PERIODIC INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN
391-3-4-.10(5) and 40 C.F.R. § 257.82
PLANT BOWEN ASH POND 1 (AP-1)
GEORGIA POWER COMPANY

The Federal CCR Rule, and, for Existing Surface Impoundments where applicable, the Georgia CCR Rule (391-3-4-.10) require the owner or operator of a CCR surface impoundment to design, construct, operate and maintain an inflow design flood control system capable of adequately managing flow during and following the peak discharge of the specified inflow design flood. The owner or operator must prepare an inflow design flood system written plan documenting how the inflow design flood control system has been designed and constructed. See 40 C.F.R. § 257.82; Ga. Comp. R. & Regs. r. 391-3-4-.10(5)(b). In addition, the Rules require periodic inflow design flood control system plans within 5 years of the completion of the previous plan. See 40 C.F.R. § 257.82(c)(4); Ga. Comp. R. & Regs. r. 391-3-4-.10(5)(b).

The existing CCR surface impoundment known as AP-1 is located west of Cartersville, Georgia on property at Plant Bowen. The Notification of Intent to Initiate Closure was placed in the Operating Record on 12/31/2020. Georgia Power Company prepared the initial Inflow Design Flood Control System Plan for AP-1 in October 2016 and the first periodic update on October 15, 2021 (the 2021 Plan). The present plan constitutes the second required 5-year update to the 2021 Plan and reflects facility conditions as of Q2 2026.

AP-1 encompasses approximately 254 acres and contains an estimated 21 million cubic yards of CCR. Georgia Power Company has elected to close AP-1 pursuant to a consolidated lined closure strategy approved under GA EPD CCR Rule 391-3-4-.10(7) and applicable Federal CCR Rule provisions (40 C.F.R. §§ 257.101 and 257.102). AP-1 CCR will be consolidated into an approximately 144-acre, fully-contained engineered structure, comprising a composite liner system underlying the consolidated CCR mass and a final cover system installed above, (AP-1 Closure) to be constructed in the south-central portion of the current AP-1 footprint. Closure construction began in 2021 and is ongoing. The present Plan reflects the Q2 2026 inflow management configuration, including closure-related construction features and water-management practices that differ from those described in the 2021 Plan. Active construction activities as of Q2 2026 include: (1) CCR excavation and removal in the southern portion of AP-1, where contact water generated within the excavation area is collected for treatment; (2) beneficial use (BU) CCR excavation in the northwestern portion of AP-1; (3) temporary stockpiling of excavated CCR above the previous dry-stack topography in the northeastern portion of AP-1 pending placement into the AP-1 Closure; and (4) active AP-1 Closure cell construction in the southern AP-1 area. Four Contact Water (CW) Ponds have been constructed to collect runoff that contacts CCR material within AP-1. Contact water is discharged from the CW Ponds via pumping to the facility's Wastewater Treatment System (WWTS), where it is managed and discharged in accordance with the facility's industrial discharge permit. Stormwater that does not contact CCR

continues to be routed by gravity through geomembrane-lined perimeter channels to the West Sump and discharged across the west perimeter dam in a manner consistent with the 2021 Plan.

The inflow design flood control system has been evaluated using the Natural Resources Conservation Service (formerly Soil Conservation Service) (SCS) method with a 1,000-year (yr), 24-hour (hr) storm event, consistent with the applicable inflow design criterion for a Significant Hazard Potential Facility. Precipitation values were obtained from NOAA's Precipitation Frequency Data Server (Atlas 14). Hydrologic and hydraulic routing was performed using HydroCAD® 10.20.

The existing inflow management system, as configured and constructed as of Q2 2026, was evaluated for the 1,000-yr, 24-hr design storm. Calculations indicate that the system has adequate capacity to manage flow during and following the peak discharge of the design event. Consistent with the conditions documented in the 2021 Plan, a series of exterior toe ditch sumps along the north stack exterior slope below the perimeter ditch can overtop during the design storm; however, these features intercept only stormwater falling on the exterior slope of the north stack, which does not contact CCR. Overflow remains on the exterior slope, does not re-enter AP-1, and does not affect flood routing within AP-1. Calculations indicate AP-1 will adequately manage flow during and following the peak discharge of the inflow design flood without overtopping the perimeter dams.

This plan is supported by appropriate calculations which are attached.

The facility is operated subject to and in accordance with 40 C.F.R. § 257.3-3.

I hereby certify that the inflow design flood control system plan meets the requirements of 40 C.F.R. § 257.82.



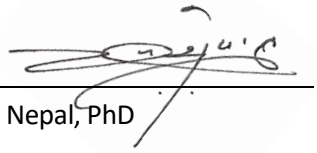
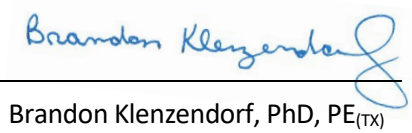
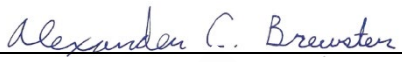
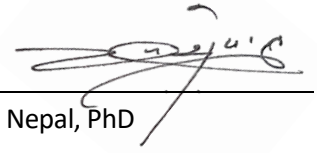
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COMPUTATION COVER SHEET

Client:	Georgia Power Company & Southern Company Services	**Project:**	Plant Bowen 5-yr Inflow Design	**Project #:**	26012494

TITLE OF COMPUTATION: **INFLOW DESIGN CONTROL SYSTEM PLAN REVISION 2: HYDROLOGIC AND HYDRAULIC CALCULATION SUMMARY**

PREPARATION	**CALCULATION PREPARED BY:** (Calculation Preparer, CP)	Signature		06/19/2026
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		Title	Senior Staff Engineer	
REVIEW	**ASSUMPTIONS & PROCEDURES CHECKED BY:** (Assumptions & Procedures Checker, APC)	Signature		09/21/2026
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REVISION HISTORY:

NO.	DESCRIPTION	DATE	CP	APC	CC	CA
0	Issued Final	October 2026	DN	BK	AB	AB

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1.0 Purpose of Calculation

The purpose of this report is to demonstrate the hydraulic capacity of the Plant Bowen Ash Pond 1 (AP-1) CCR surface impoundment inflow management system in order to prepare a Periodic Inflow Design Flood Control System Plan as required by the United States Environmental Protection Agency's (EPA) final rule for Disposal of CCR from Electric Utilities (EPA 40 CFR 257) and the Georgia Environmental Protection Division's (EPD) Georgia CCR Rule (391-3-4-.10). This report constitutes the second 5-year periodic update to the original Inflow Design Flood Control System Plan, covering the facility condition as of Q2 2026.

2.0 Summary of Inflow Management System and Conclusions

A hydrologic and hydraulic model was developed for AP-1 to evaluate the hydraulic capacity of the impoundment's inflow management system during a 1,000-year (yr), 24-hour (hr) design storm event (also referred to as a 0.1% annual chance event).

2.1 Facility Overview and Discharge Points

AP-1 is bounded on its south, west, and north perimeters by an engineered perimeter dam maintaining minimum crest elevations (El.) of approximately El. 700' (south) and El. 714' (west and north). The east boundary is formed by relatively flat, upgradient extents of the Bowen Power Plant at a minimum elevation of El. 716'. These bounded extents effectively isolate AP-1 from any external run-on, such that all runoff generated within AP-1 is managed internally. Along the northwest and north perimeters, the dry stack rises above the El. 714' dam crest, and a geomembrane-lined stormwater channel constructed at an approximate elevation of El. 734' serves as the interior drainage boundary for the majority of the northern AP-1 area. The exterior stack slope below the El. 734' channel drains away from AP-1 and is not tributary to the inflow management system; it is addressed separately in Section 2.2.

The AP-1 inflow management system consists of two functionally distinct systems, each with a single ultimate discharge point. Stormwater (SW) runoff generated within AP-1 that does not contact CCR discharges at the West Sump, which conveys flow through a network of four 54-inch HDPE downdrain pipes crossing the El. 714' west perimeter dam crest. All contact water (CW) runoff generated within AP-1 is ultimately collected in the CW Ponds, from which it is pumped to the facility's Wastewater Treatment System (WWTS) and managed in accordance with the facility's industrial discharge permit.

2.2 Upstream Inflow Management Network

Upstream of these two ultimate discharge points, AP-1 is divided into Northern and Southern sections, each further subdivided into drainage basins based on topographic characteristics and runoff flow patterns:

- **Northern AP-1: Stormwater (SW) System.** SW runoff from undisturbed, grass-stabilized areas in the northwestern portion of AP-1 (Basin N-1) and the self-footprint of the perimeter channel network (N-5 and N-6) is intercepted by geomembrane-lined perimeter channels (R-N-1, R-N-5, and R-N-6) and routed by gravity to the West Sump, while other adjacent upland areas drain directly to the West Sump (S-1). The SW routed to the West Sump does not contact CCR.

- **Northern AP-1: Contact Water (CW) System.** Runoff from the temporary CCR stockpile (Basin N-4) is intercepted by a geomembrane-lined toe channel (R-N-4) and conveyed to the North Sump. Runoff from adjacent CCR excavation areas (Basin N-3) discharges directly to the North Sump. The North Sump discharges via culvert and overflow weir to the CW Ponds. Runoff from the beneficial use (BU) CCR excavation area (Basin N-2) pools at the base of excavation (P-N-2) and is pumped directly to the CW Ponds.

- **Southern AP-1: Contact Water System.** All runoff from Southern AP-1 is routed to the CW Ponds. The primary active CCR excavation area (Basin S-3) pools at the base of excavation (P-S-3) and is pumped to the CW Ponds. Adjacent upland areas associated with active containment structure construction (S-4) and demolition of pre-closure appurtenances (S-6, S-8) are each contained by secondary berms and managed under typical conditions via pumping to the CW Ponds; however, for purposes of this analysis, these basins are conservatively modeled as overtopping their respective containment features and discharging by gravity to P-S-3, with no credit taken for internal storage or interim pump operations. An existing water management pond (P-S-7) near the demolition area collects runoff within its own footprint and is pumped to the CW Ponds. A future pond excavation area bounded by the El. 700' southern dam (Basin S-5) pools at its base (P-S-5) and is pumped to the CW Ponds. The self-footprint of the CW Ponds and immediately adjacent areas (Basin S-2) drain directly into the CW Ponds.

- **North Dry Stack Exterior Toe Sumps.** SW runoff generated along the exterior slope of the north stack area below the perimeter ditch is intercepted by a series of seven exterior toe ditches and discharge sumps (P-EN-1 through P-EN-7) connected by gravity outlet pipes. These features are included in this analysis for completeness because they receive runoff from the exterior stack slope during the design storm event. Overflow from these sumps remains on the exterior stack slope, does not contact CCR or re-enter AP-1, and does not affect flood routing within the CCR unit.

2.3 Results and Conclusions

The results of routing the 1,000-yr, 24-hr design storm through the inflow management network are presented in **Table 1**. **Figure 1** illustrates the spatial location and layout of all features.

Table 1. Flood Routing Results for Plant Bowen Ash Pond (AP-1)

Inflow Management Feature Type			Current Feature Conditions		Calculated Flow Conditions (1000-yr, 24-hr Rainfall Event)				
Location	Model ID	Type [1]	Crest Elevation (ft) [2]	Channel Depth (ft) [2]	Peak WSE (ft) [3]	Peak Channel Flow Depth (ft) [3]	Freeboard (ft) [4]	Peak Inflow (cfs) [5]	Discharge Capacity at Crest (cfs) [6]
AP-1 North	R-N-1	channel	-	2.5	-	2.14	0.36	224	305
	P-N-2	excavation	726	-	704.65	-	21.35	566	0
	North Sump		736	-	735.43	-	0.57	383	534
	R-N-4	channel	-	2.0	-	1.52	0.48	267	444
	R-N-5	channel	-	3.0	-	1.42	1.58	105	466
	R-N-6	channel	-	2.5	-	0.55	1.95	88	1,198
AP-1 North Exterior Toe [7]	P-EN-1	sump	713	-	>713.00	-	0.00	26	5.9
	P-EN-2	sump	713	-	712.52	-	0.48	41	7.2
	P-EN-3	sump	713	-	>713.00	-	0.00	23	5.9
	P-EN-4	sump	713	-	>713.00	-	0.00	32	5.9
	P-EN-5	sump	714	-	>714.00	-	0.00	17	5.9
	P-EN-6	sump	714	-	>714.00	-	0.00	17	5.1
	P-EN-7	sump	714	-	>714.00	-	0.00	51	9.8
AP-1 South	CW Ponds*		724	-	720.49	-	3.51	576	0
	West Sump		714	-	710.52	-	3.48	275	612
	P-S-3	excavation	706	-	682.83	-	23.17	1,314	0
	P-S-5	excavation	700	-	692.82	-	7.18	187	0
	P-S-7	pond**	734**	-	732.05	-	1.95	109	0
	P-S-8	basin***	714***	-	713.33	-	0.67	109	0

Notes:

ft – feet; cfs – cubic feet per second

1. Under normal operating conditions, channels and sumps drain to a dry condition by gravity and excavations are dewatered to a dry condition via pumping.
2. Crest elevation is reported for ponds/sumps/excavations; channel depth is reported for channels. Both represent the elevation or depth at which overtopping of the feature would occur. No auxiliary spillways are provided for AP-1.
3. Peak WSE is reported for ponds/sumps/excavations; peak flow depth is reported for channels. Both reflect the maximum computed water level during the 1,000-yr, 24-hr simulation.
4. Freeboard = (Channel Depth – Peak Flow Depth) for channels; (Crest El. – Peak WSE) for all other features.
5. Peak inflow is the maximum computed discharge routing to a respective feature during the simulation.
6. Discharge capacity is reported at the controlling crest condition: bankfull flow rate for channels per Manning's calculations (Attachment 3); peak outlet discharge at embankment elevation for sumps; zero for excavations and ponds (pump-only discharge; no pumping credited during the design storm).
7. The north exterior toe sump network (P-EN-1 through P-EN-7) overtops during the 1,000-yr, 24-hr event, with the exception of P-EN-2. Overflow remains confined to the exterior embankment slope and does not re-enter AP-1 or affect flood routing within the CCR unit.

* The CW Ponds represent four detention units that are hydraulically connected via culverts; a single combined storage area was defined to simplify the containment capacity demonstration. An initial pool elevation of El. 716' is considered for the CW Ponds, consistent with the level during normal operations.

** The existing water management pond (P-S-7) contains two chambers that are hydraulically connected via spillway with an invert at El. 730'. While this invert is above its typical operational pool, it was conservatively set as the initial pool level to simplify the containment capacity demonstration.

