

INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN
40 C.F.R. § 257.100(f)(3)(v) and 40 C.F.R. § 257.82(c)
PLANT HARLLEE BRANCH ASH POND E (AP-E)
GEORGIA POWER COMPANY

A rule amendment to the Federal CCR Rule became effective on November 8, 2024. See Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Legacy CCR Surface Impoundments, 89 Fed. Reg. 38950 (“Legacy Rule”). The Legacy Rule defines the term “legacy CCR surface impoundment” and establishes regulatory requirements for units that meet the definition of a legacy CCR surface impoundment. The owner or operator of a legacy surface impoundment must prepare a written inflow design flood system plan documenting how the inflow design flood control system has been designed and constructed. See 40 C.F.R. § 257.100(f)(3)(v) and 40 C.F.R. § 257.82(c). In addition, the Rules require periodic inflow design flood control system plans within 5 years of development of the previous plan. See 40 C.F.R. § 257.82(c)(4).

The legacy CCR surface impoundment known as Ash Pond E (AP-E) at Georgia Power Company’s (Georgia Power) Plant Harlee Branch (Plant Branch) property is located near Beaverdam Creek, off State Route 24 (US 441) near Milledgeville and Eatonton in Putnam County, Georgia. AP-E encompasses approximately 348 acres and is impounded by a dam on the east side and by natural ground on the remaining sides. AP-E is classified as a high hazard potential CCR surface impoundment. Therefore, AP-E must adequately manage the peak discharge resulting from the Probable Maximum Flood (PMF) without overtopping the dam. The PMF is determined based on the Probable Maximum Precipitation (PMP) storm event with a 6-hour (hr) duration and Antecedent Moisture Condition (AMC)-III.

Georgia Power submitted a CCR handling permit application to the Georgia Environmental Protection Division (GA EPD) in November 2018 in accordance with the Georgia Rules for Solid Waste Management, Chapter 391-3-4-.10 (State CCR Rule). The CCR handling permit application is currently under review by GA EPD. Georgia Power intends to close AP-E in accordance with 40 C.F.R. § 257.102(c) and corresponding State CCR Rule 391-3-4-.10(7)(b) by removing and relocating the CCR to a permitted on-site landfill and/or selling the CCR for beneficial use. The closure has been designed to have no negative impacts on the surface impoundment’s hazard classification.

The attached calculation package presents the design criteria, analysis methodology, design parameters, and calculations and results for the hydraulic capacity of AP-E. The detailed evaluation included the hydrologic contributions to the Northern and Western Diversions and AP-E, as well as the hydraulic connections amongst these features. These factors were analyzed to estimate the maximum allowable starting water surface elevation in AP-E, while adequately managing the peak discharge resulting from the PMP storm event (6-hr, AMC-III) without overtopping the dam. The maximum allowable starting water surface elevation in AP-E was calculated as El. 417.0 ft, and the resulting peak water surface elevation during the PMP storm event (6-hr, AMC-III) was calculated as El. 431.4 ft (i.e., the crest of the dam). For reference, the normal operating water surface elevation in AP-E is maintained at or below El. 416.0 ft, and currently, the ponding in AP-E is limited to seasonal ponding in certain areas of the unit.

Therefore, AP-E can adequately manage the peak discharge from the PMF (i.e., PMP storm event with a 6-hr duration and AMC-III) without overtopping the dam.

Discharge from AP-E is handled in accordance with the surface water requirements under § 257.3-3.

I hereby certify that the inflow design flood control system plan meets the requirements of 40 C.F.R. § 257.100(f)(3)(v) and 40 C.F.R. § 257.82(c).



05/06/2026

Victoria Cheplak, P.E.

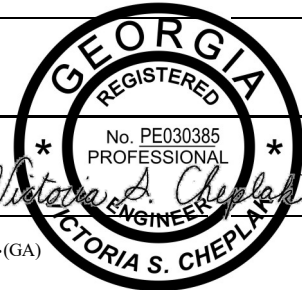
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CALCULATION PACKAGE COVER SHEET

Client: Georgia Power Company **Project:** Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units **Project #:** GW11718

TITLE OF PACKAGE: INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM ANALYSIS FOR PLANT HARLLEE BRANCH ASH POND E (AP-E)

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REVISION HISTORY:

<u>NO.</u>	<u>DESCRIPTION</u>	<u>DATE</u>	<u>CP</u>	<u>APC</u>	<u>CC</u>	<u>CA</u>
0	Final Submittal	05/06/2026	SH	VC	BS	VC

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Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM ANALYSIS FOR PLANT HARLLEE BRANCH ASH POND E (AP-E)

PURPOSE

This calculation package presents the design criteria, analysis methodology, design parameters, and calculations and results for the hydraulic capacity of the coal combustion residual (CCR) surface impoundment known as Plant Harllee Branch (Plant Branch) Ash Pond E (AP-E) in Putnam County, Georgia. The dam at AP-E, adjacent to the inlet cove of Beaverdam Creek to Lake Sinclair, is classified as a Category I Dam under the Georgia Environmental Protection Division (GA EPD) Safe Dams Program (SDP). Analyses were conducted to estimate the maximum allowable starting water surface elevation in AP-E, while adequately managing the peak discharge resulting from the Probable Maximum Precipitation (PMP) storm event (6-hour [hr], Antecedent Moisture Condition [AMC]-III) without overtopping the dam. This calculation package supports the preparation of the initial inflow design flood control system plan required by Title 40 of the Code of Federal Regulations (C.F.R.) Part 257 (40 C.F.R. §257, Federal CCR Rule) and Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Legacy CCR Surface Impoundments (89 Federal Register 38950, Legacy Rule) as promulgated by the United States Environmental Protection Agency (USEPA).

DESIGN CRITERIA

The Federal CCR Rule [USEPA, 2015] includes the following relevant requirements (with citations):

- §257.82(a): The owner or operator of an existing or new CCR surface impoundment or any lateral expansion of a CCR surface impoundment must design, construct, operate, and maintain an inflow design flood control system as specified in paragraphs (a)(1) and (2) of this section.
- §257.82(a)(1): The inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood specified in paragraph (a)(3) of this section.
- §257.82(a)(2) The inflow design flood control system must adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood specified in paragraph (a)(3) of this section.

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

- §257.82(a)(3)(i): The inflow design flood is the Probable Maximum Flood (PMF) for a high hazard potential CCR surface impoundment.

AP-E is classified as a high hazard potential CCR surface impoundment. Therefore, AP-E must adequately manage the peak discharge resulting from the PMP storm event (6-hr, AMC-III) without overtopping the Category I Dam. (Note: Per Section 5.2.5.1 of the “Engineer Guidelines” provided by the Georgia Department of Natural Resources (GA DNR) under the SDP, curve numbers should be adjusted for the AMC. The PMP design event should be assessed using a 6-hr duration assuming AMC-III [GA DNR, 2015].)

ANALYSIS METHODOLOGY

Stormwater flow rates, depths, and volumes were calculated using hydrology and hydraulic procedures presented in the Soil Conservation Service (SCS) Technical Release 55 (TR-55), Manning’s kinematic equation, and other recognized engineering procedures encoded in the HydroCAD™ software and the USEPA’s Storm Water Management Model (SWMM) software [SCS, 1986; HydroCAD™, 2024; USEPA, 2023]. HydroCAD™ was used to generate hydrographs for the various drainage areas, and these hydrographs were imported as time series into SWMM. SWMM was employed for hydraulic routing to simulate the impacts of backflow within the water management system.

DESIGN PARAMETERS

The following design parameters were utilized within this calculation package:

- Rainfall Distribution and Depths: **Figure 1** [SCS, 1986] shows the location of Plant Branch on the rainfall distribution map of the United States. The site is located in Putnam County, Georgia, which is categorized as having a Type II rainfall distribution. Rainfall depths for the design storm event and for calculating times of concentration (TOC) are: (i) 3.66 inches (in.) for the 2-year (yr), 24-hr storm [National Oceanic and Atmospheric Administration (NOAA), 2017] and (ii) 31 in. for the PMP, 6-hr storm [NOAA, 1978]. **Figure 2** [NOAA, 1978] shows the location of the site on the “All-season PMP (in.) for 6 hr 10 mi² (26 km²)” map of the United States. Relevant precipitation frequencies are presented in **Attachment 1**.
- Drainage Areas: Drainage areas were generally delineated to water management features (e.g., diversions, ponds) using the existing ground contours obtained from the Light Detection and Ranging (LiDAR) survey performed by Georgia Power Company (GPC) on 22 January 2024 [GPC, 2024a]. The drainage areas are presented in **Figure 3** and described

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

in **Table 1**. No additional inflows, apart from direct rainfall and run-on, were considered in this analysis (e.g., inflow from the on-site wastewater treatment system).

- Hydrologic Soil Groups (HSGs): **Attachment 2** presents the different soil classifications for the site from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey (WSS) [USDA, 2021]. The major soil units found within the area consisted of Cecil (HSG B) and Davidson (HSG B). HSGs for the drainage areas specified above are described in **Table 1**.
- Curve Numbers (CNs): CNs corresponding to land cover shown in the site aerial presented in **Figure 4** and obtained from the LiDAR survey performed by GPC on 20 June 2024 [GPC, 2024b] were selected based on Table 2-2 of TR-55 [SCS, 1986]. CNs were adjusted for AMC-III, within HydroCAD, where applicable, using Table 10-1 of the National Engineering Handbook (NEH) [NRCS, 2004]. Relevant excerpts from reference materials are provided in **Attachment 3**. CNs for the drainage areas specified above are described in **Table 1**.
- Times of Concentration: TOCs were calculated for the drainage areas. Computations for travel time for sheet flow were performed using the equation for Manning’s kinematic solution [SCS, 1986]:

$$T_t = \frac{0.007(nL)^{0.8}}{P^{0.5}S^{0.4}} \quad (1)$$

where: T_t = travel time (hr); n = Manning’s roughness coefficient equal to 0.8 for woods: dense underbrush and 0.15 for grass: short [SCS, 1986]; L = flow length (feet [ft]); P = 2-yr, 24-hr rainfall depth (in.); and S = land slope (ft/ft).

After a maximum flow length of 100 ft, sheet flow was assumed to become shallow concentrated flow (i.e., upland flow). Travel times for shallow concentrated flow were estimated from SCS TR-55 [SCS, 1986] as follows:

$$T_t = \frac{L}{3600V} \quad (2)$$

$$V = KS^{0.5} \quad (3)$$

where: T_t = travel time (hr); L = flow length (ft); V = average velocity (feet per second [fps]); K = velocity factor (fps) equal to 5.0 for woodland and 7.0 for short grass pasture [SCS, 1986]; and S = land slope (ft/ft).

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

Travel times for channel flow were calculated using Equation (2) [SCS, 1986] and Manning’s equation as follows:

$$V = \frac{1.49r^{2/3}(S)^{1/2}}{n} \quad (4)$$

$$r = \frac{a}{w_p} \quad (5)$$

where: V = average velocity (fps); r = hydraulic radius (ft); a = cross-sectional flow area (square feet [sf]); w_p = wetted perimeter (ft); n = Manning’s roughness coefficient equal to 0.030 for vegetative lining [SCS, 1986]; and S = land slope (ft/ft).

TOCs for the drainage areas specified above are presented in **Figures 3 and 4** and described in **Table 2**.

- **Diversions:** The following features reduce the volume of run-on into AP-E: (i) Northern Diversions and the associated stormwater pond (i.e., North Pond) to divert run-on away from Finger 1 and the northern portion of AP-E and (ii) Western Diversions and the associated stormwater pond (i.e., West Pond) to divert run-on away from Finger 2. The presence of these features impacts the water management system; as such, the Northern and Western Diversions and their associated stormwater ponds were included in the analysis herein. The designs of these features are presented in drawing sets entitled “Plant Branch, Preliminary Sitework Phase 1, Northern Diversion Project” [Southern Company Services Technical and Project Solutions (SCS T&PS), 2020a] and “Plant Branch, Preliminary Sitework Phase 1, Western Diversion Project” [SCS T&PS, 2020b]. The diversions were generally designed as trapezoidal in shape with 3H:1V (horizontal:vertical) side slopes and varying bottom widths, minimum depths, and longitudinal slopes. The Northern Diversions were designed with either National Stone Association (N.S.A.) R-3 or R-4 graded riprap with Manning’s n values of 0.031 and 0.035, respectively [Georgia Soil and Water Conservation Commission (GSWCC), 2016; Atlanta Regional Commission (ARC), 2016]. The Western Diversions were designed with erosion control blanket with a Manning’s n value of 0.027 for straight, uniform earthen channels with short grass [Chow, 1959]. The diversions are presented in **Figure 3** and described in **Table 3**.
- **Stormwater Pipes:** The stormwater pipes conveying flow as part of the Northern and Western Diversions and their associated stormwater ponds, as shown in the drawing sets entitled “Plant Branch, Preliminary Sitework Phase 1, Northern Diversion Project” [SCS T&PS, 2020a] and “Preliminary Sitework Phase 1, Western Diversion Project” [SCS T&PS, 2020b], included single or double barrels of 24-in. or 48-in. diameter high density

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

polyethylene (HDPE) pipe with a Manning’s n value of 0.012 [Federal Highway Administration (FHWA) National Highway Institute (NHI), 2012]. The stormwater pipes are presented in **Figure 3** and described in **Table 4**.

- **Stage Storage Relationships:** The stage storage relationships for the North and West Ponds were generated from the designs presented in the drawing sets entitled “Plant Branch, Preliminary Sitework Phase 1, Northern Diversion Project” [SCS T&PS, 2020a] and “Plant Branch, Preliminary Sitework Phase 1, Western Diversion Project” [SCS T&PS, 2020b]. The stage storage relationship for AP-E was generated from existing ground contours obtained from the LiDAR survey performed by GPC on 22 January 2024 [GPC, 2024a]. The stage storage relationships for the North and West Ponds and AP-E are described in **Tables 5** and **6**, respectively.
- **Discharge Mechanisms:** The discharge mechanisms associated with the North and West Ponds were obtained from the designs presented in the drawing sets entitled “Plant Branch, Preliminary Sitework Phase 1, Northern Diversion Project” [SCS T&PS, 2020a] and “Plant Branch, Preliminary Sitework Phase 1, Western Diversion Project” [SCS T&PS, 2020b]. The discharge mechanisms for the North and West Ponds are described in **Tables 7** and **8**, respectively.

