Storm Drainage Calculations

Rolesville NC

Frazier Farms Park Phase 1A / May 2023 / Revised September 2023 / 2020110039

McAdams

FRAZIER FARM PARK

PHASE 1A

ROLESVILLE, NORTH CAROLINA

STORM DRAINAGE CALCULATIONS

PROJECT NUMBER: **2020110039**
CERTIFIED BY: **ERIC DOMONELL, PE**

DATE: **MAY 2023**
REVISION 1: **AUGUST 2023**
REVISION 2: **SEPTEMBER 2023**

MCADAMS
621 HILLSBOROUGH STREET
SUITE 500
RALEIGH, NORTH CAROLINA 27603
NC LIC. # C-0293

TOWN OF ROLESVILLE
FRAZIER FARM PARK
SIA NARRATIVE

GENERAL DESCRIPTION

Located on Louisburg Road between Zebulon Road and Pulley Town Road in Rolesville, North Carolina, the approximately 8-acre project area is located within a portion of a +/- 116.56-acre parcel, which is further described by State Parcel Identification Numbers (PIN) 1779076610.

The site is located within the limits of the Town of Rolesville (the Town) and is therefore under the jurisdiction of the Town. Per the Town's mapping, the site is currently zoned PNR, Parks and Natural Resources. The portion of the parcels in which the site is located is bound to the north by an agricultural land class parcel, the west by Louisburg Rd with a residential development across the street, the south by a forestry land class parcel, and to the east by another agricultural land class parcel. The receiving stream for the proposed site is Perry Creek (NC stream index number 27-57-2, NC stream classification: Class WS-II;HQW;NSW), which belongs to the Neuse River Basin. The site is currently vacant farmland.

At this time, the Town of Rolesville is seeking to develop a roadway to serve the future recreational facility on the property. Anticipated improvements include two driveways, the roadway, associated parking and utilities.

DISCUSSION OF STORMWATER MANAGEMENT

The project, for this phase of development, will add a maximum of 1.85 acres of impervious surface. This project will be a low-density development and stormwater run-off will be collected via swales adjacent to the road then dissipated at low points via riprap pads. The design storm used for sizing of the pipes on site was the 25 year storm.

Development on this site will be required to meet the stormwater management requirements enforced by the State. The construction of permanent stormwater control measures (SCMs) are not anticipated due to the low-impact nature of this development.

DISCUSSION OF EROSION CONTROL

It is our understanding that land-disturbing activities will be governed by NCDEQ. Development on this tract will be designed to incorporate appropriate erosion and sediment controls onsite, which are anticipated to consist largely of silt fence and silt fence outlets. The silt fence outlets will be installed in low spots and as the engineer instructs throughout the project, in accordance with the details and project specification manual, to prevent silt fence failure. Where stockpiles exist, an additional row of silt fence will be provided. One sediment trap will be required. There are no proposed experimental erosion control devices or methods proposed in this design.

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 Wake County, North Carolina

June 27, 2023

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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface.....2
How Soil Surveys Are Made.....5
Soil Map.....8
Soil Map.....9
Legend.....10
Map Unit Legend.....11
Map Unit Descriptions.....11
Wake County, North Carolina.....14
AaA—Altavista fine sandy loam, 0 to 4 percent slopes, rarely flooded.....14
AuA—Augusta fine sandy loam, 0 to 2 percent slopes, rarely flooded.....15
ChA—Chewacla and Wehadkee soils, 0 to 2 percent slopes, frequently flooded.....16
HeB—Helena sandy loam, 2 to 6 percent slopes.....17
RgB—Rawlings-Rion complex, 2 to 6 percent slopes.....18
RgC—Rawlings-Rion complex, 6 to 10 percent slopes.....20
RgD—Rawlings-Rion complex, 10 to 15 percent slopes.....22
VaB—Vance sandy loam, 2 to 6 percent slopes.....23
W—Water.....24
WeB—Wedowee sandy loam, 2 to 6 percent slopes.....25
WeC—Wedowee sandy loam, 6 to 10 percent slopes.....26
WfB—Wedowee-Saw complex, 2 to 6 percent slopes.....27
References.....29

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.

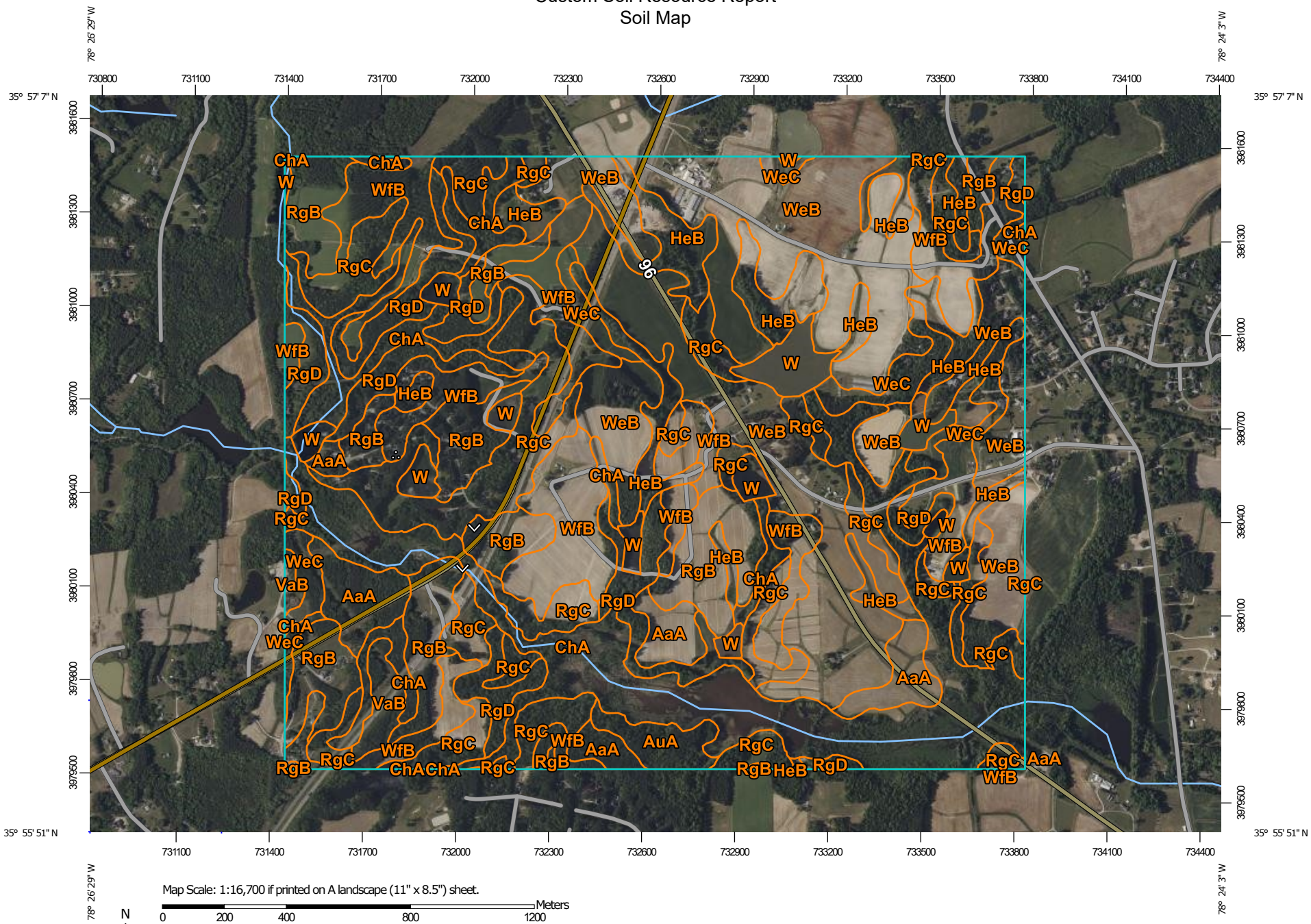
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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



Map Scale: 1:16,700 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

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 1:24,000.

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: Wake County, North Carolina
Survey Area Data: Version 23, Sep 12, 2022

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

Date(s) aerial images were photographed: Apr 24, 2022—May 9, 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
AaA	Altavista fine sandy loam, 0 to 4 percent slopes, rarely flooded	44.2	3.8%
AuA	Augusta fine sandy loam, 0 to 2 percent slopes, rarely flooded	11.2	1.0%
ChA	Chewacla and Wehadkee soils, 0 to 2 percent slopes, frequently flooded	183.4	15.8%
HeB	Helena sandy loam, 2 to 6 percent slopes	84.5	7.3%
RgB	Rawlings-Rion complex, 2 to 6 percent slopes	110.4	9.5%
RgC	Rawlings-Rion complex, 6 to 10 percent slopes	152.8	13.1%
RgD	Rawlings-Rion complex, 10 to 15 percent slopes	74.1	6.4%
VaB	Vance sandy loam, 2 to 6 percent slopes	10.7	0.9%
W	Water	37.0	3.2%
WeB	Wedowee sandy loam, 2 to 6 percent slopes	268.2	23.1%
WeC	Wedowee sandy loam, 6 to 10 percent slopes	33.3	2.9%
WfB	Wedowee-Saw complex, 2 to 6 percent slopes	153.1	13.2%
Totals for Area of Interest		**1,163.0**	**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.