*** Basin S-8 encompasses the drainage area near the western perimeter of AP-1, bounded by the El. 714' west dam and a low spot formed by a historical HDPE-lined channel. Field observations and the Q2 2026 topographic survey indicate that this area would overtop into the primary CCR excavation (P-S-3) under storm conditions; however, the survey resolution is insufficient to define a stage-discharge relationship for the overtopping pathway. Accordingly, a conservative alternate case was evaluated in which Basin S-8 is modeled as an isolated excavation (P-S-8) with no overflow to P-S-3. Results confirm that contact water remains adequately contained below the El. 714 west perimeter dam crest in both cases.

As shown in **Table 1**, all AP-1 inflow management features maintain positive freeboard during the design storm, with the exception of the north exterior toe sumps (P-EN-1 and P-EN-3 through P-EN-7), which overtop as discussed above. The AP-1 inflow management system therefore meets or exceeds the requirements of 40 C.F.R. § 257.82 and Ga. Comp. R. & Regs. r. 391-3-4-.10(5)(b) to safely manage peak discharge from the 1,000-yr, 24-hr inflow design flood. Full HydroCAD model output is provided in **Attachment 1**.

3.0 Methodology

3.1 Hydrologic Analysis

Design Storm Event

AP-1 is classified as a significant hazard structure. A 1,000-yr, 24-hr rainfall event was used to represent the applicable inflow design flood, as summarized in **Table 2**. Rainfall depth was obtained from NOAA Precipitation Frequency Data Server (Atlas 14).

Table 2. Plant Bowen Ash Pond Rainfall Distribution

Hazard Classification	Return Frequency (yr)	Storm Duration (hr)	Rainfall Total (in)	Rainfall Source	Rainfall Distribution
Significant	1,000	24	9.95	NOAA Atlas 14	SCS Type II

Note: The 2021 Plan used a rainfall depth of 9.98 inches. The current analysis reflects 9.95 inches per the current NOAA Atlas 14 query; the difference is less than 0.5% and has no material effect on results.

Rainfall Distribution

Attachment 2 [Soil Conservation Service (SCS), 1986] shows the Site location on the rainfall distribution map of the United States. The Site is located west of Cartersville, Georgia at coordinates $34^{0}07'23"$N and $84^{0}55'13"$W, which is categorized by SCS Type II Rainfall Distribution. Rainfall depth for the design storm event was obtained from the NOAA Precipitation Frequency Data Server and is shown in **Attachment 2** and presented in **Table 2**.

Drainage Areas

Drainage basin boundaries were delineated based on Q2 2026 LiDAR topographic survey data for AP-1, supplemented by aerial photography for land cover classification. Basin delineations are illustrated in **Figure 1**. The AP-1 inflow management network consists of two functionally distinct systems: a stormwater (SW) system and a contact water (CW) system, each with its own ultimate discharge point. Drainage basins were assigned to one

system or the other based on whether they generate runoff that contacts CCR material. Basin characteristics are summarized in **Table 3**.

Table 3. Ash Pond Hydrologic Information

Section	Basin ID	Description	Area (ac)	CN	Tc (min)	Basis
AP-1 North (CW)	N-2	BU CCR Excavation → P-N-2	38.54	98	5	Impermeable, min travel time
	N-3	CCR Stockpile Excavation → North Sump	15.77	98	5	Impermeable, min travel time
	N-4	CCR Stockpile → R-N-4	18.17	98	5	Impermeable, min travel time
AP-1 North (SW)	N-1	Undisturbed NW area → R-N-1	22.10	65	5	2021 Plan, min travel time
	N-5	Perimeter channel self-footprint → R-N-5	7.16	98	5	Impermeable, min travel time
	N-6	Perimeter channel self-footprint → R-N-6	0.90	98	5	Impermeable, min travel time
	S-1	West Sump area → West Sump	10.21	98	5	Impermeable, min travel time
AP-1 South (CW)	S-2	CW Ponds self-footprint → CW Ponds	14.82	98	5	Impermeable, min travel time
	S-3	Primary CCR Excavation → P-S-3	46.53	98	5	Impermeable, min travel time
	S-4	Containment Structure construction → P-S-3	27.57	98	5	Impermeable, min travel time
	S-5	Pond excavation → P-S-5	12.76	98	5	Impermeable, min travel time
	S-6	Demolition area → P-S-3	7.98	98	5	Impermeable, min travel time
	S-7	Demolition pond → P-S-7	7.40	98	5	Impermeable, min travel time
	S-8	Demolition area → P-S-3	7.46	98	5	Impermeable, min travel time
AP-1 North Exterior Toe (SW)	EN-1	Exterior dike toe → P-EN-1	2.25	73	5.4	2021 Plan
	EN-2	Exterior dike toe → P-EN-2	3.90	71	7.6	2021 Plan
	EN-3	Exterior dike toe → P-EN-3	2.17	70	6.5	2021 Plan
	EN-4	Exterior dike toe → P-EN-4	3.70	64	8.8	2021 Plan
	EN-5	Exterior dike toe → P-EN-5	1.79	64	6.1	2021 Plan
	EN-6	Exterior dike toe → P-EN-6	1.72	65	6.3	2021 Plan
	EN-7	Exterior dike toe → P-EN-7	6.35	65	11.7	2021 Plan

Notes:

1. The 2021 Plan evaluated a total area of 257.37 acres. The current analysis reflects 259.25 acres based on minor topographical changes to the perimeter dike extents in addition to conservative basin delineation practices. The difference is less than one percent and has no material effects on the results. The total acreage evaluated herein exceeds the 254-acre AP-1 footprint due to drainage boundaries associated with perimeter dike width and other areas adjacent to but immediately outside the AP-1 footprint.
2. "2021 Plan" indicates that individual CN values and Tc components for sheet, shallow, and channel flow were taken from the 2021 Plan. All aggregate CN and total Tc values were recomputed within the HydroCAD model described in Section 3.2.

Curve Numbers

Curve numbers (CNs) were selected based on TR-55 Table 2-2 and the physical conditions of each basin, as summarized in **Table 4**. Two distinct CN approaches were applied depending on basin type:

- **Contact Water (CW) Basins: Conservative Construction Condition.** All basins generating CW runoff were assigned CN=98 and Tc=5 minutes, regardless of actual surface cover. These basins encompass active CCR excavation areas, stockpiles, and containment structure construction zones where grading, topography, and drainage patterns evolve continuously as construction progresses. While the general low-point locations where water pools in excavations remain relatively consistent, inter-basin drainage divides and surface characteristics within these

areas change frequently. A CN=98 (effectively fully impervious) and minimum Tc=5 minutes conservatively bounds this variability and ensures the analysis is not dependent on construction-condition surface detail that may not persist.

- **Stormwater (SW) Basins: Pre-Construction Condition.** SW-generating areas encompass portions of AP-1 that remain in a pre-closure, grass-stabilized condition and have not been disturbed by closure construction activities. The Q2 2026 survey confirmed that drainage divides for these basins, including the north exterior toe sump catchments (EN-1 through EN-7), are consistent with those evaluated in the 2021 Plan. Land cover classifications, individual CN values, and Tc flow-path components for these basins were taken from the 2021 Plan, as described in **Table 3**, Note 2; these curve numbers correspond to hydrologic soil group (HSG) B.

Table 4. Curve Number Summary

Surface / Land Cover	CN	Applicable Basins
CCR / Active Excavation / Lined Surface (construction condition)	98	N-2 through N-6, S-1 through S-8
Grass (undisturbed, pre-construction)	61	Portions of N-1, Portions of EN-1 through EN-7
Gravel	85	Portions of N-1, Portions of EN-1 through EN-7
HDPE-Lined Surface	98	Portions of N-1, EN-3 (minor area)

Time of Concentration

For CW-generating basins, a minimum Tc of 5 minutes was applied as a conservative assumption consistent with the construction-condition rationale described above. For the exterior toe SW basins (EN-1 through EN-7), Tc was computed using TR-55 sheet flow, shallow concentrated flow, and channel flow methodologies. Computed Tc values are reported in **Table 3** and documented in **Attachment 1**.

3.2 Hydraulic Analysis

Hydrologic and Hydraulic Model

Runoff hydrographs were generated using HydroCAD® 10.20 (SCS TR-20 method, UH=SCS, Type II 24-hr distribution) and routed through the inflow management network using the Storage-Indication method (Modified Puls; implemented in HydroCAD via the Stor-Ind routing option) for ponds and sumps, and kinematic wave travel time and storage attenuation methods (implemented in HydroCAD via the Stor-Ind+Trans routing option) for channels. Full model output, including stage-area relationships and outlet device stage-discharge data for all modeled features, is provided in **Attachment 1**.

Topographic and As-Built Data

Elevation-area relationships for all ponds, sumps, and excavations were derived from 2-ft contours generated from the Q2 2026 aerial LiDAR survey (CW basins), or carried forward from the 2021 Plan for features confirmed to be undisturbed (SW and exterior toe features). Channel geometries, runoff storage area configurations, and overtopping elevations were also defined using the Q2 2026 survey data, further supplemented by

design and as-built documentation for the perimeter channels (R-N-1, R-N-4, R-N-5, R-N-6), the West Sump, and the CW Ponds. Features not subject to active construction are generally consistent with conditions reported in the 2021 Plan.

Channel Capacity

Perimeter channels R-N-1, R-N-4, R-N-5, and R-N-6 were routed using kinematic wave travel time and storage attenuation methods — implemented in HydroCAD via the Stor-Ind+Trans routing option — which accounts for channel storage attenuation and travel time. The controlling design criterion for each channel was determined independently via Manning's equation using the minimum (controlling) longitudinal slope identified within each channel reach to determine the flow depth corresponding to the peak inflow computed via HydroCAD at the respective channel. Channel slopes used in HydroCAD reach routing reflect representative average slopes over the full channel length for computation of hydrograph travel time and attenuation; these may differ from the controlling slopes applied in Manning's calculations and are not intended to represent channel capacity. Manning's calculations are documented in **Attachment 3** and results are reported in **Tables 1** and **5**. Channel geometry and Manning's parameters are summarized in **Table 5**.

Table 5. Channel Geometry and Bankfull Capacity

Channel ID	Bottom Width (ft)	Depth (ft)	Side Slope (H:V)	Top Width (ft)	Length (ft)	Controlling Slope (ft/ft)	Manning's n	Bankfull Capacity (cfs)	HydroCAD Routing
R-N-1	5.0	2.5	1.8:1	14.0	4,200	0.0050	0.011	305	Stor-Ind+Trans
R-N-4	12.0	2.0	3.0:1	24.0	3,270	0.0050	0.011	444	Stor-Ind+Trans
R-N-5	5.0	3.0	2.0:1	17.0	3,480	0.0050	0.011	466	Stor-Ind+Trans
R-N-6	20.0	2.5	2.5:1	32.5	1,360	0.0074	0.011	1,198	Stor-Ind+Trans

Sump Outlet Structures

All gravity outlet structures in the AP-1 inflow management system are associated with the sumps; excavations, the CW Ponds, and P-S-7 are pump-only features with no gravity discharge. Outlet structures are described below; detailed stage-discharge data as modeled in HydroCAD are provided in **Table 6**.

- **West Sump.** The West Sump is fitted with four 54-inch HDPE downdrain pipes that convey discharge across the El. 714' west perimeter dam crest by gravity. The combined stage-discharge relationship for the four-pipe system was established consistent with the 2021 Plan and was input to HydroCAD as a user-defined curve.

- **North Sump.** The North Sump discharges to the CW Ponds via a combined outlet consisting of three 24-inch corrugated polyethylene pipe (CPP) culverts (US invert El. 727.00', DS invert El. 713.24', L=240', S=0.057 ft/ft) providing primary controlled discharge, and a broad-crested overflow weir (invert El. 733.04', Cv=2.62) providing secondary capacity during larger events.

- **North Exterior Toe Sumps (P-EN-1 through P-EN-7).** Each exterior toe sump is fitted with a gravity outlet pipe approximately 100 ft in length. Pipes for P-EN-1 through P-EN-6 are 1-ft diameter; P-EN-7 is fitted with a 1.25-ft diameter pipe to accommodate its larger contributing area. Outlet inverts range from El. 707' to El. 711' consistent with the sump bottom elevations established in the 2021 Plan. Stage-discharge relationships for all toe sump outlets were modeled using the custom head-flow rating curves carried forward from the 2021 Plan. In HydroCAD, sump overtopping is represented by a secondary constant-flow device at the crest elevation, which functions as a modeling surrogate for uncontrolled overflow and does not represent a physical structure.