The discharge mechanisms associated with AP-E include the following features:

- The primary outlet structure is located in the southeastern region of the CCR surface impoundment, approximately 1,200 ft southeast of the Category I Dam. The primary outlet structure includes a vertical, concrete inlet structure with a weir. The top opening of the inlet structure is 13.5-ft long by 7-ft wide at Elevation (El.) 430 ft. The height of the weir, and thereby the operating water elevation within AP-E, is controlled by adding or removing 9.5-ft long stop logs from El. 416 ft to El. 430 ft. For this analysis, the stop logs were assumed to be set at El. 430 ft. The inlet structure discharges through an underground 36-in. diameter HDPE pipe with an upstream invert elevation at El. 410 ft.
- The auxiliary spillway, permitted under National Pollutant Discharge Elimination System (NPDES) Permit Number GA0026051 as Outfall Number 05 [GA EPD, 2023], is an approximately 85-ft wide grassed, earthen spillway at El. 430 ft [GPC, 2024a] and is located directly behind the primary outlet structure.
- The lowest elevation along the crest of the Category I Dam is approximately El. 431.4 ft.

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for
Plant Branch Legacy CCR Units Project No: GW11718

CALCULATIONS AND RESULTS

HydroCAD™ was employed for the hydrologic analysis, while SWMM was employed for the hydraulic analysis to simulate the impacts of backflow within the water management system. HydroCAD™ and SWMM results supporting the analysis are provided in **Attachments 4 and 5**, respectively.

Tables 7 and 8 present the hydrologic and hydraulic results for the North and West Ponds, respectively. **Table 9** presents the hydrologic and hydraulic results for AP-E, including the maximum allowable starting water surface elevation and the resulting peak water surface elevation during the PMP storm event (6-hr, AMC-III). The maximum allowable starting water surface elevation in AP-E was set at El. 417.0 ft, and the resulting peak water surface elevation during the PMP storm event (6-hr, AMC-III) was El. 431.4 ft (i.e., the crest of the Category I Dam). For reference, the normal operating water surface elevation in AP-E is maintained at or below El. 416.0 ft.

SUMMARY AND CONCLUSIONS

This calculation package presents the design criteria, analysis methodology, design parameters, and calculations and results for the hydraulic capacity of the CCR surface impoundment known as Plant Branch AP-E in Putnam County, Georgia. This analysis supports the preparation of the initial inflow design flood control system plan required by the Federal CCR Rule and Legacy Rule, as promulgated by the USEPA. The detailed evaluation included the hydrologic contributions to the Northern and Western Diversions and AP-E, as well as the hydraulic connections amongst these features. These factors were analyzed to estimate the maximum allowable starting water surface elevation in AP-E, while adequately managing the peak discharge resulting from the PMP storm event (6-hr, AMC-III) without overtopping the Category I Dam. The maximum allowable starting water surface elevation was calculated to be above the normal operating water surface elevation in AP-E.

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CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

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CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for
Plant Branch Legacy CCR Units Project No: GW11718

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CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for
Plant Branch Legacy CCR Units Project No: GW11718

TABLES

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

Table 1. Drainage Areas and Curve Numbers

Subcatchment ID	Area (ac)	Total Area (%)	Total Area (ac)	Land Use Description ⁽¹⁾	CN ⁽²⁾	Weighted CN
E101	74.219	10%	747.8	Pasture/grassland/range, Fair, HSG B	69	79
	308.653	41%		Woods, Fair, HSG B	60	
	348.113	47%		AP-E and CCR surface	98	
	1.879	0%		Beneficial use facility (Impervious surface)	98	
	14.887	2%		Beneficial use facility (Newly graded area, HSG B)	86	
E201	17.969	66%	27.1	Pasture/grassland/range, Fair, HSG B	69	70
	6.149	23%		Woods, Fair, HSG B	60	
	2.952	11%		Diversion	98	
E202	41.993	73%	57.4	Pasture/grassland/range, Fair, HSG B	69	68
	13.108	23%		Woods, Fair, HSG B	60	
	2.291	4%		Diversion	98	
E203	25.198	86%	29.4	Pasture/grassland/range, Fair, HSG B	69	71
	1.497	5%		Woods, Fair, HSG B	60	
	2.737	9%		Diversion and pond surface	98	
E301	11.527	87%	13.3	Pasture/grassland/range, Fair, HSG B	69	71
	0.690	5%		Woods, Fair, HSG B	60	
	1.050	8%		Diversion	98	
E302	1.069	22%	4.9	Pasture/grassland/range, Fair, HSG B	69	92
	3.855	78%		Diversion	98	
E303	16.227	97%	16.7	Pasture/grassland/range, Fair, HSG B	69	70
	0.448	3%		Diversion	98	
E304	15.107	95%	16.0	Pasture/grassland/range, Fair, HSG B	69	71
	0.879	5%		Diversion and pond surface	98	

Notes:

1. Diversions were modeled with a curve number of 98 due to the potential for ponded water to be present.
2. Curve numbers were adjusted for AMC-III within HydroCAD, where applicable.

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

Table 2. Times of Concentration

Subcatchment ID	Sheet Flow				Shallow Concentrated Flow				Channel Flow			Total Time of Concentration (min)
	Flow Length (ft)	Surface Description	Manning's n	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Velocity Factor (ft/s)	Land Slope (ft/ft)	Flow Length (ft)	Surface Description	Land Slope (ft/ft)	
E101	100	Woods: Dense Underbrush	0.800	0.040	2,256	Woodland	5.0	0.038	-	-	-	65.1
E201	100	Woods: Dense Underbrush	0.800	0.035	671	Woodland	5.0	0.044	-	-	-	38.6
E202	100	Grass: Short	0.150	0.014	976	Short Grass Pasture	7.0	0.037	-	-	-	22.7
E203	100	Grass: Short	0.150	0.023	1,955	Short Grass Pasture	7.0	0.024	-	-	-	38.7
E301	100	Woods: Dense Underbrush	0.800	0.055	613	Short Grass Pasture	7.0	0.013	-	-	-	36.1
E302	100	Grass: Short	0.150	0.060	116	Short Grass Pasture	7.0	0.151	-	-	-	6.6
E303	100	Grass: Short	0.150	0.014	941	Short Grass Pasture	7.0	0.029	-	-	-	23.8
E304	100	Grass: Short	0.150	0.039	514	Short Grass Pasture	7.0	0.056	434	Western Diversion ⁽¹⁾	0.044	12.8

Note:

1. "Western Diversion" refers to an existing channel near the West Pond. The drawings entitled "Plant Branch, Preliminary Sitework Phase 1, Western Diversion Project" and dated 31 January 2020 show conveyance of this channel to the West Pond. This channel was modeled with a cross-sectional area of 16.0 sf, perimeter of 14.6 ft, and Manning's n of 0.027 (i.e., erosion control blanket).

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

Table 3. Diversion Characteristics and Results

Channel ID	Channel Characteristics										
	Section Shape ⁽¹⁾	Minimum Channel Depth (ft)	Start Invert Elevation (ft)	End Invert Elevation (ft)	Length (ft)	Longitudinal Slope (ft/ft)	Manning's n	Minimum Bottom Width (ft)	Side Slope ⁽²⁾ M ₁ :1	Side Slope ⁽²⁾ M ₂ :1	Lining Material
1A	trap	10.3	422.0	417.0	2,237	0.002	0.031	4.0	3.0	3.0	N.S.A. No. R-3
1B	trap	13.8	416.0	406.0	417	0.024	0.035	4.0	3.0	3.0	N.S.A. No. R-4
1D ⁽³⁾	trap	3.7	434.8	422.0	3,156	0.004	0.031	4.0	3.0	3.0	N.S.A. No. R-3
5A ⁽³⁾	trap	2.0	452.0	437.8	833	0.017	0.027	7.5	3.0	3.0	Erosion control blanket
5B ⁽³⁾	trap	2.4	442.6	437.9	498	0.009	0.027	3.5	3.0	3.0	Erosion control blanket
5C	trap	4.1	437.9	432.0	1,284	0.005	0.027	8.0	3.0	3.0	Erosion control blanket

Notes:

1. trap = trapezoidal
2. Side slope dimensions are presented such that the channel cross section is cut looking downstream with respect to the direction of flow, and M1 is the side slope on the left, while M2 is the side slope on the right.
3. Diversions 1D, 5A, and 5B were modeled as storage units to account for overtopping of channel banks, which overflow into AP-E during the PMP event.

Channel ID	Results - PMP (6-hr, AMC-III) Storm Event		
	Peak Flow Rate (cfs)	Peak Flow Depth (ft)	Channel Freeboard (ft)
1A ⁽¹⁾	1,185	10.3	0.0
1B	1,326	9.1	4.7
1D ⁽²⁾	428	4.0	-0.3
5A ⁽³⁾	154	2.2	-0.2
5B ⁽³⁾	170	2.8	-0.4
5C	559	4.1	0.0

Notes:

1. Diversion 1A was modeled as two different diversions (Diversion_1A_1 and Diversion_1A_2). The higher peak flow rate and peak flow depth are recorded in the table.
2. Diversion 1D was modeled as a storage unit to account for overtopping of channel banks, which overflow into AP-E during the PMP storm event.
3. Diversions 5A and 5B were modeled as storage units to account for overtopping of channel banks, which overflow into AP-E during the PMP storm event.

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

Table 4. Pipe Characteristics and Results

Pipe ID	Pipe Characteristics							
	Material Type	Manning's n	(Number of Pipes) - Diameter	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Slope (ft/ft)	Overtopping Depth ⁽¹⁾ (ft)
SWP 16	HDPE	0.012	(2) - 48 in.	189	417.0	416.1	0.005	14.0
North Pond Primary Outlet Structure	HDPE	0.012	(1) - 48 in.	93	402.7	402.3	0.005	13.3
West Pond Primary Outlet Structure	HDPE	0.012	(1) - 24 in.	72.5	425.0	424.0	0.014	7.0

Pipe ID	Results - PMP (6-hr, AMC-III) Storm Event		
	Peak Flow Rate (cfs)	Controlling Headwater Depth (ft)	Calculated Freeboard (ft)
SWP 16	557	14.5	-0.5
North Pond Primary Outlet Structure	Hydraulic capacity and performance of pond primary outlet structure is addressed in the pond summary tables.		
West Pond Primary Outlet Structure	Hydraulic capacity and performance of pond primary outlet structure is addressed in the pond summary tables.		

Note:

1. The overtopping depth was considered to be the difference between the diversion top of berm elevation in the vicinity of the pipe or the pond auxiliary spillway elevation and the pipe inlet invert elevation.

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

Table 5. Stage Storage Relationship – North and West Ponds

Depth from Bottom Elevation (ft)	North Pond Surface Area (sf)	West Pond Surface Area (sf)
Pond Bottom Elevation (ft)	402.5	425
0	0	0
0.5	21	0
1	2,961	17,113
1.5	11,219	22,250
2	25,186	35,186
2.5	41,729	37,878
3	42,900	40,722
3.5	44,086	41,898
4	45,444	43,084
4.5	46,814	44,291
5	48,132	45,507
5.5	49,576	46,740
6	51,012	47,983
6.5	52,484	49,378
7	53,992	52,193
7.5	55,536	53,926
8	57,117	58,033
8.5	58,733	61,268
9	60,386	66,228
9.5	62,074	
10	63,799	
10.5	65,560	
11	67,348	
11.5	69,216	
12	71,076	
12.5	73,222	
13	75,244	
13.5	78,515	
14	81,113	
14.5	83,743	

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

Table 6. Stage Storage Relationship – AP-E

Depth from Bottom Elevation (ft)	AP-E Surface Area (sf)
Pond Bottom Elevation (ft)	413
0	128,590
1	454,260
2	546,640
3	660,010
4	780,510
5	958,430
6	1,146,820
7	1,318,830
8	1,538,490
9	1,879,710
10	2,459,020
11	3,169,550
12	4,155,290
13	5,859,980
14	7,498,990
15	11,519,820
16	13,020,480
17	13,020,480
18	13,020,480
18.4	13,020,480

Note:

1. The surface area of the highest closed contour available in the AP-E surface was used as the surface area for elevations above the highest closed contour.

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

Table 7. Pond Summary – North Pond

Item	North Pond		
	Description	Parameter Value in Units Shown	
Invert Elevation	Lowest Bottom Elevation of Pond		402.5
Primary Outlet Structure	Drawdown Orifice	18" Diameter Circular Orifice	402.7
	Riser Structure	6' Diameter Circular Opening at Top of Riser Structure ⁽¹⁾	415.0
	Outlet Pipe (U/S Invert)	1 - 48" Diameter HDPE	402.7
	Outlet Pipe (D/S Invert)		402.3
Auxiliary Spillway	20' Long Broad Crested Rectangular Weir		416.0
Embankment	Value Represents Minimum Embankment Elevation		417.0
Available Storage Volume	To Embankment	Elevation (ft)	17.2
Subcatchment	Total Upstream Drainage Area	Area (ac)	113.9
Results			
PMP (6-hr, AMC-III) Storm Event	Peak Discharge Flow Rate	cfs	1,317
	Peak Water Surface Elevation	ft	418.9
	Freeboard to Embankment	ft	-1.9

Note:

1. Dimensions are provided for the interior of the riser structure.

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

Table 8. Pond Summary – West Pond

Item	West Pond		
	Description	Parameter Value in Units Shown	
Invert Elevation	Lowest Bottom Elevation of Pond		425.0
Primary Outlet Structure	Drawdown Orifice	6" Diameter Circular Orifice	425.1
	Riser Structure	4' Diameter Circular Opening at Top of Riser Structure ⁽¹⁾	430.5
	Outlet Pipe (U/S Invert)	1 - 24" Diameter HDPE	425.0
	Outlet Pipe (D/S Invert)		424.0
Auxiliary Spillway	15' Long Broad Crested Rectangular Weir		432.0
Embankment	Value Represents Minimum Embankment Elevation		434.0
Available Storage Volume	To Embankment	Elevation (ft)	8.4
Subcatchment	Total Upstream Drainage Area	Area (ac)	50.9
Results			
PMP (6-hr, AMC-III) Storm Event	Peak Discharge Flow Rate	cfs	1,296
	Peak Water Surface Elevation	ft	436.1
	Freeboard to Embankment	ft	-2.1

Note:

1. Dimensions are provided for the interior of the riser structure.

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

Table 9. Pond Summary – AP-E

		AP-E
Pond Bottom Elevation (ft)		413.0
Maximum Allowable Starting Water Surface Elevation (ft)		417.0
PMP (6-hr, AMC-III) Storm Event	Peak Water Surface Elevation (ft)	431.4
	Wave Wall Crest Freeboard (ft) ⁽¹⁾	3.0
	Dam Crest Freeboard (ft) ⁽²⁾	0.0
	Flow through Auxiliary Spillway (cfs) ⁽³⁾	445.0
	Maximum Flow Velocity through Auxiliary Spillway (fps)	3.7

Notes:

1. The wave wall crest elevation was assumed to be 434.4 ft.
2. The dam crest elevation was assumed to be 431.4 ft.
3. AP-E auxiliary spillway invert elevation is 430.0 ft.

