Ash Pond Inflow Design Flood Control System Plan

Wateree Station
Richland County, South Carolina

October 2021

Prepared For:

Dominion Energy of South Carolina
142 Wateree Station Road
Eastover, South Carolina 29044

Prepared By:

TRC
50 International Drive, Suite 150
Greenville, South Carolina 29615

Jonathan Hotstream
Senior Scientist

Nakia Addison, P.E.
Office Practice Leader

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FIGURES

APPENDICES

1.0 Background

Dominion Energy of South Carolina (DESC) owns and operates the Wateree Station (Station). The purpose of this Inflow Design Flood Control System Plan (Plan) is to present the flood control features of the Ash Pond at the Station as required by the United States Environmental Protection Agency's (USEPA) final coal combustion residuals (CCR) rule Title 40 Code of Federal Regulations (40 CFR) Part 257 Subpart D - "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments." The requirements for Inflow Design Flood Control System Plans for surface impoundments are presented in 40 CFR 257.82. The initial Inflow Design Flood Control System Plan was developed and placed in the Station's operating record on October 17, 2016. A periodic revision to the Plan is required every 5 years pursuant to 40 CFR 257.82(c)(4).

This Plan is a periodic revision based on review of the initial Plan, the recent closure activities that have occurred at the Ash Pond, and a site visit by TRC to observe existing conditions.

1.1 Existing Conditions

The Station is located on the Wateree River in Richland County, South Carolina, near the Town of Eastover, refer to Figure 1. The Ash Pond was an approximately 80-acre surface impoundment that was used for the management of sluiced fly and bottom ash material, as well as other low volume plant wastewaters. A Closure Plan was prepared for the Ash Pond in 2013. The Closure Plan was approved by the South Carolina Department of Health and Environmental Control (SC DHEC) in February 2013 (LOA-004214).

Closure activities began in the northern portion of the Ash Pond (Phase 1) in July 2016, and the southern portion of the Ash Pond (Phase 2) in July 2017. Closure activities included the removal of CCR as well as a minimum two feet of residual soils under the CCR. Upon removal of the CCR and soil, the Ash Pond area was backfilled with clean, native soils to a grade that would prevent ponding and enable stormwater to gravity discharge from the Ash Pond area via stormwater Outfall SW-003 and NPDES Outfall 03B (Garrett & Moore, 2018, 2019). Phase 1 of the Ash Pond closure construction was completed in November 2017, and Phase 2 construction was completed in October 2019. Closure Certification Reports were prepared by Garrett & Moore in February 2018 and October 2019. Refer to Appendix A for final grades record drawings for Phase 1 and Phase 2 closures.

A closeout notification of successful completion of Phase 1 closure was provided by SC DHEC in March 2018. Closeout notification of successful completion of Phase 2 closure was provided by SC DHEC in October 2019.

Effluent discharge from the Ash Pond is regulated under a National Pollution Discharge Elimination System Permit. Operational and groundwater requirements continue for the pond under the CCR rule.

2.0 Federal Regulations

An owner or operator of an existing or new CCR surface impoundment or any lateral expansion must design, construct, operate, and maintain an inflow design flood control system for the CCR surface impoundment to: (1) adequately manage flow into the CCR surface impoundment during and following the peak discharge of the inflow design flood, and (2) adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood. The inflow design flood is based on the hazard potential classification of the unit as required by 40 CFR 257.73. The inflow design floods for specific hazard potential classifications are as follows:

(1) The probable maximum flood for high hazard potential CCR surface impoundments

(2) The 1,000-year flood for significant hazard potential CCR surface impoundments

(3) The 100-year flood for low hazard potential CCR surface impoundments

(4) The 25-year flood for incised CCR surface impoundments

The former Ash Pond at the Wateree Station was classified as an incised CCR surface impoundment (Garrett & Moore, 2016): therefore, the Ash Pond must be designed and constructed to adequately manage peak discharges from a 25-year, 24-hour flood. Since the original classification, the Pond's CCR material has been removed and graded so that CCR and liquids are not impounded within the area.

3.0 Flow into the Ash Pond

The Ash Pond was constructed in an area beyond the 100-year floodplain, refer to Appendix B.

The Ash Pond receives no flows from the Station. Removal of CCR, over-excavation of soils, and final grading was competed in October 2019. Therefore, inflow into the former Ash Pond is limited to stormwater that falls within the former Ash Pond footprint and drainage area. During closure of the Ash Pond, the area was graded to provide gentle slopes for overland flow to swales located at the perimeter of the former Ash Pond footprint. These swales convey stormwater to Outfall SW-003 and NPDES Outfall 03B. The outlets are open channel features that do not impound stormwater within the Ash Pond area.

The stormwater modeling software HydroCAD, was utilized to estimate stormwater volume, peak flow rates, and associated velocities for the design 24-hour, 25-year storm event. HydroCAD is largely based on the United States Department of Agriculture Soil Conservation Service's, Technical Release 55 (TR-55) and TR-20 hydrology methods.

TRC performed stormwater analysis considering the following:

- The precipitation volume for the 24-hour, 25-year storm event is 6.66 inches.
- The drainage area and swale geometry are based on the final grades record drawings in Appendix A.

Based on the HydroCAD results (Appendix C) stormwater collected within the footprint of the former Ash Pond during the 24-hour, 25-year storm is adequately managed by the constructed features.

During the site visit the former Ash Pond area had an established vegetative cover with no distressed areas and no erosion or ponding was observed. The site observations confirm the results of the stormwater modeling.

4.0 Flow out of the Ash Pond

During the Ash Pond closure construction, the site was graded to not allow water to be impounded within the former Ash Pond. Closure construction removed CCR therefore stormwater does not come in contact with CCR.

Discharge from the Ash Pond is regulated in accordance with a National Pollutant Discharge Elimination System (NPDES) permit issued by the SC DHEC. The permit grants the Station permission to discharge from the facility to the Wateree River in accordance with effluent limitations, monitoring requirements, and other conditions. The NPDES permit is issued in accordance with the provisions of the Federal Clean Water Act. Therefore, by complying with the NPDES permit, the discharge from the former Ash Pond is also being handled in accordance with the applicable surface water requirements.

Stormwater that enters into the former Ash Pond sheet flows and discharges to either stormwater Outfall SW-003 and NPDES Outfall 03B via engineered ditches. The northern area of the Ash Pond, closed during Phase 1 of the closure, drains to Outfall SW-003. Outfall SW-003 is an open channel swale that discharges to the Wateree River. This swale has a fabric formed concrete lining to protect against erosion. Stormwater that contacts the surface of the northern area closure flows to two perimeter ditches located either along the northern perimeter or eastern perimeter of the former Ash Pond area. These perimeter ditches are lined with permanent turf reinforcement mat, LANDLOK 450 which has allowable flow rates of up to 18 feet per second.

The southern area of the Ash Pond drains to NPDES Outfall 03B, which is an 8-foot-wide box culvert that discharges to the Wateree River. The discharge from the box culvert is stabilized with riprap to prevent erosion. Stormwater runoff from the southern area cover flows to a perimeter drainage ditch along the eastern side of the Ash Pond area that routes the stormwater to Outfall 03B.

Stormwater Flow Summary:

- Northern Area (Phase 1 of Closure):
  - Perimeter Ditch 1:
    - Maximum Peak Flow from 24-hour, 25-year storm: 37 cubic feet per second (cfs); velocity: 6 feet per second (ft/sec)
    - Flow Capacity: 364 cfs; allowable velocity: 18 ft/s
- Southern Area (Phase 2 of Closure):
  - Perimeter Ditch:
    - Maximum Peak Flow from 24-hour, 25-year storm: 122 cfs, velocity: 3 ft/sec
    - Flow Capacity: 110 cfs; allowable velocity: 5 ft/s

Based on the stormwater calculations in Appendix C and as-built documentation, the discharge of the 25-year, 24-hour storm is managed in a controlled manner that does not result in erosive flows.

5.0 Conclusion

The Wateree Station Ash Pond meets the requirements of 40 CFR 257.82 of adequately controlling the inflows and outflows of peak discharge for the following reasons:

- The Ash Pond is constructed outside of the 100-year floodplain.
- Ash Pond removal of CCR, over-excavation of soils, and final grading was achieved in 2019. Construction included final grading to prevent ponding of stormwater in the former Ash Pond area.
- The Ash Pond can adequately receive and manage the discharges of direct rainfall from a 25-year, 24-hour storm. The Ash Pond was graded, during closure, to prevent water from being impounded. Stormwater that enters the former Ash Pond footprint discharges via stormwater Outfall SW-003 and NPDES Outfall 03B.
- The discharge from the Ash Pond is permitted under a NPDES permit which was issued in accordance with the provisions of the Federal Clean Water Act.

6.0 Amendment and Periodic Plan Revision

This plan has been completed in compliance with the requirements set forth in 40 CFR 257.82. This document will be placed in the Station's CCR operating record, posted to the publicly accessible CCR website, and government notifications will be provided.

A periodic inflow design flood control system plan must be prepared every 5 years from the completion date of this Plan. However, because the Ash Pond is in the process of confirming its closure, this Plan revision is anticipated to be the last. If closure for the Ash Pond is not confirmed, the next Plan revision is required by October 2026.

The Plan must be amended whenever the periodic review period is reached, or if changes in site conditions occur that will substantially affect the current written Plan.

7.0 References

National Flood Insurance Program. 2017. Flood Insurance Rate Map: Richland County, South Carolina Panel 560 of 650. Map Number 45079C0560L. Map Revised December 21, 2017. Federal Emergency Management Agency. Washington, D.C.

Garrett & Moore. 2016. Inflow Design Flood Control System Plan for the Wateree Station Ash Pond. Richland County, South Carolina. July 2016.

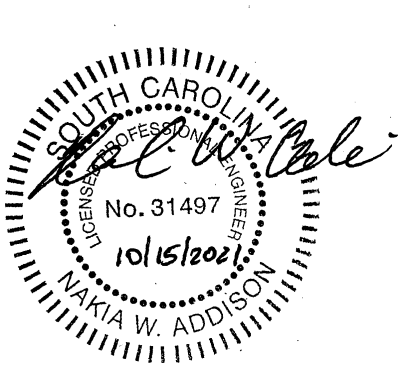
Garrett & Moore. 2018. Closure Certification Report for Wateree Station Ash Pond 1 – Phase 1. Richland County, South Carolina. February 2018.

Garrett & Moore. 2019. Closure Certification Report for Wateree Station Ash Pond – Phase 2. Richland County, South Carolina. October 2019.