Table 6. Elevation Discharge Curves for Sump Outflow Structures

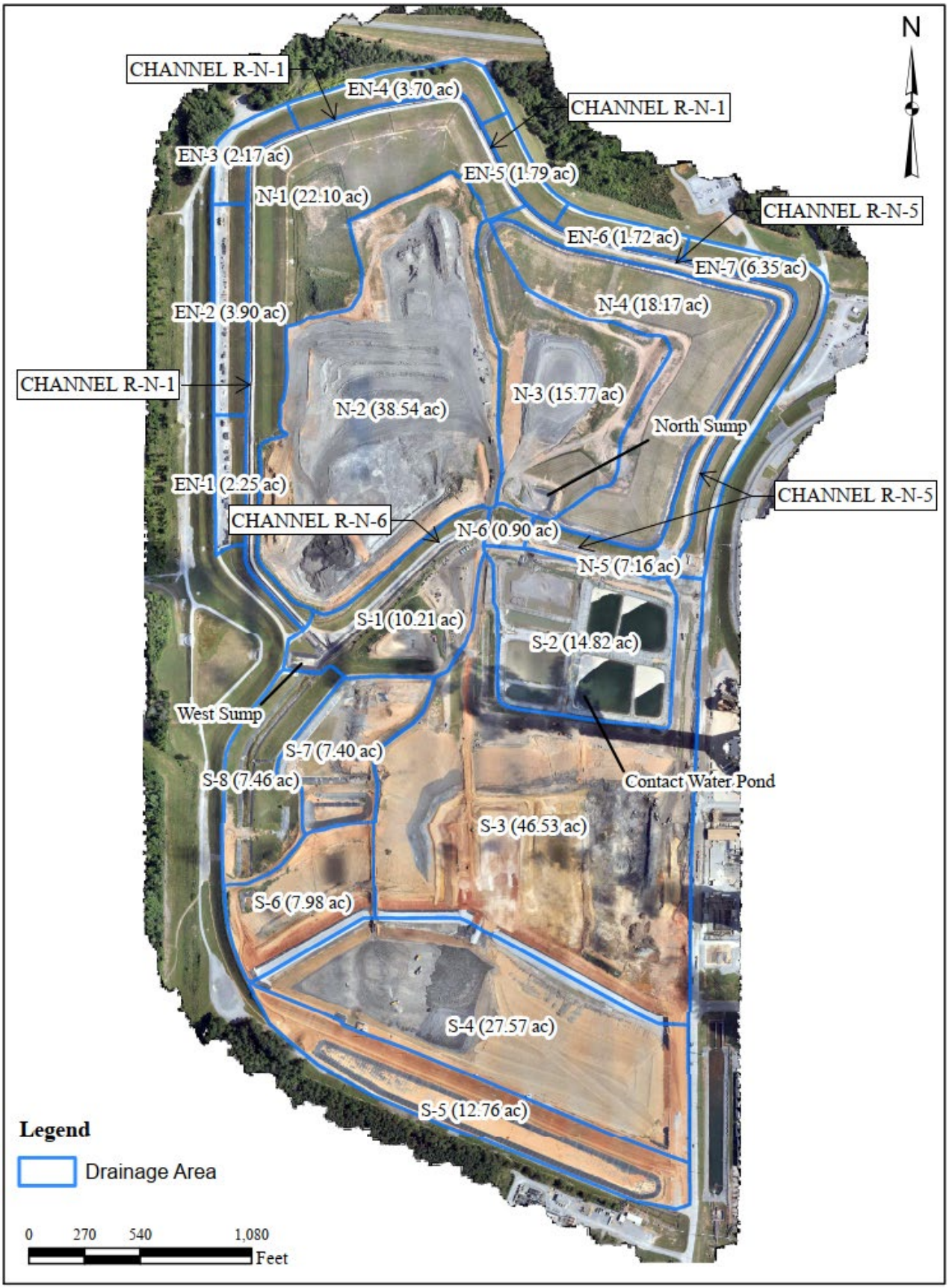
West Sump (72P) Inv. El. 706 Crest El. 714		**North Sump (74P) Inv. El. 727 Crest El. 736**		**P-EN-1 (92P) Inv. El. 709 Crest El. 713**		**P-EN-2 (93P) Inv. El. 707 Crest El. 713**		**P-EN-3 (94P) Inv. El. 709 Crest El. 713**	
El. (ft)	**Q (cfs)**	**El. (ft)**	**Q (cfs)**	**El. (ft)**	**Q (cfs)**	**El. (ft)**	**Q (cfs)**	**El. (ft)**	**Q (cfs)**
706.00	**0.00**	**727.00**	**0.00**	**709.00**	**0.00**	**707.00**	**0.00**	**709.00**	**0.00**
707.00	32.69	728.00	12.67	710.00	2.67	708.00	2.67	710.00	2.67
708.00	91.66	729.00	35.83	711.00	4.16	709.00	4.16	711.00	4.16
709.00	151.61	730.00	50.67	712.00	5.09	710.00	5.09	712.00	5.09
710.00	188.93	731.00	62.05	**713.00**	**5.88**	711.00	5.88	**713.00**	**5.88**
711.00	349.92	732.00	71.65			712.00	6.57		
712.00	465.17	733.00	80.11			**713.00**	**7.20**		
713.00	557.07	**733.04**	**80.43**						
714.00	**612.36**	734.00	126.69						
		735.00	280.78						
		736.00	**533.74**						

P-EN-4 (95P) Inv. El. 709 Crest El. 713		**P-EN-5 (96P) Inv. El. 710 Crest El. 714**		**P-EN-6 (97P) Inv. El. 711 Crest El. 714**		**P-EN-7 (98P) Inv. El. 710 Crest El. 714**	
El. (ft)	**Q (cfs)**	**El. (ft)**	**Q (cfs)**	**El. (ft)**	**Q (cfs)**	**El. (ft)**	**Q (cfs)**
709.00	**0.00**	**710.00**	**0.00**	**711.00**	**0.00**	**710.00**	**0.00**
710.00	2.67	711.00	2.67	712.00	2.67	711.00	3.58
711.00	4.16	712.00	4.16	713.00	4.16	712.00	6.68
712.00	5.09	713.00	5.09	**714.00**	**5.09**	713.00	8.37
713.00	**5.88**	**714.00**	**5.88**			**714.00**	**9.78**

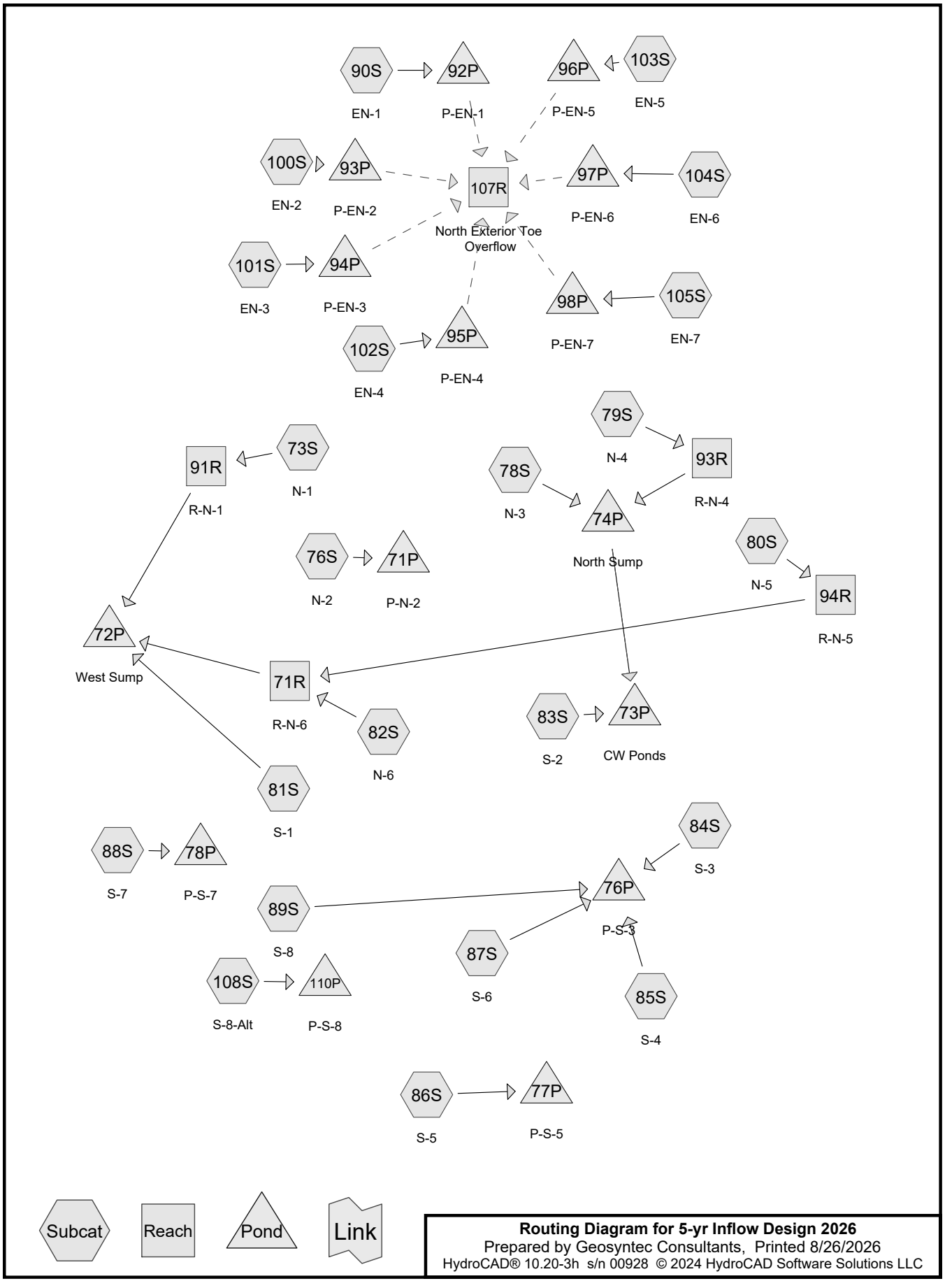
Notes:

1. El. = elevation (ft, NAVD88);
2. Discharge = combined primary outlet discharge (cfs).
3. Bold rows indicate outlet invert and sump crest elevations.
4. North Sump primary discharge begins at culvert invert El. 727.00 ft; weir discharge initiates at El. 733.04 ft.
5. Exterior toe sumps (P-EN-1 through P-EN-7) discharge via gravity outlet pipe only; crest elevation represents sump embankment top.
6. P-EN-2 does not overtop during the design storm; all other exterior toe sumps overtop at crest elevation.

FIGURE 1
Drainage Area Map



ATTACHMENT 1
HydroCAD Model Results



Routing Diagram for 5-yr Inflow Design 2026

Prepared by Geosyntec Consultants, Printed 8/26/2026

HydroCAD® 10.20-3h s/n 00928 © 2024 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
19.194	61	(73S)
222.730	98	(76S, 78S, 79S, 80S, 81S, 82S, 83S, 84S, 85S, 86S, 87S, 88S, 89S, 108S)
16.430	61	Grass (90S, 100S, 101S, 102S, 103S, 104S, 105S)
7.033	85	Gravel (73S, 90S, 100S, 101S, 102S, 103S, 104S, 105S)
1.322	98	HDPE (73S, 101S)
266.709	**93**	**TOTAL AREA**

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	241.924	241.924		73S, 76S, 78S, 79S, 80S, 81S, 82S, 83S, 84S, 85S, 86S, 87S, 88S, 89S, 108S
0.000	0.000	0.000	0.000	16.430	16.430	Grass	90S, 100S, 101S, 102S, 103S, 104S, 105S
0.000	0.000	0.000	0.000	7.033	7.033	Gravel	73S, 90S, 100S, 101S, 102S, 103S, 104S, 105S
0.000	0.000	0.000	0.000	1.322	1.322	HDPE	73S, 101S
0.000	**0.000**	**0.000**	**0.000**	**266.709**	**266.709**	**TOTAL AREA**	

Time span=0.00-26.00 hrs, dt=0.01 hrs, 2601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment73S: N-1 Runoff Area=22.099 ac 5.94% Impervious Runoff Depth=5.52"
Tc=5.0 min CN=65 Runoff=224.36 cfs 10.169 af

Subcatchment76S: N-2 Runoff Area=38.540 ac 100.00% Impervious Runoff Depth=9.71"
Tc=5.0 min CN=98 Runoff=565.50 cfs 31.183 af

Subcatchment78S: N-3 Runoff Area=15.770 ac 100.00% Impervious Runoff Depth=9.71"
Tc=5.0 min CN=98 Runoff=231.40 cfs 12.760 af

Subcatchment79S: N-4 Runoff Area=18.170 ac 100.00% Impervious Runoff Depth=9.71"
Tc=5.0 min CN=98 Runoff=266.61 cfs 14.701 af

Subcatchment80S: N-5 Runoff Area=7.160 ac 100.00% Impervious Runoff Depth=9.71"
Tc=5.0 min CN=98 Runoff=105.06 cfs 5.793 af

Subcatchment81S: S-1 Runoff Area=10.210 ac 100.00% Impervious Runoff Depth=9.71"
Tc=5.0 min CN=98 Runoff=149.81 cfs 8.261 af

Subcatchment82S: N-6 Runoff Area=0.900 ac 100.00% Impervious Runoff Depth=9.71"
Tc=5.0 min CN=98 Runoff=13.21 cfs 0.728 af

Subcatchment83S: S-2 Runoff Area=14.820 ac 100.00% Impervious Runoff Depth=9.71"
Tc=5.0 min CN=98 Runoff=217.46 cfs 11.991 af

Subcatchment84S: S-3 Runoff Area=46.530 ac 100.00% Impervious Runoff Depth=9.71"
Tc=5.0 min CN=98 Runoff=682.74 cfs 37.648 af

Subcatchment85S: S-4 Runoff Area=27.570 ac 100.00% Impervious Runoff Depth=9.71"
Tc=5.0 min CN=98 Runoff=404.54 cfs 22.307 af

Subcatchment86S: S-5 Runoff Area=12.760 ac 100.00% Impervious Runoff Depth=9.71"
Tc=5.0 min CN=98 Runoff=187.23 cfs 10.324 af

Subcatchment87S: S-6 Runoff Area=7.980 ac 100.00% Impervious Runoff Depth=9.71"
Tc=5.0 min CN=98 Runoff=117.09 cfs 6.457 af

Subcatchment88S: S-7 Runoff Area=7.400 ac 100.00% Impervious Runoff Depth=9.71"
Tc=5.0 min CN=98 Runoff=108.58 cfs 5.987 af

Subcatchment89S: S-8 Runoff Area=7.460 ac 100.00% Impervious Runoff Depth=9.71"
Tc=5.0 min CN=98 Runoff=109.46 cfs 6.036 af

Subcatchment90S: EN-1 Runoff Area=2.250 ac 0.00% Impervious Runoff Depth=6.57"
Flow Length=660' Tc=5.4 min CN=73 Runoff=26.16 cfs 1.232 af

Subcatchment100S: EN-2 Runoff Area=3.900 ac 0.00% Impervious Runoff Depth=6.31"
Flow Length=1,096' Tc=7.6 min CN=71 Runoff=40.60 cfs 2.051 af

Subcatchment 101S: EN-3 Runoff Area=2.170 ac 0.46% Impervious Runoff Depth=6.18"
Flow Length=702' Tc=6.5 min CN=70 Runoff=23.07 cfs 1.118 af

Subcatchment 102S: EN-4 Runoff Area=3.700 ac 0.00% Impervious Runoff Depth=5.39"
Flow Length=1,233' Tc=8.8 min CN=64 Runoff=32.04 cfs 1.662 af

Subcatchment 103S: EN-5 Runoff Area=1.790 ac 0.00% Impervious Runoff Depth=5.39"
Flow Length=650' Tc=6.1 min CN=64 Runoff=17.08 cfs 0.804 af

Subcatchment 104S: EN-6 Runoff Area=1.720 ac 0.00% Impervious Runoff Depth=5.52"
Flow Length=639' Tc=6.3 min CN=65 Runoff=16.66 cfs 0.791 af

Subcatchment 105S: EN-7 Runoff Area=6.350 ac 0.00% Impervious Runoff Depth=5.52"
Flow Length=1,610' Tc=11.7 min CN=65 Runoff=50.76 cfs 2.922 af

Subcatchment 108S: S-8-Alt Runoff Area=7.460 ac 100.00% Impervious Runoff Depth=9.71"
Tc=5.0 min CN=98 Runoff=109.46 cfs 6.036 af

Reach 71R: R-N-6 Avg. Flow Depth=0.54' Max Vel=7.34 fps Inflow=88.31 cfs 6.517 af
n=0.011 L=1,360.0' S=0.0074 '/' Capacity=1,191.05 cfs Outflow=84.86 cfs 6.514 af

Reach 91R: R-N-1 Avg. Flow Depth=1.90' Max Vel=11.08 fps Inflow=224.36 cfs 10.169 af
n=0.011 L=4,200.0' S=0.0050 '/' Capacity=304.21 cfs Outflow=177.56 cfs 10.159 af

Reach 93R: R-N-4 Avg. Flow Depth=1.24' Max Vel=12.09 fps Inflow=266.61 cfs 14.701 af
n=0.011 L=3,270.0' S=0.0082 '/' Capacity=566.75 cfs Outflow=235.58 cfs 14.694 af