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for
Plant Branch Legacy CCR Units Project No: GW11718

FIGURES

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

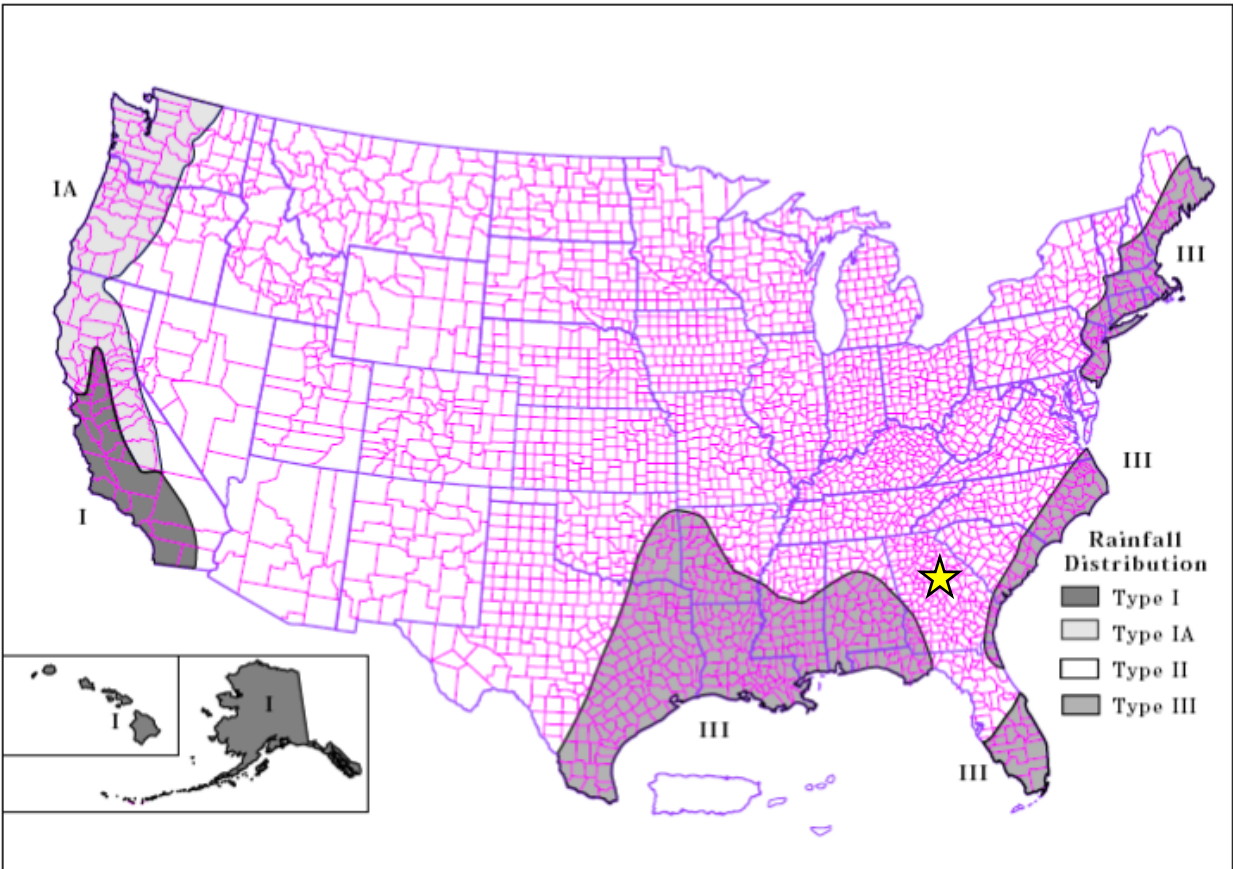


Figure 1. Rainfall Distribution [SCS, 1986]

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for Plant Branch Legacy CCR Units Project No: GW11718

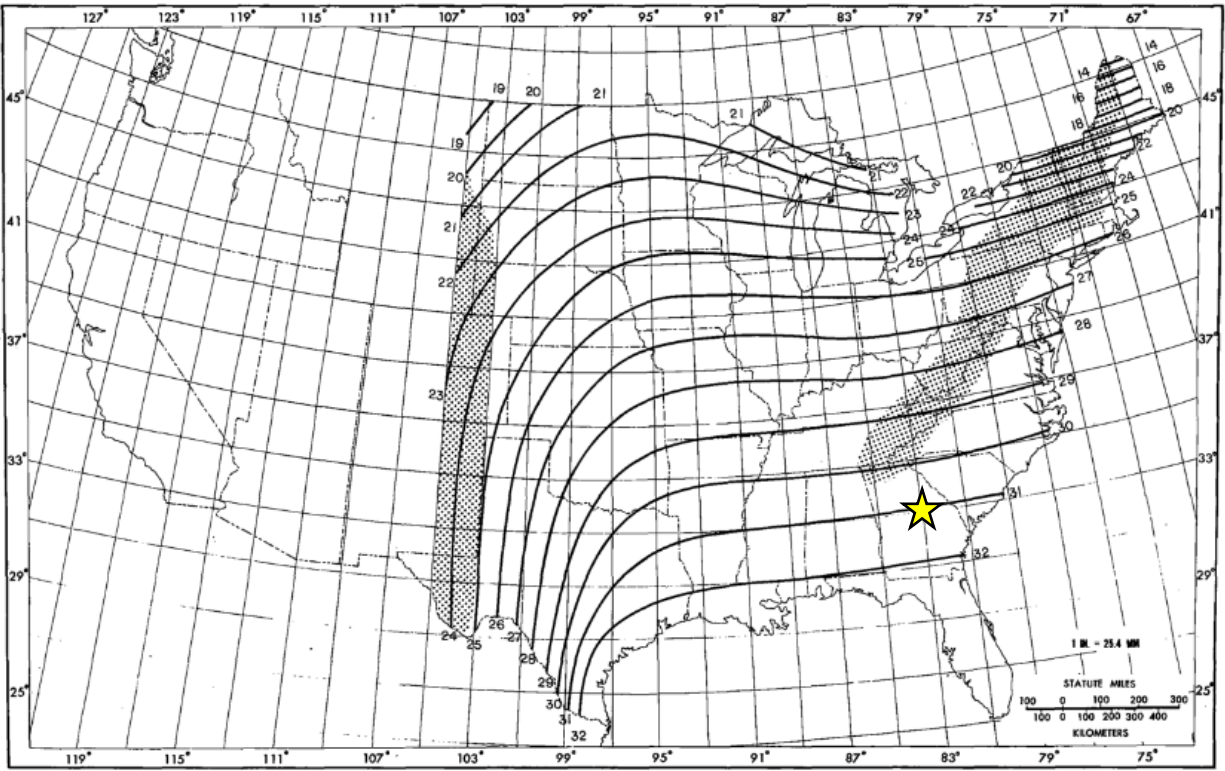


Figure 18.--All-season PMP (in.) for 6 hr 10 mi² (26 km²).

Figure 2. Probable Maximum Precipitation [NOAA, 1978]

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for
Plant Branch Legacy CCR Units Project No: GW11718

Figure 3. Existing Conditions – Topography

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for
Plant Branch Legacy CCR Units Project No: GW11718

Figure 4. Existing Conditions – Site Aerial

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for
Plant Branch Legacy CCR Units Project No: GW11718

ATTACHMENTS

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for
Plant Branch Legacy CCR Units Project No: GW11718

Attachment 1. Precipitation Frequencies [NOAA, 2017]



NOAA Atlas 14, Volume 9, Version 2
 Location name: Eatonton, Georgia, USA*
 Latitude: 33.2041°, Longitude: -83.3277°
 Elevation: 423.28 ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aerals](#)

PF tabular

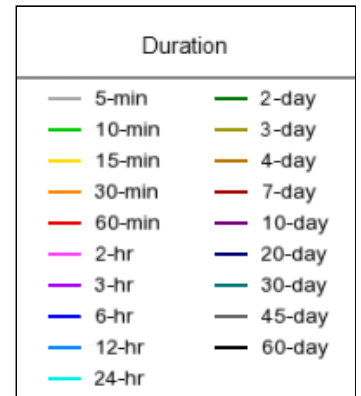
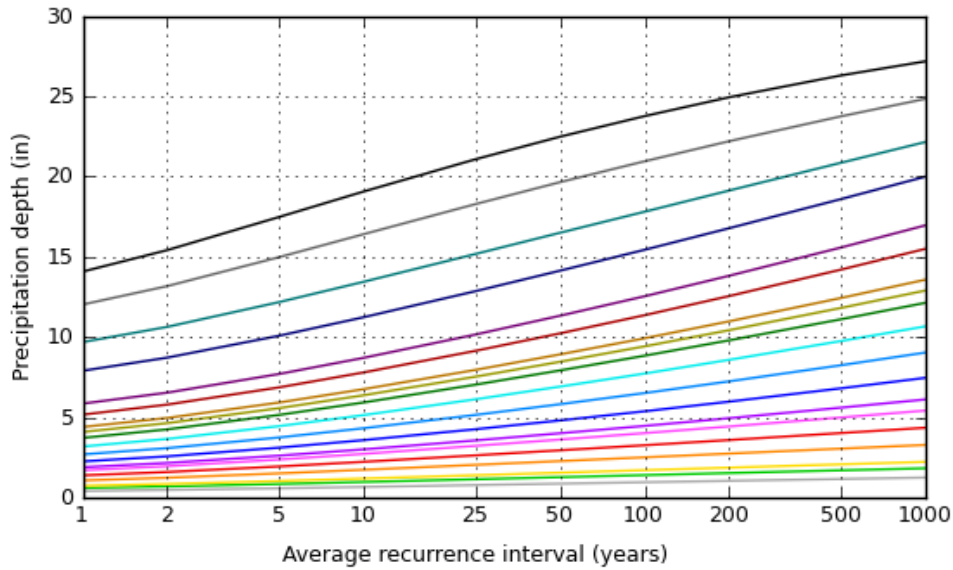
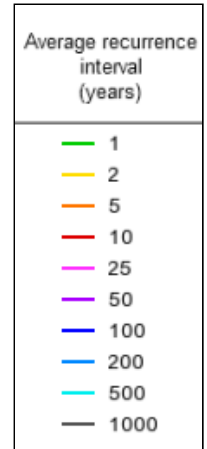
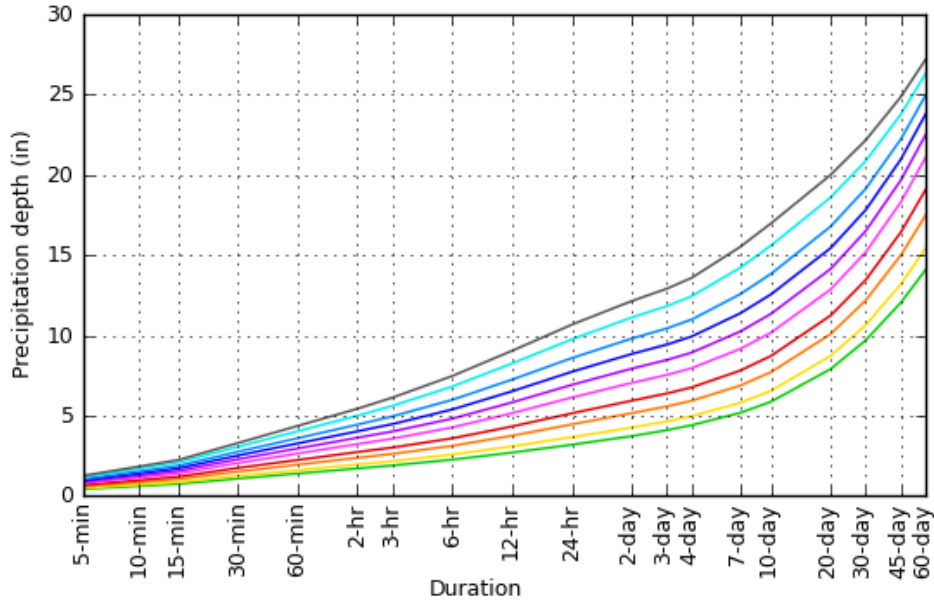
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.413 (0.343-0.490)	0.476 (0.396-0.566)	0.580 (0.481-0.690)	0.665 (0.549-0.794)	0.781 (0.627-0.950)	0.869 (0.686-1.07)	0.957 (0.736-1.20)	1.05 (0.779-1.33)	1.16 (0.840-1.51)	1.25 (0.886-1.64)
10-min	0.604 (0.503-0.718)	0.698 (0.580-0.829)	0.849 (0.704-1.01)	0.973 (0.803-1.16)	1.14 (0.918-1.39)	1.27 (1.00-1.56)	1.40 (1.08-1.75)	1.53 (1.14-1.95)	1.70 (1.23-2.21)	1.83 (1.30-2.40)
15-min	0.737 (0.613-0.875)	0.851 (0.707-1.01)	1.03 (0.858-1.23)	1.19 (0.980-1.42)	1.39 (1.12-1.70)	1.55 (1.23-1.91)	1.71 (1.32-2.13)	1.87 (1.39-2.38)	2.07 (1.50-2.69)	2.23 (1.58-2.93)
30-min	1.07 (0.889-1.27)	1.24 (1.03-1.47)	1.51 (1.25-1.80)	1.73 (1.43-2.07)	2.04 (1.64-2.48)	2.28 (1.80-2.80)	2.51 (1.93-3.13)	2.74 (2.05-3.49)	3.05 (2.21-3.96)	3.28 (2.33-4.31)
60-min	1.39 (1.15-1.65)	1.60 (1.33-1.90)	1.94 (1.61-2.31)	2.23 (1.84-2.66)	2.63 (2.12-3.21)	2.95 (2.33-3.63)	3.26 (2.52-4.09)	3.59 (2.68-4.57)	4.02 (2.91-5.23)	4.35 (3.09-5.72)
2-hr	1.70 (1.43-2.00)	1.95 (1.64-2.30)	2.37 (1.98-2.80)	2.73 (2.27-3.23)	3.22 (2.62-3.91)	3.62 (2.89-4.42)	4.02 (3.13-5.00)	4.43 (3.34-5.61)	4.99 (3.65-6.44)	5.42 (3.88-7.07)
3-hr	1.89 (1.60-2.21)	2.16 (1.82-2.53)	2.61 (2.20-3.07)	3.01 (2.52-3.54)	3.56 (2.92-4.30)	4.01 (3.22-4.88)	4.47 (3.50-5.54)	4.95 (3.75-6.25)	5.61 (4.12-7.21)	6.12 (4.40-7.94)
6-hr	2.25 (1.92-2.62)	2.57 (2.19-2.98)	3.11 (2.64-3.62)	3.58 (3.03-4.18)	4.26 (3.53-5.11)	4.81 (3.90-5.82)	5.38 (4.25-6.62)	5.98 (4.57-7.50)	6.81 (5.05-8.71)	7.47 (5.41-9.62)
12-hr	2.69 (2.32-3.10)	3.08 (2.65-3.55)	3.75 (3.21-4.32)	4.32 (3.69-5.00)	5.15 (4.30-6.13)	5.82 (4.76-6.98)	6.51 (5.19-7.95)	7.24 (5.59-9.01)	8.25 (6.17-10.5)	9.04 (6.60-11.6)
24-hr	3.18 (2.77-3.63)	3.66 (3.17-4.17)	4.45 (3.86-5.09)	5.14 (4.43-5.89)	6.13 (5.16-7.22)	6.92 (5.71-8.22)	7.73 (6.21-9.35)	8.59 (6.67-10.6)	9.76 (7.35-12.3)	10.7 (7.86-13.5)
2-day	3.72 (3.26-4.20)	4.25 (3.73-4.80)	5.15 (4.51-5.83)	5.93 (5.16-6.73)	7.04 (5.98-8.21)	7.93 (6.61-9.33)	8.84 (7.17-10.6)	9.80 (7.69-12.0)	11.1 (8.44-13.9)	12.1 (9.01-15.3)
3-day	4.09 (3.61-4.59)	4.64 (4.09-5.21)	5.57 (4.90-6.27)	6.38 (5.58-7.20)	7.53 (6.44-8.75)	8.46 (7.10-9.92)	9.43 (7.69-11.2)	10.4 (8.23-12.7)	11.8 (9.02-14.7)	12.9 (9.63-16.2)
4-day	4.40 (3.90-4.92)	4.96 (4.39-5.56)	5.92 (5.23-6.64)	6.76 (5.94-7.60)	7.96 (6.84-9.21)	8.93 (7.51-10.4)	9.93 (8.13-11.8)	11.0 (8.69-13.3)	12.4 (9.53-15.4)	13.6 (10.2-17.0)
7-day	5.17 (4.62-5.74)	5.80 (5.17-6.44)	6.87 (6.11-7.64)	7.80 (6.91-8.71)	9.15 (7.92-10.5)	10.2 (8.68-11.9)	11.4 (9.38-13.4)	12.6 (10.0-15.1)	14.2 (11.0-17.5)	15.5 (11.7-19.3)
10-day	5.86 (5.26-6.47)	6.54 (5.87-7.23)	7.70 (6.89-8.53)	8.71 (7.76-9.68)	10.2 (8.84-11.6)	11.3 (9.66-13.1)	12.5 (10.4-14.7)	13.8 (11.1-16.6)	15.6 (12.1-19.1)	17.0 (12.8-21.0)
20-day	7.90 (7.17-8.65)	8.72 (7.91-9.55)	10.1 (9.12-11.1)	11.2 (10.1-12.4)	12.9 (11.3-14.5)	14.1 (12.2-16.1)	15.4 (12.9-17.9)	16.8 (13.5-19.9)	18.6 (14.5-22.6)	20.0 (15.3-24.6)
30-day	9.69 (8.84-10.5)	10.6 (9.70-11.6)	12.2 (11.1-13.3)	13.4 (12.2-14.7)	15.2 (13.3-17.0)	16.5 (14.2-18.7)	17.8 (14.9-20.5)	19.1 (15.5-22.5)	20.9 (16.4-25.1)	22.2 (17.0-27.1)
45-day	12.0 (11.0-13.0)	13.2 (12.1-14.3)	15.0 (13.7-16.3)	16.4 (14.9-17.9)	18.3 (16.1-20.2)	19.7 (17.0-22.0)	21.0 (17.6-23.9)	22.2 (18.0-25.9)	23.8 (18.7-28.4)	24.9 (19.2-30.2)
60-day	14.1 (13.0-15.2)	15.4 (14.2-16.6)	17.5 (16.1-18.9)	19.1 (17.4-20.7)	21.1 (18.6-23.2)	22.5 (19.5-25.0)	23.8 (20.1-27.0)	24.9 (20.3-28.9)	26.3 (20.7-31.2)	27.2 (21.0-33.0)

