DRAFT

Preliminary Stormwater Management Plan

For

Clear River Energy Center

Town of Burrillville
Providence County, Rhode Island

PREPARED FOR:
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SUBMITTED TO:
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OWNER CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under the direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I am aware that it is the responsibility of the site owner and operator to implement and amend the Soil Erosion and Sediment Control Plan as appropriate in accordance with the requirements of the RIPDES Construction General Permit.

_____

Owner Signature: Date

Owner Name: TBD
Owner Title: TBD
Company Name: Clear River Energy LLC
Address: One South Wacker Drive, Suite 1900, Chicago, IL 60606
Phone Number: TBD
Email Address: TBD

OPERATOR CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under the direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

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_____

Operator Signature: Date

Contractor Representative: TBD
Contractor Title: TBD
Contractor Company Name: TBD
Address: TBD
Phone Number: TBD
Email Address: TBD

1.0 INTRODUCTION

1.1 Site Description

The Clear River Energy Center (CREC) site is located in a forested, predominantly rural area. The 67 acres of land area will be purchased from the Spectra Energy Algonquin Compressor Station site ("Spectra") and is a subset of a 730-acre site that Spectra owns that currently contains the Algonquin Compressor Station. The Facility will be constructed just south of the existing compressor station. The Algonquin Compressor Station is surrounded by dense vegetation. The CREC will require a new access road which will be located south of, and parallel to, the existing Algonquin Road. The closest residents are approximately 2,300 feet to the north of the north-northeast corner of the property line.

1.2 Receiving Waters

The primary surface hydrologic feature, Iron Mine Brook, is located east of the CREC site. Iron Mine Brook is a perennial stream that flows in a northeasterly direction through the southern portion of Wetland 1 (refer to drawings in Appendix B). Iron Mine Brook is a lower perennial stream (R2) with a sandy bottom. Iron Mine Brook flows beneath Wallum Lake Road to the east of the proposed CREC via culvert and eventually discharges to the Clear River. Iron Mine Brook is a RIDEM Category 3 river, meaning that there is insufficient or no data to identify its designated uses, and is classified as a Class-B waterbody. A Class-B waterbody can be considered potentially suitable for bathing, fish and wildlife habitat, recreational use, agricultural use, industrial supply and other legitimate uses, including navigation. Iron Mine Brook is approximately 10 to 12 feet wide; it therefore has an associated 200-foot Riverbank Wetland per the RIDEM Wetland Regulations.

Two unnamed intermittent streams are present in the eastern Project area. Both of these streams originate north of the Project area, and flow under Algonquin Lane via culverts. The two streams meet in the northeastern portion of Wetland 1 and flow south, passing through a metal pipe culvert under the woods road, until ultimately reaching Iron Mine Brook. These streams average less than 10 feet wide in their reach through the proposed Project site; they therefore have an associated 100-foot Riverbank Wetland per the RIDEM Wetland Regulations.

The primary surface hydrologic feature in the western portion of the proposed Project area is an unnamed perennial tributary to Dry Arm Brook, which flows

through the western branch of Wetland 2 in a generally northeasterly direction. This perennial stream is designated as a Class-B waterbody. In its reach through the proposed Project site, this stream is a lower perennial stream with a sandy and muddy bottom (R2). Where it passes through the proposed Project area, this stream averages less than 10 feet wide; it therefore has an associated 100-foot Riverbank Wetland per the RIDEM Wetland Regulations.

Two unnamed intermittent streams are located in the western portion of the proposed Project site, which discharge into the unnamed perennial tributary to Dry Arm Brook. A fifth unnamed,intermittent stream is located in the central Project area and flows through a forested wetland. Each of these streams average less than 10 feet wide in their reach through the proposed Project site; they therefore have an associated 100-foot Riverbank Wetland per the RIDEM Wetland Regulations. Refer to drawings in Appendix B for stream locations.

1.3 Natural Heritage Area Information

All construction activities required to submit an NOI to RIDEM are required to provide the Natural Heritage Area (NHA) information in the NOI application. This information is to assist RIDEM in the determination of projects that propose a storm water or allowable non-storm water discharge to a NHA, or has discharge related activities that may potentially affect a listed or proposed to be listed endangered or threatened species or its critical habitat.

The online RIDEM mapping services depicting NHAs were consulted for this project. The powerblock site is not within or discharging directly to any listed NHAs.

1.4 Historic Preservation and Cultural Resources Information

A Phase I Archeological Intensive Survey was conducted in each of the site areas designated for the Project. Shovel test pits were excavated at 10.0 meter intervals. Shovel test pits measured 50 by 50 cm square and were typically excavated no greater than 80 cm below the ground surface.

Seven areas of archeological interest were identified:

- A historic structure near the transmission line area. This structure will be avoided;
- A lithic scatter in the northeastern portion of the powerblock;
- A historic artifact scatter in the southeastern portion of the powerblock;

- A lithic scatter in the southeastern workspace area (Iron Mine Brook Dune Site). A Phase II archeological site examination was completed on this site which concluded that based on the lack of diversity of artifacts and absence of cultural features, the site lacks the ability to expand on the region's knowledge of Pre-Contact Native American people and, therefore, no further archeological investigation was recommended;
- A historic structure in the northeastern portion of the frontage area. This structure will be avoided.
- Historic artifacts in the in the frontage area; and
- Historic artifacts in the PUD well site survey area.

In a letter dated June 28, 2016, the Rhode Island Historical Preservation and Heritage Commission concluded the following:

- The artifact scatters do not constitute significant cultural resources and that no further archeological investigation of them is warranted;
- The Iron Mine Brook Dune site is not eligible for listing on the National Register of Historic Places, but is a potentially significant cultural resource, and should be avoided;
- Unless the project's construction impacts change, the construction of the Clear River Energy Center will have no effect on any significant cultural resources (those listed or eligible for listing on the National Register of Historic Places).

The complete Phase I and Phase II Archaeological Report for the Project site has been provided under separate cover.

1.5 Site Features and Constraints

The first goal in the low impact development (LID) site planning and design process is to avoid disturbance of natural features. This includes identification and preservation of natural areas that can be used in the protection of water resources.

Sensitive resources that exist at the site are described herein. Avoidance and minimization of impact to these features and mitigation of such impact has been the primary goal of the site design.

- Floodplains: there are no FEMA-mapped floodplains on site or within the limits of disturbance.
- Steep slopes (>15%): According to elevation data collected in 2011 with Light Detection and Ranging technology and obtained from the Rhode Island GIS database, the elevation of the proposed site varies from approximately 530 to 590 feet above sea level, with the parcel sloping downward from southwest to northeast. The average grade on the property is 5.5%, but the hill in the southwestern portion of the Site has steeper slopes. This hill (area of steep slopes) has been avoided to preclude future slope stability issues.
- Areas with the potential to receive run-on from off-site areas: The majority of the site receives runoff from offsite areas. This constraint has been mitigated through the site grading plan and stormwater management system proposed.
- Erodible soils: the preliminary geotechnical report prepared for the project site did not note presence of specific erodible soils.
- Wetlands, hydric soils, surface waters, and their riparian buffers, specimen trees, natural vegetation, forest areas, and stream crossings: these constraints are described in Section 1.2.
- Historic properties, historic cemeteries or cultural resources: these constraints are described in Section 1.4.

1.6 Appendix A Checklist

The Appendix A Checklist in the RISDISM serves as a guide for engineers and designers to refer to during all stages of a project to insure that they are meeting all applicable requirements. The checklist for this project is included as Appendix C of this report.

2.0 STORMWATER SITE PLANNING, ANALYSIS, AND DESIGN REPORT

Minimum Standard 1 of the Rhode Island Stormwater Design and Installation Standards Manual, last amended March 2015 (RISDISM) establishes an approach for measuring

compliance with appropriate LID site planning and design and requires that the site planning process be formally documented and address at least the following objectives. These objectives have been reproduced below with this project's compliance with each following in **bold.**

2.1 Low Impact Development (LID) Planning

2.1.1 Avoid Impacts

1. Protect as much undisturbed open space as possible to maintain pre-development hydrology and allow precipitation to naturally infiltrate into the ground. **The site design and layout have been optimized to minimize footprint and protect as much undisturbed open space as feasible while still accomplishing the project objective (installation of a power generation facility). The site's proposed drainage pattern and post-construction stormwater management program have been designed to maintain the pre-development hydrology to the extent practicable. Care has been given to discharge stormwater to the surrounding wetlands to protect the existing hydrology and drainage patterns to the extent practicable. To protect against soil erosion up flow level spreaders have been utilized to dissipate energy. Refer to drawings in Appendix B for proposed site grading and layout.**
2. Maximize the protection of natural drainage areas, streams, surface waters, wetlands, and jurisdictional wetland buffers. **The site design and layout have been prepared with the goal of minimizing disturbance to on-site streams and wetlands to the extent practicable. Stream and wetland impacts are proposed in order to construct and operate the facility, however these impacts have been reduced through the use of retaining walls, site general arrangement configuration, and access road alignment selection. Further details regarding the access road alignment and site general arrangement configuration can be found on the drawings in Appendix B.**
3. Minimize land disturbance, including clearing and grading, and avoid areas susceptible to erosion and sediment loss. **The disturbance limits for this project have been reduced to the minimum required to construct and operate the facility. Areas prone to erosion and**

sediment loss have been avoided (steep slopes at the southwest corner of the site).

4. Minimize soil compaction and restore soils compacted as a result of construction activities or prior development. **The majority of the site disturbance area is proposed to be improved surfaces (gravel or pavement) at which minimization of compaction is infeasible. In areas proposed to be restored to existing conditions (laydown areas), provisions have been made to the Soil Erosion and Sediment Control (SESC) plan requiring the contractor to limit compaction to the minimum amount required to construct the facility. Provisions to restore in-situ relative compaction levels to pre-construction conditions, to the extent practicable, have also been included in the SESC plan.**

2.1.2 Reduce Impacts

5. Provide low-maintenance, native vegetation that encourages retention and minimizes the use of lawns, fertilizers, and pesticides. **Low-maintenance and natively vegetated surfaces have been specified in areas proposed for restoration following construction. A small portion of the overall site (not the site disturbance limits) is proposed to be improved surfaces, at which locations native vegetation is infeasible. The use of lawns, fertilizers, and pesticides has been minimized to the extent practicable in the Operations and Maintenance plan (refer to Section 4.0 of this document).**
6. Minimize impervious surfaces. **The site General Arrangement (GA) has been optimized to minimize improved (impervious) surface area to the extent practicable while still accomplishing the project's goals. Refer to drawings in Appendix B for proposed site grading and layout. Construction and operation of a power generation facility requires impervious surface; the site GA has been designed to minimize impervious surface. Minimization measures include but are not limited to bringing buildings closer together and utilizing retaining walls to minimize grading activities.**
7. Minimize the decrease in the "time of concentration" from pre-construction to post construction, where "time of concentration" means the time it takes for runoff to travel from the hydraulically most distant point of the drainage area to the point of interest within a watershed.

The site's stormwater management program and associated proposed grading and drainage plans have been designed specifically to minimize the decrease to Time of Concentration (Tc) in the post-construction condition, to the maximum extent practicable given site constraints. Consideration to avoidance of impacts was given over Tc matching.

2.1.3 Manage Impacts at the Source

8. Infiltrate precipitation as close as possible to the point it reaches the ground using vegetated conveyance and treatment systems. **Vegetated conveyance and treatment systems have been proposed in applicable areas. The powerblock area is classified as a Land Use with Higher Potential Pollutant Loads (LUHPPL), which are precluded from infiltrating precipitation which has contacted the LUHPPL. An unlined dry swale is proposed in the access road area to meet this LID objective. Additional details regarding the proposed stormwater Best Management Practices (BMPs) is presented in Section 2.5 of this report, below.**
9. Break up or disconnect the flow of runoff over impervious surfaces. **The site access road has been designed with a cross slope to meet the intent of this LID objective. The road cross slope drains to a dry swale, thereby reducing flow over impervious surfaces to the maximum extent practicable. This LID objective is not applicable to the powerblock area, as it is classified as a LUHPPL.**
10. Provide source controls to prevent or minimize the use or exposure of pollutants into stormwater runoff at the site in order to prevent or minimize the release of those pollutants into stormwater runoff. **Source control BMPs will be provided at the project site in the form of a Pollution Prevention Plan to be developed in final design of the project.**

2.1.4 LID Credits

The LID Stormwater Credit rewards the use of LID techniques for disconnecting impervious surfaces and preserving natural hydrologic conditions. The Credit allows project applicants to reduce or eliminate the structural stormwater BMPs otherwise required to meet groundwater recharge (Rev) and water quality volume (WQv) criteria by directing

stormwater runoff to qualifying pervious areas (QPAs) that provide recharge and treatment.

Due to the nature of the proposed project and site, installation of QPAs is infeasible at the project site and no LID Credits are sought. The overall configuration of the power generation facility and its access road precludes development of a site drainage program which complies with the minimum criteria for draining stormwater to a QPA. Specifically, Section 4.6.1.1 of the RISDISM requires rooftop and non-rooftop impervious areas draining to any one discharge location not to exceed 1,000 square feet. Micro-division of the approximately 700,000 square feet (powerblock area only) of proposed impervious surface into individual areas which drain to QPAs is an infeasible alternative due to the equipment and building sizes required to accomplish the overall objective of the project.

In addition to being infeasible due to drainage plan requirements, Section 4.6.1.1 of the RISDISM requires the minimum QPA length be that of its contributing impervious area flow path. Compliance with this requirement would necessitate increasing the overall disturbance limits substantially, which would impact additional aquatic resources and be counterproductive to LID objective 1.

2.2 Hydrologic and Hydraulic Analysis

Portions of the project site proposed for improvement have been analyzed in accordance with guidance presented in Appendix K of the RISDISM. Five Points of Interest (POIs) have been established, POI A though POI E. Each point of interest is common in pre- and post-development conditions. There are minor existing roadway culverts within the project area which are proposed for removal or replacement; there are no known existing other drainage facilities in any POI's drainage area. All cover types within all drainage areas are currently forested.

POI A is downgradient of the proposed discharge structure from the powerblock's stormwater detention facility (refer to Appendix B for additional design details). POI A drains to Iron Mine Brook, and is set in existing wetlands.

POI B is set at the downstream end of the proposed culvert (and approximately location of a culver for the existing wood road). POI B discharges to Iron Mine Brook.

POI C has been established immediately south of Wallum Lake Road at the downstream end of a proposed roadway culvert. POI C discharges to Iron Mine Brook.

POI D is an off-site point of interest, needed to determine the peak runoff reduction caused by the project at this off-site area. The proposed grading plan (refer to Appendix B) results in a small amount of area tributary to POI D being diverted to POIs A and B. This reduction is quantified in the calculations discussed below and presented in Appendix A.

POI E is at the existing road culvert for Iron Mine Brook. POI E is needed to perform the downstream analysis discussed below.

2.2.1 Groundwater Recharge

The recharge criterion (Rev) requires that the stormwater be recharged based on the amount of impervious area and in accordance with RISDISM Section 3.3.2. The groundwater recharge requirement may be waived or reduced by applying the LID Stormwater Credit; however, as discussed in Section 2.1.4, due to the nature of the proposed project, no LID Stormwater Credit is sought. Recharge requirements are based on hydrologic soil group (HSG).

The powerblock area is classified as a LUHPPL, for which infiltration or Groundwater Recharge is prohibited per RISDISM Section 3.3.2. The access road area meets the Groundwater Recharge criteria through the use of a Dry Swale (see Section 2.5, below, for additional detail).

Groundwater Recharge at the project site's proposed access road is summarized below. The access road area meets the minimum requirements of the RISDISM Minimum Standard 2. The required volume was calculated using Section 3.3.2 of the RISDISM guidance; please refer to Appendix A for associated calculations.

Table 1 – Summary of Groundwater Recharge (Rev)		
Area	Required minimum Rev, cf	Provided Rev, cf
Powerblock	N/A	N/A
West Access Road	495	500
East Access Road	495	500

2.2.2 Water Quality Volume

The water quality volume (WQv) is the amount of stormwater runoff from any given storm that must be captured and treated in order to remove a significant fraction of stormwater pollutants on an average annual basis. The required WQv, which results in the capture and treatment of the entire runoff volume for 90 percent of the average annual storm events, is equivalent to the runoff associated with the first 1.2 inches of rainfall over the impervious surface (i.e., 1 inch of runoff).

The powerblock area meets this criterion through the use of a Gravel Wet Vegetated Treatment System (GWVTS), see Section 2.5 of this document for additional details regarding this structural stormwater management BMP. The access road area meets this criterion through the use of a Dry Swale. Minimum required water quality volumes were calculated in accordance with RISDISM Section 3.3.3 (refer to Appendix A for calculations). The proposed site's compliance with Minimum Standard 3 is summarized below.

Table 2 - Summary of Water Quality Volume (WQv)		
Area	Required minimum WQv, cf	Provided WQv, cf
Powerblock	54,102	57,517
West Access Road	1,978	4,641
East Access Road	1,978	2,330

2.2.3 Water Quality Flow

The GWVTS proposed to treat the powerblock's drainage area is connected to a detention pond proposed as a peak mitigation facility. In accordance with RISDISM Section 3.3.3.2, calculation of the water quality flow is required. The water quality flow (WQf) is the peak flow rate associated with the water quality design storm or WQv. The water quality flow must be calculated to insure that only the water quality volume reaches the proposed GWVTS, and storms of higher return period are bypassed to the detention basin to avoid damaging flows impacting the GWVTS.

Although most of the stormwater treatment practices in the RISDISM manual are sized based on WQv, flow diversion structures for off-line stormwater treatment practices must be designed to bypass flows greater than the WQf. Due to the configuration of the proposed GWVTS and its associated sediment forebay (refer to Section 2.5 of this document for additional detail), calculation of the WQf was undertaken. Refer to Appendix A for calculations. The WQf and associated bypass structure has been designed in accordance with RISDISM Section 3.3.3.2, and is summarized below. The WQf is the peak discharge for the water quality event.

Table 3 - Summary of Water Quality Flow (WQf)		
Area	Calculated WQf, cfs*	Maximum flowrate through sediment forebay riser structure, cfs
Powerblock	6.73	3.76
West Access Road	0.22	0.05
East Access Road	0.22	0.20

*Flows greater than this are diverted into the detention basin (refer to drawings in Appendix B for stormwater BMP locations).

2.2.4 Channel Protection

The channel protection volume (CPv) is the 24-hour extended detention of the post-development runoff volume from the 1-year, 24-hour Type III design storm event.

For facility sizing criteria, the basis for hydrologic and hydraulic evaluation of the project site are as follows:

- The NRCS TR-20 model was used to determine the CPv (in accordance with Section 3.3.4 of the RISDISM guidance).
- Conveyance systems were sized using the NRCS TR-55 (swales and stormsewers).
- Off-site areas draining to proposed facilities were modeled as “present condition” for the one-year storm event.
- The length of sheet flow used in time of concentration (tc) calculations was limited to no more than 100 feet for post-development conditions.
- The CPv shall be released at roughly a uniform rate over a 24-hour duration.

The RISDISM guidance document requires computation of the CPv using methodology developed by Harrington in 1987. For the proposed project,

the runoff volume associated with the 1-year, 24-hour Type III storm event was computed for each drainage area (refer to Appendix A for calculations), and the CPv determined by multiplying the runoff volume for each area by 0.65. The results of this analysis are presented below.

Table 4 - Summary of Channel Protection Volumes (CPv)

Area	Calculated CPv, cf	Calculated average release rate, cfs	Provided average release rate, cfs
Powerblock	260,220	3.01	2.64
West Access Road	12,080	0.14	0.14
East Access Road	N/A	N/A	N/A

As summarized above, the powerblock drainage area's detention pond has been designed to meet Channel Protection criteria. The access road's detention basin has also been designed to meet these criteria. Refer to Appendix A for associated calculations.

2.2.5 Overbank Flood Protection

Peak flow attenuation is required for the 10-year and 100-year, 24-hour Type III design storm events. The primary purpose of this sizing criterion is to prevent an increase in the frequency and magnitude of out-of-bank flooding (i.e., flow events that exceed the bankfull capacity of the channel, and therefore, must spill over to the floodplain). One of the key objectives of an out-of-bank flooding requirement is to protect downstream structures (houses, businesses, culverts, bridge abutments, etc.) from increased flows and velocities from upstream development. The intent of this criterion is to prevent increased flood damage from infrequent but very large storm events, maintain the boundaries of the predevelopment floodplain, and protect the physical integrity of a stormwater management practice itself.

For facility sizing criteria, the basis for hydrologic and hydraulic evaluation of the project site are as follows:

- The TR-20 model was used for determining the required storage and outlet structures for attenuating the peak flows from the 10-year and 100-year, 24-hour Type III design storms.
- The standard for characterizing pre-development land use for on-site areas was woods (entire proposed drainage area is wooded).
- For purposes of computing runoff, all pervious lands prior to development were assumed to be in good condition regardless of conditions existing at the time of computation.
- Off-site areas that drain to a proposed facility were modeled as "present condition" for peak-flow attenuation requirements.
- Off-site areas drain to the proposed stormwater management BMPs. The calculations in Appendix A of this document demonstrate safe passage of the 100-year event based on actual conditions upstream.
- The length of sheet flow used in tc calculations is limited to no more than 150 feet for pre-development conditions and 100 feet for post-development conditions.
- The proposed site design demonstrates that the 100-year event will be safely conveyed through the proposed ponds (two detention facilities—one at the powerblock drainage area and one at the proposed access road drainage area), which have been designed to manage the 100-year event.

The detention basin at the south side of the powerblock area and detention basin serving the proposed access road have been designed to meet these criteria and that of Minimum Standard 5. The results are summarized below.

Table 5 - Summary of Overbank Flood Protection (Qp), cfs				
POI	10-year pre-development runoff rate, cfs	10-year post-development runoff rate, cfs	100-year pre-development runoff rate, cfs	100-year post-development runoff rate, cfs
A	19.52	17.92	45.19	39.82
B	77.91	66.18	180.53	152.67
C	9.01	8.12	20.58	18.06
D	140.96	137.55	327.06	319.56
E	132.27	118.78	312.72	277.27

2.2.6 Downstream Analysis

A downstream analysis is required for projects meeting the project size and impervious cover characteristics specified in the RISDISM or when deemed appropriate by the approving agency when existing conditions are already causing a problem (e.g., known drainage or flooding conditions or existing channel erosion is evident), to determine whether peak flow impacts are fully attenuated by controlling the 10- and 100-year events. The criterion used for the limit of the downstream analysis is referred to as the "10% rule." Under the 10% rule, a hydrologic and hydraulic analysis is extended downstream to the point where the site represents 10% of the total drainage area. For example, a 10-acre disturbed area within the same subwatershed would be analyzed to the point downstream with a drainage area of 100 acres.

This project's disturbance area within the watershed and proposed impervious cover percentage require the preparation of a Downstream Analysis in accordance with Section 3.3.6 of the RISDISM. Such an analysis has been prepared, and the site's proposed stormwater management BMPs meet the requirements of RISDISM Section 3.3.6 related to Downstream Analysis. The analysis is included in Appendix A of this report.

2.3 Land Uses with Higher Potential Pollutant Loads (LUHPPL)

The majority of the developed portion of the project site qualifies as a LUHPPL in accordance Section 3.0 of the RIDEM Stormwater Manual. The proposed site use in the powerblock area is a power generation facility (industrial site as defined in RIPDES Rule 31(b)(15)). The site does not qualify for a No Exposure Certification for Exclusion from RIPDES Stormwater Permitting. Only the drainage area comprised of the project's access road is not considered a LUHPPL.

2.4 Illicit Discharges

All illicit discharges to stormwater management systems are prohibited, including stormwater best management practices and any pipes intended to transport stormwater to ground water, surface water, or municipal separate storm sewer system (MS4). Illicit discharges to the stormwater management system, i.e., illicit connections, are discharges not entirely comprised of stormwater that are not specifically authorized by a National Pollutant Discharge Elimination System (NPDES) or RIPDES permit. The project plan prevents pollutants from being discharged into MS4s and Waters of the State, and safeguards the environment and public health, safety, and welfare.

2.5 Structural Best Management Practices

Structural Best Management Practices (BMPs) to be installed at the project site include a Dry Swale (RISDISM # 5.7) and a Gravel Wet Vegetated Treatment System (RISDISM # 5.2). Refer to drawings in Appendix B for design details of each proposed facility.

The Gravel Wet Vegetated Treatment System meets the following design criteria:

- Surface area must be minimum of 0.35% of drainage area.
- At least 10% of the WQv shall be provided in a sediment forebay or other pretreatment practice. The remaining 90% of the WQv may be provided in some combination of one or more basins filled with gravel and Extended Detention (ED) storage above the gravel. ED storage volume shall not exceed 50% of the WQv and shall drain over 24 hours.
- Maintain substrate in saturated condition

The Dry Swale meets the following design criteria:

- Maximum longitudinal slope of 4%, without check dams. **Maximum slope of 3.9% is proposed**

- Non-erosive (3.5 to 5.0 fps) peak velocity for the 1-year storm. **Maximum velocity of approximately 3 fps is proposed.**
- Safe conveyance of the 10-year storm. **Refer to Appendix A for conveyance calculations**
- Side slopes gentler than 2:1 (3:1 preferred). **2:1 side slopes proposed.**
- The maximum allowable temporary ponding time of 48 hours. **The maximum ponding time varies (refer to Appendix A), but is approximately 12 hours.**
- 10% of the WQv in pretreatment, usually provided using check dams at culverts or driveway crossings. **Check dams are provided – refer to Appendix B. 10% of WQv is provided in check dams.**
- Storage of WQv through properly sized filter media/bioretention soil (dry swale). **Refer to appendix A – filter media has been sized.**
- Bottom width no greater than 8 feet, but no less than 2 feet. **Bottom widths vary, but are generally 2 feet in width.**
- Dry Swale utilizes bioretention soil media as detailed in Appendix F of RISDISM. **Appendix F of the RISDISM was used to specify soil media.**

The proposed post construction stormwater management BMPs meet or exceed all criteria listed above. Refer to Appendix A for calculations demonstrating designed compliance, and Appendix B for plan drawings of details.

2.6 Stormwater Design Calculations

Stormwater design calculations have been included in Appendix A of this document. Please refer to this appendix for further information.

3.0 SOIL EROSION AND SEDIMENT CONTROL PLAN

3.1 Erosion, Runoff, and Sediment Control Practices

3.1.1 Avoid and Protect Sensitive Areas and Natural Resources

Areas of existing and remaining vegetation and areas that are to be protected during construction have been clearly marked on the plans (all areas outside the proposed project's Limit of Disturbance shall not be disturbed). The site plan has been developed to maximize the protection of natural drainage areas, streams, surface waters, and jurisdictional wetland buffers to the extent practicable. The site plan has been designed to avoid impacts, requiring the preservation of buffers and floodplains by delineating

and preserving naturally vegetated riparian buffers and floodplains and implementing measures to ensure that buffers and native vegetation are protected. These measures consist of limiting grading and disturbance limits to the minimum amount needed to construct the project.

3.1.2 Minimize Area of Disturbance

Limits of Disturbance (LOD) are clearly marked on the preliminary draft SESC plan. The amount of land area disturbed has been minimized to the extent practicable. Existing vegetation has been left in place as far as practical. The site design has been optimized to result in the minimum area of disturbance needed to construct the project.

The total amount of land area disturbed at one time has been minimized. Construction activity will be phased to minimize the amount of area that is being actively disturbed. The following distinct phases designed to limit the amount of exposed soil are anticipated:

- Clearing and grubbing;
- Site grading and construction of fill/cut slopes;
- Facility construction

Adequate temporary controls will be installed on previous phases prior to initiating the land disturbance in subsequent phases until final site stabilization is achieved and post-construction control measures are brought on-line. Phasing will take into account the requirements to manage temporary changes to runoff volume and peak runoff rates due to changes to runoff characteristics caused by the construction activity.

3.1.3 Minimize Disturbance of Steep Slopes

Construction activities on steep slopes (>15%) have been avoided by precluding disturbance on the existing steep slope areas on site (near the southwest corner).

3.1.4 Preserve Topsoil

The Limits of Disturbance will be scraped of usable and vegetation-supporting topsoil, and such topsoil will be stockpiled on the laydown yard to the extent feasible. Disturbed areas that are not designed to be an improved surface post-construction will be respread with the stockpiled topsoil prior to revegetation .

3.1.5 Stabilize Soils

Upon completion and acceptance of site preparation and initial installation of erosion, runoff, and sediment controls and temporary pollution prevention measures, the contractor shall initiate appropriate stabilization practices during all phases of construction on all disturbed areas as soon as possible, but not more than 14 days after the construction activity in that area has temporarily or permanently ceased.

Any disturbed areas that will not have active construction activity occurring within 14 days shall be stabilized using the control measures depicted on the approved plan set and in accordance with applicable measures specified in the Rhode Island Soil Erosion and Sediment Control Handbook. (Handbook)

3.1.6 Protect Storm Drain Inlets/Outlets

There are no known storm drain inlets/outlets on site within the disturbance limits. Should any inlets be discovered in the course of the work, the contractor shall immediately implement storm drain inlet protection measures to prevent soil and debris from entering storm drain inlets in compliance with the Handbook.

3.1.7 Establish Temporary Controls for Post Construction BMP Protection

Temporary measures shall be installed (please refer to the project's Soil Erosion and Sediment Control (SESC) plan, under separate cover) to protect permanent or long-term stormwater control and treatment measures as they are installed and throughout the construction phase of the project so that they will function properly when they are brought online. There are no proposed infiltration practices BMPs proposed on site; however, soil compaction shall be limited to the minimum extent necessary to construct the project.

3.1.8 Divert Run-on

Structural control measures are proposed to limit stormwater flow from coming onto the project area, and to divert and slow on-site stormwater flow from exposed soils to limit erosion, runoff, and the discharge of pollutants from the site. A channel is proposed to divert run-on near the proposed stream crossing.

3.1.9 Retain Sediment Onsite

Due to the existing and proposed grading of the Project site, two sediment basins are proposed. Each sediment basin is anticipated to control the runoff from common drainage locations serving five or more acres.

Sediment basins are proposed in the future location of detention/retention BMPs. In the proposed temporary construction laydown areas, temporary sediment basins will be provided where attainable until final stabilization of the site is complete. Temporary sediment basins are designed in accordance with the Handbook.

The volume of wet storage is at least twice the sediment storage volume and has a minimum depth of two feet. Sediment storage volume accommodates a minimum of one year of predicted sediment load as calculated using the sediment volume formula provided in the Measure, Temporary Sediment Basins section of the Handbook.

In addition to sediment storage volume and wet storage volume, the sediment basins provide adequate residence storage volume to provide a minimum 10 hours residence time for a 10-year frequency, 24-hour duration, and Type III distribution storm.

3.1.10 Conveyance Channel Design

Temporary conveyance practices have been sized to handle the peak flow from the 10-year, 24-hour Type III design storm. Temporary conveyance measures diverting off-site runoff have been sized to handle the 100-year, 24-hour Type III design storm event.

3.1.11 BMP List

Please refer to the project's SESC plan, transmitted under separate cover for details.

3.2 Construction Activity Pollution Prevention Practices

3.2.1 Discharges from Site

The site currently discharges to Iron Mine Brook and an Unnamed Tributary to Iron Mine Brook. There is no known water quality data on the discharges from the site.

3.2.2 Proper Waste Disposal

Building materials and other construction site wastes must be properly managed and disposed of in a manner consistent with State Law and/or regulations.

- A waste collection area shall be designated on the site that does not receive a substantial amount of runoff from upland areas and does not drain directly to a waterbody or storm drain.
- All waste containers shall be covered to avoid contact with wind and precipitation.
- Waste collection shall be scheduled frequently enough to prevent containers from overfilling.
- All construction site wastes shall be collected, removed, and disposed of in accordance with applicable regulatory requirements and only at authorized disposal sites.
- Equipment and containers shall be checked for leaks, corrosion, support or foundation failure, or other signs of deterioration. Those that are found to be defective shall be immediately repaired or replaced.

3.2.3 Spill Prevention and Control

All chemicals and/or hazardous waste material must be stored properly and legally in covered areas, with containment systems constructed in or around the storage areas. Areas must be designated for materials delivery and storage. All areas where potential spills can occur and their accompanying drainage points must be described. The owner and operator must establish spill prevention and control measures to reduce the chance of spills, stop the source of spills, contain and clean-up spills, and dispose of materials contaminated by spills. The operator must establish and make highly visible location(s) for the storage of spill prevention and control equipment and provide training for personnel responsible for spill prevention and control on the construction site. A Spill Prevention and Control plan will be developed by the contractor prior to the start of construction.

3.2.4 Prohibited Discharges

The following discharges are prohibited at the construction site:

- Contaminated groundwater, unless specifically authorized by the DEM. These types of discharges may only be authorized under a separate DEM RIPDES permit.
- Wastewater from washout of concrete, unless the discharge is contained and managed by appropriate control measures.
- Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials.
- Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance. Proper storage and spill prevention practices must be utilized at all construction sites.
- Soaps or solvents used in vehicle and equipment washing.
- Toxic or hazardous substances from a spill or other release.

3.2.5 Dewatering Practices

Site owners and operators are prohibited from discharging groundwater or accumulated stormwater that is removed from excavations, trenches, foundations, vaults, or other similar points of accumulation, unless such waters are first effectively managed by appropriate control measures.

Examples of appropriate control measures include, but are not limited to, temporary sediment basins or sediment traps, sediment socks, dewatering tanks and bags, or filtration systems (e.g. bag or sand filters) that are designed to remove sediment. Uncontaminated, non-turbid dewatering water can be discharged without being routed to a control.

At a minimum the following discharge requirements will be met for dewatering activities:

- Do not discharge visible floating solids or foam.
- To the extent feasible, utilize vegetated, upland areas of the site to infiltrate dewatering water before discharge. In no case will surface waters be considered part of the treatment area.
- At all points where dewatering water is discharged, utilize velocity dissipation devices.
- With filter backwash water, either haul it away for disposal or return it to the beginning of the treatment process.

- Replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications.
- Dewatering practices must involve the implementation of appropriate control measures as applicable (i.e. containment areas for dewatering earth materials, portable sediment tanks and bags, pumping settling basins, and pump intake protection.)

3.2.6 Building Material Staging

All construction materials that have the potential to contaminate stormwater must be stored properly and legally in covered areas, with containment systems constructed in or around the storage areas. Areas must be designated for materials delivery and storage. Designated areas shall be approved by the site owner/engineer. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in the discharge of pollutants, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use).

3.2.7 Dust Control

Dust control procedures and practices shall be used to suppress dust on a construction site during the construction process, as applicable. Precipitation, temperature, humidity, wind velocity and direction will determine amount and frequency of applications. However, the best method of controlling dust is to prevent dust production. This can best be accomplished by limiting the amount of bare soil exposed at one time. Dust Control measures outlined in the RI SESC Handbook shall be followed. Other dust control methods include watering, chemical application, surface roughening, wind barriers, walls, and covers.

3.2.8 Designated Washout Areas

At no time shall any material (concrete, paint, chemicals) be washed into storm drains, open ditches, streets, streams, wetlands, or any environmentally sensitive area. The site operator must ensure that construction waste is properly disposed of, to avoid exposure to precipitation, at the end of each working day.

3.2.9 Fuel and Maintenance of Vehicles and Equipment

Vehicle fueling shall not take place within regulated wetlands or buffer zone areas, or within 50-feet of the storm drain system. Designated areas shall be depicted on the SESC Site Plans, or shall be approved by the site owner.

Vehicle maintenance and washing shall occur off-site, or in designated areas depicted on the SESC Site Plans or approved of by the site owner. Maintenance or washing areas shall not be within regulated wetlands or buffer zone areas, or within 50-feet of the storm drain system. Maintenance areas shall be clearly designated, and barriers shall be used around the perimeter of the maintenance area to prevent stormwater contamination.

Construction vehicles shall be inspected frequently for leaks. Repairs shall take place immediately. Disposal of all used oil, antifreeze, solvents and other automotive-related chemicals shall be according to applicable regulations; at no time shall any material be washed down the storm drain or in to any environmentally sensitive area.

3.2.10 Chemical Treatment for Erosion and Sediment Control

Chemical stabilizers, polymers, and flocculants are readily available on the market and can be easily applied to construction sites for the purposes of enhancing the control of erosion, runoff, and sedimentation. The following guidelines should be adhered to for construction sites that plan to use treatment chemicals as part of their overall erosion, runoff, and sedimentation control strategy.

The U.S. Environmental Protection Agency has conducted research into the relative toxicity of chemicals commonly used for the treatment of construction stormwater discharges. The research conducted by the EPA focused on different formulations of chitosan, a cationic compound, and both cationic and anionic polyacrylamide (PAM). In summary, the studies found significant toxicity resulting from the use of chitosan and cationic PAM in laboratory conditions, and significantly less toxicity associated with using anionic PAM. EPA's research has led to the conclusion that the use of treatment chemicals for erosion, runoff, and sedimentation control requires proper operator training and appropriate usage to avoid risk to aquatic species. In the case of cationic treatment chemicals additional safeguards may be necessary.

Application/Installation Minimum Requirements

If a site operator plans to use polymers, flocculants, or other treatment chemicals during construction the SESC plan must address the following:

- Treatment chemicals shall not be applied directly to or within 100 feet of any surface water body, wetland, or storm drain inlet.
- Use conventional erosion, runoff, and sedimentation controls prior to and after the application of treatment chemicals. Use conventional erosion, runoff, and sedimentation controls prior to chemical addition to ensure effective treatment. Chemicals may only be applied where treated stormwater is directed to a sediment control (e.g. temporary sediment basin, temporary sediment trap or sediment barrier) prior to discharge.
- Sites shall be stabilized as soon as possible using conventional measures to minimize the need to use chemical treatment.
- Select appropriate treatment chemicals. Chemicals must be selected that are appropriately suited to the types of soils likely to be exposed during construction and to the expected turbidity, pH, and flow rate of stormwater flowing into the chemical treatment system or treatment area. Soil testing is essential. Using the wrong form of chemical treatment will result in some form of performance failure and unnecessary environmental risk.
- Minimize discharge risk from stored chemicals. Store all treatment chemicals in leak-proof containers that are kept under storm-resistant cover and surrounded by secondary containment structures (e.g., spill berms, decks, spill containment pallets), or provide equivalent measures, designed and maintained to minimize the potential discharge of treatment chemicals in stormwater or by any other means (e.g., storing chemicals in covered areas or having a spill kit available on site).
- Use chemicals in accordance with good engineering practices and specifications of the chemical provider/supplier. You must also use treatment chemicals and chemical treatment systems in accordance with good engineering practices, and with dosing specifications and sediment removal design specifications provided by the supplier of the applicable chemicals, or document specific departures from these

practices or specifications and how they reflect good engineering practice.

3.2.11 Construction Activity Pollution Prevention

Please refer to the Soil Erosion and Sediment Control plan, transmitted under separate cover, for additional details regarding construction phase pollution prevention

3.3 Control Practice Installation, Inspection, and Maintenance Requirements

3.3.1 Installation

The installation of temporary erosion, runoff, sediment, and pollution prevention control measures must be completed by the time each phase of earth-disturbance has begun.

3.3.2 Monitoring Weather

The project site shall be inspected by or under the supervision of the owner and operator at least once every seven (7) calendar days and within twenty-four (24) hours after any storm event which generates at least 0.25 inches of rainfall per twenty-four (24) hour period and/or after a significant amount of runoff. A standard graduated cylinder rain gauge will be used.

3.3.3 Inspections

If an inspection reveals a problem, the operator must initiate work to fix the problem immediately after discovering the problem, and complete such work by the close of the next work day, if the problem does not require significant repair or replacement, or if the problem can be corrected through routine maintenance.

3.3.4 Maintenance

When installation of a new control or a significant repair is needed, site owners and operators must ensure that the new or modified control measure is installed and made operational by no later than seven (7) calendar days from the time of discovery where feasible. If it is infeasible to complete the installation or repair within seven (7) calendar days, the reasons why it is infeasible must be documented in the SESC Plan along with the schedule for installing the stormwater control measure(s) and making it operational as soon as practicable after the 7-day timeframe.

3.3.5 Corrective Action

If corrective actions are required, the site owner and operator must ensure that all corrective actions are documented on the inspection report in which the problem was first discovered. Corrective actions shall be documented, signed, and dated by the site operator once all necessary repairs have been completed.

3.4 Site Plans

Refer to the SESC Plans for a draft preliminary soil erosion and sediment control plan.

4.0 OPERATION AND MAINTENANCE PLAN

4.1 Introduction

An essential component of a successful stormwater system is the ongoing operation and maintenance of the various components of the stormwater drainage, control, and conveyance systems. Failure to provide effective maintenance can reduce the hydraulic capacity and the pollutant removal efficiency of stormwater practices.

Many people expect that stormwater facilities will continue to function correctly as designed forever. However, it is inevitable that deterioration of the stormwater infrastructure will occur once it becomes operational. The question is not whether stormwater management system maintenance is necessary but how often.

The operation and maintenance (O&M) program discussed in this plan is intended to address operation and maintenance concerns proactively instead of reacting to problems that occur such as flooding or water quality degradation associated with erosion, clogging, or failure of one or more practices. On-going maintenance is a vital part of ensuring the operational success of stormwater management facilities and is critical to achieving an extended service life of continuous operation as designed.

The project site is accessible via Wallum Lake Road (Route 100). Stormwater best management practices will be installed to manage flow from the proposed site. The majority of the developed portion of the site is considered a Land Use with Higher Potential Pollutant Load (LUHPPL), and drains to a lined gravel wet vegetated treatment system (GWVTS) designed in accordance with the Rhode

Island Department of Environmental Management (RIDEM) Rhode Island Stormwater Design and Installation Standards Manual, last revised March 2015. The site access road is not considered a LUHPPL, and drains to a dry swale and attenuation pond. The character and scale of the project site preclude the implementation of Qualified Pervious Areas (QPAs).

4.2 Responsible Party For Maintenance

Name:	Clear River Energy LLC.
Address:	One South Wacker Drive | Suite 1800 Chicago IL 60606
Phone Number:	TBD
Email:	TBD

4.3 Annual Maintenance Tasks and Post Storm Event Inspection

The following text describes required annual maintenance tasks for the GWVTS and dry swale. These are the only two types of post-construction best management practices (BMPs) at the project site.

The use of pesticides and fertilizers shall be reduced to the maximum extent practicable.

Inspections discussed below will be performed annually and after major storm events. For the purposes of this plan, major storm events are considered to be 1-year, 24-hour Type III precipitation event (i.e., storm events that generate 2.7 inches of rain or more – Providence County).

4.3.1 Gravel Wet Vegetated Treatment System

General inspections should be conducted on an annual basis and after storm events greater than or equal to the 1-year, 24-hour Type III precipitation event (2.7 inches of rain). The maintenance objectives for these practices include preserving the hydraulic and removal efficiency of the GWVTS and maintaining the structural integrity. The slopes of the basin or GWVTS should be inspected for erosion and gullying. Reinforce existing riprap if riprap is found to be deficient, erosion is present at the outfalls of any control structures, or the existing riprap has been compromised. All structural components, which include, but are not limited to, trash racks, access gates, valves, pipes, weir walls, orifice structures,

and spillway structures, should be inspected and any deficiencies should be reported. This includes a visual inspection of all stormwater control structures for damage and/or accumulation of sediment. Sediment should be removed from the forebay when design depth has been reduced by 50%. All material, including any trash and/or debris from all areas within the extents of the GWVTS area including trash rack and flow control structures, should be disposed of in accordance with all federal and local regulations.

Any areas within the extents of the stormwater facility that are subject to erosion or gullying should be replenished with the original design material and re-vegetated according to design drawings. Slope protection material should be placed in areas prone to erosion. Embankment stability should be inspected for seepage and burrowing animals.

Mow the grass around the perimeter of the GWVTS at least 4 times annually. Vegetation along the maintenance access roads should be mowed annually. Prune all dead or dying vegetation within the extents of the GWVTS, remove all herbaceous vegetation root stock when overcrowding the maintenance access to the facility, remove any vegetation that has a negative impact on stormwater flowage through the facility, and trim any overgrown vegetation within the basin. Any invasive vegetation encroaching upon the perimeter of the facility should be pruned or removed if it is prohibiting access to the facility, compromising sight visibility and/or compromising original design vegetation. Replace any/all original vegetation that has died off or has not fully established, as determined at the time of the inspection. GWVTS vegetation should be reinforced to its original design standards if less than 50% of the original vegetation is established after two years.

The GWVTS inspection form located in the separate Soil Erosion and Sediment Control (SESC) plan is to be used to document inspections of the GWVTS. Completed forms are to be maintained as part of this document for the time period specified in the project's RIPDES permit.

4.3.2 Dry Swales (Conveyance and Treatment Swales)

Inspect dry swales on an annual basis and after storms of greater than or equal to the 1-year, 24-hour Type III precipitation event. Both the structural

and vegetative components should be inspected and repaired. When sediment accumulates to a depth of approximately 3 inches, it should be removed, and the swale should be reconfigured to its original dimensions.

The vegetation in the dry swale should be mowed as required to maintain heights in the 4-6 inch range, with mandatory mowing once heights exceed 10 inches. At a minimum, each swale should be mowed at least once per year.

If the surface of the dry swale becomes clogged to the point that standing water is observed on the surface 48 hours after precipitation events, the bottom should be roto-tilled or cultivated to break up any hard-packed sediment, and then reseeded. Trash and debris should be removed and properly disposed of.

Check dams should be inspected annually or after major storm events for evidence of flow going around the check dams, evidence of erosion, or accumulated sediments and repaired as necessary.

The Open Channel inspection form in the separate Soil Erosion and Sediment Control (SESC) plan is to be used to document inspections of the swales. Completed forms are to be maintained as part of this document for the time period specified in the project's RIPDES permit.

4.4 Easements

Easements for construction and maintenance of the proposed power plant have been obtained from underlying property owners. No maintenance easements are needed.

4.5 Source of Ongoing Funding For Maintenance

The project will be operated by Clear River Energy LLC. Funding for BMP operation and maintenance will be included as part of the overall plant operations budget. Project operations will be funded through revenue from the electric generation capacity planned on site.

4.6 Minimum Vegetative Cover Requirements

Minimum vegetative cover requirements are addressed as part of section 4.3 of this document, specifically related to the mowing frequency of both the GWVTS and Dry Swale.

4.7 Access and Safety

The GWVTS and the dry swale are accessible from the project's access road and power plant site area. Long-term access to the project will be from Wallum Lake Road. Due to the location and nature of these BMPs, no access or safety issues are anticipated.