Reach 94R: R-N-5 Avg. Flow Depth=1.26' Max Vel=9.02 fps Inflow=105.06 cfs 5.793 af
n=0.011 L=3,480.0' S=0.0052 '/' Capacity=473.52 cfs Outflow=85.83 cfs 5.789 af

Reach 107R: North Exterior Toe Overflow Inflow=118.53 cfs 1.105 af
Outflow=118.53 cfs 1.105 af

Pond 71P: P-N-2 Peak Elev=704.65' Storage=31.177 af Inflow=565.50 cfs 31.183 af
Outflow=0.00 cfs 0.000 af

Pond 72P: West Sump Peak Elev=710.52' Storage=0.639 af Inflow=275.30 cfs 24.934 af
Outflow=272.97 cfs 24.934 af

Pond 73P: CW Ponds Peak Elev=720.49' Storage=39.444 af Inflow=575.83 cfs 39.444 af
Outflow=0.00 cfs 0.000 af

Pond 74P: North Sump Peak Elev=735.43' Storage=85,609 cf Inflow=383.29 cfs 27.454 af
Outflow=376.90 cfs 27.453 af

Pond 76P: P-S-3 Peak Elev=682.83' Storage=3,155,440 cf Inflow=1,313.83 cfs 72.447 af
Outflow=0.00 cfs 0.000 af

Pond 77P: P-S-5 Peak Elev=692.82' Storage=449,711 cf Inflow=187.23 cfs 10.324 af
Outflow=0.00 cfs 0.000 af

Pond 78P: P-S-7 Peak Elev=732.05' Storage=260,808 cf Inflow=108.58 cfs 5.987 af
Outflow=0.00 cfs 0.000 af

Pond 92P: P-EN-1 Peak Elev=713.00' Storage=6,883 cf Inflow=26.16 cfs 1.232 af
Primary=5.88 cfs 1.067 af Secondary=29.04 cfs 0.165 af Outflow=34.92 cfs 1.232 af

Pond 93P: P-EN-2 Peak Elev=712.52' Storage=28,615 cf Inflow=40.60 cfs 2.051 af
Primary=6.90 cfs 2.051 af Secondary=0.00 cfs 0.000 af Outflow=6.90 cfs 2.051 af

Pond 94P: P-EN-3 Peak Elev=713.00' Storage=9,060 cf Inflow=23.07 cfs 1.118 af
Primary=5.88 cfs 1.038 af Secondary=22.28 cfs 0.079 af Outflow=28.16 cfs 1.118 af

Pond 95P: P-EN-4 Peak Elev=713.00' Storage=4,643 cf Inflow=32.04 cfs 1.662 af
Primary=5.88 cfs 1.282 af Secondary=35.29 cfs 0.380 af Outflow=41.17 cfs 1.662 af

Pond 96P: P-EN-5 Peak Elev=714.00' Storage=5,937 cf Inflow=17.08 cfs 0.804 af
Primary=5.88 cfs 0.777 af Secondary=10.18 cfs 0.027 af Outflow=16.06 cfs 0.804 af

Pond 97P: P-EN-6 Peak Elev=714.00' Storage=6,546 cf Inflow=16.66 cfs 0.791 af
Primary=5.09 cfs 0.755 af Secondary=16.46 cfs 0.037 af Outflow=21.55 cfs 0.791 af

Pond 98P: P-EN-7 Peak Elev=714.00' Storage=20,511 cf Inflow=50.76 cfs 2.922 af
Primary=9.78 cfs 2.505 af Secondary=60.68 cfs 0.417 af Outflow=70.46 cfs 2.922 af

Pond 110P: P-S-8 Peak Elev=713.33' Storage=262,918 cf Inflow=109.46 cfs 6.036 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 266.709 ac Runoff Volume = 200.961 af Average Runoff Depth = 9.04"
15.99% Pervious = 42.657 ac 84.01% Impervious = 224.052 ac

Summary for Subcatchment 73S: N-1

Runoff = 224.36 cfs @ 11.96 hrs, Volume= 10.169 af, Depth= 5.52"
Routed to Reach 91R : R-N-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	19.194	61	
*	1.593	85	Gravel
*	1.312	98	HDPE
	22.099	65	Weighted Average
	20.787		94.06% Pervious Area
	1.312		5.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 76S: N-2

Runoff = 565.50 cfs @ 11.96 hrs, Volume= 31.183 af, Depth= 9.71"
Routed to Pond 71P : P-N-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	38.540	98	
	38.540		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 78S: N-3

Runoff = 231.40 cfs @ 11.96 hrs, Volume= 12.760 af, Depth= 9.71"
Routed to Pond 74P : North Sump

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	15.770	98	
	15.770		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 79S: N-4

Runoff = 266.61 cfs @ 11.96 hrs, Volume= 14.701 af, Depth= 9.71"
Routed to Reach 93R : R-N-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	18.170	98	
	18.170		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 80S: N-5

Runoff = 105.06 cfs @ 11.96 hrs, Volume= 5.793 af, Depth= 9.71"
Routed to Reach 94R : R-N-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	7.160	98	
	7.160		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 81S: S-1

Runoff = 149.81 cfs @ 11.96 hrs, Volume= 8.261 af, Depth= 9.71"
Routed to Pond 72P : West Sump

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	10.210	98	
	10.210		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 82S: N-6

Runoff = 13.21 cfs @ 11.96 hrs, Volume= 0.728 af, Depth= 9.71"
Routed to Reach 71R : R-N-6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	0.900	98	
	0.900		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 83S: S-2

Runoff = 217.46 cfs @ 11.96 hrs, Volume= 11.991 af, Depth= 9.71"
Routed to Pond 73P : CW Ponds

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	14.820	98	
	14.820		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 84S: S-3

Runoff = 682.74 cfs @ 11.96 hrs, Volume= 37.648 af, Depth= 9.71"
Routed to Pond 76P : P-S-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	46.530	98	
	46.530		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 85S: S-4

Runoff = 404.54 cfs @ 11.96 hrs, Volume= 22.307 af, Depth= 9.71"
Routed to Pond 76P : P-S-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	27.570	98	
	27.570		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 86S: S-5

Runoff = 187.23 cfs @ 11.96 hrs, Volume= 10.324 af, Depth= 9.71"
Routed to Pond 77P : P-S-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	12.760	98	
	12.760		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 87S: S-6

Runoff = 117.09 cfs @ 11.96 hrs, Volume= 6.457 af, Depth= 9.71"
Routed to Pond 76P : P-S-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	7.980	98	
	7.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 88S: S-7

Runoff = 108.58 cfs @ 11.96 hrs, Volume= 5.987 af, Depth= 9.71"
Routed to Pond 78P : P-S-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	7.400	98	
	7.400		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 89S: S-8

Runoff = 109.46 cfs @ 11.96 hrs, Volume= 6.036 af, Depth= 9.71"
Routed to Pond 76P : P-S-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	7.460	98	
	7.460		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 90S: EN-1

Runoff = 26.16 cfs @ 11.96 hrs, Volume= 1.232 af, Depth= 6.57"
Routed to Pond 92P : P-EN-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	1.140	61	Grass
*	1.110	85	Gravel
	2.250	73	Weighted Average
	2.250		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	77	0.2500	0.48		**Sheet Flow,** n= 0.150 P2= 3.79"
2.7	583	0.0069	3.64	26.92	**Channel Flow,** Area= 7.4 sf Perim= 8.9' r= 0.83' n= 0.030
5.4	660	Total			

Summary for Subcatchment 100S: EN-2

Runoff = 40.60 cfs @ 11.99 hrs, Volume= 2.051 af, Depth= 6.31"
Routed to Pond 93P : P-EN-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	2.280	61	Grass
*	1.620	85	Gravel
	3.900	71	Weighted Average
	3.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	98	0.2372	0.50		**Sheet Flow,** n= 0.150 P2= 3.79"
4.3	998	0.0060	3.86	40.93	**Channel Flow,** Area= 10.6 sf Perim= 10.5' r= 1.01' n= 0.030
7.6	1,096	Total			

Summary for Subcatchment 101S: EN-3

Runoff = 23.07 cfs @ 11.98 hrs, Volume= 1.118 af, Depth= 6.18"
Routed to Pond 94P : P-EN-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	1.390	61	Grass
*	0.770	85	Gravel
*	0.010	98	HDPE
	2.170	70	Weighted Average
	2.160		99.54% Pervious Area
	0.010		0.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	115	0.2217	0.50		**Sheet Flow,** n= 0.150 P2= 3.79"
2.7	587	0.0068	3.56	24.93	**Channel Flow,** Area= 7.0 sf Perim= 8.6' r= 0.81' n= 0.030
6.5	702	Total			

Summary for Subcatchment 102S: EN-4

Runoff = 32.04 cfs @ 12.00 hrs, Volume= 1.662 af, Depth= 5.39"
Routed to Pond 95P : P-EN-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	3.220	61	Grass
*	0.480	85	Gravel
	3.700	64	Weighted Average
	3.700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	106	0.2476	0.51		**Sheet Flow,** n= 0.150 P2= 3.79"
5.4	1,127	0.0053	3.48	32.39	**Channel Flow,** Area= 9.3 sf Perim= 9.8' r= 0.95' n= 0.030
8.8	1,233	Total			

Summary for Subcatchment 103S: EN-5

Runoff = 17.08 cfs @ 11.97 hrs, Volume= 0.804 af, Depth= 5.39"
Routed to Pond 96P : P-EN-5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	1.570	61	Grass
*	0.220	85	Gravel
	1.790	64	Weighted Average
	1.790		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	109	0.2408	0.51		**Sheet Flow,** n= 0.150 P2= 3.79"
2.5	541	0.0092	3.63	18.13	**Channel Flow,** Area= 5.0 sf Perim= 7.5' r= 0.67' n= 0.030
6.1	650	Total			

Summary for Subcatchment 104S: EN-6

Runoff = 16.66 cfs @ 11.98 hrs, Volume= 0.791 af, Depth= 5.52"
Routed to Pond 97P : P-EN-6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	1.430	61	Grass
*	0.290	85	Gravel
	1.720	65	Weighted Average
	1.720		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	98	0.2474	0.50		**Sheet Flow,** n= 0.150 P2= 3.79"
3.1	541	0.0051	2.93	17.86	**Channel Flow,** Area= 6.1 sf Perim= 8.1' r= 0.75' n= 0.030
6.3	639	Total			

Summary for Subcatchment 105S: EN-7

Runoff = 50.76 cfs @ 12.03 hrs, Volume= 2.922 af, Depth= 5.52"
Routed to Pond 98P : P-EN-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	5.400	61	Grass
*	0.950	85	Gravel
	6.350	65	Weighted Average
	6.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	88	0.0938	0.33		**Sheet Flow,** n= 0.150 P2= 3.79"
2.4	174	0.0057	1.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.9	1,348	0.0052	4.58	164.86	**Channel Flow,** Area= 36.0 sf Perim= 24.8' r= 1.45' n= 0.030
11.7	1,610	Total			

Summary for Subcatchment 108S: S-8-Alt

Runoff = 109.46 cfs @ 11.96 hrs, Volume= 6.036 af, Depth= 9.71"
Routed to Pond 110P : P-S-8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type II 24-hr 1k yr, 24 hr Rainfall=9.95"

	Area (ac)	CN	Description
*	7.460	98	
	7.460		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Reach 71R: R-N-6

Inflow Area = 8.060 ac,100.00% Impervious, Inflow Depth > 9.70" for 1k yr, 24 hr event
Inflow = 88.31 cfs @ 12.11 hrs, Volume= 6.517 af
Outflow = 84.86 cfs @ 12.18 hrs, Volume= 6.514 af, Atten= 4%, Lag= 4.7 min
Routed to Pond 72P : West Sump

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.34 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 1.70 fps, Avg. Travel Time= 13.3 min

Peak Storage= 15,725 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.54' , Surface Width= 22.71'
Bank-Full Depth= 2.50' Flow Area= 65.6 sf, Capacity= 1,191.05 cfs

20.00' x 2.50' deep channel, n= 0.011
Side Slope Z-value= 2.5 '/' Top Width= 32.50'
Length= 1,360.0' Slope= 0.0074 '/'
Inlet Invert= 718.00', Outlet Invert= 708.00'



‡

Summary for Reach 91R: R-N-1

Inflow Area = 22.099 ac, 5.94% Impervious, Inflow Depth = 5.52" for 1k yr, 24 hr event
Inflow = 224.36 cfs @ 11.96 hrs, Volume= 10.169 af
Outflow = 177.56 cfs @ 12.11 hrs, Volume= 10.159 af, Atten= 21%, Lag= 9.2 min
Routed to Pond 72P : West Sump

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Max. Velocity= 11.08 fps, Min. Travel Time= 6.3 min
Avg. Velocity = 3.05 fps, Avg. Travel Time= 22.9 min

Peak Storage= 67,397 cf @ 12.01 hrs
Average Depth at Peak Storage= 1.90' , Surface Width= 11.85'
Bank-Full Depth= 2.50' Flow Area= 23.8 sf, Capacity= 304.21 cfs

5.00' x 2.50' deep channel, n= 0.011
Side Slope Z-value= 1.8 '/' Top Width= 14.00'
Length= 4,200.0' Slope= 0.0050 '/'
Inlet Invert= 738.00', Outlet Invert= 717.00'



Summary for Reach 93R: R-N-4

Inflow Area = 18.170 ac,100.00% Impervious, Inflow Depth = 9.71" for 1k yr, 24 hr event
Inflow = 266.61 cfs @ 11.96 hrs, Volume= 14.701 af
Outflow = 235.58 cfs @ 12.07 hrs, Volume= 14.694 af, Atten= 12%, Lag= 6.6 min
Routed to Pond 74P : North Sump

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Max. Velocity= 12.09 fps, Min. Travel Time= 4.5 min
Avg. Velocity = 2.79 fps, Avg. Travel Time= 19.5 min

Peak Storage= 63,814 cf @ 11.99 hrs
Average Depth at Peak Storage= 1.24' , Surface Width= 19.45'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 566.75 cfs

12.00' x 2.00' deep channel, n= 0.011
Side Slope Z-value= 3.0 '/' Top Width= 24.00'
Length= 3,270.0' Slope= 0.0082 '/'
Inlet Invert= 760.00', Outlet Invert= 733.20'



‡

Summary for Reach 94R: R-N-5

Inflow Area = 7.160 ac,100.00% Impervious, Inflow Depth = 9.71" for 1k yr, 24 hr event
Inflow = 105.06 cfs @ 11.96 hrs, Volume= 5.793 af
Outflow = 85.83 cfs @ 12.11 hrs, Volume= 5.789 af, Atten= 18%, Lag= 9.1 min
Routed to Reach 71R : R-N-6

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Max. Velocity= 9.02 fps, Min. Travel Time= 6.4 min
Avg. Velocity = 2.34 fps, Avg. Travel Time= 24.8 min