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

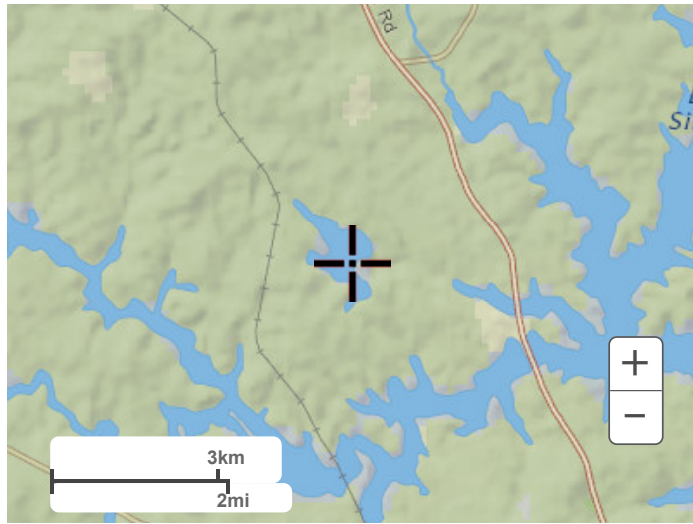
PDS-based depth-duration-frequency (DDF) curves
 Latitude: 33.2041°, Longitude: -83.3277°



[Back to Top](#)

Maps & aeriels

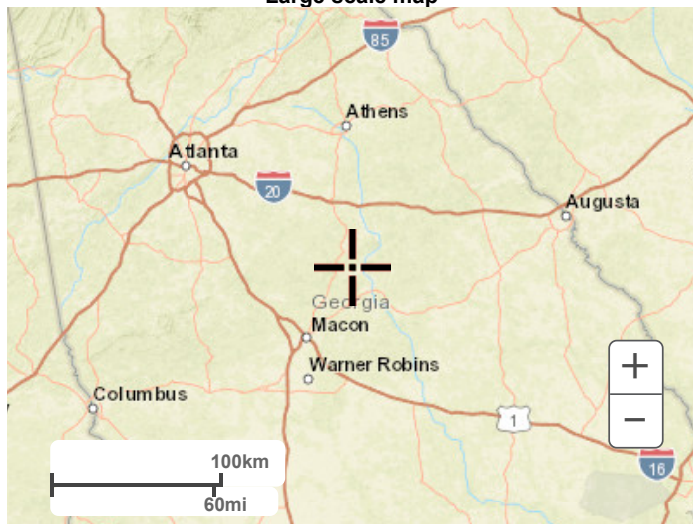
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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Client: GPC Project: Design and Operating Criteria Assessments for
Plant Branch Legacy CCR Units Project No: GW11718

Attachment 2. NRCS WSS Soil Classifications [USDA, 2021]



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 **Baldwin, Jones, and Putnam Counties, Georgia**



Preface

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

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

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

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

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

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

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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
Baldwin, Jones, and Putnam Counties, Georgia.....	14
Cst—Chewacla and Starr soils.....	14
CyB2—Cecil sandy loam, 2 to 6 percent slopes, moderately eroded.....	15
CZB2—Cecil sandy clay loam, 2 to 6 percent slopes, eroded.....	16
CZC2—Cecil sandy clay loam, 6 to 10 percent slopes, eroded.....	17
DgB2—Davidson loam, 2 to 6 percent slopes, moderately eroded.....	18
DhC2—Davidson clay loam, 6 to 10 percent slopes, moderately eroded...	19
DhE2—Davidson clay loam, 10 to 25 percent slopes, moderately eroded.....	20
Sen—Starr and Toccoa soils.....	21
VbC2—Vance sandy clay loam, 2 to 10 percent slopes, eroded.....	23
W—Water.....	24
WiE—Wilkes soils, 10 to 25 percent slopes.....	24
References	26

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

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

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

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

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

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

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

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

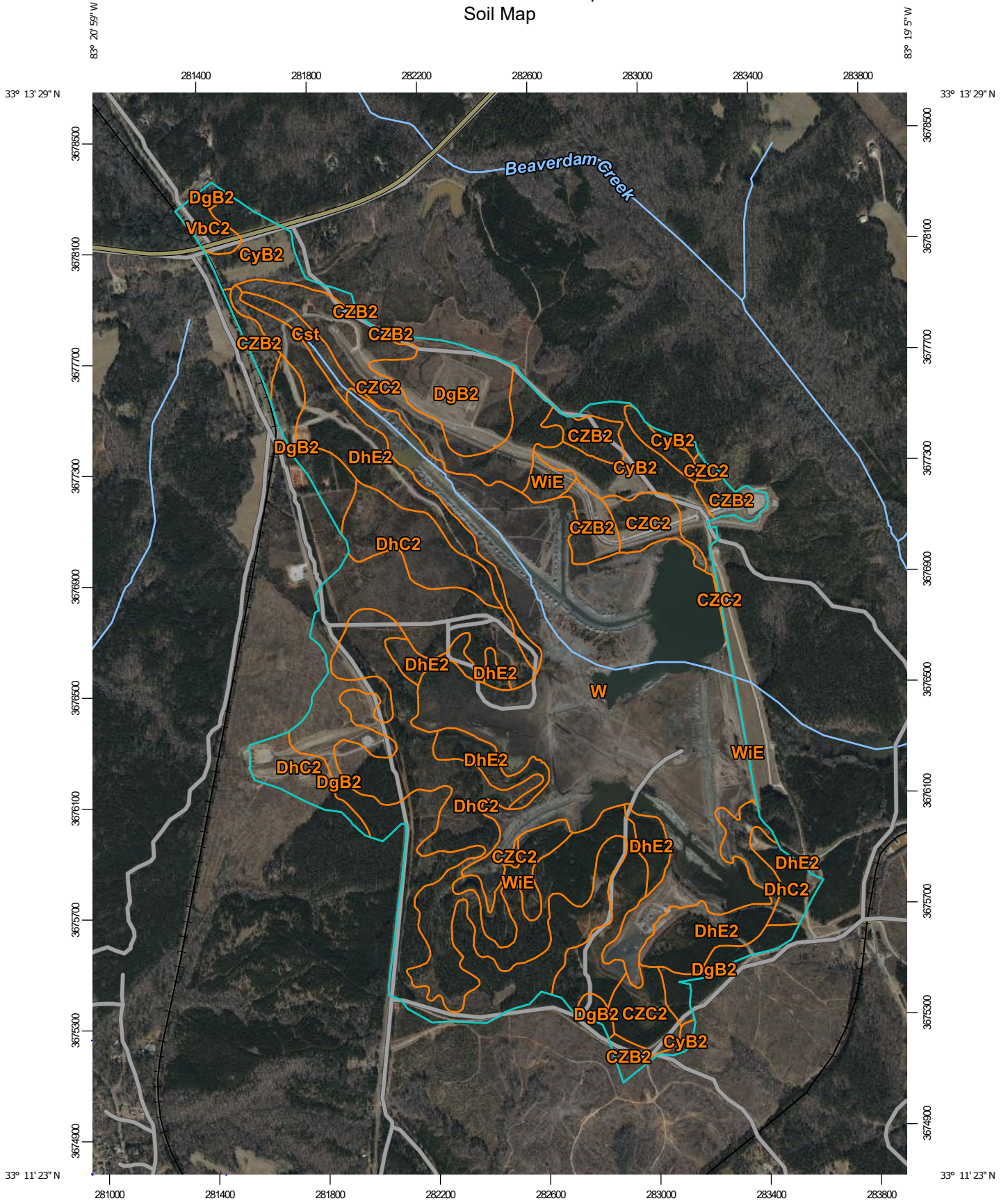
Custom Soil Resource Report

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

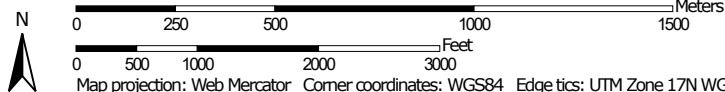
Soil Map

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

Custom Soil Resource Report Soil Map




Map Scale: 1:19,000 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge ticks: 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 1:20,000.

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: Baldwin, Jones, and Putnam Counties, Georgia
 Survey Area Data: Version 22, Aug 29, 2025

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

Date(s) aerial images were photographed: Feb 4, 2023—Feb 18, 2023

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
Cst	Chewacla and Starr soils	7.6	0.8%
CyB2	Cecil sandy loam, 2 to 6 percent slopes, moderately eroded	47.8	5.2%
CZB2	Cecil sandy clay loam, 2 to 6 percent slopes, eroded	33.2	3.6%
CZC2	Cecil sandy clay loam, 6 to 10 percent slopes, eroded	72.5	7.9%
DgB2	Davidson loam, 2 to 6 percent slopes, moderately eroded	184.4	20.2%
DhC2	Davidson clay loam, 6 to 10 percent slopes, moderately eroded	166.6	18.3%
DhE2	Davidson clay loam, 10 to 25 percent slopes, moderately eroded	91.8	10.1%
Sen	Starr and Toccoa soils	5.1	0.6%
VbC2	Vance sandy clay loam, 2 to 10 percent slopes, eroded	6.3	0.7%
W	Water	278.0	30.5%
WIE	Wilkes soils, 10 to 25 percent slopes	19.3	2.1%
Totals for Area of Interest		912.5	100.0%

Map Unit Descriptions

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

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called

Custom Soil Resource Report

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

Custom Soil Resource Report

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.

