacturer that outlines the operational techniques and activities which sustain a quality of the synthetic HPTRM product(s) that will satisfy given needs.
- E. MARV: Property value calculated as typical minus two standard deviations. Statistically, it yields a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported.
- F. RECP: A temporary degradable or long-term non-degradable material manufactured or fabricated into rolls designed to protect the soil surface, reduce soil erosion and if needed assist in the growth, establishment and protection of vegetation.
- G. Securing Pin: A device designed to secure the HPTRM in place during installation, or until the establishment of vegetation occurs.

- H. Trilobal Monofilament Yarn: A multi-dimensional polymer fiber with at least three points, providing increased surface area and grooves/channels along the fiber to capture additional moisture and sediment to enhance vegetative growth.
- I. Typical Roll Value: Property value calculated from average or mean obtained from test data.
- J. Vendor: An entity that provides HPTRM product(s) to a customer, on behalf of an independent manufacturer. A vendor does not manufacture the actual turf reinforcement mat product(s) and is not subject to certified MQC Program provisions.

1.5 SUBMITTALS

A. Qualifications:

1. The following documentation shall be submitted to Engineer of record and/or Project Owner for review and approval before installation:
 - a) A COC stating the name of the HPTRM manufacturer, product name, style, chemical compositions of filaments or yarns and other pertinent information to fully describe the HPTRM. COC shall state that the furnished HPTRM meets the requirements of the specification and shall be attested to by a person having legal authority to bind Manufacturer.
 - b) MQC Program assures compliance with the specification's requirements.
 - c) A project list demonstrating a documented history of HPTRM installations totaling more than 2,000,000 square yards (about half the area of Central Park in New York City), with over 500,000 square yards having been installed in the marketplace for more than five (5) years. Past project documentation submitted for evaluation shall include project name, date of installation, and size of the project.
 - d) A certification demonstrating that the HPTRM is manufactured in a facility that has been ISO 14001 certified for measuring environmental impact and continuously looking for ways to improve it for a minimum of ten (10) years.
 - e) A certification demonstrating that the HPTRM is manufactured in a facility that has been ISO 9001:2015 certified and tested in a laboratory that has been both GAI-LAP and ISO 17025:2005 certified.
 - f) Third party / Independent Testing values demonstrating UV resistance testing for two consecutive years including most recent year. Testing and reporting of the results shall follow ASTM D4355, showing the percent tensile strength retained in both machine and cross-machine direction.
 - g) Documentation of functional longevity for the HPTRM demonstrating the material's durability in the field. The documentation shall demonstrate a minimum retained tensile strength of 70 percent per ASTM D6818 after a minimum of ten (10) years of exposure in an area having a minimum solar radiation of 21.70 MJ/m²-day. The documentation shall include photos and date of initial installation and field sampling, and test results of the field sampling.

- h) A certification demonstrating that the HPTRM has been evaluated and certified by an independent third party to have a maximum cradle-to-grave carbon footprint of 2.7 kg CO₂e/m² when tested per GHG Protocol, ISO 14064-3:2006, and PAS 2050:2011.
- i) Documentation of full-scale flume testing demonstrating the required performance when subjected to at least 0.5 hours of continuous flow for the unvegetated HPTRM, partially vegetated HPTRM, and fully vegetated HPTRM.
- j) Documentation demonstrating that in a vegetated state, the HPTRM can perform when subjected to wave overtopping simulations, performed by Colorado State University (CSU), and authorized and directed by the U.S. Army Corps of Engineers (USACE).

1.6 DELIVERY, STORAGE, AND HANDLING

- A. HPTRM labeling, shipment and storage shall follow ASTM D4873.
- B. Product labels shall clearly depict the manufacturer or supplier name, style name, and roll number.
- C. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.
- D. Each HPTRM roll shall be wrapped with a material that will protect the RECP from damage due to shipment, water, sunlight, and contaminants. Individual roll wrapping will not be required for HPTRMs exceeding the UV Resistance requirements per ASTM D4355 in Section 2.2.A.6. The protective wrapping shall be maintained during periods of shipment and storage.
- E. During storage, HPTRM rolls shall be elevated off the ground and adequately covered to protect them from the following: Site construction damage, extended exposure to UV radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperatures in excess of 160 degrees F (71 degrees C) and any other environmental condition that might damage the HPTRM.

1.7 QUALITY ASSURANCE SAMPLING, TESTING, AND ACCEPTANCE

- A. A HPTRM shall be subject to sampling and testing to verify conformance with this specification. Sampling for testing shall be in accordance with ASTM D4354.
- B. Acceptance shall be in accordance with ASTM D4759 based on testing of either conformance samples obtained using Procedure A of ASTM D4354 or based on manufacturer's certifications and testing of quality control samples obtained using Procedure B of ASTM D4354.
- C. Quality Assurance Sampling and Testing shall be waived for ISO 9001:2015 Certified Manufacturing Facilities. Documentation of ISO 9001:2015 Certification shall be provided per the requirements of Section 1.6.A.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. All components of the HPTRM solution shall be furnished by a single manufacturer as a complete system.
- B. Approved HPTRM Manufacturers:
 - 1. Solmax.
 - 2. Western Green.
 - 3. Futerra.
 - 4. Maccaferri.
 - 5. TenCate.
- C. Approved HPTRM:
 - 1. Pyramat 75 HPTRM.
- D. Alternative HPTRM Manufacturers:
 - 1. Alternate manufacturers seeking pre-approval shall be submitted to Engineer of record and/or Owner a minimum of ten (10) workdays prior to the bid date and must meet the requirements outlined within this document.
 - 2. Alternate manufacturers meeting the material specifications within Section 2 seeking pre-approval shall submit the following for evaluation.
 - a) Documentation demonstrating a history of installations designed for non-structural slope protection and/or erosion control meeting the requirements of Section 1.6.A.1.c.
 - b) Documentation demonstrating local representation within the state in which the Project is being constructed.
 - c) Documentation demonstrating the alternative engineering design for channel protection and/or erosion control considered the soil properties, erosion potential, hydrology, hydraulics, and vegetation requirements. The following shall be submitted:
 - 1) Overall alternative HPTRM design methodology.
 - d) Input parameters.
 - e) Calculations / Model output.
 - f) Factor of Safety to support the erosion control design; with the conditions analyzed and documented for the proposed Project.
 - g) Alternative HPTRM product sample including all components.
 - 3. Alternate manufacturers seeking pre-approval shall have a manufacturer's representative present at the pre-bid meeting.
 - 4. Alternate manufacturers that do not provide documentation meeting or exceeding the requirements of Section 1.6.A will not be approved.

2.2 MATERIALS

A. HPTRM:

1. A three-dimensional, high tensile strength, long term non-degradable lofty woven polypropylene RECP specially designed for erosion control applications that exhibits very high interlock and reinforcement capacity with both soil and vegetative root systems.
2. A homogeneous woven matrix composed of Trilobal monofilament yarns heat-set and woven into uniform configuration of resilient pyramid-like projections to improve interlock and minimize yarn displacement around pins, which also results in greater flexibility for improved conformance to uneven surfaces.
3. A material not comprised of layers, composites, or discontinuous materials, or otherwise loosely held together by stitched or glued netting.
4. Material Properties:

PROPERTY	TEST METHOD	TEST PARAMETERS	UNITS	PROPERTY REQUIREMENT
Thickness ¹	ASTM D6525	Minimum	in	0.40
Light Penetration ¹ (% Passing)	ASTM D6567	Maximum	percent	10
Tensile Strength ¹	ASTM D6818	Minimum	lb/ft	4,000 x 3,000
Tensile Elongation ¹	ASTM D6818	Maximum	percent	40 x 35
Resiliency ¹	ASTM D6524	Minimum	percent	80
Flexibility ^{2, 3}	ASTM D6575	Maximum	in-lb	0.534
UV Resistance ²	ASTM D4355	Minimum	percent	90 at 3,000 hrs ⁴ 90 at 6,000 hrs
Burn Rate ²	FMVSS 302	Maximum	ft/min.	1
Time to Extinguish ²	FMVSS 302	Maximum	sec.	1
Carbon Footprint ²	ISO 14064-3 GHG Protocol PAS 2050:2011	Maximum	Kg CO ₂ e	2.7 per 1 m ²

Notes:

1. MARV.
2. Typical Value.
3. A smaller value for flexibility denotes a more flexible material.
4. Third party/independent testing values must be provided showing UV resistance testing for two consecutive years including most recent year.

5. Hydraulic Performance Properties:

- a) Flume Testing: The HPTRM must meet the following at a minimum when subjected to at least 0.5 hours of continuous flow producing the following conditions.
 - 1) Unvegetated HPTRM:
Permissible velocity: 9 ft/sec.
Permissible shear stress: 2.8 psf.
 - 2) Partially Vegetated HPTRM:
Permissible velocity: 15 ft/sec.
Permissible shear stress: 8 psf.
 - 3) Fully Vegetated HPTRM:
Permissible velocity: 25 ft/sec.
Permissible shear stress: 16 psf.
- b) Wave Overtopping Testing: In a vegetated state, the HPTRM must demonstrate the following at a minimum when subjected to wave overtopping simulations, performed by CSU, and/or as authorized and directed by the USACE.
- c) Each type of HPTRM product shall be subject to a single wave overtopping simulation down the flume on one set of trays (linear and angled sections) at 4.0 cfs/ft for the duration equivalent to 3 test hours (~6 elapsed hours).
- d) Passing this wave overtopping test is defined as surviving the three (3) equivalent test hours without visible damage.
- e) Failure is defined by 0.2 feet or more of soil/grass erosion over a 4 ft² area.

- 6. Functional Longevity: The HPTRM shall have a documented installation history demonstrating a minimum retained tensile strength of 70 percent per ASTM D6818 after a minimum of ten (10) years of exposure to a minimum solar radiation of 21.70 MJ/m²-day.
- 7. Environmental Impact: The HPTRM shall be evaluated and certified by an independent third party to have a maximum cradle-to-grave carbon footprint of 2.7 kg CO₂e/m² when tested per GHG Protocol, ISO 14064-3:2006, and PAS 2050:2011.
- 8. Manufacturing Impact: The HPTRM shall be manufactured in an ISO 14001 facility certified for measuring environmental impact and continuously looking for ways to improve it for at least ten (10) years.
- 9. Manufacturing Quality Control: Testing shall be performed at a laboratory accredited by GAI-LAP for tests required for the HPTRM, at frequency exceeding ASTM D4354, with following minimum acceptable testing frequency:

PROPERTY	TEST FREQUENCY yd ²
Thickness	1/14,700

PROPERTY	TEST FREQUENCY yd ²
Light Penetration (percent Passing)	1/14,700
Tensile Strength	1/14,700
Tensile Elongation	1/14,700
Resiliency	1/14,700
Flexibility	1/14,700
Burn Rate	1/14,700
Time to Extinguish	1/14,700
UV Resistance	Annually

2.3 SECURING DEVICES

A. Securing Pins:

1. Securing pins should be a minimum of 0.20 inch diameter steel with a 1.5 inch steel washer at the head of the pin.
2. Length: 12 to 24 inches as depicted on Drawings to provide sufficient ground penetration for pullout resistance.
3. Heavier metal securing pins and/or stakes may be required in rocky soils.
4. Depending on soil pH and design life of the securing pin, galvanized or stainless steel securing pins may be required.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Area(s) to be treated with the HPTRM shall be cleared, grubbed, graded and compacted as indicated on the construction plans and technical specifications or as directed by Engineer of Record.
- B. Placement of new fill may require soil placed to be keyed into the existing slope and compacted in horizontal lifts per Engineer of Record. To ensure compaction at the face of the slope, the slope face may be over-built, compacted in lifts, and then regraded or trimmed to the final grade. All fill shall be placed and compacted per the Project's earthwork technical specifications.
- C. Subgrade shall be uniform and smooth. Large rocks, soil clods, vegetation, and other sharp objects shall be removed before installation of the HPTRM. This will assist the HPTRM in maintaining direct contact with the soil surface.
- D. Construct a perimeter trench around the area(s) limits to be treated with the HPTRM as follows:
 1. Excavate a Crest of Slope (COS) trench at least 3 feet horizontal over each side slope's crest. Trench dimensions shall be 12 inches wide by 12 inches deep.

2. Excavate an Initial Channel (IC) and Terminal Channel (TC) trench 12 inches wide by 12 inches deep at the channel armoring limits.

E. Refer to Section 3.2 for the appropriate vegetation establishment method.

3.2 VEGETATION ESTABLISHMENT

- A. Establish permanent vegetation, where feasible, to assist in the long-term performance of the HPTRM and the control of erosion.
- B. A site-specific soil test shall be conducted to determine the recommended soil amendments required to establish permanent vegetation.
- C. The type and method of vegetation establishment should be unique to the Project's geometry, location, climate, season, topography, soils, seed type, etc. and shall be as directed per one of the following:
 1. Construction plans.
 2. Technical specifications.
 3. Manufacturer's HPTRM submittal.
 4. As directed by the Engineer of Record.
 5. As directed by Project Owner.
- D. Water and/or irrigate seeded/sodded areas as needed to establish and maintain permanent vegetation until the desired vegetative density has been achieved.
- E. Rubber-tired or rubber-tracked vehicles shall be used, and sharp turns avoided. No heavy and/or metal-tracked equipment or sharp turns shall be permitted on the installed HPTRM. Foot traffic and construction equipment shall be avoided over the HPTRM if loose or wet soil conditions exist.

3.3 INSTALLATION

- A. Install HPTRM at elevations and alignments indicated.
- B. Beginning at the downstream end of the channel, place initial end of first roll of HPTRM in one of the COS trenches and secure with securing pins. The securing pins shall be placed at 12-inch intervals.
- C. Unroll the HPTRM down the initial side slope and up the opposing side slope, terminating the HPTRM edge in the IC trench.
- D. Secure the HPTRM end in the opposite COS trench with securing pins at 12-inch intervals.
- E. Secure the HPTRM to the slope face with the securing pins driven flush with the HPTRM at the designated frequency based on the channel protection requirements.
- F. Position adjacent upstream rolls in same manner until the armoring limits are completed, overlapping preceding rolls a minimum of 3 inches with the last HPTRM panel edge terminating in the TC trench with securing pins at 12-inch intervals.

- G. Secure the overlaps with securing pins placed at 12-inch intervals.
- H. Backfill and compact the trenches with specified soil or as directed by the earthwork technical specifications or as directed by Engineer of Record.
- I. Alternate installation methods must be approved by Engineer of Record and manufacturer prior to execution.
- J. Refer to Section 3.2 for the appropriate vegetation establishment method.

END OF SECTION 312513

SECTION 313600 - GABIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. The work under this specification includes furnishing, assembling, filling and tying open wire mesh rectangular compartmented gabions placed on a prepared surface, as specified, and in accordance with the lines, grades, and dimensions shown or otherwise established in the field.
1. Gabions are wire mesh containers of variable sizes, uniformly partitioned into internal cells, interconnected with other similar units and filled with stone at the site to form flexible, permeable, monolithic structures. Manufacture gabions with all components mechanically connected at the production facility with the exception of the mattress lid, which is produced separately from the base. The supply to the site of unassembled individual wire mesh components (panels) forming gabions will not be permitted.
 2. Ensure definitions of terms specific to this specification and to all materials furnished on the site, with the exception of the rock to fill the baskets and the filter material, refer to and are in compliance with American Society for Testing and Materials (ASTM) A975 for double twisted wire mesh gabions, or with ASTM A974 for welded wire fabric gabions.

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL

- a. ASTM A90/A90M (2021) Standard Test Method for Weight of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
- b. ASTM A313/A313M (2017) Standard Specification for Stainless Steel Spring Wire.
- c. ASTM A370 (2024) Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
- d. ASTM A428/A428M (2021) Standard Test Method for Weight of Coating on Aluminum-Coated Iron or Steel Articles.
- e. ASTM A641/A641M (2019) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- f. ASTM A764 (2007; R 2021) Standard Specification for Metallic Coated Carbon Steel Wire, Coated at Size and Drawn to Size for Mechanical Springs.
- g. ASTM A809 (2023) Standard Specification for Aluminum-Coated (Aluminized) Carbon Steel Wire.
- h. ASTM A853 (2019) Standard Specification for Steel Wire, Carbon, for General Use.
- i. ASTM A856/A856M (2003; R 2020) Standard Specification for Zinc-5% Aluminum-Mischmetal Alloy-Coated Carbon Steel Wire.

- j. ASTM A974 (1997; R 2021) Standard Specification for Welded Wire Fabric Gabion and Gabion Mattresses (Metallic Coated or Polyvinyl Chloride [PVC] Coated).
- k. ASTM A975 (2024) Standard Specification for Double-Twisted Hexagonal Mesh Gabions and Revet Mattresses (Metallic-Coated Steel Wire or Metallic-Coated Steel Wire With PVC Coating).
- l. ASTM B117 (2019) Standard Practice for Operating Salt Spray (Fog) Apparatus.
- m. ASTM C33/C33M (2024a) Standard Specification for Concrete Aggregates.
- n. ASTM C136/C136M (2019) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- o. ASTM D412 (2016; R 2021) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
- p. ASTM D638 (2014) Standard Test Method for Tensile Properties of Plastics.
- q. ASTM D746 (2014) Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
- r. ASTM D792 (2013) Density and Specific Gravity (Relative Density) of Plastics by Displacement.
- s. ASTM D1499 (2013) Filtered Open-Flame Carbon-Arc Type Exposures of Plastics.
- t. ASTM D2240 (2015; E 2017) Standard Test Method for Rubber Property - Durometer Hardness.
- u. ASTM D5312/D5312M (2012; R 2013) Evaluation of Durability of Rock for Erosion Control Under Freezing and Thawing Conditions.
- v. ASTM G152 (2013; R 2021) Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials.

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- a. USACE CRD-C 144 (1992) Standard Test Method for Resistance of Rock to Freezing and Thawing.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 013300 Submittal Procedures:

- a. Samples.
- b. Gabions.
- c. Test Reports Gabions.
- d. Certificates.
- e. Stone Fill Filter Material.

1.4 QUALITY ASSURANCE

B. Samples:

- 1. Furnish samples of materials used to fabricate the gabions to the Engineer 60 days prior to start of installation.
- 2. Samples will be tested in accordance with specification and either ASTM A974 or ASTM A975 depending on which system is being furnished by Contractor. When the first test results indicate that the fasteners do not meet the specified requirements, the

additional test will be at Contractor's expense. The fasteners will be rejected after two tests failing to meet the requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Mattress lids may be supplied either as individual units (bundled) or in roll form. Ship lacing wire in coils with a diameter of the coil approximately 2 feet. Ship fasteners in boxes. Ship preformed stiffeners in bundles.
- B. Deliver gabions with all components mechanically connected at the production facility, which is produced separately from the base. All gabions are supplied in the collapsed form, either folded or bundled or rolled, for shipping. Bundles are banded together at the factory for ease of shipping and handling.
- C. Deliver gabions to the site labeled in bundles. Labels show the dimensions of the gabions included the number of pieces and the color code.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Double twisted wire mesh gabions:
 - 1. Double twisted wire mesh gabions must be manufactured with a non-raveling mesh made by twisting continuous pairs of wires through three half turns (commonly called double twisted) to form a hexagonal-shaped opening.
 - 2. Ensure gabion sizes, wire diameters, mesh opening sizes, and tolerances comply with the requirements of ASTM A975 (Table 1). Provide gabions that meet the following test requirements:
- B. Metallic Coating:
 - 1. Ensure coating weights conform to the requirements of ASTM A856/A856M.
- C. Wire Tensile Strength:
 - 1. The tensile strength of the wire used for the double twisted mesh, lacing wire, and stiffener, when tested in accordance with test methods and definitions ASTM A370, must be in accordance with the requirements of ASTM A856/A856M (Style 2), for soft temper wire.
 - 2. Mesh strength and panel to panel joint strength.
 - 3. Use the minimum strength requirements of the mesh, selvedge wire to mesh connection, panel to panel connection, and punch test, when tested in accordance with ASTM A975 Section 13.1 as shown in Table 1. The strength values reported in lb/ft are referred to the unitary width of the specimen. Perform the panel-to-panel test to demonstrate the ability of the fastening system to achieve the required strength and indicate the number of wire revolutions for the lacing wire or the ring spacing for ring fasteners used. Use the same number of wire revolutions or ring spacing in the field installation. Pleating the based panel to obtain internal panels is prohibited.

TABLE 1: Minimum Strength Requirements of Mesh and Connections

TEST DESCRIPTION	GABIONS, METALLIC COATED
Tensile strength parallel to twist	3500 lb/ft
Tensile strength perpendicular to twist	1800 lb/ft
Connection to selvages	1400 lb/ft
Panel to panel (using lacing wire or ring fasteners)	1400 lb/ft
Punch Test	6000 lb

D. Testing:

1. Test records made within one year by certified laboratories and government agencies will be used to determine the acceptability of the fastening system. Submit samples of wire fasteners and samples of material for fabricating the gabions and mattresses with their certified test records at least 60 days in advance to Engineer for approval. When the first test results indicate that the fasteners do not meet the specified requirements, the additional test will be at Contractor's expense. The fasteners will be rejected after two tests failing to meet the requirements.

E. Stone Fill:

1. Submit a certificate or affidavit signed by a legally authorized official of the supplier of the stone fill and the supplier of the natural filter material (see next main paragraph below) that it meets the quality required and gradation limits specified.
2. The stone fill for gabions shall be hard, angular to round, durable and of such quality that they shall not disintegrate on exposure to water or weathering during the life of the structure. Not more than 5 percent by weight of clean spalls resulting from loading and shipment will be allowed in any truckload. The rock may be unwashed quarry material provided it meets all requirements of these special provisions and is placed in conformance with all requirements of the Department's construction permits (including water quality requirements). Prior to construction, submit testing results and certification that all proposed construction materials meet all requirements of the Standard Specifications to the Engineer. The minimum unit weight of the rock shall be 164 pounds per cubic foot (saturated surface dry) and the absorption shall be less than 4 percent. Rock containing organic matter or soft, friable particles in quantities considered objectionable to the Engineer will be rejected. Only crystalline rock obtained by quarrying with the following size limitations will be allowed:
 - a. Gradation: Use rock that ranges in dimension from a minimum of 4 in. to a maximum of 8 in. The range in sizes shall allow for a variation of 5% oversize and/or 5% undersize stone, provided it is not placed on the gabion exposed surface. The size shall be such that a minimum of three layers of rock must be achieved when filling the gabion

2.2 ASSEMBLY

A. Double twisted wire mesh gabions:

1. Open the gabions and unfold one by one on a flat, hard surface. Gabion units over 6 foot in length usually have an extra shipping fold, which must be removed. Lift up the sides, ends and diaphragms into a vertical position to form an open box shape. Connect the back and the front panels of the gabion to the end panels and center diaphragms. The top corner of the end panels and center diaphragms have a selvedge wire extending approximately 4 inches out from the corner edge. Raise the end panels and the diaphragms to a vertical position and wrap the selvedge wire around the edge wire of the top and back panels.

2.3 LACING OPERATIONS

A. Double Twisted Wire Mesh Gabions:

1. Either lacing wire or ring fasteners are permitted to lace double twisted wire mesh gabions.

B. Lacing Wire:

1. When using lacing wire, cut off a piece of wire 1.2 to 1.5 times the length of the edge to be laced. If the edge of the basket is 3 foot long, no more than 4 to 5 feet of wire should be used at a time to lace. For vertical joints, starting at the bottom end of the panel, twist the lacing wire and wrap two times around the bottom selvedge and alternate double and single loops through at intervals no bigger than 4 to 6 inches. Finish the operation by looping around the top selvedge wire. The use of pliers to assemble the units with lacing wire is normally recommended.

C. Steel Wire Ring Fasteners:

1. When steel wire ring fasteners are used, install the rings at the top and bottom connections of the end and center diaphragms. Base the ring spacing on the minimum pull apart strength as specified in Table 1. In any case, do not exceed maximum ring spacing along the edges of 6 inches. The use of either a mechanical or a pneumatic fastening tool for steel wire ring fasteners is required. Provide galvanized, stainless steel or Zn-5 percent aluminum-mischmetal alloy coated ring fasteners.

2.4 INSTALLATION AND FILLING

A. Gabion units:

- a. Assemble empty gabion units individually and place on the approved surface to the lines and grades as shown or as directed, with sides, ends, and erect diaphragms in such a manner to ensure the correct position of all creases and that the tops of all sides are level. Properly stagger all gabion units horizontally and vertically as shown in the Drawings. Finished gabion structures must have no gaps along the perimeter of the

contact surfaces between adjoining units. Connect all adjoining empty gabion units along the perimeter of their contact surfaces in order to obtain a monolithic structure. Securely fasten all lacing wire terminals. Make all joining through selvedge-to-selvedge or selvedge-to-edge wire connection; mesh-to-mesh or selvedge-to-mesh wire connection is prohibited except in the case where baskets are offset or stacked, and selvedge-to-mesh or mesh-to-mesh wire connection would be necessary. As a minimum, install a fastener at each mesh opening at the location where mesh wire meets selvedge or edge wire.

B. Basket units:

- a. Place the initial line of basket units on the prepared foundation and adjoining empty baskets set to line and grade, and common sides with adjacent units thoroughly laced or fastened. Place them in a manner to remove any kinks from the mesh and to a uniform alignment. Then partially fill basket units to provide anchorage against deformation and displacement during the filling operation. Place stone in the units as specified in paragraph STONE FILL, subparagraph GRADATION.
- b. Correct undue deformation and bulging of the mesh prior to further stone filling. Take care, when placing the stone by hand or machine, to assure that the PVC coating on gabions will not be damaged. Fill all visible faces with some hand placement to ensure a neat and compact appearance and that the void ratio is kept to a minimum.
- c. Uniformly overfill gabions by about 1 to 2 inches to compensate for future rock settlements. Gabions can be filled by any kind of earth-filling equipment, such as a backhoe, gradall, crane, etc. The maximum height from which the stones may be dropped into the baskets is 3 to 4 feet.

C. Double Twisted Wire Mesh Gabions:

- a. After the foundation has been prepared, place the pre-assembled gabions in their proper location to form the structure. Connect gabions together and align before filling the baskets with rock. Carry out all connections (panel-to-panel) and basket-to-basket as described in paragraph ASSEMBLY. Provide stone fill with a gradation of 4 to 8 inches, as described in paragraph GRADATION, and place in 1-foot lifts. Fill cells to a depth not exceeding 1 foot at a time. The fill layer should never be more than 1 foot higher than any adjoining cell. Install stiffeners or internal cross ties in all front and side of the gabions at 1/3 and 2/3 of the height for 3 feet or higher gabions, as the cell is being filled. Install stiffeners in the center of the cells. In 1.5-foot-high units, stiffeners or internal crossties are not required. Loop internal cross ties, or alternatively the preformed stiffeners, around three twisted wire mesh openings at each basket face and securely twist the wire terminals to prevent their loosening. Minimize the number of voids by using a well-graded stone in order to achieve a dense, compact stone fill. Connect all corners securely to the neighboring baskets of the same layer before filling the units. When more than one layer of gabions is required, in order for the individual units to become incorporated into one continuous structure, connect the next layer of gabions to the layer underneath after this layer has been securely closed. Overfill gabions uniformly by about 1 to 2 inches to compensate for future rock settlements.
- b. Connect all corners securely to the neighboring baskets of the same layer before filling the units. When more than one layer of gabions is required, in order for the individual units to become incorporated into one continuous structure, connect the

next layer of gabions to the layer underneath after this layer has been securely closed. Overfill gabions uniformly by about 1 to 2 inches to compensate for future rock settlements.

2.5 CLOSING

- A. Secure lids tightly along all edges, ends and diaphragms in the same manner as described for assembling. Adjacent lids may be securely attached simultaneously. Connect panel edges by pulling using the appropriate closing tools where necessary. Do not use single point leverage tools, such as crowbars, which may damage the wire mesh. Then turn in all end wires.

PART 3 – EXECUTION (NOT USED)

END OF SECTION 313600

SECTION 313700 - RIPRAP

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Provide all labor, materials, equipment, and incidentals required to furnish and install riprap at locations shown or indicated in Contract Documents.

B. Coordination:

1. Review procedures under this and other Sections and coordinate the Work that must be performed with or before riprap is installed.

C. Related Sections:

1. Section 312000 "Earthwork".
2. Section 311000 "Site Clearing".
3. Section 312500 "Erosion and Sedimentation Controls".
4. Section 313600 "Gabions".

1.2 REFERENCES

A. Standards referenced in this Section are:

1. American Society for Testing and Materials C127, Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
2. National Stone, Sand, and Gravel Association-293, Aggregate Handbook.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Riprap Supplier:

- a. Supplier of riprap and other materials furnished under this Section shall be certified by the North Carolina Department of Transportation (NCDOT) for furnishing such materials for NCDOT highways.

B. Regulatory Requirements:

1. Reference Specifications and Details:

- a. Comply with applicable requirements of NCDOT Standard Specifications for Roads and Structures.

1.4 SUBMITTALS

A. Acton Submittals: Submit the following:

1. Product Data:

- a. Source or quarry name, gradation, and other information required by Engineer. Submit for each source of material proposed.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Riprap: Material shall be Item 1042-1 Class A or Class B, in accordance with the reference specifications indicated in Article 1.3 of this Section.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clear ground surface of brush, trees, stumps, and other objectionable material, and dress to a smooth surface. Clear and grub, where required.
- B. Remove all soft or spongy material to depth shown or indicated on Drawings or as directed by Engineer and replace with acceptable material. Excavation, removal of unsuitable material if any, and backfilling shall comply.
- C. Placing of geosynthetics, where required, shall comply with City of Greensboro Standard Detail No. 214.

3.2 INSTALLATION

A. Riprap Placing:

1. Minimum total thickness of riprap shall be as shown on Drawings.
2. Place riprap stones so that weight of stone is carried by underlying material and not by adjacent stones. Carefully place the stones on geosynthetics, where required, to produce an even distribution of pieces, with minimum of voids and without damaging the geosynthetic. Place the full-course thickness in one operation while preventing segregation and avoiding displacing of underlying material. Do not place stones in layers, by dumping into chutes, or by other methods that cause segregation or damage to geosynthetic, if any. When necessary, rearrange individual stones for uniform distribution.

3. Riprap may be placed using equipment, and placing shall produce an installation of firm and solid riprap. Level the top surface of riprap to required alignment and slope by hand-placing stones to fill large voids and to make surface even.
4. On slopes, place the largest stones at the bottom. Riprap shall be properly sized to form compact, solid blanket to protect the slope or channel, as applicable. On slopes steeper than one foot vertical to 1.5 feet horizontal, do not use rounded boulders or cobbles without grouting stones in place.
5. Grouting: Where grouting of riprap is required, comply with the following:
 - a. When stones are in place, completely fill spaces between stones with "grout fill" material.
 - b. Engineer may direct that occasional spaces be left ungrouted for relief of hydrostatic pressure. Chink ungrouted spaces with spalls of suitable size.
 - c. Do not grout riprap in freezing weather.
 - d. Clean exposed surface of stones to remove accumulation of grout.
 - e. Keep grouted riprap moist for seven days after grouting. Suitable grout curing compound may be employed when approved by Engineer.
6. When existing riprap is in proximity to riprap provided under this Section, place riprap to conform as closely as practicable in size and character to existing riprap.
7. Unless otherwise indicated, existing riprap removed to facilitate other Work shall be reinstalled or replaced at no additional cost to Owner.

END OF SECTION 313700

SECTION 320191 – TREE PROTECTION AND TRIMMING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and perform tree protection and trimming.
2. Extent of tree protection and trimming may include, but is not limited to, crown cleaning, crown thinning, crown raising, crown reduction, vista pruning and crown restoration; in addition to soil aeration, drip line, root zone and tree trunk protection, and temporary barriers.
3. Work may include, but is not limited to, the cutting, removal, and satisfactory disposal of selected trees, including the stump, within the construction right-of-way that are not designated on the Drawings to be cleared and grubbed.
4. Types of products required include the following:
 - a. Temporary protection barriers.
 - b. Tree wound dressing.
 - c. Drainage fill.
 - d. Topsoil.
 - e. Drain tile.
 - f. Straw.
 - g. Stone.
 - h. Burlap.
 - i. Accessories.

B. Coordination:

1. Review installation procedures under other Sections and coordinate construction activities and the installation of items that pass within the drip line, or that affect existing grade, in areas where existing plantings are to remain.

C. Related Sections:

1. Section 311000 "Site Clearing".
2. Section 3123500 "Erosion and Sedimentation Controls".
3. Section 329113 "Soil Preparation".

1.2 REFERENCES

A. Standards referenced in this Section are listed below:

1. American National Standards Institute, (ANSI).

- a. ANSI 300, Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance - Standard Practices.
2. American Society for Testing and Materials, (ASTM).
 - a. ASTM C700, Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
 - b. ASTM D448, Classification for Sizes of Aggregate for Road and Bridge Construction.
3. International Society of Arboriculture, (ISA).
 - a. Trees and Building Sites.
 - b. Tree-Pruning Guidelines.

1.3 QUALITY ASSURANCE

A. Professional Arborist Qualifications:

1. Engage an accredited professional arborist, acceptable to Engineer, skilled, trained and with successful and documented experience in the protection and restorative care of trees, certified by the ISA or American Society of Consulting Arborists; who agrees to employ only tradesmen with specific skill and successful experience in this type of Work.
2. Submit names and qualifications to Engineer along with the following information on a minimum of three successful projects.
 - a. Names and telephone numbers of owner, architects or engineers responsible for projects.
 - b. Approximate contract cost of the tree protection and trimming.
 - c. Amount and kinds of tree protection and trimming performed.

B. Tree Pruning Standards: Comply with ANSI A300 and ISA standards, unless more stringent requirements are specified, or required by site conditions.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:

1. Product Data:
 - a. Submit product data for each material specified.

B. Informational Submittals: Submit the following:

1. Certificates:
 - a. Certification by professional arborist that trees shown to remain were protected during the course of construction in accordance with recognized standards of the industry, as specified.

- b. Certification that where damage did occur, trees were promptly and properly treated or replaced.
 - 2. Qualifications Data:
 - a. Professional arborist.
- C. Closeout Submittals: Submit the following:
 - 1. Care and Maintenance Data:
 - a. Submit typewritten instructions recommending procedures to be established by Owner for seasonal care and maintenance of trees affected by construction activities, after Substantial Completion.

1.5 EXTENDED SERVICE

- A. Extended Landscape Service for Tree Repair and Replacement and Trees Affected by Grade Lowering:
 - 1. Begin extended service immediately after each tree is acceptably planted or area regraded. Provide extended service for 90 days after tree plantings are acceptably completed and grade modifications performed.
 - 2. Prune, cultivate, water, weed, fertilize, shade, mist, restore planting saucers, tighten and repair stakes and guy supports, and reset tree plantings to proper grades or vertical position, as required to establish healthy, viable plantings.
 - a. Do not allow trees to wilt or show other signs of environmental stress. Visit the site twice a week during the extended service periods, to inspect the condition of the plantings and immediately provide required care.
 - b. Provide landscape installer who shall be available on-call if notified between regular visits that plants require critical care or maintenance, throughout the time of extended service period.
 - 3. Check and observe tree plantings for signs of insect and disease attack. Take corrective measures immediately upon notice of such attack. Control damaging insects and diseases, as specified.
 - 4. Restore or replace damaged tree wrappings.
 - 5. Remove dead trees immediately. Replace immediately unless required to plant in the succeeding planting season.
- B. Provide sufficient water to ensure that tree root zone remains moist at all times.
 - 1. Apply water using a 1-inch diameter hose with an attached metering gauge.
 - 2. Apply water at a sufficiently slow rate to prevent water run-off from the soil surface but great enough to provide 0.2-inches of water per square foot of canopy area per hour for five hours each week.

- C. Any decline in the condition of trees shall require Contractor to take immediate action to identify potential problems and undertake corrective measures. If required, engage professional arborist or horticulturist to inspect trees, identify problems and recommend corrective procedures. Advise Engineer of all such actions and submit inspection and recommendation reports.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Tree Wound Dressing: Provide tree wound dressing which is waterproof, adhesive and elastic with an antiseptic, free from kerosene, coal tar, creosote or any other material injurious to the life of the plant.
- B. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D448, Size 24, with 90 to 100 percent passing a 2-1/2-inch sieve and not more than 10 percent passing a 3/4-inch sieve.
- C. Topsoil: Provide topsoil, as required, that is fertile, friable, natural loam, surface soil, capable of sustaining vigorous plant growth, free of any admixture of subsoil, clods of hard earth, plants or roots, sticks or other extraneous material harmful to the growth of plants. Obtain topsoil only from well-drained sites where soil occurs in depth of 4-inches or more; do not obtain from bogs or marshes. Supply topsoil with the analyses below or analyses in Sections 310515 "Soils and Aggregates for Earthwork" and Section 329113 "Soil Preparation," whichever is more stringent:
 - 1. 3/4-inch Mesh: 100 percent passing.
 - 2. No. 4 Sieve: 90 to 100 percent passing.
 - 3. No. 200 Sieve: 0 to 10 percent passing.
 - 4. Clay content of material passing No. 200 sieve not greater than 60 percent, as determined by hydrometer tests.
 - 5. pH 5.0 to pH 6.5. If approved by Engineer, natural topsoil not having the hydrogen ion value specified may be amended by Contractor at his own expense.
 - 6. Organic content not less than five percent, as determined by ignition loss.
 - 7. Free of pests or pest larvae.
- D. Drain Tile: Provide 4-inch standard strength, perforated bell and spigot clay pipe, in compliance with ASTM C700.
- E. Filter Fabric: Manufacturer's standard, nonwoven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.
- F. Stone: Naturally occurring at the site, as selected by Contractor.
- G. Burlap: Jute not less than 7.2 ounces per square yard.

PART 3 - EXECUTION

3.1 GENERAL

A. Construction requirements for tree removal include the following:

1. The trees that are to be removed will be designated on the Drawings or by Engineer. All tree stumps shall be grubbed. All brush, roots, stumps, tree laps, and trees not reserved by the property Owner shall be disposed of by Contractor offsite at designated location on Drawings or at the cost of Contractor to proper disposal facility.
2. Conduct operations in a manner to prevent limb, bark, or root injuries to trees, shrubs, or other types of vegetation that are to remain growing and also to prevent damage to adjacent property. Exercise extreme caution in order not to remove any trees outside of the construction right-of-way.
3. Perform such erosion control work, temporary or permanent, as may be directed by Engineer in order to satisfactorily minimize erosion resulting from the tree removal operations.
4. Where designated on the Drawings individual trees shall be limbed-up, cut into six-foot lengths, and stacked outside of the construction right-of-way, as directed by Engineer, for removal by the Owner.

3.2 PERFORMANCE

A. General:

1. Install temporary fencing, barricades or guards, located as recommended by professional arborist, outside the drip line of trees.
2. Protect tree root systems from damage caused by noxious materials from run off or spillage during mixing, placing, or storing of construction materials. Protect root systems from flooding, erosion or excessive wetting resulting from dewatering operations or other construction activities.
3. Do not allow fires under or adjacent to trees or other plants to remain.
4. Do not store materials, debris, topsoil or excavated subsoil within the drip line of trees to remain. Do not permit vehicles within drip line. Restrict foot, vehicle and equipment traffic to prevent compaction of soil over root systems. Where such activities are unavoidable, and only as acceptable to Engineer, provide continuous heavy wood planking, effectively fastened together and capable of distributing all loads from such activities, above a filter fabric layer covered with 2-inches of gravel.
5. Cut branches and roots, if required, with sharp pruning instruments; do not break or chop. Paint cuts over 1/2-inch in size with tree wound dressing.

B. Excavation:

1. Excavate within drip line of trees only where shown.
2. Where trenching for utilities is required within drip line, tunnel under or around main lateral feeder roots by drilling, auger boring, pipe jacking, or digging by hand under supervision of professional arborist. Do not cut main lateral roots or tap roots; cut smaller roots, which interfere with installation of the Work.
3. Where excavation for construction is required within drip line of trees, hand excavate to minimize damage to root systems. Perform excavation under supervision of professional

arborist. Install shoring or other protective support systems at excavations, to minimize sloping or benching of excavations. Use narrow tine spading forks and comb soil to expose roots.

4. Relocate roots in backfill areas wherever possible. If large, main lateral roots are encountered, expose beyond excavation limits as required to bend and relocate without breaking. If encountered immediately adjacent to location of construction and relocation is not practical, cut roots approximately 3-inches back from construction.
5. Do not allow exposed roots to dry out before permanent backfill is placed; provide temporary earth cover. Water and maintain in moist condition and temporarily support and protect from damage until permanently relocated and covered with earth.

C. Regrading:

1. Maintain existing grade within drip line of trees, unless otherwise shown or specified.
2. Grade Lowering:
 - a. Where new finish grade is shown below existing grade around trees, slope grade beyond drip line. Maintain existing grade within the drip line of trees.
 - b. Prune tree roots exposed during grade lowering, or provide permanent protections as recommended by professional arborist. Do not cut main or lateral roots or taproots; cut only smaller roots.
 - c. Compensate for loss of roots and prune branches to stimulate root growth.
 - d. Provide extended service during the Contract period as recommended by professional arborist.
3. Minor Fills:
 - a. Where existing grade is 6-inches or less below elevation of finish grade shown, fill with topsoil.
 - b. Place in single layer and do not compact.
 - c. Hand grade to required finish elevations.
4. Moderate Fills:
 - a. Where existing grade is more than 6-inches, but less than 12-inches, below finish grade elevation, place a layer of drainage fill and filter fabric on existing grade prior to placing topsoil.
 - b. Carefully place drainage fill against tree trunk approximately 2-inches above elevation of finish grade and extend not less than 18-inches from tree trunk on all sides.
 - c. Place filter fabric with edges overlapping 6-inches, minimum.
 - d. Place fill layer of topsoil to finish grade elevation.
 - e. Do not compact stone, gravel or topsoil layers; hand grade to required finish elevations.
5. Deep Fills:
 - a. Provide an open dry circular well of durable stone, without mortar, situated at least 24-inches from the tree trunk.

- b. To facilitate proper drainage, place eight to ten continuous runs of 4-inch drain tiles horizontally on the original grade under the complete spread of the branches in a radial pattern around the tree.
- c. Slope drains away from tree.
- d. Place drainage fill on the ground for a depth of 2-inches under and 6-inches over the drain tile.
- e. Place filter fabric over drainage fill.
- f. Place eight to ten 4-inch drain tiles vertically in a radial pattern around the tree at a distance of five feet from the tree. Extend vertical drain tiles from the filter fabric layer above the horizontal drain to finished grade.
- g. Hold drains in place with fill.
- h. Hand grade to required elevation.

D. Tree Pruning:

1. Remove branches from trees to remain only with the approval of Engineer, and only as required to clear permanent construction, using branch removal methods in compliance with specified standards.
2. Extend pruning operation to restore natural shape of entire tree where pruning is approved by Engineer.
3. Prune branches to balance loss to root system caused by damage or cutting of root system.
4. Chip branches removed from trees. Stockpile and spread chips as directed by Engineer.

E. Tree Repair and Replacement:

1. Cavity Repair:

- a. Remove decayed areas to depth, which exposes healthy tissue.
 - b. Shape cavities to provide drainage.
 - c. Paint inside of cavity with accepted antiseptic tree wound paint.
 - d. Do not fill cavities.
 - e. When cavity cross section exceeds 60 percent of cross section of tree, remove tree upon authorization of Engineer.
 - f. Remove tree stumps to 18-inches below finished grade.
2. Promptly repair trees damaged by construction operations within 24 hours of the occurrence of such damage. Treat damaged trunks, limbs, and roots according to written instructions of professional arborist.
 3. Remove and replace dead trees, and damaged trees determined by professional arborist to be incapable of restoration to normal growth pattern.
 4. If trees over 6 inches in caliper measurement, taken 12-inches above grade, are required to be replaced, provide new trees of 6-inch caliper size, and of the species selected by Engineer.