Peak Storage= 33,138 cf @ 12.00 hrs
Average Depth at Peak Storage= 1.26' , Surface Width= 10.06'
Bank-Full Depth= 3.00' Flow Area= 33.0 sf, Capacity= 473.52 cfs

5.00' x 3.00' deep channel, n= 0.011
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 3,480.0' Slope= 0.0052 '/'
Inlet Invert= 738.04', Outlet Invert= 720.00'



Summary for Reach 107R: North Exterior Toe Overflow

Inflow = 118.53 cfs @ 12.04 hrs, Volume= 1.105 af
Outflow = 118.53 cfs @ 12.04 hrs, Volume= 1.105 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs

Summary for Pond 71P: P-N-2

Inflow Area = 38.540 ac,100.00% Impervious, Inflow Depth = 9.71" for 1k yr, 24 hr event
Inflow = 565.50 cfs @ 11.96 hrs, Volume= 31.183 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 704.65' @ 24.29 hrs Surf.Area= 6.968 ac Storage= 31.177 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	698.00'	271.517 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
698.00	1.890	0.000	0.000
700.00	3.950	5.840	5.840
702.00	5.270	9.220	15.060
704.00	6.470	11.740	26.800
706.00	8.000	14.470	41.270
708.00	8.840	16.840	58.110
710.00	9.572	18.412	76.522
712.00	10.234	19.806	96.328
714.00	10.829	21.063	117.391
716.00	11.367	22.196	139.587
718.00	11.962	23.329	162.916
720.00	12.873	24.835	187.751
722.00	13.608	26.481	214.232
724.00	14.326	27.934	242.166
726.00	15.025	29.351	271.517

Summary for Pond 72P: West Sump

Inflow Area = 40.369 ac, 48.51% Impervious, Inflow Depth > 7.41" for 1k yr, 24 hr event
Inflow = 275.30 cfs @ 12.12 hrs, Volume= 24.934 af
Outflow = 272.97 cfs @ 12.13 hrs, Volume= 24.934 af, Atten= 1%, Lag= 1.0 min
Primary = 272.97 cfs @ 12.13 hrs, Volume= 24.934 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 710.52' @ 12.13 hrs Surf.Area= 0.264 ac Storage= 0.639 af

Plug-Flow detention time= 0.9 min calculated for 24.925 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (786.1 - 785.3)

Volume	Invert	Avail.Storage	Storage Description
#1	706.00'	4.590 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
706.00	0.000	0.000	0.000
708.00	0.140	0.140	0.140
710.00	0.230	0.370	0.510
712.00	0.360	0.590	1.100
714.00	3.130	3.490	4.590

Device	Routing	Invert	Outlet Devices
#1	Primary	706.00'	**Special & User-Defined** Elev. (feet) 706.00 707.00 708.00 709.00 710.00 711.00 712.00 713.00 714.00 Disch. (cfs) 0.000 32.690 91.660 151.610 188.930 349.920 465.170 557.070 612.360

Primary OutFlow Max=272.80 cfs @ 12.13 hrs HW=710.52' (Free Discharge)
↑—**1=Special & User-Defined** (Custom Controls 272.80 cfs)

Summary for Pond 73P: CW Ponds

Inflow Area = 48.760 ac,100.00% Impervious, Inflow Depth > 9.71" for 1k yr, 24 hr event
Inflow = 575.83 cfs @ 11.98 hrs, Volume= 39.444 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 720.49' @ 26.00 hrs Surf.Area= 9.827 ac Storage= 39.444 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	716.00'	76.205 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
716.00	7.690	0.000	0.000
717.00	8.170	7.930	7.930
718.00	8.680	8.425	16.355
719.00	9.130	8.905	25.260
720.00	9.640	9.385	34.645
721.00	10.020	9.830	44.475
722.00	10.390	10.205	54.680
723.00	10.760	10.575	65.255
724.00	11.140	10.950	76.205

Summary for Pond 74P: North Sump

Inflow Area = 33.940 ac,100.00% Impervious, Inflow Depth > 9.71" for 1k yr, 24 hr event
Inflow = 383.29 cfs @ 11.98 hrs, Volume= 27.454 af
Outflow = 376.90 cfs @ 12.00 hrs, Volume= 27.453 af, Atten= 2%, Lag= 1.3 min
Primary = 376.90 cfs @ 12.00 hrs, Volume= 27.453 af
Routed to Pond 73P : CW Ponds

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 735.43' @ 12.00 hrs Surf.Area= 16,690 sf Storage= 85,609 cf

Plug-Flow detention time= 4.8 min calculated for 27.453 af (100% of inflow)
Center-of-Mass det. time= 4.7 min (747.1 - 742.3)

Volume	Invert	Avail.Storage	Storage Description
#1	727.00'	95,477 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
727.00	550	0	0
728.00	4,624	2,587	2,587
729.00	8,367	6,496	9,083
730.00	9,250	8,809	17,891
731.00	10,158	9,704	27,595
732.00	11,162	10,660	38,255
733.00	12,499	11,831	50,086
734.00	14,379	13,439	63,525
735.00	15,867	15,123	78,648
736.00	17,791	16,829	95,477

Device	Routing	Invert	Outlet Devices
#1	Primary	727.00'	**24.0" Round Culvert X 3.00** L= 240.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 727.00' / 713.24' S= 0.0573 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Primary	733.04'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.96 3.98 Width (feet) 2.31 28.13 53.43

Primary OutFlow Max=376.76 cfs @ 12.00 hrs HW=735.43' (Free Discharge)
1=Culvert (Inlet Controls 97.64 cfs @ 10.36 fps)
2=Custom Weir/Orifice (Weir Controls 279.13 cfs @ 4.41 fps)

Summary for Pond 76P: P-S-3

Inflow Area = 89.540 ac,100.00% Impervious, Inflow Depth = 9.71" for 1k yr, 24 hr event
Inflow = 1,313.83 cfs @ 11.96 hrs, Volume= 72.447 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 682.83' @ 24.29 hrs Surf.Area= 521,192 sf Storage= 3,155,440 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	674.00'	26,696,968 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
674.00	87,120	0	0
676.00	250,688	337,808	337,808
678.00	370,086	620,774	958,582
680.00	452,371	822,457	1,781,039
682.00	497,325	949,696	2,730,735
684.00	554,562	1,051,887	3,782,622
686.00	605,440	1,160,002	4,942,624
688.00	678,229	1,283,669	6,226,293
690.00	726,363	1,404,592	7,630,885
692.00	874,119	1,600,482	9,231,367
694.00	968,339	1,842,458	11,073,825
696.00	1,153,599	2,121,938	13,195,763
698.00	1,216,631	2,370,230	15,565,993
700.00	1,308,673	2,525,304	18,091,297
702.00	1,368,917	2,677,590	20,768,887
704.00	1,495,981	2,864,898	23,633,785
706.00	1,567,202	3,063,183	26,696,968

Summary for Pond 77P: P-S-5

Inflow Area = 12.760 ac,100.00% Impervious, Inflow Depth = 9.71" for 1k yr, 24 hr event
Inflow = 187.23 cfs @ 11.96 hrs, Volume= 10.324 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 692.82' @ 24.29 hrs Surf.Area= 183,960 sf Storage= 449,711 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	690.00'	2,098,808 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
690.00	127,457	0	0
692.00	175,242	302,699	302,699
694.00	196,543	371,785	674,484
696.00	218,148	414,691	1,089,175
698.00	245,330	463,478	1,552,653
700.00	300,825	546,155	2,098,808

Summary for Pond 78P: P-S-7

Inflow Area = 7.400 ac,100.00% Impervious, Inflow Depth = 9.71" for 1k yr, 24 hr event
Inflow = 108.58 cfs @ 11.96 hrs, Volume= 5.987 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 732.05' @ 24.29 hrs Surf.Area= 134,579 sf Storage= 260,808 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	730.00'	537,027 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
730.00	120,072	0	0
732.00	134,234	254,306	254,306
734.00	148,487	282,721	537,027

Summary for Pond 92P: P-EN-1

Inflow Area = 2.250 ac, 0.00% Impervious, Inflow Depth = 6.57" for 1k yr, 24 hr event
Inflow = 26.16 cfs @ 11.96 hrs, Volume= 1.232 af
Outflow = 34.92 cfs @ 11.97 hrs, Volume= 1.232 af, Atten= 0%, Lag= 0.4 min
Primary = 5.88 cfs @ 11.94 hrs, Volume= 1.067 af
Secondary = 29.04 cfs @ 11.97 hrs, Volume= 0.165 af
Routed to Reach 107R : North Exterior Toe Overflow

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 713.00' @ 11.97 hrs Surf.Area= 7,667 sf Storage= 6,883 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.8 min (810.7 - 805.9)

Volume	Invert	Avail.Storage	Storage Description
#1	709.00'	6,883 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
709.00	0	0	0
710.00	26	13	13
711.00	518	272	285
712.00	2,505	1,512	1,797
713.00	7,667	5,086	6,883

Device	Routing	Invert	Outlet Devices
#1	Primary	709.00'	**Special & User-Defined**
			Head (feet) 0.00 1.00 2.00 3.00 4.00
			Disch. (cfs) 0.000 2.674 4.156 5.090 5.878

#2 Secondary 713.00' **5,000.000 cfs Constant Flow/Skimmer**

Primary OutFlow Max=5.88 cfs @ 11.94 hrs HW=713.00' (Free Discharge)
1=Special & User-Defined (Custom Controls 5.88 cfs)

Secondary OutFlow Max=5,000.00 cfs @ 11.97 hrs HW=713.00' (Free Discharge)
2=Constant Flow/Skimmer (Constant Controls 5,000.00 cfs)

Summary for Pond 93P: P-EN-2

Inflow Area = 3.900 ac, 0.00% Impervious, Inflow Depth = 6.31" for 1k yr, 24 hr event
Inflow = 40.60 cfs @ 11.99 hrs, Volume= 2.051 af
Outflow = 6.90 cfs @ 12.22 hrs, Volume= 2.051 af, Atten= 83%, Lag= 13.8 min
Primary = 6.90 cfs @ 12.22 hrs, Volume= 2.051 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 107R : North Exterior Toe Overflow

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 712.52' @ 12.22 hrs Surf.Area= 18,944 sf Storage= 28,615 cf

Plug-Flow detention time= 26.8 min calculated for 2.050 af (100% of inflow)
Center-of-Mass det. time= 26.8 min (838.7 - 811.9)

Volume	Invert	Avail.Storage	Storage Description
#1	707.00'	38,901 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
707.00	0	0	0
708.00	389	195	195
709.00	934	662	856
710.00	3,773	2,354	3,210
711.00	8,114	5,944	9,153
712.00	13,841	10,978	20,131
713.00	23,699	18,770	38,901

Device	Routing	Invert	Outlet Devices
#1	Primary	707.00'	**Special & User-Defined** Head (feet) 0.00 1.00 2.00 3.00 4.00 5.00 6.00 Disch. (cfs) 0.000 2.674 4.156 5.090 5.878 6.572 7.199
#2	Secondary	713.00'	**5,000.000 cfs Constant Flow/Skimmer**

Primary OutFlow Max=6.90 cfs @ 12.22 hrs HW=712.52' (Free Discharge)
1=Special & User-Defined (Custom Controls 6.90 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=707.00' (Free Discharge)
2=Constant Flow/Skimmer (Controls 0.00 cfs)

Summary for Pond 94P: P-EN-3

Inflow Area = 2.170 ac, 0.46% Impervious, Inflow Depth = 6.18" for 1k yr, 24 hr event
Inflow = 23.07 cfs @ 11.98 hrs, Volume= 1.118 af
Outflow = 28.16 cfs @ 12.01 hrs, Volume= 1.118 af, Atten= 0%, Lag= 1.9 min
Primary = 5.88 cfs @ 12.00 hrs, Volume= 1.038 af
Secondary = 22.28 cfs @ 12.01 hrs, Volume= 0.079 af
Routed to Reach 107R : North Exterior Toe Overflow

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 713.00' @ 12.01 hrs Surf.Area= 7,228 sf Storage= 9,060 cf

Plug-Flow detention time= 7.6 min calculated for 1.117 af (100% of inflow)
Center-of-Mass det. time= 7.6 min (820.5 - 812.9)

Volume	Invert	Avail.Storage	Storage Description
#1	709.00'	9,060 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
709.00	0	0	0
710.00	302	151	151
711.00	1,413	858	1,009
712.00	3,731	2,572	3,581
713.00	7,228	5,480	9,060

Device	Routing	Invert	Outlet Devices
#1	Primary	709.00'	**Special & User-Defined** Head (feet) 0.00 1.00 2.00 3.00 4.00 Disch. (cfs) 0.000 2.674 4.156 5.090 5.878
#2	Secondary	713.00'	**5,000.000 cfs Constant Flow/Skimmer**

Primary OutFlow Max=5.88 cfs @ 12.00 hrs HW=713.00' (Free Discharge)
↑└**1=Special & User-Defined** (Custom Controls 5.88 cfs)

Secondary OutFlow Max=5,000.00 cfs @ 12.01 hrs HW=713.00' (Free Discharge)
↑└**2=Constant Flow/Skimmer** (Constant Controls 5,000.00 cfs)

Summary for Pond 95P: P-EN-4

Inflow Area = 3.700 ac, 0.00% Impervious, Inflow Depth = 5.39" for 1k yr, 24 hr event
Inflow = 32.04 cfs @ 12.00 hrs, Volume= 1.662 af
Outflow = 41.17 cfs @ 12.00 hrs, Volume= 1.662 af, Atten= 0%, Lag= 0.0 min
Primary = 5.88 cfs @ 11.92 hrs, Volume= 1.282 af
Secondary = 35.29 cfs @ 12.00 hrs, Volume= 0.380 af
Routed to Reach 107R : North Exterior Toe Overflow

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 713.00' @ 12.00 hrs Surf.Area= 4,701 sf Storage= 4,643 cf

Plug-Flow detention time= 3.0 min calculated for 1.661 af (100% of inflow)
Center-of-Mass det. time= 3.0 min (829.6 - 826.7)

Volume	Invert	Avail.Storage	Storage Description
#1	709.00'	4,643 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
709.00	0	0	0
710.00	19	10	10
711.00	550	285	294
712.00	1,723	1,137	1,431
713.00	4,701	3,212	4,643

Device	Routing	Invert	Outlet Devices
#1	Primary	709.00'	**Special & User-Defined** Head (feet) 0.00 1.00 2.00 3.00 4.00 Disch. (cfs) 0.000 2.674 4.156 5.090 5.878
#2	Secondary	713.00'	**5,000.000 cfs Constant Flow/Skimmer**

Primary OutFlow Max=5.88 cfs @ 11.92 hrs HW=713.00' (Free Discharge)
└**1=Special & User-Defined** (Custom Controls 5.88 cfs)