Baldwin, Jones, and Putnam Counties, Georgia

Cst—Chewacla and Starr soils

Map Unit Setting

National map unit symbol: 468t

Elevation: 210 to 1,400 feet

Mean annual precipitation: 44 to 60 inches

Mean annual air temperature: 59 to 64 degrees F

Frost-free period: 190 to 230 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Chewacla and similar soils: 75 percent

Starr and similar soils: 20 percent

Minor components: 5 percent

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

Description of Chewacla

Setting

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

H1 - 0 to 8 inches: silt loam

H2 - 8 to 24 inches: silt loam

H3 - 24 to 34 inches: loam

H4 - 34 to 58 inches: silt loam

H5 - 58 to 70 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 18 inches

Frequency of flooding: Occasional

Frequency of ponding: None

Available water supply, 0 to 60 inches: High (about 11.4 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 Starr

Setting

Landform: Flood plains

Down-slope shape: Linear

Custom Soil Resource Report

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

H1 - 0 to 10 inches: sandy loam

H2 - 10 to 53 inches: sandy clay loam

H3 - 53 to 70 inches: sandy clay loam

Properties and qualities

Slope: 0 to 2 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: Occasional

Frequency of ponding: None

Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: B

Ecological site: F136XY620GA - Flood Plain Forest, Moist

Hydric soil rating: No

Minor Components

Wehadkee

Percent of map unit: 5 percent

Landform: Depressions on flood plains, backswamps on flood plains

Down-slope shape: Linear, concave

Across-slope shape: Linear, concave

Hydric soil rating: Yes

CyB2—Cecil sandy loam, 2 to 6 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2tfg8

Elevation: 200 to 1,400 feet

Mean annual precipitation: 44 to 60 inches

Mean annual air temperature: 59 to 64 degrees F

Frost-free period: 190 to 230 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Cecil, moderately eroded, and similar soils: 100 percent

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

Description of Cecil, Moderately Eroded

Setting

Landform: Hills

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Crest

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Clayey residuum weathered from igneous and metamorphic rock

Typical profile

Ap - 0 to 4 inches: sandy loam

Bt1 - 4 to 12 inches: clay loam

Bt2 - 12 to 39 inches: clay

Bt3 - 39 to 50 inches: clay loam

BC - 50 to 64 inches: clay loam

C - 64 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 8.3 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

CZB2—Cecil sandy clay loam, 2 to 6 percent slopes, eroded

Map Unit Setting

National map unit symbol: 468p

Elevation: 200 to 1,400 feet

Mean annual precipitation: 44 to 60 inches

Mean annual air temperature: 59 to 64 degrees F

Frost-free period: 190 to 230 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Cecil and similar soils: 100 percent

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

Description of Cecil

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss and/or residuum weathered from schist

Typical profile

H1 - 0 to 7 inches: sandy clay loam
H2 - 7 to 11 inches: sandy clay loam
H3 - 11 to 50 inches: clay
H4 - 50 to 75 inches: 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 8.2 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

CZC2—Cecil sandy clay loam, 6 to 10 percent slopes, eroded

Map Unit Setting

National map unit symbol: 468q
Elevation: 200 to 1,400 feet
Mean annual precipitation: 44 to 60 inches
Mean annual air temperature: 59 to 64 degrees F
Frost-free period: 190 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Cecil

Setting

Landform: Hills

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from granite and gneiss and/or residuum weathered from schist

Typical profile

H1 - 0 to 7 inches: sandy clay loam

H2 - 7 to 11 inches: sandy clay loam

H3 - 11 to 50 inches: clay

H4 - 50 to 75 inches: 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 8.2 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

DgB2—Davidson loam, 2 to 6 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2tx3f

Elevation: 400 to 1,200 feet

Mean annual precipitation: 44 to 60 inches

Mean annual air temperature: 59 to 64 degrees F

Frost-free period: 190 to 230 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Davidson, moderately eroded, and similar soils: 100 percent

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

Description of Davidson, Moderately Eroded

Setting

Landform: Ridges, hills

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Crest, interfluve

Down-slope shape: Convex

Across-slope shape: Linear, convex

Parent material: Residuum weathered from amphibolite and/or residuum weathered from hornblende gneiss and/or residuum weathered from diorite and/or residuum weathered from granodiorite

Typical profile

Ap - 0 to 7 inches: loam

Bt1 - 7 to 12 inches: clay loam

Bt2 - 12 to 53 inches: clay

Bt3 - 53 to 72 inches: clay

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 8.7 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

DhC2—Davidson clay loam, 6 to 10 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2tx3h

Elevation: 400 to 1,200 feet

Mean annual precipitation: 44 to 60 inches

Mean annual air temperature: 59 to 64 degrees F

Frost-free period: 190 to 230 days

Farmland classification: Not prime farmland

Map Unit Composition

Davidson, moderately eroded, and similar soils: 100 percent

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

Description of Davidson, Moderately Eroded

Setting

Landform: Ridges, hills

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex, linear

Across-slope shape: Linear

Parent material: Residuum weathered from amphibolite and/or residuum weathered from hornblende gneiss and/or residuum weathered from diorite and/or residuum weathered from granodiorite

Typical profile

Ap - 0 to 7 inches: clay loam

Bt1 - 7 to 12 inches: clay loam

Bt2 - 12 to 53 inches: clay

Bt3 - 53 to 72 inches: clay

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 8.7 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

DhE2—Davidson clay loam, 10 to 25 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2tx3g

Elevation: 400 to 1,200 feet

Mean annual precipitation: 44 to 60 inches

Mean annual air temperature: 59 to 64 degrees F

Frost-free period: 190 to 230 days

Farmland classification: Not prime farmland

Map Unit Composition

Davidson, moderately eroded, and similar soils: 100 percent

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

Description of Davidson, Moderately Eroded

Setting

Landform: Ridges, hills

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex, linear

Across-slope shape: Linear

Parent material: Residuum weathered from amphibolite and/or residuum weathered from hornblende gneiss and/or residuum weathered from diorite and/or residuum weathered from granodiorite

Typical profile

Ap - 0 to 7 inches: clay loam

Bt1 - 7 to 12 inches: clay loam

Bt2 - 12 to 53 inches: clay

Bt3 - 53 to 72 inches: clay

Properties and qualities

Slope: 10 to 25 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 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Ecological site: F136XY820GA - Acidic upland forest, moist

Hydric soil rating: No

Sen—Starr and Toccoa soils

Map Unit Setting

National map unit symbol: 469q

Elevation: 400 to 1,500 feet

Mean annual precipitation: 44 to 60 inches

Mean annual air temperature: 59 to 64 degrees F

Frost-free period: 190 to 230 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Starr and similar soils: 60 percent

Toccoa and similar soils: 40 percent

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

Description of Starr

Setting

Landform: Flood plains, open depressions
Down-slope shape: Linear
Across-slope shape: Linear, concave
Parent material: Alluvium

Typical profile

H1 - 0 to 10 inches: sandy loam
H2 - 10 to 53 inches: sandy clay loam
H3 - 53 to 70 inches: sandy clay loam

Properties and qualities

Slope: 0 to 2 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: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: F136XY620GA - Flood Plain Forest, Moist
Hydric soil rating: No

Description of Toccoa

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 10 inches: sandy loam
H2 - 10 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95
in/hr)
Depth to water table: About 30 to 60 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w

Custom Soil Resource Report

Hydrologic Soil Group: A

Ecological site: F136XY620GA - Flood Plain Forest, Moist

Hydric soil rating: No

VbC2—Vance sandy clay loam, 2 to 10 percent slopes, eroded

Map Unit Setting

National map unit symbol: 469w

Elevation: 260 to 660 feet

Mean annual precipitation: 44 to 60 inches

Mean annual air temperature: 59 to 64 degrees F

Frost-free period: 190 to 230 days

Farmland classification: Not prime farmland

Map Unit Composition

Vance and similar soils: 100 percent

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

Description of Vance

Setting

Landform: Hills

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from granite and gneiss and/or residuum weathered from schist

Typical profile

H1 - 0 to 5 inches: sandy clay loam

H2 - 5 to 29 inches: clay

H3 - 29 to 72 inches: loam

Properties and qualities

Slope: 2 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 low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: F136XY820GA - Acidic upland forest, moist

Hydric soil rating: No

W—Water

Map Unit Composition

Water: 100 percent

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

WiE—Wilkes soils, 10 to 25 percent slopes

Map Unit Setting

National map unit symbol: 46b1

Elevation: 230 to 640 feet

Mean annual precipitation: 44 to 60 inches

Mean annual air temperature: 59 to 64 degrees F

Frost-free period: 190 to 230 days

Farmland classification: Not prime farmland

Map Unit Composition

Wilkes and similar soils: 100 percent

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

Description of Wilkes

Setting

Landform: Hills

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from hornfels and/or residuum weathered from diabase and/or residuum weathered from gneiss and/or residuum weathered from diorite

Typical profile

H1 - 0 to 6 inches: sandy loam

H2 - 6 to 13 inches: clay loam

Cr - 13 to 48 inches: weathered bedrock

Properties and qualities

Slope: 10 to 25 percent

Depth to restrictive feature: 10 to 20 inches to paralithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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: Very low (about 2.0 inches)

Custom Soil Resource Report

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Ecological site: F136XY730SC - Basic Upland Forest, Depth Restriction, Dry

Hydric soil rating: No

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Custom Soil Resource Report

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Client: GPC Project: Design and Operating Criteria Assessments for
Plant Branch Legacy CCR Units Project No: GW11718

**Attachment 3. Relevant Excerpts from Table 2-2 of TR-55 [SCS, 1986] and Table 10-1 of the
NEH [NRCS, 2004]**

Table 2-2a Runoff curve numbers for urban areas ^{1/}

Cover description	Average percent impervious area ^{2/}	Curve numbers for hydrologic soil group			
		A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) ^{3/} :					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) ^{4/}		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82

Developing urban areas

Newly graded areas
(pervious areas only, no vegetation) ^{5/}

		77	86	91	94
--	--	----	----	----	----

Idle lands (CN's are determined using cover types
similar to those in table 2-2c).

^{1/} Average runoff condition, and $I_a = 0.2S$.

^{2/} The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

^{3/} CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

^{4/} Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

^{5/} Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2c Runoff curve numbers for other agricultural lands ^{1/}

Cover description	Hydrologic condition	Curve numbers for hydrologic soil group			
		A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. ^{2/}	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. ^{3/}	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 ^{4/}	48	65	73
Woods—grass combination (orchard or tree farm). ^{5/}	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. ^{6/}	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 ^{4/}	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

¹ Average runoff condition, and $I_a = 0.2S$.

² **Poor:** <50% ground cover or heavily grazed with no mulch.

Fair: 50 to 75% ground cover and not heavily grazed.

Good: > 75% ground cover and lightly or only occasionally grazed.

³ **Poor:** <50% ground cover.

Fair: 50 to 75% ground cover.

Good: >75% ground cover.

⁴ Actual curve number is less than 30; use CN = 30 for runoff computations.

⁵ CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

⁶ **Poor:** Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.

Fair: Woods are grazed but not burned, and some forest litter covers the soil.

Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

Table 10-1 Curve numbers (CN) and constants for the case $I_a = 0.2S$

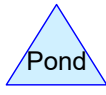
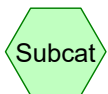
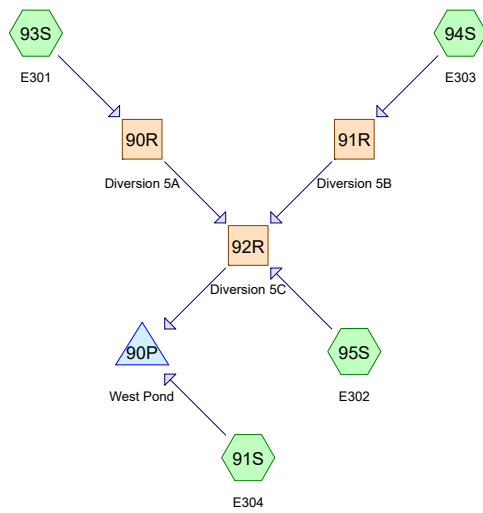
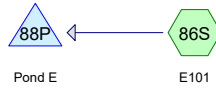
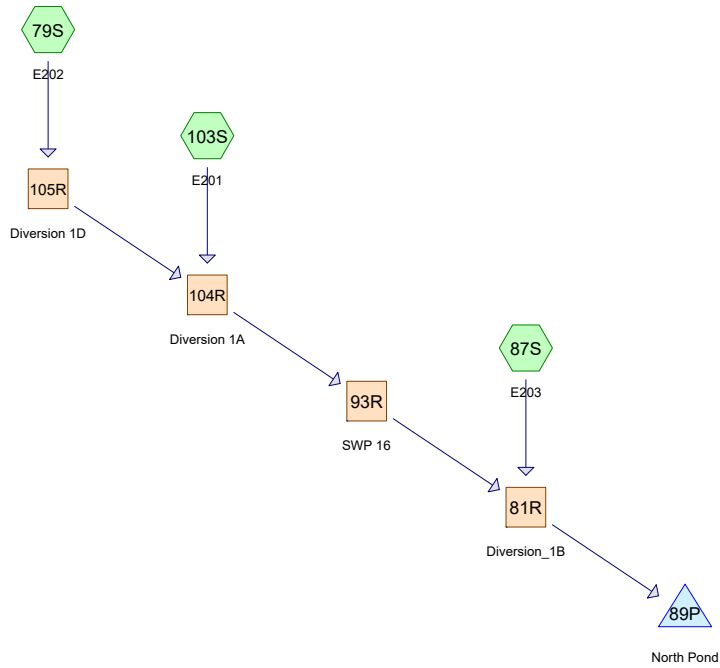
1	2	3	4	5	1	2	3	4	5
CN for ARC II	-- CN for ARC -- I	III	S values* (in)	Curve* starts where P = (in)	CN for ARC II	-- CN for ARC -- I	III	S values* (in)	Curve* starts where P = (in)
100	100	100	0	0	60	40	78	6.67	1.33
99	97	100	.101	.02	59	39	77	6.95	1.39
98	94	99	.204	.04	58	38	76	7.24	1.45
97	91	99	.309	.06	57	37	75	7.54	1.51
96	89	99	.417	.08	56	36	75	7.86	1.57
95	87	98	.526	.11	55	35	74	8.18	1.64
94	85	98	.638	.13	54	34	73	8.52	1.70
93	83	98	.753	.15	53	33	72	8.87	1.77
92	81	97	.870	.17	52	32	71	9.23	1.85
91	80	97	.989	.20	51	31	70	9.61	1.92
90	78	96	1.11	.22	50	31	70	10.0	2.00
89	76	96	1.24	.25	49	30	69	10.4	2.08
88	75	95	1.36	.27	48	29	68	10.8	2.16
87	73	95	1.49	.30	47	28	67	11.3	2.26
86	72	94	1.63	.33	46	27	66	11.7	2.34
85	70	94	1.76	.35	45	26	65	12.2	2.44
84	68	93	1.90	.38	44	25	64	12.7	2.54
83	67	93	2.05	.41	43	25	63	13.2	2.64
82	66	92	2.20	.44	42	24	62	13.8	2.76
81	64	92	2.34	.47	41	23	61	14.4	2.88
80	63	91	2.50	.50	40	22	60	15.0	3.00
79	62	91	2.66	.53	39	21	59	15.6	3.12
78	60	90	2.82	.56	38	21	58	16.3	3.26
77	59	89	2.99	.60	37	20	57	17.0	3.40
76	58	89	3.16	.63	36	19	56	17.8	3.56
75	57	88	3.33	.67	35	18	55	18.6	3.72
74	55	88	3.51	.70	34	18	54	19.4	3.88
73	54	87	3.70	.74	33	17	53	20.3	4.06
72	53	86	3.89	.78	32	16	52	21.2	4.24
71	52	86	4.08	.82	31	16	51	22.2	4.44
70	51	85	4.28	.86	30	15	50	23.3	4.66
69	50	84	4.49	.90	25	12	43	30.0	6.00
68	48	84	4.70	.94	20	9	37	40.0	8.00
67	47	83	4.92	.98	15	6	30	56.7	11.34
66	46	82	5.15	1.03	10	4	22	90.0	18.00
65	45	82	5.38	1.08	5	2	13	190.0	38.00
64	44	81	5.62	1.12	0	0	0	infinity	infinity
63	43	80	5.87	1.17					
62	42	79	6.13	1.23					
61	41	78	6.39	1.28					

* For CN in column 1.

CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for
Plant Branch Legacy CCR Units Project No: GW11718

Attachment 4. HydroCAD™ Results



Routing Diagram for Existing Conditions
 Prepared by Geosyntec Consultants, Printed 12/5/2025
 HydroCAD® 10.20-3h s/n 00939 © 2024 HydroCAD Software Solutions LLC

Existing Conditions

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	PMP	Type II 6-hr		Default	6.00	1	31.00	3

Existing Conditions

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
348.113	98	Ash Pond E and CCR surface (86S)
14.212	98	Diversion (79S, 87S, 91S, 93S, 94S, 95S, 103S)
1.879	98	Impervious surfaces (86S)
14.887	86	Newly graded area, HSG B (86S)
203.309	69	Pasture/grassland/range, Fair, HSG B (79S, 86S, 87S, 91S, 93S, 94S, 95S, 103S)
330.097	60	Woods, Fair, HSG B (79S, 86S, 87S, 93S, 103S)
912.497	78	TOTAL AREA

Existing Conditions

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
548.293	HSG B	79S, 86S, 87S, 91S, 93S, 94S, 95S, 103S
0.000	HSG C	
0.000	HSG D	
364.204	Other	79S, 86S, 87S, 91S, 93S, 94S, 95S, 103S
912.497		TOTAL AREA

Existing Conditions

Ground Covers (all 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	0.000	0.000	348.113	348.113	Ash Pond E and CCR surface	86S
0.000	0.000	0.000	0.000	14.212	14.212	Diversion	79S, 87S, 91S, 93S, 94S, 95S, 103S
0.000	0.000	0.000	0.000	1.879	1.879	Impervious surfaces	86S
0.000	14.887	0.000	0.000	0.000	14.887	Newly graded area	86S
0.000	203.309	0.000	0.000	0.000	203.309	Pasture/grassland/range, Fair	79S, 86S, 87S, 91S, 93S, 94S, 95S, 103S
0.000	330.097	0.000	0.000	0.000	330.097	Woods, Fair	79S, 86S, 87S, 93S, 103S
0.000	548.293	0.000	0.000	364.204	912.497	TOTAL AREA	

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

- Subcatchment 79S: E202** Runoff Area=57.392 ac 3.99% Impervious Runoff Depth=28.83"
 Flow Length=1,076' Tc=22.7 min AMC Adjusted CN=84 Runoff=2,185.21 cfs 137,864 af
- Subcatchment 86S: E101** Runoff Area=747.751 ac 46.81% Impervious Runoff Depth=29.84"
 Flow Length=2,356' Tc=65.1 min AMC Adjusted CN=91 Runoff=14,369.40 cfs 1,859,654 af
- Subcatchment 87S: E203** Runoff Area=29.432 ac 9.30% Impervious Runoff Depth=29.13"
 Flow Length=2,055' Tc=38.7 min AMC Adjusted CN=86 Runoff=808.16 cfs 71,443 af
- Subcatchment 91S: E304** Runoff Area=15.986 ac 5.50% Impervious Runoff Depth=29.13"
 Flow Length=1,048' Tc=12.8 min AMC Adjusted CN=86 Runoff=802.78 cfs 38,804 af
- Subcatchment 93S: E301** Runoff Area=13.267 ac 7.91% Impervious Runoff Depth=29.13"
 Flow Length=713' Tc=36.1 min AMC Adjusted CN=86 Runoff=380.87 cfs 32,204 af
- Subcatchment 94S: E303** Runoff Area=16.675 ac 2.69% Impervious Runoff Depth=28.98"
 Flow Length=1,041' Tc=23.8 min AMC Adjusted CN=85 Runoff=618.91 cfs 40,268 af
- Subcatchment 95S: E302** Runoff Area=4.924 ac 78.29% Impervious Runoff Depth=30.63"
 Flow Length=216' Tc=6.6 min AMC Adjusted CN=97 Runoff=303.28 cfs 12,569 af
- Subcatchment 103S: E201** Runoff Area=27.070 ac 10.91% Impervious Runoff Depth=28.98"
 Flow Length=771' Tc=38.6 min AMC Adjusted CN=85 Runoff=741.60 cfs 65,371 af

- Reach 81R: Diversion_1B** Inflow=3,416.07 cfs 274,678 af
 Outflow=3,416.07 cfs 274,678 af
- Reach 90R: Diversion 5A** Inflow=380.87 cfs 32,204 af
 Outflow=380.87 cfs 32,204 af
- Reach 91R: Diversion 5B** Inflow=618.91 cfs 40,268 af
 Outflow=618.91 cfs 40,268 af
- Reach 92R: Diversion 5C** Inflow=993.57 cfs 85,041 af
 Outflow=993.57 cfs 85,041 af
- Reach 93R: SWP 16** Inflow=2,754.05 cfs 203,235 af
 Outflow=2,754.05 cfs 203,235 af
- Reach 104R: Diversion 1A** Inflow=2,754.05 cfs 203,235 af
 Outflow=2,754.05 cfs 203,235 af
- Reach 105R: Diversion 1D** Inflow=2,185.21 cfs 137,864 af
 Outflow=2,185.21 cfs 137,864 af
- Pond 88P: Pond E** Inflow=14,369.40 cfs 1,859,654 af
 Primary=14,369.40 cfs 1,859,654 af

Pond 89P: North Pond Inflow=3,416.07 cfs 274,678 af
 Primary=3,416.07 cfs 274,678 af

Pond 90P: West Pond Inflow=1,700.27 cfs 123,845 af
 Primary=1,700.27 cfs 123,845 af

Total Runoff Area = 912.497 ac Runoff Volume = 2,258.177 af Average Runoff Depth = 29.70"
60.09% Pervious = 548.293 ac 39.91% Impervious = 364.204 ac

Summary for Subcatchment 79S: E202

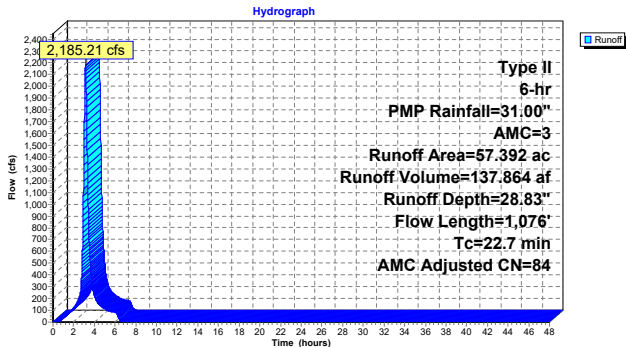
Runoff = 2,185.21 cfs @ 3.15 hrs, Volume= 137,864 af, Depth=28.83"
 Routed to Reach 105R : Diversion 1D

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 6-hr PMP Rainfall=31.00", AMC=3

Area (ac)	CN	Adj	Description
41.993	69		Pasture/grassland/range, Fair, HSG B
13.108	60		Woods, Fair, HSG B
* 2.291	98		Diversion
57.392	68	84	Weighted Average, AMC Adjusted
55.101			96.01% Pervious Area
2.291			3.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0140	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 3.66"
12.1	976	0.0370	1.35		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
22.7	1,076	Total			

Subcatchment 79S: E202



Summary for Subcatchment 86S: E101

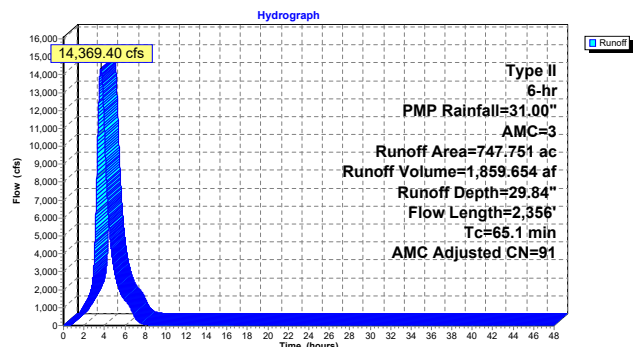
Runoff = 14,369.40 cfs @ 3.68 hrs, Volume= 1,859,654 af, Depth=29.84"
 Routed to Pond 88p : Pond E

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 6-hr PMP Rainfall=31.00", AMC=3

Area (ac)	CN	Adj	Description
74.219	69		Pasture/grassland/range, Fair, HSG B
308.653	60		Woods, Fair, HSG B
* 348.113	98		Ash Pond E and CCR surface
* 1.879	98		Impervious surfaces
14.887	86		Newly graded area, HSG B
747.751	79	91	Weighted Average, AMC Adjusted
397.759			53.19% Pervious Area
349.992			46.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.5	100	0.0400	0.06		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.66"
38.6	2,256	0.0380	0.97		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
65.1	2,356	Total			

Subcatchment 86S: E101



Summary for Subcatchment 87S: E203

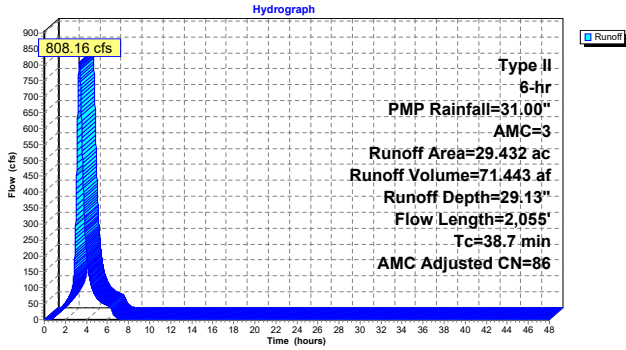
Runoff = 808.16 cfs @ 3.31 hrs, Volume= 71.443 af, Depth=29.13"
 Routed to Reach 81R : Diversion_1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 6-hr PMP Rainfall=31.00", AMC=3

Area (ac)	CN	Adj	Description
25.198	69		Pasture/grassland/range, Fair, HSG B
1.497	60		Woods, Fair, HSG B
2.737	98		Diversion
29.432	71	86	Weighted Average, AMC Adjusted
26.695			90.70% Pervious Area
2.737			9.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0230	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 3.66"
30.0	1,955	0.0240	1.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
38.7	2,055				Total

Subcatchment 87S: E203



Summary for Subcatchment 91S: E304

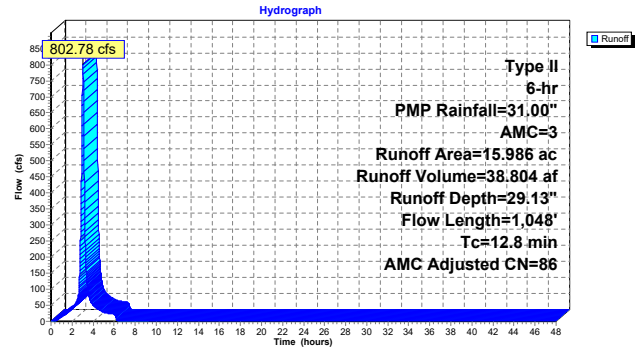
[47] Hint: Peak is 409% of capacity of segment #3
 Runoff = 802.78 cfs @ 3.04 hrs, Volume= 38.804 af, Depth=29.13"
 Routed to Pond 90p : West Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 6-hr PMP Rainfall=31.00", AMC=3

Area (ac)	CN	Adj	Description
15.107	69		Pasture/grassland/range, Fair, HSG B
0.879	98		Diversion
15.986	71	86	Weighted Average, AMC Adjusted
15.107			94.50% Pervious Area
0.879			5.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	100	0.0390	0.24		Sheet Flow, Grass: Short n= 0.150 P2= 3.66"
5.2	514	0.0560	1.66		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.6	434	0.0440	12.27	196.34	Channel Flow, Area= 16.0 sf Perim= 14.6' r= 1.10' n= 0.027
12.8	1,048				Total

Subcatchment 91S: E304



Summary for Subcatchment 93S: E301

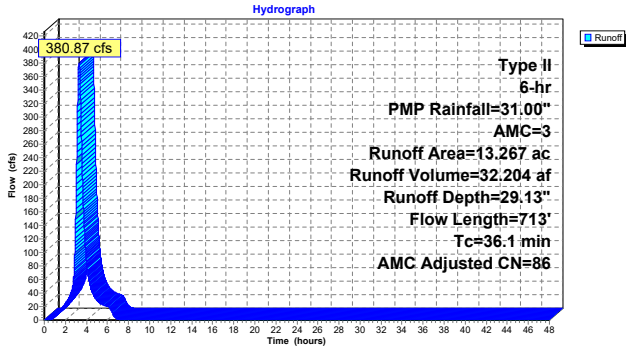
Runoff = 380.87 cfs @ 3.29 hrs, Volume= 32.204 af, Depth=29.13"
 Routed to Reach 90r : Diversion 5A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 6-hr PMP Rainfall=31.00", AMC=3

Area (ac)	CN	Adj	Description
11.527	69		Pasture/grassland/range, Fair, HSG B
0.690	60		Woods, Fair, HSG B
1.050	98		Diversion
13.267	71	86	Weighted Average, AMC Adjusted
12.217			92.09% Pervious Area
1.050			7.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.3	100	0.0550	0.07		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.66"
12.8	613	0.0130	0.80		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
36.1	713				Total

Subcatchment 93S: E301



Summary for Subcatchment 94S: E303

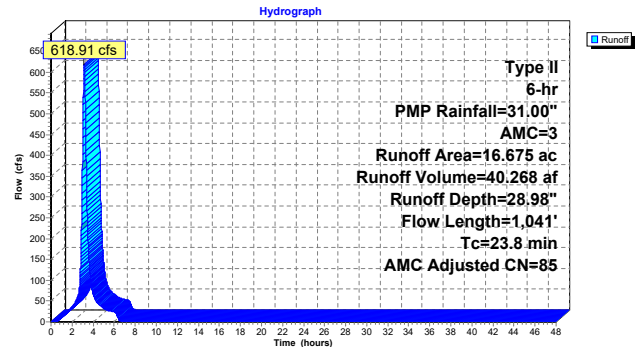
Runoff = 618.91 cfs @ 3.15 hrs, Volume= 40.268 af, Depth=28.98"
 Routed to Reach 91r : Diversion 5B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 6-hr PMP Rainfall=31.00", AMC=3