F. Soil Aeration:

1. Aerate surface soil compacted during construction.

2. Extend aeration operations from ten feet beyond the drip line of trees to an area no closer than three feet to tree trunk.
3. Drill 2-inch diameter holes a minimum of 12-inches deep at two feet on centers.
4. Fill holes with an equal mix of augered soil and sand.

3.3 CLEAN-UP

- A. Burning of removed trees, chips and branches is not permitted on the site.
- B. Remove excess excavated material, displaced trees, excess chips and trimmings. Legally dispose offsite at a permitted facility.
- C. Remove protection barriers and load distributing layers when no longer needed and restore areas beneath trees.

END OF SECTION 320191

SECTION 323113 – CHAIN LINK FENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Chain link fences.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Fence, rails, and fittings.
 - b. Chain link fabric, reinforcements, and attachments.
- B. Shop Drawings: For each type of fence assembly.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include accessories, hardware, and operational clearances.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of chain link fence.

1.5 FIELD CONDITIONS

- A. Field Measurements: Verify layout information for chain link fences shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of chain link fences that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Failure to comply with performance requirements.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CHAIN LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "Chain Link Fence Manufacturers Institute Product Manual" and requirements indicated below:
 1. Fabric Height: As indicated on Drawings.
 2. Steel Wire for Fabric: Wire diameter of 0.148 inch.
 - a. Mesh Size: 2 inches.
 - b. Zinc-Coated Fabric: American Society for Testing and Materials (ASTM) A392, Type II, Class 2, 2.0 oz./sq. ft. with zinc coating applied after weaving.
 3. Selvage: Twisted top and knuckled bottom.

2.2 FENCE FRAMEWORK

- A. Posts and Rails: ASTM F1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F1043 based on the following:
 1. Fence Height: As indicated on Drawings.
 2. Heavy-Industrial-Strength Material: Group IA, round steel pipe, Schedule 40.
 - a. Line Post: 2.5-inches in diameter.
 - b. End, Corner, and Pull Posts: 3-inches in diameter.
 3. Horizontal Framework Members: Intermediate and top rails according to ASTM F1043.
 - a. Top Rail: 1.66-inches in diameter.
 4. Brace Rails: ASTM F1043.
 5. Metallic Coating for Steel Framework:

- a. Type A: Not less than minimum 2.0-oz./sq. ft. average zinc coating according to ASTM A123/A123M or 4.0-oz./sq. ft. zinc coating according to ASTM A653/A653M.

2.3 TENSION WIRE

- A. Metallic-Coated Steel Wire: 0.177-inch- diameter, marcelled tension wire according to ASTM A817 or ASTM A824, with the following metallic coating:
 - 1. Type II: Zinc coated (galvanized) by hot-dip process, with the following minimum coating weight:
- B. Pipe and Tubing:
 - 1. Zinc-Coated Steel: ASTM F1043 and ASTM F1083; protective coating and finish to match fence framework.
- C. Frame Corner Construction: Welded or assembled with corner fittings.

2.4 FITTINGS

- A. Provide fittings according to ASTM F626.
- B. Post Caps: Provide for each post.
 - 1. Provide line post caps with loop to receive tension wire or top rail.
- C. Rail and Brace Ends: For each corner, pull, and end post.
- D. Rail Fittings: Provide the following:
 - 1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
 - 2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate rails to posts.
- E. Tension and Brace Bands: Pressed steel.
- F. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain link fabric. Provide one bar for each end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
- H. Barbed Wire Arms: Pressed steel or cast iron, with clips, slots, or other means for attaching strands of barbed wire, integral with post cap, for each post unless otherwise indicated, and as follows:

1. Provide line posts with arms that accommodate top rail or tension wire.
 2. Provide corner arms at fence corner posts unless extended posts are indicated.
 3. Single-Arm Type: Type I, slanted arm.
- I. Tie Wires, Clips, and Fasteners: According to ASTM F626.
1. Standard Round Wire Ties: For attaching chain link fabric to posts, rails, and frames, according to the following:
 - a. Hot-Dip Galvanized Steel: 0.106-inch-diameter wire; galvanized coating thickness matching coating thickness of chain link fence fabric.
- J. Finish:
1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.

2.5 BARBED WIRE

- A. Steel Barbed Wire: ASTM A121, three-strand barbed wire, 0.099-inch-diameter line wire with 0.080-inch-diameter, four-point round barbs spaced not more than 5 inches off-center.
1. Zinc Coating: Type Z, Class 3.

2.6 ANCHORING CEMENT

- A. Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for a certified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
1. Do not begin installation before final grading is completed unless otherwise permitted by Engineer.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 CHAIN LINK FENCE INSTALLATION

- A. Install chain link fencing according to ASTM F567 and more stringent requirements specified.
 - 1. Install fencing on established boundary lines inside property line.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
- C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.
- D. Anchor new posts for all fences directly into new concrete footings as shown on the Drawings.
- E. Terminal Posts: Install terminal end and corner posts according to ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.
- F. Line Posts: Space line posts uniformly at 10 feet off-center.
- G. Post Bracing and Intermediate Rails: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end posts and at both sides of corner and pull posts.
 - 1. Locate horizontal braces at mid-height of fabric 72 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- H. Tension Wire: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches off-center. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:

1. Extended along bottom of fence fabric. Install bottom tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.
- I. Top Rail: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- J. Intermediate: Secure to posts with fittings.
- K. Chain Link Fabric: Apply fabric to outside of enclosing framework. Leave 2-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- L. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, and pull posts, with tension bands spaced not more than 15 inches off-center.
- M. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain link fabric according to ASTM F626. Bend ends of wire to minimize hazard to individuals and clothing.
 1. Maximum Spacing: Tie fabric to line posts at 12 inches off-center and to braces at 24 inches off-center.
- N. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side.
- O. Barbed Wire: Install barbed wire uniformly spaced, angled toward security side of fence. Pull wire taut, install securely to extension arms, and secure to end post or terminal arms.

END OF SECTION 323113

SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes loam and topsoil specified by composition of the mixes.
- B. Related Requirements:
 - 1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
 - 2. Section 312000 "Earthwork" for excavating and backfilling operations.
 - 3. Section 312500 "Erosion and Sedimentation Controls" for erosion and sedimentation control devices.

1.3 DEFINITIONS

- A. AOAC: Association of Official Analytical Chemists.
- B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- C. CEC: Cation exchange capacity. The measure of a soil's ability to retain and supply nutrients.
- D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- E. Imported Soil: Soil that is transported to Project site for use.
- F. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
- G. Methods of Soil Analysis: Standards of soil testing by the AOAC.
- H. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

- I. Planting Soil: Existing, onsite soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- J. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- K. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- L. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 ACTION SUBMITTALS

- A. Submit to Engineer for review and approval complete shop drawings, materials, and equipment furnished under this Section including seed mixtures, grower, and product information.
- B. Product Data: Specifications and other supporting documentation shall be provided for any amendments, fertilizers, or additives which will be recommended based on the results of the topsoil testing.

1.5 INFORMATIONAL SUBMITTALS

- A. Final testing results from the lab shall be provided by Contractor.

1.6 QUALITY ASSURANCE

- A. Acceptable soil testing laboratory. Contractor may use a different soil testing laboratory following approval from Engineer.
 - 1. Use of All Profile Soil Analysis Laboratory
300 Speedway Circle, Suite 2
Lincoln, NE 68502
800-508-8681
 - 2. Submittal forms and free-soil testing is available through www.ProfilePS3.com.

1.7 SOIL-SAMPLING REQUIREMENTS

- A. General: Extract soil samples according to requirements in this article. Contractor shall be responsible for screening topsoil and adding amendments to create suitable topsoil at his/her own expense. Contractor shall screen existing topsoil with a 1-inch screen prior to reuse. Stockpiled

topsoil may be used in areas disturbed by Contractor's activities as approved by Engineer. Stockpiled topsoil not used for repair or new work shall be properly disposed of offsite.

B. Proper sampling equipment:

1. Equipment should be such, that sampling depth can be monitored and controlled.
 - a. A stainless steel sampling probe is suggested but not required.
 - b. A garden spade is also generally effective.
2. Composite samples should be collected in a plastic bucket for thorough mixing. Metal buckets can contain traces of some micro-nutrients (particularly zinc), which can contaminate samples.
3. Soil sample bags should be either plastic or plastic lined.

C. The topsoil must be tested every 5,000 cubic yards. Review the sample location for significant changes in soil, such as color or texture.

D. Sample Collection and Labeling:

1. Number and Location of Samples: Minimum of 10 to 12 composite representative soil samples.
2. Procedures: The minimum volume of soil needed is roughly 12 ounces or approximately 1.5 pounds.
3. If organic material is on the surface, scrape away prior to sampling. Typically, no more than 1/4-inch to 1/2-inch surface layer.
4. Labeling: Insert each composite sample into a bag and clearly mark each sample back with the corresponding sample identification number (1, 2, or 3).

E. Paperwork and shipping instructions:

1. Please be sure all information is completed on the Soil Testing Input Form (obtained from www.profileps3.com).
2. Prior to sealing the box, make sure that the input forms and soil sample bags are compliant with Section 3.03 SAMPLING PROCEDURES.
3. Pack samples very tightly in a strong shipping box. Use packing material so the bag(s) will not shift in the box. Tape the box completely and affix a shipping label. If possible, collect and ship samples the same day.
4. For additional instruction regarding the completion and submission of the Soil Testing Input Form view the instructional video at www.profileevs.com/free-soil-test.
5. For additional assistance in interpreting your soil analysis results please utilize the Soil Testing Properties Tech Bulletin - <https://www.profileevs.com/resources/library/soil-testing-properties-tech-bulletin>

F. Sample Guidance and Assistance:

1. Manufacturer Representatives from Profile Products may be utilized to collect and submit the required soil samples.
 - a. This is a service provided at no cost to the parties involved in the project with a Profile Product good specified.
 - b. Interpretation of the final soil test results may also be conducted by the Manufacturer Representative including any amendment, fertilizer or other additive recommendations.
 - c. Contact information for the local Manufacturer Representative:
Profile Products Technical Representative
Matt Welch, CESSWI
Technical Manager
Profile Products LLC
Office: (847) 215-3464
Email: mwelch@profileproducts.com

1.8 TESTING REQUIREMENTS

- A. General: Perform tests on soil samples according to requirements in this article. The tests shall include analysis and interpretation of the results.
- B. Soil analysis shall include results for:
 1. Soil pH and conductivity.
 2. Soluble salts.
 3. Excess carbonate.
 4. Organic matter.
 5. Nutrient readings for:
 - a. Nitrogen, Phosphorus, Potassium.
 - b. Magnesium, Calcium, Sodium, Manganese, Sulfur, Zinc, Copper, Iron, Boron.
 6. CEC.
 7. Percent Base Saturation Sodium.
- C. The topsoil must fall within the following parameters based on the results:

SOIL CHARACTERISTIC TESTED	UNIT	PERMISSIBLE RANGE
Organic Matter (OM)	OM mass/sample mass	> 3 percent
pH		6.0 - 7.0
Electrical Conductivity (EC)	mmhos/cm = dS/m	< 2.0
SAR (Sodium Adsorption Ratio)		< 5.0
K (Potassium)	CEC percent	2 – 15 percent
Mg (Magnesium)	CEC percent	10 – 30 percent

SOIL CHARACTERISTIC TESTED	UNIT	PERMISSIBLE RANGE
Ca (Calcium)	CEC percent	55 – 85 percent
Na (Sodium)	CEC percent	< 10 percent
H (Hydrogen)	CEC percent	< 10 percent

PART 2 - PRODUCTS

2.1 INORGANIC SOIL AMENDMENTS

- A. Lime: Agricultural ground limestone of approved agricultural dolomite material containing a minimum of 85 percent calcium or magnesium carbonates. Limestone shall be ground to such fineness that 50 percent will pass through a 100-mesh-sieve and 95 percent will pass through a 20-mesh-sieve.

2.2 FERTILIZERS

- A. Superphosphate: finely ground phosphate rock as commonly used for agricultural purposes containing not less than 18 percent available phosphoric acid.
- B. Fertilizer: fertilizer consisting of 50 percent by weight of nitrogen derived from natural organic sources.

PART 3 - EXECUTION

3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.
- B. Fertilizer and lime shall be spread and incorporated as per soil test recommendations after the topsoil is spread but prior to final grading.
- C. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.
- D. Proceed with placement only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF UNAMENDED, ONSITE SOIL BEFORE AMENDING

- A. Screening: Pass unamended soil through a 1-inch sieve to remove large materials.

3.3 PLACING TOPSOIL OVER EXPOSED SUBGRADE

- A. Topsoil shall be placed in all areas to be seeded at a minimum depth as specified herein.
- B. General: Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- C. Subgrade Preparation: The subgrade shall be harrowed, raked, tilled or otherwise loosened to a minimum depth of 4 inches. Remove stones, rubbish, sticks, and roots larger than 2-inches in any dimension. Large stones and boulders shall be removed. Subgrade shall be inspected and approved by the Engineer before topsoil is placed.
- D. Topsoil shall be placed over all disturbed areas of limits of work, so that after natural settlement and light rolling it will conform smoothly to the lines, grades, and elevations shown on the Drawings. Do not spread if soil or subgrade is frozen, muddy, or excessively wet. Topsoil shall not be handled or moved when in a wet or frozen condition.
 - 1. Amendments: Soil additives shall be installed as specified.
- E. After topsoil has been spread, it shall be carefully prepared by scarifying or harrowing and hand raking. All large stiff clods, lumps, brush, roots, stumps, litter and other foreign material equal to or greater than 1-inch or larger in any dimension shall be raked up from the topsoil areas and removed from the premises by Contractor. The areas shall also be free of smaller stones, in excessive quantities, as determined by Engineer. The whole surface shall then be raked to a smooth, uniform surface. Finished grading work shall not be done during unsuitable weather. All depressions caused by settlement shall be filled with additional topsoil and the surface shall be regraded and raked until a smooth and even finished grade is created.
- F. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- G. Resupplying of topsoil to eroded or settled areas to finish grade shall be the responsibility of Contractor.

END OF SECTION 329113

SECTION 329300 - PLANTINGS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. Work Included in this section: Furnish all materials, equipment, protection maintenance, guarantee, and replacement of plants, coordination with other trades, and related items required to complete the work indicated on Drawings and as specified, including but not limited to:
 - a. Soil preparation and fertilizing.
 - b. Topsoil spreading.
 - c. Placement of prepared planting media including additives.
 - d. Planting.
 - e. Fertilizing.
 - f. Seeding, mulching and watering.
 - g. Sodding for fescue.
 - h. Maintenance.
 - i. Extended service.
 - j. Warranty.

1.2 REFERENCES

- A. Industry Standards: Some products and execution are specified in this Section by reference to published Specifications or standards of the following (with respective abbreviations used):
 1. North Carolina Department of Transportation (NCDOT).
 2. The American Society for Testing and Materials (ASTM).
 3. Association of Official Agricultural Chemists (AOAC).
 4. American Association of Nurserymen (AAN).
 5. U.S. Department of Agriculture (USDA).
 6. N.C. Department of Agriculture (NCDA).

1.3 QUALITY ASSURANCE

- A. Topsoil spreading and sodding work to be performed by firms specializing in this type of work. Provide sod from a reputable grower with at least 3 years of experience in turfgrass production. Sod shall be Certified or approved equal. Certification tag must accompany sod.
- B. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.4 SUBMITTALS

- A. Guarantees: Submit guarantee in writing (in duplicate) stating terms of guarantee, name of installer, name of Owner, name of project, location, and date.
- B. Topsoil Tests: pH, percentage of organic content, and recommendations on additives required to establish satisfactory pH for planting. Soil samples shall be taken with no less than 15 cores per acre.
- C. Project Schedule: Prior to 14 calendar days of beginning landscaping work as defined herein, submit a proposed time schedule indicating estimated dates for beginning and completing the following operations:
 - 1. Delivery of materials.
 - 2. Preparation of seedbeds and planting beds.
 - 3. Seeding.
 - 4. Planting.
 - 5. Clean-up and completion.
- D. Materials: Manufacturer's names and data relating to planting media, fertilizers, soil, and additive shall be submitted for approval.
- E. Certificates of Inspection: Contractor shall be responsible for all certificates of inspection of plant materials that may be required by federal, state, or other authorities to accompany shipments of plants. Contractor may request an inspection of plant materials by Owner's representative or his authorized agent to confirm quality, size, and variety of plant materials prior to installation. This preliminary inspection shall not in any way impair the right of rejection for failure to meet other requirements during the progress of work.
- F. Subcontractors: All subcontractors must be approved in writing by Owner's representative prior to the execution of any Contract.
- G. Maintenance Schedule: Submit to Owner, with copy to Owner's representative, typewritten instructions outlining procedures to be established by Contractor for maintenance of landscape work during the guarantee period. Submit prior to Final Acceptance.
 - 1. Provide a uniform stand of grass by watering, mowing, and maintaining lawn areas until final acceptance. Re-sod areas with specified materials which fail to provide a uniform stand of grass until all affected areas are accepted.

1.5 REGULATORY REQUIREMENTS

- A. Materials to comply with requirements of the North Carolina Fertilizer Law, the North Carolina Lime Law and the North Carolina Seed Law, as applicable, and the rules and regulations adopted by the North Carolina Department of Agriculture in accordance with the provisions of these laws.

1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Delivery of Materials:

1. Deliver each type of plant as the Work progresses, after preparations for planting that specific type of plant is completed, and when plants will be planted immediately upon arrival at the site. Do not stockpile plants onsite.
2. Deliver packaged materials in original, unopened containers, legibly showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery. Provide protective covering.
3. Do not drop plants during delivery.
4. Immediately remove unacceptable material from the site.

B. Storage of Materials:

1. If planting is delayed more than six hours after delivery, set plants in shade, protect from weather and mechanical damage, and keep roots moist.
2. Set balled stock on ground and cover ball with soil, moistened peat moss or other acceptable material.
3. Heel-in bare root plants in a bed containing adequate peat moss to keep roots in a moist condition. Soak roots in water for two hours before planting.
4. Store and cover materials to prevent deterioration. Remove packaged materials that have become wet, or show deterioration or water marks, from site.

C. Handling of Materials:

1. Handle balled and burlapped plants so that the ball will not be loosened or broken. Immediately remove split, broken or loosened balled and burlapped material from the site and replace with new material.
2. Do not remove container-grown plants from containers until planting time.
3. Do not lift or drag plants by stems or trunks. Handle plants by lifting root ball or container.
4. Water as necessary to maintain plant root systems in a moist condition.

1.7 EXTENDED SERVICE

A. Extended Landscape Service:

1. Begin extended service immediately after each planted area is acceptably completed. Provide extended service for not less than the following periods:
 - a. Trees and Shrubs: 90 days after trees and shrub plantings are acceptably completed.
 - b. Vines and Ground Cover Plants: 90 days after vines and ground cover plantings are acceptably completed.
2. Prune, cultivate, water, weed, fertilize, shade, mist, restore planting saucers, tighten and repair stakes and guy supports, and reset plantings to proper grades or vertical position, as required to establish healthy, viable plantings.
 - a. Do not allow plantings to wilt or show other signs of environmental stress. Visit the site twice a week during the extended service periods, to inspect the condition of the plantings and immediately provide required care.

- b. Contractor shall provide landscape installer who shall be available on-call if notified between regular visits that plants require critical care or maintenance, throughout the time of extended service periods.
 - 3. Check and observe plantings for signs of insect and disease attack. Take corrective measures immediately upon notice of such attack. Control damaging insects and diseases, as specified.
 - 4. Restore or replace damaged tree wrappings.
 - 5. Remove dead plants immediately. Replace immediately, unless required to plant in the succeeding planting season.
- B. Provide sufficient water to ensure that the top six inches of the planting bed mix remains moist at all times.
- 1. Apply water using a 1-inch diameter hose with an attached metering gauge.
 - 2. For trees in seeded areas or mulched beds, apply water to the ground surface directly under the canopy. Apply water at a sufficiently slow rate to prevent water run-off from the soil surface but great enough to provide 0.2-inches of water per square foot of canopy area per hour for five hours each week.
- C. Any decline in the condition of plants shall require Contractor to take immediate action to identify potential problems and undertake corrective measures. If required, engage professional arborists or horticulturists to inspect plants, identify problems and recommend correctives procedures. Advise Engineer of all such actions and submit inspection and recommendation reports.

1.8 WARRANTY

- A. Warranty: After acceptance by Owner on the day of Substantial Completion, all plants shall be warranted for a minimum of twelve months. Plantings shall be alive and in satisfactory growth at the end of the warranty period.
- B. Call for Final Inspection: At the end of the guaranty period, inspection will be made by Owner's representative upon written notice requesting such inspection submitted by Contractor at least ten days before the anticipated date.
- C. Replacements: Any plant required under this Contract that is dead or not in satisfactory growth as determined by Owner's representative, shall be removed from the site; these and any plants missing due to Contractor's negligence shall be replaced as soon as conditions permit, but during the normal planting season. In case of any questions regarding the condition and satisfactory establishment of a rejected plant, Contractor may elect to allow such plant to remain through another complete growing season at which time the rejected plant, if found dead, in an unhealthy or badly impaired condition, shall be replaced.
- D. Materials and Operations: All replacements shall be plants of the same kind as originally planted and shall be of size equal to that attained by adjacent plants of the same kind at the time replacement is made. Replacement costs shall be borne by Contractor.

PART 2 MATERIALS

2.1 MATERIALS

- A. Fertilizer: Shall be commercial slow-release fertilizer delivered to the site in unopened original containers each bearing the manufacturer's guaranteed analysis. Any fertilizer which becomes caked or otherwise damaged shall not be accepted. Slow-release fertilizer shall contain a 10-10-10 ratio of nitrogen, phosphate, and potash.
- B. Lime: Lime shall be ground dolomitic limestone containing not less than 85 percent of total carbonates and shall be ground to such fineness that 50 percent will pass through a 100-mesh sieve and 90 percent will pass through a 20-mesh sieve. Coarser material will be acceptable, provided the specified rates of application are increased proportionately on the basis of quantities passing through the 100-mesh sieve. All lime must meet NCDA requirements.
- C. Mulches: After plants are installed a layer of pine straw, to be obtained from Loblolly or other native long leaf pine varieties, shall be placed on all mulched areas. Pine straw shall be delivered to the site in bales free of weeds or debris, showing no visible signs of advanced decay, and in no case shall have been baled longer than twelve months.
- D. Decomposed Organic Matter: Provide any kind of sawdust or ground (milled) bark that is non-toxic to plants, of uniform texture and subject to slow decomposition when mixed with soil. Provide untreated and mix at site with not less than five lbs. of ammonium sulfate per cubic foot of loose sawdust or ground bark. Sawdust must be well-rotted. Acceptable peat moss for use as organic matter shall be a domestic product consisting of partially decomposed vegetable matter of natural occurrence. It shall be brown, clean, low in content of woody and mineral material, mildly acid, and granulated or shredded.
- E. Water: Water used in this work shall be furnished by Owner unless otherwise noted. Hose and other watering equipment as required for the work shall be furnished by Contractor.
- F. Topsoil: Topsoil furnished shall be a natural, fertile, friable soil, possessing characteristics of representative productive soils in the vicinity. Topsoil shall be without admixture or subsoil and shall be cleaned and reasonably free from clay lumps, stone, stumps, roots, or similar substances two inches or more in diameter, debris, or other objects which might be a hindrance to planting operations.
- G. Plant Materials:
 - 1. Plant List: A list of plants is shown on Drawings.
 - 2. Nomenclature: The names of plants required under this Contract conform to those generally accepted in the nursery trade.
 - 3. Quantities: Quantities necessary to complete the plantings as shown and located on the Drawings shall be furnished by Contractor.
 - 4. Quality and Size: Plants shall have a habit of growth that is normal for the species and shall be sound, healthy, vigorous, and free from insect pests, plant diseases, and injuries. All plants shall equal or exceed the measurements specified in the Plant List, which are

minimum acceptable sizes. Plants shall be measured before pruning, with branches in normal position. Any necessary pruning shall be done at time of planting. Requirements for the measurements, branching, grading, quality, balling and burlapping of plants in the Plant List generally follow the code of standards currently recommended by the American Association of Nurserymen, Inc., in the American Standard for Nursery Stock, latest edition.

5. All plants shall be uniform within each bed or grouping.
6. Substitutions will be permitted only upon submission of proof that any plant as specified is not obtainable during the schedule planting season, within 200 statute miles of the project location. Proof of the unavailability of a plant must contain as a minimum, a list of ten nurseries within 200 miles that have been checked by Contractor for plant material in question. Written authorization of Owner's representative will be required for any substitution.
7. Plants not in pots shall be balled and burlapped. They shall be dug with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Balls shall be firmly wrapped with burlap or similar material and bound with twine, cord, or wire mesh. Where necessary to prevent breaking or cracking of the ball during the process of planting, the ball may be secured to a platform. Ball must be kept moist and shaded until it is planted.
8. Plants stored on the site must be watered thoroughly at least once every 48 hours.
9. The root zone of all plants not yet installed must be protected from freezing, drying, and direct sunlight.

2.2 SOD

- A. Sod shall match existing onsite turf species.
- B. Sod shall be fresh cut, delivered and installed within 48 hours, and consist of live, growing plants secured from sources where the soil is fertile and shall have a healthy, virile root system or dense, thickly matted roots throughout the soil of the sod for a minimum of one inch. Sod shall be free from noxious weeds or other grasses and shall not contain any matter deleterious to growth or which might affect its subsistence or hardiness when transplanted. Only sod secured from approved sources shall be used.
- C. Certified Turfgrass 100 percent Confederate Grand Turf Type or approved equal.
 1. Tall Fescue Seed Blend.

2.3 FERTILIZER

- A. Soil sample shall be taken with no less than 15 cores per acre.
 1. Fescue: The premium starter fertilizer shall be a 12-24-14 analysis Elite grade product, containing monoammonium phosphate as the phosphate source with a minimum of 50 percent of the total nitrogen, 12 percent derived from Poly Plus sulfur coated urea, and a minimum of 24 percent from monoammonium phosphate.

- B. Fertilizer will be delivered to the site in bags or other convenient containers, each fully labeled, conforming to applicable State fertilizer laws, and bearing the name, trade name, or trademark and warranty of the producer.

2.4 TOPSOIL

- A. Furnish from stockpiled onsite material. If an insufficient quantity exists, furnish from offsite sources in quantities sufficient to complete the requirements as specified.
- B. Natural, friable, fertile soil, characteristics of productive soil in the vicinity, reasonably free of stones, clay lumps, roots and other foreign matter. Acidity between 6.0-6.8 pH as determined by tests (to be performed by Contractor and submitted for approval). Amend as necessary to adjust pH to acceptable levels. Organic content 6 percent by weight. Amend as necessary to adjust pH nutrients and organic content to acceptable levels, or as required by soil tests.
- C. Proposed topsoil material shall be subject to approval.

2.5 SEED MIXTURE, EXCEPT FOR WETLAND AREAS

- A. From August 1 through June 1:
 - 1. 120 pounds per acre Ky.31 Tall Fescue or Fescue.
 - 2. 500 pounds per acre Fertilizer.
 - 3. 4,000 pounds per acre Limestone.
- B. From May 1 through September 1:
 - 1. 120 pounds per acre Ky.31 Tall Fescue or Fescue.
 - 2. 50 pounds per acre Kobe or Korean Lespedeza.
 - 3. 500 pounds per acre Fertilizer.
 - 4. 4,000 pounds per acre Limestone.
- C. Seed: 98 percent pure; 85 percent germination; contain no noxious weeds.
- D. Between May 1 and August 15, add 15 pounds per acre Sudon Grass or 10 pounds per acre German Millet.
- E. Before May 1 or after August 15, add 40 pounds per acre Rye (Grain).
- F. If certain disturbed lawns are of better quality than the specified seed will produce, as determined by Engineer, furnish seed for such specific lawns that will produce a lawn of equal quality. Extra cost for the better-quality seed will be the actual invoice price differential between the seeds.

2.6 SEED FOR WETLAND AREAS

- A. Apply type from following species list at a rate of 350 pounds per acre:

Aug. 20th – Oct. 31st May 1st – June 30th April 25th – June 30th Feb 1st – March 30th

Annual Rye Grass,
Rye, Wheat, Oats,
or Barley

Millet

Sorghum

Annual Lespedeza

2.7 MULCHING MATERIALS FOR SEEDING

A. Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry; anchor in place.

1. Mulch Anchoring: Fiber mulch or commercially synthetic binder (non-asphaltic).

2.8 FERTILIZER FOR SEEDING

A. Liquid or dry; recommended for grass, with 50 percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil to the following proportions:

1. Nitrogen: 10 percent.
2. Phosphoric Acid: 10 percent.
3. Soluble Potash: 10 percent.

2.9 WATER FOR SEEDING

A. Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

- A. Experience: Employ only experienced personnel who are familiar with the required work. Provide adequate supervision by a qualified foreman.
- B. Planting Time: Plant or install materials only during normal planting seasons for each type of landscape work required. Correlate planting with specified maintenance periods to provide maintenance until acceptance by Owner.
- C. Subgrade Elevations: Excavation, filling, and grading required to establish elevations shown on Drawings are specified under other Sections of these Specifications. Prior to beginning work the Landscape Contractor shall verify subgrade elevations and notify General Contractor and Owner's representative in writing of any discrepancies.
- D. Obstructions Below Ground or Overhead: It is not contemplated that planting shall occur where the depth of soil over underground construction or rock is insufficient to accommodate the roots. If such conditions are encountered in excavation of planting areas and where the stone, boulders, or other obstruction cannot be broken and removed by hand methods in the course of digging

plant pits of the usual size, Owner's representative shall be notified. Removal of rock or other underground obstructions, and relocation of construction, shall be done only as directed by Owner's representative, after approval by Owner.

3.2 EXAMINATION

- A. Examine substrate surfaces to receive Work of this Section. Do not proceed until satisfactory conditions have been corrected in a manner complying with Contract Documents and acceptable to the installer. Starting of work within a particular area will be construed as installer's acceptance of surface conditions.

3.3 PREPARATION OF PLANTING BEDS AND PLANTING SOIL MIX

- A. General: Preparation shall not start until after all other site and utilities work has been completed and approved by Owner's representative within the areas to be seeded or planted.
- B. Plant Bed Preparation:
 - 1. Approximately one week prior to beginning planting in the beds, plant beds should be watered to germinate any weed seed. One to two days later, spray plant beds with "Round-Up" or other approved systemic weed killer, applied at the manufacturer's recommended rate of dilution and coverage.
 - 2. At the time of planting, thoroughly till plant beds to a minimum depth of six inches. Add to this broken subsoil a sufficient amount of decomposed organic matter sufficient to raise the organic content to 5 percent by volume and the following additives:
 - a. Lime: 100 lbs./1000 sq. ft.
 - b. Fertilizer: 25 lbs. of Formula 10-10-10/1000 sq. ft.
 - 3. Adjust rates of lime and fertilizer based on laboratory soil tests.
- C. Mix the following soil additives to topsoil stored onsite or approved subsoil for planting soil mix:
 - 1. Decomposed organic matter: Use sufficient amount to raise the organic content to 5 percent minimum by volume.
 - 2. Use 0.1 pound/cu. ft., 10-10-10 slow release fertilizer.
 - 3. Use 0.4 pounds/cu. ft. dolomitic lime meeting North Carolina Department of Agriculture standards for fineness and purity.
 - 4. Circular pits shall be excavated for all trees and shrubs. Diameter of pits for trees shall be at least two feet greater than the diameter of the ball or spread of roots. The depth of pits for trees shall be enough to accommodate the ball of roots when the plant is set to finished grade allowing 3 inches of prepared planting soil mix in the bottom of the pit. Use planting soil mix as shown in planting details on Drawings.
 - 5. Prior to beginning work Contractor shall obtain a laboratory soils analysis. Soil additives shall be adjusted to conform with the results of this test.

3.4 FINISH GRADING

- A. Spreading Topsoil: Topsoil may be spread at the option of Contractor at any time that will not cause a disruption of other construction or site improvement operations, provided that it is thoroughly loosened to its full depth, and brought to a friable, mellow condition immediately prior to the start of planting operations. Topsoil shall measure 6-inches in depth after compaction over the entire area of the site designated to receive planting. Topsoil shall be spread over all areas that have been disturbed in any manner during construction or other site improvement operations. Do not place topsoil until the previously established subgrade has been approved. Use equipment and conduct all finish grading operations in such a manner as to avoid the lifting of subsoil or other unsuitable material. Do not place topsoil until the entire area to be covered has been shaped, trimmed, and cleaned up, and all construction or site improvement work in the area has been completed.
- B. Finished Grades: Shall be understood to be final spot grades and contours indicated on the contract Drawings. Where final spot grades or new contours are not indicated, finished grades shall be uniformly level or sloping between points for which elevations are given or contours are shown.
- C. Tops and bottoms of all slopes: Round tops and bottoms of slopes and drainage swales. Adjust and warp slopes, at intersections of cuts and fills, to flow into each other or into the existing natural ground surface without noticeable break. Cuts and fills shall have a maximum slope of 3 feet horizontally to 1 foot vertically, unless otherwise shown on Contract Drawings. The finished surface of all lawn areas after planting shall not be less than 1/4 inch below or more than 3/4 inch below the finished grade of all walks or other surface areas.
- D. Fine Grading Lawn Areas: Bring the grade of areas to receive turf to a uniform, level slope, as determined by the use of surveying instruments, by discing, harrowing and other approved methods. When establishing finish grades, remove and dispose of all clods, hard lumps, rocks, roots, litter, and other foreign matter not passing through the teeth of a hand iron rake. Tractor drawn raking equipment that compacts lawn areas will not be allowed. Where lawns are intended to drain across pavements, the uphill grade shall be flush with the pavement; the downhill grade shall be 1/2 inch to 3/4 inch below the pavement grade.
- E. Settlement: Maintain ground surfaces to the finish grades shown on the contract Drawings, and deposit whatever additional topsoil that may be required to correct any settlement or erosion that occurs prior to the date of Final Acceptance. The surface upon which additional topsoil is to be deposited shall be raked or otherwise satisfactorily prepared to ensure a proper bond. Fill hollows that develop from settling, to the finished elevations, with approved topsoil. Finished lawn areas shall be sufficiently high to meet all paved areas and catch basins after settlement.

3.5 FERTILIZING AND SODDING

- A. Examine finish surfaces, grades, topsoil quality and depth. Do not start sodding work until satisfactory conditions are corrected.
- B. Preparation:
 - 1. Limit preparation to areas which will be immediately sodded.

2. Loosen topsoil of lawn areas to minimum depth of 4 inches. Remove stones over 1-inch in any dimension, and stick, roots, rubbish and extraneous matter.
3. Grade lawn areas to smooth, free draining and even surface with a loose, uniformly fine texture. Roll and rake, removing ridges and fill depressions as required to drain.
4. Apply fertilizer by mechanical rotary or drop type distributor, thoroughly, and evenly, incorporated into the soil to a depth of 3 inches by discing or other approved methods. Fertilize areas inaccessible to power equipment with hand tools and incorporate into soil. Apply fertilizer to sod as below:
 - a. Fescue: 100 lbs/acre.
5. Dampen dry soil prior to sodding.
6. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to sodding.

C. Installation:

1. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips. Do not overlay edges. Stagger strips to offset joints in adjacent courses. Remove excess smothering of adjacent grass. Provide sod pad top flush with adjacent curbs, sidewalks, drains, and seeded areas.
2. All sodded areas shall be knotted neatly and firmly together allowing no spaces, gaps, voids, or depressions within sodded areas.
3. Do not lay dormant sod or install sod on saturated or frozen soil. Contractor shall not use sod from areas where the roots have dried because of exposure to air and sun, or from where grass has thinned from these or other reasons.
4. Install initial row of sod in a straight line, beginning at bottom of slopes, perpendicular to direction of the sloped area. Place subsequent rows parallel to and lightly against previously installed row.
5. Water sod thoroughly, with a fine spray, immediately after laying, and supply Owner with watering guide.
6. Roll with light lawn roller to ensure contact with subgrade.
7. When laid on surfaces of slopes which may cause sod to slide due to the height and slope of the surface or due to the nature of the soil, sod shall be stabilized by a method acceptable to Owner to ensure proper binding and to prevent slippage. Anchoring is best achieved by using wooden pegs to anchor the sod to the slope. To avoid interference with the future mowing operations, pegs shall be driven beneath the mower cutting height. Curvilinear shapes and forms shall be cut and trimmed with a sharp cutting tool to assure proper shapes and forms.

3.6 MAINTENANCE OF SODDED AREAS

- A. Maintenance of sodded lawns shall include watering, spot weeding, mowing, application of herbicides, fungicides, insecticides according to fescue maintenance calendar and resodding until a full, uniform stand of grass, free of weeds, undesirable gross species, disease and insects until a well rooted and healthy lawn is achieved and accepted.

- B. Water sod thoroughly as required to establish proper rooting. Use sound, established sod watering practices.

3.7 PLANTING

- A. Planting Season: The normal planting season should be considered as October 1 through April 15.
- B. After notification to proceed, planting operations shall be conducted under favorable weather conditions during the normal planting season. At the option of and on the full responsibility of the Contractor, planting operations may be conducted during unseasonable conditions without additional compensation.
- C. Layout: New planting shall be located where shown on Drawings except where obstructions below ground or overhead are encountered or where changes have been made in the construction. Necessary adjustments shall be approved by Owner's representative.
- D. Pruning: Remove dead and broken branches from all plant material. Prune bare root deciduous trees and shrubs to reduce total amount of anticipated foliage by 1/4 to 1/3. Prune only to retain typical growth habit of individual plants. Make all cuts in accordance with current horticultural methods. "Head-back" cuts at right angles to line of growth will not be permitted. Trees shall not be poled or topped. Remove trimmings from the site. Paint all cuts 1/2 inch in diameter and larger with waterproof antiseptic tree paint. Plants must meet minimum size requirements after pruning.
- E. Drainage: Contractor shall be responsible for adequate drainage from all plants. If during the planting operations, Contractor determines that conditions are such that drain lines or other drainage measures are necessary, he shall install such measures as is required.
- F. Setting Plants: Unless otherwise indicated on Drawings all plants shall be planted in prepared soil beds and set on compacted prepared soil mix to such depth that the finished grade level of the plant after settlement will be the same as that at which the plant was grown. They shall be planted upright and faced to give the best appearance of relationship to adjacent structures. No burlap shall be pulled from under the balls. Roots on bare root plants shall be spread in their normal position. All broken or frayed roots shall be cut off cleanly. Topsoil or prepared soil shall be placed and compacted carefully to avoid injury to roots and to fill all voids. Add water and tamp the backfill until the backfill is completely saturated, then allow it to soak away. Fill the hole to finished grade and form a shallow saucer around each plant by placing a ridge of topsoil around the edge of each pit. After the ground settles, additional soil shall be filled in to the level of the finished grade.
- G. Guying Trees: Place guys not less than 1/3 height of tree above ground. Place anchors so that guys are equally spaced and at 45-degree angle to horizon. Keep guys taut but not overly tight until the end of the guarantee period. Guys are to be removed at that time by this Contractor.
- H. Wrapping Trees: After completing guying operations, spirally wrap all deciduous tree trunks with strip burlap or approved treated paper with at least one inch overlap. Wrap is to be removed at the end of the guarantee period by this Contractor.

3.8 MULCHING AND PROTECTION

- A. All plant saucers and plant beds shall be thoroughly mulched as specified within 2 days of planting.

3.9 MAINTENANCE

- A. Maintain work of this Section from time of installation until the end of the guarantee period. Maintenance shall include watering of plantings; protection of plantings; weeding, cultivating, and mulching plant beds; and one application of pre-emergent herbicide (Ronstar-G) to all plant beds as per manufacturer's recommendations.
- B. At the end of the guarantee period, all plant beds will be free from weeds and edged neatly to a line as shown on the Drawings. Plant tags of all description shall be removed by Contractor prior to the inspection for final acceptance.

3.10 PREPARATION OF TOPSOIL FOR SEEDING

- A. Prepare topsoil 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, clods, lumps, boulders and stones.
- C. Scarify topsoil to a depth of 2 inches. Repeat cultivation in areas where equipment used for hauling has compacted topsoil.

3.11 FERTILIZING FOR SEEDING

- A. Apply fertilizer after smooth raking of topsoil.
- B. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- C. Mix thoroughly into upper 2 inches of topsoil.
- D. Lightly water to aid the dissipation of fertilizer.

3.12 SEEDING

- A. Mix seed varieties in the presence of a representative of Owner or Engineer.
- B. Apply seed evenly in two intersecting directions. Rake in lightly to cover seed to a depth of 1/4 inch.
- C. Do not seed areas in excess of that which can be mulched on same day.
- D. Do not sow immediately following rain, when ground is too dry, frozen or during windy periods.

3.13 MULCHING FOR SEEDING

- A. Apply mulching materials immediately following seeding.
- B. For all areas, except on slopes 3:1 or greater, apply mulch at a rate of 2 tons per acre for straw when seeding between March 15 and October 15, and at the rate of 3 tons per acre for straw when seeding between October 15 and March 15. Anchor mulch in place. Maintain clear of shrubs and trees.
- C. For slopes 3:1 or greater, provide erosion matting. Comply with manufacturer's instructions for soil type, slope and, where applicable, channel flow; secure with staples.

3.14 WATERING FOR SEEDING

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

3.15 MAINTENANCE FOR SEEDING

- A. Protect and care for seeded areas until grass is a well-established, uniform growth at least 4 inches high.
- B. Water to prevent grass and soil from drying out.
- C. Once established, remove excess mulch and mow grass to a height not less than 1-1/2 inches nor greater than 2-1/2 inches.
- D. Control growth of weeds.
- E. Maintain grass for 2 weeks after initial mowing.
- F. Reseed areas that do not show a prompt catch at intervals of 21 days until a uniform growth is established.
- G. Reseed areas damaged due to acts of neglect by residents or vandalism only at the request and expense of Owner.

3.16 CLEAN-UP AND COMPLETION

- A. Upon completion of work, remove from the site all equipment and other articles used. All excess soil, stones and debris shall be removed and legally disposed of. All work areas shall be left in a clean and neat condition.
- B. All damage to existing construction caused by landscaping operations shall be repaired in accordance with all local codes and approved by authorities having jurisdiction (and to the satisfaction of Owner), at Contractor's expense.

3.17 FINAL ACCEPTANCE

- A. Inspection to determine final acceptance of sodded lawns will be made upon Contractor's written request to Owner. Provide notification at least 10 working days before requesting an inspection.

1. Sodded areas will be acceptable provided all requirements, including maintenance, have been completed and a healthy, uniform, close stand of grass is established, free of weeds, undesirable grass species, disease and insects.
2. No individual lawn areas shall have bare spots or unacceptable cover totaling more than one percent of the individual areas, in areas requested to be inspected.
3. Upon acceptance of the sodding operations, Owner will assume lawn maintenance.

END OF SECTION 329300

SECTION 354231 – IN-STREAM STRUCTURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Boulders.
2. Boulder vanes.
3. Boulder sill.
4. Toe boulder stabilization.
5. Backfill materials:
 - a. Filter fabric.
 - b. Riprap.
 - c. Sedimentation control stone.