Secondary OutFlow Max=5,000.00 cfs @ 12.00 hrs HW=713.00' (Free Discharge)
└**2=Constant Flow/Skimmer** (Constant Controls 5,000.00 cfs)

Summary for Pond 96P: P-EN-5

Inflow Area = 1.790 ac, 0.00% Impervious, Inflow Depth = 5.39" for 1k yr, 24 hr event
Inflow = 17.08 cfs @ 11.97 hrs, Volume= 0.804 af
Outflow = 16.06 cfs @ 12.02 hrs, Volume= 0.804 af, Atten= 6%, Lag= 2.8 min
Primary = 5.88 cfs @ 12.02 hrs, Volume= 0.777 af
Secondary = 10.18 cfs @ 12.02 hrs, Volume= 0.027 af
Routed to Reach 107R : North Exterior Toe Overflow

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 714.00' @ 12.02 hrs Surf.Area= 4,847 sf Storage= 5,937 cf

Plug-Flow detention time= 4.6 min calculated for 0.804 af (100% of inflow)
Center-of-Mass det. time= 4.6 min (828.8 - 824.2)

Volume	Invert	Avail.Storage	Storage Description
#1	710.00'	5,937 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
710.00	0	0	0
711.00	56	28	28
712.00	940	498	526
713.00	2,517	1,729	2,255
714.00	4,847	3,682	5,937

Device	Routing	Invert	Outlet Devices
#1	Primary	710.00'	**Special & User-Defined**
			Head (feet) 0.00 1.00 2.00 3.00 4.00
			Disch. (cfs) 0.000 2.674 4.156 5.090 5.878
#2	Secondary	714.00'	**5,000.000 cfs Constant Flow/Skimmer**

Primary OutFlow Max=5.88 cfs @ 12.02 hrs HW=714.00' (Free Discharge)
└**1=Special & User-Defined** (Custom Controls 5.88 cfs)

Secondary OutFlow Max=5,000.00 cfs @ 12.02 hrs HW=714.00' (Free Discharge)
└**2=Constant Flow/Skimmer** (Constant Controls 5,000.00 cfs)

Summary for Pond 97P: P-EN-6

Inflow Area = 1.720 ac, 0.00% Impervious, Inflow Depth = 5.52" for 1k yr, 24 hr event
Inflow = 16.66 cfs @ 11.98 hrs, Volume= 0.791 af
Outflow = 21.55 cfs @ 12.02 hrs, Volume= 0.791 af, Atten= 0%, Lag= 2.6 min
Primary = 5.09 cfs @ 12.01 hrs, Volume= 0.755 af
Secondary = 16.46 cfs @ 12.02 hrs, Volume= 0.037 af
Routed to Reach 107R : North Exterior Toe Overflow

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 714.00' @ 12.02 hrs Surf.Area= 5,716 sf Storage= 6,546 cf

Plug-Flow detention time= 6.8 min calculated for 0.791 af (100% of inflow)
Center-of-Mass det. time= 6.8 min (829.2 - 822.4)

Volume	Invert	Avail.Storage	Storage Description
#1	711.00'	6,546 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
711.00	0	0	0
712.00	936	468	468
713.00	2,752	1,844	2,312
714.00	5,716	4,234	6,546

Device	Routing	Invert	Outlet Devices
#1	Primary	711.00'	**Special & User-Defined**
			Head (feet) 0.00 1.00 2.00 3.00
			Disch. (cfs) 0.000 2.674 4.156 5.090
#2	Secondary	714.00'	**5,000.000 cfs Constant Flow/Skimmer**

Primary OutFlow Max=5.09 cfs @ 12.01 hrs HW=714.00' (Free Discharge)
└**1=Special & User-Defined** (Custom Controls 5.09 cfs)

Secondary OutFlow Max=5,000.00 cfs @ 12.02 hrs HW=714.00' (Free Discharge)
└**2=Constant Flow/Skimmer** (Constant Controls 5,000.00 cfs)

Summary for Pond 98P: P-EN-7

Inflow Area = 6.350 ac, 0.00% Impervious, Inflow Depth = 5.52" for 1k yr, 24 hr event
Inflow = 50.76 cfs @ 12.03 hrs, Volume= 2.922 af
Outflow = 70.46 cfs @ 12.04 hrs, Volume= 2.922 af, Atten= 0%, Lag= 0.3 min
Primary = 9.78 cfs @ 12.04 hrs, Volume= 2.505 af
Secondary = 60.68 cfs @ 12.04 hrs, Volume= 0.417 af
Routed to Reach 107R : North Exterior Toe Overflow

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 714.00' @ 12.04 hrs Surf.Area= 21,203 sf Storage= 20,511 cf

Plug-Flow detention time= 10.6 min calculated for 2.921 af (100% of inflow)
Center-of-Mass det. time= 10.6 min (838.0 - 827.4)

Volume	Invert	Avail.Storage	Storage Description
#1	710.00'	20,511 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
710.00	0	0	0
711.00	209	105	105
712.00	2,204	1,207	1,311
713.00	7,496	4,850	6,161
714.00	21,203	14,350	20,511

Device	Routing	Invert	Outlet Devices
#1	Primary	710.00'	**Special & User-Defined** Head (feet) 0.00 1.00 2.00 3.00 4.00 Disch. (cfs) 0.000 3.584 6.680 8.374 9.779
#2	Secondary	714.00'	**5,000.000 cfs Constant Flow/Skimmer**

Primary OutFlow Max=9.78 cfs @ 12.04 hrs HW=714.00' (Free Discharge)
↑└**1=Special & User-Defined** (Custom Controls 9.78 cfs)

Secondary OutFlow Max=5,000.00 cfs @ 12.04 hrs HW=714.00' (Free Discharge)
↑└**2=Constant Flow/Skimmer** (Constant Controls 5,000.00 cfs)

Summary for Pond 110P: P-S-8

Inflow Area = 7.460 ac,100.00% Impervious, Inflow Depth = 9.71" for 1k yr, 24 hr event
Inflow = 109.46 cfs @ 11.96 hrs, Volume= 6.036 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 713.33' @ 24.29 hrs Surf.Area= 90,787 sf Storage= 262,918 cf

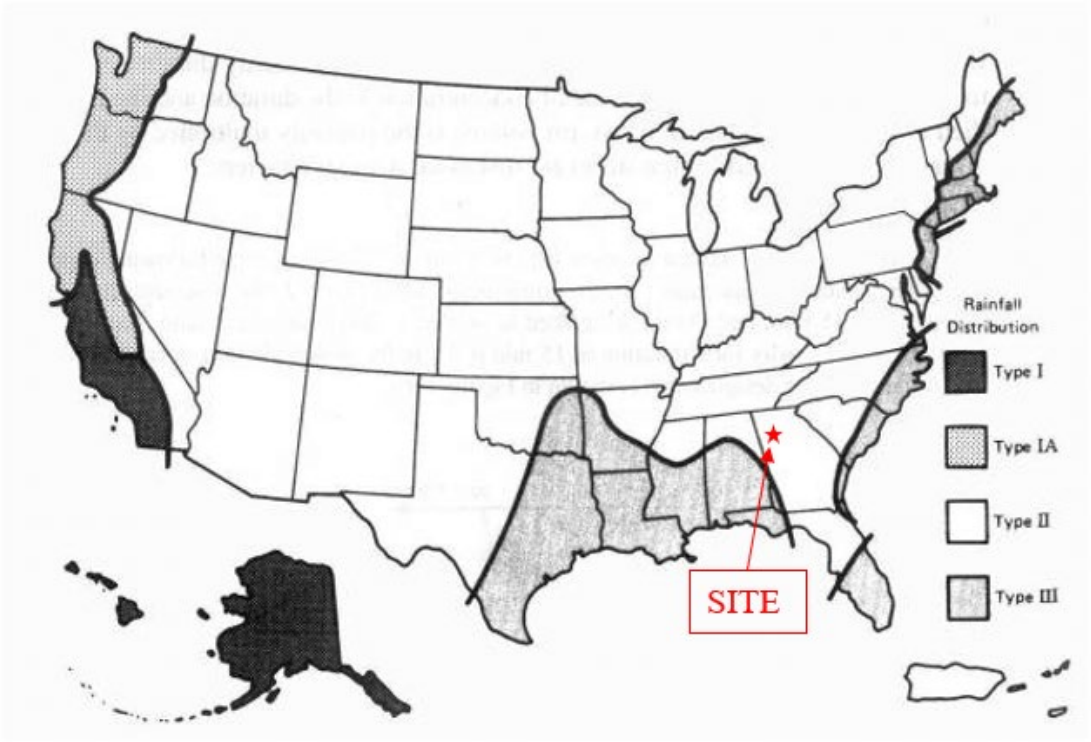
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	708.00'	328,950 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
708.00	6,901	0	0
710.00	47,937	54,838	54,838
712.00	59,920	107,857	162,695
714.00	106,335	166,255	328,950

ATTACHMENT 2
SCS Rainfall Distribution and NOAA Precipitation Frequency Data

SCS Rainfall Distribution



NOAA Precipitation Frequency Data

NOAA Atlas 14, Volume 9, Version 2
Location name: Cartersville, Georgia, USA*
Latitude: 34.1231°, Longitude: -84.9203°
Elevation: 713 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_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.407 (0.324-0.520)	0.466 (0.370-0.595)	0.571 (0.452-0.730)	0.666 (0.524-0.854)	0.809 (0.625-1.07)	0.930 (0.701-1.24)	1.06 (0.774-1.44)	1.20 (0.844-1.65)	1.40 (0.949-1.96)	1.56 (1.03-2.19)
10-min	0.597 (0.474-0.761)	0.682 (0.542-0.871)	0.836 (0.661-1.07)	0.975 (0.768-1.25)	1.18 (0.915-1.57)	1.36 (1.03-1.82)	1.55 (1.13-2.10)	1.75 (1.24-2.42)	2.04 (1.39-2.87)	2.28 (1.51-3.21)
15-min	0.728 (0.578-0.929)	0.832 (0.660-1.06)	1.02 (0.806-1.30)	1.19 (0.936-1.52)	1.44 (1.12-1.92)	1.66 (1.25-2.22)	1.89 (1.38-2.56)	2.14 (1.51-2.95)	2.49 (1.70-3.50)	2.78 (1.84-3.91)
30-min	1.03 (0.815-1.31)	1.17 (0.929-1.50)	1.43 (1.13-1.83)	1.67 (1.32-2.14)	2.03 (1.57-2.70)	2.34 (1.76-3.13)	2.67 (1.95-3.62)	3.02 (2.13-4.18)	3.53 (2.40-4.96)	3.94 (2.61-5.56)
60-min	1.33 (1.06-1.70)	1.52 (1.21-1.94)	1.86 (1.47-2.37)	2.16 (1.70-2.77)	2.62 (2.02-3.48)	3.01 (2.27-4.01)	3.42 (2.50-4.64)	3.86 (2.72-5.33)	4.50 (3.06-6.31)	5.01 (3.31-7.06)
2-hr	1.64 (1.32-2.06)	1.87 (1.50-2.35)	2.28 (1.82-2.88)	2.65 (2.11-3.36)	3.21 (2.51-4.20)	3.67 (2.80-4.84)	4.17 (3.09-5.58)	4.71 (3.36-6.40)	5.46 (3.77-7.56)	6.07 (4.08-8.44)
3-hr	1.84 (1.49-2.30)	2.10 (1.70-2.63)	2.56 (2.06-3.20)	2.97 (2.38-3.73)	3.58 (2.81-4.63)	4.08 (3.13-5.32)	4.61 (3.44-6.10)	5.18 (3.73-6.98)	5.98 (4.16-8.20)	6.62 (4.49-9.13)
6-hr	2.27 (1.86-2.80)	2.58 (2.11-3.18)	3.12 (2.54-3.85)	3.59 (2.92-4.44)	4.27 (3.40-5.44)	4.83 (3.76-6.20)	5.42 (4.10-7.06)	6.04 (4.41-8.02)	6.91 (4.88-9.33)	7.60 (5.23-10.3)
12-hr	2.80 (2.32-3.40)	3.17 (2.63-3.85)	3.79 (3.13-4.61)	4.33 (3.56-5.28)	5.10 (4.10-6.38)	5.72 (4.50-7.22)	6.36 (4.87-8.16)	7.03 (5.21-9.19)	7.96 (5.70-10.6)	8.68 (6.08-11.6)
24-hr	3.35 (2.81-4.01)	3.81 (3.20-4.56)	4.57 (3.82-5.48)	5.21 (4.34-6.27)	6.10 (4.95-7.50)	6.80 (5.42-8.43)	7.51 (5.82-9.46)	8.23 (6.17-10.6)	9.20 (6.69-12.0)	9.95 (7.08-13.2)
2-day	[illegible] (3.29-4.56)	[illegible] (3.78-5.24)	[illegible] (4.55-6.35)	[illegible] (5.18-7.28)	[illegible] (5.90-8.68)	[illegible] (6.44-9.74)	[illegible] (6.90-10.9)	[illegible] (7.29-12.1)	[illegible] (7.85-13.7)	[illegible] (8.27-14.9)
3-day	4.24 (3.63-4.96)	4.82 (4.13-5.64)	5.78 (4.93-6.77)	6.58 (5.59-7.73)	7.69 (6.37-9.23)	8.55 (6.96-10.4)	9.42 (7.48-11.6)	10.3 (7.92-12.9)	11.5 (8.57-14.7)	12.4 (9.06-16.0)
4-day	4.55 (3.92-5.29)	5.13 (4.42-5.97)	6.10 (5.24-7.10)	6.92 (5.92-8.08)	8.08 (6.75-9.65)	8.99 (7.38-10.8)	9.93 (7.93-12.2)	10.9 (8.44-13.6)	12.2 (9.17-15.5)	13.2 (9.72-17.0)
7-day	5.36 (4.66-6.15)	5.97 (5.19-6.86)	7.02 (6.09-8.07)	7.92 (6.84-9.14)	9.21 (7.80-10.9)	10.3 (8.52-12.2)	11.3 (9.18-13.7)	12.5 (9.79-15.4)	14.0 (10.7-17.6)	15.2 (11.4-19.4)
10-day	6.06 (5.31-6.90)	6.72 (5.88-7.66)	7.85 (6.86-8.96)	8.83 (7.68-10.1)	10.2 (8.74-12.0)	11.4 (9.54-13.5)	12.6 (10.3-15.1)	13.8 (10.9-17.0)	15.5 (12.0-19.4)	16.9 (12.7-21.3)
20-day	8.07 (7.16-9.05)	8.89 (7.88-9.97)	10.3 (9.10-11.6)	11.5 (10.1-12.9)	13.2 (11.4-15.2)	14.6 (12.4-17.0)	16.0 (13.3-18.9)	17.5 (14.1-21.1)	19.5 (15.3-24.0)	21.1 (16.2-26.2)
30-day	9.85 (8.81-10.9)	10.8 (9.68-12.0)	12.5 (11.1-13.9)	13.8 (12.3-15.5)	15.8 (13.7-18.0)	17.3 (14.8-20.0)	18.9 (15.8-22.1)	20.5 (16.6-24.5)	22.7 (17.9-27.6)	24.4 (18.9-30.0)
45-day	12.2 (11.0-13.5)	13.5 (12.1-14.8)	15.4 (13.9-17.0)	17.1 (15.3-18.9)	19.3 (16.9-21.7)	21.0 (18.1-23.9)	22.7 (19.1-26.3)	24.4 (19.9-28.8)	26.6 (21.2-32.0)	28.3 (22.1-34.5)
60-day	14.4 (13.0-15.7)	15.8 (14.3-17.3)	18.1 (16.4-19.9)	20.0 (18.0-22.0)	22.4 (19.7-25.0)	24.2 (21.0-27.4)	26.0 (22.0-29.8)	27.7 (22.8-32.4)	29.9 (24.0-35.7)	31.5 (24.8-38.2)

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

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

Please refer to NOAA Atlas 14 document for more information.