Wake County, North Carolina

AaA—Altavista fine sandy loam, 0 to 4 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: 2xh95
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Altavista, rarely flooded, and similar soils: 95 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Altavista, Rarely Flooded

Setting

Landform: Stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old loamy alluvium derived from igneous and metamorphic rock

Typical profile

Ap - 0 to 8 inches: fine sandy loam
E - 8 to 12 inches: fine sandy loam
BE - 12 to 15 inches: sandy clay loam
Bt - 15 to 35 inches: clay loam
BC - 35 to 42 inches: sandy loam
C - 42 to 80 inches: coarse sandy loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
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 18 to 30 inches
Frequency of flooding: Rare
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): 2e
Hydrologic Soil Group: C
Ecological site: F136XY660NC - High-bottomland forest, moist
Hydric soil rating: No

Minor Components

Roanoke, occasionally flooded, undrained

Percent of map unit: 2 percent
Landform: Stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

AuA—Augusta fine sandy loam, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: 2spph
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Augusta, rarely flooded, and similar soils: 95 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Augusta, Rarely Flooded

Setting

Landform: Stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old loamy alluvium derived from igneous and metamorphic rock

Typical profile

A - 0 to 12 inches: fine sandy loam
Btg - 12 to 50 inches: sandy clay loam
Cg - 50 to 80 inches: loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: Rare
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): 3w
Hydrologic Soil Group: C/D
Ecological site: F136XY650NC - Bottomland forest, wet
Hydric soil rating: No

ChA—Chewacla and Wehadkee soils, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2qwpj
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Chewacla, frequently flooded, and similar soils: 50 percent
Wehadkee, frequently flooded, and similar soils: 45 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chewacla, Frequently Flooded

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous and metamorphic rock

Typical profile

A - 0 to 4 inches: loam
Bw1 - 4 to 26 inches: silty clay loam
Bw2 - 26 to 38 inches: loam
Bw3 - 38 to 60 inches: clay loam
C - 60 to 80 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
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 6 to 24 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Ecological site: F136XY610GA - Flood plain forest, wet
Hydric soil rating: No

Description of Wehadkee, Frequently Flooded

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous and metamorphic rock

Typical profile

A - 0 to 7 inches: silt loam
Bg - 7 to 49 inches: clay loam
Cg - 49 to 80 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.8 inches)

Interpretive groups

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

HeB—Helena sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2qqgq
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Helena and similar soils: 92 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Helena

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 12 inches: sandy loam
BE - 12 to 19 inches: sandy clay loam
Bt1 - 19 to 39 inches: clay
Bt2 - 39 to 43 inches: clay loam
BCg - 43 to 46 inches: clay loam
C - 46 to 80 inches: sandy loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 30 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): 2e
Hydrologic Soil Group: D
Ecological site: F136XY810SC - Acidic upland forest, seasonally wet
Hydric soil rating: No

RgB—Rawlings-Rion complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2xhb9
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rawlings and similar soils: 55 percent
Rion and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rawlings

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: sandy clay loam
C - 20 to 40 inches: gravelly sandy loam
R - 40 to 80 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 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: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, dry-moist
Hydric soil rating: No

Description of Rion

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite derived from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt1 - 8 to 17 inches: sandy clay loam
Bt2 - 17 to 38 inches: sandy loam
C - 38 to 80 inches: sandy loam

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

RgC—Rawlings-Rion complex, 6 to 10 percent slopes

Map Unit Setting

National map unit symbol: 2xhbb
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rawlings and similar soils: 55 percent
Rion and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rawlings

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: sandy clay loam
C - 20 to 40 inches: gravelly sandy loam
R - 40 to 80 inches: bedrock

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 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: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, dry-moist
Hydric soil rating: No

Description of Rion

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite derived from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt1 - 8 to 17 inches: sandy clay loam
Bt2 - 17 to 38 inches: sandy loam
C - 38 to 80 inches: sandy loam

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

RgD—Rawlings-Rion complex, 10 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2xhb8
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rawlings and similar soils: 55 percent
Rion and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rawlings

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: sandy clay loam
C - 20 to 40 inches: gravelly sandy loam
R - 40 to 80 inches: bedrock

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 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: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, dry-moist
Hydric soil rating: No

Description of Rion

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite derived from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt1 - 8 to 17 inches: sandy clay loam
Bt2 - 17 to 38 inches: sandy loam
C - 38 to 80 inches: sandy loam

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

VaB—Vance sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2qqjj
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Vance and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vance

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 5 inches: sandy loam
Bt1 - 5 to 23 inches: clay
Bt2 - 23 to 29 inches: clay loam
C - 29 to 80 inches: loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 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: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

W—Water

Map Unit Setting

National map unit symbol: 2qqjv
Elevation: 70 to 450 feet
Mean annual precipitation: 39 to 51 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8
Hydric soil rating: No

WeB—Wedowee sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2xn40
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Wedowee and similar soils: 94 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wedowee

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite residuum weathered from granite and gneiss and/or saprolite residuum weathered from schist

Typical profile

Ap - 0 to 4 inches: sandy loam
E - 4 to 7 inches: sandy loam
BC - 23 to 35 inches: clay loam
C - 35 to 80 inches: sandy clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

WeC—Wedowee sandy loam, 6 to 10 percent slopes

Map Unit Setting

National map unit symbol: 2xn41
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Wedowee and similar soils: 94 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wedowee

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite residuum weathered from granite and gneiss and/or saprolite residuum weathered from schist

Typical profile

Ap - 0 to 4 inches: sandy loam
E - 4 to 7 inches: sandy loam
BC - 23 to 35 inches: clay loam
C - 35 to 80 inches: sandy clay loam

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

WfB—Wedowee-Saw complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2xn42
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Wedowee and similar soils: 60 percent
Saw and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wedowee

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite residuum weathered from granite and gneiss and/or saprolite residuum weathered from schist

Typical profile

Ap - 0 to 4 inches: sandy loam
E - 4 to 7 inches: sandy loam
BC - 23 to 35 inches: clay loam
C - 35 to 80 inches: sandy clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

Description of Saw

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: clay
BC - 20 to 26 inches: sandy clay loam
C - 26 to 29 inches: sandy loam
R - 29 to 80 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 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: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, dry-moist
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