B. Related Sections:

1. Section 312500 “Erosion and Sedimentation Controls”.
2. Section 025242 “Temporary Bypass Pumping”.

1.2 REGULATORY REQUIREMENTS

- A. Comply with local, state, and federal regulations regarding erosion control, water quality, and stream disturbance.
- B. All work in streams shall be performed in the dry.
- C. At the close of each workday stabilize stream banks using temporary erosion control measures.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:

1. Boulders:
 - a. Pre-approval by Engineer required of Contractor selected boulders prior to hauling from the rock quarry or other approved boulder site.
 - b. Provide shop drawing submittals listing boulder sizes for approval by Engineer. Note the required minimum and maximum boulder sizes.
2. Backfill materials: Riprap, sedimentation control stone, and filter fabric certifications.
3. Steel anchoring materials.

1.4 INSPECTIONS

- A. Construction verification inspections to be performed by Engineer or other individual trained and experienced in-stream stabilization measures.
- B. Verify that all boulders, stones, seed, geotextile fabric, coir matting, and all required materials are on site prior to beginning construction of in-stream structures.
- C. Verify with Engineer that in-stream structures are at the location and grade indicated on the plans. Engineer and Contractor shall observe all structures during normal stream flow. Contractor shall adjust boulders, rock fill, or any other items as directed by Engineer before structures are accepted as complete.
- D. Erection Tolerances: Maximum Variation from Plans: 0.2 feet vertical, 0.2 feet horizontal.

PART 2 - PRODUCTS

2.1 IMBRICATED STONE

- A. IMBRICATED STONE: Stone shall consist of blasted stone or other stone approved by Engineer. The stone shall be sound, tough, dense, resistant to the action of air and water, and suitable in all other respects for the purpose intended. Boulders shall be shaped with one axis 2-3 times longer than others to resist rolling and shall be individually picked for use as specified in the plans. Boulders shall be relatively flat on either side in the same dimension, preferably the long dimension to enable stacking for construction of vanes. Engineer shall approve the maximum dimension of all boulders. Boulder sizes may vary, based on the boulder available, with the approval of Engineer.
- B. Boulders for vane, sills, and toe boulders:
 - 1. Size: 2 H feet x 3 W feet x 4 L feet; approximately one cubic yard each.

2.2 BACKFILL MATERIALS

- A. Filter fabric: Non-woven geotextile with wire staples; North Carolina Department of Transportation (NCDOT) Section 1056-1, Type 2.
- B. Riprap: Class A; 4-inch nominal stone, minimum 2-inches to maximum 6-inches; NCDOT Section 1042-1.
- C. Sediment control stone: Coarse Aggregate No. 5 or No. 57 washed stone; NCDOT Section 1005-1.
- D. Stream excavations: Well graded mix consisting of either salvaged channel bed material

or furnished channel bed material; 3-inch nominal size, minimum of 0.5-inches to maximum 9-inches.

- E. Select earth backfill: NCDOT Type 2 select material as described in NCDOT Section 1016.

PART 3 - EXECUTION

3.1 GENERAL

- A. **Boulder Sill:** A boulder sill is constructed perpendicular to the channel to hold grade where the swales flow into the stream. Sill footer boulders are placed in the channel bottom for stability. Header boulders are then placed on top of the footer boulders to the elevations shown on Drawings. Header and footer boulders shall be tied securely into the bank to prevent flow diversion around them. The center of the sill shall be slightly lower in elevation than the rest of the sill.
- B. **Boulder Cross Vanes:** A cross vane is primarily used for grade control and stream bank protection. The design shape is roughly that of the letter "U" with the apex located on the upstream side. For these structures, footer boulders are placed in the channel bottom for stability. Header boulders are then placed on top of the footer boulders to the elevations shown on Drawings. Header and footer boulders shall be tied securely into the bank to prevent flow diversion around them. Water flowing downstream is forced over the top of the boulders and towards the middle of the channel from both sides of the structure, effectively scouring out a pool below and between the vane arms. A boulder sill is constructed perpendicular to the channel at the end of each arm to prevent the stream from cutting into the bank around the structure in high flows.
- C. **Boulder J-Hook:** A j-hook is primarily used for grade control and stream bank protection. The design shape is roughly that of the letter "J" with the apex located on the upstream side. For these structures, footer boulders are placed in the channel bottom for stability. Header boulders are then placed on top of the footer boulders to the elevations shown on Drawings. Header and footer boulders shall be tied securely into the bank to prevent flow diversion around them. Water flowing downstream is forced over the top of the boulders and towards the middle of the channel from both sides of the structure, effectively scouring out a pool below and downstream of the vane arm. A boulder sill is constructed perpendicular to the channel at the end of each arm to prevent the stream from cutting into the bank around the structure in high flows.
- D. **Non-woven geotextile fabric** is placed upstream behind and against in-stream structures and covered with stone backfill material to prevent flow from cutting through the gaps between header and footer boulders thus compromising the structure.

3.2 INSTALLATION

- A. Install erosion control measure; follow Section 312500 "Erosion and Sedimentation Controls".

- B. Install in-stream structures under the observation and to the approval of the Engineer.
- C. At the site, header and footer boulders shall be hand-selected from a boulder stockpile supplied by Contractor from the quarry or other approved source.
- D. Rough grade banks to proposed contours. Prepare a trench such that the footer boulders, header boulders and at least 1/3 of the arm boulders are buried beneath the proposed bed and bank surface elevations.
- E. Place boulders using an excavator with a bucket that contains a hydraulic thumb. Place all footer boulders first and prior to any backfilling of the trench, place header boulders on top of footer. Boulders shall be examined by Engineer and adjusted by Contractor to provide the best possible fit. At the apex center portion of the channel, place header boulders such that the top of the header boulder is at an elevation equal to the proposed bed elevation.
- F. Construct in-stream structures such that there are no gaps between the boulders. Hand-place erosion control stone and compact in and around boulders to reduce voids between the footer and header boulders.
- G. Tie header and footer boulder arms at both banks securely into the bank so as to divert water across the top of the header boulders.
- H. Install boulders at the end of each vane arm and perpendicular from the stream bank for a minimum length of 5 feet or across the bank full bench to form a sill as shown on Drawings. Prepare a trench such that the tops of the sill header boulders are below the bank full bench elevation. Rocks less than 24-inches in any dimension or boulders not acceptable for use in other structures may be utilized in construction of the sill and to chink in the gaps between header boulders to the approval of Engineer. Backfill the sill trench with soil after the boulders have been placed.
- I. Place vane or sill boulders to the thickness, width, and length shown on Drawings to form an in-stream structure with a neat, uniform, and even surface and to the approval of Engineer.
- J. Backfill for vane, sill structures, and toe boulders: Place riprap and sedimentation stone backfill materials behind the vanes to reduce sediment loss through the structure (see the Section View for each Vane or Sill Detail). Sedimentation stone placed upstream of the vanes is utilized as sediment barrier to fines that would pass through the vane and possibly compromise the structure and to promote flow over the top of the header boulders.
 - 1. After the vane or sill is constructed, install a trench upstream of the vane. The trench shall extend a minimum of 1.0 foot below the footer boulder and curve upward to create a pocket.
 - 2. Place filter fabric in the trench and wrap fabric over the top of the header boulders. Overlap adjacent geotextiles at least 24 inches in the downhill and downstream direction to prevent flow from lifting the edge of the top geotextile. Place filter fabric in slight tension free of kinks, folds, wrinkles or creases. Use

wire staples or anchor pins as needed to hold filter fabric in place until covered. Do not displace or damage filter fabric while placing backfill riprap and sedimentation stone. Replace any damaged filter fabric to the satisfaction of Engineer.

3. Place riprap on top of the filter fabric to a minimum width of 3 feet and as shown on Drawings. Place stone such that the smaller riprap is uniformly distributed throughout. Install riprap with mechanical methods and if necessary, by hand to form a well-graded, dense and neat layer of riprap. Tamp down to compact riprap to a density comparable to the adjacent undisturbed channel material. Place sedimentation stone directly on top of and upstream of the riprap.
 4. Trim off excess filter fabric at the interface between the header boulders and the backfill material.
 5. For toe boulder, add select earth backfill from top of the boulder to existing bank.
- K. Install stream restoration seeding, plantings, and coir matting; follow Section 329300 "Plantings".

END OF SECTION 354231



Appendix C Draft Erosion and Sedimentation Control Plan

City of Greensboro

Bingham Park Remedial Action plan

Erosion and Sedimentation Control Narrative

Prepared by



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October 2025

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NARRATIVE

PROJECT DESCRIPTION

The purpose of this project is to provide the City of Greensboro a remediation for the Bingham Park including onsite streambank stabilization, the removal of trees and woody vegetation, excavating waste material adjacent to the channel and replacing with clean fill, grading bankfull benches, regrading floodplain slopes and installing bank stabilization measures. The construction of 18-inch thick vegetated soil cover over consolidated and regraded waste area.

The City proposes to relocate the waste to a central portion of the site prior to installing geotextile demarcation fabric and soil cover in Guilford County. The limits of disturbance consists of approximately 15.4 acres. All the necessary approvals will be obtained from the Sate and Army Corps of Engineers for stream crossings and wetland disturbances.

SITE DESCRIPTION

The project site is located primarily on the municipal Bingham Park Property (PIN Nos. 7874545922 and 7874641800) between Bingham Street and South English Street and East of South English Street on property where the W.M. Hampton Elementary School is located (PIN No. 7874647410). The site slopes typically range from 2% to 10%. The project is located in the Cape Fear River Basin within the flood hazard per FEMA FIRM 3710787400J. The receiving waters and river classifications include:

- Unnamed Creek: surface water classification – AE
- Unnamed Creek: surface water classification - AE

ADJACENT PROPERTY

The land use in the vicinity is zoned in residential, planned unit development, and research and technology. Sediment control measures will be taken to prevent damage to White Oak Creek and Utley Creek.

SOILS

The soil in the project area consists of a host of soil according to USDA NRCS Soils Report. The list of soils and more information about the typical profile for each soil type can be found in the Soil report in Appendix A.

PLANNED EROSION AND SEDIMENTATION CONTROL PRACTICES

1. SILT FENCE- PRACTICE 6.62

Silt fence shall be installed and located along the proposed limits of disturbance, around the soil stockpile areas and as directed by the engineer. See City's detail on sheet CD-2 of the drawings.

2. SURFACE STABILIZATION

Surface stabilization will be accomplished with vegetation, mulch, matting, and erosion control stone as indicated on the plans. High performance turf reinforcement matting will be utilized at slopes along streams with appropriate vegetation. See sheet C-9 of the drawings.

3. TEMPORARY CONSTRUCTION ENTRANCE – PRACTICE 6.06

Temporary stabilized construction entrances shall be installed for access to and from the construction site. Wash-down water and runoff from the construction entrances shall be directed to appropriate soil erosion and sediment control measures. See City's detail on sheet CD-2 of drawings.

4. STAGING AND LAYDOWN AREAS

Staging and laydown areas for vehicles, equipment and construction materials, shall be located on stabilized portions of the site. Vehicles and equipment shall be washed down in stabilized areas prior to exiting the site.

5. DUST CONTROL

Should excessive dust be generated; it shall be controlled by sprinkling. A dust control fabric shall be securely attached to all temporary perimeter protection fencing. The material shall be a minimum of five feet in height with a minimum blockage of 50%.

6. DEWATERING

Temporary dewatering practices shall be used to prevent ponding of rainwater or groundwater during construction of excavated area such as launch pits, receiving pits, and other areas where the water table is exposed due to excavation.

7. SUPER SILT CONTROL FENCE

Special sediment control fence shall be installed and located along the proposed limits of disturbance as directed by the engineer. See detail on sheet CD-3.

8. TEMPORARY SEDIMENT TRAPS

A temporary basin formed by an embankment or excavation to collect sediment from construction runoff and allow for sediment to settle out of suspension “trapping” it on site. See detail on sheet CD-3.

9. WATER BARS

An earthen ridge with a shallow channel built at an angle across a disturbed area like a construction path. The ridge helps divert water away from the main path to a stable area/away from specific areas of construction. See detail on sheet CD-2.

CONSTRUCTION SEQUENCE

1. Obtain plan approval and other applicable permits.
2. The contractor shall contact the NCDEQ land quality section, at 336-776-9800, prior to any land disturbance activity, to schedule a pre-construction meeting with representatives from NCDEQ, contractor, engineer, and owner.
3. Flag the work limits and mark items to be protected, such as trees and existing utilities that are to remain.
4. Hold preconstruction conference at least one week prior to starting construction.
5. No major grading activities are to take place during wet weather or periods of predicted wet weather, i.e. hurricanes.
6. Install temporary construction entrances as shown.
7. Install temporary fencing with dust cloth.
8. Limit disturbed areas to section of sewer under construction to the fullest extent possible. Any disturbed areas that are not under construction must be stabilized with permanent or temporary seeding and mulch.
9. Remove trees and other vegetation, as necessary, for the installation of perimeter measures.
10. Install sediment fence and stone outlets as needed.
11. Install heavy equipment mat wetland crossings, water bars and timber bridges as necessary to access work. Mats and bridges are to be utilized to the fullest extent possible to limit disruption to wetlands and streams.
12. Begin sanitary sewer installation only after all erosion control devices are installed and areas downstream of work limits are protected.
13. Existing grade is to be maintained for the site unless otherwise noted on the plans. Within 7 days of completing a section of the project where no further land disturbance is necessary, close out, seed and stabilize area to prevent further erosion. Seed areas according to the seed specifications.

14. Site must be "storm ready" before any extended breaks in construction activities, including weekends.
15. All erosion and sediment control practices will be inspected weekly and after each rainfall event of 1 inch or more. Needed repairs will be made immediately.
16. After site is stabilized, remove all temporary measures, seed and mulch remaining disturbed areas.
17. Notify NCDEQ LQS inspector when project is ready for close out inspection. File for NPDES NCG010000 Enotice of termination when final close out inspection report is received from NCDEQ LQS.

MAINTENANCE PLAN

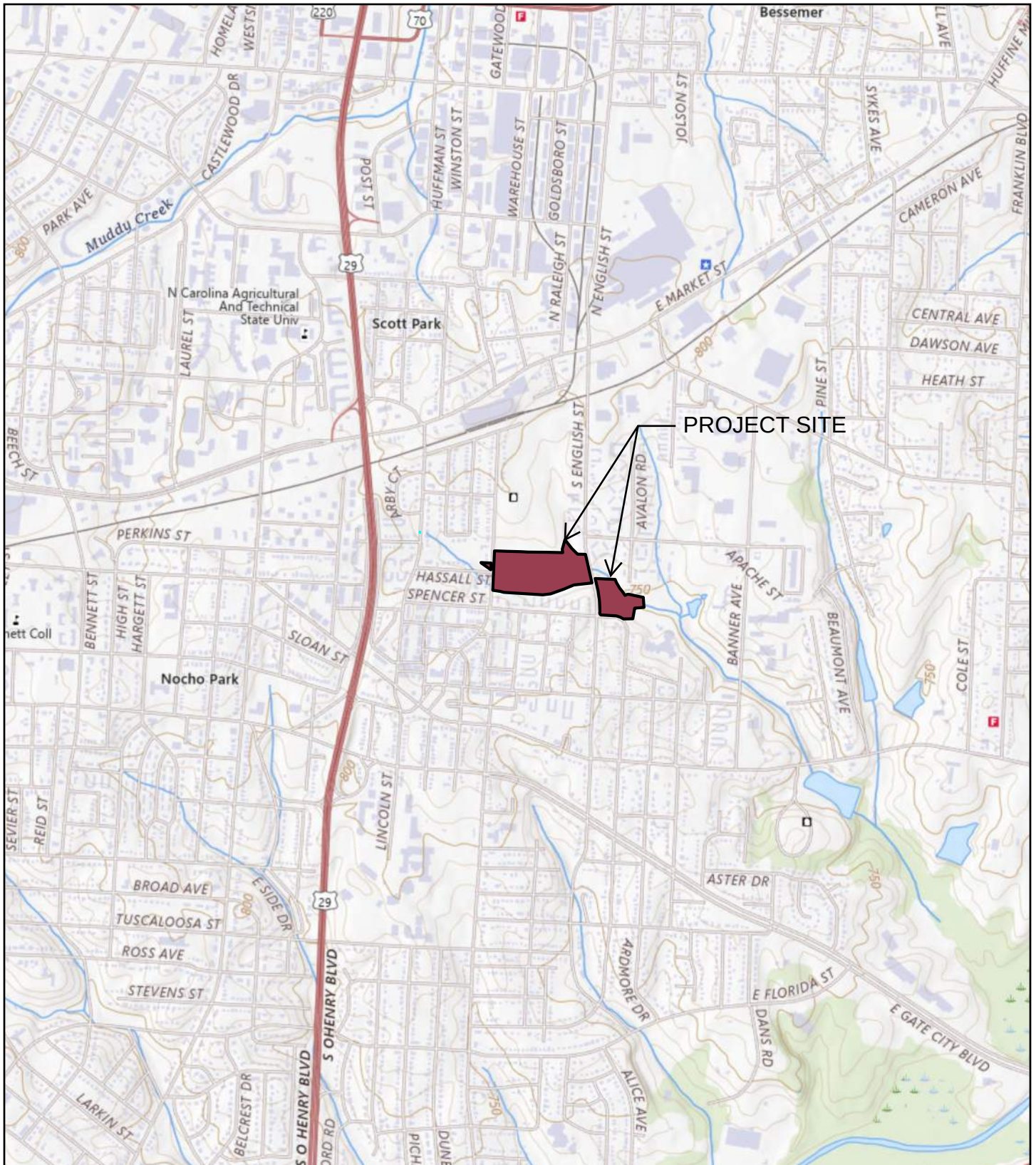
1. Erosion and sediment control measures shall be maintained continually, relocated when and as required and shall be checked after each rainfall event of 1 inch or more. Seeded areas shall be checked regularly and shall be water, fertilized and mulched as required to obtain a dense stand of grass. Any repairs will be made immediately to maintain all practices as designed.
2. All drainage inlets down slope of the construction work area shall protected from siltation. Ineffective protection devices shall be laid in such a way that good contact with the ground is established.
3. Sediment shall be removed from behind the silt fence when it reached 0.5 feet deep at the silt fence. Should the silt fence fabric collapse, tear, decompose or become ineffective. Replace it promptly and remove sediment deposits as necessary to reduce pressure on the fence. Avoid undermining silt fence during clean out.
4. Check stone silt fence outlets for erosion, piping and rock displacement weekly and after each rainfall event of 1 inch or more. Remove sediment deposits, straw, limbs and debris from behind temporary sediment traps and temporary rock silt check as necessary to prevent channel clogging. Add stones as necessary to maintain design height.
5. All impervious dikes shall be constructed from non-erodible materials (e.g. rip rap, sandbags, precast concrete barriers, plastic sheeting, etc.) In accordance with details provided. Damaged materials will be repaired or replaced immediately. Additional materials may be required if undermining or washout of stream banks occurs.
6. Sediment removed for any temporary soil erosion and sediment control measure during regular maintenance shall be removed from site and disposed of in an off-site facility with proper permitting for disposal of said materials.
7. Affected roads shall be cleaned daily or more frequently if otherwise required by the e&sc inspector, engineer, owner, or their representative(s).

8. construction equipment and vehicles within the work area shall be properly maintained and inspected, particularly for identification and repair of vehicles leaking petroleum products that could enter adjacent stormwater drainage facilities.
9. All seeded area shall be fertilized, reseeded, and mulched as necessary to maintain a vigorous, dense vegetative cover, through the one-year warranty period.

APPENDIX

APPENDIX A

USGS TOPOGRAPHIC MAP



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86*6 7RSRJUDSKLF 0DS
*UHHQVERUR 4XDGUDQJOH

86*6 7KH 1DWLRQDO 0DS. 1DWLRQDO %RXQGDULHV 'DWDVHW '(3 (OHDWLRO
3URJUDP *HRJUDSKLF 1DPHV ,QIRUPDWLRQ 6VWHP 1DWLRQDO +IGURJUDSKI
'DWDVHW 1DWLRQDO /DQG &RYHU 'DWDVHW 1DWLRQDO 6WUXFWXUHV 'DWDVHW DQ
1DWLRQDO 7UDQVSRUWDWLRO 'DWDVHW 86*6 *OREDO (FRVWV 86*6 *HQWLV
%XUHD 7,* (5 /LQH GDWD 86)6 5RDG GDWD 1DWXUDO (DUWK 'DWD 86
&RRUGLQDWH 6VWHP, 1\$ 6WDWH 3DQJHUWK &DURLOD),36

APPENDIX B
BINGHAM PARK
CUSTOM SOIL RESOURCE REPORT



United States
Department of
Agriculture

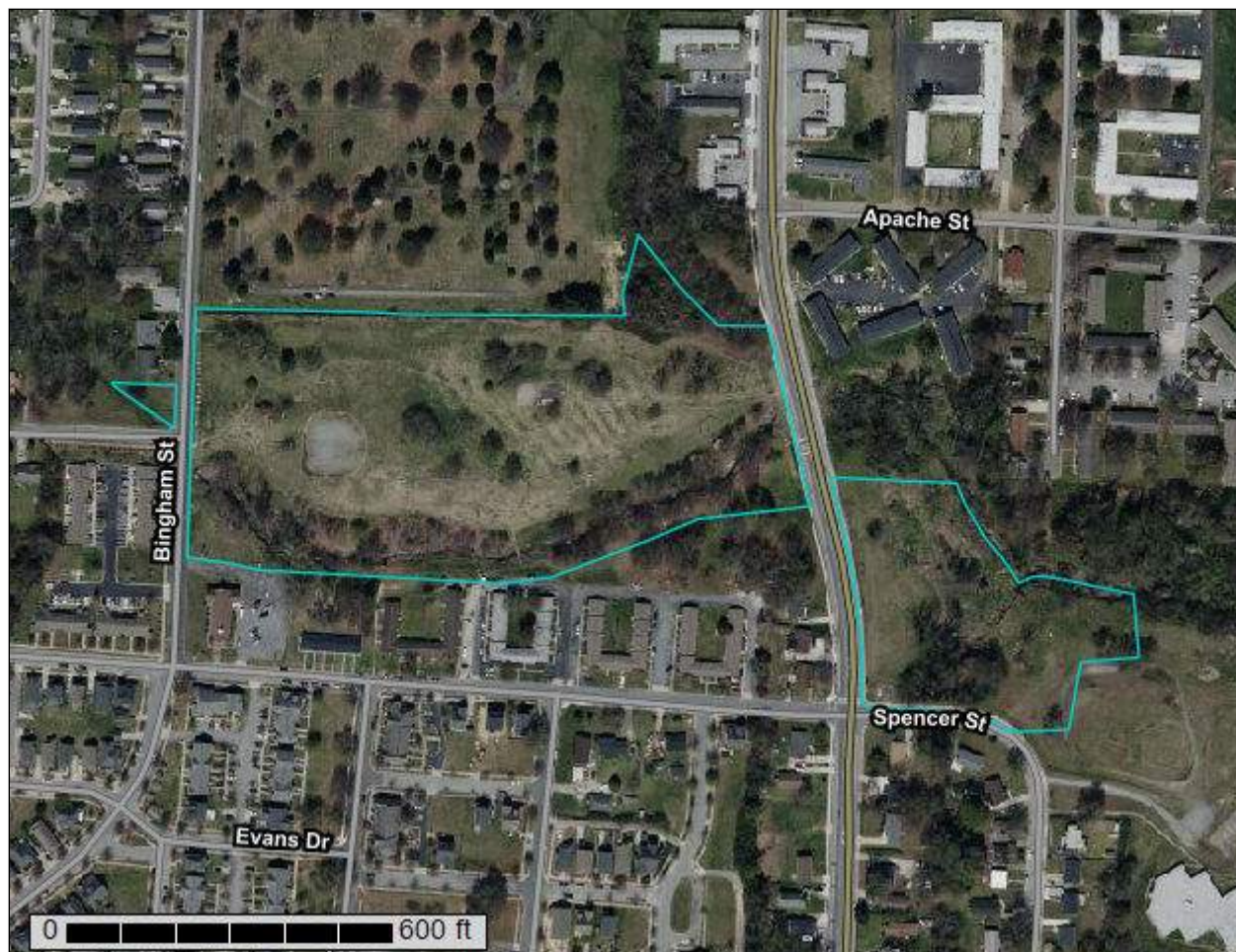
NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for **Guilford County, North Carolina**

Bingham Park



September 9, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

-  Soil Map Unit Polygons
-  Soil Map Unit Lines
-  Soil Map Unit Points

Special Point Features

-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features

Water Features

-  Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

Background

-  Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Guilford County, North Carolina
Survey Area Data: Version 23, Sep 9, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 2, 2022—Jun 18, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EnC	Enon fine sandy loam, 6 to 10 percent slopes	0.0	0.3%
EuB	Enon-Urban land complex, 2 to 10 percent slopes	13.6	88.1%
WhA	Wehadkee loam, 0 to 2 percent slopes, frequently flooded	1.8	11.6%
Totals for Area of Interest		15.5	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Guilford County, North Carolina

EnC—Enon fine sandy loam, 6 to 10 percent slopes

Map Unit Setting

National map unit symbol: 2mnv2

Elevation: 200 to 1,400 feet

Mean annual precipitation: 37 to 60 inches

Mean annual air temperature: 59 to 66 degrees F

Frost-free period: 200 to 240 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Enon and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Enon

Setting

Landform: Hillslopes on ridges

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Convex

Parent material: Saprolite derived from diorite and/or gabbro and/or diabase and/or gneiss

Typical profile

A - 0 to 3 inches: fine sandy loam

E - 3 to 8 inches: fine sandy loam

BE - 8 to 11 inches: sandy clay loam

Bt - 11 to 33 inches: clay

C - 33 to 80 inches: loam

Properties and qualities

Slope: 6 to 10 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C

Ecological site: F136XY720NC - Basic upland forest, moist

Hydric soil rating: No

EuB—Enon-Urban land complex, 2 to 10 percent slopes

Map Unit Setting

National map unit symbol: 3sf1
Elevation: 200 to 1,400 feet
Mean annual precipitation: 37 to 60 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 200 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Enon and similar soils: 50 percent
Urban land: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Enon

Setting

Landform: Hillslopes on ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Saprolite derived from diorite and/or gabbro and/or diabase and/or gneiss

Typical profile

Ap - 0 to 7 inches: fine sandy loam
BA - 7 to 10 inches: sandy clay loam
Bt - 10 to 27 inches: clay
BC - 27 to 33 inches: clay loam
C - 33 to 80 inches: loam

Properties and qualities

Slope: 2 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F136XY720NC - Basic upland forest, moist
Hydric soil rating: No

Description of Urban Land

Setting

Landform: Hillslopes on ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Impervious layers over human transported material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

WhA—Wehadkee loam, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2mns3
Elevation: 200 to 1,400 feet
Mean annual precipitation: 37 to 60 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 200 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Wehadkee, undrained, and similar soils: 85 percent
Wehadkee, drained, and similar soils: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wehadkee, Undrained

Setting

Landform: Depressions on flood plains
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous and metamorphic rock

Typical profile

A - 0 to 8 inches: loam
Bg - 8 to 43 inches: sandy clay loam
Cg - 43 to 80 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Ponded
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 1.98 in/hr)

Custom Soil Resource Report

Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Ecological site: F136XY600NC - Flood plain forest, very wet
Hydric soil rating: Yes

Description of Wehadkee, Drained

Setting

Landform: Depressions on flood plains
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous and metamorphic rock

Typical profile

Ap - 0 to 8 inches: loam
Bg - 8 to 43 inches: sandy clay loam
Cg - 43 to 80 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Ponded
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Ecological site: F136XY600NC - Flood plain forest, very wet
Hydric soil rating: Yes

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Custom Soil Resource Report

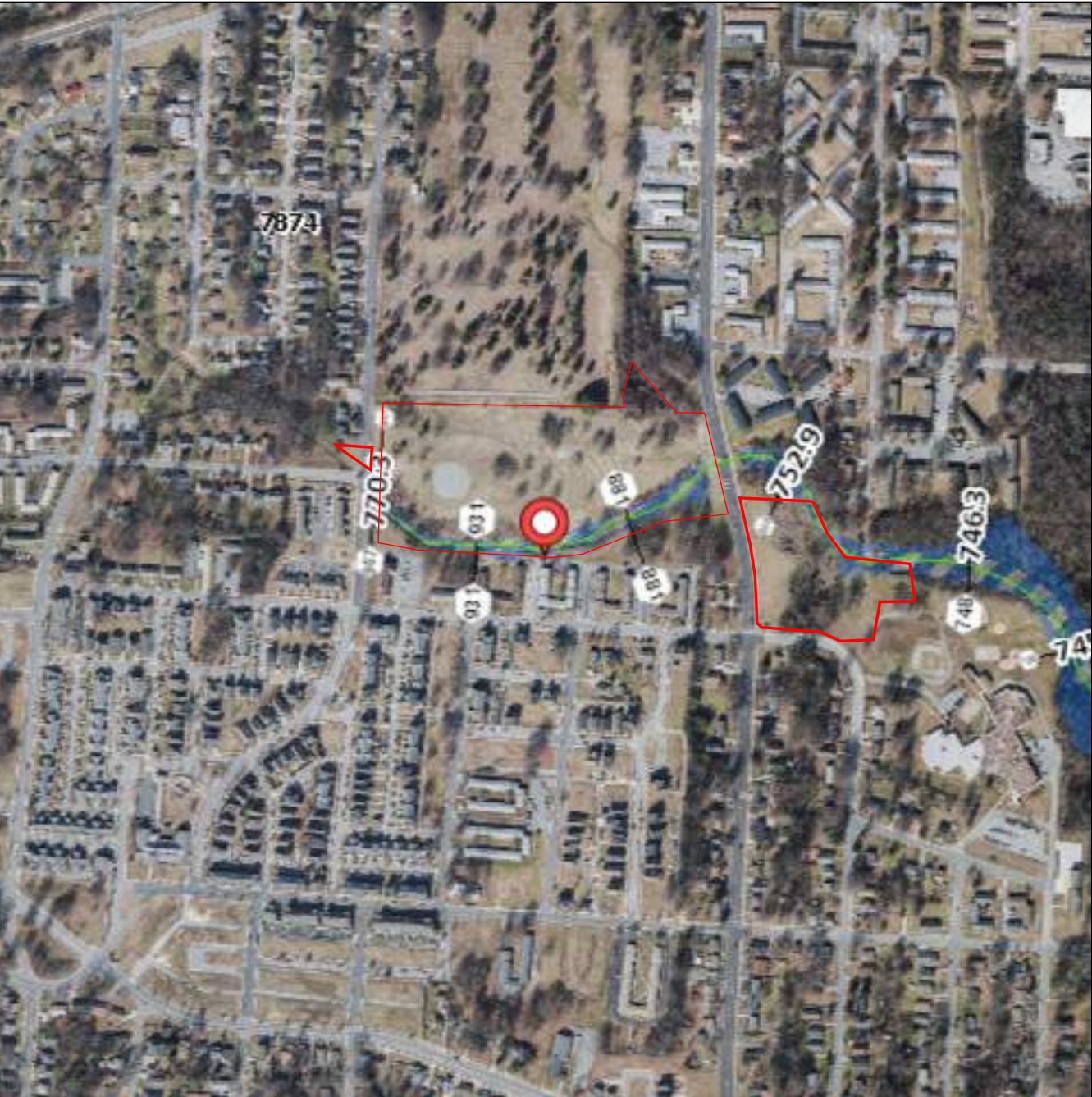
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APPENDIX C

NATIONAL FLOOD HAZARD LAYER FIRMETTE



This is an official copy of a portion of the above referenced flood map. This map incorporates changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at <https://msc.fema.gov>.

Without Base Flood Elevation (BFE)
Zone A, V, A99

With BFE or Depth
Zone AE, AO, AH, VE, AR

Regulatory Floodway

0.2% Annual Chance Flood Hazard

Future Conditions 1% Annual Chance Flood Hazard *Zone X*

Areas Determined to be Outside the 0.2% Annual Chance Flood Hazard
Zone X

Jurisdiction Boundary

FIRM Panel Boundary

North Carolina State Plane Projection Feet (Zone 3200)
 Datum: NAD 1983 (Horizontal), NAVD 1988 (Vertical)

1 inch = 500 feet

1:6000

N

0 125 250 500

Feet

0 25 50 100

Meters

FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

Panel(s): 7874

CONTAINS:

COMMUNITY

CITY OF GREENSBORO

CID

375351

Notice to User: The Map Number(s) shown below should be used when placing map orders; the Community Number(s) shown above should be used on insurance applications for the subject community.

SELECTED PANELS:

MAP NUMBER

3710787400J

EFFECTIVE DATE

06/18/2007



FEMA: National Flood Insurance Program



Page 2 of 2

Panel(s): 7874

CONTAINS:

COMMUNITY	CID
CITY OF GREENSBORO	375351

Notice to User: The Map Number(s) shown below should be used when placing map orders; the Community Number(s) shown above should be used on insurance applications for the subject community.

SELECTED PANELS:

MAP NUMBER	EFFECTIVE DATE
3710787400J	06/18/2007

NOTES TO USERS

This is an official FIRMette of a portion of the effective panels listed in the Title Block shown on Page 1. The information represented on this FIRMette was extracted from the effective digital flood hazard data available at <https://fris.nc.gov>.

Base flood elevation data, floodway, nonencroachment widths, information on certain areas no in the Special Flood Hazard Areas protected by flood control structures, and other pertinent data are available in the Flood Insurance Study (FIS) available at <https://fris.nc.gov>. Users should be aware that flood elevations shown on this FIRMette represent elevations rounded to one tenth of a foot (0.1') and should be utilized in conjunction with data available in the FIS.

NOTES TO USERS

Base map information and geospatial data used to develop this FIRMette were obtained from various organizations, including the participating local community(ies), state and federal agencies, and/or other sources. The primary base for this FIRM is aerial imagery acquired by the State in 2010. Information and geospatial data supplied by the local community(ies) that met FEMA base map specifications were considered the preferred source for development of the base map.

See geospatial metadata for the associated digital FIRMette for additional information about base map preparation. Base map features shown on this FIRMette, such as corporate limits, are based on the most up-to-date data available at the time of publication. Changes in the corporate limits may have occurred since this map was published. Map users should consult the appropriate community official or website to verify current conditions of jurisdictional boundaries and base map features. This map may contain roads that were not considered in the hydraulic analysis of streams where no new hydraulic model was created during the production of this statewide format FIRM.

Flood elevations on this map are referenced to either or both the North American Vertical Datum of 1988 (NAVD 88) or National Geodetic Datum of 1929 (NGVD 29), and are labeled accordingly. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. To obtain current elevation, description, and/or location information for bench marks shown on this map, or for information regarding conversion between NGVD 29 and NAVD 88, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at <https://www.ngs.noaa.gov>.

MORE INFORMATION

Letters of Map Amendment (LOMA)	1-877-336-2627
	https://msc.fema.gov
Letters of Map Revision (LOMR)	919-715-5711
	https://flood.nc.gov
Flood Insurance Availability	
North Carolina Division of Emergency Management (NCDEM)	919-715-5711
	https://flood.nc.gov/ncflood/ncfip.html
National Flood Insurance Program (NFIP)	1-877-638-6620
	https://www.fema.gov/flood-insurance
Questions about this FIRMette	1-877-336-2627
	https://fema.gov

LEGEND

MAP REVISIONS

*This FIRMette includes revisions for the following LOMR

LOMR	DATE
LOMR- S Buffalo Creek Trib 4 GUILFORD 13-04-0966P	05/06/2013

APPENDIX D

ARMY CORPS 404/WATER QUALITY 401
CERTIFICATIONS

APPENDIX E

SPECIFICATIONS

SECTION 312500 – EROSION AND SEDIMENTATION CONTROLS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide and maintain methods, equipment, and temporary construction as required to control environmental conditions at the Site and adjacent areas.
2. Maintain controls until no longer required.
3. Temporary controls include, but are not limited to, the following:
 - a. Erosion and sediment controls.
 - 1) Temporary Sediment Traps
 - 2) Temporary Diversion Ditches
 - 3) Straw Wattle.
 - 4) Temporary seeding and mulching.
 - 5) Temporary construction entrance.
 - 6) Matting.
 - 7) Inlet protection.
 - 8) Temporary silt fence.
 - 9) Stone ditch check.
 - 10) Stone filter outlet.
 - 11) Temporary Soil Stabilizer
4. Noise controls.
5. Dust control.
6. Guarantee

B. Related Sections:

1. Section 312513 – High Performance Turf Reinforcement Mat
2. Section 313700 – Riprap
3. Section 311000 – Site Clearing
4. Section 310000, Earthwork

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions and recommendations of the following:

1. State of North Carolina Erosion and Sediment Control Planning and Design Manual.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings for temporary pump around and diversion plan.
2. Product Data:

- a. Silt fencing materials.
 - b. Stone materials.
 - c. Filter fabric material.
 - d. Chanel liner material.
 - e. Straw wattle material.
 - f. Any other product material.
 3. Submit rain gauge data and all inspection records with every payment application.
- B. Informational Submittals: Submit the following:
1. Procedural Submittals:
 - a. Proposed dust control measures, when submittal is requested by ENGINEER.

1.4 INSPECTIONS

- A. Initial Inspection: Inspect existing Site conditions and note irregularities affecting Work of this Section. Report irregularities to ENGINEER prior to beginning Work. Initiation of Work described in this Section implies acceptance of existing conditions.
- B. In-Progress Inspection: Give OWNER at least 3 working days' notice to schedule an in-progress inspection. This inspection shall occur when all temporary structural erosion control measures are completed and in place but prior to the start of any other construction activities. ENGINEER will notify CONTRACTOR of any deficiencies that exist. Correct such deficiencies before other construction activities begin. In addition to this inspection, the CONTRACTOR shall inform NC Division of Land Quality, Winston Salem regional office, that erosion control measures are completed and in place and a representative from the NC Division of Land Quality may schedule an additional inspection with the CONTRACTOR to ensure adequacy of installation.
- C. Monitoring: All sedimentation and erosion control devices or measures shall be inspected weekly and within 24 hours after any storm event greater than a half inch. Utilize the North Carolina Division of Land Quality Inspection Record log sheet located at <http://portal.ncdenr.org/web/wq/ws/su/construction>. Maintain all records on site and make available during inspections.
- D. Self-Inspection: All sediment and erosion control devices or measures shall be inspected after each phase of the project and the inspection documented in writing. Utilize the North Carolina Division of Land Quality Self Inspection Report located at <http://portal.ncdenr.org/web/lr/erosion>.
- E. Final Inspection: Give ENGINEER at least 3 working days' notice to schedule the final inspection. All temporary structural erosion control measures shall be removed and all affected areas re-graded as described in this Section prior to final acceptance. ENGINEER will notify CONTRACTOR of any deficiencies that exist. The CONTRACTOR shall also inform NC Division of Land Quality, Winston Salem regional office that construction is complete and a representative from the office may schedule an additional inspection with the CONTRACTOR to ensure adequacy of completion. Final acceptance will not be given until all deficiencies are corrected.
- F. Take immediate correction action for any device failure discovered during inspections.

PART 2 – PRODUCTS

2.1 MATERIALS FOR TEMPORARY EROSION AND SEDIMENT CONTROLS

- A. General: Materials utilized for erosion and sediment controls shall be in accordance with the applicable regulatory requirements indicated in Article 1.2 of this Section, unless otherwise shown or indicated in the Contract Documents.
- B. Stones for Sediment Erosion Control
 - 1. Coarse Aggregate: No. 5 or No. 57; comply with NCDOT Section 1005.
 - 2. Plain Riprap: Class A or Class B; comply with NCDOT Section 1042.
- C. Riprap: Class 1 and Class 2; comply with NCDOT Section 1042.
- D. Silt Fence: Refer to COG standard 216.
- E. Filter Fabric: Type 2 and Type 3, Class A; comply with NCDOT Section 1056.
- F. Posts: Steel; comply with NCDOT Section 1605.
- G. Woven Wire Fence
 - 1. Comply with NCDOT Section 1605.
- H. Erosion Control Matting for Temporary Stabilization
 - 1. Straw Wattle:
 - a. For excelsior matting refer to FHWA Section 713.17 Type 4 matting, comply with NCDOT Section 1631.
 - 2. Straw with Net Lining:
 - a. Straw fiber matrix sewn between two photo-degradable nets.
 - b. Wire staples machine made of No. 11 gage new steel wire formed into a “U” shape; not less than 6 inches long with not less than a 1-inch-wide throat.
- I. Aggregate Base Course: Type A Aggregate; comply with NCDOT Section 1010
- J. Temporary Soil Stabilizer: TerraTack III, Curasol AE, Aerospray 70,

PART 3 – EXECUTION

3.1 NOISE CONTROL

- A. Noise Control – General:
 - 1. CONTRACTOR’s vehicles and equipment shall minimize noise emissions to greatest degree practicable. Provide mufflers, silencers, and sound barriers when necessary.
 - 2. Noise levels shall comply with Laws and Regulations, including OSHA requirements and local ordinances.
 - 3. Noise emissions shall not interfere with the work of OWNER or others.

3.2 DUST CONTROL

A. Dust Control – General:

1. Control objectionable dust caused by CONTRACTOR's operation of vehicles and equipment, clearing, and other actions. To minimize airborne dust, apply water or use other methods subject to acceptance of ENGINEER and approval of authorities having jurisdiction.
2. A dust control fabric shall be securely attached to all temporary perimeter protection fencing. The material shall be a minimum of five feet in height with a minimum blockage of 50%. Information placed on the fabric shall be limited to identification of the responsible Demolition Contractor and any information required by law.
3. CONTRACTOR shall prevent blowing and movement of dust from exposed soil surfaces and access roads to reduce on- and off-Site damage, nuisances, and health hazards associated with dust emissions. Control may be achieved by irrigation in which the Site shall be sprinkled with water until the surface is moist. Apply dust controls as frequently as required without creating nuisances such as excessive mud and ponding of water at the Site.
4. Remove dust from roadways and access roads at maximum intervals of seven days by mechanical brooming or other method acceptable to ENGINEER.

3.3 PEST AND RODENT CONTROL

A. Pest and Rodent Control – General:

1. Provide rodent and pest control as required to prevent infestation of the Site and storage areas.
2. Employ methods and use materials that do not adversely affect conditions at the Site or on adjoining properties.
3. In accordance with Laws and Regulations, promptly and properly dispose of pests and rodents trapped or otherwise controlled.

3.4 WATER CONTROL

A. Water Control – General:

1. Provide methods to control surface water and water from excavations and structures to prevent damage to the Work, the Site, and adjoining properties.
2. Control fill, grading, and ditching to direct water away from excavations, pits, tunnels and other construction areas and to direct drainage to proper runoff courses to prevent erosion, damage, or nuisance.

B. Equipment and Facilities for Water Control: Provide, operate, and maintain equipment and facilities of adequate size to control surface water.

C. Discharge and Disposal: Dispose of drainage water in manner to prevent flooding, erosion, and other damage to any and all parts of the Site and adjoining areas, and that complies with Laws and Regulations.

3.5 POLLUTION CONTROL

A. Pollution Control – General:

1. Provide means, methods, and facilities required to prevent contamination of soil, water, and atmosphere caused by discharge of noxious substances from construction operations.

2. Equipment used during construction shall comply with Laws and Regulations.

B. Spills and Contamination:

1. Provide equipment and personnel to perform emergency measures required to contain spills and to remove contaminated soils and liquids.
2. Excavate contaminated material and properly dispose of off-Site and replace with suitable compacted fill and topsoil.

C. Protection of Surface Waters: Implement special measures to prevent harmful substances from entering surface waters. Prevent disposal of wastes, effluents, chemicals, and other such substances in or adjacent to surface waters and open drainage routes, in sanitary sewers, or in storm sewers.