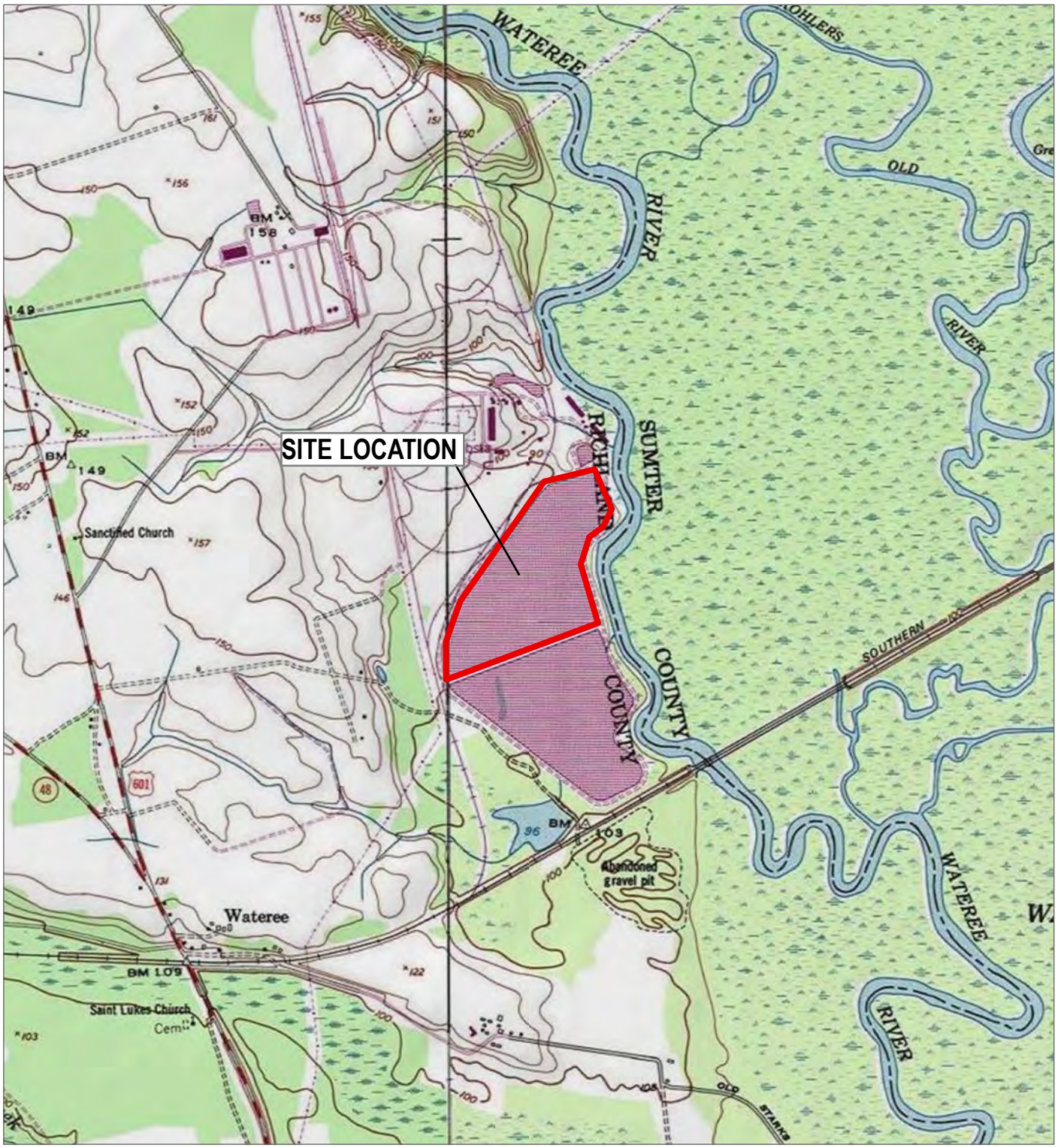
8.0 Certification

I, the undersigned South Carolina Professional Engineer, hereby certify that I am familiar with the technical requirements of 40 CFR 257 Subpart D. I also certify that it is my professional opinion that, to the best of my knowledge, information, and belief, that the information in this demonstration is in accordance with current good and accepted engineering practice(s) and standard(s) and meets the requirements of paragraph (c) in 40 CFR 257.82.

For the purpose of this document, "certify" and "certification" shall be interpreted and construed to be a "statement of professional opinion." The certification is understood and intended to be an expression of my professional opinion as a South Carolina Licensed Professional Engineer, based upon knowledge, information, and belief. The statement(s) of professional opinion are not and shall not be interpreted or construed to be a guarantee or a warranty of the analysis herein.



Nakia Addison, P.E.	31497 Engineer License Number
Signature of Professional Engineer	10/15/2021 Date



ASH POND

BASE MAP: USGS TOPO MAP

0 1,000 2,000

FEET

1:24,000 1" = 2,000'

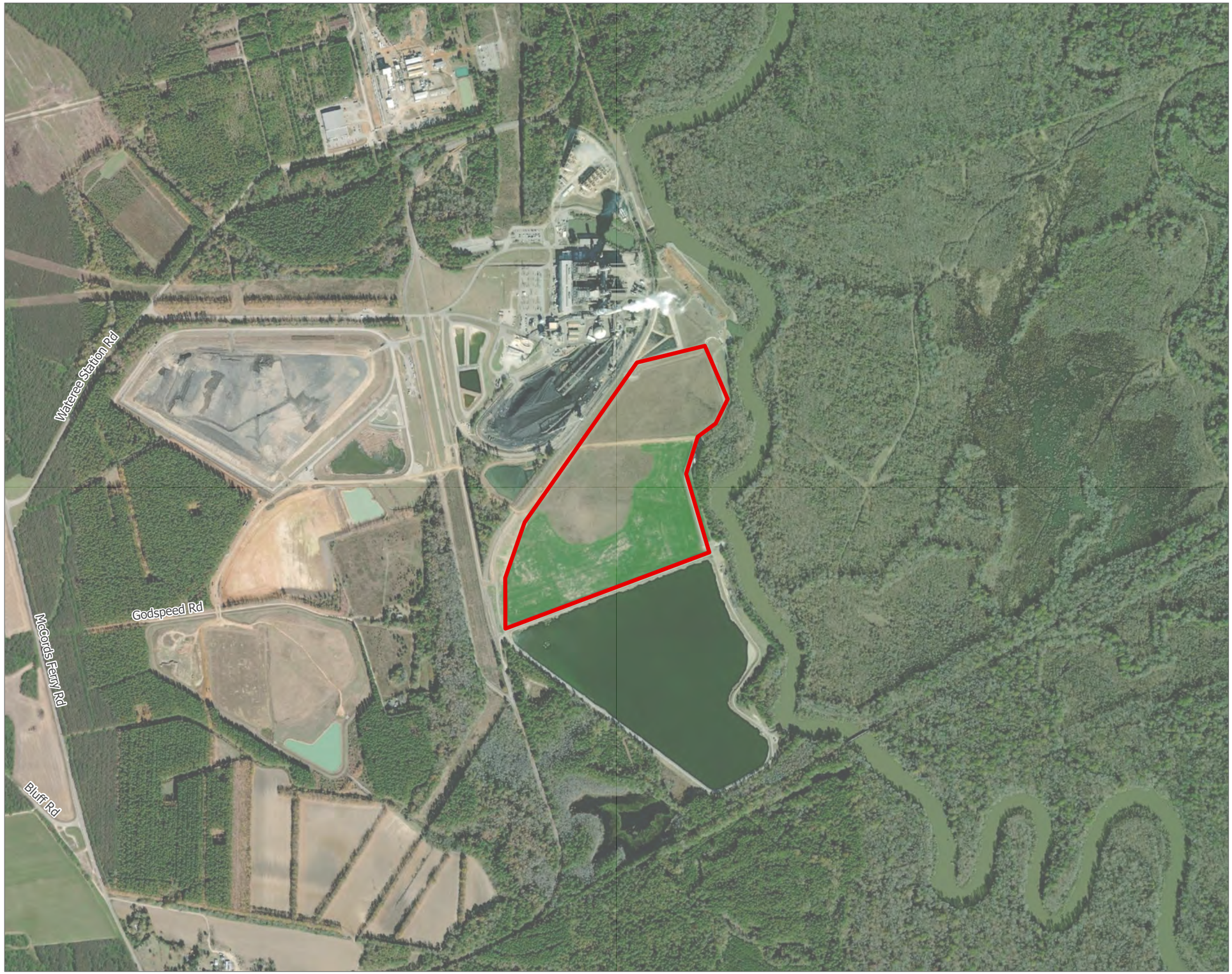
PROJECT: **DOMINION ENERGY OF SOUTH CAROLINA**
WATEREE STATION ASH-POND
EASTOVER, RICHLAND COUNTY, SOUTH CAROLINA

TITLE: SITE LOCATION MAP

DRAWN BY:	A. FOJTIK	PROJ. NO.:	447435
CHECKED BY:	A. ADAIR		
APPROVED BY:	J. HOTSTREAM		**FIGURE 1**
DATE:	OCTOBER 2021		

TRC
50 INTERNATIONAL DRIVE
PATEWOOD PLAZA THREE, SUITE 150
GREENVILLE, SC 29615
PHONE: 864.281.0030

FILE: 447435_AF



ASH POND

NOTES:

BASE MAP: ESRI "WORLD IMAGERY" ONLINE SERVICE LAYER.

1:12,000
1" = 1,000'
0 200 400 600 800
FEET

PROJECT:
DOMINION ENERGY OF SOUTH CAROLINA
WATEREE STATION-ASH POND
EASTOVER, RICHLAND COUNTY, SOUTH CAROLINA

TITLE:
SITE OVERVIEW MAP

DRAWN BY:	A. FOJTIK	PROJ. NO.:	447435
CHECKED BY:	A. ADAIR		
APPROVED BY:	J. HOTSTREAM		
DATE:	OCTOBER 2021		

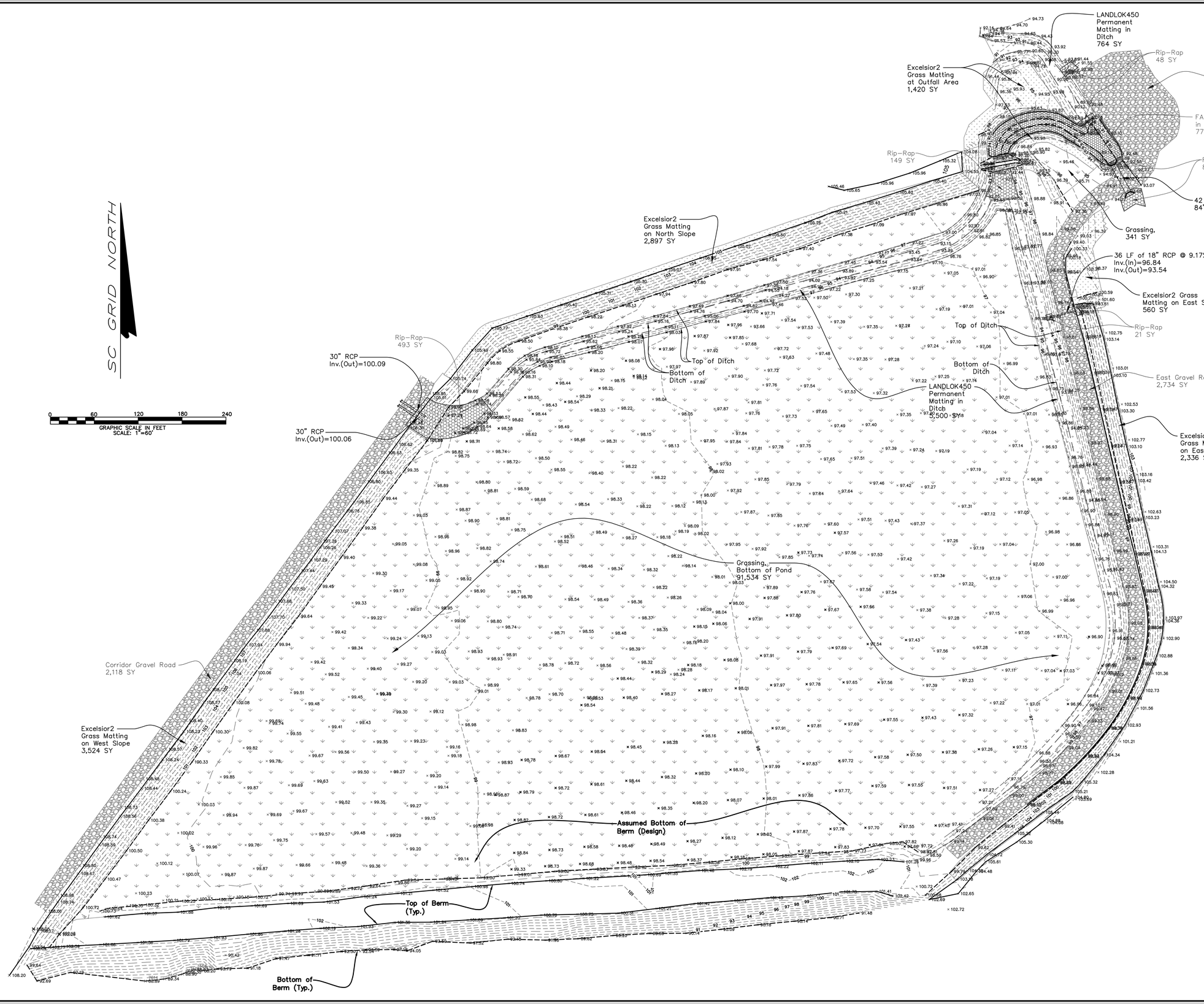
FIGURE 2

TRC
50 INTERNATIONAL DRIVE
PATEWOOD PLAZA THREE, SUITE 150
GREENVILLE, SC 29615
PHONE: 864.281.0030

FILE: 447435_af.aprx

Coordinate System: NAD 1983 StatePlane South Carolina FIPS 3900 Feet - Map Rotation: 0
Saved By: AFOJTIK on 10/4/2021, 08:29:50 AM - File Path: T:\1-PROJECTS\Dominion\447435_Wateree_ Station\2-APRX\447435_af.aprx - Layout Name: 447435_fig2

Appendix A: Select Engineering Drawings



COX AND DINKINS
ENGINEERS - SURVEYORS

COX AND DINKINS, INC.
724 BELTLINE BLVD.
COLUMBIA, SC 29205
803-254-0518
Fax: 803-765-0993
Email: cdinc@coxanddinkins.com

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 20942 DANIEL C. LAM

11-14-17

REGISTERED PROFESSIONAL ENGINEER NO. 20942

SOUTH CAROLINA COX AND DINKINS, INC. No. C00294 CERTIFICATE OF AUTHORIZATION

CERTIFICATE OF AUTHORIZATION SEAL

REVISIONS

No.	DATE	DESCRIPTION
1	11/21/2017	ADDITIONAL ASBUILT INFO FOR POND
2	11/27/2017	ADDITIONAL ASBUILT INFO EAST GRAVEL ROAD, CORRIDOR ROAD, IMPOUNDMENT REVISED.
3	01/22/2018	EAST GRAVEL ROAD IMPROVEMENTS REVISED. ADD'L EAST SLOPE GRASS MATTING ADDED.