5.0 APPENDICES

5.1 Appendix A – Calculations

Drainage Report

For

Clear River Energy LLC
Rhode Island

September 2016

DISCHARGE POINT COMPARISONS

Point A			
Storm	**Existing (1S)**	**Proposed (21L)**	**Velocity [1]**
10-Year	19.52	19.01	0.89
100-Year	45.19	41.69	1.12
Note [1] - Exit at Level Spreader			

Point B			
Storm	**Existing (2S)**	**Proposed (22L)**	
10-Year	77.91	69.25	
100-Year	180.53	158.43	
Note 1 - Note 2			

Point C			
Storm	**Existing (3S)**	**Proposed (21R)**	
10-Year	9.01	8.12	
100-Year	20.85	18.06	

Point D			
Storm	**Existing (4S)**	**Proposed (23S)**	**% Increase**
10-Year	140.96	137.55	-2.42%
100-Year	327.06	319.56	-2.29%

DISCHARGE POINT COMPARISONS

Point E			
Storm	**Existing**	**Proposed**	**% Increase**
10-Year	132.27	118.78	-10.20%
100-Year	312.72	277.27	-11.34%

Invenergy – Rhode Island - Clear River Energy

Main Site (1S)

Total Drainage Area = 16.56 ac
Impervious Area = 16.56 ac
HSG = D

Groundwater Recharge (Re_v)

Note: LUHPPL therefore no infiltration required

$$Re_v = (1")(F)\left(\frac{I}{12}\right)$$

Table 3-4	
HSG	**Recharge Factor (F)**
A	0.60
B	0.35
C	0.25
D	0.10

F = recharge factor (Table 3-4)
I = 16.56 impervious area (ac)

Re_v = 1*F*(I/12)

Re_v = 0 groundwater recharge volume (ac-ft)

Re_v = 0 groundwater recharge volume (ft^3)

Water Quality Volume (WQ_v)

Note:

$$WQ_v = (1")\left(\frac{I}{12}\right)$$

I = 16.56 impervious area (ac)

WQ_v = 1*(I/12)

WQ_v = 1.38 Total Water Quality Volume (ac-ft) **OR** 60,113 ft^3 65,285 ft^3 - Actual Total Volume

Forbay = 0.14 10% of WQ_v in ac-ft **OR** 6,011 ft^3 7,768 ft^3 - Actual Forbay volume

WQ_v = 1.24 90% of WQ_v in ac-ft **OR** 54,102 ft^3 57,517 ft^3 - Actual rest of the WQ volume

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Modified CN

Note:

$$CN = 1000/\left[10 + 5P + 10Q - 10\left(Q^2 + 1.25QP\right)^{1/2}\right]$$

P = 1.2 rainfall in inches (use 1.2 inches for the Water Quality Storm)
Q = 1.00 runoff volume in watershed inches (equal to WQ_v / total drainage area)
A_t = 16.56 total drainage area in acres

CN = 1000/(10+5*P+10*Q-10*((Q^2)+1.25*Q*P)^(1/2))

CN = 98.15 Use = 98

Water Quality Flow (WQ_f)

Note:

$$WQ_f = (q_u)(A)(Q)$$

I_a = 0.04

T_c = 6 min. **OR** 0.10 hrs

I_a / P = 0.03

q_u = 260 unit peak discharge in cfs/mi^2/inch (from Exhibit 4-III of the TR-55 Manual)

A = 0.026 drainage area in mi^2

Q = 1.00

WQ_f = qu*A*Q

WQ_f = 6.73 peak discharge for a water quality event (cfs)

WQ_{f_actual} = 3.76 actual peak discharge for a water quality event (cfs) from HydroCAD **OK**

Surface Area of Filter Bed (A_f)

Note: LUHPPL therefore no infiltration required

$$A_f = (WQ_v)(d_f)/[(k)(h_f + d_f)(t_f)]$$

WQ_v = 60,113 Water Quality Volume in ft^3

d_f = Filter Bed Depth in ft

k = Coefficient of Permeability of Filter Media in ft/day

h_f = Average height of water above surface in ft

t_f = Design filter bed drain time in days

A_f = IFERROR((WQv*df)/((k)*(hf+df)*(tf)),"")

A_f = Surface area of filter bed in ft^2

Channel Protection Volume (CP_v)

Note:

$$CP_v = (V_r)/(0.65)$$

V_r = 169,143 runoff volume from 1-yr 24-hr Type III storm (ft^3)

T = 86400 Extended detention time (24 hrs) sec

CP_v = 260,220 required channel protection storage volume (ft^3)

CP_v / T 3.01 Average Release Rate (cfs)

2.64 Actual Release Rate (cfs) from HydroCAD **OK**

Invenergy – Rhode Island - Clear River Energy

Entrance Road - West End (12S & 26S)

Total Drainage Area = 1.33 ac
Impervious Area = 0.545 ac
HSG = C Note: use C instead of D because the soil is above the wetland

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Groundwater Recharge (Re_v)

Note:

$$Re_v = (1")(F)\left(\frac{I}{12}\right)$$

Table 3-4	
HSG	Recharge Factor (F)
A	0.60
B	0.35
C	0.25
D	0.10

F = 0.25 recharge factor (Table 3-4)
I = 0.545 impervious area (ac)

Re_v = 1*F*(I/12)

Re_v = 0.011354 groundwater recharge volume (ac-ft)

Re_v = 495 groundwater recharge volume (ft^3)

Water Quality Volume (WQ_v)

Note:

$$WQ_v = (1")\left(\frac{I}{12}\right)$$

I = 0.545 impervious area (ac)

WQ_v = 1*(I/12)

WQ_v = 0.05 Water Quality Volume (ac-ft) **OR** 1,978 ft^3

$Re_v + WQ_v$ = 2,473 ft^3 5,141 ft^3 **OK**

Modified CN

Note:

$$CN = 1000/\left[10 + 5P + 10Q - 10\left(Q^2 + 1.25QP\right)^{1/2}\right]$$

P = 1.2 rainfall in inches (use 1.2 inches for the Water Quality Storm)
Q = 0.41 runoff volume in watershed inches (equal to WQ_v / total drainage area)
A_t = 1.327 total drainage area in acres

CN = 1000/(10+5*P+10*Q-10*((Q^2)+1.25*Q*P)^(1/2))

CN = 88.90 Use = 89 Composit CN

Water Quality Flow (WQ_f)

Note: from DP 13P

$$WQ_f = (q_u)(A)(Q)$$

I_a = 0.25

T_c = 6 min. **OR** 0.10 hrs

I_a/P = 0.21

q_u = 260 unit peak discharge in cfs/mi^2/inch (from Exhibit 4-III of the TR-55 Manual)

A = 0.002 drainage area in mi^2

Q = 0.41

WQ_f = qu*A*Q

WQ_f = 0.22 peak discharge for a water quality event (cfs)

0.05 Actual peak discharge (cfs) from HydroCad **OK**

Surface Area of Filter Bed (A_f)

Note: For a Dry Swell

$$A_f = (WQ_v)(d_f)/[(k)(h_f + d_f)(t_f)]$$

WQ_v = 1,978 Water Quality Volume in ft^3

d_f = 2.5 Filter Bed Depth in ft

k = 1 Coefficient of Permeability of Filter Media in ft/day

h_f = 0.31 Average height of water above surface in ft

t_f = 2 Design filter bed drain time in days

A_f = (WQv*df)/((k)*(hf+df)*(tf))

A_f = 880 Surface area of filter bed in ft^2

2,571 Actual surface area **OK**

Channel Protection Volume (CP_v)

Note: West End Ditch from 13P

$$CP_v = (V_r)/(0.65)$$

V_r = 7,852 runoff volume from 1-yr 24-hr Type III storm (ft^3)

T = 86400 Extended detention time (24 hrs) sec

CP_v = 12,080 required channel protection storage volume (ft^3)

CP_v / T 0.14 Average Release Rate (cfs)

0.14 Actual Release Rate (cfs) from HydroCAD **OK**

Invenergy – Rhode Island - Clear River Energy

Entrance Road - East End (19S, & 22S)

Total Drainage Area = 0.75 ac
Impervious Area = 0.545 ac
HSG = C Note: use C instead of D because the soil is above the wetland

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Groundwater Recharge (Re_v)

Note:

$$Re_v = (1")(F)\left(\frac{I}{12}\right)$$

Table 3-4	
HSG	Recharge Factor (F)
A	0.60
B	0.35
C	0.25
D	0.10

F = 0.25 recharge factor (Table 3-4)
I = 0.545 impervious area (ac)

Re_v = 1*F*(I/12)

Re_v = 0.011354 groundwater recharge volume (ac-ft)

Re_v = 495 groundwater recharge volume (ft^3)

Water Quality Volume (WQ_v)

Note:

$$WQ_v = (1")\left(\frac{I}{12}\right)$$

I = 0.545 impervious area (ac)

WQ_v = 1*(I/12)

WQ_v = 0.05 Water Quality Volume (ac-ft) **OR** 1,978 ft^3

$Re_v + WQ_v$ = 2,473 ft^3 2,830 ft^3 **OK**

Modified CN

Note:

$$CN = 1000/\left[10 + 5P + 10Q - 10\left(Q^2 + 1.25QP\right)^{1/2}\right]$$

P = 1.2 rainfall in inches (use 1.2 inches for the Water Quality Storm)
Q = 0.73 runoff volume in watershed inches (equal to WQ_v / total drainage area)
A_t = 0.745 total drainage area in acres

CN = 1000/(10+5*P+10*Q-10*((Q^2)+1.25*Q*P)^(1/2))

CN = 94.89 Use = 95

Water Quality Flow (WQ_f)

Note:

$$WQ_f = (q_u)(A)(Q)$$

I_a = 0.11

T_c = 6 min. **OR** 0.10 hrs

I_a/P = 0.09

q_u = 260 unit peak discharge in cfs/mi^2/inch (from Exhibit 4-III of the TR-55 Manual)

A = 0.001 drainage area in mi^2

Q = 0.73

WQ_f = qu*A*Q

WQ_f = 0.22 peak discharge for a water quality event (cfs)

0.20 Actual peak discharge (cfs) **OK**

Surface Area of Filter Bed (A_f)

Note: For a Dry Swell

$$A_f = (WQ_v)(d_f)/[(k)(h_f + d_f)(t_f)]$$

WQ_v = 1,978 Water Quality Volume in ft^3

d_f = 2.5 Filter Bed Depth in ft

k = 1 Coefficient of Permeability of Filter Media in ft/day

h_f = 0.31 Average height of water above surface in ft

t_f = 2 Design filter bed drain time in days

A_f = (WQv*df)/((k)*(hf+df)*(tf))

A_f = 880 Surface area of filter bed in ft^2

1,415 Actual surface area **OK**

DITCH CALCULATIONS

Dry Swale - 1 (15R)			
Storm	**Flow**	**Depth[1]**	**Velocity**
WQv	0.37	0.12	1.44
1-Year	1.56	0.26	2.33
10-Year	3.44	0.41	2.97
100-Year	6.73	0.59	3.60
Note 1 - Depth of ditch is 2 feet			

Dry Swale - 4 (29R)			
Storm	**Flow**	**Depth[1]**	**Velocity**
WQv	0.49	0.13	1.64
1-Year	2.03	0.30	2.62
10-Year	4.52	0.46	3.33
100-Year	8.86	0.66	4.03
Note 1 - Depth of ditch is 2 feet			

Dry Swale - 2 (18R)			
Storm	**Flow**	**Depth[1]**	**Velocity**
WQv	0.16	0.03	0.78
1-Year	0.60	0.08	1.30
10-Year	1.28	0.12	1.73
100-Year	2.45	0.17	2.21
Note 1 - Depth of ditch is 2 feet			

DITCH CALCULATIONS

Dry Swale - 3 (20R)			
Storm	**Flow**	**Depth[1]**	**Velocity**
WQv	0.42	0.11	1.65
1-Year	1.59	0.25	2.57
10-Year	3.37	0.38	3.25
100-Year	6.43	0.53	3.92
Note 1 - Depth of ditch is 2 feet			

Rerouting Ditch (23R)			
Storm	**Flow**	**Depth[1]**	**Velocity**
1-Year	1.46	0.32	1.72
10-Year	4.59	0.60	2.40
100-Year	10.72	0.92	3.03
Note 1 - Ditch is 1' deep; 2' wide; with 2:1 side slopes			

Level Spreader (8R)			
Storm	**Flow**	**Depth**	**Velocity**
1-Year	2.56	0.05	0.67
10-Year	3.74	0.06	0.77
100-Year	8.22	0.10	1.05

DITCH CALCULATIONS

Entr. Pipe Exit Ditch (21R)			
Storm	**Flow**	**Depth[1]**	**Velocity**
1-Year	2.89	0.16	1.94
10-Year	8.12	0.30	2.86
100-Year	18.06	0.47	3.82
Note 1 - Ditch is 1' deep; 10' wide; with 2:1 side slopes			

Rerouting Ditch (25R)			
Storm	**Flow**	**Depth[1]**	**Velocity**
1-Year	4.42	0.56	2.52
10-Year	13.70	1.00	3.44
100-Year	31.74	1.49	4.28
Note 1 - Ditch is 2' deep; 2' Bottom; with 2:1 side slopes			

STORM WATER CALCULATIONS

POINT A

	2P (Forebay)		
Storms			
	Existing	**Total**	
	Calculated	**Proposed**	
	(cfs)	**(cfs)**	**Water Elev. (ft)**
WQ_f	6.72	5.12	564.50
10-Year		76.76	566.78
100-Year		137.32	566.96

	3P (WQv Pond)		
Storms			
	Total	**Total**	
	In (cfs)	**Out (cfs)**	**Water Elev. (ft)**
WQ_f		3.29	561.76
10-Year		34.64	563.14
100-Year		81.45	564.19

STORM WATER CALCULATIONS

	4P (Detention)		
Storms			
	Total	**Total**	
	In (cfs)	**Out (cfs)**	**Water Elev. (ft)**
WQ_f		1.23	558.71
10-Year		3.74	561.46
100-Year		8.22	563.76
1-Year		2.56	559.82

	18P (Level Spreader)		
Storms			
	Total	**Total**	
	In (cfs)	**Out (cfs)**	**Water Elev. (ft)**
WQ_f		1.23	558.08
10-Year		3.74	558.17
100-Year		8.22	558.28
1-Year		2.56	558.13

STORM WATER CALCULATIONS

	21L (Point A)		
Storms			
	Existing	**Proposed Total**	
	Calculated		
	(cfs)	**(cfs)**	**Water Elev. (ft)**
WQ_f [1]	6.72	1.48	
10-Year	19.52	19.01	
100-Year	45.19	41.69	
Note 1 = Calculated			

POINT B

	28P (DP for Ramp Culvert)		
Storms			
	Existing Total	**Proposed Total**	
	(cfs)	**(cfs)**	**Water Elev. (ft)**
1-Year		1.56	555.02
10-Year		3.44	555.25
100-Year		6.72	555.57

STORM WATER CALCULATIONS

	13P (DP for Swale - 1 & 4)		
Storms			
	Existing Total (cfs)	**Proposed Total (cfs)**	**Water Elev. (ft)**
WQ_f	0.22	0.05	538.19
1-Year	0.14	0.14	538.92
10-Year		1.11	539.60
100-Year		6.71	539.97

	17P (Arch Pipe)		
Storms			
	Existing Total (cfs)	**Proposed Total (cfs)**	**Water Elev. (ft)**
1-Year		22.82	533.00
10-Year		69.25	533.73
100-Year		158.43	534.96

STORM WATER CALCULATIONS

	22L (Point B)		
Storms			
	Existing Total (cfs)	**Proposed Total (cfs)**	**Water Elev. (ft)**
1-Year	25.03	22.82	
10-Year	77.91	69.25	
100-Year	180.53	158.43	

POINT C

	15P (Point C - Culvert at Entr.)		
Storms			
	Existing Total (cfs)	**Proposed Total (cfs)**	**Water Elev. (ft)**
1-Year	2.89	2.85	529.79
10-Year	9.01	8.22	530.16
100-Year	20.85	18.21	530.33

STORM WATER CALCULATIONS

	23P (DP for Swell at Entrence)		
Storms			
	Existing Total (cfs)	**Proposed Total (cfs)**	**Water Elev. (ft)**
WQ_f	0.22	0.20	531.56
1-Year		1.55	531.74
10-Year		3.30	531.85
100-Year		6.34	531.99

POINT D

	Point D		
Storms			
	Existing Total (cfs)	**Proposed Total (cfs)**	**% Reduction**
1-Year	45.55	44.54	2.22%
10-Year	140.96	137.55	2.42%
100-Year	327.06	319.56	2.29%

MH STORM SEWER CALCULATIONS
10-YEAR STORM

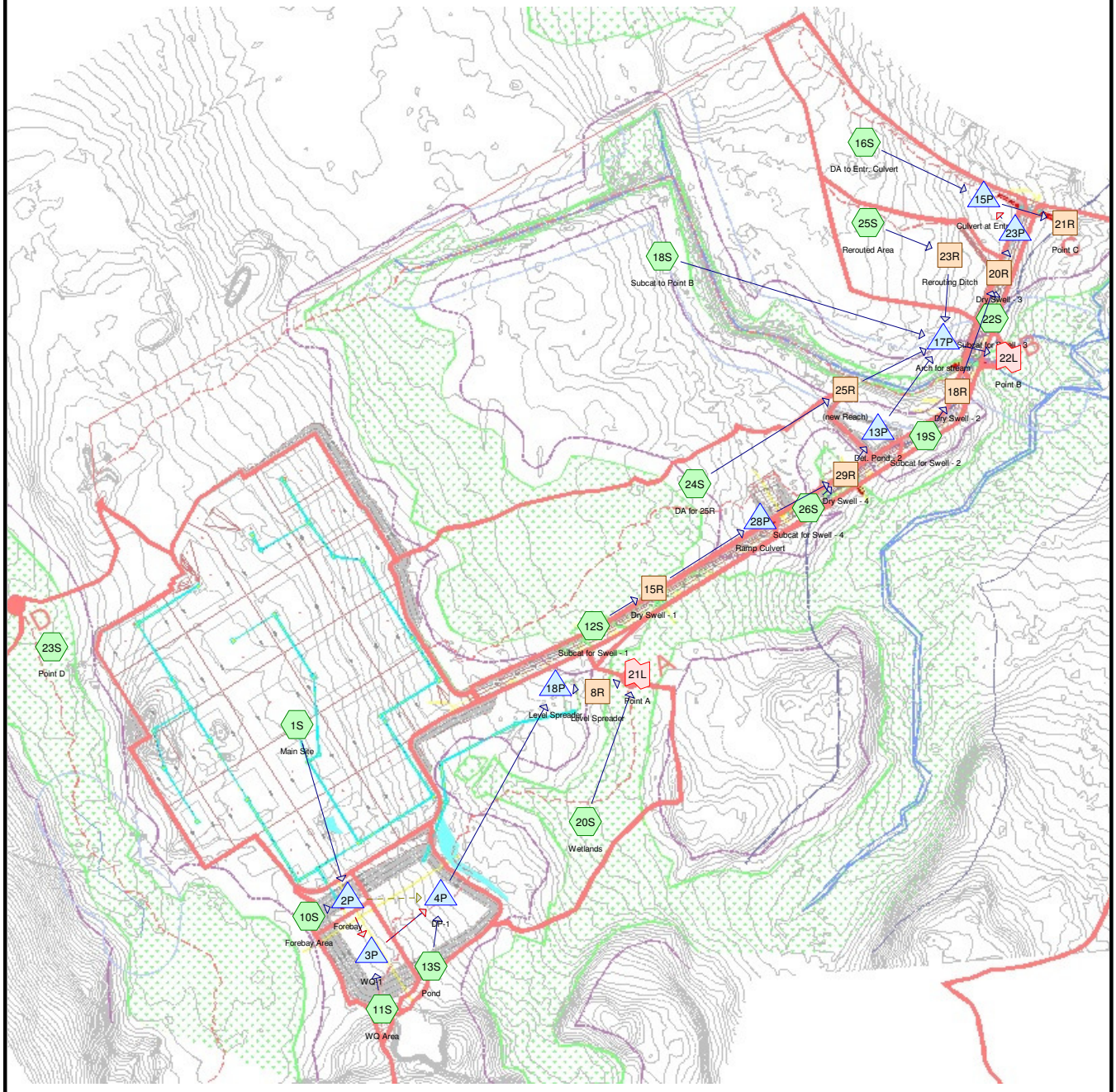
SN	Element ID	Invert Elevation	Ground/Rim (Max) Elevation	Ground/Rim (Max) Offset	Peak Inflow	Peak Lateral Inflow	Average HGL Elevation Attained	Average HGL Depth Attained
		(ft)	(ft)	(ft)	(cfs)	(cfs)	(ft)	(ft)
1	A-01	563.12	573.78	10.66	70.43	0.00	566.79	3.67
2	A-02	563.43	572.62	9.19	41.47	3.86	566.79	3.36
3	A-03	564.02	572.38	8.36	23.12	3.05	566.79	2.77
4	A-04	564.66	572.69	8.03	20.08	3.39	566.79	2.13
5	A-05	565.11	572.94	7.83	16.89	2.60	566.80	1.69
6	A-06	565.44	572.57	7.13	14.27	2.53	566.80	1.37
7	A-07	566.05	573.02	6.97	11.86	3.31	566.80	0.75
8	A-08	566.25	573.84	7.59	8.92	0.00	566.81	0.56
9	A-09	566.52	572.90	6.38	9.34	2.40	566.82	0.30
10	A-10	566.86	572.90	6.04	2.40	2.40	566.94	0.08
11	A1-01	566.89	573.36	6.47	5.07	0.00	566.99	0.10
12	A1-02	567.01	572.77	5.76	5.13	5.13	567.11	0.10
13	A2-01	564.09	573.16	9.07	16.56	3.39	566.79	2.70
14	A2-02	564.18	573.59	9.41	11.03	0.00	566.79	2.61
15	A2-03	564.70	572.95	8.25	9.91	3.31	566.80	2.10
16	A2-04	565.19	572.95	7.76	6.61	3.31	566.80	1.61
17	A2-05	565.52	573.17	7.65	3.31	3.31	566.80	1.28
18	A3-01	564.38	573.16	8.78	3.35	3.31	566.79	2.41
19	A4-01	563.27	572.62	9.35	42.08	2.29	566.79	3.52
20	A4-02	563.91	573.16	9.25	19.34	3.39	566.79	2.88
21	A4-03	564.38	573.16	8.78	16.08	3.31	566.79	2.41
22	A4-04	564.63	574.34	9.71	12.91	0.00	566.79	2.16
23	A4-05	564.84	572.89	8.05	9.64	3.96	566.79	1.95
24	A4-06	565.29	572.92	7.63	5.72	2.45	566.79	1.50
25	A4-07	565.77	572.75	6.98	3.31	3.31	566.80	1.03
26	A5-01	564.91	574.34	9.43	4.92	0.00	566.79	1.88
27	A5-02	565.18	573.45	8.27	3.38	1.67	566.79	1.61
28	A5-03	565.60	573.26	7.66	2.01	1.72	566.79	1.19

MH STORM SEWER CALCULATIONS
10-YEAR STORM

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)
1	A-01	563.12	573.78	10.66	70.43	0.00	566.79	3.67
2	A-02	563.43	572.62	9.19	41.47	3.86	566.79	3.36
3	A-03	564.02	572.38	8.36	23.12	3.05	566.79	2.77
4	A-04	564.66	572.69	8.03	20.08	3.39	566.79	2.13
5	A-05	565.11	572.94	7.83	16.89	2.60	566.80	1.69
6	A-06	565.44	572.57	7.13	14.27	2.53	566.80	1.37
7	A-07	566.05	573.02	6.97	11.86	3.31	566.80	0.75
8	A-08	566.25	573.84	7.59	8.92	0.00	566.81	0.56
9	A-09	566.52	572.90	6.38	9.34	2.40	566.82	0.30
10	A-10	566.86	572.90	6.04	2.40	2.40	566.94	0.08
11	A1-01	566.89	573.36	6.47	5.07	0.00	566.99	0.10
12	A1-02	567.01	572.77	5.76	5.13	5.13	567.11	0.10
13	A2-01	564.09	573.16	9.07	16.56	3.39	566.79	2.70
14	A2-02	564.18	573.59	9.41	11.03	0.00	566.79	2.61
15	A2-03	564.70	572.95	8.25	9.91	3.31	566.80	2.10
16	A2-04	565.19	572.95	7.76	6.61	3.31	566.80	1.61
17	A2-05	565.52	573.17	7.65	3.31	3.31	566.80	1.28
18	A3-01	564.38	573.16	8.78	3.35	3.31	566.79	2.41
19	A4-01	563.27	572.62	9.35	42.08	2.29	566.79	3.52
20	A4-02	563.91	573.16	9.25	19.34	3.39	566.79	2.88
21	A4-03	564.38	573.16	8.78	16.08	3.31	566.79	2.41
22	A4-04	564.63	574.34	9.71	12.91	0.00	566.79	2.16
23	A4-05	564.84	572.89	8.05	9.64	3.96	566.79	1.95
24	A4-06	565.29	572.92	7.63	5.72	2.45	566.79	1.50
25	A4-07	565.77	572.75	6.98	3.31	3.31	566.80	1.03
26	A5-01	564.91	574.34	9.43	4.92	0.00	566.79	1.88
27	A5-02	565.18	573.45	8.27	3.38	1.67	566.79	1.61
28	A5-03	565.60	573.26	7.66	2.01	1.72	566.79	1.19

PIPES FOR STORM SEWER CALCULATIONS

SN	LINE ID	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Pipe Diameter	Manning's Roughness
				(ft)	(ft)	(ft)	(%)	(inches)	
13	P-1	A-01	A	111.17	563.12	562.86	0.2300	48.000	0.0130
2	P-2	A-02	A-01	130.31	563.43	563.12	0.2400	48.000	0.0130
3	P-3	A-03	A-02	233.18	564.02	563.43	0.2500	48.000	0.0130
4	P-4	A-04	A-03	256.48	564.66	564.02	0.2500	48.000	0.0130
5	P-5	A-05	A-04	182.09	565.11	564.66	0.2500	42.000	0.0130
6	P-6	A-06	A-05	132.96	565.43	565.11	0.2400	42.000	0.0130
7	P-7	A-07	A-06	245.96	566.05	565.43	0.2500	42.000	0.0130
8	P-8	A-08	A-07	78.69	566.25	566.05	0.2500	36.000	0.0130
9	P-9	A-09	A-08	110.45	566.52	566.25	0.2500	36.000	0.0130
1	P-10	A-10	A-09	135.48	566.86	566.52	0.2500	30.000	0.0130
10	P-11	A1-01	A-09	148.86	566.89	566.52	0.2500	36.000	0.0130
11	P-12	A1-02	A1-01	47.30	567.01	566.89	0.2500	30.000	0.0130
22	P-13	A2-01	A-02	256.44	564.09	563.43	0.2600	36.000	0.0130
23	P-14	A2-02	A2-01	34.06	564.18	564.09	0.2700	36.000	0.0130
24	P-15	A2-03	A2-02	208.02	564.70	564.18	0.2500	36.000	0.0130
25	P-16	A2-04	A2-03	195.86	565.19	564.70	0.2500	30.000	0.0130
26	P-17	A2-05	A2-04	132.41	565.52	565.19	0.2500	24.000	0.0130
27	P-18	A3-01	A2-01	117.59	564.38	564.09	0.2500	30.000	0.0130
14	P-19	A4-01	A-01	61.01	563.27	563.12	0.2500	42.000	0.0130
12	P-20	A4-02	A4-01	256.44	563.91	563.27	0.2500	42.000	0.0130
28	P-21	A4-03	A4-02	187.23	564.38	563.91	0.2500	36.000	0.0130
15	P-22	A4-04	A4-03	101.61	564.63	564.38	0.2500	36.000	0.0130
16	P-23	A4-05	A4-04	83.80	564.84	564.63	0.2500	36.000	0.0130
17	P-24	A4-06	A4-05	180.43	565.29	564.84	0.2500	36.000	0.0130
18	P-25	A4-07	A4-06	191.32	565.77	565.29	0.2500	30.000	0.0130
19	P-26	A5-01	A4-04	113.93	564.91	564.63	0.2500	30.000	0.0130
20	P-27	A5-02	A5-01	106.04	565.18	564.91	0.2500	24.000	0.0130
21	P-28	A5-03	A5-02	167.00	565.60	565.18	0.2500	24.000	0.0130



Subcat | Reach | Pond | Link

Routing Diagram for WQv

Prepared by HDR Inc, Printed 9/12/2016

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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Main Site Runoff Area=16.555 ac 100.00% Impervious Runoff Depth=0.99"
Flow Length=1,775' Tc=7.4 min CN=98 Runoff=17.29 cfs 1.360 af

Subcatchment 10S: Forebay Area Runoff Area=0.354 ac 24.29% Impervious Runoff Depth=0.25"
Tc=5.0 min CN=84 Runoff=0.09 cfs 0.007 af

Subcatchment 11S: WQ Area Runoff Area=1.129 ac 53.59% Impervious Runoff Depth=0.41"
Tc=5.0 min CN=89 Runoff=0.55 cfs 0.039 af

Subcatchment 12S: Subcat for Swell - 1 Runoff Area=0.933 ac 0.00% Impervious Runoff Depth=0.41"
Flow Length=993' Slope=0.1266 '/' Tc=6.5 min CN=89 Runoff=0.43 cfs 0.032 af

Subcatchment 13S: Pond Runoff Area=1.949 ac 64.70% Impervious Runoff Depth=0.56"
Tc=5.0 min CN=92 Runoff=1.31 cfs 0.090 af

Subcatchment 16S: DA to Entr. Culvert Runoff Area=140,442 sf 0.87% Impervious Runoff Depth=0.10"
Flow Length=1,034' Slope=0.0359 '/' Tc=18.9 min CN=77 Runoff=0.12 cfs 0.027 af

Subcatchment 18S: Subcat to Point B Runoff Area=1,632,095 sf 2.40% Impervious Runoff Depth=0.12"
Flow Length=3,073' Slope=0.0324 '/' Tc=46.1 min CN=78 Runoff=1.29 cfs 0.365 af

Subcatchment 19S: Subcat for Swell - 2 Runoff Area=0.272 ac 73.53% Impervious Runoff Depth=0.74"
Flow Length=313' Slope=0.1239 '/' Tc=2.0 min CN=95 Runoff=0.27 cfs 0.017 af

Subcatchment 20S: Wetlands Runoff Area=7.773 ac 0.00% Impervious Runoff Depth=0.10"
Flow Length=1,002' Slope=0.0286 '/' Tc=20.6 min CN=77 Runoff=0.29 cfs 0.066 af

Subcatchment 22S: Subcat for Swell - 3 Runoff Area=0.473 ac 72.94% Impervious Runoff Depth=0.74"
Flow Length=505' Slope=0.1265 '/' Tc=2.9 min CN=95 Runoff=0.46 cfs 0.029 af

Subcatchment 23S: Point D Runoff Area=3,639,264 sf 0.00% Impervious Runoff Depth=0.10"
Flow Length=3,135' Slope=0.0772 '/' Tc=31.3 min CN=77 Runoff=2.65 cfs 0.704 af

Subcatchment 24S: DA for 25R Runoff Area=8.906 ac 0.00% Impervious Runoff Depth=0.10"
Flow Length=1,580' Slope=0.0192 '/' Tc=36.2 min CN=77 Runoff=0.27 cfs 0.075 af

Subcatchment 25S: Rerouted Area Runoff Area=2.241 ac 0.00% Impervious Runoff Depth=0.10"
Flow Length=797' Slope=0.0260 '/' Tc=18.0 min CN=77 Runoff=0.09 cfs 0.019 af

Subcatchment 26S: Subcat for Swell - 4 Runoff Area=0.394 ac 0.00% Impervious Runoff Depth=0.41"
Flow Length=293' Slope=0.1266 '/' Tc=2.4 min CN=89 Runoff=0.21 cfs 0.014 af

Reach 8R: Level Spreader Avg. Flow Depth=0.03' Max Vel=0.50 fps Inflow=1.23 cfs 1.252 af
n=0.030 L=48.0' S=0.0100 '/' Capacity=439.80 cfs Outflow=1.23 cfs 1.252 af

Reach 15R: Dry Swell - 1 Avg. Flow Depth=0.10' Max Vel=1.30 fps Inflow=0.43 cfs 0.032 af
n=0.030 L=992.7' S=0.0177 '/' Capacity=84.06 cfs Outflow=0.28 cfs 0.032 af

Reach 18R: Dry Swell - 2 Avg. Flow Depth=0.04' Max Vel=0.88 fps Inflow=0.27 cfs 0.017 af
n=0.030 L=259.1' S=0.0222 '/' Capacity=49.33 cfs Outflow=0.23 cfs 0.017 af

Reach 20R: Dry Swell - 3 Avg. Flow Depth=0.14' Max Vel=1.85 fps Inflow=0.67 cfs 0.046 af
n=0.030 L=448.4' S=0.0233 '/' Capacity=96.49 cfs Outflow=0.59 cfs 0.046 af

Reach 21R: Point C Avg. Flow Depth=0.04' Max Vel=0.86 fps Inflow=0.32 cfs 0.073 af
n=0.024 L=77.4' S=0.0136 '/' Capacity=240.09 cfs Outflow=0.32 cfs 0.073 af

Reach 23R: Rerouting Ditch Avg. Flow Depth=0.06' Max Vel=0.62 fps Inflow=0.09 cfs 0.019 af
n=0.025 L=405.0' S=0.0054 '/' Capacity=12.66 cfs Outflow=0.08 cfs 0.019 af

Reach 25R: (new Reach) Avg. Flow Depth=0.11' Max Vel=1.03 fps Inflow=0.27 cfs 0.075 af
n=0.025 L=262.2' S=0.0064 '/' Capacity=60.53 cfs Outflow=0.26 cfs 0.075 af

Reach 29R: Dry Swell - 4 Avg. Flow Depth=0.11' Max Vel=1.49 fps Inflow=0.38 cfs 0.046 af
n=0.030 L=292.6' S=0.0196 '/' Capacity=88.45 cfs Outflow=0.37 cfs 0.046 af

Pond 2P: Forebay Peak Elev=564.50' Storage=19,915 cf Inflow=17.37 cfs 1.367 af
Primary=5.12 cfs 1.364 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=5.12 cfs 1.364 af

Pond 3P: WQ-1 Peak Elev=561.76' Storage=45,503 cf Inflow=5.32 cfs 1.403 af
Primary=3.29 cfs 1.387 af Secondary=0.00 cfs 0.000 af Outflow=3.29 cfs 1.387 af

Pond 4P: DP-1 Peak Elev=558.71' Storage=34,160 cf Inflow=3.40 cfs 1.477 af
Primary=1.23 cfs 1.252 af Secondary=0.00 cfs 0.000 af Outflow=1.23 cfs 1.252 af

Pond 13P: Det. Pond - 2 Peak Elev=538.19' Storage=973 cf Inflow=0.37 cfs 0.046 af
Outflow=0.05 cfs 0.043 af

Pond 15P: Culvert at Entr. Peak Elev=527.35' Storage=2 cf Inflow=0.32 cfs 0.073 af
Outflow=0.32 cfs 0.073 af

Pond 17P: Arch for stream Peak Elev=533.00' Storage=0 cf Inflow=1.64 cfs 0.502 af
144.0" x 49.0", R=77.5" Arch Culvert n=0.024 L=51.5' S=0.0299 '/' Outflow=1.64 cfs 0.502 af

Pond 18P: Level Spreader Peak Elev=558.08' Storage=7,435 cf Inflow=1.23 cfs 1.252 af
Outflow=1.23 cfs 1.252 af

Pond 23P: Peak Elev=531.56' Storage=411 cf Inflow=0.59 cfs 0.046 af
Primary=0.20 cfs 0.046 af Secondary=0.00 cfs 0.000 af Outflow=0.20 cfs 0.046 af

Pond 28P: Ramp Culvert Peak Elev=554.61' Storage=0 cf Inflow=0.28 cfs 0.032 af
23.0" x 14.0", R=22.0" Elliptical Culvert n=0.013 L=30.0' S=0.0207 '/' Outflow=0.28 cfs 0.032 af

Link 21L: Point A Inflow=1.30 cfs 1.317 af
Primary=1.30 cfs 1.317 af

Link 22L: Point B Inflow=1.64 cfs 0.502 af
Primary=1.64 cfs 0.502 af

Total Runoff Area = 165.217 ac Runoff Volume = 2.844 af Average Runoff Depth = 0.21"
87.91% Pervious = 145.239 ac 12.09% Impervious = 19.978 ac

Summary for Subcatchment 1S: Main Site

Runoff = 17.29 cfs @ 12.10 hrs, Volume= 1.360 af, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
16.555	98	Paved parking, HSG D
16.555		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	158	0.0100	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.5	135	0.0025	4.18	20.51	**Pipe Channel, 130-131** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
0.4	110	0.0025	4.72	33.35	**Pipe Channel, 131-132** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.3	79	0.0025	4.72	33.35	**Pipe Channel, 132-133** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.8	246	0.0025	5.23	50.30	**Pipe Channel, 133-134** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.4	133	0.0025	5.23	50.30	**Pipe Channel, 134-135** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.6	182	0.0025	5.23	50.30	**Pipe Channel, 135-136** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.7	256	0.0025	5.72	71.82	**Pipe Channel, 136-137** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.7	233	0.0025	5.72	71.82	**Pipe Channel, 137-138** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.4	130	0.0025	5.72	71.82	**Pipe Channel, 138-139** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.3	113	0.0025	5.72	71.82	**Pipe Channel, 139-Outlet** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
7.4	1,775	Total			

Summary for Subcatchment 10S: Forebay Area

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 0.007 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
0.268	80	>75% Grass cover, Good, HSG D
0.086	98	Water Surface, HSG D
0.354	84	Weighted Average
0.268		75.71% Pervious Area
0.086		24.29% Impervious Area

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

Summary for Subcatchment 11S: WQ Area

Runoff = 0.55 cfs @ 12.08 hrs, Volume= 0.039 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
0.605	98	Water Surface, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
1.129	89	Weighted Average
0.524		46.41% Pervious Area
0.605		53.59% Impervious Area

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

Summary for Subcatchment 12S: Subcat for Swell - 1

Runoff = 0.43 cfs @ 12.10 hrs, Volume= 0.032 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

	Area (ac)	CN	Description
	0.253	74	>75% Grass cover, Good, HSG C
*	0.680	95	Paved parking, HSG C
	0.933	89	Weighted Average
	0.933		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	993	0.1266	2.55		**Lag/CN Method,**

Summary for Subcatchment 13S: Pond

Runoff = 1.31 cfs @ 12.08 hrs, Volume= 0.090 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
1.261	98	Water Surface, HSG C
0.624	80	>75% Grass cover, Good, HSG D
0.064	77	Woods, Good, HSG D
1.949	92	Weighted Average
0.688		35.30% Pervious Area
1.261		64.70% Impervious Area

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

Summary for Subcatchment 16S: DA to Entr. Culvert

Runoff = 0.12 cfs @ 12.51 hrs, Volume= 0.027 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
139,222	77	Woods, Good, HSG D
1,220	98	Paved parking, HSG D
140,442	77	Weighted Average
139,222		99.13% Pervious Area
1,220		0.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	1,034	0.0359	0.91		**Lag/CN Method,**

Summary for Subcatchment 18S: Subcat to Point B

Runoff = 1.29 cfs @ 12.86 hrs, Volume= 0.365 af, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
1,592,978	77	Woods, Good, HSG D
39,117	98	Paved parking, HSG D
1,632,095	78	Weighted Average
1,592,978		97.60% Pervious Area
39,117		2.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.1	3,073	0.0324	1.11		**Lag/CN Method,**

Summary for Subcatchment 19S: Subcat for Swell - 2

Runoff = 0.27 cfs @ 12.03 hrs, Volume= 0.017 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

	Area (ac)	CN	Description
*	0.200	100	Water Surface, HSG C
*	0.072	80	>75% Grass cover, Good, HSG C
	0.272	95	Weighted Average
	0.072		26.47% Pervious Area
	0.200		73.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	313	0.1239	2.62		**Lag/CN Method,**

Summary for Subcatchment 20S: Wetlands

Runoff = 0.29 cfs @ 12.54 hrs, Volume= 0.066 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
7.773	77	Woods, Good, HSG D
7.773		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,002	0.0286	0.81		**Lag/CN Method,**

Summary for Subcatchment 22S: Subcat for Swell - 3

Runoff = 0.46 cfs @ 12.04 hrs, Volume= 0.029 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

	Area (ac)	CN	Description
*	0.128	80	>75% Grass cover, Good, HSG C
*	0.345	100	Paved parking, HSG C
	0.473	95	Weighted Average
	0.128		27.06% Pervious Area
	0.345		72.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	505	0.1265	2.91		**Lag/CN Method,**

Summary for Subcatchment 23S: Point D

Runoff = 2.65 cfs @ 12.69 hrs, Volume= 0.704 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
3,639,264	77	Woods, Good, HSG D
3,639,264		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.3	3,135	0.0772	1.67		**Lag/CN Method,**

Summary for Subcatchment 24S: DA for 25R

Runoff = 0.27 cfs @ 12.75 hrs, Volume= 0.075 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
8.906	77	Woods, Good, HSG D
8.906		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.2	1,580	0.0192	0.73		**Lag/CN Method,**

Summary for Subcatchment 25S: Rerouted Area

Runoff = 0.09 cfs @ 12.50 hrs, Volume= 0.019 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
2.241	77	Woods, Good, HSG D
2.241		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	797	0.0260	0.74		**Lag/CN Method,**

Summary for Subcatchment 26S: Subcat for Swell - 4

Runoff = 0.21 cfs @ 12.04 hrs, Volume= 0.014 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

	Area (ac)	CN	Description
*	0.287	95	Paved parking, HSG D
	0.107	74	>75% Grass cover, Good, HSG C
	0.394	89	Weighted Average
	0.394		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	293	0.1266	2.00		**Lag/CN Method,**

Summary for Reach 8R: Level Spreader

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 0.75" for WQv event
Inflow = 1.23 cfs @ 16.36 hrs, Volume= 1.252 af
Outflow = 1.23 cfs @ 16.38 hrs, Volume= 1.252 af, Atten= 0%, Lag= 0.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.50 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.31 fps, Avg. Travel Time= 2.6 min

Peak Storage= 118 cf @ 16.38 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 1.00' Flow Area= 105.0 sf, Capacity= 439.80 cfs

75.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 30.0 '/' Top Width= 135.00'
Length= 48.0' Slope= 0.0100 '/'
Inlet Invert= 558.00', Outlet Invert= 557.52'

‡

Summary for Reach 15R: Dry Swell - 1

Inflow Area = 0.933 ac, 0.00% Impervious, Inflow Depth = 0.41" for WQv event
Inflow = 0.43 cfs @ 12.10 hrs, Volume= 0.032 af
Outflow = 0.28 cfs @ 12.21 hrs, Volume= 0.032 af, Atten= 35%, Lag= 6.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.30 fps, Min. Travel Time= 12.7 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 30.6 min

Peak Storage= 212 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 84.06 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 992.7' Slope= 0.0177 '/'
Inlet Invert= 572.18', Outlet Invert= 554.62'

Summary for Reach 18R: Dry Swell - 2

Inflow Area = 0.272 ac, 73.53% Impervious, Inflow Depth = 0.74" for WQv event
Inflow = 0.27 cfs @ 12.03 hrs, Volume= 0.017 af
Outflow = 0.23 cfs @ 12.07 hrs, Volume= 0.017 af, Atten= 17%, Lag= 2.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.88 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 0.36 fps, Avg. Travel Time= 12.1 min

Peak Storage= 66 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 49.33 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 259.1' Slope= 0.0222 '/'
Inlet Invert= 547.00', Outlet Invert= 541.25'

‡

Summary for Reach 20R: Dry Swell - 3

Inflow Area = 0.745 ac, 73.15% Impervious, Inflow Depth = 0.74" for WQv event
Inflow = 0.67 cfs @ 12.05 hrs, Volume= 0.046 af
Outflow = 0.59 cfs @ 12.09 hrs, Volume= 0.046 af, Atten= 12%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.85 fps, Min. Travel Time= 4.0 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 11.9 min

Peak Storage= 143 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 96.49 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 448.4' Slope= 0.0233 '/'
Inlet Invert= 541.25', Outlet Invert= 530.80'

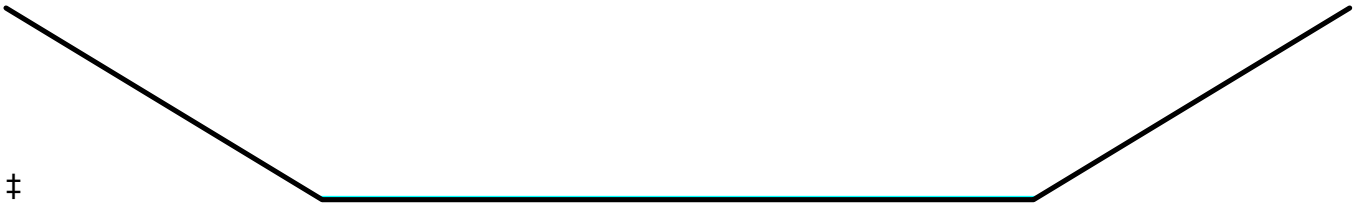
Summary for Reach 21R: Point C

Inflow Area = 3.969 ac, 14.44% Impervious, Inflow Depth = 0.22" for WQv event
Inflow = 0.32 cfs @ 12.50 hrs, Volume= 0.073 af
Outflow = 0.32 cfs @ 12.52 hrs, Volume= 0.073 af, Atten= 0%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.86 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 2.3 min

Peak Storage= 29 cf @ 12.52 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 2.00' Flow Area= 26.0 sf, Capacity= 240.09 cfs

9.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 77.4' Slope= 0.0136 '/'
Inlet Invert= 526.65', Outlet Invert= 525.60'



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Summary for Reach 23R: Rerouting Ditch

Inflow Area = 2.241 ac, 0.00% Impervious, Inflow Depth = 0.10" for WQv event
Inflow = 0.09 cfs @ 12.50 hrs, Volume= 0.019 af
Outflow = 0.08 cfs @ 12.63 hrs, Volume= 0.019 af, Atten= 13%, Lag= 8.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.62 fps, Min. Travel Time= 10.9 min
Avg. Velocity = 0.32 fps, Avg. Travel Time= 21.1 min

Peak Storage= 49 cf @ 12.63 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 12.66 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 405.0' Slope= 0.0054 '/'
Inlet Invert= 536.00', Outlet Invert= 533.82'

Summary for Reach 25R: (new Reach)

Inflow Area = 8.906 ac, 0.00% Impervious, Inflow Depth = 0.10" for WQv event
Inflow = 0.27 cfs @ 12.75 hrs, Volume= 0.075 af
Outflow = 0.26 cfs @ 12.81 hrs, Volume= 0.075 af, Atten= 1%, Lag= 3.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.03 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.59 fps, Avg. Travel Time= 7.5 min

Peak Storage= 67 cf @ 12.81 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 60.53 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 262.2' Slope= 0.0064 '/'
Inlet Invert= 540.67', Outlet Invert= 539.00'

Summary for Reach 29R: Dry Swell - 4

Inflow Area = 1.327 ac, 0.00% Impervious, Inflow Depth = 0.41" for WQv event
Inflow = 0.38 cfs @ 12.19 hrs, Volume= 0.046 af
Outflow = 0.37 cfs @ 12.22 hrs, Volume= 0.046 af, Atten= 1%, Lag= 2.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.49 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 8.2 min

Peak Storage= 73 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 88.45 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 292.6' Slope= 0.0196 '/'
Inlet Invert= 552.74', Outlet Invert= 547.01'

Summary for Pond 2P: Forebay

Inflow Area = 16.909 ac, 98.42% Impervious, Inflow Depth = 0.97" for WQv event
Inflow = 17.37 cfs @ 12.10 hrs, Volume= 1.367 af
Outflow = 5.12 cfs @ 12.41 hrs, Volume= 1.364 af, Atten= 71%, Lag= 18.4 min
Primary = 5.12 cfs @ 12.41 hrs, Volume= 1.364 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 3,802 sf Storage= 3,789 cf
Peak Elev= 564.50' @ 12.45 hrs Surf.Area= 5,438 sf Storage= 19,915 cf (16,126 cf above start)
Flood Elev= 568.00' Surf.Area= 7,249 sf Storage= 42,057 cf (38,268 cf above start)

Plug-Flow detention time= 100.9 min calculated for 1.277 af (93% of inflow)
Center-of-Mass det. time= 42.5 min (826.4 - 783.9)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	49,579 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	2,536	269.1	0.0	0	0	2,536
559.00	2,944	279.8	40.0	1,095	1,095	3,078
560.00	3,366	290.5	40.0	1,261	2,356	3,641
561.00	3,802	301.2	40.0	1,433	3,789	4,225
562.00	4,252	312.0	100.0	4,025	7,814	4,835
563.00	4,716	322.7	100.0	4,482	12,296	5,462
564.00	5,194	333.4	100.0	4,953	17,249	6,110
565.00	5,687	344.1	100.0	5,439	22,687	6,779
566.00	6,193	354.8	100.0	5,938	28,626	7,469
567.00	6,714	365.5	100.0	6,452	35,077	8,180
568.00	7,249	376.2	100.0	6,980	42,057	8,912
569.00	7,798	386.9	100.0	7,522	49,579	9,666

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Tertiary	558.00'	**36.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#3	Device 2	566.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	566.50'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=5.11 cfs @ 12.41 hrs HW=564.49' TW=561.56' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 5.11 cfs @ 6.51 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=561.00' TW=561.00' (Dynamic Tailwater)
↑—**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=561.00' TW=558.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 0.00 cfs of 27.86 cfs potential flow)
↑—**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 3P: WQ-1

Inflow Area = 18.038 ac, 95.61% Impervious, Inflow Depth > 0.93" for WQv event
Inflow = 5.32 cfs @ 12.36 hrs, Volume= 1.403 af
Outflow = 3.29 cfs @ 13.44 hrs, Volume= 1.387 af, Atten= 38%, Lag= 64.7 min
Primary = 3.29 cfs @ 13.44 hrs, Volume= 1.387 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 23,969 sf Storage= 27,117 cf
Peak Elev= 561.76' @ 13.44 hrs Surf.Area= 24,675 sf Storage= 45,503 cf (18,387 cf above start)
Flood Elev= 568.00' Surf.Area= 30,816 sf Storage= 218,459 cf (191,342 cf above start)

Plug-Flow detention time= 416.9 min calculated for 0.764 af (54% of inflow)
Center-of-Mass det. time= 136.0 min (963.2 - 827.2)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	249,790 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	21,247	600.7	0.0	0	0	21,247
559.00	22,140	611.4	40.0	8,677	8,677	22,444
560.00	23,048	622.1	40.0	9,037	17,714	23,662
561.00	23,969	632.9	40.0	9,403	27,117	24,910
562.00	24,905	643.6	100.0	24,436	51,552	26,170
563.00	25,855	654.3	100.0	25,379	76,931	27,452
564.00	26,819	665.0	100.0	26,336	103,266	28,754
565.00	27,797	675.8	100.0	27,307	130,573	30,088
566.00	28,789	686.5	100.0	28,292	158,864	31,433
567.00	29,795	697.2	100.0	29,291	188,155	32,799
568.00	30,816	707.9	100.0	30,304	218,459	34,187
569.00	31,850	718.7	100.0	31,332	249,790	35,605

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**36.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	561.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 2	558.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	564.00'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=3.29 cfs @ 13.44 hrs HW=561.76' TW=558.41' (Dynamic Tailwater)
- **1=Culvert** (Passes 3.29 cfs of 42.11 cfs potential flow)
  - **2=Orifice/Grate** (Passes 3.29 cfs of 3.77 cfs potential flow)
    - **3=Orifice/Grate** (Orifice Controls 3.29 cfs @ 4.19 fps)
    - **5=Orifice/Grate** (Controls 0.00 cfs)
  - **4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=561.00' TW=558.00' (Dynamic Tailwater)
- **6=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4P: DP-1

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 0.89" for WQv event
Inflow = 3.40 cfs @ 13.38 hrs, Volume= 1.477 af
Outflow = 1.23 cfs @ 16.35 hrs, Volume= 1.252 af, Atten= 64%, Lag= 178.2 min
Primary = 1.23 cfs @ 16.35 hrs, Volume= 1.252 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 558.71' @ 16.35 hrs Surf.Area= 49,107 sf Storage= 34,160 cf
Flood Elev= 565.00' Surf.Area= 62,400 sf Storage= 384,495 cf

Plug-Flow detention time= 493.0 min calculated for 1.252 af (85% of inflow)
Center-of-Mass det. time= 395.8 min (1,351.4 - 955.5)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	651,999 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	47,688	883.6	0	0	47,688
559.00	49,705	899.0	48,693	48,693	50,047
560.00	51,750	914.4	50,724	99,417	52,448
561.00	53,824	929.8	52,784	152,201	54,888
562.00	55,926	945.2	54,872	207,072	57,370
563.00	58,056	960.6	56,988	264,060	59,893
564.00	60,214	976.1	59,132	323,192	62,470
565.00	62,400	991.5	61,304	384,495	65,075
566.00	64,615	1,006.9	63,504	448,000	67,720
567.00	66,858	1,022.3	65,733	513,733	70,405
568.00	69,129	1,037.7	67,990	581,723	73,132
569.00	71,429	1,053.2	70,276	651,999	75,915

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**48.0" Round Culvert** L= 663.9' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 551.36' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	558.00'	**9.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	562.50'	**12.0" Vert. Orifice/Grate** C= 0.600

#4	Secondary	568.00'	**45.0 deg x 100.0' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=1.23 cfs @ 16.35 hrs HW=558.71' TW=558.08' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.23 cfs of 1.55 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.23 cfs @ 2.86 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=558.00' (Free Discharge)
└─**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 13P: Det. Pond - 2

Inflow Area = 1.327 ac, 0.00% Impervious, Inflow Depth = 0.41" for WQv event
Inflow = 0.37 cfs @ 12.22 hrs, Volume= 0.046 af
Outflow = 0.05 cfs @ 14.62 hrs, Volume= 0.043 af, Atten= 88%, Lag= 143.8 min
Primary = 0.05 cfs @ 14.62 hrs, Volume= 0.043 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 538.19' @ 14.62 hrs Surf.Area= 5,269 sf Storage= 973 cf
Flood Elev= 541.00' Surf.Area= 8,791 sf Storage= 20,626 cf

Plug-Flow detention time= 386.8 min calculated for 0.043 af (94% of inflow)
Center-of-Mass det. time= 353.2 min (1,233.3 - 880.1)

Volume	Invert	Avail.Storage	Storage Description
#1	538.00'	20,626 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
538.00	5,054	387.0	0	0	5,054
539.00	6,243	405.8	5,638	5,638	6,305
540.00	7,489	424.7	6,857	12,495	7,621
541.00	8,791	423.9	8,131	20,626	8,049

Device	Routing	Invert	Outlet Devices
#1	Primary	538.00'	**15.0" Round Culvert** L= 96.8' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.00' / 537.00' S= 0.0103 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	538.00'	**2.4" Vert. Orifice/Grate** C= 0.600
#3	Device 1	538.90'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	539.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.05 cfs @ 14.62 hrs HW=538.19' TW=533.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.05 cfs of 0.17 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 1.48 fps)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 15P: Culvert at Entr.