NOAA Atlas 14, Volume 2, Version 3
Location name: Wake Forest, North Carolina, USA*
Latitude: 35.9388°, Longitude: -78.4234°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.84** (4.44-5.30)	**5.62** (5.15-6.13)	**6.40** (5.86-6.97)	**7.19** (6.58-7.85)	**7.99** (7.27-8.71)	**8.64** (7.82-9.41)	**9.20** (8.29-10.0)	**9.72** (8.70-10.6)	**10.3** (9.13-11.2)	**10.8** (9.52-11.8)
10-min	**3.86** (3.55-4.23)	**4.49** (4.12-4.91)	**5.12** (4.69-5.58)	**5.75** (5.26-6.27)	**6.37** (5.80-6.94)	**6.88** (6.23-7.49)	**7.31** (6.59-7.97)	**7.70** (6.90-8.41)	**8.14** (7.22-8.89)	**8.51** (7.49-9.31)
15-min	**3.22** (2.95-3.53)	**3.76** (3.45-4.11)	**4.32** (3.96-4.71)	**4.85** (4.44-5.29)	**5.38** (4.90-5.86)	**5.80** (5.26-6.33)	**6.16** (5.56-6.72)	**6.48** (5.80-7.07)	**6.82** (6.06-7.46)	**7.12** (6.27-7.79)
30-min	**2.21** (2.02-2.42)	**2.60** (2.38-2.84)	**3.07** (2.81-3.34)	**3.51** (3.21-3.83)	**3.98** (3.63-4.34)	**4.37** (3.96-4.76)	**4.72** (4.25-5.14)	**5.04** (4.52-5.50)	**5.43** (4.82-5.93)	**5.76** (5.08-6.31)
60-min	**1.38** (1.26-1.51)	**1.63** (1.50-1.78)	**1.97** (1.80-2.14)	**2.29** (2.09-2.50)	**2.65** (2.42-2.89)	**2.96** (2.69-3.23)	**3.25** (2.93-3.54)	**3.54** (3.17-3.86)	**3.90** (3.46-4.26)	**4.21** (3.71-4.61)
2-hr	**0.806** (0.733-0.889)	**0.958** (0.874-1.05)	**1.17** (1.06-1.28)	**1.37** (1.25-1.51)	**1.62** (1.46-1.77)	**1.84** (1.65-2.00)	**2.04** (1.82-2.23)	**2.26** (2.00-2.47)	**2.54** (2.23-2.77)	**2.79** (2.43-3.05)
3-hr	**0.569** (0.517-0.631)	**0.677** (0.618-0.747)	**0.827** (0.753-0.913)	**0.982** (0.890-1.08)	**1.17** (1.05-1.28)	**1.34** (1.20-1.47)	**1.50** (1.33-1.65)	**1.68** (1.48-1.84)	**1.91** (1.67-2.09)	**2.13** (1.83-2.34)
6-hr	**0.342** (0.312-0.379)	**0.407** (0.372-0.449)	**0.498** (0.454-0.548)	**0.592** (0.538-0.650)	**0.707** (0.638-0.774)	**0.812** (0.728-0.888)	**0.917** (0.815-1.00)	**1.03** (0.905-1.12)	**1.18** (1.02-1.29)	**1.32** (1.13-1.44)
12-hr	**0.201** (0.183-0.221)	**0.239** (0.219-0.262)	**0.293** (0.269-0.322)	**0.350** (0.319-0.384)	**0.421** (0.382-0.460)	**0.487** (0.438-0.530)	**0.554** (0.493-0.602)	**0.626** (0.550-0.680)	**0.725** (0.628-0.788)	**0.818** (0.697-0.890)
24-hr	**0.119** (0.111-0.128)	**0.144** (0.134-0.155)	**0.181** (0.168-0.195)	**0.211** (0.195-0.227)	**0.251** (0.232-0.270)	**0.284** (0.261-0.305)	**0.317** (0.291-0.342)	**0.352** (0.322-0.380)	**0.401** (0.364-0.433)	**0.440** (0.398-0.476)
2-day	**0.069** (0.064-0.074)	**0.083** (0.078-0.090)	**0.104** (0.097-0.112)	**0.120** (0.112-0.129)	**0.142** (0.132-0.153)	**0.160** (0.148-0.172)	**0.179** (0.164-0.192)	**0.198** (0.181-0.213)	**0.224** (0.204-0.242)	**0.245** (0.222-0.266)
3-day	**0.049** (0.046-0.052)	**0.059** (0.055-0.063)	**0.073** (0.068-0.078)	**0.084** (0.078-0.090)	**0.100** (0.092-0.107)	**0.112** (0.103-0.120)	**0.125** (0.115-0.134)	**0.138** (0.126-0.148)	**0.156** (0.142-0.168)	**0.171** (0.154-0.184)
4-day	**0.039** (0.036-0.041)	**0.046** (0.043-0.050)	**0.058** (0.054-0.061)	**0.066** (0.062-0.071)	**0.078** (0.073-0.084)	**0.088** (0.081-0.094)	**0.098** (0.090-0.105)	**0.108** (0.099-0.116)	**0.122** (0.111-0.131)	**0.133** (0.121-0.143)
7-day	**0.026** (0.024-0.027)	**0.031** (0.029-0.033)	**0.037** (0.035-0.040)	**0.043** (0.040-0.046)	**0.050** (0.047-0.054)	**0.056** (0.052-0.060)	**0.062** (0.058-0.067)	**0.069** (0.063-0.074)	**0.077** (0.071-0.083)	**0.084** (0.077-0.091)
10-day	**0.020** (0.019-0.022)	**0.024** (0.023-0.026)	**0.029** (0.028-0.031)	**0.033** (0.031-0.035)	**0.039** (0.036-0.041)	**0.043** (0.040-0.046)	**0.047** (0.044-0.050)	**0.051** (0.048-0.055)	**0.057** (0.053-0.062)	**0.062** (0.057-0.067)
20-day	**0.014** (0.013-0.015)	**0.016** (0.015-0.017)	**0.019** (0.018-0.020)	**0.022** (0.020-0.023)	**0.025** (0.023-0.026)	**0.027** (0.026-0.029)	**0.030** (0.028-0.032)	**0.033** (0.030-0.035)	**0.036** (0.033-0.039)	**0.039** (0.036-0.042)
30-day	**0.011** (0.011-0.012)	**0.013** (0.013-0.014)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.020** (0.018-0.021)	**0.021** (0.020-0.023)	**0.023** (0.022-0.025)	**0.025** (0.023-0.027)	**0.027** (0.025-0.029)	**0.029** (0.027-0.031)
45-day	**0.010** (0.009-0.010)	**0.011** (0.011-0.012)	**0.013** (0.012-0.014)	**0.014** (0.014-0.015)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.018** (0.017-0.020)	**0.020** (0.019-0.021)	**0.021** (0.020-0.023)	**0.023** (0.021-0.024)
60-day	**0.009** (0.008-0.009)	**0.010** (0.010-0.011)	**0.012** (0.011-0.012)	**0.013** (0.012-0.013)	**0.014** (0.013-0.015)	**0.015** (0.014-0.016)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.018** (0.017-0.019)	**0.019** (0.018-0.020)

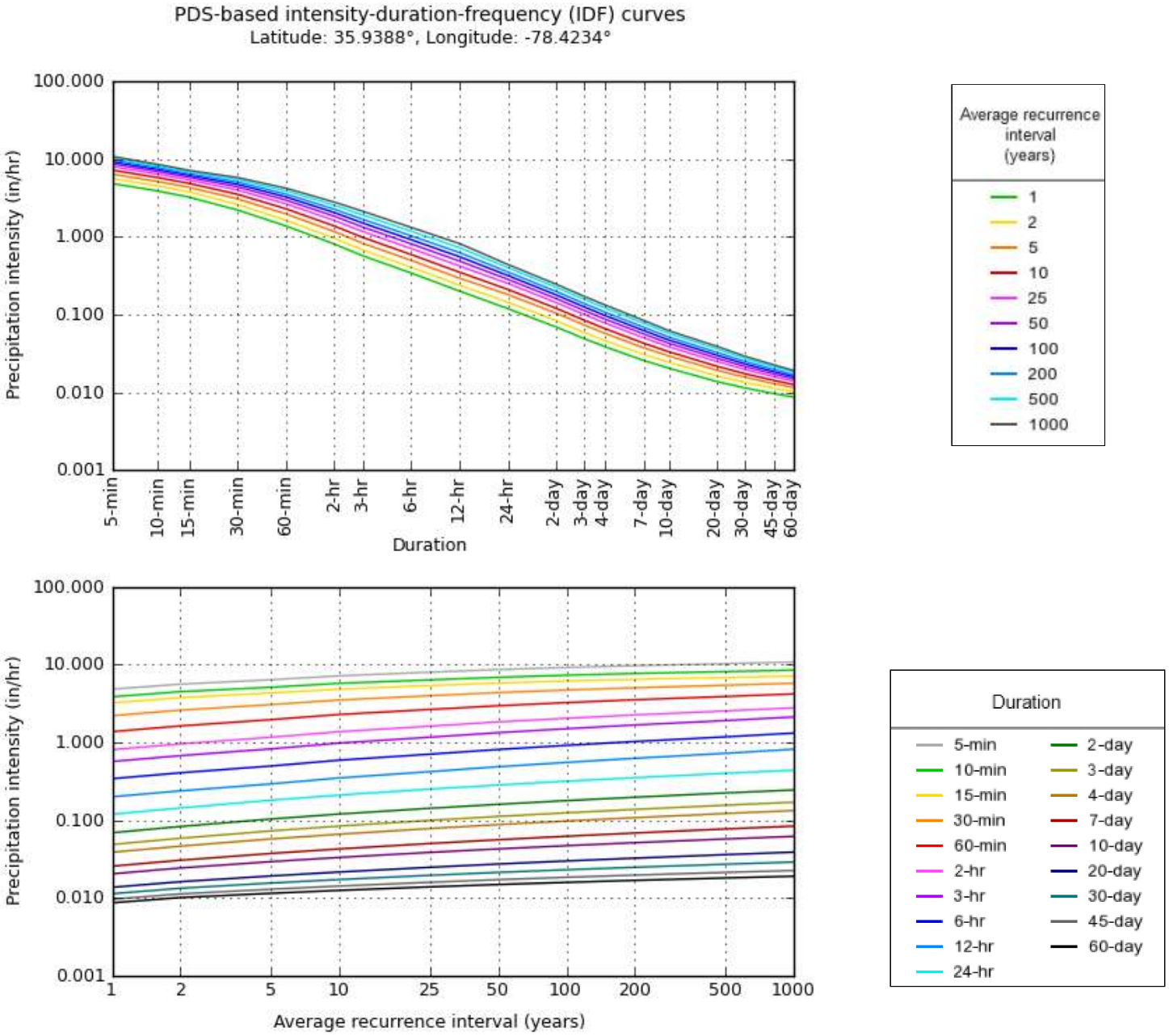
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