PREPARED FOR:

COOPER BARNETTE PAGE, INC.
1928 EXECUTIVE PARK DRIVE
STATHAM, GA. 30666
Tel: (770) 725-4100
Fax: (770) 725-6090

PROJECT:

WATEREE STATION ASH POND 1 CLOSURE PHASE 1

LOCATED NEAR EASTOVER
RICHLAND COUNTY, SOUTH CAROLINA

FINAL GRADES RECORD DRAWING

TMS	R40900-01-01
BOOK 77C	SF NO. 10AP01
PROJECT NO. 1882A	SHEET NO. C1
DATE 11/14/2017	

G:\Proj\1882A Wateree Station Ash Pond 1\DRAWINGS\RECORD\1882A Final Grades Record Drawing-Rev 3-2018-01-22.dwg, Plotted By: DCL, Plotted: Jan 26, 2018 - 3:36pm

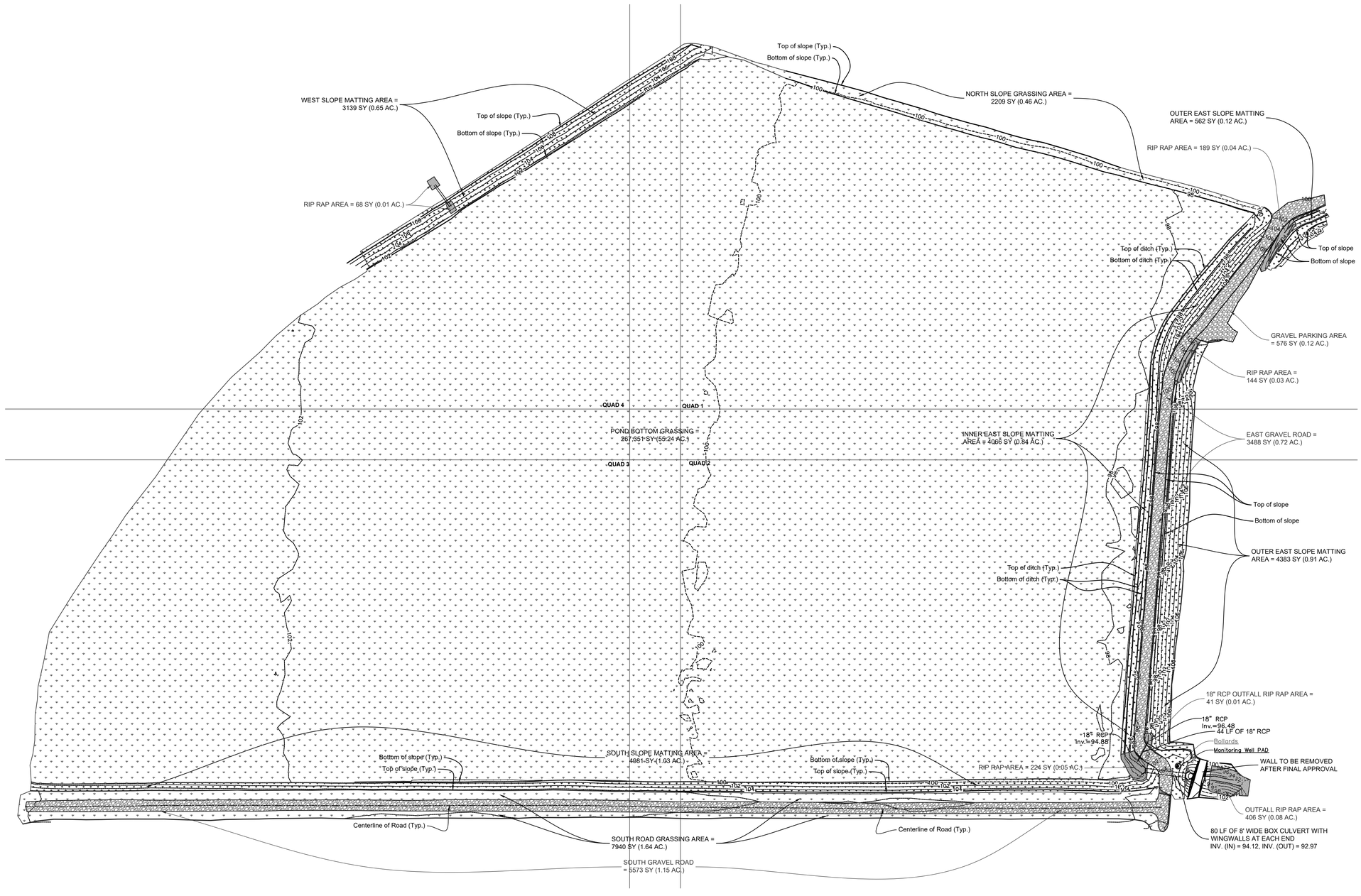
LEGEND

- FINAL GRADE CONTOURS
- GRAVEL ROAD SURFACE
- RIP-RAP
- AREA OF SEED GRASSING
- AREA OF GRASS MATTING

SC GRID NORTH

0 100 200 300 400

GRAPHIC SCALE IN FEET
SCALE: 1"=100'



GENERAL NOTES:

1. THE SUBJECT PROPERTY IS IDENTIFIED AS A RICHLAND COUNTY TAX MAP PARCEL 40900-01-01 (PORTION).
2. CONTOUR INTERVAL ELEVATIONS ARE TWO (2) FEET. ELEVATIONS SHOWN ARE NAVD 88 DATUM.
3. THE LOCATIONS OF OTHER UNDERGROUND UTILITIES AND THEIR SERVICES ARE UNKNOWN.

COX AND DINKINS
ENGINEERS - SURVEYORS

COX AND DINKINS, INC.
724 BELTLINE BLVD.
COLUMBIA, SC 29205
803-254-0518
Fax: 803-765-0993
Email: cdinc@coxanddinkins.com

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No.20942 DANIEL C. LEM

10-25-19

LICENSED PROFESSIONAL ENGINEER
NO. 20942

SOUTH CAROLINA JOINT CERTIFICATE OF AUTHORIZATION
COX AND DINKINS, INC.
No. C00294

CERTIFICATE OF AUTHORIZATION SEAL

REVISIONS

No.	DATE	DESCRIPTION

COOPER BARNETTE PAGE

1928 EXECUTIVE PARK DRIVE
STATHAM, GEOGIA 30666

770-725-4100
770-725-6090
email: BRUCE.PAGE@CBPINC-GA.COM

PROJECT:
WATEREE STATION
ASH POND 1 PHASE 2 CLOSURE
LOCATED IN RICHLAND COUNTY
NEAR EASTOVER, SOUTH CAROLINA

FINAL GRADE OVERALL RECORD DRAWING

TMS R40900-01-01 (PORTION)

BOOK

SF NO.

SHEET NO. 1 of 5

PROJECT NO. 1882B

DATE 10/25/2019

G:\Proj\1882B Watetee Station Ash Pond 1 Phase 2\DRAWINGS\RECORD\AP1 PH2 RECORD.dwg, Plotted By: DCL, Plotted: Oct 23, 2019 - 4:26pm

Appendix B: Flood Insurance Rate Map

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Lambert Conformal Conic State Plane South Carolina FIPS 3900. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by Richland County, South Carolina.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

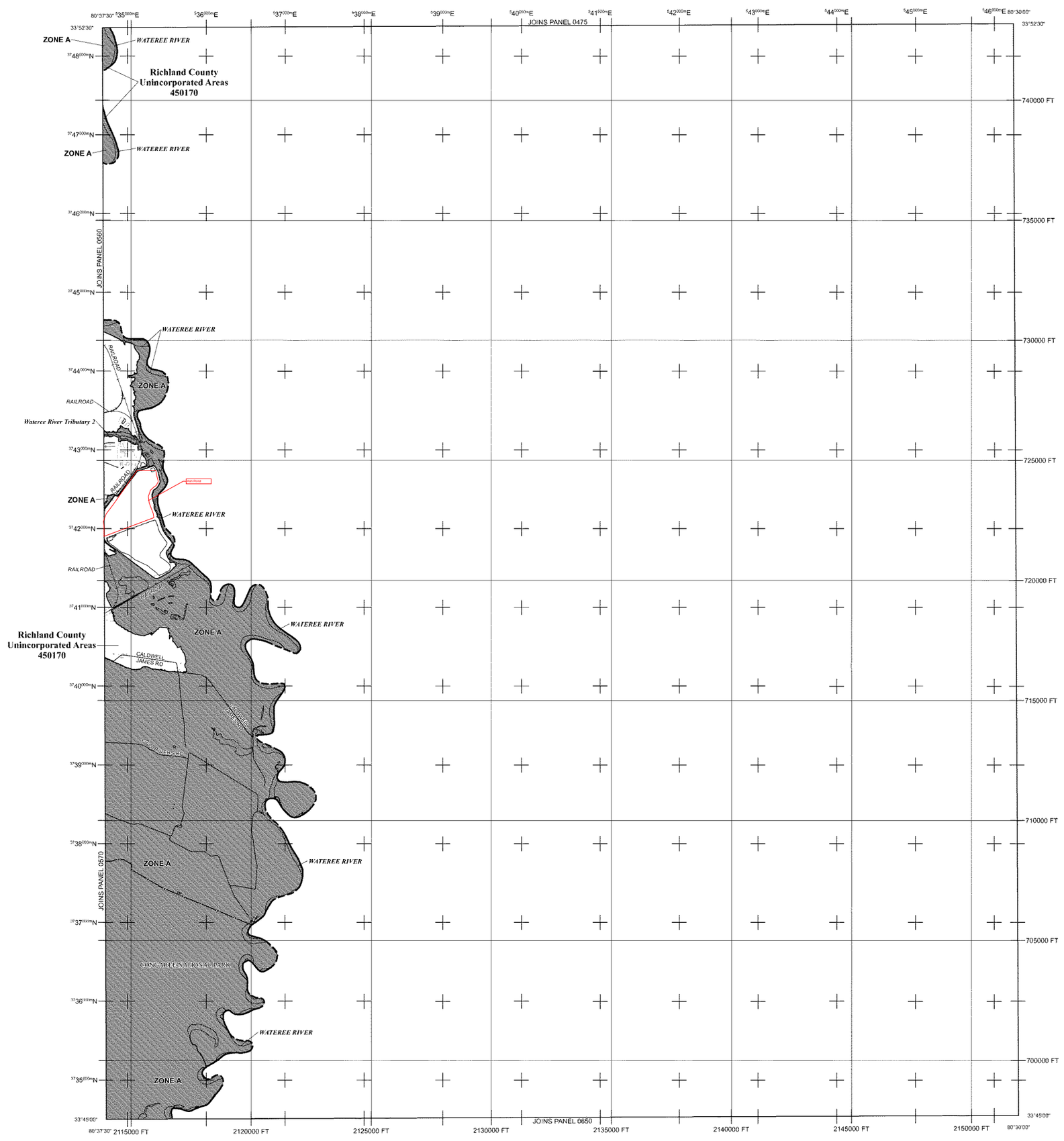
For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the **FEMA Mapping Information eXchange** at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service website at http://www.msc.fema.gov/. Available products may include previously issued Letters of Map Change, a Flood Insurance Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