Inflow Area = 3.969 ac, 14.44% Impervious, Inflow Depth = 0.22" for WQv event
Inflow = 0.32 cfs @ 12.50 hrs, Volume= 0.073 af
Outflow = 0.32 cfs @ 12.50 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min
Primary = 0.32 cfs @ 12.50 hrs, Volume= 0.073 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 527.35' @ 12.50 hrs Surf.Area= 11 sf Storage= 2 cf

Plug-Flow detention time= 0.1 min calculated for 0.073 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (885.9 - 885.8)

Volume	Invert	Avail.Storage	Storage Description
#1	527.17'	1,407 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
527.17	6	14.0	0	0	6
528.00	44	35.0	18	18	90
529.00	121	58.1	79	98	268
530.00	266	92.9	189	286	693
531.00	555	117.6	402	688	1,120
532.00	897	157.4	719	1,407	2,001

Device	Routing	Invert	Outlet Devices
#1	Primary	527.17'	**18.0" Round Culvert X 2.00** L= 52.8' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 527.17' / 526.65' S= 0.0098 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	527.17'	**18.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	530.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.32 cfs @ 12.50 hrs HW=527.35' TW=526.69' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.32 cfs @ 2.11 fps)
  ├─**2=Orifice/Grate** (Passes 0.32 cfs of 0.36 cfs potential flow)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 17P: Arch for stream

Inflow Area = 49.942 ac, 1.80% Impervious, Inflow Depth > 0.12" for WQv event
Inflow = 1.64 cfs @ 12.86 hrs, Volume= 0.502 af
Outflow = 1.64 cfs @ 12.86 hrs, Volume= 0.502 af, Atten= 0%, Lag= 0.0 min
Primary = 1.64 cfs @ 12.86 hrs, Volume= 0.502 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 533.00' @ 0.00 hrs Surf.Area= 412 sf Storage= 0 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	533.00'	25,714 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
533.00	412	159.8	0	0	412
534.00	5,210	513.7	2,362	2,362	19,382
535.00	11,714	795.5	8,245	10,608	48,748
536.00	18,774	996.6	15,106	25,714	77,441

Device	Routing	Invert	Outlet Devices
#1	Primary	532.20'	**144.0" W x 49.0" H, R=77.5" Arch Culvert** L= 51.5' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 532.20' / 530.66' S= 0.0299 '/' Cc= 0.900 n= 0.024, Flow Area= 35.55 sf

Primary OutFlow Max=0.00 cfs @ 12.86 hrs HW=533.00' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.00 cfs of 26.96 cfs potential flow)

Summary for Pond 18P: Level Spreader

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 0.75" for WQv event
Inflow = 1.23 cfs @ 16.35 hrs, Volume= 1.252 af
Outflow = 1.23 cfs @ 16.36 hrs, Volume= 1.252 af, Atten= 0%, Lag= 0.8 min
Primary = 1.23 cfs @ 16.36 hrs, Volume= 1.252 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 558.00' Surf.Area= 2,625 sf Storage= 7,350 cf
Peak Elev= 558.08' @ 16.37 hrs Surf.Area= 2,625 sf Storage= 7,435 cf (85 cf above start)

Plug-Flow detention time= 221.0 min calculated for 1.083 af (86% of inflow)
Center-of-Mass det. time= 1.2 min (1,352.5 - 1,351.4)

Volume	Invert	Avail.Storage	Storage Description
#1	551.00'	8,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 21,000 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
551.00	2,625	0	0
556.00	2,625	13,125	13,125
557.00	2,625	2,625	15,750
558.00	2,625	2,625	18,375
559.00	2,625	2,625	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**75.0" x 35.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.23 cfs @ 16.36 hrs HW=558.08' TW=558.03' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Weir Controls 1.23 cfs @ 0.83 fps)

Summary for Pond 23P:

Inflow Area = 0.745 ac, 73.15% Impervious, Inflow Depth = 0.74" for WQv event
Inflow = 0.59 cfs @ 12.09 hrs, Volume= 0.046 af
Outflow = 0.20 cfs @ 12.45 hrs, Volume= 0.046 af, Atten= 66%, Lag= 21.3 min
Primary = 0.20 cfs @ 12.45 hrs, Volume= 0.046 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 531.56' @ 12.45 hrs Surf.Area= 676 sf Storage= 411 cf

Plug-Flow detention time= 15.4 min calculated for 0.046 af (100% of inflow)
Center-of-Mass det. time= 15.4 min (840.7 - 825.3)

Volume	Invert	Avail.Storage	Storage Description
#1	530.19'	782 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
530.19	56	110.4	0	0	56
531.00	317	180.9	137	137	1,695
532.00	1,044	364.9	645	782	9,691

Device	Routing	Invert	Outlet Devices
#1	Primary	530.19'	**3.0" Round Culvert** L= 17.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 530.19' / 530.00' S= 0.0110 '/' Cc= 0.900 n= 0.013, Flow Area= 0.05 sf
#2	Secondary	531.60'	**30.0 deg x 7.7' long x 0.40' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.20 cfs @ 12.45 hrs HW=531.56' TW=527.35' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.20 cfs @ 4.14 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=530.19' TW=527.17' (Dynamic Tailwater)
↑—**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 28P: Ramp Culvert

Inflow Area = 0.933 ac, 0.00% Impervious, Inflow Depth = 0.41" for WQv event
Inflow = 0.28 cfs @ 12.21 hrs, Volume= 0.032 af
Outflow = 0.28 cfs @ 12.21 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min
Primary = 0.28 cfs @ 12.21 hrs, Volume= 0.032 af

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

Peak Elev= 554.61' @ 0.00 hrs Surf.Area= 4 sf Storage= 0 cf
Flood Elev= 556.36' Surf.Area= 534 sf Storage= 342 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	554.61'	342 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
554.61	4	8.0	0	0	4
555.00	56	45.8	10	10	166
556.00	337	150.1	177	187	1,795
556.36	534	184.0	155	342	2,698

Device	Routing	Invert	Outlet Devices
#1	Primary	553.36'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 30.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 553.36' / 552.74' S= 0.0207 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=0.00 cfs @ 12.21 hrs HW=554.61' TW=552.85' (Dynamic Tailwater)
↑—**1=RCP_Elliptical 23x14** (Passes 0.00 cfs of 8.72 cfs potential flow)

Summary for Link 21L: Point A

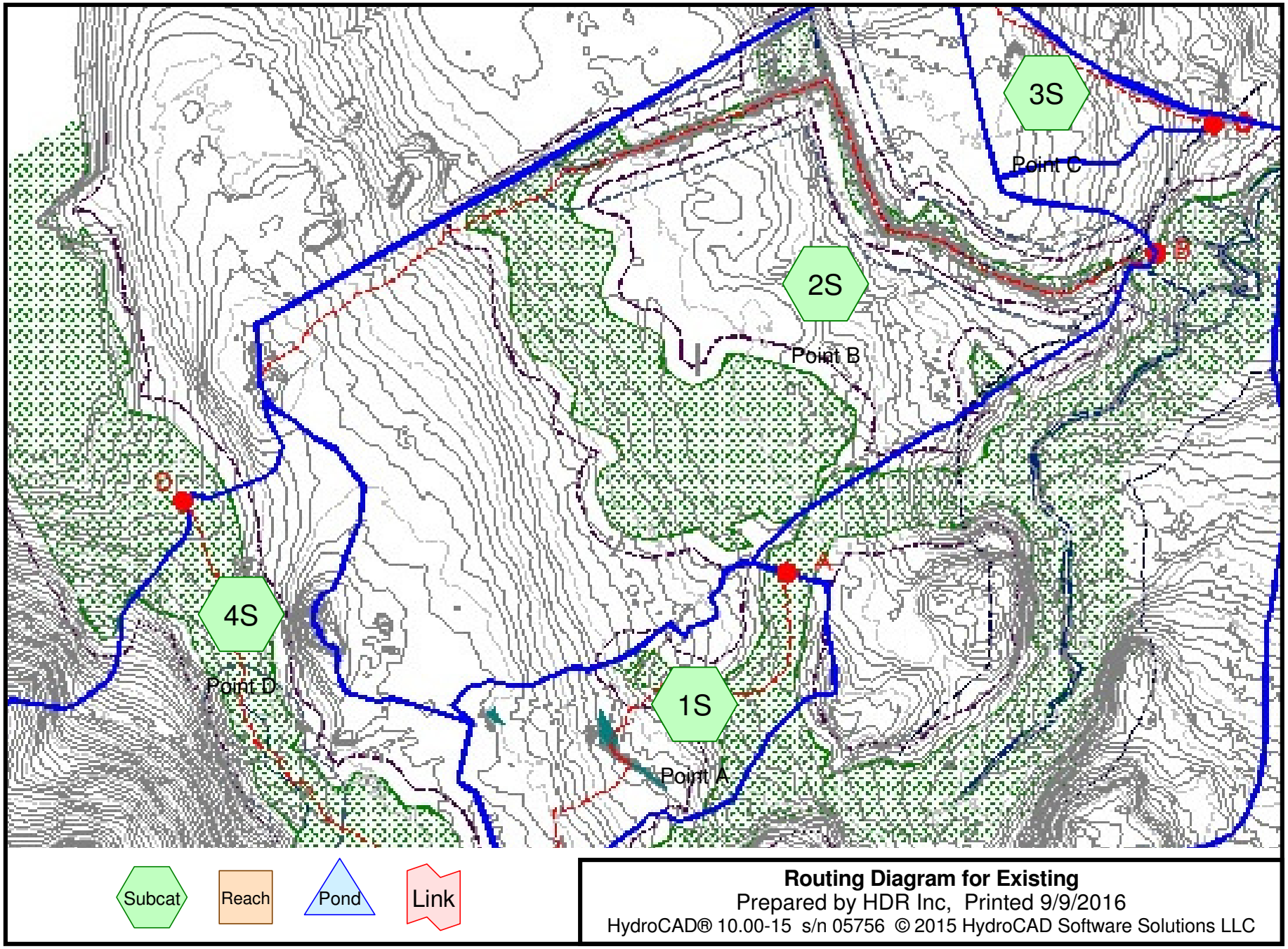
Inflow Area = 27.760 ac, 66.67% Impervious, Inflow Depth > 0.57" for WQv event
Inflow = 1.30 cfs @ 16.09 hrs, Volume= 1.317 af
Primary = 1.30 cfs @ 16.09 hrs, Volume= 1.317 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 22L: Point B

Inflow Area = 49.942 ac, 1.80% Impervious, Inflow Depth > 0.12" for WQv event
Inflow = 1.64 cfs @ 12.86 hrs, Volume= 0.502 af
Primary = 1.64 cfs @ 12.86 hrs, Volume= 0.502 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs



Routing Diagram for Existing
Prepared by HDR Inc, Printed 9/9/2016

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 1S: Point A Runoff Area=11.418 ac 0.00% Impervious Runoff Depth=2.54"
Flow Length=1,588' Slope=0.0303 '/' Tc=29.0 min CN=77 Runoff=19.52 cfs 2.416 af

Subcatchment 2S: Point B Runoff Area=59.760 ac 1.50% Impervious Runoff Depth=2.54"
Flow Length=3,073' Slope=0.0293 '/' Tc=49.9 min CN=77 Runoff=77.91 cfs 12.647 af

Subcatchment 3S: Point C Runoff Area=4.464 ac 0.00% Impervious Runoff Depth=2.54"
Flow Length=1,034' Slope=0.0331 '/' Tc=19.7 min CN=77 Runoff=9.01 cfs 0.945 af

Subcatchment 4S: Point D Runoff Area=85.739 ac 0.00% Impervious Runoff Depth=2.54"
Flow Length=3,135' Slope=0.0762 '/' Tc=31.5 min CN=77 Runoff=140.96 cfs 18.145 af

Total Runoff Area = 161.381 ac Runoff Volume = 34.153 af Average Runoff Depth = 2.54"
99.44% Pervious = 160.483 ac 0.56% Impervious = 0.898 ac

Summary for Subcatchment 1S: Point A

Runoff = 19.52 cfs @ 12.41 hrs, Volume= 2.416 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
11.418	77	Woods, Good, HSG D
11.418		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.0	1,588	0.0303	0.91		**Lag/CN Method,**

Summary for Subcatchment 2S: Point B

Runoff = 77.91 cfs @ 12.70 hrs, Volume= 12.647 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
58.862	77	Woods, Good, HSG D
0.898	98	Paved parking, HSG D
59.760	77	Weighted Average
58.862		98.50% Pervious Area
0.898		1.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.9	3,073	0.0293	1.03		**Lag/CN Method,**

Summary for Subcatchment 3S: Point C

Runoff = 9.01 cfs @ 12.28 hrs, Volume= 0.945 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
4.464	77	Woods, Good, HSG D
4.464		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.7	1,034	0.0331	0.88		**Lag/CN Method,**

Summary for Subcatchment 4S: Point D

Runoff = 140.96 cfs @ 12.43 hrs, Volume= 18.145 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
85.739	77	Woods, Good, HSG D
85.739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.5	3,135	0.0762	1.66		**Lag/CN Method,**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 1S: Point A Runoff Area=11.418 ac 0.00% Impervious Runoff Depth=5.92"
Flow Length=1,588' Slope=0.0303 '/' Tc=29.0 min CN=77 Runoff=45.19 cfs 5.633 af

Subcatchment 2S: Point B Runoff Area=59.760 ac 1.50% Impervious Runoff Depth=5.92"
Flow Length=3,073' Slope=0.0293 '/' Tc=49.9 min CN=77 Runoff=180.53 cfs 29.482 af

Subcatchment 3S: Point C Runoff Area=4.464 ac 0.00% Impervious Runoff Depth=5.92"
Flow Length=1,034' Slope=0.0331 '/' Tc=19.7 min CN=77 Runoff=20.85 cfs 2.202 af

Subcatchment 4S: Point D Runoff Area=85.739 ac 0.00% Impervious Runoff Depth=5.92"
Flow Length=3,135' Slope=0.0762 '/' Tc=31.5 min CN=77 Runoff=327.06 cfs 42.299 af

Total Runoff Area = 161.381 ac Runoff Volume = 79.617 af Average Runoff Depth = 5.92"
99.44% Pervious = 160.483 ac 0.56% Impervious = 0.898 ac

Summary for Subcatchment 1S: Point A

Runoff = 45.19 cfs @ 12.40 hrs, Volume= 5.633 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
11.418	77	Woods, Good, HSG D
11.418		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.0	1,588	0.0303	0.91		**Lag/CN Method,**

Summary for Subcatchment 2S: Point B

Runoff = 180.53 cfs @ 12.69 hrs, Volume= 29.482 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
58.862	77	Woods, Good, HSG D
0.898	98	Paved parking, HSG D
59.760	77	Weighted Average
58.862		98.50% Pervious Area
0.898		1.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.9	3,073	0.0293	1.03		**Lag/CN Method,**

Summary for Subcatchment 3S: Point C

Runoff = 20.85 cfs @ 12.27 hrs, Volume= 2.202 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
4.464	77	Woods, Good, HSG D
4.464		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.7	1,034	0.0331	0.88		**Lag/CN Method,**

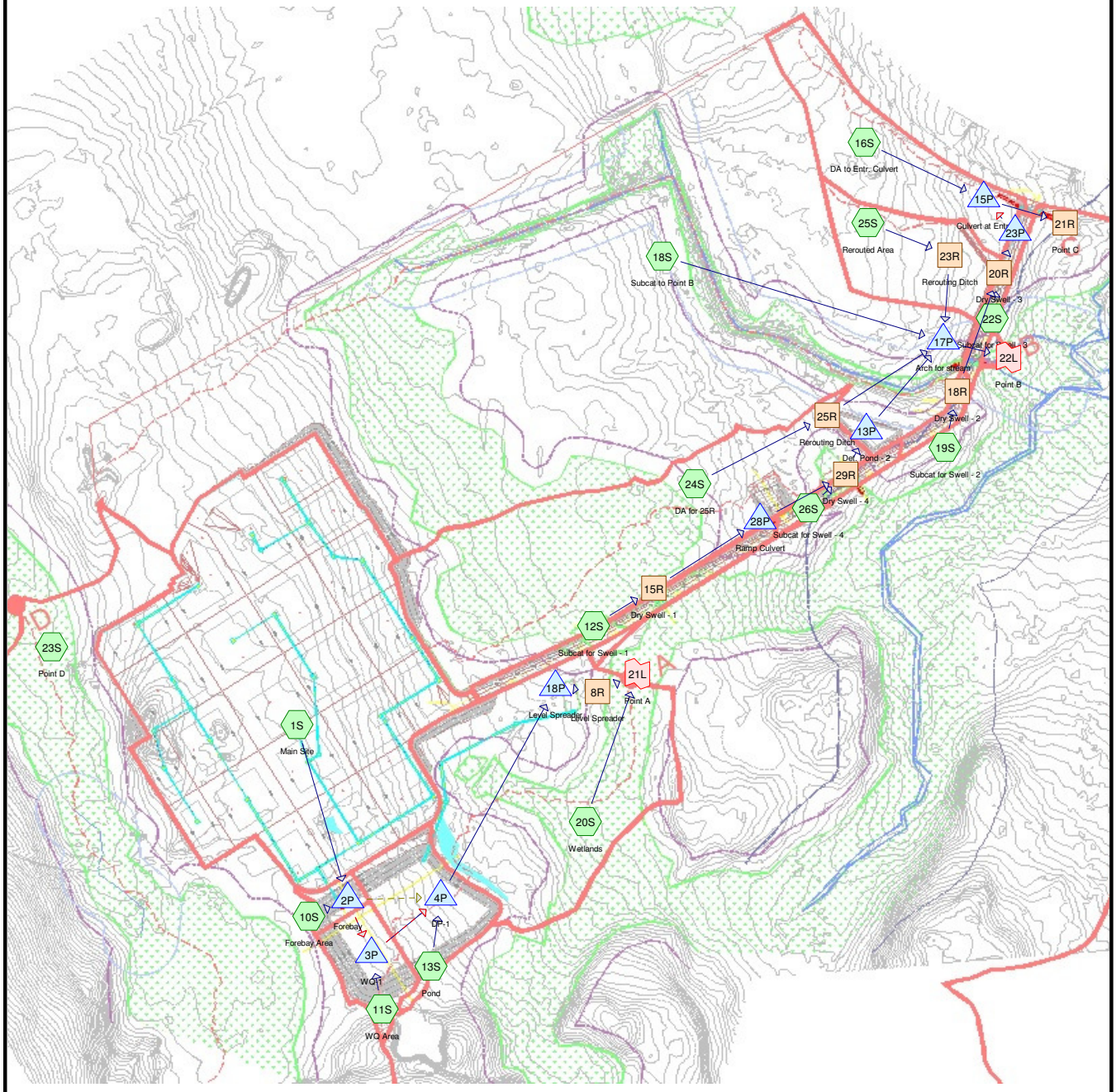
Summary for Subcatchment 4S: Point D

Runoff = 327.06 cfs @ 12.43 hrs, Volume= 42.299 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
85.739	77	Woods, Good, HSG D
85.739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.5	3,135	0.0762	1.66		**Lag/CN Method,**



Routing Diagram for Proposed
Prepared by HDR Inc, Printed 9/12/2016

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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Main Site Runoff Area=16.555 ac 100.00% Impervious Runoff Depth=2.47"
Flow Length=1,775' Tc=7.4 min CN=98 Runoff=41.18 cfs 3.407 af

Subcatchment 10S: Forebay Area Runoff Area=0.354 ac 24.29% Impervious Runoff Depth=1.27"
Tc=5.0 min CN=84 Runoff=0.55 cfs 0.038 af

Subcatchment 11S: WQ Area Runoff Area=1.129 ac 53.59% Impervious Runoff Depth=1.63"
Tc=5.0 min CN=89 Runoff=2.23 cfs 0.153 af

Subcatchment 12S: Subcat for Swell - 1 Runoff Area=0.933 ac 72.88% Impervious Runoff Depth=1.79"
Flow Length=993' Slope=0.1266 '/' Tc=6.0 min CN=91 Runoff=1.95 cfs 0.139 af

Subcatchment 13S: Pond Runoff Area=1.949 ac 64.70% Impervious Runoff Depth=1.88"
Tc=5.0 min CN=92 Runoff=4.39 cfs 0.305 af

Subcatchment 16S: DA to Entr. Culvert Runoff Area=140,442 sf 0.87% Impervious Runoff Depth=0.87"
Flow Length=1,034' Slope=0.0359 '/' Tc=18.9 min CN=77 Runoff=2.13 cfs 0.233 af

Subcatchment 18S: Subcat to Point B Runoff Area=1,632,095 sf 2.40% Impervious Runoff Depth=0.92"
Flow Length=3,073' Slope=0.0324 '/' Tc=46.1 min CN=78 Runoff=17.61 cfs 2.874 af

Subcatchment 19S: Subcat for Swell - 2 Runoff Area=0.272 ac 73.53% Impervious Runoff Depth=1.88"
Flow Length=313' Slope=0.1239 '/' Tc=2.3 min CN=92 Runoff=0.68 cfs 0.043 af

Subcatchment 20S: Wetlands Runoff Area=7.773 ac 0.00% Impervious Runoff Depth=0.87"
Flow Length=1,002' Slope=0.0286 '/' Tc=20.6 min CN=77 Runoff=4.95 cfs 0.563 af

Subcatchment 22S: Subcat for Swell - 3 Runoff Area=0.473 ac 72.94% Impervious Runoff Depth=1.88"
Flow Length=505' Slope=0.1265 '/' Tc=3.3 min CN=92 Runoff=1.13 cfs 0.074 af

Subcatchment 23S: Point D Runoff Area=3,639,264 sf 0.00% Impervious Runoff Depth=0.87"
Flow Length=3,135' Slope=0.0772 '/' Tc=31.3 min CN=77 Runoff=44.54 cfs 6.047 af

Subcatchment 24S: DA for 25R Runoff Area=8.906 ac 0.00% Impervious Runoff Depth=0.87"
Flow Length=1,580' Slope=0.0192 '/' Tc=36.2 min CN=77 Runoff=4.43 cfs 0.645 af

Subcatchment 25S: Rerouted Area Runoff Area=2.241 ac 0.00% Impervious Runoff Depth=0.87"
Flow Length=797' Slope=0.0260 '/' Tc=18.0 min CN=77 Runoff=1.51 cfs 0.162 af

Subcatchment 26S: Subcat for Swell - 4 Runoff Area=0.394 ac 72.84% Impervious Runoff Depth=1.79"
Flow Length=293' Slope=0.1266 '/' Tc=2.3 min CN=91 Runoff=0.94 cfs 0.059 af

Reach 8R: Level Spreader Avg. Flow Depth=0.05' Max Vel=0.67 fps Inflow=2.56 cfs 3.616 af
n=0.030 L=48.0' S=0.0100 '/' Capacity=439.80 cfs Outflow=2.56 cfs 3.616 af

Reach 15R: Dry Swell - 1 Avg. Flow Depth=0.26' Max Vel=2.33 fps Inflow=1.95 cfs 0.139 af
n=0.030 L=992.7' S=0.0177 '/' Capacity=84.06 cfs Outflow=1.56 cfs 0.139 af

Reach 18R: Dry Swell - 2 Avg. Flow Depth=0.08' Max Vel=1.30 fps Inflow=0.68 cfs 0.043 af
n=0.030 L=259.1' S=0.0222 '/' Capacity=49.33 cfs Outflow=0.60 cfs 0.043 af

Reach 20R: Dry Swell - 3 Avg. Flow Depth=0.25' Max Vel=2.57 fps Inflow=1.73 cfs 0.117 af
n=0.030 L=448.4' S=0.0233 '/' Capacity=96.49 cfs Outflow=1.58 cfs 0.117 af

Reach 21R: Point C Avg. Flow Depth=0.15' Max Vel=2.01 fps Inflow=2.85 cfs 0.350 af
n=0.024 L=77.4' S=0.0136 '/' Capacity=240.09 cfs Outflow=2.85 cfs 0.350 af

Reach 23R: Rerouting Ditch Avg. Flow Depth=0.32' Max Vel=1.72 fps Inflow=1.51 cfs 0.162 af
n=0.025 L=405.0' S=0.0054 '/' Capacity=12.66 cfs Outflow=1.46 cfs 0.162 af

Reach 25R: Rerouting Ditch Avg. Flow Depth=0.56' Max Vel=2.52 fps Inflow=4.43 cfs 0.645 af
n=0.025 L=262.2' S=0.0064 '/' Capacity=60.53 cfs Outflow=4.42 cfs 0.645 af

Reach 29R: Dry Swell - 4 Avg. Flow Depth=0.30' Max Vel=2.62 fps Inflow=2.06 cfs 0.198 af
n=0.030 L=292.6' S=0.0196 '/' Capacity=88.45 cfs Outflow=2.03 cfs 0.198 af

Pond 2P: Forebay Peak Elev=566.64' Storage=32,724 cf Inflow=41.70 cfs 3.445 af
Primary=6.59 cfs 2.823 af Secondary=18.06 cfs 0.159 af Tertiary=15.95 cfs 0.461 af Outflow=40.58 cfs 3.442 af

Pond 3P: WQ-1 Peak Elev=562.44' Storage=62,609 cf Inflow=26.49 cfs 3.135 af
Primary=4.54 cfs 3.117 af Secondary=0.00 cfs 0.000 af Outflow=4.54 cfs 3.117 af

Pond 4P: DP-1 Peak Elev=559.82' Storage=90,251 cf Inflow=23.02 cfs 3.883 af
Primary=2.56 cfs 3.617 af Secondary=0.00 cfs 0.000 af Outflow=2.56 cfs 3.617 af

Pond 13P: Det. Pond - 2 Peak Elev=538.92' Storage=5,166 cf Inflow=2.03 cfs 0.198 af
Outflow=0.14 cfs 0.194 af

Pond 15P: Culvert at Entr. Peak Elev=529.79' Storage=234 cf Inflow=2.96 cfs 0.350 af
Outflow=2.85 cfs 0.350 af

Pond 17P: Arch for stream Peak Elev=533.00' Storage=0 cf Inflow=22.82 cfs 3.874 af
144.0" x 49.0", R=77.5" Arch Culvert n=0.024 L=51.5' S=0.0299 '/' Outflow=22.82 cfs 3.874 af

Pond 18P: Level Spreader Peak Elev=558.13' Storage=7,487 cf Inflow=2.56 cfs 3.617 af
Outflow=2.56 cfs 3.616 af

Pond 23P: Peak Elev=531.74' Storage=542 cf Inflow=1.58 cfs 0.117 af
Primary=0.22 cfs 0.087 af Secondary=1.34 cfs 0.030 af Outflow=1.55 cfs 0.117 af

Pond 28P: Ramp Culvert Peak Elev=554.61' Storage=0 cf Inflow=1.56 cfs 0.139 af
23.0" x 14.0", R=22.0" Elliptical Culvert n=0.013 L=30.0' S=0.0207 '/' Outflow=1.56 cfs 0.139 af

Link 21L: Point A Inflow=6.34 cfs 4.178 af
Primary=6.34 cfs 4.178 af

Link 22L: Point B Inflow=22.82 cfs 3.874 af
Primary=22.82 cfs 3.874 af

Total Runoff Area = 165.217 ac Runoff Volume = 14.743 af Average Runoff Depth = 1.07"
87.32% Pervious = 144.272 ac 12.68% Impervious = 20.945 ac

Summary for Subcatchment 1S: Main Site

Runoff = 41.18 cfs @ 12.10 hrs, Volume= 3.407 af, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
16.555	98	Paved parking, HSG D
16.555		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	158	0.0100	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.5	135	0.0025	4.18	20.51	**Pipe Channel, 130-131** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
0.4	110	0.0025	4.72	33.35	**Pipe Channel, 131-132** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.3	79	0.0025	4.72	33.35	**Pipe Channel, 132-133** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.8	246	0.0025	5.23	50.30	**Pipe Channel, 133-134** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.4	133	0.0025	5.23	50.30	**Pipe Channel, 134-135** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.6	182	0.0025	5.23	50.30	**Pipe Channel, 135-136** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.7	256	0.0025	5.72	71.82	**Pipe Channel, 136-137** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.7	233	0.0025	5.72	71.82	**Pipe Channel, 137-138** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.4	130	0.0025	5.72	71.82	**Pipe Channel, 138-139** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.3	113	0.0025	5.72	71.82	**Pipe Channel, 139-Outlet** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
7.4	1,775	Total			

Summary for Subcatchment 10S: Forebay Area

Runoff = 0.55 cfs @ 12.08 hrs, Volume= 0.038 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.268	80	>75% Grass cover, Good, HSG D
0.086	98	Water Surface, HSG D
0.354	84	Weighted Average
0.268		75.71% Pervious Area
0.086		24.29% Impervious Area

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

Summary for Subcatchment 11S: WQ Area

Runoff = 2.23 cfs @ 12.07 hrs, Volume= 0.153 af, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.605	98	Water Surface, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
1.129	89	Weighted Average
0.524		46.41% Pervious Area
0.605		53.59% Impervious Area

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

Summary for Subcatchment 12S: Subcat for Swell - 1

Runoff = 1.95 cfs @ 12.09 hrs, Volume= 0.139 af, Depth= 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.253	74	>75% Grass cover, Good, HSG C
* 0.680	98	Paved parking, HSG C
0.933	91	Weighted Average
0.253		27.12% Pervious Area
0.680		72.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	993	0.1266	2.77		**Lag/CN Method,**

Summary for Subcatchment 13S: Pond

Runoff = 4.39 cfs @ 12.07 hrs, Volume= 0.305 af, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
1.261	98	Water Surface, HSG C
0.624	80	>75% Grass cover, Good, HSG D
0.064	77	Woods, Good, HSG D
1.949	92	Weighted Average
0.688		35.30% Pervious Area
1.261		64.70% Impervious Area

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

Summary for Subcatchment 16S: DA to Entr. Culvert

Runoff = 2.13 cfs @ 12.28 hrs, Volume= 0.233 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
139,222	77	Woods, Good, HSG D
1,220	98	Paved parking, HSG D
140,442	77	Weighted Average
139,222		99.13% Pervious Area
1,220		0.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	1,034	0.0359	0.91		**Lag/CN Method,**

Summary for Subcatchment 18S: Subcat to Point B

Runoff = 17.61 cfs @ 12.66 hrs, Volume= 2.874 af, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
1,592,978	77	Woods, Good, HSG D
39,117	98	Paved parking, HSG D
1,632,095	78	Weighted Average
1,592,978		97.60% Pervious Area
39,117		2.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.1	3,073	0.0324	1.11		**Lag/CN Method,**

Summary for Subcatchment 19S: Subcat for Swell - 2

Runoff = 0.68 cfs @ 12.03 hrs, Volume= 0.043 af, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

	Area (ac)	CN	Description
	0.200	98	Water Surface, HSG C
*	0.072	74	>75% Grass cover, Good, HSG C
	0.272	92	Weighted Average
	0.072		26.47% Pervious Area
	0.200		73.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	313	0.1239	2.27		**Lag/CN Method,**

Summary for Subcatchment 20S: Wetlands

Runoff = 4.95 cfs @ 12.31 hrs, Volume= 0.563 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
7.773	77	Woods, Good, HSG D
7.773		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,002	0.0286	0.81		**Lag/CN Method,**

Summary for Subcatchment 22S: Subcat for Swell - 3

Runoff = 1.13 cfs @ 12.05 hrs, Volume= 0.074 af, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

	Area (ac)	CN	Description
*	0.128	74	>75% Grass cover, Good, HSG C
*	0.345	98	Paved parking, HSG C
	0.473	92	Weighted Average
	0.128		27.06% Pervious Area
	0.345		72.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	505	0.1265	2.52		**Lag/CN Method,**

Summary for Subcatchment 23S: Point D

Runoff = 44.54 cfs @ 12.48 hrs, Volume= 6.047 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
3,639,264	77	Woods, Good, HSG D
3,639,264		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.3	3,135	0.0772	1.67		**Lag/CN Method,**

Summary for Subcatchment 24S: DA for 25R

Runoff = 4.43 cfs @ 12.55 hrs, Volume= 0.645 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
8.906	77	Woods, Good, HSG D
8.906		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.2	1,580	0.0192	0.73		**Lag/CN Method,**

Summary for Subcatchment 25S: Rerouted Area

Runoff = 1.51 cfs @ 12.26 hrs, Volume= 0.162 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
2.241	77	Woods, Good, HSG D
2.241		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	797	0.0260	0.74		**Lag/CN Method,**

Summary for Subcatchment 26S: Subcat for Swell - 4

Runoff = 0.94 cfs @ 12.03 hrs, Volume= 0.059 af, Depth= 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

	Area (ac)	CN	Description
*	0.287	98	Paved parking, HSG D
	0.107	74	>75% Grass cover, Good, HSG C
	0.394	91	Weighted Average
	0.107		27.16% Pervious Area
	0.287		72.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	293	0.1266	2.17		**Lag/CN Method,**

Summary for Reach 8R: Level Spreader

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 2.17" for 1-Year event
Inflow = 2.56 cfs @ 18.01 hrs, Volume= 3.616 af
Outflow = 2.56 cfs @ 18.02 hrs, Volume= 3.616 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.67 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 1.9 min

Peak Storage= 184 cf @ 18.02 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 1.00' Flow Area= 105.0 sf, Capacity= 439.80 cfs

75.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 30.0 '/' Top Width= 135.00'
Length= 48.0' Slope= 0.0100 '/'
Inlet Invert= 558.00', Outlet Invert= 557.52'

‡

Summary for Reach 15R: Dry Swell - 1

Inflow Area = 0.933 ac, 72.88% Impervious, Inflow Depth = 1.79" for 1-Year event
Inflow = 1.95 cfs @ 12.09 hrs, Volume= 0.139 af
Outflow = 1.56 cfs @ 12.15 hrs, Volume= 0.139 af, Atten= 20%, Lag= 3.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.33 fps, Min. Travel Time= 7.1 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 23.7 min

Peak Storage= 664 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 84.06 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 992.7' Slope= 0.0177 '/'
Inlet Invert= 572.18', Outlet Invert= 554.62'

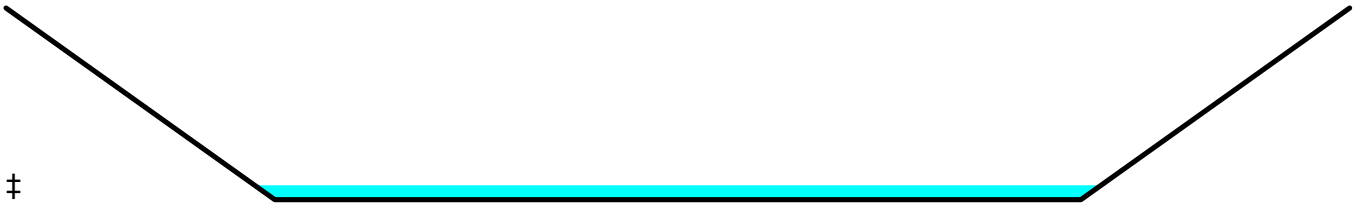
Summary for Reach 18R: Dry Swell - 2

Inflow Area = 0.272 ac, 73.53% Impervious, Inflow Depth = 1.88" for 1-Year event
Inflow = 0.68 cfs @ 12.03 hrs, Volume= 0.043 af
Outflow = 0.60 cfs @ 12.06 hrs, Volume= 0.043 af, Atten= 11%, Lag= 1.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.30 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 11.1 min

Peak Storage= 121 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 49.33 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 259.1' Slope= 0.0222 '/'
Inlet Invert= 547.00', Outlet Invert= 541.25'



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Summary for Reach 20R: Dry Swell - 3

Inflow Area = 0.745 ac, 73.15% Impervious, Inflow Depth = 1.88" for 1-Year event
Inflow = 1.73 cfs @ 12.05 hrs, Volume= 0.117 af
Outflow = 1.58 cfs @ 12.08 hrs, Volume= 0.117 af, Atten= 8%, Lag= 1.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.57 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 10.1 min

Peak Storage= 276 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 96.49 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 448.4' Slope= 0.0233 '/'
Inlet Invert= 541.25', Outlet Invert= 530.80'

Summary for Reach 21R: Point C

Inflow Area = 3.969 ac, 14.44% Impervious, Inflow Depth = 1.06" for 1-Year event
Inflow = 2.85 cfs @ 12.30 hrs, Volume= 0.350 af
Outflow = 2.85 cfs @ 12.31 hrs, Volume= 0.350 af, Atten= 0%, Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.01 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 1.9 min

Peak Storage= 110 cf @ 12.31 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 2.00' Flow Area= 26.0 sf, Capacity= 240.09 cfs

9.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 77.4' Slope= 0.0136 '/'
Inlet Invert= 526.65', Outlet Invert= 525.60'

‡

Summary for Reach 23R: Rerouting Ditch

Inflow Area = 2.241 ac, 0.00% Impervious, Inflow Depth = 0.87" for 1-Year event
Inflow = 1.51 cfs @ 12.26 hrs, Volume= 0.162 af
Outflow = 1.46 cfs @ 12.32 hrs, Volume= 0.162 af, Atten= 4%, Lag= 3.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.72 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 0.58 fps, Avg. Travel Time= 11.7 min

Peak Storage= 343 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 12.66 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 405.0' Slope= 0.0054 '/'
Inlet Invert= 536.00', Outlet Invert= 533.82'

Summary for Reach 25R: Rerouting Ditch

Inflow Area = 8.906 ac, 0.00% Impervious, Inflow Depth = 0.87" for 1-Year event
Inflow = 4.43 cfs @ 12.55 hrs, Volume= 0.645 af
Outflow = 4.42 cfs @ 12.57 hrs, Volume= 0.645 af, Atten= 0%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.52 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.05 fps, Avg. Travel Time= 4.2 min

Peak Storage= 459 cf @ 12.57 hrs
Average Depth at Peak Storage= 0.56'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 60.53 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 262.2' Slope= 0.0064 '/'
Inlet Invert= 540.67', Outlet Invert= 539.00'

Summary for Reach 29R: Dry Swell - 4

Inflow Area = 1.327 ac, 72.87% Impervious, Inflow Depth = 1.79" for 1-Year event
Inflow = 2.06 cfs @ 12.10 hrs, Volume= 0.198 af
Outflow = 2.03 cfs @ 12.12 hrs, Volume= 0.198 af, Atten= 1%, Lag= 1.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.62 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 6.1 min

Peak Storage= 227 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 88.45 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 292.6' Slope= 0.0196 '/'
Inlet Invert= 552.74', Outlet Invert= 547.01'

Summary for Pond 2P: Forebay

Inflow Area = 16.909 ac, 98.42% Impervious, Inflow Depth = 2.44" for 1-Year event
Inflow = 41.70 cfs @ 12.10 hrs, Volume= 3.445 af
Outflow = 40.58 cfs @ 12.12 hrs, Volume= 3.442 af, Atten= 3%, Lag= 1.4 min
Primary = 6.59 cfs @ 12.11 hrs, Volume= 2.823 af
Secondary = 18.06 cfs @ 12.12 hrs, Volume= 0.159 af
Tertiary = 15.95 cfs @ 12.12 hrs, Volume= 0.461 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 3,802 sf Storage= 3,789 cf
Peak Elev= 566.64' @ 12.12 hrs Surf.Area= 6,526 sf Storage= 32,724 cf (28,935 cf above start)
Flood Elev= 568.00' Surf.Area= 7,249 sf Storage= 42,057 cf (38,268 cf above start)

Plug-Flow detention time= 72.1 min calculated for 3.354 af (97% of inflow)
Center-of-Mass det. time= 42.7 min (804.9 - 762.2)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	49,579 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	2,536	269.1	0.0	0	0	2,536
559.00	2,944	279.8	40.0	1,095	1,095	3,078
560.00	3,366	290.5	40.0	1,261	2,356	3,641
561.00	3,802	301.2	40.0	1,433	3,789	4,225
562.00	4,252	312.0	100.0	4,025	7,814	4,835
563.00	4,716	322.7	100.0	4,482	12,296	5,462
564.00	5,194	333.4	100.0	4,953	17,249	6,110
565.00	5,687	344.1	100.0	5,439	22,687	6,779
566.00	6,193	354.8	100.0	5,938	28,626	7,469
567.00	6,714	365.5	100.0	6,452	35,077	8,180
568.00	7,249	376.2	100.0	6,980	42,057	8,912
569.00	7,798	386.9	100.0	7,522	49,579	9,666

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Tertiary	558.00'	**36.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#3	Device 2	566.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	566.50'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=6.57 cfs @ 12.11 hrs HW=566.63' TW=561.79' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 6.57 cfs @ 8.37 fps)

Secondary OutFlow Max=17.79 cfs @ 12.12 hrs HW=566.64' TW=561.83' (Dynamic Tailwater)
└**4=Sharp-Crested Rectangular Weir** (Weir Controls 17.79 cfs @ 1.24 fps)

Tertiary OutFlow Max=15.89 cfs @ 12.12 hrs HW=566.64' TW=558.58' (Dynamic Tailwater)
└**2=Culvert** (Passes 15.89 cfs of 71.81 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 15.89 cfs @ 2.62 fps)

Summary for Pond 3P: WQ-1

Inflow Area = 18.038 ac, 95.61% Impervious, Inflow Depth = 2.09" for 1-Year event
Inflow = 26.49 cfs @ 12.12 hrs, Volume= 3.135 af
Outflow = 4.54 cfs @ 13.96 hrs, Volume= 3.117 af, Atten= 83%, Lag= 110.0 min
Primary = 4.54 cfs @ 13.96 hrs, Volume= 3.117 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 23,969 sf Storage= 27,117 cf
Peak Elev= 562.44' @ 13.96 hrs Surf.Area= 25,321 sf Storage= 62,609 cf (35,492 cf above start)
Flood Elev= 568.00' Surf.Area= 30,816 sf Storage= 218,459 cf (191,342 cf above start)

Plug-Flow detention time= 288.9 min calculated for 2.495 af (80% of inflow)
Center-of-Mass det. time= 127.5 min (942.8 - 815.3)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	249,790 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	21,247	600.7	0.0	0	0	21,247
559.00	22,140	611.4	40.0	8,677	8,677	22,444
560.00	23,048	622.1	40.0	9,037	17,714	23,662
561.00	23,969	632.9	40.0	9,403	27,117	24,910
562.00	24,905	643.6	100.0	24,436	51,552	26,170
563.00	25,855	654.3	100.0	25,379	76,931	27,452
564.00	26,819	665.0	100.0	26,336	103,266	28,754
565.00	27,797	675.8	100.0	27,307	130,573	30,088
566.00	28,789	686.5	100.0	28,292	158,864	31,433
567.00	29,795	697.2	100.0	29,291	188,155	32,799
568.00	30,816	707.9	100.0	30,304	218,459	34,187
569.00	31,850	718.7	100.0	31,332	249,790	35,605

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**36.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	561.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 2	558.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	564.00'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=4.54 cfs @ 13.96 hrs HW=562.44' TW=559.35' (Dynamic Tailwater)
- **1=Culvert** (Passes 4.54 cfs of 53.08 cfs potential flow)
  - **2=Orifice/Grate** (Passes 4.54 cfs of 7.33 cfs potential flow)
    - **3=Orifice/Grate** (Orifice Controls 4.54 cfs @ 5.78 fps)
    - **5=Orifice/Grate** (Controls 0.00 cfs)
  - **4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=561.00' TW=558.00' (Dynamic Tailwater)
- **6=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4P: DP-1

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 2.33" for 1-Year event
Inflow = 23.02 cfs @ 12.12 hrs, Volume= 3.883 af
Outflow = 2.56 cfs @ 18.00 hrs, Volume= 3.617 af, Atten= 89%, Lag= 352.6 min
Primary = 2.56 cfs @ 18.00 hrs, Volume= 3.617 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 559.82' @ 18.00 hrs Surf.Area= 51,383 sf Storage= 90,251 cf
Flood Elev= 565.00' Surf.Area= 62,400 sf Storage= 384,495 cf

Plug-Flow detention time= 493.8 min calculated for 3.616 af (93% of inflow)
Center-of-Mass det. time= 445.1 min (1,352.7 - 907.5)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	651,999 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	47,688	883.6	0	0	47,688
559.00	49,705	899.0	48,693	48,693	50,047
560.00	51,750	914.4	50,724	99,417	52,448
561.00	53,824	929.8	52,784	152,201	54,888
562.00	55,926	945.2	54,872	207,072	57,370
563.00	58,056	960.6	56,988	264,060	59,893
564.00	60,214	976.1	59,132	323,192	62,470
565.00	62,400	991.5	61,304	384,495	65,075
566.00	64,615	1,006.9	63,504	448,000	67,720
567.00	66,858	1,022.3	65,733	513,733	70,405
568.00	69,129	1,037.7	67,990	581,723	73,132
569.00	71,429	1,053.2	70,276	651,999	75,915

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**48.0" Round Culvert** L= 663.9' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 551.36' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	558.00'	**9.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	562.50'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Secondary	568.00'	**45.0 deg x 100.0' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=2.56 cfs @ 18.00 hrs HW=559.82' TW=558.13' (Dynamic Tailwater)
↑**1=Culvert** (Passes 2.56 cfs of 15.36 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 2.56 cfs @ 5.79 fps)
3=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=558.00' (Free Discharge)
↑**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 13P: Det. Pond - 2

Inflow Area = 1.327 ac, 72.87% Impervious, Inflow Depth = 1.79" for 1-Year event
Inflow = 2.03 cfs @ 12.12 hrs, Volume= 0.198 af
Outflow = 0.14 cfs @ 14.79 hrs, Volume= 0.194 af, Atten= 93%, Lag= 160.4 min
Primary = 0.14 cfs @ 14.79 hrs, Volume= 0.194 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 538.92' @ 14.79 hrs Surf.Area= 6,148 sf Storage= 5,166 cf
Flood Elev= 541.00' Surf.Area= 8,791 sf Storage= 20,626 cf

Plug-Flow detention time= 497.2 min calculated for 0.194 af (98% of inflow)
Center-of-Mass det. time= 482.9 min (1,305.5 - 822.6)

Volume	Invert	Avail.Storage	Storage Description
#1	538.00'	20,626 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
538.00	5,054	387.0	0	0	5,054
539.00	6,243	405.8	5,638	5,638	6,305
540.00	7,489	424.7	6,857	12,495	7,621
541.00	8,791	423.9	8,131	20,626	8,049

Device	Routing	Invert	Outlet Devices
#1	Primary	538.00'	**15.0" Round Culvert** L= 94.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.00' / 537.00' S= 0.0106 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	538.00'	**2.4" Vert. Orifice/Grate** C= 0.600
#3	Device 1	538.90'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	539.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.14 cfs @ 14.79 hrs HW=538.92' TW=533.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.14 cfs of 3.18 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.14 cfs @ 4.37 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.53 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 15P: Culvert at Entr.

Inflow Area = 3.969 ac, 14.44% Impervious, Inflow Depth = 1.06" for 1-Year event
Inflow = 2.96 cfs @ 12.24 hrs, Volume= 0.350 af
Outflow = 2.85 cfs @ 12.30 hrs, Volume= 0.350 af, Atten= 4%, Lag= 3.7 min
Primary = 2.85 cfs @ 12.30 hrs, Volume= 0.350 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 529.79' @ 12.30 hrs Surf.Area= 231 sf Storage= 234 cf

Plug-Flow detention time= 0.4 min calculated for 0.350 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (857.9 - 857.5)

Volume	Invert	Avail.Storage	Storage Description
#1	527.17'	1,407 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
527.17	6	14.0	0	0	6
528.00	44	35.0	18	18	90
529.00	121	58.1	79	98	268
530.00	266	92.9	189	286	693
531.00	555	117.6	402	688	1,120
532.00	897	157.4	719	1,407	2,001

Device	Routing	Invert	Outlet Devices
#1	Primary	527.17'	**18.0" Round Culvert X 2.00** L= 52.8' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 527.17' / 526.65' S= 0.0098 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	527.17'	**18.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	530.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.85 cfs @ 12.30 hrs HW=529.79' TW=526.80' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.85 cfs of 24.69 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 2.85 cfs @ 7.61 fps)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 17P: Arch for stream

Inflow Area = 49.942 ac, 3.73% Impervious, Inflow Depth > 0.93" for 1-Year event
Inflow = 22.82 cfs @ 12.65 hrs, Volume= 3.874 af
Outflow = 22.82 cfs @ 12.65 hrs, Volume= 3.874 af, Atten= 0%, Lag= 0.0 min
Primary = 22.82 cfs @ 12.65 hrs, Volume= 3.874 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 533.00' @ 12.65 hrs Surf.Area= 412 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (915.6 - 915.6)

Volume	Invert	Avail.Storage	Storage Description
#1	533.00'	25,714 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
533.00	412	159.8	0	0	412
534.00	5,210	513.7	2,362	2,362	19,382
535.00	11,714	795.5	8,245	10,608	48,748
536.00	18,774	996.6	15,106	25,714	77,441

Device	Routing	Invert	Outlet Devices
#1	Primary	532.20'	**144.0" W x 49.0" H, R=77.5" Arch Culvert** L= 51.5' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 532.20' / 530.66' S= 0.0299 '/' Cc= 0.900 n= 0.024, Flow Area= 35.55 sf

Primary OutFlow Max=26.96 cfs @ 12.65 hrs HW=533.00' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 26.96 cfs @ 2.89 fps)

Summary for Pond 18P: Level Spreader

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 2.17" for 1-Year event
Inflow = 2.56 cfs @ 18.00 hrs, Volume= 3.617 af
Outflow = 2.56 cfs @ 18.01 hrs, Volume= 3.616 af, Atten= 0%, Lag= 0.6 min
Primary = 2.56 cfs @ 18.01 hrs, Volume= 3.616 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 558.00' Surf.Area= 2,625 sf Storage= 7,350 cf
Peak Elev= 558.13' @ 18.01 hrs Surf.Area= 2,625 sf Storage= 7,487 cf (137 cf above start)

Plug-Flow detention time= 85.8 min calculated for 3.447 af (95% of inflow)
Center-of-Mass det. time= 0.9 min (1,353.6 - 1,352.7)

Volume	Invert	Avail.Storage	Storage Description
#1	551.00'	8,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 21,000 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
551.00	2,625	0	0
556.00	2,625	13,125	13,125
557.00	2,625	2,625	15,750
558.00	2,625	2,625	18,375
559.00	2,625	2,625	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**75.0" x 35.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.56 cfs @ 18.01 hrs HW=558.13' TW=558.05' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Weir Controls 2.56 cfs @ 1.07 fps)

Summary for Pond 23P:

Inflow Area = 0.745 ac, 73.15% Impervious, Inflow Depth = 1.88" for 1-Year event
Inflow = 1.58 cfs @ 12.08 hrs, Volume= 0.117 af
Outflow = 1.55 cfs @ 12.10 hrs, Volume= 0.117 af, Atten= 2%, Lag= 1.0 min
Primary = 0.22 cfs @ 12.10 hrs, Volume= 0.087 af
Secondary = 1.34 cfs @ 12.10 hrs, Volume= 0.030 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 531.74' @ 12.10 hrs Surf.Area= 815 sf Storage= 542 cf

Plug-Flow detention time= 12.8 min calculated for 0.117 af (100% of inflow)
Center-of-Mass det. time= 12.7 min (823.5 - 810.8)

Volume	Invert	Avail.Storage	Storage Description
#1	530.19'	782 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
530.19	56	110.4	0	0	56
531.00	317	180.9	137	137	1,695
532.00	1,044	364.9	645	782	9,691

Device	Routing	Invert	Outlet Devices
#1	Primary	530.19'	**3.0" Round Culvert** L= 17.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 530.19' / 530.00' S= 0.0110 '/' Cc= 0.900 n= 0.013, Flow Area= 0.05 sf
#2	Secondary	531.60'	**30.0 deg x 7.7' long x 0.40' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.22 cfs @ 12.10 hrs HW=531.74' TW=528.95' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.22 cfs @ 4.41 fps)

Secondary OutFlow Max=1.33 cfs @ 12.10 hrs HW=531.74' TW=528.95' (Dynamic Tailwater)
↑—**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 1.33 cfs @ 1.22 fps)

Summary for Pond 28P: Ramp Culvert

Inflow Area = 0.933 ac, 72.88% Impervious, Inflow Depth = 1.79" for 1-Year event
Inflow = 1.56 cfs @ 12.15 hrs, Volume= 0.139 af
Outflow = 1.56 cfs @ 12.15 hrs, Volume= 0.139 af, Atten= 0%, Lag= 0.0 min
Primary = 1.56 cfs @ 12.15 hrs, Volume= 0.139 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 554.61' @ 0.00 hrs Surf.Area= 4 sf Storage= 0 cf
Flood Elev= 556.36' Surf.Area= 534 sf Storage= 342 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (824.3 - 824.3)

Volume	Invert	Avail.Storage	Storage Description
#1	554.61'	342 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
554.61	4	8.0	0	0	4
555.00	56	45.8	10	10	166
556.00	337	150.1	177	187	1,795
556.36	534	184.0	155	342	2,698

Device	Routing	Invert	Outlet Devices
#1	Primary	553.36'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 30.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 553.36' / 552.74' S= 0.0207 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=0.00 cfs @ 12.15 hrs HW=554.61' TW=553.04' (Dynamic Tailwater)
↑—**1=RCP_Elliptical 23x14** (Passes 0.00 cfs of 8.72 cfs potential flow)

Summary for Link 21L: Point A

Inflow Area = 27.760 ac, 66.67% Impervious, Inflow Depth > 1.81" for 1-Year event
Inflow = 6.34 cfs @ 12.33 hrs, Volume= 4.178 af
Primary = 6.34 cfs @ 12.33 hrs, Volume= 4.178 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 22L: Point B

Inflow Area = 49.942 ac, 3.73% Impervious, Inflow Depth > 0.93" for 1-Year event
Inflow = 22.82 cfs @ 12.65 hrs, Volume= 3.874 af
Primary = 22.82 cfs @ 12.65 hrs, Volume= 3.874 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Main Site Runoff Area=16.555 ac 100.00% Impervious Runoff Depth=4.66"
Flow Length=1,775' Tc=7.4 min CN=98 Runoff=75.68 cfs 6.433 af

Subcatchment 10S: Forebay Area Runoff Area=0.354 ac 24.29% Impervious Runoff Depth=3.18"
Tc=5.0 min CN=84 Runoff=1.36 cfs 0.094 af

Subcatchment 11S: WQ Area Runoff Area=1.129 ac 53.59% Impervious Runoff Depth=3.68"
Tc=5.0 min CN=89 Runoff=4.90 cfs 0.346 af

Subcatchment 12S: Subcat for Swell - 1 Runoff Area=0.933 ac 72.88% Impervious Runoff Depth=3.89"
Flow Length=993' Slope=0.1266 '/' Tc=6.0 min CN=91 Runoff=4.07 cfs 0.302 af

Subcatchment 13S: Pond Runoff Area=1.949 ac 64.70% Impervious Runoff Depth=3.99"
Tc=5.0 min CN=92 Runoff=8.98 cfs 0.648 af

Subcatchment 16S: DA to Entr. Culvert Runoff Area=140,442 sf 0.87% Impervious Runoff Depth=2.54"
Flow Length=1,034' Slope=0.0359 '/' Tc=18.9 min CN=77 Runoff=6.61 cfs 0.682 af

Subcatchment 18S: Subcat to Point B Runoff Area=1,632,095 sf 2.40% Impervious Runoff Depth=2.63"
Flow Length=3,073' Slope=0.0324 '/' Tc=46.1 min CN=78 Runoff=52.82 cfs 8.202 af

Subcatchment 19S: Subcat for Swell - 2 Runoff Area=0.272 ac 73.53% Impervious Runoff Depth=3.99"
Flow Length=313' Slope=0.1239 '/' Tc=2.3 min CN=92 Runoff=1.38 cfs 0.090 af

Subcatchment 20S: Wetlands Runoff Area=7.773 ac 0.00% Impervious Runoff Depth=2.54"
Flow Length=1,002' Slope=0.0286 '/' Tc=20.6 min CN=77 Runoff=15.41 cfs 1.645 af

Subcatchment 22S: Subcat for Swell - 3 Runoff Area=0.473 ac 72.94% Impervious Runoff Depth=3.99"
Flow Length=505' Slope=0.1265 '/' Tc=3.3 min CN=92 Runoff=2.32 cfs 0.157 af

Subcatchment 23S: Point D Runoff Area=3,639,264 sf 0.00% Impervious Runoff Depth=2.54"
Flow Length=3,135' Slope=0.0772 '/' Tc=31.3 min CN=77 Runoff=137.55 cfs 17.681 af

Subcatchment 24S: DA for 25R Runoff Area=8.906 ac 0.00% Impervious Runoff Depth=2.54"
Flow Length=1,580' Slope=0.0192 '/' Tc=36.2 min CN=77 Runoff=13.73 cfs 1.885 af

Subcatchment 25S: Rerouted Area Runoff Area=2.241 ac 0.00% Impervious Runoff Depth=2.54"
Flow Length=797' Slope=0.0260 '/' Tc=18.0 min CN=77 Runoff=4.69 cfs 0.474 af

Subcatchment 26S: Subcat for Swell - 4 Runoff Area=0.394 ac 72.84% Impervious Runoff Depth=3.89"
Flow Length=293' Slope=0.1266 '/' Tc=2.3 min CN=91 Runoff=1.97 cfs 0.128 af

Reach 8R: Level Spreader Avg. Flow Depth=0.06' Max Vel=0.77 fps Inflow=3.74 cfs 7.134 af
n=0.030 L=48.0' S=0.0100 '/' Capacity=439.80 cfs Outflow=3.74 cfs 7.133 af

Reach 15R: Dry Swell - 1 Avg. Flow Depth=0.41' Max Vel=2.97 fps Inflow=4.07 cfs 0.302 af
n=0.030 L=992.7' S=0.0177 '/' Capacity=84.06 cfs Outflow=3.44 cfs 0.302 af

Reach 18R: Dry Swell - 2 Avg. Flow Depth=0.12' Max Vel=1.73 fps Inflow=1.38 cfs 0.090 af
n=0.030 L=259.1' S=0.0222 '/' Capacity=49.33 cfs Outflow=1.28 cfs 0.090 af

Reach 20R: Dry Swell - 3 Avg. Flow Depth=0.38' Max Vel=3.25 fps Inflow=3.59 cfs 0.248 af
n=0.030 L=448.4' S=0.0233 '/' Capacity=96.49 cfs Outflow=3.36 cfs 0.248 af

Reach 21R: Point C Avg. Flow Depth=0.29' Max Vel=2.99 fps Inflow=8.22 cfs 0.930 af
n=0.024 L=77.4' S=0.0136 '/' Capacity=240.09 cfs Outflow=8.21 cfs 0.930 af

Reach 23R: Rerouting Ditch Avg. Flow Depth=0.60' Max Vel=2.40 fps Inflow=4.69 cfs 0.474 af
n=0.025 L=405.0' S=0.0054 '/' Capacity=12.66 cfs Outflow=4.59 cfs 0.474 af

Reach 25R: Rerouting Ditch Avg. Flow Depth=1.00' Max Vel=3.44 fps Inflow=13.73 cfs 1.885 af
n=0.025 L=262.2' S=0.0064 '/' Capacity=60.53 cfs Outflow=13.70 cfs 1.885 af

Reach 29R: Dry Swell - 4 Avg. Flow Depth=0.46' Max Vel=3.33 fps Inflow=4.56 cfs 0.430 af
n=0.030 L=292.6' S=0.0196 '/' Capacity=88.45 cfs Outflow=4.52 cfs 0.430 af

Pond 2P: Forebay Peak Elev=566.78' Storage=33,626 cf Inflow=76.95 cfs 6.527 af
Primary=6.41 cfs 4.326 af Secondary=49.49 cfs 1.065 af Tertiary=21.31 cfs 1.133 af Outflow=76.76 cfs 6.524 af

Pond 3P: WQ-1 Peak Elev=563.14' Storage=80,492 cf Inflow=59.93 cfs 5.737 af
Primary=34.64 cfs 5.718 af Secondary=0.00 cfs 0.000 af Outflow=34.64 cfs 5.718 af

Pond 4P: DP-1 Peak Elev=561.46' Storage=177,399 cf Inflow=57.35 cfs 7.500 af
Primary=3.74 cfs 7.135 af Secondary=0.00 cfs 0.000 af Outflow=3.74 cfs 7.135 af