D. Atmospheric Pollutants:

1. Provide systems for controlling atmospheric pollutants related to the Work.
2. Prevent toxic concentrations of chemicals and vapors.
3. Prevent harmful dispersal of pollutants into atmosphere.

E. Solid Waste:

1. Provide systems for controlling and managing solid waste related to the Work.
2. Prevent solid waste from becoming airborne, and from discharging to surface waters and drainage routes.
3. Properly handle and dispose of solid waste.

3.6 EROSION AND SEDIMENT CONTROL

A. Installation and Maintenance of Erosion and Sediment Controls – General:

1. General:
 - a. Provide erosion and sediment controls as shown and indicated on the Drawings and elsewhere in the Contract Documents. Provide erosion and sediment controls as the Work progresses into previously undisturbed areas.
 - b. Installation of erosion and sediment controls shall be in accordance with the applicable regulatory requirements indicated in Article 1.2 of this Section, unless otherwise shown or indicated in the Contract Documents.
 - c. Use necessary methods to successfully control erosion and sedimentation, including ecology-oriented construction practices, vegetative measures, and mechanical controls. Use best management practices (BMP) in accordance with Laws and Regulations, and regulatory requirements indicated in Article 1.2 of this Section, to control erosion and sedimentation during the Project.
 - d. Plan and execute construction, disturbances of soils and soil cover, and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation. Provide temporary measures for controlling erosion and sedimentation, as indicated in the Contract Documents and as required for the Project.
 - e. Where areas must be cleared for storage of materials or equipment, or for temporary facilities, provisions shall be made for regulating drainage and controlling erosion and sedimentation, subject to the ENGINEER'S approval.
 - f. Provide erosion and sediment controls, including stabilization of soils, at the end of each workday.

2. Preparation: Clear only as required for erosion control measures to be installed prior to commencing activities that will disturb soil or soil cover.
3. Coordination:
 - a. Coordinate erosion and sediment controls with this Section's requirements on water control.
 - b. Coordinate temporary erosion and sediment controls with construction of permanent drainage facilities and other Work to the extent necessary for economical, effective, and continuous erosion and sediment control.
4. Before commencing activities that will disturb soil or soil cover at the Site, provide all erosion and sediment control measures required by the Contract Documents for the areas where soil or soil cover will be disturbed.
5. In general, implement construction procedures associated with, or that may affect, erosion and sediment control to ensure minimum damage to the environment during construction. CONTRACTOR shall implement any and all additional measures required to comply with Laws and Regulations.
6. Vegetation Removal: Remove only those shrubs, grasses, and other vegetation that must be removed for construction. Protect remaining vegetation.
7. Access Roads and Parking Areas: When possible, access roads and temporary roads shall be located and constructed to avoid adverse effects on the environment. Provisions shall be made to regulate drainage, avoid erosion and sedimentation, and minimize damage to vegetation.
8. Earthwork and Temporary Controls:
 - a. Perform excavation, fill, and related operations in accordance with Section 31 23 33 Trenching and Backfilling.
 - b. Control erosion to minimize transport of silt from the Site into existing waterways and surface waters. Such measures shall include, but are not limited to, using berms, silt fencing, baled straw silt barriers, gravel or crushed stone, mulching and soil stabilization, slope drains, and other methods. Apply such temporary measures to erodible materials exposed by activities associated with the construction of the Project.
 - c. Hold to a minimum the areas of bare soil exposed at one time.
 - d. Construct fills and waste areas by selectively placing fill and waste materials to eliminate surface silts and clays that will erode.
 - e. In performing earthwork, eliminate depressions that could serve as mosquito pools.
 - f. CONTRACTOR shall provide special care in areas with steep slopes, where disturbance of vegetation shall be minimized to maintain soil stability.
9. Inspection and Maintenance:
 - a. Periodically inspect areas of earthwork and areas where soil or soil cover are disturbed to detect evidence of the start of erosion and sedimentation; apply corrective measures as required to control erosion and sedimentation. Continue inspections and corrective measures until soils are permanently stabilized and permanent vegetation has been established
 - b. Repair or replace damaged erosion and sediment controls within 24 hours of CONTRACTOR becoming aware of such damage.
 - c. Periodically remove silt and sediment that has accumulated in or behind sediment and erosion controls. Properly dispose of silt and sediment.
10. Duration of Erosion and Sediment Controls:
 - a. Maintain erosion and sediment controls in effective working condition until the associated drainage area has been permanently stabilized.

- b. Maintain erosion and sediment controls until the Site is restored and site improvements including landscaping, if any, are complete with underlying soils permanently stabilized.
 11. Work Stoppage: If the Work is temporarily stopped or suspended for any reason, CONTRACTOR shall provide additional temporary controls necessary to prevent environmental damage to the Site and adjacent areas while the Work is stopped or suspended.
 12. Failure to Provide Adequate Controls: In the event CONTRACTOR repeatedly fails to satisfactorily control erosion and siltation, OWNER reserves the right to employ outside assistance or to use OWNER's own forces for erosion and sediment control. Cost of such work, plus engineering and inspection costs, will be deducted from monies due CONTRACTOR.
- B. Temporary Silt Fence:
1. Refer to COG Standard 216.
 2. Comply with NCDOT Section 1605.
- C. Straw Wattle
1. Install straw wattle in accordance to COG Standard 223 where shown or indicated, including in swales, along contours, and along toe of slopes.
 2. Frequently inspect bales and repair or replace as required. Remove accumulated silt and debris from behind straw bales.
- D. Seeding and Mulching:
1. Temporary Ground Cover:
 - a. Refer to the Contract Drawings for ground coverage requirements and timeframes for disturbed land.
 - b. Seeding and mulching or proper ground cover will be provided for disturbed areas at least every 1,000 linear feet of utility line construction.
 2. Use mulching to temporarily stabilize exposed soil and fill material.
 - a. Immediately following final grading, provide mulch and stabilize with mats or netting, or sprayed soil stabilization emulsion with fiber additive.
 - b. Application of mulching for soil stabilization shall be as follows.
 - 1) Unrotted Straw or Salt Hay: 1.5 to two tons per acre.
 - 2) Soil stabilization emulsions, when used, shall be applied in accordance with manufacturer's instructions, and shall be applied with mulch or stabilization fibers.
 - 3) Wood-fiber or Paper-fiber Application: 1,500 lbs. per acre, installed by hydroseeding.
 - c. Matting is to be used in locations where ditch slope is 2% or greater. Where mats or netting are used:
 - 1) Cover entire area to be stabilized with mats or netting.
 - 2) Provide anchoring trenches at the top and bottom of slopes to receive mats or netting. Bury at least the top and bottom ends of mat or netting, four inches or more wide, at top and bottom of slope. Tamp trench full of soil. Four inches from trench, secure mat or netting with appropriate staples spaced at intervals of 10 inches.
 - 3) Overlap adjacent strips of mat or netting by at least four inches.

- E. Protection of Storm Water Drainage Inlets and Catch Basins:
 - 1. Protect each drainage inlet and catch basin that has the potential to receive storm water runoff from exposed soils and does not discharge into a storm water settlement basin.
 - 2. Install stormwater inlet protection per Roadway Standard No. 431 Standard Stormwater Inlet Protection Measures.
- F. Temporary Sediment Traps.
 - 1. For constructing embankments comply with requirements in Division 31 Sections on earthwork, embankments, excavation, and fill.
 - 2. Overflow Weir:
 - a. Install overflow weirs at elevations on shown or indicated on the Drawings or approved Shop Drawings, as applicable, to avoid overtopping and overfilling of settlement basin without short-circuiting the settlement basin's hydraulics.
 - b. Wrap geotextile material specified for silt fencing around discharge structures of temporary settlement basins
 - 3. Crushed Stone and Riprap: Install in accordance with Division 31 Sections on crushed stone and riprap. Provide in areas of temporary settlement basin subject to erosion, and at upstream and downstream ends of discharge piping.
 - 4. Remove sediment when required based on accumulation of material.
 - 5. When temporary settlement trap is no longer required, remove the temporary settlement trap discharge weir, and spillway, fill the temporary sediment trap to required grade in accordance with requirements of Division 31 Section on excavation and fill, and provide landscaping in accordance with Division 32 Sections on landscaping.
- G. Silt Bag on Dewatering Pump Discharge:
 - 1. Provide dewatering of excavations in compliance with Division 31 Sections on earthmoving, excavation, and fill.
 - 2. Locate filter bags and temporary pump discharge lines to avoid interfering with the public, use of private property, and OWNER's operations. Relocate filter bags and appurtenances when required.
 - 3. Filter bag discharge shall be directed to appropriate storm water drainage route. Do not discharge into roadways, driveways, access roads, and overland. When temporary settlement basin is used, locate filter bags to discharge to temporary settlement basin when practicable.
 - 4. Provide filter bag on discharge of each dewatering pump drawing from an excavation.
 - 5. Securely attach filter bag to pump discharge pipe or hose.
 - 6. Maintain, clean out, and replace filter bags as required.
- H. Construction Entrance:
 - 1. Install geotextile liner and Class A stone to minimum 8 inches thick to the dimensions and in the location shown on Drawings; comply with NCDOT Section 520 except that the requirement for a sand seal shall not apply. Refer to COG Standard 217 and 217-A.
 - 2. Installation:
 - a. Ensure that subgrade under temporary stone construction entrance is suitably dense for the intended purpose. Suitably prepare subgrade as required for temporary construction entrance.
 - b. Provide on subgrade a layer of geotextile fabric, installed in accordance with geotextile manufacturer's recommendations for separation.
 - c. Provide stone on installed geotextile. Grade stone for passage of vehicles.

3. Maintenance:
 - a. Maintain temporary stone construction entrance at not less than the minimum required thickness. Add stone as required to maintain thickness.
 - b. When upper layer of temporary stone construction entrance becomes contaminated with soil, remove the contaminated material and replace with clean stone.
 - c. Using water to wash down temporary construction entrance or paved areas onto which soil material has been tracked is not allowed.

I. Drainage Areas: Install erosion control matting.

J. Inlet Protection: Refer to COG Standard 431.

K. Temporary Stone Ditch Check or Stone Filter Outlet: Refer to COG Standard 215.

3.7 REMOVAL OF TEMPORARY CONTROLS

A. Removals - General:

1. Upon completion of the Work and approval from regulatory agency, remove temporary controls and restore Site to specified condition; if condition is not specified, restore Site to pre-construction condition.
2. After soils are permanently stabilized, remove from the Site temporary erosion and sediment controls.
3. Sediment collected behind control structures shall be excavated and transported to an approved location for disposal. Replace topsoil which was stripped and stockpiled when erosion control measures were installed.

END OF SECTION 312500

APPENDIX F

CHECKLIST

EROSION and SEDIMENTATION CONTROL PLAN PRELIMINARY REVIEW CHECKLIST

In order to comply with G.S. 113A, Article 4 and 15A NCAC 04, see below for items routinely needed for review of an erosion and sedimentation control plan. Some items may not be applicable to every plan, depending on the specific site conditions:

NPDES Construction Stormwater General Permit NCG010000

- ☒ Designation on the plans where the 7 or 14 day ground stabilization requirements apply per Part II.E.1 of the permit.
- ☒ Design of basins with one acre or more of drainage area for surface withdrawal as per Part II.B.8 of the permit.

LOCATION INFORMATION

- ☒ Project location & labeled vicinity map (roads, streets, landmarks)
- ☒ North arrow and scale
- ☒ Identify River Basin.
- ☒ Provide a copy of site located on applicable USGS quadrangle and NRCS Soils maps if it is in a River Basin with Riparian Buffer requirements.

GENERAL SITE FEATURES (Plan elements)

- ☒ Property lines & ownership ID for adjoining properties
- ☒ Existing contours (topographic lines)
- ☒ Proposed contours
- ☒ Limits of disturbed area (provide acreage total, delineate limits, and label). Be sure to include all access to measures, lots that will be disturbed, and utilities that may extend offsite.
- ☒ Planned and existing building locations and elevations
- ☒ Planned & existing road locations & elevations, including temporary access roads
- ☒ Lot and/or building numbers
- ☒ Hydrogeologic features: rock outcrops, seeps, springs, wetland and their limits, streams, lakes, ponds, dams, etc. (include all required local or state buffer zones and any DWQ Riparian Buffer determinations)
- ☒ Easements and drainageways, particularly required for offsite affected areas. Include copies of any recorded easements and/or agreements with adjoining property owners.
- ☒ Profiles of streets, utilities, ditch lines, etc.
- ☒ Stockpiled topsoil or subsoil locations
- ☒ If the same person conducts the land-disturbing activity & any related borrow or waste activity, the related borrow or waste activity shall constitute part of the land-disturbing activity unless the borrow or waste activity is regulated under the Mining Act of 1971, or is a landfill regulated by the Division of Waste Management. If the land-disturbing activity and any related borrow or waste activity are not conducted by the same person, they shall be considered separate land-disturbing activities and must be permitted either through the Sedimentation Pollution Control Act as a one-use borrow site or through the Mining Act.
- ☒ Location and details associated with any onsite stone crushing or other processing of material excavated. If the affected area associated with excavation, processing, stockpiles and transport of such materials will comprise 1 or more acres, and materials will be leaving the development tract, a mining permit will be required.
- ☒ Required Army Corps 404 permit and Water Quality 401 certification (e.g. stream disturbances over 150 linear feet)

EROSION & SEDIMENT CONTROL MEASURES (on plan)

- ☒ Legend (provide appropriate symbols for all measures and reference them to the construction details)
- ☒ Location of temporary measures
- ☒ Location of permanent measures
- ☒ Construction drawings and details for temporary and permanent measures. Show measures to scale on plan and include proposed contours where necessary. Ensure design storage requirements are maintained through all phases of construction.
- ☒ Maintenance requirements for measures
- ☒ Contact person responsible for maintenance

SITE DRAINAGE FEATURES

- ☒ Existing and planned drainage patterns (include off-site areas that drain through project and address temporary and permanent conveyance of stormwater over graded slopes)
- ☒ Method used to determine acreage of land being disturbed and drainage areas to all proposed measures (e.g. delineation map)
- ☒ Size, pipe material and location of culverts and sewers
- ☒ Soil information: type, special characteristics
- ☒ Soil information below culvert storm outlets

- ☒ Name and classification of receiving water course or name of municipal operator (only where stormwater discharges are to occur)

STORMWATER CALCULATIONS

- ☒ Pre-construction runoff calculations for each outlet from the site (at peak discharge points). Be sure to provide all supporting data for the computation methods used (rainfall data for required storm events, time of concentration/storm duration, and runoff coefficients).
- ☒ Design calculations for peak discharges of runoff (including the construction phase & the final runoff coefficients for the site)
- ☒ Design calcs for culverts and storm sewers (include HW, TW and outlet velocities)
- ☒ Discharge and velocity calculations for open channel and ditch flows (easement & rights-of-way)
- ☒ Design calcs for cross sections and method of stabilization for existing and planned channels (include temporary linings). Include appropriate permissible velocity and/or shear stress data.
- ☒ Design calcs and construction details for energy dissipaters below culvert and storm sewer outlets (include stone/material specs & apron dimensions). Avoid discharges on fill slopes.
- ☒ Design calcs and dimension of sediment basins (note current surface area and dewatering standards as well as diversion of runoff to the basins). Be sure that all surface drains, including ditches and berms, will have positive drainage to the basins.

VEGETATIVE STABILIZATION

- ☒ Area & acreage to be stabilized with vegetation
 - ☒ Method of soil preparation
 - ☒ Seed type & rates (temporary & permanent)
 - ☒ Fertilizer type and rates
 - ☒ Mulch type and rates (include mulch anchoring methods)
- NOTE: Plan should include provisions for groundcover in accordance with NPDES Construction Stormwater General Permit NCG010000.

FINANCIAL RESPONSIBILITY/OWNERSHIP FORM

- ☒ Completed, signed & notarized FR/O Form
 - ☒ Accurate application fee payable to NCDEQ (\$100.00 per acre rounded up the next acre with no ceiling amount)
 - ☒ Certificate of assumed name, if the owner is a partnership
 - ☒ Name of Registered Agent (if applicable)
 - ☒ Copy of the most current Deed for the site. Please make sure the deed(s) and ownership information are consistent between the plan sheets, local records and this form.
 - ☒ Provide latitude & longitude (in decimal degrees) at the project entrance.
 - ☒ Two hard-copies of the plans (some regional offices require additional plans or multiple sizes; please contact the regional coordinator prior to such submittal.)
- NOTE: For the Express Permitting Option, inquire at the local Regional Office for availability. Express Reviews are performed by appointment only.

NARRATIVE AND CONSTRUCTION SEQUENCE

- ☒ Narrative describing the nature & purpose of the construction activity.
- ☒ Pre-construction conference, if requested.
- ☒ Construction sequence related to erosion and sediment control (including installation of critical measures prior to the initiation of the land-disturbing activity & removal of measures after areas they serve are permanently stabilized). Address all phases of construction and necessary practices associated with temporary stream bypasses and/or crossings.
- ☒ Bid specifications related only to erosion control

APPENDIX G

PROPERTY DEEDS AND PLATS

13007
RESOLUTION OF THE CITY COUNCIL OF GREENSBORO

RESOLUTION OF THE CITY COUNCIL OF GREENSBORO
APPROXIMATELY 1,040 FEET TO COTTAGE GROVE AVENUE

555-7F6231 #00002.00 DE

WHEREAS, the City of Greensboro owns all of the property abutting on both sides of Perkins Street from Bingham Street eastward approximately 1,040 feet to Cottage Grove Avenue and the Mayor and City Clerk on behalf of the City of Greensboro have signed the petition requesting that said portion of street be closed and abandoned as a public street;

WHEREAS, a notice was duly published that a public hearing would be held by the City Council in the Council Chamber in the Municipal Office Building on Monday, June 19, 1972, on the closing of said portion of street; and

WHEREAS, the public hearing has now been held and no objections have been made to the closing thereof;

555-7F6231 #00000.50 FE

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF GREENSBORO:

1. That the City Council hereby finds as a fact that the owner of all the property abutting both sides of the hereinafter mentioned portion of street have requested in writing that said portion of street be closed.
2. That the City Council hereby finds as a fact that the closing of the portion of street is not contrary to the public interest and that no individual or other party owning property in the vicinity of the street or in the subdivision in which the street is located will be deprived of reasonable means of ingress or egress to his or its property.
3. That the following portion of street is hereby permanently closed and abandoned as a public street:

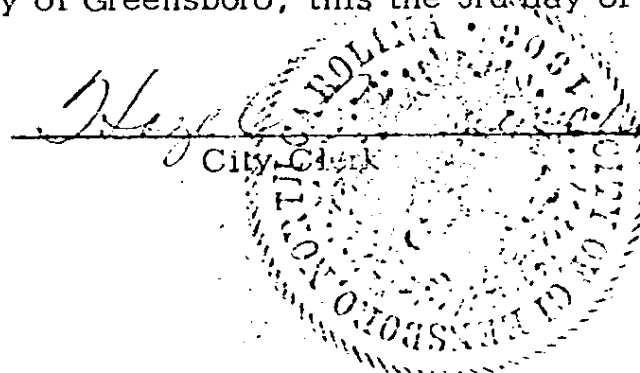
Perkins Street from Bingham Street eastward approximately 1,040 feet to Cottage Grove Avenue.
4. That the City of Greensboro hereby reserves utility easements for any water and sewer lines existing in the above mentioned street until such time as said lines are no longer required by the City.

I, Hazel N. Burch, City Clerk of the City of Greensboro, hereby certify the foregoing to be a true and exact copy of a resolution adopted by the City Council of the City of Greensboro on the 3rd day of July, 1972.

Witness my hand and the seal of the City of Greensboro, this the 3rd day of July, 1972.

Sworn and subscribed to before me,
this the 3rd day of July, 1972.

Eileen G. Woollers
Notary



EILEEN G. WOOLLERS
NOTARY PUBLIC
GUILFORD COUNTY, N. C.
Commission Expires July 15, 1976

RECORDED
MARK STEWART
REGISTER OF DEEDS
GUILFORD COUNTY, N. C.

JUL 7 4 10 PM '72

DEED 2598 PAGE 775

NORTH CAROLINA - GUILFORD

The foregoing certificate(s) of

Eileen G. Woollers

A Notary Public of said county is
(are) certified to be correct.

This July 7, 1972
MARK STEWART, Register of Deeds

Naugle Wood
County of Deeds

for said County, ^{so} do hereby certify that Franklin Jordan and Eveline Jordan his wife, grantors, personally appeared before me this day and acknowledged the execution of the foregoing deed of conveyance, and the said Eveline Jordan, being by me privately examined, separated and apart from her said husband, touching her voluntary execution of the same, doth state that she signed the same freely and voluntarily, without fear or compulsion of her said husband or any other person, and that she doth still voluntarily assent thereto. Let the said deed and this certificate be registered. Witness my hand and seal this the 6 day of Sept. 1895.

Ed. L. Ragan, C. S. C.
 Filed for registration on the 30 day of July
 1897, at 10:30 o'clock A. M. and duly
 recorded.
 A. G. Kirkman
 Register of Deeds.

Anderson G. Nelson Deed from Jno. W. Cooker Sheriff.

North Carolina }
 Guilford County }

Whereas the properly constituted authorities of Guilford County aforesaid, assessed and levied Taxes, as required by law, against the property of H. A. May, in Morehead Township, which property is hereinafter described, the same being subject to taxation for the year 1894, and whereas said Taxes

THIS DEED, Made this the 14 day of February, 1949,
by J. M. Sutphin and his wife, Jennie Sutphin,
of _____ County and State of _____,
parties of the first part, to the City of Greensboro, a Municipal
Corporation of Guilford County and State of North Carolina, party of
the second part,

W I T N E S S E T H

That the said parties of the first part, in consideration of Two
Hundred Dollars (\$200.00) to them in hand paid by the said party of
the second part, the receipt of which is hereby acknowledged, have
bargained and sold and by these presents do bargain, sell and convey
unto the said party of the second part and its successors or assigns
a tract or parcel of land in the County of Guilford and State of North
Carolina, in Gilmer Township, adjoining the lands of _____
and others, and bounded as follows:

BEGINNING at a point in the western margin of Cottage Grove
Avenue, said point being south 01 deg. west, 206.2 feet from
the southeast intersection of Cottage Grove Avenue and
Liberty Street; thence south 02 deg. 11 min. west along the
City of Greensboro line, 261 feet to a granite stone
(grantors' southwest corner, see book 592, page 502); thence
with the City of Greensboro line (formerly Brawley line) north
87 deg. 18 min. west, 149 feet to a stake in the western margin
of Cottage Grove Avenue; thence with the western margin of Cot-
tage Grove Avenue, as it curves, 305 feet, more or less, to the
point of BEGINNING.

Being all the land lying west of Cottage Grove Avenue convey-
ed to J. M. Sutphin by deeds duly recorded in book 592, page
502 and book 685, page 88, in the office of the Register of
Deeds of Guilford County, North Carolina.

Subject to the right-of-way of Duke Power Company (See book
1071, page 190), if any.

The above land was conveyed to grantors by _____
_____. See book No. _____, page _____, etc.

TO HAVE AND TO HOLD the aforesaid tract or parcel of land and all
privileges and appurtenances thereunto belonging to the said party of
the second part and its successors and assigns forever.

And the said parties of the first part do hereby covenant that
they are seized of said premises in fee and have the right to convey
the same in fee simple.

IN TESTIMONY WHEREOF, the said parties of the first part have here -
unto set their hands and seals on the day and year first above written.

J. M. Sutphin (SEAL)
J. M. Sutphin
Jennie Sutphin (SEAL)
Jennie Sutphin

Witness:

Chris Ray

✓
NORTH CAROLINA
GUILFORD COUNTY

THIS DEED, made this the 3rd day of May, 1967, by City of Greensboro, a municipal corporation located in Guilford County, North Carolina, party of the first part, to The Greensboro City Board of Education, a body politic and corporate, of said County and State, party of the second part,

WITNESSETH:

THAT, WHEREAS, City of Greensboro has acquired a certain tract of land hereinafter described;

WHEREAS, said City of Greensboro has no governmental or other public need for said property;

WHEREAS, the party of the second part offered to buy of the party of the first part the tract of land hereinafter described for a consideration of Ten Thousand and no/100 Dollars (\$10,000.00);

WHEREAS, the City Council on the 20th day of February, 1967, adopted a resolution directing the publication in a newspaper published in the City of Greensboro a notice setting forth a description of said property, the amount offered therefor, and the terms offered, together with a notice that within ten days from the date thereof any person might raise said bid not less than five per cent (5%);

WHEREAS, said notice was published in accordance with the requirements of law; and

6071
WHEREAS, the City Council did on the 1st day of May, 1967, adopt a final resolution authorizing and directing the Mayor and City Clerk to execute and deliver to the grantee herein a conveyance of all right, title and interest of City of Greensboro in and to the tract or parcel of land hereinafter described at and for the sum of Ten Thousand and no/100 Dollars (\$10,000.00);

NOW, THEREFORE, in consideration of the premises and the sum of Ten Thousand and no/100 Dollars (\$10,000.00) in hand paid to the party of the first part by the party of the second part, the receipt of which is hereby acknowledged, the party of the first part does hereby bargain, sell and convey to the party of the second part, its successors and assigns, all of the right, title and interest of City of Greensboro in and to the certain tract or parcel of land in Gilmer Township, Guilford County, North Carolina, and being more particularly described as follows:

BEGINNING at a point in the present east margin of Cottage Grove Avenue, said point being the proposed northeast intersection of Spencer Street with Cottage Grove Avenue; thence with the present east margin of Cottage Grove Avenue along a curve to the left, having a chord bearing and distance of north 05 deg. 55 min. 35 sec. west 295.49 feet, an arc distance of 296.33 feet to a point; thence continuing with the present east margin of said street north 13 deg. 38 min. west 125.15 feet to a point; thence south 87 deg. 50 min. 30 sec. east 260.85 feet to a point; thence south 86 deg. 29 min. 30 sec. east 162.15 feet to the northwest corner of the property of The Greensboro City Board of Education; thence south 02 deg. 04 min. 30 sec. west with The Greensboro City Board of Education's west line 582.80 feet to a point in the proposed north margin of Spencer Street; thence with the proposed north margin of Spencer Street along a curve to the left, having a chord bearing and distance of north 47 deg. 11 min. 22 sec. west 247.98 feet, an arc distance of 275.79 feet to the point of tangency of said curve; thence continuing with the

This Deed

Made this the 14 day of September, 1944,
by James W. Young and his wife Montrose B. Young

of Guilford County and State of North Carolina, parties of the first part,
to City of Greensboro, a Municipal Corporation of Guilford County and
State of North Carolina, party of the second part, Witnesseth, That the said parties of the first part, in consideration of
(\$ 1.00) One Dollar and other valuable considerations ~~XXXXX~~
them paid by the said party of the second part, the receipt of which is hereby acknowledged, ~~but~~ have bargained and sold
and by these presents do bargain, sell and convey unto the said party of the second part and its successors ~~XXXXX~~
or parcel of land in the County of Guilford and State of North Carolina, in Gilmer Township, adjoining the
lands of _____ and others, and bounded as follows:

TRACT 1: Being all of Lots 51, 52, 53 and 54 Block "B" of the map of
John A. Young, property, a plat of which is duly recorded in the office of
the Register of Deeds of Guilford County, North Carolina in Plat Book 4,
at Page 57.

TRACT 2: BEGINNING at Charles Goode's northwest corner (See Book 407
at Page 63) thence south 88 deg. 20 min. west 25 feet to a stake; thence
south 3 deg. 04 min. west 50 ft. to a stake; thence north 88 deg. 20 min.
east 25 feet to Charles Goode's southwest corner; thence with his west
line north 3 deg. 04 min. east 50 feet to the point of beginning.



The above land was conveyed to grantor by R. D. Douglas, Trustee See Book No. 792, Page 345, etc.

To have and to hold the aforesaid tract or parcel of land and all privileges and appurtenances thereunto belonging to the
said party of the second part and its successors ~~XXXXX~~ and assigns forever.

And the said parties of the first part do covenant that they ~~XXXXX~~ are seized of said premises in fee and
have the right to convey the same in fee simple; that the same are free from incumbrances; and that they
will warrant and defend the said title to the same against the claims of all persons whatsoever.

In Testimony Whereof the said parties of the first part do hereunto set their hand S and seal S
on _____ the day and year first above written.

WITNESS:

Montrose B. Young [SEAL]
James W. Young [SEAL]
[SEAL]
[SEAL]

STATE OF NORTH CAROLINA—GUILFORD COUNTY

I, Lawrence J. Hayle, a notary public of said County, do hereby certify
that James W. Young and his wife Montrose B. Young

grantors personally appeared before me this day and acknowledged the execution of the foregoing deed of conveyance, and the
said Montrose B. Young

being by me privately examined, separate and apart from her said husband, touching her voluntary execution of the same, doth
state that she signed the same freely and voluntarily, without fear or compulsion of her said husband or any other person, and that
she doth still voluntarily assent thereto. Let the said deed and this certificate be registered.

Witness my hand and seal this the 14 day of September, 1944.
My commission expires 1-27, 1945. Lawrence J. Hayle, N. P. [SEAL]

STATE OF NORTH CAROLINA—GUILFORD COUNTY

I, _____ of said County, do hereby certify
that _____ grantor, personally appeared before me this day and acknowledged
the execution of the foregoing deed. Let the said deed and this certificate be registered.

Witness my hand and seal this the _____ day of _____, 194____.

My commission expires _____, 194____, N. P. [SEAL]

STATE OF NORTH CAROLINA—GUILFORD COUNTY

The foregoing certificate of Lawrence J. Hayle, N.P.
of said County, is adjudged to be correct. Let the said deed and this certificate be registered.

Witness my hand and seal this the SEP 16 1944 day of September, 1944.
James W. Young, C. S. C.

Filed for registration on the _____ day of SEP 16 1944, 194____, at 11 30 o'clock A M.,
and duly recorded in the office of the Register of Deeds in Guilford County, N. C., in Book _____, Page _____, Etc.

James W. Young
Register of Deeds



Appendix D Guidelines for Addressing Pre-Regulatory Landfills and Dumps

Special Remediation Branch

GUIDELINES FOR ADDRESSING PRE-REGULATORY LANDFILLS AND DUMPS

February 2025

**Department of Environmental Quality
Division of Waste Management
Superfund Section
Special Remediation Branch
Pre-Regulatory Landfill Unit**

217 West Jones Street
1646 Mail Service Center
Raleigh, North Carolina 27699-1646
Telephone: (919) 707-8200

Pre-Regulatory Landfill Program:

<https://deq.nc.gov/about/divisions/waste-management/superfund-section/pre-regulatory-landfill-program>



Updates from March 2022 Version:

1. Web links and reference information page.
2. NC DEQ EDD required for all laboratory data.
3. Laboratory data loaded to EQuIS production database.
4. RI phase – PFAS added as potential contaminate of concern.
5. Laboratory data quality validation procedures.
6. Background sample collection and evaluation procedures.
7. Sensitive environment survey radius increased from 500 feet to 1,000 feet.
8. Vicinity Map – increased radius from 500 feet to 1,000 feet.
9. Surface water sampling must represent the potential or known area of impact from the WDA.
10. Evaluation of existing soil covers – added confirmation sampling for excavation, grid spacing, sample locations, and iterative truncation process.
11. Groundwater investigation procedures.
12. Potable well sampling procedures.
13. Landfill & soil gas evaluation.
14. TCE indoor air immediate action levels.
15. RI summary review with Unit PM and Unit Supervisor.
16. Conceptual site model summary chart.
17. Notice plat recordation procedures.
18. Field procedures and sample collection techniques.
19. Laboratory Analytical Parameters.
20. Borrow soil location and sampling procedures.
21. Engineered waste disposal area cover system procedures.

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DEFINITIONS

The following definitions apply to this guidance:

1. **Contamination:** a contaminant released into an environmental medium that has resulted in or has the potential to result in an increase in the concentration of the contaminant in the environmental medium in excess of unrestricted use standards.
2. **Disposal:** the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste into or on any land or water so that the solid waste or any constituent part of the solid waste may enter the environment or be emitted into the air or discharged into any waters, including groundwaters (Ref. North Carolina General Statute (NCGS) 130A-290(a) (6)).
3. **Hazardous waste:** a solid waste, or combination of solid wastes, which because of its quantity, concentration or physical, chemical, or infectious characteristics may:
 - a. Cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or
 - b. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed (Ref. NCGS 130A-290(a) (8)).
4. **Inactive Hazardous Substance or Waste Disposal Site or Site:** any facility as defined in CERCLA/SARA which includes any site or area where a hazardous substance has been deposited, stored, disposed of, or placed or otherwise come to be located. The site includes the waste disposal area and any area containing media impacted by the waste disposal area.
5. **Industrial solid waste:** solid waste generated by manufacturing or industrial processes that is not hazardous waste (Ref. NCGS 130A-290(a) (13b)).
6. **Municipal solid waste:** any solid waste resulting from the operation of residential, commercial, industrial, governmental, or institutional establishments that would normally be collected, processed, and disposed of through a public or private solid waste management service. Municipal solid waste does not include hazardous waste, sludge, industrial waste managed in a solid waste management facility owned and operated by the generator of the industrial waste for management of that waste, or solid waste from mining or agricultural operations (Ref. NCGS 130A-290(a) (18a)).
7. **Pre-1983 landfill:** any land area, whether publicly or privately owned, on which municipal solid waste disposal occurred prior to 1 January 1983 but not thereafter but does not include any landfill used primarily for the disposal of industrial solid waste (Ref. NCGS 130A-290(a) (22a)).
8. **Property/Properties:** the parcel(s) that include the site/waste disposal area and anywhere contamination from the pre-1983 landfill has come to be located.
9. **Waste disposal area:** the estimated or actual waste disposal footprint derived from investigation activities regardless of the number of properties on which it is located.

RELATED LINKS & REFERENCE INFORMATION

Pre-Regulatory Landfill Unit Information

[Pre-Regulatory Landfill Unit](#) | NC DEQ

Division of Waste Management Resources

[DEQ Risk-Based Remediation](#) | NC DEQ

[DWM Vapor Intrusion Guidance](#) | NC DEQ

[DWM Site Locator Tool](#) | NC DEQ GIS Data (arcgis.com)

[DWM Online Documents and Environmental Data](#) | NC DEQ

[Contaminated Property: Issues and Liabilities Brochure](#) | NC DEQ

Division of Water Resources

[Groundwater Standards](#) | NC DEQ

[Surface Water Standards](#) | NC DEQ

[NC Surface Water Classifications map](#) | NC DEQ

United States Environmental Protection Agency (always consult the most current versions)

[Quality System and Technical Procedures for LSASD Field Branches](#) | US EPA

[Region 4 Human Health Risk Assessment Supplemental Guidance](#), January 2014 Draft Final | US EPA

[Laboratory Data Review for the Non-Chemist](#) | US EPA

[Risk Assessment Guidance for Superfund Volume I, Human Health Evaluation Manual \(Part A\)](#) | US EPA

[Superfund Residential Lead Sites Handbook](#) | US EPA

PFAS Resources (always consult the sources for the most current PFAS Resources)

[PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024](#) | US EPA

[USEPA Designation of PFOA and PFOS as Hazardous Substances - May 2024](#)

[ITRC PFAS Sampling and Analysis - September 2023](#)

[ITRC Sampling Precautions and Laboratory Analytical Methods for PFAS - July 2022](#)

[USEPA Multi-Industry PFAS Study - September 2021](#)

INTRODUCTION

The Pre-Regulatory Landfill Unit (Unit) was established in 2007 to address pre-1983 non-industrial landfills and dumps (landfills and dumps that ceased accepting waste prior to January 1, 1983). These landfills and dumps are unlined waste disposal areas (WDA) that are not subject to the North Carolina Department of Environmental Quality (DEQ) Solid Waste Management post-closure regulations administered by the Solid Waste Section (Title 15A North Carolina Administrative Code (NCAC) 13B). The legislation passed in 2007 established funding for remedial investigations (RI) and risk based remedial action plans (RAP) at these sites. The RI and risk-based RAP work activities are completed by Professional Engineering firms (Contractors) under contract with DEQ.

The Unit also manages a Local Government Reimbursement Program for certain eligible activities. Local governments may conduct RI activities in accordance with this guidance document including subsequent amendments and editions and request reimbursement of assessment expenses if the activities and costs are pre-approved by the Unit and comply with statutory requirements. *Guidelines for the Local Government Reimbursement Program* are outlined in Attachment 1.

The RI phase for each pre-1983 landfill is initiated by obtaining property access permission for DEQ staff, Contractor staff and U.S. Army Corp of Engineers (USACE) staff. Once property access permission has been obtained, an initial site visit is performed by the Unit PM, the Contractor PM, and Contractor staff personnel who will be performing field work.

Typical RI activities include collecting receptor information, identifying all potential sensitive environments, performing a geophysical survey to delineate the edge of the WDA, soil borings and/or test pits to confirm the extent of waste, and media sampling (groundwater, surface water, soil, sediment, surface vapor screening and subsurface landfill and soil gas) to identify and delineate the extent of contaminants of concern. These RI activities are planned based on historical information available in the Unit's records, risks posed by current site conditions, and any pending redevelopment plans. If needed, access permission will be obtained from the North Carolina Department of Transportation (NCDOT) to install borings in the NCDOT right-of-way.

The Contractor PM must submit a work plan, cost estimate and proposed schedule for review and approval by the Unit PM prior to implementation. Additional information regarding general task order management protocol is available in the *Pre-Regulatory Landfill Program Contract Task Management Guidance*, which can be found in Attachment 2.

After the RI is complete, the next step is the remedial design (RD) phase. The Contractor PM will prepare a draft RAP based on the contaminants of concern, topography, and sensitive environments for review by the Unit. The draft RAP will be made available for public comment prior to final approval and implementation. If significant public interest exists, a public meeting and/or informational session may be held. Contractors may need to provide technical and administrative support for public meetings and informational sessions.

Note: Due to the wide range of conditions encountered at pre-1983 landfill sites, these guidelines will not address every conceivable situation.

DOCUMENT FORMATTING AND SUBMITTAL REQUIREMENTS

All documents should be submitted electronically in PDF format unless otherwise specified by the Unit PM. Laboratory data must be submitted in PDF format with each report and electronically according to the DEQ Electronic Data Deliverable (EDD) template for upload to the EQuIS Database. All laboratory data must be uploaded to the EQuIS production database by the Contractor PM. The associated cover letters, appendices, and signed and notarized certifications should be included with the document as one PDF. Company logos may be used on the report cover page, but company logos and file names cannot be in the text of the report including headers/footers and figures. Documents may be e-mailed, but if they are large then a file-sharing system may be used. Electronic documents should not be protected or encrypted with passwords. Any paper submissions to the Unit should be double-sided (except for figures, tables, and color photographs).

The Contractor PM shall perform a complete review of all draft reports to identify all errors and omissions prior to submitting to the Unit PM for review and is expected to make requested revisions. The Contractor PM should not make report revisions that are not requested by the Unit PM unless the Contractor identifies a reporting error.

All reports should be submitted in accordance with the following:

1. Summarize methods and results and do not include conclusions or recommendations.
2. Sequentially numbered sections that reflect each task in the task order.
3. Letter size paper (8.5 x 11 inch) and ledger (11x17) if approved by Unit PM.
4. Font size 9 or greater for all text in documents, tables, and figures.
5. Font size must remain 9 or greater after conversion to PDF.
6. Submittal date.
7. Name of the pre-1983 landfill.
8. Identification number of the pre-1983 landfill.
9. Approved task order identification number.
10. Summary of any required variances from the approved work plan (Contractor must seek Unit pre-approval).
11. Copies of all Contractor field notes and waste manifests.

Field notes include but are not limited to, soil boring logs, equipment calibration logs, and water sample collection field sheets. All abbreviations and symbols used for field notes must correspond to the requirements as outlined in the *Pre-Regulatory Landfill Program Contract Task Management Guidance*, which can be found in Attachment 2.

Report appendices should not include correspondence with the Unit relative to contracting and task orders, but may include the following:

1. Photographs.
2. GPS coordinates.
3. Site survey plat.
4. Soil boring and well construction logs (digital and in diagram form).
5. Field notes.
6. Geophysical survey.
7. Laboratory analytical reports.

All site reports are stored with other site records electronically in an online document management system (Laserfiche). Instructions for accessing the Laserfiche system are provided in a link at the front of this document.

REPORT CERTIFICATION REQUIREMENTS

The following certification statement with the notarized signature of the Contractor PM, must be included on each RI report and RAP report: “I certify that, to the best of my knowledge, after thorough investigation, the information contained in or accompanying this certification is true, accurate, and complete.”

Additional certification by relevant professionals is required if applicable. Any work that would constitute the “practice of engineering” as defined by NCGS 89C shall be performed under the responsible charge of, and signed and sealed by, a professional engineer licensed in the state of North Carolina. Any work that would constitute the “public practice of geology” as defined by NCGS 89E shall be performed under the responsible charge of, and signed and sealed by, a geologist licensed in the state of North Carolina.

SURVEY CERTIFICATION REQUIREMENTS

All surveys must comply with and be signed and sealed by a surveyor licensed in the state of North Carolina in accordance with NCGS 47-30 (plats and subdivisions; mapping requirements). In addition to NCGS 47-30, Appendix A, *Instructions for Preparing a Notice Plat for Recordation*, outlines the requirements for preparing a pre-1983 landfill Notice Plat and the associated recordation process.

REMEDIAL INVESTIGATION PHASE

The lateral and vertical extent of contamination must be delineated to unrestricted use or natural background concentrations in each area of concern for all contaminated media (soil, groundwater, sediment, surface water, and vapor) during the RI. The DEQ Risk Calculator may also be used to calculate cumulative risk for residential/unrestricted use at the perimeter soil sampling locations to satisfy delineation of soil contamination. However, at some sites, natural background concentrations (metals only) and anthropogenic background concentrations (PFAS, PAHs, PCB and/or Dioxins) or sample reporting limits may serve as delineation endpoints, provided that the laboratory's reporting limits are not elevated more than ten times the laboratory's MDLs, and/or published average MDLs for the method/analyte.

Subsequent delineation work phases must include all CERCLA hazardous substances detected (including those with qualified estimated concentrations), unless the contaminant concentration is proven through sampling to be the result of a naturally occurring condition, area wide anthropogenic background, or the contaminant is a common laboratory contaminant detected in concentrations below that detected in the method blank.

Per- and polyfluoroalkyl substances (PFAS) are now designated as hazardous substances by the United States Environmental Protection Agency (USEPA), so these compounds should be considered as potential contaminants of concern at a site when conducting a RI. PFAS are a complex group of chemicals found in the environment worldwide due to their widespread use in, but not limited to, aerospace, automotive, construction, textile and waterproof fabrics, paper and packaging, metal plating and etching, semi-conductor and electronic industries, food packaging, and non-stick coatings, and in firefighting foams. Sampling and analytical methods, fate and transport properties and toxicity data are evolving rapidly. The RI of sites with known or potential PFAS should aim for a comprehensive characterization of *all known and potential* PFAS sources and analytes. The lack of documentation of PFAS use is not sufficient to rule out a site from further investigation, because PFAS chemicals are generally not listed on Safety Data Sheets or other product inserts. See the Interstate Technology & Regulatory Council (ITRC) PFAS sampling and analytical methods fact sheet and supplemental information on PFAS assessment from USEPA that can be accessed using the links provided at the front of this document.