The **profile base lines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the profile base line , in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

DNR

This digital Flood Insurance Rate Map (FIRM) was produced through a unique cooperative partnership between the State of South Carolina and the Federal Emergency Management Agency (FEMA). The State of South Carolina has implemented a long term approach of floodplain management to decrease the costs associated with flooding. This is demonstrated by the State's commitment to map floodplain areas at the local level. As a part of this effort, the state of South Carolina has joined in a Cooperating Technical State agreement with FEMA to produce and maintain this digital FIRM.

http://www.dnr.state.sc.us/



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4275000mE — 1000-meter Universal Transverse Mercator grid ticks, zone 17
- 6000000 FT — 5000-foot grid values: South Carolina State Plane coordinate system (FIPSZONE = 3900), Lambert projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)

MAP REPOSITORIES
Refer to Map Repositories List on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
January 19, 1994

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
February 20, 2002
September 29, 2010

December 21, 2017 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas , to update map format, to add roads and road names, to reflect updated topographic information, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'

1,000 0 1,000 2,000 3,000 4,000 FEET
600 0 600 1,200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0600L

FIRM

FLOOD INSURANCE RATE MAP

RICHLAND COUNTY, SOUTH CAROLINA AND INCORPORATED AREAS

PANEL 600 OF 650

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
RICHLAND COUNTY	450170	0600	L

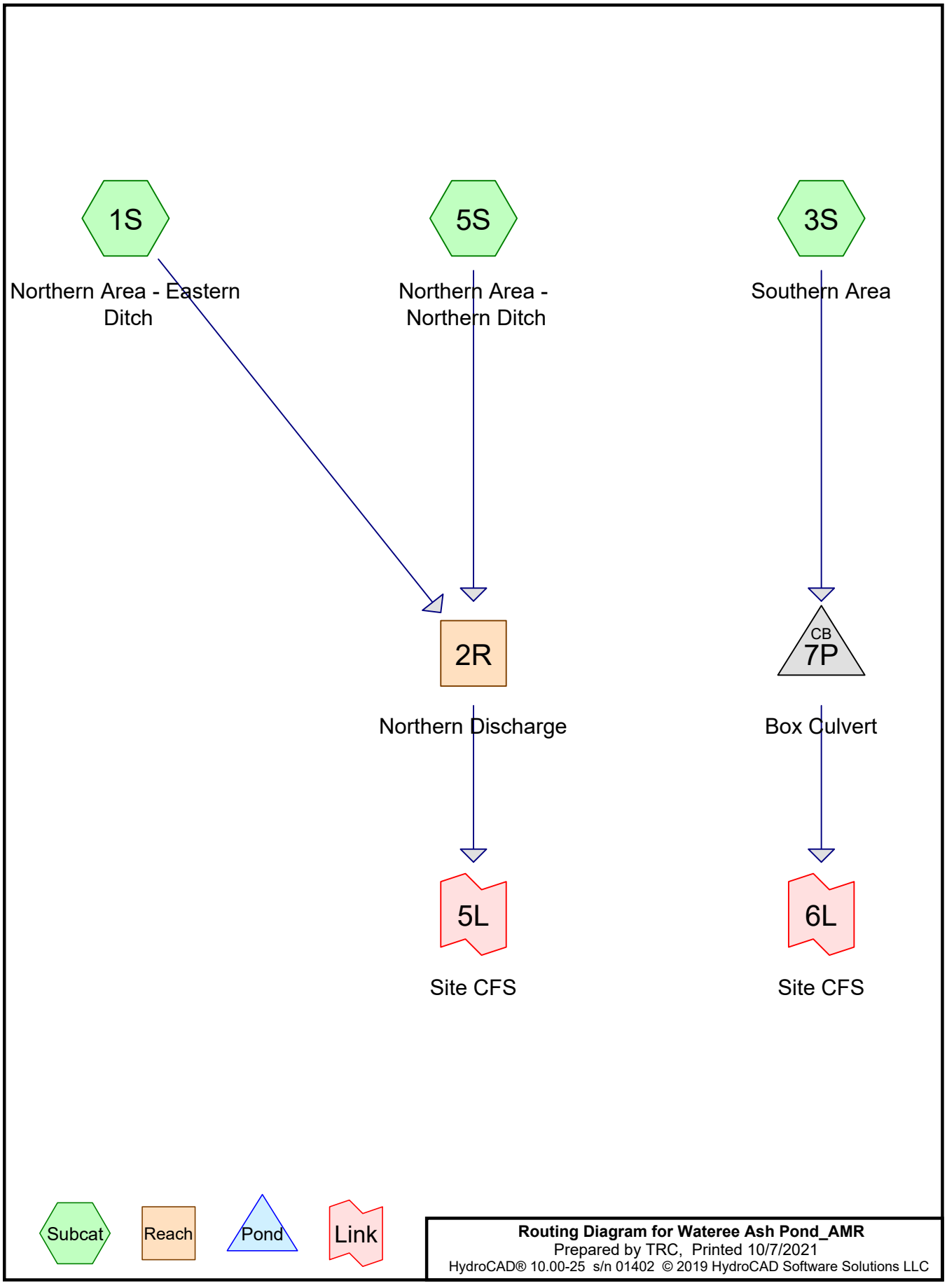
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
45079C0600L

MAP REVISED
DECEMBER 21, 2017

Federal Emergency Management Agency

Appendix C: Stormwater Calculations



Routing Diagram for Wateree Ash Pond_AMR
Prepared by TRC, Printed 10/7/2021

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
83.455	74	>75% Grass cover, Good, HSG C (1S, 3S, 5S)
2.924	96	Gravel surface, HSG C (1S, 3S, 5S)
86.379	**75**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
86.379	HSG C	1S, 3S, 5S
0.000	HSG D	
0.000	Other	
86.379		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	83.455	0.000	0.000	83.455	>75% Grass cover, Good	1S, 3S, 5S
0.000	0.000	2.924	0.000	0.000	2.924	Gravel surface	1S, 3S, 5S
0.000	**0.000**	**86.379**	**0.000**	**0.000**	**86.379**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	7P	94.12	92.97	80.0	0.0144	0.017	96.0	96.0	0.0

Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Northern Area - Eastern Runoff Area=21.160 ac 0.00% Impervious Runoff Depth=3.85"
Flow Length=2,237' Tc=74.9 min CN=75 Runoff=36.91 cfs 6.791 af

Subcatchment3S: Southern Area Runoff Area=62.759 ac 0.00% Impervious Runoff Depth=3.85"
Flow Length=2,062' Tc=64.9 min CN=75 Runoff=121.80 cfs 20.142 af

Subcatchment5S: Northern Area - Northern Runoff Area=2.460 ac 0.00% Impervious Runoff Depth=3.85"
Flow Length=906' Tc=4.6 min CN=75 Runoff=17.47 cfs 0.790 af

Reach 2R: Northern Discharge Avg. Flow Depth=1.30' Max Vel=2.45 fps Inflow=37.91 cfs 7.581 af
n=0.069 L=200.3' S=0.0144 '/' Capacity=787.13 cfs Outflow=37.88 cfs 7.581 af

Pond 7P: Box Culvert Peak Elev=97.19' Inflow=121.80 cfs 20.142 af
96.0" x 96.0" Box Culvert n=0.017 L=80.0' S=0.0144 '/' Outflow=121.80 cfs 20.142 af

Link 5L: Site CFS Inflow=37.88 cfs 7.581 af
Primary=37.88 cfs 7.581 af

Link 6L: Site CFS Inflow=121.80 cfs 20.142 af
Primary=121.80 cfs 20.142 af

Total Runoff Area = 86.379 ac Runoff Volume = 27.723 af Average Runoff Depth = 3.85"
100.00% Pervious = 86.379 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Northern Area - Eastern Ditch

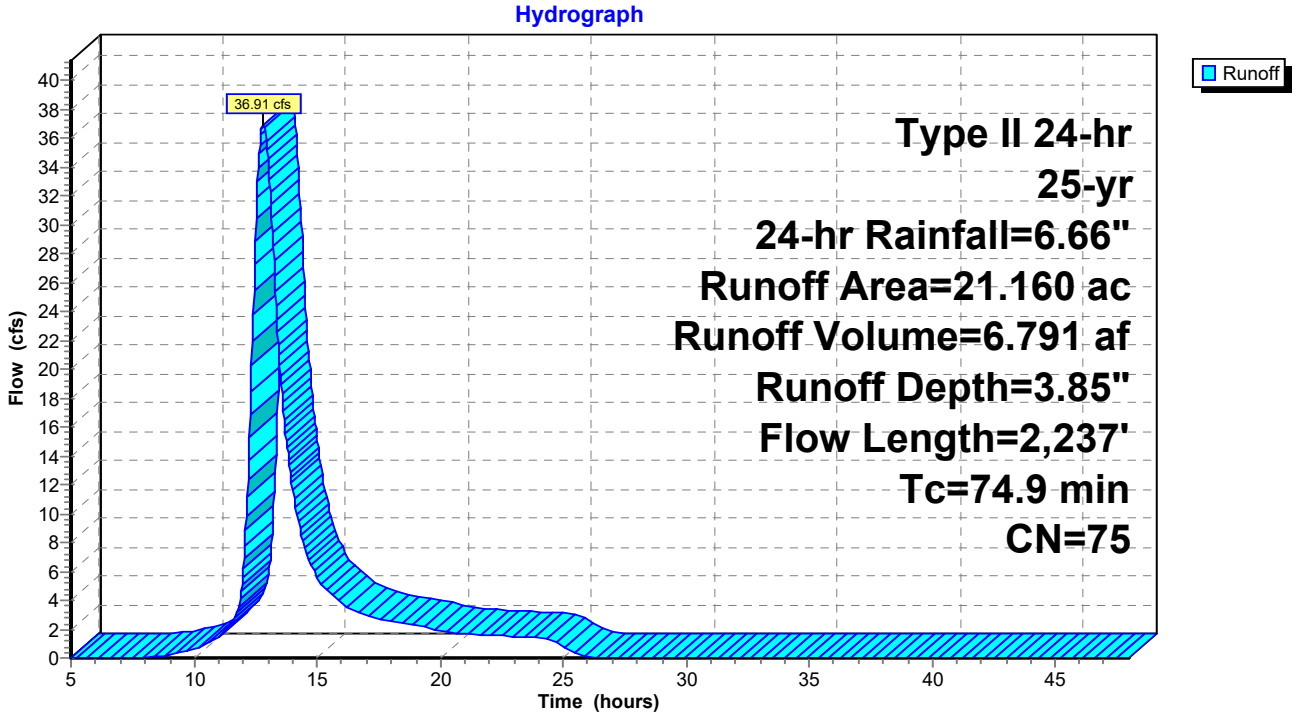
Runoff = 36.91 cfs @ 12.82 hrs, Volume= 6.791 af, Depth= 3.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type II 24-hr 25-yr, 24-hr Rainfall=6.66"

Area (ac)	CN	Description
20.390	74	>75% Grass cover, Good, HSG C
0.750	96	Gravel surface, HSG C
0.020	96	Gravel surface, HSG C
21.160	75	Weighted Average
21.160		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	200	0.0445	0.21		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.04"
57.0	1,221	0.0026	0.36		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
2.4	816	0.0057	5.72	363.96	**Trap/Vee/Rect Channel Flow, Grassed Ditch** Bot.W=9.52' D=3.00' Z= 3.9 '/' Top.W=32.92' n= 0.030 Earth, grassed & winding
74.9	2,237	Total			