Pond 13P: Det. Pond - 2 Peak Elev=539.60' Storage=9,579 cf Inflow=4.52 cfs 0.430 af
Outflow=1.11 cfs 0.424 af

Pond 15P: Culvert at Entr. Peak Elev=530.16' Storage=333 cf Inflow=8.22 cfs 0.930 af
Outflow=8.22 cfs 0.930 af

Pond 17P: Arch for stream Peak Elev=533.73' Storage=1,205 cf Inflow=69.32 cfs 10.985 af
144.0" x 49.0", R=77.5" Arch Culvert n=0.024 L=51.5' S=0.0299 '/' Outflow=69.25 cfs 10.985 af

Pond 18P: Level Spreader Peak Elev=558.17' Storage=7,527 cf Inflow=3.74 cfs 7.135 af
Outflow=3.74 cfs 7.134 af

Pond 23P: Peak Elev=531.85' Storage=632 cf Inflow=3.36 cfs 0.248 af
Primary=0.22 cfs 0.148 af Secondary=3.09 cfs 0.100 af Outflow=3.32 cfs 0.248 af

Pond 28P: Ramp Culvert Peak Elev=554.61' Storage=0 cf Inflow=3.44 cfs 0.302 af
23.0" x 14.0", R=22.0" Elliptical Culvert n=0.013 L=30.0' S=0.0207 '/' Outflow=3.44 cfs 0.302 af

Link 21L: Point A Inflow=18.07 cfs 8.778 af
Primary=18.07 cfs 8.778 af

Link 22L: Point B Inflow=69.25 cfs 10.985 af
Primary=69.25 cfs 10.985 af

Total Runoff Area = 165.217 ac Runoff Volume = 38.768 af Average Runoff Depth = 2.82"
87.32% Pervious = 144.272 ac 12.68% Impervious = 20.945 ac

Summary for Subcatchment 1S: Main Site

Runoff = 75.68 cfs @ 12.10 hrs, Volume= 6.433 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
16.555	98	Paved parking, HSG D
16.555		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	158	0.0100	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.5	135	0.0025	4.18	20.51	**Pipe Channel, 130-131** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
0.4	110	0.0025	4.72	33.35	**Pipe Channel, 131-132** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.3	79	0.0025	4.72	33.35	**Pipe Channel, 132-133** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.8	246	0.0025	5.23	50.30	**Pipe Channel, 133-134** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.4	133	0.0025	5.23	50.30	**Pipe Channel, 134-135** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.6	182	0.0025	5.23	50.30	**Pipe Channel, 135-136** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.7	256	0.0025	5.72	71.82	**Pipe Channel, 136-137** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.7	233	0.0025	5.72	71.82	**Pipe Channel, 137-138** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.4	130	0.0025	5.72	71.82	**Pipe Channel, 138-139** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.3	113	0.0025	5.72	71.82	**Pipe Channel, 139-Outlet** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
7.4	1,775	Total			

Summary for Subcatchment 10S: Forebay Area

Runoff = 1.36 cfs @ 12.07 hrs, Volume= 0.094 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
0.268	80	>75% Grass cover, Good, HSG D
0.086	98	Water Surface, HSG D
0.354	84	Weighted Average
0.268		75.71% Pervious Area
0.086		24.29% Impervious Area

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

Summary for Subcatchment 11S: WQ Area

Runoff = 4.90 cfs @ 12.07 hrs, Volume= 0.346 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
0.605	98	Water Surface, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
1.129	89	Weighted Average
0.524		46.41% Pervious Area
0.605		53.59% Impervious Area

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

Summary for Subcatchment 12S: Subcat for Swell - 1

Runoff = 4.07 cfs @ 12.08 hrs, Volume= 0.302 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

	Area (ac)	CN	Description
	0.253	74	>75% Grass cover, Good, HSG C
*	0.680	98	Paved parking, HSG C
	0.933	91	Weighted Average
	0.253		27.12% Pervious Area
	0.680		72.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	993	0.1266	2.77		**Lag/CN Method,**

Summary for Subcatchment 13S: Pond

Runoff = 8.98 cfs @ 12.07 hrs, Volume= 0.648 af, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
1.261	98	Water Surface, HSG C
0.624	80	>75% Grass cover, Good, HSG D
0.064	77	Woods, Good, HSG D
1.949	92	Weighted Average
0.688		35.30% Pervious Area
1.261		64.70% Impervious Area

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

Summary for Subcatchment 16S: DA to Entr. Culvert

Runoff = 6.61 cfs @ 12.26 hrs, Volume= 0.682 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
139,222	77	Woods, Good, HSG D
1,220	98	Paved parking, HSG D
140,442	77	Weighted Average
139,222		99.13% Pervious Area
1,220		0.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	1,034	0.0359	0.91		**Lag/CN Method,**

Summary for Subcatchment 18S: Subcat to Point B

Runoff = 52.82 cfs @ 12.65 hrs, Volume= 8.202 af, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
1,592,978	77	Woods, Good, HSG D
39,117	98	Paved parking, HSG D
1,632,095	78	Weighted Average
1,592,978		97.60% Pervious Area
39,117		2.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.1	3,073	0.0324	1.11		**Lag/CN Method,**

Summary for Subcatchment 19S: Subcat for Swell - 2

Runoff = 1.38 cfs @ 12.03 hrs, Volume= 0.090 af, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

	Area (ac)	CN	Description
	0.200	98	Water Surface, HSG C
*	0.072	74	>75% Grass cover, Good, HSG C
	0.272	92	Weighted Average
	0.072		26.47% Pervious Area
	0.200		73.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	313	0.1239	2.27		**Lag/CN Method,**

Summary for Subcatchment 20S: Wetlands

Runoff = 15.41 cfs @ 12.29 hrs, Volume= 1.645 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
7.773	77	Woods, Good, HSG D
7.773		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,002	0.0286	0.81		**Lag/CN Method,**

Summary for Subcatchment 22S: Subcat for Swell - 3

Runoff = 2.32 cfs @ 12.05 hrs, Volume= 0.157 af, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

	Area (ac)	CN	Description
*	0.128	74	>75% Grass cover, Good, HSG C
*	0.345	98	Paved parking, HSG C
	0.473	92	Weighted Average
	0.128		27.06% Pervious Area
	0.345		72.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	505	0.1265	2.52		**Lag/CN Method,**

Summary for Subcatchment 23S: Point D

Runoff = 137.55 cfs @ 12.44 hrs, Volume= 17.681 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
3,639,264	77	Woods, Good, HSG D
3,639,264		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.3	3,135	0.0772	1.67		**Lag/CN Method,**

Summary for Subcatchment 24S: DA for 25R

Runoff = 13.73 cfs @ 12.51 hrs, Volume= 1.885 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
8.906	77	Woods, Good, HSG D
8.906		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.2	1,580	0.0192	0.73		**Lag/CN Method,**

Summary for Subcatchment 25S: Rerouted Area

Runoff = 4.69 cfs @ 12.26 hrs, Volume= 0.474 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
2.241	77	Woods, Good, HSG D
2.241		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	797	0.0260	0.74		**Lag/CN Method,**

Summary for Subcatchment 26S: Subcat for Swell - 4

Runoff = 1.97 cfs @ 12.03 hrs, Volume= 0.128 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

	Area (ac)	CN	Description
*	0.287	98	Paved parking, HSG D
	0.107	74	>75% Grass cover, Good, HSG C
	0.394	91	Weighted Average
	0.107		27.16% Pervious Area
	0.287		72.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	293	0.1266	2.17		**Lag/CN Method,**

Summary for Reach 8R: Level Spreader

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 4.28" for 10-Year event
Inflow = 3.74 cfs @ 17.52 hrs, Volume= 7.134 af
Outflow = 3.74 cfs @ 17.53 hrs, Volume= 7.133 af, Atten= 0%, Lag= 0.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.77 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 1.4 min

Peak Storage= 232 cf @ 17.53 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 1.00' Flow Area= 105.0 sf, Capacity= 439.80 cfs

75.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 30.0 '/' Top Width= 135.00'
Length= 48.0' Slope= 0.0100 '/'
Inlet Invert= 558.00', Outlet Invert= 557.52'

‡

Summary for Reach 15R: Dry Swell - 1

Inflow Area = 0.933 ac, 72.88% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 4.07 cfs @ 12.08 hrs, Volume= 0.302 af
Outflow = 3.44 cfs @ 12.14 hrs, Volume= 0.302 af, Atten= 15%, Lag= 3.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.97 fps, Min. Travel Time= 5.6 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 19.5 min

Peak Storage= 1,152 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 84.06 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 992.7' Slope= 0.0177 '/'
Inlet Invert= 572.18', Outlet Invert= 554.62'

Summary for Reach 18R: Dry Swell - 2

Inflow Area = 0.272 ac, 73.53% Impervious, Inflow Depth = 3.99" for 10-Year event
Inflow = 1.38 cfs @ 12.03 hrs, Volume= 0.090 af
Outflow = 1.28 cfs @ 12.06 hrs, Volume= 0.090 af, Atten= 7%, Lag= 1.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.73 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 9.8 min

Peak Storage= 192 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 49.33 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 259.1' Slope= 0.0222 '/'
Inlet Invert= 547.00', Outlet Invert= 541.25'

‡

Summary for Reach 20R: Dry Swell - 3

Inflow Area = 0.745 ac, 73.15% Impervious, Inflow Depth = 3.99" for 10-Year event
Inflow = 3.59 cfs @ 12.05 hrs, Volume= 0.248 af
Outflow = 3.36 cfs @ 12.08 hrs, Volume= 0.248 af, Atten= 6%, Lag= 1.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.25 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 8.3 min

Peak Storage= 465 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 96.49 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 448.4' Slope= 0.0233 '/'
Inlet Invert= 541.25', Outlet Invert= 530.80'

Summary for Reach 21R: Point C

Inflow Area = 3.969 ac, 14.44% Impervious, Inflow Depth = 2.81" for 10-Year event
Inflow = 8.22 cfs @ 12.24 hrs, Volume= 0.930 af
Outflow = 8.21 cfs @ 12.24 hrs, Volume= 0.930 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.99 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 1.5 min

Peak Storage= 212 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 2.00' Flow Area= 26.0 sf, Capacity= 240.09 cfs

9.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 77.4' Slope= 0.0136 '/'
Inlet Invert= 526.65', Outlet Invert= 525.60'

‡

Summary for Reach 23R: Rerouting Ditch

Inflow Area = 2.241 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 4.69 cfs @ 12.26 hrs, Volume= 0.474 af
Outflow = 4.59 cfs @ 12.29 hrs, Volume= 0.474 af, Atten= 2%, Lag= 1.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.40 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 8.7 min

Peak Storage= 774 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 12.66 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 405.0' Slope= 0.0054 '/'
Inlet Invert= 536.00', Outlet Invert= 533.82'

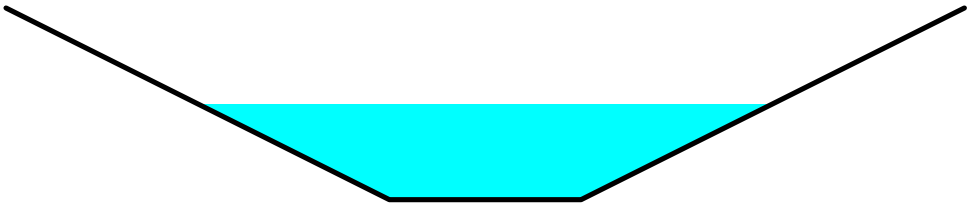
Summary for Reach 25R: Rerouting Ditch

Inflow Area = 8.906 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 13.73 cfs @ 12.51 hrs, Volume= 1.885 af
Outflow = 13.70 cfs @ 12.52 hrs, Volume= 1.885 af, Atten= 0%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.44 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 1.37 fps, Avg. Travel Time= 3.2 min

Peak Storage= 1,045 cf @ 12.52 hrs
Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 60.53 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 262.2' Slope= 0.0064 '/'
Inlet Invert= 540.67', Outlet Invert= 539.00'



Summary for Reach 29R: Dry Swell - 4

Inflow Area = 1.327 ac, 72.87% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 4.56 cfs @ 12.10 hrs, Volume= 0.430 af
Outflow = 4.52 cfs @ 12.11 hrs, Volume= 0.430 af, Atten= 1%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.33 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 5.0 min

Peak Storage= 397 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 88.45 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 292.6' Slope= 0.0196 '/'
Inlet Invert= 552.74', Outlet Invert= 547.01'

Summary for Pond 2P: Forebay

Inflow Area = 16.909 ac, 98.42% Impervious, Inflow Depth = 4.63" for 10-Year event
Inflow = 76.95 cfs @ 12.10 hrs, Volume= 6.527 af
Outflow = 76.76 cfs @ 12.11 hrs, Volume= 6.524 af, Atten= 0%, Lag= 0.4 min
Primary = 6.41 cfs @ 11.88 hrs, Volume= 4.326 af
Secondary = 49.49 cfs @ 12.11 hrs, Volume= 1.065 af
Tertiary = 21.31 cfs @ 12.11 hrs, Volume= 1.133 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 3,802 sf Storage= 3,789 cf
Peak Elev= 566.78' @ 12.11 hrs Surf.Area= 6,599 sf Storage= 33,626 cf (29,837 cf above start)
Flood Elev= 568.00' Surf.Area= 7,249 sf Storage= 42,057 cf (38,268 cf above start)

Plug-Flow detention time= 54.9 min calculated for 6.436 af (99% of inflow)
Center-of-Mass det. time= 37.8 min (788.3 - 750.5)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	49,579 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	2,536	269.1	0.0	0	0	2,536
559.00	2,944	279.8	40.0	1,095	1,095	3,078
560.00	3,366	290.5	40.0	1,261	2,356	3,641
561.00	3,802	301.2	40.0	1,433	3,789	4,225
562.00	4,252	312.0	100.0	4,025	7,814	4,835
563.00	4,716	322.7	100.0	4,482	12,296	5,462
564.00	5,194	333.4	100.0	4,953	17,249	6,110
565.00	5,687	344.1	100.0	5,439	22,687	6,779
566.00	6,193	354.8	100.0	5,938	28,626	7,469
567.00	6,714	365.5	100.0	6,452	35,077	8,180
568.00	7,249	376.2	100.0	6,980	42,057	8,912
569.00	7,798	386.9	100.0	7,522	49,579	9,666

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Tertiary	558.00'	**36.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#3	Device 2	566.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	566.50'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=6.40 cfs @ 11.88 hrs HW=566.58' TW=561.99' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 6.40 cfs @ 8.14 fps)

Secondary OutFlow Max=49.41 cfs @ 12.11 hrs HW=566.78' TW=562.86' (Dynamic Tailwater)
└**4=Sharp-Crested Rectangular Weir** (Weir Controls 49.41 cfs @ 1.76 fps)

Tertiary OutFlow Max=21.30 cfs @ 12.11 hrs HW=566.78' TW=559.35' (Dynamic Tailwater)
└**2=Culvert** (Passes 21.30 cfs of 72.51 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 21.30 cfs @ 2.89 fps)

Summary for Pond 3P: WQ-1

Inflow Area = 18.038 ac, 95.61% Impervious, Inflow Depth = 3.82" for 10-Year event
Inflow = 59.93 cfs @ 12.10 hrs, Volume= 5.737 af
Outflow = 34.64 cfs @ 12.21 hrs, Volume= 5.718 af, Atten= 42%, Lag= 6.4 min
Primary = 34.64 cfs @ 12.21 hrs, Volume= 5.718 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 23,969 sf Storage= 27,117 cf
Peak Elev= 563.14' @ 12.21 hrs Surf.Area= 25,986 sf Storage= 80,492 cf (53,375 cf above start)
Flood Elev= 568.00' Surf.Area= 30,816 sf Storage= 218,459 cf (191,342 cf above start)

Plug-Flow detention time= 218.2 min calculated for 5.096 af (89% of inflow)
Center-of-Mass det. time= 108.8 min (907.5 - 798.7)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	249,790 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	21,247	600.7	0.0	0	0	21,247
559.00	22,140	611.4	40.0	8,677	8,677	22,444
560.00	23,048	622.1	40.0	9,037	17,714	23,662
561.00	23,969	632.9	40.0	9,403	27,117	24,910
562.00	24,905	643.6	100.0	24,436	51,552	26,170
563.00	25,855	654.3	100.0	25,379	76,931	27,452
564.00	26,819	665.0	100.0	26,336	103,266	28,754
565.00	27,797	675.8	100.0	27,307	130,573	30,088
566.00	28,789	686.5	100.0	28,292	158,864	31,433
567.00	29,795	697.2	100.0	29,291	188,155	32,799
568.00	30,816	707.9	100.0	30,304	218,459	34,187
569.00	31,850	718.7	100.0	31,332	249,790	35,605

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**36.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	561.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 2	558.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	564.00'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=34.63 cfs @ 12.21 hrs HW=563.14' TW=559.74' (Dynamic Tailwater)
- **1=Culvert** (Passes 34.63 cfs of 62.76 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 9.68 cfs @ 6.16 fps)
    - **3=Orifice/Grate** (Passes < 5.53 cfs potential flow)
    - **5=Orifice/Grate** (Passes < 24.95 cfs potential flow)
  - **4=Orifice/Grate** (Weir Controls 24.95 cfs @ 2.61 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=561.00' TW=558.00' (Dynamic Tailwater)
- **6=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4P: DP-1

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 4.50" for 10-Year event
Inflow = 57.35 cfs @ 12.18 hrs, Volume= 7.500 af
Outflow = 3.74 cfs @ 17.51 hrs, Volume= 7.135 af, Atten= 93%, Lag= 319.8 min
Primary = 3.74 cfs @ 17.51 hrs, Volume= 7.135 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 561.46' @ 17.51 hrs Surf.Area= 54,794 sf Storage= 177,399 cf
Flood Elev= 565.00' Surf.Area= 62,400 sf Storage= 384,495 cf

Plug-Flow detention time= 622.0 min calculated for 7.135 af (95% of inflow)
Center-of-Mass det. time= 585.7 min (1,456.7 - 871.0)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	651,999 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	47,688	883.6	0	0	47,688
559.00	49,705	899.0	48,693	48,693	50,047
560.00	51,750	914.4	50,724	99,417	52,448
561.00	53,824	929.8	52,784	152,201	54,888
562.00	55,926	945.2	54,872	207,072	57,370
563.00	58,056	960.6	56,988	264,060	59,893
564.00	60,214	976.1	59,132	323,192	62,470
565.00	62,400	991.5	61,304	384,495	65,075
566.00	64,615	1,006.9	63,504	448,000	67,720
567.00	66,858	1,022.3	65,733	513,733	70,405
568.00	69,129	1,037.7	67,990	581,723	73,132
569.00	71,429	1,053.2	70,276	651,999	75,915

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**48.0" Round Culvert** L= 663.9' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 551.36' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	558.00'	**9.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	562.50'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Secondary	568.00'	**45.0 deg x 100.0' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=3.74 cfs @ 17.51 hrs HW=561.46' TW=558.17' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.74 cfs of 57.85 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 3.74 cfs @ 8.46 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=558.00' (Free Discharge)
└─**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 13P: Det. Pond - 2

Inflow Area = 1.327 ac, 72.87% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 4.52 cfs @ 12.11 hrs, Volume= 0.430 af
Outflow = 1.11 cfs @ 12.61 hrs, Volume= 0.424 af, Atten= 75%, Lag= 30.0 min
Primary = 1.11 cfs @ 12.61 hrs, Volume= 0.424 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 539.60' @ 12.61 hrs Surf.Area= 6,973 sf Storage= 9,579 cf
Flood Elev= 541.00' Surf.Area= 8,791 sf Storage= 20,626 cf

Plug-Flow detention time= 375.7 min calculated for 0.424 af (99% of inflow)
Center-of-Mass det. time= 367.1 min (1,165.2 - 798.1)

Volume	Invert	Avail.Storage	Storage Description
#1	538.00'	20,626 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
538.00	5,054	387.0	0	0	5,054
539.00	6,243	405.8	5,638	5,638	6,305
540.00	7,489	424.7	6,857	12,495	7,621
541.00	8,791	423.9	8,131	20,626	8,049

Device	Routing	Invert	Outlet Devices
#1	Primary	538.00'	**15.0" Round Culvert** L= 94.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.00' / 537.00' S= 0.0106 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	538.00'	**2.4" Vert. Orifice/Grate** C= 0.600
#3	Device 1	538.90'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	539.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.11 cfs @ 12.61 hrs HW=539.60' TW=533.73' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.11 cfs of 5.82 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.19 cfs @ 5.89 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.31 cfs @ 3.51 fps)
  └─**4=Orifice/Grate** (Weir Controls 0.62 cfs @ 1.02 fps)

Summary for Pond 15P: Culvert at Entr.

Inflow Area = 3.969 ac, 14.44% Impervious, Inflow Depth = 2.81" for 10-Year event
Inflow = 8.22 cfs @ 12.24 hrs, Volume= 0.930 af
Outflow = 8.22 cfs @ 12.24 hrs, Volume= 0.930 af, Atten= 0%, Lag= 0.0 min
Primary = 8.22 cfs @ 12.24 hrs, Volume= 0.930 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 530.16' @ 12.24 hrs Surf.Area= 306 sf Storage= 333 cf

Plug-Flow detention time= 0.5 min calculated for 0.930 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (831.8 - 831.3)

Volume	Invert	Avail.Storage	Storage Description
#1	527.17'	1,407 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
527.17	6	14.0	0	0	6
528.00	44	35.0	18	18	90
529.00	121	58.1	79	98	268
530.00	266	92.9	189	286	693
531.00	555	117.6	402	688	1,120
532.00	897	157.4	719	1,407	2,001

Device	Routing	Invert	Outlet Devices
#1	Primary	527.17'	**18.0" Round Culvert X 2.00** L= 52.8' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 527.17' / 526.65' S= 0.0098 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	527.17'	**18.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	530.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.22 cfs @ 12.24 hrs HW=530.16' TW=526.94' (Dynamic Tailwater)
└**1=Culvert** (Passes 8.22 cfs of 27.34 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 3.06 cfs @ 8.15 fps)
└**3=Orifice/Grate** (Weir Controls 5.16 cfs @ 1.32 fps)

Summary for Pond 17P: Arch for stream

Inflow Area = 49.942 ac, 3.73% Impervious, Inflow Depth = 2.64" for 10-Year event
Inflow = 69.32 cfs @ 12.60 hrs, Volume= 10.985 af
Outflow = 69.25 cfs @ 12.61 hrs, Volume= 10.985 af, Atten= 0%, Lag= 0.7 min
Primary = 69.25 cfs @ 12.61 hrs, Volume= 10.985 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 533.73' @ 12.61 hrs Surf.Area= 3,373 sf Storage= 1,205 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.1 min (875.3 - 875.2)

Volume	Invert	Avail.Storage	Storage Description
#1	533.00'	25,714 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
533.00	412	159.8	0	0	412
534.00	5,210	513.7	2,362	2,362	19,382
535.00	11,714	795.5	8,245	10,608	48,748
536.00	18,774	996.6	15,106	25,714	77,441

Device	Routing	Invert	Outlet Devices
#1	Primary	532.20'	**144.0" W x 49.0" H, R=77.5" Arch Culvert** L= 51.5' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 532.20' / 530.66' S= 0.0299 '/' Cc= 0.900 n= 0.024, Flow Area= 35.55 sf

Primary OutFlow Max=69.24 cfs @ 12.61 hrs HW=533.73' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 69.24 cfs @ 4.03 fps)

Summary for Pond 18P: Level Spreader

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 4.28" for 10-Year event
Inflow = 3.74 cfs @ 17.51 hrs, Volume= 7.135 af
Outflow = 3.74 cfs @ 17.52 hrs, Volume= 7.134 af, Atten= 0%, Lag= 0.5 min
Primary = 3.74 cfs @ 17.52 hrs, Volume= 7.134 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 558.00' Surf.Area= 2,625 sf Storage= 7,350 cf
Peak Elev= 558.17' @ 17.52 hrs Surf.Area= 2,625 sf Storage= 7,527 cf (177 cf above start)

Plug-Flow detention time= 50.7 min calculated for 6.964 af (98% of inflow)
Center-of-Mass det. time= 0.8 min (1,457.5 - 1,456.7)

Volume	Invert	Avail.Storage	Storage Description
#1	551.00'	8,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 21,000 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
551.00	2,625	0	0
556.00	2,625	13,125	13,125
557.00	2,625	2,625	15,750
558.00	2,625	2,625	18,375
559.00	2,625	2,625	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**75.0" x 35.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.74 cfs @ 17.52 hrs HW=558.17' TW=558.06' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Weir Controls 3.74 cfs @ 1.21 fps)

Summary for Pond 23P:

Inflow Area = 0.745 ac, 73.15% Impervious, Inflow Depth = 3.99" for 10-Year event
Inflow = 3.36 cfs @ 12.08 hrs, Volume= 0.248 af
Outflow = 3.32 cfs @ 12.09 hrs, Volume= 0.248 af, Atten= 1%, Lag= 0.8 min
Primary = 0.22 cfs @ 12.09 hrs, Volume= 0.148 af
Secondary = 3.09 cfs @ 12.09 hrs, Volume= 0.100 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 531.85' @ 12.09 hrs Surf.Area= 905 sf Storage= 632 cf

Plug-Flow detention time= 12.0 min calculated for 0.248 af (100% of inflow)
Center-of-Mass det. time= 12.0 min (800.3 - 788.3)

Volume	Invert	Avail.Storage	Storage Description
#1	530.19'	782 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
530.19	56	110.4	0	0	56
531.00	317	180.9	137	137	1,695
532.00	1,044	364.9	645	782	9,691

Device	Routing	Invert	Outlet Devices
#1	Primary	530.19'	**3.0" Round Culvert** L= 17.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 530.19' / 530.00' S= 0.0110 '/' Cc= 0.900 n= 0.013, Flow Area= 0.05 sf
#2	Secondary	531.60'	**30.0 deg x 7.7' long x 0.40' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.22 cfs @ 12.09 hrs HW=531.85' TW=530.14' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.22 cfs @ 4.56 fps)

Secondary OutFlow Max=3.09 cfs @ 12.09 hrs HW=531.85' TW=530.14' (Dynamic Tailwater)
↑—**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 3.09 cfs @ 1.62 fps)

Summary for Pond 28P: Ramp Culvert

Inflow Area = 0.933 ac, 72.88% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 3.44 cfs @ 12.14 hrs, Volume= 0.302 af
Outflow = 3.44 cfs @ 12.14 hrs, Volume= 0.302 af, Atten= 0%, Lag= 0.0 min
Primary = 3.44 cfs @ 12.14 hrs, Volume= 0.302 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 554.61' @ 0.00 hrs Surf.Area= 4 sf Storage= 0 cf
Flood Elev= 556.36' Surf.Area= 534 sf Storage= 342 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (799.6 - 799.6)

Volume	Invert	Avail.Storage	Storage Description
#1	554.61'	342 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
554.61	4	8.0	0	0	4
555.00	56	45.8	10	10	166
556.00	337	150.1	177	187	1,795
556.36	534	184.0	155	342	2,698

Device	Routing	Invert	Outlet Devices
#1	Primary	553.36'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 30.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 553.36' / 552.74' S= 0.0207 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=554.61' TW=553.20' (Dynamic Tailwater)
↑—**1=RCP_Elliptical 23x14** (Passes 0.00 cfs of 8.72 cfs potential flow)

Summary for Link 21L: Point A

Inflow Area = 27.760 ac, 66.67% Impervious, Inflow Depth > 3.79" for 10-Year event
Inflow = 18.07 cfs @ 12.29 hrs, Volume= 8.778 af
Primary = 18.07 cfs @ 12.29 hrs, Volume= 8.778 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 22L: Point B

Inflow Area = 49.942 ac, 3.73% Impervious, Inflow Depth = 2.64" for 10-Year event
Inflow = 69.25 cfs @ 12.61 hrs, Volume= 10.985 af
Primary = 69.25 cfs @ 12.61 hrs, Volume= 10.985 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Main Site Runoff Area=16.555 ac 100.00% Impervious Runoff Depth=8.46"
Flow Length=1,775' Tc=7.4 min CN=98 Runoff=134.93 cfs 11.671 af

Subcatchment 10S: Forebay Area Runoff Area=0.354 ac 24.29% Impervious Runoff Depth=6.77"
Tc=5.0 min CN=84 Runoff=2.81 cfs 0.200 af

Subcatchment 11S: WQ Area Runoff Area=1.129 ac 53.59% Impervious Runoff Depth=7.37"
Tc=5.0 min CN=89 Runoff=9.47 cfs 0.694 af

Subcatchment 12S: Subcat for Swell - 1 Runoff Area=0.933 ac 72.88% Impervious Runoff Depth=7.62"
Flow Length=993' Slope=0.1266 '/' Tc=6.0 min CN=91 Runoff=7.69 cfs 0.592 af

Subcatchment 13S: Pond Runoff Area=1.949 ac 64.70% Impervious Runoff Depth=7.74"
Tc=5.0 min CN=92 Runoff=16.77 cfs 1.257 af

Subcatchment 16S: DA to Entr. Culvert Runoff Area=140,442 sf 0.87% Impervious Runoff Depth=5.92"
Flow Length=1,034' Slope=0.0359 '/' Tc=18.9 min CN=77 Runoff=15.33 cfs 1.591 af

Subcatchment 18S: Subcat to Point B Runoff Area=1,632,095 sf 2.40% Impervious Runoff Depth=6.04"
Flow Length=3,073' Slope=0.0324 '/' Tc=46.1 min CN=78 Runoff=120.16 cfs 18.863 af

Subcatchment 19S: Subcat for Swell - 2 Runoff Area=0.272 ac 73.53% Impervious Runoff Depth=7.74"
Flow Length=313' Slope=0.1239 '/' Tc=2.3 min CN=92 Runoff=2.58 cfs 0.175 af

Subcatchment 20S: Wetlands Runoff Area=7.773 ac 0.00% Impervious Runoff Depth=5.92"
Flow Length=1,002' Slope=0.0286 '/' Tc=20.6 min CN=77 Runoff=35.64 cfs 3.835 af

Subcatchment 22S: Subcat for Swell - 3 Runoff Area=0.473 ac 72.94% Impervious Runoff Depth=7.74"
Flow Length=505' Slope=0.1265 '/' Tc=3.3 min CN=92 Runoff=4.33 cfs 0.305 af

Subcatchment 23S: Point D Runoff Area=3,639,264 sf 0.00% Impervious Runoff Depth=5.92"
Flow Length=3,135' Slope=0.0772 '/' Tc=31.3 min CN=77 Runoff=319.56 cfs 41.217 af

Subcatchment 24S: DA for 25R Runoff Area=8.906 ac 0.00% Impervious Runoff Depth=5.92"
Flow Length=1,580' Slope=0.0192 '/' Tc=36.2 min CN=77 Runoff=31.78 cfs 4.394 af

Subcatchment 25S: Rerouted Area Runoff Area=2.241 ac 0.00% Impervious Runoff Depth=5.92"
Flow Length=797' Slope=0.0260 '/' Tc=18.0 min CN=77 Runoff=10.86 cfs 1.106 af

Subcatchment 26S: Subcat for Swell - 4 Runoff Area=0.394 ac 72.84% Impervious Runoff Depth=7.62"
Flow Length=293' Slope=0.1266 '/' Tc=2.3 min CN=91 Runoff=3.71 cfs 0.250 af

Reach 8R: Level Spreader Avg. Flow Depth=0.10' Max Vel=1.05 fps Inflow=8.22 cfs 13.017 af
n=0.030 L=48.0' S=0.0100 '/' Capacity=439.80 cfs Outflow=8.22 cfs 13.014 af

Reach 15R: Dry Swell - 1 Avg. Flow Depth=0.59' Max Vel=3.60 fps Inflow=7.69 cfs 0.592 af
n=0.030 L=992.7' S=0.0177 '/' Capacity=84.06 cfs Outflow=6.73 cfs 0.592 af

Reach 18R: Dry Swell - 2 Avg. Flow Depth=0.17' Max Vel=2.21 fps Inflow=2.58 cfs 0.175 af
n=0.030 L=259.1' S=0.0222 '/' Capacity=49.33 cfs Outflow=2.45 cfs 0.175 af

Reach 20R: Dry Swell - 3 Avg. Flow Depth=0.53' Max Vel=3.92 fps Inflow=6.77 cfs 0.480 af
n=0.030 L=448.4' S=0.0233 '/' Capacity=96.49 cfs Outflow=6.43 cfs 0.480 af

Reach 21R: Point C Avg. Flow Depth=0.46' Max Vel=3.99 fps Inflow=18.21 cfs 2.071 af
n=0.024 L=77.4' S=0.0136 '/' Capacity=240.09 cfs Outflow=18.20 cfs 2.071 af

Reach 23R: Rerouting Ditch Avg. Flow Depth=0.92' Max Vel=3.03 fps Inflow=10.86 cfs 1.106 af
n=0.025 L=405.0' S=0.0054 '/' Capacity=12.66 cfs Outflow=10.72 cfs 1.106 af

Reach 25R: Rerouting Ditch Avg. Flow Depth=1.49' Max Vel=4.28 fps Inflow=31.78 cfs 4.394 af
n=0.025 L=262.2' S=0.0064 '/' Capacity=60.53 cfs Outflow=31.74 cfs 4.394 af

Reach 29R: Dry Swell - 4 Avg. Flow Depth=0.66' Max Vel=4.03 fps Inflow=8.92 cfs 0.842 af
n=0.030 L=292.6' S=0.0196 '/' Capacity=88.45 cfs Outflow=8.86 cfs 0.842 af

Pond 2P: Forebay Peak Elev=566.96' Storage=34,794 cf Inflow=137.55 cfs 11.871 af
Primary=6.06 cfs 6.051 af Secondary=103.08 cfs 2.940 af Tertiary=28.89 cfs 2.876 af Outflow=137.32 cfs 11.866 af

Pond 3P: WQ-1 Peak Elev=564.19' Storage=108,289 cf Inflow=117.11 cfs 9.684 af
Primary=56.93 cfs 9.391 af Secondary=26.48 cfs 0.266 af Outflow=81.45 cfs 9.657 af

Pond 4P: DP-1 Peak Elev=563.76' Storage=308,564 cf Inflow=115.86 cfs 13.790 af
Primary=8.22 cfs 13.019 af Secondary=0.00 cfs 0.000 af Outflow=8.22 cfs 13.019 af

Pond 13P: Det. Pond - 2 Peak Elev=539.97' Storage=12,243 cf Inflow=8.86 cfs 0.842 af
Outflow=6.71 cfs 0.836 af

Pond 15P: Culvert at Entr. Peak Elev=530.33' Storage=389 cf Inflow=18.21 cfs 2.071 af
Outflow=18.21 cfs 2.071 af

Pond 17P: Arch for stream Peak Elev=534.96' Storage=10,200 cf Inflow=159.54 cfs 25.198 af
144.0" x 49.0", R=77.5" Arch Culvert n=0.024 L=51.5' S=0.0299 '/' Outflow=158.43 cfs 25.198 af

Pond 18P: Level Spreader Peak Elev=558.28' Storage=7,647 cf Inflow=8.22 cfs 13.019 af
Outflow=8.22 cfs 13.017 af

Pond 23P: Peak Elev=531.99' Storage=769 cf Inflow=6.43 cfs 0.480 af
Primary=0.23 cfs 0.223 af Secondary=6.11 cfs 0.257 af Outflow=6.34 cfs 0.480 af

Pond 28P: Ramp Culvert Peak Elev=554.61' Storage=0 cf Inflow=6.73 cfs 0.592 af
23.0" x 14.0", R=22.0" Elliptical Culvert n=0.013 L=30.0' S=0.0207 '/' Outflow=6.73 cfs 0.592 af

Link 21L: Point A Inflow=39.81 cfs 16.849 af
Primary=39.81 cfs 16.849 af

Link 22L: Point B Inflow=158.43 cfs 25.198 af
Primary=158.43 cfs 25.198 af

Total Runoff Area = 165.217 ac Runoff Volume = 86.149 af Average Runoff Depth = 6.26"
87.32% Pervious = 144.272 ac 12.68% Impervious = 20.945 ac

Summary for Subcatchment 1S: Main Site

Runoff = 134.93 cfs @ 12.10 hrs, Volume= 11.671 af, Depth= 8.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
16.555	98	Paved parking, HSG D
16.555		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	158	0.0100	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.5	135	0.0025	4.18	20.51	**Pipe Channel, 130-131** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
0.4	110	0.0025	4.72	33.35	**Pipe Channel, 131-132** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.3	79	0.0025	4.72	33.35	**Pipe Channel, 132-133** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.8	246	0.0025	5.23	50.30	**Pipe Channel, 133-134** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.4	133	0.0025	5.23	50.30	**Pipe Channel, 134-135** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.6	182	0.0025	5.23	50.30	**Pipe Channel, 135-136** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.7	256	0.0025	5.72	71.82	**Pipe Channel, 136-137** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.7	233	0.0025	5.72	71.82	**Pipe Channel, 137-138** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.4	130	0.0025	5.72	71.82	**Pipe Channel, 138-139** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.3	113	0.0025	5.72	71.82	**Pipe Channel, 139-Outlet** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
7.4	1,775	Total			

Summary for Subcatchment 10S: Forebay Area

Runoff = 2.81 cfs @ 12.07 hrs, Volume= 0.200 af, Depth= 6.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.268	80	>75% Grass cover, Good, HSG D
0.086	98	Water Surface, HSG D
0.354	84	Weighted Average
0.268		75.71% Pervious Area
0.086		24.29% Impervious Area

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

Summary for Subcatchment 11S: WQ Area

Runoff = 9.47 cfs @ 12.07 hrs, Volume= 0.694 af, Depth= 7.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.605	98	Water Surface, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
1.129	89	Weighted Average
0.524		46.41% Pervious Area
0.605		53.59% Impervious Area

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

Summary for Subcatchment 12S: Subcat for Swell - 1

Runoff = 7.69 cfs @ 12.08 hrs, Volume= 0.592 af, Depth= 7.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.253	74	>75% Grass cover, Good, HSG C
* 0.680	98	Paved parking, HSG C
0.933	91	Weighted Average
0.253		27.12% Pervious Area
0.680		72.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	993	0.1266	2.77		**Lag/CN Method,**

Summary for Subcatchment 13S: Pond

Runoff = 16.77 cfs @ 12.07 hrs, Volume= 1.257 af, Depth= 7.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
1.261	98	Water Surface, HSG C
0.624	80	>75% Grass cover, Good, HSG D
0.064	77	Woods, Good, HSG D
1.949	92	Weighted Average
0.688		35.30% Pervious Area
1.261		64.70% Impervious Area

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

Summary for Subcatchment 16S: DA to Entr. Culvert

Runoff = 15.33 cfs @ 12.25 hrs, Volume= 1.591 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
139,222	77	Woods, Good, HSG D
1,220	98	Paved parking, HSG D
140,442	77	Weighted Average
139,222		99.13% Pervious Area
1,220		0.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	1,034	0.0359	0.91		**Lag/CN Method,**

Summary for Subcatchment 18S: Subcat to Point B

Runoff = 120.16 cfs @ 12.64 hrs, Volume= 18.863 af, Depth= 6.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
1,592,978	77	Woods, Good, HSG D
39,117	98	Paved parking, HSG D
1,632,095	78	Weighted Average
1,592,978		97.60% Pervious Area
39,117		2.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.1	3,073	0.0324	1.11		**Lag/CN Method,**

Summary for Subcatchment 19S: Subcat for Swell - 2

Runoff = 2.58 cfs @ 12.03 hrs, Volume= 0.175 af, Depth= 7.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

	Area (ac)	CN	Description
	0.200	98	Water Surface, HSG C
*	0.072	74	>75% Grass cover, Good, HSG C
	0.272	92	Weighted Average
	0.072		26.47% Pervious Area
	0.200		73.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	313	0.1239	2.27		**Lag/CN Method,**

Summary for Subcatchment 20S: Wetlands

Runoff = 35.64 cfs @ 12.28 hrs, Volume= 3.835 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
7.773	77	Woods, Good, HSG D
7.773		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,002	0.0286	0.81		**Lag/CN Method,**

Summary for Subcatchment 22S: Subcat for Swell - 3

Runoff = 4.33 cfs @ 12.05 hrs, Volume= 0.305 af, Depth= 7.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

	Area (ac)	CN	Description
*	0.128	74	>75% Grass cover, Good, HSG C
*	0.345	98	Paved parking, HSG C
	0.473	92	Weighted Average
	0.128		27.06% Pervious Area
	0.345		72.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	505	0.1265	2.52		**Lag/CN Method,**

Summary for Subcatchment 23S: Point D

Runoff = 319.56 cfs @ 12.42 hrs, Volume= 41.217 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
3,639,264	77	Woods, Good, HSG D
3,639,264		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.3	3,135	0.0772	1.67		**Lag/CN Method,**

Summary for Subcatchment 24S: DA for 25R

Runoff = 31.78 cfs @ 12.51 hrs, Volume= 4.394 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
8.906	77	Woods, Good, HSG D
8.906		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.2	1,580	0.0192	0.73		**Lag/CN Method,**

Summary for Subcatchment 25S: Rerouted Area

Runoff = 10.86 cfs @ 12.24 hrs, Volume= 1.106 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
2.241	77	Woods, Good, HSG D
2.241		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	797	0.0260	0.74		**Lag/CN Method,**

Summary for Subcatchment 26S: Subcat for Swell - 4

Runoff = 3.71 cfs @ 12.03 hrs, Volume= 0.250 af, Depth= 7.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

	Area (ac)	CN	Description
*	0.287	98	Paved parking, HSG D
	0.107	74	>75% Grass cover, Good, HSG C
	0.394	91	Weighted Average
	0.107		27.16% Pervious Area
	0.287		72.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	293	0.1266	2.17		**Lag/CN Method,**

Summary for Reach 8R: Level Spreader

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 7.82" for 100-Year event
Inflow = 8.22 cfs @ 14.34 hrs, Volume= 13.017 af
Outflow = 8.22 cfs @ 14.35 hrs, Volume= 13.014 af, Atten= 0%, Lag= 0.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.05 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 1.1 min

Peak Storage= 377 cf @ 14.35 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 1.00' Flow Area= 105.0 sf, Capacity= 439.80 cfs

75.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 30.0 '/' Top Width= 135.00'
Length= 48.0' Slope= 0.0100 '/'
Inlet Invert= 558.00', Outlet Invert= 557.52'

‡

Summary for Reach 15R: Dry Swell - 1

Inflow Area = 0.933 ac, 72.88% Impervious, Inflow Depth = 7.62" for 100-Year event
Inflow = 7.69 cfs @ 12.08 hrs, Volume= 0.592 af
Outflow = 6.73 cfs @ 12.13 hrs, Volume= 0.592 af, Atten= 13%, Lag= 2.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.60 fps, Min. Travel Time= 4.6 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 16.1 min

Peak Storage= 1,855 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.59'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 84.06 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 992.7' Slope= 0.0177 '/'
Inlet Invert= 572.18', Outlet Invert= 554.62'

Summary for Reach 18R: Dry Swell - 2

Inflow Area = 0.272 ac, 73.53% Impervious, Inflow Depth = 7.74" for 100-Year event
Inflow = 2.58 cfs @ 12.03 hrs, Volume= 0.175 af
Outflow = 2.45 cfs @ 12.05 hrs, Volume= 0.175 af, Atten= 5%, Lag= 1.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.21 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 8.2 min

Peak Storage= 287 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 49.33 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 259.1' Slope= 0.0222 '/'
Inlet Invert= 547.00', Outlet Invert= 541.25'

‡

Summary for Reach 20R: Dry Swell - 3

Inflow Area = 0.745 ac, 73.15% Impervious, Inflow Depth = 7.74" for 100-Year event
Inflow = 6.77 cfs @ 12.05 hrs, Volume= 0.480 af
Outflow = 6.43 cfs @ 12.07 hrs, Volume= 0.480 af, Atten= 5%, Lag= 1.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.92 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 6.8 min

Peak Storage= 735 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 96.49 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 448.4' Slope= 0.0233 '/'
Inlet Invert= 541.25', Outlet Invert= 530.80'

Summary for Reach 21R: Point C

Inflow Area = 3.969 ac, 14.44% Impervious, Inflow Depth = 6.26" for 100-Year event
Inflow = 18.21 cfs @ 12.24 hrs, Volume= 2.071 af
Outflow = 18.20 cfs @ 12.24 hrs, Volume= 2.071 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.99 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 1.2 min

Peak Storage= 353 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 2.00' Flow Area= 26.0 sf, Capacity= 240.09 cfs

9.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 77.4' Slope= 0.0136 '/'
Inlet Invert= 526.65', Outlet Invert= 525.60'

‡

Summary for Reach 23R: Rerouting Ditch

Inflow Area = 2.241 ac, 0.00% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 10.86 cfs @ 12.24 hrs, Volume= 1.106 af
Outflow = 10.72 cfs @ 12.27 hrs, Volume= 1.106 af, Atten= 1%, Lag= 1.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.03 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.96 fps, Avg. Travel Time= 7.0 min

Peak Storage= 1,434 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.92'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 12.66 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 405.0' Slope= 0.0054 '/'
Inlet Invert= 536.00', Outlet Invert= 533.82'

Summary for Reach 25R: Rerouting Ditch

Inflow Area = 8.906 ac, 0.00% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 31.78 cfs @ 12.51 hrs, Volume= 4.394 af
Outflow = 31.74 cfs @ 12.51 hrs, Volume= 4.394 af, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.28 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.67 fps, Avg. Travel Time= 2.6 min

Peak Storage= 1,945 cf @ 12.51 hrs
Average Depth at Peak Storage= 1.49'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 60.53 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 262.2' Slope= 0.0064 '/'
Inlet Invert= 540.67', Outlet Invert= 539.00'

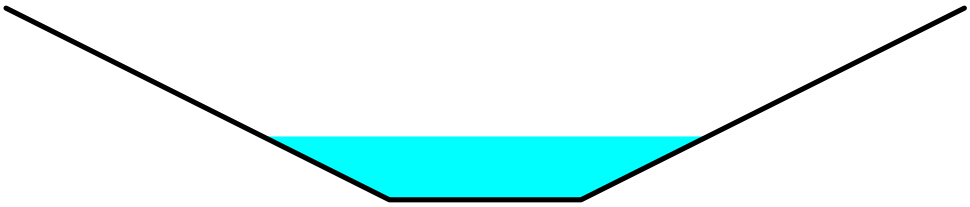
Summary for Reach 29R: Dry Swell - 4

Inflow Area = 1.327 ac, 72.87% Impervious, Inflow Depth = 7.62" for 100-Year event
Inflow = 8.92 cfs @ 12.09 hrs, Volume= 0.842 af
Outflow = 8.86 cfs @ 12.11 hrs, Volume= 0.842 af, Atten= 1%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.03 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.18 fps, Avg. Travel Time= 4.1 min

Peak Storage= 643 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 88.45 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 292.6' Slope= 0.0196 '/'
Inlet Invert= 552.74', Outlet Invert= 547.01'



Summary for Pond 2P: Forebay

Inflow Area = 16.909 ac, 98.42% Impervious, Inflow Depth = 8.42" for 100-Year event
Inflow = 137.55 cfs @ 12.10 hrs, Volume= 11.871 af
Outflow = 137.32 cfs @ 12.11 hrs, Volume= 11.866 af, Atten= 0%, Lag= 0.3 min
Primary = 6.06 cfs @ 11.65 hrs, Volume= 6.051 af
Secondary = 103.08 cfs @ 12.11 hrs, Volume= 2.940 af
Tertiary = 28.89 cfs @ 12.11 hrs, Volume= 2.876 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 3,802 sf Storage= 3,789 cf
Peak Elev= 566.96' @ 12.11 hrs Surf.Area= 6,692 sf Storage= 34,794 cf (31,006 cf above start)
Flood Elev= 568.00' Surf.Area= 7,249 sf Storage= 42,057 cf (38,268 cf above start)

Plug-Flow detention time= 50.0 min calculated for 11.779 af (99% of inflow)
Center-of-Mass det. time= 39.8 min (782.1 - 742.3)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	49,579 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	2,536	269.1	0.0	0	0	2,536
559.00	2,944	279.8	40.0	1,095	1,095	3,078
560.00	3,366	290.5	40.0	1,261	2,356	3,641
561.00	3,802	301.2	40.0	1,433	3,789	4,225
562.00	4,252	312.0	100.0	4,025	7,814	4,835
563.00	4,716	322.7	100.0	4,482	12,296	5,462
564.00	5,194	333.4	100.0	4,953	17,249	6,110
565.00	5,687	344.1	100.0	5,439	22,687	6,779
566.00	6,193	354.8	100.0	5,938	28,626	7,469
567.00	6,714	365.5	100.0	6,452	35,077	8,180
568.00	7,249	376.2	100.0	6,980	42,057	8,912
569.00	7,798	386.9	100.0	7,522	49,579	9,666

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Tertiary	558.00'	**36.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#3	Device 2	566.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	566.50'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=6.05 cfs @ 11.65 hrs HW=566.55' TW=562.44' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 6.05 cfs @ 7.71 fps)

Secondary OutFlow Max=102.89 cfs @ 12.11 hrs HW=566.96' TW=563.82' (Dynamic Tailwater)
└**4=Sharp-Crested Rectangular Weir** (Weir Controls 102.89 cfs @ 2.25 fps)

Tertiary OutFlow Max=28.86 cfs @ 12.11 hrs HW=566.96' TW=561.12' (Dynamic Tailwater)
└**2=Culvert** (Passes 28.86 cfs of 64.89 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 28.86 cfs @ 3.20 fps)

Summary for Pond 3P: WQ-1

Inflow Area = 18.038 ac, 95.61% Impervious, Inflow Depth = 6.44" for 100-Year event
Inflow = 117.11 cfs @ 12.10 hrs, Volume= 9.684 af
Outflow = 81.45 cfs @ 12.18 hrs, Volume= 9.657 af, Atten= 30%, Lag= 4.7 min
Primary = 56.93 cfs @ 12.14 hrs, Volume= 9.391 af
Secondary = 26.48 cfs @ 12.19 hrs, Volume= 0.266 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 23,969 sf Storage= 27,117 cf
Peak Elev= 564.19' @ 12.19 hrs Surf.Area= 27,000 sf Storage= 108,289 cf (81,172 cf above start)
Flood Elev= 568.00' Surf.Area= 30,816 sf Storage= 218,459 cf (191,342 cf above start)

Plug-Flow detention time= 238.9 min calculated for 9.033 af (93% of inflow)
Center-of-Mass det. time= 152.0 min (943.5 - 791.5)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	249,790 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	21,247	600.7	0.0	0	0	21,247
559.00	22,140	611.4	40.0	8,677	8,677	22,444
560.00	23,048	622.1	40.0	9,037	17,714	23,662
561.00	23,969	632.9	40.0	9,403	27,117	24,910
562.00	24,905	643.6	100.0	24,436	51,552	26,170
563.00	25,855	654.3	100.0	25,379	76,931	27,452
564.00	26,819	665.0	100.0	26,336	103,266	28,754
565.00	27,797	675.8	100.0	27,307	130,573	30,088
566.00	28,789	686.5	100.0	28,292	158,864	31,433
567.00	29,795	697.2	100.0	29,291	188,155	32,799
568.00	30,816	707.9	100.0	30,304	218,459	34,187
569.00	31,850	718.7	100.0	31,332	249,790	35,605

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**36.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	561.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 2	558.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	564.00'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=56.25 cfs @ 12.14 hrs HW=564.05' TW=561.32' (Dynamic Tailwater)
- **1=Culvert** (Inlet Controls 56.25 cfs @ 7.96 fps)
  - **2=Orifice/Grate** (Passes < 12.08 cfs potential flow)
    - **3=Orifice/Grate** (Passes < 6.25 cfs potential flow)
    - **5=Orifice/Grate** (Passes < 74.94 cfs potential flow)
  - **4=Orifice/Grate** (Passes < 74.94 cfs potential flow)

Secondary OutFlow Max=26.35 cfs @ 12.19 hrs HW=564.19' TW=561.68' (Dynamic Tailwater)
- **6=Sharp-Crested Rectangular Weir** (Weir Controls 26.35 cfs @ 1.42 fps)

Summary for Pond 4P: DP-1

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 8.28" for 100-Year event
Inflow = 115.86 cfs @ 12.17 hrs, Volume= 13.790 af
Outflow = 8.22 cfs @ 14.33 hrs, Volume= 13.019 af, Atten= 93%, Lag= 129.5 min
Primary = 8.22 cfs @ 14.33 hrs, Volume= 13.019 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 563.76' @ 14.33 hrs Surf.Area= 59,684 sf Storage= 308,564 cf
Flood Elev= 565.00' Surf.Area= 62,400 sf Storage= 384,495 cf

Plug-Flow detention time= 644.8 min calculated for 13.016 af (94% of inflow)
Center-of-Mass det. time= 587.1 min (1,473.8 - 886.7)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	651,999 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	47,688	883.6	0	0	47,688
559.00	49,705	899.0	48,693	48,693	50,047
560.00	51,750	914.4	50,724	99,417	52,448
561.00	53,824	929.8	52,784	152,201	54,888
562.00	55,926	945.2	54,872	207,072	57,370
563.00	58,056	960.6	56,988	264,060	59,893
564.00	60,214	976.1	59,132	323,192	62,470
565.00	62,400	991.5	61,304	384,495	65,075
566.00	64,615	1,006.9	63,504	448,000	67,720
567.00	66,858	1,022.3	65,733	513,733	70,405
568.00	69,129	1,037.7	67,990	581,723	73,132
569.00	71,429	1,053.2	70,276	651,999	75,915

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**48.0" Round Culvert** L= 663.9' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 551.36' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	558.00'	**9.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	562.50'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Secondary	568.00'	**45.0 deg x 100.0' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=8.22 cfs @ 14.33 hrs HW=563.76' TW=558.28' (Dynamic Tailwater)
└─**1=Culvert** (Passes 8.22 cfs of 92.58 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 4.93 cfs @ 11.17 fps)
  └─**3=Orifice/Grate** (Orifice Controls 3.29 cfs @ 4.19 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=558.00' (Free Discharge)
└─**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 13P: Det. Pond - 2

Inflow Area = 1.327 ac, 72.87% Impervious, Inflow Depth = 7.62" for 100-Year event
Inflow = 8.86 cfs @ 12.11 hrs, Volume= 0.842 af
Outflow = 6.71 cfs @ 12.23 hrs, Volume= 0.836 af, Atten= 24%, Lag= 7.2 min
Primary = 6.71 cfs @ 12.23 hrs, Volume= 0.836 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 539.97' @ 12.23 hrs Surf.Area= 7,445 sf Storage= 12,243 cf
Flood Elev= 541.00' Surf.Area= 8,791 sf Storage= 20,626 cf

Plug-Flow detention time= 240.6 min calculated for 0.836 af (99% of inflow)
Center-of-Mass det. time= 235.2 min (1,014.0 - 778.7)

Volume	Invert	Avail.Storage	Storage Description
#1	538.00'	20,626 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
538.00	5,054	387.0	0	0	5,054
539.00	6,243	405.8	5,638	5,638	6,305
540.00	7,489	424.7	6,857	12,495	7,621
541.00	8,791	423.9	8,131	20,626	8,049

Device	Routing	Invert	Outlet Devices
#1	Primary	538.00'	**15.0" Round Culvert** L= 94.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.00' / 537.00' S= 0.0106 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	538.00'	**2.4" Vert. Orifice/Grate** C= 0.600
#3	Device 1	538.90'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	539.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=6.71 cfs @ 12.23 hrs HW=539.97' TW=534.05' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 6.71 cfs @ 5.47 fps)
  ├─**2=Orifice/Grate** (Passes < 0.21 cfs potential flow)
  ├─**3=Orifice/Grate** (Passes < 0.40 cfs potential flow)
  └─**4=Orifice/Grate** (Passes < 6.54 cfs potential flow)

Summary for Pond 15P: Culvert at Entr.