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ATTACHMENT 3
Manning's Channel Capacity Calculations

Design/Check: Trapezoidal/Triangular Channel

Methodology: Manning's Equation

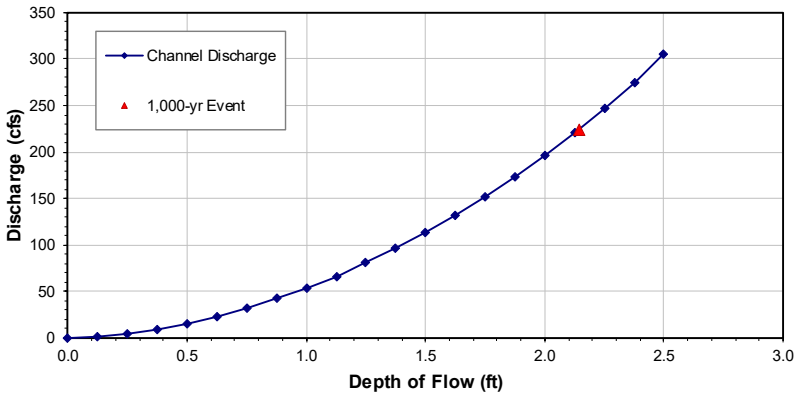
Project: Bowen 5-year Permit Renewal Inflow Design

Ditch ID: **Northwest Perimeter Channel (R-N-1)**

Peak Discharge, $Q_{1,000}$ =	224	cfs (1,000-yr Event)
Bottom Width, B =	5.0	ft
Left Side Slope, Z_1 =	1.8	horizontal :1 vertical
Right Side Slope, Z_2 =	1.8	horizontal :1 vertical
Channel Depth, Y =	2.5	ft
Top Width, T =	14.0	ft
Manning's Roughness Coeff., n =	0.011	
Longitudinal Channel Slope, S_o =	0.0050	ft/ft

Depth of Flow Y ft	Area of Flow A ft^2	Wetted Perimeter P ft	Hydraulic Radius R=A/P ft	Average Velocity V ft/s	Discharge (Flow Rate) Q=AV ft^3/s	Avg. Tractive Stress τ_0 lb/ft^2	Comments
0.00	0.00	5.00	0.00	0.00	0.0	0.00	
0.13	0.65	5.51	0.12	2.31	1.5	0.04	
0.25	1.36	6.03	0.23	3.55	4.8	0.07	
0.38	2.13	6.54	0.33	4.53	9.6	0.10	
0.50	2.95	7.06	0.42	5.35	15.8	0.13	
0.63	3.83	7.57	0.51	6.08	23.3	0.16	
0.75	4.76	8.09	0.59	6.73	32.0	0.18	
0.88	5.75	8.60	0.67	7.32	42.1	0.21	
1.00	6.80	9.12	0.75	7.88	53.6	0.23	
1.13	7.90	9.63	0.82	8.39	66.3	0.26	
1.25	9.06	10.15	0.89	8.88	80.5	0.28	
1.38	10.28	10.66	0.96	9.35	96.1	0.30	
1.50	11.55	11.18	1.03	9.79	113.1	0.32	
1.63	12.88	11.69	1.10	10.22	131.6	0.34	
1.75	14.26	12.21	1.17	10.63	151.6	0.36	
1.88	15.70	12.72	1.23	11.02	173.1	0.39	
2.00	17.20	13.24	1.30	11.41	196.2	0.41	
2.13	18.75	13.75	1.36	11.78	220.9	0.43	
2.25	20.36	14.27	1.43	12.14	247.3	0.45	
2.38	22.03	14.78	1.49	12.50	275.3	0.46	
2.50	23.75	15.30	1.55	12.85	305.1	0.48	
2.14	19.0	13.8	1.4	11.8	224	0.43	Q (1,000-yr Event)

Discharge versus Depth Relationship



Design/Check: Trapezoidal/Triangular Channel

Methodology: Manning's Equation

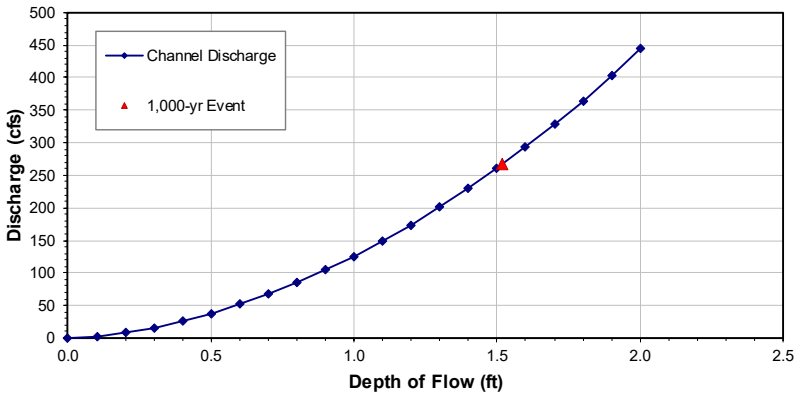
Project: Bowen 5-year Permit Renewal Inflow Design

Ditch ID: **Northeast Stockpile Diversion Channel (R-N-4)**

Peak Discharge, $Q_{1,000}$ =	267	cfs (1,000-yr Event)
Bottom Width, B =	12.0	ft
Left Side Slope, Z_1 =	3.0	horizontal :1 vertical
Right Side Slope, Z_2 =	3.0	horizontal :1 vertical
Channel Depth, Y =	2.0	ft
Top Width, T =	24.0	ft
Manning's Roughness Coeff., n =	0.011	
Longitudinal Channel Slope, S_o =	0.0050	ft/ft

Depth of Flow Y ft	Area of Flow A ft^2	Wetted Perimeter P ft	Hydraulic Radius R=A/P ft	Average Velocity V ft/s	Discharge (Flow Rate) Q=AV ft^3/s	Avg. Tractive Stress τ_0 lb/ft^2	Comments
0.00	0.00	12.00	0.00	0.00	0.0	0.00	
0.10	1.23	12.63	0.10	2.03	2.5	0.03	
0.20	2.52	13.26	0.19	3.16	8.0	0.06	
0.30	3.87	13.90	0.28	4.08	15.8	0.09	
0.40	5.28	14.53	0.36	4.88	25.7	0.11	
0.50	6.75	15.16	0.45	5.58	37.7	0.14	
0.60	8.28	15.79	0.52	6.23	51.5	0.16	
0.70	9.87	16.43	0.60	6.82	67.3	0.19	
0.80	11.52	17.06	0.68	7.37	84.9	0.21	
0.90	13.23	17.69	0.75	7.89	104.4	0.23	
1.00	15.00	18.32	0.82	8.38	125.7	0.26	
1.10	16.83	18.96	0.89	8.85	148.9	0.28	
1.20	18.72	19.59	0.96	9.29	174.0	0.30	
1.30	20.67	20.22	1.02	9.72	200.9	0.32	
1.40	22.68	20.85	1.09	10.13	229.7	0.34	
1.50	24.75	21.49	1.15	10.53	260.5	0.36	
1.60	26.88	22.12	1.22	10.91	293.2	0.38	
1.70	29.07	22.75	1.28	11.28	327.9	0.40	
1.80	31.32	23.38	1.34	11.64	364.5	0.42	
1.90	33.63	24.02	1.40	11.99	403.2	0.44	
2.00	36.00	24.65	1.46	12.33	443.9	0.46	
1.52	25.2	21.6	1.2	10.6	267	0.36	Q (1,000-yr Event)

Discharge versus Depth Relationship



Design/Check: Trapezoidal/Triangular Channel

Methodology: Manning's Equation

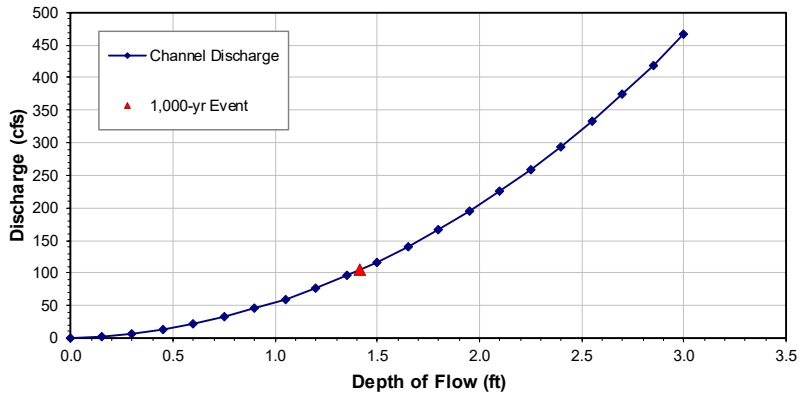
Project: Bowen 5-year Permit Renewal Inflow Design

Ditch ID: **Northeast Perimeter Channel (R-N-5)**

Peak Discharge, $Q_{1,000}$ =	105	cfs (1,000-yr Event)
Bottom Width, B =	5.0	ft
Left Side Slope, Z_1 =	2.0	horizontal :1 vertical
Right Side Slope, Z_2 =	2.0	horizontal :1 vertical
Channel Depth, Y =	3.0	ft
Top Width, T =	17.0	ft
Manning's Roughness Coeff., n =	0.011	
Longitudinal Channel Slope, S_o =	0.0050	ft/ft

Depth of Flow Y ft	Area of Flow A ft^2	Wetted Perimeter P ft	Hydraulic Radius R=A/P ft	Average Velocity V ft/s	Discharge (Flow Rate) Q=AV ft^3/s	Avg. Tractive Stress τ_0 lb/ft^2	Comments
0.00	0.00	5.00	0.00	0.00	0.0	0.00	
0.15	0.80	5.67	0.14	2.58	2.1	0.04	
0.30	1.68	6.34	0.26	3.95	6.6	0.08	
0.45	2.66	7.01	0.38	5.01	13.3	0.12	
0.60	3.72	7.68	0.48	5.90	22.0	0.15	
0.75	4.88	8.35	0.58	6.69	32.6	0.18	
0.90	6.12	9.02	0.68	7.39	45.2	0.21	
1.05	7.46	9.70	0.77	8.04	59.9	0.24	
1.20	8.88	10.37	0.86	8.64	76.7	0.27	
1.35	10.40	11.04	0.94	9.20	95.7	0.29	
1.50	12.00	11.71	1.02	9.74	116.8	0.32	
1.65	13.70	12.38	1.11	10.25	140.3	0.35	
1.80	15.48	13.05	1.19	10.73	166.2	0.37	
1.95	17.36	13.72	1.26	11.20	194.4	0.39	
2.10	19.32	14.39	1.34	11.66	225.2	0.42	
2.25	21.38	15.06	1.42	12.10	258.6	0.44	
2.40	23.52	15.73	1.49	12.52	294.6	0.47	
2.55	25.76	16.40	1.57	12.94	333.3	0.49	
2.70	28.08	17.07	1.64	13.35	374.8	0.51	
2.85	30.50	17.75	1.72	13.74	419.1	0.54	
3.00	33.00	18.42	1.79	14.13	466.4	0.56	
1.42	11.1	11.3	1.0	9.4	105	0.31	Q (1,000-yr Event)

Discharge versus Depth Relationship



Design/Check: Trapezoidal/Triangular Channel

Methodology: Manning's Equation

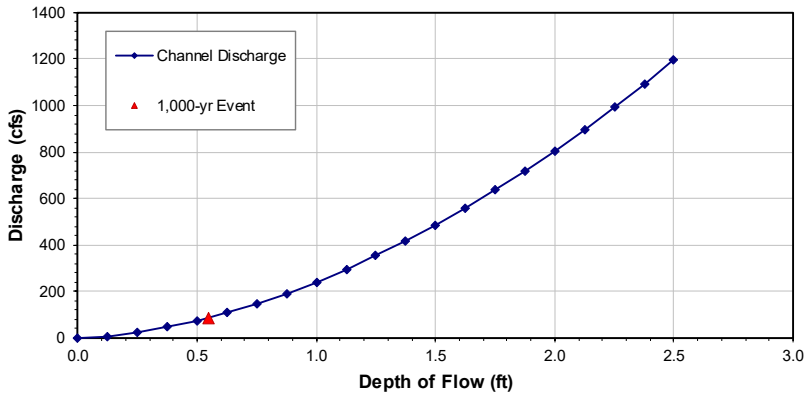
Project: Bowen 5-year Permit Renewal Inflow Design