Subcatchment 1S: Northern Area - Eastern Ditch



Summary for Subcatchment 3S: Southern Area

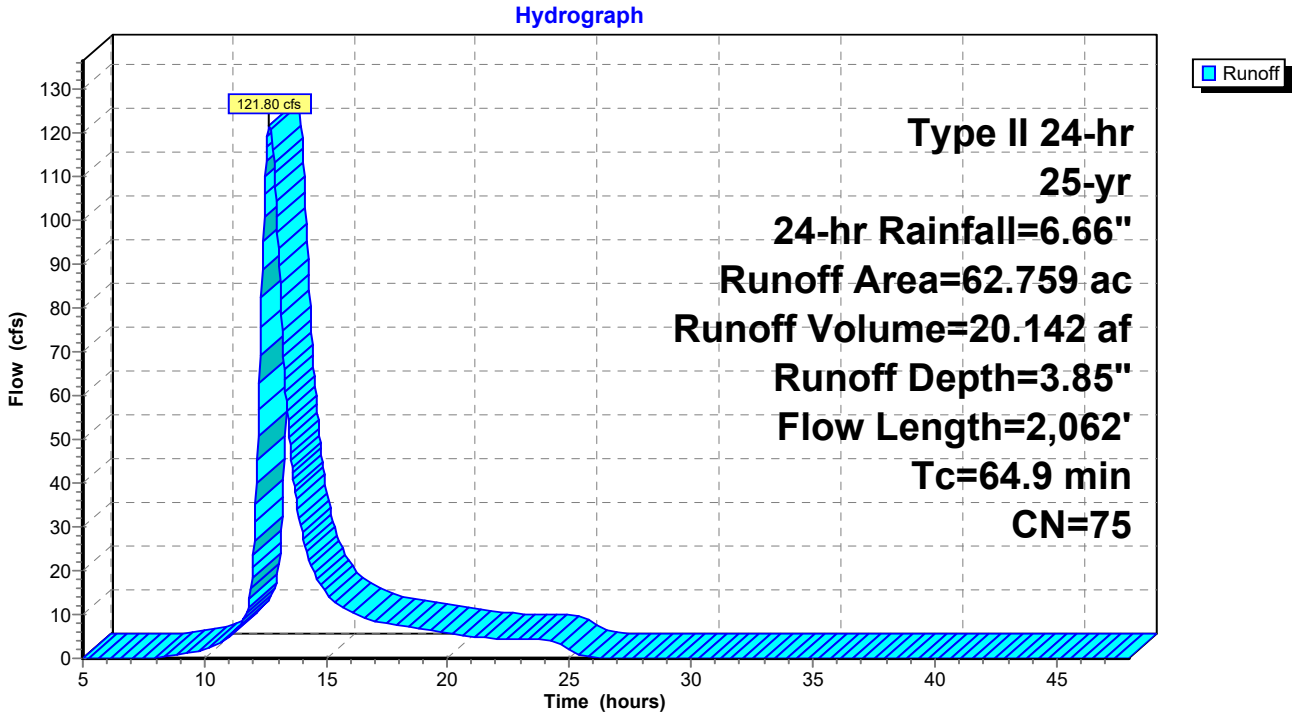
Runoff = 121.80 cfs @ 12.68 hrs, Volume= 20.142 af, Depth= 3.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type II 24-hr 25-yr, 24-hr Rainfall=6.66"

Area (ac)	CN	Description
60.715	74	>75% Grass cover, Good, HSG C
1.968	96	Gravel surface, HSG C
0.076	96	Gravel surface, HSG C
62.759	75	Weighted Average
62.759		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.1	196	0.0456	0.22		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.04"
44.9	923	0.0024	0.34		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
4.7	890	0.0028	3.19	110.30	**Trap/Vee/Rect Channel Flow, Grassed Ditch** Bot.W=9.30' D=2.00' Z= 3.7 & 4.3 '/' Top.W=25.30' n= 0.030 Earth, grassed & winding
0.2	53	0.0251	4.74	215.27	**Trap/Vee/Rect Channel Flow, Riprap Channel** Bot.W=9.30' D=2.50' Z= 4.3 & 2.8 '/' Top.W=27.05' n= 0.069 Riprap, 6-inch
64.9	2,062	Total			

Subcatchment 3S: Southern Area



Summary for Subcatchment 5S: Northern Area - Northern Ditch

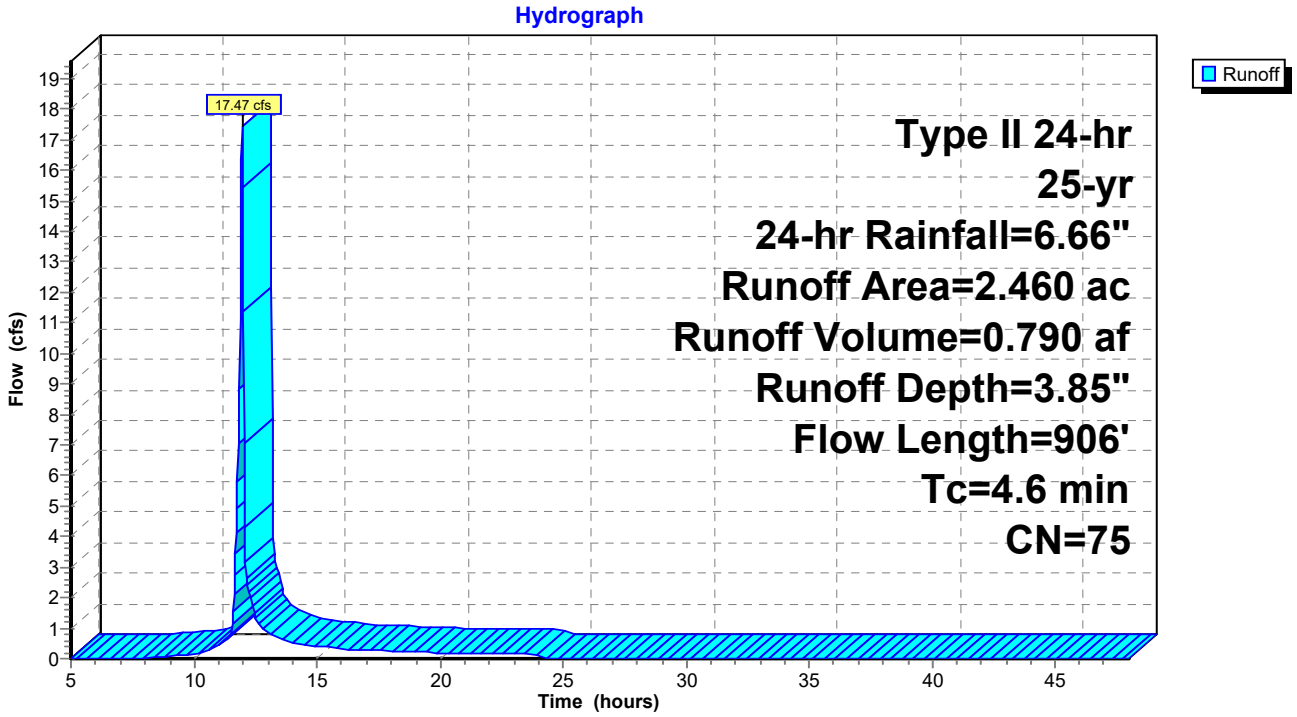
Runoff = 17.47 cfs @ 11.96 hrs, Volume= 0.790 af, Depth= 3.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type II 24-hr 25-yr, 24-hr Rainfall=6.66"

Area (ac)	CN	Description
2.350	74	>75% Grass cover, Good, HSG C
0.110	96	Gravel surface, HSG C
2.460	75	Weighted Average
2.460		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	34	0.1730	0.26		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.04"
2.4	872	0.0089	6.11	199.63	**Trap/Vee/Rect Channel Flow, Northern Ditch** Bot.W=9.29' D=2.15' Z= 2.6 & 2.9 '/' Top.W=21.11' n= 0.030 Earth, grassed & winding
4.6	906	Total			

Subcatchment 5S: Northern Area - Northern Ditch



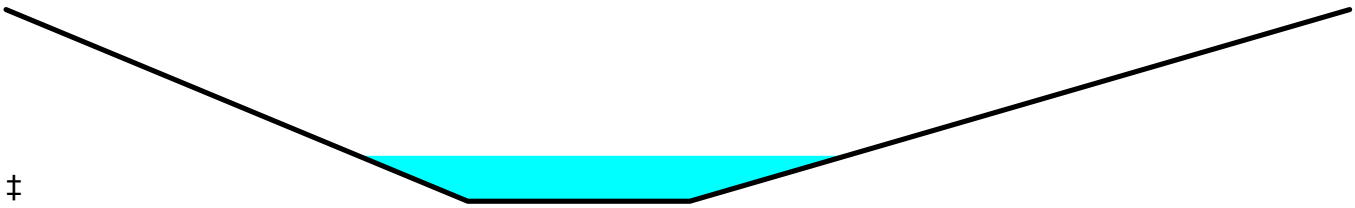
Summary for Reach 2R: Northern Discharge

Inflow Area = 23.620 ac, 0.00% Impervious, Inflow Depth = 3.85" for 25-yr, 24-hr event
Inflow = 37.91 cfs @ 12.81 hrs, Volume= 7.581 af
Outflow = 37.88 cfs @ 12.85 hrs, Volume= 7.581 af, Atten= 0%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Max. Velocity= 2.45 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 3.4 min

Peak Storage= 3,092 cf @ 12.83 hrs
Average Depth at Peak Storage= 1.30'
Bank-Full Depth= 5.50' Flow Area= 143.6 sf, Capacity= 787.13 cfs

7.41' x 5.50' deep channel, n= 0.069 Riprap, 6-inch
Side Slope Z-value= 2.8 4.0 '/' Top Width= 44.81'
Length= 200.3' Slope= 0.0144 '/'
Inlet Invert= 92.27', Outlet Invert= 89.39'



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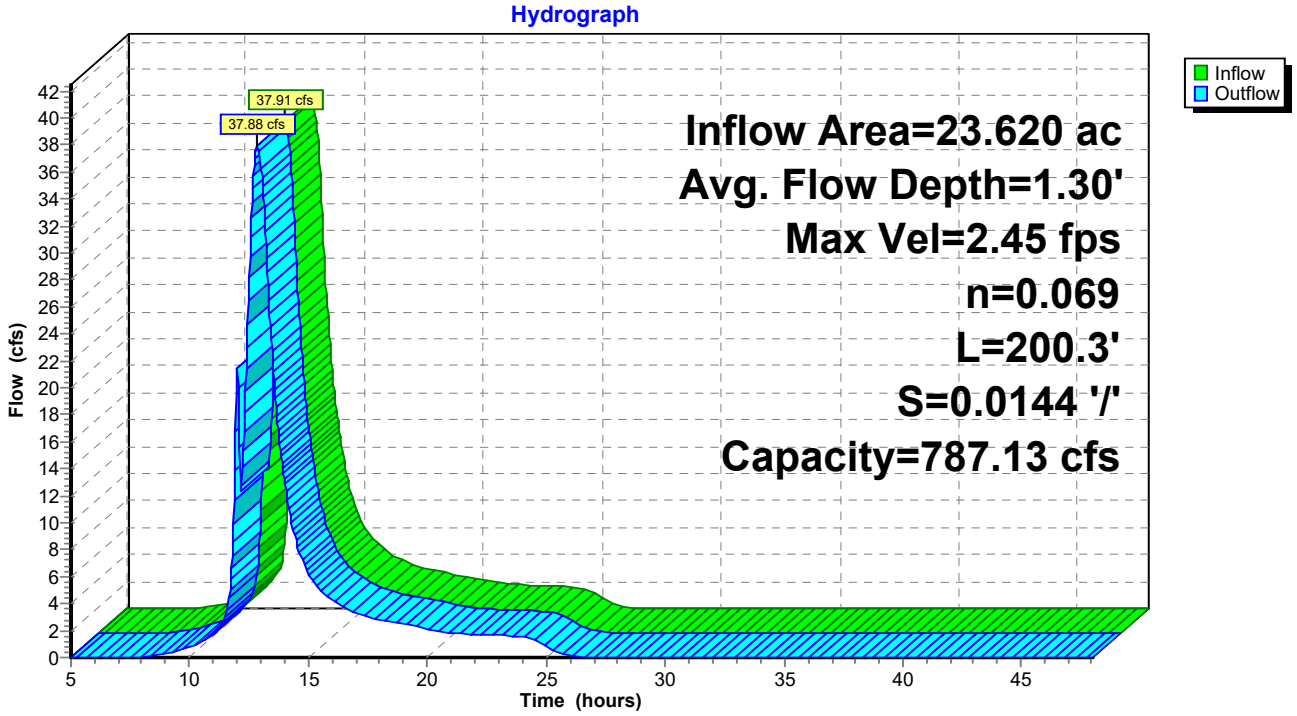
Reach 2R: Northern Discharge