Inflow Area = 3.969 ac, 14.44% Impervious, Inflow Depth = 6.26" for 100-Year event
Inflow = 18.21 cfs @ 12.24 hrs, Volume= 2.071 af
Outflow = 18.21 cfs @ 12.24 hrs, Volume= 2.071 af, Atten= 0%, Lag= 0.0 min
Primary = 18.21 cfs @ 12.24 hrs, Volume= 2.071 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 530.33' @ 12.24 hrs Surf.Area= 350 sf Storage= 389 cf

Plug-Flow detention time= 0.4 min calculated for 2.071 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (810.4 - 809.9)

Volume	Invert	Avail.Storage	Storage Description
#1	527.17'	1,407 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
527.17	6	14.0	0	0	6
528.00	44	35.0	18	18	90
529.00	121	58.1	79	98	268
530.00	266	92.9	189	286	693
531.00	555	117.6	402	688	1,120
532.00	897	157.4	719	1,407	2,001

Device	Routing	Invert	Outlet Devices
#1	Primary	527.17'	**18.0" Round Culvert X 2.00** L= 52.8' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 527.17' / 526.65' S= 0.0098 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	527.17'	**18.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	530.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=18.20 cfs @ 12.24 hrs HW=530.33' TW=527.11' (Dynamic Tailwater)
└─**1=Culvert** (Passes 18.20 cfs of 28.47 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 3.15 cfs @ 8.39 fps)
  └─**3=Orifice/Grate** (Weir Controls 15.06 cfs @ 1.89 fps)

Summary for Pond 17P: Arch for stream

Inflow Area = 49.942 ac, 3.73% Impervious, Inflow Depth = 6.05" for 100-Year event
Inflow = 159.54 cfs @ 12.55 hrs, Volume= 25.198 af
Outflow = 158.43 cfs @ 12.61 hrs, Volume= 25.198 af, Atten= 1%, Lag= 3.3 min
Primary = 158.43 cfs @ 12.61 hrs, Volume= 25.198 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 534.96' @ 12.61 hrs Surf.Area= 11,441 sf Storage= 10,200 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.4 min (845.7 - 845.4)

Volume	Invert	Avail.Storage	Storage Description
#1	533.00'	25,714 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
533.00	412	159.8	0	0	412
534.00	5,210	513.7	2,362	2,362	19,382
535.00	11,714	795.5	8,245	10,608	48,748
536.00	18,774	996.6	15,106	25,714	77,441

Device	Routing	Invert	Outlet Devices
#1	Primary	532.20'	**144.0" W x 49.0" H, R=77.5" Arch Culvert** L= 51.5' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 532.20' / 530.66' S= 0.0299 '/' Cc= 0.900 n= 0.024, Flow Area= 35.55 sf

Primary OutFlow Max=158.43 cfs @ 12.61 hrs HW=534.96' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 158.43 cfs @ 5.56 fps)

Summary for Pond 18P: Level Spreader

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 7.82" for 100-Year event
Inflow = 8.22 cfs @ 14.33 hrs, Volume= 13.019 af
Outflow = 8.22 cfs @ 14.34 hrs, Volume= 13.017 af, Atten= 0%, Lag= 0.4 min
Primary = 8.22 cfs @ 14.34 hrs, Volume= 13.017 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 558.00' Surf.Area= 2,625 sf Storage= 7,350 cf
Peak Elev= 558.28' @ 14.34 hrs Surf.Area= 2,625 sf Storage= 7,647 cf (297 cf above start)

Plug-Flow detention time= 31.6 min calculated for 12.845 af (99% of inflow)
Center-of-Mass det. time= 0.5 min (1,474.3 - 1,473.8)

Volume	Invert	Avail.Storage	Storage Description
#1	551.00'	8,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 21,000 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
551.00	2,625	0	0
556.00	2,625	13,125	13,125
557.00	2,625	2,625	15,750
558.00	2,625	2,625	18,375
559.00	2,625	2,625	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**75.0" x 35.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.22 cfs @ 14.34 hrs HW=558.28' TW=558.10' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Weir Controls 8.22 cfs @ 1.59 fps)

Summary for Pond 23P:

Inflow Area = 0.745 ac, 73.15% Impervious, Inflow Depth = 7.74" for 100-Year event
Inflow = 6.43 cfs @ 12.07 hrs, Volume= 0.480 af
Outflow = 6.34 cfs @ 12.08 hrs, Volume= 0.480 af, Atten= 1%, Lag= 0.7 min
Primary = 0.23 cfs @ 12.06 hrs, Volume= 0.223 af
Secondary = 6.11 cfs @ 12.08 hrs, Volume= 0.257 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 531.99' @ 12.08 hrs Surf.Area= 1,032 sf Storage= 769 cf

Plug-Flow detention time= 11.5 min calculated for 0.480 af (100% of inflow)
Center-of-Mass det. time= 11.4 min (781.8 - 770.4)

Volume	Invert	Avail.Storage	Storage Description
#1	530.19'	782 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
530.19	56	110.4	0	0	56
531.00	317	180.9	137	137	1,695
532.00	1,044	364.9	645	782	9,691

Device	Routing	Invert	Outlet Devices
#1	Primary	530.19'	**3.0" Round Culvert** L= 17.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 530.19' / 530.00' S= 0.0110 '/' Cc= 0.900 n= 0.013, Flow Area= 0.05 sf
#2	Secondary	531.60'	**30.0 deg x 7.7' long x 0.40' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.23 cfs @ 12.06 hrs HW=531.98' TW=530.27' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.23 cfs @ 4.71 fps)

Secondary OutFlow Max=6.10 cfs @ 12.08 hrs HW=531.99' TW=530.29' (Dynamic Tailwater)
↑—**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 6.10 cfs @ 2.02 fps)

Summary for Pond 28P: Ramp Culvert

Inflow Area = 0.933 ac, 72.88% Impervious, Inflow Depth = 7.62" for 100-Year event
Inflow = 6.73 cfs @ 12.13 hrs, Volume= 0.592 af
Outflow = 6.73 cfs @ 12.13 hrs, Volume= 0.592 af, Atten= 0%, Lag= 0.0 min
Primary = 6.73 cfs @ 12.13 hrs, Volume= 0.592 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 554.61' @ 12.13 hrs Surf.Area= 4 sf Storage= 0 cf
Flood Elev= 556.36' Surf.Area= 534 sf Storage= 342 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (780.2 - 780.2)

Volume	Invert	Avail.Storage	Storage Description
#1	554.61'	342 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
554.61	4	8.0	0	0	4
555.00	56	45.8	10	10	166
556.00	337	150.1	177	187	1,795
556.36	534	184.0	155	342	2,698

Device	Routing	Invert	Outlet Devices
#1	Primary	553.36'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 30.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 553.36' / 552.74' S= 0.0207 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=8.72 cfs @ 12.13 hrs HW=554.61' TW=553.40' (Dynamic Tailwater)
↑—**1=RCP_Elliptical 23x14** (Inlet Controls 8.72 cfs @ 4.77 fps)

Summary for Link 21L: Point A

Inflow Area = 27.760 ac, 66.67% Impervious, Inflow Depth > 7.28" for 100-Year event
Inflow = 39.81 cfs @ 12.29 hrs, Volume= 16.849 af
Primary = 39.81 cfs @ 12.29 hrs, Volume= 16.849 af, Atten= 0%, Lag= 0.0 min

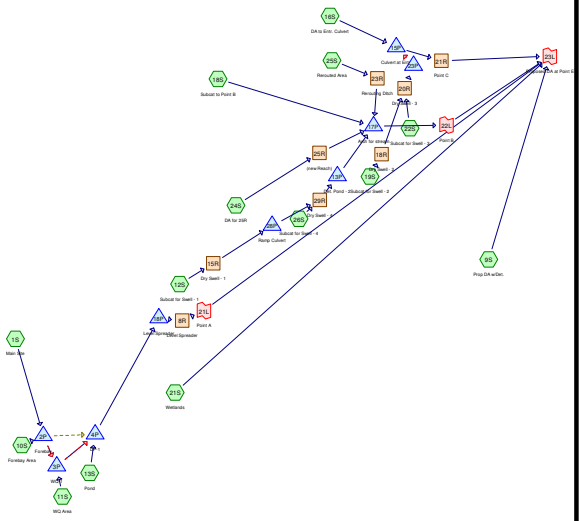
Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 22L: Point B

Inflow Area = 49.942 ac, 3.73% Impervious, Inflow Depth = 6.05" for 100-Year event
Inflow = 158.43 cfs @ 12.61 hrs, Volume= 25.198 af
Primary = 158.43 cfs @ 12.61 hrs, Volume= 25.198 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Existing Drainage



Proposed Drainage

Subcat | Reach | Pond | Link

Routing Diagram for Exist&Prop_Dn_Stream
Prepared by HDR Inc, Printed 9/12/2016

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Main Site Runoff Area=16.555 ac 100.00% Impervious Runoff Depth=4.66"
Flow Length=1,775' Tc=7.4 min CN=98 Runoff=75.68 cfs 6.433 af

Subcatchment 5S: Exist DA at Point E Runoff Area=451.520 ac 0.20% Impervious Runoff Depth>2.53"
Flow Length=11,874' Tc=430.9 min CN=77 Runoff=132.27 cfs 95.224 af

Subcatchment 9S: Prop DA w/Det. Runoff Area=16,322,252 sf 0.00% Impervious Runoff Depth>2.53"
Flow Length=11,874' Tc=430.9 min CN=77 Runoff=109.77 cfs 79.024 af

Subcatchment 10S: Forebay Area Runoff Area=0.354 ac 24.29% Impervious Runoff Depth=3.18"
Tc=5.0 min CN=84 Runoff=1.36 cfs 0.094 af

Subcatchment 11S: WQ Area Runoff Area=1.129 ac 53.59% Impervious Runoff Depth=3.68"
Tc=5.0 min CN=89 Runoff=4.90 cfs 0.346 af

Subcatchment 12S: Subcat for Swell - 1 Runoff Area=0.933 ac 72.88% Impervious Runoff Depth=3.89"
Flow Length=993' Slope=0.1266 '/' Tc=6.0 min CN=91 Runoff=4.07 cfs 0.302 af

Subcatchment 13S: Pond Runoff Area=1.949 ac 64.70% Impervious Runoff Depth=3.99"
Tc=5.0 min CN=92 Runoff=8.98 cfs 0.648 af

Subcatchment 16S: DA to Entr. Culvert Runoff Area=140,442 sf 0.87% Impervious Runoff Depth=2.54"
Flow Length=1,034' Slope=0.0359 '/' Tc=18.9 min CN=77 Runoff=6.61 cfs 0.682 af

Subcatchment 18S: Subcat to Point B Runoff Area=1,632,095 sf 2.40% Impervious Runoff Depth=2.63"
Flow Length=3,073' Slope=0.0324 '/' Tc=46.1 min CN=78 Runoff=52.82 cfs 8.202 af

Subcatchment 19S: Subcat for Swell - 2 Runoff Area=0.272 ac 73.53% Impervious Runoff Depth=3.99"
Flow Length=313' Slope=0.1239 '/' Tc=2.3 min CN=92 Runoff=1.38 cfs 0.090 af

Subcatchment 21S: Wetlands Runoff Area=7.773 ac 0.00% Impervious Runoff Depth=2.54"
Flow Length=1,002' Slope=0.0286 '/' Tc=20.6 min CN=77 Runoff=15.41 cfs 1.645 af

Subcatchment 22S: Subcat for Swell - 3 Runoff Area=0.473 ac 72.94% Impervious Runoff Depth=3.99"
Flow Length=505' Slope=0.1265 '/' Tc=3.3 min CN=92 Runoff=2.32 cfs 0.157 af

Subcatchment 24S: DA for 25R Runoff Area=8.906 ac 0.00% Impervious Runoff Depth=2.54"
Flow Length=1,580' Slope=0.0192 '/' Tc=36.2 min CN=77 Runoff=13.73 cfs 1.885 af

Subcatchment 25S: Rerouted Area Runoff Area=2.241 ac 0.00% Impervious Runoff Depth=2.54"
Flow Length=797' Slope=0.0260 '/' Tc=18.0 min CN=77 Runoff=4.69 cfs 0.474 af

Subcatchment 26S: Subcat for Swell - 4 Runoff Area=0.394 ac 72.84% Impervious Runoff Depth=3.89"
Flow Length=293' Slope=0.1266 '/' Tc=2.3 min CN=91 Runoff=1.97 cfs 0.128 af

Reach 8R: Level Spreader Avg. Flow Depth=0.06' Max Vel=0.77 fps Inflow=3.74 cfs 6.362 af
n=0.030 L=48.0' S=0.0100 '/' Capacity=439.80 cfs Outflow=3.74 cfs 6.359 af

Reach 15R: Dry Swell - 1 Avg. Flow Depth=0.41' Max Vel=2.97 fps Inflow=4.07 cfs 0.302 af
n=0.030 L=992.7' S=0.0177 '/' Capacity=84.06 cfs Outflow=3.44 cfs 0.302 af

Reach 18R: Dry Swell - 2 Avg. Flow Depth=0.12' Max Vel=1.73 fps Inflow=1.38 cfs 0.090 af
n=0.030 L=259.1' S=0.0222 '/' Capacity=49.33 cfs Outflow=1.28 cfs 0.090 af

Reach 20R: Dry Swell - 3 Avg. Flow Depth=0.38' Max Vel=3.25 fps Inflow=3.59 cfs 0.248 af
n=0.030 L=448.4' S=0.0233 '/' Capacity=96.49 cfs Outflow=3.36 cfs 0.248 af

Reach 21R: Point C Avg. Flow Depth=0.29' Max Vel=2.99 fps Inflow=8.22 cfs 0.930 af
n=0.024 L=77.4' S=0.0136 '/' Capacity=240.09 cfs Outflow=8.21 cfs 0.930 af

Reach 23R: Rerouting Ditch Avg. Flow Depth=0.60' Max Vel=2.40 fps Inflow=4.69 cfs 0.474 af
n=0.025 L=405.0' S=0.0054 '/' Capacity=12.66 cfs Outflow=4.59 cfs 0.474 af

Reach 25R: (new Reach) Avg. Flow Depth=1.00' Max Vel=3.44 fps Inflow=13.73 cfs 1.885 af
n=0.025 L=262.2' S=0.0064 '/' Capacity=60.53 cfs Outflow=13.70 cfs 1.885 af

Reach 29R: Dry Swell - 4 Avg. Flow Depth=0.46' Max Vel=3.33 fps Inflow=4.56 cfs 0.430 af
n=0.030 L=292.6' S=0.0196 '/' Capacity=88.45 cfs Outflow=4.52 cfs 0.430 af

Pond 2P: Forebay Peak Elev=566.78' Storage=33,626 cf Inflow=76.95 cfs 6.527 af
Primary=6.41 cfs 4.323 af Secondary=49.49 cfs 1.065 af Tertiary=21.31 cfs 1.133 af Outflow=76.76 cfs 6.522 af

Pond 3P: WQ-1 Peak Elev=563.14' Storage=80,492 cf Inflow=59.93 cfs 5.734 af
Primary=34.64 cfs 5.700 af Secondary=0.00 cfs 0.000 af Outflow=34.64 cfs 5.700 af

Pond 4P: DP-1 Peak Elev=561.46' Storage=177,399 cf Inflow=57.35 cfs 7.481 af
Primary=3.74 cfs 6.365 af Secondary=0.00 cfs 0.000 af Outflow=3.74 cfs 6.365 af

Pond 13P: Det. Pond - 2 Peak Elev=539.60' Storage=9,579 cf Inflow=4.52 cfs 0.430 af
Outflow=1.11 cfs 0.408 af

Pond 15P: Culvert at Entr. Peak Elev=530.16' Storage=333 cf Inflow=8.22 cfs 0.930 af
Outflow=8.22 cfs 0.930 af

Pond 17P: Arch for stream Peak Elev=533.73' Storage=1,205 cf Inflow=69.32 cfs 10.970 af
144.0" x 49.0", R=77.5" Arch Culvert n=0.024 L=51.5' S=0.0299 '/' Outflow=69.25 cfs 10.970 af

Pond 18P: Level Spreader Peak Elev=558.17' Storage=7,527 cf Inflow=3.74 cfs 6.365 af
Outflow=3.74 cfs 6.362 af

Pond 23P: Peak Elev=531.85' Storage=632 cf Inflow=3.36 cfs 0.248 af
Primary=0.22 cfs 0.148 af Secondary=3.09 cfs 0.100 af Outflow=3.32 cfs 0.248 af

Pond 28P: Ramp Culvert Peak Elev=554.61' Storage=0 cf Inflow=3.44 cfs 0.302 af
23.0" x 14.0", R=22.0" Elliptical Culvert n=0.013 L=30.0' S=0.0207 '/' Outflow=3.44 cfs 0.302 af

Link 21L: Point A Inflow=3.74 cfs 6.359 af
Primary=3.74 cfs 6.359 af

Link 22L: Point B Inflow=69.25 cfs 10.970 af
Primary=69.25 cfs 10.970 af

Link 23L: Proposed DA at Point E Inflow=118.78 cfs 98.928 af
Primary=118.78 cfs 98.928 af

Total Runoff Area = 907.898 ac Runoff Volume = 195.336 af Average Runoff Depth = 2.58"
97.59% Pervious = 886.055 ac 2.41% Impervious = 21.843 ac

Summary for Subcatchment 1S: Main Site

Runoff = 75.68 cfs @ 12.10 hrs, Volume= 6.433 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
16.555	98	Paved parking, HSG D
16.555		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	158	0.0100	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.5	135	0.0025	4.18	20.51	**Pipe Channel, 130-131** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
0.4	110	0.0025	4.72	33.35	**Pipe Channel, 131-132** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.3	79	0.0025	4.72	33.35	**Pipe Channel, 132-133** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.8	246	0.0025	5.23	50.30	**Pipe Channel, 133-134** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.4	133	0.0025	5.23	50.30	**Pipe Channel, 134-135** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.6	182	0.0025	5.23	50.30	**Pipe Channel, 135-136** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.7	256	0.0025	5.72	71.82	**Pipe Channel, 136-137** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.7	233	0.0025	5.72	71.82	**Pipe Channel, 137-138** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.4	130	0.0025	5.72	71.82	**Pipe Channel, 138-139** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.3	113	0.0025	5.72	71.82	**Pipe Channel, 139-Outlet** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
7.4	1,775	Total			

Summary for Subcatchment 5S: Exist DA at Point E

Runoff = 132.27 cfs @ 17.72 hrs, Volume= 95.224 af, Depth> 2.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
450.622	77	Woods, Good, HSG D
0.898	98	Paved parking, HSG D
451.520	77	Weighted Average
450.622		99.80% Pervious Area
0.898		0.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	80	0.0480	0.26		**Sheet Flow,** Range n= 0.130 P2= 3.30"
391.3	7,875	0.0180	0.34		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
34.5	3,919	0.0130	1.90	182.01	**Channel Flow,** Area= 96.0 sf Perim= 81.1' r= 1.18' n= 0.100 Very weedy reaches w/pools
430.9	11,874	Total			

Summary for Subcatchment 9S: Prop DA w/Det.

Runoff = 109.77 cfs @ 17.72 hrs, Volume= 79.024 af, Depth> 2.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
16,322,252	77	Woods, Good, HSG D
16,322,252		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	80	0.0480	0.26		**Sheet Flow,** Range n= 0.130 P2= 3.30"
391.3	7,875	0.0180	0.34		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
34.5	3,919	0.0130	1.90	182.01	**Channel Flow,** Area= 96.0 sf Perim= 81.1' r= 1.18' n= 0.100 Very weedy reaches w/pools
430.9	11,874	Total			

Summary for Subcatchment 10S: Forebay Area

Runoff = 1.36 cfs @ 12.07 hrs, Volume= 0.094 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
0.268	80	>75% Grass cover, Good, HSG D
0.086	98	Water Surface, HSG D
0.354	84	Weighted Average
0.268		75.71% Pervious Area
0.086		24.29% Impervious Area

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

Summary for Subcatchment 11S: WQ Area

Runoff = 4.90 cfs @ 12.07 hrs, Volume= 0.346 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
0.605	98	Water Surface, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
1.129	89	Weighted Average
0.524		46.41% Pervious Area
0.605		53.59% Impervious Area

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

Summary for Subcatchment 12S: Subcat for Swell - 1

Runoff = 4.07 cfs @ 12.08 hrs, Volume= 0.302 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

	Area (ac)	CN	Description
	0.253	74	>75% Grass cover, Good, HSG C
*	0.680	98	Paved parking, HSG C
	0.933	91	Weighted Average
	0.253		27.12% Pervious Area
	0.680		72.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	993	0.1266	2.77		**Lag/CN Method,**

Summary for Subcatchment 13S: Pond

Runoff = 8.98 cfs @ 12.07 hrs, Volume= 0.648 af, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
1.261	98	Water Surface, HSG C
0.624	80	>75% Grass cover, Good, HSG D
0.064	77	Woods, Good, HSG D
1.949	92	Weighted Average
0.688		35.30% Pervious Area
1.261		64.70% Impervious Area

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

Summary for Subcatchment 16S: DA to Entr. Culvert

Runoff = 6.61 cfs @ 12.26 hrs, Volume= 0.682 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
139,222	77	Woods, Good, HSG D
1,220	98	Paved parking, HSG D
140,442	77	Weighted Average
139,222		99.13% Pervious Area
1,220		0.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	1,034	0.0359	0.91		**Lag/CN Method,**

Summary for Subcatchment 18S: Subcat to Point B

Runoff = 52.82 cfs @ 12.65 hrs, Volume= 8.202 af, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
1,592,978	77	Woods, Good, HSG D
39,117	98	Paved parking, HSG D
1,632,095	78	Weighted Average
1,592,978		97.60% Pervious Area
39,117		2.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.1	3,073	0.0324	1.11		**Lag/CN Method,**

Summary for Subcatchment 19S: Subcat for Swell - 2

Runoff = 1.38 cfs @ 12.03 hrs, Volume= 0.090 af, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
0.200	98	Paved parking, HSG C
0.072	74	>75% Grass cover, Good, HSG C
0.272	92	Weighted Average
0.072		26.47% Pervious Area
0.200		73.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	313	0.1239	2.27		**Lag/CN Method,**

Summary for Subcatchment 21S: Wetlands

Runoff = 15.41 cfs @ 12.29 hrs, Volume= 1.645 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
7.773	77	Woods, Good, HSG D
7.773		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,002	0.0286	0.81		**Lag/CN Method,**

Summary for Subcatchment 22S: Subcat for Swell - 3

Runoff = 2.32 cfs @ 12.05 hrs, Volume= 0.157 af, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

	Area (ac)	CN	Description
*	0.128	74	>75% Grass cover, Good, HSG C
*	0.345	98	Paved parking, HSG C
	0.473	92	Weighted Average
	0.128		27.06% Pervious Area
	0.345		72.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	505	0.1265	2.52		**Lag/CN Method,**

Summary for Subcatchment 24S: DA for 25R

Runoff = 13.73 cfs @ 12.51 hrs, Volume= 1.885 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
8.906	77	Woods, Good, HSG D
8.906		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.2	1,580	0.0192	0.73		**Lag/CN Method,**

Summary for Subcatchment 25S: Rerouted Area

Runoff = 4.69 cfs @ 12.26 hrs, Volume= 0.474 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
2.241	77	Woods, Good, HSG D
2.241		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	797	0.0260	0.74		**Lag/CN Method,**

Summary for Subcatchment 26S: Subcat for Swell - 4

Runoff = 1.97 cfs @ 12.03 hrs, Volume= 0.128 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

	Area (ac)	CN	Description
*	0.287	98	Paved parking, HSG D
	0.107	74	>75% Grass cover, Good, HSG C
	0.394	91	Weighted Average
	0.107		27.16% Pervious Area
	0.287		72.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	293	0.1266	2.17		**Lag/CN Method,**

Summary for Reach 8R: Level Spreader

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 3.82" for 10-Year event
Inflow = 3.74 cfs @ 17.52 hrs, Volume= 6.362 af
Outflow = 3.74 cfs @ 17.53 hrs, Volume= 6.359 af, Atten= 0%, Lag= 0.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.77 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 1.3 min

Peak Storage= 232 cf @ 17.53 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 1.00' Flow Area= 105.0 sf, Capacity= 439.80 cfs

75.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 30.0 '/' Top Width= 135.00'
Length= 48.0' Slope= 0.0100 '/'
Inlet Invert= 558.00', Outlet Invert= 557.52'

‡

Summary for Reach 15R: Dry Swell - 1

Inflow Area = 0.933 ac, 72.88% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 4.07 cfs @ 12.08 hrs, Volume= 0.302 af
Outflow = 3.44 cfs @ 12.14 hrs, Volume= 0.302 af, Atten= 15%, Lag= 3.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.97 fps, Min. Travel Time= 5.6 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 19.5 min

Peak Storage= 1,152 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 84.06 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 992.7' Slope= 0.0177 '/'
Inlet Invert= 572.18', Outlet Invert= 554.62'

Summary for Reach 18R: Dry Swell - 2

Inflow Area = 0.272 ac, 73.53% Impervious, Inflow Depth = 3.99" for 10-Year event
Inflow = 1.38 cfs @ 12.03 hrs, Volume= 0.090 af
Outflow = 1.28 cfs @ 12.06 hrs, Volume= 0.090 af, Atten= 7%, Lag= 1.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.73 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 9.8 min

Peak Storage= 192 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 49.33 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 259.1' Slope= 0.0222 '/'
Inlet Invert= 547.00', Outlet Invert= 541.25'

‡

Summary for Reach 20R: Dry Swell - 3

Inflow Area = 0.745 ac, 73.15% Impervious, Inflow Depth = 3.99" for 10-Year event
Inflow = 3.59 cfs @ 12.05 hrs, Volume= 0.248 af
Outflow = 3.36 cfs @ 12.08 hrs, Volume= 0.248 af, Atten= 6%, Lag= 1.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.25 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 8.3 min

Peak Storage= 465 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 96.49 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 448.4' Slope= 0.0233 '/'
Inlet Invert= 541.25', Outlet Invert= 530.80'

Summary for Reach 21R: Point C

Inflow Area = 3.969 ac, 14.44% Impervious, Inflow Depth = 2.81" for 10-Year event
Inflow = 8.22 cfs @ 12.24 hrs, Volume= 0.930 af
Outflow = 8.21 cfs @ 12.24 hrs, Volume= 0.930 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.99 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 1.5 min

Peak Storage= 212 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 2.00' Flow Area= 26.0 sf, Capacity= 240.09 cfs

9.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 77.4' Slope= 0.0136 '/'
Inlet Invert= 526.65', Outlet Invert= 525.60'

‡

Summary for Reach 23R: Rerouting Ditch

Inflow Area = 2.241 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 4.69 cfs @ 12.26 hrs, Volume= 0.474 af
Outflow = 4.59 cfs @ 12.29 hrs, Volume= 0.474 af, Atten= 2%, Lag= 1.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.40 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 8.7 min

Peak Storage= 774 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 12.66 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 405.0' Slope= 0.0054 '/'
Inlet Invert= 536.00', Outlet Invert= 533.82'

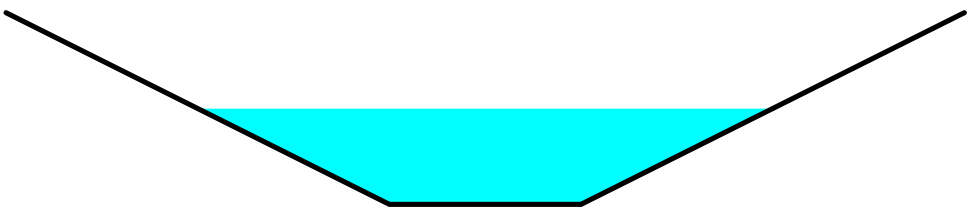
Summary for Reach 25R: (new Reach)

Inflow Area = 8.906 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 13.73 cfs @ 12.51 hrs, Volume= 1.885 af
Outflow = 13.70 cfs @ 12.52 hrs, Volume= 1.885 af, Atten= 0%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.44 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 1.37 fps, Avg. Travel Time= 3.2 min

Peak Storage= 1,045 cf @ 12.52 hrs
Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 60.53 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 262.2' Slope= 0.0064 '/'
Inlet Invert= 540.67', Outlet Invert= 539.00'



Summary for Reach 29R: Dry Swell - 4

Inflow Area = 1.327 ac, 72.87% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 4.56 cfs @ 12.10 hrs, Volume= 0.430 af
Outflow = 4.52 cfs @ 12.11 hrs, Volume= 0.430 af, Atten= 1%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.33 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 5.0 min

Peak Storage= 397 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 88.45 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 292.6' Slope= 0.0196 '/'
Inlet Invert= 552.74', Outlet Invert= 547.01'

Summary for Pond 2P: Forebay

Inflow Area = 16.909 ac, 98.42% Impervious, Inflow Depth = 4.63" for 10-Year event
Inflow = 76.95 cfs @ 12.10 hrs, Volume= 6.527 af
Outflow = 76.76 cfs @ 12.11 hrs, Volume= 6.522 af, Atten= 0%, Lag= 0.4 min
Primary = 6.41 cfs @ 11.88 hrs, Volume= 4.323 af
Secondary = 49.49 cfs @ 12.11 hrs, Volume= 1.065 af
Tertiary = 21.31 cfs @ 12.11 hrs, Volume= 1.133 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 3,802 sf Storage= 3,789 cf
Peak Elev= 566.78' @ 12.11 hrs Surf.Area= 6,599 sf Storage= 33,626 cf (29,837 cf above start)
Flood Elev= 568.00' Surf.Area= 7,249 sf Storage= 42,057 cf (38,268 cf above start)

Plug-Flow detention time= 54.6 min calculated for 6.433 af (99% of inflow)
Center-of-Mass det. time= 37.1 min (787.6 - 750.5)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	49,579 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	2,536	269.1	0.0	0	0	2,536
559.00	2,944	279.8	40.0	1,095	1,095	3,078
560.00	3,366	290.5	40.0	1,261	2,356	3,641
561.00	3,802	301.2	40.0	1,433	3,789	4,225
562.00	4,252	312.0	100.0	4,025	7,814	4,835
563.00	4,716	322.7	100.0	4,482	12,296	5,462
564.00	5,194	333.4	100.0	4,953	17,249	6,110
565.00	5,687	344.1	100.0	5,439	22,687	6,779
566.00	6,193	354.8	100.0	5,938	28,626	7,469
567.00	6,714	365.5	100.0	6,452	35,077	8,180
568.00	7,249	376.2	100.0	6,980	42,057	8,912
569.00	7,798	386.9	100.0	7,522	49,579	9,666

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Tertiary	558.00'	**36.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#3	Device 2	566.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	566.50'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=6.40 cfs @ 11.88 hrs HW=566.58' TW=561.99' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 6.40 cfs @ 8.14 fps)

Secondary OutFlow Max=49.41 cfs @ 12.11 hrs HW=566.78' TW=562.86' (Dynamic Tailwater)
└**4=Sharp-Crested Rectangular Weir** (Weir Controls 49.41 cfs @ 1.76 fps)

Tertiary OutFlow Max=21.30 cfs @ 12.11 hrs HW=566.78' TW=559.35' (Dynamic Tailwater)
└**2=Culvert** (Passes 21.30 cfs of 72.51 cfs potential flow)
  └**3=Orifice/Grate** (Weir Controls 21.30 cfs @ 2.89 fps)

Summary for Pond 3P: WQ-1

Inflow Area = 18.038 ac, 95.61% Impervious, Inflow Depth = 3.81" for 10-Year event
Inflow = 59.93 cfs @ 12.10 hrs, Volume= 5.734 af
Outflow = 34.64 cfs @ 12.21 hrs, Volume= 5.700 af, Atten= 42%, Lag= 6.4 min
Primary = 34.64 cfs @ 12.21 hrs, Volume= 5.700 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 23,969 sf Storage= 27,117 cf
Peak Elev= 563.14' @ 12.21 hrs Surf.Area= 25,986 sf Storage= 80,492 cf (53,375 cf above start)
Flood Elev= 568.00' Surf.Area= 30,816 sf Storage= 218,459 cf (191,342 cf above start)

Plug-Flow detention time= 214.0 min calculated for 5.077 af (89% of inflow)
Center-of-Mass det. time= 104.4 min (902.4 - 798.0)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	249,790 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	21,247	600.7	0.0	0	0	21,247
559.00	22,140	611.4	40.0	8,677	8,677	22,444
560.00	23,048	622.1	40.0	9,037	17,714	23,662
561.00	23,969	632.9	40.0	9,403	27,117	24,910
562.00	24,905	643.6	100.0	24,436	51,552	26,170
563.00	25,855	654.3	100.0	25,379	76,931	27,452
564.00	26,819	665.0	100.0	26,336	103,266	28,754
565.00	27,797	675.8	100.0	27,307	130,573	30,088
566.00	28,789	686.5	100.0	28,292	158,864	31,433
567.00	29,795	697.2	100.0	29,291	188,155	32,799
568.00	30,816	707.9	100.0	30,304	218,459	34,187
569.00	31,850	718.7	100.0	31,332	249,790	35,605

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**36.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	561.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 2	558.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	564.00'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=34.63 cfs @ 12.21 hrs HW=563.14' TW=559.74' (Dynamic Tailwater)
- **1=Culvert** (Passes 34.63 cfs of 62.76 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 9.68 cfs @ 6.16 fps)
    - **3=Orifice/Grate** (Passes < 5.53 cfs potential flow)
    - **5=Orifice/Grate** (Passes < 24.95 cfs potential flow)
  - **4=Orifice/Grate** (Weir Controls 24.95 cfs @ 2.61 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=561.00' TW=558.00' (Dynamic Tailwater)
- **6=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4P: DP-1

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 4.49" for 10-Year event
Inflow = 57.35 cfs @ 12.18 hrs, Volume= 7.481 af
Outflow = 3.74 cfs @ 17.51 hrs, Volume= 6.365 af, Atten= 93%, Lag= 319.8 min
Primary = 3.74 cfs @ 17.51 hrs, Volume= 6.365 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 561.46' @ 17.51 hrs Surf.Area= 54,794 sf Storage= 177,399 cf
Flood Elev= 565.00' Surf.Area= 62,400 sf Storage= 384,495 cf

Plug-Flow detention time= 558.5 min calculated for 6.365 af (85% of inflow)
Center-of-Mass det. time= 475.6 min (1,342.6 - 867.0)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	651,999 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	47,688	883.6	0	0	47,688
559.00	49,705	899.0	48,693	48,693	50,047
560.00	51,750	914.4	50,724	99,417	52,448
561.00	53,824	929.8	52,784	152,201	54,888
562.00	55,926	945.2	54,872	207,072	57,370
563.00	58,056	960.6	56,988	264,060	59,893
564.00	60,214	976.1	59,132	323,192	62,470
565.00	62,400	991.5	61,304	384,495	65,075
566.00	64,615	1,006.9	63,504	448,000	67,720
567.00	66,858	1,022.3	65,733	513,733	70,405
568.00	69,129	1,037.7	67,990	581,723	73,132
569.00	71,429	1,053.2	70,276	651,999	75,915

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**48.0" Round Culvert** L= 663.9' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 551.36' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	558.00'	**9.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	562.50'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Secondary	568.00'	**45.0 deg x 100.0' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=3.74 cfs @ 17.51 hrs HW=561.46' TW=558.17' (Dynamic Tailwater)
└**1=Culvert** (Passes 3.74 cfs of 57.85 cfs potential flow)
  └**2=Orifice/Grate** (Orifice Controls 3.74 cfs @ 8.46 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=558.00' (Free Discharge)
└**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 13P: Det. Pond - 2

Inflow Area = 1.327 ac, 72.87% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 4.52 cfs @ 12.11 hrs, Volume= 0.430 af
Outflow = 1.11 cfs @ 12.61 hrs, Volume= 0.408 af, Atten= 75%, Lag= 30.0 min
Primary = 1.11 cfs @ 12.61 hrs, Volume= 0.408 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 539.60' @ 12.61 hrs Surf.Area= 6,973 sf Storage= 9,579 cf
Flood Elev= 541.00' Surf.Area= 8,791 sf Storage= 20,626 cf

Plug-Flow detention time= 349.6 min calculated for 0.408 af (95% of inflow)
Center-of-Mass det. time= 321.1 min (1,119.2 - 798.1)

Volume	Invert	Avail.Storage	Storage Description
#1	538.00'	20,626 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
538.00	5,054	387.0	0	0	5,054
539.00	6,243	405.8	5,638	5,638	6,305
540.00	7,489	424.7	6,857	12,495	7,621
541.00	8,791	423.9	8,131	20,626	8,049

Device	Routing	Invert	Outlet Devices
#1	Primary	538.00'	**15.0" Round Culvert** L= 94.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.00' / 537.00' S= 0.0106 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	538.00'	**2.4" Vert. Orifice/Grate** C= 0.600
#3	Device 1	538.90'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	539.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.11 cfs @ 12.61 hrs HW=539.60' TW=533.73' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.11 cfs of 5.82 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.19 cfs @ 5.89 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.31 cfs @ 3.51 fps)
  └─**4=Orifice/Grate** (Weir Controls 0.62 cfs @ 1.02 fps)

Summary for Pond 15P: Culvert at Entr.

Inflow Area = 3.969 ac, 14.44% Impervious, Inflow Depth = 2.81" for 10-Year event
Inflow = 8.22 cfs @ 12.24 hrs, Volume= 0.930 af
Outflow = 8.22 cfs @ 12.24 hrs, Volume= 0.930 af, Atten= 0%, Lag= 0.0 min
Primary = 8.22 cfs @ 12.24 hrs, Volume= 0.930 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 530.16' @ 12.24 hrs Surf.Area= 306 sf Storage= 333 cf

Plug-Flow detention time= 0.5 min calculated for 0.930 af (100% of inflow)

Center-of-Mass det. time= 0.5 min (831.8 - 831.3)

Volume	Invert	Avail.Storage	Storage Description
#1	527.17'	1,407 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
527.17	6	14.0	0	0	6
528.00	44	35.0	18	18	90
529.00	121	58.1	79	98	268
530.00	266	92.9	189	286	693
531.00	555	117.6	402	688	1,120
532.00	897	157.4	719	1,407	2,001

Device	Routing	Invert	Outlet Devices
#1	Primary	527.17'	**18.0" Round Culvert X 2.00** L= 52.8' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 527.17' / 526.65' S= 0.0098 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	527.17'	**18.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	530.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.22 cfs @ 12.24 hrs HW=530.16' TW=526.94' (Dynamic Tailwater)
↑**1=Culvert** (Passes 8.22 cfs of 27.34 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 3.06 cfs @ 8.15 fps)
3=Orifice/Grate (Weir Controls 5.16 cfs @ 1.32 fps)

Summary for Pond 17P: Arch for stream

Inflow Area = 49.942 ac, 3.73% Impervious, Inflow Depth > 2.64" for 10-Year event
Inflow = 69.32 cfs @ 12.60 hrs, Volume= 10.970 af
Outflow = 69.25 cfs @ 12.61 hrs, Volume= 10.970 af, Atten= 0%, Lag= 0.7 min
Primary = 69.25 cfs @ 12.61 hrs, Volume= 10.970 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 533.73' @ 12.61 hrs Surf.Area= 3,373 sf Storage= 1,205 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.1 min (873.2 - 873.1)

Volume	Invert	Avail.Storage	Storage Description
#1	533.00'	25,714 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
533.00	412	159.8	0	0	412
534.00	5,210	513.7	2,362	2,362	19,382
535.00	11,714	795.5	8,245	10,608	48,748
536.00	18,774	996.6	15,106	25,714	77,441

Device	Routing	Invert	Outlet Devices
#1	Primary	532.20'	**144.0" W x 49.0" H, R=77.5" Arch Culvert** L= 51.5' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 532.20' / 530.66' S= 0.0299 '/' Cc= 0.900 n= 0.024, Flow Area= 35.55 sf

Primary OutFlow Max=69.24 cfs @ 12.61 hrs HW=533.73' TW=0.00' (Dynamic Tailwater)
1=Culvert (Inlet Controls 69.24 cfs @ 4.03 fps)

Summary for Pond 18P: Level Spreader

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 3.82" for 10-Year event
Inflow = 3.74 cfs @ 17.51 hrs, Volume= 6.365 af
Outflow = 3.74 cfs @ 17.52 hrs, Volume= 6.362 af, Atten= 0%, Lag= 0.5 min
Primary = 3.74 cfs @ 17.52 hrs, Volume= 6.362 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Starting Elev= 558.00' Surf.Area= 2,625 sf Storage= 7,350 cf
Peak Elev= 558.17' @ 17.52 hrs Surf.Area= 2,625 sf Storage= 7,527 cf (177 cf above start)

Plug-Flow detention time= 41.7 min calculated for 6.194 af (97% of inflow)
Center-of-Mass det. time= 0.5 min (1,343.2 - 1,342.6)

Volume	Invert	Avail.Storage	Storage Description
#1	551.00'	8,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 21,000 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
551.00	2,625	0	0
556.00	2,625	13,125	13,125
557.00	2,625	2,625	15,750
558.00	2,625	2,625	18,375
559.00	2,625	2,625	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**75.0" x 35.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.74 cfs @ 17.52 hrs HW=558.17' TW=558.06' (Dynamic Tailwater)
1=Orifice/Grate (Weir Controls 3.74 cfs @ 1.21 fps)

Summary for Pond 23P:

Inflow Area = 0.745 ac, 73.15% Impervious, Inflow Depth = 3.99" for 10-Year event
Inflow = 3.36 cfs @ 12.08 hrs, Volume= 0.248 af
Outflow = 3.32 cfs @ 12.09 hrs, Volume= 0.248 af, Atten= 1%, Lag= 0.8 min
Primary = 0.22 cfs @ 12.09 hrs, Volume= 0.148 af
Secondary = 3.09 cfs @ 12.09 hrs, Volume= 0.100 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Peak Elev= 531.85' @ 12.09 hrs Surf.Area= 905 sf Storage= 632 cf

Plug-Flow detention time= 12.0 min calculated for 0.248 af (100% of inflow)
Center-of-Mass det. time= 12.0 min (800.3 - 788.3)

Volume	Invert	Avail.Storage	Storage Description
#1	530.19'	782 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
530.19	56	110.4	0	0	56
531.00	317	180.9	137	137	1,695
532.00	1,044	364.9	645	782	9,691

Device	Routing	Invert	Outlet Devices
#1	Primary	530.19'	**3.0" Round Culvert** L= 17.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 530.19' / 530.00' S= 0.0110 '/' Cc= 0.900 n= 0.013, Flow Area= 0.05 sf
#2	Secondary	531.60'	**30.0 deg x 7.7' long x 0.40' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.22 cfs @ 12.09 hrs HW=531.85' TW=530.14' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.22 cfs @ 4.56 fps)

Secondary OutFlow Max=3.09 cfs @ 12.09 hrs HW=531.85' TW=530.14' (Dynamic Tailwater)
↑—**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 3.09 cfs @ 1.62 fps)

Summary for Pond 28P: Ramp Culvert

Inflow Area = 0.933 ac, 72.88% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 3.44 cfs @ 12.14 hrs, Volume= 0.302 af
Outflow = 3.44 cfs @ 12.14 hrs, Volume= 0.302 af, Atten= 0%, Lag= 0.0 min
Primary = 3.44 cfs @ 12.14 hrs, Volume= 0.302 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 554.61' @ 0.00 hrs Surf.Area= 4 sf Storage= 0 cf
Flood Elev= 556.36' Surf.Area= 534 sf Storage= 342 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (799.6 - 799.6)

Volume	Invert	Avail.Storage	Storage Description
#1	554.61'	342 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
554.61	4	8.0	0	0	4
555.00	56	45.8	10	10	166
556.00	337	150.1	177	187	1,795
556.36	534	184.0	155	342	2,698

Device	Routing	Invert	Outlet Devices
#1	Primary	553.36'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 30.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 553.36' / 552.74' S= 0.0207 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=554.61' TW=553.20' (Dynamic Tailwater)
↑—**1=RCP_Elliptical 23x14** (Passes 0.00 cfs of 8.72 cfs potential flow)

Summary for Link 21L: Point A

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 3.82" for 10-Year event
Inflow = 3.74 cfs @ 17.53 hrs, Volume= 6.359 af
Primary = 3.74 cfs @ 17.53 hrs, Volume= 6.359 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Link 22L: Point B

Inflow Area = 49.942 ac, 3.73% Impervious, Inflow Depth > 2.64" for 10-Year event
Inflow = 69.25 cfs @ 12.61 hrs, Volume= 10.970 af
Primary = 69.25 cfs @ 12.61 hrs, Volume= 10.970 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Link 23L: Proposed DA at Point E

Inflow Area = 456.378 ac, 4.59% Impervious, Inflow Depth > 2.60" for 10-Year event
Inflow = 118.78 cfs @ 17.72 hrs, Volume= 98.928 af
Primary = 118.78 cfs @ 17.72 hrs, Volume= 98.928 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Main Site Runoff Area=16.555 ac 100.00% Impervious Runoff Depth=8.46"
Flow Length=1,775' Tc=7.4 min CN=98 Runoff=134.93 cfs 11.671 af

Subcatchment 5S: Exist DA at Point E Runoff Area=451.520 ac 0.20% Impervious Runoff Depth>5.90"
Flow Length=11,874' Tc=430.9 min CN=77 Runoff=312.72 cfs 222.095 af

Subcatchment 9S: Prop DA w/Det. Runoff Area=16,322,252 sf 0.00% Impervious Runoff Depth>5.90"
Flow Length=11,874' Tc=430.9 min CN=77 Runoff=259.52 cfs 184.312 af

Subcatchment 10S: Forebay Area Runoff Area=0.354 ac 24.29% Impervious Runoff Depth=6.77"
Tc=5.0 min CN=84 Runoff=2.81 cfs 0.200 af

Subcatchment 11S: WQ Area Runoff Area=1.129 ac 53.59% Impervious Runoff Depth=7.37"
Tc=5.0 min CN=89 Runoff=9.47 cfs 0.694 af

Subcatchment 12S: Subcat for Swell - 1 Runoff Area=0.933 ac 72.88% Impervious Runoff Depth=7.62"
Flow Length=993' Slope=0.1266 '/' Tc=6.0 min CN=91 Runoff=7.69 cfs 0.592 af

Subcatchment 13S: Pond Runoff Area=1.949 ac 64.70% Impervious Runoff Depth=7.74"
Tc=5.0 min CN=92 Runoff=16.77 cfs 1.257 af

Subcatchment 16S: DA to Entr. Culvert Runoff Area=140,442 sf 0.87% Impervious Runoff Depth=5.92"
Flow Length=1,034' Slope=0.0359 '/' Tc=18.9 min CN=77 Runoff=15.33 cfs 1.591 af

Subcatchment 18S: Subcat to Point B Runoff Area=1,632,095 sf 2.40% Impervious Runoff Depth=6.04"
Flow Length=3,073' Slope=0.0324 '/' Tc=46.1 min CN=78 Runoff=120.16 cfs 18.863 af

Subcatchment 19S: Subcat for Swell - 2 Runoff Area=0.272 ac 73.53% Impervious Runoff Depth=7.74"
Flow Length=313' Slope=0.1239 '/' Tc=2.3 min CN=92 Runoff=2.58 cfs 0.175 af

Subcatchment 21S: Wetlands Runoff Area=7.773 ac 0.00% Impervious Runoff Depth=5.92"
Flow Length=1,002' Slope=0.0286 '/' Tc=20.6 min CN=77 Runoff=35.64 cfs 3.835 af

Subcatchment 22S: Subcat for Swell - 3 Runoff Area=0.473 ac 72.94% Impervious Runoff Depth=7.74"
Flow Length=505' Slope=0.1265 '/' Tc=3.3 min CN=92 Runoff=4.33 cfs 0.305 af

Subcatchment 24S: DA for 25R Runoff Area=8.906 ac 0.00% Impervious Runoff Depth=5.92"
Flow Length=1,580' Slope=0.0192 '/' Tc=36.2 min CN=77 Runoff=31.78 cfs 4.394 af

Subcatchment 25S: Rerouted Area Runoff Area=2.241 ac 0.00% Impervious Runoff Depth=5.92"
Flow Length=797' Slope=0.0260 '/' Tc=18.0 min CN=77 Runoff=10.86 cfs 1.106 af

Subcatchment 26S: Subcat for Swell - 4 Runoff Area=0.394 ac 72.84% Impervious Runoff Depth=7.62"
Flow Length=293' Slope=0.1266 '/' Tc=2.3 min CN=91 Runoff=3.71 cfs 0.250 af

Reach 8R: Level Spreader Avg. Flow Depth=0.10' Max Vel=1.05 fps Inflow=8.22 cfs 10.874 af
n=0.030 L=48.0' S=0.0100 '/' Capacity=439.80 cfs Outflow=8.22 cfs 10.869 af

Reach 15R: Dry Swell - 1 Avg. Flow Depth=0.59' Max Vel=3.60 fps Inflow=7.69 cfs 0.592 af
n=0.030 L=992.7' S=0.0177 '/' Capacity=84.06 cfs Outflow=6.73 cfs 0.592 af

Reach 18R: Dry Swell - 2 Avg. Flow Depth=0.17' Max Vel=2.21 fps Inflow=2.58 cfs 0.175 af
n=0.030 L=259.1' S=0.0222 '/' Capacity=49.33 cfs Outflow=2.45 cfs 0.175 af

Reach 20R: Dry Swell - 3 Avg. Flow Depth=0.53' Max Vel=3.92 fps Inflow=6.77 cfs 0.480 af
n=0.030 L=448.4' S=0.0233 '/' Capacity=96.49 cfs Outflow=6.43 cfs 0.480 af

Reach 21R: Point C Avg. Flow Depth=0.46' Max Vel=3.99 fps Inflow=18.21 cfs 2.071 af
n=0.024 L=77.4' S=0.0136 '/' Capacity=240.09 cfs Outflow=18.20 cfs 2.071 af

Reach 23R: Rerouting Ditch Avg. Flow Depth=0.92' Max Vel=3.03 fps Inflow=10.86 cfs 1.106 af
n=0.025 L=405.0' S=0.0054 '/' Capacity=12.66 cfs Outflow=10.72 cfs 1.106 af

Reach 25R: (new Reach) Avg. Flow Depth=1.49' Max Vel=4.28 fps Inflow=31.78 cfs 4.394 af
n=0.025 L=262.2' S=0.0064 '/' Capacity=60.53 cfs Outflow=31.74 cfs 4.394 af

Reach 29R: Dry Swell - 4 Avg. Flow Depth=0.66' Max Vel=4.03 fps Inflow=8.92 cfs 0.842 af
n=0.030 L=292.6' S=0.0196 '/' Capacity=88.45 cfs Outflow=8.86 cfs 0.842 af

Pond 2P: Forebay Peak Elev=566.96' Storage=34,794 cf Inflow=137.55 cfs 11.871 af
Primary=6.06 cfs 6.042 af Secondary=103.08 cfs 2.940 af Tertiary=28.89 cfs 2.876 af Outflow=137.32 cfs 11.858 af

Pond 3P: WQ-1 Peak Elev=564.19' Storage=108,289 cf Inflow=117.11 cfs 9.675 af
Primary=56.93 cfs 9.329 af Secondary=26.48 cfs 0.266 af Outflow=81.45 cfs 9.595 af

Pond 4P: DP-1 Peak Elev=563.76' Storage=308,564 cf Inflow=115.86 cfs 13.728 af
Primary=8.22 cfs 10.877 af Secondary=0.00 cfs 0.000 af Outflow=8.22 cfs 10.877 af

Pond 13P: Det. Pond - 2 Peak Elev=539.97' Storage=12,243 cf Inflow=8.86 cfs 0.842 af
Outflow=6.71 cfs 0.814 af

Pond 15P: Culvert at Entr. Peak Elev=530.33' Storage=389 cf Inflow=18.21 cfs 2.071 af
Outflow=18.21 cfs 2.071 af

Pond 17P: Arch for stream Peak Elev=534.96' Storage=10,200 cf Inflow=159.54 cfs 25.176 af
144.0" x 49.0", R=77.5" Arch Culvert n=0.024 L=51.5' S=0.0299 '/' Outflow=158.43 cfs 25.176 af

Pond 18P: Level Spreader Peak Elev=558.28' Storage=7,647 cf Inflow=8.22 cfs 10.877 af
Outflow=8.22 cfs 10.874 af

Pond 23P: Peak Elev=531.99' Storage=769 cf Inflow=6.43 cfs 0.480 af
Primary=0.23 cfs 0.223 af Secondary=6.11 cfs 0.257 af Outflow=6.34 cfs 0.480 af

Pond 28P: Ramp Culvert Peak Elev=554.61' Storage=0 cf Inflow=6.73 cfs 0.592 af
23.0" x 14.0", R=22.0" Elliptical Culvert n=0.013 L=30.0' S=0.0207 '/' Outflow=6.73 cfs 0.592 af

Link 21L: Point A Inflow=8.22 cfs 10.869 af
Primary=8.22 cfs 10.869 af

Link 22L: Point B Inflow=158.43 cfs 25.176 af
Primary=158.43 cfs 25.176 af

Link 23L: Proposed DA at Point E Inflow=277.27 cfs 226.263 af
Primary=277.27 cfs 226.263 af

Total Runoff Area = 907.898 ac Runoff Volume = 451.339 af Average Runoff Depth = 5.97"
97.59% Pervious = 886.055 ac 2.41% Impervious = 21.843 ac

Summary for Subcatchment 1S: Main Site

Runoff = 134.93 cfs @ 12.10 hrs, Volume= 11.671 af, Depth= 8.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
16.555	98	Paved parking, HSG D
16.555		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	158	0.0100	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.5	135	0.0025	4.18	20.51	**Pipe Channel, 130-131** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
0.4	110	0.0025	4.72	33.35	**Pipe Channel, 131-132** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.3	79	0.0025	4.72	33.35	**Pipe Channel, 132-133** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.8	246	0.0025	5.23	50.30	**Pipe Channel, 133-134** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.4	133	0.0025	5.23	50.30	**Pipe Channel, 134-135** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.6	182	0.0025	5.23	50.30	**Pipe Channel, 135-136** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.7	256	0.0025	5.72	71.82	**Pipe Channel, 136-137** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.7	233	0.0025	5.72	71.82	**Pipe Channel, 137-138** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.4	130	0.0025	5.72	71.82	**Pipe Channel, 138-139** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.3	113	0.0025	5.72	71.82	**Pipe Channel, 139-Outlet** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
7.4	1,775	Total			

Summary for Subcatchment 5S: Exist DA at Point E

Runoff = 312.72 cfs @ 17.71 hrs, Volume= 222.095 af, Depth> 5.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
450.622	77	Woods, Good, HSG D
0.898	98	Paved parking, HSG D
451.520	77	Weighted Average
450.622		99.80% Pervious Area
0.898		0.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	80	0.0480	0.26		**Sheet Flow,** Range n= 0.130 P2= 3.30"
391.3	7,875	0.0180	0.34		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
34.5	3,919	0.0130	1.90	182.01	**Channel Flow,** Area= 96.0 sf Perim= 81.1' r= 1.18' n= 0.100 Very weedy reaches w/pools
430.9	11,874	Total			

Summary for Subcatchment 9S: Prop DA w/Det.