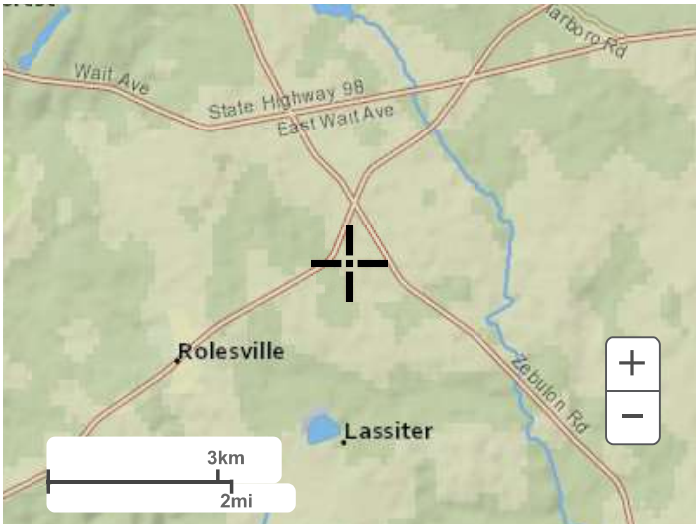
NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Wed May 17 15:04:26 2023

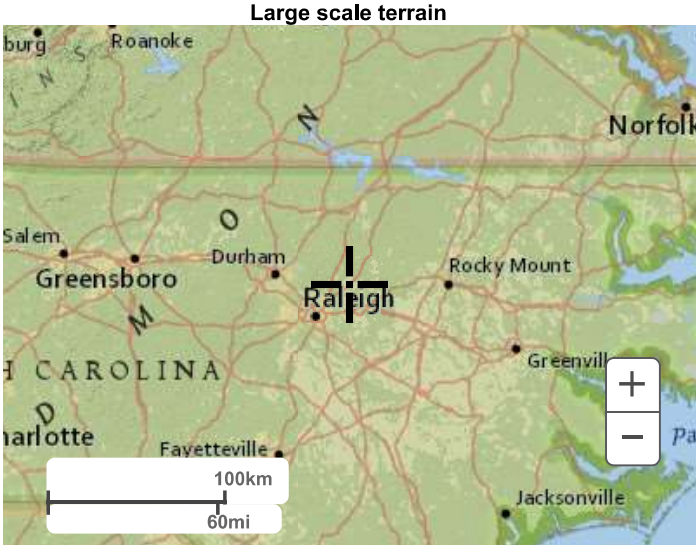
Back to Top

Maps & aerials

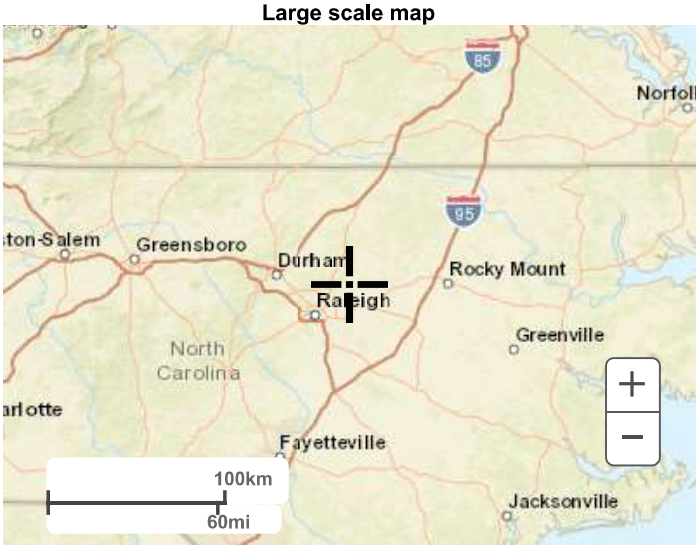
Small scale terrain



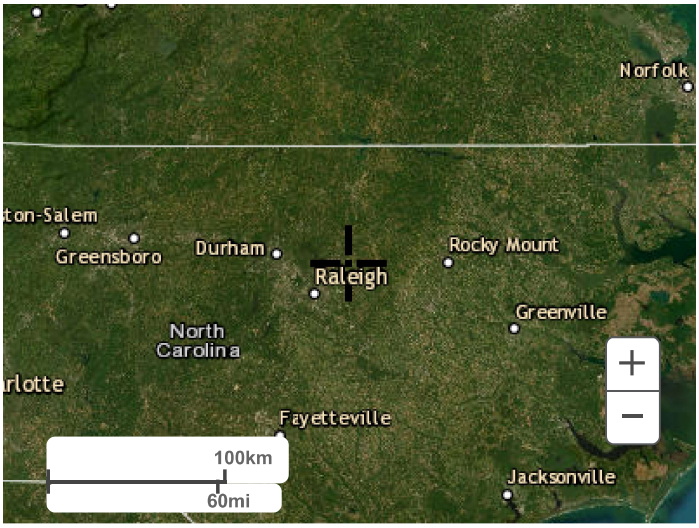
Large scale terrain



Large scale map



Large scale aerial



Back to Top

Could not retrieve elevation data due to Cross-Origin permissions.

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

IMPERVIOUS TABLE	
PRE-DEVELOPMENT	0.14 AC
POST-DEVELOPMENT	1.92 AC

PRE-DA 1
113.49 AC

PRE-DA 2
6.17 AC

PRE-DA 2 DRAINAGE POINT

PRE-DA 1
DRAINAGE
POINT

U.S. HIGHWAY 401
LOUISBURG ROAD
VARIABLE WIDTH PUBLIC RIGHT-OF-WAY

CREEK PINE DRIVE

N.C. HIGHWAY 96
VARIABLE WIDTH PUBLIC RIGHT-OF-WAY

PERRY CREEK

CHANNELIZED FLOW

SHEET FLOW

SHALLOW CONCENTRATED FLOW

START OF TC PATH

SOIL GROUP B
SOIL GROUP C
SOIL GROUP D

WETLAND

NEUSE RIVER BUFFER
ZONE 1 AND 2

POND

SWALE

SHED

WELL HOUSE

GRAVEL DRIVE

2-STORY FRAME HOUSE
FFE=378.21

TOWN OF ROLESVILLE
PIN: 1779-07-6610
D.B. 16956, PG. 781

THE JAMES D. FOLKSTON, JR. FAMILY, LLC
PIN: 1779-17-2427
D.B. 17180, PG. 742

N/F
E.C. LUMPKIN LIMITED PARTNERSHIP
PIN: 1779-19-0357
D.B. 7695, PG. 481

N/F
FOSTER DANIEL & WYNNALEE V.
PIN: 1779-19-1243
D.B. 17243, PG. 2153

S 05°29'00" E 3075.00' (TOTAL)
2835.00'

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CURRENT TOWN OF ROLESVILLE ENGINEERING DESIGN AND CONSTRUCTION STANDARDS

GRAPHIC SCALE
0 5 120 240
1 inch = 120 ft.

CID-23-5
PRELIMINARY DRAWING - NOT RELEASED FOR CONSTRUCTION

M:\Projects\RGV\202011039 Frazier Farm Park\03-Technical Data\Calcs-Reports\Storm Drainage\202011039-PH1- preDA.dwg, 9/20/2023 11:28:34 AM, Liv Taylor

McADAMS
The John R. McAdams Company, Inc.
2905 Meridian Parkway
Durham, NC 27713

phone 919. 361. 5000
fax 919. 361. 2269
license number: C-0293

www.mcadamsco.com

CLIENT

NAME: TOWN OF ROLESVILLE
ADDRESS: 502 SOUTHTOWN CIRCLE
ADDRESS: ROLESVILLE NC 27571
PHONE: 919.554.6582

FRAZIER FARM PARK
CONSTRUCTION DRAWINGS
PHASE 1A
11624 LOUISBURG ROAD
ROLESVILLE, NORTH CAROLINA

NORTH CAROLINA PROFESSIONAL SEAL 047504 ENGINEER ERIC M. DOMONELL
9/7/2023

REVISIONS

NO. DATE

PLAN INFORMATION

PROJECT NO.	202011039
FILENAME	2020110039-PH1- PREDA
CHECKED BY	EMD
DRAWN BY	SME
SCALE	1"=120'
DATE	08.01.2023

SHEET

PRE DRAINAGE MAP

IMPERVIOUS TABLE	
PRE-DEVELOPMENT	0.14 AC
POST-DEVELOPMENT	1.92 AC

POST-DA 1
113.87 AC

POST-DA 2
5.90 AC

POST-DA 2 DRAINAGE POINT

POST-DA 1
DRAINAGE
POINT

U.S. HIGHWAY 401
LOUISBURG ROAD
VARIABLE WIDTH PUBLIC RIGHT-OF-WAY

N.C. HIGHWAY 96
VARIABLE WIDTH PUBLIC RIGHT-OF-WAY

CREEK PINE DRIVE

FARMSTEAD

EXISTING POND

EXISTING POND

TOWN OF ROLESVILLE
PIN: 1779-07-6610
D.B. 16956, PG. 781

PIN: 1779-08-3669
OWNER: CASTER, DANIEL R. & ANNALEE V.
D.B. 17246, PG. 2153

PIN: 1779-19-0357
OWNER: E.C. LUMPKIN LIMITED PARTNERSHIP
D.B. 7695, PG. 481

PIN: 1779-26-3965
OWNER: PULLEY, MICHAEL HUGH & WILLIAM SCOTT
D.B. 17362, PG. 2427

30' ZONE 1 NEUSE RIVER BUFFER
20' ZONE 2 NEUSE RIVER BUFFER
100' WS VEGETATIVE SETBACK

SOIL GROUP B
SOIL GROUP C
SOIL GROUP D

CHANNELIZED FLOW
SHALLOW FLOW
100' SHEET FLOW
START OF TC PATH

FES-100
FES-101
FES-200
FES-201
FES-300
FES-301
FES-400
FES-401
DI-201

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CURRENT TOWN OF ROLESVILLE ENGINEERING DESIGN AND CONSTRUCTION STANDARDS

GRAPHIC SCALE
0 5 120 240
1 inch = 120 ft.