Summary for Pond 7P: Box Culvert

[57] Hint: Peaked at 97.19' (Flood elevation advised)

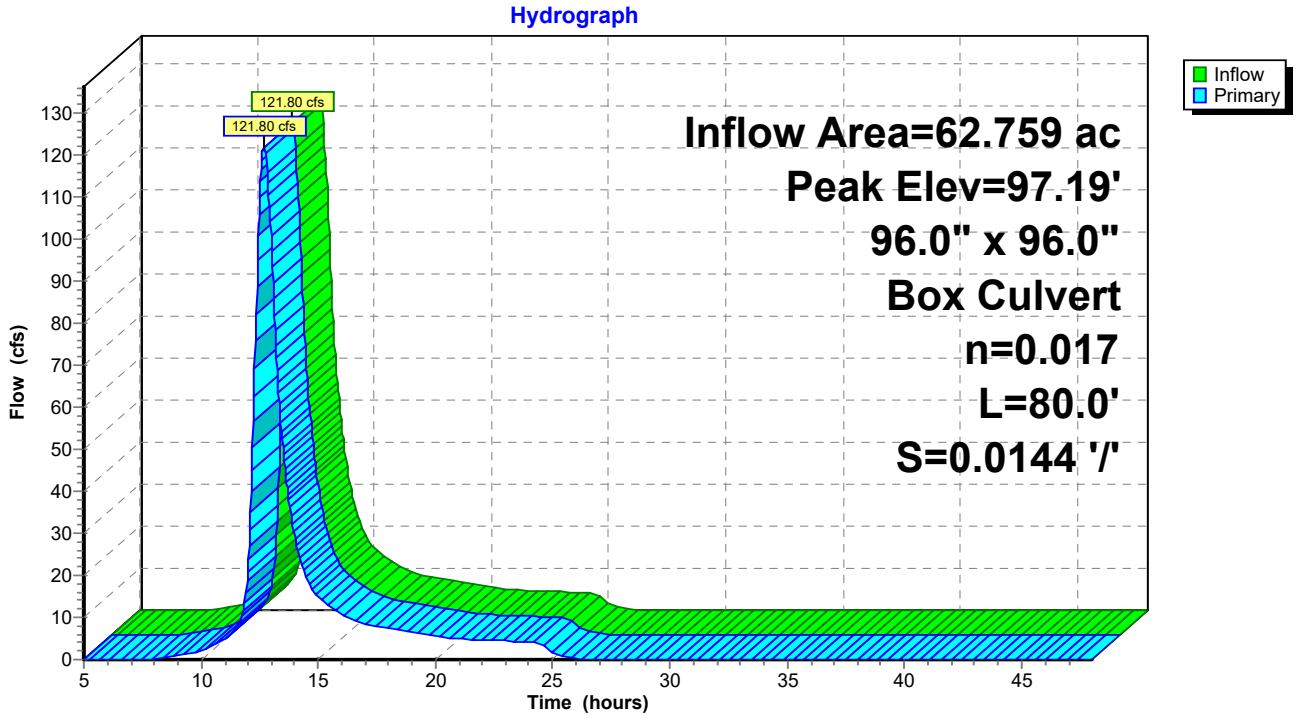
Inflow Area = 62.759 ac, 0.00% Impervious, Inflow Depth = 3.85" for 25-yr, 24-hr event
Inflow = 121.80 cfs @ 12.68 hrs, Volume= 20.142 af
Outflow = 121.80 cfs @ 12.68 hrs, Volume= 20.142 af, Atten= 0%, Lag= 0.0 min
Primary = 121.80 cfs @ 12.68 hrs, Volume= 20.142 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 97.19' @ 12.68 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	94.12'	**96.0" W x 96.0" H Box Box Culvert** L= 80.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 94.12' / 92.97' S= 0.0144 '/' Cc= 0.900 n= 0.017 Concrete, unfinished, Flow Area= 64.00 sf

Primary OutFlow Max=121.77 cfs @ 12.68 hrs HW=97.19' (Free Discharge)
↑**1=Box Culvert** (Inlet Controls 121.77 cfs @ 4.96 fps)

Pond 7P: Box Culvert

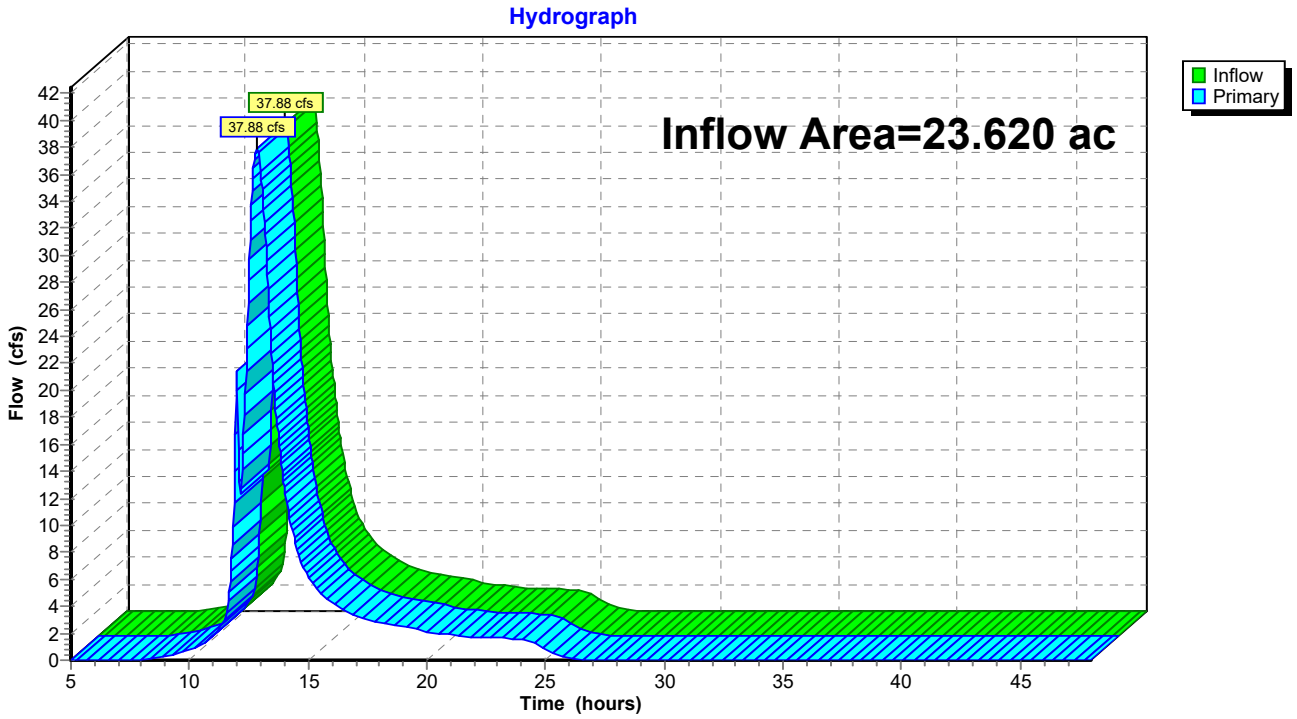


Summary for Link 5L: Site CFS

Inflow Area = 23.620 ac, 0.00% Impervious, Inflow Depth = 3.85" for 25-yr, 24-hr event
Inflow = 37.88 cfs @ 12.85 hrs, Volume= 7.581 af
Primary = 37.88 cfs @ 12.85 hrs, Volume= 7.581 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Link 5L: Site CFS