Runoff = 259.52 cfs @ 17.71 hrs, Volume= 184.312 af, Depth> 5.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
16,322,252	77	Woods, Good, HSG D
16,322,252		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	80	0.0480	0.26		**Sheet Flow,** Range n= 0.130 P2= 3.30"
391.3	7,875	0.0180	0.34		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
34.5	3,919	0.0130	1.90	182.01	**Channel Flow,** Area= 96.0 sf Perim= 81.1' r= 1.18' n= 0.100 Very weedy reaches w/pools
430.9	11,874	Total			

Summary for Subcatchment 10S: Forebay Area

Runoff = 2.81 cfs @ 12.07 hrs, Volume= 0.200 af, Depth= 6.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.268	80	>75% Grass cover, Good, HSG D
0.086	98	Water Surface, HSG D
0.354	84	Weighted Average
0.268		75.71% Pervious Area
0.086		24.29% Impervious Area

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

Summary for Subcatchment 11S: WQ Area

Runoff = 9.47 cfs @ 12.07 hrs, Volume= 0.694 af, Depth= 7.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.605	98	Water Surface, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
1.129	89	Weighted Average
0.524		46.41% Pervious Area
0.605		53.59% Impervious Area

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

Summary for Subcatchment 12S: Subcat for Swell - 1

Runoff = 7.69 cfs @ 12.08 hrs, Volume= 0.592 af, Depth= 7.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

	Area (ac)	CN	Description
	0.253	74	>75% Grass cover, Good, HSG C
*	0.680	98	Paved parking, HSG C
	0.933	91	Weighted Average
	0.253		27.12% Pervious Area
	0.680		72.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	993	0.1266	2.77		**Lag/CN Method,**

Summary for Subcatchment 13S: Pond

Runoff = 16.77 cfs @ 12.07 hrs, Volume= 1.257 af, Depth= 7.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
1.261	98	Water Surface, HSG C
0.624	80	>75% Grass cover, Good, HSG D
0.064	77	Woods, Good, HSG D
1.949	92	Weighted Average
0.688		35.30% Pervious Area
1.261		64.70% Impervious Area

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

Summary for Subcatchment 16S: DA to Entr. Culvert

Runoff = 15.33 cfs @ 12.25 hrs, Volume= 1.591 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
139,222	77	Woods, Good, HSG D
1,220	98	Paved parking, HSG D
140,442	77	Weighted Average
139,222		99.13% Pervious Area
1,220		0.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	1,034	0.0359	0.91		**Lag/CN Method,**

Summary for Subcatchment 18S: Subcat to Point B

Runoff = 120.16 cfs @ 12.64 hrs, Volume= 18.863 af, Depth= 6.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
1,592,978	77	Woods, Good, HSG D
39,117	98	Paved parking, HSG D
1,632,095	78	Weighted Average
1,592,978		97.60% Pervious Area
39,117		2.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.1	3,073	0.0324	1.11		**Lag/CN Method,**

Summary for Subcatchment 19S: Subcat for Swell - 2

Runoff = 2.58 cfs @ 12.03 hrs, Volume= 0.175 af, Depth= 7.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.200	98	Paved parking, HSG C
0.072	74	>75% Grass cover, Good, HSG C
0.272	92	Weighted Average
0.072		26.47% Pervious Area
0.200		73.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	313	0.1239	2.27		**Lag/CN Method,**

Summary for Subcatchment 21S: Wetlands

Runoff = 35.64 cfs @ 12.28 hrs, Volume= 3.835 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
7.773	77	Woods, Good, HSG D
7.773		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,002	0.0286	0.81		**Lag/CN Method,**

Summary for Subcatchment 22S: Subcat for Swell - 3

Runoff = 4.33 cfs @ 12.05 hrs, Volume= 0.305 af, Depth= 7.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

	Area (ac)	CN	Description
*	0.128	74	>75% Grass cover, Good, HSG C
*	0.345	98	Paved parking, HSG C
	0.473	92	Weighted Average
	0.128		27.06% Pervious Area
	0.345		72.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	505	0.1265	2.52		**Lag/CN Method,**

Summary for Subcatchment 24S: DA for 25R

Runoff = 31.78 cfs @ 12.51 hrs, Volume= 4.394 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
8.906	77	Woods, Good, HSG D
8.906		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.2	1,580	0.0192	0.73		**Lag/CN Method,**

Summary for Subcatchment 25S: Rerouted Area

Runoff = 10.86 cfs @ 12.24 hrs, Volume= 1.106 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
2.241	77	Woods, Good, HSG D
2.241		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	797	0.0260	0.74		**Lag/CN Method,**

Summary for Subcatchment 26S: Subcat for Swell - 4

Runoff = 3.71 cfs @ 12.03 hrs, Volume= 0.250 af, Depth= 7.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

	Area (ac)	CN	Description
*	0.287	98	Paved parking, HSG D
	0.107	74	>75% Grass cover, Good, HSG C
	0.394	91	Weighted Average
	0.107		27.16% Pervious Area
	0.287		72.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	293	0.1266	2.17		**Lag/CN Method,**

Summary for Reach 8R: Level Spreader

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 6.53" for 100-Year event
Inflow = 8.22 cfs @ 14.34 hrs, Volume= 10.874 af
Outflow = 8.22 cfs @ 14.35 hrs, Volume= 10.869 af, Atten= 0%, Lag= 0.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.05 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.73 fps, Avg. Travel Time= 1.1 min

Peak Storage= 377 cf @ 14.35 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 1.00' Flow Area= 105.0 sf, Capacity= 439.80 cfs

75.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 30.0 '/' Top Width= 135.00'
Length= 48.0' Slope= 0.0100 '/'
Inlet Invert= 558.00', Outlet Invert= 557.52'

‡

Summary for Reach 15R: Dry Swell - 1

Inflow Area = 0.933 ac, 72.88% Impervious, Inflow Depth = 7.62" for 100-Year event
Inflow = 7.69 cfs @ 12.08 hrs, Volume= 0.592 af
Outflow = 6.73 cfs @ 12.13 hrs, Volume= 0.592 af, Atten= 13%, Lag= 2.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.60 fps, Min. Travel Time= 4.6 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 16.1 min

Peak Storage= 1,855 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.59'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 84.06 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 992.7' Slope= 0.0177 '/'
Inlet Invert= 572.18', Outlet Invert= 554.62'

Summary for Reach 18R: Dry Swell - 2

Inflow Area = 0.272 ac, 73.53% Impervious, Inflow Depth = 7.74" for 100-Year event
Inflow = 2.58 cfs @ 12.03 hrs, Volume= 0.175 af
Outflow = 2.45 cfs @ 12.05 hrs, Volume= 0.175 af, Atten= 5%, Lag= 1.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.21 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 8.2 min

Peak Storage= 287 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 49.33 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 259.1' Slope= 0.0222 '/'
Inlet Invert= 547.00', Outlet Invert= 541.25'

‡

Summary for Reach 20R: Dry Swell - 3

Inflow Area = 0.745 ac, 73.15% Impervious, Inflow Depth = 7.74" for 100-Year event
Inflow = 6.77 cfs @ 12.05 hrs, Volume= 0.480 af
Outflow = 6.43 cfs @ 12.07 hrs, Volume= 0.480 af, Atten= 5%, Lag= 1.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.92 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 6.8 min

Peak Storage= 735 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 96.49 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 448.4' Slope= 0.0233 '/'
Inlet Invert= 541.25', Outlet Invert= 530.80'

Summary for Reach 21R: Point C

Inflow Area = 3.969 ac, 14.44% Impervious, Inflow Depth = 6.26" for 100-Year event
Inflow = 18.21 cfs @ 12.24 hrs, Volume= 2.071 af
Outflow = 18.20 cfs @ 12.24 hrs, Volume= 2.071 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.99 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 1.2 min

Peak Storage= 353 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 2.00' Flow Area= 26.0 sf, Capacity= 240.09 cfs

9.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 77.4' Slope= 0.0136 '/'
Inlet Invert= 526.65', Outlet Invert= 525.60'

‡

Summary for Reach 23R: Rerouting Ditch

Inflow Area = 2.241 ac, 0.00% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 10.86 cfs @ 12.24 hrs, Volume= 1.106 af
Outflow = 10.72 cfs @ 12.27 hrs, Volume= 1.106 af, Atten= 1%, Lag= 1.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.03 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.96 fps, Avg. Travel Time= 7.0 min

Peak Storage= 1,434 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.92'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 12.66 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 405.0' Slope= 0.0054 '/'
Inlet Invert= 536.00', Outlet Invert= 533.82'

Summary for Reach 25R: (new Reach)

Inflow Area = 8.906 ac, 0.00% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 31.78 cfs @ 12.51 hrs, Volume= 4.394 af
Outflow = 31.74 cfs @ 12.51 hrs, Volume= 4.394 af, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.28 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.67 fps, Avg. Travel Time= 2.6 min

Peak Storage= 1,945 cf @ 12.51 hrs
Average Depth at Peak Storage= 1.49'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 60.53 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 262.2' Slope= 0.0064 '/'
Inlet Invert= 540.67', Outlet Invert= 539.00'

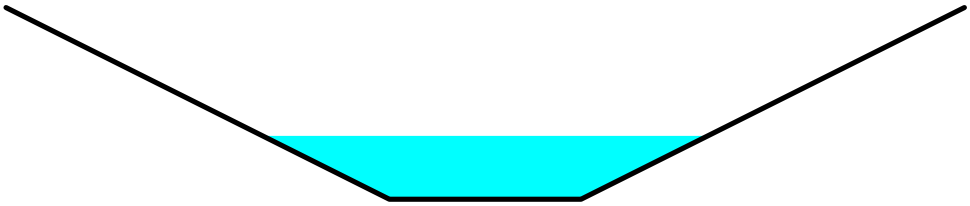
Summary for Reach 29R: Dry Swell - 4

Inflow Area = 1.327 ac, 72.87% Impervious, Inflow Depth = 7.62" for 100-Year event
Inflow = 8.92 cfs @ 12.09 hrs, Volume= 0.842 af
Outflow = 8.86 cfs @ 12.11 hrs, Volume= 0.842 af, Atten= 1%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.03 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.18 fps, Avg. Travel Time= 4.1 min

Peak Storage= 643 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 88.45 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 292.6' Slope= 0.0196 '/'
Inlet Invert= 552.74', Outlet Invert= 547.01'



Summary for Pond 2P: Forebay

Inflow Area = 16.909 ac, 98.42% Impervious, Inflow Depth = 8.42" for 100-Year event
Inflow = 137.55 cfs @ 12.10 hrs, Volume= 11.871 af
Outflow = 137.32 cfs @ 12.11 hrs, Volume= 11.858 af, Atten= 0%, Lag= 0.3 min
Primary = 6.06 cfs @ 11.65 hrs, Volume= 6.042 af
Secondary = 103.08 cfs @ 12.11 hrs, Volume= 2.940 af
Tertiary = 28.89 cfs @ 12.11 hrs, Volume= 2.876 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 3,802 sf Storage= 3,789 cf
Peak Elev= 566.96' @ 12.11 hrs Surf.Area= 6,692 sf Storage= 34,794 cf (31,006 cf above start)
Flood Elev= 568.00' Surf.Area= 7,249 sf Storage= 42,057 cf (38,268 cf above start)

Plug-Flow detention time= 49.3 min calculated for 11.771 af (99% of inflow)
Center-of-Mass det. time= 38.6 min (780.9 - 742.3)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	49,579 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	2,536	269.1	0.0	0	0	2,536
559.00	2,944	279.8	40.0	1,095	1,095	3,078
560.00	3,366	290.5	40.0	1,261	2,356	3,641
561.00	3,802	301.2	40.0	1,433	3,789	4,225
562.00	4,252	312.0	100.0	4,025	7,814	4,835
563.00	4,716	322.7	100.0	4,482	12,296	5,462
564.00	5,194	333.4	100.0	4,953	17,249	6,110
565.00	5,687	344.1	100.0	5,439	22,687	6,779
566.00	6,193	354.8	100.0	5,938	28,626	7,469
567.00	6,714	365.5	100.0	6,452	35,077	8,180
568.00	7,249	376.2	100.0	6,980	42,057	8,912
569.00	7,798	386.9	100.0	7,522	49,579	9,666

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Tertiary	558.00'	**36.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#3	Device 2	566.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	566.50'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=6.05 cfs @ 11.65 hrs HW=566.55' TW=562.44' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 6.05 cfs @ 7.71 fps)

Secondary OutFlow Max=102.89 cfs @ 12.11 hrs HW=566.96' TW=563.82' (Dynamic Tailwater)
└**4=Sharp-Crested Rectangular Weir** (Weir Controls 102.89 cfs @ 2.25 fps)

Tertiary OutFlow Max=28.86 cfs @ 12.11 hrs HW=566.96' TW=561.12' (Dynamic Tailwater)
└**2=Culvert** (Passes 28.86 cfs of 64.89 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 28.86 cfs @ 3.20 fps)

Summary for Pond 3P: WQ-1

Inflow Area = 18.038 ac, 95.61% Impervious, Inflow Depth > 6.44" for 100-Year event
Inflow = 117.11 cfs @ 12.10 hrs, Volume= 9.675 af
Outflow = 81.45 cfs @ 12.18 hrs, Volume= 9.595 af, Atten= 30%, Lag= 4.7 min
Primary = 56.93 cfs @ 12.14 hrs, Volume= 9.329 af
Secondary = 26.48 cfs @ 12.19 hrs, Volume= 0.266 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 23,969 sf Storage= 27,117 cf
Peak Elev= 564.19' @ 12.19 hrs Surf.Area= 27,000 sf Storage= 108,289 cf (81,172 cf above start)
Flood Elev= 568.00' Surf.Area= 30,816 sf Storage= 218,459 cf (191,342 cf above start)

Plug-Flow detention time= 232.9 min calculated for 8.972 af (93% of inflow)
Center-of-Mass det. time= 144.0 min (934.0 - 790.0)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	249,790 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	21,247	600.7	0.0	0	0	21,247
559.00	22,140	611.4	40.0	8,677	8,677	22,444
560.00	23,048	622.1	40.0	9,037	17,714	23,662
561.00	23,969	632.9	40.0	9,403	27,117	24,910
562.00	24,905	643.6	100.0	24,436	51,552	26,170
563.00	25,855	654.3	100.0	25,379	76,931	27,452
564.00	26,819	665.0	100.0	26,336	103,266	28,754
565.00	27,797	675.8	100.0	27,307	130,573	30,088
566.00	28,789	686.5	100.0	28,292	158,864	31,433
567.00	29,795	697.2	100.0	29,291	188,155	32,799
568.00	30,816	707.9	100.0	30,304	218,459	34,187
569.00	31,850	718.7	100.0	31,332	249,790	35,605

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**36.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	561.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 2	558.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	564.00'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=56.25 cfs @ 12.14 hrs HW=564.05' TW=561.32' (Dynamic Tailwater)
- **1=Culvert** (Inlet Controls 56.25 cfs @ 7.96 fps)
  - **2=Orifice/Grate** (Passes < 12.08 cfs potential flow)
    - **3=Orifice/Grate** (Passes < 6.25 cfs potential flow)
    - **5=Orifice/Grate** (Passes < 74.94 cfs potential flow)
  - **4=Orifice/Grate** (Passes < 74.94 cfs potential flow)

Secondary OutFlow Max=26.35 cfs @ 12.19 hrs HW=564.19' TW=561.68' (Dynamic Tailwater)
- **6=Sharp-Crested Rectangular Weir** (Weir Controls 26.35 cfs @ 1.42 fps)

Summary for Pond 4P: DP-1

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 8.24" for 100-Year event
Inflow = 115.86 cfs @ 12.17 hrs, Volume= 13.728 af
Outflow = 8.22 cfs @ 14.33 hrs, Volume= 10.877 af, Atten= 93%, Lag= 129.5 min
Primary = 8.22 cfs @ 14.33 hrs, Volume= 10.877 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 563.76' @ 14.33 hrs Surf.Area= 59,684 sf Storage= 308,564 cf
Flood Elev= 565.00' Surf.Area= 62,400 sf Storage= 384,495 cf

Plug-Flow detention time= 537.5 min calculated for 10.874 af (79% of inflow)
Center-of-Mass det. time= 398.2 min (1,278.0 - 879.9)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	651,999 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	47,688	883.6	0	0	47,688
559.00	49,705	899.0	48,693	48,693	50,047
560.00	51,750	914.4	50,724	99,417	52,448
561.00	53,824	929.8	52,784	152,201	54,888
562.00	55,926	945.2	54,872	207,072	57,370
563.00	58,056	960.6	56,988	264,060	59,893
564.00	60,214	976.1	59,132	323,192	62,470
565.00	62,400	991.5	61,304	384,495	65,075
566.00	64,615	1,006.9	63,504	448,000	67,720
567.00	66,858	1,022.3	65,733	513,733	70,405
568.00	69,129	1,037.7	67,990	581,723	73,132
569.00	71,429	1,053.2	70,276	651,999	75,915

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**48.0" Round Culvert** L= 663.9' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 551.36' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	558.00'	**9.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	562.50'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Secondary	568.00'	**45.0 deg x 100.0' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=8.22 cfs @ 14.33 hrs HW=563.76' TW=558.28' (Dynamic Tailwater)
└**1=Culvert** (Passes 8.22 cfs of 92.58 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 4.93 cfs @ 11.17 fps)
  └**3=Orifice/Grate** (Orifice Controls 3.29 cfs @ 4.19 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=558.00' (Free Discharge)
└**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 13P: Det. Pond - 2

Inflow Area = 1.327 ac, 72.87% Impervious, Inflow Depth = 7.62" for 100-Year event
Inflow = 8.86 cfs @ 12.11 hrs, Volume= 0.842 af
Outflow = 6.71 cfs @ 12.23 hrs, Volume= 0.814 af, Atten= 24%, Lag= 7.2 min
Primary = 6.71 cfs @ 12.23 hrs, Volume= 0.814 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 539.97' @ 12.23 hrs Surf.Area= 7,445 sf Storage= 12,243 cf
Flood Elev= 541.00' Surf.Area= 8,791 sf Storage= 20,626 cf

Plug-Flow detention time= 219.0 min calculated for 0.814 af (97% of inflow)
Center-of-Mass det. time= 198.1 min (976.8 - 778.7)

Volume	Invert	Avail.Storage	Storage Description
#1	538.00'	20,626 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
538.00	5,054	387.0	0	0	5,054
539.00	6,243	405.8	5,638	5,638	6,305
540.00	7,489	424.7	6,857	12,495	7,621
541.00	8,791	423.9	8,131	20,626	8,049

Device	Routing	Invert	Outlet Devices
#1	Primary	538.00'	**15.0" Round Culvert** L= 94.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.00' / 537.00' S= 0.0106 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	538.00'	**2.4" Vert. Orifice/Grate** C= 0.600
#3	Device 1	538.90'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	539.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=6.71 cfs @ 12.23 hrs HW=539.97' TW=534.05' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 6.71 cfs @ 5.47 fps)
  ├─**2=Orifice/Grate** (Passes < 0.21 cfs potential flow)
  ├─**3=Orifice/Grate** (Passes < 0.40 cfs potential flow)
  └─**4=Orifice/Grate** (Passes < 6.54 cfs potential flow)

Summary for Pond 15P: Culvert at Entr.

Inflow Area = 3.969 ac, 14.44% Impervious, Inflow Depth = 6.26" for 100-Year event
Inflow = 18.21 cfs @ 12.24 hrs, Volume= 2.071 af
Outflow = 18.21 cfs @ 12.24 hrs, Volume= 2.071 af, Atten= 0%, Lag= 0.0 min
Primary = 18.21 cfs @ 12.24 hrs, Volume= 2.071 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 530.33' @ 12.24 hrs Surf.Area= 350 sf Storage= 389 cf

Plug-Flow detention time= 0.4 min calculated for 2.071 af (100% of inflow)

Center-of-Mass det. time= 0.4 min (810.4 - 809.9)

Volume	Invert	Avail.Storage	Storage Description
#1	527.17'	1,407 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
527.17	6	14.0	0	0	6
528.00	44	35.0	18	18	90
529.00	121	58.1	79	98	268
530.00	266	92.9	189	286	693
531.00	555	117.6	402	688	1,120
532.00	897	157.4	719	1,407	2,001

Device	Routing	Invert	Outlet Devices
#1	Primary	527.17'	**18.0" Round Culvert X 2.00** L= 52.8' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 527.17' / 526.65' S= 0.0098 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	527.17'	**18.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	530.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=18.20 cfs @ 12.24 hrs HW=530.33' TW=527.11' (Dynamic Tailwater)
↑**1=Culvert** (Passes 18.20 cfs of 28.47 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 3.15 cfs @ 8.39 fps)
3=Orifice/Grate (Weir Controls 15.06 cfs @ 1.89 fps)

Summary for Pond 17P: Arch for stream

Inflow Area = 49.942 ac, 3.73% Impervious, Inflow Depth > 6.05" for 100-Year event
Inflow = 159.54 cfs @ 12.55 hrs, Volume= 25.176 af
Outflow = 158.43 cfs @ 12.61 hrs, Volume= 25.176 af, Atten= 1%, Lag= 3.3 min
Primary = 158.43 cfs @ 12.61 hrs, Volume= 25.176 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 534.96' @ 12.61 hrs Surf.Area= 11,441 sf Storage= 10,200 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.4 min (844.4 - 844.0)

Volume	Invert	Avail.Storage	Storage Description
#1	533.00'	25,714 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
533.00	412	159.8	0	0	412
534.00	5,210	513.7	2,362	2,362	19,382
535.00	11,714	795.5	8,245	10,608	48,748
536.00	18,774	996.6	15,106	25,714	77,441

Device	Routing	Invert	Outlet Devices
#1	Primary	532.20'	**144.0" W x 49.0" H, R=77.5" Arch Culvert** L= 51.5' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 532.20' / 530.66' S= 0.0299 '/' Cc= 0.900 n= 0.024, Flow Area= 35.55 sf

Primary OutFlow Max=158.43 cfs @ 12.61 hrs HW=534.96' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 158.43 cfs @ 5.56 fps)

Summary for Pond 18P: Level Spreader

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 6.53" for 100-Year event
Inflow = 8.22 cfs @ 14.33 hrs, Volume= 10.877 af
Outflow = 8.22 cfs @ 14.34 hrs, Volume= 10.874 af, Atten= 0%, Lag= 0.4 min
Primary = 8.22 cfs @ 14.34 hrs, Volume= 10.874 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Starting Elev= 558.00' Surf.Area= 2,625 sf Storage= 7,350 cf
Peak Elev= 558.28' @ 14.34 hrs Surf.Area= 2,625 sf Storage= 7,647 cf (297 cf above start)

Plug-Flow detention time= 26.9 min calculated for 10.702 af (98% of inflow)
Center-of-Mass det. time= 0.4 min (1,278.5 - 1,278.0)

Volume	Invert	Avail.Storage	Storage Description
#1	551.00'	8,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 21,000 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
551.00	2,625	0	0
556.00	2,625	13,125	13,125
557.00	2,625	2,625	15,750
558.00	2,625	2,625	18,375
559.00	2,625	2,625	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**75.0" x 35.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.22 cfs @ 14.34 hrs HW=558.28' TW=558.10' (Dynamic Tailwater)
↑**1=Orifice/Grate** (Weir Controls 8.22 cfs @ 1.59 fps)

Summary for Pond 23P:

Inflow Area = 0.745 ac, 73.15% Impervious, Inflow Depth = 7.74" for 100-Year event
Inflow = 6.43 cfs @ 12.07 hrs, Volume= 0.480 af
Outflow = 6.34 cfs @ 12.08 hrs, Volume= 0.480 af, Atten= 1%, Lag= 0.7 min
Primary = 0.23 cfs @ 12.06 hrs, Volume= 0.223 af
Secondary = 6.11 cfs @ 12.08 hrs, Volume= 0.257 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Peak Elev= 531.99' @ 12.08 hrs Surf.Area= 1,032 sf Storage= 769 cf

Plug-Flow detention time= 11.4 min calculated for 0.480 af (100% of inflow)
Center-of-Mass det. time= 11.4 min (781.8 - 770.4)

Volume	Invert	Avail.Storage	Storage Description
#1	530.19'	782 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
530.19	56	110.4	0	0	56
531.00	317	180.9	137	137	1,695
532.00	1,044	364.9	645	782	9,691

Device	Routing	Invert	Outlet Devices
#1	Primary	530.19'	**3.0" Round Culvert** L= 17.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 530.19' / 530.00' S= 0.0110 '/' Cc= 0.900 n= 0.013, Flow Area= 0.05 sf
#2	Secondary	531.60'	**30.0 deg x 7.7' long x 0.40' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.23 cfs @ 12.06 hrs HW=531.98' TW=530.27' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.23 cfs @ 4.71 fps)

Secondary OutFlow Max=6.10 cfs @ 12.08 hrs HW=531.99' TW=530.29' (Dynamic Tailwater)
↑—**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 6.10 cfs @ 2.02 fps)

Summary for Pond 28P: Ramp Culvert

Inflow Area = 0.933 ac, 72.88% Impervious, Inflow Depth = 7.62" for 100-Year event
Inflow = 6.73 cfs @ 12.13 hrs, Volume= 0.592 af
Outflow = 6.73 cfs @ 12.13 hrs, Volume= 0.592 af, Atten= 0%, Lag= 0.0 min
Primary = 6.73 cfs @ 12.13 hrs, Volume= 0.592 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 554.61' @ 12.13 hrs Surf.Area= 4 sf Storage= 0 cf
Flood Elev= 556.36' Surf.Area= 534 sf Storage= 342 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (780.2 - 780.2)

Volume	Invert	Avail.Storage	Storage Description
#1	554.61'	342 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
554.61	4	8.0	0	0	4
555.00	56	45.8	10	10	166
556.00	337	150.1	177	187	1,795
556.36	534	184.0	155	342	2,698

Device	Routing	Invert	Outlet Devices
#1	Primary	553.36'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 30.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 553.36' / 552.74' S= 0.0207 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=8.72 cfs @ 12.13 hrs HW=554.61' TW=553.40' (Dynamic Tailwater)
↑—**1=RCP_Elliptical 23x14** (Inlet Controls 8.72 cfs @ 4.77 fps)

Summary for Link 21L: Point A

Inflow Area = 19.987 ac, 92.60% Impervious, Inflow Depth > 6.53" for 100-Year event
Inflow = 8.22 cfs @ 14.35 hrs, Volume= 10.869 af
Primary = 8.22 cfs @ 14.35 hrs, Volume= 10.869 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Link 22L: Point B

Inflow Area = 49.942 ac, 3.73% Impervious, Inflow Depth > 6.05" for 100-Year event
Inflow = 158.43 cfs @ 12.61 hrs, Volume= 25.176 af
Primary = 158.43 cfs @ 12.61 hrs, Volume= 25.176 af, Atten= 0%, Lag= 0.0 min

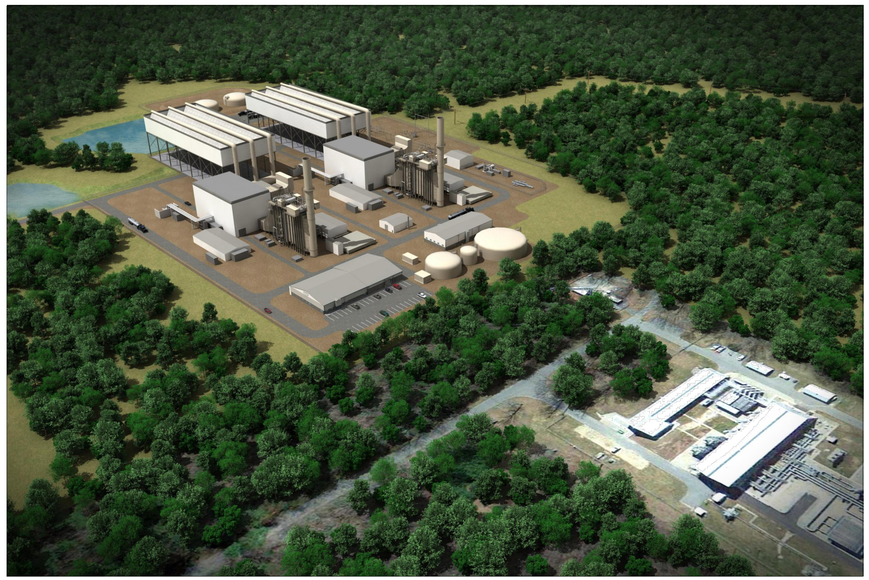
Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Link 23L: Proposed DA at Point E

Inflow Area = 456.378 ac, 4.59% Impervious, Inflow Depth > 5.95" for 100-Year event
Inflow = 277.27 cfs @ 17.71 hrs, Volume= 226.263 af
Primary = 277.27 cfs @ 17.71 hrs, Volume= 226.263 af, Atten= 0%, Lag= 0.0 min

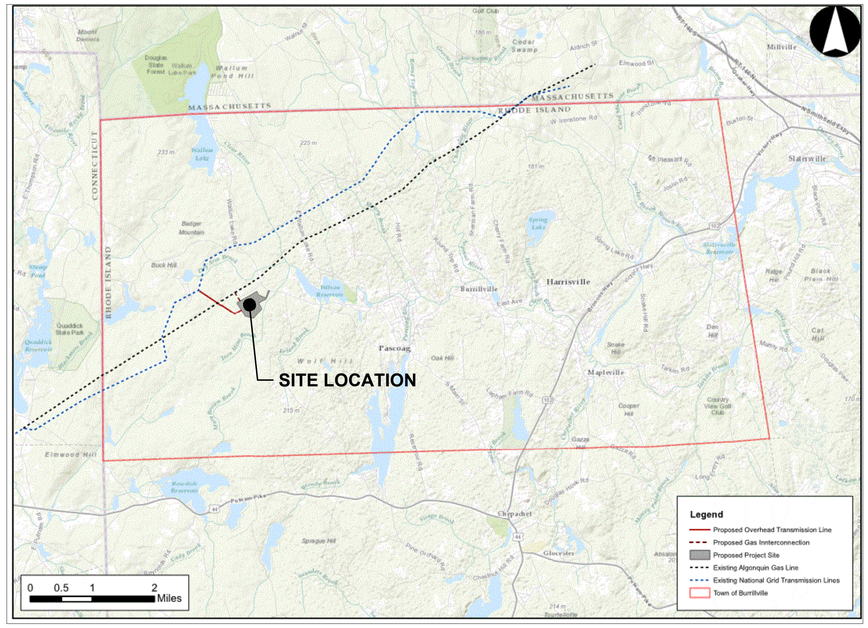
Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

5.2 Appendix B – Plan Drawings



Drawing Package For

Stormwater Management



Clear River Energy LLC

Project No.
000000000238926

Burrillville, Rhode Island
September, 2016

INDEX OF DRAWINGS

CIVIL MAPPING SYMBOLOGY

Symbol	Description
IP6	SILT FENCE INLET PROTECTION
	DIRECTION OF OVERLAND FLOW DURING & AFTER MASS GRADING
X.XX	DIRECTION OF OVERLAND FLOW W/ GRADE
SB SB	SEDIMENT BASIN
CE	TEMPORARY STONE CONSTRUCTION EXIT
DB	TEMPORARY DIVERSION DITCH/BERM
OP1	OUTLET PROTECTION RIP-RAP PAD (FOR SIZE SEE DETAIL)
(11R)	HYDROCAD REFERENCE NODE FOR CALCS
	WETLAND
	SPECIAL AQUATIC SITE
	PROPOSED STORM STRUCTURE
D	EXISTING POINT OF DISCHARGE
D	PROPOSED POINT OF DISCHARGE
	LIMITS OF DRAINAGE SUB-BASIN
	EXISTING LIGHT POLE
S	EXISTING SIGN

UTILITY/CIVIL LINE SYMBOLOGY

Symbol	Description
	PROPERTY LINE SETBACK
	PROPERTY LINE
500	EXISTING CONTOUR ELEVATIONS
500	PROPOSED CONTOUR ELEVATIONS
LOD	LIMITS OF DISTURBANCE (SILT FENCE INSTALLATION, SEE NOTE ABOVE)
SF	PROPOSED SILT FENCE
	PROPOSED STORM DRAIN
	WETLAND
	WETLAND BUFFER
	EXISTING STREAM
	EXISTING STREAM BANK
	100' STREAM BUFFER
	200' STREAM BUFFER
	RIGHT OF WAY
	DRAINAGE AREAS
>	DRAINAGE PATHS
	TREELINE
G	EXISTING GAS LINE

GENERAL NOTES:

1. THIS IS A STANDARD CIVIL SYMBOLOGY SHEET. ALL SYMBOLS ARE NOT NECESSARILY USED ON THIS PROJECT.

2. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE-EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH SHEET FOR USAGE.

C:\pwworking\oma\d2215977\01C001.dwg{PLOT} LS:(9/12/2016 - rbender) - LP: 9/12/2016 2:13 PM

HDR

PROJECT MANAGER	C. JACOBS
PROJECT NUMBER	000000000238926

ISSUE | DATE | DESCRIPTION

CLEAR RIVER ENERGY CENTER
TOWN OF BURRILLVILLE,
PROVIDENCE COUNTY, RHODE ISLAND

LEGEND

SCALE IN FEET 0 1 2

FILENAME 01C001.dwg
SCALE AS SHOWN

SHEET 01C001

Groundwater Measurements			
Boring	Date	Depth to Groundwater (ft)	Elevation (ft)
BH-07(OW)	10/30/2015	11.0	563
BH-07(OW)	11/4/2015	13.3	561
BH-13(OW)	10/29/2015	9.2	567
BH-13(OW)	11/4/2015	8.9	567

HDR

PROJECT MANAGER C. JACOBS

ISSUE DATE DESCRIPTION

PROJECT NUMBER 000000000238926

CLEAR RIVER ENERGY CENTER
TOWN OF BURRILLVILLE,
PROVIDENCE COUNTY, RHODE ISLAND

EXISTING DRAINAGE CONDITIONS

SCALE IN FEET 0 100 200

FILENAME 01C100.dwg

SCALE AS SHOWN

SHEET 01C100

PROJECT MANAGER C. JACOBS

ISSUE	DATE	DESCRIPTION

PROJECT NUMBER 000000000238926

CLEAR RIVER ENERGY CENTER
TOWN OF BURRILLVILLE,
PROVIDENCE COUNTY, RHODE ISLAND

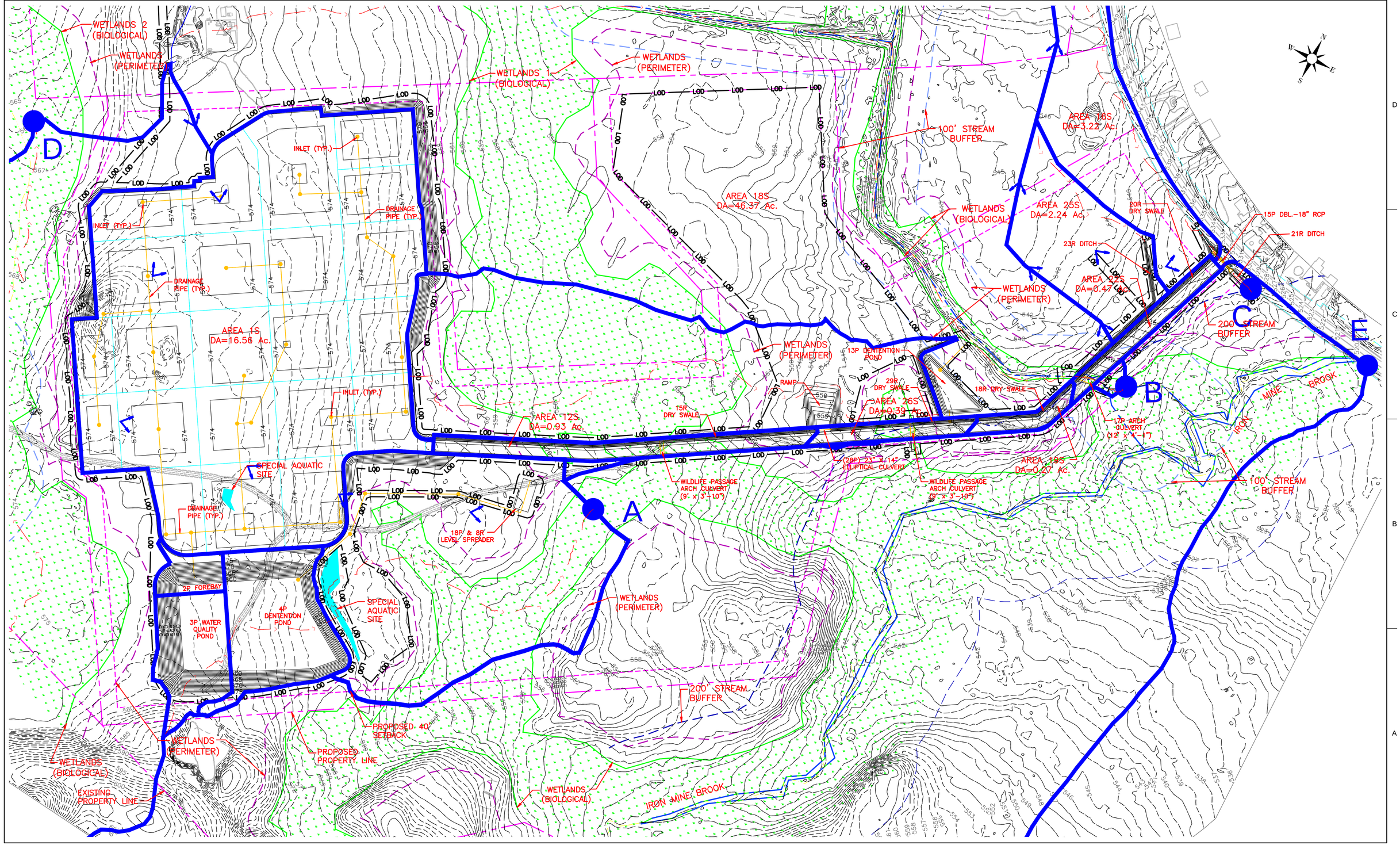
PROPOSED SITE LAYOUT PLAN

SCALE IN FEET 0 100 200

FILENAME 01C200.dwg

SCALE AS SHOWN

SHEET 01C200



C:\Jarworking\cmd\d2215371\01C300.dwg[EXHIBIT 2] 1:5(9/10/2016 - rkenday) - LN: 9/12/2016 3:43 PM

ISSUE	DATE	DESCRIPTION	PROJECT MANAGER	C. JACOBS
			PROJECT NUMBER	000000000238926

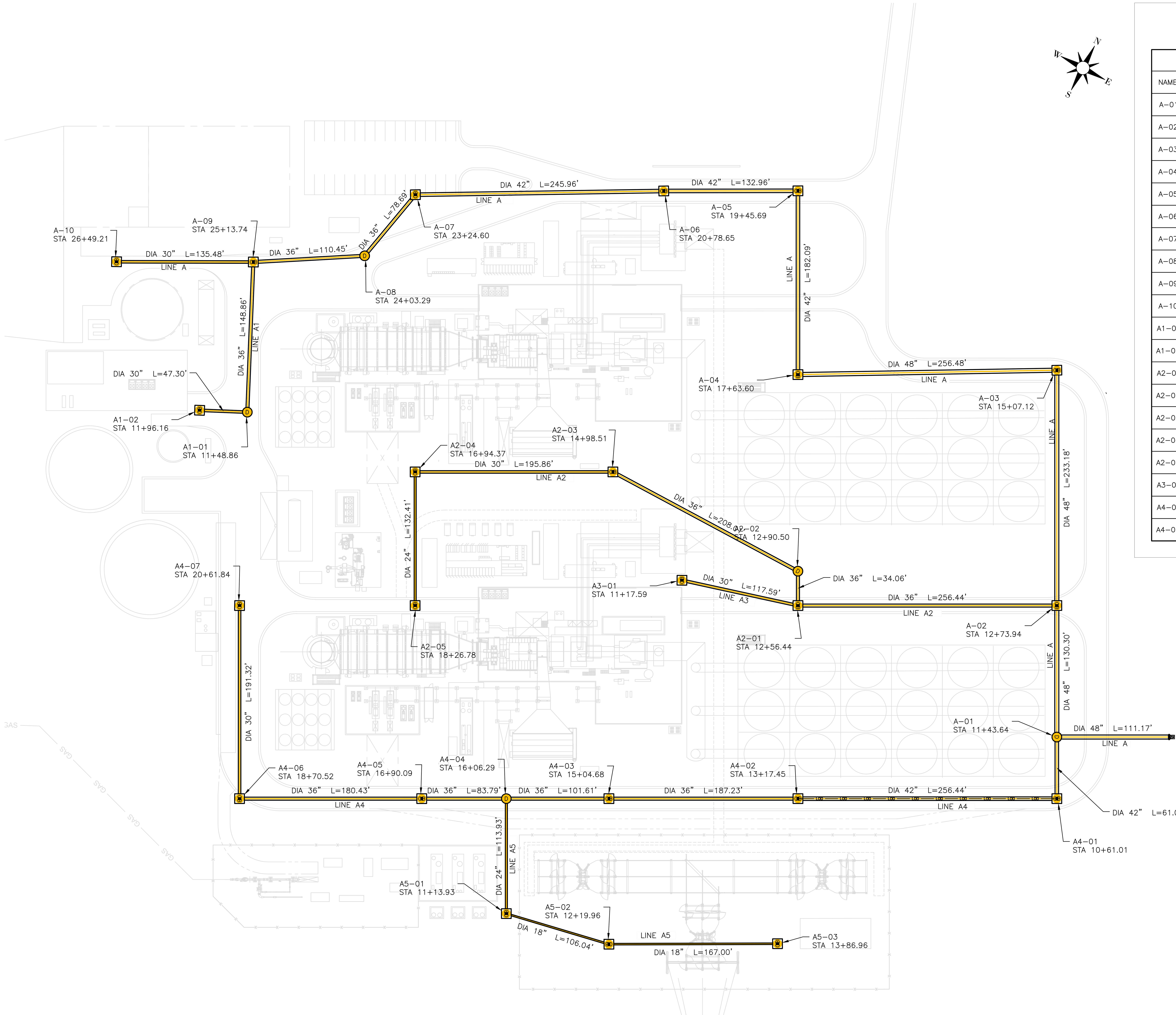
CLEAR RIVER ENERGY CENTER
TOWN OF BURRILLVILLE,
PROVIDENCE COUNTY, RHODE ISLAND

PROPOSED GRADING, DRAINAGE AND WATER QUALITY PLAN

SCALE IN FEET
0 100 200

FILENAME	01C300.dwg
SCALE	AS SHOWN

SHEET
01C300



STRUCTURE TABLE				
NAME	TYPE	LAYOUT COORDINATES	LID	SUMP ELEVATION
A-01	MANHOLE	N:320837.98 E:259130.75	573.78	563.12
A-02	DROP BOX INLET	N:320907.01 E:259241.27	572.62	563.43
A-03	DROP BOX INLET	N:321030.54 E:259439.04	572.38	564.02
A-04	DROP BOX INLET	N:321245.76 E:259299.53	572.69	564.66
A-05	DROP BOX INLET	N:321342.22 E:259453.97	572.94	565.11
A-06	DROP BOX INLET	N:321454.91 E:259383.40	572.57	565.43
A-07	DROP BOX INLET	N:321661.52 E:259249.96	573.02	566.05
A-08	MANHOLE	N:321672.10 E:259171.98	573.84	566.25
A-09	DROP BOX INLET	N:321762.35 E:259108.33	572.90	566.52
A-10	DROP BOX INLET	N:321877.40 E:259036.78	572.90	566.86
A1-01	MANHOLE	N:321688.60 E:258979.02	573.36	566.89
A1-02	DROP BOX INLET	N:321729.69 E:258955.59	572.77	567.01
A2-01	DROP BOX INLET	N:321124.51 E:259105.41	573.16	564.09
A2-02	MANHOLE	N:321142.55 E:259134.30	573.59	564.18
A2-03	DROP BOX INLET	N:321350.11 E:259120.61	572.95	564.70
A2-04	DROP BOX INLET	N:321516.23 E:259016.85	572.95	565.19
A2-05	DROP BOX INLET	N:321446.08 E:258904.55	573.17	565.52
A3-01	DROP BOX INLET	N:321235.22 E:259065.79	573.16	564.38
A4-01	DROP BOX INLET	N:320805.65 E:259079.00	572.62	563.27
A4-02	DROP BOX INLET	N:321023.15 E:258943.15	573.16	563.91

STRUCTURE TABLE				
NAME	TYPE	LAYOUT COORDINATES	LID	SUMP ELEVAT
A4-03	DROP BOX INLET	N:321181.95 E:258843.96	573.16	564.38
A4-04	MANHOLE	N:321268.12 E:258790.13	574.34	564.63
A4-05	DROP BOX INLET	N:321339.19 E:258745.74	572.89	564.84
A4-06	DROP BOX INLET	N:321492.23 E:258650.15	572.92	565.29
A4-07	DROP BOX INLET	N:321593.58 E:258812.41	572.75	565.77
A5-01	DROP BOX INLET	N:321207.77 E:258693.50	574.34	564.91
A5-02	DROP BOX INLET	N:321105.53 E:258721.62	573.45	565.18
A5-03	DROP BOX INLET	N:320964.15 E:258810.50	573.26	565.60

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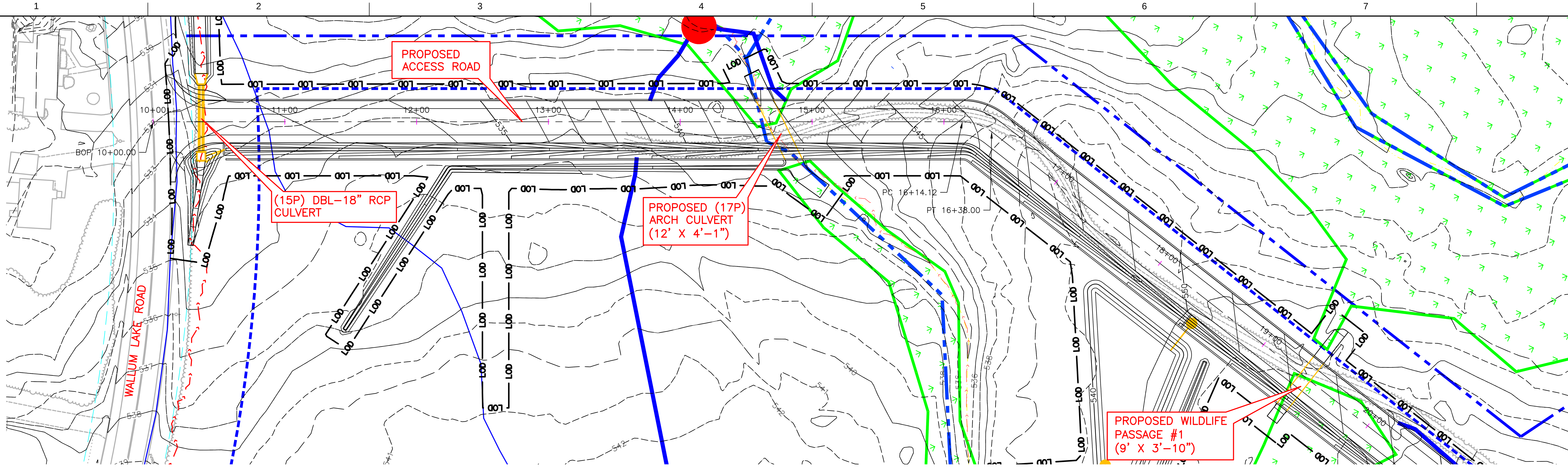
PROVIDENCE COUNTY, RHODE ISLAND