Note: Contaminants such as 1,4-Dioxane and several short-chained PFAS are highly water soluble and tend to travel with minimal degradation in groundwater. Concentrations of these chemicals, time since the release, groundwater flow velocity, local topography, preferential groundwater flow pathways (such as geologic fractures and foliations or subsurface utilities) and likelihood of aerial deposition (e.g., previous presence of a smokestack or fume hood at facility) should be considered when determining the distance from the property that may impact receptors.

Remediation to below the practical quantitation limits or site-specific natural background concentrations (for metals only) is not required. Final remediation goals should be based on acceptable risk and can be determined using the DEQ Risk Calculator and Risk Calculator User Guide (provided in a link at the front of this document).

At any time during the remedial investigation, the Unit must be notified within 24 hours of discovery, or as soon as feasible, of the following:

- 1. Contamination that has migrated beyond the source property**
- 2. Imminent Hazards**
 - a. Uncontrolled access by children to the contaminated media**
 - b. Detections in water supply wells, or**
 - c. Site contaminant vapors detected within occupiable structures**
- 3. Threat to sensitive environment**

The notification can be by phone or email and any notification delays should be shown to be unavoidable.

The Contractor PM will submit a work plan, cost estimate, and proposed schedule to perform RI phase activities for assigned sites. Each work plan should describe the plans for gathering data to build the conceptual site model (CSM). The Unit PM will review the submitted packet and will request edits to the packet or will provide approval of the proposed RI phase work activities. Requested edits to work plans and cost estimates (identifying personnel and materials) addressing the scope of work are typically delivered to the Unit PM within ten business days of receipt. The work plan and cost estimate must be based on information gathered during the initial site visit. Prior to conducting RI activities, the proposed work plan and cost estimate must be pre-approved by the Unit PM. Assign a task order number that increases sequentially for each specific activity, and each task order should be authorized, completed, and invoiced separately.

Generally, the pre-1983 landfills included in the Unit inventory have location-receptor summary reports on file, Contractor PMs should ensure completed work is not duplicated.

Required field procedures and sample collection techniques are outlined in Appendix B, *Field Procedures and Sample Collection Techniques*.

Information pertaining to asbestos containing materials, required handling protocols and notification procedures are provided in Appendix C, *Asbestos Containing Material*.

All soil and water samples must be submitted to either a laboratory certified under 15A NCAC Subchapter 02H .0800 or a laboratory currently part of the USEPA Contract Laboratory Program and analyzed in accordance with the requirements outlined in Appendix D, *Laboratory Analytical Parameters*. Laboratories analyzing vapor samples should have NELAP certification.

The Unit prefers that investigation-derived waste (IDW) be disposed of off-site at appropriate disposal or recycling facilities. In residential and public use areas, IDW will require off-property management unless it meets unrestricted use levels and disposal permission has been granted by the property owner. IDW cannot be transferred and discharged to another area of the property.

With Unit concurrence drill cuttings, fluids, muds, soils, and sampling purge water may be discharged or stored in the area of contamination from which it was derived and are not subject to RCRA permitting as long as the material:

1. Stays on site and remains in the contaminated area.

2. Is secured.
3. Does not increase the spread of contamination or concentrations in a particular medium.
4. Does not cause mobilization of contaminants.
5. Does not introduce contamination to uncontaminated soil or groundwater.
6. Does not cause an increase in contaminant concentrations.

The completion of the RI phase should establish the following:

1. The lateral and vertical extent of contamination in each area of concern for all contaminated media (soil, groundwater, sediment, surface water and vapor) delineated to unrestricted use standards.
2. Identify potential exposure pathways and receptors that may currently be, or may become, exposed to contamination.
3. Collect sufficient sampling data to support inclusion or elimination of chemicals at concentrations within naturally occurring or anthropogenic background levels, and to determine a cleanup level.
4. Characterize site conditions to address data gaps and refine the CSM to support the proposed remedy for each contaminated medium.

Once the Unit PM and the Contractor PM are satisfied that the RI phase is complete, the Contractor PM will request a meeting with the Unit PM and Unit Supervisor to review the site and ensure the criteria listed are complete. After the meeting, if all the criteria are complete, the Contractor PM will receive a request to submit a RI summary report using the template in Appendix E, *Remedial Investigation Summary Report Template*.

LABORATORY DATA QUALITY VALIDATION

A thorough review of each laboratory report should be conducted by the Contractor PM to ensure quality control standards have been met. Standard Operating Procedures (SOPs) should be requested from each laboratory so the process of analysis, quantitation limits (QLs), and quality control procedures are clear. Additionally, the Contractor PM must be familiar with each analytical method to understand the method requirements and identify if the laboratory meets those requirements.

VALIDATION STATEMENT

1. The Contractor PM must confirm the following items are included in each laboratory report before submitting to the Unit PM and provide a statement that the sample results are valid for the intended purpose.

CHAIN OF CUSTODY (COC)

1. Compare the date and time of sample collection with the date and time of analysis to ensure the samples were analyzed within the specified holding time.
2. The COC form must be completed and signed. Notes concerning what happened to the sample from the time of collection to the time the sample was received at the laboratory should be included in the COC.

LABORATORY CERTIFICATION

1. Laboratory certification should be in accordance with 15A NCAC 2H, USEPA contract laboratory, or NELAP certification for vapor samples. The laboratory certification numbers must be included in the laboratory report.

CASE NARRATIVE

1. A case narrative must always be included in a laboratory report, even if the laboratory did not encounter any issues. Any significant receipt, analysis, or quality assurance/quality control (QA/QC) problems should be documented in this section, and specifically:
 - a. Whether the holding times were met or exceeded.
 - b. Whether samples were received in good condition and at the required temperature/preservation.
 - c. Discussion of possible reasons for any quality control criteria outside acceptance limits.
 - d. Justification for any deviation from the methods, additional sample preparation, sample dilution, and analytical problems not rectified.
 - e. Observations regarding any occurrences that may affect sample integrity or data quality.

QUALIFIERS

1. Qualifiers are laboratory codes that provide comments on the data. Since each laboratory has its own qualifier nomenclature, the laboratory report should provide a description of the qualifiers used.

2. Careful attention should be given to low-biased analytical results, which indicate the results of a specific analyte are likely to be underestimated. Low-biased data may be used to show an exceedance of a regulatory standard or acceptable risk value. However, low-biased data may not be used to show that a regulatory standard or acceptable risk value **has not** been exceeded. In these cases, resampling may be necessary. In general, high-biased data are acceptable for use.

METHOD BLANK (MB) ANALYSIS

1. The MB should indicate there is no detection for any analytes. An analyte detection suggests potential cross-contamination. If the detected analyte in the MB is also detected in the sample, a more in-depth review may be needed.
2. Review surrogate analytes associated with the MB to ensure they are within the established control limits.

LAB CONTROL SAMPLE (LCS)

1. A LCS consists of ultra-pure water spiked with known concentrations of target analytes. The LCS tests whether the method can reliably measure the concentration of a target analyte when that analyte is spiked into an interference-free medium. To verify calculations are done correctly, perform a spot check using the equation below; where the spike concentration is the “true value” and the LCS result is the “actual value”.

$$(\text{Actual Value} \div \text{True value}) \times 100 = \% \text{ Recovery}$$

2. Compare the LCS % recovery values to the established % recovery limits. Highlight any analyte that exceeds this range and compare it with the sample. If there is a low-biased qualifier for a detected analyte, resampling may be necessary.
3. Review surrogate compounds associated with the LCS to ensure the calculations are done correctly and the % recovery is within the established reporting limits.

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

1. A MS sample is an environmental sample that has been spiked with known concentrations of target analytes. A matrix spike duplicate (MSD) is a split sample of the MS and is used to assess the precision of a method in that sample matrix. Since the MS/MSD analyses are performed on batches of samples, the sample selected to spike may be one on which a HRE is performed, one on which an HRE is not performed but within the same project, or outside the project. A MS/MSD performed on a sample evaluated in the HRE has the most relevance, within the same project may have some relevance, and outside the project may have little to no relevance.
2. To verify calculations are done correctly, perform a spot check using the equation below, where the spike concentration is the “true value” and the MS/MSD result is the “actual value”.

$$(\text{Actual Value} \div \text{True value}) \times 100 = \% \text{ Recovery}$$

If an analyte was detected in the MS/MSD sample, the pre-spike concentration must be subtracted from the MS and MSD results to calculate the actual value before calculating the % recovery of each. *Note: Use the absolute value of the difference.*

Example: Analyte in sample = 1.3 µg/L, MS Spike Conc. = 40 µg/L; MS Result = 55.9 µg/L, thus:

$$\text{MS \% Recovery} = [(55.9 - 1.3) \div 40] \times 100 = 137\%$$

MATRIX SPIKE & MATRIX SPIKE DUPLICATE:			4310609		4310610							
Parameter	Units	92714708012	MS	MSD	MS	MSD	MS	MSD	% Rec	% Rec	RPD	Qual
		Result	Spike Conc.	Spike Conc.								
1,1,1-Trichloroethane	ug/L	ND	20	20	30.9	28.7	154	143	60-140	7	M1	
1,1,2,2-Tetrachloroethane	ug/L	ND	20	20	26.9	24.9	135	124	60-140	8		
1,1,2-Trichloroethane	ug/L	ND	20	20	29.0	26.0	145	130	60-140	11	M1	
1,1-Dichloroethane	ug/L	ND	20	20	29.8	27.9	149	140	60-140	7	M1	
1,1-Dichloroethene	ug/L	ND	20	20	30.2	28.5	151	142	60-140	6	M1	
1,2,4-Trichlorobenzene	ug/L	ND	20	20	25.7	25.6	128	128	60-140	0		
1,2-Dibromo-3-chloropropane	ug/L	ND	20	20	29.2	27.0	146	135	60-140	8	M1	
1,2-Dibromoethane (EDB)	ug/L	ND	20	20	29.8	27.2	149	136	60-140	9	M1	
1,2-Dichlorobenzene	ug/L	ND	20	20	27.8	27.4	139	137	60-140	1		
1,2-Dichloroethane	ug/L	ND	20	20	29.3	27.1	146	136	60-140	8	M1	
1,2-Dichloropropane	ug/L	ND	20	20	30.0	27.2	150	136	60-140	10	M1	
1,3-Dichlorobenzene	ug/L	ND	20	20	27.3	27.0	136	135	60-140	1		
1,4-Dichlorobenzene	ug/L	ND	20	20	26.9	26.3	134	132	60-140	2		
2-Butanone (MEK)	ug/L	1.3J	40	40	55.9	49.2	137	120	60-140	13		
2-Hexanone	ug/L	ND	40	40	63.2	55.5	158	139	60-140	13	M1	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	40	40	58.5	51.0	146	127	60-140	14	M1	

3. Compare the MS % recovery and MSD % recovery values to their respective established % recovery limits. Highlight any analyte that exceeds this range to compare it with the sample.

Results of the MS/MSD are used to measure precision in the analysis by calculating a relative percent difference (RPD). Ideally, RPD values are below 30%; however, factors such as sample heterogeneity or samples with high contaminant concentrations can affect these results. Further evaluation is necessary if RDP values are greater than 30%. To verify RPD calculations are done correctly, perform a spot check for the RPD using the equation below. *Note: Use the absolute value of the difference.*

$$[(\text{MS} - \text{MSD}) \div \text{Mean of MS and MSD}] \times 100 = \text{RPD}$$

Example: MS = 29 µg/L and MSD = 26 µg/L; RPD = $((29-26) \div [(29+26)/2]) \times 100 = 11\%$

4. Review surrogate compounds associated with the MS/MSD to ensure the % recoveries are within the established reporting limits and the calculations for the RPD are correct.

DILUTIONS

1. Make sure dilutions have the appropriate qualifier and the reporting limit has been adjusted. Sometimes a diluted analyte may be reported as “non-detect”. The reporting limit will be much higher than expected, and data may be of limited use.

ANALYTICAL RESULTS

1. After the QC data has been reviewed, the analytical results for the samples are evaluated. Surrogate results should be within the established reporting limits for each sample.
2. Compare the sample results to the QC data. MB, LCS, and MS/MSD results affecting detected chemicals should be qualified on the analytical result pages and mentioned in the Case Narrative. If the qualifiers do not pertain to the analyte(s) detected in the sample, the analytical results may be used. If there are qualifiers associated with detected chemicals, those data should be evaluated for useability.

LABORATORY DATA QUALITY VALIDATION INFORMATION

For further information regarding laboratory data review and data evaluation, the following documents may be used:

1. Laboratory Data Review for the Non-Chemist, United States Environmental Protection Agency, October 2014 (provided in a link at the front of this document).
2. 2) Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A, Chapter 5, Data Evaluation), United States Environmental Protection Agency, December 1989 (provided in a link at the front of this document).

GENERAL REQUIREMENTS FOR REMEDIAL INVESTIGATION AND REMEDIAL ACTION PLAN WORK PLANS AND REPORTS

The following items may need to be included in RI and RAP work plans and reports.

1. All work proposals must include a description of:
 - a. Equipment and personnel decontamination procedures.
 - b. Measures that assure the health and safety of nearby residential and business communities by demonstrating that they will not be adversely affected by activities.
2. All work proposals, cost estimates, reports and other relevant correspondence submitted to the Unit PM must include the following:
 - a. Name of the pre-1983 landfill.
 - b. Pre-1983 landfill identification number.
 - c. Task order number.
 - d. Date(s) samples collected.
3. Before task activities begin, current site conditions must be photographed. The photographic record must include areas or objects that may be disturbed or affected. Restoration efforts and noteworthy items encountered during RI and RAP task activities must be documented. After RI and RAP task activities are complete, a photograph is required to document restoration. If pre-disturbed conditions are not documented to support complete restoration, the Contractor will be held responsible for all associated restoration expenses. Photographs must be submitted with a point of reference description in the report for the task. Unit PMs may identify specific photographs to include in reports.

4. The Contractor PM must ensure all personnel, including subcontractor personnel, engaged in intrusive field activities at the site comply with OSHA required health and safety training for hazardous waste sites and site health and safety plans. The Contractor PM must also ensure that personnel in the field are qualified to identify contaminated material and landfill waste.
5. All GPS coordinates must be submitted in the following format:
 - a. Latitude/longitude.
 - b. Decimal degrees to the fifth order.
 - c. Differentially corrected.
 - d. WGS84 format.
 - e. Sample ID (i.e. monitoring well, soil gas probe, and etc.).
 - f. Tabulated as an appendix in the RI Summary Report.
6. All supporting figures and maps should be drawn to scale and include, at a minimum, the following:
 - a. Bar scale (in feet and miles).
 - b. Legend with an explanation of all symbols.
 - c. North arrow.
 - d. Background topographic contours (light grey shading).

Note: Multiple maps or figures may be required to adequately display information.

7. All professional work (reports) must be signed and sealed by the appropriate State licensed professionals (geologist and engineers). A single document may require the signature and seal of more than one professional.

DEVELOPING THE CONCEPTUAL SITE MODEL

Evaluating current and potential future site related risk requires the development of a CSM where the exposure pathways and receptors are known. The level of detail in the CSM should match the complexity of the site and receptor impact (risk) from contaminated media. A detailed and complete CSM is the basis for selecting an appropriate and effective remedy for a site. The following RI activities include elements of a CSM that demonstrate site conditions are well understood, and a risk-based remedy will be protective of all current and potential future receptors.

Contamination extent, fate and transport, should be well understood to predict the ultimate extent of contamination. A risk-based remedy relies on the placement of institutional controls on all properties affected by the contamination. Adequately predicting the maximum extent of a groundwater contaminant plume and demonstrating a groundwater contaminant plume is predictable, stable or shrinking over time along with delineating hazardous/explosive vapors to unrestricted use standards is critical for proper placement of institutional controls.

The CSM flow chart displayed in Appendix F, *Conceptual Site Model*, must be complete and reflective of the site. Submit the CSM flow chart with each report showing completed activities and the completed CSM must be included in the RI summary report. The same figure should be updated and included in all subsequent report submittals to show the final CSM for the site.

REMEDIAL INVESTIGATION ACTIVITIES

Data for each tasked item must be submitted to the Unit in a report.

REMEDIAL INVESTIGATION HISTORICAL USE RESEARCH

8. Provide a summary of historical operations including, but not limited to:
 - a. A chronological listing of owners and operators.
 - b. Written documentation and interviews with individuals who have historical knowledge to provide verification of time operated.
 - c. Types of waste received.
 - d. Other relevant information about disposal operations.
 - e. Current site use.
 - f. Surrounding property use.
 - g. Street address of site.
 - h. Records, if available, indicating large quantities of industrial waste (more than expected at a municipal solid waste landfill for the time of operation).
 - i. Known or suspected areas of hazardous substance disposal (hot spots).

Important: If research indicates that paragraph 9(h) or 9(i) may be of concern at the WDA, contact the Unit. Waste characterization of exposed wastes or hot spots may be required prior to any other investigation activities.

9. Provide aerial photography and Sanborn Fire Insurance maps, if available, showing:
 - a. WDA conditions from pristine land.
 - b. WDA during the time of active operation.
 - c. WDA present conditions.
10. Provide copies of all non-financial encumbrances (easements and rights-of-way) and leases for the site.

REMEDIAL INVESTIGATION SITE LOCATION

11. Collect geographic coordinates (GPS) for the following:
 - a. WDA entrance.
 - b. Site entrance.
 - c. Points delineating the suspected perimeter of the WDA.

REMEDIAL INVESTIGATION REPORT INFORMATION

12. Provide a figure titled, "USGS Topographic Location Map," using the current published United States Geological Survey topographic map for the subject area that includes the following:
 - a. WDA estimated perimeter.
 - b. 500-foot radius from the estimated WDA perimeter.
 - c. 1,000-foot radius from the estimated WDA perimeter.
 - d. Maximum scale: 1" = 1,000'.

13. Provide a figure, titled “Vicinity Map,” that includes the following:
 - a. Property owner name, zoning classification, and property boundaries of property/properties containing the WDA.
 - b. WDA estimated perimeter.
 - c. Property owner name, zoning classification, and property boundaries of adjacent properties within 1,000 feet of the WDA perimeter.
 - d. Roadways.
 - e. Easements.
14. Provide a figure, titled “Surface Water Map,” that includes the following information pertaining to surface water bodies within 1,000 feet of the estimated WDA perimeter:
 - a. WDA estimated perimeter.
 - b. Locations of surface water bodies:
 - i. Streams (ephemeral, intermittent, and perennial).
 - ii. Division of Water Resources Index number.
 - iii. Lakes.
 - iv. Storm ditches.
 - c. Name and class of each water feature.
 - d. Flow direction of each water feature.
15. Provide a figure, titled “Water Supply Map,” that includes the following water supply sources within 1,000 feet of the estimated WDA perimeter:
 - a. WDA estimated perimeter.
 - b. Water supply wells.
 - c. Water supply springs.
 - d. Surface water intakes.
 - e. Distance in feet to the WDA perimeter.
16. Provide a table, titled “Water Supply Table,” that includes the following information cross referenced to the “Water Supply Map”:
 - a. Current water source owner.
 - b. Current water source user (if other than water source owner).
 - c. Address and Parcel Identification Number (PIN) of water source.

Note: water sources should be identified using available maps, online resources, local utility offices and by visual inspection.

17. Provide a figure, titled “Site Map,” (multiple maps may be used) that includes the following:
 - a. WDA estimated perimeter.
 - b. Accessibility issues.
 - c. Existing monitoring wells.
 - d. Paved areas.
 - e. Landscaped areas.
 - f. Type and extent of ground cover.
 - g. General surface conditions.
 - h. On-site structures.

- i. Sumps.
 - j. Septic systems.
 - k. Storm water conduits.
 - l. Above ground and underground utilities (electric, water, and sewer).
 - m. Non-financial encumbrances (easements and rights-of-way).
 - n. Leases.
 - o. Surface or exposed waste.
18. Provide a summary of a sensitive environment survey of the WDA and areas located within 1,000 feet of the estimated WDA perimeter. For each sensitive environment (as listed in Appendix G, *Sensitive Environment Survey*) identified, the following is required:
- a. Provide a summary of potential effects to sensitive environments identified for RAP options.
 - b. Tabulate results to include the following:
 - i. Contacts.
 - ii. Responses.
 - iii. Dates and types of communication.
19. Provide a figure, titled “Sensitive Environment Map,” that includes the delineated boundary of all sensitive environments across all properties containing, all or a portion of, the WDA and any additional property within 1,000 feet of the estimated WDA perimeter. The map should be prepared using the contacts provided in Appendix G.
20. Conduct and provide a summary of a geophysical survey delineating the horizontal extent of the WDA, including a 25-foot buffer beyond the estimated WDA perimeter using single frequency methods on a 100-foot grid. Describe any on-site features that may cause interference with the survey (i.e. railroad, electric fence, etc.).
21. Provide a figure, titled “Geophysical Survey Results Map” that includes the following:
- a. WDA perimeter determined visually and by the geophysical survey.
 - b. 25-foot buffer beyond the estimated WDA perimeter.
 - c. Point locations where survey grade GPS data delineating the WDA boundary were collected.
22. Provide a description of local/regional geologic and hydrogeologic conditions.

CONTAMINANT DELINEATION REMEDIAL INVESTIGATION ACTIVITIES

Prior to initiating invasive field work activities, the Contractor PM must contact the North Carolina One-Call Center (NC811) to request the identification of all publicly owned underground utilities. The Contractor PM must also ensure that publicly and privately-owned utilities are not damaged during invasive field work activities.

The clearing of vegetative material to enable access to proposed sampling points should be minimized. Hand tools must be used for clearing unless justification for use of heavy equipment is provided to and approved by the Unit PM.

All contaminant delineation work plans and reports must provide a summary of the planned and actual handling of investigation-derived wastes.

BACKGROUND SAMPLE COLLECTION

Naturally occurring or anthropogenic substances can be present in the environment and not associated with site conditions, actions, or activities. In North Carolina, several naturally occurring metals are prevalent in soil, sediment, groundwater and surface water. In addition, anthropogenic (human-made) background contaminants can include PFAS, dioxins, polycyclic aromatic hydrocarbons (PAHs), and/or polychlorinated biphenyls (PCBs). Indoor air may have non-site-related contaminants detected indoors or in outdoor ambient air, so establishing background conditions is important for all media.

Remediation of contaminants below naturally occurring or anthropogenic background concentrations is not required, even if the background levels are higher than State or Federal standards. However, the Unit does not allow comparison with published regional background values alone.

Sufficient sampling near the site should take place to quantify these potential contributions to the site in a legally defensible manner. Statistics play a major role in establishing background concentration levels, and methods vary widely in their degree of complexity, but in all cases, sample concentrations that are obvious outliers should not be used to establish background concentrations.

The *USEPA Region IV January 2014 Draft Final Human Health Risk Assessment Supplemental Guidance* (provided in a link at the front of this document) has recommended that two times the average site-specific background concentration can be used to eliminate contaminants of concern.

In vapor-intrusion investigations, identifying background contamination is especially complicated, for several reasons:

1. Some background contaminants are present in most structures.
2. Background concentrations can vary by orders of magnitude over the course of a day.
3. Some commercial/industrial facilities may have Permissible Exposure Limits under OSHA that may be much higher than vapor-intrusion limits, making indoor sources potentially huge in occupational settings.

For these reasons, the list of analytes during indoor sampling should be restricted to those measured in soil gas, including their daughter products. Care should be taken to rule out indoor air contaminants that may not be attributed to the site. An occupant survey and site walkover should identify known and potential indoor sources. Lab, container and ambient air contaminants should be ruled out. Sub slab soil gas samples should be collected concurrently with indoor air samples to identify inconsistent attenuation ratios.

When determining background levels for any media, the methodology used to eliminate background compounds or determine cleanup levels for site contaminants that are also present as background should be well-documented in reports submitted to the Unit. The risk of the background chemicals contributing to the site should be included in the initial risk calculation, and an unacceptable risk due to the contribution from background levels should be reported to the Unit for awareness.

Site-specific soil, sediment, surface water, and groundwater samples must be collected and analyzed in accordance with Appendix B, *Field Procedures and Sample Collection Techniques* and Appendix D, *Laboratory Analytical Parameters* to establish natural metals concentrations and area-wide anthropogenic background. Because natural metals concentrations are highly variable, the Unit recommends a minimum of 12 background soil samples for each site.

The laboratory PQL is a scientific standard pursuant to G.S. 150B-2(8a)(h). Substances which are not naturally occurring and for which no standard is specified shall not be permitted in concentrations at or above the PQL. For contaminants with an existing standard that is less than the laboratory's PQL, the PQL is the State standard per 15A NCAC 02L .0202(b1) when the analytical methods specified in Appendix B are used. In these cases, the laboratory's PQL cannot be elevated more than 10 times the Method Detection Limit (MDL) or published MDL for a contaminant.

NATURAL SOIL METALS CONCENTRATIONS

23. Collect a minimum of 12 site-specific background soil samples at locations that are not impacted by the landfill and away from roadways, railways, parking areas and other potential sources of contamination. Background soil samples should be collected from 0 to 12 inches below ground surface.

AREA-WIDE SOIL ANTHROPOGENIC BACKGROUND DUE TO AIRBORN RELEASES

24. Background soil samples should also be collected at any site having known or suspected PFAS, Dioxin, PAH, and/or PCB contamination to establish area-wide anthropogenic background levels. These samples should be collected at various distances from the site. If the results indicate over a large area, no increase in concentration toward the site and after any obvious outliers are removed, the upper end of the range of concentrations detected (or preferably the 95% UCL) can be used as the anthropogenic level.

NATURAL GROUNDWATER METALS CONCENTRATION

25. Install permanent groundwater monitoring well(s) to establish natural background concentrations of metals. The monitoring well(s) should be installed upgradient of the WDA and sampled a minimum of four times to generate an average concentration for each analyte.

Arsenic and 1,2-dichloropropane are sometimes found in groundwater due to normal application of pesticides. Other pesticides, if applied properly, are not as commonly found in groundwater due to their lower solubility. Many former agricultural properties, however, will have levels of pesticides or nitrates remaining in soil due to routine application. Federal and state laws generally exempt concentrations associated with normal application of agricultural chemicals. Overuse and improper use do not qualify for that exemption. If the presence of agricultural chemicals can be shown to be due to normal application, their remediation is not required by the Inactive Hazardous Sites Response Act (IHSRA) and by most state and federal remediation law.

SURFACE WATER AND SEDIMENT BACKGROUND CONCENTRATION

26. Collect surface water and sediment samples upstream of the WDA to establish natural or anthropogenic background concentrations. If contamination is found upstream of the site in concentrations greater than the downstream concentrations, downstream delineation may not be necessary.

BACKGROUND SAMPLE RESULTS

27. Provide a figure(s), titled “Background Sample Results Map” that depicts the location of all background samples.
28. Provide a table, titled “Background Sample Results Table,” that summarizes the results of collected background soil, sediment, groundwater, and surface water samples. Show the average concentration and 2x the average concentration for each analyte. The results are not compared to any standards, but instead are used to establish natural background concentrations at the site and to assist with establishing remediation goals.

WASTE DISPOSAL AREA DELINEATION/THICKNESS AND SURFACE WASTE CHARACTERIZATION

29. Determine the perimeter and thickness of the WDA by completing the following:
 - a. Advance hollow stem auger (HSA) borings or other methods (test pits) around the perimeter of the WDA as depicted by the geophysical survey and/or historical information. The distance between borings is site specific considering property boundaries, utilities, steep slopes, and other items where a more accurately characterized Site boundary will enable a more effective remedial action plan.
 - b. If waste is not encountered in the initial boring, offset additional borings in the direction of the estimated WDA until waste is encountered.
 - c. If waste is encountered in the initial boring, offset additional borings in the direction away from the estimated WDA until no waste is encountered.
 - d. Extend borings a minimum of ten feet below ground surface (bgs) unless waste is encountered (delineation of boundary).
 - e. Extend borings along at least two perpendicular transects through the WDA to determine the thickness of the WDA. The size and shape of the WDA should be considered when determining the total number of borings needed to provide a general waste volume.
 - f. Collect GPS coordinates for the center of the delineated WDA.
30. Provide a figure, titled “WDA Delineation,” that includes the following:
 - a. Unique identifier for each boring.
 - b. Locations of all borings.
 - c. Perimeter of WDA based on borings or other method.
 - d. Location and approximate volume of surface waste.
 - e. Location and approximate volume of buried waste.
 - f. Parcels and PIN containing waste and/or contaminated media.
 - g. Acres of waste determined by the delineated boundary.

- h. Acres for all parcels containing waste and/or contaminated media.
31. Provide a table, titled “WDA Delineation,” that includes the following:
- a. Unique identifier for each boring.
 - b. Total depth of each boring.
 - c. Depth to waste from the surface.
 - d. Waste type (if applicable).
 - e. Lithologic description based on Unified Soil Classification System.
32. Characterize surface waste by completing the following:
- a. Identify and describe the location, volume and type of surface waste related to each parcel containing the WDA.
 - b. List tires and white goods separately.
 - c. Identify and describe the types of physical hazards found at the WDA.
 - d. Describe the potential mobility of surface waste related to erosional features, stormwater channels, streams, flooding etc.
33. Provide a figure, titled “Location of Surface Waste,” that includes the location of surface waste on each parcel containing the WDA.

ABOVE GROUND VAPOR SURVEY

For larger sites with consistent terrain and no known hot spots, a larger grid spacing could be used.

34. Evaluate the potential for above ground vapors by collecting landfill gas readings across the WDA on a 50-foot grid using field instrumentation. Reference the geophysical survey or the WDA delineation maps for the location and extent of the WDA. At each sampling point, collect measurements in accordance with the following:
- a. Instruments must run for at least 30 seconds or as specified in the manufacturer’s instructions before recording the measurement.
 - b. Collect measurements no more than six inches above the ground surface.
 - c. Do not perform the above ground vapor evaluation on rainy or windy days or during a period of changing barometric pressure.
 - d. Record background measurements upwind of, but in close proximity to the WDA.
 - e. Collect the following parameters at each sampling point and report each parameter in the units as outlined in Appendix B:
 - i. Methane.
 - ii. Oxygen.
 - iii. Carbon dioxide.
 - iv. Hydrogen sulfide.
 - v. Total volatile organic compounds.
 - f. Collect the following parameters hourly during the above ground vapor evaluation and report each parameter in the units as outlined in Appendix B:
 - i. Barometric pressure.
 - ii. Ambient temperature.
 - iii. Humidity.

- g. Place temporary flagging (i.e. wooden stakes) at all grid points with detectable concentrations of any of the contaminants listed in paragraph 34e.
- h. Recheck each of the grid points with detectable concentrations of any landfill gas before leaving the WDA.
- i. Collect GPS coordinate data for all sampling points.
- j. If any contaminants are detected, a second confirmation survey may need to be conducted on a later day.

35. Provide a figure, titled “Above Ground Vapor Survey,” that includes the following:

- a. Unique identifier for each sampling node.
- b. Locations of all above ground vapor sampling points.
- c. Locations of background sampling points.
- d. Highlight, or otherwise designate, where contaminants of concern were detected.

36. Provide a table, titled “Above Ground Vapor Survey,” that includes the following:

- a. Unique identifier for each sampling node.
- b. Field measurement results for all survey events as outlined in paragraph 34.

EVALUATION OF WDA EXISTING SOIL COVER AS THE PERMANENT SOIL COVER SYSTEM & CONFIRMATION SAMPLING FOR AREAS WHERE WASTE HAS BEEN REMOVED

Soil cover evaluation may be applicable for sites that meet specific criteria. If a site currently does not have trees covering the WDA, the thickness and quality of the existing soil cover could be considered. If grubbing activities are needed, the existing soil cover thickness and quality may not be evaluated due to potentially contaminating the soil during grubbing.

For an existing soil cover to qualify as the permanent soil cover, the existing soil cover must be a minimum of 12 inches thick, be free of any waste material, and meet unrestricted use standards.

37. Establish a 100-foot by 100-foot grid (roughly ¼ acre sectors) across the delineated WDA, subject property if the WDA has not been delineated, or excavation area where waste was removed. Do not extend the grids beyond the delineated WDA, subject property boundary, or excavation. Depending on the size of the excavation, the grid spacing may be reduced. Submit a figure to the Unit PM showing proposed sample locations and 25-foot grid lines in each grid as depicted in Figure 1 (Soil Cover/Confirmation Sampling Locations) for approval prior to initiating sample collection.

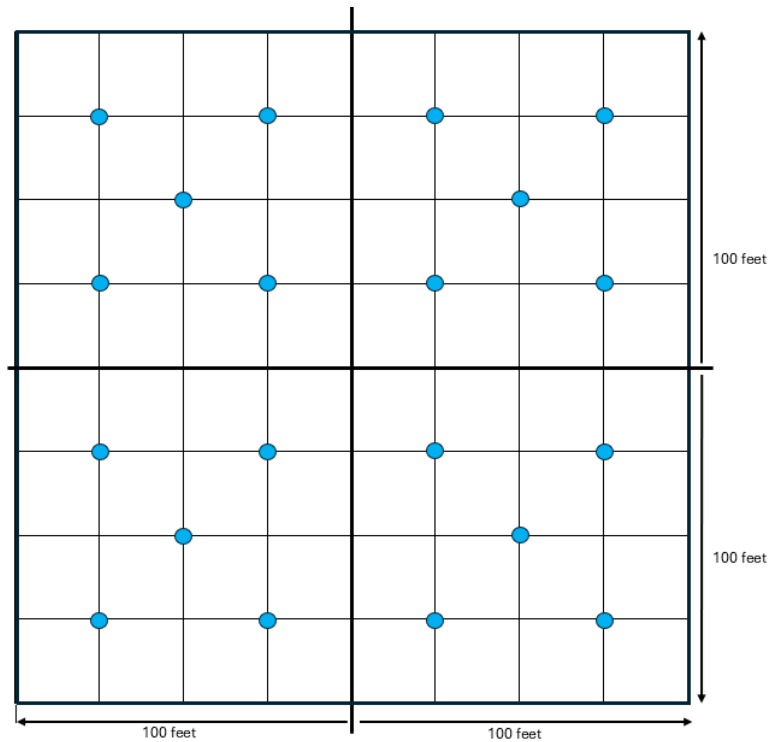


Figure 1: Soil Cover/Confirmation Sampling Locations.

The sample locations in each grid should be 25 feet in both directions from the grid intersection and one sample location in the center of the grid. If this is not possible, adjustments may be made in consultation with the Unit PM. Grids that are less than 10,000 square feet will need to include the same number of sample locations as a full grid and multiple contiguous grids may be combined to reach the maximum area of 10,000 square feet.

The composite soil sample should include five aliquots, one sample from each circle icon as shown in Figure 1. The discrete soil sample should be collected from the center circle icon of each 100-foot by 100-foot grid.

38. Collect soil cover or confirmation samples for laboratory analysis according to the following:
 - a. The top 12 inches of soil should be sampled to determine if the existing soil cover can be used as a permanent soil cover over the WDA or if the excavated area is sufficient to meet unrestricted use standards. Each aliquot for the composite sample and each discrete sample should be collected from 0 inches to 12 inches bgs.
 - b. The thickness of the existing soil cover over the WDA must be recorded at each sample location (composite and discrete) as depicted in Figure 1.
 - c. If there is no existing soil cover over the WDA at the designated sample location, document the absence of an existing soil cover and collect a sample from the location for compositing or the discrete sample.
 - d. In each grid, collect five aliquots, one from each circle icon as depicted in Figure 1 to create one composite sample per grid for analysis of metals (antimony, arsenic, barium, beryllium, cadmium, trivalent and hexavalent chromium, cobalt, copper, lead,

- manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc), semi-volatile organic compounds, 1,4-Dioxane, ammonia, sulfate, nitrates, and nitrites, .
- e. In each grid, collect one discrete sample from the center circle icon for analysis of volatile organic compounds.
 - f. Soil cover and confirmation samples must be collected in accordance with Appendix B, *Field Procedures and Sample Collection Techniques*.
 - g. Soil cover and confirmation analysis must be conducted in accordance with Appendix D, *Laboratory Analytical Parameters*.
39. Evaluate soil cover or confirmation sample analytical results by applying the following iterative truncation procedure:
- a. Compile an Excel table that includes all sample results to be used in the risk evaluation. The sample locations should be in rows, chemicals in columns. All sample results should be included, along with detection limits for non-detects. Screen the maximum concentration of all contaminants against the Environmental Protection Agency Regional Screening Level (EPA RSL) at the lower of 1) the incremental cancer risk (ICR) of 1.0E-06, and 2) a hazard quotient (HQ) 0.1. Only contaminants with maximum concentrations exceeding these levels will be entered into the risk calculator. In addition, if the PRLF program collected site-specific or regional background data (sampling area and total number of samples for regional background data sets will be determined by the PRLF program based on the area of interest), contaminants with a maximum concentration greater than 2 times the average site-specific or regional background concentration will be entered into the risk calculator. The maximum concentration vs. RSL and site-specific background comparison must be documented in the above-mentioned excel table. Below are examples of applications of this screening process.

Example 1: Background Calculation Example for Inorganics

Chemical	Area	Concentration (mg/kg)
Antimony	1	<0.142
	2	<0.111
	3	<0.104
	4	<0.131
2x average bkgd		0.244

If there are no detections, the background is calculated based on the detection limit.

Example 2: Background Calculation Examples for Inorganics

Chemical	Area	Concentration (mg/kg)
Antimony	1	<0.142
	2	1.3
	3	0.704 J
	4	<0.131
2x average bkgd		1.14

If there is a combination of detects and nondetects, the detection limit is used as a proxy concentration for the nondetects. J qualified samples are used at their full value.

Example 3: Screening using background and RSLs

Chemical	Maximum Concentration	2x average bkgd	RSL (Lower of CR= 10^{-6} and HI= 0.1)	Enter in Calculator?
Antimony	0.9	1.14	3.1	No (max < bkgd, RSL)
Arsenic	0.5	0.3	0.68	No (max < RSL)
Cadmium	1.1	1.4	0.71	No (max < bkgd)
Nickel	160	70	140	Yes
Acetone	1,700	NA	7,300	No (max < RSL)
Benzene	7	NA	1.2	Yes

- b. Areas with lead contamination exceeding the PSRG (for residential, either 200 mg/kg or 100 mg/kg if additional sources of lead are identified) should be removed from the risk evaluation and placed in the “potential remediation” category. The PSRG will be determined by completing the [Residential Lead Screening Level Checklist](#) and submitting it to DEQ with the recommended screening level.
 - c. Only contaminants with maximum concentrations exceeding the RSLs (ICR = $1.0E-06$, HI = 0.1) and 2 times the average site-specific or regional background concentrations should be entered into the DEQ Risk Calculator. The location of the concentrations entered must appear on the data input sheet.
40. To determine which areas exceed allowable risk limits, systematically remove areas from the original risk calculator (above). For each area removed, use a separate calculator, and each calculator should be saved. The calculator used for the first removal will be the original risk calculator. The calculator used for the second removal will be the calculator modified for the first removal, and so on. Only one location removal may be conducted per calculator.
- a. If the Cumulative Calculated Carcinogenic Risk > $1.0E-04$, replace the concentration of the chemical contributing the highest risk with the second highest concentration for that chemical. Repeat this process for all other chemicals associated with this location. Record the location(s) of the new maximum concentration(s) in the data input sheet.
 - b. Repeat Step 1 until the Cumulative Calculated Carcinogenic Risk < $1.0E-04$.
 - c. If any individual chemical Cumulative Calculated Non-Carcinogenic Hazard Quotient > 1.0, repeat step 1 until no individual chemical HQ > 1.0. The last calculator you modified for the carcinogenic risk will be the first calculator you use to start this process.
 - d. **Stop when no individual Calculated Non-Carcinogenic Hazard Quotients > 1.0.** Load the risk results into the Critical Effects Evaluation Tool (CEET). Submit the completed Request for Review of Critical Effects Evaluation form along with items 1, 3, 4, and 5 from the submittals list below.
 - e. After reviewing the critical effects evaluation, DEQ will either:
 - i. Ask for additional runs of the risk calculator, or
 - ii. Confirm the results of the critical effects evaluation.

41. Iterative Truncation Submittals:

- a. Excel table that includes all sample results to be used in the risk evaluation (number 1 from the beginning of this guidance).
- b. Map(s) depicting all sample locations.
- c. Pdf of the calculator data output sheets for each location removal. The associated excel spreadsheets will be requested if necessary.
- d. The excel version of the risk calculator for the last run.
- e. The excel version of the DEQ critical effects evaluation.
- f. Each area removed using the above procedure will require a separate risk evaluation. For example, if you removed Area 1 from the evaluation because of a risk exceedance, you would run a separate risk calculation for all the chemicals detected in Area 1 that exceeded the initial screen (RSL greater than 1.0E-06 or HI greater than 0.1 *and 2 times the average site-specific background concentration*). The data output sheets can be submitted as a pdf, the associated excel spreadsheets will be requested if necessary.
- g. If a risk evaluation is needed in an area where a duplicate sample was collected, the original and duplicate sample results should be combined. If, for a specific chemical, one sample was non-detect and the other a detection, enter the higher of the detected concentration or $\frac{1}{2}$ the detection limit. If a chemical was detected in both the original and duplicate sample and relative percent difference is less than 50% for soil, enter the average concentration. If the RPD is greater than 50%, enter the higher concentration.

42. Provide the following figures for the evaluation of WDA existing soil cover as the permanent soil cover system or confirmation sampling process that includes the following:

- a. Site map with actual soil sample collection locations (based on GPS data) in each grid to include grid numbering and the WDA or property boundary.
- b. Existing soil cover thickness results over the WDA or subject property in three-inch increments, 3, 6, 9, and 12 inches to include grid numbering. The soil thickness data can be displayed by grid using average thickness for the samples collected in each grid.
- c. Lead concentrations per grid using transparent red for concentrations exceeding 200 mg/kg.
- d. Other contaminants of concern per grid using transparent purple for concentrations exceeding applicable risk thresholds based on the data reduction and critical effects evaluation process.
- e. Areas of existing soil cover less than 12 inches in thickness using black line cross hatching per grid.
- f. Comprehensive site map showing each grid with grid numbering, lead concentrations exceeding 200 mg/kg, other contaminants of concern exceeding unrestricted use standards, and existing soil cover less than 12 inches and/or existing soil cover containing waste material. This figure is intended to show the grids that need to be addressed for a risk-based remedial action plan.

43. Provide tables for the evaluation of WDA existing soil cover as the permanent soil cover system or confirmation sampling that includes the following:

- a. Unique identifier for each soil cover sample.
- b. PID results.
- c. Analytical results from all cover soil sampling events.

- d. Identify concentrations used for DEQ risk calculator.
- e. Identify concentrations exceeding background sample results.

SURFACE WATER/SEDIMENT/SEEP INVESTIGATION

If contamination is detected in any downstream sample above upstream conditions, additional surface water/sediment assessment will be needed. The downstream extent of contamination must be delineated to concentrations less than or equal to the 15A NCAC 02B standards for surface water or upstream concentrations whichever is higher.

There is no risk-based alternative for surface waters, so applicable 15A NCAC 02B standards must always be met for perennial and intermittent streams.

Remediation goals for sediment should be based on the same procedures used to establish remedial goals for soil. The sediment remedial goals should be based on the residential health-based soil remediation goals (or the upstream “background” concentrations if higher) and should be based on concentrations that ensure contaminated sediment will not cause exceedance of the remediation goals for groundwater or surface water.