CID-23-5
PRELIMINARY DRAWING - NOT RELEASED FOR CONSTRUCTION

McAdams
The John R. McAdams Company, Inc.
2905 Meridian Parkway
Durham, NC 27713

phone 919. 361. 5000
fax 919. 361. 2269
license number: C-0293

www.mcadamsco.com

CLIENT

NAME: TOWN OF ROLESVILLE
ADDRESS: 502 SOUTHTOWN CIRCLE
ADDRESS: ROLESVILLE NC 27571
PHONE: 919.554.6582

FRAZIER FARM PARK
CONSTRUCTION DRAWINGS
PHASE 1A
11624 LOUISBURG ROAD
ROLESVILLE, NORTH CAROLINA

NORTH CAROLINA PROFESSIONAL SEAL 047504 ENGINEER ERIC M. DOMONELL
8/1/2023

REVISIONS

NO. DATE

PLAN INFORMATION

PROJECT NO.	202011039
FILENAME	2020110039-PH1- POSTDA
CHECKED BY	EMD
DRAWN BY	SME
SCALE	1"=120'
DATE	08.01.2023

SHEET

POST DRAINAGE AREA

M:\Projects\RO\2020110039 Frazier Farm Park\03-Technical Data\Calcs-Reports\Storm Drainage\2020110039-PH1- postDA.dwg, 9/20/2023 11:28:59 AM, Lin Taylor

III. TIME OF CONCENTRATION INFORMATION - PRE DA 1

Time of concentration is calculated using the SCS Segmental Approach (TR-55).

Segment 1: Overland Flow

Length =	100	ft
Top Elev =	376.00	ft
Bot Elev =	373.00	ft
Height =	3	ft
Slope =	0.0300	ft/ft
Manning's n =	0.24	dense grasses
P (2-year/24-hour) =	3.5	inches (Durham, NC)
Segment Time =	***11.59***	***minutes***

Segment 2: Concentrated Flow

Length =	1404	ft
Top Elev =	373.00	ft
Bot Elev =	332.00	ft
Height =	41	ft
Slope =	0.0292	ft/ft
Paved ? =	No	
Velocity =	2.76	ft/sec
Segment Time =	***8.48***	***minutes***

Segment 3: Channel Flow

Length =	2570	ft
Top Elev =	332.00	ft
Bot Elev =	328.00	ft
Height =	4	ft
Slope =	0.0016	ft/ft
Manning's n =	0.045	natural channel
Flow Area =	700.00	sf (assume 100'w x 7'h channel)
Wetted Perimeter =	600.00	lf (assume 10' x 7' channel)
Channel Velocity =	1.45	ft/sec
Segment Time =	***29.59***	***minutes***

Time of Concentration =	49.66	minutes
SCS Lag Time =	29.80	minutes (SCS Lag = 0.6* Tc)
Time Increment =	8.64	minutes (= 0.29*SCS Lag)

III. TIME OF CONCENTRATION INFORMATION - PRE DA 2

Time of concentration is calculated using the SCS Segmental Approach (TR-55).

Segment 1: Overland Flow

Length =	100	ft
Top Elev =	395.00	ft
Bot Elev =	391.00	ft
Height =	4	ft
Slope =	0.0400	ft/ft
Manning's n =	0.24	dense grasses
P (2-year/24-hour) =	3.5	inches (Durham, NC)
Segment Time =	***10.33***	***minutes***

Segment 2: Concentrated Flow

Length =	813	ft
Top Elev =	391.00	ft
Bot Elev =	367.90	ft
Height =	23	ft
Slope =	0.0284	ft/ft
Paved ? =	No	
Velocity =	2.72	ft/sec
Segment Time =	***4.98***	***minutes***

Segment 3: Pipe Flow

Length =	21	ft
Top Elev =	367.90	ft
Bot Elev =	367.40	ft
Height =	0.5	ft
Slope =	0.0243	ft/ft
Manning's n =	0.013	concrete pipe
Pipe Diameter=	1.25	ft
Flow Area =	1.23	sf
Wetted Perimeter =	3.93	lf (2 ft ID pipe)
Channel Velocity =	8.23	ft/sec
Segment Time =	***0.04***	***minutes***

Segment 4: Concentrated Flow

Length =	155	ft
Top Elev =	367.40	ft
Bot Elev =	361.62	ft
Height =	6	ft
Slope =	0.0372	ft/ft
Paved ? =	No	
Velocity =	3.11	ft/sec
Segment Time =	***0.83***	***minutes***

Segment 5: Pipe Flow

Length =	308	ft
Top Elev =	361.62	ft
Bot Elev =	360.34	ft
Height =	1.28	ft
Slope =	0.0042	ft/ft
Manning's n =	0.013	concrete pipe
Pipe Diameter=	3.00	ft
Flow Area =	7.07	sf
Wetted Perimeter =	9.42	lf (2 ft ID pipe)
Channel Velocity =	6.10	ft/sec
Segment Time =	***0.84***	***minutes***

Time of Concentration =	16.19	minutes
SCS Lag Time =	9.72	minutes (SCS Lag = 0.6* Tc)
Time Increment =	2.82	minutes (= 0.29*SCS Lag)

III. TIME OF CONCENTRATION INFORMATION - POST DA 1

Time of concentration is calculated using the SCS Segmental Approach (TR-55).

Segment 1: Overland Flow

Length =	100	ft
Top Elev =	373.50	ft
Bot Elev =	370.80	ft
Height =	2.7	ft
Slope =	0.0270	ft/ft
Manning's n =	0.24	dense grasses
P (2-year/24-hour) =	3.5	inches (Durham, NC)
Segment Time =	*12.09*	***minutes***

Segment 2: Concentrated Flow

Length =	1429	ft
Top Elev =	370.80	ft
Bot Elev =	332.00	ft
Height =	39	ft
Slope =	0.0272	ft/ft
Paved ? =	No	
Velocity =	2.66	ft/sec
Segment Time =	*8.96*	***minutes***

Segment 3: Channel Flow

Length =	2570	ft
Top Elev =	332.00	ft
Bot Elev =	328.00	ft
Height =	4	ft
Slope =	0.0016	ft/ft
Manning's n =	0.045	natural channel
Flow Area =	700.00	sf (assume 100'w x 7'h channel)
Wetted Perimeter =	600.00	lf (assume 100' x 7' channel)
Channel Velocity =	1.45	ft/sec
Segment Time =	*29.59*	***minutes***

Time of Concentration =	50.63	minutes
SCS Lag Time =	30.38	minutes (SCS Lag = 0.6* Tc)
Time Increment =	8.81	minutes (= 0.29*SCS Lag)

III. TIME OF CONCENTRATION INFORMATION - POST DA 2

Time of concentration is calculated using the SCS Segmental Approach (TR-55).