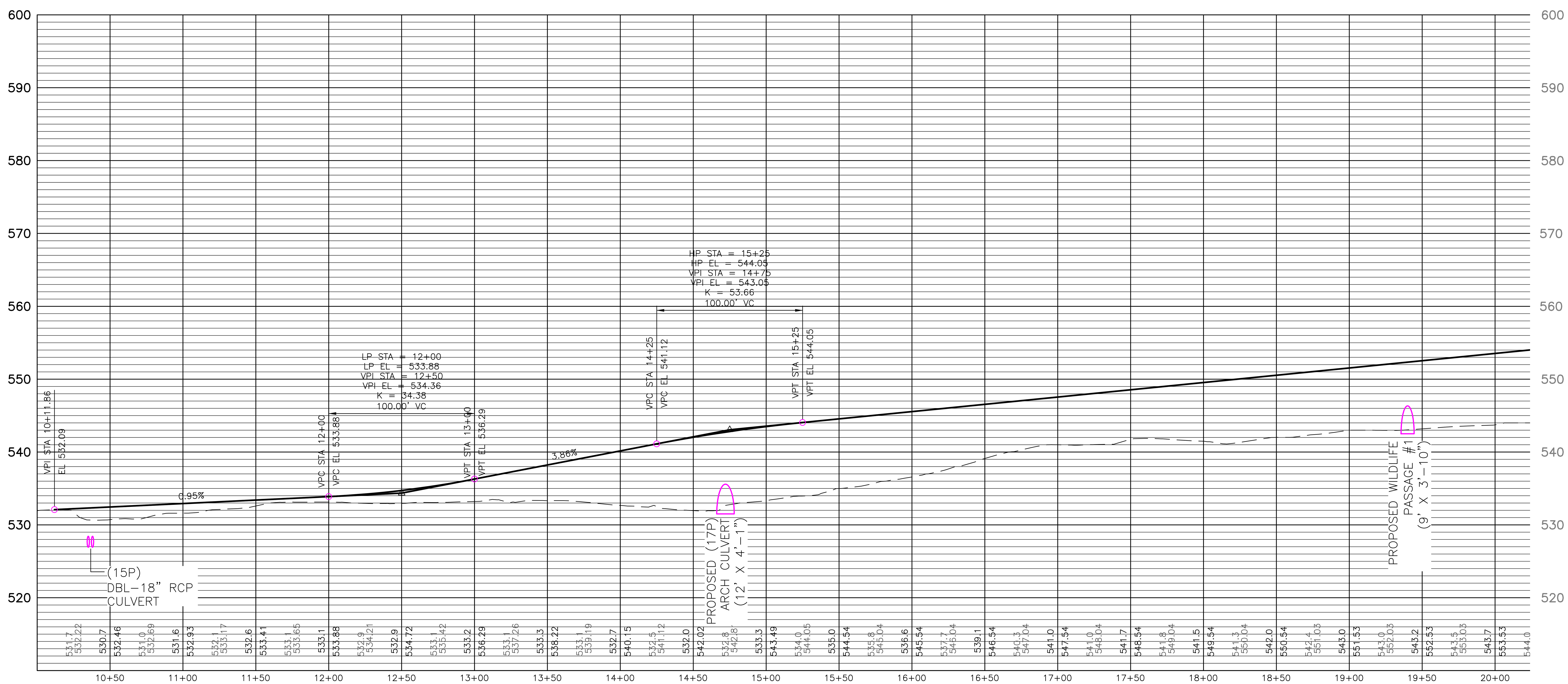
PROPOSED DRAINAGE PLAN

SCALE IN FEET 0 50 100

FILENAME 01C400.dwg
SCALE AS SHOWN

SHEET 01C400





HDR

PROJECT MANAGER C. JACOBS

ISSUE DATE DESCRIPTION

PROJECT NUMBER 000000000238926

CLEAR RIVER ENERGY CENTER
TOWN OF BURRILLVILLE,
PROVIDENCE COUNTY, RHODE ISLAND

SCALE IN FEET
0 40 80

ROADWAY PLAN & PROFILE

FILENAME 01C600.dwg

SCALE AS SHOWN

SHEET 01C600

PROJECT MANAGER C. JACOBS

ISSUE DATE DESCRIPTION

PROJECT NUMBER 000000000238926

CLEAR RIVER ENERGY CENTER
TOWN OF BURRILLVILLE,
PROVIDENCE COUNTY, RHODE ISLAND

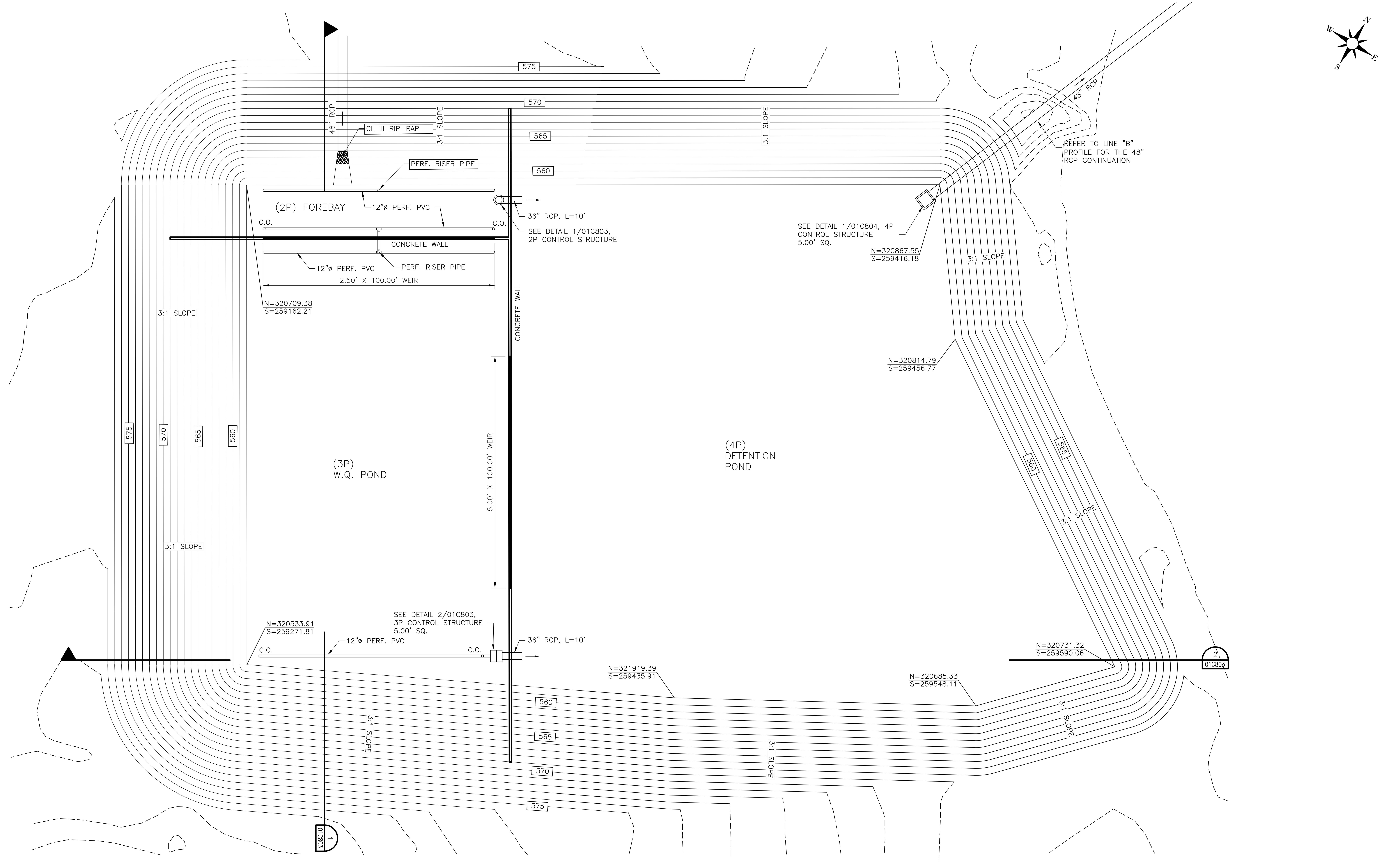
ROADWAY PLAN & PROFILE

SCALE IN FEET 0 40 80

FILENAME 01C601.dwg

SCALE AS SHOWN

SHEET 01C601



BASIN A DETAIL (2P)(3P)(4P)

SCALE: 1"=20'

1 / 01C800

PROJECT MANAGER C. JACOBS

ISSUE	DATE	DESCRIPTION

PROJECT NUMBER 000000000238926

CLEAR RIVER ENERGY CENTER
TOWN OF BURRILLVILLE,
PROVIDENCE COUNTY, RHODE ISLAND

PROPOSED SITE DRAINAGE DETAILS

SCALE IN FEET 0 20 40

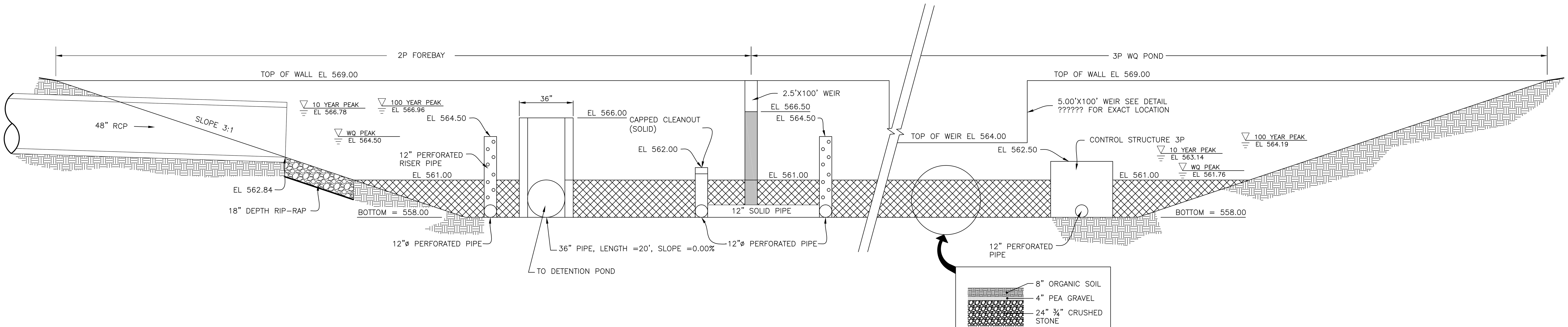
FILENAME 01C800.dwg

SCALE AS SHOWN

SHEET 01C800

1 2 3 4 5 6 7 8

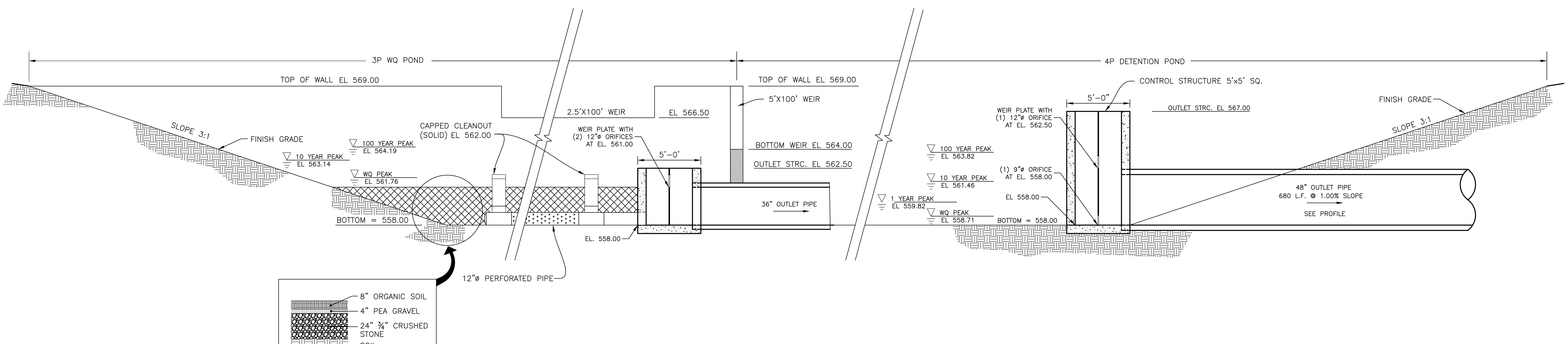
D C B A



SECTION A–A DETAIL

SCALE: 1/4"=1'-0"

1 / 01C801



SECTION B–B DETAIL

SCALE: 1/4"=1'-0"

2 / 01C801

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HDR

ISSUE	DATE	DESCRIPTION

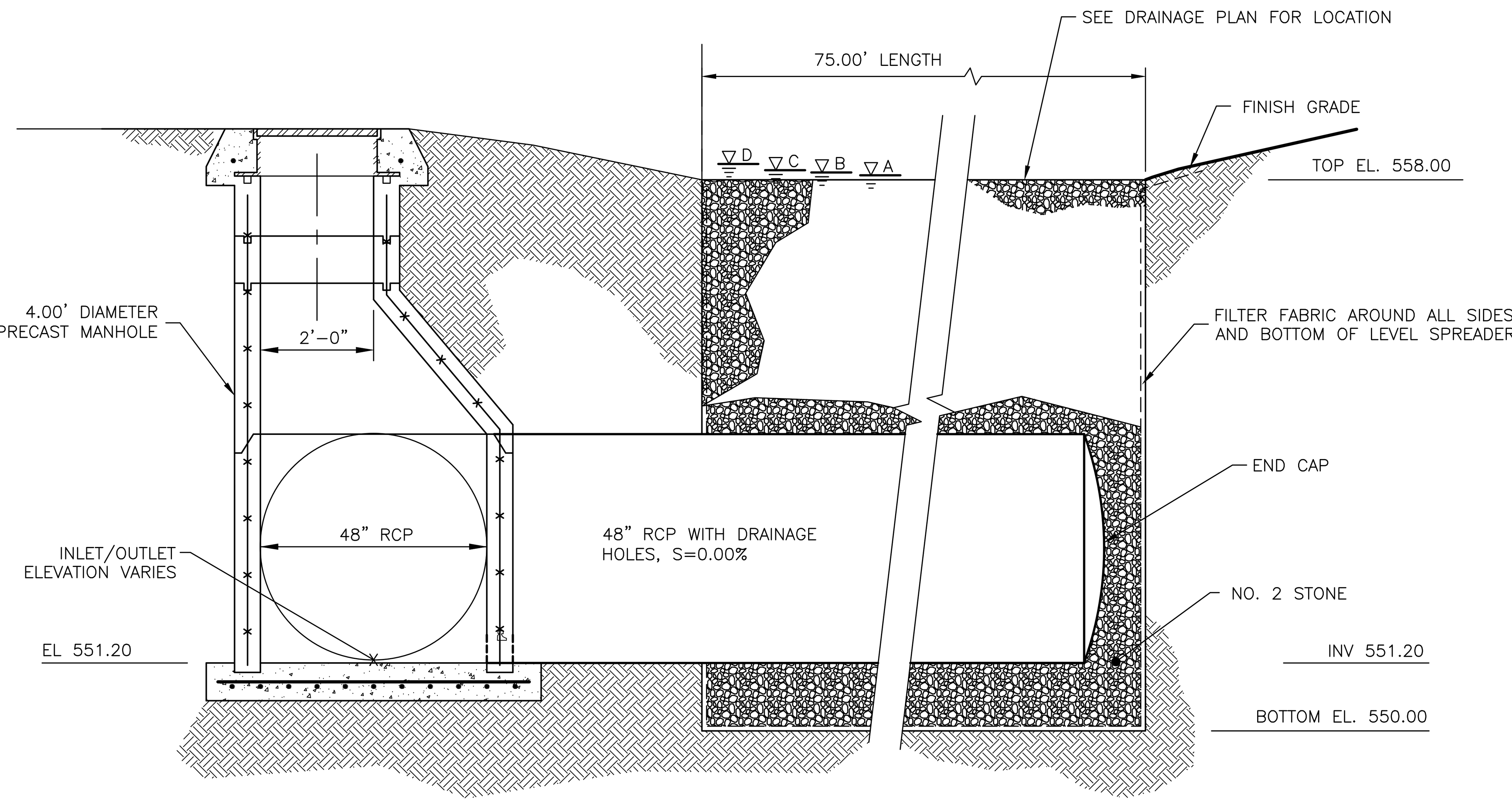
PROJECT MANAGER	C. JACOBS
PROJECT NUMBER	000000000238926

CLEAR RIVER ENERGY CENTER
TOWN OF BURRILLVILLE,
PROVIDENCE COUNTY, RHODE ISLAND

SCALE IN FEET 0 1 2

PROPOSED SITE DRAINAGE DETAILS

FILENAME	01C801.dwg
SCALE	AS SHOWN
SHEET	01C801



WATER DEPTH SCHEDULE		
	STORM EVENT	ELEVATION
A	WQ PEAK	558.08
B	1 YR PEAK	558.13
C	10 YR PEAK	558.17
D	100 YR PEAK	558.28

NOTE:

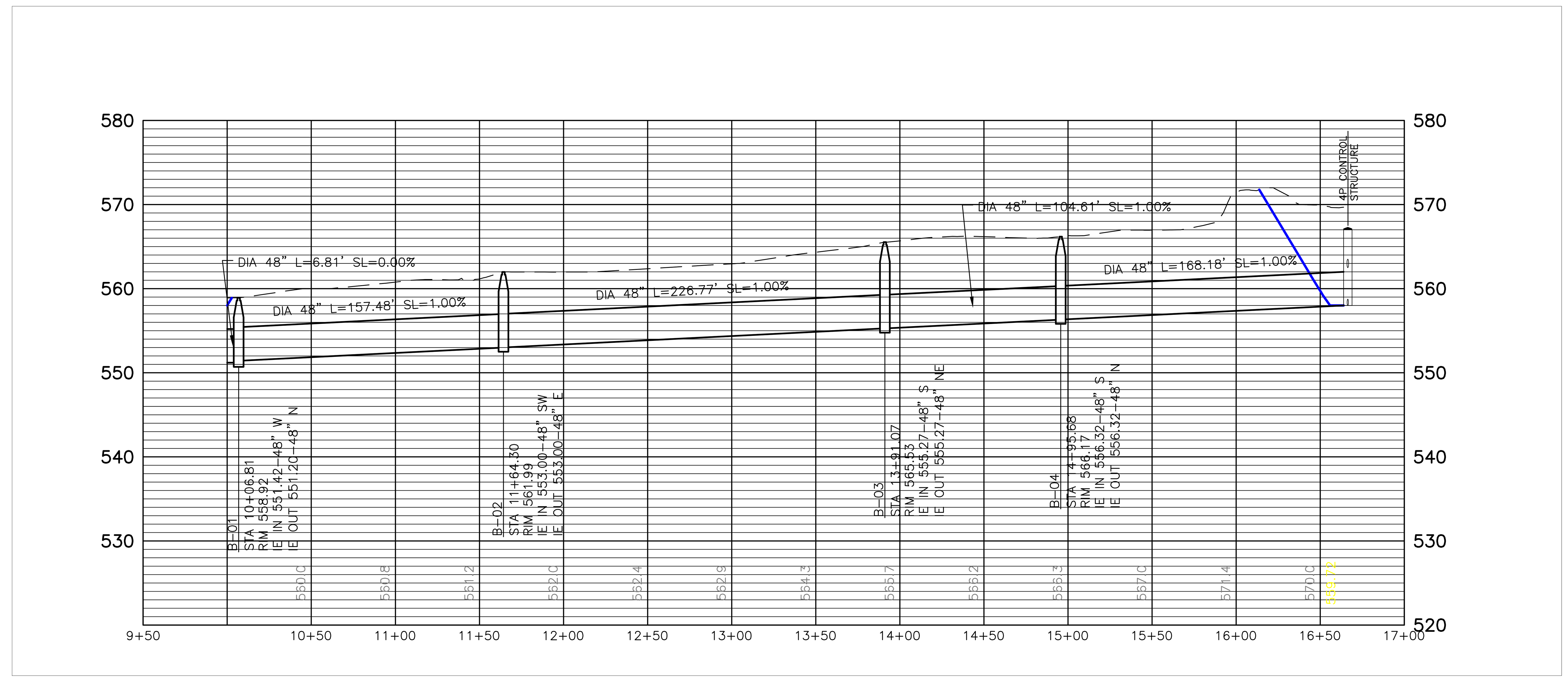
1) 48" I.D. PERFORATED UNDERDRAIN WITH FILTER SOCK. LAY PIPE WITH PERFORATIONS ON BOTTOM OF PIPE AND CAP END OF PIPE. LAY UNDERDRAIN AT 0.00% SLOPE FROM MANHOLE INVERT AND THRU BOTTOM OF LEVEL SPREADER.

2) WATER DEPTH MEASURED FROM TOP OF LEVEL SPREADER = EL 558.00.

LEVEL SPREADER DETAIL (18P)

SCALE: 1/2"=1'-0"

1
01C802



PROFILE OF LINE B

SCALE: HOR- 1"=50' VER- 1" = 5'

2
01C802

HDR

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER C. JACOBS

PROJECT NUMBER 000000000238926

CLEAR RIVER ENERGY CENTER
TOWN OF BURRILLVILLE,
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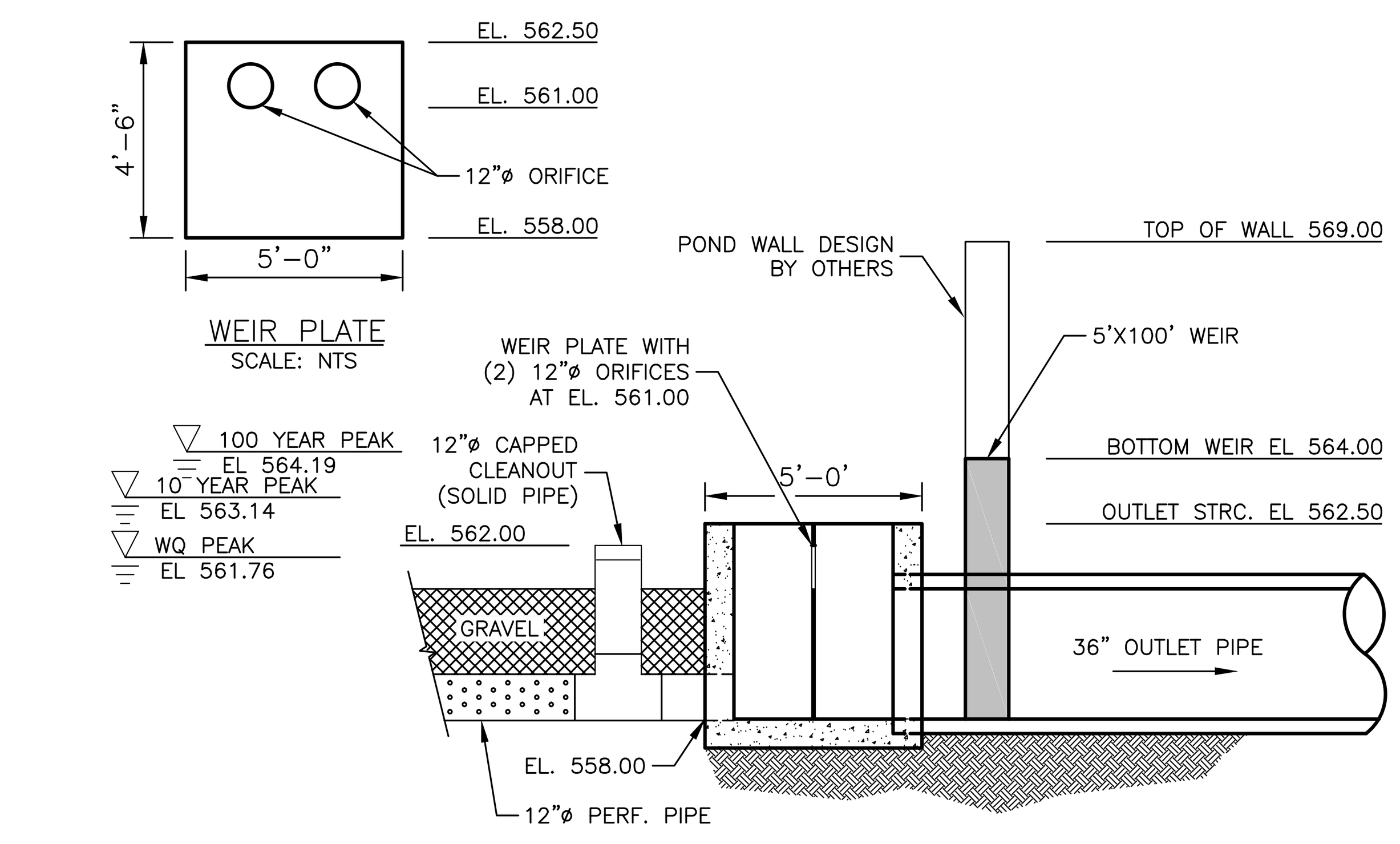
PROPOSED SITE DRAINAGE DETAILS

SCALE IN FEET
0 1 2

FILENAME 01C802.dwg

SCALE AS SHOWN

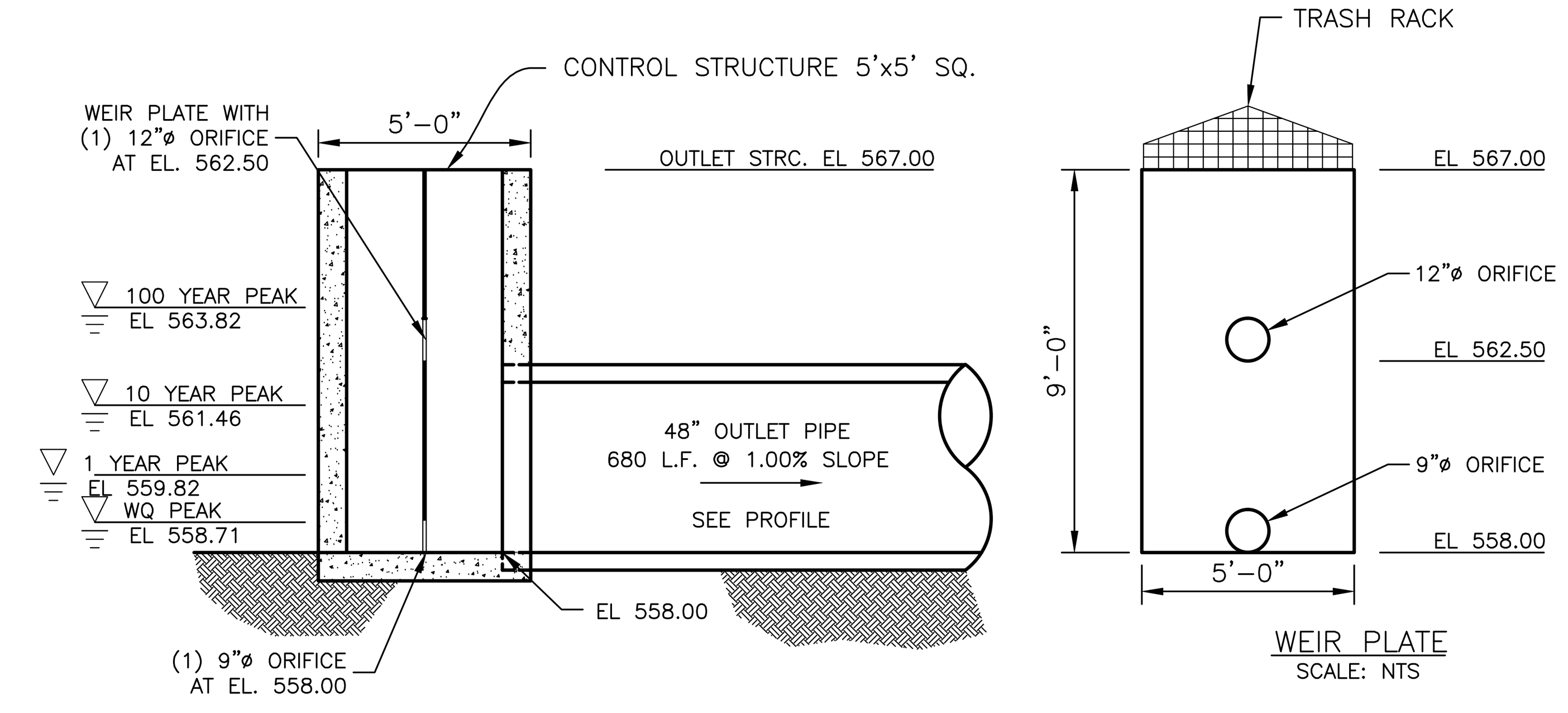
SHEET 01C801



CONTROL STRUCTURE DETAIL (3P)

SCALE: NTS

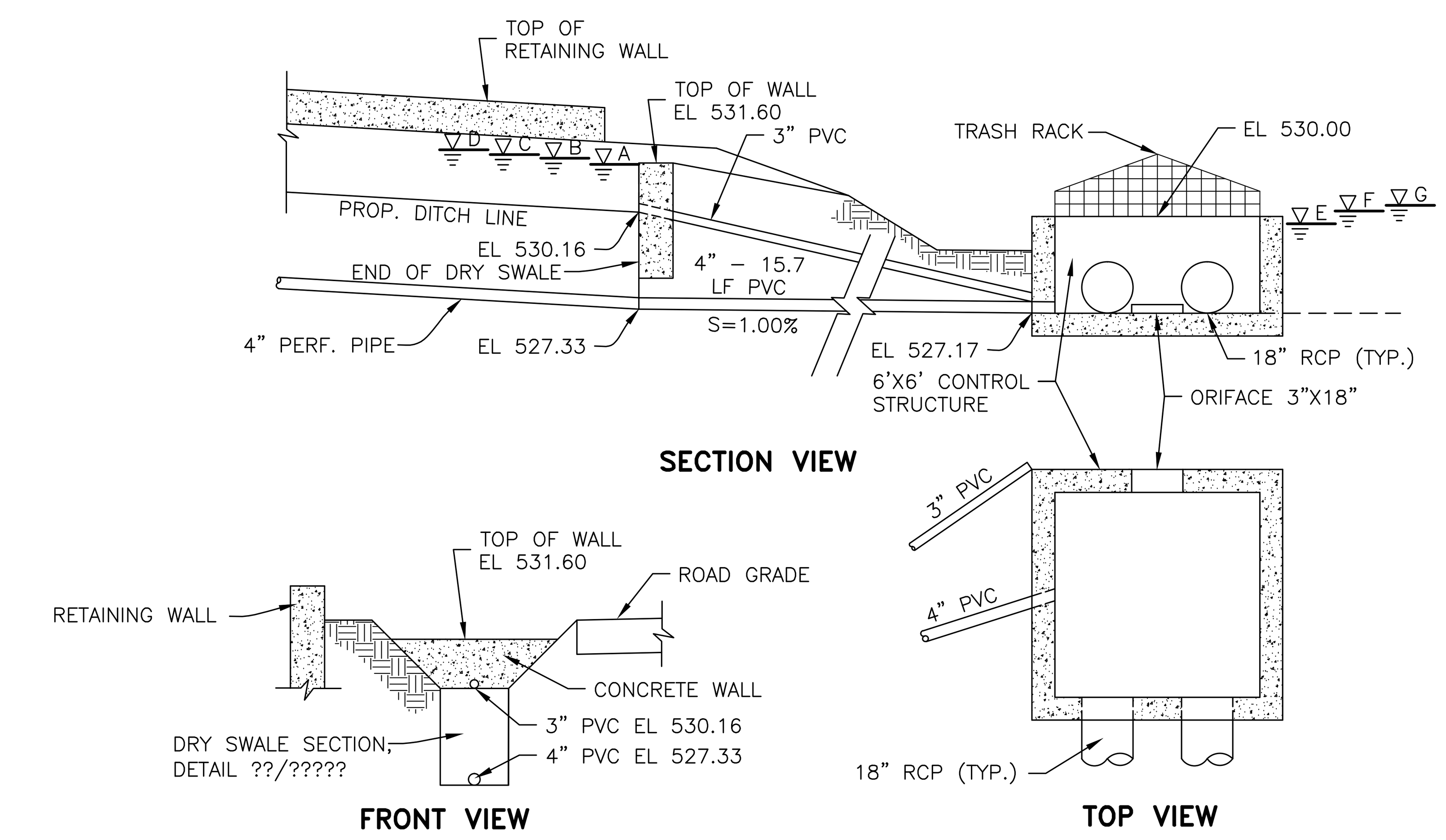
1 / 01C803



CONTROL STRUCTURE DETAIL (4P)

SCALE: NTS

2 / 01C803



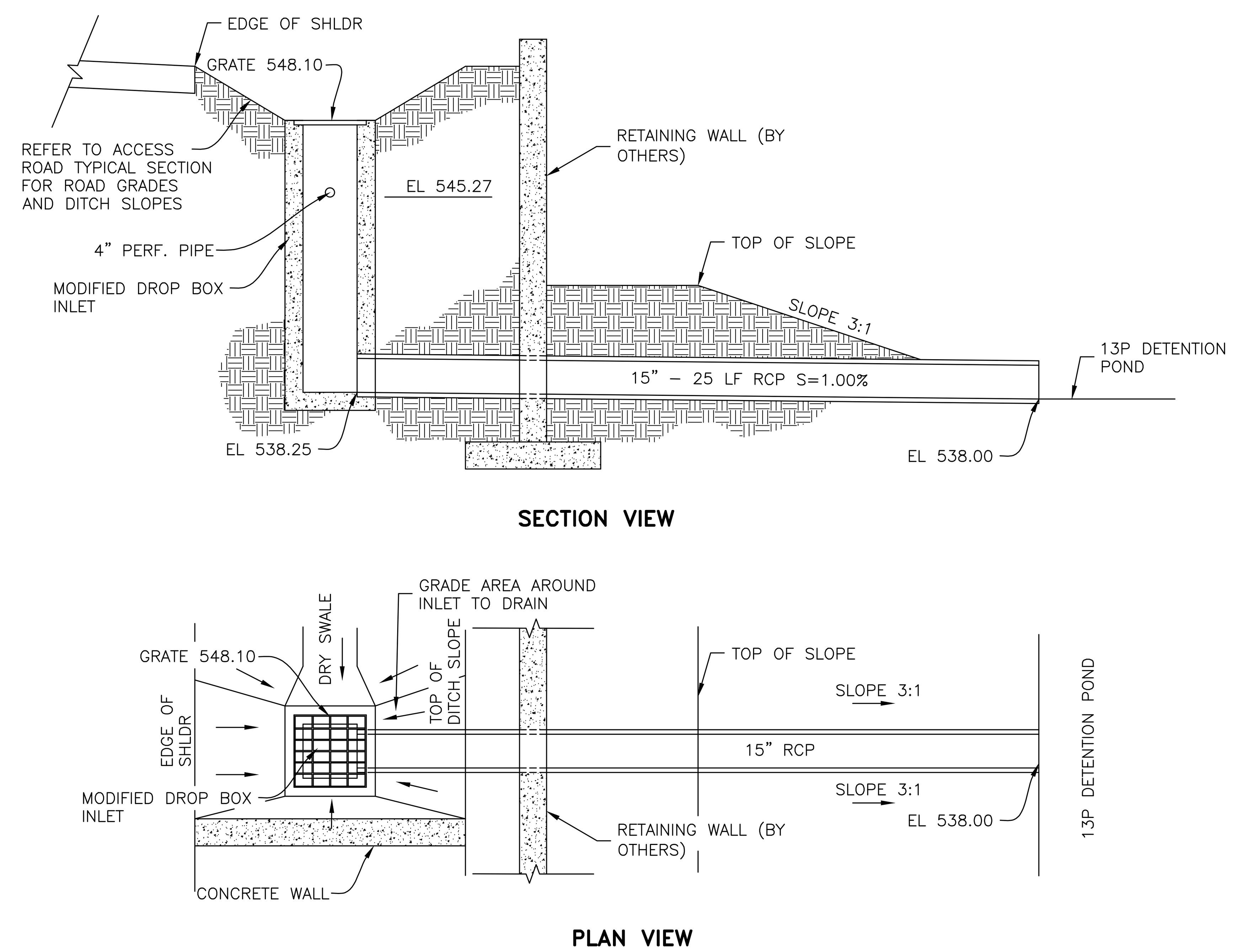
WATER DEPTH SCHEDULE (23P)		
	STORM EVENT	ELEVATION
A	WQ PEAK	531.56
B	1 YR PEAK	531.74
C	10 YR PEAK	531.85
D	100 YR PEAK	531.99

WATER DEPTH SCHEDULE (15P)		
	STORM EVENT	ELEVATION
E	1 YR PEAK	529.79
F	10 YR PEAK	530.16
G	100 YR PEAK	530.33

END OF SWELL 20R DETAIL (23P)(15P)

SCALE: 1/4"=1'-0"

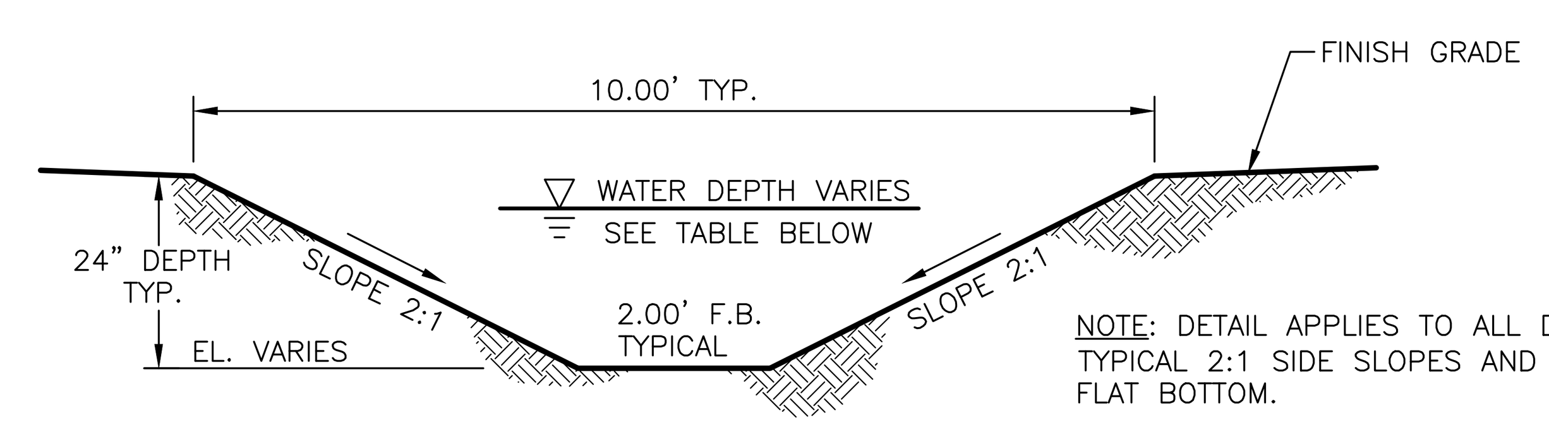
3 / 01C803



END OF SWELL DETAIL (29R)

SCALE: 1/4"=1'-0"

4 / 01C803



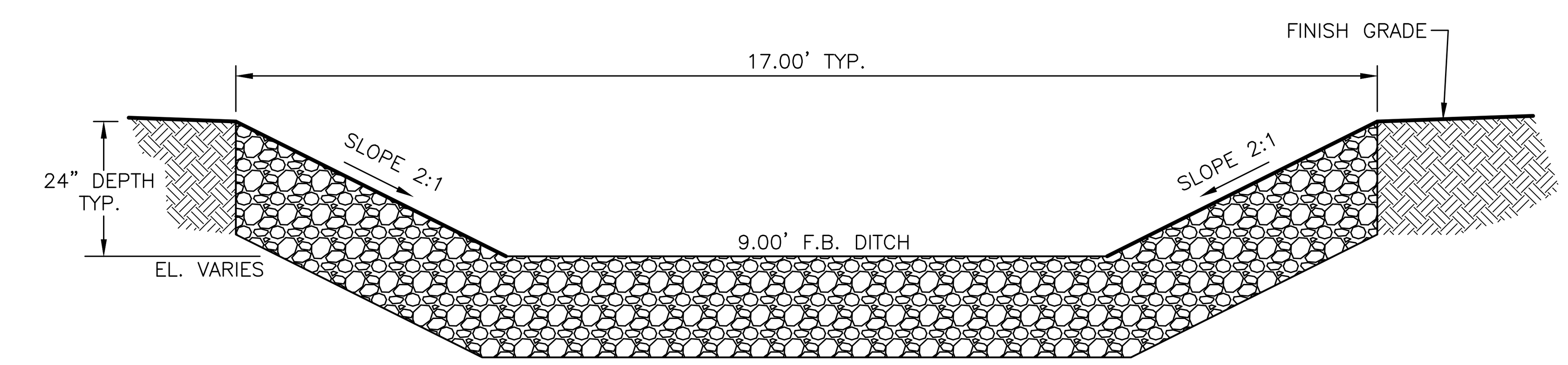
NOTE: DETAIL APPLIES TO ALL DITCHES. TYPICAL 2:1 SIDE SLOPES AND 2' WIDE FLAT BOTTOM.

WATER DEPTH SCHEDULE		
STORM EVENT	MAX. WATER DEPTH (IN FEET)	
	RE-ROUTING DITCH (23R)	RE-ROUTING DITCH (25R)
1 YR PEAK	0.32	0.56
10 YR PEAK	0.60	1.00
100 YR PEAK	0.92	1.49

TYPICAL DITCH SECTION (23R)

SCALE: 1/2"=1'-0"

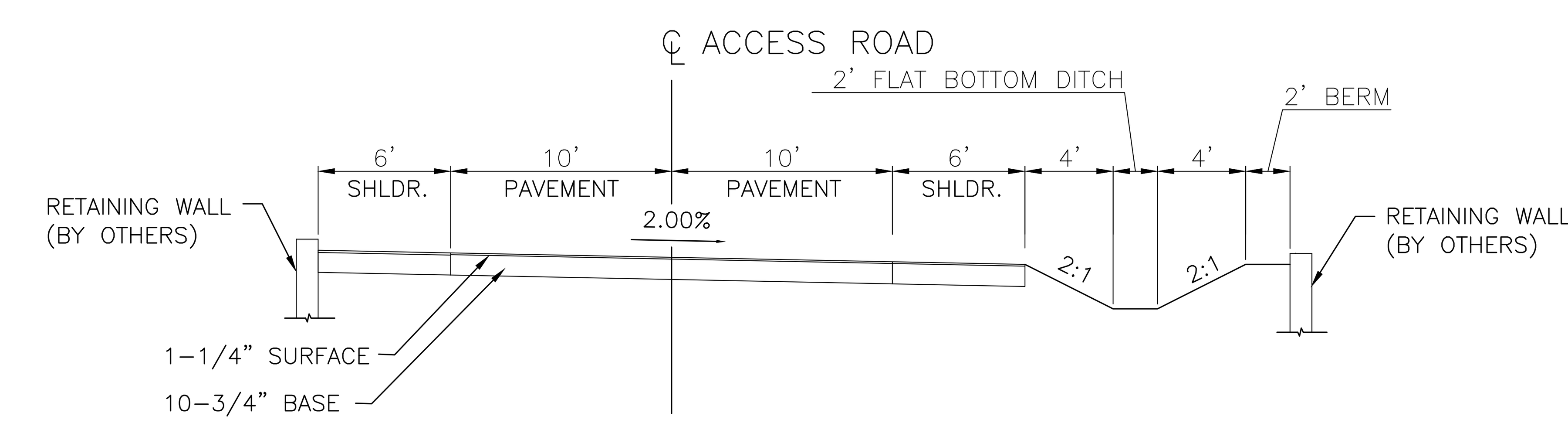
5 / 01C803



OUTLET CHANNEL FOR DBL 18" RCP (21R)

SCALE: 1/2"=1'-0"

6 / 01C803



ACCESS ROAD TYPICAL SECTION

SCALE: 1/4"=1-0'

7 / 01C803

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CLEAR RIVER ENERGY CENTER
TOWN OF BURRILLVILLE,
PROVIDENCE COUNTY, RHODE ISLAND

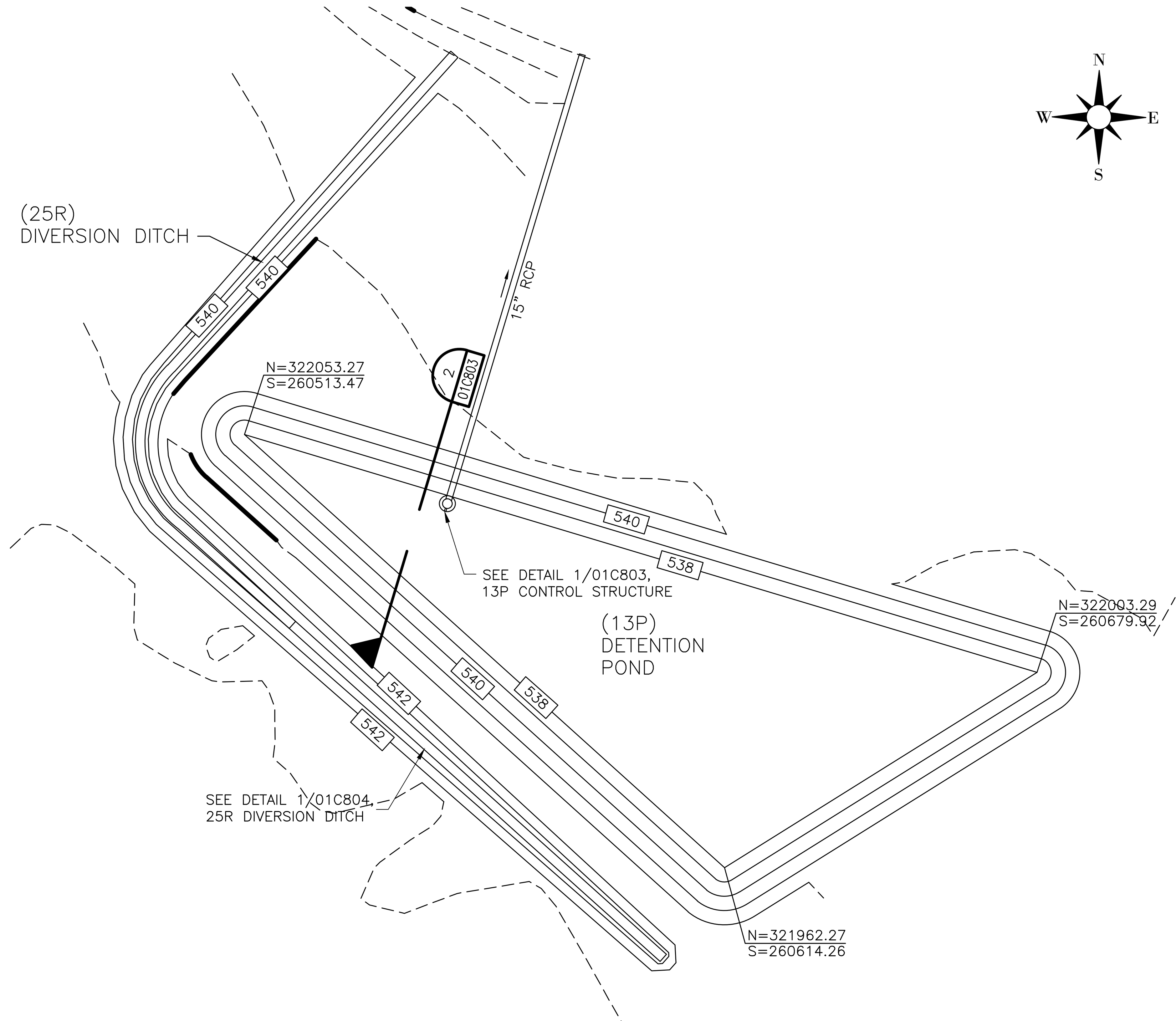
PROPOSED SITE DRAINAGE DETAILS

SCALE IN FEET 0 1 2

FILENAME 01C803.dwg

SCALE AS SHOWN

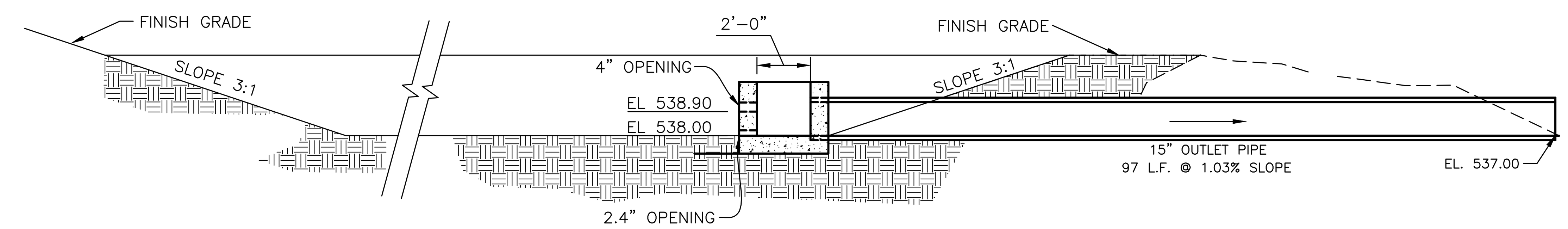
SHEET **01C803**



BASIN B DETAIL (13P)

SCALE: 1"=20'

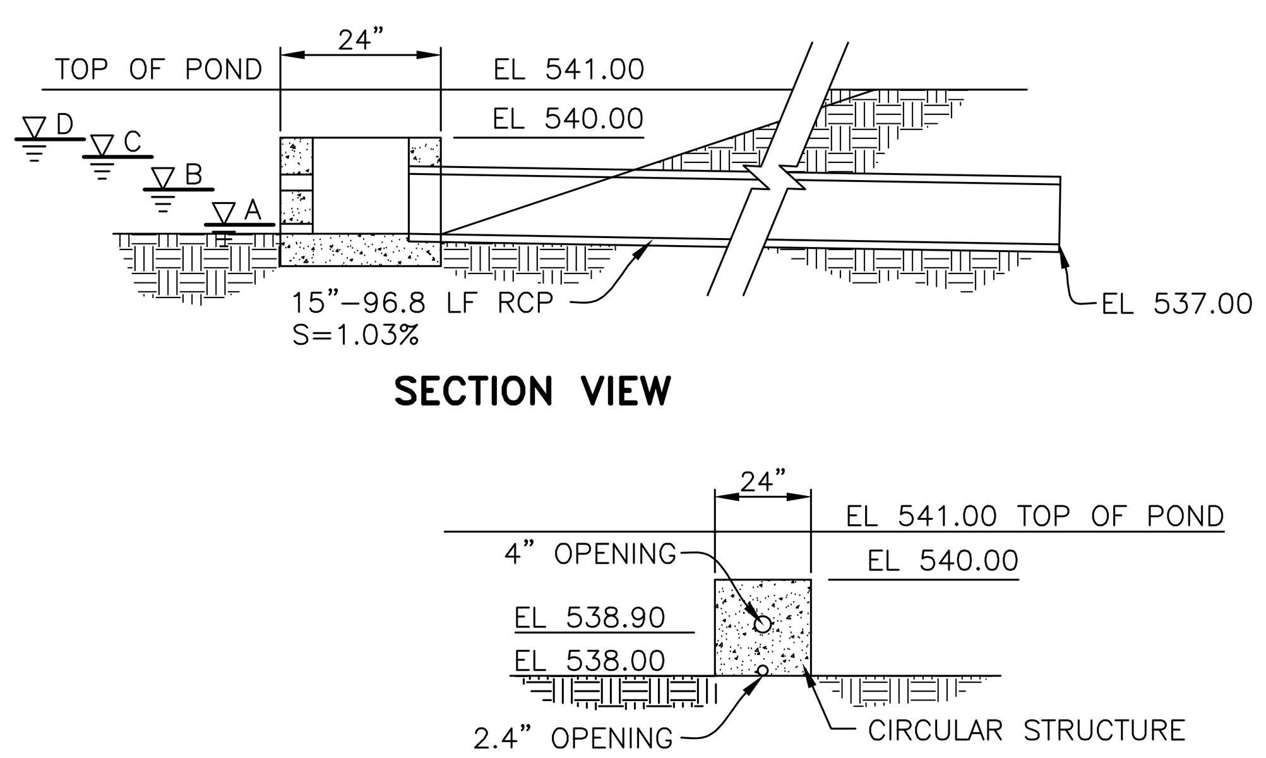
1 / 01C805



SECTION C-C DETAIL (13P)

SCALE: 1/4"=1'-0"

2 / 01C804

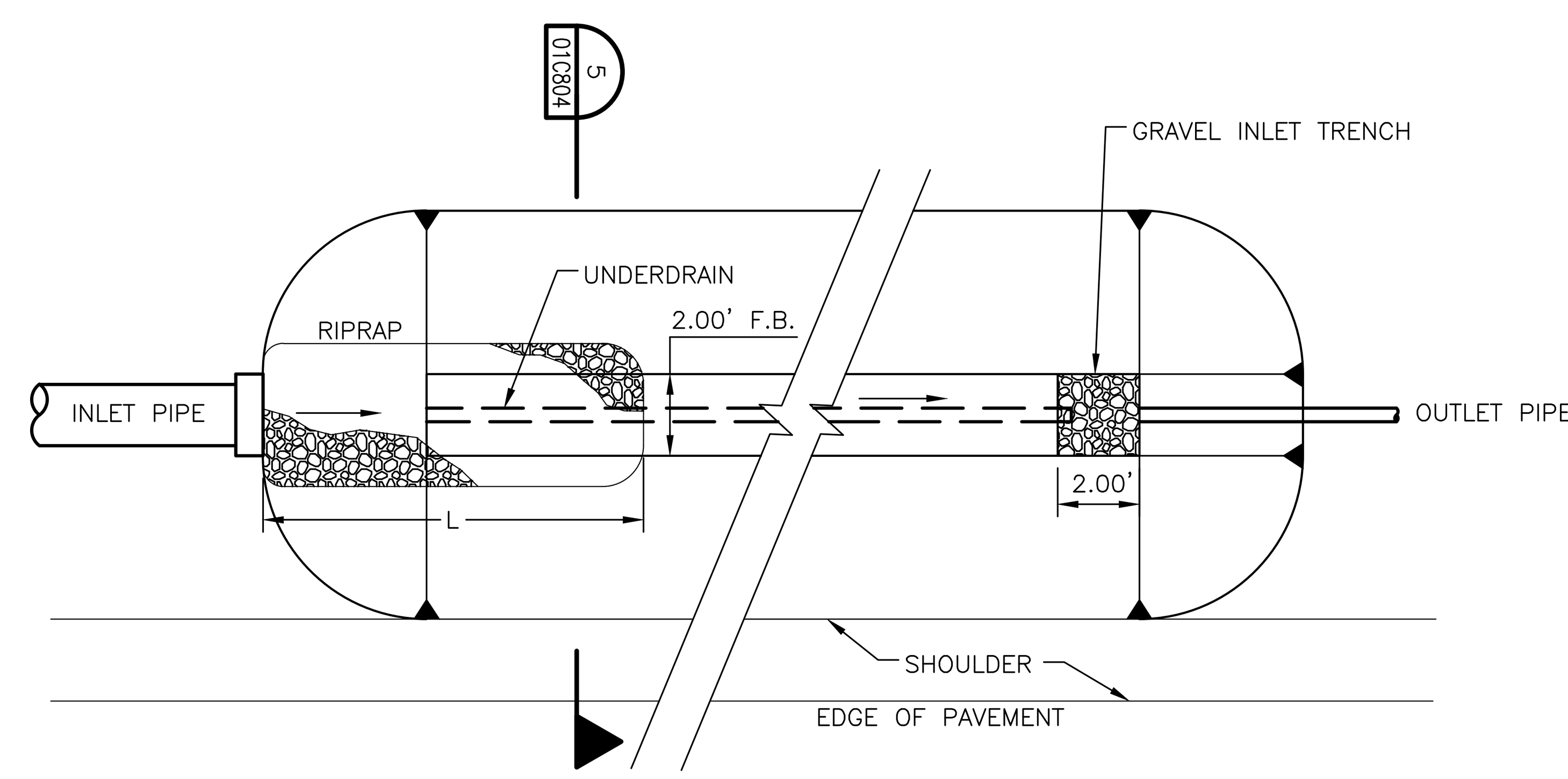


WATER DEPTH SCHEDULE		
	STORM EVENT	ELEVATION
A	WQ PEAK	538.19
B	1 YR PEAK	538.92
C	10 YR PEAK	539.60
D	100 YR PEAK	539.97

CONTROL STRUCTURE DETAIL (13P)

SCALE: 1/4"=1'-0"

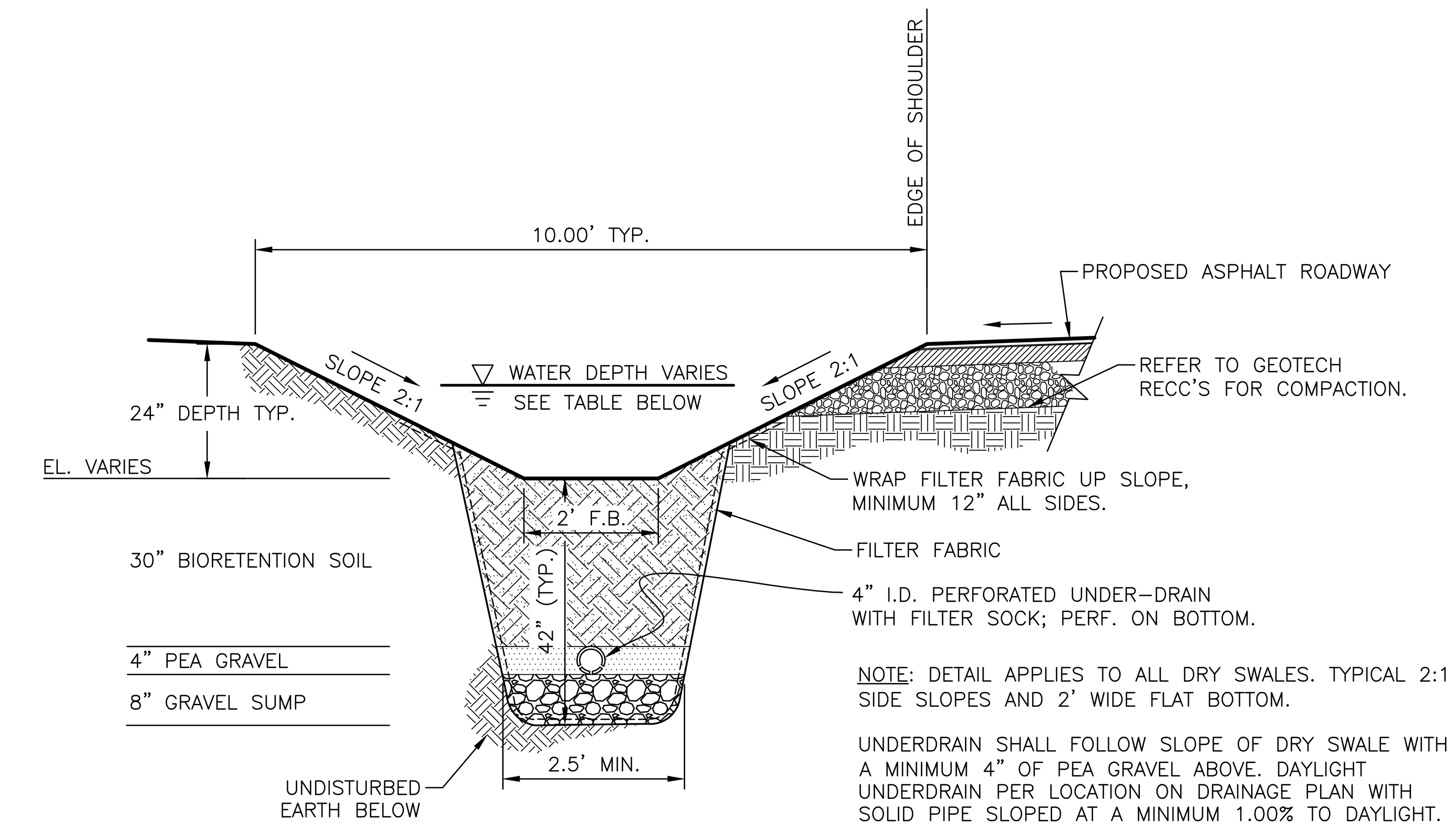
3 / 01C804



TYPICAL DRY SWALE DETAIL

SCALE: 1/4"=1'-0"

4 / 01C804



NOTE: DETAIL APPLIES TO ALL DRY SWALES. TYPICAL 2:1 SIDE SLOPES AND 2' WIDE FLAT BOTTOM.