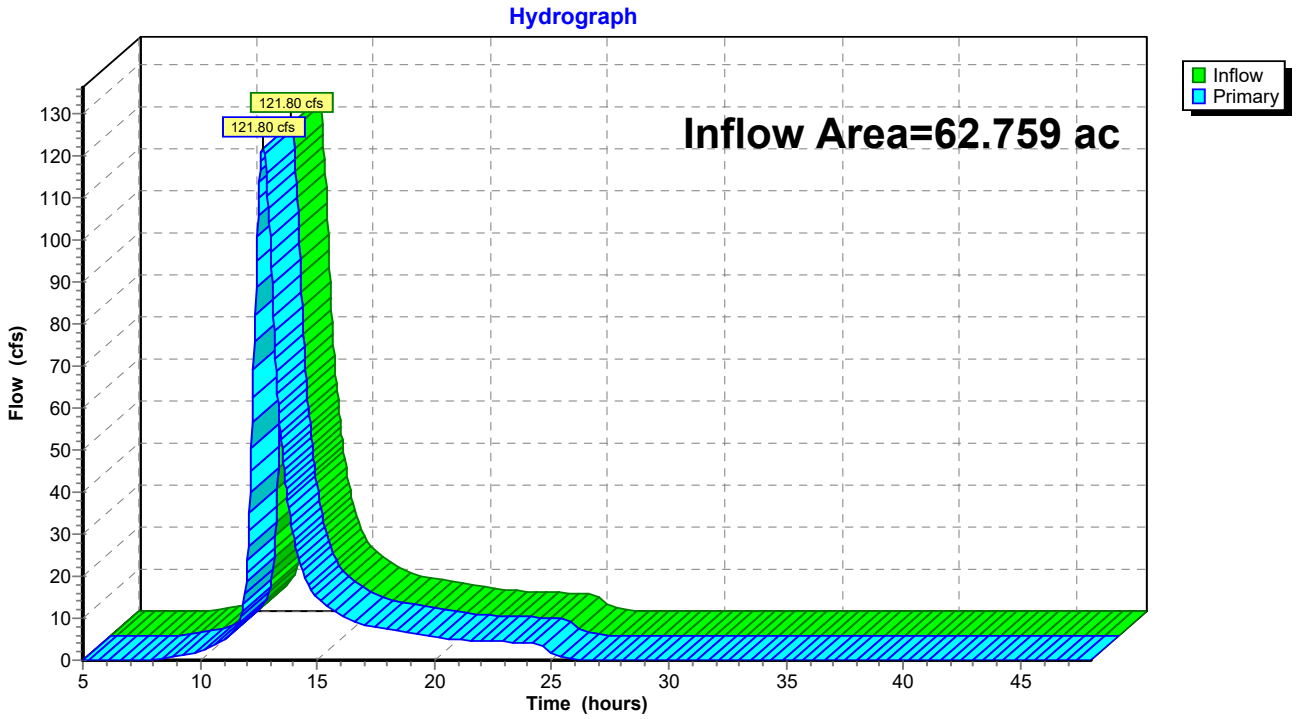


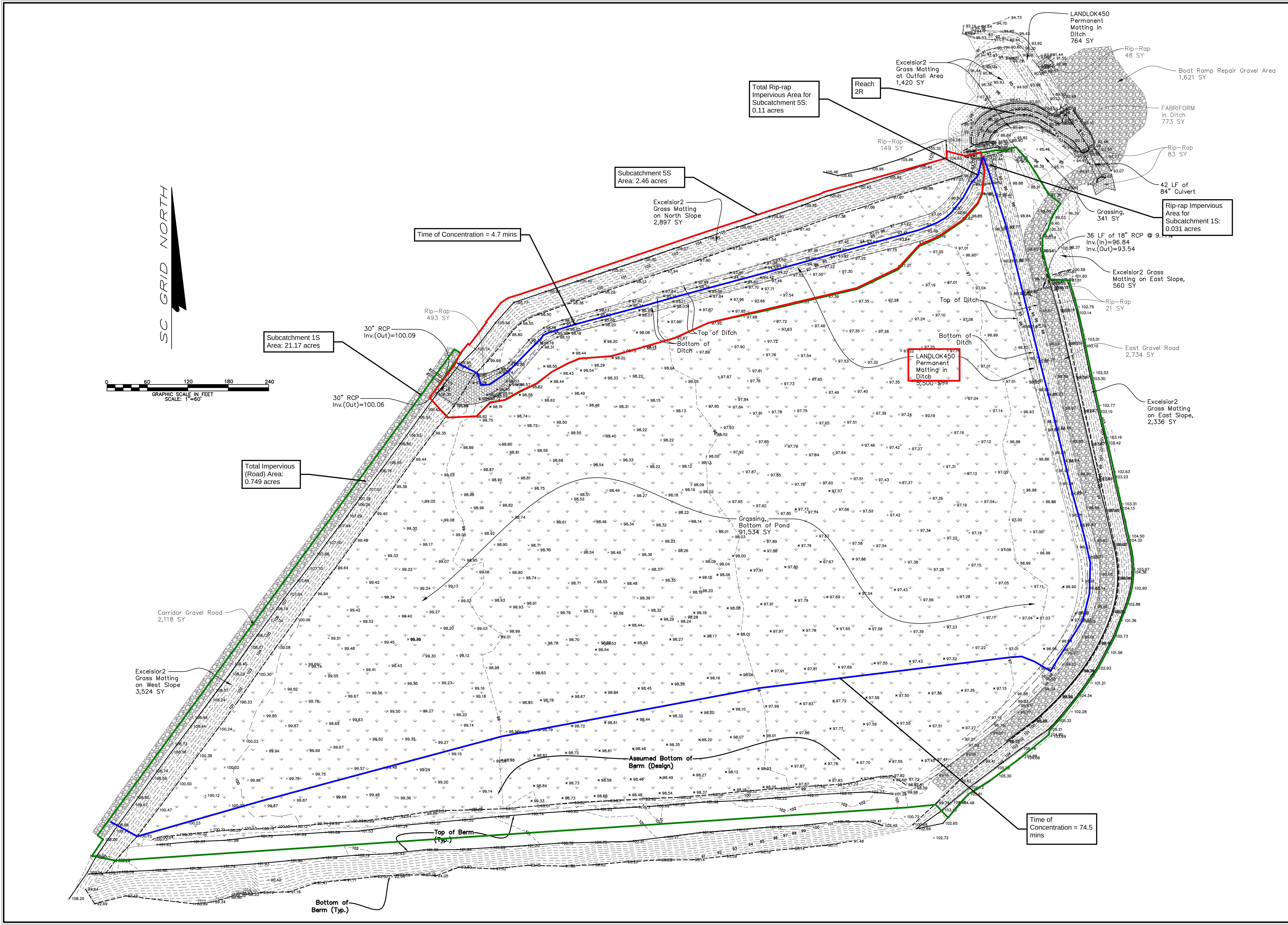
Summary for Link 6L: Site CFS

Inflow Area = 62.759 ac, 0.00% Impervious, Inflow Depth = 3.85" for 25-yr, 24-hr event
Inflow = 121.80 cfs @ 12.68 hrs, Volume= 20.142 af
Primary = 121.80 cfs @ 12.68 hrs, Volume= 20.142 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Link 6L: Site CFS





COX AND DINKINS
ENGINEERS - SURVEYORS
COX AND DINKINS, INC.
724 BELTLINE BLVD.
COLUMBIA, SC 29205
803-254-0518
Fax: 803-765-0993
Email: cdinc@coxanddinkins.com

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 20942 DANIEL C. LAM

Daniel C Lam 11-14-17

REGISTERED PROFESSIONAL ENGINEER NO. 20942

SOUTH CAROLINA COX AND DINKINS, INC. No. C00294 CERTIFICATE OF AUTHORIZATION

CERTIFICATE OF AUTHORIZATION SEAL

REVISIONS

No.	DATE	DESCRIPTION
1	11/21/2017	ADDITIONAL ASBUILT INFO FOR POND OUTFALL
2	11/27/2017	ADDITIONAL ASBUILT INFO EAST GRAVEL ROAD AND BOAT RAMP REPAIR AREA
3	01/22/2018	EARTHWORK VOLUME INFORMATION REMOVED. ADD'L EAST SLOPE GRASS MATTING ADDED.

PREPARED FOR:

COOPER BARNETTE PAGE, INC.
1928 EXECUTIVE PARK DRIVE
STATHAM, G.A. 30666
Tel: (770) 725-4100
Fax: (770) 725-6090

PROJECT:

WATEREE STATION ASH POND 1 CLOSURE PHASE 1

LOCATED NEAR EASTOVER
RICHLAND COUNTY, SOUTH CAROLINA

FINAL GRADES RECORD DRAWING

TMS R40900-01-01	
BOOK 77C	SF NO. 10AP01
PROJECT NO. 1882A	SHEET NO. C1
DATE 11/14/2017	

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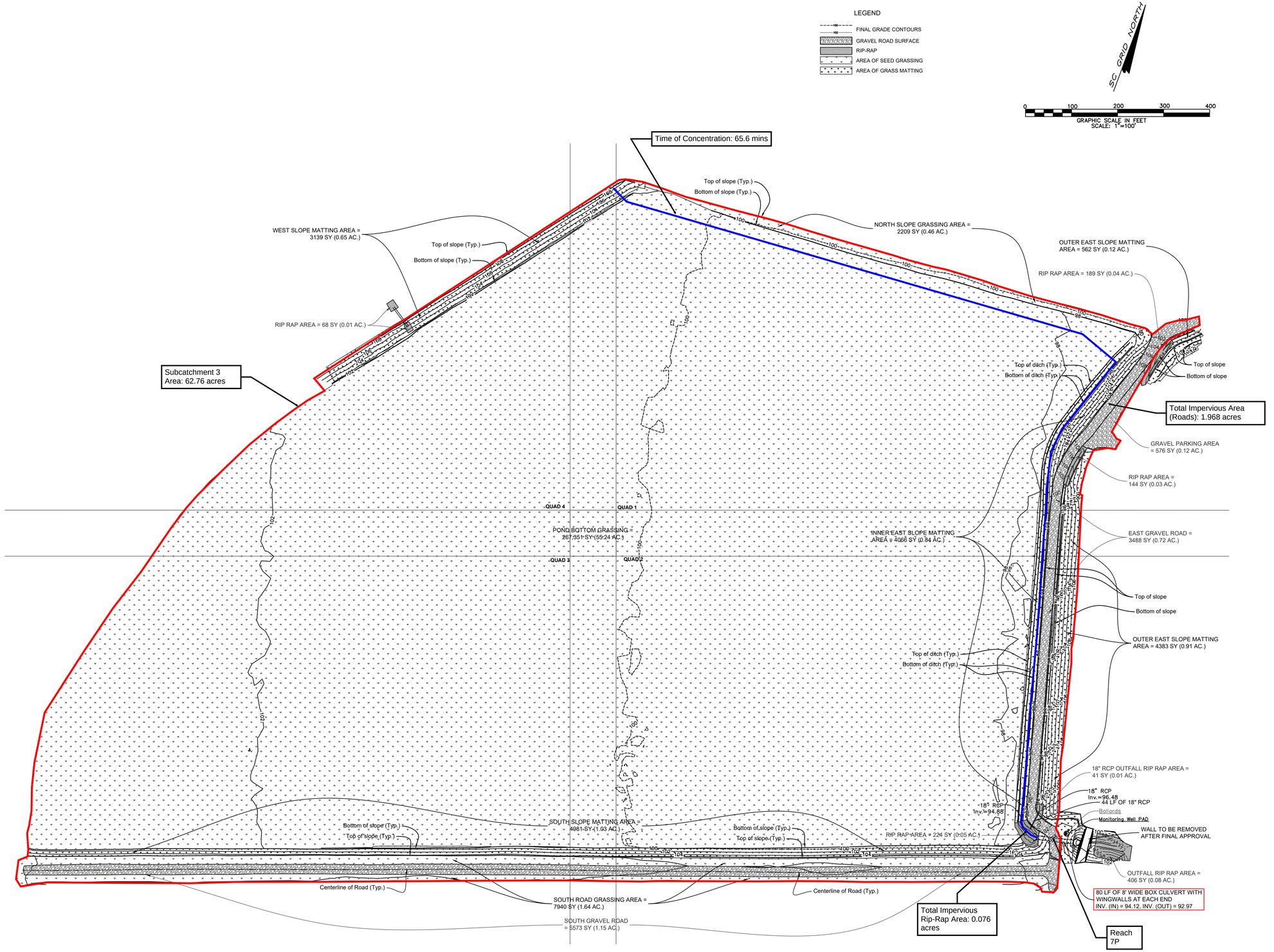

GENERAL NOTES:

1. THE SUBJECT PROPERTY IS IDENTIFIED AS A RICHLAND COUNTY TAX MAP PARCEL 40900-01-01 (PORTION).
2. CONTOUR INTERVAL ELEVATIONS ARE TWO (2) FEET. ELEVATIONS SHOWN ARE NAVD 88 DATUM.
3. THE LOCATIONS OF OTHER UNDERGROUND UTILITIES AND THEIR SERVICES ARE UNKNOWN.

COX AND DINKINS
ENGINEERS - SURVEYORS
COX AND DINKINS, INC.
724 BELTLINE BLVD.
COLUMBIA, SC 29205
803-254-0518
Fax: 803-765-0993
Email: cdinc@coxanddinkins.com

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No.20942 DANIEL C. LEM

Daniel C Lem 10-25-19

LICENSED PROFESSIONAL ENGINEER
NO. 20942

SOUTH CAROLINA JOINT CERTIFICATE OF AUTHORIZATION
COX AND DINKINS, INC.
No. C00294

CERTIFICATE OF AUTHORIZATION SEAL

REVISIONS

No.	DATE	DESCRIPTION

COOPER BARNETTE PAGE

1928 EXECUTIVE PARK DRIVE
STATHAM, GEOGIA 30666

770-725-4100
770-725-6090
email: BRUCE.PAGE@CBPINC-GA.COM

PROJECT:
WATEREE STATION
ASH POND 1 PHASE 2 CLOSURE
LOCATED IN RICHLAND COUNTY
NEAR EASTOVER, SOUTH CAROLINA

FINAL GRADE OVERALL RECORD DRAWING

TMS
R40900-01-01 (PORTION)

BOOK

SF NO.

PROJECT NO.
1882B

DATE
10/25/2019

SHEET NO.
1 of 5

G:\Proj\1882B Watetee Station Ash Pond 1 Phase 2\DRAWINGS\RECORD\AP1 PH2 RECORD.dwg, Plotted By: DCL, Plotted: Oct 23, 2019 - 4:26pm