Segment 1: Overland Flow

Length =	100	ft
Top Elev =	381.50	ft
Bot Elev =	376.50	ft
Height =	5	ft
Slope =	0.0501	ft/ft
Manning's n =	0.24	dense grasses
P (2-year/24-hour) =	3.5	inches (Durham, NC)
Segment Time =	***9.45***	***minutes***

Segment 2: Concentrated Flow

Length =	473	ft
Top Elev =	376.50	ft
Bot Elev =	367.90	ft
Height =	9	ft
Slope =	0.0182	ft/ft
Paved ? =	No	
Velocity =	2.18	ft/sec
Segment Time =	***3.62***	***minutes***

Segment 3: Pipe Flow

Length =	21	ft
Top Elev =	367.90	ft
Bot Elev =	367.40	ft
Height =	0.5	ft
Slope =	0.0243	ft/ft
Manning's n =	0.013	concrete pipe
Pipe Diameter=	1.25	ft
Flow Area =	1.23	sf
Wetted Perimeter =	3.93	lf (2 ft ID pipe)
Channel Velocity =	8.23	ft/sec
Segment Time =	***0.04***	***minutes***

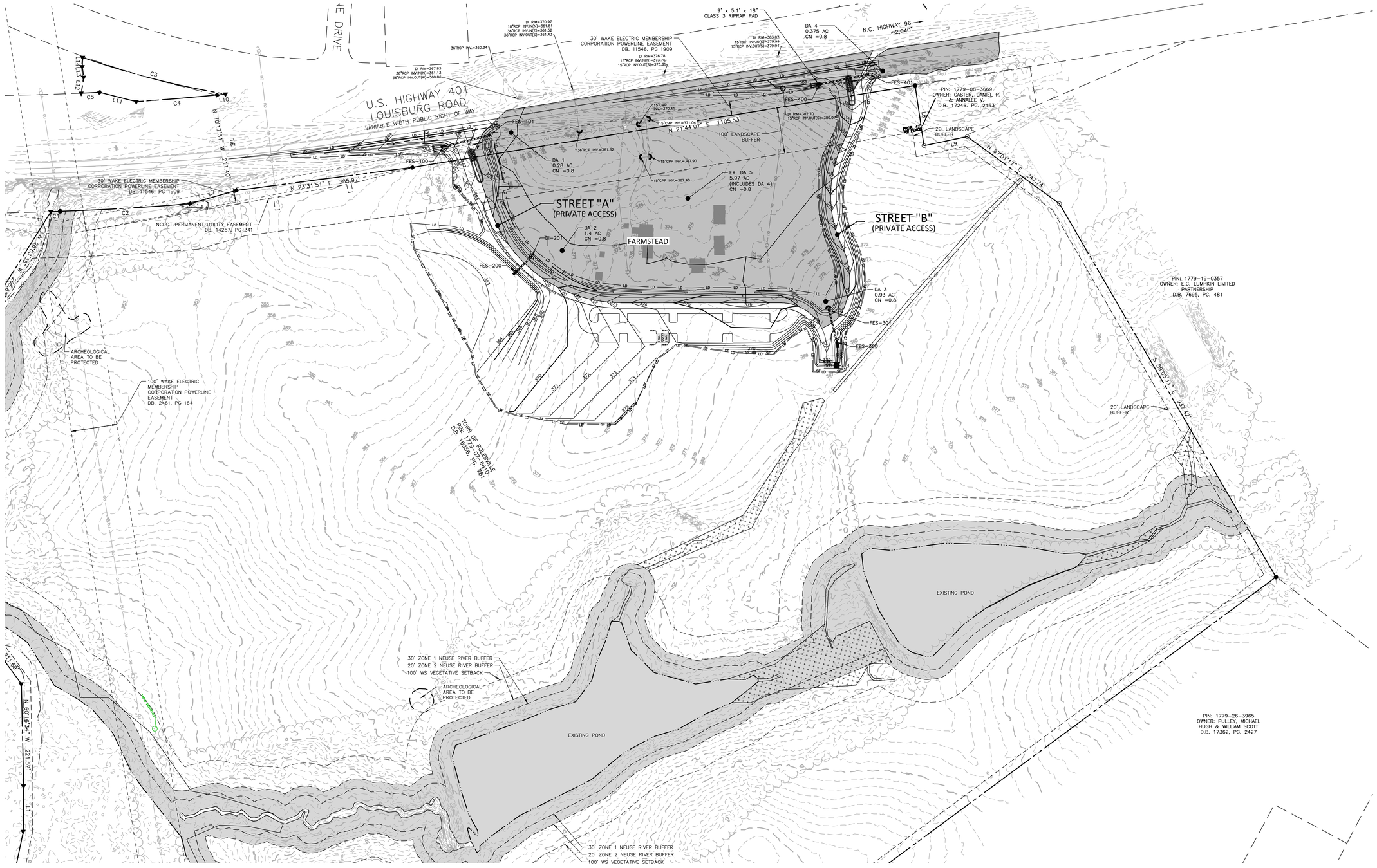
Segment 4: Concentrated Flow

Length =	155	ft
Top Elev =	367.40	ft
Bot Elev =	361.62	ft
Height =	6	ft
Slope =	0.0372	ft/ft
Paved ? =	No	
Velocity =	3.11	ft/sec
Segment Time =	***0.83***	***minutes***

Segment 5: Pipe Flow

Length =	308	ft
Top Elev =	361.62	ft
Bot Elev =	360.34	ft
Height =	1.28	ft
Slope =	0.0042	ft/ft
Manning's n =	0.013	concrete pipe
Pipe Diameter=	3.00	ft
Flow Area =	7.07	sf
Wetted Perimeter =	9.42	lf (2 ft ID pipe)
Channel Velocity =	6.10	ft/sec
Segment Time =	***0.84***	***minutes***

Time of Concentration =	13.95	minutes
SCS Lag Time =	8.37	minutes (SCS Lag = 0.6* Tc)
Time Increment =	2.43	minutes (= 0.29*SCS Lag)



ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CURRENT TOWN OF ROLESVILLE ENGINEERING DESIGN AND CONSTRUCTION STANDARDS

GRAPHIC SCALE
0 50 100 200
1 inch = 100 ft.

CID-23-5
PRELIMINARY DRAWING - NOT RELEASED FOR CONSTRUCTION

McADAMS
The John R. McAdams Company, Inc.
2905 Meridian Parkway
Durham, NC 27713

phone 919. 361. 5000
fax 919. 361. 2269
license number: C-0293

www.mcadamsco.com

CLIENT

NAME: TOWN OF ROLESVILLE
ADDRESS: 502 SOUTHTOWN CIRCLE
ADDRESS: ROLESVILLE NC 27571
PHONE: 919.554.6582

FRAZIER FARM PARK
CONSTRUCTION DRAWINGS
PHASE 1A
11624 LOUISBURG ROAD
ROLESVILLE, NORTH CAROLINA

NORTH CAROLINA PROFESSIONAL SEAL 047504 ENGINEER ERIC M. DOMONELL
8/1/2023

REVISIONS

NO. DATE

PLAN INFORMATION

PROJECT NO.	202011039
FILENAME	202011039-PH1- DA
CHECKED BY	EMD
DRAWN BY	SME
SCALE	1"=100'
DATE	08.01.2023

SHEET

INLET DRAINAGE AREAS

M:\Projects\RO\2020110039 Frazier Farm Park\03-Technical Data\Calcs-Reports\Storm Drainage\202011039-PH1- DA.dwg, 9/20/2023 11:29:10 AM, Liv Taylor

INLET FLEX TABLES

ID	Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Inlet Type
64	FES-101	366.97	365.48	Full Capture
66	DI-201	366.25	363.5	Full Capture
69	FES-301	372.3	370.8	Full Capture
70	FES-401	386	384.5	Full Capture

Capture Efficiency (Calculated) (%)	Flow (Captured) (cfs)	Hydraulic Grade Line (In) (ft)
100	1.8	365.98
100	9.02	364.9
100	5.99	371.75
100	2.42	385.09

Inlet Drainage Area (acres)
0.28
1.4
0.93
0.375

OUTFALL FLEX TABLES

ID	Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Hydraulic Grade (ft)
55	FES-400	385.4	383.9	384.47
56	FES-300	371.4	369.9	370.66
57	FES-200	364.77	363.27	364.43
58	FES-100	364	362.5	362.82