Area (ac)	CN	Adj	Description
16.227	69		Pasture/grassland/range, Fair, HSG B
0.448	98		Diversion
16.675	70	85	Weighted Average, AMC Adjusted
16.227			97.31% Pervious Area
0.448			2.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0140	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 3.66"
13.2	941	0.0290	1.19		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
23.8	1,041				Total

Subcatchment 94S: E303



Summary for Subcatchment 95S: E302

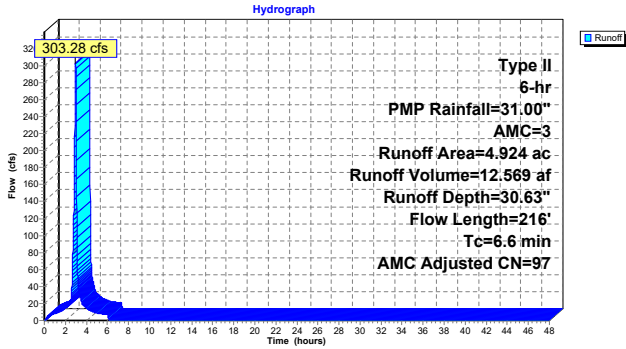
Runoff = 303.28 cfs @ 2.97 hrs, Volume= 12,569 af, Depth=30.63"
 Routed to Reach 92r : Diversion 5C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 6-hr PMP Rainfall=31.00", AMC=3

Area (ac)	CN	Adj	Description
* 1.069	69		Pasture/grassland/range, Fair, HSG B
* 3.855	98		Diversion
4.924	92	97	Weighted Average, AMC Adjusted
1.069			21.71% Pervious Area
3.855			78.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.0600	0.28		Sheet Flow, Grass: Short n= 0.150 P2= 3.66"
0.7	116	0.1510	2.72		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.6	216	Total			

Subcatchment 95S: E302



Summary for Subcatchment 103S: E201

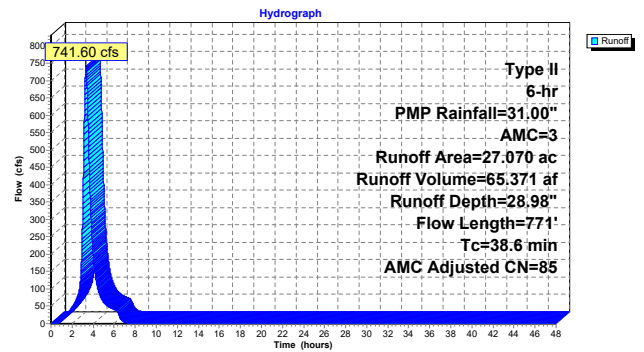
Runoff = 741.60 cfs @ 3.31 hrs, Volume= 65,371 af, Depth=28.98"
 Routed to Reach 104R : Diversion 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 6-hr PMP Rainfall=31.00", AMC=3

Area (ac)	CN	Adj	Description
17.969	69		Pasture/grassland/range, Fair, HSG B
6.149	60		Woods, Fair, HSG B
* 2.952	98		Diversion
27.070	70	85	Weighted Average, AMC Adjusted
24.118			89.09% Pervious Area
2.952			10.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.9	100	0.0350	0.06		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.66"
10.7	671	0.0440	1.05		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
38.6	771	Total			

Subcatchment 103S: E201



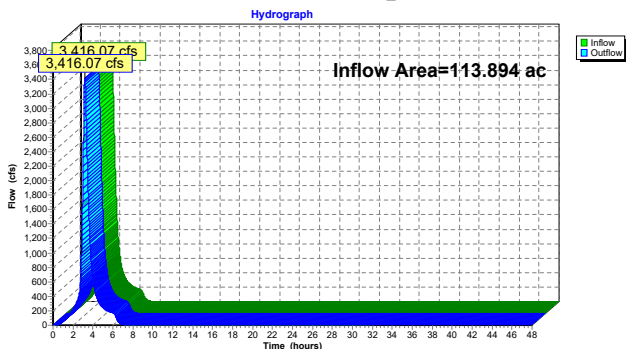
Summary for Reach 81R: Diversion_1B

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 113.894 ac, 7.01% Impervious, Inflow Depth = 28.94" for PMP event
 Inflow = 3,416.07 cfs @ 3.19 hrs, Volume= 274,678 af
 Outflow = 3,416.07 cfs @ 3.19 hrs, Volume= 274,678 af, Atten= 0%, Lag= 0.0 min
 Routed to Pond 89P : North Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 81R: Diversion_1B



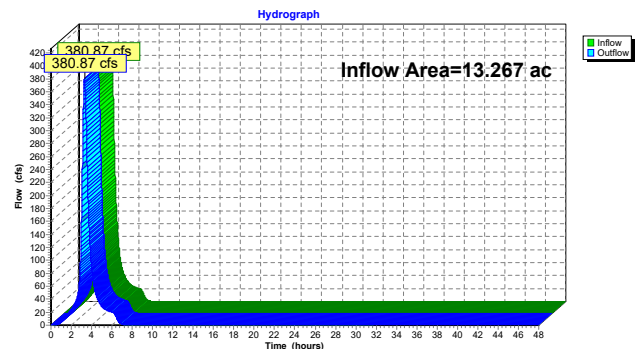
Summary for Reach 90R: Diversion 5A

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13.267 ac, 7.91% Impervious, Inflow Depth = 29.13" for PMP event
 Inflow = 380.87 cfs @ 3.29 hrs, Volume= 32,204 af
 Outflow = 380.87 cfs @ 3.29 hrs, Volume= 32,204 af, Atten= 0%, Lag= 0.0 min
 Routed to Reach 92r : Diversion 5C

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 90R: Diversion 5A

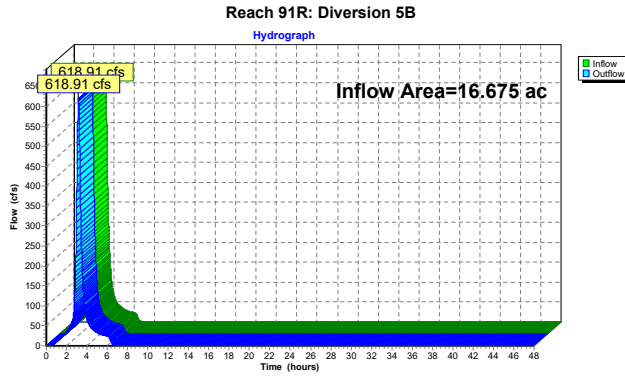


Summary for Reach 91R: Diversion 5B

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 16.675 ac, 2.69% Impervious, Inflow Depth = 28.98" for PMP event
 Inflow = 618.91 cfs @ 3.15 hrs, Volume= 40.268 af
 Outflow = 618.91 cfs @ 3.15 hrs, Volume= 40.268 af, Atten= 0%, Lag= 0.0 min
 Routed to Reach 92r : Diversion 5C

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

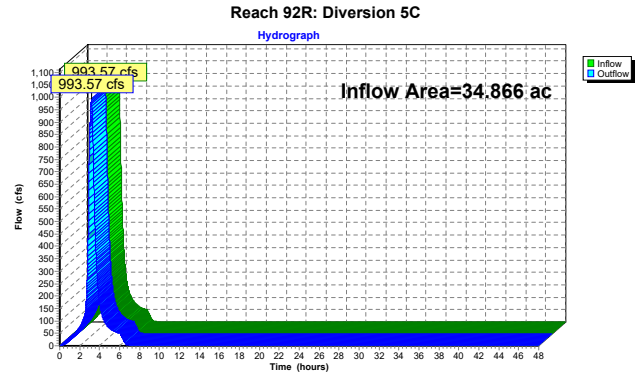


Summary for Reach 92R: Diversion 5C

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 34.866 ac, 15.35% Impervious, Inflow Depth = 29.27" for PMP event
 Inflow = 993.57 cfs @ 3.18 hrs, Volume= 85.041 af
 Outflow = 993.57 cfs @ 3.18 hrs, Volume= 85.041 af, Atten= 0%, Lag= 0.0 min
 Routed to Pond 90p : West Pond

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

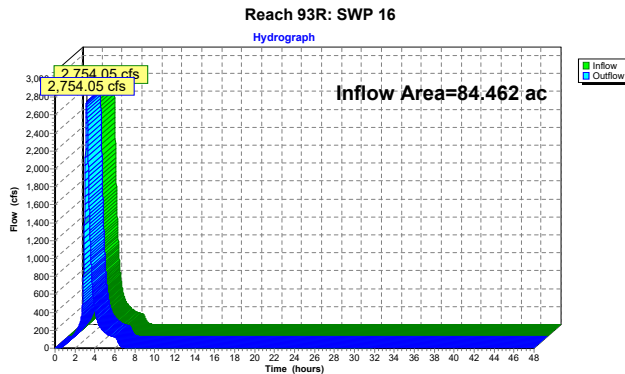


Summary for Reach 93R: SWP 16

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 84.462 ac, 6.21% Impervious, Inflow Depth = 28.87" for PMP event
 Inflow = 2,754.05 cfs @ 3.16 hrs, Volume= 203.235 af
 Outflow = 2,754.05 cfs @ 3.16 hrs, Volume= 203.235 af, Atten= 0%, Lag= 0.0 min
 Routed to Reach 81r : Diversion_1B

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

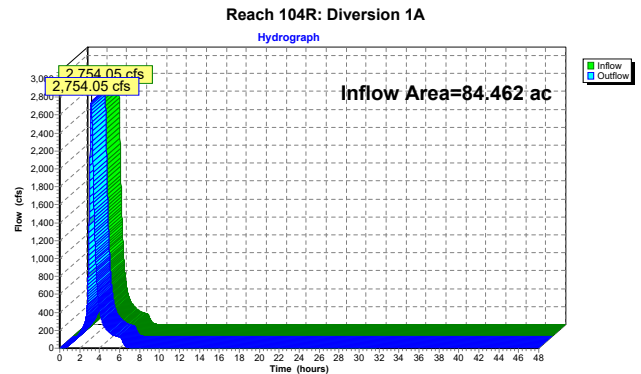


Summary for Reach 104R: Diversion 1A

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 84.462 ac, 6.21% Impervious, Inflow Depth = 28.87" for PMP event
 Inflow = 2,754.05 cfs @ 3.16 hrs, Volume= 203.235 af
 Outflow = 2,754.05 cfs @ 3.16 hrs, Volume= 203.235 af, Atten= 0%, Lag= 0.0 min
 Routed to Reach 93R : SWP 16

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

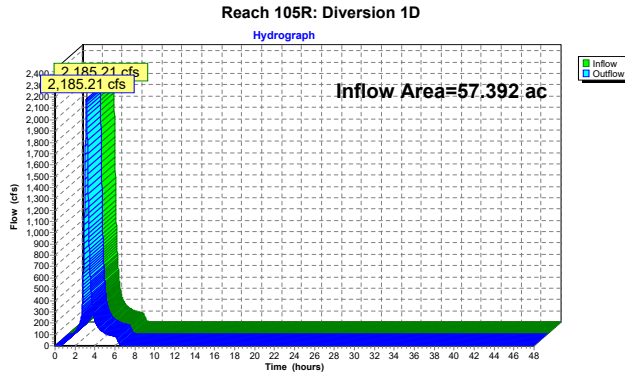


Summary for Reach 105R: Diversion 1D

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 57.392 ac, 3.99% Impervious, Inflow Depth = 28.83" for PMP event
 Inflow = 2,185.21 cfs @ 3.15 hrs, Volume= 137.864 af
 Outflow = 2,185.21 cfs @ 3.15 hrs, Volume= 137.864 af, Atten= 0%, Lag= 0.0 min
 Routed to Reach 104R : Diversion 1A

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

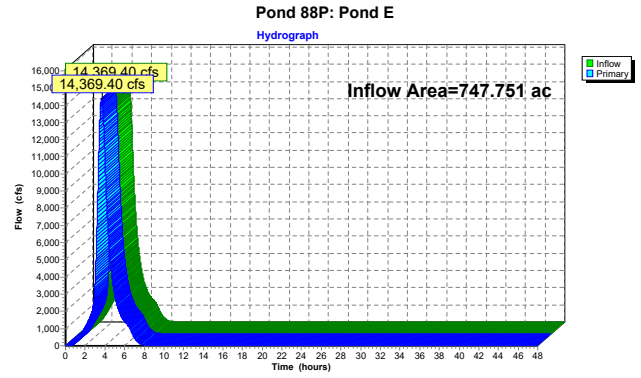


Summary for Pond 88P: Pond E

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 747.751 ac, 46.81% Impervious, Inflow Depth = 29.84" for PMP event
 Inflow = 14,369.40 cfs @ 3.68 hrs, Volume= 1,859.654 af
 Primary = 14,369.40 cfs @ 3.68 hrs, Volume= 1,859.654 af, Atten= 0%, Lag= 0.0 min
 Routed to nonexistent node 82L

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

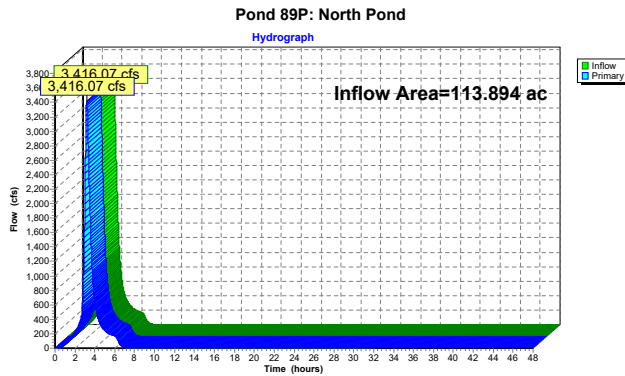


Summary for Pond 89P: North Pond

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 113.894 ac, 7.01% Impervious, Inflow Depth = 28.94" for PMP event
 Inflow = 3,416.07 cfs @ 3.19 hrs, Volume= 274.678 af
 Primary = 3,416.07 cfs @ 3.19 hrs, Volume= 274.678 af, Atten= 0%, Lag= 0.0 min
 Routed to nonexistent node 94I