Ditch ID: **Interior Channel (R-N-6)**

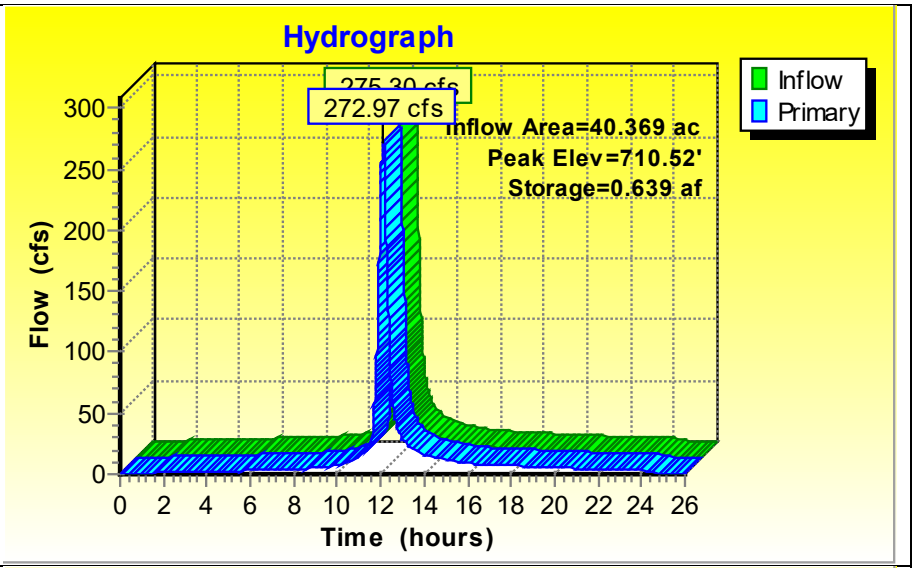
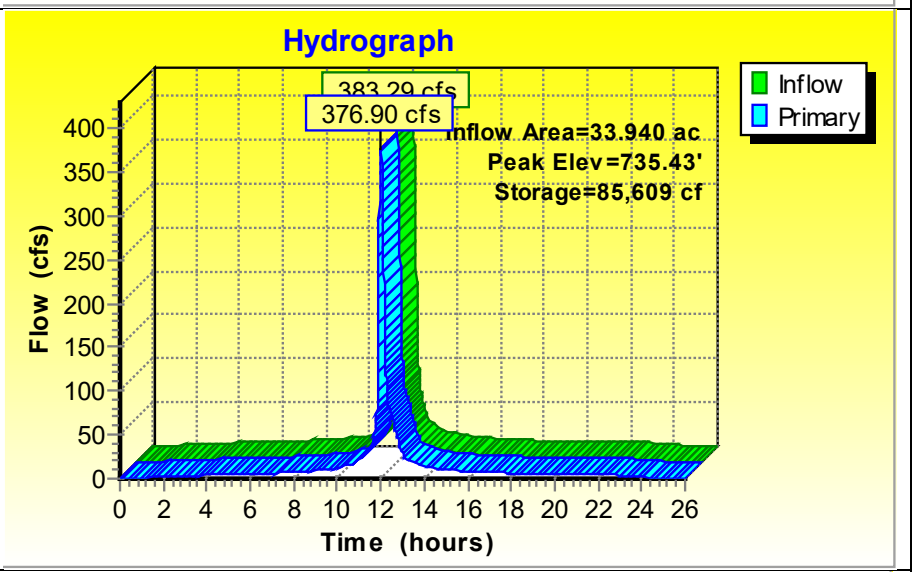
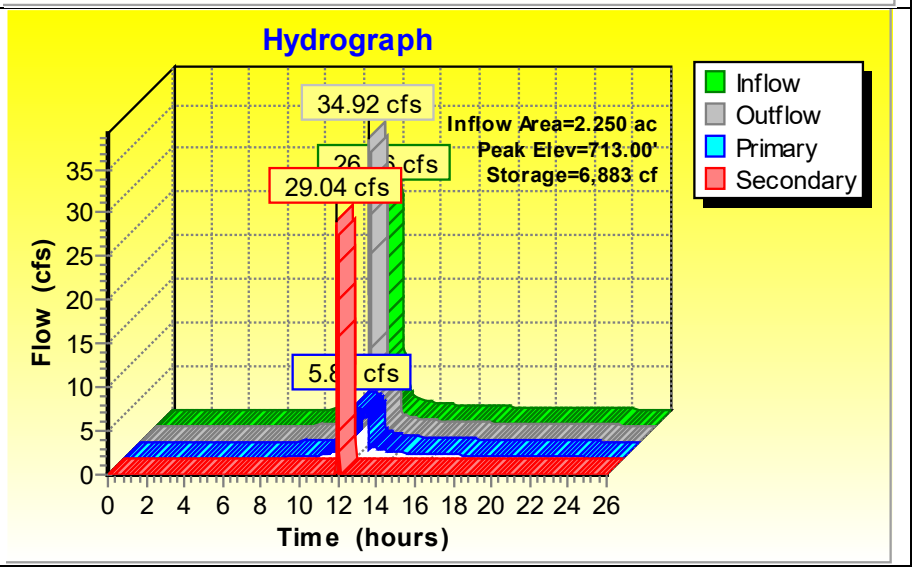
Peak Discharge, $Q_{1,000}$ =	88	cfs (1,000-yr Event)
Bottom Width, B =	20.0	ft
Left Side Slope, Z_1 =	2.5	horizontal :1 vertical
Right Side Slope, Z_2 =	2.5	horizontal :1 vertical
Channel Depth, Y =	2.5	ft
Top Width, T =	32.5	ft
Manning's Roughness Coeff., n =	0.011	
Longitudinal Channel Slope, S_o =	0.0074	ft/ft

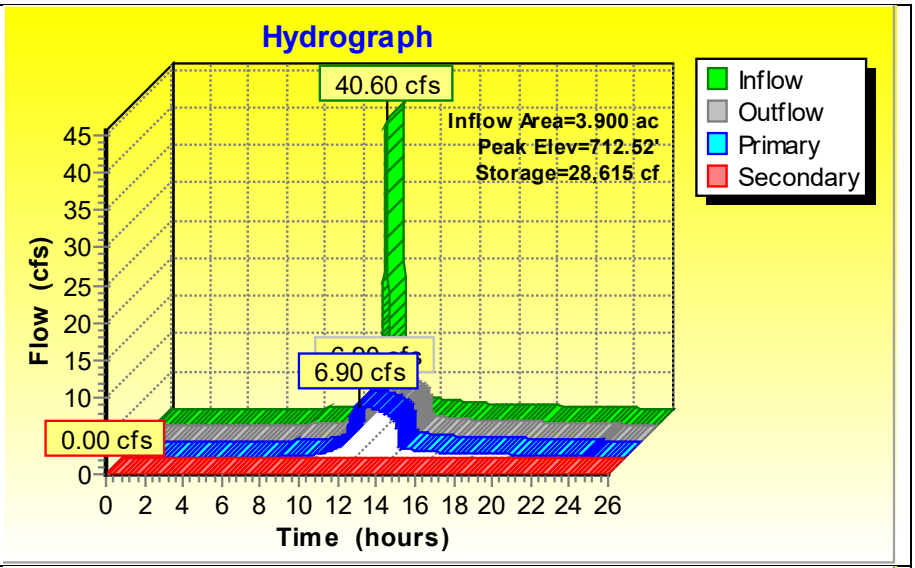
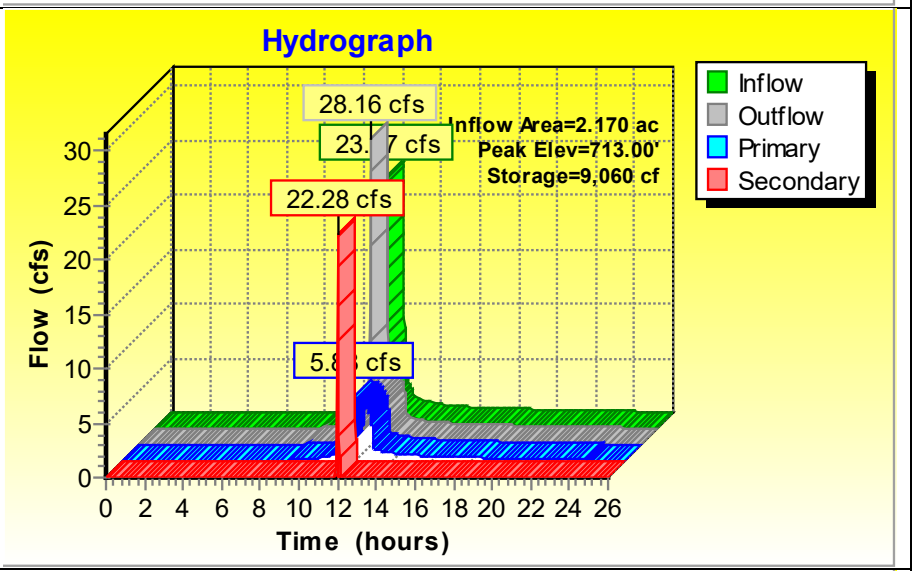
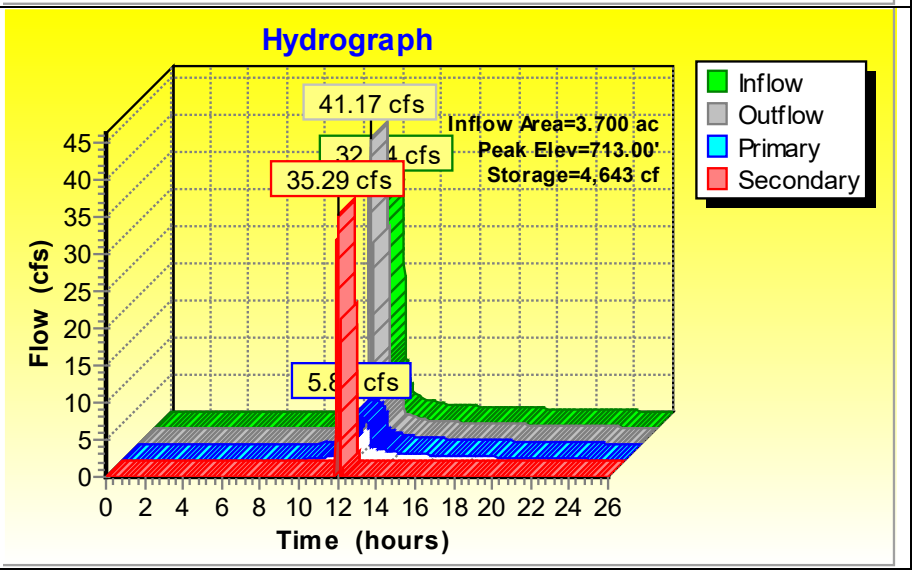
Depth of Flow Y ft	Area of Flow A ft^2	Wetted Perimeter P ft	Hydraulic Radius R=A/P ft	Average Velocity V ft/s	Discharge (Flow Rate) Q=AV ft^3/s	Avg. Tractive Stress τ_0 lb/ft^2	Comments
0.00	0.00	20.00	0.00	0.00	0.0	0.00	
0.13	2.54	20.67	0.12	2.88	7.3	0.06	
0.25	5.16	21.35	0.24	4.52	23.3	0.11	
0.38	7.85	22.02	0.36	5.86	46.0	0.16	
0.50	10.63	22.69	0.47	7.02	74.6	0.22	
0.63	13.48	23.37	0.58	8.07	108.8	0.27	
0.75	16.41	24.04	0.68	9.03	148.2	0.32	
0.88	19.41	24.71	0.79	9.92	192.6	0.36	
1.00	22.50	25.39	0.89	10.75	241.9	0.41	
1.13	25.66	26.06	0.98	11.53	296.0	0.45	
1.25	28.91	26.73	1.08	12.28	354.9	0.50	
1.38	32.23	27.40	1.18	12.98	418.4	0.54	
1.50	35.63	28.08	1.27	13.66	486.5	0.59	
1.63	39.10	28.75	1.36	14.30	559.3	0.63	
1.75	42.66	29.42	1.45	14.93	636.7	0.67	
1.88	46.29	30.10	1.54	15.53	718.8	0.71	
2.00	50.00	30.77	1.62	16.11	805.4	0.75	
2.13	53.79	31.44	1.71	16.67	896.7	0.79	
2.25	57.66	32.12	1.80	17.21	992.5	0.83	
2.38	61.60	32.79	1.88	17.74	1093.1	0.87	
2.50	65.63	33.46	1.96	18.26	1198.3	0.91	
0.55	11.7	23.0	0.5	7.4	87	0.24	Q (1,000-yr Event)

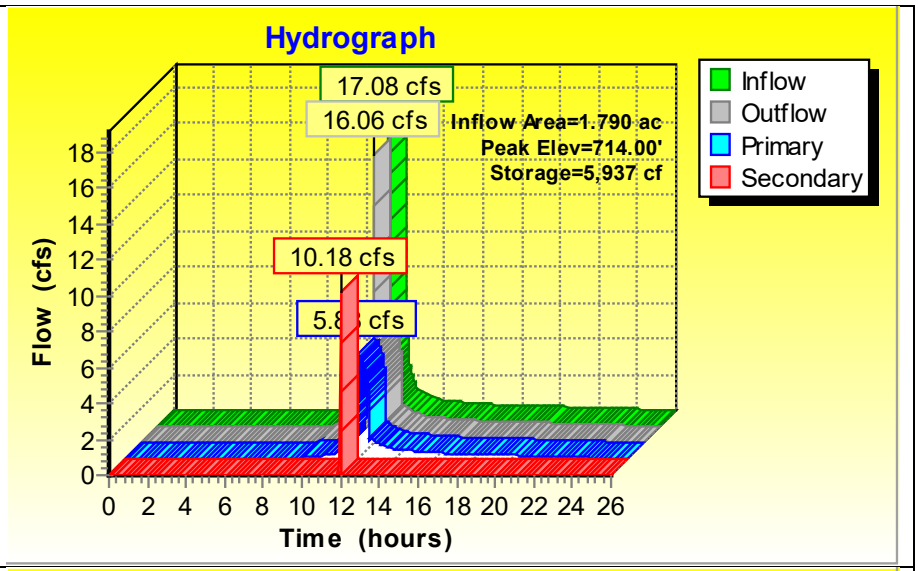
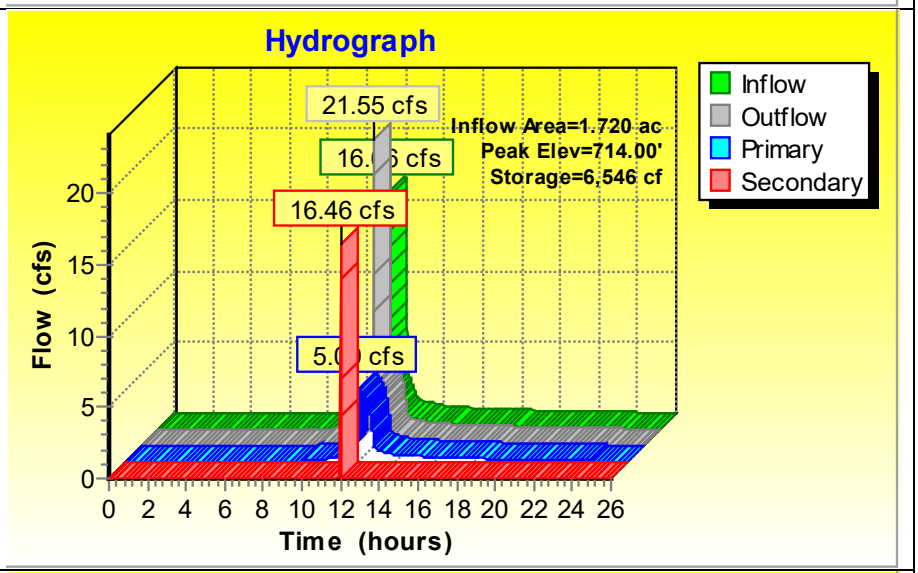
Discharge versus Depth Relationship



ATTACHMENT 4
Hydrograph Plots

West Sump	
North Sump	
P-EN-1	

P-EN-2	
P-EN-3	
P-EN-4	

P-EN-5	
P-EN-6	
P-EN-7	