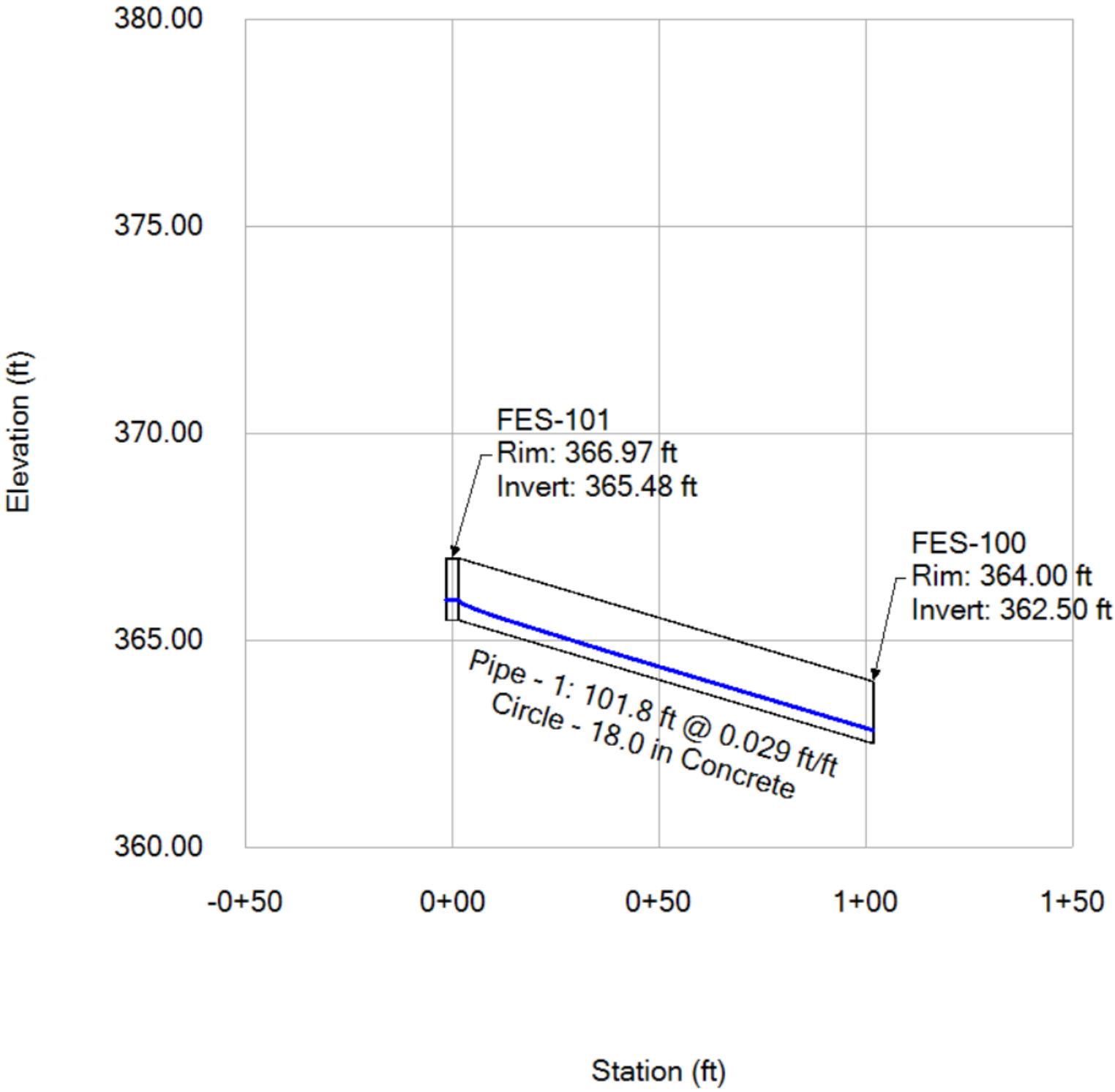
Flow (Total Out) (cfs)
2.37
5.95
8.96
1.78

CONDUIT FLEX TABLES

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (ft)
47	Pipe - 1	FES-101	365.48	FES-100	362.5	101.8
48	Pipe - 4	FES-401	384.5	FES-400	383.9	108.9
53	Pipe - 3	FES-301	370.8	FES-300	369.9	71.1
54	Pipe - 2	DI-201	363.5	FES-200	363.27	47.1

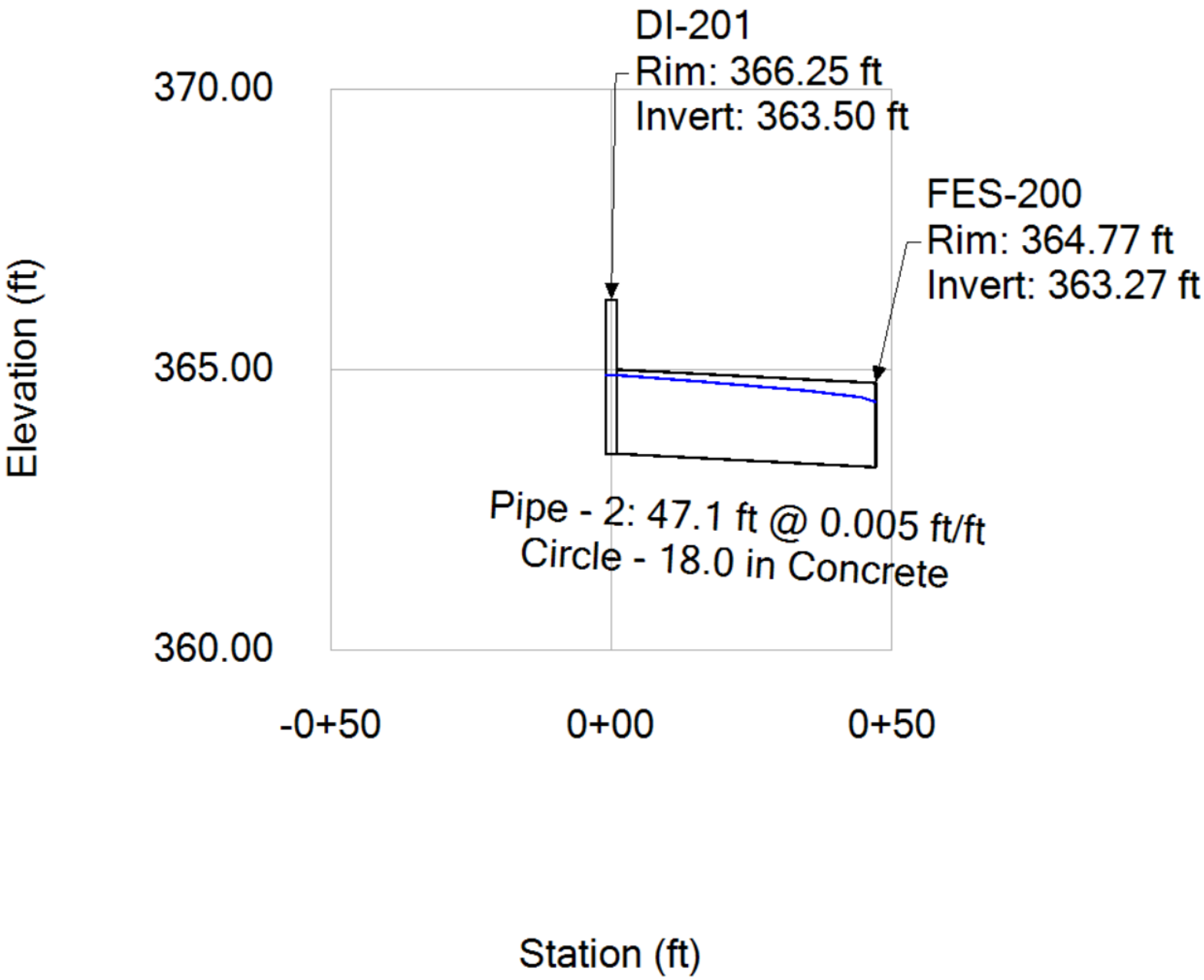
Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)
0.029	Circle	18	0.013	1.8	6.51
0.006	Circle	18	0.013	2.42	3.89
0.013	Circle	18	0.013	5.99	6.71
0.005	Circle	18	0.013	9.02	5.1

Depth (Out) (ft)	Capacity (Full Flow) (cfs)
0.32	17.95
0.57	7.8
0.76	11.82
1.16	7.42



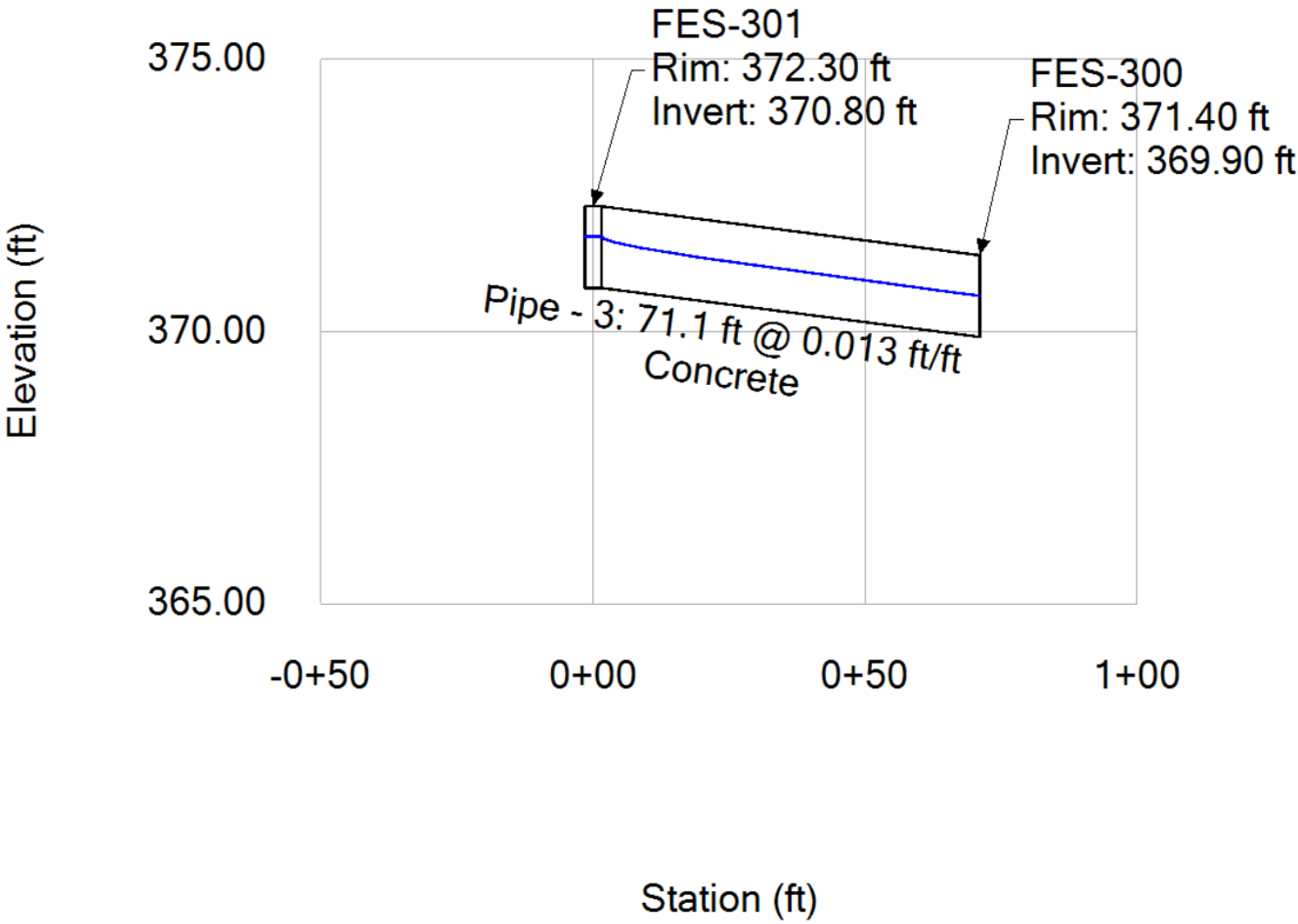
NOTE: FOR SURFACE PROFILES SEE SHEETS C3.00s