NOAA Atlas 14, Volume 2, Version 3
Location name: Eastover, South Carolina, USA*
Latitude: 33.8247°, Longitude: -80.6262°
Elevation: 133.29 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)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.449** (0.416-0.484)	**0.512** (0.476-0.552)	**0.577** (0.534-0.621)	**0.659** (0.610-0.709)	**0.741** (0.682-0.797)	**0.818** (0.750-0.879)	**0.886** (0.808-0.952)	**0.954** (0.862-1.03)	**1.03** (0.926-1.12)	**1.12** (0.989-1.21)
10-min	**0.717** (0.664-0.774)	**0.819** (0.761-0.882)	**0.924** (0.856-0.994)	**1.05** (0.975-1.13)	**1.18** (1.09-1.27)	**1.30** (1.19-1.40)	**1.41** (1.28-1.51)	**1.51** (1.37-1.63)	**1.64** (1.47-1.76)	**1.76** (1.56-1.90)
15-min	**0.896** (0.830-0.967)	**1.03** (0.956-1.11)	**1.17** (1.08-1.26)	**1.33** (1.23-1.43)	**1.50** (1.38-1.61)	**1.65** (1.51-1.77)	**1.78** (1.62-1.91)	**1.91** (1.72-2.05)	**2.06** (1.84-2.22)	**2.20** (1.96-2.38)
30-min	**1.23** (1.14-1.33)	**1.42** (1.32-1.53)	**1.66** (1.54-1.79)	**1.93** (1.79-2.08)	**2.22** (2.04-2.38)	**2.48** (2.28-2.67)	**2.73** (2.48-2.93)	**2.97** (2.68-3.19)	**3.28** (2.93-3.53)	**3.57** (3.17-3.86)
60-min	**1.53** (1.42-1.65)	**1.78** (1.66-1.92)	**2.13** (1.97-2.29)	**2.52** (2.33-2.71)	**2.95** (2.72-3.17)	**3.37** (3.09-3.62)	**3.76** (3.42-4.04)	**4.17** (3.76-4.48)	**4.70** (4.21-5.07)	**5.21** (4.62-5.64)
2-hr	**1.73** (1.60-1.88)	**2.04** (1.88-2.21)	**2.46** (2.27-2.66)	**2.95** (2.72-3.19)	**3.53** (3.24-3.81)	**4.09** (3.73-4.40)	**4.64** (4.21-4.99)	**5.23** (4.71-5.63)	**6.01** (5.36-6.49)	**6.77** (5.98-7.34)
3-hr	**1.82** (1.67-1.99)	**2.15** (1.98-2.35)	**2.60** (2.39-2.84)	**3.14** (2.89-3.42)	**3.80** (3.47-4.13)	**4.45** (4.04-4.82)	**5.11** (4.59-5.53)	**5.82** (5.19-6.30)	**6.80** (6.00-7.38)	**7.78** (6.77-8.45)
6-hr	**2.15** (1.98-2.36)	**2.54** (2.35-2.78)	**3.08** (2.83-3.36)	**3.72** (3.41-4.06)	**4.51** (4.12-4.92)	**5.30** (4.81-5.76)	**6.10** (5.48-6.62)	**6.98** (6.21-7.57)	**8.20** (7.20-8.91)	**9.42** (8.15-10.2)
12-hr	**2.52** (2.31-2.78)	**2.97** (2.73-3.27)	**3.61** (3.31-3.97)	**4.39** (4.01-4.81)	**5.36** (4.87-5.86)	**6.33** (5.71-6.91)	**7.33** (6.55-7.99)	**8.44** (7.45-9.19)	**10.00** (8.69-10.9)	**11.6** (9.89-12.6)
24-hr	**2.94** (2.71-3.23)	**3.54** (3.26-3.89)	**4.51** (4.13-4.94)	**5.35** (4.90-5.87)	**6.66** (6.04-7.29)	**7.81** (7.02-8.56)	**9.12** (8.10-10.0)	**10.6** (9.29-11.7)	**12.9** (11.1-14.3)	**14.9** (12.6-16.7)
2-day	**3.42** (3.15-3.75)	**4.11** (3.79-4.50)	**5.19** (4.77-5.69)	**6.15** (5.63-6.74)	**7.62** (6.92-8.36)	**8.92** (8.03-9.81)	**10.4** (9.25-11.5)	**12.1** (10.6-13.4)	**14.6** (12.6-16.3)	**16.9** (14.2-19.0)
3-day	**3.68** (3.40-4.01)	**4.41** (4.07-4.81)	**5.53** (5.10-6.04)	**6.51** (5.99-7.12)	**8.00** (7.29-8.74)	**9.30** (8.41-10.2)	**10.8** (9.62-11.8)	**12.4** (10.9-13.7)	**14.9** (12.9-16.6)	**17.1** (14.5-19.2)
4-day	**3.93** (3.64-4.28)	**4.71** (4.36-5.13)	**5.87** (5.43-6.39)	**6.88** (6.34-7.49)	**8.38** (7.67-9.13)	**9.69** (8.79-10.6)	**11.1** (10.00-12.2)	**12.7** (11.3-14.0)	**15.2** (13.2-16.8)	**17.3** (14.8-19.3)
7-day	**4.59** (4.27-4.96)	**5.48** (5.09-5.93)	**6.74** (6.25-7.29)	**7.80** (7.22-8.44)	**9.33** (8.58-10.1)	**10.6** (9.71-11.5)	**12.0** (10.9-13.0)	**13.5** (12.1-14.7)	**15.8** (13.9-17.3)	**17.8** (15.6-19.7)
10-day	**5.24** (4.90-5.62)	**6.23** (5.83-6.69)	**7.57** (7.06-8.13)	**8.67** (8.08-9.30)	**10.2** (9.48-11.0)	**11.5** (10.6-12.4)	**12.8** (11.8-13.8)	**14.3** (13.0-15.4)	**16.4** (14.7-17.8)	**18.3** (16.2-20.1)
20-day	**7.01** (6.56-7.53)	**8.29** (7.75-8.91)	**9.87** (9.22-10.6)	**11.2** (10.4-12.0)	**13.0** (12.1-14.0)	**14.5** (13.4-15.6)	**16.0** (14.7-17.3)	**17.6** (16.0-19.1)	**19.8** (17.9-21.6)	**21.5** (19.2-23.7)
30-day	**8.64** (8.11-9.23)	**10.2** (9.55-10.9)	**11.9** (11.2-12.8)	**13.3** (12.5-14.3)	**15.2** (14.2-16.3)	**16.6** (15.5-17.8)	**18.1** (16.7-19.4)	**19.5** (18.0-21.0)	**21.4** (19.6-23.2)	**22.9** (20.8-24.9)
45-day	**10.8** (10.2-11.5)	**12.7** (11.9-13.5)	**14.7** (13.8-15.6)	**16.2** (15.2-17.3)	**18.3** (17.2-19.5)	**19.9** (18.6-21.3)	**21.5** (20.0-23.0)	**23.1** (21.4-24.7)	**25.1** (23.1-27.1)	**26.7** (24.4-28.9)
60-day	**12.9** (12.2-13.6)	**15.1** (14.2-16.0)	**17.3** (16.3-18.3)	**19.0** (17.9-20.1)	**21.2** (19.9-22.5)	**22.9** (21.4-24.3)	**24.5** (22.9-26.1)	**26.1** (24.3-27.8)	**28.1** (26.0-30.1)	**29.5** (27.2-31.7)

[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.

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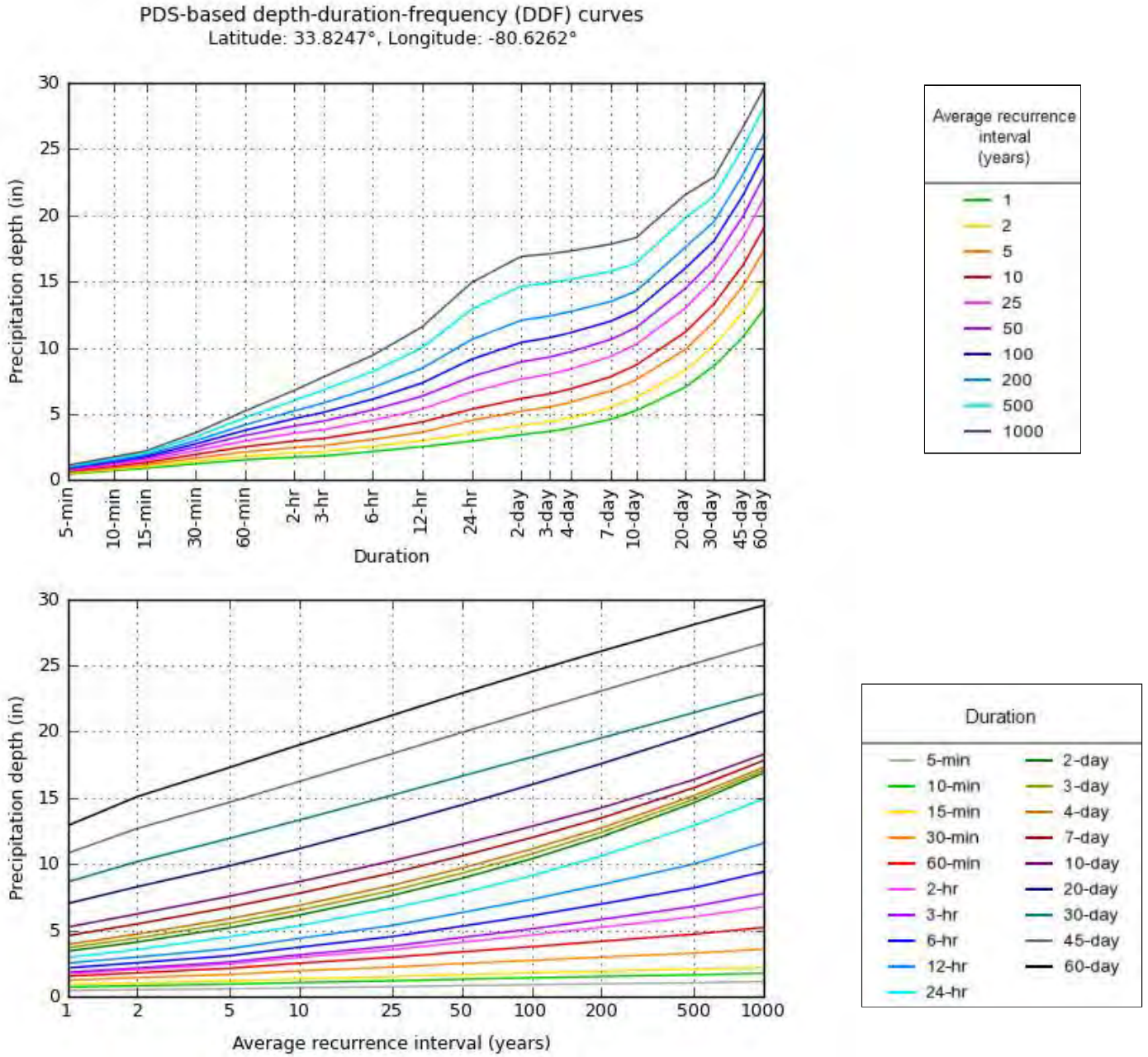
PF graphical



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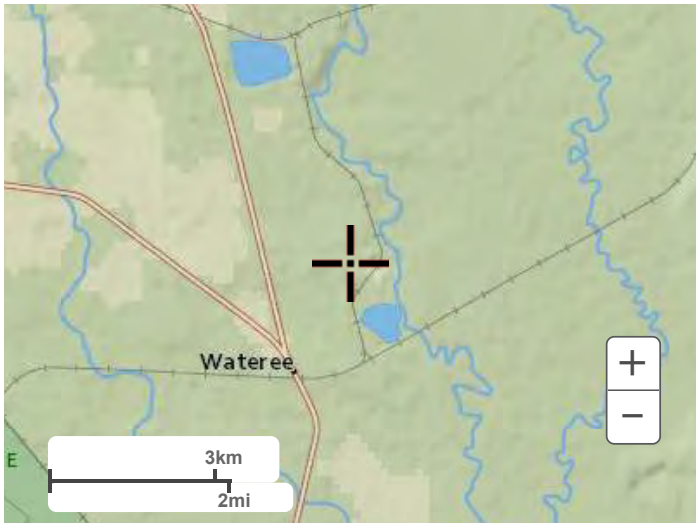
Maps & aerials

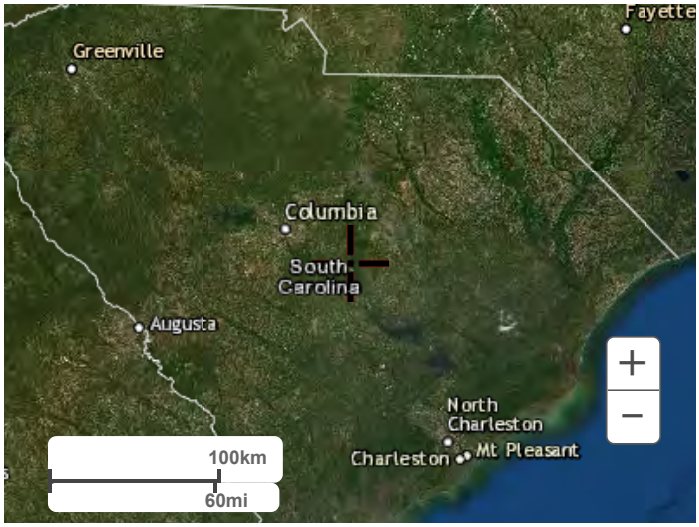
Small scale terrain



Large scale terrain

Large scale map

Large scale aerial



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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

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