- 44. Collect surface water and sediment samples according to the following:
 - a. Samples must be collected in a downstream to upstream progression and must represent the potential area of impact from the WDA.
 - b. Surface water and sediment samples must be collected in accordance with Appendix B, *Field Procedures and Sample Collection Techniques*.
 - c. Surface water and sediment sample analysis must be in accordance with Appendix D, *Laboratory Analytical Parameters*.
- 45. Collect one set of sediment and water samples from each seep location observed on-site.
- 46. Provide a figure, titled “Surface Water/Sediment/Seep Investigation,” that includes the following:
 - a. Unique identifier for each surface water/sediment/seep sample.
 - b. Location of surface water samples.
 - c. Location of sediment samples.
 - d. Location of seep samples.
 - e. Location of samples exceeding 15A NCAC 02B standards, upstream background concentrations, and unrestricted use standards for soils.
- 47. Provide a table, titled “Surface Water/Sediment/Seep Investigation,” that includes the following:
 - a. Unique identifier for each surface water/sediment/seep sample.
 - b. Analytical results compared to 15A NCAC 02B and upstream background for surface water.
 - c. Identify concentrations used for DEQ risk calculator.
 - d. Identify concentrations exceeding background sample results.

If hazardous substances are present in groundwater, the lateral and vertical extent of all contaminant plumes must be delineated to develop a conceptual site model. Development of the conceptual site model may include complex hydrogeology such as fractured bedrock aquifers, complex contaminant behavior, and dense non-aqueous phase liquids. The lateral and vertical extent of the groundwater contaminant plumes must be defined to the 15A NCAC 02L standards.

Temporary monitoring wells are not permitted. Permanent monitoring wells should be used at all sites and well installation and abandonment must comply with the current codified edition of 15A NCAC 02C well construction standards. Permanent monitoring wells are necessary to support multiple sampling events for site characterization and completion of the remedial investigation. Contractor PM must submit a GW-1 Well Construction Form to DEQ and obtain approval from the applicable regional office prior to installation of all monitoring wells.

Subsequent monitoring well installation and sampling work phases must include all CERCLA hazardous substances detected (including those with qualified estimated concentrations) and degradation products, unless the contaminant concentration is proven through sampling to be the result of a naturally occurring condition, area wide anthropogenic background or the contaminant is a common laboratory contaminant detected in concentrations below that detected in the method blank.

For a monitoring well to be considered a delineation end point, it must have a minimum of four sampling events that meets unrestricted use standards unless the contaminant concentration is proven through sampling to be the result of a naturally occurring condition, area wide anthropogenic background or the contaminant is a common laboratory contaminant detected in concentrations below that detected in the method blank.

48. Permanent groundwater monitoring wells must be installed according to the following:

- a. Advance soil borings outside of the delineated WDA to groundwater.
- b. Install a permanent groundwater monitoring well in each boring.
- c. Various drilling methods such as hollow stem auger, air rotary, sonic..., may be used depending on the depth to groundwater.
- d. Flush mount versus stick up well covers will be determined based on property usage.

49. In-waste permanent groundwater monitoring wells (used when there is a suspected hot spot) must be installed according to the following:

- a. Advance soil borings within the WDA.
- b. Install a permanent Type III groundwater monitoring well in each boring, double case the well to the waste-soil interface.
- c. Various drilling methods such as hollow stem auger, air rotary, sonic..., may be used depending on the depth to groundwater.
- d. Flush mount versus stick up well covers will be determined based on property usage.

50. Bedrock surface permanent groundwater monitoring wells must be installed according to the following:

- a. Advance soil borings outside of the delineated WDA to the top of bedrock.
- b. Install a 2-inch diameter permanent groundwater monitoring well in each boring.
- c. Install ten feet of screen.

Important: All borings must be logged in the field.

51. Provide the following for each permanent monitoring well:

- a. Boring log information must include but is not limited to:
 - i. Top of ground elevation.
 - ii. Detailed soil description and lithology at depths.
 - iii. Depth of groundwater observed during drilling.
 - iv. Notable reaction of drill rig during advancement.
 - v. Depth of competent rock encountered.
 - vi. Detailed notes/remarks.
- b. A well construction diagram.
- c. GW-1 well construction form.
- d. Ground water elevation for each well.
- e. Details of well development.
- f. Details of well abandonment.
- g. Water level measurements for all available groundwater wells.
- h. One groundwater sample from each well must be collected in accordance with Appendix B, *Field Procedures and Sample Collection Techniques*, and the groundwater sample analysis must be in accordance with Appendix D, *Laboratory Analytical Parameters*.
- i. Well construction details in a table and including the following:
 - i. Installation date.
 - ii. Top of casing elevation.
 - iii. Ground surface elevation.
 - iv. Total well depth.
 - v. Well screen interval.
 - vi. Depth to groundwater.
 - vii. Groundwater elevation.

52. Provide a figure(s), titled “Groundwater Investigation,” that includes the following for each sampling event:

- a. Unique identifier for each monitoring well.
- b. Location of permanent monitoring wells.
- c. Groundwater potentiometric surface and flow direction map to include land surface topography and surface water features.
- d. Location of samples exceeding 15A NCAC 02L standards
- e. Area representing the 15A NCAC 02L standard exceedance (contaminant plume) displayed on the figure.
- f. Notes section on the figure with the following information:

Risk values shown in **bold** (red text) exceed the DEQ risk calculator acceptable limits of 1.0E-04 for carcinogenic risk and 1.0 for the Hazard Index.

- g. Groundwater to Indoor Air risk calculator results for each monitoring well with a call out box including the following information and the abbreviations shown in parentheses may be used:
- Residential carcinogenic risk (RES CR).
 - Residential hazard index (RES HI).
 - Non-residential carcinogenic risk (NON-RES CR).
 - Non-residential hazard index (NON-RES HI).

Example of monitoring well call out box.

<u>MW-001</u>	<u>Date</u>
RES CR:	7.3E-07
RES HI:	1.6E+01
NON-RES CR:	4.7E-06
NON-RES HI:	1.3E+00

53. Provide a table, titled “Groundwater Investigation,” that includes the following:
- Unique identifier for each monitoring well.
 - Identify concentrations exceeding natural background sample results.
 - Analytical results compared to 15A NCAC 02L and upgradient natural background concentrations for groundwater.
 - Identify concentrations used for DEQ risk calculator.
54. Monitoring well construction and abandonment documentation must be submitted to the NC Division of Water Resources and to the County Health Department responsible for the county in which the monitoring well is located and included in the report to the Unit.

POTABLE WATER SUPPLY WELL SAMPLING

55. Collect a potable water supply sample from each potable water supply well that is within 1,000 feet of the delineated WDA boundary according to the procedure outlined in Appendix B, Section 8.

If the remedial investigation is complete, only analyze contaminants of concern detected in groundwater and their degradation products identified during the groundwater investigation. If the remedial investigation is not complete, only analyze for VOCs to include all US EPA Target Compound List analytes.

The Contractor PM will be responsible for completing the laboratory data quality validation procedure, as outlined in this document, and submitting the laboratory data along with the validation statement to the Unit PM within 24 hours of receipt.

The Unit PM will request a health risk evaluation (HRE) from the DWM toxicologist for any detected analytes in the potable water supply well laboratory report. Attach the appropriate cover letter to the HRE and mail/email to the potable water supply well owner. If the HRE states the potable water is not safe for consumption, bottled water must be delivered to the potable

water supply well owner. The Unit PM will contact the Contractor PM to coordinate delivery of bottled water and contact the potable water supply well owner to inform them of the results and pending delivery of bottled water.

56. Provide a figure, titled “Potable Water Supply Well Sampling,” that includes the following:
- Unique identifier for each potable water supply well.
 - Location of each potable water supply well.
 - Analytical results detected above applicable Federal Maximum Contaminant Levels (MCL), 15A NCAC 02L standards or Interim Maximum Allowable Concentrations (IMAC) if final standards are not available.
57. Provide a table, titled “Potable Water Supply Well Sampling,” that includes the following:
- Unique identifier for each potable water supply well.
 - Analytical results compared to MCL, 15A NCAC 02L standards or IMAC if final standards are not available.

LANDFILL & SOIL GAS PROBE INSTALLATION AND MONITORING

The DEQ Risk Calculator can calculate cumulative risk to indoor air using groundwater, soil gas or indoor air data as the vapor intrusion evaluation progresses. Where a property is vacant or no structures exist to evaluate indoor air, soil gas data will be used to determine whether indoor air must be evaluated in future structures.

TCE INDOOR AIR IMMEDIATE ACTION LEVELS

The DWM implemented Trichloroethylene (TCE) vapor intrusion indoor air action levels in 2019. The TCE-sensitive population at risk is women of child-bearing age (defined as age 15 to 50 years), and the action level for each scenario is as follows:

- Residential setting action level = **2.1 micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$)**.
- Non-residential setting action level = **8.8 $\mu\text{g}/\text{m}^3$** .

Based upon information from the USEPA and other scientific studies, the DWM has determined that when the inhalation action level concentration has been exceeded and the TCE-sensitive population may be exposed, immediate actions must be taken to report the concentrations to the DWM, notify the exposed population, and take response actions to reduce the exposure to below the action level concentration as quickly as possible (within 72-hours or less for women in their first trimester of pregnancy).

If unacceptable TCE levels are reported in indoor air, procedures for notifying the Branch, implementing mitigation response actions, and communicating with building occupants must be followed. Fact sheets are available to communicate information to the public for both the residential and workplace scenarios. More information on procedures and resources can be accessed using the link to the *DWM Vapor Intrusion Guidance* webpage provided at the front of this document.

INDOOR AIR MITIGATION LEVELS FOR RESTRICTED PROPERTY USE

Indoor air levels that do not meet acceptable risk for the property's use will require active mitigation with engineered controls. If the building is occupied and VOC indoor air levels exceed acceptable risk, temporary air purification units should be installed immediately with concurrent and ongoing monitoring until a permanent vapor intrusion mitigation system (VIMS) can be installed and tested for effectiveness. Plans for a permanent system should be provided in a sitewide or interim RAP and include the recordation of PRLF-approved LURs that specify the monitoring and maintenance requirements of the VIMS.

58. Landfill Gas Probe (LFGP) & Soil Gas Probe (SGP) Installation:

LFGPs must be installed with a minimum spacing of one probe every two acres across the delineated WDA. If the WDA is less than two (2) acres in size, install at least one probe. If the WDA is greater than 20 acres in size, the total number of probes may be adjusted based on site conditions.

- a. Install LFGPs within the delineated WDA according to the minimum requirements outlined in Appendix B.
- b. Install SGPs or LFGPs outside the delineated WDA according to the minimum requirements outlined in Appendix B.
- c. If gas probes cannot be constructed according to the approved work plan and minimum requirements as outlined in Appendix B, contact the Unit PM, and document any variances.

59. Gas Sample Collection:

Landfill & Soil Gas Sampling should be conducted in accordance with the NCDEQ DWM Vapor Intrusion Guidance (provided in a link at the front of this document).

Gas sample collection should also be conducted in accordance with Appendix B (*Field Procedures and Sample Collection Techniques*) and Appendix D (*Laboratory Analytical Parameters*).

The following sampling methods and parameters are used to establish landfill and soil gas conditions.

- a. Field Instrument Measurements
 - i. Methane
 - ii. Hydrogen sulfide
 - iii. Oxygen
 - iv. Carbon dioxide
 - v. Ambient barometric pressure
 - vi. VOCs
 - vii. Ambient temperature at time of screening
 - viii. Relative humidity
- b. Summa Canister Sample Collection
 - i. VOCs and methane

- c. Tedlar Bag Sample Collection
 - i. Hydrogen sulfide
- d. SiloCan Sample Collection
 - i. VOCs
 - ii. Methane
 - iii. Hydrogen sulfide
- e. Sorbent Tube Sample Collection
 - i. Mercury
 - ii. Other contaminants of concern
- f. Flux Chamber Installation and Sample Collection
 - i. VOCs
- g. Passive Soil Gas Sample Collection
 - i. VOCs
- h. Gas Probe Inspection
- i. Gas Probe Gauging (only if blockage or water intrusion suspected)
- j. Gas Probe Static and Differential Pressure Measurements
- k. A representative picture of the setup for each type (summa cans, sorbent tubes, etc.) of gas sampling (one per event).

60. Provide a figure, titled “Gas Probe Results,” that includes the following:

- a. Unique identifier for each gas probe.
- b. Location of gas probes.
- c. Notes section on the figure with the following information:
 - Risk values shown in **bold** (red text) exceed the DEQ risk calculator acceptable limits of 1.0E-04 for carcinogenic risk, 1.0 for the Hazard Index, or the Lower Explosive Limit for methane of 5% by volume.
- d. Soil Gas to Indoor Air risk calculator results for each gas probe plus percent by volume of methane. Each gas probe should have a call out box with the following information and the abbreviations shown in parentheses may be used:
 - i. Residential carcinogenic risk (RES CR).
 - ii. Residential hazard index (RES HI).
 - iii. Non-residential carcinogenic risk (NON-RES CR).
 - iv. Non-residential hazard index (NON-RES HI).
 - v. Percent by volume of methane.

Example of gas probe call out box.

<u>LFGP/SGP-001</u>	<u>Date</u>
RES CR:	7.3E-07
RES HI:	1.6E+01
NON-RES CR:	4.7E-06
NON-RES HI:	1.3E+00
Methane by Volume:	45%

- e. Identify the gas probes with detections using field instruments in accordance with Appendix B, (*Field Instrument Parameters and Equipment Requirements*).

61. Provide a table, titled “Gas Probe Results,” that includes the following:
- Unique identifier for each gas probe.
 - Field measurement results as outlined in Section 58.
 - Contaminant concentrations for all detected compounds in summa canister samples.
 - Identify concentrations used for DEQ risk calculator.
 - Risk calculator results for each sample location.

METHANE ASSESSMENT

62. Methane assessment must be completed if methane is greater than 1.25% by volume (12,500 ppm of methane in air equals 1.25% by volume or 25% of the LEL) in any landfill or soil gas probe and if existing or future structures are located on or within 1,000 feet of the delineated WDA boundary. Delineate methane until the percent by volume is less than 1.25% in soil gas (or no more than global background). Static and differential pressure readings should be collected during methane assessments.

STRUCTURAL VAPOR INTRUSION

Once the groundwater investigation and WDA landfill/soil gas probe sampling is complete, a structural vapor intrusion investigation will be necessary if contaminants exceed the target risk in the DEQ risk calculator. Samples should only be analyzed for COCs previously detected and their degradation products. The structural vapor intrusion investigation should evaluate current and future structures on or within 500 feet of the WDA perimeter and within 100 feet of the perimeter of groundwater volatile organic contaminant plumes. Refer to DWM Vapor Intrusion Guidance Document.

If methane is detected above 5% by volume in soil gas within 100 feet of an occupied structure, methane alarms should be installed, and additional evaluation and/or mitigation should be conducted.

Important: Contact the Unit PM immediately upon receipt of any indoor air samples that exceed the DEQ risk calculator target risk or if methane is detected above 1.25% by volume.

63. Collect soil gas samples using batch-certified Summa canisters for VOC analysis in accordance with Appendix D, *Laboratory Analytical Parameters*. Sample collection must comply with the DWM Vapor Intrusion Guidance (in particular, collection protocols and Appendix B within the DWM Vapor Intrusion guidance).
64. Provide a map(s), titled “Soil Gas Results,” that includes the following:
- Unique identifier for each soil gas probe.
 - Location of soil gas probes.
 - Notes section on the figure with the following information:
Risk values shown in **bold** (red text) exceed the DEQ risk calculator acceptable limits of 1.0E-04 for carcinogenic risk, 1.0 for the Hazard Index, or the Lower Explosive Limit for methane of 5% by volume.

- d. Soil Gas to Indoor Air risk calculator results for each gas probe plus percent by volume of methane. Each gas probe should have a call out box with the following information and the abbreviations shown in parentheses may be used:
 - i. Residential carcinogenic risk (RES CR).
 - ii. Residential hazard index (RES HI).
 - iii. Non-residential carcinogenic risk (NON-RES CR).
 - iv. Non-residential hazard index (NON-RES HI).
 - v. Percent by volume of methane.

Example of gas probe call out box.

<u>LFGP/SGP-001</u>	<u>Date</u>
RES CR:	7.3E-07
RES HI:	1.6E+01
NON-RES CR:	4.7E-06
NON-RES HI:	1.3E+00
Methane by Volume:	45%

65. Provide a table(s), titled “Soil Gas Probe Results,” that includes the following:
 - a. Sample date(s).
 - b. Sample probe depth (if applicable).
 - c. Contaminant concentrations for all detected compounds in summa canister or passive sampler analytical results.
 - d. Concentrations used for DEQ risk calculator.
 - e. Risk calculator results for each sample location
66. Evaluate laboratory analysis data using the DEQ risk calculator and submit the results to the Unit PM.
67. Collect crawlspace gas samples for laboratory analysis from buildings in accordance with the following:
 - a. Samples must comply with the DWM Vapor Intrusion Guidance (in particular, collection protocols and Appendix B within the DWM Vapor Intrusion guidance).
 - b. Survey the crawlspace for background sources.
 - c. If present, remove background sources 24 to 72 hours prior to sample collection.
 - d. Document background sources that cannot be removed and collect photos.
 - e. Screen for the following using field instrumentation to locate points of vapor entry and background sources to assist in determining sample locations, and report each parameter in the units as outlined in Appendix B:
 - i. Methane.
 - ii. Oxygen.
 - iii. Carbon dioxide.
 - iv. Barometric pressure.
 - v. Hydrogen sulfide.
 - vi. Volatile organic compounds (VOCs).
 - vii. Temperature.

- viii. Humidity.
- f. Confirm that exhaust fans, clothes dryers, fireplaces, and other items that may induce short term pressure changes are inoperable during the sampling event.
- g. Collect samples using batch-certified Summa canisters or passive samplers and analyze for only contaminants detected at the site and their degradation products.
- h. Collect an exterior upwind background air sample initiated one hour prior to the collection of the crawlspace samples.
- i. Continuous supervision of the equipment by the consultant performing the test or secured access is required.
- j. Before moving to indoor air sampling, evaluate laboratory analysis data using the DEQ risk calculator and submit the results to the Unit PM.
- k. Notes section on the figure with the following information:
 - Risk values shown in **bold** (red text) exceed the DEQ risk calculator acceptable limits of 1.0E-04 for carcinogenic risk, 1.0 for the Hazard Index, or the Lower Explosive Limit for methane of 5% by volume.
- l. Indoor Air risk calculator results for crawl space sample plus percent by volume of methane. Each crawl space sample should have a call out box with the following information and the abbreviations shown in parentheses may be used:
 - i. Residential carcinogenic risk (RES CR).
 - ii. Residential hazard index (RES HI).
 - iii. Non-residential carcinogenic risk (NON-RES CR).
 - iv. Non-residential hazard index (NON-RES HI).
 - v. Percent by volume of methane.

Example of indoor air call out box.

<u>LFGP/SGP-001</u>	<u>Date</u>
RES CR:	7.3E-07
RES HI:	1.6E+01
NON-RES CR:	4.7E-06
NON-RES HI:	1.3E+00
Methane by Volume:	45%

68. Collect indoor air samples for laboratory analysis for buildings and locations in accordance with the following:
- a. Samples must comply with the DWM Vapor Intrusion Guidance (in particular, collection protocols and Appendix B within the DWM Vapor Intrusion guidance).
 - b. Survey the interior of the structure for background sources.
 - c. If present, remove background sources 24 to 72 hours prior to sample collection.
 - d. Document background sources that cannot be removed and collect photos.
 - e. Screen for the following using field instrumentation to locate points of vapor entry and background sources to assist in determining sample locations, and report each parameter in the units as outlined in Appendix B:
 - i. Methane.
 - ii. Oxygen.
 - iii. Carbon dioxide.

- iv. Barometric pressure.
- v. Hydrogen sulfide.
- vi. Volatile organic compounds (VOCs);
- vii. Temperature.
- viii. Humidity.
- f. Confirm that exhaust fans, clothes dryers, fireplaces, and other items that may induce short term pressure changes are inoperable during the sampling event.
- g. Collect samples using individually certified Summa canisters or passive samplers and analyze for only contaminants detected at the site and their degradation products.
- h. Collect an exterior (ambient air) upwind background sample in accordance with DWM Vapor Intrusion Guidance (provided in a link at the front of this document).
- i. Continuous supervision of the equipment by the consultant performing the test or secured access is required.
- j. Notes section on the figure with the following information:
 - Risk values shown in **bold** (red text) exceed the DEQ risk calculator acceptable limits of 1.0E-04 for carcinogenic risk, 1.0 for the Hazard Index, or the Lower Explosive Limit for methane of 5% by volume.
- k. Indoor Air risk calculator results for each indoor air sample plus percent by volume of methane. Each indoor air sample should have a call out box with the following information and the abbreviations shown in parentheses may be used:
 - i. Residential carcinogenic risk (RES CR).
 - ii. Residential hazard index (RES HI).
 - iii. Non-residential carcinogenic risk (NON-RES CR).
 - iv. Non-residential hazard index (NON-RES HI).
 - v. Percent by volume of methane.

Example of indoor air call out box.

<u>LFGP/SGP-001</u>	<u>Date</u>
RES CR:	7.3E-07
RES HI:	1.6E+01
NON-RES CR:	4.7E-06
NON-RES HI:	1.3E+00
Methane by Volume:	45%

69. Provide a table, titled “Structural Vapor Intrusion,” that includes the following:
- a. Unique identifier for structures screened for vapor intrusion.
 - b. Risk calculator results for each sample location.

CONTAMINANT SOURCES AND IMPACTED RECEPTORS

70. Identify contaminant sources that may be contributing to the potential and/or documented contamination at the pre-1983 landfill.
71. Provide a map, titled “Contaminant Sources and Impacted Receptors,” that includes the following:

- a. Unique identifier for points of contamination and impacted receptors.
- b. Location of each impacted receptor.
- c. Contaminants with associated concentrations impacting each receptor.
- d. Iso-concentrations for each contaminant.

72. Provide a table, titled “Contaminant Sources and Impacted Receptors,” that includes the following:

- a. Unique identifier for points of contamination and impacted receptors.
- b. Contaminants (including degradation products) in concentrations by media type.

WASTE CHARACTERIZATION FOR HOT SPOT ASSESSMENT

In addition to characterizing the waste, an estimated volume reported in cubic yards, will be required. After waste removal, native soils below removed waste must be sampled and evaluated according to the confirmation sampling for areas where waste has been removed section of this guidance document.

73. Characterize buried waste at the WDA by completing the following:

- a. Advance borings into the WDA.
- b. Continuously log each boring and characterize (describe) the waste/soil encountered.
- c. Provide boring logs with the following information:
 - i. Ground elevation.
 - ii. Soil cover thickness.
 - iii. Waste description and soil lithology based on Unified Soil Classification System.
 - iv. Soil contamination ranges.
 - v. Top of waste elevation.
 - vi. Thickness of waste.
- d. Collect solid media samples from each boring from intervals below ground surface.
- e. Collect solid media samples from the highest readings recorded, using a PID instrument, for analysis and identify the sampled interval(s).
- f. Collect one sample from native soil 1-2 feet beneath waste.
- g. Provide a description of the buried waste.
- h. Provide an estimated volume of buried waste and impacted soil in cubic yards to be removed to restore the area to unrestricted use.
- i. Laboratory analysis of waste sample should comply with permitted receiving facility requirements.

74. Provide a map(s), titled “Waste Characterization Borings,” that includes the following:

- a. Unique identifier for each waste characterization boring.
- b. Locations of all waste characterization borings.
- c. Soil cover iso-thickness contours.
- d. Waste iso-thickness contours.
- e. Hazards requiring special management during removal (asbestos, high methane, high VOCs...)

75. Provide a table, titled “Waste Characterization Borings,” that includes the following:
- a. Unique identifier for each waste characterization boring.
 - b. Thickness of waste (reported in feet) in each waste characterization boring.
 - c. Depth (reported in feet) to native soil below waste.
 - d. PID field screening results for each waste characterization boring.
 - e. Waste characterization analytical results compared to permitted receiving facility requirements.

REMEDIAL INVESTIGATION SUMMARY REPORT

Once the Unit PM and the Contractor PM are satisfied that the RI phase is complete, the Contractor PM will request a meeting with the Unit PM and Unit Supervisor to review the site and ensure the criteria listed are complete. After the meeting, if all the criteria are complete, the Contractor PM will receive a request to submit a RI summary report using the template in Appendix E, *Remedial Investigation Summary Report Template*.

REMEDIAL ACTION PLAN DESIGN

Upon completion of the investigation, the Contractor PM will schedule a meeting with the Unit PM and Unit Supervisor to present a generalized remedial action plan based on the risk from the WDA and contaminated media (i.e. groundwater, surface water, sediment, vapor or exposed contaminated soils) to determine the appropriate risk-based remedial activities for the site. Draft RAPs must address the risk identified at each site but should not include activities such as waste relocation and/or removal unless the WDA is impacting a receptor, or a known hotspot is contributing to groundwater contamination. The investigation establishes the site and identifies the risk for a particular PRLF, and the RI summary should be the foundation for the risk-based RAP. The Unit PM will authorize the RAP design phase after the review meeting. The Contractor PM is responsible for acquiring all applicable permits and approvals during the RAP design phase to ensure there is not a delay implementing the RAP.

This is not an exhaustive list of RAP criteria, and the Unit may request additional items for consideration during the RAP design phase to address site specific conditions.

At a minimum, the RAP should be based on site specific conditions and risk and include the following:

1. A discussion of the RI results and CSM, including media contaminated, contaminants of concern and the areal and vertical extent of contamination.
2. A brief statement of objectives for the remedial action.
3. Discussion of the following, if applicable, but final remedy elements are determined by site specific conditions, risk, and cost:
 - a. Management of exposed waste and/or surface debris.
 - b. Relocation or removal of waste “hotspots” impacting receptors or contributing to groundwater contamination.
 - c. Management of landfill leachate.
 - d. Slope stabilization.
4. A brief evaluation of risk-based remedial alternatives addressing site specific risk (soil cover with geotextile, soil cover with geoweb, combination of geotextile and geoweb, or use of existing soil cover, if applicable) using the following feasibility study criteria:
 - a. Protection of human health and the environment, including attainment of cleanup levels.
 - b. Compliance with applicable federal, state and local regulations.
 - c. Long-term effectiveness and permanence.
 - d. Reduction of toxicity, mobility and volume.
 - e. Short-term effectiveness (i.e., effectiveness at minimizing the impact of the site remedial action on the environment and the local community).
 - f. Implementability (i.e., technical and logistical feasibility, including an estimate of time required for completion).
 - g. Cost.
 - h. Community acceptance.

5. A detailed description and conceptual design of the proposed remedy, for each contaminated medium including an evaluation of the potential for the remedy to affect sensitive environments identified.
6. A Description of procedures to install an engineered WDA cover system.
7. A sampling plan for monitoring and evaluating a groundwater remedy's performance and any changes to the extent of the contaminant and associated risk to receptors and sensitive environments.
8. A description of any proposed treatability studies, interim steps, and additional site characterization needed to support the final design.
9. A description of well installation and abandonment, stormwater management and management of investigation and remedial action derived wastes (i.e. purge water and drill cuttings).
10. A list of required permits and verification of regulatory agency approval.
11. Mitigation measures pertaining to Waters of the United States (404/401 permits, buffer permitting and pre-construction notifications).
12. Planned erosion and sediment control (E&SC) measures must be designed to satisfy the regulatory requirements of the Division of Energy, Mineral & Land Resources (DEMLR).
13. A description of procedures and a schedule for construction, implementation, operation and maintenance, system monitoring and performance evaluation, and progress reporting. The construction schedule must include the total time needed to complete the remedy plus the average number of adverse weather days for the proposed time of year. The number of proposed adverse weather days per month is determined using 24-hour rain event volumes, averaged for the past three calendar years, and the impact of that volume to the on-site soil type. One-quarter inch of rain in 24 hours may be enough to impact a clay rich site, while one-inch of rain may be needed to impact a site consisting of mostly sand. The expectation is to develop a realistic construction schedule to include the average number of adverse weather days.

Important: The National Oceanic and Atmospheric Administration (NOAA) should be used to establish the number of proposed adverse weather days per month using the following website: <https://www.ncdc.noaa.gov/cdo-web/datatools/lcd>. Select the county corresponding to the location of the pre-1983 landfill and add the county station to the cart. Once added to the cart, select the file format, daily output and the date range for the requested report.

14. A description of the criteria used for remedial action completion, including procedures for post-remediation confirmation sampling.
15. Identification of off-site borrow material that will be used for the engineered WDA cover system. Fill must be evaluated pursuant to the guidance outlined in Appendix H, *Borrow Soil Location and Sampling Procedure*.

16. An evaluation of the off-site borrow material analytical results using the DEQ risk calculator and critical effects tool, if applicable, to ensure the material is acceptable for unrestricted use in the engineered WDA cover system. The risk calculator results must be submitted to the Unit PM for review before any material is transported to the site.
17. An evaluation of surface preparation techniques and engineered WDA cover systems according to the guidance outlined in Appendix H, *Engineered Cover Systems*.
18. A description of procedures for establishing a vegetative cover as a component of the engineered WDA cover system.
19. A health and safety plan that assures that the health and safety of nearby residential and business communities (erecting physical barriers and/or signs, controlling foot and vehicular traffic, suppressing dust, etc.) will not be adversely affected by exposure to site contaminants and activities related to the remedial action. The plan should conform to all local, state, and federal regulations for health and safety.
20. Equipment and personnel decontamination procedures.
21. A description of the land use restrictions if institutional controls serve as, or are part of, the remedial action plan. The description must identify all parcels requiring institutional controls.
22. All professional work must be signed and sealed by the appropriate professionals, if necessary (e.g., licensed geologist, registered professional engineer, etc.). A single document may require the signature and seal of more than one professional.

PUBLIC COMMENT

1. All draft RAPs must be publicly noticed prior to implementation by publishing weekly for a period of three consecutive weeks in a newspaper having general circulation in the county or counties where the site is located and by mail to persons that have requested to be on the mailing list for the site in accordance with NCGS 130A-310.4(c)(2).
2. Copies of the draft RAP must be sent to the following when the public comment period begins:
 - a. impacted property owners (parcels containing the WDA and adjoining parcels);
 - b. local government officials (city/town manager or county manager depending on the location of the pre-1983 landfill);
 - c. the county health director; and
 - d. the public library closest to the site location.
3. The public comment period must remain open for 45 days after the three-week publication to allow for receipt of written comments before the RAP is approved.
4. All public comments will be evaluated and considered before finalizing the draft RAP.
5. The Unit will conduct a hearing if there is significant public interest at the site:
 - a. the hearing date and time will be posted 30 calendar days in advance of the scheduled hearing; and
 - b. the public comment period will extend to 20 calendar days after the date of the scheduled hearing.

REMEDIAL ACTION PHASE

After the public comment period has ended, the Unit must review and respond to all submitted comments and conduct a public hearing, if applicable. Recordation of the land use restrictions and notice plat must be complete prior to subcontractor solicitation.

RECORDATION OF NOTICE PLATS

1. Notice Plats, approved by the Unit, may be recorded upon completion of the remedial investigation. A Notice may be recorded for all properties contaminated with physical waste and impacted by migrating contaminated groundwater and/or landfill gas.
2. A Notice Plat will not be required for a property where the remedial action plan will be to restore the property to unrestricted use standards.
3. Instructions for preparing a Notice Plat and recordation instructions are outlined in Appendix A, *Instructions for Preparing a Notice Plat for Recordation*.

RECORDATION OF LAND USE RESTRICTIONS

1. Land use restrictions, approved by the Unit, and the Notice of Environmental Contamination must be recorded prior to the Unit authorizing the Contractor PM to initiate the subcontractor solicitation for RAP implementation.
2. Land use restrictions will not be required for a property where the remedial action plan is to restore the property to unrestricted use standards if confirmation sampling supports the intended use.

The RA phase is the implementation of the final RAP. The Contractor PM must submit a final RAP to the Unit based on applicable public comments, prior to commencement of RAP activities and include an updated implementation timeline.

WDA REMEDY

1. The Contractor PM will prepare a request for proposal (RFP) for advertisement, in accordance with NCGS Chapter 143, Articles 3D and 8, to select a sub-contractor to implement the construction components of the RAP.
2. A pre-bid meeting will be held for all interested parties at the WDA.
3. The RFP advertisement must be published for 15 calendar days and include the following:
 - a. WDA name and location;
 - b. location of bidding documents drafted by the Contractor (Contractor website);
 - c. contractor PM contact information (name, phone number and email); and
 - d. day, time and location when the sealed bids will be opened.

SOIL, GROUNDWATER AND WASTE HOT SPOT REMEDIATION

4. Active soil and/or groundwater remediation will most often precede WDA remediation unless incorporated in the waste.

REMEDIAL ACTION PROGRESS REPORTS

Daily remedial action progress reports must be submitted to the Unit PM.

5. The daily progress report must include the following:
 - a. pre-1983 landfill name and identification number;
 - b. location;
 - c. date;
 - d. temperature (°F);
 - e. weather;
 - f. name, company affiliation and title for all personnel on-site;
 - g. equipment:
 - i. description;
 - ii. number on-site; and
 - iii. number in-use;

- h. narrative outlining all activities for the day listed by applicable time the action occurred;
 - i. Operation and maintenance results, if needed;
 - j. Discussion of major problems, if encountered;
 - k. Attestation that a request for a cost adjustment is or is not required at this time;
 - l. signature of on-site Contractor representative; and
 - m. photographs documenting the daily activities.
6. The progress report must include the following:
- a. operation and maintenance results; and
 - b. discussion of major problems encountered.

REMEDIAL ACTION COMPLETION REPORT

Remedial action completion reports must be submitted to the Unit within 30 calendar days of the Division of Energy, Mineral and Land Resources (DEMLR) closing the erosion and sedimentation control permit for the site.

7. The RA completion report must include the following:
- a. results of the remedy;
 - b. final drawings (as-built plans and specifications);
 - c. summary of variances from the final design plans (approved work variances and change orders);
 - d. summary of any problems encountered during construction;
 - e. Proof that each monitoring well has been properly abandoned;
 - f. Disposal facility approvals, and disposal manifests for an excavation/offsite disposal;
 - g. post remedy confirmation sampling;
 - h. monitoring requirements;
 - i. appropriate certification statements or forms;
 - j. verification DEMLR closed the erosion and sedimentation control permit and all erosion control measures have been removed from the site;
 - k. photographic record of completed RAP;
 - l. summary of remedial action operating experience and effectiveness in meeting design specifications; and
 - m. discussion of criteria for remedial action completion.
8. For remedial action completion the following certification language must also be included in the report:

“I certify that, to the best of my knowledge, after thorough investigation, the information contained in or accompanying this certification is true, accurate, and complete.”

APPENDIX A: INSTRUCTIONS FOR PREPARING A NOTICE PLAT FOR RECORDATION

The following is a list of instructions to assist in the preparation and recordation of a survey plat (Notice Plat) that serves as a notice of environmental contamination or an institutional control as a site remedy per 130A-310.8. Plat nomenclature has been updated according to Session Law 2021-158 (SB 389), effective 9/16/21. The Notice Plat may be recorded with a companion Declaration of Perpetual Land Use Restriction (DPLUR) document that specifies the land-use restriction and annual inspection and reporting requirements, or it may stand alone.

NOTICE PLAT CONTENT REQUIREMENTS

The Notice Plat of the subject property must be prepared and certified by a professional land surveyor registered in North Carolina. Every plat should be based on a new or existing survey of the entire property unless the property is extremely large or otherwise problematic to resurvey. The modification of an existing survey prepared by another surveyor is allowed if approved by the Unit PM. Where a site is located on more than one parcel or tract of land, a composite map or plat showing all parcels or tracts may be recorded.

The Notice Plat must meet the requirements of NCGS § 47-30 [§ 130A-310.8(a)] for maps and plats (some, but not all are specified below) and any requirements of the Register of Deeds in the county where the site is located. It's best to contact them early to understand their requirements. All plats must be reviewed and approved by the North Carolina Geodetic Survey (Gary Thompson) prior to recordation. Unit PMs should email a PDF copy of the plat to the North Carolina Geodetic Survey for approval prior to printing mylars and requesting signatures from property owners. The plat must include the following:

1. A title block located at one of the plat perimeters with the following:
 - a. Notice of Environmental Contamination.
 - b. The name of the PRLF site and the PRLF identification number (precede with the phrase "A portion of the Site:" if the property is but one part of the overall contaminated site).
 - c. The names of the current owner(s) exactly as they appear on the existing property deed.
 - d. The property township, county and state, the date(s) of the survey, a scale, and name and address of surveyor or firm preparing the plat.
2. Property lines with bearings and distances, a north arrow (specifying whether true or magnetic), datum used (NAD 83 or NAD 27) or references to previously recorded deed or plat bearings (if based on magnetic north or referenced to previously recorded deed or plat bearings, must include the date and source the index was originally determined).
3. Identification of all adjacent property owners.
4. A vicinity map.
5. Unique site features.

6. On-property structures.
7. A notes section including the following information or specific language. In all cases, Notes a. - e. are required. Notes f. - j. should be selected based on the specific situations explained in **bold**.
 - a. A list (or type) of regulated contaminants known to be present (today) in each environmental medium (soil, groundwater, surface water, and sediment). § 130A-310.8(a)(2).
 - b. The quantity of each contaminant disposed on the property (if known). § 130A-310.8(a)(2).
 - c. The phrase: "The contaminant information identified on this Notice Plat is based on the best available information at the time of filing."
 - d. The phrase: this Notice Plat supersedes any previous Notice recorded for this parcel pursuant to NCGS 130A-310.8.
 - e. The following instructional language (exactly as written in the box below): § 130A-310.8(e).

When this property or any part of it is sold, leased, conveyed or transferred, North Carolina law requires that the following language be placed in the description section of the deed or other instrument of transfer in no smaller type than that used in the body of the deed:

Hazardous substances are present in environmental media at this property. [**<Add, if Notice is part of a RAP>**], and the property has been remediated by use of land use controls with Department approval.] A Notice of Environmental Contamination is recorded at the [**fill in**] County Register of Deed's office in Map Book [**fill in**], Page [**fill in**].

When the Notice Plat is being recorded in conjunction with a Declaration of Perpetual Land Use Restrictions document (DPLUR), add:

- f. The phrase: "A Land Use Restrictions document entitled "**[enter the appropriate title, e.g., Declaration of Perpetual Land-Use Restrictions]**" limiting the uses of this property, is being recorded concurrently with this Notice Plat."

Or, when no Land Use Restriction document is being recorded concurrently with the Notice Plat, the property's groundwater is currently contaminated above 15A NCAC .02L standards, and the Department allows reliance on other State or local land-use controls, include Notes a. through e., AND the water supply well installation restriction specified in 15A NCAC 02C (aka 2C Rule) below: § 130A-310.8(a)(3)

- g. "Pursuant to 15A North Carolina Administrative Code 02C .0107 (b)(1), the source of water for any water supply well shall not be from a water bearing zone or aquifer that is contaminated. Therefore, state law prohibits construction of a water supply well on this property after groundwater contamination is known to exist on the property. After

- the date of recordation of this Notice, pre-existing wells should not be used without contaminant testing and appropriate treatment. Further, pursuant to North Carolina General Statute 87-88(c) and 15A North Carolina Administrative Code 02C .0112(a), no well may be constructed or maintained in a manner whereby it could be a source or channel of contamination of the groundwater supply or any aquifer.”
- h. Add references to any local ordinances relating to groundwater use (e.g., water line connection requirements, well-installation prohibitions or groundwater-use restrictions).

Where a Notice Plat only is being recorded on an uncontaminated, non-source property because a future water supply well installed on the property could draw contaminants onto the property at levels that exceed the 15A NCAC .02L standards, include the 2C Rule and the following:

- i. The phrase: “Based on the best available information at the time of filing, this property does not contain hazardous substances in groundwater. However, a future water supply well installed on the property could influence groundwater migration from a neighboring property that contains hazardous substances in groundwater.”

Where a Notice of Residual Petroleum is already recorded on the deed and the restrictions specified therein are not in conflict with the intended property use, add the following: § 130A-310.8(a)(3)

- j. The phrase: “The land-use restrictions specified in the Notice of Residual Petroleum, previously recorded pursuant to N.C. Gen. Stat. § 143B-279.9(b) and N.C. Gen. Stat. § 143B-279.11(g) in the [redacted] County Register of Deeds, Book [redacted], Page [redacted] on <date>, remain in full force and effect, and are incorporated herein.”
- 8. The location and dimensions of distinct areas where hazardous substances are known to have been disposed (landfills, trenches, and open impoundments/pits) with respect to a surveyed corner of the affected property. This requirement is not necessary for spills or indistinct releases § 130A-310.8(a)(1).
 - 9. The location of on-site wells with respect to a surveyed corner of the affected property (potable, production, monitoring and any other type) where hazardous substances have been detected in groundwater, unless each hazardous substance detected has an associated 15A NCAC 2L groundwater standard and the concentration is below such standard § 130A-310.8(a)(1 and 2).
 - 10. The surveyor's certification and seal (using a permanent ink stamp) which includes, but is not limited to, specification of the source of information for the plat, the ratio of precision, and the type of survey pursuant to NCGS 47-30 (f)(11).
 - 11. The location of the delineated waste disposal area.
 - 12. The following language positioned in the upper left corner of the plat:

Approved for the purposes of NCGS § 130A-310.8.

William F. Hunneke
Chief, Superfund Section
Division of Waste Management

**NORTH CAROLINA
WAKE COUNTY**

I, _____, a Notary Public of said County and State,
do hereby certify that _____ did personally
appear and sign before me this the _____ day of _____, _____.

Notary Public (signature)

My commission expires _____, _____. (official seal)

13. Owner acknowledgement consisting of the printed name(s), title(s) and properly notarized (using a permanent ink stamp) signature(s) (signature(s) made in indelible ink) of individual(s) with authority to legally bind the property owner(s), with the following language:

This certifies that the undersigned is (are) the owner(s) of the property shown on this map.

[Owner or Owner's Representative signature]

[Owner or Owner's Representative Name]

[Owner or Owner's Representative Title and Organization]

[State]
[County]

I, _____, a Notary Public of said County and State, do
hereby certify that _____ did personally
appear and sign before me this the _____ day of _____, _____.

Notary Public (signature)

My commission expires _____, _____. (official seal)

INSTRUCTIONS FOR DIVISION APPROVAL

14. The draft Notice Plat (and companion DPLUR, if any) must be delivered directly to the Unit PM for review. The Unit PM will send the Notice Plat to the State surveyor for their additional review and comment (North Carolina Geodetic Survey). All instructions must be followed, and all comments must be addressed to receive approval.
15. After receiving approval from the Unit PM, the Contractor PM may order the final Notice Plat and coordinate with the property owner to obtain signature.
16. Once the Contractor PM has obtained the property owners signature, the signed Notice Plat must be delivered to the Unit PM at one of the addresses below (Do Not Fold Document):

Via Overnight Courier or Hand Delivery

NC Division of Waste Management
Pre-Regulatory Landfill Unit
DEQ Office Building
217 W. Jones Street
Raleigh, NC 27699

Or

Via US Mail

NC Division of Waste Management
Pre-Regulatory Landfill Unit
1646 Mail Service Center
Raleigh, NC 27699-1646

RECORDATION OF DOCUMENT(S)

17. After the Unit PM obtains the Section Chief's signature, the Notice Plat must be sent back to the Contractor PM for recordation. Recordation must be completed within 15 days of receiving the completed Notice Plat:
 - a. File a certified copy of the Notice Plat in the site's county Register of Deeds' office.
 - b. Send the Unit PM, (1) an electronic version of the Notice Plat affixed with the seal of the Register of Deeds and reflecting the book and page number where recorded, and (2) an electronic copy of the page in the grantor index where the Notice Plat is referenced.