UNDERDRAIN SHALL FOLLOW SLOPE OF DRY SWALE WITH A MINIMUM 4" OF PEA GRAVEL ABOVE. DAYLIGHT UNDERDRAIN PER LOCATION ON DRAINAGE PLAN WITH SOLID PIPE SLOPED AT A MINIMUM 1.00% TO DAYLIGHT.

WATER DEPTH SCHEDULE				
STORM EVENT	MAX. WATER DEPTH (IN FEET)			
	DRY SWALE – 1 (15R)	DRY SWALE – 2 (18R)	DRY SWALE – 3 (20R)	DRY SWALE – 4 (29R)
WATER QUALITY	0.12	0.03	0.11	0.13
1 YR PEAK	0.26	0.08	0.25	0.30
10 YR PEAK	0.41	0.12	0.38	0.46
100 YR PEAK	0.59	0.17	0.53	0.66

TYPICAL DRY SWALE SECTION (15R)(29R)(18R)(20R)

SCALE: 1/2"=1'-0"

5 / 01C804

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HDR

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER C. JACOBS

PROJECT NUMBER 000000000238926

CLEAR RIVER ENERGY CENTER
TOWN OF BURRILLVILLE,
PROVIDENCE COUNTY, RHODE ISLAND

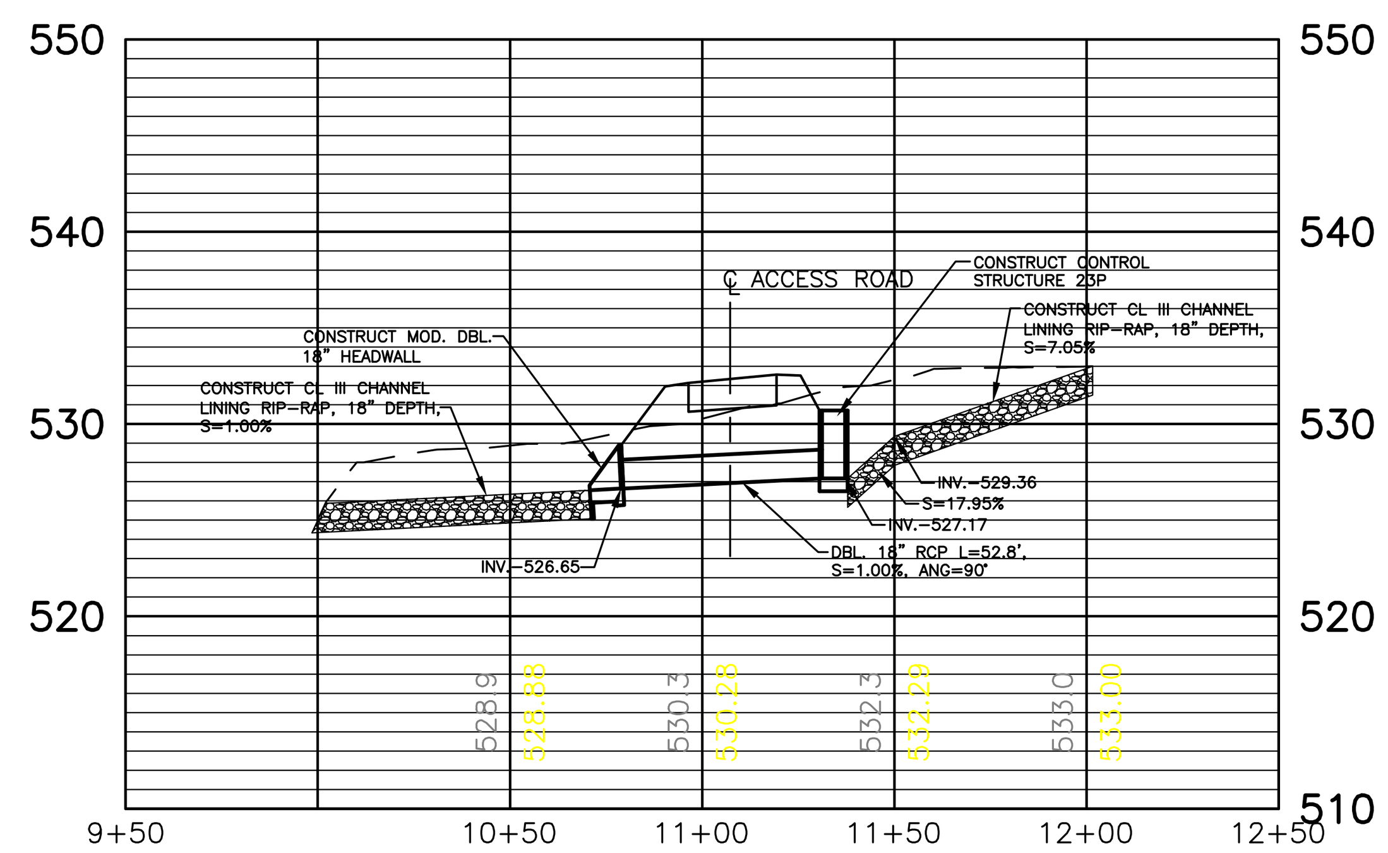
PROPOSED SITE DRAINAGE DETAILS

SCALE IN FEET 0 1 2

FILENAME 01C804.dwg

SCALE AS SHOWN

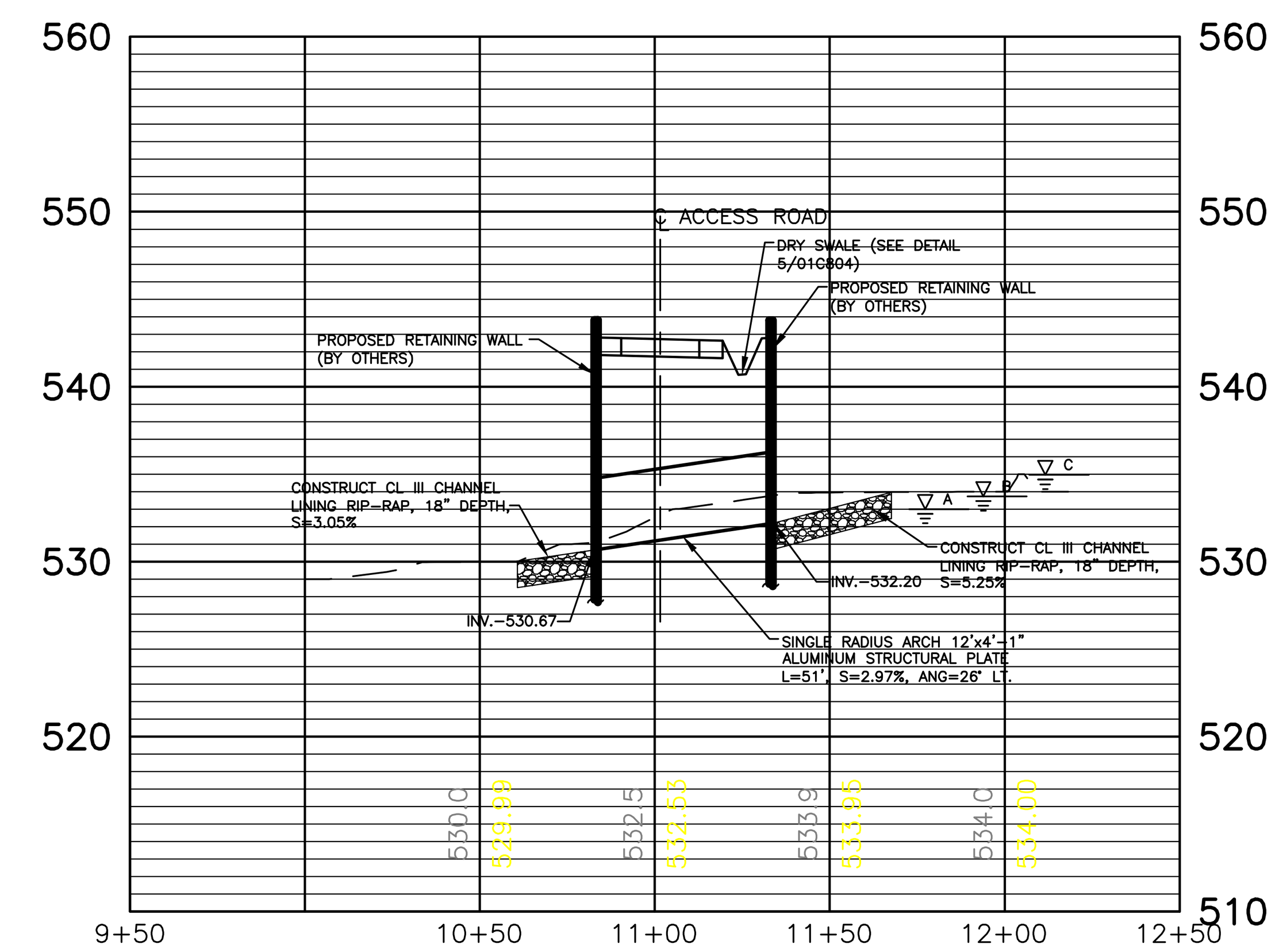
SHEET 01C804



CULVERT #1 SECTION (15P)

SCALE: HOR- 1"=50' VER- 1"=5'

1 / 01C805

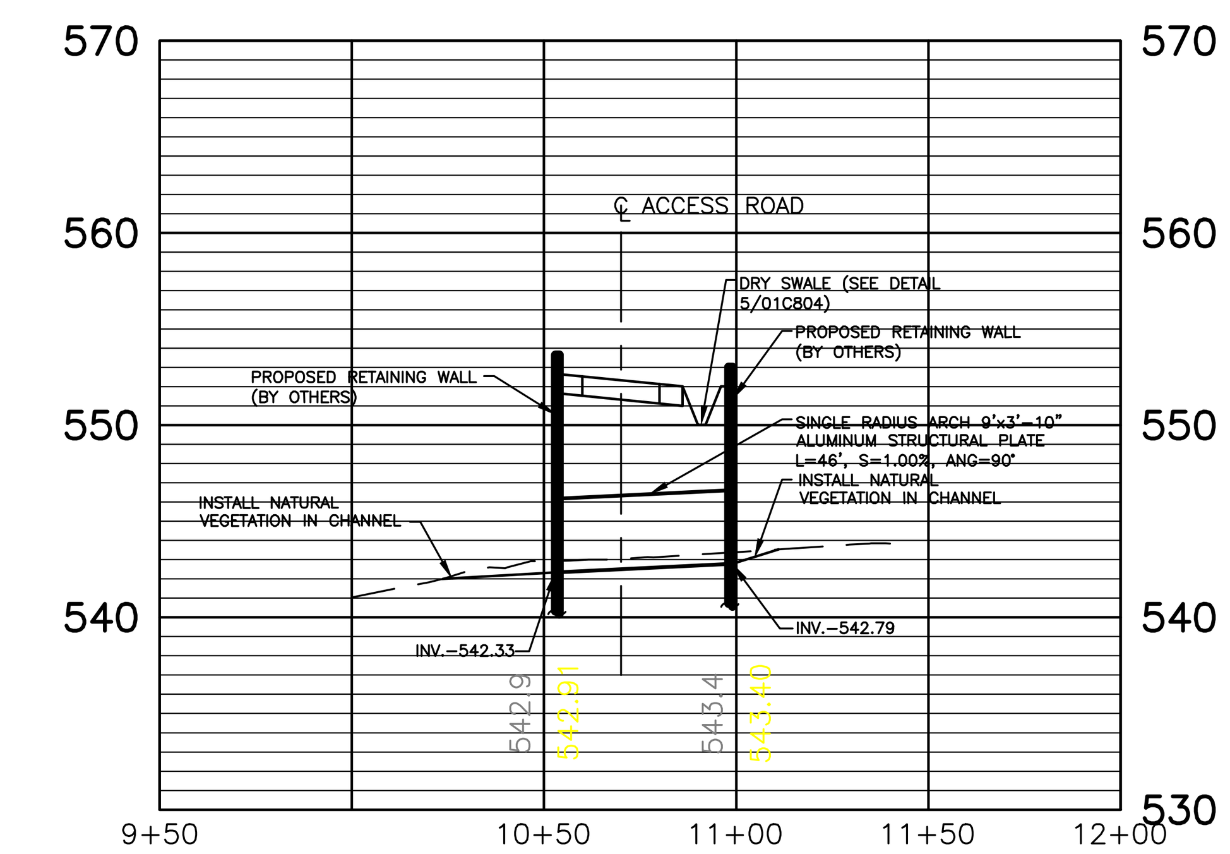


WATER DEPTH SCHEDULE		
	STORM EVENT	ELEVATION
A	1 YR PEAK	533.00
B	10 YR PEAK	533.76
C	100 YR PEAK	534.96

CULVERT #2 SECTION (17P)

SCALE: HOR- 1"=50' VER- 1"=5'

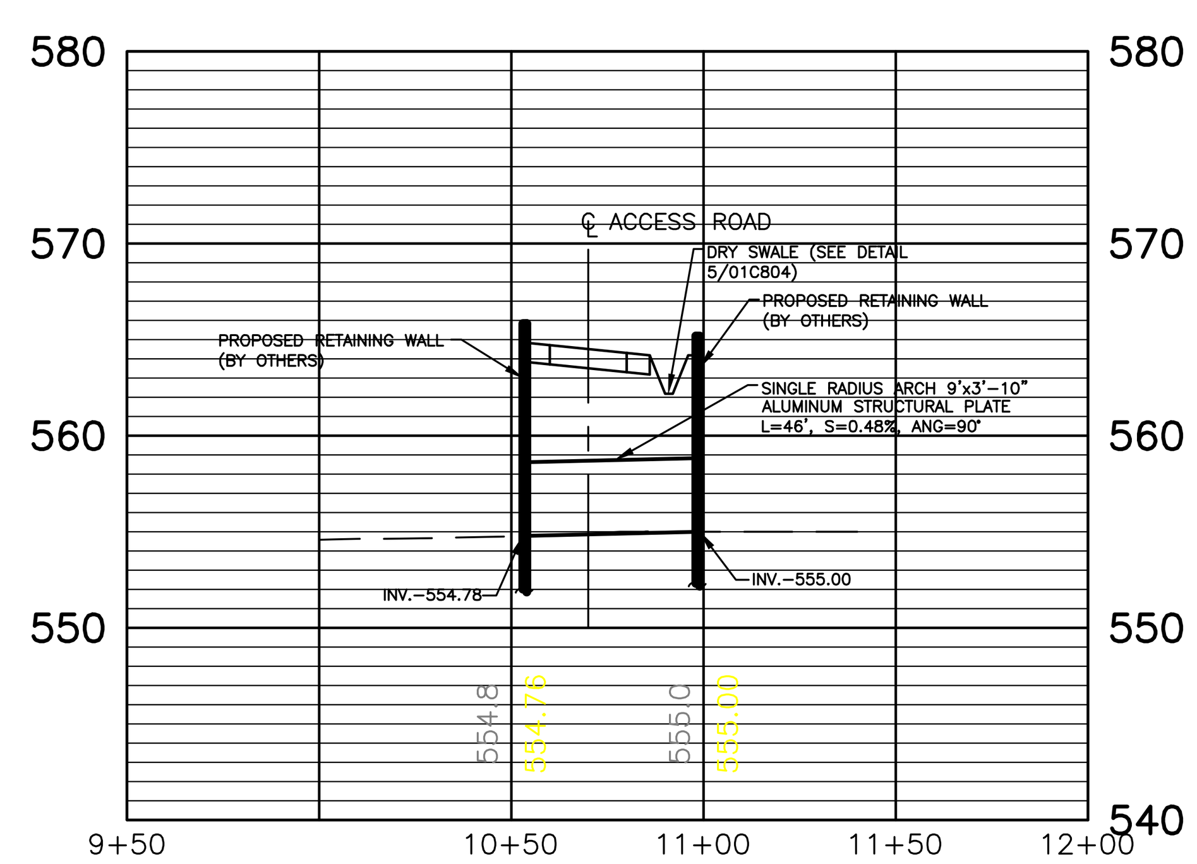
2 / 01C805



WILDLIFE PASSAGE #1 SECTION

SCALE: HOR- 1"=50' VER- 1"=5'

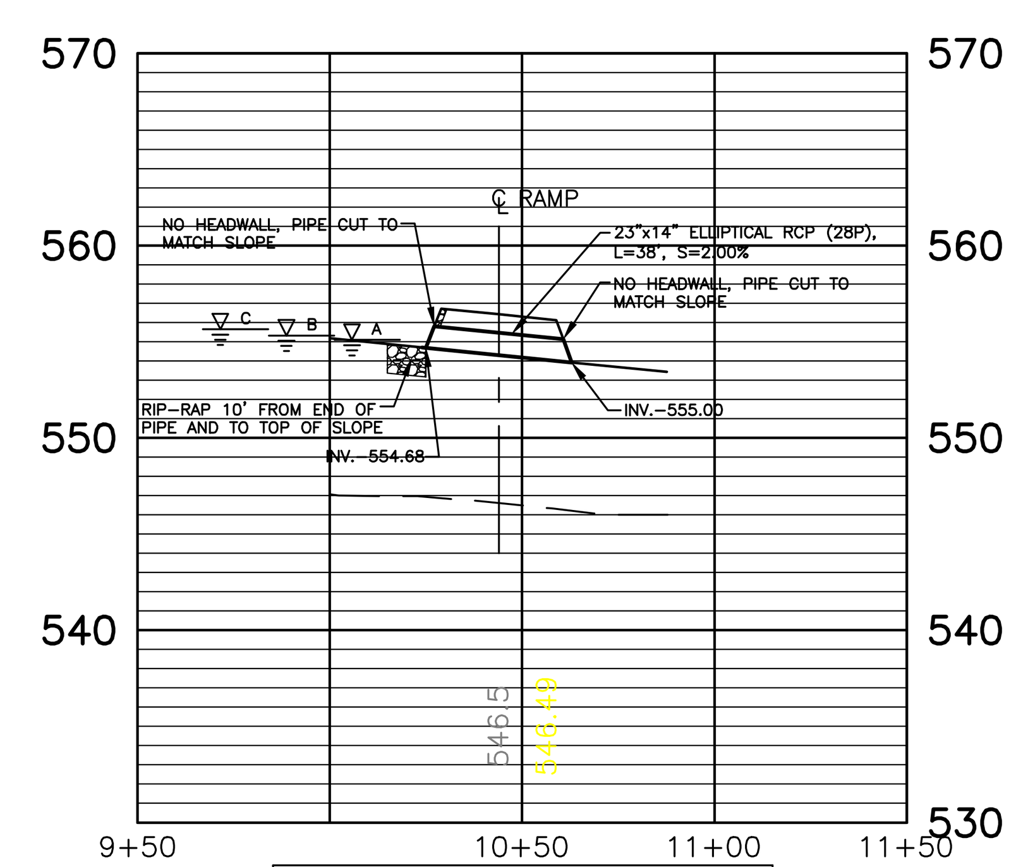
3 / 01C805



WILDLIFE PASSAGE #2 SECTION

SCALE: HOR- 1"=50' VER- 1"=5'

4 / 01C805

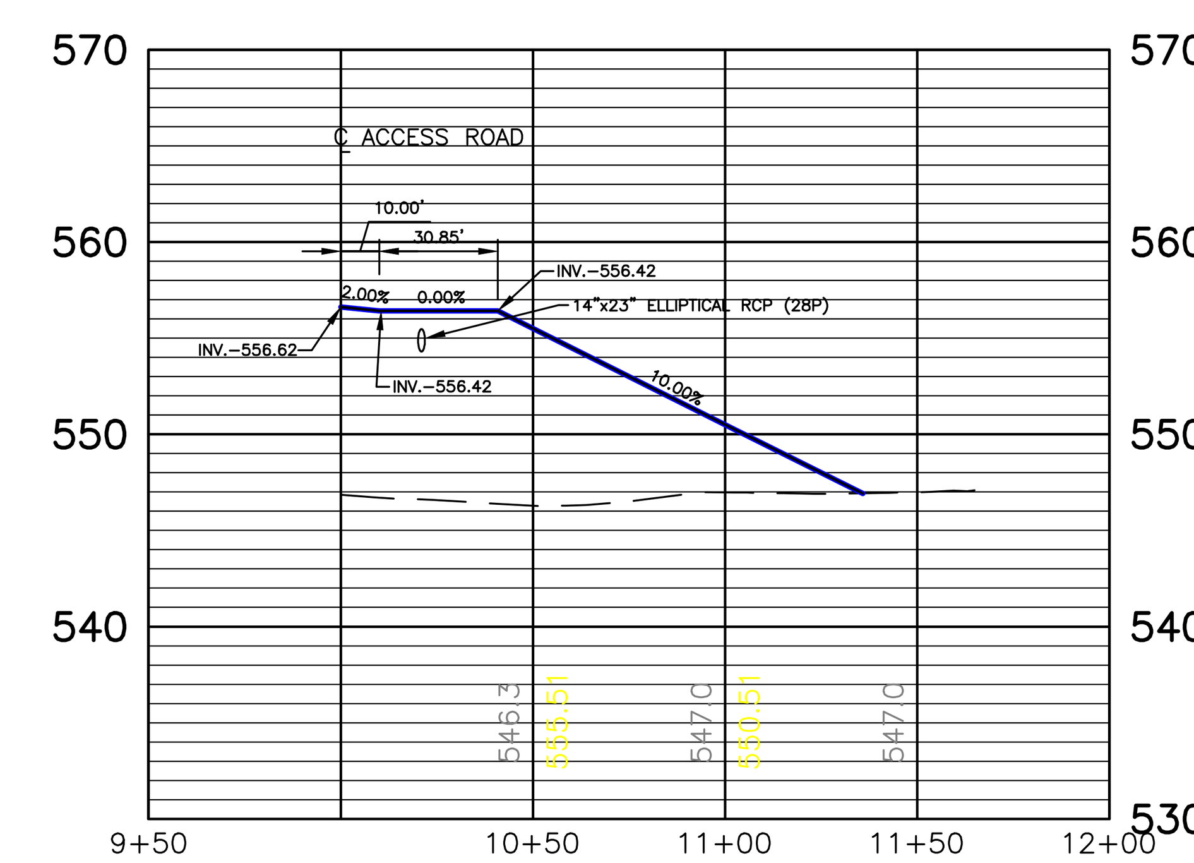


WATER DEPTH SCHEDULE		
	STORM EVENT	ELEVATION
A	1 YR PEAK	555.02
B	10 YR PEAK	555.25
C	100 YR PEAK	555.57

RAMP PIPE SECTION (28P)

SCALE: HOR- 1"=50' VER- 1"=5'

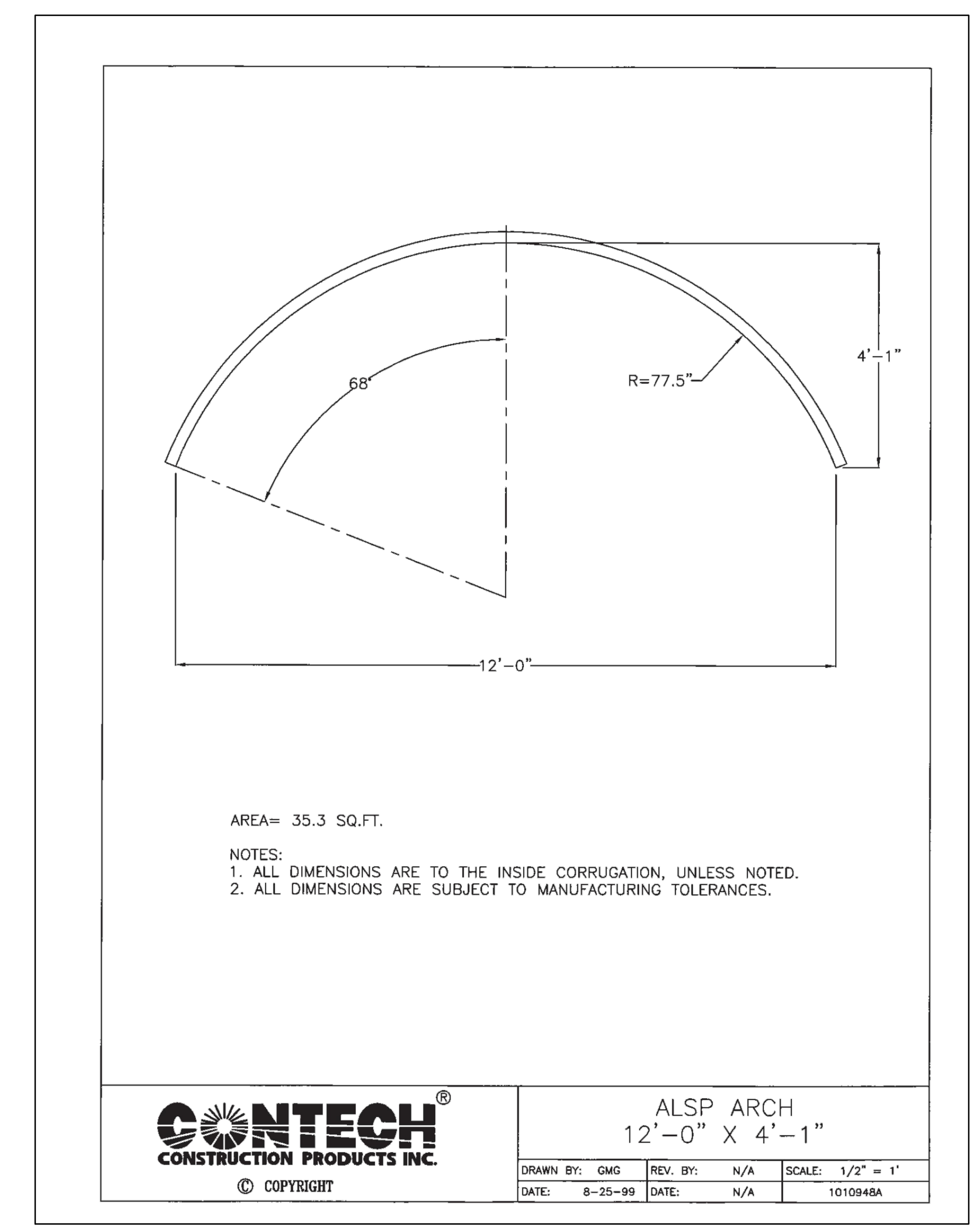
5 / 01C805



RAMP PIPE SECTION (28P)

SCALE: HOR- 1"=50' VER- 1"=5'

6 / 01C805



ALSP ARCH 12'-0" X 4'-1"

NTS

7 / 01C805

PROJECT MANAGER C. JACOBS

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CLEAR RIVER ENERGY CENTER
TOWN OF BURRILLVILLE,
PROVIDENCE COUNTY, RHODE ISLAND

PROPOSED SITE DRAINAGE DETAILS

SCALE IN FEET 0 1 2

FILENAME 01C805.dwg

SCALE AS SHOWN

SHEET **01C805**

5.3 Appendix C – RISDISM Checklist

APPENDIX A: STORMWATER MANAGEMENT CHECKLIST

The first thing that applicants and designers must do before beginning a project is to make sure they are familiar with the 11 minimum standards listed in Manual Chapter Three, as all projects must meet each of the 11 standards unless otherwise exempted. Next, designers should review the available LID site planning and design strategies and BMPs in Manual Chapters Four through Seven to determine which would work best at their site. This checklist serves as a guide for engineers and designers to refer to during all stages of a project to ensure that they are meeting all applicable requirements. In addition, designers must include a completed checklist with their final stormwater management plan.

A.1 STORMWATER SITE PLANNING, ANALYSIS, AND DESIGN

A.1.1 General Information

- ☒ Applicant name, mailing address, and telephone number
- ☒ Contact information for the licensed professional(s) responsible for site plans and stormwater management plan
- ☒ Common address and legal description of project site
- ☒ Vicinity map
- ☒ Existing zoning and land use at the project site
- ☒ Proposed land use – indicate if land use meets definition of a LUHPPL (see Manual Table 3-2)
- ☒ General Project Narrative
- ☒ Project type (new development or redevelopment)
- ☒ Site Disturbance ≥ 1 acre or ☐ Site Disturbance < 1 acre

A.1.2 Existing and Proposed Mapping and Plans

- ☐ Existing and proposed mapping and plans (scale not greater than 1” = 40’) with North arrow that illustrate at a minimum:
  - ☒ Existing and proposed site topography (2-foot contours required). 10-foot contours accepted for off-site areas.
  - ☒ Existing and proposed drainage area delineations and drainage flow paths, mapped according to the DEM *Guidance for Preparation of Drainage Area Maps* (included in Appendix K). Drainage area boundaries need to be complete; include off-site areas in both mapping and analyses, as applicable.

- [x] Perennial and intermittent streams, in addition to areas subject to storm flowage (ASSFs)
- [x] Mapping of predominant soils from USDA soil surveys, especially hydric soil groups as well as location of site-specific borings and/or test pits (on drainage area maps only – not site plans)
- [x] Boundaries of existing predominant vegetation and proposed limits of clearing
- [x] Location and field-verified boundaries of resource protection areas such as freshwater and coastal wetlands, lakes, ponds, coastal shoreline features and required setbacks (e.g., buffers, water supply wells, septic systems)
- [x] Location of floodplain and, if applicable, floodway limits and relationship of site to upstream and downstream properties and drainages
- [x] Location of existing and proposed roads, buildings, and other structures including limits of disturbance
- [ ] Existing and proposed utilities (e.g., water, sewer, gas, electric) and easements
- [x] Location of existing and proposed conveyance systems such as grass channels, swales, and storm drains
- [x] Location and dimensions of channel modifications, such as bridge or culvert crossings
- [x] Location, size, and limits of proposed LID planning and site design techniques (type of practice, depth, area). LID techniques should be labeled clearly on the plan and a key should be provided that corresponds to a tabular description.
- [x] Location, size, and limits of disturbance of proposed stormwater treatment practices (type of practice, depth, area). Stormwater treatment practices (BMPs) should be labeled with numbers that correspond to Table A.2-1.
- [x] Soils information from test pits or borings at the location of proposed stormwater management facilities, including but not limited to soil descriptions, depth to seasonal high groundwater, depth to bedrock, and estimated hydraulic conductivity. Soils information will be based on site test pits or borings logged by a DEM-licensed Class IV soil evaluator or RI-registered P.E.

A.1.3 Minimum Stormwater Management Standards

☒ Minimum Standard 1: LID Site Planning and Design Strategies

Document specific LID site planning and design strategies and associated methods that were employed for the project in the following table. If a redevelopment project site has 40% or more existing impervious surface coverage, Minimum Standard 1: LID Site Planning and Design Strategies does not apply.

Table A.1-1 LID Site Planning and Design Checklist

The applicant must document specific LID site planning and design strategies applied for the project (see Manual Chapter Four and the *RI Community LID Guidance Manual* for more details regarding each strategy). If a particular strategy was not used, a justification and description of proposed alternatives must be provided. If a strategy is not applicable (N/A), applicants must describe why a certain method is not applicable at their site. For example, preserving wetland buffers may be not applicable for sites located outside any jurisdictional wetland buffers. In communities where conservation development or other low-impact development site planning and design processes exist, following the local community conservation development option may help a project achieve this standard.

1. Strategies to Avoid the Impacts

A. Preservation of Undisturbed Areas

☐ Not Applied or N/A. *Use space below to explain why:*

Select from the following list:

- ☒ Limits of disturbance clearly marked on all construction plans.
- ☐ Mapped soils by Hydrologic Soil Group (HSG).
- ☐ Building envelopes avoid steep slopes, forest stands, riparian corridors, HSG D soils, and floodplains.
- ☐ New lots, to the extent practicable, have been kept out of freshwater and coastal wetland jurisdictional areas.
- ☐ Important natural areas (i.e., undisturbed forest, riparian corridors, and wetlands) identified and protected with permanent conservation easement.
- ☐ Percent of natural open space calculation is provided.
- ☐ Other (describe):

Explain constraints when a strategy is applied and/or proposed alternatives in space below:

Table A.1-1 LID Site Planning and Design Checklist

B. Preservation of Buffers and Floodplains

☐ Not Applied or N/A. *Use space below to explain why:*

Select from the following:

- ■ Applicable vegetated buffers of coastal and freshwater wetlands and perennial and intermittent streams have been preserved, where possible.
- ☐ Limits of disturbance included on all construction plans that protect applicable buffers
- ☐ Other (describe):

Explain constraints and/or proposed alternatives in space below:

C. Minimized Clearing and Grading

☐ Not Applied or N/A. *Use space below to explain why:*

Select from the following list:

- ■ Site fingerprinting to extent needed for building footprints, construction access and safety (i.e., clearing and grading limited to 15 feet beyond building pad or 5 feet beyond road bed/shoulder).
- ☐ Other (describe):

Explain constraints and/or proposed alternatives in space below:

D. Locating Sites in Less Sensitive Areas

☐ Not Applied or N/A. *Use space below to explain why:*

Select from the following list:

- ■ A site design process, such as conservation development, used to avoid or minimize impacts to sensitive resources such as floodplains, steep slopes, erodible soils, wetlands, hydric soils, surface waters, and their riparian buffers.
- ☐ Development located in areas with least hydrologic value (e.g., soil groups A and B)
- ☐ Development on steep slopes, grading and flattening of ridges has been avoided to the maximum extent practicable.
- ☐ Other (describe):

Explain constraints and/or proposed alternatives in space below:

Table A.1-1 LID Site Planning and Design Checklist

E. Compact Development

☐ Not Applied or N/A. *Use space below to explain why:*

Select from the following list:

- ■ A site design technique (e.g., conservation development) used to concentrate development to preserve as much undisturbed open space as practicable and reduce impervious cover.
- ■ Reduced setbacks, frontages, and right- of- way widths have been used where practicable.
- ☐ Other (describe):

Explain constraints and/or proposed alternatives in space below:

F. Work with the Natural Landscape Conditions, Hydrology, and Soils

☐ Not Applied or N/A. *Use space below to explain why:*

Select from the following list:

- ☐ Stormwater management system mimics pre-development hydrology to retain and attenuate runoff in upland areas (e.g., cuts and fills limited and BMPs distributed throughout site; trees used for interception and uptake).
- ☐ The post-development time of concentration (t_c) should approximate pre-development t_c.
- ■ Flow velocity in graded areas as low as practicable to avoid soil erosion (i.e., slope grade minimized). Velocities shall not exceed velocities in Appendix B, Table B-2.
- ☐ Plans show measures to prevent soil compaction in areas designated as Qualified Pervious Areas (QPAs) for better infiltration.
- ☐ Site designed to locate buildings, roadways and parking to minimize grading (cut and fill quantities)
- ☐ Other (describe):

Explain constraints and/or proposed alternatives in space below:

2. Strategies to Reduce the Impacts

A. Reduce Impervious Cover

☐ Not Applied or N/A. *Use space below to explain why:*

Select from the following list:

- ■ Reduced roadway widths
- ■ Reduce driveway areas
- ■ Reduced building footprint
- ☐ Reduced sidewalk area
- ☐ Reduced cul-de-sacs
- ■ Reduced parking lot area
- ☐ Other (describe):

Explain constraints and/or proposed alternatives in space below:

Table A.1-1 LID Site Planning and Design Checklist

3. Strategies to Manage the Impacts

A. Disconnecting Impervious Area

☒ Not Applied or N/A. *Use space below to explain why:*

Select from the following list:

- ☐ Impervious surfaces have been disconnected to QPAs to the extent possible.
- ☐ Other (describe):

Explain constraints and/or proposed alternatives in space below:

THIS SITE IS CLASSIFIED AS A LUHPPL

B. Mitigation of Runoff at the point of generation

☒ Not Applied or N/A. *Use space below to explain why:*

Select from the following list:

- ☐ Roof runoff has been directed to a QPA, such as a yard or vegetated area.
- ☐ Roof runoff has been directed to a lower impact practice such as a rain barrel or cistern.
- ☐ A green roof has been designed to reduce runoff.
- ☐ Small-scale BMPs applied at source.
- ☐ Other (describe):

Explain constraints and/or proposed alternatives in space below:

THIS SITE IS CLASSIFIED AS A LUHPPL

C. Stream/Wetland Restoration

☐ Not Applied or N/A. *Use space below to explain why:*

Select from the following list:

- ☒ Historic drainage patterns have been restored by removing closed drainage systems and/or restoring degraded stream channels and/or wetlands.
- ☐ Removal of invasive species.
- ☐ Other (describe):

Explain constraints and/or proposed alternatives in space below:

Table A.1-1 LID Site Planning and Design Checklist

D. Reforestation

☐ Not Applied or N/A. *Use space below to explain why:*

Select from the following list:

- ☒ Low maintenance, native vegetation has been proposed.
- ☐ Trees are proposed to be planted or conserved to reduce runoff volume, increase nutrient uptake, and provide shading and habitat.
- ☐ Other (describe):

Explain constraints and/or proposed alternatives in space below:

_____

_____

_____

Table A.1-2 LID Stormwater Credit

Description of stormwater credit, if applicable. Label qualifying pervious areas (QPAs) on the site map, and document that all stormwater credit requirements listed in Manual Section 4.6 are met. For each QPA, note the impervious area (in acres) that drains to it, and place a check in the appropriate box to demonstrate that it meets the following criteria:

	QPA 1	QPA 2	QPA 3	QPA 4
Impervious Area Draining to QPA (acres)	N/A			
QPA Criteria	**Criterion Met?**			
Construction vehicles shall not be allowed to drive over the QPA during construction. If the area becomes compacted, soil must be suitably amended, tilled, and revegetated once construction is complete to restore infiltration capacity.				
QPA infiltration area is at least 10ft from building foundation.				
Contributing impervious area does not exceed 1,000 ft^2.				
Length of QPA in feet is equal to or greater than the contributing rooftop area in ft^2 divided by 13.3. The maximum contributing flow path from non-rooftop impervious areas is 75ft.				
QPA does not overlap any other QPA.				

	QPA 1	QPA 2	QPA 3	QPA 4
Lot is greater than 6,000 ft^2.				
The slope of the QPA is less than or equal to 5.0%.				
Disconnected downspouts draining to QPA are at least 10 feet away from the nearest impervious surface.				
Runoff from rooftops without gutters / downspouts that drains to QPA flows away from the structure as low-velocity sheet flow.				
QPA is located on Hydrologic Soil Group (HSG) A or B soils.				
Depth to groundwater within QPA is 18 inches or greater (has been confirmed by evaluation by a DEM-licensed Class IV soil evaluator or RI-registered PE).				
Runoff is directed over soft shoulders, through curb cuts or level spreaders to QPA.				
Measures are employed at discharge point to prevent erosion and promote sheet flow.				
The flow path through the QPA complies with the setback requirements for structural infiltration BMPs.				
Rooftop runoff draining to QPA from LUHPPLs does not commingle with runoff from any paved surface or areas that may generate higher pollutant loads				
Inspection and maintenance of the QPA is included in the site Operation and Maintenance Plan (Minimum Standard 11).				
The QPA is owned or controlled by the property owner				
There is no history of groundwater seepage and / or basement flooding on the property				

■ Minimum Standard 2: Groundwater Recharge

Demonstrate that groundwater recharge criteria for the site have been met. Include:

■ The required recharge volume (Re_v) in acre-feet (See Manual Section 3.3.2)

☐ LID Stormwater Credit from Table A.1-2 to be applied to recharge requirement, if applicable, with the following calculations (See Manual Section 4.6.1):

- the recharge area (Re_a) in acres for the site
- the site impervious area draining to QPAs
- the new Re_v requirement

☐ Specific BMPs from Table A.2-1 that will be used to meet the recharge requirement. *Note: Only BMPs listed in Manual Table 3-5, List of BMPs Acceptable for Recharge may be used to meet the recharge requirement.*

■ Minimum Standard 3: Water Quality

Demonstrate that the water quality criteria for the site have been met. Include:

■ Required water quality volume (WQ_v) in acre-feet or ft^3 (see Manual Section 3.3.3).

☐ LID Stormwater Credit from Table A.1-2 to be applied to water quality requirement, if applicable, with the following calculations (see Manual Section 4.6.1):

- the new impervious area (in acres) for the site
- the new WQ_v in acre-feet or ft^3

■ Specific BMPs from Table A.2-1 that will be used to meet water quality volume requirement. *Note: Only BMPs listed in Manual Table 3-6, Acceptable BMPs for Water Quality Treatment may be used to meet the water quality requirement.*

☐ Specify any additional pollutant-specific requirements and/or pollutant removal efficiencies applicable to the site as the result of SAMP, TMDL, or other watershed-specific requirements.

■ Minimum Standard 4: Conveyance and Natural Channel Protection

Demonstrate that the conveyance and natural channel protection criteria for the site have been met. Include:

☐ Justification for channel protection criterion waiver, if applicable (see Manual Section 3.3.4).

■ Required channel protection volume (CP_v) (see Manual Section 3.3.4).

■ Specific BMPs from Table A.2-1 that will be used to meet the channel protection requirement. Hydrologic and hydraulic site evaluation as described

in Manual Section 3.3.4 should be included in Table A.2-1 for each channel protection BMP.

☒ **Minimum Standard 5: Overbank Flood Protection**

Demonstrate that the overbank flood protection criteria for the site have been met. Include:

☐ Justification for overbank flood protection criterion waiver, if applicable (see Manual Section 3.3.5).

☒ Pre- and post-development peak discharge rates.

☐ Specific BMPs from Table A.2-1 that will be used to meet the overbank flood protection requirement. Hydrologic and hydraulic site evaluation as described in Manual Section 3.3.5 should be included in Table A.2-1 for each overbank flood protection BMP.

☐ **Minimum Standard 6: Redevelopment and Infill Projects**

Determine if project meets the criteria for redevelopment and/or infill projects. If applicable, include:

☐ Description of site that meets redevelopment/infill definition.

☐ Approved off-site location within watershed where stormwater management requirements will be met, if applicable (see Manual Section 3.2.6).

☒ Not Applicable.

☒ **Minimum Standard 7: See page A-15**

☒ **Minimum Standard 8: LUHPPLs**

Demonstrate that the project meets the criteria for LUHPPLs, if applicable. Include:

☐ Description of any land use activities considered stormwater LUHPPL (see Manual Table 3-2).

☒ Specific BMPs listed in Table A.2-1 that receive stormwater from LUHPPL drainage areas. These BMP types must be listed in Manual Table 3-3, "Acceptable BMPs for Use at LUHPPLs."

☐ Additional BMPs, if any, that meet RIPDES MSGP requirements.

☐ Not Applicable.

☒ **Minimum Standard 9: Illicit Discharges**

Applicant asserts that no illicit discharges exist or are proposed to the stormwater

management system in accordance with State regulations.

■ Minimum Standard 10: See page A-13 Minimum Standard 11: See p. A-15

A.2 BEST MANAGEMENT PRACTICES

Provide detailed information for all structural stormwater best management practices (BMPs) to be implemented. *Note: If a BMP cannot meet the required design criteria in Manual Chapters Five, Six and Seven, a different BMP should be considered*.

Table A.2-1 Best Management Practices

Fill in the following table to document which proposed practices meet which requirement(s). Number each BMP and label them accordingly on the site map:

BMP No.	Type of BMP	Check the function provided by the BMP				
		Pretreatment	Re_v	WQ_v	CP_v	Q_p
2P	FOREBAY	☑	☐	☐	☐	☐
3P	WATER QUALITY BASIN (GWVTS)	☐	☐	☑	☐	☐
4P	DETENTION BASIN	☐	☐	☐	☑	☑
13P	DETENTION BASIN	☐	☐	☐	☑	☑
15R	DRY SWALE	☐	☑	☑	☐	☐
29R	DRY SWALE	☐	☑	☑	☐	☐
18R	DRY SWALE	☐	☑	☑	☐	☐
20R	DRY SWALE	☐	☑	☑	☐	☐

In addition, for all structural components of stormwater system (e.g., storm drains, open channels, swales, stormwater BMPs, etc.) provide the following, if applicable:

■ Hydrologic and hydraulic analysis, including:

- √ Study design/analysis points. The existing and proposed condition analyses need to compare the same overall area; thus, common study points are needed for both existing and proposed conditions.
- √ Existing condition analysis for drainage area boundaries, curve numbers, times of concentration, runoff rates, volumes, velocities, and water surface elevations showing methodologies used and supporting calculations.
- √ Proposed condition analysis for drainage area boundaries, curve numbers, times of concentration, runoff rates, volumes, velocities, water surface elevations, and routing showing the methodologies used and supporting calculations.
- √ Downstream Analysis, where required (see Manual Section 3.3.6).
- √ Final sizing calculations for structural stormwater BMPs including, contributing drainage area, storage, and outlet configuration.
- √ Stage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities (e.g., detention, retention, or infiltration facilities).
- NA Dam breach analysis, where necessary, for earthen embankments over six (6) feet in height, or a capacity of 15 acre-feet or more, and that is a significant or high hazard dam.

■ Drainage Area Maps prepared in accordance with DEM's *Guidance for Preparation of Drainage Area Maps* (included in Appendix K).

☐ Representative cross-section and profile drawings, notes and details of structural stormwater management practices and conveyances (i.e., storm drains, open channels, swales, etc.), which include:

- Locations, cross sections, and profiles of all streams and drainage swales and their method of stabilization.
- Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.).
- Design water surface elevations.
- Structural details of outlet structures, embankments, spillways, stilling basins, grade control structures, conveyance channels, etc.
- Logs of borings and/or test pit investigations along with supporting soils/geotechnical report.

☐ Planting plans for structural stormwater BMPs, including:

- Species, size, planting methods, and maintenance requirements of proposed planting.

☐ Structural calculations, where necessary.

☐ Applicable construction specifications.

☐ Identification of all anticipated applicable local and State permits.

☐ Identification of all anticipated legal agreements related to stormwater (e.g., off-site easements, deed restrictions, and covenants).

A.3 EROSION AND SEDIMENT CONTROL (ESC) AND STORMWATER POLLUTION PREVENTION PLANS (SWPPP)

A.3.1 All Projects

■ **Minimum Standard 10: Construction Erosion and Sedimentation Control**

All projects must demonstrate that ESC practices will be used during the construction phase and land disturbing activities. Include:

☒ Description of temporary sediment trapping and conveyance practices, including sizing calculations and method of temporary and permanent stabilization (see Manual Section 3.2.10 and *the Rhode Island Soil Erosion and Sediment Control Handbook*).

☒ Description of sequence of construction. Activities should be phased to avoid compacting soil during construction, particularly in the location of infiltrating stormwater practices and qualifying pervious areas for stormwater credits.

☒ Location of construction staging and material stockpiling areas.

A.3.2 Construction Projects Disturbing ≥ 1 Acre

Demonstrate the project meets the criteria of the Rhode Island Pollutant Discharge Elimination System (RIPDES) General Permit for Stormwater Discharge Associated with Construction Activity (RIPDES Construction General Permit). A ***Stormwater Pollution Prevention Plan (SWPPP)*** must be kept on-site during the active construction phase of the project. Include:

■ Estimates of the total area of the site and the total area of the site that is expected to undergo soil disturbance.

■ A determination regarding whether or not the site is within or directly discharges to a Natural Heritage Area (NHA) or has discharge related activities that potentially affect a listed or proposed to be listed endangered or threatened species or its critical habitat. To determine if your site is within or directly discharges to an NHA complete the following steps:

1. Go to http://www.dem.ri.gov/maps/index.htm
2. Click on the “Environmental Resource Map” link.
3. Open the “Regulatory Overlays” Group/Folder listed under the LAYERS heading.
4. Select Natural Heritage Area – Rare Species as a visible layer from the menu and press the “Refresh Map” button (*Note: Menu may not

list all layers if scale factor is too large. If this is the case, then use the "zoom in" feature until all layers are listed in menu).

5. Select any other layer that may be useful in determining the location of the construction activity relative to a NHA (such as roads).
6. Check the appropriate box to indicate whether or not your site is located within or directly discharges to an NHA or has discharge related activities that potentially affect a listed or proposed to be listed endangered or threatened species or its critical habitat.

☐ Yes or ☒ No

If Yes, your project requires an additional review and approval by the DEM. In order to begin this process, the Stormwater Management Plan must include a specific request for NHA review and approval of the proposed project.

☐ Description of potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharges from the site, such as exposed, unstabilized soil stockpiles.

☐ Existing data on the quality of any known discharges from the site if available.

☐ List of sources of allowable non-stormwater discharges, as described in Part I.B.2 of the 2008 RIPDES Construction General Permit (except flows from fire fighting activities). If allowable non-stormwater discharges are occurring at the site, then the SWPPP shall identify how such discharges shall be visually observed and recorded in accordance with the weekly inspection procedures contained in the 2008 RIPDES Construction General Permit.

■ Description of how wastes generated at the site will be disposed of in a manner consistent with State Law and/or regulations.

■ Spill Prevention and Response Procedure which meets the following minimum requirements: Areas where potential spills can occur, and their accompanying drainage points, shall be identified clearly in the Stormwater Pollution Prevention Plan (SWPPP). The potential for spills to enter the stormwater drainage system shall be eliminated wherever feasible. Where appropriate, specific material handling procedures, storage requirements, and procedures for cleaning up spills shall be identified in the SWPPP and made available to the appropriate personnel. The necessary equipment to implement a cleanup must also be made available to personnel.

■ Description of how construction waste is managed and properly disposed of at the end of each working day and how the operator will minimize the exposure of construction debris to precipitation, including, but not limited to, insulation, wiring, paints and paint cans, solvents, wall board, etc.

■ Graveled access entrance and exit drives and parking areas to reduce the tracking of sediment onto public and private roads in accordance with the Rhode Island Soil Erosion and Sediment Control Handbook, as amended.

■ Appropriate vegetative practices on all disturbed areas as soon as possible,

but not more than fourteen (14) days after the construction activity in that area has temporarily or permanently ceased, unless the activity is to resume within twenty one (21) days.

☒ Provisions for all stormwater control measures, disturbed areas, areas used for the storage of materials that are exposed to precipitation (including unstabilized soil stockpiles), discharge locations, and locations where vehicles enter or exit the site to be inspected by or under the supervision of the applicant at least once every seven (7) calendar days and within twenty-four (24) hours after any storm event which generates at least 0.25 inches of rainfall per twenty four (24) hour period and/or after a significant amount of runoff.

☒ Procedures for maintaining inspection reports which summarize the inspection and corrective actions taken in accordance with Part II.B and C of the 2008 RIPDES Construction General Permit. These inspection reports and associated records must be retained for five (5) years from the date that the site has undergone final stabilization.

A.4 OPERATION & MAINTENANCE AND POLLUTION PREVENTION PLANS

☒ **Minimum Standard 7: Pollution Prevention**

Demonstrate that the project meets the criteria for pollution prevention. Include:

☒ Appendix G Pollution Prevention and Source Controls

☐ If applicable, a RIPDES Industrial Stormwater Pollution Prevention Plan as required by the Multi-Sector General Permit for Stormwater Discharge Associated with Industrial Activity.

☒ **Minimum Standard 11: Stormwater Management System Operation and Maintenance (O&M) See Appendix E for guidance**

Provide a stormwater management system operation and maintenance plan that at a minimum includes:

☒ Name, address, and phone number of responsible parties for maintenance

☐ 8-1/2 X 11 inch plan depicting the locations of all BMPs requiring O&M as numbered in Table A.2-1.

☒ Description of annual maintenance tasks

☐ Description of applicable easements

☒ Description of funding source

☒ Minimum vegetative cover requirements

☒ Access and safety issues