NOTE: DESIGNED FOR THE 25 YEAR STORM



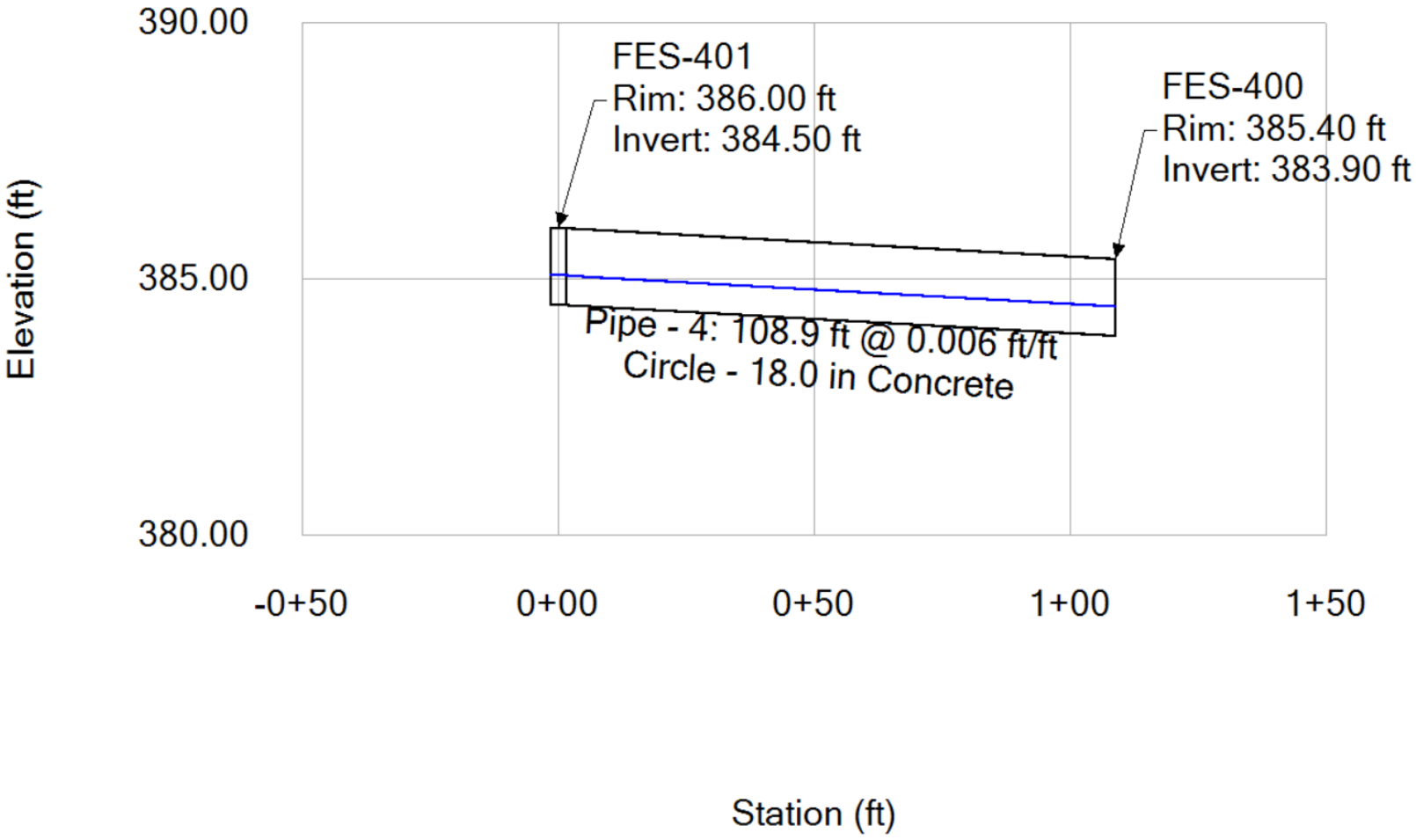
NOTE: FOR SURFACE PROFILES SEE SHEETS C3.00s

NOTE: DESIGNED FOR THE 25 YEAR STORM



NOTE: FOR SURFACE PROFILES SEE SHEETS C3.00s

NOTE: DESIGNED FOR THE 25 YEAR STORM



NOTE: FOR SURFACE PROFILES SEE SHEETS C3.00s

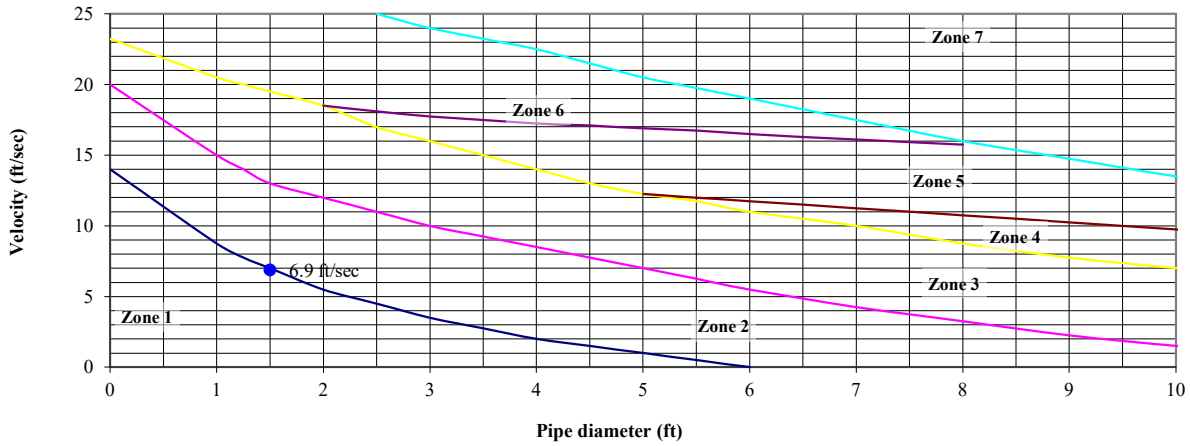
NOTE: DESIGNED FOR THE 25 YEAR STORM

DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project:	Frazier Farms	Date:	8/24/2023
Project Number:	2020110039	Calculated By:	OGT
Outlet Number:	18-IN Worst Case		

Outlet flowrate =	5.38	cfs
Pipe diameter =	18	inches
Number of pipes =	1	
Pipe separation =	0	feet
Outlet Velocity =	6.9	ft/sec

Figure 8.06.b.1



Zone from graph above = 2

Outlet pipe diameter	18 in.	Length =	9.0 ft.
Outlet flowrate	5.4 cfs	Width =	5.1 ft.
Outlet velocity	6.9 ft/sec	Stone diameter =	6 in.
Material =	Class B	Thickness =	18 in.

Zone	Material	Diameter	Thickness	Length	Width
1	Class A	3	12	4 x D(o)	3 x D(o)
2	Class B	6	18	6 x D(o)	3 x D(o)
3	Class I	13	24	8 x D(o)	3 x D(o)
4	Class I	13	24	8 x D(o)	3 x D(o)
5	Class II	23	36	10 x D(o)	3 x D(o)
6	Class II	23	36	10 x D(o)	3 x D(o)
7	Special study required				

1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual

2. Outlet velocity based on full-flow velocity