Important: If the Notice Plat is being recorded concurrently with a DPLUR document, these documents must be recorded as follows: The Notice Plat must be recorded first and assigned book and page numbers. The book and page numbers where the Notice Plat is recorded must be handwritten in the designated blanks on the DPLUR document prior to the DPLUR document being recorded.

**** Always check with the specific County's Register of Deeds office early on for their requirements on paper type (mylar or paper) and other requirements they may have.****

APPENDIX B: FIELD PROCEDURES AND SAMPLE COLLECTION TECHNIQUES

Sample collection and analyses must be performed by persons who are qualified by education, training, and experience and under the supervision of a licensed professional. Field procedures relating to sample collection techniques, sample containers, sample preservation, sample holding times equipment decontamination and field measurement procedures, should comply with the most current version of the USEPA Region IV Science And Ecosystem Support Division (SESD) *Field Branches Quality System and Technical Procedures* (provided in a link at the front of this document).

Due to the extensive use of PFAS and their presence at trace levels in most environmental media, aspects of sampling and analysis require a unique protocol and high level of care to avoid cross-contamination with everyday packaging, body lotions, and biasing sampling equipment. Please follow the links provided at the front of this document for PFAS sampling protocols.

In addition to the standard protocols outlined in the USEPA technical procedures referenced above, the following should be considered to ensure defensible quality data is submitted to the Unit.

1. Collect GPS coordinates of all sample locations (soil, sediment, borings, gas probes, and monitoring wells) and if needed, stake and flag until the remedial investigation is complete.
2. Survey grade data is required for monitoring well(s) top of casing.
3. Field QC samples are required for each sampling event (field day) and each laboratory if different laboratories are utilized for the same sampling event. Include the following for each sampling event unless additional QA/QC testing is specified by the Unit PM:
 - a. One duplicate sample (for multi-point soil or monitoring well sampling events only):
 - i. Per medium.
 - ii. Per container type.
 - b. One equipment rinsate blank collected prior to sample collection.
 - c. Trip blank.
4. Portable field instrumentation must be capable of detecting the following parameters:
 - a. Methane instruments must have an infrared sensor capable of detecting methane at least 0.5% by volume of air. Methane should be reported in the following formats:
 - i. Percent of lower explosive limit (% LEL).
 - ii. Percent by volume in air (% bv).
 - b. Oxygen as percent by volume in air (% bv).
 - c. Carbon dioxide as percent by volume in air (% bv).
 - d. Barometric pressure (inches Hg).
 - e. Hydrogen sulfide as parts per million (ppm).
 - f. Volatile organic compounds (VOCs by PID) as parts per million (ppm).
 - g. Temperature as degrees Fahrenheit.
 - h. Relative humidity as percent (%).
 - i. Mercury as $\mu\text{g}/\text{m}^3$, minimum detection limit of $25 \mu\text{g}/\text{m}^3$.

5. Field Instrument Calibration Data, Quality Assurance Data and Reporting Requirements. Include all of the following in the landfill gas evaluation report:
- a. Instrument manufacturer.
 - b. Model number.
 - c. Serial number.
 - d. Date of factory calibration (annual) and maintenance parameters.
 - e. Instrument detection limits (upper and lower).
 - f. Field calibration data:
 - i. Date and time of field calibration (must be same day as screening).
 - ii. Bump test(s) to verify proper calibration and instrument accuracy is maintained before, during and after evaluation.
 - iii. Type(s) of calibration gas and expiration dates.
 - iv. Additional field calibration if specified by the manufacturer due to changing weather conditions (such as barometric pressure, temperature, etc.).
 - g. Field conditions:
 - i. Name(s) of person conducting the evaluation.
 - ii. Brief description of weather conditions and other possible impacts on data: windy, nearby exhaust from vehicles etc.
 - iii. Date and time begin/end of field screening.
 - iv. Ambient temperature, humidity and barometric pressure readings (collected at least hourly during field sampling).
6. Field instrument landfill gas survey results should be submitted on a table that includes the following:
- a. Sample location.
 - b. Instrument readings.
 - c. Observations that may affect the results like a water trap, filters, increasing barometer pressure, significant change in the temperature, etc.
 - d. At least two (2) readings must be recorded and reported anywhere there is equal to or greater than 2% change in the reading.
 - e. Two readings must be recorded for the background locations and two other randomly selected monitoring points for all direct read instruments.

Note: Manufacturer calibration is not the same as field calibration.

7. Sampling must be planned so that required holding times for analytical methods are met.
8. Potable water supply well sampling must comply with the following:

If the remedial investigation is complete, only analyze for contaminants detected in groundwater and their degradation products identified during the groundwater investigation. If the remedial investigation is not complete, only analyze for VOCs to include all US EPA Target Compound List analytes.

- a. Record the location of each water supply well using a handheld GPS unit in accordance with the spatial data requirements outlined in this document.

- b. Photograph each water supply well to document the following:
 - i. Well location related to the residence (view from driveway if both residence and well can be captured in the same frame showing house number).
 - ii. Current condition of the wellhead.
 - iii. Sampling location (valve at wellhead or hose bib on residence).
- c. Record the sampling location and document if the sample is collected downstream of pressure tanks, filtration systems, or other devices (i.e. valve at wellhead or hose bib outside the house).
- d. Do not remove or alter insulation, heat tape or other site-specific items that the homeowner has installed on their wellhead (document the current condition and sample the well as close to the wellhead as possible).
- e. Record site specific conditions that might impact the well (debris surrounding the well or industrial operations).
- f. Water supply well sampling steps:
 - i. Collect the initial turbidity reading.
 - ii. Purge tap for 15 minutes.
 - iii. Collect additional turbidity, conductivity and pH (at least 3 sets) readings during purging.
 - iv. Collect additional sample if the post-purge turbidity is lower than the pre-purge turbidity reading and discard the pre-purge sample.
 - v. If post-purge turbidity reading has increased, purge an additional 15 minutes and recheck turbidity.
 - vi. If turbidity is lower, follow the procedure in Section 8(f)(iv).
 - vii. If turbidity is higher, collect and filter sample and analyze with initial unfiltered (pre-purge) sample at the site.
- g. Record the amount of time the well was purged in minutes.
- h. Document the total volume of water purged.
- i. Prepare trip blanks for each sampling event (if more than one laboratory is used, each laboratory must have a trip blank for analysis).
- j. For sites with a completed remedial investigation, include only contaminants identified including TICs (library search) if retained as contaminants of concern and the degradation product of the contaminants.
- k. Samples collected for Volatile Organic Analysis (VOA) should be collected directly into sample containers without mixing. Composite samples are not permitted.

9. The following should be considered when collecting groundwater samples:

Temporary monitoring wells are not permitted. Permanent monitoring wells should be used at all sites and well installation and abandonment must comply with the current codified edition of 15A NCAC 02C well construction standards. Permanent monitoring wells are necessary to support multiple sampling events for site characterization (CSM development) and completion of the remedial investigation.

- a. Filtration of samples for metals analysis before acid digestion is not permitted (See exception for hexavalent chromium in water in Appendix D).
- b. If turbidity is a problem:

- i. Collect samples using low-flow purging and sampling techniques.
 - ii. Passive bag samplers.
 - c. Additional well development may be necessary.
 - d. Rapid analysis is recommended to reduce contact time with the acid preservative.
10. The following must be considered when collecting surface water samples:
- a. Shallow surface waters (less than six inches deep) or highly turbid, samples may be collected in a separate collection container and then decanted into the sample container.
 - b. Samples for VOA must be decanted into the sample container immediately.
 - c. Samples for metals analysis may be allowed to settle for a few minutes prior to decanting.
 - d. All collection containers must be made of the same materials, be pre-cleaned and handled in the same manner as the sample container.
11. All soil, sediment and waste samples for VOA should be collected directly into sample containers without mixing.
12. Landfill Gas Probe Installation (LFGPs are typically installed within the delineated WDA):
- a. LFGP construction is similar to monitoring well construction standards, using one-inch PVC with flush mount completion.
 - b. LFGPs should be sealed at least five feet below ground surface (shallower depths may draw air from the surface) and the screened interval must be at least two feet above seasonal high-water table (if encountered).
 - c. The minimum screen length is two feet; but five feet of screen is optimal.
 - d. An additional screen can be used where waste thicknesses extend beyond 10 feet below ground surface to get better coverage of the waste area.
 - e. An air-tight cap/seal and sampling port should be installed at the surface termination of the PVC casing and can consist of a slip-cap, stopper, or threaded fittings.
 - f. PVC glues, caulking or other substances with the potential to off-gas VOCs should not be used during LFGP construction.
 - g. A dedicated two-way valve and tubing should be installed to the cap/seal to allow for sampling and the valve should remain in the closed position until sample tubing and instrumentation is connected.
 - h. LFGPs are not required to have a protective lockable casing unless in areas accessible to the public.
 - i. Where applicable, a permanently affixed identification plate should be included with the date of probe completion, total probe depth, screen length, and probe ID number.
 - j. LFGPs should be allowed 48 hours to equilibrate before sampling.
13. Soil Gas Probe Installation (SGPs are typically used outside of the delineated WDA):
- a. SGP construction consists of a 6-inch implant attached to Teflon tubing with flush mount completion.
 - b. SGPs implants should be sealed at least five feet below ground surface.
 - c. A two-way valve should be installed to the tubing to allow for sampling and the valve should remain in the closed position until sample tubing and instrumentation is connected.
 - d. SGPs should be allowed 48 hours to equilibrate before sampling.

14. Gas probe inspections should be conducted each time a gas probe is sampled. If the integrity of a probe is in question during the inspection, the Unit PM should be notified to determine if sampling/analysis should proceed at that probe. Deficiencies should be noted in the field notes and documented with a photo as needed. The inspection should include the following:
 - a. Visually inspect the integrity of the probe including: the annular seal, cap/seal, valve, tubing, and fittings.
 - b. Confirm that a seal is established on the probe (cap/seal intact and two-way valve in the closed position).
 - c. Document any deficiencies such as cracked concrete, damaged/missing valves or fittings, missing or stripped bolts, missing locks, or evidence of water intrusion or damage to the probe.
15. Gas probe static and differential pressure measurements may be used to assess whether and to what extent pressure gradients might influence soil gas flow. General considerations for gas probe static pressure measurements:
 - a. Pressure readings should be collected prior to opening the gas probe valve. If a probe has not been properly sealed (valve closed or cap/seal is not installed), pressure readings should not be collected until at least 24-hours after the seal on the probe has been re-established.
 - b. A Landtec GEM 5000+ or digital manometer should be used. The type of manometer should be included in reporting with the static pressure reading (inches H₂O), date, time, ambient barometric pressure, and temperature.
 - c. If Field Instrument Measurements are requested by the Unit PM in conjunction with Static Pressure Readings, the measurements should be collected consecutively.
 - d. The sequence for static pressure readings should include the following:
 - i. Visually inspect the integrity of the cap/seal/tubing and confirm the two-way valve has been in the closed position for at least 24-hours.
 - ii. With the two-way valve in the closed position, connect the GEM 5000+ (or manometer) to the probe tubing.
 - iii. Zero the manometer.
 - iv. Open the valve and record the stabilized reading (in inches H₂O).
 - v. Close the valve and then remove the gauge from the tubing.
 - vi. Proceed with other sample collection methods.
16. Gas probe sampling should be conducted in accordance with the NCDEQ DWM Vapor Intrusion Guidance including subsequent amendments and editions (provided in a link at the front of this document). If repairs, adjustments or alterations are made to the probe, the probe must be purged before sampling. If gas probe static pressure measurements are being collected, the probe must equilibrate for at least 24-hours after a seal has been re-established. Valves and fittings should be used and placed in closed positions when connecting/disconnecting sampling instrumentation to maintain a gas seal and minimize the potential for ambient air to enter the probe/sample train.
17. Field instrument measurements should be collected for screening purposes from each gas probe for all sampling events. The following are the units of measurement to be reported:
 - a. Landfill Gas Analyzer:

- i. Methane.
 - ii. Hydrogen sulfide.
 - iii. Oxygen.
 - iv. Carbon dioxide.
 - v. Ambient barometric pressure.
- b. Photoionization Detector (PID)
 - vi. VOCs.
- c. Thermometer/Hygrometer
 - vii. Ambient temperature at time of screening (or within 1 hour).
 - viii. Relative humidity.

Sampling equipment should be included in the approved work plan. Equipment and reporting must be in accordance with the *Field Instrument Parameters and Equipment Requirements* (Section 4 - Appendix B) and *Field Instrument Calibration Data, Quality Assurance Data and Reporting Requirements* (Section 5 - Appendix B).

18. Flux chambers may be used at sites where geologic conditions prevent construction of gas probes (results from flux chambers are qualitative and not quantitative). The following should be considered when utilizing flux chambers:
 - a. Recess the flux chamber into the ground surface and seal with grout or hydrated bentonite.
 - b. Attach to the chamber air-tight fittings that allow connections to either field instruments and/or summa canisters.
 - c. Use water trap filters in the sample line when moisture or liquid is found in the flux chamber.
 - d. Record the length of time a calibrated field instrument is connected to the flux chamber when taking a reading so the procedure may be duplicated if re-testing is needed.
19. Passive gas sample collection should consider the following:
 - a. Understand the limitations of the sampler and ensure that proper detection limits can be obtained since there are different reporting limits for different sampling times.
 - b. Soil gas samples using passive samplers should only be utilized for screening purposes such as understanding spatial distribution or source identification. Passive sampler soil gas results should not be used to evaluate potential risk (risk calculations).
 - c. Passive samplers can be used for crawlspace and indoor air samples to evaluate potential risk (risk calculations).
 - d. Samplers should be appropriate for the chemicals of concern being investigated since some compounds are less reliably detected with passive samplers due to unknown uptake rates.
20. A leak test should be performed directly before sample collection. The following methods can be used:
 - a. Introducing helium as a tracer compound through a shroud over the probe and sampling train.
 - b. Introducing helium through a shroud over the sample probe and a shut-in pressure test of the entire sampling train.

If a shroud is not feasible based on probe construction, a shut-in test of the sampling train should be performed. The method used must be documented and if the leak test fails, the gas probe should not be sampled. A leak test can also be conducted on the laboratory supplied cannister and regulator prior to mobilizing to the field.

21. Sorbent tube screening may be utilized to test for the presence of landfill gas contaminants (e.g. mercury). Sorbent Tubes shall be used in accordance with the manufacturers' guidance and reporting limits must be adequately low.
22. Landfill gas probe gauging can be completed by using a decontaminated water level meter to evaluate if there is water, sediment, debris, or other blockages in the probe. If water or debris is encountered in the probe, a gas sample should not be collected.

APPENDIX C: ASBESTOS CONTAINING MATERIAL

1. The presence of asbestos containing materials (ACM) must be determined if waste material will be disturbed as part of the remedy (consolidation or removal). If any suspected ACM is observed (demolition debris would be considered suspect) during the site investigation phase, collect samples from the suspect materials for analysis to determine percent asbestos. Select five soil sample locations so that each location represents approximately 20% of the area to be disturbed. (Note: 5 samples may not be enough to determine if suspect asbestos is present) At each location determine the depth of waste and collect a composite sample that represents the thickness of waste in that area. Collect soil and any suspect ACMs identified in the cuttings. Analyze samples by EPA Method 600/R-93/116 or equivalent. No additional activities should take place in the suspect area until the presence and concentration of ACM is known. Any identified ACMs must be categorized as friable or non-friable.
2. Sites Containing Friable ACMs
Friable ACMs can be crumbled with hand pressure. Fibrous fluffy sprayed-on materials used for fireproofing, insulation, or sound proofing are considered friable as they readily release airborne fibers if disturbed. Also, concrete ACM is a non-friable ACM that can release fibers if broken. If encountered, a determination must be made if the material can be removed without breaking, or the material must be treated as a friable ACM. The following must be completed when friable ACMs will be disturbed:
 - a. All friable ACMs must be removed and disposed of at a permitted facility.
 - b. State and federal asbestos regulations must be reviewed and followed.
 - c. The RAP must contain an asbestos remediation plan. This plan must be sent to the NC DHHS Health Hazards Control Unit for review at least 45 days before the start of any land disturbing activities.
 - d. Air monitoring must be conducted by an asbestos accredited air monitor during disturbance and removal.
 - e. An accredited asbestos supervisor will be on site during ACM disturbance.
3. Sites Containing Non-friable ACMs
Materials such as vinyl-asbestos floor tile or roofing felt are considered non-friable if intact and generally do not emit airborne fibers unless subjected to sanding, sawing and other aggressive operations. The following must be completed when non-friable ACMs will be disturbed:
 - a. All non-friable ACMs must be removed and disposed of at a permitted facility.
 - b. State and federal asbestos regulations must be reviewed and followed.
 - c. The RAP must contain an asbestos remediation plan. This plan must be sent to the NC DHHS Health Hazards Control Unit for review at least 45 days before the start of any land disturbing activities.
 - d. The RAP must include an alternative plan that addresses the discovery of friable asbestos or exposures above the Permissible exposure limit (PEL). These discoveries should not result in work delays.
 - e. During non-friable asbestos waste disturbance, a trained or an accredited asbestos supervisor must be on site.
 - f. Air monitoring must be conducted by an asbestos accredited air monitor during disturbance.

- g. If air monitoring shows a result above the PEL, then all ACMs in the identified area will be handled as friable ACMs.
 - h. If the content of the disturbed area is shown to be relatively homogeneous, and 5 days of air monitoring has not identified any exceedances of the PEL, air monitoring may be discontinued.
- 4. If ACMs were not identified within areas of planned disturbance, on-site personnel must still include an accredited asbestos inspector during waste removal or consolidation activities. An ACM contingency plan should also be prepared to address ACMs if identified.
- 5. Code of Federal Regulations:
 - a. 29 CFR - 1926.1101(c) - Permissible exposure limit (PEL): The employer shall ensure that no employee is exposed to an airborne concentration of asbestos in excess of 0.1 fiber per cubic centimeter of air as an eight (8) hour time-weighted average (TWA); and
 - b. 29 CFR - 1926.1101 App H: C. The potential for an asbestos-containing product to release breathable fibers depends largely on its degree of friability. Friable means that the material can be crumbled with hand pressure and is therefore likely to emit fibers. The fibrous fluffy sprayed-on materials used for fireproofing, insulation, or sound proofing are considered to be friable, and they readily release airborne fibers if disturbed. Materials such as vinyl-asbestos floor tile or roofing felt are considered non-friable if intact and generally do not emit airborne fibers unless subjected to sanding, sawing and other aggressive operations. Asbestos-cement pipe or sheet can emit airborne fibers if the materials are cut or sawed, or if they are broken.
- 6. For additional information regarding asbestos regulation and guidance please contact:
Jeff Dellinger, Health Hazards Control Unit, North Carolina Department of Health and Human Services.
Telephone number: (919) 707-5972 or email jeff.dellinger@dhhs.nc.gov
Web site: <https://epi.dph.ncdhhs.gov/asbestos/healthaz.html>

Ms. Hollis Yelverton, Occupational Safety and Health Program, North Carolina Department of Labor
Telephone number: (919) 807-7865.
Web site: <https://www.labor.nc.gov/safety-and-health/occupational-safety-and-health/occupational-safety-and-health-topic-pages/asbestos>

APPENDIX D: LABORATORY ANALYTICAL PARAMETERS

GENERAL INSTRUCTION

All samples must be submitted to a certified laboratory under 15A NCAC Subchapter 02H .0800 or be a contract laboratory under the USEPA Contract Laboratory Program. The Contractor PM must provide a copy of Appendix D to the laboratory to ensure appropriate analyte lists are used in the analysis of samples.

The comprehensive list of parameters below must be included in the remedial investigation phase of testing each contaminated medium. Each sample should be analyzed for the following unless there is documentation indicating that a specific analysis is not necessary:

1. **Metals:** Hazardous substance list metals (totals analysis) which include antimony, arsenic, barium, beryllium, cadmium, trivalent and hexavalent chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc.

Iron is only analyzed when conducting background soil sampling and borrow source soil sampling.

Analysis of chromium in soil should be speciated into trivalent and hexavalent chromium, since hexavalent chromium is more toxic than trivalent chromium. For groundwater, hexavalent chromium analyses is not needed because the 15A NCAC 02L groundwater standard for total chromium accounts for the toxicity of hexavalent chromium.

If coal ash is known or suspected to have been discharged at the site, the following additional toxic, non-hazardous substance metals should be included in the testing of groundwater: boron, molybdenum, and strontium.

Total metals analysis should be used for groundwater samples. However, analysis of surface water for toxicity testing and hardness dependent metals (e.g., cadmium, chromium, copper, lead, nickel, silver, and zinc) requires analysis of dissolved metals according to DWR.

2. **Ammonia, Nitrates, Nitrites, and Sulfate:** In addition to all investigation samples, included when evaluating existing soil covers.
3. **VOCs/SVOCs:** Volatile and semi-volatile organic compounds listed on the most current USEPA Contract Laboratory Program Target Compound List using analytical methods specified in Tables 1, 2, and 3 with a library search (using the National Institute of Standards and Technology mass spectral library) to produce a list of tentatively identified compounds (TICs). The library search should identify TICs for the largest ten peaks in each analytical fraction of VOCs and SVOCs that have reasonable agreement with reference spectra (i.e. relative intensities of major ions agree within $\pm 20\%$). The list of identified TICs should not include laboratory control sample compounds, surrogates, matrix spike compounds, internal standards, system monitoring compounds or target compounds. The library search for TICs during the remedial investigation phase should be done on samples from the location with the highest contamination in each area of concern or if the “worst case” location is not known, then on a representative number of samples across the area.

Any TICs that are hazardous substances, that have reasonable agreement with reference spectra and are detected in more than one sample in an area of concern should be included in all subsequent analytical work unless the compound is a laboratory contaminant, documented to be naturally occurring or from an anthropogenic background. Check with the laboratory on possible procedures to quantify the TICs so that cleanup levels can be determined. A summary of the nature of any TICs eliminated from future analysis and reporting should be provided in the RI report, including reasons for eliminating the constituent.

4. **Methane, Hydrogen Sulfide, and Mercury:** Dissolved methane in groundwater may be a concern at sites with methane migration. Concentrations greater than 28 mg/l could potentially cause flammable or explosive levels in confined spaces like crawl spaces, well houses or pipes.
5. **1,4-Dioxane:** If chlorinated solvents, including 1,1,1-trichloroethane (TCA) or trichloroethylene (TCE), are present, or if it is a suspected contaminant of concern. It is often associated with certain chlorinated solvents because of its widespread use as a stabilizer, but other uses are documented such as printing inks and paints, flame retardant production, rubber and plastics, deicing and antifreeze, among others. It is also a by-product present in many goods, including personal care products and herbicides (i.e., Round-up, and other herbicides) and is used as a purifying agent in the manufacture of pharmaceuticals.
6. **PFAS:** If suspected to have been discharged at the property with other contaminants, through aerial deposition (such as from a smokestack) or associated with a process that commonly involves PFAS. Information regarding the list of USEPA-industry sectors likely to have used PFAS and how to comprehensively characterize sites affected by PFAS can be found in the links available at the front of this document. Note that in May 2024, the USEPA designated PFOA and PFOS, including their salts and structural isomers, as CERCLA hazardous substances.
7. **Other Potential Contaminants:** Pesticides, PCBs, dioxins, cyanide, formaldehyde, phosphorous and any other CERCLA hazardous substance or pollutants not mentioned here if suspected to have been discharged at the site.
 - a. If cyanide is a known or suspected contaminant of concern, cyanide should be analyzed using total cyanide methods.
 - b. If PCBs are a known or suspected contaminant of concern in soils, samples should be collected in the area of highest concentration and analyzed using both total PCB analysis and congener-specific analysis. The congener analysis should specify the dioxin-like PCB congeners for comparison with their PSRGs. The sum of the dioxin-like PCB congener concentrations should be subtracted from the Total PCB analytical result. The resulting concentration are then compared to allowable concentrations for non-dioxin-like PCBs, which are the PSRGs for “Polychlorinated Biphenyls (high risk)”. If concentrations detected are less than soil remedial goals for both the individual dioxin-like congeners and for the total non-dioxin like congeners, no additional PCB sampling is required. If concentrations exceed applicable remedial goals, more gross delineation can be performed using total PCB analyses and then the perimeter of the extent of contamination samples run for the dioxin-like congeners found at the site. In areas where

PCBs are detected, soil samples should also be collected and analyzed for VOCs because they are commonly present as carriers for PCBs. Final confirmation samples must also be analyzed using congener specific analyses. Aroclor analyses should not be used unless trying to fingerprint a manufacturer of PCB fluid.

If soil in a fairly large area contains PCBs above the PSRGs, an evaluation of anthropogenic background concentrations may be warranted. If a protection of groundwater PSRG is exceeded, a groundwater samples should be collected at that location and analyzed for *Total* PCBs and the results compared to the current IMAC of 0.09 ug/L.

If laboratory sample dilutions were performed on initial samples, subsequent phase samples must be analyzed for the entire analytical fraction previously diluted. Sample dilutions raise analytical detection limits and can mask the presence of other constituents at lower concentrations.

If a compound that is not a common laboratory contaminant is detected in both the blank and a sample, another phase of sampling is necessary to demonstrate the absence or presence of the contaminant.

After completing the first round of sampling in source areas, subsequent samples must include all CERCLA hazardous substances detected (including those with qualified estimated concentrations), unless the contaminant concentration is proven through sampling to be the result of a naturally occurring condition, area wide anthropogenic background or the contaminant is a common laboratory contaminant detected in concentrations below that detected in the method blank. Subsequent sampling events would also need to include potential degradation compounds (which are also CERCLA hazardous substances) of those CERCLA hazardous substances detected at the site.

ANALYTICAL METHODS

The analytical methods used should be the most recent versions of the analytical methods tabulated below. For hazardous and solid waste test methods (SW-846 Method), the latest edition of SW-846, including any subsequent updates which have been incorporated into the edition, must be used. Sampling must be planned so that required holding times for analytical methods are met. The laboratory's reporting limits should be at or below remedial goals.

Table 1: Soil, Sediment and Waste Analytical Methods.

Volatile Organic Compounds ¹	SW-846 Method 8260
1,4-Dioxane ²	SW-846 Method 8270
Semi-volatile Organic Compounds ¹	SW-846 Method 8270
Metals ³ (excluding hexavalent chromium) Pesticides, Herbicides, PCB congeners, Dioxins, Cyanide, Phosphorous, Formaldehyde and any other analytes not covered by above methods	USEPA method or method published in <i>Standard Methods for the Examination of Water and Wastewater</i> having detection limits below unrestricted use remedial goals or having the lowest detection limit. For PCB congeners use USEPA Method 1668.
Hexavalent chromium	SW-846 Method 3060A ⁴ alkaline digestion coupled with a USEPA method or method published in <i>Standard Methods for the Examination of Water and Wastewater</i> having detection limits below unrestricted use remedial goals or otherwise having the lowest detection limit.
PFAS compounds ⁸	USEPA Method 1633 ASTM D7968-17a
Ammonia	USEPA Method 350.1
Nitrate & Sulfate	USEPA Method 300.0 or 353.2

Table 2: Water Analytical Methods Including Groundwater, Surface Water and TCLP/SPLP Leachate.

Volatile Organic Compounds ¹	SW 846 Method 8260
1,4-Dioxane ²	SW 846 Method 8270 SIM using d8 isotope analysis
Semi-volatile Organic Compounds ¹	SW-846 Method 8270
Metals ^{3,5} , Pesticides, Herbicides, PCBs, Dioxins, Cyanide, Phosphorous, Formaldehyde and any other analytes not covered by above methods	USEPA method or method published in <i>Standard Methods for the Examination of Water and Wastewater</i> having the lowest detection limits or having detection limits below the 15A NCAC 02L standards or IMACs.
Hexavalent chromium (if total chromium exceeds 2 times the site-specific natural background concentrations and the applicable remedial goal for hexavalent chromium and chromium is a known or suspected contaminant at the site) ^{6,7}	USEPA Method 218.7 or Method 218.6 as modified by USEPA Region IV.
Ammonia	USEPA Method 350.1

Nitrate & Sulfate	USEPA Method 300.0 or 353.2
Dissolved methane	Method RSK 175
PFAS compounds ⁸	USEPA Method 1633 USEPA Method 537.1 Modified for drinking water.

Table 3: Gas Analytical Methods.

Volatile Organic Compounds using batch-certified or individually certified (indoor air only) Summa canisters	Method TO-15 or TO-15 SIM (indoor air or crawlspace only)
Methane	USEPA Method 3C or ASTM D1946/D1945
Hydrogen Sulfide	USEPA Method 15
Mercury	NIOSH 6009

References for Tables 1, 2 and 3:

1. *Analyses must include the USEPA Target Compound List plus a library search in certain cases as described in Appendix D.*
2. *1, 4-Dioxane samples should not be collected with passive or diffusive bag samplers. Also, avoid use of Alconox and Liquinox for precleaning of sampling equipment and containers. Methods 8260 and 8260 SIM is not recommended due to interference issues between 1,4-Dioxane and some chlorinated solvents, particularly TCE and 1,2-DCE.*
3. *SW-846 Method 6010 does not have detection limits below the unrestricted use standards/15A NCAC 02L standards for all of the hazardous substance list metals. Therefore, ICP-MS should be used instead of ICP when conducting metals scans. For metals, ICP-MS has lower quantitation limits than ICP. However, ICP should be used for certain metals where interference issues exist.*
4. *SW-846 Method 3060A extraction for soil and sediment samples allows for a 30-day holding time prior to extraction.*
5. *Rapid analyses of samples are recommended to lessen the contact time with the acid preservative. Filtration of groundwater and surface water samples before digestion is not permitted. Highly turbid water samples for metals analysis should be collected when turbidity is less than 10 NTUs. Highly turbid samples may be collected in a separate collection container and then decanted into the sample container.*
6. *Hexavalent chromium analysis is not needed for groundwater samples as the 15A NCAC 02L standard for total chromium is based on the more toxic hexavalent chromium species. The listed methods can be used for surface water and for ecological assessment purposes.*
7. *Samples collected for hexavalent chromium analyses must be field filtered within 15 minutes of collection. Each sample must be collected in a separate pre-preserved container from those for other metals analyses. Method 218.7 or Method 218.6 as modified by USEPA Region IV should be used. Method 218.7 requires low turbidity and allows for a 14-day holding time. USEPA*

Region IV has developed a modification to Method 218.6 that allows for a 28-day holding time. Bottles must be pre-preserved as specified in the modification to the Method. Laboratories should contact the USEPA in Region IV for the methodology modification. Otherwise, any USEPA Method or Standard Method may be used. However, other methods have a 24-hour holding time. Selection of methods and pre-preservation of bottles should be discussed with the laboratory prior to sample collection.

8. *Analysis of a comprehensive list of PFAS analytes with a reporting limit of 4 ppt or less for PFOA and PFOS is required.*

The recommended analytical methods for PFAS are referred to as targeted methods because they provide concentrations of known and commonly detected PFAS. Additional analytical methods are available to characterize the total PFAS that may be present at a site. The total oxidizable precursor (TOP) method can identify PFAS precursors (or parent compounds) that degrade to PFOS and PFOA over time. Conversely the TOP assay can indicate which sites do not have such precursors present, so future occurrence of PFOS and PFOA as degradation products can be ruled out. Consult with DEQ chemists for more information on the uses and limitations of total PFAS methods such as TOP, Non-targeted Analysis, and total organic fluorine methods.

LABORATORY DATA REPORTING

The Unit will not approve payment for samples analyzed out of holding time or if the Contractor fails to comply with this guidance document including subsequent amendments and editions.

Laboratory reports submitted to the Unit must include the items listed below:

1. The laboratory report must state the name and address of the laboratory and that the laboratory is either certified for applicable parameters under 15A NCAC Subchapter 02H .0800 and provide its certification number, or that it is a contract laboratory under the US EPA's Contract Laboratory Program (CLP). Full US EPA CLP documentation packages are not required.
2. A signed statement from the laboratory that the samples were received in good condition, at the required temperature and that analysis of the samples complied with all procedures outlined in the analytical method used, unless otherwise specified in a narrative.
3. A report of the remaining vacuum of each Summa canister received. Summa canisters shall be identified as either being batch certified or individually certified as cleaned by the laboratory.
4. A case narrative justifying any deviations from the methods, additional sample preparation, sample dilution, and unrectified analytical problems, including details of any known conditions or findings which may affect the validity of analytical data, including but not limited to equipment blank, trip blank, method blank, surrogate, spiked sample, or other QC data.

The laboratory must provide a written explanation for any sample having sample quantitation limits that exceed 10 times the laboratory or published MDLs.

5. Names of the individuals performing each analysis, the quality assurance officer reviewing the data and the laboratory manager.
6. Laboratory report of analytical results with consecutive page numbers, including:
 - a. Date and time of sampling.
 - b. Sample matrix description and identification number(s).
 - c. Date samples were received, extracted and analyzed by the laboratory.
 - d. Sample preparation and analytical method name(s) and number(s), including filtration or preservation procedures used.
 - e. Dilution factors and the sample PQL of each reported analyte based upon analytical conditions. Any PQL exceeding 10 times the published analytical MDL must be justified with supporting information.
 - f. Reports of detected and estimated constituents even if they were not definitively quantified. All estimated concentrations and constituents not meeting method QA/QC requirements which have data qualifiers must be reported.
 - g. The results of any library searches performed for TICs.
 - h. Units reported as mass per unit volume for air, soil gas, vapor, and aqueous samples. Units reported as mass per unit mass for solid samples.
 - i. Laboratory sheets for the laboratory QC samples, including results for bias and precision, continued calibration and control limits used. The following minimum laboratory quality control sample reporting information must be provided, and samples that exceed control limits/acceptance criteria must be flagged:
 - i. At least one matrix spike and one matrix spike duplicate per sample delivery group or 14-day period, whichever is more frequent (control limits must be specified):
 - i. At least one matrix spike and one matrix spike duplicate per sample delivery group or 14-day period, whichever is more frequent (control limits must be specified).
 - ii. At least one method blank per sample delivery group or 12-hour period, whichever is less.
 - iii. System monitoring compounds, surrogate recovery required by the method and laboratory control sample analysis (acceptance criteria must be specified).
7. Laboratory sheets for all analytical results, including sample identification, sampling dates, date samples were received by laboratory, extraction dates, analysis dates, analytical methods used, dilution factors, and sample quantitation limits.
8. All constituents detected must be reported even if they were not definitively quantified. All estimated concentrations with data qualifiers must be reported.
9. The results of any library search performed for “tentatively identified compounds.”

Any quality control concerns, data qualifiers or flags should be evaluated and discussed in the associated report.

- j. Completed chain-of-custody documentation with associated air bill (if applicable) attached.

10. Data quality should be reviewed and validated by both the Contractor PM and the laboratory. Any quality control concerns, data qualifiers or flags should be evaluated and discussed in the associated report.

APPENDIX E: REMEDIAL INVESTIGATION SUMMARY REPORT TEMPLATE

The following template must be used to draft a RI summary report. Populate/modify the text within the brackets [] to reflect site specific information.

REMEDIAL INVESTIGATION SUMMARY REPORT

[SITE NAME]

[SITE CITY], [SITE COUNTY], North Carolina

Site ID No. [SITE ID]

State Contract No. [N1####S]

Task Order [TASK ORDER NUMBER]

Prepared By:

Submitted To:

North Carolina Department of Environmental
Quality
Division of Waste Management
Superfund Section
Special Remediation Branch
Pre-Regulatory Landfill Unit
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

[Name]

[Title]

[NC License #]

[Name]

[Title]

[NC License #]

Prepared By:

[Company Name]

[Address]

[Phone #]

[Company Logo]

[Date]

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1.0 INTRODUCTION

All RI summary reports should include the following introductory text:

Pre-regulatory landfills include any land area that was used for municipal solid waste disposal prior to January 1, 1983. These waste disposal areas were unlined and unregulated receiving facilities and could contain hazardous waste, medical waste, and/or asbestos-containing materials. Exposure to contaminated soils, hazardous materials, contaminated groundwater, hazardous, and/or explosive vapors are typical risks associated with PRLFs.

Environmental and human health risks posed by PRLFs are mitigated using a risk-based approach for assessment and remediation. There are three goals for the remedial investigation. One goal is to establish the lateral and vertical extent of contamination in each area of concern for all contaminated media, such as soil, groundwater, sediment, surface water, and vapor. The second goal is to determine if hazardous exposure risks are present within the Site. However, it is technically infeasible and cost prohibitive to identify all contaminants and the highest contaminant concentrations present within PRLF sites; therefore, the investigation may include limited waste characterization data. The third goal is to establish potential exposure pathways and receptors that are impacted or may become exposed to contamination. The investigation should also include the geologic conditions and site conditions to support a feasibility study of remedial alternatives. The typical risk-based remedial alternative for a PRLF includes an engineered WDA cover system installed over the delineated footprint of the waste disposal area and recordation of land use restrictions and a notice of environmental contamination.

Provide the information required in the RI Activities section of this guidance document.

2.0 SENSITIVE ENVIRONMENTS

Provide the information required in the RI Activities section of this guidance document. Provide a narrative summarizing all activities that took place during the on-site investigation and the results of those field activities. Provide the information returned from contacted agencies from Appendix G.

If sensitive environments were not identified, state “No sensitive environments were identified in the site vicinity.”

3.0 GEOPHYSICAL SURVEY

Provide the information required in the RI Activities section of this guidance document.

4.0 GEOLOGY AND HYDROGEOLOGY

Provide the information required in the RI Activities section of this guidance document.

5.0 NATURAL AND ANTHROPOGENIC BACKGROUND

Provide the information required in the Background Sample Collection section of this guidance document.

6.0 WASTE DISPOSAL AREA

Provide the information required in the Contaminant Delineation RI Activities section of this guidance document.

7.0 MEDIA CHARACTERIZATION

7.1 Above Ground Vapor Survey

Provide the information required in the Contaminant Delineation RI Activities section of this guidance document.

If above ground vapors were not detected during the above ground vapor survey, state “No above ground vapors were detected at the ground surface.”

7.2 Evaluation of Existing Soil Cover for use as the Permanent Cover System

Provide the information required in the Contaminant Delineation RI Activities section of this guidance document.

7.3 Surface Water/Sediment/Seep Investigation

Provide the information required in the Contaminant Delineation RI Activities section of this guidance document.

7.4 Groundwater Investigation

Provide the information required in the Contaminant Delineation RI Activities section of this guidance document.

7.5 Potable Water Supply Well Sampling

Provide the information required in the Contaminant Delineation RI Activities section of this guidance document.

7.6 Landfill Gas Probe Installation and Monitoring

Provide the information required in the Contaminant Delineation RI Activities section of this guidance document.

7.7 Methane Assessment

Provide the information required in the Contaminant Delineation RI Activities section of this guidance document.

7.8 Structural Vapor Intrusion

Provide the information required in the Contaminant Delineation RI Activities section of this guidance document.

7.9 Contaminant Sources and Impacted Receptors

Provide the information required in the Contaminant Delineation RI Activities section of this guidance document.

7.10 Waste Characterization (Consolidation, Total Removal or Hot Spot Assessment)

If the Unit PM requested waste characterization, provide the information required in the Contaminant Delineation RI Activities section of this guidance document.

8.0 CONCEPTUAL SITE MODEL

Discuss the CSM and include the completed flow chart from Appendix F.

9.0 RISK EVALUATION

9.1 Physical Risks

Discuss physical risks associated with the waste disposal area including slip, trip, and fall hazards, voids created by USTs or vehicles, sharps, oxygen displacement by hydrogen sulfide, and explosion/fire hazards associated with methane.

9.2 Chemical Risks

For each investigated media type, the data must be entered into the DEQ risk calculator, and the following statement must be included in the RI summary report with the risk calculator results: “The DEQ risk calculator was utilized to evaluate the risks of contaminants of concern identified in (*select each investigated media type*) and the results are outlined below.” Provide an explanation if a media type was not investigated.

Summarize the risk calculator results for each investigated media type for all receptors and pathways provided in the risk calculator.

10.0 SOLE USE STATEMENT AND CERTIFICATION

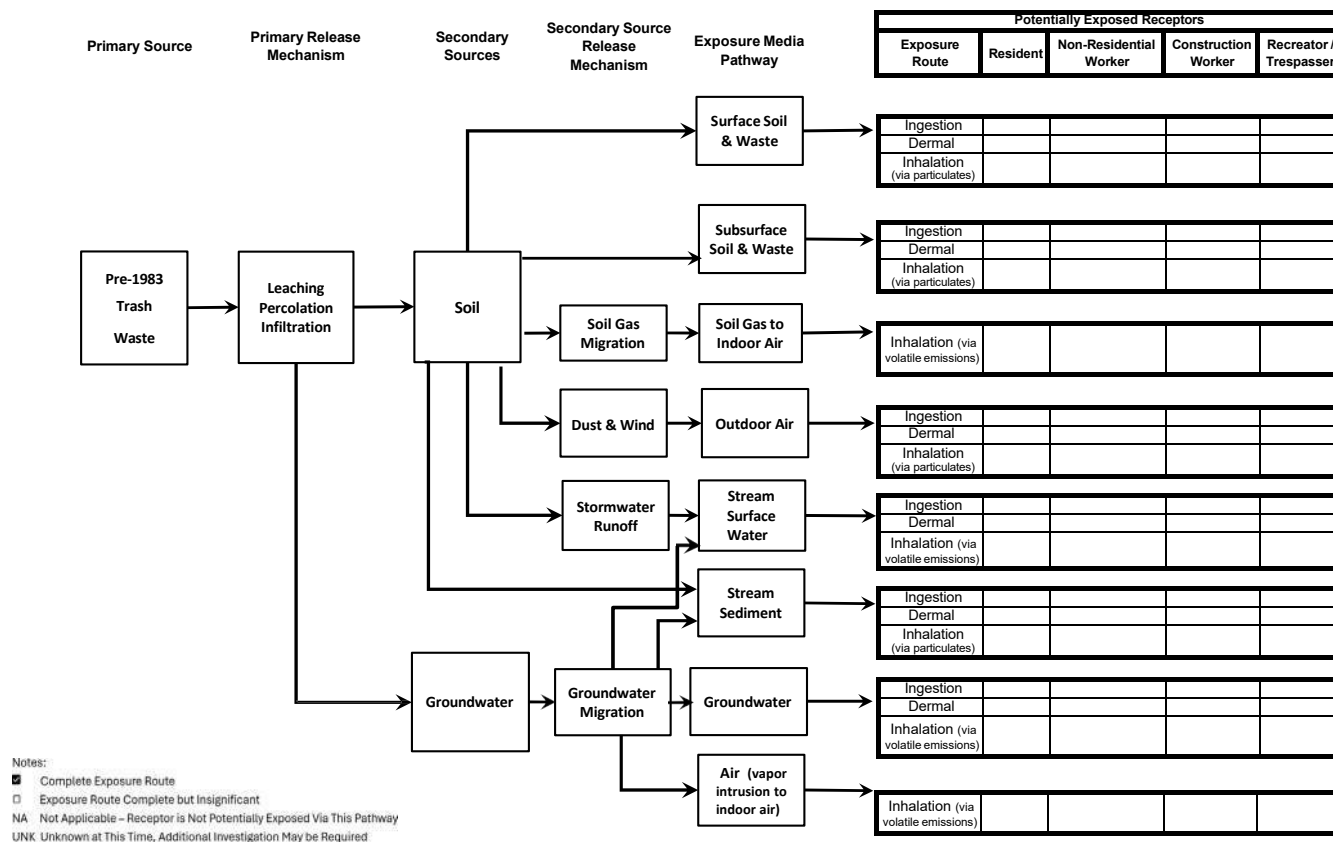
Suggested language: The report was prepared solely for the intended use of NCDEQ Special Remediation Branch, Pre-Regulatory Landfill Unit performed in the scope of work for Task Order [_____]. Use of this document for other purposes is at the sole risk of the user.