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

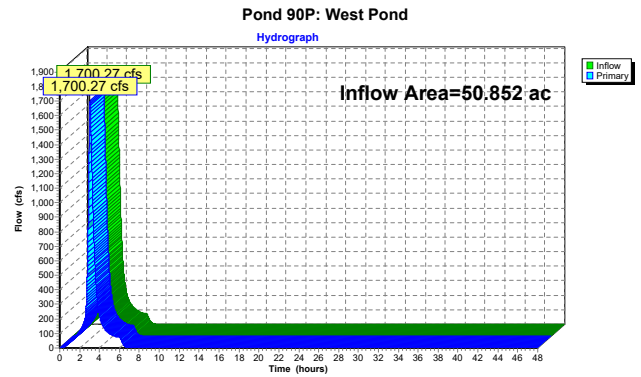


Summary for Pond 90P: West Pond

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 50.852 ac, 12.26% Impervious, Inflow Depth = 29.22" for PMP event
 Inflow = 1,700.27 cfs @ 3.05 hrs, Volume= 123.845 af
 Primary = 1,700.27 cfs @ 3.05 hrs, Volume= 123.845 af, Atten= 0%, Lag= 0.0 min

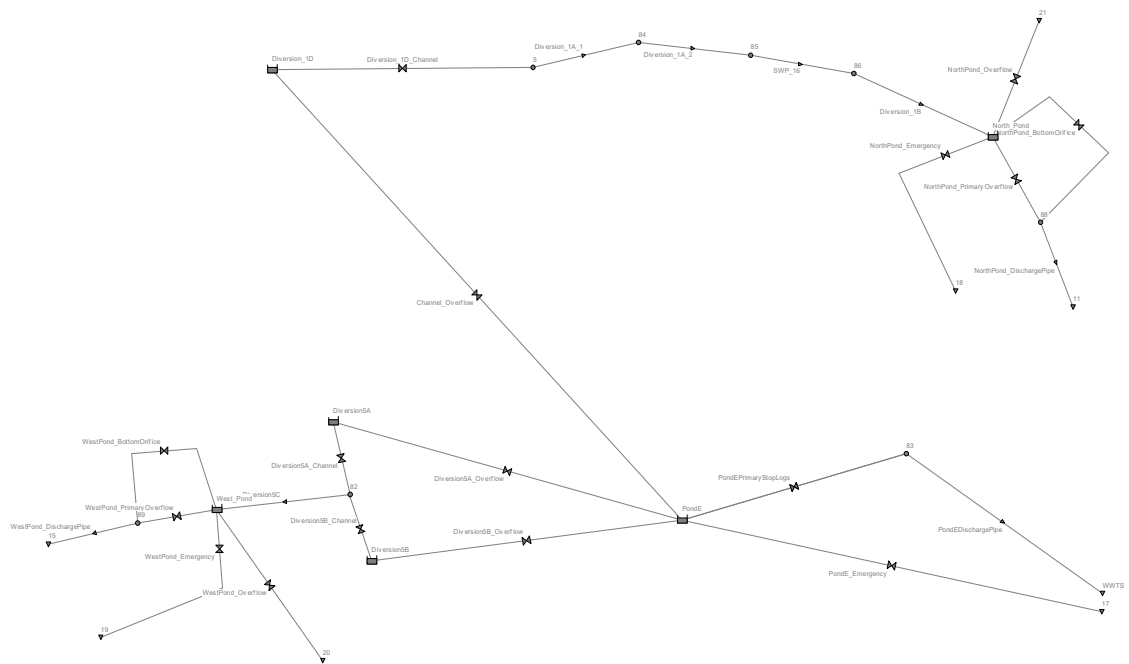
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs



CP: SH Date: 05/06/2026 APC: VC Date: 05/06/2026 CC: BS Date: 05/06/2026

Client: GPC Project: Design and Operating Criteria Assessments for
Plant Branch Legacy CCR Units Project No: GW11718

Attachment 5. SWMM Results



Existing_Conditions_PMP

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

Analysis Options

Flow Units CFS
 Process Models:
 Rainfall/Runoff NO
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed YES
 Water Quality NO
 Flow Routing Method DYNWAVE
 Surcharge Method EXTRAN
 Starting Date 09/21/2017 00:00:00
 Ending Date 09/25/2017 06:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:03:00
 Routing Time Step 1.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 1
 Head Tolerance 0.005000 ft

	Volume acre-feet	Volume 10 ⁶ gal
Flow Routing Continuity		
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	2258.094	735.834
External Outflow	769.531	250.763
Flooding Loss	71.929	23.439
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	48.563	15.825
Final Stored Volume	1465.118	477.430
Continuity Error (%)	0.003	

Existing_Conditions_PMP

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Most Frequent Nonconverging Nodes

- Node 11 (0.05%)
- Node 15 (0.05%)
- Node WWTS (0.05%)
- Node 17 (0.05%)
- Node 18 (0.05%)

Routing Time Step Summary

```

Minimum Time Step      :      0.50 sec
Average Time Step      :      1.00 sec
Maximum Time Step      :      1.00 sec
% of Time in Steady State :      0.00
Average Iterations per Step :      2.01
% of Steps Not Converging :      0.05
Time Step Frequencies  :
    1.000 - 0.871 sec   :     100.00 %
    0.871 - 0.758 sec   :       0.00 %
    0.758 - 0.660 sec   :       0.00 %
    0.660 - 0.574 sec   :       0.00 %
    0.574 - 0.500 sec   :       0.00 %
    
```

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
5	JUNCTION	0.35	10.03	432.03	0 03:16	10.01

Existing_Conditions_PMP

82	JUNCTION	0.12	4.10	442.00	0	02:56	4.10
83	JUNCTION	2.77	20.00	430.00	0	04:56	20.00
84	JUNCTION	0.33	10.66	431.66	0	03:45	10.66
85	JUNCTION	0.43	14.52	431.52	0	03:55	14.52
86	JUNCTION	0.18	5.21	421.21	0	03:19	5.21
88	JUNCTION	1.21	12.69	414.69	0	03:22	12.69
89	JUNCTION	0.46	9.00	434.00	0	02:56	9.00
11	OUTFALL	0.30	4.00	406.30	0	02:39	4.00
15	OUTFALL	0.21	2.00	426.00	0	01:51	2.00
WVTS	OUTFALL	0.86	2.72	398.22	0	05:04	2.72
17	OUTFALL	0.00	0.00	420.00	0	00:00	0.00
18	OUTFALL	0.00	0.00	402.30	0	00:00	0.00
19	OUTFALL	0.00	0.00	424.00	0	00:00	0.00
20	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
21	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
PondE	STORAGE	16.83	18.35	431.35	0	06:47	18.35
Diversion_1D	STORAGE	0.11	4.01	438.81	0	03:08	4.01
Diversion5A	STORAGE	0.05	2.19	454.19	0	03:17	2.19
Diversion5B	STORAGE	0.07	2.82	445.42	0	03:09	2.82
North_Pond	STORAGE	1.58	16.39	418.89	0	03:22	16.38
West_Pond	STORAGE	1.51	11.06	436.06	0	03:03	11.06

Node Inflow Summary

Total Flow		Maximum Lateral Inflow	Maximum Total Inflow	Time of Max Occurrence	Lateral Inflow Volume
Node	Error Percent	Type	CFS	days hr:min	10^6 gal
5		JUNCTION	741.50	0 03:19	21.3
47.5	-0.132				
82		JUNCTION	303.05	0 02:58	4.1
20.5	0.099				
83		JUNCTION	0.00	0 06:47	0
64.2	0.005				
84		JUNCTION	0.00	0 03:17	0

Existing_Conditions_PMP

47.5	0.035						
85		JUNCTION	0.00	875.53	0	03:21	0
47.5	0.031						
86		JUNCTION	807.54	1325.76	0	03:19	23.3
70.8	-0.027						
88		JUNCTION	0.00	309.58	0	03:22	0
33.4	0.000						
89		JUNCTION	0.00	95.58	0	03:03	0
9.28	-0.000						
11		OUTFALL	0.00	309.58	0	03:22	0
33.4	0.000						
15		OUTFALL	0.00	63.34	0	02:58	0
9.11	0.000						
WWT5		OUTFALL	0.00	75.94	0	05:04	0
41	0.000						
17		OUTFALL	0.00	444.95	0	06:47	0
106	0.000						
18		OUTFALL	0.00	145.46	0	03:22	0
9.93	0.000						
19		OUTFALL	0.00	247.18	0	03:03	0
12	0.000						
20		OUTFALL	0.00	985.36	0	03:03	0
11.7	0.000						
21		OUTFALL	0.00	861.90	0	03:22	0
27.4	0.000						
PondE		STORAGE	14368.44	14447.81	0	03:37	606
648	0.004						
Diversion_1D		STORAGE	2184.84	2184.84	0	03:09	44.9
44.9	0.004						
Diversion5A		STORAGE	380.77	380.77	0	03:17	10.5
10.5	0.001						
Diversion5B		STORAGE	618.80	618.80	0	03:09	13.1
13.1	-0.000						
North_Pond		STORAGE	0.00	1325.53	0	03:19	0
70.8	0.026						
West_Pond		STORAGE	802.55	1360.18	0	03:01	12.6
33	0.035						

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
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Existing_Conditions_PMP

Node	Type	Inflow (CFS)	Outflow (CFS)	Storage (10^6 gal)
82	JUNCTION	0.08	0.000	0.000
84	JUNCTION	1.43	0.357	0.000
85	JUNCTION	2.11	4.217	0.000

Node Flooding Summary

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 gal	Maximum Poned Depth Feet
82	0.08	60.60	0 02:58	0.093	0.000
83	9.51	193.27	0 06:47	23.176	0.000
84	1.43	404.59	0 03:16	2.853	0.357
85	1.72	355.73	0 03:21	4.061	0.517
89	0.23	32.23	0 03:03	0.168	0.000

Storage Volume Summary

Max Occurrence	Maximum Outflow Storage Unit	Average Volume 1000 ft	Avg Pc Full	Evap Loss	Exfil Loss	Maximum Volume 1000 ft	Max Pc Full	Time of days
06:47	714.16	63917.724	52.9	0.0	0.0	81144.500	67.2	0
03:08	2202.12	0.113	1.1	0.0	0.0	4.009	40.1	0
03:17	380.77	0.053	0.5	0.0	0.0	2.189	21.9	0
03:09	618.79	0.067	0.7	0.0	0.0	2.818	28.2	0

		Existing_Conditions_PMP						
North_Pond		62.506	3.8	0.0	0.0	906.050	55.7	0
03:22	1316.94							
West_Pond		41.905	3.8	0.0	0.0	501.787	45.9	0
03:03	1328.12							

 Outfall Loading Summary

Outfall Node	Flow Freq Pcmt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
11	20.20	60.23	309.58	33.424
15	37.63	8.81	63.34	9.111
WWTS	95.77	15.59	75.94	41.019
17	95.78	40.33	444.95	106.107
18	4.12	87.79	145.46	9.931
19	4.42	99.26	247.18	12.043
20	1.48	287.19	985.36	11.682
21	2.95	338.26	861.90	27.427
System	32.79	937.46	2076.72	250.745

 Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
Diversion5C	CONDUIT	558.94	0 03:01	7.07	0.99	0.99
PondEDischargePipe	CONDUIT	75.94	0 05:04	10.93	1.51	0.95
Diversion_1A_1	CONDUIT	1185.25	0 03:17	4.59	0.76	0.99
Diversion_1A_2	CONDUIT	875.53	0 03:21	4.17	0.29	1.00
SWP_16	CONDUIT	557.14	0 04:03	22.17	2.59	1.00
Diversion_1B	CONDUIT	1325.53	0 03:19	7.22	0.09	0.66
NorthPond_DischargePipe	CONDUIT	309.58	0 03:22	24.64	3.03	1.00
WestPond_DischargePipe	CONDUIT	63.34	0 02:58	20.16	2.20	1.00
Diversion_1D_Channel	ORIFICE	427.86	0 03:08			1.00
Diversion5A_Channel	ORIFICE	153.55	0 03:17			1.00
Diversion5B_Channel	ORIFICE	170.40	0 03:09			1.00
PondEPrimaryOverflow	ORIFICE	214.13	0 06:47			

Existing_Conditions_PMP					
StopLogs	ORIFICE	55.08	0	06:47	0.19
NorthPond_PrimaryOverflow	ORIFICE	290.70	0	03:22	
NorthPond_BottomOrifice	ORIFICE	30.12	0	07:18	1.00
WestPond_BottomOrifice	ORIFICE	2.31	0	01:42	1.00
WestPond_PrimaryOverflow	ORIFICE	94.11	0	03:03	
PondE_Auxiliary	WEIR	444.95	0	06:47	0.68
Channel_Overflow	WEIR	1774.26	0	03:08	0.05
Diversion5A_Overflow	WEIR	227.22	0	03:17	0.02
Diversion5B_Overflow	WEIR	448.40	0	03:09	0.06
NorthPond_Auxiliary	WEIR	145.46	0	03:22	1.00
WestPond_Auxiliary	WEIR	247.18	0	03:03	1.00
WestPond_Overflow	WEIR	985.36	0	03:03	0.41
NorthPond_Overflow	WEIR	861.90	0	03:22	0.38

Flow Classification Summary

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	Adjusted	----- Fraction of Time in Flow Class							
	/Actual	Up	Down	Sub	Sup	Up	Down	Norm	
Inlet	Length	Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd
Conduit	Ctrl	-----							

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Diversion5C	1.00	0.27	0.00	0.00	0.02	0.00	0.00	0.70	0.00
0.00									
PondEDischargePipe	1.00	0.04	0.00	0.00	0.14	0.82	0.00	0.00	0.25
0.00									
Diversion_1A_1	1.00	0.00	0.20	0.00	0.79	0.00	0.00	0.00	0.93
0.00									
Diversion_1A_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.71
0.00									
SWP_16	1.00	0.01	0.00	0.00	0.01	0.00	0.00	0.98	0.00
0.00									
Diversion_1B	1.00	0.29	0.00	0.00	0.12	0.00	0.00	0.58	0.13
0.00									
NorthPond_DischargePipe	1.00	0.01	0.00	0.00	0.88	0.11	0.00	0.00	0.00
0.00									
WestPond_DischargePipe	1.00	0.00	0.00	0.00	0.53	0.46	0.00	0.00	0.00
0.00									

Existing_Conditions_PMP

 Conduit Surge Summary

Conduit	Hours Full			Hours	Hours
	Both Ends	Upstream	Dnstream	Above Full Normal Flow	Capacity Limited
Diversion5C	0.01	0.08	0.01	0.01	0.01
PondEDischargePipe	0.01	12.97	0.01	13.14	0.01
Diversion_1A_1	0.01	0.01	1.43	0.01	0.01
Diversion_1A_2	1.43	1.43	2.11	0.01	0.01
SWP_16	2.38	3.17	2.38	3.13	2.38
NorthPond_DischargePipe	3.04	4.07	3.04	4.12	3.04
WestPond_DischargePipe	4.94	5.05	4.94	5.02	4.94

Analysis begun on: Tue Dec 30 09:35:25 2025
 Analysis ended on: Tue Dec 30 09:36:13 2025
 Total elapsed time: 00:00:48