Report Certification

11.0 REFERENCES

APPENDIX F: CONCEPTUAL SITE MODEL

Conceptual Site Model
Site Name (Site ID number)



APPENDIX G: SENSITIVE ENVIRONMENT SURVEY

1. Sensitive environment surveys must include the WDA and all areas within 1,000 feet of the delineated WDA perimeter.
2. The survey must also identify areas that likely serve as natural areas attractive to terrestrial ecological receptors and for the existence of stressed vegetation or stressed wildlife.
3. Establishing the presence of sensitive environments is necessary to determine if special sampling (such as aquatic toxicity testing) is required and if remediation activities would result in more harm than good (for example, excavation and destruction of a wetland versus leaving in place residual contamination which may not significantly impact the wetland environment).
4. Refer to the *Sensitive Environment Contact List* for agency information. These individuals must be contacted in order to identify specific sensitive environments.
5. Sensitive environments include the following:
 - a. State Parks;
 - b. Areas Important to Maintenance of Unique Natural Communities;
 - c. Sensitive Areas Identified Under the National Estuary Program;
 - d. Designated State Natural Areas;
 - e. State Seashore, Lakeshore and River Recreational Areas;
 - f. Rare Species (state and federal Threatened and Endangered);
 - g. Sensitive Aquatic Habitat;
 - h. State Wild and Scenic Rivers;
 - i. National Seashore, Lakeshore and River Recreational Areas;
 - j. National Parks or Monuments;
 - k. Federal Designated Scenic or Wild Rivers;
 - l. Designated and Proposed Federal Wilderness and Natural Areas;
 - m. National Preserves and Forests;
 - n. Federal Land designated for the protection of Natural Ecosystems;
 - o. State-Designated Areas for Protection or Maintenance of Aquatic Life;
 - p. State Preserves and Forests;
 - q. Terrestrial Areas Utilized for Breeding by Large or Dense Aggregations of Animals;
 - r. National or State Wildlife Refuges;
 - s. Marine Sanctuaries;
 - t. National and State Historical Sites;
 - u. Areas Identified Under Coastal Protection Legislation;
 - v. Coastal Barriers or Units of a Coastal Barrier Resources System;
 - w. Spawning Areas Critical for the Maintenance of Fish/Shellfish Species within River, Lake or Coastal Tidal Waters;
 - x. Migratory Pathways and Feeding Areas Critical for Maintenance of Anadromous Fish Species within River Reaches or Areas in Lakes or Coastal Tidal Waters in which such Fish Spend Extended Periods of Time;
 - y. State Lands Designated for Wildlife or Game Management; and
 - z. Wetlands.

Sensitive Environment Contact List

CONTACT	NAME & CONTACT INFORMATION	SENSITIVE ENVIRONMENT
NC Division of Conservation, Planning, and Community Affairs – Natural Heritage Program	Visit the Natural Heritage Program’s interactive maps of Natural Heritage resources to search for records within 2 miles of your project area or the database search tool for record summaries by county and USGS 7.5-minute topo map. You can also download GIS shapefiles of our data; see the “GIS Download” page for details. Email inquiries to: natural.heritage@ncdenr.gov	State Parks Areas Important to Maintenance of Unique Natural Communities Sensitive Areas Identified Under the National Estuary Program Designated State Natural Areas State Seashore, Lakeshore and River Recreational Areas Rare species (state and federal Threatened and Endangered) Sensitive Aquatic Habitat State Wild & Scenic Rivers
National Park Service - Public Affairs Office	Anita Barnett Anita_Barnett@nps.gov (404) 507-5706 http://www.nps.gov/rivers	National Seashore, Lakeshore and River Recreational Areas National Parks or Monuments Federal Designated Wild & Scenic Rivers
US Forest Service	Heather Luczak, Forest NEPA Coordinator Heather.luczak@usda.gov (828) 257- 4817	Designated and Proposed Federal Wilderness and Natural Areas National Preserves and Forests Federal Land Designated for the Protection of Natural Ecosystems
NC Division of Water Resources	Nora Dreamer, Basin Planner nora.deamer@ncdenr.gov (919) 707-9119 Ian McMillan, Branch Supervisor Ian.Mcmillan@ncdenr.gov (919) 707-9026 Ask for Clean Water Act 305b report	State-Designated Areas for Protection or Maintenance of Aquatic Life

NC Forest Service	Michael Foushee, Director, Safety, Planning & Analysis michael.foushee@ncagr.gov (919) 857-4820	State Preserves and Forests
US Fish & Wildlife Service	Pete Benjamin, Field Supervisor Pete_benjamin@fws.gov (919) 856-4520 x 11	Endangered Species
NC Department of Natural and Cultural Resources	Renee Gledhill-Earley, Environmental Review Coordinator (919) 814-6579 Renee.gledhill-earley@ncdcr.gov	National and State Historical Sites
NC Division of Coastal Management	Mike Lopazanski, Deputy Director mike.lopezanski@ncdenr.gov (252) 808-2808 ext. 223 http://dcm2.enr.state.nc.us	Areas Identified Under Coastal Protection Legislation Coastal Barriers or Units of a Coastal Barrier Resources System.
NC Wildlife Resources Commission	David Cox, Technical Guidance Supervisor David.Cox@ncwildlife.org (919) 707-0366	National or State Wildlife Refuges State lands designated for wildlife or game management Migratory pathways and feeding areas critical for maintenance of anadromous fish species within river reaches or lakes or coastal tidal waters. Spawning Areas Critical for the Maintenance of Fish/Shellfish Species within River, Lake or Coastal Tidal Waters.
US Army Corps of Engineers	Asheville Regulatory Field Office Dina Supple: (828) 271-7980 AshevilleNCREG@usace.army.mil Charlotte Regulatory Field Office Lisa Hreha: (704) 510-1441 CharlotteNCREG1@usace.army.mil Raleigh Regulatory Field Office Josephine Schaffer: (919) 554-4884 RaleighNCREG@usace.army.mil Washington Regulatory Field Office Nikki Dameron: (252) 975-1399 WashingtonNCREG@usace.army.mil Wilmington Regulatory Field Office Kasey Jones: (910) 251-4811 WilmingtonNCREG@usace.army.mil	Wetlands

APPENDIX H: BORROW SOIL LOCATION AND SAMPLING PROCEDURES

The Unit must approve the import of fill material that originates from an off-site source. Imported fill material must meet the acceptable risk for unrestricted property use. If metals exceed levels suitable for unrestricted use, according to the DEQ risk calculator, a critical effects evaluation (CEE) must be performed. The CEE should be submitted to the Unit PM for review and the DEQ toxicologist must approve of the CEE prior to the Unit approving the fill material for import. The receiving site's naturally occurring background levels should be considered prior to importing fill material to ensure the imported fill material has metal concentrations similar to the receiving site.

Any party accepting or importing contaminated soil that exceeds levels suitable for unrestricted use may make themselves a responsible party under CERCLA.

Off-site borrow sources may be in-situ sources or stockpiled sources. If a stockpile is utilized, the owner of the stockpiled fill material will be required to sign an affidavit, attesting that the stockpiled fill material originated from one source location and not from multiple sources and the owner of the stockpile must provide documentation for the origin of the fill material. The stockpiled fill material that is sampled and tested must be the same fill material that is purchased and imported for use at the site.

OFF-SITE BORROW SOURCES

Preferred borrow sources for fill material are those that were previously undeveloped or used solely for agricultural or residential purposes. The following list of borrow sources are considered undesirable as soil fill material and shall not be utilized:

1. Locations on or within 1,000 feet of a site that the Division of Waste Management (DWM) manages, permits, or has inventoried.
2. Dredged material from a marine environment (unless it has dried to meet the moisture content of the receiving site).
3. Soils from below the groundwater table (unless it has dried to meet the moisture content of the receiving site).
4. Soils containing construction, demolition debris, and/or reclaimed asphalt pavement or concrete.
5. Soils from recycling operations that collect, sort, reprocess, or manufacture products.
6. Soils from transfer stations that collect, consolidate, temporarily store, sort, or recover refuse or used materials from off site.
7. Soils from a contaminant cleanup or removal.
8. Commercial or industrial sites where hazardous materials were used, handled, or stored.
9. Soils containing coal and wood ash.

Collect samples from the fill material source according to the type of fill (in-situ or stockpile). Sampling methodologies must be in accordance with USEPA Region IV *Field Branches Quality System and Technical Procedures* for soil sampling and these guidelines.

The history and location of the proposed borrow source must be established and documented. If the proposed borrow source meets the criteria listed above, the following procedure shall be used for verification sampling and testing.

Borrow Soil Collection Procedure (in-situ and stockpiles):

1. Discrete samples at different depth horizons according to the following:
 - a) Up to 1,000 cubic yards – collect one sample per 250 cubic yards.
 - b) 1,000 cubic yards to 5,000 cubic yards - collect four samples for the first 1,000 cubic yards plus one sample per each additional 500 cubic yards.
 - c) Greater than 5,000 cubic yards – collect 12 samples for the first 5,000 cubic yards plus one sample per each additional 1,000 cubic yards.
2. Generate a table with the following:
 - a. Sample ID with depth horizon.
 - b. Individual sample results.
 - c. Average borrow soil concentration per analyte.
 - d. Add 2x average background soil (site specific or regional data set) concentration per analyte according to background soil collection procedures (see below).
 - e. Add EPA Regional Screening Levels (RSLs) for residential soil at the lessor of cancer risk = $1.0\text{E-}06$ and $\text{HQ} = 0.1$.

Background Soil Collection Procedure:

1. Discrete samples collected from top 12 inches of soil outside the delineated waste disposal area.
2. Collect a minimum of 12 discrete samples for site specific background and a minimum of 50 discrete samples for regional background (sampling area and total number of samples for regional background data sets will be determined by the PRLF program based on the area of interest).
3. Generate a table with the following:
 - a. Sample ID.
 - b. Individual sample results.
 - c. Average background soil concentration per analyte.
 - d. Add 2x average background soil (site specific or regional data set) concentration per analyte.
 - e. Add EPA RSLs for residential soil at the lessor of cancer risk = $1.0\text{E-}06$ and $\text{HQ} = 0.1$.

Borrow Soil Evaluation Process:

1. Screen average borrow soil concentrations per analyte against the greater of 2x average background (site specific or regional) soil concentration per analyte and EPA RSLs at the lower of 1) the incremental cancer risk (ICR) of $1.0\text{E-}06$, and 2) a hazard quotient (HQ) 0.1.
2. Only contaminants exceeding these levels will be entered into the risk calculator.
3. If the average borrow soil concentration has a cumulative carcinogenic risk $> 1.0\text{E-}04$, go to step 5. If not, proceed to step 4.
4. If
 - a. The average borrow soil concentration has a cumulative carcinogenic risk $< 1.0\text{E-}04$,
 - b. Each analyte has a calculated non-carcinogenic hazard quotient (HQ) of 1.0 or less, and

- c. The cumulative HQ is greater than 1.0, you can stop and perform a critical effects evaluation.
-
5. If the average borrow soil concentration of one or more analyte has a cumulative carcinogenic risk of $> 1.0E-04$ or a calculated non-carcinogenic HQ greater than 1.0, that sample location (soil boring) with the highest concentration should be removed from the data set and a new average calculated.
 6. Enter the new average for the analyte into the DEQ risk calculator and continue this process until both the cumulative carcinogenic risk is less than $1.0E-04$ and the calculated non-carcinogenic HQ for each analyte is 1.0 or less.
 7. Submit the excel version of the DEQ risk calculator for the last run, the excel version of the DEQ critical effects evaluation, along with data tables to DEQ toxicologist for review of the risk calculator and critical effects evaluation output.
 8. DEQ toxicologist will provide a borrow source memo stating the soil is suitable for unrestricted use and can be used as beneficial fill or request another run of the DEQ risk calculator.

APPENDIX I: ENGINEERED WDA COVER SYSTEMS

Engineered cover systems may be used at pre-1983 landfills to prevent dermal exposure to physical or chemical hazards created by the WDA or to prevent infiltration of precipitation at a site with groundwater contamination. The engineered WDA cover systems can include a soil cover with geotextile demarcation fabric, a matrix of soil filled high-density polyethylene (HDPE) expandable cells or a combination of both.

All engineered WDA cover systems must include manufacturing recommendations for products incorporated into the design and site-specific conditions to ensure the implementation and success of a risk-based remediation. The engineered WDA cover system must be a minimum of 12 inches of clean soil, aggregate, or a soil/aggregate mixture suitable for unrestricted use and must support vegetative growth regardless of the type of engineered WDA cover system selected. The vegetative cover must consist of grasses appropriate for the physiographic province where the Site is located.

Installation of an engineered WDA cover system would not be necessary for sites that are void of trees and have an existing soil cover that is a minimum of 12 inches thick and meets unrestricted use. In these situations, the existing soil cover would be utilized as the permanent WDA cover system without incorporating a geotextile demarcation fabric or HDPE expandable cells.

SOIL COVERS WITH GEOTEXTILE DEMARCATION FABRIC

Information pertaining to the NC Department of Transportation (NCDOT) approved geotextiles (1056-4) is available at the following website: <https://apps.ncdot.gov/vendor/approvedproducts/>. Geotextile demarcation fabric (or equivalent) that may be used is listed in the following table.

Company Name	Product Name	Model Number	Description
TenCate Geosynthetics	Mirafi 140NL/O	Orange	Nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. The product is inert to biological degradation and resists naturally encountered chemicals.

SOIL COVER WITH HIGH-DENSITY POLYETHYLENE EXPANDABLE CELLS

Information pertaining to the approved NCDOT geocells (1056-6) is available at the following website: <https://apps.ncdot.gov/vendor/approvedproducts/>. Geocells (or equivalent) that may be used are listed in the following table.

Company Name	Product Name	Model Number	Description
Presto Geosystems	Presto Geoweb	GW20V4, GW30V4, and GW40V4	Cell length ranges from 8.8 to 18.7 inches. Cellular confinement system for soil stabilization and slope protection.
Hanes Geo Components	TerraCell	140	Cellular confinement system for soil stabilization and slope protection.

Strata Systems, Inc.	Strataweb (4 inch height)	Styles 356 & 445	High performance three-dimensional cellular confinement system manufactured from extruded strips of HDPE, precision welded to form multiple cell heights and sizes. When filled with granular material, provides superior confinement and reinforcement.
Geo Products	EnviroGrid	EGA20 4 inch	Cellular confinement.

Research these products and be familiar with their characteristics (strength, flexibility, installation procedures, accessories, tools required for installation and etc.) and Site-specific conditions (environmental, logistical and engineering challenges) before selecting a product for the cover system. Follow the manufacturer's recommendations when installing and anchoring the product to the ground surface. Anchors may include product specific anchors, cut rebar stakes, polyethylene strips, and/or installation of an anchor trench.

WDA SURFACE PREPARATION

1. After grubbing activities are complete (if applicable) and the WDA has been graded for positive storm water runoff (if applicable), the WDA is covered with a geotextile demarcation fabric and/or the HDPE expandable cell system and filled with soil, aggregate, or a soil/aggregate mixture suitable for unrestricted use.
2. Refer to manufacturer installation recommendations and guidelines pertaining to the use of a geotextile between waste and the base of the cellular confinement system.
3. All daylighting tires and white goods must be removed prior to installation of the cellular confinement system and large individual pieces of daylighting waste that would result in a surface variation greater than 3 inches must be removed.
4. The top of the cellular confinement system should be covered with a minimum thickness of 2 inches of fill material. If the chosen fill material varies significantly from the WDA surface material, and sufficient surface compaction cannot be achieved, a non-woven geotextile may be required to maintain separation of the WDA surface and fill materials.

ATTACHMENT 1: GUIDELINES FOR THE LOCAL GOVERNMENT REIMBURSEMENT PROGRAM

The following guidelines pertain to local governments requesting approval to conduct RI activities at pre-1983 landfills and participate in the reimbursement program.

INTRODUCTION

1. Local governments may conduct RI phase activities in accordance with the current published edition of the *Guidelines for Addressing Pre-Regulatory Landfills and Dumps* guidance document including subsequent amendments and editions and seek reimbursement of assessment expenses if the activities were approved by the Unit.
2. Questions regarding the local government reimbursement program may be emailed to the PRLF Unit Supervisor, or by telephone at (919) 707-8333. PRLF Unit contact information may be found at the following website: [PRLF Unit](#).
3. NCGS 130A-310.6 (f) establishes the local government reimbursement program and outlines the four criteria necessary to qualify for reimbursement.

A unit of local government that voluntarily undertakes assessment or remediation of a pre-1983 landfill may request that the Department reimburse the costs of assessment of the pre-1983 landfill and implementation of measures necessary to remediate the site to eliminate an imminent hazard. The Department shall provide reimbursement under this subsection if the Department finds all of the following:

- (1) The unit of local government undertakes assessment and remediation under a plan approved by the Department.*
- (2) The unit of local government provides a certified accounting of costs incurred for assessment and remediation.*
- (3) Each contract for assessment and remediation complies with the requirements of Articles 3D and 8 of Chapter 143 of the NCGS.*
- (4) Remedial action is limited to measures necessary to abate the imminent hazard.*

LETTER OF INTEREST/REIMBURSEMENT ELIGIBILITY

4. To establish eligibility, the local government must submit a “Letter of Interest” to the North Carolina Division of Waste Management PRLF Unit stating the desire to voluntarily conduct an environmental assessment of a qualified pre-1983 landfill. The “Letter of Interest” should include the pre-1983 Landfill ID#, Landfill Name, and Landfill street address (including the City and County). Mail the “Letters of Interest” to:

PRLF Unit Supervisor
Local Government Reimbursement Program
Pre-Regulatory Landfill Unit
1646 Mail Service Center
Raleigh, NC 27699-1646

5. Prior to submittal of the initial work plan, the local government must provide a signed statement to the Unit confirming that the local government's consultant contract complies with Articles 3D (Procurement of Architectural, Engineering, and Surveying Services) and 8 (Public Contracts) of Chapter 143 of the NCGS to be eligible for reimbursement. A *Certification of Contracting Procedures Form* is provided in this document and must be completed to meet this requirement. The local government is required to provide, on official letterhead, its vendor and federal identification number to establish a reimbursement account with the Unit.
6. Once the completed *Certification of Contracting Procedures Form* has been received, the Unit will contact the local government to arrange a meeting with the local government to provide guidance on the work plan.
7. The local government's contractor must provide a work plan, cost proposal, and schedule for implementation once approved by the Unit.
8. Assessment work plans, cost proposals, and schedules require review and approval by the Unit. Reimbursement is subject to availability of funds and the Unit's review of the local government's certified accounting of costs to ensure they are consistent with standard assessment costs. To ensure reimbursement, the local government should closely monitor costs and confirm the consultant complies with NCGS 130A-310.6 (f).

WORK PLAN/COST PROPOSAL PREPARATION

WORK PLAN

9. Work plans should include: an in-depth description of the proposed scope of work and methodologies that will be utilized and a proposed schedule for completing the scope of work.
10. The local government's contractor must comply with the current published edition of the *Guidelines for Addressing Pre-Regulatory Landfills and Dumps* guidance document including subsequent amendments and editions to develop and complete all work activities. Procedures outlined in work plans must also comply with the current published version of the US Environmental Protection Agency Region IV Science and Ecosystem Support Division "Field Branches Quality System and Technical Procedures."
11. Due to the wide range of conditions encountered at pre-1983 landfills, the guidance document will not address every conceivable situation. The local government's contractor may need to consider proposing additional analyses and sample collection based on existing site-specific conditions and future land use.

COST PROPOSAL

12. A cost proposal outlining the costs for completing the scope of work presented in the work plan, must be attached to each work plan for review and approval by the Unit. Cost proposals must be submitted to the Unit in accordance with the *Cost Proposal and Invoice Format Sheets* which an

example can be found in Attachment 4. **Costs not approved by the Unit are not eligible for reimbursement.**

13. Cost proposals are required to be prepared on a time and materials basis and should be broken out per task as outlined in the associated work plan. Labor costs per personnel level unit rates, subcontractor costs (i.e. driller, analytical, etc.), and expense details (i.e. mileage, instruments, etc.) should be provided for each task. Use the Personnel Qualifications and Task Descriptions reference sheet, which can be found in Attachment 3, to determine the labor costs for various personnel.

REIMBURSEMENT

14. The local government must pay the consultant in accordance with their contract and then submit a certified accounting of costs with the consultant invoice(s) to the Unit for reimbursement.
15. All invoices must be submitted to the Unit in accordance with the *Cost Proposal and Invoice Format Sheets* which can be found in Attachment 4. Invoices must be submitted in the same format as the cost proposal for reconciliation and each invoice submittal must include a completed *PRLF Invoice Check List Form* which can be provided by the Unit (example in Attachment 5).
16. Submit a cover letter on official local government letterhead to request reimbursement and include the following:
 - a. vendor/Federal ID number;
 - b. current mailing address;
 - c. invoice(s) from contractor in the same format as the proposal cost sheet;
 - d. copies of the check(s) used to pay the contractor;
 - e. dollar amount you are requesting for reimbursement; and
 - f. a statement verifying that certified accounting in accordance with NCGS 130A-310.6(f)(2) was conducted.
17. The invoice packet will be reviewed by the Unit and compared to the work plan and cost proposal. After the invoice review is complete, the invoice packet will be submitted to accounting for processing, or the Local Government representative will receive a response requesting additional invoicing details.

Important: To avoid delay in reimbursement and multiple requests for additional supporting documentation, the Local Government representative must submit invoices in the same format as the cost proposal with the completed *PRLF Invoicing Check List Form* (Attachment 5) and all receipts organized and numbered to reflect the order outlined in the approved work plan.

CERTIFICATION OF CONTRACTING PROCEDURES FORM

Complete the Certification of Contracting Procedures Form by populating/modifying the italicized text within the brackets [] to reflect site specific information.

[name of unit of local government], hereby affirms that it complied
with the requirements of Articles 3D and 8 of Chapter 143 of the North Carolina General
Statutes in all contracts entered into to date for the assessment and/or remediation of the _____
[name of landfill] Landfill [landfill ID number] located
at [street address, city, county] for which it is seeking
reimbursement of expenses from the North Carolina Division of Waste Management.

IN WITNESS WHEREOF, _____ *[name of unit of local government]* _____ has caused these presents to be executed in its name by _____ *[name of authorized agent]* _____, its _____ *[title]* _____, on this the _____ *[date]* day of _____ *[month]* _____, *[year]* .

[name of unit of local government]

By: _____ *[signature of authorized agent]*

Signatory's name typed or printed: [name of authorized agent]

STATE OF NORTH CAROLINA

COUNTY OF _____ *[county]*

I, _____ *[name]* _____, a Notary Public, do hereby certify that _____
_____ *[name of authorized agent]* _____ personally appeared before me on
this day, produced proper identification in the form of _____, was duly sworn
and or affirmed, and declared that he or she holds the title of _____ *[title]* _____ of _____
_____ *[name of unit of local government]* _____, and declared that, to the
best of his or her knowledge and belief, that the information contained in the above
Certification is true and accurate, and he or she then signed this Certification in my presence.

WITNESS my hand and official seal this _____ *[date]* day of _____ *[month]* _____, *[year]* _____.

_____ *[name]* _____
Notary Public

My commission expires _____ *[date]* _____.

REQUEST FOR PROPOSAL (RFP) TEMPLATE

The following template may be used to draft a request for proposal (RFP). Populate/modify the italicized text within the brackets [] to reflect site specific information.

Request for Proposals (RFP): Pre-Regulatory Landfill Assessment

[North Carolina Local Government Name] is exploring the potential for re-use of a tract of land known as the *[Pre-Regulatory Landfill Site Name]*. In order to determine the feasibility of the re-use of this property, a detailed assessment of this closed landfill is needed. The landfill is located in *[City]*, *[County]*, North Carolina.

[North Carolina Local Government Name] is interested in contracting the services of an approved environmental consultant to perform and certify assessment services for this landfill in full cooperation of and under the guidance of the North Carolina Department of Environmental Quality (NC DEQ) Division of Waste Management, Special Remediation Branch, Pre-Regulatory Landfill Unit (Unit).

All environmental consultants interested in responding to this RFP should refer to the current published edition of the Unit's *Guidelines for Addressing Pre-Regulatory Landfills and Dumps* guidance document including subsequent amendments and editions when responding in order to adequately prepare for the effort required in work plan preparation, cost proposals and report submittal. All services proposed must be approved by the Unit following these guidelines and other regulations as determined by the Unit.

[North Carolina Local Government Name] is voluntarily undertaking the assessment of this pre-1983 landfill as defined in NCGS130A-290(a) (21a). The approved environmental consultant must be qualified to perform and will be responsible for compliance of all phases of this voluntary remedial investigation as directed by the Unit.

[North Carolina Local Government Name] will not be responsible for any activities, services or other costs associated with this RFP or subsequent contract work that is not pre-approved by the Unit. All work must comply with the requirements of NCGS 130A-310.6 (f) and designated by NC DEQ as reimbursable to the *[North Carolina Local Government Name]* under this statute. It is the sole responsibility of the approved environmental consultant to assure that all work performed as a result of this RFP is reimbursable to the *[North Carolina Local Government Name]* under this program administered by the Unit.

The property is known to the Unit and listed on the *Old Landfill Inventory* as: *[SITE NAME]*, *[IDENTIFICATION NUMBER]*. The landfill is located on a portion of *[County]* Parcel, PIN: *[number]*. Only the landfill and areas that may have been impacted by past landfill activities as outlined in the *Guidelines for Addressing Pre-Regulatory Landfills and Dumps* is to be considered for this RFP.

ATTACHMENT 2: PRE-REGULATORY LANDFILL PROGRAM CONTRACT TASK MANAGEMENT GUIDANCE

The following guidelines pertain to Professional Engineering firms (Contractors) awarded a contract to complete RI and risk based remedial action plans with the North Carolina Department of Environmental Quality's (NC DEQ) Pre-Regulatory Landfill Unit (Unit).

INTRODUCTION

Executed contracts are in accordance with Articles 3D and 8 of Chapter 143 of the North Carolina General Statutes. The statutory references can be found at the following websites, respectively:

https://www.ncleg.net/EnactedLegislation/Statutes/HTML/ByArticle/Chapter_143/Article_3D.html and
https://www.ncleg.net/EnactedLegislation/Statutes/HTML/ByArticle/Chapter_143/Article_8.html

The Contractor shall ensure that all documents and work plans comply with the Contractor's executed contract with the NC DEQ and the Inactive Hazardous Sites Response Act. All work activities shall be conducted in compliance with the current published editions of the following guidance documents including subsequent amendments and editions:

1. Guidelines for Addressing Pre-Regulatory Landfills and Dumps; and
2. Division of Waste Management: Vapor Intrusion Guidance.

The Contractor must assign a PM who will manage all RI and RA activities for the pre-1983 landfill. The Contractor PM is critical for maintaining communication and efficiently completing RI and RA activities. During the preparation of a remedial action plan (RAP), the Contractor PM may transition to an engineer PM due to engineering design components.

TASK ORDERS

All work activities must be performed on a task order not to exceed basis as outlined in the executed contract.

The Contractor PM will develop work plans, cost proposals, schedules and reports for Unit review. Task orders should contain all activities that will be completed at approximately the same time. If beneficial, subtasks can be used in a task order to separate events. Deadline extensions may be requested in writing on Contractor company letterhead only when unforeseen circumstances arise, otherwise all work is expected by the requested deadline.

Once the Unit PM confirms the work plan, cost proposal and schedule satisfy the requested task order, an approval authorization will be sent to the Contractor PM via e-mail. The Contractor PM must receive the task order approval authorization prior to commencement of any work activities.

Important: Work activities completed without prior authorization from the Unit will not be reimbursed.

Once the Unit PM confirms the work activities outlined in the approved task order are complete, the Contractor PM may submit an invoice to the Unit.

WORK PLANS, COST PROPOSALS AND SCHEDULES

Work plans, cost proposals and schedules must include a cover letter addressed to the attention of the assigned Unit PM and submitted via email. Include the pre-1983 landfill identification number and name along with the task order number exactly as listed in the task order request.

Include a proposed schedule with all work plans that includes the task(s)/subtask(s) to be performed each day (field activities) and the Contractor personnel that will be on site based on the Personnel Qualifications and Task Descriptions as outlined in Attachment 3 (i.e. Staff Geologist, Technician, sub-contractor).

Figure 1 is an example of a field activities schedule outlining the number of weeks, the day of the week, associated task order/subtask number and quantity and classification of contractor personnel and sub-contractor personnel for each day.

Week 1 – Day 1	Subtask #(s)	Quantity of Staff	Personnel Classification
Week 1 – Day 2	Subtask #(s)	Quantity of Staff	Personnel Classification
Week 1 – Day 3	Subtask #(s)	Quantity of Staff	Personnel Classification
Week 1 – Day 4	Subtask #(s)	Quantity of Staff	Personnel Classification
Week 1 – Day 5	Subtask #(s)	Quantity of Staff	Personnel Classification
Week 1 – Day 6	Subtask #(s)	Quantity of Staff	Personnel Classification
Week 1 – Day 7	Subtask #(s)	Quantity of Staff	Personnel Classification

Figure 1: Field Activities Schedule

The week is the week that field work begins for the associated task(s)/subtask(s). Day 1 is the first day that field work begins, regardless of the day of the week. The task/subtask number(s) are the task/subtask(s) that will be performed on the listed day(s). The number of personnel for each day represents the number of staff in the field for that day.

Contractor field personnel must receive a copy of the approved work plan for reference during field activities.

If revisions to work plans, cost proposals and/or reports are required, provide the Unit PM, via email, a complete document with revisions including a new revision date. The work plan should not be modified without approval of the Unit.

Cost proposals must have numbered pages and conform to the formatting as shown in the *Cost Proposal and Invoice Format Sheets* which can be found in Attachment 4.

Unit rates must match with the corresponding Personnel Level description based on the type of work activity such as remedial investigation/design and active remedial oversight as outlined in the Fee Schedule of each executed contract.

Costs associated with the preparation of health and safety plans are part of the Contractor's responsibility to ensure the safety of field staff. When special site conditions exist that affect public safety, i.e. exclusion zones to protect the public, then costs associated with the health and safety plan may be included.

Activities exceeding \$10,000 require quotes to document the competitive bidding process. The Contractor must comply with paragraph K as outlined in the Scope of Work in each executed contract.

COST ADJUSTMENTS AND WORK VARIANCES

When the approved work plan, cost proposal or schedule will not be maintained or cannot be completed as planned, the Contractor PM must notify the respective Unit PM and explain the pending issues. The Contractor PM must request a cost adjustment (change order) when a specific activity will exceed the approved task order dollar amount or a work variance if there are significant changes to the approved work plan impacting itemized costs or the approved schedule.

In accordance with the terms of the executed contract, the Contractor PM must immediately contact the Unit PM and provide the details, cost proposal, and schedule for the requested change order. The Unit PM may provide verbal approval of the cost adjustment. If verbal approval is granted, the Contractor PM must submit a written request along with the itemized costs within 48 hours of the verbal approval. If the Unit PM does not receive the written request within 48 hours, the Contractor may not be paid for the work activities.

Note: Work activities completed without approval from the Unit will not be paid.

A variance from the approved work plan must also be requested when there are significant changes to work plan activities that will affect individual line-item costs (unit rates) but will not exceed the total approved cost of the task order. The Contractor PM must immediately contact the Unit PM when issues arise that will result in work not being completed in accordance with the work plan. Discuss the details, cost, and schedule for the work plan variances with the Unit PM. The Unit PM may provide verbal approval of the variance. If verbal approval is granted, the Contractor PM must submit a written request along with the new itemized costs within 48 hours of the verbal approval. If the Unit PM does not receive the written request within 48 hours, the Contractor may not be paid for the work activities.

INVOICES

After the Contractor PM provides notification that all work activities associated with a particular task order is complete and the Unit PM is satisfied with the deliverable, the Contractor PM shall submit invoices.

Upon completion of each task order, including submittal of all approved related documents (including but not limited to written reports on technical progress, identification of problems, delays and cost updates) and the associated certifications, the Contractor PM may submit an invoice for payment that complies with the authorized costs outlined for each task order.

The Contractor PM should submit invoices as soon as possible once task order(s) activities are complete but must submit the invoice and all associated verification documents within 30 days from the date when the Unit PM issued the task order completion letter.

All invoices must be submitted in the same format as the approved cost proposal with all costs identified and a completed *PRLF Invoice Check List Form* which can be found in Attachment 5. Each invoice packet must include numbering to identify the costs associated with quotes and supporting documentation. The numbering will assist both the Contractor PM and Unit PM with review and

verification of all required documentation. The Contractor PM must initial and date all invoices submitted to the attention of the Unit PM assigned to the project.

Include approved cost adjustments and approved work variances with all invoice submittals. Identify the approved changes on the invoice checklist for review by the Unit PM.

CONTRACTOR INTERACTION WITH UNIT PM AND PROPERTY OWNERS

The Contractor PM will be the primary point of contact with the property owner(s). Whether at meetings on site or via telephone, the Contractor PM will provide the property owner(s) with information associated with all activities.

If a property owner becomes uncooperative or if the Contractor PM or their staff must leave a site due to safety concerns, immediately report the situation to the Unit PM. The Unit will work to resolve any property access concerns or safety issues with the Contractor PM, property owner(s) and any other impacted parties.

The Contractor PM must communicate with the Unit PM on a frequency established by the Unit and based on the type of field activities and work phase. There may be the need for daily communication via telephone, email and/or written reports. Communication between the Contractor PM and Unit PM is critical for maintaining a transparent record of completed RI and RA phase work activities.

REPORT SYMBOLS AND ABBREVIATIONS

Display symbols and abbreviations on all figures and maps according to the following:

Note: Use the last four digits of the site identification number before the sample abbreviation.

Example: 0730-TW-1

Description	Abbreviation		Symbol
Monitoring Well	MW-#		
Water Supply Well	PW-House number		 or 
Waste Characterization	WC-#		
Boring (no soil sample collected)	B-#		
Soil Boring (soil sample collected)	SB-#		
Surface Water/Sediment Sample	SW/SD-#		
Landfill Gas Probe	LFGP-#		
Soil Gas Probe	SGP-#		

ATTACHMENT 3: PERSONNEL QUALIFICATIONS AND TASK DESCRIPTIONS

PERSONNEL AND QUALIFICATIONS	TASK DESCRIPTIONS
Principal Engineer/Geologist/Hydrogeologist/Scientist Administrative and/or professional head of the organization or primary contract. Responsible for conceiving and executing business functions of the organization. Directs the professional staff. Normally has a financial interest in the company as partial owner, major investor or stockholder, or officer. Charges an extremely limited number of hours per site as the Principal. This position should never bill field or field supervision hours.	- Expert testimony - Legal strategies - Depositions - Contract oversight (limited)
Senior Engineer/Geologist/Hydrogeologist/Scientist Typically requires professional registration when applicable to task, 8 years of experience in technical or managerial roles, and regulatory compliance. Serves as senior technical leader, provides contract oversight for environmental remediation projects of medium to large scope and/or complexity and has developed substantial expertise in their field of practice. Generally, supervises Project Managers and oversees several projects. Duties typically include reviewing reports, developing strategies, and attending client and/or associated project meetings. Responsible for approving designs, reports, plans, and specifications before submittal to the Pre-Regulatory Landfill Unit. If significantly involved in a highly technical project, should have substantial technical expertise directly related to the project. Ensures compliance of field service operations with OSHA safety standards. Addresses public health concerns.	- Expert testimony - Site strategy and planning - Contract oversight - Reviews technical reports - Reviews corrective action plans - Reviews engineering/remedial system design - Health and safety coordinator - Reviews site safety plans
Project Engineer/Geologist/Hydrogeologist/Scientist Typically possesses at a minimum, a bachelor of science degree in engineering, geology, hydrogeology, or a directly related field. Serves as manager for entire project and has at least 5 years of experience in the environmental field. Duties typically include preparing proposals, reviewing reports, developing strategies, and attending client and/or associated project meetings. Under general supervision, prepares environmental design and plan specifications for site remedial activities. Leads and supervises teams of staff and technician level personnel, but would have a limited number of hours charged to each site, and only a small percentage of total field hours. Serves as site technical expert or supervisor for hydrogeological site characterizations and remediation activities and tests, and assembly of reports, plans, and specifications.	- Project management - Site strategy and planning - Develop site health and safety plans - Engineering/remedial system design - Data review and analysis - Report review - Site meetings and reconnaissance - On-site supervision (periodic) - Work plan preparation/review - Site investigation planning/review - Field work planning/review - Site inspection (periodic)
Staff Engineer/Geologist/Hydrogeologist/Scientist Requires at a minimum, a bachelor's degree in engineering, geology, hydrogeology, or related science and 1 to 5 years of experience in the environmental field. Works under supervision of the project manager to perform routine tasks related to environmental investigation and remediation projects. Is the primary person responsible for gathering field data and is competent at data analysis. Must be able to conduct investigation and remedial activities including directing drilling and monitoring well installation, sampling, conducting site and geologic mapping, documenting field activities, and compiling data. Must have knowledge of QA/QC procedures and protocol. This position will normally be highest in the number of hours billed for on-site work. However, technicians (see below) would conduct routine or on-going monitoring.	- Report preparation - Field work preparation/planning - Supervises site investigation and remediation activities - Site reconnaissance and mapping - Engineering/remedial system design and installation - Limited data review and analysis - On-site health and safety supervisor
Technician Typically requires a high school diploma, certified or licensed trades-person, or an associate's degree at a minimum. Responsible for general supervision of the installation, maintenance, and repair of on-site equipment. Conducting routine monitoring, collecting samples, and preparing equipment maintenance/operating logs.	- Field work preparation - Operation and maintenance of equipment - Well developing and sampling - Soil sampling - Handling of investigation and remediation derived wastes - Remedial system installation, operation, and maintenance - Monitoring activities
Draftsperson/CAD Typically requires a high school diploma. Requires 2 to 8 years of experience or 2 years of related college and more than 1 year of experience. Generally requires a Technical Drawing Certificate, and advanced drafting skills such as Computer Aided Drafting (CAD) & Design (CADD) operations.	- Drafting - CAD/CADD work - Cartography - Plotting of GPS and standard survey data
Word Processor/Clerical Operates computer for work processing, spreadsheets, and statistical typing, correspondence report generation, general office work, typing, and filing.	- Spreadsheets - Report generation - Word processing - Typing - Filing - General secretarial - Document reproduction

ATTACHMENT 4: COST PROPOSAL AND INVOICE FORMAT SHEETS

The following formats must be used by both Contractors and Local Governments for developing cost proposals and invoice submittals.

COST PROPOSAL FORMAT SHEET

Cost Proposal

Site ID #: Task Order #: Work Phase Description: RI Delineation
 State Contract #: Site Name:

Task Order # & Task Description (Work Plan and Field Services):

Subtask A - Subtask Description (Work Plan and Estimate):

Labor

Personnel Level	Unit Rate (\$)	# Units	Total Cost
Project	\$0	0	\$0
Staff	\$0	0	\$0
Word Processor/Clerical	\$0	0	<u>\$0</u>
		Subtotal Subtask A	\$0

Subtask B – Cover Soil Sampling:

Labor

Personnel Level	Unit Rate (\$)	# Units	Total Cost
Staff	\$0	0	\$0
Technician	\$0	0	\$0

Expendables and Reimbursable:

GPS Unit	\$0	0	\$0
PID	\$0	0	\$0
Subcontractor drilling	\$0	0	\$0
Per diem	\$0	0	\$0
Mileage	\$0	0	<u>\$0</u>
		Subtotal Subtask B	\$0

Cost Proposal Task Total \$0

INVOICE FORMAT SHEET

Invoice

Site ID #:

Task Order #:

Work Phase Description: RI Delineation

State Contract #:

Site Name:

Task Order # & Task Description (Work Plan and Field Services):

Subtask A - Subtask Description (Work Plan and Estimate):

Labor

Personnel Level	Unit Rate (\$)	# Units	Total Cost
Project	\$0	0	\$0
Staff	\$0	0	\$0
Word Processor/Clerical	\$0	0	<u>\$0</u>
Subtotal Subtask A			\$0

Subtask B – Cover Soil Sampling:

Labor

Personnel Level	Unit Rate (\$)	# Units	Total Cost
Staff	\$0	0	\$0
Technician	\$0	0	\$0

Expendables and Reimbursable:

GPS Unit	\$0	0	\$0
PID	\$0	0	\$0
Subcontractor drilling	\$0	0	\$0
Per diem	\$0	0	\$0
Mileage	\$0	0	<u>\$0</u>
Subtotal Subtask B			\$0

Invoice Task Total \$0

(Contractor PM Signature)

Name:

Invoice # (Company Invoice #):

Title:

Remit To: (Company Name)
(Company Address)

Company Name:

ATTACHMENT 5: PRLF INVOICING CHECK LIST FORM

PRLF INVOICING CHECK LIST

Contractor PM Initial:

Task Order ID:

PRLF PM Initial:

Date Invoice Submitted to PRLF:

Date to PRLF Peer:

Contractor PM

Local Gov't PM

PRLF PM

PRLF PEER

EXAMPLE ONLY

Contractor Invoice

Is the approved cost proposal included at the end of the invoice package?

Was a work plan variance submitted that affected costs? (If so, explain in notes below)

Is the site name and ID # correct on the invoice and cost proposal?

Is the invoice date representative of the latest invoice submittal date?

Does the format of the invoice match the format of the cost proposal, including breakout of subtasks?

Are all line items from the cost proposal included in the invoice?

Is an explanation provided in the notes for **all** items that vary from the cost proposal to the invoice? Such as:

 Invoiced line items not included in the cost proposal?

 Equipment unit rates invoiced higher than proposed?

 Large variances in proposed personnel hours and invoiced hours? (Reasonable variances are accepted)

Are the unit costs correct per the contract fee schedule?

Is tax for rented equipment and purchased supplies listed as a separate line item?

Are shipping costs listed as a separate line item?

Is an explanation provided in the notes if the invoice includes project or senior level hours for field work?

Is the math correct?

Subcontractor Invoice(s)

Are all subcontractor invoices provided, and in the order they appear on the contractor's invoice?

Are all subcontractor bids provided with the cost proposal in the order they appear in the cost proposal?

Do the subcontractor's total costs match the consultant's invoice line items?

Is an explanation provided in the notes for sub line items not included in the cost proposal bid?

Is an explanation provided in the notes for sub rates invoiced higher than in the cost proposal bid?

If the sub invoice covers multiple tasks and/or cost adjustments, are the totals clearly broken out for each?

If a sub's proposed line items/unit hours were reduced, are the consultant's associated line items reduced?

Do all sub invoices and bids show a breakdown of costs in separate line items (no lump sum costs)?

Is the math correct on the subcontractor invoices?

Additional Items for Remedy Invoices

Is the cost spreadsheet from the consultant/subcontractor contract included?

Are the line items relevant to this invoice highlighted on the contractor/subcontractor cost spreadsheet?

Does the invoice contain validation of units for invoiced subcontractor items?

Such as: weight tickets, surveyor statements of volumes (SF, acres, etc.) field measurements collected by contractor, cut/fill reports, field observation reports documenting days, activities, etc.

If a sub hires a sub to complete a line item (i.e. surveyor, driller, etc) is there proof of services rendered?

Such as: surveyor report, driller well abandonment records, field observation reports, etc.

To be Completed by PRLF Staff Only

Is the invoice and approved cost proposal separately secured (if more than 1 page each)?

Is the task order on the database?

Does the total cost of the cost proposal match the database?

Notes: