EXHIBIT 12

Analysis of Environmental Impacts
Pursuant to the
State Environmental Quality Review Act

Project Name:
Project Olive Proposed E-Commerce Distribution Facility
2780 Long Road
Town of Grand Island, New York

Dated:
February 21, 2020

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Project Olive Proposed E-Commerce Distribution Facility

TC Buffalo Development Associates, LLC ("TC Buffalo") is proposing development of approximately 145.4 acres of land located at 2780 Long Road ("Site") in the Town of Grand Island ("Town"), New York, for use as an e-commerce storage and distribution center for consumer goods ("Facility") by a single prospective entity ("Project"). Under the Town of Grand Island Zoning Code ("Code"), the Site is located in the M-1 Light Industrial and Research District ("M-1") which authorizes the proposed use as a permitted use. TC Buffalo is requesting that the Town Board designate the Site as Planned Development District ("PDD") under the Code (the "Application"). The Site is currently owned by Grand Island Commerce Center Joint Venture ("Owner") which has authorized TC Buffalo to file the Application. The Owner also owns approximately 62.1 acres of land adjacent to the western boundary of the Site ("West Parcel"). The West Parcel is zoned R-1A Low Density Single Family Residential. No development is proposed in the West Parcel and the West Parcel is not part of the Application. The Application involves approval of a development concept plan and a detailed plan, which incorporates site plan approval, as necessary, to designate the Site as a PDD.

Under the New York State Environmental Quality Review Act ("SEQRA"), prior to an agency undertaking or approving a project, it must consider the potential environmental impacts of a proposed project. As such, the Town Board cannot act on the Application until a SEQRA process has been completed.

An evaluation of the potential environmental impacts associated with the construction and operation of the Project is provided herein. The purpose of this analysis is to provide the Town Board, interested and involved agencies, stakeholders, and the public with a clear understanding of the areas of potential environmental concern arising out of the Project, and the likelihood of severity of potential impacts associated with such areas of concern. The following Exhibits are annexed hereto and made part hereof:

Exhibit A: **Geotechnical Engineering Study Report**
Exhibit B: **SWPPP**
Exhibit C: **Wetlands/Waters Impact Assessment**
Exhibit D: **Threatened and Endangered Species Assessment**
Exhibit E: **Visual Analysis Report**
Exhibit F: **Cultural Resources Assessment**
Exhibit G: **Traffic Impact Study**
Exhibit H: **Water Distribution System Engineer's Report**
Exhibit I: **Sanitary Sewer System and Pump Station Engineer's Report**
Exhibit J: **Energy Conservation Assessment**
Exhibit K: **Evaluation of Site Sound Emissions Report**
Exhibit L: **Public Service Impact Assessment**

PROJECT DETAILS

Project Background

The Facility will be occupied and operated by a single prospective entity to address growing demand for warehouse distribution facilities throughout the United States. The Facility will operate as a fulfillment center, receiving in-bound bulk shipments of products from various vendors, suppliers and sellers, and then packaging and shipping these items to last-mile facilities, for ultimate delivery to the end users.

The Facility is proposing to bring at least 1,000 new full-time jobs, typically in two shifts. The Facility has a footprint of approximately 823,522 square feet ("SF"), and will consist of five stories, for a total floor area of approximately

3,783,124 SF. Proposed accessory features at the Site include two guard buildings, 1,855 car parking spaces, 16 motorcycle parking spaces, 219 trailer parking spaces, 69 loading docks, one pump station maintenance space, water tank, stormwater management basins and improvements, accessory site driveways, lighting, landscaping, signage, and other related improvements as demonstrated in the attached Site Plans.

The vast majority of on-Site activities will take place within the Facility, in a secured environment that is not open to the public. The Facility will operate 24 hours, 7 days a week, 365 days per year and is expected to be fully operational in approximately 18 to 24 months from the start of construction. The Facility will also employ additional seasonal workers in the fourth quarter annually, and will create at least 300 construction jobs.

Project Location & Setting

Site Description

The Site is located on Long Road, immediately west of Interstate Route 190 ("I-190") and adjacent to southbound Exit 20B. The Site is bound to the north by Long Road, five single-family residences in the R1A zone (fronting on Long Road), a commercial property and the I-190 entrance and exit ramps followed by commercial and industrial properties; to the east by I-190 followed by commercial and industrial properties; to the south by commercial and residential properties fronting on Bedell Road with undeveloped wooded land beyond; and to the west by wooded lands and the West Parcel followed by single-family residences (approximately ¼ to ½ miles away) fronting on Sunset Drive and West River Road. Beyond West River Road is the Niagara River. The Site is located approximately 2.5 miles northwest of the center of Grand Island, approximately 2.5 miles south of the City of Niagara Falls and approximately 10 miles north of Buffalo. Niagara Falls International Airport is located approximately 6 miles northeast of the Site. According to Town and County tax records, the Site property class is "Vacant Industrial."

The Site is currently undeveloped and primarily consists of forested land, grassland and wetlands. The northern portion of the Site is primarily grassland and wetlands; the southern portion of the Site is primarily forested land. According to historic records, the Site appears to have been used for agricultural purposes prior to the early 1960s. The Site appears to have remained undeveloped ever since with the exception of apparent earth work in the northwestern portion of the Site, and a historical pond in the northern portion of the Site that was filled in the early 1970s.

Environmental Conditions

The Site contains several forested wetlands, isolated wetlands, and emergent wetlands. The majority of wetlands appear to have formed within depressions or may have been modified when the Site was agricultural fields from the 1950s to the 1970s. The on-Site wetlands are both regulated and non-regulated wetlands. In addition, three waterbodies were identified on the Site. One ditch flows through the central part of the Site, one ditch flows along Long Road, and the last ditch flows through the southern part of the Site near Bedell Road. The ditches join together and flow north along Long Road to the Niagara River.

Based on a response from the New York State Department of Environmental Conservation ("NYSDEC") Natural Heritage Program ("NHP"), there are records of rare or state-listed animals, plants or significant natural communities in the Site's vicinity (Blacknose Shiners, Northern Long-eared Bat, Short-eared owl, and Silver Maple-ash Swamp). While the Northern Long-eared Bat was identified, there are no known occurrences on, or within proximity to, the Site. The Project will not result in the removal of any trees that would constitute a prohibited taking. Additionally, there are no Critical Environmental Areas, or unique geological features noted on the Site, and the Site soils generally consists of silt and clay with varying amounts of fine to medium sand.

TC Buffalo and its representatives have reached out and continue to engage in communications with the NYSDEC, USACE, NHP, National Grid, National Fuel and local officials regarding the Project. TC Buffalo and its representatives will continue this outreach as the Project moves through the zoning and approval process with the Town, and the permitting process with the requisite agencies.

Project Purpose, Public Need & Benefit

The Project is consistent with many goals and objectives identified in *Bridging the Future: Town of Grand Island 2018 Comprehensive Plan* (the "Comprehensive Plan"). As stated in the Comprehensive Plan, the Town's Economic Development goal is to "[m]aintain a strong and diverse economy that capitalizes on the existing assets of the community, provides a business environment that retains and attracts new ventures, and complements the "Island character" that is unique to Grand Island." Comprehensive Plan, p. 37. Specifically, the Comprehensive Plan identifies uses in M1 that are non-polluting, light industrial in nature, such as the Facility, and are in close proximity to or along the thruway where sewer is available. Comprehensive Plan, p. 27.

The Project will result in exactly the kind of redevelopment envisioned by the Comprehensive Plan, and is proposed to be located along the Thruway in an area with existing sewer capacity. The Project will make productive economic use of currently vacant property, resulting in substantial tax revenues generated for the Town, with limited demands upon Town services. A significant number of new jobs will be created, both for construction and related to the operation of the Facility. The Site is ideally located with convenient access between I-190 and the regional highway network leading to Buffalo and other Erie County communities to the south and Niagara Falls/Niagara County to the north.

In addition there is available sewer and water service, and the proposed Site avoids conflicts with incompatible uses based on the size of the Site, the location of the Facility on the Site, and the limited development surrounding in the immediate vicinity of the Site. The long-term impact, in addition to job creation, would also include some likely additional economic activity generated on Grand Island and beyond. All of these factors contribute to developing a balanced and vibrant economy consistent with the goals and objectives of the Comprehensive Plan.

Proposed PDD Designation

The Project is proposed to be designated PDD. As noted in Chapter 407-120.B of the Code, the PDD procedures are "intended to substitute procedural protections for substantive regulations in recognition of the fact that traditional density, bulk, spacing and use regulations, which may be useful in protecting the character of substantially developed and stable areas, may impose inappropriate preregulations and rigidities upon development or redevelopment of parcels or areas which lend themselves to an individual, planned approach."

Applying the PDD zoning will facilitate the development of a modern storage distribution center at a location with convenient access to I-190 and available utilities. Designating the Site as PDD is vital to the Project because the M1 zoning bulk regulations do not address the unique nature of the Site and the Facility. While the Site is approximately 145 acres, the irregular shape does not provide sufficient lot width and frontage near Long Road and Bedell Road. The M1 district maximum building height limit does not permit the development of modern warehouse distribution facilities, which require higher interior clearances for efficient operations to address the growing demands of e-commerce. Although the Project requests a PDD designation, the Project is consistent with the past and present permitted uses at the Site and the economic development goals outlined in the Comprehensive Plan.

ANALYSIS OF ENVIRONMENTAL IMPACTS

For the convenience of the Lead Agency and interested and involved agencies, this analysis is organized based on Part 2 of the Full Environmental Assessment Form (Full EAF).

A. Impact on Land

1. Physical Resources: The Project will involve construction on, and physical alteration of, the land surface of the Site, and the addition of impervious surfaces on the Site. All work will be completed in conformance with applicable State and local regulations.

   The Project will not involve construction on land where the depth to water table is less than three feet. A Draft Preliminary Geotechnical Engineering Study Report (the "GeoTech Report") was prepared for the Project and is annexed hereto as **Exhibit A**. As shown in the GeoTech Report, groundwater levels recorded were approximately 21 to 22 feet below grade. The Site has no slopes of 15 percent or greater. Depth to bedrock ranges from approximately 30 to 57.5 feet below grade. There is grading and excavation work related to Site preparation, building foundations, parking areas, stormwater management features, and installation of utilities. However, all excavated material will remain on Site. Except for this grading and excavation work, the slope of the land will not be significantly altered by the Project.

   Project construction does not involve multiple phases and is expected to be completed in approximately 18 to 24 months. While construction will take more than one year, the Site predominantly adjoins other commercial and industrial sites, the I-190 and the West Parcel. In addition, activity will be intermittent with planned winter shutdowns to mitigate construction impacts to the nearby residential neighbors. Moreover, given the size of the Site and location of the disturbance on the Site, the impacts to nearby residential neighbors from construction activities will be limited.

   In addition, the construction of the Project will have impacts from sound. As such, an Evaluation of Site Sound Emissions Report (the "Sound Report") was prepared for the Project, a copy of which is annexed hereto as **Exhibit K**. Although construction conditions are temporary in nature, the Town prohibits operation of heavy equipment outside the hours of 0700-1900 Monday to Saturday. While the construction of the Project will conform to these requirements, earth moving equipment used during the civil construction phase of the Project can be close to nearby residential receptors. Construction equipment, such as bulldozers, front end loaders, and dump trucks, can typically produce maximum sound levels of 80 dB(A) at 50 feet. The Town and State provide sound limits for transient sources, but do so relative to the noise source, not the receptor. As a result, appropriate project criteria at nearby residential receptors were established for personnel vehicles and heavy trucks during the nighttime hours. At northern noise-sensitive receptors, Site sound should not exceed 55 dB(A); Site sound should not exceed 50 dB(A) at the western and southern noise-sensitive receptors.

   To minimize receptor exposure to construction noise during construction, the Sound Report recommends (1) limiting all heavy equipment operation to non-noise-sensitive daytime hours and follow town construction hours, (2) where possible, limit the number of equipment operating near one receptor at a given time. Avoid exposing any one receptor to high sound levels for an extended period of time (3) place stationary equipment, such as generators, compressors, and office trailers, away from noise-sensitive receptors, and (4) avoid having construction parking or laydown areas near noise-sensitive receptors. In addition, the Sound Report recommends construction of a sound barrier along the northern driveway of the Site carried to a height of 16 feet above grade. Accordingly, based on the above, and with the proposed mitigation measures, the Project will not have any significant adverse impacts from construction activities.

The Project will not result in increased erosion. A Stormwater Pollution Prevention Plan ("SWPPP") has been prepared for the Project. **See Exhibit B**. As shown in the SWPPP, temporary erosion and sediment control measures will be used during construction and permanent erosion and sediment control measures will be used after construction. Before construction, a stabilized construction access shall be installed to reduce the tracking of sediment onto adjacent roadways. The erosion control, sediment control, pollution-prevention, and stormwater management measures to be implemented during construction will minimize soil erosion and control sediment transport off-Site, and after construction will control the water quality and quantity of stormwater runoff.

Thus, while the Site has a high potential for turbid runoff due to high clay content, construction activities present the possibility of silt laden runoff entering streams due to storm events, a State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity (GP-0-10-001) will be obtained and, as shown in the SWPPP, permanent and temporary stormwater control measures will be used to minimize runoff during construction and operation of the Project. **See Exhibit B**. Soil and erosion control measures will be implemented so there are no inappropriate discharges of contaminants to surface waters during construction. As indicated in the SWPPP, the overall comparison of the pre- and post-development stormwater runoff peak discharge rates demonstrates no significant adverse impacts to the design points analyzed. **See Exhibit B**. The Site is not located in a Coastal Erosion hazard area.

Accordingly, the Project will not have any significant adverse impacts to the physical resources of the land.

2. <u>Land Use and Zoning</u>: The Project will result in a new e-commerce distribution Facility on vacant land that has been zoned for light industrial uses that are non-polluting. The Site was the subject of an Environmental Impact Statement ("EIS") approved in 1991 by the Town Board that involved the development of the Site into a light industrial/office park complex. Public improvements were proposed to be installed to service the Site and a sanitary sewer district was to be created as part of the proposed action.
   As discussed above, while the Project involves a request to designate the Site PDD, the Code authorizes the Facility as a permitted use and the Project is consistent with the economic development goals outlined in the Comprehensive Plan. In addition, the Site is consistent with the character of the surrounding uses, which includes the I-190 and a mix of commercial and industrial uses to the north, east and south. The Site is also adjacent to the West Parcel, which will remain in its current state and will act as a buffer area for other existing residential development in the area.

   In the Comprehensive Plan, the Town describes its vision for the Town's future:

   > "Grand Island is the "heart of the Niagara"–a unique community unlike any other in western New York combining a relaxed, island lifestyle with small town living. We will capitalize on our natural assets; enhance our Town Center; and create opportunities for growth to sustain our community for the future while striving for harmony between the natural environment, development, and our heritage."

   This vision is a distillation of various community values that provide a framework for the Town's future and animate its goals. Specifically, the Comprehensive Plan identifies five goals that "provide more specific direction, a foundation for future actions, and act as a benchmark for measuring success." The Town's five goals are: (1) natural resources; (2) economic development; (3) transportation and accessibility; (4) community and social capital; and (5) neighborhoods and housing.

1. Natural Resources - The Comprehensive Plan states that this goal is to "[s]upport the preservation of Grand Island's many natural resources due to their contribution to the overall character of the Island as well as the numerous economic opportunities they can provide." In furtherance of this goal, the Comprehensive Plan

identifies a number of objectives, including, among other things, the protection of waterbodies and watercourses, and promoting "efforts that recognize the importance of environmental sustainability," "[e]ncourage renewable energy systems," and "[p]romote the use of energy-efficient systems, materials, and equipment."

While the Project will result in impacts to wetlands and watercourses on the Site, disturbance of these critical areas will be conducted in accordance with the permitting requirements of USACE and NYSDEC and, as such, disturbance of these wetland areas will be mitigated in accordance with state and federal law. Additionally, the Project provides for 25 acres of open space on the Site and will leave the 62.1 acre West Parcel undisturbed. This open space, as well as the area that will remain in its naturalized state and will continue to provide wildlife habitat for area species. Furthermore, the Project incorporates a number of sustainability measures into its design, both inside and outside the facility, including a variety of landscaping that not only serve an aesthetic purpose on the Site and replace the trees that will be lost during construction, but also serve a carbon sequestration function.

2. Economic Development - The Comprehensive Plan states that this goal is to "[m]aintain a strong and diverse economy that capitalizes on the existing assets of the community (built and natural), provides a business environment that retains and attracts new ventures, and complements the 'Island Character' that is unique to Grand Island." In furtherance of this goal, the Comprehensive Plan encourages the Town to "[e]nsure that zoning districts are appropriately sized and their intent provides the direction for the desired development." As relevant to this objective, the PDD designation requested by TC Buffalo enables unique development in an area identified by the Town as a key location for development. According to the Comprehensive Plan, the industrial area on Long Road is ideal for expansion of existing uses, "infill development and clustering of buildings in a park setting."

   In fact, the Comprehensive Plan even provides a conceptual rendering of the Site, showing a large, six-building development with some landscaping. The Project differs somewhat from the conceptual rendering created by the Town in that it proposes fewer structures, but is otherwise consistent with the Town's goals for the Site as it leaves a multitude of open space on and near the Site and features generous landscaping features, making the Project surroundings parklike, as desired by the Town.

3. Transportation and Accessibility - Provide a safe and reliable multi-modal transportation system that balances the movement of people and goods through and within Grand Island, seeks to minimize congestion, supports economic development, and is visually engaging to users. The objectives identified by the Town that serve this goal are chiefly focused on ensuring continued walkability in the Town and making multi-modal transportation safe and feasible throughout the Town. The Project serves these objectives by providing an expansive network of sidewalks around the Facility, making it safe for workers to circulate on the Site. Additionally, the Project facilitates multi-modal transportation by providing bike racks on the Site and designating drop off points for public transportation and carpooling. Moreover, these aspects of the facility are well-designed, incorporating evergreen screening and other landscaping features to make these features aesthetically pleasing and inviting for users and visitors to the Site. See **Exhibit 1.**

4. Community and Social Capital - Provide facilities and services that meet the physical, social, and cultural needs of Grand Island residents, build community, and provides an attractive and inviting environment for current and future residents. In furtherance of this goal, the Comprehensive Plan states that one of its objectives is to "[s]eek opportunities for expanding and improving upon available recreational resources in the Town . . . ." The Site is currently a vacant, wooded area of land and, in this regard, serves as a visual resource in the Town. Although the Project will result in development of the Site, roughly 25 acres of the Site will be left as open space, so that employees and other visitors to the Site can continue to enjoy views and green space on the Site.

Moreover, the neighboring West Parcel will remain undeveloped and in its naturalized state, such that the West Parcel will continue to serve as a visual resource in the area.

5. Neighborhoods and Housing - Grand Island supports residential growth that provides a variety of housing choices, styles and types while continuing to maintain the unique "Island character," especially within existing neighborhoods and "urban villages." Encouraging housing that is well-designed, affordable, and multi-generational helps ensure the possibilities for potential homeowners to live in Grand Island. In furtherance of this goal, the Project identifies a number of objectives targeted at residential development projects. As a warehouse and distribution facility, the Project has no direct impact on these objectives. Nevertheless, the Project may tangentially impact the Town's housing goals by providing economic stimulus and jobs, enabling more Town residents to enter the housing market.

Much more detail regarding consistency with the Comprehensive Plan is provided in the letter of intent for the Application. Accordingly, the Project will not have any significant adverse impacts on land use and zoning.

B. Impact on Geological Features

The Site is undeveloped and has no unusual or unique land forms, such as cliffs, dunes, minerals, fossils or caves, that may be modified or face destruction. There are no National Natural Landmarks at or near the Site. Accordingly, the Project will not have any significant adverse impact upon geological features.

C. Impact on Water

There will be impacts to wetlands and surface waters at the Site. The Project will result in new impervious surfaces that require stormwater management systems to handle stormwater flows and provide proper management of on-Site stormwater.

The Wetlands/Waters Impact Assessment is annexed hereto as **Exhibit C**. A Wetland Delineation Report dated August 27, 2019 (the "Wetland Report") was completed for the Site by Wilson Environmental Technologies, Inc. ("WET") on behalf of the Owner, a copy of which is annexed to **Exhibit C**. The Wetland Report was prepared in accordance with federal delineation methodology outlined under the U.S. Army Corps of Engineers (USACE) Wetlands Delineation Manual and Northcentral and Northeast Regional Supplement. The Wetland Report is based on an evaluation of the Site during several weeks in July and August of 2019.

Two jurisdictional watercourses/drainage ditches and eleven wetlands are present on the Site. See **Exhibit E** at Figure 1. The first ditch bisects the Site from north to south and the second ditch is located in the southeastern corner of the Site. On-Site wetlands generally consist of scrub-shrub and emergency wetlands and the regulated wetland areas within the Site total approximately 5.07 acres.

Based on recent discussions with the USACE, seven of the eleven wetlands (Wetlands J, L, N, P, Q, R and T), totaling approximately 4.56 acres, are subject to regulation by the USACE. In addition, two of the ditches — the ditch that bisects the Site from north to south (approximately 3,200 linear feet) and the ditch located in the southeastern corner of the Site (approximately 475 linear feet) are subject to regulation by the USACE. A regulatory jurisdiction confirming the wetlands and water boundaries is forthcoming.

Based on the recent issuance of a NYSDEC Wetland Delineation Verification dated January 23, 2020, six of the eleven wetlands (Wetlands M, R, S, T, U and V), totaling approximately 1.0 acres, are subject to regulation by the

NYSDEC. NYSDEC freshwater wetlands contain a 100-foot regulated adjacent area (buffer). None of the NYSDEC jurisdictional wetlands, nor any of their 100-foot buffer, will be disturbed by the Project. The watercourses/drainage ditches are not identified by the NYSDEC and, based on feedback by the NYSDEC, are not considered protected streams under the NYSDEC's Protection of Waters Program.

In addition, the two USACE watercourses/drainage ditches have also been designated by the Town as a "Feeder Creek" (3,200 linear feet) and a "Collector Creek" (475 linear feet).

The Project will result in limited impacts to wetlands/waters (approximately 0.79 acres) for the construction of parking areas, access roads, part of the Facility, and stormwater basins. The Project will impact approximately 0.416 acres of Wetland J, approximately 0.232 acres of Wetland L, approximately 0.118 acres of Wetland Q, and approximately 0.023 acres of a portion of the Collector Creek. Wetland L consists of an emergent wetland located along Bedell Road, and Wetlands J and Q comprise small, depressional wetlands characterized by scrub-shrub vegetation and located on the interior of the Site. The Project will also require relocation of the Feeder Creek to the western portion of the Site.

The Collector Creek road crossing has been designed and will be constructed to maintain low flow and potential aquatic life movement and will also be sized/designed to provide adequate capacity and stability for various flood flows. The Feeder Creek will be relocated to the western portion of the Site and has been designed with a similar length and longitudinal slope as the current feature to maintain similar stream flow. Based on a hydraulic and hydrologic analysis, the relocation will not adversely impact flood conditions. Rather, as designed, additional flood storage will be provided along the stream corridor through the creation of adjacent floodplain wetlands and oversized stormwater basins that will provide additional flood storage under certain conditions.

Additionally, as shown in Exhibit B, appropriate stormwater management measures have been designed to avoid potential degradation of on-Site and downstream surface waters. Accordingly, based on the low value of most on-Site wetlands, the limited area of wetlands/waters impacts, and incorporated design elements, the Project will not have any significant adverse impacts on wetlands/waters.

Furthermore, based on a joint preapplication meeting with USACE and NYSDEC, and as required by the USACE, compensatory wetland mitigation for the Project is anticipated to be satisfied through the purchase of 1.58 wetland mitigation credits from the Ducks Unlimited — Niagara River In-Lieu Fee Program. Moreover, for the purpose of USACE regulation, the stream relocation will be considered in-kind mitigation that will be supplemented by the creation of new floodplain wetlands immediately adjacent. A wetlands/waters mitigation proposal and design will be submitted to the USACE/NYSDEC as part of a joint permit application. Finally, TC Buffalo will continue to work with the USACE and the NYSDEC and will comply with all applicable state and federal requirements.

Accordingly, based on the low value of most on-Site wetlands, the limited area of wetlands/waters impacts, the incorporated design elements, and the proposed mitigation measures, the Project will not have any significant adverse impacts on wetlands/waters.

As discussed above, construction activities present the possibility of silt laden runoff entering streams due to storm events. A SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-10-001) and a SWPPP are required. A five-acre waiver for site disturbance activity is also being requested because the Project is in a municipal separate storm sewer system (MS4). The SWPPP includes permanent and temporary stormwater control measures to minimize runoff during construction and operation of the Project. **See Exhibit B**. Soil and erosion control measures will be implemented so there are no inappropriate discharges of contaminants to surface waters during construction.

As indicated in the SWPPP, the overall comparison of the pre- and post-development stormwater runoff peak discharge rates demonstrates no significant adverse impacts to the design points analyzed. **See Exhibit B**. In addition, the erosion control, sediment control, pollution-prevention, and stormwater management measures to be implemented during construction will minimize soil erosion and control sediment transport off-Site, and after construction will control the water quality and quantity of stormwater runoff.

Overall, the development of the Project will have minor impacts on wetlands and surface waters. Based on the low value of most on-Site wetlands, the limited area of wetlands/waters impacts, the incorporated design elements, and the proposed mitigation measures, the Project will not have any significant adverse impacts on wetlands/waters.

D. Impact on Groundwater

The Project will not affect groundwater. Water to the Facility will be supplied by the Town of Grand Island Water Department. The sanitary sewer system is designed to collect the wastewater generated from the proposed development and convey it by gravity to the existing on-Site pump station. The pump station will pump the wastewater south to Bedell Road and ultimately into the 30-inch diameter interceptor sewer. All sanitary flows will be domestic in nature and void of any industrial solid, hazardous, or toxic waste contamination.

While water and sewer lines will need to be extended to the Site, there is available water and sewer capacity to address the demands of the Project. No bulk storage of petroleum or chemical products over ground water or an aquifer is proposed. The Project does not involved the commercial application of pesticides within 100 feet of potable drinking water or irrigation sources. Accordingly, the Project will not have any significant adverse impact on ground water.

E. Impact on Flooding

The Site is not located in a designated floodway, 100-year floodplain or 500-year floodplain. Stormwater generated from the impervious surface associated with the Project will be handled on-Site in accordance with its SWPPP. There are no dams located on the Site. Accordingly, the Project will not have any significant adverse impacts on flooding or flooding conditions.

F. Impact on Air

The Project does not entail the types of activities or operations that require TC Buffalo to acquire air registration permits or that are associated with a significant potential for air emissions. Any impacts to air quality from construction activities will be minor, and temporary in nature. Regular operation of the Project will have a minimal impact on air quality. The primary energy source for heating the warehouse is natural gas and back-up generators are subject to NYSDEC regulations, specifically 6 NYCRR Part 222. Vehicles associated with the Project will not be permitted to idle excessively, and will comply with NYSDEC regulations regarding heavy duty vehicle idling, specifically 6 NYCRR Part 217-3.

Accordingly, the Project will not have any significant adverse impacts on air quality.

G. Impact on Plants and Animals

A Threatened and Endangered Species Assessment ("T&E Report") was prepared for the Project, which is annexed hereto as **Exhibit D**. Based on a response from the NYSDEC Natural Heritage Program (NHP) (**see Exhibit D**), there are records of three rare or state-listed animals, plants or significant natural communities in the vicinity of the Site - the Blacknose Shiner, the Silver Maple-Ash Swamp and the Short-eared Owl. A Blacknose Shiner (*Notropis* *heterolepis*) is documented in a nearby stretch of the Niagara River. While it is unlisted by the state; it is rare in New York and is of conservation concern. A Silver Maple-Ash Swamp is documented within 0.35 miles north of the Site in Buckhorn Island State Park. Lastly, the short-eared owl (*Asio flammeus*) is a state endangered species and was last observed in the area in 1979. In addition, an official species list was generated for the Site in November 2019 using the U.S. Fish and Wildlife Service ("USFWS") Information for Planning and Consultation tool. **See Exhibit D**. The official species list identifies the Northern Long-eared Bat (*Myotis septentrionalis*) as a species that should be considered in a review the Project.

Based on the T&E Report, it does not appear that the Site is used as habitat by any of the threatened and endangered species of concern. Based on the T&E Report:

1. Blacknose Shiners: Blacknose Shiners are typically found in creeks, small rivers and ponds with submerged aquatic vegetation. According to the NHP, Blacknose Shiners have been documented within the nearby Niagara River. While the Feeder Creek on-Site drains to the Niagara River, it is separated by a series of roadside ditches that do not provide consistent water levels or habitat to support this population. As such, it is unlikely this species is present on-Site.
2. Short-eared Owl: Short-eared owls prefer expansive, open areas such as grasslands and marshes. According to the NHP, the Short-eared owl was documented in the vicinity of the Site as late as 1979 and there is uncertainty regarding its continued presence and the NHP recommends field surveys to the Site include a search for this species, particularly at sites that are undeveloped and may still contain suitable habitat. Although the Site historically afforded large areas of open space that may have been considered suitable habitat, the Site is currently dominated by scrub-shrub, successional stage and mature wooded areas that are not conducive to Short-eared owl habitats. Only the northern portion of the Site has limited grassy, open areas, and this portion of the Site has been subject to land disturbance for construction of an 8-inch diameter sanitary sewer force main, several manholes associated with the line, and a concrete vault associated with the sanitary sewer. Based on the limited size of open vegetated areas coupled with its proximity to adjacent commercial and residential development and roadways, the Site does not appear to provide a significant amount of desirable habitat for the Short-eared Owl. As a result, the Project is not expected to impact the Short-eared Owl.
3. Silver Maple—Ash Swamp: According to the NHP, the Silver Maple-Ash Swam is documented within 0.35 miles north of the Site, in Buckhorn Island State Park. The Swamp is a moderately large, mature hardwood swamp in a protected, 450 acre natural area. Based on the distance between the Site and this community, the Project is not expected to impact the Silver Maple-ash Swamp.
4. Northern Long-eared Bat (NLEB): While the NLEB is considered a threatened species by the USFWS, there are no critical habitats within the Site or the West Parcel. Additionally, pursuant to the federal 4(d) rule under the Endangered Species Act, since the Project is not expected to remove any known, occupied maternity roost trees, any trees within 150 feet of a known occupied maternity roost tree or any trees within 0.25 miles of a NLEB hibernaculum, the Project will not result in a prohibited taking of the NLEB.

Additionally, because the Site is currently undeveloped and primarily consists of forested land, grassland and wetlands, the Project will displace on-Site animal and plant populations. However, the Project will not fragment significant habitats, and there are no known critical areas, critical vegetation known for creating important fish breeding sites, or critical features on the Site. Moreover, the West Parcel will remain in its current state providing habitat for any impacted plants or animals.

Accordingly, the Project will not have any significant adverse impact on plants and animals.

H. Impact on Agricultural Resources

The Site has not been used for agriculture, is not considered prime farmland, and is not located in a NYS certified Agricultural District. Accordingly, the Project will not have any significant adverse impact on agriculture or agricultural uses.

I. Impact on Aesthetic Resources

As defined by NYSDEC Program Policy (DEP-00-2 / Assessing and Mitigating Visual and Aesthetic Impacts, latest date revised December 13, 2019), an "aesthetic impact" is "the consequence of a visual impact on the public's use and enjoyment of the appearance or qualities of a listed resource". Visual impact is not determined by whether a specific structure can be seen. It is based on the context in which new structures or elements are located and viewed, the degree to which they are visible, and how they blend in with the landscape. Based on the size and height of the building, and because the Site is located within five miles of an officially designated and public accessible Federal, State, or local scenic and aesthetic resource, a detailed Visual Assessment of the Site from various viewpoints in the surrounding area was conducted to evaluate any potential aesthetic impacts resulting from the Project. A copy of the Visual Assessment is annexed hereto as **Exhibit E.** These viewpoints include various locations in the Town of Grand Island, and views from aesthetic resources such as State and local parks and scenic byways.

As demonstrated in the Visual Assessment, despite the scale of the Facility, the Facility is generally not visible from surrounding areas and most of the visual impact will be along the NYS Thruway where visual sensitivity is lowest. Across the Niagara River to the north are several resources, including Niagara Falls State Park, scenic view along Niagara State Parkway, and the Great Lakes Seaway Trail. The proposed Facility will not be seen from those areas. The Facility will also not be seen from residential neighborhoods in the vicinity of the Site. While the Facility has a proposed footprint of approximately 822,522 SF and a proposed height of 98.23 feet, due to the Facility location on the Site, the size of the overall Site where the Facility will be developed, setbacks from surrounding lot lines, the distance from surrounding development, and screening provided by existing wooded area, such that there are no significant adverse impacts to the surrounding community. In addition, the proposed extensive landscaping provides aesthetic benefits to surrounding areas.

Any potential adverse aesthetic impacts from the Project have been sufficiently mitigated, and the Project will not have significant adverse impact on views from various viewpoints in Grand Island and the surrounding area, including residential areas and State and local aesthetic resources such as parks, parkways, and scenic byways. Accordingly, the Project will not have significant adverse impact on aesthetic resources.

J. Impact on Historic and Archaeological Resources

Background research conducted for the Site revealed that there are seven known archaeological sites have been identified within a one-mile radius of the archaeological-APE (the Site) listed on the OPRHP Cultural Resource Information System (CRIS). All seven sites are prehistoric, and one is located within the current archaeological-APE. In addition, 12 previous archaeological surveys have been performed within one mile of the archaeological-APE. All of the Phase IA (and IA/IB) surveys reviewed concluded that there was potential for prehistoric archaeological sites. As such, a Phase 1A Archeological Resources Survey ("Phase 1A") was prepared for the Project, which is annexed hereto as **Exhibit F**.

In order to ensure that the Project will not adversely impact archeological resources, a Phase IB Subsurface testing will be completed to determine the absence or presence of prehistoric archaeological materials. The Phase IB subsurface testing will be conducted in areas of the archaeological-APE where soil disturbance is anticipated. A plan for the subsurface testing is included in **Exhibit F** for OPRHP review and approval prior to subsurface testing. Should any archeological resources be present in the area of disturbance, an appropriate mitigation plan will be undertaken in coordination with OPRHP.

While there are several historic properties and districts in the vicinity of the Site, the New York State Office of Parks, Recreation and Historic Preservation ("OPRHP") has confirmed there are no historic resources located on the Site. There are seven historic properties and two historic districts within a one-mile radius of the Site. Of the seven historic properties, six are listed as not eligible and one is list as undetermined. Of the two historic districts, one is listed as eligible and the other is listed as undetermined for listing on the State or National Register of Historic Places (NRHP). West of the Site, the West River Parkway along the Niagara River is located approximately 0.5 miles west of the Site and identified as an eligible or undetermined district. The West River Parkway has not been formally designated and is not immediately adjacent to the Site.

Research on the CRIS confirmed that there are also no previously identified historic structures on or adjacent to the Site. An architectural review was conducted to determine whether any of the buildings located within the architectural-APE could be considered eligible for the NRHP. There were no buildings identified 50 years or older that would be impacted by the Project due to screening by trees. Based on the above, the Project will not have any significant adverse impact on cultural resources.

K. Impact on Open Space and Recreation

The Site is not presently used for open space or recreation purposes. The entire Site, and the West Parcel, are privately owned and not available for public use. The closest recreational resource is Buckhorn Island State Park, located approximately 0.35 miles north of the Site and the Project will not have any impacts upon the state park. Visual assessments have confirmed that the Facility will not be visible from the Park. See **Exhibit E**. Accordingly, the Project will not have any significant adverse impacts on open space and recreation.

L. Impact on Critical Environmental Areas (CEA)

There are no designated CEA as described per 6 NYCRR 617.14(g) at the Site or in the area. Accordingly, the Project will not have any significant adverse impacts upon CEA.

M. Impact on Transportation

A Traffic Impact Study ("TIS") was prepared for the Project, which is annexed hereto as **Exhibit G**. On-Site parking will consist of approximately 1,855 car parking spaces, 16 motorcycle parking spaces, 219 trailer parking spaces, and 69 loading docks. There are two proposed access driveways, located as follows:

1. Long Road: providing access to car parking, trailer parking, and the loading docks.
2. Bedell Road: providing access to car parking only.

There are no existing pedestrian or dedicated bicycle facilities in the area. Bicyclists are permitted to share the surrounding roadways and future bicycle routes are planned. Niagara Frontier Transit Authority Metro System (NFTA) Route 40 provides bus service between Buffalo and Niagara Falls with several stops along Grand Island Boulevard near the Site. See Exhibit G.

The Project is anticipated to reach full buildout in approximately two years. To account for normal increases in background traffic growth, including potential development in the study area, a 0.5 percent annual growth rate was applied to existing traffic volumes. The TIS compared the use of transit and carpooling for a typical distribution facility with statistics for Erie County and estimates that nine percent of Project's employees will either carpool or use public transit. In addition, in terms of anticipated levels of traffic, based on Project shift times, peak traffic will occur between 6:30-7:30 AM and 5:30-6:30 PM. For employee vehicles, at full buildout, the Project is anticipated to generate 658 entering and 29 exiting vehicles during AM peak hour, and 582 entering and 592 exiting during PM peak hour. For trucks, at full buildout, the Project is anticipated to generate 10 entering and 10 exiting vehicles during AM peak hour, and 8 entering and 8 exiting during PM peak hour.

Since the most amount of delay to motorists usually occurs at intersections, a capacity analysis of the nearby intersections was conducted. Eight intersections in the surrounding area were studied during weekday commuter AM and PM peak hours while school was in session for Level of Service (LOS) to determine potential delays at intersections. Six of the studied intersections operate at LOS A, B or C, which are acceptable operating conditions. The remaining two studied intersections require improvements. The Project is expected to add traffic both entering and exiting the southbound ramp of I-190 as well as through traffic on Long Road. As a result, the TIS recommends adding a traffic signal at this intersection. The Project is also expected to increase traffic volumes at the northbound ramp of I-190 and Grand Island Boulevard. As a result, the TIS recommends a right turn lane exiting the off-ramp at this intersection.

The TIS concludes that the existing roadway network can accommodated the Project with implementation of the following recommendations:

1. All truck traffic will travel to and from the New York State Thruway via Long Road and I-190.
2. Install a fully actuated three-color traffic signal at the southbound ramp of I-190 and Long Road.
3. Construct a new right turn lane for traffic existing the I-190 northbound ramp at Grand Island Boulevard.
4. Continue discussions with NFTA to provide transit service on-Site.

The TIS also performed a crash investigation at the study area intersections to assess the safety history of those intersections. A total of 52 crashes were documented during the investigation period (3 years) of which, a large portion of the crashes occurred at the signalized intersections of Grand Island Boulevard/Whitehaven Road and Grand Island Boulevard/Baseline Road. Several crashes also occurred at the un-signalized intersection of Grand Island Boulevard/Staley Road. Several of the intersections studied have crash rates that are higher than the state average. Given that several of the intersections have rates that exceed statewide averages, further investigation was performed to identify high incident areas and possible trends/causes of the crashes. The majority of crashes were caused by either driver inattention, following too closely, or slippery pavement. Human error contributing factors were the most prevalent causes of the crashes.

Based upon the crash details at the study intersections, the majority of crashes were rear-end collisions. These types of collisions are more common at traffic signals on high volume roadways. Recommended mitigation countermeasures may include optimizing the change intervals (yellow time) at the traffic signals (to increase the length of time between phase intervals) or improve the visibility of the traffic signals to make drivers more aware of the operating conditions. It should be noted that Grand Island Boulevard / I-190 Off Ramp, Long Road/I-190 Off Ramp, and Grand Island Boulevard/Long Road are un-signalized intersections. In addition, the number and type of crashes documented at these intersections do not indicate the need for signalization as they are not susceptible to correction by a traffic signal.

Consultation with New York State Thruway Authority regarding potential impacts to the Grand Island bridges is ongoing.

Overall, the Project will have impacts on traffic. However with the implementation of appropriate mitigation accessories identified herein, the Project will not have any significant adverse impact on transportation or the surrounding roadway network.

N. Impact on Energy and Utilities

The Project will have minor impacts to energy and utilities.

1. Water: The Project will create a new demand for approximately 45,000 gallons per day (GPD) of water to serve its operations and employees. There are currently existing water lines located along Long Road (12 inch cast iron (CI) on the south side) and Bedell Road (eight inch CI on the north side) that serve the Site. There is sufficient capacity to meet demand without expansion of the water district or extension within the water district. See Water Distribution System Engineer's Report annexed hereto as **Exhibit H**.

2. Sewer: The Project will generate approximately 45,000 GPD of sanitary wastewater. While the Site is located in Sewer District Number 6, it has been part of a private development initiative, along with the neighboring Holiday Inn Express hotel, in which a sewer pump station and forcemain were constructed to serve the Site. The pump station has a design flow of 97,770 GPD, with 22,400 GPD identified for the hotel and therefore has adequate capacity to handle the Project. See Sanitary Sewer System Engineer's Report annexed hereto as **Exhibit I**. In addition, the Grand Island Wastewater Treatment Facility, located in the southeast corner of Buckhorn State Park, discharges effluent, after undergoing advanced secondary treatment and disinfection, to the Niagara River. As such, and as a mitigation measure, the Town has an Inflow & Infiltration contribution program with an offset of 4:1 of the peak flow in gallons per minute (gpm) [16x average daily flow (in gpm)]. TC Buffalo is willing to participate in the Town I&I contribution program, which equates to $50,000 and will be requested by the NYSDEC/ Erie County Department of Health (ECDOH) during their review/approval of the Project and will likely be a condition of the permit.

3. Natural Gas and Electricity: See Energy Conservation Assessment annexed hereto as **Exhibit J**. The primary energy source for heating will be natural gas, which will also be used to operate ventilation and HVAC systems. Electricity will be used to provide lighting and energy for warehouse and accessory office operations. Electric and natural gas service would be extended from the utility lines north and south of the Site. The Project will create a demand for approximately 3350 megawatt hours per year of energy. National Grid services the electricity for the Site and has indicated that there is sufficient capacity to accommodate the Project's energy needs. The Site will not require a new substation or upgrade to an existing substation.

   National Fuel indicated that a summary of all natural gas equipment with Btu requirements specifying process equipment versus heating and cooling equipment, site drawings and specifications, preferred location of outside gas meter at the site and a new service line application will be required together with a review of required permits and rights-of-way to provide a cost for gas service and capacity requirements. The Project will also implement energy conservation measures, such as high-efficiency motors and transformers, LED lighting, motion sensors to avoid lighting areas that are not in use, and use of temperature set points to maximize energy conservation potential. See **Exhibit J**.

Overall, the Project will have minor impacts to energy and utilities. However, based on the above, the Project will not have any significant impact on energy or utilities.

O. Impacts on Noise and Light

1. Noise: An evaluation of Site sound emissions was prepared for the Project, which is annexed hereto as **Exhibit K**. As discussed above, the construction of the Project would bring personnel vehicle and truck activity near noise-sensitive receptors which is a potential acoustical concern. However, at the northern noise-sensitive receptors, Site sound should not exceed 55 dB(A); Site sound should not exceed 50 dB(A) at the western and southern noise-sensitive receptors. To minimize receptor exposure to construction noise during

construction, the Sound Report recommends certain mitigation measures that will further reduce any potential adverse impacts. Since facility operations will be 24/7, the primary concern with sound emissions is minimizing the acoustical impact and meeting appropriate noise goals at night at residences. Site sound will likely be dominated by on-site truck activity. Other activities, such as sound from personnel vehicles, are lower in level, but higher in quantity, and therefore also of concern. The Sound Study analyzes the sound levels contributed by these intermittent noise sources as well as from steady rooftop HVAC equipment. Grand Island limits noise from a facility such as this to 50 dB(A) for steady sources, such as HVAC equipment. The Town and State provide sound limits for transient sources, but do so relative to the noise source, not the receptor. Analyses show that HVAC sound meets the applicable nighttime code limit. Sound from personnel vehicles and heavy trucks will meet the intent of the Project due to distance, site geometry, and proposed sound barriers. Motor vehicle sound is expected to be similar in level to what currently exists, and will have no negative effect on the surroundings. Additionally, using the layout and sound barriers proposed in **Exhibit K** will put the site in the best position to minimize the acoustical impact of the Site. As shown in **Exhibit K**, on-Site noise is not expected to have a negative acoustical impact per DEC guidelines, and HVAC and motor vehicle sound will comply with all local and State noise codes, as well as the intent of recommended project criteria. Accordingly, based on the above, and with the proposed mitigation measures, the Project will not have any significant adverse impacts due to noise.

2. <u>Light</u>: The Project will not include excessive lighting and is not expected to appreciably increase ambient lighting of any neighboring properties. The Project will require night time lighting in parking and loading areas and around the buildings. Light sources are building-mounted at approximately 25 feet in height and pole-mounted at a maximum height of 40 feet. High quality lighting will be installed as a part of the Project, however, as the detailed Lighting Plan included in the Site Plans shows, Project Site lighting will be LED fixtures designed to focus lighting in needed areas and minimize light spillover onto adjacent areas. Exterior lighting will include fixtures at parking lots and building entrances as well as Pedestrian-scale fixtures. Luminaries are dark-sky, high-efficiency LED lights with cut-off shields to provide uniform and energy-conscious illumination to walkways and parking lots on-Site. In addition, as previously noted, the Facility is well away from surrounding residential or recreational uses. Accordingly, the Project will not create any significant adverse impacts due to lighting.

P. Impacts on Human Health

A Health and Safety Plan (HASP) will be prepared for the construction and operations of the facility. Neither the construction nor the daily operation of the Project will have any significant impacts on public health and safety.

1. <u>Construction Activities</u>: All Project construction will take place within the boundaries of the Site. The general public's exposure to Site hazards will be limited. Fencing, signs, and barriers will be used at the Site during construction. Where necessary, construction areas will be delineated and entry of unauthorized personnel will be restricted. Appropriate signs will be posted to inform of potential construction hazards. The Project will minimize risks to construction personnel by complying with applicable Occupational Safety and Health Administration (OSHA) and New York State Labor Law requirements. Accordingly, the construction activities associated with the Project will not have any significant impact on public health and safety.

   <u>Operational Activities</u>: The Project is a private and secure facility with 24-hour-a-day, seven days a week (24/7) operations. The Facility will not be open to the public. Two guard houses are located at each access point and the perimeter of the Site is fenced for security purposes.

   Current emergency services are anticipated to be sufficient to serve the Project. See Emergency Services Assessment annexed hereto as **Exhibit L**. The Site will be serviced by three police agencies — the Grand Island Town Police, the Erie County Sheriff's Office, and the New York State Park Police. While there is no anticipated need for additional police manpower at the Project site, it is acknowledged that there may be calls generated by the Facility operations. While there could be the potential increase in the need for police services due to the proposed use at the Project site, it is anticipated that on-site security measures will be implemented at the Facility to mitigate any potential impacts. Security measures include, among others, gates and guardhouses, video surveillance, alarms, internal training of its staff, identification badges for employees, guest sign in and escort, and trailer parking area access limited by guardhouses. Such security measures would be fully implemented and function on a 24/7 basis and the Town Police will have the opportunity to review the application and plans to address concerns.

The Site will also be serviced by the Grand Island Fire Company ("GIFC"), who will provide fire protection and emergency medical services (EMS) for the Site. GIFC acknowledges the Facility would be the largest structure in the Town and are trained on scaling up an incident as required with the assistance of mutual aid from the City of Tonawanda, Town of Tonawanda (six fire companies) and beyond if necessary. See **Exhibit L**. The Utility Plan (Site Plan Drawing Nos. CU100-CU107, bound separately) indicates the location of fire hydrants, fire riser rooms, and .fire pump discharge to tie into the internal fire service loop includes the provision of well labeled sprinkler and standpipe connections on the outside of the Facility. As required by the NYS Fire Code, multiple points of access to the building will be provided allowing for alternate routes of entry and exit in the event of an emergency. The GIFC will have the opportunity to review plans for new construction.

The Facility will be also equipped with two completely independent and redundant automatic fire water supplies, each of sufficient capacity, reliability, and duration to serve automatic fire sprinkler systems in the facility in accordance with NFPA 13, NFPA 24, and all local requirements. The fire suppression water supply source will need to meet the greater of the sprinkler hose demand and the fire flow demand. All sprinkler systems and fire alarm components such as smoke detectors and pull stations will be properly labeled. This will allow the fire department to quickly locate activated alarms and minimize the facility's evacuation time.

The proposed access driveways will be designed to accommodate fire engines. Emergency vehicle access will be provided around the building and fire lanes will be provided at appropriate locations around the building in accordance with the Town Code.

Due enhanced and state-of-the art fire protection measures that shall be implemented at the Site and a review with GIFC regarding the site plans and a determination of equipment requirements for the Project, any potential impacts will not be significant and can be appropriately addressed within the existing resources of the GIFC. Based on the foregoing, the Project will not pose a significant adverse impact to the GIFC in carrying out fire protection duties at the Site.

Based on the aforementioned operational safety measures proposed as part of the Project, that the daily operational activities of the Project will not have any significant impact on public health and safety.

Q. Consistency with Community Plans

As discussed above, even though a PDD designation has been requested, the Code authorizes the Facility as a permitted use and the Project is consistent with the economic development goals outlined in the Comprehensive Plan. In addition, the Site is consistent with the character of the surrounding uses, which includes the I-190 and a mix of commercial and industrial uses to the north, east and south. The Site is also adjacent to the West Parcel, which will remain in its current state to act as a buffer area for other existing residential development in the area.

The M1 zoning bulk regulations do not address the unique nature of the lot and the Project and designating the Site as PDD will facilitate the development of a modern warehouse distribution facility at a location with convenient access to I-190. The Project would serve as a catalyst for economic activity through the creation of construction and operation jobs and a substantial tax base on what is now vacant land. The long-term impact, in addition to jobs creation, would be additional economic activity generated around the Site. All of these factors contribute to developing a balanced and vibrant economy consistent with the goals and objectives of the Comprehensive Plan.

Although the Site is not currently developed, there is sufficient capacity available for water, sewer, electric and natural gas service to service the Project without upgrades to substations or expansion of water and sewer districts.

The Project is consistent with the overall vision and goals of the Town to activate a Site that is approved for light industrial use to further economic development. Accordingly, the Project will not have any significant adverse impact to community plans.

R. Consistency with Community Character

Despite the scale of the Facility, the Facility is generally not visible from surrounding areas and most of the visual impact will be along the NYS Thruway where visual sensitivity is lowest. See Exhibit E. While the Facility has a proposed footprint of approximately 822,522 SF and a proposed height of 98.23 feet, due to the Facility location on the Site, the size of the overall Site where the Facility will be developed, setbacks from surrounding lot lines, the distance from surrounding development, and screening provided by existing wooded area, such that there are no significant adverse impacts to the surrounding community. In addition, the proposed extensive landscaping provides aesthetic benefits to surrounding areas.

Moreover, the West Parcel, which is not part of the instant Application, is in the R1A Low Density Single Family Residential district. This area is characterized by wetlands and wooded area. It will remain in its current state, acting as a buffer area for other existing residential development in the area. North of the Site across Long Road consists of M1 district lots developed with light industrial uses and a Holiday Inn Express hotel (former Dunlop site).

East of the Site across I-190 are M1 district lots and the Northern Business District (NBD) zone along NYS Route 324 (Grand Island Boulevard). South of the Site along Bedell Road are a mix of uses in the M1, M2 and R1A districts. The proposed Project is consistent with the character of the surrounding uses. Furthermore, given the size of the Site, there is sufficient area to address potential concerns regarding land use impacts.

The Project will not replace or eliminate existing facilities, structures or areas of historic and cultural importance to the community. It is anticipated that community services are sufficient to accommodate the Project. Even though the Site is located approximately 0.35 miles from Buckhorn Island State Park, the Project will not interfere with the use of the park.

While the scale of the Project differs from nearby development, given the size of the Site and the location of the Facility on the Site, no impacts to neighboring properties are anticipated. The visual character of the Project will not create any substantial impact as shown in the Visual Analysis Report (**Exhibit E**). The Project will not introduce objectionable lighting or noise to the area.

Accordingly, the Project will not have any significant adverse impacts to community character.

S. Cumulative/Growth Inducing Impacts

Certain proposed actions covered under the SEQRA process have the potential to trigger further development by either attracting a significant local population, inviting commercial industrial growth, or by inducing the development of similar projects adjacent to the project constituting an action. The Project has the potential to induce growth in the Town and the surrounding areas through employment opportunities, housing and ancillary businesses. The development of the Project will result in a significant number construction workers with seasonal employment at the Site, and at least 1,000 new jobs to the Facility. It is anticipated that these workers will come from the Buffalo-Grand Island-Niagara greater region, and that many of these workers will be drawn from the existing labor pool along with residents of Erie County and Western New York, within an approximate 60-70 mile radius of the Site.

Some jobs may be filled by professionals moving into the area. However, the Project is not expected to impact the local housing market on Grand Island. Construction workers and Facility employees will most likely patronize restaurants, hotels/motels, entertainment facilities, and other services provided in the vicinity of the Site and surrounding communities. While the Project has the potential to induce growth, as discussed above, it will be consistent with the local zoning and the Comprehensive Plan. Accordingly, the Project will not have any significant adverse growth inducing impacts on the Town.

CONCLUSION

A number of temporary and/or minor environmental impacts have been identified in connection with the Project. However, a thorough analysis of these potential impacts reveals that, where necessary, such impacts have been mitigated to the greatest extent possible by the Project design and/or off-Site mitigation, and that none of these impacts will be significant. Accordingly, it is respectfully submitted that it is appropriate that the lead agency issue a negative declaration for the Project.

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EXHIBIT A

PRELIMINARY GEOTECHNICAL ENGINEERING STUDY REPORT

for

Project Olive
Proposed Distribution Facility Project
Grand Island, Erie County, New York

Prepared For:

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20 February 2020
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INTRODUCTION

At your request, we have completed our preliminary geotechnical engineering study for the Applicant, TC Buffalo Development Associates, LLC, who is proposing to develop ±145.4 acres of land located at 2780 Long Road ("Site") in the Town of Grand Island ("Town"), Erie County, New York for use as an e-commerce storage and distribution facility for consumer products ("Facility") by a single prospective entity ("Project"). The Project, also known as Project Olive, is a commercial development that consists of a 5-story building with a ±823,400 square foot warehouse building footprint (±3,783,124 square feet total) with associated car and trailer parking (see Figure 1). The Site is currently owned by Grand Island Commerce Center Joint Venture ("Owner"). The Owner also owns ± 62.1 acres of land adjacent to the western boundary of the Site ("West Parcel"). No development is proposed in the West Parcel, and the West Parcel was not analyzed as part of this Report.

The purpose of this study was to: 1) research and review available Site information; 2) obtain subsurface information by drilling borings, excavating test pits, and performing percolation tests at accessible Site areas; and 3) provide our preliminary recommendations regarding earthwork, foundation support for the Facility, and other geotechnical aspects of the Project.

No environmental investigations or sampling were performed as part of this geotechnical investigation work.

All elevations provided in this report reference the 1998 North American Vertical Datum (NAVD88), unless otherwise noted.

SITE DESCRIPTION

Existing Conditions

The Site is located at the intersection of Long Road and Interstate I-190.

The Site is bounded by the following:

- Long Road and industrial, commercial, and residential development to the north.
- Interstate I-190 and industrial and commercial developments to the east.
- Wooded areas, Bedell Road, and industrial, commercial, and residential developments to the south.
- The West Parcel, which is predominantly wooded areas, and residential development to the west. West River Parkway and the Niagara River are located further to the west of the Site.

The Site is currently vacant. The majority of the Site is covered by vegetation (grass, shrubs, and trees). The Site also contains several regulated and non-regulated wetlands. A large drainage ditch traverses through the middle of the Site and flows south to north. There is also a smaller ditch on the southern side of the Site that runs parallel to Bedell Road. A network of trails exist throughout the Site. Some of these trails have been created by people that hunt on the property.

Scattered debris and small stockpiles of material were observed at the surface in portions of the Site. Tree logs were observed at the ground surface throughout the wooded portions of the Site.

There is an existing 8-inch-diameter sanitary sewer force main that traverses the Site in a northwest to southeast direction. Several manholes associated with this line are visible at the surface. A concrete vault reportedly containing a pump associated with the sanitary sewer was observed at the Site entrance.

According to the survey performed by our firm, existing grades at the Site generally range from approximate el 573 to el 592 (NAVD88).

Proposed Construction

Based on the latest Concept Plan prepared by our firm, we understand that the Project will consist of the following:

- Construction of a 5-level warehouse having a footprint area of approximately 823,500 ft^2 and a finished floor elevation (FFE) of el 599.
- Construction of associated loading docks, aprons, parking lots, and access drives.
- Installation of associated utilities.
- Construction of nine (9) bioretention basins, with proposed bottom of basin elevations listed below:
    - Six (6) basins within the eastern portion of the Site = el 584 to el 589.
    - Two (2) basins within the southwestern portion of the Site = el 585.
    - One (1) basin within the northwestern corner of the Site = el 571.
- Construction of four (4) stormwater ponds, with proposed bottom of basin elevations listed below:
    - Three (3) ponds within the southern portion of the Site = el 556 to el 570.
    - One (1) large pond within the northwestern corner of the Site = el 540.
- Relocation of the existing drainage ditch to the west of the Facility.
- Construction of two culverts for crossing the existing and relocated ditches.

Based on the latest Grading and Drainage Plan prepared by our firm, we understand the following cuts and fills will be required to achieve final grades:

- Fills up to 16 feet throughout the majority of the development area.

- Fills up to 20 feet to fill the existing drainage ditch.
- Cuts up to 15 feet to construct the relocated drainage ditch along the western boundary of the Site.
- Cuts up to 35 feet to construct the stormwater ponds within the southern portion of the Site, and cuts up to 48 feet to construct the stormwater pond within the northwestern corner of the Site.

Based on structural loading information provided by the Structural Engineer (BL Companies) for similar projects, the following typical column and floor loads associated with a 5-level warehouse were used for our analysis:

- Ground Floor Slab Live Load = 500 psf
- Column Footing Loads = 50 to 2,000 kips
- Perimeter Wall Footing Loads = 5 to 7.5 kips/foot

Once it becomes available, we should review the final structural loading information for the Facility so that we may evaluate and modify, if necessary, the recommendations provided herein.

REVIEW OF AVAILABLE INFORMATION

We reviewed available historic aerial photographs, historic topographic maps, soil survey data, regional geologic information, and the flood map for the Site vicinity. In addition, we reviewed subsurface information provided by others for an investigation performed at the Site on behalf of the Owner. Pertinent information obtained from these documents is summarized in the following paragraphs.

Historic Aerial Photographs

We reviewed historical aerial photographs dated 1938 through 2017; see Appendix A. The historic aerials show the Site to be undeveloped and cleared for farming. A stream is shown to run north to south through the Site. Starting in the early 1960's and going into the 1980's, there appears to be land disturbance at the north side of the Site. Trees and vegetation are shown to take over the reminder of the Site starting around the same time as the land no longer appears to be utilized for farming.

Historical Topographic Maps

We reviewed historical topographic maps dated 1894 through 2013; see Appendix B. Historic topographic maps depict the Site as undeveloped land with elevations generally ranging from about el 580 to el 590. There is a stream shown to run north to south in the central portion of the Site.

Soil Survey Data

We reviewed the United States Department of Agriculture (USDA) Natural Resources Conservation Service and Soil Survey Geographic Database soil survey map for Erie County, New York; see Figure 3. Based on this survey, the soil types found at the Site and the immediate surrounding areas consist of the following:

- *Odessa-Lakemont complex (Oe)* – These areas are described as somewhat poorly drained silt loam to silty clay loam to silty clay. They typically originate from lake terraces of red clayey glaciolacustrine deposits derived from calcareous shale.
- *Odessa silt loam (Od)* – These areas are described as somewhat poorly drained silt loam to silty clay loam to silty clay. They typically originate from lake terraces of red clayey glaciolacustrine deposits derived from calcareous shale.
- *Churchville silt loam (CoA)* – These areas are described as somewhat poorly drained silt loam to silty clay to gravelly loam. They typically originate from lake plains or till plains of clayey glaciolacustrine deposits over loamy till.
- *Lakemont silt loam (La)* – These areas are described as poorly drained silt loam to silty clay loam. They typically originate from depressions of red clayey glaciolacustrine deposits derived from calcareous shale.
- *Rhinebeck gravelly loam (RkA)* – These areas as described as somewhat poorly drained gravelly loam overlying silty clay. They typically originate from lake plains of clayey and silty glaciolacustrine deposits.
- *Schoharie silt loam (SaA, SaB)* – These areas are described as moderately well drained silt loam overlying silty clay to clay. They typically originate from lake terraces of red clayey glaciolacustrine deposits derived from calcareous shale.
- *Cazenovia silt loam (CgB)* – These areas are described as well drained silt loam to silty clay loam to gravelly silty clay loam. They typically originate from reworked lake plains or till plains of loamy till containing limestone mixed with reddish lake-laid clays or reddish clay shale.
- *Swormville clay loam (Sw)* – These areas are described as clay loam overlying loamy fine sand to sand. They typically originate from lake plains of silty glaciolacustrine deposits overlying sandy glaciolacustrine, deltaic, or glaciofluvial deposits.

Based on the soil survey map, an area of a borrow pit was identified in the northwest portion of the Site.

Regional Geology

We reviewed the 1995 New York Surficial Geology of the Niagara Boundary published by New York State Museum and Science Service; see Figure 4. According to this map, the Site is underlain by the following soil types:

- *Till (T)* – This soil typically consists of relatively impermeable variable material, such as clay, silty clay, and boulder clay. The material was deposited beneath glacier ice, and the thickness can vary from 3 to 165 feet.
- *Till moraine (Tm)* – This soil is typically similar to till, but it is more permeable and more variable in sorting. The material was deposited adjacent glacier ice, and the thickness can vary from 30 to 100 feet.

We reviewed the United States Geological Survey (USGS) 1980 Swelling Clays Map of the Conterminous United States; see Figure 5. According to this map, the Site is within a unit identified as containing little or no swelling clay.

We also reviewed the 1970 Bedrock Geological Map of New York published by the New York State Museum and Science Service; see Figure 7. The bedrock map indicates the bedrock below the Site is the Upper Silurian Camilus, Syracuse, and Vernon Formations (SCV), which consist of shale, dolostone, salt, and gypsum.

Salt and gypsum are known to be evaporate bedrock, and dolostone is a known carbonate bedrock. These types of rocks are susceptible to void formation and subsequent karst solution features. Karst solution features such as sinkholes, caves, springs, and mudboils may occur when carbonate bedrock dissolves. A review of the 2014 United States Karst Map shows that the Site is underlain by carbonate rock with less than 50 feet of glacially derived insoluble sediment overburden. However, a 2008 Land Subsidence Hazard Profile Report prepared by the New York State Department of Homeland Security and Emergency Services states that subsidence is relatively rare in the New York regions of karst topography. The report states that the relatively low density of reported karst features in the area is predominantly due to the very dense material overlying the bedrock, which is able to support itself and subside slowly over developing carbonate sinks.

Based on discussions with the Building Department of Grand Island, karst activity has not been reported in the vicinity of the Site.

We also reviewed the New York State Department of Environmental Conservation online GIS-based database for New York State Mines and Wells. According to the GIS database, mining operations have been reported within the vicinity the Site, however no mines have been reported within the Site; see Figure 6 for approximate mine locations. A summary of the mines in the general vicinity of the Site is as follows:

- Mine on Property North of the Site – surface mine reported to be inactive.
- Mine on Property South of the Site – surface mine reported to be inactive.
- Mines at Northwest portion of the Site – surface mines reported to have former activity with no recently reported activity.

Flood Map

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel No. 346029C0036H dated 7 June 2019 (preliminary – revised map), the Site is outside of the 100-year and 500-year floodplains; see Figure 8.

Subsurface Information by Others

In August 2019, Empire Geotechnical Engineering Services performed an investigation of the Site on behalf of the Owner. The investigation consisted of drilling 14 borings and installing 3 groundwater monitoring wells. Below is a summary of their findings:

- The subsurface conditions generally consisted of topsoil overlying medium to hard silty clay, very compact clayey silty sand and gravel, and dolostone bedrock. Occasional layers of non-plastic silt were also encountered.
- The topsoil was found to typically range from about 3 to 8 inches. Topsoil was not found in 2 of the 14 borings.
- Zones of soft clay were encountered within 6 of the 14 borings (identified as B-2, B-5, B-6, B-7, B-8, and B-9), and had an approximate thickness of 5 feet. The soft clay was found to be thicker in borings B-5 (10 feet thick) and B-9 (23.5 feet thick). The top of the soft clay was encountered at approximately 13 to 35 feet below grade, corresponding to approximate el 68 to el 86. Based on their experience in the Town, the soft clay found nearby is reportedly slightly over-consolidated.
- Weathered dolostone bedrock was encountered in 10 of the 14 borings (identified as B-1, B-2, B-5, B-6, B-7, B-9, B-11, B-12, B-13, and B-14) at approximately 30 to 57.5 feet below grade, corresponding to approximate el 49 to el 68. Bedrock was either inferred from auger refusal or rock coring. Rock coring resulted in rock core recovery ranging from 10% to 97% and rock quality designation values ranging from 0% to 7.5%. An approximate 5-foot-thick layer of highly weathered/decomposed rock consisting of gray sand and gravel was encountered prior to auger refusal or rock coring being performed.

- Groundwater levels recorded in the two monitoring wells (installed in boring B-4 and B-10) ranged from approximately 21 to 22 feet below grades, corresponding to approximate el 86. Groundwater level observations were also recorded in the borings upon encountering auger refusal or prior to rock coring and ranged from approximately 12 to 49 feet below grade, corresponding to approximate el 56.5 to el 95.

According to the report prepared by Empire, laser survey level measurements were utilized by the boring subcontractor to determine the relative existing ground elevations at the boring locations. The ground surface elevations were referenced to a temporary benchmark on the top of an existing sanitary sewer manhole rim located on-Site, and was assigned an arbitrary datum of el 100; refer to Appendix C for location plan and boring logs by others.

SUBSURFACE INVESTIGATION

The geotechnical field investigation performed for this study consisted of the following:

- Eight (8) borings identified as LB-1 through LB-8.
- Fourteen (14) test pits identified as TP-1 through TP-16. Note that test pits TP-6 and TP-7 were not completed as part of this investigation.
- Four (4) profile test pits and percolation tests identified as PT-1 through PT-4.

The approximate locations of the borings, test pits, and percolation tests are shown on Figure 2.

Permission to access the Site was obtained from TC Buffalo and the Owner prior to performing our field work. The One-Call utility mark-out request was performed by our subcontractor prior to initiating the field work.

The borings, test pits, and percolation tests were completed under the full-time observation of a field engineer from our office and under the direct supervision of our project Professional Engineer. Our field engineer maintained logs of the explorations, classified soil, and obtained representative material samples. Boring, test pit, and percolation test locations were laid out by our subcontractor using survey-grade equipment. Surface elevations at each of the boring, test pit, and percolation test locations were provided to us by our subcontractor.

Borings

Borings for this study were drilled by Buffalo Drilling Company, Inc. from 19 to 25 November 2019 using a track-mounted drill rig. The borings were advanced using a 4-inch-diameter hollow stem auger. Borings were advanced to depths ranging from 26 to 50 feet below existing grades. A standard 2-inch O. D. split spoon sampler was used to obtain samples of the underlying soil strata. The Standard Penetration Test (SPT)[1] was accomplished as part of the sampling procedure (in accordance with ASTM D1586), and the SPT results were recorded by our inspecting engineer. A safety hammer was used as part of the SPT test for all sampling in the borings. All borings were backfilled with soil cuttings and bentonite upon completion.

The individual boring logs are provided in Appendix D.

Test Pits

Test pits for this study were excavated by Buffalo Drilling Company, Inc. from 13 to 18 November 2019. The test pits were excavated using a CAT 310 track excavator to depths ranging from 6 to 10.5 feet below existing grades. Our field engineer observed and recorded subsurface conditions and groundwater levels in the test pit excavations. Upon completion, all test pits were backfilled in lifts and lightly compacted with the bucket of the excavator.

The individual test pit logs are provided in Appendix E. Select test pit photographs are provided in Appendix F.

Percolation Testing

Percolation testing was performed from 12 to 14 November 2019 as part of our preliminary geotechnical investigation.

Percolation testing was performed using the following procedure:

- An approximate 12 to 14-inch-deep percolation test hole was excavated at the bottom of a test pit. The percolation hole was excavated into the test soil stratum and a layer of fine gravel was placed at the bottom of each test hole to protect the soil surface from disturbance.
- A hole liner was then installed in each hole and fine gravel was placed in the space between the liner and the sides of the test hole.
- Each test hole was pre-soaked for a minimum of 12 hours.

The percolation tests were performed at four (4) locations throughout the Site at approximately 5 feet below existing grades, corresponding to approximate el 571 to el 583.5; see Figure 2 for locations.

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[1] The Standard Penetration Test (SPT) is a measure of the soil density and consistency. The SPT N-value is defined as the number of blows required to drive a 2-inch O.D. split-barrel sampler 12 inches, after an initial penetration of 6 inches using a 140 pound hammer falling freely for 30 inches.

Laboratory Testing

Soil samples from the geotechnical investigation were visually examined in the field and classifications were confirmed by re-examination in our Parsippany, New Jersey office. Select soil samples were sent to a specialty testing laboratory where the following tests were performed:

- Grain-Size Distribution
- Atterberg Limits
- Water Content
- Modified Proctor Compaction Test
- California Bearing Ratio (CBR) Test

The results of the geotechnical laboratory testing are provided in Appendix G.

SUBSURFACE CONDITIONS

Based on the results of the borings and test pits performed for this study, the subsurface conditions typically consisted of a surface layer of topsoil overlying fill, clayey silt, clay, silty sand, and glacial till. The following sections describe the encountered subsurface conditions.

Topsoil

Topsoil generally consisting of brown to dark brown to orangish brown silt and clay with varying amounts of fine to medium sand, roots, and organics was encountered in most borings and test pits. The topsoil layer was found to range in thickness from approximately 6 to 24 inches but was typically 8 to 12 inches thick.

Fill

A layer of fill generally consisting of orangish brown to grayish brown clay and silt with varying amounts of sand and roots was encountered in several test pits within the western portion of the Site. The fill is expected to be re-worked natural material from the Site. The fill layer was found to range in thickness from approximately 10 inches to 2.5 feet.

Clayey Silt

A stratum of dark reddish brown to brown to gray clayey silt and silty clay with varying amounts of fine to coarse sand, fine to coarse gravel, cobbles, roots, and thin fibers was encountered beneath the topsoil and fill (where encountered). The clayey silt layer was typically found to be stiff to hard as evidenced by SPT N-values ranging from 8 to 58 blows/foot (average SPT N-value of 29 blows/foot).

The clayey silt was found to be approximately 18 to 33 feet thick.

Clay

A layer of brownish gray to grayish brown clay with varying amounts of silt, fine to coarse sand, roots, and occasional thin fibers was encountered below the clayey silt layer in several borings at depths ranging from 19 to 34 feet below existing grades, corresponding to approximate el 551 to el 564. In test pit TP-16, the clay layer was encountered directly below the topsoil layer and extended to the depth the test pit. The clay was typically found to be medium stiff to hard as evidenced by SPT N-values of 5 to 38 blows/foot (average SPT N-value of 18 blows/foot).

The clay layer was found to the limit of borings LB-1, LB-3, LB-4, LB-6, LB-8 and test pit TP-16. In boring LB-2, the clay layer was found to be approximately 26 feet thick.

Silty Sand

A stratum of silty sand with trace amounts of clay and fine to coarse gravel was encountered within borings LB-2 and LB-5 at depths ranging from 20.5 to 45 feet below existing grades, corresponding to approximate el 538 to el 559.5. The silty sand was typically found to be very dense as evidenced by SPT N-values indicating refusal (over 100 blows/foot).

In boring LB-5, the silty sand was found to be approximately 9.5 feet thick, and boring LB-2 terminated in this material.

Glacial Till

Glacial till consisting of dark grayish brown silt with varying amounts of clay, fine to coarse gravel, and fine to coarse sand was first encountered beneath the silty sand layer in boring LB-5 at a depth of 30 feet below existing grades, corresponding to approximate el 550. The glacial till was found to be very dense as evidenced by SPT N-values indicating refusal (over 100 blows/foot).

Groundwater

Groundwater was not observed in any of the borings or test pits. However, perched water was observed in several test pits.

Percolation Test Results

Water remained in all four (4) test holes after the pre-soak period of 12 hours and the tests were, therefore, terminated. Upon backfilling the percolation tests holes approximately 24 hours after attempting the tests, water was observed to still remain within the excavations.

PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

Our preliminary geotechnical recommendations regarding the Project are presented below.

Site Clearing and Preparation

Clearing and grubbing of all trees (including removal of any associated root systems and stumps) and vegetation designated for removal should be performed.

We recommend the following guidelines for removal of the topsoil within the Site:

- Topsoil should be completely stripped from the Facility footprint area and 10 feet beyond the building limits.
- Topsoil should be completely stripped in pavement areas receiving less than 5 feet of new fill.
- In pavement areas receiving more than 5 feet of new fill to raise grades, the topsoil layer can be left in place subsequent to removal of vegetation and root mats and performance of subgrade preparation procedures recommended below.
- The topsoil should be stockpiled and protected from erosion. Topsoil should be evaluated by the project Landscape Architect for re-use in landscape areas.

Topsoil stripped from the proposed development areas can be mixed with the cut natural soils (using a tentative 50/50 blend) and used as structural fill in pavement areas or landscape areas as determined by a qualified geotechnical engineer. The proportions of topsoil and natural soils will be dependent on the amount of organics present in the topsoil layer. The resulting mixture should contain less than 3% (by weight) organics. Topsoil containing roots and a significant amount of organics should not be mixed to create structural fill. This mixture containing topsoil should not be used as fill within 3 feet of pavement finish grades.

If necessary to help balance the Site from an earthwork perspective, the reuse of topsoil as fill or in areas where topsoil has been left in-place as described herein requires that a sufficient grubbing and root raking program be implemented to remove the roots and vegetative matter from the soils. In addition, the Contractor will be required to completely remove tree stumps and associated root mass.

Prior to commencement of grading or fill placement, any miscellaneous trash, debris, or other unsuitable materials should be removed from the Site. All debris and trees/vegetation should be properly disposed off-Site in accordance with applicable regulations.

At this time, we recommend the following regarding Site demolition:

- Any active existing utilities that are encountered in the Facility footprint area should be re-routed. Utilities designated for removal should be completely removed within the Facility footprint. Existing utilities located outside the Facility footprint should be removed or abandoned in-place by complete filling with grout.

- Excavations made to remove existing utilities should be backfilled with approved compacted fill as discussed herein.

Before construction, we recommend field locating any existing utilities that are to remain or that must be temporarily maintained during construction. Existing utilities within or immediately adjacent to the excavation areas should be relocated prior to excavation work.

All clearing and stripping activities should be performed in strict accordance with the approved soil erosion and sediment control plan prepared for the project. All Site preparation work should be performed in accordance with any environmental regulations and requirements established for the Site as well as all Local, State, and Federal regulations.

All work should also be performed so as to not adversely impact the existing neighboring structures, roadways, utilities, wetlands, and waterways to remain. Protection of these elements should be provided as necessary during the course of all construction activities at the Site.

Subgrade Preparation

After performing the aforementioned Site preparation work and prior to placing compacted fill to raise Site grades or constructing finished surfaces (building slabs, pavement, and sidewalks), all subgrade areas should be compacted with a minimum of three (3) overlapping coverages of a vibratory roller having a minimum static drum weight of 5 tons. In addition, we recommend that a fully loaded tri-axle dump truck or haul truck be used to proof-roll the subgrade. Additional compaction and proof-rolling coverages should be performed in any areas deemed necessary based on observations made by a qualified inspecting geotechnical engineer. Soft areas identified during proof-rolling should be excavated and replaced with approved, compacted fill.

The on-Site soils are highly sensitive to water exposure. Care should be taken to prevent the softening of these materials during subgrade preparation. Therefore, we recommend that the Site be graded and drainage swales and berms be used to convey surface runoff away from fill areas. During the cutting and filling, construction equipment should follow consistent traffic patterns throughout the Site to minimize disturbance of the subgrade. Should soft or unsuitable subgrade soils be observed, as identified by the inspecting Geotechnical Engineer during construction, these materials should be excavated and replaced with approved compacted fill.

As an option to preserve the soil subgrade during building and pavement construction to reduce the possibility of subgrade soils softening and requiring removal and replacement, the Contractor can consider soil stabilization or placement of a granular working platform. We recommend that the granular working platform consist of a minimum of 12 inches of granular material (sand and gravel mixture) above a layer of geotextile (i.e. Mirafi 500X or equivalent). Additional thickness is anticipated to be necessary in heavily trafficked areas and roads. This sand and gravel material should meet the same requirements for engineered fill as described herein, with fill placement and compaction performed as discussed in the following sections.

The Contractor's ability to successfully work the Site soils, combined with the weather conditions and the time of year during the Site preparation and filling phases of construction, will have a significant impact on timely project completion. Care should be taken to prevent disturbance of the proof-rolled areas and softening of these materials prior to finished construction. As a minimum, all subgrade areas should be temporarily sloped and sealed by rolling with a smooth drum roller at the end of each working day, as necessary, so as to maximize surface water runoff, and minimize potential ponding and infiltration.

We also recommend that the Site be graded and drainage swales and berms be used to convey surface runoff away from fill areas. During the cutting and filling, construction equipment should follow consistent traffic patterns throughout the Site to minimize disturbance of the subgrade during wet periods.

If subgrade areas become wet and disturbed, the surficial soils may no longer be suitable for use in fill placement unless sufficiently dried. In addition, the surficial soils that become wet/soft will need to be removed prior to preparation of the building slab and pavement subgrades. For pavement areas, we recommend the subbase material be immediately placed upon completing Site grading and pavement subgrade preparation work.

Prior to asphalt paving and placement of concrete for the loading dock aprons, we also recommend that the subbase be proof-rolled using a fully loaded tri-axle dump truck in the presence of a qualified geotechnical engineer. Soft areas identified during proof-rolling should be excavated and replaced with approved, compacted fill.

Excavation

Based on the latest grading plan, the majority of the Facility footprint and immediately surrounding areas will be filled. Cuts up to 7 feet will be required for the proposed stormwater basins. However, more substantial cuts of up to approximately 48 feet will be required for the proposed stormwater ponds.

We anticipate that the stiff silts and clays can be excavated using a conventional excavator having a bucket fitted with ripping teeth and a dozer with ripper blades.

At this time, we do not anticipate that weathered rock or more competent rock will be encountered during the mass earthwork or during excavation for the majority of the stormwater basins. However, based on borings performed by others in the vicinity of the proposed large stormwater pond at the northwest corner of the Site, we anticipate that weathered rock will be encountered during excavating work. Large excavation equipment fitted with rock ripping teeth and/or hoe-ram attachments are anticipated to be required to remove the weathered rock. Should the excavation extend into more competent rock, the Contractor should be prepared to break the rock surface using a hydraulic hoe-ram. We recommend that the subsurface conditions be further investigated in these areas to assist our evaluation of excavation procedures for these areas.

Engineered Fill

Reuse of Existing On-Site Soils

The on-Site soils can be used as compacted fill to raise grades or backfill foundation and utility excavations. Most of the on-Site soils have a relatively high percentage of fines and are expected to be difficult to handle, place, and compact if they become excessively wet. During periods of wet weather, the Contractor should make provisions to dry portions of the excavated material such as by discing/air drying, as necessary, prior to compaction to an acceptable moisture content as determined by the Geotechnical Engineer. At this time, we recommend wherever possible minimizing the on-Site soil's duration of exposure to weather conditions; cut soils should be placed as fill as soon as possible once they are excavated, with stockpiling of on-Site soil minimized where construction permits. Stockpiled soil should be protected from rain/snow when practical.

The Contractor's ability to successfully work the Site soils, combined with the weather conditions and the time of year during the Site preparation and filling phases of construction, will have a significant impact on timely project completion. Care should be taken to prevent disturbance of the proof-rolled areas and softening of these materials prior to finished construction. At a minimum, all subgrade areas should be temporarily sloped and sealed by rolling with a smooth drum roller at the end of each working day, as necessary, so as to maximize surface water runoff, and minimize potential ponding and infiltration.

We also recommend that cut and fill operations occur in the dry-weather periods during the year, if possible. Fill placement and compaction is expected to be extremely difficult during late fall, winter, and early spring when the soils are wet and frozen. Delays in fill placement operations due to wet weather should be expected and incorporated into the schedule.

Excavation into portions of the silt and clay soils will result in clods of soil. We recommend that these clods be sufficiently broken apart during fill placement and compaction operations by reducing lift thickness, tracking over with a dozer, and using a sheeps-foot roller to compact the fill.

Imported Fill

Imported fill should consist of a relatively well graded mixture of sand and gravel with a maximum particle size of 4 inches and not more than 15 percent (by weight) finer than the No. 200 sieve. The use of any imported fill containing a higher percentage of fines would need to be evaluated by a qualified geotechnical engineer during construction.

Imported fill will need to meet the environmental requirements for the Site. At this time, we expect that all imported fill material should be environmentally clean. The Contractor should provide documentation of compliance prior to delivery of any fill to the Site.

Grain size distribution, maximum dry density, and the optimum water content determinations should be made on representative samples of the backfill and fill materials proposed by the Contractor.

Fill Placement and Compaction

All structural fill should be placed in uniform lifts and compacted to at least 95 percent of the material's maximum dry density as determined by the Modified Proctor Compaction Test (ASTM D1557). On-Site granular soils and imported select fill can be placed in 12-inch-thick loose lifts and compacted using a smooth drum vibratory roller having a minimum static drum weight of 5 tons. Silt and clay soils should be placed in maximum 8-inch-thick loose lifts and initially compacted using a sheeps-foot roller having a minimum static drum weight of 5 tons, which provides a kneading action.

Smaller compaction equipment (i.e. walk-behind trench roller or jumping jack compactor) and thinner lifts (maximum 6 to 8 inch thick) should be used in areas of limited maneuverability.

The water content at the time of compaction should be within 3 percentage points of the optimum water content. All fill placement should be subject to observation and testing by a qualified geotechnical engineer.

No fill material should be placed on areas where free water is standing, on frozen subgrade areas, or on surfaces which have not been approved by a qualified geotechnical engineer.

Fill Placement in Landscape Areas

Fill placed in any exterior landscaped areas should be compacted to at least 90% of the material's maximum dry density as determined by the Modified Proctor Compaction Test (ASTM D 1557).

Site Filling and Monitoring

Based on the latest concept plans, the proposed grades will require fills of up to approximately 20 feet throughout the Site. We anticipate that this areal fill will settle under its own weight and may compress the softer zones of the underlying silty clay soils, resulting in surface settlement.

Placement of fill to raise grade should be performed at the beginning of construction. Finished construction, including installation of utilities, concrete sidewalks, hardscaping (i.e. pavers), concrete aprons, and asphalt pavement in fill areas should be delayed for as long as possible after fill placement. This will allow the majority of the anticipated settlement to occur before finished surfaces are constructed.

Due to the variable thickness of the required fill and type of the underlying soils, it is difficult to estimate accurately the duration of the settlement. At this time, we estimate that a wait period of approximately 3 months following the completion of the mass fill placement prior to building construction and finished Site construction.

The fill settlement should be monitored using settlement plates. The wait period should be confirmed when the magnitude of the settlement is observed to be sufficiently slowed (settlement curve flattens out) as determined by the project geotechnical engineer.

To potentially avoid or minimize the estimated wait period stated above, we recommend that the soil stabilization consisting of lime or cement stabilization of the clayey fill be performed on each lift of the fill placed within the proposed building footprint.

Soil Stabilization

Fine-grained soils (silt and clay) or coarse-grained soils with appreciable amounts of fines will be encountered at the proposed building and pavement subgrade throughout the Site.

To improve workability, reduce moisture, and increase the strength of these subgrade soils for supporting construction equipment, the Contractor can stabilize the soils by using either Portland cement or Lime additives.

Lime stabilization and cement stabilization involve in-place mixing of the clayey soils with an appropriate amount of lime or cement, followed by proper compaction and curing time. The stabilized soil will result in a reduced moisture content and improved stability of the soil.

The percentage of cement or lime by weight per square yard of soil should be determined by the Contractor and may be modified by the Geotechnical Engineer if field conditions warrant. All lime used for this stabilization should be high-calcium lime, containing a minimum 90 percent active lime content by weight. The Contractor should use approved single or multiple pass rotary speed mixers to uniformly mix soil, cement, or lime, and water to the required depth. Stabilization should be performed only when ambient air temperature is above 40 degrees Fahrenheit, and when the soil is not frozen. Do not perform this work during wet or unsuitable weather, or when freezing weather is anticipated within 24 hours of mixing/compaction.

The cement-soil and lime-soil mixtures should be initially compacted with a sheeps-foot roller, and then completed with surface compaction using a smooth drum roller to seal the fill material.

The stabilized soil should be allowed to properly cure and gain adequate strength prior to placing successive lifts of fill or traversing the area with construction equipment. Curing may take several days (typically 3 to 5 days) depending on soil type, initial moisture content, and weather conditions. The Contractor should conduct a proofroll on the top of each lift using a fully-loaded tandem dump truck for observation by a qualified Geotechnical Engineer prior to the placement of the next successive lift.

Recommended Criteria for Chemical Stabilization:

- Soils having a fines content (percent passing No. 200 sieve) greater than 25% are suitable for chemical stabilization
- Cement If PI < 10 and Clay Content (2µ) < 20%
- Lime If PI > 10 and Clay Content (2µ) > 20%

Recommended Chemical Quantities for Stabilization:

- Cement or Lime 4% to 8% (by weight)

A laboratory and field cement and/or lime test program should be performed prior to construction if such stabilization measures will be utilized to confirm proper admixture percentages and construction means and methods.

Foundation Support

<u>Shallow Foundations</u>

Grades within the Facility footprint will be raised by approximately 11 to 16 feet. We anticipate that the fill will predominately consist of the natural silty clay soils from the Site. The Facilitycan be supported on shallow foundations bearing on the approved, compacted fill and designed using an allowable bearing pressure of 4 kips/ft^2.

It is critical that a qualified geotechnical engineer be present during the foundation excavation work to verify adequate bearing is achieved. After the bearing surface has been approved, it should be protected until the footing is poured.

Perimeter strip footings should have a minimum width of 24 inches and interior strip footings should have a minimum width of 18 inches. The minimum dimension for isolated footings should be 3 feet by 3 feet.

All exterior footings or footings within an unheated portion of the building should be constructed at least 42 inches below the lowest adjacent grade to protect from frost.

Subgrade Preparation

All footing bearing areas should be level and proof-rolled and compacted using either a large smooth drum roller or a double-drum walk-behind vibratory compactor such as a Wacker RT 82-SC or equivalent prior to footing construction. Footing areas must be inspected and approved by a qualified geotechnical engineer prior to steel reinforcement or concrete placement. Any soft, loose, or unsuitable soils identified by the inspecting geotechnical engineer during proof-rolling should be removed and replaced with approved compacted fill. The on-Site soils are extremely sensitive to water exposure. Care should be taken to prevent the softening of these materials prior to concrete placement for footings.

If the foundation excavations will be left open for more than one day or excavated during a wet time of the year, we recommend that the bottom of the footing trench be over excavated and a 4-inch-thick layer of lean concrete mud-mat be placed to protect the footing subgrade from softening due to water and disturbance prior to placement of concrete.

The Contractor should be responsible for maintaining all footing subgrades in their as-approved condition until footing concrete is placed and the excavations are properly backfilled. Rainwater, snow, ice or trash/debris should not be allowed to accumulate in the excavation. If subgrade areas become wet and disturbed, they may no longer be suitable for foundations. Footings should be constructed as soon as possible following subgrade approval by the geotechnical engineer to minimize possible deterioration.

Ground Improvement

In order to provide a higher allowable bearing pressure for foundation design, we recommend that a ground improvement system consisting of either Compacted Stone Columns or Rigid Inclusions be considered for the building foundations only. Ground improvement beneath the ground floor slab areas is not necessary. A brief description of each ground improvement method is provided below:

- Compacted Stone Columns are constructed by augering a hole and backfilling the excavated shaft with compacted lifts of crushed stone. The crushed stone is placed in approximately one-foot-thick lifts and compacted with a special hydraulic tamper attached to an excavator. The compacted stone columns improve the ground conditions by providing a stiffer composite ground mass.

- Rigid Inclusions are constructed by drilling a hollow auger completely through the silt and clay and into the underlying decomposed rock. The excavated hole is then filled with a cement-based grout column using pressure through the hollow auger. The process of augering leaves the majority of the drilled soil in place, to minimize spoils generation.

Preliminarily Recommended Allowable Bearing Pressures for each ground improvement option:

- Compacted Stone Columns = 8 kips/ft^2
- Controlled Modulus Columns = 10 kips/ft^2

The ground improvement system (i.e. diameter, spacing, stone specifications or grout mix/strength, and locations) should be designed by the Contractor's Professional Engineer licensed in New York State and submitted to our firm for review. The design and improved ground must simultaneously provide the recommended design bearing pressure at foundation locations and satisfy the foundation settlement criteria specified herein.

<u>Floor Slabs</u>

The building ground floor slab can be conventional slab-on-grade construction bearing on proof-rolled/compacted fill, native soil or stabilized native soil subgrade (for cases where such stabilization is deemed to be necessary based on inspection by a qualified geotechnical engineer). The floor slab can be designed using a modulus of subgrade reaction of 150 lbs/in^3 when the soil subgrade is stabilized with cement treatment or a 18-inch-thick layer of granular soil (working platform) is placed above the soil subgrade. Otherwise, the floor slab should be designed using a modulus of subgrade reaction of 125 lbs/in^3.

To protect the soil subgrade from deterioration during construction, a minimum 6-inch-thick drainage layer consisting of ¾-inch clean, crushed stone can be placed above the subgrade. This stone drainage layer can be incorporated as part of the 18-inch-thick working platform specified above. A layer of geotextile (i.e. Mirafi 500X or equivalent) should be placed beneath the stone. Piping consisting of 4-inch-dia perforated PVC should be embedded within the drainage layer in a connected network to remove water that accumulates above the clayey and relatively impermeable subgrade during periods of wet weather, prior to pouring the concrete slab.

Slab areas should be proof-rolled with a smooth drum roller having a minimum static drum weight of 5 tons and a fully-loaded tri-axle dump truck. Slab bearing areas must be inspected and approved by a qualified geotechnical engineer prior to steel reinforcement or concrete placement. Any soft, loose, or unsuitable soils identified by the inspecting geotechnical engineer during proof-rolling should be removed and replaced with approved compacted fill.

We recommend that, at a minimum, a vapor retarder for moisture control having a minimum thickness of 15 mils be provided beneath the floor slab. The vapor retarder can potentially be eliminated from warehouse floor slab areas that do not have special floor coverings (i.e. tile, carpeting) and are not humidity controlled areas. Eliminating the vapor retarder should only be performed with the proper approvals from ownership and the design team.

A minimum 6-inch-thick layer of processed aggregate should be provided beneath the building floor slab.

Construction and/or saw cut joints should be provided as necessary for crack control.

Below Grade Walls

Permanent below-grade walls will be required for the proposed loading dock areas. The below-grade walls are expected to bear on compacted fill or natural soils. Below-grade walls can be designed using an equivalent fluid pressure of 100 lbs/ft^3 where the structure provides lateral restraint at the top of the wall and the backfill material consists of the on-Site clayey (non-expansive) soils or imported granular soil. This parameter presumes the retaining wall backfill meets the minimum requirements for approved compacted fill previously discussed, that full drainage is provided behind the wall, and that there are not any surface surcharge or structure loads at the top of the wall. Adjustment of the pressures should be made by the designer where appropriate to consider these factors. Presuming the aforementioned fill, fill placement, and compaction requirements, a coefficient of at-rest earth pressure $K_o = 0.7$ can be used in evaluating surcharge loads transmitted to the wall.

Passive resistance for approved compacted on-Site soils can be calculated using an equivalent fluid unit weight of 120 lbs/ft^3, which includes a reduction factor of 2. Extreme care and proper construction sequencing must be taken during construction in areas where passive resistance is required for wall support. This includes filling simultaneously on both sides of the wall, and not performing future excavations without properly bracing the wall.

Building Settlements

The settlement criteria for the building is the following:

- Total Settlement for columns, walls, and slab-on-grade = Less than 1 inch
- Differential Settlement between adjacent columns = Less than ½ inch

Seismicity

Based on the latest New York State Building Code and the United States Geological Survey, the proposed buildings should be designed using the following parameters:

- Site Class = D
- Maximum Considered Earthquake Ground Motions:
  - 0.2 Second Spectral Response Acceleration, %g: $S_s = 20.9$
  - 1.0 Second Spectral Response Acceleration, %g: $S_1 = 6.0$

The above ground motions should be adjusted for site class "D" effects using coefficients $F_a = 1.6$ and $F_v = 2.4$.

Based on the relative density of the Site soils as inferred from the boring data and the type of soils encountered, liquefaction is considered to be unlikely.

Site and Building Utilities

Excavations will be required for the installation of proposed utilities and associated structures. All excavations should be properly sloped and/or braced in conformance with applicable OSHA regulations including, but not limited to, temporary shoring, utilizing trench boxes and/or proper benching.

Prior to construction, we recommend field locating any existing utilities that are to remain or that must be temporarily maintained during construction.

We expect Site excavations for proposed utilities to be constructed in native soils or new compacted fill. Exposed utility trenches in soil should be proof-rolled with at least six overlapping coverages of a double-drum walk-behind vibratory compactor such as a Wacker RT 82-SC or equivalent. Any soft or unstable areas identified by the proof-rolling should be removed and replaced with compacted fill. Backfill in utility excavations should meet the previously discussed requirements for engineered fill, with fill placement and compaction performed as previously discussed.

If unsuitable bearing material is encountered at the proposed utility subgrade elevation, we recommend that 1 foot of over-excavation and replacement with approved bedding material be performed beneath all utilities. The actual extent of removal should be determined by a qualified inspecting geotechnical engineer based on the ground conditions encountered at the time of excavation.

Permanent Slopes

Based on the latest grading plan, we understand that permanent fill slopes as high as 40 feet and cut slopes as high as 20 feet will be constructed. At this time, we recommend that the permanent cut/fill in soil have a maximum slope of 3H:1V. For soil slopes steeper than 3H:1V, we recommend that erosion control matting be used to provide sufficient soil stabilization, but slopes should be no steeper than 2H:1V.

Fill Slopes

Fill placement for fill slopes should be done in horizontal lifts. The fill should be benched into existing slope faces.

In addition, we recommend that each lift be constructed beyond the proposed slope face, where feasible, and cut back after slope construction to ensure proper compaction of the slope face.

Cut Slopes

All cut slopes should be uniform. Cut slopes may need to be flatter and/or benched if groundwater seepage is observed in the slope face. The purpose of the flatter slopes and/or bench is to reduce the potential for erosion and instability. In addition, permanent erosion control matting may be necessary. The Contractor should be careful not to over-excavate or create steeper slopes than designed. Placement and compaction of fill to replace over-excavations and/or to flatten steep slopes is difficult and should only be done under the guidance of a qualified geotechnical engineer.

For permanent cut slopes in rock, we recommend a maximum slope of 1H:1V. Steeper cuts in competent rock are possible but may require rock stabilization (i.e. rock bolting and netting) and rock fall catchment ditches with fences.

Surface drainage including drainage ditches and berms located at the top of the cut slopes should be constructed as deemed necessary by the Site/Civil Engineer.

Slope cutting work should be done under the full time observation of a qualified geotechnical engineer so the exposed conditions can be evaluated and determinations made if any supplemental recommendations regarding slope excavation or other stabilization measures are necessary.

Erosion Control

To reduce and slow weathering, erosion, and surficial sloughing of temporary and permanent slopes, we recommend that the following erosion control measures be implemented:

- Seeding and other slope protection should be implemented immediately following construction of the cut. Temporary erosion control measures must be provided during construction activities and maintained until permanent erosion control measures are functional.
- Excavation of cut slopes should be limited during the wet season to minimize erosion.
- Concentrated surface water or significant sheet flow should not be discharged onto temporary or permanent slopes.

- Groundwater seepage, if encountered during construction, should be collected and discharged at appropriate off-Site locations.
- Surface water runoff must be properly contained and channeled using drainage ditches, berms, swales, and/or siltation fences.
- Removal of existing natural vegetation should be minimized and limited to active construction areas.
- Surface water and drainage from impervious surfaces must be directed to appropriate stormwater facilities.

Seepage Control

We anticipate that pockets of groundwater seepage could be encountered as the slopes are excavated. This is relatively common when excavating cut slopes in compact clay soils. These localized areas of groundwater seepage typically "dry up" soon after the cut slope is completed as the water stored within permeable areas drains out. However, it is possible that areas of wet soil will persist and continue to seep.

We recommend that areas of persistent wet soil be addressed by placing at least 6 inches of sand and gravel filter blanket material topped with about 6 inches of quarry rock (2-inch to 4-inch size). The purpose of the sand and gravel filter is to help control against erosion and piping and loss of native soil materials on the slope, which could lead to surficial slope failure if not controlled. Some over-excavation of the existing soils will be necessary to install the sand and gravel filter and quarry rock.

In larger areas where persistent water seepage is present, we recommend that lateral drains be installed. Each lateral drain should consist of a perforated pipe installed parallel to the slope within a trench excavated beneath the seep into the underlying relatively impermeable clayey soils. The perforated pipe should be placed near the base of the trench. The trench should then be backfilled with ¾-inch clean, crushed stone. The down slope side of the trench should be lined with an impermeable plastic liner. The perforated pipe should be discharged into the Site stormwater drainage system.

Where groundwater seepage is observed near the base of the slope, an underdrain at the toe of the slope should be installed. Where groundwater seepage is relatively shallow, cut-off trenches at the top of the slope can be used.

Site Retaining Walls

We understand that Site retaining walls may be needed to achieve proposed Site grades. At this time, we anticipate that any proposed Site retaining walls will be designed as "fill" retaining walls. Depending on the proposed wall height, we expect that the retaining walls may be designed as one of the following wall systems:

- Geogrid reinforced modular block wall system such as Mesa®, Keystone®, or Versa-Lok® systems.
- Gravity Block retaining wall.

Fill Retaining Walls

Fill retaining walls at the Site may be designed as a geogrid reinforced modular block wall system (i.e. Mesa, Keystone, or Versa-Lok). The retaining walls can also be designed using a gravity block retaining wall system.

Should the proposed grading require significant wall heights, the fill retaining walls will need to be designed using a batter; the batter should be taken into account when designing the Site because the top of the wall will be offset from the bottom of the wall by several feet.

We recommend that imported select granular fill having a fines content less than 15% be utilized as backfill behind these "fill" Site retaining walls, including in the entire reinforced zone of geogrid reinforced walls. Due to the relatively high fines content of the on-Site soils, we anticipate that re-use of on-Site soils within the reinforced zone of the proposed retaining walls is not feasible.

Foundation Support

Once the proposed retaining wall height becomes available, we should review the information so that we may evaluate and modify, if necessary, the recommendations provided herein. At this time, we anticipate that the foundation support for the proposed retaining walls can be designed by the Wall Designer in accordance with the Foundation Support section of this report.

Wall Subgrade Preparation

We recommend that the wall foundation subgrade be prepared in accordance with the Site Grading, Fill Placement and Subgrade Preparation sections of this report. All wall foundation subgrade should be prepared by proofrolling with a large smooth drum roller or an approved double-drum walk-behind vibratory compactor. Any soft areas should be removed and replaced with approved compacted fill.

Wall Drainage

The Site retaining walls should be designed with a gravel backdrain and perforated pipe behind the wall to assist in the relief of water pressure. The perforated pipe should be tied into weep holes near the base of the wall, daylighted on both ends of the wall, or drained into a nearby permanent drainage structure.

Wall Design

At this time, we anticipate that imported select granular fill having a fines content less than 15% will be required as backfill behind the "fill" Site retaining wall, including the entire reinforced zone of the retaining wall.

For fill walls, geogrid reinforced modular block walls should be designed using a backfill moist unit weight of 135 lbs/ft^3 and a drained angle of internal friction of 32 degrees assuming that imported granular fill is used in the reinforced zone. These values should be re-evaluated by the wall designer once the source of the imported fill material is known and laboratory testing is performed on representative samples of the fill material.

These design parameters presume full drainage is provided behind the retaining wall to prevent build-up of hydrostatic pressure, there are no surface surcharge (i.e. traffic loading) or structure loads at the top of the wall, and the wall fill materials meet the minimum requirements for approved compacted fill as discussed previously. Adjustment of the pressures should be made by the designer where appropriate to consider these factors and the actual fill material used behind the wall. Presuming the aforementioned fill, fill placement, and compaction requirements are adhered to, a coefficient of active earth pressure $K_a = 0.30$ can be used in evaluating surcharge loads transmitted to the wall.

We recommend that a guiderail and fence be installed at the top of the retaining wall and should be part of the design of the retaining wall.

The Contractor's proposed retaining wall types, construction means and methods, and supporting design calculations, signed and sealed by a Professional Engineer licensed in the State of New York, should be submitted to the Owner and the Geotechnical Engineer. Global Stability should be included as part of the Wall Designer's calculations.

Stormwater Basin Construction

Based on the latest conceptual Site plan prepared by our firm, we understand that nine stormwater detention basins and four stormwater ponds are to be constructed at the Site. We recommend that the side slopes for the proposed detention basin be cut or constructed no steeper than 3H:1V. The side slopes and basin bottom should be compacted to form a stable base and side slopes. The Contractor should avoid over-excavating the side slopes and/or causing instability of the side slopes.

Due to the fines content and relative density of on-Site soils encountered during our subsurface investigation, we do not believe stormwater infiltration will be feasible.

Fill placed to construct detention basin embankments should be placed in horizontal lifts. Fill can consist of on-Site or imported soil containing a high percentage of fines and should be placed in maximum 8-inch-thick loose lifts and compacted to at least 95% of the material's maximum dry density as determined by the Modified Proctor Compaction Test (ASTM D1557). The water content at the time of compaction should be within 3 percentage points of the optimum water content. Backfill placed in the excavations for inlet and outlet pipe installations should be placed in 8-inch-thick loose lifts and compacted to at least 95% of the material's maximum dry density.

The Contractor should establish vegetation immediately after constructing the detention basins to minimize erosion.

Temporary Excavation Support and Sloped Excavations

All excavations should be properly sloped and/or braced in conformance with applicable OSHA regulations including, but not limited to, temporary shoring, utilizing trench boxes and/or proper benching. The Contractor should be responsible for maintaining the stability of the soil excavations.

Groundwater Control

Excavations for the proposed building foundations and Site utilities are anticipated to be above groundwater levels. However, perched water may still be encountered. Groundwater can be expected to fluctuate with weather, seasonal conditions, construction activity, or groundwater pumping. Surface runoff and groundwater seepage with higher groundwater levels should be expected during wet weather conditions. We anticipate that collected storm water runoff and groundwater seepage can be controlled using conventional submersible pumps in conjunction with gravel sumps.

Based on the latest grading plans, excavations for the proposed stormwater basins are anticipated to reach depths of up to 48 feet. Although groundwater was not encountered during our investigation, groundwater was reportedly observed in borings by others at the Site ranging from approximately 12 to 49 feet below existing grades. We anticipate that groundwater encountered at higher elevations is perched. However, we recommend that the Contractor anticipate encountering groundwater during the deep basin excavations that will require more substantial pumping effort in conjunction with continued maintenance of gravel sumps, seepage control, and erosion protection along the side slopes.

The pumping, handling and discharge of all dewatering effluent should be performed in accordance with all applicable regulations and any environmental requirements for the Site.

Pavement Design

From a geotechnical perspective, we anticipate the parking and access drive for the Project can consist of on-grade supported asphalt pavement, subsequent to pavement subgrade preparation consisting of proof-rolling of natural soils and raising grades by placing approved compacted fill. Soil stabilization may be required if wet fine-grained soils (silt and clay) or coarse-grained soils with appreciable amounts of fines are encountered at the proposed pavement subgrade and cannot be sufficiently dried.

We have provided recommendations for asphalt pavement minimum sections for the proposed development based on estimated traffic loading and anticipated subgrade soils. We have analyzed and designed asphalt pavement sections for the proposed development following the flexible pavement design guidelines given in the AASHTO Guide for Design of Pavement Structures. Refer to Appendix H for pavement design calculations.

For purposed of this report, we conservatively utilized an average daily truck traffic volume of 350 trucks per day based on tenant requirements. Once a traffic study has been completed, we can evaluate the pavement sections provided in this report and revise as necessary.

The following summarizes the data utilized in our design calculations:

Design Life = 15 years
Initial Serviceability = 4.2
Terminal Serviceability = 2.5
Reliability = 90%
Standard Deviation = 0.45
Vehicle Loading

Light Duty (Car Parking) = 1,000 cars/day (assumed)
Heavy Duty (Access Drives and Truck Courts) = 350 trucks/day (assumed)
Heavy Duty (Trailer Parking) = 100 trucks/day (assumed)

Based on laboratory testing on the anticipated soils at the subgrade elevation, a California Bearing Ratio (CBR) value of 4 was utilized for our design.

Our calculations using the parameters shown above indicate the following pavement sections to be suitable for this project following the specified pavement subgrade preparation:

RECOMMENDED FLEXIBLE PAVEMENT MINIMUM SECTIONS (LIGHT DUTY – CAR PARKING)	
Material	**Thickness**
Bituminous Concrete Surface Course (9.5M64)	1½ inches
Bituminous Concrete Binder Course (19M64)	2 ½ inches
Processed Aggregate Base Course (Subbase)	6 inches

RECOMMENDED FLEXIBLE PAVEMENT MINIMUM SECTIONS (HEAVY DUTY – TRAILER PARKING)	
Material	**Thickness**
Bituminous Concrete Surface Course (12.5M64)	2 inches
Bituminous Concrete Binder Course (19M64)	-
Bituminous Concrete Base Course (25M64)	4 inches
Processed Aggregate Base Course (Subbase)	10 inches

RECOMMENDED FLEXIBLE PAVEMENT MINIMUM SECTIONS (HEAVY DUTY – ACCESS DRIVES AND TRUCK COURTS)	
Material	**Thickness**
Bituminous Concrete Surface Course (9.5M64)	1½ inches
Bituminous Concrete Binder Course (19M64)	2 ½ inches
Bituminous Concrete Base Course (25M64)	4 inches
Processed Aggregate Base Course (Subbase)	10 inches

The recommended pavement sections use the Superpave mixes in accordance with NYSDOT specifications.

The processed aggregate base course should be Type 2 subbase material consisting of stone which is the product of crushing ledge rock in accordance with NYSDOT specifications.

For any paving outside the subject property limits, the minimum pavement sections specified by the City of Grand Island, Erie County, or NYSDOT should be utilized.

We recommend a concrete pavement for loading dock, aprons, truck approaches, or dolly pads as follows:

Recommended Loading Dock Pad Minimum Section

Material	Thickness
4,500 psi concrete	7 inches
Compacted Aggregate Base	10 inches

The concrete pavement should include steel reinforcement consisting of the following:

- Grade 60 No. 3 deformed bars - slab reinforcement longitudinal and transverse spacing should be a maximum of 16 inches on center. Reinforcement should be properly supported during concrete placement.

Reinforcement should be placed so that 3 inches of concrete coverage is provided between the reinforcement steel and the compacted aggregate base. The exterior concrete should have a water content ratio of 0.45 and 6% air entrainment.

Sawcut joints should be provided as necessary for crack control. At this time, we recommend that control joints be spaced 15 feet apart in both directions. The control joint spacing should be determined once the Site plan drawings, including the dimensions of the loading and approach slab area, are finalized.

Pavement subgrade preparation work should be inspected by a qualified geotechnical engineer. Should isolated areas exhibit unsuitable conditions, the isolated areas should be over-excavated to a depth as determined by the Geotechnical Engineer and immediately replaced with approved compacted fill.

Pavement Underdrains

Soils with poor drainage will be present at pavement subgrade. Therefore, we recommend the use of pavement underdrains in all pavement areas. Pavement underdrains can be installed as finger drains extending approximately 15 feet from the proposed catch basin structures to provide drainage of any water trapped within the stone subbase. We also recommend that additional underdrain trenches be installed along the edge of roadways with curbs and throughout the pavement areas. These pavement drains should consist of a shallow trench excavated below the pavement subbase layer and backfilled with ¾-inch crushed stone and wrapped with a filter fabric (i.e. Mirafi 140N). A 4-inch-diameter perforated HDPE pipe should be installed at the bottom of the trench and routed to the nearest stormwater structure.

We recommend that the pavement subgrade be graded to match the slope of the surface to allow water trapped in the stone subbase layer to drain towards the underdrains.

ADDITIONAL INVESTIGATION

Subsequent to finalizing a Site plan, a final investigation consisting of additional borings and test pits performed throughout the Site and within the proposed building footprint is required.

CONSTRUCTION DOCUMENTS AND INSPECTION / QUALITY ASSURANCE

Technical specifications addressing earthwork and all other work related to the building foundations and Site preparation/construction should be prepared by our firm. In addition, the foundation recommendations given herein should be included in the structural drawings for the project. Our firm should be provided with and review any Contractor submittals related to foundation work, Site preparation, earthwork, ground improvement, and soil importation for conformance with the recommendations given in this report.

During construction, it is critical that all geotechnical related work be performed under qualified geotechnical engineering inspection/monitoring/testing in order to ensure proper and timely implementation of the recommendations given in this report. We recommend that Langan perform this work to verify proper implementation of our recommendations and to maintain continuity of our responsibility for this project. Our field engineer would be able to immediately address unexpected or unusual conditions that may be encountered and provide remedial recommendations. This work includes: Site preparation and proof-rolling, compacted fill placement, ground improvement, footing and slab subgrade preparation, pavement subgrade preparation, and utility construction and backfill placement.

CLOSURE

The Contractor is responsible for construction quality control, which includes satisfactorily constructing the foundation system and any associated temporary works to achieve the design intent while not adversely impacting or causing loss of support to neighboring property, structures, utilities, roadways, etc. Construction activities that can alter the existing ground conditions such as excavation, fill placement, foundation construction, ground improvement, dewatering, etc. can also induce stresses, vibrations, and movements in nearby structures and utilities, and disturb occupants. Contractors are solely responsible to ensure that their activities will not adversely affect the structures and utilities, and will not disturb occupants. Contractors must also take all necessary measures to protect the existing structures, utilities, etc. during construction. By using this report, the Owner agrees that Langan will not be held responsible for any damage to adjacent structures, utilities, etc.

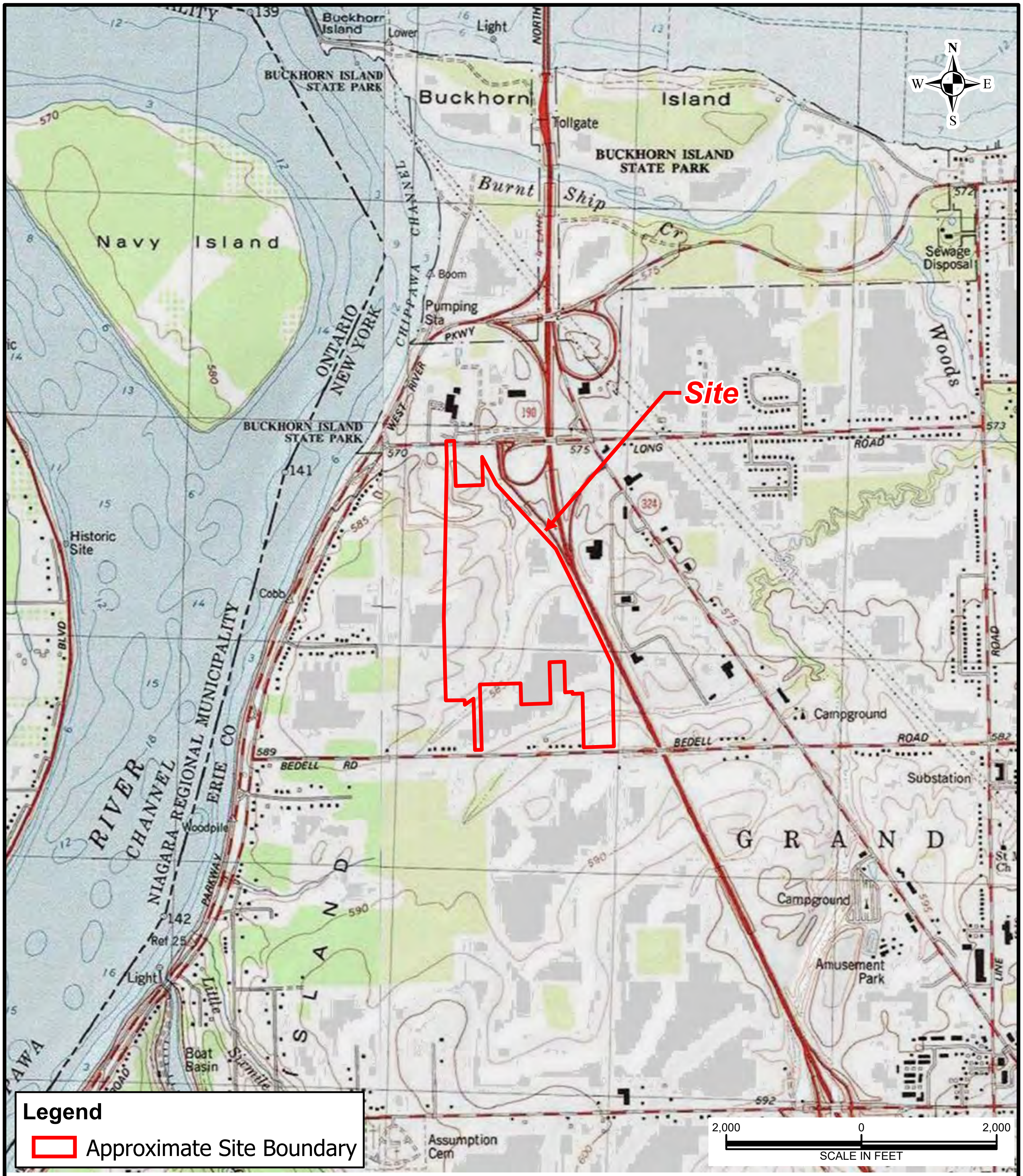
This report presents our preliminary recommendations regarding the geotechnical aspects of design and construction for the proposed distribution facility project located in Grand Island, Erie County, New York. This report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the Site, or by natural events such as floods, earthquakes, slope instability, or groundwater fluctuations.

The conclusions and recommendations provided in this report result from our interpretation of the geotechnical conditions existing at the Site inferred from a limited number of borings and as well as Site information provided to our firm. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Actual subsurface conditions may vary. Langan reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the Site. Recommendations provided are dependent upon one another and no recommendation should be followed independent of the others. Our report, conclusions, and interpretations should not be construed as a warranty of the subsurface conditions.

Any proposed changes in structures or their locations should be brought to Langan's attention as soon as possible so that we can determine whether such changes affect our recommendations. Information on subsurface strata and groundwater levels shown on the logs represent conditions encountered only at the locations indicated and at the time of investigation. If different conditions are encountered during construction, they should immediately be brought to Langan's attention for evaluation, as they may affect our recommendations. This report has been prepared to assist the Owner, Site/Civil Engineer, Architect, and Structural Engineer in the design process and is only applicable to the design of the specific project identified. The information in this report cannot be utilized or depended on by engineers or contractors who are involved in evaluations or designs of facilities (including underpinning, grouting, stabilization, etc.) on adjacent properties which are beyond the limits of that which is the specific subject of this report.

Environmental issues (such as permitting or potentially contaminated soil and groundwater) are outside the scope of this study and should be addressed in a separate evaluation.

FIGURES



Map References: World topographic basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online.

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Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project	PROJECT OLIVE TOWN OF GRAND ISLAND ERIE COUNTY NEW YORK
Drawing Title	SITE LOCATION MAP
Project No.	100785901
Date	2/20/2020
Scale	1"=2,000'
Drawn By	IHB
Last Revised	
Figure	1

Path: \\langan.com\data\PAR\data9\100785901\Project Data\ArcGIS\100785901\100785901.aprx Date: 1/7/2020 User: ibaker Time: 2:16 PM

LEGEND:

LB	LANGAN BORING LOCATION
TP	LANGAN TEST PIT LOCATION
PT	LANGAN PROFILE TEST PIT WITH PERCOLATION TEST LOCATION
GEO-B-1	BORING LOCATION BY OTHERS (2019)
— - —	EXISTING STREAM BED/DITCH

NOTES:

1. PROPOSED DEVELOPMENT BASED ON THE LATEST SITE PLAN PREPARED BY LANGAN.
2. BACKGROUND AERIAL PHOTOGRAPH PROVIDED BY NYS CLEARINGHOUSE IMAGES.
3. ALL BORING LOCATIONS ARE APPROXIMATE.
4. BORINGS LB-1 THROUGH LB-8 WERE PERFORMED BY BUFFALO DRILLING COMPANY, INC. BETWEEN 19 AND 25 NOVEMBER 2019 UNDER THE DIRECT SUPERVISION OF LANGAN.
5. TEST PITS TP-1 THROUGH TP-16 WERE PERFORMED BY BUFFALO DRILLING COMPANY, INC. BETWEEN 13 AND 18 NOVEMBER 2019 UNDER THE DIRECT SUPERVISION OF LANGAN. TP-6 AND TP-7 WERE NOT PERFORMED.
6. REFER TO APPENDIX C FOR BORING LOGS BY OTHERS, APPENDIX D FOR LANGAN BORING LOGS FOR THIS STUDY, AND APPENDIX E FOR LANGAN TEST PIT LOGS FOR THIS STUDY.

DRAFT

120 0 60 120
SCALE: 1 INCH = 120 FEET

WARNING:
IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

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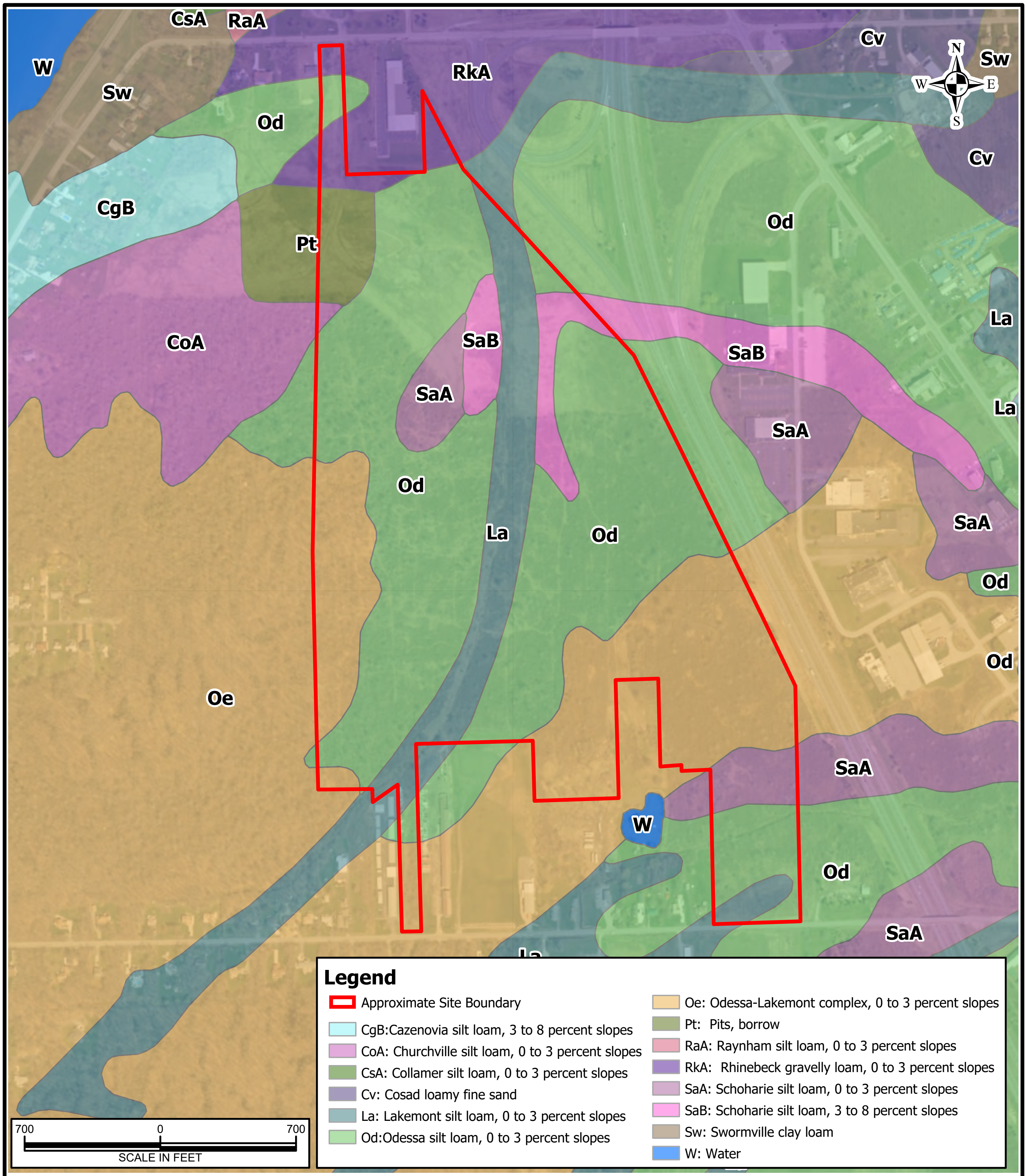
Project	Drawing Title	Project No.	Drawing No.
PROJECT OLIVE (BUF1 - 2780 LONG ROAD) SECTION No. 23.00, BLOCK No. 1, LOT Nos. 50 & 26.1 TOWN OF GRAND ISLAND ERIE COUNTY NEW YORK	LOCATION PLAN	100785901 Date 2/20/2020 Drawn By AC Checked By RB	2

Filename: \\langan.com\data\PAR\data9\100785901\Project Data\CAD\01\SheetFiles\Geotechnical\100785901-BI101-0101 - GEOTECH FIGURE 2 WITHOUT final locations.dwg Date: 1/8/2020 Time: 11:16 User: kshetler Style Table: Langan.stb Layout: ARCHF-BL



Map Reference: Soil Polygons acquired from the USDAA NRCS soil survey, last updated 2018.

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Project

PROJECT OLIVE

TOWN OF GRAND ISLAND

ERIE COUNTY NEW YORK

Drawing Title

SOIL SURVEY MAP

Project No. 100785901	Figure 3
Date 2/20/2020	
Scale 1"=700'	
Drawn By IHB	
Last Revised	

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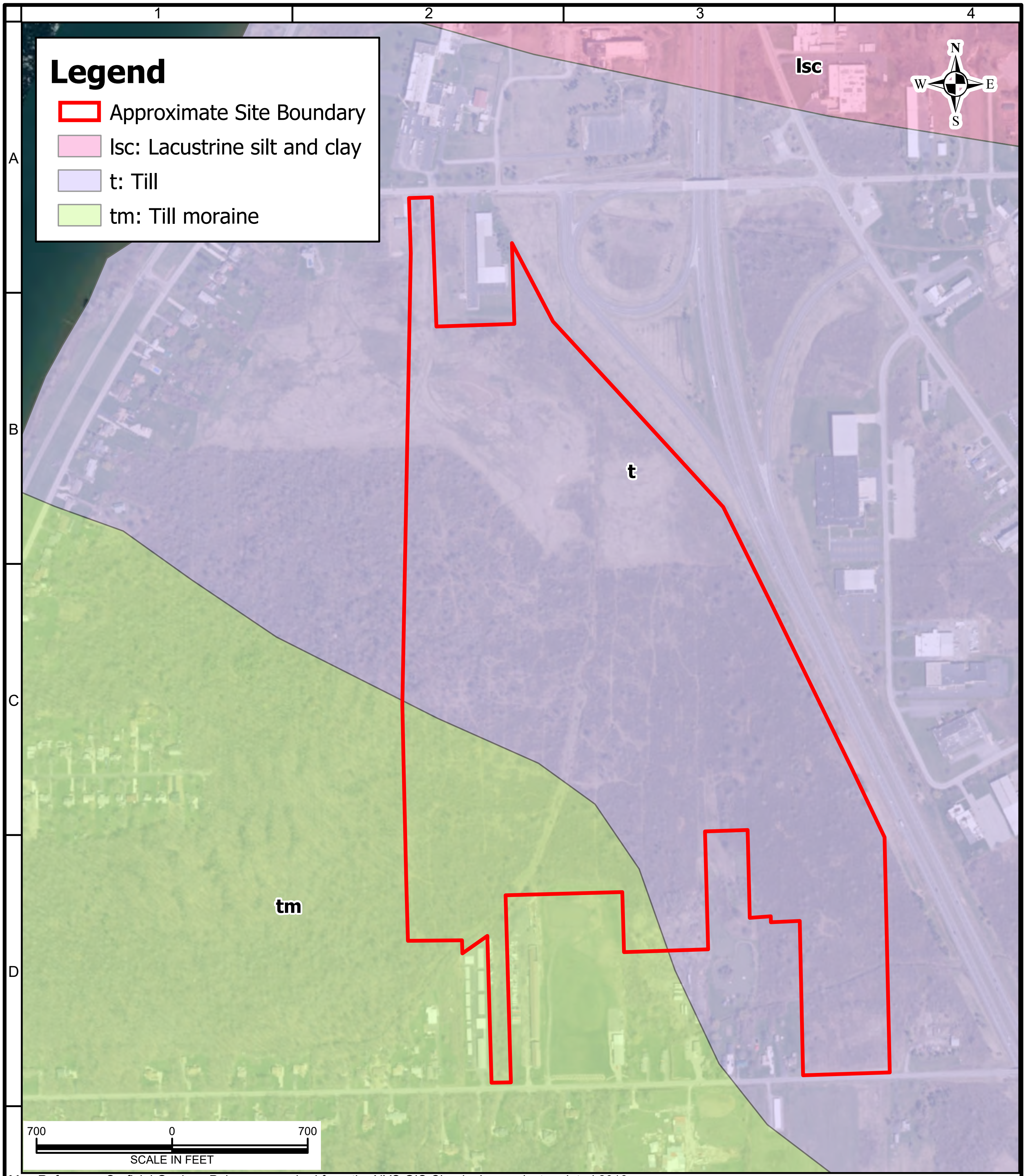

Map Reference: Surficial Geology Polygons acquired from the NYS GIS Clearinghouse, last updated 2018.

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Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

PROJECT OLIVE

TOWN OF GRAND ISLAND

ERIE COUNTY NEW YORK

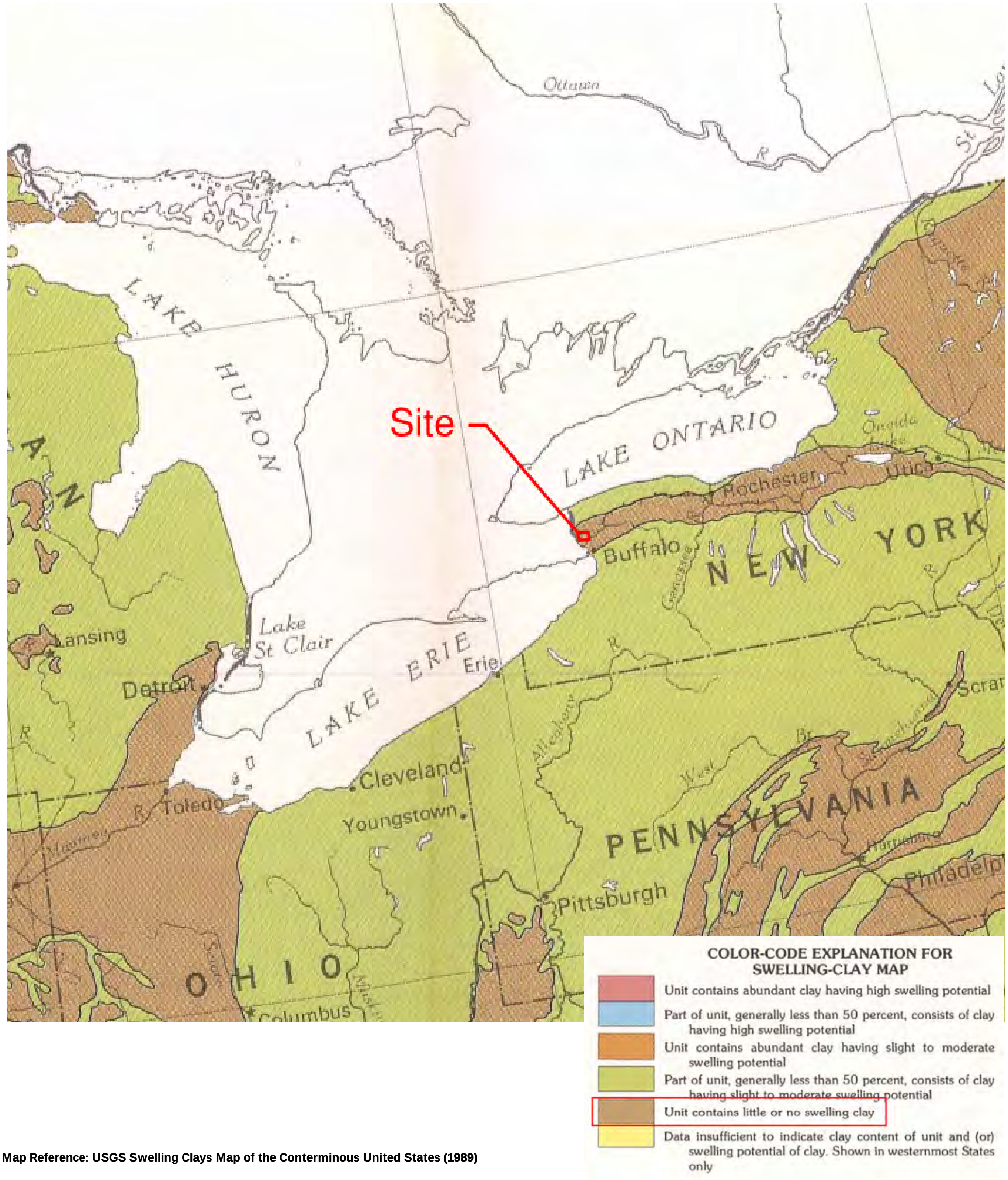
Drawing Title

REGIONAL GEOLOGY MAP

Project No. 100785901
Date 2/20/2020
Scale 1" = 500'
Drawn By IHB
Submission Date

Figure 4

Path: \\langan.com\data\PAR\data9\100785901\Project Data\ArcGIS\100785901\100785901.aprx Date: 1/7/2020 User: ibaker Time: 3:09 PM



COLOR-CODE EXPLANATION FOR SWELLING-CLAY MAP

🟥	Unit contains abundant clay having high swelling potential
🟦	Part of unit, generally less than 50 percent, consists of clay having high swelling potential
🟧	Unit contains abundant clay having slight to moderate swelling potential
🟩	Part of unit, generally less than 50 percent, consists of clay having slight to moderate swelling potential
🟫	Unit contains little or no swelling clay
🟨	Data insufficient to indicate clay content of unit and (or) swelling potential of clay. Shown in westernmost States only

Map Reference: USGS Swelling Clays Map of the Conterminous United States (1989)

LANGAN

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Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. S.A
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

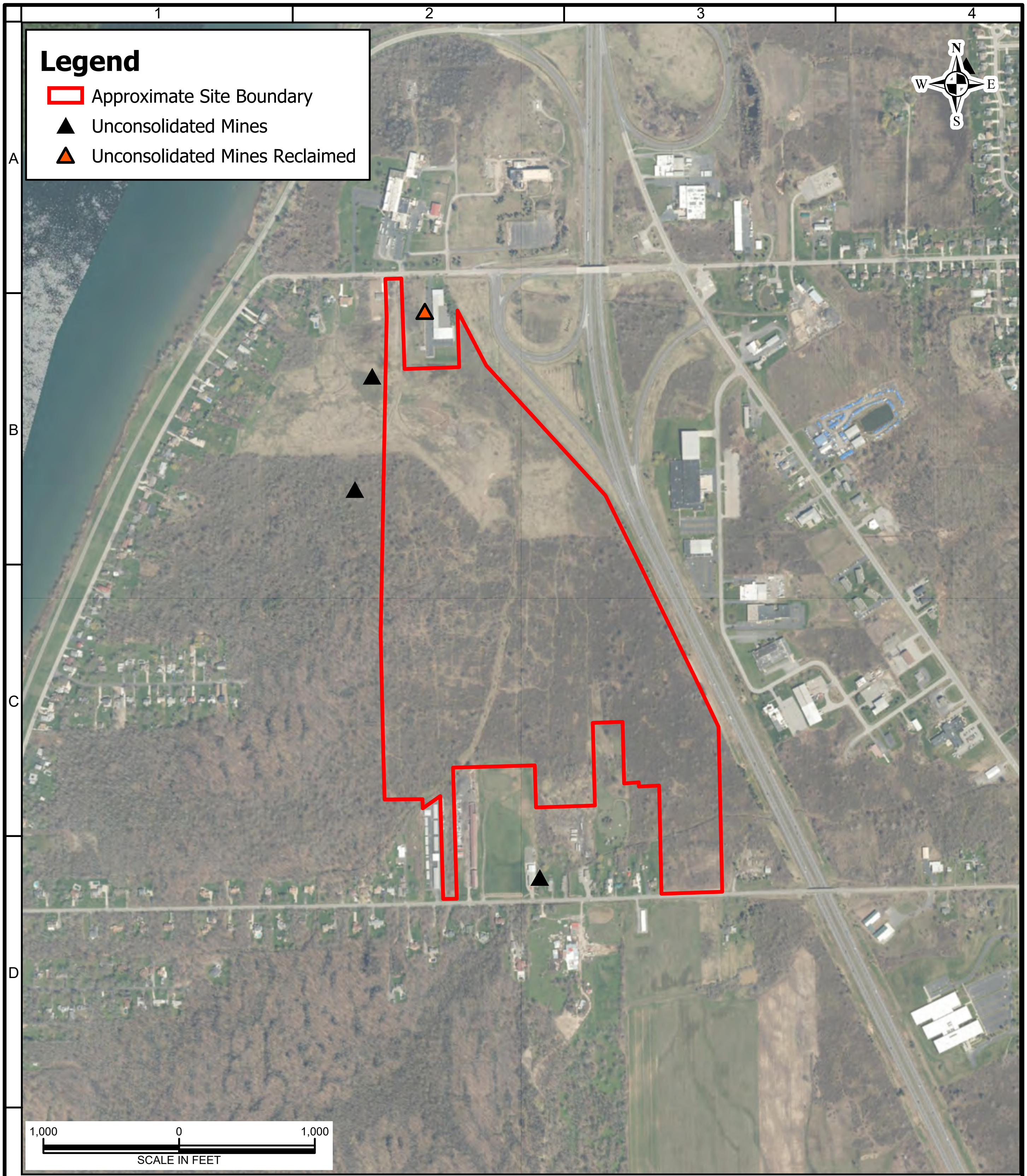
PROJECT OLIVE

TOWN OF GRAND ISLAND
BAYONNE
ERIE COUNTY NEW YORK

Drawing Title

SWELLING CLAYS MAP

Project No. 100785901
Date 2/20/2020
Scale N.T.S.
Drawn By KS
Checked By MH
Figure **5**



Map Reference: Mine locations provided through the New York State Department of Environmental Conservation.

LANGAN

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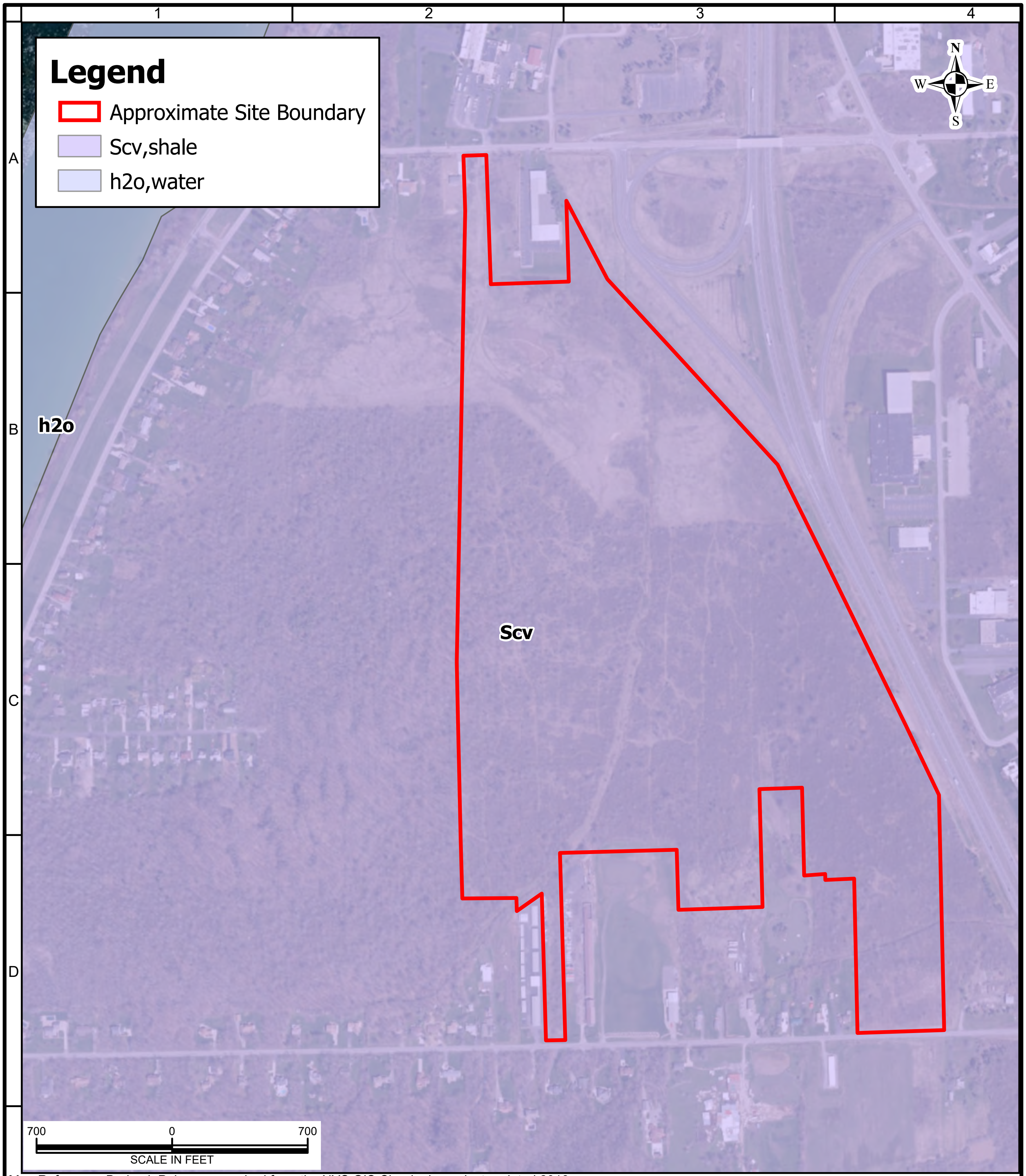
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project	PROJECT OLIVE TOWN OF GRAND ISLAND ERIE COUNTY NEW YORK
Drawing Title	MINE ACTIVITY MAP
Project No.	100785901
Date	2/20/2020
Scale	1" = 1,000'
Drawn By	IHB
Submission Date	
Figure	6

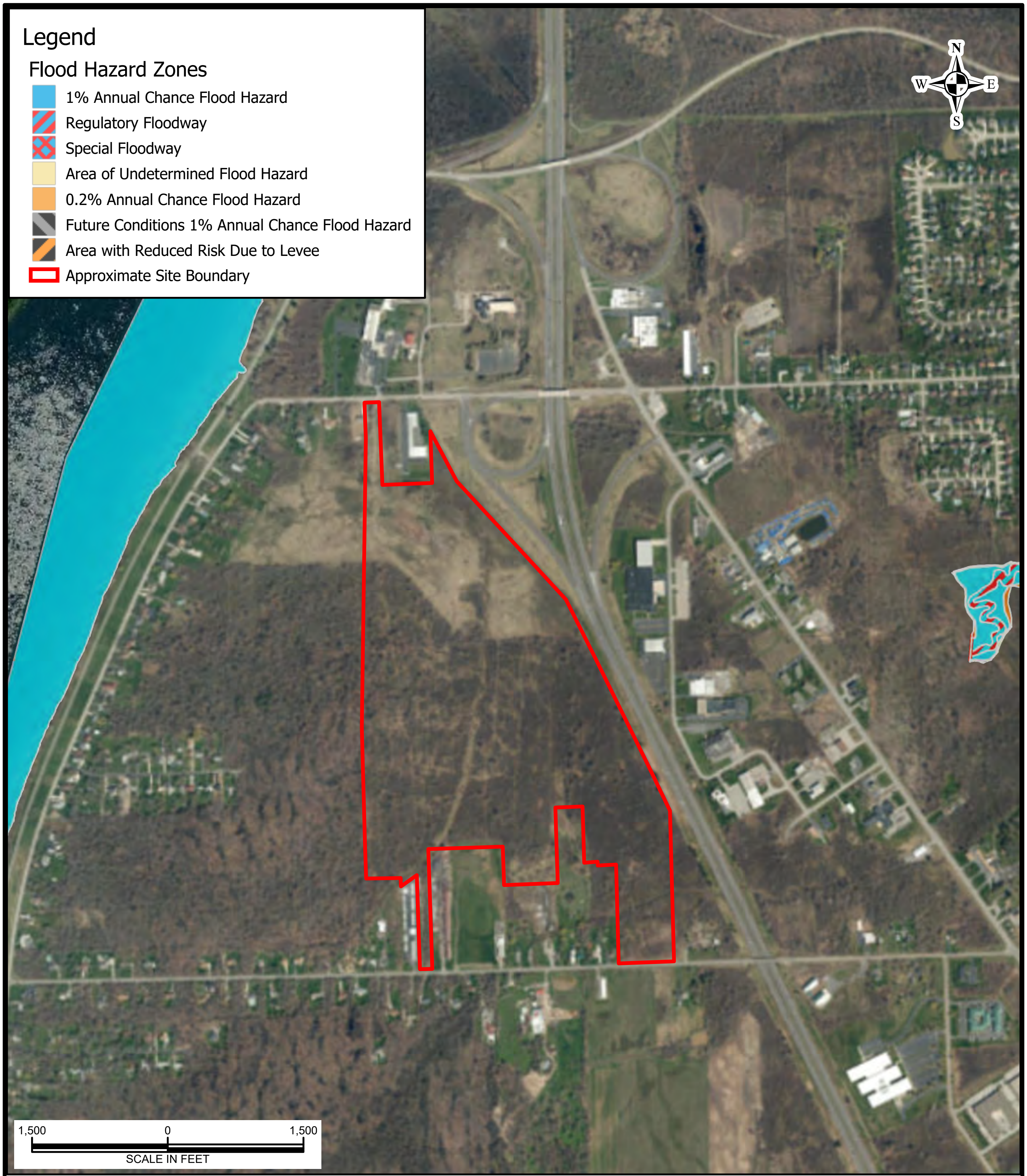
Path: \\langan.com\data\PAR\data9\100785901\Project Data\ArcGIS\100785901\100785901.aprx Date: 1/7/2020 User: ibaker Time: 3:07 PM



Map Reference: Bedrock Polygons acquired from the NYS GIS Clearinghouselast updated 2018.

LANGAN 300 Kimball Drive Parsippany, NJ 07054 T: 973.560.4900 F: 973.560.4901 www.langan.com Langan Engineering & Environmental Services, Inc. Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. Langan International LLC Collectively known as Langan NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400	Project PROJECT OLIVE TOWN OF GRAND ISLAND ERIE COUNTY NEW YORK	Drawing Title BEDROCK MAP	Project No. 100785901 Date 2/20/2020 Scale 1" = 500' Drawn By IHB Submission Date	Figure 7

Path: \\langan.com\data\PAR\data9\100785901\Project Data\ArcGIS\100785901\100785901.aprx Date: 1/7/2020 User: ibaker Time: 2:21 PM



Map Reference: FEMA Flood Insurance Rate Map 36029C0036H/ 36029C0020H . Effective 6/7/2019.

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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

PROJECT OLIVE

TOWN OF GRAND ISLAND

ERIE COUNTY NEW YORK

Drawing Title

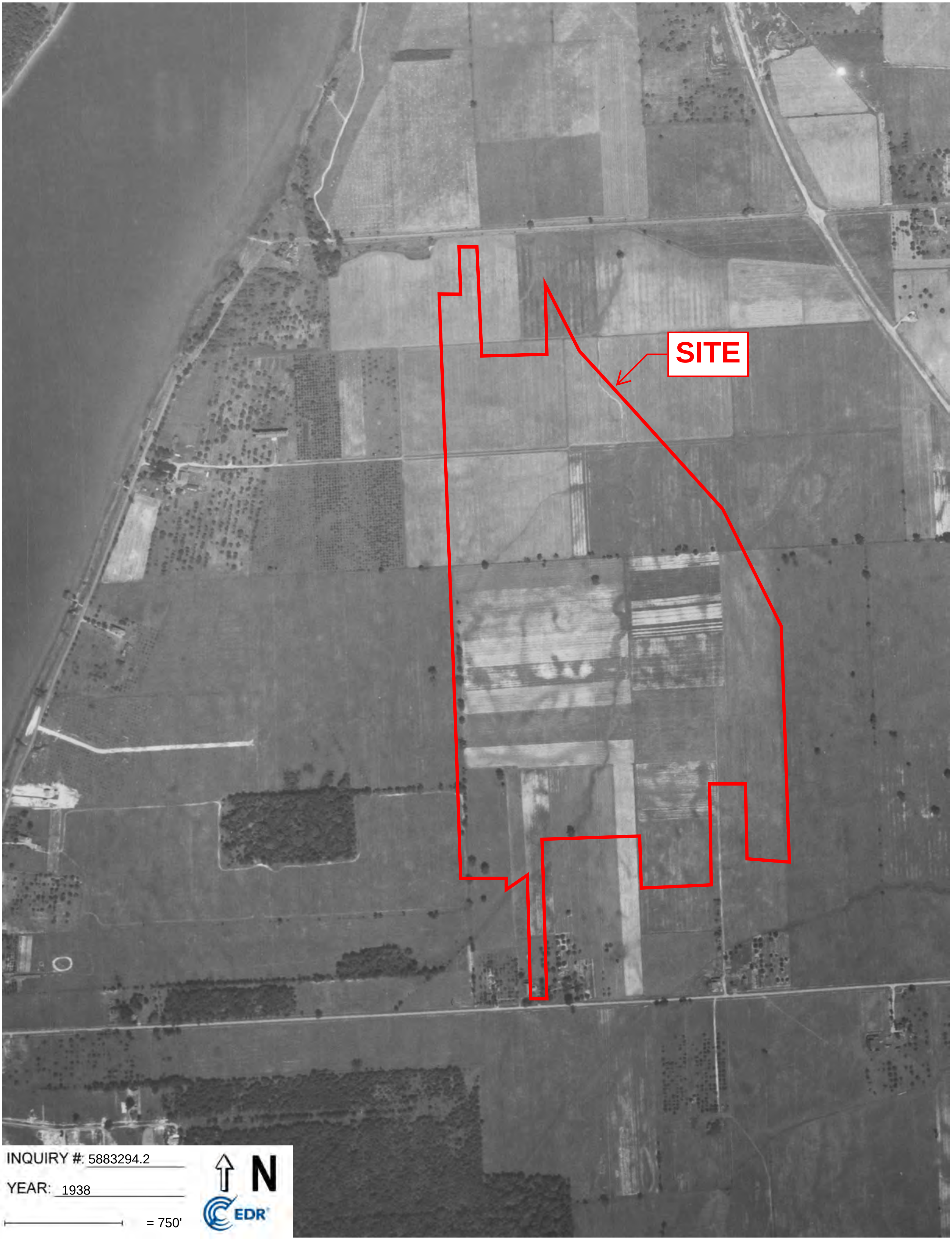
FLOOD MAP

Project No. 100785901	Figure 8
Date 2/20/2020	
Scale 1"= 1500'	
Drawn By IHB	
Last Revised	

Path: \\langan.com\data\PAR\data9\100785901\Project Data\ArcGIS\100785901\100785901.aprx Date: 1/7/2020 User: ibaker Time: 3:09 PM

APPENDIX A

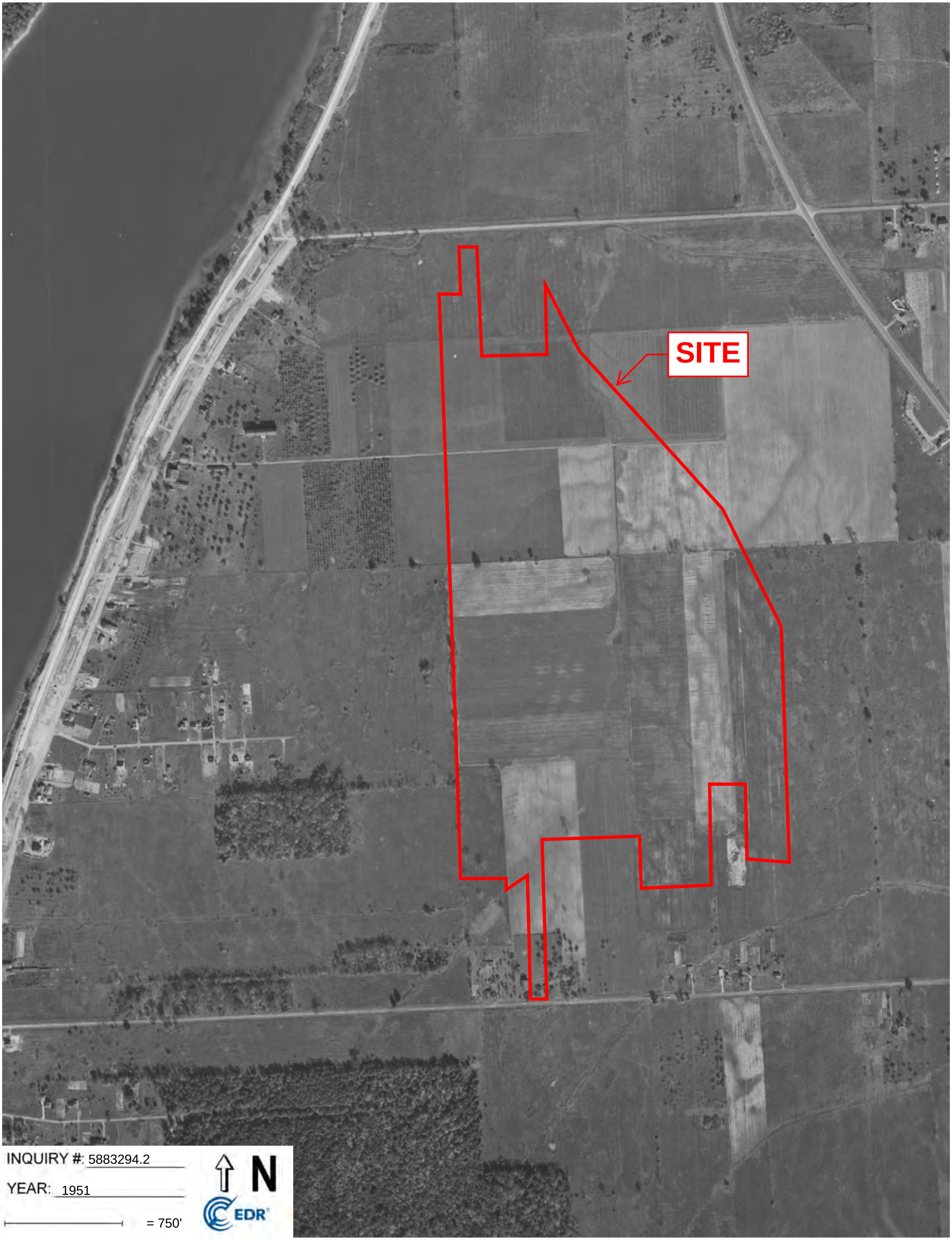
Historical Aerial Photographs



INQUIRY #: 5883294.2

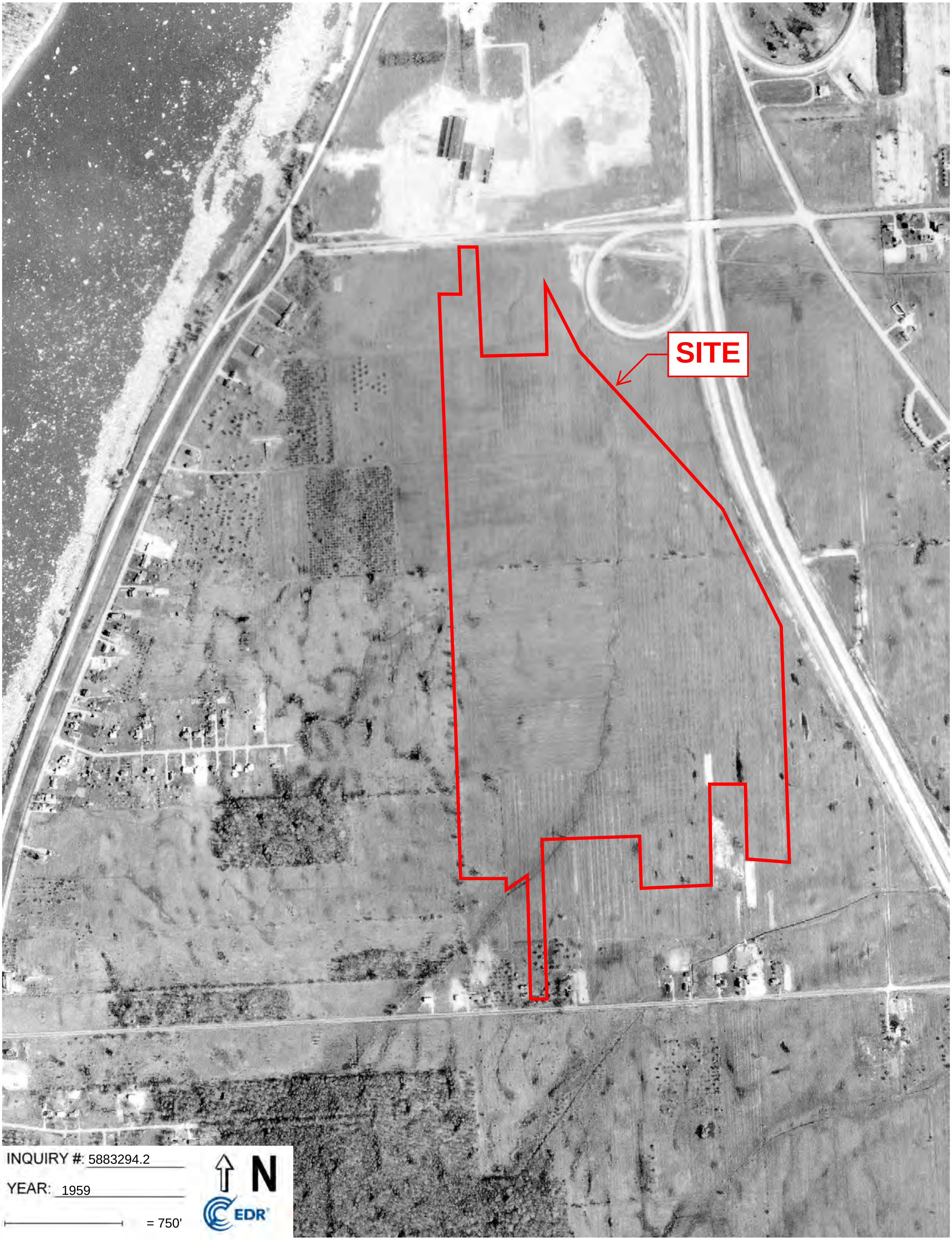
YEAR: 1938

= 750'



INQUIRY #: 5883294.2

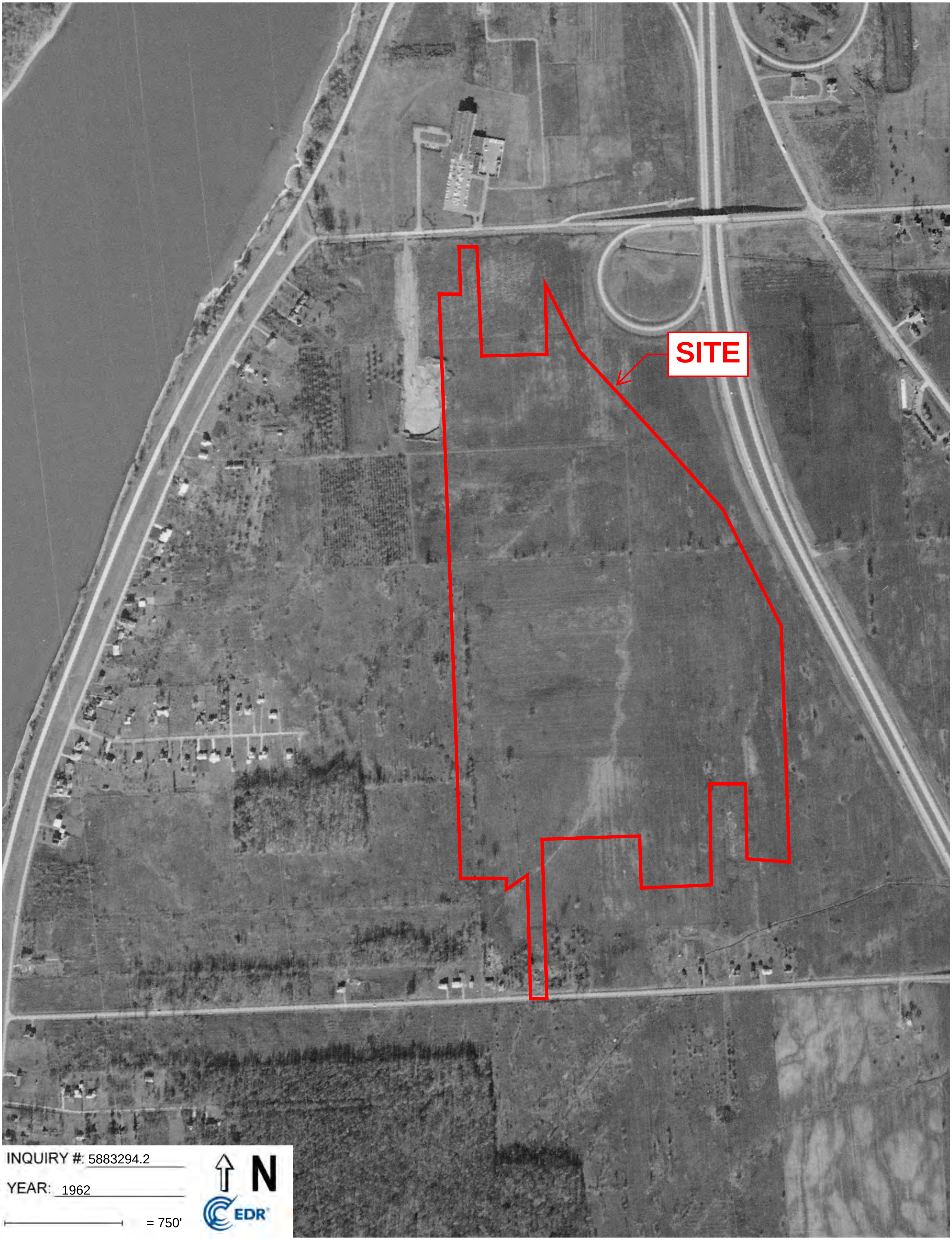
YEAR: 1951



INQUIRY #: 5883294.2

YEAR: 1959

= 750'



INQUIRY #: 5883294.2

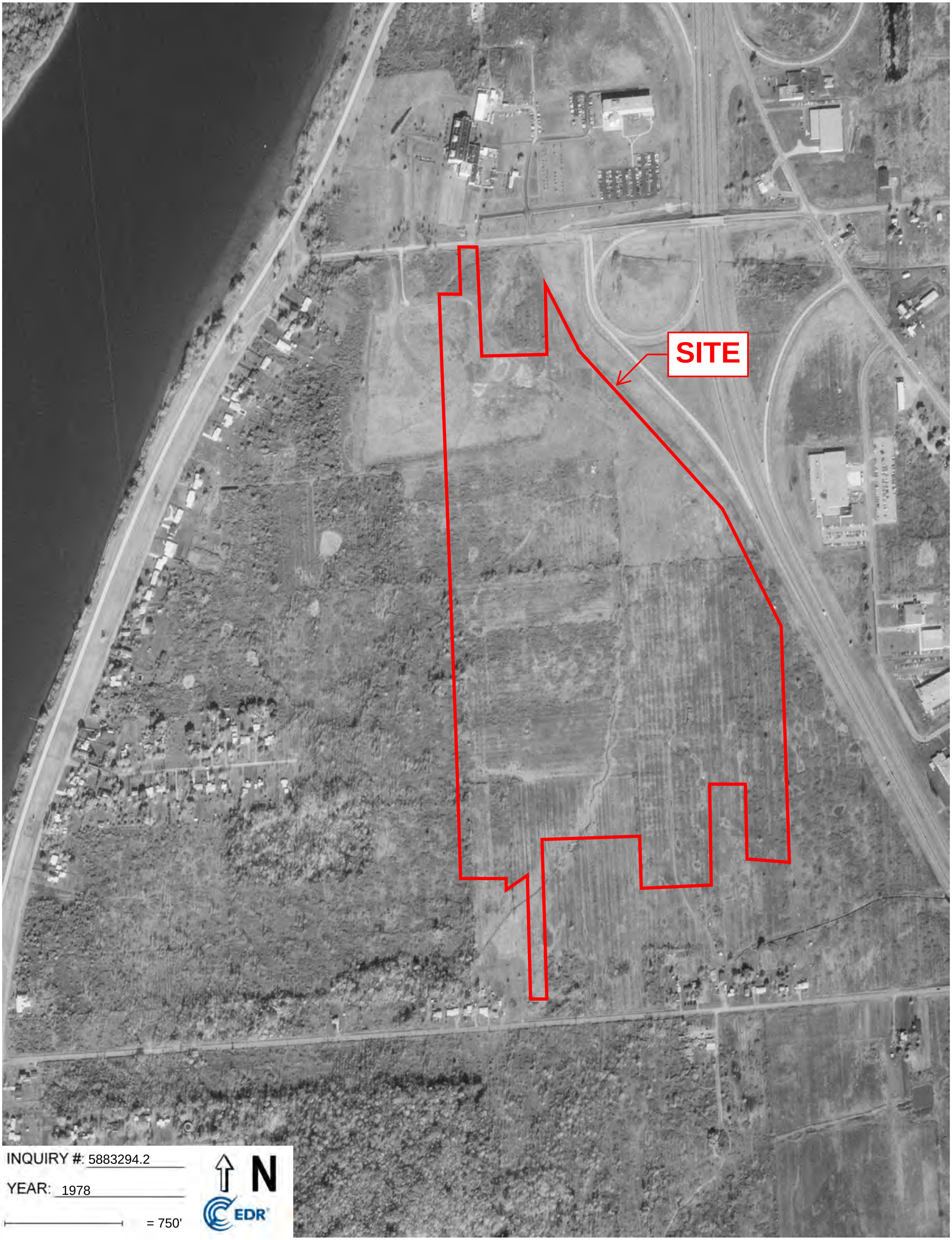
YEAR: 1962

= 750'

INQUIRY #: 5883294.2

YEAR: 1970

= 750'



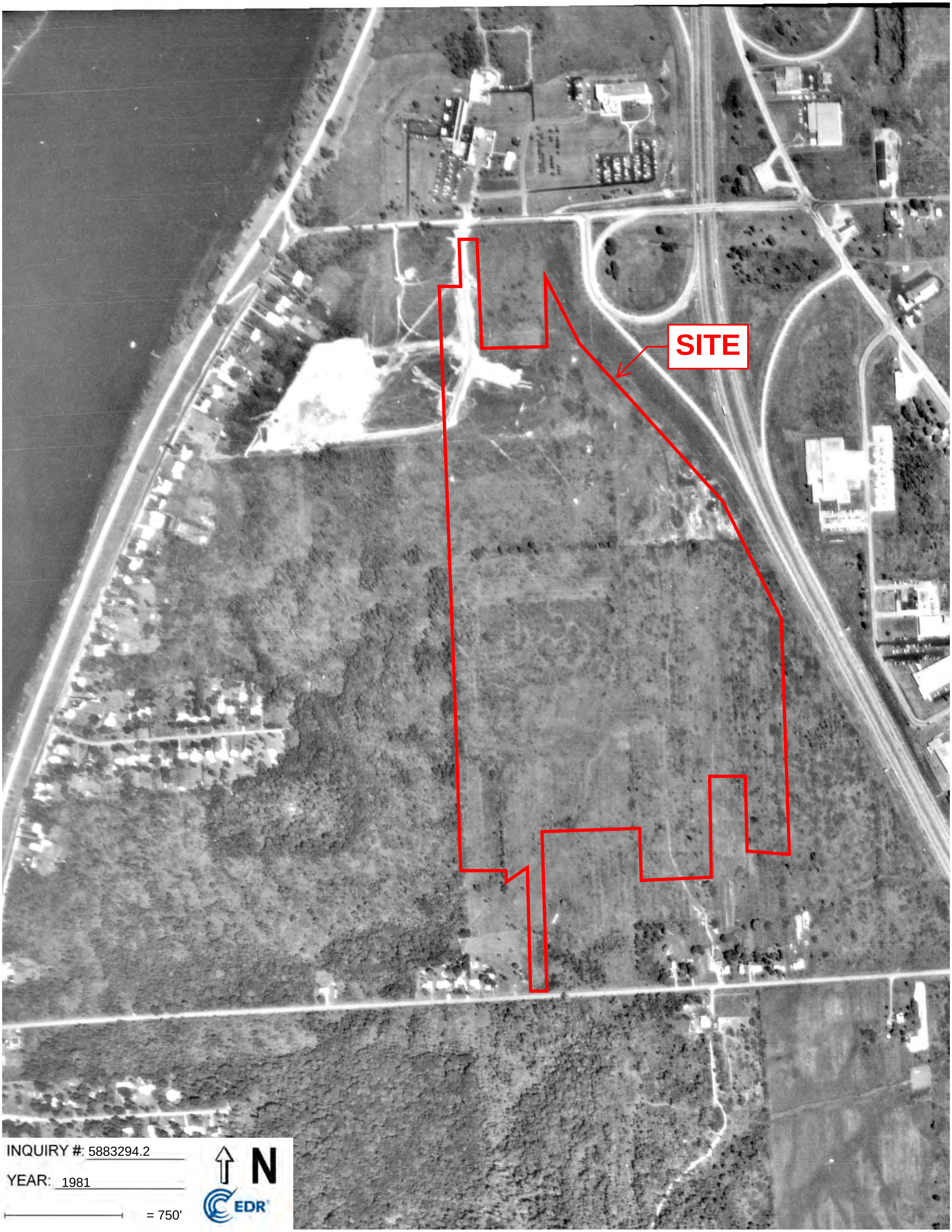
INQUIRY #: 5883294.2

YEAR: 1978

= 750'

N

EDR



INQUIRY #: 5883294.2

YEAR: 1981

= 750'

INQUIRY #: 5883294.2

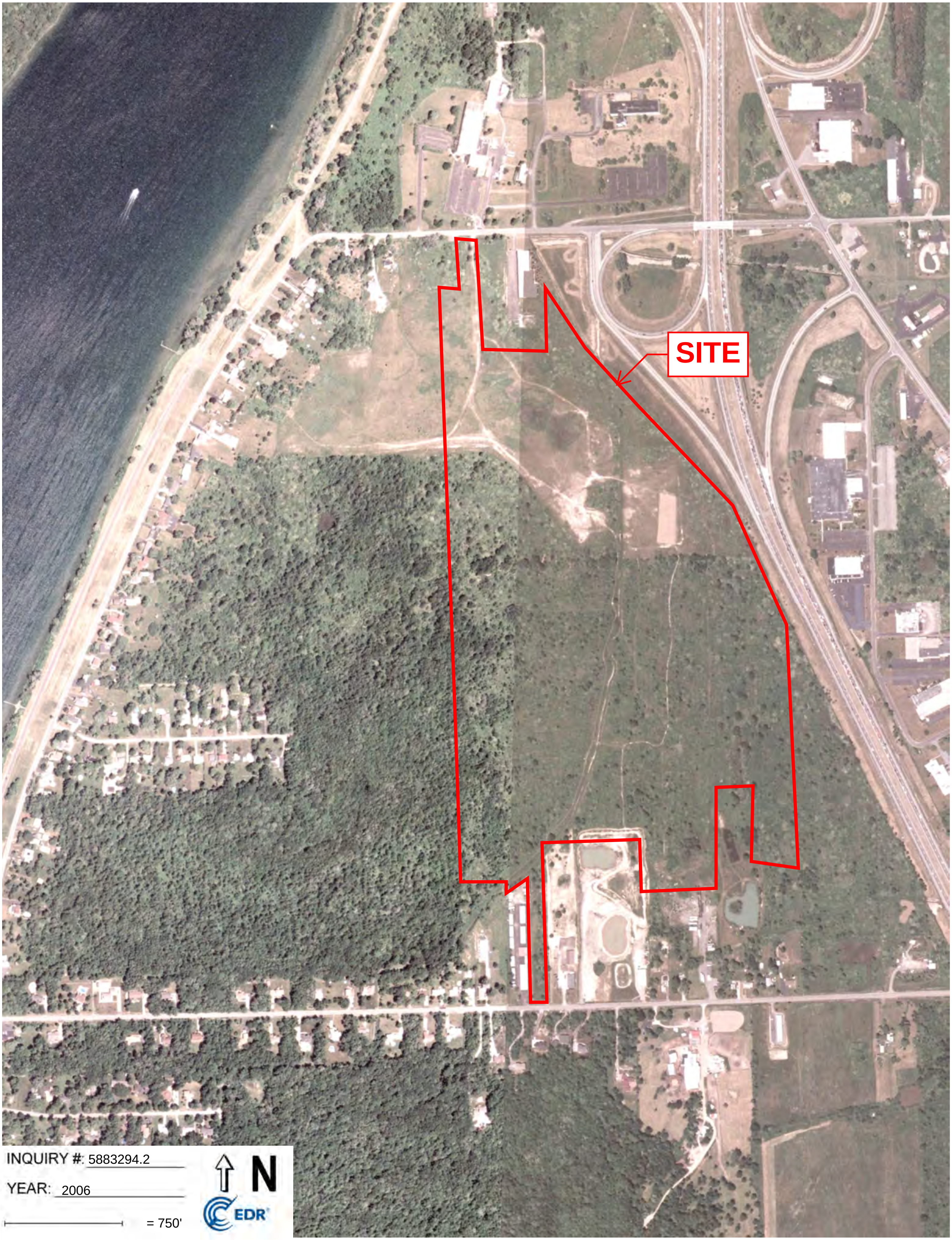
YEAR: 1985

= 750'

INQUIRY #: 5883294.2

YEAR: 1995

= 750'



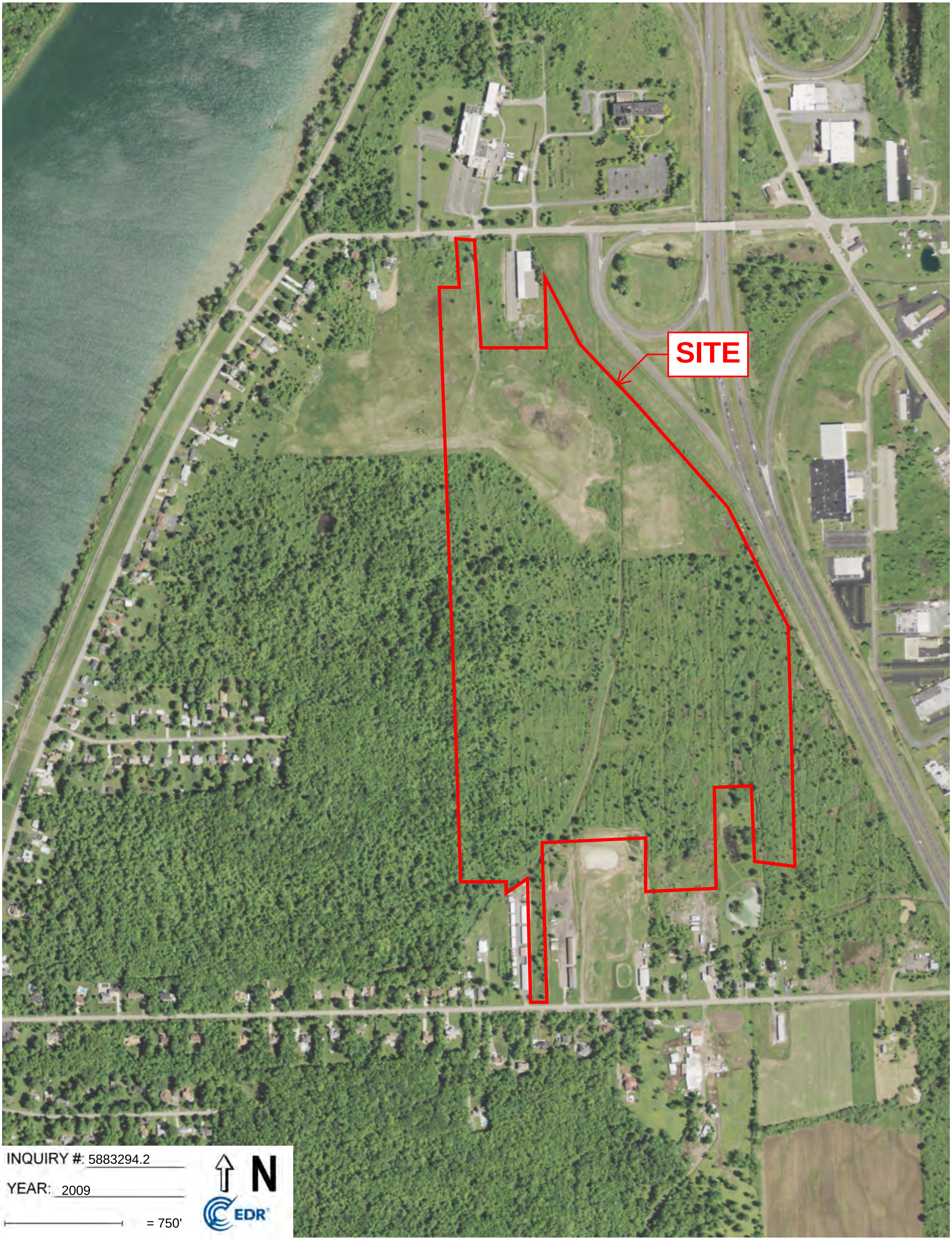
INQUIRY #: 5883294.2

YEAR: 2006

= 750'

N

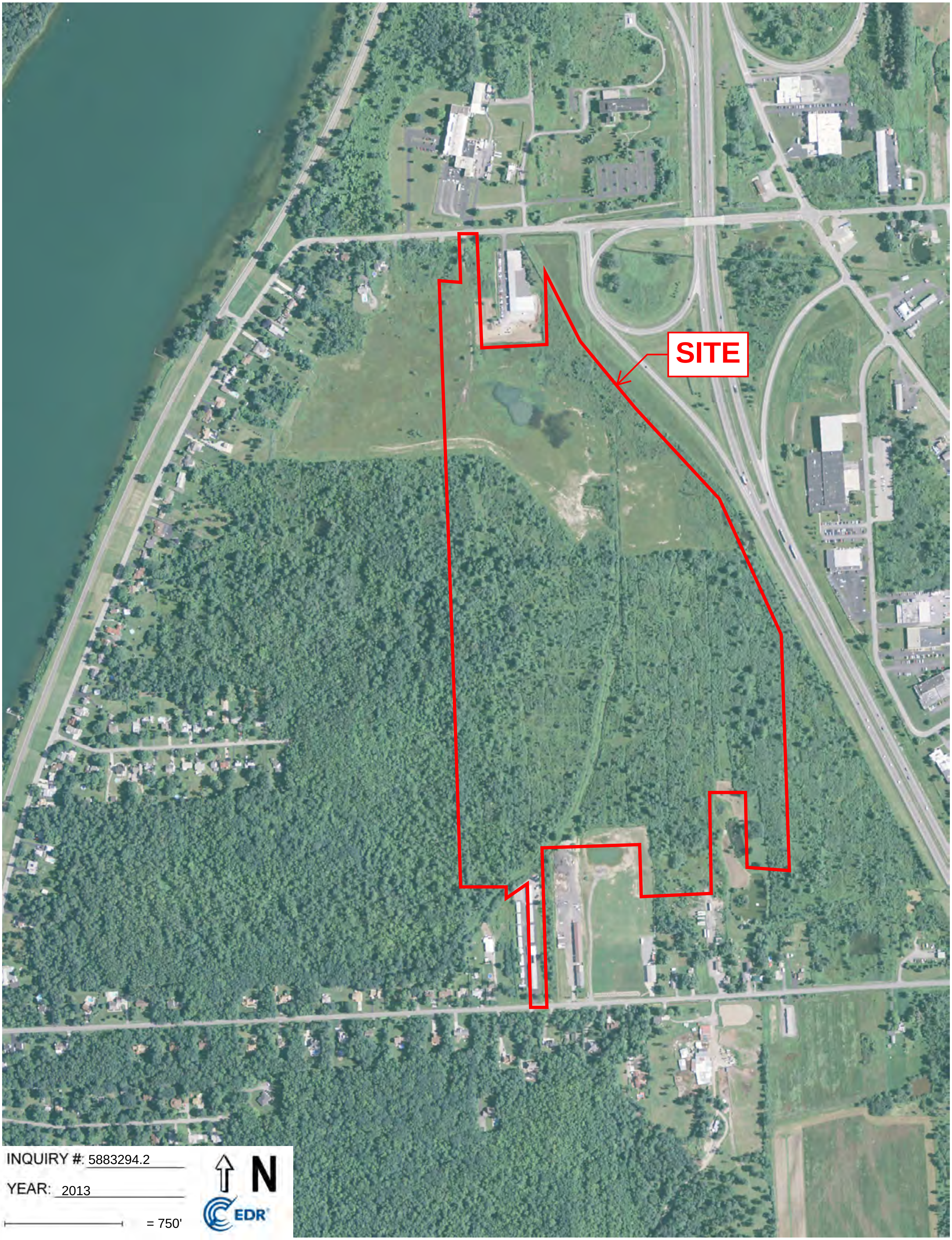
EDR



INQUIRY #: 5883294.2

YEAR: 2009

= 750'



INQUIRY #: 5883294.2

YEAR: 2013

= 750'

INQUIRY #: 5883294.2

YEAR: 2017

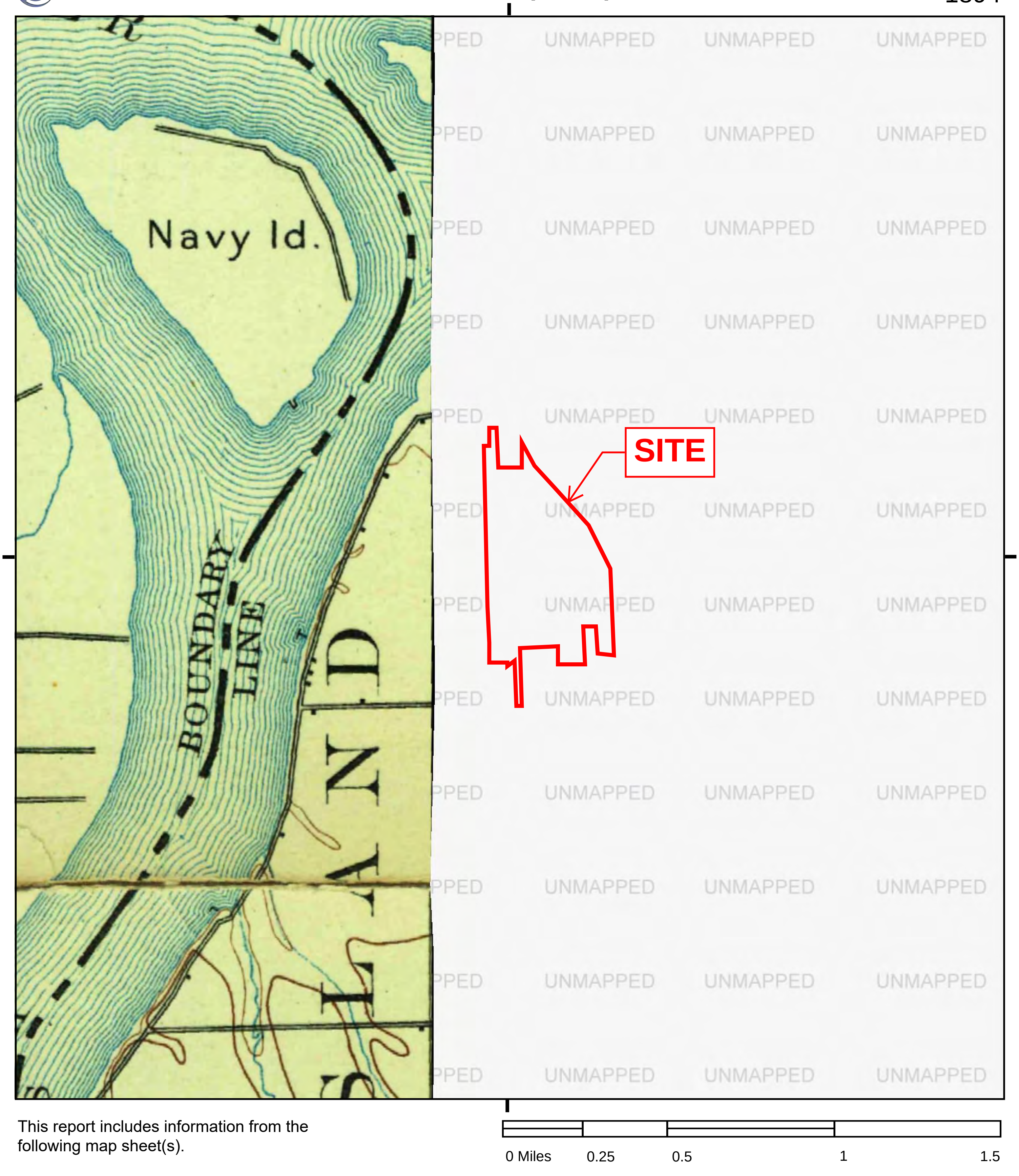
= 750'

APPENDIX B

Historical Topographic Maps

Historical Topo Map

1894



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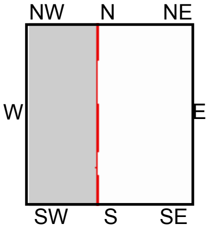
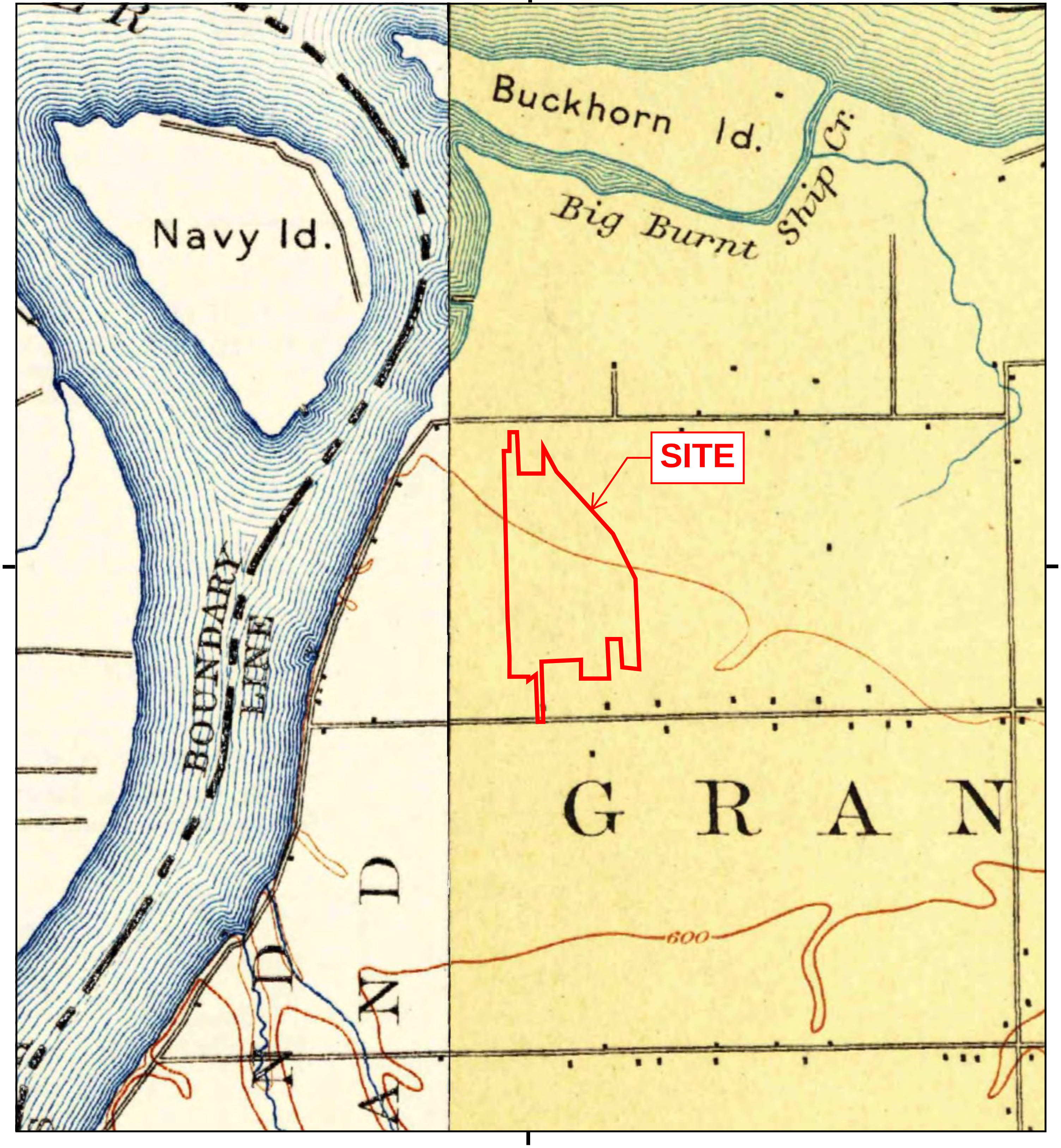


NW, Niagara Falls, 1894, 15-minute

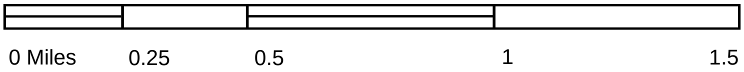
SITE NAME:	Project Olive
ADDRESS:	Long Road Grand Island, NY 14072
CLIENT:	Langan Engineering

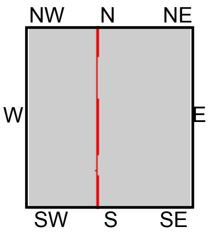
Historical Topo Map

1901



This report includes information from the following map sheet(s).



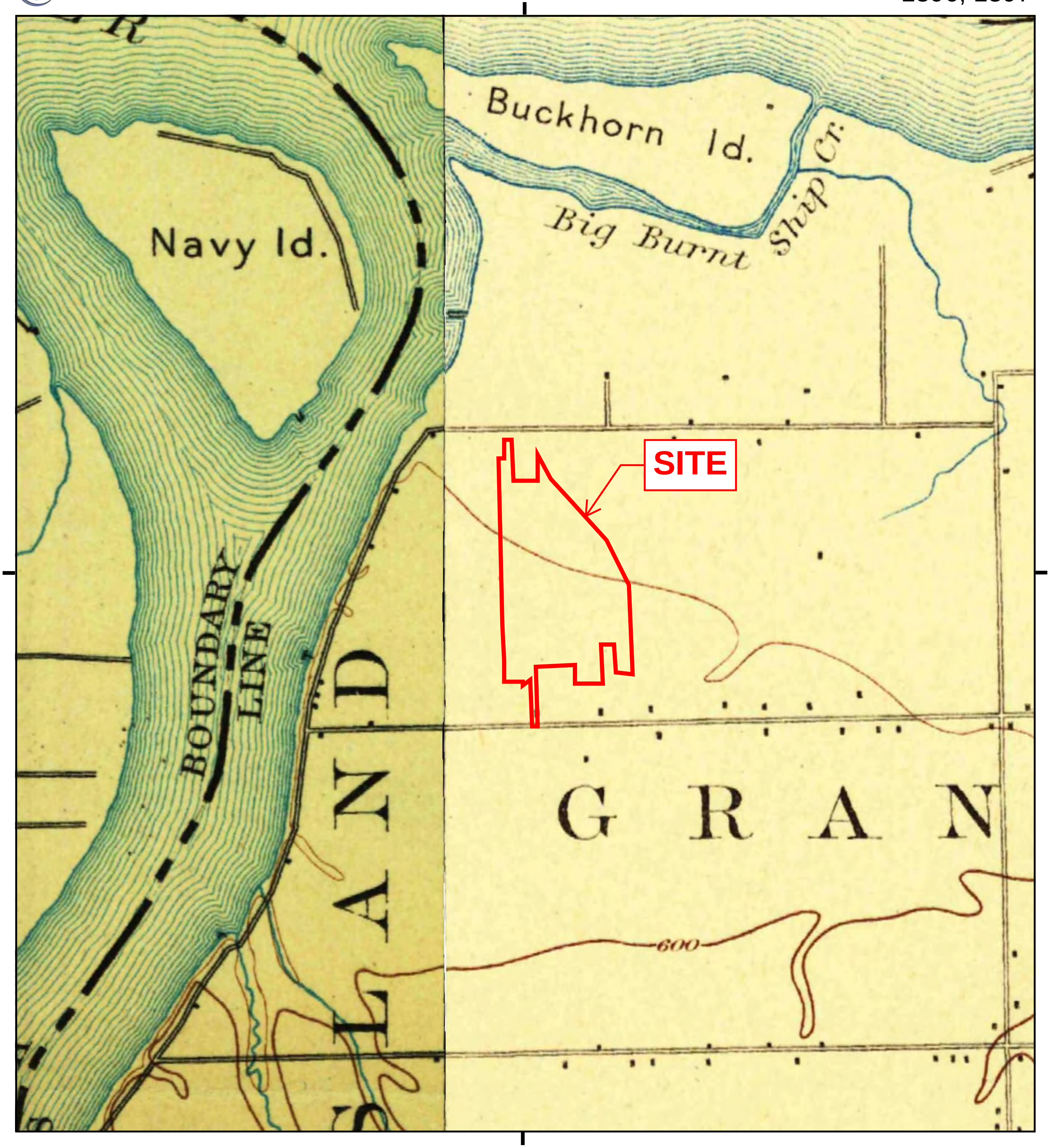


TP, Tonawanda, 1901, 15-minute
NW, Niagara Falls, 1901, 15-minute

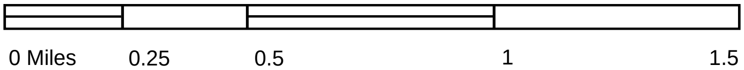
SITE NAME: Project Olive
ADDRESS: Long Road
Grand Island, NY 14072
CLIENT: Langan Engineering

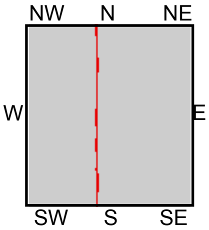
Historical Topo Map

1896, 1897



This report includes information from the following map sheet(s).



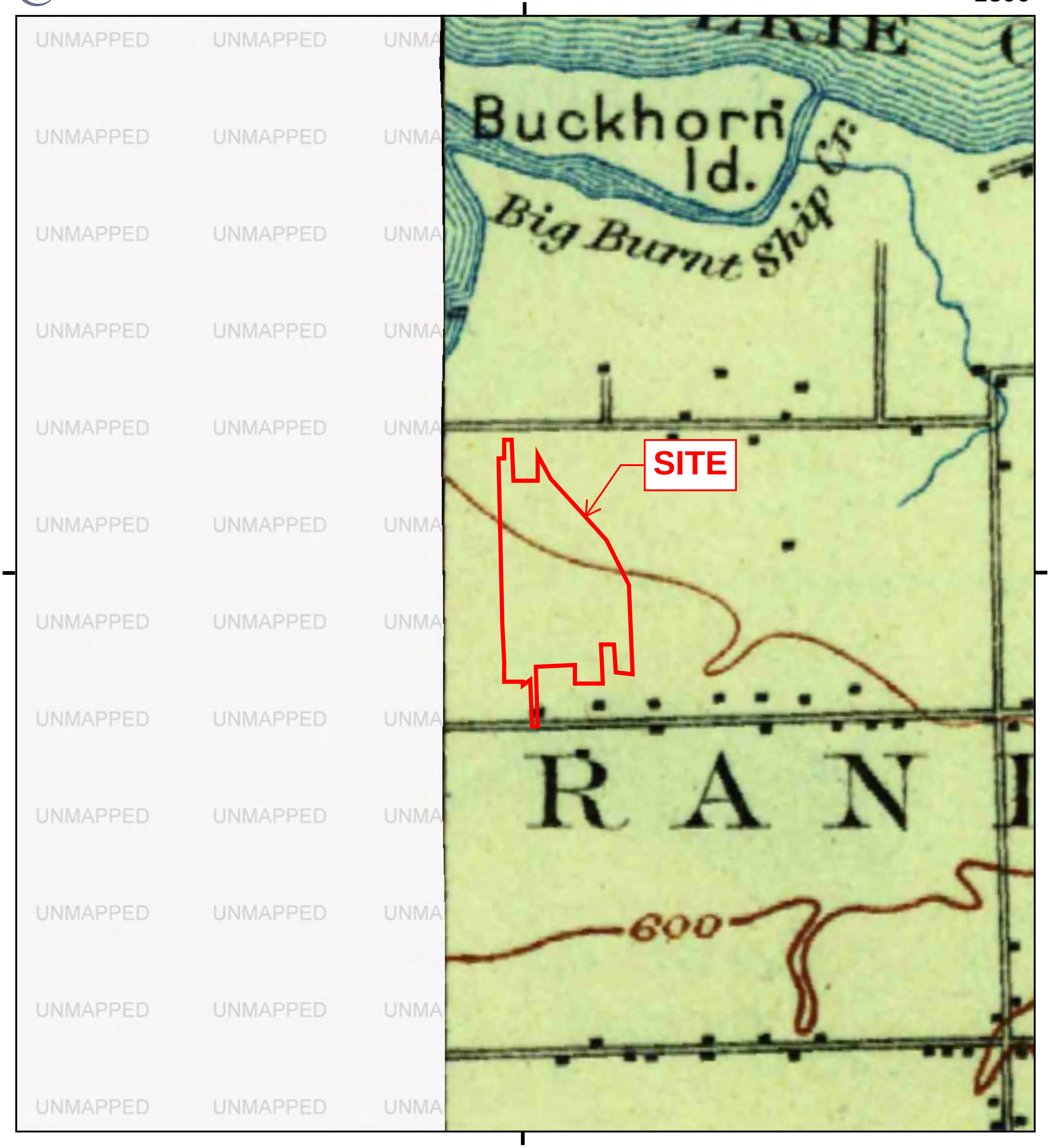


TP, Tonawanda, 1897, 15-minute
NW, Niagara Falls, 1896, 15-minute

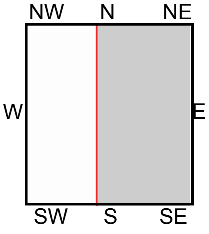
SITE NAME: Project Olive
ADDRESS: Long Road
Grand Island, NY 14072
CLIENT: Langan Engineering

Historical Topo Map

1899



This report includes information from the following map sheet(s).

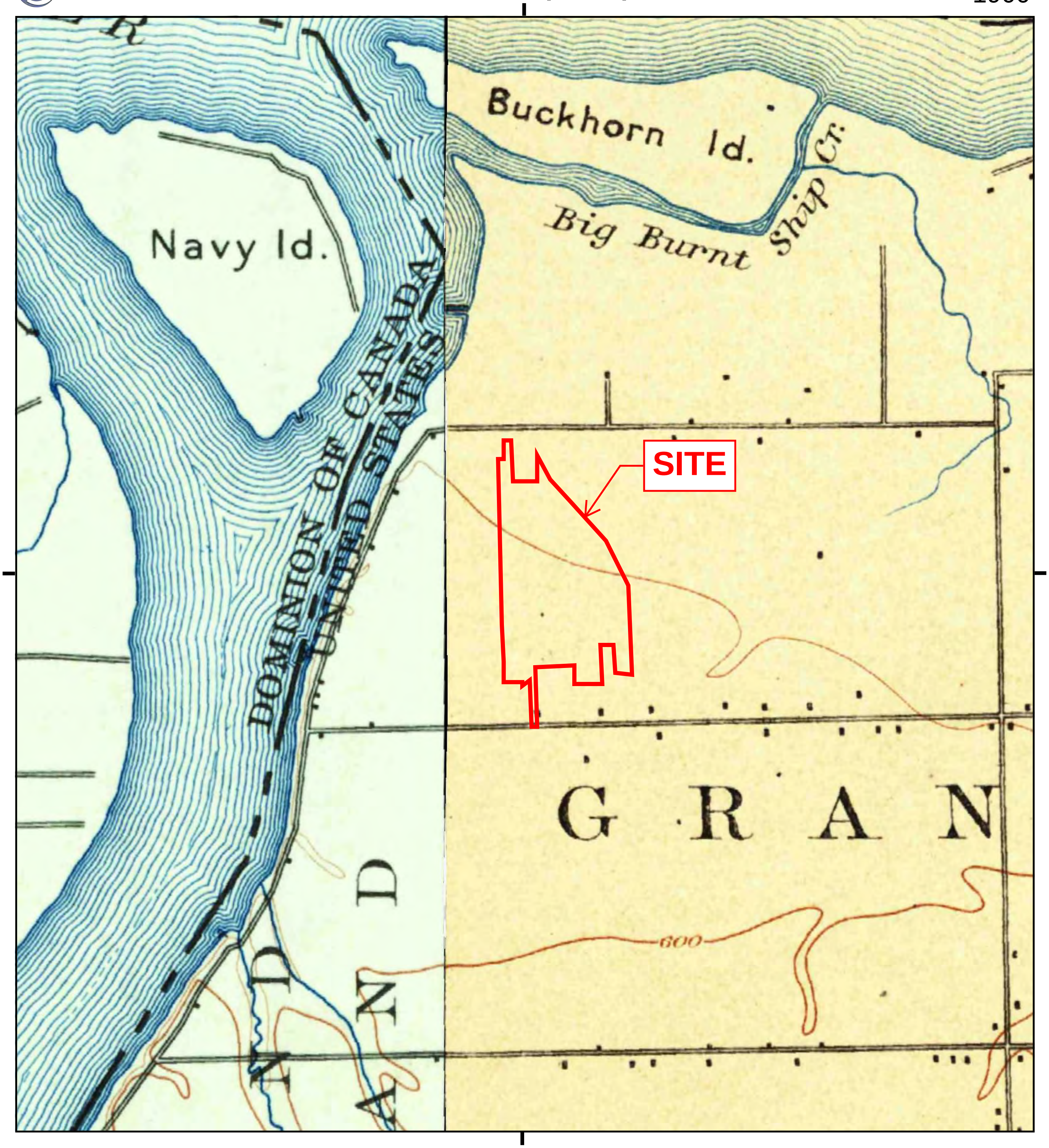


TP, Niagara, 1899, 30-minute

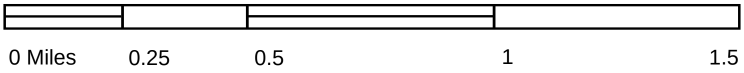
SITE NAME: Project Olive
ADDRESS: Long Road
Grand Island, NY 14072
CLIENT: Langan Engineering

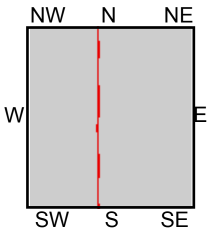
Historical Topo Map

1900



This report includes information from the following map sheet(s).



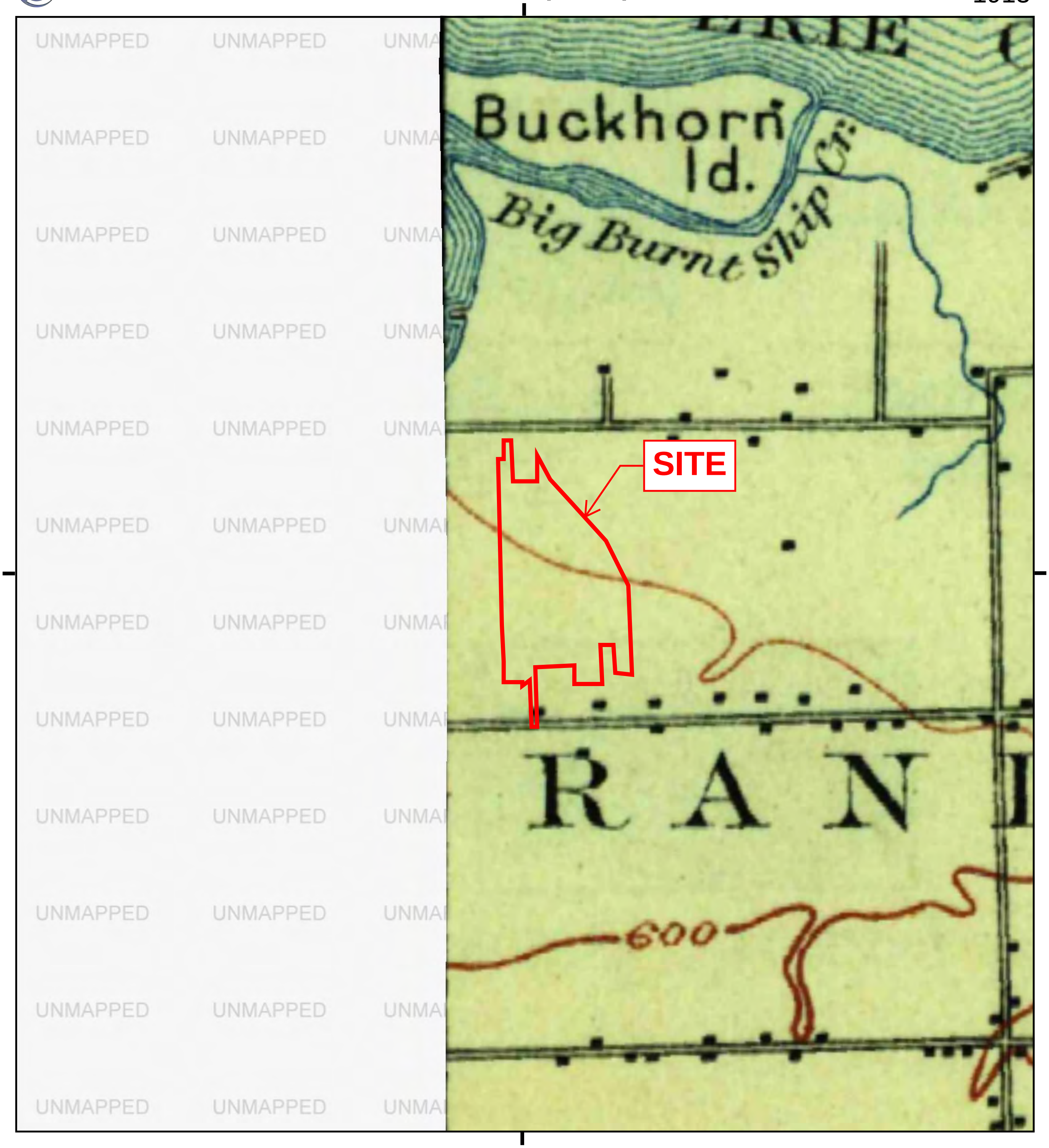


TP, Tonawanda, 1900, 15-minute
NW, Niagara Falls, 1900, 15-minute

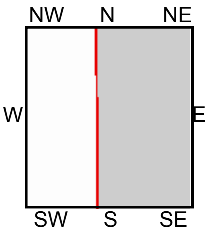
SITE NAME: Project Olive
ADDRESS: Long Road
Grand Island, NY 14072
CLIENT: Langan Engineering

Historical Topo Map

1913



This report includes information from the following map sheet(s).

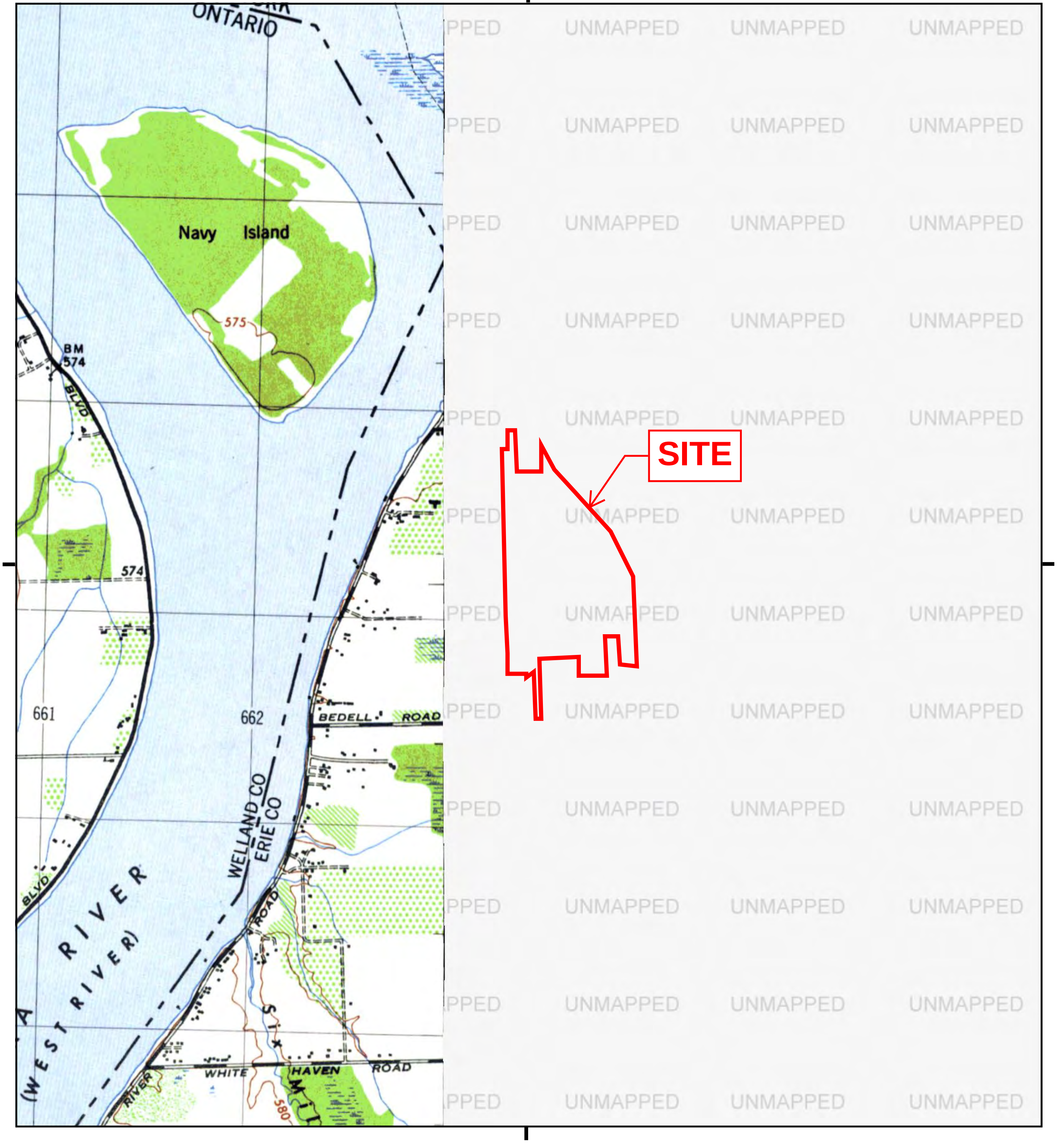


TP, Niagara, 1913, 30-minute

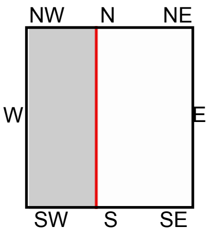
SITE NAME: Project Olive
ADDRESS: Long Road
Grand Island, NY 14072
CLIENT: Langan Engineering

Historical Topo Map

1944



This report includes information from the following map sheet(s).

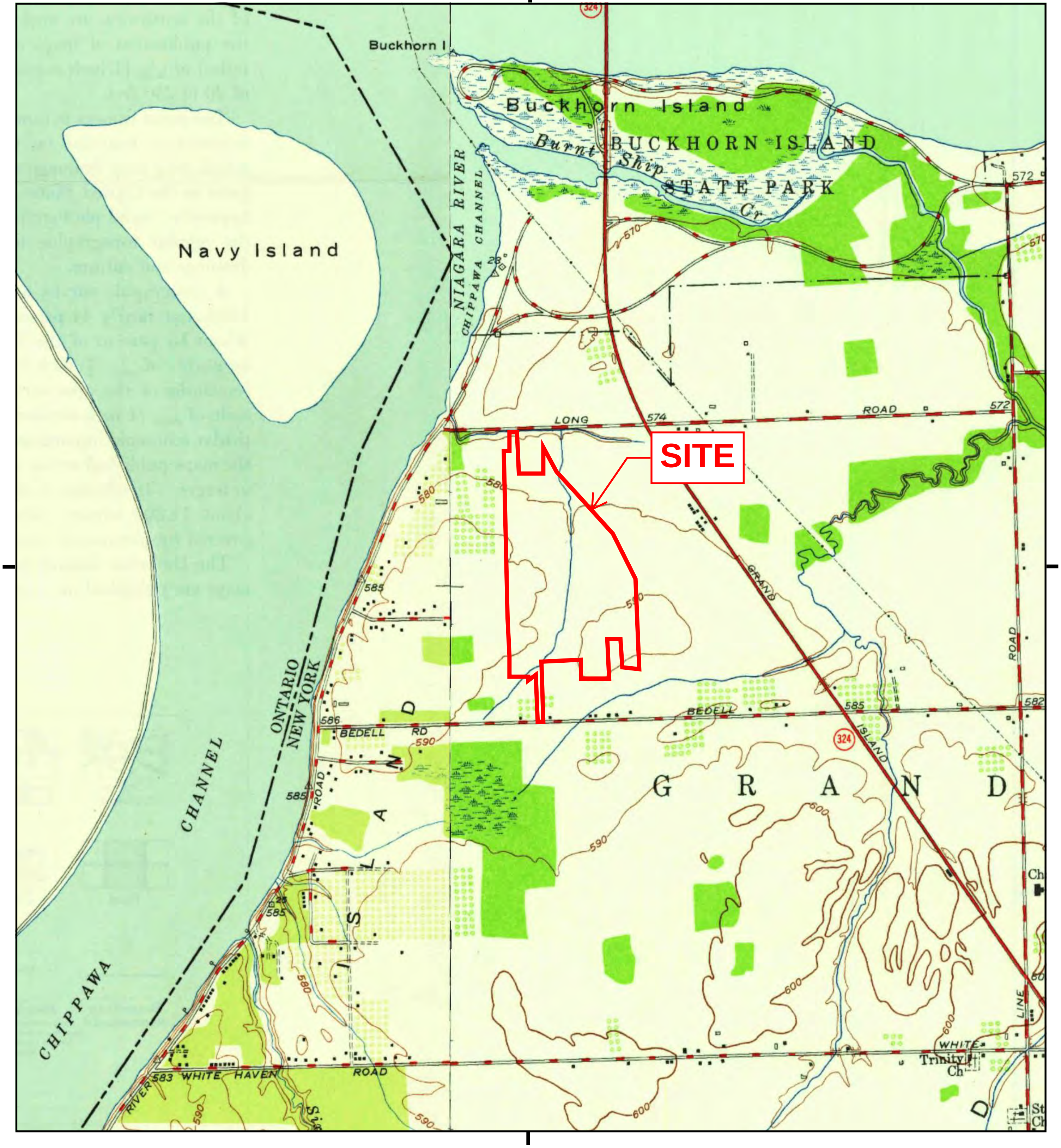


W, NIAGARA FALLS, 1944, 7.5-minute

SITE NAME: Project Olive
ADDRESS: Long Road
Grand Island, NY 14072
CLIENT: Langan Engineering

Historical Topo Map

1948, 1949



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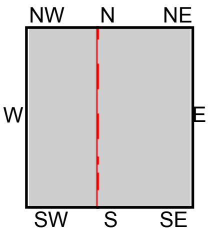
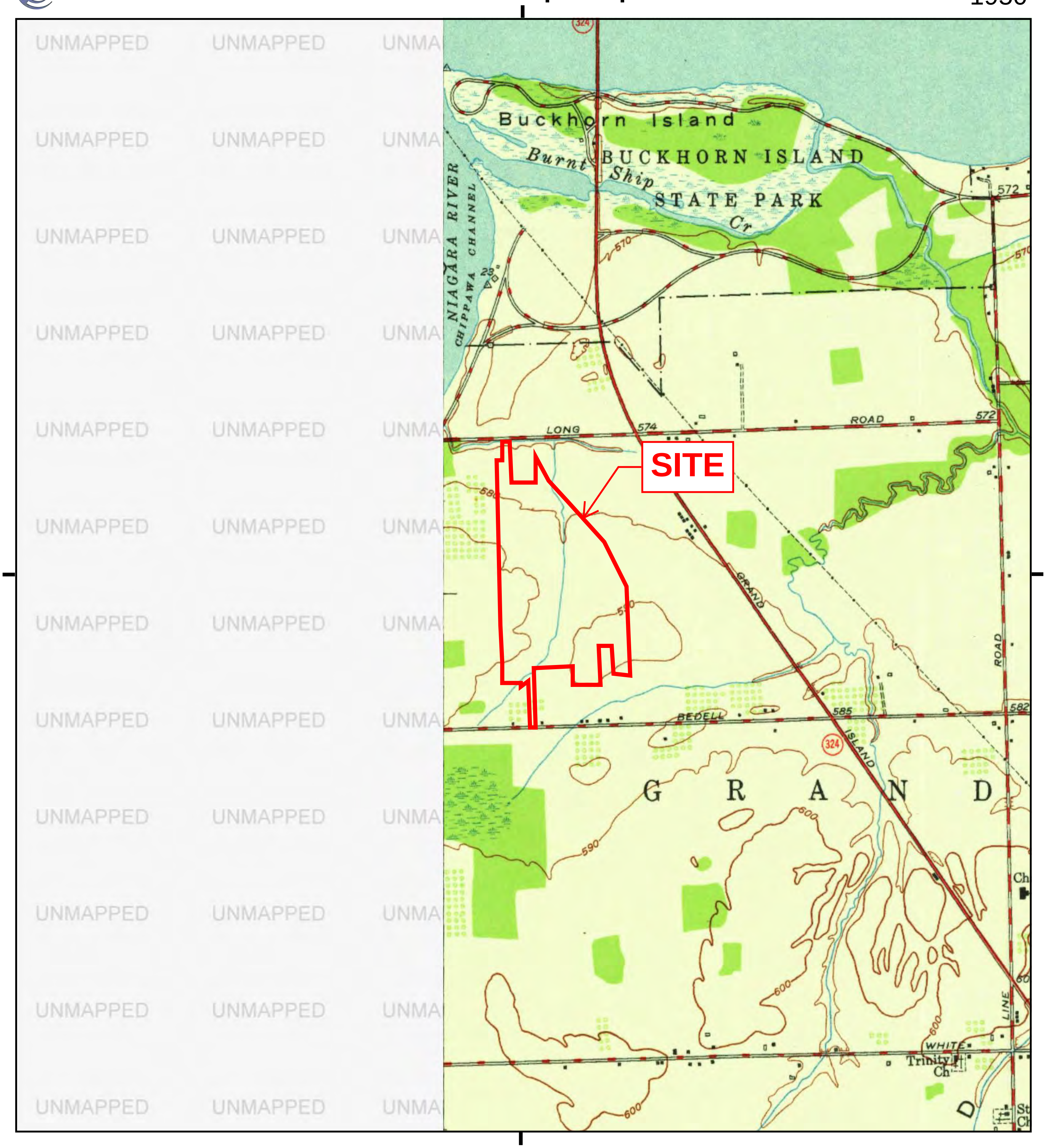


TP, Tonawanda West, 1948, 7.5-minute
W, Niagara Falls, 1949, 7.5-minute

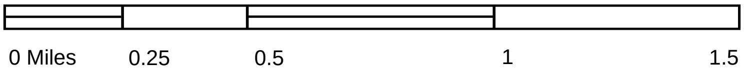
SITE NAME: Project Olive
ADDRESS: Long Road
Grand Island, NY 14072
CLIENT: Langan Engineering

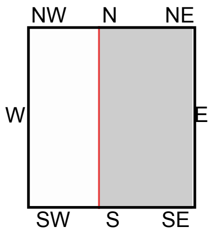
Historical Topo Map

1950



This report includes information from the following map sheet(s).



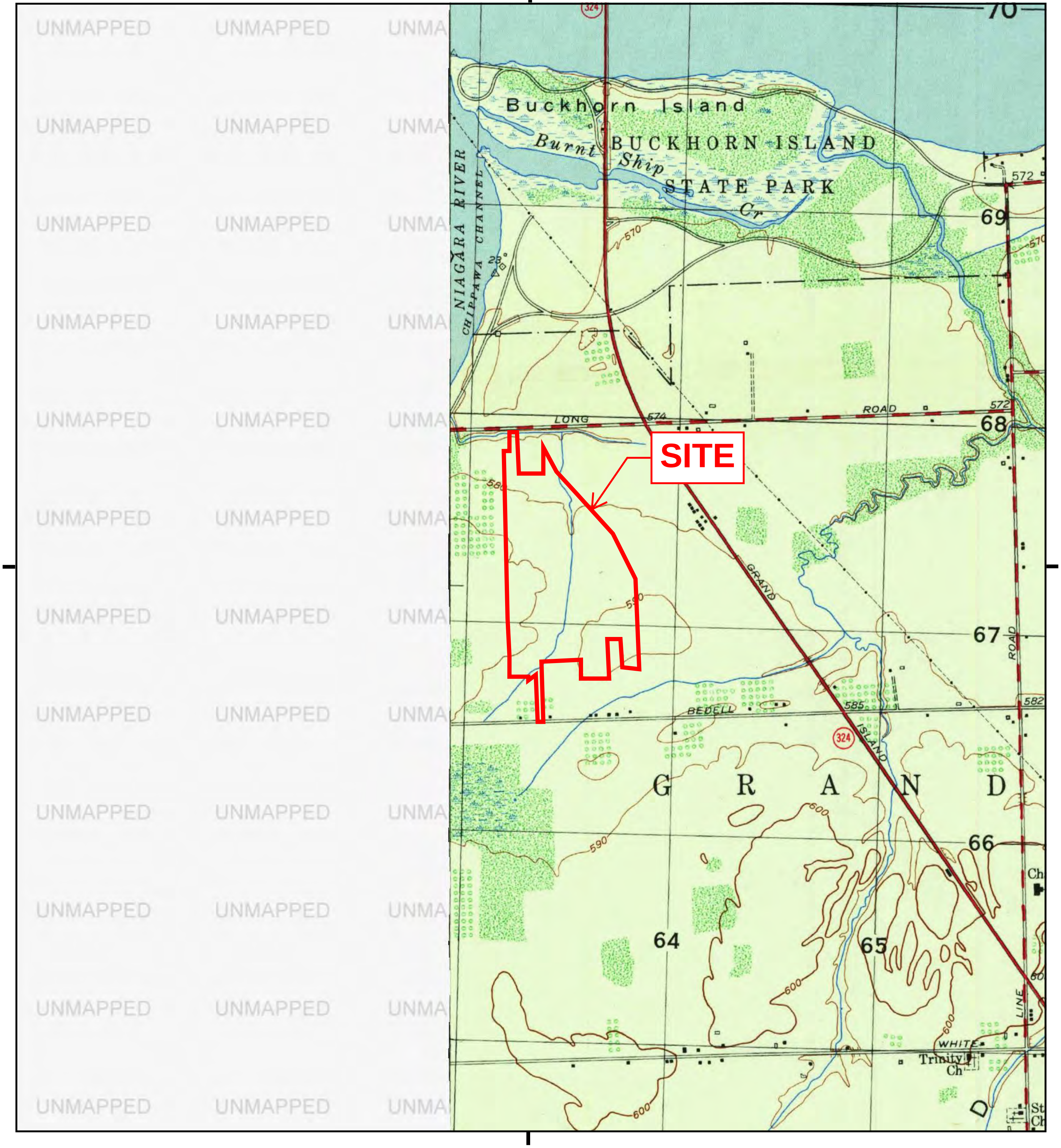


TP, Tonawanda West, 1950, 7.5-minute

SITE NAME: Project Olive
ADDRESS: Long Road
Grand Island, NY 14072
CLIENT: Langan Engineering

Historical Topo Map

1954



This report includes information from the following map sheet(s).

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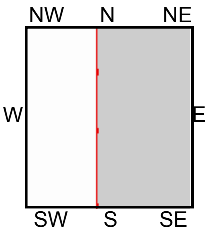


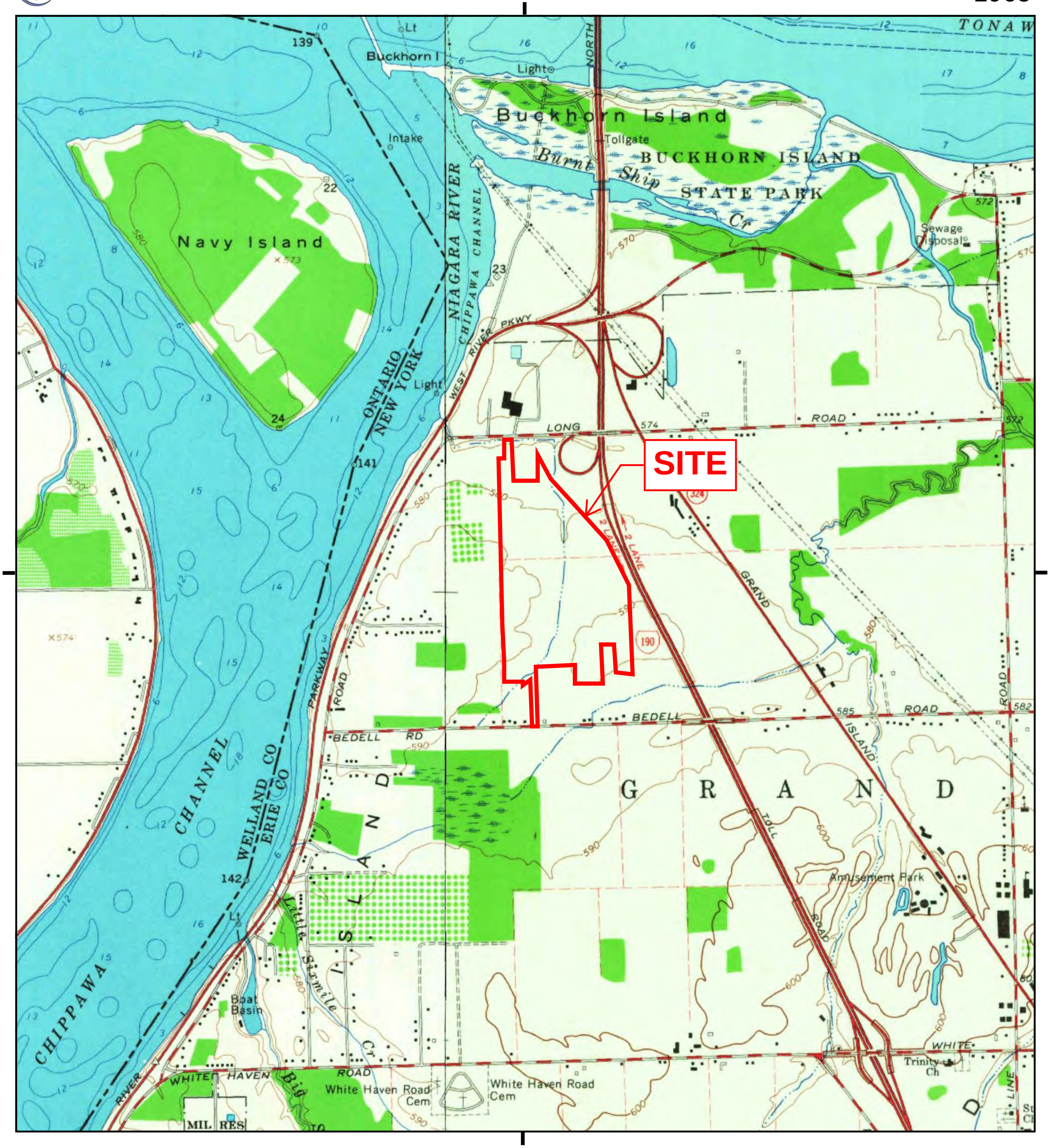
TP, Tonawanda West, 1954, 7.5-minute

SITE NAME: Project Olive
ADDRESS: Long Road
Grand Island, NY 14072
CLIENT: Langan Engineering

N

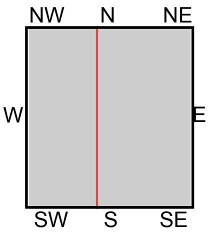
Historical Topo Map

1965



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5



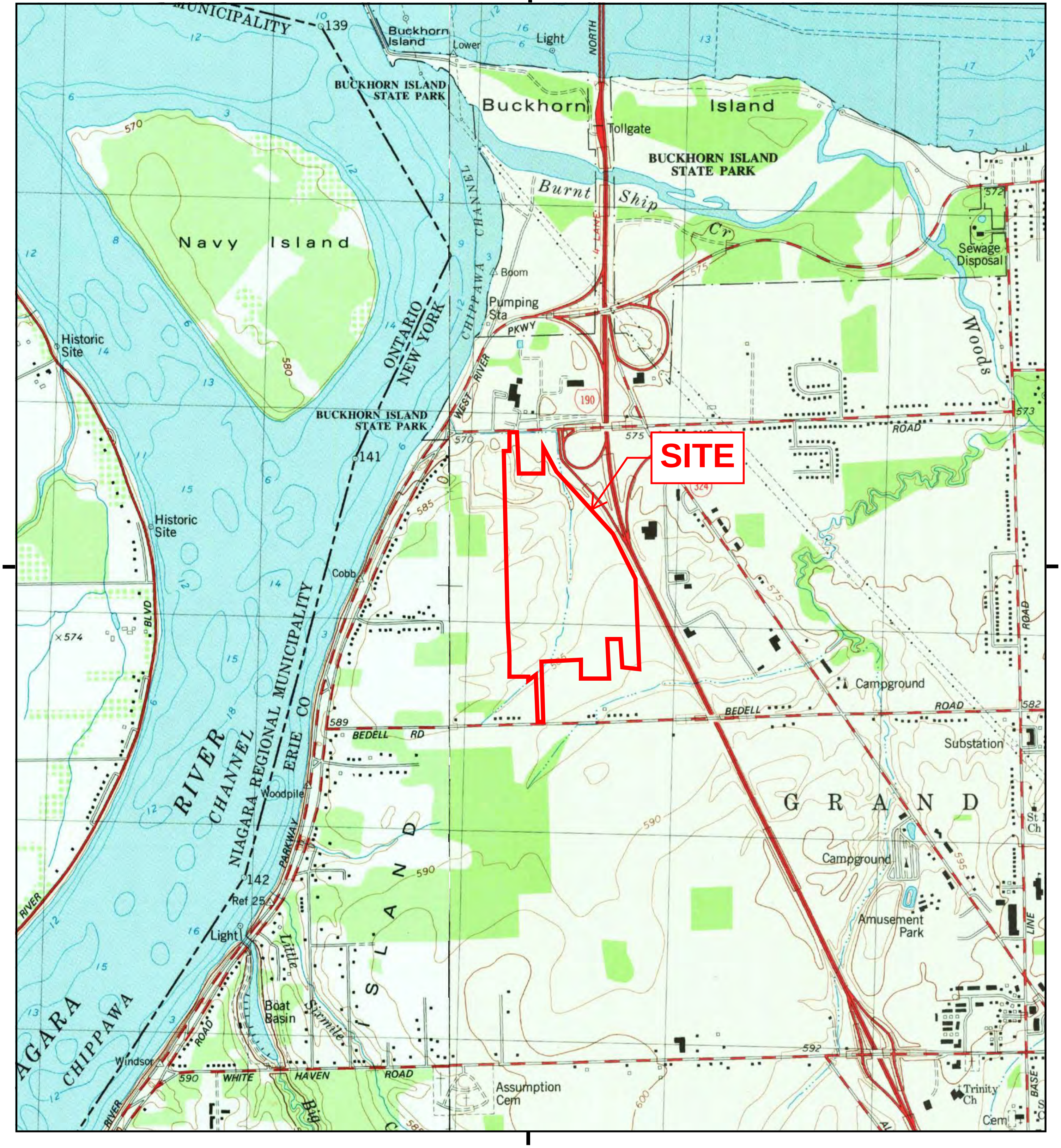
TP, Tonawanda West, 1965, 7.5-minute
W, Niagara Falls, 1965, 7.5-minute

SITE NAME: Project Olive
ADDRESS: Long Road
Grand Island, NY 14072
CLIENT: Langan Engineering

N

Historical Topo Map

1980



0 Miles 0.25 0.5 1 1.5

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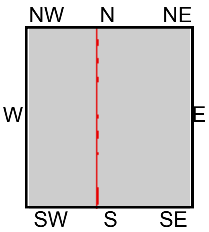
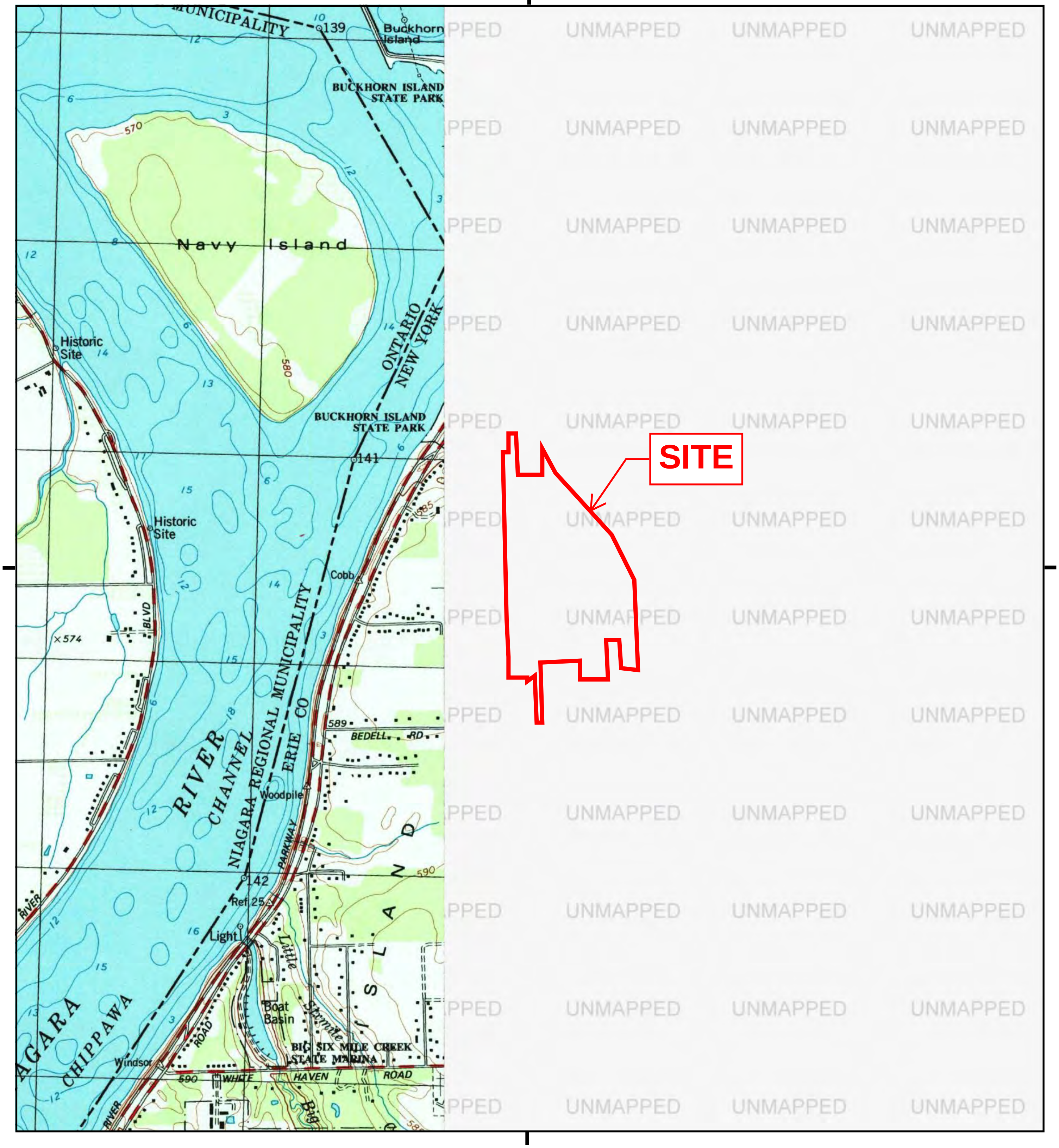


TP, Tonawanda West, 1980, 7.5-minute
W, Niagara Falls, 1980, 7.5-minute

SITE NAME: Project Olive
ADDRESS: Long Road
Grand Island, NY 14072
CLIENT: Langan Engineering

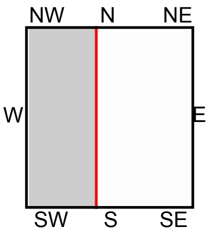
Historical Topo Map

1999



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

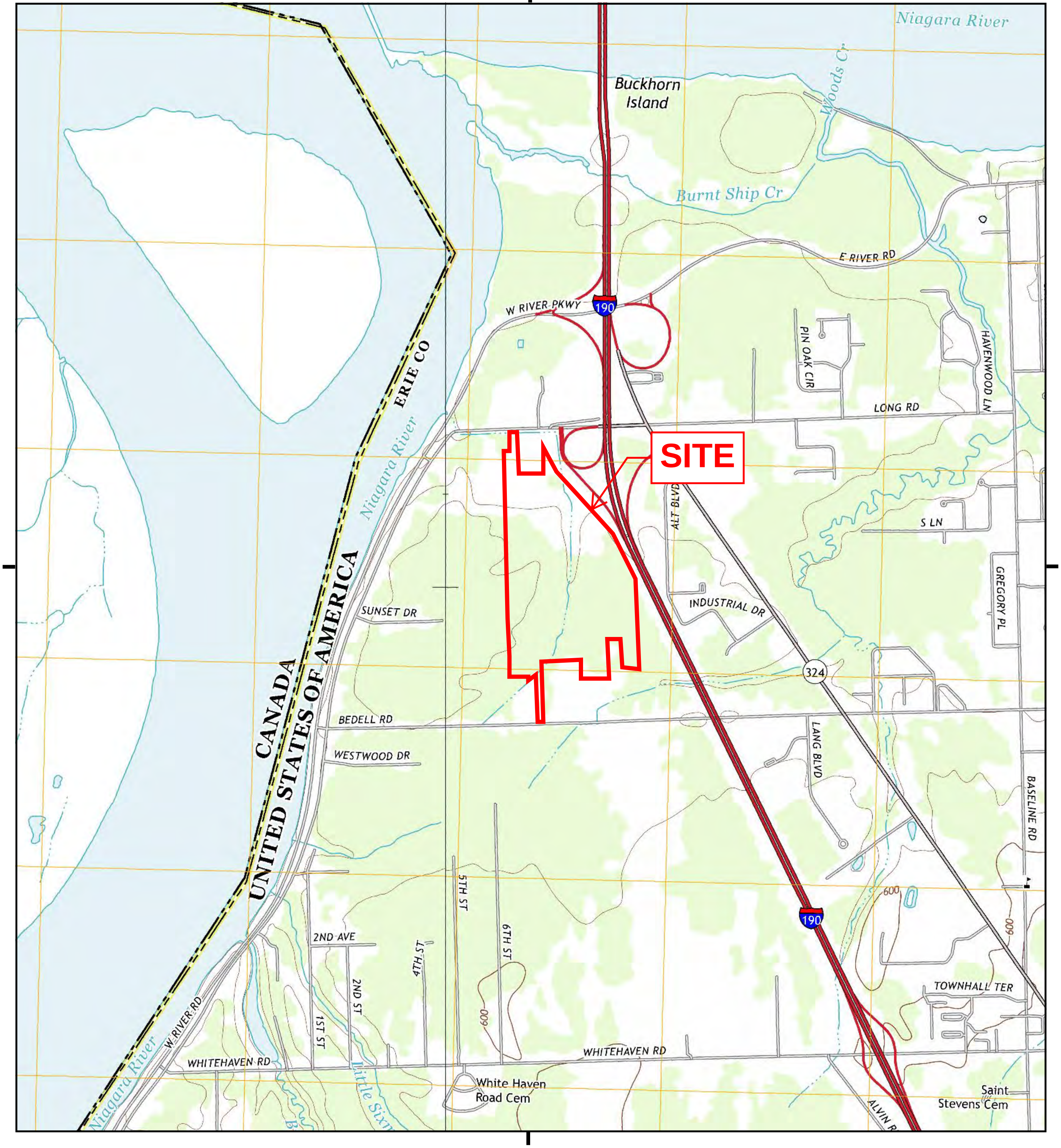


W, Niagara Falls, 1999, 7.5-minute

SITE NAME: Project Olive
ADDRESS: Long Road
Grand Island, NY 14072
CLIENT: Langan Engineering

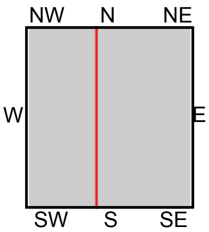
Historical Topo Map

2013



0 Miles 0.25 0.5 1 1.5

This report includes information from the following map sheet(s).

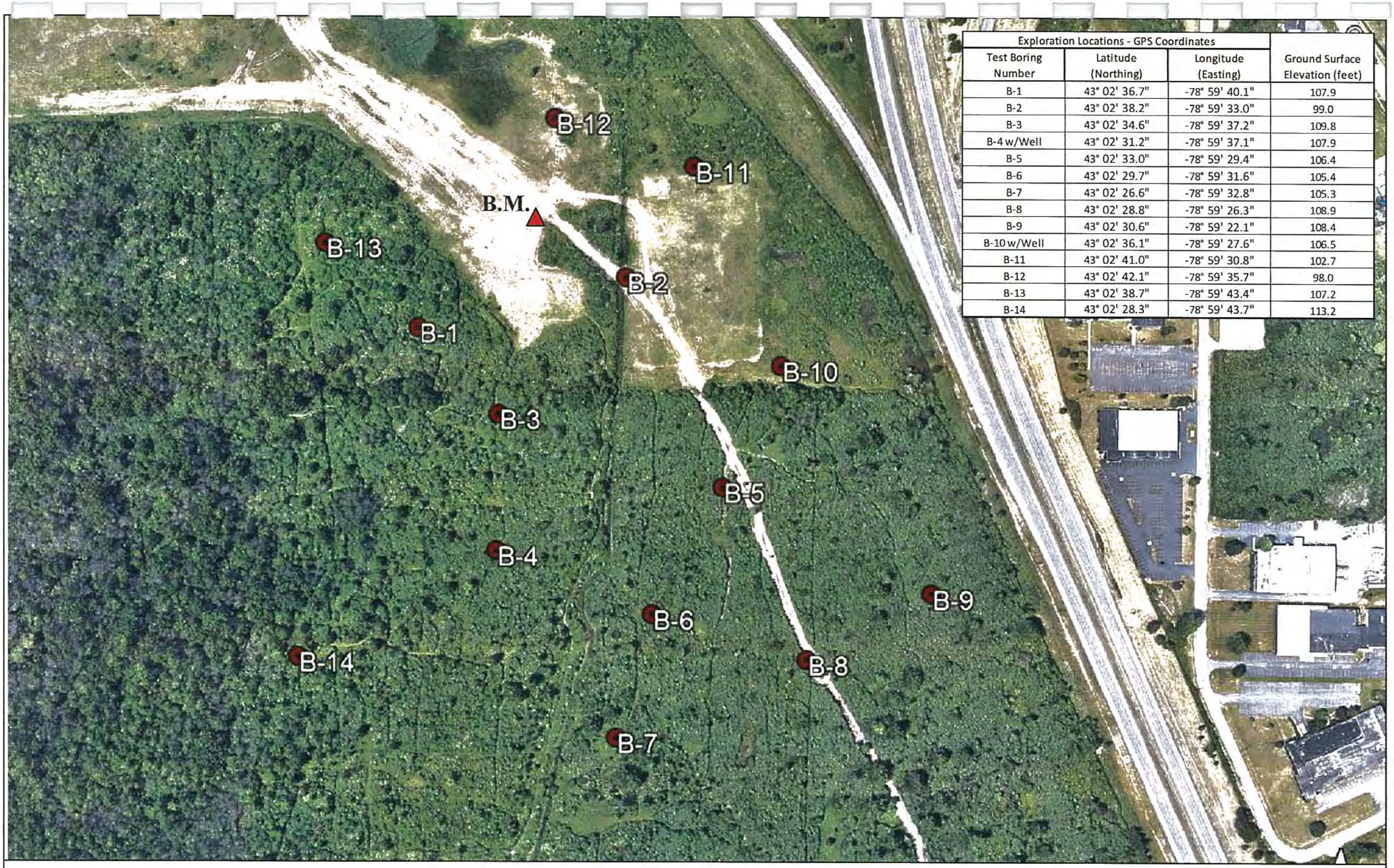


TP, Tonawanda West, 2013, 7.5-minute
W, Niagara Falls, 2013, 7.5-minute

SITE NAME: Project Olive
ADDRESS: Long Road
Grand Island, NY 14072
CLIENT: Langan Engineering

APPENDIX C

Subsurface Information by Others



Exploration Locations - GPS Coordinates			
Test Boring Number	Latitude (Northing)	Longitude (Easting)	Ground Surface Elevation (feet)
B-1	43° 02' 36.7"	-78° 59' 40.1"	107.9
B-2	43° 02' 38.2"	-78° 59' 33.0"	99.0
B-3	43° 02' 34.6"	-78° 59' 37.2"	109.8
B-4 w/Well	43° 02' 31.2"	-78° 59' 37.1"	107.9
B-5	43° 02' 33.0"	-78° 59' 29.4"	106.4
B-6	43° 02' 29.7"	-78° 59' 31.6"	105.4
B-7	43° 02' 26.6"	-78° 59' 32.8"	105.3
B-8	43° 02' 28.8"	-78° 59' 26.3"	108.9
B-9	43° 02' 30.6"	-78° 59' 22.1"	108.4
B-10 w/Well	43° 02' 36.1"	-78° 59' 27.6"	106.5
B-11	43° 02' 41.0"	-78° 59' 30.8"	102.7
B-12	43° 02' 42.1"	-78° 59' 35.7"	98.0
B-13	43° 02' 38.7"	-78° 59' 43.4"	107.2
B-14	43° 02' 28.3"	-78° 59' 43.7"	113.2

LEGEND:

B-1 ● INDICATES APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING.

B.M. ▲ BENCHMARK: APPROXIMATE LOCATION OF TEMPORARY BENCHMARK ESTABLISHED BY SJB ON EXISTING SANITARY SEWER MANHOLE RIM. ASSUMED ARBITRARY ELEVATION DATUM = 100.00 FEET.

NOTE: FIGURE DEVELOPED USING GOOGLE EARTH.

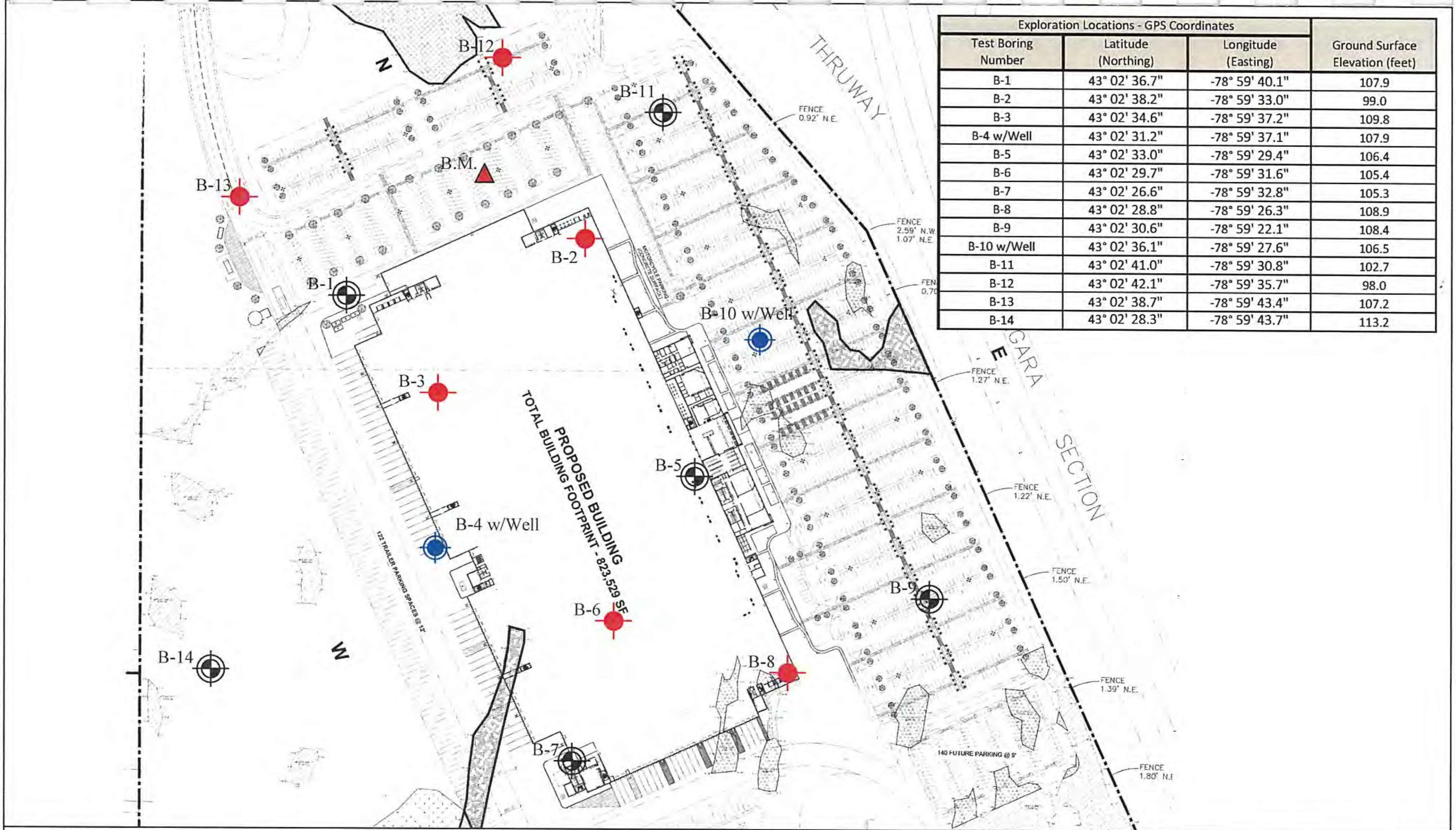
N

WMA ENGINEERING DPC|DBA
EMPIRE GEOTECHNICAL
ENGINEERING SERVICES

SUBSURFACE EXPLORATION PLAN
(EXISTING SITE CONDITIONS)

PROPOSED WAREHOUSE AND DISTRIBUTION FACILITY
LONG ROAD
GRAND ISLAND, NEW YORK

DR BY: BVB	SCALE: NTS	PROJECT NO.: WB-19-102
CHKD BY: JJD	DATE: 11/06/2019	FIGURE NO: 2



Exploration Locations - GPS Coordinates			
Test Boring Number	Latitude (Northing)	Longitude (Easting)	Ground Surface Elevation (feet)
B-1	43° 02' 36.7"	-78° 59' 40.1"	107.9
B-2	43° 02' 38.2"	-78° 59' 33.0"	99.0
B-3	43° 02' 34.6"	-78° 59' 37.2"	109.8
B-4 w/Well	43° 02' 31.2"	-78° 59' 37.1"	107.9
B-5	43° 02' 33.0"	-78° 59' 29.4"	106.4
B-6	43° 02' 29.7"	-78° 59' 31.6"	105.4
B-7	43° 02' 26.6"	-78° 59' 32.8"	105.3
B-8	43° 02' 28.8"	-78° 59' 26.3"	108.9
B-9	43° 02' 30.6"	-78° 59' 22.1"	108.4
B-10 w/Well	43° 02' 36.1"	-78° 59' 27.6"	106.5
B-11	43° 02' 41.0"	-78° 59' 30.8"	102.7
B-12	43° 02' 42.1"	-78° 59' 35.7"	98.0
B-13	43° 02' 38.7"	-78° 59' 43.4"	107.2
B-14	43° 02' 28.3"	-78° 59' 43.7"	113.2

LEGEND:

B-1 ⊕ INDICATES APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING ADVANCED TO AUGER REFUSAL WITH 10 FEET OF BEDROCK CORED.

B-2 ✚ INDICATES APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING ADVANCED TO AUGER REFUSAL ONLY.

B-4 w/Well ⊕ INDICATES APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING ADVANCED TO AUGER REFUSAL WITH GROUNDWATER OBSERVATION WELL INSTALLATION.

B.M. ▲ BENCHMARK: APPROXIMATE LOCATION OF TEMPORARY BENCHMARK ESTABLISHED BY SJB ON EXISTING SANITARY SEWER MANHOLE RIM. ASSUMED ARBITRARY ELEVATION DATUM = 100.00 FEET.

NOTE: FIGURE DEVELOPED USING A PROPOSED SITE DEVELOPMENT PLAN PROVIDED BY ACQUEST DEVELOPMENT COMPANY.

N

PROPOSED WAREHOUSE AND DISTRIBUTION FACILITY
LONG ROAD
GRAND ISLAND, NEW YORK

WMA ENGINEERING DPC|DBA
EMPIRE GEOTECHNICAL
ENGINEERING SERVICES

SUBSURFACE EXPLORATION PLAN
(PROPOSED SITE DEVELOPMENT)

DR BY: BVB
CHKD BY: JJD
SCALE: NTS
DATE: 11/06/2019
PROJECT NO.: WB-19-102
FIGURE NO: 3

APPENDIX A1

TEST BORING LOGS
(TEST BORINGS B-1 THROUGH B-14)

GENERAL INFORMATION & KEY TO SUBSURFACE LOGS

The Subsurface Logs attached to this report present the observations and mechanical data collected by the driller at the site, supplemented by classification of the material removed from the borings as determined through visual identification by technicians in the laboratory. It is cautioned that the materials removed from the borings represent only a fraction of the total volume of the deposits at the site and may not necessarily be representative of the subsurface condition between adjacent borings or between the sampled intervals. The data presented of the Subsurface Logs together with the recovered samples provide a basis for evaluating the character of the subsurface conditions relative to the project. The evaluation must consider all the recorded details and their procedures to more accurately evaluate the subsurface conditions. Any evaluation of the contents of this report and recovered samples must be performed by qualified professionals. The following information defines some of the procedures and terms used of the Subsurface Logs to describe the conditions encountered, consistent with the numbered identifiers shown on the Key opposite this page.

1. **The figures in the Depth column define the scale of the Subsurface Log.**
2. **The Samples column shows, graphically, the depth range from which a sample was recovered. See Table I for descriptions of the symbols used to represent the various types of samples.**
3. **The Sample No. is used for identification on sample containers and/or Laboratory Test Reports.**
4. **Blows on Sampler - shows the results of the "Penetration Test", recording the number of blows required to drive a split spoon sampler into the soil. The number of blows required for each six inches is recorded. The first 6 inches of penetration is considered a seating drive. The number of blows required for the second and third 6 inches of penetration is termed the penetration resistance, N.**
5. **Blows on Casing- Shows the number of blows required to advance the casing a distance of 12 inches. The casing size, hammer weight, and length of drop are noted at the bottom of the Subsurface Log. If the casing is advanced by means other than driving, the method of advancement will be indicated in the Notes column or under the Method of Investigation at the bottom of the Subsurface Log. Alternatively, sample recovery may be shown in this column or other data consistent with the column heading.**
6. **All recovered soil samples are reviewed in the laboratory by an engineering technician, geologist, o.r geotechnical engineer, unless noted otherwise. Visual descriptions are made on the basis of a combination of the driller's field descriptions and noted observations together with the sample as received in the laboratory. The method of visual classification is based primarily on the Unified Soil Classification System (ASTM D 2487) with regard to the particle size and plasticity (See Table No. II), and the Unified Soil Classification System group symbols for the soil types are sometimes included with the soil classification. Additionally, the relative portion, by weight, of two or more soil types is described for granular soils in accordance with "Suggested Methods of Test for Identification of Soils" by D.M. Burmister, ASTM Special Technical Publication 479, June 1970. (See Table No. III). Description of the relative soil density or consistency is based upon the penetration records as defined in Table No. IV. The description of the soil moisture is based upon the relative wetness of the soil as recovered and is described as dry, moist, wet, and saturated. Water introduced into the boring either naturally or during drilling may have affected the moisture condition of the recovered sample. Special terms are used as required to describe soil deposition in greater detail; several such terms are listed in Table V. When sampling gravelly soils with a standard two inch diameter split spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter. The presence of boulders and large gravel is sometimes, but not necessarily, detected by an evaluation of the casing and sampler blows or through the "action" of the drill rig as reported by the driller.**
7. **Rock description is based on review of the recovered rock core and the driller's notes. Frequently used rock classification terms are included in Table VI.**
8. **The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Solid stratification lines delineate apparent changes in soil type, based upon review of recovered soil samples and the driller's notes. Dashed lines convey a lesser degree of certainty with respect to either a change in soil type or where such change may occur.**
9. **Miscellaneous observations and procedures noted by the driller are shown in this column, including water level observations. It is important to realize the reliability of the water level observations depends upon the soil type (water does not readily stabilize in a hole through fine grained soils), and that any drill water used to advance the boring may have influenced the observations. The ground water level will fluctuate seasonally, typically. One or more perched or trapped water levels may exist in the ground seasonally. All the available readings should be evaluated. If definite conclusions cannot be made, it is often prudent to examine the conditions more thoroughly through test pit excavations or groundwater observation wells.**
10. **The length of core run is defined as the length of penetration of the core barrel. Core recovery is the length of core recovered divided by the core run. The RQD (Rock Quality Designation) is the total length of pieces of NX core exceeding 4 inches divided by the core run. The size core barrel used is also noted in the Method of Investigation at the bottom of the Subsurface Log.**

DATE:		**SJB SERVICES, INC.**	HOLE NO. B-1
START	8/26/2019	**SUBSURFACE LOG**	SURF. ELEV 107.9' +/-
FINISH	8/26/2019		G.W. DEPTH See Notes
SHEET	1 OF 2		

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK
PROJ. NO.: BE-19-102

DEPTH FT.		SMPL NO.	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES
			0/6	6/12	12/18	N			
		1	1	2				TOPSOIL	Driller noted approximately
			4	9		6		Brown Silty CLAY, tr.sand, tr.roots	3" of Topsoil at the surface
		2	7	15				(moist, medium, CL)	
			23	27		38		Contains tr.gravel (hard)	
5		3	6	11				(v.stiff)	
			14	17		25			
		4	22	28				(hard)	
			31	36		59			
		5	8	12				(v.stiff)	
10			14	17		26			
		6	5	12					
			12	14		24			
15									
		7	3	3		9		(stiff)	
			6	6					
20									
		8	2	4				Contains little f-c Gravel	
			6	10		10			
25									
		9	3	7				Contains tr.gravel (v. stiff)	
			11	9		18			
30									
		10	21	24				Brown f-c SAND, and Clayey Silt, little Gravel	
			31	28		55		(moist, v.compact, SM-SC)	
35									
		11	14	27				Brown Silty CLAY, little f-c Gravel, little f-c Sand	
			24	19		51		(moist, hard, CL)	
40									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: S. WOLKIEWICZ JR.

DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE
START 8/26/2019
FINISH 8/26/2019
SHEET 2 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-1
SURF. ELEV 107.9' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK
PROJ. NO.: BE-19-102

DEPTH FT.		SMPL. NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N		SOIL OR ROCK CLASSIFICATION	NOTES
40		12	16	32				Brown f-c GRAVEL, little f-c Sand, little Clayey Silt (moist, v.compact, GM-GC)	Driller notes auger refusal at 44.5'. NQ '2' Size Core
			36	24		68			
45								Gray DOLOSTONE, hard, weathered, laminated to thinly bedded, numerous horizontal fractures and mechanical breaks, occasional vugs	Run #1: 44.5' - 49'5' REC = 25% RQD = 0% Run #1: 49.5' - 54.5' REC = 28% RQD = 0%
50									
55								Boring Complete at 54.5'	No Free Standing water encountered at auger refusal.
60									
65									
70									
75									
80									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist
DRILLER: S. WOLKIEWICZ JR DRILL RIG TYPE : CME-550X
METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
START 8/22/2019
FINISH 8/22/2019
SHEET 1 OF 1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-2
SURF. ELEV 99.0' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK
PROJ. NO.: BE-19-102

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER				SOIL OR ROCK CLASSIFICATION	NOTES
		0/6	6/12	12/18	N		
	1	WOH	2			TOPSOIL	Driller noted approximately
		3	6		5	Brown Silty CLAY, tr.gravel, tr.sand (moist, medium	7" of Topsoil at the surface
	2	6	10			CL / Possible Reworked Native Soil)	
		30	27		40	Brown Silty CLAY, little f-c Gravel, tr.sand	
5	3	6	10			(moist, hard, CL)	
		15	21		25	Becomes Brown (v.stiff)	
	4	17	15			(hard)	
		16	18		31		
	5	6	5			Contains tr.gravel (stiff)	
10		6	5		11		
	6	1	2			(medium)	
		2	3		4		
15							
	7	WOH	1			(soft)	WOH = Weight of
		2	3		3		Hammer and Rods
20							REF = Sample Spoon
	8	28	52	50/0.4	REF	Light Brown f-c SAND, little fine Gravel, little Silt	Refusal
						(moist, v.compact, SM)	
25							
	9	50/0.4			REF	Gray f-c GRAVEL, little f-c Sand, tr.silt	
						(moist, v.compact, GP/Possible Cobble Fragments)	
30							
	10	37	30	50/0.4	REF	Brown Silty CLAY, some f-c Sand, little f-c Gravel	
						(moist, hard, CL)	
						Boring Complete with Auger Refusal at 32.5'	No free standing water
							noted at boring completion
35							
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: A. KOSKE

DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
START 8/28/2019
FINISH 8/28/2019
SHEET 1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-3
SURF. ELEV 109.8' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK
PROJ. NO.: BE-19-102

DEPTH FT.		SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N		SOIL OR ROCK CLASSIFICATION	NOTES
		1	2	4				TOPSOIL	Driller noted approximately
			6	6		10		Brown Silty CLAY, tr.sand (moist, stiff,	8" of Topsil at the surface
		2	3	5				CL / Possible Reworked Native Soil)	
			8	16		13			
5		3	4	8				Brown Silty CLAY, tr.sand (moist, v.stiff, CL)	
			9	11		17			
		4	5	8					
			11	18		19			
		5	7	11				Contains tr.gravel	
10			14	18		25			
		6	6	9					
			13	17		22			
15									
		7	10	24				Contains some f-c Gravel, occasional f-c Sand Seams	Sample #7: Possible
			30	22		54		(hard)	Cobble Fragments
20									
		8	18	22				Light Brown SILT, little f-c Sand	
			22	14		44		(dry-moist, compact, ML)	
25									
		9	6	5				Dark Brown Silty CLAY, tr.gravel, tr.sand	
			7	5		12		(moist, stiff, CL)	
30									WOH = Weight of
		10	WOH	2					Hammer and Rods
			5	8		7		(medium)	
35									REF = Sample Spoon
		11	43	48	50/0.2	REF		Gray f-c SAND, some fine Gravel, tr.silt	Refusal
								(moist-wet, v.compact, SP / Possible Weathered	
								Bedrock)	
40									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: S. WOLKIEWICZ JR.

DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE
START 8/28/2019
FINISH 8/28/2019
SHEET 2 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-3
SURF. ELEV 109.8' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
PROJ. NO.: BE-19-102
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK

DEPTH FT.		SMPL NO.	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES
			0/6	6/12	12/18	N			
40	/	12	18	24				Brown Silty CLAY, some f-c Gravel, some f-c Sand (moist, hard, CL)	
	/		38	42		62			
45									
	/	13	15	25					
	/		48	50/0.3		73			
50								Boring Complete with Auger Refusal at 49.5'	Free standing water at 31.6' after augers left in ground overnight.
55									
60									
65									
70									
75									
80									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: S. WOLKIEWICZ, JR.

DRILL RIG TYPE : CME 550 X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
START 8/29/2019
FINISH 8/29/2019

SHEET 1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-4
SURF. ELEV 107.9' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
PROJ. NO.: BE-19-102
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
	1	4	3			TOPSOIL	Driller noted approximately
		6	8		9	Brown Silty CLAY, tr.sand (moist, stiff, CL)	4" of Topsoil at the surface
	2	8	9			Contains tr.gravel (v.stiff)	
		11	8		20		
5	3	8	17			(hard)	
		19	15		36		
	4	25	18				
		24	26		42		
	5	4	8			(v.stiff)	
10		10	12		18		
	6	6	8				
		11	14		19		
15							
	7	5	8			Becomes Dark Brown	
		9	14		17		
20							
	8	2	4			Contains occasional Silt laminations	
		8	18		12		
25							
	9	5	9				
		7	8		16		
30							
	10	2	2			(medium)	
		4	8		6		
35							
	11	2	2				
		4	5		6		
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW
CLASSIFIED BY: Geologist
DRILLER: S. WOLKIEWICZ JR.
DRILL RIG TYPE : CME-550X
METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE
START 8/28/2019
FINISH 8/28/2019
SHEET 2 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-4
SURF. ELEV 109.7' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK
PROJ. NO.: BE-19-102

DEPTH FT.		SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N		SOIL OR ROCK CLASSIFICATION	NOTES
40		12	8	17				Contains little f-c Sand (hard)	
			34	40		51			
45									
		13	56	25				Brown f-c SAND, little f-c Gravel, little Silt, occasional Silty Clay seams (moist-wet, firm, SM-SC)	
			11	13		36			
50									
		14	24	48	50/0.2	REF		Gray f-c SAND, little fine Gravel, tr.silt (wet, v.compact, SP / Possible Weathered Bedrock)	
								Boring Complete with Auger Refusal at 51.2'	Driller noted auger refusal at 51.2' below ground surface Free Standing Water measured at 30.0' at auger refusal Set 2" PVC monitoring well at 50.5'. See "Monitoring Well Completion Record" for details.
55									
60									
65									
70									
75									
80									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: S. WOLKIEWICZ, JR.

DRILL RIG TYPE : CME 550 X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
START 8/20/2019
FINISH 8/20/2019

SHEET 1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-5
SURF. ELEV 106.4' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
PROJ. NO.: BE-19-102
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER				SOIL OR ROCK CLASSIFICATION	NOTES
		0/6	6/12	12/18	N		
	1	2	4			TOPSOIL	Driller noted approximately
		3	5		7	Light Brown to Brown Silty CLAY, tr.sand, tr.roots	6" of Topsoil at the surface
	2	3	7			(moist, medium, CL / Possible Reworked Soil)	
		9	14		16	Brown Silty CLAY, little Sand, occasional Silt	
5	3	8	11			laminations (moist, v.stiff, CL)	
		17	22		28	Contains tr.gravel	
	4	22	29			(hard)	
		29	32		58		
	5	7	11			Becomes Dark Brown (v.stiff)	
10		17	20		28		
	6	7	11				
		16	21		27		
15							
	7	7	10				
		13	23		23		
20							
	8	3	5			(stiff)	
		8	10		13		
25							
	9	4	6				
		8	11		14		
30							
	10	3	6				
		6	8		12		
35							
	11	WOH	WOH			(soft)	
		2	3		2		
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: A. KOSKE

DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE
START 8/20/2019
FINISH 8/20/2019
SHEET 2 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-5
SURF. ELEV 106.4' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK
PROJ. NO.: BE-19-102

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
40	12	WOH	WOH			Contains little f-c Sand (v.soft)	
		WOH	1		WOH		
45							Driller notes auger refusal at 52.7' below ground Surface
	13	WOH	6			Brown to Gray f-c GRAVEL, little f-c Sand, tr.silt (moist, firm, GP / Possible Weathered Bedrock)	
		9	50		15		Free Standing Water measured at 38.8' at auger refusal
50	14	20	34	50/0.4	REF	Gray f-c SAND, some f-c Gravel, little Silt (wet, v.compact, SM / Possible Weathered Bedrock)	NQ '2" Size Rock Core
55						Gray DOLOSTONE, medium hard, weathered, laminated to thinly bedded, some horizontal and vertical fractures, some horizontal mechanical breaks	RUN #1: 52.7' - 55.9' REC = 94% RQD = 0%
							RUN #2: 55.9' - 58.0' REC = 67% RQD = 0%
60							RUN #3: 58.0' - 60.1' REC = 76% RQD = 0%
65						Boring Complete at 62.9'	RUN #4: 60.1' - 62.9' REC = 29% RQD = 0%
70							Free Standing Water measured at 6.2' after rock coring
75							Free Standing Water at 7.5' after Augers were left in ground overnight.
80							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW
CLASSIFIED BY: Geologist
DRILLER: S. WOLKIEWICZ JR
DRILL RIG TYPE : CME-550X
METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:			
START	8/21/2019		HOLE NO. B-6
FINISH	8/21/2019		SURF. ELEV 105.4' +/-
SHEET	1 OF 2		G.W. DEPTH See Notes

SJB SERVICES, INC.
SUBSURFACE LOG

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
PROJ. NO.: BE-19-102
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER				SOIL OR ROCK CLASSIFICATION	NOTES
		0/6	6/12	12/18	N		
	1	1	2			TOPSOIL	Driller noted approximately
		5	7		7	Red-Brown Silty CLAY, tr.sand, tr.roots	6" of Topsoil at the surface
	2	9	11			(moist, medium, CL)	
		13	19		24	Contains occasional Silt partings (v.stiff)	
5	3	8	12			Contains occasional Silt seams	
		18	24		30		
	4	17	23			Contains tr.gravel (hard)	
		24	24		47		
	5	18	18			Grades to Brown	
10		13	14		31		
	6	5	8			Contains occasional f-c Sand seam (v.stiff)	
		13	12		21		
15							
	7	6	9				WOH = Weight of
		8	10		17		Hammer and Rods
20							
	8	1	3			Becomes Dark Brown (stiff)	
		7	6		10		
25							
	9	3	5				
		9	9		14		
30							
	10	2	4				
		6	5		10		
35							
	11	WOH	1				
		2	3		3	(soft)	
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: A. KOSKE DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE
START 8/21/2019
FINISH 8/21/2019
SHEET 2 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-6
SURF. ELEV 105.4' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK
PROJ. NO.: BE-19-102

DEPTH FT.		SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N		SOIL OR ROCK CLASSIFICATION	NOTES
40		12	WOH	1				Contains little f-c Gravel, little Sand (medium)	
			6	9		7			
45		13	2	26	50/0.4	REF		Brown f-c GRAVEL, some f-c Sand, tr.silty clay (moist, v.compact, GP/Possible weathered Bedrock)	
50								Boring Complete with Auger Refusal at 49.4'	Free Standing Water measured at 48.8' below ground surface at boring completion
55									
60									
65									
70									
75									
80									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: A. KOSKE

DRILL RIG TYPE : CME 550 X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
START 8/22/2019
FINISH 8/22/2019

SHEET 1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-7
SURF. ELEV 105.3' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
PROJ. NO.: BE-19-102
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER				SOIL OR ROCK CLASSIFICATION	NOTES
		0/6	6/12	12/18	N		
	1	1	2			TOPSOIL	Driller noted approximately
		3	3		5	Brown Silty CLAY, little f-c Sand, tr.roots	8" of Topsoil at the surface
	2	5	10			(moist, medium, CL / Possible Reworked Soil)	
		15	18		25	Brown Silty CLAY, tr.sand (moist, v.stiff, CL)	
5	3	10	15			Contains tr.gravel (hard)	
		18	21		33		
	4	18	23			Becomes Red Brown to Brown	
		24	26		47		
	5	6	9			Contains occasional Silt seams (v.stiff)	
10		14	17		23		
	6	7	9				
		12	13		21		
15							
	7	6	5			(stiff)	
		9	9		14		
20							
	8	3	4				
		6	8		10		
25							
	9	2	2			(medium)	
		3	3		5		
30							
	10	1	2			Contains little f-c Sand, occasional moist-wet	
		3	3		5	laminations	
35							
	11	2	2				
		4	4		6		
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: A. KOSKE

DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE	
START	8/22/2019
FINISH	8/22/2019
SHEET	2 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-7
SURF. ELEV 105.3' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK
PROJ. NO.: BE-19-102

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N		SOIL OR ROCK CLASSIFICATION	NOTES
40	12	WOH	WOH				Becomes Brown Gray, contains tr.sand (v.soft)	
		2	4		2			
45								Free Standing Water measured at 25.8' below ground surface prior to coring.
	13	14	50/0.4		REF		Brown to Gray f-c GRAVEL, little f-c Sand, little Silty Clay (moist, v.compact, GC)	NQ '2' Rock Core
50							Gray DOLOSTONE, medium hard, weathered, laminated, thinly bedded, some horizontal fractures, some horizontal mechanical breaks, occasional vugs	RUN #1: 49.0' - 52.6' REC = 75% RQD = 0%
								RUN #2: 52.6' - 55.5' REC = 60% RQD = 0%
55							Contains occasional interbedded Shale	RUN #3: 55.5' - 59.0' REC = 97% RQD = 0%
60							Boring Complete at 59.0' below ground surface	Free Standing Water measured at 4.5' below ground surface after coring
65								
70								
75								
80								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: A. KOSKE

DRILL RIG TYPE : CME 550 X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
START 8/19/2019
FINISH 8/19/2019

SHEET 1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-8
SURF. ELEV 108.9' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
PROJ. NO.: BE-19-102
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK

DEPTH		SMPL	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES
FT.		NO.	0/6	6/12	12/18	N			
		1	1	1				TOPSOIL	Driller noted approximately
			3	4		4		Dark Brown Silty CLAY, tr.sand, tr.organics	4" of Topsoil at the surface
		2	12	12				(moist, soft, CL)	
			14	15		26		Brown to Red Brown Silty CLAY, tr.sand, occasional	
5		3	5	8				Silt laminations (moist, v.stiff, CL)	
			12	17		20			
		4	17	22				(hard)	
			24	29		46			
		5	6	11				Becomes Brown, contains tr.gravel (v.stiff)	
10			12	14		23			
		6	5	6				Becomes Dark Brown (stiff)	
			7	10		13			
15									
		7	4	6					
			8	11		14			
20									
		8	2	2					
			4	6		6		(medium)	
25									
		9	1	1					
			2	4		3		(soft)	
30									
		10	2	2				Contains occasional moist-wet laminations (medium)	
			4	4		6			
35									
		11	4	4				(stiff)	
			6	7		10			
40									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: A. KOSKE

DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE		**SJB SERVICES, INC.** **SUBSURFACE LOG**	
START	8/19/2019		HOLE NO. B-8
FINISH	8/19/2019		SURF. ELEV 108.9' +/-
SHEET	2 OF 2		G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK
PROJ. NO.: BE-19-102

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N		SOIL OR ROCK CLASSIFICATION	NOTES
40	12	1	1				(medium)	
		3	4		4			
45								
	13	WOH	WOH				Contains little f-c Sand	
		6	12		6			
50								
	14	18	20				Contains some f-c Gravel (hard)	Sample #14: Poor Recovery
		24	26		44			
55								
	15	14	15				Gray f-c GRAVEL and f-c Sand, little Silt	
		16	13		31		(wet, compact, GM/Possible Weathered Bedrock)	
60							Boring Complete with Auger Refusal at 58.6'	Free Standing Water measured at 29.8' below ground surface at auger refusal
65								Free standing water at 26.5' after Augers left in ground overnight
70								
75								
80								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: A. KOSKE

DRILL RIG TYPE : 550 X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
START 8/16/2019
FINISH 8/19/2019

SHEET 1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-9
SURF. ELEV 108.4' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
PROJ. NO.: BE-19-102
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK

DEPTH	SMPL	BLOWS ON SAMPLER				SOIL OR ROCK CLASSIFICATION	NOTES
FT.	NO.	0/6	6/12	12/18	N		
	1	3	5			TOPSOIL	Driller noted approximately
		6	8		11	Light Brown to Brown Silty CLAY, little f-c Sand,	5" of Topsoil at the surface
	2	4	6			tr.roots, occasional Silt seams (moist, stiff, CL)	
		10	10		16	Becomes Brown (v. stiff)	
5	3	9	13			Brown to Red Brown Silty CLAY, tr.sand	
		16	20		29	(moist, v.stiff, CL)	WOH = Weight of
	4	4	18			(hard)	Hammer and Rods
		18	20		36		
	5	10	18				
10		16	22		34		
	6	4	6			Contains occasional Silt laminations (stiff)	
		8	11		14		
15							
	7	6	5			Becomes Brown, contains little Sand, tr.gravel	
		10	13		15		
20							
	8	2	2			Becomes Dark Brown (medium)	
		4	4		6		
25							
	9	2	2				
		2	3		4		
30							
	10	WOH	WOH			(v.soft)	
		WOH	1		WOH		
35							
	11	2	3				
		2	WOH		5	(medium)	
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: A. KOSKE DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
START 8/15/2019
FINISH 8/16/2019

SHEET 1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-10
SURF. ELEV 106.5' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
PROJ. NO.: BE-19-102
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK

DEPTH FT.		SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N		SOIL OR ROCK CLASSIFICATION	NOTES
		1	2	2				Brown to Dark Brown Silty CLAY, tr.sand, tr.roots	Topsoil layer not apparent
			6	8		8		(moist, medium, CL / Possible Reworked Native Soil)	at surface
		2	8	10				Brown Silty CLAY, tr.sand, occasional Silt partings	
			12	16		22		(moist, v.stiff, CL)	
5		3	10	13				Contains organics (hard)	
			18	23		31			
		4	18	22					
			25	26		47			
		5	7	8				Contains tr.gravel (v.stiff)	
10			11	16		19			
		6	2	4				(stiff)	
			6	10		10			
15									
		7	2	4					
			6	9		10			
									End of Day 8/15/19
20									No Free Standing Water
		8	3	4				Grades to Dark Brown	encountered
			6	8		10			8/16/2019
									No Free Standing Water
									encountered prior to
25									resuming boring
		9	2	2				(medium)	
			3	5		5			
30									
		10	2	3					
			3	5		6			
35									
		11	2	2					
			4	5		6			
40									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: A. KOSKE

DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE
START 8/15/2019
FINISH 8/16/2019
SHEET 2 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-10
SURF. ELEV 106.5' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK
PROJ. NO.: BE-19-102

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
40	12	3	2			Contains little f-c Sand	
		4	3		6		
45							REF = Sample Spoon Refusal
	13	1	5			Contains tr.sand, occasional Silt seams (stiff)	
		6	7		11		
						- - - - - - - - - - - -	
50							
	14	2	7			Brown f-c SAND, little fine Gravel, little Silty Clay (moist, firm, SC)	
		10	13		17		
55							
	15	50	50/0.1		REF		Sample #15: No Recovery, lost sampling shoe
						Boring Complete with auger refusal at 57.4'	Driller noted running sands at 55 '
60							Free Standing Water measured at 28.7' at boring completion
65							Set 2" PVC monitoring well at 55.0'. See "Monitoring Well Completion Record" for details.
70							
75							
80							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW
CLASSIFIED BY: Geologist
DRILLER: A. KOSKE
DRILL RIG TYPE : CME-550X
METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
START 8/14/2019
FINISH 8/15/2019
SHEET 1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-11
SURF. ELEV 102.7' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK
PROJ. NO.: BE-19-102

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
	1	1	4			TOPSOIL	Driller noted approximately
		4	8		8	Brown SILT, some f-c Sand, tr.roots	4" of Topsoil at the surface
	2	12	18			(moist, loose, ML / Possible Reworked Soil)	
		18	20		36	Light Brown to Brown Silty CLAY, tr.sand	Sample #1: Poor Recovery
5	3	11	13			(moist hard, CL)	
		15	20		28	Becomes Brown (v.stiff)	
	4	18	24			(hard)	
		27	33		51		
	5	10	14			Contains tr.gravel	
10		19	23		33		
	6	8	13			Becomes Dark Brown, contains little f-c Gravel	End of Day 8/14/19
		15	20		28	(v.stiff)	No Free Standing Water
							encountered
							Start of Day 8/15/19 No
15							Free Standing Water
	7	5	7			Contains little Sand, tr.gravel, occasional Silt	encountered prior to
		8	9		15	laminations	resuming boring
20							
	8	3	4			(stiff)	
		7	8		11		
25							
	9	50	50/0.4		REF	Gray to Brown f-c GRAVEL, little Silty Clay, tr.sand	
						(moist, v.compact, GC/Possible Cobble Fragments)	
30							Driller noted auger refusal
	10	28	37			Brown f-c SAND, little f-c Gravel, tr.silty clay	at 37.0'. No Free Standing
		39	45		76	(moist, v.compact, SP)	Water encountered at
							auger refusal
35							
	11	30	50			Brown to Gray f-c GRAVEL, little f-c Sand, little Silty	
		50	50/0		100	Clay (moist-wet, v.compact, GC)	NQ '2' Rock Core
						Gray DOLOSTONE, medium hard, weathered,	RUN #1: 37.0' - 40.0'
						laminated to thinly bedded, numerous horizontal	REC = 94%
40						fractures and mechanical breaks	RQD = 0%

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: A. KOSKE

DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE
START 8/14/2019
FINISH 8/15/2019
SHEET 2 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-11
SURF. ELEV 102.7' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
PROJ. NO.: BE-19-102
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK

DEPTH FT.		SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N		SOIL OR ROCK CLASSIFICATION	NOTES
40								Becomes laminated to bedded	RUN #2: 40.0' - 45.0' REC = 67% RQD = 7%
45								Becomes laminated to thinly bedded	RUN #3: 45.0' - 47.0' REC = 95% RQD = 0%
								Boring Complete at 47.0'	Driller noted loss of core water at 46'
50									
55									
60									
65									
70									
75									
80									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: A. KOSKE

DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
START 8/14/2019
FINISH 8/14/2019

SHEET 1 OF 1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-12
SURF. ELEV 98.0' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK
PROJ. NO.: BE-19-102

DEPTH FT.		SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N		SOIL OR ROCK CLASSIFICATION	NOTES
		1	2	6				Brown Silty CLAY, little f-c Sand, tr.roots	Topsoil layer not apparent
			11	12		17		(moist, v.stiff, CL / Possible Reworked Native Soil)	at surface
		2	14	22				Contains tr.gravel (hard)	
			20	18		42			
5		3	12	10				Brown Silty CLAY, little f-c Sand, tr.gravel	
			8	11		18		(moist, v.stiff, CL)	
		4	11	15				Becomes Dark Brown, contains tr.sand, occasional	
			14	16		29		Silt laminations	
		5	8	8					
10			11	12		19			
		6	5	7				Contains some f-c Gravel	
			10	11		17			
15									
		7	27	39				Contains little f-c Sand, tr.gravel (hard)	
			40	50		79			
20									
		8	35	40				Brown f-c SAND and Silty Clay, little fine Gravel	
			50	50/0.2		90		(moist-wet, v.compact, SC)	
25									REF = Sample Spoon
		9	30	50	50/0.2	REF		Brown Silty CLAY, some f-c Sand, little fine Gravel	Refusal
								(moist, hard, CL)	
30									
		10	50/0.1						
								Boring Complete with Auger Refusal at 30.1'	Sample #10: No Recovery
									Free Standing Water
35									measured at 26.0' at
									boring completion
40									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: A. KOSKE DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
START 8/26/2019
FINISH 8/26/2019
SHEET 1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-13
SURF. ELEV 107.2' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
PROJ. NO.: BE-19-102
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK

DEPTH FT.		SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N		SOIL OR ROCK CLASSIFICATION	NOTES
		1	3	4				TOPSOIL	Driller noted approximately
			9	11		13		Brown Silty CLAY, tr.sand (moist, stiff, CL)	3" of Topsoil at the surface
		2	14	12				(v.stiff)	
			11	17		23			Sample #2: Poor Recovery
5		3	7	11				Contains tr.gravel	
			14	15		25			
		4	15	16				(hard)	
			18	20		34			
		5	7	14				(v.stiff)	
10			14	16		28			
		6	12	13				Contains 'And' f-c Gravel	Sample #6: Poor Recovery
			7	5		20			
15									
		7	3	6				Becomes Dark Brown, contains little f-c Sand,	
			8	11		14		tr.gravel (stiff)	
20									
		8	1	3					
			7	8		10			
25									
		9	9	3		9		Contains tr.sand	
			5	7					
30									
		10	4	6				Contains little f-c Sand (v.stiff)	
			14	10		20			
								- - - - - - - - - - - -	
									REF = Sample Spoon
35									Refusal
		11	24	50	50/0.2	REF		Brown f-c GRAVEL, some f-c Sand, little Silt	
								(moist, v.compact, GM)	
40									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW   CLASSIFIED BY: Geologist

DRILLER: S. WOLKIEWICZ, JR.   DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE		**SJB SERVICES, INC.** **SUBSURFACE LOG**	HOLE NO. B-13
START	8/26/2019		SURF. ELEV 107.2' +/-
FINISH	8/26/2019		G.W. DEPTH See Notes
SHEET	2 OF 2		

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY

LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK

PROJ. NO.: BE-19-102

DEPTH FT.		SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N		SOIL OR ROCK CLASSIFICATION	NOTES
40								Boring Complete with Auger Refusal at 39.5'	Free Standing Water measured at 12.2' at boring completion
45									
50									
55									
60									
65									
70									
75									
80									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: A. KOSKE

DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
START 8/29/2019
FINISH 8/29/2019

SHEET 1 OF 2

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-14
SURF. ELEV 113.2' +/-

G.W. DEPTH See Notes

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY
PROJ. NO.: BE-19-102
LOCATION: LONG ROAD
GRAND ISLAND, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
	1	2	3			TOPSOIL	Driller noted approximately
		5	8		8	Dark Brown Silty CLAY, tr.Snd, tr.roots	4" of Topsoil at the surface
	2	10	11			(moist, stiff, CL / Possible Reworked Native Soil)	
		14	14		25	Brown to Red Brown Silty CLAY, tr.sand	
5	3	8	11			(moist, v.stiff, CL)	
		16	15		27	Becomes Brown, contains occasional Silt partings	
	4	23	24				
		21	16		45	(hard)	
	5	5	12			Contains tr.gravel (v.stiff)	
10		15	17		27		
	6	21	26			(hard)	
		31	33		57		
15							
	7	3	4			(stiff)	
		7	12		11		
20							
	8	2	5				
		5	7		10		
25							
	9	2	4			Contains occasional fine Sand partings	
		6	6		10		
30							
	10	3	4			Becomes Dark Brown (medium)	
		3	6		7		
							REF = Sample Spoon
35							Refusal
	11	2	3				
		3	4		6		
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist
DRILLER: S. WOLKIEWICZ, JR. DRILL RIG TYPE : CME-550X
METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE		**SJB SERVICES, INC.**	HOLE NO. B-14
START	8/29/2019	**SUBSURFACE LOG**	SURF. ELEV 113.2' +/-
FINISH	8/29/2019		G.W. DEPTH See Notes
SHEET	2 OF 2		

PROJECT: PROPOSED WAREHOUSE & DIST. FACILITY LOCATION: LONG ROAD
PROJ. NO.: BE-19-102 GRAND ISLAND, NEW YORK

DEPTH FT.		SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N		SOIL OR ROCK CLASSIFICATION	NOTES
40		12	22	19				Contains little f-c Gravel, little f-c Sand (hard)	
			21	24		40			
45									Driller noted auger refusal at 51.1'
		13	6	9				Brown f-c SAND, little fine Gravel, little Silt (wet, firm, SM)	Free Standing Water measured at 41.4' at auger refusal
			11	22		20			
50									
		14	5	15	50/0.1	REF		Contains some Silt	NQ '2' Rock Core
55								Gray DOLOSTONE, hard, weathered, laminated to bedded, some horizontal fractures, occasional vertical and horizontal mechanical breaks, occasional vugs	RUN #1: 51.1' - 56.1' REC = 44% RQD = 7.5%
60								Becomes laminated to thinly bedded, contains occasional Shale partings, occasional horizontal fractures	RUN #2: 56.1' - 61.1' REC = 52% RQD = 0%
								Boring Complete at 61.1'	
65									
70									
75									
80									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: A. KOSKE DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

APPENDIX B

LABORATORY TEST DATA

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
Phone: (716) 649-8110
Fax: (716) 649-8051

Laboratory Test Report

PROJECT: **Proposed Warehouse / Distribution Facility; Grand Island, NY**

CLIENT: **Acquest Development Company**

DATE: **October 23, 2019**

PROJECT NO.: BE-19-102
REPORT NO.: LTR-1
Page 1 of 7

SJB Sample Number: 19-1785
Sample Location: B-1, S-5: 8' – 10'

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil &Rock
ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index
14.1 %	30	17	13

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	***Percent Passing***
$^{3}/_{8}$"	100.0
¼"	97.9
#4	97.1
#10	94.0
#20	91.3
#40	89.2
#100	84.5
#200	79.2

Laboratory Test Report

PROJECT: **Proposed Warehouse / Distribution Facility; Grand Island, NY**

CLIENT: **Acquest Development Company**

DATE: **October 23, 2019**

PROJECT NO.: BE-19-102
REPORT NO.: LTR-1
Page 2 of 7

SJB Sample Number: 19-1786
Sample Location: B-1, S-10: 30’ – 32’

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil &Rock

Moisture Content = 6.1 %

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	*Percent Passing*
¾”	100.0
½”	96.9
3/8”	88.8
¼”	86.6
#4	83.7
#10	77.5
#20	71.2
#40	66.9
#100	57.7
#200	49.0

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
Phone: (716) 649-8110
Fax: (716) 649-8051

Laboratory Test Report

PROJECT: **Proposed Warehouse / Distribution Facility; Grand Island, NY**

CLIENT: **Acquest Development Company**

DATE: **October 23, 2019**

PROJECT NO.: BE-19-102
REPORT NO.: LTR-1
Page 3 of 7

SJB Sample Number: 19-1787
Sample Location: B-5, S-11: 35' – 37'

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil &Rock
ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index
21.8 %	33	20	13

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	*Percent Passing*
½"	100.0
$^3/_8$"	99.5
¼"	98.1
#4	97.1
#10	95.1
#20	93.6
#40	92.3
#100	89.7
#200	86.9

Laboratory Test Report

PROJECT: **Proposed Warehouse / Distribution Facility; Grand Island, NY**

CLIENT: **Acquest Development Company**

DATE: **October 23, 2019**

PROJECT NO.: BE-19-102
REPORT NO.: LTR-1
Page 4 of 7

SJB Sample Number: 19-1788
Sample Location: B-7, S-2: 2' – 4'

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil &Rock
ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index
17.9 %	41	22	19

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	*Percent Passing*
3/8"	100.0
¼"	99.4
#4	99.1
#10	97.7
#20	96.7
#40	95.8
#100	93.7
#200	91.4

Laboratory Test Report

PROJECT: **Proposed Warehouse / Distribution Facility; Grand Island, NY**

CLIENT: **Acquest Development Company**

DATE: **October 23, 2019**

PROJECT NO.: BE-19-102
REPORT NO.: LTR-1
Page 5 of 7

SJB Sample Number: 19-1789
Sample Location: B-7, S-12: 40' – 42'

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil &Rock
ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index
26.4 %	34	19	15

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	*Percent Passing*
#4	100.0
#10	100.0
#20	99.9
#40	99.6
#100	99.0
#200	98.7

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Laboratory Test Report

PROJECT: **Proposed Warehouse / Distribution Facility; Grand Island, NY**

CLIENT: **Acquest Development Company**

DATE: **October 23, 2019**

PROJECT NO.: BE-19-102
REPORT NO.: LTR-1

SJB Sample Number: 19-1790
Sample Location: B-9, S-10: 30' – 32'

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil &Rock
ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index
20.7 %	29	17	12

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	*Percent Passing*
3/8"	100.0
¼"	97.3
#4	96.0
#10	92.9
#20	90.2
#40	88.2
#100	83.9
#200	79.1

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
Phone: (716) 649-8110
Fax: (716) 649-8051

Laboratory Test Report

PROJECT: **Proposed Warehouse / Distribution Facility; Grand Island, NY**

CLIENT: **Acquest Development Company**

DATE: **October 23, 2019**

PROJECT NO.: BE-19-102
REPORT NO.: LTR-1
Page 7 of 7

SJB Sample Number: 19-1791
Sample Location: B-11, S-7: 15’ – 17’

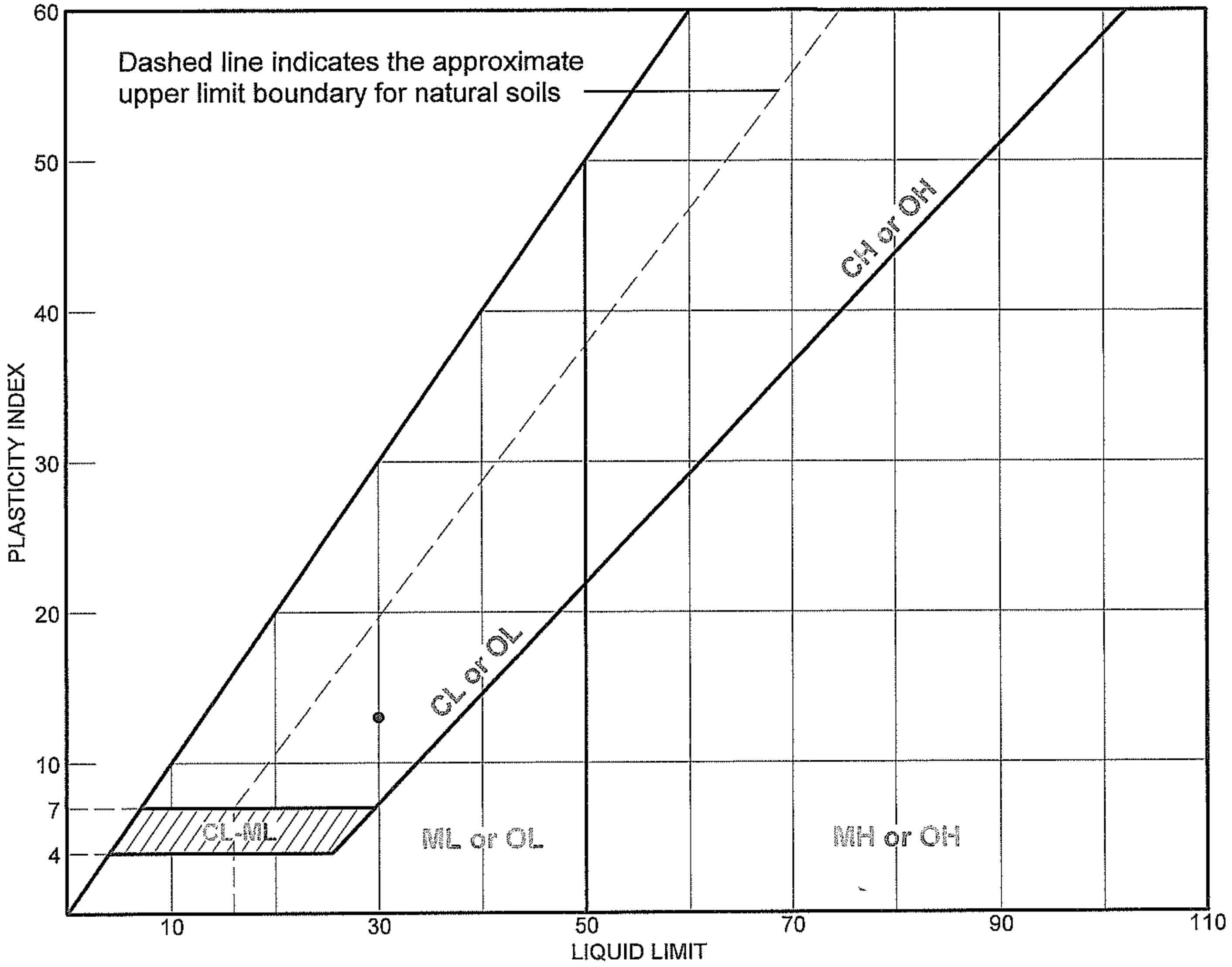
ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil &Rock
ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index
18.2 %	31	17	14

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	*Percent Passing*
½”	100.0
$^{3}/_{8}$”	98.4
¼”	96.4
#4	95.5
#10	92.2
#20	89.4
#40	87.4
#100	83.2
#200	78.7

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-1	S-5	8' -10'	14.1 %	17	30	13	

LIQUID AND PLASTIC LIMITS TEST REPORT

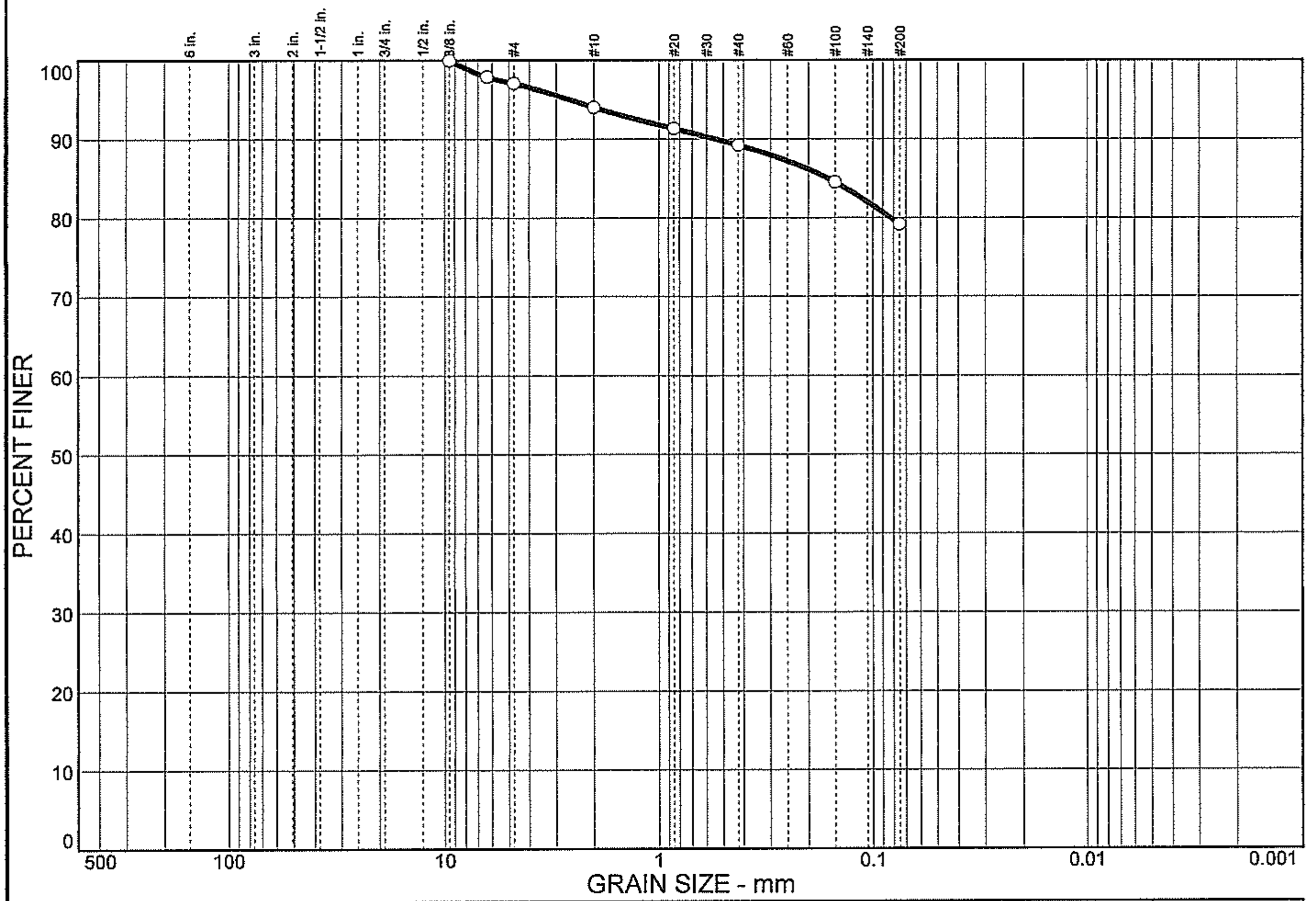
SJB SERVICES, INC.

Client: ACQUEST DEVELOPMENT CO.

Project: PROPOSED WAREHOUSE/DISTRIBUTION FACILITY
GRAND ISLAND, NY

Project No.: BE-19-102 **Plate**

Particle Size Distribution Report ASTM D-422



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.9	17.9	79.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
.25 in.	97.9		
#4	97.1		
#10	94.0		
#20	91.3		
#40	89.2		
#100	84.5		
#200	79.2		

* (no specification provided)

Soil Description

B-1, S-5: 8' - 10'

Atterberg Limits

PL= 17 LL= 30 PI= 13

Coefficients

D_{85}= 0.162 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

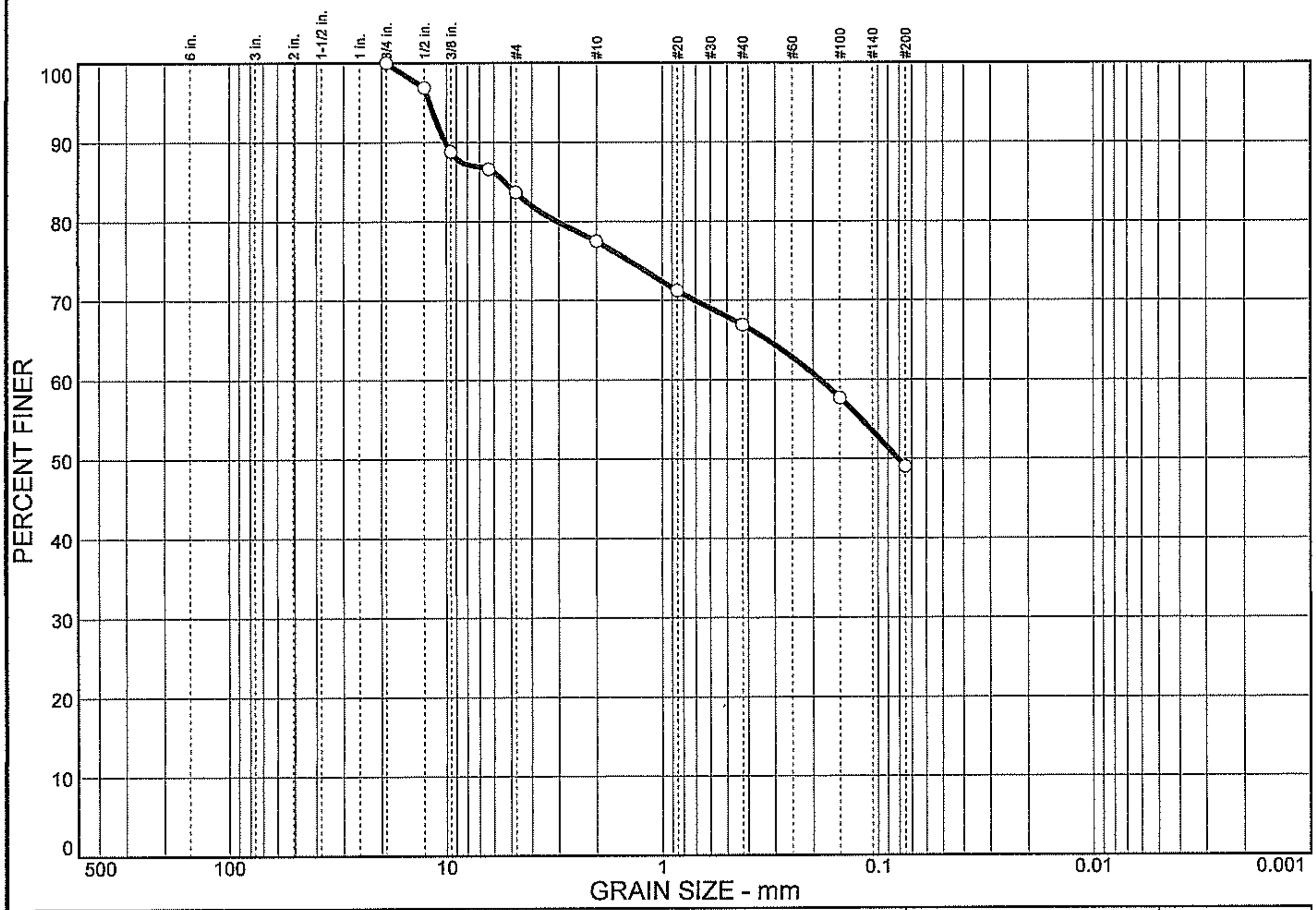
LTR-1
SAMPLE NUMBER: 19-1785

Sample No.: S-5 **Source of Sample:** B-1 **Date:** 10-23-2019
Location: B-1, S-5: 8' - 10' **Elev./Depth:** 8' -10'

SJB SERVICES, INC.

Client: ACQUEST DEVELOPMENT CO.
Project: PROPOSED WAREHOUSE/DISTRIBUTION FACILITY
GRAND ISLAND, NY
Project No: BE-19-102 **Plate**

Particle Size Distribution Report ASTM D-422



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	16.3	34.7	49.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	96.9		
.375 in.	88.8		
.25 in.	86.6		
#4	83.7		
#10	77.5		
#20	71.2		
#40	66.9		
#100	57.7		
#200	49.0		

* (no specification provided)

Soil Description

B-1, S-10: 30' - 32'

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.32 D_{60}= 0.186 D_{50}= 0.0809
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

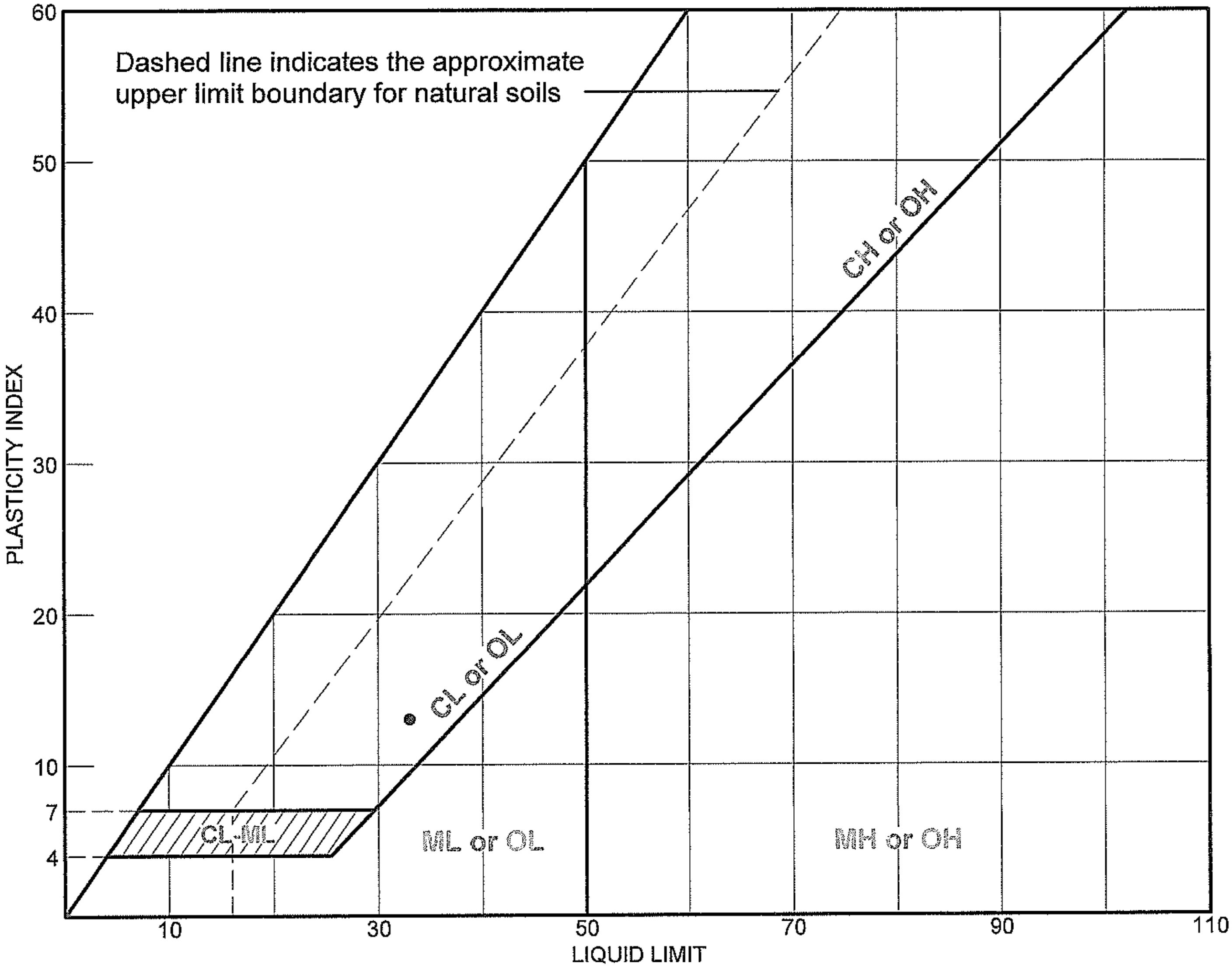
LTR-1
SAMPLE NUMBER: 19-1786

Sample No.: S-10 **Source of Sample:** B-1 **Date:** 10-23-2019
Location: B-1, S-10: 30' - 32' **Elev./Depth:** 30' - 32'

SJB SERVICES, INC.

Client: ACQUEST DEVELOPMENT CO.
Project: PROPOSED WAREHOUSE/DISTRIBUTION FACILITY
GRAND ISLAND, NY
Project No: BE-19-102 **Plate**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-5	S-11	35' - 37'	21.8 %	20	33	13	

LIQUID AND PLASTIC LIMITS TEST REPORT

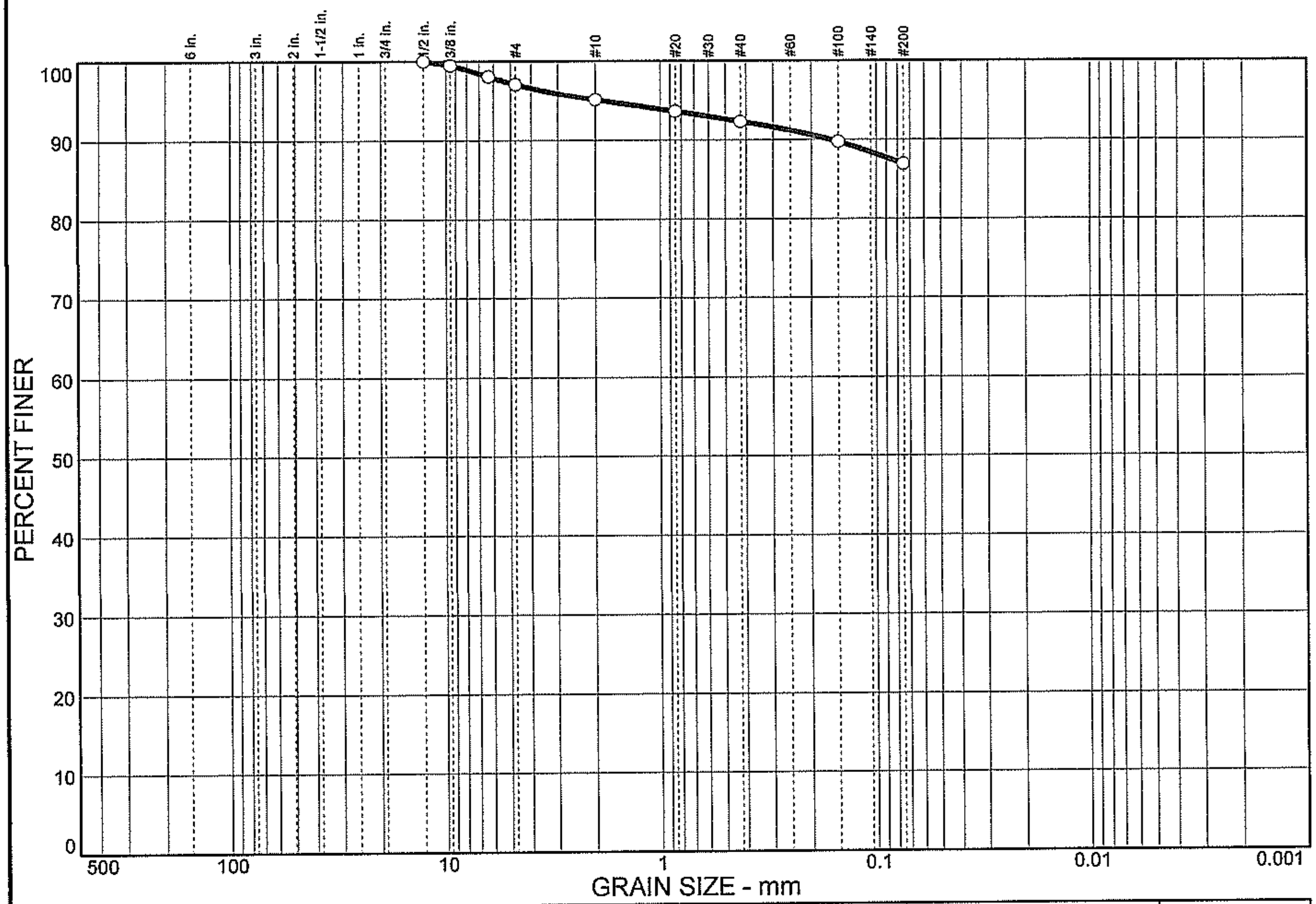
SJB SERVICES, INC.

Client: ACQUEST DEVELOPMENT CO.

Project: PROPOSED WAREHOUSE/DISTRIBUTION FACILITY
GRAND ISLAND, NY

Project No.: BE-19-102 **Plate**

Particle Size Distribution Report ASTM D-422



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.9	10.2	86.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.375 in.	99.5		
.25 in.	98.1		
#4	97.1		
#10	95.1		
#20	93.6		
#40	92.3		
#100	89.7		
#200	86.9		

* (no specification provided)

Soil Description

B-5, S-11: 35' - 37'

Atterberg Limits

PL= 20 LL= 33 PI= 13

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

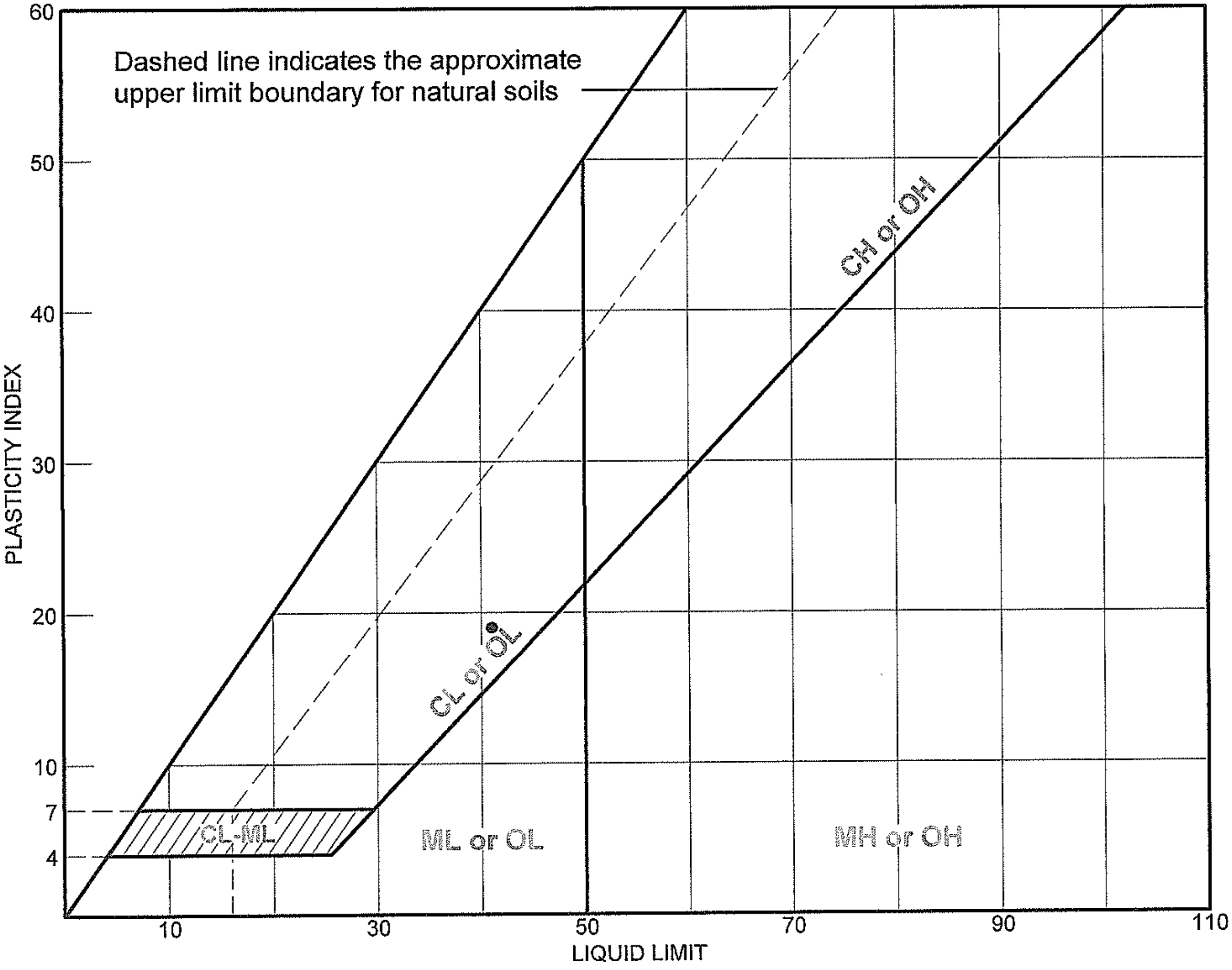
LTR-1
SAMPLE NUMBER: 19-1787

Sample No.: S-11 **Source of Sample:** B-5 **Date:** 10-23-2019
Location: B-5, S-11: 35' - 37' **Elev./Depth:** 35' - 37'

SJB SERVICES, INC.

Client: ACQUEST DEVELOPMENT CO.
Project: PROPOSED WAREHOUSE/DISTRIBUTION FACILITY
GRAND ISLAND, NY
Project No: BE-19-102 **Plate**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-7	S-2	2' - 4'	17.9 %	22	41	19	

LIQUID AND PLASTIC LIMITS TEST REPORT

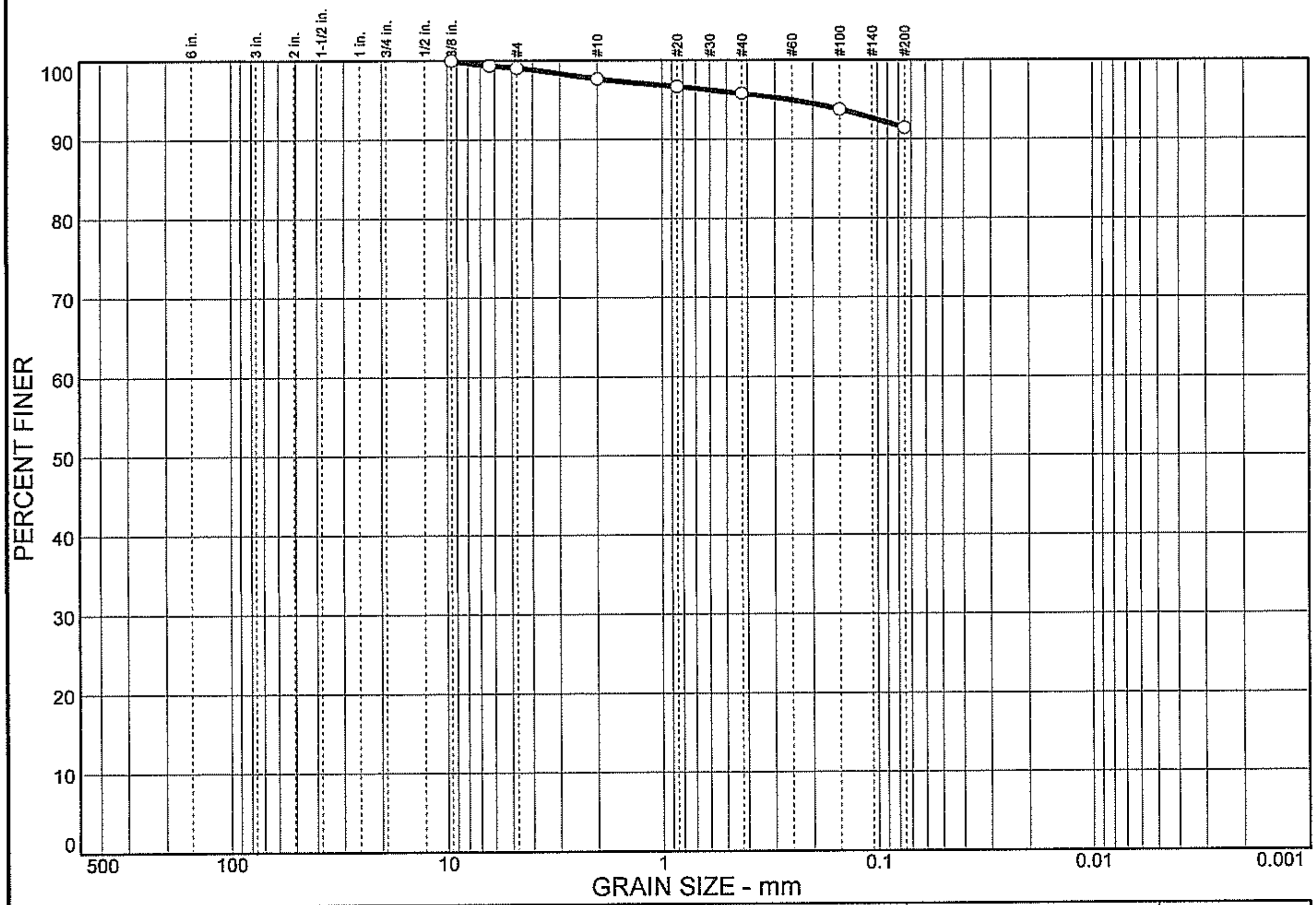
SJB SERVICES, INC.

Client: ACQUEST DEVELOPMENT CO.

Project: PROPOSED WAREHOUSE/DISTRIBUTION FACILITY
GRAND ISLAND, NY

Project No.: BE-19-102 **Plate**

Particle Size Distribution Report ASTM D-422



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.9	7.7	91.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
.25 in.	99.4		
#4	99.1		
#10	97.7		
#20	96.7		
#40	95.8		
#100	93.7		
#200	91.4		

* (no specification provided)

Soil Description

B-7, S-2: 2' - 4'

Atterberg Limits

PL= 22 LL= 41 PI= 19

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

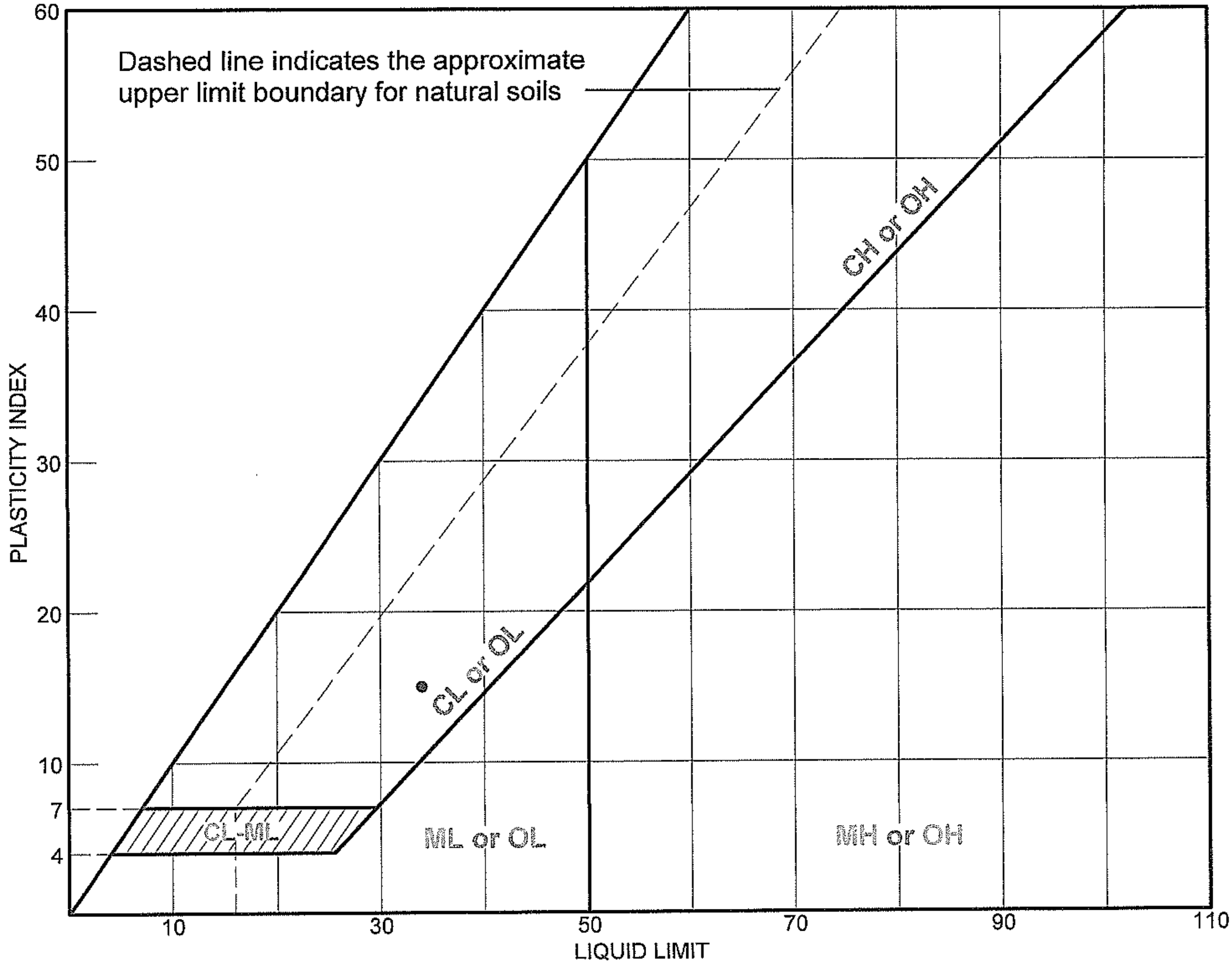
LTR-1
SAMPLE NUMBER: 19-1788

Sample No.: S-2 **Source of Sample:** B-7 **Date:** 10-23-2019
Location: B-7, S-2: 2' - 4' **Elev./Depth:** 2' - 4'

SJB SERVICES, INC.

Client: ACQUEST DEVELOPMENT CO.
Project: PROPOSED WAREHOUSE/DISTRIBUTION FACILITY
GRAND ISLAND, NY
Project No: BE-19-102 **Plate**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-7	S-12	40' - 42'	26.4 %	19	34	15	

LIQUID AND PLASTIC LIMITS TEST REPORT

SJB SERVICES, INC.

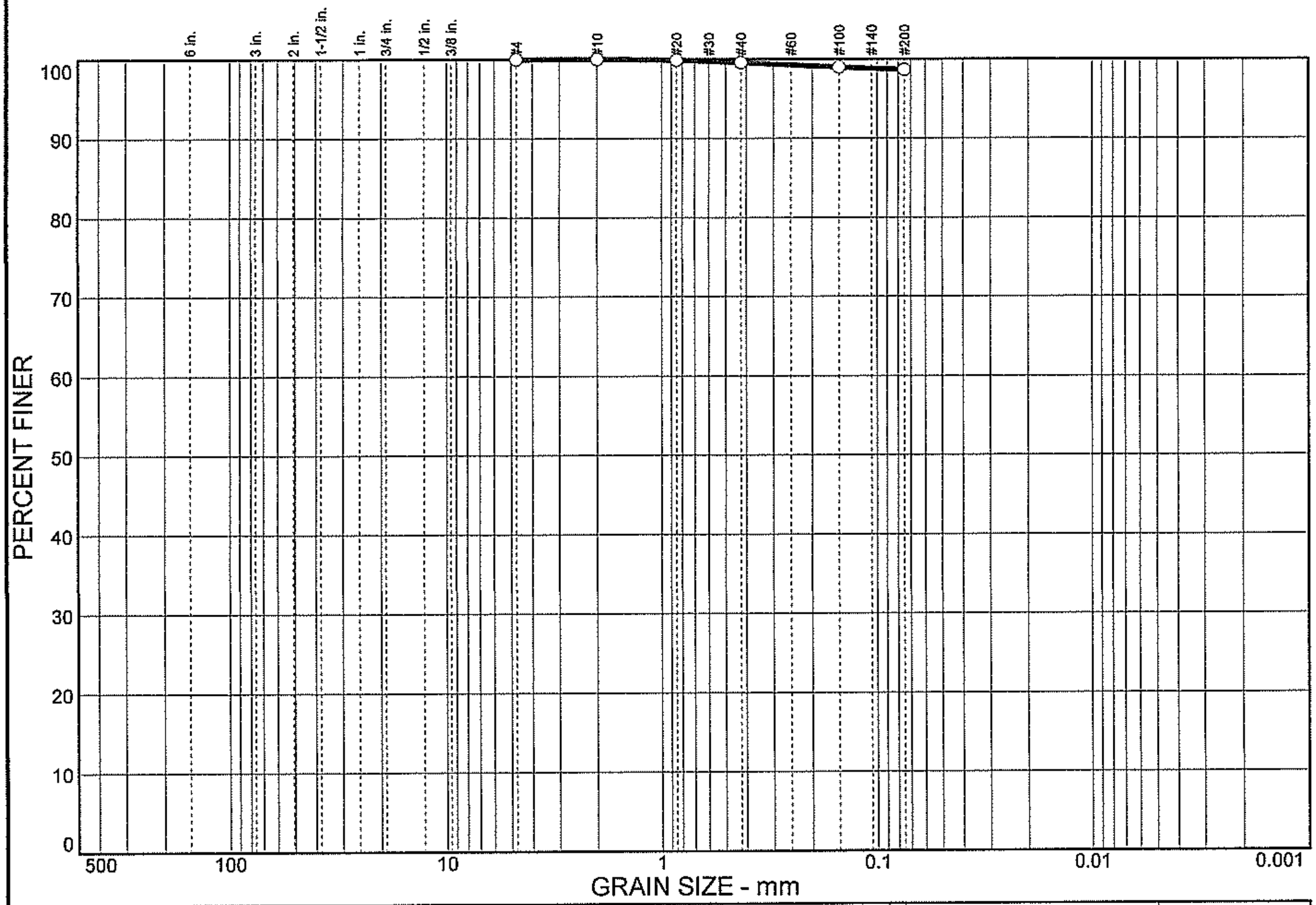
Client: ACQUEST DEVELOPMENT CO.

Project: PROPOSED WAREHOUSE/DISTRIBUTION FACILITY
GRAND ISLAND, NY

Project No.: BE-19-102

Plate

Particle Size Distribution Report ASTM D-422



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	1.3	98.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.6		
#100	99.0		
#200	98.7		

* (no specification provided)

Soil Description

B-7, S-12: 40' - 42'

Atterberg Limits

PL= 19 LL= 34 PI= 15

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

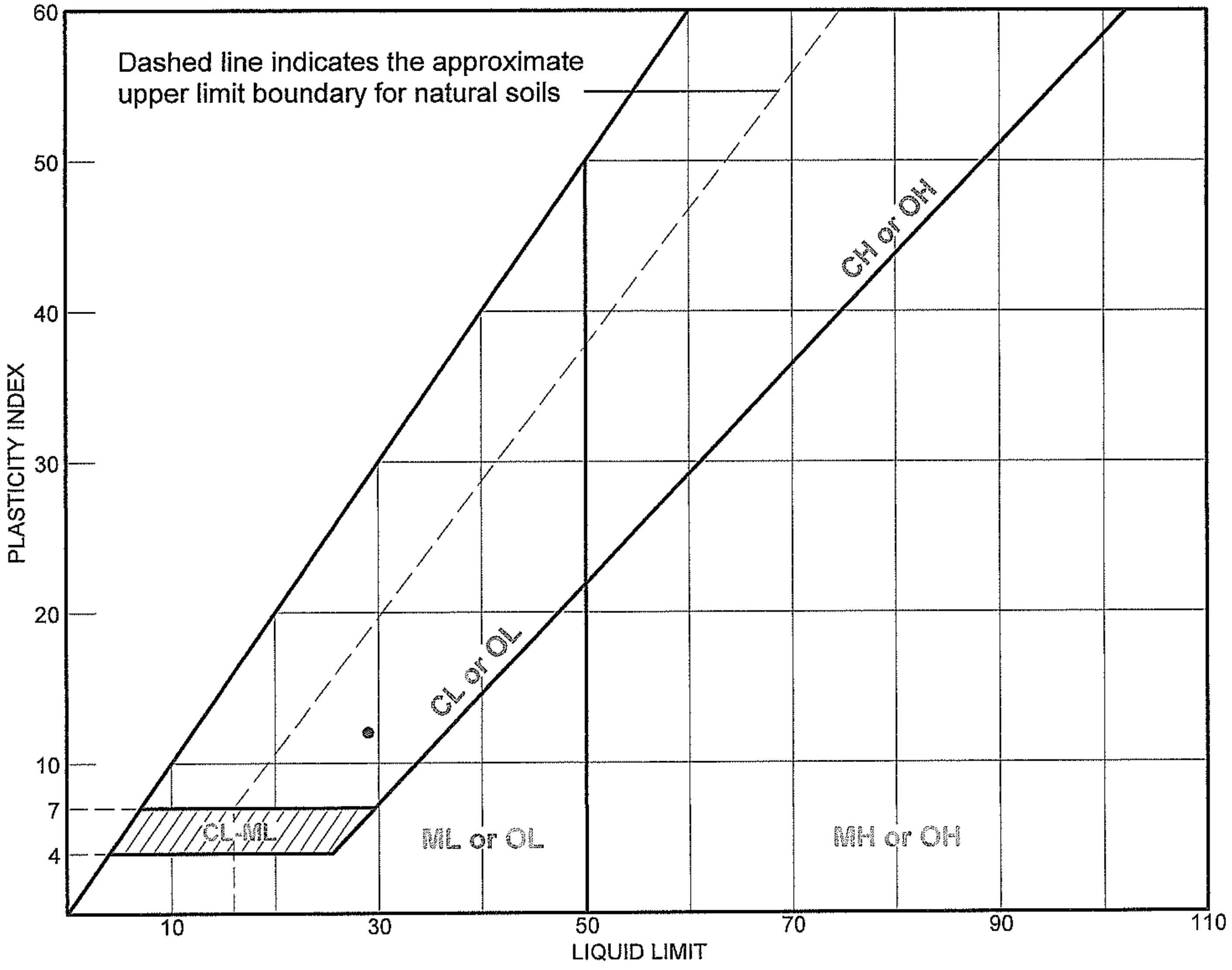
LTR-1
SAMPLE NUMBER: 19-1789

Sample No.: S-12 **Source of Sample:** B-7 **Date:** 10-23-2019
Location: B-7, S-12: 40' - 42' **Elev./Depth:** 40' - 42'

SJB SERVICES, INC.

Client: ACQUEST DEVELOPMENT CO.
Project: PROPOSED WAREHOUSE/DISTRIBUTION FACILITY
GRAND ISLAND, NY
Project No: BE-19-102 **Plate**

LIQUID AND PLASTIC LIMITS TEST REPORT

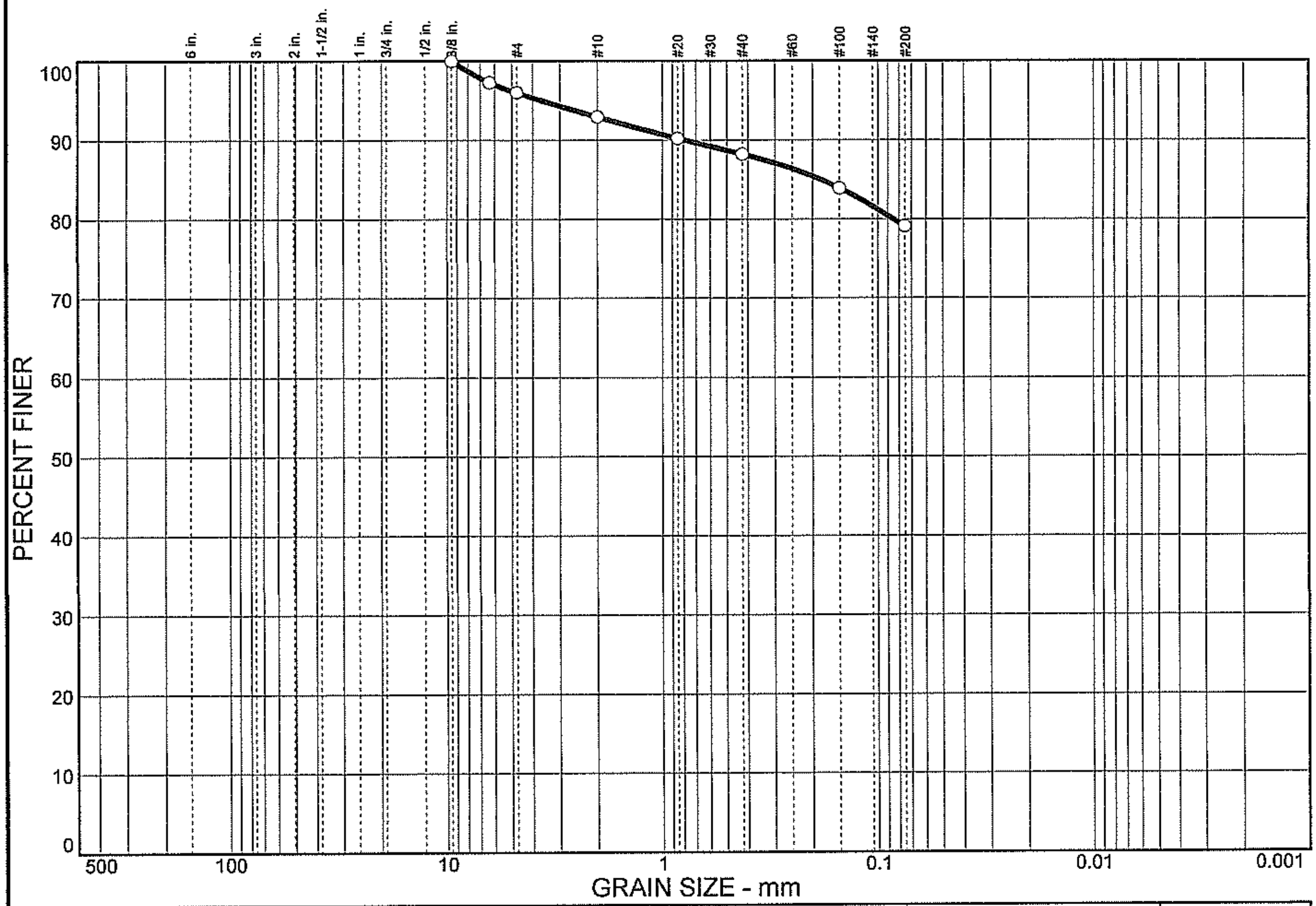


SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-9	S-10	30' - 32'	20.7 %	17	29	12	

LIQUID AND PLASTIC LIMITS TEST REPORT **SJB SERVICES, INC.**	**Client:** ACQUEST DEVELOPMENT CO. **Project:** PROPOSED WAREHOUSE/DISTRIBUTION FACILITY GRAND ISLAND, NY **Project No.:** BE-19-102 **Plate**

Particle Size Distribution Report ASTM D-422



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.0	16.9	79.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
.25 in.	97.3		
#4	96.0		
#10	92.9		
#20	90.2		
#40	88.2		
#100	83.9		
#200	79.1		

* (no specification provided)

Soil Description

B-9, S-10: 30' - 32'

Atterberg Limits

PL= 17 LL= 29 PI= 12

Coefficients

D_{85}= 0.184 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

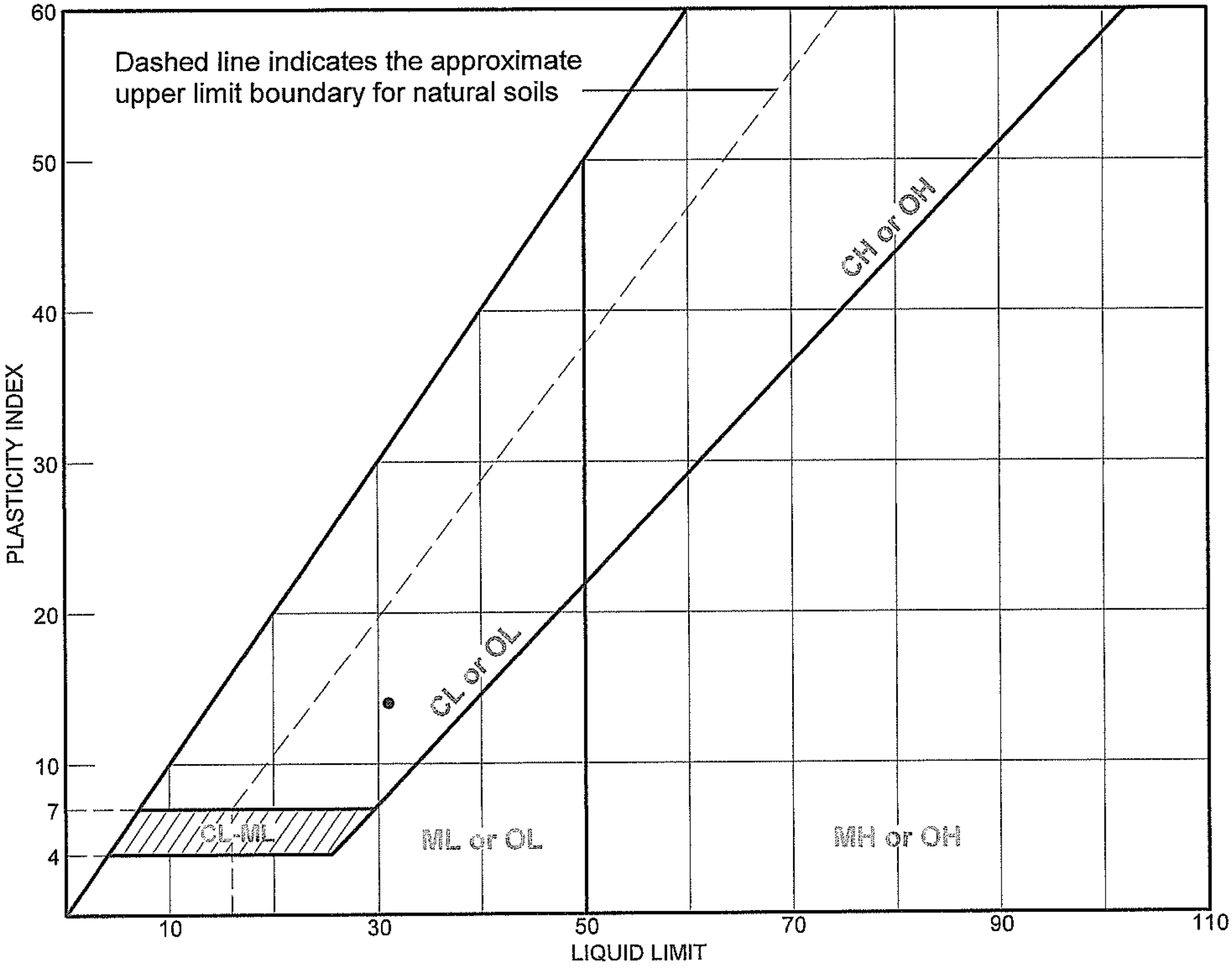
LTR-1
SAMPLE NUMBER: 19-1790

Sample No.: S-10 **Source of Sample:** B-9 **Date:** 10-23-2019
Location: B-9, S-10: 30' - 32' **Elev./Depth:** 30' - 32'

SJB SERVICES, INC.

Client: ACQUEST DEVELOPMENT CO.
Project: PROPOSED WAREHOUSE/DISTRIBUTION FACILITY
GRAND ISLAND, NY
Project No: BE-19-102 **Plate**

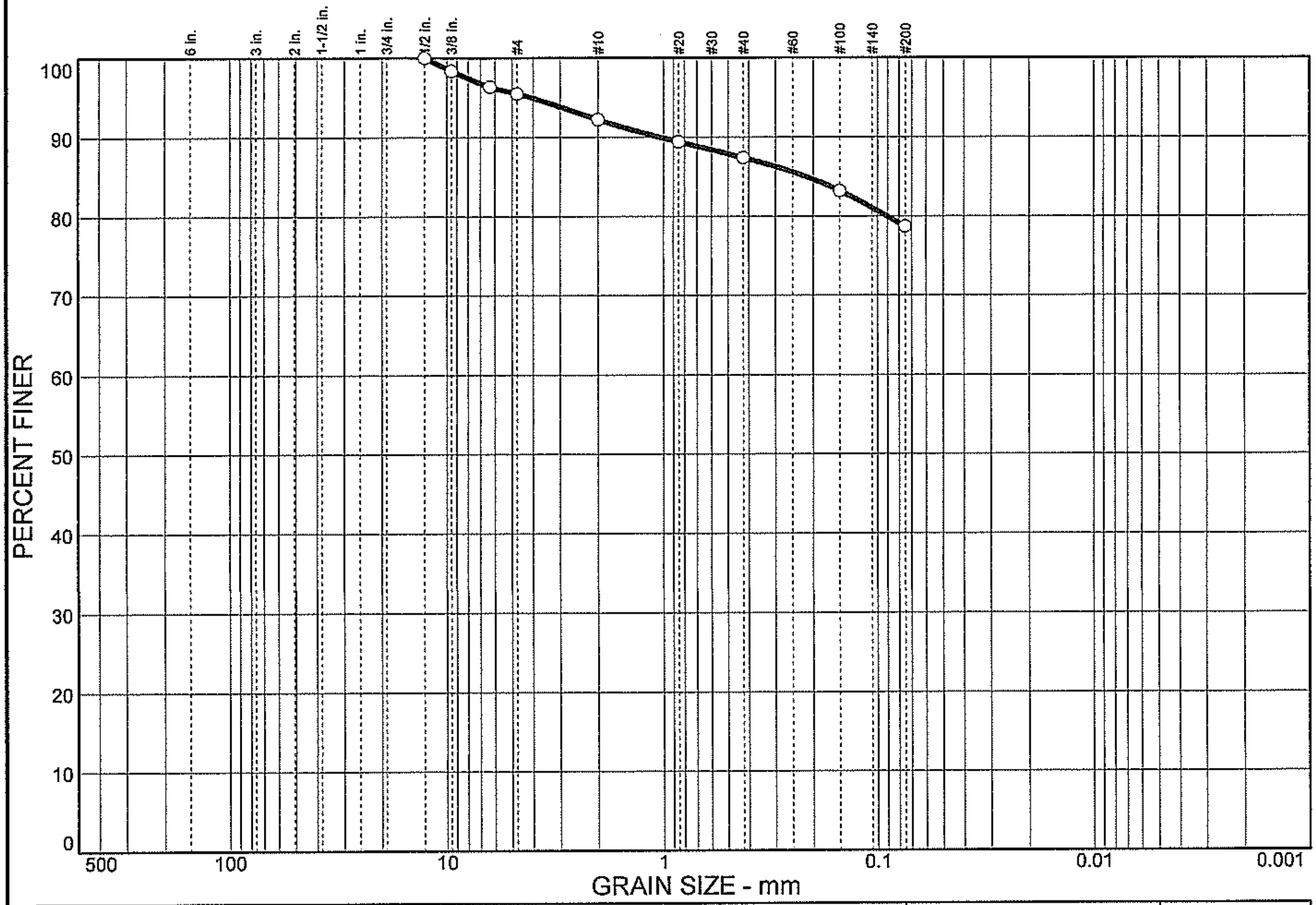
LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-11	S-7	15' - 17'	18.2 %	17	31	14	

LIQUID AND PLASTIC LIMITS TEST REPORT **SJB SERVICES, INC.**	**Client:** ACQUEST DEVELOPMENT CO. **Project:** PROPOSED WAREHOUSE/DISTRIBUTION FACILITY GRAND ISLAND, NY **Project No.:** BE-19-102 **Plate**

Particle Size Distribution Report ASTM D-422



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.5	16.8	78.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.375 in.	98.4		
.25 in.	96.4		
#4	95.5		
#10	92.2		
#20	89.4		
#40	87.4		
#100	83.2		
#200	78.7		

* (no specification provided)

Soil Description

B-11, S-7: 15' - 17'

Atterberg Limits

PL= 17 LL= 31 PI= 14

Coefficients

D_{85}= 0.216 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

LTR-1
SAMPLE NUMBER: 19-1791

Sample No.: S-7 **Source of Sample:** B-11 **Date:** 10-23-2019
Location: B-11, S-7: 15' - 17' **Elev./Depth:** 15' - 17'

SJB SERVICES, INC.

Client: ACQUEST DEVELOPMENT CO.
Project: PROPOSED WAREHOUSE/DISTRIBUTION FACILITY
GRAND ISLAND, NY
Project No: BE-19-102 **Plate**

APPENDIX D

Boring Logs

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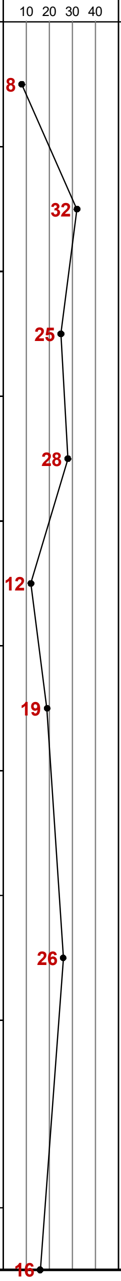
Log of Boring **LB-1** Sheet 1 of 2

Project Project Olive - Proposed Distribution Facility		Project No. 100785901	
Location Grand Island, New York		Elevation and Datum Approx. el. 587 ft (NAVD 88)	
Drilling Company Buffalo Drilling Company, Inc.		Date Started 11/22/19	Date Finished 11/22/19
Drilling Equipment Track-Mounted Drill Rig		Completion Depth 36 ft	Rock Depth N/E

Size and Type of Bit 4" Hollow Stem Auger			Number of Samples	Disturbed 11	Undisturbed -	Core -
Casing Diameter (in) -	Casing Depth (ft) -		Water Level (ft.)	First ▽ N/E	Completion ▼ -	24 HR. ▼ -
Casing Hammer -	Weight (lbs) -	Drop (in) -	Drilling Foreman Don			
Sampler 2" O.D. Split Spoon			Field Engineer Katie Kalish			
Sampler Hammer Safety	Weight (lbs) 140	Drop (in) 30				

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+587.0	Grayish brown Silty CLAY, trace f-m sand, trace roots, trace organics (moist) [TOPSOIL]	0	S-1A	SS	12	1 3	8	Started drilling at 9:33 AM on 11/22/2019. S-1 at 0ft
+586.0	Brown to reddish brown Silty CLAY, trace f-m sand, trace roots (moist)	1	S-1B			5 4		
+585.0	Reddish brown SILT, some clay, trace f-m sand, trace roots (moist)	2	S-2	SS	18	10 13 19 20	32	S-2 at 2ft
	Dark reddish brown to gray Clayey SILT, trace f-m sand (moist)	4	S-3	SS	18	5 10 15 22	25	Drilled to 4ft. S-3 at 4ft
	Dark reddish brown to gray Clayey SILT, trace f-c sand, trace fine gravel (moist)	6	S-4	SS	18	6 9 19 19	28	Drilled to 6ft. S-4 at 6ft
	Dark reddish brown to gray Clayey SILT, trace f-c sand, trace fine gravel (moist)	8	S-5	SS	12	3 3 9 12	12	Drilled to 8ft. S-5 at 8ft
	Dark reddish brown to gray Clayey SILT, trace f-c sand, trace fine gravel (moist)	10	S-6	SS	18	3 6 13 16	19	Drilled to 10ft. S-6 at 10ft
	Dark reddish brown to gray Clayey SILT, trace f-c sand, trace fine gravel (moist)	14	S-7	SS	24	8 10 16 16	26	Drilled to 14ft. S-7 at 14ft
	Dark reddish brown to gray Clayey SILT, trace f-c sand, trace fine gravel, trace thin fibers (moist)	19	S-8	SS	24	6 6	16	Drilled to 19ft. S-8 at 19ft



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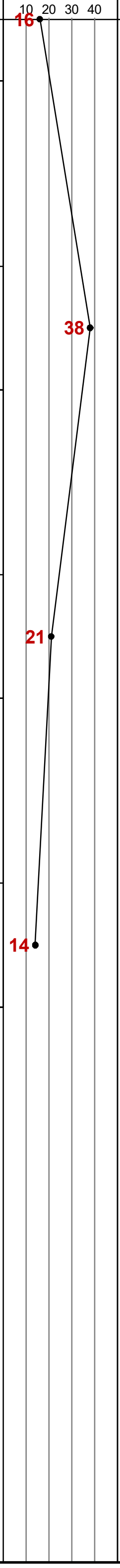
Log of Boring **LB-1** Sheet 2 of 2

Project Project Olive - Proposed Distribution Facility	Project No. 100785901
Location Grand Island, New York	Elevation and Datum Approx. el. 587 ft (NAVD 88)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data Number	Sample Data Type	Sample Data Recov. (in)	Sample Data Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
▨	+567.0	Dark reddish brown to gray Clayey SILT, trace f-c sand, trace fine gravel, trace thin fibers (moist)	20	S-8	SS	24	10 16	16	
▨	+563.0	Brownish gray CLAY, some silt, some f-c sand, trace fine gravel (moist)	24	S-9	SS	24	5 11 27 22	38	Drilled to 24ft. S-9 at 24ft
▨		Brownish gray CLAY, some silt, trace f-c sand (moist)	29	S-10	SS	24	30 10 11 8	21	Drilled to 29ft. S-10 at 29ft
▨		Brownish gray CLAY, some silt, some f-c sand (moist)	34	S-11	SS	24	8 7 7 7	14	Drilled to 34ft. S-11 at 34ft
	+551.0	End of Boring at 36'.	36						Finished drilling at 11:44 AM on 11/22/2019. Backfilled boring with soil cuttings upon completion.

Depth Scale: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45



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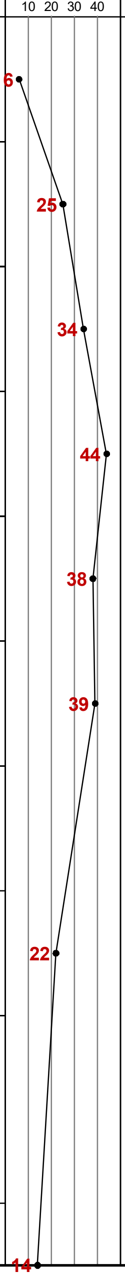
Log of Boring **LB-2** Sheet 1 of 3

Project Project Olive - Proposed Distribution Facility			Project No. 100785901		
Location Grand Island, New York			Elevation and Datum Approx. el. 583 ft (NAVD 88)		
Drilling Company Buffalo Drilling Company, Inc.			Date Started 11/20/19	Date Finished 11/21/19	
Drilling Equipment Track-Mounted Drill Rig			Completion Depth 50.2 ft	Rock Depth N/E	
Size and Type of Bit 4" Hollow Stem Auger			Number of Samples	Disturbed 14	Undisturbed -	Core -
Casing Diameter (in) -	Casing Depth (ft) -		Water Level (ft.)	First ▽ N/E	Completion ▼ -	24 HR. ▼ -
Casing Hammer -	Weight (lbs) -	Drop (in) -	Drilling Foreman Don		
Sampler 2" O.D. Split Spoon			Field Engineer John Fitzpatrick		
Sampler Hammer Safety	Weight (lbs) 140	Drop (in) 30			

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+583.0	Dark grayish brown to orangish brown Clayey SILT, some organics, trace f-m sand, trace roots (moist) [TOPSOIL]	0	S-1	SS	12	2 2 4 7	6	Started drilling at 2:30pm on 11/20/19. S-1 at 0ft
+581.0	Dark reddish brown to brown Clayey SILT, some f-m sand, trace roots (moist)	2	S-2	SS	24	6 11 14 32	25	S-2 at 2ft. Environmental samples collected from 2ft to 3ft.
	Dark reddish brown Clayey SILT, trace f-m sand, trace fine gravel, trace roots (moist)	4	S-3	SS	24	6 14 20 33	34	Drilled to 4ft. Rod Chattering. S-3 at 4ft
	Dark reddish brown Clayey SILT, trace f-m sand, trace fine gravel (moist)	6	S-4	SS	24	8 19 25 30	44	Drilled to 6ft. S-4 at 6ft
	Dark reddish brown Clayey SILT, some f-c sand, trace fine gravel (moist)	8	S-5	SS	24	6 19 19 30	38	Drilled to 8ft. S-5 at 8ft
	Dark reddish brown Clayey SILT, some f-c sand, trace f-c gravel (moist)	10	S-6	SS	24	6 15 24 27	39	Drilled to 10ft. S-6 at 10ft
		12						
+569.0	Dark reddish brown Silty CLAY, trace fine gravel, trace f-c sand (moist)	14	S-7	SS	24	6 7 15 17	22	Drilled to 14ft. S-7 at 14ft
		16						
+564.0	Dark grayish brown Silty CLAY, trace f-c sand, trace fine gravel (moist)	19	S-8	SS	24	3 6	14	Drilled to 19ft. S-8 at 19ft
		20						



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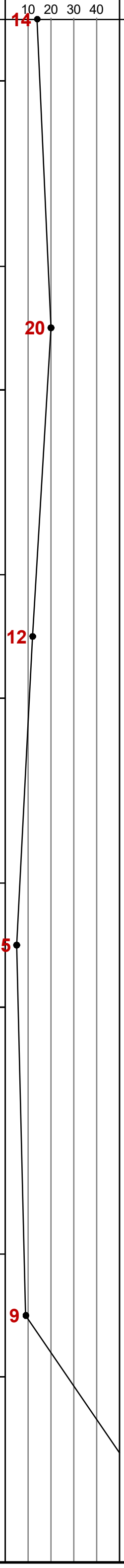
Log of Boring **LB-2** Sheet 2 of 3

Project Project Olive - Proposed Distribution Facility	Project No. 100785901
Location Grand Island, New York	Elevation and Datum Approx. el. 583 ft (NAVD 88)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data Number	Sample Data Type	Sample Data Recov. (in)	Sample Data Penetr. resist BL/6in	Sample Data N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
▨	563.0	Dark grayish brown Silty CLAY, trace f-m sand (moist)	20	S-8	SS	24	8 10	14	
▨	559.0	Dark grayish brown CLAY, some silt, some f-c sand, trace fine gravel (moist)	24	S-9	SS	18	6 8 12 10	20	Drilled to 24ft. S-9 at 24ft
▨		NO RECOVERY [Inferred CLAY with silt based on drilling observations]	29	S-10	SS	0	5 6 6 8	12	Drilled to 29ft. S-10 at 29ft
▨	549.0	Brownish gray CLAY, trace silt, trace f-c sand (moist)	34	S-11	SS	24	2 2 3 3	5	Drilled to 34ft. S-11 at 34ft
▨		Brownish gray CLAY, some f-c sand, trace silt (moist)	40	S-12	SS	18	5 3 6 6	9	Drilled to 40ft. S-12 at 40ft
▨			43						Rod Chattering. Hard drilling observed at 43ft.
	538.0		45						



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Log of Boring **LB-2** Sheet 3 of 3

Project Project Olive - Proposed Distribution Facility	Project No. 100785901
Location Grand Island, New York	Elevation and Datum Approx. el. 583 ft (NAVD 88)

Elev. (ft)	Sample Description	Depth Scale	Sample Data Number	Sample Data Type	Sample Data Recov. (in)	Sample Data Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
538.0	Brown Silty f-c SAND, some f-c gravel, trace clay (moist)	45	S-13	SS	12	50 65/6"	65/6"	Drilled to 45ft. S-13 at 45ft
	Brown f-c SAND, some silt, trace f-c gravel, trace clay (moist)							
532.8	End of Boring at 50'.	50	S-14	SS	1	50/2"	50/2"	Drilled to 50ft. S-14 at 50ft Finished drilling at 8:57 AM on 11/21/2019. Boring backfilled with soil cuttings upon completion.

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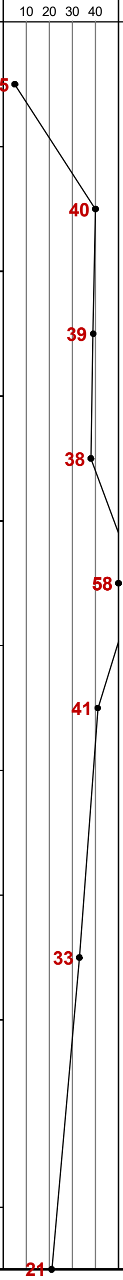
Log of Boring **LB-3** Sheet 1 of 2

Project	Project Olive - Proposed Distribution Facility	Project No.	100785901
Location	Grand Island, New York	Elevation and Datum	Approx. el. 585 ft (NAVD 88)
Drilling Company	Buffalo Drilling Company, Inc.	Date Started / Date Finished	11/22/19 / 11/22/19
Drilling Equipment	Track-Mounted Drill Rig	Completion Depth / Rock Depth	36 ft / N/E
Size and Type of Bit	4" Hollow Stem Auger	Number of Samples	Disturbed 11; Undisturbed -; Core -
Casing Diameter (in)	- ; Casing Depth (ft) -	Water Level (ft.)	First ▽ N/E; Completion ▼ -; 24 HR. ▼ -
Casing Hammer	- ; Weight (lbs) - ; Drop (in) -	Drilling Foreman	Don
Sampler	2" O.D. Split Spoon	Field Engineer	Katie Kalish
Sampler Hammer	Safety ; Weight (lbs) 140 ; Drop (in) 30		

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+585.0	Orangish brown to reddish brown Clayey SILT, some roots, trace f-m sand (moist) [TOPSOIL]	0	S-1A	SS	12	1 2	5	Started drilling at 12:28 PM on 11/22/2019. S-1 at 0ft
+584.0	Brown to reddish brown Clayey SILT, trace f-m sand, trace roots (moist)	1	S-1B			3 7		
	Brown to reddish brown to gray Clayey SILT, trace f-m sand, trace roots (moist)	2	S-2	SS	18	12 20 20 33	40	S-2 at 2ft
	Brown to gray Clayey SILT, some f-m sand, trace thin fibers (moist)	4	S-3	SS	18	7 15 24 30	39	Drilled to 4ft. S-3 at 4ft
+579.0	Reddish brown CLAY, some silt, trace f-c sand, trace fine gravel (moist)	6	S-4	SS	18	10 16 22 31	38	Drilled to 6ft. S-4 at 6ft
+577.0	Dark reddish brown Clayey SILT, trace f-m sand (moist)	8	S-5	SS	1	12 23 35 35	58	Drilled to 8ft. S-5 at 8ft
	Dark reddish brown Clayey SILT, some f-c sand, trace fine gravel (moist)	10	S-6	SS	12	11 19 22 27	41	Drilled to 10ft. S-6 at 10ft
		12						Hard drilling observed starting at 12ft.
+571.0	Dark reddish brown Silty CLAY, trace fine gravel, trace f-c sand (moist)	14	S-7	SS	18	9 13 20 24	33	Drilled to 14ft. S-7 at 14ft
	NO RECOVERY [Inferred Silty CLAY based on drilling observations]	19	S-8	SS	0	11 8	21	Drilled to 19ft. S-8 at 19ft



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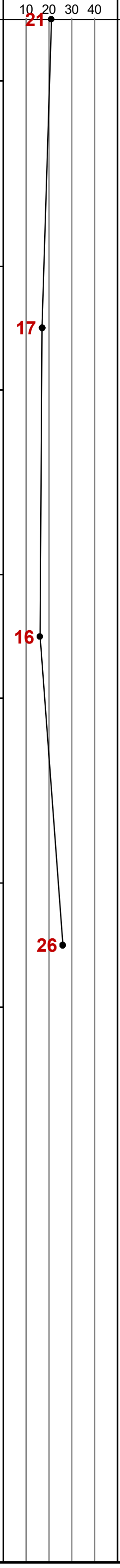
Log of Boring **LB-3** Sheet 2 of 2

Project Project Olive - Proposed Distribution Facility	Project No. 100785901
Location Grand Island, New York	Elevation and Datum Approx. el. 585 ft (NAVD 88)

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
565.0	NO RECOVERY [Inferred Silty CLAY based on drilling observations]	20	S-8	SS	0	13 17	21	
	Dark reddish brown Silty CLAY, some f-c sand, trace fine gravel (moist)	24	S-9	SS	18	6 7 10 10	17	Drilled to 24ft. S-9 at 24ft
	NO RECOVERY [Inferred Silty CLAY based on drilling observations]	29	S-10	SS	0	5 7 9 9	16	Drilled to 29ft. S-10 at 29ft
551.0	Brownish gray CLAY, some silt, trace f-c sand, trace fine gravel (moist)	34	S-11	SS	12	11 13 13 10	26	Drilled to 34ft. S-11 at 34ft
549.0	End of Boring at 36'.	36						Finished drilling at 3:19 PM on 11/22/2019. Backfilled boring with soil cuttings upon completion.

Depth Scale: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45



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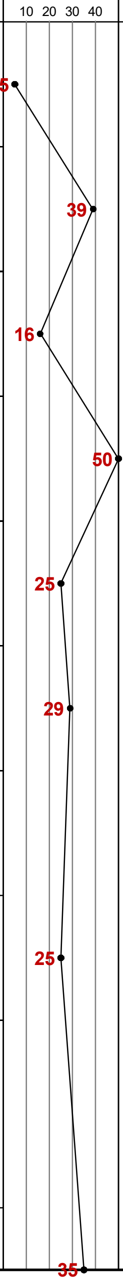
Log of Boring **LB-4** Sheet 1 of 2

Project Project Olive - Proposed Distribution Facility		Project No. 100785901			
Location Grand Island, New York		Elevation and Datum Approx. el. 585.5 ft (NAVD 88)			
Drilling Company Buffalo Drilling Company, Inc.		Date Started 11/25/19		Date Finished 11/25/19	
Drilling Equipment Track-Mounted Drill Rig		Completion Depth 36 ft		Rock Depth N/E	
Size and Type of Bit 4" Hollow Stem Auger		Number of Samples	Disturbed 11	Undisturbed -	Core -
Casing Diameter (in) -	Casing Depth (ft) -	Water Level (ft.)	First ▽ N/E	Completion ▼ -	24 HR. ▽ -
Casing Hammer -	Weight (lbs) - Drop (in) -	Drilling Foreman Joe			
Sampler 2" O.D. Split Spoon, Shelby Tube & Macrocore		Field Engineer Katie Kalish			
Sampler Hammer Safety	Weight (lbs) 140 Drop (in) 30				

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+585.5	Brown to orangish brown Silty CLAY, some roots, some organics, trace f-m sand (moist) [TOPSOIL]	0	S-1A	SS	18	1 2	5	Started drilling at 9:05 AM on 11/25/2019. S-1 at 0ft
	+584.5	Dark reddish brown SILT, some clay, trace f-m sand, trace roots (moist)	1	S-1B			3 5		
		Reddish brown to gray SILT, some clay, trace f-m sand, trace roots (dry)	2	S-2	SS	18	10 17 22 23	39	Drilled to 2ft. S-2 at 2ft
		Reddish brown to gray SILT, some clay, trace f-m sand (dry)	4	S-3	SS	12	1 5 11 21	16	Drilled to 4ft. S-3 at 4ft
		Reddish brown to gray SILT, some clay, trace f-c sand, trace thin fibers (moist)	6	S-4	SS	2	14 25 25 23	50	Drilled to 6ft. S-4 at 6ft
	+577.5	Dark reddish brown CLAY, some silt, some f-c gravel, trace f-c sand (moist)	8	S-5	SS	18	4 10 15 19	25	Drilled to 8ft. S-5 at 8ft
		Dark reddish brown Silty CLAY, trace f-c sand, trace fine gravel (moist)	10	S-6	SS	18	6 14 15 23	29	Drilled to 10ft. S-6 at 10ft
			12						
		Dark reddish brown Silty CLAY, trace f-c sand, trace fine gravel (moist)	14	S-7	SS	18	5 10 15 21	25	Drilled to 14ft. S-7 at 14ft
			16						
		Dark reddish brown to light grayish brown Silty CLAY, trace f-c sand, trace fine gravel (moist)	19	S-8	SS	18	44 13	35	Drilled to 19ft. S-8 at 19ft
			20						



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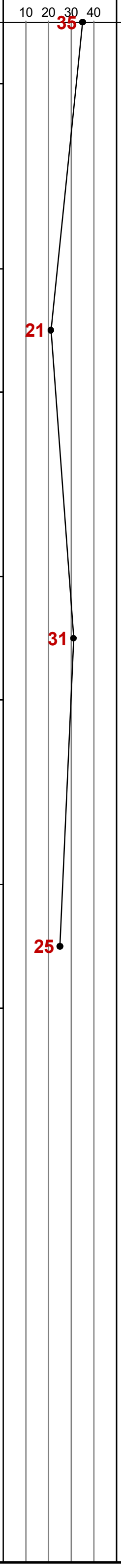
Log of Boring **LB-4** Sheet 2 of 2

Project Project Olive - Proposed Distribution Facility	Project No. 100785901
Location Grand Island, New York	Elevation and Datum Approx. el. 585.5 ft (NAVD 88)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
▨	565.5	Dark reddish brown to light grayish brown Silty CLAY, trace f-c sand, trace fine gravel (moist)	20	S-8	SS	18	22 22	35	
		Dark reddish brown Silty CLAY, some f-c gravel, trace f-c sand (moist)	24	S-9	SS	18	5 8 13 20	21	Drilled to 24ft. S-9 at 24ft
		Dark reddish brown Silty CLAY, trace f-c gravel, trace f-c sand (moist)	29	S-10	SS	6	2 15 16 18	31	Drilled to 29ft. S-10 at 29ft
▦	551.5	Dark grayish brown CLAY, some silt, trace f-c gravel, trace f-c sand (moist)	34	S-11	SS	12	3 12 13 16	25	Drilled to 34ft. S-11 at 34ft
	549.5	End of Boring at 36'.	36						Finished drilling at 10:48AM on 11/25/2019. Backfilled boring with soil cuttings upon completion.

Depth Scale: 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45



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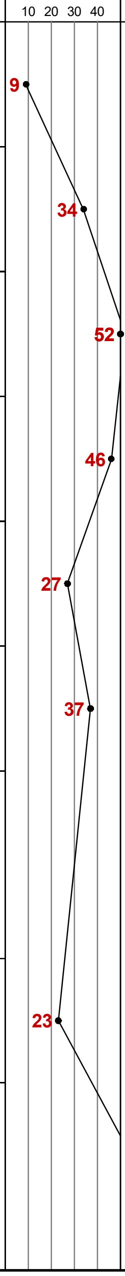
Log of Boring **LB-5** Sheet 1 of 2

Project	Project Olive - Proposed Distribution Facility	Project No.	100785901
Location	Grand Island, New York	Elevation and Datum	Approx. el. 580 ft (NAVD 88)
Drilling Company	Buffalo Drilling Company, Inc.	Date Started / Date Finished	11/21/19 / 11/22/19
Drilling Equipment	Track-Mounted Drill Rig	Completion Depth / Rock Depth	35.1 ft / N/E
Size and Type of Bit	2.25" Hollow Stem Auger	Number of Samples	Disturbed 11 / Undisturbed - / Core -
Casing Diameter (in)	- ; Casing Depth (ft) -	Water Level (ft.)	First ▽ N/E / Completion ▼ - / 24 HR. ▼ -
Casing Hammer	- ; Weight (lbs) - ; Drop (in) -	Drilling Foreman	Don
Sampler	2" O.D. Split Spoon		
Sampler Hammer	Safety ; Weight (lbs) 140 ; Drop (in) 30	Field Engineer	Katie Kalish

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+580.0	Brown Clayey SILT, trace f-m sand, some roots, some organics (moist) [TOPSOIL]	0	S-1A	SS	18	1 3	9	Started drilling at 2:23 PM on 11/21/2019. S-1 at 0ft
+579.0	Reddish brown SILT, some clay, trace fine gravel, trace f-c sand, trace roots (moist)	1	S-1B			6 14		
	Reddish brown SILT, some clay, some f-c gravel, trace f-c sand (moist)	2	S-2	SS	18	9 11 23 23	34	Drilled to 2ft. S-2 at 2ft
+576.0	Dark reddish brown CLAY, some silt, some f-c sand, trace f-c gravel (moist)	4	S-3	SS	18	7 22 30 34	52	Drilled to 4ft. S-3 at 4ft
+574.0	Dark reddish brown Clayey SILT, trace fine gravel, trace f-c sand (moist)	6	S-4	SS	18	12 20 26 26	46	Drilled to 6ft. S-4 at 6ft
	Dark reddish brown Clayey SILT, trace fine gravel, trace f-c sand (moist)	8	S-5	SS	12	4 11 16 20	27	Drilled to 8ft. S-5 at 8ft
	Dark reddish brown Clayey SILT, some f-c gravel, trace f-c sand (moist)	10	S-6	SS	6	3 16 21 20	37	Drilled to 10ft. S-6 at 10ft
		12						
	Dark reddish brown Clayey SILT, trace f-c gravel, trace f-c sand (moist)	15	S-7	SS	8	4 9 14 19	23	Drilled to 15ft. S-7 at 15ft
		20						



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Log of Boring **LB-5** Sheet 2 of 2

Project Project Olive - Proposed Distribution Facility	Project No. 100785901
Location Grand Island, New York	Elevation and Datum Approx. el. 580 ft (NAVD 88)

Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Sample Data: Type	Sample Data: Recov. (in)	Sample Data: Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
560.0	Dark reddish brown Clayey SILT, some f-c sand, trace fine gravel (moist)	20	S-8A	SS	12	19 32		Drilled to 20ft. S-8 at 20ft
559.3	Grayish brown Silty f-m SAND, trace clay (moist)	21	S-8B			50/4"	50/4"	Stopped Drilling for the day at 3:44 PM on 11/21/2019. Started drilling for the day at 8:19 AM on 11/22/2019.
		22						
		23						
		24						
	Reddish brown to grayish brown f-c SAND, some silt, some f-c gravel, trace clay (moist)	25	S-9	SS	9	43 50/3"	50/3"	Drilled to 25ft. Cobbles or boulders encountered starting at 25ft. S-9 at 25ft.
		26						
		27						
		28						
		29						
550.0	Dark grayish brown SILT, some clay, some f-c gravel, some sand (moist)	30	S-10	SS	9	42 50/3"	50/3"	Drilled to 30ft. S-10 at 30ft
		31						
		32						
		33						
		34						Rod Chattering.
	NO RECOVERY							
544.9	End of Boring at 35.1'.	35	S-11	SS	0	50/1"	50/1"	Drilled to 35ft. S-11 at 35ft Split spoon bouncing. Finished drilling at 9:10 AM on 11/22/2019. Borehole backfilled with soil cuttings upon completion.
		36						
		37						
		38						
		39						
		40						
		41						
		42						
		43						
		44						
		45						

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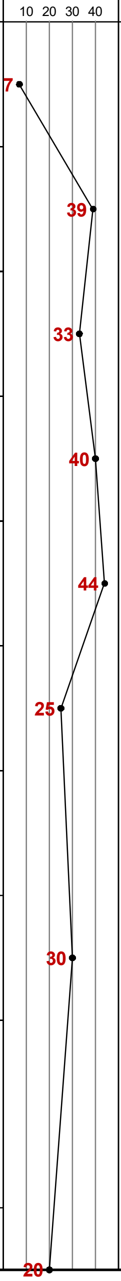
Log of Boring **LB-6** Sheet 1 of 2

Project	Project Olive - Proposed Distribution Facility	Project No.	100785901
Location	Grand Island, New York	Elevation and Datum	Approx. el. 588 ft (NAVD 88)
Drilling Company	Buffalo Drilling Company, Inc.	Date Started / Date Finished	11/21/19 / 11/21/19
Drilling Equipment	Track-Mounted Drill Rig	Completion Depth / Rock Depth	26 ft / N/E
Size and Type of Bit	2.25" Hollow Stem Auger	Number of Samples	Disturbed 9 / Undisturbed - / Core -
Casing Diameter (in) / Casing Depth (ft)	- / -	Water Level (ft.)	First ▽ N/E / Completion ▼ - / 24 HR. ▼ -
Casing Hammer / Weight (lbs) / Drop (in)	- / - / -	Drilling Foreman	Don
Sampler	2" O.D. Split Spoon	Field Engineer	Katie Kalish
Sampler Hammer / Weight (lbs) / Drop (in)	Safety / 140 / 30		

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+588.0	Orangish brown Silty CLAY, some roots, some organics, trace f-m sand (moist) [TOPSOIL]	0	S-1A	SS	12	2 3	7	Started drilling at 12:37 PM on 11/21/2019. S-1 at 0ft
+587.0	Orangish brown to reddish brown SILT, some clay, trace f-m sand, trace roots (moist)	1	S-1B			4 5		
	Orangish brown to reddish brown SILT, some clay, trace f-m sand (moist)	2	S-2	SS	18	7 17 22 25	39	S-2 at 2ft
	Dark reddish brown to gray SILT, some clay, some f-c sand, trace roots (moist)	4	S-3	SS	18	8 13 20 25	33	Drilled to 4ft. S-3 at 4ft
	Dark reddish brown SILT, some clay, trace f-c sand, trace fine gravel (moist)	6	S-4	SS	18	10 16 24 27	40	Drilled to 6ft S-4 at 6ft
+580.0	Dark reddish brown CLAY, some silt, trace fine sand, trace fine gravel (moist)	8	S-5	SS	18	11 20 24 33	44	Drilled to 8ft. S-5 at 8ft
+578.0	Dark reddish brown Clayey SILT, trace f-c sand, trace fine gravel (moist)	10	S-6	SS	24	4 9 16 24	25	Drilled to 10ft. S-6 at 10ft
		12						
+574.0	Dark reddish brown CLAY, some silt, trace f-c sand, trace fine gravel (moist)	14	S-7	SS	24	8 14 16 18	30	Drilled to 14ft. S-7 at 14ft
		16						
	Reddish brown CLAY, some silt, trace f-c sand, trace fine gravel (moist)	19	S-8	SS	24	5 7	20	Drilled to 19ft. S-8 at 19ft
		20						



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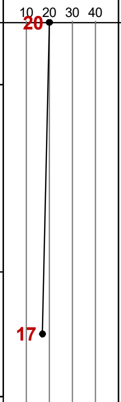
Log of Boring **LB-6** Sheet 2 of 2

Project Project Olive - Proposed Distribution Facility	Project No. 100785901
Location Grand Island, New York	Elevation and Datum Approx. el. 588 ft (NAVD 88)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
▨	568.0	Reddish brown CLAY, some silt, trace fine gravel, trace f-m sand (moist)	20	S-8	SS	24	13 15	20	
▨	564.0	Dark reddish brown to gray CLAY, some silt, trace f-c sand, trace gravel (moist)	24	S-9	SS	24	2 6 11 12	17	Drilled to 24ft. S-9 at 24ft
	562.0	End of Boring at 26'.	26						Finished drilling at 2:04PM on 11/21/2019. Borehole backfilled with soil cuttings upon completion.

Depth Scale: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45



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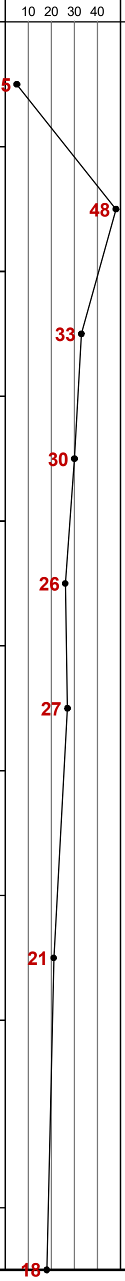
LANGAN Log of Boring **LB-7** Sheet 1 of 2

Project Project Olive - Proposed Distribution Facility	Project No. 100785901
Location Grand Island, New York	Elevation and Datum Approx. el. 585.5 ft (NAVD 88)
Drilling Company Buffalo Drilling Company, Inc.	Date Started 11/21/19 / Date Finished 11/21/19
Drilling Equipment Track-Mounted Drill Rig	Completion Depth 26 ft / Rock Depth N/E
Size and Type of Bit 4" Hollow Stem Auger	Number of Samples: Disturbed 9 / Undisturbed - / Core -
Casing Diameter (in) - / Casing Depth (ft) -	Water Level (ft.): First ▽ N/E / Completion ▼ - / 24 HR. ▽ -
Casing Hammer - / Weight (lbs) - / Drop (in) -	Drilling Foreman Don
Sampler 2" O.D. Split Spoon	
Sampler Hammer Safety / Weight (lbs) 140 / Drop (in) 30	Field Engineer John Fitzpatrick

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+585.5 +585.0	Brown SILT, some clay, trace f-m sand, some roots (wet) [TOPSOIL]	0	S-1A	SS	18	1 2	5	Started drilling at 9:02 AM on 11/21/2019. S-1 at 0ft Environmental samples collected from 0ft to 2ft.
	Dark reddish brown SILT, some clay, trace f-m sand, trace roots (moist)	1	S-1B			3 6		
	Dark reddish brown SILT, some clay, trace f-c sand, trace roots (moist)	2	S-2	SS	12	14 20 28 31	48	S-2 at 2ft
+581.5	Dark reddish brown to gray Clayey SILT, trace f-c sand, trace roots (moist)	4	S-3	SS	18	6 13 20 28	33	Drilled to 4ft. S-3 at 4ft
	Dark reddish brown to gray Clayey SILT, trace f-c sand, trace roots (moist)	6	S-4	SS	18	6 12 18 20	30	Drilled to 6ft. S-4 at 6ft
	Dark reddish brown Clayey SILT, trace f-c sand, trace fine gravel (moist)	8	S-5	SS	18	6 9 17 18	26	Drilled to 8ft. S-5 at 8ft
	Dark reddish brown Clayey SILT, trace f-c sand, trace fine gravel (moist)	10	S-6	SS	24	5 10 17 21	27	Drilled to 10ft. S-6 at 10ft
+571.5	Dark reddish brown CLAY, some silt, some f-c sand, trace f-c gravel (moist)	14	S-7	SS	18	4 9 12 20	21	Drilled to 14ft. S-7 at 14ft
	Dark reddish brown Silty CLAY, some f-c sand, trace fine gravel (moist)	19	S-8	SS	18	5 8	18	Drilled to 19ft. S-8 at 19ft



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Log of Boring **LB-7** Sheet 2 of 2

Project Project Olive - Proposed Distribution Facility	Project No. 100785901
Location Grand Island, New York	Elevation and Datum Approx. el. 585.5 ft (NAVD 88)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
▨	565.5	Dark reddish brown Silty CLAY, some f-c sand, trace fine gravel (moist)	20	S-8	SS	18	10 13	18	
▨		Dark reddish brown to light grayish brown Silty CLAY, trace f-c sand, trace thin fibers (moist)	24	S-9	SS	1	8 8 10 12	18	Drilled to 24ft. S-9 at 24ft
	559.5	End of Boring at 26'.	26						Finished drilling at 11:01 AM on 11/21/2019. Boring backfilled with soil cuttings upon completion.

Depth Scale: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45

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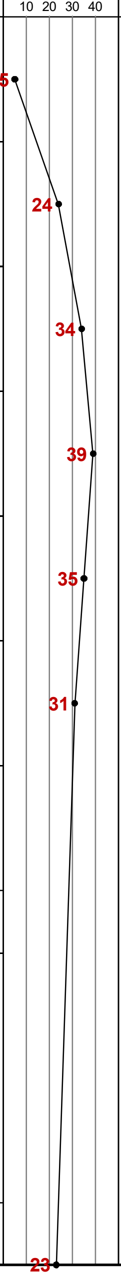
Log of Boring **LB-8** Sheet 1 of 2

Project	Project Olive - Proposed Distribution Facility	Project No.	100785901
Location	Grand Island, New York	Elevation and Datum	Approx. el. 580.5 ft (NAVD 88)
Drilling Company	Buffalo Drilling Company, Inc.	Date Started	11/19/19
		Date Finished	11/20/19
Drilling Equipment	Track-Mounted Drill Rig	Completion Depth	24.5 ft
		Rock Depth	N/E
Size and Type of Bit	4" Hollow Stem Auger	Number of Samples	Disturbed 9 / Undisturbed - / Core -
Casing Diameter (in)	-	Casing Depth (ft)	-
Water Level (ft.)	First ∇ N/E / Completion ▼ - / 24 HR. ▼ -		
Casing Hammer	-	Weight (lbs)	-
Drop (in)	-	Drilling Foreman	Don
Sampler	2" O.D. Split Spoon	Field Engineer	Katie Kalish, John Fitzpatrick
Sampler Hammer	Safety	Weight (lbs)	140
Drop (in)	30		

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
580.5	Reddish brown to light brown Clayey SILT, trace f-m sand, some roots, trace thin fibers (moist)	0	S-1	SS	12	1 2 3 5	5	Started drilling at 10:31 AM on 11/19/2019. S-1 at 0ft
	Reddish brown to brown Clayey SILT, trace f-m sand, trace roots, trace thin fibers (moist)	2	S-2	SS	18	5 9 15 21	24	S-2 at 2ft
	Dark reddish brown Clayey SILT, some f-c sand, trace fine gravel, trace thin fibers (moist)	4	S-3	SS	18	5 12 22 25	34	Petroleum smell is PB blaster. Drilled to 4ft. S-3 at 4ft
	Dark reddish brown Clayey SILT, some fine gravel, trace f-c sand, trace roots (moist)	6	S-4	SS	24	9 17 22 26	39	Drilled to 6ft. S-4 at 6ft
	Dark reddish brown Clayey SILT, some f-c sand, trace fine gravel (moist)	8	S-5	SS	24	5 13 22 29	35	Drilled to 8ft. S-5 at 8ft
570.5	Dark reddish brown CLAY, some silt, some f-c sand (moist)	10	S-6	SS	24	11 15 16 16	31	Drilled to 10ft. S-6 at 10ft
	Dark reddish brown Silty CLAY, some f-c sand, trace fine gravel, trace thin fibers (moist)	14	S-7	SS	12	5 12		Drilled to 14ft. S-7 at 14ft Stopped drilling for the day at 12:52 PM on 11/19/2019. Started drilling for the day at 8:12 AM on 11/20/2019.
561.5	Dark reddish brown CLAY, some silt, some f-c gravel, trace f-c sand, trace thin fibers (moist)	19	S-8	SS	3	12 13	23	Drilled to 19ft. S-8 at 19ft



Depth Scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

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Log of Boring **LB-8** Sheet 2 of 2

Project Project Olive - Proposed Distribution Facility	Project No. 100785901
Location Grand Island, New York	Elevation and Datum Approx. el. 580.5 ft (NAVD 88)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
▨	560.5	Dark reddish brown CLAY, some silt, some f-c gravel, trace f-c sand, trace thin fibers (moist)	20	S-8	SS	3	10 15		
			21						
			22						
			23						
▨		Brown Gravelly CLAY, some silt, trace f-c sand, trace thin fibers (moist)	24	S-9	SS	3	92		Drilled to 24ft. S-9 at 24ft Finished drilling at 9:04 AM on 11/20/2019. Boring backfilled with soil cuttings upon completion.
	556.0	End of Boring at 24.5'.	25						
			26						
			27						
			28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
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			45						

APPENDIX E

Test Pit Logs

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LOG OF TEST PIT TP-1

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901	DATE 11/15/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 590 ft (NAVD 88)	
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 10 ft	WATER LEVEL - First N/E ▽ WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don	LANGAN PERSONNEL Katie Kalish

ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
+590.0	Brown to orangish brown Clayey SILT, some roots, trace f-m sand (moist) [TOPSOIL]	0	S-1	GRAB	Started excavating at 8:57 AM. 12-inch thick root zone observed.
+589.0		1			
	Dark reddish brown to gray SILT, some clay, trace f-c sand, trace roots, trace thin fibers (moist)	2	S-2	GRAB	Orange mottling observed at 2' bgs.
		3			Orange and olive mottling observed at 3' bgs.
	Reddish brown to orangish brown SILT, some clay, trace f-c sand, trace roots, trace thin fibers (moist)	4	S-3	GRAB	
		5			
		6			
	Dark reddish brown SILT, some clay, trace f-c sand, trace fine gravel (moist)	7	S-4	GRAB	
		8			
	Dark reddish brown to gray SILT, some clay, some f-c sand, trace f-c gravel (moist)	9	S-5	GRAB	
+580.0	End of Test Pit at 10'.	10			Stopped excavating at 9:17 AM. Test pit was backfilled with excavated material upon completion.
		11			
		12			
		13			
		14			
		15			

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LOG OF TEST PIT TP-2

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901	DATE 11/15/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 586.5 ft (NAVD 88)	
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 10.5 ft	WATER LEVEL - First N/E ▽ WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don	LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
⁘	+586.5	Brown Sandy SILT, some clay, some roots (moist) [TOPSOIL]	0	S-1	GRAB	Started excavating at 9:38 AM. 8-inch thick root zone observed.
▨	+585.5	Reddish brown Silty CLAY, trace f-c sand, trace roots (moist)	1	S-2	GRAB	Orange mottling observed at 1' bgs.
▨			2			
▨	+583.5	Dark reddish brown SILT, some clay, some f-c sand, trace f-c gravel, trace cobbles, trace thin fibers (moist)	3	S-3	GRAB	Cobbles of 4-inches to 6-inches in size observed starting at 3' bgs.
▨			4			
▨			5			
▨		Dark reddish brown SILT, some clay, some f-c sand, trace f-c gravel, trace cobbles, trace thin fibers (moist)	6	S-4	GRAB	
▨			7			
▨			8			
▨		Dark reddish brown SILT, some clay, some f-c sand, trace f-c gravel, trace cobbles, trace thin fibers (moist)	9	S-5	GRAB	
▨			10			
	+576.0	End of Test Pit at 10.5'.	11			Stopped excavating at 10:04 AM. Test pit was backfilled with excavated material upon completion.
			12			
			13			
			14			
			15			

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LOG OF TEST PIT TP-3

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901	DATE 11/14/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 576.5 ft (NAVD 88)	
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 9.5 ft	WATER LEVEL - First N/E ▽ WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don	LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+576.5	Brown Silty CLAY, some roots, trace f-m sand (wet) [8-INCH THICK TOPSOIL]	0	S-1	GRAB	Started excavating at 3:05 PM. Water seepage observed at 1' bgs.
	+575.8	Dark reddish brown Silty CLAY, trace f-c sand, trace f-c gravel, trace roots, trace thin fibers (moist)	1	S-2	GRAB	
			2			
		Dark reddish brown Silty CLAY, trace f-c gravel, trace f-c sand, trace thin fibers (moist)	3	S-3	GRAB	
			4			
		Dark reddish brown to gray Silty CLAY, some f-c gravel, trace f-m sand, trace thin fibers (moist)	5	S-4	GRAB	
			6			
			7			
		Dark reddish brown to gray Silty CLAY, some f-c gravel, some f-c sand, trace cobbles, trace thin fibers (moist)	8	S-5	GRAB	
			9			
	+567.0	End of Test Pit at 9.5'.	10			Stopped excavating at 3:46 PM. Test pit was backfilled with excavated material upon completion.
			11			
			12			
			13			
			14			
			15			

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LOG OF TEST PIT TP-4

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901	DATE 11/18/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 575 ft (NAVD 88)	
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 8 ft	WATER LEVEL - First N/E ▽ ; WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don	LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
⁘	+575.0	Dark grayish brown Silty CLAY, some roots, some organics, trace f-m sand (wet) [12-INCH THICK TOPSOIL]	0	S-1	GRAB	Started excavating at 1:35 pm. 16-inch thick root zone observed.
▩	+574.0	Orangish brown to grayish brown Clayey SILT, trace f-m sand, trace roots (moist) [FILL]	1	S-2	GRAB	Orange mottling observed at 1' bgs.
			2			
▨	+572.0	Dark reddish brown to grayish brown Clayey SILT, trace f-c gravel, trace f-c sand, trace roots, trace thin fibers (moist)	3	S-3	GRAB	
			4			Very difficult excavating observed at 4' bgs.
		Dark reddish brown to gray Clayey SILT, trace f-c gravel, trace f-c sand, trace cobbles, trace thin fibers (moist)	5	S-4	GRAB	Cobbles observed starting at 5' bgs.
			6			
		Dark reddish brown to gray SILT, some clay, trace f-c gravel, trace f-c sand, trace cobbles (moist)	7	S-5	GRAB	
	+567.0	End of Test Pit at 8'.	8			Stopped excavating at 2:11 PM. Test pit was backfilled with excavated material upon completion.
			9			
			10			
			11			
			12			
			13			
			14			
			15			

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LOG OF TEST PIT TP-5

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901	DATE 11/15/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 570 ft (NAVD 88)	
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 10 ft	WATER LEVEL - First N/E ▽
		WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don	LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
⁙	+570.0	Brown to dark brown Clayey SILT, some f-c sand, trace roots, trace organics (wet) [TOPSOIL]	0	S-1	GRAB	Started excavating at 1:47 PM. Standing surface water observed in area. Water seepage observed from surface.
			1			
▨	+568.5	Dark reddish brown Clayey SILT, some f-c sand, trace f-c gravel, trace roots (moist)	2	S-2	GRAB	
▨		Dark reddish brown SILT, some clay, trace f-c gravel, trace f-m sand, trace cobbles, trace thin fibers (moist)	3	S-3	GRAB	Cobbles 4-inches to 6-inches in size observed starting at 2.5' bgs.
▨			4			
▨			5			
▨			6			
▨		Dark reddish brown SILT, some clay, some f-c gravel, some f-c sand, trace cobbles, trace thin fibers (moist)	7	S-4	GRAB	
▨			8			Cobbles up to 10-inches in size observed at 8.5' bgs.
▨		Dark reddish brown SILT, some clay, some f-c gravel, trace f-c sand, trace cobbles, trace thin fibers (moist)	9	S-5	GRAB	
	+560.0	End of Test Pit at 10'.	10			Stopped excavating at 2:10 PM. Test pit was backfilled with excavated material upon completion.
			11			
			12			
			13			
			14			
			15			

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LOG OF TEST PIT TP-8

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901	DATE 11/15/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 575 ft (NAVD 88)	
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 10 ft	WATER LEVEL - First N/E ▽ WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don	LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+575.0	Brown to reddish-brown Silty CLAY, some roots, trace f-m sand (wet) [TOPSOIL]	0	S-1	GRAB	Started excavating at 11:57 AM. Test pit location close to stream. Standing surface water in area. Water seepage observed from surface. 6-inch thick root zone.
	+574.0	Reddish brown to grayish brown Silty CLAY, trace f-c sand, trace roots (moist) [FILL]	1	S-2	GRAB	Some olive mottling observed at 1.5' bgs.
			2			
			3			
	+571.5	Dark reddish brown Clayey SILT, some f-c gravel, some f-c sand, trace thin fibers (moist)		S-3	GRAB	Hard excavating at 3.5' bgs. Soil is very stiff.
			4			
			5			
		Dark reddish brown Clayey SILT, some f-c gravel, some f-c sand, trace cobbles, trace roots (moist)	6	S-4	GRAB	Cobbles observed starting at 6' bgs.
			7			
			8			
		Dark reddish brown to gray Clayey SILT, some f-c gravel, trace f-c sand, trace cobbles, trace roots (moist)	9	S-5	GRAB	
	+565.0	End of Test Pit at 10'.	10			Stopped excavating at 12:28 PM. Test pit was backfilled with excavated material upon completion.
			11			
			12			
			13			
			14			
			15			

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LOG OF TEST PIT TP-9

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901		DATE 11/14/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 587 ft (NAVD 88)		
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 9.5 ft	WATER LEVEL - First N/E ▽	WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don		LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+587.0	Brown Clayey SILT, some roots, some organics, trace f-m sand (moist) [10-INCH THICK TOPSOIL]	0	S-1	GRAB	Started excavating at 13:18 PM.
	+586.2	Orangish brown to brown Silty CLAY, trace f-m sand, trace roots (moist) [FILL]	1	S-2	GRAB	Observed orange mottling at 1' bgs.
			2			
	+584.0	Dark reddish brown Clayey SILT, trace f-c sand, trace thin fibers (moist)	3	S-3	GRAB	
			4			
		Dark reddish brown to gray Clayey SILT, trace f-c gravel, trace f-c sand, trace thin fibers (moist)	5	S-4	GRAB	
			6			
		Dark reddish brown Clayey SILT, trace f-c sand, trace fine gravel, trace cobbles, trace thin fibers (moist)	7	S-5	GRAB	Observed cobbles from 7ft to 9ft bgs.
			8			
		Dark reddish brown Clayey SILT, some f-m sand, trace fine gravel, trace cobbles, trace thin fibers (moist)	9	S-6	GRAB	
	+577.5	End of Test Pit at 9.5'.	10			Stopped excavating at 14:03 PM. Test pit was backfilled with excavated material upon completion.
			11			
			12			
			13			
			14			
			15			

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LOG OF TEST PIT TP-10

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901	DATE 11/14/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 589 ft (NAVD 88)	
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 9.5 ft	WATER LEVEL - First 1 ft ▽ WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don	LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+589.0	Brown to dark brown Clayey SILT, trace f-m sand, trace roots, trace organics (wet) [8-INCH THICK TOPSOIL]	0	S-1	GRAB	Stared excavating at 12:02 PM.
	+588.2	▽ Orangish brown to brown Silty CLAY, trace f-m sand, trace roots (moist) [FILL]	1 2 3	S-2	GRAB	Perched water seepage observed at 1' bgs.
	+585.5	Reddish brown Silty CLAY, trace f-m sand, trace roots (moist)	4 5	S-3	GRAB	
	+583.0	Dark reddish brown Clayey SILT, trace f-c sand, trace fine gravel (moist)	6 7	S-4	GRAB	
		Dark reddish brown Clayey SILT, trace f-c sand (moist)	8 9	S-5	GRAB	
	+579.5	End of Test Pit at 9.5'.	10 11 12 13 14 15			Stopped excavating at 12:51 PM. Test pit was backfilled with excavated material upon completion.

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LOG OF TEST PIT TP-11

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901		DATE 11/14/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 588.5 ft (NAVD 88)		
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 9 ft	WATER LEVEL - First N/E ▽	WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don		LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
⁘	+588.5	Dark grayish brown Clayey SILT, some roots, some organics, trace f-m sand (moist) [8-INCH THICK TOPSOIL]	0	S-1	GRAB	Started excavating at 10:55 AM. Perched water seepage observed at 0.83' bgs. Location in close proximity to stream and surface water. Orange mottling observed at 1' bgs.
▩	+587.5	Orangish to grayish brown CLAY, some silt, trace f-m sand, trace roots (moist) [FILL]	1	S-2	GRAB	
▩			2			
▨	+585.5	Dark reddish brown to gray Clayey SILT, trace f-m sand, trace roots, trace thin fibers (moist)	3	S-3	GRAB	
▨			4			
▨	+583.5	Dark reddish brown to gray Silty CLAY, trace f-m sand, trace thin fibers (moist)	5	S-4	GRAB	
▨			6			
▨			7			
▨		Dark reddish brown CLAY, some silt, trace f-m sand, trace thin fibers (moist)	8	S-5	GRAB	
	+579.5	End of Test Pit at 9'.	9			Stopped excavating at 11:20 AM. Test pit was backfilled with excavated material upon completion.
			10			
			11			
			12			
			13			
			14			
			15			

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LOG OF TEST PIT TP-12

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901		DATE 11/15/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 582 ft (NAVD 88)		
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 9.5 ft	WATER LEVEL - First N/E ▽	WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don		LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+582.0	Brown Clayey SILT, some clay, some roots, trace f-m sand (moist) [TOPSOIL]	0	S-1	GRAB	Started excavating at 10:49 AM. 6-inch thick root zone observed.
	+581.0		1			
		Reddish brown to grayish brown Clayey SILT, some f-c sand, trace f-c gravel, trace roots, trace thin fibers (moist)	2	S-2	GRAB	
			3			
		Dark reddish brown to gray Clayey SILT, some f-c sand, trace f-c gravel, trace roots, trace thin fibers (moist)	4	S-3	GRAB	
			5			Cobbles up to 8-inches in size observed starting at 5.5' bgs.
		Dark reddish brown to gray Clayey SILT, some f-c sand, trace f-c gravel, trace cobbles, trace roots (moist)	6			
		Dark reddish brown to gray Clayey SILT, some f-c gravel, trace f-c sand, trace cobbles, trace roots (moist)	7	S-4	GRAB	
		Dark reddish brown to gray Clayey SILT, some clay, some f-c gravel, some f-c sand, trace cobbles, trace roots (moist)	8	S-5	GRAB	
			9			
	+572.5	End of Test Pit at 9.5'.	10			Stopped excavating at 11:25 AM. Test pit was backfilled with excavated material upon completion.
			11			
			12			
			13			
			14			
			15			

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LOG OF TEST PIT TP-13

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901	DATE 11/18/2019	
LOCATION Grand Island, New York	ELEVATION Approx. el. 590.5 ft (NAVD 88)		
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 10.5 ft	WATER LEVEL - First N/E ▽	WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don	LANGAN PERSONNEL Katie Kalish	

ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
+590.5	Black to dark brown Clayey SILT, some f-m sand, some roots (moist) [TOPSOIL]	0	S-1	GRAB	Started excavating at 11:54 AM. 6-inch root zone observed.
+589.7	Orangish-brown Silty CLAY, some roots, trace f-m sand (moist) [FILL]	1	S-2	GRAB	Orange mottling observed starting at 0.83' bgs.
+588.5	Dark reddish-brown to grayish-brown Clayey SILT, trace f-c sand, trace roots, trace thin fibers (moist)	2	S-3	GRAB	
		3			
		4			
	Reddish-brown to gayish-brown SILT, some clay, trace f-m sand, trace thin fibers (moist)	5	S-4	GRAB	
		6			
	Dark reddish-brown to grayish-brown SILT, some clay, trace f-m sand, trace f-c gravel, trace thin fibers (moist)	7			Difficult excavating starting at 7.5' bgs.
		8			
		9			
	Dark reddish-brown to gray Clayey SILT, some f-c gravel, trace f-c sand, trace cobbles, trace thin fibers (moist)	10	S-5	GRAB	Cobbles observed up to 6-inches in size.
+580.0	End of Test Pit at 10.5'.	11			Stopped excavating at 12:20 PM. Test pit was backfilled with excavated material upon completion.
		12			
		13			
		14			
		15			

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LOG OF TEST PIT TP-14

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901		DATE 11/18/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 584.5 ft (NAVD 88)		
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 10 ft	WATER LEVEL - First N/E ▽	WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don		LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+584.5	Dark brown Clayey SILT, some f-m sand, some roots (moist) [8-INCH THICK TOPSOIL]	0	S-1	GRAB	Started excavating at 10:13 AM. 6-inch root zone observed.
	+583.7	Orangish-brown to grayish-brown CLAY, some silt, trace f-m sand, trace roots (moist) [FILL]	1	S-2	GRAB	Orange mottling observed starting at 0.83' bgs.
	+583.0	Dark reddish-brown to grayish-brown Clayey SILT, trace f-m sand, trace roots, trace thin fibers (moist)	2	S-3	GRAB	
			3			
		Dark reddish-brown to gray Clayey SILT, trace f-m sand, trace thin fibers (moist)	4	S-4	GRAB	
			5			
		Dark reddish-brown to gray Clayey SILT, trace f-c sand, trace f-c gravel, trace thin fibers (moist)	6	S-5	GRAB	
			7			
			8			
		Dark reddish-brown to gray Clayey SILT, trace f-c sand, trace f-c gravel, trace thin fibers (moist)	9	S-6	GRAB	
	+574.5	End of Test Pit at 10'.	10			Stopped excavating at 10:42 AM. Test pit was backfilled with excavated material upon completion.
			11			
			12			
			13			
			14			
			15			

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LOG OF TEST PIT TP-15

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901		DATE 11/14/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 589 ft (NAVD 88)		
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 10 ft	WATER LEVEL - First N/E ▽	WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don		LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+589.0	Dark brown Clayey SILT, some organics, trace f-m sand, trace roots (moist) [6-INCH THICK TOPSOIL]	0	S-1	GRAB	Started Excavating at 9:25 AM.
	+588.5	Orangish brown to grayish brown CLAY, some silt, trace f-m sand, trace roots (moist) [FILL]	1	S-2	GRAB	Orage mottling observed at 1' bgs.
			2			
	+586.0	Dark reddish brown to gray Silty CLAY, trace f-c sand, trace roots, trace thin fibers (moist)	3	S-3	GRAB	
		Dark reddish brown to gray Silty CLAY, trace f-c sand, trace roots, trace thin fibers (moist)	4	S-4	GRAB	
			5			
		Dark reddish brown to gray Silty CLAY, trace f-c sand, trace thin fibers (moist)	6	S-5	GRAB	
			7			
			8			
		Reddish brown Silty CLAY, trace f-c sand, trace fine gravel (moist)	9	S-6	GRAB	
	+579.0	End of Test Pit at 10'.	10			Stopped excavating 9:54 AM. Test pit was backfilled with excavated material upon completion.
			11			
			12			
			13			
			14			
			15			

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LOG OF TEST PIT TP-16

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901		DATE 11/15/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 570 ft (NAVD 88)		
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 6 ft	WATER LEVEL - First N/E ▽	WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don		LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
░	+570.0	Brown Sandy SILT, some clay, some roots (wet) [8-INCH THICK TOPSOIL]	0	S-1	GRAB	Started excavating at 12:50 PM. 8-inch thick root zone observed.
▨	+569.3	Grayish brown CLAY, some silt, trace f-c sand, trace f-c gravel, trace roots (moist)	1	S-2	GRAB	Standing surface water observed in area. Perched water seepage observed from surface.
▨		Grayish brown CLAY, some silt, some f-c gravel, some f-c sand, trace roots (moist)	2	S-3	GRAB	
▨			3			
▨			4			
▨		Grayish brown CLAY, some silt, some fine gravel, some f-c sand, trace thin fibers (moist)	5	S-4	GRAB	
	+564.0	End of Test Pit at 6'.	6			Stopped excavating at 1:33 PM. Test pit was backfilled with excavated materials upon completion.
			7			
			8			
			9			
			10			
			11			
			12			
			13			
			14			
			15			

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LOG OF TEST PIT PT-1

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901	DATE 11/13/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 588.5 ft (NAVD 88)	
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 9.75 ft	WATER LEVEL - First N/E ▽ WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don	LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
	+588.5	Brown to orangish brown Silty CLAY, some f-m sand, some roots (moist) [TOPSOIL]	0 1	S-1	GRAB	Started excavating at 1:26 PM. 18-inch root zone observed.
	+587.0	Dark reddish brown to brown SILT, some clay, some f-c sand, trace roots (dry)	2 3 4	S-2	GRAB	
		Dark reddish brown to brown SILT, some clay, trace f-c sand, trace roots (moist)	5 6 7	S-3	GRAB	
		Dark reddish brown SILT, some clay, some f-c gravel, trace f-c sand (moist)	8	S-4	GRAB	
		Dark reddish brown SILT, some clay, trace f-c sand, trace fine gravel (moist)	9	S-5	GRAB	
	+578.8	End of Test Pit at 9.75'.	10 11 12 13 14 15			Stopped excavating at 2:21 PM. Test pit was backfilled with excavated material upon completion.

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LOG OF TEST PIT PT-2

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility		PROJECT NUMBER 100785901	DATE 11/13/2019
LOCATION Grand Island, New York		ELEVATION Approx. el. 576 ft (NAVD 88)	
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 8 ft	WATER LEVEL - First N/E ▽	WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator		FOREMAN Don	LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
⁘	+576.0	Brown to dark reddish brown Silty CLAY, some f-c sand, som roots (moist) [TOPSOIL]	0	S-1	GRAB	Started excavating at 8:43 AM.
▨	+575.0		1			
▨			2			
▨		Dark reddish brown Clayey SILT, some f-c gravel, trace f-c sand, trace roots, trace thin fibers (moist)	3	S-2	GRAB	
▨			4			
▨		Dark reddish brown Silty CLAY, some f-c sand, trace f-c gravel, trace cobbles, trace thin fibers (moist)	5	S-3	GRAB	
▨			6			
▨		Dark reddish brown Silty CLAY, some f-c sand, some f-c gravel (moist)	7	S-4	GRAB	
	+568.0	End of Test Pit at 8'.	8			Stopped excavating at 9:25 AM. Test pit was backfilled with excavated material upon completion.
			9			
			10			
			11			
			12			
			13			
			14			
			15			

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LOG OF TEST PIT PT-3

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility	PROJECT NUMBER 100785901		DATE 11/13/2019
LOCATION Grand Island, New York	ELEVATION Approx. el. 580.5 ft (NAVD 88)		
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.	DEPTH 8 ft	WATER LEVEL - First N/E ▽	WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator	FOREMAN Don		LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
░	+580.5	Brown Silty CLAY, some f-m sand, some roots (moist) [TOPSOIL]	0	S-1	GRAB	Started excavating at 9:37 AM.
▨	+579.5		1			
▨			2			
▨		Dark reddish brown to gray Clayey SILT, trace f-c sand, trace roots, trace thin fibers (moist)	3	S-2	GRAB	
▨		Dark reddish brown Clayey SILT, trace f-c sand, trace f-c gravel, trace thin fibers (moist)	4	S-3	GRAB	
▨			5			
▨		Dark reddish brown Clayey SILT, trace f-c sand, trace f-c gravel, trace thin fibers (moist)	6	S-4	GRAB	
▨		Dark reddish brown Clayey SILT, trace f-c sand, trace f-c gravel, trace thin fibers (moist)	7	S-5	GRAB	
	+572.5	End of Test Pit at 8'.	8			Stopped excavating at 10:21 AM. Test pit was backfilled with excavated material upon completion.
			9			
			10			
			11			
			12			
			13			
			14			
			15			

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LOG OF TEST PIT PT-4

Sheet 1 of 1

PROJECT NAME Project Olive - Proposed Distribution Facility		PROJECT NUMBER 100785901		DATE 11/13/2019
LOCATION Grand Island, New York		ELEVATION Approx. el. 585.5 ft (NAVD 88)		
EXCAVATION CONTRACTOR Buffalo Drilling Company, Inc.		DEPTH 8 ft	WATER LEVEL - First N/E ▽	WATER LEVEL - Completion - ▼
EQUIPMENT CAT 310 Track Excavator		FOREMAN Don		LANGAN PERSONNEL Katie Kalish

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE Number	SAMPLE Type	REMARKS
⁖	+585.5 +584.5	Brown to reddish brown Silty CLAY, trace f-m sand, trace roots (moist) [TOPSOIL]	0	S-1	GRAB	Started excavating at 12:01 PM. 12-inch root zone observed.
▨		Dark reddish brown to brown SILT, some clay, trace f-c sand, trace roots (moist)	1	S-2	GRAB	
▨			2			
▨			3			
▨		Dark reddish brown to gray SILT, some clay, some f-c sand, trace roots, trace thin fibers (moist)	4	S-3	GRAB	
▨			5			
▨			6			
▨	+577.5	Dark reddish brown to gray SILT, some clay, trace f-c sand, trace f-c gravel, trace thin fibers (moist)	7	S-4	GRAB	
		End of Test Pit at 8'.	8			Stopped excavating at 12:22 PM. Test pit was backfilled with excavated material upon completion.
			9			
			10			
			11			
			12			
			13			
			14			
			15			

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APPENDIX F

Select Test Pit Photographs

Photo 1: Profile of Test Pit TP-1.

Photo 2: Excavated material from Test Pit TP-1.

Photo 3: Profile of Test Pit TP-2.

Photo 4: Excavated material from Test Pit TP-2.

Photo 5: Profile of Test Pit TP-3.

Photo 6: Excavated material from Test Pit TP-3.

Photo 7: Profile of Test Pit TP-4.

Photo 8: Excavated material from Test Pit TP-4.

Photo 9: Profile of Test Pit TP-5.

Photo 10: Excavated material from Test Pit TP-5.

Photo 11: Profile of Test Pit TP-8.

Photo 12: Excavated material from Test Pit TP-8.

Photo 13: Profile of Test Pit TP-9.

Photo 14: Excavated material from Test Pit TP-9.

Photo 15: Profile of Test Pit TP-10.

Photo 16: Excavated material from Test Pit TP-10.

Photo 17: Profile of Test Pit TP-11.

Photo 18: Excavated material from Test Pit TP-11.

Photo 19: Profile of Test Pit TP-12.

Photo 20: Excavated material from Test Pit TP-12.

Photo 21: Profile of Test Pit TP-13.

Photo 22: Excavated material from Test Pit TP-13.

Photo 23: Profile of Test Pit TP-14.

Photo 24: Excavated material from Test Pit TP-14.

Photo 25: Profile of Test Pit TP-15.

Photo 26: Excavated material from Test Pit TP-15.

Photo 27: Profile of Test Pit TP-16.

Photo 28: Excavated material from Test Pit TP-16.

Photo 29: Profile of Test Pit PT-1.

Photo 30: Excavated material from Test Pit PT-1.

Photo 31: Profile of Test Pit PT-2.

Photo 32: Excavated material from Test Pit PT-2.

Photo 33: Profile of Test Pit PT-3.

Photo 34: Excavated material from Test Pit PT-3.

Photo 35: Profile of Test Pit PT-4.

Photo 36: Excavated material from Test Pit PT-4.

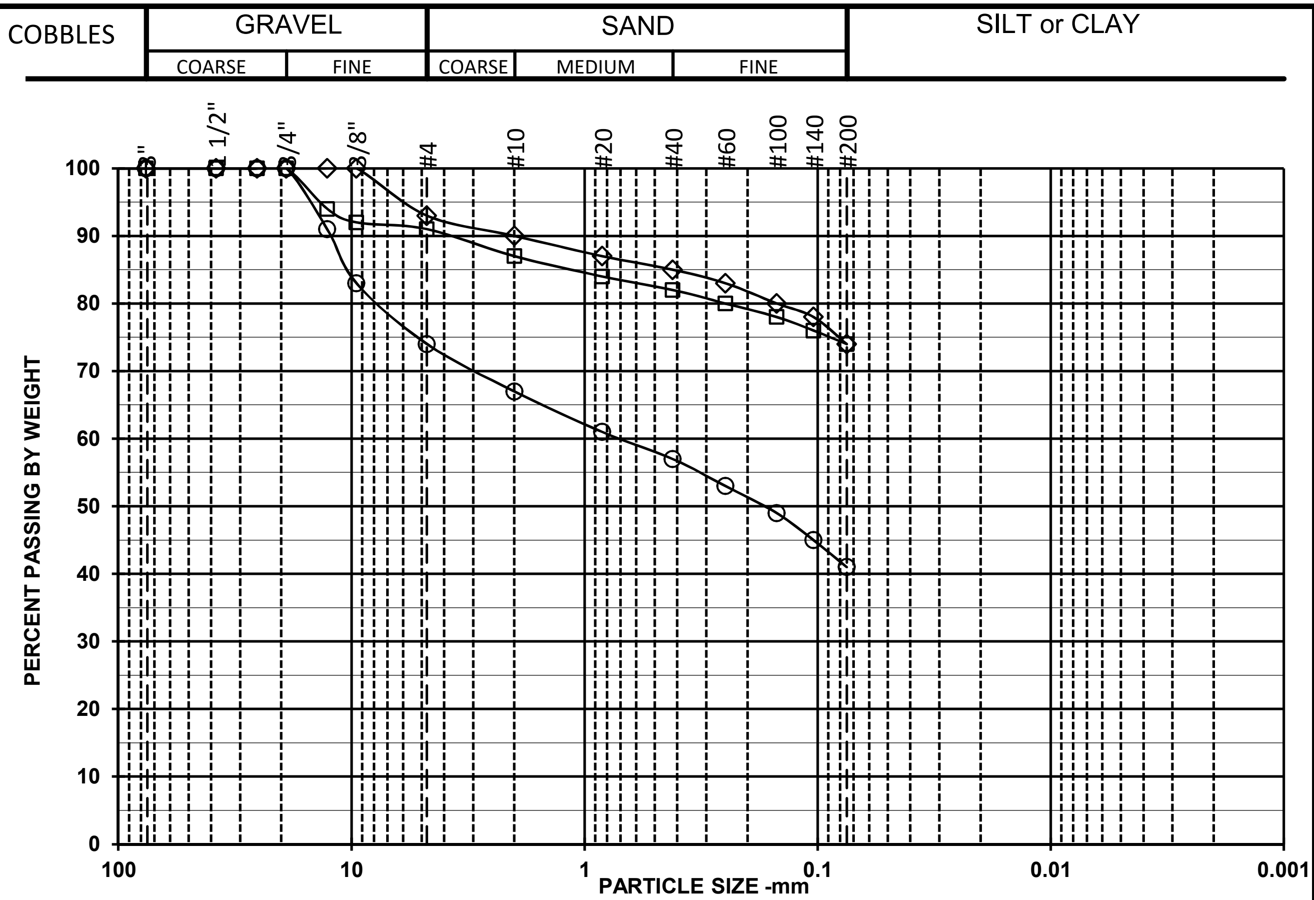
APPENDIX G

Laboratory Test Results

Langan Engineering #100785901
Trammell Crow
LABORATORY TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS						REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	
LB-1	S-9	24-26	17.4	34	15	19	CL	74	
LB-2	S-9	24-26	15.6	31	14	17	CL	74	
LB-2	S-13	45-46	5.9				SM	41	
LB-3	S-4	6-8	15.3	39	18	21	CL	85	
LB-4	S-5	8-10	15.5	39	16	23	CL	75	
LB-5	S-3	4-6	12.5	32	15	17	CL	76	
LB-6	S-5	8-10	17.9	41	18	23	CL	88	
LB-7	S-7	14-16	15.6	33	15	18	CL	79	
LB-8	S-6	10-12	14.3	31	15	16	CL	79	

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.



Open Symbols: Sieve analysis by ASTM D6913

Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

Symbol	□	◇	○
Boring	LB-1	LB-2	LB-2
Sample	S-9	S-9	S-13
Depth	24-26	24-26	45-46
% +3"	0	0	0
% Gravel	9	7	26
% SAND	17	19	33
%C SAND	4	3	7
%M SAND	5	5	10
%F SAND	8	11	16
% FINES	74	74	41
D_{100} (mm)	19.1	9.53	19.1
D_{60} (mm)			0.706
D_{30} (mm)			
D_{10} (mm)			
Cc			
Cu			

Sieve Size/ID #	Percent Finer Data		
6"	100	100	100
4"	100	100	100
3"	100	100	100
1 1/2"	100	100	100
1"	100	100	100
3/4"	100	100	100
1/2"	94	100	91
3/8"	92	100	83
#4	91	93	74
#10	87	90	67
#20	84	87	61
#40	82	85	57
#60	80	83	53
#100	78	80	49
#140	76	78	45
#200	74	74	41
5µ m			
2µ m			
1µ m			

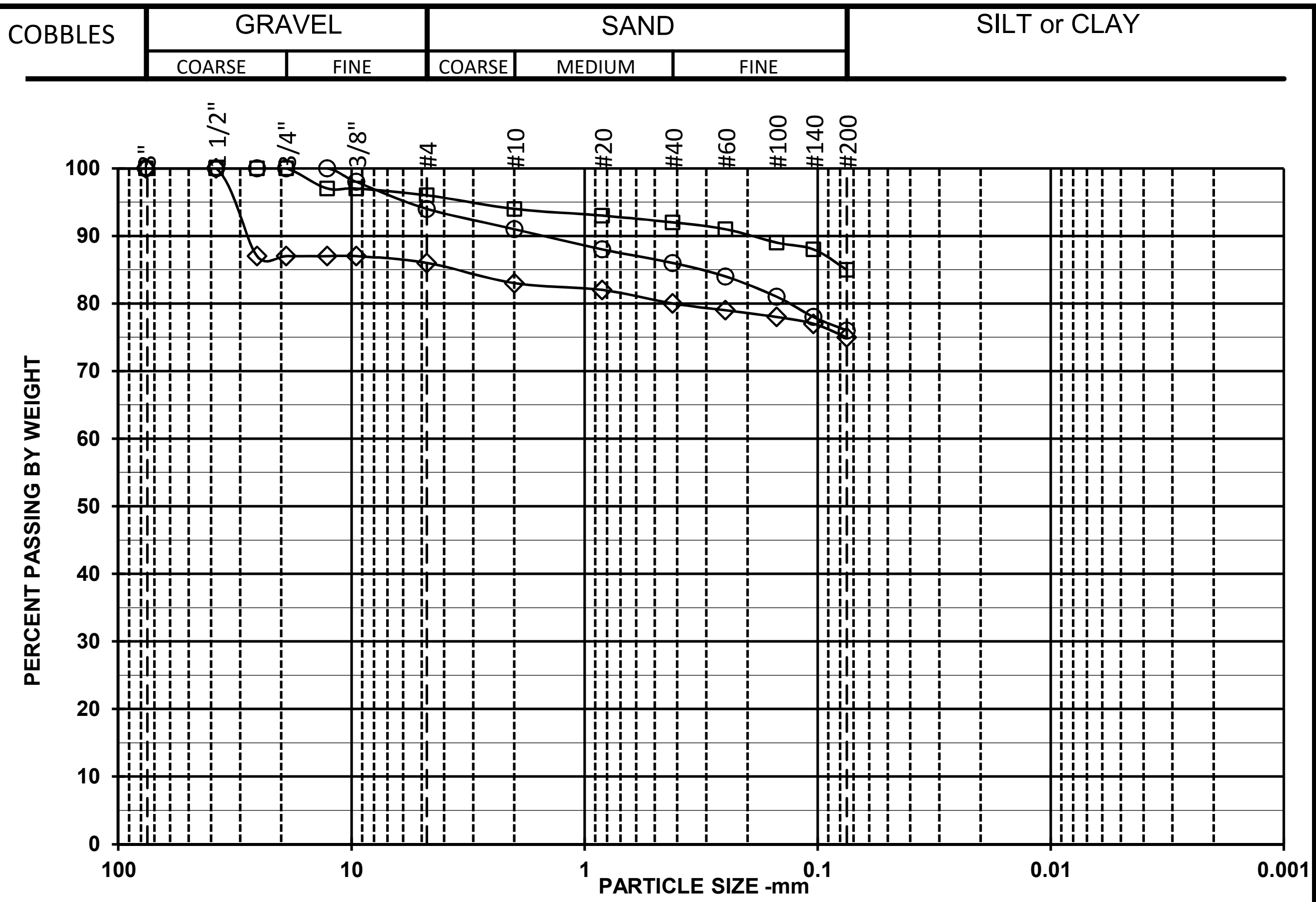
SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	17.4	34	15	19	CL		Brown, Lean clay with sand	12/12/2019
△	15.6	31	14	17	CL		Brown, Lean clay with sand	12/12/2019
○	5.9				SM		Brown, Silty sand with gravel	12/12/2019

Langan Engineering #100785901

TerraSense, LLC #7920-957

Trammell Crow

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928



Open Symbols: Sieve analysis by ASTM D6913
Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	15.3	39	18	21	CL		Brown, Lean clay with sand	12/12/2019
△	15.5	39	16	23	CL		Brown, Lean clay with gravel	12/12/2019
○	12.5	32	15	17	CL		Brown, Lean clay with sand	12/12/2019

Symbol	□	◇	○
Boring	LB-3	LB-4	LB-5
Sample	S-4	S-5	S-3
Depth	6-8	8-10	4-6
% +3"	0	0	0
% Gravel	4	14	6
% SAND	11	11	18
%C SAND	2	3	3
%M SAND	2	3	5
%F SAND	7	5	10
% FINES	85	75	76
D_{100} (mm)	19.1	38.1	12.7
D_{60} (mm)			
D_{30} (mm)			
D_{10} (mm)			
Cc			
Cu			

Sieve Size/ID #	Percent Finer Data		
6"	100	100	100
4"	100	100	100
3"	100	100	100
1 1/2"	100	100	100
1"	100	87	100
3/4"	100	87	100
1/2"	97	87	100
3/8"	97	87	98
#4	96	86	94
#10	94	83	91
#20	93	82	88
#40	92	80	86
#60	91	79	84
#100	89	78	81
#140	88	77	78
#200	85	75	76
5µ m			
2µ m			
1µ m			

Langan Engineering #100785901

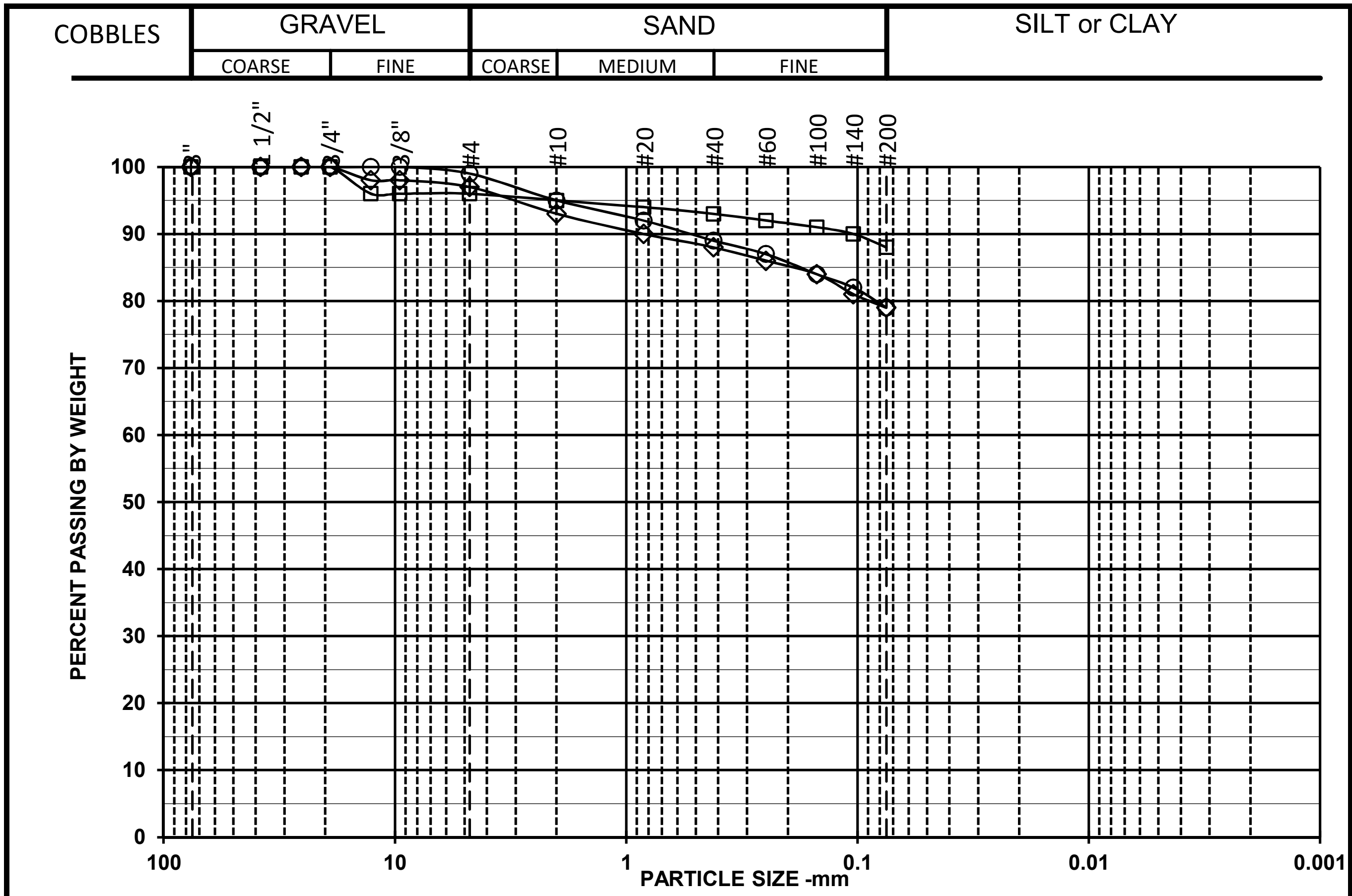
TerraSense, LLC #7920-957

Trammell Crow

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

TerraSense Analysis File: GrainSizeV6Rev1a (11/19)

Siev1b.xlsx 12/19/2019



Open Symbols: Sieve analysis by ASTM D6913
Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	17.9	41	18	23	CL		Brown, Lean clay	12/12/2019
△	15.6	33	15	18	CL		Brown, Lean clay with sand	12/12/2019
○	14.3	31	15	16	CL		Brown, Lean clay with sand	12/12/2019

Langan Engineering	#100785901	Trammell Crow
TerraSense, LLC	#7920-957	

Symbol	□	◇	○
Boring	LB-6	LB-7	LB-8
Sample	S-5	S-7	S-6
Depth	8-10	14-16	10-12
% +3"	0	0	0
% Gravel	4	3	1
% SAND	8	18	20
%C SAND	1	4	4
%M SAND	2	5	6
%F SAND	5	9	10
% FINES	88	79	79
D_{100} (mm)	19.1	19.1	9.53
D_{60} (mm)			
D_{30} (mm)			
D_{10} (mm)			
Cc			
Cu			

Sieve Size/ID #	Percent Finer Data		
6"	100	100	100
4"	100	100	100
3"	100	100	100
1 1/2"	100	100	100
1"	100	100	100
3/4"	100	100	100
1/2"	96	98	100
3/8"	96	98	100
#4	96	97	99
#10	95	93	95
#20	94	90	92
#40	93	88	89
#60	92	86	87
#100	91	84	84
#140	90	81	82
#200	88	79	79
5μ m			
2μ m			
1μ m			

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

TerraSense Analysis File: GrainSizeV6Rev1a (11/19)

Siev1c.xlsx 12/19/2019

Langan Engineering #100785901
Trammell Crow
LABORATORY TESTING DATA SUMMARY

BORING	SAMPLE	DEPTH	IDENTIFICATION TESTS					COMPACTION							REMARKS
									PREPARATION						
NO.	NO.	(ft)	WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	ASTM STD.	-3/8"	-3/4"	wet	dry	OPT. WATER CONTENT (%)	MAX . DRY UNIT WGT. (pcf)	
PT-2	CBR-1	1-2	13.9	32	14	18	CL	D1557		X	X		10.7	129.2	see CBR

Note: (1) USCS symbol based on visual observation and Atterberg limits reported.

Prepared by: NG
Reviewed by: CMJ
Date: 12/19/2019

TerraSense, LLC
45H Commerce Way
Totowa, NJ 07512

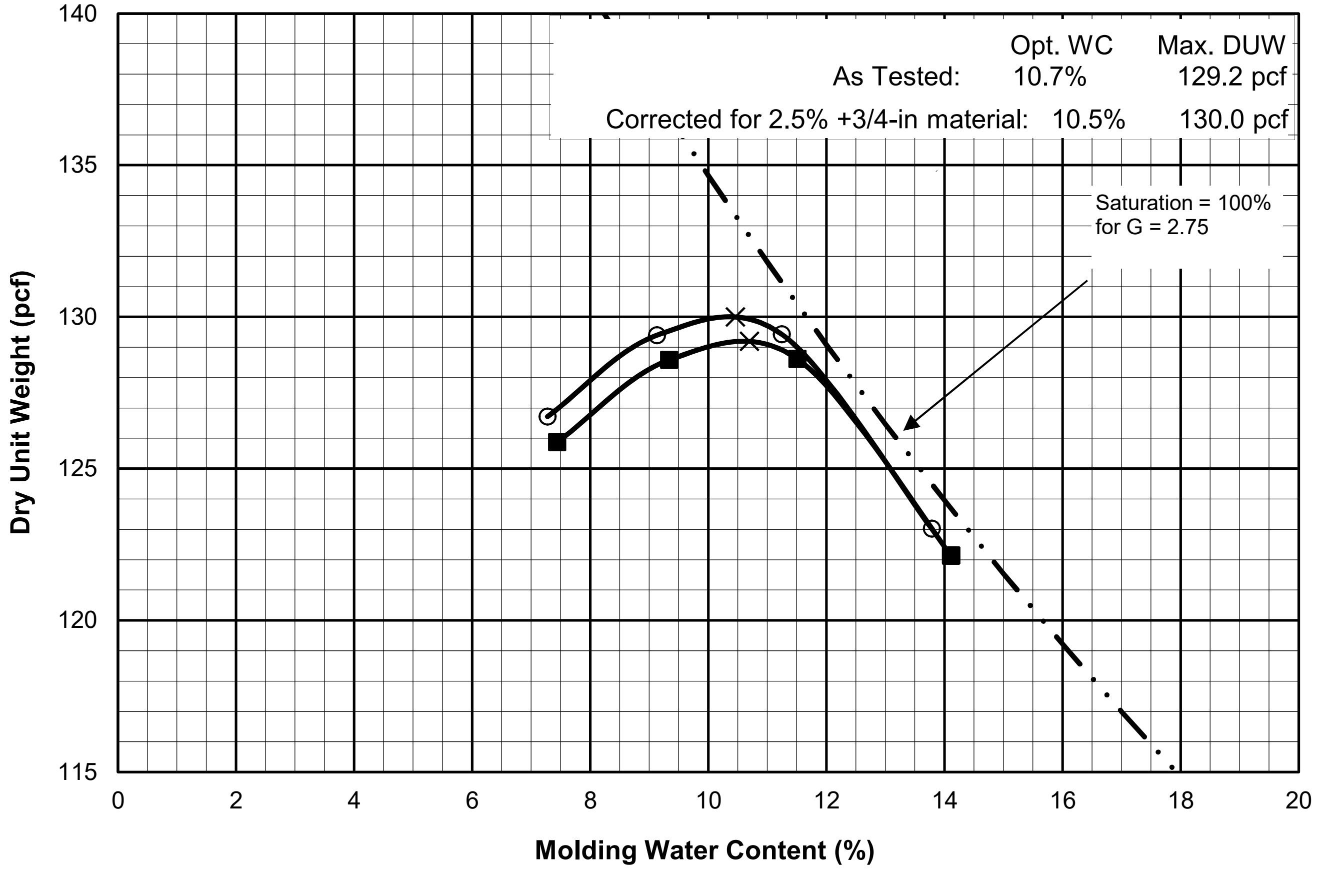
Project No.: 7920-957
File: Indx2.xlsx

COMPACTION CURVE

Test Method: ASTM D1557 Compaction Procedure: **C** Specimen Preparation Method: **Moist**

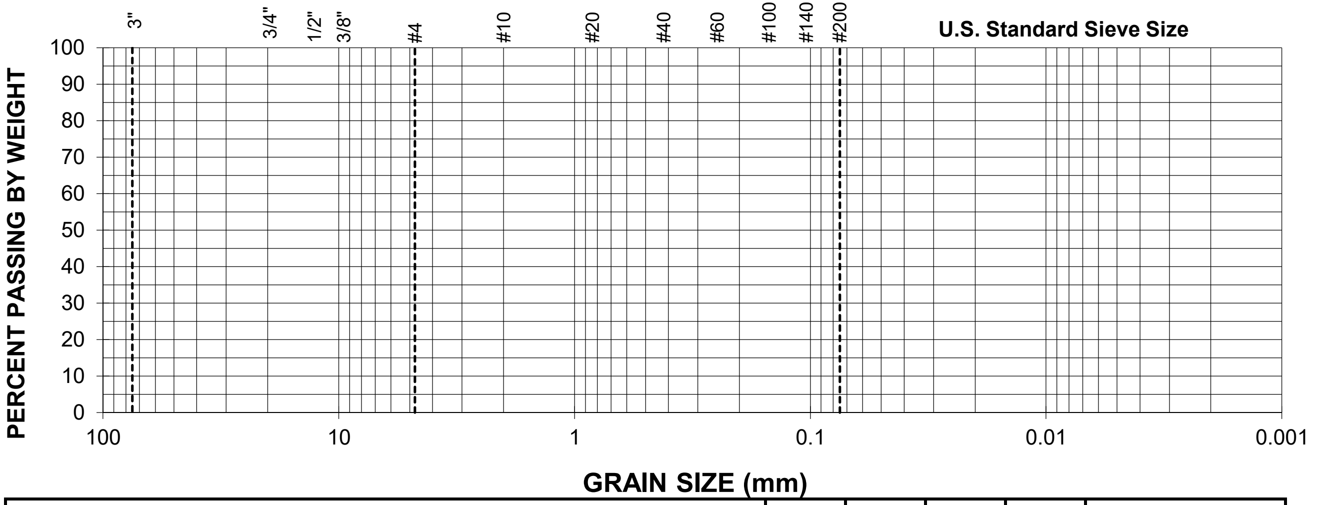
Type of Rammer: **Mechanical** Rammer Face: **Sectional**

NOTATION: ○ Representative of entire sample ■ Compaction Test specimen X Selected Optimum Point



PARTICLE-SIZE DISTRIBUTION CURVE

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

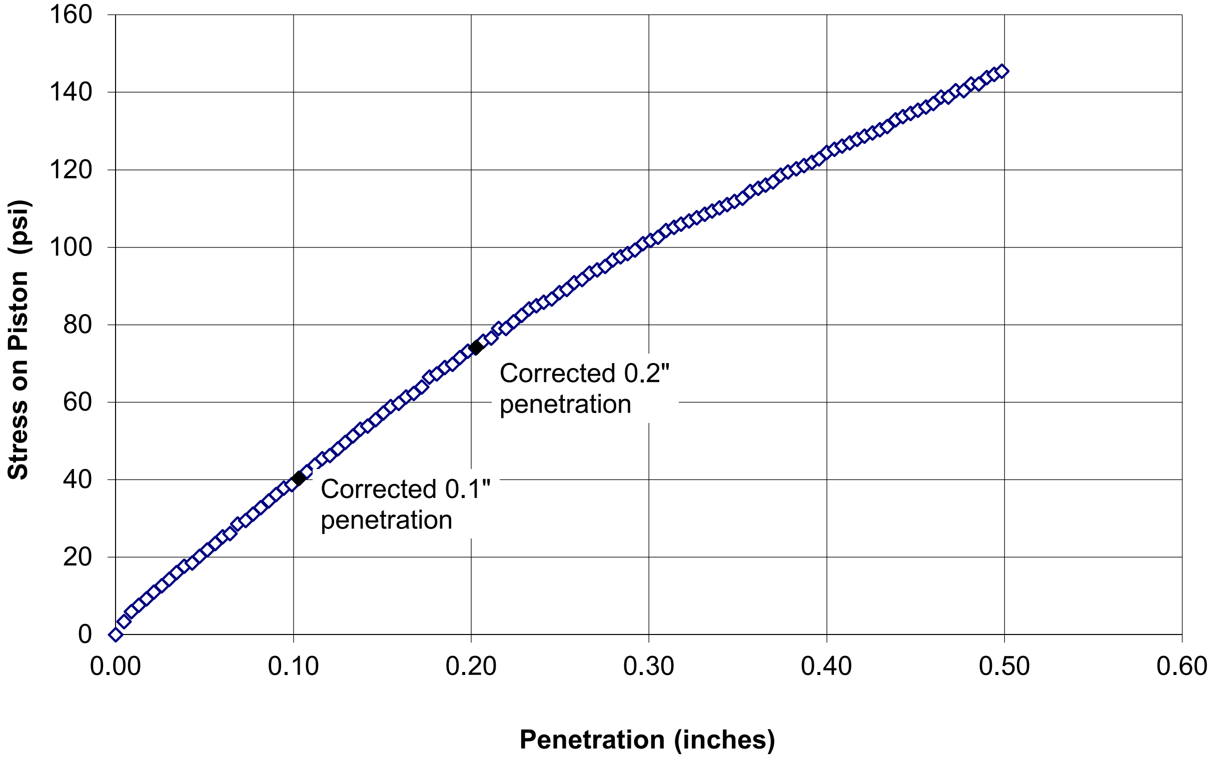


Description and/or Classification	LL	PL	PI	% Fines	Specific Gravity
CL, brown, Lean clay with gravel	32	14	18		2.75 (Assumed)

Trammell Crow	**ID PT-2** **Sample CBR-1**

Langan Engineering	Project No. 100785901	**COMPACTION AND INDEX PROPERTY DATA**
TerraSense, LLC	Project No. 7920-957	

Analysis File: CMP_PLTv7 (1/19) Cmp2a.xlsx **12/19/2019**



TEST SUMMARY

	Bearing Ratio at 0.1"	Bearing Ratio at 0.2"	Surcharge Used lbs	Penetration Rate inch/min
Specimen Soaked	4.0	4.9	10	0.05

SAMPLE INFORMATION

Boring: PT-2
Sample: CBR-1
Depth: 1-2 ft

Compaction water content = 13.5 %
Compaction dry density =123.0 pcf

SPECIMEN INFORMATION

Height: 4.6 inch
Diameter: 6.0 inch
Volume: 0.0749 ft³
Sample swelled 0.2% after soaking for 4 days

Final water content = 14.1 %
Final dry density =122.9 pcf

Remarks: Specimen compacted using Modified effort at as-received water content

Tested by: BB Test Date: Dec 16, 2019 Checked By: GET

Trammell Crow	**CALIFORNIA BEARING RATIO TEST**
Langan Engineering	Project No. 100785901
TerraSense, LLC	Project No. 7920-957 — December 2019

APPENDIX H

Pavement Design

CAR PARKING
ASPHALT PAVEMENT DESIGN REQUIREMENTS FOR
A CBR VALUE = 4

Pavement Design Requirements:

For a pavement design life of 15 Years, use the anticipated Traffic Data for Design

- **Anticipated Traffic Data**

Anticipated Traffic Data for Pavement: **1,000 Vehicles/Day**

Anticipated Traffic Breakdown for Pavement Areas:
1,000 Cars/day

- **AASHTO Vehicle Factors:**

AASHTO Car Factor = **0.00209**

- **FOR PAVEMENT DESIGN AREAS**

Equivalent Single Axle Loads ($ESAL_{CARS}$) = 1000 Cars/Day x 365 Days/Year x 15 Years * 0.00209

$ESAL_{CARS}$ = **11,443 Equivalent Single Axle Loads**

$ESAL_{TOTAL}$ = **11,443 Equivalent Single Axle Loads**

LANGAN

PROJECT:
Proposed Warehouse Development

Light Duty (Car Parking)

Grand Island **New York**

Job # 100785901
Date: 2/20/2020

Sheet 1/3

A CBR VALUE = 4

M_R =

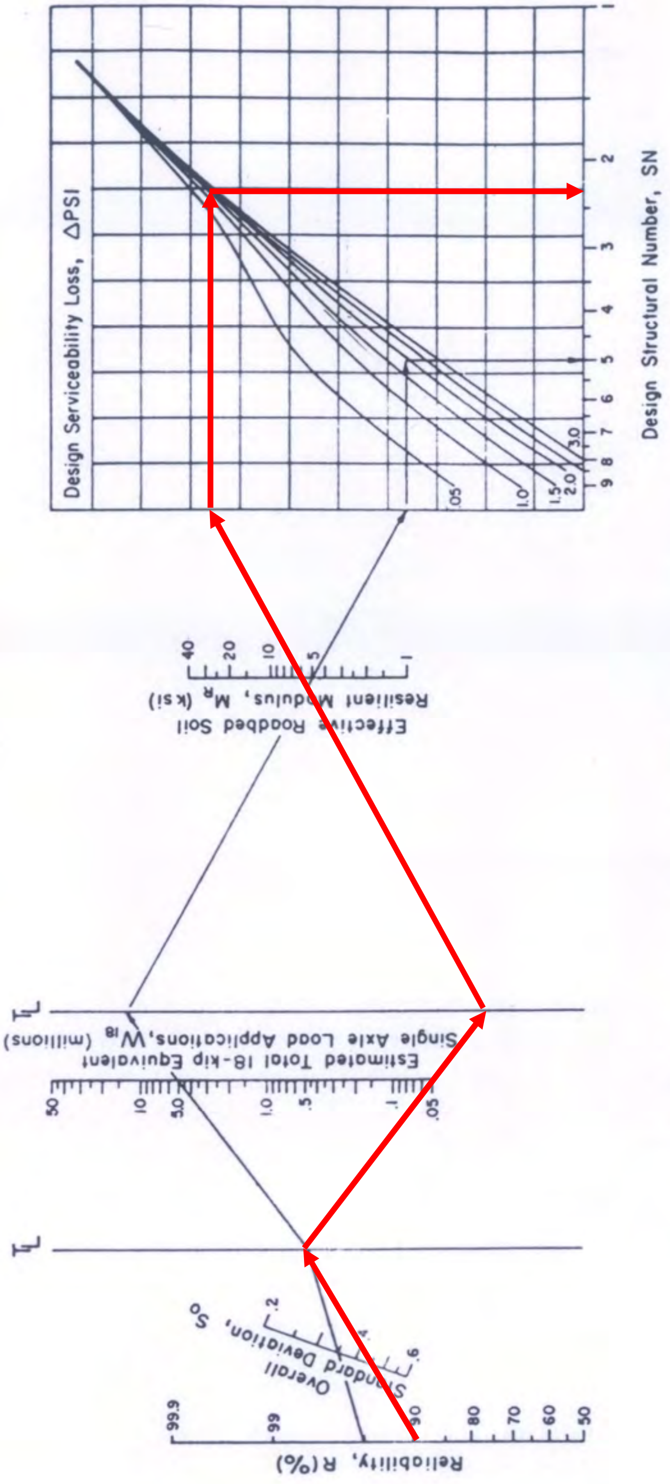


Figure 11.25 Design chart for flexible pavements based on mean values for each input (1 ksi = 6.9 MPa). (From the *AASHTO Guide for Design of Pavement Structures.* Copyright 1986. American Association of State Highway and Transportation Officials, Washington, DC. Used by permission.)

LANGAN

PROJECT:	**Proposed Warehouse Development**
	Light Duty (Car Parking)
Grand Island	**New York**
Job #	100785901
Date:	2/20/2020
	Sheet 2/3

CAR PARKING
A CBR VALUE = 4

Design Criteria :

Design Life =	*15*	**Years**
Terminal Serviceability =	*2.5*	
Reliability =	*90*	**percent**
Initial Serviceability =	*4.2*	
Standard Deviation =	*0.45*	
CBR =	*4*	
Equivalent Single Axle Loads =	*11,443*	

Estimate Resilient Modulus (M_R)

M_R = (1,500) x (CBR) = 6,000

From the AASHTO Design Chart, $SN_{Required}$ = 2.3 (See Sheet 2)

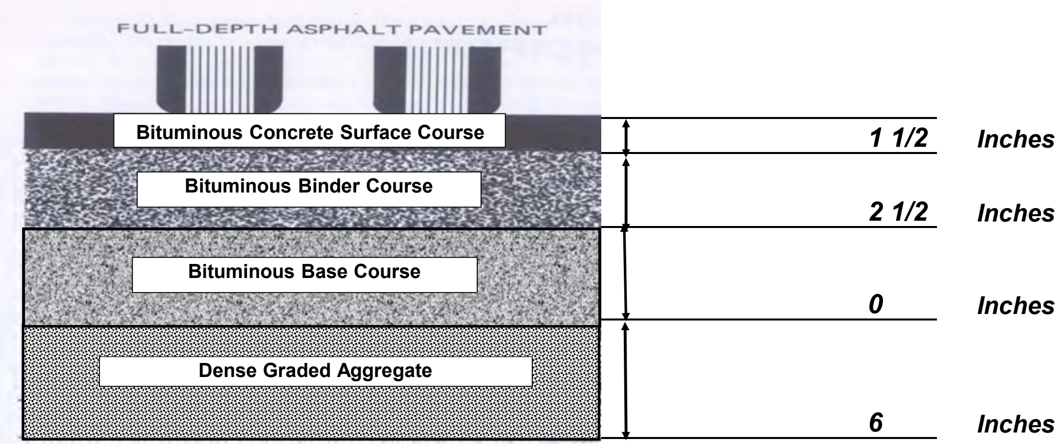
Langan Minimum Recommended Pavement Section:

Thickness		**Material**		**AASHTO Coefficient**		
1 1/2	*inches*	Bituminous Concrete Surface Course	x	0.44	=	0.66
2 1/2	*inches*	Bituminous Binder Course	x	0.44	=	1.10
0	*inches*	Bituminous Base Course	x	0.4	=	0.00
6	*inches*	Dense Graded Aggregate	x	0.11	=	0.66

Recommended SN= 2.42

Check whether the Recommended SN is greater than or equal to the Required SN

Recommended SN		**Required SN**	**CHECK**
2.42	>/=	2.3	OK



LANGAN

PROJECT:
Proposed Warehouse Development

Light Duty (Car Parking)

Grand Island New York

Job # 100785901

Date: 2/20/2020

Sheet 3/3

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HEAVY DUTY
ASPHALT PAVEMENT DESIGN REQUIREMENTS FOR A CBR VALUE = 4

Pavement Design Requirements:

For a pavement design life of 15 Years, use the anticipated Traffic Data for Design

- **Anticipated Traffic Data**

Anticipated Traffic Data for Pavement: **100 Vehicles/Day**

Anticipated Traffic Breakdown for Pavement Areas:
100 Trucks/day

- **AASHTO Vehicle Factors:**

Assuming 75 kips/Truck: 2 tandem axles (32 kips/axle)
1 front axle (12 kips/axle)

AASHTO Truck Factor = 2 * (0.875) + (0.189) = **1.94**

- **FOR HEAVY DUTY PAVEMENT DESIGN AREAS**

Equivalent Single Axle Loads ($ESAL_{TRUCKS}$) = 100 Trucks/Day x 365 Days/Year x 15 Years * 1.94

$ESAL_{TRUCKS}$ = 1,061,603 Equivalent Single Axle Loads

$ESAL_{TOTAL}$ = 1,061,603 Equivalent Single Axle Loads

LANGAN

PROJECT:
Proposed Warehouse Development
Heavy Duty (Trailer Parking)
Grand Island **New York**
Job # 100785901
Date: 2/20/2020
Sheet 1/3

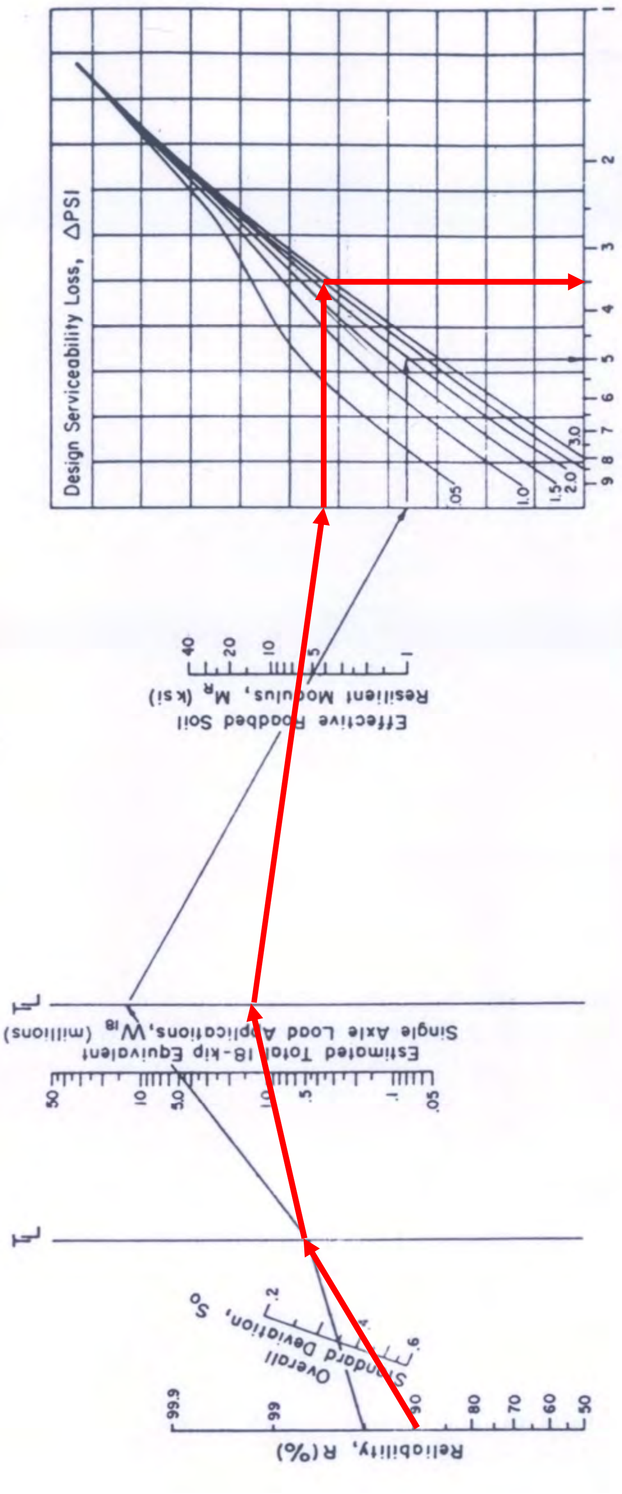


Figure 11.25 Design chart for flexible pavements based on mean values for each input (1 ksi = 6.9 MPa). (From the *AASHTO Guide for Design of Pavement Structures.* Copyright 1986. American Association of State Highway and Transportation Officials, Washington, DC. Used by permission.)

LANGAN

PROJECT:

Proposed Warehouse Development

Heavy Duty (Trailer Parking)

Grand Island **New York**

Job # 100785901

Date: 2/20/2020

Sheet 2/3

HEAVY DUTY
ASPHALT PAVEMENT DESIGN

Design Criteria :

Design Life = *15* **Years**
Terminal Serviceability = *2.5*
Reliability = *90* **percent**
Initial Serviceability = *4.2*
Standard Deviation = *0.45*
CBR = *4*
Equivalent Single Axle Loads = *1,061,603*

Estimate Resilient Modulus (M_R)

M_R = (1,500) x (CBR) = 6,000

From the AASHTO Design Chart, $SN_{Required}$ = 3.6 (See Sheet 2)

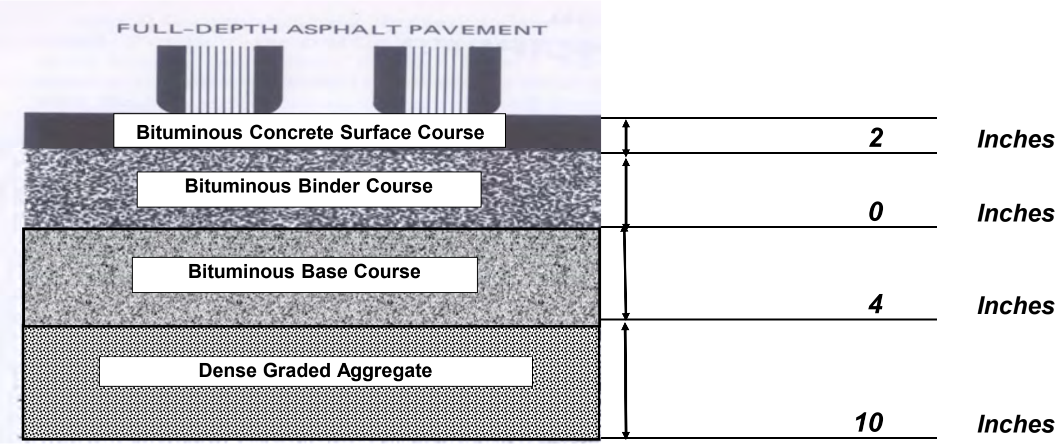
Langan Minimum Recommended Pavement Section:

Thickness		Material		AASHTO Coefficient		
2	*inches*	Bituminous Concrete Surface Course	x	0.44	=	0.88
0	*inches*	Bituminous Binder Course	x	0.44	=	0.00
4	*inches*	Bituminous Base Course	x	0.4	=	1.60
10	*inches*	Dense Graded Aggregate	x	0.11	=	1.10

Recommended SN= 3.58

Check whether the Recommended SN is greater than or equal to the Required SN

Recommended SN		Required SN	CHECK
3.58	>/=	3.5	OK



LANGAN

PROJECT: **Proposed Warehouse Development**

Heavy Duty (Trailer Parking)

Grand Island **New York**

Job # 100785901
Date: 2/20/2020

Sheet 3/3

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HEAVY DUTY
ASPHALT PAVEMENT DESIGN REQUIREMENTS FOR A CBR VALUE = 4

Pavement Design Requirements:

For a pavement design life of 15 Years, use the anticipated Traffic Data for Design

- ### Anticipated Traffic Data

Anticipated Traffic Data for Pavement: **350 Vehicles/Day**

Anticipated Traffic Breakdown for Pavement Areas:

350 Trucks/day

- ### AASHTO Vehicle Factors:

Assuming 75 kips/Truck:	2 tandem axles (32 kips/axle) 1 front axle (12 kips/axle)

AASHTO Truck Factor = 2 * (0.875) + (0.189) = **1.94**

- ### FOR HEAVY DUTY PAVEMENT DESIGN AREAS

Equivalent Single Axle Loads ($ESAL_{TRUCKS}$) = 350 Trucks/Day x 365 Days/Year x 15 Years * 1.94

$ESAL_{TRUCKS}$ = **3,715,609 Equivalent Single Axle Loads**

$ESAL_{TOTAL}$ = **3,715,609 Equivalent Single Axle Loads**

LANGAN

PROJECT:
Proposed Warehouse Development
Heavy Duty (Access Drives and Truck Courts)
Grand Island **New York**
Job # 100785901
Date: 2/20/2020
Sheet 1/3

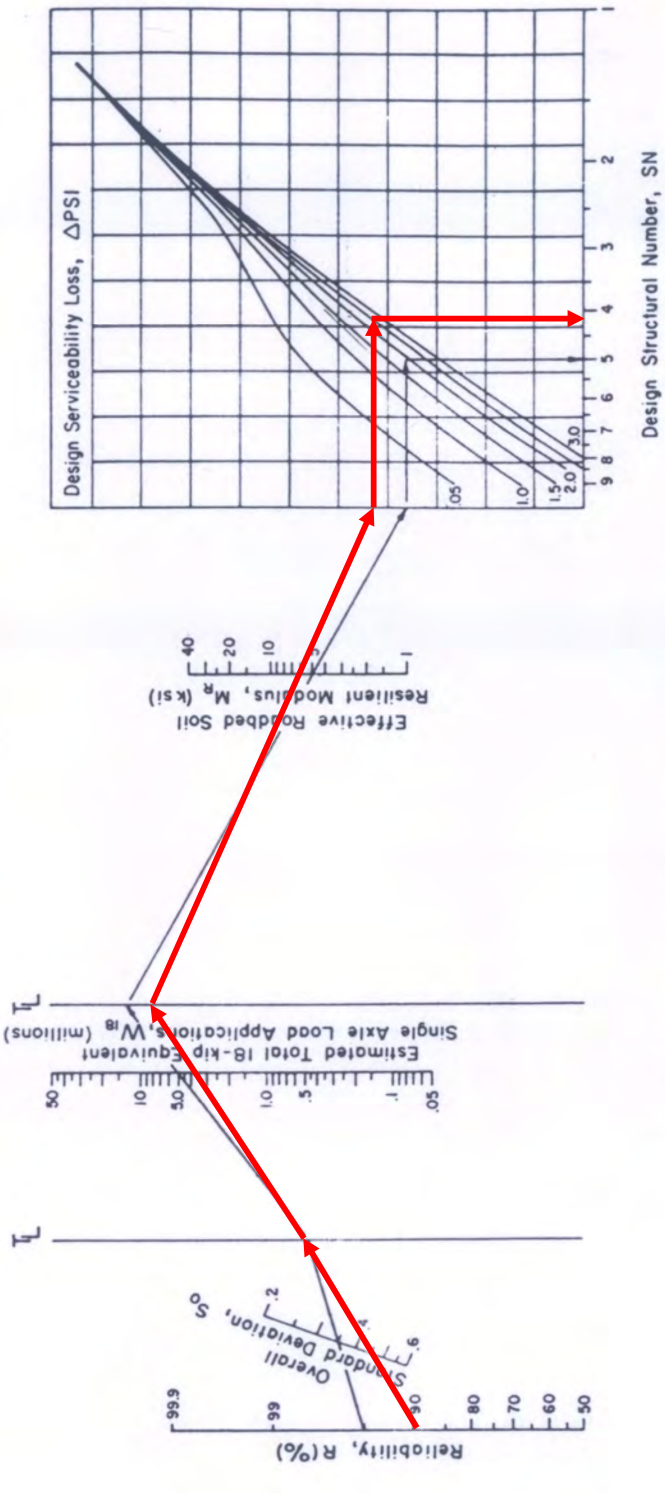


Figure 11.25 Design chart for flexible pavements based on mean values for each input (1 ksi = 6.9 MPa). (From the *AASHTO Guide for Design of Pavement Structures*. Copyright 1986. American Association of State Highway and Transportation Officials, Washington, DC. Used by permission.)

LANGAN

PROJECT:

Proposed Warehouse Development

Heavy Duty (Access Drives and Truck Courts)

Grand Island New York

Job # 100785901

Date: 2/20/2020

Sheet 2/3

HEAVY DUTY
ASPHALT PAVEMENT DESIGN

Design Criteria :

Design Life = *15* **Years**
Terminal Serviceability = *2.5*
Reliability = *90* **percent**
Initial Serviceability = *4.2*
Standard Deviation = *0.45*
CBR = *4*
Equivalent Single Axle Loads = *3,715,609*

Estimate Resilient Modulus (M_R)
M_R = (1,500) x (CBR) = **6,000**

From the AASHTO Design Chart, SN$_{\text{Required}}$ = **4.4** **(See Sheet 2)**

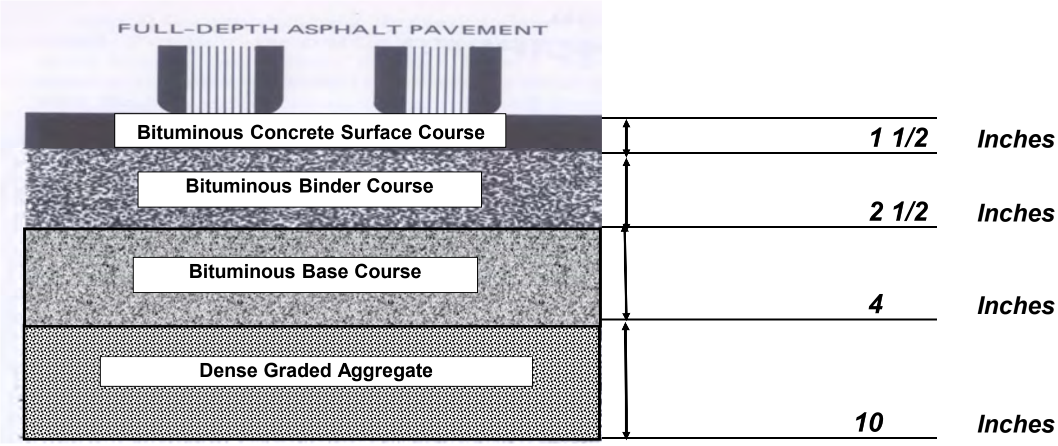
Langan Minimum Recommended Pavement Section:

Thickness		Material		AASHTO Coefficient		
1 1/2	*inches*	Bituminous Concrete Surface Course	x	0.44	=	0.66
2 1/2	*inches*	Bituminous Binder Course	x	0.44	=	1.10
4	*inches*	Bituminous Base Course	x	0.4	=	1.60
10	*inches*	Dense Graded Aggregate	x	0.11	=	1.10

Recommended SN= **4.46**

Check whether the Recommended SN is greater than or equal to the Required SN

Recommended SN		Required SN	CHECK
4.46	>/=	4.2	OK



LANGAN

PROJECT:
Proposed Warehouse Development
Heavy Duty (Access Drives and Truck Courts)
Grand Island **New York**
Job # 100785901
Date: 2/20/2020
Sheet 3/3

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EXHIBIT B

STORMWATER POLLUTION PREVENTION PLAN

for

Project Olive
2780 Long Road
Town of Grand Island, New York

Prepared For:

TC Buffalo Development Associates, LLC
600 Grant Street, Suite 4800
Pittsburgh, PA 15219

Prepared By:

Langan Engineering, Environmental, Surveying Landscape Architecture and Geology, D.P.C.
One North Broadway, Suite 910
White Plains, New York 10601

February 21, 2020

Project No.: 100785901

Preparer of the SWPPP

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the SPDES General Permit for Stormwater Discharges from Construction Activity. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil or administrative proceedings.

Name: Michael Finan, PE, LEED-AP

Date: February 21, 2020

MICHAEL J. FINAN
081473

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Appendices

1 Executive Summary

This Stormwater Pollution Prevention Plan (SWPPP) and accompanying project plans have been prepared in accordance with the New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity (General Permit) latest revision, the *New York State Stormwater Management Design Manual* (*Design Manual*) latest revision, and the *New York State Standards and Specifications for Erosion and Sediment Control* latest revision. . The Applicant, TC Buffalo Development Associates, LLC, is proposing to develop ±145.4 acres of land located at 2780 Long Road ("Site"), in the Town of Grand Island ("Town"), New York for use as an e-commerce storage and distribution facility for consumer products ("Facility") by a single prospective entity ("Project"). The Project, also known as Project Olive, is a commercial development that consists of a 5-story building with a ±823,400 square foot warehouse building footprint (±3,783,124 square feet total) with associated car and trailer parking. The Site is currently owned by Grand Island Commerce Center Joint Venture ("Owner"). The Owner also owns ±62.1 acres of land adjacent to the western boundary of the Site ("West Parcel"). No development is proposed in the West Parcel, and the West Parcel was not analyzed as part of this Report.

The project is a new development that will maintain existing drainage patterns as much as practical, control the rate of stormwater runoff resulting from the development, and mitigate potential impacts on water quality and erosion generated during and after construction. A combination of runoff reduction techniques and standard stormwater management practices with runoff reduction volume capacity will be used to treat stormwater runoff.

The pre- and post-development conditions were analyzed using the USDA Soil Conservation Service Publication Technical Release (TR-55) "Urban Hydrology for Small Watersheds", which provides procedures for estimating runoff and peak discharges in small watersheds. The analysis is based upon the watershed areas, land coverage, soil group types, curve numbers (CN), times of concentration (Tc), rainfall distribution type, and rainfall amount for the design storm events. The pre- and post-development peak discharge rates of runoff have been evaluated utilizing stormwater modeling software. An overall comparison of the pre- and post-development peak discharge rates for each of the design storms analyzed is provided in the table below.

Table 1-1: Overall Comparison of Pre- & Post-Development Peak Discharge Rates

Storm Event	Pre (cfs)	Post (cfs)	Diff (cfs)
1-year	87.63	66.65	-20.98
10-year	276.50	212.03	-64.47
100-year	622.76	489.24	-133.52

The overall comparison of the pre- and post-development stormwater runoff peak discharge rates demonstrates no significant adverse impacts to the design points analyzed. In addition, the erosion control, sediment control, pollution-prevention, and stormwater management measures to be implemented during construction as outlined in this SWPPP and project drawings will minimize soil erosion and control sediment transport off site, and after construction will control the water quality and quantity of stormwater runoff.

2 Project Information

TC Buffalo is proposing to develop the Project on the Site (see Figure 1). Below is a summary of the Project information:

Table 2-1: Project Summary

Project Name:	Project Olive
Project Location:	2780 Long Road (±775 feet west of the 1-190 on/off ramp) Town of Grand Island, New York
Property Tax ID No.:	Section 23.00 Block 1 Lots 26.1 and 50
Proposed Property Acreage:	±145.4 acres
Municipality:	Town of Grand Island, which is an municipal separate storm sewer system (MS4)
Project Description:	Commercial development that consists of a warehouse distribution building with a footprint of ±823,400 square (±3,783,124 square feet total) with associated car and trailer parking.
Estimated Disturbed Area:	±119 acres, which does require coverage under the SPDES General Permit
Existing Site Conditions:	Woods (fair condition), grass (fair condition), impervious area (pavement and concrete)
Proposed Site Conditions:	Woods (fair condition), grass (fair condition), grass (good condition), impervious area (pavement and concrete)
Stormwater Management Practices:	Bioretention basins and wet extended detention ponds
Construction Duration:	From Spring 2020 to Spring 2022, including planned winter shutdowns.

Coverage under the New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity (General Permit) latest revision will be required (see Appendix A), since the project involves soil disturbance of 1 or more acres. The proposed project is also in a municipal separate storm sewer system (MS4); therefore, the Town will review and accept the SWPPP. The Notice of Intent (NOI) form and signed "MS4 SWPPP Acceptance" form will be submitted to the NYSDEC before construction begins to obtain coverage under the SPDES General Permit. The forms have been provided in Appendix B.

3 Site Conditions

3.1 Soils

The United States Department of Agriculture (USDA) Soil Conservation Service Soil Survey for Erie County has been reviewed. The surficial soil conditions are shown in Figure 2 and are summarized in the table below.

Table 3-1: USDA Soil Data

Map Symbol	Description	Depth to Groundwater (ft)	Depth to Bedrock (in)	Hydrologic Soil Group
CoA	Churchville silt loam, 0 to 3 percent slopes	0.5 – 1.5 (Dec – May)	>60	C/D(1)
La	Lakemont silt loam, 0 to 3 percent slopes	0 – 0.5 (Nov – June)	>60	D
Od	Odessa silt loam, 0 to 3 percent slopes	0.5 – 1.5 (Dec – May)	>60	D
Oe	Odessa-Lakemont complex, 0 to 3 percent slopes	0.5 – 1.5 (Dec – May)	>60	D
Pt	Pits, borrow	>6.0	>60	–(2)
RkA	Rhinebeck gravelly loam, 0 to 3 percent slopes	0.5 – 1.5 (Jan – May)	>60	C/D(1)
SaA	Schoharie silt loam, 0 to 3 percent slopes	1.5 – 3.0 (Mar – May)	>60	D
SaB	Schoharie silt loam, 3 to 8 percent slopes	1.5 – 3.0 (Mar – May)	>60	D

1. Dual hydrologic soil groups cannot be modeled; therefore, to be conservative, Type D will be used.
2. A hydrological soil group is not given for Pits. The hydrological soils group will be assumed to be the same as the surrounding soil groups. In this instance, the surrounding soil groups are Type D; therefore, the hydrological soil group will be assumed to be Type D.

The Soil Conservation Service defines the hydrologic soil groups as follows:

- **Type A Soils**: Soils having a high infiltration rate and low runoff potential when thoroughly wet. These soils consist mainly of deep, well-drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

- **Type B Soils**: Soils having a moderate infiltration rate when thoroughly wet. These soils consist mainly of moderately deep to deep, moderately well to well-drained soils with moderately fine to moderately course textures. These soils have a moderate rate of water transmission.

- **Type C Soils**: Soils having a low infiltration rate when thoroughly wet. These soils consist mainly of soils with a layer that impedes downward movement of water, and soils with moderately fine to fine texture. These soils have a low rate of water transmission.

- **Type D Soils**: Soils having a very low infiltration rate and high runoff potential when thoroughly wet. These soils consist mainly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a clay pan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very low rate of water transmission.

A geotechnical field investigation was performed by Langan from November 12, 2019 to November 25, 2019 to determine the subsurface soil conditions in various locations throughout the site. A total of eight borings, fourteen test pits and four percolation tests were performed.

- Boring depths ranged from 26 to 50 feet below existing grade. Groundwater and bedrock were not encountered in any of the borings.
- Test pit depths ranged from 6 to 1.5 feet below existing grade. Groundwater and bedrock were not encountered in any of the test pits.
- Percolation test depths were 5 feet below existing grade. Percolation rates were less than 0.1 inches per hour.

Refer to the Preliminary Geotechnical Engineering Study Report prepared by Langan for additional information.

3.2 Water Resources

A wetland and waterbody delineation was conducted in October 1990 by Acres International Corporation for the Grand Island Commerce Center and in 2019 by Wilson Environmental Technologies, Inc. Several wetlands were identified on the Site. Four wetlands are United States Army Corps of Engineers (USACE) jurisdictional wetlands and are identified on the plans as wetlands J, L, N, and P. Five wetlands are New York State Department of Environmental Conservation (NYSDEC) regulated wetlands and are identified on the plans as wetlands M, R, S, T, and U. The remaining wetlands are non-jurisdictional and are identified on the plans as wetlands A, B, C, D, E, F, G, H, I, K, O, and Q. In addition to the wetlands, three waterbodies were identified on the site. One ditch flows through the central part of the Site, one ditch flows along Long Road, and the last ditch flows through the southern part of the Site near Bedell Road. The ditches ultimately join together and flow north along Long Road to the Niagara River.

Aquifer mapping was reviewed to determine whether the Site is over a sole source, primary or principal aquifer. According to the Environmental Protection Agency "Sole Source Aquifers" map, the site is not over a sole-source aquifer. According to the NYSDEC "Primary and Principal Aquifers in New York State" map, the Site is not over a primary aquifer or a principal aquifer.

3.3 Floodplains

The Flood Insurance Rate Map (FIRM) Community Panel Number 36029C0036H with an effective date of June 7, 2019 was reviewed. According to Panel 36 of 807, the property is within other areas flood areas Zone X (see Figure 3), which is defined as "areas determined to be outside the 0.2% annual chance floodplain; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual change flood."

3.4 Cultural Resources

According to the New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP) Cultural Resource Information System (CRIS) database, the Site is within an archaeologically sensitive area (see Figure 4). Archeological investigations were performed as part of the Environmental Impact Statement for the Grand Island Commerce Center project. In a letter dated April 16, 2007 from NYSOPRHP, NYSOPRHP determined that the project will continue to have no impact on cultural resources in or eligible for inclusion in the State and National Registers of Historic Places. An updated Phase IA archeological investigation for the project development area is currently being performed.

4 Stormwater Management Plan

This SWPPP and project plans identify green infrastructure techniques and stormwater management practices to be implemented during and after construction to minimize stormwater related impacts. Green infrastructure techniques use the natural features of the Site and promote runoff reduction through micromanaging runoff, promoting groundwater recharge, increasing losses through evapotranspiration, and emulating the existing hydrology. The green infrastructure techniques used include soil restoration and standard stormwater management practices with runoff reduction capacity, such as bioretention basins.

The stormwater runoff generated from the Site will not be instantaneously directed to the design points. The proposed topography will convey stormwater runoff via sheet flow to on-Site catch basins within paved roads and parking areas or to grass swales. Localized low and high points have been created to aid in the collection of stormwater runoff. The collected stormwater runoff will be conveyed to the stormwater management practices for both water quality and water quantity control. The stormwater management practices will improve the water quality by capturing and treating runoff from small, frequent storm events that tend to contain higher pollutant levels. Bioretention basins will be used to provide water quality treatment in addition to the pollution prevention measures and the wet extended detention ponds will be used to provide water quantity control.

The stormwater management practices have also been designed to provide water quantity treatment, which includes channel protection, overbank flood control, and extreme flood protection. In addition, the stormwater management practices provide approximately 4.4 million cubic feet (or ±33.4 million gallons) of total storage volume. This storage volume is used to attenuate the post-development peak runoff rates so that they are less than or equal to the pre-development peak runoff rates. To accomplish this, the stormwater management practices have been designed with an outlet control structure that will have a staged drawdown design. The smaller orifices are located near the bottom of the structure, while the larger slots or weirs are located near the top of the structure. This design allows for the storm events to be released over a period of time so that the rate of runoff is equal to or less than what existed prior to construction. As demonstrated in this SWPPP, the required water quantity controls have been provided and the stormwater runoff volume has been minimized to the maximum extent practical through the use of stormwater management practices.

4.1 Process for Stormwater Site Planning and Practice Selection Compliance

4.1.1 Site Planning

Preservation of Natural Features and Conservation

Preservation of natural features includes techniques to identify and preserve natural areas that can be used to protect water, habitat and vegetative resources. Conservation includes designing elements of the development in a way that the site design takes advantage of a site's natural features, preserves sensitive areas and identifies constraints and opportunities to prevent or reduce negative effects of a development. An evaluation of the preservation of natural features and conservation planning practices is provided in the table below.

Table 4-1: Preservation of Natural Features and Conservation

Practice	Description	Application	Reason
Preservation of Undisturbed Areas	Delineate and place into permanent conservation undisturbed forests, native vegetated areas, riparian corridors, wetlands, and natural terrain.	Considered and Not Applied	In order to take credit, these areas must be placed into legally enforceable deed restrictions, conservation easements or a maintenance agreement. The Project is not proposing to place the undisturbed areas into conservation easements.
Preservation of Buffers	Define, delineate and preserve naturally vegetated buffers along perennial streams, rivers, shorelines and wetlands.	Considered and Applied	The majority of the regulated wetlands and 100 foot adjacent area will remain undisturbed. The wetland disturbance has been limited to less than 1.0 acres. In addition, the Project has been designed to limit adjacent are impacts to the greatest extent practical.
Reduction of Clearing and Grading	Limit clearing and grading to the minimum amount needed for roads, driveways, foundations, utilities and stormwater management facilities.	Considered and Applied	The grading has been minimized to the greatest extent practical for the Project and incorporates retaining walls to minimize environmental impacts.
Locating Development in Less Sensitive Areas	Avoid sensitive resource areas such as floodplains, steep slopes, erodible soils, wetlands, mature forests and critical habitats by locating development to fit the terrain in areas that will create the least impact.	Considered and Applied	The majority of the sensitive resources, such as steep slopes and wetlands have been avoided.
Open Space Design	Use clustering, conservation design or open space design to reduce impervious cover, preserve more open space and protect water resources.	N/A	This is more applicable to a residential subdivision, which the Project is not.
Soil Restoration	Restore the original properties and porosity of the soil by deep till and amendment with compost to reduce the generation of runoff and enhance the runoff reduction performance of post construction practices.	Considered and Applied	Soil restoration will be applied to all pervious areas within the limits of disturbance to restore the original properties and porosity of the soil.

Reduction of Impervious Cover

Reduction of impervious cover includes methods to reduce the amount of rooftops, parking lots, roadways, sidewalks, and other surfaces that do not allow rain to infiltrate into the soil. An evaluation of the reduction of impervious cover techniques is provided in the table below.

Table 4-2: Reduction of Impervious Cover

Practice	Description	Application	Reason
Roadway Reduction	Minimize roadway widths and lengths to reduce site impervious area	Considered and Not Applied	The roadway width cannot be minimized, since the driveway is designed to accommodate a WB67 tractor trailer and turning lanes are required.
Sidewalk Reduction	Minimize sidewalk lengths and widths to reduce site impervious area	Considered and Applied	Sidewalks have been limited to provide to areas where pedestrian connectivity is required and not throughout the development.
Driveway Reduction	Minimize driveway lengths and widths to reduce site impervious area	Considered and Not Applied	This is more suitable for residential developments. The driveway width cannot be minimized, since the driveway is designed to accommodate a WB67 tractor trailer and turning lanes are required.
Cul-de-sac Reduction	Minimize the number of cul-de-sacs and incorporate landscaped areas to reduce their impervious cover.	N/A	There are no cul-de-sacs proposed as part of this Project.
Building Footprint Reduction	Reduce the impervious footprint of residences and commercial buildings by using alternate or taller buildings while maintaining the same floor to area ratio.	Considered and Applied	A multi-story building is proposed to reduce the overall building footprint in order to provide the same total square footage.
Parking Reduction	Reduce imperviousness on parking lots by eliminating unneeded spaces, providing compact car spaces and efficient parking lanes, minimizing stall dimensions, using porous pavement surfaces in overflow parking areas, and using multi-storied parking decks where appropriate.	Considered and Applied	Based on the proposed use, the Town Zoning Code requires over 4,000 parking spaces, which is nearly double the parking spaces required for the Project. The proposed parking shown on the plans is the minimum parking required by the Project.

Runoff Reduction Techniques

Green infrastructure techniques use the natural features of the Site and promote runoff reduction through micromanaging runoff, promoting groundwater recharge, increasing losses through evapotranspiration, and emulating the existing hydrology. An evaluation of the runoff reduction practices is provided in the table below.

Table 4-3: Runoff-Reduction Practices

Practice	Description	Application	Reason
Conservation of Natural Areas	Retain the pre-development hydrologic and water quality characteristics of undisturbed natural areas, stream and wetland buffers by restoring and/or permanently conserving these areas on a site.	Considered and Not Applied	In order to take credit, these areas must be placed into legally enforceable deed restrictions, conservation easements or a maintenance agreement. The Project is not proposing to place the undisturbed areas into conservation easements.
Sheet flow to Riparian Buffers or Filter Strips	Undisturbed natural areas such as forested conservation areas and stream buffers or vegetated filter strips and riparian buffers can be used to treat and control stormwater runoff from some areas of a development project.	Considered and Not Applied	The site slopes do not meet the criteria to take credit for sheet flow to riparian buffers or filter strips.
Vegetated Open Swale	The natural drainage paths, or properly designed vegetated channels, can be used instead of constructing underground storm sewers or concrete open channels to increase time of concentration, reduce the peak discharge, and provide infiltration.	Considered and Not Applied	Vegetated swales are provided; however, they do not meet the design criteria requirements to take credit.

Practice	Description	Application	Reason
Tree Planting/Tree Box	Plant or conserve trees to reduce stormwater runoff, increase nutrient uptake, and provide bank stabilization. Trees can be used for applications such as landscaping, stormwater management practice areas, conservation areas and erosion and sediment control.	Considered and Not Applied	Tree plantings have been provided; however, the proposed trees are not within then minimum distance required to take credit.
Disconnection of Rooftop Runoff	Direct runoff from residential rooftop areas and upland overland runoff flow to designated pervious areas to reduce runoff volumes and rates.	N/A	The maximum allowed rooftop contributing area is 2,000 square feet with suitable flow dispersion and downspouts have to be at least 10 feet away from the nearest impervious surface to discourage re-connections. Based on the proposed project it is not feasible to meet the design criteria to take credit.
Stream Daylighting for Redevelopment Projects	Stream Daylight previously-culverted/piped streams to restore natural habitats, better attenuate runoff by increasing the storage size, promoting infiltration, and help reduce pollutant loads.	N/A	There are no previously culverted/piped streams to restore.
Rain Garden	Manage and treat small volumes of stormwater runoff using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression.	Considered and Not Applied	Similar to bioretention practices; however they do not provide the added benefit of using the portion of the water quality volume that is not reduced to meet the total water quality volume requirement.
Green Roof	Capture runoff by a layer of vegetation and soil installed on top of a conventional flat or sloped roof. The rooftop vegetation allows evaporation and evapotranspiration processes to reduce volume and discharge rate of runoff entering conveyance system.	Considered and Not Applied	Based on the size of the building it is not feasible to incorporate a green roof. In addition, portions of the roof will be sloped to roof leader drains.
Stormwater Planter	Small landscaped stormwater treatment devices that can be designed as infiltration or filtering practices. Stormwater planters use soil infiltration and biogeochemical processes to decrease stormwater quantity and improve water quality.	Considered and Not Applied	Stormwater planter are more suitable for residential or smaller commercial buildings.
Rain Tank/Cistern	Capture and store stormwater runoff to be used for irrigation systems or filtered and reused for non-contact activities.	Considered and Not Applied	The water source provided by the cisterns is not reliable for firefighting purposes.
Porous Pavement	Pervious types of pavements that provide an alternative to conventional paved surfaces, designed to infiltrate rainfall through the surface, thereby reducing stormwater runoff from a site and providing some pollutant uptake in the underlying soils.	Considered and Not Applied	Based on the soil testing, the on-Site soils are not suitable for infiltration based practices. In addition, a large part of the Site will be filled.

4.1.2 Water Quality Treatment Volume Determination

The total required water quality volume was determined by totaling the individual water quality volumes for each of the subcatchments that contribute to a stormwater management system and excludes the subcatchments that were diverted from the proposed development and stormwater management systems. The water quality volume was determined based on the methodology as described in the NYSDEC Design Manual. Detailed design calculations are provided in Appendix E.

4.1.3 Runoff Reduction Volume Determination

In addition to the applied runoff reduction techniques discussed previously, standard stormwater management facilities with runoff reduction capacity were used to reduce the total required water quality volume. After applying the runoff-reduction-volume techniques, the total required water quality volume was not reduced 100 percent. The minimum required runoff reduction volume was determined to verify that the minimum required runoff reduction has been provided. The total provided runoff reduction volume was greater than the minimum required runoff reduction volume. Therefore, the minimum required runoff reduction volume has been met. Detailed design calculations have been provided in Appendix E.

4.1.4 Standard Stormwater Management Practice Application

The portion of the water quality volume that is not reduced in the standard stormwater management practices with runoff reduction volume capacity can be credited toward meeting the total required water quality volume. The total provided water quality-volume (total provided runoff-reduction volume plus total treated water quality volume) is greater than the total required water quality volume. Therefore, the total required water quality volume has been met. Detailed design calculations have been provided in Appendix E.

4.1.5 Volume and Peak Control Practice Application

The proposed stormwater management facilities have been designed and sized to provide channel protection, overbank flood control, and extreme flood protection. In addition, comparison of the peak discharge rates for pre- and post-development watershed conditions demonstrates that the peak rate of runoff from the proposed development are less than or equal to the existing conditions. Detailed design calculations have been provided in Appendix E.

4.2 Stormwater Management Facilities

4.2.1 Bioretention Areas

Bioretention practices will be used to treat the stormwater runoff and they are a standard stormwater management practice with runoff volume capacity. In addition, bioretention areas improve water quality by removing suspended solids, metals, and nutrients. A combination of a forebay and mulch layer will be used for pretreatment. The bioretention areas will be landscaped with a variety of plants in accordance with the NYSDEC Design Manual.

4.2.2 Stormwater Management Ponds

Stormwater management ponds will be used to meet the total required water quality volume requirement, since they are standard stormwater management practices that do not provide runoff reduction volume capacity. The stormwater management ponds are wet ponds and have been sized to provide the required water quality volume for its contributing drainage area as well as provide the required water quantity controls. The outlet control structure has a staged drawdown design. The smaller orifices are located at or near the permanent pool elevation, while the larger slots are located near the top of the structure. The smaller orifices will restrict the outflow at the beginning of storms when the effluent temperature is highest. This will allow the incoming water to cool as it mixes with the water already in the stormwater pond.

Dam Evaluation

According to the 6 CCR-NY 608 "Use and Protection of Waters" Section 608.3 "Dams", the requirement of a permit pursuant to this section does not apply to the following:

1. The construction, reconstruction, repair, breach or removal of a dam that has a height less than 15 feet and a maximum impoundment capacity less than three million gallons;
2. The construction, reconstruction, repair, breach or removal of a dam with a height equal to or less than six feet, regardless of its maximum impoundment capacity, or a dam with a maximum impoundment capacity equal to or less than one million gallons, regardless of its height; and
3. The ordinary maintenance of a dam.

A dam evaluation was performed for each of the proposed stormwater management ponds to determine whether or not a dam permit would be required based upon conditions 1 and 2, since condition 3 is not applicable to this project. The evaluation is summarized below.

- *Stormwater Pond 10 (Wet Pond 239)*

  The water surface elevation is at elevation 575.0. The top of berm is at elevation 579.0 and the bottom of the berm embankment is at elevation 575.0. The proposed berm height is 4 feet (elev. 579.0 – elev. 575.0). The maximum impoundment capacity is 2.1 million cubic feet (or ±15.6 million gallons), which is calculated from the top of berm to the bottom of the berm embankment (15,160,446 cf – 13,083,100 cf). Based upon condition 2, the proposed berm is not considered a dam; therefore, a dam permit will not be required.

- *Stormwater Pond 11 (Wet Pond 238)*

  The water surface elevation is at elevation 582.0. The top of berm is at elevation 587.0 and the bottom of the berm embankment is at elevation 582.0. The proposed berm height is 5 feet (elev. 587.0 – elev. 582.0). The maximum impoundment capacity is 462,592 cubic feet (or ±3.5 million gallons), which is calculated from the top of berm to the bottom of the berm embankment (943,710 cf – 481,118 cf). Based upon condition 2, the proposed berm is not considered a dam; therefore, a dam permit will not be required.

- *Stormwater Pond 12A (Wet Pond 121)*

  The water surface elevation is at elevation 586.0. The top of berm is at elevation 591.0 and the bottom of the berm embankment is at elevation 585.0. The proposed berm height is 6 feet (elev. 591.0 – elev. 585.0). The maximum impoundment capacity is 1.1 million cubic feet (or ±8.6 million gallons), which is calculated from the top of berm to the bottom of the berm embankment (4,140,758 cf – 2,993,170 cf). Based upon condition 2, the proposed berm is not considered a dam; therefore, a dam permit will not be required.

- *<u>Stormwater Pond 12B (Wet Pond 122)</u>*

  The water surface elevation is at elevation 586.0. The top of berm is at elevation 591.0 and the bottom of the berm embankment is at elevation 588.0. The proposed berm height is 3 feet (elev. 591.0 – elev. 588.0). The maximum impoundment capacity is 224,660 cubic feet (or ±1.7 million gallons), which is calculated from the top of berm to the bottom of the berm embankment (1,037,148 cf – 812,488 cf). Based upon condition 2, the proposed berm is not considered a dam; therefore, a dam permit will not be required.

4.3 Hydrologic Analysis

4.3.1 Drainage Patterns

The Site is located within the Lake Erie – Niagara River drainage basin. The drainage patterns for the existing and proposed conditions were limited to the proposed development area. In the existing conditions, stormwater runoff generally flows overland either southeast or northeast. Runoff flowing southeast enters a ditch where if flows off-Site. Runoff flowing northeast enters a ditch where it flows off-Site. The ditches ultimately join together and flow north along Long Road to the Niagara River.

In the proposed conditions, stormwater runoff outside the development will continue to flow overland in the same direction as in the existing conditions. Stormwater runoff with the development will flow overland to on-Site drainage structures in paved roads and parking areas or to grass swales. Localized low and high points have been created to aid in the collection of stormwater runoff. The collected stormwater will be conveyed via a closed pipe network or via grass swales to stormwater management systems for treatment. Treated stormwater will be released in a controlled manner prior to entering the on-Site ditches.

4.3.2 Stormwater Modeling

The USDA Soil Conservation Service Publication Technical Release (TR-55) "Urban Hydrology for Small Watersheds" has been used to analyze the pre- and post-development rainfall runoff rates and volumes. Watershed areas, curve numbers (CN), and times of concentration (T_C) were calculated for each contributing watershed. The curve number is a land-sensitive coefficient that dictates the relationship between total rainfall depth and direct storm runoff. Based on the land coverage and soil group types, the average CN has been determined for both the pervious and impervious area of each watershed for both the existing and proposed conditions.

The T_C is defined as the time for runoff to travel from the hydraulically most distant point in the watershed to a Design Point (DP). Values of the time of concentration were determined for both the pervious and impervious area of each watershed for both the existing and proposed conditions based on land cover and slope of the flow path using methods outlined in TR-55. As per TR-55, the minimum T_C used in 0.1 hours (for 6 minutes).

An overall watershed boundary was developed for the pre- and post-development conditions (see <u>Figure 5</u> and <u>Figure 6</u>, respectively). The overall watershed was broken down into smaller watersheds, or subcatchments to allow for analysis of runoff conditions at several locations.

Each of these locations is defined as a Design Point (DP) to compare the proposed development to the existing conditions. Descriptions of each of the selected design points are provided below:

- Design Point 1: Southern collector creek (ditch) discharge point at eastern property line.
- Design Point 2: Central feeder creek (ditch) discharge point at eastern property line.
- Design Point 3: Ditch/inlet to twin culverts along Long Road.
- Design Point 4: Ditch/inlet to twin culverts along Long Road.

Rainfall data used in the modeling and analysis was obtained from the isohyet maps provided in the *Design Manual* and the Northeast Regional Climate Center (NRCC). A Type II rainfall distribution was used to evaluate the pre- and post-development stormwater runoff conditions for the 1-, 10-, and 100-year 24-hour storm events. The rainfall data used in the stormwater management design and analysis is provided in the table below.

Table 4-4: Rainfall Data

Storm Event	24-Hour Rainfall
90th Percentile(1,2)	1.00 inches
1-year	1.77 inches
2-year(3)	2.13 inches
10-year	2.98 inches
100-year	4.83 inches

1. The 90th percentile 24-hour rainfall value was taken from the *New York State Stormwater Management Design Manual*. The other 24-hour rainfall values are taken from NRCC.
2. The 90th percentile 24-hour rainfall amount was used to calculate the required total water quality volume.
3. The 2-year 24-hour rainfall amount was used to calculate the sheet flow component in the time of concentration.

The rainfall data used in the stormwater management design and analysis is provided in Appendix E. The results of the computer modeling used to analyze the pre- and post-development watershed conditions are provided in Appendix F and Appendix G, respectively.

4.3.3 Water Quality Control

Treatment of stormwater runoff is important because most runoff-related water quality contaminants are transported during the initial stages of storms. The water quality volumes have been determined based on the methodology described in the Design Manual. The total water quality volume is provided in the table below.

Table 4-5: Total Water Quality Volume

Subcatchment	Area (ac)	Impervious Area (ac)	WQ_v (cf)
120	0.99	0.59	2,115
230	10.17	8.56	29,820
231	10.82	8.78	30,641
232	9.44	5.63	20,113
234	8.36	6.95	24,218
235	9.53	6.82	24,003
236	7.49	6.03	26,809
237	11.24	8.04	18,857
350	1.81	1.16	25,546
Total	**69.85**	**52.56**	**202,123**

Detailed design calculations have been provided in Appendix E.

4.3.4 Runoff Reduction Volume

Runoff reduction is achieved by infiltration, groundwater recharge, reuse, recycle, evaporation and evapotranspiration of 100 percent of the post-development water quality volumes to replicate pre-development hydrology by maintaining pre-construction infiltration, peak runoff flow, discharge volume, and minimizing concentrated flow by using runoff-control techniques to provide treatment in a distributed manner before runoff reaches the collection system. The runoff-reduction-volume techniques that were used to reduce the total required water quality volume are in the table below.

Table 4-6: Implemented Runoff Reduction Volume Techniques

Techniques/ Practices	RRv Reduction Method	Reduction Amount
Bioretention Practice	Standard SMP with RRv capacity	40% of the WQv provided by practice (with underdrains)

After applying the runoff-reduction-volume techniques, the total required water quality volume was not reduced 100 percent. The minimum required runoff reduction volume was determined to confirm that at least the minimum percent of the total water quality volume has been reduced. The total provided runoff reduction volume was greater than the minimum required runoff reduction volume. Therefore, the minimum required runoff-reduction volume has been met. Detailed design calculations have been provided in Appendix E.

4.3.5 Water Quantity Control

Channel Protection Volume requirements are designed to protect stream channels from erosion. This protection is accomplished by providing 24-hour extended detention of the 1-year 24-hour storm. A comparison of the required and provided channel protection volume is provided in the table below.

Table 4-7: Summary of Required & Provided Channel Protection Volumes

Water Quantity Parameter	Required (ac-ft)	Provided (ac-ft)
Channel Protection Volume	13.44	88.79

A comparison of the pre- and post-development peak discharge rates is provided in the table below.

Table 4-8: Summary of Pre- & Post-Development Peak Discharge Rates

Storm Event	Design Point	Pre (cfs)	Post (cfs)	Diff (cfs)
1-year	1	20.26	17.75	-2.51
	2	17.55	12.44	-5.11
	3	19.48	16.53	-2.95
	4	30.34	19.93	-10.41
10-year	1	58.51	48.25	-10.26
	2	58.21	43.27	-14.94
	3	62.59	55.84	-6.75
	4	97.19	64.67	-32.52
100-year	1	125.08	100.81	-24.27
	2	134.74	104.69	-30.05
	3	142.70	134.28	-8.42
	4	220.24	149.46	-70.78

Comparison of the peak discharge rates for pre- and post-development watershed conditions demonstrates that the peak rate of runoff from the proposed development will not be increased. The pre- and post-development stormwater models have been provided in Appendix F and Appendix G, respectively.

4.4 Hydraulic Analysis

Stormwater runoff from the proposed development will be collected and conveyed to the proposed stormwater management facilities by the closed pipe-network system or grass swales. A hydraulic analysis of the proposed stormwater collection system was performed to verify that the system has the capacity to convey the stormwater runoff associated with the 25-year storm.

The Rational Method was used to calculate the peak surface runoff rate for the each of the drainage structures. The contributing drainage areas to each of the drainage structures were defined and broken into impervious and pervious areas. A runoff coefficient of 0.9 was used for impervious areas and 0.4 for pervious areas. A rainfall intensity of 5.25 inches per hour was used for the 25-year storm. The minimum time of concentration of six minutes was used for each of the drainage areas to be conservative.

Based upon the hydraulic analysis, the proposed stormwater collection system has adequate capacity to collect and convey the stormwater runoff associated with the 25-year storm. None of the proposed drainage structures surcharge above the proposed rim elevations. The proposed stormwater collection system hydraulic analysis has been provided in Appendix H.

5 Erosion and Sediment Control Plan

This SWPPP and accompanying project plans identify erosion and sediment control measures to be implemented during and after construction to minimize erosion and sediment impacts. The erosion and sediment control measures have been designed in accordance with the *New York State Standards and Specifications for Erosion and Sediment Control*, latest revision.

5.1 Construction Sequencing Schedule and Phasing

5.1.1 Sequencing Schedule

The purpose of the construction sequencing schedule and phasing plan is to limit the overall disturbance and ensure that previously disturbed areas are reestablished before construction in another part of the site. The duration of the construction activities, including planned winter shutdowns, will be from late summer of 2020 to fall 2022. The general construction sequencing and phasing is provided on the project drawings.

5.1.2 Land Disturbance Waiver

The Applicant is requesting written approval from the Town, which is an MS4, to disturb more than 5 acres of soil at any one time. The total disturbance area associated with the Site is approximately 119 acres. The proposed project and amenities will be constructed in phases to obtain the necessary fill to construct sections of the Project disturbing a maximum of 20 acres. This will reduce the need to import material from off site.

The total earthwork operations will proceed generally as shown on the erosion and sediment control plans. The construction sequencing and phasing is generally as follows:

Clearing and Grubbing Activities

1. Flag the disturbance limits prior to the commencement of clearing and grubbing activities.

2. Install perimeter silt fence and tree protection measures as shown on the project plans.

3. Clearing and grubbing activities shall be limited to a maximum of 5-acres. Stabilize concurrently with the clearing activities such that no more than 5-acres are cleared and grubbed at any one time. Woods chips and/or spray mulch shall be used to temporarily stabilize the cleared area. Chipping trees and stump grindings generated as part of the clearing operations will also be used to produce wood chips.

4. Inspect all erosion control measures during clearing and grubbing activities. Repair any damaged erosion control measures upon discovery.

Bulk Grading Construction

1. The Contractor shall demarcate the disturbance limits prior to the commencement of construction of each Phase.

2. Access to the site will be provided off of Long Road through a construction haul road. The construction haul road will be installed during the Initial Access Phase. The construction haul road will remain in place to access the phases located in the southern portion of the site.

3. Install temporary diversion measures to ensure that stormwater runoff is conveyed to the temporary sediment basins. Temporary diversion measures shall be located in a manner that will ensure that the tributary area to each diversion measure shall not exceed 5-acres.

4. The temporary sediment basins shall be graded to the top of the gravel layer in the bioretention practices and graded to the top of the aquatic bench in the stormwater ponds. Install dewatering devices and outlet control structures with dewatering riser in accordance with the project plans. Cover the primary inlet of the outlet control structure with AMOCO type 4545 or approved equal construction fabric to prevent fines from entering the stormwater discharges.

5. The earthwork operations will generally proceed as shown on the phasing plans. To minimize the need to import or export material, the excess cut material can be placed in a phase requiring fill as long as the overall total disturbance between the phases does not exceed 20 acres.

6. Any temporary or topsoil stockpiles shall be protected from erosion with seed/mulch and shall be covered in rain events as conditions warrant. (Refer to project details for additional information.)

7. To minimize unnecessary disturbances, excavation and fill areas shall be managed to enable the installation of utilities as the fill progresses, wherever possible.

8. The disturbed areas shall be actively stabilized as work progresses.

9. Repeat the above process for each of the phases until the necessary fill material has been obtained.

10. The temporary sediment basins shall remain in place until all soil disturbance activities that contribute to the temporary sediment basins have been completed.

11. The permanent stormwater management practices shall not be completed until all of the contributing areas to the practices have been constructed and stabilized.

General Construction

1. Bulk grading operations shall occur first.

2. Prepare pavement subgrade and install subbase material. Inlet protection measures may be removed temporarily during this operation, but no more than 24-hours prior to placement of the subbase material. Inlet protection measures shall be replaced once the subbase material has been installed.

3. Install proposed curbing and binder course. Inlet protection measures may be removed temporarily during this operation, but no more than 24-hours prior to placement of the subbase material. Inlet protection measures shall be replaced once the binder course has been installed.

4. Finish grading and stabilize all disturbed areas. All catch basins, drainage manholes, and drainage lines shall be cleaned of any accumulated silt and sediment.

5. Remove all accumulated sediment within the temporary sediment basins. Remove the temporary perforated risers and construction fabric from outlet control structures.

6. Finalize construction of the bioretention areas and stormwater ponds upon completion of construction activities.

7. Install all plantings in accordance with the project plans.

8. Place pavement top course and pavement markings, as appropriate.

9. Remove all temporary erosion and sediment control measures. Immediately stabilize the areas disturbed during their removal. Establish permanent vegetative cover and install all landscaping.

The limits of disturbance will be flagged prior to the commencement of construction to ensure over clearing does not occur. The entire disturbance area will be cleared initially for bulk grading activities. Portions of the phase will be stabilized with appropriate stabilization measures while construction is occurring in other portions of the site. Stabilization methods will include, but not limited to, hydro-seeding, mulching, haying, and spreading wood chips over the disturbed areas once construction within those areas are complete.

A minimum of two site inspections will be conducted every seven calendar days by the qualified inspector to ensure the stability and effectiveness of all protective measures and practices during construction for as long as more than 5-acres of land remains disturbed.

5.2 Erosion and Sediment Control Measures

Temporary erosion and sediment control measures to be used during construction generally include the following:

- **Stabilized Construction Access** - Before construction, the stabilized construction access shall be installed to reduce the tracking of sediment onto adjacent roadways. Construction traffic must enter and exit the site at the stabilized construction access. The stabilized construction access shall be maintained in good condition to control tracking of sediment onto rights-of-way or streets. When necessary, the placement of additional aggregate atop the filter fabric shall be done to maintain the minimum thickness. Sediments and soils spilled, dropped, or washed onto the public rights-of-way shall be removed immediately.

- **Dust Control** - Water trucks or other approved water source shall be used, as needed, during construction to reduce dust generated on the site. Dust control shall be provided by the general contractor to a degree acceptable to the owner/operator, and in compliance with the applicable local and state dust control requirements.

- **Temporary Soil Stockpile** - Materials, such as topsoil, shall be temporarily stockpiled (if necessary) on site during construction. Stockpiles shall be located away from storm drainage, water bodies or courses, and shall be properly protected from erosion in accordance with the NYSDEC standard detail.

- **Silt Fencing** - Before initiation of and during construction, silt fencing shall be established along the perimeter of areas to be disturbed as a result of the construction up gradient of water courses or adjacent properties. These barriers may extend into non-impact areas to adequately protect adjacent lands. Clearing and grubbing shall be performed only as necessary for the installation of the sediment control barrier. To maximize effectiveness of the silt fencing, daily inspections shall be performed by site personnel. Maintenance of the fence shall be performed as needed and when directed by the Qualified Inspector.

- **Temporary Seeding** - Within seven days after construction ceases on any particular area of the site, all disturbed areas where there shall be no construction for longer than 14 days shall be temporarily seeded and mulched to minimize erosion and sediment loss. Other stabilization methods maybe approved by the Qualified Inspector.

- **Inlet Protection** – Inlet protection shall be installed around existing and proposed catch basins (once installed) to keep sediment from entering the storm-sewer system. During construction, the inlet protection measures shall be replaced as needed to ensure proper function of the structure.

- **Check Dams** - Check dams shall be installed within drainage ditches to reduce the velocity of stormwater runoff, promote settling of sediment, and reduce sediment transport off site. The stone check dams shall be inspected at least every seven days. Damage shall be repaired upon discovery. If significant erosion has occurred between structures, a liner of stone or other suitable material shall be installed in that part of the channel. Sediment accumulated behind the stone check dams shall be removed to allow the channel to drain through the stone check dam and prevent large flows from carrying sediment over or around the dam. Stones shall be replaced to maintain the design cross section of the structures.

- **Temporary Sediment Basins and Traps** - Temporary sediment basins and traps shall be constructed to intercept sediment laden runoff, reduce the amount of sediment leaving the disturbed areas, and protect drainage ways, properties, and rights-of-way. Projects that have proposed stormwater ponds can be used as temporary sediment basins during construction. Temporary sediment basins and traps shall be inspected at least every seven days. All damage caused by soil erosion and construction equipment shall be repaired upon discovery. Accumulated sediment shall be removed from the sediment basin or trap when it reaches 50 percent of the design capacity and must not exceed 50 percent. Sediment must not be placed downstream from the embankment, adjacent to a stream, or floodplain.

- **Fiber Rolls** – Fiber rolls shall be installed on the finished slopes 3:1 or steeper to reduce sheet flow on slopes help minimize erosion while final seeding and planting is underway.

- **Erosion Control Matting** – Erosion control matting shall be installed on all slopes exceeding 3:1. Erosion control matting shall provide protection from temporary erosion, establishment of rapid vegetation, and long-term resistance of erosion to shear stresses associated with high runoff flow velocities associated with steep slopes.

- **Dewatering** - Dewatering, if required, must not be discharged directly into wetlands, water courses, water bodies, and storm sewer systems without appropriate protection or authorizations. Proper methods and devices shall be used to the extent permitted by law, such as pumping water into temporary sediment basins, providing surge protection at the inlet and outlet of pumps, floating the intake of the pump, or other methods to minimize and retain the suspended solids.

Permanent erosion and sediment control measures to be used after construction generally include the following:

- **Establish Permanent Vegetation** - Disturbed areas not covered by impervious surfaces shall be seeded in accordance with the accompanying plans. The type of seed, mulch, and maintenance measures shall be followed. All areas at final grade shall be seeded and mulched within 14 days after completion of the major construction. All seeded areas shall be protected with mulch or hay. Final site stabilization is achieved when soil-disturbing activities have been completed and a uniform, perennial vegetative cover with a density of 80 percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on the disturbed unpaved areas and areas not covered by permanent structures.

- **Rock Outlet Protection** - Rock outlet protection shall be installed at the locations as shown on the accompanying plans. The installation of rock outlet protection will reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving water course or water body.

Specific erosion and sediment control measures, inspection frequency, and remediation procedures are provided in the subsequent sections and on the accompanying project plans.

5.3 Pollution Prevention Controls

Good housekeeping practices are designed to maintain a clean and orderly work environment. Good housekeeping measures shall be maintained throughout the construction process by those parties involved with the direct care and development of the Site. The following measures shall be implemented to control the possible exposure of harmful substances and materials to stormwater runoff:

1. Material resulting from the clearing and grubbing operation shall be stockpiled away from storm drainage, water bodies or watercourses and surrounded with adequate erosion and sediment control measures. Soil stockpile locations shall be exposed no longer than 14 days before seeding.

2. Equipment maintenance areas shall be protected from stormwater flows and shall be supplied with appropriate waste receptacles for spent chemicals, solvents, oils, greases, gasoline, and any pollutants that might contaminate the surrounding habitat or water supply. Equipment wash-down zones shall be within areas draining to sediment control devices.

3. The use of detergents for large-scale (e.g., vehicles, buildings, pavement surfaces) washing is prohibited.

4. Material storage locations and facilities (e.g., covered storage areas, storage sheds) shall be on-Site and shall be stored according to the manufacturer's standards in a dedicated staging area. Chemicals, paints, solvents, fertilizers, and other toxic material shall be stored in waterproof containers. Runoff containing such materials shall be collected, removed from the Site, treated and disposed of at an approved solid waste or chemical disposal facility.

5. Hazardous spills shall be immediately contained to prevent pollutants from entering the surrounding habitat or water supply. Spill Kits shall be provided on Site and shall be displayed in a prominent location for ease of access and use. Spills greater than 5 gallons shall be reported to the NYSDEC Response Unit at 1-800-457-7362. In addition, a record of the incidents or notifications shall be documented and attached to the SWPPP.

6. Portable sanitary waste facilities shall be provided on Site for workers and shall be properly maintained.

7. Dumpsters or debris containers shall be on Site and shall be of adequate size to manage respective materials. Regular collection and disposal of wastes must occur as required.

8. Temporary concrete washout facilities shall be a minimum of 50 feet from storm drain inlets, open drainage facilities, and watercourses. Each facility should be away from construction traffic or access areas to prevent disturbance or tracking. A sign shall be installed adjacent to each washout facility to inform concrete equipment operators to use the proper facilities. When temporary concrete washout facilities are no longer required for the work, the hardened concrete shall be removed and properly disposed. Materials used to construct the temporary concrete washout facilities shall be removed and properly disposed. Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled or repaired, seeded, and mulched for final stabilization. Wastewater discharges from washout of concrete is prohibited.

9. Non-stormwater components of Site discharge shall be clean water. Water used for construction, which discharges from the Site, must originate from a public water supply or approved private well. Water used for construction that does not originate from an approved public supply must not discharge from the Site.

10. Discharges from dewatering activities, including discharges from dewatering trenches and excavations, shall be managed by appropriate control measures.

11. Wastewater discharges from washout and cleanout of stucco, paint, form-release oils, curing compounds, and other construction materials is prohibited.

5.4 Soil Stabilization and Restoration

5.4.1 Stabilization

In areas where soil disturbance has temporarily or permanently ceased, the application of soil stabilization measures shall be initiated by the end of the next business day and completed within 14 days from the date the current soil disturbance ceased. The soil-stabilization measures shall be in conformance with the *New York State Standards and Specifications for Erosion and Sediment Control*, latest edition.

For construction sites authorized to disturb more than 5 acres of soil at any one time, the application of soil stabilization measures shall be initiated by the end of the next business day and completed within seven days from the date that current soil disturbance ceased. The soil-stabilization measures shall be in conformance with the *New York State Standards and Specifications for Erosion and Sediment Control*, latest edition. Additional Site-specific practices shall be installed as needed to protect water quality.

5.4.2 Restoration

Soil restoration shall be performed in the disturbed areas. The soils shall be restored in accordance with the table below.

Table 5-1: Soil Restoration

Type of Soil Disturbance	Soil Restoration Requirement
No Soil Disturbance (e.g., preservation of natural features)	Restoration not required.
Minimal Soil Disturbance (e.g., clearing and grubbing)	Restoration not required.
Areas where top soil is stripped only (e.g., no change in grade)	Aerate and apply 6 inches of topsoil
Areas of cut or fill	Apply full soil restoration
Heavy traffic areas on site (especially in 5 to 25 feet around buildings, but not within a 5 foot perimeter around foundation walls)	Apply full soil restoration (see below).
Areas where runoff reduction or infiltration practices are applied	Restoration not required, but can be applied to enhance soil infiltration.
Redevelopment projects	Soil restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.

Full Soil Restoration

Before applying full soil restoration, all construction, including construction equipment and material storage, site cleanup and trafficking, should be finished and the site closed to further disturbance. Full soil restoration should be performed with a heavy-duty agricultural-grade deep ripper, deep angled-leg subsoiler, or equivalent machinery to achieve de-compaction.

Full soil restoration is implemented in a two-phase process:

1. Deep rip the affected thickness of exposed subsoil, aggressively fracturing it before the protected topsoil is reapplied on the site.
2. De-compact simultaneously through the restored topsoil layer and upper half of the affected subsoil.

Low to Moderate Subsoil Moisture

The disturbed soils are returned to rough grade and the following is applied:

1. Apply 3 inches of compost over the subsoil.
2. Till compost a minimum of 12 inches into the subsoil using a cat-mounted ripper, tractor-mounted disc, or tiller mixing and circulating air and compost into subsoils.
3. Rock-pick until uplifted stone and rock of 4 inches or larger size are cleaned off the site. All construction material and foreign debris and existing root masses shall be removed from proposed planting areas.
4. Apply 6 inches of topsoil. Newly installed planting soils shall be mixed with existing soils where they meet in order to create a transitional gradient to allow for proper drainage.
5. Install plants and vegetation in accordance with the Landscaping Plan.

6 Stormwater Pollution Prevention Plan Implementation

6.1 Certification Statements

Before starting construction, the owner/operator, contractors, and subcontractors are required to sign the certification statements provided in Appendix C.

The owner/operator must sign a copy of the Owner's/Operator's certification before submitting the Notice of Intent. The owner/operator acknowledges that the SWPPP has been developed and will be implemented as the first element of construction and agrees to comply with the terms and conditions of the general permit for which the Notice of Intent is being submitted.

The owner/operator must identify the contractors and subcontractors that will be responsible for installing, constructing, repairing, replacing, inspecting, and maintaining the erosion and sediment control practices; and constructing the post-construction stormwater management practices included in the SWPPP. The contractors and subcontractors must identify at least one trained individual from their company who will be responsible for implementation of the SWPPP. This person will be known as the trained contractor. At least one trained contractor will be on Site daily when soil disturbing activities are being performed. If new or additional contractors are hired to implement measures identified in the SWPPP after construction has begun, they must also sign the certification statement and identify their responsibilities.

6.2 Pre-Construction Meeting

Before beginning construction, the owner/operator must set up a pre-construction meeting with the Town representative, qualified professional, qualified inspector, contractors, and subcontractors. The primary purpose of the pre-construction meeting is to discuss the responsibilities of each party as they relate to the implementation of the SWPPP and to clarify any questions.

6.3 Construction Site Log

The owner/operator must maintain a copy of the following, including but not limited to: General Permit, signed NOI, signed MS4 Acceptance form, NOI Acknowledgement Letter, SWPPP, signed certification statements, and inspections reports. The documents must be maintained in a secure location on site. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

6.4 Construction Inspections and Maintenance

6.4.1 Contractor Maintenance Inspection Requirements

The trained contractor must inspect the erosion and sediment control practices and pollution-prevention measures to verify that they are being maintained in effective operating condition. The inspections will be conducted as follows:

- For construction sites where soil disturbance is on-going, the trained contractor must inspect the measures within the active work area daily. If deficiencies are identified, the contractor will begin implementing corrective actions within one business day and must complete the corrective actions by the end of the day.

- For construction sites where soil disturbance activities have been temporarily suspended (e.g., winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the trained contractor can stop conducting the maintenance inspections. The trained contractor must conduct the daily maintenance inspections as soil disturbance resumes.

- For construction sites where soil disturbance has been shut down with partial project completion, the trained contractor can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved final stabilization and all post-construction stormwater management practices required for the completed part of the project have been constructed in conformance with the SWPPP and are operational.

6.4.2 Qualified Inspector Inspection Requirements

The owner/operator must have a Qualified Inspector conduct site inspections to verify the stability and effectiveness of protective measures and practices employed during construction. The site inspections will be conducted as follows:

- For construction sites where soil disturbance is ongoing, the Qualified Inspector must conduct a site inspection at least once every seven days.

- For construction sites where soil disturbance is ongoing and the owner/operator has received authorization to disturb greater than 5 acres, the Qualified Inspector must conduct at least two site inspections every seven days. The two site inspections shall be separated by a minimum of two days.

- For construction sites where soil disturbance activities have been temporarily suspended (e.g., winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the Qualified Inspector must conduct a site inspection at least once every 30 days. The owner/operator must notify the NYSDEC or MS4 in writing before reducing the frequency of the inspections.

- For construction sites where soil disturbance activities have been shut down with partial project completion, the Qualified Inspector can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved final stabilization and all post-construction stormwater management practices are operational. The owner/operator must notify the NYSDEC or the MS4 in writing before the shutdown.

All erosion and sediment control inspections shall be performed in accordance with this SWPPP, accompanying project plans, latest revision of *New York State Standards and Specifications for Erosion and Sediment Control,* and procedures outlined in Appendix H of the latest revision of the *New York State Stormwater Management Design Manual*. Inspection reports must identify and document the maintenance of the erosion and sediment control measures. An Example inspection report has been provided in Appendix D.

Specific maintenance components, schedule frequency, inspection parameters and remediation procedures are provided on the accompanying project plans. Any adjustments or modifications to the maintenance plan shall be noted in the inspection reports and submitted to the Town for approval.

7 Termination of Coverage

The owner/operator may terminate coverage when:

a. Total project completion has occurred.

b. A planned shutdown with partial project completion has occurred.

c. Property ownership changes or when there is a change in operational control over the construction plans and specifications; and the new owner/operator has obtained coverage under the SPDES General Permit.

d. Coverage under an alternative SPDES general permit or an individual SPDES permit has been obtained.

If a planned shutdown with partial project completion or total project completion has occurred, then the owner/operator must have the Qualified Inspector perform a final site inspection to ensure that the following have been met:

- **Planned Shutdown with Partial Project Completion** – all soil disturbance has ceased; and all areas disturbed as of the project shutdown date have achieved final stabilization; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices required for the completed part of the project have been constructed in conformance with the SWPPP and are operational.

- **Total Project Completion** – all construction activity has been completed; and all areas disturbed as of the project shutdown date have achieved final stabilization; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices required for the completed part of the project have been constructed in conformance with the SWPPP and are operational.

The completed NOT must be submitted to the NYSDEC to cancel coverage. A blank copy of the NOT has been provided in Appendix B.

8 Post-Construction Requirements

8.1 Record Retention

Following construction, the owner/operator must retain a copy of the signed NOI, signed MS4 SWPPP Acceptance, NOI Acknowledgement Letter, SWPPP, project plans, and any inspection reports that were prepared in conjunction with the General Permit for at least five years from the date that the NYSDEC receives a complete NOT.

8.2 Inspection and Maintenance

Post-construction inspections and maintenance will be performed by the tenant. Inspections and maintenance for the various site components and stormwater management facilities shall be performed in accordance with the accompanying project plans and this SWPPP. Detailed post-construction inspections and maintenance procedures are provided in Appendix I.

9 Conclusion

This Stormwater Pollution Prevention Plan has been developed in accordance with the requirements of the Town of Grand Island and the New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) Phase II technical guidelines. This SWPPP identifies the erosion control, sediment control, pollution-prevention, and stormwater management measures to be implemented during construction to minimize soil erosion and control sediment transport off site, and after construction to control and treat stormwater runoff from the developed site.

In the opinion of the SWPPP preparer, the proposed project will not have adverse impacts if the measures for erosion control, sediment control, pollution prevention, and stormwater management measures are properly constructed and maintained in accordance with the requirements outlined herein and on the accompanying project plans.

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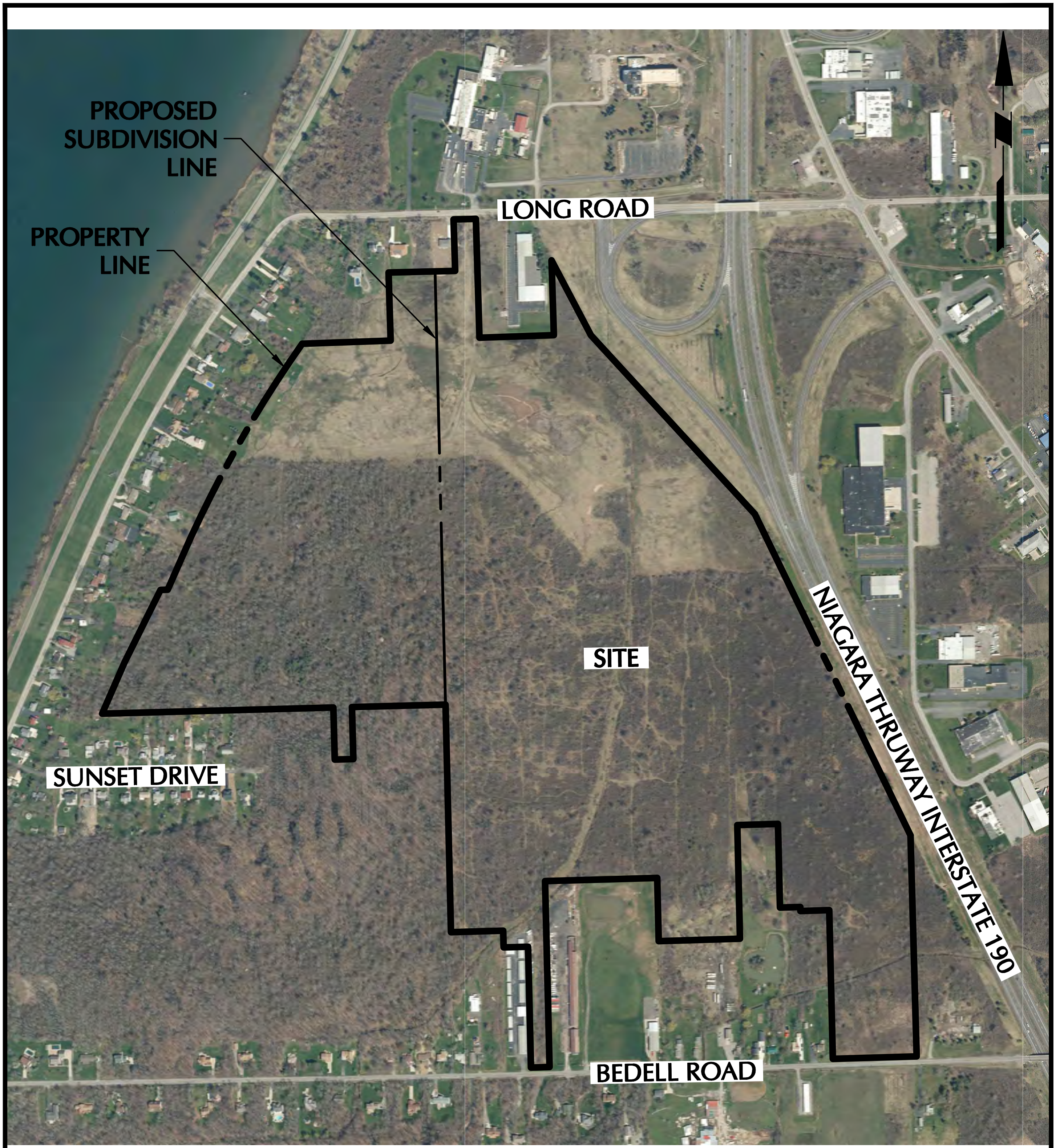
Figures



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SCALE: 1 INCH = 750 FEET

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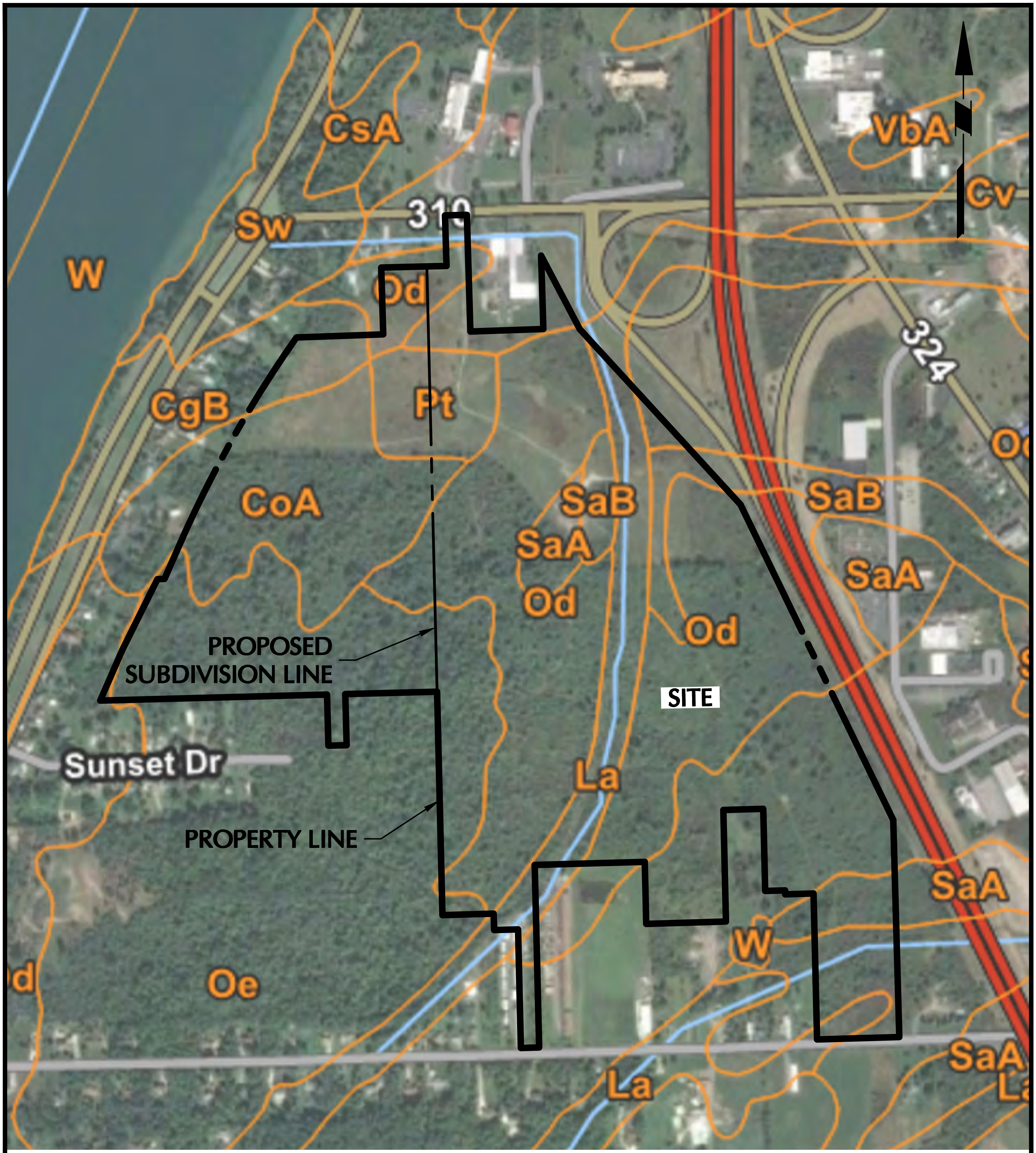
Project **PROJECT OLIVE** BLOCK No. 1, LOT No.50 & 26.1 TOWN OF GRAND ISLAND ERIE COUNTY NEW YORK	Drawing Title **SITE LOCATION MAP**	Project No. 100785901 Date 02-21-2020 Drawn By LM Checked By CZ	Drawing No. **FG01** Sheet 1 of 1



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Project	Drawing Title	Project No.	Drawing No.
PROJECT OLIVE BLOCK No. 1, LOT No.50 & 26.1 TOWN OF GRAND ISLAND ERIE COUNTY NEW YORK	SOILS MAP	100785901 Date 02–21–2020 Drawn By LM Checked By CZ	FG02 Sheet 1 of 1

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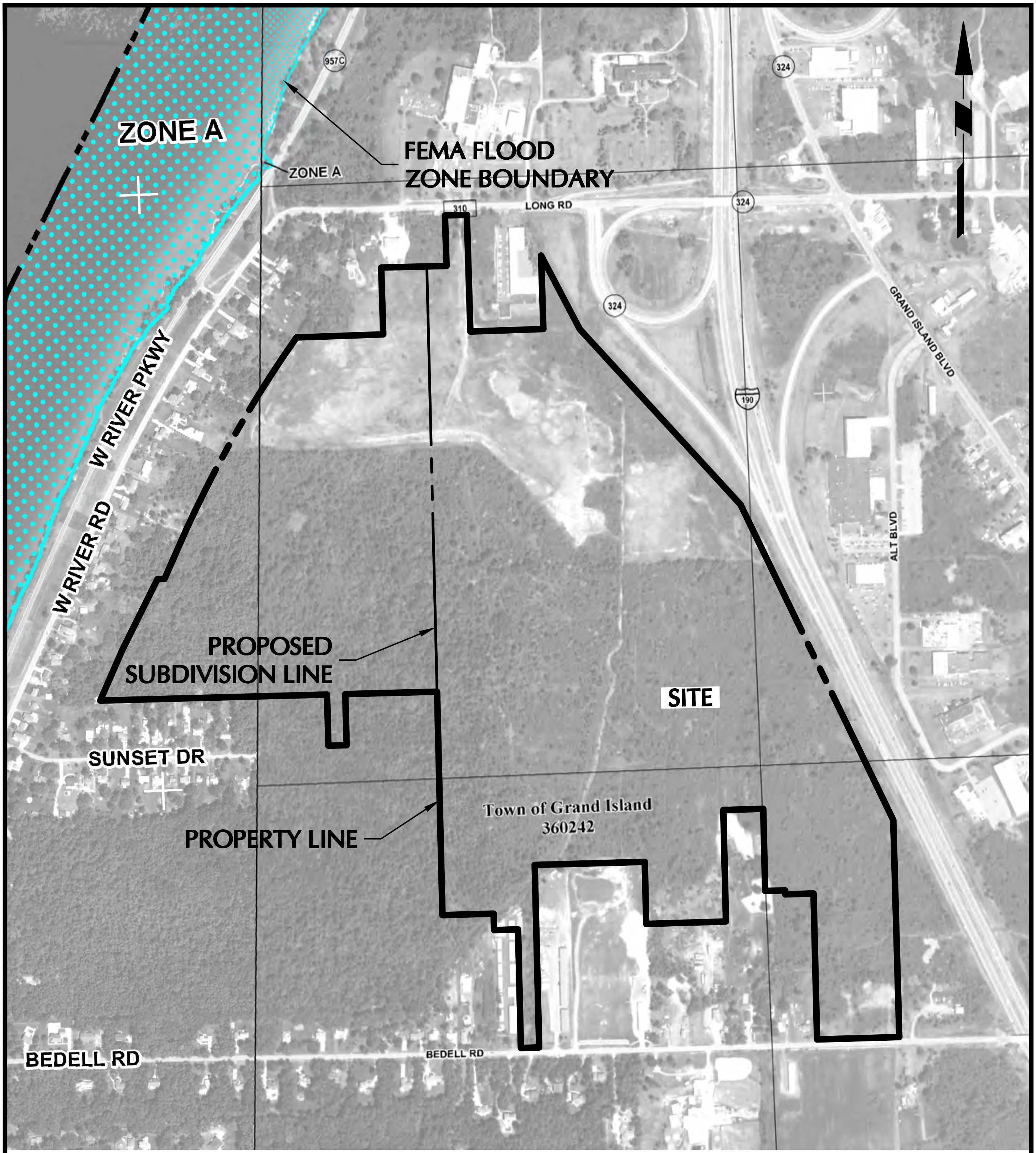

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Project

PROJECT OLIVE

BLOCK No. 1, LOT No.50 & 26.1
TOWN OF GRAND ISLAND
ERIE COUNTY NEW YORK

Drawing Title

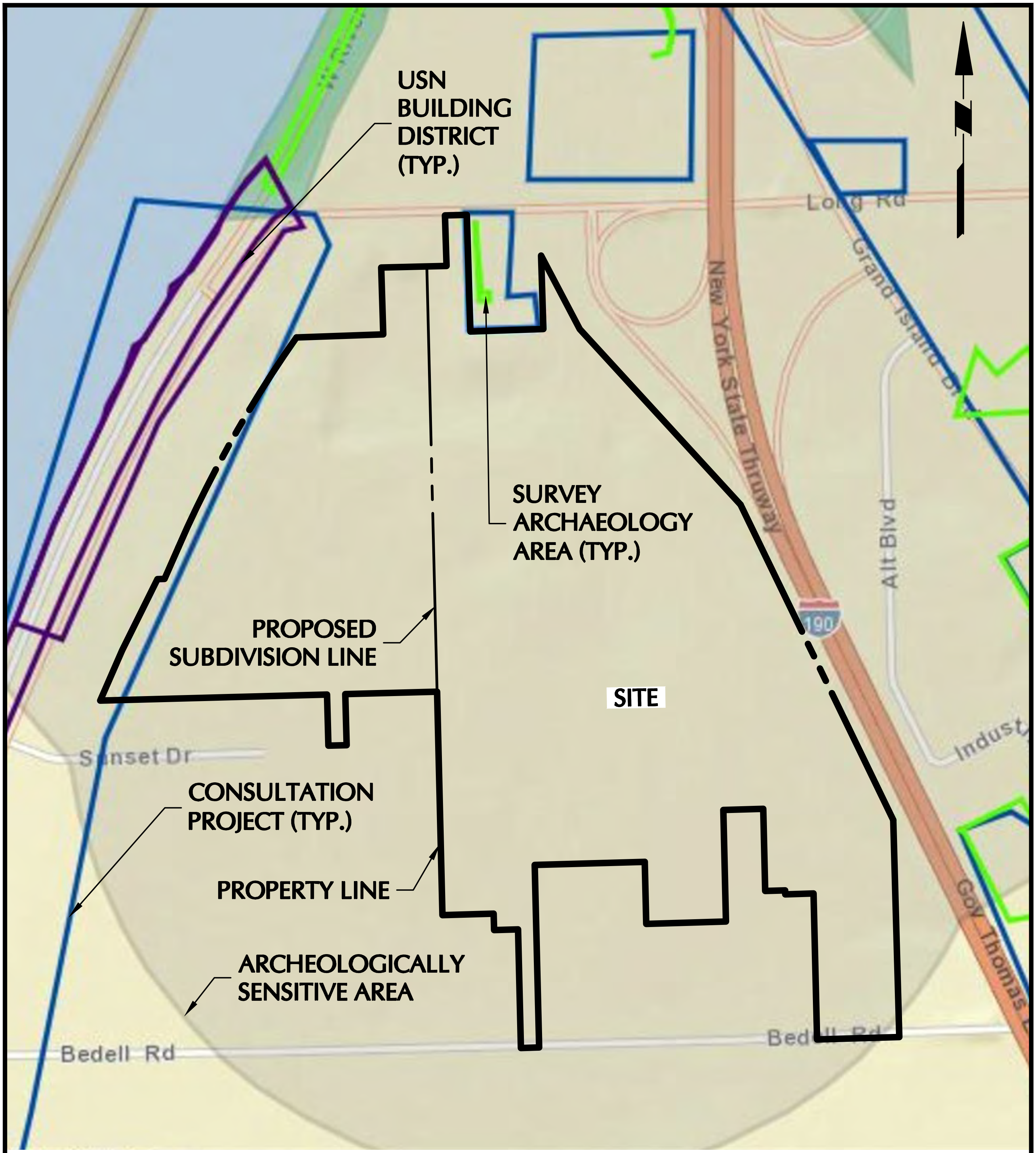
FLOOD
INSURANCE
RATE MAP

Project No. 100785901
Date 02-21-2020
Drawn By LM
Checked By CZ

Drawing No.

FG03

Sheet 1 of 1



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750 0 375 750

SCALE: 1 INCH = 750 FEET

LANGAN

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.

One North Broadway, Suite 910
White Plains, NY 10601

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Project

PROJECT OLIVE

BLOCK No. 1, LOT No.50 & 26.1
TOWN OF GRAND ISLAND
ERIE COUNTY NEW YORK

Drawing Title

CULTURAL RESOURCES

Project No. 100785901
Date 02-21-2020
Drawn By LM
Checked By CZ

Drawing No.

FG04

Sheet 1 of 1

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Project
PROJECT OLIVE
BLOCK No. 1, LOT No.50 & 26.1
TOWN OF GRAND ISLAND
ERIE COUNTY NEW YORK

Drawing Title
POST DEVELOPMENT WATERSHED MAP

Project No. 100785901
Date 02-21-2020
Drawn By CZ
Checked By MF

Drawing No.
FG06
Sheet 1 of 1

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PROJECT NO. 100785901

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Project
PROJECT OLIVE
BLOCK No. 1, LOT No.50 & 26.1
TOWN OF GRAND ISLAND
ERIE COUNTY NEW YORK

Drawing Title
POST DEVELOPMENT WATERSHED MAP

Project No.
100785901
Date
02-21-2020
Drawn By
CZ
Checked By
MF

Drawing No.
FG06
Sheet 1 of 1

LANGAN
PROJECT NO. 100785901

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Date	Description	No.

REVISIONS

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Project
PROJECT OLIVE
BLOCK No. 1, LOT No.50 & 26.1
TOWN OF GRAND ISLAND
ERIE COUNTY NEW YORK

Drawing Title
HYDRAULIC ANALYSIS WATERSHED MAP

Project No.
100785901
Date
02-21-2020
Drawn By
CZ
Checked By
MF

Drawing No.
FG07
Sheet 1 of 1

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Appendix A

NYSDEC SPDES General Permit

NEW YORK
STATE OF
OPPORTUNITY

Department of
Environmental
Conservation

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES

From

CONSTRUCTION ACTIVITY

Permit No. GP- 0-20-001

Issued Pursuant to Article 17, Titles 7, 8 and Article 70

of the Environmental Conservation Law

Effective Date: January 29, 2020 Expiration Date: January 28, 2025

John J. Ferguson

Chief Permit Administrator

1-23-20

Authorized Signature Date

Address: NYS DEC
Division of Environmental Permits
625 Broadway, 4th Floor
Albany, N.Y. 12233-1750

PREFACE

Pursuant to Section 402 of the Clean Water Act ("CWA"), stormwater *discharges* from certain *construction activities* are unlawful unless they are authorized by a *National Pollutant Discharge Elimination System ("NPDES")* permit or by a state permit program. New York administers the approved State Pollutant Discharge Elimination System (SPDES) program with permits issued in accordance with the New York State Environmental Conservation Law (ECL) Article 17, Titles 7, 8 and Article 70.

An *owner or operator* of a *construction activity* that is eligible for coverage under this permit must obtain coverage prior to the *commencement of construction activity*. Activities that fit the definition of "*construction activity*", as defined under 40 CFR 122.26(b)(14)(x), (15)(i), and (15)(ii), constitute construction of a *point source* and therefore, pursuant to ECL section 17-0505 and 17-0701, the *owner or operator* must have coverage under a SPDES permit prior to *commencing construction activity*. The *owner or operator* cannot wait until there is an actual *discharge* from the *construction site* to obtain permit coverage.

***Note: The italicized words/phrases within this permit are defined in Appendix A.**

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES

Table of Contents

Part 1. PERMIT COVERAGE AND LIMITATIONS

A. Permit Application

This permit authorizes stormwater *discharges* to *surface waters of the State* from the following *construction activities* identified within 40 CFR Parts 122.26(b)(14)(x), 122.26(b)(15)(i) and 122.26(b)(15)(ii), provided all of the eligibility provisions of this permit are met:

1. *Construction activities* involving soil disturbances of one (1) or more acres; including disturbances of less than one acre that are part of a *larger common plan of development or sale* that will ultimately disturb one or more acres of land; excluding *routine maintenance activity* that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility;

2. *Construction activities* involving soil disturbances of less than one (1) acre where the Department has determined that a *SPDES* permit is required for stormwater *discharges* based on the potential for contribution to a violation of a *water quality standard* or for significant contribution of *pollutants* to *surface waters of the State.*

3. *Construction activities* located in the watershed(s) identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

B. Effluent Limitations Applicable to Discharges from Construction Activities

*Discharge*s authorized by this permit must achieve, at a minimum, the effluent limitations in Part I.B.1. (a) – (f) of this permit. These limitations represent the degree of effluent reduction attainable by the application of best practicable technology currently available.

1. Erosion and Sediment Control Requirements - The *owner or operator* must select, design, install, implement and maintain control measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. The selection, design, installation, implementation, and maintenance of these control measures must meet the non-numeric effluent limitations in Part I.B.1.(a) – (f) of this permit and be in accordance with the New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, using sound engineering judgment. Where control measures are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must include in the *Stormwater Pollution Prevention Plan* ("SWPPP") the reason(s) for the

deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

a. **Erosion and Sediment Controls.** Design, install and maintain effective erosion and sediment controls to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such controls must be designed, installed and maintained to:

   (i) *Minimize* soil erosion through application of runoff control and soil stabilization control measure to *minimize pollutant discharges*;

   (ii) Control stormwater *discharge*s, including both peak flowrates and total stormwater volume, to *minimize* channel and *streambank* erosion and scour in the immediate vicinity of the *discharge* points;

   (iii) *Minimize* the amount of soil exposed during *construction activity*;

   (iv) *Minimize* the disturbance of *steep slopes*;

   (v) *Minimize* sediment *discharge*s from the site;

   (vi) Provide and maintain *natural buffer*s around surface waters, direct stormwater to vegetated areas and maximize stormwater infiltration to reduce *pollutant discharge*s, unless *infeasible*;

   (vii) *Minimize* soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted;

   (viii) Unless *infeasible*, preserve a sufficient amount of topsoil to complete soil restoration and establish a uniform, dense vegetative cover; and

   (ix) *Minimize* dust. On areas of exposed soil, *minimize* dust through the appropriate application of water or other dust suppression techniques to control the generation of pollutants that could be discharged from the site.

b. **Soil Stabilization**. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within fourteen (14) days from the date the current soil disturbance activity ceased. For construction sites that *directly discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. See Appendix A for definition of *Temporarily Ceased*.

c. **Dewatering**. *Discharge*s from *dewatering* activities, including *discharge*s from *dewatering* of trenches and excavations, must be managed by appropriate control measures.

d. **Pollution Prevention Measures**. Design, install, implement, and maintain effective pollution prevention measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such measures must be designed, installed, implemented and maintained to:

    (i) *Minimize* the *discharge* of *pollutants* from equipment and vehicle washing, wheel wash water, and other wash waters. This applies to washing operations that use clean water only. Soaps, detergents and solvents cannot be used;

    (ii) *Minimize* the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, hazardous and toxic waste, and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a *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) ; and

    (iii) Prevent the *discharge* of *pollutants* from spills and leaks and implement chemical spill and leak prevention and response procedures.

e. **Prohibited *Discharges*.** The following *discharge*s are prohibited:

    (i) Wastewater from washout of concrete;

    (ii) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;

(iii) Fuels, oils, or other *pollutants* used in vehicle and equipment operation and maintenance;

(iv) Soaps or solvents used in vehicle and equipment washing; and

(v) Toxic or hazardous substances from a spill or other release.

f. Surface Outlets. When discharging from basins and impoundments, the outlets shall be designed, constructed and maintained in such a manner that sediment does not leave the basin or impoundment and that erosion at or below the outlet does not occur.

C. Post-construction Stormwater Management Practice Requirements

1. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must select, design, install, and maintain the practices to meet the *performance criteria* in the New York State Stormwater Management Design Manual ("Design Manual"), dated January 2015, using sound engineering judgment. Where post-construction stormwater management practices ("SMPs") are not designed in conformance with the *performance criteria* in the Design Manual, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must design the practices to meet the applicable *sizing criteria* in Part I.C.2.a., b., c. or d. of this permit.

a. Sizing Criteria for New Development

(i) Runoff Reduction Volume ("RRv"): Reduce the total Water Quality Volume ("WQv") by application of RR techniques and standard SMPs with RRv capacity. The total WQv shall be calculated in accordance with the criteria in Section 4.2 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: Construction activities that cannot meet the criteria in Part I.C.2.a.(i) of this permit due to site limitations shall direct runoff from all newly constructed impervious areas to a RR technique or standard SMP with RRv capacity unless infeasible. The specific site limitations that prevent the reduction of 100% of the WQv shall be documented in the SWPPP.

For each impervious area that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered infeasible.

In no case shall the runoff reduction achieved from the newly constructed impervious areas be less than the Minimum RRv as calculated using the criteria in Section 4.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume ("Cpv"): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
(2) The site discharges directly to tidal waters, or fifth order or larger streams.

(iv) *Overbank* Flood Control Criteria ("Qp"): Requires storage to attenuate the post-development 10-year, 24-hour peak discharge rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
(1) the site discharges directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

(v) Extreme Flood Control Criteria ("Qf"): Requires storage to attenuate the post-development 100-year, 24-hour peak discharge rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
(1) the site discharges directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

b. *Sizing Criteria* for *New Development* in Enhanced Phosphorus Removal Watershed

(i) Runoff Reduction Volume (RRv): Reduce the total Water Quality Volume (WQv) by application of RR techniques and standard SMPs with RRv capacity. The total WQv is the runoff volume from the 1-year, 24 hour design storm over the post-developed watershed and shall be calculated in accordance with the criteria in Section 10.3 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part I.C.2.b.(i) of this permit due to *site limitations* shall direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv shall be documented in the SWPPP. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible.*

In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 10.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (Cpv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:

(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or

(2) The site *discharge*s directly to tidal waters, or fifth order or larger streams.

(iv) *Overbank* Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:

(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or

(2) A downstream analysis reveals that *overbank* control is not required.

(v) Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:

(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or

(2) A downstream analysis reveals that *overbank* control is not required.

c. Sizing Criteria for Redevelopment Activity

(i) Water Quality Volume (WQv): The WQv treatment objective for *redevelopment activity* shall be addressed by one of the following options. *Redevelopment activities* located in an Enhanced Phosphorus Removal Watershed (see Part III.B.3. and Appendix C of this permit) shall calculate the WQv in accordance with Section 10.3 of the Design Manual. All other *redevelopment activities* shall calculate the WQv in accordance with Section 4.2 of the Design Manual.

(1) Reduce the existing *impervious cover* by a minimum of 25% of the total disturbed, *impervious area*. The Soil Restoration criteria in Section 5.1.6 of the Design Manual must be applied to all newly created pervious areas, or

(2) Capture and treat a minimum of 25% of the WQv from the disturbed, *impervious area* by the application of standard SMPs; or reduce 25% of the WQv from the disturbed, *impervious area* by the application of RR techniques or standard SMPs with RRv capacity., or

(3) Capture and treat a minimum of 75% of the WQv from the disturbed, *impervious area* as well as any additional runoff from tributary areas by application of the alternative practices discussed in Sections 9.3 and 9.4 of the Design Manual., or

(4) Application of a combination of 1, 2 and 3 above that provide a weighted average of at least two of the above methods. Application of this method shall be in accordance with the criteria in Section 9.2.1(B) (IV) of the Design Manual.

If there is an existing post-construction stormwater management practice located on the site that captures and treats runoff from the *impervious area* that is being disturbed, the WQv treatment option selected must, at a minimum, provide treatment equal to the treatment that was being provided by the existing practice(s) if that treatment is greater than the treatment required by options 1 – 4 above.

(ii) Channel Protection Volume (Cpv): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iii) *Overbank* Flood Control Criteria (Qp): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iv) Extreme Flood Control Criteria (Qf): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site

d. Sizing Criteria for Combination of Redevelopment Activity and New Development

Construction projects that include both New Development and Redevelopment Activity shall provide post-construction stormwater management controls that meet the sizing criteria calculated as an aggregate of the Sizing Criteria in Part I.C.2.a. or b. of this permit for the New Development portion of the project and Part I.C.2.c of this permit for Redevelopment Activity portion of the project.

D. Maintaining Water Quality

The Department expects that compliance with the conditions of this permit will control *discharge*s necessary to meet applicable *water quality standards*. It shall be a violation of the *ECL* for any discharge to either cause or contribute to a violation of *water quality standards* as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, such as:

1. There shall be no increase in turbidity that will cause a substantial visible contrast to natural conditions;

2. There shall be no increase in suspended, colloidal or settleable solids that will cause deposition or impair the waters for their best usages; and

3. There shall be no residue from oil and floating substances, nor visible oil film, nor globules of grease.

If there is evidence indicating that the stormwater *discharge*s authorized by this permit are causing, have the reasonable potential to cause, or are contributing to a violation of the *water quality standards*; the *owner or operator* must take appropriate corrective action in accordance with Part IV.C.5. of this general permit and document in accordance with Part IV.C.4. of this general permit. To address the *water quality standard* violation the *owner or operator* may need to provide additional information, include and implement appropriate controls in the SWPPP to correct the problem, or obtain an individual SPDES permit.

If there is evidence indicating that despite compliance with the terms and conditions of this general permit it is demonstrated that the stormwater *discharge*s authorized by this permit are causing or contributing to a violation of *water quality standards*, or if the Department determines that a modification of the permit is necessary to prevent a violation of *water quality standards*, the authorized *discharge*s will no longer be eligible for coverage under this permit. The Department may require the *owner or operator* to obtain an individual SPDES permit to continue discharging.

E. Eligibility Under This General Permit

1. This permit may authorize all *discharges* of stormwater from *construction activity* to *surface waters of the State* and *groundwaters* except for ineligible *discharges* identified under subparagraph F. of this Part.

2. Except for non-stormwater *discharges* explicitly listed in the next paragraph, this permit only authorizes stormwater *discharge*s; including stormwater runoff, snowmelt runoff, and surface runoff and drainage, from *construction activities*.

3. Notwithstanding paragraphs E.1 and E.2 above, the following non-stormwater discharges are authorized by this permit: those listed in 6 NYCRR 750-1.2(a)(29)(vi), with the following exception: "Discharges from firefighting activities are authorized only when the firefighting activities are emergencies/unplanned"; waters to which other components have not been added that are used to control dust in accordance with the SWPPP; and uncontaminated *discharge*s from *construction site* de-watering operations. All non-stormwater discharges must be identified in the SWPPP. Under all circumstances, the *owner or operator* must still comply with *water quality standards* in Part I.D of this permit.

4. The *owner or operator* must maintain permit eligibility to *discharge* under this permit. Any *discharges* that are not compliant with the eligibility conditions of this permit are not authorized by the permit and the *owner or operator* must either apply for a separate permit to cover those ineligible *discharges* or take steps necessary to make the *discharge* eligible for coverage.

F. Activities Which Are Ineligible for Coverage Under This General Permit

All of the following are **not** authorized by this permit:

1. *Discharge*s after *construction activities* have been completed and the site has undergone *final stabilization*;

2. *Discharge*s that are mixed with sources of non-stormwater other than those expressly authorized under subsection E.3. of this Part and identified in the SWPPP required by this permit;

3. *Discharges* that are required to obtain an individual SPDES permit or another SPDES general permit pursuant to Part VII.K. of this permit;

4. *Construction activities* or *discharges* from *construction activities* that may adversely affect an *endangered or threatened species* unless the *owner or*

operator has obtained a permit issued pursuant to 6 NYCRR Part 182 for the project or the Department has issued a letter of non-jurisdiction for the project. All documentation necessary to demonstrate eligibility shall be maintained on site in accordance with Part II.D.2 of this permit;

5. *Discharges* which either cause or contribute to a violation of *water quality standards* adopted pursuant to the *ECL* and its accompanying regulations;

6. *Construction activities* for residential, commercial and institutional projects:

    a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

    b. Which are undertaken on land with no existing *impervious cover*; and

    c. Which disturb one (1) or more acres of land designated on the current United States Department of Agriculture ("USDA") Soil Survey as Soil Slope Phase "D", (provided the map unit name is inclusive of slopes greater than 25%), or Soil Slope Phase "E" or "F" (regardless of the map unit name), or a combination of the three designations.

7. *Construction activities* for linear transportation projects and linear utility projects:

    a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

    b. Which are undertaken on land with no existing *impervious cover*; and

    c. Which disturb two (2) or more acres of land designated on the current USDA Soil Survey as Soil Slope Phase "D" (provided the map unit name is inclusive of slopes greater than 25%), or Soil Slope Phase "E" or "F" (regardless of the map unit name), or a combination of the three designations.

8. *Construction activities* that have the potential to affect an *historic property*, unless there is documentation that such impacts have been resolved. The following documentation necessary to demonstrate eligibility with this requirement shall be maintained on site in accordance with Part II.D.2 of this permit and made available to the Department in accordance with Part VII.F of this permit:

   a. Documentation that the *construction activity* is not within an archeologically sensitive area indicated on the sensitivity map, and that the *construction activity* is not located on or immediately adjacent to a property listed or determined to be eligible for listing on the National or State Registers of Historic Places, and that there is no new permanent building on the *construction site* within the following distances from a building, structure, or object that is more than 50 years old, or if there is such a new permanent building on the *construction site* within those parameters that NYS Office of Parks, Recreation and Historic Preservation (OPRHP), a Historic Preservation Commission of a Certified Local Government, or a qualified preservation professional has determined that the building, structure, or object more than 50 years old is not historically/archeologically significant.

      - 1-5 acres of disturbance - 20 feet
      - 5-20 acres of disturbance - 50 feet
      - 20+ acres of disturbance - 100 feet, or

   b. DEC consultation form sent to OPRHP, and copied to the NYS DEC Agency Historic Preservation Officer (APO), and
      (i) the State Environmental Quality Review (SEQR) Environmental Assessment Form (EAF) with a negative declaration or the Findings Statement, with documentation of OPRHP's agreement with the resolution; or
      (ii) documentation from OPRHP that the *construction activity* will result in No Impact; or
      (iii) documentation from OPRHP providing a determination of No Adverse Impact; or
      (iv) a Letter of Resolution signed by the owner/operator, OPRHP and the DEC APO which allows for this *construction activity* to be eligible for coverage under the general permit in terms of the State Historic Preservation Act (SHPA); or

   c. Documentation of satisfactory compliance with Section 106 of the National Historic Preservation Act for a coterminous project area:

   (i) No Affect
   (ii) No Adverse Affect
   (iii) Executed Memorandum of Agreement, or

d. Documentation that:

(i) SHPA Section 14.09 has been completed by NYS DEC or another state agency.

9. *Discharge*s from *construction activities* that are subject to an existing SPDES individual or general permit where a SPDES permit for *construction activity* has been terminated or denied; or where the *owner or operator* has failed to renew an expired individual permit.

Part II. PERMIT COVERAGE

A. How to Obtain Coverage

1. An *owner or operator* of a *construction activity* that is not subject to the requirements of a regulated, traditional land use control MS4 must first prepare a SWPPP in accordance with all applicable requirements of this permit and then submit a completed Notice of Intent (NOI) to the Department to be authorized to discharge under this permit.

2. An *owner or operator* of a *construction activity* that is subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then have the SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department. The *owner or operator* shall have the “MS4 SWPPP Acceptance” form signed in accordance with Part VII.H., and then submit that form along with a completed NOI to the Department.

3. The requirement for an *owner or operator* to have its SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department does not apply to an *owner or operator* that is obtaining permit coverage in accordance with the requirements in Part II.F. (Change of *Owner or Operator*) or where the *owner or operator* of the *construction activity* is the *regulated, traditional land use control MS4* . This exemption does not apply to *construction activities* subject to the New York City Administrative Code.

B. Notice of Intent (NOI) Submittal

1. Prior to December 21, 2020, an owner or operator shall use either the electronic (eNOI) or paper version of the NOI that the Department prepared. Both versions of the NOI are located on the Department's website (http://www.dec.ny.gov/). The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the following address:

   NOTICE OF INTENT
   NYS DEC, Bureau of Water Permits
   625 Broadway, 4th Floor
   Albany, New York 12233-3505

2. Beginning December 21, 2020 and in accordance with EPA's 2015 NPDES Electronic Reporting Rule (40 CFR Part 127), the *owner or operator* must submit the NOI electronically using the *Department's* online NOI.

3. The *owner or operator* shall have the SWPPP preparer sign the "SWPPP Preparer Certification" statement on the NOI prior to submitting the form to the Department.

4. As of the date the NOI is submitted to the Department, the *owner or operator* shall make the NOI and SWPPP available for review and copying in accordance with the requirements in Part VII.F. of this permit.

C. Permit Authorization

1. An *owner or operator* shall not *commence construction activity* until their authorization to *discharge* under this permit goes into effect.

2. Authorization to *discharge* under this permit will be effective when the *owner or operator* has satisfied all of the following criteria:

   a. project review pursuant to the State Environmental Quality Review Act ("SEQRA") have been satisfied, when SEQRA is applicable. See the Department's website (http://www.dec.ny.gov/) for more information,

   b. where required, all necessary Department permits subject to the *Uniform Procedures Act ("UPA")* (see 6 NYCRR Part 621), or the equivalent from another New York State agency, have been obtained, unless otherwise notified by the Department pursuant to 6 NYCRR 621.3(a)(4). *Owners or operators* of *construction activities* that are required to obtain *UPA* permits must submit a preliminary SWPPP to the appropriate DEC Permit Administrator at the Regional Office listed in Appendix F at the time all other necessary *UPA* permit applications are submitted. The preliminary SWPPP must include sufficient information to demonstrate that the *construction activity* qualifies for authorization under this permit,

c. the final SWPPP has been prepared, and

d. a complete NOI has been submitted to the Department in accordance with the requirements of this permit.

3. An *owner or operator* that has satisfied the requirements of Part II.C.2 above will be authorized to *discharge* stormwater from their *construction activity* in accordance with the following schedule:

   a. For *construction activities* that are not subject to the requirements of a *regulated, traditional land use control MS4*:

      (i) Five (5) business days from the date the Department receives a complete electronic version of the NOI (eNOI) for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.; or

      (ii) Sixty (60) business days from the date the Department receives a complete NOI (electronic or paper version) for *construction activities* with a SWPPP that has not been prepared in conformance with the design criteria in technical standard referenced in Part III.B.1. or, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C., the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, or;

      (iii) Ten (10) business days from the date the Department receives a complete paper version of the NOI for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.

b. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*:

   (i) Five (5) business days from the date the Department receives both a complete electronic version of the NOI (eNOI) and signed "*MS4* SWPPP Acceptance" form, or

   (ii) Ten (10) business days from the date the Department receives both a complete paper version of the NOI and signed "MS4 SWPPP Acceptance" form.

4. Coverage under this permit authorizes stormwater *discharges* from only those areas of disturbance that are identified in the NOI. If an *owner or operator* wishes to have stormwater *discharges* from future or additional areas of disturbance authorized, they must submit a new NOI that addresses that phase of the development, unless otherwise notified by the Department. The *owner or operator* shall not *commence construction activity* on the future or additional areas until their authorization to *discharge* under this permit goes into effect in accordance with Part II.C. of this permit.

D. General Requirements For Owners or Operators With Permit Coverage

1. The *owner or operator* shall ensure that the provisions of the SWPPP are implemented from the *commencement of construction activity* until all areas of disturbance have achieved *final stabilization* and the Notice of Termination ("NOT") has been submitted to the Department in accordance with Part V. of this permit. This includes any changes made to the SWPPP pursuant to Part III.A.4. of this permit.

2. The *owner or operator* shall maintain a copy of the General Permit (GP-0-20-001), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form, inspection reports, responsible contractor's or subcontractor's certification statement (see Part III.A.6.), and all documentation necessary to demonstrate eligibility with this permit at the *construction site* until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department. The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

3. The *owner or operator* of a *construction activity* shall not disturb greater than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a *regulated, traditional land*

use control MS4, the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*). At a minimum, the *owner or operator* must comply with the following requirements in order to be authorized to disturb greater than five (5) acres of soil at any one time:

a. The *owner or operator* shall have a *qualified inspector* conduct **at least** two (2) site inspections in accordance with Part IV.C. of this permit every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

b. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016.

c. The *owner or operator* shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.

d. The *owner or operator* shall install any additional site-specific practices needed to protect water quality.

e. The *owner or operator* shall include the requirements above in their SWPPP.

4. In accordance with statute, regulations, and the terms and conditions of this permit, the Department may suspend or revoke an *owner's or operator's* coverage under this permit at any time if the Department determines that the SWPPP does not meet the permit requirements or consistent with Part VII.K..

5. Upon a finding of significant non-compliance with the practices described in the SWPPP or violation of this permit, the Department may order an immediate stop to all activity at the site until the non-compliance is remedied. The stop work order shall be in writing, describe the non-compliance in detail, and be sent to the *owner or operator*.

6. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*, the *owner or operator* shall notify the

regulated, traditional land use control MS4 in writing of any planned amendments or modifications to the post-construction stormwater management practice component of the SWPPP required by Part III.A. 4. and 5. of this permit. Unless otherwise notified by the *regulated, traditional land use control MS4*, the *owner or operator* shall have the SWPPP amendments or modifications reviewed and accepted by the *regulated, traditional land use control MS4* prior to commencing construction of the post-construction stormwater management practice.

E. Permit Coverage for Discharges Authorized Under GP-0-15-002

1. Upon renewal of SPDES General Permit for Stormwater Discharges from *Construction Activity* (Permit No. GP-0-15-002), an *owner or operator* of *a construction activity* with coverage under GP-0-15-002, as of the effective date of GP- 0-20-001, shall be authorized to *discharge* in accordance with GP- 0-20-001, unless otherwise notified by the Department.

   An *owner or operator* may continue to implement the technical/design components of the post-construction stormwater management controls provided that such design was done in conformance with the technical standards in place at the time of initial project authorization. However, they must comply with the other, non-design provisions of GP-0-20-001.

F. Change of Owner or Operator

1. When property ownership changes or when there is a change in operational control over the construction plans and specifications, the original *owner or operator* must notify the new *owner or operator*, in writing, of the requirement to obtain permit coverage by submitting a NOI with the Department. For *construction activities* subject to the requirements of a *regulated, traditional land use control MS4,* the original *owner or operator* must also notify the MS4, in writing, of the change in ownership at least 30 calendar days prior to the change in ownership.

2. Once the new *owner or operator* obtains permit coverage, the original *owner or operator* shall then submit a completed NOT with the name and permit identification number of the new *owner or operator* to the Department at the address in Part II.B.1. of this permit. If the original *owner or operator* maintains ownership of a portion of the *construction activity* and will disturb soil, they must maintain their coverage under the permit.

3. Permit coverage for the new *owner or operator* will be effective as of the date the Department receives a complete NOI, provided the original *owner or*

operator was not subject to a sixty (60) business day authorization period that has not expired as of the date the Department receives the NOI from the new *owner or operator*.

Part III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. General SWPPP Requirements

1. A SWPPP shall be prepared and implemented by the *owner or operator* of each *construction activity* covered by this permit. The SWPPP must document the selection, design, installation, implementation and maintenance of the control measures and practices that will be used to meet the effluent limitations in Part I.B. of this permit and where applicable, the post-construction stormwater management practice requirements in Part I.C. of this permit. The SWPPP shall be prepared prior to the submittal of the NOI. The NOI shall be submitted to the Department prior to the *commencement of construction activity*. A copy of the completed, final NOI shall be included in the SWPPP.

2. The SWPPP shall describe the erosion and sediment control practices and where required, post-construction stormwater management practices that will be used and/or constructed to reduce the *pollutants* in stormwater *discharges* and to assure compliance with the terms and conditions of this permit. In addition, the SWPPP shall identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater *discharges*.

3. All SWPPPs that require the post-construction stormwater management practice component shall be prepared by a *qualified professional* that is knowledgeable in the principles and practices of stormwater management and treatment.

4. The *owner or operator* must keep the SWPPP current so that it at all times accurately documents the erosion and sediment controls practices that are being used or will be used during construction, and all post-construction stormwater management practices that will be constructed on the site. At a minimum, the *owner or operator* shall amend the SWPPP, including construction drawings:

    a. whenever the current provisions prove to be ineffective in minimizing *pollutants* in stormwater *discharges* from the site;

b. whenever there is a change in design, construction, or operation at the *construction site* that has or could have an effect on the *discharge* of *pollutants*;

c. to address issues or deficiencies identified during an inspection by the *qualified inspector,* the Department or other regulatory authority; and

d. to document the final construction conditions.

5. The Department may notify the *owner or operator* at any time that the SWPPP does not meet one or more of the minimum requirements of this permit. The notification shall be in writing and identify the provisions of the SWPPP that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by the Department, the *owner or operator* shall make the required changes to the SWPPP and submit written notification to the Department that the changes have been made. If the *owner or operator* does not respond to the Department's comments in the specified time frame, the Department may suspend the *owner's or operator's* coverage under this permit or require the *owner or operator* to obtain coverage under an individual SPDES permit in accordance with Part II.D.4. of this permit.

6. Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP. The *owner or operator* shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the *trained contractor.* The *owner or operator* shall ensure that at least one *trained contractor* is on site on a daily basis when soil disturbance activities are being performed.

   The *owner or operator* shall have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before they commence any *construction activity*:

   > "I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with

the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater *discharge*s from *construction activities* and that it is unlawful for any person to cause or contribute to a violation of *water quality standards*. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations"

In addition to providing the certification statement above, the certification page must also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the *trained contractor* responsible for SWPPP implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The *owner or operator* shall attach the certification statement(s) to the copy of the SWPPP that is maintained at the *construction site*. If new or additional contractors are hired to implement measures identified in the SWPPP after construction has commenced, they must also sign the certification statement and provide the information listed above.

7. For projects where the Department requests a copy of the SWPPP or inspection reports, the *owner or operator* shall submit the documents in both electronic (PDF only) and paper format within five (5) business days, unless otherwise notified by the Department.

B. Required SWPPP Contents

1. Erosion and sediment control component - All SWPPPs prepared pursuant to this permit shall include erosion and sediment control practices designed in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Where erosion and sediment control practices are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must demonstrate *equivalence* to the technical standard. At a minimum, the erosion and sediment control component of the SWPPP shall include the following:

   a. Background information about the scope of the project, including the location, type and size of project

b. A site map/construction drawing(s) for the project, including a general location map. At a minimum, the site map shall show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s); floodplain/floodway boundaries; wetlands and drainage patterns that could be affected by the *construction activity*; existing and final contours ; locations of different soil types with boundaries; material, waste, borrow or equipment storage areas located on adjacent properties; and location(s) of the stormwater *discharge*(s);

c. A description of the soil(s) present at the site, including an identification of the Hydrologic Soil Group (HSG);

d. A construction phasing plan and sequence of operations describing the intended order of *construction activities*, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other activity at the site that results in soil disturbance;

e. A description of the minimum erosion and sediment control practices to be installed or implemented for each *construction activity* that will result in soil disturbance. Include a schedule that identifies the timing of initial placement or implementation of each erosion and sediment control practice and the minimum time frames that each practice should remain in place or be implemented;

f. A temporary and permanent soil stabilization plan that meets the requirements of this general permit and the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, for each stage of the project, including initial land clearing and grubbing to project completion and achievement of *final stabilization*;

g. A site map/construction drawing(s) showing the specific location(s), size(s), and length(s) of each erosion and sediment control practice;

h. The dimensions, material specifications, installation details, and operation and maintenance requirements for all erosion and sediment control practices. Include the location and sizing of any temporary sediment basins and structural practices that will be used to divert flows from exposed soils;

i. A maintenance inspection schedule for the contractor(s) identified in Part III.A.6. of this permit, to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection schedule shall be in accordance with the requirements in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016;

j. A description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a *pollutant* source in the stormwater *discharges*;

k. A description and location of any stormwater *discharges* associated with industrial activity other than construction at the site, including, but not limited to, stormwater *discharges* from asphalt plants and concrete plants located on the *construction site*; and

l. Identification of any elements of the design that are not in conformance with the design criteria in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. Post-construction stormwater management practice component – The *owner or operator* of any construction project identified in Table 2 of Appendix B as needing post-construction stormwater management practices shall prepare a SWPPP that includes practices designed in conformance with the applicable *sizing criteria* in Part I.C.2.a., c. or d. of this permit and the *performance criteria* in the technical standard, New York State Stormwater Management Design Manual dated January 2015

   Where post-construction stormwater management practices are not designed in conformance with the *performance criteria* in the technical standard, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

   The post-construction stormwater management practice component of the SWPPP shall include the following:

   a. Identification of all post-construction stormwater management practices to be constructed as part of the project. Include the dimensions, material specifications and installation details for each post-construction stormwater management practice;

b. A site map/construction drawing(s) showing the specific location and size of each post-construction stormwater management practice;

c. A Stormwater Modeling and Analysis Report that includes:
   (i) Map(s) showing pre-development conditions, including watershed/subcatchments boundaries, flow paths/routing, and design points;

   (ii) Map(s) showing post-development conditions, including watershed/subcatchments boundaries, flow paths/routing, design points and post-construction stormwater management practices;

   (iii) Results of stormwater modeling (i.e. hydrology and hydraulic analysis) for the required storm events. Include supporting calculations (model runs), methodology, and a summary table that compares pre and post-development runoff rates and volumes for the different storm events;

   (iv) Summary table, with supporting calculations, which demonstrates that each post-construction stormwater management practice has been designed in conformance with the *sizing criteria* included in the Design Manual;

   (v) Identification of any *sizing criteria* that is not required based on the requirements included in Part I.C. of this permit; and

   (vi) Identification of any elements of the design that are not in conformance with the *performance criteria* in the Design Manual. Include the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the Design Manual;

d. Soil testing results and locations (test pits, borings);

e. Infiltration test results, when required; and

f. An operations and maintenance plan that includes inspection and maintenance schedules and actions to ensure continuous and effective operation of each post-construction stormwater management practice. The plan shall identify the entity that will be responsible for the long term operation and maintenance of each practice.

3. Enhanced Phosphorus Removal Standards - All construction projects identified in Table 2 of Appendix B that are located in the watersheds identified in Appendix C shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the applicable *sizing criteria* in Part I.C.2. b., c. or d. of this permit and the *performance criteria,* Enhanced Phosphorus Removal Standards included in the Design Manual. At a minimum, the post-construction stormwater management practice component of the SWPPP shall include items 2.a - 2.f. above.

C. Required SWPPP Components by Project Type

Unless otherwise notified by the Department, *owners or operators* of *construction activities* identified in Table 1 of Appendix B are required to prepare a SWPPP that only includes erosion and sediment control practices designed in conformance with Part III.B.1 of this permit. *Owners or operators* of the *construction activities* identified in Table 2 of Appendix B shall prepare a SWPPP that also includes post-construction stormwater management practices designed in conformance with Part III.B.2 or 3 of this permit.

Part IV. INSPECTION AND MAINTENANCE REQUIREMENTS

A. General Construction Site Inspection and Maintenance Requirements

1. The *owner or operator* must ensure that all erosion and sediment control practices (including pollution prevention measures) and all post-construction stormwater management practices identified in the SWPPP are inspected and maintained in accordance with Part IV.B. and C. of this permit.

2. The terms of this permit shall not be construed to prohibit the State of New York from exercising any authority pursuant to the ECL, common law or federal law, or prohibit New York State from taking any measures, whether civil or criminal, to prevent violations of the laws of the State of New York or protect the public health and safety and/or the environment.

B. Contractor Maintenance Inspection Requirements

1. The *owner or operator* of each *construction activity* identified in Tables 1 and 2 of Appendix B shall have a *trained contractor* inspect the erosion and sediment control practices and pollution prevention measures being implemented within the active work area daily to ensure that they are being maintained in effective operating condition at all times. If deficiencies are identified, the contractor shall

begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.

2. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *trained contractor* can stop conducting the maintenance inspections. The *trained contractor* shall begin conducting the maintenance inspections in accordance with Part IV.B.1. of this permit as soon as soil disturbance activities resume.

3. For construction sites where soil disturbance activities have been shut down with partial project completion, the *trained contractor* can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

C. Qualified Inspector Inspection Requirements

The *owner or operator* shall have a *qualified inspector* conduct site inspections in conformance with the following requirements:

[Note: The *trained contractor* identified in Part III.A.6. and IV.B. of this permit **cannot** conduct the *qualified inspector* site inspections unless they meet the *qualified inspector* qualifications included in Appendix A. In order to perform these inspections, the *trained contractor* would have to be a:

- licensed Professional Engineer,
- Certified Professional in Erosion and Sediment Control (CPESC),
- New York State Erosion and Sediment Control Certificate Program holder
- Registered Landscape Architect, or
- someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity].

1. A *qualified inspector* shall conduct site inspections for all *construction activities* identified in Tables 1 and 2 of Appendix B, with the exception of:

    a. the construction of a single family residential subdivision with 25% or less *impervious cover* at total site build-out that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E;

b. the construction of a single family home that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E;

c. construction on agricultural property that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres; and

d. *construction activities* located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

2. Unless otherwise notified by the Department, the *qualified inspector* shall conduct site inspections in accordance with the following timetable:

    a. For construction sites where soil disturbance activities are on-going, the *qualified inspector* shall conduct a site inspection at least once every seven (7) calendar days.

    b. For construction sites where soil disturbance activities are on-going and the *owner or operator* has received authorization in accordance with Part II.D.3 to disturb greater than five (5) acres of soil at any one time, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

    c. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *qualified inspector* shall conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to reducing the frequency of inspections.

d. For construction sites where soil disturbance activities have been shut down with partial project completion, the *qualified inspector* can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the *owner or operator* shall have the *qualified inspector* perform a final inspection and certify that all disturbed areas have achieved *final stabilization,* and all temporary, structural erosion and sediment control measures have been removed*;* and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice" certification statements on the NOT. The *owner or operator* shall then submit the completed NOT form to the address in Part II.B.1 of this permit.

e. For construction sites that directly *discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

3. At a minimum, the *qualified inspector* shall inspect all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved *final stabilization,* all points of *discharge* to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the *construction site*, and all points of *discharge* from the *construction site*.

4. The *qualified inspector* shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

a. Date and time of inspection;

b. Name and title of person(s) performing inspection;

c. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

d. A description of the condition of the runoff at all points of *discharge* from the *construction site*. This shall include identification of any *discharges* of sediment from the *construction site*. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the *construction site* which receive runoff from disturbed areas. This shall include identification of any *discharges* of sediment to the surface waterbody;

f. Identification of all erosion and sediment control practices and pollution prevention measures that need repair or maintenance;

g. Identification of all erosion and sediment control practices and pollution prevention measures that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

h. Description and sketch of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection;

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices and pollution prevention measures; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s);

k. Identification and status of all corrective actions that were required by previous inspection; and

l. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

5. Within one business day of the completion of an inspection, the *qualified inspector* shall notify the *owner or operator* and appropriate contractor or subcontractor identified in Part III.A.6. of this permit of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

6. All inspection reports shall be signed by the *qualified inspector.* Pursuant to Part II.D.2. of this permit, the inspection reports shall be maintained on site with the SWPPP.

Part V. TERMINATION OF PERMIT COVERAGE

A. Termination of Permit Coverage

1. An *owner or operator* that is eligible to terminate coverage under this permit must submit a completed NOT form to the address in Part II.B.1 of this permit. The NOT form shall be one which is associated with this permit, signed in accordance with Part VII.H of this permit.

2. An *owner or operator* may terminate coverage when one or more the following conditions have been met:

   a. Total project completion - All *construction activity* identified in the SWPPP has been completed; and all areas of disturbance have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices have been constructed in conformance with the SWPPP and are operational;

b. Planned shutdown with partial project completion - All soil disturbance activities have ceased; and all areas disturbed as of the project shutdown date have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational;

c. A new *owner or operator* has obtained coverage under this permit in accordance with Part II.F. of this permit.

d. The *owner or operator* obtains coverage under an alternative SPDES general permit or an individual SPDES permit.

3. For *construction activities* meeting subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *qualified inspector* perform a final site inspection prior to submitting the NOT. The *qualified inspector* shall, by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice certification statements on the NOT, certify that all the requirements in Part V.A.2.a. or b. of this permit have been achieved.

4. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4* and meet subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *regulated, traditional land use control MS4* sign the "MS4 Acceptance" statement on the NOT in accordance with the requirements in Part VII.H. of this permit. The *regulated, traditional land use control MS4* official, by signing this statement, has determined that it is acceptable for the *owner or operator* to submit the NOT in accordance with the requirements of this Part. The *regulated, traditional land use control MS4* can make this determination by performing a final site inspection themselves or by accepting the *qualified inspector*'s final site inspection certification(s) required in Part V.A.3. of this permit.

5. For *construction activities* that require post-construction stormwater management practices and meet subdivision 2a. of this Part, the *owner or operator* must, prior to submitting the NOT, ensure one of the following:

a. the post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain such practice(s) have been deeded to the municipality in which the practice(s) is located,

b. an executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s),

c. for post-construction stormwater management practices that are privately owned, the *owner or operator* has a mechanism in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the *owner or operator's* deed of record,

d. for post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university, hospital), government agency or authority, or public utility; the *owner or operator* has policy and procedures in place that ensures operation and maintenance of the practices in accordance with the operation and maintenance plan.

Part VI. REPORTING AND RETENTION RECORDS

A. Record Retention

The *owner or operator* shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five (5) years from the date that the Department receives a complete NOT submitted in accordance with Part V. of this general permit.

B. Addresses

With the exception of the NOI, NOT, and MS4 SWPPP Acceptance form (which must be submitted to the address referenced in Part II.B.1 of this permit), all written correspondence requested by the Department, including individual permit applications, shall be sent to the address of the appropriate DOW Water (SPDES) Program contact at the Regional Office listed in Appendix F.

Part VII. STANDARD PERMIT CONDITIONS

A. Duty to Comply

The *owner or operator* must comply with all conditions of this permit. All contractors and subcontractors associated with the project must comply with the terms of the SWPPP. Any non-compliance with this permit constitutes a violation of the Clean Water

Act (CWA) and the ECL and is grounds for an enforcement action against the *owner or operator* and/or the contractor/subcontractor; permit revocation, suspension or modification; or denial of a permit renewal application. Upon a finding of significant non-compliance with this permit or the applicable SWPPP, the Department may order an immediate stop to all *construction activity* at the site until the non-compliance is remedied. The stop work order shall be in writing, shall describe the non-compliance in detail, and shall be sent to the *owner or operator*.

If any human remains or archaeological remains are encountered during excavation, the *owner or operator* must immediately cease, or cause to cease, all *construction activity* in the area of the remains and notify the appropriate Regional Water Engineer (RWE). *Construction activity* shall not resume until written permission to do so has been received from the RWE.

B. Continuation of the Expired General Permit

This permit expires five (5) years from the effective date. If a new general permit is not issued prior to the expiration of this general permit, an *owner or operator* with coverage under this permit may continue to operate and *discharge* in accordance with the terms and conditions of this general permit, if it is extended pursuant to the State Administrative Procedure Act and 6 NYCRR Part 621, until a new general permit is issued.

C. Enforcement

Failure of the *owner or operator,* its contractors, subcontractors, agents and/or assigns to strictly adhere to any of the permit requirements contained herein shall constitute a violation of this permit. There are substantial criminal, civil, and administrative penalties associated with violating the provisions of this permit. Fines of up to $37,500 per day for each violation and imprisonment for up to fifteen (15) years may be assessed depending upon the nature and degree of the offense.

D. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for an *owner or operator* in an enforcement action that it would have been necessary to halt or reduce the *construction activity* in order to maintain compliance with the conditions of this permit.

E. Duty to Mitigate

The *owner or operator* and its contractors and subcontractors shall take all reasonable steps to *minimize* or prevent any *discharge* in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

F. Duty to Provide Information

The *owner or operator* shall furnish to the Department, within a reasonable specified time period of a written request, all documentation necessary to demonstrate eligibility and any information to determine compliance with this permit or to determine whether cause exists for modifying or revoking this permit, or suspending or denying coverage under this permit, in accordance with the terms and conditions of this permit. The NOI, SWPPP and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five (5) business days of the *owner or operator* receiving a written request by any such person to review these documents. Copying of documents will be done at the requester's expense.

G. Other Information

When the *owner or operator* becomes aware that they failed to submit any relevant facts, or submitted incorrect information in the NOI or in any of the documents required by this permit , or have made substantive revisions to the SWPPP (e.g. the scope of the project changes significantly, the type of post-construction stormwater management practice(s) changes, there is a reduction in the sizing of the post-construction stormwater management practice, or there is an increase in the disturbance area or *impervious area*), which were not reflected in the original NOI submitted to the Department, they shall promptly submit such facts or information to the Department using the contact information in Part II.A. of this permit. Failure of the *owner or operator* to correct or supplement any relevant facts within five (5) business days of becoming aware of the deficiency shall constitute a violation of this permit.

H. Signatory Requirements

1. All NOIs and NOTs shall be signed as follows:

   a. For a corporation these forms shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

(i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

(ii) the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

b. For a partnership or sole proprietorship these forms shall be signed by a general partner or the proprietor, respectively; or

c. For a municipality, State, Federal, or other public agency these forms shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(i) the chief executive officer of the agency, or

(ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. The SWPPP and other information requested by the Department shall be signed by a person described in Part VII.H.1. of this permit or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Part VII.H.1. of this permit;

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of *equivalent* responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position) and,

c. The written authorization shall include the name, title and signature of the authorized representative and be attached to the SWPPP.

3. All inspection reports shall be signed by the *qualified inspector* that performs the inspection.

4. The MS4 SWPPP Acceptance form shall be signed by the principal executive officer or ranking elected official from the *regulated, traditional land use control MS4,* or by a duly authorized representative of that person.

   It shall constitute a permit violation if an incorrect and/or improper signatory authorizes any required forms, SWPPP and/or inspection reports.

I. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. *Owners or operators* must obtain any applicable conveyances, easements, licenses and/or access to real property prior to *commencing construction activity*.

J. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

K. Requirement to Obtain Coverage Under an Alternative Permit

1. The Department may require any owner or operator authorized by this permit to apply for and/or obtain either an individual SPDES permit or another SPDES general permit. When the Department requires any discharger authorized by a general permit to apply for an individual SPDES permit, it shall notify the discharger in writing that a permit application is required. This notice shall

include a brief statement of the reasons for this decision, an application form, a statement setting a time frame for the owner or operator to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from owner or operator receipt of the notification letter, whereby the authorization to discharge under this general permit shall be terminated. Applications must be submitted to the appropriate Permit Administrator at the Regional Office. The Department may grant additional time upon demonstration, to the satisfaction of the Department, that additional time to apply for an alternative authorization is necessary or where the Department has not provided a permit determination in accordance with Part 621 of this Title.

2. When an individual SPDES permit is issued to a discharger authorized to *discharge* under a general SPDES permit for the same *discharge*(s), the general permit authorization for outfalls authorized under the individual SPDES permit is automatically terminated on the effective date of the individual permit unless termination is earlier in accordance with 6 NYCRR Part 750.

L. Proper Operation and Maintenance

The *owner or operator* shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the *owner or operator* to achieve compliance with the conditions of this permit and with the requirements of the SWPPP.

M. Inspection and Entry

The *owner or operator* shall allow an authorized representative of the Department, EPA, applicable county health department, or, in the case of a *construction site* which *discharges* through an *MS4*, an authorized representative of the *MS4* receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the owner’s or operator's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment), practices or operations regulated or required by this permit.

4. Sample or monitor at reasonable times, for purposes of assuring permit compliance or as otherwise authorized by the Act or ECL, any substances or parameters at any location.

N. Permit Actions

This permit may, at any time, be modified, suspended, revoked, or renewed by the Department in accordance with 6 NYCRR Part 621. The filing of a request by the *owner or operator* for a permit modification, revocation and reissuance, termination, a notification of planned changes or anticipated noncompliance does not limit, diminish and/or stay compliance with any terms of this permit.

O. Definitions

Definitions of key terms are included in Appendix A of this permit.

P. Re-Opener Clause

1. If there is evidence indicating potential or realized impacts on water quality due to any stormwater discharge associated with construction activity covered by this permit, the owner or operator of such discharge may be required to obtain an individual permit or alternative general permit in accordance with Part VII.K. of this permit or the permit may be modified to include different limitations and/or requirements.

2. Any Department initiated permit modification, suspension or revocation will be conducted in accordance with 6 NYCRR Part 621, 6 NYCRR 750-1.18, and 6 NYCRR 750-1.20.

Q. Penalties for Falsification of Forms and Reports

In accordance with 6NYCRR Part 750-2.4 and 750-2.5, any person who knowingly makes any false material statement, representation, or certification in any application, record, report or other document filed or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished in accordance with ECL §71-1933 and or Articles 175 and 210 of the New York State Penal Law.

R. Other Permits

Nothing in this permit relieves the *owner or operator* from a requirement to obtain any other permits required by law.

APPENDIX A – Acronyms and Definitions

Acronyms

APO – Agency Preservation Officer
BMP – Best Management Practice
CPESC – Certified Professional in Erosion and Sediment Control
Cpv – Channel Protection Volume
CWA – Clean Water Act (or the Federal Water Pollution Control Act, 33 U.S.C. §1251 et seq)
DOW – Division of Water
EAF – Environmental Assessment Form
ECL - Environmental Conservation Law
EPA – U. S. Environmental Protection Agency
HSG – Hydrologic Soil Group
MS4 – Municipal Separate Storm Sewer System
NOI – Notice of Intent
NOT – Notice of Termination
NPDES – National Pollutant Discharge Elimination System
OPRHP – Office of Parks, Recreation and Historic Places
Qf – Extreme Flood
Qp – Overbank Flood
RRv – Runoff Reduction Volume
RWE – Regional Water Engineer
SEQR – State Environmental Quality Review
SEQRA - State Environmental Quality Review Act
SHPA – State Historic Preservation Act
SPDES – State Pollutant Discharge Elimination System
SWPPP – Stormwater Pollution Prevention Plan
TMDL – Total Maximum Daily Load
UPA – Uniform Procedures Act
USDA – United States Department of Agriculture
WQv – Water Quality Volume

Definitions

All definitions in this section are solely for the purposes of this permit.

Agricultural Building – a structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products; excluding any structure designed, constructed or used, in whole or in part, for human habitation, as a place of employment where agricultural products are processed, treated or packaged, or as a place used by the public.

Agricultural Property –means the land for construction of a barn, *agricultural building*, silo, stockyard, pen or other structural practices identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State" prepared by the Department in cooperation with agencies of New York Nonpoint Source Coordinating Committee (dated June 2007).

Alter Hydrology from Pre to Post-Development Conditions - means the post-development peak flow rate(s) has increased by more than 5% of the pre-developed condition for the design storm of interest (e.g. 10 yr and 100 yr).

Combined Sewer - means a sewer that is designed to collect and convey both "sewage" and "stormwater".

Commence (Commencement of) Construction Activities - means the initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices required in the SWPPP. See definition for "*Construction Activity(ies)*" also.

Construction Activity(ies) - means any clearing, grading, excavation, filling, demolition or stockpiling activities that result in soil disturbance. Clearing activities can include, but are not limited to, logging equipment operation, the cutting and skidding of trees, stump removal and/or brush root removal. Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Construction Site – means the land area where *construction activity(ies)* will occur. See definition for "*Commence (Commencement of) Construction Activities"* and "*Larger Common Plan of Development or Sale" also.*

Dewatering – means the act of draining rainwater and/or groundwater from building foundations, vaults or excavations/trenches.

Direct Discharge (to a specific surface waterbody) - means that runoff flows from a *construction site* by overland flow and the first point of discharge is the specific surface waterbody, or runoff flows from a *construction site* to a separate storm sewer system and the first point of discharge from the separate storm sewer system is the specific surface waterbody.

Discharge(s) - means any addition of any pollutant to waters of the State through an outlet or *point source*.

Embankment –means an earthen or rock slope that supports a road/highway.

Endangered or Threatened Species – see 6 NYCRR Part 182 of the Department's rules and regulations for definition of terms and requirements.

Environmental Conservation Law (ECL) - means chapter 43-B of the Consolidated Laws of the State of New York, entitled the Environmental Conservation Law.

Equivalent (Equivalence) – means that the practice or measure meets all the performance, longevity, maintenance, and safety objectives of the technical standard and will provide an equal or greater degree of water quality protection.

Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

General SPDES permit - means a SPDES permit issued pursuant to 6 NYCRR Part 750-1.21 and Section 70-0117 of the ECL authorizing a category of discharges.

Groundwater(s) - means waters in the saturated zone. The saturated zone is a subsurface zone in which all the interstices are filled with water under pressure greater than that of the atmosphere. Although the zone may contain gas-filled interstices or interstices filled with fluids other than water, it is still considered saturated.

Historic Property – means any building, structure, site, object or district that is listed on the State or National Registers of Historic Places or is determined to be eligible for listing on the State or National Registers of Historic Places.

Impervious Area (Cover) - means all impermeable surfaces that cannot effectively infiltrate rainfall. This includes paved, concrete and gravel surfaces (i.e. parking lots, driveways, roads, runways and sidewalks); building rooftops and miscellaneous impermeable structures such as patios, pools, and sheds.

Infeasible – means not technologically possible, or not economically practicable and achievable in light of best industry practices.

Larger Common Plan of Development or Sale - means a contiguous area where multiple separate and distinct *construction activities* are occurring, or will occur, under one plan. The term “plan” in “larger common plan of development or sale” is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, marketing plan, advertisement, drawing, permit application, State Environmental Quality Review Act (SEQRA) environmental assessment form or other documents, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that *construction activities* may occur on a specific plot.

For discrete construction projects that are located within a larger common plan of development or sale that are at least 1/4 mile apart, each project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline or utility project that is part of the same “common plan” is not concurrently being disturbed.

Minimize – means reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practices.

Municipal Separate Storm Sewer (MS4) - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters of the State*;*
(ii) Designed or used for collecting or conveying stormwater;
(iii) Which is not a *combined sewer*; and
(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES) - means the national system for the issuance of wastewater and stormwater permits under the Federal Water Pollution Control Act (Clean Water Act).

Natural Buffer –means an undisturbed area with natural cover running along a surface water (e.g. wetland, stream, river, lake, etc.).

New Development – means any land disturbance that does not meet the definition of Redevelopment Activity included in this appendix.

New York State Erosion and Sediment Control Certificate Program – a certificate program that establishes and maintains a process to identify and recognize individuals who are capable of developing, designing, inspecting and maintaining erosion and sediment control plans on projects that disturb soils in New York State. The certificate program is administered by the New York State Conservation District Employees Association.

NOI Acknowledgment Letter - means the letter that the Department sends to an owner or operator to acknowledge the Department's receipt and acceptance of a complete Notice of Intent. This letter documents the owner's or operator's authorization to discharge in accordance with the general permit for stormwater discharges from *construction activity*.

Nonpoint Source - means any source of water pollution or pollutants which is not a discrete conveyance or *point source* permitted pursuant to Title 7 or 8 of Article 17 of the Environmental Conservation Law (see ECL Section 17-1403).

Overbank –means flow events that exceed the capacity of the stream channel and spill out into the adjacent floodplain.

Owner or Operator - means the person, persons or legal entity which owns or leases the property on which the *construction activity* is occurring; an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications; and/or an entity that has day-to-day operational control of those activities at a project that are necessary to ensure compliance with the permit conditions.

Performance Criteria – means the design criteria listed under the "Required Elements" sections in Chapters 5, 6 and 10 of the technical standard, New York State Stormwater Management Design Manual, dated January 2015. It does not include the Sizing Criteria (i.e. WQv, RRv, Cpv, Qp and Qf) in Part I.C.2. of the permit.

Point Source - means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, or landfill leachate collection system from which *pollutants* are or may be discharged.

Pollutant - means dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast discharged into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in 6 NYCRR Parts 700 et seq .

Qualified Inspector - means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, New York State Erosion and Sediment Control Certificate Program holder or other Department endorsed individual(s).

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the *Qualified Professional* qualifications in addition to the *Qualified Inspector* qualifications.

Note: Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

Qualified Professional - means a person that is knowledgeable in the principles and practices of stormwater management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other Department endorsed individual(s). Individuals preparing SWPPPs that require the post-construction stormwater management practice component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics. All components of the SWPPP that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York.

Redevelopment Activity(ies) – means the disturbance and reconstruction of existing impervious area, including impervious areas that were removed from a project site within five (5) years of preliminary project plan submission to the local government (i.e. site plan, subdivision, etc.).

Regulated, Traditional Land Use Control MS4 - means a city, town or village with land use control authority that is authorized to discharge under New York State DEC's

SPDES General Permit For Stormwater Discharges from Municipal Separate Stormwater Sewer Systems (MS4s) or the City of New York's Individual SPDES Permit for their Municipal Separate Storm Sewer Systems (NY-0287890).

Routine Maintenance Activity - means *construction activity* that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility, including, but not limited to:

- Re-grading of gravel roads or parking lots,
- Cleaning and shaping of existing roadside ditches and culverts that maintains the approximate original line and grade, and hydraulic capacity of the ditch,
- Cleaning and shaping of existing roadside ditches that does not maintain the approximate original grade, hydraulic capacity and purpose of the ditch if the changes to the line and grade, hydraulic capacity or purpose of the ditch are installed to improve water quality and quantity controls (e.g. installing grass lined ditch),
- Placement of aggregate shoulder backing that stabilizes the transition between the road shoulder and the ditch or *embankment*,
- Full depth milling and filling of existing asphalt pavements, replacement of concrete pavement slabs, and similar work that does not expose soil or disturb the bottom six (6) inches of subbase material,
- Long-term use of equipment storage areas at or near highway maintenance facilities,
- Removal of sediment from the edge of the highway to restore a previously existing sheet-flow drainage connection from the highway surface to the highway ditch or *embankment*,
- Existing use of Canal Corp owned upland disposal sites for the canal, and
- Replacement of curbs, gutters, sidewalks and guide rail posts.

Site limitations – means site conditions that prevent the use of an infiltration technique and or infiltration of the total WQv. Typical site limitations include: seasonal high groundwater, shallow depth to bedrock, and soils with an infiltration rate less than 0.5 inches/hour. The existence of site limitations shall be confirmed and documented using actual field testing (i.e. test pits, soil borings, and infiltration test) or using information from the most current United States Department of Agriculture (USDA) Soil Survey for the County where the project is located.

Sizing Criteria – means the criteria included in Part I.C.2 of the permit that are used to size post-construction stormwater management control practices. The criteria include; Water Quality Volume (WQv), Runoff Reduction Volume (RRv), Channel Protection Volume (Cpv), *Overbank* Flood (Qp), and Extreme Flood (Qf).

State Pollutant Discharge Elimination System (SPDES) - means the system established pursuant to Article 17 of the ECL and 6 NYCRR Part 750 for issuance of permits authorizing discharges to the waters of the state.

Steep Slope – means land area designated on the current United States Department of Agriculture ("USDA") Soil Survey as Soil Slope Phase "D", (provided the map unit name is inclusive of slopes greater than 25%) , or Soil Slope Phase E or F, (regardless of the map unit name), or a combination of the three designations.

Streambank – as used in this permit, means the terrain alongside the bed of a creek or stream. The bank consists of the sides of the channel, between which the flow is confined.

Stormwater Pollution Prevention Plan (SWPPP) – means a project specific report, including construction drawings, that among other things: describes the construction activity(ies), identifies the potential sources of pollution at the *construction site*; describes and shows the stormwater controls that will be used to control the pollutants (i.e. erosion and sediment controls; for many projects, includes post-construction stormwater management controls); and identifies procedures the *owner or operator* will implement to comply with the terms and conditions of the permit. See Part III of the permit for a complete description of the information that must be included in the SWPPP.

Surface Waters of the State - shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial seas of the state of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface waters), which are wholly or partially within or bordering the state or within its jurisdiction. Waters of the state are further defined in 6 NYCRR Parts 800 to 941.

Temporarily Ceased – means that an existing disturbed area will not be disturbed again within 14 calendar days of the previous soil disturbance.

Temporary Stabilization - means that exposed soil has been covered with material(s) as set forth in the technical standard, New York Standards and Specifications for Erosion and Sediment Control, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats (e.g. jute twisted yarn, excelsior wood fiber mats).

Total Maximum Daily Loads (TMDLs) - A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and *nonpoint source*s. It is a calculation of the maximum amount of a pollutant that a waterbody can receive on a daily basis and still meet *water quality standards*, and an allocation of that amount to the pollutant's sources. A TMDL stipulates wasteload allocations (WLAs) for *point source* discharges, load allocations (LAs) for *nonpoint source*s, and a margin of safety (MOS).

Trained Contractor - means an employee from the contracting (construction) company, identified in Part III.A.6., that has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

It can also mean an employee from the contracting (construction) company, identified in Part III.A.6., that meets the *qualified inspector* qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, New York State Erosion and Sediment Control Certificate Program holder, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity).

The *trained contractor* is responsible for the day to day implementation of the SWPPP.

Uniform Procedures Act (UPA) Permit - means a permit required under 6 NYCRR Part 621 of the Environmental Conservation Law (ECL), Article 70.

Water Quality Standard - means such measures of purity or quality for any waters in relation to their reasonable and necessary use as promulgated in 6 NYCRR Part 700 et seq.

APPENDIX B – Required SWPPP Components by Project Type

Table 1
Construction Activities that Require the Preparation of a SWPPP That Only Includes Erosion and Sediment Controls

The following construction activities that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres:

- Single family home not located in one of the watersheds listed in Appendix C or not *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions with 25% or less impervious cover at total site build-out and not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E
- Construction of a barn or other *agricultural building*, silo, stock yard or pen.

The following construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land:

All construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Installation of underground, linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains
- Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects
- Pond construction
- Linear bike paths running through areas with vegetative cover, including bike paths surfaced with an impervious cover
- Cross-country ski trails and walking/hiking trails
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are not part of residential, commercial or institutional development;
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that include incidental shoulder or curb work along an existing highway to support construction of the sidewalk, bike path or walking path.
- Slope stabilization projects
- Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics

Table 1 (Continued) CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP

THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Spoil areas that will be covered with vegetation
- Vegetated open space projects (i.e. recreational parks, lawns, meadows, fields, downhill ski trails) excluding projects that *alter hydrology from pre to post development* conditions,
- Athletic fields (natural grass) that do not include the construction or reconstruction of *impervious area* and do not *alter hydrology from pre to post development* conditions
- Demolition project where vegetation will be established, and no redevelopment is planned
- Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with *impervious cover*
- Structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State”, excluding projects that involve soil disturbances of greater than five acres and construction activities that include the construction or reconstruction of impervious area
- Temporary access roads, median crossovers, detour roads, lanes, or other temporary impervious areas that will be restored to pre-construction conditions once the construction activity is complete

Table 2

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Single family home located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family home that disturbs five (5) or more acres of land
- Single family residential subdivisions located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions that involve soil disturbances of between one (1) and five (5) acres of land with greater than 25% impervious cover at total site build-out
- Single family residential subdivisions that involve soil disturbances of five (5) or more acres of land, and single family residential subdivisions that involve soil disturbances of less than five (5) acres that are part of a larger common plan of development or sale that will ultimately disturb five or more acres of land
- Multi-family residential developments; includes duplexes, townhomes, condominiums, senior housing complexes, apartment complexes, and mobile home parks
- Airports
- Amusement parks
- Breweries, cideries, and wineries, including establishments constructed on agricultural land
- Campgrounds
- Cemeteries that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Commercial developments
- Churches and other places of worship
- Construction of a barn or other *agricultural building* (e.g. silo) and structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State” that include the construction or reconstruction of *impervious area*, excluding projects that involve soil disturbances of less than five acres.
- Golf courses
- Institutional development; includes hospitals, prisons, schools and colleges
- Industrial facilities; includes industrial parks
- Landfills
- Municipal facilities; includes highway garages, transfer stations, office buildings, POTW’s, water treatment plants, and water storage tanks
- Office complexes
- Playgrounds that include the construction or reconstruction of impervious area
- Sports complexes
- Racetracks; includes racetracks with earthen (dirt) surface
- Road construction or reconstruction, including roads constructed as part of the construction activities listed in Table 1

Table 2 (Continued)

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Parking lot construction or reconstruction, including parking lots constructed as part of the construction activities listed in Table 1
- Athletic fields (natural grass) that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Athletic fields with artificial turf
- Permanent access roads, parking areas, substations, compressor stations and well drilling pads, surfaced with *impervious cover,* and constructed as part of an over-head electric transmission line project, wind-power project, cell tower project, oil or gas well drilling project, sewer or water main project or other linear utility project
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a residential, commercial or institutional development
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a highway construction or reconstruction project
- All other construction activities that include the construction or reconstruction of *impervious area* or *alter the hydrology from pre to post development* conditions, and are not listed in Table 1

APPENDIX C – Watersheds Requiring Enhanced Phosphorus Removal

Watersheds where *owners or operators* of construction activities identified in Table 2 of Appendix B must prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the technical standard, New York State Stormwater Management Design Manual ("Design Manual").

- Entire New York City Watershed located east of the Hudson River **-** Figure 1
- Onondaga Lake Watershed **-** Figure 2
- Greenwood Lake Watershed **-**Figure 3
- Oscawana Lake Watershed – Figure 4
- Kinderhook Lake Watershed – Figure 5

Figure 1 - New York City Watershed East of the Hudson

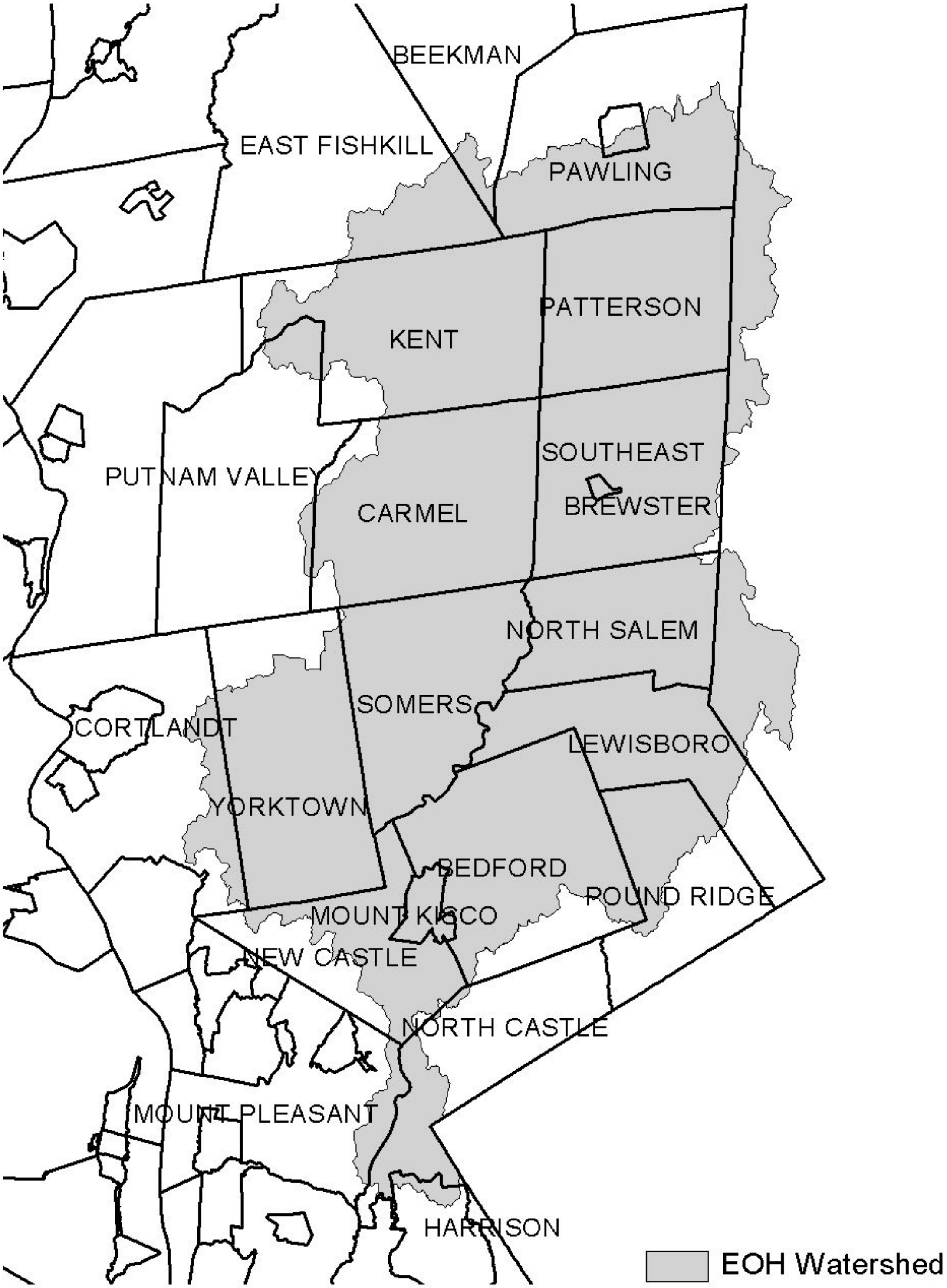


Figure 2 - Onondaga Lake Watershed

Figure 3 - Greenwood Lake Watershed

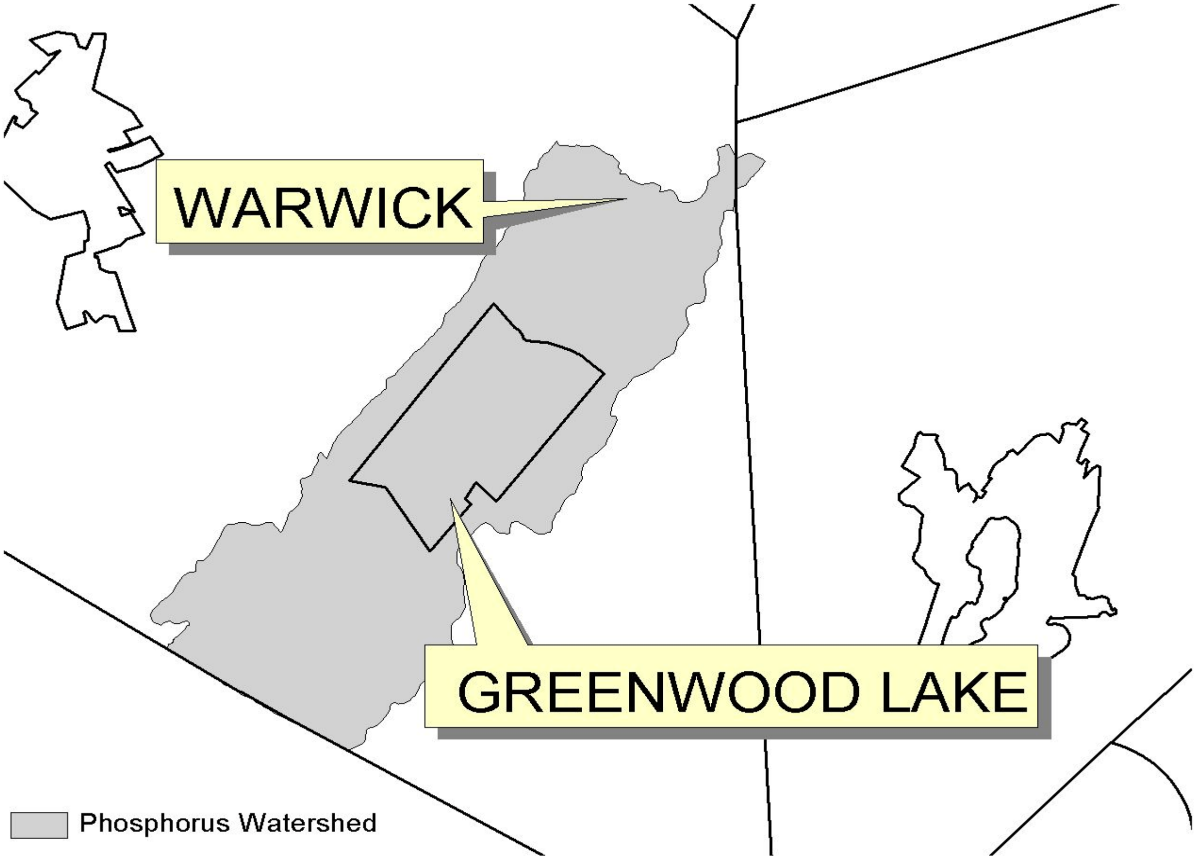


Figure 4 - Oscawana Lake Watershed

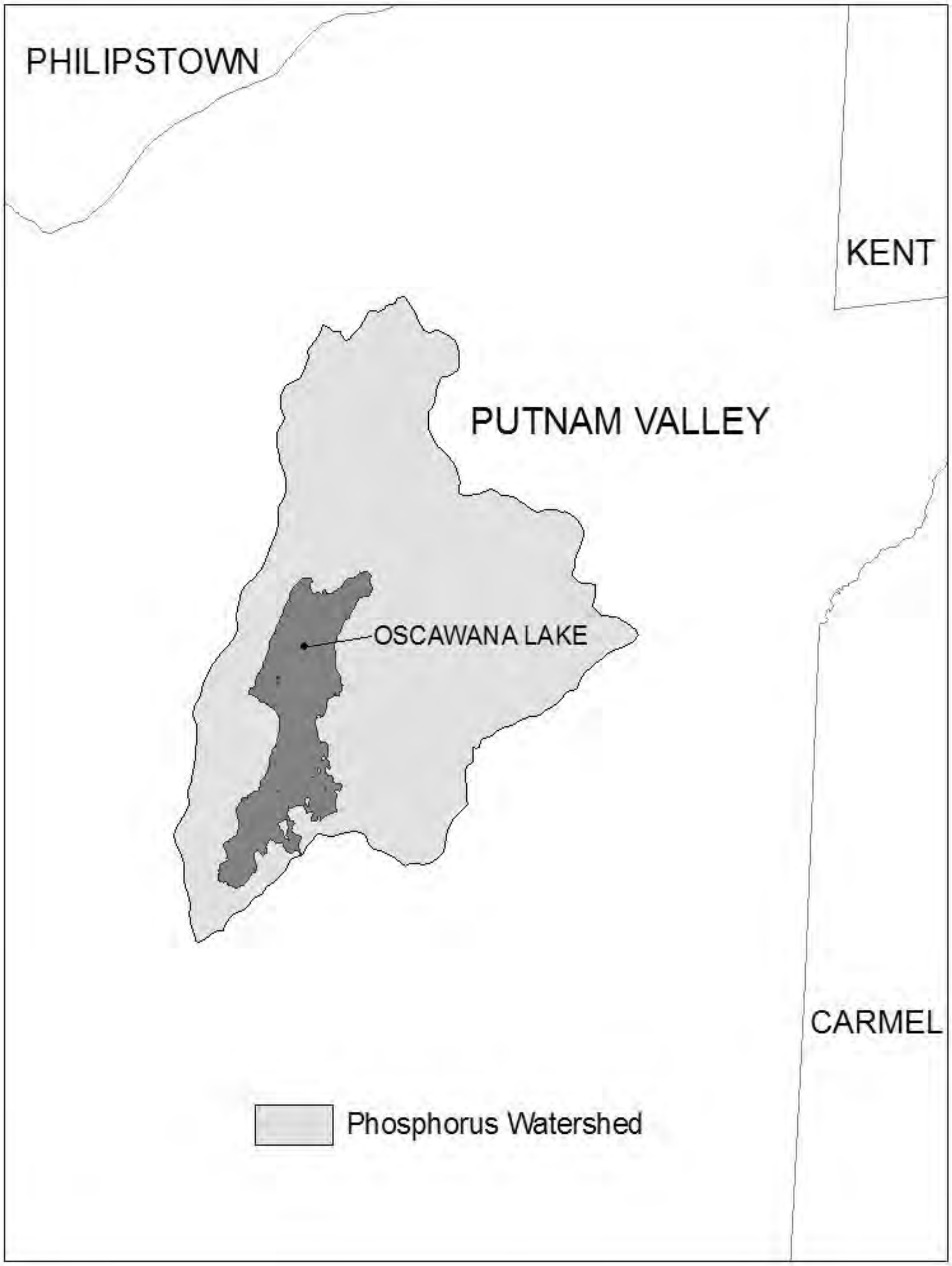
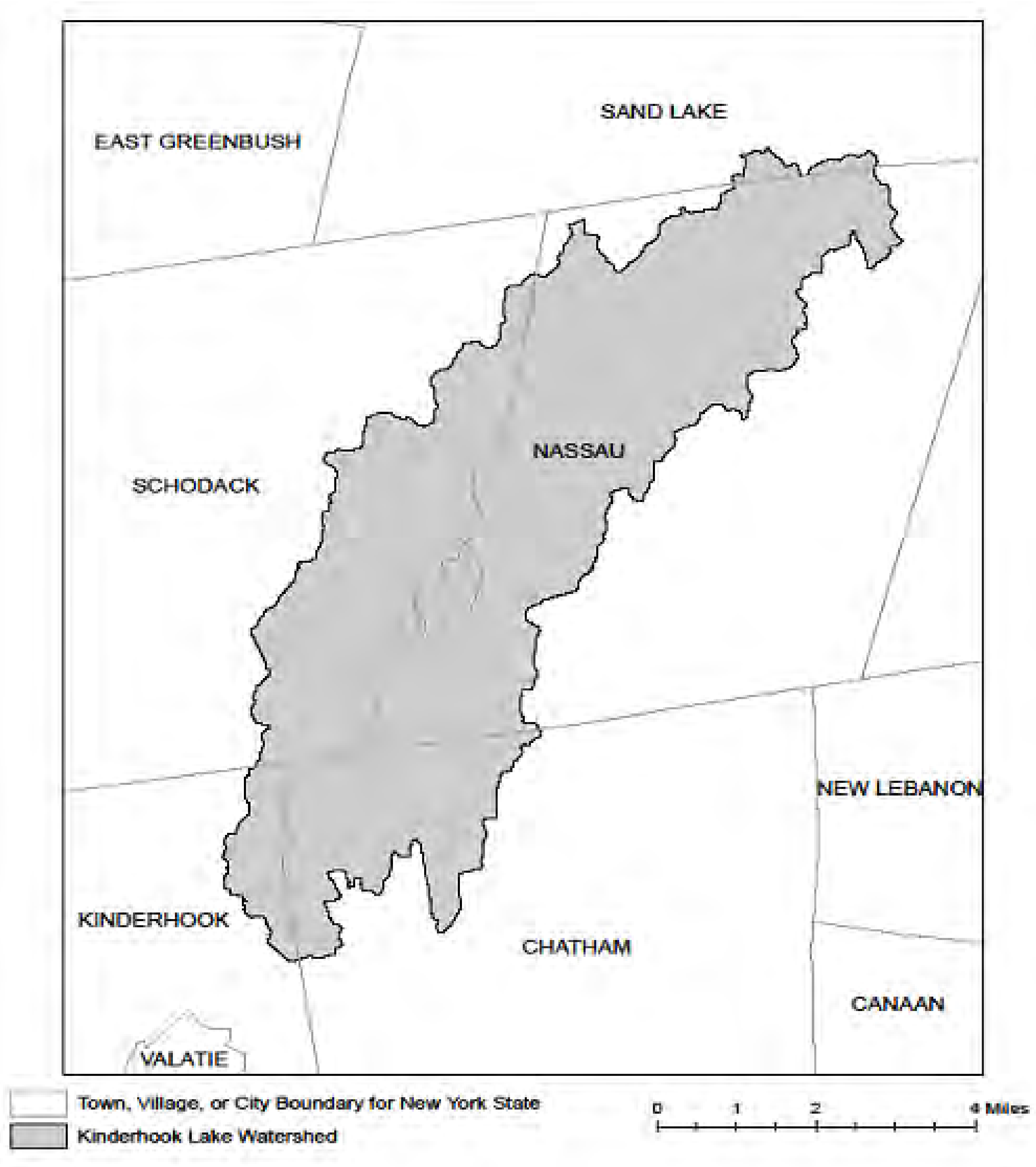


Figure 5 - Kinderhook Lake Watershed



APPENDIX D – Watersheds with Lower Disturbance Threshold

Watersheds where *owners or operators* of construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land must obtain coverage under this permit.

Entire New York City Watershed that is located east of the Hudson River **-** See Figure 1 in Appendix C

APPENDIX E – 303(d) Segments Impaired by Construction Related Pollutant(s)

List of 303(d) segments impaired by pollutants related to *construction activity* (e.g. silt, sediment or nutrients). The list was developed using ”The Final New York State 2016 Section 303(d) List of Impaired Waters Requiring a TMDL/Other Strategy” dated November 2016. *Owners or operators* of single family home and single family residential subdivisions with 25% or less total impervious cover at total site build-out that involve soil disturbances of one or more acres of land, but less than 5 acres, and *directly discharge* to one of the listed segments below shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the New York State Stormwater Management Design Manual (“Design Manual”), dated January 2015.

COUNTY	WATERBODY	POLLUTANT
Albany	Ann Lee (Shakers) Pond, Stump Pond	Nutrients
Albany	Basic Creek Reservoir	Nutrients
Allegany	Amity Lake, Saunders Pond	Nutrients
Bronx	Long Island Sound, Bronx	Nutrients
Bronx	Van Cortlandt Lake	Nutrients
Broome	Fly Pond, Deer Lake, Sky Lake	Nutrients
Broome	Minor Tribs to Lower Susquehanna (north)	Nutrients
Broome	Whitney Point Lake/Reservoir	Nutrients
Cattaraugus	Allegheny River/Reservoir	Nutrients
Cattaraugus	Beaver (Alma) Lake	Nutrients
Cattaraugus	Case Lake	Nutrients
Cattaraugus	Linlyco/Club Pond	Nutrients
Cayuga	Duck Lake	Nutrients
Cayuga	Little Sodus Bay	Nutrients
Chautauqua	Bear Lake	Nutrients
Chautauqua	Chadakoin River and tribs	Nutrients
Chautauqua	Chautauqua Lake, North	Nutrients
Chautauqua	Chautauqua Lake, South	Nutrients
Chautauqua	Findley Lake	Nutrients
Chautauqua	Hulburt/Clymer Pond	Nutrients
Clinton	Great Chazy River, Lower, Main Stem	Silt/Sediment
Clinton	Lake Champlain, Main Lake, Middle	Nutrients
Clinton	Lake Champlain, Main Lake, North	Nutrients
Columbia	Kinderhook Lake	Nutrients
Columbia	Robinson Pond	Nutrients
Cortland	Dean Pond	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Dutchess	Fall Kill and tribs	Nutrients
Dutchess	Hillside Lake	Nutrients
Dutchess	Wappingers Lake	Nutrients
Dutchess	Wappingers Lake	Silt/Sediment
Erie	Beeman Creek and tribs	Nutrients
Erie	Ellicott Creek, Lower, and tribs	Silt/Sediment
Erie	Ellicott Creek, Lower, and tribs	Nutrients
Erie	Green Lake	Nutrients
Erie	Little Sister Creek, Lower, and tribs	Nutrients
Erie	Murder Creek, Lower, and tribs	Nutrients
Erie	Rush Creek and tribs	Nutrients
Erie	Scajaquada Creek, Lower, and tribs	Nutrients
Erie	Scajaquada Creek, Middle, and tribs	Nutrients
Erie	Scajaquada Creek, Upper, and tribs	Nutrients
Erie	South Branch Smoke Cr, Lower, and tribs	Silt/Sediment
Erie	South Branch Smoke Cr, Lower, and tribs	Nutrients
Essex	Lake Champlain, Main Lake, South	Nutrients
Essex	Lake Champlain, South Lake	Nutrients
Essex	Willsboro Bay	Nutrients
Genesee	Bigelow Creek and tribs	Nutrients
Genesee	Black Creek, Middle, and minor tribs	Nutrients
Genesee	Black Creek, Upper, and minor tribs	Nutrients
Genesee	Bowen Brook and tribs	Nutrients
Genesee	LeRoy Reservoir	Nutrients
Genesee	Oak Orchard Cr, Upper, and tribs	Nutrients
Genesee	Tonawanda Creek, Middle, Main Stem	Nutrients
Greene	Schoharie Reservoir	Silt/Sediment
Greene	Sleepy Hollow Lake	Silt/Sediment
Herkimer	Steele Creek tribs	Silt/Sediment
Herkimer	Steele Creek tribs	Nutrients
Jefferson	Moon Lake	Nutrients
Kings	Hendrix Creek	Nutrients
Kings	Prospect Park Lake	Nutrients
Lewis	Mill Creek/South Branch, and tribs	Nutrients
Livingston	Christie Creek and tribs	Nutrients
Livingston	Conesus Lake	Nutrients
Livingston	Mill Creek and minor tribs	Silt/Sediment
Monroe	Black Creek, Lower, and minor tribs	Nutrients
Monroe	Buck Pond	Nutrients
Monroe	Cranberry Pond	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Monroe	Lake Ontario Shoreline, Western	Nutrients
Monroe	Long Pond	Nutrients
Monroe	Mill Creek and tribs	Nutrients
Monroe	Mill Creek/Blue Pond Outlet and tribs	Nutrients
Monroe	Minor Tribs to Irondequoit Bay	Nutrients
Monroe	Rochester Embayment - East	Nutrients
Monroe	Rochester Embayment - West	Nutrients
Monroe	Shipbuilders Creek and tribs	Nutrients
Monroe	Thomas Creek/White Brook and tribs	Nutrients
Nassau	Beaver Lake	Nutrients
Nassau	Camaans Pond	Nutrients
Nassau	East Meadow Brook, Upper, and tribs	Silt/Sediment
Nassau	East Rockaway Channel	Nutrients
Nassau	Grant Park Pond	Nutrients
Nassau	Hempstead Bay	Nutrients
Nassau	Hempstead Lake	Nutrients
Nassau	Hewlett Bay	Nutrients
Nassau	Hog Island Channel	Nutrients
Nassau	Long Island Sound, Nassau County Waters	Nutrients
Nassau	Massapequa Creek and tribs	Nutrients
Nassau	Milburn/Parsonage Creeks, Upp, and tribs	Nutrients
Nassau	Reynolds Channel, west	Nutrients
Nassau	Tidal Tribs to Hempstead Bay	Nutrients
Nassau	Tribs (fresh) to East Bay	Nutrients
Nassau	Tribs (fresh) to East Bay	Silt/Sediment
Nassau	Tribs to Smith/Halls Ponds	Nutrients
Nassau	Woodmere Channel	Nutrients
New York	Harlem Meer	Nutrients
New York	The Lake in Central Park	Nutrients
Niagara	Bergholtz Creek and tribs	Nutrients
Niagara	Hyde Park Lake	Nutrients
Niagara	Lake Ontario Shoreline, Western	Nutrients
Niagara	Lake Ontario Shoreline, Western	Nutrients
Oneida	Ballou, Nail Creeks and tribs	Nutrients
Onondaga	Harbor Brook, Lower, and tribs	Nutrients
Onondaga	Ley Creek and tribs	Nutrients
Onondaga	Minor Tribs to Onondaga Lake	Nutrients
Onondaga	Ninemile Creek, Lower, and tribs	Nutrients
Onondaga	Onondaga Creek, Lower, and tribs	Nutrients
Onondaga	Onondaga Creek, Middle, and tribs	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Onondaga	Onondaga Lake, northern end	Nutrients
Onondaga	Onondaga Lake, southern end	Nutrients
Ontario	Great Brook and minor tribs	Silt/Sediment
Ontario	Great Brook and minor tribs	Nutrients
Ontario	Hemlock Lake Outlet and minor tribs	Nutrients
Ontario	Honeoye Lake	Nutrients
Orange	Greenwood Lake	Nutrients
Orange	Monhagen Brook and tribs	Nutrients
Orange	Orange Lake	Nutrients
Orleans	Lake Ontario Shoreline, Western	Nutrients
Orleans	Lake Ontario Shoreline, Western	Nutrients
Oswego	Lake Neatahwanta	Nutrients
Oswego	Pleasant Lake	Nutrients
Putnam	Bog Brook Reservoir	Nutrients
Putnam	Boyd Corners Reservoir	Nutrients
Putnam	Croton Falls Reservoir	Nutrients
Putnam	Diverting Reservoir	Nutrients
Putnam	East Branch Reservoir	Nutrients
Putnam	Lake Carmel	Nutrients
Putnam	Middle Branch Reservoir	Nutrients
Putnam	Oscawana Lake	Nutrients
Putnam	Palmer Lake	Nutrients
Putnam	West Branch Reservoir	Nutrients
Queens	Bergen Basin	Nutrients
Queens	Flushing Creek/Bay	Nutrients
Queens	Jamaica Bay, Eastern, and tribs (Queens)	Nutrients
Queens	Kissena Lake	Nutrients
Queens	Meadow Lake	Nutrients
Queens	Willow Lake	Nutrients
Rensselaer	Nassau Lake	Nutrients
Rensselaer	Snyders Lake	Nutrients
Richmond	Grasmere Lake/Bradys Pond	Nutrients
Rockland	Congers Lake, Swartout Lake	Nutrients
Rockland	Rockland Lake	Nutrients
Saratoga	Ballston Lake	Nutrients
Saratoga	Dwaas Kill and tribs	Silt/Sediment
Saratoga	Dwaas Kill and tribs	Nutrients
Saratoga	Lake Lonely	Nutrients
Saratoga	Round Lake	Nutrients
Saratoga	Tribs to Lake Lonely	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Schenectady	Collins Lake	Nutrients
Schenectady	Duane Lake	Nutrients
Schenectady	Mariaville Lake	Nutrients
Schoharie	Engleville Pond	Nutrients
Schoharie	Summit Lake	Nutrients
Seneca	Reeder Creek and tribs	Nutrients
St.Lawrence	Black Lake Outlet/Black Lake	Nutrients
St.Lawrence	Fish Creek and minor tribs	Nutrients
Steuben	Smith Pond	Nutrients
Suffolk	Agawam Lake	Nutrients
Suffolk	Big/Little Fresh Ponds	Nutrients
Suffolk	Canaan Lake	Silt/Sediment
Suffolk	Canaan Lake	Nutrients
Suffolk	Flanders Bay, West/Lower Sawmill Creek	Nutrients
Suffolk	Fresh Pond	Nutrients
Suffolk	Great South Bay, East	Nutrients
Suffolk	Great South Bay, Middle	Nutrients
Suffolk	Great South Bay, West	Nutrients
Suffolk	Lake Ronkonkoma	Nutrients
Suffolk	Long Island Sound, Suffolk County, West	Nutrients
Suffolk	Mattituck (Marratooka) Pond	Nutrients
Suffolk	Meetinghouse/Terrys Creeks and tribs	Nutrients
Suffolk	Mill and Seven Ponds	Nutrients
Suffolk	Millers Pond	Nutrients
Suffolk	Moriches Bay, East	Nutrients
Suffolk	Moriches Bay, West	Nutrients
Suffolk	Peconic River, Lower, and tidal tribs	Nutrients
Suffolk	Quantuck Bay	Nutrients
Suffolk	Shinnecock Bay and Inlet	Nutrients
Suffolk	Tidal tribs to West Moriches Bay	Nutrients
Sullivan	Bodine, Montgomery Lakes	Nutrients
Sullivan	Davies Lake	Nutrients
Sullivan	Evens Lake	Nutrients
Sullivan	Pleasure Lake	Nutrients
Tompkins	Cayuga Lake, Southern End	Nutrients
Tompkins	Cayuga Lake, Southern End	Silt/Sediment
Tompkins	Owasco Inlet, Upper, and tribs	Nutrients
Ulster	Ashokan Reservoir	Silt/Sediment
Ulster	Esopus Creek, Upper, and minor tribs	Silt/Sediment
Warren	Hague Brook and tribs	Silt/Sediment

303(d) Segments Impaired by Construction Related Pollutant(s)

Warren	Huddle/Finkle Brooks and tribs	Silt/Sediment
Warren	Indian Brook and tribs	Silt/Sediment
Warren	Lake George	Silt/Sediment
Warren	Tribs to L.George, Village of L George	Silt/Sediment
Washington	Cossayuna Lake	Nutrients
Washington	Lake Champlain, South Bay	Nutrients
Washington	Tribs to L.George, East Shore	Silt/Sediment
Washington	Wood Cr/Champlain Canal and minor tribs	Nutrients
Wayne	Port Bay	Nutrients
Westchester	Amawalk Reservoir	Nutrients
Westchester	Blind Brook, Upper, and tribs	Silt/Sediment
Westchester	Cross River Reservoir	Nutrients
Westchester	Lake Katonah	Nutrients
Westchester	Lake Lincolndale	Nutrients
Westchester	Lake Meahagh	Nutrients
Westchester	Lake Mohegan	Nutrients
Westchester	Lake Shenorock	Nutrients
Westchester	Long Island Sound, Westchester (East)	Nutrients
Westchester	Mamaroneck River, Lower	Silt/Sediment
Westchester	Mamaroneck River, Upper, and minor tribs	Silt/Sediment
Westchester	Muscoot/Upper New Croton Reservoir	Nutrients
Westchester	New Croton Reservoir	Nutrients
Westchester	Peach Lake	Nutrients
Westchester	Reservoir No.1 (Lake Isle)	Nutrients
Westchester	Saw Mill River, Lower, and tribs	Nutrients
Westchester	Saw Mill River, Middle, and tribs	Nutrients
Westchester	Sheldrake River and tribs	Silt/Sediment
Westchester	Sheldrake River and tribs	Nutrients
Westchester	Silver Lake	Nutrients
Westchester	Teatown Lake	Nutrients
Westchester	Titicus Reservoir	Nutrients
Westchester	Truesdale Lake	Nutrients
Westchester	Wallace Pond	Nutrients
Wyoming	Java Lake	Nutrients
Wyoming	Silver Lake	Nutrients

APPENDIX F – List of NYS DEC Regional Offices

Region	Covering the following counties:	DIVISION OF ENVIRONMENTAL PERMITS (DEP) Permit Administrators	DIVISION OF WATER (DOW) Water (SPDES) Program
1	Nassau and Suffolk	50 Circle Road Stony Brook, Ny 11790 Tel. (631) 444-0365	50 Circle Road Stony Brook, Ny 11790-3409 Tel. (631) 444-0405
2	Bronx, Kings, New York, Queens and Richmond	1 Hunters Point Plaza, 47-40 21st St. Long Island City, Ny 11101-5407 Tel. (718) 482-4997	1 Hunters Point Plaza, 47-40 21st St. Long Island City, Ny 11101-5407 Tel. (718) 482-4933
3	Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester	21 South Putt Corners Road New Paltz, Ny 12561-1696 Tel. (845) 256-3059	100 Hillside Avenue, Suite 1w White Plains, Ny 10603 Tel. (914) 428 - 2505
4	Albany, Columbia, Delaware, Greene, Montgomery, Otsego, Rensselaer, Schenectady and Schoharie	1150 North Westcott Road Schenectady, Ny 12306-2014 Tel. (518) 357-2069	1130 North Westcott Road Schenectady, Ny 12306-2014 Tel. (518) 357-2045
5	Clinton, Essex, Franklin, Fulton, Hamilton, Saratoga, Warren and Washington	1115 State Route 86, Po Box 296 Ray Brook, Ny 12977-0296 Tel. (518) 897-1234	232 Golf Course Road Warrensburg, Ny 12885-1172 Tel. (518) 623-1200
6	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
7	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7438	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7500
8	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROADAVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
9	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7165	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7070

Project Olive
2780 Long Road
Town of Grand Island, New York

Appendix B

NYSDEC SPDES General Permit Forms

LANGAN

NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR ☐☐☐☐☐☐
(for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-20-001

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required.

-IMPORTANT-

RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)
TC Buffalo Development Associates, LLC

Owner/Operator Contact Person Last Name (NOT CONSULTANT)
Murray-Coleman

Owner/Operator Contact Person First Name
James

Owner/Operator Mailing Address
600 Grant Street, Suite 4800

City
Pittsburgh

State
PA

Zip
15219 -

Phone (Owner/Operator)
412 - 316 - 2403

Fax (Owner/Operator)
 - -

Email (Owner/Operator)
J.MurrayColeman@trammellcrow.com

FED TAX ID
 - (not required for individuals)

Project Site Information

Project/Site Name
Project Olive

Street Address (NOT P.O. BOX)
2780 Long Road

Side of Street
○ **North** ● **South** ○ **East** ○ **West**

City/Town/Village (THAT ISSUES BUILDING PERMIT)
Town of Grand Island

State	Zip	County	DEC Region
NY	14072 -	Erie	9

Name of Nearest Cross Street
I-190

Distance to Nearest Cross Street (Feet)
1600

Project In Relation to Cross Street
○ **North** ○ **South** ● **East** ○ **West**

Tax Map Numbers
Section-Block-Parcel
23.00-1-26.1

Tax Map Numbers
23.00-1-50

1. Provide the Geographic Coordinates for the project site in NYTM Units. To do this you **must** go to the NYSDEC Stormwater Interactive Map on the DEC website at:

www.dec.ny.gov/imsmaps/stormwater/viewer.htm

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located your project site, go to the tool boxes on the top and choose "i"(identify). Then click on the center of your site and a new window containing the X, Y coordinates in UTM will pop up. Transcribe these coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting)	**Y Coordinates (Northing)**
174552	4773885

2. What is the nature of this construction project?

● **New Construction**

○ **Redevelopment with increase in impervious area**

○ **Redevelopment with no increase in impervious area**

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development Existing Land Use

● FOREST
○ PASTURE/OPEN LAND
○ CULTIVATED LAND
○ SINGLE FAMILY HOME
○ SINGLE FAMILY SUBDIVISION
○ TOWN HOME RESIDENTIAL
○ MULTIFAMILY RESIDENTIAL
○ INSTITUTIONAL/SCHOOL
○ INDUSTRIAL
○ COMMERCIAL
○ ROAD/HIGHWAY
○ RECREATIONAL/SPORTS FIELD
○ BIKE PATH/TRAIL
○ LINEAR UTILITY
○ PARKING LOT
○ OTHER

Post-Development Future Land Use

○ SINGLE FAMILY HOME
○ SINGLE FAMILY SUBDIVISION — Number of Lots
○ TOWN HOME RESIDENTIAL
○ MULTIFAMILY RESIDENTIAL
○ INSTITUTIONAL/SCHOOL
○ INDUSTRIAL
● COMMERCIAL
○ MUNICIPAL
○ ROAD/HIGHWAY
○ RECREATIONAL/SPORTS FIELD
○ BIKE PATH/TRAIL
○ LINEAR UTILITY (water, sewer, gas, etc.)
○ PARKING LOT
○ CLEARING/GRADING ONLY
○ DEMOLITION, NO REDEVELOPMENT
○ WELL DRILLING ACTIVITY *(Oil, Gas, etc.)
○ OTHER

***Note**: for gas well drilling, non-high volume hydraulic fractured wells only

4. In accordance with the larger common plan of development or sale, enter the total project site area; the total area to be disturbed; existing impervious area to be disturbed (for redevelopment activities); and the future impervious area constructed within the disturbed area. (Round to the nearest tenth of an acre.)

Total Site Area	**Total Area To Be Disturbed**	**Existing Impervious Area To Be Disturbed**	**Future Impervious Area Within Disturbed Area**
145.4	119.0	0.3	55.4

5. Do you plan to disturb more than 5 acres of soil at any one time? ● **Yes** ○ **No**

6. Indicate the percentage of each Hydrologic Soil Group(HSG) at the site.

A	**B**	**C**	**D**
0 %	0 %	0 %	100 %

7. Is this a phased project? ● **Yes** ○ **No**

8. Enter the planned start and end dates of the disturbance activities.

Start Date 04/01/2020 - **End Date** 04/01/2022

9. Identify the nearest surface waterbody(ies) to which construction site runoff will discharge.

Name

Feeder Creek

9a. Type of waterbody identified in Question 9?

○ Wetland / State Jurisdiction On Site (Answer 9b)
○ Wetland / State Jurisdiction Off Site
○ Wetland / Federal Jurisdiction On Site (Answer 9b)
○ Wetland / Federal Jurisdiction Off Site
● Stream / Creek On Site
○ Stream / Creek Off Site
○ River On Site
○ River Off Site
○ Lake On Site
○ Lake Off Site
○ Other Type On Site
○ Other Type Off Site

9b. How was the wetland identified?

○ Regulatory Map
○ Delineated by Consultant
○ Delineated by Army Corps of Engineers
○ Other (identify)

10. Has the surface waterbody(ies) in question 9 been identified as a 303(d) segment in Appendix E of GP-0-20-001? ○ **Yes** ● **No**

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-20-001? ○ **Yes** ● **No**

12. Is the project located in one of the watershed areas associated with AA and AA-S classified waters? ○ **Yes** ● **No**
If no, skip question 13.

13. Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey? ○ **Yes** ○ **No**
If Yes, what is the acreage to be disturbed?

.

14. Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area? ○ **Yes** ● **No**

15. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)? ● **Yes** ○ **No** ○ **Unknown**

16. What is the name of the municipality/entity that owns the separate storm sewer system?

Town of Grand Island

17. Does any runoff from the site enter a sewer classified as a Combined Sewer? ○ **Yes** ● **No** ○ **Unknown**

18. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law? ○ **Yes** ● **No**

19. Is this property owned by a state authority, state agency, federal government or local government? ○ **Yes** ● **No**

20. Is this a remediation project being done under a Department approved work plan? (i.e. CERCLA, RCRA, Voluntary Cleanup Agreement, etc.) ○ **Yes** ● **No**

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book)? ● **Yes** ○ **No**

22. Does this construction activity require the development of a SWPPP that includes the post-construction stormwater management practice component (i.e. Runoff Reduction, Water Quality and Quantity Control practices/techniques)? **If No, skip questions 23 and 27-39.** ● **Yes** ○ **No**

23. Has the post-construction stormwater management practice component of the SWPPP been developed in conformance with the current NYS Stormwater Management Design Manual? ● **Yes** ○ **No**

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

● **Professional Engineer (P.E.)**
○ **Soil and Water Conservation District (SWCD)**
○ **Registered Landscape Architect (R.L.A)**
○ **Certified Professional in Erosion and Sediment Control (CPESC)**
○ **Owner/Operator**
○ **Other**

SWPPP Preparer
Langan

Contact Name (Last, Space, First)
Zolezi Christina

Mailing Address
One North Broadway, Suite 910

City
White Plains

State NY
Zip 10601-

Phone 914-323-7418
Fax 914-323-7401

Email
czolezi@langan.com

SWPPP Preparer Certification

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-20-001. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First Name
MI

Last Name

Signature

Date
/ /

25. Has a construction sequence schedule for the planned management practices been prepared? ● Yes ○ No

26. Select **all** of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural

- ● **Check Dams**
- ● **Construction Road Stabilization**
- ● **Dust Control**
- ○ **Earth Dike**
- ○ **Level Spreader**
- ○ **Perimeter Dike/Swale**
- ○ **Pipe Slope Drain**
- ○ **Portable Sediment Tank**
- ○ **Rock Dam**
- ● **Sediment Basin**
- ● **Sediment Traps**
- ● **Silt Fence**
- ● **Stabilized Construction Entrance**
- ● **Storm Drain Inlet Protection**
- ● **Straw/Hay Bale Dike**
- ● **Temporary Access Waterway Crossing**
- ○ **Temporary Stormdrain Diversion**
- ● **Temporary Swale**
- ○ **Turbidity Curtain**
- ○ **Water bars**

Biotechnical

- ○ **Brush Matting**
- ○ **Wattling**

Vegetative Measures

- ○ **Brush Matting**
- ○ **Dune Stabilization**
- ○ **Grassed Waterway**
- ● **Mulching**
- ● **Protecting Vegetation**
- ○ **Recreation Area Improvement**
- ● **Seeding**
- ○ **Sodding**
- ○ **Straw/Hay Bale Dike**
- ○ **Streambank Protection**
- ○ **Temporary Swale**
- ● **Topsoiling**
- ○ **Vegetating Waterways**

Permanent Structural

- ○ **Debris Basin**
- ○ **Diversion**
- ○ **Grade Stabilization Structure**
- ○ **Land Grading**
- ○ **Lined Waterway (Rock)**
- ○ **Paved Channel (Concrete)**
- ○ **Paved Flume**
- ● **Retaining Wall**
- ○ **Riprap Slope Protection**
- ● **Rock Outlet Protection**
- ○ **Streambank Protection**

Other

Post-construction Stormwater Management Practice (SMP) Requirements

Important: Completion of Questions 27-39 is not required if response to Question 22 is No.

27. Identify all site planning practices that were used to prepare the final site plan/layout for the project.

○ **Preservation of Undisturbed Areas**
○ **Preservation of Buffers**
○ **Reduction of Clearing and Grading**
● **Locating Development in Less Sensitive Areas**
○ **Roadway Reduction**
○ **Sidewalk Reduction**
○ **Driveway Reduction**
○ **Cul-de-sac Reduction**
● **Building Footprint Reduction**
● **Parking Reduction**

27a. Indicate which of the following soil restoration criteria was used to address the requirements in Section 5.1.6("Soil Restoration") of the Design Manual (2010 version).

● All disturbed areas will be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).

○ Compacted areas were considered as impervious cover when calculating the **WQv Required**, and the compacted areas were assigned a post-construction Hydrologic Soil Group (HSG) designation that is one level less permeable than existing conditions for the hydrology analysis.

28. Provide the total Water Quality Volume (WQv) required for this project (based on final site plan/layout).

Total WQv Required
4.233 **acre-feet**

29. Identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity in Table 1 (See Page 9) that were used to reduce the Total WQv Required(#28).

Also, provide in Table 1 the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

Note: Redevelopment projects shall use Tables 1 and 2 to identify the SMPs used to treat and/or reduce the WQv required. If runoff reduction techniques will not be used to reduce the required WQv, skip to question 33a after identifying the SMPs.

Table 1 - Runoff Reduction (RR) Techniques and Standard Stormwater Management Practices (SMPs)

	Total Contributing Area (acres)		Total Contributing Impervious Area (acres)
RR Techniques (Area Reduction)			
○ Conservation of Natural Areas (RR-1)	.	and/or	.
○ Sheetflow to Riparian Buffers/Filters Strips (RR-2)	.	and/or	.
○ Tree Planting/Tree Pit (RR-3)	.	and/or	.
○ Disconnection of Rooftop Runoff (RR-4)	.	and/or	.
RR Techniques (Volume Reduction)			
○ Vegetated Swale (RR-5)			.
○ Rain Garden (RR-6)			.
○ Stormwater Planter (RR-7)			.
○ Rain Barrel/Cistern (RR-8)			.
○ Porous Pavement (RR-9)			.
○ Green Roof (RR-10)			.
Standard SMPs with RRv Capacity			
○ Infiltration Trench (I-1)			.
○ Infiltration Basin (I-2)			.
○ Dry Well (I-3)			.
○ Underground Infiltration System (I-4)			.
● Bioretention (F-5)			52.56
○ Dry Swale (O-1)			.
Standard SMPs			
○ Micropool Extended Detention (P-1)			.
○ Wet Pond (P-2)			.
○ Wet Extended Detention (P-3)			.
○ Multiple Pond System (P-4)			.
○ Pocket Pond (P-5)			.
○ Surface Sand Filter (F-1)			.
○ Underground Sand Filter (F-2)			.
○ Perimeter Sand Filter (F-3)			.
○ Organic Filter (F-4)			.
○ Shallow Wetland (W-1)			.
○ Extended Detention Wetland (W-2)			.
○ Pond/Wetland System (W-3)			.
○ Pocket Wetland (W-4)			.
○ Wet Swale (O-2)			.

Table 2 - Alternative SMPs (DO NOT INCLUDE PRACTICES BEING USED FOR PRETREATMENT ONLY)

Alternative SMP	Total Contributing Impervious Area(acres)
○ Hydrodynamic	.
○ Wet Vault	.
○ Media Filter	.
○ Other	.

Provide the name and manufacturer of the Alternative SMPs (i.e. proprietary practice(s)) being used for WQv treatment.

Name

Manufacturer

Note: Redevelopment projects which do not use RR techniques, shall use questions 28, 29, 33 and 33a to provide SMPs used, total WQv required and total WQv provided for the project.

30. Indicate the Total RRv provided by the RR techniques (Area/Volume Reduction) and Standard SMPs with RRv capacity identified in question 29.

Total RRv provided

1.974 **acre-feet**

31. Is the Total RRv provided (#30) greater than or equal to the total WQv required (#28).

○ **Yes** ● **No**

If Yes, go to question 36.
If No, go to question 32.

32. Provide the Minimum RRv required based on HSG.
[Minimum RRv Required = (P)(0.95)(Ai)/12, Ai=(S)(Aic)]

Minimum RRv Required

0.838 **acre-feet**

32a. Is the Total RRv provided (#30) greater than or equal to the Minimum RRv Required (#32)?

● **Yes** ○ **No**

If Yes, go to question 33.
Note: Use the space provided in question #39 to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). A detailed evaluation of the specific site limitations and justification for not reducing 100% of the WQv required (#28) must also be included in the SWPPP.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. Identify the Standard SMPs in Table 1 and, if applicable, the Alternative SMPs in Table 2 that were used to treat the remaining total WQv(=Total WQv Required in 28 - Total RRv Provided in 30).

Also, provide in Table 1 and 2 the total impervious area that contributes runoff to each practice selected.

Note: Use Tables 1 and 2 to identify the SMPs used on Redevelopment projects.

33a. Indicate the Total WQv provided (i.e. WQv treated) by the SMPs identified in question #33 and Standard SMPs with RRv Capacity identified in question 29.

WQv Provided

2.287 **acre-feet**

Note: For the standard SMPs with RRv capacity, the WQv provided by each practice = the WQv calculated using the contributing drainage area to the practice - RRv provided by the practice. (See Table 3.5 in Design Manual)

34. Provide the sum of the Total RRv provided (#30) and the WQv provided (#33a). 4.261

35. Is the sum of the RRv provided (#30) and the WQv provided (#33a) greater than or equal to the total WQv required (#28)? ● **Yes** ○ **No**

If Yes, go to question 36.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

36. Provide the total Channel Protection Storage Volume (CPv) required and provided or select waiver (36a), if applicable.

CPv Required	**CPv Provided**
13.438 **acre-feet**	88.794 **acre-feet**

36a. The need to provide channel protection has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.

○ Reduction of the total CPv is achieved on site through runoff reduction techniques or infiltration systems.

37. Provide the Overbank Flood (Qp) and Extreme Flood (Qf) control criteria or select waiver (37a), if applicable.

Total Overbank Flood Control Criteria (Qp)

Pre-Development	**Post-development**
276.50 **CFS**	212.03 **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development	**Post-development**
622.76 **CFS**	489.24 **CFS**

37a. The need to meet the Qp and Qf criteria has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.
○ Downstream analysis reveals that the Qp and Qf controls are not required

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed? ● **Yes** ○ **No**

If Yes, Identify the entity responsible for the long term Operation and Maintenance

Tenant

39. Use this space to summarize the specific site limitations and justification for not reducing 100% of WQv required(#28). (See question 32a) This space can also be used for other pertinent project information.

The placement of the runoff reduction practices, stormwater management practices, and the volume of water quality provided in the runoff reduction practices were dictated by a number of specific site characteristics. These characteristics include: onsite creeks; onsite wetlands; and regulated 100-foot adjacent areas. In addition, the onsite soils do not infiltrate (less than 0.1 in/hr) and this limited the use of infiltration based runoff reduction practices. Given these factors, 100% of the water quality volume could not be reduced through the use of runoff reduction practices. However, approximately 46% of the required water quality volume has been reduced through the use of runoff reduction practices, which exceeds the minimum required runoff reduction volume.

40. Identify other DEC permits, existing and new, that are required for this project/facility.

○ Air Pollution Control

○ Coastal Erosion

○ Hazardous Waste

○ Long Island Wells

○ Mined Land Reclamation

○ Solid Waste

○ Navigable Waters Protection / Article 15

● Water Quality Certificate

○ Dam Safety

○ Water Supply

○ Freshwater Wetlands/Article 24

○ Tidal Wetlands

○ Wild, Scenic and Recreational Rivers

○ Stream Bed or Bank Protection / Article 15

○ Endangered or Threatened Species(Incidental Take Permit)

○ Individual SPDES

○ SPDES Multi-Sector GP NYR

○ Other

○ None

41. Does this project require a US Army Corps of Engineers Wetland Permit? ● Yes ○ No
If Yes, Indicate Size of Impact. 0.7

42. Is this project subject to the requirements of a regulated, traditional land use control MS4? ● Yes ○ No
(If No, skip question 43)

43. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI? ● Yes ○ No

44. If this NOI is being submitted for the purpose of continuing or transferring coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned. NYR

Owner/Operator Certification

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Print First Name James

MI

Print Last Name Murray-Coleman

Owner/Operator Signature

Date / /

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

NYS Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form

for

Construction Activities Seeking Authorization Under SPDES General Permit

*(NOTE: Attach Completed Form to Notice Of Intent and Submit to Address Above)

I. Project Owner/Operator Information

1. Owner/Operator Name: TC Buffalo Development Associates, LLC
2. Contact Person: James F. Murray-Coleman
3. Street Address: 600 Grant Street, Suite 4800
4. City/State/Zip: Pittsburgh, PA 15219

II. Project Site Information

5. Project/Site Name: Project Olive
6. Street Address: 2780 Long Road
7. City/State/Zip: Grand Island, NY 14072

III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information

8. SWPPP Reviewed by: Robert Westfall, PE
9. Title/Position: TTown Engineer and Stormwater Management Program Coordinator
10. Date Final SWPPP Reviewed and Accepted:

IV. Regulated MS4 Information

11. Name of MS4: Town of Grand Island
12. MS4 SPDES Permit Identification Number: NYR20A 382
13. Contact Person: Robert Westfall, PE
14. Street Address: 225 Baseline Road
15. City/State/Zip: Grand Island, NY 14072
16. Telephone Number: (716) 773-9600 x639

MS4 SWPPP Acceptance Form - continued

V. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative

I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in question 5 has been reviewed and meets the substantive requirements in the SPDES General Permit For Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s). Note: The MS4, through the acceptance of the SWPPP, assumes no responsibility for the accuracy and adequacy of the design included in the SWPPP. In addition, review and acceptance of the SWPPP by the MS4 does not relieve the owner/operator or their SWPPP preparer of responsibility or liability for errors or omissions in the plan.

Printed Name:	Robert Westfall, PE
Title/Position:	Town Engineer and Stormwater Management Program Coordinator
Signature:	
Date:	

VI. Additional Information

(NYS DEC - MS4 SWPPP Acceptance Form - January 2015)

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

SWPPP Preparer Certification Form

SPDES General Permit for Stormwater Discharges From Construction Activity (GP-0-20-001)

Project Site Information

Project/Site Name

Project Olive

Owner/Operator Information

Owner/Operator (Company Name/Private Owner/Municipality Name)

Langan

Certification Statement – SWPPP Preparer

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-20-001. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First name	MI	Last Name

Signature

Date

Revised: January 2020

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Owner/Operator Certification Form

SPDES General Permit For Stormwater Discharges From Construction Activity (GP-0-20-001)

Project/Site Name: Project Olive

eNOI Submission Number: ____________________

eNOI Submitted by: ☐ **Owner/Operator** ☑ **SWPPP Preparer** ☐ **Other**

Certification Statement - Owner/Operator

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

James	F.	Murray-Coleman
Owner/Operator First Name	M.I.	Last Name

____
Signature

____
Date

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505
(NOTE: Submit completed form to address above)

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity

Please indicate your permit identification number: NYR ___ ___ ___ ___ ___ ___

I. Owner or Operator Information

1. Owner/Operator Name:

2. Street Address:

3. City/State/Zip:

4. Contact Person: 4a.Telephone:

4b. Contact Person E-Mail:

II. Project Site Information

5. Project/Site Name:

6. Street Address:

7. City/Zip:

8. County:

III. Reason for Termination

9a. ☐ All disturbed areas have achieved final stabilization in accordance with the general permit and SWPPP. ***Date final stabilization completed** (month/year): ______________________________

9b. ☐ Permit coverage has been transferred to new owner/operator. Indicate new owner/operator's permit identification number: NYR ___ ___ ___ ___ ___ ___
(Note: Permit coverage can not be terminated by owner identified in I.1. above until new owner/operator obtains coverage under the general permit)

9c. ☐ Other (Explain on Page 2)

IV. Final Site Information:

10a. Did this construction activity require the development of a SWPPP that includes post-construction stormwater management practices? ☐ yes ☐ no (If no, go to question 10f.)

10b. Have all post-construction stormwater management practices included in the final SWPPP been constructed? ☐ yes ☐ no (If no, explain on Page 2)

10c. Identify the entity responsible for long-term operation and maintenance of practice(s)?

____

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

10d. Has the entity responsible for long-term operation and maintenance been given a copy of the operation and maintenance plan required by the general permit? ☐ yes ☐ no

10e. Indicate the method used to ensure long-term operation and maintenance of the post-construction stormwater management practice(s):

☐ Post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain practice(s) have been deeded to the municipality.

☐ Executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s).

☐ For post-construction stormwater management practices that are privately owned, a mechanism is in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the owner or operator's deed of record.

☐ For post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university or hospital), government agency or authority, or public utility; policy and procedures are in place that ensures operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

10f. Provide the total area of impervious surface (i.e. roof, pavement, concrete, gravel, etc.) constructed within the disturbance area? ______________________________ (acres)

11. Is this project subject to the requirements of a regulated, traditional land use control MS4? ☐ yes ☐ no

(If Yes, complete section VI - "MS4 Acceptance" statement

V. Additional Information/Explanation:

(Use this section to answer questions 9c. and 10b., if applicable)

VI. MS4 Acceptance - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative (Note: Not required when 9b. is checked -transfer of coverage)

I have determined that it is acceptable for the owner or operator of the construction project identified in question 5 to submit the Notice of Termination at this time.

Printed Name:

Title/Position:

Signature:

Date:

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

VII. Qualified Inspector Certification - Final Stabilization:

I hereby certify that all disturbed areas have achieved final stabilization as defined in the current version of the general permit, and that all temporary, structural erosion and sediment control measures have been removed. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:

Title/Position:

Signature: Date:

VIII. Qualified Inspector Certification - Post-construction Stormwater Management Practice(s):

I hereby certify that all post-construction stormwater management practices have been constructed in conformance with the SWPPP. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:

Title/Position:

Signature: Date:

IX. Owner or Operator Certification

I hereby certify that this document was prepared by me or under my direction or supervision. My determination, based upon my inquiry of the person(s) who managed the construction activity, or those persons directly responsible for gathering the information, is that the information provided in this document is true, accurate and complete. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:

Title/Position:

Signature: Date:

(NYS DEC Notice of Termination - January 2015)

Project Olive
2780 Long Road
Town of Grand Island, New York

Appendix C

Certification Statements

Owner's/Operator's Certification

"I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted."

Name (please print) ______________________________

Title ______________________________ **Date** ______________

Address ______________________________

Phone ______________ **Email** ______________________

Signature ______________________________

Contractor's Certification

"I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations."

Contracting Firm Name ____________________

Address ____________________

Phone ____________________ **Fax** ____________________

Name (please print) ____________________

Title ____________________ **Date** ____________________

Signature ____________________

SWPPP Responsibilities ____________________

____

____

____

Trained Individual Name (please print) ____________________

Title ____________________ **Date** ____________________

Signature ____________________

SWPPP Responsibilities ____________________

____

____

Note: All Contractors involved with Stormwater related activities shall sign a Contractor's Certification.

Subcontractor's Certification

"I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations."

Subcontracting Firm Name ____________________

Address ____________________

Phone ____________________ **Fax** ____________________

Name (please print) ____________________

Title ____________________ **Date** ____________________

Signature ____________________

SWPPP Responsibilities ____________________

____

____

____

Trained Individual Name (please print) ____________________

Title ____________________ **Date** ____________________

Signature ____________________

SWPPP Responsibilities ____________________

____

____

Note: All subcontractors involved with Stormwater related activities shall sign a Subcontractor's Certification.

Appendix D

Example Inspection Form

EXAMPLE EROSION CONTROL REPORT

PROJECT NO: ____________ PROJECT NAME: ________________________ DATE: ___________

MUNICIPALITY: __________________________ LOCATION: ____________________________

CONTRACTOR: ___________________________ OWNER: _________________________________

DATE OF PREVIOUS INSPECTION: __________ INSPECTOR'S NAME: _____________________

DATE OF MOST RECENT STORM
0.5" OR GREATER: __________ DATE OF INSPECTION: ___________________

LAST RAIN EVENT: ______________________ DEPTH: __________________________________

WEATHER: ______________________________ TEMPERATURE: ____________°F____________

SPECIAL NOTES:

EROSION CONTROL CHECKLIST

ADDITIONAL ACTION REQUIRED BY PROJECT MANAGER OR PROJECT ENGINEER ☐YES ☐NO

PHOTOS OR SKETCHES ATTACHED ☐ ADDITIONAL REMARKS ATTACHED ☐

Inspector (print name) **Inspection Date**

Qualified Professional (print name) **Qualified Professional Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Maintaining Water Quality

Yes	No	NA	
☐	☐	☐	Is there an increase in turbidity causing a substantial visible contrast to natural conditions?
☐	☐	☐	Is there residue from oil and floating substances, visible oil film, or globules of grease?
☐	☐	☐	All disturbance is within the limits of the approved plans.
☐	☐	☐	Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

Housekeeping

1. General Site Conditions

Yes	No	NA	
☐	☐	☐	Is construction site litter and debris appropriately managed?
☐	☐	☐	Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
☐	☐	☐	Is construction impacting the adjacent properties?
☐	☐	☐	Is dust adequately controlled?

2. Temporary Stream Crossing

Yes	No	NA	
☐	☐	☐	Maximum diameter pipes necessary to span creek without dredging are installed.
☐	☐	☐	Installed non-woven geotextile fabric beneath approaches
☐	☐	☐	Is fill composed of aggregate (no earth or soil)?
☐	☐	☐	Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

Runoff Control Practices

1. Excavation Dewatering

Yes	No	NA	
☐	☐	☐	Upstream and downstream berms (sandbags, inflatable damns, etc.) are installed per plan.
☐	☐	☐	Clean water from upstream pool is being pumped to the downstream pool.
☐	☐	☐	Sediment laden water from work area is being discharged to a silt-trapping device.
☐	☐	☐	Constructed upstream berm with one-foot minimum freeboard.

2. Level Spreader

Yes	No	NA	
☐	☐	☐	Installed per plan.
☐	☐	☐	Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
☐	☐	☐	Flow sheets out of level spreader without erosion on downstream edge.

3. Interceptor Dikes and Swales

Yes	No	NA	
☐	☐	☐	Installed per plan with minimum side slopes 2H:1V or flatter.
☐	☐	☐	Stabilized by geotextile fabric, seed, or mulch with no erosion occuring.
☐	☐	☐	Sediment-laden runoff directed to sediment trapping structure.

4. Stone Check Dam

Yes No NA
☐ ☐ ☐ Is channel stable? (flow is not eroding soil underneath or around the structure).
☐ ☐ ☐ Check is in good condition (rocks in place and no permanent pools behind the structure).
☐ ☐ ☐ Has accumulated sediment been removed?

5. Rock Outlet Protection

Yes No NA
☐ ☐ ☐ Installed per plan.
☐ ☐ ☐ Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles

Yes No NA
☐ ☐ ☐ Stockpiles are stabilized with vegetation and/or mulch.
☐ ☐ ☐ Sediment control is installed at the toe of the slope.

2. Revegetation

Yes No NA
☐ ☐ ☐ Temporary seedings and mulch have been applied to idle areas.
☐ ☐ ☐ 4 inches minimum of topsoil has been applied under permanent seedings

Sediment Control Practices

1. Stabilized Construction Entrance

Yes No NA
☐ ☐ ☐ Stone is clean enough to effectively remove mud from vehicles.
☐ ☐ ☐ Installed per standards and specifications?
☐ ☐ ☐ Does all traffic use the stabilized entrance to enter and leave the site?
☐ ☐ ☐ Is adequate drainage provided to prevent ponding at entrance?

2. Silt Fence

Yes No NA
☐ ☐ ☐ Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
☐ ☐ ☐ Joints constructed by wrapping the two ends together for continuous support.
☐ ☐ ☐ Fabric buried 6 inches minimum.
☐ ☐ ☐ Posts are stable, fabric is tight and without rips or frayed areas.

Sediment accumulation is ____% of design capacity.

3. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated practices)

Yes No NA

☐ ☐ ☐ Installed concrete blocks lengthwise so open ends face outward, not upward.
☐ ☐ ☐ Place wire screen between No. 3 crushed stone and concrete blocks.
☐ ☐ ☐ Drainage area is 1 acre or less.
☐ ☐ ☐ Excavated area is 900 cubic feet.
☐ ☐ ☐ Excavated side slopes should be 2:1.
☐ ☐ ☐ 2" x 4" frame is constructed and structurally sound.
☐ ☐ ☐ Posts 3-foot maximum spacing between posts.
☐ ☐ ☐ Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
☐ ☐ ☐ Posts are stable, fabric is tight and without rips or frayed areas.

Sediment accumulation is ____% of design capacity.

4. Temporary Sediment Trap

Yes No NA

☐ ☐ ☐ Outlet structure is constructed per the approved plan or drawing.
☐ ☐ ☐ Geotextile fabric has been placed beneath rock fill.

Sediment accumulation is ____% of design capacity.

5. Temporary Sediment Basin

Yes No NA

☐ ☐ ☐ Basin and outlet structure constructed per the approved plan.
☐ ☐ ☐ Basin side slopes are stablized with seed/mulch.
☐ ☐ ☐ Drainage structure is flushed and basin surface restored upon removal of sediment basin facility.

Sediment accumulation is ____% of design capacity.

Project Olive
2780 Long Road
Town of Grand Island, New York

Appendix E

Design Calculations

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Total Required Water Quality Volume Calculation Worksheet

Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?...	*no*

Design Point(s):	1, 2, 3, & 4	*Manually enter the information below.*
P=	1.00 *inch*	

Breakdown of Subcatchments

Subcatchment Number	**Subcatchment Model Number**	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Description**
1	120	0.99	0.59	60%	0.59	2,115	Bioretention
2	230	10.46	8.85	85%	0.81	30,809	Bioretention
3	231	10.82	8.78	81%	0.78	30,641	Bioretention
4	232	9.44	5.63	60%	0.59	20,113	Bioretention
5	234	7.86	6.45	82%	0.79	22,494	Bioretention
6	235	10.03	7.32	73%	0.71	25,728	Bioretention
7	236	7.49	6.03	81%	0.77	21,064	Bioretention
8	237	11.24	8.04	72%	0.69	28,296	Bioretention
9	350	1.87	1.22	65%	0.64	4,312	Bioretention
10							
Subtotal		70.19	52.90	75%	0.73	185,571	Subtotal 1
Total		**70.19**	**52.90**	**75%**	**0.73**	**185,571**	**Initial WQv**

Identify Runoff Reduction Techniques By Area

Technique	**Total Contributing Area**	**Contributing Impervious Area**	**Notes**
	(Acre)	*(Acre)*	
Conservation of Natural Areas	0.00	0.00	*minimum 10,000 sf*
Riparian Buffers	0.00	0.00	*maximum contributing length 75 feet to*
Filter Strips	0.00	0.00	
Tree Planting	0.00	0.00	*Up to 100 sf directly connected*
Total	**0.00**	**0.00**	

Recalculate WQv after application of Area Reduction Techniques

	Total Area *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Runoff Coefficient Rv**	**WQv** *(ft^3)*
Initial WQv	70.19	52.90	75%	0.73	185,571
Subtract Area	0.00	0.00	--	--	--
WQv adjusted after Area Reductions	**70.19**	**52.90**	75%	0.73	185,571
Disconnection of Rooftops		0.00			
Adjusted WQv after Area Reduction and Rooftop Disconnect	70.19	52.90	75%	0.73	**185,571**
WQv reduced by Area Reduction techniques					0

Subcatchment Summary Table Worksheet

All Subcatchments							
Subcatchment	Subcatchment Model	Total Area	Impervious Cover	Percent Impervious	Runoff Coefficient	WQv	Description
		(Acres)	*(Acres)*	*%*	*Rv*	*(ft^3)*	
1	120	0.99	0.59	0.60	0.59	2,115	Bioretention
2	230	10.46	8.85	0.85	0.81	30,809	Bioretention
3	231	10.82	8.78	0.81	0.78	30,641	Bioretention
4	232	9.44	5.63	0.60	0.59	20,113	Bioretention
5	234	7.86	6.45	0.82	0.79	22,494	Bioretention
6	235	10.03	7.32	0.73	0.71	25,728	Bioretention
7	236	7.49	6.03	0.81	0.77	21,064	Bioretention
8	237	11.24	8.04	0.72	0.69	28,296	Bioretention
9	350	1.87	1.22	0.65	0.64	4,312	Bioretention
10							
11							
12							
13							
14							
15							
16							
17							
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24							
25							
26							
27							
28							
29							
30							

Runoff Reduction Summary Table Worksheet

Runoff Reduction Volume and Treated Volumes

Runoff Reduction Techniques/Standard SMPs			Total Contributing Area (acres)	Total Contributing Impervious Area (acres)	WQv Reduced (RRv) cf	WQv Treated cf
Area Reduction	Conservation of Natural Areas	RR-1	0.00	0.00		
	Sheet flow to Riparian Buffers	RR-2	0.00	0.00		
	Sheet flow to Filter Strips		0.00	0.00		
	Tree Planting/Tree Pit	RR-3	0.00	0.00		
	Disconnection of Rooftop Runoff	RR-4		0.00		
Volume Reduction	Vegetated Swale	RR-5	0.00	0.00	0	
	Rain Garden	RR-6	0.00	0.00	0	
	Stormwater Planter	RR-7	0.00	0.00	0	
	Rain Barrel/Cistern	RR-8	0.00	0.00	0	
	Porous Pavement	RR-9	0.00	0.00	0	
	Green Roof (Intensive)	RR-10	0.00	0.00	0	
	Green Roof (Extensive)		0.00	0.00	0	
Standard SMPs w/RRv Capacity	Infiltration Trench	I-1	0.00	0.00	0	0
	Infiltration Basin	I-2	0.00	0.00	0	0
	Dry Well	I-3	0.00	0.00	0	0
	Underground Infiltration System	I-4	0.00	0.00	0	0
	Bioretention	F-5	70.19	52.90	85,937	99,634
	Infiltration Bioretention		0.00	0.00	0	0
	Dry swale	O-1	0.00	0.00		0
Standard SMPs	Micropool Extended Detention Pond	P-1	0.00	0.00		0
	Wet Pond	P-2	0.00	0.00		0
	Wet Extended Detention Pond	P-3	0.00	0.00		0
	Multiple Pond system	P-4	0.00	0.00		0
	Pocket Pond	P-5	0.00	0.00		0
	Surface Sand Filter	F-1	0.00	0.00		0
	Underground Sand Filter	F-2	0.00	0.00		0
	Perimeter Sand Filter	F-3	0.00	0.00		0
	Organic Filter	F-4	0.00	0.00		0
	Shallow Wetland	W-1	0.00	0.00		0
	Extended Detention Shallow Wetland	W-2	0.00	0.00		0
	Pond/Wetland System	W-3	0.00	0.00		0
	Pocket Wetland	W-4	0.00	0.00		0
	Wet Swale	O-2	0.00	0.00		0
Totals by Area Reduction →			0.00	0.00	53	
Totals by Volume Reduction →			0.00	0.00	0	
Totals by Standard SMP w/RRV →			70.19	52.90	85,937	99,634
Totals by Standard SMP →			0.00	0.00		0
Totals (Area + Volume + all SMPs) →			**70.19**	**52.90**	**85,990**	**99,634**

Minimum Runoff Reduction Volume Worksheet

Minimum Runoff Reduction Volume

1. Construction activities that cannot achieve 100% reduction of the total water quality volume due to site limitation shall direct runoff from all newly constructed impervious areas to a runoff reduction technique or standard stormwater management practice with runoff reduction volume capacity unless infeasible.

2. In no case shall the runoff reduction achieved from the newly constructed impervious areas be less than the minimum runoff reduction (RRv_{min}).

3. The minimum runoff reduction volume is calculated as follows:

$$RRv_{min} = \frac{P * \bar{R}v * Aic * S}{12}$$

Where:

RRv_{min} = Minimum runoff reduction required from impervious area

$\bar{R}v$ = 0.05 + 0.009 (I), where I is 100% impervious

Aic = Total area of new impervious cover

S = Hydrologic Soil Group Specific Reduction Factor

Enter the Soils Data for the site

Soil Group	Acres	S	
A	0.00	55%	*(new impervious area in Type A Soils)*
B	0.00	40%	*(new impervious area in Type B Soils)*
C	0.00	30%	*(new impervious area in Type C Soils)*
D	55.43	20%	*(new impervious area in Type D Soils)*
Total Area	55.43		

Calculate the Minimum RRv

Soil Group Speific Reduction Factor (S)	**0.20**		*(weighted average)*
Total Area of New Impervious Cover (Aic)	52.90	*acre*	
Precipitation (P)	1.00	*in*	
Rv	0.95		
Minimum RRv	**36,487**	***ft3***	*(P * Rv x Aic * S)/12*
	0.84	af	

LANGAN

Notice of Intent Questions Worksheet

#	NOI Question		Reported Value	
			cf	af
28	Total Water Quality Volume (WQv) Required		185,571	*4.260*
30	Total RRV Provided		85,990	*1.974*
31	Is RRv Provided ≥WQv Required?		No	
32	Minimum RRv		36,487	*0.838*
32a	Is RRv Provided ≥ Minimum RRv Required?	Yes	*Conditions Met*	
33a	Total WQv Treated		99,634	*2.287*
34	Sum of Volume Reduced & Treated		185,624	*4.261*
35	Is Sum RRv Provided and WQv Provided ≥WQv Required?	Yes	*Conditions Met*	
Apply Peak Flow Attenuation				
			af	af
36	Channel Protection	*Cpv*	*13.444*	*88.794*
			cfs	cfs
37	Overbank	*Qp*	*276.50*	*212.03*
37	Extreme Flood Control	*Qf*	*622.76*	*489.24*
	Are Quantity Control requirements met?	*yes*	*Plan Completed*	

Planning Worksheet

Practice	Description	Application
Preservation of Undisturbed Areas	Delineate and place into permanent conservation undisturbed forests, native vegetated areas, riparian corridors, wetlands, and natural terrain.	*Considered and Not Applied*
Preservation of Buffers	Define, delineate and preserve naturally vegetated buffers along perennial streams, rivers, shorelines and wetlands.	*Considered and Applied*
Reduction of Clearing and Grading	Limit clearing and grading to the minimum amount needed for roads, driveways, foundations, utilities and stormwater management facilities.	*Considered and Applied*
Locating Development in Less Sensitive Areas	Avoid sensitive resource areas such as floodplains, steep slopes, erodible soils, wetlands, mature forests and critical habitats by locating development to fit the terrain in areas that will create the least impact.	*Considered and Applied*
Open Space Design	Use clustering, conservation design or open space design to reduce impervious cover, preserve more open space and protect water resources.	*N/A*
Soil Restoration	Restore the original properties and porosity of the soil by deep till and amendment with compost to reduce the generation of runoff and enhance the runoff reduction performance of post construction practices.	*Considered and Applied*
Roadway Reduction	Minimize roadway widths and lengths to reduce site impervious area	*Considered and Not Applied*
Sidewalk Reduction	Minimize sidewalk lengths and widths to reduce site impervious area	*Considered and Applied*
Driveway Reduction	Minimize driveway lengths and widths to reduce site impervious area	*Considered and Not Applied*
Cul-de-sac Reduction	Minimize the number of cul-de-sacs and incorporate landscaped areas to reduce their impervious cover.	*N/A*
Building Footprint Reduction	Reduce the impervious footprint of residences and commercial buildings by using alternate or taller buildings while maintaining the same floor to area ratio.	*Considered and Applied*
Parking Reduction	Reduce imperviousness on parking lots by eliminating unneeded spaces, providing compact car spaces and efficient parking lanes, minimizing stall dimensions, using porous pavement surfaces in overflow parking areas, and using multi-storied parking decks where appropriate.	*Considered and Applied*

Bioretention Worksheet

(For use on HSG C or D Soils with underdrains)

Af=WQv*(df)/[k*(hf+df)(tf)]

where:	*Af*	Required Surface Area (ft^2)
	WQv	Water Quality Volume (ft^3)
	df	Depth of the Soil Medium (ft)
	hf	Average height of water above the planter bed (ft)
	tf	The Design Time to Filter the Treatment Volume Through the Filter Media (days)
	k	Hydraulic conductivity (ft/day)

Design Point(s):	**1, 2, 3, & 4**							
Enter Site Data For Drainage Area to be Treated by Practice								
Subcatchment Number	**Subcatchment Model Number**	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
1	120	0.99	0.59	0.60	0.59	2,115	1.00	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops			0.00	60%	0.59	2,115	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						0	*ft^3*	
Soil Information								
Soil Group			D					
Using Underdrains?			*yes*	*Okay*				
Pretreatment								
WQv				2,115	*ft^3*			
Pretreatment Sizing				25%	*of WQv*			
Required Pretreatment Volume				529	*ft^3*			
Pretreatment Provided				2,900	*ft^3*			
Pretreatment techniques utilized				*Sediment Basin/Forebay*				
Calculate the Minimum Filter Area								
WQv				2,115		*ft^3*		
Media Type			--	Bioretention Soil				
Depth of Soil Media			*df*	2.5		*ft*	*2.5 ft to 4 ft*	
Hydraulic Conductivity			*k*	0.5		*ft/day*		
Average Height of Ponding			*hf*	0.25		*ft*	*typically 0.25 ft*	
Filter Time			*tf*	2.00		*days*		
Required Filter Area			***Af***	**1,923**		***ft^2***		
Determine Actual Bioretention Area								
Filter Width			--	*ft*				
Filter Length			--	*ft*				
Filter Area			7,135	*ft^2*	*OK*			
Actual Volume Provided			7,849	*ft^3*				
Determine Underdrain								
Underdrain Gravel Bed With			3	*ft*				
Required length of underdrain			238	*ft*				
Provided length of underdain			482	*ft*	*OK*			
Determine Runoff Reduction								
Percent Reduction			40%					
Runoff Reduction			**846**	***ft^3***	***This is 40% of the storage provided or WQv, whichever is smaller.***			
Volume Treated			**1,269**	***ft^3***	***This is the portion of the WQv that is not reduced in the practice.***			
Is the Bioretention contributing flow to another practice?				*no*	Select Practice			
Volume Directed to Another Practice			0	*ft^3*	This volume is directed another practice			

Bioretention Worksheet

Design Point(s):	**1, 2, 3, & 4**

Enter Site Data For Drainage Area to be Treated by Practice

Subcatchment Number	**Subcatchment Model Number**	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
2	230	10.46	8.85	0.85	0.81	30,809	1.00	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops			0.00	85%	0.81	30,809	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						0	*ft^3*	

Soil Information

Soil Group	D	
Using Underdrains?	*yes*	*Okay*

Pretreatment

WQv	30,809	*ft^3*
Pretreatment Sizing	25%	*of WQv*
Required Pretreatment Volume	7,702	*ft^3*
Pretreatment Provided	10,445	*ft^3*
Pretreatment techniques utilized	*Sediment Basin/Forebay*	

Calculate the Minimum Filter Area

WQv		30,809	*ft^3*	
Media Type	--	Bioretention Soil		
Depth of Soil Media	*df*	2.5	*ft*	*2.5 ft to 4 ft*
Hydraulic Conductivity	*k*	0.5	*ft/day*	
Average Height of Ponding	*hf*	0.25	*ft*	*typically 0.25 ft*
Filter Time	*tf*	2.00	*days*	
Required Filter Area	***Af***	**28,009**	***ft^2***	

Determine Actual Bioretention Area

Filter Width	--	*ft*	
Filter Length	--	*ft*	
Filter Area	28,375	*ft^2*	*OK*
Actual Volume Provided	31,213	*ft^3*	

Determine Underdrain

Underdrain Gravel Bed With	3	*ft*	
Required length of underdrain	946	*ft*	
Provided length of underdain	1,433	*ft*	*OK*

Determine Runoff Reduction

Percent Reduction	40%		
Runoff Reduction	**12,485**	***ft^3***	***This is 40% of the storage provided or WQv, whichever is smaller.***
Volume Treated	**18,324**	***ft^3***	***This is the portion of the WQv that is not reduced in the practice.***
Is the Bioretention contributing flow to another practice?	*no*	Select Practice	
Volume Directed to Another Practice	0	*ft^3*	This volume is directed another practice

Bioretention Worksheet

Design Point(s):	**1, 2, 3, & 4**

Enter Site Data For Drainage Area to be Treated by Practice

Subcatchment Number	**Subcatchment Model Number**	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
3	231	10.82	8.78	0.81	0.78	30,641	1.00	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops			0.00	81%	0.78	30,641	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						0	*ft^3*	

Soil Information

Soil Group	D	
Using Underdrains?	*yes*	*Okay*

Pretreatment

WQv	30,641	*ft^3*	
Pretreatment Sizing	25%	*of WQv*	
Required Pretreatment Volume	7,660	*ft^3*	
Pretreatment Provided	14,163	*ft^3*	
Pretreatment techniques utilized	*Sediment Basin/Forebay*		

Calculate the Minimum Filter Area

WQv		30,641	*ft^3*	
Media Type	--	Bioretention Soil		
Depth of Soil Media	*df*	2.5	*ft*	*2.5 ft to 4 ft*
Hydraulic Conductivity	*k*	0.5	*ft/day*	
Average Height of Ponding	*hf*	0.25	*ft*	*typically 0.25 ft*
Filter Time	*tf*	2.00	*days*	
Required Filter Area	***Af***	**27,855**	***ft^2***	

Determine Actual Bioretention Area

Filter Width	--	*ft*	
Filter Length	--	*ft*	
Filter Area	32,315	*ft^2*	*OK*
Actual Volume Provided	35,547	*ft^3*	

Determine Underdrain

Underdrain Gravel Bed With	3	*ft*	
Required length of underdrain	1,077	*ft*	
Provided length of underdain	1,761	*ft*	*OK*

Determine Runoff Reduction

Percent Reduction	40%		
Runoff Reduction	**14,219**	***ft^3***	***This is 40% of the storage provided or WQv, whichever is smaller.***
Volume Treated	**16,422**	***ft^3***	***This is the portion of the WQv that is not reduced in the practice.***
Is the Bioretention contributing flow to another practice?	*no*	Select Practice	
Volume Directed to Another Practice	0	*ft^3*	This volume is directed another practice

Bioretention Worksheet

Design Point(s):	**1, 2, 3, & 4**							
Enter Site Data For Drainage Area to be Treated by Practice								
Subcatchment Number	**Subcatchment Model Number**	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
4	232	9.44	5.63	0.60	0.59	20,113	1.00	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops			0.00	60%	0.59	20,113	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						0	*ft^3*	
Soil Information								
Soil Group			D					
Using Underdrains?			*yes*	*Okay*				
Pretreatment								
WQv				20,113	*ft^3*			
Pretreatment Sizing				25%	*of WQv*			
Required Pretreatment Volume				5,028	*ft^3*			
Pretreatment Provided				9,890	*ft^3*			
Pretreatment techniques utilized				*Sediment Basin/Forebay*				
Calculate the Minimum Filter Area								
WQv				20,113		*ft^3*		
Media Type			--	Bioretention Soil				
Depth of Soil Media			*df*	2.5		*ft*	*2.5 ft to 4 ft*	
Hydraulic Conductivity			*k*	0.5		*ft/day*		
Average Height of Ponding			*hf*	0.25		*ft*	*typically 0.25 ft*	
Filter Time			*tf*	2.00		*days*		
Required Filter Area			***Af***	**18,285**		***ft^2***		
Determine Actual Bioretention Area								
Filter Width			--	*ft*				
Filter Length			--	*ft*				
Filter Area			21,580	*ft^2*	*OK*			
Actual Volume Provided			23,738	*ft^3*				
Determine Underdrain								
Underdrain Gravel Bed With			3	*ft*				
Required length of underdrain			719	*ft*				
Provided length of underdain			1,035	*ft*	*OK*			
Determine Runoff Reduction								
Percent Reduction			40%					
Runoff Reduction			**9,495**	***ft^3***	***This is 40% of the storage provided or WQv, whichever is smaller.***			
Volume Treated			**10,618**	***ft^3***	***This is the portion of the WQv that is not reduced in the practice.***			
Is the Bioretention contributing flow to another practice?				*no*	Select Practice			
Volume Directed to Another Practice			0	*ft^3*	This volume is directed another practice			

Bioretention Worksheet

Design Point(s):	**1, 2, 3, & 4**							
Enter Site Data For Drainage Area to be Treated by Practice								
Subcatchment Number	**Subcatchment Model Number**	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
5	234	7.86	6.45	0.82	0.79	22,494	1.00	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops			0.00	82%	0.79	22,494	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						0	*ft^3*	
Soil Information								
Soil Group			D					
Using Underdrains?			*yes*	*Okay*				
Pretreatment								
WQv				22,494	*ft^3*			
Pretreatment Sizing				25%	*of WQv*			
Required Pretreatment Volume				5,623	*ft^3*			
Pretreatment Provided				8,951	*ft^3*			
Pretreatment techniques utilized				*Sediment Basin/Forebay*				
Calculate the Minimum Filter Area								
WQv				22,494		*ft^3*		
Media Type			--	Bioretention Soil				
Depth of Soil Media			*df*	2.5		*ft*	*2.5 ft to 4 ft*	
Hydraulic Conductivity			*k*	0.5		*ft/day*		
Average Height of Ponding			*hf*	0.25		*ft*	*typically 0.25 ft*	
Filter Time			*tf*	2.00		*days*		
Required Filter Area			***Af***	**20,449**		***ft^2***		
Determine Actual Bioretention Area								
Filter Width			--	*ft*				
Filter Length			--	*ft*				
Filter Area			20,920	*ft^2*	*OK*			
Actual Volume Provided			23,012	*ft^3*				
Determine Underdrain								
Underdrain Gravel Bed With			3	*ft*				
Required length of underdrain			697	*ft*				
Provided length of underdain			1,051	*ft*	*OK*			
Determine Runoff Reduction								
Percent Reduction			40%					
Runoff Reduction			**9,205**	***ft^3***	***This is 40% of the storage provided or WQv, whichever is smaller.***			
Volume Treated			**13,289**	***ft^3***	***This is the portion of the WQv that is not reduced in the practice.***			
Is the Bioretention contributing flow to another practice?				*no*	Select Practice			
Volume Directed to Another Practice			0	*ft^3*	This volume is directed another practice			

Bioretention Worksheet

Design Point(s):	**1, 2, 3, & 4**

Enter Site Data For Drainage Area to be Treated by Practice

Subcatchment Number	**Subcatchment Model Number**	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
6	235	10.03	7.32	0.73	0.71	25,728	1.00	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops			0.00	73%	0.71	25,728	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						0	*ft^3*	

Soil Information

Soil Group	D	
Using Underdrains?	*yes*	*Okay*

Pretreatment

WQv	25,728	*ft^3*
Pretreatment Sizing	25%	*of WQv*
Required Pretreatment Volume	6,432	*ft^3*
Pretreatment Provided	8,782	*ft^3*
Pretreatment techniques utilized	*Sediment Basin/Forebay*	

Calculate the Minimum Filter Area

WQv		25,728	*ft^3*	
Media Type	--	Bioretention Soil		
Depth of Soil Media	*df*	2.5	*ft*	*2.5 ft to 4 ft*
Hydraulic Conductivity	*k*	0.5	*ft/day*	
Average Height of Ponding	*hf*	0.25	*ft*	*typically 0.25 ft*
Filter Time	*tf*	2.00	*days*	
Required Filter Area	***Af***	**23,389**	***ft^2***	

Determine Actual Bioretention Area

Filter Width	--	*ft*	
Filter Length	--	*ft*	
Filter Area	38,130	*ft^2*	*OK*
Actual Volume Provided	41,943	*ft^3*	

Determine Underdrain

Underdrain Gravel Bed With	3	*ft*	
Required length of underdrain	1,271	*ft*	
Provided length of underdain	1,997	*ft*	*OK*

Determine Runoff Reduction

Percent Reduction	40%		
Runoff Reduction	**16,777**	***ft^3***	***This is 40% of the storage provided or WQv, whichever is smaller.***
Volume Treated	**8,950**	***ft^3***	***This is the portion of the WQv that is not reduced in the practice.***
Is the Bioretention contributing flow to another practice?	*no*	Select Practice	
Volume Directed to Another Practice	0	*ft^3*	This volume is directed another practice

Bioretention Worksheet

Design Point(s):	**1, 2, 3, & 4**							
Enter Site Data For Drainage Area to be Treated by Practice								
Subcatchment Number	**Subcatchment Model Number**	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
7	236	7.49	6.03	0.81	0.77	21,064	1.00	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops			0.00	81%	0.77	21,064	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						0	*ft^3*	
Soil Information								
Soil Group			D					
Using Underdrains?			*yes*	*Okay*				
Pretreatment								
WQv				21,064	*ft^3*			
Pretreatment Sizing				25%	*of WQv*			
Required Pretreatment Volume				5,266	*ft^3*			
Pretreatment Provided				10,485	*ft^3*			
Pretreatment techniques utilized				*Sediment Basin/Forebay*				
Calculate the Minimum Filter Area								
WQv				21,064		*ft^3*		
Media Type			--	Bioretention Soil				
Depth of Soil Media			*df*	2.5		*ft*	*2.5 ft to 4 ft*	
Hydraulic Conductivity			*k*	0.5		*ft/day*		
Average Height of Ponding			*hf*	0.25		*ft*	*typically 0.25 ft*	
Filter Time			*tf*	2.00		*days*		
Required Filter Area			***Af***	**19,149**		***ft^2***		
Determine Actual Bioretention Area								
Filter Width			--	*ft*				
Filter Length			--	*ft*				
Filter Area			19,350	*ft^2*	*OK*			
Actual Volume Provided			21,285	*ft^3*				
Determine Underdrain								
Underdrain Gravel Bed With			3	*ft*				
Required length of underdrain			645	*ft*				
Provided length of underdain			1,061	*ft*	*OK*			
Determine Runoff Reduction								
Percent Reduction			40%					
Runoff Reduction			**8,514**	***ft^3***	***This is 40% of the storage provided or WQv, whichever is smaller.***			
Volume Treated			**12,550**	***ft^3***	***This is the portion of the WQv that is not reduced in the practice.***			
Is the Bioretention contributing flow to another practice?				*no*	Select Practice			
Volume Directed to Another Practice			0	*ft^3*	This volume is directed another practice			

Bioretention Worksheet

Design Point(s):	**1, 2, 3, & 4**

Enter Site Data For Drainage Area to be Treated by Practice

Subcatchment Number	**Subcatchment Model Number**	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^{3})*	**Precipitation** *(in)*	**Description**
8	237	11.24	8.04	0.72	0.69	28,296	1.00	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops			0.00	72%	0.69	28,296	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						0	*ft^{3}*	

Soil Information

Soil Group	D	
Using Underdrains?	*yes*	*Okay*

Pretreatment

WQv	28,296	*ft^{3}*	
Pretreatment Sizing	25%	*of WQv*	
Required Pretreatment Volume	7,074	*ft^{3}*	
Pretreatment Provided	14,464	*ft^{3}*	
Pretreatment techniques utilized	*Sediment Basin/Forebay*		

Calculate the Minimum Filter Area

WQv		28,296	*ft^{3}*	
Media Type	--	Bioretention Soil		
Depth of Soil Media	*df*	2.5	*ft*	*2.5 ft to 4 ft*
Hydraulic Conductivity	*k*	0.5	*ft/day*	
Average Height of Ponding	*hf*	0.25	*ft*	*typically 0.25 ft*
Filter Time	*tf*	2.00	*days*	
Required Filter Area	***Af***	**25,723**	***ft^{2}***	

Determine Actual Bioretention Area

Filter Width	--	*ft*	
Filter Length	--	*ft*	
Filter Area	28,800	*ft^{2}*	*OK*
Actual Volume Provided	31,680	*ft^{3}*	

Determine Underdrain

Underdrain Gravel Bed With	3	*ft*	
Required length of underdrain	960	*ft*	
Provided length of underdain	1,442	*ft*	*OK*

Determine Runoff Reduction

Percent Reduction	40%		
Runoff Reduction	**12,672**	***ft^{3}***	***This is 40% of the storage provided or WQv, whichever is smaller.***
Volume Treated	**15,624**	***ft^{3}***	***This is the portion of the WQv that is not reduced in the practice.***
Is the Bioretention contributing flow to another practice?	*no*	Select Practice	
Volume Directed to Another Practice	0	*ft^{3}*	This volume is directed another practice

Bioretention Worksheet

Design Point(s): **1, 2, 3, & 4**

Enter Site Data For Drainage Area to be Treated by Practice

Subcatchment Number	**Subcatchment Model Number**	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
9	350	1.87	1.22	0.65	0.64	4,312	1.00	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops			0.00	65%	0.64	4,312	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						0	*ft^3*	

Soil Information

Soil Group	D	
Using Underdrains?	*yes*	*Okay*

Pretreatment

WQv	4,312	*ft^3*	
Pretreatment Sizing	25%	*of WQv*	
Required Pretreatment Volume	1,078	*ft^3*	
Pretreatment Provided	14,464	*ft^3*	
Pretreatment techniques utilized	*Sediment Basin/Forebay*		

Calculate the Minimum Filter Area

WQv		4,312	*ft^3*	
Media Type	--	Bioretention Soil		
Depth of Soil Media	*df*	2.5	*ft*	*2.5 ft to 4 ft*
Hydraulic Conductivity	*k*	0.5	*ft/day*	
Average Height of Ponding	*hf*	0.25	*ft*	*typically 0.25 ft*
Filter Time	*tf*	2.00	*days*	
Required Filter Area	***Af***	**3,920**	***ft^2***	

Determine Actual Bioretention Area

Filter Width	--	*ft*	
Filter Length	--	*ft*	
Filter Area	10,045	*ft^2*	*OK*
Actual Volume Provided	11,050	*ft^3*	

Determine Underdrain

Underdrain Gravel Bed With	3	*ft*	
Required length of underdrain	335	*ft*	
Provided length of underdain	628	*ft*	*OK*

Determine Runoff Reduction

Percent Reduction	40%		
Runoff Reduction	**1,725**	***ft^3***	***This is 40% of the storage provided or WQv, whichever is smaller.***
Volume Treated	**2,587**	***ft^3***	***This is the portion of the WQv that is not reduced in the practice.***
Is the Bioretention contributing flow to another practice?	*no*	Select Practice	
Volume Directed to Another Practice	0	*ft^3*	This volume is directed another practice

Channel Protection Volume Worksheet

Design Point(s):	1, 2, 3, & 4		
Channel Protection Volume			
Area	136.27	*ac*	*0.213 sq. miles*
Curve Number (CN)	90		
Precipitation for 1 yr storm ($P_{1\ yr\ storm}$)	1.77	*in*	
Ia (200 / CN - 2)	0.21		
Ia / $P_{1\ yr\ storm}$	0.12		
S (Ia / 0.2)	1.07		
Time of Concentration	6.00	*min*	*0.100 hours*
Unit peak discharge (q_u)	973	*csm/in*	*from Exhibit 4-III of TR-55*
Ratio of Outflow to Inflow (q_o/q_i)	0.010		*from Figure B.1 of Design Manual*
Unit Volume (V_S/V_r)	0.67		$0.683 - 1.43*(q_o/q_i) + 1.64*(q_o/q_i)^2 - 0.804*(q_o/q_i)^3$
Runoff for 1 yr storm ($Q_{1\ yr\ runoff}$)	2.65	*in*	$(P_{1\ yr\ storm} - 0.2*S)^2/(P_{1\ yr\ storm} - 0.8*S)$
Channel Protection Volume	**585,613**	***cf***	$[((V_s/V_r) * (Q_{1\ yr\ runoff}) * A)/12]*43560$
Average Release Rate over 24 hours	**6.78**	***cfs***	

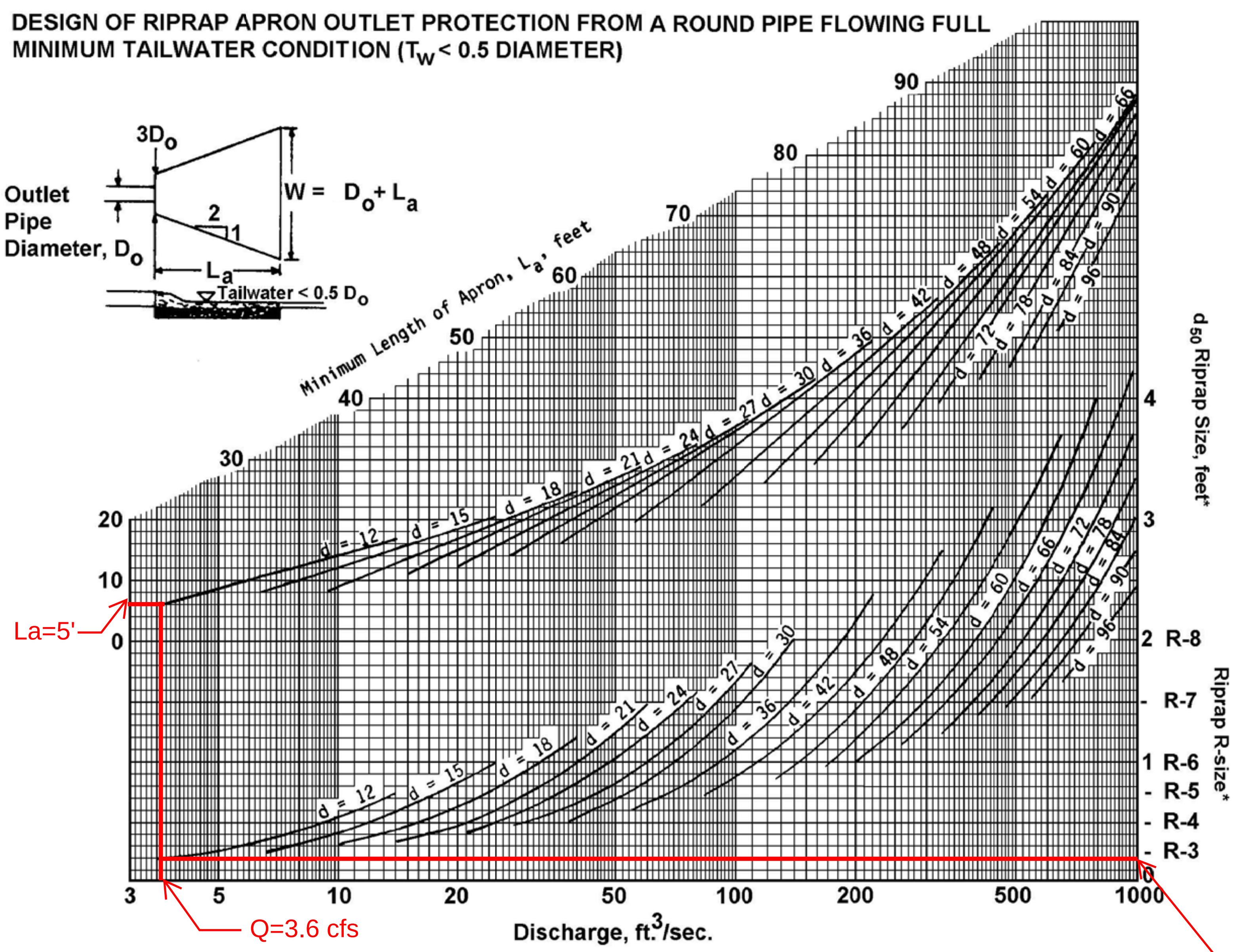
Rip Rap Sizing using Flowing Full Capacity Worksheet

Structure	pipe size (in)	pipe size (ft)	hydraulic radius, R (ft)	Pipe Area (sf)	Slope (ft/ft)	n	velocity, full (fps)	Discharge, Full (cfs)	End Section or Headwall?	Top With of Rip Rap, $3D_o$ (ft)	Bottom Width of Rip Rap, W (ft)	Length of Rip Rap, L_a (ft)	d_{50} Rip Rap Size (in)	Rip Rap thickness (in)
HW-04	12	1.0	0.3	0.8	0.010	0.013	4.5	3.6	yes	Conform to ES or HW	5.0	4	6	14
HW-101	18	1.5	0.4	1.8	0.006	0.013	4.5	8.0	yes	Conform to ES or HW	9.5	8	6	14
HW-201	24	2.0	0.5	3.1	0.008	0.013	6.5	20.3	yes	Conform to ES or HW	14.0	12	6	14
HW-208	18	1.5	0.4	1.8	0.099	0.013	18.7	33.1	yes	Conform to ES or HW	23.5	22	12	27
HW-209	18	1.5	0.4	1.8	0.050	0.013	13.3	23.6	yes	Conform to ES or HW	21.5	20	9	20
HW-210	18	1.5	0.4	1.8	0.034	0.013	11.0	19.4	yes	Conform to ES or HW	19.5	18	9	20
HW-211	18	1.5	0.4	1.8	0.004	0.013	3.8	6.7	yes	Conform to ES or HW	5.5	4	6	14
HW-215	24	2.0	0.5	3.1	0.007	0.013	6.0	19.0	yes	Conform to ES or HW	13.0	11	6	14
HW-301	36	3.0	0.8	7.1	0.009	0.013	9.0	63.4	yes	Conform to ES or HW	25.0	22	9	20
HW-321	36	3.00	0.8	7.1	0.004	0.013	6.0	42.3	yes	Conform to ES or HW	13.0	10	6	14
HW-401	30	2.5	0.6	4.9	0.004	0.013	5.3	26.0	yes	Conform to ES or HW	10.5	8	6	14
HW-419	18	1.5	0.4	1.8	0.029	0.013	10.1	17.9	yes	Conform to ES or HW	14.5	13	6	14
HW-501	36	3.0	0.8	7.1	0.004	0.013	6.0	42.3	yes	Conform to ES or HW	13.0	10	6	14
HW-511	18	1.5	0.4	1.8	0.088	0.013	17.6	31.2	yes	Conform to ES or HW	23.5	22	12	27
HW-512	24	2.0	0.5	3.1	0.101	0.013	23.0	72.2	yes	Conform to ES or HW	34.0	32	18	32
HW-513	18	1.5	0.4	1.8	0.075	0.013	16.4	28.9	yes	Conform to ES or HW	22.5	21	12	27
HW-601	15	1.3	0.3	1.2	0.004	0.013	3.3	4.1	yes	Conform to ES or HW	5.3	4	6	14
HW-606	42	3.5	0.9	9.6	0.005	0.013	7.4	71.3	yes	Conform to ES or HW	21.5	18	9	20
HW-615	18	1.5	0.4	1.8	0.098	0.013	18.6	32.9	yes	Conform to ES or HW	21.5	20	12	27
HW-701	36	3.0	0.8	7.1	0.010	0.013	9.5	66.9	yes	Conform to ES or HW	27.0	24	9	20
HW-705	36	3.0	0.8	7.1	0.006	0.013	7.3	51.8	yes	Conform to ES or HW	21.0	18	9	20
HW-801	36	3.0	0.8	7.1	0.010	0.013	9.5	66.9	yes	Conform to ES or HW	26.0	23	9	20
HW-901	12	1.0	0.3	0.8	0.040	0.013	9.1	7.1	yes	Conform to ES or HW	13.0	12	6	14
HW-903	12	1.0	0.3	0.8	0.017	0.013	5.9	4.7	yes	Conform to ES or HW	9.0	8	6	14

Rip Rap Sizing using Flowing Full Capacity Worksheet

Structure	pipe size (in)	pipe size (ft)	hydraulic radius, R (ft)	Pipe Area (sf)	Slope (ft/ft)	n	velocity, full (fps)	Discharge, Full (cfs)	End Section or Headwall?	Top With of Rip Rap, $3D_o$ (ft)	Bottom Width of Rip Rap, W (ft)	Length of Rip Rap, L_a (ft)	d_{50} Rip Rap Size (in)	Rip Rap thickness (in)
HW-905	15	1.3	0.3	1.2	0.073	0.013	14.3	17.5	yes	Conform to ES or HW	14.3	13	6	14
HW-1104	18	1.5	0.4	1.8	0.004	0.013	3.8	6.7	yes	Conform to ES or HW	5.5	4	6	14
HW-1105	10	0.8	0.2	0.5	0.027	0.013	6.6	3.6	yes	Conform to ES or HW	4.8	4	6	14

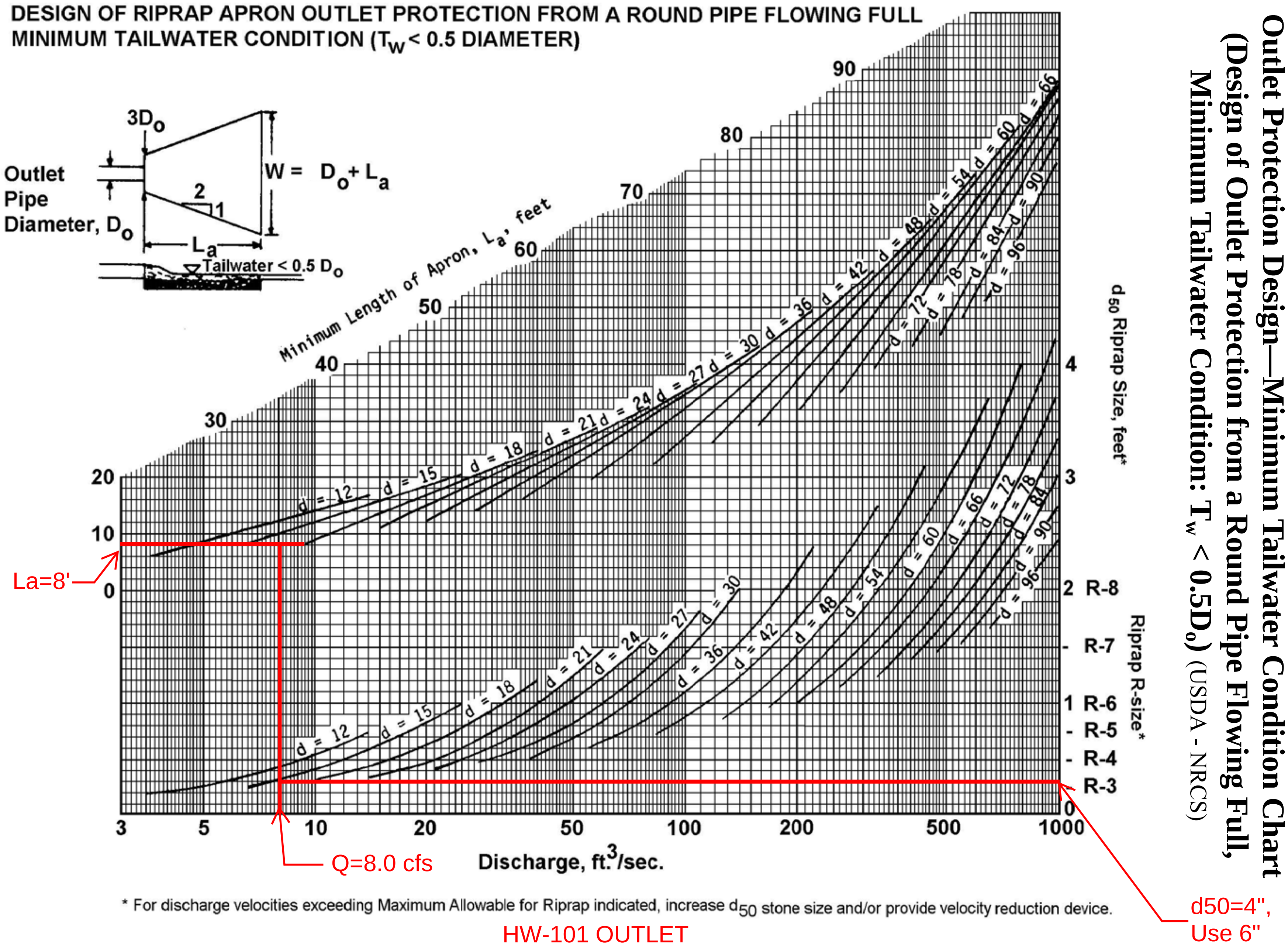
Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-04 OUTLET

d50=2",
Use 6"

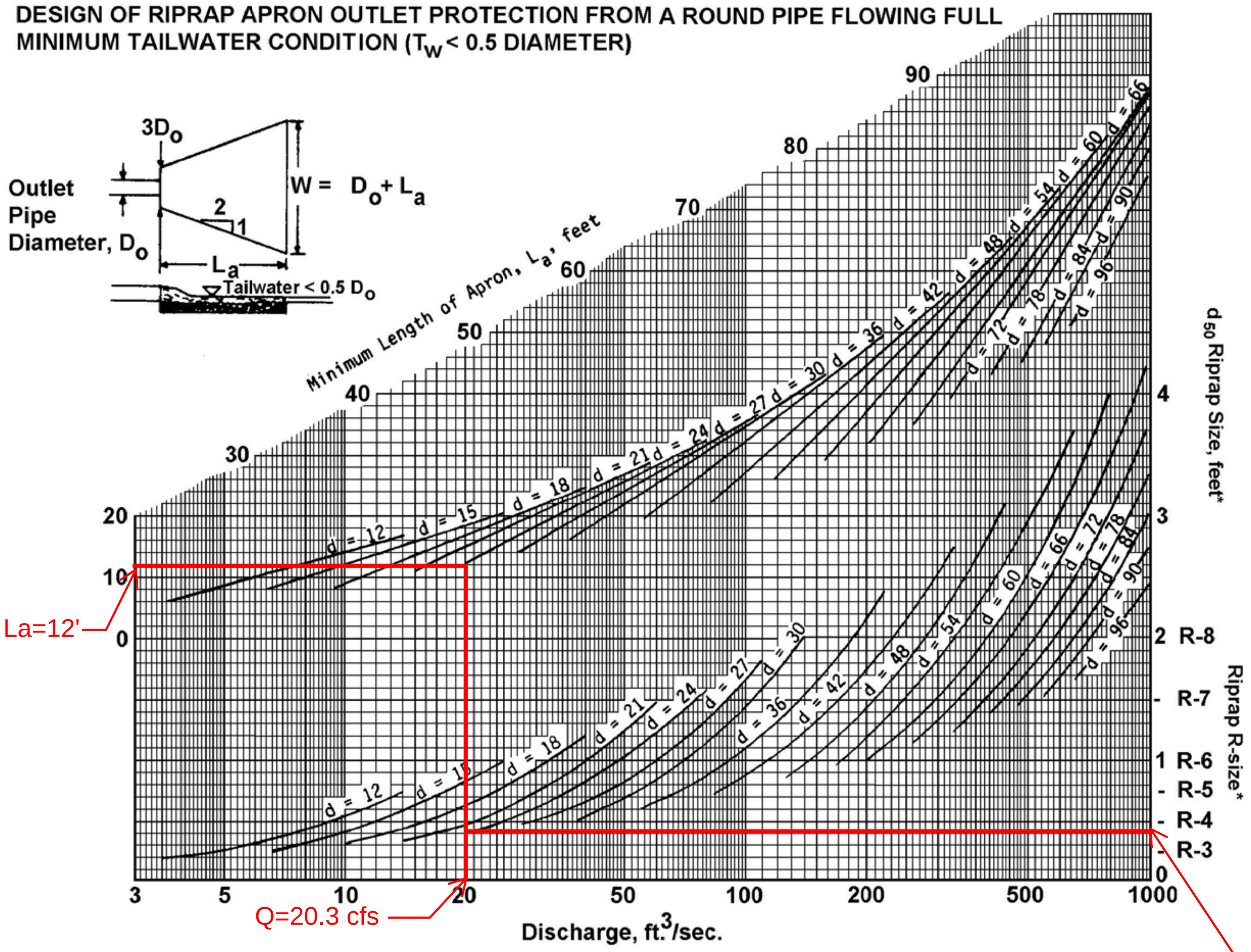


* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart
(Design of Outlet Protection from a Round Pipe Flowing Full,
Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

Figure 3.16

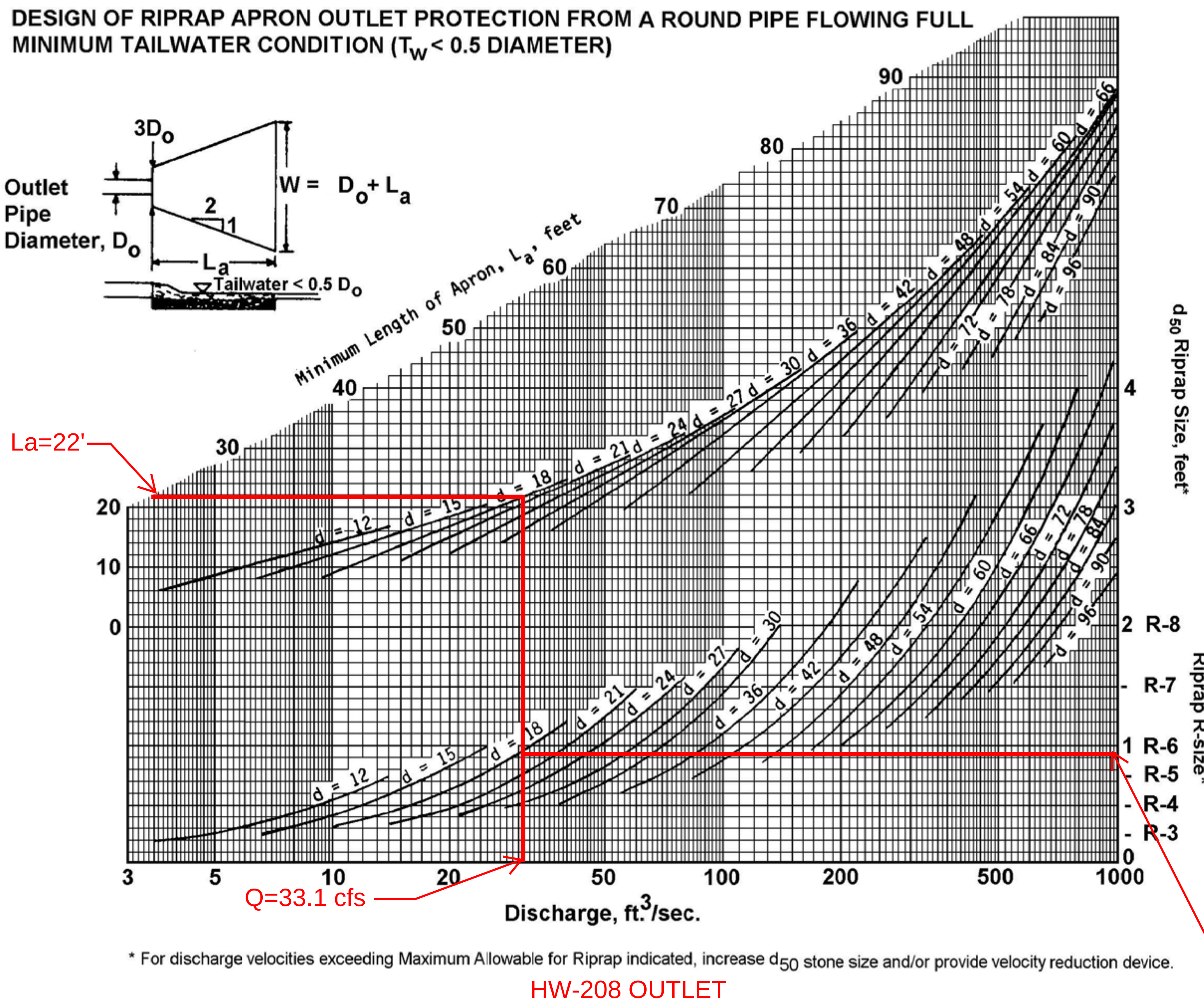
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

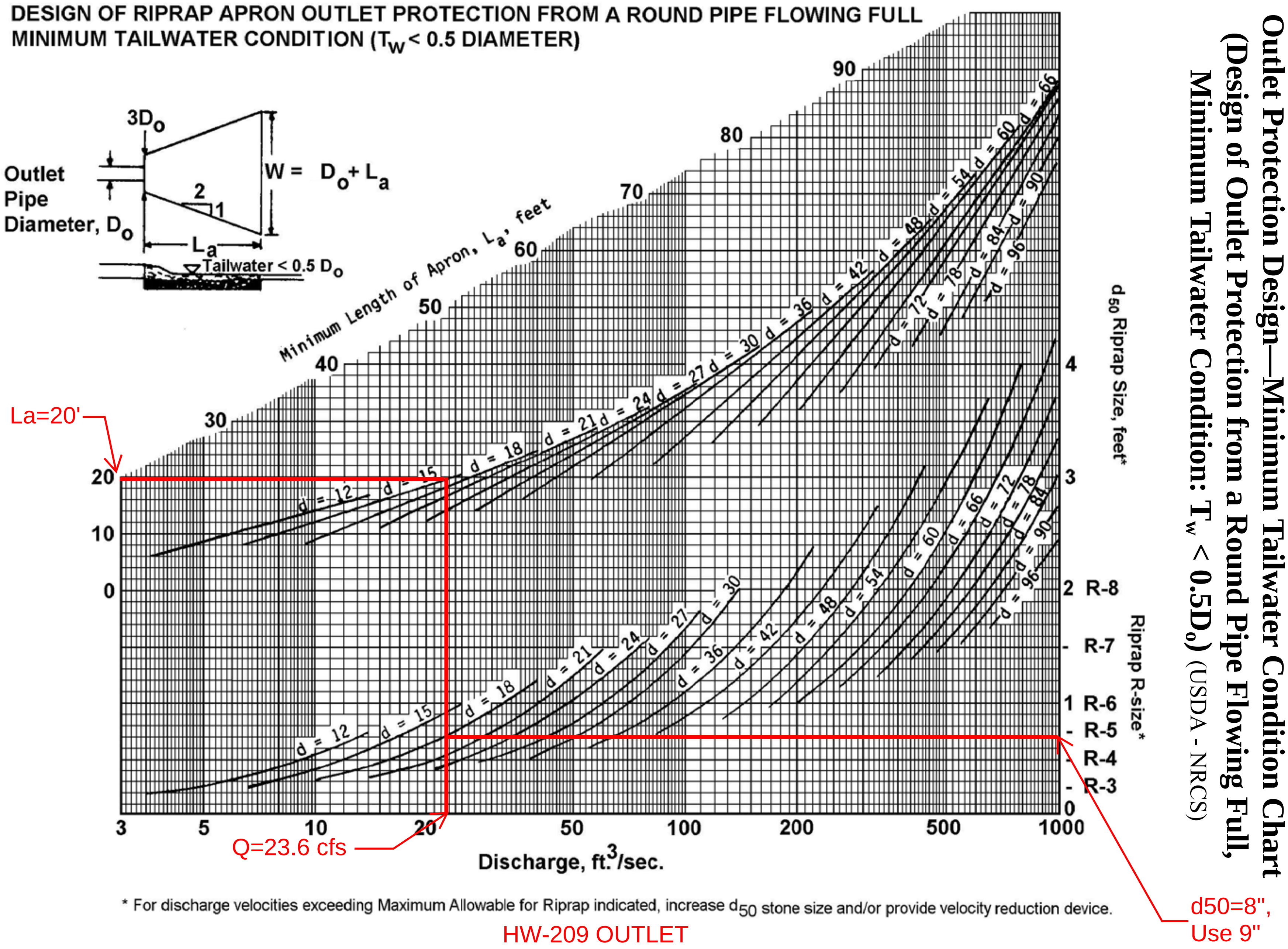
HW-201 OUTLET

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-208 OUTLET

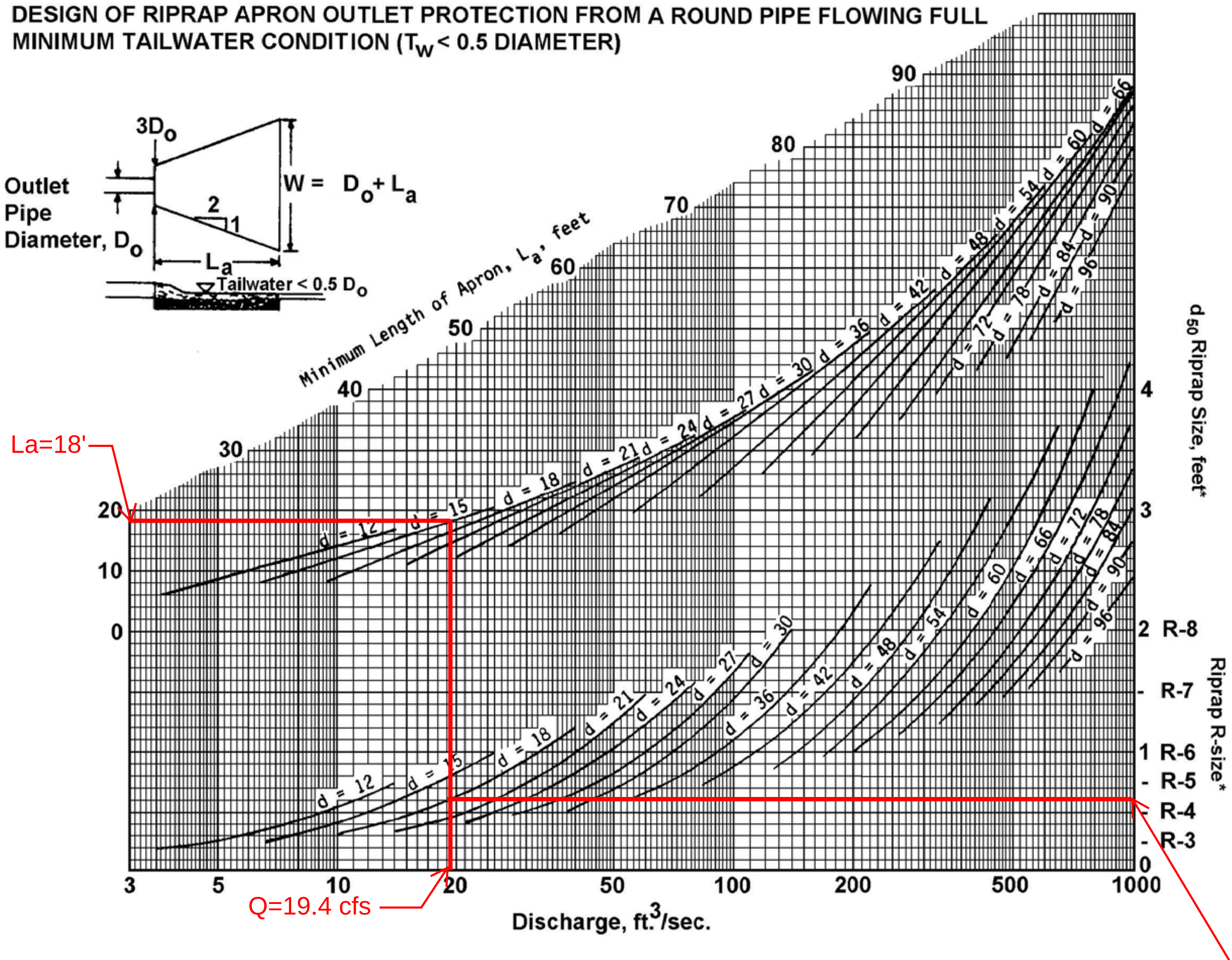


* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-209 OUTLET

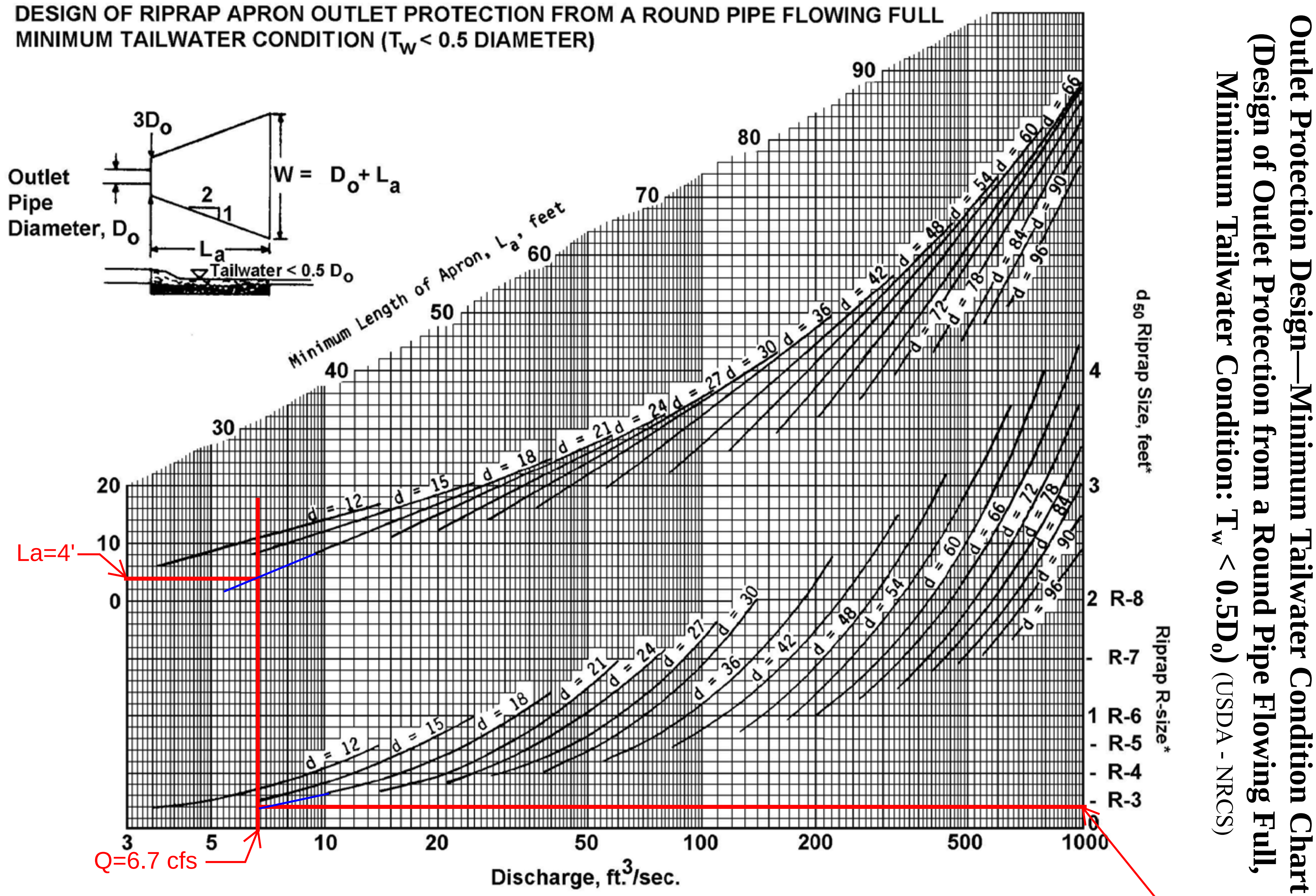
Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

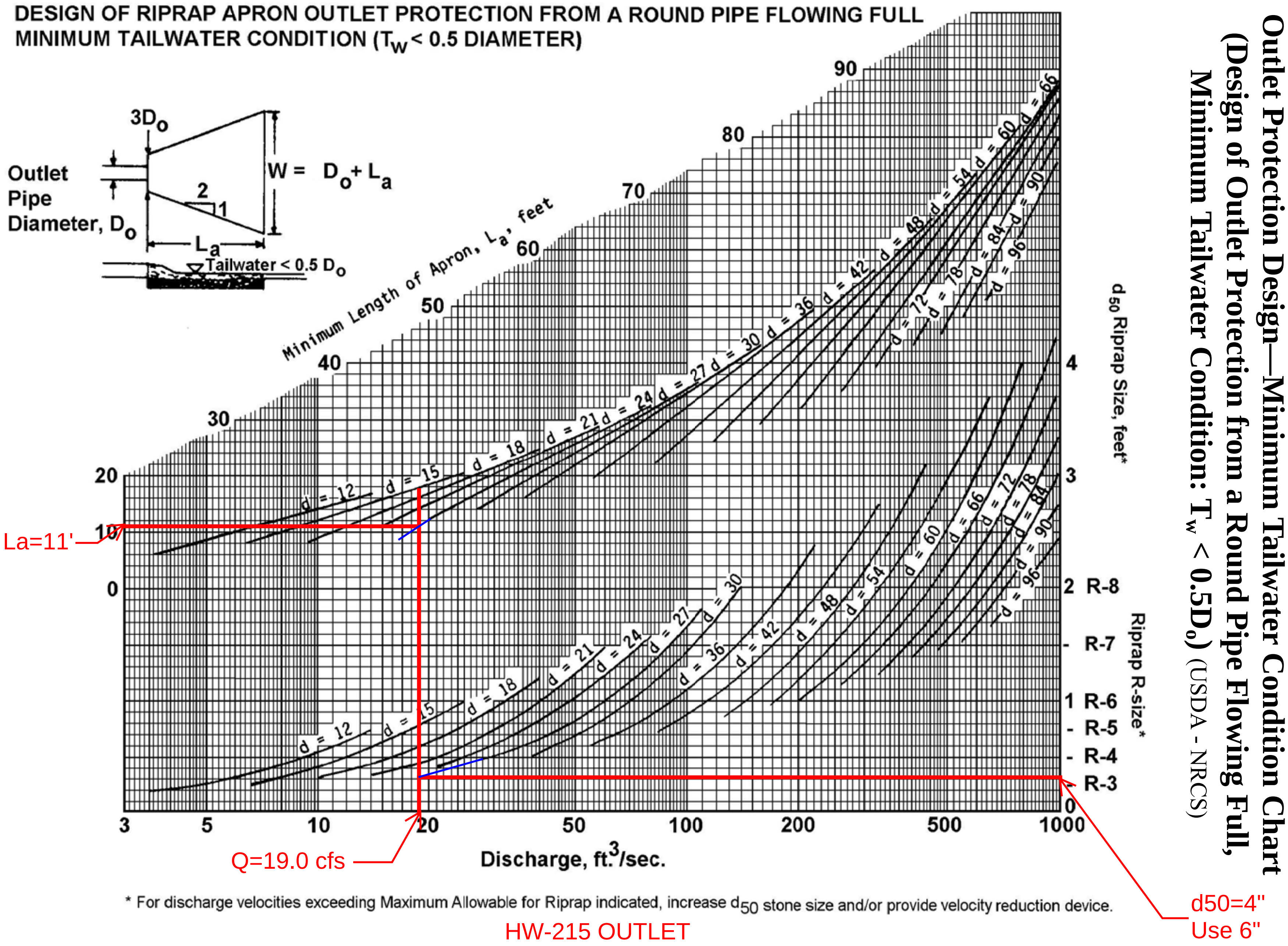
HW-210 OUTLET



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-211 OUTLET

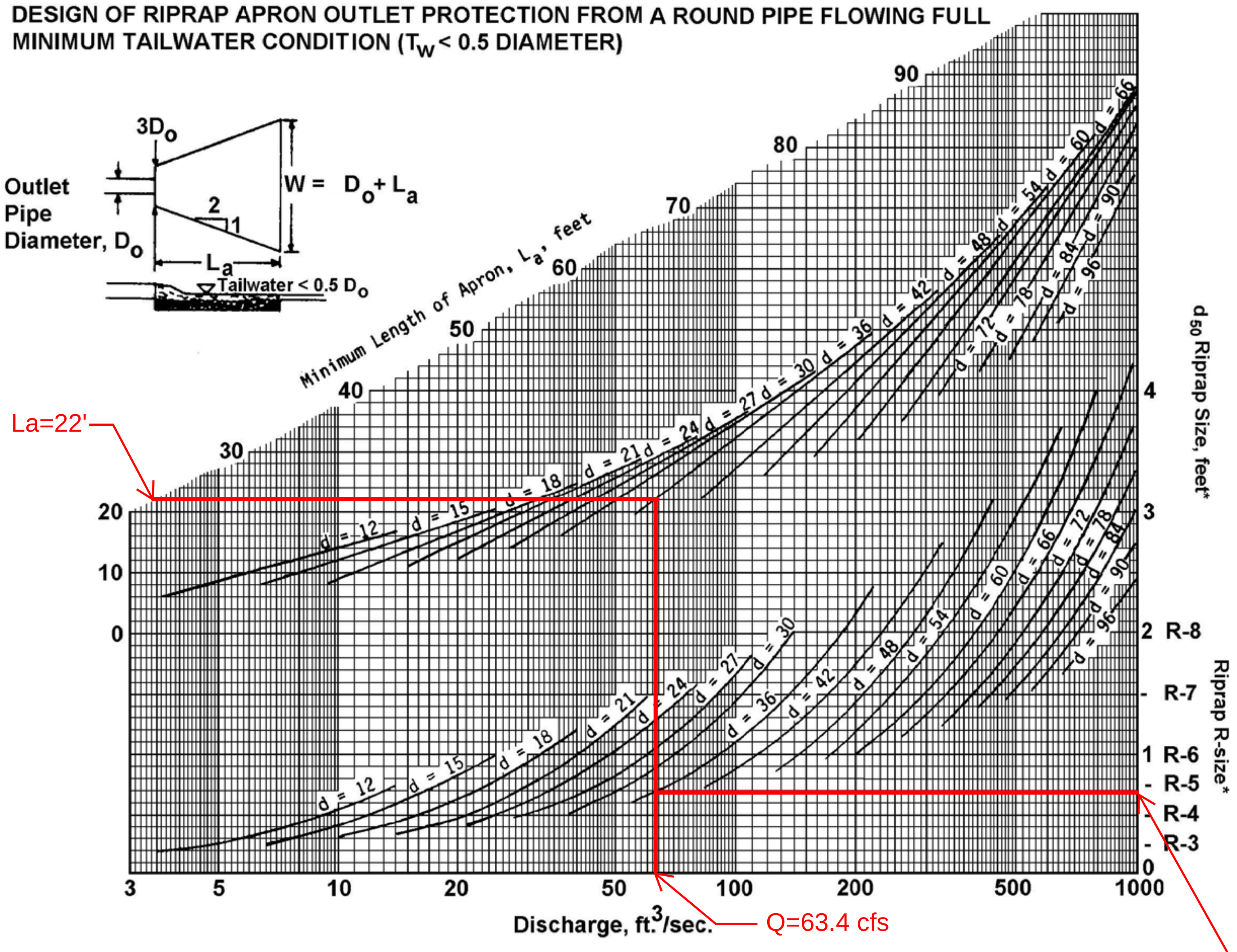
Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart
(Design of Outlet Protection from a Round Pipe Flowing Full,
Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: T_w < $0.5D_o$) (USDA - NRCS)

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

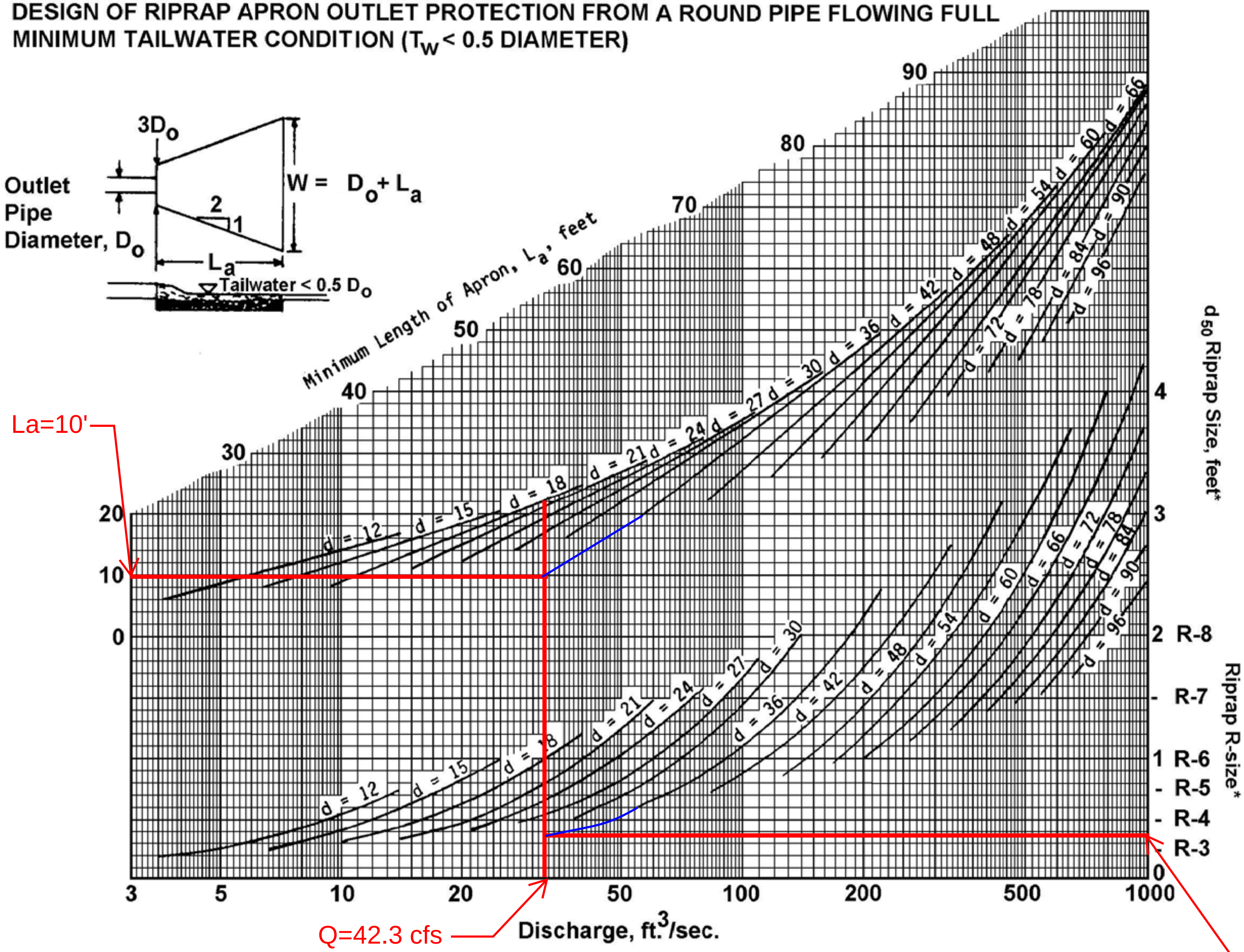


* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-301 OUTLET

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

DESIGN OF RIPRAP APRON OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL
MINIMUM TAILWATER CONDITION ($T_W < 0.5$ DIAMETER)

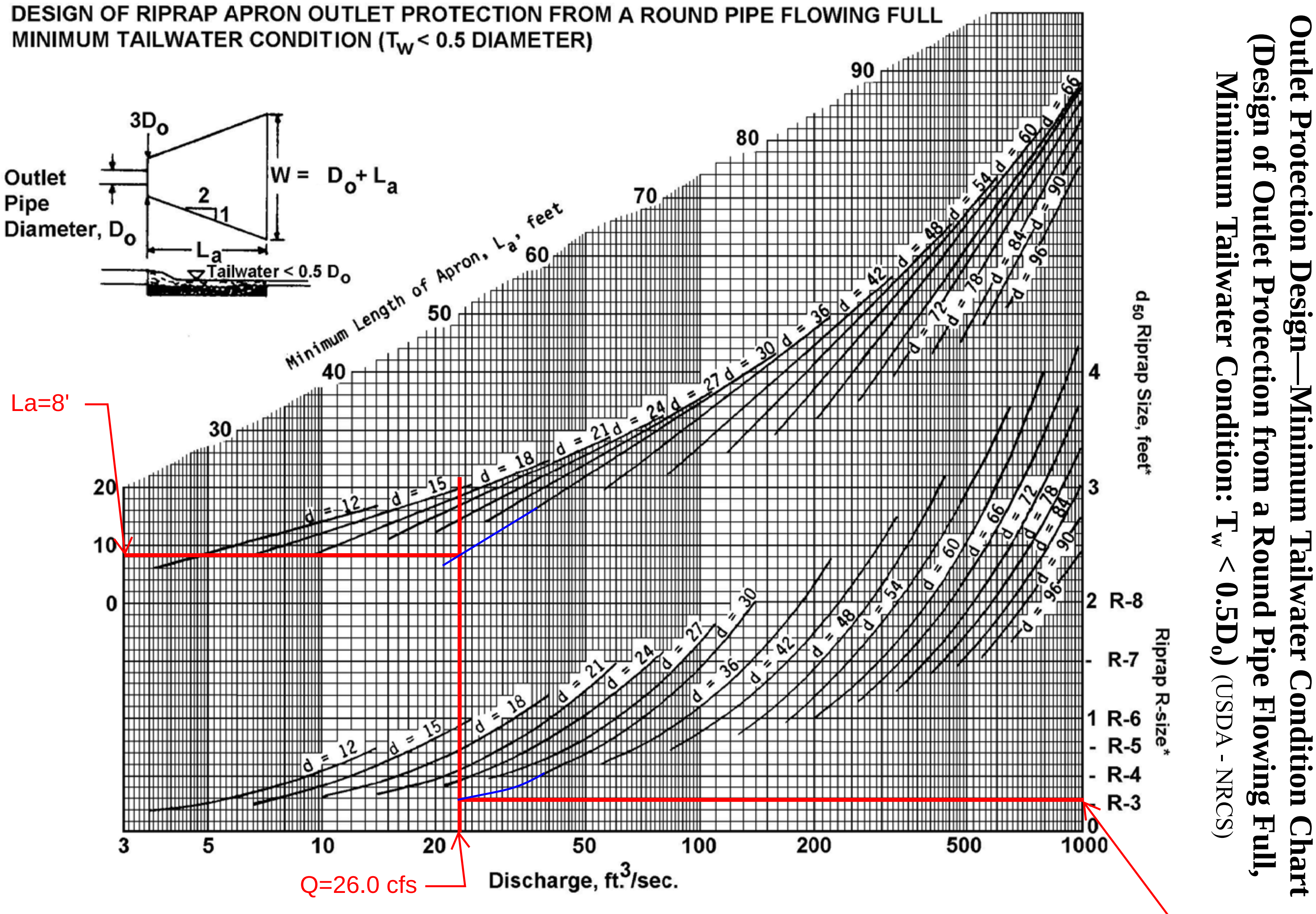


* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-321 OUTLET

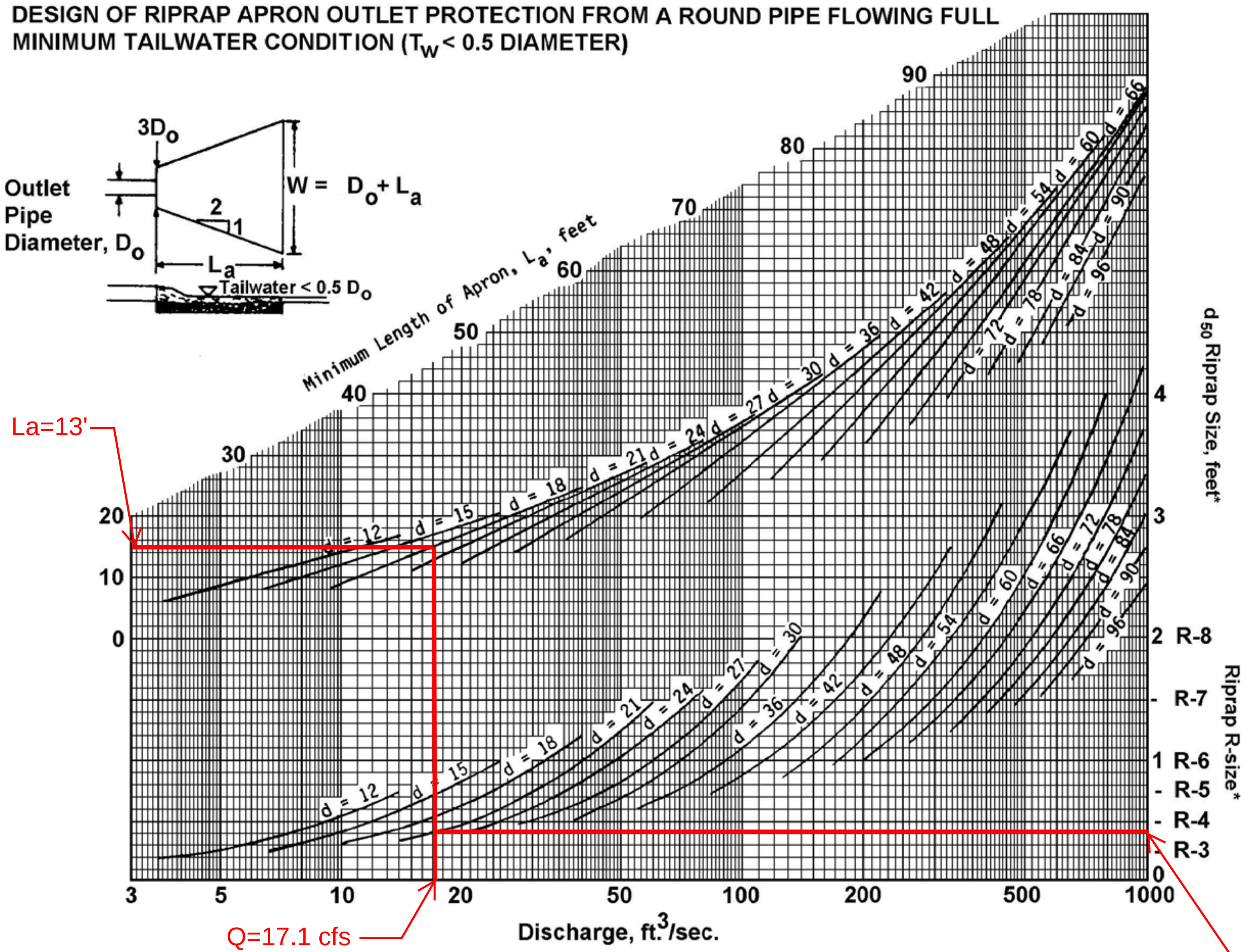
d50=5"
Use 6"

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-401 OUTLET

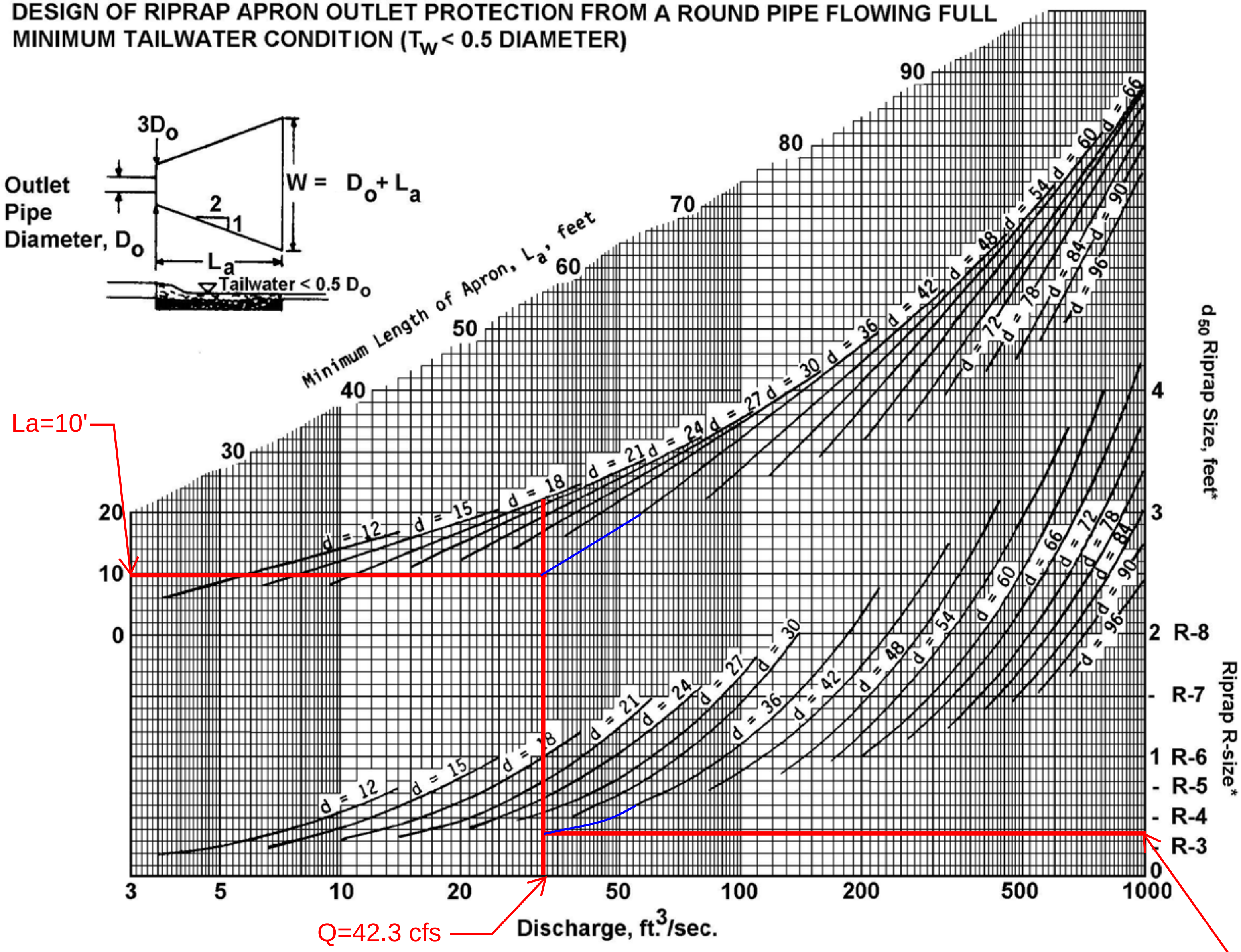


* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-419 OUTLET

d50=5"
Use 6"

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



La=10'

Q=42.3 cfs

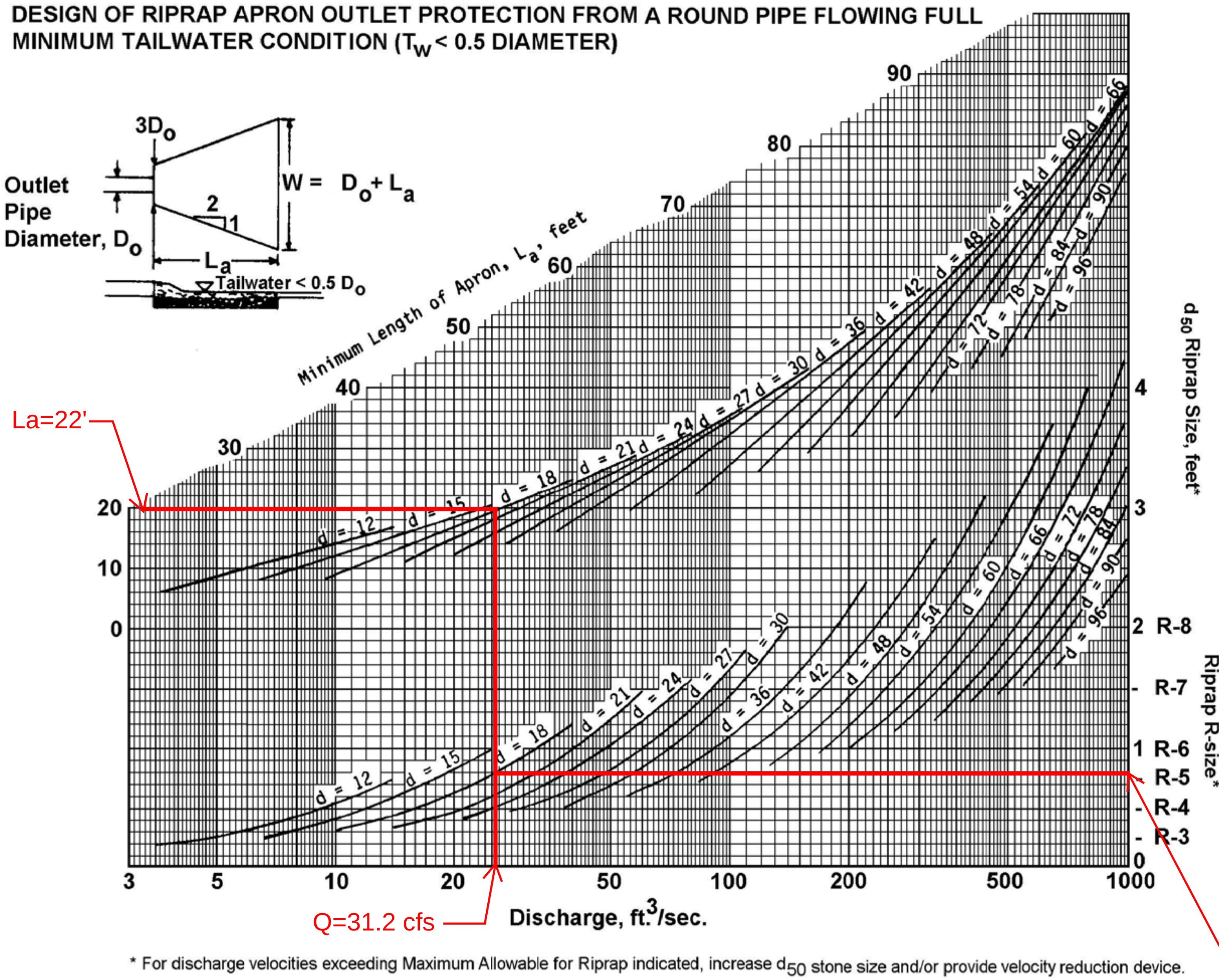
d50=4"
Use 6"

* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-501 OUTLET

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: T_w < 0.5D_o) (USDA - NRCS)

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



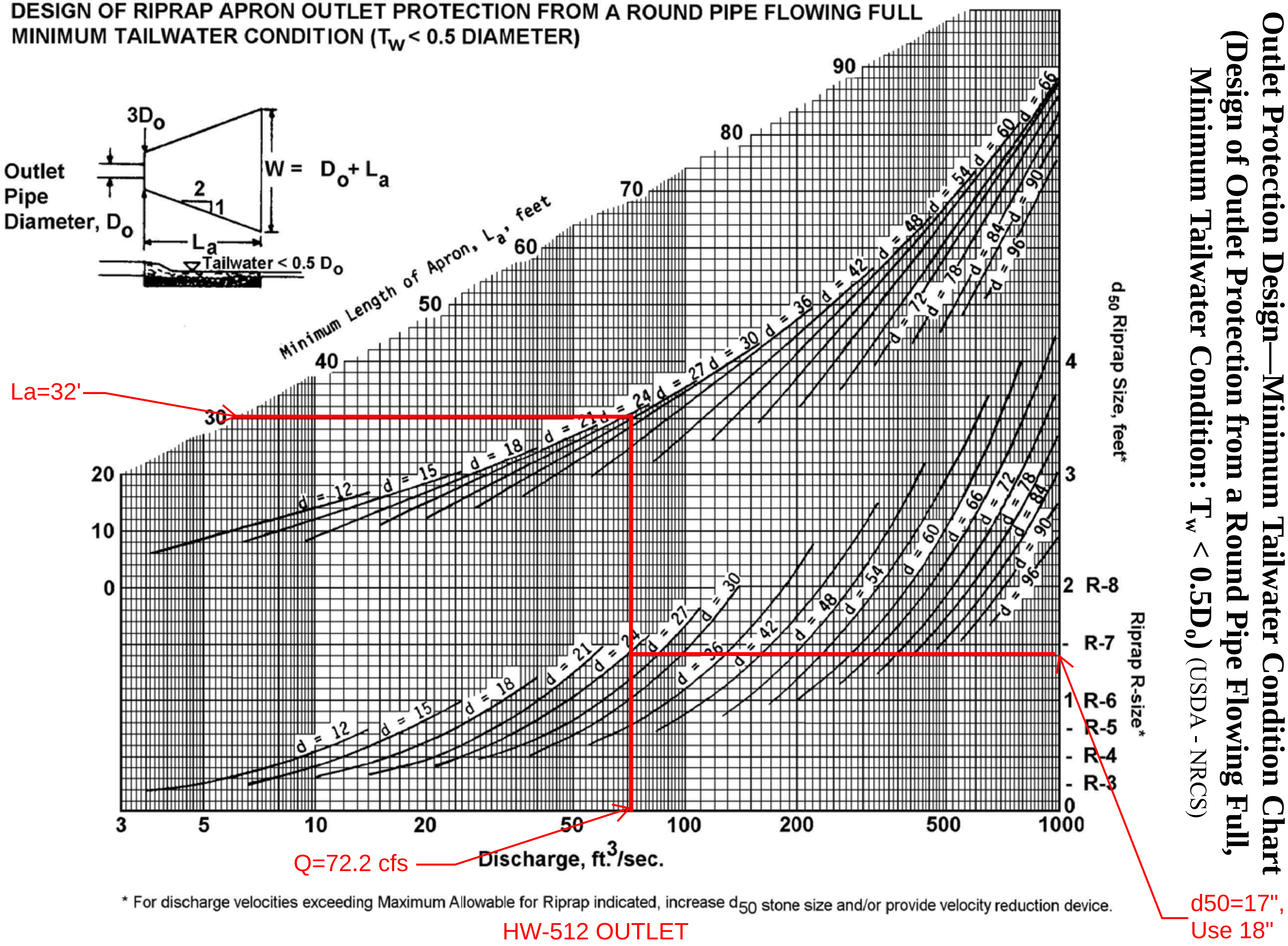
* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

La=22'

Q=31.2 cfs

d50=10",
Use 12"

HW-511 OUTLET

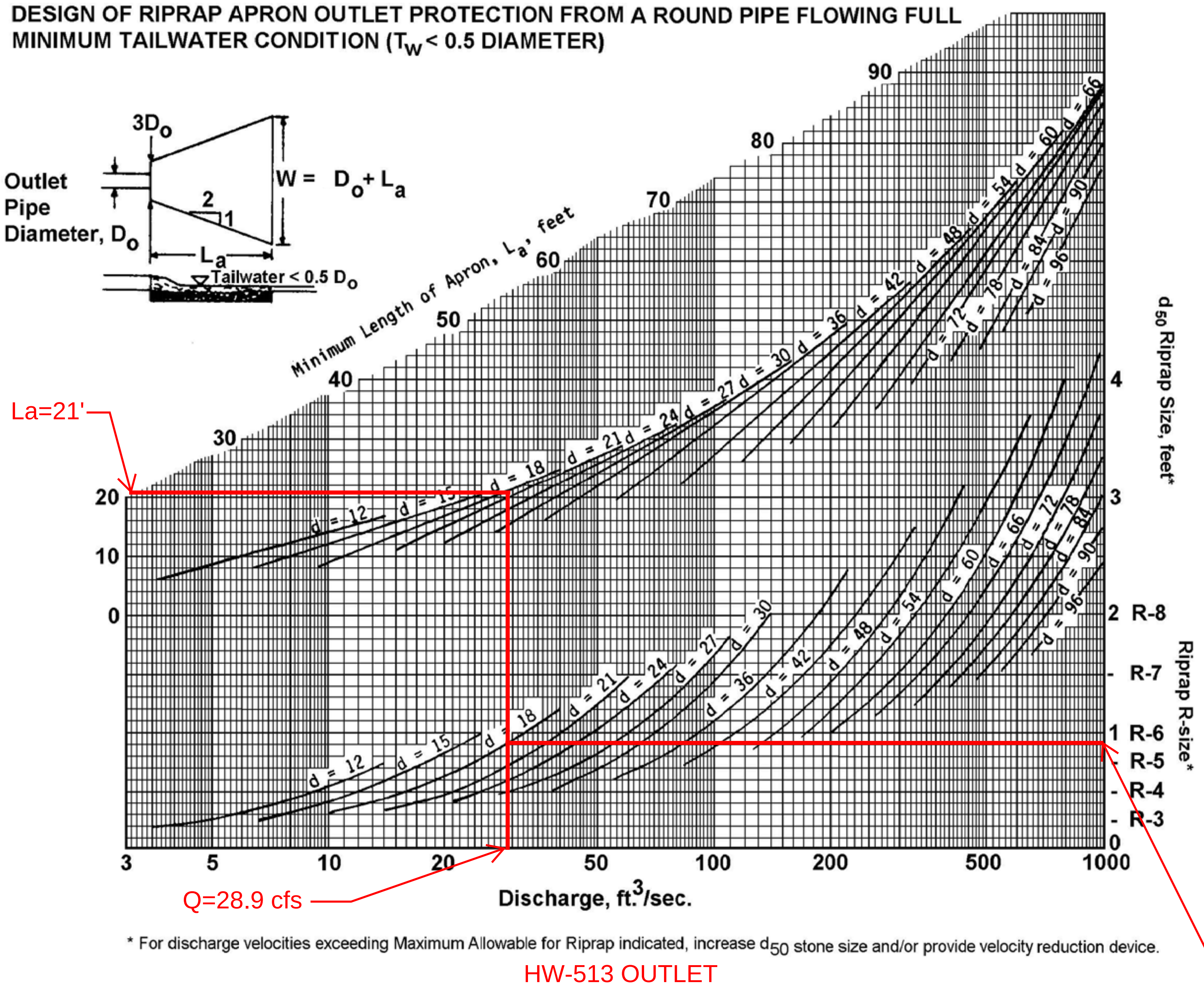


* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-512 OUTLET

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart
(Design of Outlet Protection from a Round Pipe Flowing Full,
Minimum Tailwater Condition: T_w < 0.5D_o) (USDA - NRCS)

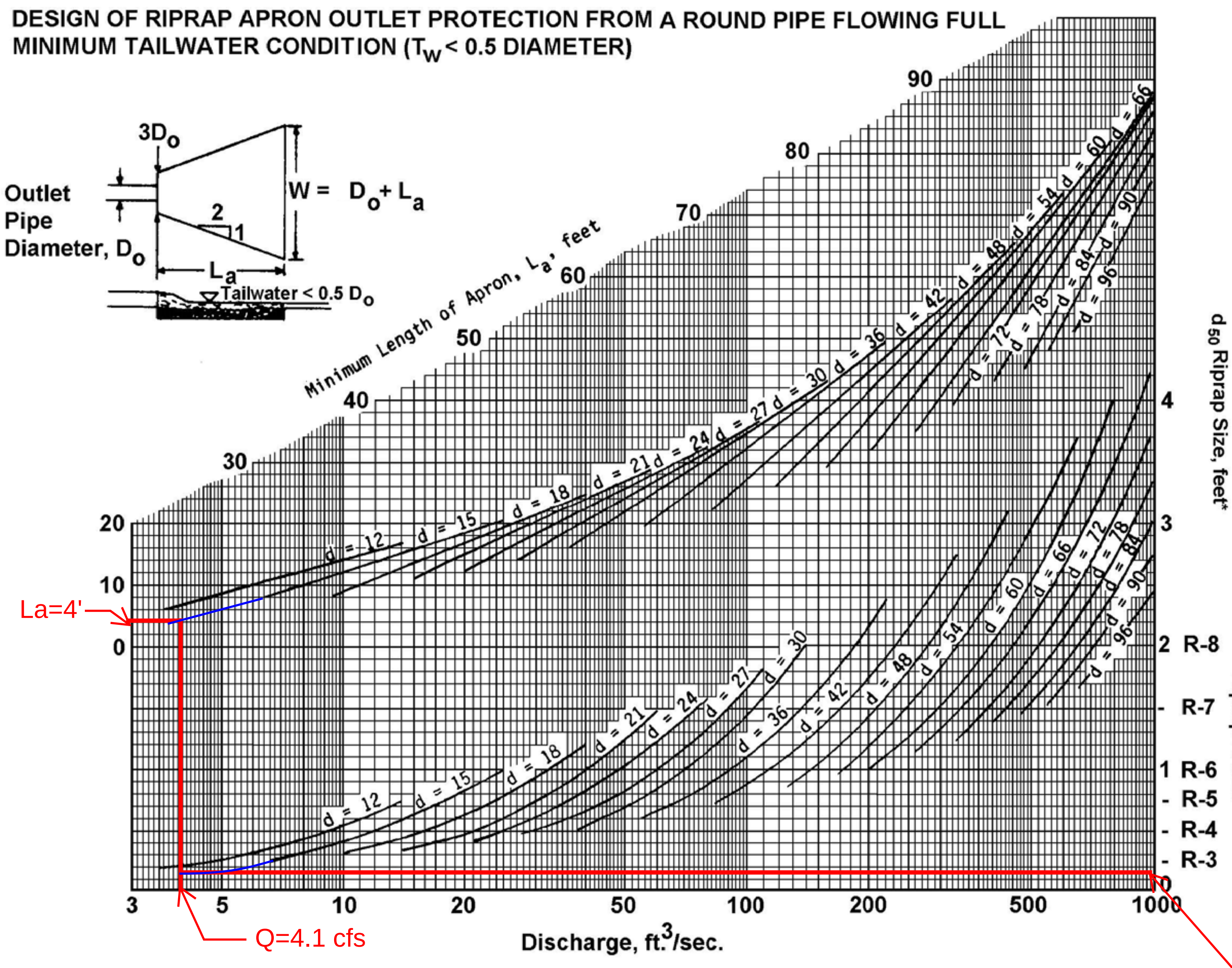
Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-513 OUTLET

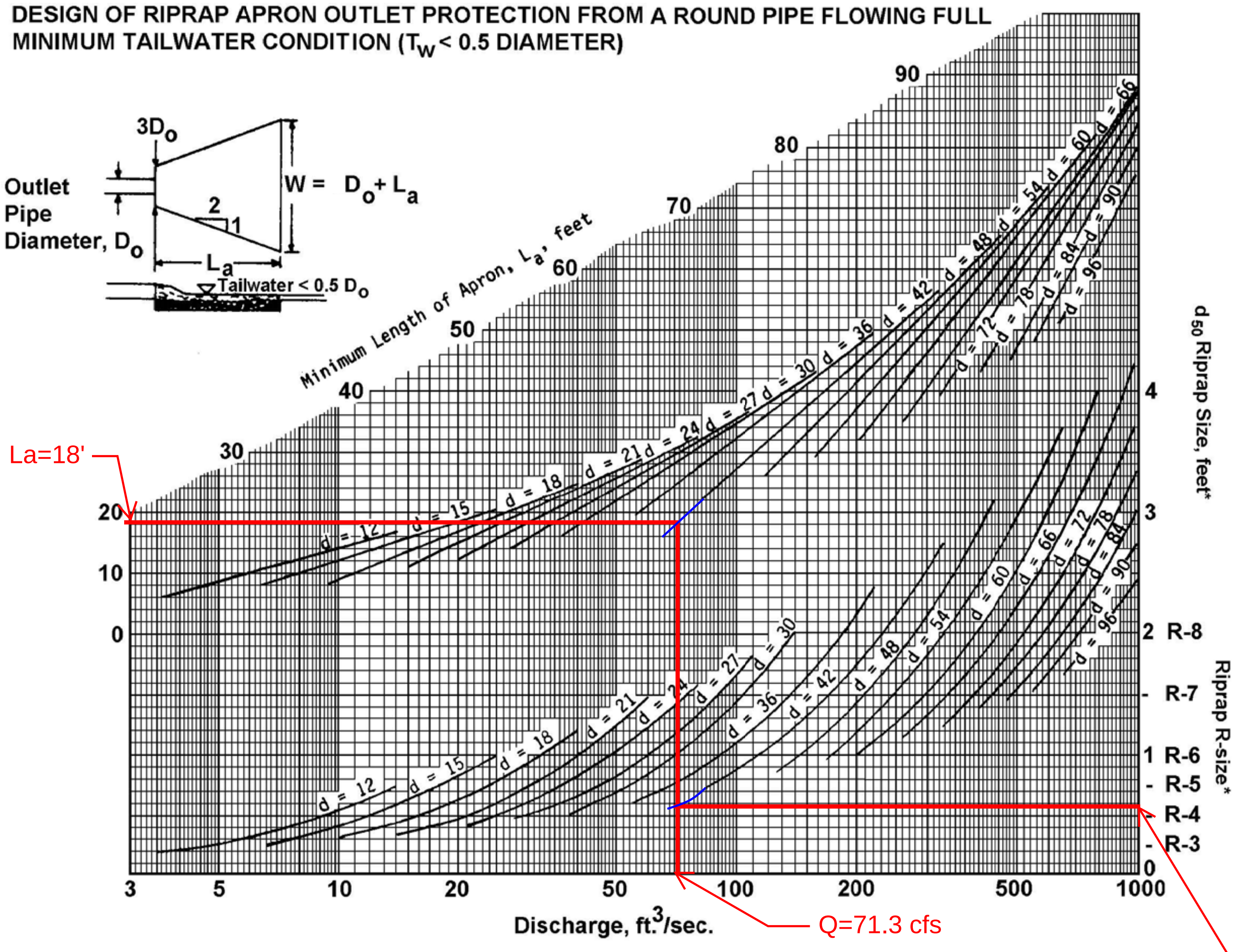
Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

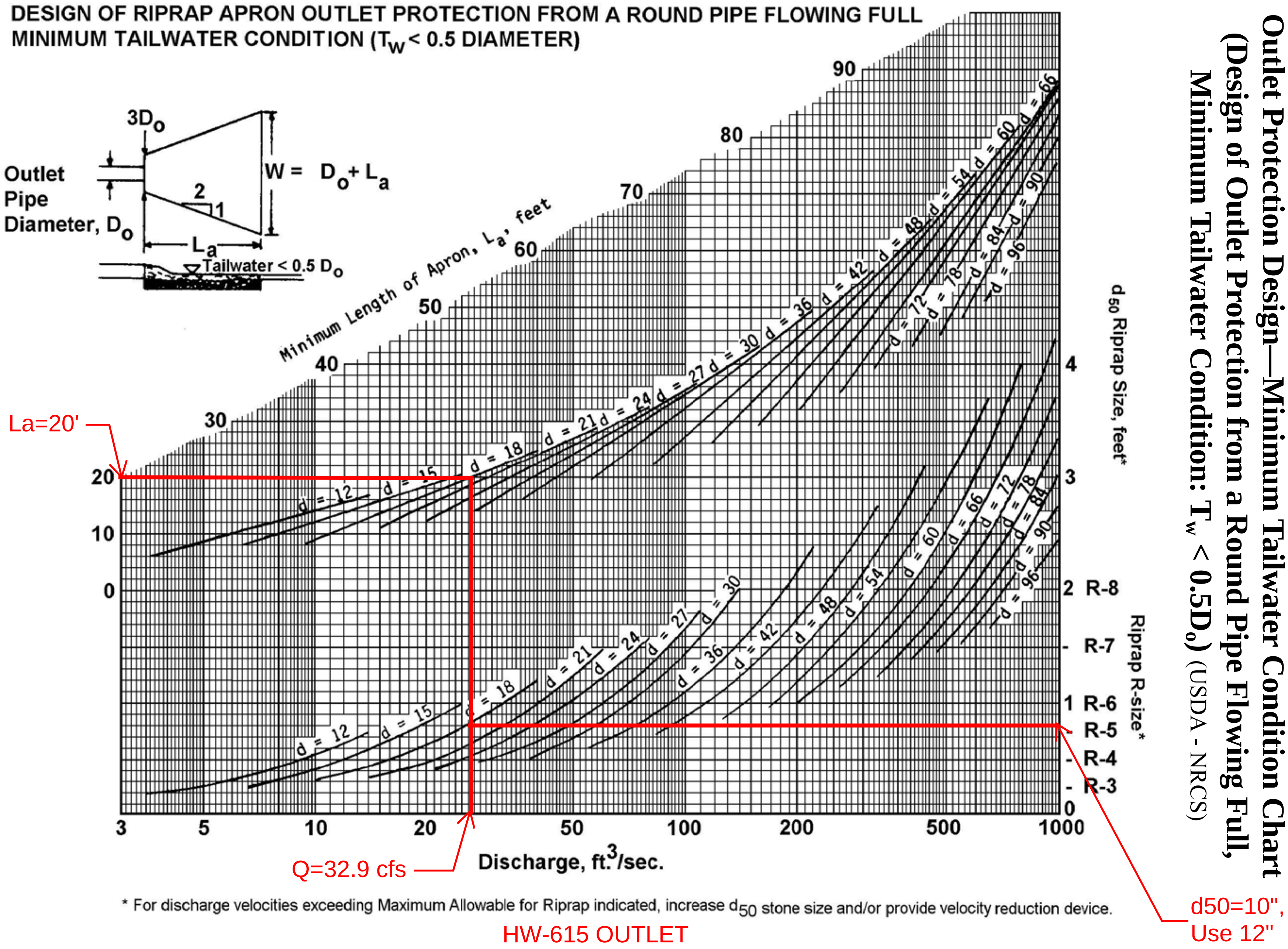
HW-601 OUTLET

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-606 OUTLET

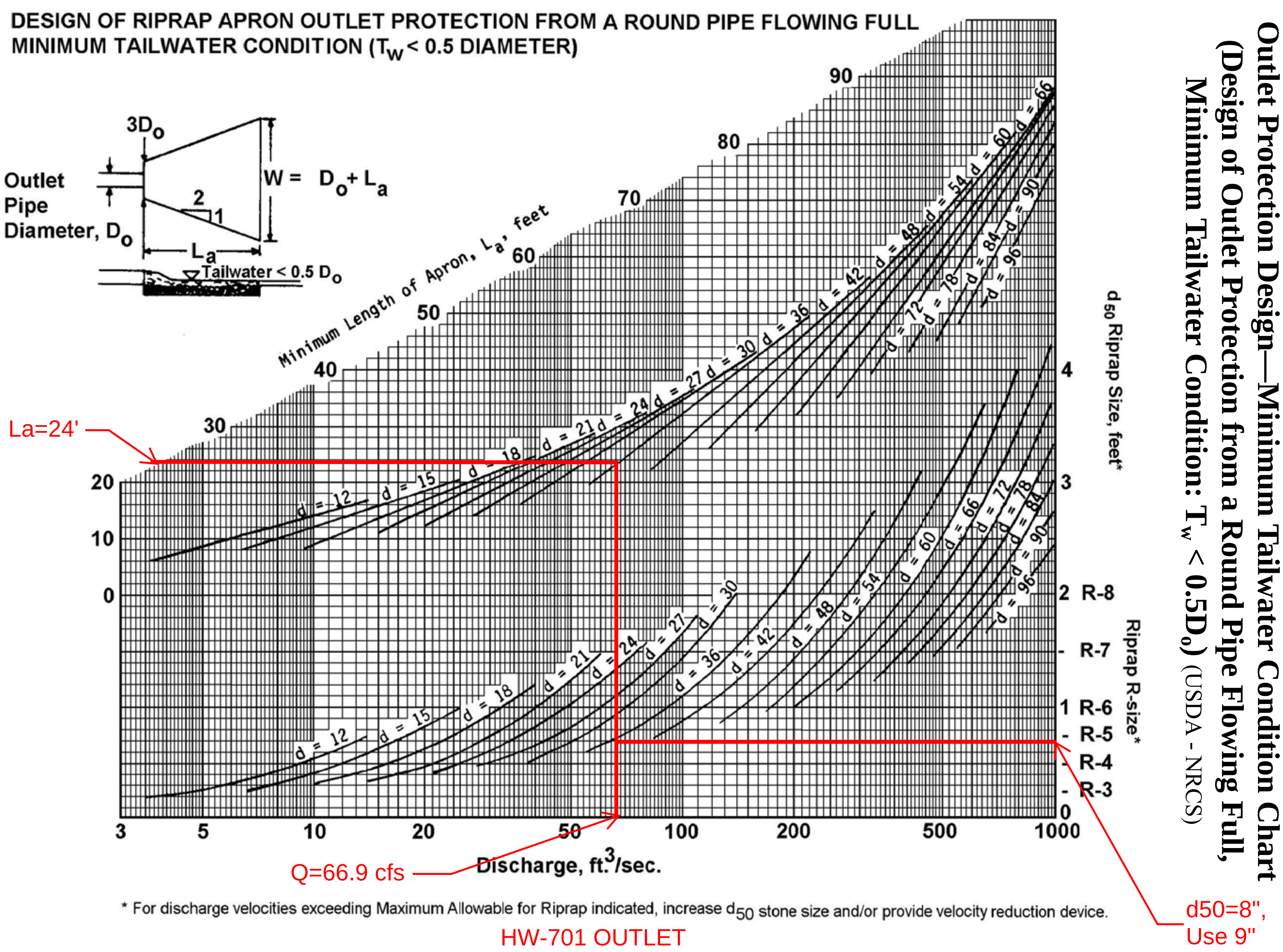


* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-615 OUTLET

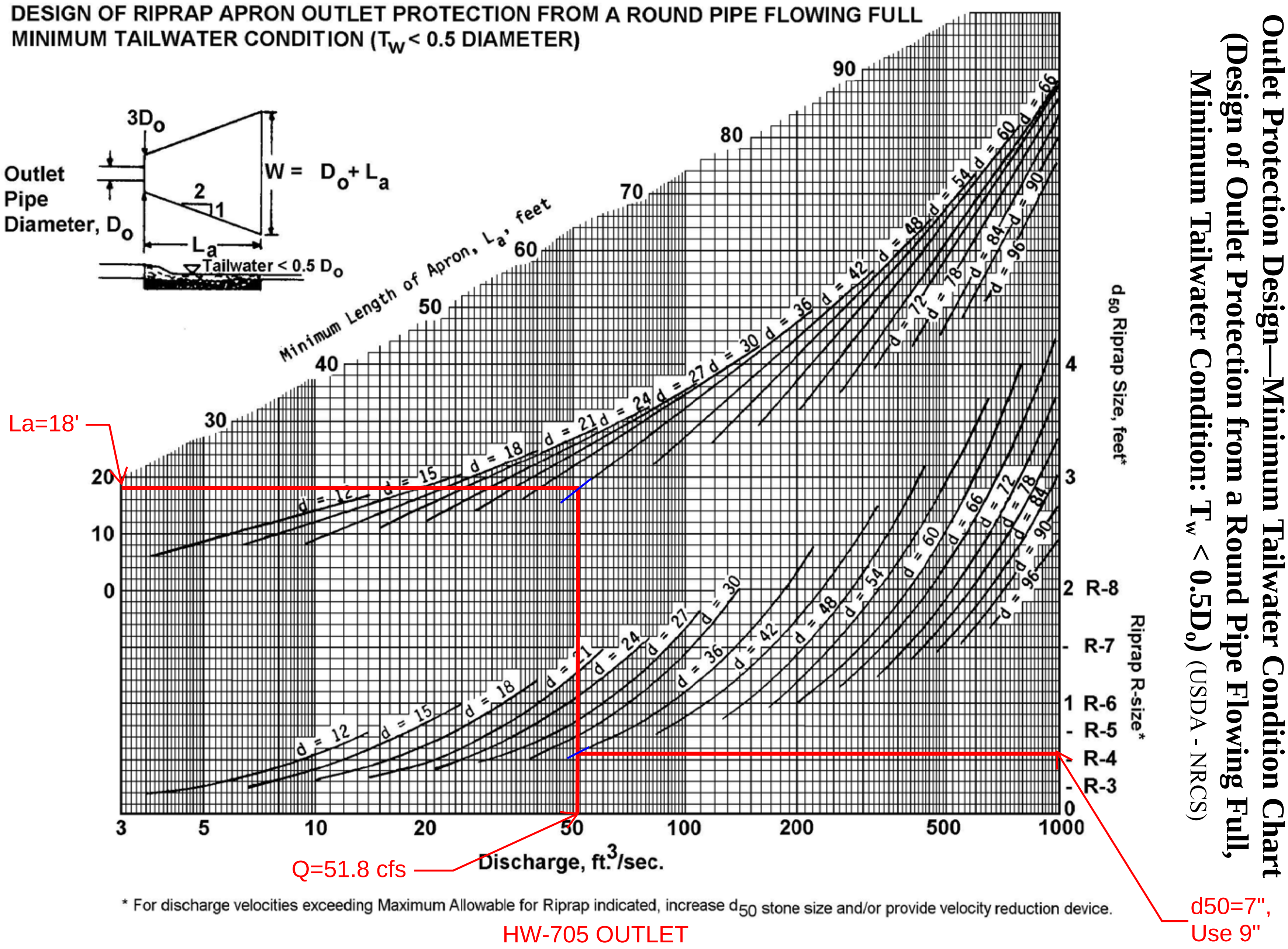
Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart
(Design of Outlet Protection from a Round Pipe Flowing Full,
Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



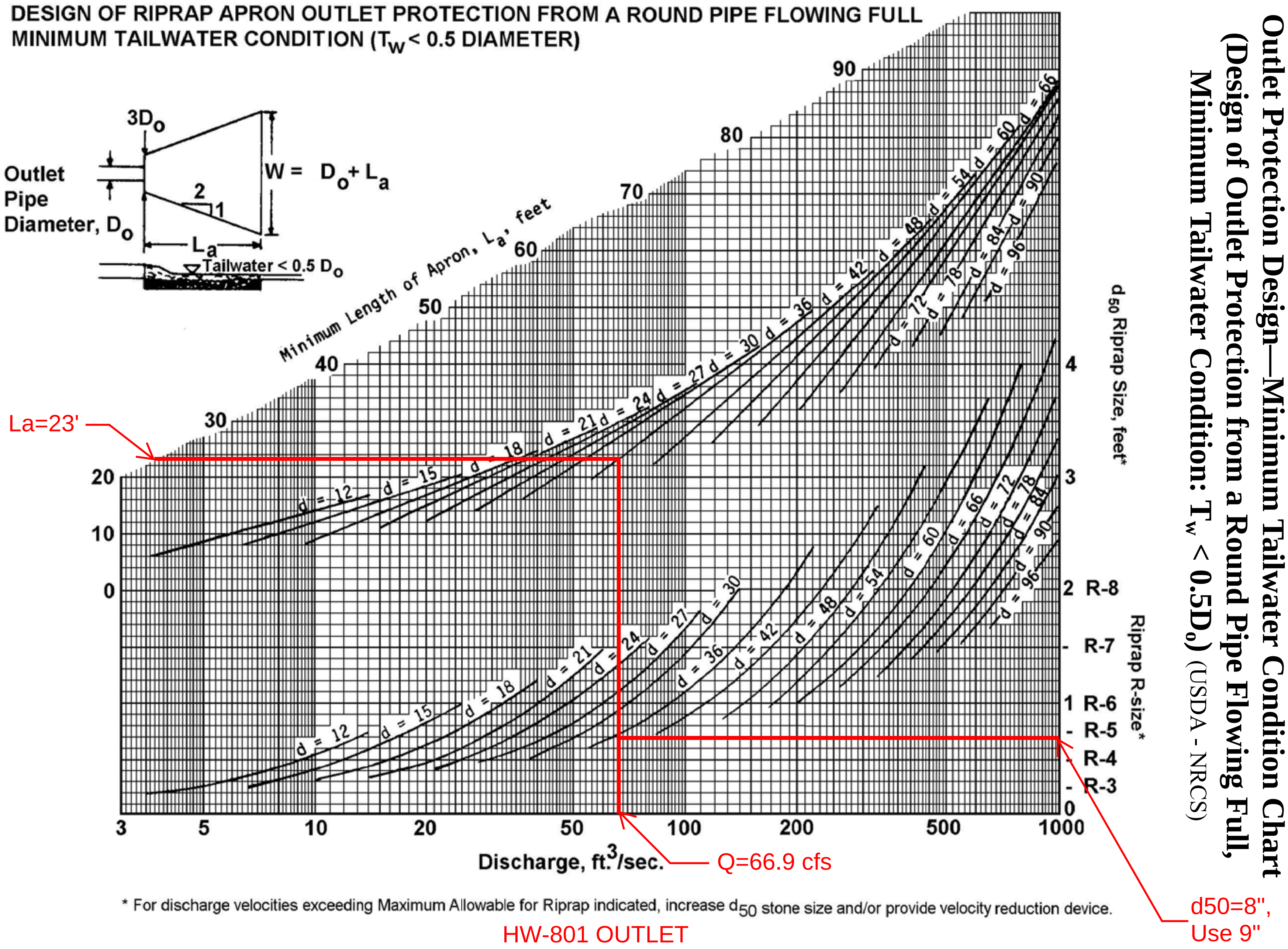
* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

La=18'

Q=51.8 cfs

d50=7",
Use 9"

HW-705 OUTLET



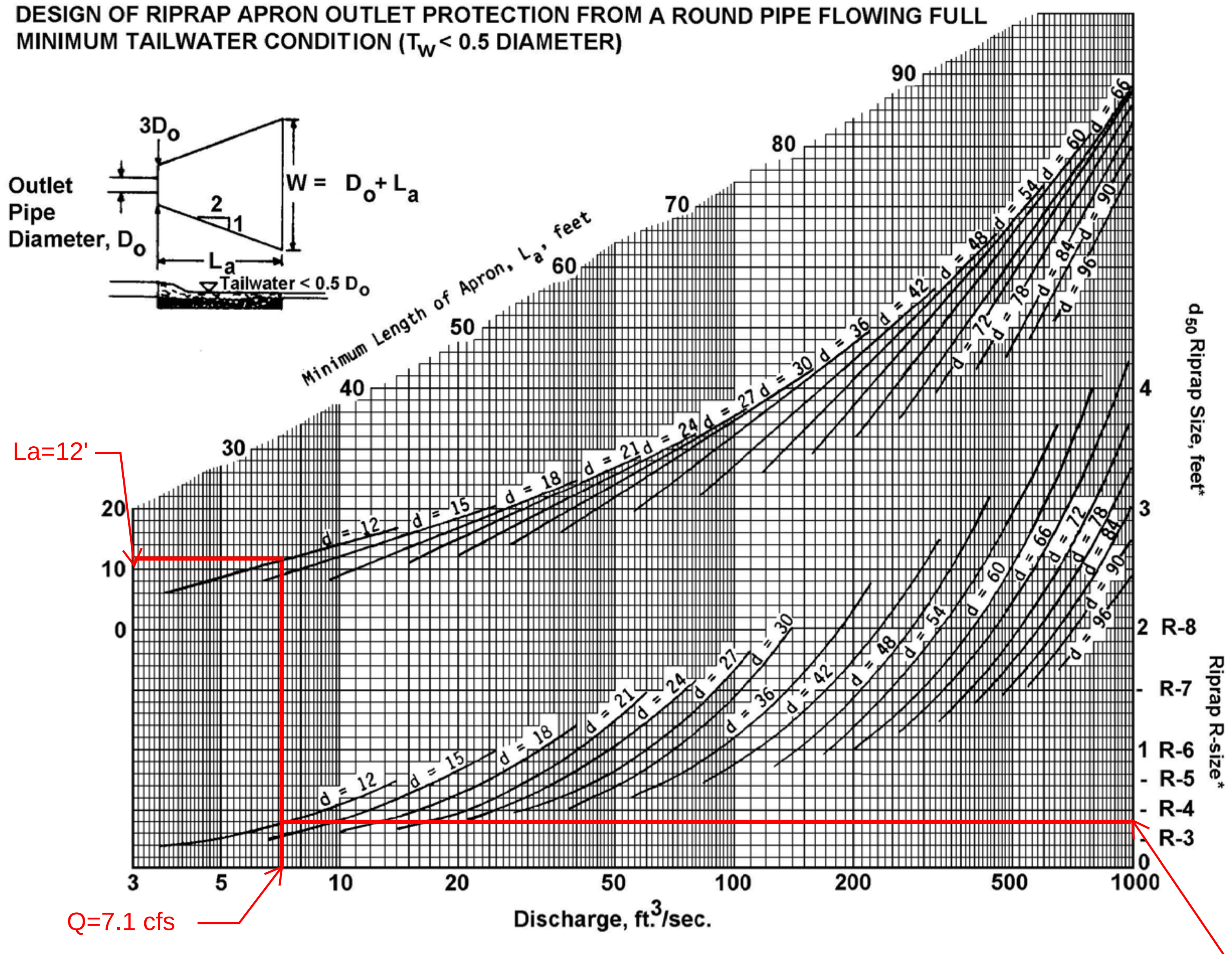
* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-801 OUTLET

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart
(Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

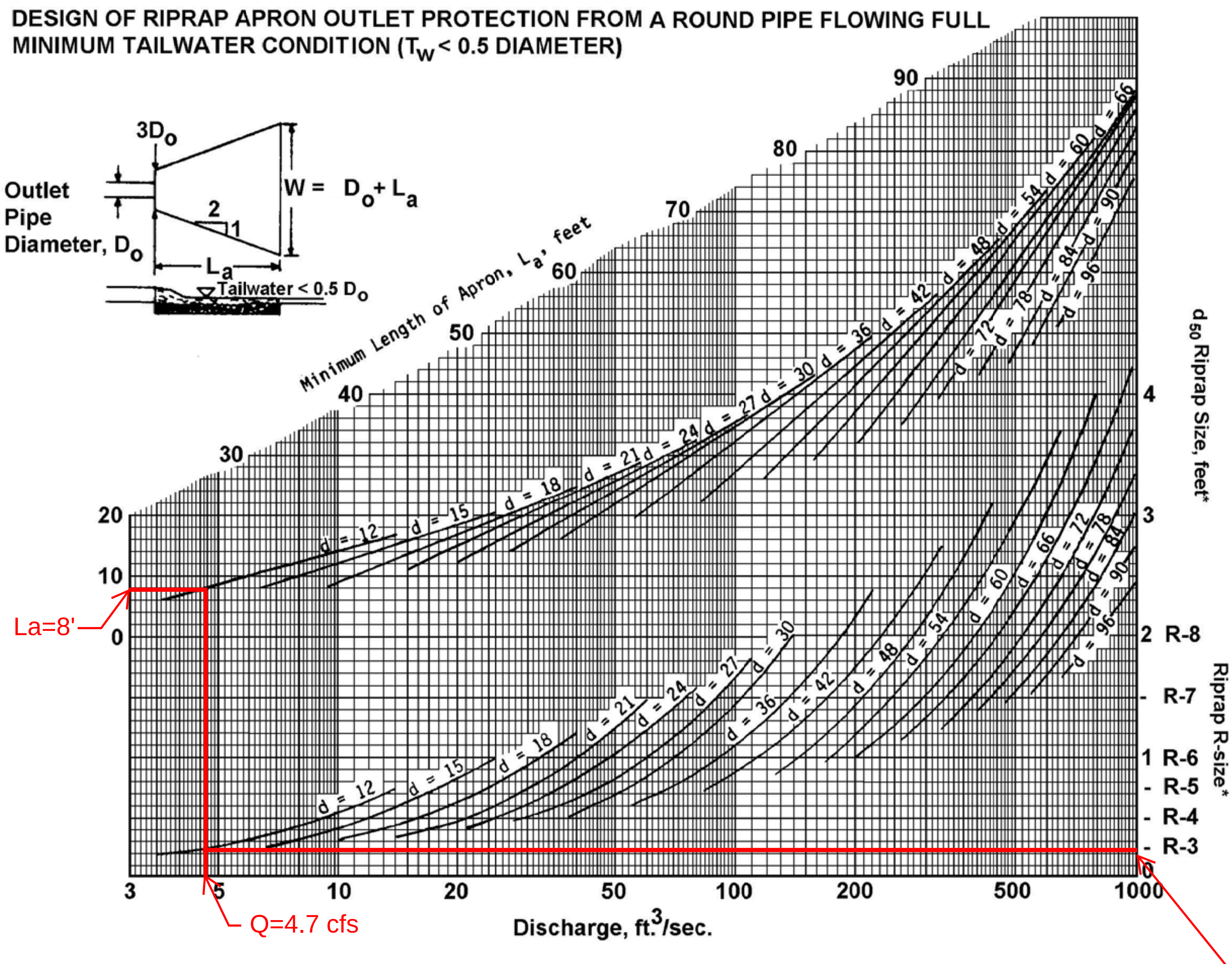
Figure 3.16

Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



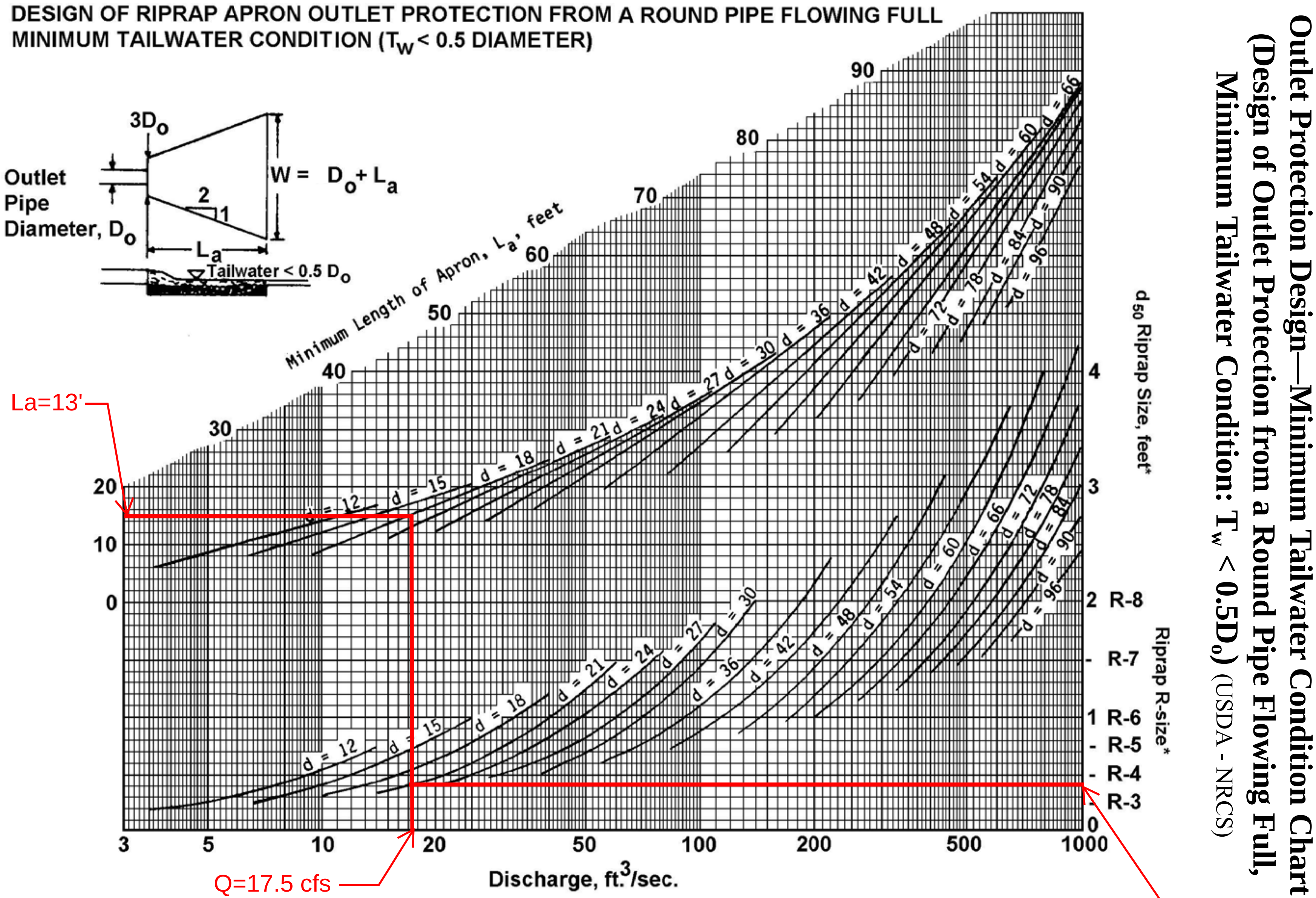
La=8'

Q=4.7 cfs

d50=3",
Use 6"

* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

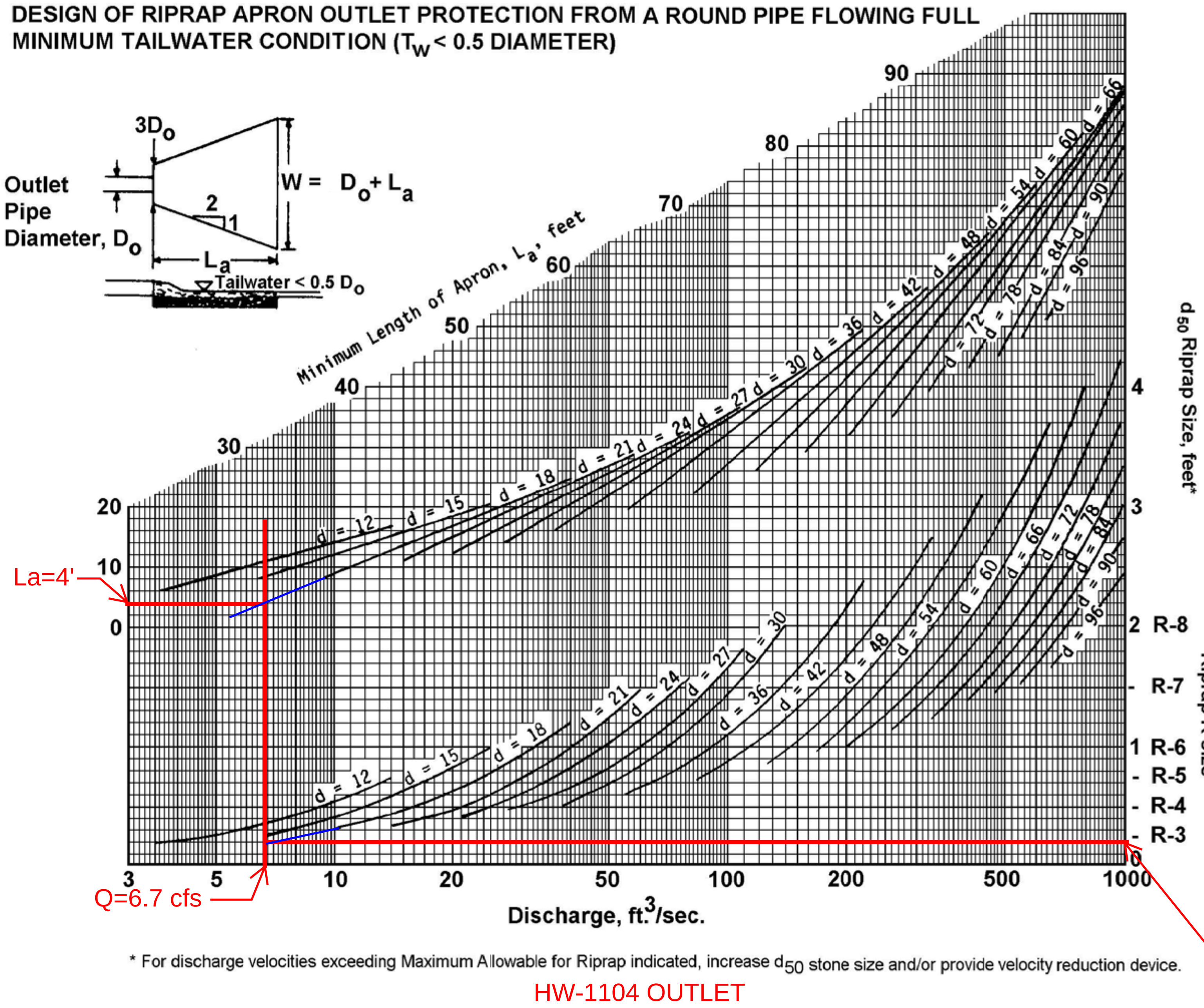
HW-903 OUTLET



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-905 OUTLET

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



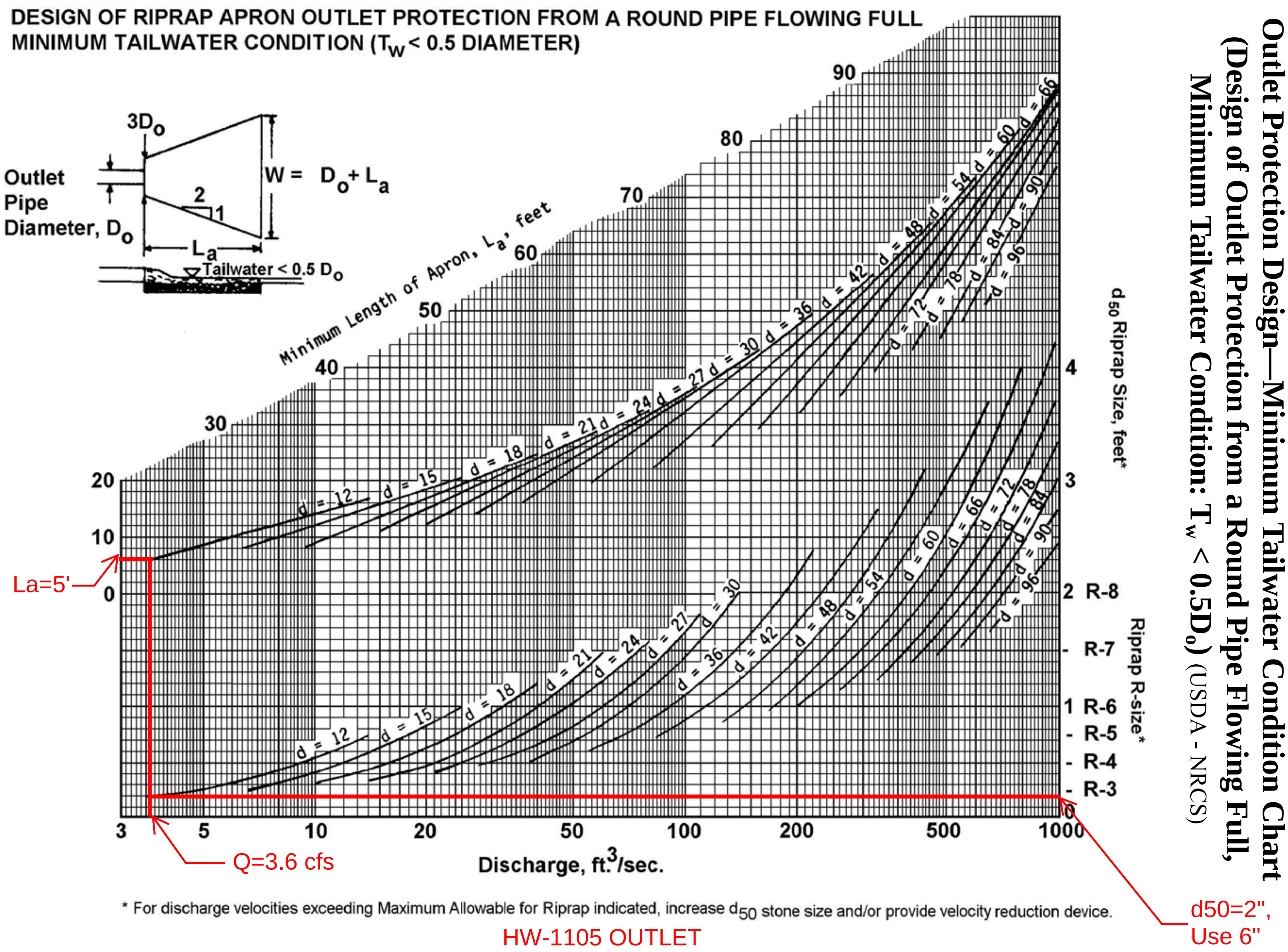
* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-1104 OUTLET

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

Figure 3.16

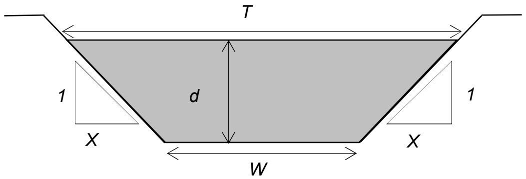
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

HW-1105 OUTLET

Overflow Weir Sizing Worksheet



Cross Section
Scale: NTS

Practice ID	Channel Type	Design Flow, Q (cfs)[1]	Depth of Flow, d (ft)	Bottom Width, W (ft)	Side Slope (X:1)	Top Width, T (ft)	Area, A (sf)	Wetted Perimeter, WP (ft)	Hydraulic Radius, R (ft)	Velocity, V (fps)	Channel Slope, S (%)	Manning's Value, n[2]	Channel Capacity (cfs)	Bottom Width Adequate?
Bioretention 100 Forebay	Rip Rap	7.5	0.5	10.0	3.0	13.0	5.8	13.2	0.4	1.3	33%	0.064	44.6	OK
Bioretention 200 Forebay	Rip Rap	25.7	0.5	10.0	3.0	13.0	5.8	13.2	0.4	4.5	33%	0.064	44.6	OK
Bioretention 300 Forebay	Rip Rap	31.3	0.5	10.0	3.0	13.0	5.8	13.2	0.4	5.4	33%	0.064	44.6	OK
Bioretention 400 Forebay	Rip Rap	26.2	0.5	10.0	3.0	13.0	5.8	13.2	0.4	4.6	33%	0.064	44.6	OK
Bioretention 500	Rip Rap	20.2	0.5	10.0	3.0	13.0	5.8	13.2	0.4	3.5	33%	0.064	44.6	OK
Bioretention 500 Forebay	Rip Rap	23.1	0.5	10.0	3.0	13.0	5.8	13.2	0.4	4.0	33%	0.064	44.6	OK
Bioretention 600	Rip Rap	26.5	0.5	10.0	3.0	13.0	5.8	13.2	0.4	4.6	33%	0.064	44.6	OK
Bioretention 600 Forebay	Rip Rap	28.9	0.5	10.0	3.0	13.0	5.8	13.2	0.4	5.0	33%	0.064	44.6	OK
Bioretention 700	Rip Rap	32.9	0.5	10.0	3.0	13.0	5.8	13.2	0.4	5.7	33%	0.064	44.6	OK
Bioretention 700 Forebay	Rip Rap	35.7	0.5	10.0	3.0	13.0	5.8	13.2	0.4	6.2	33%	0.064	44.6	OK
Bioretention 800	Rip Rap	40.1	0.5	10.0	3.0	13.0	5.8	13.2	0.4	7.0	33%	0.064	44.6	OK
Bioretention 800 Forebay	Rip Rap	42.2	0.5	10.0	3.0	13.0	5.8	13.2	0.4	7.3	33%	0.064	44.6	OK
Bioretention 900	Rip Rap	3.5	0.5	10.0	3.0	13.0	5.8	13.2	0.4	0.6	33%	0.064	44.6	OK
Bioretention 900 Forebay	Rip Rap	3.5	0.5	10.0	3.0	13.0	5.8	13.2	0.4	0.6	33%	0.064	44.6	OK
Pond 10	Rip Rap	46.7	0.5	15.0	3.0	18.0	8.3	18.2	0.5	5.7	33%	0.064	65.6	OK
Pond 11	Rip Rap	49.4	0.5	15.0	3.0	18.0	8.3	18.2	0.5	6.0	33%	0.064	65.6	OK
Pond 12A	Rip Rap	21.4	0.5	10.0	3.0	13.0	5.8	13.2	0.4	3.7	33%	0.064	44.6	OK

Notes:

1. Design flow will depend upon the design storm you want to size your overflow weir for. Design storm is the 10-year, 24-hour storm event.
2. The mannining's n will vary based upon your channel coverage type and depth of flow.

LANGAN

Overflow Weir Stone Sizing Worksheet

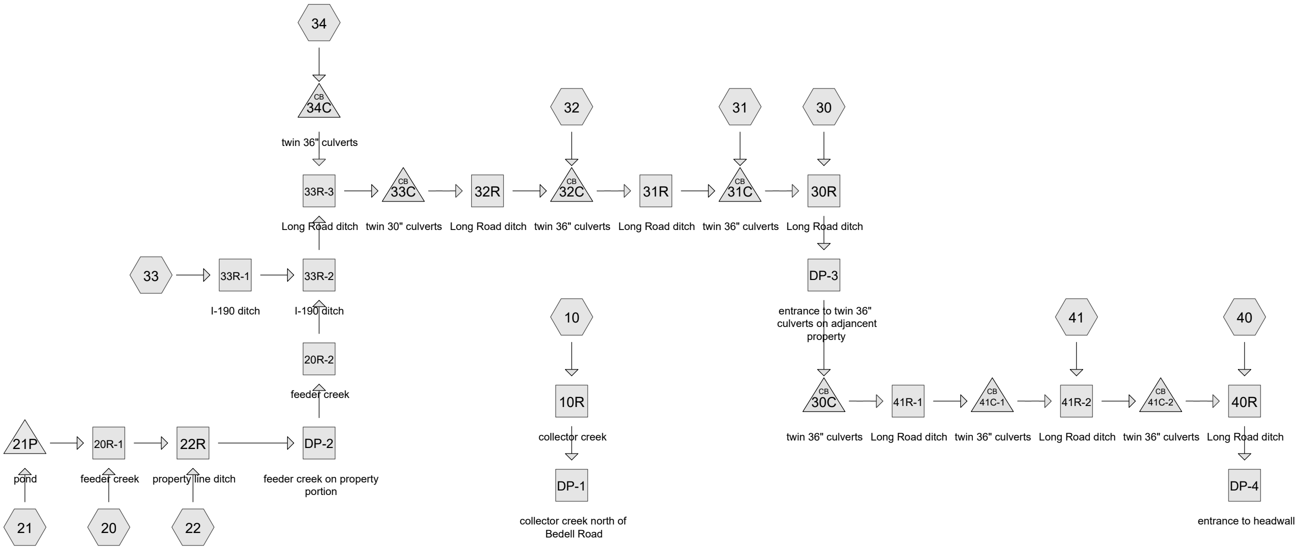
Practice ID	Velocity, V (fps)	d_{50} Rip Rap Size (in)	d_{max} Rip Rap Size (in)	Rip Rap thickness (in)
Bioretention 100 Forebay	1.3	4	6	9
Bioretention 200 Forebay	4.5	4	6	9
Bioretention 300 Forebay	5.4	8	12	18
Bioretention 400 Forebay	4.6	4	6	9
Bioretention 500	3.5	4	6	9
Bioretention 500 Forebay	4.0	4	6	9
Bioretention 600	4.6	4	6	9
Bioretention 600 Forebay	5.0	4	6	9
Bioretention 700	5.7	8	12	18
Bioretention 700 Forebay	6.2	8	12	18
Bioretention 800	7.0	8	12	18
Bioretention 800 Forebay	7.3	8	12	18
Bioretention 900	0.6	4	6	9
Bioretention 900 Forebay	0.6	4	6	9
Pond 10	5.7	8	12	18
Pond 11	6.0	8	12	18
Pond 12A	3.7	4	6	9

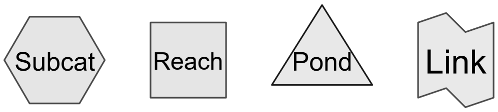
Project Olive
2780 Long Road
Town of Grand Island, New York

Appendix F

Pre-Development Stormwater Analysis

LANGAN





Routing Diagram for 2020-02-21 Project Olive Existing
Prepared by Langan Eng & Env Srvcs, Inc, Printed 2/3/2020
HydroCAD® 10.00-18 s/n 11081 © 2016 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 4
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Runoff Area=48.750 ac 4.88% Impervious Runoff Depth=0.54"
Flow Length=1,342' Tc=30.1 min CN=83 Runoff=21.00 cfs 2.206 af

Subcatchment20: Runoff Area=124.090 ac 3.19% Impervious Runoff Depth=0.46"
Flow Length=1,668' Tc=99.0 min CN=81 Runoff=18.14 cfs 4.799 af

Subcatchment21: Runoff Area=3.440 ac 0.00% Impervious Runoff Depth=0.54"
Flow Length=289' Tc=19.4 min CN=83 Runoff=1.97 cfs 0.156 af

Subcatchment22: Runoff Area=15.010 ac 0.00% Impervious Runoff Depth=0.43"
Flow Length=1,231' Slope=0.0050 '/' Tc=59.0 min CN=80 Runoff=2.89 cfs 0.535 af

Subcatchment30: Runoff Area=0.640 ac 12.50% Impervious Runoff Depth=0.63"
Flow Length=258' Slope=0.0400 '/' Tc=11.0 min CN=85 Runoff=0.58 cfs 0.034 af

Subcatchment31: Runoff Area=0.740 ac 24.32% Impervious Runoff Depth=0.68"
Flow Length=261' Tc=12.1 min CN=86 Runoff=0.70 cfs 0.042 af

Subcatchment32: Runoff Area=3.290 ac 53.19% Impervious Runoff Depth=0.97"
Flow Length=626' Tc=30.2 min CN=91 Runoff=2.73 cfs 0.265 af

Subcatchment33: Runoff Area=16.720 ac 20.57% Impervious Runoff Depth=0.73"
Flow Length=33' Slope=0.1400 '/' Tc=6.0 min CN=87 Runoff=21.26 cfs 1.017 af

Subcatchment34: Runoff Area=0.640 ac 42.19% Impervious Runoff Depth=0.90"
Tc=6.0 min CN=90 Runoff=0.99 cfs 0.048 af

Subcatchment40: Runoff Area=89.180 ac 0.25% Impervious Runoff Depth=0.46"
Flow Length=2,815' Tc=125.8 min CN=81 Runoff=10.88 cfs 3.449 af

Subcatchment41: Runoff Area=2.130 ac 18.78% Impervious Runoff Depth=0.68"
Flow Length=267' Tc=13.0 min CN=86 Runoff=1.96 cfs 0.121 af

Reach 10R: collector creek Avg. Flow Depth=1.00' Max Vel=1.85 fps Inflow=21.00 cfs 2.206 af
n=0.030 L=500.0' S=0.0020 '/' Capacity=75.99 cfs Outflow=20.26 cfs 2.206 af

Reach 20R-1: feeder creek Avg. Flow Depth=0.77' Max Vel=2.07 fps Inflow=18.14 cfs 4.799 af
n=0.030 L=3,004.0' S=0.0033 '/' Capacity=98.03 cfs Outflow=16.49 cfs 4.799 af

Reach 20R-2: feeder creek Avg. Flow Depth=0.80' Max Vel=2.11 fps Inflow=17.55 cfs 5.334 af
n=0.030 L=245.0' S=0.0033 '/' Capacity=97.70 cfs Outflow=17.54 cfs 5.334 af

Reach 22R: property line ditch Avg. Flow Depth=0.61' Max Vel=2.91 fps Inflow=17.69 cfs 5.334 af
n=0.030 L=1,402.0' S=0.0086 '/' Capacity=157.20 cfs Outflow=17.55 cfs 5.334 af

Reach 30R: Long Road ditch Avg. Flow Depth=1.94' Max Vel=0.72 fps Inflow=19.48 cfs 6.738 af
n=0.030 L=68.0' S=0.0001 '/' Capacity=20.60 cfs Outflow=19.48 cfs 6.738 af

Reach 31R: Long Road ditch Avg. Flow Depth=1.11' Max Vel=1.55 fps Inflow=19.41 cfs 6.663 af
n=0.030 L=64.0' S=0.0013 '/' Capacity=60.07 cfs Outflow=19.41 cfs 6.663 af

Reach 32R: Long Road ditch Avg. Flow Depth=1.22' Max Vel=1.35 fps Inflow=19.16 cfs 6.398 af
n=0.030 L=47.0' S=0.0009 '/' Capacity=49.57 cfs Outflow=19.16 cfs 6.398 af

Reach 33R-1: I-190 ditch Avg. Flow Depth=0.43' Max Vel=1.54 fps Inflow=21.26 cfs 1.017 af
n=0.030 L=3,824.0' S=0.0036 '/' Capacity=102.11 cfs Outflow=6.21 cfs 1.017 af

Reach 33R-2: I-190 ditch Avg. Flow Depth=0.82' Max Vel=2.23 fps Inflow=19.19 cfs 6.350 af
n=0.030 L=509.0' S=0.0036 '/' Capacity=101.88 cfs Outflow=19.15 cfs 6.350 af

Reach 33R-3: Long Road ditch Avg. Flow Depth=0.82' Max Vel=2.23 fps Inflow=19.23 cfs 6.398 af
n=0.030 L=509.0' S=0.0036 '/' Capacity=101.88 cfs Outflow=19.16 cfs 6.398 af

Reach 40R: Long Road ditch Avg. Flow Depth=1.49' Max Vel=1.63 fps Inflow=30.34 cfs 10.308 af
n=0.030 L=81.0' S=0.0010 '/' Capacity=53.40 cfs Outflow=30.34 cfs 10.308 af

Reach 41R-1: Long Road ditch Avg. Flow Depth=0.77' Max Vel=2.44 fps Inflow=19.48 cfs 6.738 af
n=0.030 L=63.0' S=0.0046 '/' Capacity=115.28 cfs Outflow=19.48 cfs 6.738 af

Reach 41R-2: Long Road ditch Avg. Flow Depth=1.17' Max Vel=1.45 fps Inflow=19.59 cfs 6.859 af
n=0.030 L=127.0' S=0.0010 '/' Capacity=54.36 cfs Outflow=19.59 cfs 6.859 af

Reach DP-1: collector creek north of Bedell Road Inflow=20.26 cfs 2.206 af
Outflow=20.26 cfs 2.206 af

Reach DP-2: feeder creek on property portion Inflow=17.55 cfs 5.334 af
Outflow=17.55 cfs 5.334 af

Reach DP-3: entrance to twin 36" culverts on adjancent property Inflow=19.48 cfs 6.738 af
Outflow=19.48 cfs 6.738 af

Reach DP-4: entrance to headwall Inflow=30.34 cfs 10.308 af
Outflow=30.34 cfs 10.308 af

Pond 21P: pond Peak Elev=586.22' Storage=6,780 cf Inflow=1.97 cfs 0.156 af
Outflow=0.00 cfs 0.000 af

Pond 30C: twin 36" culverts Peak Elev=566.94' Inflow=19.48 cfs 6.738 af
Primary=12.61 cfs 5.518 af Secondary=6.87 cfs 1.220 af Outflow=19.48 cfs 6.738 af

Pond 31C: twin 36" culverts Peak Elev=567.62' Inflow=19.45 cfs 6.705 af
Primary=9.59 cfs 3.224 af Secondary=9.87 cfs 3.480 af Outflow=19.45 cfs 6.705 af

Pond 32C: twin 36" culverts Peak Elev=567.09' Inflow=19.41 cfs 6.663 af
Primary=9.65 cfs 3.482 af Secondary=9.77 cfs 3.181 af Outflow=19.41 cfs 6.663 af

Pond 33C: twin 30" culverts Peak Elev=567.59' Inflow=19.16 cfs 6.398 af
Primary=9.59 cfs 3.161 af Secondary=9.57 cfs 3.238 af Outflow=19.16 cfs 6.398 af

Pond 34C: twin 36" culverts Peak Elev=572.01' Inflow=0.99 cfs 0.048 af
Primary=0.50 cfs 0.024 af Secondary=0.50 cfs 0.024 af Outflow=0.99 cfs 0.048 af

Pond 41C-1: twin 36" culverts Peak Elev=566.38' Inflow=19.48 cfs 6.738 af
Primary=10.01 cfs 3.644 af Secondary=9.47 cfs 3.094 af Outflow=19.48 cfs 6.738 af

Pond 41C-2: twin 36" culverts Peak Elev=566.44' Inflow=19.59 cfs 6.859 af
Primary=9.79 cfs 3.429 af Secondary=9.79 cfs 3.429 af Outflow=19.59 cfs 6.859 af

Total Runoff Area = 304.630 ac Runoff Volume = 12.670 af Average Runoff Depth = 0.50"
95.84% Pervious = 291.950 ac 4.16% Impervious = 12.680 ac

Summary for Subcatchment 10:

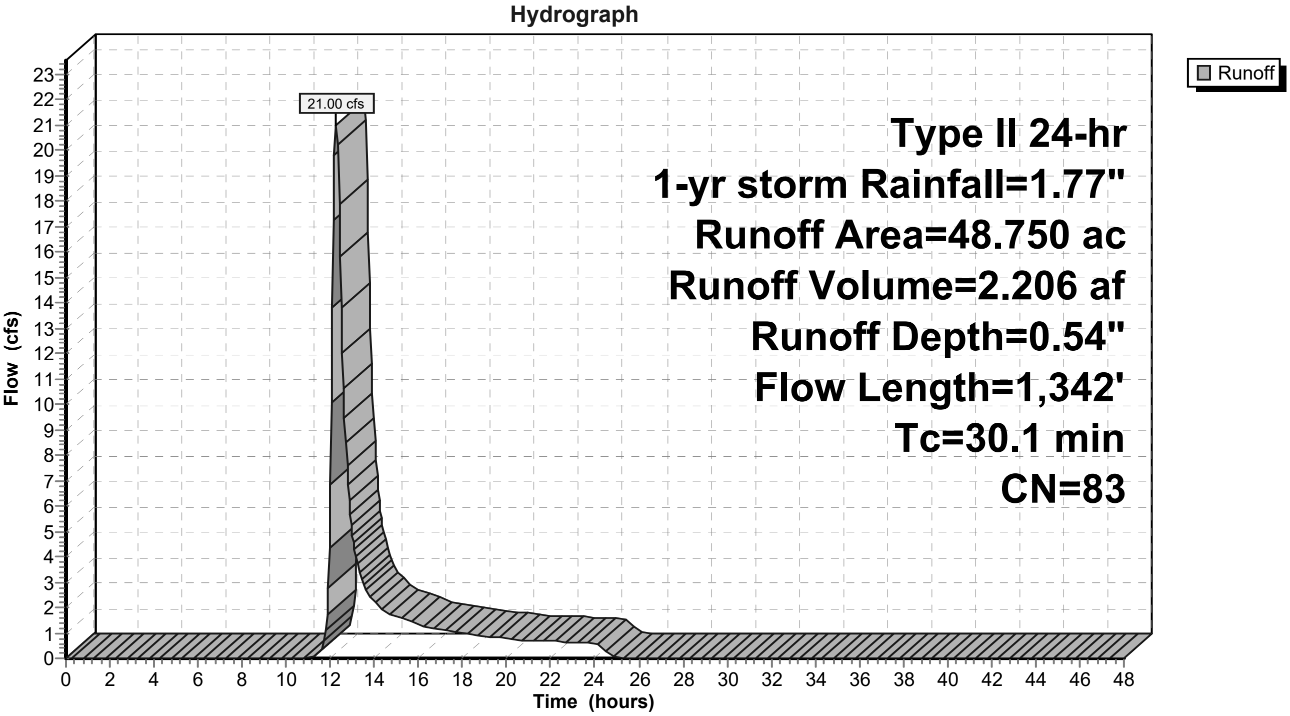
Runoff = 21.00 cfs @ 12.27 hrs, Volume= 2.206 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	2.040	84	50-75% Grass cover, Fair, HSG D
	20.060	79	Woods, Fair, HSG D
	0.120	98	Water Surface, 0% imp, HSG D
*	16.290	84	50-75% Grass cover, Fair, HSG D (offsite)
*	5.670	79	Woods, Fair, HSG D (offsite)
*	1.740	98	Paved parking, HSG D (offsite)
*	0.640	98	Roofs, HSG D (offsite)
*	0.620	91	Gravel roads, HSG D (offsite)
*	1.570	98	Water Surface, 0% imp, HSG D (offsite)
	48.750	83	Weighted Average
	46.370		95.12% Pervious Area
	2.380		4.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0170	0.13		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.1	87	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.7	84	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
7.1	266	0.0080	0.63		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
7.4	805	0.0020	1.81	21.76	**Channel Flow, E-F** Area= 12.0 sf Perim= 16.2' r= 0.74' n= 0.030 Earth, grassed & winding
30.1	1,342	Total			

Subcatchment 10:



Summary for Subcatchment 20:

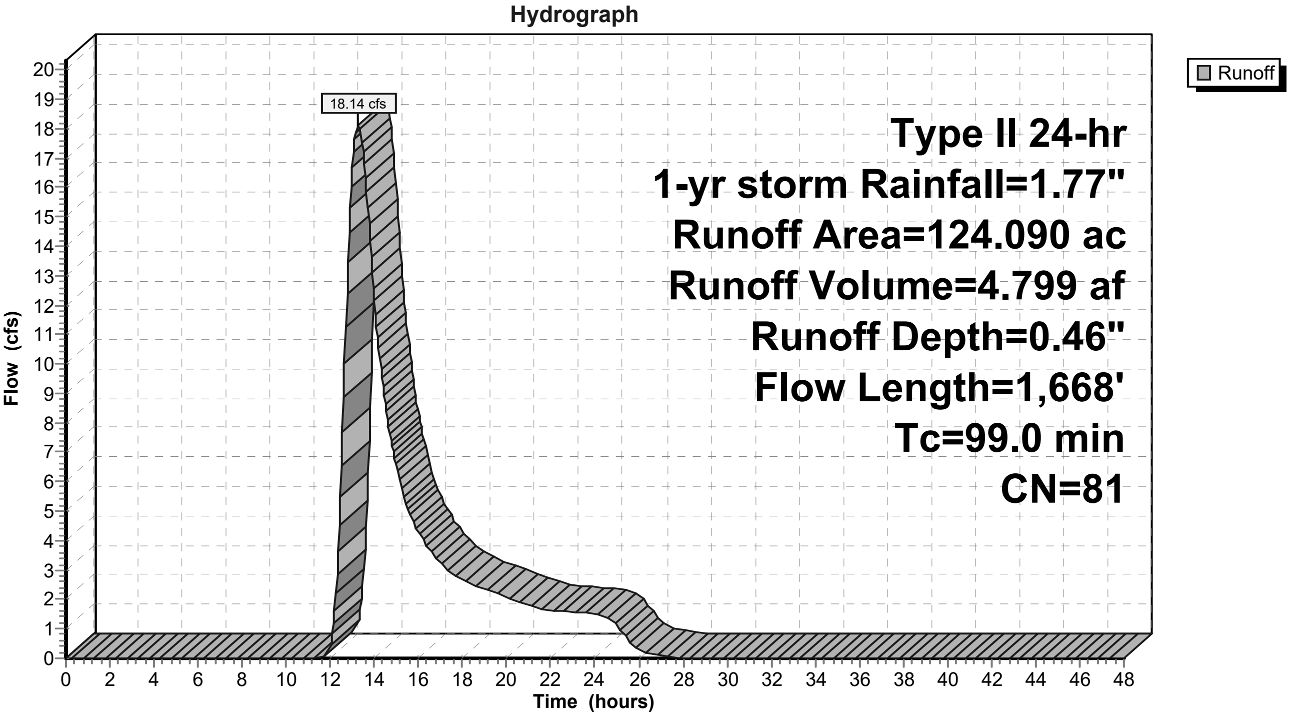
Runoff = 18.14 cfs @ 13.29 hrs, Volume= 4.799 af, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	8.910	84	50-75% Grass cover, Fair, HSG D
	65.560	79	Woods, Fair, HSG D
	0.120	98	Paved parking, HSG D
	0.030	98	Roofs, HSG D
	1.160	98	Water Surface, 0% imp, HSG D
*	8.770	84	50-75% Grass cover, Fair, HSG D (offsite)
*	33.440	79	Woods, Fair, HSG D (offsite)
*	1.770	98	Paved parking, HSG D (offsite)
*	2.040	98	Roofs, HSG D (offsite)
*	1.960	91	Gravel roads, HSG D (offsite)
*	0.330	98	Water Surface, 0% imp, HSG D (offsite)
	124.090	81	Weighted Average
	120.130		96.81% Pervious Area
	3.960		3.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.7	100	0.0100	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
49.7	1,055	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
14.2	447	0.0110	0.52		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.4	66	0.0040	2.63	28.93	**Channel Flow, D-E** Area= 11.0 sf Perim= 14.3' r= 0.77' n= 0.030 Earth, grassed & winding
99.0	1,668	Total			

Subcatchment 20:



Summary for Subcatchment 21:

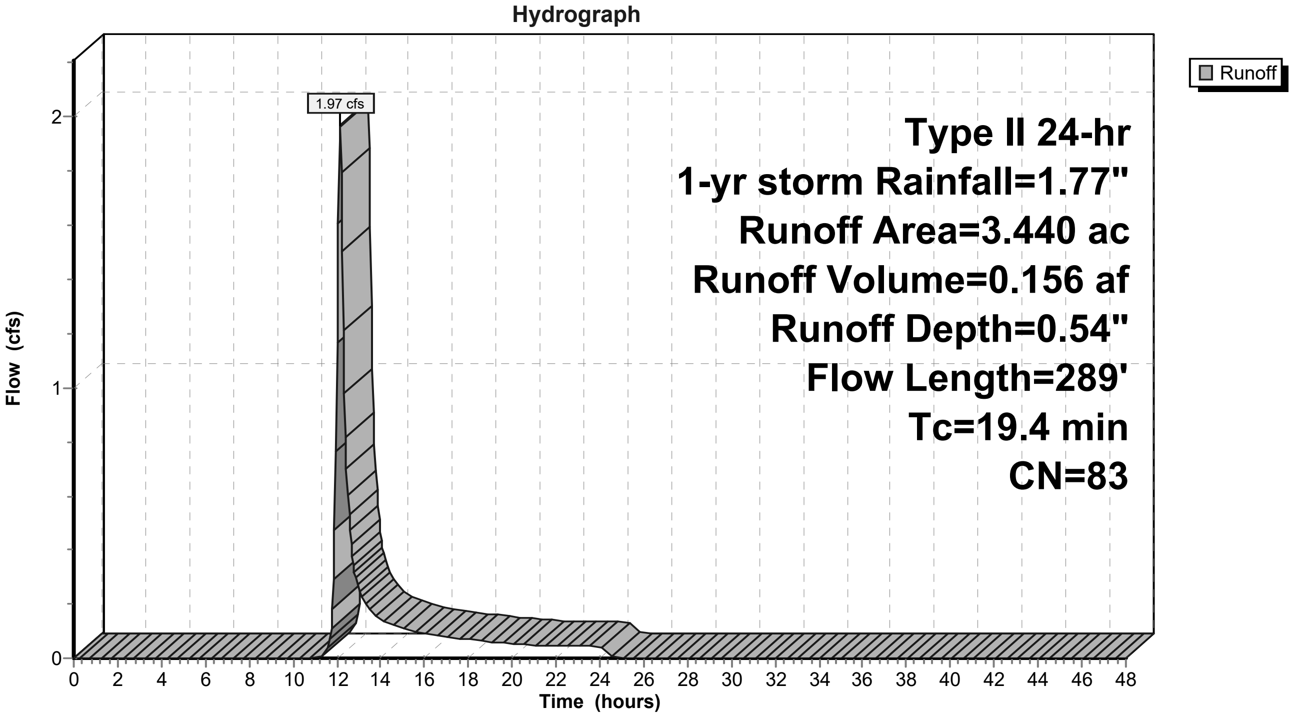
Runoff = 1.97 cfs @ 12.14 hrs, Volume= 0.156 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
2.920	84	50-75% Grass cover, Fair, HSG D
0.520	79	Woods, Fair, HSG D
3.440	83	Weighted Average
3.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.8	100	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
3.6	189	0.0160	0.89		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
19.4	289	Total			

Subcatchment 21:



Summary for Subcatchment 22:

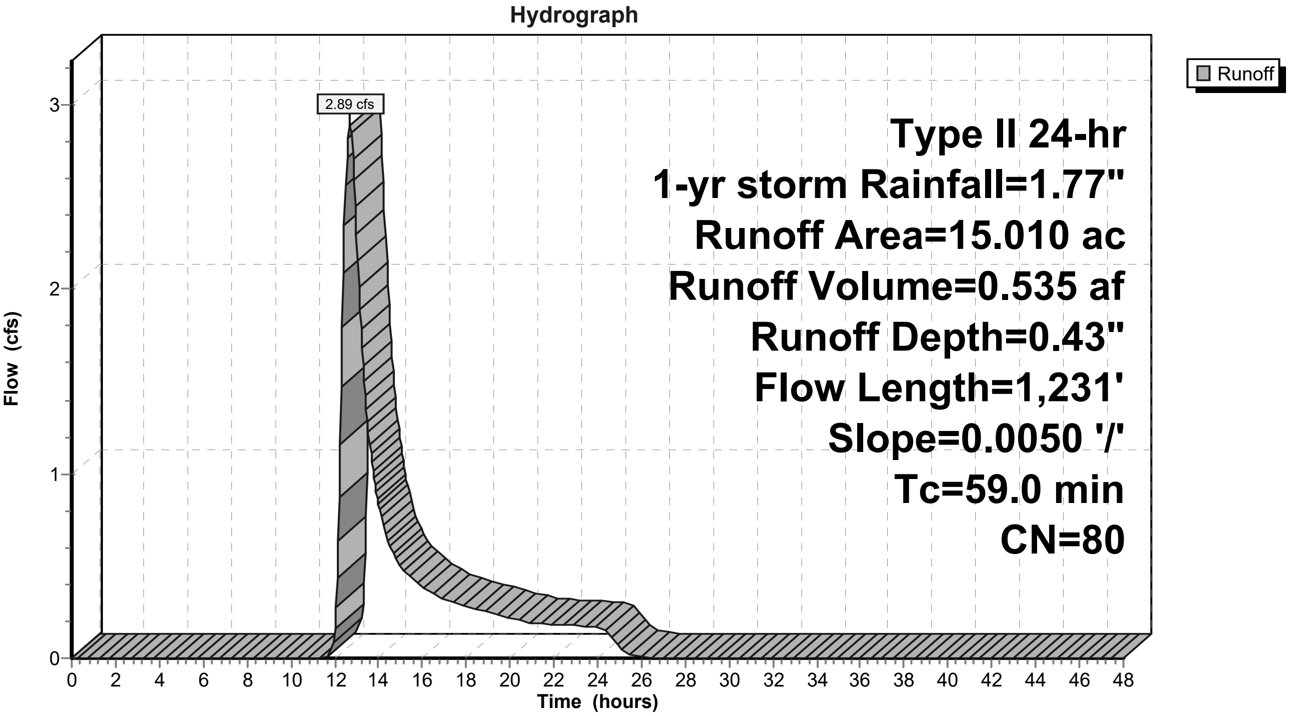
Runoff = 2.89 cfs @ 12.68 hrs, Volume= 0.535 af, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	0.200	84	50-75% Grass cover, Fair, HSG D
	13.400	79	Woods, Fair, HSG D
*	0.770	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.490	79	Woods, Fair, HSG D (offsite)
*	0.150	98	Water Surface, 0% imp, HSG D (offsite)
	15.010	80	Weighted Average
	15.010		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0050	0.08		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
38.1	1,131	0.0050	0.49		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
59.0	1,231	Total			

Subcatchment 22:



Summary for Subcatchment 30:

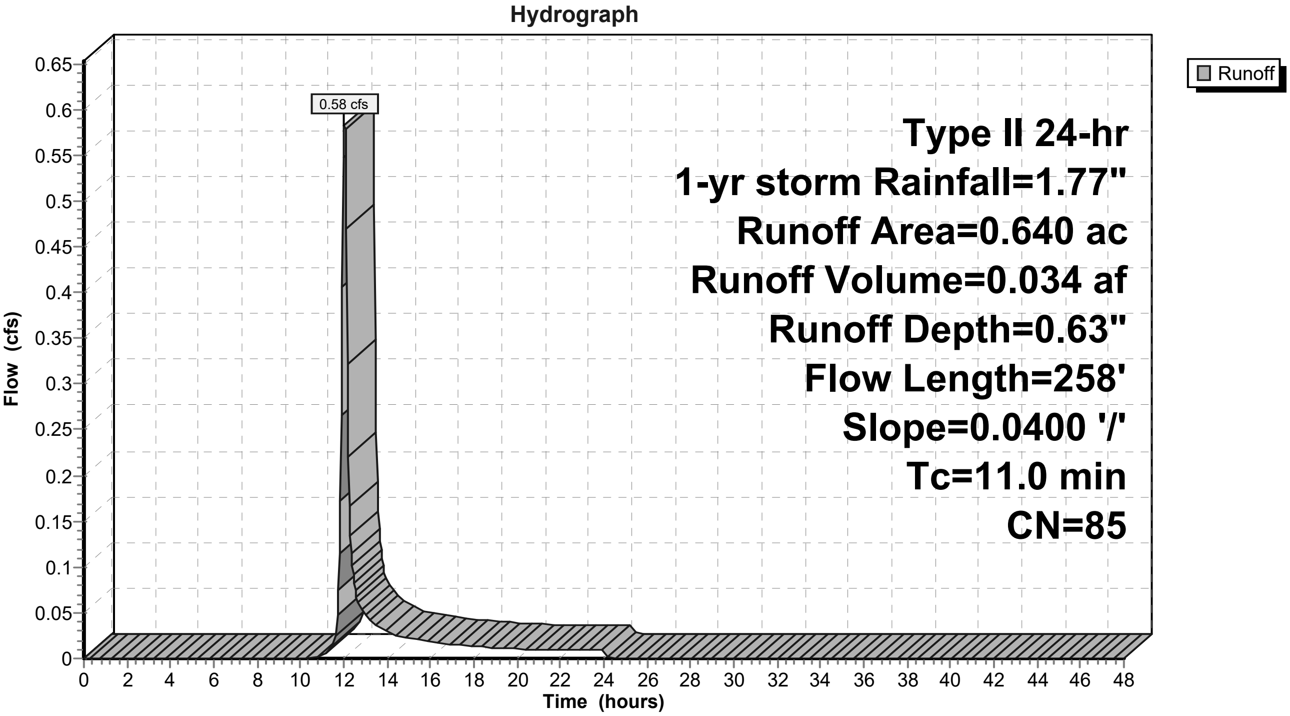
Runoff = 0.58 cfs @ 12.04 hrs, Volume= 0.034 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	0.230	84	50-75% Grass cover, Fair, HSG D
	0.050	98	Paved parking, HSG D
	0.200	79	Woods, Fair, HSG D
	0.010	98	Water Surface, 0% imp, HSG D
*	0.110	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.030	98	Paved parking, HSG D (offsite)
*	0.010	98	Water Surface, 0% imp, HSG D (offsite)
	0.640	85	Weighted Average
	0.560		87.50% Pervious Area
	0.080		12.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0400	0.18		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
1.9	158	0.0400	1.40		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
11.0	258	Total			

Subcatchment 30:



Summary for Subcatchment 31:

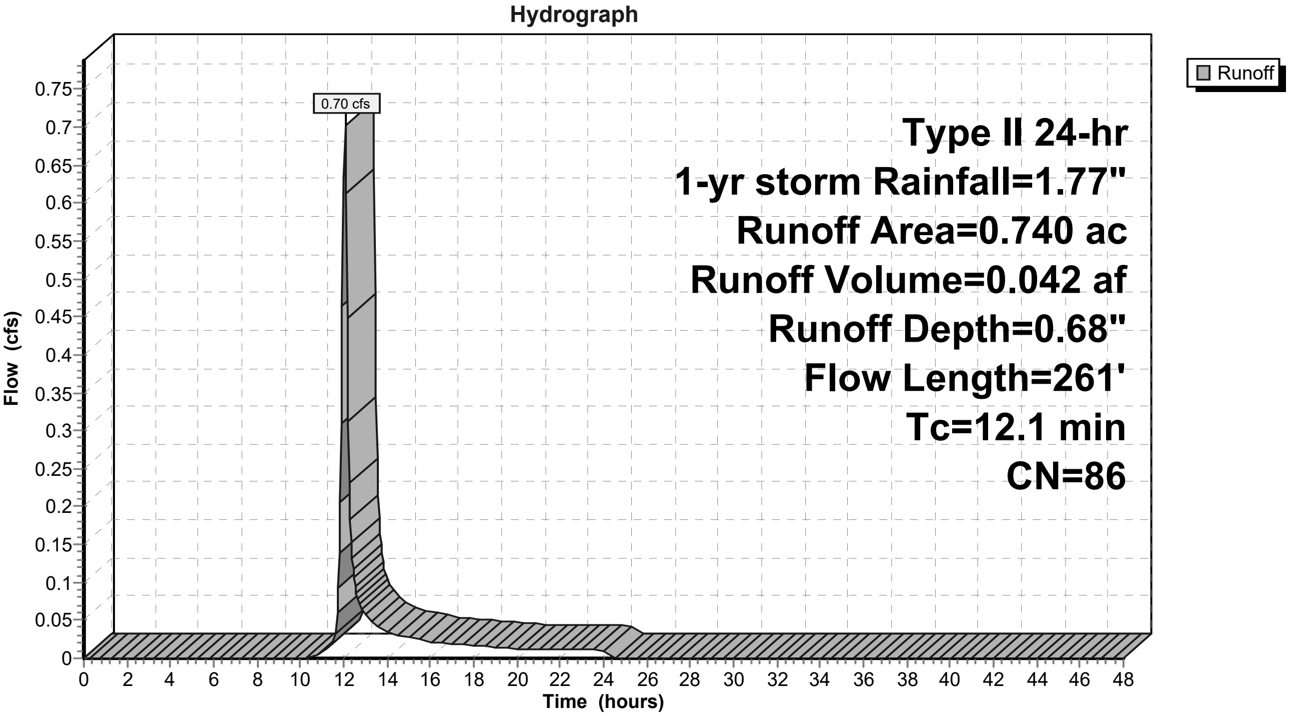
Runoff = 0.70 cfs @ 12.05 hrs, Volume= 0.042 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	0.210	84	50-75% Grass cover, Fair, HSG D
	0.020	98	Paved parking, HSG D
	0.010	79	Woods, Fair, HSG D
	0.010	98	Water Surface, 0% imp, HSG D
*	0.310	79	50-75% Grass cover, Fair, HSG C (offsite)
*	0.160	98	Paved parking, HSG D (offsite)
*	0.010	79	Woods, Fair, HSG D (offsite)
*	0.010	98	Water Surface, 0% imp, HSG D (offsite)
	0.740	86	Weighted Average
	0.560		75.68% Pervious Area
	0.180		24.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	100	0.0300	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
1.9	161	0.0400	1.40		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
12.1	261	Total			

Subcatchment 31:



Summary for Subcatchment 32:

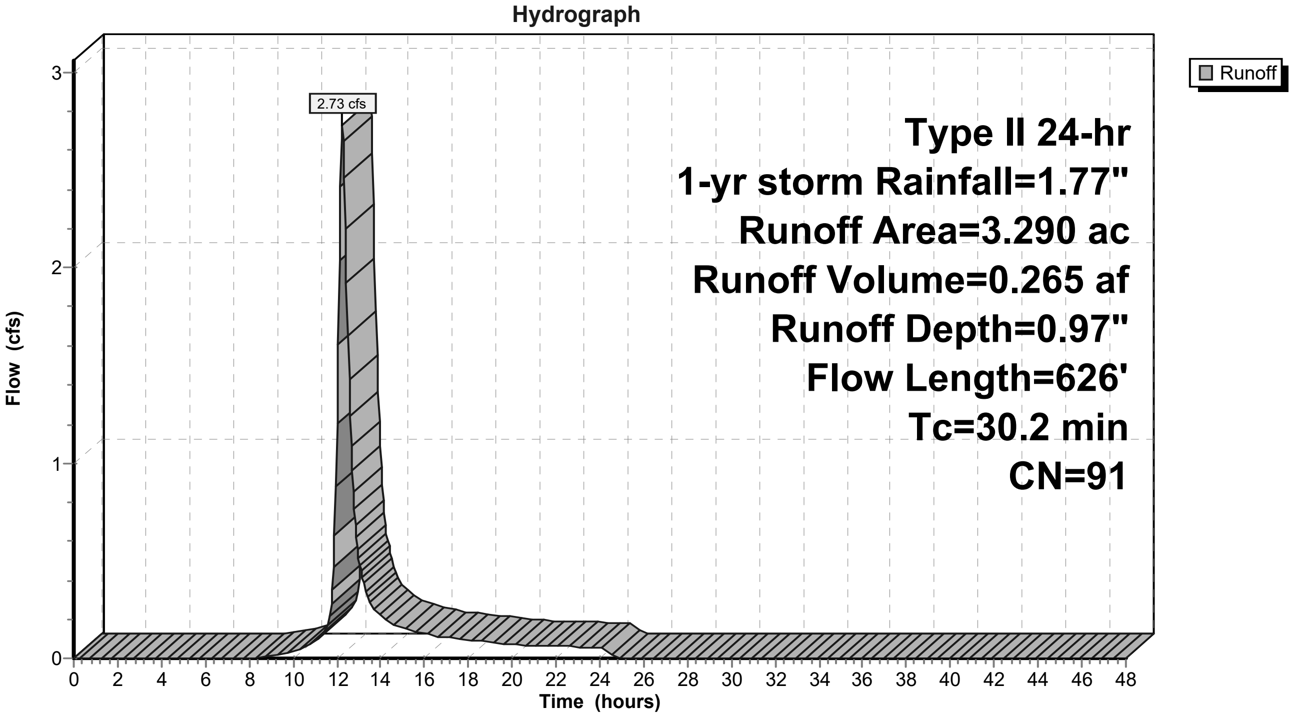
Runoff = 2.73 cfs @ 12.25 hrs, Volume= 0.265 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
1.530	84	50-75% Grass cover, Fair, HSG D
1.130	98	Water Surface, HSG D
0.620	98	Roofs, HSG D
0.010	98	Water Surface, 0% imp, HSG D
3.290	91	Weighted Average
1.540		46.81% Pervious Area
1.750		53.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	100	0.0300	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
16.6	171	0.0006	0.17		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
2.7	277	0.0070	1.70		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.7	78	0.0800	1.98		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
30.2	626	Total			

Subcatchment 32:



Summary for Subcatchment 33:

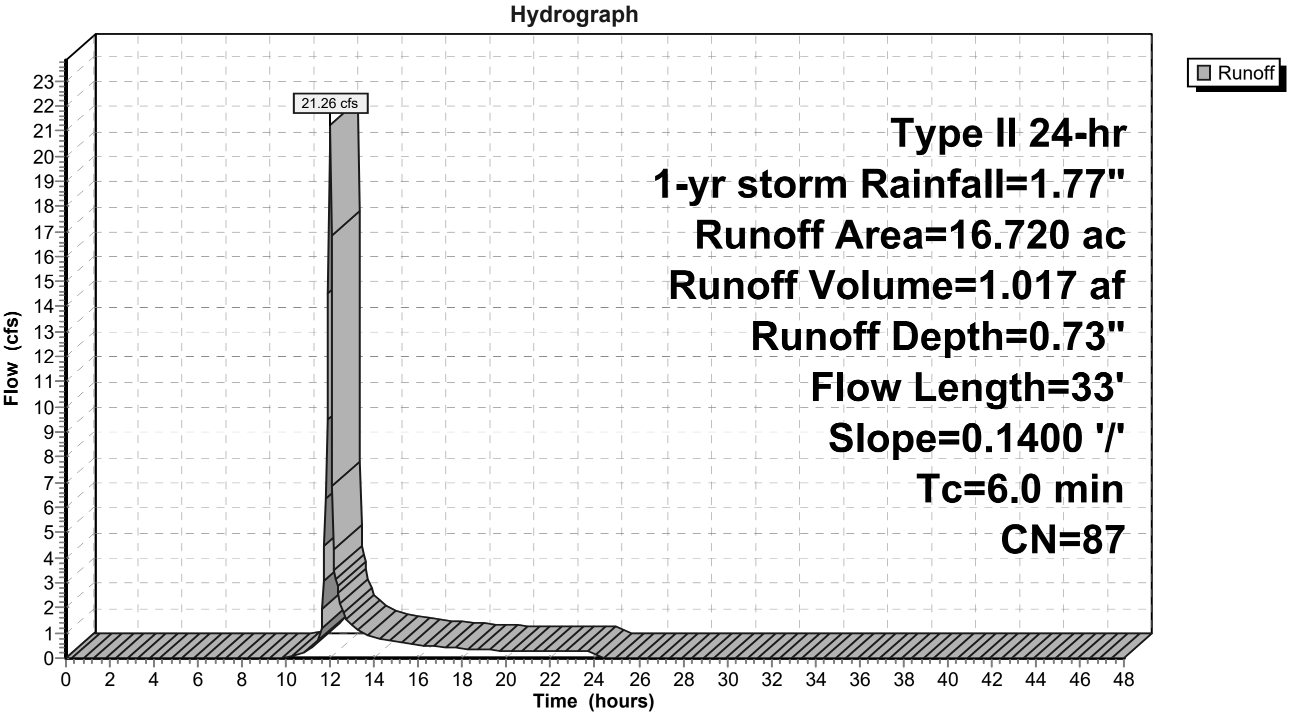
Runoff = 21.26 cfs @ 11.98 hrs, Volume= 1.017 af, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	0.050	84	50-75% Grass cover, Fair, HSG D
	0.620	79	Woods, Fair, HSG D
*	11.780	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.350	79	Woods, Fair, HSG D (offsite)
*	2.850	98	Paved parking, HSG D (offsite)
*	0.590	98	Roofs, HSG D (offsite)
*	0.010	91	Gravel roads, HSG D (offiste)
*	0.470	98	Water Surface, 0% imp, HSG D (offsite)
	16.720	87	Weighted Average
	13.280		79.43% Pervious Area
	3.440		20.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	33	0.1400	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.3	33	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 33:



Summary for Subcatchment 34:

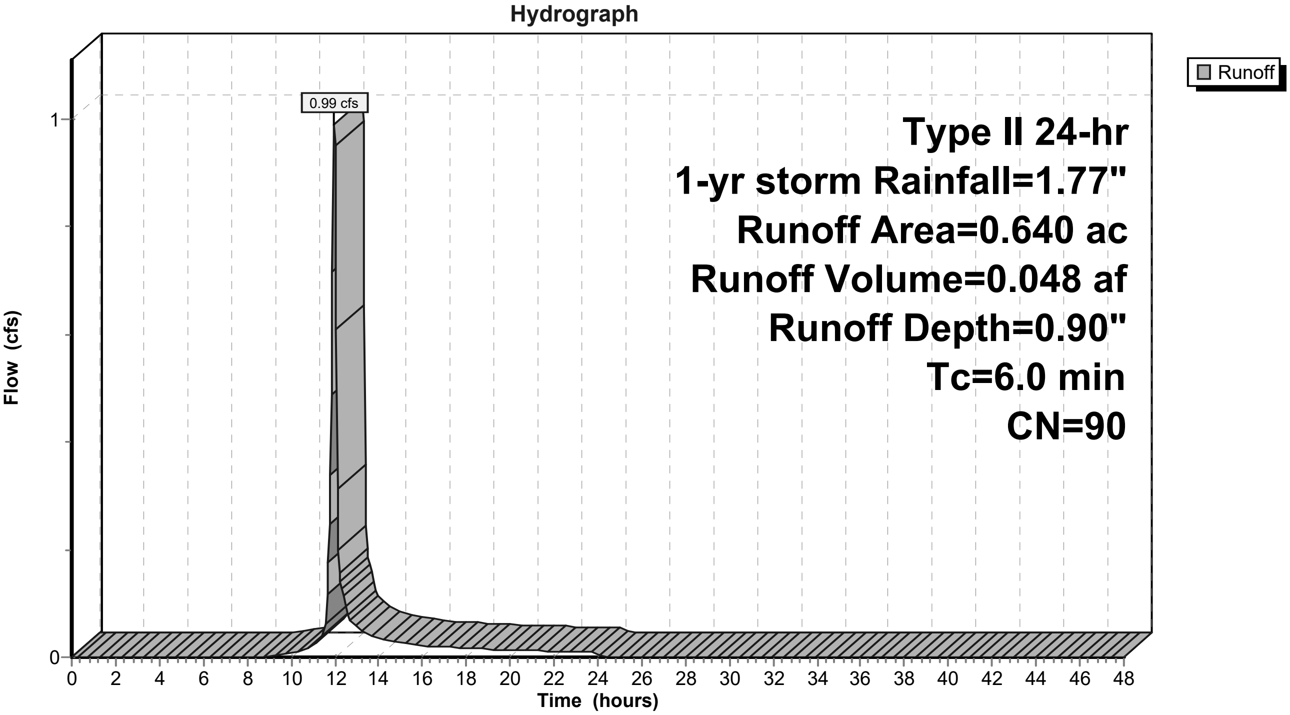
Runoff = 0.99 cfs @ 11.97 hrs, Volume= 0.048 af, Depth= 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
*	0.350	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.270	98	Paved parking, HSG D (offsite)
*	0.020	98	Water Surface, 0% imp, HSG D (offsite)
	0.640	90	Weighted Average
	0.370		57.81% Pervious Area
	0.270		42.19% Impervious Area

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

Subcatchment 34:



Summary for Subcatchment 40:

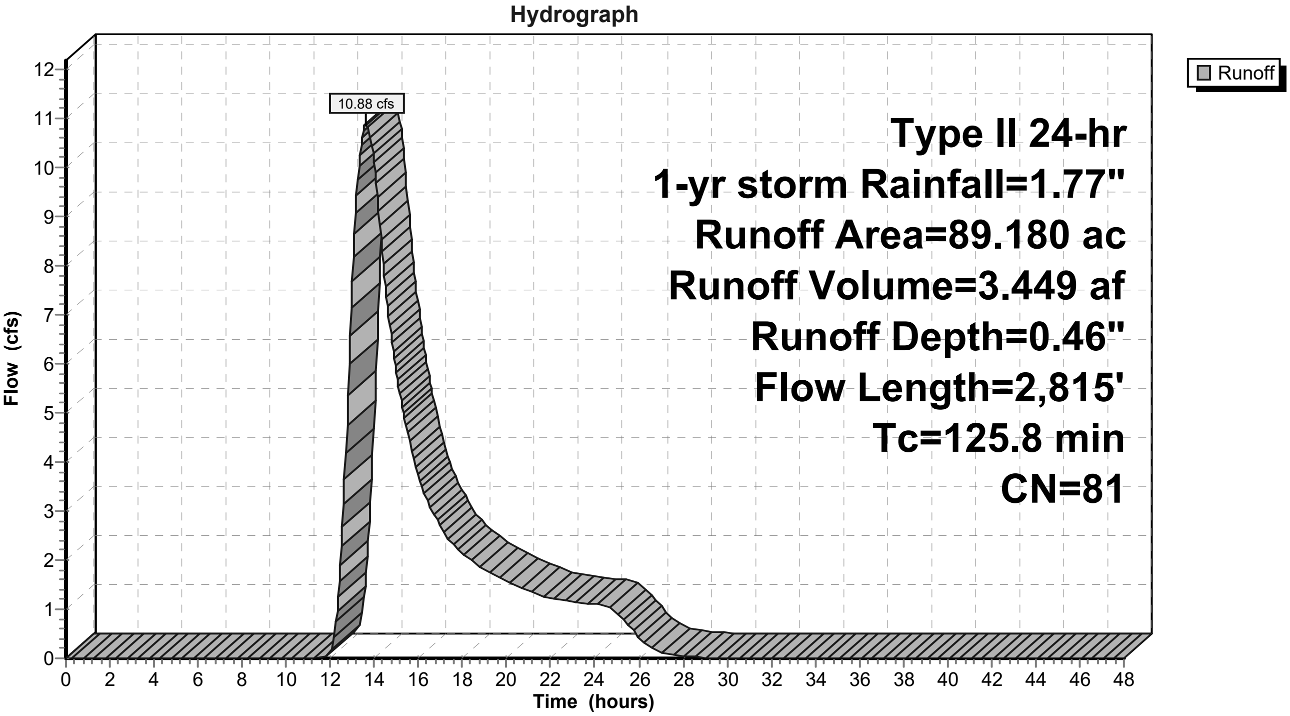
Runoff = 10.88 cfs @ 13.59 hrs, Volume= 3.449 af, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	2.710	79	50-75% Grass cover, Fair, HSG C
	0.240	73	Woods, Fair, HSG C
	18.540	84	50-75% Grass cover, Fair, HSG D
	43.330	79	Woods, Fair, HSG D
*	0.390	79	50-75% Grass cover, Fair, HSG C (offsite)
*	0.300	73	Woods, Fair, HSG C (offsite)
*	14.170	84	50-75% Grass cover, Fair, HSG D (offsite)
*	9.260	79	Woods, Fair, HSG D (offsite)
*	0.130	98	Paved parking, HSG D (offsite)
*	0.090	98	Roofs, HSG D (offsite)
*	0.020	98	Water Surface, 0% imp, HSG D (offsite)
	89.180	81	Weighted Average
	88.960		99.75% Pervious Area
	0.220		0.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.1	100	0.0070	0.04		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
72.2	1,370	0.0040	0.32		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	91	0.1500	2.71		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
10.1	378	0.0080	0.63		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
2.8	876	0.0160	5.26	57.86	**Channel Flow, E-F** Area= 11.0 sf Perim= 14.3' r= 0.77' n= 0.030 Earth, grassed & winding
125.8	2,815	Total			

Subcatchment 40:



Summary for Subcatchment 41:

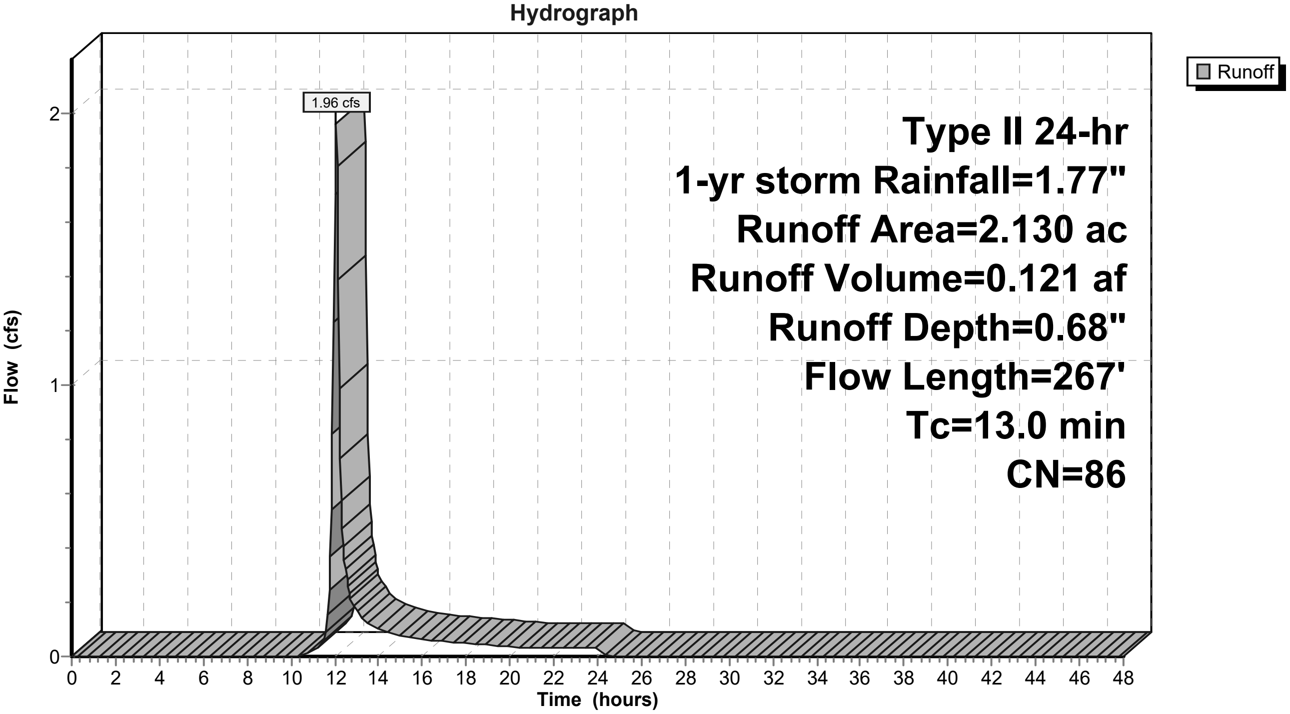
Runoff = 1.96 cfs @ 12.06 hrs, Volume= 0.121 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
*	1.430	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.210	98	Paved parking, HSG D (offsite)
*	0.190	98	Roofs, HSG D (offsite)
*	0.260	79	Woods, Fair, HSG D (offsite)
*	0.040	98	Water Surface, 0% imp, HSG D (offsite)
	2.130	86	Weighted Average
	1.730		81.22% Pervious Area
	0.400		18.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0270	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.3	167	0.0300	1.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
13.0	267	Total			

Subcatchment 41:



Summary for Reach 10R: collector creek

Inflow Area = 48.750 ac, 4.88% Impervious, Inflow Depth = 0.54" for 1-yr storm event
Inflow = 21.00 cfs @ 12.27 hrs, Volume= 2.206 af
Outflow = 20.26 cfs @ 12.33 hrs, Volume= 2.206 af, Atten= 3%, Lag= 3.5 min

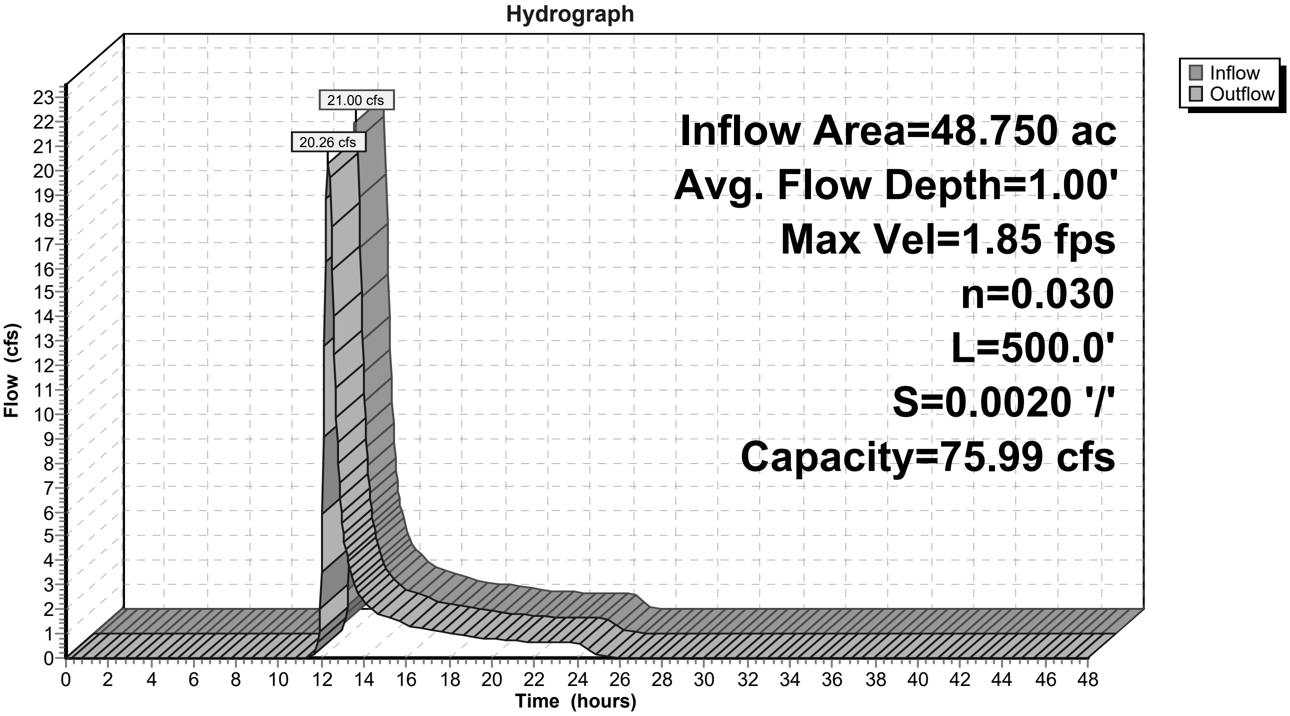
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.85 fps, Min. Travel Time= 4.5 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 15.6 min

Peak Storage= 5,468 cf @ 12.33 hrs
Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 75.99 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 500.0' Slope= 0.0020 '/'
Inlet Invert= 584.05', Outlet Invert= 583.05'

‡

Reach 10R: collector creek



Summary for Reach 20R-1: feeder creek

Inflow Area = 127.530 ac, 3.11% Impervious, Inflow Depth = 0.45" for 1-yr storm event
Inflow = 18.14 cfs @ 13.29 hrs, Volume= 4.799 af
Outflow = 16.49 cfs @ 13.58 hrs, Volume= 4.799 af, Atten= 9%, Lag= 17.8 min

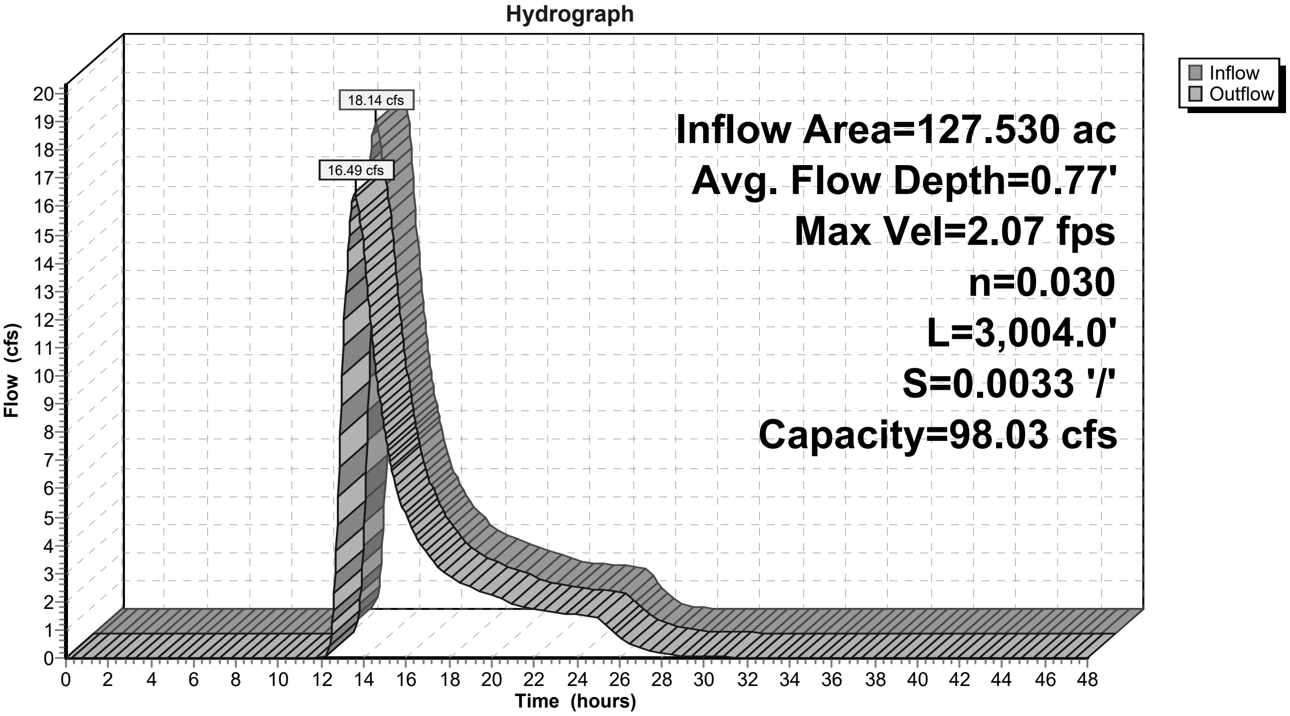
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.07 fps, Min. Travel Time= 24.2 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 82.7 min

Peak Storage= 23,899 cf @ 13.58 hrs
Average Depth at Peak Storage= 0.77'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 98.03 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 3,004.0' Slope= 0.0033 '/'
Inlet Invert= 582.00', Outlet Invert= 572.00'

‡

Reach 20R-1: feeder creek



Summary for Reach 20R-2: feeder creek

Inflow Area = 142.540 ac, 2.78% Impervious, Inflow Depth = 0.45" for 1-yr storm event
Inflow = 17.55 cfs @ 13.64 hrs, Volume= 5.334 af
Outflow = 17.54 cfs @ 13.67 hrs, Volume= 5.334 af, Atten= 0%, Lag= 1.3 min

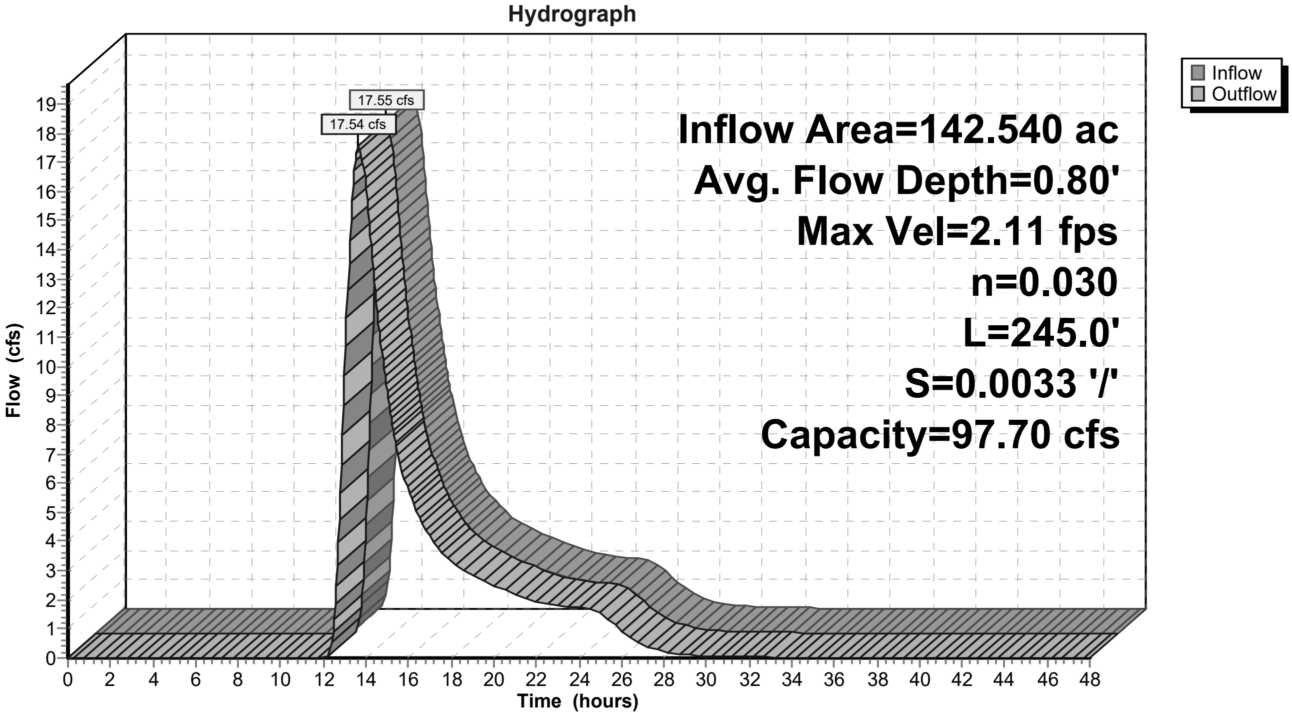
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.11 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 6.5 min

Peak Storage= 2,038 cf @ 13.67 hrs
Average Depth at Peak Storage= 0.80'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 97.70 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 245.0' Slope= 0.0033 '/'
Inlet Invert= 572.00', Outlet Invert= 571.19'

‡

Reach 20R-2: feeder creek



Summary for Reach 22R: property line ditch

Inflow Area = 142.540 ac, 2.78% Impervious, Inflow Depth = 0.45" for 1-yr storm event
Inflow = 17.69 cfs @ 13.55 hrs, Volume= 5.334 af
Outflow = 17.55 cfs @ 13.64 hrs, Volume= 5.334 af, Atten= 1%, Lag= 5.7 min

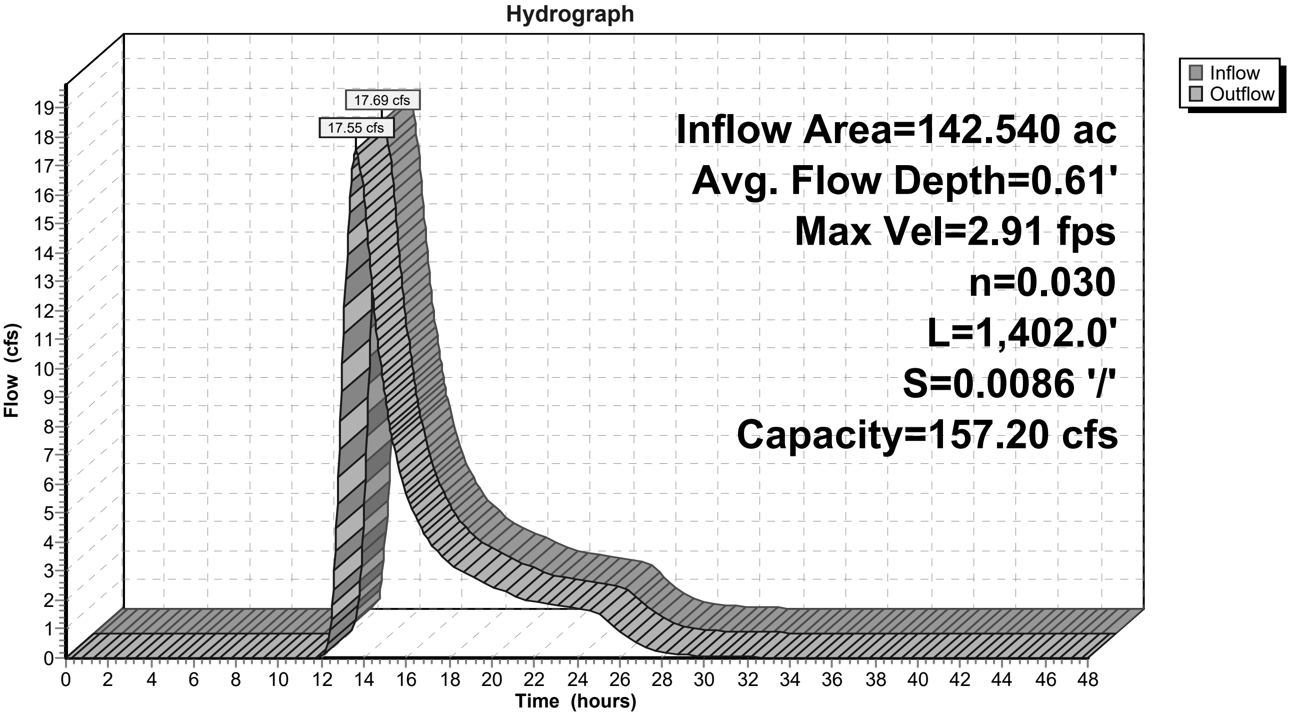
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.91 fps, Min. Travel Time= 8.0 min
Avg. Velocity = 0.88 fps, Avg. Travel Time= 26.5 min

Peak Storage= 8,441 cf @ 13.64 hrs
Average Depth at Peak Storage= 0.61'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 157.20 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 1,402.0' Slope= 0.0086 '/'
Inlet Invert= 584.00', Outlet Invert= 572.00'

‡

Reach 22R: property line ditch



Summary for Reach 30R: Long Road ditch

```
Inflow Area =      164.570 ac,   5.88% Impervious,  Inflow Depth =   0.49"    for  1-yr storm event
Inflow      =        19.48 cfs @   13.73 hrs,  Volume=            6.738 af
Outflow     =        19.48 cfs @   13.75 hrs,  Volume=            6.738 af,  Atten= 0%,  Lag= 1.2 min
```

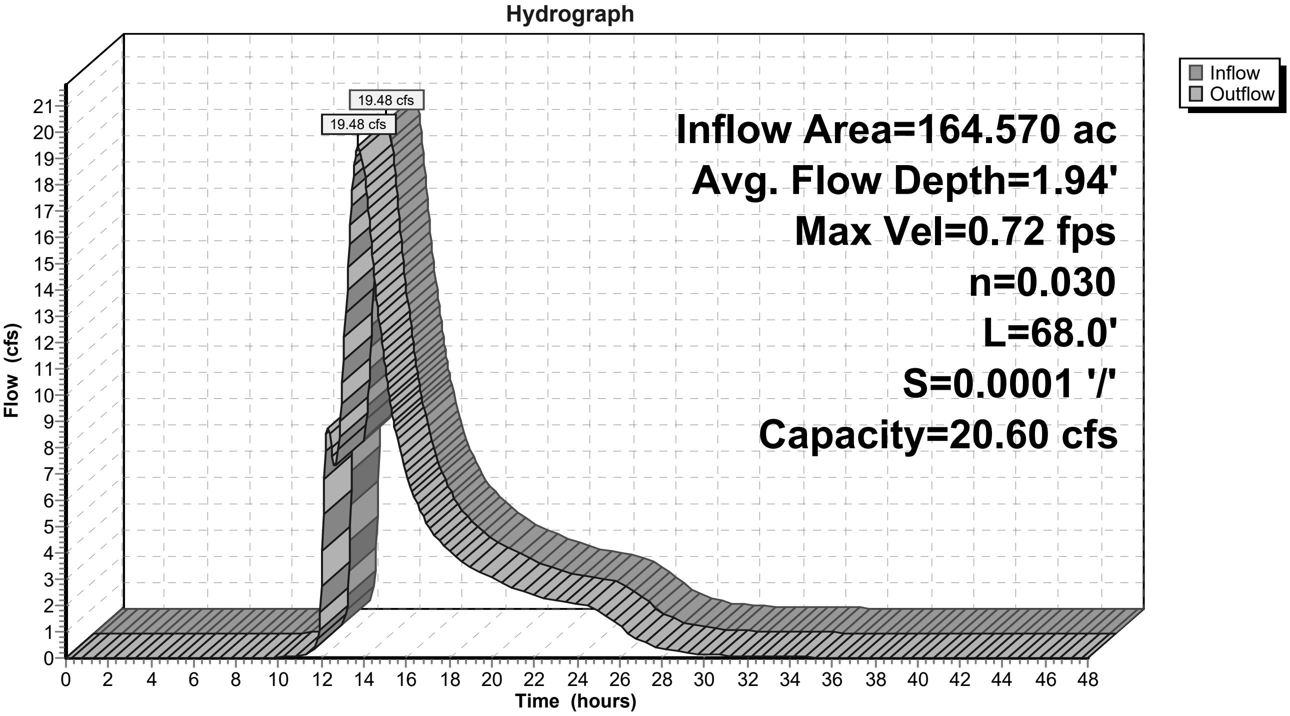
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 0.72 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.23 fps, Avg. Travel Time= 5.0 min

Peak Storage= 1,828 cf @ 13.75 hrs
Average Depth at Peak Storage= 1.94'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 20.60 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 68.0' Slope= 0.0001 '/'
Inlet Invert= 565.46', Outlet Invert= 565.45'

‡

Reach 30R: Long Road ditch



Summary for Reach 31R: Long Road ditch

Inflow Area = 163.190 ac, 5.77% Impervious, Inflow Depth = 0.49" for 1-yr storm event
Inflow = 19.41 cfs @ 13.73 hrs, Volume= 6.663 af
Outflow = 19.41 cfs @ 13.74 hrs, Volume= 6.663 af, Atten= 0%, Lag= 0.5 min

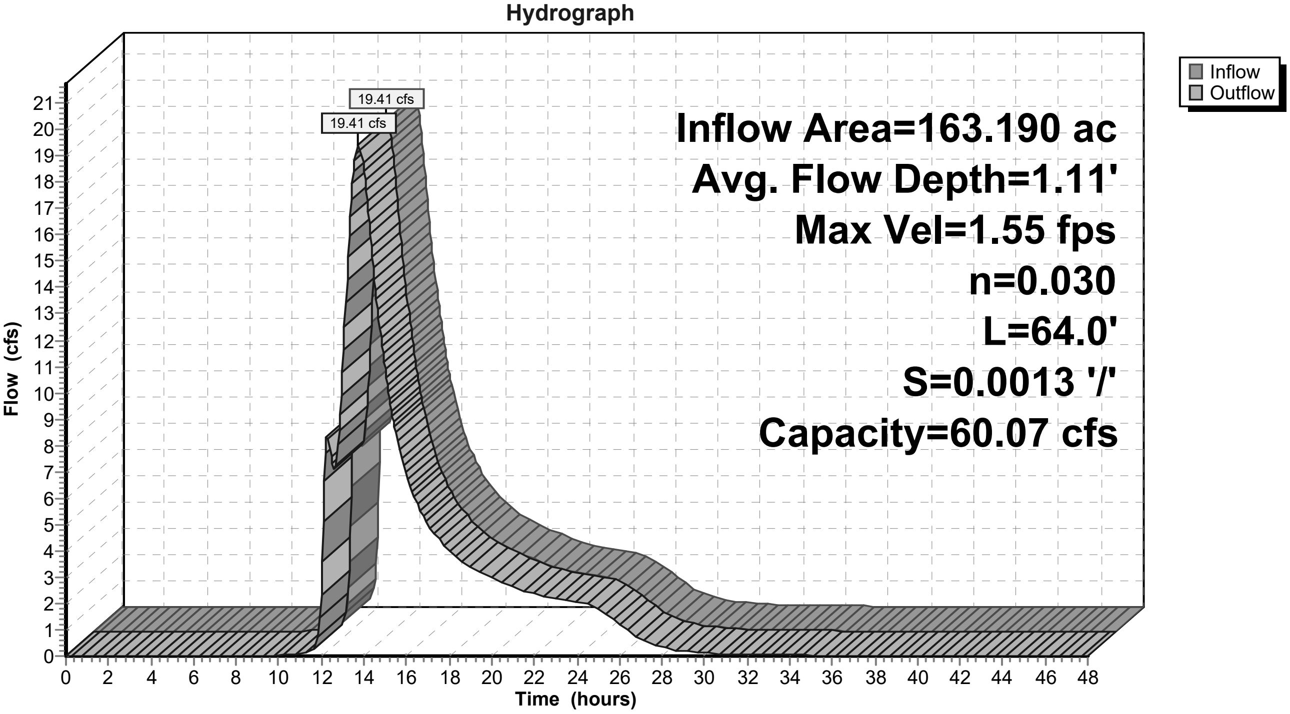
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.55 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 0.47 fps, Avg. Travel Time= 2.3 min

Peak Storage= 800 cf @ 13.74 hrs
Average Depth at Peak Storage= 1.11'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 60.07 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 64.0' Slope= 0.0013 '/'
Inlet Invert= 565.09', Outlet Invert= 565.01'

‡

Reach 31R: Long Road ditch



Summary for Reach 32R: Long Road ditch

Inflow Area = 159.900 ac, 4.80% Impervious, Inflow Depth = 0.48" for 1-yr storm event
Inflow = 19.16 cfs @ 13.73 hrs, Volume= 6.398 af
Outflow = 19.16 cfs @ 13.73 hrs, Volume= 6.398 af, Atten= 0%, Lag= 0.4 min

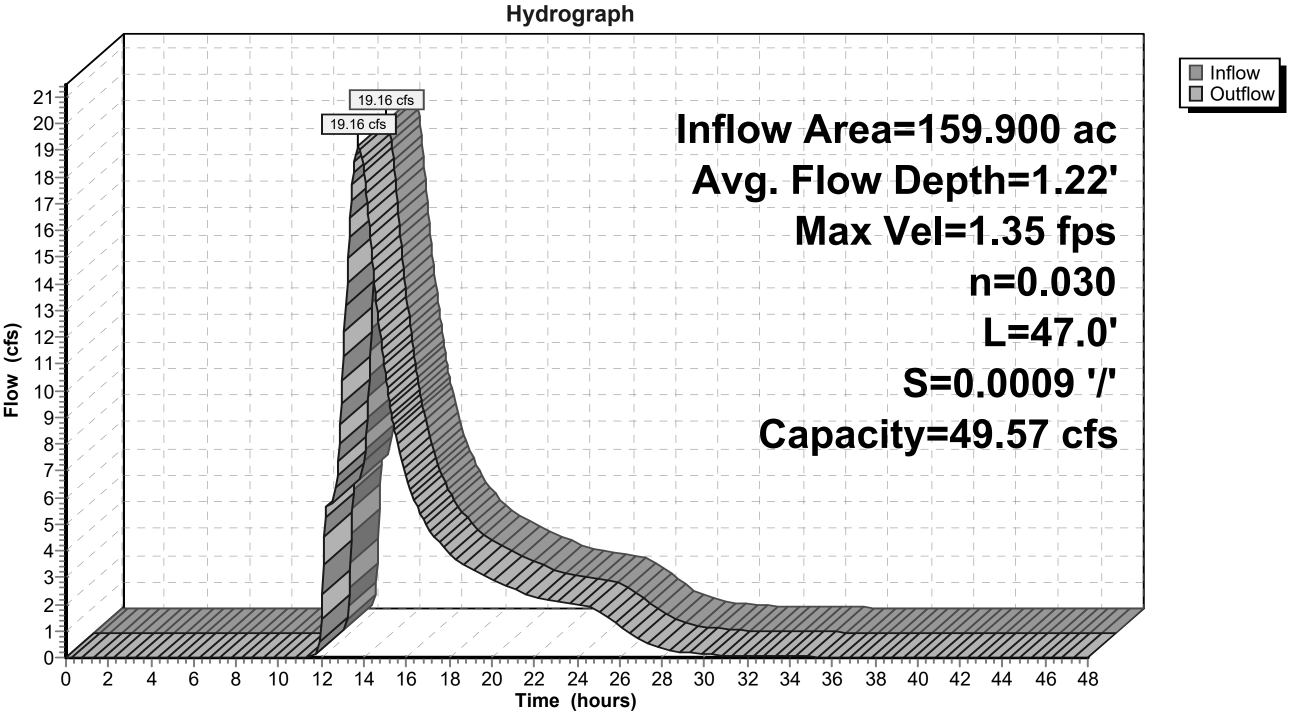
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.35 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 1.9 min

Peak Storage= 667 cf @ 13.73 hrs
Average Depth at Peak Storage= 1.22'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 49.57 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 47.0' Slope= 0.0009 '/'
Inlet Invert= 565.64', Outlet Invert= 565.60'

‡

Reach 32R: Long Road ditch



Summary for Reach 33R-1: I-190 ditch

Inflow Area = 16.720 ac, 20.57% Impervious, Inflow Depth = 0.73" for 1-yr storm event
Inflow = 21.26 cfs @ 11.98 hrs, Volume= 1.017 af
Outflow = 6.21 cfs @ 12.12 hrs, Volume= 1.017 af, Atten= 71%, Lag= 8.6 min

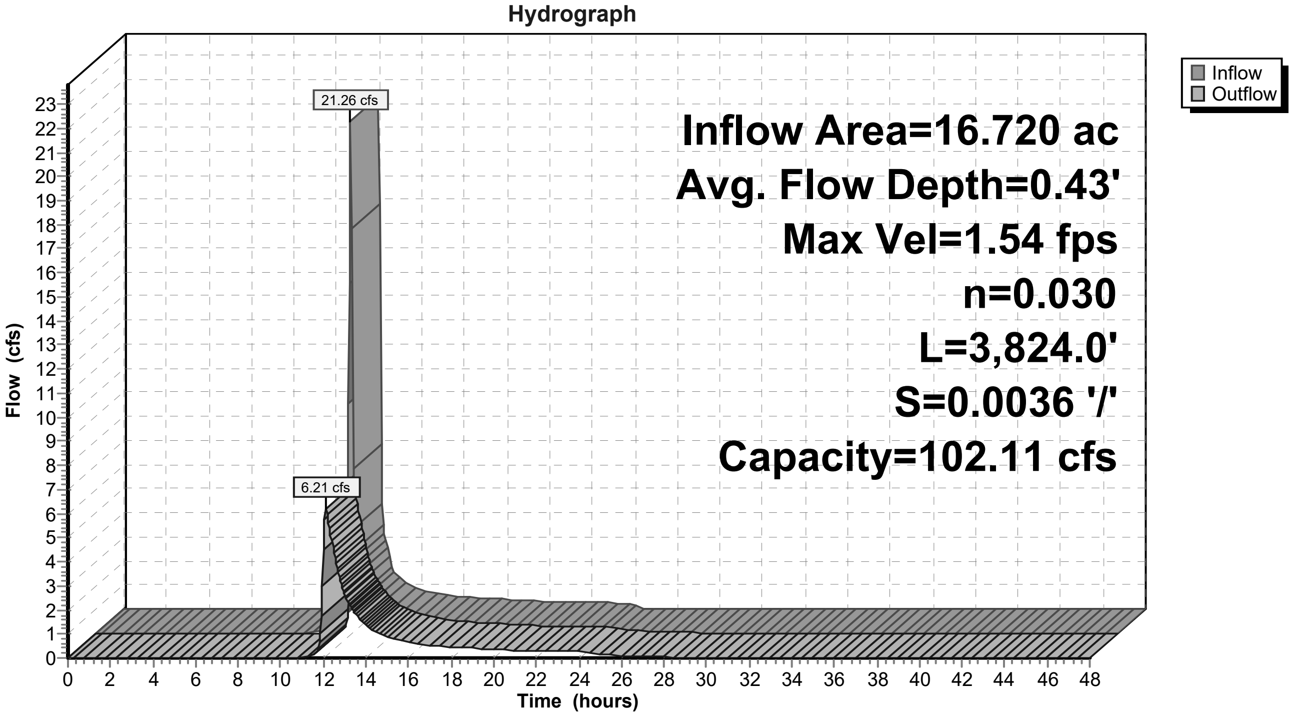
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.54 fps, Min. Travel Time= 41.3 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 165.1 min

Peak Storage= 15,360 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 102.11 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 3,824.0' Slope= 0.0036 '/'
Inlet Invert= 585.00', Outlet Invert= 571.19'

‡

Reach 33R-1: I-190 ditch



Summary for Reach 33R-2: I-190 ditch

Inflow Area = 159.260 ac, 4.65% Impervious, Inflow Depth = 0.48" for 1-yr storm event
Inflow = 19.19 cfs @ 13.64 hrs, Volume= 6.350 af
Outflow = 19.15 cfs @ 13.68 hrs, Volume= 6.350 af, Atten= 0%, Lag= 2.7 min

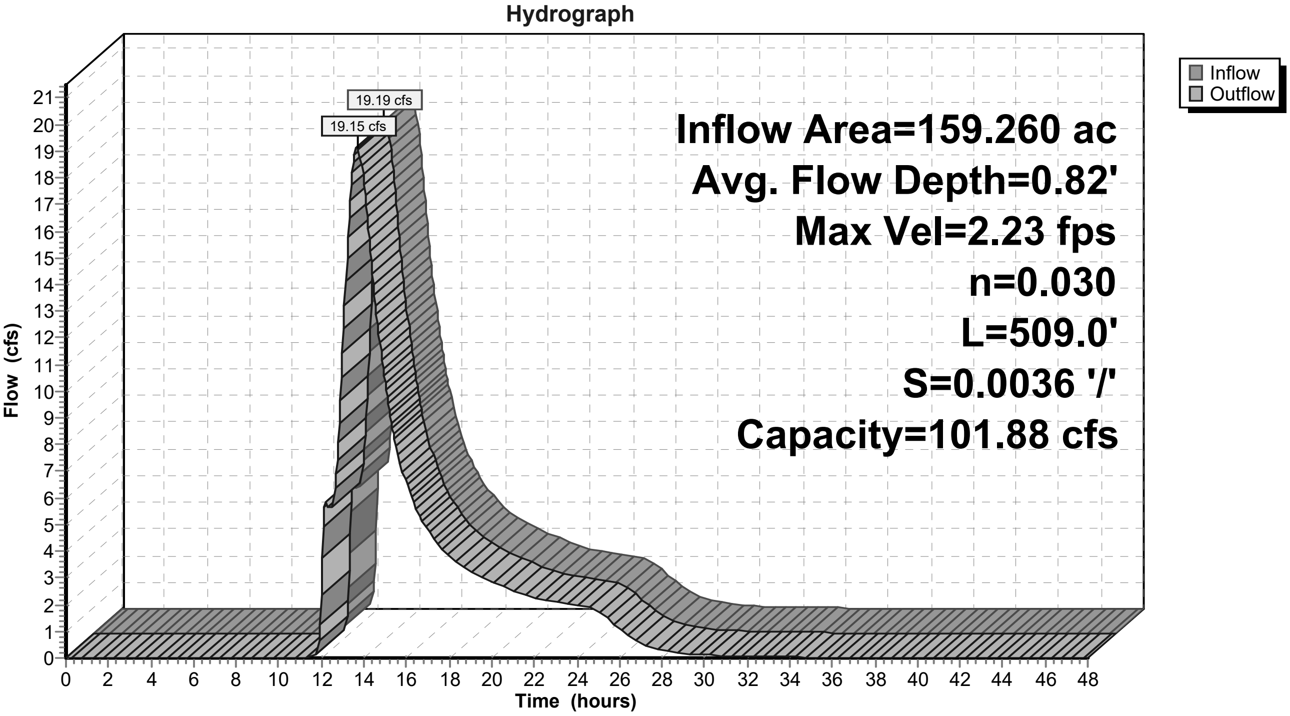
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.23 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 12.5 min

Peak Storage= 4,370 cf @ 13.68 hrs
Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 101.88 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 509.0' Slope= 0.0036 '/'
Inlet Invert= 571.19', Outlet Invert= 569.36'

‡

Reach 33R-2: I-190 ditch



Summary for Reach 33R-3: Long Road ditch

Inflow Area = 159.900 ac, 4.80% Impervious, Inflow Depth = 0.48" for 1-yr storm event
Inflow = 19.23 cfs @ 13.69 hrs, Volume= 6.398 af
Outflow = 19.16 cfs @ 13.73 hrs, Volume= 6.398 af, Atten= 0%, Lag= 1.9 min

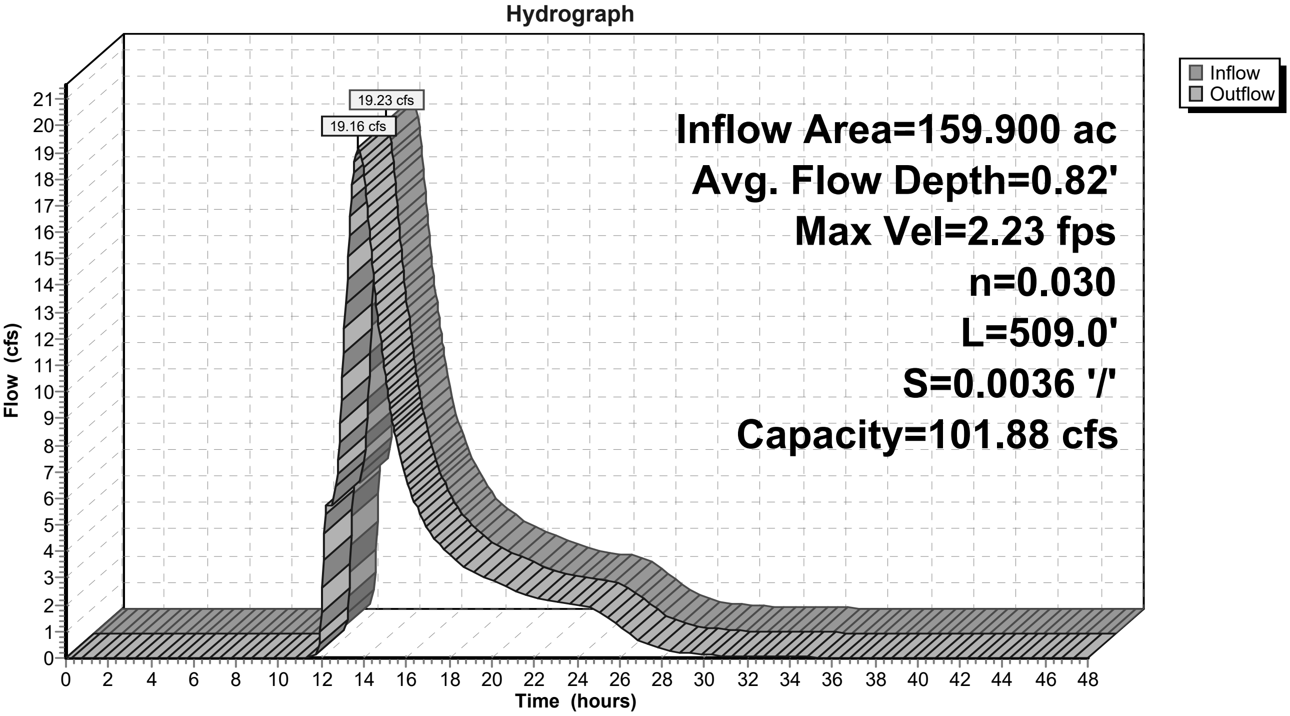
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.23 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 12.7 min

Peak Storage= 4,371 cf @ 13.73 hrs
Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 101.88 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 509.0' Slope= 0.0036 '/'
Inlet Invert= 571.19', Outlet Invert= 569.36'

‡

Reach 33R-3: Long Road ditch



Summary for Reach 40R: Long Road ditch

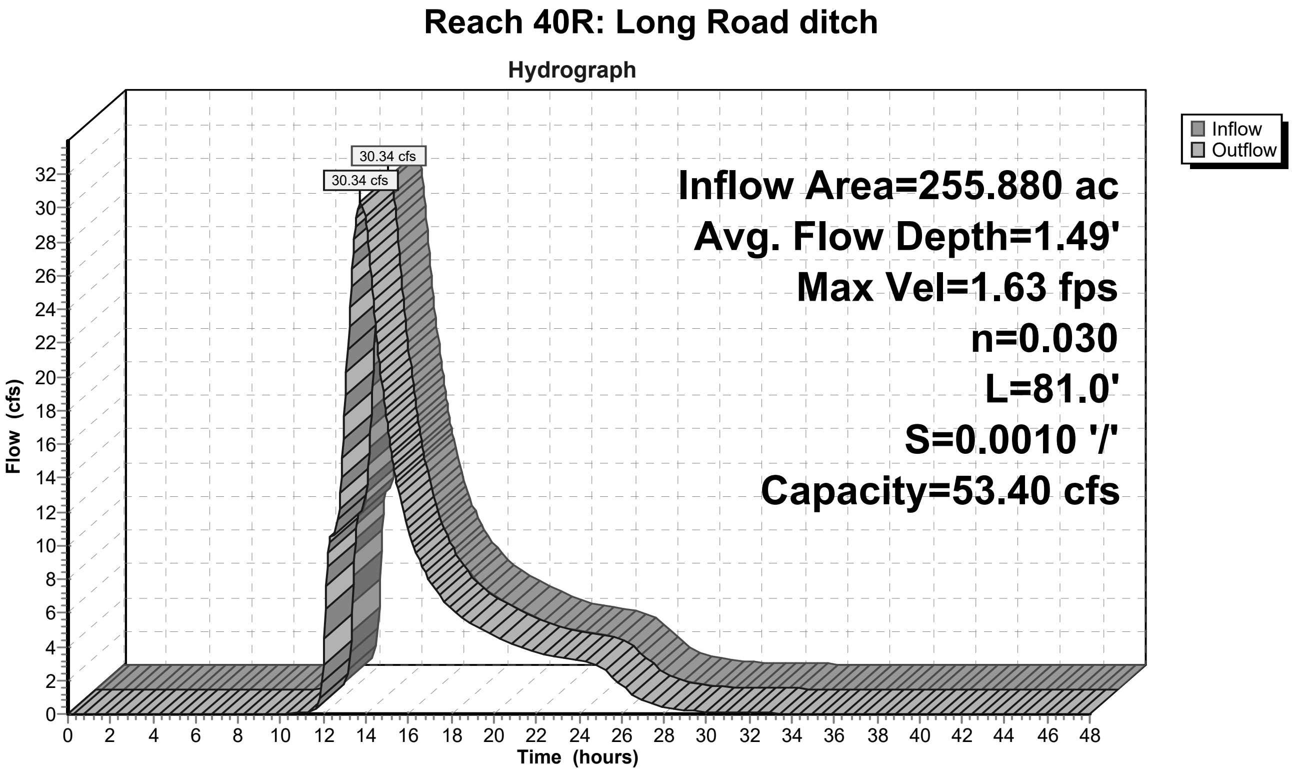
Inflow Area = 255.880 ac, 4.03% Impervious, Inflow Depth = 0.48" for 1-yr storm event
Inflow = 30.34 cfs @ 13.73 hrs, Volume= 10.308 af
Outflow = 30.34 cfs @ 13.74 hrs, Volume= 10.308 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.63 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 2.8 min

Peak Storage= 1,510 cf @ 13.74 hrs
Average Depth at Peak Storage= 1.49'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 53.40 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 81.0' Slope= 0.0010 '/'
Inlet Invert= 564.47', Outlet Invert= 564.39'

‡



Summary for Reach 41R-1: Long Road ditch

Inflow Area = 164.570 ac, 5.88% Impervious, Inflow Depth > 0.49" for 1-yr storm event
Inflow = 19.48 cfs @ 13.75 hrs, Volume= 6.738 af
Outflow = 19.48 cfs @ 13.76 hrs, Volume= 6.738 af, Atten= 0%, Lag= 0.3 min

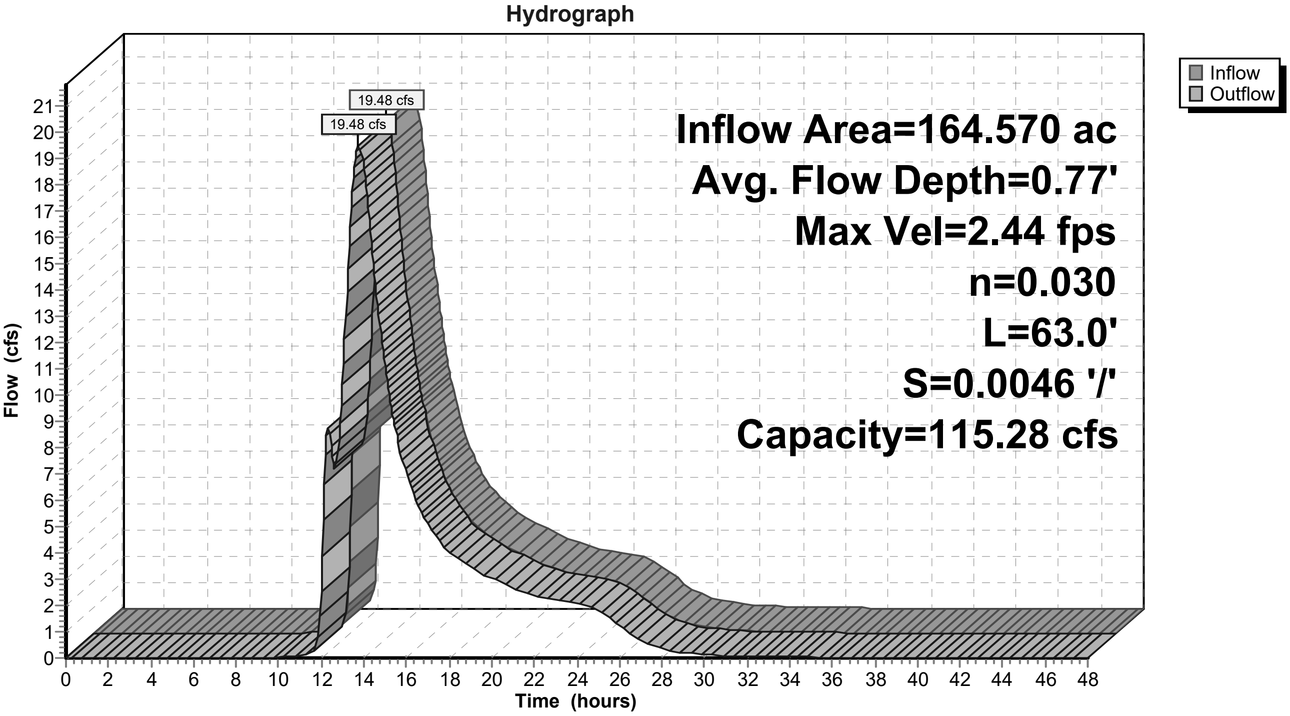
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.44 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 1.4 min

Peak Storage= 503 cf @ 13.76 hrs
Average Depth at Peak Storage= 0.77'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 115.28 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 63.0' Slope= 0.0046 '/'
Inlet Invert= 564.87', Outlet Invert= 564.58'

‡

Reach 41R-1: Long Road ditch



Summary for Reach 41R-2: Long Road ditch

Inflow Area = 166.700 ac, 6.05% Impervious, Inflow Depth > 0.49" for 1-yr storm event
Inflow = 19.59 cfs @ 13.76 hrs, Volume= 6.859 af
Outflow = 19.59 cfs @ 13.77 hrs, Volume= 6.859 af, Atten= 0%, Lag= 1.0 min

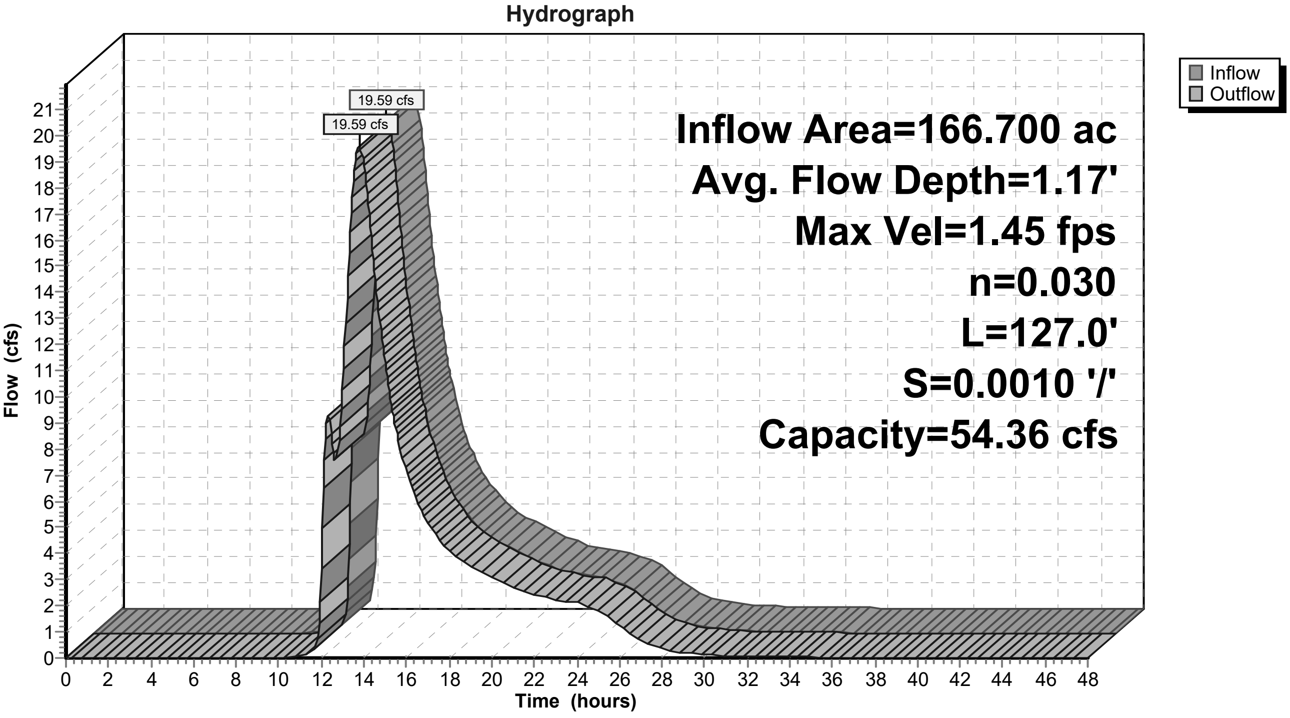
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.45 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 4.8 min

Peak Storage= 1,715 cf @ 13.77 hrs
Average Depth at Peak Storage= 1.17'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 54.36 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 127.0' Slope= 0.0010 '/'
Inlet Invert= 564.66', Outlet Invert= 564.53'

‡

Reach 41R-2: Long Road ditch

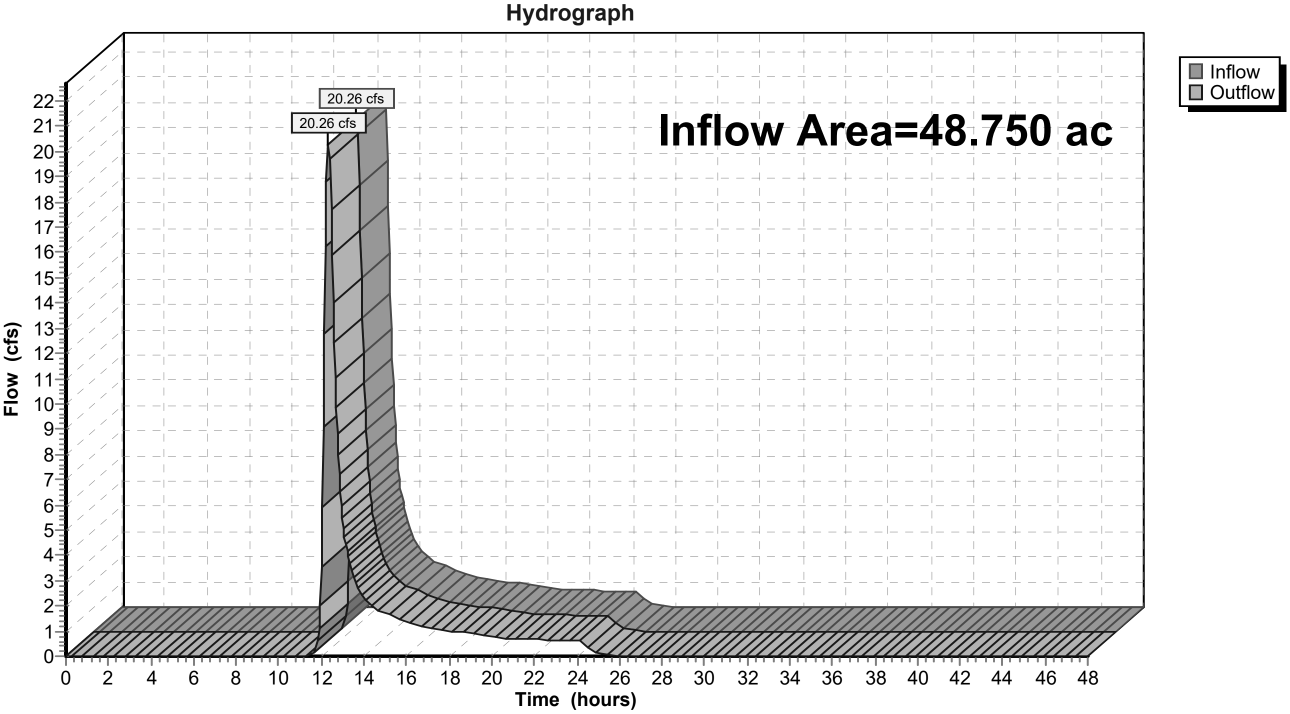


Summary for Reach DP-1: collector creek north of Bedell Road

```
Inflow Area =        48.750 ac,    4.88% Impervious,  Inflow Depth =   0.54"    for  1-yr storm event
Inflow       =       20.26 cfs @   12.33 hrs,  Volume=            2.206 af
Outflow      =       20.26 cfs @   12.33 hrs,  Volume=            2.206 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-1: collector creek north of Bedell Road

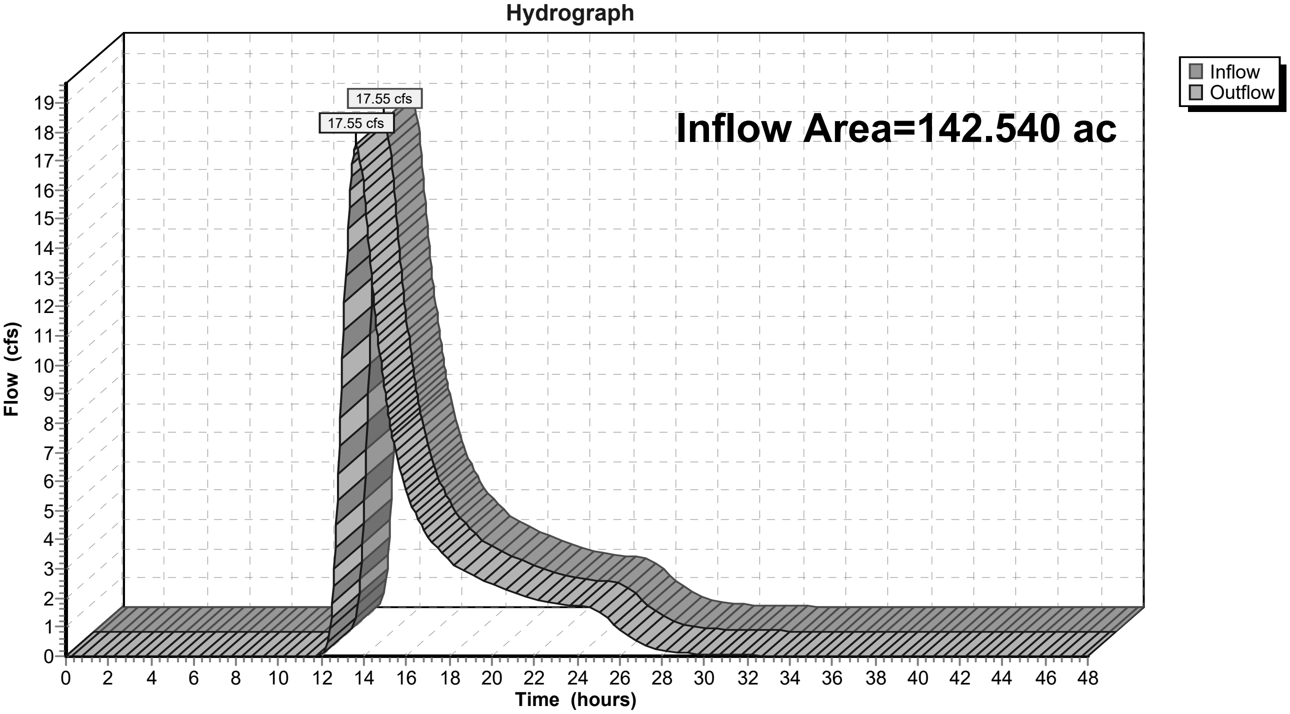


Summary for Reach DP-2: feeder creek on property portion

```
Inflow Area =      142.540 ac,    2.78% Impervious,  Inflow Depth =   0.45"    for  1-yr storm event
Inflow      =       17.55 cfs @   13.64 hrs,  Volume=          5.334 af
Outflow     =       17.55 cfs @   13.64 hrs,  Volume=          5.334 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-2: feeder creek on property portion

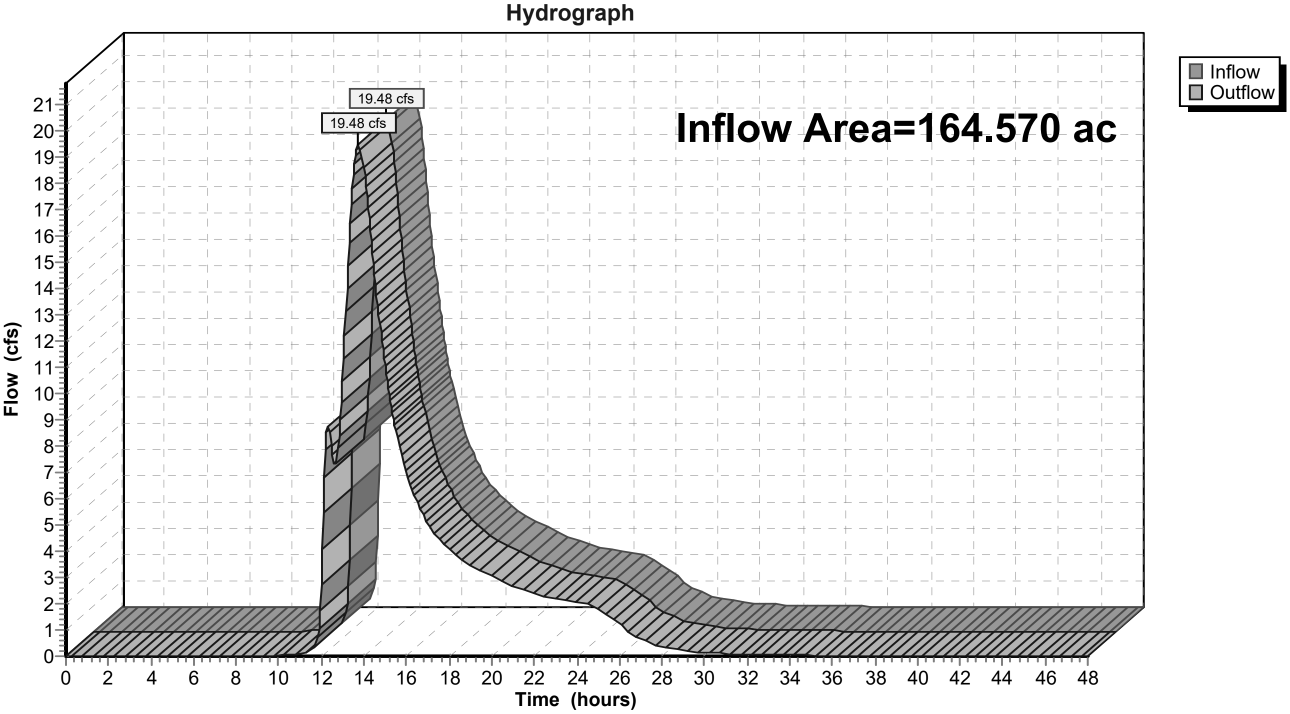


Summary for Reach DP-3: entrance to twin 36" culverts on adjancent property

Inflow Area =	164.570 ac,	5.88% Impervious, Inflow Depth > 0.49"	for 1-yr storm event	
Inflow =	19.48 cfs @	13.75 hrs, Volume=	6.738 af	
Outflow =	19.48 cfs @	13.75 hrs, Volume=	6.738 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-3: entrance to twin 36" culverts on adjancent property

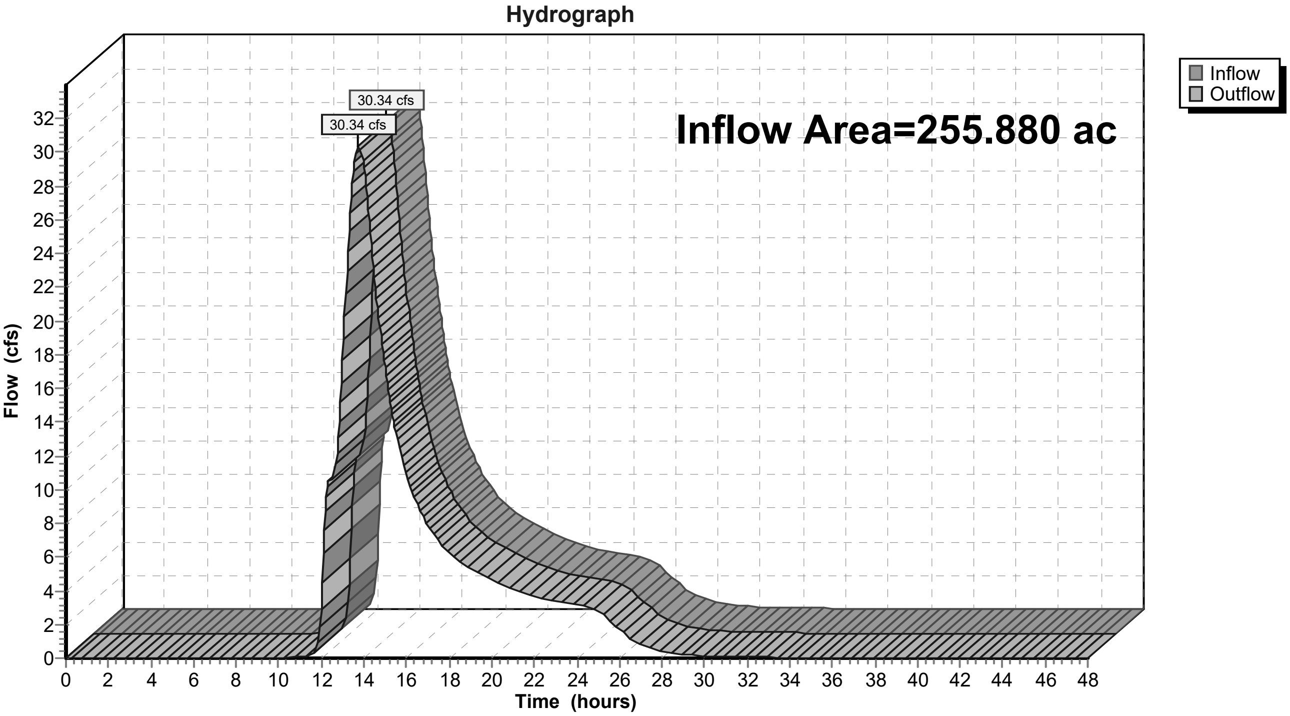


Summary for Reach DP-4: entrance to headwall

Inflow Area = 255.880 ac, 4.03% Impervious, Inflow Depth = 0.48" for 1-yr storm event
Inflow = 30.34 cfs @ 13.74 hrs, Volume= 10.308 af
Outflow = 30.34 cfs @ 13.74 hrs, Volume= 10.308 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-4: entrance to headwall



Summary for Pond 21P: pond

Inflow Area = 3.440 ac, 0.00% Impervious, Inflow Depth = 0.54" for 1-yr storm event
Inflow = 1.97 cfs @ 12.14 hrs, Volume= 0.156 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 586.22' @ 25.15 hrs Surf.Area= 31,268 sf Storage= 6,780 cf
Flood Elev= 587.00' Surf.Area= 36,973 sf Storage= 33,304 cf

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

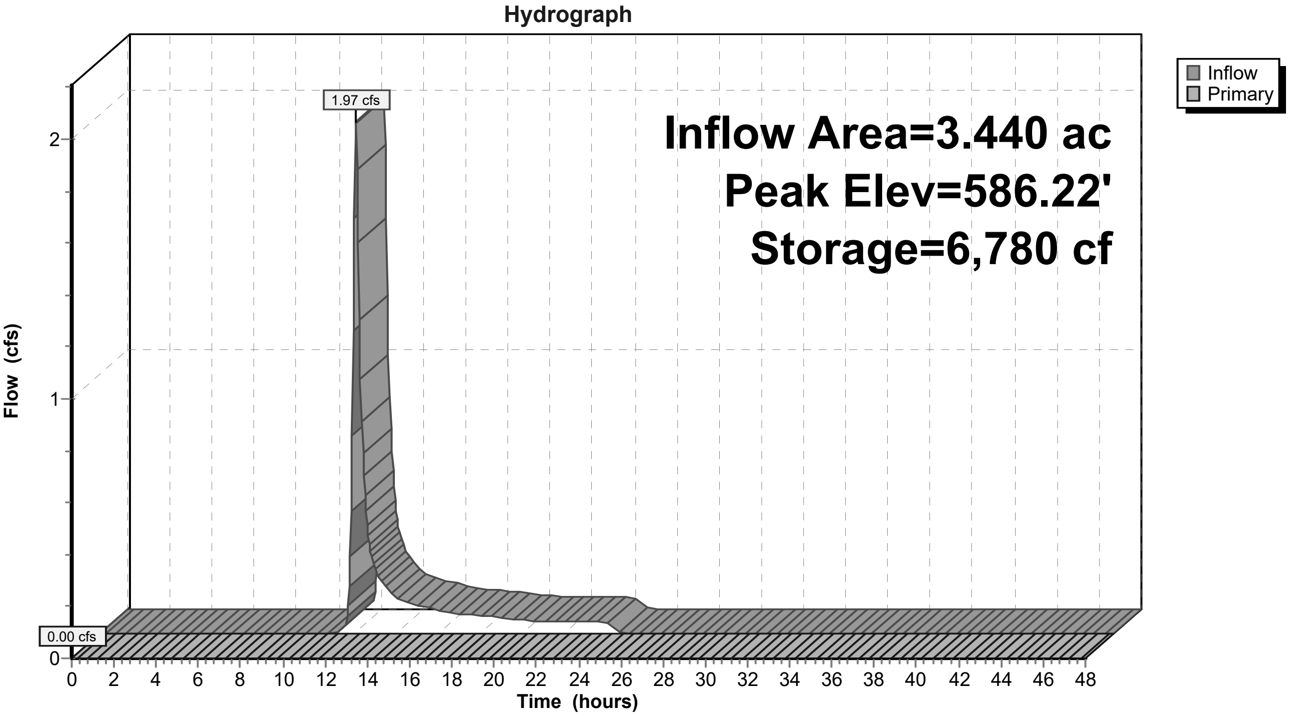
Volume	Invert	Avail.Storage	Storage Description
#1	586.00'	33,304 cf	**pond (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
586.00	29,634	0	0
587.00	36,973	33,304	33,304

Device	Routing	Invert	Outlet Devices
#1	Primary	586.70'	**100.0' long x 8.0' breadth overflow weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=586.00' TW=582.00' (Dynamic Tailwater)
↑—**1=overflow weir** (Controls 0.00 cfs)

Pond 21P: pond



Summary for Pond 30C: twin 36" culverts

```
Inflow Area =      164.570 ac,   5.88% Impervious,  Inflow Depth >  0.49"    for  1-yr storm event
Inflow      =       19.48 cfs @  13.75 hrs,  Volume=           6.738 af
Outflow     =       19.48 cfs @  13.75 hrs,  Volume=           6.738 af,  Atten= 0%,  Lag= 0.0 min
Primary     =       12.61 cfs @  13.75 hrs,  Volume=           5.518 af
Secondary   =        6.87 cfs @  13.75 hrs,  Volume=           1.220 af
```

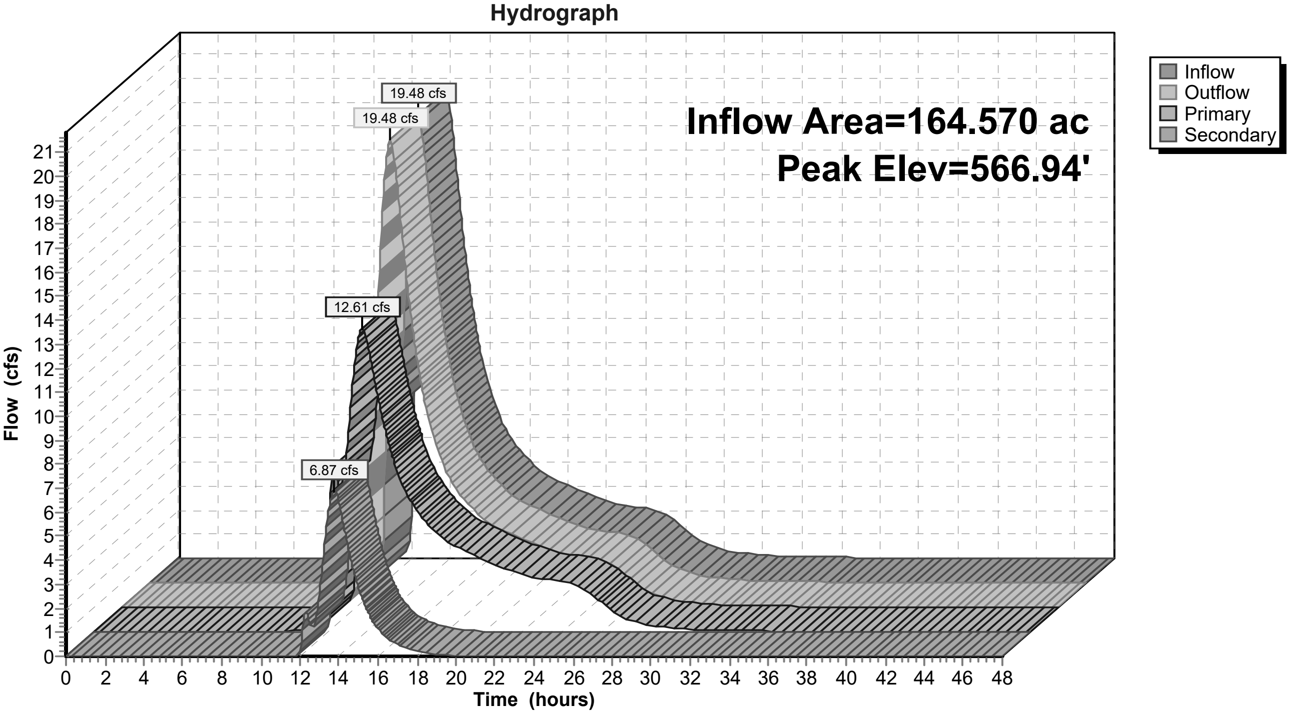
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 566.94' @ 13.75 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.97'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.76' / 564.97' S= -0.0035 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	565.78'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.78' / 564.87' S= 0.0152 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=12.60 cfs @ 13.75 hrs HW=566.94' TW=565.64' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 12.60 cfs @ 3.21 fps)

Secondary OutFlow Max=6.87 cfs @ 13.75 hrs HW=566.94' TW=565.64' (Dynamic Tailwater)
└─**2=Culvert** (Barrel Controls 6.87 cfs @ 4.06 fps)

Pond 30C: twin 36" culverts



Summary for Pond 31C: twin 36" culverts

Inflow Area = 163.930 ac, 5.86% Impervious, Inflow Depth = 0.49" for 1-yr storm event
Inflow = 19.45 cfs @ 13.74 hrs, Volume= 6.705 af
Outflow = 19.45 cfs @ 13.74 hrs, Volume= 6.705 af, Atten= 0%, Lag= 0.0 min
Primary = 9.59 cfs @ 13.74 hrs, Volume= 3.224 af
Secondary = 9.87 cfs @ 13.74 hrs, Volume= 3.480 af

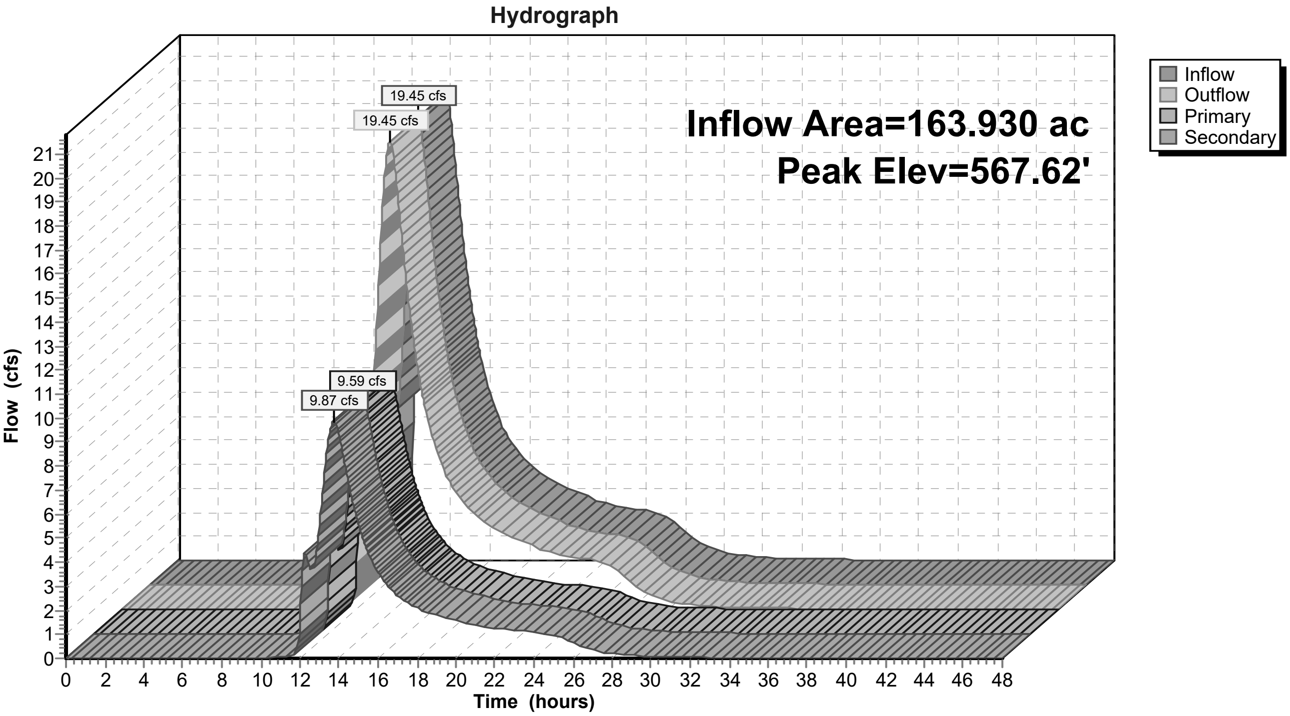
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 567.62' @ 13.75 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	565.46'	**36.0" Round Culvert** L= 41.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.99' / 565.46' S= -0.0115 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	565.40'	**36.0" Round Culvert** L= 41.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.01' / 565.40' S= -0.0095 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=9.58 cfs @ 13.74 hrs HW=567.62' TW=567.40' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 9.58 cfs @ 1.76 fps)

Secondary OutFlow Max=9.86 cfs @ 13.74 hrs HW=567.62' TW=567.40' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 9.86 cfs @ 1.76 fps)

Pond 31C: twin 36" culverts



Summary for Pond 32C: twin 36" culverts

Inflow Area =	163.190 ac,	5.77% Impervious,	Inflow Depth = 0.49"	for 1-yr storm event
Inflow =	19.41 cfs @	13.73 hrs, Volume=	6.663 af	
Outflow =	19.41 cfs @	13.73 hrs, Volume=	6.663 af,	Atten= 0%, Lag= 0.0 min
Primary =	9.65 cfs @	13.73 hrs, Volume=	3.482 af	
Secondary =	9.77 cfs @	13.73 hrs, Volume=	3.181 af	

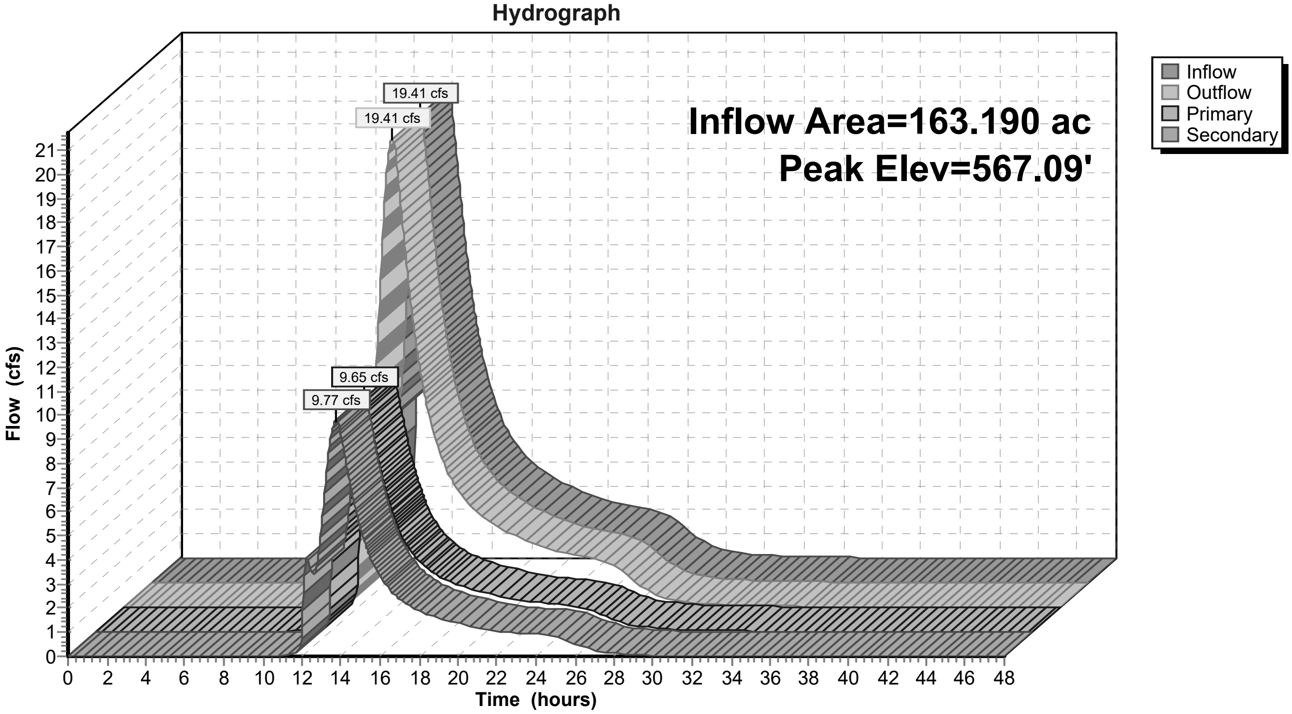
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 567.09' @ 13.73 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	565.68'	**36.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.68' / 565.25' S= 0.0055 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#2	Secondary	565.73'	**36.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.73' / 565.09' S= 0.0082 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=9.64 cfs @ 13.73 hrs HW=567.09' TW=566.19' (Dynamic Tailwater)
1=Culvert (Barrel Controls 9.64 cfs @ 4.33 fps)

Secondary OutFlow Max=9.76 cfs @ 13.73 hrs HW=567.09' TW=566.19' (Dynamic Tailwater)
2=Culvert (Outlet Controls 9.76 cfs @ 4.60 fps)

Pond 32C: twin 36" culverts



Summary for Pond 33C: twin 30" culverts

```
Inflow Area =      159.900 ac,   4.80% Impervious,  Inflow Depth =   0.48"    for  1-yr storm event
Inflow       =       19.16 cfs @   13.73 hrs,  Volume=            6.398 af
Outflow      =       19.16 cfs @   13.73 hrs,  Volume=            6.398 af,  Atten= 0%,  Lag= 0.0 min
Primary      =        9.59 cfs @   13.73 hrs,  Volume=            3.161 af
Secondary    =        9.57 cfs @   13.73 hrs,  Volume=            3.238 af

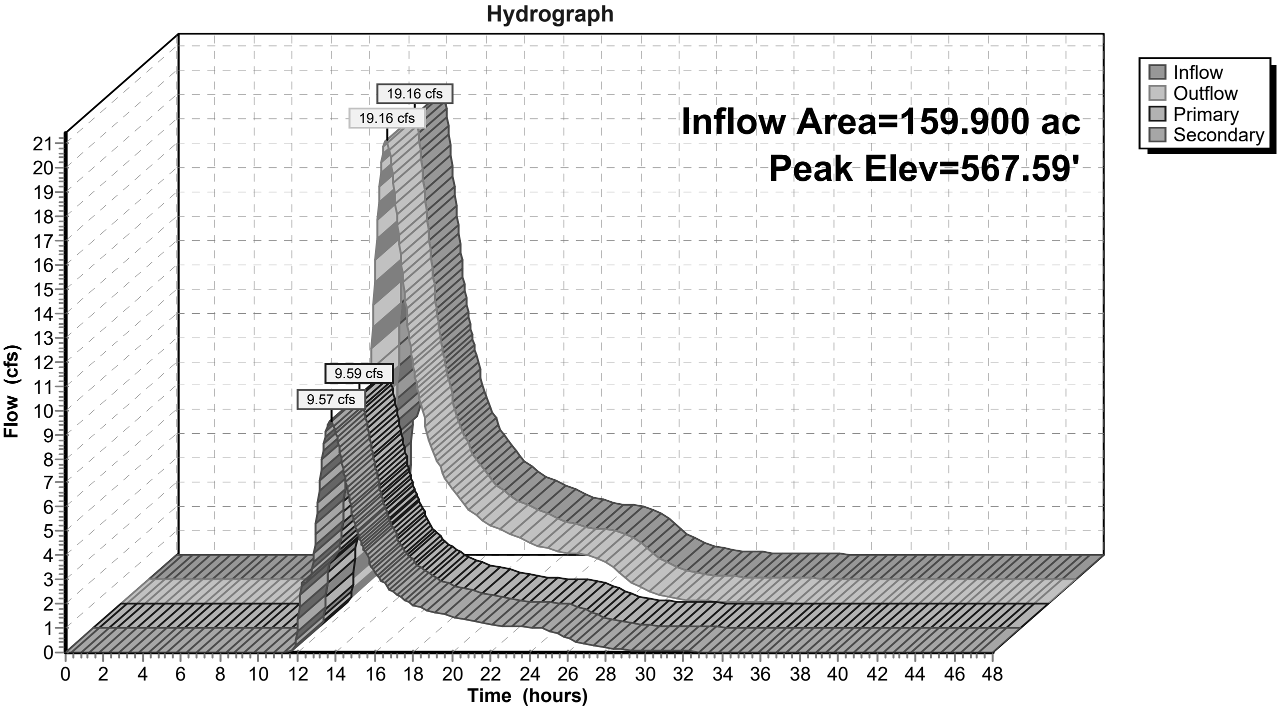
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 567.59' @ 13.73 hrs
Flood Elev= 571.00'

Device   Routing          Invert   Outlet Devices
   #1    Primary         565.70'   30.0"  Round Culvert
                                   L= 140.0'   CPP, projecting, no headwall,  Ke= 0.900
                                   Inlet / Outlet Invert= 565.70' / 565.64'   S= 0.0004 '/'   Cc= 0.900
                                   n= 0.013  Corrugated PE, smooth interior,  Flow Area= 4.91 sf
   #2    Secondary       565.65'   30.0"  Round Culvert
                                   L= 140.0'   CPP, projecting, no headwall,  Ke= 0.900
                                   Inlet / Outlet Invert= 565.64' / 565.65'   S= -0.0001 '/'   Cc= 0.900
                                   n= 0.013  Corrugated PE, smooth interior,  Flow Area= 4.91 sf

Primary OutFlow Max=9.58 cfs @ 13.73 hrs  HW=567.59'  TW=566.86'   (Dynamic Tailwater)
  └─1=Culvert  (Barrel Controls 9.58 cfs @ 3.34 fps)

Secondary OutFlow Max=9.57 cfs @ 13.73 hrs  HW=567.59'  TW=566.86'   (Dynamic Tailwater)
  └─2=Culvert  (Barrel Controls 9.57 cfs @ 3.21 fps)
```

Pond 33C: twin 30" culverts



Summary for Pond 34C: twin 36" culverts

```
Inflow Area =      0.640 ac,  42.19% Impervious,  Inflow Depth =   0.90"    for  1-yr storm event
Inflow      =     0.99 cfs @   11.97 hrs,  Volume=           0.048 af
Outflow     =     0.99 cfs @   11.97 hrs,  Volume=           0.048 af,  Atten= 0%,  Lag= 0.0 min
Primary     =     0.50 cfs @   11.97 hrs,  Volume=           0.024 af
Secondary   =     0.50 cfs @   11.97 hrs,  Volume=           0.024 af
```

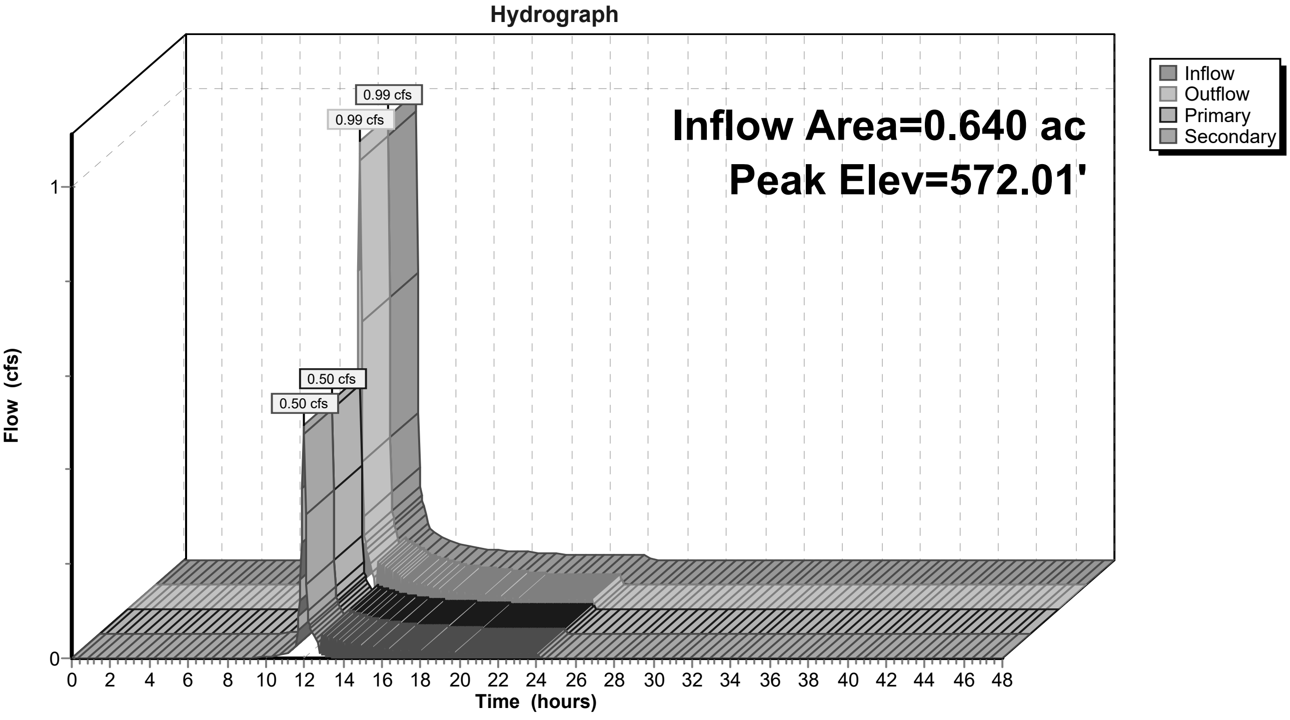
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 572.01' @ 13.70 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	567.07'	**36.0" Round Culvert** L= 91.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 567.07' / 566.90' S= 0.0019 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#2	Secondary	567.17'	**36.0" Round Culvert** L= 91.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 567.17' / 566.89' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=0.48 cfs @ 11.97 hrs HW=571.36' TW=571.36' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.48 cfs @ 0.07 fps)

Secondary OutFlow Max=0.48 cfs @ 11.97 hrs HW=571.36' TW=571.36' (Dynamic Tailwater)
↑**2=Culvert** (Inlet Controls 0.48 cfs @ 0.07 fps)

Pond 34C: twin 36" culverts



Summary for Pond 41C-1: twin 36" culverts

```
Inflow Area =      164.570 ac,   5.88% Impervious,  Inflow Depth >   0.49"    for  1-yr storm event
Inflow      =       19.48 cfs @   13.76 hrs,  Volume=           6.738 af
Outflow     =       19.48 cfs @   13.76 hrs,  Volume=           6.738 af,  Atten= 0%,  Lag= 0.0 min
Primary     =       10.01 cfs @   13.76 hrs,  Volume=           3.644 af
Secondary =          9.47 cfs @   13.76 hrs,  Volume=           3.094 af
```

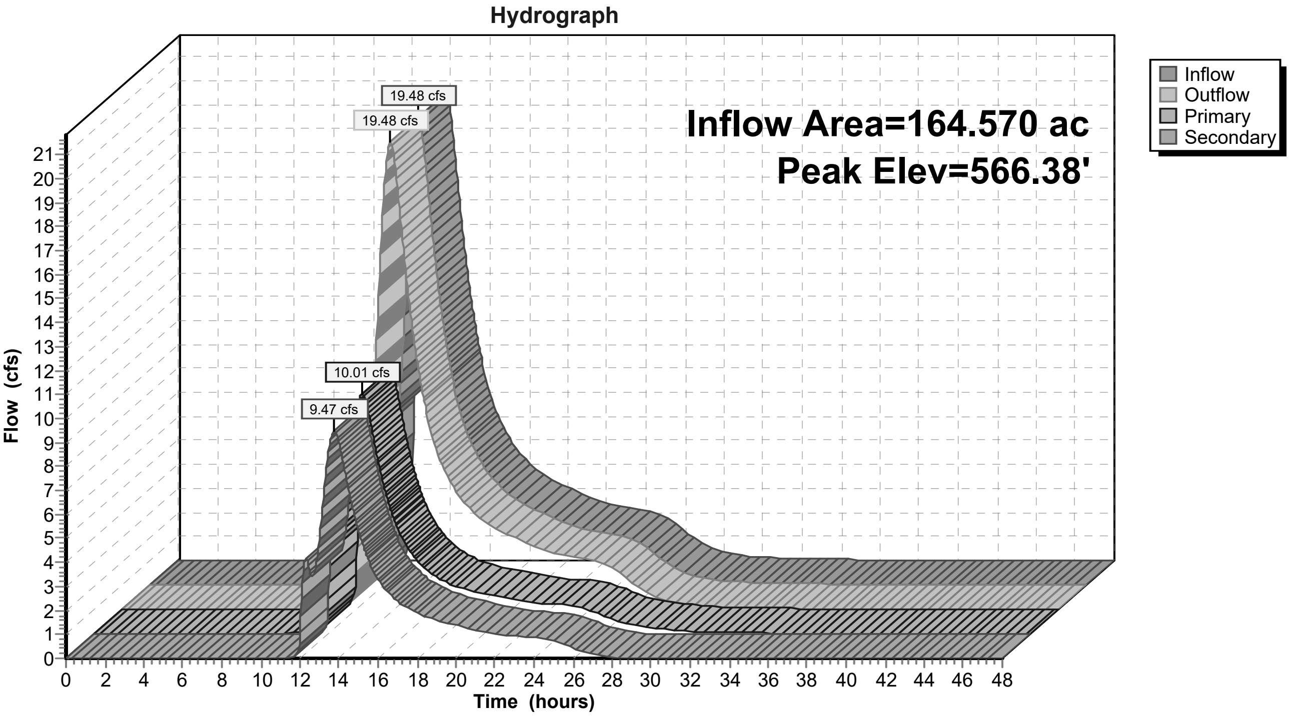
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 566.38' @ 13.76 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.66'	**36.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.58' / 564.66' S= -0.0027 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	564.87'	**36.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.63' / 564.87' S= -0.0080 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=10.00 cfs @ 13.76 hrs HW=566.38' TW=565.83' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 10.00 cfs @ 3.23 fps)

Secondary OutFlow Max=9.47 cfs @ 13.76 hrs HW=566.38' TW=565.83' (Dynamic Tailwater)
↑—**2=Culvert** (Barrel Controls 9.47 cfs @ 3.17 fps)

Pond 41C-1: twin 36" culverts



Summary for Pond 41C-2: twin 36" culverts

```
Inflow Area =      166.700 ac,   6.05% Impervious,  Inflow Depth >   0.49"    for  1-yr storm event
Inflow       =      19.59 cfs @   13.77 hrs,  Volume=           6.859 af
Outflow      =      19.59 cfs @   13.77 hrs,  Volume=           6.859 af,  Atten= 0%,  Lag= 0.0 min
Primary      =       9.79 cfs @   13.77 hrs,  Volume=           3.429 af
Secondary =          9.79 cfs @   13.77 hrs,  Volume=           3.429 af
```

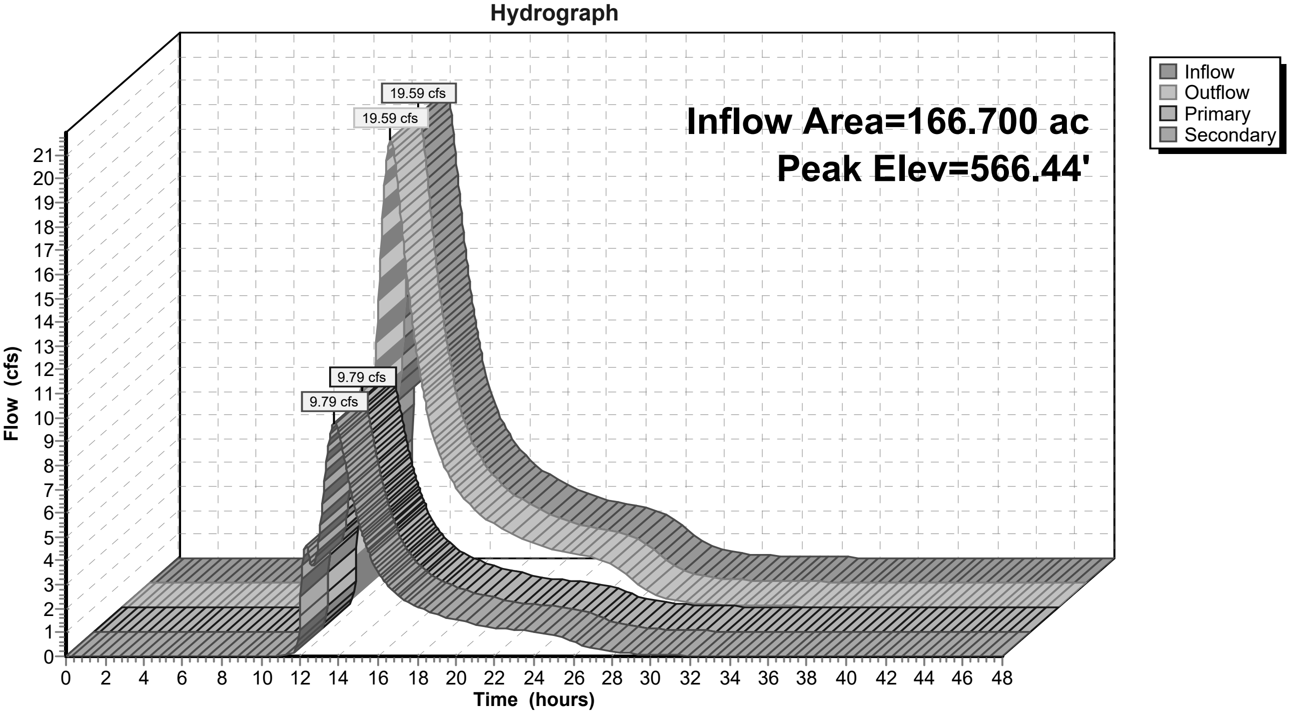
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 566.44' @ 13.76 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.53'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.53' / 564.47' S= 0.0010 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	564.53'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.53' / 564.47' S= 0.0010 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=9.79 cfs @ 13.77 hrs HW=566.44' TW=565.96' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 9.79 cfs @ 2.94 fps)

Secondary OutFlow Max=9.79 cfs @ 13.77 hrs HW=566.44' TW=565.96' (Dynamic Tailwater)
↑—**2=Culvert** (Outlet Controls 9.79 cfs @ 2.94 fps)

Pond 41C-2: twin 36" culverts



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 4
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Runoff Area=48.750 ac 4.88% Impervious Runoff Depth=1.43"
Flow Length=1,342' Tc=30.1 min CN=83 Runoff=59.66 cfs 5.811 af

Subcatchment20: Runoff Area=124.090 ac 3.19% Impervious Runoff Depth=1.30"
Flow Length=1,668' Tc=99.0 min CN=81 Runoff=57.07 cfs 13.424 af

Subcatchment21: Runoff Area=3.440 ac 0.00% Impervious Runoff Depth=1.43"
Flow Length=289' Tc=19.4 min CN=83 Runoff=5.52 cfs 0.410 af

Subcatchment22: Runoff Area=15.010 ac 0.00% Impervious Runoff Depth=1.24"
Flow Length=1,231' Slope=0.0050 '/' Tc=59.0 min CN=80 Runoff=9.68 cfs 1.545 af

Subcatchment30: Runoff Area=0.640 ac 12.50% Impervious Runoff Depth=1.57"
Flow Length=258' Slope=0.0400 '/' Tc=11.0 min CN=85 Runoff=1.47 cfs 0.084 af

Subcatchment31: Runoff Area=0.740 ac 24.32% Impervious Runoff Depth=1.65"
Flow Length=261' Tc=12.1 min CN=86 Runoff=1.72 cfs 0.101 af

Subcatchment32: Runoff Area=3.290 ac 53.19% Impervious Runoff Depth=2.05"
Flow Length=626' Tc=30.2 min CN=91 Runoff=5.78 cfs 0.563 af

Subcatchment33: Runoff Area=16.720 ac 20.57% Impervious Runoff Depth=1.72"
Flow Length=33' Slope=0.1400 '/' Tc=6.0 min CN=87 Runoff=49.11 cfs 2.399 af

Subcatchment34: Runoff Area=0.640 ac 42.19% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=90 Runoff=2.11 cfs 0.105 af

Subcatchment40: Runoff Area=89.180 ac 0.25% Impervious Runoff Depth=1.30"
Flow Length=2,815' Tc=125.8 min CN=81 Runoff=34.39 cfs 9.647 af

Subcatchment41: Runoff Area=2.130 ac 18.78% Impervious Runoff Depth=1.65"
Flow Length=267' Tc=13.0 min CN=86 Runoff=4.81 cfs 0.292 af

Reach 10R: collector creek Avg. Flow Depth=1.75' Max Vel=2.52 fps Inflow=59.66 cfs 5.811 af
n=0.030 L=500.0' S=0.0020 '/' Capacity=75.99 cfs Outflow=58.51 cfs 5.811 af

Reach 20R-1: feeder creek Avg. Flow Depth=1.47' Max Vel=2.97 fps Inflow=57.07 cfs 13.424 af
n=0.030 L=3,004.0' S=0.0033 '/' Capacity=98.03 cfs Outflow=54.34 cfs 13.424 af

Reach 20R-2: feeder creek Avg. Flow Depth=1.53' Max Vel=3.02 fps Inflow=58.21 cfs 14.968 af
n=0.030 L=245.0' S=0.0033 '/' Capacity=97.70 cfs Outflow=58.19 cfs 14.968 af

Reach 22R: property line ditch Avg. Flow Depth=1.19' Max Vel=4.23 fps Inflow=58.46 cfs 14.968 af
n=0.030 L=1,402.0' S=0.0086 '/' Capacity=157.20 cfs Outflow=58.21 cfs 14.968 af

Reach 30R: Long Road ditch Avg. Flow Depth=4.08' Max Vel=0.90 fps Inflow=62.60 cfs 18.219 af
n=0.030 L=68.0' S=0.0001 '/' Capacity=20.60 cfs Outflow=62.59 cfs 18.219 af

Reach 31R: Long Road ditch Avg. Flow Depth=2.04' Max Vel=2.17 fps Inflow=62.44 cfs 18.034 af
n=0.030 L=64.0' S=0.0013 '/' Capacity=60.07 cfs Outflow=62.43 cfs 18.034 af

Reach 32R: Long Road ditch Avg. Flow Depth=2.25' Max Vel=1.87 fps Inflow=61.86 cfs 17.471 af
n=0.030 L=47.0' S=0.0009 '/' Capacity=49.57 cfs Outflow=61.86 cfs 17.471 af

Reach 33R-1: I-190 ditch Avg. Flow Depth=0.85' Max Vel=2.28 fps Inflow=49.11 cfs 2.399 af
n=0.030 L=3,824.0' S=0.0036 '/' Capacity=102.11 cfs Outflow=20.45 cfs 2.399 af

Reach 33R-2: I-190 ditch Avg. Flow Depth=1.55' Max Vel=3.16 fps Inflow=61.89 cfs 17.367 af
n=0.030 L=509.0' S=0.0036 '/' Capacity=101.88 cfs Outflow=61.84 cfs 17.367 af

Reach 33R-3: Long Road ditch Avg. Flow Depth=1.55' Max Vel=3.16 fps Inflow=61.85 cfs 17.471 af
n=0.030 L=509.0' S=0.0036 '/' Capacity=101.88 cfs Outflow=61.86 cfs 17.471 af

Reach 40R: Long Road ditch Avg. Flow Depth=2.84' Max Vel=2.18 fps Inflow=97.22 cfs 28.158 af
n=0.030 L=81.0' S=0.0010 '/' Capacity=53.40 cfs Outflow=97.19 cfs 28.158 af

Reach 41R-1: Long Road ditch Avg. Flow Depth=1.46' Max Vel=3.47 fps Inflow=62.59 cfs 18.219 af
n=0.030 L=63.0' S=0.0046 '/' Capacity=115.28 cfs Outflow=62.59 cfs 18.219 af

Reach 41R-2: Long Road ditch Avg. Flow Depth=2.16' Max Vel=2.02 fps Inflow=62.85 cfs 18.511 af
n=0.030 L=127.0' S=0.0010 '/' Capacity=54.36 cfs Outflow=62.84 cfs 18.511 af

Reach DP-1: collector creek north of Bedell Road Inflow=58.51 cfs 5.811 af
Outflow=58.51 cfs 5.811 af

Reach DP-2: feeder creek on property portion Inflow=58.21 cfs 14.968 af
Outflow=58.21 cfs 14.968 af

Reach DP-3: entrance to twin 36" culverts on adjancent property Inflow=62.59 cfs 18.219 af
Outflow=62.59 cfs 18.219 af

Reach DP-4: entrance to headwall Inflow=97.19 cfs 28.158 af
Outflow=97.19 cfs 28.158 af

Pond 21P: pond Peak Elev=586.56' Storage=17,863 cf Inflow=5.52 cfs 0.410 af
Outflow=0.00 cfs 0.000 af

Pond 30C: twin 36" culverts Peak Elev=568.70' Inflow=62.59 cfs 18.219 af
Primary=30.66 cfs 11.852 af Secondary=31.93 cfs 6.367 af Outflow=62.59 cfs 18.219 af

Pond 31C: twin 36" culverts Peak Elev=570.89' Inflow=62.53 cfs 18.135 af
Primary=31.26 cfs 8.927 af Secondary=31.26 cfs 9.208 af Outflow=62.53 cfs 18.135 af

Pond 32C: twin 36" culverts Peak Elev=568.58' Inflow=62.44 cfs 18.034 af
Primary=30.94 cfs 9.078 af Secondary=31.50 cfs 8.956 af Outflow=62.44 cfs 18.034 af

Pond 33C: twin 30" culverts Peak Elev=570.64' Inflow=61.86 cfs 17.471 af
Primary=30.93 cfs 8.710 af Secondary=30.93 cfs 8.762 af Outflow=61.86 cfs 17.471 af

```
Pond 34C: twin 36" culverts                               Peak Elev=572.73'   Inflow=2.11 cfs  0.105 af
                      Primary=1.06 cfs  0.052 af   Secondary=1.06 cfs  0.052 af   Outflow=2.12 cfs  0.105 af

Pond 41C-1: twin 36" culverts                            Peak Elev=568.18'   Inflow=62.59 cfs  18.219 af
                   Primary=31.29 cfs  9.446 af   Secondary=31.29 cfs  8.773 af   Outflow=62.59 cfs  18.219 af

Pond 41C-2: twin 36" culverts                            Peak Elev=568.67'   Inflow=62.84 cfs  18.511 af
                   Primary=31.42 cfs  9.256 af   Secondary=31.42 cfs  9.256 af   Outflow=62.84 cfs  18.511 af

         Total Runoff Area = 304.630 ac   Runoff Volume = 34.381 af   Average Runoff Depth = 1.35"
                                   95.84% Pervious = 291.950 ac     4.16% Impervious = 12.680 ac
```

Summary for Subcatchment 10:

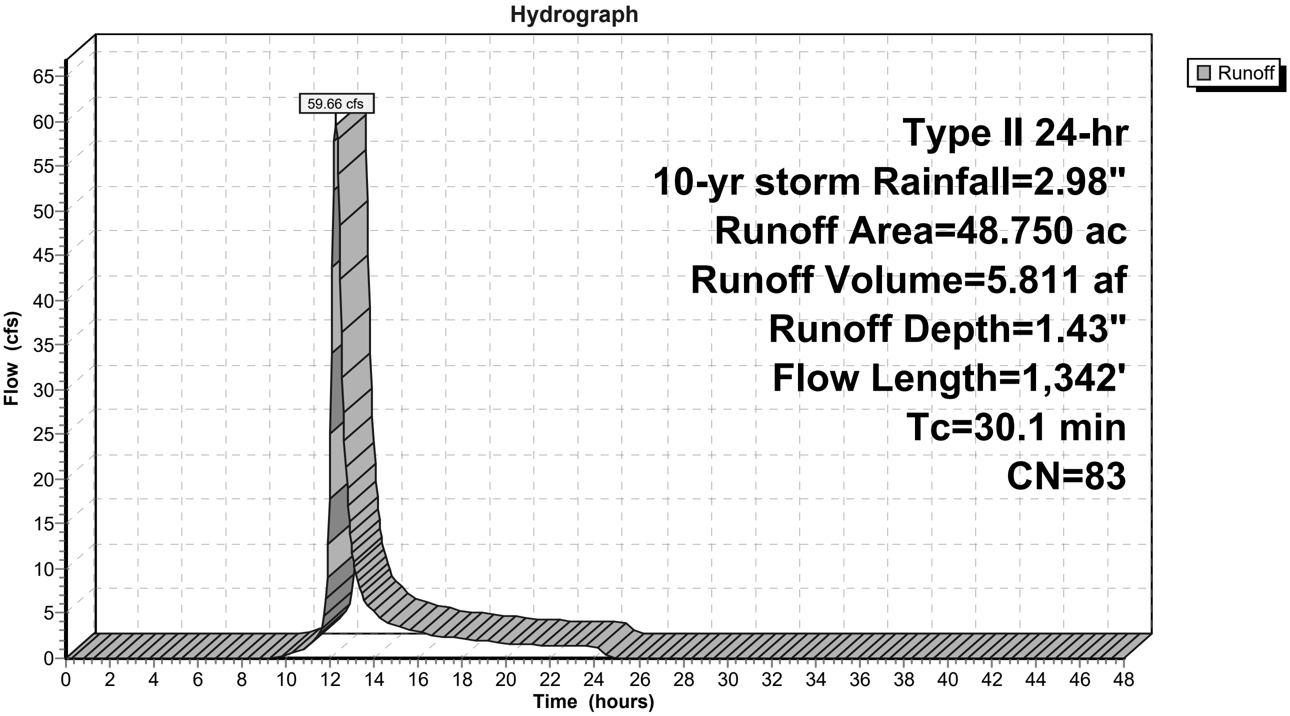
Runoff = 59.66 cfs @ 12.25 hrs, Volume= 5.811 af, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	2.040	84	50-75% Grass cover, Fair, HSG D
	20.060	79	Woods, Fair, HSG D
	0.120	98	Water Surface, 0% imp, HSG D
*	16.290	84	50-75% Grass cover, Fair, HSG D (offsite)
*	5.670	79	Woods, Fair, HSG D (offsite)
*	1.740	98	Paved parking, HSG D (offsite)
*	0.640	98	Roofs, HSG D (offsite)
*	0.620	91	Gravel roads, HSG D (offsite)
*	1.570	98	Water Surface, 0% imp, HSG D (offsite)
	48.750	83	Weighted Average
	46.370		95.12% Pervious Area
	2.380		4.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0170	0.13		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.1	87	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.7	84	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
7.1	266	0.0080	0.63		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
7.4	805	0.0020	1.81	21.76	**Channel Flow, E-F** Area= 12.0 sf Perim= 16.2' r= 0.74' n= 0.030 Earth, grassed & winding
30.1	1,342	Total			

Subcatchment 10:



Summary for Subcatchment 20:

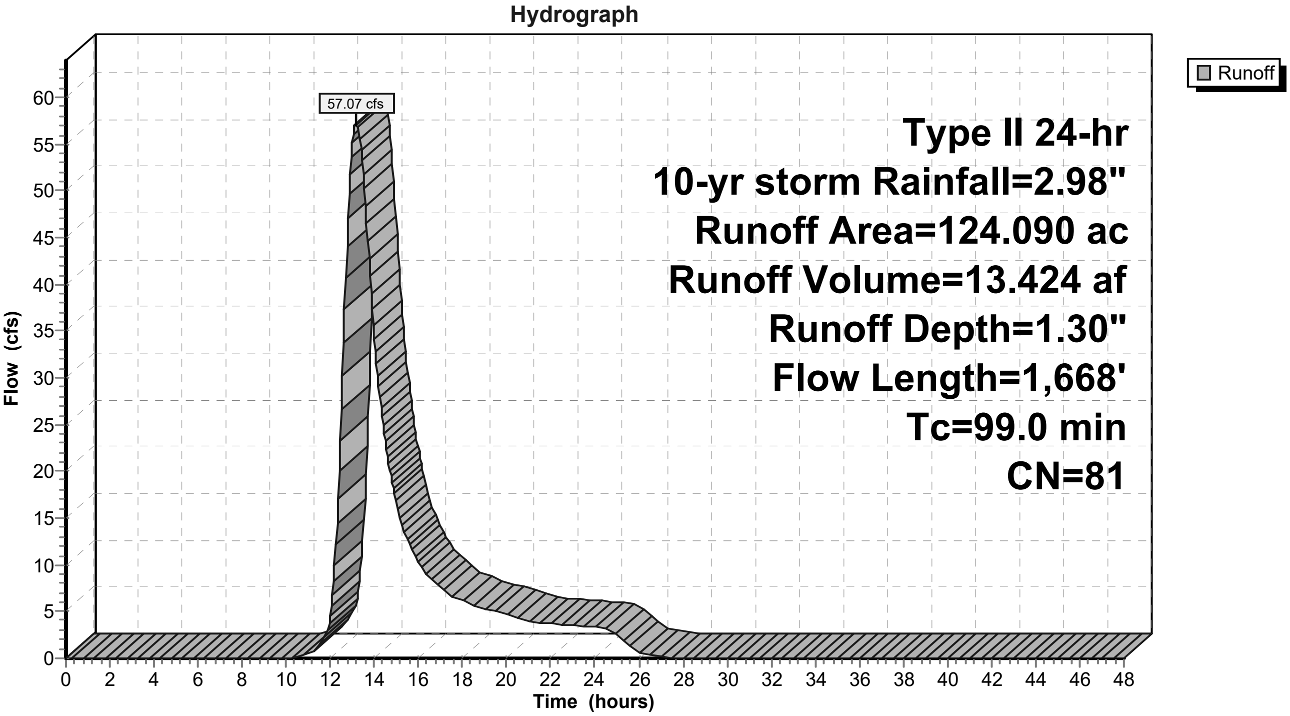
Runoff = 57.07 cfs @ 13.18 hrs, Volume= 13.424 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	8.910	84	50-75% Grass cover, Fair, HSG D
	65.560	79	Woods, Fair, HSG D
	0.120	98	Paved parking, HSG D
	0.030	98	Roofs, HSG D
	1.160	98	Water Surface, 0% imp, HSG D
*	8.770	84	50-75% Grass cover, Fair, HSG D (offsite)
*	33.440	79	Woods, Fair, HSG D (offsite)
*	1.770	98	Paved parking, HSG D (offsite)
*	2.040	98	Roofs, HSG D (offsite)
*	1.960	91	Gravel roads, HSG D (offsite)
*	0.330	98	Water Surface, 0% imp, HSG D (offsite)
	124.090	81	Weighted Average
	120.130		96.81% Pervious Area
	3.960		3.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.7	100	0.0100	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
49.7	1,055	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
14.2	447	0.0110	0.52		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.4	66	0.0040	2.63	28.93	**Channel Flow, D-E** Area= 11.0 sf Perim= 14.3' r= 0.77' n= 0.030 Earth, grassed & winding
99.0	1,668	Total			

Subcatchment 20:



Summary for Subcatchment 21:

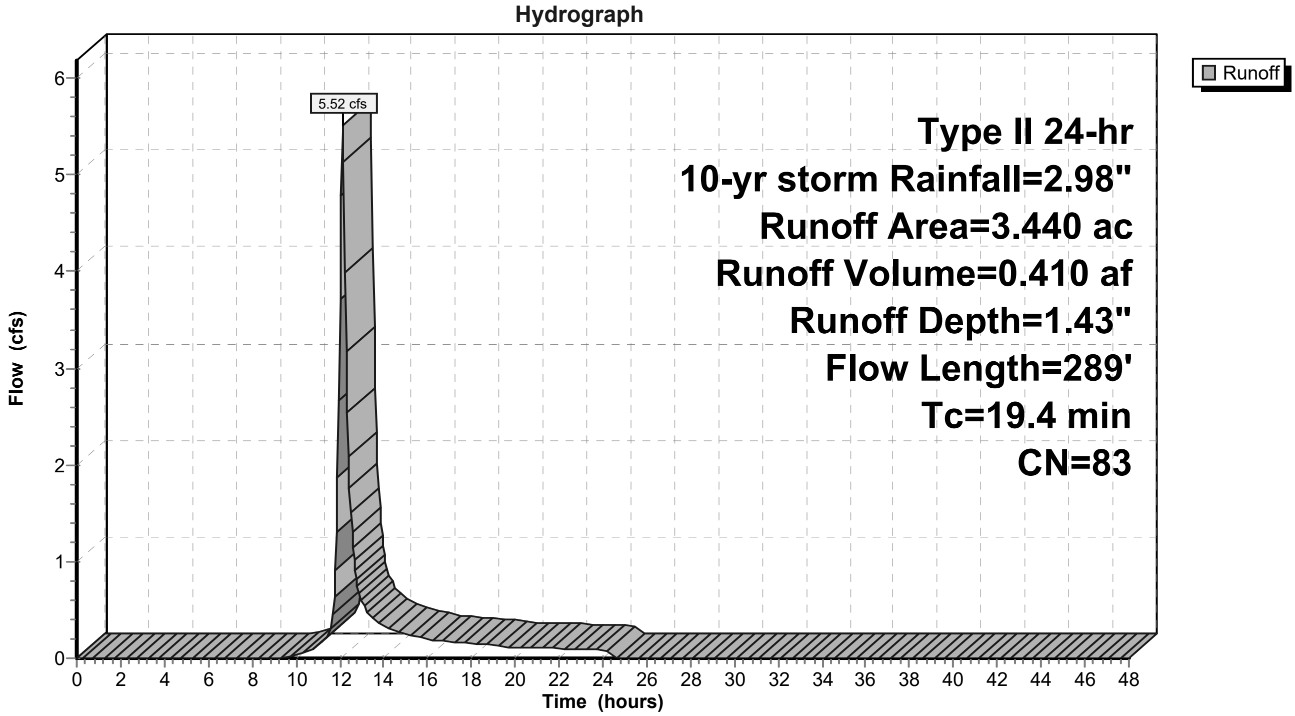
Runoff = 5.52 cfs @ 12.12 hrs, Volume= 0.410 af, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
2.920	84	50-75% Grass cover, Fair, HSG D
0.520	79	Woods, Fair, HSG D
3.440	83	Weighted Average
3.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.8	100	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
3.6	189	0.0160	0.89		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
19.4	289	Total			

Subcatchment 21:



Summary for Subcatchment 22:

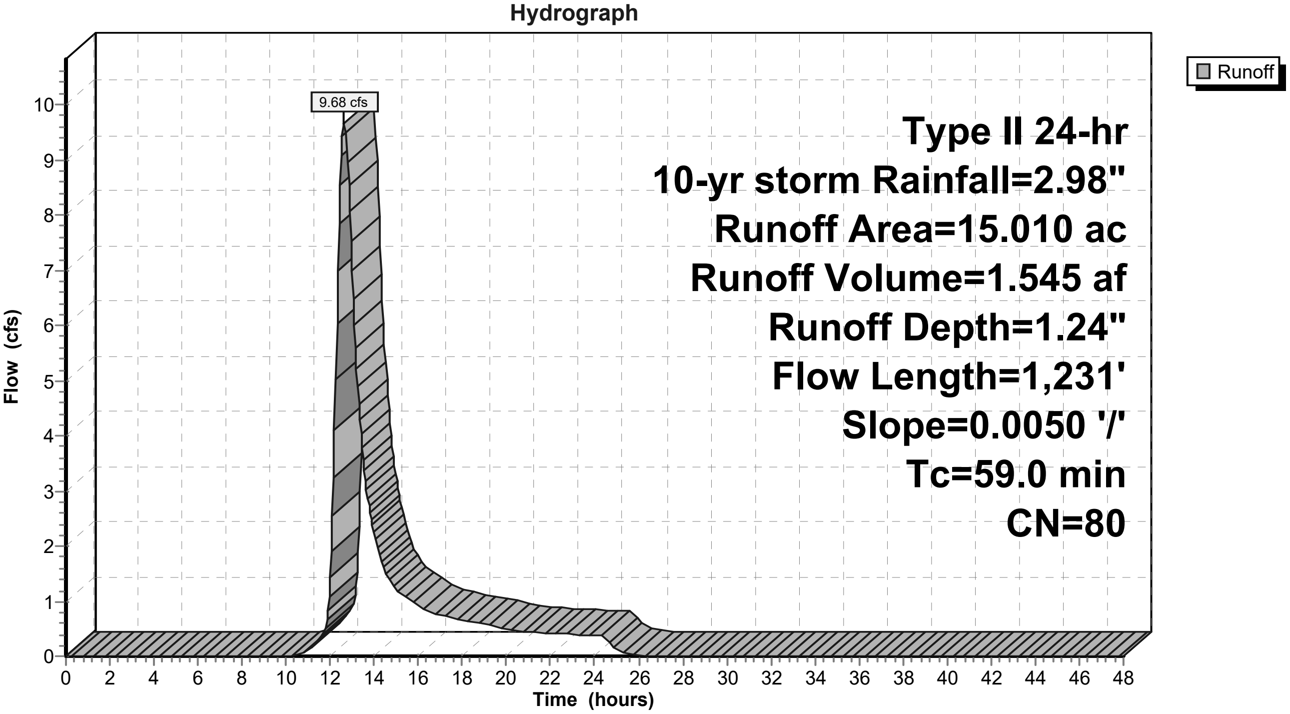
Runoff = 9.68 cfs @ 12.64 hrs, Volume= 1.545 af, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	0.200	84	50-75% Grass cover, Fair, HSG D
	13.400	79	Woods, Fair, HSG D
*	0.770	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.490	79	Woods, Fair, HSG D (offsite)
*	0.150	98	Water Surface, 0% imp, HSG D (offsite)
	15.010	80	Weighted Average
	15.010		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0050	0.08		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
38.1	1,131	0.0050	0.49		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
59.0	1,231	Total			

Subcatchment 22:



Summary for Subcatchment 30:

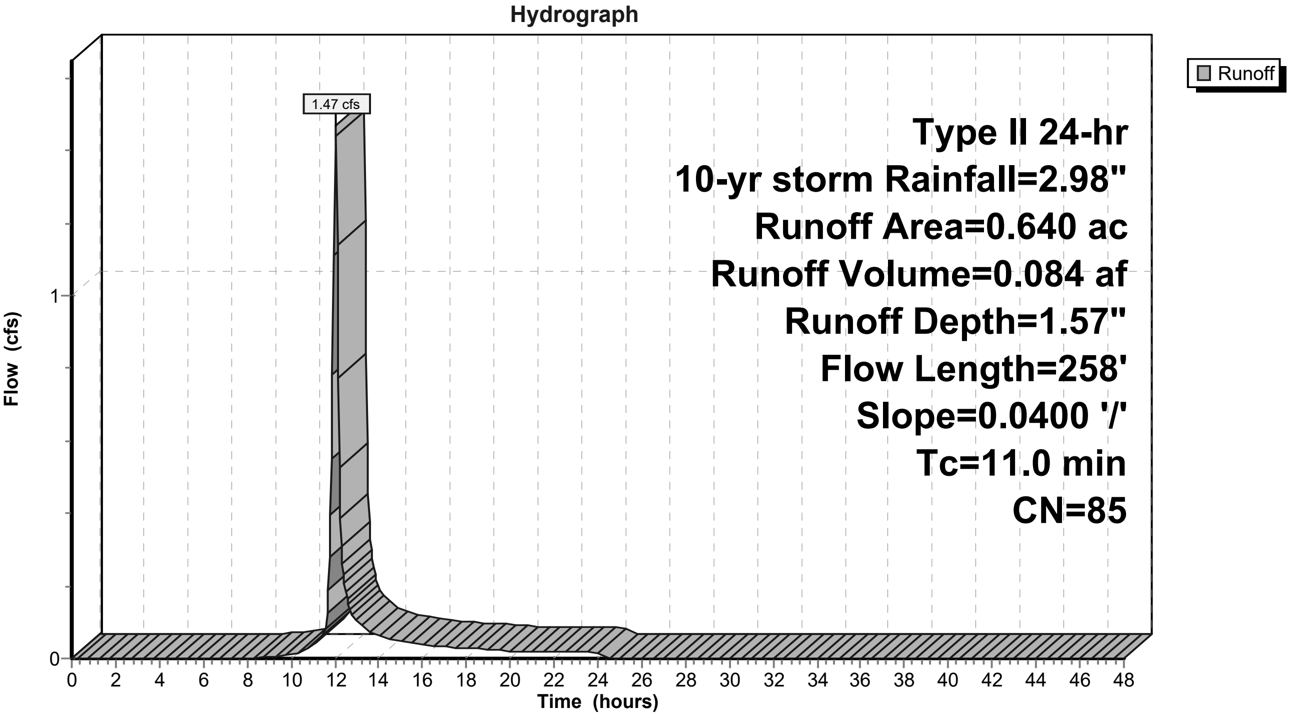
Runoff = 1.47 cfs @ 12.03 hrs, Volume= 0.084 af, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	0.230	84	50-75% Grass cover, Fair, HSG D
	0.050	98	Paved parking, HSG D
	0.200	79	Woods, Fair, HSG D
	0.010	98	Water Surface, 0% imp, HSG D
*	0.110	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.030	98	Paved parking, HSG D (offsite)
*	0.010	98	Water Surface, 0% imp, HSG D (offsite)
	0.640	85	Weighted Average
	0.560		87.50% Pervious Area
	0.080		12.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0400	0.18		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
1.9	158	0.0400	1.40		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
11.0	258	Total			

Subcatchment 30:



Summary for Subcatchment 31:

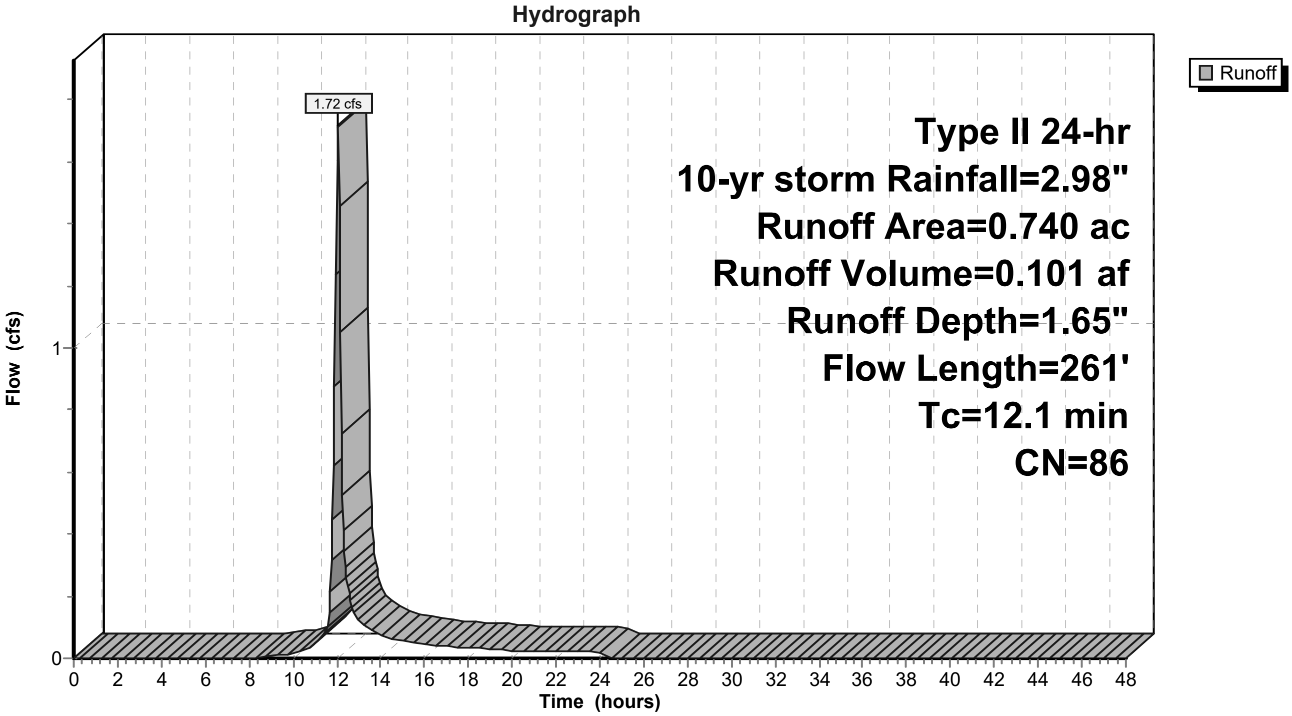
Runoff = 1.72 cfs @ 12.04 hrs, Volume= 0.101 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	0.210	84	50-75% Grass cover, Fair, HSG D
	0.020	98	Paved parking, HSG D
	0.010	79	Woods, Fair, HSG D
	0.010	98	Water Surface, 0% imp, HSG D
*	0.310	79	50-75% Grass cover, Fair, HSG C (offsite)
*	0.160	98	Paved parking, HSG D (offsite)
*	0.010	79	Woods, Fair, HSG D (offsite)
*	0.010	98	Water Surface, 0% imp, HSG D (offsite)
	0.740	86	Weighted Average
	0.560		75.68% Pervious Area
	0.180		24.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	100	0.0300	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
1.9	161	0.0400	1.40		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
12.1	261	Total			

Subcatchment 31:



Summary for Subcatchment 32:

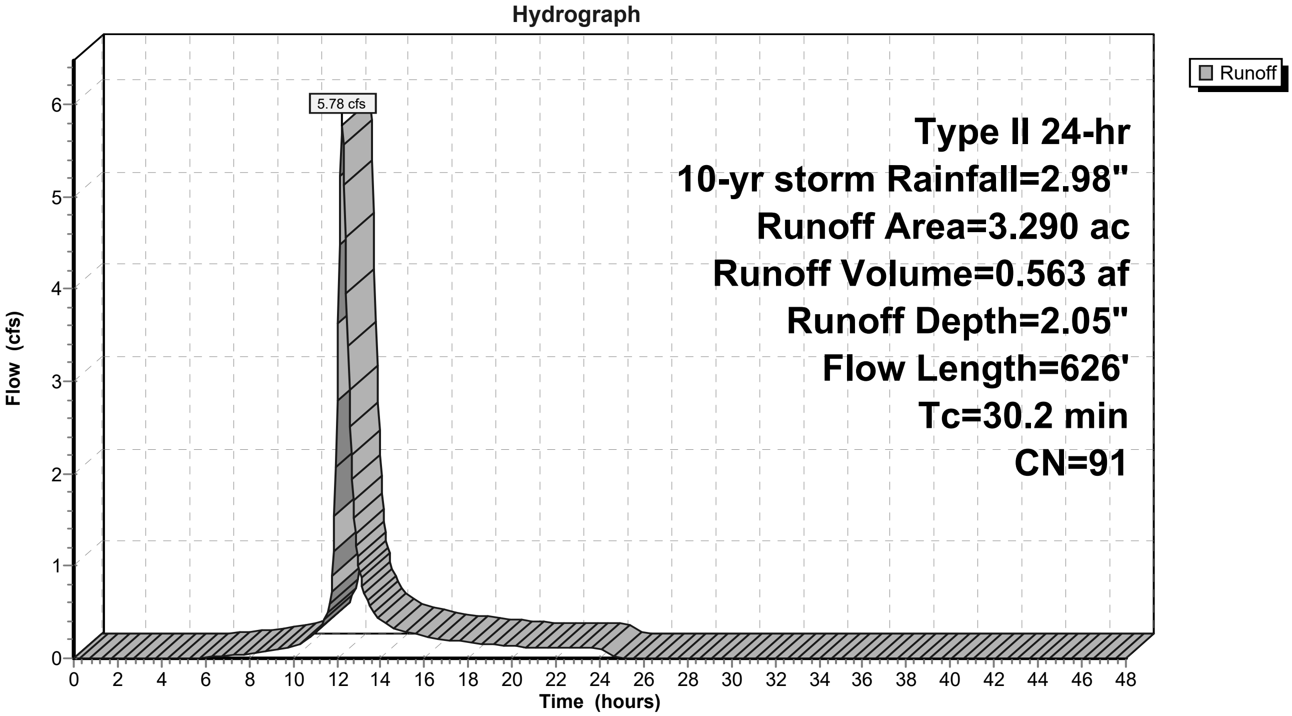
Runoff = 5.78 cfs @ 12.24 hrs, Volume= 0.563 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
1.530	84	50-75% Grass cover, Fair, HSG D
1.130	98	Water Surface, HSG D
0.620	98	Roofs, HSG D
0.010	98	Water Surface, 0% imp, HSG D
3.290	91	Weighted Average
1.540		46.81% Pervious Area
1.750		53.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	100	0.0300	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
16.6	171	0.0006	0.17		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
2.7	277	0.0070	1.70		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.7	78	0.0800	1.98		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
30.2	626	Total			

Subcatchment 32:



Summary for Subcatchment 33:

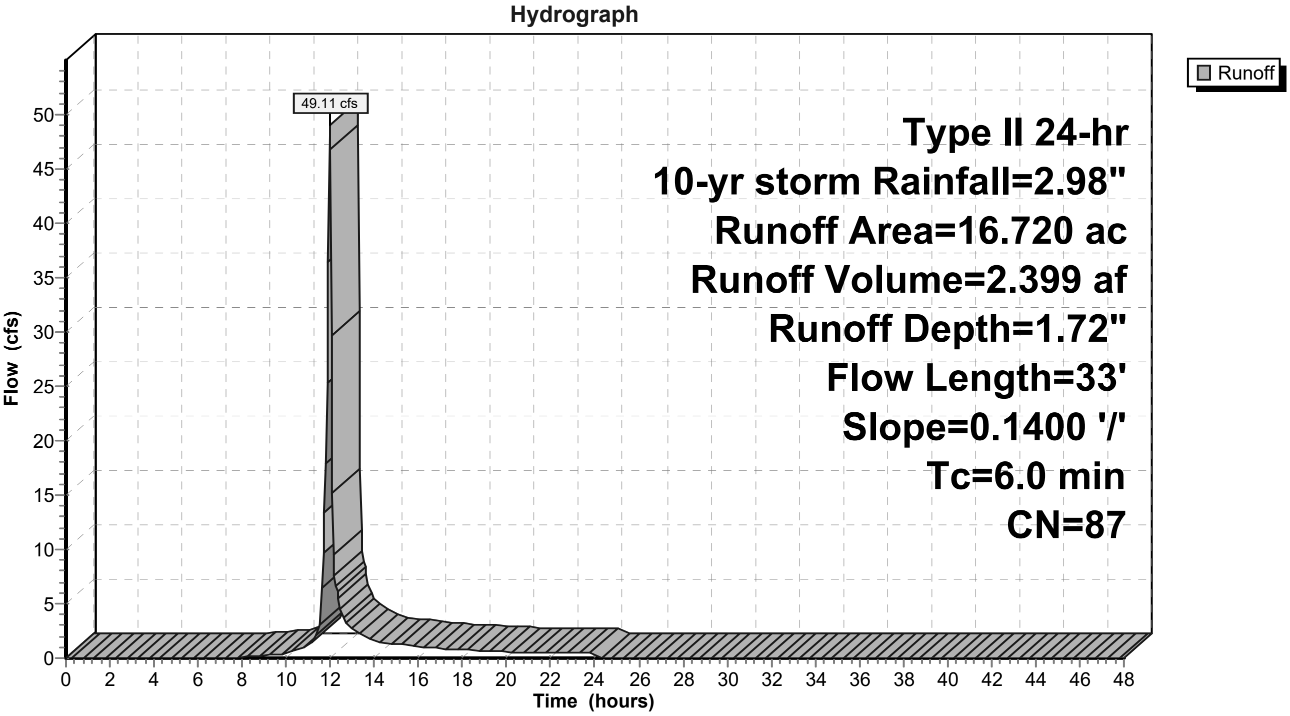
Runoff = 49.11 cfs @ 11.97 hrs, Volume= 2.399 af, Depth= 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	0.050	84	50-75% Grass cover, Fair, HSG D
	0.620	79	Woods, Fair, HSG D
*	11.780	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.350	79	Woods, Fair, HSG D (offsite)
*	2.850	98	Paved parking, HSG D (offsite)
*	0.590	98	Roofs, HSG D (offsite)
*	0.010	91	Gravel roads, HSG D (offiste)
*	0.470	98	Water Surface, 0% imp, HSG D (offsite)
	16.720	87	Weighted Average
	13.280		79.43% Pervious Area
	3.440		20.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	33	0.1400	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.3	33	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 33:



Summary for Subcatchment 34:

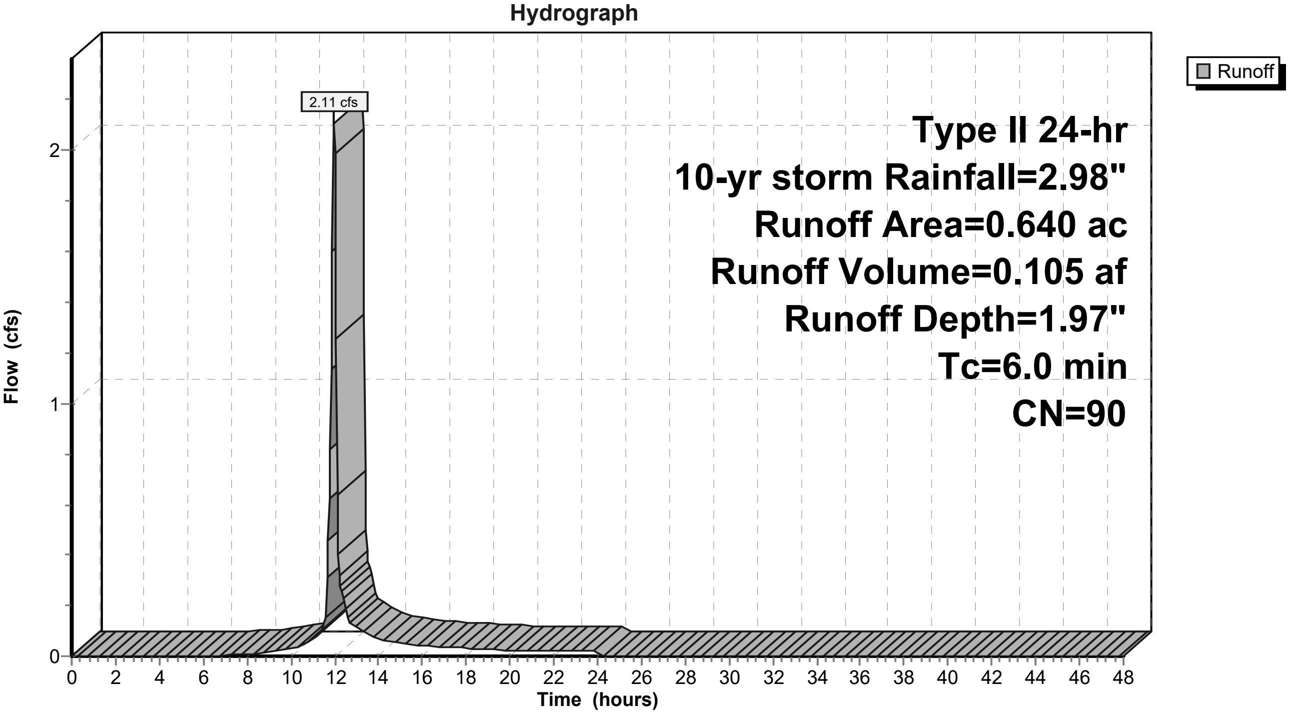
Runoff = 2.11 cfs @ 11.97 hrs, Volume= 0.105 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
*	0.350	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.270	98	Paved parking, HSG D (offsite)
*	0.020	98	Water Surface, 0% imp, HSG D (offsite)
	0.640	90	Weighted Average
	0.370		57.81% Pervious Area
	0.270		42.19% Impervious Area

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

Subcatchment 34:



Summary for Subcatchment 40:

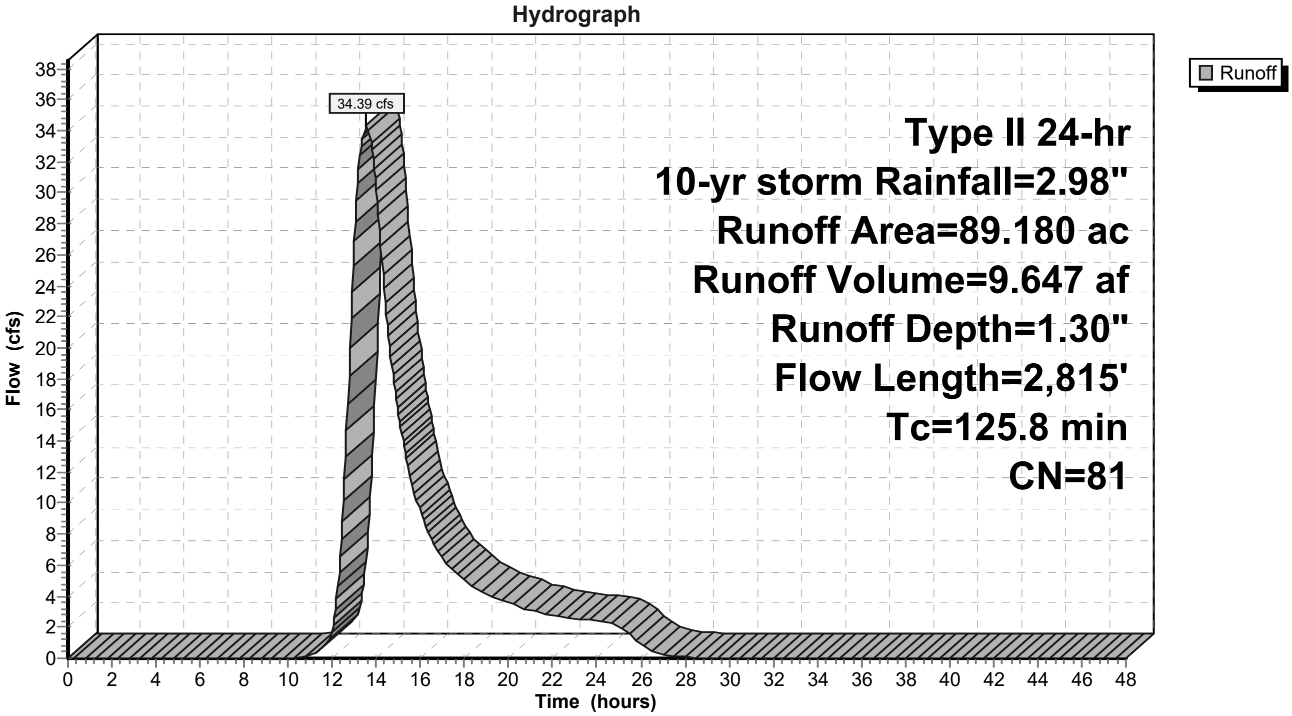
Runoff = 34.39 cfs @ 13.55 hrs, Volume= 9.647 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	2.710	79	50-75% Grass cover, Fair, HSG C
	0.240	73	Woods, Fair, HSG C
	18.540	84	50-75% Grass cover, Fair, HSG D
	43.330	79	Woods, Fair, HSG D
*	0.390	79	50-75% Grass cover, Fair, HSG C (offsite)
*	0.300	73	Woods, Fair, HSG C (offsite)
*	14.170	84	50-75% Grass cover, Fair, HSG D (offsite)
*	9.260	79	Woods, Fair, HSG D (offsite)
*	0.130	98	Paved parking, HSG D (offsite)
*	0.090	98	Roofs, HSG D (offsite)
*	0.020	98	Water Surface, 0% imp, HSG D (offsite)
	89.180	81	Weighted Average
	88.960		99.75% Pervious Area
	0.220		0.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.1	100	0.0070	0.04		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
72.2	1,370	0.0040	0.32		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	91	0.1500	2.71		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
10.1	378	0.0080	0.63		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
2.8	876	0.0160	5.26	57.86	**Channel Flow, E-F** Area= 11.0 sf Perim= 14.3' r= 0.77' n= 0.030 Earth, grassed & winding
125.8	2,815	Total			

Subcatchment 40:



Summary for Subcatchment 41:

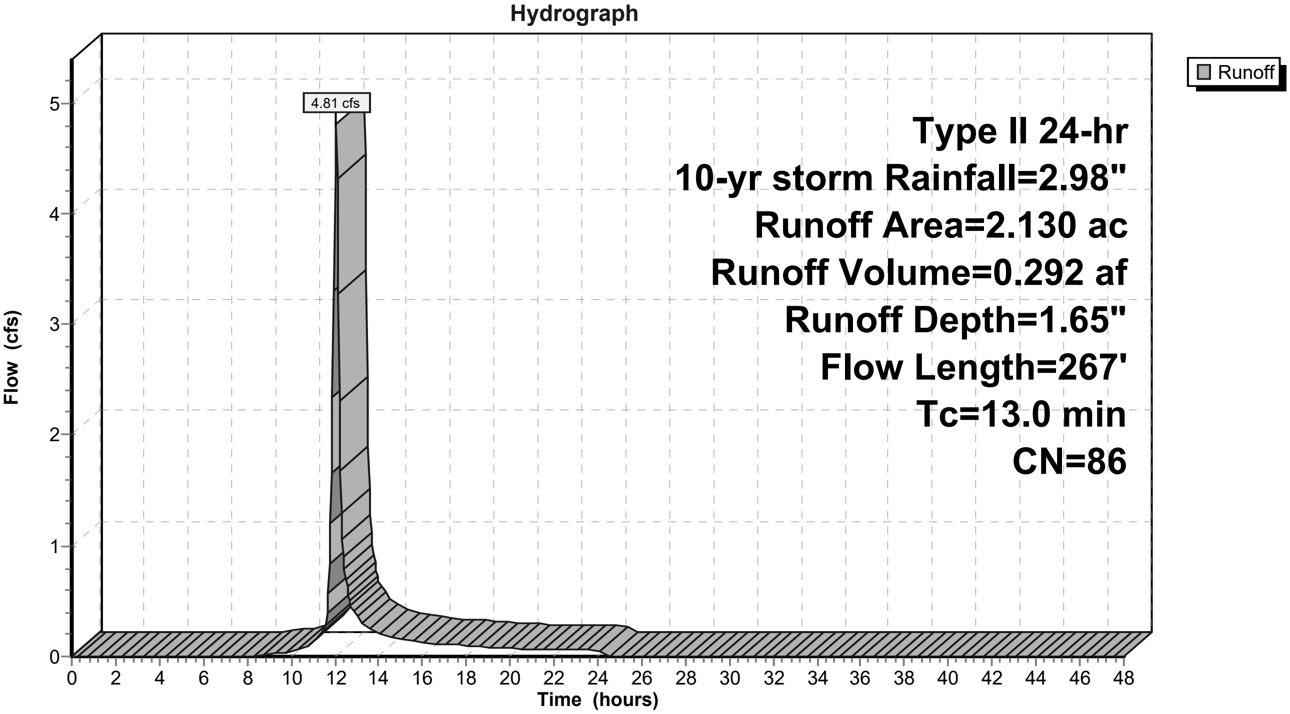
Runoff = 4.81 cfs @ 12.05 hrs, Volume= 0.292 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
*	1.430	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.210	98	Paved parking, HSG D (offsite)
*	0.190	98	Roofs, HSG D (offsite)
*	0.260	79	Woods, Fair, HSG D (offsite)
*	0.040	98	Water Surface, 0% imp, HSG D (offsite)
	2.130	86	Weighted Average
	1.730		81.22% Pervious Area
	0.400		18.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0270	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.3	167	0.0300	1.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
13.0	267	Total			

Subcatchment 41:



Summary for Reach 10R: collector creek

Inflow Area =	48.750 ac,	4.88% Impervious,	Inflow Depth = 1.43"	for 10-yr storm event	
Inflow =	59.66 cfs @	12.25 hrs,	Volume=	5.811 af	
Outflow =	58.51 cfs @	12.29 hrs,	Volume=	5.811 af,	Atten= 2%, Lag= 2.6 min

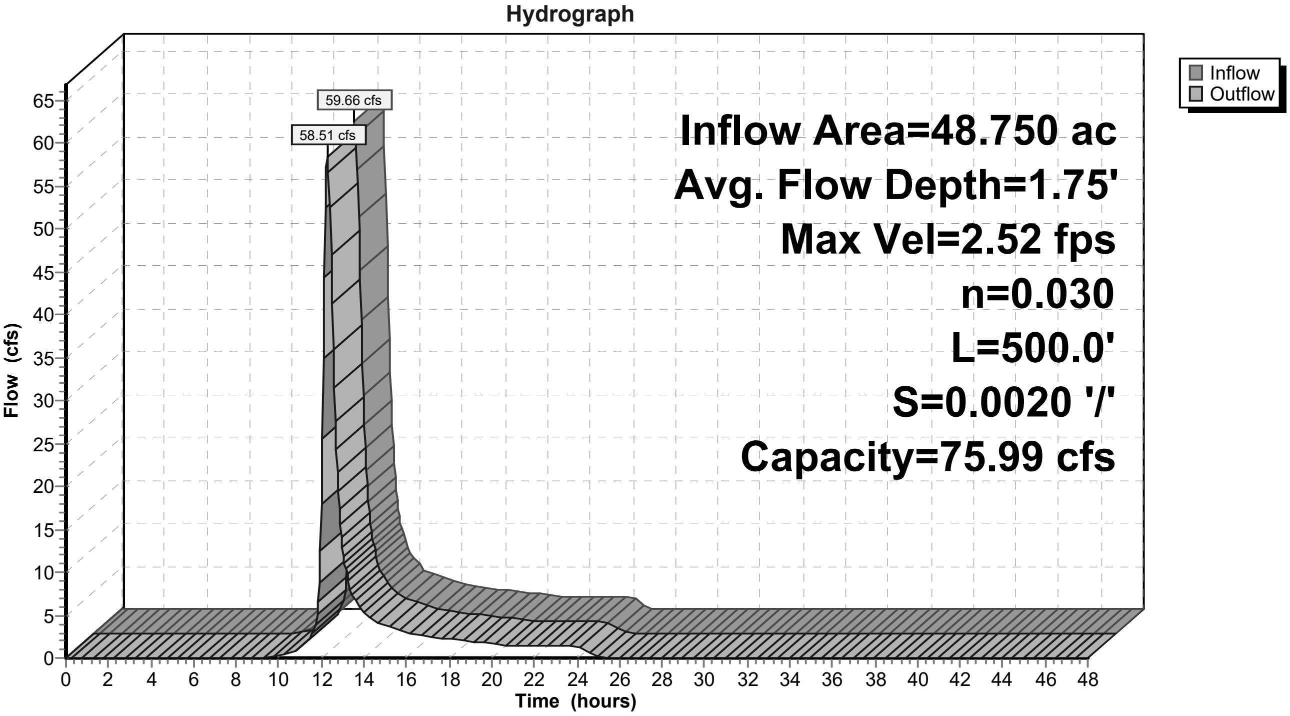
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.52 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 12.2 min

Peak Storage= 11,593 cf @ 12.29 hrs
Average Depth at Peak Storage= 1.75'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 75.99 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 500.0' Slope= 0.0020 '/'
Inlet Invert= 584.05', Outlet Invert= 583.05'

‡

Reach 10R: collector creek



Summary for Reach 20R-1: feeder creek

Inflow Area = 127.530 ac, 3.11% Impervious, Inflow Depth = 1.26" for 10-yr storm event
Inflow = 57.07 cfs @ 13.18 hrs, Volume= 13.424 af
Outflow = 54.34 cfs @ 13.40 hrs, Volume= 13.424 af, Atten= 5%, Lag= 13.7 min

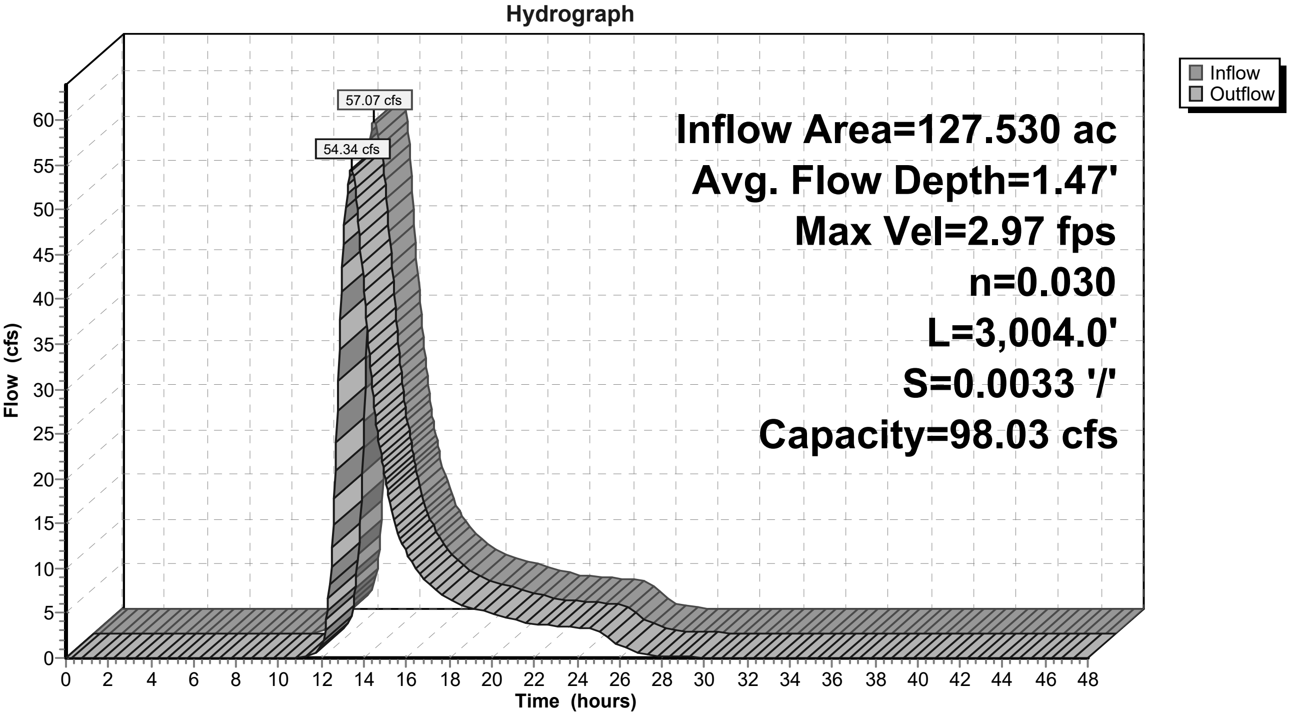
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.97 fps, Min. Travel Time= 16.9 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 65.0 min

Peak Storage= 55,030 cf @ 13.40 hrs
Average Depth at Peak Storage= 1.47'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 98.03 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 3,004.0' Slope= 0.0033 '/'
Inlet Invert= 582.00', Outlet Invert= 572.00'

‡

Reach 20R-1: feeder creek



Summary for Reach 20R-2: feeder creek

Inflow Area = 142.540 ac, 2.78% Impervious, Inflow Depth = 1.26" for 10-yr storm event
Inflow = 58.21 cfs @ 13.43 hrs, Volume= 14.968 af
Outflow = 58.19 cfs @ 13.44 hrs, Volume= 14.968 af, Atten= 0%, Lag= 1.0 min

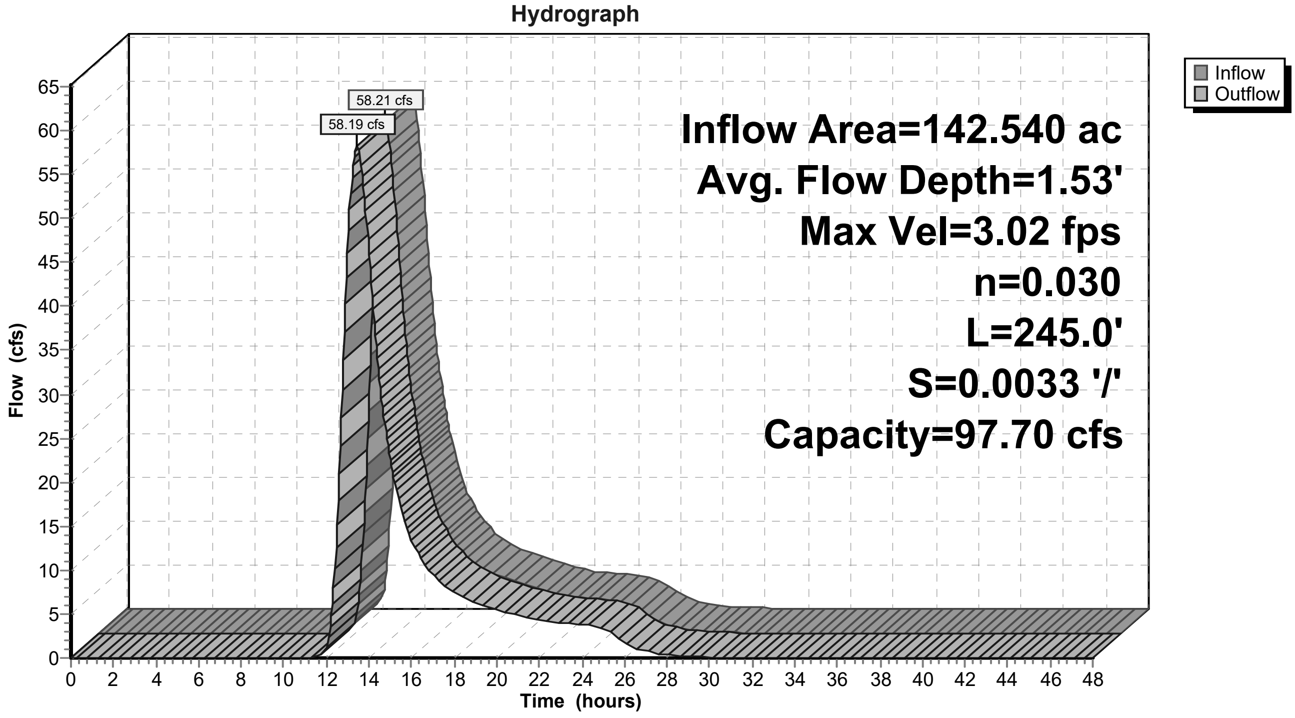
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 3.02 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 5.1 min

Peak Storage= 4,725 cf @ 13.44 hrs
Average Depth at Peak Storage= 1.53'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 97.70 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 245.0' Slope= 0.0033 '/'
Inlet Invert= 572.00', Outlet Invert= 571.19'

‡

Reach 20R-2: feeder creek



Summary for Reach 22R: property line ditch

```
Inflow Area =      142.540 ac,   2.78% Impervious,  Inflow Depth =   1.26"    for  10-yr storm event
Inflow      =       58.46 cfs @   13.36 hrs,  Volume=          14.968 af
Outflow     =       58.21 cfs @   13.43 hrs,  Volume=          14.968 af,  Atten= 0%,  Lag= 4.0 min
```

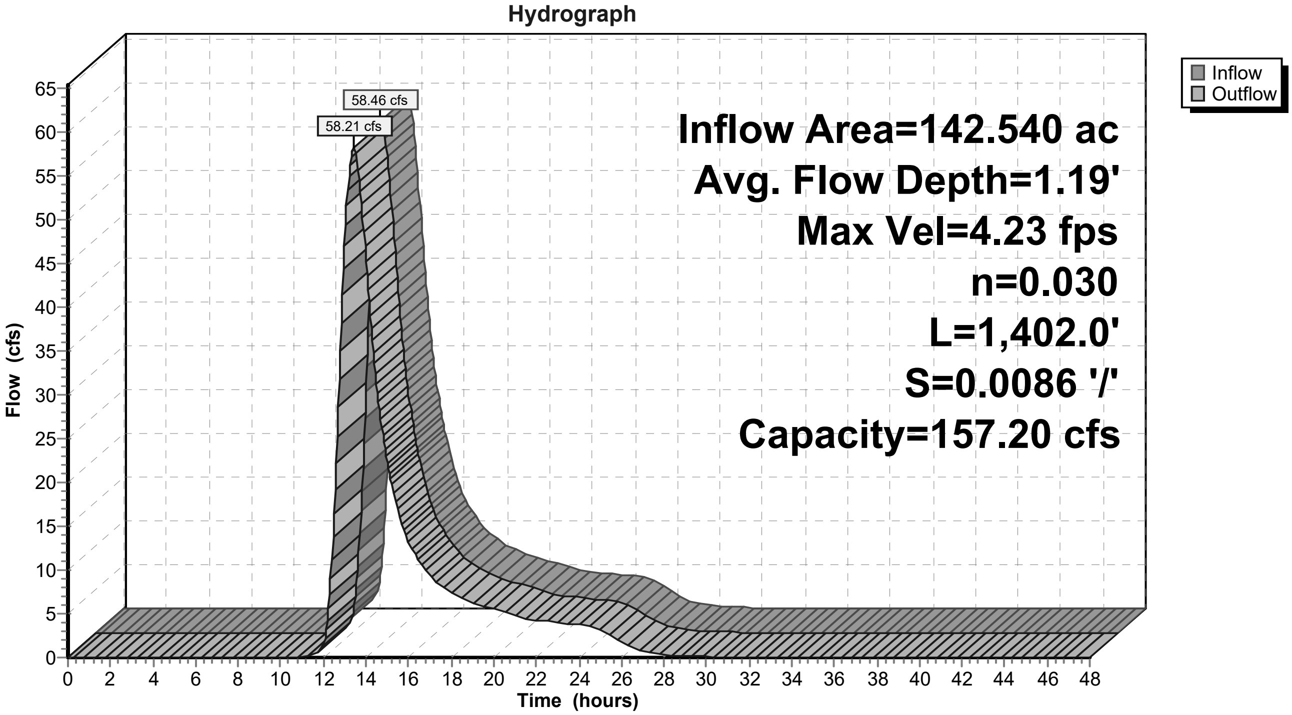
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 4.23 fps, Min. Travel Time= 5.5 min
Avg. Velocity = 1.12 fps, Avg. Travel Time= 20.8 min

Peak Storage= 19,296 cf @ 13.43 hrs
Average Depth at Peak Storage= 1.19'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 157.20 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 1,402.0' Slope= 0.0086 '/'
Inlet Invert= 584.00', Outlet Invert= 572.00'

‡

Reach 22R: property line ditch



Summary for Reach 30R: Long Road ditch

Inflow Area = 164.570 ac, 5.88% Impervious, Inflow Depth = 1.33" for 10-yr storm event
Inflow = 62.60 cfs @ 13.49 hrs, Volume= 18.219 af
Outflow = 62.59 cfs @ 13.51 hrs, Volume= 18.219 af, Atten= 0%, Lag= 1.1 min

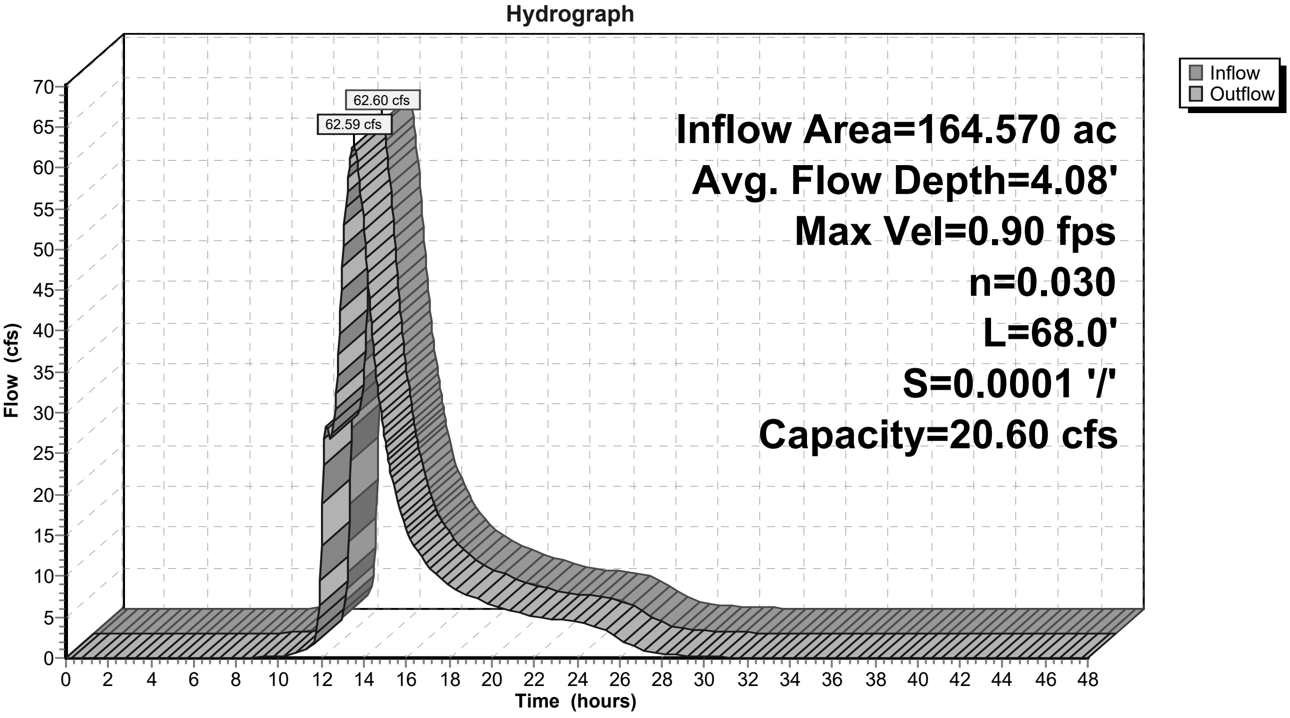
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 0.90 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.28 fps, Avg. Travel Time= 4.1 min

Peak Storage= 4,720 cf @ 13.51 hrs
Average Depth at Peak Storage= 4.08'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 20.60 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 68.0' Slope= 0.0001 '/'
Inlet Invert= 565.46', Outlet Invert= 565.45'

‡

Reach 30R: Long Road ditch



Summary for Reach 31R: Long Road ditch

Inflow Area = 163.190 ac, 5.77% Impervious, Inflow Depth = 1.33" for 10-yr storm event
Inflow = 62.44 cfs @ 13.48 hrs, Volume= 18.034 af
Outflow = 62.43 cfs @ 13.49 hrs, Volume= 18.034 af, Atten= 0%, Lag= 0.4 min

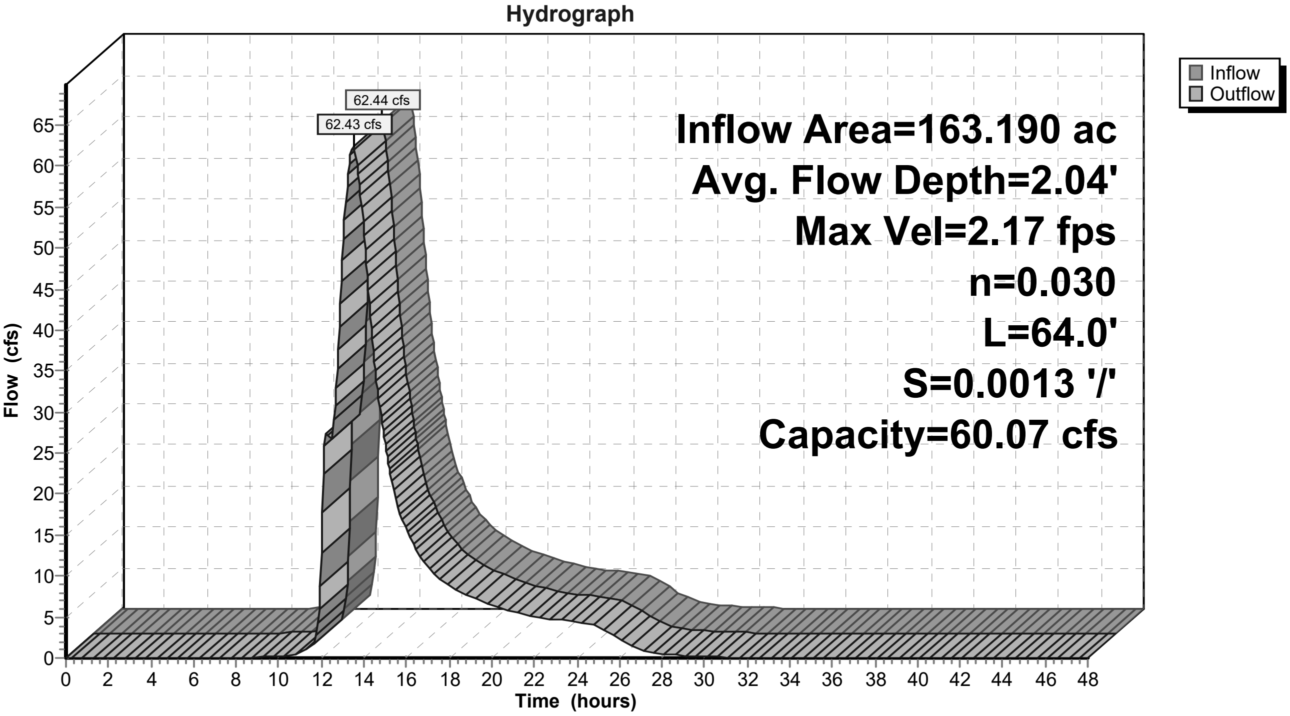
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.17 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 0.58 fps, Avg. Travel Time= 1.8 min

Peak Storage= 1,843 cf @ 13.49 hrs
Average Depth at Peak Storage= 2.04'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 60.07 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 64.0' Slope= 0.0013 '/'
Inlet Invert= 565.09', Outlet Invert= 565.01'

‡

Reach 31R: Long Road ditch



Summary for Reach 32R: Long Road ditch

```
Inflow Area =      159.900 ac,   4.80% Impervious,  Inflow Depth =   1.31"    for  10-yr storm event
Inflow      =        61.86 cfs @   13.48 hrs,  Volume=            17.471 af
Outflow     =        61.86 cfs @   13.49 hrs,  Volume=            17.471 af,  Atten= 0%,  Lag= 0.3 min
```

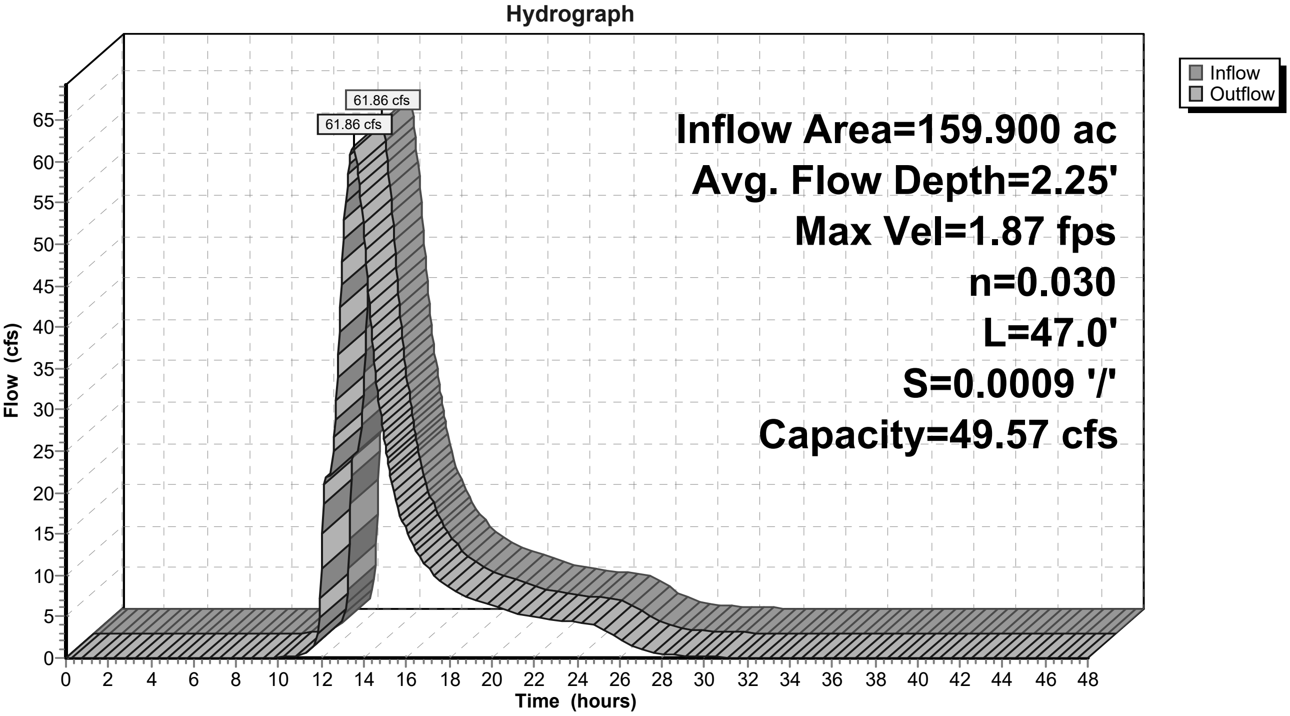
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.87 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.50 fps, Avg. Travel Time= 1.6 min

Peak Storage= 1,553 cf @ 13.49 hrs
Average Depth at Peak Storage= 2.25'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 49.57 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 47.0' Slope= 0.0009 '/'
Inlet Invert= 565.64', Outlet Invert= 565.60'

‡

Reach 32R: Long Road ditch



Summary for Reach 33R-1: I-190 ditch

```
Inflow Area =        16.720 ac,  20.57% Impervious,  Inflow Depth =   1.72"    for  10-yr storm event
Inflow      =       49.11 cfs @   11.97 hrs,  Volume=            2.399 af
Outflow     =       20.45 cfs @   12.09 hrs,  Volume=            2.399 af,  Atten= 58%,  Lag= 7.0 min
```

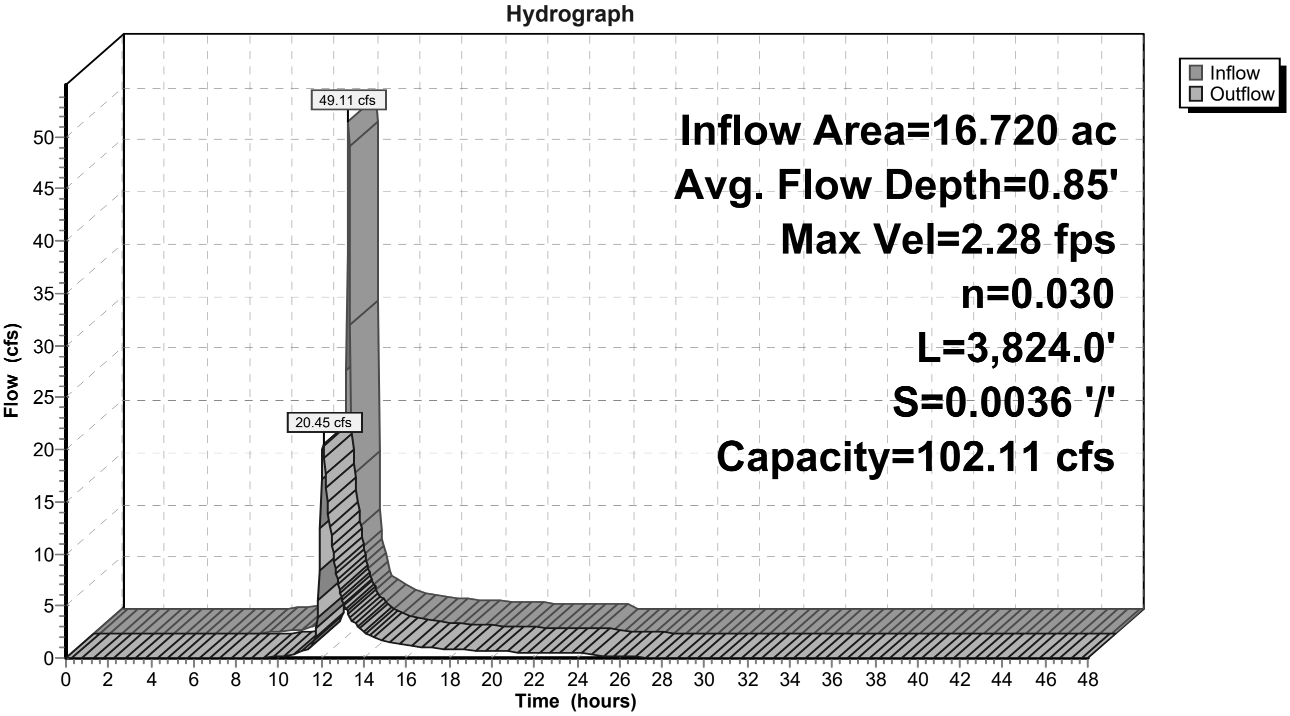
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.28 fps, Min. Travel Time= 28.0 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 137.3 min

Peak Storage= 34,291 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.85'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 102.11 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 3,824.0' Slope= 0.0036 '/'
Inlet Invert= 585.00', Outlet Invert= 571.19'

‡

Reach 33R-1: I-190 ditch



Summary for Reach 33R-2: I-190 ditch

Inflow Area = 159.260 ac, 4.65% Impervious, Inflow Depth = 1.31" for 10-yr storm event
Inflow = 61.89 cfs @ 13.42 hrs, Volume= 17.367 af
Outflow = 61.84 cfs @ 13.45 hrs, Volume= 17.367 af, Atten= 0%, Lag= 2.0 min

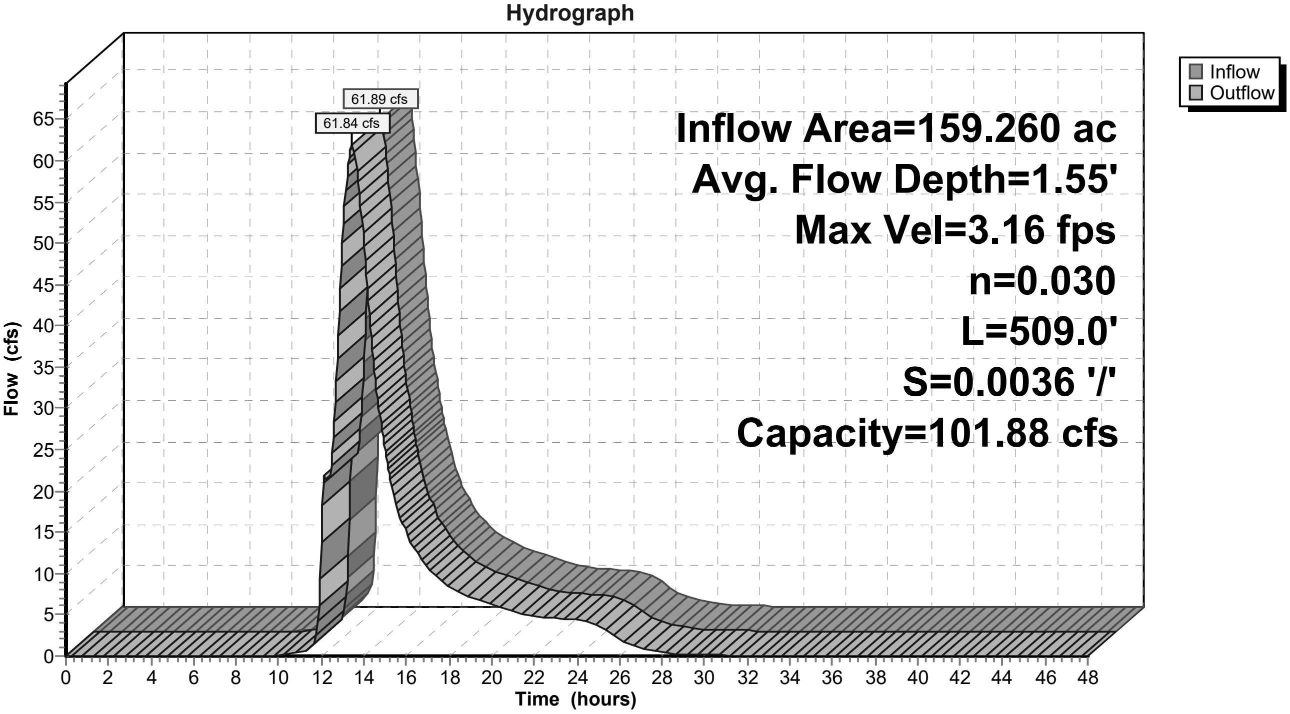
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 3.16 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 10.0 min

Peak Storage= 9,949 cf @ 13.45 hrs
Average Depth at Peak Storage= 1.55'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 101.88 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 509.0' Slope= 0.0036 '/'
Inlet Invert= 571.19', Outlet Invert= 569.36'

‡

Reach 33R-2: I-190 ditch



Summary for Reach 33R-3: Long Road ditch

Inflow Area = 159.900 ac, 4.80% Impervious, Inflow Depth = 1.31" for 10-yr storm event
Inflow = 61.85 cfs @ 13.40 hrs, Volume= 17.471 af
Outflow = 61.86 cfs @ 13.48 hrs, Volume= 17.471 af, Atten= 0%, Lag= 4.9 min

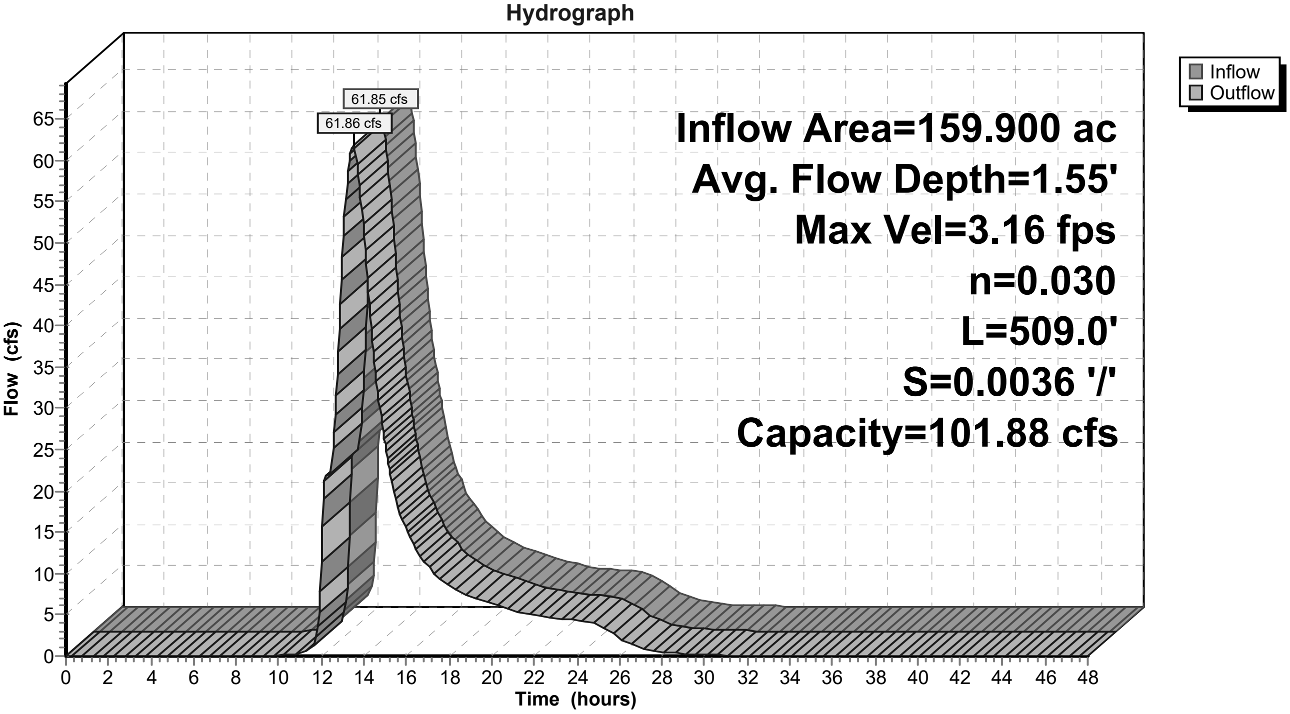
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 3.16 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 10.2 min

Peak Storage= 9,952 cf @ 13.48 hrs
Average Depth at Peak Storage= 1.55'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 101.88 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 509.0' Slope= 0.0036 '/'
Inlet Invert= 571.19', Outlet Invert= 569.36'

‡

Reach 33R-3: Long Road ditch



Summary for Reach 40R: Long Road ditch

Inflow Area =	255.880 ac,	4.03% Impervious,	Inflow Depth = 1.32"	for 10-yr storm event	
Inflow =	97.22 cfs @	13.54 hrs,	Volume=	28.158 af	
Outflow =	97.19 cfs @	13.54 hrs,	Volume=	28.158 af,	Atten= 0%, Lag= 0.4 min

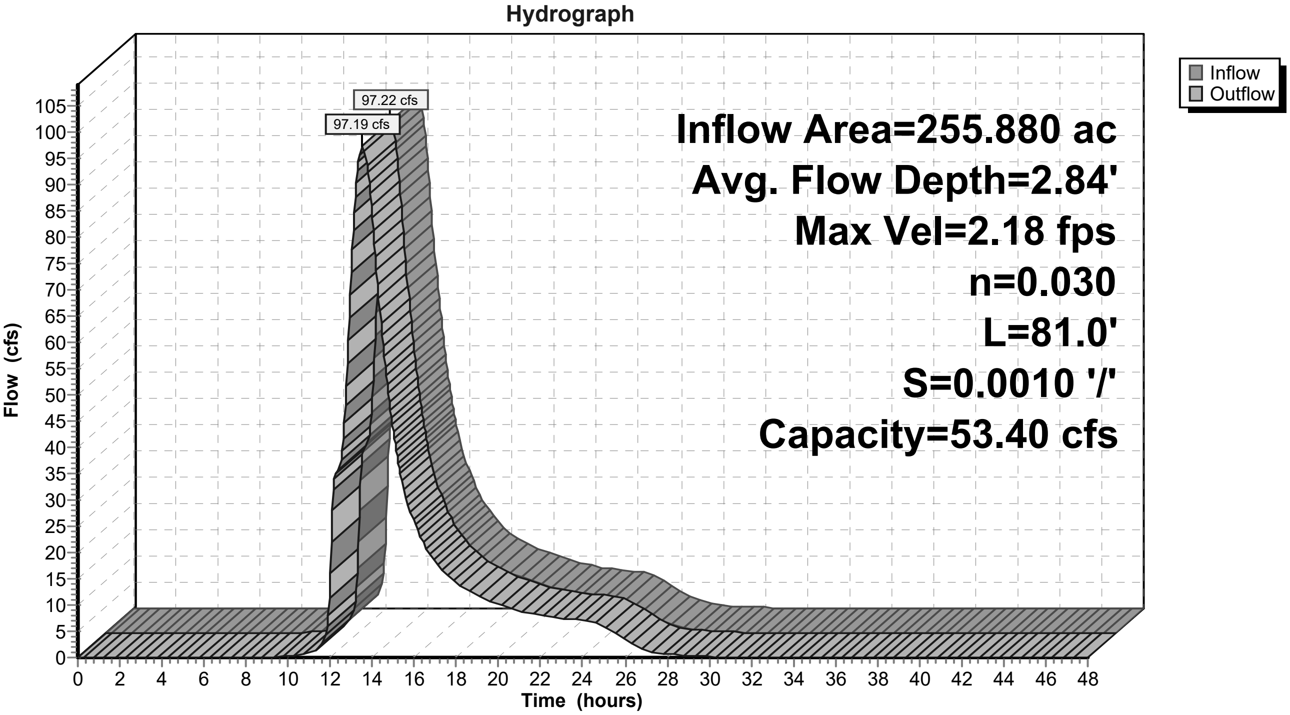
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.18 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 2.2 min

Peak Storage= 3,618 cf @ 13.54 hrs
Average Depth at Peak Storage= 2.84'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 53.40 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 81.0' Slope= 0.0010 '/'
Inlet Invert= 564.47', Outlet Invert= 564.39'

‡

Reach 40R: Long Road ditch



Summary for Reach 41R-1: Long Road ditch

Inflow Area = 164.570 ac, 5.88% Impervious, Inflow Depth = 1.33" for 10-yr storm event
Inflow = 62.59 cfs @ 13.51 hrs, Volume= 18.219 af
Outflow = 62.59 cfs @ 13.51 hrs, Volume= 18.219 af, Atten= 0%, Lag= 0.2 min

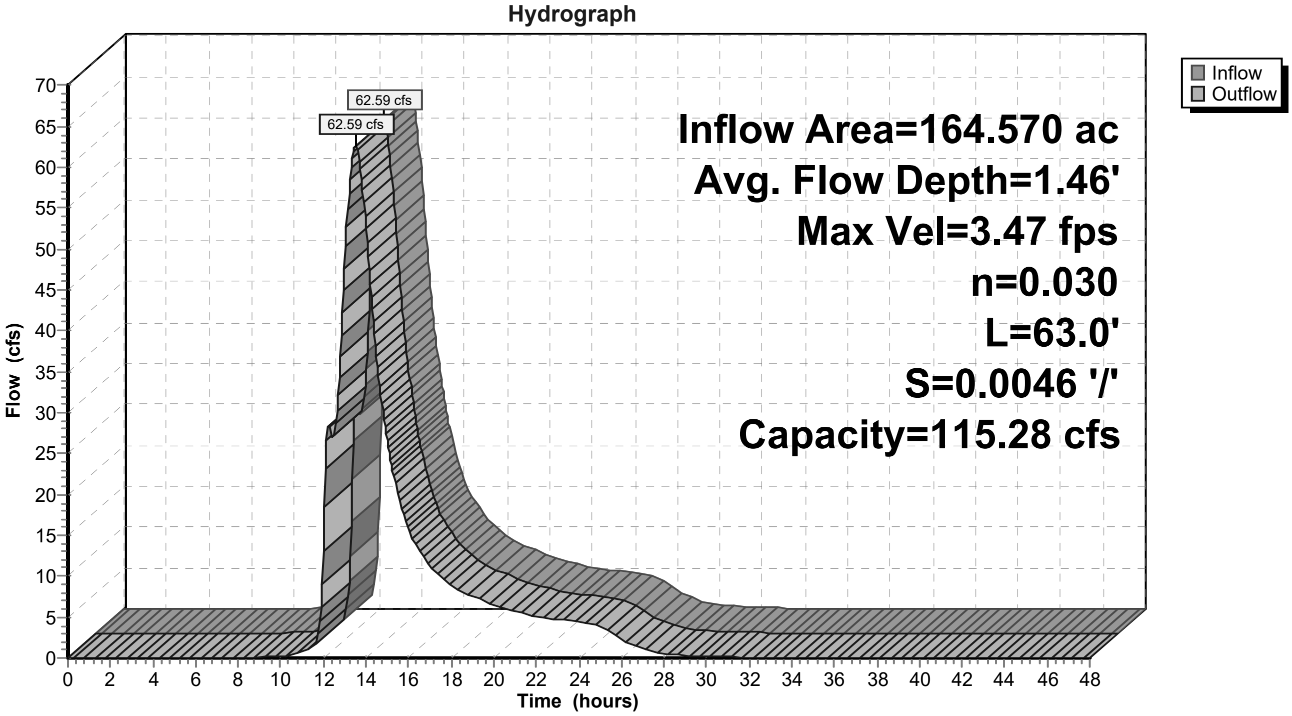
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 3.47 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 1.1 min

Peak Storage= 1,137 cf @ 13.51 hrs
Average Depth at Peak Storage= 1.46'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 115.28 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 63.0' Slope= 0.0046 '/'
Inlet Invert= 564.87', Outlet Invert= 564.58'

‡

Reach 41R-1: Long Road ditch



Summary for Reach 41R-2: Long Road ditch

Inflow Area = 166.700 ac, 6.05% Impervious, Inflow Depth = 1.33" for 10-yr storm event
Inflow = 62.85 cfs @ 13.51 hrs, Volume= 18.511 af
Outflow = 62.84 cfs @ 13.52 hrs, Volume= 18.511 af, Atten= 0%, Lag= 0.8 min

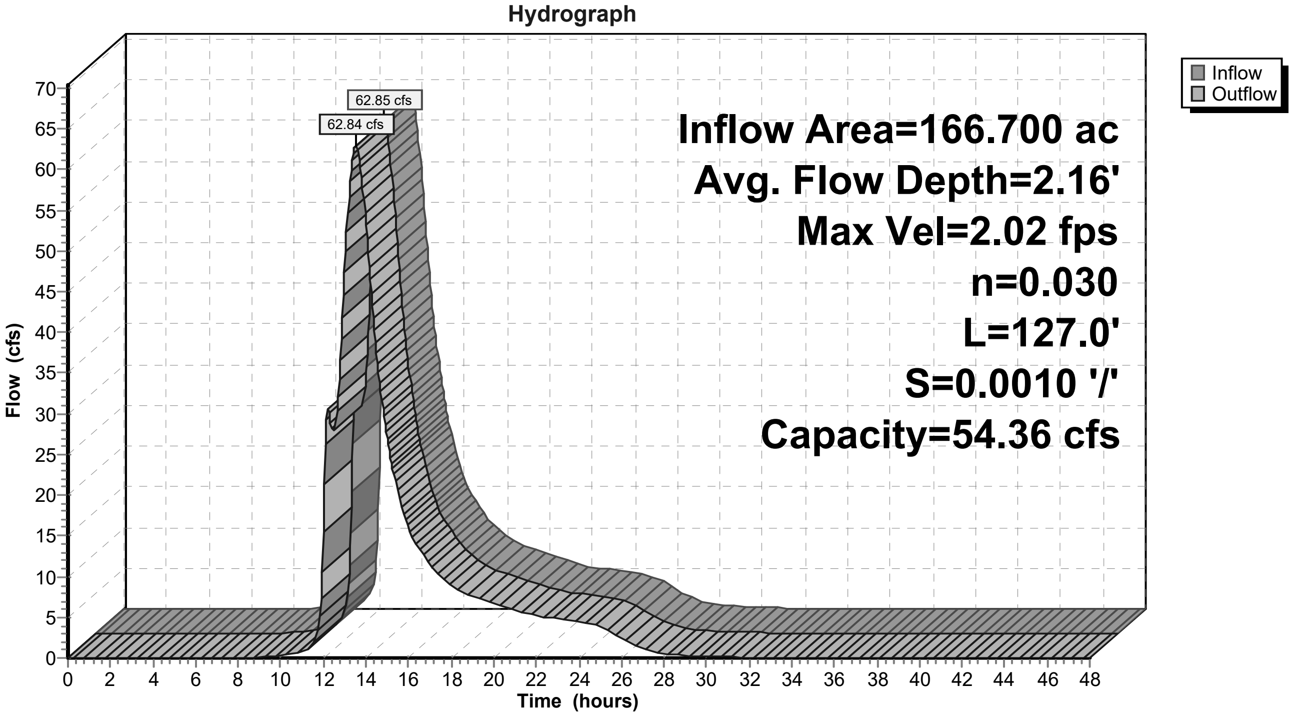
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.02 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 3.8 min

Peak Storage= 3,959 cf @ 13.52 hrs
Average Depth at Peak Storage= 2.16'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 54.36 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 127.0' Slope= 0.0010 '/'
Inlet Invert= 564.66', Outlet Invert= 564.53'

‡

Reach 41R-2: Long Road ditch

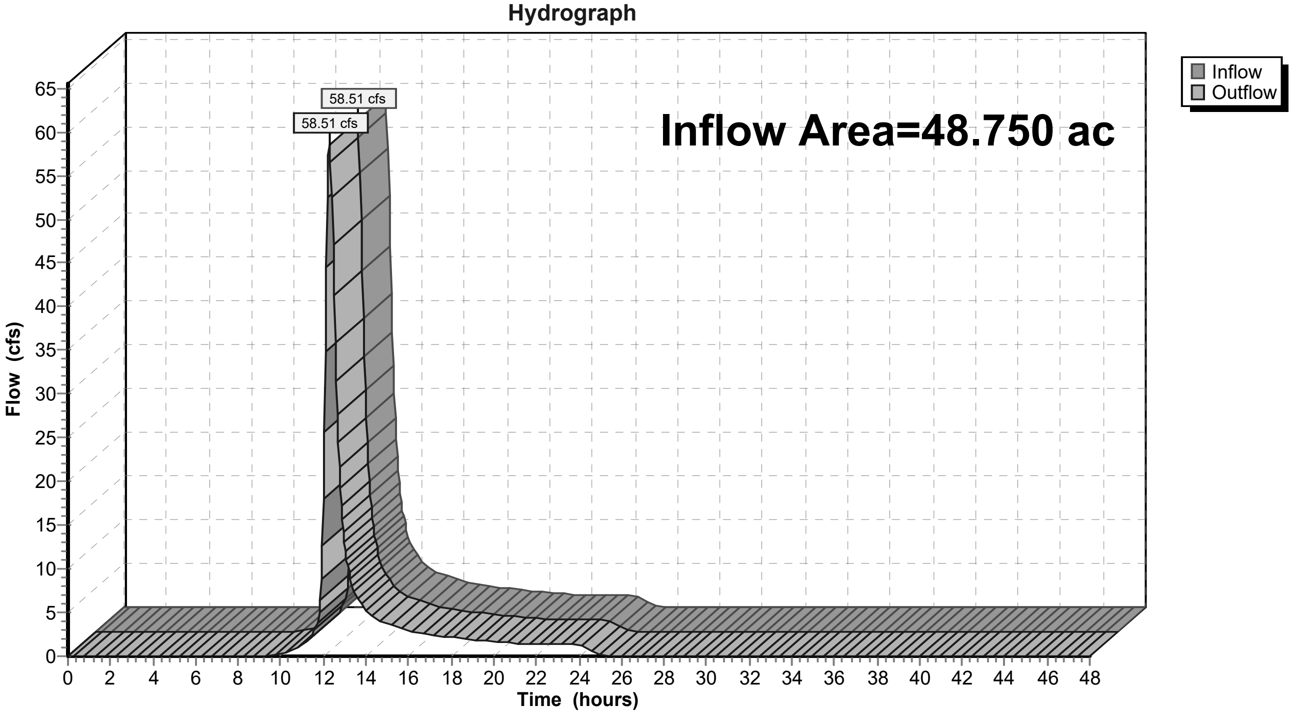


Summary for Reach DP-1: collector creek north of Bedell Road

Inflow Area = 48.750 ac, 4.88% Impervious, Inflow Depth = 1.43" for 10-yr storm event
Inflow = 58.51 cfs @ 12.29 hrs, Volume= 5.811 af
Outflow = 58.51 cfs @ 12.29 hrs, Volume= 5.811 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-1: collector creek north of Bedell Road

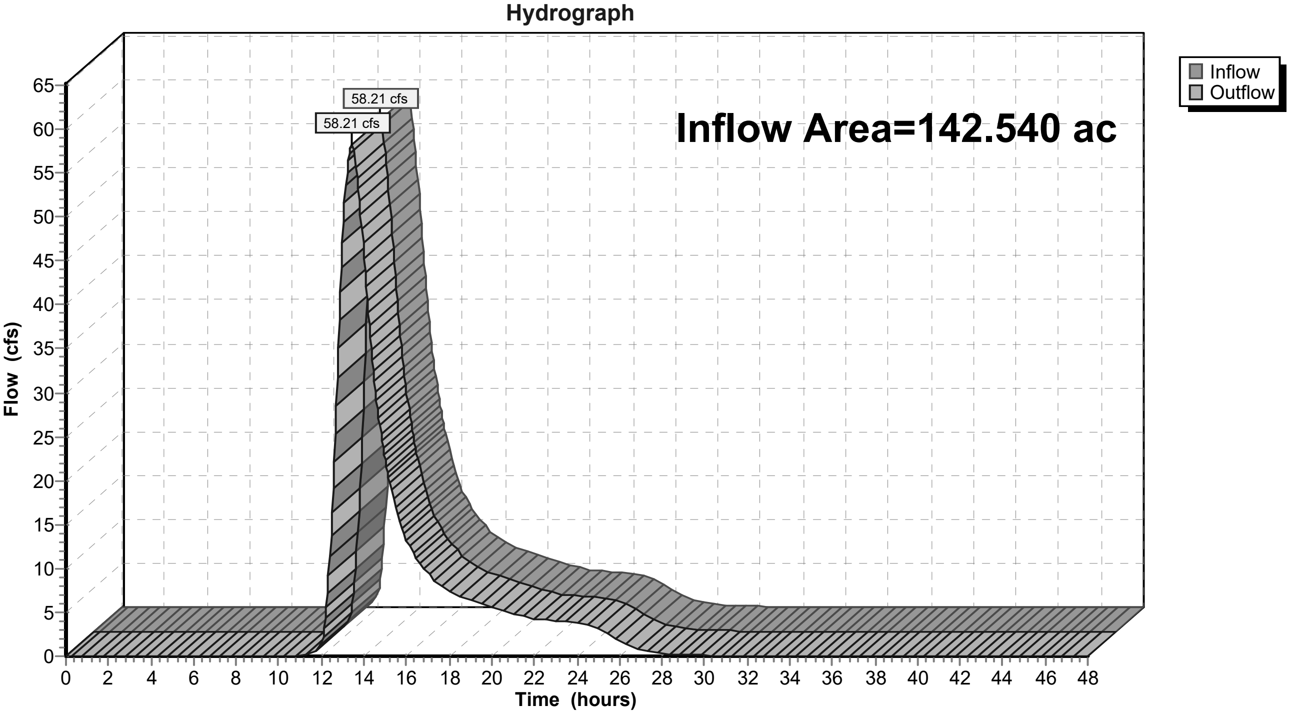


Summary for Reach DP-2: feeder creek on property portion

```
Inflow Area =      142.540 ac,    2.78% Impervious,  Inflow Depth =   1.26"    for  10-yr storm event
Inflow       =       58.21 cfs @   13.43 hrs,  Volume=          14.968 af
Outflow      =       58.21 cfs @   13.43 hrs,  Volume=          14.968 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-2: feeder creek on property portion

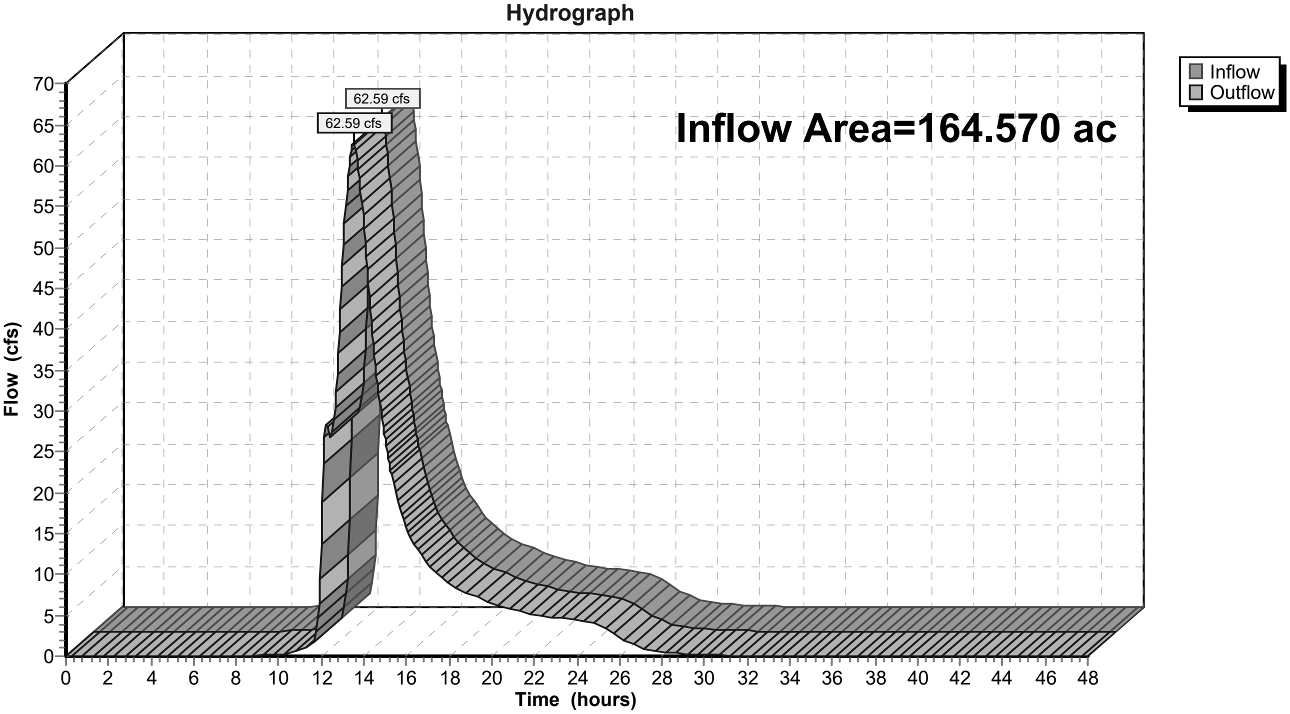


Summary for Reach DP-3: entrance to twin 36" culverts on adjancent property

Inflow Area =	164.570 ac,	5.88% Impervious,	Inflow Depth = 1.33"	for 10-yr storm event	
Inflow =	62.59 cfs @	13.51 hrs,	Volume=	18.219 af	
Outflow =	62.59 cfs @	13.51 hrs,	Volume=	18.219 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-3: entrance to twin 36" culverts on adjancent property

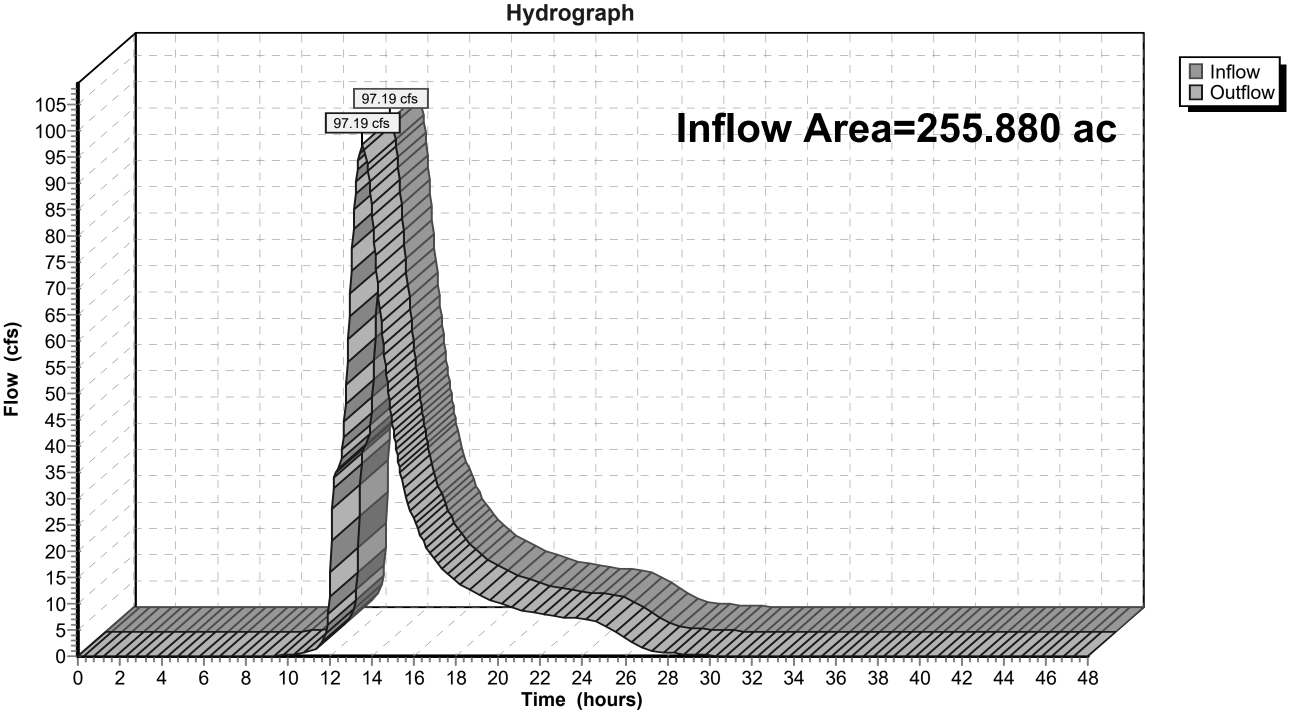


Summary for Reach DP-4: entrance to headwall

Inflow Area =	255.880 ac,	4.03% Impervious,	Inflow Depth = 1.32"	for 10-yr storm event	
Inflow =	97.19 cfs @	13.54 hrs, Volume=	28.158 af		
Outflow =	97.19 cfs @	13.54 hrs, Volume=	28.158 af,	Atten= 0%,	Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-4: entrance to headwall



Summary for Pond 21P: pond

Inflow Area = 3.440 ac, 0.00% Impervious, Inflow Depth = 1.43" for 10-yr storm event
Inflow = 5.52 cfs @ 12.12 hrs, Volume= 0.410 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 586.56' @ 25.15 hrs Surf.Area= 33,769 sf Storage= 17,863 cf
Flood Elev= 587.00' Surf.Area= 36,973 sf Storage= 33,304 cf

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

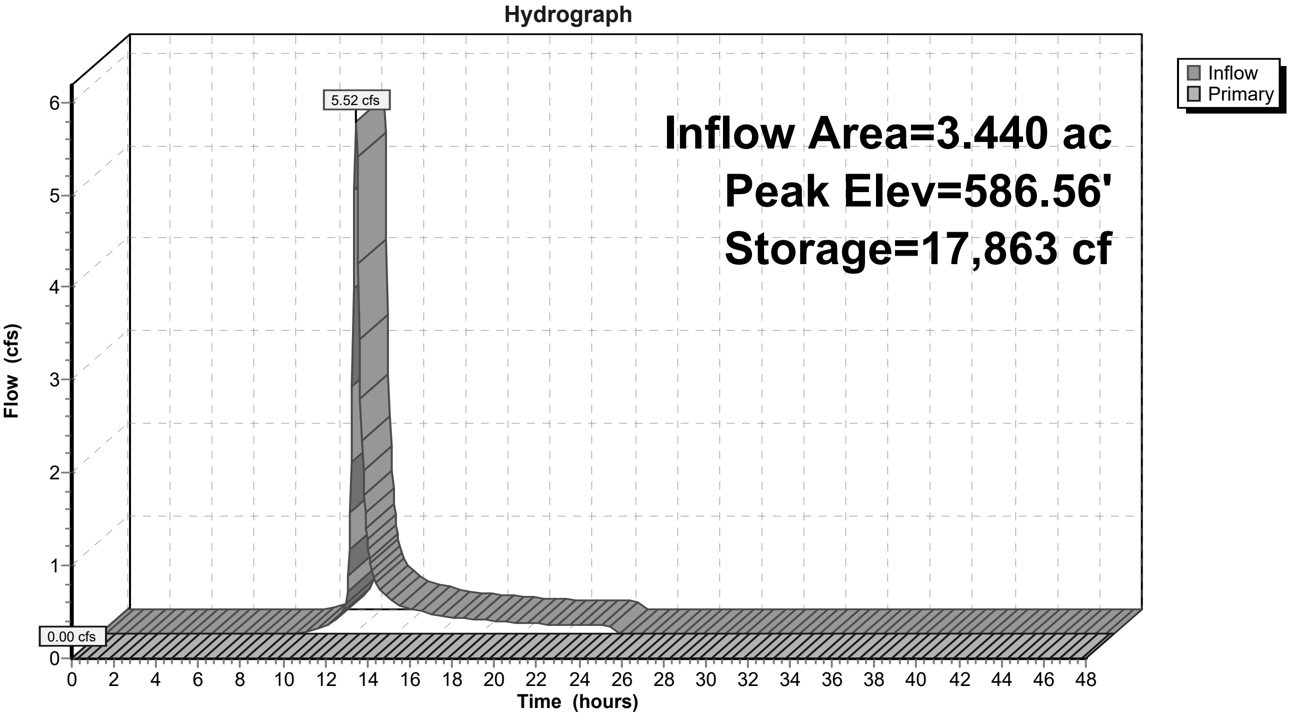
Volume	Invert	Avail.Storage	Storage Description
#1	586.00'	33,304 cf	**pond (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
586.00	29,634	0	0
587.00	36,973	33,304	33,304

Device	Routing	Invert	Outlet Devices
#1	Primary	586.70'	**100.0' long x 8.0' breadth overflow weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=586.00' TW=582.00' (Dynamic Tailwater)
↑—**1=overflow weir** (Controls 0.00 cfs)

Pond 21P: pond



Summary for Pond 30C: twin 36" culverts

Inflow Area = 164.570 ac, 5.88% Impervious, Inflow Depth = 1.33" for 10-yr storm event
Inflow = 62.59 cfs @ 13.51 hrs, Volume= 18.219 af
Outflow = 62.59 cfs @ 13.51 hrs, Volume= 18.219 af, Atten= 0%, Lag= 0.0 min
Primary = 30.66 cfs @ 13.51 hrs, Volume= 11.852 af
Secondary = 31.93 cfs @ 13.51 hrs, Volume= 6.367 af

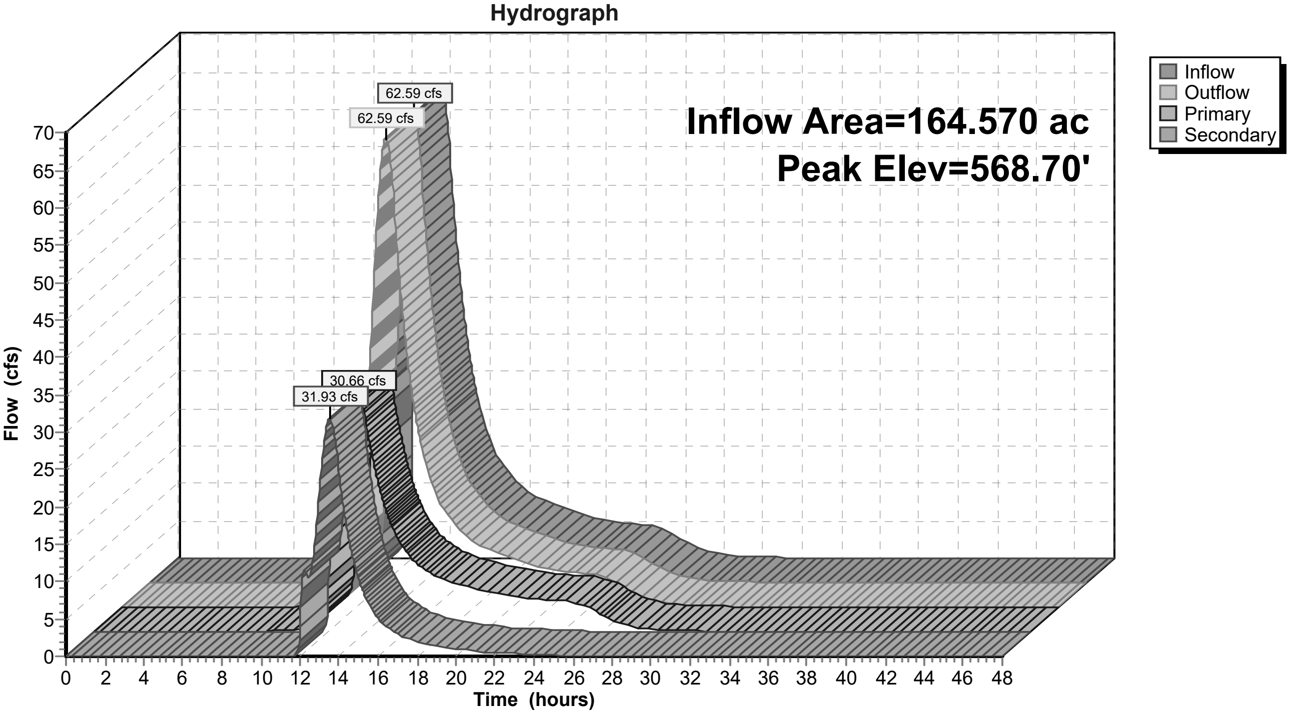
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 568.70' @ 13.51 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.97'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.76' / 564.97' S= -0.0035 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	565.78'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.78' / 564.87' S= 0.0152 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=30.66 cfs @ 13.51 hrs HW=568.70' TW=566.33' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 30.66 cfs @ 4.35 fps)

Secondary OutFlow Max=31.91 cfs @ 13.51 hrs HW=568.70' TW=566.33' (Dynamic Tailwater)
↑—**2=Culvert** (Barrel Controls 31.91 cfs @ 5.78 fps)

Pond 30C: twin 36" culverts



Summary for Pond 31C: twin 36" culverts

```
Inflow Area =      163.930 ac,    5.86% Impervious,  Inflow Depth =   1.33"    for  10-yr storm event
Inflow       =       62.53 cfs @   13.49 hrs,  Volume=          18.135 af
Outflow      =       62.53 cfs @   13.49 hrs,  Volume=          18.135 af,  Atten= 0%,  Lag= 0.0 min
Primary      =       31.26 cfs @   13.49 hrs,  Volume=           8.927 af
Secondary =          31.26 cfs @   13.49 hrs,  Volume=           9.208 af
```

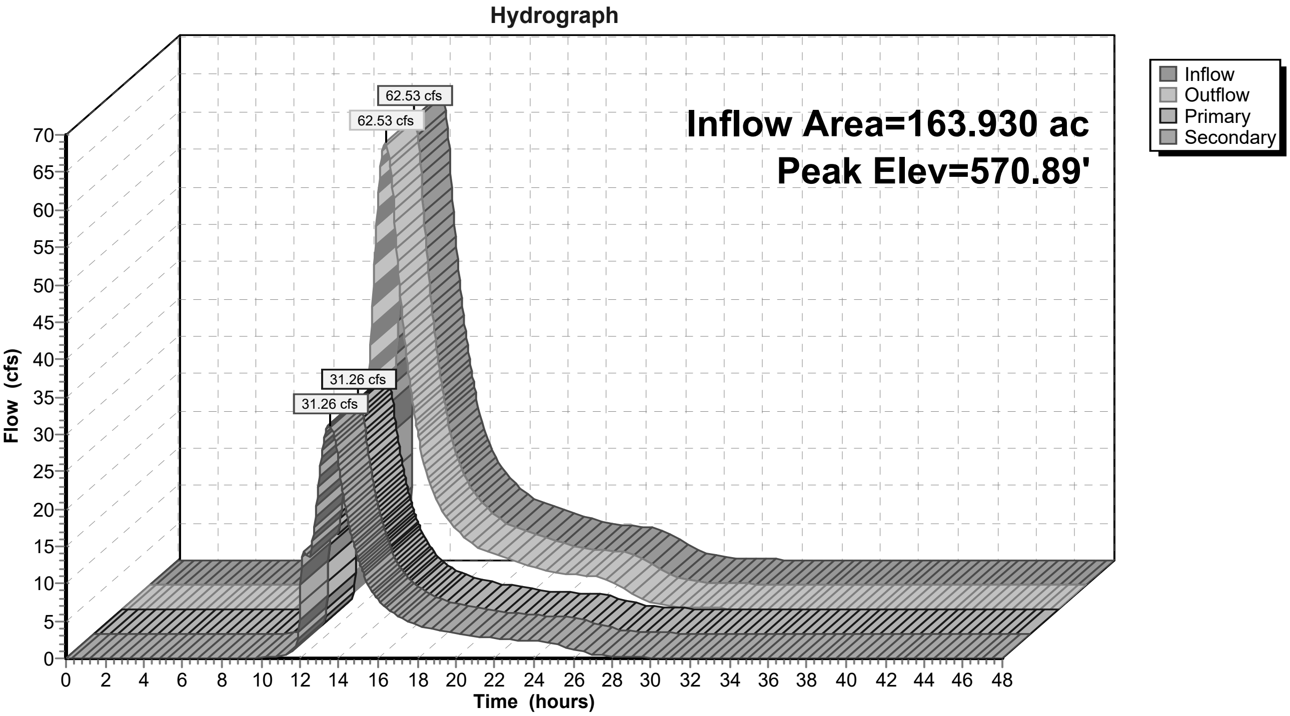
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 570.89' @ 13.50 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	565.46'	**36.0" Round Culvert** L= 41.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.99' / 565.46' S= -0.0115 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	565.40'	**36.0" Round Culvert** L= 41.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.01' / 565.40' S= -0.0095 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=31.25 cfs @ 13.49 hrs HW=570.89' TW=569.54' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 31.25 cfs @ 4.42 fps)

Secondary OutFlow Max=31.25 cfs @ 13.49 hrs HW=570.89' TW=569.54' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 31.25 cfs @ 4.42 fps)

Pond 31C: twin 36" culverts



Summary for Pond 32C: twin 36" culverts

Inflow Area = 163.190 ac, 5.77% Impervious, Inflow Depth = 1.33" for 10-yr storm event
Inflow = 62.44 cfs @ 13.48 hrs, Volume= 18.034 af
Outflow = 62.44 cfs @ 13.48 hrs, Volume= 18.034 af, Atten= 0%, Lag= 0.0 min
Primary = 30.94 cfs @ 13.48 hrs, Volume= 9.078 af
Secondary = 31.50 cfs @ 13.48 hrs, Volume= 8.956 af

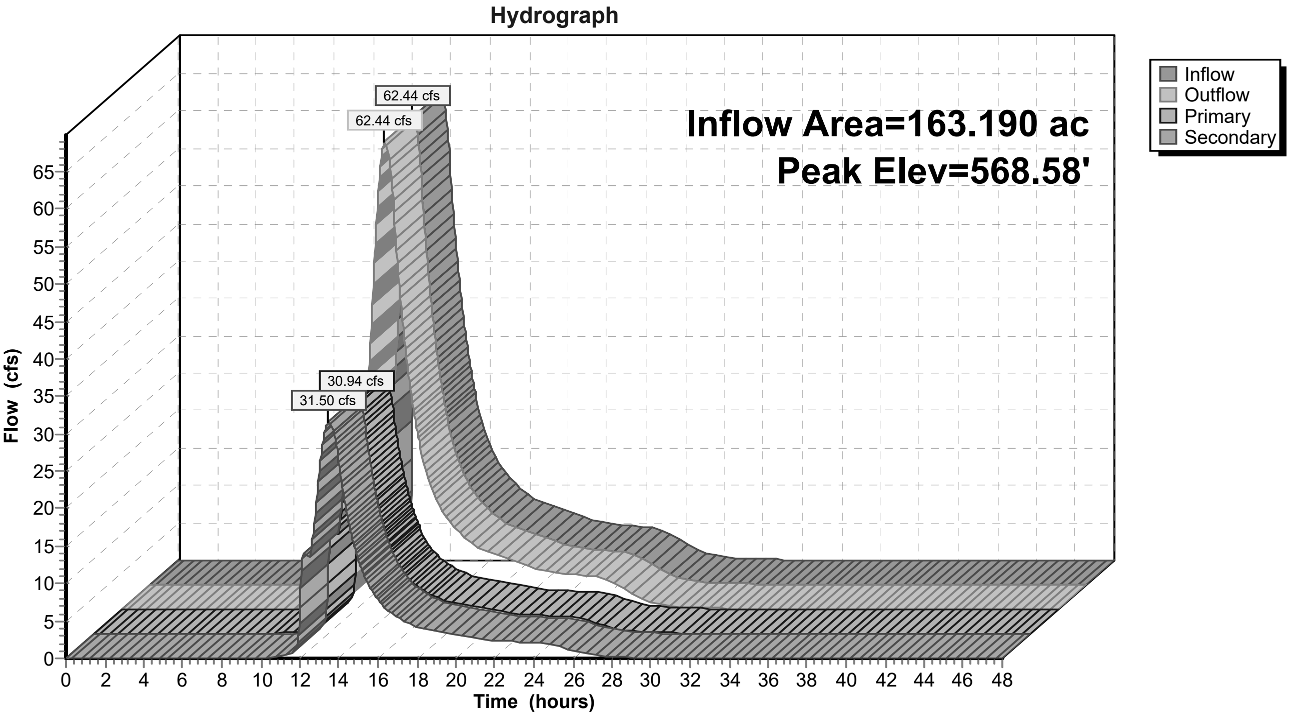
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 568.58' @ 13.48 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	565.68'	**36.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.68' / 565.25' S= 0.0055 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#2	Secondary	565.73'	**36.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.73' / 565.09' S= 0.0082 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=30.92 cfs @ 13.48 hrs HW=568.58' TW=567.13' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 30.92 cfs @ 5.63 fps)

Secondary OutFlow Max=31.48 cfs @ 13.48 hrs HW=568.58' TW=567.13' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 31.48 cfs @ 4.54 fps)

Pond 32C: twin 36" culverts



Summary for Pond 33C: twin 30" culverts

Inflow Area = 159.900 ac, 4.80% Impervious, Inflow Depth = 1.31" for 10-yr storm event
Inflow = 61.86 cfs @ 13.48 hrs, Volume= 17.471 af
Outflow = 61.86 cfs @ 13.48 hrs, Volume= 17.471 af, Atten= 0%, Lag= 0.0 min
Primary = 30.93 cfs @ 13.48 hrs, Volume= 8.710 af
Secondary = 30.93 cfs @ 13.48 hrs, Volume= 8.762 af

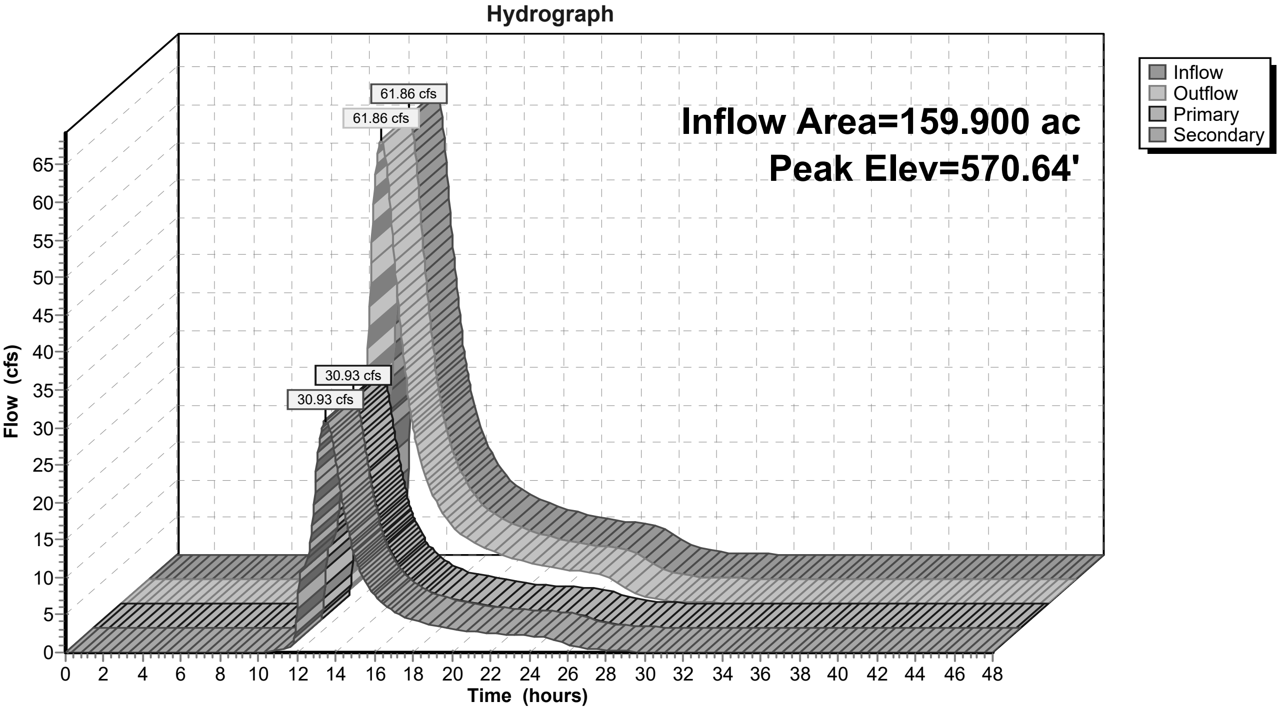
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 570.64' @ 13.48 hrs
Flood Elev= 571.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	565.70'	**30.0" Round Culvert** L= 140.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.70' / 565.64' S= 0.0004 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Secondary	565.65'	**30.0" Round Culvert** L= 140.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.64' / 565.65' S= -0.0001 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=30.92 cfs @ 13.48 hrs HW=570.64' TW=567.89' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 30.92 cfs @ 6.30 fps)

Secondary OutFlow Max=30.92 cfs @ 13.48 hrs HW=570.64' TW=567.89' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 30.92 cfs @ 6.30 fps)

Pond 33C: twin 30" culverts



Summary for Pond 34C: twin 36" culverts

Inflow Area = 0.640 ac, 42.19% Impervious, Inflow Depth = 1.97" for 10-yr storm event
Inflow = 2.11 cfs @ 11.97 hrs, Volume= 0.105 af
Outflow = 2.12 cfs @ 11.97 hrs, Volume= 0.105 af, Atten= 0%, Lag= 0.0 min
Primary = 1.06 cfs @ 11.97 hrs, Volume= 0.052 af
Secondary = 1.06 cfs @ 11.97 hrs, Volume= 0.052 af

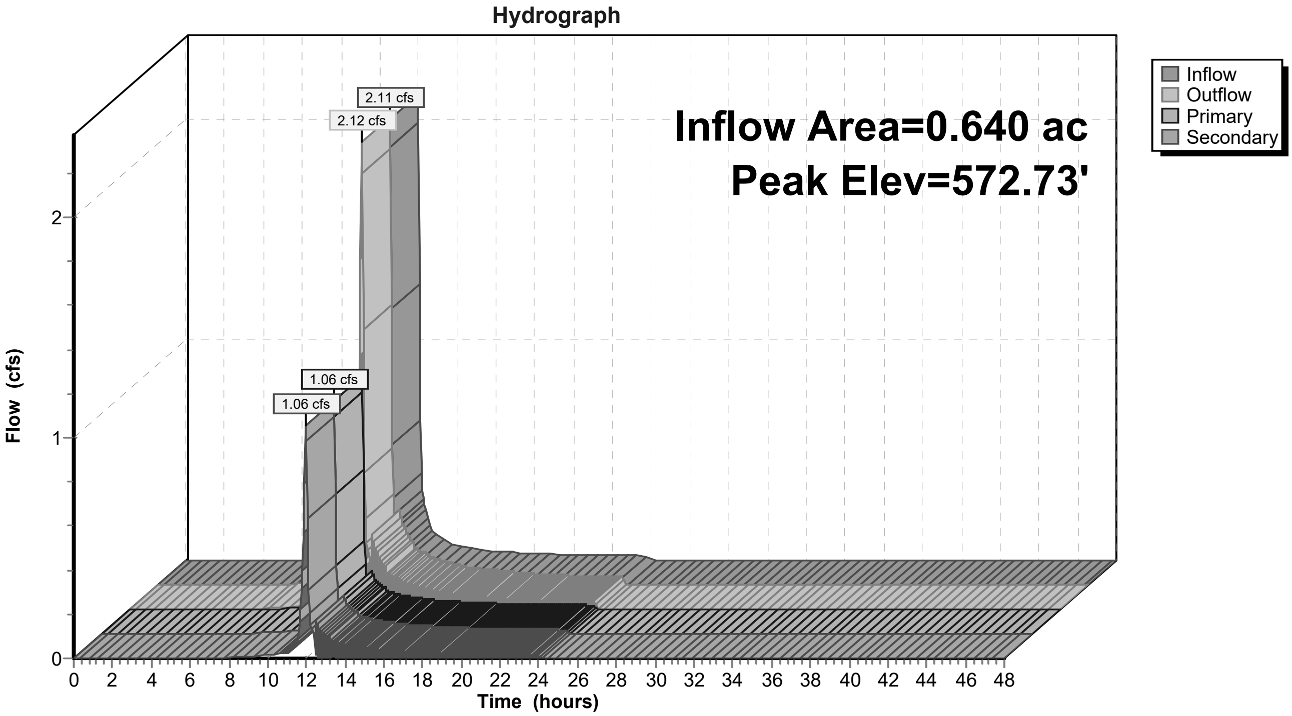
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 572.73' @ 13.50 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	567.07'	**36.0" Round Culvert** L= 91.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 567.07' / 566.90' S= 0.0019 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#2	Secondary	567.17'	**36.0" Round Culvert** L= 91.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 567.17' / 566.89' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=1.03 cfs @ 11.97 hrs HW=571.72' TW=571.72' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.03 cfs @ 0.15 fps)

Secondary OutFlow Max=1.03 cfs @ 11.97 hrs HW=571.72' TW=571.72' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 1.03 cfs @ 0.15 fps)

Pond 34C: twin 36" culverts



Summary for Pond 41C-1: twin 36" culverts

Inflow Area = 164.570 ac, 5.88% Impervious, Inflow Depth = 1.33" for 10-yr storm event
Inflow = 62.59 cfs @ 13.51 hrs, Volume= 18.219 af
Outflow = 62.59 cfs @ 13.51 hrs, Volume= 18.219 af, Atten= 0%, Lag= 0.0 min
Primary = 31.29 cfs @ 13.51 hrs, Volume= 9.446 af
Secondary = 31.29 cfs @ 13.51 hrs, Volume= 8.773 af

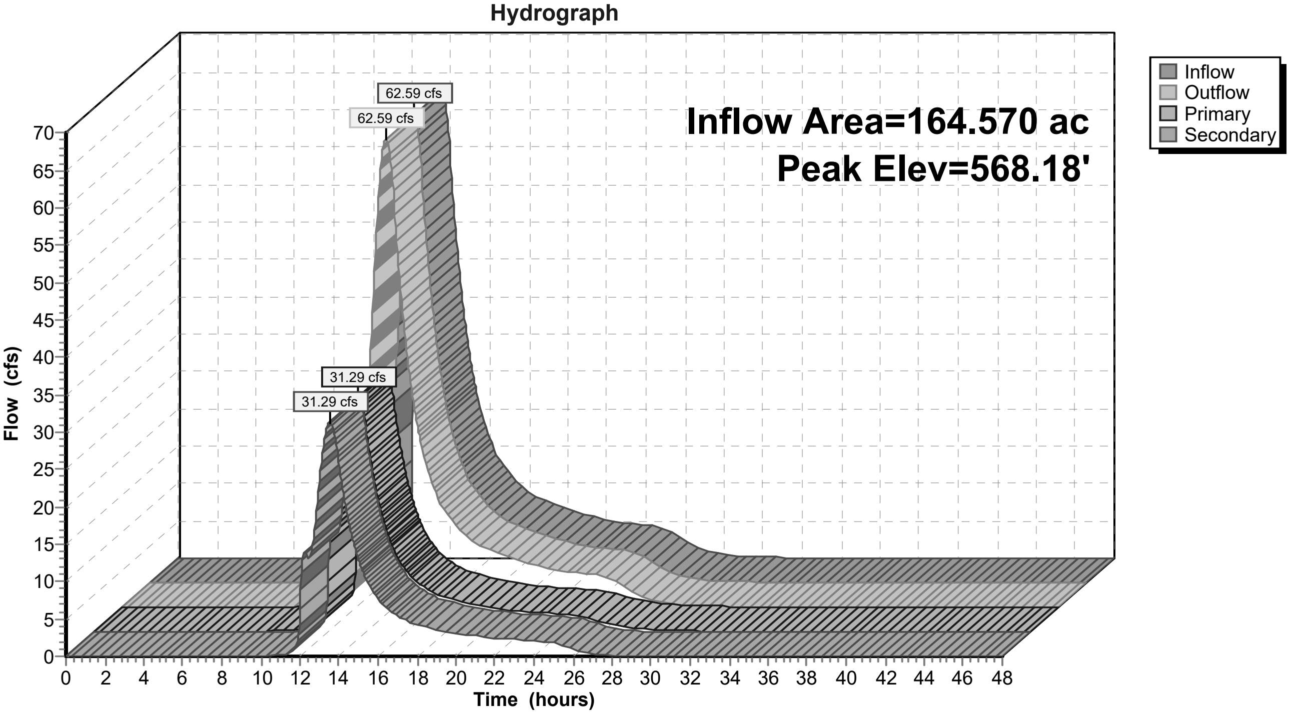
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 568.18' @ 13.51 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.66'	**36.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.58' / 564.66' S= -0.0027 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	564.87'	**36.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.63' / 564.87' S= -0.0080 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=31.28 cfs @ 13.51 hrs HW=568.17' TW=566.82' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 31.28 cfs @ 4.43 fps)

Secondary OutFlow Max=31.28 cfs @ 13.51 hrs HW=568.17' TW=566.82' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 31.28 cfs @ 4.43 fps)

Pond 41C-1: twin 36" culverts



Summary for Pond 41C-2: twin 36" culverts

Inflow Area =	166.700 ac,	6.05% Impervious,	Inflow Depth = 1.33"		for 10-yr storm event
Inflow =	62.84 cfs @	13.52 hrs,	Volume=	18.511 af	
Outflow =	62.84 cfs @	13.52 hrs,	Volume=	18.511 af,	Atten= 0%, Lag= 0.0 min
Primary =	31.42 cfs @	13.52 hrs,	Volume=	9.256 af	
Secondary =	31.42 cfs @	13.52 hrs,	Volume=	9.256 af	

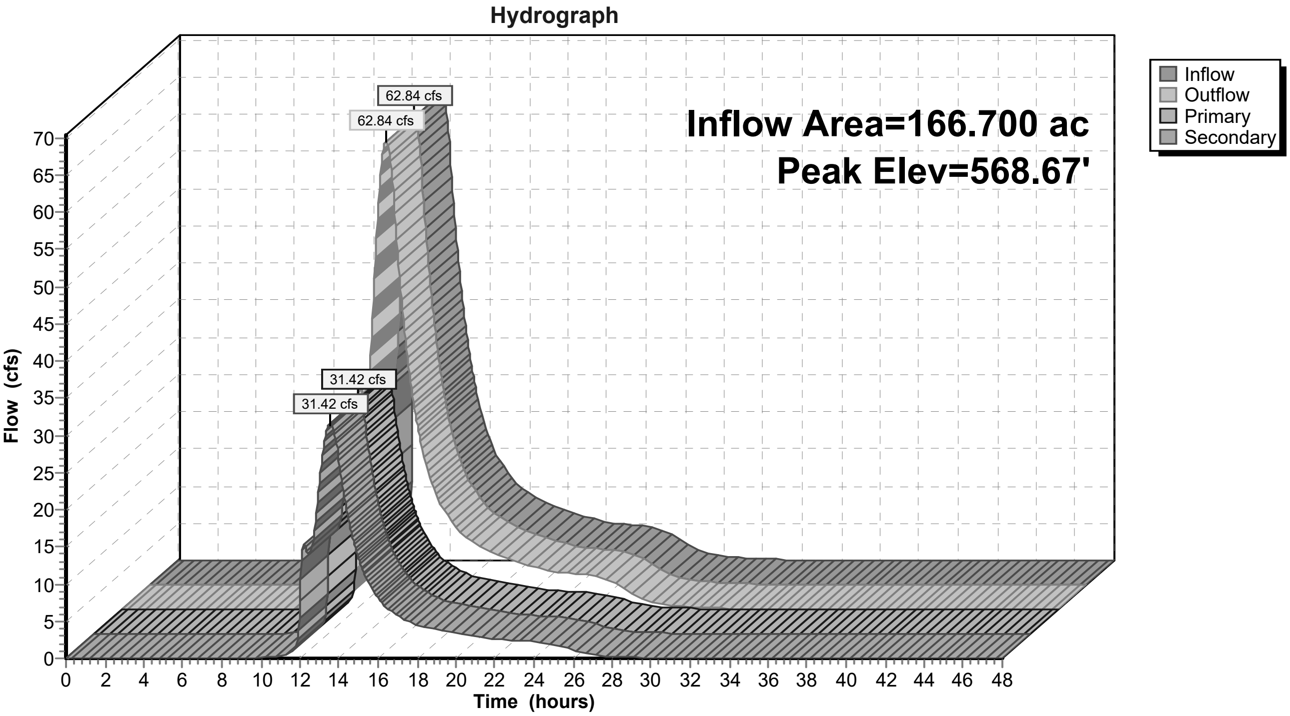
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 568.67' @ 13.53 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.53'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.53' / 564.47' S= 0.0010 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	564.53'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.53' / 564.47' S= 0.0010 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=31.40 cfs @ 13.52 hrs HW=568.67' TW=567.30' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 31.40 cfs @ 4.44 fps)

Secondary OutFlow Max=31.40 cfs @ 13.52 hrs HW=568.67' TW=567.30' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 31.40 cfs @ 4.44 fps)

Pond 41C-2: twin 36" culverts



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 4
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Runoff Area=48.750 ac 4.88% Impervious Runoff Depth=3.02"
Flow Length=1,342' Tc=30.1 min CN=83 Runoff=127.14 cfs 12.272 af

Subcatchment20: Runoff Area=124.090 ac 3.19% Impervious Runoff Depth=2.84"
Flow Length=1,668' Tc=99.0 min CN=81 Runoff=128.97 cfs 29.323 af

Subcatchment21: Runoff Area=3.440 ac 0.00% Impervious Runoff Depth=3.02"
Flow Length=289' Tc=19.4 min CN=83 Runoff=11.67 cfs 0.866 af

Subcatchment22: Runoff Area=15.010 ac 0.00% Impervious Runoff Depth=2.75"
Flow Length=1,231' Slope=0.0050 '/' Tc=59.0 min CN=80 Runoff=22.23 cfs 3.434 af

Subcatchment30: Runoff Area=0.640 ac 12.50% Impervious Runoff Depth=3.21"
Flow Length=258' Slope=0.0400 '/' Tc=11.0 min CN=85 Runoff=2.95 cfs 0.171 af

Subcatchment31: Runoff Area=0.740 ac 24.32% Impervious Runoff Depth=3.31"
Flow Length=261' Tc=12.1 min CN=86 Runoff=3.39 cfs 0.204 af

Subcatchment32: Runoff Area=3.290 ac 53.19% Impervious Runoff Depth=3.82"
Flow Length=626' Tc=30.2 min CN=91 Runoff=10.53 cfs 1.047 af

Subcatchment33: Runoff Area=16.720 ac 20.57% Impervious Runoff Depth=3.41"
Flow Length=33' Slope=0.1400 '/' Tc=6.0 min CN=87 Runoff=94.33 cfs 4.748 af

Subcatchment34: Runoff Area=0.640 ac 42.19% Impervious Runoff Depth=3.71"
Tc=6.0 min CN=90 Runoff=3.85 cfs 0.198 af

Subcatchment40: Runoff Area=89.180 ac 0.25% Impervious Runoff Depth=2.84"
Flow Length=2,815' Tc=125.8 min CN=81 Runoff=77.43 cfs 21.073 af

Subcatchment41: Runoff Area=2.130 ac 18.78% Impervious Runoff Depth=3.31"
Flow Length=267' Tc=13.0 min CN=86 Runoff=9.50 cfs 0.587 af

Reach 10R: collector creek Avg. Flow Depth=2.66' Max Vel=3.04 fps Inflow=127.14 cfs 12.272 af
n=0.030 L=500.0' S=0.0020 '/' Capacity=75.99 cfs Outflow=125.08 cfs 12.272 af

Reach 20R-1: feeder creek Avg. Flow Depth=2.28' Max Vel=3.72 fps Inflow=130.06 cfs 29.671 af
n=0.030 L=3,004.0' S=0.0033 '/' Capacity=98.03 cfs Outflow=125.26 cfs 29.671 af

Reach 20R-2: feeder creek Avg. Flow Depth=2.39' Max Vel=3.77 fps Inflow=134.74 cfs 33.104 af
n=0.030 L=245.0' S=0.0033 '/' Capacity=97.70 cfs Outflow=134.72 cfs 33.104 af

Reach 22R: property line ditch Avg. Flow Depth=1.85' Max Vel=5.38 fps Inflow=135.08 cfs 33.104 af
n=0.030 L=1,402.0' S=0.0086 '/' Capacity=157.20 cfs Outflow=134.74 cfs 33.104 af

Reach 30R: Long Road ditch Avg. Flow Depth=8.04' Max Vel=0.96 fps Inflow=142.74 cfs 39.471 af
n=0.030 L=68.0' S=0.0001 '/' Capacity=20.60 cfs Outflow=142.70 cfs 39.471 af

Reach 31R: Long Road ditch Avg. Flow Depth=3.40' Max Vel=2.55 fps Inflow=142.41 cfs 39.096 af
n=0.030 L=64.0' S=0.0013 '/' Capacity=60.07 cfs Outflow=142.41 cfs 39.096 af

Reach 32R: Long Road ditch Avg. Flow Depth=3.89' Max Vel=2.15 fps Inflow=141.33 cfs 38.049 af
n=0.030 L=47.0' S=0.0009 '/' Capacity=49.57 cfs Outflow=141.32 cfs 38.049 af

Reach 33R-1: I-190 ditch Avg. Flow Depth=1.34' Max Vel=2.92 fps Inflow=94.33 cfs 4.748 af
n=0.030 L=3,824.0' S=0.0036 '/' Capacity=102.11 cfs Outflow=47.14 cfs 4.747 af

Reach 33R-2: I-190 ditch Avg. Flow Depth=2.39' Max Vel=3.94 fps Inflow=141.35 cfs 37.852 af
n=0.030 L=509.0' S=0.0036 '/' Capacity=101.88 cfs Outflow=141.26 cfs 37.852 af

Reach 33R-3: Long Road ditch Avg. Flow Depth=2.39' Max Vel=3.94 fps Inflow=141.47 cfs 38.049 af
n=0.030 L=509.0' S=0.0036 '/' Capacity=101.88 cfs Outflow=141.33 cfs 38.049 af

Reach 40R: Long Road ditch Avg. Flow Depth=5.19' Max Vel=2.41 fps Inflow=220.23 cfs 61.131 af
n=0.030 L=81.0' S=0.0010 '/' Capacity=53.40 cfs Outflow=220.24 cfs 61.131 af

Reach 41R-1: Long Road ditch Avg. Flow Depth=2.24' Max Vel=4.35 fps Inflow=142.70 cfs 39.471 af
n=0.030 L=63.0' S=0.0046 '/' Capacity=115.28 cfs Outflow=142.70 cfs 39.471 af

Reach 41R-2: Long Road ditch Avg. Flow Depth=3.67' Max Vel=2.34 fps Inflow=143.21 cfs 40.058 af
n=0.030 L=127.0' S=0.0010 '/' Capacity=54.36 cfs Outflow=143.19 cfs 40.058 af

Reach DP-1: collector creek north of Bedell Road Inflow=125.08 cfs 12.272 af
Outflow=125.08 cfs 12.272 af

Reach DP-2: feeder creek on property portion Inflow=134.74 cfs 33.104 af
Outflow=134.74 cfs 33.104 af

Reach DP-3: entrance to twin 36" culverts on adjancent property Inflow=142.70 cfs 39.471 af
Outflow=142.70 cfs 39.471 af

Reach DP-4: entrance to headwall Inflow=220.24 cfs 61.131 af
Outflow=220.24 cfs 61.131 af

Pond 21P: pond Peak Elev=586.73' Storage=23,509 cf Inflow=11.67 cfs 0.866 af
Outflow=1.12 cfs 0.348 af

Pond 30C: twin 36" culverts Peak Elev=574.25' Inflow=142.70 cfs 39.471 af
Primary=71.77 cfs 22.817 af Secondary=70.92 cfs 16.654 af Outflow=142.70 cfs 39.471 af

Pond 31C: twin 36" culverts Peak Elev=580.54' Inflow=142.59 cfs 39.300 af
Primary=71.29 cfs 19.493 af Secondary=71.29 cfs 19.807 af Outflow=142.59 cfs 39.300 af

Pond 32C: twin 36" culverts Peak Elev=575.51' Inflow=142.41 cfs 39.096 af
Primary=71.21 cfs 19.620 af Secondary=71.21 cfs 19.475 af Outflow=142.41 cfs 39.096 af

Pond 33C: twin 30" culverts Peak Elev=583.87' Inflow=141.33 cfs 38.049 af
Primary=70.66 cfs 19.003 af Secondary=70.66 cfs 19.046 af Outflow=141.33 cfs 38.049 af

Pond 34C: twin 36" culverts Peak Elev=573.58' Inflow=3.85 cfs 0.198 af
Primary=1.91 cfs 0.099 af Secondary=1.91 cfs 0.099 af Outflow=3.82 cfs 0.198 af

Pond 41C-1: twin 36" culverts Peak Elev=575.38' Inflow=142.70 cfs 39.471 af
Primary=71.35 cfs 20.095 af Secondary=71.35 cfs 19.375 af Outflow=142.70 cfs 39.471 af

Pond 41C-2: twin 36" culverts Peak Elev=576.75' Inflow=143.19 cfs 40.058 af
Primary=71.60 cfs 20.029 af Secondary=71.60 cfs 20.029 af Outflow=143.19 cfs 40.058 af

Total Runoff Area = 304.630 ac Runoff Volume = 73.922 af Average Runoff Depth = 2.91"
95.84% Pervious = 291.950 ac 4.16% Impervious = 12.680 ac

Summary for Subcatchment 10:

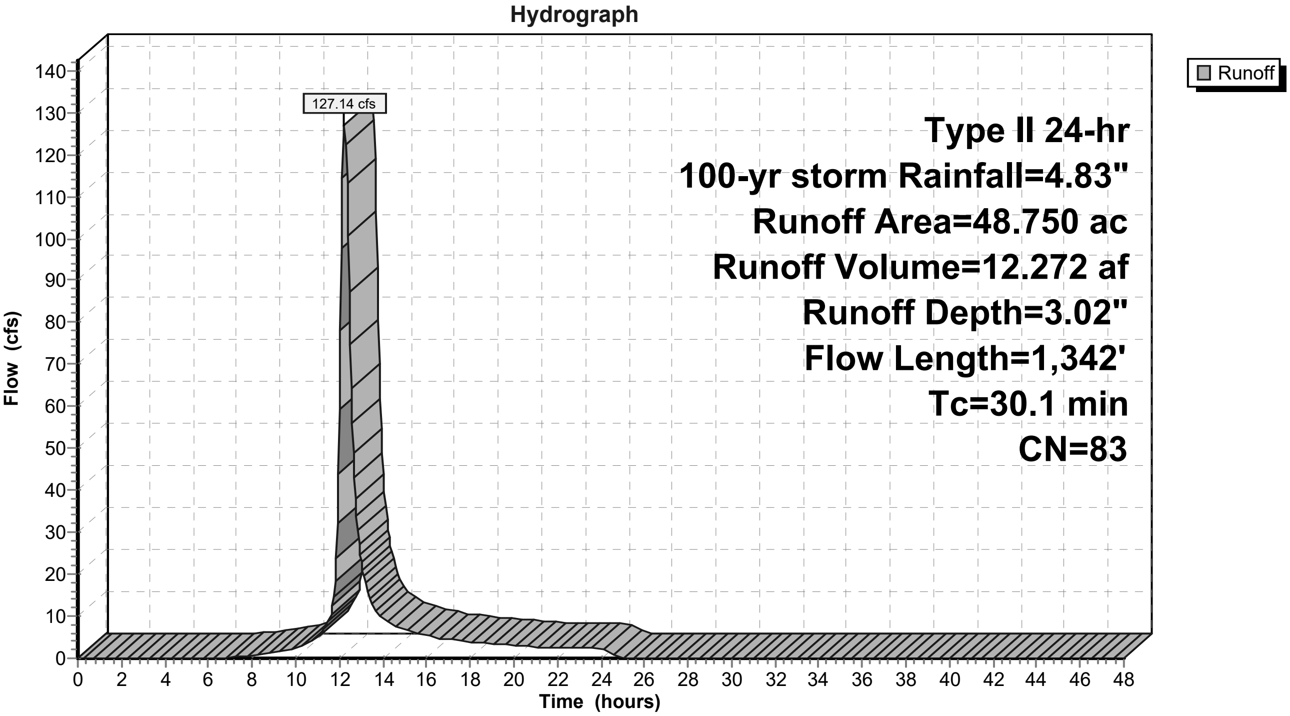
Runoff = 127.14 cfs @ 12.24 hrs, Volume= 12.272 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	2.040	84	50-75% Grass cover, Fair, HSG D
	20.060	79	Woods, Fair, HSG D
	0.120	98	Water Surface, 0% imp, HSG D
*	16.290	84	50-75% Grass cover, Fair, HSG D (offsite)
*	5.670	79	Woods, Fair, HSG D (offsite)
*	1.740	98	Paved parking, HSG D (offsite)
*	0.640	98	Roofs, HSG D (offsite)
*	0.620	91	Gravel roads, HSG D (offsite)
*	1.570	98	Water Surface, 0% imp, HSG D (offsite)
	48.750	83	Weighted Average
	46.370		95.12% Pervious Area
	2.380		4.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0170	0.13		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.1	87	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.7	84	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
7.1	266	0.0080	0.63		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
7.4	805	0.0020	1.81	21.76	**Channel Flow, E-F** Area= 12.0 sf Perim= 16.2' r= 0.74' n= 0.030 Earth, grassed & winding
30.1	1,342	Total			

Subcatchment 10:



Summary for Subcatchment 20:

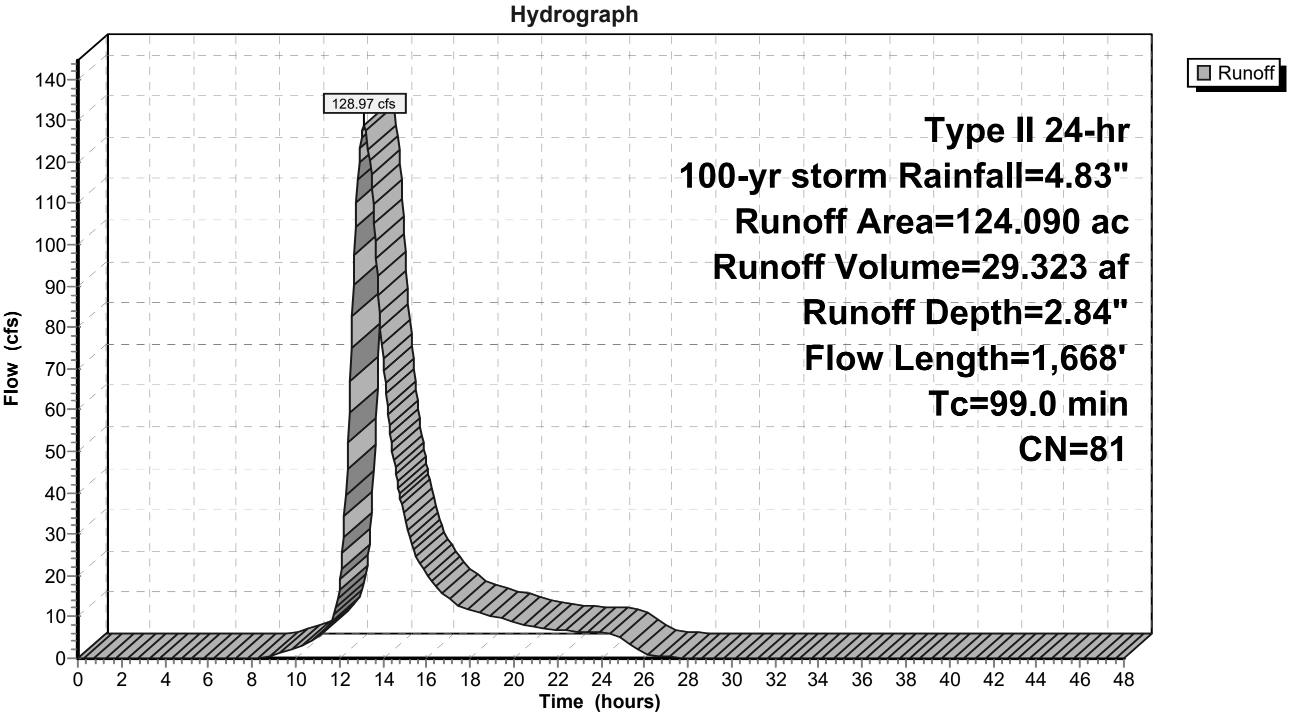
Runoff = 128.97 cfs @ 13.11 hrs, Volume= 29.323 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	8.910	84	50-75% Grass cover, Fair, HSG D
	65.560	79	Woods, Fair, HSG D
	0.120	98	Paved parking, HSG D
	0.030	98	Roofs, HSG D
	1.160	98	Water Surface, 0% imp, HSG D
*	8.770	84	50-75% Grass cover, Fair, HSG D (offsite)
*	33.440	79	Woods, Fair, HSG D (offsite)
*	1.770	98	Paved parking, HSG D (offsite)
*	2.040	98	Roofs, HSG D (offsite)
*	1.960	91	Gravel roads, HSG D (offsite)
*	0.330	98	Water Surface, 0% imp, HSG D (offsite)
	124.090	81	Weighted Average
	120.130		96.81% Pervious Area
	3.960		3.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.7	100	0.0100	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
49.7	1,055	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
14.2	447	0.0110	0.52		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.4	66	0.0040	2.63	28.93	**Channel Flow, D-E** Area= 11.0 sf Perim= 14.3' r= 0.77' n= 0.030 Earth, grassed & winding
99.0	1,668	Total			

Subcatchment 20:



Summary for Subcatchment 21:

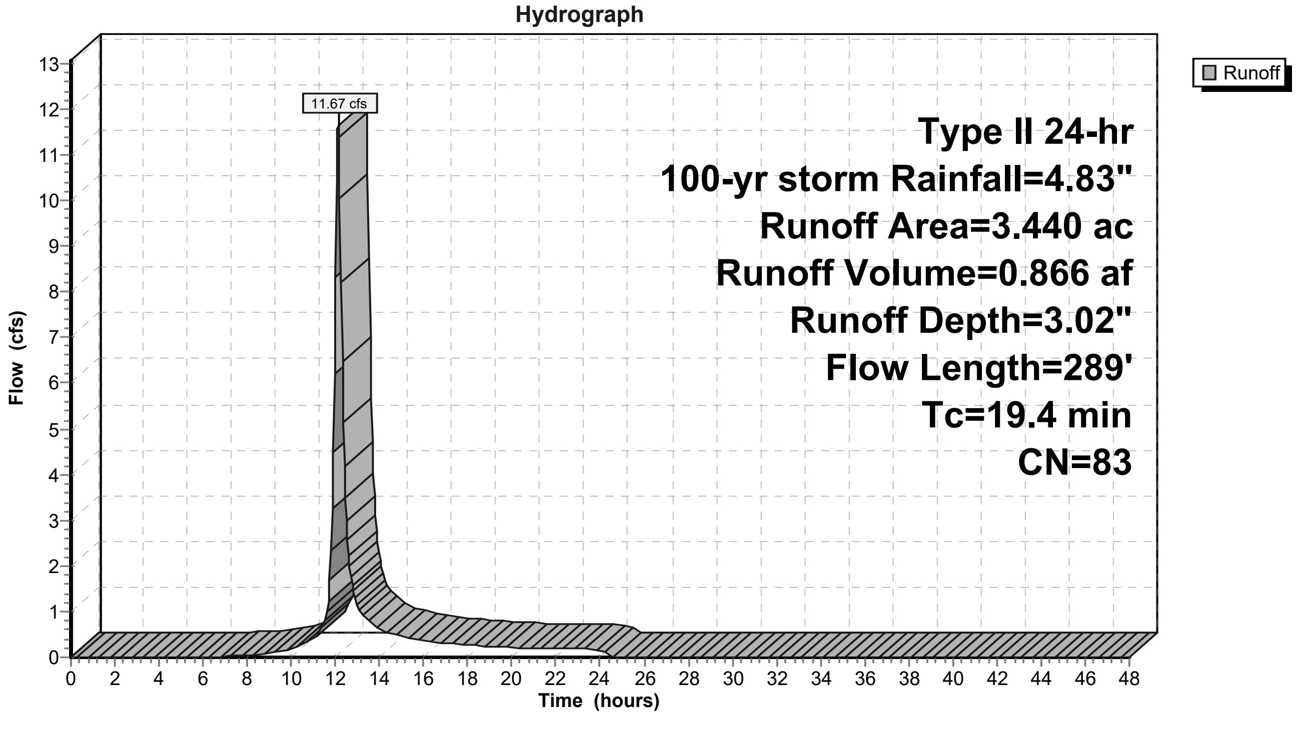
Runoff = 11.67 cfs @ 12.12 hrs, Volume= 0.866 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
2.920	84	50-75% Grass cover, Fair, HSG D
0.520	79	Woods, Fair, HSG D
3.440	83	Weighted Average
3.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.8	100	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
3.6	189	0.0160	0.89		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
19.4	289	Total			

Subcatchment 21:



Summary for Subcatchment 22:

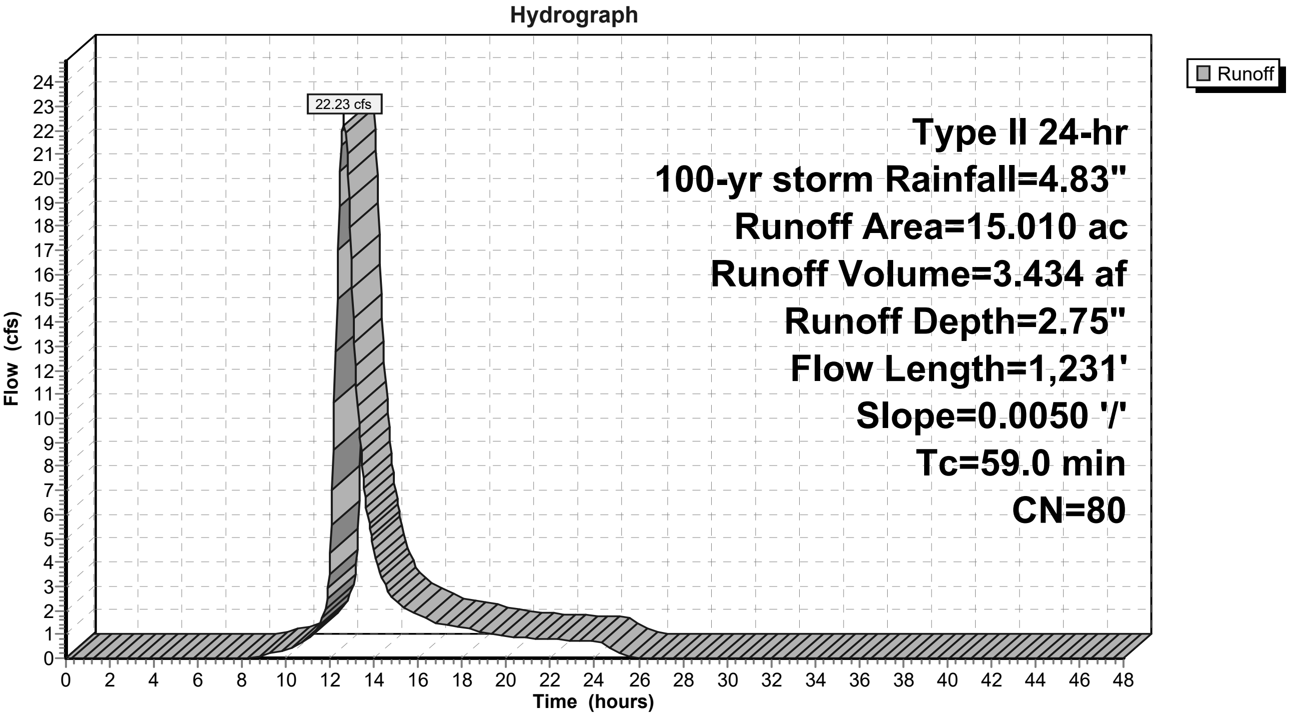
Runoff = 22.23 cfs @ 12.62 hrs, Volume= 3.434 af, Depth= 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	0.200	84	50-75% Grass cover, Fair, HSG D
	13.400	79	Woods, Fair, HSG D
*	0.770	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.490	79	Woods, Fair, HSG D (offsite)
*	0.150	98	Water Surface, 0% imp, HSG D (offsite)
	15.010	80	Weighted Average
	15.010		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0050	0.08		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
38.1	1,131	0.0050	0.49		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
59.0	1,231	Total			

Subcatchment 22:



Summary for Subcatchment 30:

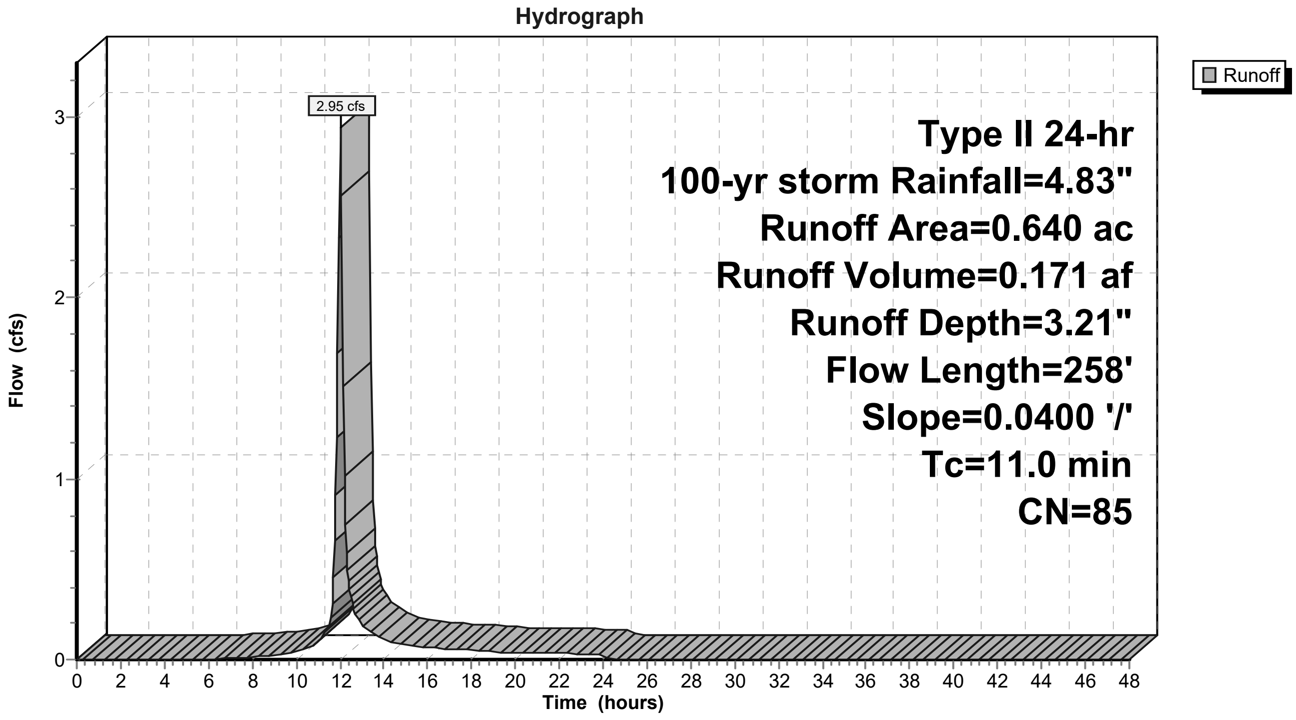
Runoff = 2.95 cfs @ 12.02 hrs, Volume= 0.171 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	0.230	84	50-75% Grass cover, Fair, HSG D
	0.050	98	Paved parking, HSG D
	0.200	79	Woods, Fair, HSG D
	0.010	98	Water Surface, 0% imp, HSG D
*	0.110	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.030	98	Paved parking, HSG D (offsite)
*	0.010	98	Water Surface, 0% imp, HSG D (offsite)
	0.640	85	Weighted Average
	0.560		87.50% Pervious Area
	0.080		12.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0400	0.18		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
1.9	158	0.0400	1.40		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
11.0	258	Total			

Subcatchment 30:



Summary for Subcatchment 31:

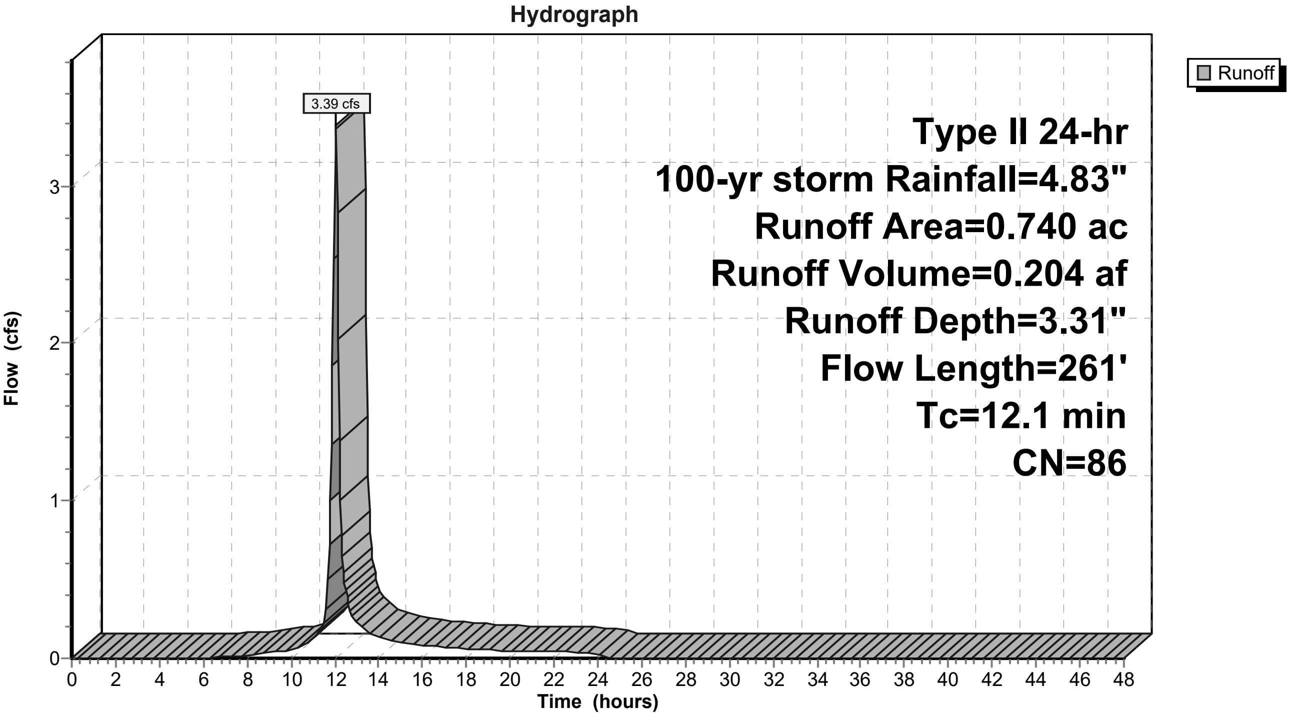
Runoff = 3.39 cfs @ 12.04 hrs, Volume= 0.204 af, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	0.210	84	50-75% Grass cover, Fair, HSG D
	0.020	98	Paved parking, HSG D
	0.010	79	Woods, Fair, HSG D
	0.010	98	Water Surface, 0% imp, HSG D
*	0.310	79	50-75% Grass cover, Fair, HSG C (offsite)
*	0.160	98	Paved parking, HSG D (offsite)
*	0.010	79	Woods, Fair, HSG D (offsite)
*	0.010	98	Water Surface, 0% imp, HSG D (offsite)
	0.740	86	Weighted Average
	0.560		75.68% Pervious Area
	0.180		24.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	100	0.0300	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
1.9	161	0.0400	1.40		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
12.1	261	Total			

Subcatchment 31:



Summary for Subcatchment 32:

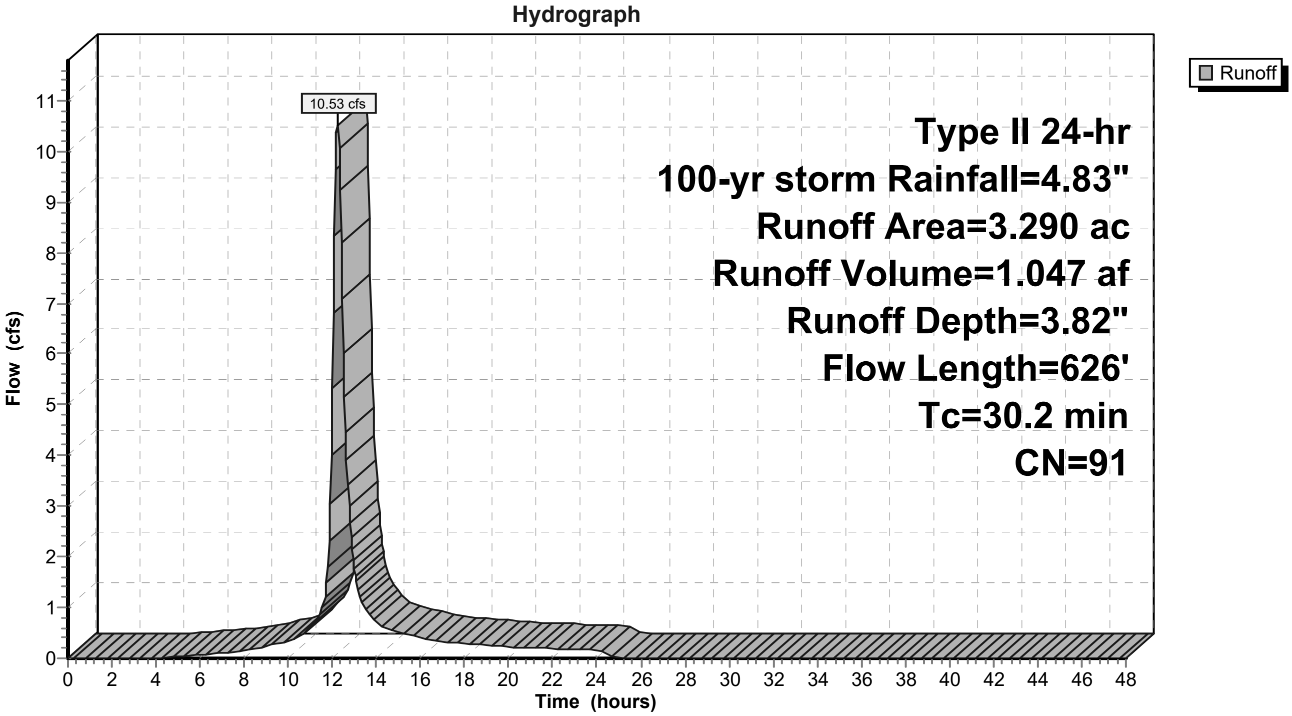
Runoff = 10.53 cfs @ 12.24 hrs, Volume= 1.047 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
1.530	84	50-75% Grass cover, Fair, HSG D
1.130	98	Water Surface, HSG D
0.620	98	Roofs, HSG D
0.010	98	Water Surface, 0% imp, HSG D
3.290	91	Weighted Average
1.540		46.81% Pervious Area
1.750		53.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	100	0.0300	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
16.6	171	0.0006	0.17		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
2.7	277	0.0070	1.70		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.7	78	0.0800	1.98		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
30.2	626	Total			

Subcatchment 32:



Summary for Subcatchment 33:

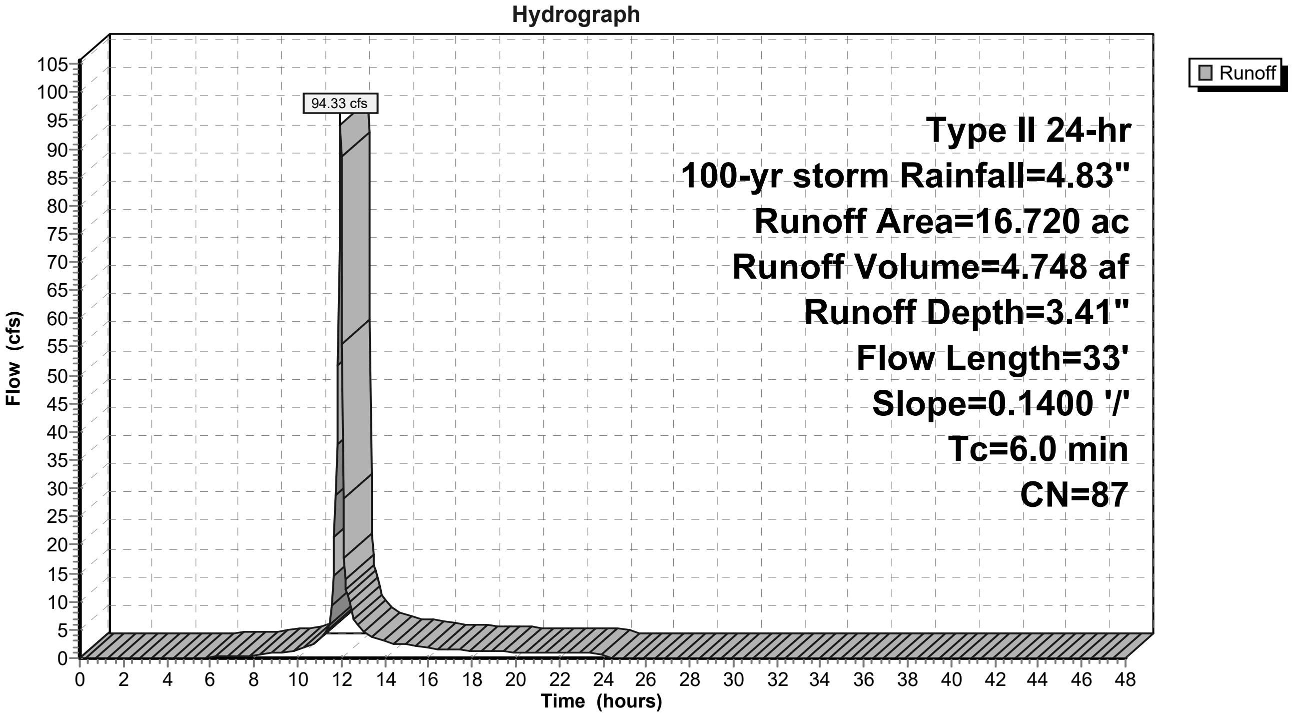
Runoff = 94.33 cfs @ 11.97 hrs, Volume= 4.748 af, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	0.050	84	50-75% Grass cover, Fair, HSG D
	0.620	79	Woods, Fair, HSG D
*	11.780	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.350	79	Woods, Fair, HSG D (offsite)
*	2.850	98	Paved parking, HSG D (offsite)
*	0.590	98	Roofs, HSG D (offsite)
*	0.010	91	Gravel roads, HSG D (offiste)
*	0.470	98	Water Surface, 0% imp, HSG D (offsite)
	16.720	87	Weighted Average
	13.280		79.43% Pervious Area
	3.440		20.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	33	0.1400	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.3	33	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 33:



Summary for Subcatchment 34:

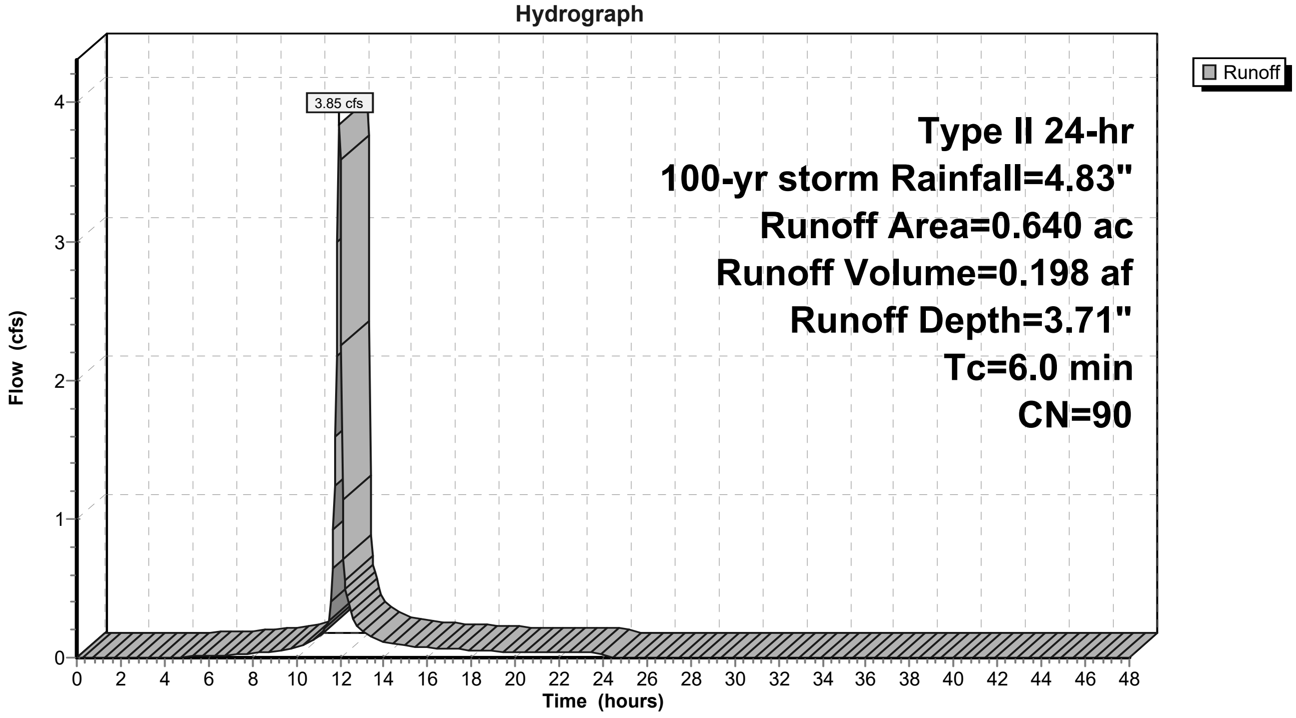
Runoff = 3.85 cfs @ 11.96 hrs, Volume= 0.198 af, Depth= 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
*	0.350	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.270	98	Paved parking, HSG D (offsite)
*	0.020	98	Water Surface, 0% imp, HSG D (offsite)
	0.640	90	Weighted Average
	0.370		57.81% Pervious Area
	0.270		42.19% Impervious Area

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

Subcatchment 34:



Summary for Subcatchment 40:

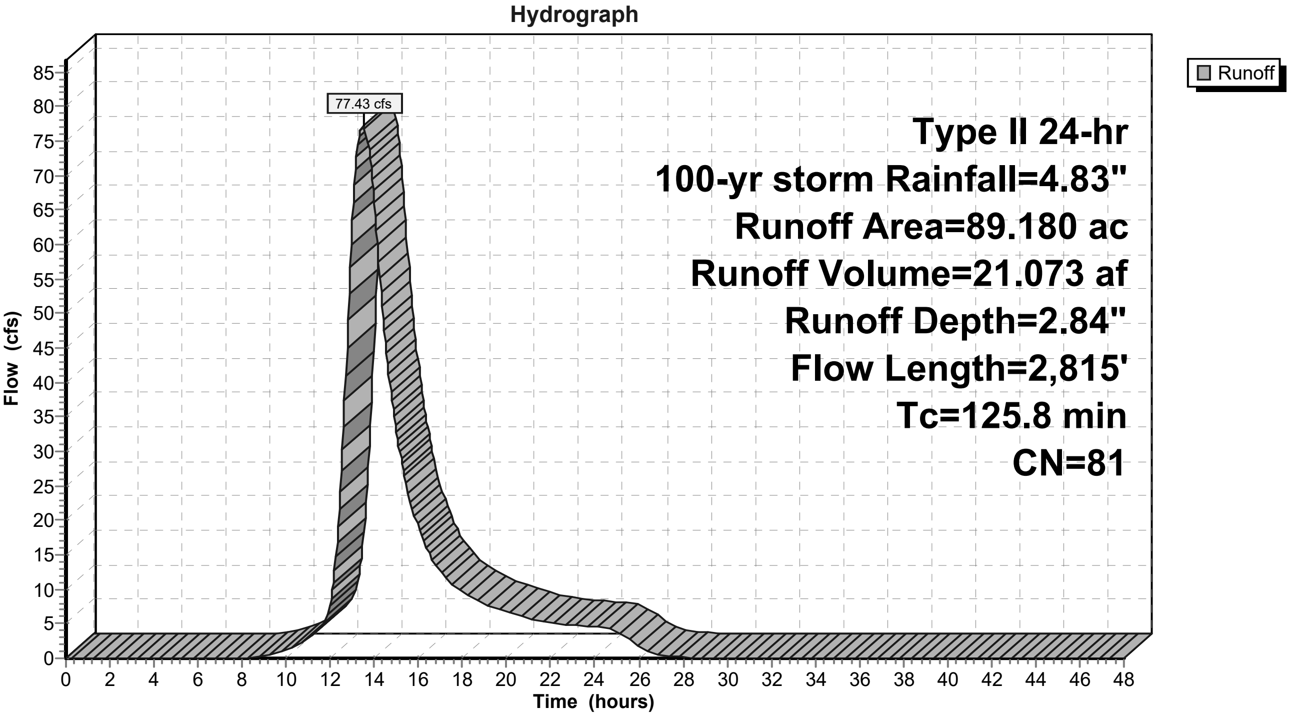
Runoff = 77.43 cfs @ 13.53 hrs, Volume= 21.073 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	2.710	79	50-75% Grass cover, Fair, HSG C
	0.240	73	Woods, Fair, HSG C
	18.540	84	50-75% Grass cover, Fair, HSG D
	43.330	79	Woods, Fair, HSG D
*	0.390	79	50-75% Grass cover, Fair, HSG C (offsite)
*	0.300	73	Woods, Fair, HSG C (offsite)
*	14.170	84	50-75% Grass cover, Fair, HSG D (offsite)
*	9.260	79	Woods, Fair, HSG D (offsite)
*	0.130	98	Paved parking, HSG D (offsite)
*	0.090	98	Roofs, HSG D (offsite)
*	0.020	98	Water Surface, 0% imp, HSG D (offsite)
	89.180	81	Weighted Average
	88.960		99.75% Pervious Area
	0.220		0.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.1	100	0.0070	0.04		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
72.2	1,370	0.0040	0.32		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	91	0.1500	2.71		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
10.1	378	0.0080	0.63		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
2.8	876	0.0160	5.26	57.86	**Channel Flow, E-F** Area= 11.0 sf Perim= 14.3' r= 0.77' n= 0.030 Earth, grassed & winding
125.8	2,815	Total			

Subcatchment 40:



Summary for Subcatchment 41:

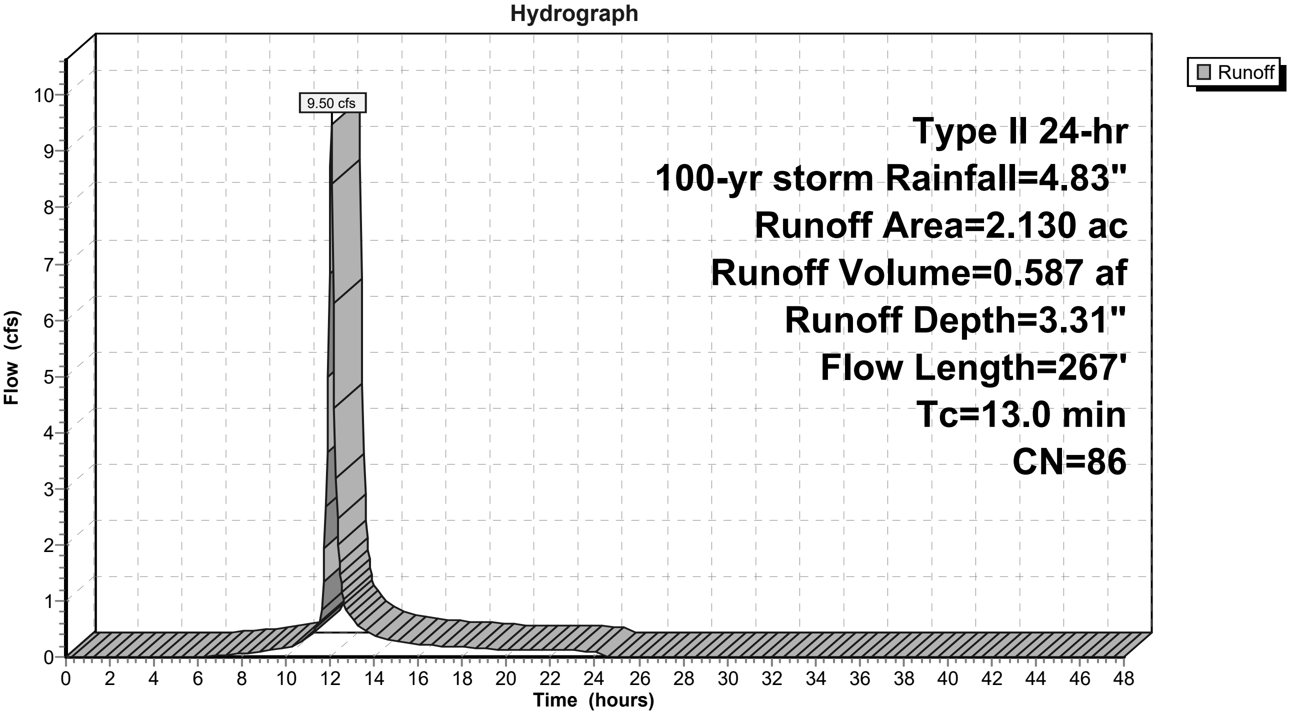
Runoff = 9.50 cfs @ 12.05 hrs, Volume= 0.587 af, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
*	1.430	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.210	98	Paved parking, HSG D (offsite)
*	0.190	98	Roofs, HSG D (offsite)
*	0.260	79	Woods, Fair, HSG D (offsite)
*	0.040	98	Water Surface, 0% imp, HSG D (offsite)
	2.130	86	Weighted Average
	1.730		81.22% Pervious Area
	0.400		18.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0270	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.3	167	0.0300	1.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
13.0	267	Total			

Subcatchment 41:



Summary for Reach 10R: collector creek

Inflow Area = 48.750 ac, 4.88% Impervious, Inflow Depth = 3.02" for 100-yr storm event
Inflow = 127.14 cfs @ 12.24 hrs, Volume= 12.272 af
Outflow = 125.08 cfs @ 12.28 hrs, Volume= 12.272 af, Atten= 2%, Lag= 2.3 min

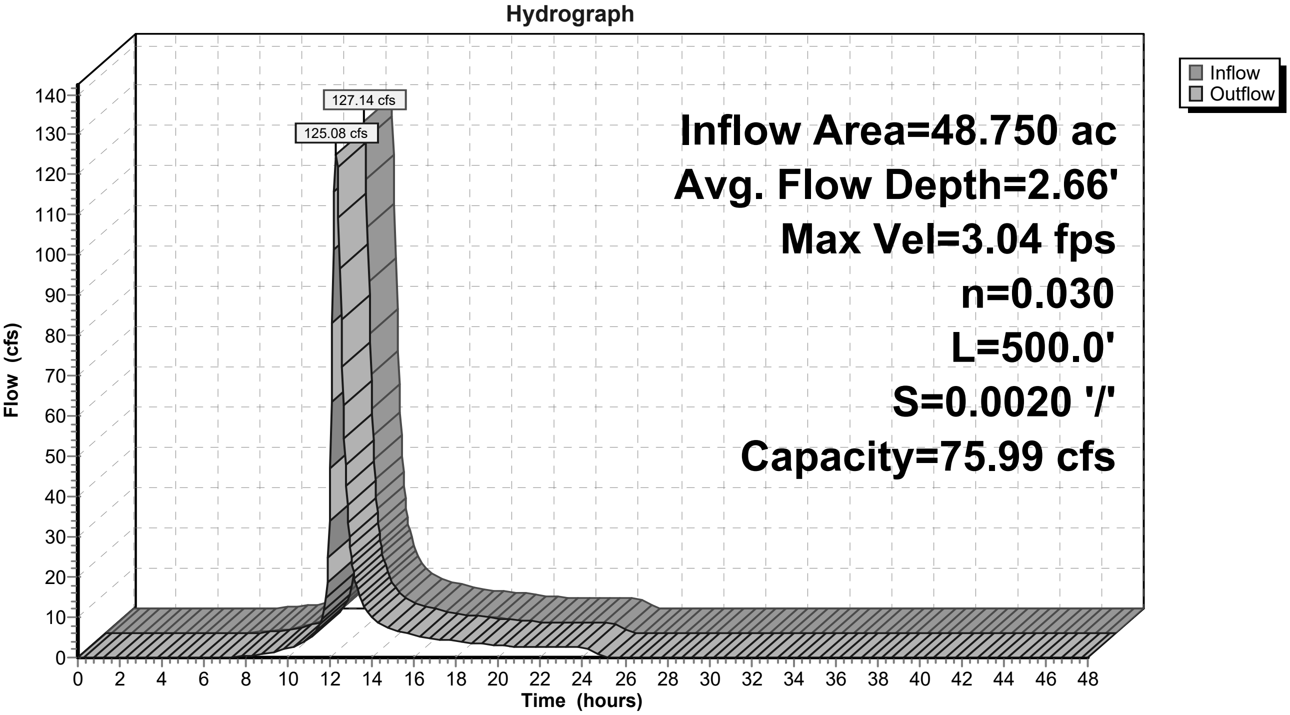
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 3.04 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 10.0 min

Peak Storage= 20,566 cf @ 12.28 hrs
Average Depth at Peak Storage= 2.66'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 75.99 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 500.0' Slope= 0.0020 '/'
Inlet Invert= 584.05', Outlet Invert= 583.05'

‡

Reach 10R: collector creek



Summary for Reach 20R-1: feeder creek

Inflow Area = 127.530 ac, 3.11% Impervious, Inflow Depth = 2.79" for 100-yr storm event
Inflow = 130.06 cfs @ 13.11 hrs, Volume= 29.671 af
Outflow = 125.26 cfs @ 13.33 hrs, Volume= 29.671 af, Atten= 4%, Lag= 12.7 min

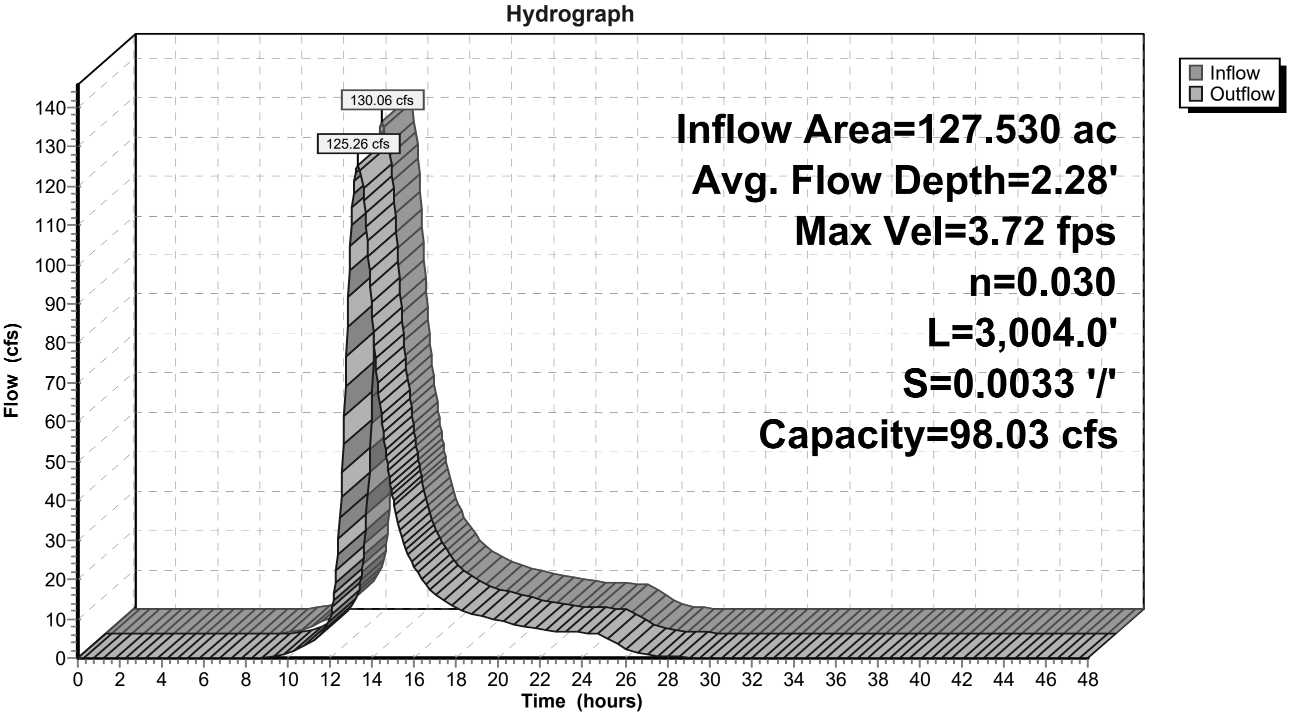
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 3.72 fps, Min. Travel Time= 13.5 min
Avg. Velocity = 0.95 fps, Avg. Travel Time= 52.9 min

Peak Storage= 101,074 cf @ 13.33 hrs
Average Depth at Peak Storage= 2.28'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 98.03 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 3,004.0' Slope= 0.0033 '/'
Inlet Invert= 582.00', Outlet Invert= 572.00'

‡

Reach 20R-1: feeder creek



Summary for Reach 20R-2: feeder creek

Inflow Area = 142.540 ac, 2.78% Impervious, Inflow Depth = 2.79" for 100-yr storm event
Inflow = 134.74 cfs @ 13.33 hrs, Volume= 33.104 af
Outflow = 134.72 cfs @ 13.34 hrs, Volume= 33.104 af, Atten= 0%, Lag= 0.8 min

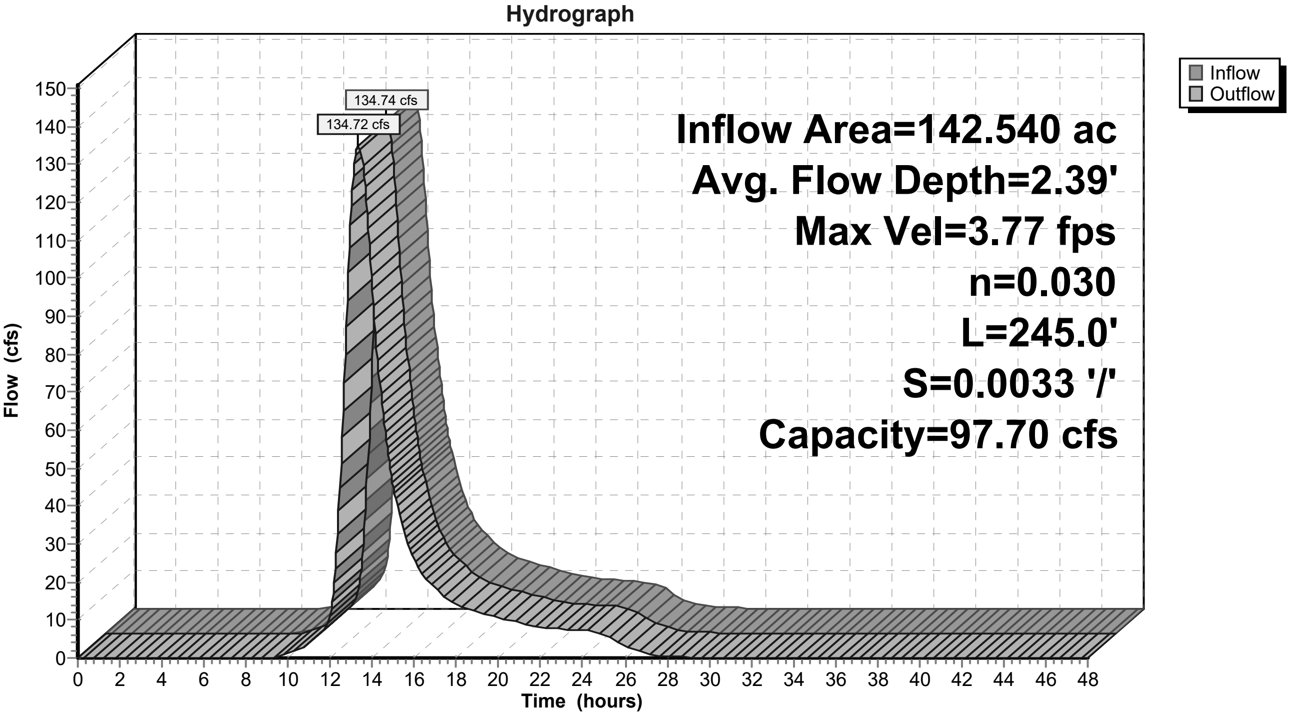
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 3.77 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.99 fps, Avg. Travel Time= 4.1 min

Peak Storage= 8,747 cf @ 13.34 hrs
Average Depth at Peak Storage= 2.39'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 97.70 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 245.0' Slope= 0.0033 '/'
Inlet Invert= 572.00', Outlet Invert= 571.19'

‡

Reach 20R-2: feeder creek



Summary for Reach 22R: property line ditch

Inflow Area = 142.540 ac, 2.78% Impervious, Inflow Depth = 2.79" for 100-yr storm event
Inflow = 135.08 cfs @ 13.27 hrs, Volume= 33.104 af
Outflow = 134.74 cfs @ 13.33 hrs, Volume= 33.104 af, Atten= 0%, Lag= 3.2 min

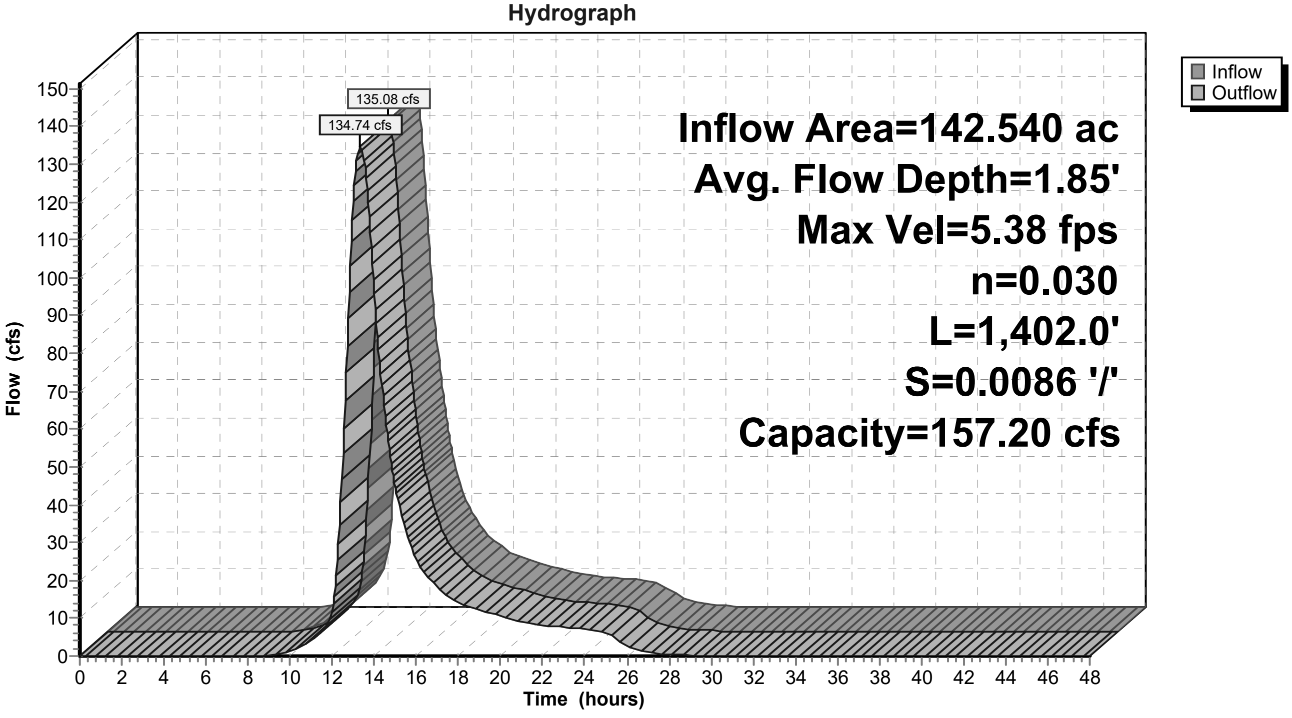
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 5.38 fps, Min. Travel Time= 4.3 min
Avg. Velocity = 1.38 fps, Avg. Travel Time= 17.0 min

Peak Storage= 35,116 cf @ 13.33 hrs
Average Depth at Peak Storage= 1.85'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 157.20 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 1,402.0' Slope= 0.0086 '/'
Inlet Invert= 584.00', Outlet Invert= 572.00'

‡

Reach 22R: property line ditch



Summary for Reach 30R: Long Road ditch

Inflow Area =	164.570 ac,	5.88% Impervious,	Inflow Depth = 2.88"	for 100-yr storm event	
Inflow =	142.74 cfs @	13.38 hrs,	Volume=	39.471 af	
Outflow =	142.70 cfs @	13.40 hrs,	Volume=	39.471 af,	Atten= 0%, Lag= 1.1 min

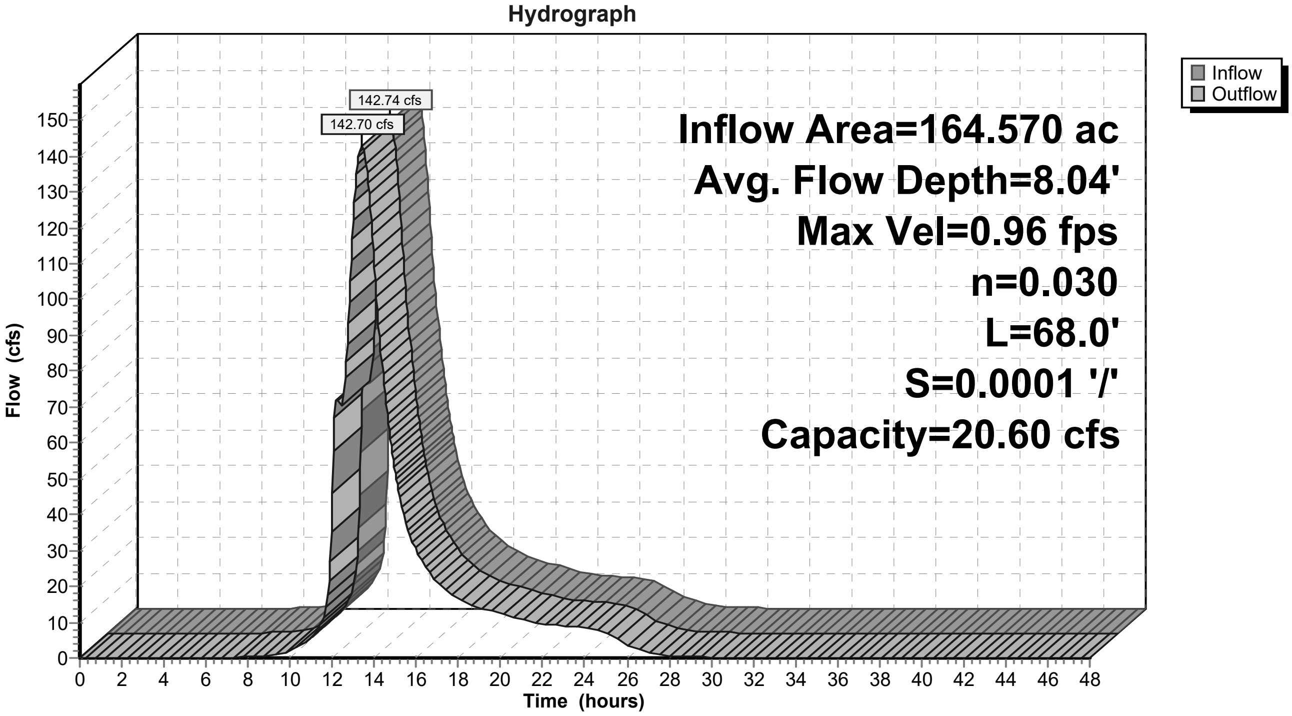
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 0.96 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.32 fps, Avg. Travel Time= 3.5 min

Peak Storage= 10,095 cf @ 13.40 hrs
Average Depth at Peak Storage= 8.04'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 20.60 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 68.0' Slope= 0.0001 '/'
Inlet Invert= 565.46', Outlet Invert= 565.45'

‡

Reach 30R: Long Road ditch



Summary for Reach 31R: Long Road ditch

Inflow Area = 163.190 ac, 5.77% Impervious, Inflow Depth = 2.87" for 100-yr storm event
Inflow = 142.41 cfs @ 13.37 hrs, Volume= 39.096 af
Outflow = 142.41 cfs @ 13.38 hrs, Volume= 39.096 af, Atten= 0%, Lag= 0.4 min

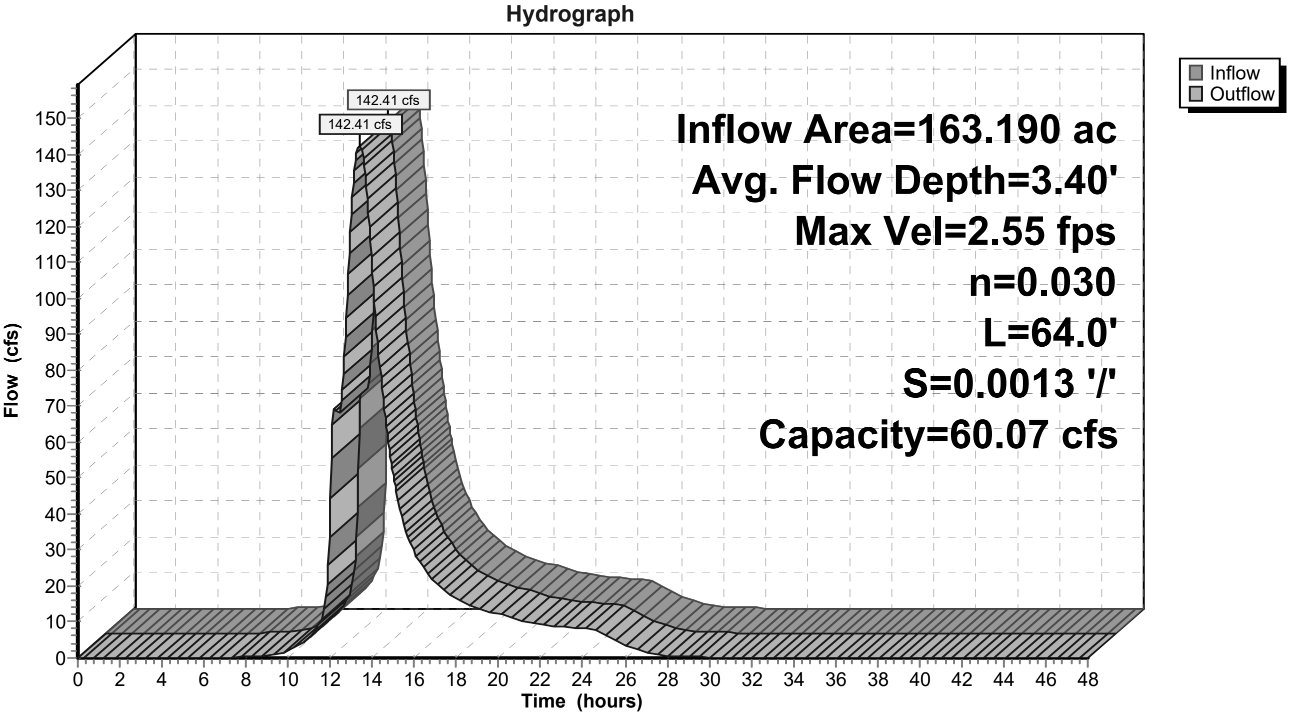
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.55 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.71 fps, Avg. Travel Time= 1.5 min

Peak Storage= 3,575 cf @ 13.38 hrs
Average Depth at Peak Storage= 3.40'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 60.07 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 64.0' Slope= 0.0013 '/'
Inlet Invert= 565.09', Outlet Invert= 565.01'

‡

Reach 31R: Long Road ditch



Summary for Reach 32R: Long Road ditch

Inflow Area = 159.900 ac, 4.80% Impervious, Inflow Depth = 2.86" for 100-yr storm event
Inflow = 141.33 cfs @ 13.37 hrs, Volume= 38.049 af
Outflow = 141.32 cfs @ 13.38 hrs, Volume= 38.049 af, Atten= 0%, Lag= 0.3 min

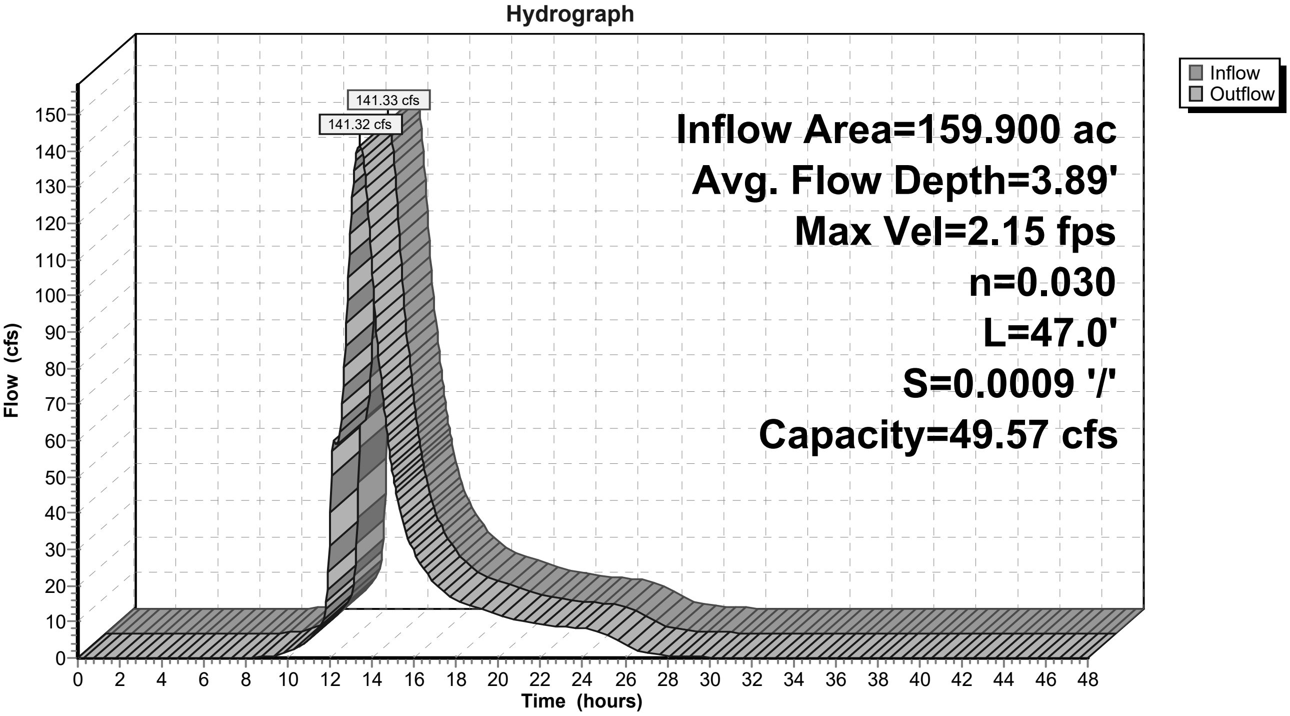
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.15 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 1.3 min

Peak Storage= 3,085 cf @ 13.38 hrs
Average Depth at Peak Storage= 3.89'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 49.57 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 47.0' Slope= 0.0009 '/'
Inlet Invert= 565.64', Outlet Invert= 565.60'

‡

Reach 32R: Long Road ditch



Summary for Reach 33R-1: I-190 ditch

Inflow Area =	16.720 ac,	20.57% Impervious,	Inflow Depth = 3.41"	for 100-yr storm event
Inflow =	94.33 cfs @	11.97 hrs, Volume=	4.748 af	
Outflow =	47.14 cfs @	12.07 hrs, Volume=	4.747 af,	Atten= 50%, Lag= 6.1 min

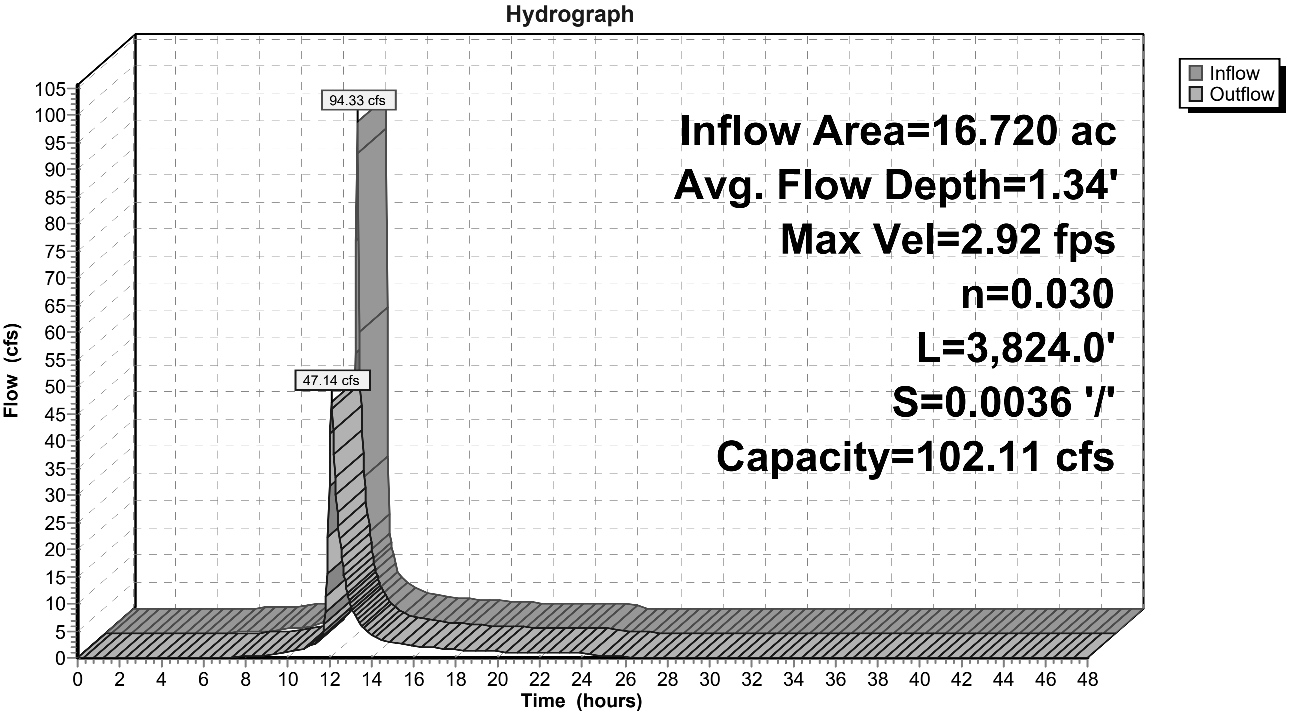
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.92 fps, Min. Travel Time= 21.8 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 115.1 min

Peak Storage= 61,518 cf @ 12.07 hrs
Average Depth at Peak Storage= 1.34'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 102.11 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 3,824.0' Slope= 0.0036 '/'
Inlet Invert= 585.00', Outlet Invert= 571.19'

‡

Reach 33R-1: I-190 ditch



Summary for Reach 33R-2: I-190 ditch

Inflow Area = 159.260 ac, 4.65% Impervious, Inflow Depth = 2.85" for 100-yr storm event
Inflow = 141.35 cfs @ 13.32 hrs, Volume= 37.852 af
Outflow = 141.26 cfs @ 13.34 hrs, Volume= 37.852 af, Atten= 0%, Lag= 1.7 min

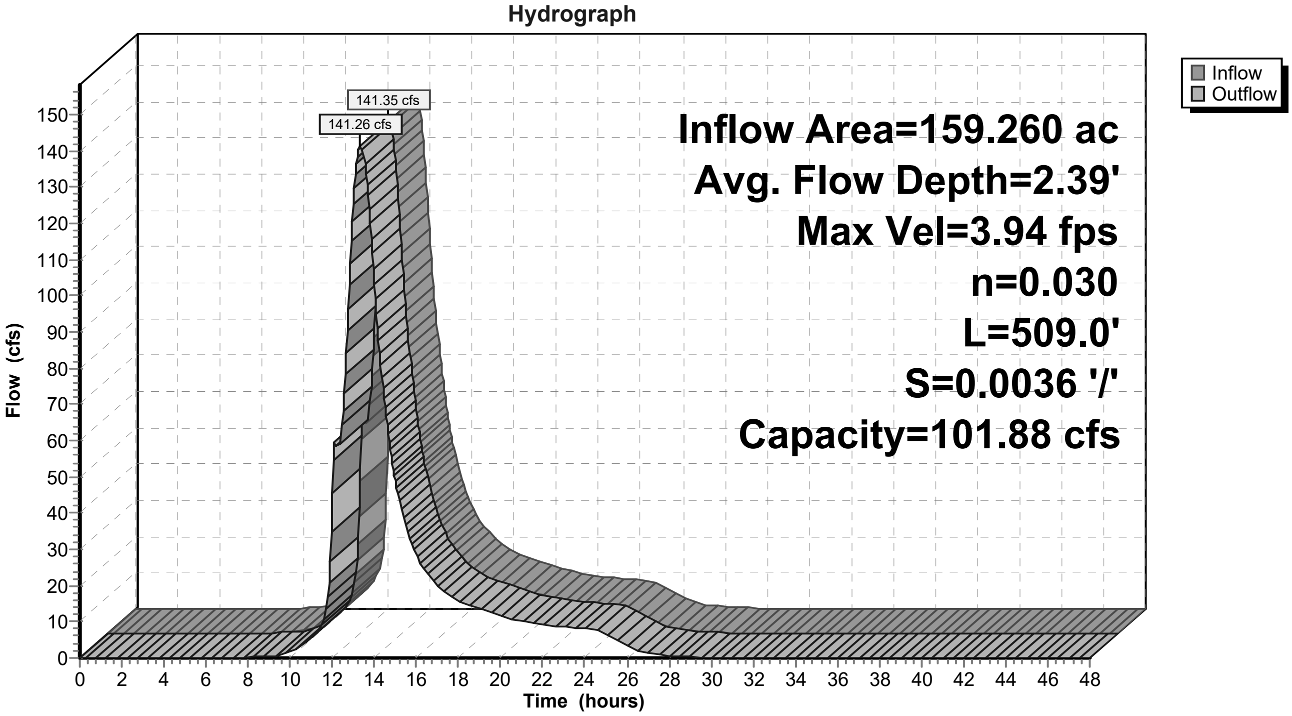
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 3.94 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 8.2 min

Peak Storage= 18,251 cf @ 13.34 hrs
Average Depth at Peak Storage= 2.39'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 101.88 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 509.0' Slope= 0.0036 '/'
Inlet Invert= 571.19', Outlet Invert= 569.36'

‡

Reach 33R-2: I-190 ditch



Summary for Reach 33R-3: Long Road ditch

Inflow Area = 159.900 ac, 4.80% Impervious, Inflow Depth = 2.86" for 100-yr storm event
Inflow = 141.47 cfs @ 13.32 hrs, Volume= 38.049 af
Outflow = 141.33 cfs @ 13.37 hrs, Volume= 38.049 af, Atten= 0%, Lag= 3.0 min

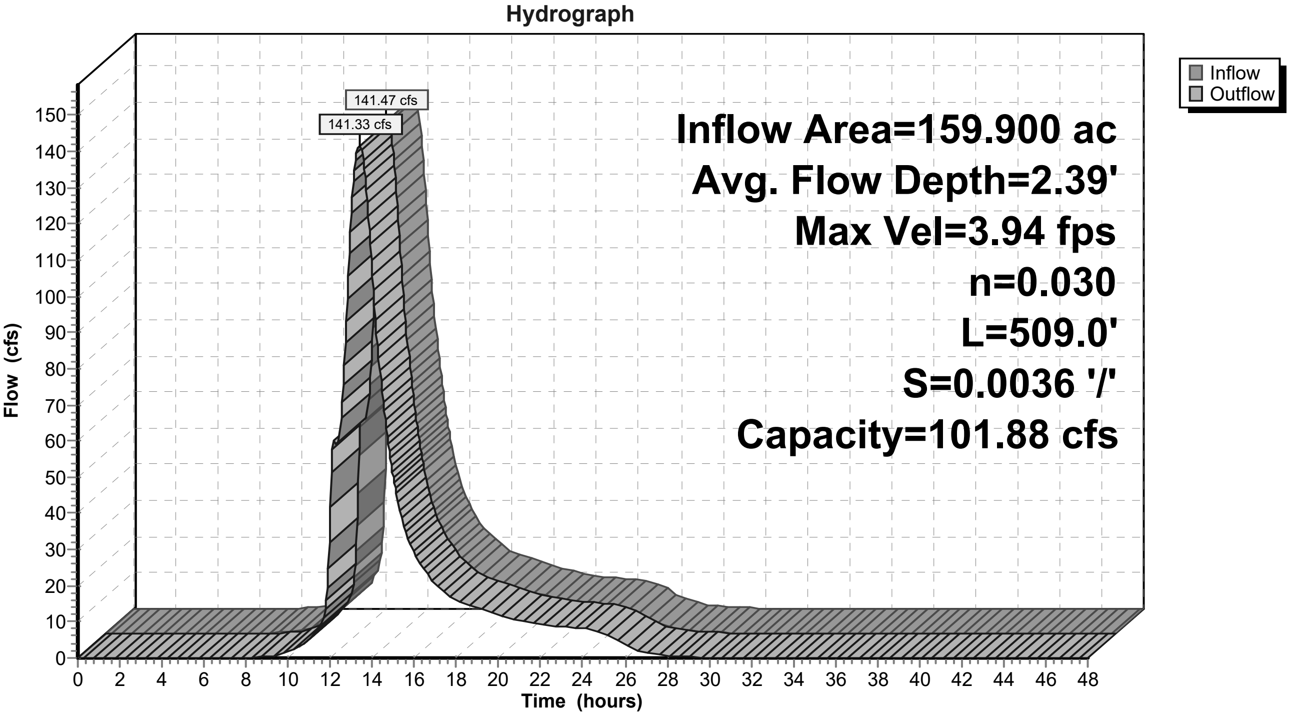
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 3.94 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.02 fps, Avg. Travel Time= 8.3 min

Peak Storage= 18,258 cf @ 13.37 hrs
Average Depth at Peak Storage= 2.39'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 101.88 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 509.0' Slope= 0.0036 '/'
Inlet Invert= 571.19', Outlet Invert= 569.36'

‡

Reach 33R-3: Long Road ditch



Summary for Reach 40R: Long Road ditch

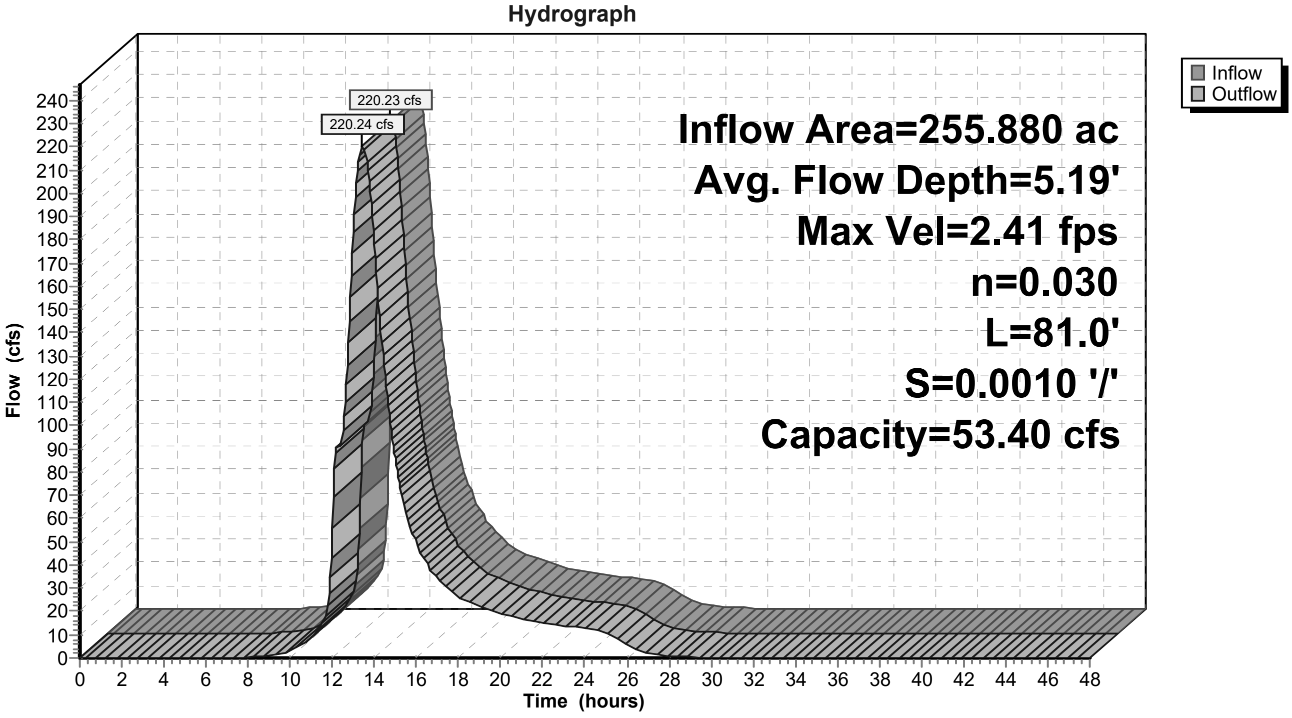
Inflow Area =	255.880 ac,	4.03% Impervious,	Inflow Depth = 2.87"	for 100-yr storm event	
Inflow =	220.23 cfs @	13.43 hrs,	Volume=	61.131 af	
Outflow =	220.24 cfs @	13.44 hrs,	Volume=	61.131 af,	Atten= 0%, Lag= 0.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.41 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.73 fps, Avg. Travel Time= 1.9 min

Peak Storage= 7,413 cf @ 13.44 hrs
Average Depth at Peak Storage= 5.19'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 53.40 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 81.0' Slope= 0.0010 '/'
Inlet Invert= 564.47', Outlet Invert= 564.39'

Reach 40R: Long Road ditch



Summary for Reach 41R-1: Long Road ditch

Inflow Area = 164.570 ac, 5.88% Impervious, Inflow Depth = 2.88" for 100-yr storm event
Inflow = 142.70 cfs @ 13.40 hrs, Volume= 39.471 af
Outflow = 142.70 cfs @ 13.40 hrs, Volume= 39.471 af, Atten= 0%, Lag= 0.2 min

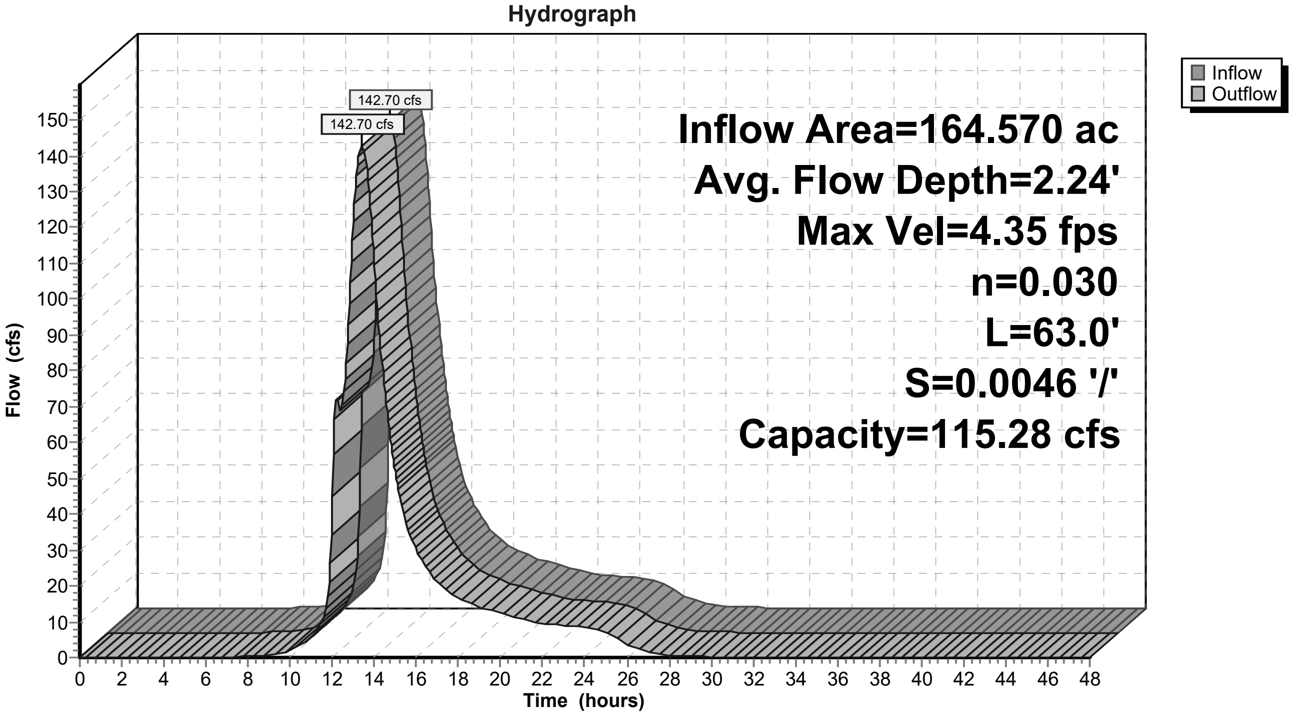
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 4.35 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.13 fps, Avg. Travel Time= 0.9 min

Peak Storage= 2,069 cf @ 13.40 hrs
Average Depth at Peak Storage= 2.24'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 115.28 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 63.0' Slope= 0.0046 '/'
Inlet Invert= 564.87', Outlet Invert= 564.58'

‡

Reach 41R-1: Long Road ditch



Summary for Reach 41R-2: Long Road ditch

Inflow Area = 166.700 ac, 6.05% Impervious, Inflow Depth = 2.88" for 100-yr storm event
Inflow = 143.21 cfs @ 13.40 hrs, Volume= 40.058 af
Outflow = 143.19 cfs @ 13.41 hrs, Volume= 40.058 af, Atten= 0%, Lag= 0.8 min

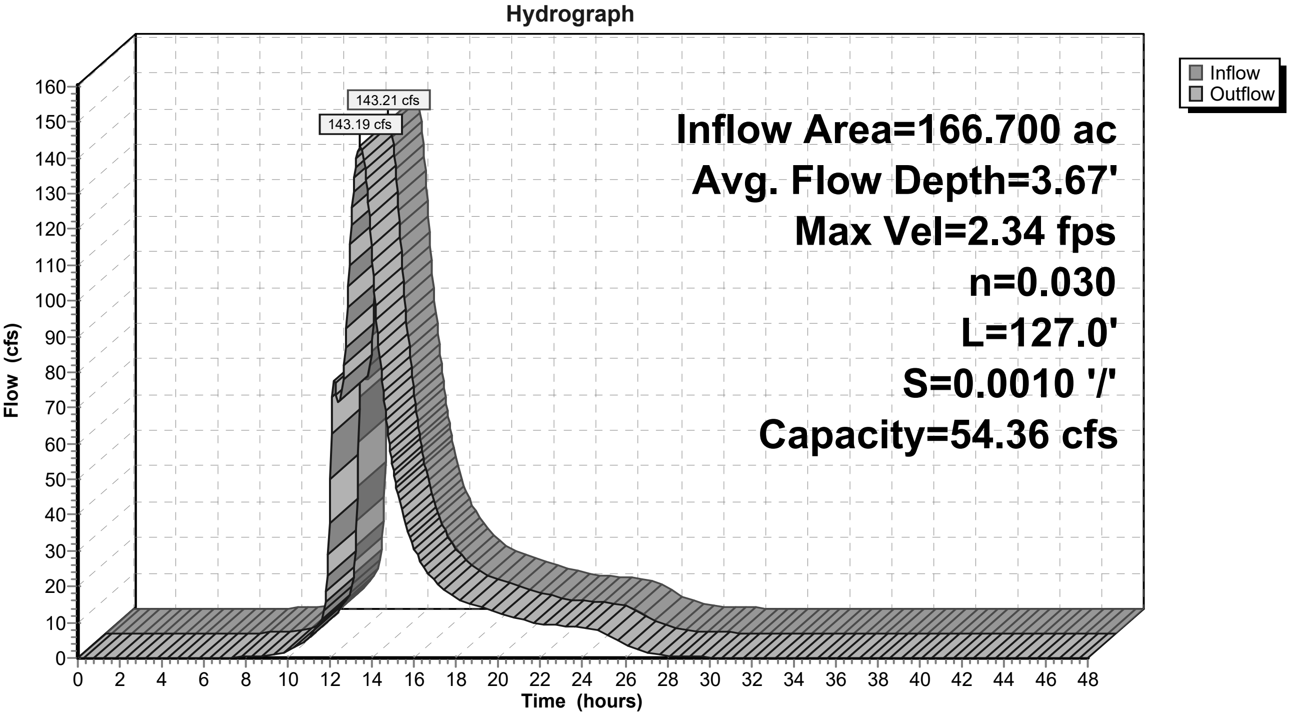
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.34 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 3.2 min

Peak Storage= 7,775 cf @ 13.41 hrs
Average Depth at Peak Storage= 3.67'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 54.36 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 127.0' Slope= 0.0010 '/'
Inlet Invert= 564.66', Outlet Invert= 564.53'

‡

Reach 41R-2: Long Road ditch

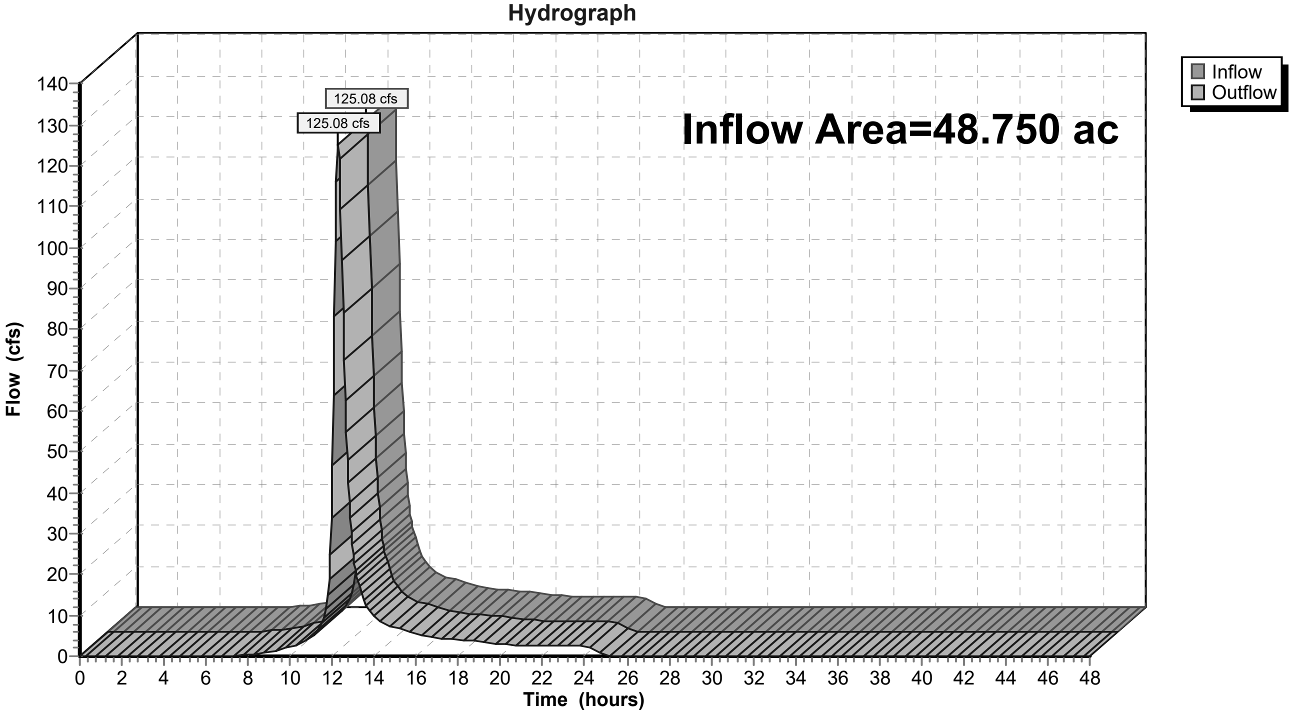


Summary for Reach DP-1: collector creek north of Bedell Road

```
Inflow Area =      48.750 ac,   4.88% Impervious,  Inflow Depth =   3.02"    for  100-yr storm event
Inflow      =     125.08 cfs @   12.28 hrs,  Volume=          12.272 af
Outflow     =     125.08 cfs @   12.28 hrs,  Volume=          12.272 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-1: collector creek north of Bedell Road

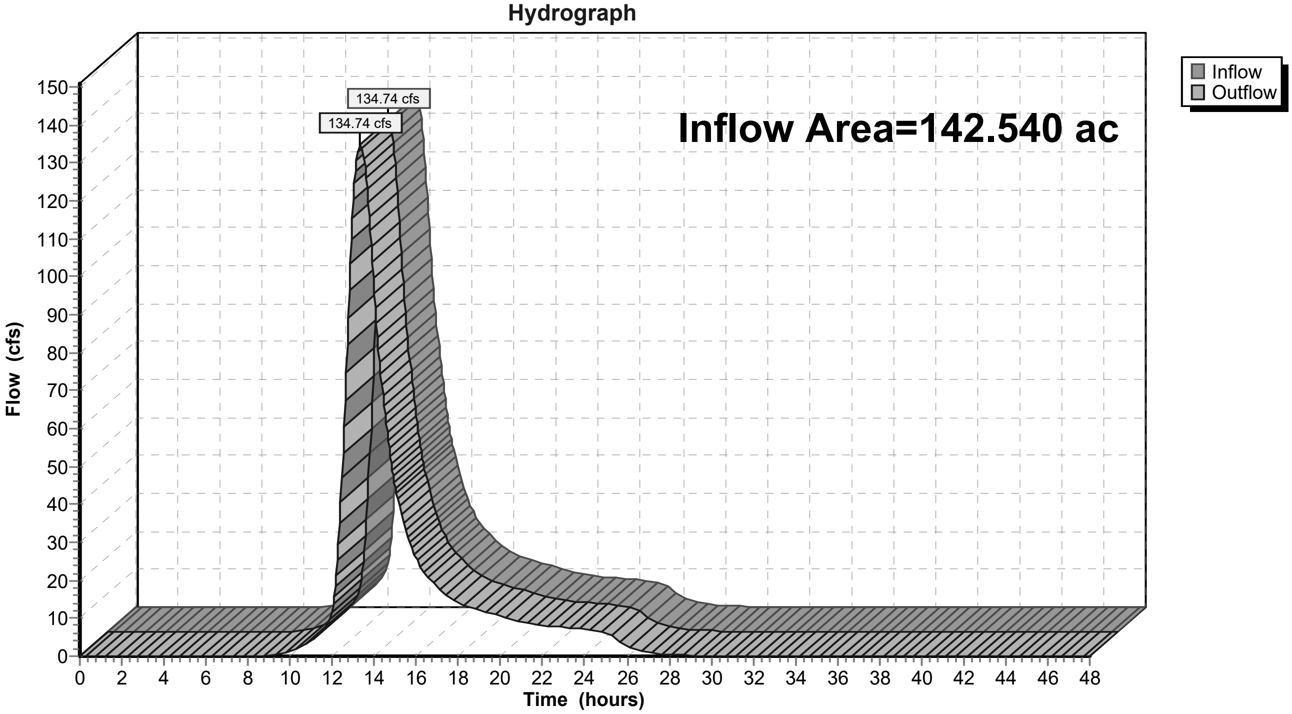


Summary for Reach DP-2: feeder creek on property portion

```
Inflow Area =       142.540 ac,    2.78% Impervious,  Inflow Depth =   2.79"    for  100-yr storm event
Inflow       =     134.74 cfs @   13.33 hrs,  Volume=          33.104 af
Outflow      =     134.74 cfs @   13.33 hrs,  Volume=          33.104 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-2: feeder creek on property portion

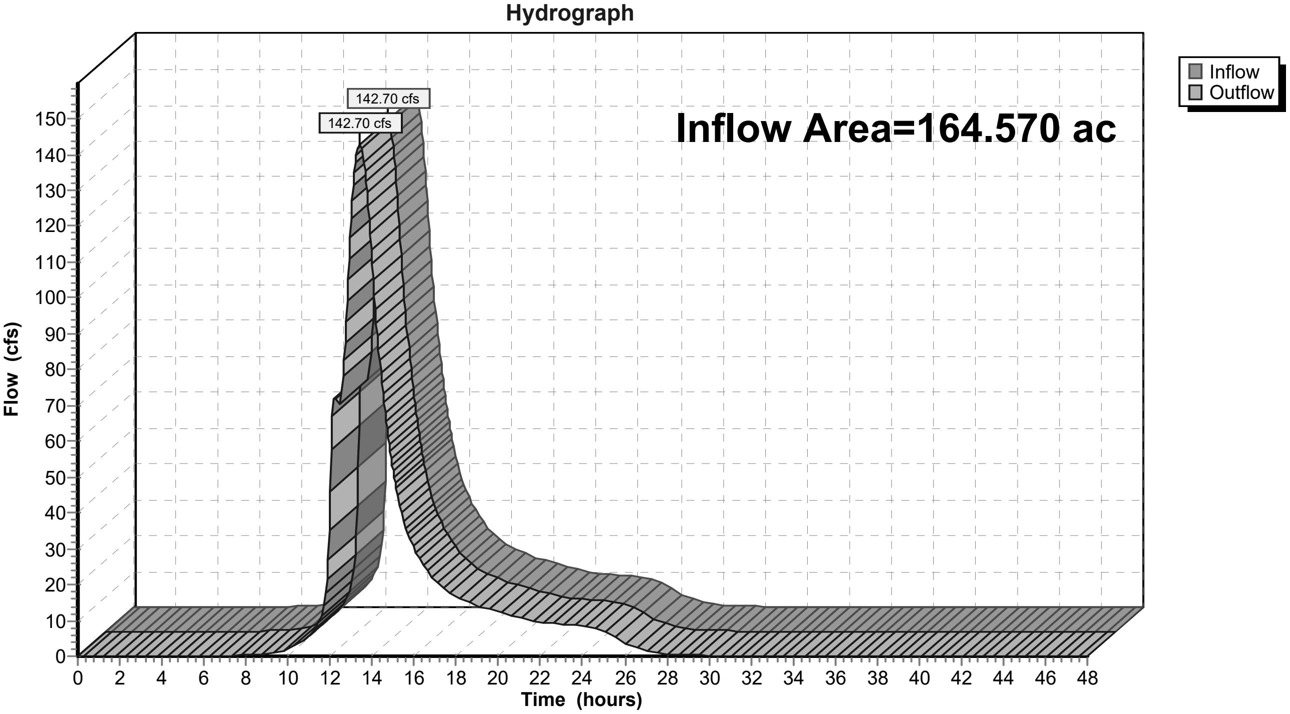


Summary for Reach DP-3: entrance to twin 36" culverts on adjancent property

```
Inflow Area =      164.570 ac,    5.88% Impervious,  Inflow Depth =   2.88"    for  100-yr storm event
Inflow       =     142.70 cfs @   13.40 hrs,  Volume=          39.471 af
Outflow      =     142.70 cfs @   13.40 hrs,  Volume=          39.471 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-3: entrance to twin 36" culverts on adjancent property

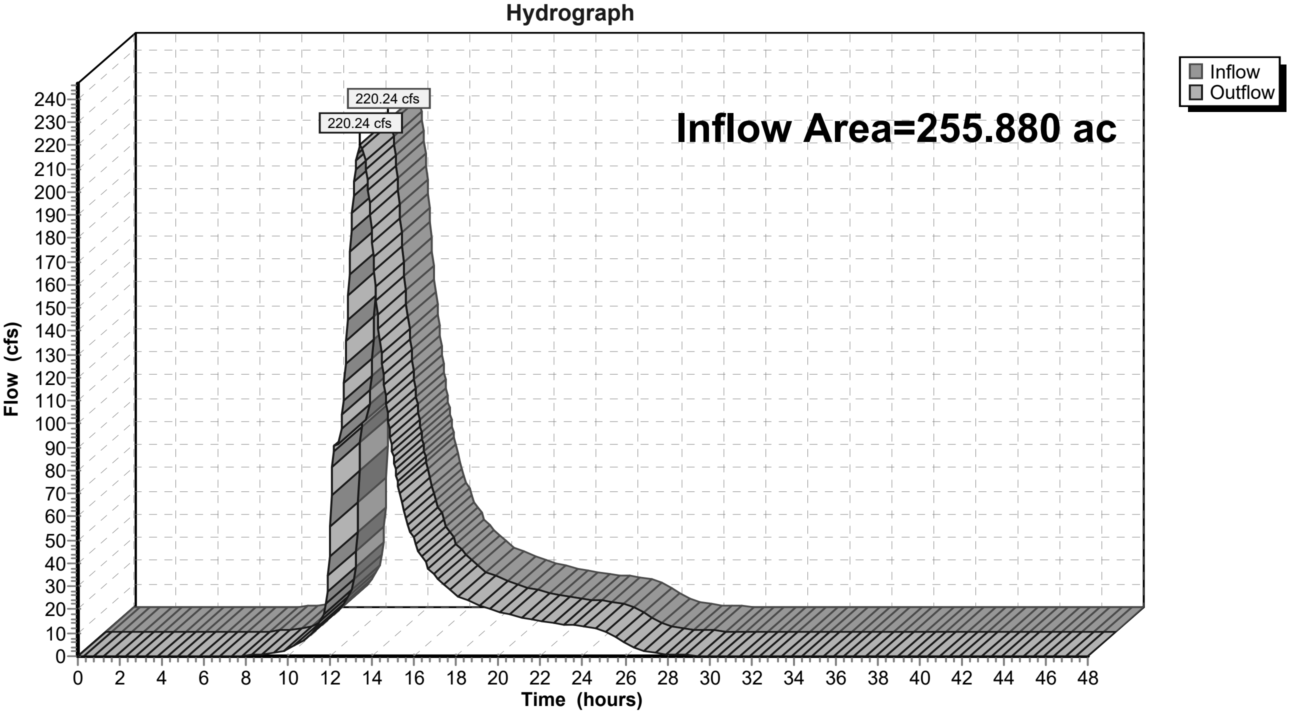


Summary for Reach DP-4: entrance to headwall

Inflow Area = 255.880 ac, 4.03% Impervious, Inflow Depth = 2.87" for 100-yr storm event
Inflow = 220.24 cfs @ 13.44 hrs, Volume= 61.131 af
Outflow = 220.24 cfs @ 13.44 hrs, Volume= 61.131 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-4: entrance to headwall



Summary for Pond 21P: pond

```
Inflow Area =        3.440 ac,   0.00% Impervious,  Inflow Depth =  3.02"    for  100-yr storm event
Inflow      =       11.67 cfs @  12.12 hrs,  Volume=           0.866 af
Outflow     =        1.12 cfs @  13.01 hrs,  Volume=           0.348 af,  Atten= 90%,  Lag= 53.3 min
Primary     =        1.12 cfs @  13.01 hrs,  Volume=           0.348 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 586.73' @ 13.01 hrs Surf.Area= 34,975 sf Storage= 23,509 cf
Flood Elev= 587.00' Surf.Area= 36,973 sf Storage= 33,304 cf

Plug-Flow detention time= 306.6 min calculated for 0.348 af (40% of inflow)
Center-of-Mass det. time= 183.7 min (1,007.9 - 824.2)

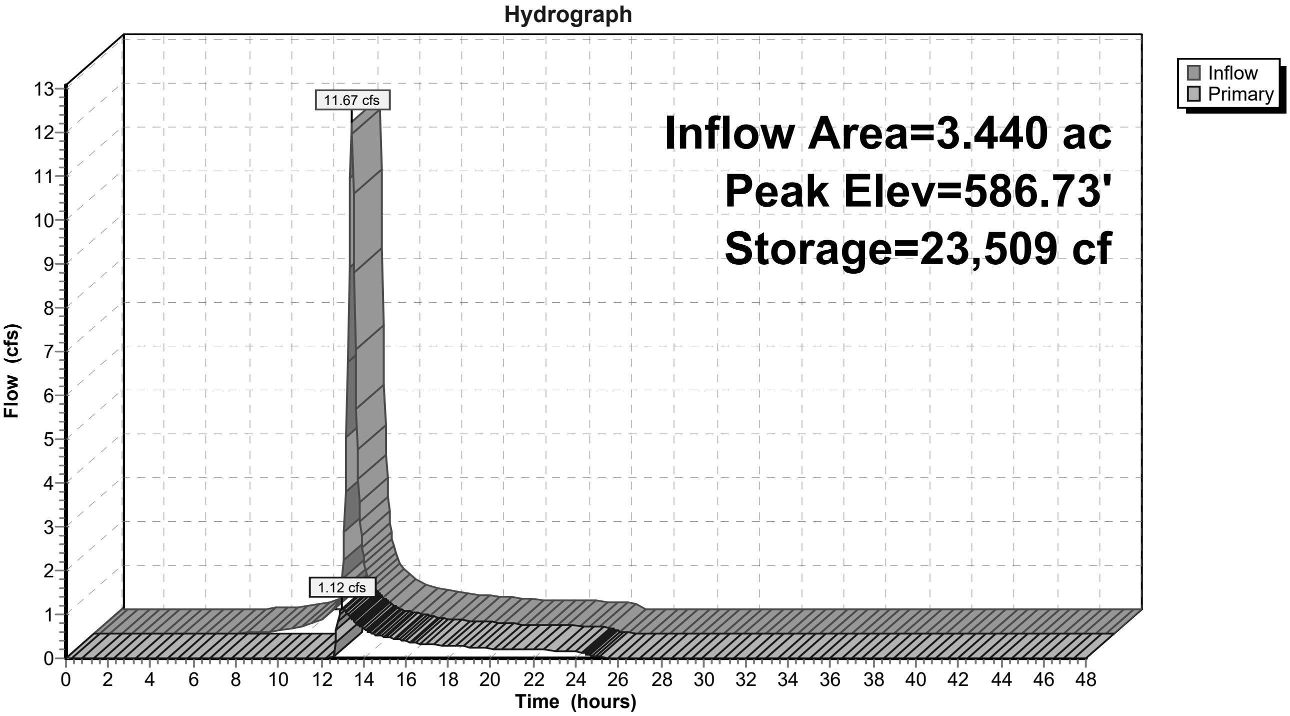
Volume	Invert	Avail.Storage	Storage Description
#1	586.00'	33,304 cf	**pond (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
586.00	29,634	0	0
587.00	36,973	33,304	33,304

Device	Routing	Invert	Outlet Devices
#1	Primary	586.70'	**100.0' long x 8.0' breadth overflow weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=1.12 cfs @ 13.01 hrs HW=586.73' TW=584.13' (Dynamic Tailwater)
↑—**1=overflow weir** (Weir Controls 1.12 cfs @ 0.40 fps)

Pond 21P: pond



Summary for Pond 30C: twin 36" culverts

```
Inflow Area =      164.570 ac,   5.88% Impervious,  Inflow Depth =   2.88"    for  100-yr storm event
Inflow       =     142.70 cfs @   13.40 hrs,  Volume=           39.471 af
Outflow      =     142.70 cfs @   13.40 hrs,  Volume=           39.471 af,  Atten= 0%,  Lag= 0.0 min
Primary      =      71.77 cfs @   13.40 hrs,  Volume=           22.817 af
Secondary =         70.92 cfs @   13.40 hrs,  Volume=           16.654 af
```

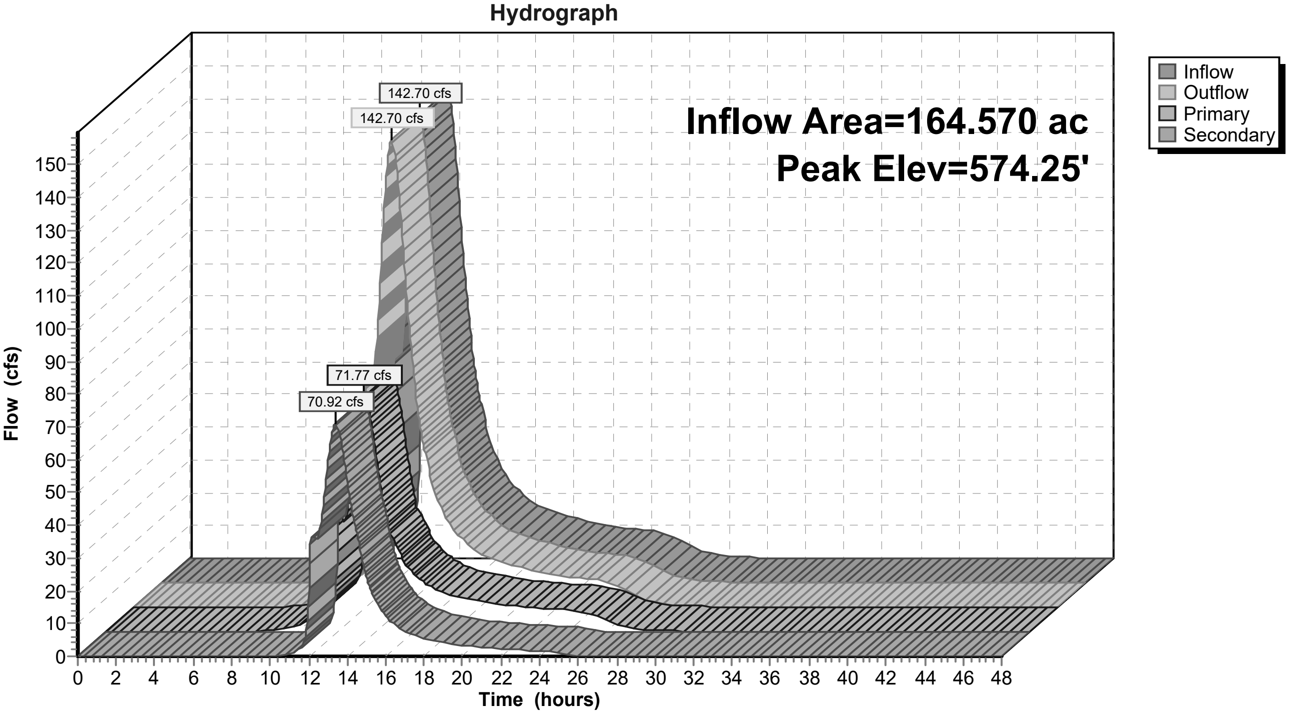
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 574.25' @ 13.40 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.97'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.76' / 564.97' S= -0.0035 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	565.78'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.78' / 564.87' S= 0.0152 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=71.76 cfs @ 13.40 hrs HW=574.25' TW=567.11' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 71.76 cfs @ 10.15 fps)

Secondary OutFlow Max=70.92 cfs @ 13.40 hrs HW=574.25' TW=567.11' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 70.92 cfs @ 10.03 fps)

Pond 30C: twin 36" culverts



Summary for Pond 31C: twin 36" culverts

Inflow Area = 163.930 ac, 5.86% Impervious, Inflow Depth = 2.88" for 100-yr storm event
Inflow = 142.59 cfs @ 13.38 hrs, Volume= 39.300 af
Outflow = 142.59 cfs @ 13.38 hrs, Volume= 39.300 af, Atten= 0%, Lag= 0.0 min
Primary = 71.29 cfs @ 13.38 hrs, Volume= 19.493 af
Secondary = 71.29 cfs @ 13.38 hrs, Volume= 19.807 af

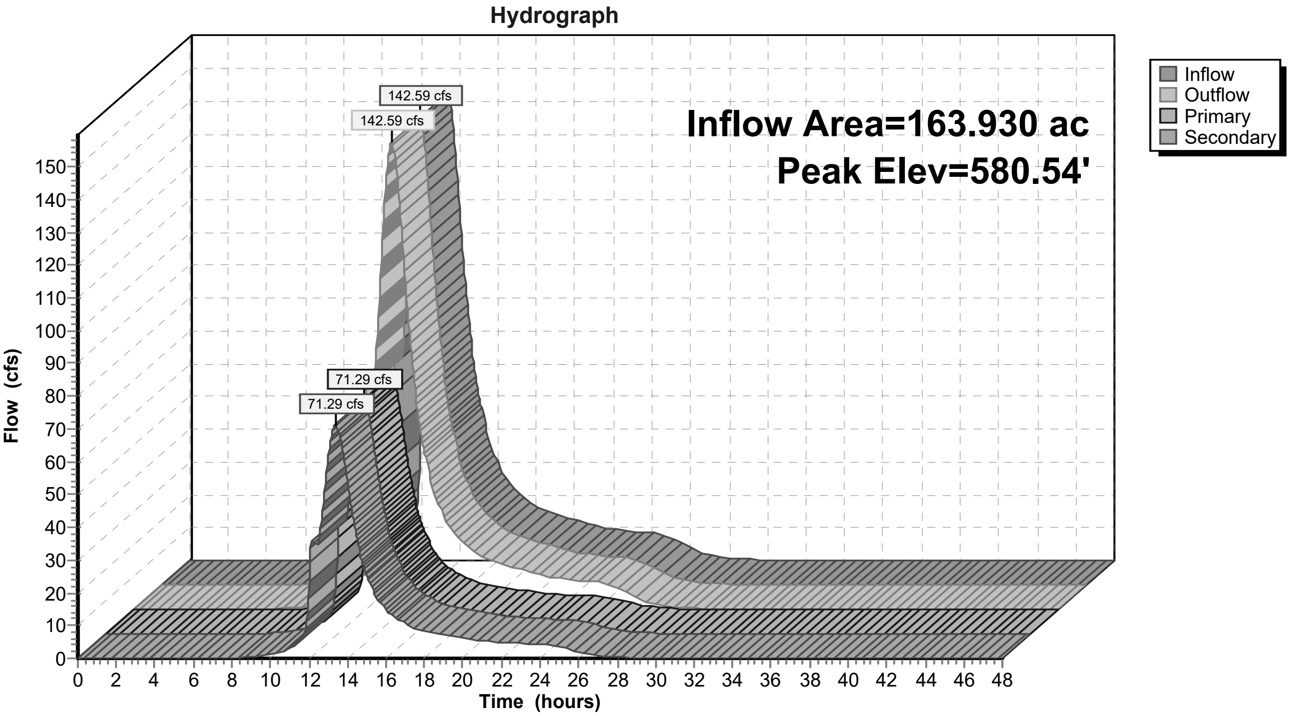
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 580.54' @ 13.38 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	565.46'	**36.0" Round Culvert** L= 41.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.99' / 565.46' S= -0.0115 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	565.40'	**36.0" Round Culvert** L= 41.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.01' / 565.40' S= -0.0095 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=71.26 cfs @ 13.38 hrs HW=580.53' TW=573.50' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 71.26 cfs @ 10.08 fps)

Secondary OutFlow Max=71.26 cfs @ 13.38 hrs HW=580.53' TW=573.50' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 71.26 cfs @ 10.08 fps)

Pond 31C: twin 36" culverts



Summary for Pond 32C: twin 36" culverts

```
Inflow Area =      163.190 ac,   5.77% Impervious,  Inflow Depth =   2.87"    for  100-yr storm event
Inflow       =     142.41 cfs @   13.37 hrs,  Volume=          39.096 af
Outflow      =     142.41 cfs @   13.37 hrs,  Volume=          39.096 af,  Atten= 0%,  Lag= 0.0 min
Primary      =      71.21 cfs @   13.37 hrs,  Volume=          19.620 af
Secondary =         71.21 cfs @   13.37 hrs,  Volume=          19.475 af
```

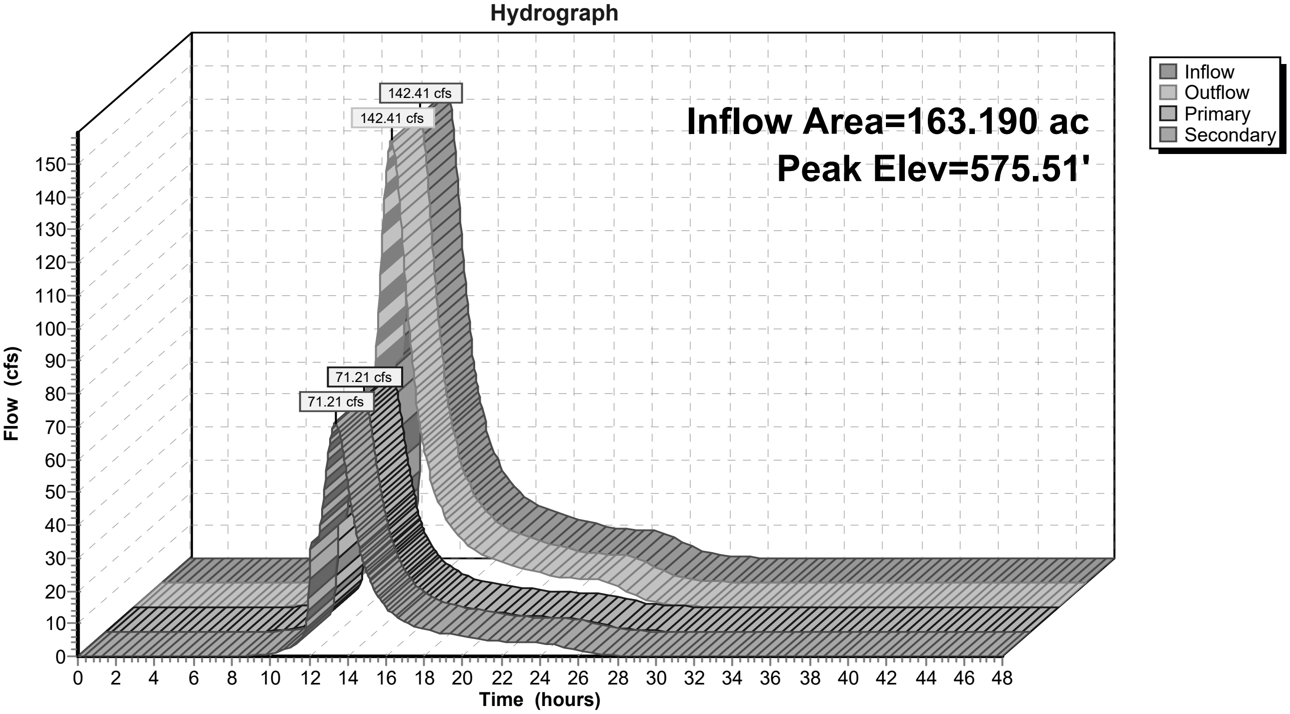
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 575.51' @ 13.37 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	565.68'	**36.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.68' / 565.25' S= 0.0055 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#2	Secondary	565.73'	**36.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.73' / 565.09' S= 0.0082 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=71.17 cfs @ 13.37 hrs HW=575.50' TW=568.49' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 71.17 cfs @ 10.07 fps)

Secondary OutFlow Max=71.17 cfs @ 13.37 hrs HW=575.50' TW=568.49' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 71.17 cfs @ 10.07 fps)

Pond 32C: twin 36" culverts



Summary for Pond 33C: twin 30" culverts

Inflow Area = 159.900 ac, 4.80% Impervious, Inflow Depth = 2.86" for 100-yr storm event
Inflow = 141.33 cfs @ 13.37 hrs, Volume= 38.049 af
Outflow = 141.33 cfs @ 13.37 hrs, Volume= 38.049 af, Atten= 0%, Lag= 0.0 min
Primary = 70.66 cfs @ 13.37 hrs, Volume= 19.003 af
Secondary = 70.66 cfs @ 13.37 hrs, Volume= 19.046 af

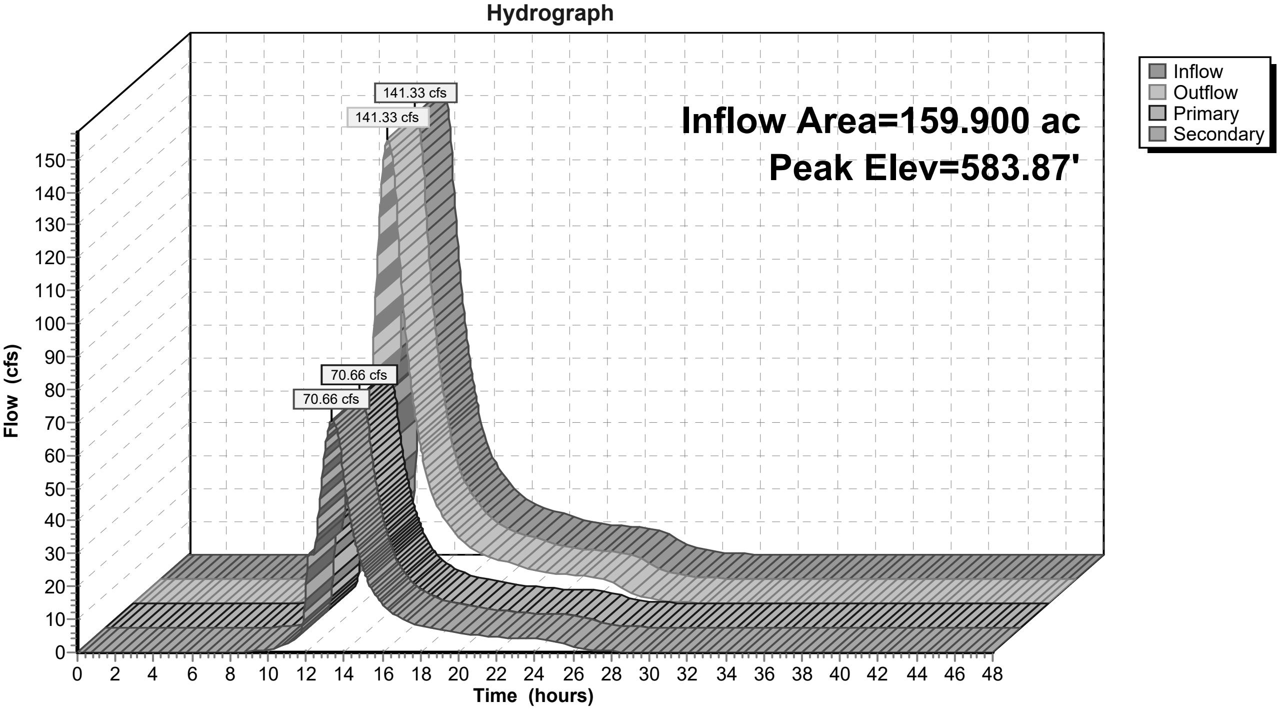
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 583.87' @ 13.37 hrs
Flood Elev= 571.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	565.70'	**30.0" Round Culvert** L= 140.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.70' / 565.64' S= 0.0004 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Secondary	565.65'	**30.0" Round Culvert** L= 140.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.64' / 565.65' S= -0.0001 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=70.62 cfs @ 13.37 hrs HW=583.85' TW=569.53' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 70.62 cfs @ 14.39 fps)

Secondary OutFlow Max=70.62 cfs @ 13.37 hrs HW=583.85' TW=569.53' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 70.62 cfs @ 14.39 fps)

Pond 33C: twin 30" culverts



Summary for Pond 34C: twin 36" culverts

Inflow Area = 0.640 ac, 42.19% Impervious, Inflow Depth = 3.71" for 100-yr storm event
Inflow = 3.85 cfs @ 11.96 hrs, Volume= 0.198 af
Outflow = 3.82 cfs @ 11.97 hrs, Volume= 0.198 af, Atten= 1%, Lag= 0.1 min
Primary = 1.91 cfs @ 11.97 hrs, Volume= 0.099 af
Secondary = 1.91 cfs @ 11.97 hrs, Volume= 0.099 af

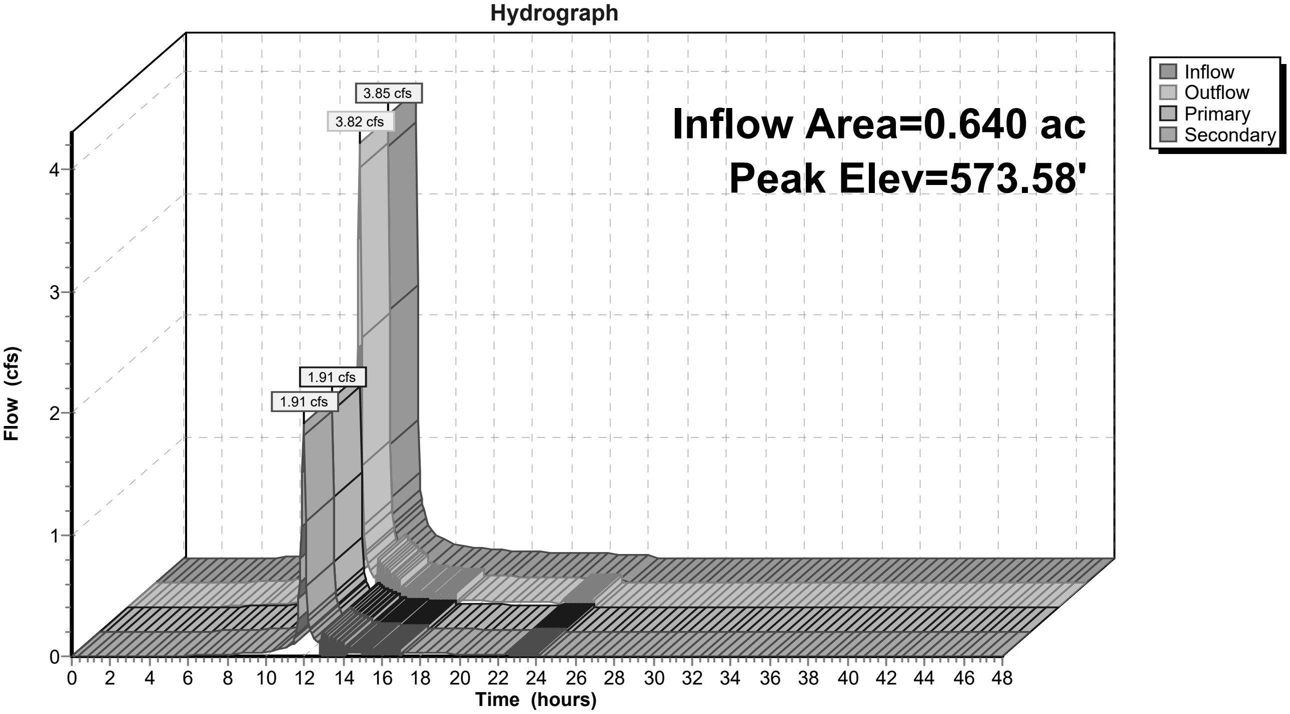
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 573.58' @ 13.40 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	567.07'	**36.0" Round Culvert** L= 91.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 567.07' / 566.90' S= 0.0019 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#2	Secondary	567.17'	**36.0" Round Culvert** L= 91.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 567.17' / 566.89' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=1.86 cfs @ 11.97 hrs HW=572.34' TW=572.33' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.86 cfs @ 0.26 fps)

Secondary OutFlow Max=1.86 cfs @ 11.97 hrs HW=572.34' TW=572.33' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 1.86 cfs @ 0.26 fps)

Pond 34C: twin 36" culverts



Summary for Pond 41C-1: twin 36" culverts

Inflow Area = 164.570 ac, 5.88% Impervious, Inflow Depth = 2.88" for 100-yr storm event
Inflow = 142.70 cfs @ 13.40 hrs, Volume= 39.471 af
Outflow = 142.70 cfs @ 13.40 hrs, Volume= 39.471 af, Atten= 0%, Lag= 0.0 min
Primary = 71.35 cfs @ 13.40 hrs, Volume= 20.095 af
Secondary = 71.35 cfs @ 13.40 hrs, Volume= 19.375 af

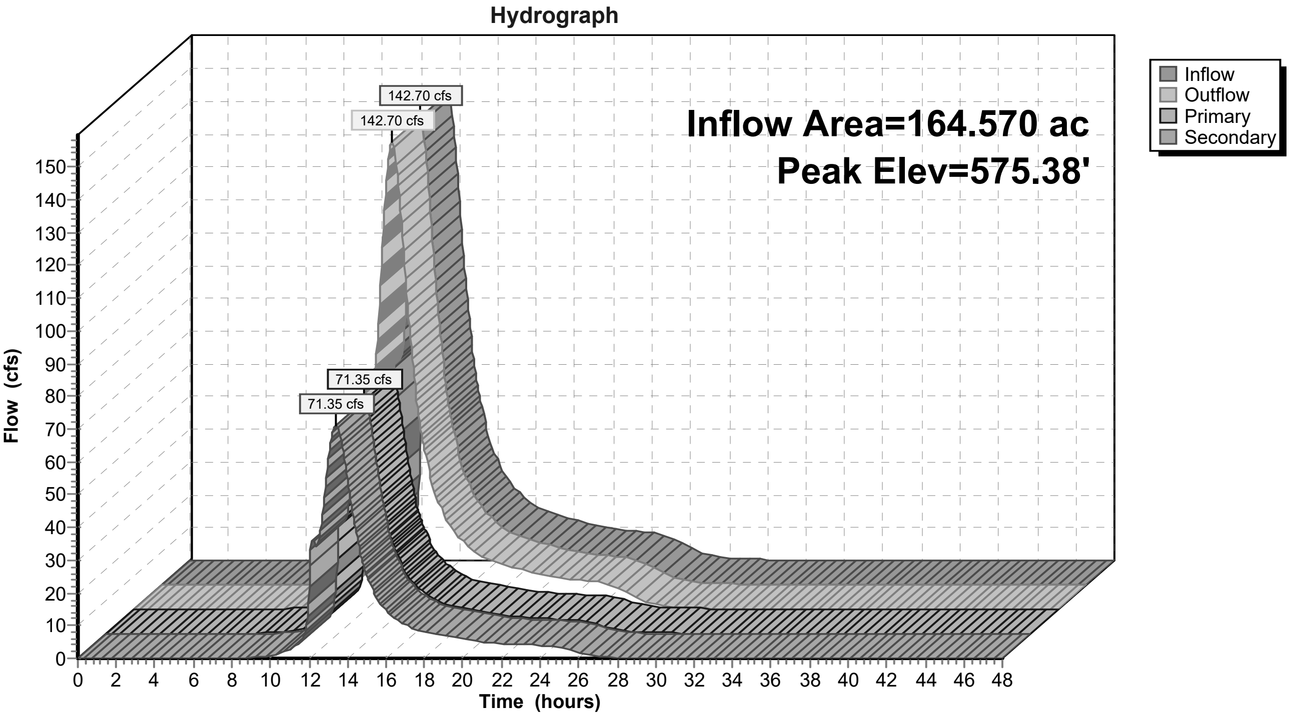
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 575.38' @ 13.40 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.66'	**36.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.58' / 564.66' S= -0.0027 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	564.87'	**36.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.63' / 564.87' S= -0.0080 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=71.35 cfs @ 13.40 hrs HW=575.38' TW=568.33' (Dynamic Tailwater)
↰**1=Culvert** (Inlet Controls 71.35 cfs @ 10.09 fps)

Secondary OutFlow Max=71.35 cfs @ 13.40 hrs HW=575.38' TW=568.33' (Dynamic Tailwater)
↰**2=Culvert** (Inlet Controls 71.35 cfs @ 10.09 fps)

Pond 41C-1: twin 36" culverts



Summary for Pond 41C-2: twin 36" culverts

Inflow Area = 166.700 ac, 6.05% Impervious, Inflow Depth = 2.88" for 100-yr storm event
Inflow = 143.19 cfs @ 13.41 hrs, Volume= 40.058 af
Outflow = 143.19 cfs @ 13.41 hrs, Volume= 40.058 af, Atten= 0%, Lag= 0.0 min
Primary = 71.60 cfs @ 13.41 hrs, Volume= 20.029 af
Secondary = 71.60 cfs @ 13.41 hrs, Volume= 20.029 af

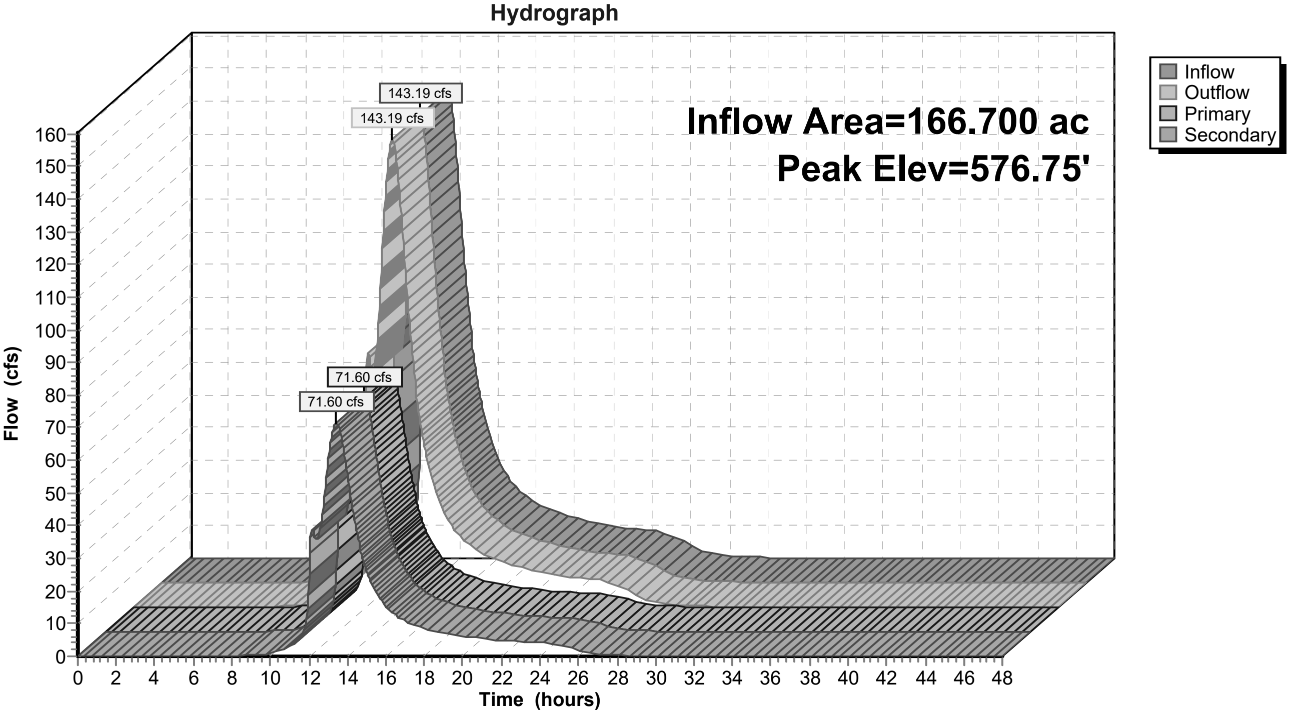
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 576.75' @ 13.42 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.53'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.53' / 564.47' S= 0.0010 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	564.53'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.53' / 564.47' S= 0.0010 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=71.57 cfs @ 13.41 hrs HW=576.74' TW=569.65' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 71.57 cfs @ 10.12 fps)

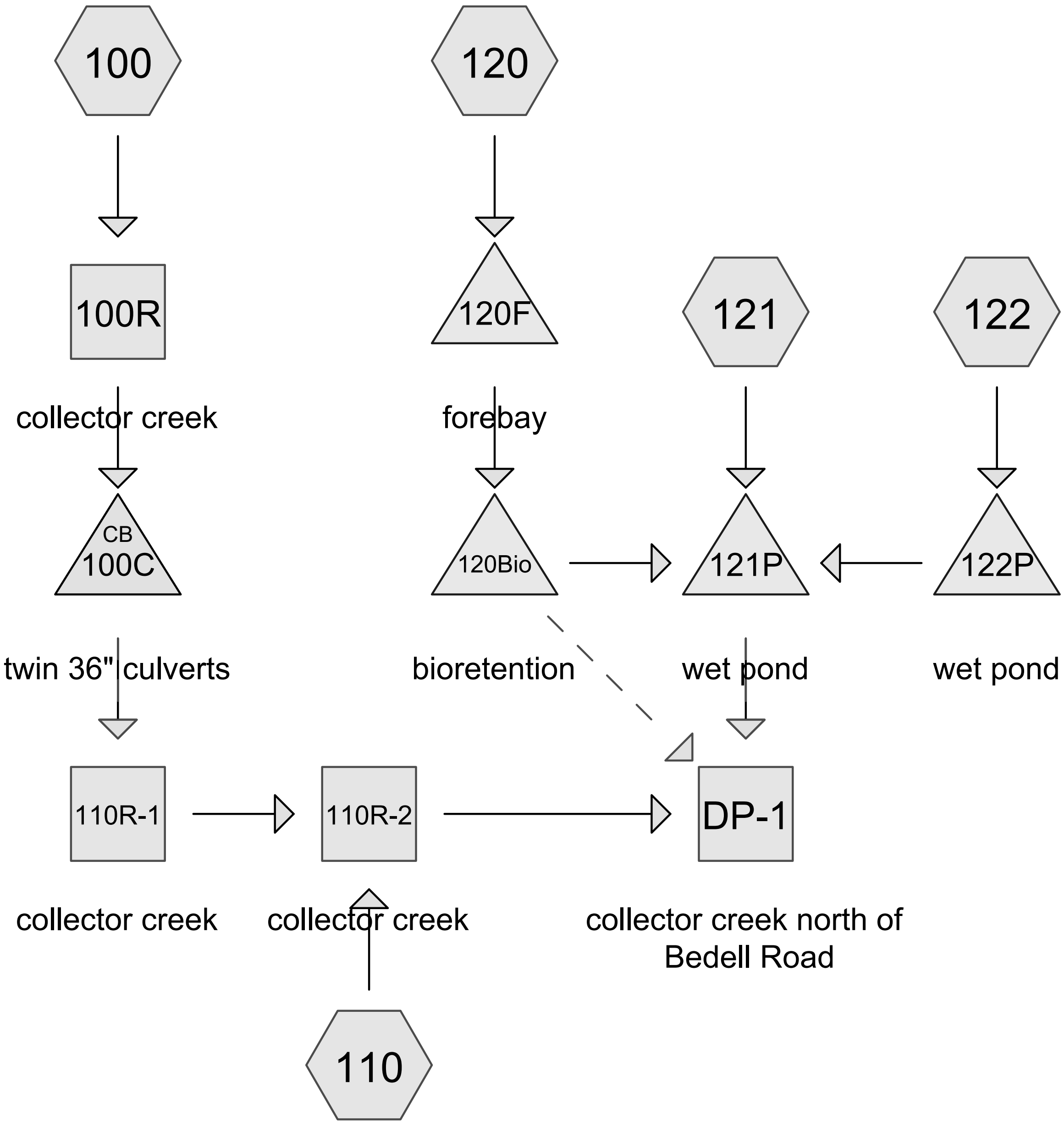
Secondary OutFlow Max=71.57 cfs @ 13.41 hrs HW=576.74' TW=569.65' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 71.57 cfs @ 10.12 fps)

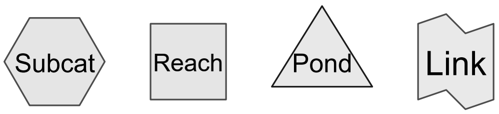
Pond 41C-2: twin 36" culverts



Appendix G

Post-Development Stormwater Analysis





Routing Diagram for 2020-02-21 Project Olive Proposed 1
Prepared by Langan Eng & Env Srvcs, Inc, Printed 2/6/2020
HydroCAD® 10.00-18 s/n 11081 © 2016 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment100: Runoff Area=28.290 ac 7.60% Impervious Runoff Depth=0.63"
Flow Length=1,342' Tc=30.1 min CN=85 Runoff=14.65 cfs 1.488 af

Subcatchment110: Runoff Area=9.030 ac 6.53% Impervious Runoff Depth=0.46"
Flow Length=541' Slope=0.0090 '/' Tc=27.6 min CN=81 Runoff=3.37 cfs 0.349 af

Subcatchment120: Runoff Area=0.990 ac 59.60% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=92 Runoff=1.74 cfs 0.085 af

Subcatchment121: Runoff Area=5.690 ac 0.00% Impervious Runoff Depth=1.18"
Tc=6.0 min CN=94 Runoff=11.26 cfs 0.561 af

Subcatchment122: Runoff Area=2.540 ac 0.00% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=92 Runoff=4.47 cfs 0.219 af

Reach 100R: collector creek Avg. Flow Depth=0.74' Max Vel=1.93 fps Inflow=14.65 cfs 1.488 af
n=0.030 L=69.0' S=0.0030 '/' Capacity=93.74 cfs Outflow=14.65 cfs 1.488 af

Reach 110R-1: collector creek Avg. Flow Depth=0.83' Max Vel=1.68 fps Inflow=14.65 cfs 1.488 af
n=0.030 L=199.0' S=0.0020 '/' Capacity=76.18 cfs Outflow=14.55 cfs 1.488 af

Reach 110R-2: collector creek Avg. Flow Depth=1.06' Max Vel=1.50 fps Inflow=17.83 cfs 1.837 af
n=0.030 L=186.0' S=0.0012 '/' Capacity=59.75 cfs Outflow=17.74 cfs 1.837 af

Reach DP-1: collector creek north of Bedell Road Inflow=17.75 cfs 1.942 af
Outflow=17.75 cfs 1.942 af

Pond 100C: twin 36" culverts Peak Elev=584.86' Inflow=14.65 cfs 1.488 af
Primary=7.33 cfs 0.744 af Secondary=7.33 cfs 0.744 af Outflow=14.65 cfs 1.488 af

Pond 120Bio: bioretention Peak Elev=589.29' Storage=2,111 cf Inflow=1.70 cfs 0.085 af
Primary=0.04 cfs 0.085 af Secondary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.085 af

Pond 120F: forebay Peak Elev=589.64' Storage=3,097 cf Inflow=1.74 cfs 0.085 af
Outflow=1.70 cfs 0.085 af

Pond 121P: wet pond Peak Elev=586.15' Storage=3,191,985 cf Inflow=11.30 cfs 0.668 af
Primary=0.04 cfs 0.105 af Secondary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.105 af

Pond 122P: wet pond Peak Elev=586.15' Storage=693,108 cf Inflow=4.47 cfs 0.219 af
36.0" Round Culvert n=0.011 L=124.0' S=0.0000 '/' Outflow=0.01 cfs 0.022 af

Total Runoff Area = 46.540 ac Runoff Volume = 2.702 af Average Runoff Depth = 0.70"
92.84% Pervious = 43.210 ac 7.16% Impervious = 3.330 ac

Summary for Subcatchment 100:

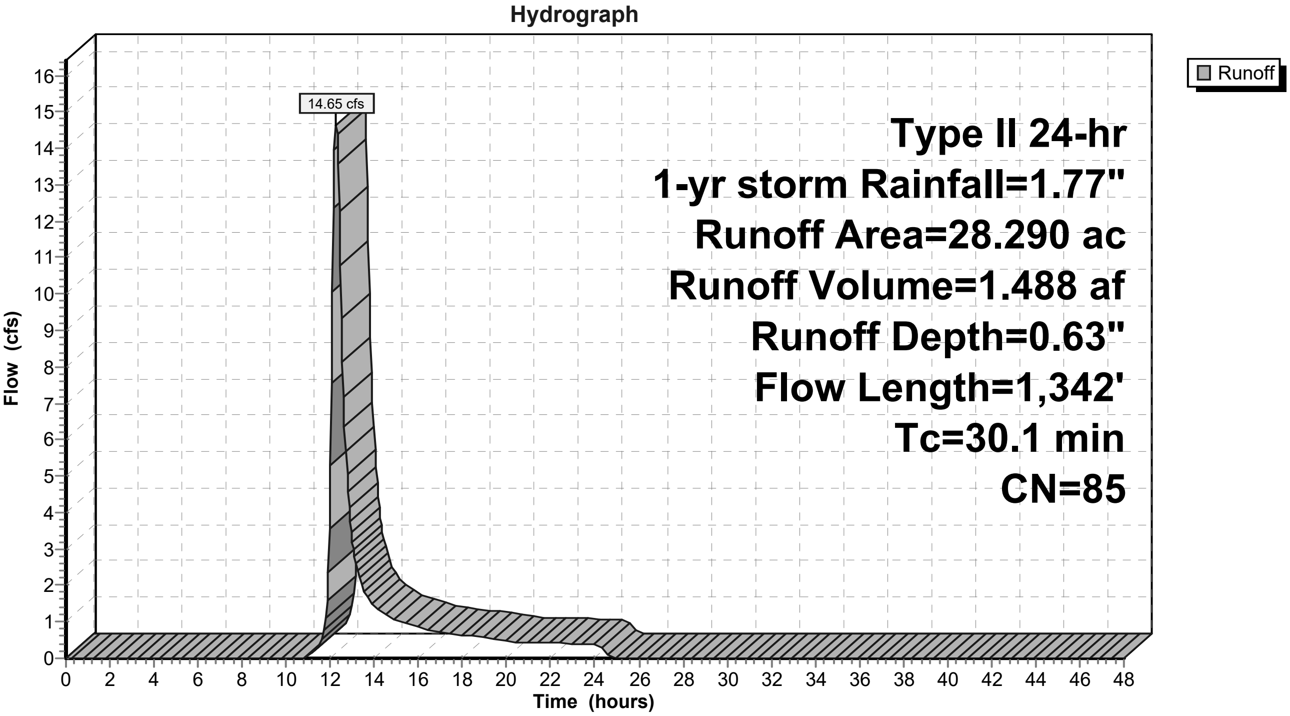
Runoff = 14.65 cfs @ 12.26 hrs, Volume= 1.488 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	2.050	84	50-75% Grass cover, Fair, HSG D
	2.010	79	Woods, Fair, HSG D
*	16.120	84	50-75% Grass cover, Fair, HSG D (offsite)
*	3.770	79	Woods, Fair, HSG D (offsite)
*	1.510	98	Paved parking, HSG D (offsite)
*	0.640	98	Roofs, HSG D (offsite)
*	0.620	91	Gravel roads, HSG D (offsite)
*	1.570	98	Water Surface, 0% imp, HSG D (offsite)
	28.290	85	Weighted Average
	26.140		92.40% Pervious Area
	2.150		7.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0170	0.13		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.1	87	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.7	84	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
7.1	266	0.0080	0.63		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
7.4	805	0.0020	1.81	21.76	**Channel Flow, E-F** Area= 12.0 sf Perim= 16.2' r= 0.74' n= 0.030 Earth, grassed & winding
30.1	1,342	Total			

Subcatchment 100:



Summary for Subcatchment 110:

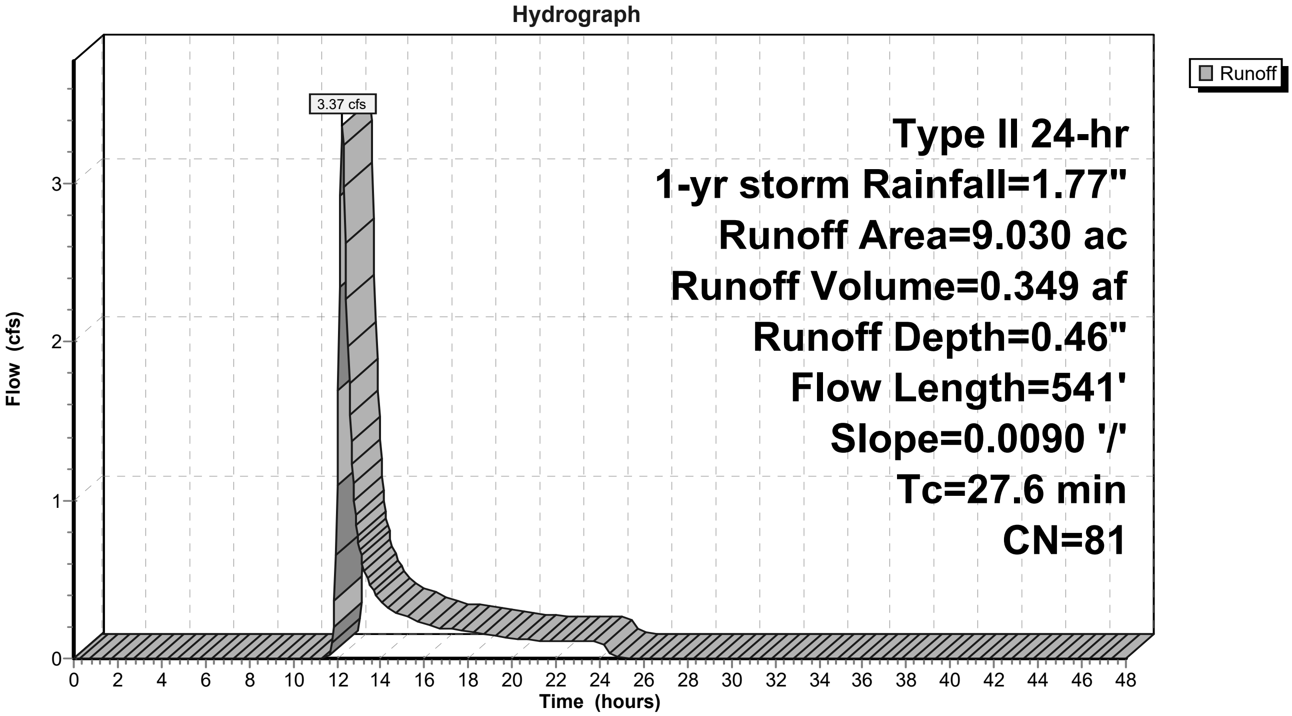
Runoff = 3.37 cfs @ 12.25 hrs, Volume= 0.349 af, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	0.870	84	50-75% Grass cover, Fair, HSG D
	0.360	98	Paved parking, HSG D
	5.390	79	Woods, Fair, HSG D
	0.120	98	Water Surface, 0% imp, HSG D
*	0.160	84	50-75% Grass cover, Fair, HSG D (offsite)
*	1.900	79	Woods, Fair, HSG D (offsite)
*	0.230	98	Paved parking, HSG D (offsite)
	9.030	81	Weighted Average
	8.440		93.47% Pervious Area
	0.590		6.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0090	0.10		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
11.1	441	0.0090	0.66		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
27.6	541	Total			

Subcatchment 110:



Summary for Subcatchment 120:

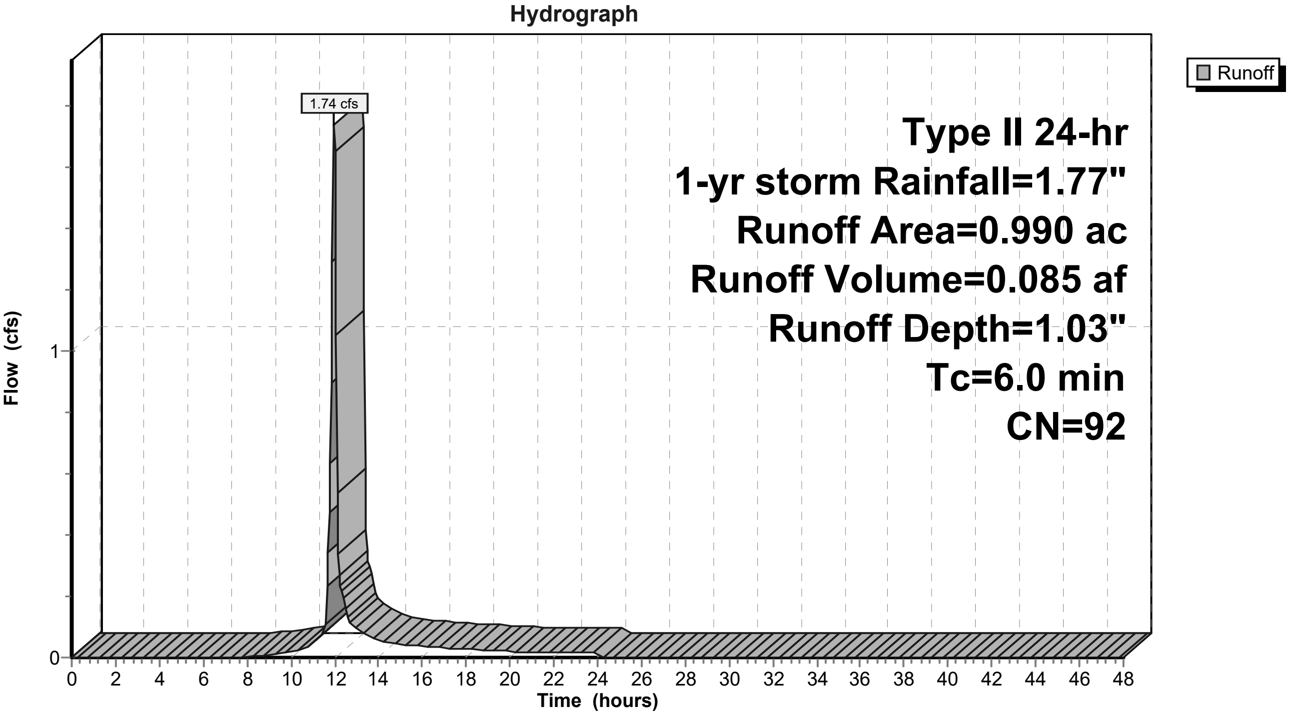
Runoff = 1.74 cfs @ 11.97 hrs, Volume= 0.085 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
0.400	84	50-75% Grass cover, Fair, HSG D
0.590	98	Paved parking, HSG D
0.990	92	Weighted Average
0.400		40.40% Pervious Area
0.590		59.60% Impervious Area

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

Subcatchment 120:



Summary for Subcatchment 121:

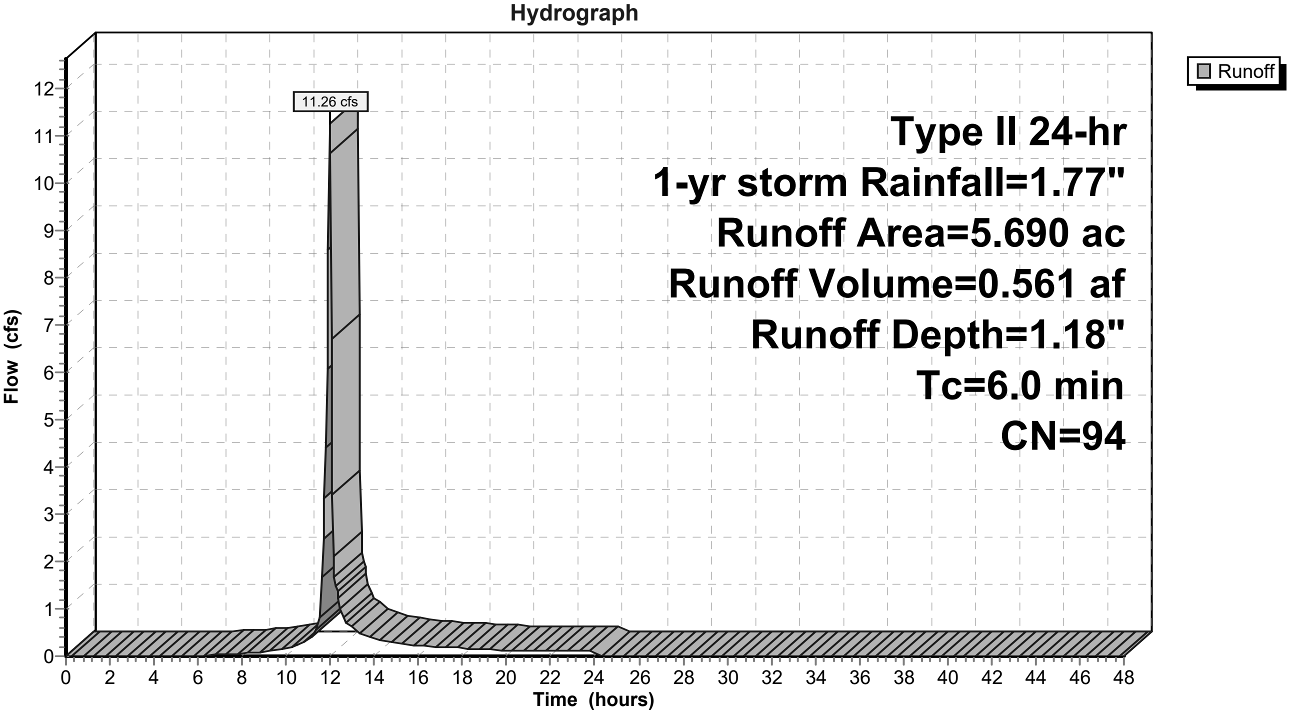
Runoff = 11.26 cfs @ 11.97 hrs, Volume= 0.561 af, Depth= 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
1.640	84	50-75% Grass cover, Fair, HSG D
4.050	98	Water Surface, 0% imp, HSG D
5.690	94	Weighted Average
5.690		100.00% Pervious Area

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

Subcatchment 121:



Summary for Subcatchment 122:

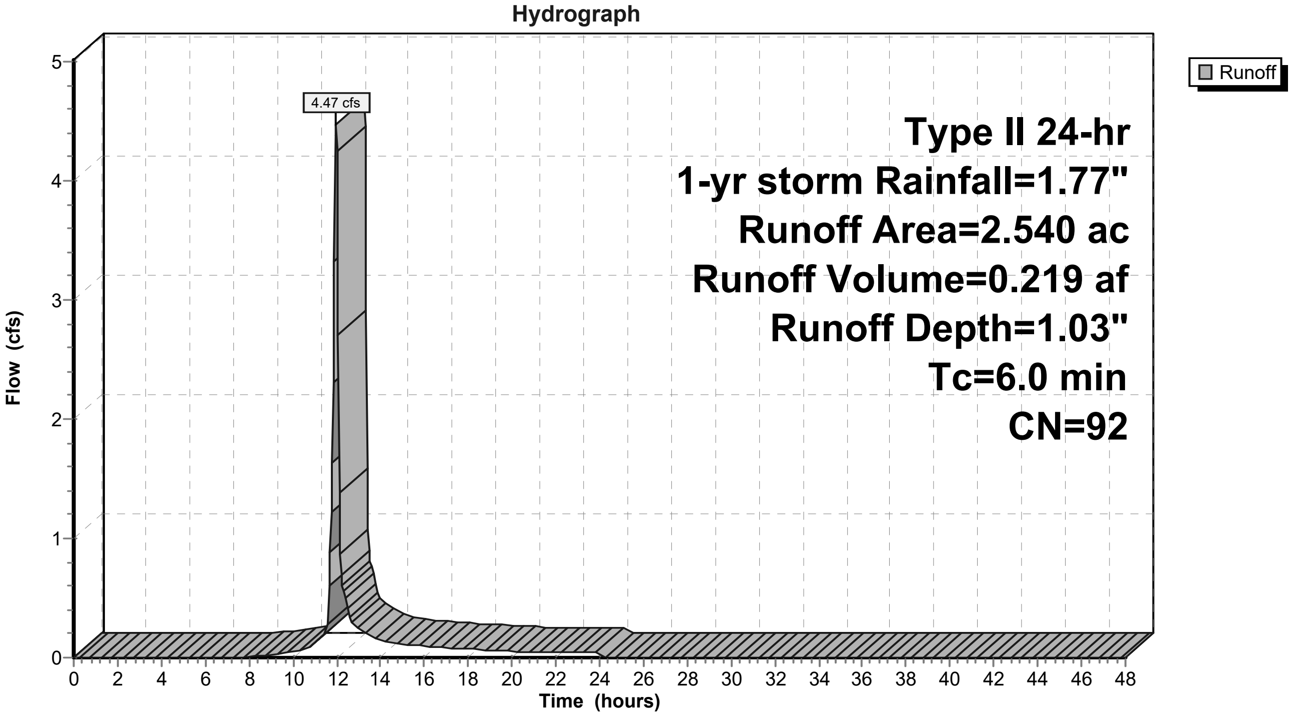
Runoff = 4.47 cfs @ 11.97 hrs, Volume= 0.219 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
1.160	84	50-75% Grass cover, Fair, HSG D
1.380	98	Water Surface, 0% imp, HSG D
2.540	92	Weighted Average
2.540		100.00% Pervious Area

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

Subcatchment 122:



Summary for Reach 100R: collector creek

Inflow Area = 28.290 ac, 7.60% Impervious, Inflow Depth = 0.63" for 1-yr storm event
Inflow = 14.65 cfs @ 12.26 hrs, Volume= 1.488 af
Outflow = 14.65 cfs @ 12.27 hrs, Volume= 1.488 af, Atten= 0%, Lag= 0.4 min

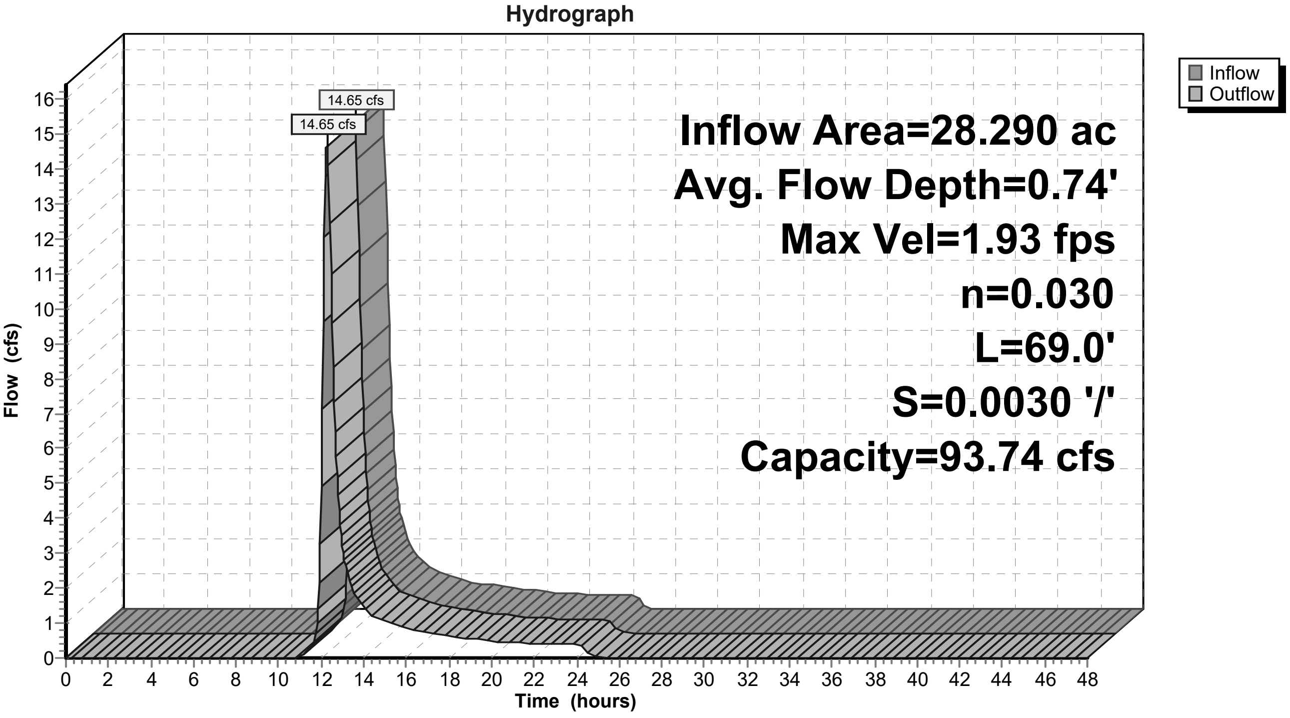
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.93 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 1.8 min

Peak Storage= 522 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.74'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 93.74 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 69.0' Slope= 0.0030 '/'
Inlet Invert= 584.05', Outlet Invert= 583.84'

‡

Reach 100R: collector creek



Summary for Reach 110R-1: collector creek

Inflow Area = 28.290 ac, 7.60% Impervious, Inflow Depth = 0.63" for 1-yr storm event
Inflow = 14.65 cfs @ 12.27 hrs, Volume= 1.488 af
Outflow = 14.55 cfs @ 12.29 hrs, Volume= 1.488 af, Atten= 1%, Lag= 1.5 min

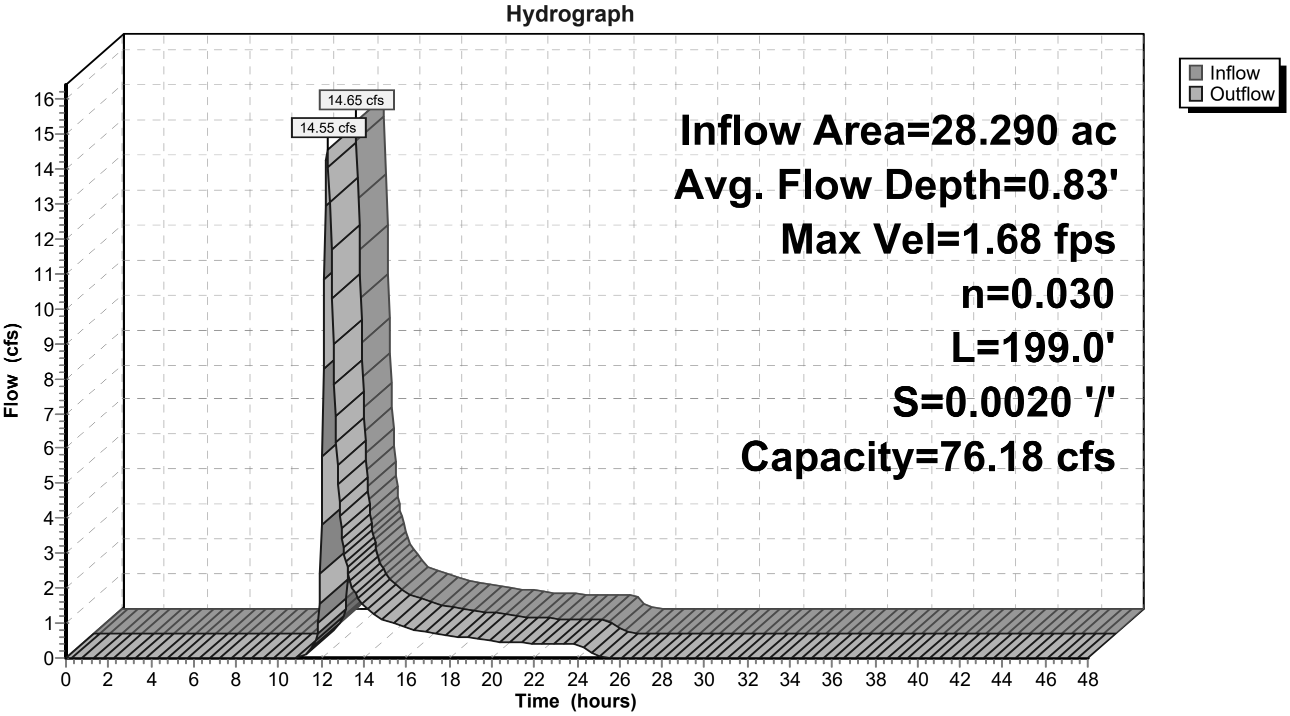
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.68 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 6.2 min

Peak Storage= 1,727 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.83'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 76.18 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 199.0' Slope= 0.0020 '/'
Inlet Invert= 583.68', Outlet Invert= 583.28'

‡

Reach 110R-1: collector creek



Summary for Reach 110R-2: collector creek

Inflow Area = 37.320 ac, 7.34% Impervious, Inflow Depth = 0.59" for 1-yr storm event
Inflow = 17.83 cfs @ 12.28 hrs, Volume= 1.837 af
Outflow = 17.74 cfs @ 12.31 hrs, Volume= 1.837 af, Atten= 1%, Lag= 1.6 min

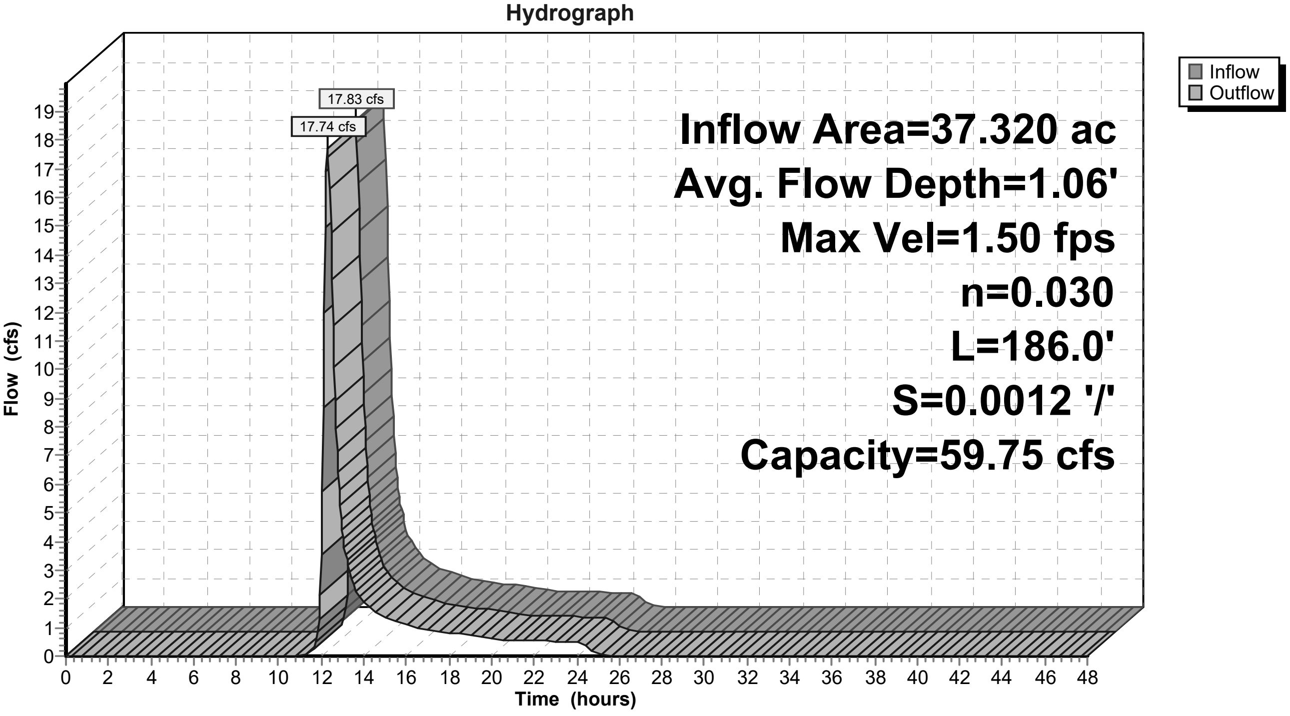
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.50 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.47 fps, Avg. Travel Time= 6.6 min

Peak Storage= 2,192 cf @ 12.31 hrs
Average Depth at Peak Storage= 1.06'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 59.75 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 186.0' Slope= 0.0012 '/'
Inlet Invert= 583.28', Outlet Invert= 583.05'

‡

Reach 110R-2: collector creek

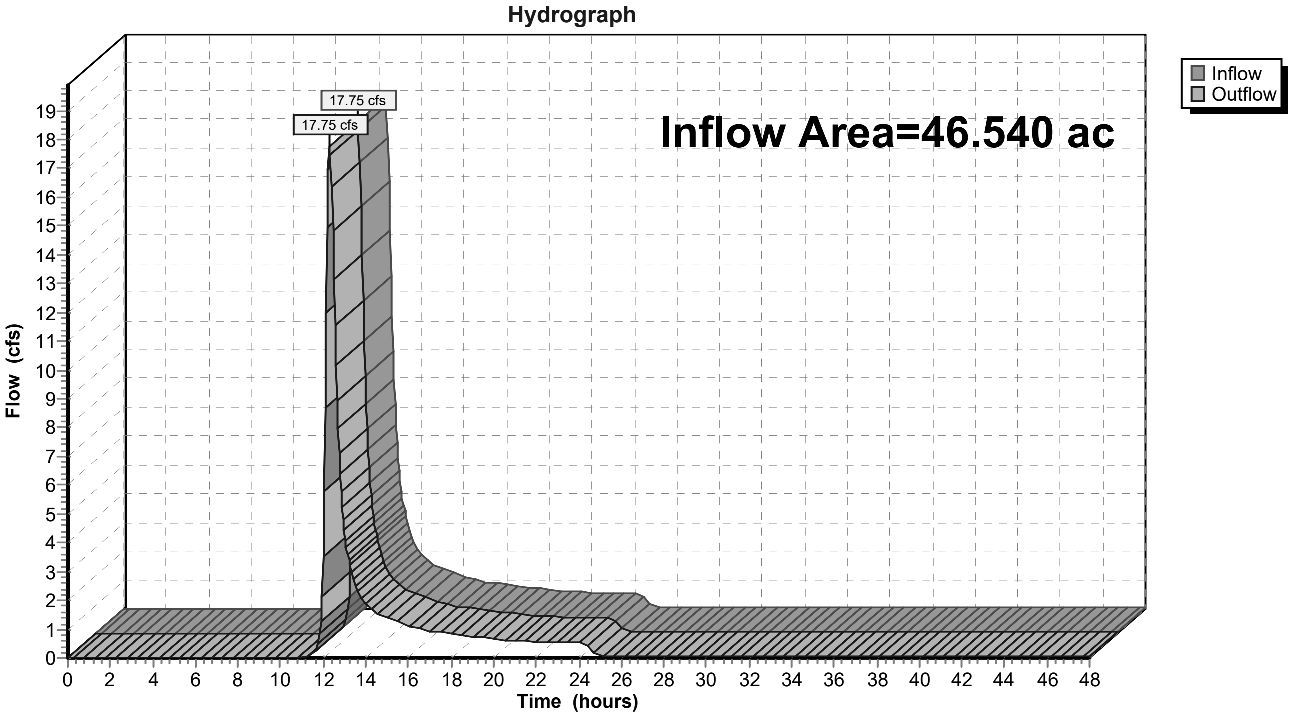


Summary for Reach DP-1: collector creek north of Bedell Road

Inflow Area = 46.540 ac, 7.16% Impervious, Inflow Depth > 0.50" for 1-yr storm event
Inflow = 17.75 cfs @ 12.31 hrs, Volume= 1.942 af
Outflow = 17.75 cfs @ 12.31 hrs, Volume= 1.942 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Reach DP-1: collector creek north of Bedell Road



Summary for Pond 100C: twin 36" culverts

Inflow Area = 28.290 ac, 7.60% Impervious, Inflow Depth = 0.63" for 1-yr storm event
Inflow = 14.65 cfs @ 12.27 hrs, Volume= 1.488 af
Outflow = 14.65 cfs @ 12.27 hrs, Volume= 1.488 af, Atten= 0%, Lag= 0.0 min
Primary = 7.33 cfs @ 12.27 hrs, Volume= 0.744 af
Secondary = 7.33 cfs @ 12.27 hrs, Volume= 0.744 af

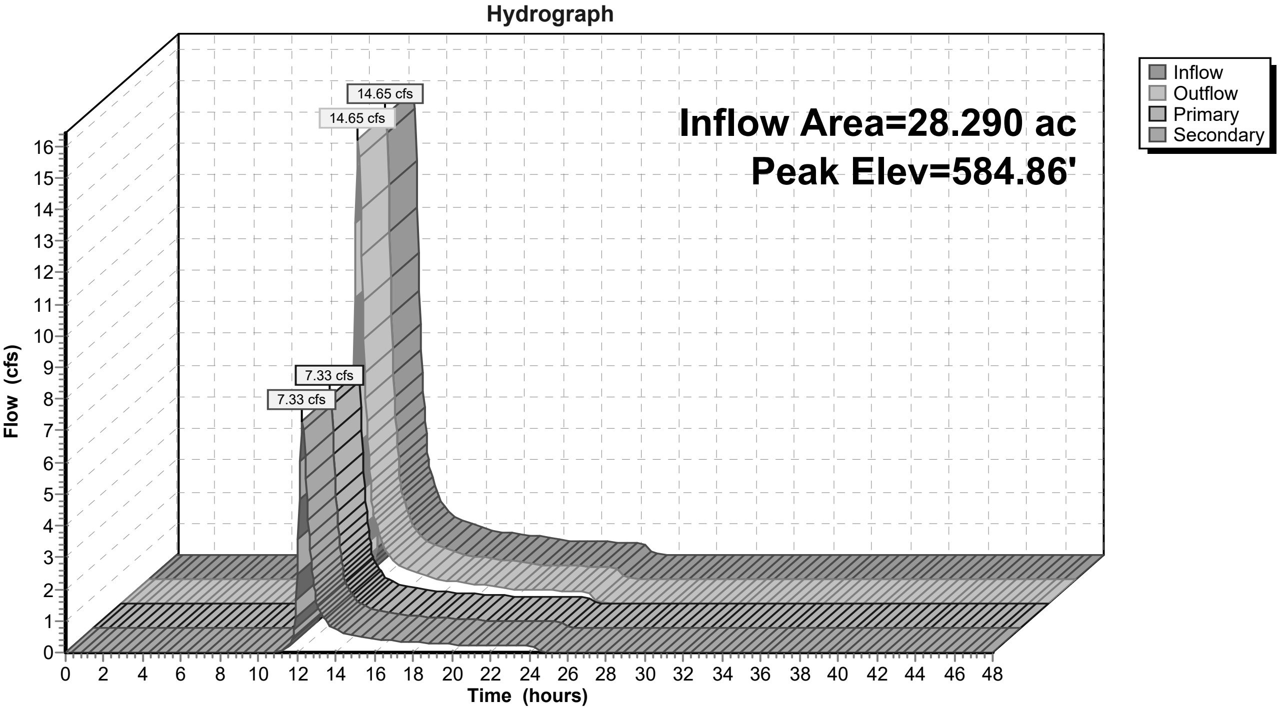
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 584.86' @ 12.28 hrs
Flood Elev= 591.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	583.83'	**36.0" Round Culvert w/ 7.0" inside fill** L= 51.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 583.25' / 583.10' S= 0.0029 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 6.10 sf
#2	Secondary	583.83'	**36.0" Round Culvert w/ 7.0" inside fill** L= 51.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 583.25' / 583.10' S= 0.0029 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 6.10 sf

Primary OutFlow Max=7.27 cfs @ 12.27 hrs HW=584.86' TW=584.50' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 7.27 cfs @ 2.52 fps)

Secondary OutFlow Max=7.27 cfs @ 12.27 hrs HW=584.86' TW=584.50' (Dynamic Tailwater)
↑**2=Culvert** (Inlet Controls 7.27 cfs @ 2.52 fps)

Pond 100C: twin 36" culverts



Summary for Pond 120Bio: bioretention

```
Inflow Area =      0.990 ac, 59.60% Impervious, Inflow Depth =  1.03"   for  1-yr storm event
Inflow     =      1.70 cfs @  11.99 hrs, Volume=         0.085 af
Outflow    =      0.04 cfs @  15.34 hrs, Volume=         0.085 af,  Atten= 97%,  Lag= 201.2 min
Primary    =      0.04 cfs @  15.34 hrs, Volume=         0.085 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= 0.05 hrs / 3
Peak Elev= 589.29' @ 15.34 hrs   Surf.Area= 7,428 sf   Storage= 2,111 cf
Flood Elev= 591.00'   Surf.Area= 9,215 sf   Storage= 16,320 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 501.7 min ( 1,324.4 - 822.7 )

Volume      Invert    Avail.Storage   Storage Description
  #1        589.00'       16,320 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

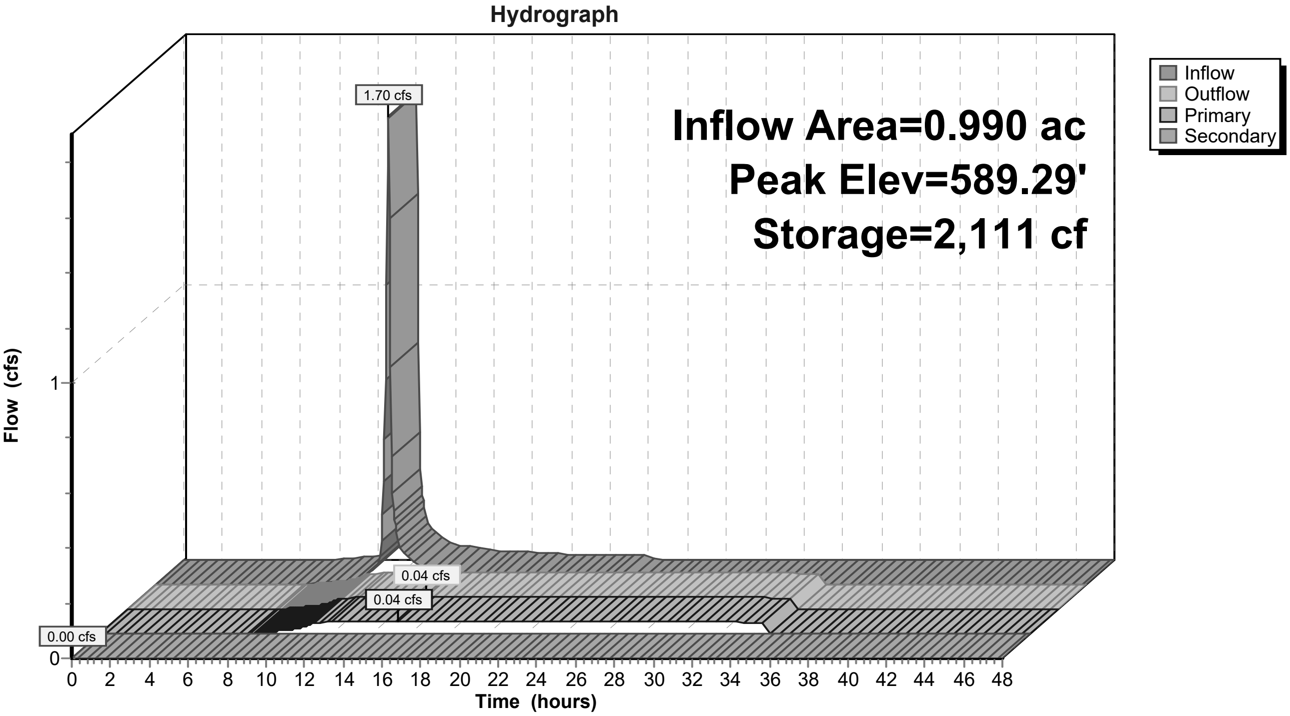
 Elevation        Surf.Area         Inc.Store        Cum.Store
   (feet)           (sq-ft)       (cubic-feet)     (cubic-feet)
   589.00             7,135                 0                0
   590.00             8,145             7,640            7,640
   591.00             9,215             8,680           16,320

Device   Routing          Invert   Outlet Devices
  #1     Primary          585.58'  15.0"  Round Culvert
                                   L= 33.0'   CPP, square edge headwall,  Ke= 0.500
                                   Inlet / Outlet Invert= 585.58' / 585.00'   S= 0.0176 '/'   Cc= 0.900
                                   n= 0.013  Corrugated PE, smooth interior,  Flow Area= 1.23 sf
  #2     Device 1         585.58'  6.0" Vert. Underdrain   C= 0.600
  #3     Device 1         589.50'  48.0" x 30.0" Horiz. Grate   C= 0.600
                                   Limited to weir flow at low heads
  #4     Secondary        590.00'  162.0 deg x 10.0' long x 1.00' rise overflow weir Cv= 2.47 (C= 3.09)
  #5     Device 2         589.00'  0.250 in/hr Exfiltration through bioretention media over Surface area

Primary OutFlow Max=0.04 cfs @ 15.34 hrs  HW=589.29'  TW=586.12'   (Dynamic Tailwater)
  1=Culvert  (Passes 0.04 cfs of 10.38 cfs potential flow)
    2=Underdrain  (Passes 0.04 cfs of 1.68 cfs potential flow)
      5=Exfiltration through bioretention media(Exfiltration Controls 0.04 cfs)
    3=Grate  ( Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=589.00'  TW=0.00'   (Dynamic Tailwater)
  4=overflow weir  ( Controls 0.00 cfs)
```

Pond 120Bio: bioretention



Summary for Pond 120F: forebay

```
Inflow Area =        0.990 ac, 59.60% Impervious, Inflow Depth =  1.03"   for 1-yr storm event
Inflow      =      1.74 cfs @  11.97 hrs, Volume=          0.085 af
Outflow     =      1.70 cfs @  11.99 hrs, Volume=          0.085 af, Atten= 2%, Lag= 1.3 min
Primary     =      1.70 cfs @  11.99 hrs, Volume=          0.085 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 589.50' Surf.Area= 1,395 sf Storage= 2,900 cf
Peak Elev= 589.64' @ 11.99 hrs Surf.Area= 1,448 sf Storage= 3,097 cf (197 cf above start)
Flood Elev= 591.00' Surf.Area= 2,050 sf Storage= 5,463 cf (2,563 cf above start)

Plug-Flow detention time= 458.6 min calculated for 0.019 af (22% of inflow)
Center-of-Mass det. time= 4.8 min (822.7 - 817.9)

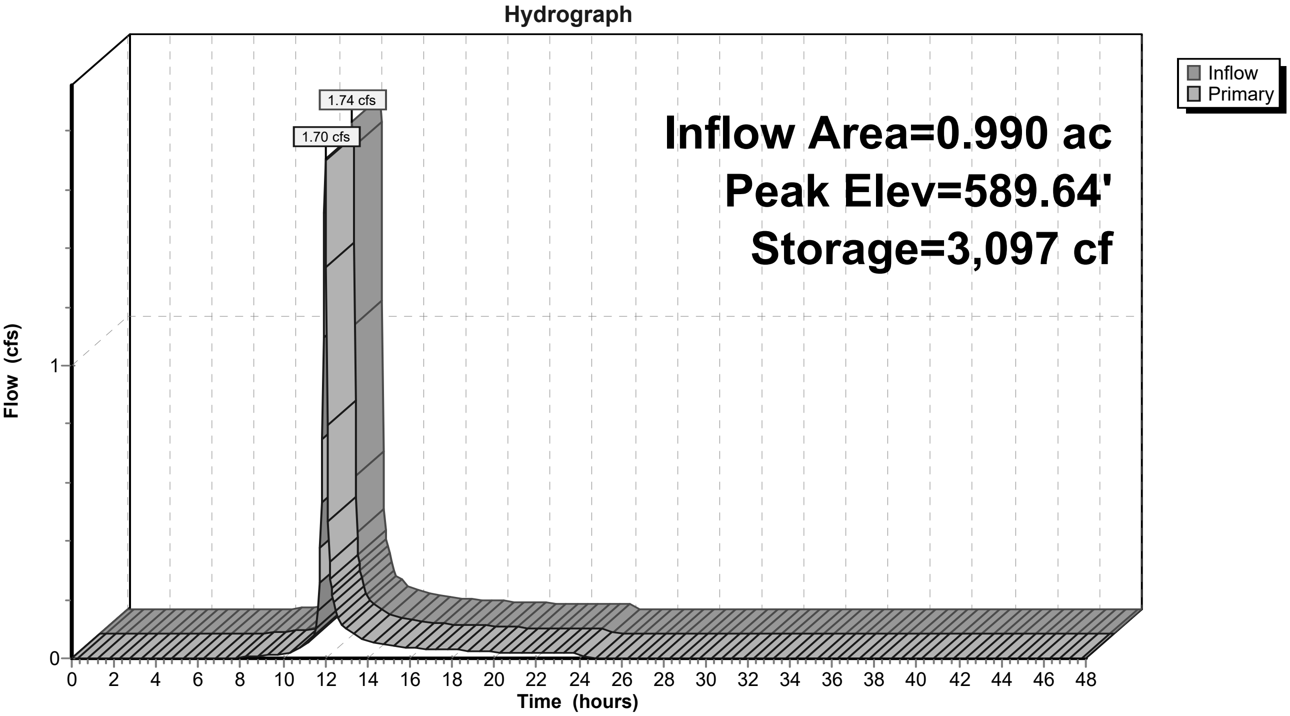
Volume	Invert	Avail.Storage	Storage Description
#1	585.50'	5,463 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
585.50	190	0	0
586.00	290	120	120
588.00	825	1,115	1,235
590.00	1,585	2,410	3,645
591.00	2,050	1,818	5,463

Device	Routing	Invert	Outlet Devices
#1	Primary	589.50'	**162.0 deg x 10.0' long x 1.50' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=1.66 cfs @ 11.99 hrs HW=589.64' TW=589.13' (Dynamic Tailwater)
↑—**1=overflow weir** (Weir Controls 1.66 cfs @ 1.12 fps)

Pond 120F: forebay



Summary for Pond 121P: wet pond

```
Inflow Area =       9.220 ac,   6.40% Impervious,  Inflow Depth >  0.87"   for  1-yr storm event
Inflow      =      11.30 cfs @  11.97 hrs,  Volume=          0.668 af
Outflow     =       0.04 cfs @  34.28 hrs,  Volume=          0.105 af,  Atten= 100%,  Lag= 1,338.8 min
Primary     =       0.04 cfs @  34.28 hrs,  Volume=          0.105 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= 0.05 hrs / 3
Starting Elev= 586.00'   Surf.Area= 176,355 sf   Storage= 3,165,935 cf
Peak Elev= 586.15' @ 34.28 hrs   Surf.Area= 177,434 sf   Storage= 3,191,985 cf   (26,050 cf above start)
Flood Elev= 591.00'   Surf.Area= 213,930 sf   Storage= 4,140,758 cf   (974,823 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 961.4 min ( 1,862.2 - 900.8 )

Volume      Invert    Avail.Storage   Storage Description
   #1      556.00'     4,140,758 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

Elevation        Surf.Area         Inc.Store          Cum.Store
   (feet)          (sq-ft)      (cubic-feet)       (cubic-feet)
   556.00           60,460                 0                  0
   558.00           65,900           126,360            126,360
   560.00           71,435           137,335            263,695
   562.00           77,065           148,500            412,195
   564.00           82,800           159,865            572,060
   566.00           88,640           171,440            743,500
   568.00           94,575           183,215            926,715
   570.00          100,610           195,185          1,121,900
   572.00          106,750           207,360          1,329,260
   574.00          112,985           219,735          1,548,995
   576.00          119,325           232,310          1,781,305
   578.00          125,765           245,090          2,026,395
   580.00          132,300           258,065          2,284,460
   582.00          138,945           271,245          2,555,705
   584.00          145,685           284,630          2,840,335
   584.50          148,240            73,481          2,913,816
   585.00          169,175            79,354          2,993,170
   586.00          176,355           172,765          3,165,935
   588.00          191,015           367,370          3,533,305
   590.00          206,315           397,330          3,930,635
   591.00          213,930           210,123          4,140,758

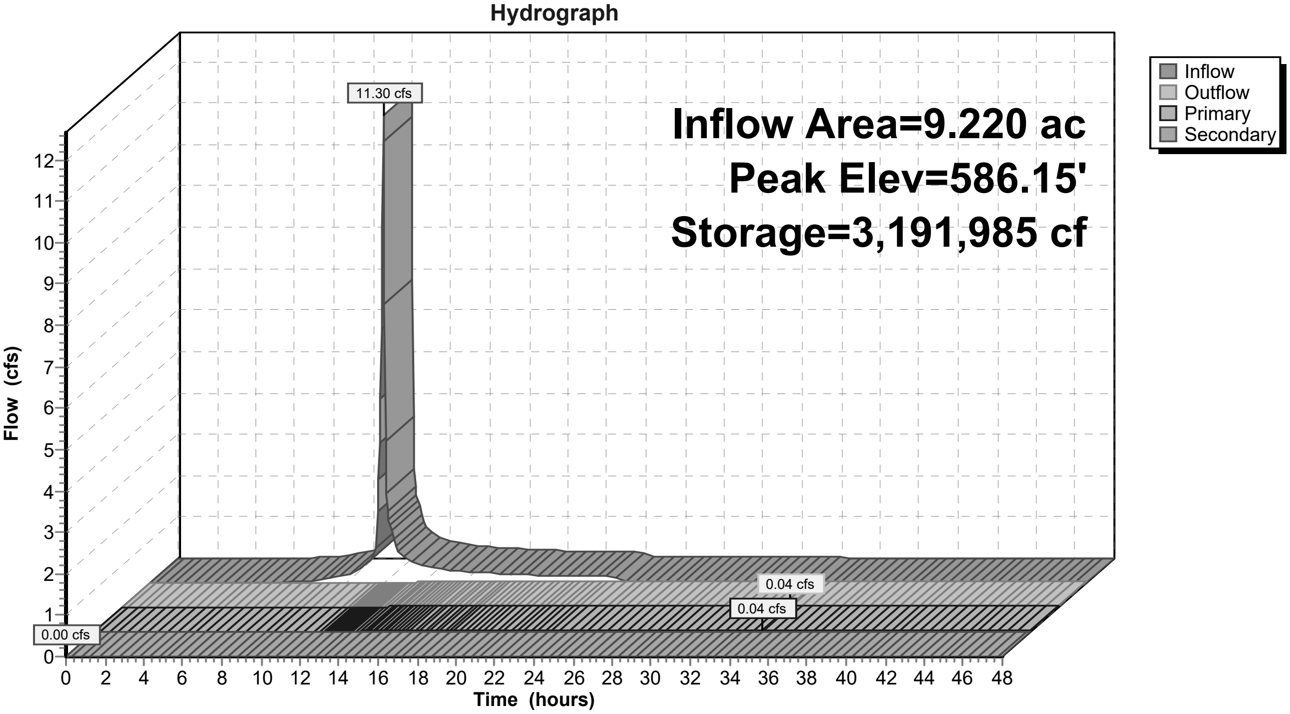
Device   Routing         Invert   Outlet Devices
   #1    Primary        586.00'   12.0"  Round Culvert
                                  L= 35.0'   CPP, square edge headwall,  Ke= 0.500
                                  Inlet / Outlet Invert= 586.00' / 585.00'   S= 0.0286 '/'   Cc= 0.900
                                  n= 0.013  Corrugated PE, smooth interior,  Flow Area= 0.79 sf
   #2    Device 1       586.00'   3.0" Vert. Orifice (internal)   C= 0.600
   #3    Device 1       586.75'   48.0" W x 8.0" H Vert. Weir (internal)  C= 0.600
   #4    Device 1       588.50'   48.0" x 30.0" Horiz. Grate   C= 0.600
```

Limited to weir flow at low heads
#5 Secondary 589.00' **162.0 deg x 10.0' long x 2.00' rise Overflow Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.04 cfs @ 34.28 hrs HW=586.15' TW=0.00' (Dynamic Tailwater)
1=Culvert (Passes 0.04 cfs of 0.09 cfs potential flow)
  2=Orifice (internal) (Orifice Controls 0.04 cfs @ 1.31 fps)
  3=Weir (internal) (Controls 0.00 cfs)
  4=Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=586.00' TW=0.00' (Dynamic Tailwater)
5=Overflow Weir (Controls 0.00 cfs)

Pond 121P: wet pond



Summary for Pond 122P: wet pond

Inflow Area = 2.540 ac, 0.00% Impervious, Inflow Depth = 1.03" for 1-yr storm event
Inflow = 4.47 cfs @ 11.97 hrs, Volume= 0.219 af
Outflow = 0.01 cfs @ 19.40 hrs, Volume= 0.022 af, Atten= 100%, Lag= 446.0 min
Primary = 0.01 cfs @ 19.40 hrs, Volume= 0.022 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 586.00' Surf.Area= 60,080 sf Storage= 684,053 cf
Peak Elev= 586.15' @ 24.12 hrs Surf.Area= 60,700 sf Storage= 693,108 cf (9,055 cf above start)
Flood Elev= 591.00' Surf.Area= 81,520 sf Storage= 1,037,148 cf (353,095 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 868.0 min (1,685.9 - 817.9)

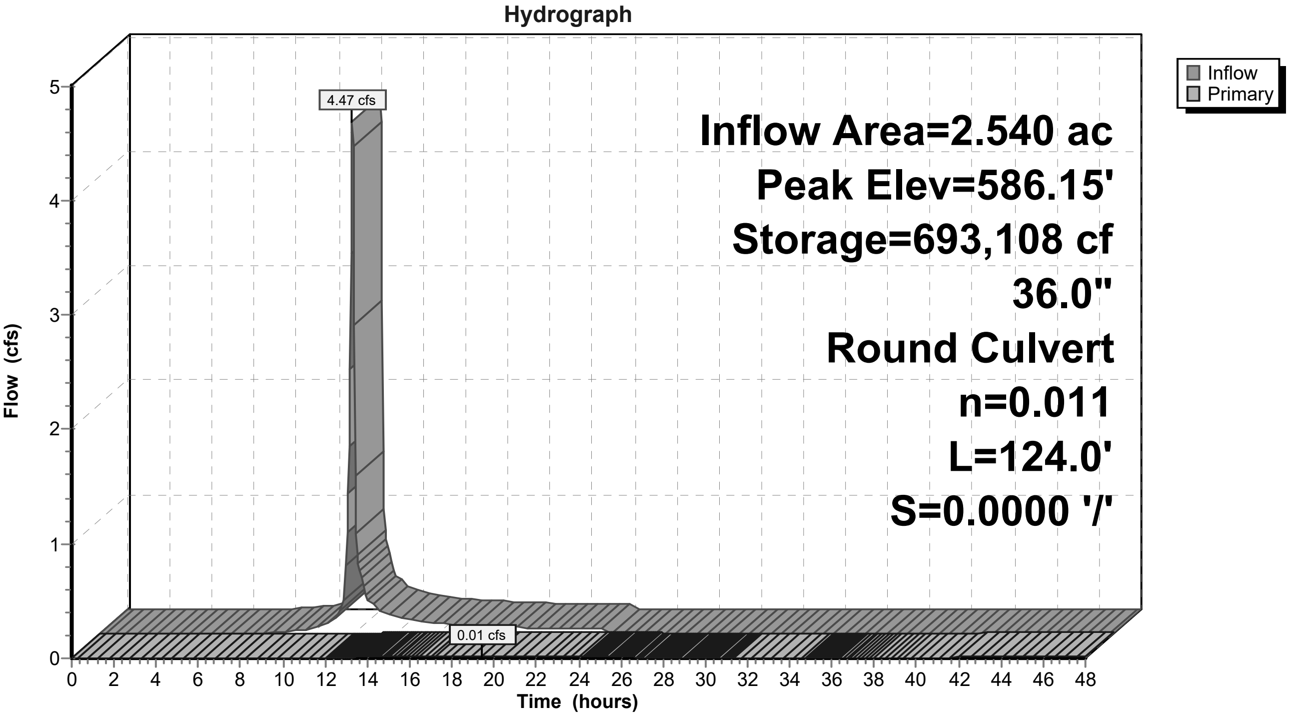
Volume	Invert	Avail.Storage	Storage Description
#1	561.00'	1,037,148 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
561.00	10,385	0	0
562.00	11,425	10,905	10,905
564.00	13,580	25,005	35,910
566.00	15,985	29,565	65,475
568.00	18,410	34,395	99,870
570.00	20,940	39,350	139,220
572.00	23,565	44,505	183,725
574.00	26,295	49,860	233,585
576.00	29,805	56,100	289,685
578.00	32,910	62,715	352,400
580.00	36,110	69,020	421,420
582.00	39,415	75,525	496,945
584.00	42,820	82,235	579,180
584.50	44,120	21,735	600,915
585.00	56,090	25,053	625,968
586.00	60,080	58,085	684,053
588.00	68,355	128,435	812,488
590.00	77,030	145,385	957,873
591.00	81,520	79,275	1,037,148

Device	Routing	Invert	Outlet Devices
#1	Primary	586.00'	**36.0" Round Culvert** L= 124.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 586.00' / 586.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 7.07 sf

Primary OutFlow Max=0.01 cfs @ 19.40 hrs HW=586.14' TW=586.13' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.01 cfs @ 0.16 fps)

Pond 122P: wet pond



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment100: Runoff Area=28.290 ac 7.60% Impervious Runoff Depth=1.57"
Flow Length=1,342' Tc=30.1 min CN=85 Runoff=38.28 cfs 3.705 af

Subcatchment110: Runoff Area=9.030 ac 6.53% Impervious Runoff Depth=1.30"
Flow Length=541' Slope=0.0090 '/' Tc=27.6 min CN=81 Runoff=10.51 cfs 0.977 af

Subcatchment120: Runoff Area=0.990 ac 59.60% Impervious Runoff Depth=2.14"
Tc=6.0 min CN=92 Runoff=3.50 cfs 0.177 af

Subcatchment121: Runoff Area=5.690 ac 0.00% Impervious Runoff Depth=2.33"
Tc=6.0 min CN=94 Runoff=21.35 cfs 1.105 af

Subcatchment122: Runoff Area=2.540 ac 0.00% Impervious Runoff Depth=2.14"
Tc=6.0 min CN=92 Runoff=8.97 cfs 0.453 af

Reach 100R: collector creek Avg. Flow Depth=1.25' Max Vel=2.60 fps Inflow=38.28 cfs 3.705 af
n=0.030 L=69.0' S=0.0030 '/' Capacity=93.74 cfs Outflow=38.29 cfs 3.705 af

Reach 110R-1: collector creek Avg. Flow Depth=1.40' Max Vel=2.24 fps Inflow=38.29 cfs 3.705 af
n=0.030 L=199.0' S=0.0020 '/' Capacity=76.18 cfs Outflow=38.18 cfs 3.705 af

Reach 110R-2: collector creek Avg. Flow Depth=1.79' Max Vel=2.01 fps Inflow=48.46 cfs 4.682 af
n=0.030 L=186.0' S=0.0012 '/' Capacity=59.75 cfs Outflow=48.20 cfs 4.682 af

Reach DP-1: collector creek north of Bedell Road Inflow=48.25 cfs 4.949 af
Outflow=48.25 cfs 4.949 af

Pond 100C: twin 36" culverts Peak Elev=585.77' Inflow=38.29 cfs 3.705 af
Primary=19.14 cfs 1.852 af Secondary=19.14 cfs 1.852 af Outflow=38.29 cfs 3.705 af

Pond 120Bio: bioretention Peak Elev=589.53' Storage=3,956 cf Inflow=3.45 cfs 0.177 af
Primary=0.31 cfs 0.177 af Secondary=0.00 cfs 0.000 af Outflow=0.31 cfs 0.177 af

Pond 120F: forebay Peak Elev=589.72' Storage=3,211 cf Inflow=3.50 cfs 0.177 af
Outflow=3.45 cfs 0.177 af

Pond 121P: wet pond Peak Elev=586.29' Storage=3,216,761 cf Inflow=21.41 cfs 1.360 af
Primary=0.09 cfs 0.267 af Secondary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.267 af

Pond 122P: wet pond Peak Elev=586.29' Storage=701,582 cf Inflow=8.97 cfs 0.453 af
36.0" Round Culvert n=0.011 L=124.0' S=0.0000 '/' Outflow=0.07 cfs 0.078 af

Total Runoff Area = 46.540 ac Runoff Volume = 6.417 af Average Runoff Depth = 1.65"
92.84% Pervious = 43.210 ac 7.16% Impervious = 3.330 ac

Summary for Subcatchment 100:

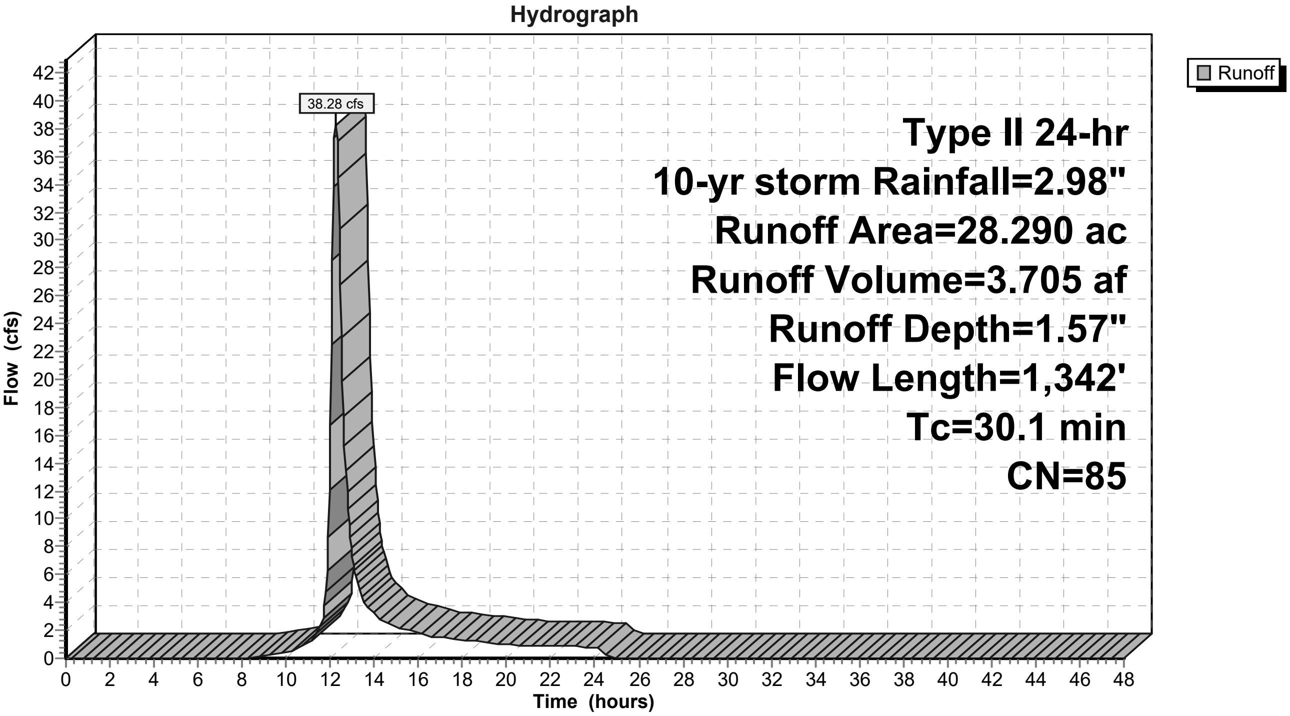
Runoff = 38.28 cfs @ 12.25 hrs, Volume= 3.705 af, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	2.050	84	50-75% Grass cover, Fair, HSG D
	2.010	79	Woods, Fair, HSG D
*	16.120	84	50-75% Grass cover, Fair, HSG D (offsite)
*	3.770	79	Woods, Fair, HSG D (offsite)
*	1.510	98	Paved parking, HSG D (offsite)
*	0.640	98	Roofs, HSG D (offsite)
*	0.620	91	Gravel roads, HSG D (offsite)
*	1.570	98	Water Surface, 0% imp, HSG D (offsite)
	28.290	85	Weighted Average
	26.140		92.40% Pervious Area
	2.150		7.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0170	0.13		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.1	87	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.7	84	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
7.1	266	0.0080	0.63		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
7.4	805	0.0020	1.81	21.76	**Channel Flow, E-F** Area= 12.0 sf Perim= 16.2' r= 0.74' n= 0.030 Earth, grassed & winding
30.1	1,342	Total			

Subcatchment 100:



Summary for Subcatchment 110:

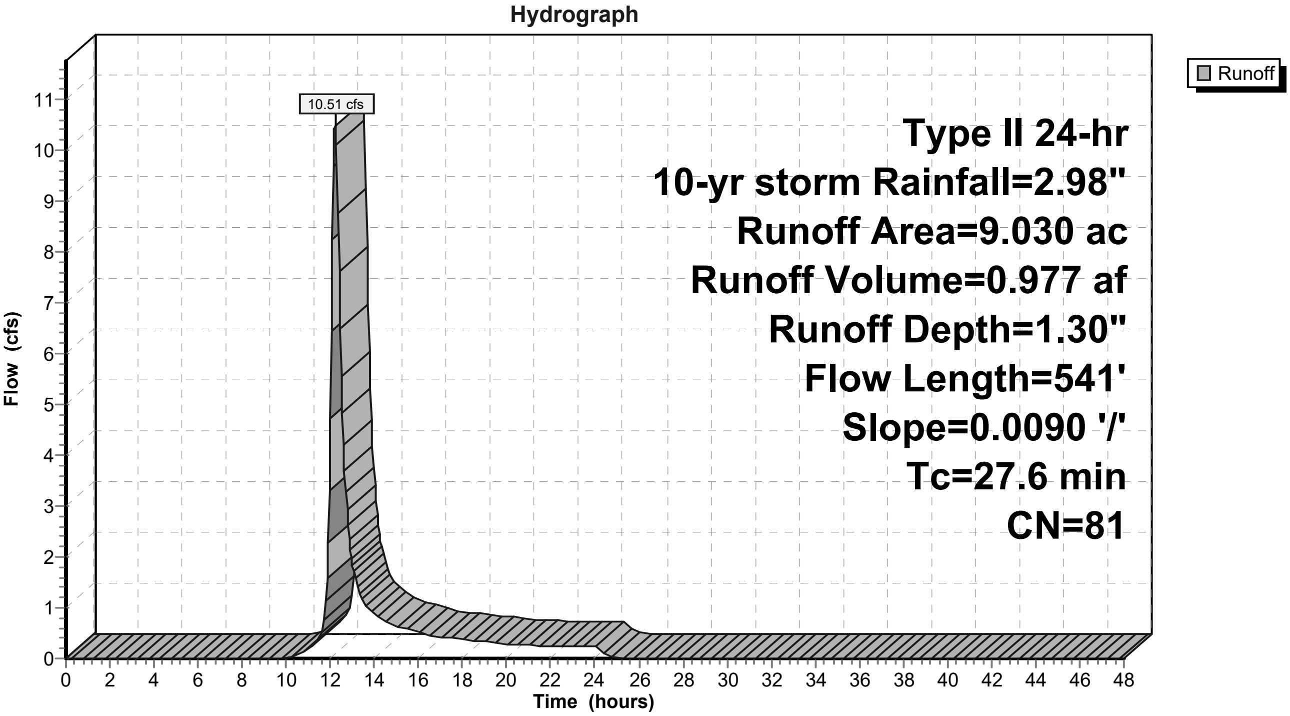
Runoff = 10.51 cfs @ 12.22 hrs, Volume= 0.977 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	0.870	84	50-75% Grass cover, Fair, HSG D
	0.360	98	Paved parking, HSG D
	5.390	79	Woods, Fair, HSG D
	0.120	98	Water Surface, 0% imp, HSG D
*	0.160	84	50-75% Grass cover, Fair, HSG D (offsite)
*	1.900	79	Woods, Fair, HSG D (offsite)
*	0.230	98	Paved parking, HSG D (offsite)
	9.030	81	Weighted Average
	8.440		93.47% Pervious Area
	0.590		6.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0090	0.10		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
11.1	441	0.0090	0.66		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
27.6	541	Total			

Subcatchment 110:



Summary for Subcatchment 120:

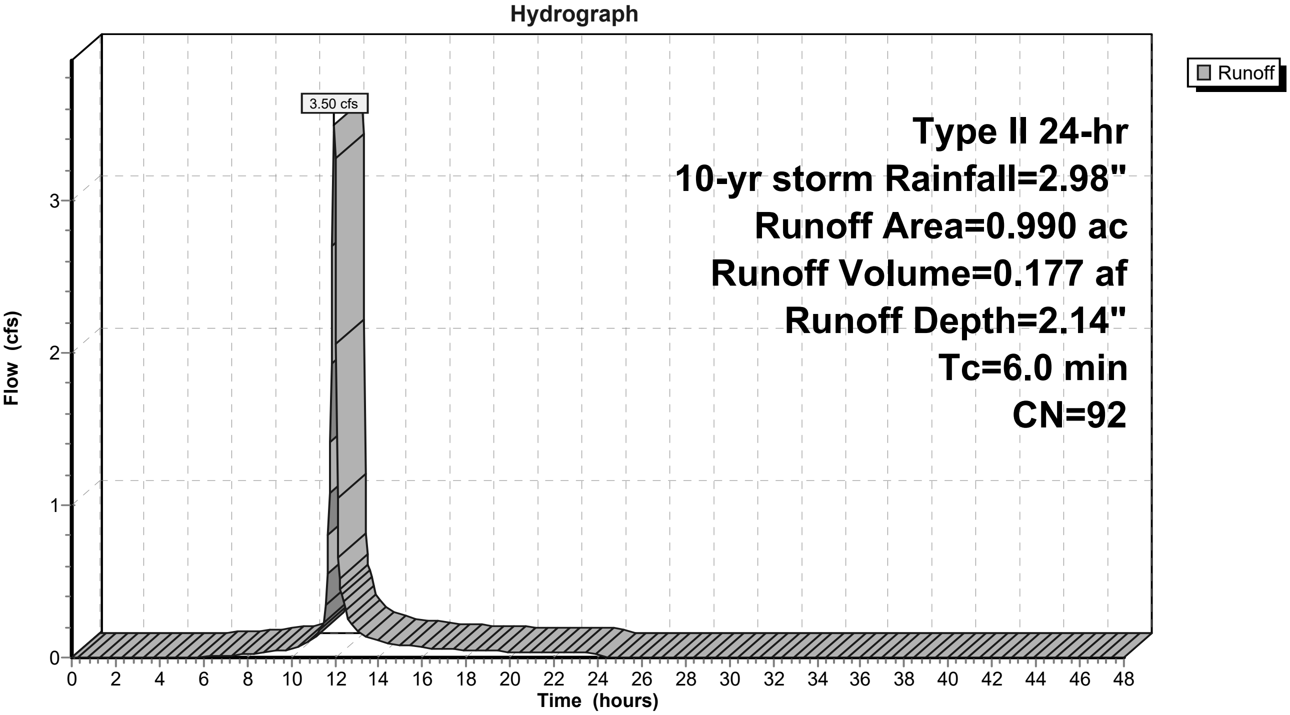
Runoff = 3.50 cfs @ 11.97 hrs, Volume= 0.177 af, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
0.400	84	50-75% Grass cover, Fair, HSG D
0.590	98	Paved parking, HSG D
0.990	92	Weighted Average
0.400		40.40% Pervious Area
0.590		59.60% Impervious Area

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

Subcatchment 120:



Summary for Subcatchment 121:

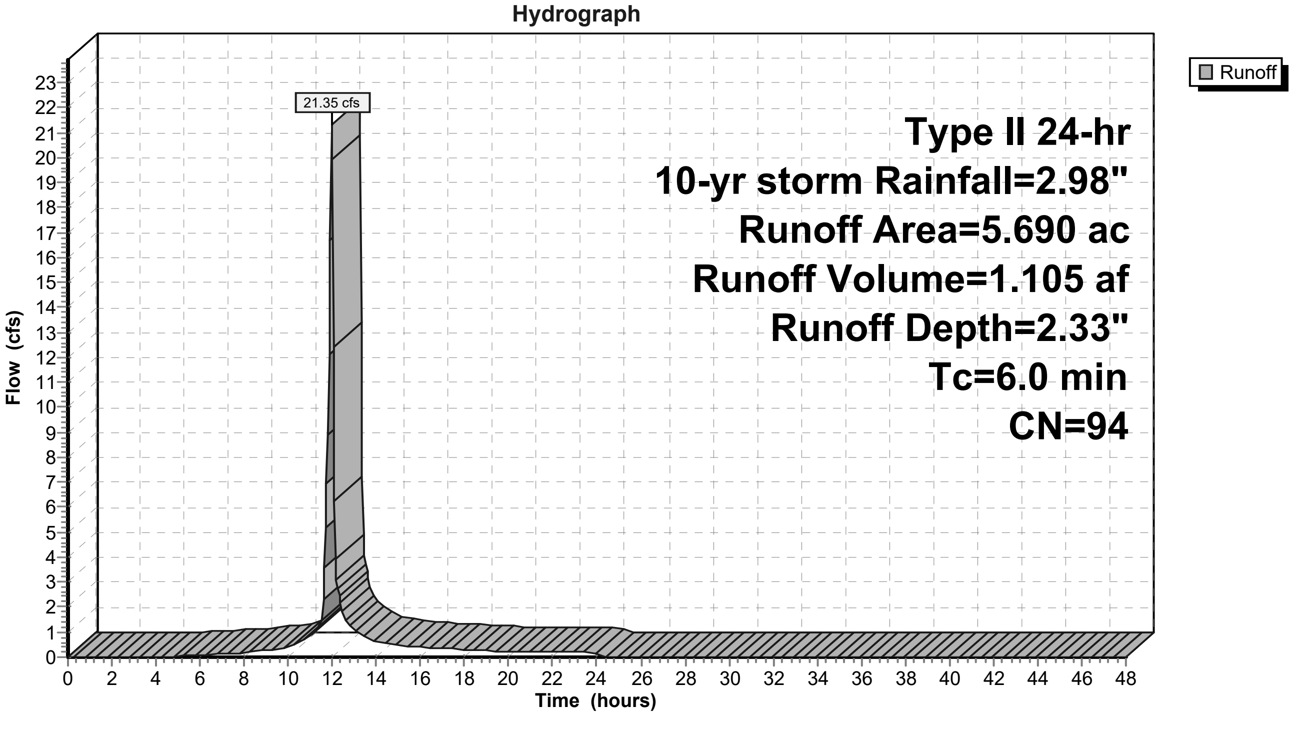
Runoff = 21.35 cfs @ 11.96 hrs, Volume= 1.105 af, Depth= 2.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
1.640	84	50-75% Grass cover, Fair, HSG D
4.050	98	Water Surface, 0% imp, HSG D
5.690	94	Weighted Average
5.690		100.00% Pervious Area

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

Subcatchment 121:



Summary for Subcatchment 122:

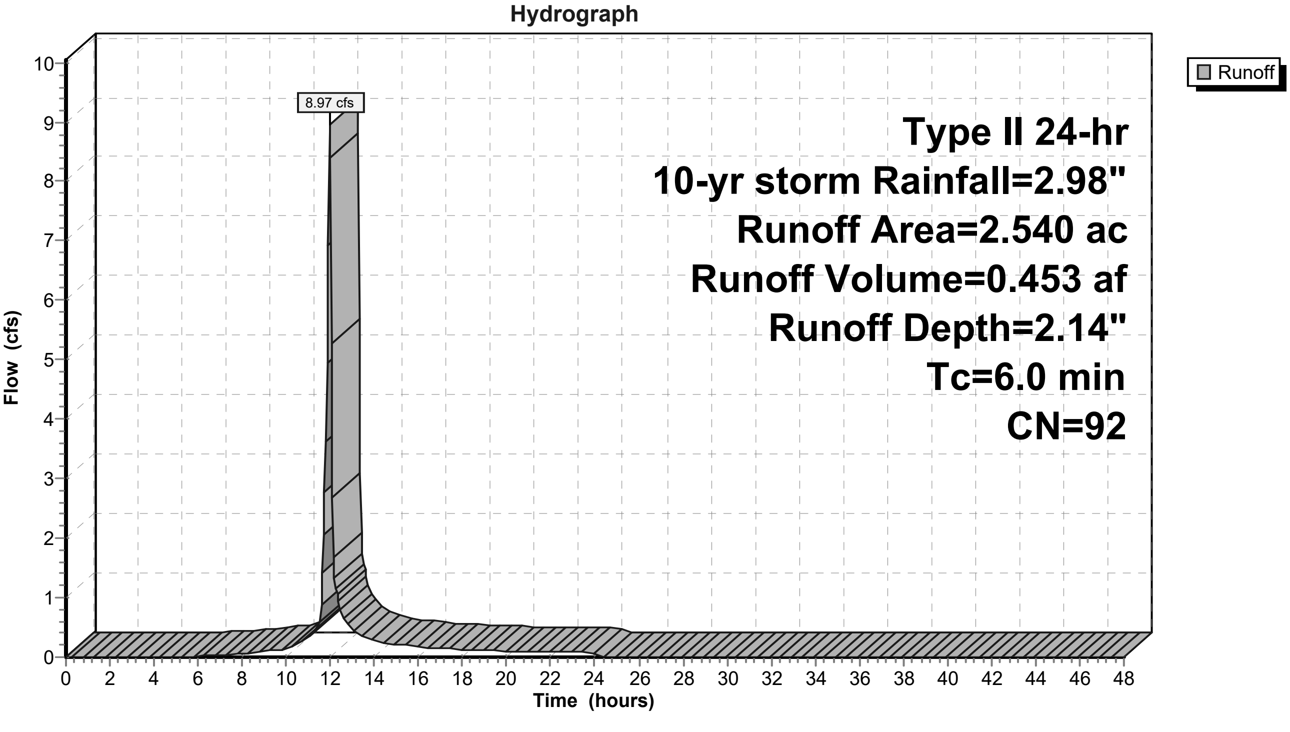
Runoff = 8.97 cfs @ 11.97 hrs, Volume= 0.453 af, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
1.160	84	50-75% Grass cover, Fair, HSG D
1.380	98	Water Surface, 0% imp, HSG D
2.540	92	Weighted Average
2.540		100.00% Pervious Area

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

Subcatchment 122:



Summary for Reach 100R: collector creek

Inflow Area = 28.290 ac, 7.60% Impervious, Inflow Depth = 1.57" for 10-yr storm event
Inflow = 38.28 cfs @ 12.25 hrs, Volume= 3.705 af
Outflow = 38.29 cfs @ 12.25 hrs, Volume= 3.705 af, Atten= 0%, Lag= 0.3 min

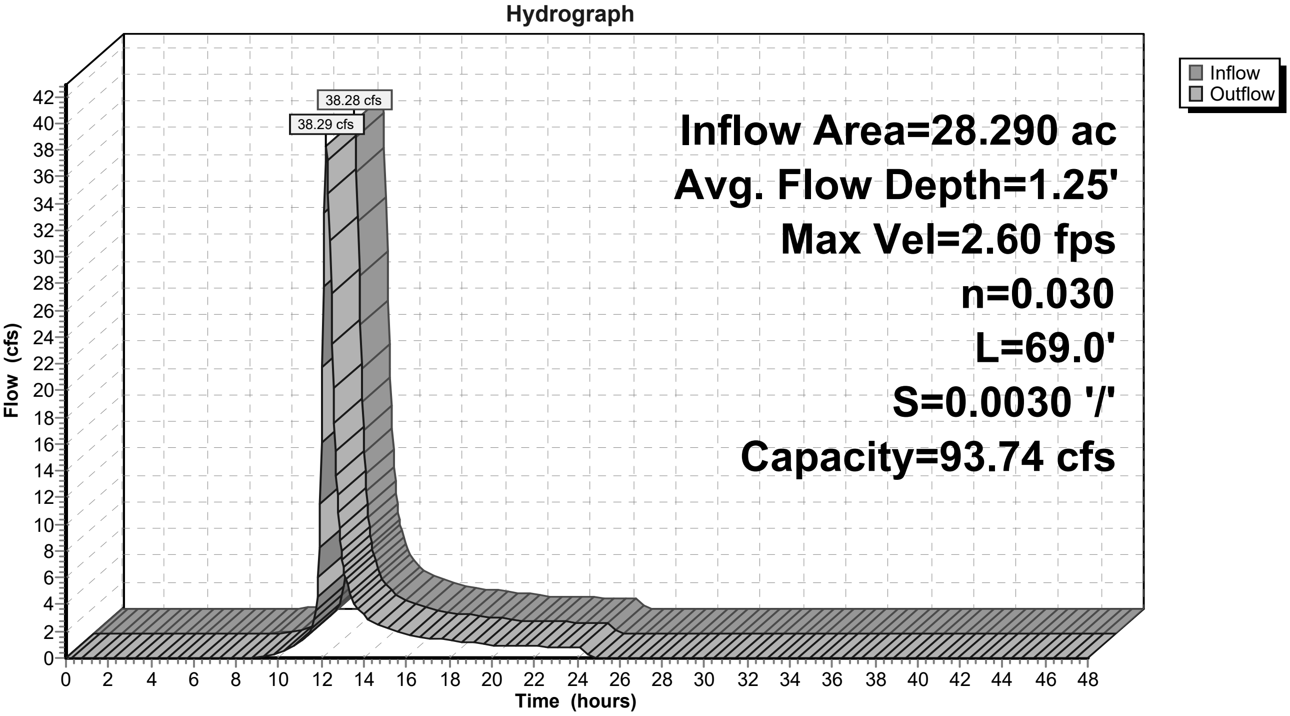
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.60 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 1.4 min

Peak Storage= 1,018 cf @ 12.25 hrs
Average Depth at Peak Storage= 1.25'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 93.74 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 69.0' Slope= 0.0030 '/'
Inlet Invert= 584.05', Outlet Invert= 583.84'

‡

Reach 100R: collector creek



Summary for Reach 110R-1: collector creek

Inflow Area = 28.290 ac, 7.60% Impervious, Inflow Depth = 1.57" for 10-yr storm event
Inflow = 38.29 cfs @ 12.25 hrs, Volume= 3.705 af
Outflow = 38.18 cfs @ 12.27 hrs, Volume= 3.705 af, Atten= 0%, Lag= 1.0 min

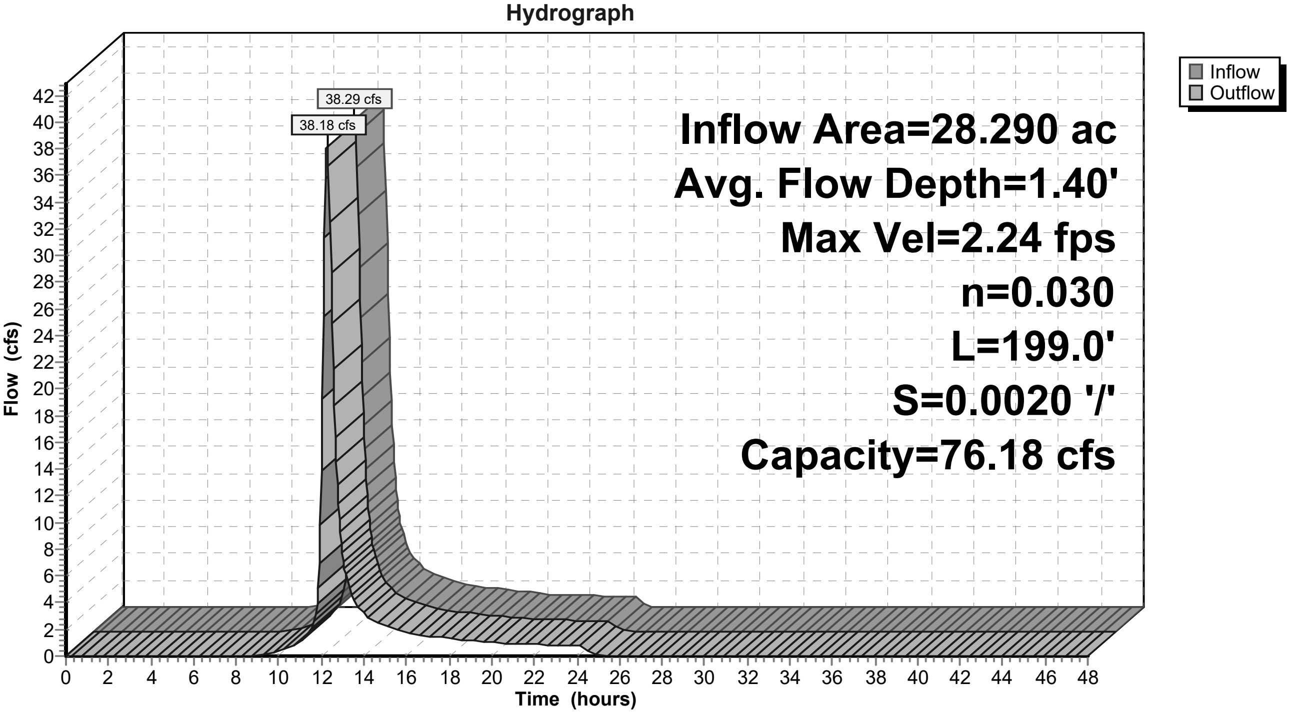
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.24 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 4.9 min

Peak Storage= 3,394 cf @ 12.27 hrs
Average Depth at Peak Storage= 1.40'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 76.18 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 199.0' Slope= 0.0020 '/'
Inlet Invert= 583.68', Outlet Invert= 583.28'

‡

Reach 110R-1: collector creek



Summary for Reach 110R-2: collector creek

Inflow Area = 37.320 ac, 7.34% Impervious, Inflow Depth = 1.51" for 10-yr storm event
Inflow = 48.46 cfs @ 12.26 hrs, Volume= 4.682 af
Outflow = 48.20 cfs @ 12.28 hrs, Volume= 4.682 af, Atten= 1%, Lag= 1.2 min

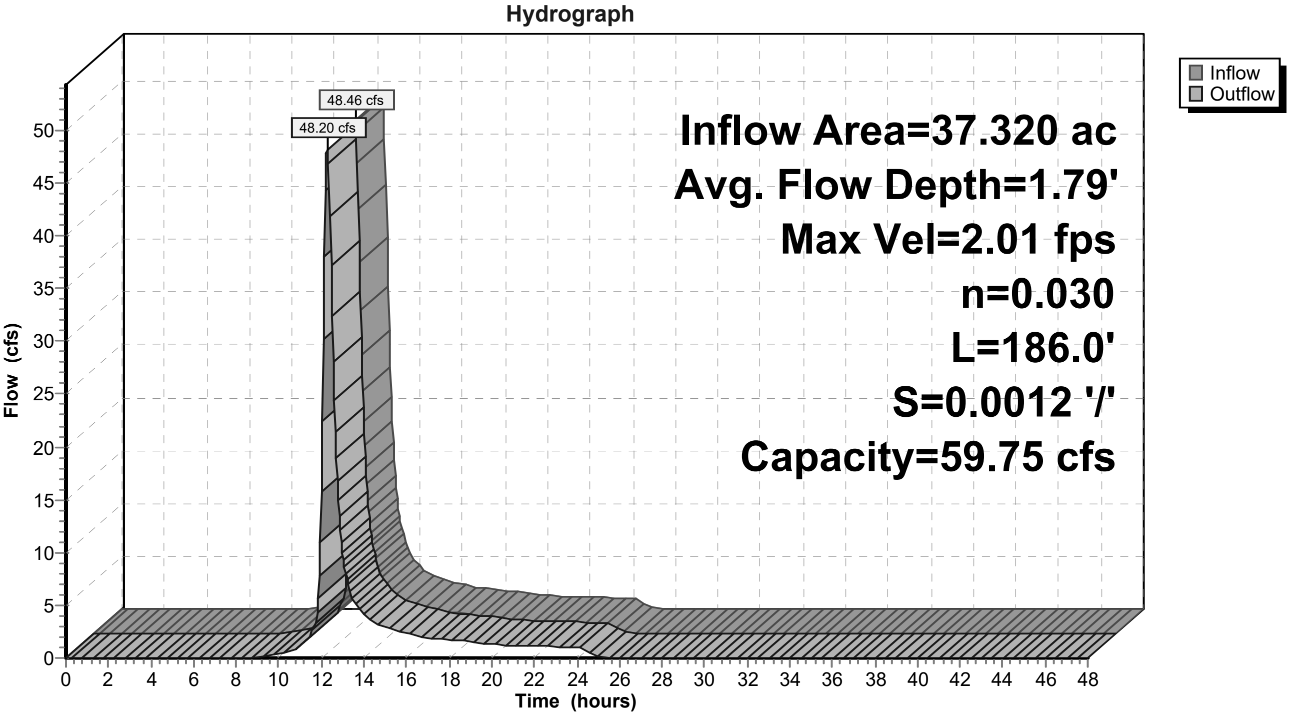
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.01 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.59 fps, Avg. Travel Time= 5.2 min

Peak Storage= 4,460 cf @ 12.28 hrs
Average Depth at Peak Storage= 1.79'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 59.75 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 186.0' Slope= 0.0012 '/'
Inlet Invert= 583.28', Outlet Invert= 583.05'

‡

Reach 110R-2: collector creek

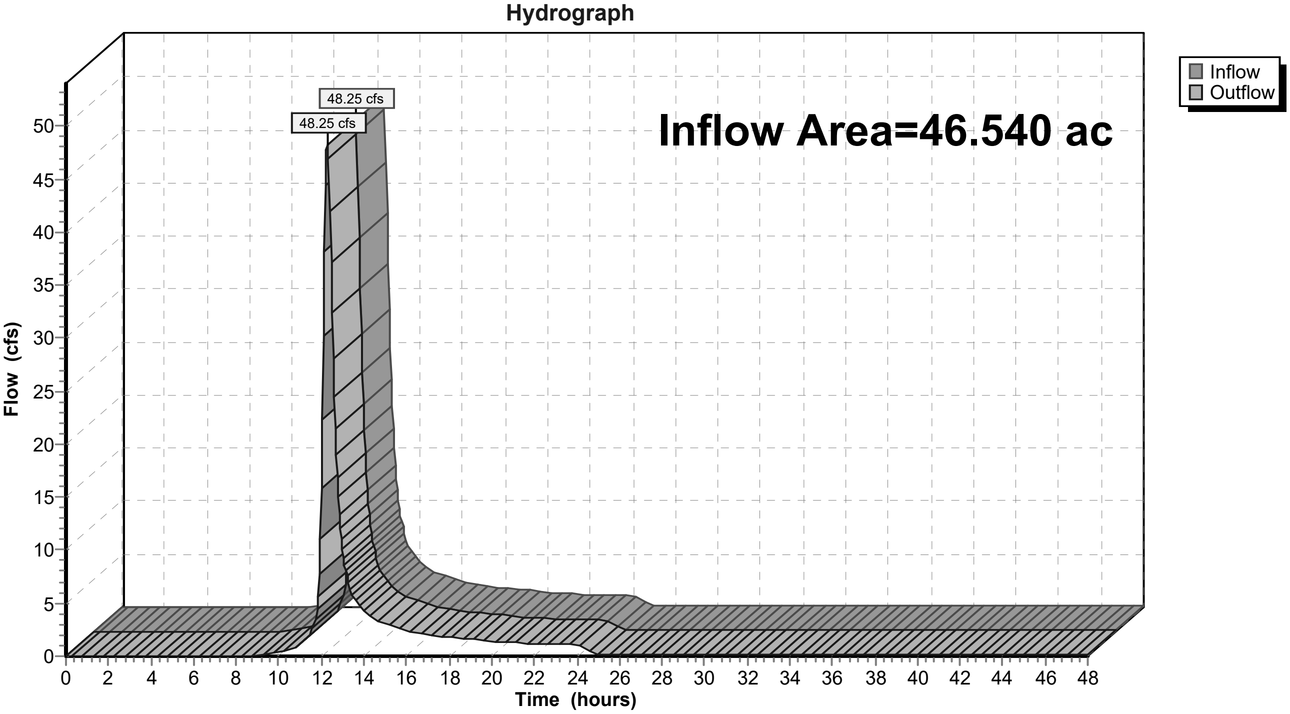


Summary for Reach DP-1: collector creek north of Bedell Road

```
Inflow Area =        46.540 ac,    7.16% Impervious,  Inflow Depth >   1.28"    for  10-yr storm event
Inflow       =       48.25 cfs @   12.28 hrs,  Volume=            4.949 af
Outflow      =       48.25 cfs @   12.28 hrs,  Volume=            4.949 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Reach DP-1: collector creek north of Bedell Road



Summary for Pond 100C: twin 36" culverts

```
Inflow Area =        28.290 ac,    7.60% Impervious,  Inflow Depth =   1.57"    for  10-yr storm event
Inflow       =      38.29 cfs @   12.25 hrs,  Volume=          3.705 af
Outflow      =      38.29 cfs @   12.25 hrs,  Volume=          3.705 af,  Atten= 0%,  Lag= 0.0 min
Primary      =      19.14 cfs @   12.25 hrs,  Volume=          1.852 af
Secondary =         19.14 cfs @   12.25 hrs,  Volume=          1.852 af
```

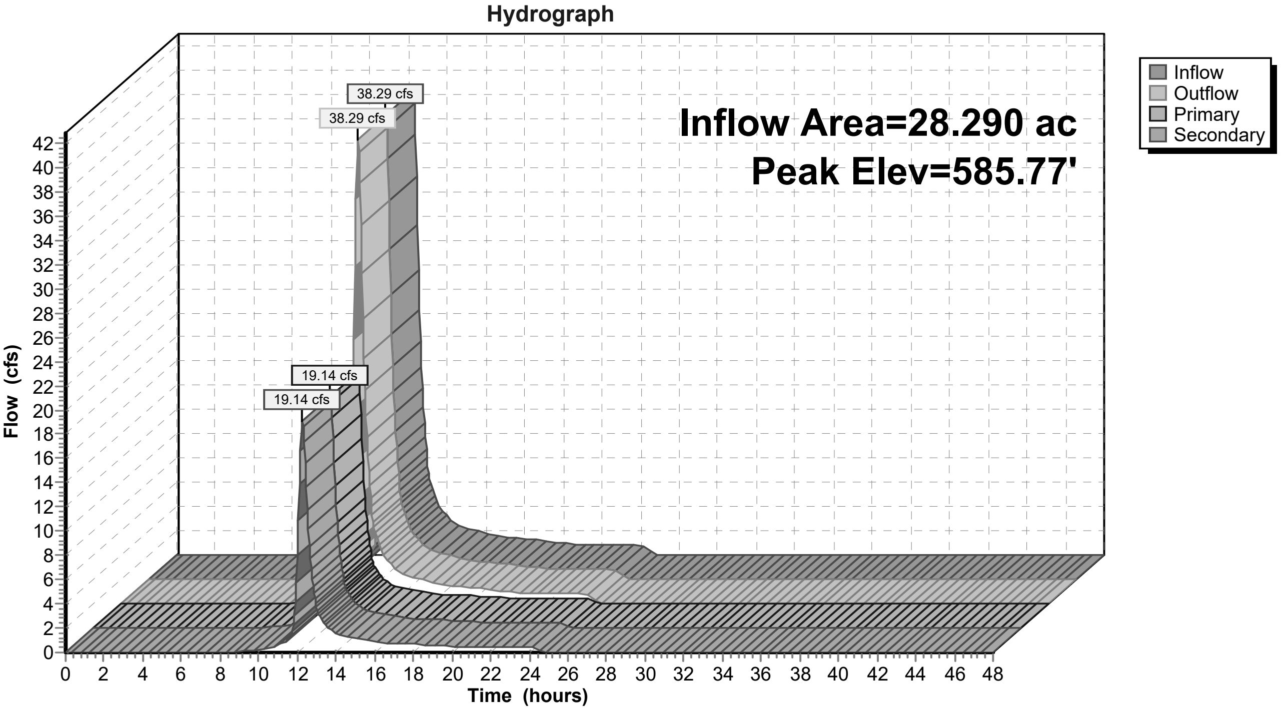
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 585.77' @ 12.26 hrs
Flood Elev= 591.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	583.83'	**36.0" Round Culvert w/ 7.0" inside fill** L= 51.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 583.25' / 583.10' S= 0.0029 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 6.10 sf
#2	Secondary	583.83'	**36.0" Round Culvert w/ 7.0" inside fill** L= 51.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 583.25' / 583.10' S= 0.0029 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 6.10 sf

Primary OutFlow Max=19.11 cfs @ 12.25 hrs HW=585.76' TW=585.07' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 19.11 cfs @ 3.57 fps)

Secondary OutFlow Max=19.11 cfs @ 12.25 hrs HW=585.76' TW=585.07' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 19.11 cfs @ 3.57 fps)

Pond 100C: twin 36" culverts



Summary for Pond 120Bio: bioretention

```
Inflow Area =      0.990 ac, 59.60% Impervious, Inflow Depth =  2.14"   for 10-yr storm event
Inflow      =     3.45 cfs @  11.98 hrs, Volume=        0.177 af
Outflow     =     0.31 cfs @  12.50 hrs, Volume=        0.177 af, Atten= 91%, Lag= 30.7 min
Primary     =     0.31 cfs @  12.50 hrs, Volume=        0.177 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= 0.05 hrs / 3
Peak Elev= 589.53' @ 12.50 hrs  Surf.Area= 7,675 sf  Storage= 3,956 cf
Flood Elev= 591.00'  Surf.Area= 9,215 sf  Storage= 16,320 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 672.3 min ( 1,473.5 - 801.2 )

Volume      Invert    Avail.Storage  Storage Description
   #1       589.00'       16,320 cf  Custom Stage Data (Prismatic)Listed below (Recalc)

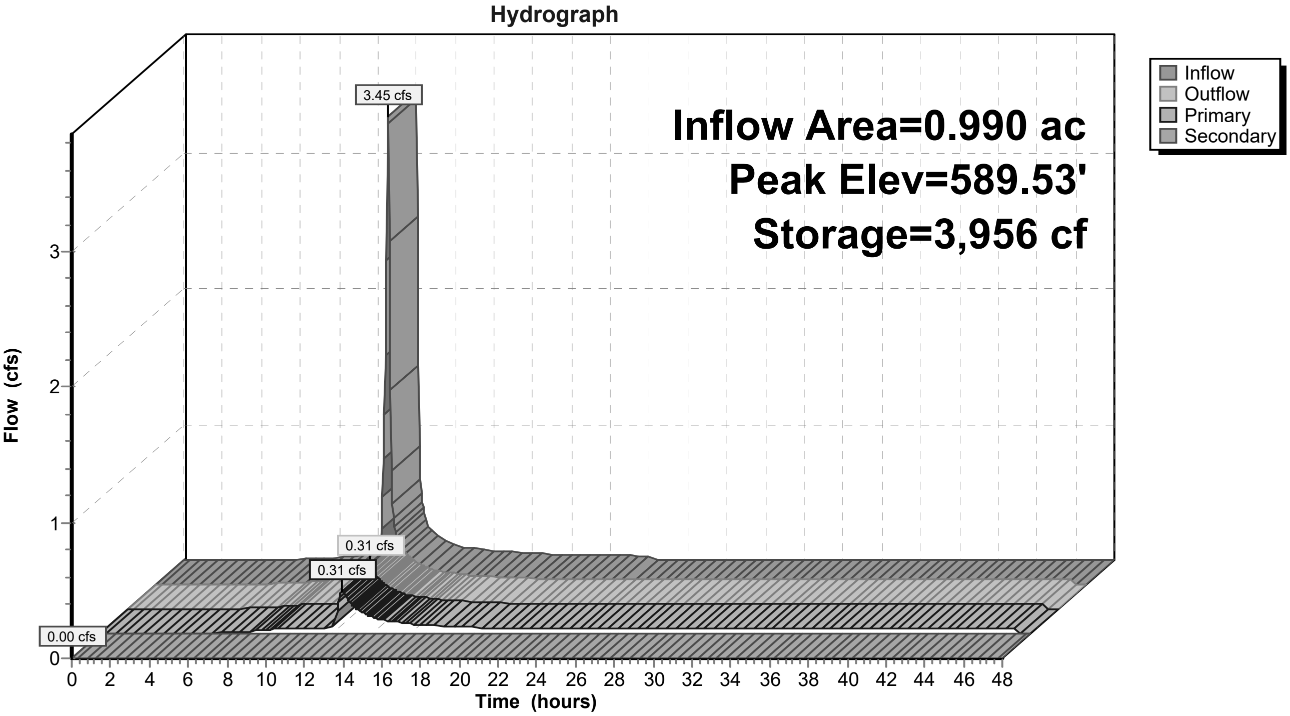
 Elevation        Surf.Area         Inc.Store        Cum.Store
    (feet)           (sq-ft)       (cubic-feet)     (cubic-feet)
    589.00             7,135                 0               0
    590.00             8,145             7,640           7,640
    591.00             9,215             8,680          16,320

Device   Routing        Invert   Outlet Devices
   #1    Primary       585.58'   15.0"  Round Culvert
                                 L= 33.0'   CPP, square edge headwall,  Ke= 0.500
                                 Inlet / Outlet Invert= 585.58' / 585.00'   S= 0.0176 '/'   Cc= 0.900
                                 n= 0.013  Corrugated PE, smooth interior,  Flow Area= 1.23 sf
   #2    Device 1      585.58'   6.0" Vert. Underdrain   C= 0.600
   #3    Device 1      589.50'   48.0" x 30.0" Horiz. Grate   C= 0.600
                                 Limited to weir flow at low heads
   #4    Secondary     590.00'   162.0 deg x 10.0' long x 1.00' rise overflow weir Cv= 2.47 (C= 3.09)
   #5    Device 2      589.00'   0.250 in/hr Exfiltration through bioretention media over Surface area

Primary OutFlow Max=0.31 cfs @ 12.50 hrs  HW=589.53'  TW=586.19'   (Dynamic Tailwater)
└─1=Culvert  (Passes 0.31 cfs of 10.78 cfs potential flow)
   ├─2=Underdrain  (Passes 0.04 cfs of 1.73 cfs potential flow)
   │  └─5=Exfiltration through bioretention media(Exfiltration Controls 0.04 cfs)
   └─3=Grate  (Weir Controls 0.27 cfs @ 0.60 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=589.00'  TW=0.00'   (Dynamic Tailwater)
└─4=overflow weir  ( Controls 0.00 cfs)
```

Pond 120Bio: bioretention



Summary for Pond 120F: forebay

```
Inflow Area =      0.990 ac, 59.60% Impervious, Inflow Depth =  2.14"   for 10-yr storm event
Inflow      =     3.50 cfs @  11.97 hrs, Volume=        0.177 af
Outflow     =     3.45 cfs @  11.98 hrs, Volume=        0.177 af, Atten= 1%, Lag= 1.1 min
Primary     =     3.45 cfs @  11.98 hrs, Volume=        0.177 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 589.50' Surf.Area= 1,395 sf Storage= 2,900 cf
Peak Elev= 589.72' @ 11.98 hrs Surf.Area= 1,477 sf Storage= 3,211 cf (311 cf above start)
Flood Elev= 591.00' Surf.Area= 2,050 sf Storage= 5,463 cf (2,563 cf above start)

Plug-Flow detention time= 183.6 min calculated for 0.110 af (62% of inflow)
Center-of-Mass det. time= 4.0 min (801.2 - 797.2)

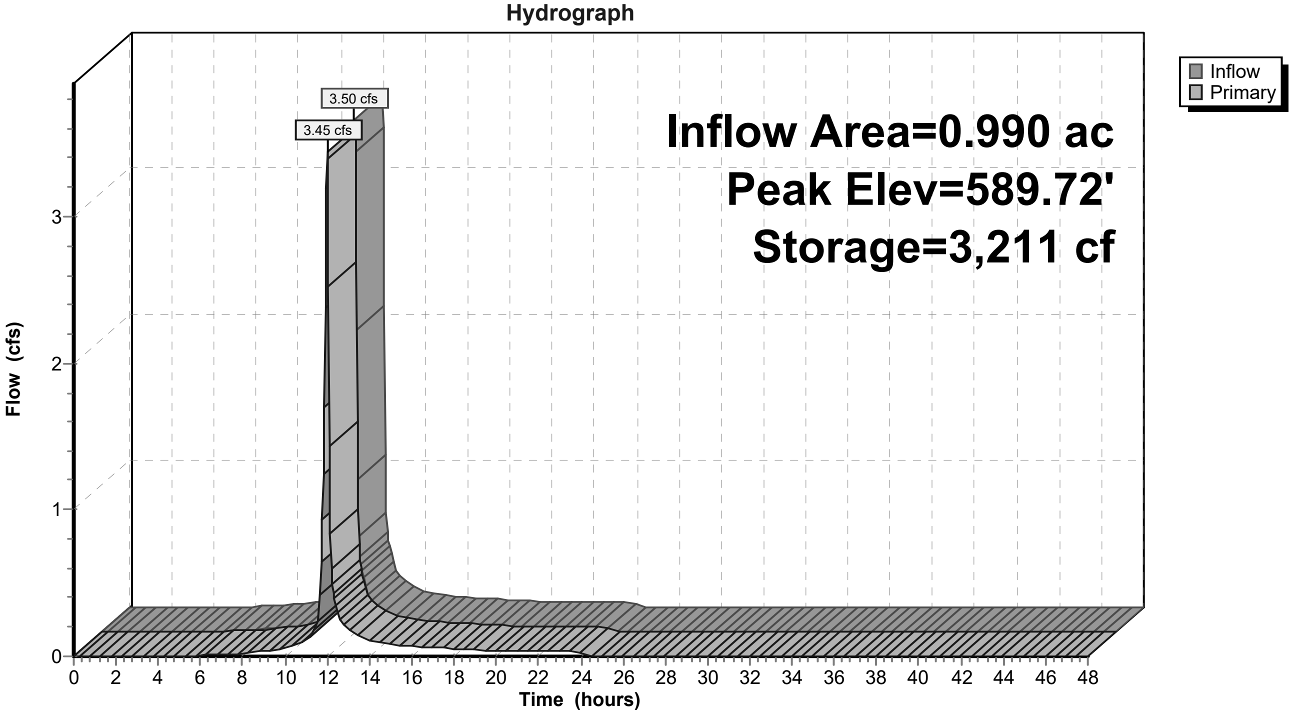
Volume	Invert	Avail.Storage	Storage Description
#1	585.50'	5,463 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
585.50	190	0	0
586.00	290	120	120
588.00	825	1,115	1,235
590.00	1,585	2,410	3,645
591.00	2,050	1,818	5,463

Device	Routing	Invert	Outlet Devices
#1	Primary	589.50'	**162.0 deg x 10.0' long x 1.50' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=3.34 cfs @ 11.98 hrs HW=589.71' TW=589.33' (Dynamic Tailwater)
└─**1=overflow weir** (Weir Controls 3.34 cfs @ 1.39 fps)

Pond 120F: forebay



Summary for Pond 121P: wet pond

```
Inflow Area =       9.220 ac,   6.40% Impervious,  Inflow Depth >  1.77"   for  10-yr storm event
Inflow       =     21.41 cfs @  11.96 hrs,  Volume=           1.360 af
Outflow      =      0.09 cfs @  24.16 hrs,  Volume=           0.267 af,  Atten= 100%,  Lag= 731.6 min
Primary      =      0.09 cfs @  24.16 hrs,  Volume=           0.267 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= 0.05 hrs / 3
Starting Elev= 586.00'   Surf.Area= 176,355 sf   Storage= 3,165,935 cf
Peak Elev= 586.29' @ 24.16 hrs   Surf.Area= 178,455 sf   Storage= 3,216,761 cf   (50,826 cf above start)
Flood Elev= 591.00'   Surf.Area= 213,930 sf   Storage= 4,140,758 cf   (974,823 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 912.7 min ( 1,824.4 - 911.8 )

Volume        Invert     Avail.Storage   Storage Description
   #1        556.00'      4,140,758 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation        Surf.Area        Inc.Store        Cum.Store
    (feet)          (sq-ft)     (cubic-feet)     (cubic-feet)
    556.00           60,460                0                0
    558.00           65,900          126,360          126,360
    560.00           71,435          137,335          263,695
    562.00           77,065          148,500          412,195
    564.00           82,800          159,865          572,060
    566.00           88,640          171,440          743,500
    568.00           94,575          183,215          926,715
    570.00          100,610          195,185        1,121,900
    572.00          106,750          207,360        1,329,260
    574.00          112,985          219,735        1,548,995
    576.00          119,325          232,310        1,781,305
    578.00          125,765          245,090        2,026,395
    580.00          132,300          258,065        2,284,460
    582.00          138,945          271,245        2,555,705
    584.00          145,685          284,630        2,840,335
    584.50          148,240           73,481        2,913,816
    585.00          169,175           79,354        2,993,170
    586.00          176,355          172,765        3,165,935
    588.00          191,015          367,370        3,533,305
    590.00          206,315          397,330        3,930,635
    591.00          213,930          210,123        4,140,758

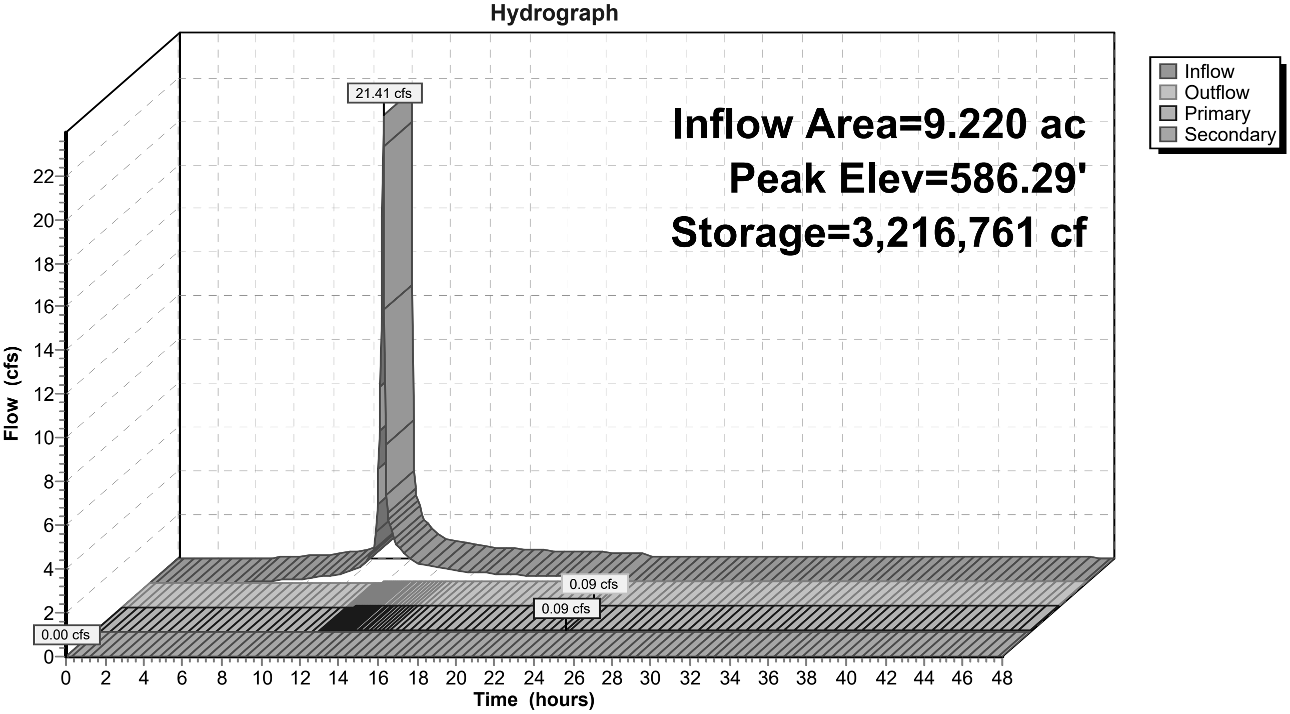
Device   Routing           Invert   Outlet Devices
   #1    Primary          586.00'   12.0"  Round Culvert
                                    L= 35.0'   CPP, square edge headwall,  Ke= 0.500
                                    Inlet / Outlet Invert= 586.00' / 585.00'   S= 0.0286 '/'   Cc= 0.900
                                    n= 0.013  Corrugated PE, smooth interior,  Flow Area= 0.79 sf
   #2    Device 1         586.00'   3.0" Vert. Orifice (internal)  C= 0.600
   #3    Device 1         586.75'   48.0" W x 8.0" H Vert. Weir (internal)  C= 0.600
   #4    Device 1         588.50'   48.0" x 30.0" Horiz. Grate   C= 0.600
```

Limited to weir flow at low heads
#5 Secondary 589.00' **162.0 deg x 10.0' long x 2.00' rise Overflow Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.09 cfs @ 24.16 hrs HW=586.29' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.09 cfs of 0.34 cfs potential flow)
  ↑—**2=Orifice (internal)** (Orifice Controls 0.09 cfs @ 1.93 fps)
  —**3=Weir (internal)** (Controls 0.00 cfs)
  └—**4=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=586.00' TW=0.00' (Dynamic Tailwater)
↑—**5=Overflow Weir** (Controls 0.00 cfs)

Pond 121P: wet pond



Summary for Pond 122P: wet pond

Inflow Area = 2.540 ac, 0.00% Impervious, Inflow Depth = 2.14" for 10-yr storm event
Inflow = 8.97 cfs @ 11.97 hrs, Volume= 0.453 af
Outflow = 0.07 cfs @ 14.70 hrs, Volume= 0.078 af, Atten= 99%, Lag= 163.9 min
Primary = 0.07 cfs @ 14.70 hrs, Volume= 0.078 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 586.00' Surf.Area= 60,080 sf Storage= 684,053 cf
Peak Elev= 586.29' @ 24.11 hrs Surf.Area= 61,275 sf Storage= 701,582 cf (17,529 cf above start)
Flood Elev= 591.00' Surf.Area= 81,520 sf Storage= 1,037,148 cf (353,095 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 618.0 min (1,415.2 - 797.2)

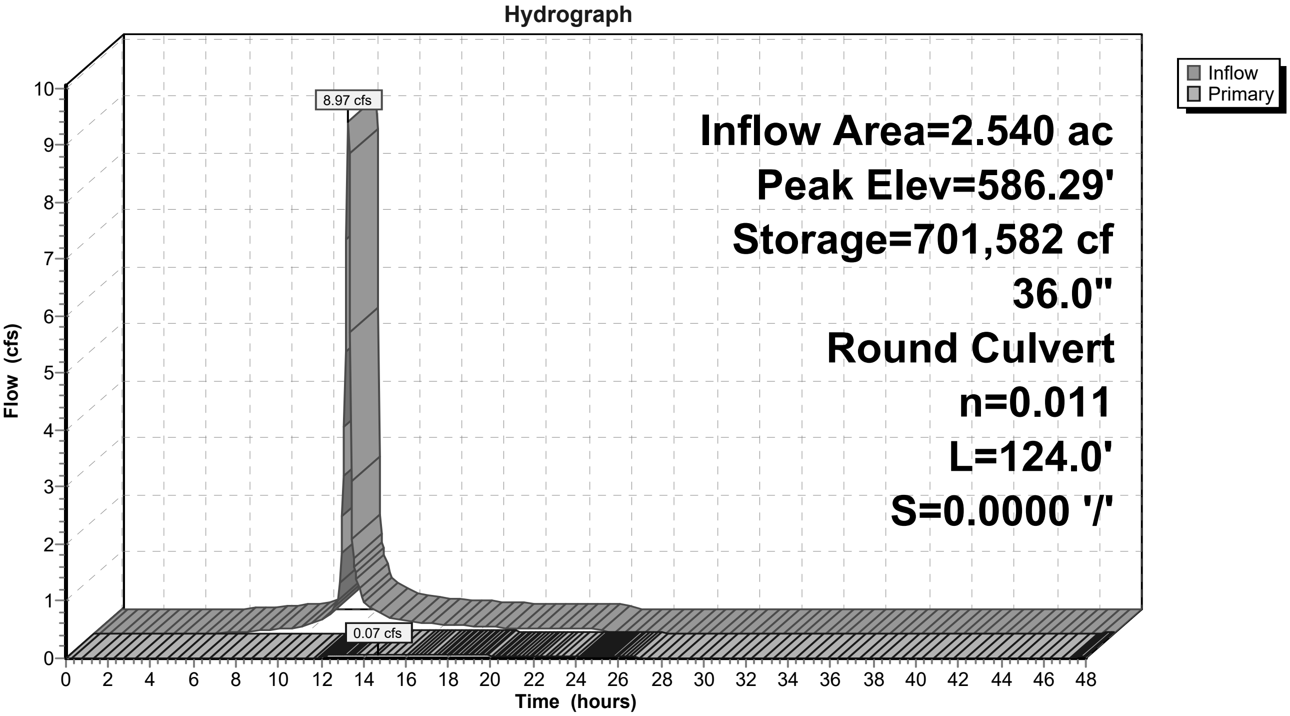
Volume	Invert	Avail.Storage	Storage Description
#1	561.00'	1,037,148 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
561.00	10,385	0	0
562.00	11,425	10,905	10,905
564.00	13,580	25,005	35,910
566.00	15,985	29,565	65,475
568.00	18,410	34,395	99,870
570.00	20,940	39,350	139,220
572.00	23,565	44,505	183,725
574.00	26,295	49,860	233,585
576.00	29,805	56,100	289,685
578.00	32,910	62,715	352,400
580.00	36,110	69,020	421,420
582.00	39,415	75,525	496,945
584.00	42,820	82,235	579,180
584.50	44,120	21,735	600,915
585.00	56,090	25,053	625,968
586.00	60,080	58,085	684,053
588.00	68,355	128,435	812,488
590.00	77,030	145,385	957,873
591.00	81,520	79,275	1,037,148

Device	Routing	Invert	Outlet Devices
#1	Primary	586.00'	**36.0" Round Culvert** L= 124.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 586.00' / 586.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 7.07 sf

Primary OutFlow Max=0.07 cfs @ 14.70 hrs HW=586.25' TW=586.23' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.07 cfs @ 0.36 fps)

Pond 122P: wet pond



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment100: Runoff Area=28.290 ac 7.60% Impervious Runoff Depth=3.21"
Flow Length=1,342' Tc=30.1 min CN=85 Runoff=78.22 cfs 7.571 af

Subcatchment110: Runoff Area=9.030 ac 6.53% Impervious Runoff Depth=2.84"
Flow Length=541' Slope=0.0090 '/' Tc=27.6 min CN=81 Runoff=23.38 cfs 2.134 af

Subcatchment120: Runoff Area=0.990 ac 59.60% Impervious Runoff Depth=3.92"
Tc=6.0 min CN=92 Runoff=6.17 cfs 0.324 af

Subcatchment121: Runoff Area=5.690 ac 0.00% Impervious Runoff Depth=4.14"
Tc=6.0 min CN=94 Runoff=36.55 cfs 1.963 af

Subcatchment122: Runoff Area=2.540 ac 0.00% Impervious Runoff Depth=3.92"
Tc=6.0 min CN=92 Runoff=15.83 cfs 0.830 af

Reach 100R: collector creek Avg. Flow Depth=1.82' Max Vel=3.18 fps Inflow=78.22 cfs 7.571 af
n=0.030 L=69.0' S=0.0030 '/' Capacity=93.74 cfs Outflow=78.24 cfs 7.571 af

Reach 110R-1: collector creek Avg. Flow Depth=2.03' Max Vel=2.74 fps Inflow=78.24 cfs 7.571 af
n=0.030 L=199.0' S=0.0020 '/' Capacity=76.18 cfs Outflow=78.11 cfs 7.571 af

Reach 110R-2: collector creek Avg. Flow Depth=2.70' Max Vel=2.40 fps Inflow=101.01 cfs 9.704 af
n=0.030 L=186.0' S=0.0012 '/' Capacity=59.75 cfs Outflow=100.70 cfs 9.704 af

Reach DP-1: collector creek north of Bedell Road Inflow=100.81 cfs 10.135 af
Outflow=100.81 cfs 10.135 af

Pond 100C: twin 36" culverts Peak Elev=587.51' Inflow=78.24 cfs 7.571 af
Primary=39.12 cfs 3.785 af Secondary=39.12 cfs 3.785 af Outflow=78.24 cfs 7.571 af

Pond 120Bio: bioretention Peak Elev=589.71' Storage=5,294 cf Inflow=5.96 cfs 0.324 af
Primary=4.04 cfs 0.323 af Secondary=0.00 cfs 0.000 af Outflow=4.04 cfs 0.323 af

Pond 120F: forebay Peak Elev=589.82' Storage=3,372 cf Inflow=6.17 cfs 0.324 af
Outflow=5.96 cfs 0.324 af

Pond 121P: wet pond Peak Elev=586.53' Storage=3,259,614 cf Inflow=38.49 cfs 2.430 af
Primary=0.15 cfs 0.431 af Secondary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.431 af

Pond 122P: wet pond Peak Elev=586.53' Storage=716,221 cf Inflow=15.83 cfs 0.830 af
36.0" Round Culvert n=0.011 L=124.0' S=0.0000 '/' Outflow=0.22 cfs 0.144 af

Total Runoff Area = 46.540 ac Runoff Volume = 12.822 af Average Runoff Depth = 3.31"
92.84% Pervious = 43.210 ac 7.16% Impervious = 3.330 ac

Summary for Subcatchment 100:

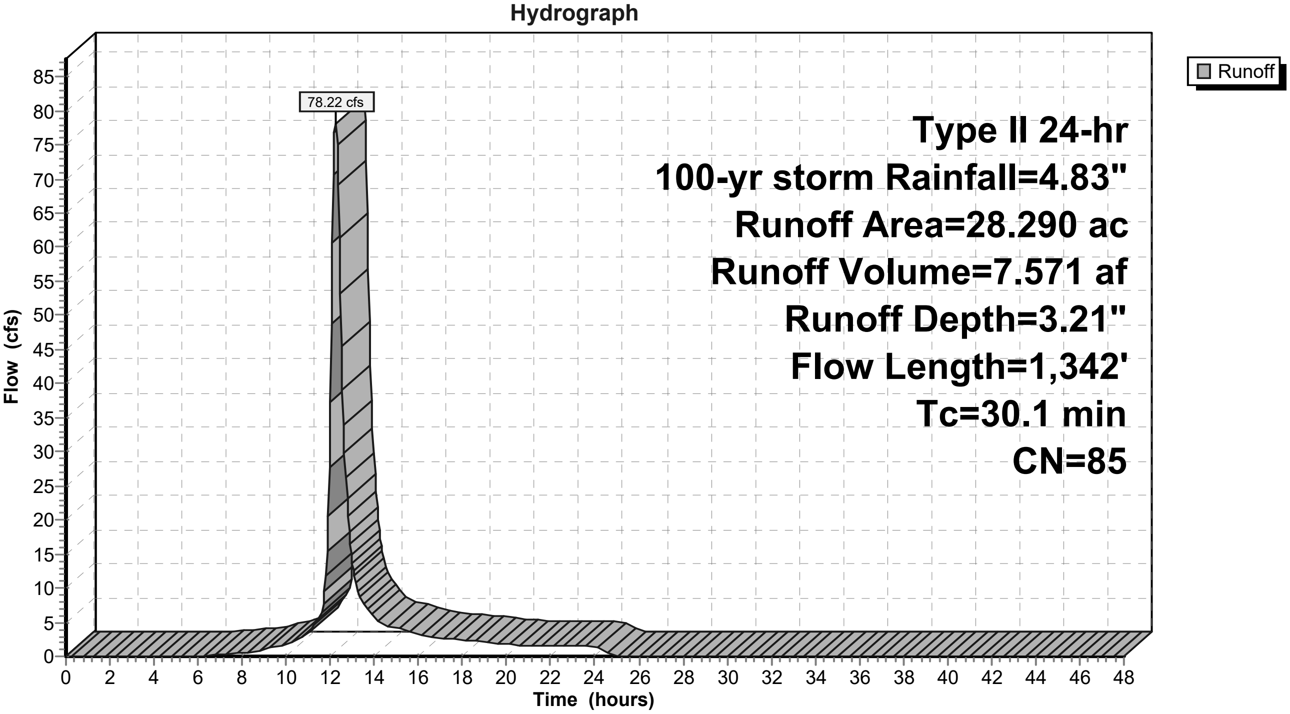
Runoff = 78.22 cfs @ 12.24 hrs, Volume= 7.571 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	2.050	84	50-75% Grass cover, Fair, HSG D
	2.010	79	Woods, Fair, HSG D
*	16.120	84	50-75% Grass cover, Fair, HSG D (offsite)
*	3.770	79	Woods, Fair, HSG D (offsite)
*	1.510	98	Paved parking, HSG D (offsite)
*	0.640	98	Roofs, HSG D (offsite)
*	0.620	91	Gravel roads, HSG D (offsite)
*	1.570	98	Water Surface, 0% imp, HSG D (offsite)
	28.290	85	Weighted Average
	26.140		92.40% Pervious Area
	2.150		7.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0170	0.13		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.1	87	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.7	84	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
7.1	266	0.0080	0.63		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
7.4	805	0.0020	1.81	21.76	**Channel Flow, E-F** Area= 12.0 sf Perim= 16.2' r= 0.74' n= 0.030 Earth, grassed & winding
30.1	1,342	Total			

Subcatchment 100:



Summary for Subcatchment 110:

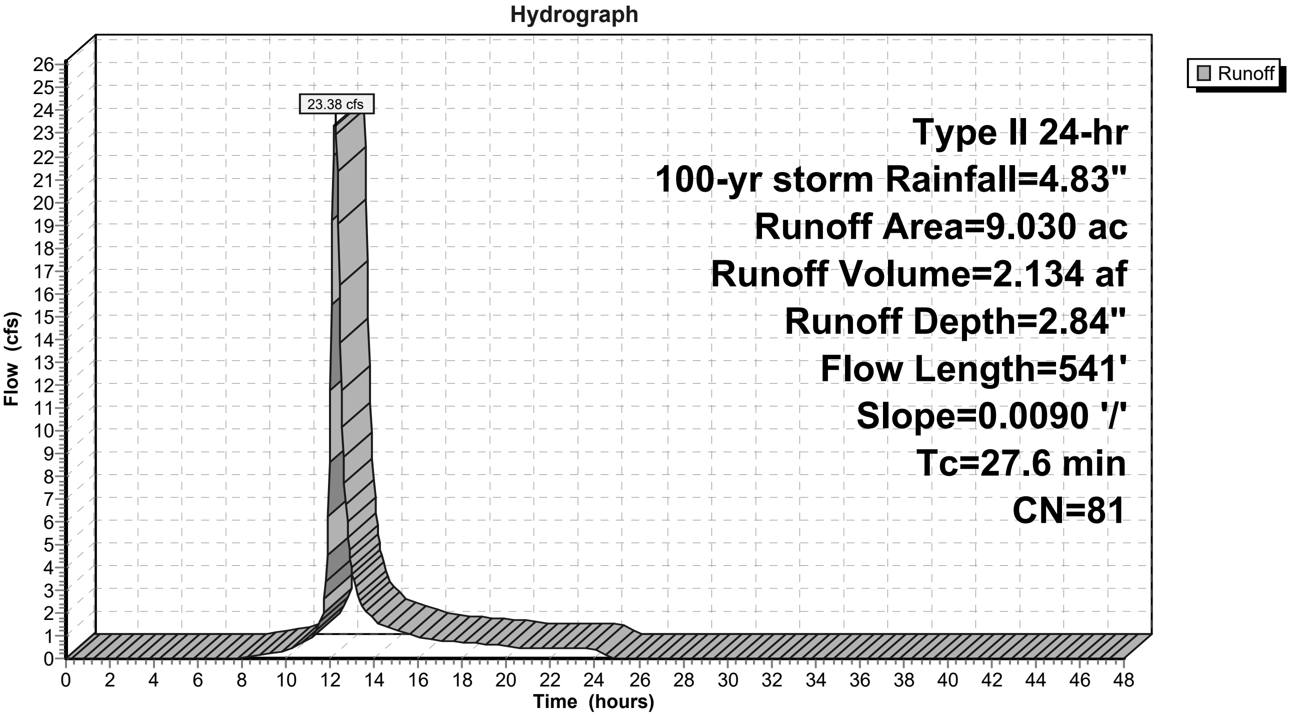
Runoff = 23.38 cfs @ 12.21 hrs, Volume= 2.134 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	0.870	84	50-75% Grass cover, Fair, HSG D
	0.360	98	Paved parking, HSG D
	5.390	79	Woods, Fair, HSG D
	0.120	98	Water Surface, 0% imp, HSG D
*	0.160	84	50-75% Grass cover, Fair, HSG D (offsite)
*	1.900	79	Woods, Fair, HSG D (offsite)
*	0.230	98	Paved parking, HSG D (offsite)
	9.030	81	Weighted Average
	8.440		93.47% Pervious Area
	0.590		6.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0090	0.10		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
11.1	441	0.0090	0.66		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
27.6	541	Total			

Subcatchment 110:



Summary for Subcatchment 120:

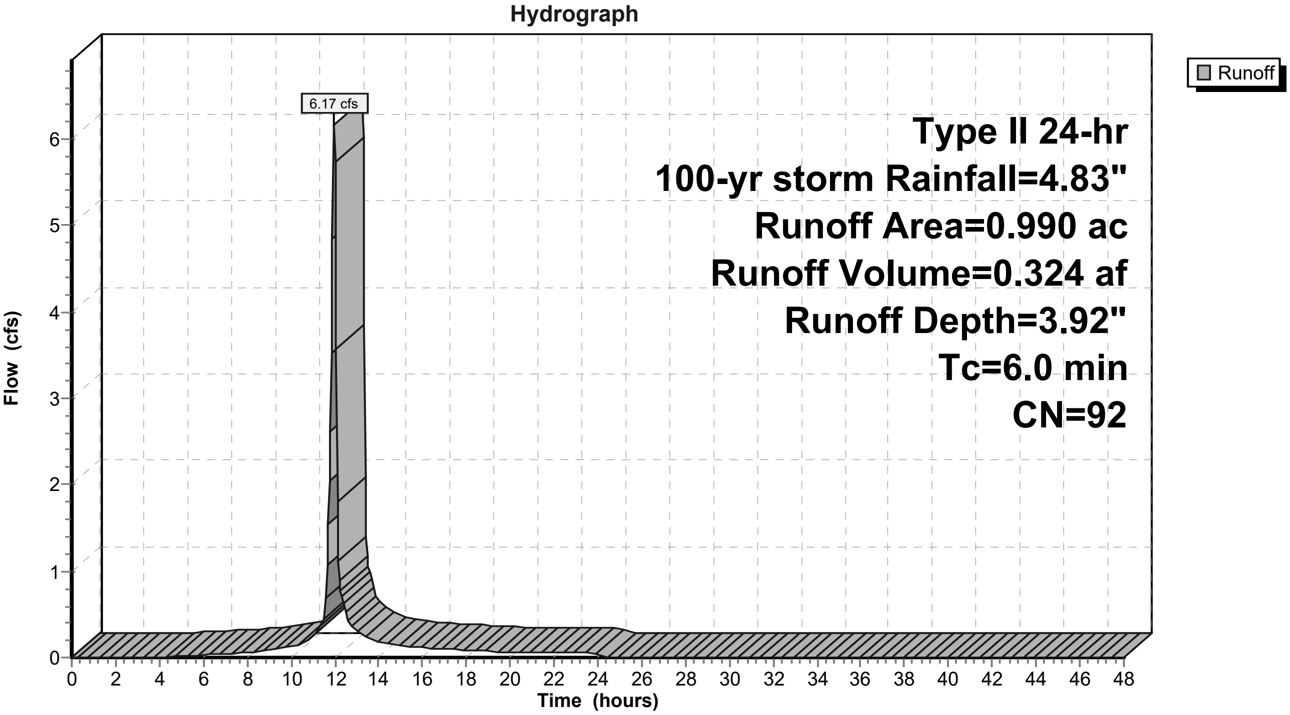
Runoff = 6.17 cfs @ 11.96 hrs, Volume= 0.324 af, Depth= 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
0.400	84	50-75% Grass cover, Fair, HSG D
0.590	98	Paved parking, HSG D
0.990	92	Weighted Average
0.400		40.40% Pervious Area
0.590		59.60% Impervious Area

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

Subcatchment 120:



Summary for Subcatchment 121:

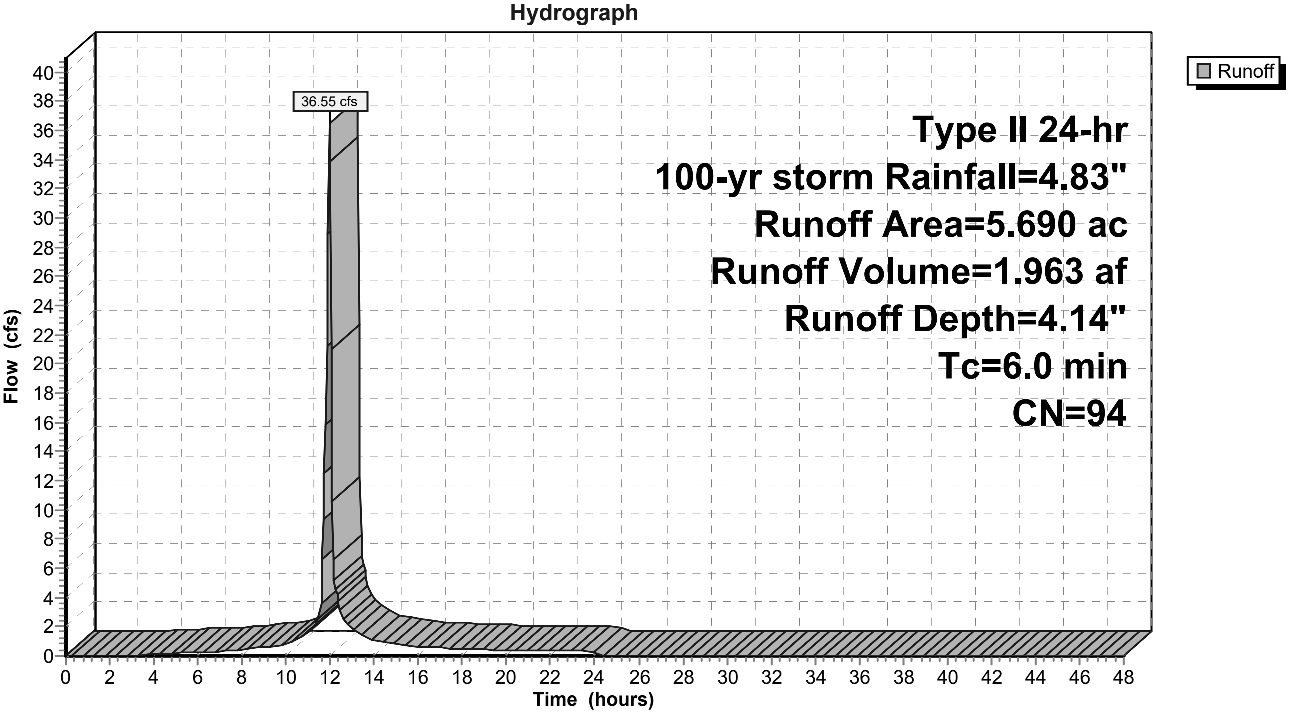
Runoff = 36.55 cfs @ 11.96 hrs, Volume= 1.963 af, Depth= 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
1.640	84	50-75% Grass cover, Fair, HSG D
4.050	98	Water Surface, 0% imp, HSG D
5.690	94	Weighted Average
5.690		100.00% Pervious Area

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

Subcatchment 121:



Summary for Subcatchment 122:

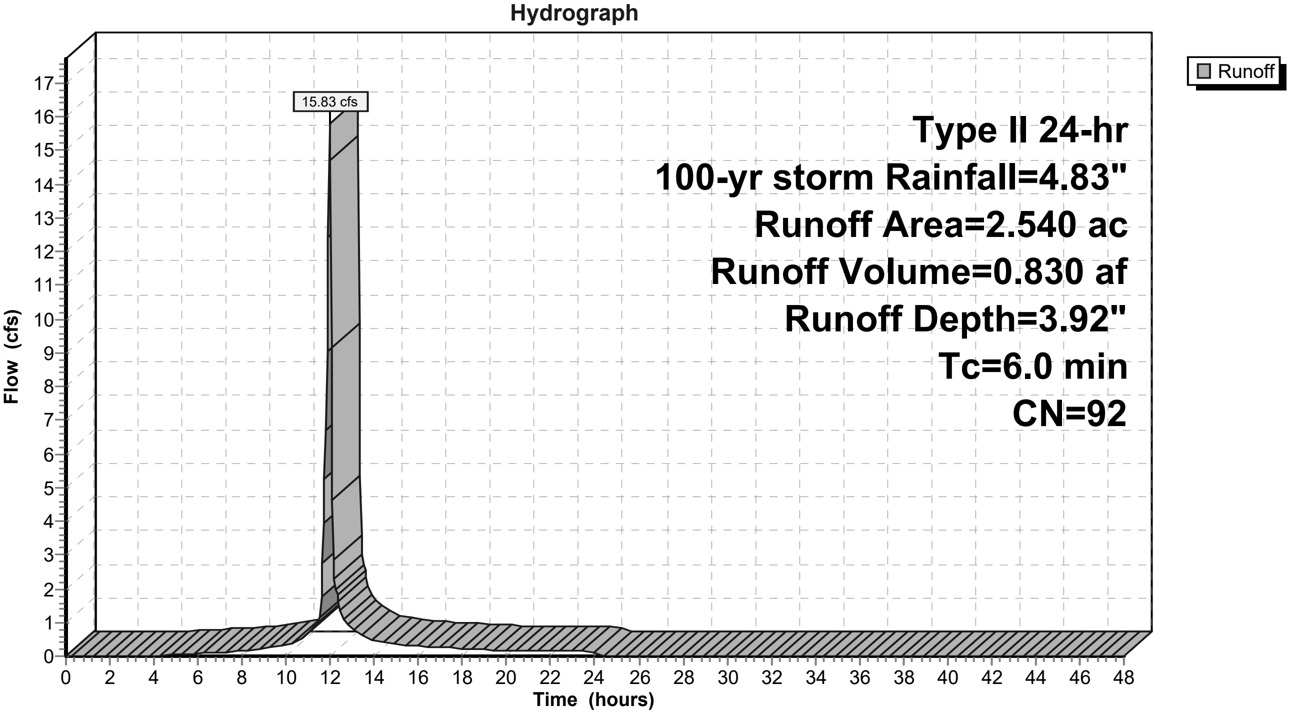
Runoff = 15.83 cfs @ 11.96 hrs, Volume= 0.830 af, Depth= 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
1.160	84	50-75% Grass cover, Fair, HSG D
1.380	98	Water Surface, 0% imp, HSG D
2.540	92	Weighted Average
2.540		100.00% Pervious Area

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

Subcatchment 122:



Summary for Reach 100R: collector creek

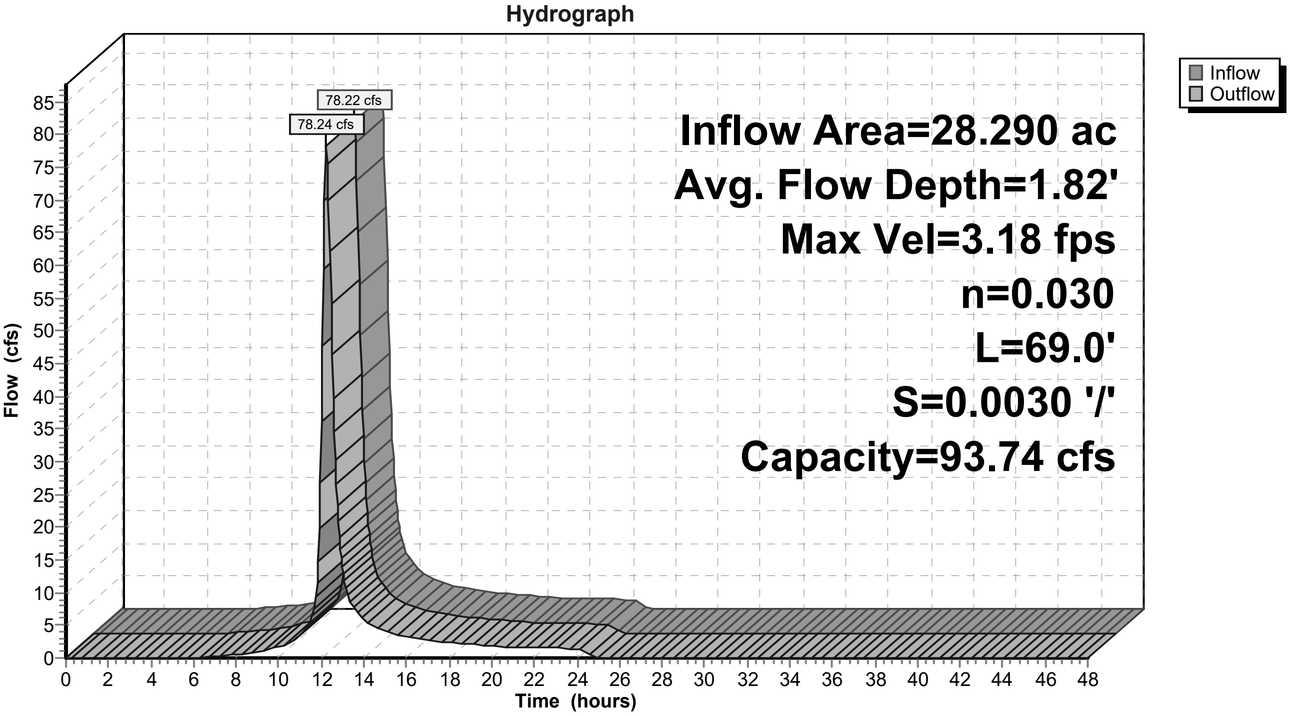
Inflow Area = 28.290 ac, 7.60% Impervious, Inflow Depth = 3.21" for 100-yr storm event
Inflow = 78.22 cfs @ 12.24 hrs, Volume= 7.571 af
Outflow = 78.24 cfs @ 12.24 hrs, Volume= 7.571 af, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.18 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 1.2 min

Peak Storage= 1,695 cf @ 12.24 hrs
Average Depth at Peak Storage= 1.82'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 93.74 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 69.0' Slope= 0.0030 '/'
Inlet Invert= 584.05', Outlet Invert= 583.84'

Reach 100R: collector creek



Summary for Reach 110R-1: collector creek

Inflow Area = 28.290 ac, 7.60% Impervious, Inflow Depth = 3.21" for 100-yr storm event
Inflow = 78.24 cfs @ 12.24 hrs, Volume= 7.571 af
Outflow = 78.11 cfs @ 12.26 hrs, Volume= 7.571 af, Atten= 0%, Lag= 0.9 min

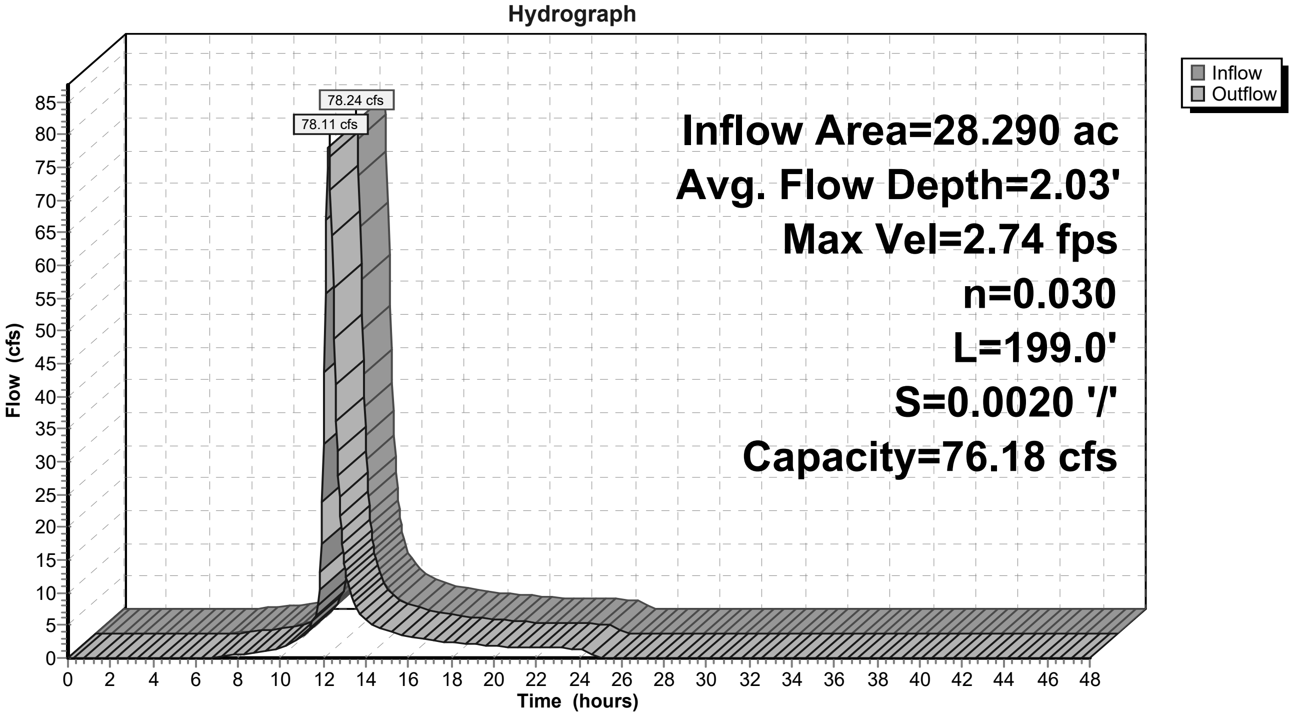
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.74 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.81 fps, Avg. Travel Time= 4.1 min

Peak Storage= 5,675 cf @ 12.26 hrs
Average Depth at Peak Storage= 2.03'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 76.18 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 199.0' Slope= 0.0020 '/'
Inlet Invert= 583.68', Outlet Invert= 583.28'

‡

Reach 110R-1: collector creek



Summary for Reach 110R-2: collector creek

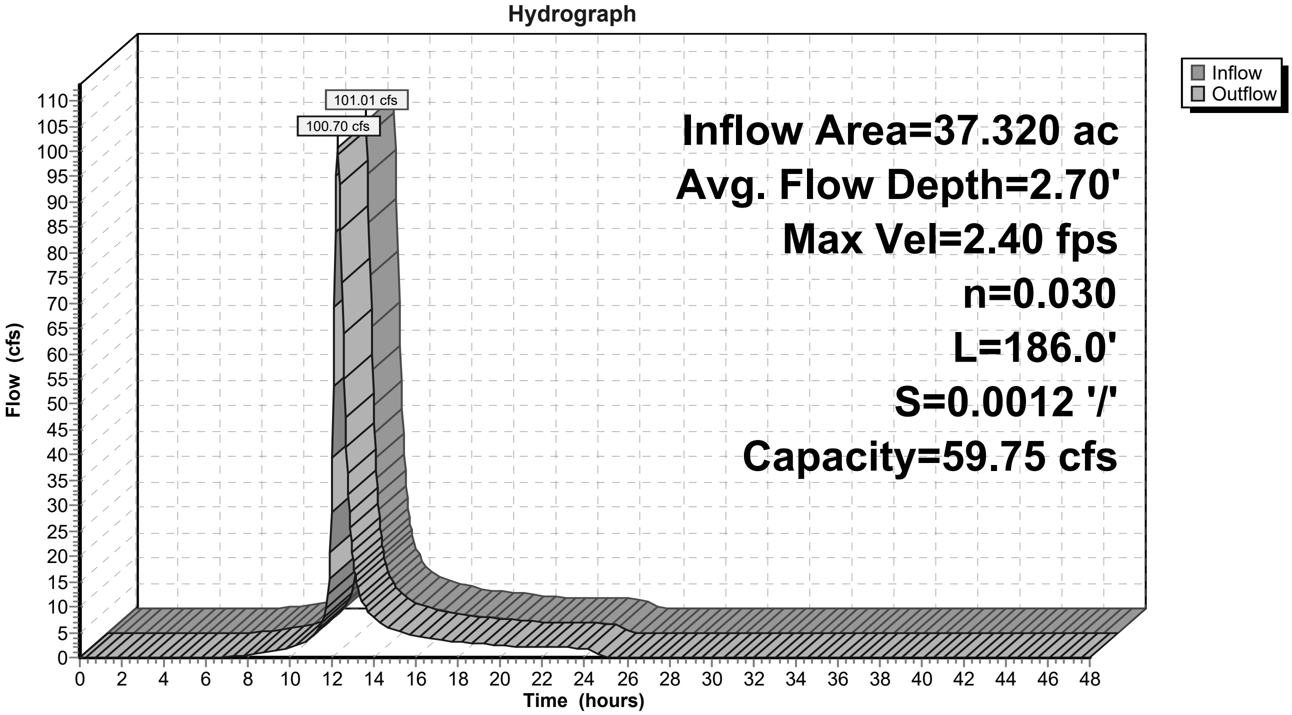
Inflow Area =	37.320 ac,	7.34% Impervious,	Inflow Depth = 3.12"	for 100-yr storm event	
Inflow =	101.01 cfs @	12.25 hrs, Volume=	9.704 af		
Outflow =	100.70 cfs @	12.27 hrs, Volume=	9.704 af,	Atten= 0%,	Lag= 1.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.40 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 4.3 min

Peak Storage= 7,800 cf @ 12.27 hrs
Average Depth at Peak Storage= 2.70'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 59.75 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 186.0' Slope= 0.0012 '/'
Inlet Invert= 583.28', Outlet Invert= 583.05'

Reach 110R-2: collector creek

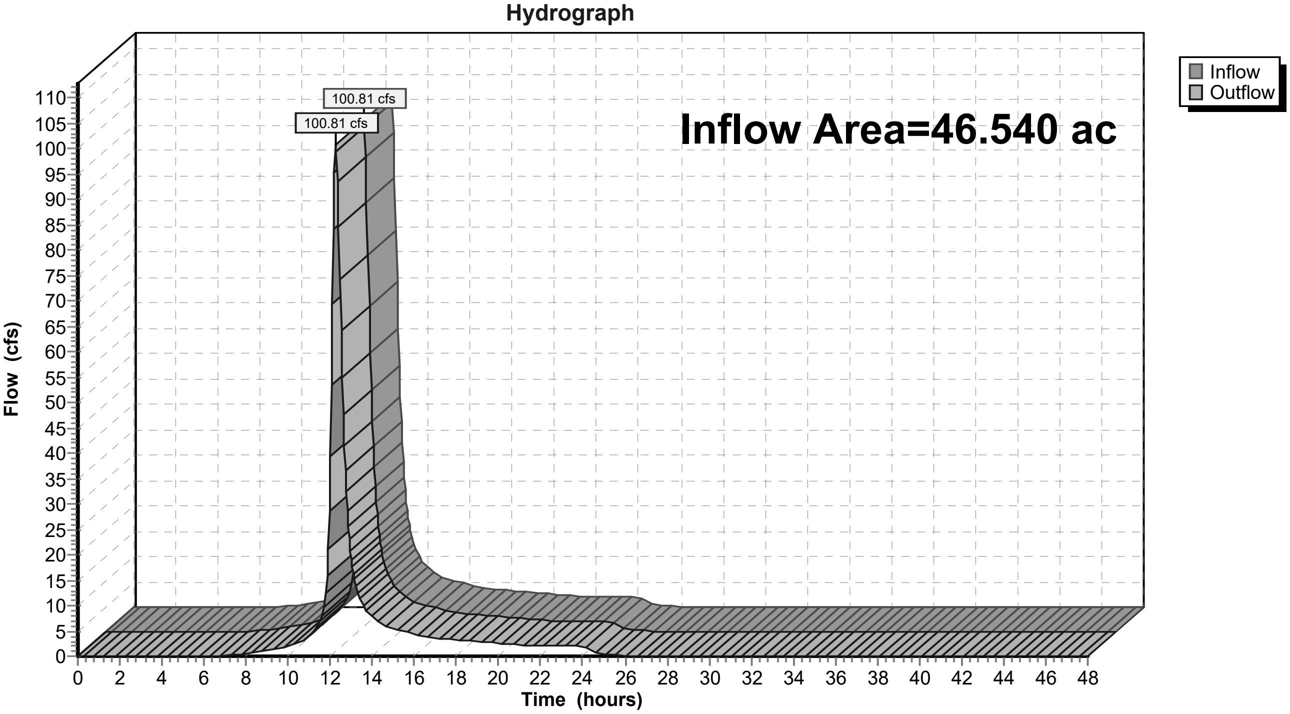


Summary for Reach DP-1: collector creek north of Bedell Road

Inflow Area = 46.540 ac, 7.16% Impervious, Inflow Depth > 2.61" for 100-yr storm event
Inflow = 100.81 cfs @ 12.27 hrs, Volume= 10.135 af
Outflow = 100.81 cfs @ 12.27 hrs, Volume= 10.135 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Reach DP-1: collector creek north of Bedell Road



Summary for Pond 100C: twin 36" culverts

```
Inflow Area =        28.290 ac,    7.60% Impervious,  Inflow Depth =   3.21"    for  100-yr storm event
Inflow      =       78.24 cfs @   12.24 hrs,  Volume=          7.571 af
Outflow     =       78.24 cfs @   12.24 hrs,  Volume=          7.571 af,  Atten= 0%,  Lag= 0.0 min
Primary     =       39.12 cfs @   12.24 hrs,  Volume=          3.785 af
Secondary   =       39.12 cfs @   12.24 hrs,  Volume=          3.785 af
```

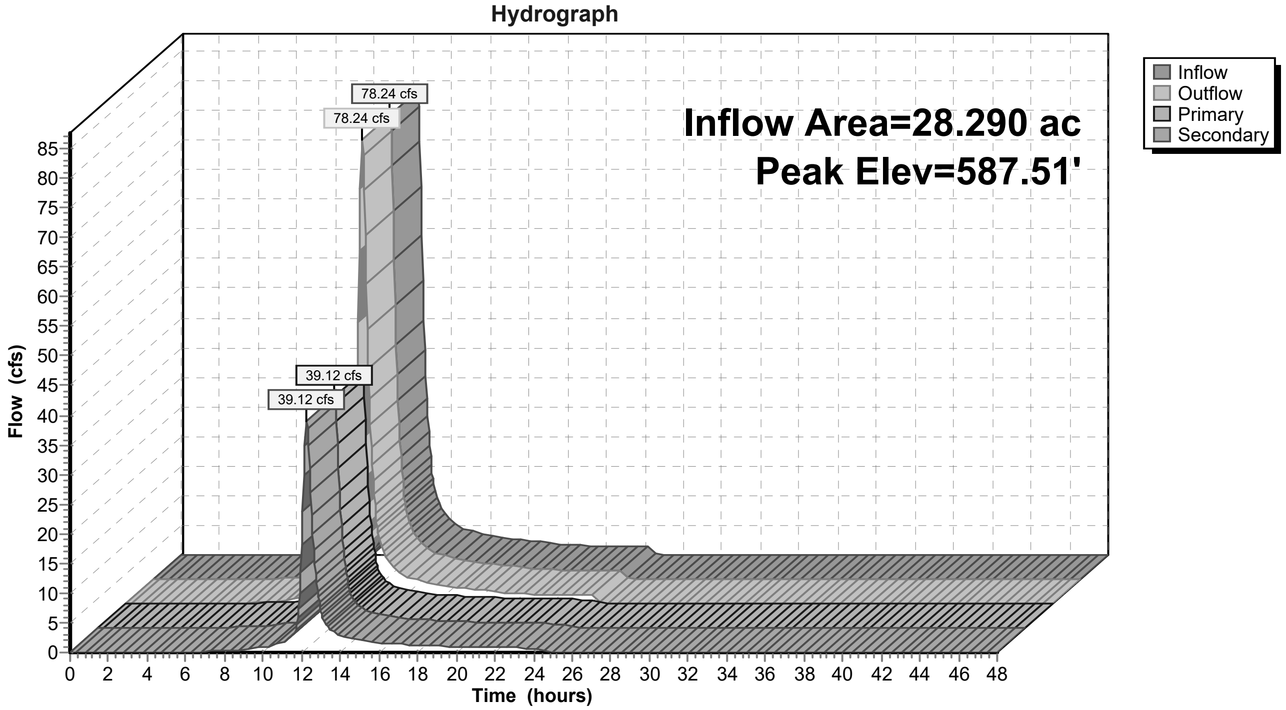
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 587.51' @ 12.25 hrs
Flood Elev= 591.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	583.83'	**36.0" Round Culvert w/ 7.0" inside fill** L= 51.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 583.25' / 583.10' S= 0.0029 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 6.10 sf
#2	Secondary	583.83'	**36.0" Round Culvert w/ 7.0" inside fill** L= 51.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 583.25' / 583.10' S= 0.0029 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 6.10 sf

Primary OutFlow Max=39.00 cfs @ 12.24 hrs HW=587.50' TW=585.70' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 39.00 cfs @ 6.39 fps)

Secondary OutFlow Max=39.00 cfs @ 12.24 hrs HW=587.50' TW=585.70' (Dynamic Tailwater)
↑**2=Culvert** (Inlet Controls 39.00 cfs @ 6.39 fps)

Pond 100C: twin 36" culverts



Summary for Pond 120Bio: bioretention

Inflow Area = 0.990 ac, 59.60% Impervious, Inflow Depth = 3.92" for 100-yr storm event
Inflow = 5.96 cfs @ 11.98 hrs, Volume= 0.324 af
Outflow = 4.04 cfs @ 12.06 hrs, Volume= 0.323 af, Atten= 32%, Lag= 4.9 min
Primary = 4.04 cfs @ 12.06 hrs, Volume= 0.323 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= 0.05 hrs / 3
Peak Elev= 589.71' @ 12.06 hrs Surf.Area= 7,849 sf Storage= 5,294 cf
Flood Elev= 591.00' Surf.Area= 9,215 sf Storage= 16,320 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 392.9 min (1,176.9 - 784.0)

Volume	Invert	Avail.Storage	Storage Description
#1	589.00'	16,320 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

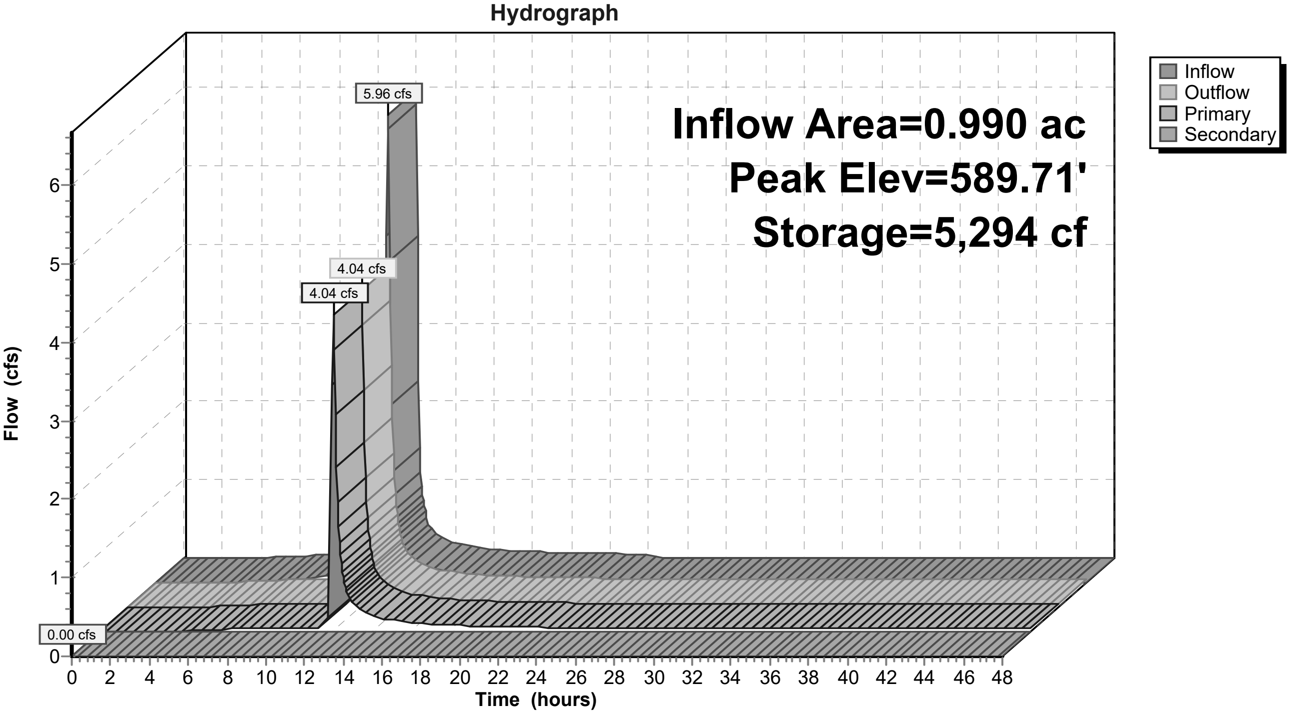
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
589.00	7,135	0	0
590.00	8,145	7,640	7,640
591.00	9,215	8,680	16,320

Device	Routing	Invert	Outlet Devices
#1	Primary	585.58'	**15.0" Round Culvert** L= 33.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.58' / 585.00' S= 0.0176 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	585.58'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	589.50'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	590.00'	**162.0 deg x 10.0' long x 1.00' rise overflow weir** Cv= 2.47 (C= 3.09)
#5	Device 2	589.00'	**0.250 in/hr Exfiltration through bioretention media over Surface area**

Primary OutFlow Max=3.94 cfs @ 12.06 hrs HW=589.70' TW=586.29' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.94 cfs of 10.91 cfs potential flow)
  ├─**2=Underdrain** (Passes 0.05 cfs of 1.75 cfs potential flow)
  │ └─**5=Exfiltration through bioretention media** (Exfiltration Controls 0.05 cfs)
  └─**3=Grate** (Weir Controls 3.89 cfs @ 1.47 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=589.00' TW=0.00' (Dynamic Tailwater)
└─**4=overflow weir** (Controls 0.00 cfs)

Pond 120Bio: bioretention



Summary for Pond 120F: forebay

Inflow Area = 0.990 ac, 59.60% Impervious, Inflow Depth = 3.92" for 100-yr storm event
Inflow = 6.17 cfs @ 11.96 hrs, Volume= 0.324 af
Outflow = 5.96 cfs @ 11.98 hrs, Volume= 0.324 af, Atten= 3%, Lag= 0.8 min
Primary = 5.96 cfs @ 11.98 hrs, Volume= 0.324 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 589.50' Surf.Area= 1,395 sf Storage= 2,900 cf
Peak Elev= 589.82' @ 11.99 hrs Surf.Area= 1,518 sf Storage= 3,372 cf (472 cf above start)
Flood Elev= 591.00' Surf.Area= 2,050 sf Storage= 5,463 cf (2,563 cf above start)

Plug-Flow detention time= 131.2 min calculated for 0.257 af (79% of inflow)
Center-of-Mass det. time= 3.5 min (784.0 - 780.5)

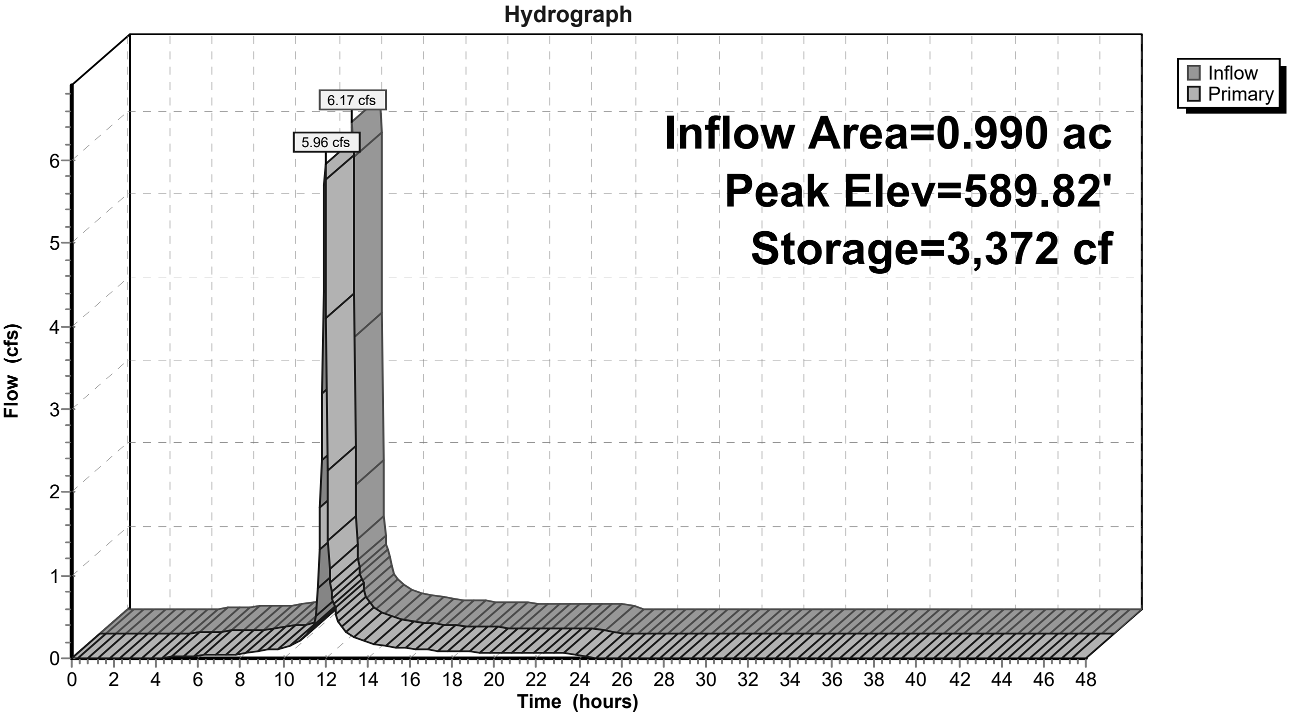
Volume	Invert	Avail.Storage	Storage Description
#1	585.50'	5,463 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
585.50	190	0	0
586.00	290	120	120
588.00	825	1,115	1,235
590.00	1,585	2,410	3,645
591.00	2,050	1,818	5,463

Device	Routing	Invert	Outlet Devices
#1	Primary	589.50'	**162.0 deg x 10.0' long x 1.50' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=5.80 cfs @ 11.98 hrs HW=589.81' TW=589.64' (Dynamic Tailwater)
↑—**1=overflow weir** (Weir Controls 5.80 cfs @ 1.54 fps)

Pond 120F: forebay



Summary for Pond 121P: wet pond

Inflow Area = 9.220 ac, 6.40% Impervious, Inflow Depth > 3.16" for 100-yr storm event
Inflow = 38.49 cfs @ 11.97 hrs, Volume= 2.430 af
Outflow = 0.15 cfs @ 24.14 hrs, Volume= 0.431 af, Atten= 100%, Lag= 730.1 min
Primary = 0.15 cfs @ 24.14 hrs, Volume= 0.431 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= 0.05 hrs / 3
Starting Elev= 586.00' Surf.Area= 176,355 sf Storage= 3,165,935 cf
Peak Elev= 586.53' @ 24.14 hrs Surf.Area= 180,207 sf Storage= 3,259,614 cf (93,679 cf above start)
Flood Elev= 591.00' Surf.Area= 213,930 sf Storage= 4,140,758 cf (974,823 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 943.4 min (1,805.2 - 861.9)

Volume	Invert	Avail.Storage	Storage Description
#1	556.00'	4,140,758 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
556.00	60,460	0	0
558.00	65,900	126,360	126,360
560.00	71,435	137,335	263,695
562.00	77,065	148,500	412,195
564.00	82,800	159,865	572,060
566.00	88,640	171,440	743,500
568.00	94,575	183,215	926,715
570.00	100,610	195,185	1,121,900
572.00	106,750	207,360	1,329,260
574.00	112,985	219,735	1,548,995
576.00	119,325	232,310	1,781,305
578.00	125,765	245,090	2,026,395
580.00	132,300	258,065	2,284,460
582.00	138,945	271,245	2,555,705
584.00	145,685	284,630	2,840,335
584.50	148,240	73,481	2,913,816
585.00	169,175	79,354	2,993,170
586.00	176,355	172,765	3,165,935
588.00	191,015	367,370	3,533,305
590.00	206,315	397,330	3,930,635
591.00	213,930	210,123	4,140,758

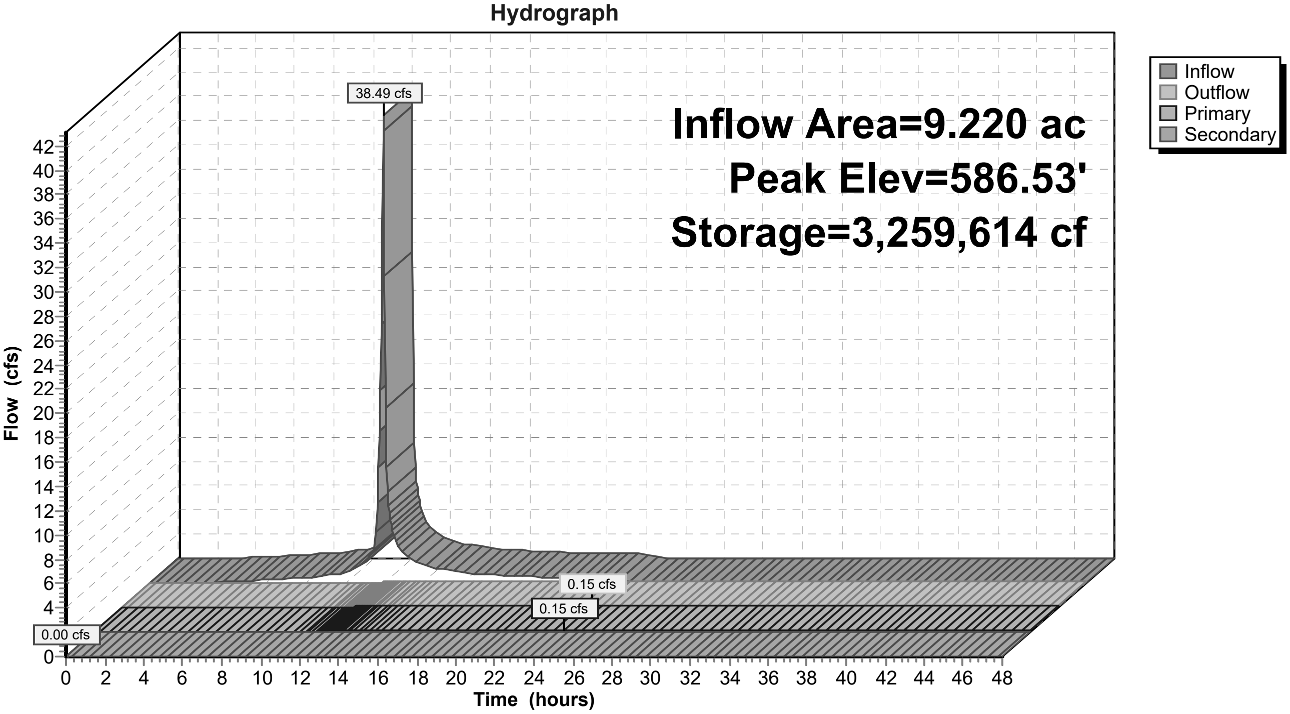
Device	Routing	Invert	Outlet Devices
#1	Primary	586.00'	**12.0" Round Culvert** L= 35.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 586.00' / 585.00' S= 0.0286 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	586.00'	**3.0" Vert. Orifice (internal)** C= 0.600
#3	Device 1	586.75'	**48.0" W x 8.0" H Vert. Weir (internal)** C= 0.600
#4	Device 1	588.50'	**48.0" x 30.0" Horiz. Grate** C= 0.600

Limited to weir flow at low heads
#5 Secondary 589.00' **162.0 deg x 10.0' long x 2.00' rise Overflow Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.15 cfs @ 24.14 hrs HW=586.53' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 0.15 cfs of 1.03 cfs potential flow)
  - **2=Orifice (internal)** (Orifice Controls 0.15 cfs @ 3.05 fps)
  - **3=Weir (internal)** (Controls 0.00 cfs)
  - **4=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=586.00' TW=0.00' (Dynamic Tailwater)
- **5=Overflow Weir** (Controls 0.00 cfs)

Pond 121P: wet pond



Summary for Pond 122P: wet pond

Inflow Area = 2.540 ac, 0.00% Impervious, Inflow Depth = 3.92" for 100-yr storm event
Inflow = 15.83 cfs @ 11.96 hrs, Volume= 0.830 af
Outflow = 0.22 cfs @ 12.63 hrs, Volume= 0.144 af, Atten= 99%, Lag= 40.0 min
Primary = 0.22 cfs @ 12.63 hrs, Volume= 0.144 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 586.00' Surf.Area= 60,080 sf Storage= 684,053 cf
Peak Elev= 586.53' @ 24.11 hrs Surf.Area= 62,256 sf Storage= 716,221 cf (32,169 cf above start)
Flood Elev= 591.00' Surf.Area= 81,520 sf Storage= 1,037,148 cf (353,095 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 613.0 min (1,393.5 - 780.5)

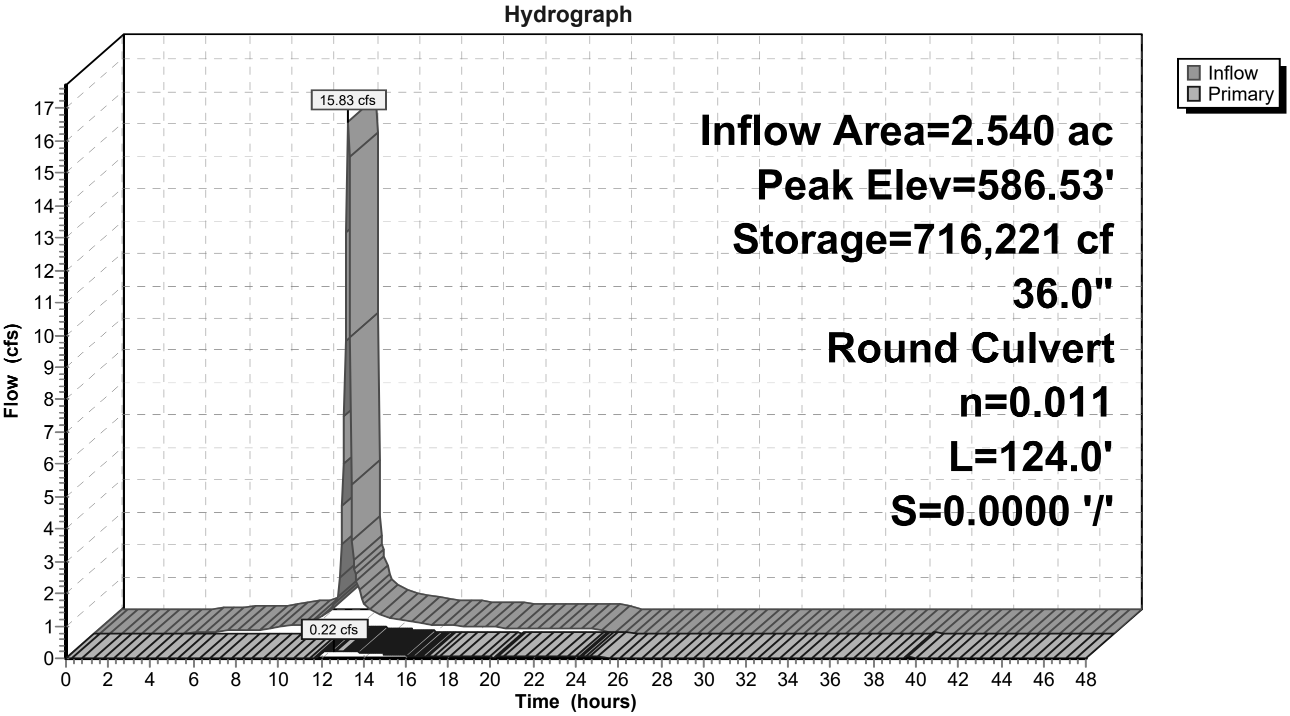
Volume	Invert	Avail.Storage	Storage Description
#1	561.00'	1,037,148 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

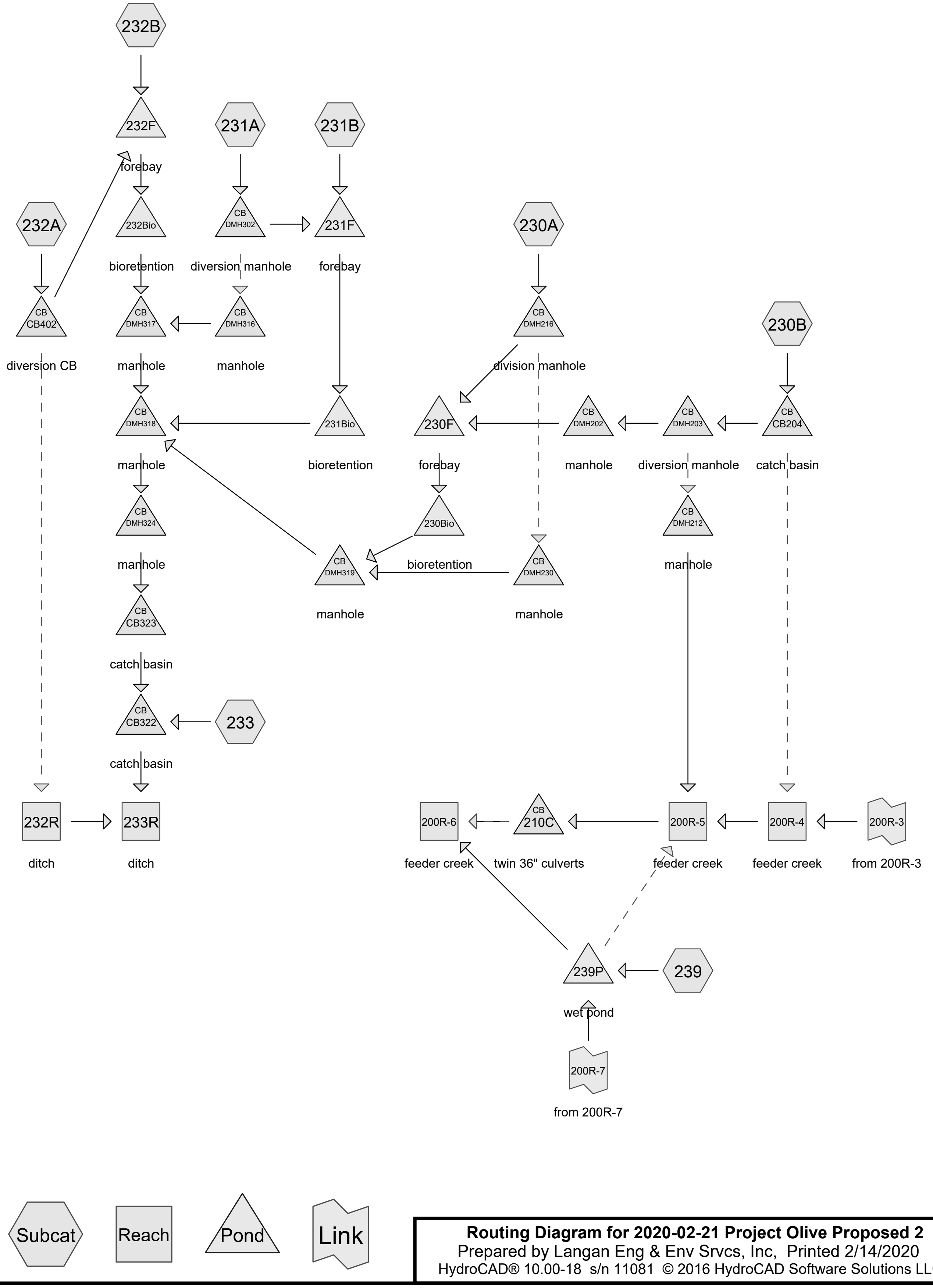
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
561.00	10,385	0	0
562.00	11,425	10,905	10,905
564.00	13,580	25,005	35,910
566.00	15,985	29,565	65,475
568.00	18,410	34,395	99,870
570.00	20,940	39,350	139,220
572.00	23,565	44,505	183,725
574.00	26,295	49,860	233,585
576.00	29,805	56,100	289,685
578.00	32,910	62,715	352,400
580.00	36,110	69,020	421,420
582.00	39,415	75,525	496,945
584.00	42,820	82,235	579,180
584.50	44,120	21,735	600,915
585.00	56,090	25,053	625,968
586.00	60,080	58,085	684,053
588.00	68,355	128,435	812,488
590.00	77,030	145,385	957,873
591.00	81,520	79,275	1,037,148

Device	Routing	Invert	Outlet Devices
#1	Primary	586.00'	**36.0" Round Culvert** L= 124.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 586.00' / 586.00' S= 0.0000 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 7.07 sf

Primary OutFlow Max=0.22 cfs @ 12.63 hrs HW=586.40' TW=586.37' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.22 cfs @ 0.60 fps)

Pond 122P: wet pond





Routing Diagram for 2020-02-21 Project Olive Proposed 2
Prepared by Langan Eng & Env Srvcs, Inc, Printed 2/14/2020
HydroCAD® 10.00-18 s/n 11081 © 2016 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment230A: Runoff Area=4.810 ac 100.00% Impervious Runoff Depth=1.55"
Tc=6.0 min CN=98 Runoff=11.43 cfs 0.620 af

Subcatchment230B: Runoff Area=5.650 ac 71.50% Impervious Runoff Depth=1.18"
Tc=6.0 min CN=94 Runoff=11.18 cfs 0.557 af

Subcatchment231A: Runoff Area=9.330 ac 93.78% Impervious Runoff Depth=1.45"
Tc=6.0 min CN=97 Runoff=21.38 cfs 1.124 af

Subcatchment231B: Runoff Area=1.480 ac 1.35% Impervious Runoff Depth=0.59"
Tc=6.0 min CN=84 Runoff=1.50 cfs 0.072 af

Subcatchment232A: Runoff Area=7.280 ac 77.06% Impervious Runoff Depth=1.26"
Tc=6.0 min CN=95 Runoff=15.20 cfs 0.767 af

Subcatchment232B: Runoff Area=1.980 ac 1.01% Impervious Runoff Depth=0.59"
Tc=6.0 min CN=84 Runoff=2.00 cfs 0.097 af

Subcatchment233: Runoff Area=3.230 ac 51.39% Impervious Runoff Depth=0.97"
Flow Length=349' Tc=20.3 min CN=91 Runoff=3.42 cfs 0.260 af

Subcatchment239: Runoff Area=15.000 ac 0.00% Impervious Runoff Depth=1.18"
Flow Length=397' Tc=29.1 min CN=94 Runoff=15.59 cfs 1.478 af

Reach 200R-4: feeder creek Avg. Flow Depth=0.57' Max Vel=1.69 fps Inflow=12.75 cfs 3.729 af
n=0.030 L=346.0' S=0.0030 '/' Capacity=439.39 cfs Outflow=11.32 cfs 3.724 af

Reach 200R-5: feeder creek Avg. Flow Depth=0.57' Max Vel=1.69 fps Inflow=11.32 cfs 3.740 af
n=0.030 L=269.0' S=0.0030 '/' Capacity=439.78 cfs Outflow=11.21 cfs 3.736 af

Reach 200R-6: feeder creek Avg. Flow Depth=0.56' Max Vel=1.72 fps Inflow=11.26 cfs 4.049 af
n=0.030 L=129.0' S=0.0032 '/' Capacity=451.82 cfs Outflow=11.25 cfs 4.047 af

Reach 232R: ditch Avg. Flow Depth=0.14' Max Vel=1.26 fps Inflow=2.44 cfs 0.029 af
n=0.030 L=913.0' S=0.0099 '/' Capacity=327.70 cfs Outflow=1.13 cfs 0.029 af

Reach 233R: ditch Avg. Flow Depth=0.41' Max Vel=2.34 fps Inflow=7.28 cfs 2.216 af
n=0.030 L=323.0' S=0.0093 '/' Capacity=318.09 cfs Outflow=6.89 cfs 2.212 af

Pond 210C: twin 36" culverts Peak Elev=573.38' Inflow=11.21 cfs 3.736 af
Primary=5.61 cfs 1.868 af Secondary=5.61 cfs 1.868 af Outflow=11.21 cfs 3.736 af

Pond 230Bio: bioretention Peak Elev=584.63' Storage=33,621 cf Inflow=17.48 cfs 1.103 af
Outflow=0.21 cfs 0.640 af

Pond 230F: forebay Peak Elev=584.63' Storage=13,431 cf Inflow=17.91 cfs 1.124 af
Outflow=17.48 cfs 1.103 af

Pond 231Bio: bioretention Peak Elev=584.55' Storage=35,141 cf Inflow=19.49 cfs 1.247 af
Outflow=0.21 cfs 0.778 af

Pond 231F: forebay Peak Elev=584.61' Storage=14,817 cf Inflow=20.18 cfs 1.171 af
Outflow=19.49 cfs 1.247 af

Pond 232Bio: bioretention Peak Elev=584.62' Storage=25,289 cf Inflow=14.37 cfs 0.819 af
Outflow=0.16 cfs 0.470 af

Pond 232F: forebay Peak Elev=584.62' Storage=12,278 cf Inflow=14.72 cfs 0.835 af
Outflow=14.37 cfs 0.819 af

Pond 239P: wet pond Peak Elev=575.38' Storage=13,272,195 cf Inflow=16.00 cfs 4.655 af
Primary=0.12 cfs 0.314 af Secondary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.314 af

Pond CB204: catch basin Peak Elev=587.50' Inflow=11.18 cfs 0.557 af
Primary=9.25 cfs 0.535 af Secondary=1.93 cfs 0.022 af Outflow=11.18 cfs 0.557 af

Pond CB322: catch basin Peak Elev=576.27' Inflow=6.52 cfs 2.187 af
36.0" Round Culvert n=0.013 L=19.0' S=0.0042 '/' Outflow=6.52 cfs 2.187 af

Pond CB323: catch basin Peak Elev=576.64' Inflow=4.65 cfs 1.928 af
36.0" Round Culvert n=0.013 L=105.0' S=0.0042 '/' Outflow=4.65 cfs 1.928 af

Pond CB402: diversion CB Peak Elev=586.58' Inflow=15.20 cfs 0.767 af
Primary=12.77 cfs 0.738 af Secondary=2.44 cfs 0.029 af Outflow=15.20 cfs 0.767 af

Pond DMH202: manhole Peak Elev=585.66' Inflow=7.99 cfs 0.519 af
24.0" Round Culvert n=0.013 L=26.0' S=0.0065 '/' Outflow=7.99 cfs 0.519 af

Pond DMH203: diversion manhole Peak Elev=586.80' Inflow=9.25 cfs 0.535 af
Primary=7.99 cfs 0.519 af Secondary=1.26 cfs 0.016 af Outflow=9.25 cfs 0.535 af

Pond DMH212: manhole Peak Elev=585.78' Inflow=1.26 cfs 0.016 af
18.0" Round Culvert n=0.013 L=40.0' S=0.0042 '/' Outflow=1.26 cfs 0.016 af

Pond DMH216: division manhole Peak Elev=586.06' Inflow=11.43 cfs 0.620 af
Primary=9.93 cfs 0.605 af Secondary=1.50 cfs 0.015 af Outflow=11.43 cfs 0.620 af

Pond DMH230: manhole Peak Elev=582.51' Inflow=1.50 cfs 0.015 af
24.0" Round Culvert n=0.013 L=281.0' S=0.0096 '/' Outflow=1.50 cfs 0.015 af

Pond DMH302: diversion manhole Peak Elev=586.48' Inflow=21.38 cfs 1.124 af
Primary=18.73 cfs 1.099 af Secondary=2.65 cfs 0.025 af Outflow=21.38 cfs 1.124 af

Pond DMH316: manhole Peak Elev=583.18' Inflow=2.65 cfs 0.025 af
24.0" Round Culvert n=0.013 L=188.0' S=0.0170 '/' Outflow=2.65 cfs 0.025 af

Pond DMH317: manhole Peak Elev=580.03' Inflow=2.78 cfs 0.495 af
24.0" Round Culvert n=0.013 L=122.0' S=0.0073 '/' Outflow=2.78 cfs 0.495 af

```
Pond DMH318: manhole                                    Peak Elev=578.77'   Inflow=4.65 cfs  1.928 af
                        30.0"  Round Culvert  n=0.013  L=50.0'  S=0.0282 '/'   Outflow=4.65 cfs  1.928 af

Pond DMH319: manhole                                    Peak Elev=579.84'   Inflow=1.68 cfs  0.655 af
                       24.0"  Round Culvert  n=0.013  L=106.0'  S=0.0084 '/'   Outflow=1.68 cfs  0.655 af

Pond DMH324: manhole                                    Peak Elev=577.15'   Inflow=4.65 cfs  1.928 af
                       36.0"  Round Culvert  n=0.013  L=136.0'  S=0.0042 '/'   Outflow=4.65 cfs  1.928 af

Link 1-yr storm Outflow  Imported from  2020-02-21 Project Olive Proposed 3~Reach 200R-3.hce   Inflow=12.75 cfs  3.707 af
                                              Area= 111.150 ac  28.72% Imperv.   Primary=12.75 cfs  3.707 af

Link 1-yr storm Outflow  Imported from  2020-02-21 Project Olive Proposed 3~Reach 200R-7.hce   Inflow=11.68 cfs  3.176 af
                                                                Area= 26.360 ac   Primary=11.68 cfs  3.176 af

              Total Runoff Area = 48.760 ac   Runoff Volume = 4.976 af   Average Runoff Depth = 1.22"
                                    48.91% Pervious = 23.850 ac     51.09% Impervious = 24.910 ac
```

Summary for Subcatchment 230A:

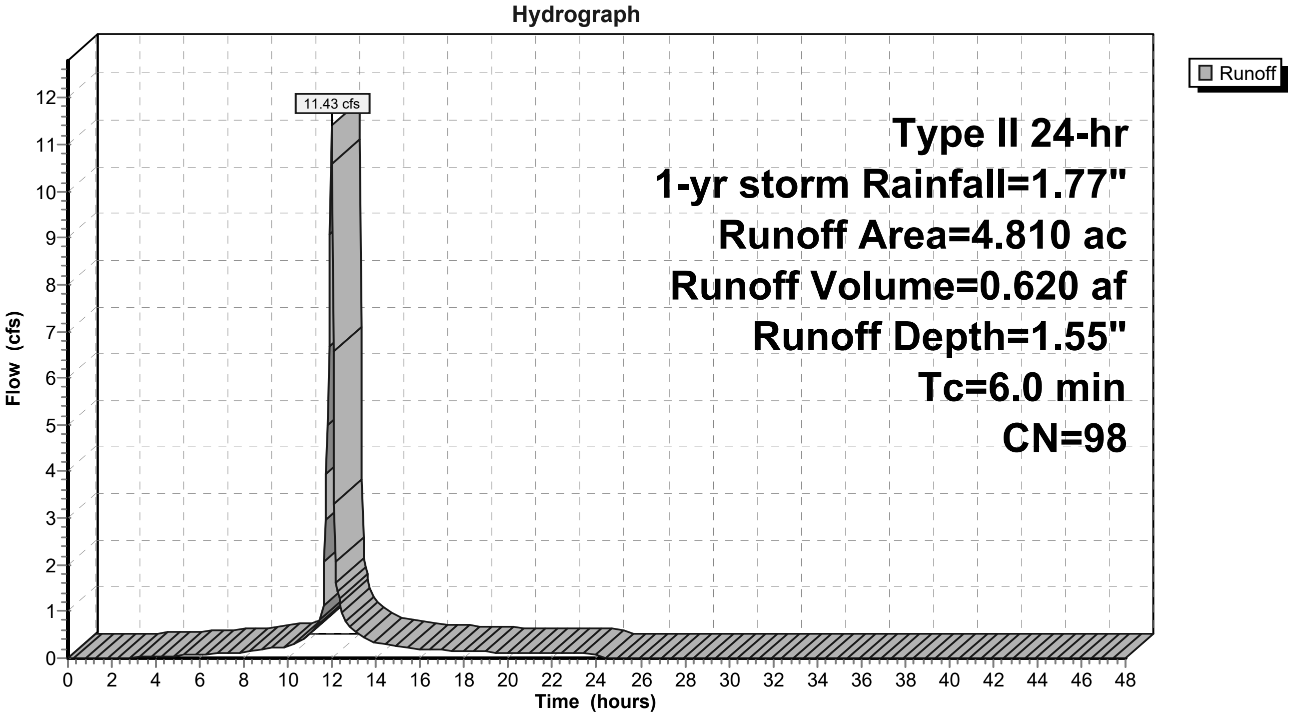
Runoff = 11.43 cfs @ 11.96 hrs, Volume= 0.620 af, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
4.810	98	Roofs, HSG D
4.810		100.00% Impervious Area

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

Subcatchment 230A:



Summary for Subcatchment 230B:

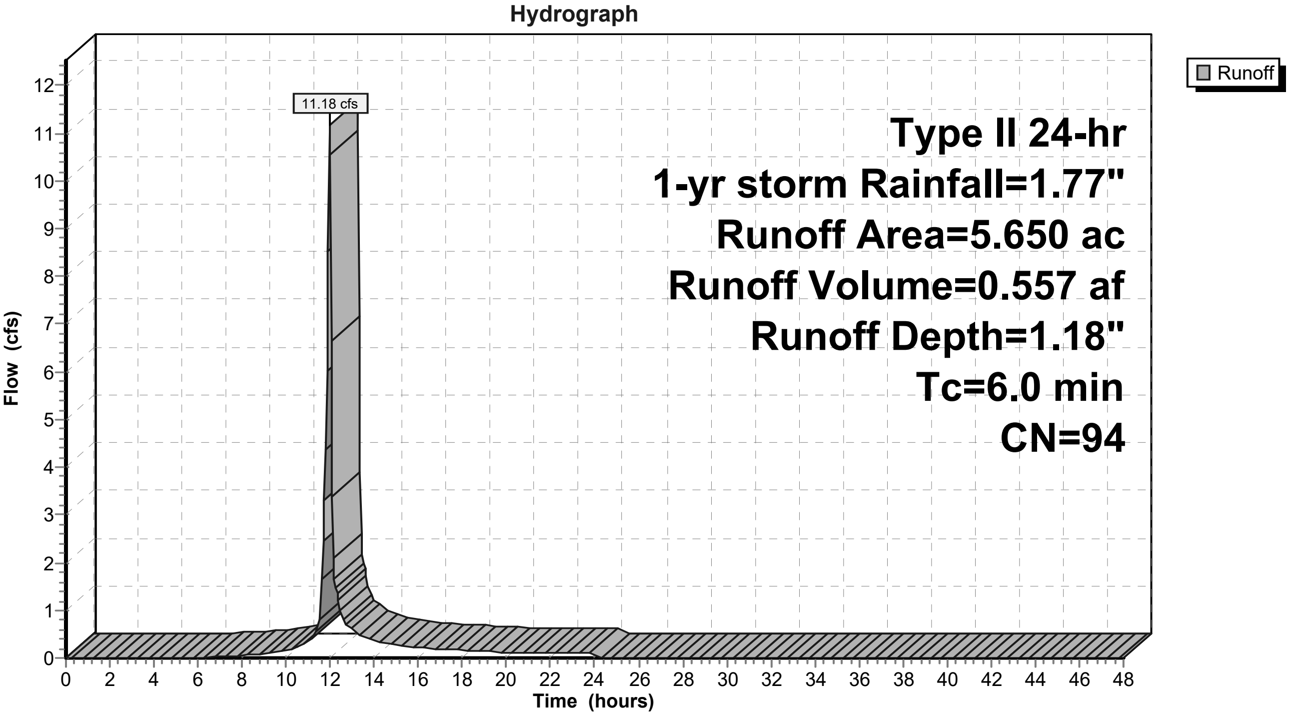
Runoff = 11.18 cfs @ 11.97 hrs, Volume= 0.557 af, Depth= 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
1.610	84	50-75% Grass cover, Fair, HSG D
4.040	98	Paved parking, HSG D
5.650	94	Weighted Average
1.610		28.50% Pervious Area
4.040		71.50% Impervious Area

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

Subcatchment 230B:



Summary for Subcatchment 231A:

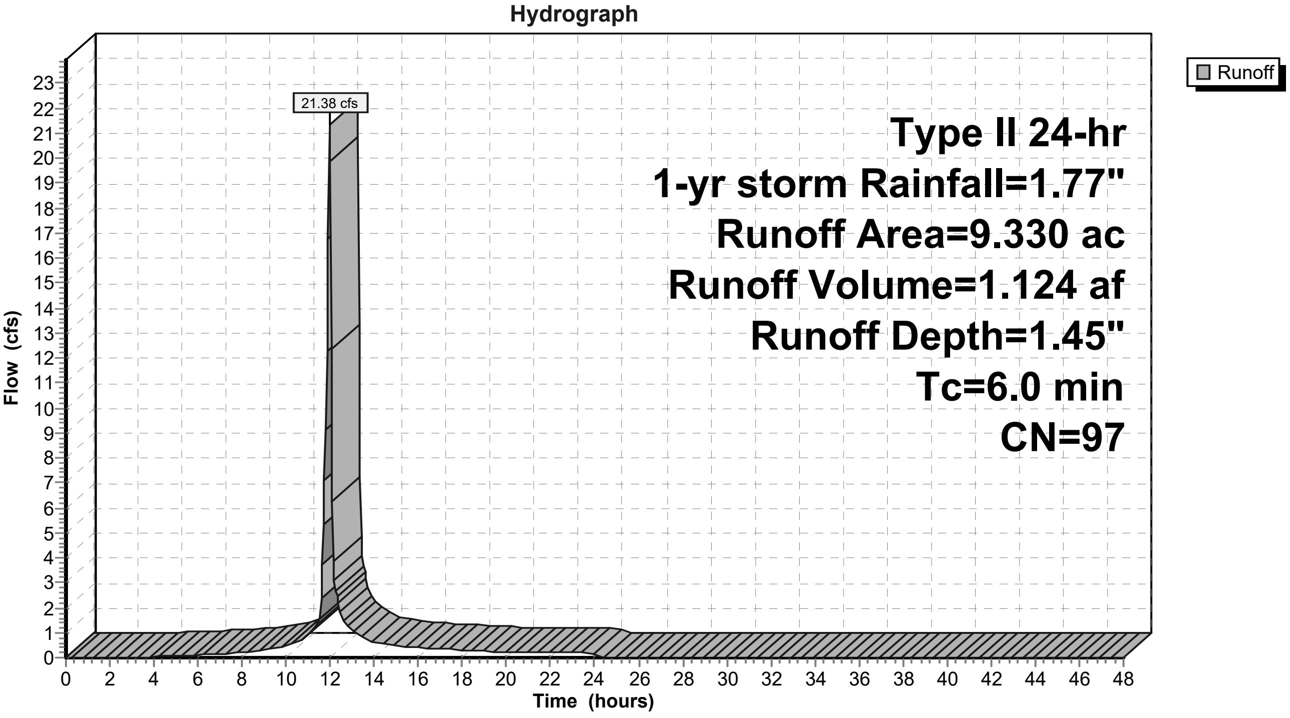
Runoff = 21.38 cfs @ 11.96 hrs, Volume= 1.124 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
0.580	84	50-75% Grass cover, Fair, HSG D
4.030	98	Paved parking, HSG D
4.720	98	Roofs, HSG D
9.330	97	Weighted Average
0.580		6.22% Pervious Area
8.750		93.78% Impervious Area

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

Subcatchment 231A:



Summary for Subcatchment 231B:

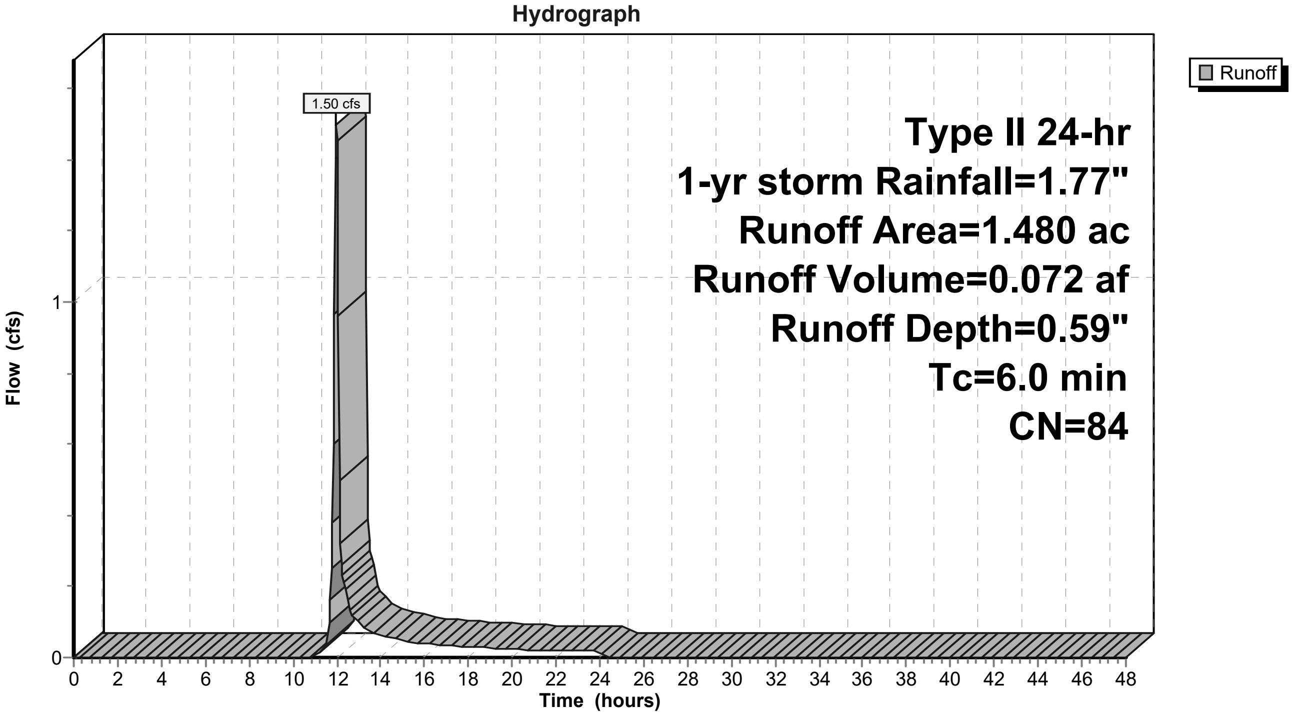
Runoff = 1.50 cfs @ 11.98 hrs, Volume= 0.072 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
1.460	84	50-75% Grass cover, Fair, HSG D
0.020	98	Paved parking, HSG D
1.480	84	Weighted Average
1.460		98.65% Pervious Area
0.020		1.35% Impervious Area

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

Subcatchment 231B:



Summary for Subcatchment 232A:

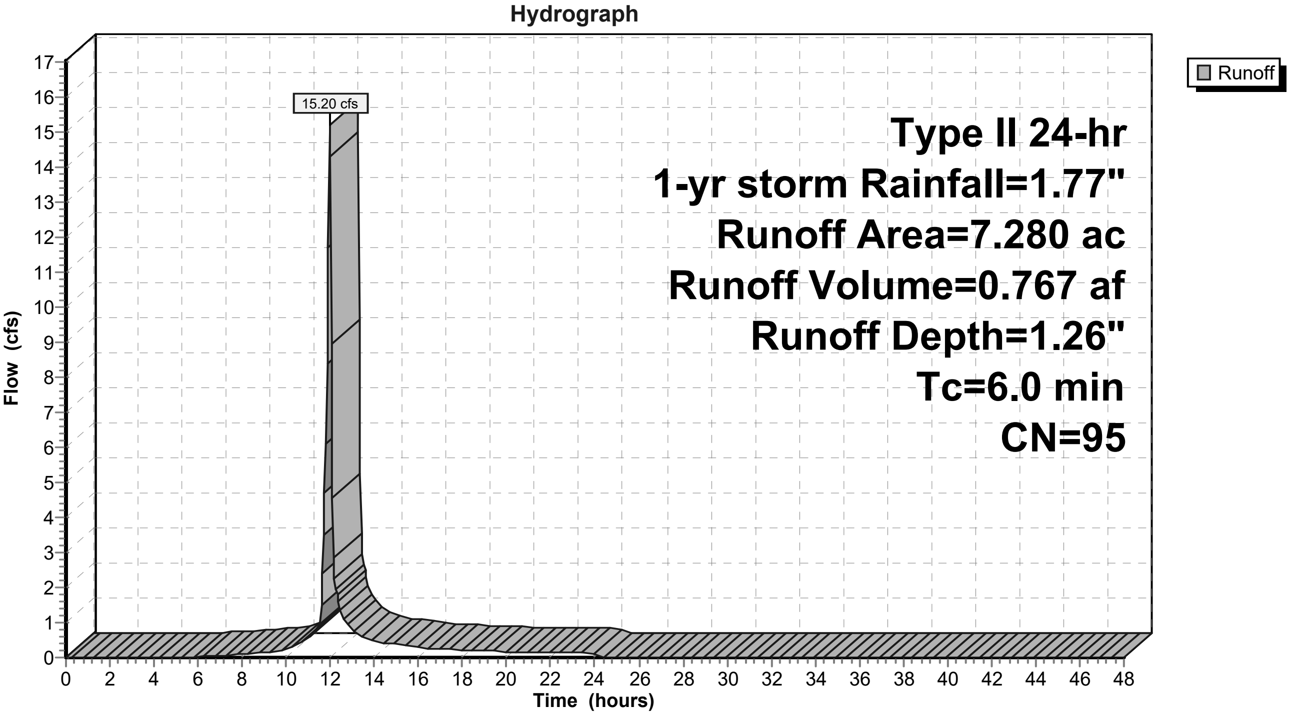
Runoff = 15.20 cfs @ 11.97 hrs, Volume= 0.767 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
1.670	84	50-75% Grass cover, Fair, HSG D
5.610	98	Paved parking, HSG D
7.280	95	Weighted Average
1.670		22.94% Pervious Area
5.610		77.06% Impervious Area

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

Subcatchment 232A:



Summary for Subcatchment 232B:

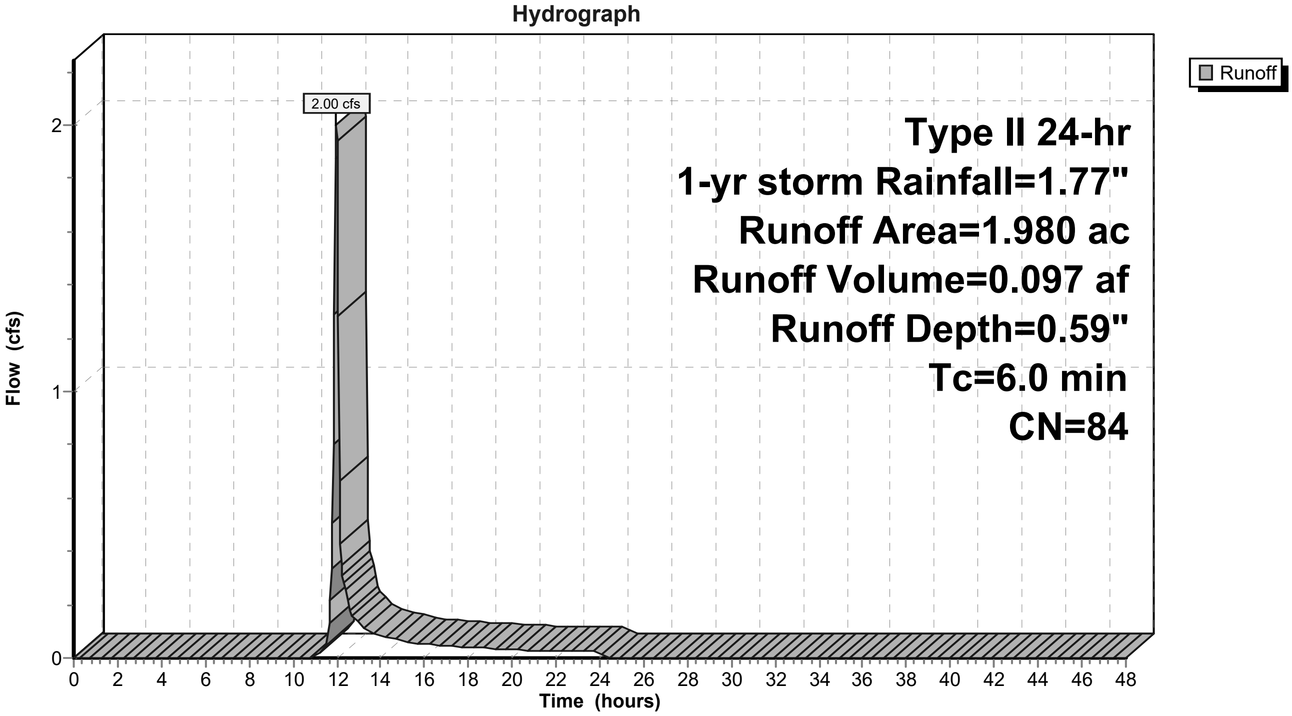
Runoff = 2.00 cfs @ 11.98 hrs, Volume= 0.097 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
1.960	84	50-75% Grass cover, Fair, HSG D
0.020	98	Paved parking, HSG D
1.980	84	Weighted Average
1.960		98.99% Pervious Area
0.020		1.01% Impervious Area

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

Subcatchment 232B:



Summary for Subcatchment 233:

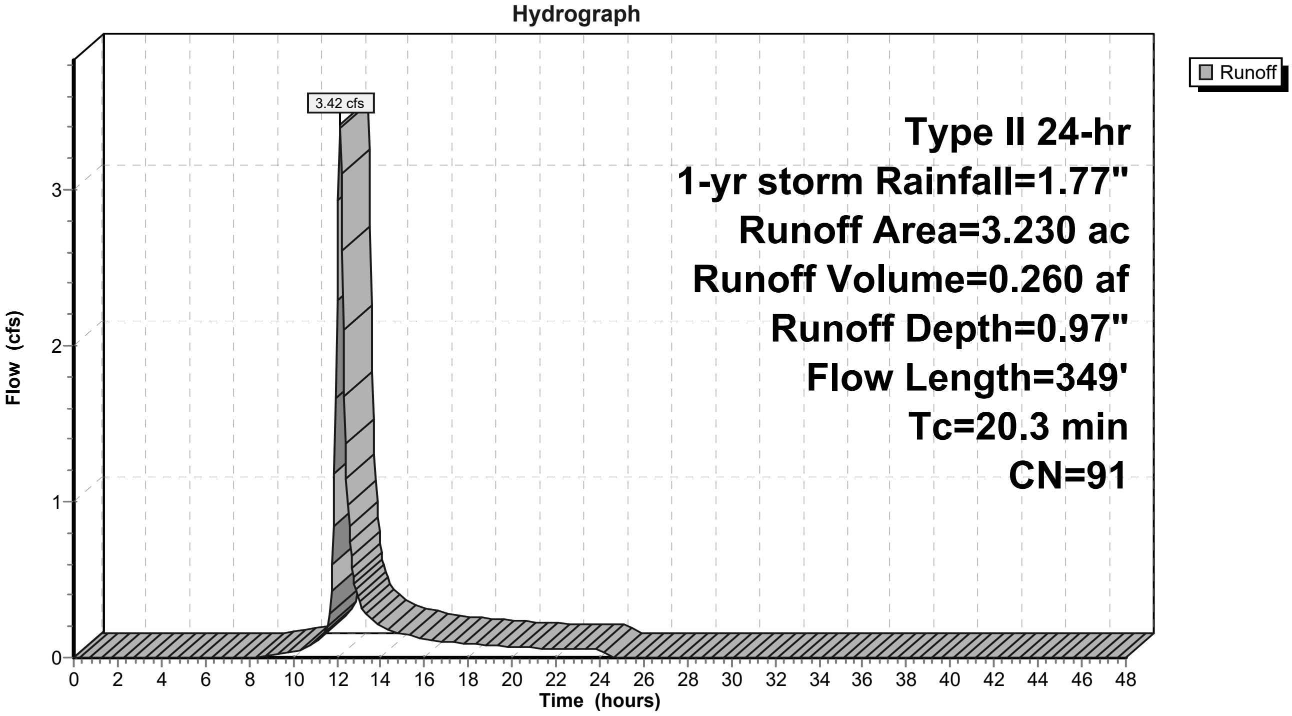
Runoff = 3.42 cfs @ 12.13 hrs, Volume= 0.260 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
1.570	84	50-75% Grass cover, Fair, HSG D
1.660	98	Paved parking, HSG D
3.230	91	Weighted Average
1.570		48.61% Pervious Area
1.660		51.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.3	100	0.0110	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
5.0	249	0.0140	0.83		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
20.3	349	Total			

Subcatchment 233:



Summary for Subcatchment 239:

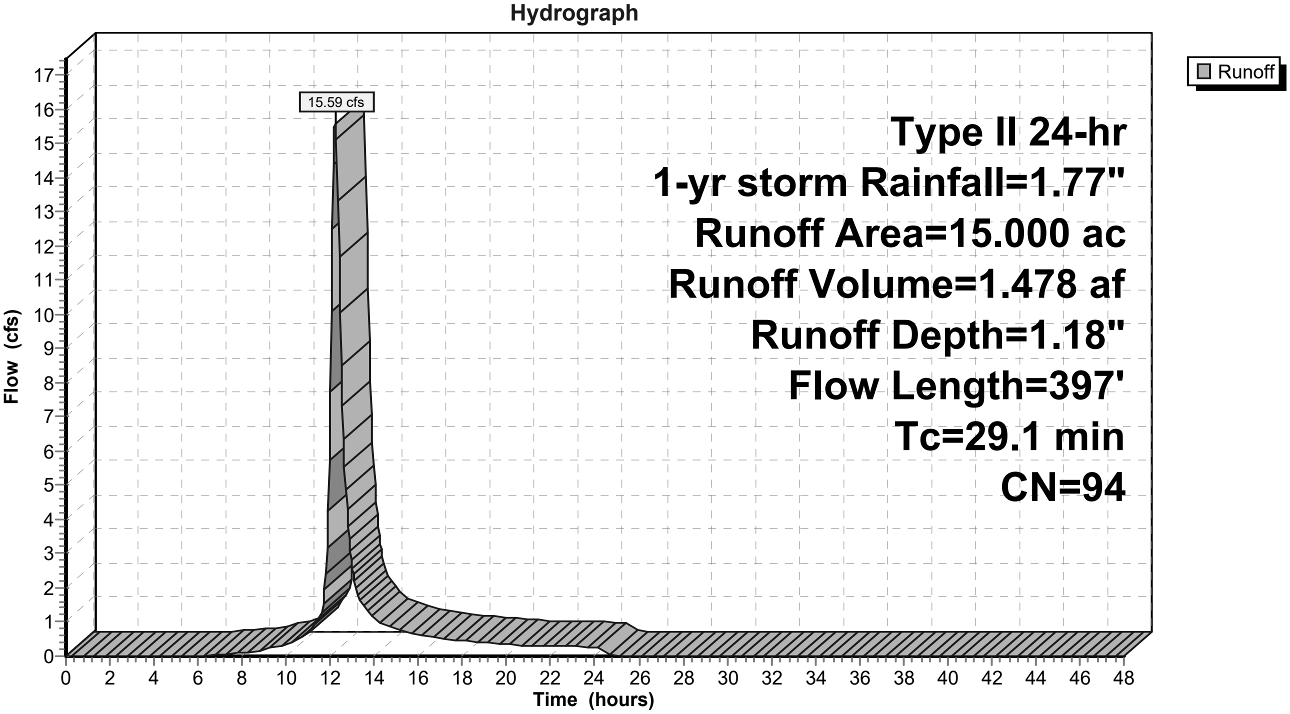
Runoff = 15.59 cfs @ 12.23 hrs, Volume= 1.478 af, Depth= 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
2.610	84	50-75% Grass cover, Fair, HSG D
11.410	98	Water Surface, 0% imp, HSG D
0.980	79	Woods, Fair, HSG D
15.000	94	Weighted Average
15.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.9	100	0.0040	0.07		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
6.0	254	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	43	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
29.1	397	Total			

Subcatchment 239:



Summary for Reach 200R-4: feeder creek

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 0.40" for 1-yr storm event
Inflow = 12.75 cfs @ 13.41 hrs, Volume= 3.729 af
Outflow = 11.32 cfs @ 13.70 hrs, Volume= 3.724 af, Atten= 11%, Lag= 17.4 min

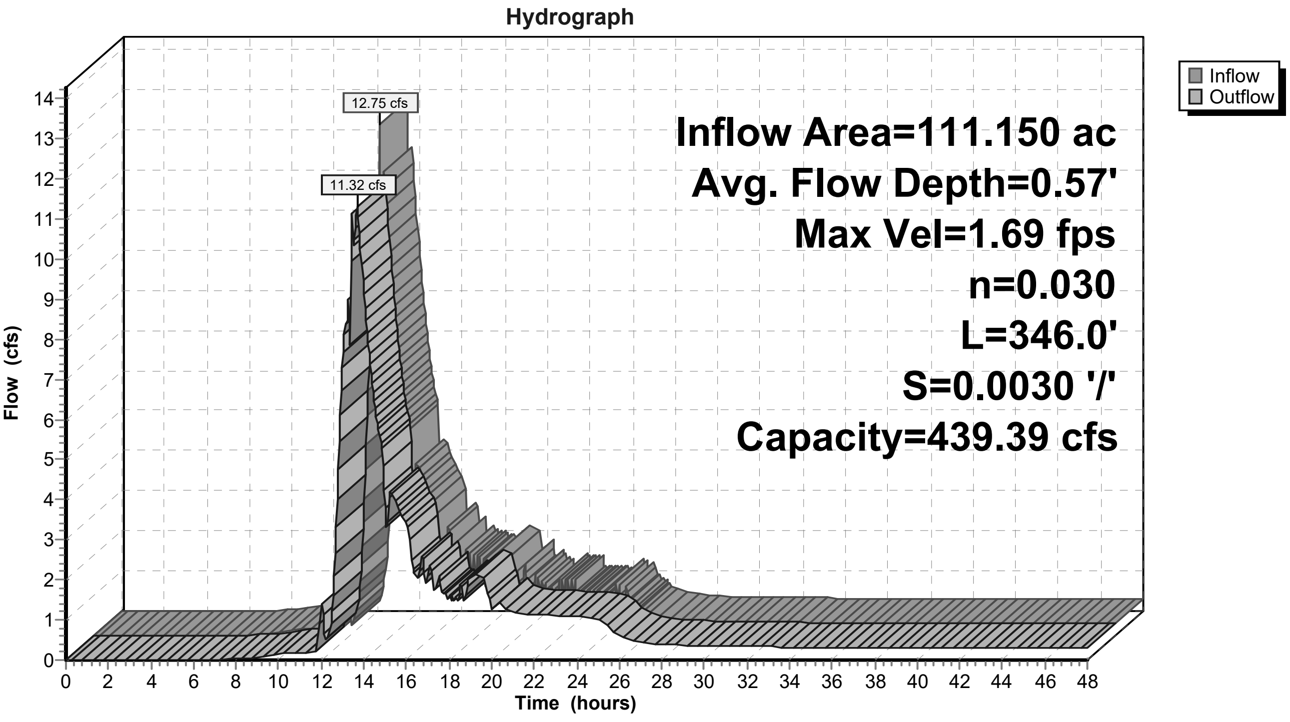
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.69 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 9.6 min

Peak Storage= 2,314 cf @ 13.70 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 439.39 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 346.0' Slope= 0.0030 '/'
Inlet Invert= 574.51', Outlet Invert= 573.47'

‡

Reach 200R-4: feeder creek



Summary for Reach 200R-5: feeder creek

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 0.40" for 1-yr storm event
Inflow = 11.32 cfs @ 13.70 hrs, Volume= 3.740 af
Outflow = 11.21 cfs @ 13.72 hrs, Volume= 3.736 af, Atten= 1%, Lag= 1.6 min

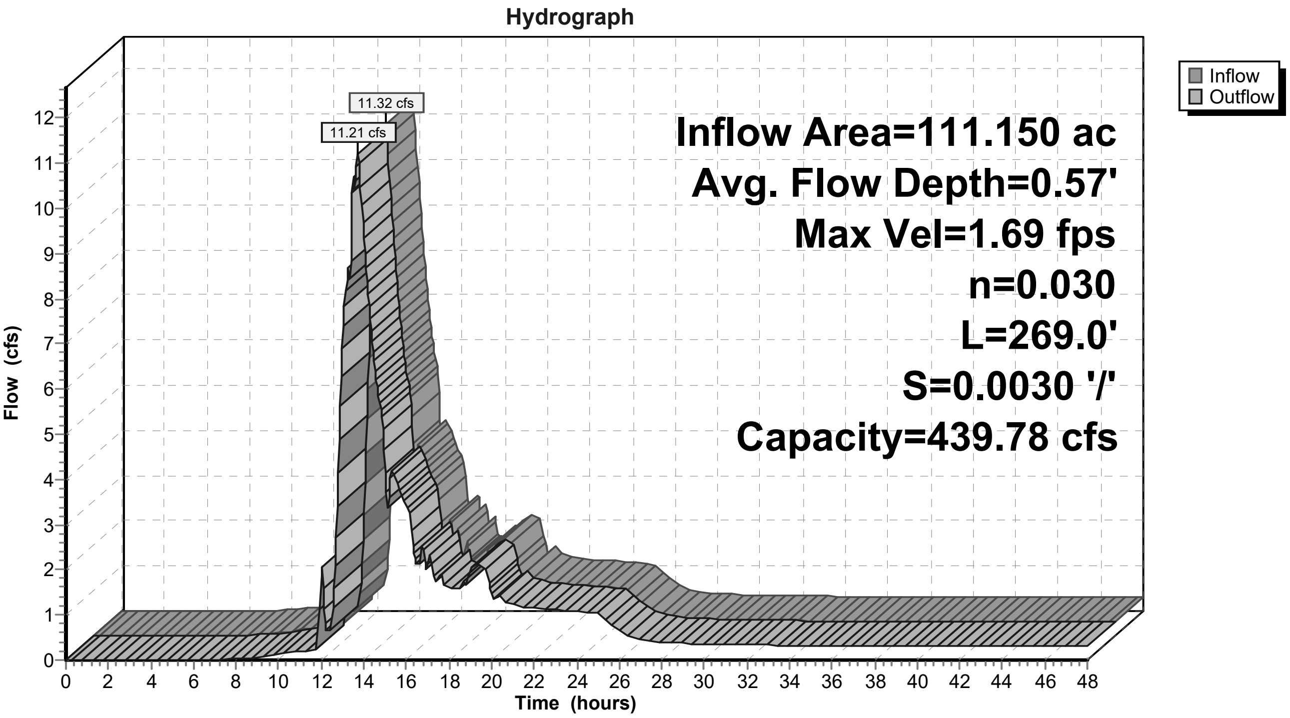
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.69 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 7.4 min

Peak Storage= 1,788 cf @ 13.72 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 439.78 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 269.0' Slope= 0.0030 '/'
Inlet Invert= 573.47', Outlet Invert= 572.66'

‡

Reach 200R-5: feeder creek



Summary for Reach 200R-6: feeder creek

Inflow Area = 152.510 ac, 20.93% Impervious, Inflow Depth > 0.32" for 1-yr storm event
Inflow = 11.26 cfs @ 13.72 hrs, Volume= 4.049 af
Outflow = 11.25 cfs @ 13.74 hrs, Volume= 4.047 af, Atten= 0%, Lag= 1.0 min

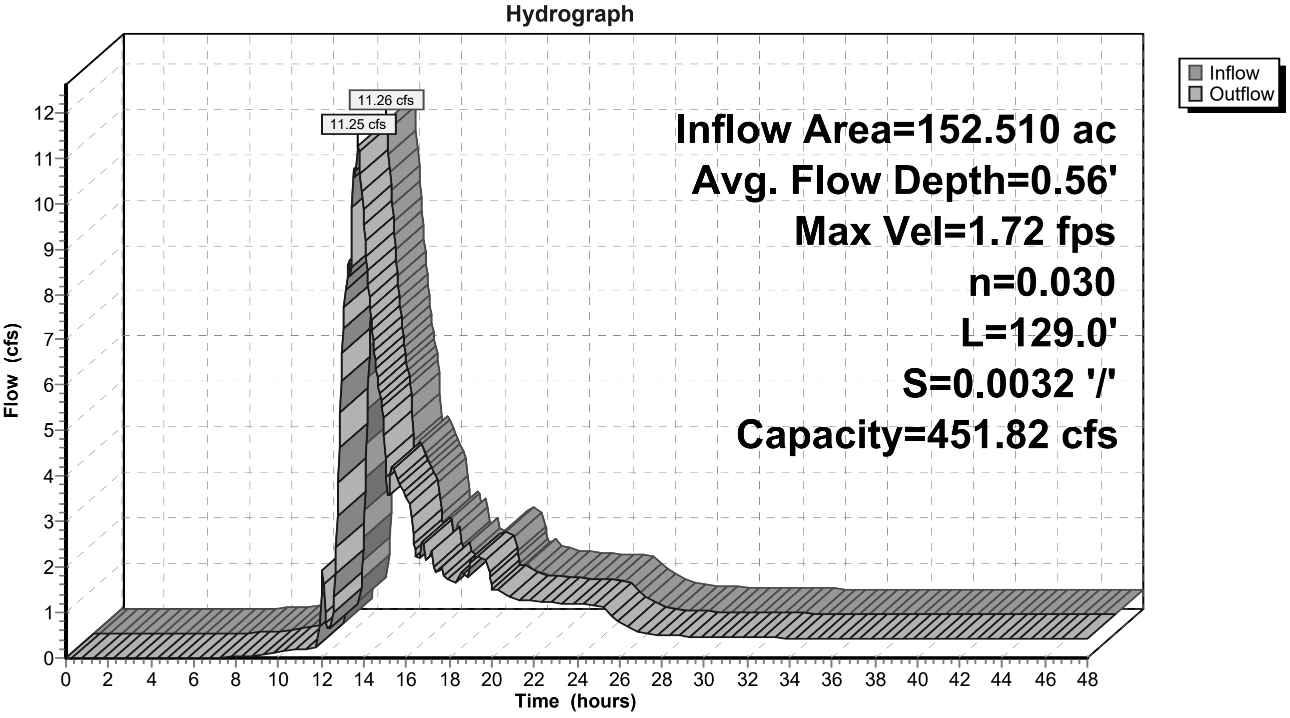
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.72 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.65 fps, Avg. Travel Time= 3.3 min

Peak Storage= 844 cf @ 13.74 hrs
Average Depth at Peak Storage= 0.56'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 451.82 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 129.0' Slope= 0.0032 '/'
Inlet Invert= 572.00', Outlet Invert= 571.59'

‡

Reach 200R-6: feeder creek



Summary for Reach 232R: ditch

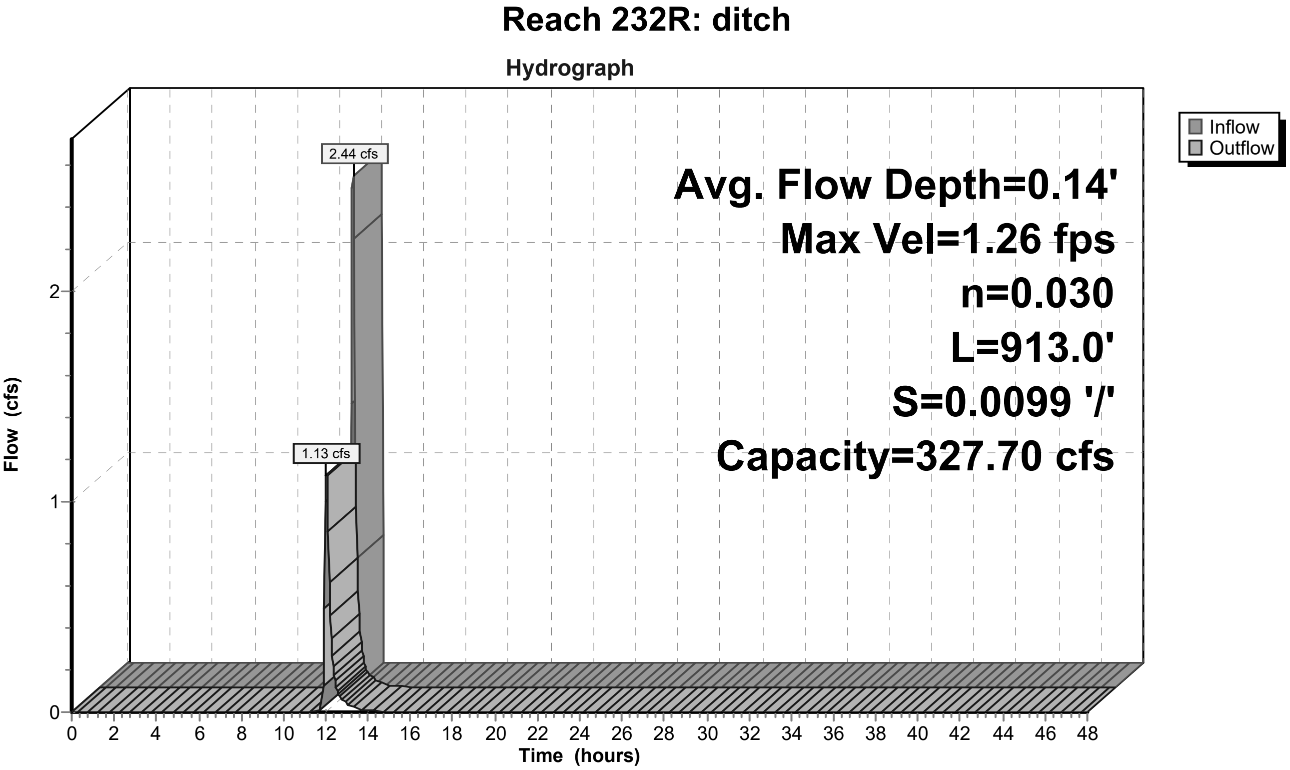
Inflow	=	2.44 cfs @	11.97 hrs, Volume=	0.029 af
Outflow	=	1.13 cfs @	12.04 hrs, Volume=	0.029 af, Atten= 54%, Lag= 4.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.26 fps, Min. Travel Time= 12.0 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 29.2 min

Peak Storage= 815 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 3.00' Flow Area= 45.0 sf, Capacity= 327.70 cfs

6.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 24.00'
Length= 913.0' Slope= 0.0099 '/'
Inlet Invert= 584.00', Outlet Invert= 575.00'

‡



Summary for Reach 233R: ditch

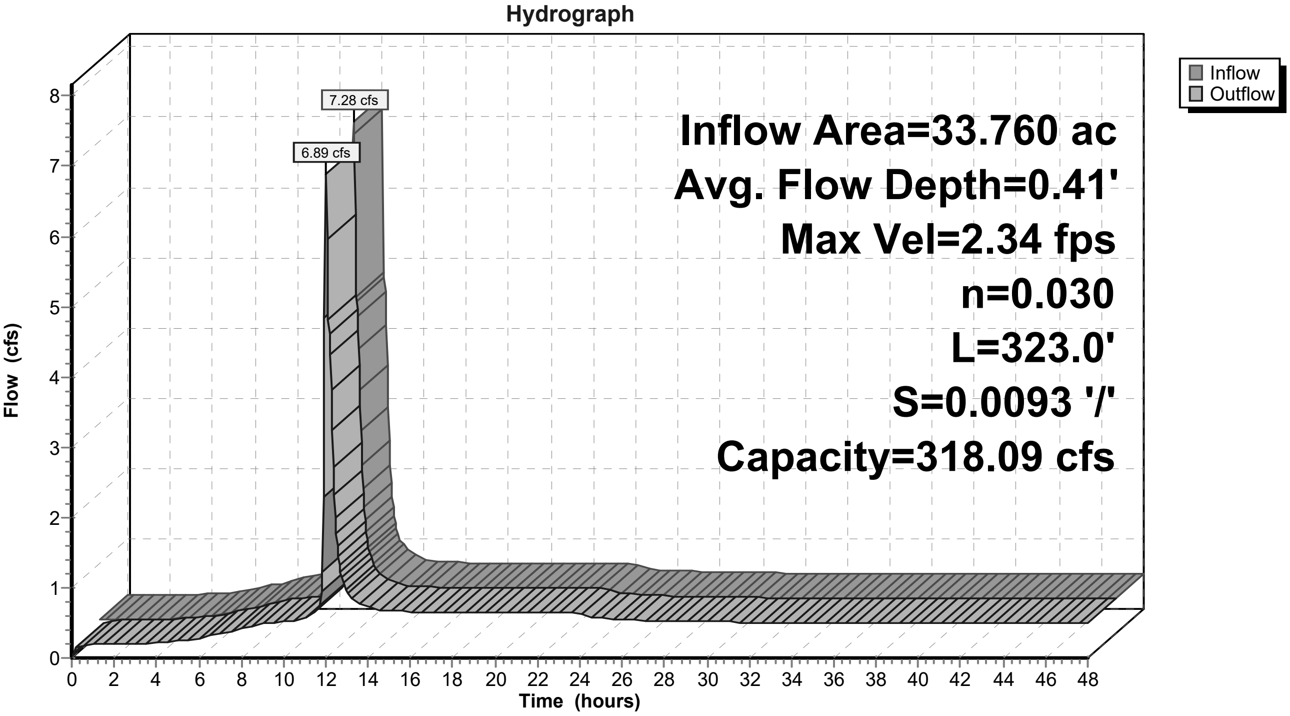
Inflow Area = 33.760 ac, 73.79% Impervious, Inflow Depth > 0.79" for 1-yr storm event
Inflow = 7.28 cfs @ 11.98 hrs, Volume= 2.216 af
Outflow = 6.89 cfs @ 12.01 hrs, Volume= 2.212 af, Atten= 5%, Lag= 1.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.34 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.93 fps, Avg. Travel Time= 5.8 min

Peak Storage= 951 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 3.00' Flow Area= 45.0 sf, Capacity= 318.09 cfs

6.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 24.00'
Length= 323.0' Slope= 0.0093 '/'
Inlet Invert= 575.00', Outlet Invert= 572.00'

Reach 233R: ditch



Summary for Pond 210C: twin 36" culverts

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 0.40" for 1-yr storm event
Inflow = 11.21 cfs @ 13.72 hrs, Volume= 3.736 af
Outflow = 11.21 cfs @ 13.72 hrs, Volume= 3.736 af, Atten= 0%, Lag= 0.0 min
Primary = 5.61 cfs @ 13.72 hrs, Volume= 1.868 af
Secondary = 5.61 cfs @ 13.72 hrs, Volume= 1.868 af

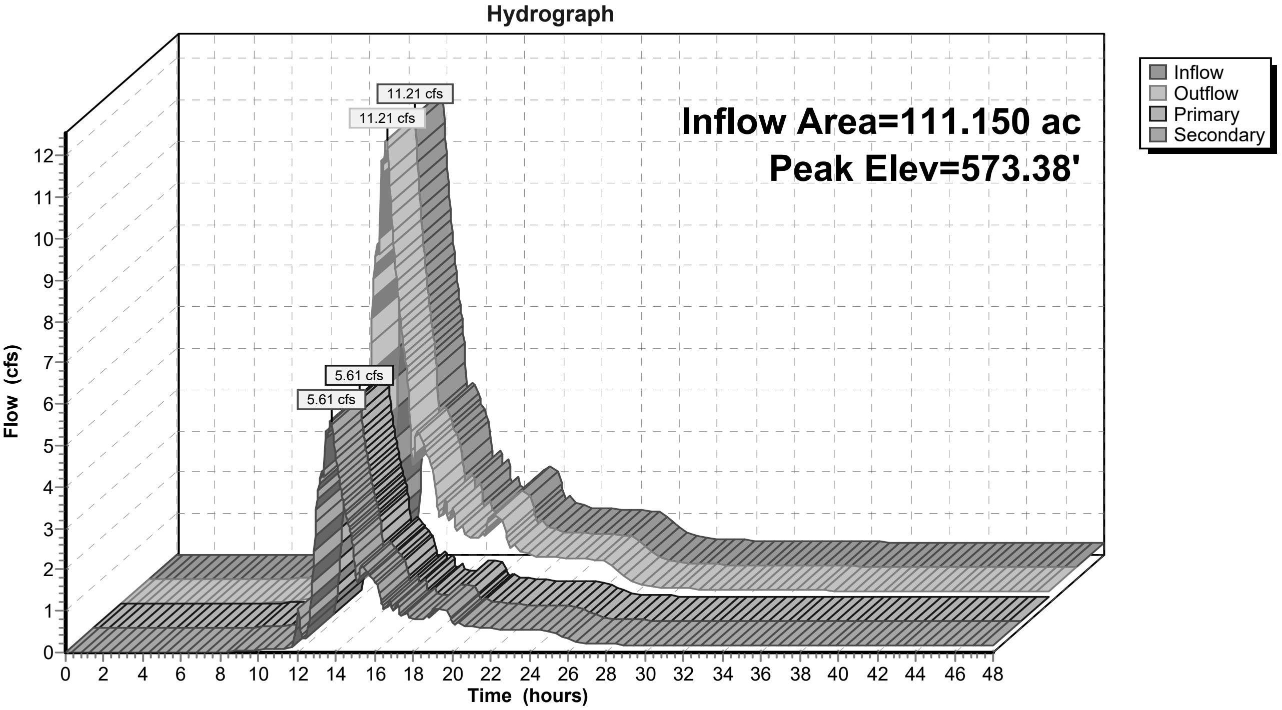
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 573.38' @ 13.72 hrs
Flood Elev= 588.31'

Device	Routing	Invert	Outlet Devices
#1	Primary	572.58'	**36.0" Round Culvert w/ 7.0" inside fill** L= 78.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 572.00' / 571.77' S= 0.0029 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 6.10 sf
#2	Secondary	572.58'	**36.0" Round Culvert w/ 7.0" inside fill** L= 78.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 572.00' / 571.77' S= 0.0029 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 6.10 sf

Primary OutFlow Max=5.59 cfs @ 13.72 hrs HW=573.38' TW=572.56' (Dynamic Tailwater)
1=Culvert (Barrel Controls 5.59 cfs @ 3.45 fps)

Secondary OutFlow Max=5.59 cfs @ 13.72 hrs HW=573.38' TW=572.56' (Dynamic Tailwater)
2=Culvert (Barrel Controls 5.59 cfs @ 3.45 fps)

Pond 210C: twin 36" culverts



Summary for Pond 230Bio: bioretention

Inflow Area = 10.460 ac, 84.61% Impervious, Inflow Depth > 1.27" for 1-yr storm event
Inflow = 17.48 cfs @ 11.99 hrs, Volume= 1.103 af
Outflow = 0.21 cfs @ 22.19 hrs, Volume= 0.640 af, Atten= 99%, Lag= 611.9 min
Primary = 0.21 cfs @ 22.19 hrs, Volume= 0.640 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 584.63' @ 22.19 hrs Surf.Area= 31,024 sf Storage= 33,621 cf
Flood Elev= 587.00' Surf.Area= 36,710 sf Storage= 113,744 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 753.0 min (1,603.4 - 850.4)

Volume	Invert	Avail.Storage	Storage Description
#1	583.50'	113,744 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

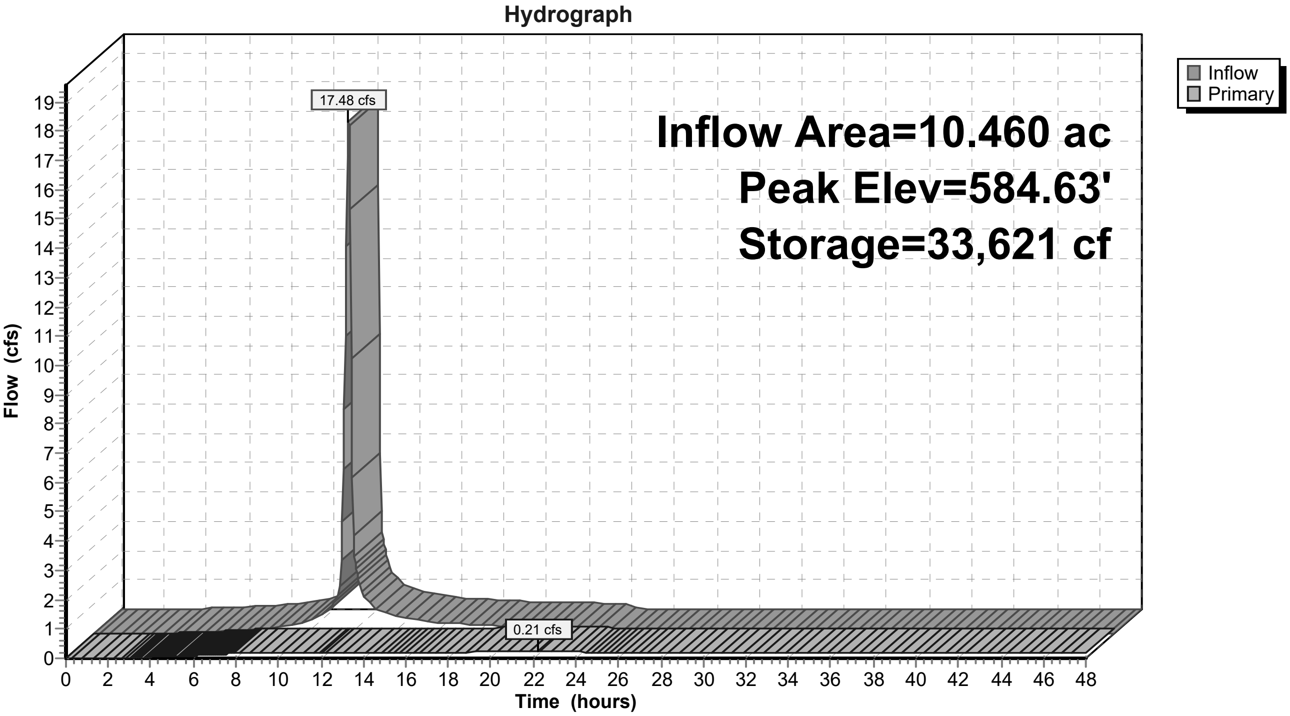
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
583.50	28,375	0	0
584.00	29,530	14,476	14,476
586.00	34,255	63,785	78,261
587.00	36,710	35,483	113,744

Device	Routing	Invert	Outlet Devices
#1	Primary	580.08'	**12.0" Round Culvert** L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.08' / 579.80' S= 0.0117 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	580.08'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	584.50'	**3.0" Vert. Orifice** C= 0.600
#4	Device 1	586.00'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	583.50'	**0.250 in/hr Exfiltration through bioretention media over Surface area**

Primary OutFlow Max=0.21 cfs @ 22.19 hrs HW=584.63' TW=579.49' (Dynamic Tailwater)

```
└─1=Culvert (Passes 0.21 cfs of 7.61 cfs potential flow)
   ├─2=Underdrain (Passes 0.18 cfs of 1.96 cfs potential flow)
   │  └─5=Exfiltration through bioretention media(Exfiltration Controls 0.18 cfs)
   ├─3=Orifice (Orifice Controls 0.03 cfs @ 1.24 fps)
   └─4=Grate ( Controls 0.00 cfs)
```

Pond 230Bio: bioretention



Summary for Pond 230F: forebay

Inflow Area = 10.460 ac, 84.61% Impervious, Inflow Depth = 1.29" for 1-yr storm event
Inflow = 17.91 cfs @ 11.96 hrs, Volume= 1.124 af
Outflow = 17.48 cfs @ 11.99 hrs, Volume= 1.103 af, Atten= 2%, Lag= 1.4 min
Primary = 17.48 cfs @ 11.99 hrs, Volume= 1.103 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.00' Surf.Area= 3,925 sf Storage= 10,445 cf
Peak Elev= 584.63' @ 22.19 hrs Surf.Area= 4,429 sf Storage= 13,431 cf (2,986 cf above start)
Flood Elev= 587.00' Surf.Area= 6,405 sf Storage= 25,853 cf (15,408 cf above start)

Plug-Flow detention time= 215.9 min calculated for 0.862 af (77% of inflow)
Center-of-Mass det. time= 62.0 min (850.4 - 788.4)

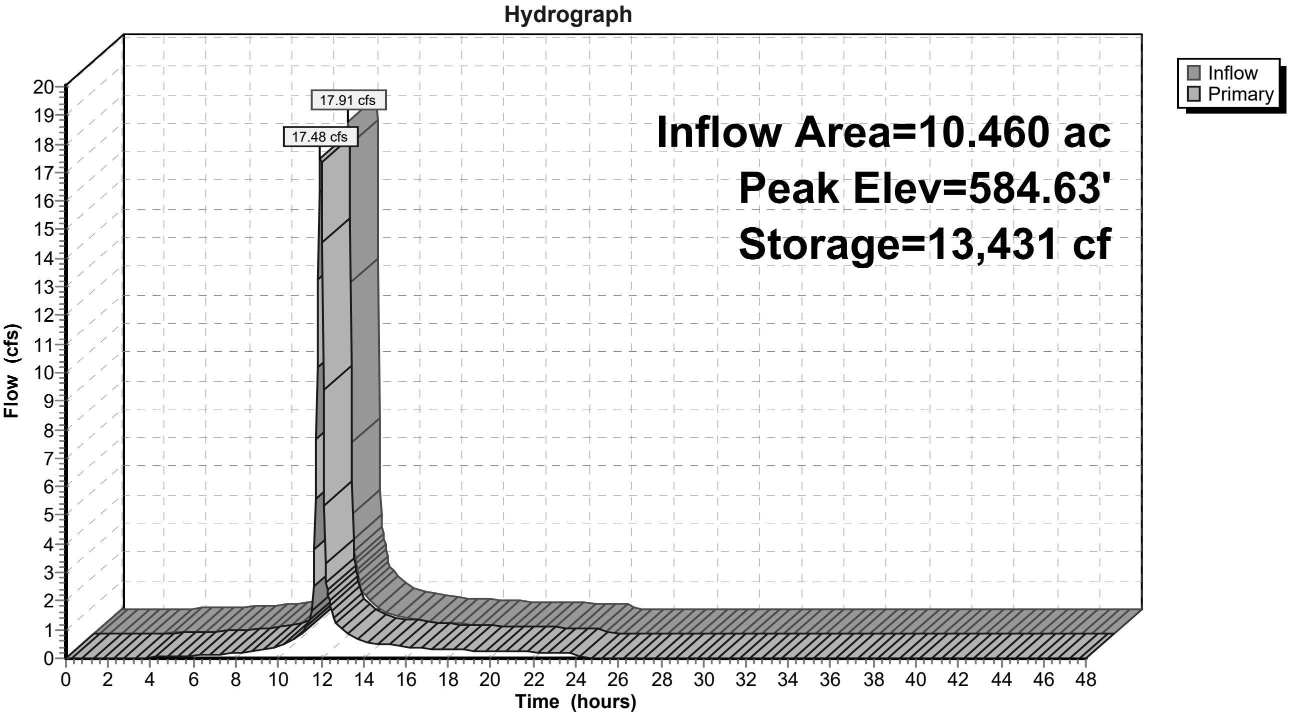
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	25,853 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	1,410	0	0
582.00	2,555	3,965	3,965
584.00	3,925	6,480	10,445
586.00	5,520	9,445	19,890
587.00	6,405	5,963	25,853

Device	Routing	Invert	Outlet Devices
#1	Primary	584.00'	**162.0 deg x 10.0' long x 3.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=17.16 cfs @ 11.99 hrs HW=584.57' TW=584.05' (Dynamic Tailwater)
└─**1=overflow weir** (Weir Controls 17.16 cfs @ 2.21 fps)

Pond 230F: forebay



Summary for Pond 231Bio: bioretention

Inflow Area = 10.810 ac, 81.13% Impervious, Inflow Depth > 1.38" for 1-yr storm event
Inflow = 19.49 cfs @ 11.99 hrs, Volume= 1.247 af
Outflow = 0.21 cfs @ 23.24 hrs, Volume= 0.778 af, Atten= 99%, Lag= 674.7 min
Primary = 0.21 cfs @ 23.24 hrs, Volume= 0.778 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 584.55' @ 23.24 hrs Surf.Area= 34,622 sf Storage= 35,141 cf
Flood Elev= 587.00' Surf.Area= 40,170 sf Storage= 126,690 cf

Plug-Flow detention time= 905.7 min calculated for 0.749 af (60% of inflow)
Center-of-Mass det. time= 662.0 min (1,453.2 - 791.2)

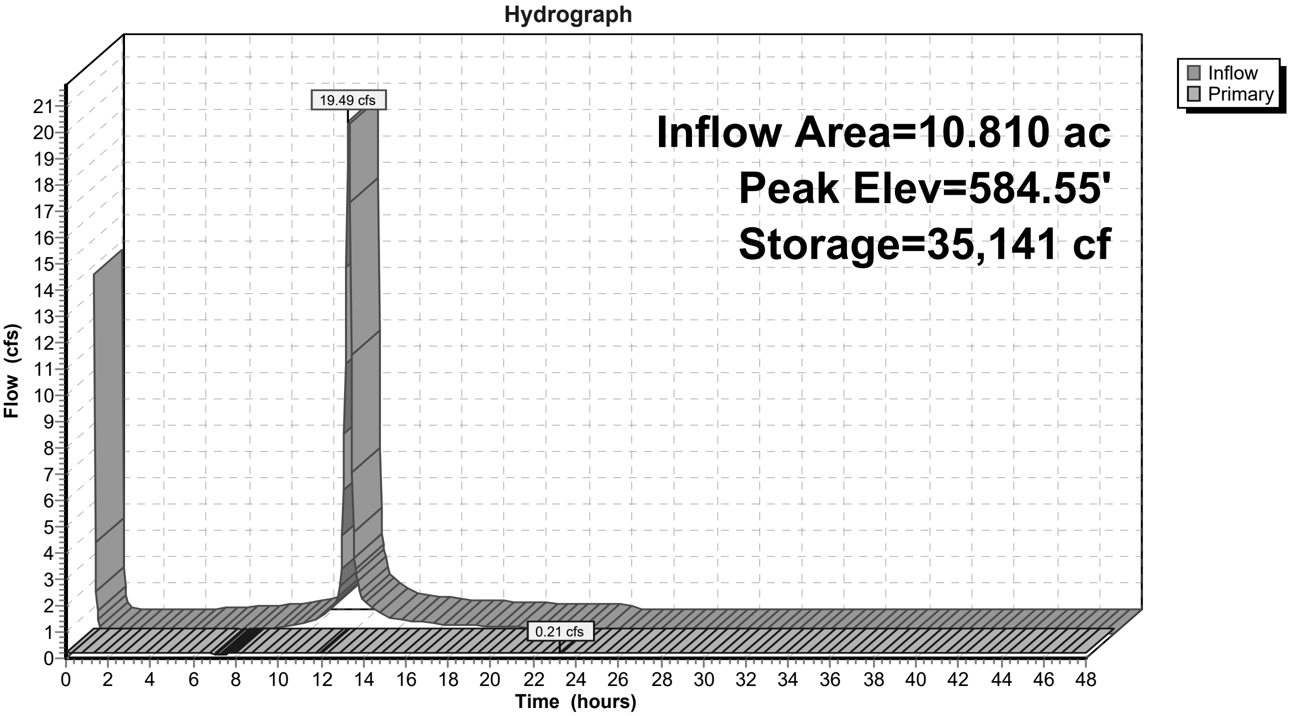
Volume	Invert	Avail.Storage	Storage Description
#1	583.50'	126,690 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
583.50	32,315	0	0
584.00	33,395	16,428	16,428
586.00	37,855	71,250	87,678
587.00	40,170	39,013	126,690

Device	Routing	Invert	Outlet Devices
#1	Primary	580.00'	**12.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.00' / 579.50' S= 0.0385 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	580.08'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	584.50'	**3.0" Vert. Orifice** C= 0.600
#4	Device 1	586.00'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	583.50'	**0.250 in/hr Exfiltration through bioretention media over Surface area**

Primary OutFlow Max=0.21 cfs @ 23.24 hrs HW=584.55' TW=578.20' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.21 cfs of 7.61 cfs potential flow)
  ↑—**2=Underdrain** (Passes 0.20 cfs of 1.94 cfs potential flow)
    ↑—**5=Exfiltration through bioretention media**(Exfiltration Controls 0.20 cfs)
  —**3=Orifice** (Orifice Controls 0.01 cfs @ 0.76 fps)
  —**4=Grate** (Controls 0.00 cfs)

Pond 231Bio: bioretention



Summary for Pond 231F: forebay

```
Inflow Area =      10.810 ac,  81.13% Impervious,  Inflow Depth =   1.30"    for  1-yr storm event
Inflow      =      20.18 cfs @   11.97 hrs,  Volume=          1.171 af
Outflow     =      19.49 cfs @   11.99 hrs,  Volume=          1.247 af,  Atten= 3%,  Lag= 1.6 min
Primary     =      19.49 cfs @   11.99 hrs,  Volume=          1.247 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.50'   Surf.Area= 5,653 sf   Storage= 14,163 cf
Peak Elev= 584.61' @ 11.99 hrs   Surf.Area= 5,793 sf   Storage= 14,817 cf   (654 cf above start)
Flood Elev= 587.00'   Surf.Area= 8,800 sf   Storage= 32,165 cf   (18,002 cf above start)

Plug-Flow detention time= 213.7 min calculated for 0.922 af (79% of inflow)
Center-of-Mass det. time= 5.5 min ( 791.2 - 785.7 )
```

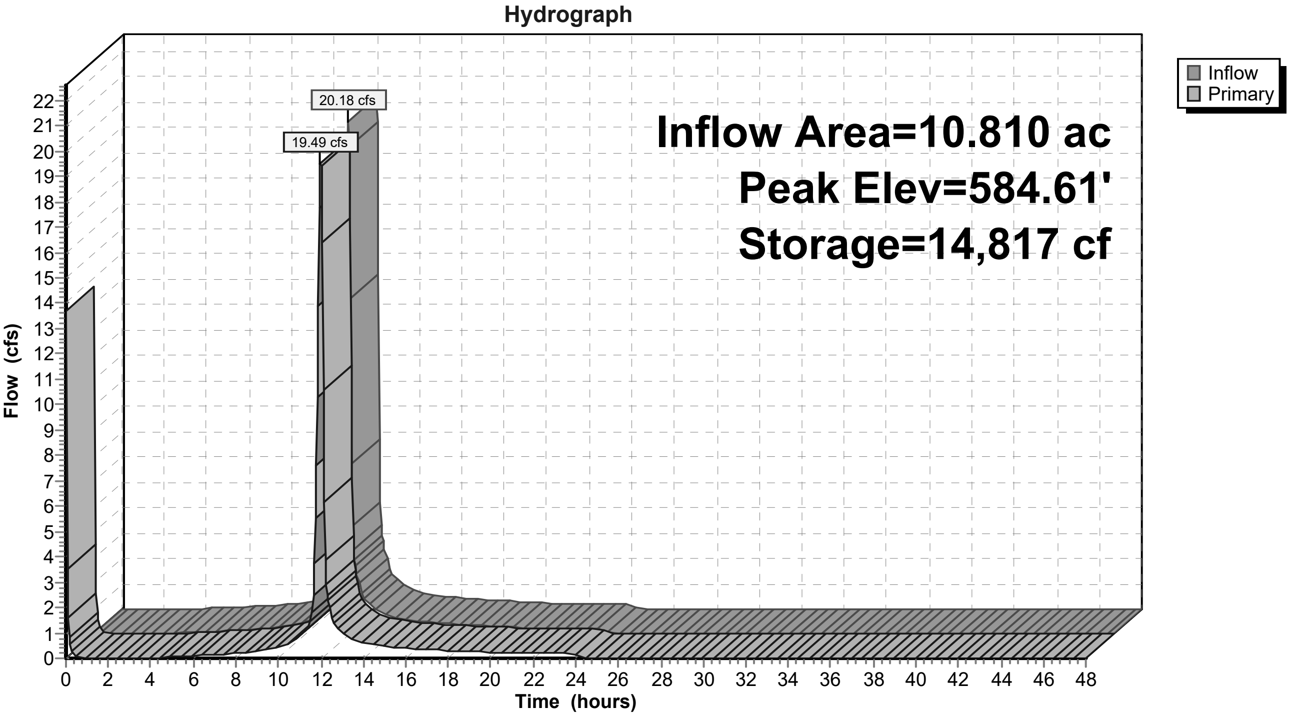
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	32,165 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	820	0	0
582.00	2,815	3,635	3,635
584.00	5,040	7,855	11,490
586.00	7,490	12,530	24,020
587.00	8,800	8,145	32,165

Device	Routing	Invert	Outlet Devices
#1	Primary	584.00'	**162.0 deg x 10.0' long x 2.50' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=19.19 cfs @ 11.99 hrs HW=584.61' TW=584.00' (Dynamic Tailwater)
↑—**1=overflow weir** (Weir Controls 19.19 cfs @ 2.28 fps)

Pond 231F: forebay



Summary for Pond 232Bio: bioretention

```
Inflow Area =       9.260 ac, 60.80% Impervious, Inflow Depth >  1.06"   for  1-yr storm event
Inflow      =      14.37 cfs @  11.99 hrs,  Volume=         0.819 af
Outflow     =       0.16 cfs @  23.58 hrs,  Volume=         0.470 af,  Atten= 99%,  Lag= 695.2 min
Primary     =       0.16 cfs @  23.58 hrs,  Volume=         0.470 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 584.62' @ 23.58 hrs Surf.Area= 23,567 sf Storage= 25,289 cf
Flood Elev= 587.00' Surf.Area= 27,940 sf Storage= 86,503 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 774.0 min (1,647.9 - 873.8)

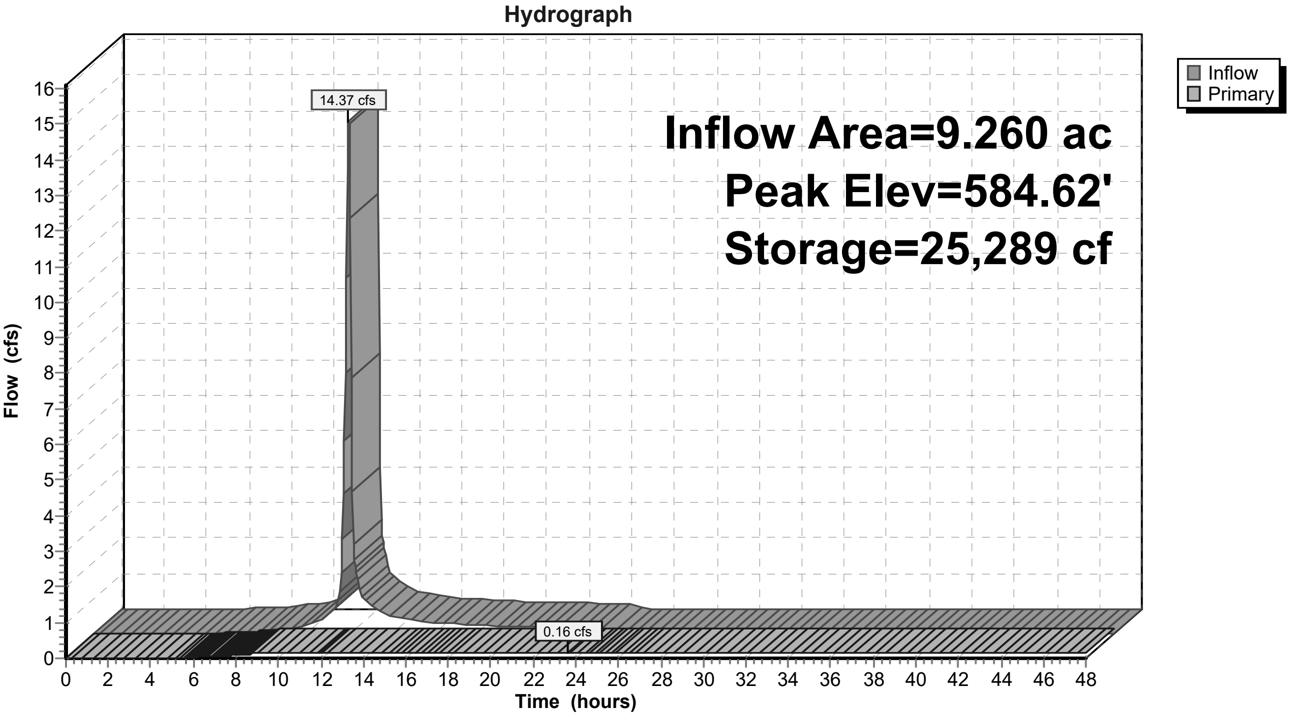
Volume	Invert	Avail.Storage	Storage Description
#1	583.50'	86,503 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
583.50	21,580	0	0
584.00	22,450	11,008	11,008
586.00	26,050	48,500	59,508
587.00	27,940	26,995	86,503

Device	Routing	Invert	Outlet Devices
#1	Primary	580.08'	**12.0" Round Culvert** L= 59.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.08' / 579.80' S= 0.0047 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	580.08'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	584.50'	**3.0" Vert. Orifice** C= 0.600
#4	Device 1	586.00'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	583.50'	**0.250 in/hr Exfiltration through bioretention media over Surface area**

```
Primary OutFlow Max=0.16 cfs @ 23.58 hrs  HW=584.62'  TW=579.48'  (Dynamic Tailwater)
└─1=Culvert  (Passes 0.16 cfs of 7.02 cfs potential flow)
   ├─2=Underdrain  (Passes 0.14 cfs of 1.96 cfs potential flow)
   │  └─5=Exfiltration through bioretention media(Exfiltration Controls 0.14 cfs)
   ├─3=Orifice  (Orifice Controls 0.03 cfs @ 1.18 fps)
   └─4=Grate  ( Controls 0.00 cfs)
```

Pond 232Bio: bioretention



Summary for Pond 232F: forebay

Inflow Area = 9.260 ac, 60.80% Impervious, Inflow Depth = 1.08" for 1-yr storm event
Inflow = 14.72 cfs @ 11.97 hrs, Volume= 0.835 af
Outflow = 14.37 cfs @ 11.99 hrs, Volume= 0.819 af, Atten= 2%, Lag= 1.4 min
Primary = 14.37 cfs @ 11.99 hrs, Volume= 0.819 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.00' Surf.Area= 3,625 sf Storage= 9,890 cf
Peak Elev= 584.62' @ 23.58 hrs Surf.Area= 4,070 sf Storage= 12,278 cf (2,388 cf above start)
Flood Elev= 587.00' Surf.Area= 5,860 sf Storage= 24,035 cf (14,145 cf above start)

Plug-Flow detention time= 244.4 min calculated for 0.591 af (71% of inflow)
Center-of-Mass det. time= 66.2 min (873.8 - 807.6)

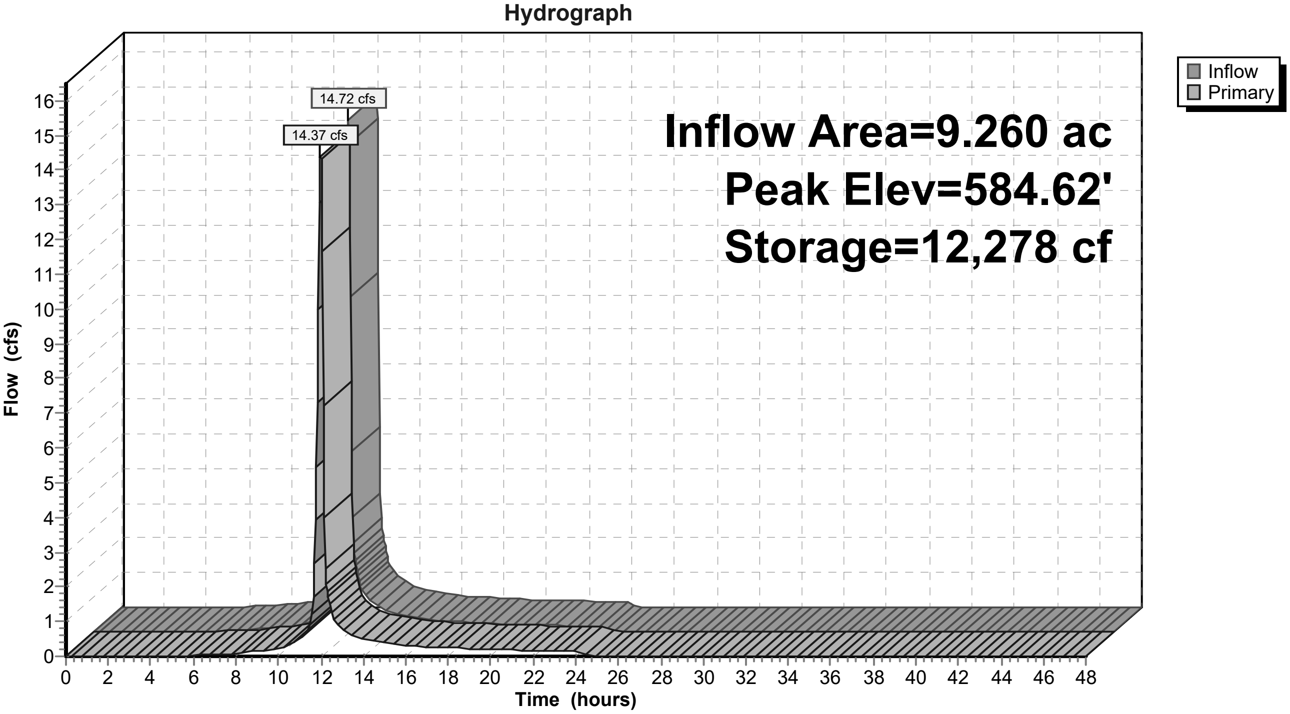
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	24,035 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	1,435	0	0
582.00	2,415	3,850	3,850
584.00	3,625	6,040	9,890
586.00	5,060	8,685	18,575
587.00	5,860	5,460	24,035

Device	Routing	Invert	Outlet Devices
#1	Primary	584.00'	**162.0 deg x 10.0' long x 3.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=14.09 cfs @ 11.99 hrs HW=584.51' TW=584.00' (Dynamic Tailwater)
↳**1=overflow weir** (Weir Controls 14.09 cfs @ 2.10 fps)

Pond 232F: forebay



Summary for Pond 239P: wet pond

Inflow Area =	41.360 ac,	0.00% Impervious, Inflow Depth >	1.35"	for 1-yr storm event	
Inflow =	16.00 cfs @	12.23 hrs, Volume=	4.655 af		
Outflow =	0.12 cfs @	48.00 hrs, Volume=	0.314 af,	Atten= 99%,	Lag= 2,146.0 min
Primary =	0.12 cfs @	48.00 hrs, Volume=	0.314 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= 0.05 hrs / 3
Starting Elev= 575.00' Surf.Area= 496,958 sf Storage= 13,083,100 cf
Peak Elev= 575.38' @ 48.00 hrs Surf.Area= 501,151 sf Storage= 13,272,195 cf (189,095 cf above start)
Flood Elev= 579.00' Surf.Area= 541,980 sf Storage= 15,160,446 cf (2,077,346 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 848.4 min (1,898.1 - 1,049.7)

Volume	Invert	Avail.Storage	Storage Description
#1	540.00'	15,160,446 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
540.00	288,900	0	0
542.00	297,925	586,825	586,825
544.00	307,060	604,985	1,191,810
546.00	316,290	623,350	1,815,160
548.00	325,630	641,920	2,457,080
550.00	335,065	660,695	3,117,775
552.00	344,605	679,670	3,797,445
554.00	354,245	698,850	4,496,295
556.00	363,990	718,235	5,214,530
558.00	373,830	737,820	5,952,350
560.00	383,775	757,605	6,709,955
562.00	393,825	777,600	7,487,555
564.00	403,975	797,800	8,285,355
566.00	414,225	818,200	9,103,555
568.00	424,575	838,800	9,942,355
570.00	435,030	859,605	10,801,960
572.00	445,585	880,615	11,682,575
573.50	453,440	674,269	12,356,844
574.00	485,890	234,833	12,591,676
576.00	508,025	993,915	13,585,591
578.00	530,560	1,038,585	14,624,176
579.00	541,980	536,270	15,160,446

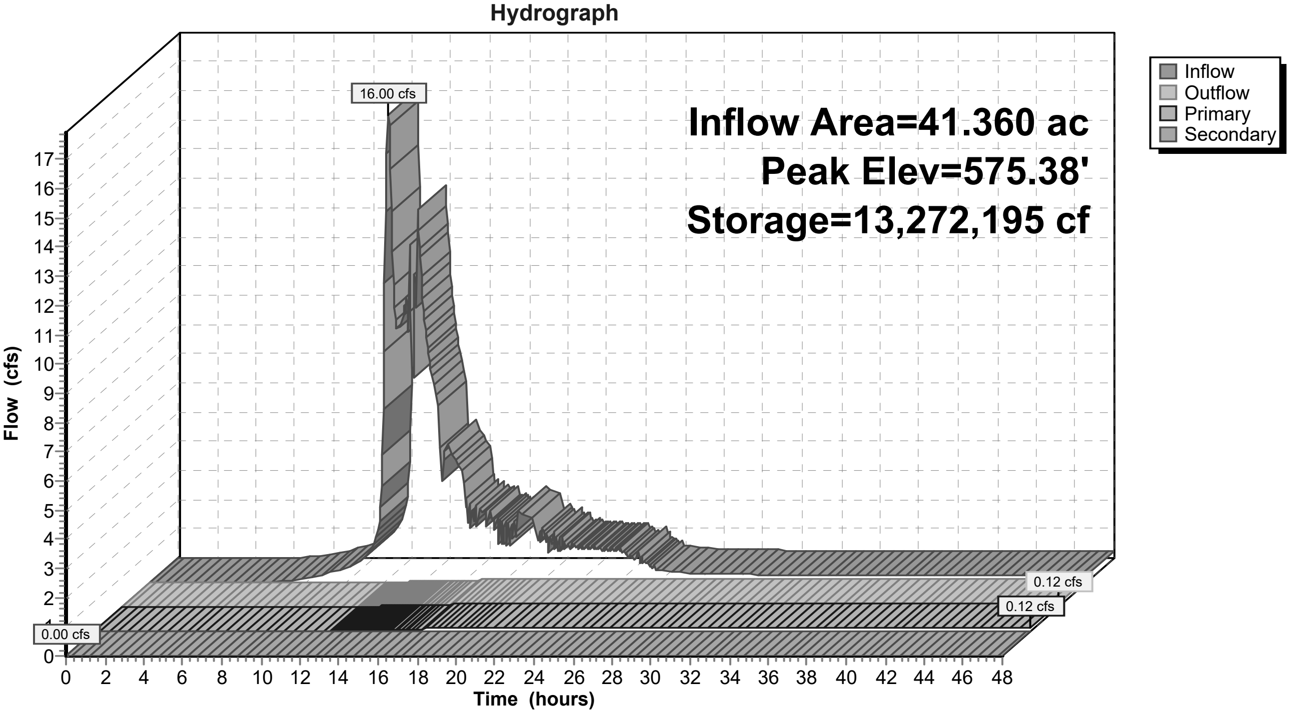
Device	Routing	Invert	Outlet Devices
#1	Primary	575.00'	**12.0" Round Culvert** L= 165.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 575.00' / 574.00' S= 0.0061 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	575.00'	**3.0" Vert. Orifice (internal)** C= 0.600
#3	Device 1	575.75'	**48.0" W x 9.0" H Vert. Slot (internal)** C= 0.600

#4	Device 1	577.50'	**30.0" x 48.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	578.00'	**162.0 deg x 15.0' long x 1.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.12 cfs @ 48.00 hrs HW=575.38' TW=572.08' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.12 cfs of 0.47 cfs potential flow)
  ├─**2=Orifice (internal)** (Orifice Controls 0.12 cfs @ 2.43 fps)
  ├─**3=Slot (internal)** (Controls 0.00 cfs)
  └─**4=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=575.00' TW=573.47' (Dynamic Tailwater)
└─**5=overflow weir** (Controls 0.00 cfs)

Pond 239P: wet pond



Summary for Pond CB204: catch basin

```
Inflow Area =       5.650 ac, 71.50% Impervious, Inflow Depth =  1.18"   for 1-yr storm event
Inflow     =      11.18 cfs @  11.97 hrs, Volume=          0.557 af
Outflow    =      11.18 cfs @  11.97 hrs, Volume=          0.557 af, Atten= 0%, Lag= 0.0 min
Primary    =       9.25 cfs @  11.97 hrs, Volume=          0.535 af
Secondary  =       1.93 cfs @  11.97 hrs, Volume=          0.022 af
```

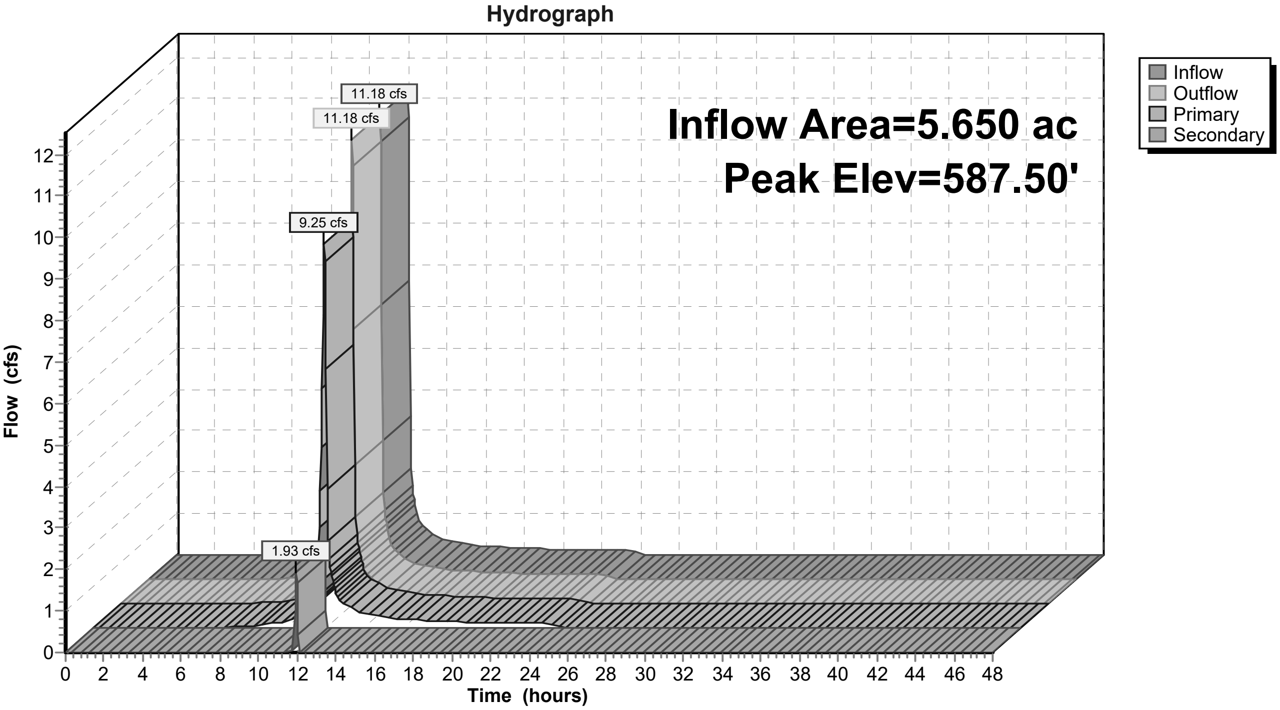
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 587.50' @ 11.97 hrs
Flood Elev= 592.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	585.86'	**24.0" Round Culvert** L= 58.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.86' / 585.39' S= 0.0081 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	586.86'	**18.0" Round Culvert** L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 586.86' / 585.00' S= 0.0338 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=9.07 cfs @ 11.97 hrs HW=587.47' TW=586.78' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 9.07 cfs @ 4.57 fps)

Secondary OutFlow Max=1.81 cfs @ 11.97 hrs HW=587.47' TW=574.65' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 1.81 cfs @ 2.67 fps)

Pond CB204: catch basin



Summary for Pond CB322: catch basin

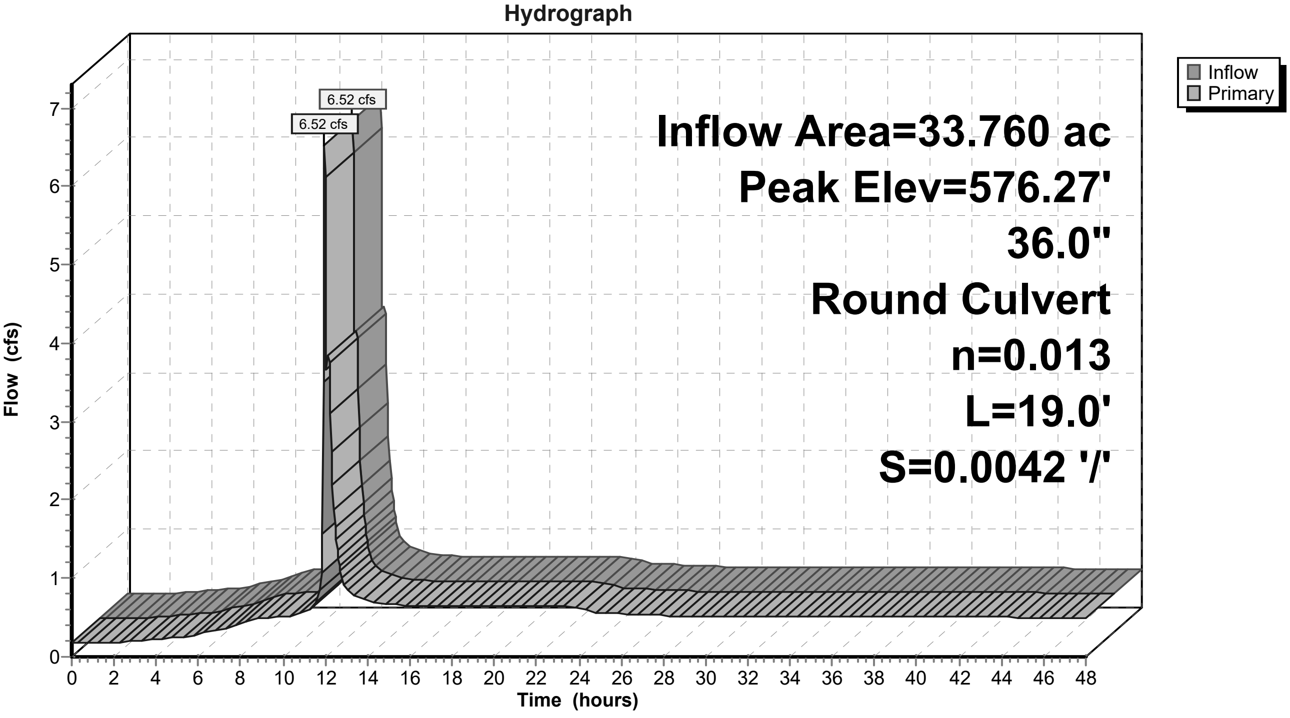
Inflow Area =	33.760 ac, 73.79% Impervious, Inflow Depth > 0.78" for 1-yr storm event				
Inflow =	6.52 cfs @	11.97 hrs, Volume=	2.187 af		
Outflow =	6.52 cfs @	11.97 hrs, Volume=	2.187 af,	Atten= 0%,	Lag= 0.0 min
Primary =	6.52 cfs @	11.97 hrs, Volume=	2.187 af		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 576.27' @ 11.97 hrs
Flood Elev= 582.23'

Device	Routing	Invert	Outlet Devices
#1	Primary	575.08'	**36.0" Round Culvert** L= 19.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 575.08' / 575.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=6.17 cfs @ 11.97 hrs HW=576.23' TW=575.37' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 6.17 cfs @ 3.68 fps)

Pond CB322: catch basin



Summary for Pond CB323: catch basin

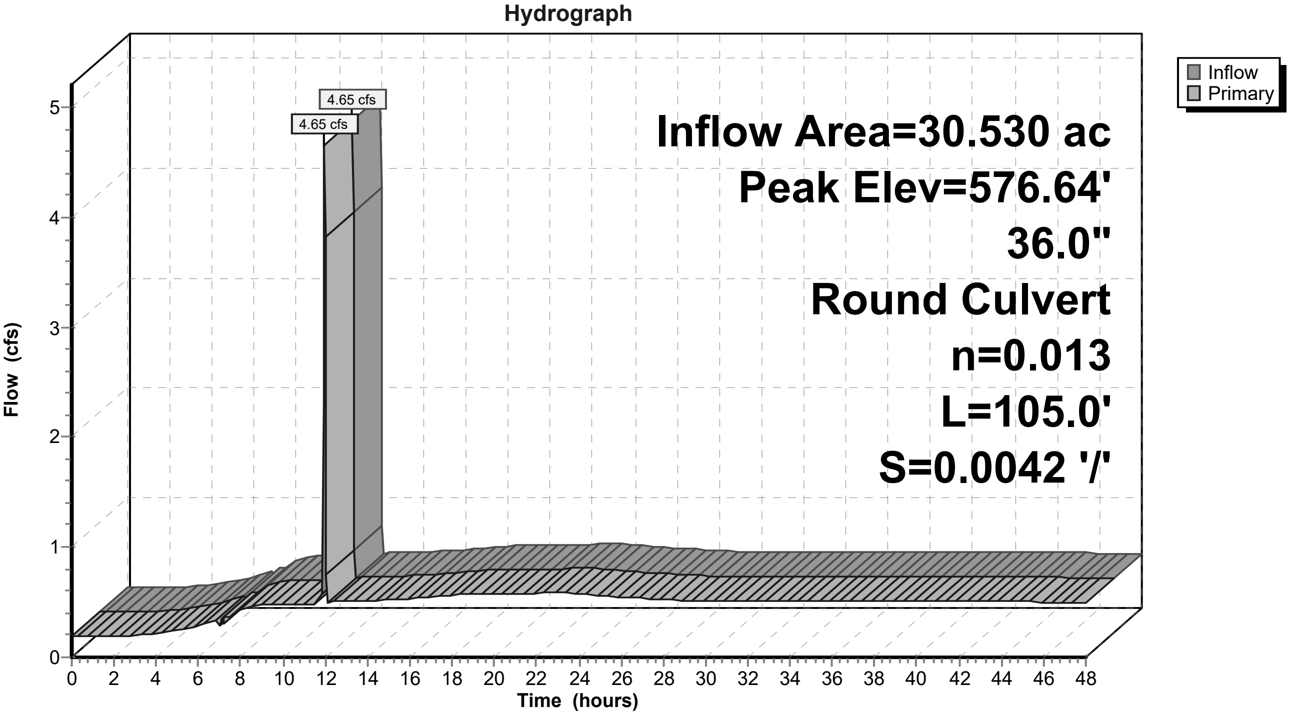
```
Inflow Area =       30.530 ac,  76.15% Impervious,  Inflow Depth >   0.76"    for  1-yr storm event
Inflow      =        4.65 cfs @   11.96 hrs,  Volume=           1.928 af
Outflow     =        4.65 cfs @   11.96 hrs,  Volume=           1.928 af,  Atten= 0%,  Lag= 0.0 min
Primary     =        4.65 cfs @   11.96 hrs,  Volume=           1.928 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 576.64' @ 11.97 hrs
Flood Elev= 580.79'

Device  Routing        Invert  Outlet Devices
  #1    Primary       575.52'  36.0"  Round Culvert
                               L= 105.0'   CPP, square edge headwall,  Ke= 0.500
                               Inlet / Outlet Invert= 575.52' / 575.08'   S= 0.0042 '/'   Cc= 0.900
                               n= 0.013  Corrugated PE, smooth interior,  Flow Area= 7.07 sf

Primary OutFlow  Max=4.37 cfs @ 11.96 hrs  HW=576.60'  TW=576.23'   (Dynamic Tailwater)
 └─1=Culvert  (Outlet Controls 4.37 cfs @ 2.85 fps)
```

Pond CB323: catch basin



Summary for Pond CB402: diversion CB

Inflow Area =	7.280 ac, 77.06% Impervious, Inflow Depth = 1.26"	for 1-yr storm event	
Inflow =	15.20 cfs @ 11.97 hrs, Volume=	0.767 af	
Outflow =	15.20 cfs @ 11.97 hrs, Volume=	0.767 af,	Atten= 0%, Lag= 0.0 min
Primary =	12.77 cfs @ 11.97 hrs, Volume=	0.738 af	
Secondary =	2.44 cfs @ 11.97 hrs, Volume=	0.029 af	

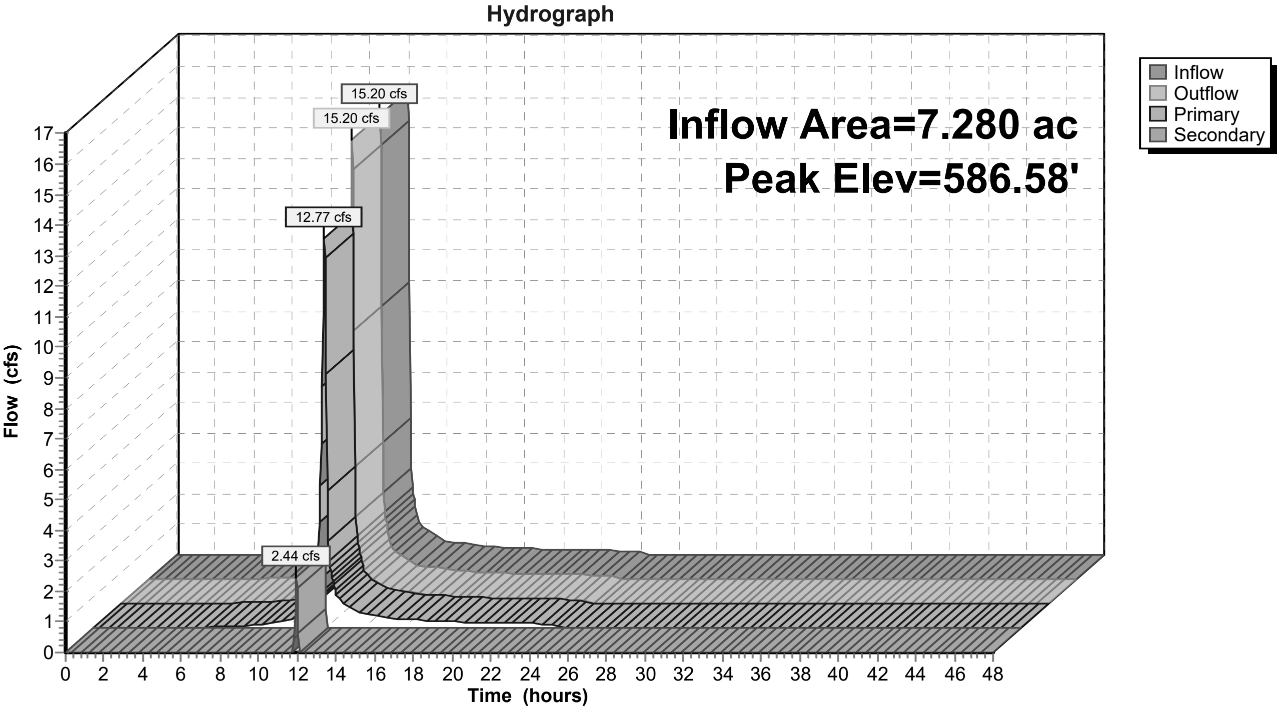
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.58' @ 11.97 hrs
Flood Elev= 589.59'

Device	Routing	Invert	Outlet Devices
#1	Primary	584.86'	**30.0" Round Culvert** L= 205.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 584.86' / 584.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Secondary	585.86'	**18.0" Round Culvert** L= 64.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.86' / 584.00' S= 0.0291 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=12.47 cfs @ 11.97 hrs HW=586.56' TW=584.49' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 12.47 cfs @ 4.96 fps)

Secondary OutFlow Max=2.30 cfs @ 11.97 hrs HW=586.56' TW=584.10' (Dynamic Tailwater)
↑**2=Culvert** (Inlet Controls 2.30 cfs @ 2.85 fps)

Pond CB402: diversion CB



Summary for Pond DMH202: manhole

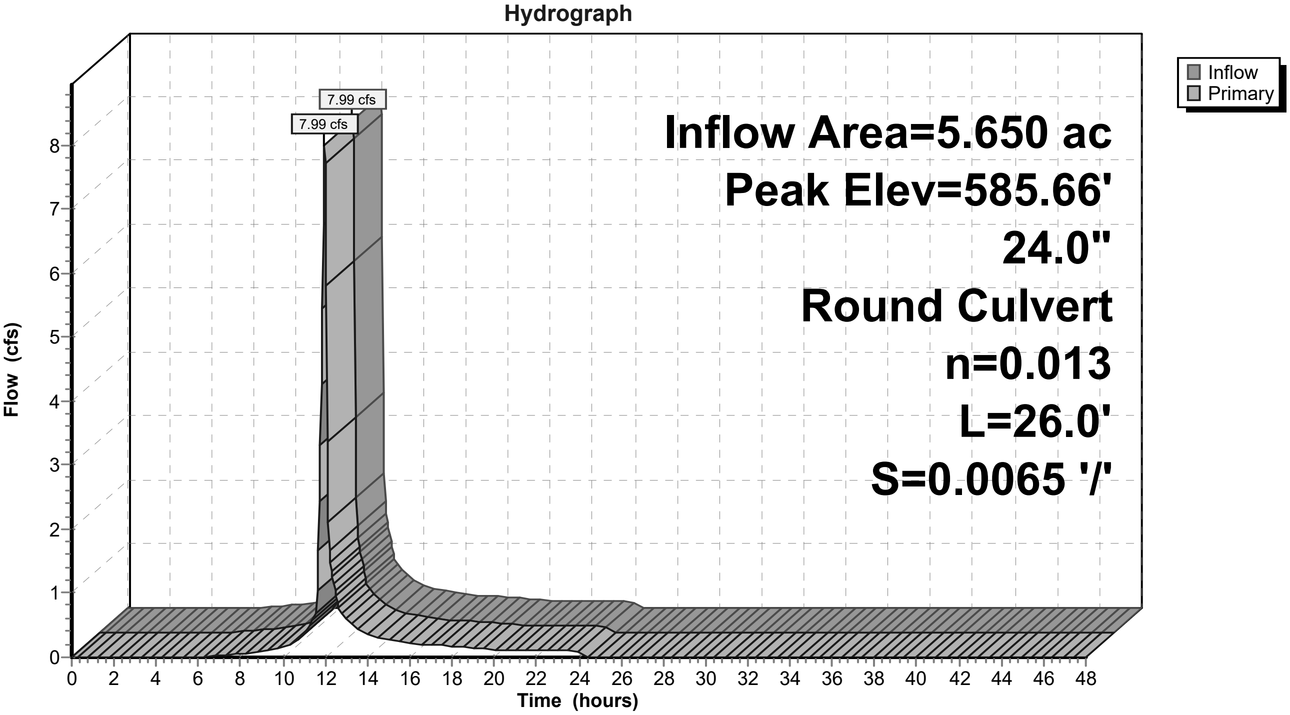
```
Inflow Area =       5.650 ac, 71.50% Impervious, Inflow Depth =  1.10"   for 1-yr storm event
Inflow      =      7.99 cfs @  11.97 hrs, Volume=          0.519 af
Outflow     =      7.99 cfs @  11.97 hrs, Volume=          0.519 af, Atten= 0%, Lag= 0.0 min
Primary     =      7.99 cfs @  11.97 hrs, Volume=          0.519 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 585.66' @ 11.97 hrs
Flood Elev= 593.41'

Device	Routing	Invert	Outlet Devices
#1	Primary	584.17'	**24.0" Round Culvert** L= 26.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 584.17' / 584.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=7.83 cfs @ 11.97 hrs HW=585.65' TW=584.56' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 7.83 cfs @ 4.39 fps)

Pond DMH202: manhole



Summary for Pond DMH203: diversion manhole

```
Inflow Area =      5.650 ac,  71.50% Impervious,  Inflow Depth =   1.14"    for  1-yr storm event
Inflow      =     9.25 cfs @  11.97 hrs,  Volume=          0.535 af
Outflow     =     9.25 cfs @  11.97 hrs,  Volume=          0.535 af,  Atten= 0%,  Lag= 0.0 min
Primary     =     7.99 cfs @  11.97 hrs,  Volume=          0.519 af
Secondary   =     1.26 cfs @  11.97 hrs,  Volume=          0.016 af
```

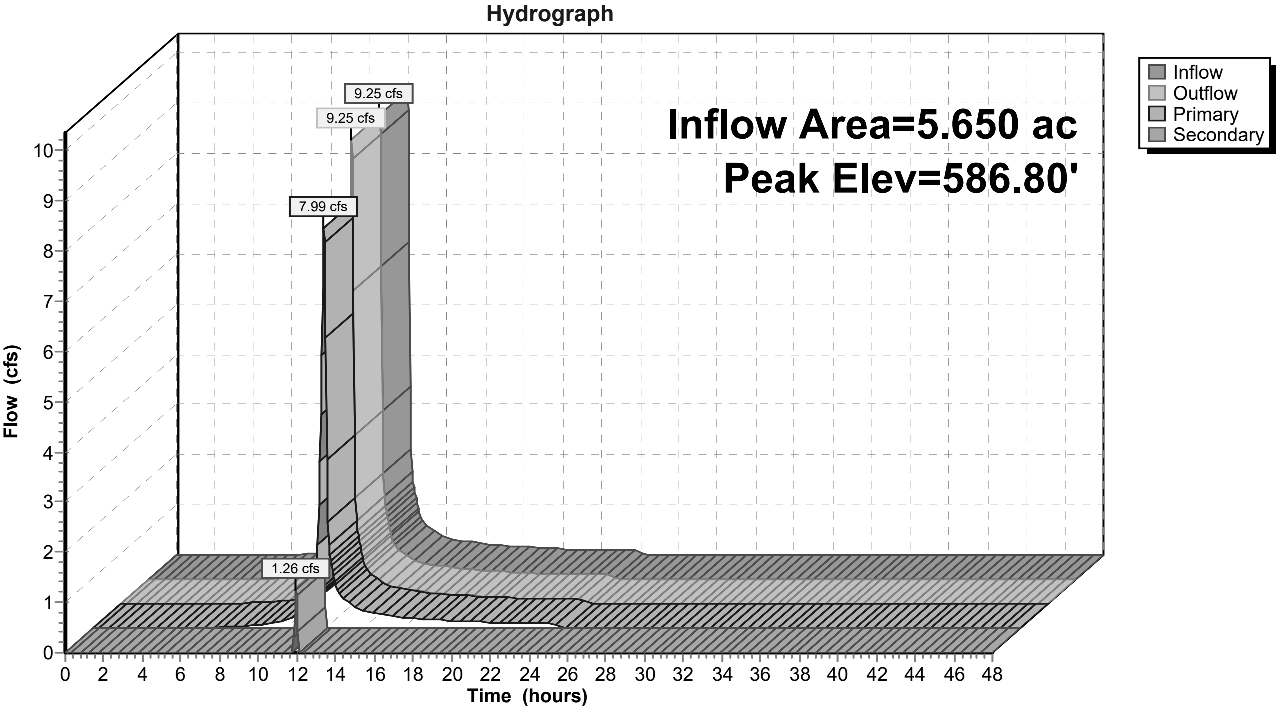
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.80' @ 11.97 hrs
Flood Elev= 593.07'

Device	Routing	Invert	Outlet Devices
#1	Primary	585.39'	**24.0" Round Culvert** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.39' / 584.20' S= 0.0079 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	586.19'	**18.0" Round Culvert** L= 237.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 586.19' / 585.17' S= 0.0043 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=7.84 cfs @ 11.97 hrs HW=586.78' TW=585.65' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 7.84 cfs @ 4.71 fps)

Secondary OutFlow Max=1.21 cfs @ 11.97 hrs HW=586.78' TW=585.76' (Dynamic Tailwater)
↑—**2=Culvert** (Outlet Controls 1.21 cfs @ 2.74 fps)

Pond DMH203: diversion manhole



Summary for Pond DMH212: manhole

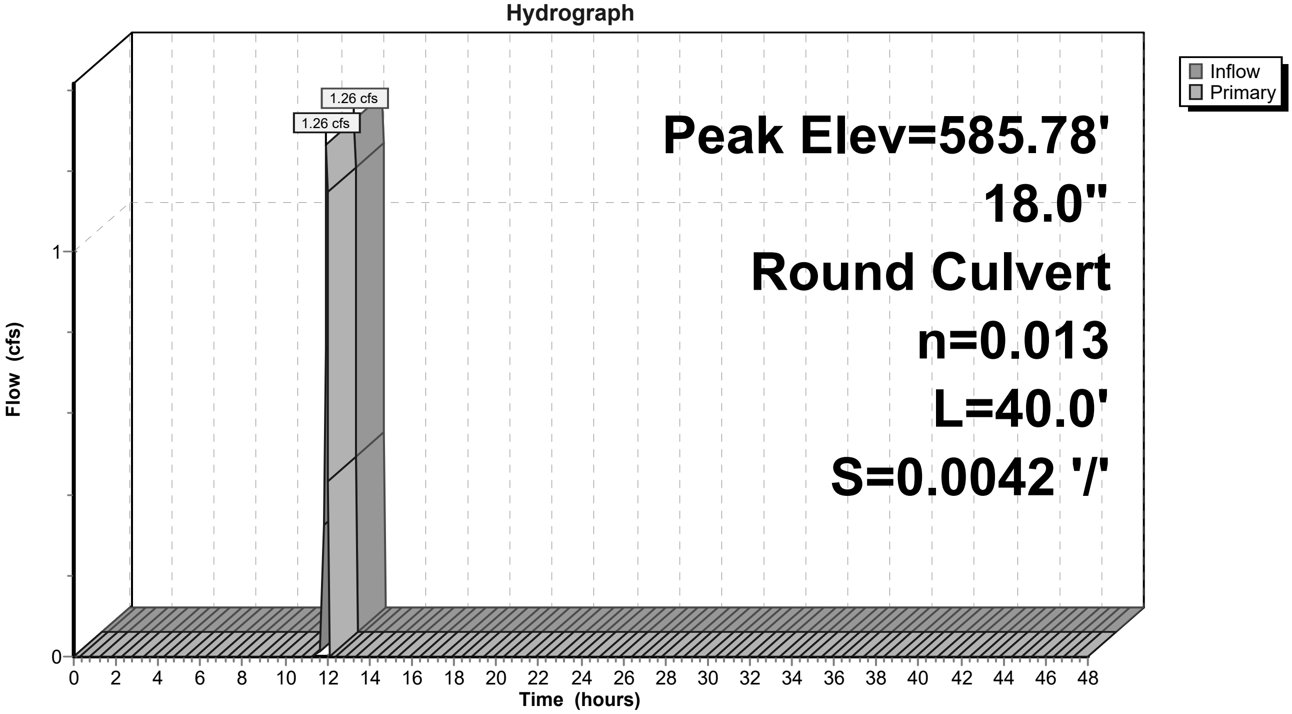
```
Inflow   =    1.26 cfs @  11.97 hrs,  Volume=        0.016 af
Outflow  =    1.26 cfs @  11.97 hrs,  Volume=        0.016 af,  Atten= 0%,  Lag= 0.0 min
Primary  =    1.26 cfs @  11.97 hrs,  Volume=        0.016 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 585.78' @ 11.97 hrs
Flood Elev= 591.88'

Device	Routing	Invert	Outlet Devices
#1	Primary	585.17'	**18.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.17' / 585.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.20 cfs @ 11.97 hrs HW=585.76' TW=573.63' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.20 cfs @ 2.74 fps)

Pond DMH212: manhole



Summary for Pond DMH216: division manhole

Inflow Area = 4.810 ac,100.00% Impervious, Inflow Depth = 1.55" for 1-yr storm event
Inflow = 11.43 cfs @ 11.96 hrs, Volume= 0.620 af
Outflow = 11.43 cfs @ 11.96 hrs, Volume= 0.620 af, Atten= 0%, Lag= 0.0 min
Primary = 9.93 cfs @ 11.96 hrs, Volume= 0.605 af
Secondary = 1.50 cfs @ 11.96 hrs, Volume= 0.015 af

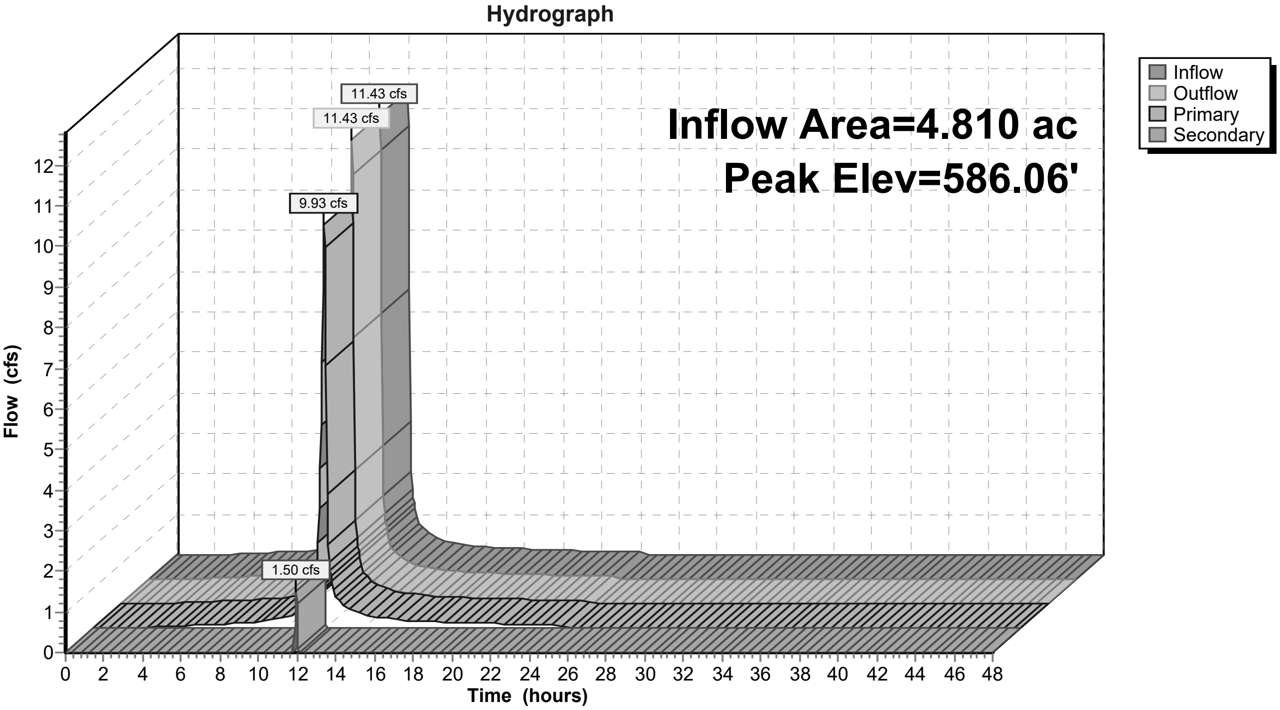
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.06' @ 11.96 hrs
Flood Elev= 594.26'

Device	Routing	Invert	Outlet Devices
#1	Primary	584.44'	**24.0" Round Culvert** L= 64.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 584.44' / 584.00' S= 0.0069 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	585.55'	**24.0" Round Culvert** L= 82.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.55' / 582.00' S= 0.0433 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=9.74 cfs @ 11.96 hrs HW=586.04' TW=584.56' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 9.74 cfs @ 4.96 fps)

Secondary OutFlow Max=1.41 cfs @ 11.96 hrs HW=586.04' TW=582.49' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 1.41 cfs @ 2.38 fps)

Pond DMH216: division manhole



Summary for Pond DMH230: manhole

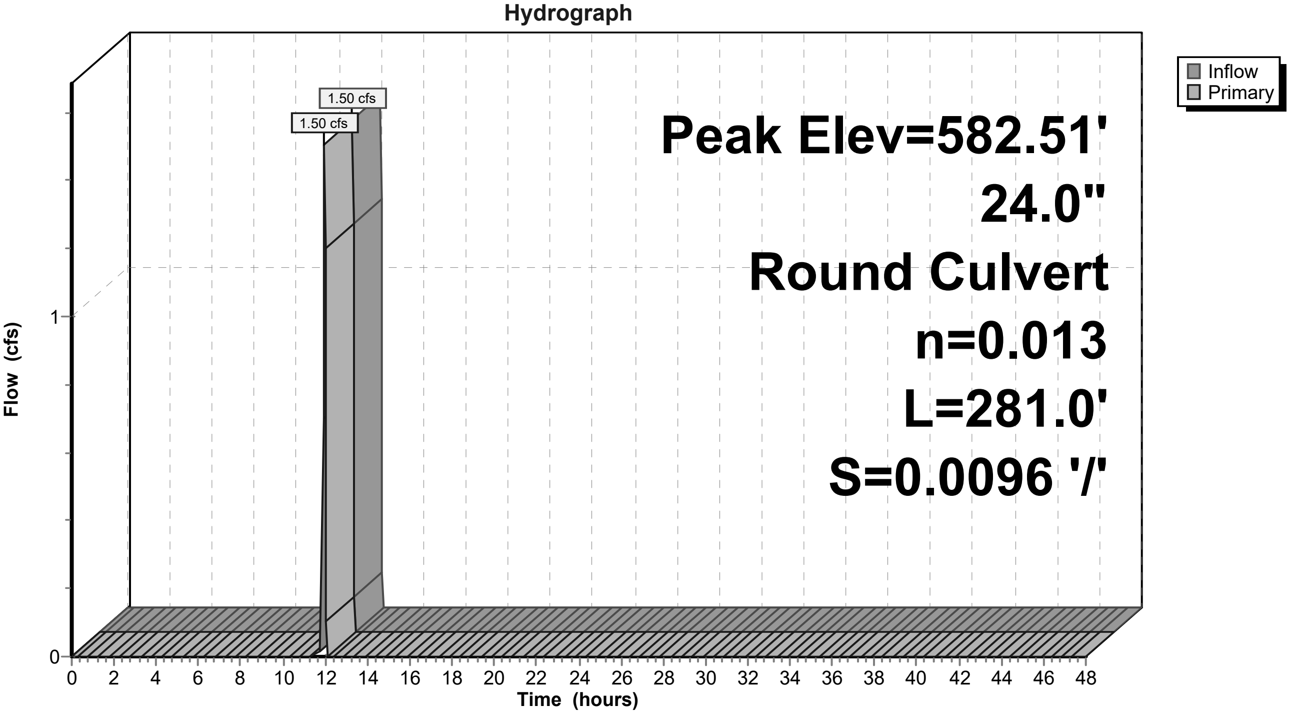
Inflow	=	1.50 cfs @	11.96 hrs,	Volume=	0.015 af
Outflow	=	1.50 cfs @	11.96 hrs,	Volume=	0.015 af, Atten= 0%, Lag= 0.0 min
Primary	=	1.50 cfs @	11.96 hrs,	Volume=	0.015 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 582.51' @ 11.96 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	582.00'	**24.0" Round Culvert** L= 281.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 582.00' / 579.30' S= 0.0096 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=1.41 cfs @ 11.96 hrs HW=582.49' TW=579.83' (Dynamic Tailwater)
↑**—1=Culvert** (Inlet Controls 1.41 cfs @ 2.38 fps)

Pond DMH230: manhole



Summary for Pond DMH302: diversion manhole

```
Inflow Area =       9.330 ac,  93.78% Impervious,  Inflow Depth =   1.45"    for  1-yr storm event
Inflow      =      21.38 cfs @   11.96 hrs,  Volume=           1.124 af
Outflow     =      21.38 cfs @   11.96 hrs,  Volume=           1.124 af,  Atten= 0%,  Lag= 0.0 min
Primary     =      18.73 cfs @   11.96 hrs,  Volume=           1.099 af
Secondary =         2.65 cfs @   11.96 hrs,  Volume=           0.025 af
```

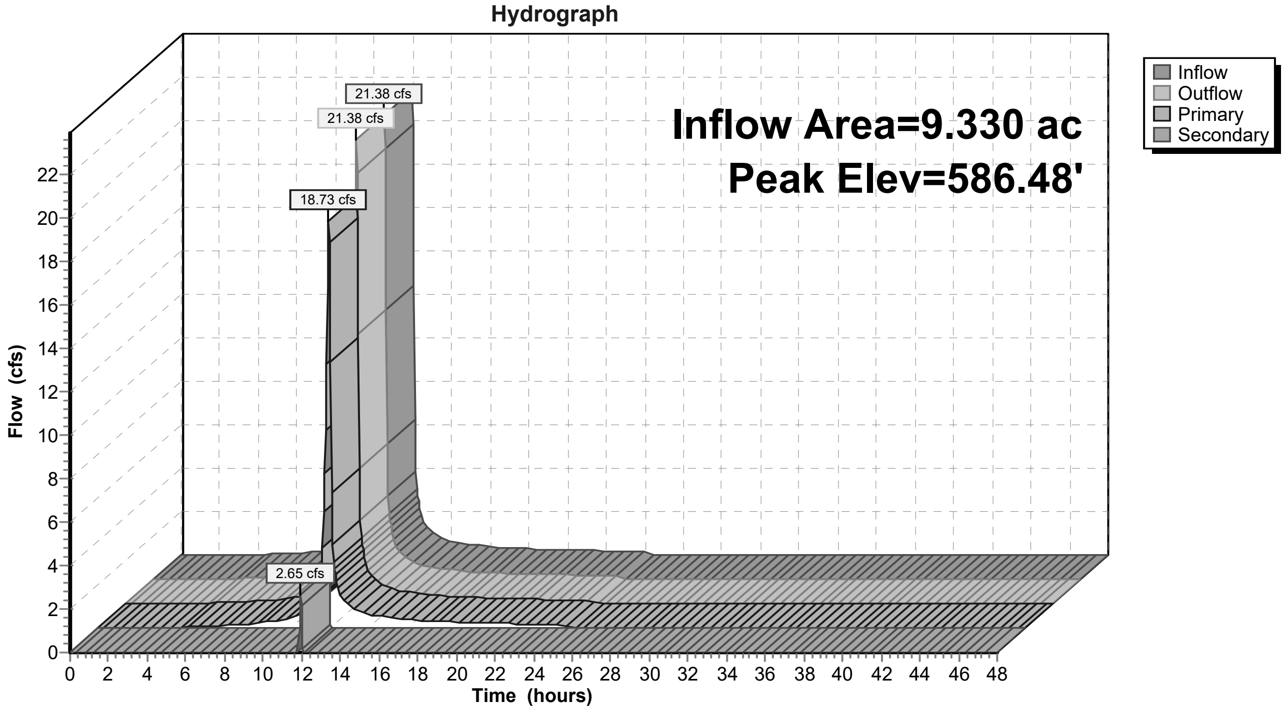
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.48' @ 11.96 hrs
Flood Elev= 596.93'

Device	Routing	Invert	Outlet Devices
#1	Primary	584.18'	**30.0" Round Culvert** L= 43.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 584.18' / 584.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Secondary	585.80'	**24.0" Round Culvert** L= 62.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.80' / 582.50' S= 0.0532 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=18.35 cfs @ 11.96 hrs HW=586.45' TW=584.59' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 18.35 cfs @ 5.14 fps)

Secondary OutFlow Max=2.47 cfs @ 11.96 hrs HW=586.46' TW=583.16' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 2.47 cfs @ 2.76 fps)

Pond DMH302: diversion manhole



Summary for Pond DMH316: manhole

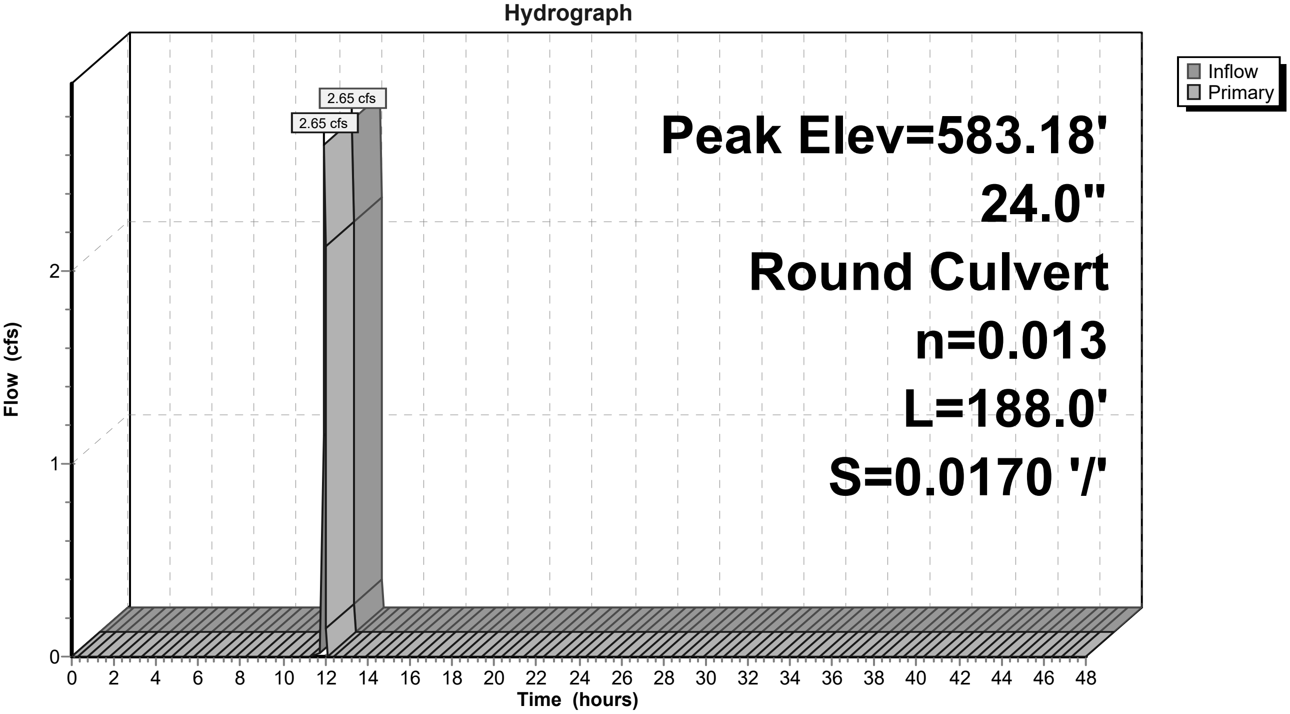
Inflow	=	2.65 cfs @	11.96 hrs,	Volume=	0.025 af
Outflow	=	2.65 cfs @	11.96 hrs,	Volume=	0.025 af, Atten= 0%, Lag= 0.0 min
Primary	=	2.65 cfs @	11.96 hrs,	Volume=	0.025 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 583.18' @ 11.96 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	582.50'	**24.0" Round Culvert** L= 188.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 582.50' / 579.30' S= 0.0170 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=2.47 cfs @ 11.96 hrs HW=583.16' TW=580.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.47 cfs @ 2.76 fps)

Pond DMH316: manhole



Summary for Pond DMH317: manhole

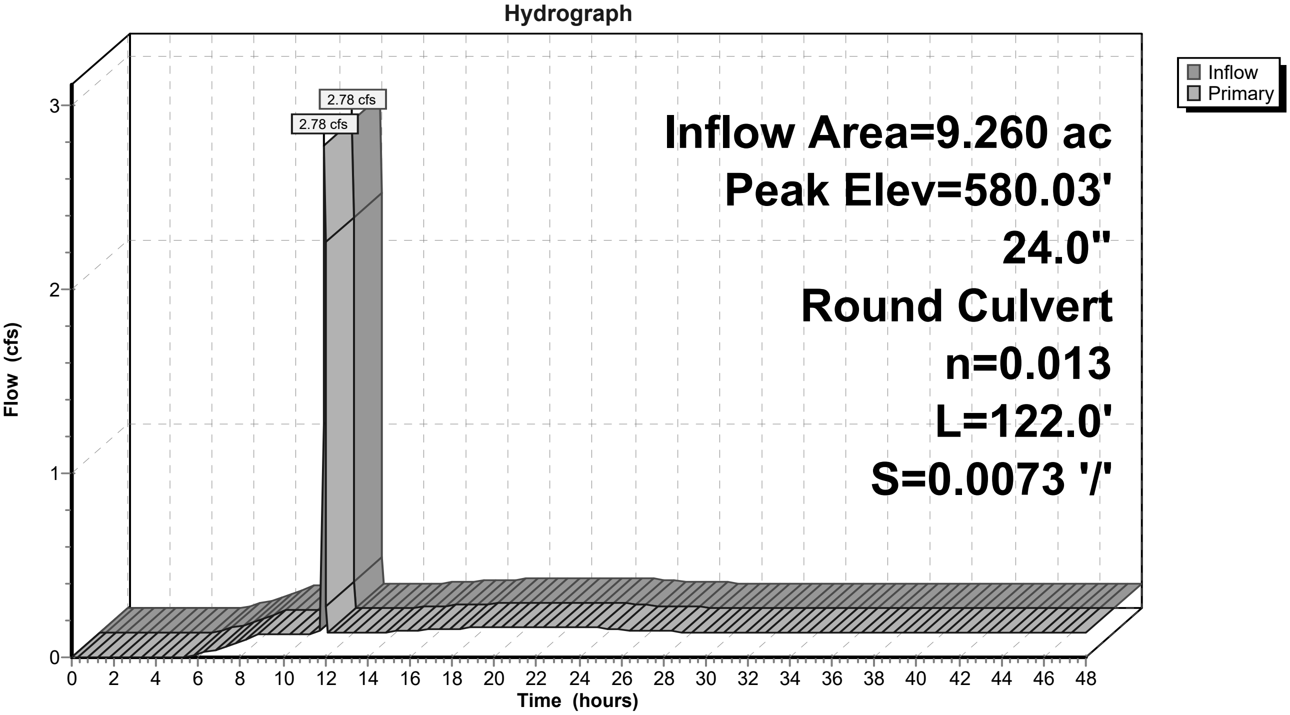
```
Inflow Area =      9.260 ac,  60.80% Impervious,  Inflow Depth >  0.64"    for  1-yr storm event
Inflow      =      2.78 cfs @  11.96 hrs,  Volume=          0.495 af
Outflow     =      2.78 cfs @  11.96 hrs,  Volume=          0.495 af,  Atten= 0%,  Lag= 0.0 min
Primary     =      2.78 cfs @  11.96 hrs,  Volume=          0.495 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 580.03' @ 11.96 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	579.30'	**24.0" Round Culvert** L= 122.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 579.30' / 578.41' S= 0.0073 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=2.60 cfs @ 11.96 hrs HW=580.00' TW=578.73' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 2.60 cfs @ 3.94 fps)

Pond DMH317: manhole



Summary for Pond DMH318: manhole

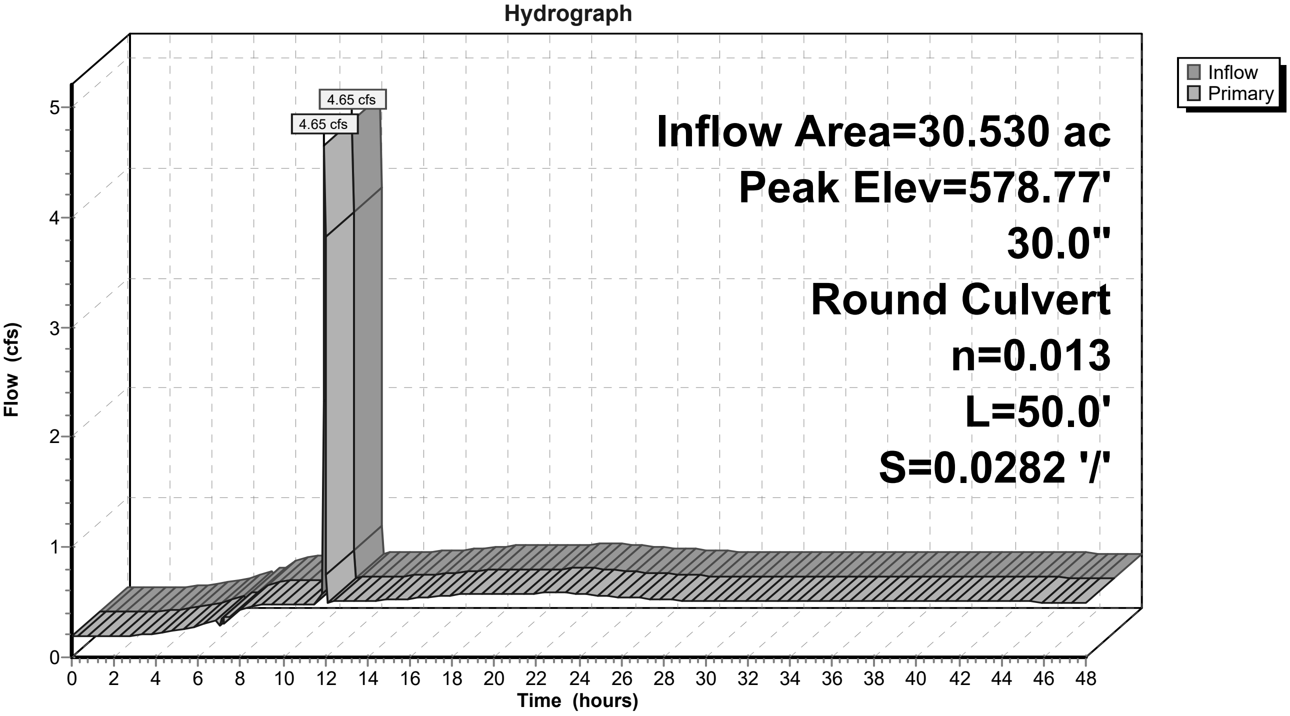
Inflow Area =	30.530 ac, 76.15% Impervious, Inflow Depth > 0.76"	for 1-yr storm event		
Inflow =	4.65 cfs @	11.96 hrs, Volume=	1.928 af	
Outflow =	4.65 cfs @	11.96 hrs, Volume=	1.928 af,	Atten= 0%, Lag= 0.0 min
Primary =	4.65 cfs @	11.96 hrs, Volume=	1.928 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 578.77' @ 11.96 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	577.91'	**30.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 577.91' / 576.50' S= 0.0282 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=4.37 cfs @ 11.96 hrs HW=578.73' TW=577.11' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 4.37 cfs @ 3.09 fps)

Pond DMH318: manhole



Summary for Pond DMH319: manhole

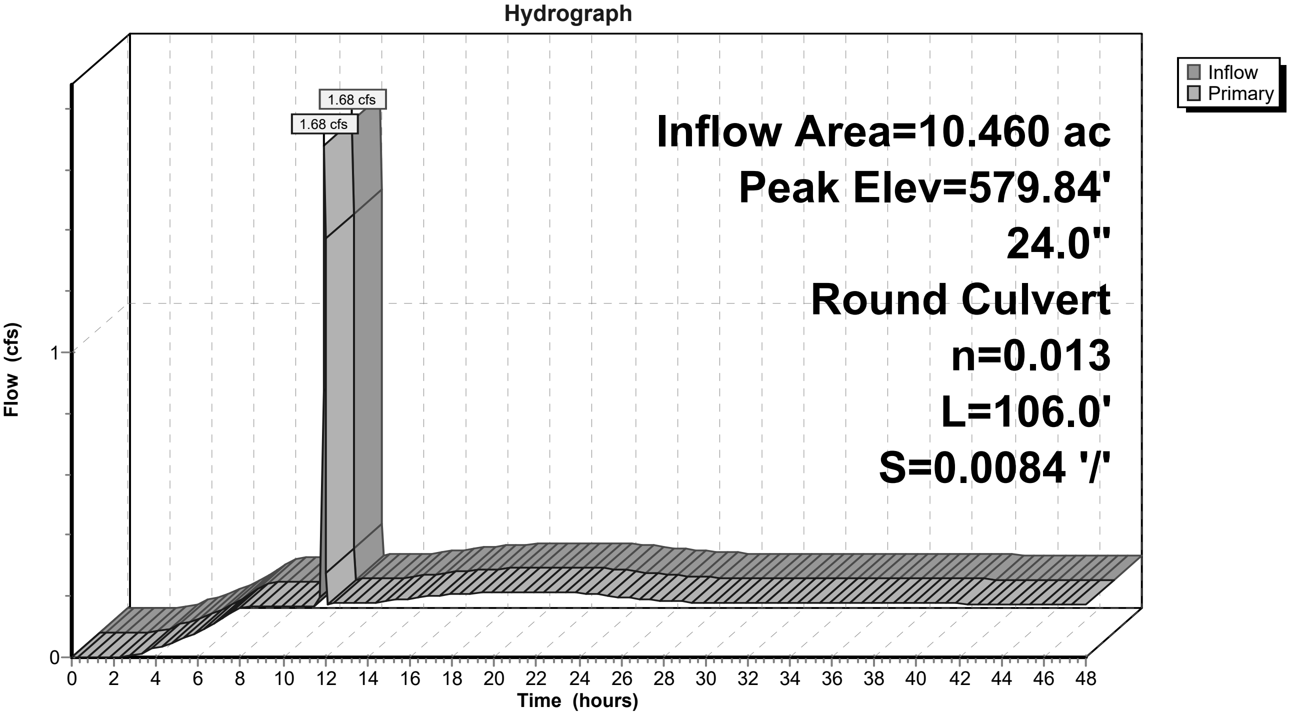
```
Inflow Area =        10.460 ac,  84.61% Impervious,  Inflow Depth >   0.75"    for  1-yr storm event
Inflow       =        1.68 cfs @   11.96 hrs,  Volume=             0.655 af
Outflow      =        1.68 cfs @   11.96 hrs,  Volume=             0.655 af,  Atten= 0%,  Lag= 0.0 min
Primary      =        1.68 cfs @   11.96 hrs,  Volume=             0.655 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 579.84' @ 11.96 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	579.30'	**24.0" Round Culvert** L= 106.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 579.30' / 578.41' S= 0.0084 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=1.58 cfs @ 11.96 hrs HW=579.83' TW=578.74' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.58 cfs @ 3.61 fps)

Pond DMH319: manhole



Summary for Pond DMH324: manhole

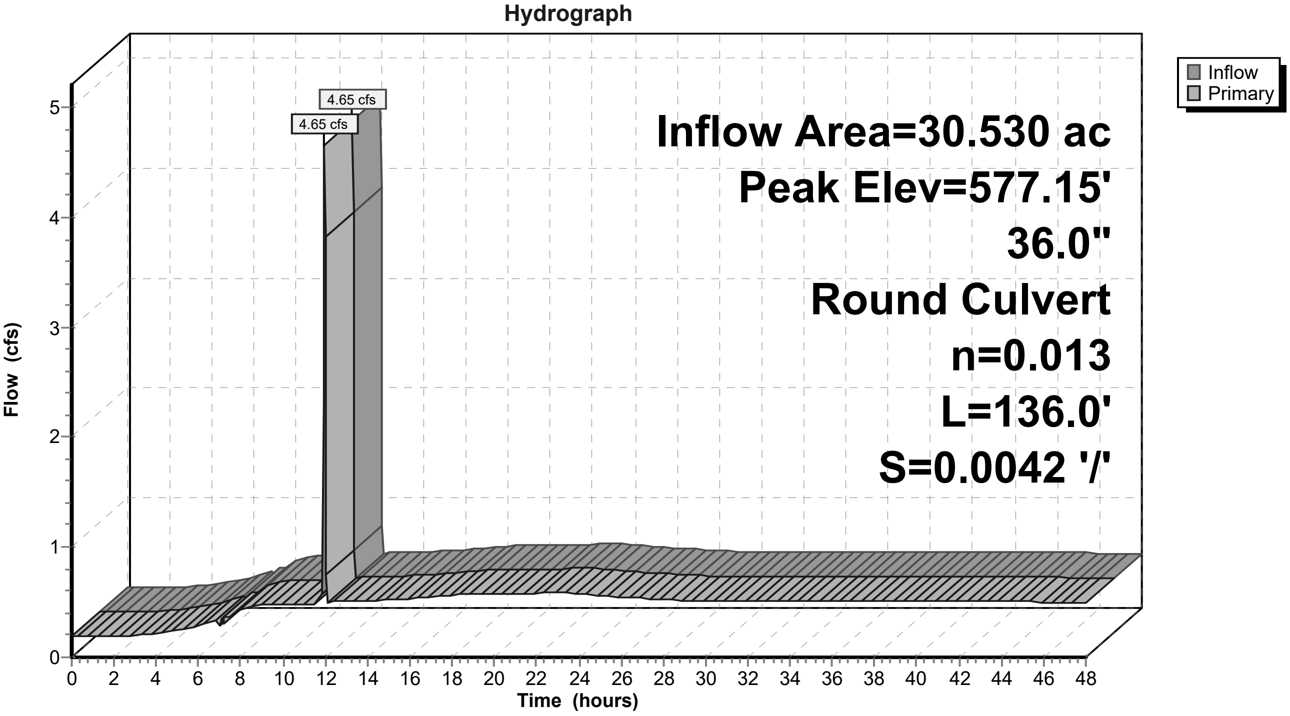
```
Inflow Area =        30.530 ac,  76.15% Impervious,  Inflow Depth >   0.76"    for  1-yr storm event
Inflow       =        4.65 cfs @   11.96 hrs,  Volume=              1.928 af
Outflow      =        4.65 cfs @   11.96 hrs,  Volume=              1.928 af,  Atten= 0%,  Lag= 0.0 min
Primary      =        4.65 cfs @   11.96 hrs,  Volume=              1.928 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 577.15' @ 11.96 hrs
Flood Elev= 582.63'

Device	Routing	Invert	Outlet Devices
#1	Primary	576.09'	**36.0" Round Culvert** L= 136.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 576.09' / 575.52' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=4.37 cfs @ 11.96 hrs HW=577.11' TW=576.60' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 4.37 cfs @ 3.08 fps)

Pond DMH324: manhole



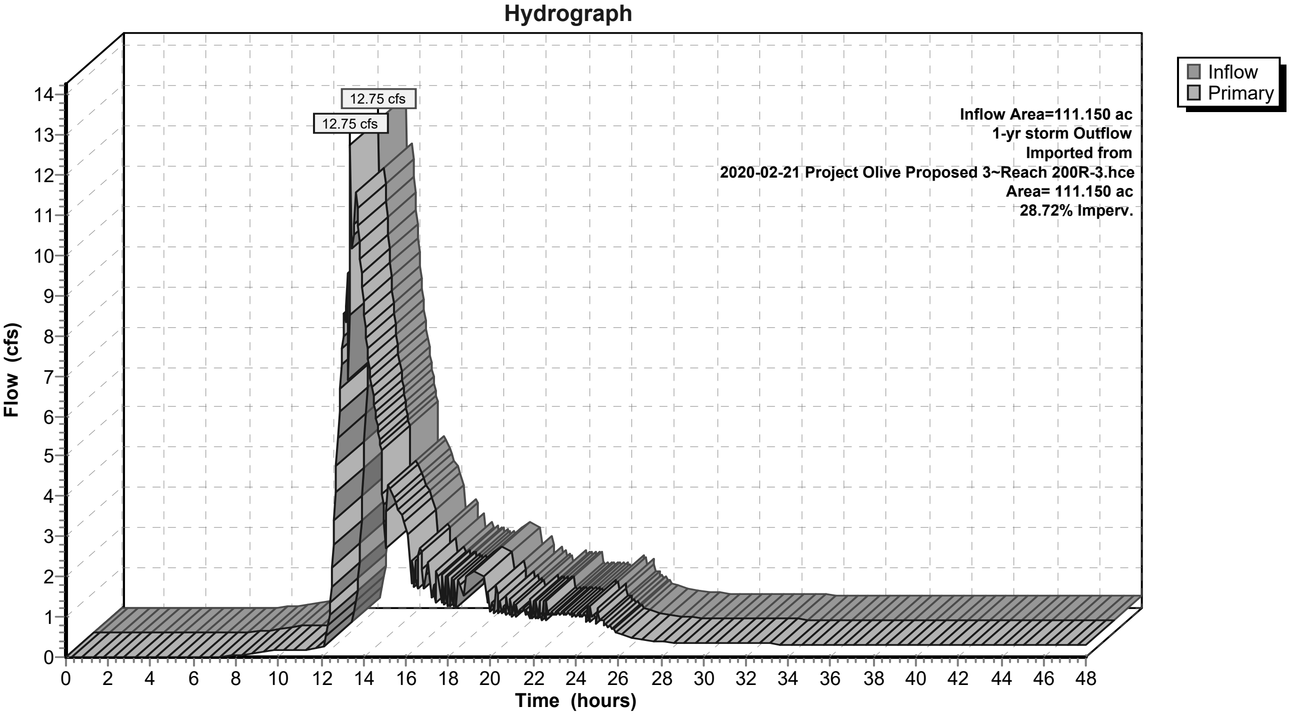
Summary for Link 200R-3: from 200R-3

Inflow Area =	111.150 ac,	28.72% Impervious,	Inflow Depth > 0.40"		for 1-yr storm event
Inflow =	12.75 cfs @	13.41 hrs,	Volume=	3.707 af	
Primary =	12.75 cfs @	13.41 hrs,	Volume=	3.707 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

1-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 3~Reach 200R-3.hce

Link 200R-3: from 200R-3



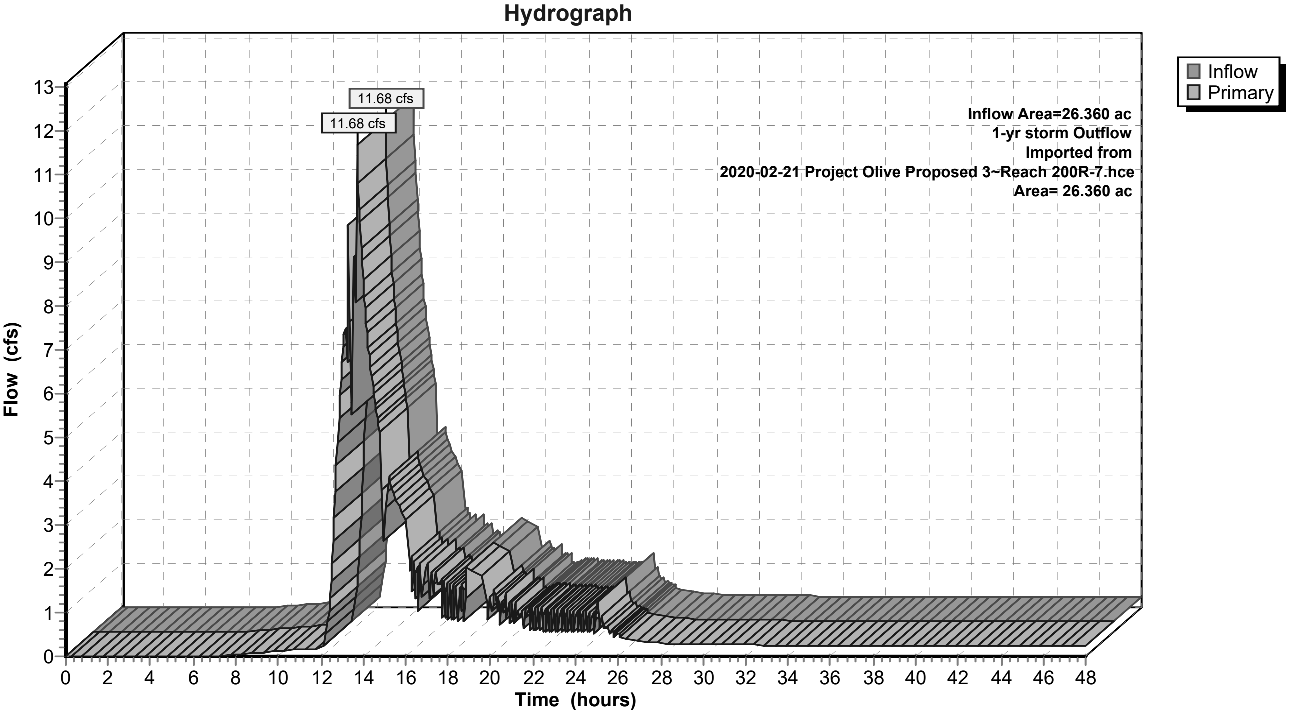
Summary for Link 200R-7: from 200R-7

Inflow Area =	26.360 ac,	0.00% Impervious,	Inflow Depth > 1.45"	for 1-yr storm event	
Inflow =	11.68 cfs @	13.72 hrs,	Volume=	3.176 af	
Primary =	11.68 cfs @	13.72 hrs,	Volume=	3.176 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

1-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 3~Reach 200R-7.hce

Link 200R-7: from 200R-7



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment230A: Runoff Area=4.810 ac 100.00% Impervious Runoff Depth=2.75"
Tc=6.0 min CN=98 Runoff=19.67 cfs 1.102 af

Subcatchment230B: Runoff Area=5.650 ac 71.50% Impervious Runoff Depth=2.33"
Tc=6.0 min CN=94 Runoff=21.20 cfs 1.097 af

Subcatchment231A: Runoff Area=9.330 ac 93.78% Impervious Runoff Depth=2.64"
Tc=6.0 min CN=97 Runoff=37.55 cfs 2.051 af

Subcatchment231B: Runoff Area=1.480 ac 1.35% Impervious Runoff Depth=1.50"
Tc=6.0 min CN=84 Runoff=3.82 cfs 0.185 af

Subcatchment232A: Runoff Area=7.280 ac 77.06% Impervious Runoff Depth=2.43"
Tc=6.0 min CN=95 Runoff=28.05 cfs 1.474 af

Subcatchment232B: Runoff Area=1.980 ac 1.01% Impervious Runoff Depth=1.50"
Tc=6.0 min CN=84 Runoff=5.11 cfs 0.247 af

Subcatchment233: Runoff Area=3.230 ac 51.39% Impervious Runoff Depth=2.05"
Flow Length=349' Tc=20.3 min CN=91 Runoff=7.19 cfs 0.552 af

Subcatchment239: Runoff Area=15.000 ac 0.00% Impervious Runoff Depth=2.33"
Flow Length=397' Tc=29.1 min CN=94 Runoff=30.11 cfs 2.913 af

Reach 200R-4: feeder creek Avg. Flow Depth=1.16' Max Vel=2.54 fps Inflow=40.55 cfs 9.558 af
n=0.030 L=346.0' S=0.0030 '/' Capacity=439.39 cfs Outflow=39.88 cfs 9.551 af

Reach 200R-5: feeder creek Avg. Flow Depth=1.16' Max Vel=2.54 fps Inflow=39.88 cfs 9.606 af
n=0.030 L=269.0' S=0.0030 '/' Capacity=439.78 cfs Outflow=39.62 cfs 9.601 af

Reach 200R-6: feeder creek Avg. Flow Depth=1.14' Max Vel=2.58 fps Inflow=39.73 cfs 11.046 af
n=0.030 L=129.0' S=0.0032 '/' Capacity=451.82 cfs Outflow=39.74 cfs 11.042 af

Reach 232R: ditch Avg. Flow Depth=0.33' Max Vel=2.12 fps Inflow=6.91 cfs 0.108 af
n=0.030 L=913.0' S=0.0099 '/' Capacity=327.70 cfs Outflow=4.95 cfs 0.108 af

Reach 233R: ditch Avg. Flow Depth=0.81' Max Vel=3.46 fps Inflow=24.27 cfs 4.209 af
n=0.030 L=323.0' S=0.0093 '/' Capacity=318.09 cfs Outflow=23.74 cfs 4.204 af

Pond 210C: twin 36" culverts Peak Elev=574.48' Inflow=39.62 cfs 9.601 af
Primary=19.81 cfs 4.800 af Secondary=19.81 cfs 4.800 af Outflow=39.62 cfs 9.601 af

Pond 230Bio: bioretention Peak Elev=585.40' Storage=58,176 cf Inflow=24.37 cfs 1.912 af
Outflow=0.40 cfs 1.133 af

Pond 230F: forebay Peak Elev=585.40' Storage=17,063 cf Inflow=25.98 cfs 1.981 af
Outflow=24.37 cfs 1.912 af

Pond 231Bio: bioretention Peak Elev=585.33' Storage=62,842 cf Inflow=29.22 cfs 2.115 af
Outflow=0.41 cfs 1.242 af

Pond 231F: forebay Peak Elev=585.33' Storage=19,282 cf Inflow=31.29 cfs 2.106 af
Outflow=29.22 cfs 2.115 af

Pond 232Bio: bioretention Peak Elev=585.48' Storage=46,222 cf Inflow=24.29 cfs 1.558 af
Outflow=0.36 cfs 0.973 af

Pond 232F: forebay Peak Elev=585.48' Storage=16,044 cf Inflow=26.24 cfs 1.613 af
Outflow=24.29 cfs 1.558 af

Pond 239P: wet pond Peak Elev=575.86' Storage=13,515,489 cf Inflow=46.77 cfs 11.065 af
Primary=0.68 cfs 1.445 af Secondary=0.00 cfs 0.000 af Outflow=0.68 cfs 1.445 af

Pond CB204: catch basin Peak Elev=588.18' Inflow=21.20 cfs 1.097 af
Primary=14.73 cfs 1.003 af Secondary=6.48 cfs 0.094 af Outflow=21.20 cfs 1.097 af

Pond CB322: catch basin Peak Elev=577.29' Inflow=20.04 cfs 4.101 af
36.0" Round Culvert n=0.013 L=19.0' S=0.0042 '/' Outflow=20.04 cfs 4.101 af

Pond CB323: catch basin Peak Elev=577.79' Inflow=15.86 cfs 3.548 af
36.0" Round Culvert n=0.013 L=105.0' S=0.0042 '/' Outflow=15.86 cfs 3.548 af

Pond CB402: diversion CB Peak Elev=587.26' Inflow=28.05 cfs 1.474 af
Primary=21.14 cfs 1.366 af Secondary=6.91 cfs 0.108 af Outflow=28.05 cfs 1.474 af

Pond DMH202: manhole Peak Elev=586.06' Inflow=11.58 cfs 0.949 af
24.0" Round Culvert n=0.013 L=26.0' S=0.0065 '/' Outflow=11.58 cfs 0.949 af

Pond DMH203: diversion manhole Peak Elev=587.23' Inflow=14.73 cfs 1.003 af
Primary=11.58 cfs 0.949 af Secondary=3.16 cfs 0.055 af Outflow=14.73 cfs 1.003 af

Pond DMH212: manhole Peak Elev=586.19' Inflow=3.16 cfs 0.055 af
18.0" Round Culvert n=0.013 L=40.0' S=0.0042 '/' Outflow=3.16 cfs 0.055 af

Pond DMH216: division manhole Peak Elev=586.54' Inflow=19.67 cfs 1.102 af
Primary=14.41 cfs 1.032 af Secondary=5.26 cfs 0.069 af Outflow=19.67 cfs 1.102 af

Pond DMH230: manhole Peak Elev=582.99' Inflow=5.26 cfs 0.069 af
24.0" Round Culvert n=0.013 L=281.0' S=0.0096 '/' Outflow=5.26 cfs 0.069 af

Pond DMH302: diversion manhole Peak Elev=587.26' Inflow=37.55 cfs 2.051 af
Primary=27.48 cfs 1.921 af Secondary=10.07 cfs 0.131 af Outflow=37.55 cfs 2.051 af

Pond DMH316: manhole Peak Elev=583.96' Inflow=10.07 cfs 0.131 af
24.0" Round Culvert n=0.013 L=188.0' S=0.0170 '/' Outflow=10.07 cfs 0.131 af

Pond DMH317: manhole Peak Elev=580.87' Inflow=10.22 cfs 1.104 af
24.0" Round Culvert n=0.013 L=122.0' S=0.0073 '/' Outflow=10.22 cfs 1.104 af

Pond DMH318: manhole Peak Elev=579.62' Inflow=15.86 cfs 3.548 af
30.0" Round Culvert n=0.013 L=50.0' S=0.0282 '/' Outflow=15.86 cfs 3.548 af

Pond DMH319: manhole Peak Elev=580.45' Inflow=5.44 cfs 1.202 af
24.0" Round Culvert n=0.013 L=106.0' S=0.0084 '/' Outflow=5.44 cfs 1.202 af

Pond DMH324: manhole Peak Elev=578.34' Inflow=15.86 cfs 3.548 af
36.0" Round Culvert n=0.013 L=136.0' S=0.0042 '/' Outflow=15.86 cfs 3.548 af

Link 10-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 3~Reach 200R-3.hce Inflow=40.55 cfs 9.464 af
Area= 111.150 ac 28.72% Imperv. Primary=40.55 cfs 9.464 af

Link 10-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 3~Reach 200R-7.hce Inflow=42.71 cfs 8.152 af
Area= 26.360 ac Primary=42.71 cfs 8.152 af

Total Runoff Area = 48.760 ac Runoff Volume = 9.623 af Average Runoff Depth = 2.37"
48.91% Pervious = 23.850 ac 51.09% Impervious = 24.910 ac

Summary for Subcatchment 230A:

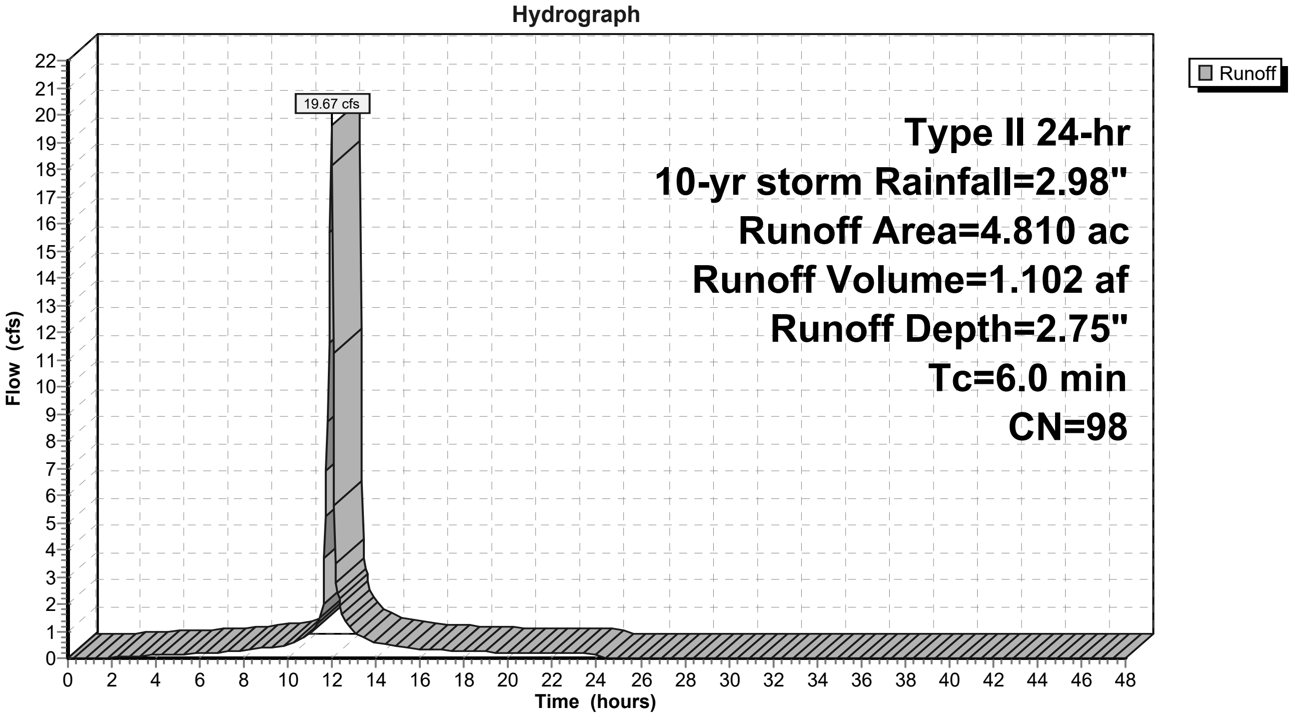
Runoff = 19.67 cfs @ 11.96 hrs, Volume= 1.102 af, Depth= 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
4.810	98	Roofs, HSG D
4.810		100.00% Impervious Area

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

Subcatchment 230A:



Summary for Subcatchment 230B:

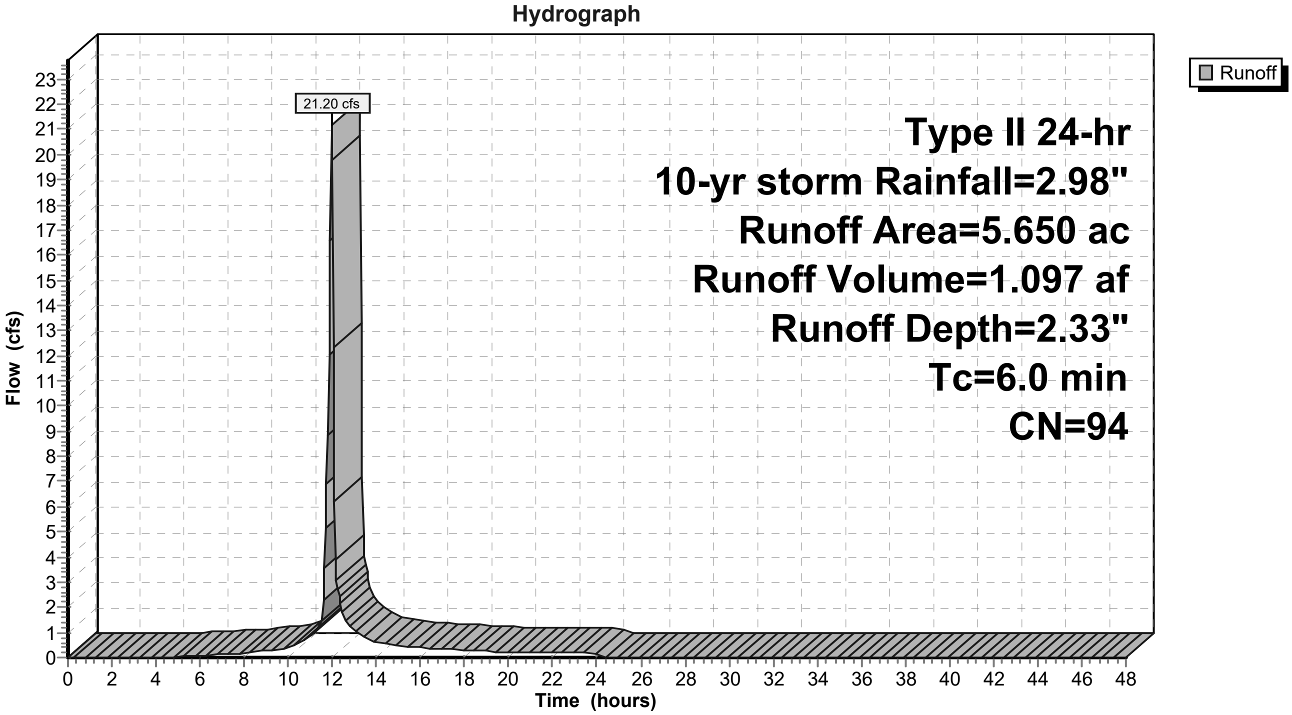
Runoff = 21.20 cfs @ 11.96 hrs, Volume= 1.097 af, Depth= 2.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
1.610	84	50-75% Grass cover, Fair, HSG D
4.040	98	Paved parking, HSG D
5.650	94	Weighted Average
1.610		28.50% Pervious Area
4.040		71.50% Impervious Area

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

Subcatchment 230B:



Summary for Subcatchment 231A:

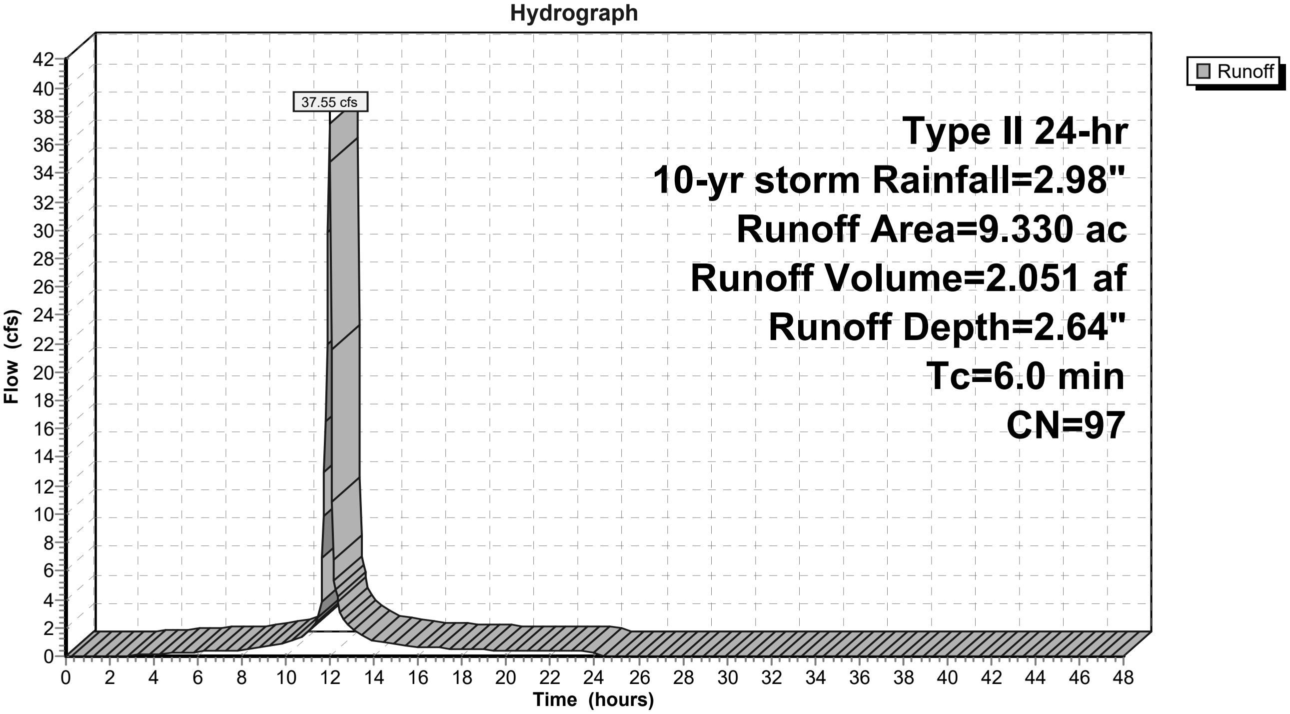
Runoff = 37.55 cfs @ 11.96 hrs, Volume= 2.051 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
0.580	84	50-75% Grass cover, Fair, HSG D
4.030	98	Paved parking, HSG D
4.720	98	Roofs, HSG D
9.330	97	Weighted Average
0.580		6.22% Pervious Area
8.750		93.78% Impervious Area

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

Subcatchment 231A:



Summary for Subcatchment 231B:

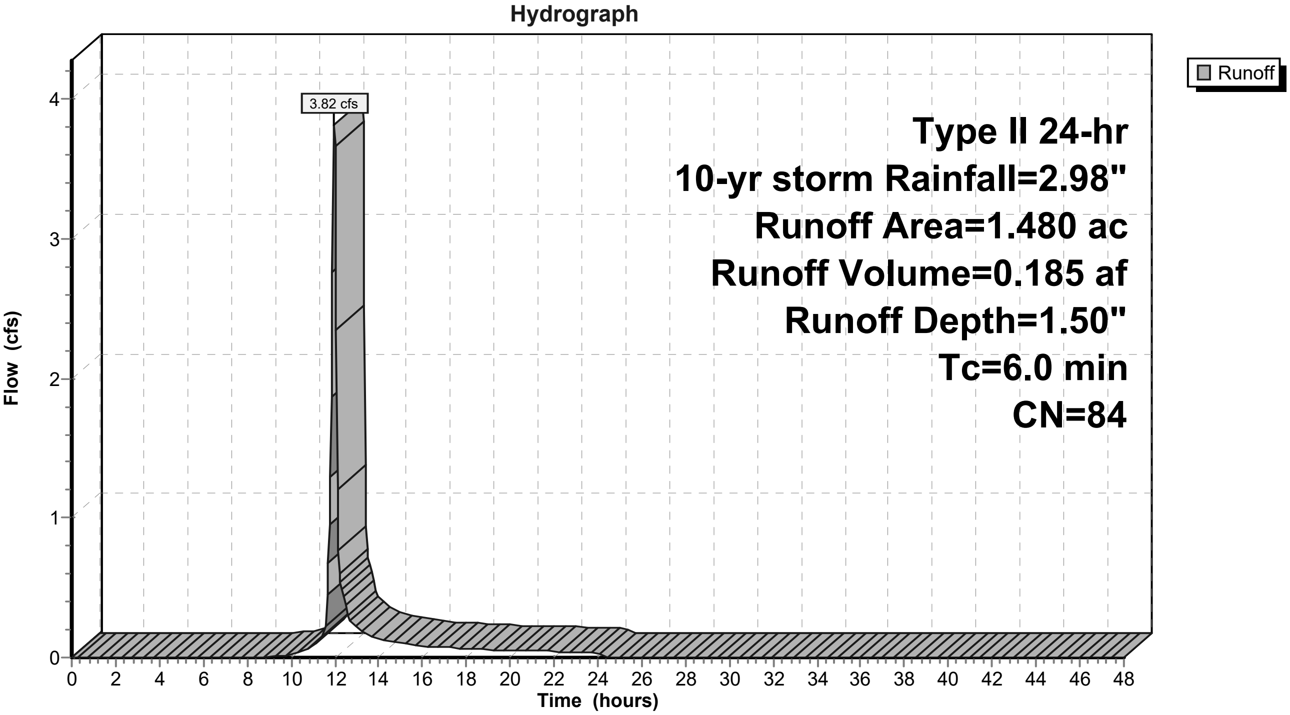
Runoff = 3.82 cfs @ 11.97 hrs, Volume= 0.185 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
1.460	84	50-75% Grass cover, Fair, HSG D
0.020	98	Paved parking, HSG D
1.480	84	Weighted Average
1.460		98.65% Pervious Area
0.020		1.35% Impervious Area

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

Subcatchment 231B:



Summary for Subcatchment 232A:

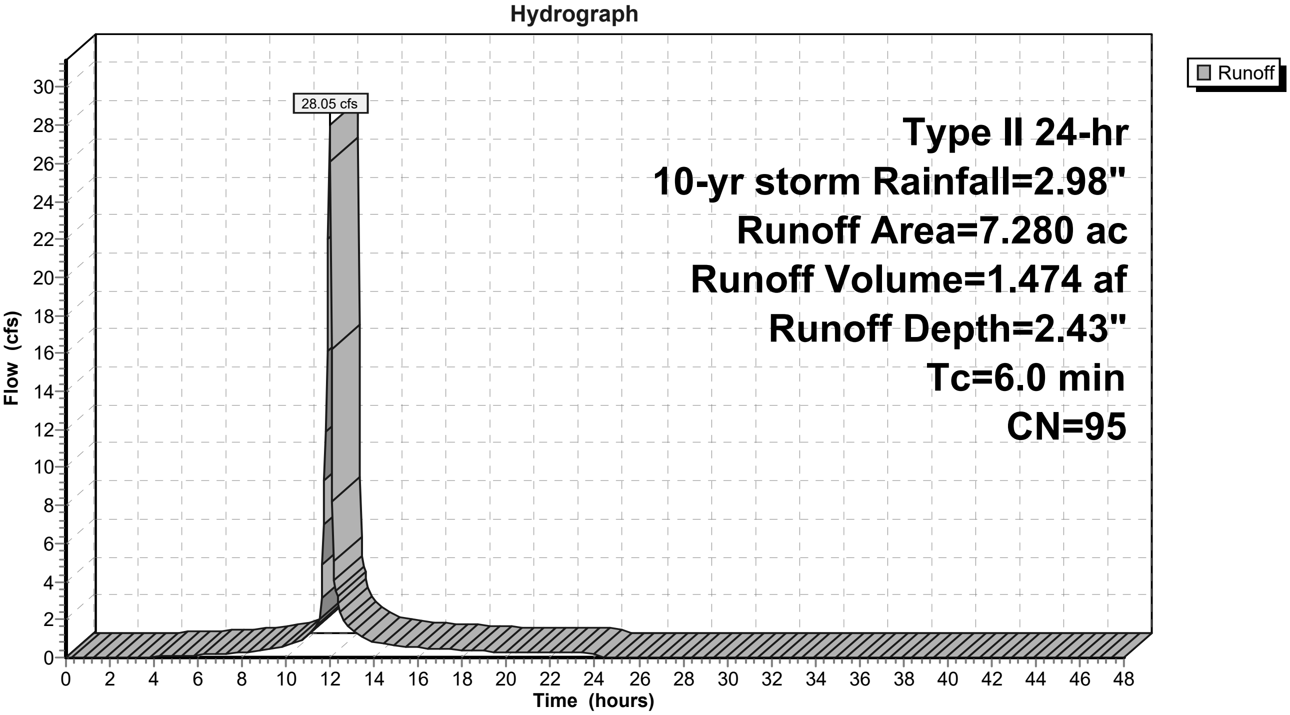
Runoff = 28.05 cfs @ 11.96 hrs, Volume= 1.474 af, Depth= 2.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
1.670	84	50-75% Grass cover, Fair, HSG D
5.610	98	Paved parking, HSG D
7.280	95	Weighted Average
1.670		22.94% Pervious Area
5.610		77.06% Impervious Area

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

Subcatchment 232A:



Summary for Subcatchment 232B:

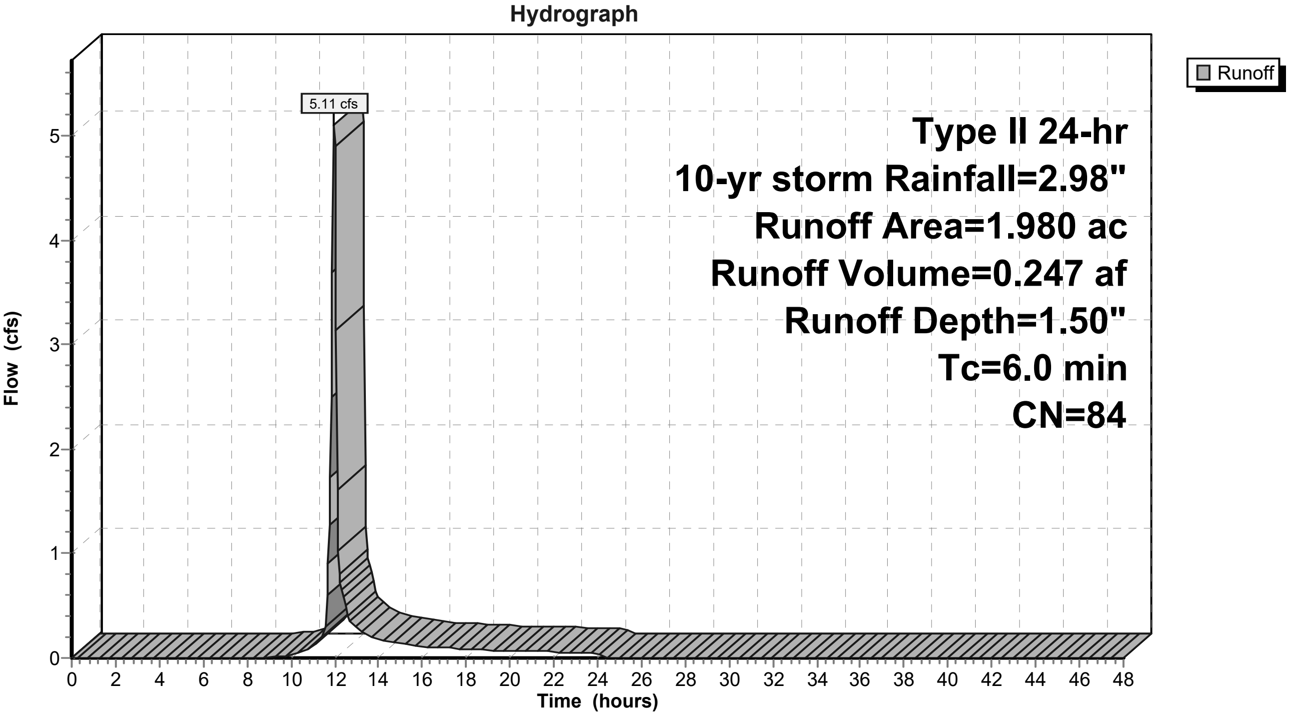
Runoff = 5.11 cfs @ 11.97 hrs, Volume= 0.247 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
1.960	84	50-75% Grass cover, Fair, HSG D
0.020	98	Paved parking, HSG D
1.980	84	Weighted Average
1.960		98.99% Pervious Area
0.020		1.01% Impervious Area

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

Subcatchment 232B:



Summary for Subcatchment 233:

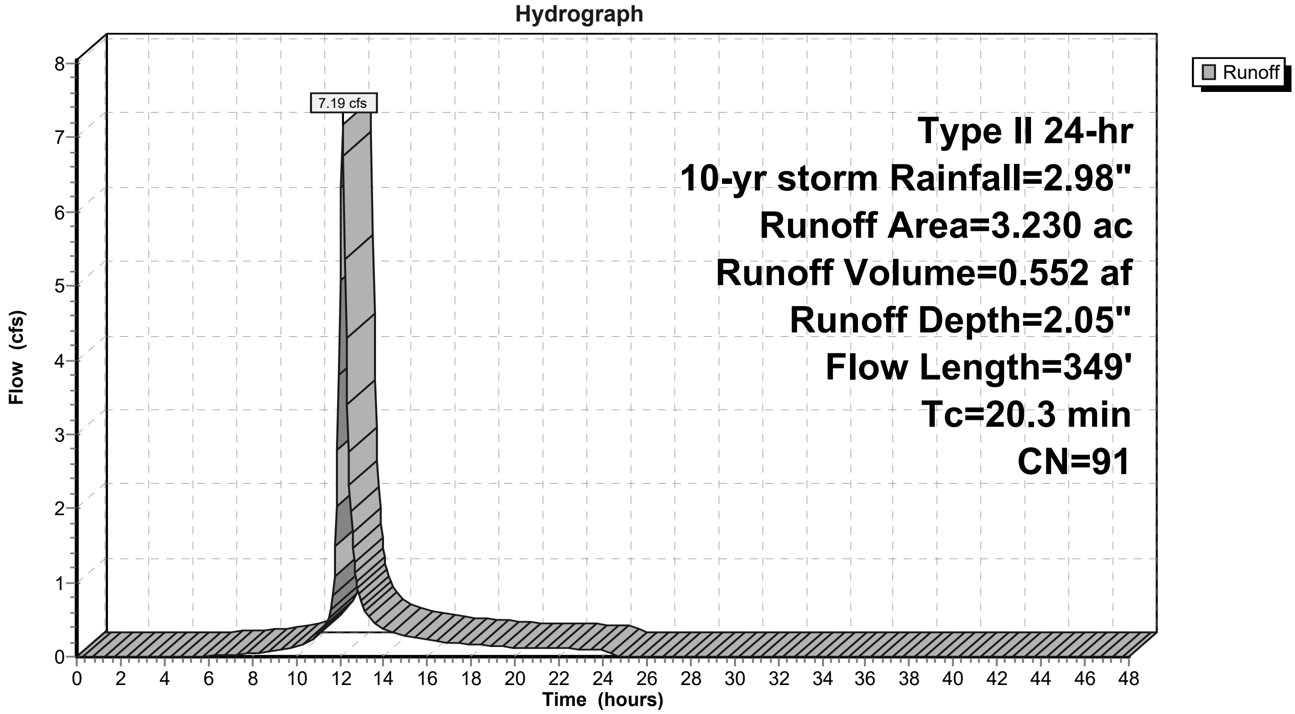
Runoff = 7.19 cfs @ 12.13 hrs, Volume= 0.552 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
1.570	84	50-75% Grass cover, Fair, HSG D
1.660	98	Paved parking, HSG D
3.230	91	Weighted Average
1.570		48.61% Pervious Area
1.660		51.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.3	100	0.0110	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
5.0	249	0.0140	0.83		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
20.3	349	Total			

Subcatchment 233:



Summary for Subcatchment 239:

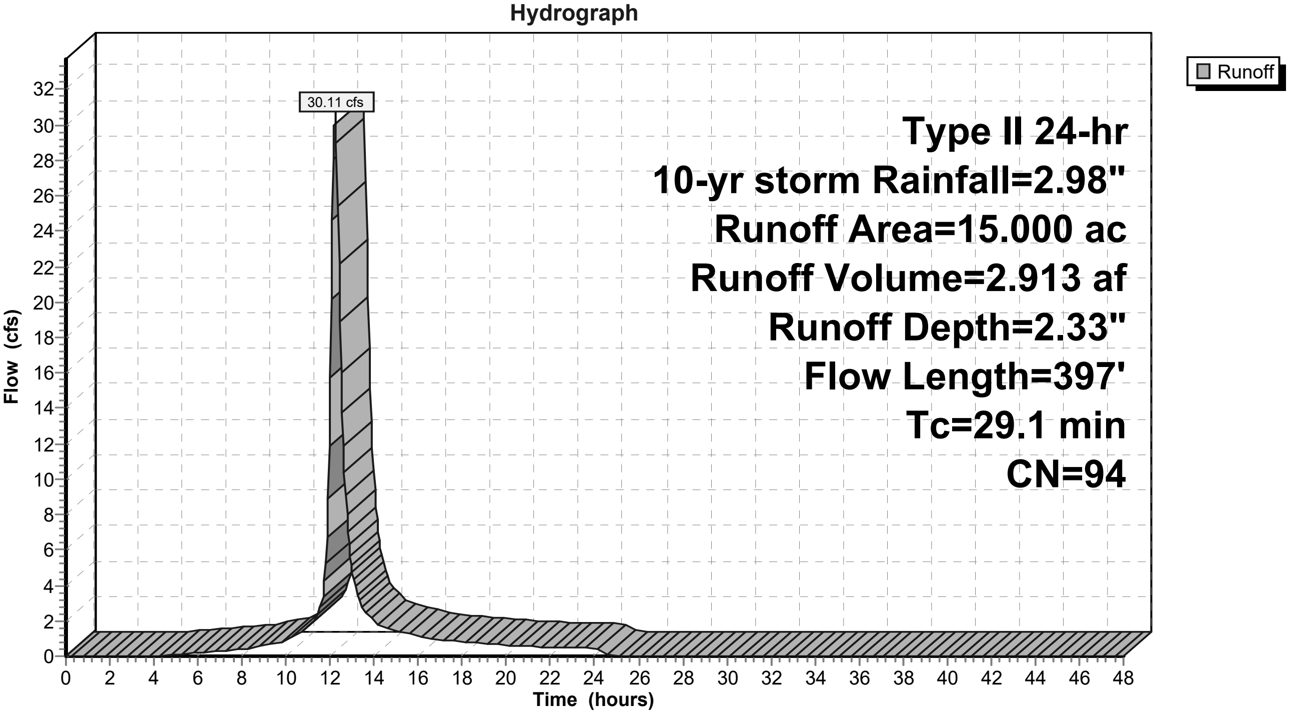
Runoff = 30.11 cfs @ 12.22 hrs, Volume= 2.913 af, Depth= 2.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
2.610	84	50-75% Grass cover, Fair, HSG D
11.410	98	Water Surface, 0% imp, HSG D
0.980	79	Woods, Fair, HSG D
15.000	94	Weighted Average
15.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.9	100	0.0040	0.07		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
6.0	254	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	43	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
29.1	397	Total			

Subcatchment 239:



Summary for Reach 200R-4: feeder creek

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 1.03" for 10-yr storm event
Inflow = 40.55 cfs @ 13.12 hrs, Volume= 9.558 af
Outflow = 39.88 cfs @ 13.17 hrs, Volume= 9.551 af, Atten= 2%, Lag= 3.0 min

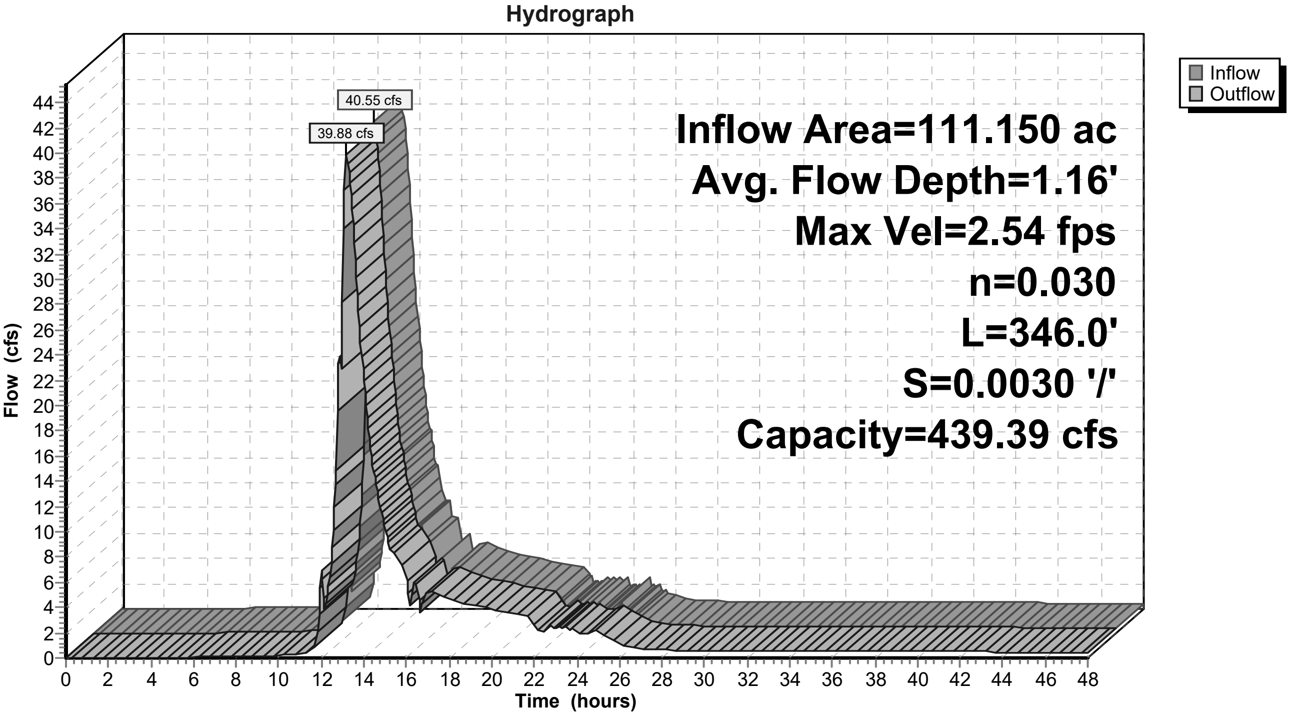
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.54 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.76 fps, Avg. Travel Time= 7.5 min

Peak Storage= 5,433 cf @ 13.17 hrs
Average Depth at Peak Storage= 1.16'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 439.39 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 346.0' Slope= 0.0030 '/'
Inlet Invert= 574.51', Outlet Invert= 573.47'

‡

Reach 200R-4: feeder creek



Summary for Reach 200R-5: feeder creek

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 1.04" for 10-yr storm event
Inflow = 39.88 cfs @ 13.17 hrs, Volume= 9.606 af
Outflow = 39.62 cfs @ 13.21 hrs, Volume= 9.601 af, Atten= 1%, Lag= 2.4 min

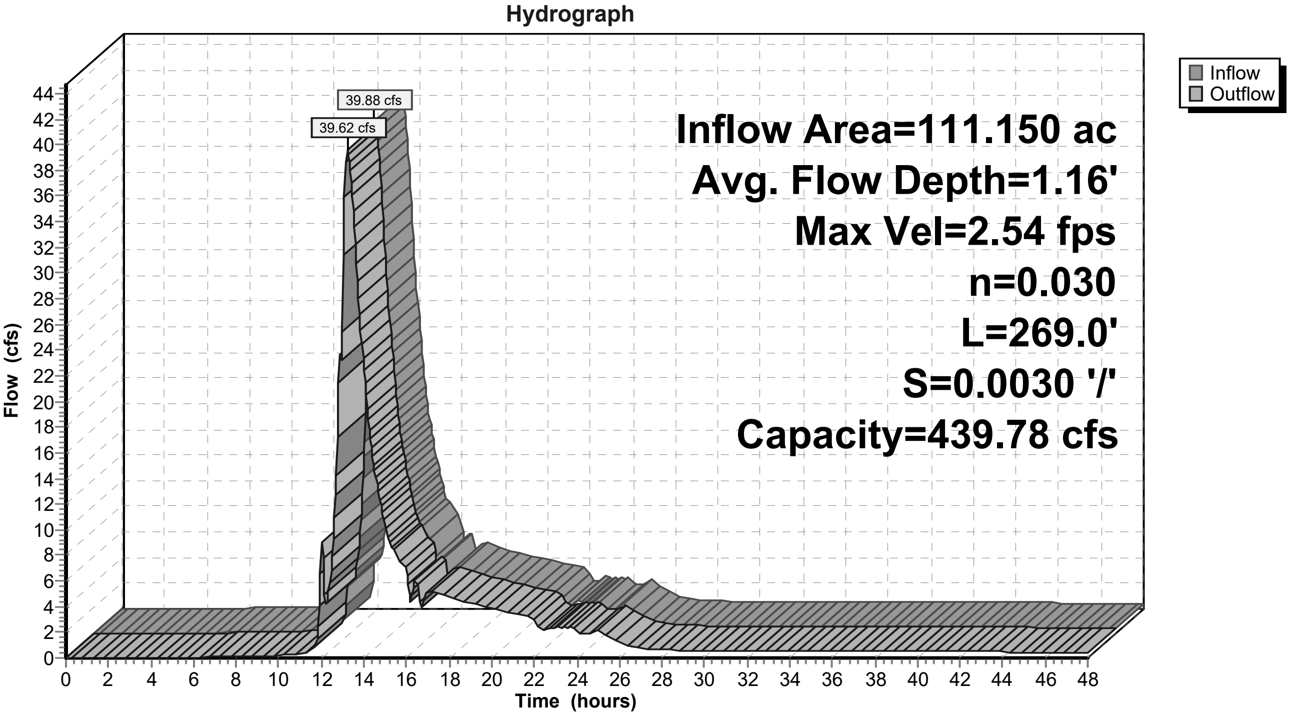
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.54 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 5.8 min

Peak Storage= 4,202 cf @ 13.21 hrs
Average Depth at Peak Storage= 1.16'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 439.78 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 269.0' Slope= 0.0030 '/'
Inlet Invert= 573.47', Outlet Invert= 572.66'

‡

Reach 200R-5: feeder creek



Summary for Reach 200R-6: feeder creek

Inflow Area =	152.510 ac, 20.93% Impervious,	Inflow Depth > 0.87"	for 10-yr storm event	
Inflow =	39.73 cfs @	13.21 hrs, Volume=	11.046 af	
Outflow =	39.74 cfs @	13.22 hrs, Volume=	11.042 af,	Atten= 0%, Lag= 0.5 min

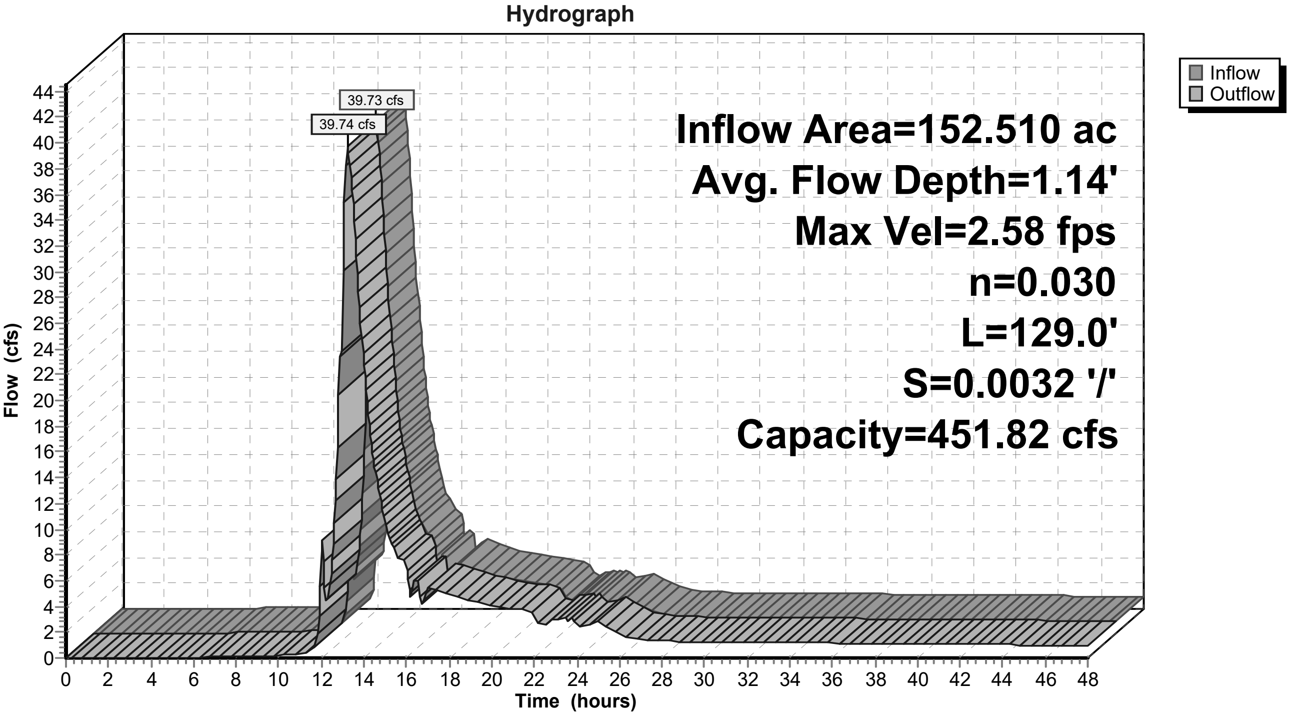
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.58 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.88 fps, Avg. Travel Time= 2.4 min

Peak Storage= 1,982 cf @ 13.22 hrs
Average Depth at Peak Storage= 1.14'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 451.82 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 129.0' Slope= 0.0032 '/'
Inlet Invert= 572.00', Outlet Invert= 571.59'

‡

Reach 200R-6: feeder creek



Summary for Reach 232R: ditch

Inflow	=	6.91 cfs @	11.96 hrs,	Volume=	0.108 af
Outflow	=	4.95 cfs @	12.02 hrs,	Volume=	0.108 af, Atten= 28%, Lag= 3.4 min

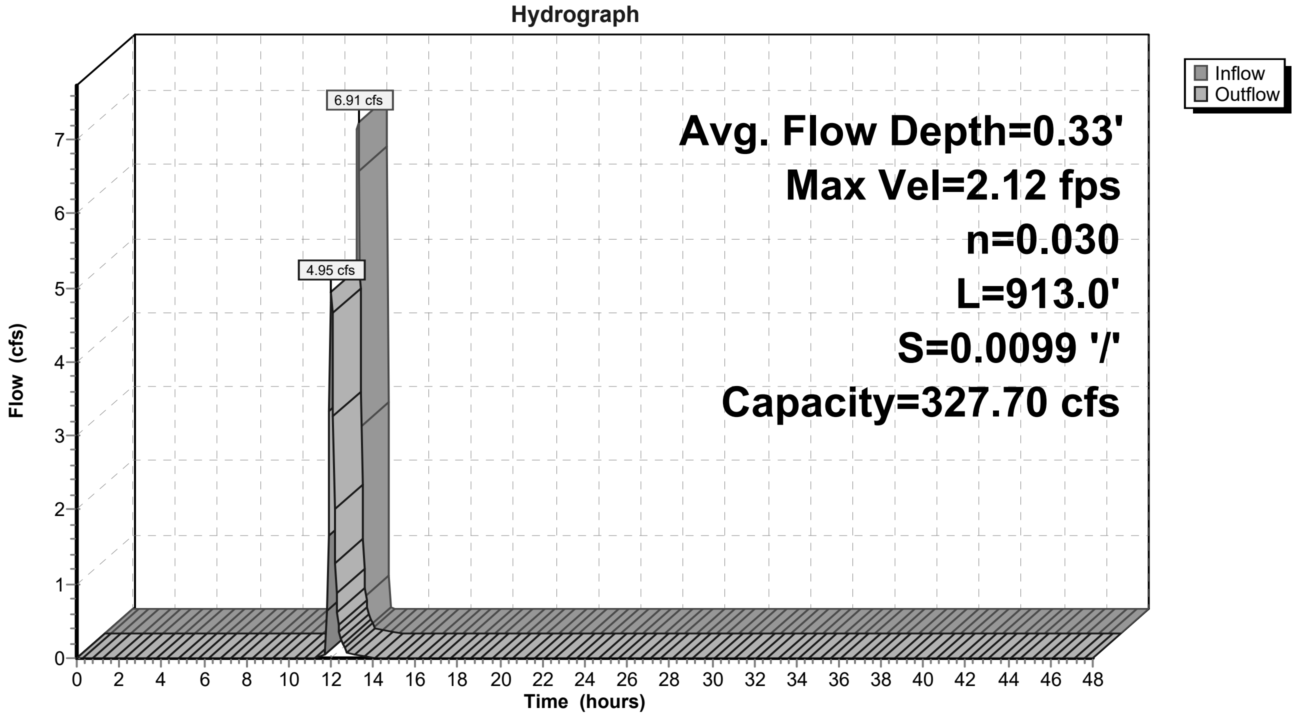
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.12 fps, Min. Travel Time= 7.2 min
Avg. Velocity = 0.59 fps, Avg. Travel Time= 25.6 min

Peak Storage= 2,118 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 3.00' Flow Area= 45.0 sf, Capacity= 327.70 cfs

6.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 24.00'
Length= 913.0' Slope= 0.0099 '/'
Inlet Invert= 584.00', Outlet Invert= 575.00'

‡

Reach 232R: ditch



Summary for Reach 233R: ditch

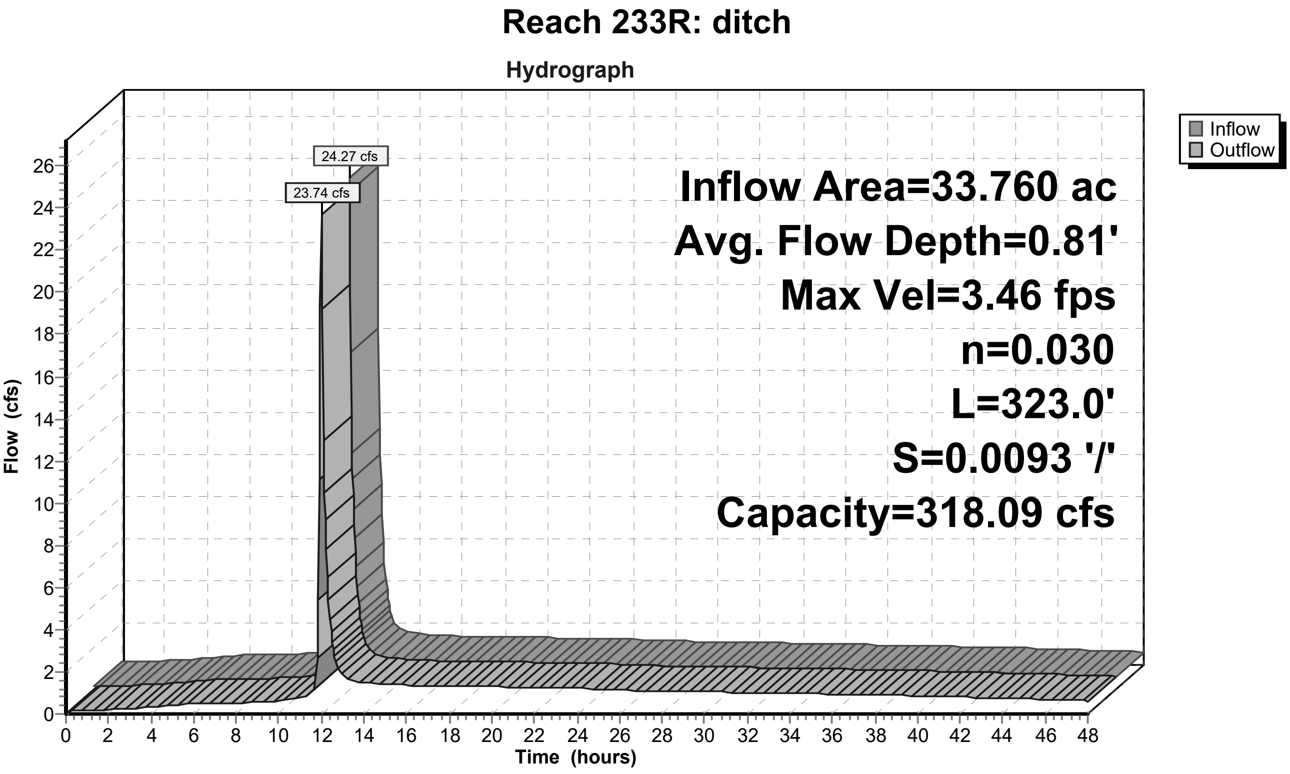
Inflow Area = 33.760 ac, 73.79% Impervious, Inflow Depth > 1.50" for 10-yr storm event
Inflow = 24.27 cfs @ 11.98 hrs, Volume= 4.209 af
Outflow = 23.74 cfs @ 12.00 hrs, Volume= 4.204 af, Atten= 2%, Lag= 1.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.46 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.14 fps, Avg. Travel Time= 4.7 min

Peak Storage= 2,218 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.81'
Bank-Full Depth= 3.00' Flow Area= 45.0 sf, Capacity= 318.09 cfs

6.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 24.00'
Length= 323.0' Slope= 0.0093 '/'
Inlet Invert= 575.00', Outlet Invert= 572.00'

‡



Summary for Pond 210C: twin 36" culverts

```
Inflow Area =      111.150 ac,  28.72% Impervious,  Inflow Depth >   1.04"    for  10-yr storm event
Inflow       =      39.62 cfs @   13.21 hrs,  Volume=            9.601 af
Outflow      =      39.62 cfs @   13.21 hrs,  Volume=            9.601 af,  Atten= 0%,  Lag= 0.0 min
Primary      =      19.81 cfs @   13.21 hrs,  Volume=            4.800 af
Secondary =         19.81 cfs @   13.21 hrs,  Volume=            4.800 af
```

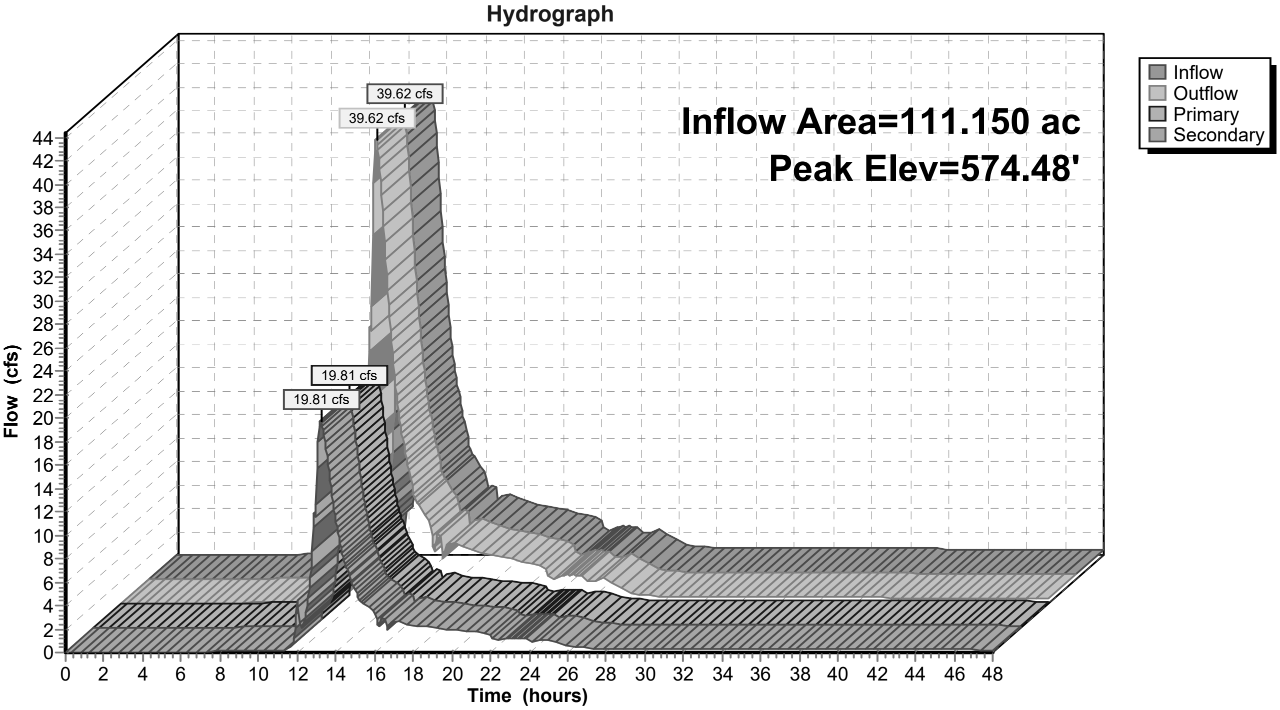
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 574.48' @ 13.21 hrs
Flood Elev= 588.31'

Device	Routing	Invert	Outlet Devices
#1	Primary	572.58'	**36.0" Round Culvert w/ 7.0" inside fill** L= 78.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 572.00' / 571.77' S= 0.0029 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 6.10 sf
#2	Secondary	572.58'	**36.0" Round Culvert w/ 7.0" inside fill** L= 78.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 572.00' / 571.77' S= 0.0029 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 6.10 sf

Primary OutFlow Max=19.76 cfs @ 13.21 hrs HW=574.48' TW=573.14' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 19.76 cfs @ 4.88 fps)

Secondary OutFlow Max=19.76 cfs @ 13.21 hrs HW=574.48' TW=573.14' (Dynamic Tailwater)
↑**2=Culvert** (Barrel Controls 19.76 cfs @ 4.88 fps)

Pond 210C: twin 36" culverts



Summary for Pond 230Bio: bioretention

Inflow Area = 10.460 ac, 84.61% Impervious, Inflow Depth > 2.19" for 10-yr storm event
Inflow = 24.37 cfs @ 11.98 hrs, Volume= 1.912 af
Outflow = 0.40 cfs @ 20.19 hrs, Volume= 1.133 af, Atten= 98%, Lag= 492.9 min
Primary = 0.40 cfs @ 20.19 hrs, Volume= 1.133 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 585.40' @ 20.19 hrs Surf.Area= 32,841 sf Storage= 58,176 cf
Flood Elev= 587.00' Surf.Area= 36,710 sf Storage= 113,744 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 748.9 min (1,585.6 - 836.7)

Volume	Invert	Avail.Storage	Storage Description
#1	583.50'	113,744 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

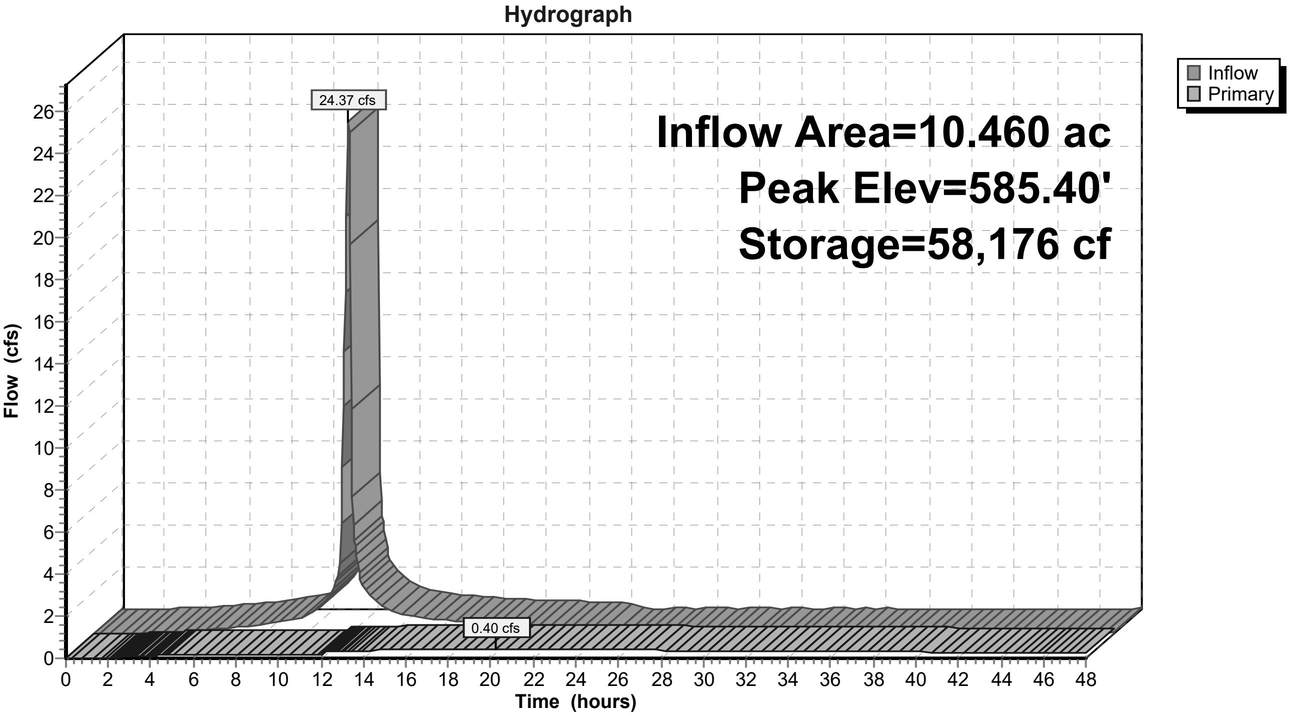
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
583.50	28,375	0	0
584.00	29,530	14,476	14,476
586.00	34,255	63,785	78,261
587.00	36,710	35,483	113,744

Device	Routing	Invert	Outlet Devices
#1	Primary	580.08'	**12.0" Round Culvert** L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.08' / 579.80' S= 0.0117 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	580.08'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	584.50'	**3.0" Vert. Orifice** C= 0.600
#4	Device 1	586.00'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	583.50'	**0.250 in/hr Exfiltration through bioretention media over Surface area**

Primary OutFlow Max=0.40 cfs @ 20.19 hrs HW=585.40' TW=579.56' (Dynamic Tailwater)

```
└─1=Culvert (Passes 0.40 cfs of 8.30 cfs potential flow)
   ├─2=Underdrain (Passes 0.19 cfs of 2.13 cfs potential flow)
   │  └─5=Exfiltration through bioretention media(Exfiltration Controls 0.19 cfs)
   ├─3=Orifice (Orifice Controls 0.21 cfs @ 4.24 fps)
   └─4=Grate ( Controls 0.00 cfs)
```

Pond 230Bio: bioretention



Summary for Pond 230F: forebay

Inflow Area = 10.460 ac, 84.61% Impervious, Inflow Depth = 2.27" for 10-yr storm event
Inflow = 25.98 cfs @ 11.96 hrs, Volume= 1.981 af
Outflow = 24.37 cfs @ 11.98 hrs, Volume= 1.912 af, Atten= 6%, Lag= 0.9 min
Primary = 24.37 cfs @ 11.98 hrs, Volume= 1.912 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.00' Surf.Area= 3,925 sf Storage= 10,445 cf
Peak Elev= 585.40' @ 20.20 hrs Surf.Area= 5,043 sf Storage= 17,063 cf (6,618 cf above start)
Flood Elev= 587.00' Surf.Area= 6,405 sf Storage= 25,853 cf (15,408 cf above start)

Plug-Flow detention time= 184.2 min calculated for 1.672 af (84% of inflow)
Center-of-Mass det. time= 60.7 min (836.7 - 776.0)

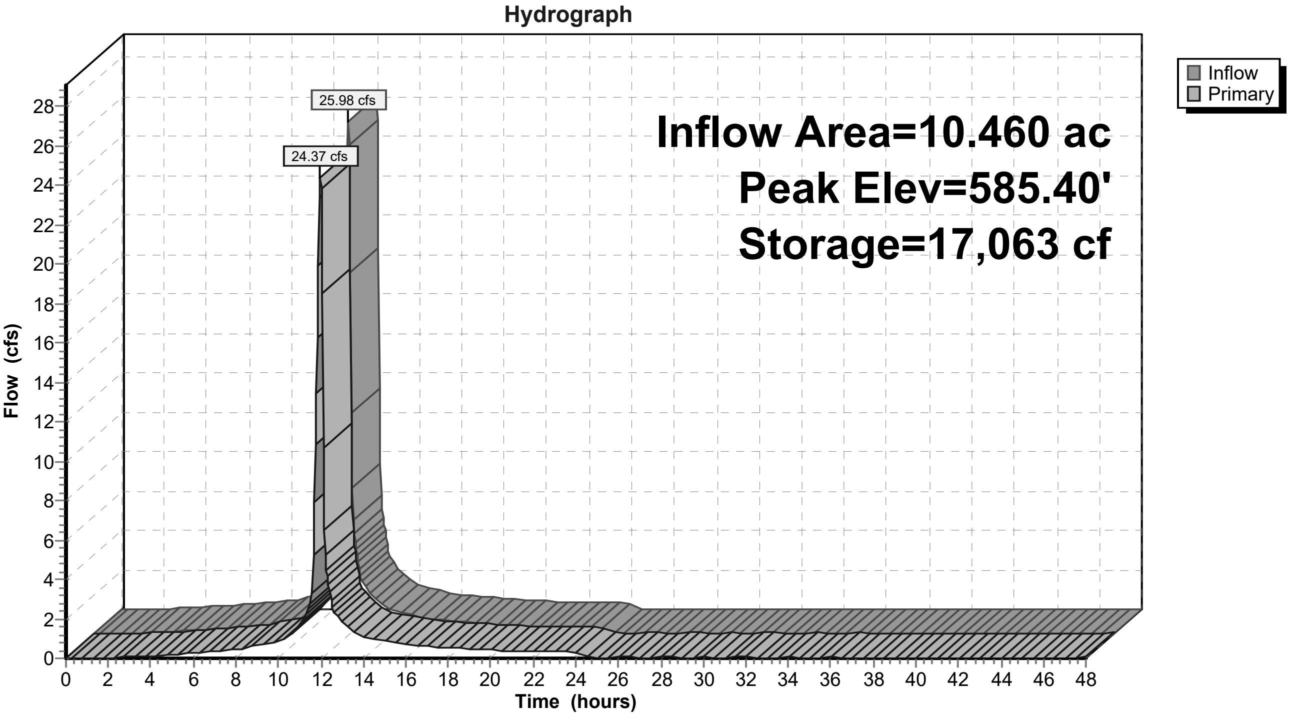
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	25,853 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	1,410	0	0
582.00	2,555	3,965	3,965
584.00	3,925	6,480	10,445
586.00	5,520	9,445	19,890
587.00	6,405	5,963	25,853

Device	Routing	Invert	Outlet Devices
#1	Primary	584.00'	**162.0 deg x 10.0' long x 3.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=23.83 cfs @ 11.98 hrs HW=584.80' TW=584.55' (Dynamic Tailwater)
1=overflow weir (Weir Controls 23.83 cfs @ 1.99 fps)

Pond 230F: forebay



Summary for Pond 231Bio: bioretention

Inflow Area = 10.810 ac, 81.13% Impervious, Inflow Depth > 2.35" for 10-yr storm event
Inflow = 29.22 cfs @ 11.98 hrs, Volume= 2.115 af
Outflow = 0.41 cfs @ 20.09 hrs, Volume= 1.242 af, Atten= 99%, Lag= 486.6 min
Primary = 0.41 cfs @ 20.09 hrs, Volume= 1.242 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 585.33' @ 20.09 hrs Surf.Area= 36,363 sf Storage= 62,842 cf
Flood Elev= 587.00' Surf.Area= 40,170 sf Storage= 126,690 cf

Plug-Flow detention time= 942.5 min calculated for 1.214 af (57% of inflow)
Center-of-Mass det. time= 711.8 min (1,517.0 - 805.2)

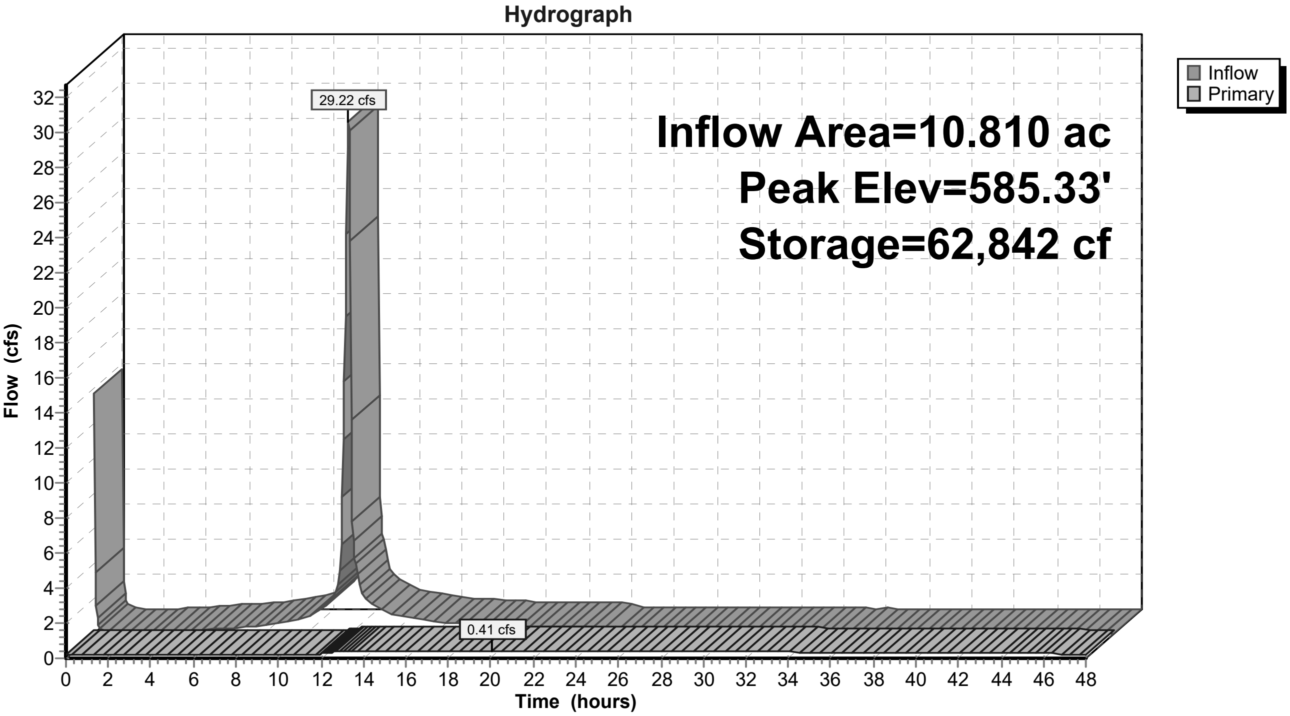
Volume	Invert	Avail.Storage	Storage Description
#1	583.50'	126,690 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
583.50	32,315	0	0
584.00	33,395	16,428	16,428
586.00	37,855	71,250	87,678
587.00	40,170	39,013	126,690

Device	Routing	Invert	Outlet Devices
#1	Primary	580.00'	**12.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.00' / 579.50' S= 0.0385 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	580.08'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	584.50'	**3.0" Vert. Orifice** C= 0.600
#4	Device 1	586.00'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	583.50'	**0.250 in/hr Exfiltration through bioretention media over Surface area**

```
Primary OutFlow Max=0.41 cfs @ 20.09 hrs  HW=585.33'  TW=578.32'  (Dynamic Tailwater)
└─1=Culvert  (Passes 0.41 cfs of 8.31 cfs potential flow)
    ├─2=Underdrain  (Passes 0.21 cfs of 2.11 cfs potential flow)
    │   └─5=Exfiltration through bioretention media(Exfiltration Controls 0.21 cfs)
    ├─3=Orifice  (Orifice Controls 0.20 cfs @ 4.04 fps)
    └─4=Grate  ( Controls 0.00 cfs)
```

Pond 231Bio: bioretention



Summary for Pond 231F: forebay

Inflow Area = 10.810 ac, 81.13% Impervious, Inflow Depth = 2.34" for 10-yr storm event
Inflow = 31.29 cfs @ 11.96 hrs, Volume= 2.106 af
Outflow = 29.22 cfs @ 11.98 hrs, Volume= 2.115 af, Atten= 7%, Lag= 1.1 min
Primary = 29.22 cfs @ 11.98 hrs, Volume= 2.115 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.50' Surf.Area= 5,653 sf Storage= 14,163 cf
Peak Elev= 585.33' @ 20.09 hrs Surf.Area= 6,670 sf Storage= 19,282 cf (5,119 cf above start)
Flood Elev= 587.00' Surf.Area= 8,800 sf Storage= 32,165 cf (18,002 cf above start)

Plug-Flow detention time= 184.1 min calculated for 1.788 af (85% of inflow)
Center-of-Mass det. time= 32.3 min (805.2 - 772.9)

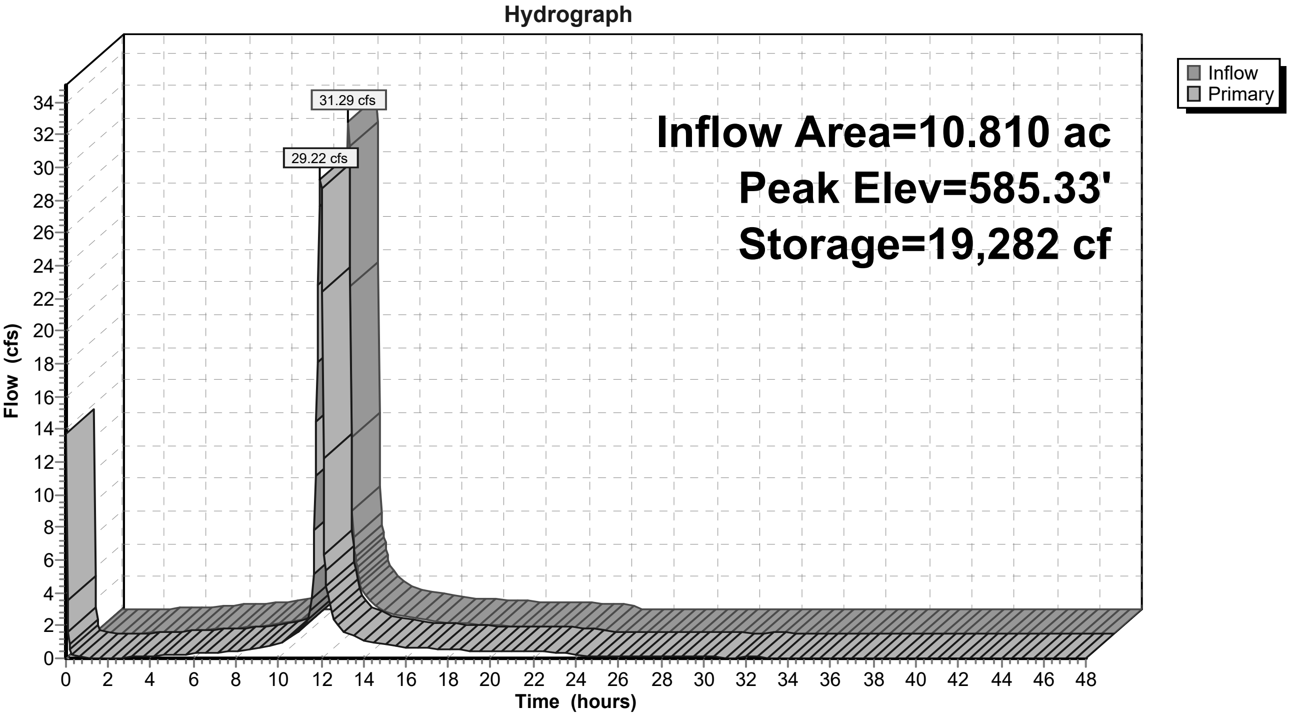
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	32,165 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	820	0	0
582.00	2,815	3,635	3,635
584.00	5,040	7,855	11,490
586.00	7,490	12,530	24,020
587.00	8,800	8,145	32,165

Device	Routing	Invert	Outlet Devices
#1	Primary	584.00'	**162.0 deg x 10.0' long x 2.50' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=28.51 cfs @ 11.98 hrs HW=584.85' TW=584.54' (Dynamic Tailwater)
↳**1=overflow weir** (Weir Controls 28.51 cfs @ 2.19 fps)

Pond 231F: forebay



Summary for Pond 232Bio: bioretention

```
Inflow Area =      9.260 ac, 60.80% Impervious, Inflow Depth >  2.02"   for 10-yr storm event
Inflow      =     24.29 cfs @  11.98 hrs, Volume=        1.558 af
Outflow     =      0.36 cfs @  19.71 hrs, Volume=        0.973 af, Atten= 99%, Lag= 464.2 min
Primary     =      0.36 cfs @  19.71 hrs, Volume=        0.973 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 585.48' @ 19.71 hrs   Surf.Area= 25,115 sf   Storage= 46,222 cf
Flood Elev= 587.00'   Surf.Area= 27,940 sf   Storage= 86,503 cf

Plug-Flow detention time= 915.5 min calculated for 0.972 af (62% of inflow)
Center-of-Mass det. time= 735.3 min ( 1,601.3 - 866.0 )

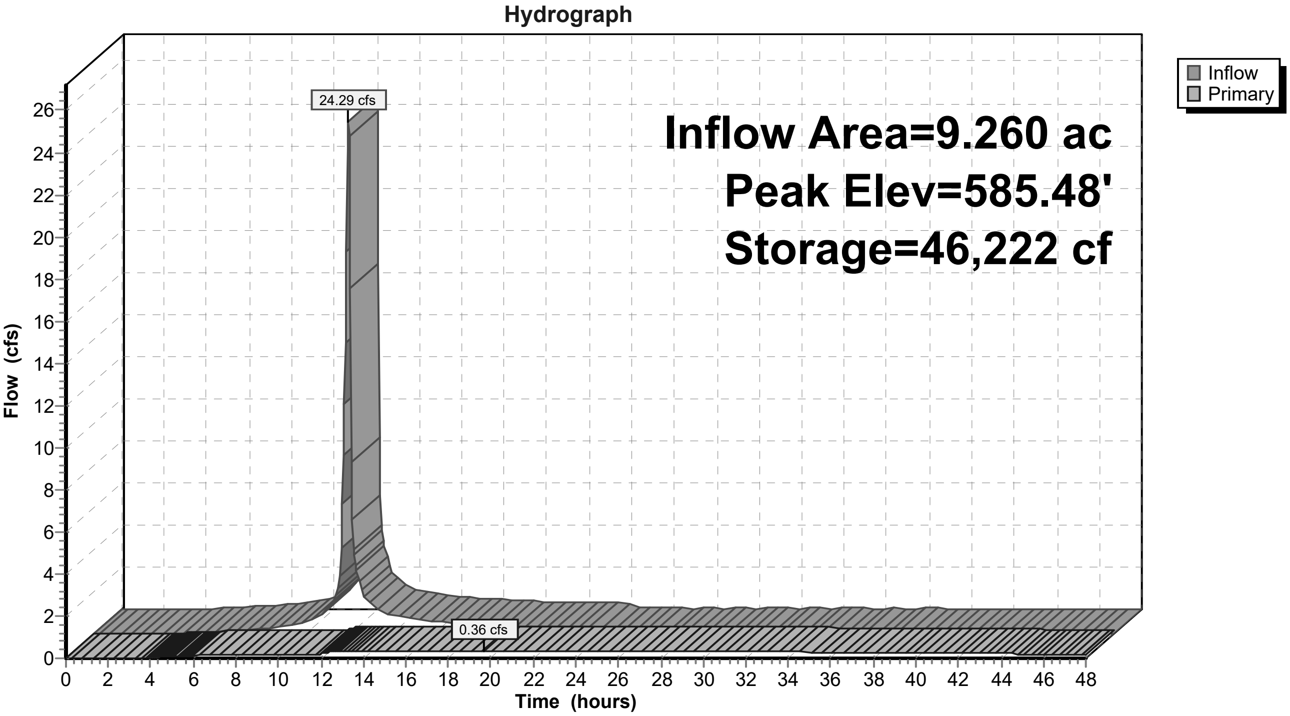
Volume    Invert    Avail.Storage   Storage Description
  #1      583.50'      86,503 cf    Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation      Surf.Area       Inc.Store       Cum.Store
    (feet)        (sq-ft)    (cubic-feet)    (cubic-feet)
    583.50         21,580               0               0
    584.00         22,450          11,008          11,008
    586.00         26,050          48,500          59,508
    587.00         27,940          26,995          86,503

Device   Routing        Invert   Outlet Devices
  #1     Primary       580.08'   12.0"  Round Culvert
                                 L= 59.0'   CPP, square edge headwall,  Ke= 0.500
                                 Inlet / Outlet Invert= 580.08' / 579.80'   S= 0.0047 '/'   Cc= 0.900
                                 n= 0.012  Concrete pipe, finished,  Flow Area= 0.79 sf
  #2     Device 1      580.08'   6.0" Vert. Underdrain   C= 0.600
  #3     Device 1      584.50'   3.0" Vert. Orifice   C= 0.600
  #4     Device 1      586.00'   48.0" x 30.0" Horiz. Grate   C= 0.600
                                 Limited to weir flow at low heads
  #5     Device 2      583.50'   0.250 in/hr Exfiltration through bioretention media over Surface area

Primary OutFlow Max=0.36 cfs @ 19.71 hrs  HW=585.48'  TW=579.56'   (Dynamic Tailwater)
↑
└─1=Culvert  (Passes 0.36 cfs of 7.77 cfs potential flow)
   ↑
   ├─2=Underdrain  (Passes 0.15 cfs of 2.15 cfs potential flow)
   │  ↑
   │  └─5=Exfiltration through bioretention media(Exfiltration Controls 0.15 cfs)
   ├─3=Orifice  (Orifice Controls 0.22 cfs @ 4.45 fps)
   └─4=Grate  ( Controls 0.00 cfs)
```

Pond 232Bio: bioretention



Summary for Pond 232F: forebay

Inflow Area = 9.260 ac, 60.80% Impervious, Inflow Depth = 2.09" for 10-yr storm event
Inflow = 26.24 cfs @ 11.97 hrs, Volume= 1.613 af
Outflow = 24.29 cfs @ 11.98 hrs, Volume= 1.558 af, Atten= 7%, Lag= 0.8 min
Primary = 24.29 cfs @ 11.98 hrs, Volume= 1.558 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.00' Surf.Area= 3,625 sf Storage= 9,890 cf
Peak Elev= 585.48' @ 19.72 hrs Surf.Area= 4,687 sf Storage= 16,044 cf (6,154 cf above start)
Flood Elev= 587.00' Surf.Area= 5,860 sf Storage= 24,035 cf (14,145 cf above start)

Plug-Flow detention time= 202.0 min calculated for 1.331 af (83% of inflow)
Center-of-Mass det. time= 74.3 min (866.0 - 791.8)

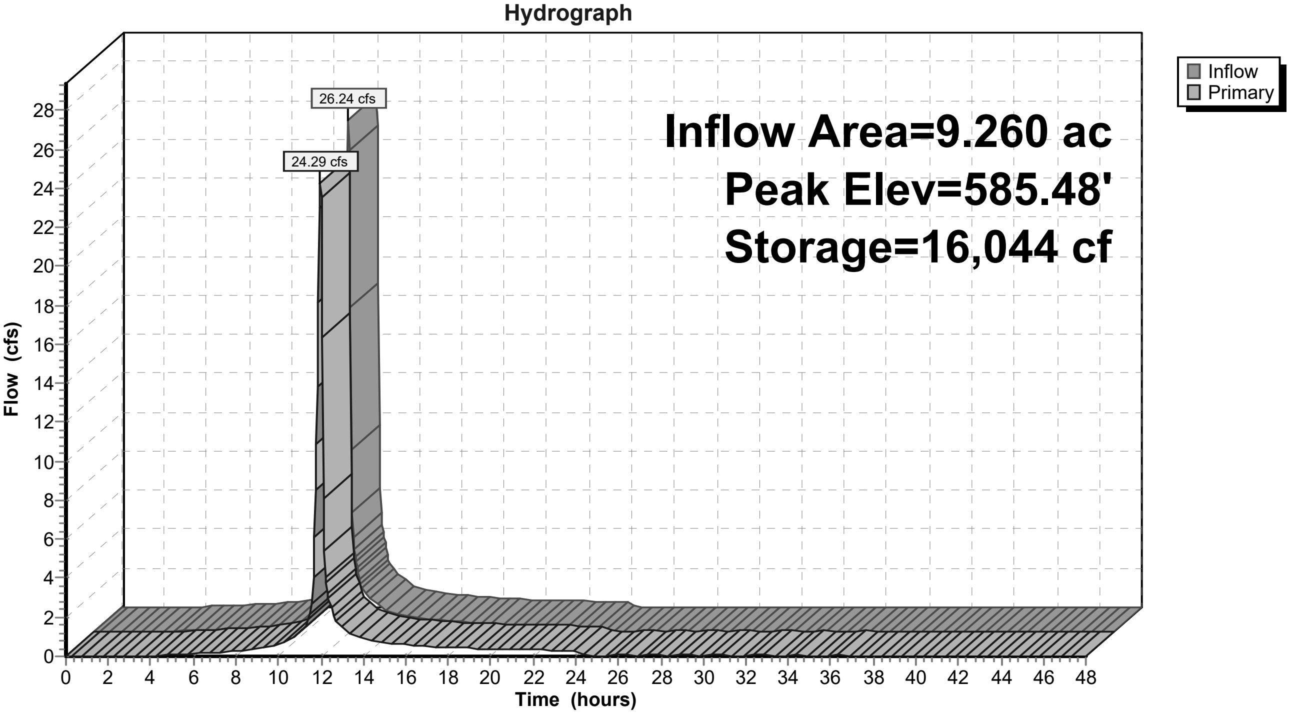
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	24,035 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	1,435	0	0
582.00	2,415	3,850	3,850
584.00	3,625	6,040	9,890
586.00	5,060	8,685	18,575
587.00	5,860	5,460	24,035

Device	Routing	Invert	Outlet Devices
#1	Primary	584.00'	**162.0 deg x 10.0' long x 3.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=23.61 cfs @ 11.98 hrs HW=584.80' TW=584.57' (Dynamic Tailwater)
↑—**1=overflow weir** (Weir Controls 23.61 cfs @ 1.96 fps)

Pond 232F: forebay



Summary for Pond 239P: wet pond

Inflow Area = 41.360 ac, 0.00% Impervious, Inflow Depth > 3.21" for 10-yr storm event
Inflow = 46.77 cfs @ 13.10 hrs, Volume= 11.065 af
Outflow = 0.68 cfs @ 26.38 hrs, Volume= 1.445 af, Atten= 99%, Lag= 797.0 min
Primary = 0.68 cfs @ 26.38 hrs, Volume= 1.445 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= 0.05 hrs / 3
Starting Elev= 575.00' Surf.Area= 496,958 sf Storage= 13,083,100 cf
Peak Elev= 575.86' @ 26.38 hrs Surf.Area= 506,495 sf Storage= 13,515,489 cf (432,389 cf above start)
Flood Elev= 579.00' Surf.Area= 541,980 sf Storage= 15,160,446 cf (2,077,346 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 975.3 min (1,972.0 - 996.7)

Volume	Invert	Avail.Storage	Storage Description
#1	540.00'	15,160,446 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
540.00	288,900	0	0
542.00	297,925	586,825	586,825
544.00	307,060	604,985	1,191,810
546.00	316,290	623,350	1,815,160
548.00	325,630	641,920	2,457,080
550.00	335,065	660,695	3,117,775
552.00	344,605	679,670	3,797,445
554.00	354,245	698,850	4,496,295
556.00	363,990	718,235	5,214,530
558.00	373,830	737,820	5,952,350
560.00	383,775	757,605	6,709,955
562.00	393,825	777,600	7,487,555
564.00	403,975	797,800	8,285,355
566.00	414,225	818,200	9,103,555
568.00	424,575	838,800	9,942,355
570.00	435,030	859,605	10,801,960
572.00	445,585	880,615	11,682,575
573.50	453,440	674,269	12,356,844
574.00	485,890	234,833	12,591,676
576.00	508,025	993,915	13,585,591
578.00	530,560	1,038,585	14,624,176
579.00	541,980	536,270	15,160,446

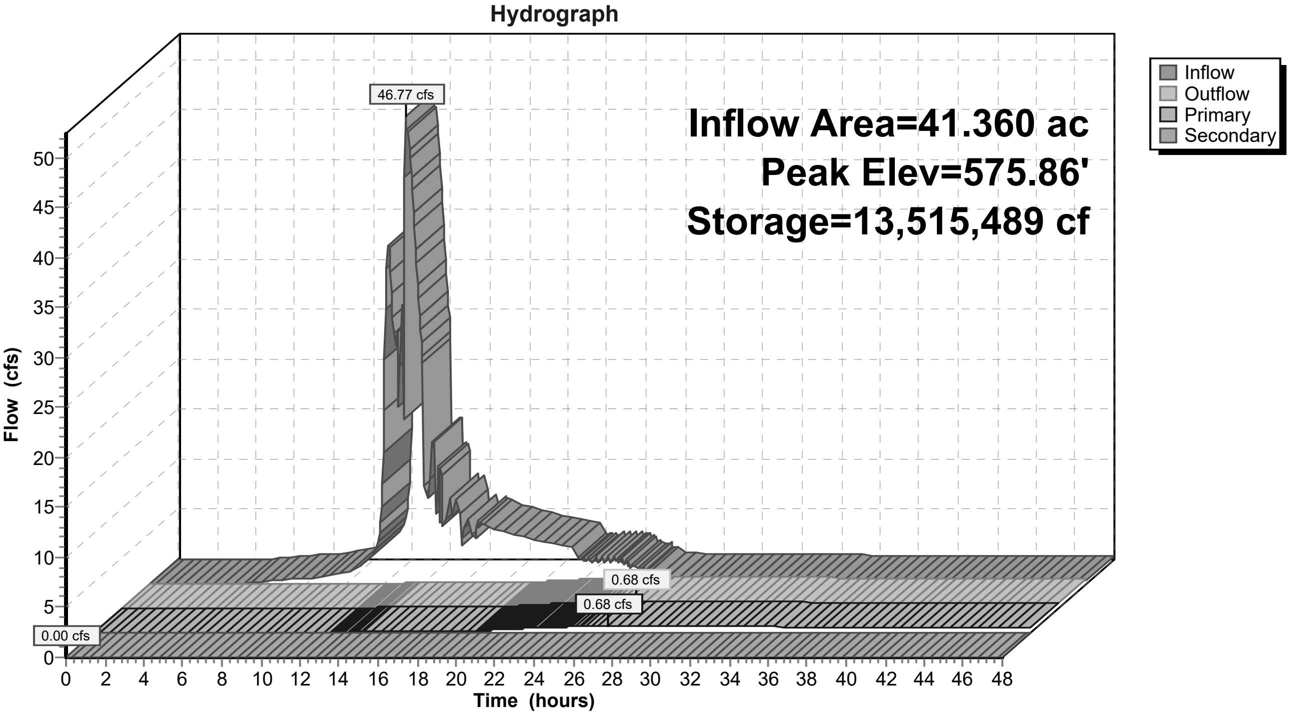
Device	Routing	Invert	Outlet Devices
#1	Primary	575.00'	**12.0" Round Culvert** L= 165.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 575.00' / 574.00' S= 0.0061 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	575.00'	**3.0" Vert. Orifice (internal)** C= 0.600
#3	Device 1	575.75'	**48.0" W x 9.0" H Vert. Slot (internal)** C= 0.600

#4	Device 1	577.50'	**30.0" x 48.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	578.00'	**162.0 deg x 15.0' long x 1.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.68 cfs @ 26.38 hrs HW=575.86' TW=572.18' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.68 cfs of 1.97 cfs potential flow)
  ↑**2=Orifice (internal)** (Orifice Controls 0.20 cfs @ 4.13 fps)
  3=Slot (internal) (Orifice Controls 0.48 cfs @ 1.07 fps)
  4=Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=575.00' TW=573.47' (Dynamic Tailwater)
↑**5=overflow weir** (Controls 0.00 cfs)

Pond 239P: wet pond



Summary for Pond CB204: catch basin

```
Inflow Area =       5.650 ac,  71.50% Impervious,  Inflow Depth =   2.33"    for  10-yr storm event
Inflow      =      21.20 cfs @  11.96 hrs,  Volume=          1.097 af
Outflow     =      21.20 cfs @  11.96 hrs,  Volume=          1.097 af,  Atten= 0%,  Lag= 0.0 min
Primary     =      14.73 cfs @  11.97 hrs,  Volume=          1.003 af
Secondary   =       6.48 cfs @  11.96 hrs,  Volume=          0.094 af
```

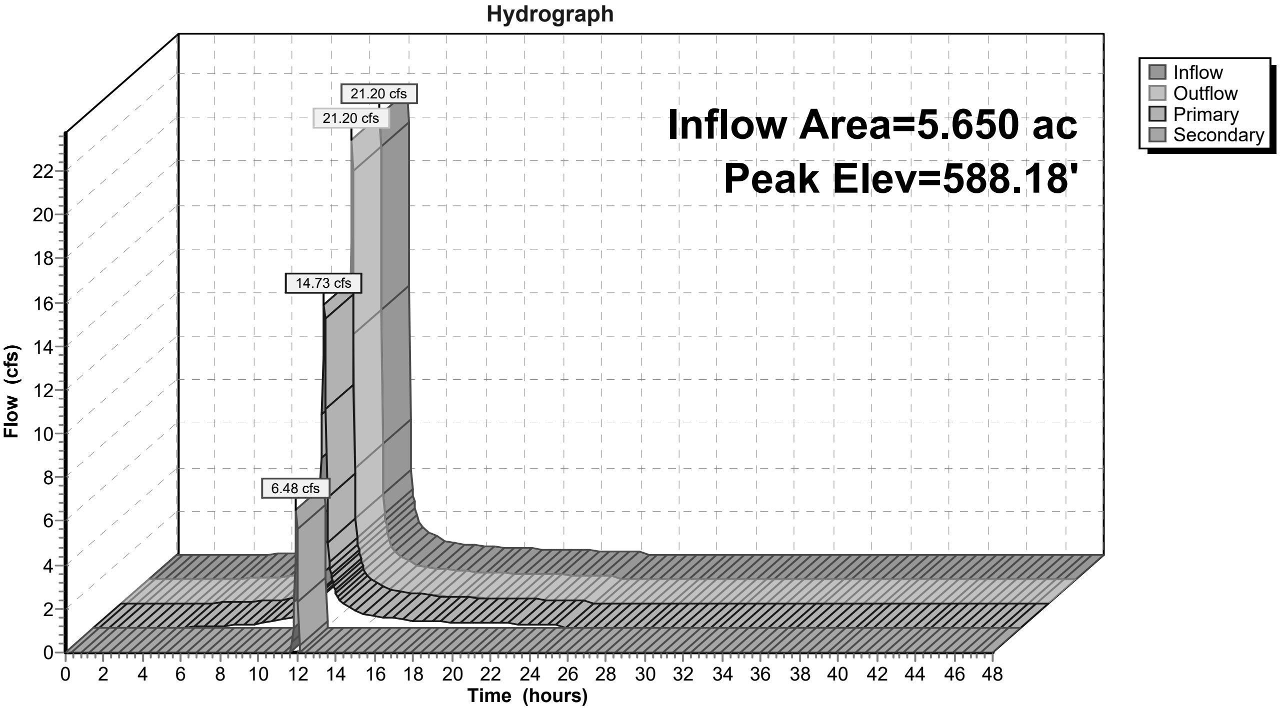
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 588.18' @ 11.96 hrs
Flood Elev= 592.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	585.86'	**24.0" Round Culvert** L= 58.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.86' / 585.39' S= 0.0081 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	586.86'	**18.0" Round Culvert** L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 586.86' / 585.00' S= 0.0338 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=14.55 cfs @ 11.97 hrs HW=588.13' TW=587.21' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 14.55 cfs @ 4.63 fps)

Secondary OutFlow Max=6.21 cfs @ 11.96 hrs HW=588.14' TW=574.90' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 6.21 cfs @ 3.86 fps)

Pond CB204: catch basin



Summary for Pond CB322: catch basin

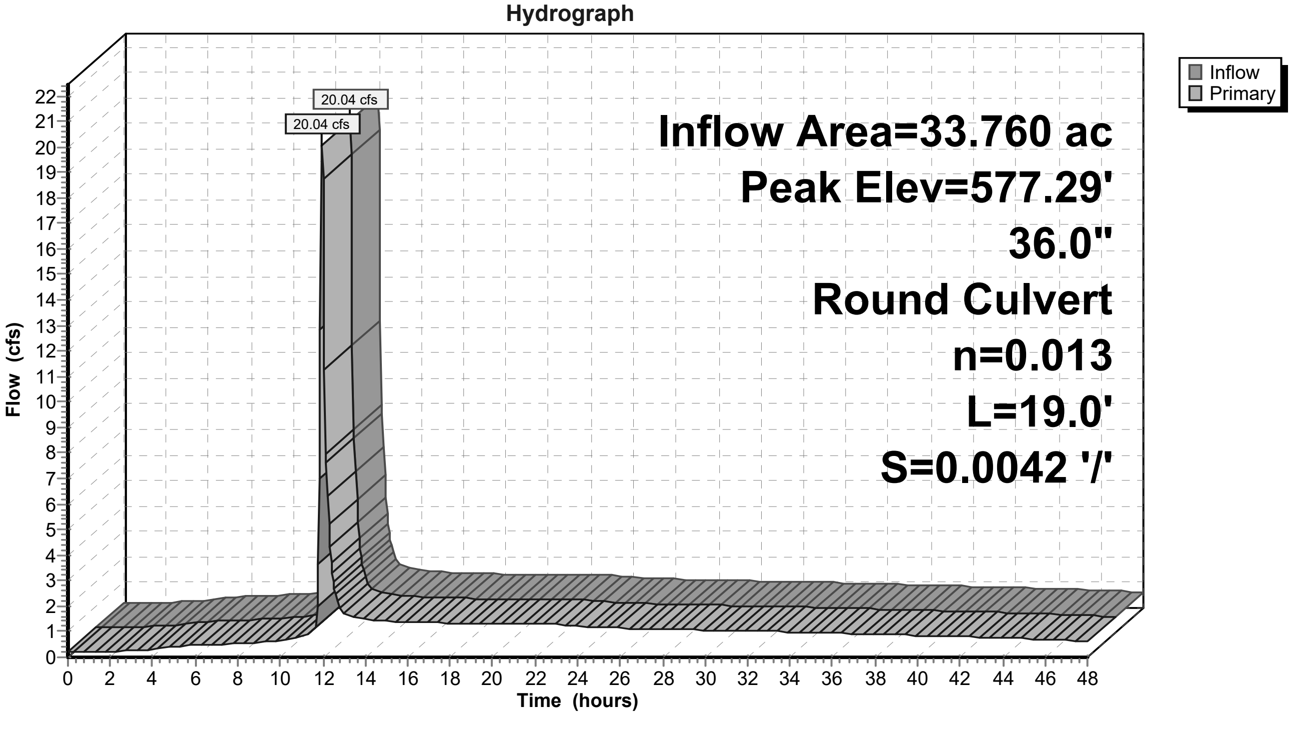
Inflow Area = 33.760 ac, 73.79% Impervious, Inflow Depth > 1.46" for 10-yr storm event
Inflow = 20.04 cfs @ 11.97 hrs, Volume= 4.101 af
Outflow = 20.04 cfs @ 11.97 hrs, Volume= 4.101 af, Atten= 0%, Lag= 0.0 min
Primary = 20.04 cfs @ 11.97 hrs, Volume= 4.101 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 577.29' @ 11.97 hrs
Flood Elev= 582.23'

Device	Routing	Invert	Outlet Devices
#1	Primary	575.08'	**36.0" Round Culvert** L= 19.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 575.08' / 575.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=19.16 cfs @ 11.97 hrs HW=577.23' TW=575.76' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 19.16 cfs @ 4.94 fps)

Pond CB322: catch basin



Summary for Pond CB323: catch basin

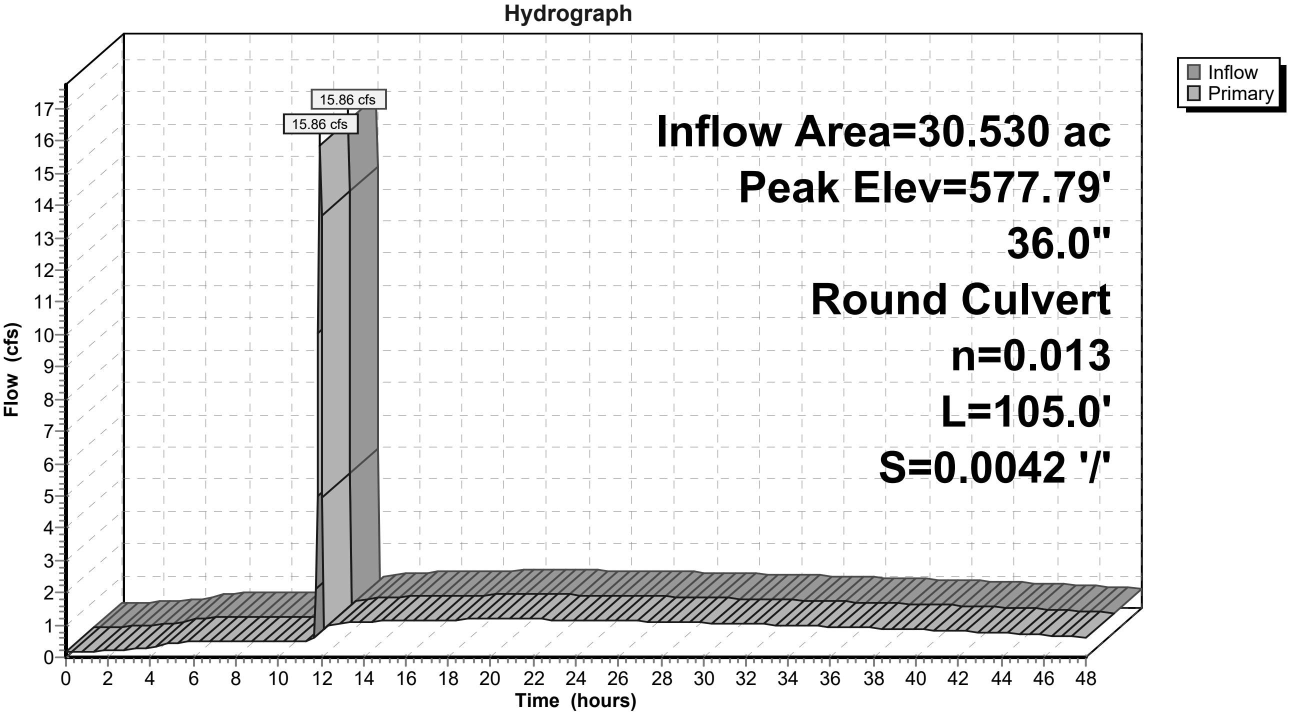
Inflow Area =	30.530 ac, 76.15% Impervious, Inflow Depth > 1.39" for 10-yr storm event				
Inflow =	15.86 cfs @	11.96 hrs, Volume=	3.548 af		
Outflow =	15.86 cfs @	11.96 hrs, Volume=	3.548 af,	Atten= 0%,	Lag= 0.0 min
Primary =	15.86 cfs @	11.96 hrs, Volume=	3.548 af		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 577.79' @ 11.97 hrs
Flood Elev= 580.79'

Device	Routing	Invert	Outlet Devices
#1	Primary	575.52'	**36.0" Round Culvert** L= 105.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 575.52' / 575.08' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=15.16 cfs @ 11.96 hrs HW=577.73' TW=577.24' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 15.16 cfs @ 3.78 fps)

Pond CB323: catch basin



Summary for Pond CB402: diversion CB

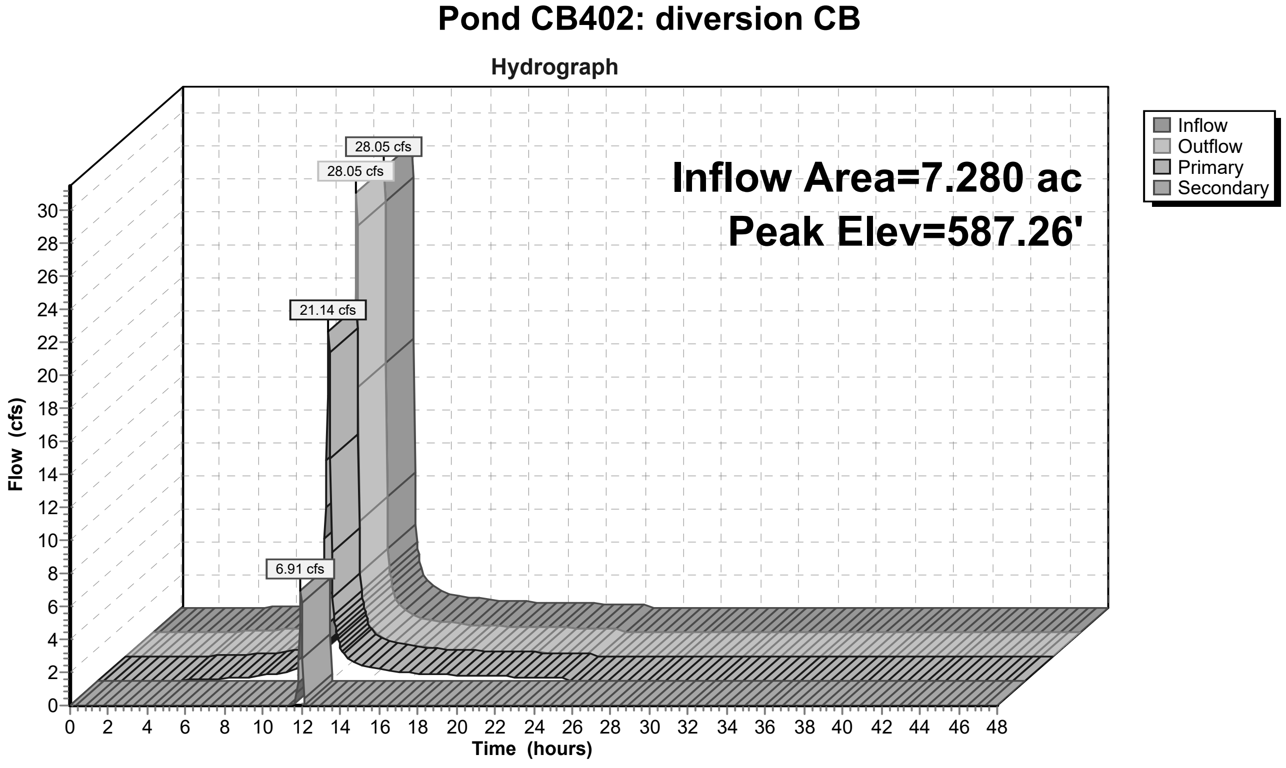
Inflow Area = 7.280 ac, 77.06% Impervious, Inflow Depth = 2.43" for 10-yr storm event
Inflow = 28.05 cfs @ 11.96 hrs, Volume= 1.474 af
Outflow = 28.05 cfs @ 11.96 hrs, Volume= 1.474 af, Atten= 0%, Lag= 0.0 min
Primary = 21.14 cfs @ 11.96 hrs, Volume= 1.366 af
Secondary = 6.91 cfs @ 11.96 hrs, Volume= 0.108 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 587.26' @ 11.96 hrs
Flood Elev= 589.59'

Device	Routing	Invert	Outlet Devices
#1	Primary	584.86'	**30.0" Round Culvert** L= 205.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 584.86' / 584.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Secondary	585.86'	**18.0" Round Culvert** L= 64.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.86' / 584.00' S= 0.0291 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=20.67 cfs @ 11.96 hrs HW=587.22' TW=584.77' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 20.67 cfs @ 5.57 fps)

Secondary OutFlow Max=6.66 cfs @ 11.96 hrs HW=587.22' TW=584.28' (Dynamic Tailwater)
↑**2=Culvert** (Inlet Controls 6.66 cfs @ 3.96 fps)



Summary for Pond DMH202: manhole

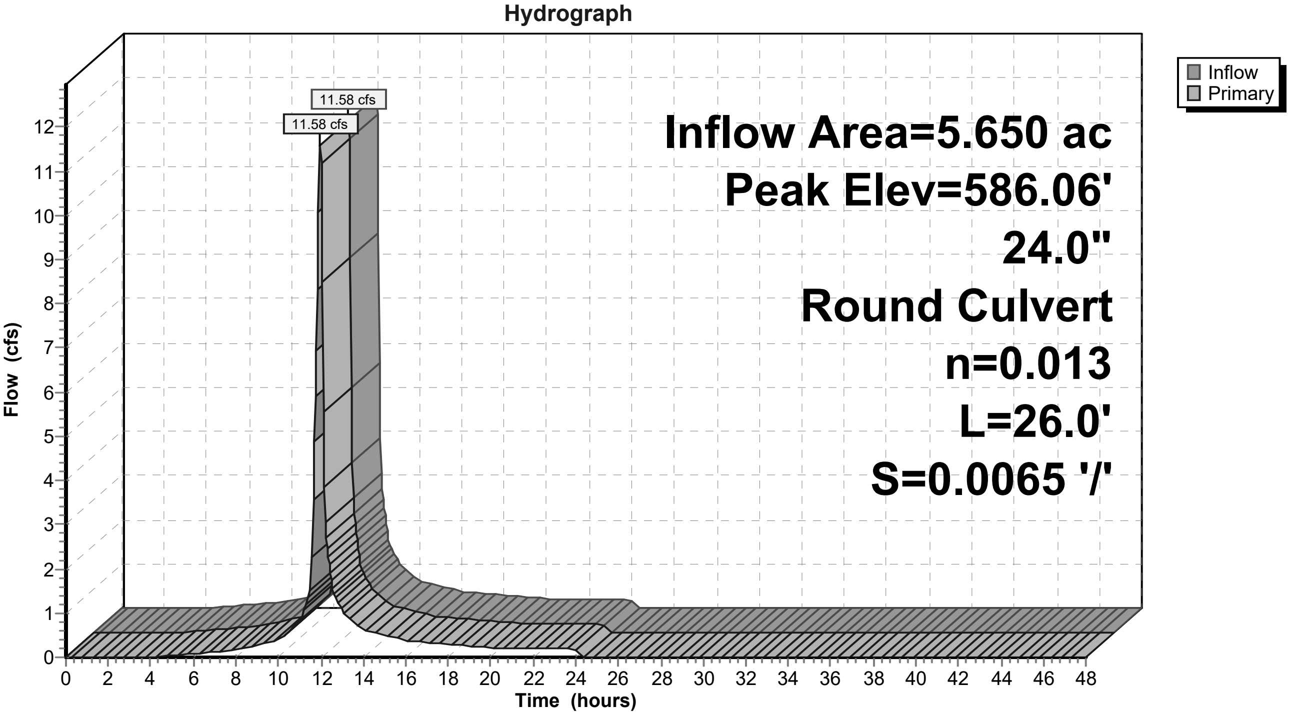
Inflow Area =	5.650 ac, 71.50% Impervious, Inflow Depth = 2.02" for 10-yr storm event				
Inflow =	11.58 cfs @	11.97 hrs, Volume=	0.949 af		
Outflow =	11.58 cfs @	11.97 hrs, Volume=	0.949 af,	Atten= 0%,	Lag= 0.0 min
Primary =	11.58 cfs @	11.97 hrs, Volume=	0.949 af		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.06' @ 11.97 hrs
Flood Elev= 593.41'

Device	Routing	Invert	Outlet Devices
#1	Primary	584.17'	**24.0" Round Culvert** L= 26.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 584.17' / 584.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=11.39 cfs @ 11.97 hrs HW=586.04' TW=584.78' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 11.39 cfs @ 4.83 fps)

Pond DMH202: manhole



Summary for Pond DMH203: diversion manhole

Inflow Area =	5.650 ac, 71.50% Impervious, Inflow Depth = 2.13" for 10-yr storm event			
Inflow =	14.73 cfs @	11.97 hrs, Volume=	1.003 af	
Outflow =	14.73 cfs @	11.97 hrs, Volume=	1.003 af,	Atten= 0%, Lag= 0.0 min
Primary =	11.58 cfs @	11.97 hrs, Volume=	0.949 af	
Secondary =	3.16 cfs @	11.97 hrs, Volume=	0.055 af	

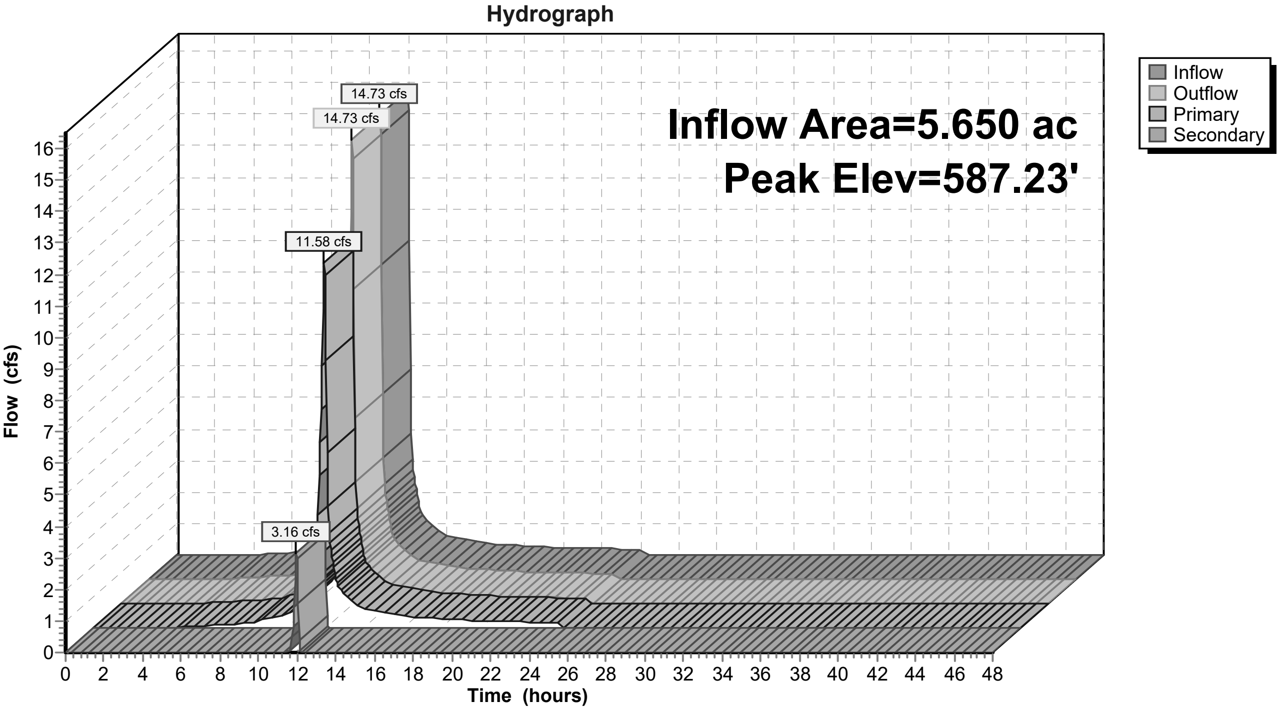
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 587.23' @ 11.97 hrs
Flood Elev= 593.07'

Device	Routing	Invert	Outlet Devices
#1	Primary	585.39'	**24.0" Round Culvert** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.39' / 584.20' S= 0.0079 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	586.19'	**18.0" Round Culvert** L= 237.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 586.19' / 585.17' S= 0.0043 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=11.39 cfs @ 11.97 hrs HW=587.21' TW=586.04' (Dynamic Tailwater)
↰**1=Culvert** (Outlet Controls 11.39 cfs @ 4.99 fps)

Secondary OutFlow Max=3.07 cfs @ 11.97 hrs HW=587.21' TW=586.17' (Dynamic Tailwater)
↰**2=Culvert** (Outlet Controls 3.07 cfs @ 3.41 fps)

Pond DMH203: diversion manhole



Summary for Pond DMH212: manhole

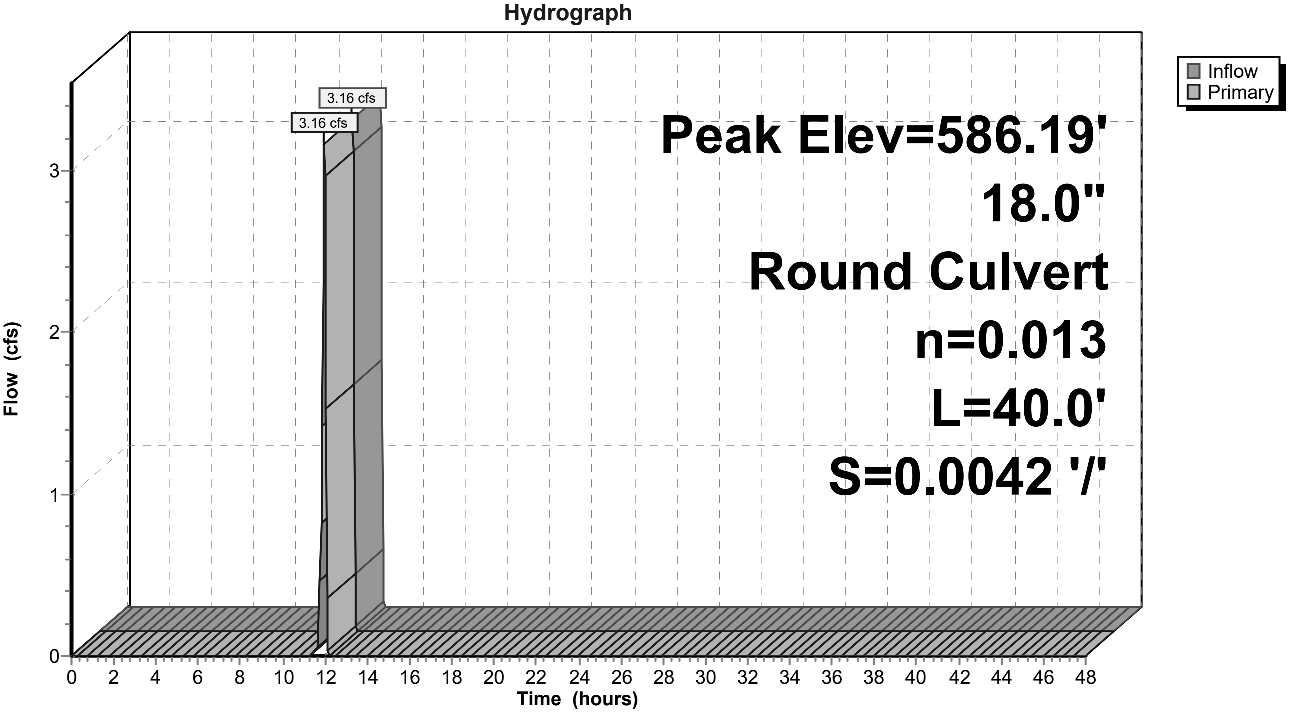
```
Inflow     =      3.16 cfs @   11.97 hrs,  Volume=           0.055 af
Outflow    =      3.16 cfs @   11.97 hrs,  Volume=           0.055 af,  Atten= 0%,  Lag= 0.0 min
Primary    =      3.16 cfs @   11.97 hrs,  Volume=           0.055 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.19' @ 11.97 hrs
Flood Elev= 591.88'

Device	Routing	Invert	Outlet Devices
#1	Primary	585.17'	**18.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.17' / 585.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.05 cfs @ 11.97 hrs HW=586.17' TW=573.92' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 3.05 cfs @ 3.47 fps)

Pond DMH212: manhole



Summary for Pond DMH216: division manhole

```
Inflow Area =      4.810 ac,100.00% Impervious,  Inflow Depth =   2.75"    for  10-yr storm event
Inflow      =     19.67 cfs @   11.96 hrs,  Volume=          1.102 af
Outflow     =     19.67 cfs @   11.96 hrs,  Volume=          1.102 af,  Atten= 0%,  Lag= 0.0 min
Primary     =     14.41 cfs @   11.96 hrs,  Volume=          1.032 af
Secondary =        5.26 cfs @   11.96 hrs,  Volume=          0.069 af
```

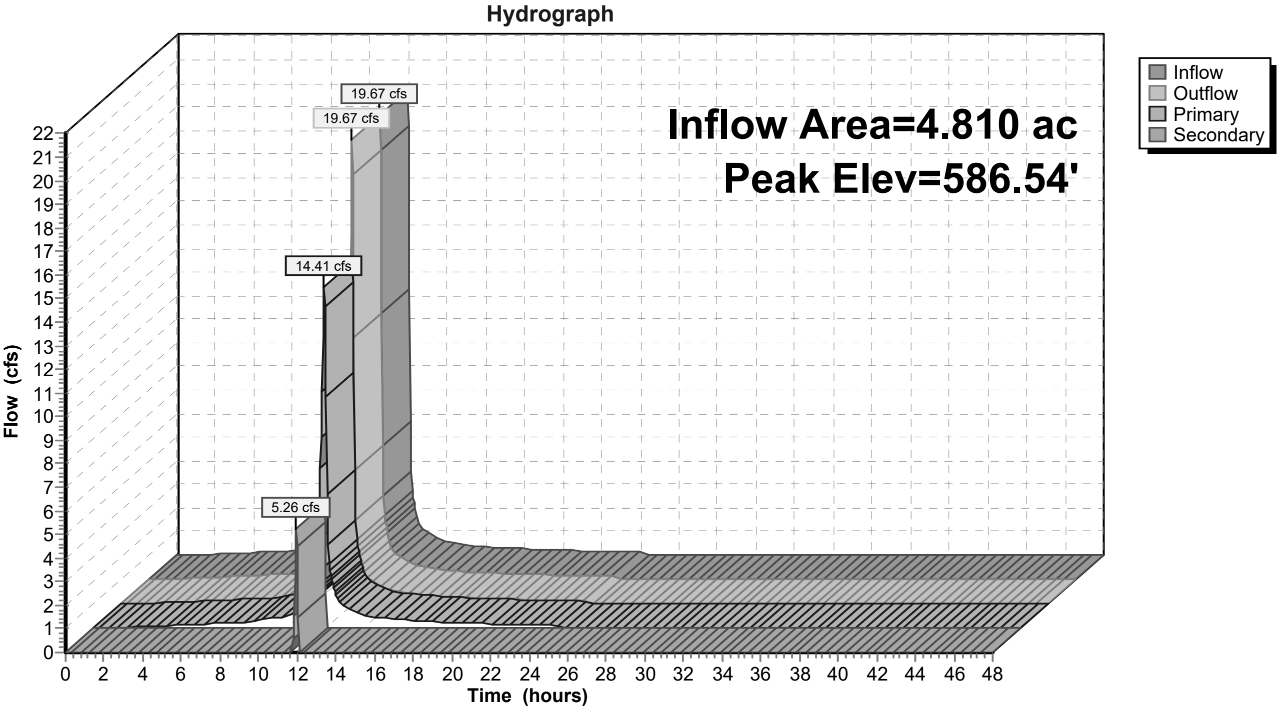
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.54' @ 11.96 hrs
Flood Elev= 594.26'

Device	Routing	Invert	Outlet Devices
#1	Primary	584.44'	**24.0" Round Culvert** L= 64.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 584.44' / 584.00' S= 0.0069 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	585.55'	**24.0" Round Culvert** L= 82.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.55' / 582.00' S= 0.0433 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=14.17 cfs @ 11.96 hrs HW=586.51' TW=584.77' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 14.17 cfs @ 5.40 fps)

Secondary OutFlow Max=5.03 cfs @ 11.96 hrs HW=586.52' TW=582.97' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 5.03 cfs @ 3.35 fps)

Pond DMH216: division manhole



Summary for Pond DMH230: manhole

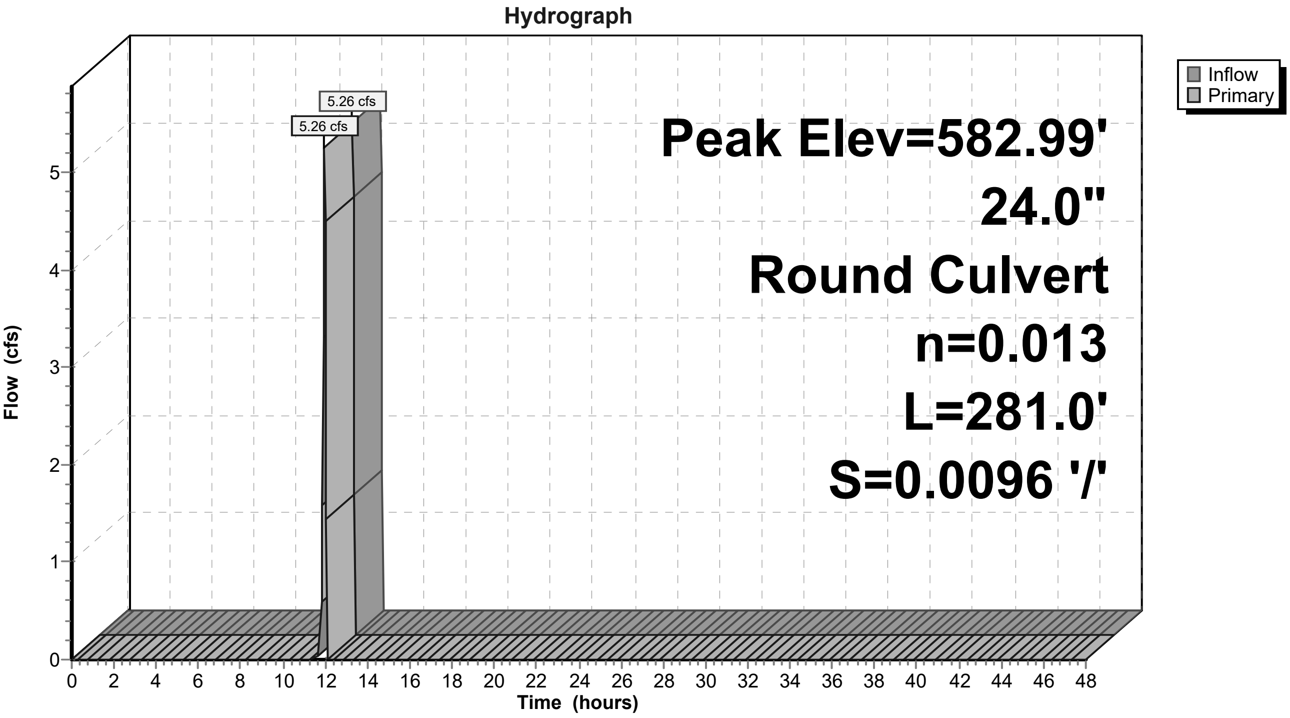
Inflow	=	5.26 cfs @	11.96 hrs,	Volume=	0.069 af
Outflow	=	5.26 cfs @	11.96 hrs,	Volume=	0.069 af, Atten= 0%, Lag= 0.0 min
Primary	=	5.26 cfs @	11.96 hrs,	Volume=	0.069 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 582.99' @ 11.96 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	582.00'	**24.0" Round Culvert** L= 281.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 582.00' / 579.30' S= 0.0096 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=5.03 cfs @ 11.96 hrs HW=582.97' TW=580.41' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 5.03 cfs @ 3.35 fps)

Pond DMH230: manhole



Summary for Pond DMH302: diversion manhole

Inflow Area = 9.330 ac, 93.78% Impervious, Inflow Depth = 2.64" for 10-yr storm event
Inflow = 37.55 cfs @ 11.96 hrs, Volume= 2.051 af
Outflow = 37.55 cfs @ 11.96 hrs, Volume= 2.051 af, Atten= 0%, Lag= 0.0 min
Primary = 27.48 cfs @ 11.96 hrs, Volume= 1.921 af
Secondary = 10.07 cfs @ 11.96 hrs, Volume= 0.131 af

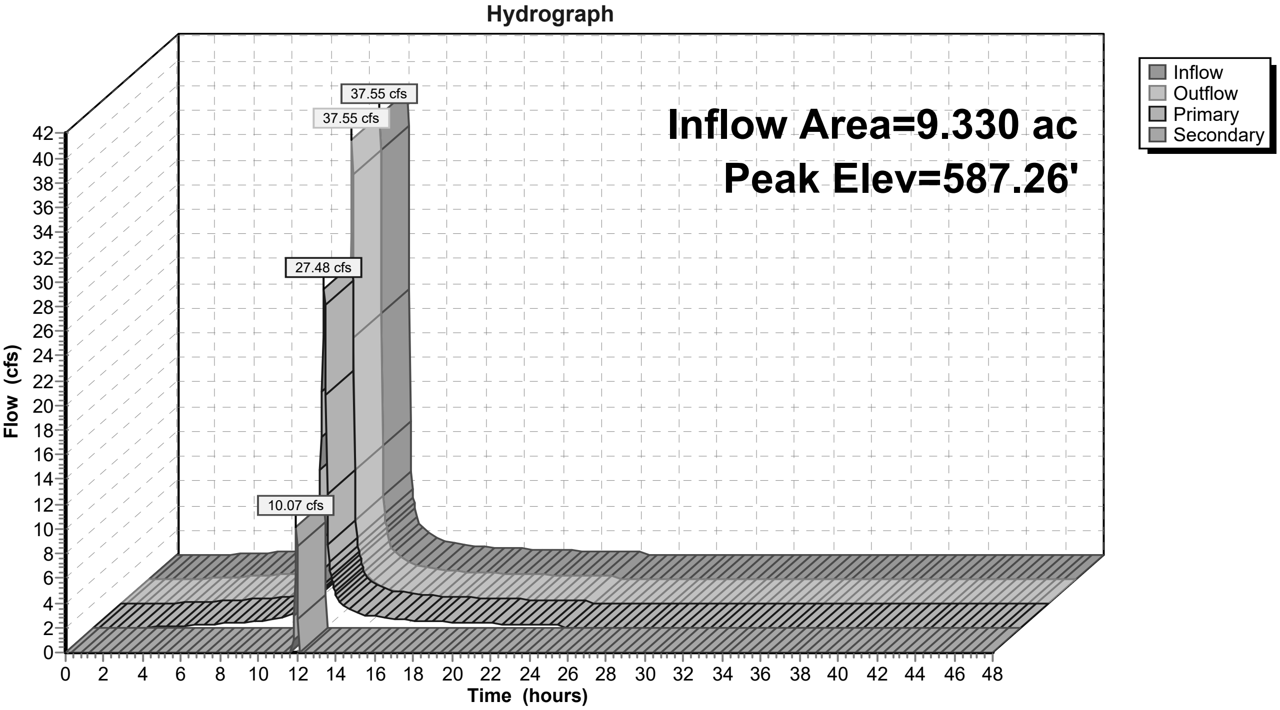
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 587.26' @ 11.96 hrs
Flood Elev= 596.93'

Device	Routing	Invert	Outlet Devices
#1	Primary	584.18'	**30.0" Round Culvert** L= 43.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 584.18' / 584.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Secondary	585.80'	**24.0" Round Culvert** L= 62.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.80' / 582.50' S= 0.0532 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=27.03 cfs @ 11.96 hrs HW=587.21' TW=584.82' (Dynamic Tailwater)
↰**1=Culvert** (Barrel Controls 27.03 cfs @ 5.77 fps)

Secondary OutFlow Max=9.62 cfs @ 11.96 hrs HW=587.21' TW=583.91' (Dynamic Tailwater)
↰**2=Culvert** (Inlet Controls 9.62 cfs @ 4.05 fps)

Pond DMH302: diversion manhole



Summary for Pond DMH316: manhole

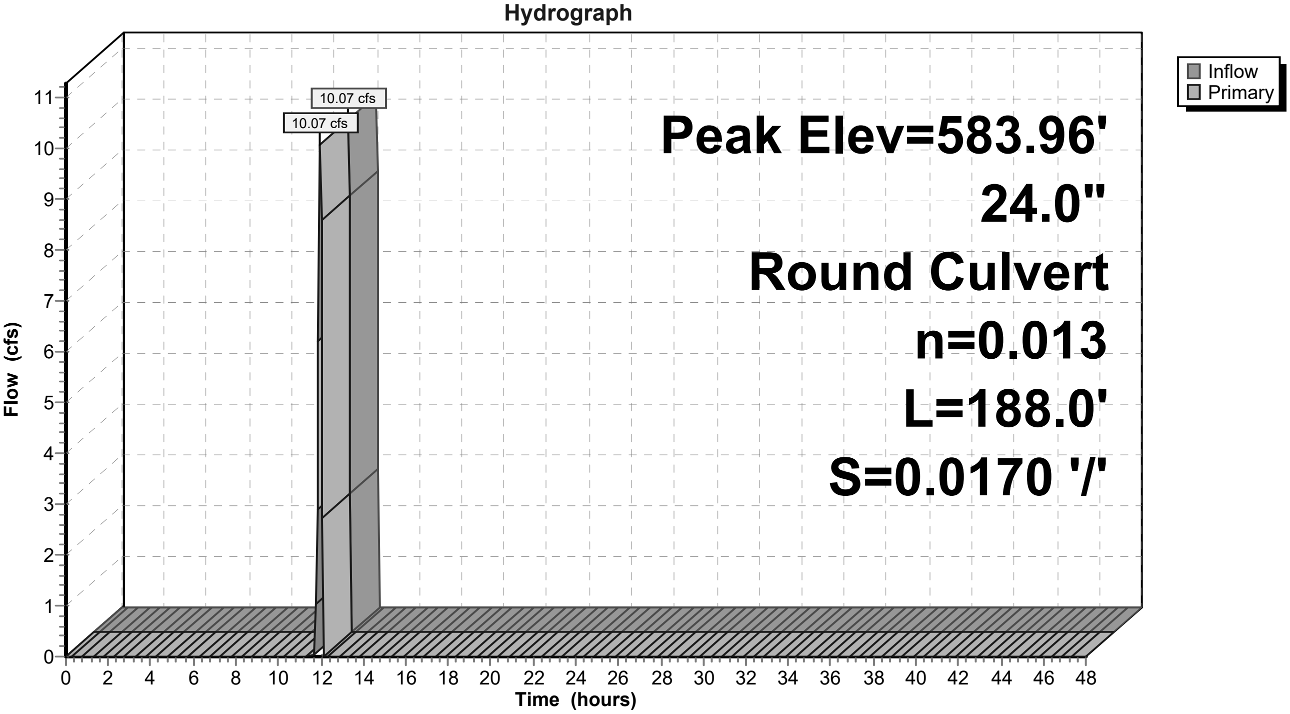
Inflow	=	10.07 cfs @	11.96 hrs, Volume=	0.131 af
Outflow	=	10.07 cfs @	11.96 hrs, Volume=	0.131 af, Atten= 0%, Lag= 0.0 min
Primary	=	10.07 cfs @	11.96 hrs, Volume=	0.131 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 583.96' @ 11.96 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	582.50'	**24.0" Round Culvert** L= 188.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 582.50' / 579.30' S= 0.0170 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=9.62 cfs @ 11.96 hrs HW=583.91' TW=580.82' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 9.62 cfs @ 4.05 fps)

Pond DMH316: manhole



Summary for Pond DMH317: manhole

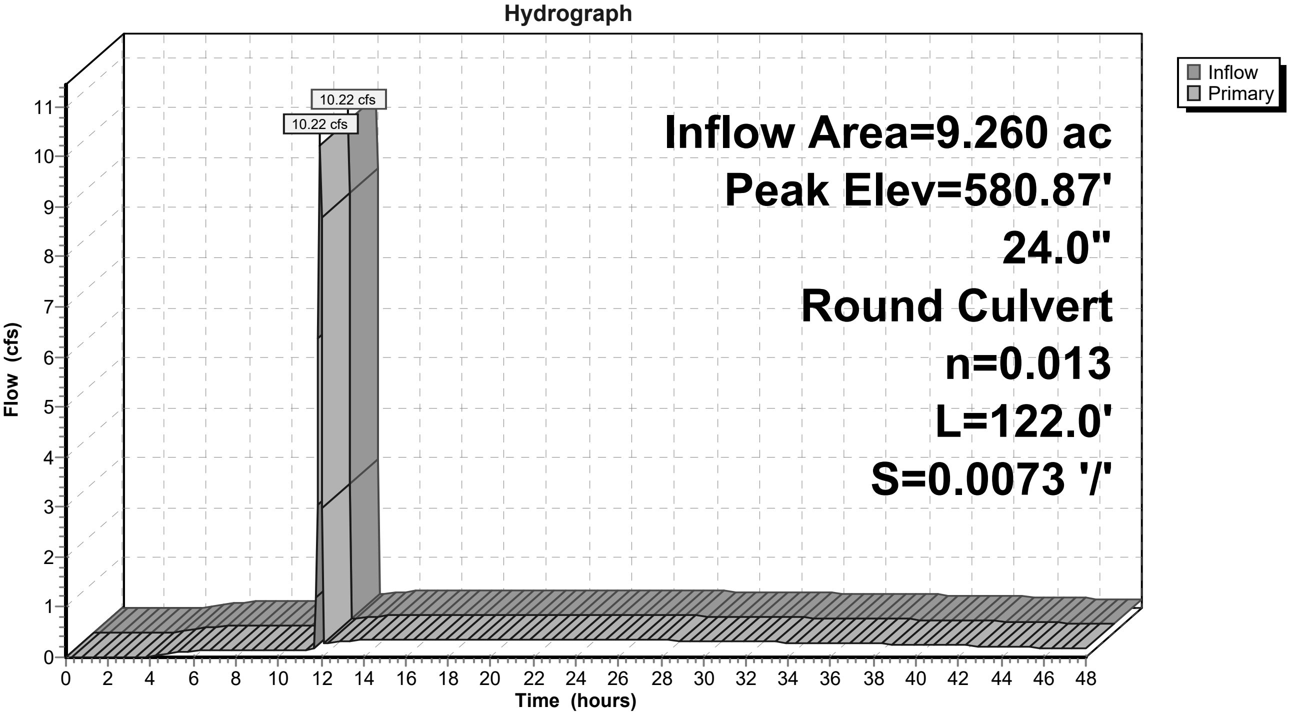
Inflow Area = 9.260 ac, 60.80% Impervious, Inflow Depth > 1.43" for 10-yr storm event
Inflow = 10.22 cfs @ 11.96 hrs, Volume= 1.104 af
Outflow = 10.22 cfs @ 11.96 hrs, Volume= 1.104 af, Atten= 0%, Lag= 0.0 min
Primary = 10.22 cfs @ 11.96 hrs, Volume= 1.104 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 580.87' @ 11.96 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	579.30'	**24.0" Round Culvert** L= 122.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 579.30' / 578.41' S= 0.0073 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=9.76 cfs @ 11.96 hrs HW=580.82' TW=579.57' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 9.76 cfs @ 5.29 fps)

Pond DMH317: manhole



Summary for Pond DMH318: manhole

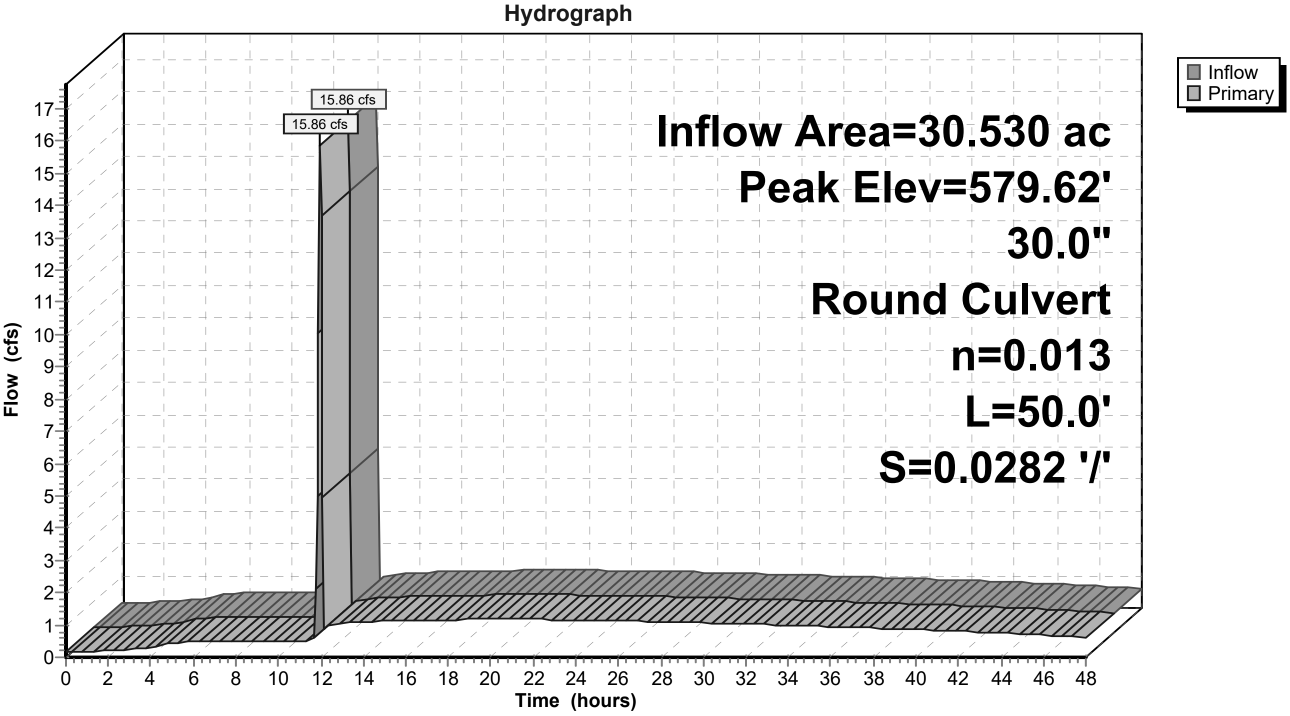
```
Inflow Area =        30.530 ac, 76.15% Impervious, Inflow Depth >  1.39"    for 10-yr storm event
Inflow      =       15.86 cfs @  11.96 hrs, Volume=          3.548 af
Outflow     =       15.86 cfs @  11.96 hrs, Volume=          3.548 af, Atten= 0%, Lag= 0.0 min
Primary     =       15.86 cfs @  11.96 hrs, Volume=          3.548 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 579.62' @ 11.96 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	577.91'	**30.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 577.91' / 576.50' S= 0.0282 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=15.16 cfs @ 11.96 hrs HW=579.57' TW=578.28' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 15.16 cfs @ 4.39 fps)

Pond DMH318: manhole



Summary for Pond DMH319: manhole

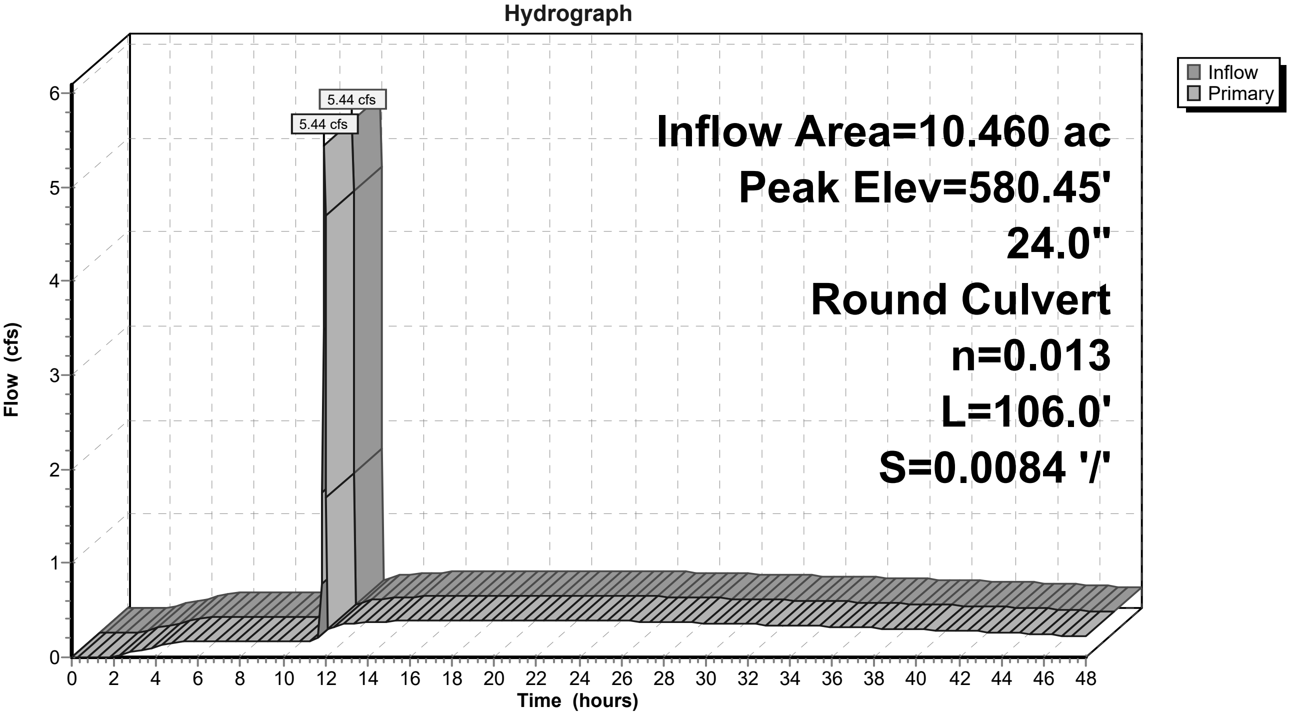
```
Inflow Area =      10.460 ac, 84.61% Impervious, Inflow Depth >  1.38"   for 10-yr storm event
Inflow      =       5.44 cfs @  11.96 hrs, Volume=          1.202 af
Outflow     =       5.44 cfs @  11.96 hrs, Volume=          1.202 af, Atten= 0%, Lag= 0.0 min
Primary     =       5.44 cfs @  11.96 hrs, Volume=          1.202 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 580.45' @ 11.96 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	579.30'	**24.0" Round Culvert** L= 106.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 579.30' / 578.41' S= 0.0084 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=5.21 cfs @ 11.96 hrs HW=580.41' TW=579.57' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 5.21 cfs @ 4.21 fps)

Pond DMH319: manhole



Summary for Pond DMH324: manhole

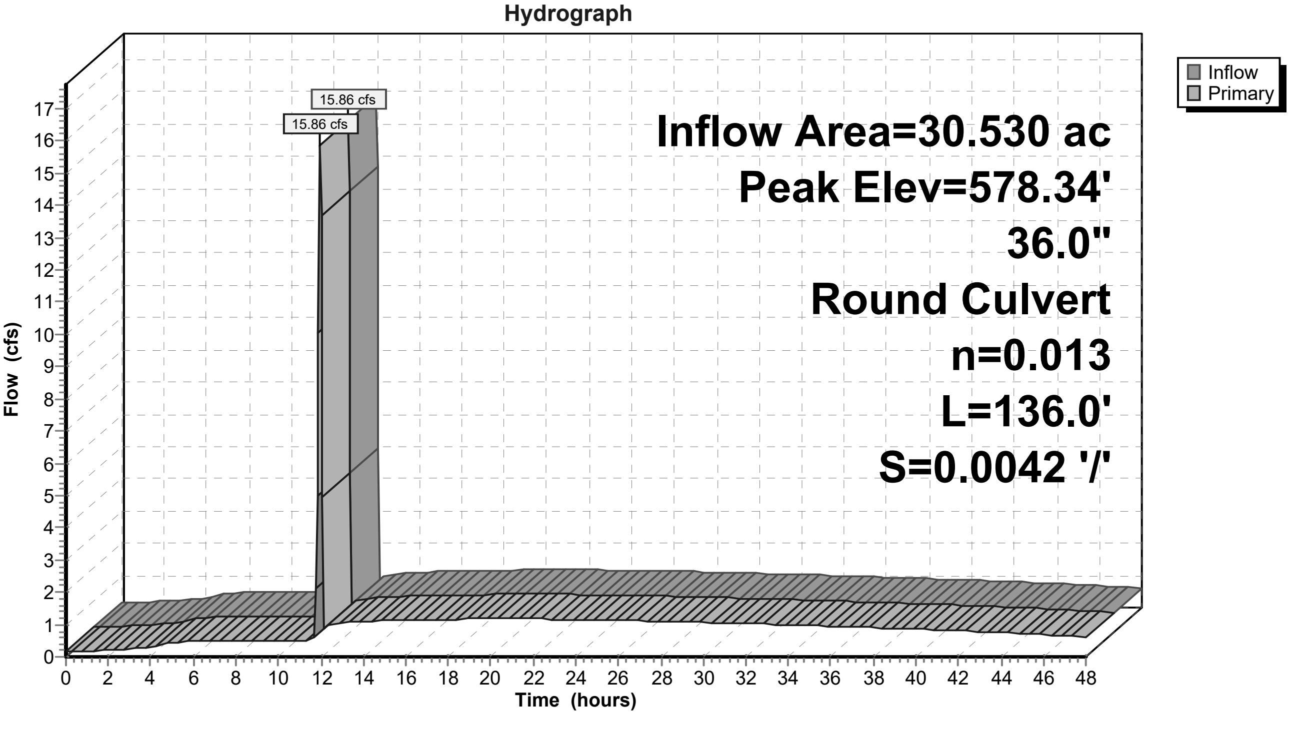
Inflow Area = 30.530 ac, 76.15% Impervious, Inflow Depth > 1.39" for 10-yr storm event
Inflow = 15.86 cfs @ 11.96 hrs, Volume= 3.548 af
Outflow = 15.86 cfs @ 11.96 hrs, Volume= 3.548 af, Atten= 0%, Lag= 0.0 min
Primary = 15.86 cfs @ 11.96 hrs, Volume= 3.548 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 578.34' @ 11.96 hrs
Flood Elev= 582.63'

Device	Routing	Invert	Outlet Devices
#1	Primary	576.09'	**36.0" Round Culvert** L= 136.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 576.09' / 575.52' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=15.16 cfs @ 11.96 hrs HW=578.28' TW=577.73' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 15.16 cfs @ 3.83 fps)

Pond DMH324: manhole



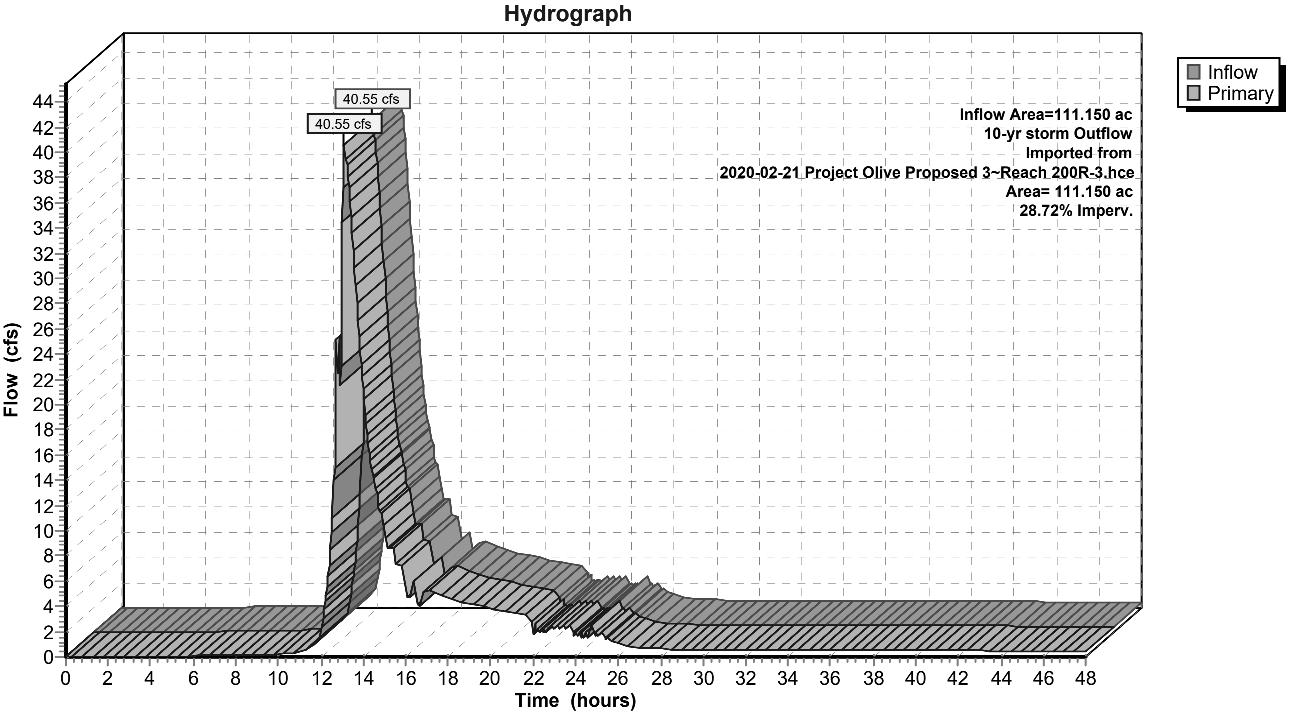
Summary for Link 200R-3: from 200R-3

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 1.02" for 10-yr storm event
Inflow = 40.55 cfs @ 13.12 hrs, Volume= 9.464 af
Primary = 40.55 cfs @ 13.12 hrs, Volume= 9.464 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

10-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 3~Reach 200R-3.hce

Link 200R-3: from 200R-3



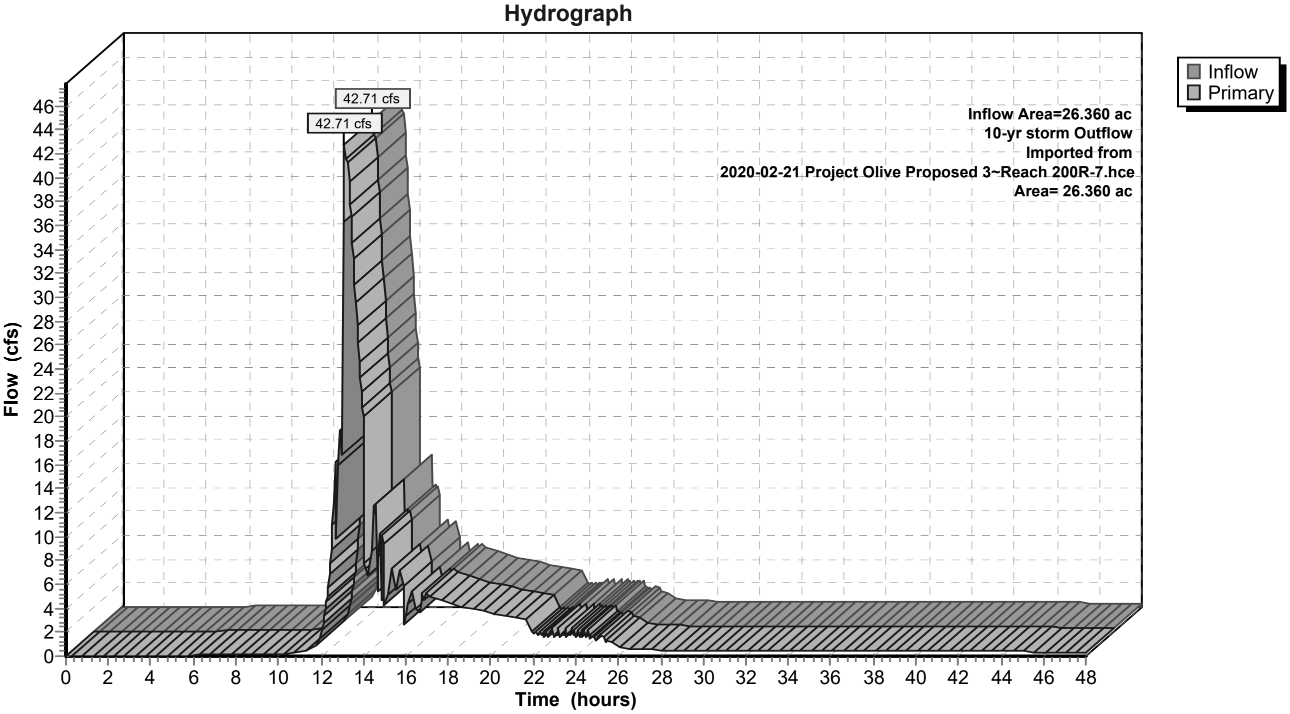
Summary for Link 200R-7: from 200R-7

Inflow Area =	26.360 ac,	0.00% Impervious, Inflow Depth > 3.71"	for 10-yr storm event
Inflow =	42.71 cfs @	13.10 hrs, Volume=	8.152 af
Primary =	42.71 cfs @	13.10 hrs, Volume=	8.152 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

10-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 3~Reach 200R-7.hce

Link 200R-7: from 200R-7



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment230A: Runoff Area=4.810 ac 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=32.15 cfs 1.841 af

Subcatchment230B: Runoff Area=5.650 ac 71.50% Impervious Runoff Depth=4.14"
Tc=6.0 min CN=94 Runoff=36.29 cfs 1.949 af

Subcatchment231A: Runoff Area=9.330 ac 93.78% Impervious Runoff Depth=4.48"
Tc=6.0 min CN=97 Runoff=61.93 cfs 3.481 af

Subcatchment231B: Runoff Area=1.480 ac 1.35% Impervious Runoff Depth=3.12"
Tc=6.0 min CN=84 Runoff=7.76 cfs 0.384 af

Subcatchment232A: Runoff Area=7.280 ac 77.06% Impervious Runoff Depth=4.25"
Tc=6.0 min CN=95 Runoff=47.37 cfs 2.579 af

Subcatchment232B: Runoff Area=1.980 ac 1.01% Impervious Runoff Depth=3.12"
Tc=6.0 min CN=84 Runoff=10.38 cfs 0.514 af

Subcatchment233: Runoff Area=3.230 ac 51.39% Impervious Runoff Depth=3.82"
Flow Length=349' Tc=20.3 min CN=91 Runoff=13.05 cfs 1.027 af

Subcatchment239: Runoff Area=15.000 ac 0.00% Impervious Runoff Depth=4.14"
Flow Length=397' Tc=29.1 min CN=94 Runoff=52.05 cfs 5.175 af

Reach 200R-4: feeder creek Avg. Flow Depth=1.83' Max Vel=3.26 fps Inflow=92.51 cfs 25.250 af
n=0.030 L=346.0' S=0.0030 '/' Capacity=439.39 cfs Outflow=92.43 cfs 25.243 af

Reach 200R-5: feeder creek Avg. Flow Depth=1.83' Max Vel=3.26 fps Inflow=92.44 cfs 25.374 af
n=0.030 L=269.0' S=0.0030 '/' Capacity=439.78 cfs Outflow=92.39 cfs 25.369 af

Reach 200R-6: feeder creek Avg. Flow Depth=1.81' Max Vel=3.33 fps Inflow=93.08 cfs 35.140 af
n=0.030 L=129.0' S=0.0032 '/' Capacity=451.82 cfs Outflow=93.07 cfs 35.130 af

Reach 232R: ditch Avg. Flow Depth=0.52' Max Vel=2.78 fps Inflow=13.34 cfs 0.495 af
n=0.030 L=913.0' S=0.0099 '/' Capacity=327.70 cfs Outflow=11.02 cfs 0.495 af

Reach 233R: ditch Avg. Flow Depth=1.24' Max Vel=4.35 fps Inflow=53.28 cfs 8.055 af
n=0.030 L=323.0' S=0.0093 '/' Capacity=318.09 cfs Outflow=52.43 cfs 8.048 af

Pond 210C: twin 36" culverts Peak Elev=576.52' Inflow=92.39 cfs 25.369 af
Primary=46.20 cfs 12.685 af Secondary=46.20 cfs 12.685 af Outflow=92.39 cfs 25.369 af

Pond 230Bio: bioretention Peak Elev=586.05' Storage=79,916 cf Inflow=31.33 cfs 2.593 af
Outflow=0.93 cfs 1.538 af

Pond 230F: forebay Peak Elev=586.05' Storage=20,178 cf Inflow=35.24 cfs 2.703 af
Outflow=31.33 cfs 2.593 af

Pond 231Bio: bioretention Peak Elev=586.09' Storage=91,187 cf Inflow=42.60 cfs 3.126 af
Outflow=1.70 cfs 1.861 af

Pond 231F: forebay Peak Elev=586.09' Storage=24,719 cf Inflow=49.31 cfs 3.185 af
Outflow=42.60 cfs 3.126 af

Pond 232Bio: bioretention Peak Elev=586.15' Storage=63,427 cf Inflow=38.21 cfs 2.511 af
Outflow=2.91 cfs 1.740 af

Pond 232F: forebay Peak Elev=586.15' Storage=19,342 cf Inflow=44.40 cfs 2.598 af
Outflow=38.21 cfs 2.511 af

Pond 239P: wet pond Peak Elev=577.19' Storage=14,196,150 cf Inflow=116.49 cfs 30.099 af
Primary=3.61 cfs 9.771 af Secondary=0.00 cfs 0.000 af Outflow=3.61 cfs 9.771 af

Pond CB204: catch basin Peak Elev=590.22' Inflow=36.29 cfs 1.949 af
Primary=22.53 cfs 1.705 af Secondary=13.77 cfs 0.245 af Outflow=36.29 cfs 1.949 af

Pond CB322: catch basin Peak Elev=578.72' Inflow=42.67 cfs 7.559 af
36.0" Round Culvert n=0.013 L=19.0' S=0.0042 '/' Outflow=42.67 cfs 7.559 af

Pond CB323: catch basin Peak Elev=579.74' Inflow=34.72 cfs 6.532 af
36.0" Round Culvert n=0.013 L=105.0' S=0.0042 '/' Outflow=34.72 cfs 6.532 af

Pond CB402: diversion CB Peak Elev=589.05' Inflow=47.37 cfs 2.579 af
Primary=34.03 cfs 2.084 af Secondary=13.34 cfs 0.495 af Outflow=47.37 cfs 2.579 af

Pond DMH202: manhole Peak Elev=586.64' Inflow=16.32 cfs 1.573 af
24.0" Round Culvert n=0.013 L=26.0' S=0.0065 '/' Outflow=16.32 cfs 1.573 af

Pond DMH203: diversion manhole Peak Elev=587.93' Inflow=22.53 cfs 1.705 af
Primary=16.32 cfs 1.573 af Secondary=6.22 cfs 0.131 af Outflow=22.53 cfs 1.705 af

Pond DMH212: manhole Peak Elev=586.74' Inflow=6.22 cfs 0.131 af
18.0" Round Culvert n=0.013 L=40.0' S=0.0042 '/' Outflow=6.22 cfs 0.131 af

Pond DMH216: division manhole Peak Elev=587.31' Inflow=32.15 cfs 1.841 af
Primary=18.93 cfs 1.129 af Secondary=13.23 cfs 0.712 af Outflow=32.15 cfs 1.841 af

Pond DMH230: manhole Peak Elev=584.32' Inflow=13.23 cfs 0.712 af
24.0" Round Culvert n=0.013 L=281.0' S=0.0096 '/' Outflow=13.23 cfs 0.712 af

Pond DMH302: diversion manhole Peak Elev=588.61' Inflow=61.93 cfs 3.481 af
Primary=41.56 cfs 2.800 af Secondary=20.37 cfs 0.681 af Outflow=61.93 cfs 3.481 af

Pond DMH316: manhole Peak Elev=586.45' Inflow=20.37 cfs 0.681 af
24.0" Round Culvert n=0.013 L=188.0' S=0.0170 '/' Outflow=20.37 cfs 0.681 af

Pond DMH317: manhole Peak Elev=584.30' Inflow=20.73 cfs 2.421 af
24.0" Round Culvert n=0.013 L=122.0' S=0.0073 '/' Outflow=20.73 cfs 2.421 af

Pond DMH318: manhole Peak Elev=582.43' Inflow=34.72 cfs 6.532 af
30.0" Round Culvert n=0.013 L=50.0' S=0.0282 '/' Outflow=34.72 cfs 6.532 af

Pond DMH319: manhole Peak Elev=583.12' Inflow=13.60 cfs 2.250 af
24.0" Round Culvert n=0.013 L=106.0' S=0.0084 '/' Outflow=13.60 cfs 2.250 af

Pond DMH324: manhole Peak Elev=580.77' Inflow=34.72 cfs 6.532 af
36.0" Round Culvert n=0.013 L=136.0' S=0.0042 '/' Outflow=34.72 cfs 6.532 af

Link 100-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 3~Reach 200R-3.hce Inflow=92.51 cfs 25.005 af
Area= 111.150 ac 28.72% Imperv. Primary=92.51 cfs 25.005 af

Link 100-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 3~Reach 200R-7.hce Inflow=109.16 cfs 24.924 af
Area= 26.360 ac Primary=109.16 cfs 24.924 af

Total Runoff Area = 48.760 ac Runoff Volume = 16.952 af Average Runoff Depth = 4.17"
48.91% Pervious = 23.850 ac 51.09% Impervious = 24.910 ac

Summary for Subcatchment 230A:

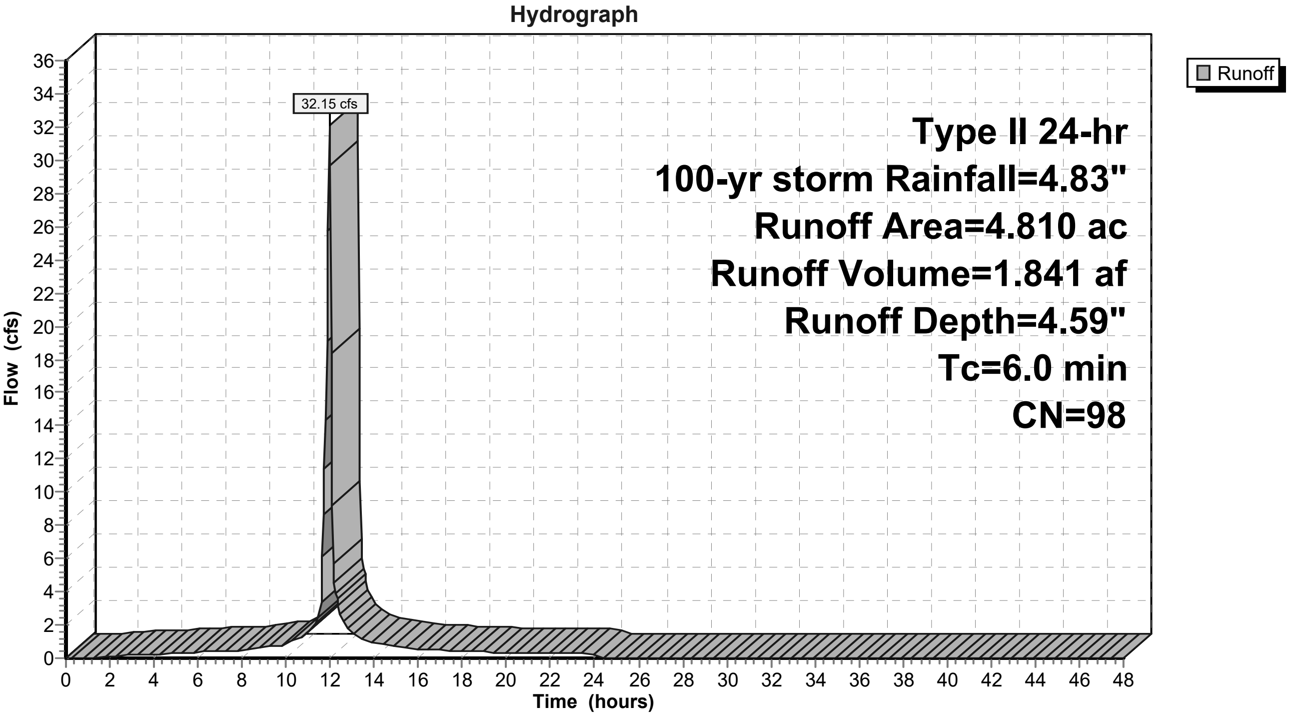
Runoff = 32.15 cfs @ 11.96 hrs, Volume= 1.841 af, Depth= 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
4.810	98	Roofs, HSG D
4.810		100.00% Impervious Area

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

Subcatchment 230A:



Summary for Subcatchment 230B:

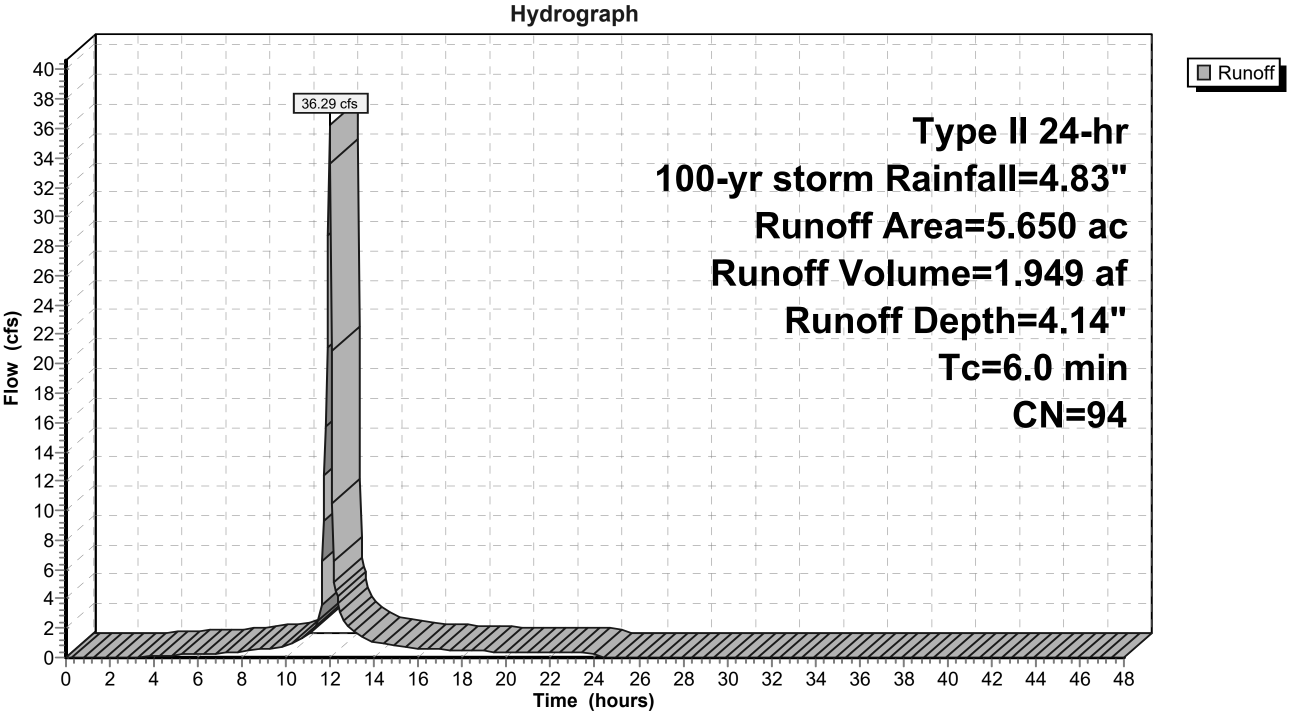
Runoff = 36.29 cfs @ 11.96 hrs, Volume= 1.949 af, Depth= 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
1.610	84	50-75% Grass cover, Fair, HSG D
4.040	98	Paved parking, HSG D
5.650	94	Weighted Average
1.610		28.50% Pervious Area
4.040		71.50% Impervious Area

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

Subcatchment 230B:



Summary for Subcatchment 231A:

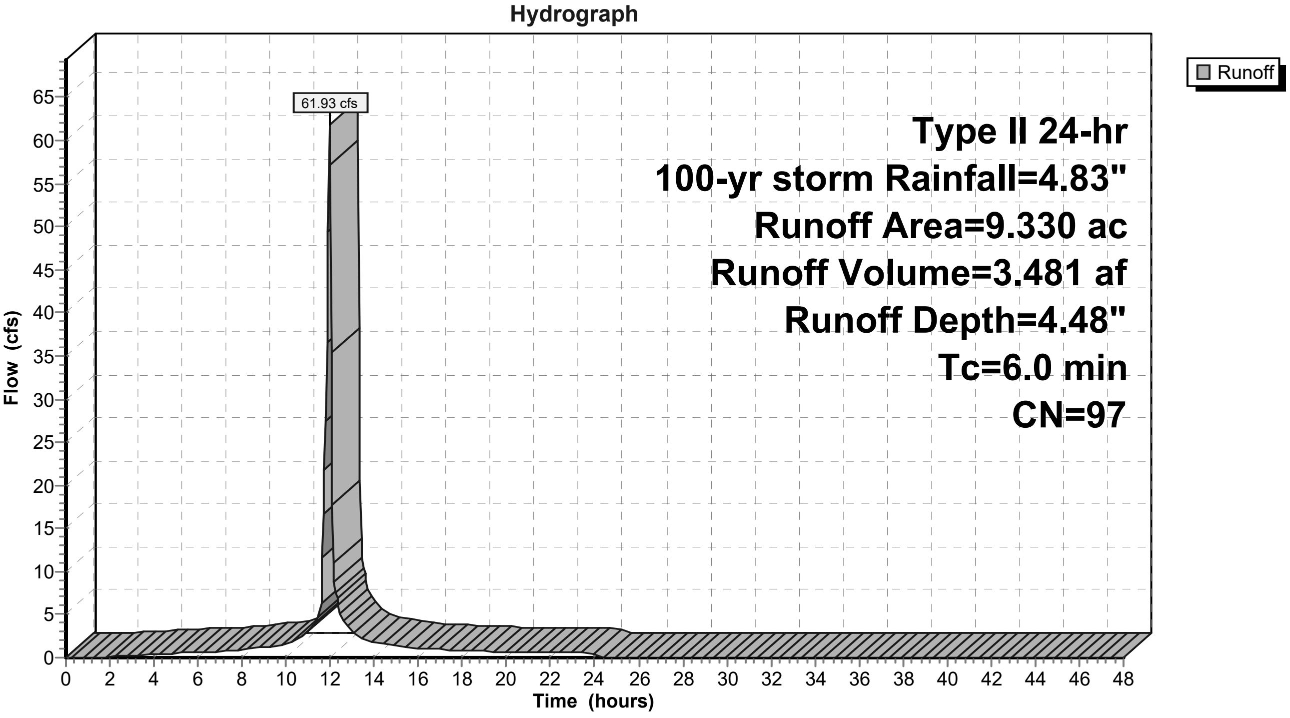
Runoff = 61.93 cfs @ 11.96 hrs, Volume= 3.481 af, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
0.580	84	50-75% Grass cover, Fair, HSG D
4.030	98	Paved parking, HSG D
4.720	98	Roofs, HSG D
9.330	97	Weighted Average
0.580		6.22% Pervious Area
8.750		93.78% Impervious Area

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

Subcatchment 231A:



Summary for Subcatchment 231B:

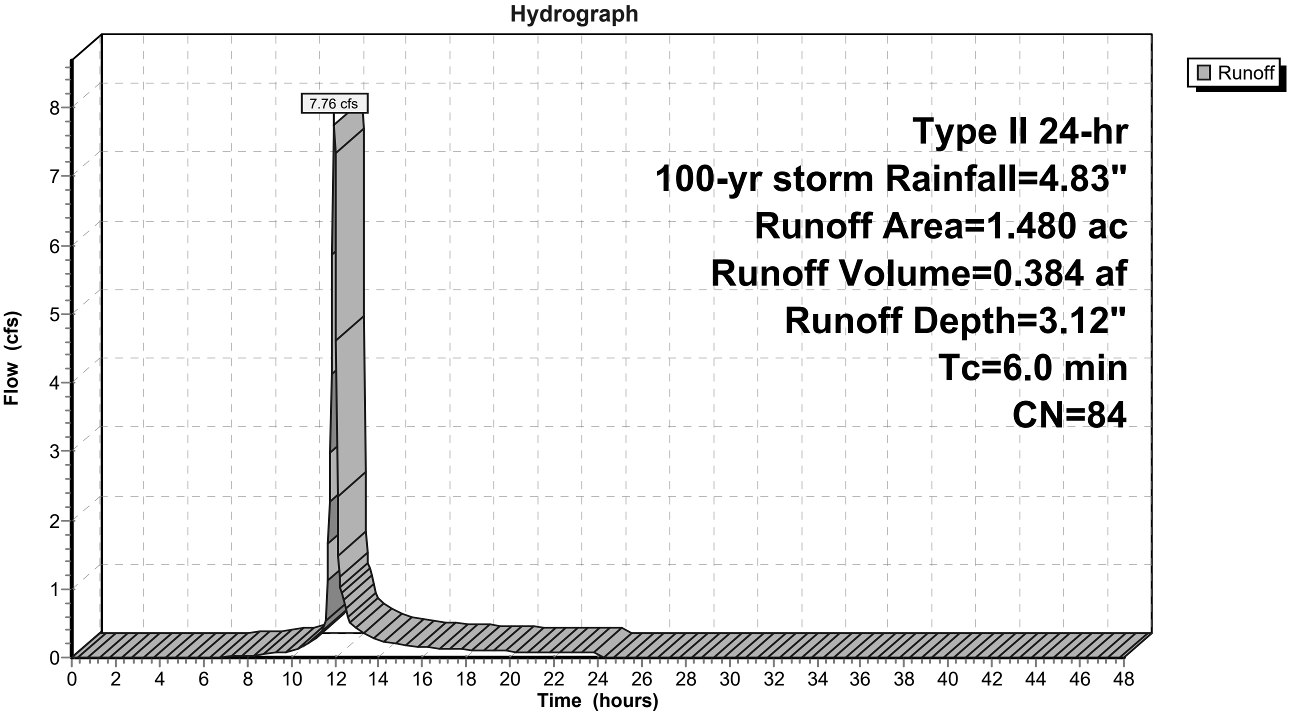
Runoff = 7.76 cfs @ 11.97 hrs, Volume= 0.384 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
1.460	84	50-75% Grass cover, Fair, HSG D
0.020	98	Paved parking, HSG D
1.480	84	Weighted Average
1.460		98.65% Pervious Area
0.020		1.35% Impervious Area

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

Subcatchment 231B:



Summary for Subcatchment 232A:

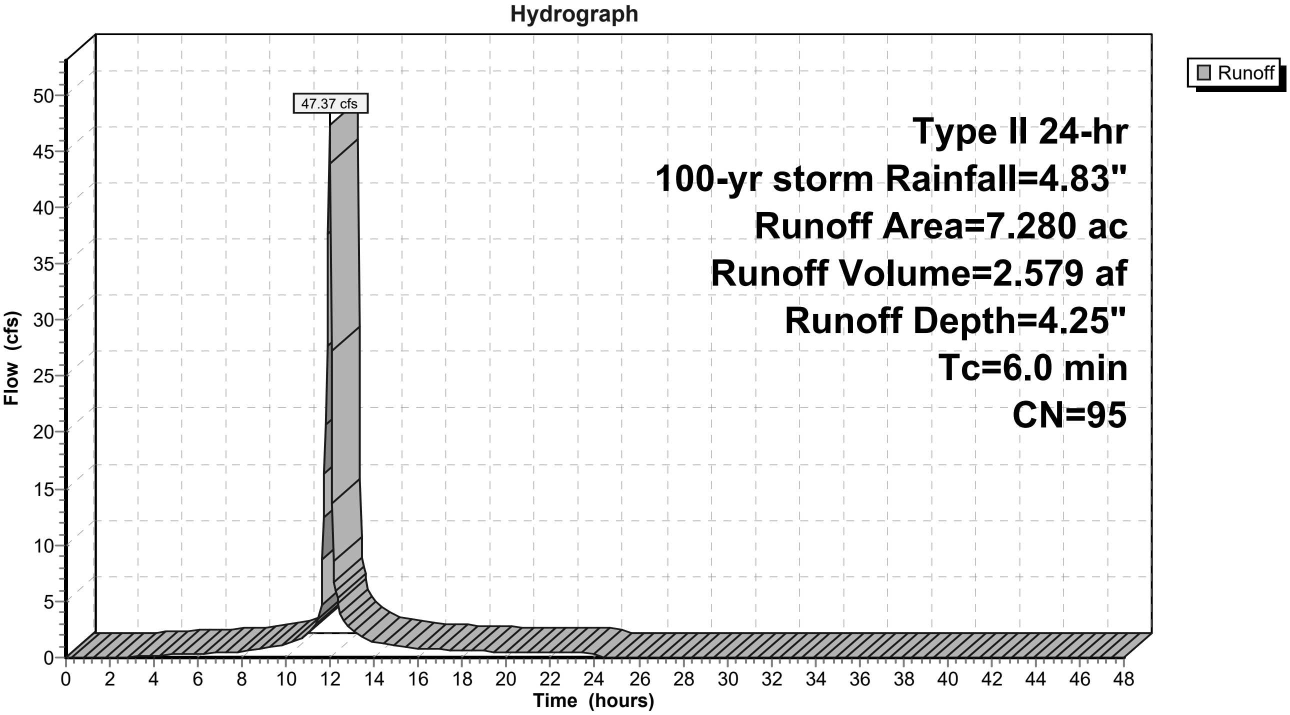
Runoff = 47.37 cfs @ 11.96 hrs, Volume= 2.579 af, Depth= 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
1.670	84	50-75% Grass cover, Fair, HSG D
5.610	98	Paved parking, HSG D
7.280	95	Weighted Average
1.670		22.94% Pervious Area
5.610		77.06% Impervious Area

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

Subcatchment 232A:



Summary for Subcatchment 232B:

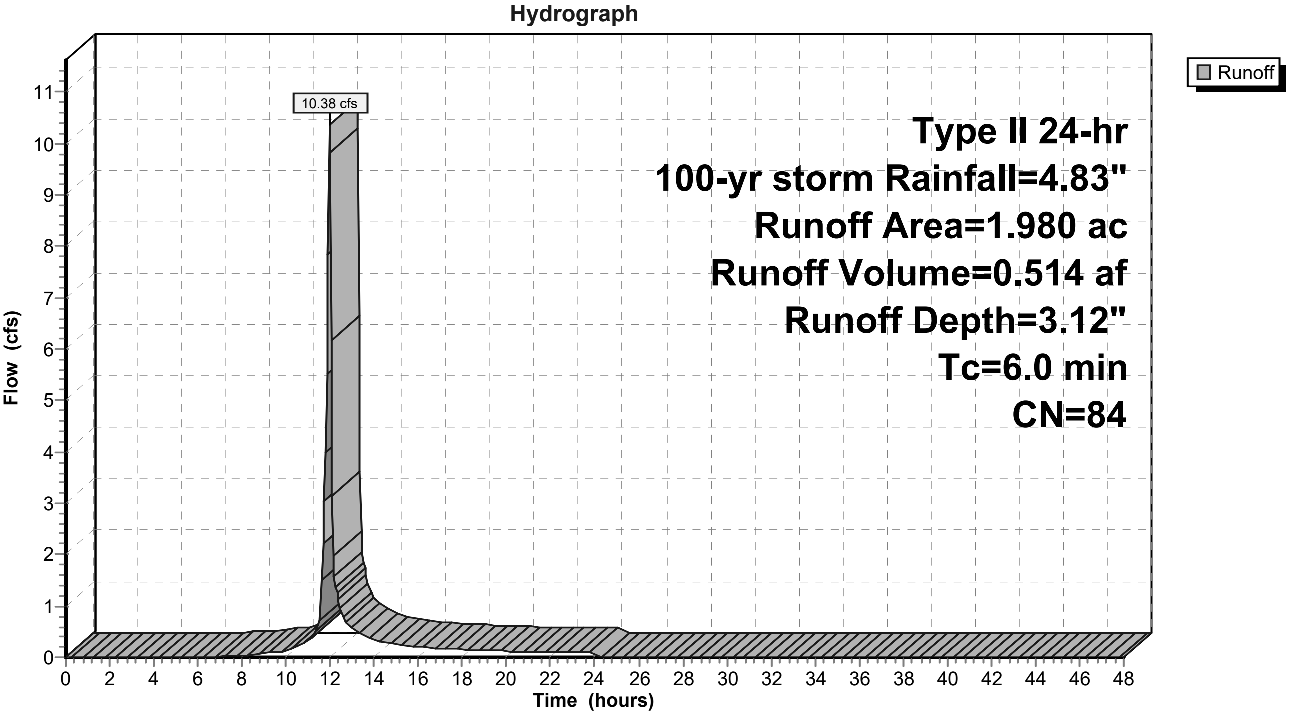
Runoff = 10.38 cfs @ 11.97 hrs, Volume= 0.514 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
1.960	84	50-75% Grass cover, Fair, HSG D
0.020	98	Paved parking, HSG D
1.980	84	Weighted Average
1.960		98.99% Pervious Area
0.020		1.01% Impervious Area

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

Subcatchment 232B:



Summary for Subcatchment 233:

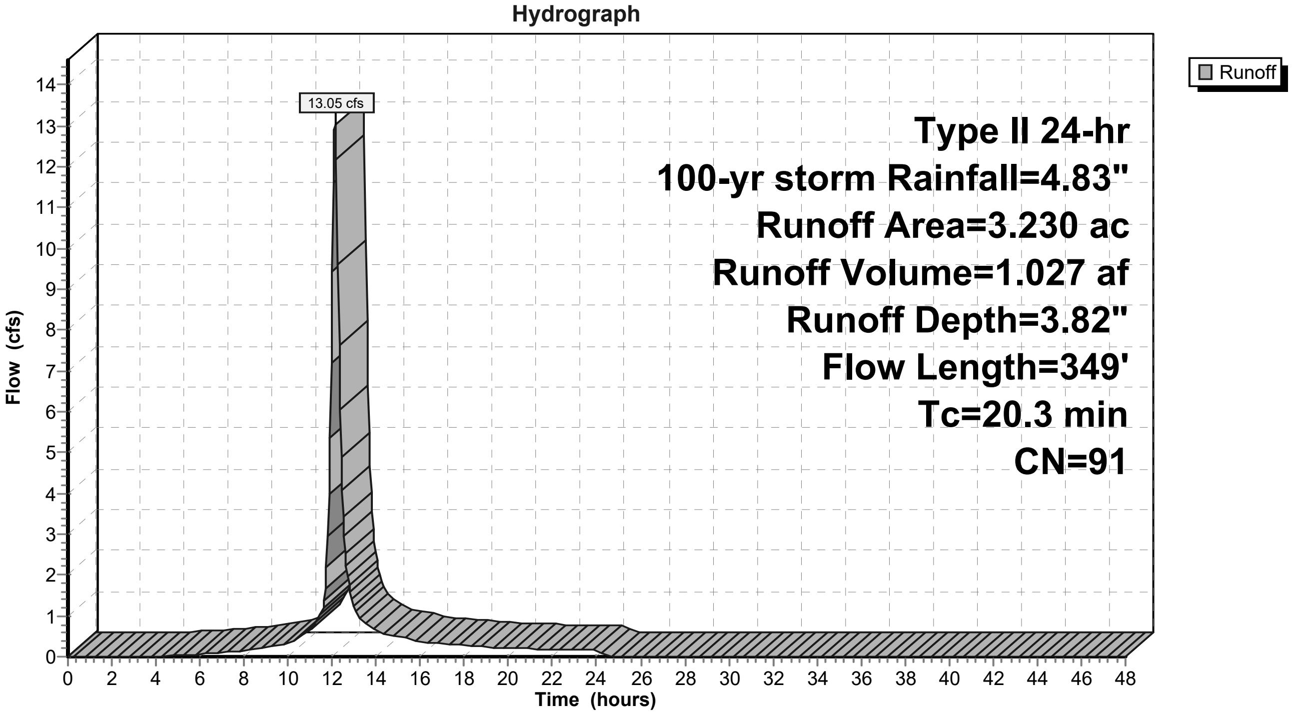
Runoff = 13.05 cfs @ 12.12 hrs, Volume= 1.027 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
1.570	84	50-75% Grass cover, Fair, HSG D
1.660	98	Paved parking, HSG D
3.230	91	Weighted Average
1.570		48.61% Pervious Area
1.660		51.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.3	100	0.0110	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
5.0	249	0.0140	0.83		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
20.3	349	Total			

Subcatchment 233:



Summary for Subcatchment 239:

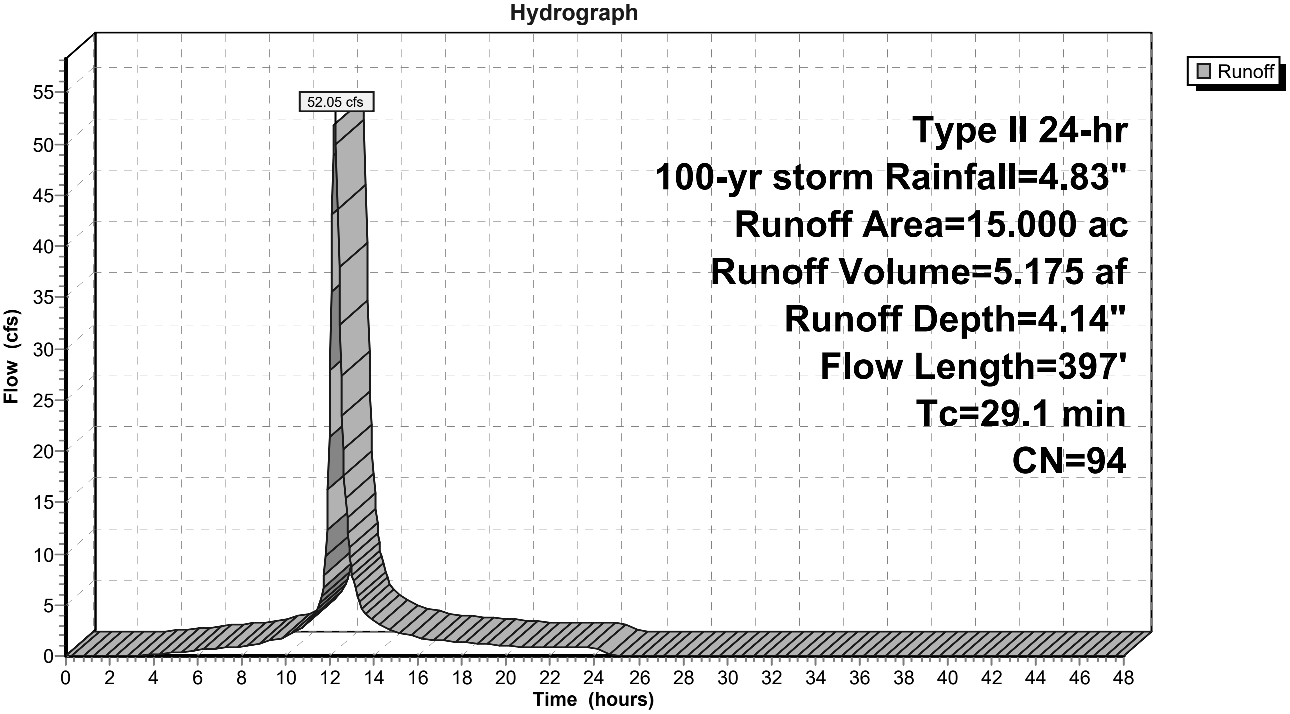
Runoff = 52.05 cfs @ 12.22 hrs, Volume= 5.175 af, Depth= 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
2.610	84	50-75% Grass cover, Fair, HSG D
11.410	98	Water Surface, 0% imp, HSG D
0.980	79	Woods, Fair, HSG D
15.000	94	Weighted Average
15.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.9	100	0.0040	0.07		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
6.0	254	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	43	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
29.1	397	Total			

Subcatchment 239:



Summary for Reach 200R-4: feeder creek

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 2.73" for 100-yr storm event
Inflow = 92.51 cfs @ 13.09 hrs, Volume= 25.250 af
Outflow = 92.43 cfs @ 13.11 hrs, Volume= 25.243 af, Atten= 0%, Lag= 1.2 min

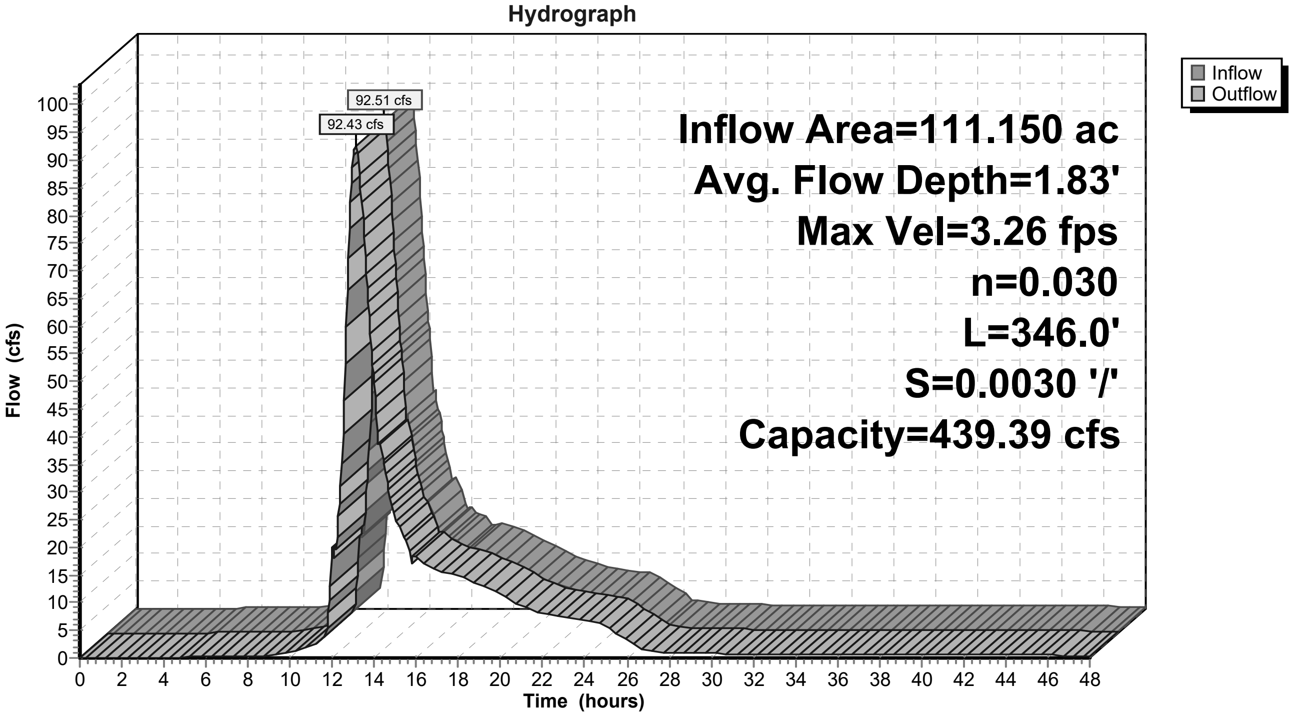
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.26 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 5.9 min

Peak Storage= 9,814 cf @ 13.11 hrs
Average Depth at Peak Storage= 1.83'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 439.39 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 346.0' Slope= 0.0030 '/'
Inlet Invert= 574.51', Outlet Invert= 573.47'

‡

Reach 200R-4: feeder creek



Summary for Reach 200R-5: feeder creek

```
Inflow Area =      111.150 ac, 28.72% Impervious, Inflow Depth >  2.74"   for 100-yr storm event
Inflow      =        92.44 cfs @  13.11 hrs, Volume=          25.374 af
Outflow     =        92.39 cfs @  13.12 hrs, Volume=          25.369 af, Atten= 0%, Lag= 1.0 min
```

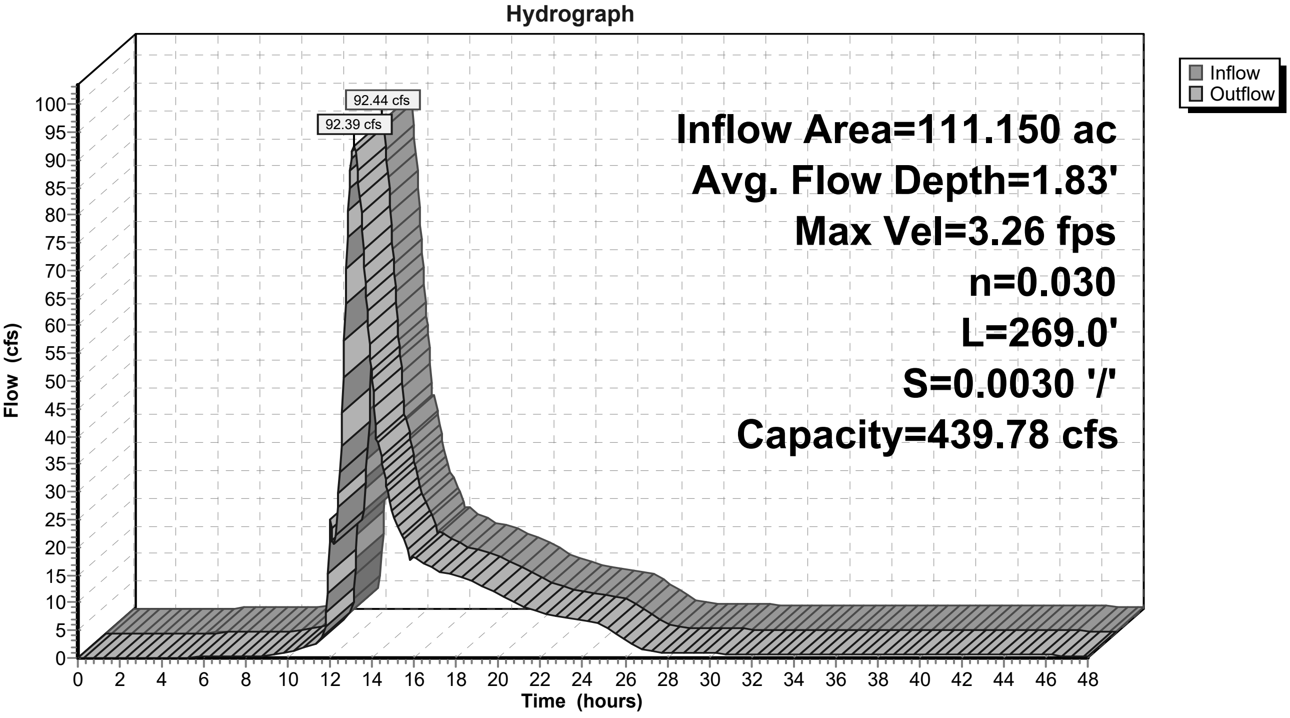
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.26 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 4.6 min

Peak Storage= 7,623 cf @ 13.12 hrs
Average Depth at Peak Storage= 1.83'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 439.78 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 269.0' Slope= 0.0030 '/'
Inlet Invert= 573.47', Outlet Invert= 572.66'

‡

Reach 200R-5: feeder creek



Summary for Reach 200R-6: feeder creek

Inflow Area = 152.510 ac, 20.93% Impervious, Inflow Depth > 2.76" for 100-yr storm event
Inflow = 93.08 cfs @ 13.14 hrs, Volume= 35.140 af
Outflow = 93.07 cfs @ 13.15 hrs, Volume= 35.130 af, Atten= 0%, Lag= 0.4 min

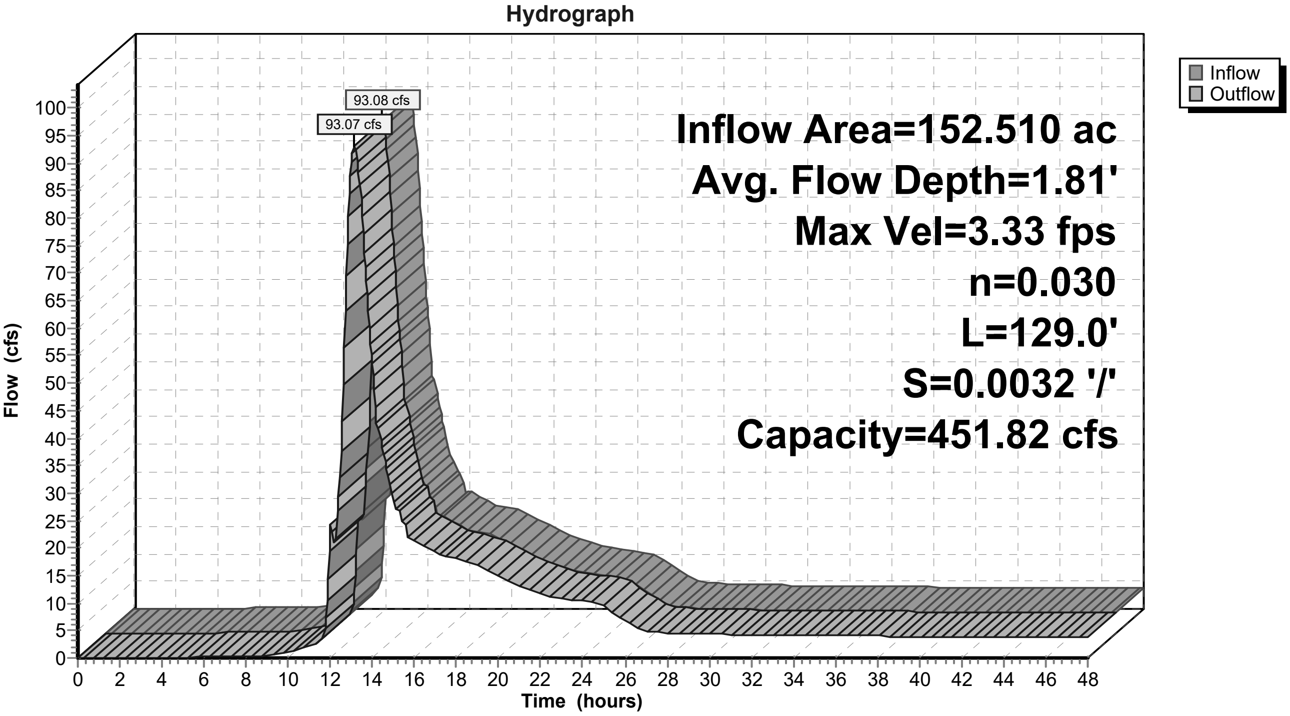
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.33 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 1.6 min

Peak Storage= 3,605 cf @ 13.15 hrs
Average Depth at Peak Storage= 1.81'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 451.82 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 129.0' Slope= 0.0032 '/'
Inlet Invert= 572.00', Outlet Invert= 571.59'

‡

Reach 200R-6: feeder creek



Summary for Reach 232R: ditch

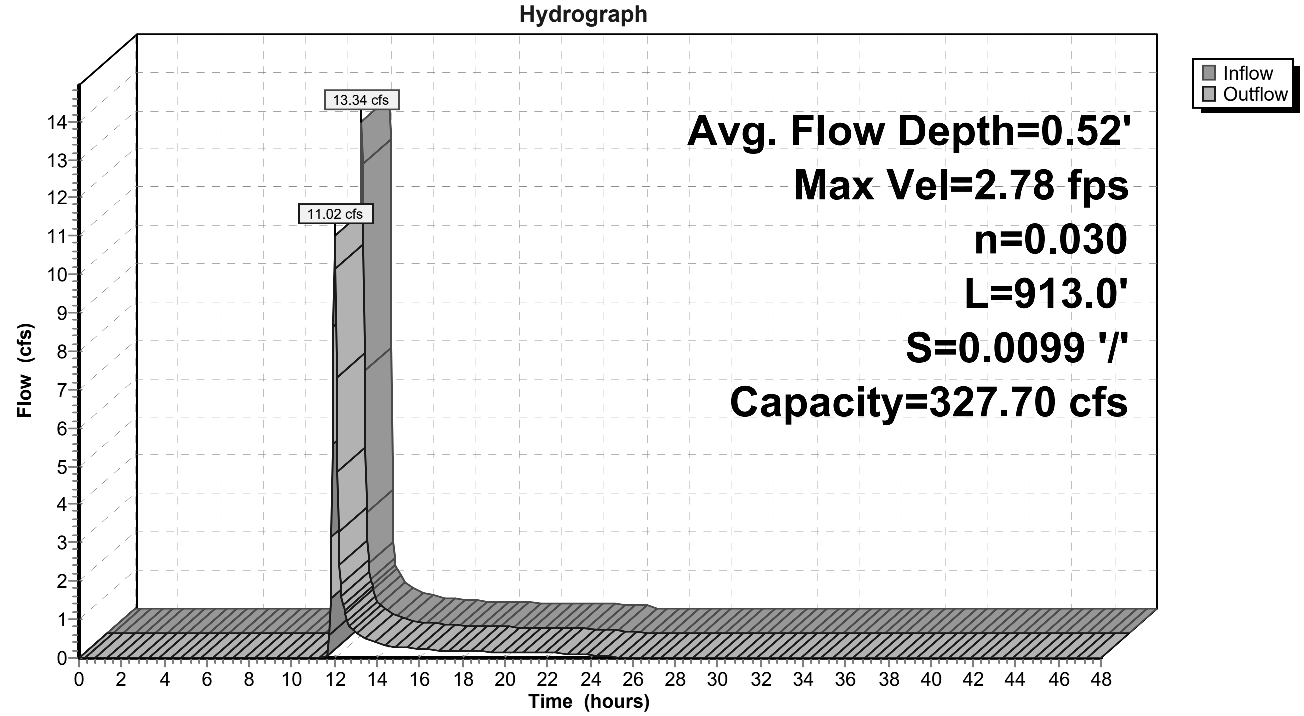
Inflow	=	13.34 cfs @	11.96 hrs, Volume=	0.495 af	
Outflow	=	11.02 cfs @	12.01 hrs, Volume=	0.495 af,	Atten= 17%, Lag= 2.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.78 fps, Min. Travel Time= 5.5 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 22.4 min

Peak Storage= 3,616 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 3.00' Flow Area= 45.0 sf, Capacity= 327.70 cfs

6.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 24.00'
Length= 913.0' Slope= 0.0099 '/'
Inlet Invert= 584.00', Outlet Invert= 575.00'

Reach 232R: ditch



Summary for Reach 233R: ditch

Inflow Area = 33.760 ac, 73.79% Impervious, Inflow Depth > 2.86" for 100-yr storm event
Inflow = 53.28 cfs @ 11.98 hrs, Volume= 8.055 af
Outflow = 52.43 cfs @ 11.99 hrs, Volume= 8.048 af, Atten= 2%, Lag= 0.9 min

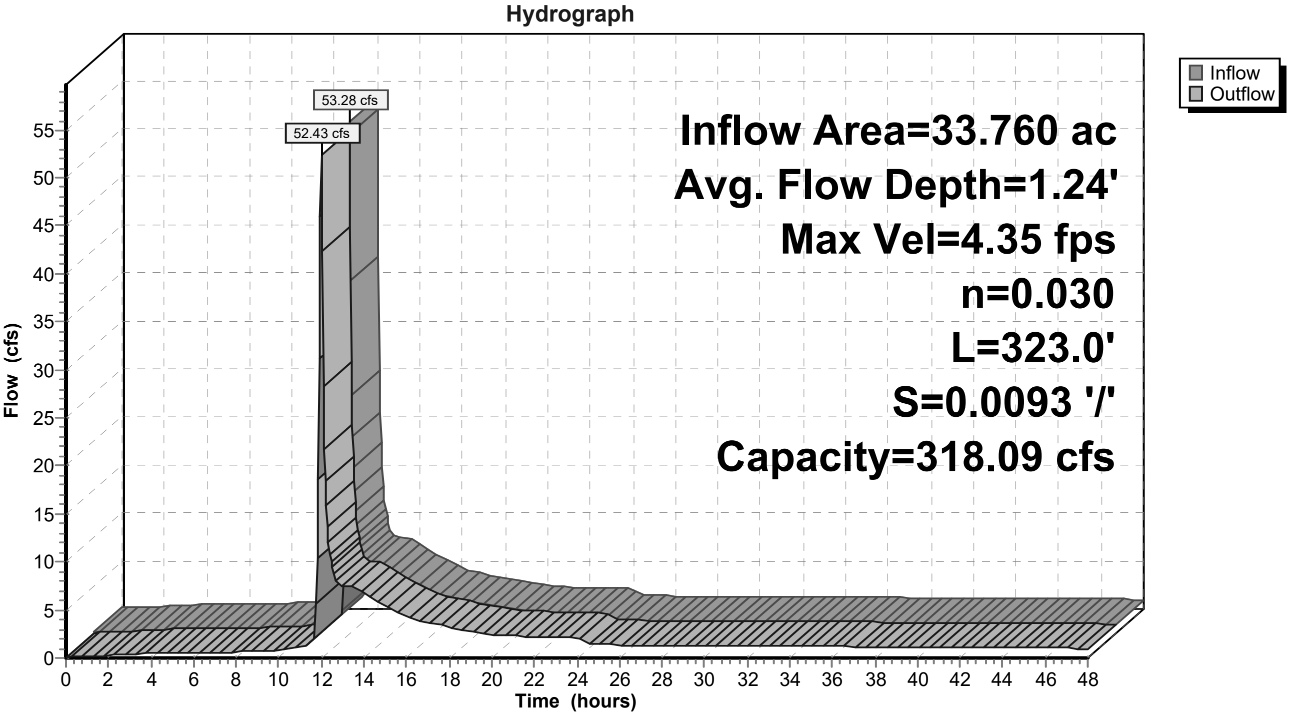
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.35 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.37 fps, Avg. Travel Time= 3.9 min

Peak Storage= 3,891 cf @ 11.99 hrs
Average Depth at Peak Storage= 1.24'
Bank-Full Depth= 3.00' Flow Area= 45.0 sf, Capacity= 318.09 cfs

6.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 24.00'
Length= 323.0' Slope= 0.0093 '/'
Inlet Invert= 575.00', Outlet Invert= 572.00'

‡

Reach 233R: ditch



Summary for Pond 210C: twin 36" culverts

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 2.74" for 100-yr storm event
Inflow = 92.39 cfs @ 13.12 hrs, Volume= 25.369 af
Outflow = 92.39 cfs @ 13.12 hrs, Volume= 25.369 af, Atten= 0%, Lag= 0.0 min
Primary = 46.20 cfs @ 13.12 hrs, Volume= 12.685 af
Secondary = 46.20 cfs @ 13.12 hrs, Volume= 12.685 af

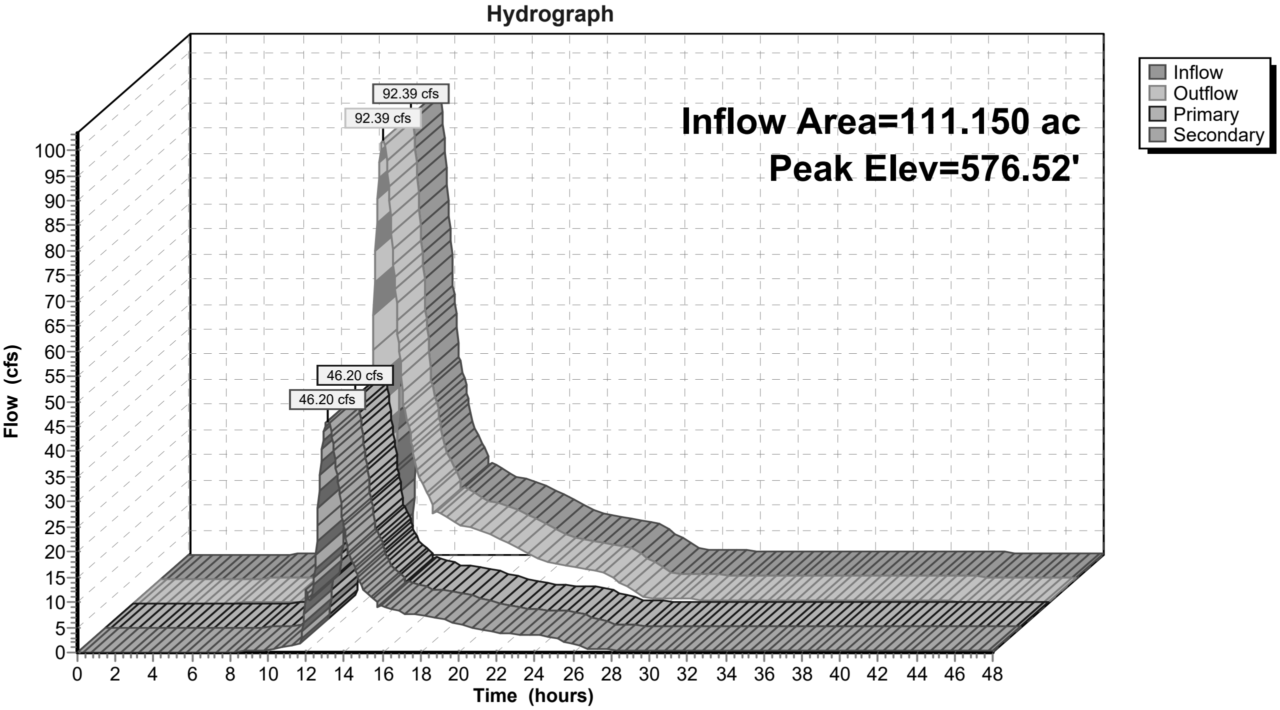
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 576.52' @ 13.12 hrs
Flood Elev= 588.31'

Device	Routing	Invert	Outlet Devices
#1	Primary	572.58'	**36.0" Round Culvert w/ 7.0" inside fill** L= 78.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 572.00' / 571.77' S= 0.0029 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 6.10 sf
#2	Secondary	572.58'	**36.0" Round Culvert w/ 7.0" inside fill** L= 78.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 572.00' / 571.77' S= 0.0029 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 6.10 sf

Primary OutFlow Max=46.15 cfs @ 13.12 hrs HW=576.52' TW=573.81' (Dynamic Tailwater)
↰**1=Culvert** (Barrel Controls 46.15 cfs @ 7.56 fps)

Secondary OutFlow Max=46.15 cfs @ 13.12 hrs HW=576.52' TW=573.81' (Dynamic Tailwater)
↰**2=Culvert** (Barrel Controls 46.15 cfs @ 7.56 fps)

Pond 210C: twin 36" culverts



Summary for Pond 230Bio: bioretention

```
Inflow Area =      10.460 ac, 84.61% Impervious, Inflow Depth >  2.97"   for 100-yr storm event
Inflow      =     31.33 cfs @  11.97 hrs, Volume=          2.593 af
Outflow     =      0.93 cfs @  14.45 hrs, Volume=          1.538 af, Atten= 97%, Lag= 148.9 min
Primary     =      0.93 cfs @  14.45 hrs, Volume=          1.538 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.05' @ 14.45 hrs   Surf.Area= 34,373 sf   Storage= 79,916 cf
Flood Elev= 587.00'   Surf.Area= 36,710 sf   Storage= 113,744 cf

Plug-Flow detention time= 927.3 min calculated for 1.536 af (59% of inflow)
Center-of-Mass det. time= 767.9 min ( 1,551.6 - 783.8 )

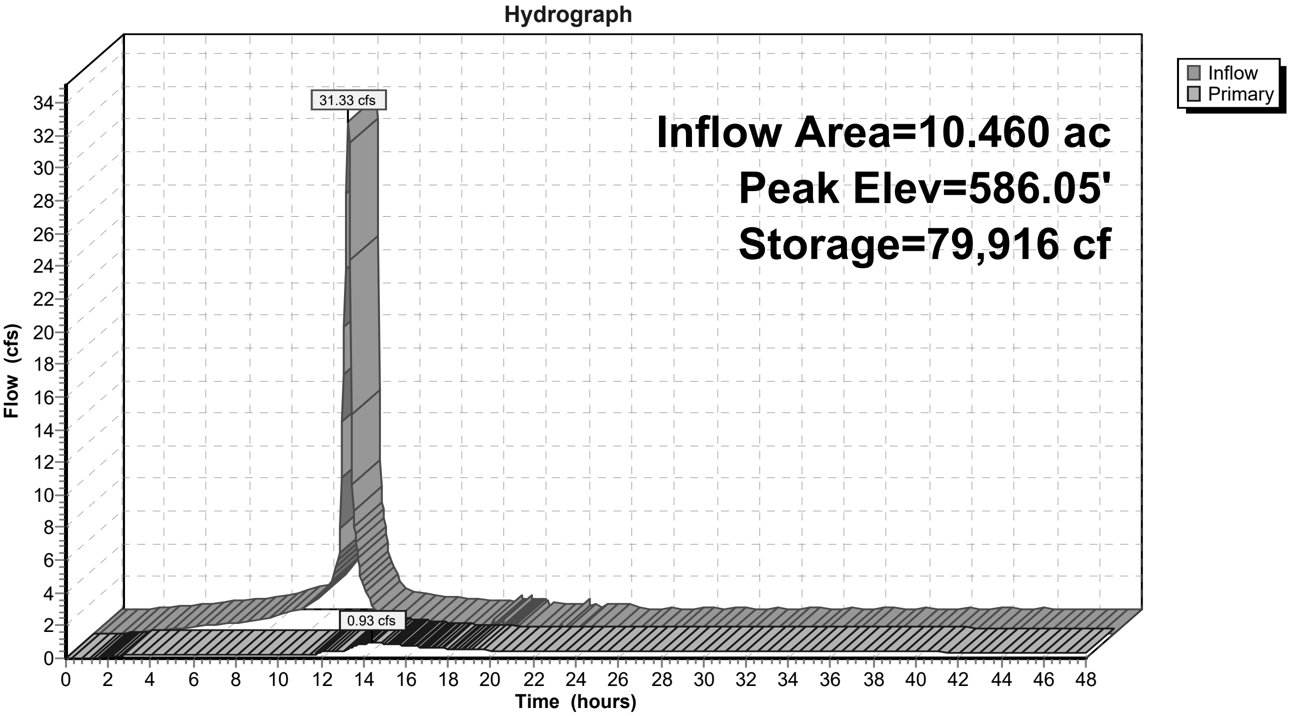
Volume      Invert    Avail.Storage   Storage Description
   #1      583.50'       113,744 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

  Elevation       Surf.Area        Inc.Store       Cum.Store
     (feet)         (sq-ft)     (cubic-feet)    (cubic-feet)
     583.50          28,375                0               0
     584.00          29,530           14,476          14,476
     586.00          34,255           63,785          78,261
     587.00          36,710           35,483         113,744

Device   Routing          Invert   Outlet Devices
   #1    Primary         580.08'   12.0"  Round Culvert
                                   L= 24.0'   CPP, square edge headwall,  Ke= 0.500
                                   Inlet / Outlet Invert= 580.08' / 579.80'   S= 0.0117 '/'   Cc= 0.900
                                   n= 0.012  Concrete pipe, finished,  Flow Area= 0.79 sf
   #2    Device 1        580.08'   6.0" Vert. Underdrain   C= 0.600
   #3    Device 1        584.50'   3.0" Vert. Orifice   C= 0.600
   #4    Device 1        586.00'   48.0" x 30.0" Horiz. Grate   C= 0.600
                                   Limited to weir flow at low heads
   #5    Device 2        583.50'   0.250 in/hr Exfiltration through bioretention media over Surface area

Primary OutFlow Max=0.93 cfs @ 14.45 hrs  HW=586.05'  TW=579.85'   (Dynamic Tailwater)
└─1=Culvert  (Passes 0.93 cfs of 8.84 cfs potential flow)
   ├─2=Underdrain  (Passes 0.20 cfs of 2.26 cfs potential flow)
   │  └─5=Exfiltration through bioretention media(Exfiltration Controls 0.20 cfs)
   ├─3=Orifice  (Orifice Controls 0.28 cfs @ 5.74 fps)
   └─4=Grate  (Weir Controls 0.45 cfs @ 0.72 fps)
```

Pond 230Bio: bioretention



Summary for Pond 230F: forebay

```
Inflow Area =       10.460 ac, 84.61% Impervious, Inflow Depth =  3.10"   for  100-yr storm event
Inflow      =      35.24 cfs @  11.96 hrs, Volume=          2.703 af
Outflow     =      31.33 cfs @  11.97 hrs, Volume=          2.593 af,  Atten= 11%,  Lag= 0.3 min
Primary     =      31.33 cfs @  11.97 hrs, Volume=          2.593 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.00'  Surf.Area= 3,925 sf  Storage= 10,445 cf
Peak Elev= 586.05' @ 14.45 hrs  Surf.Area= 5,563 sf  Storage= 20,178 cf  (9,733 cf above start)
Flood Elev= 587.00'  Surf.Area= 6,405 sf  Storage= 25,853 cf  (15,408 cf above start)

Plug-Flow detention time= 160.6 min calculated for 2.351 af (87% of inflow)
Center-of-Mass det. time= 60.4 min ( 783.8 - 723.4 )

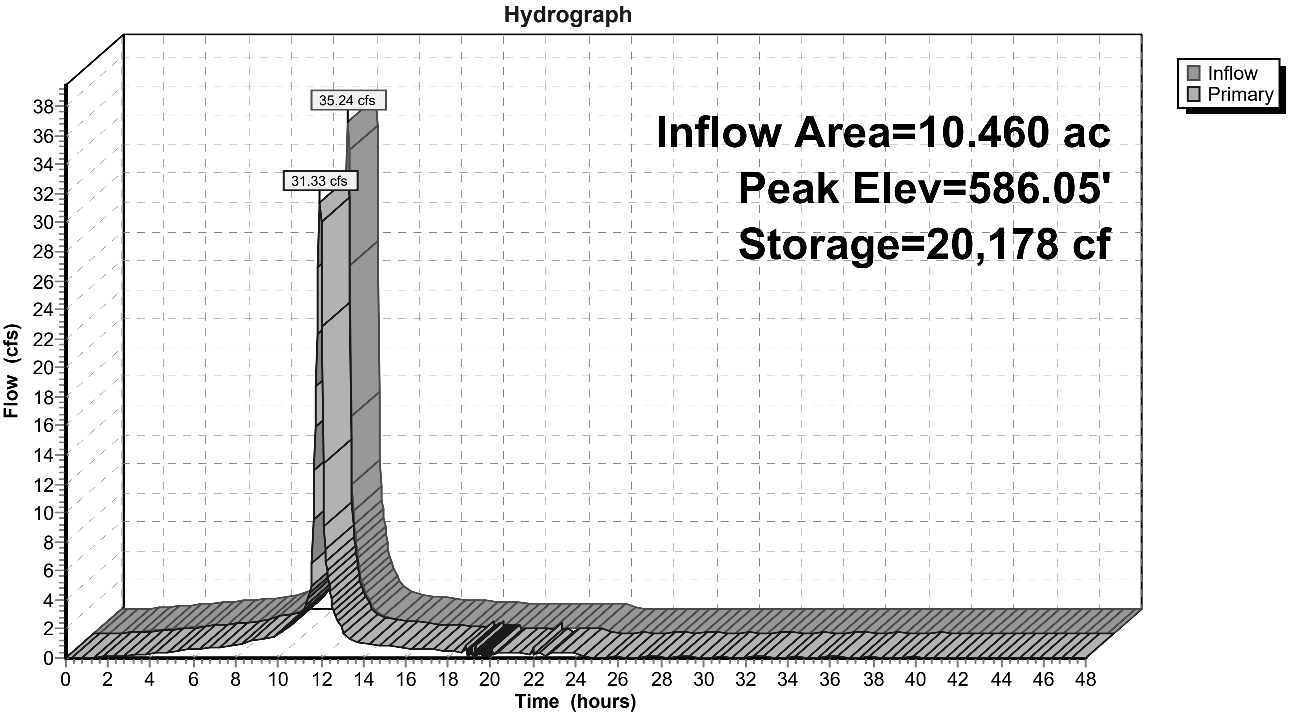
Volume      Invert     Avail.Storage  Storage Description
   #1       580.00'        25,853 cf  Custom Stage Data (Prismatic)Listed below

 Elevation        Surf.Area        Inc.Store       Cum.Store
    (feet)           (sq-ft)     (cubic-feet)    (cubic-feet)
    580.00             1,410                0               0
    582.00             2,555            3,965           3,965
    584.00             3,925            6,480          10,445
    586.00             5,520            9,445          19,890
    587.00             6,405            5,963          25,853

Device   Routing          Invert   Outlet Devices
   #1    Primary          584.00'  162.0 deg x 10.0' long x 3.00' rise overflow weir Cv= 2.47 (C= 3.09)

Primary OutFlow Max=30.73 cfs @ 11.97 hrs  HW=585.32'  TW=585.24'   (Dynamic Tailwater)
└─1=overflow weir  (Weir Controls 30.73 cfs @ 1.27 fps)
```

Pond 230F: forebay



Summary for Pond 231Bio: bioretention

```
Inflow Area =       10.810 ac,  81.13% Impervious,  Inflow Depth >   3.47"    for  100-yr storm event
Inflow      =       42.60 cfs @   11.97 hrs,  Volume=          3.126 af
Outflow     =        1.70 cfs @   13.76 hrs,  Volume=          1.861 af,  Atten= 96%,  Lag= 107.1 min
Primary     =        1.70 cfs @   13.76 hrs,  Volume=          1.861 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.09' @ 13.76 hrs   Surf.Area= 38,069 sf   Storage= 91,187 cf
Flood Elev= 587.00'   Surf.Area= 40,170 sf   Storage= 126,690 cf

Plug-Flow detention time= 884.6 min calculated for 1.831 af (59% of inflow)
Center-of-Mass det. time= 686.2 min ( 1,465.6 - 779.3 )

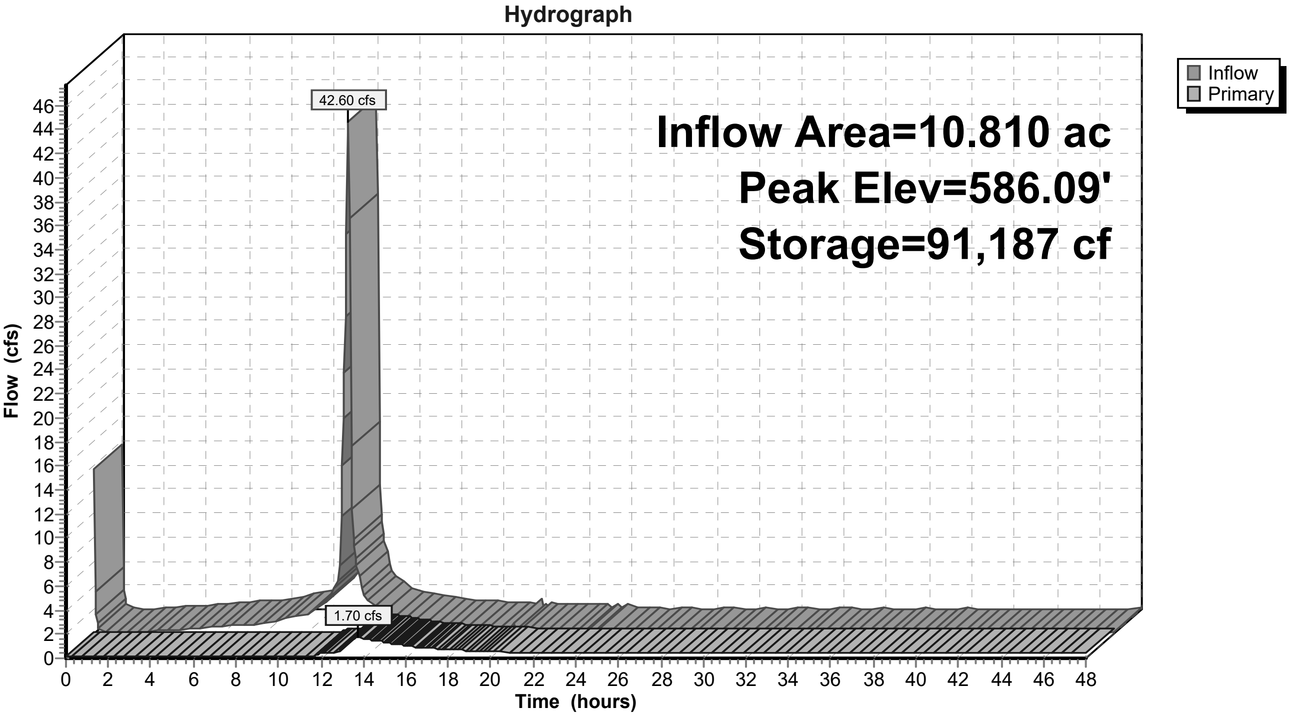
Volume        Invert    Avail.Storage   Storage Description
   #1        583.50'       126,690 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation          Surf.Area         Inc.Store        Cum.Store
    (feet)             (sq-ft)       (cubic-feet)     (cubic-feet)
    583.50              32,315                 0                0
    584.00              33,395            16,428           16,428
    586.00              37,855            71,250           87,678
    587.00              40,170            39,013          126,690

Device   Routing            Invert   Outlet Devices
   #1    Primary           580.00'   12.0"  Round Culvert
                                     L= 13.0'   CPP, square edge headwall,  Ke= 0.500
                                     Inlet / Outlet Invert= 580.00' / 579.50'   S= 0.0385 '/'   Cc= 0.900
                                     n= 0.012  Concrete pipe, finished,  Flow Area= 0.79 sf
   #2    Device 1          580.08'   6.0" Vert. Underdrain   C= 0.600
   #3    Device 1          584.50'   3.0" Vert. Orifice   C= 0.600
   #4    Device 1          586.00'   48.0" x 30.0" Horiz. Grate   C= 0.600
                                     Limited to weir flow at low heads
   #5    Device 2          583.50'   0.250 in/hr Exfiltration through bioretention media over Surface area

Primary OutFlow Max=1.70 cfs @ 13.76 hrs  HW=586.09'  TW=578.89'   (Dynamic Tailwater)
↑
└─1=Culvert  (Passes 1.70 cfs of 8.94 cfs potential flow)
   ↑
   ├─2=Underdrain  (Passes 0.22 cfs of 2.27 cfs potential flow)
   │  ↑
   │  └─5=Exfiltration through bioretention media(Exfiltration Controls 0.22 cfs)
   ├─3=Orifice  (Orifice Controls 0.29 cfs @ 5.83 fps)
   └─4=Grate  (Weir Controls 1.19 cfs @ 0.99 fps)
```

Pond 231Bio: bioretention



Summary for Pond 231F: forebay

```
Inflow Area =        10.810 ac,  81.13% Impervious,  Inflow Depth =   3.54"    for  100-yr storm event
Inflow       =       49.31 cfs @   11.96 hrs,  Volume=             3.185 af
Outflow      =       42.60 cfs @   11.97 hrs,  Volume=             3.126 af,  Atten= 14%,  Lag= 0.7 min
Primary      =       42.60 cfs @   11.97 hrs,  Volume=             3.126 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.50' Surf.Area= 5,653 sf Storage= 14,163 cf
Peak Elev= 586.09' @ 13.76 hrs Surf.Area= 7,611 sf Storage= 24,719 cf (10,555 cf above start)
Flood Elev= 587.00' Surf.Area= 8,800 sf Storage= 32,165 cf (18,002 cf above start)

Plug-Flow detention time= 160.1 min calculated for 2.798 af (88% of inflow)
Center-of-Mass det. time= 45.3 min (779.3 - 734.0)

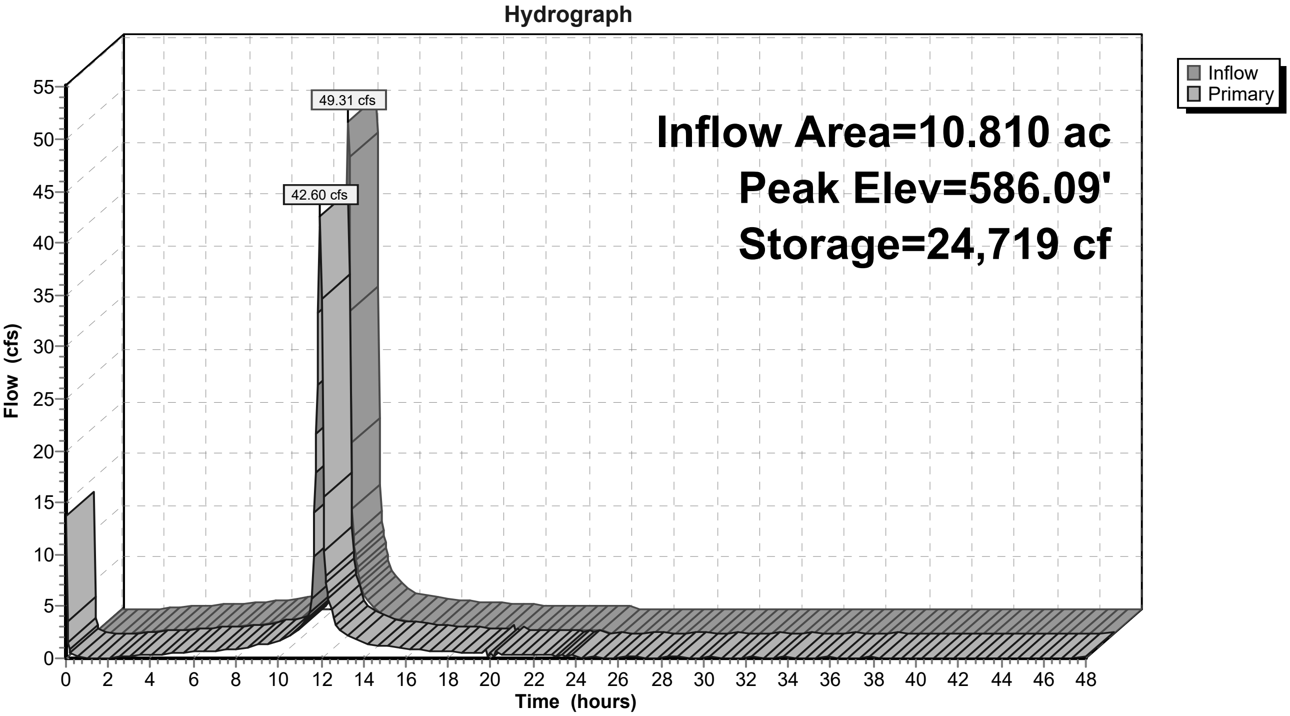
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	32,165 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	820	0	0
582.00	2,815	3,635	3,635
584.00	5,040	7,855	11,490
586.00	7,490	12,530	24,020
587.00	8,800	8,145	32,165

Device	Routing	Invert	Outlet Devices
#1	Primary	584.00'	**162.0 deg x 10.0' long x 2.50' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=41.69 cfs @ 11.97 hrs HW=585.41' TW=585.28' (Dynamic Tailwater)
↑—**1=overflow weir** (Weir Controls 41.69 cfs @ 1.57 fps)

Pond 231F: forebay



Summary for Pond 232Bio: bioretention

```
Inflow Area =      9.260 ac, 60.80% Impervious, Inflow Depth >  3.25"   for 100-yr storm event
Inflow     =      38.21 cfs @  11.97 hrs, Volume=          2.511 af
Outflow    =       2.91 cfs @  12.67 hrs, Volume=          1.740 af, Atten= 92%, Lag= 42.3 min
Primary    =       2.91 cfs @  12.67 hrs, Volume=          1.740 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.15' @ 12.67 hrs Surf.Area= 26,333 sf Storage= 63,427 cf
Flood Elev= 587.00' Surf.Area= 27,940 sf Storage= 86,503 cf

Plug-Flow detention time= 729.9 min calculated for 1.738 af (69% of inflow)
Center-of-Mass det. time= 574.5 min (1,402.9 - 828.4)

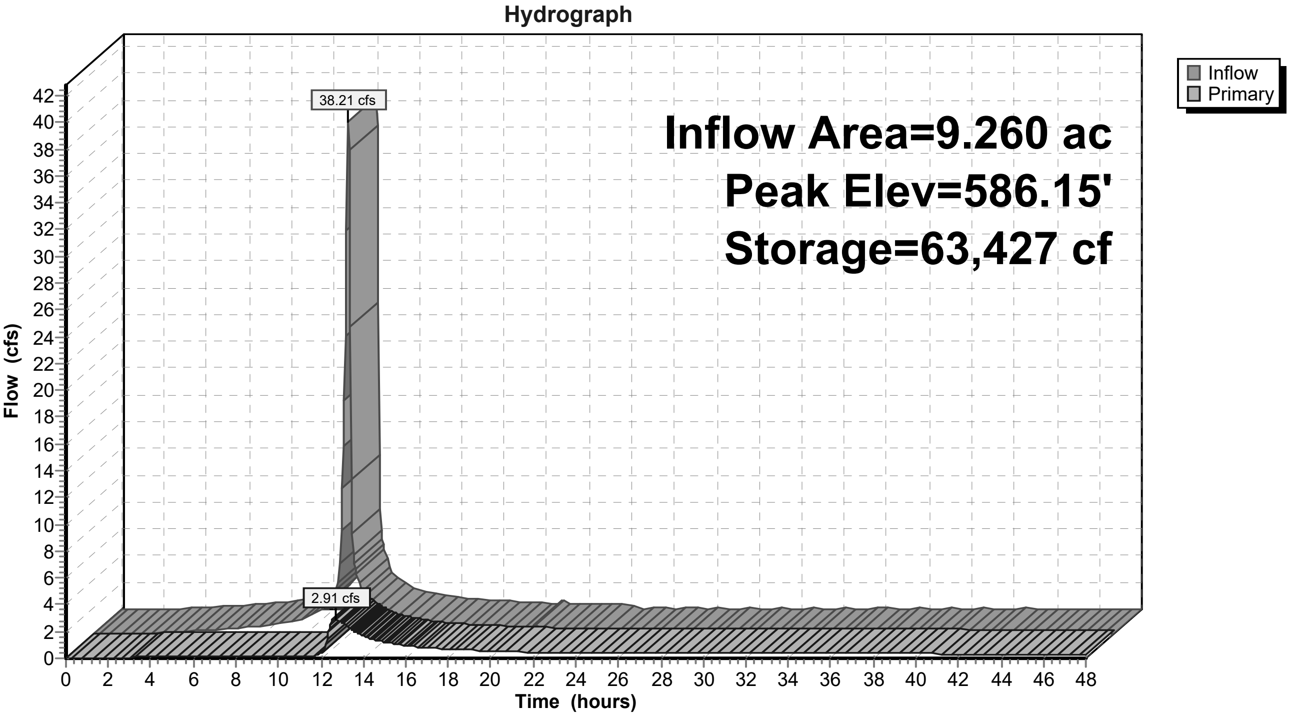
Volume	Invert	Avail.Storage	Storage Description
#1	583.50'	86,503 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
583.50	21,580	0	0
584.00	22,450	11,008	11,008
586.00	26,050	48,500	59,508
587.00	27,940	26,995	86,503

Device	Routing	Invert	Outlet Devices
#1	Primary	580.08'	**12.0" Round Culvert** L= 59.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.08' / 579.80' S= 0.0047 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	580.08'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	584.50'	**3.0" Vert. Orifice** C= 0.600
#4	Device 1	586.00'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	583.50'	**0.250 in/hr Exfiltration through bioretention media over Surface area**

```
Primary OutFlow Max=2.90 cfs @ 12.67 hrs HW=586.15' TW=580.09' (Dynamic Tailwater)
└─1=Culvert (Passes 2.90 cfs of 8.31 cfs potential flow)
   ├─2=Underdrain (Passes 0.15 cfs of 2.28 cfs potential flow)
   │  └─5=Exfiltration through bioretention media(Exfiltration Controls 0.15 cfs)
   ├─3=Orifice (Orifice Controls 0.29 cfs @ 5.95 fps)
   └─4=Grate (Weir Controls 2.46 cfs @ 1.26 fps)
```

Pond 232Bio: bioretention



Summary for Pond 232F: forebay

Inflow Area = 9.260 ac, 60.80% Impervious, Inflow Depth = 3.37" for 100-yr storm event
Inflow = 44.40 cfs @ 11.96 hrs, Volume= 2.598 af
Outflow = 38.21 cfs @ 11.97 hrs, Volume= 2.511 af, Atten= 14%, Lag= 0.2 min
Primary = 38.21 cfs @ 11.97 hrs, Volume= 2.511 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.00' Surf.Area= 3,625 sf Storage= 9,890 cf
Peak Elev= 586.15' @ 12.67 hrs Surf.Area= 5,180 sf Storage= 19,342 cf (9,452 cf above start)
Flood Elev= 587.00' Surf.Area= 5,860 sf Storage= 24,035 cf (14,145 cf above start)

Plug-Flow detention time= 164.7 min calculated for 2.284 af (88% of inflow)
Center-of-Mass det. time= 67.2 min (828.4 - 761.2)

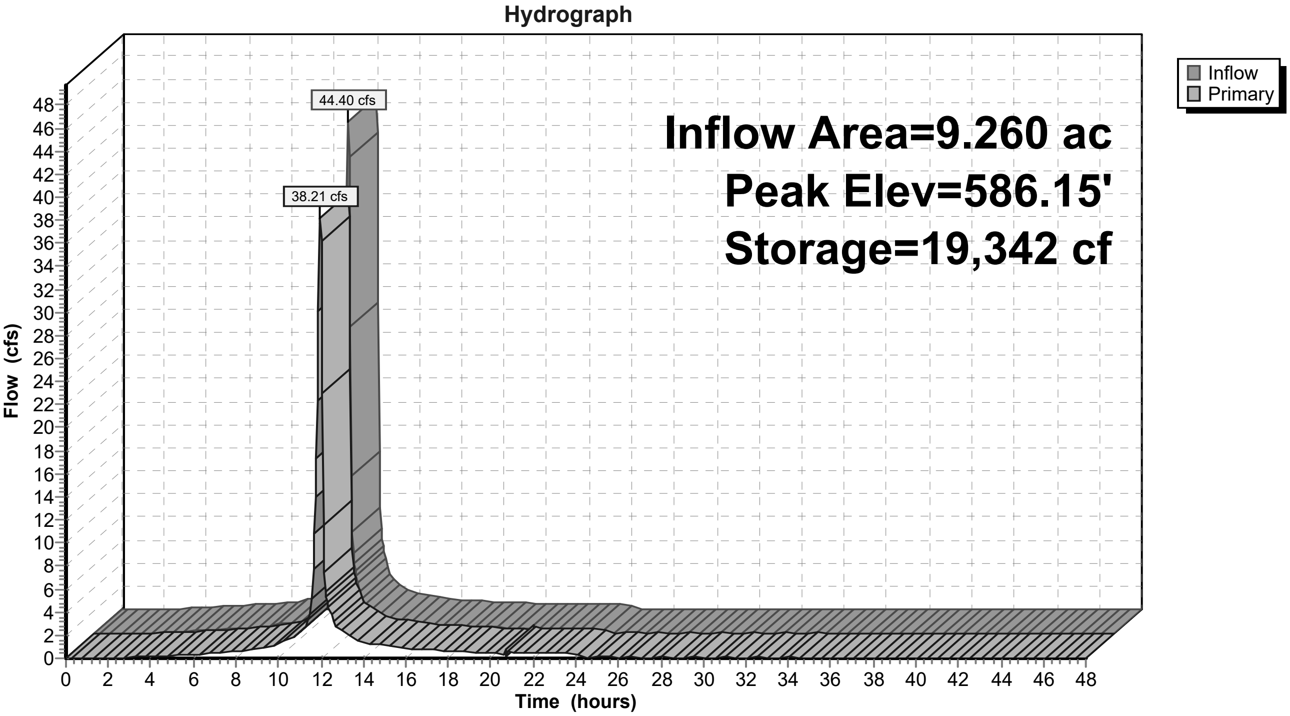
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	24,035 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	1,435	0	0
582.00	2,415	3,850	3,850
584.00	3,625	6,040	9,890
586.00	5,060	8,685	18,575
587.00	5,860	5,460	24,035

Device	Routing	Invert	Outlet Devices
#1	Primary	584.00'	**162.0 deg x 10.0' long x 3.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=36.90 cfs @ 11.97 hrs HW=585.50' TW=585.42' (Dynamic Tailwater)
↑—**1=overflow weir** (Weir Controls 36.90 cfs @ 1.26 fps)

Pond 232F: forebay



Summary for Pond 239P: wet pond

```
Inflow Area =        41.360 ac,    0.00% Impervious,  Inflow Depth >   8.73"    for  100-yr storm event
Inflow       =      116.49 cfs @   13.05 hrs,  Volume=          30.099 af
Outflow      =        3.61 cfs @   25.64 hrs,  Volume=            9.771 af,  Atten= 97%,  Lag= 755.6 min
Primary      =        3.61 cfs @   25.64 hrs,  Volume=            9.771 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= 0.05 hrs / 3
Starting Elev= 575.00' Surf.Area= 496,958 sf Storage= 13,083,100 cf
Peak Elev= 577.19' @ 25.64 hrs Surf.Area= 521,391 sf Storage= 14,196,150 cf (1,113,050 cf above start)
Flood Elev= 579.00' Surf.Area= 541,980 sf Storage= 15,160,446 cf (2,077,346 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 883.4 min (1,839.2 - 955.8)

Volume	Invert	Avail.Storage	Storage Description
#1	540.00'	15,160,446 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
540.00	288,900	0	0
542.00	297,925	586,825	586,825
544.00	307,060	604,985	1,191,810
546.00	316,290	623,350	1,815,160
548.00	325,630	641,920	2,457,080
550.00	335,065	660,695	3,117,775
552.00	344,605	679,670	3,797,445
554.00	354,245	698,850	4,496,295
556.00	363,990	718,235	5,214,530
558.00	373,830	737,820	5,952,350
560.00	383,775	757,605	6,709,955
562.00	393,825	777,600	7,487,555
564.00	403,975	797,800	8,285,355
566.00	414,225	818,200	9,103,555
568.00	424,575	838,800	9,942,355
570.00	435,030	859,605	10,801,960
572.00	445,585	880,615	11,682,575
573.50	453,440	674,269	12,356,844
574.00	485,890	234,833	12,591,676
576.00	508,025	993,915	13,585,591
578.00	530,560	1,038,585	14,624,176
579.00	541,980	536,270	15,160,446

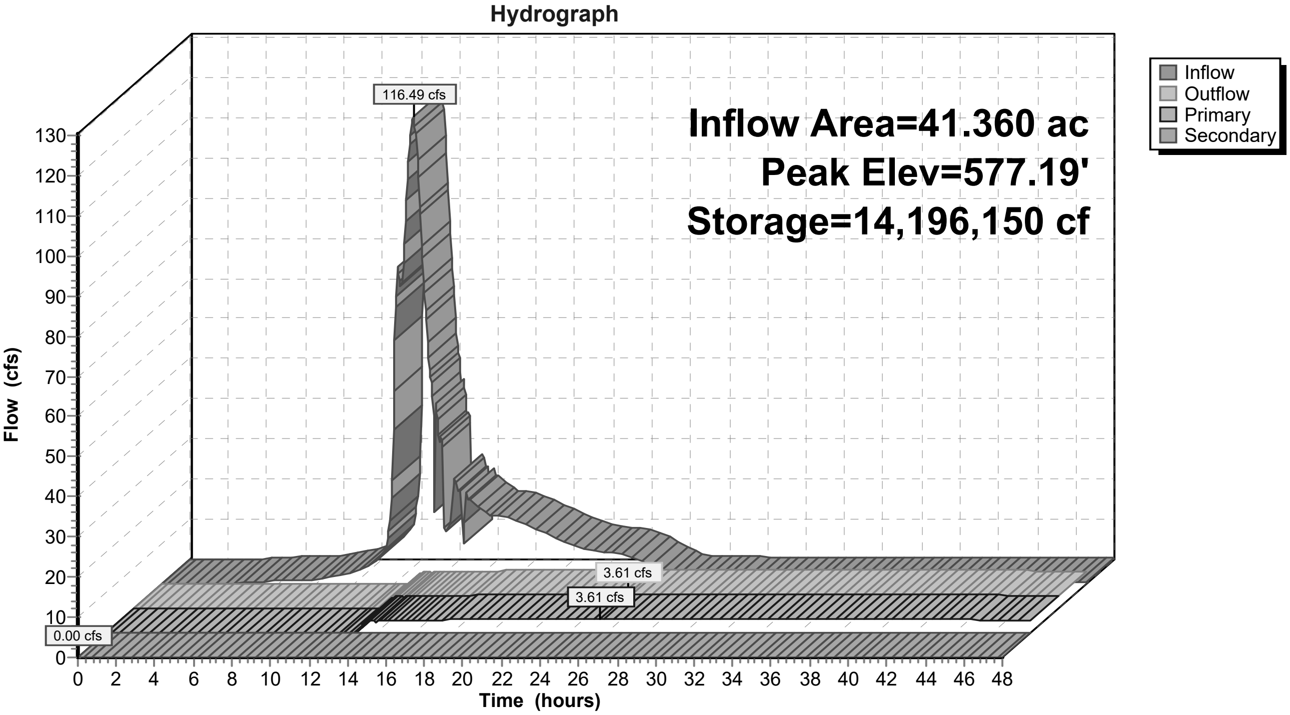
Device	Routing	Invert	Outlet Devices
#1	Primary	575.00'	**12.0" Round Culvert** L= 165.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 575.00' / 574.00' S= 0.0061 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	575.00'	**3.0" Vert. Orifice (internal)** C= 0.600
#3	Device 1	575.75'	**48.0" W x 9.0" H Vert. Slot (internal)** C= 0.600

#4	Device 1	577.50'	**30.0" x 48.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	578.00'	**162.0 deg x 15.0' long x 1.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=3.61 cfs @ 25.64 hrs HW=577.19' TW=572.45' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 3.61 cfs @ 4.59 fps)
  ├─**2=Orifice (internal)** (Passes < 0.34 cfs potential flow)
  ├─**3=Slot (internal)** (Passes < 14.80 cfs potential flow)
  └─**4=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=575.00' TW=573.47' (Dynamic Tailwater)
└─**5=overflow weir** (Controls 0.00 cfs)

Pond 239P: wet pond



Summary for Pond CB204: catch basin

Inflow Area = 5.650 ac, 71.50% Impervious, Inflow Depth = 4.14" for 100-yr storm event
Inflow = 36.29 cfs @ 11.96 hrs, Volume= 1.949 af
Outflow = 36.29 cfs @ 11.96 hrs, Volume= 1.949 af, Atten= 0%, Lag= 0.0 min
Primary = 22.53 cfs @ 11.96 hrs, Volume= 1.705 af
Secondary = 13.77 cfs @ 11.96 hrs, Volume= 0.245 af

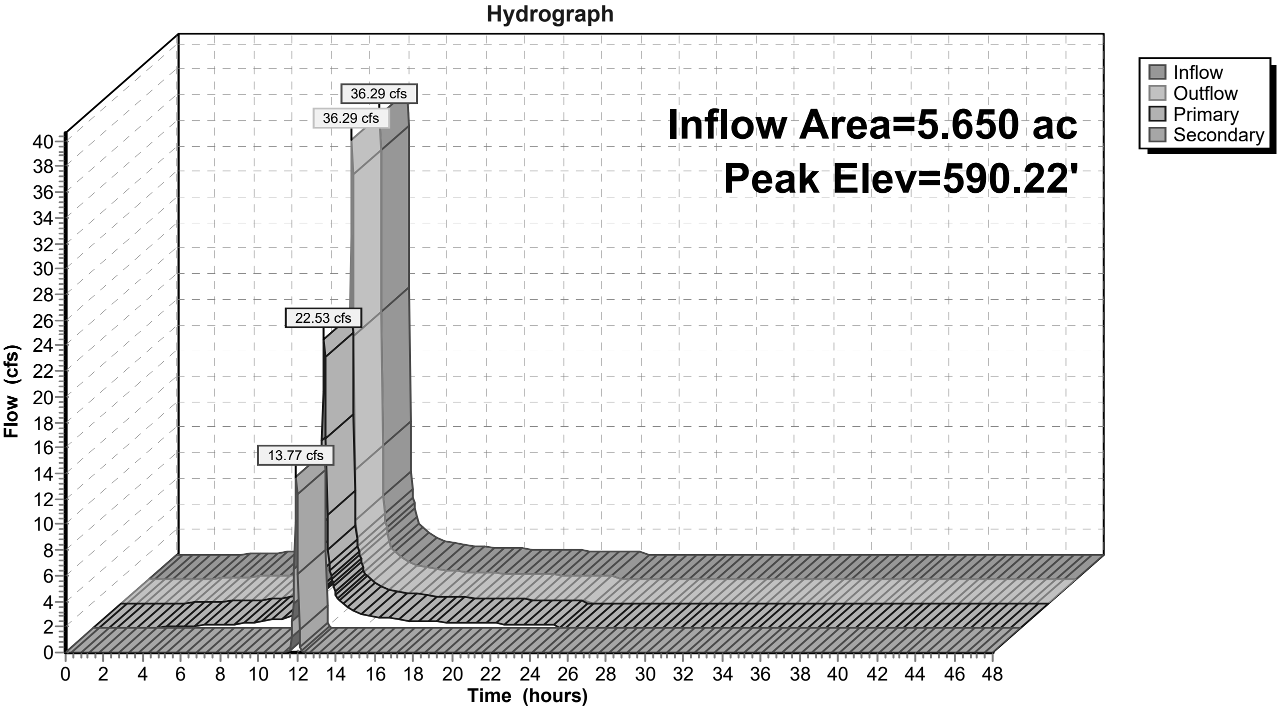
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 590.22' @ 11.96 hrs
Flood Elev= 592.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	585.86'	**24.0" Round Culvert** L= 58.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.86' / 585.39' S= 0.0081 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	586.86'	**18.0" Round Culvert** L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 586.86' / 585.00' S= 0.0338 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=22.34 cfs @ 11.96 hrs HW=590.05' TW=587.87' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 22.34 cfs @ 7.11 fps)

Secondary OutFlow Max=13.36 cfs @ 11.96 hrs HW=590.08' TW=575.27' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 13.36 cfs @ 7.56 fps)

Pond CB204: catch basin



Summary for Pond CB322: catch basin

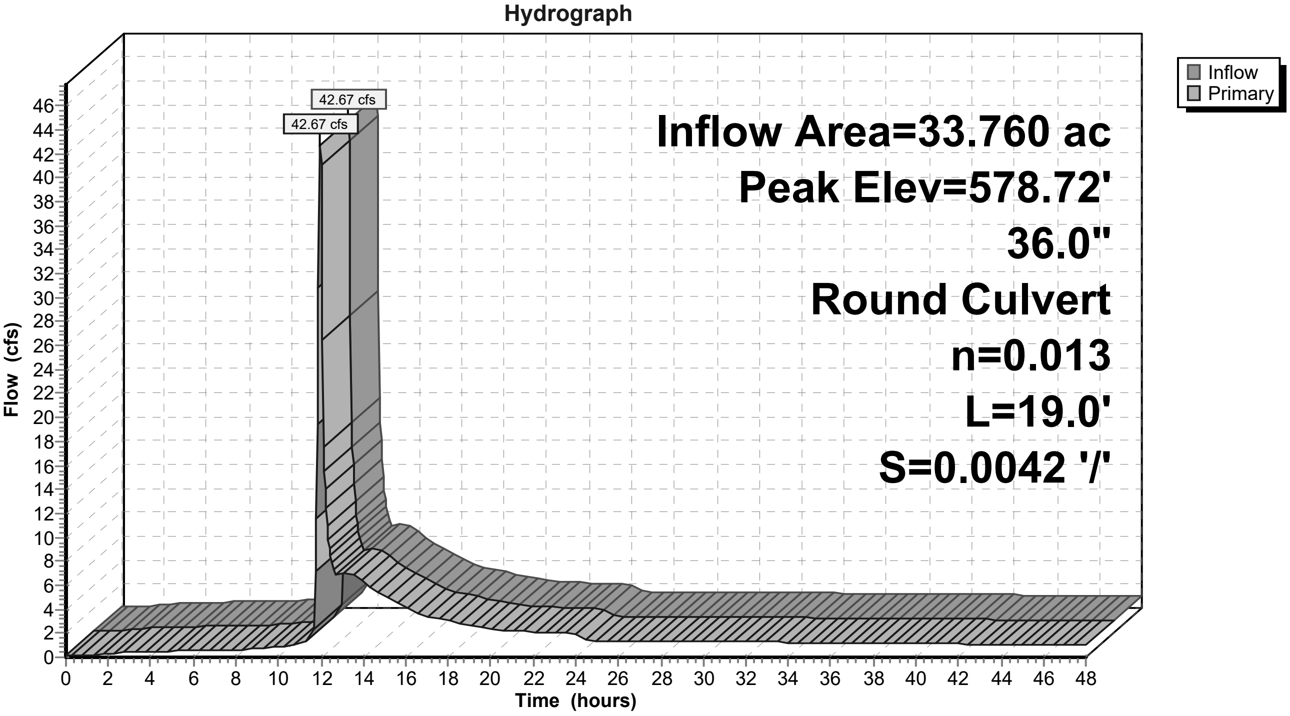
```
Inflow Area =      33.760 ac, 73.79% Impervious,  Inflow Depth >  2.69"   for  100-yr storm event
Inflow      =      42.67 cfs @  11.97 hrs,  Volume=         7.559 af
Outflow     =      42.67 cfs @  11.97 hrs,  Volume=         7.559 af,  Atten= 0%,  Lag= 0.0 min
Primary     =      42.67 cfs @  11.97 hrs,  Volume=         7.559 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 578.72' @ 11.97 hrs
Flood Elev= 582.23'

Device	Routing	Invert	Outlet Devices
#1	Primary	575.08'	**36.0" Round Culvert** L= 19.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 575.08' / 575.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=41.29 cfs @ 11.97 hrs HW=578.63' TW=576.19' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 41.29 cfs @ 6.22 fps)

Pond CB322: catch basin



Summary for Pond CB323: catch basin

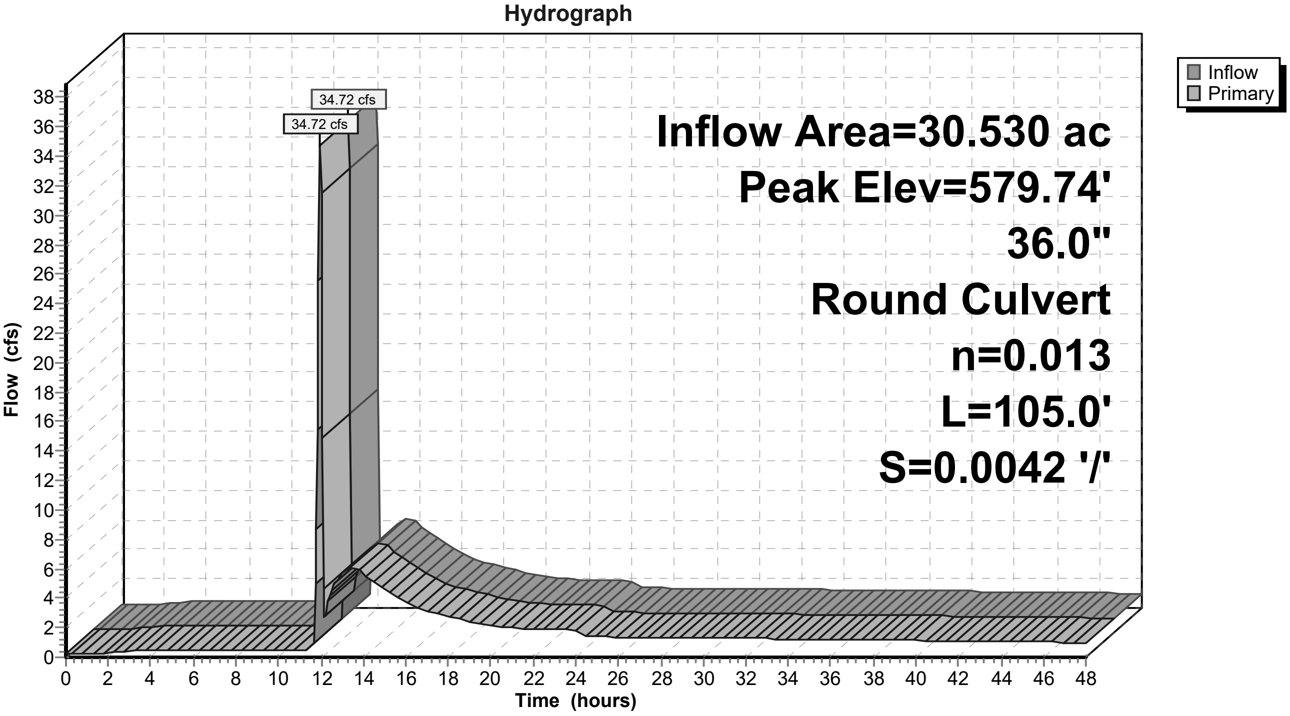
Inflow Area = 30.530 ac, 76.15% Impervious, Inflow Depth > 2.57" for 100-yr storm event
Inflow = 34.72 cfs @ 11.96 hrs, Volume= 6.532 af
Outflow = 34.72 cfs @ 11.96 hrs, Volume= 6.532 af, Atten= 0%, Lag= 0.0 min
Primary = 34.72 cfs @ 11.96 hrs, Volume= 6.532 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 579.74' @ 11.97 hrs
Flood Elev= 580.79'

Device	Routing	Invert	Outlet Devices
#1	Primary	575.52'	**36.0" Round Culvert** L= 105.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 575.52' / 575.08' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=33.62 cfs @ 11.96 hrs HW=579.61' TW=578.64' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 33.62 cfs @ 4.76 fps)

Pond CB323: catch basin



Summary for Pond CB402: diversion CB

Inflow Area =	7.280 ac, 77.06% Impervious, Inflow Depth = 4.25" for 100-yr storm event			
Inflow =	47.37 cfs @	11.96 hrs, Volume=	2.579 af	
Outflow =	47.37 cfs @	11.96 hrs, Volume=	2.579 af,	Atten= 0%, Lag= 0.0 min
Primary =	34.03 cfs @	11.96 hrs, Volume=	2.084 af	
Secondary =	13.34 cfs @	11.96 hrs, Volume=	0.495 af	

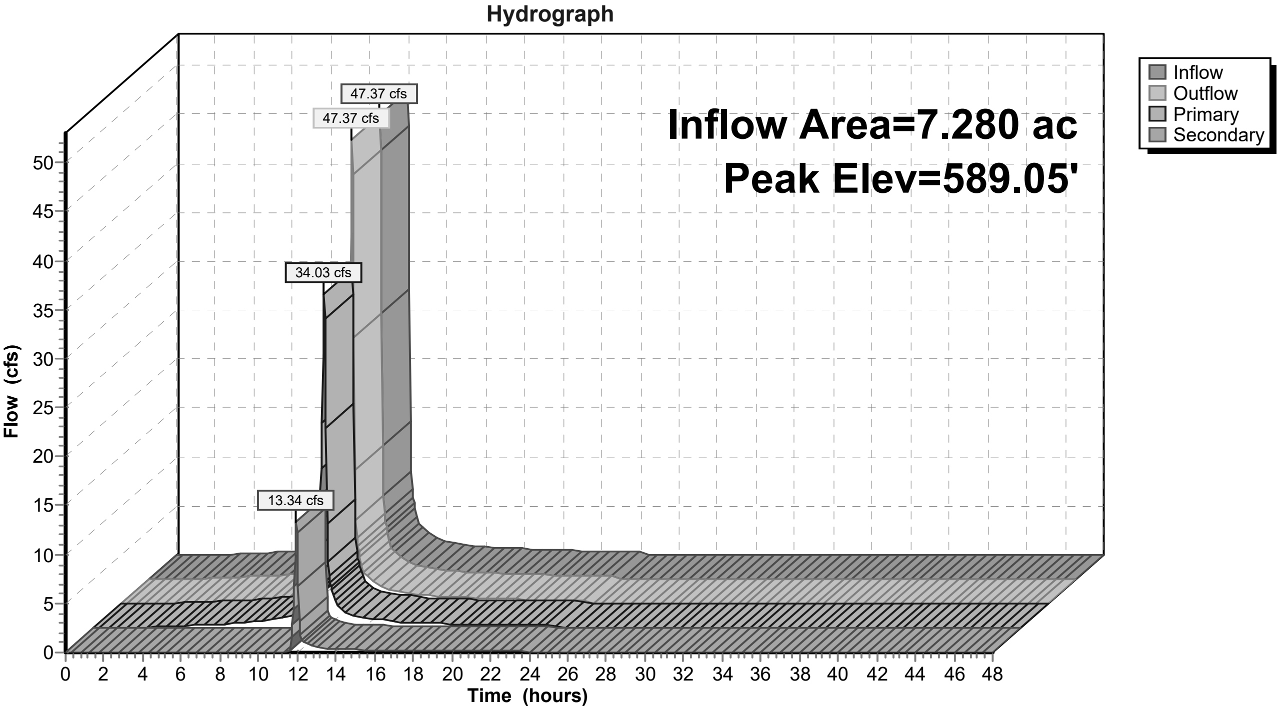
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 589.05' @ 11.96 hrs
Flood Elev= 589.59'

Device	Routing	Invert	Outlet Devices
#1	Primary	584.86'	**30.0" Round Culvert** L= 205.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 584.86' / 584.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Secondary	585.86'	**18.0" Round Culvert** L= 64.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.86' / 584.00' S= 0.0291 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=33.32 cfs @ 11.96 hrs HW=588.93' TW=585.48' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 33.32 cfs @ 6.79 fps)

Secondary OutFlow Max=12.91 cfs @ 11.96 hrs HW=588.91' TW=584.47' (Dynamic Tailwater)
└**2=Culvert** (Inlet Controls 12.91 cfs @ 7.31 fps)

Pond CB402: diversion CB



Summary for Pond DMH202: manhole

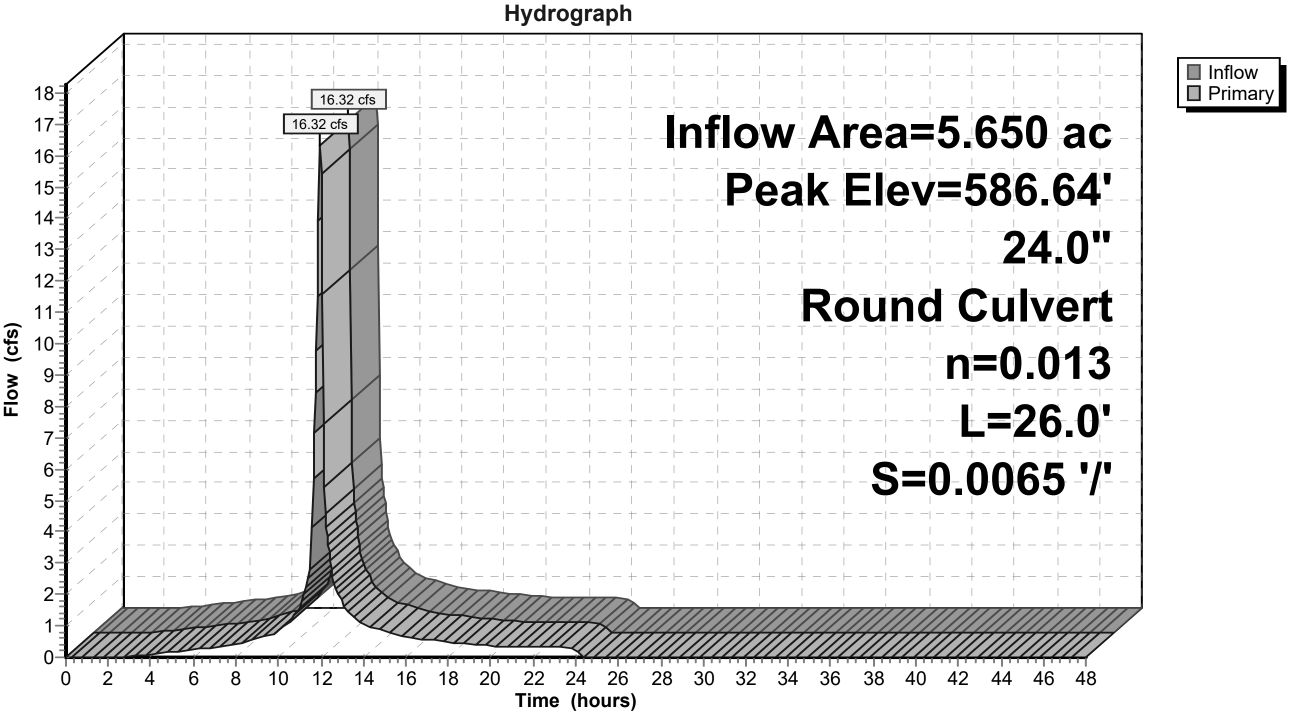
Inflow Area =	5.650 ac,	71.50% Impervious,	Inflow Depth = 3.34"	for 100-yr storm event
Inflow =	16.32 cfs @	11.96 hrs, Volume=	1.573 af	
Outflow =	16.32 cfs @	11.96 hrs, Volume=	1.573 af,	Atten= 0%, Lag= 0.0 min
Primary =	16.32 cfs @	11.96 hrs, Volume=	1.573 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.64' @ 11.96 hrs
Flood Elev= 593.41'

Device	Routing	Invert	Outlet Devices
#1	Primary	584.17'	**24.0" Round Culvert** L= 26.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 584.17' / 584.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=16.04 cfs @ 11.96 hrs HW=586.60' TW=585.31' (Dynamic Tailwater)
↰**1=Culvert** (Barrel Controls 16.04 cfs @ 5.34 fps)

Pond DMH202: manhole



Summary for Pond DMH203: diversion manhole

```
Inflow Area =      5.650 ac,  71.50% Impervious,  Inflow Depth =   3.62"    for  100-yr storm event
Inflow      =     22.53 cfs @  11.96 hrs,  Volume=          1.705 af
Outflow     =     22.53 cfs @  11.96 hrs,  Volume=          1.705 af,  Atten= 0%,  Lag= 0.0 min
Primary     =     16.32 cfs @  11.96 hrs,  Volume=          1.573 af
Secondary   =      6.22 cfs @  11.97 hrs,  Volume=          0.131 af
```

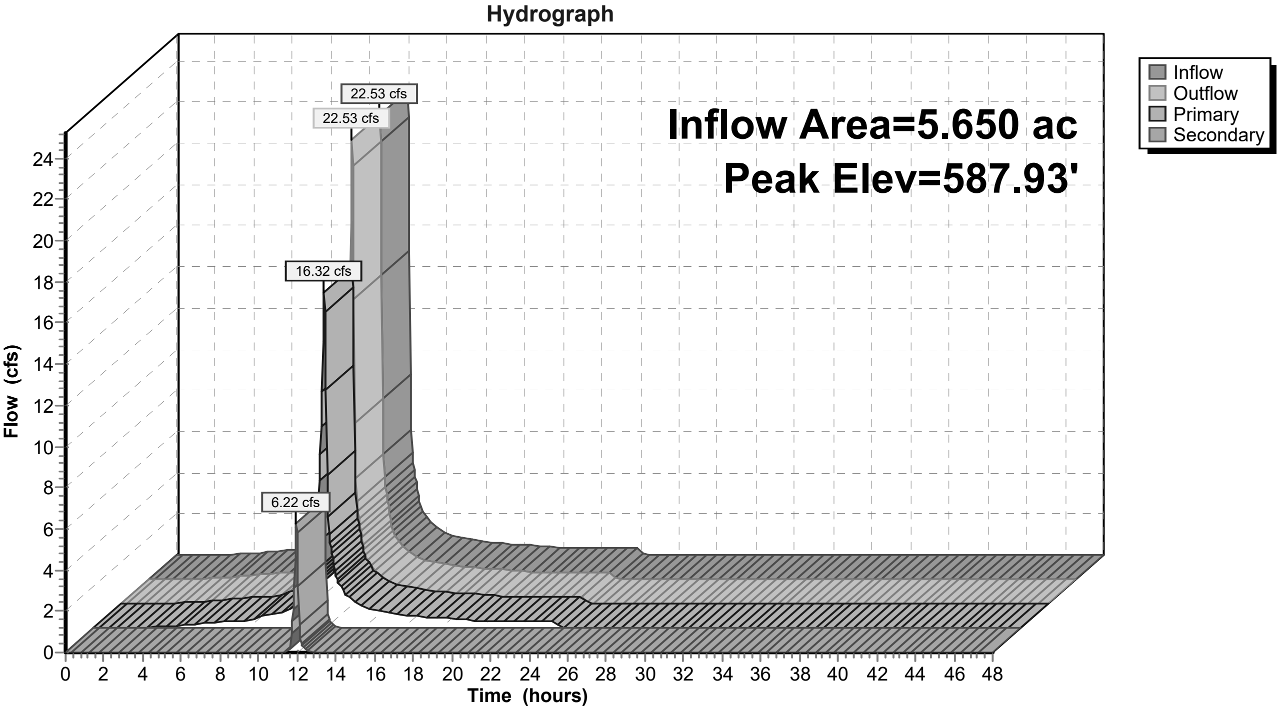
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 587.93' @ 11.96 hrs
Flood Elev= 593.07'

```
Device  Routing      Invert  Outlet Devices
  #1    Primary     585.39'  24.0"  Round Culvert
                             L= 150.0'   CPP, square edge headwall,  Ke= 0.500
                             Inlet / Outlet Invert= 585.39' / 584.20'   S= 0.0079 '/'   Cc= 0.900
                             n= 0.013  Corrugated PE, smooth interior,  Flow Area= 3.14 sf
  #2    Secondary   586.19'  18.0"  Round Culvert
                             L= 237.0'   CPP, square edge headwall,  Ke= 0.500
                             Inlet / Outlet Invert= 586.19' / 585.17'   S= 0.0043 '/'   Cc= 0.900
                             n= 0.013  Corrugated PE, smooth interior,  Flow Area= 1.77 sf
```

Primary OutFlow Max=15.91 cfs @ 11.96 hrs HW=587.88' TW=586.60' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 15.91 cfs @ 5.21 fps)

Secondary OutFlow Max=6.20 cfs @ 11.97 hrs HW=587.86' TW=586.70' (Dynamic Tailwater)
↑—**2=Culvert** (Outlet Controls 6.20 cfs @ 3.93 fps)

Pond DMH203: diversion manhole



Summary for Pond DMH212: manhole

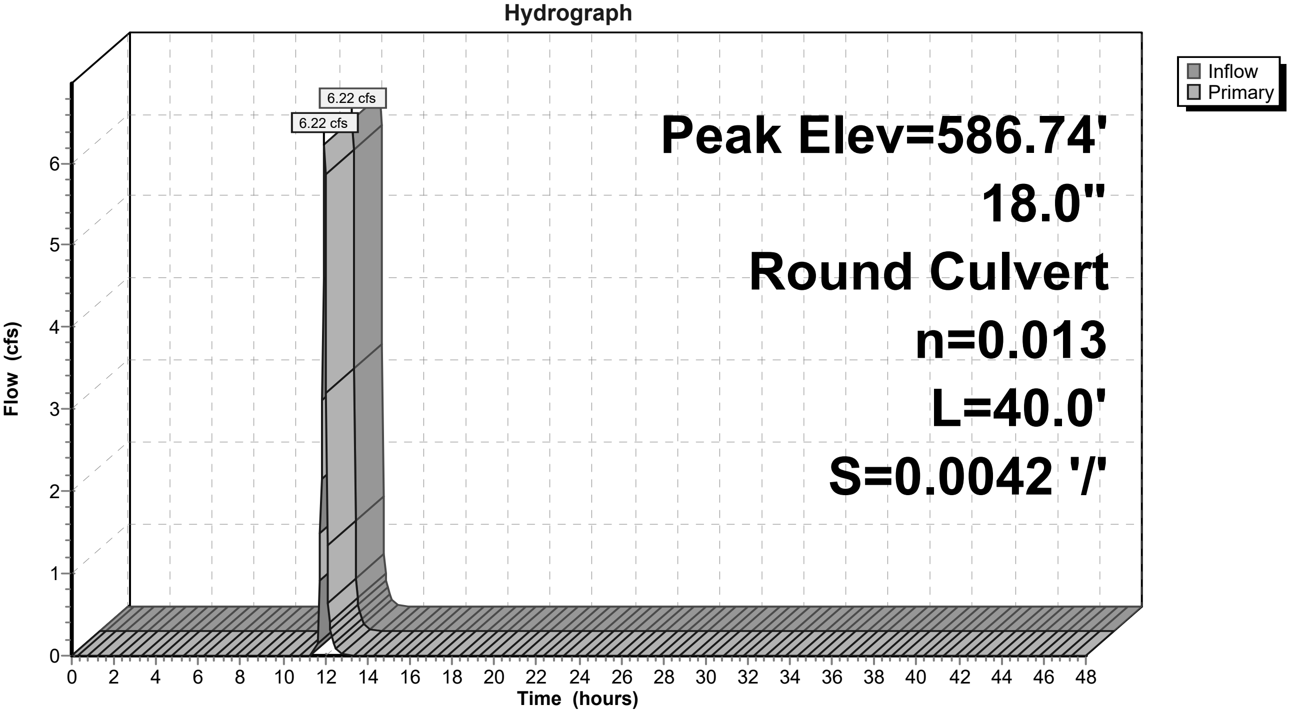
Inflow = 6.22 cfs @ 11.97 hrs, Volume= 0.131 af
Outflow = 6.22 cfs @ 11.97 hrs, Volume= 0.131 af, Atten= 0%, Lag= 0.0 min
Primary = 6.22 cfs @ 11.97 hrs, Volume= 0.131 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.74' @ 11.97 hrs
Flood Elev= 591.88'

Device	Routing	Invert	Outlet Devices
#1	Primary	585.17'	**18.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.17' / 585.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=6.02 cfs @ 11.97 hrs HW=586.70' TW=574.31' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 6.02 cfs @ 4.15 fps)

Pond DMH212: manhole



Summary for Pond DMH216: division manhole

```
Inflow Area =      4.810 ac,100.00% Impervious,  Inflow Depth =   4.59"    for  100-yr storm event
Inflow      =      32.15 cfs @   11.96 hrs,  Volume=          1.841 af
Outflow     =      32.15 cfs @   11.96 hrs,  Volume=          1.841 af,  Atten= 0%,  Lag= 0.0 min
Primary     =      18.93 cfs @   11.96 hrs,  Volume=          1.129 af
Secondary =        13.23 cfs @   11.96 hrs,  Volume=          0.712 af
```

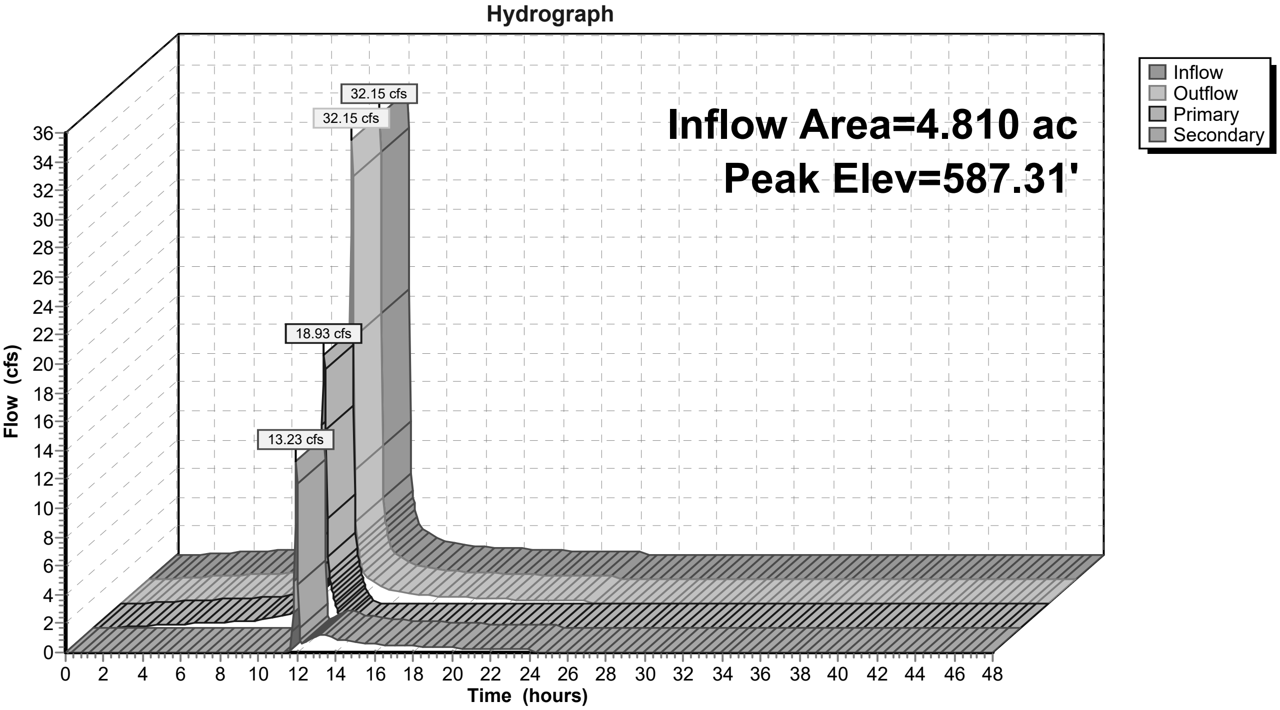
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 587.31' @ 11.96 hrs
Flood Elev= 594.26'

Device	Routing	Invert	Outlet Devices
#1	Primary	584.44'	**24.0" Round Culvert** L= 64.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 584.44' / 584.00' S= 0.0069 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	585.55'	**24.0" Round Culvert** L= 82.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.55' / 582.00' S= 0.0433 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=18.73 cfs @ 11.96 hrs HW=587.27' TW=585.30' (Dynamic Tailwater)
↰**1=Culvert** (Barrel Controls 18.73 cfs @ 5.96 fps)

Secondary OutFlow Max=12.69 cfs @ 11.96 hrs HW=587.26' TW=584.04' (Dynamic Tailwater)
↰**2=Culvert** (Inlet Controls 12.69 cfs @ 4.45 fps)

Pond DMH216: division manhole



Summary for Pond DMH230: manhole

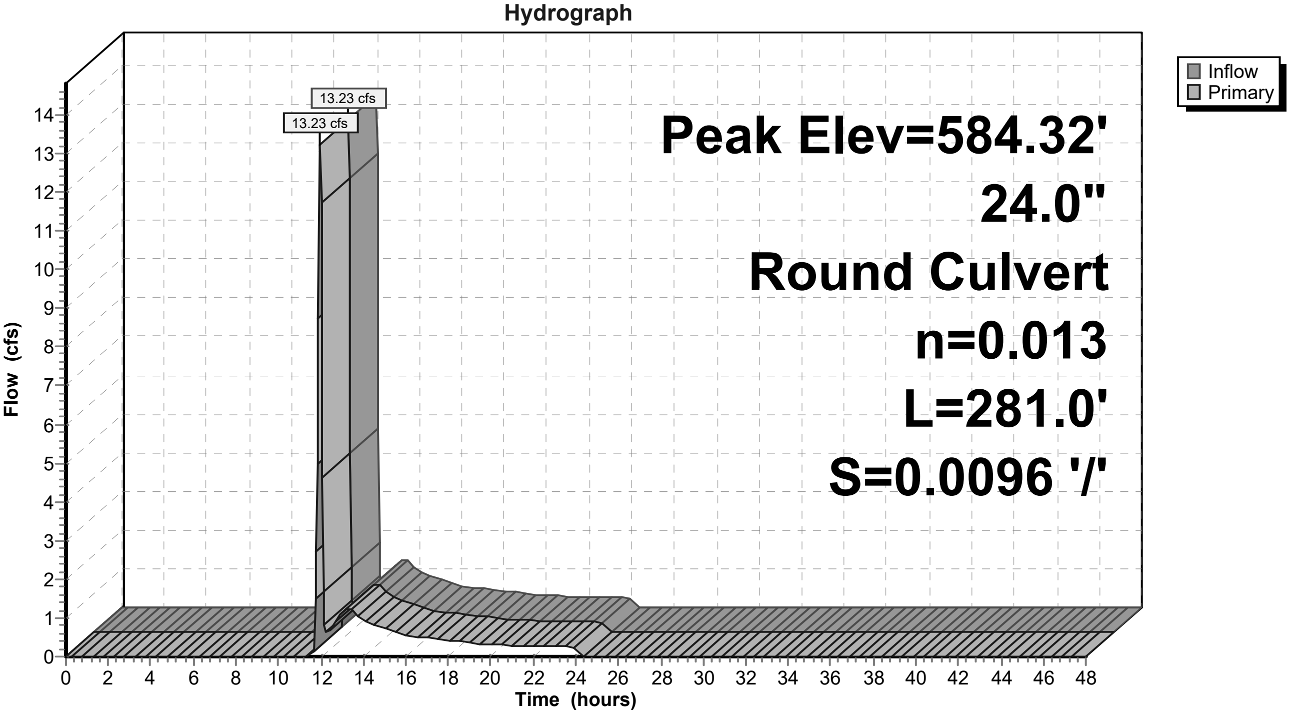
Inflow	=	13.23 cfs @	11.96 hrs,	Volume=	0.712 af
Outflow	=	13.23 cfs @	11.96 hrs,	Volume=	0.712 af, Atten= 0%, Lag= 0.0 min
Primary	=	13.23 cfs @	11.96 hrs,	Volume=	0.712 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 584.32' @ 11.98 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	582.00'	**24.0" Round Culvert** L= 281.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 582.00' / 579.30' S= 0.0096 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=11.94 cfs @ 11.96 hrs HW=584.04' TW=582.63' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 11.94 cfs @ 4.64 fps)

Pond DMH230: manhole



Summary for Pond DMH302: diversion manhole

Inflow Area = 9.330 ac, 93.78% Impervious, Inflow Depth = 4.48" for 100-yr storm event
Inflow = 61.93 cfs @ 11.96 hrs, Volume= 3.481 af
Outflow = 61.93 cfs @ 11.96 hrs, Volume= 3.481 af, Atten= 0%, Lag= 0.0 min
Primary = 41.56 cfs @ 11.96 hrs, Volume= 2.800 af
Secondary = 20.37 cfs @ 11.96 hrs, Volume= 0.681 af

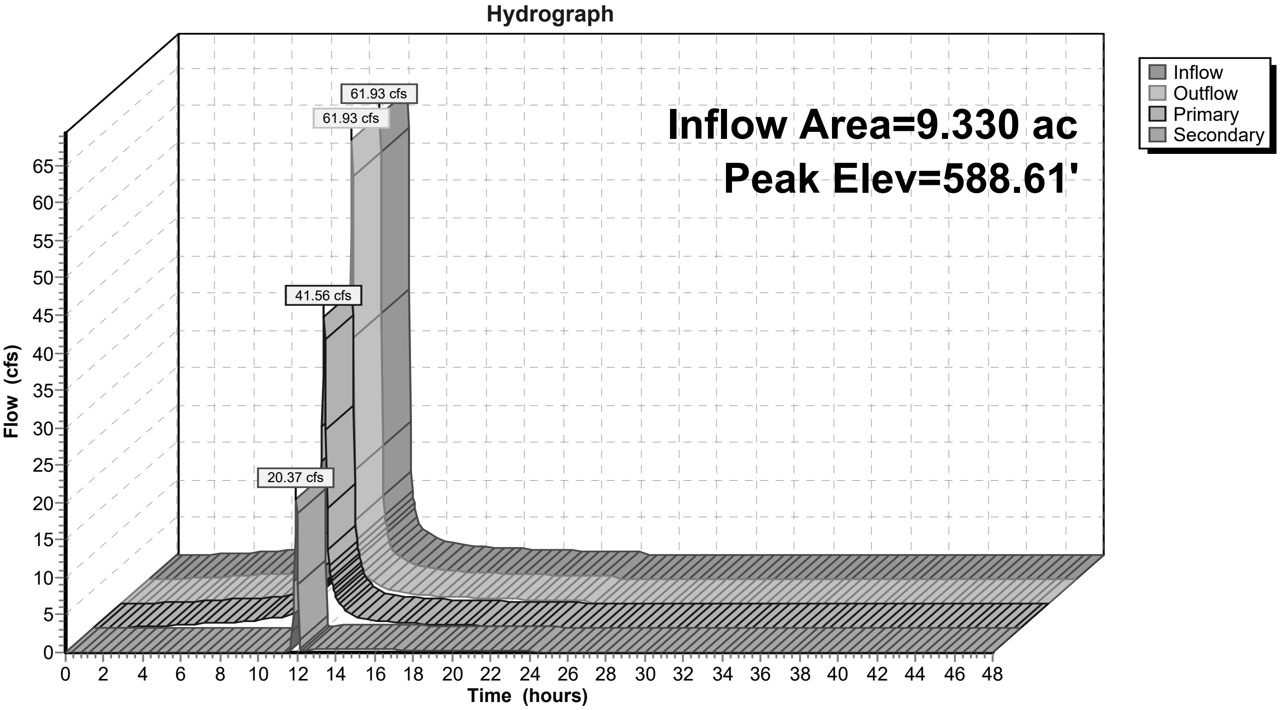
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 588.61' @ 11.96 hrs
Flood Elev= 596.93'

Device	Routing	Invert	Outlet Devices
#1	Primary	584.18'	**30.0" Round Culvert** L= 43.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 584.18' / 584.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Secondary	585.80'	**24.0" Round Culvert** L= 62.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 585.80' / 582.50' S= 0.0532 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=40.65 cfs @ 11.96 hrs HW=588.52' TW=585.37' (Dynamic Tailwater)
↰**1=Culvert** (Barrel Controls 40.65 cfs @ 8.28 fps)

Secondary OutFlow Max=19.84 cfs @ 11.96 hrs HW=588.52' TW=585.93' (Dynamic Tailwater)
↰**2=Culvert** (Inlet Controls 19.84 cfs @ 6.32 fps)

Pond DMH302: diversion manhole



Summary for Pond DMH316: manhole

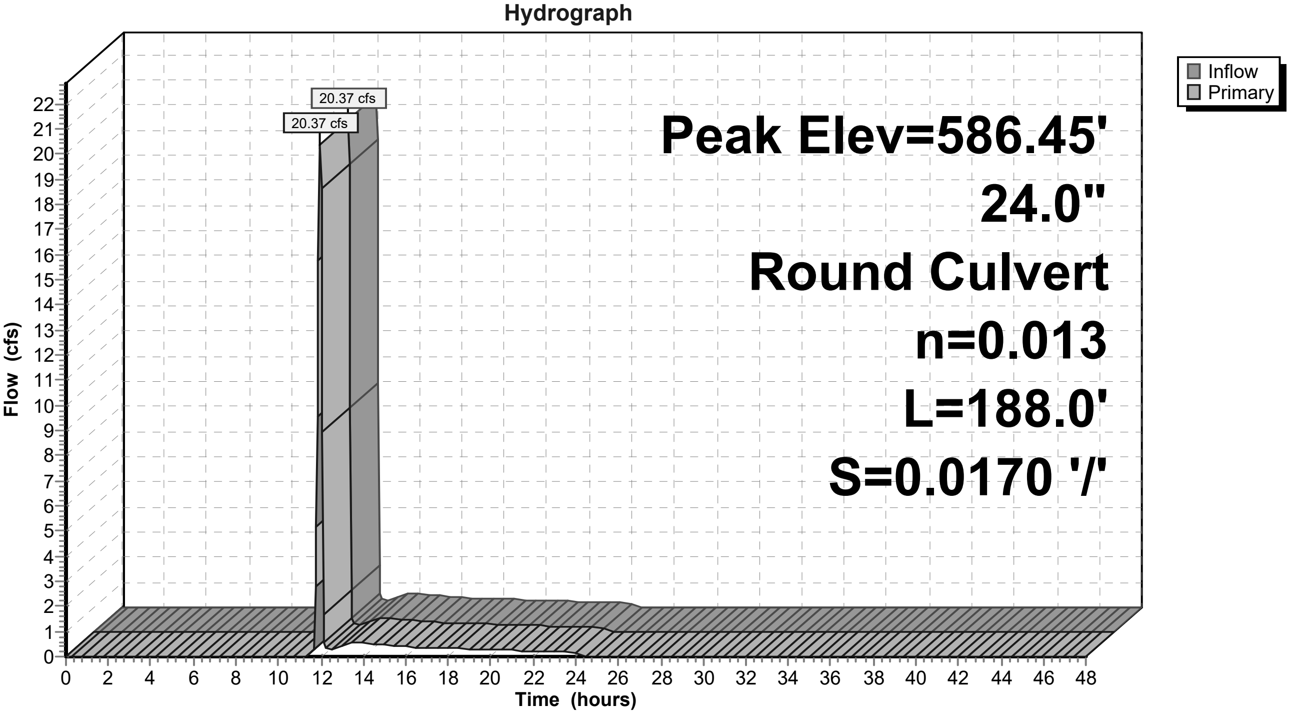
Inflow	=	20.37 cfs @	11.96 hrs, Volume=	0.681 af
Outflow	=	20.37 cfs @	11.96 hrs, Volume=	0.681 af, Atten= 0%, Lag= 0.0 min
Primary	=	20.37 cfs @	11.96 hrs, Volume=	0.681 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.45' @ 11.98 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	582.50'	**24.0" Round Culvert** L= 188.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 582.50' / 579.30' S= 0.0170 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=18.79 cfs @ 11.96 hrs HW=585.93' TW=583.79' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 18.79 cfs @ 5.98 fps)

Pond DMH316: manhole



Summary for Pond DMH317: manhole

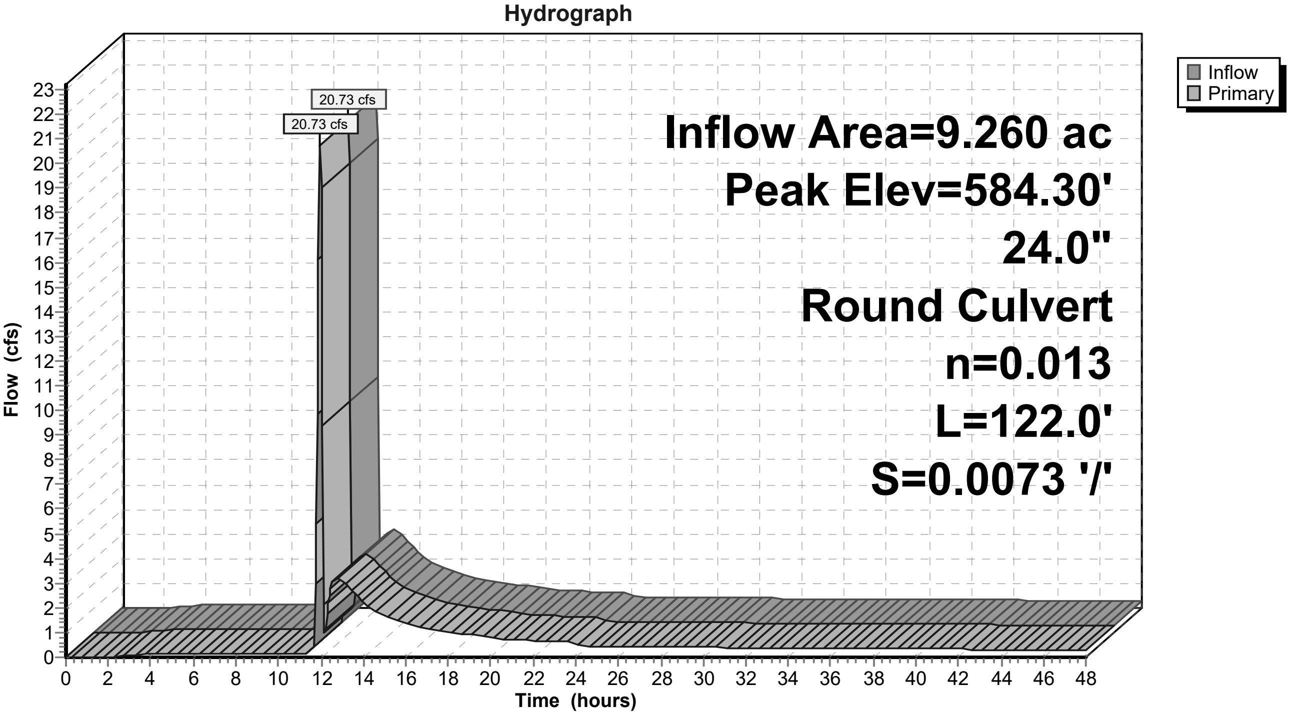
```
Inflow Area =      9.260 ac, 60.80% Impervious, Inflow Depth >  3.14"   for 100-yr storm event
Inflow      =     20.73 cfs @  11.96 hrs, Volume=        2.421 af
Outflow     =     20.73 cfs @  11.96 hrs, Volume=        2.421 af, Atten= 0%, Lag= 0.0 min
Primary     =     20.73 cfs @  11.96 hrs, Volume=        2.421 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 584.30' @ 11.98 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	579.30'	**24.0" Round Culvert** L= 122.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 579.30' / 578.41' S= 0.0073 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=18.79 cfs @ 11.96 hrs HW=583.80' TW=582.12' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 18.79 cfs @ 5.98 fps)

Pond DMH317: manhole



Summary for Pond DMH318: manhole

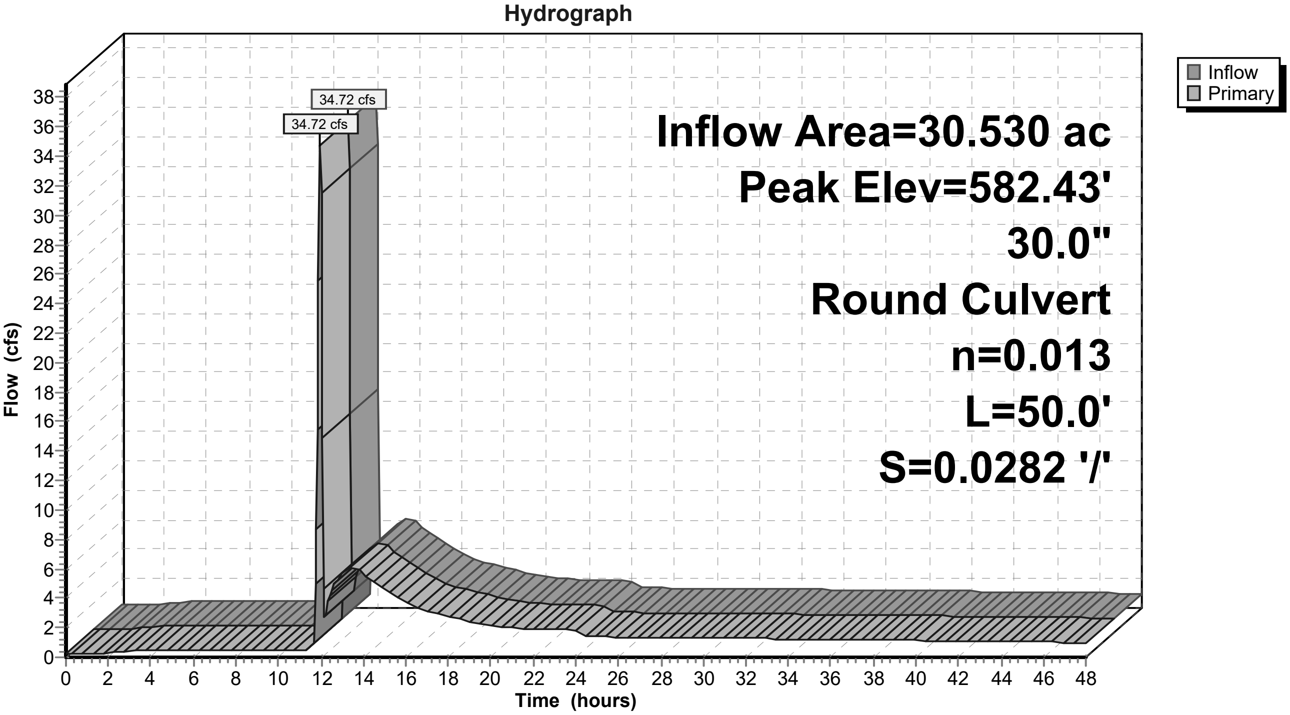
Inflow Area = 30.530 ac, 76.15% Impervious, Inflow Depth > 2.57" for 100-yr storm event
Inflow = 34.72 cfs @ 11.96 hrs, Volume= 6.532 af
Outflow = 34.72 cfs @ 11.96 hrs, Volume= 6.532 af, Atten= 0%, Lag= 0.0 min
Primary = 34.72 cfs @ 11.96 hrs, Volume= 6.532 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 582.43' @ 11.98 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	577.91'	**30.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 577.91' / 576.50' S= 0.0282 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=29.21 cfs @ 11.96 hrs HW=582.12' TW=580.59' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 29.21 cfs @ 5.95 fps)

Pond DMH318: manhole



Summary for Pond DMH319: manhole

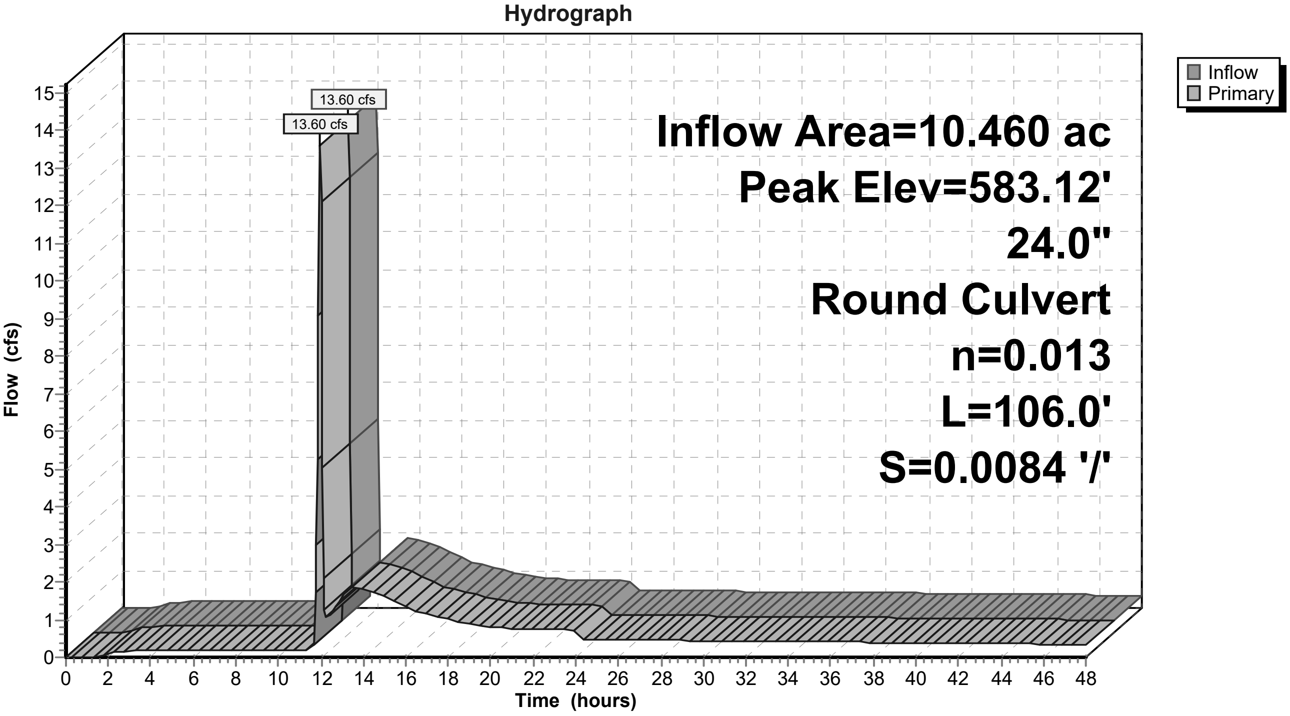
```
Inflow Area =      10.460 ac, 84.61% Impervious, Inflow Depth >  2.58"   for 100-yr storm event
Inflow      =     13.60 cfs @  11.96 hrs, Volume=          2.250 af
Outflow     =     13.60 cfs @  11.96 hrs, Volume=          2.250 af,  Atten= 0%,  Lag= 0.0 min
Primary     =     13.60 cfs @  11.96 hrs, Volume=          2.250 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 583.12' @ 11.98 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	579.30'	**24.0" Round Culvert** L= 106.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 579.30' / 578.41' S= 0.0084 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=10.76 cfs @ 11.96 hrs HW=582.63' TW=582.12' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 10.76 cfs @ 3.42 fps)

Pond DMH319: manhole



Summary for Pond DMH324: manhole

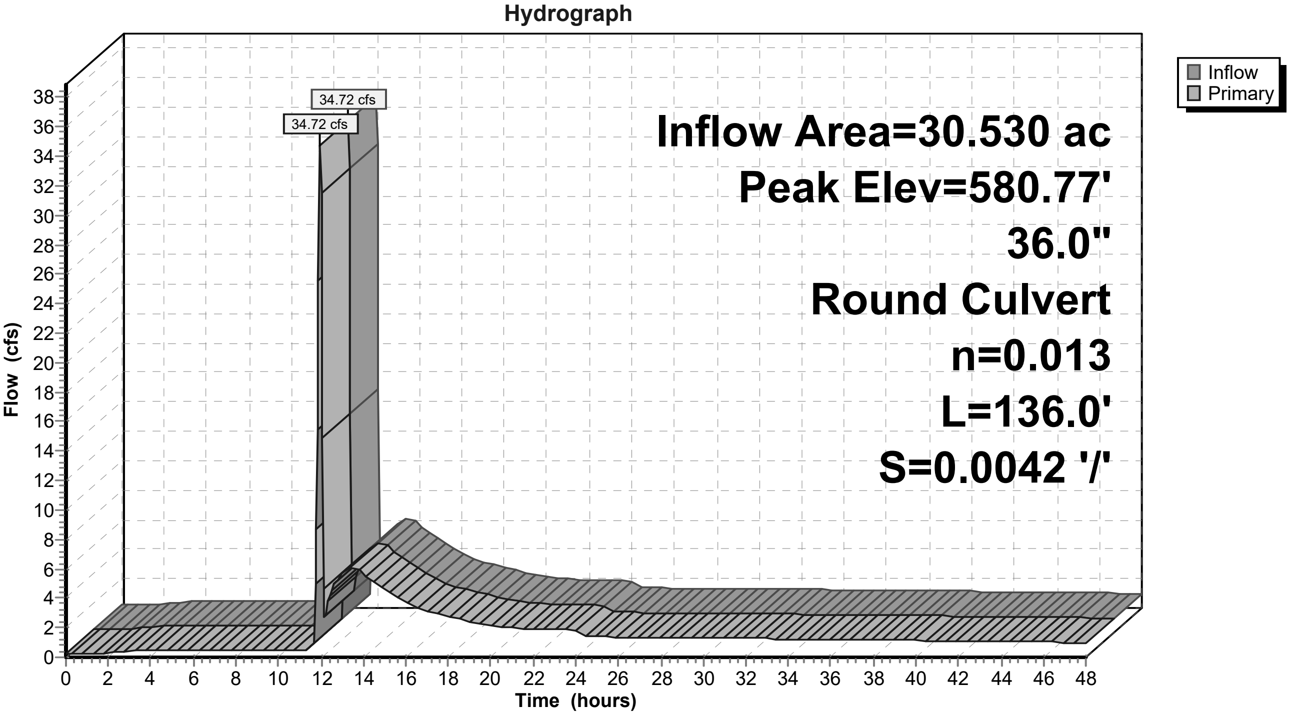
Inflow Area = 30.530 ac, 76.15% Impervious, Inflow Depth > 2.57" for 100-yr storm event
Inflow = 34.72 cfs @ 11.96 hrs, Volume= 6.532 af
Outflow = 34.72 cfs @ 11.96 hrs, Volume= 6.532 af, Atten= 0%, Lag= 0.0 min
Primary = 34.72 cfs @ 11.96 hrs, Volume= 6.532 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 580.77' @ 11.97 hrs
Flood Elev= 582.63'

Device	Routing	Invert	Outlet Devices
#1	Primary	576.09'	**36.0" Round Culvert** L= 136.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 576.09' / 575.52' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=33.64 cfs @ 11.96 hrs HW=580.59' TW=579.61' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 33.64 cfs @ 4.76 fps)

Pond DMH324: manhole



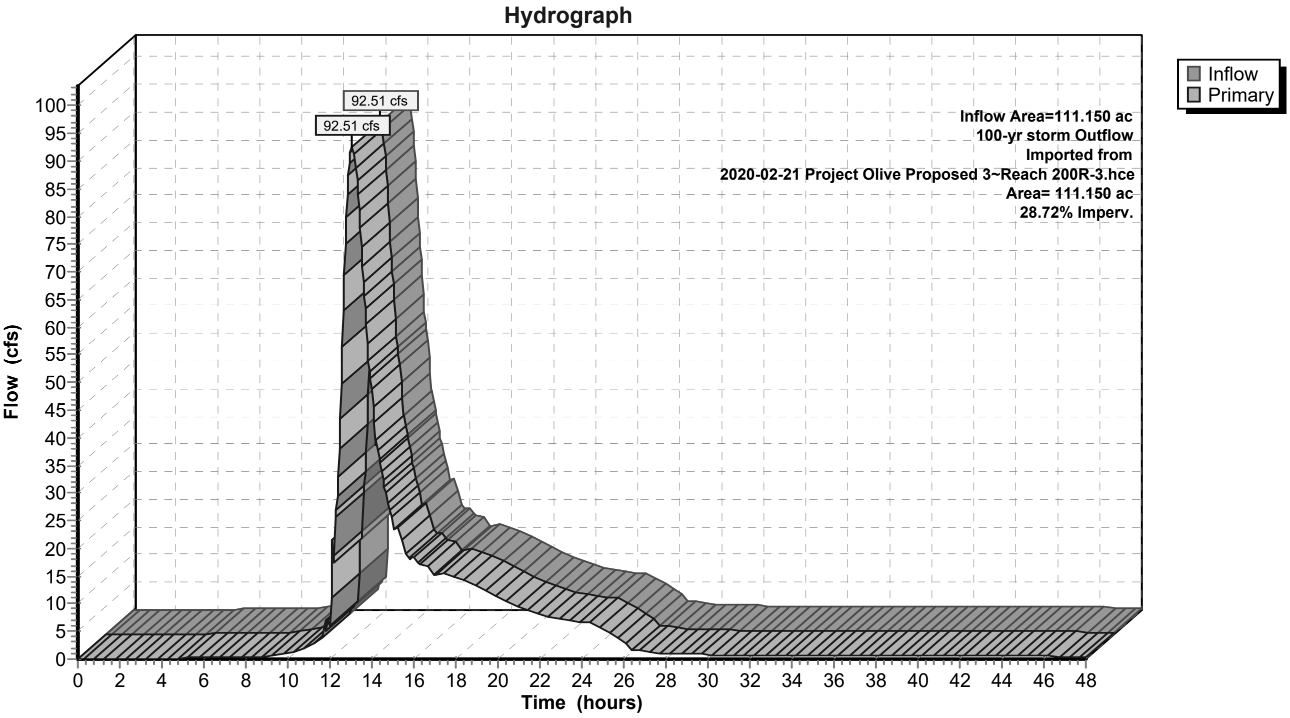
Summary for Link 200R-3: from 200R-3

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 2.70" for 100-yr storm event
Inflow = 92.51 cfs @ 13.09 hrs, Volume= 25.005 af
Primary = 92.51 cfs @ 13.09 hrs, Volume= 25.005 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

100-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 3~Reach 200R-3.hce

Link 200R-3: from 200R-3



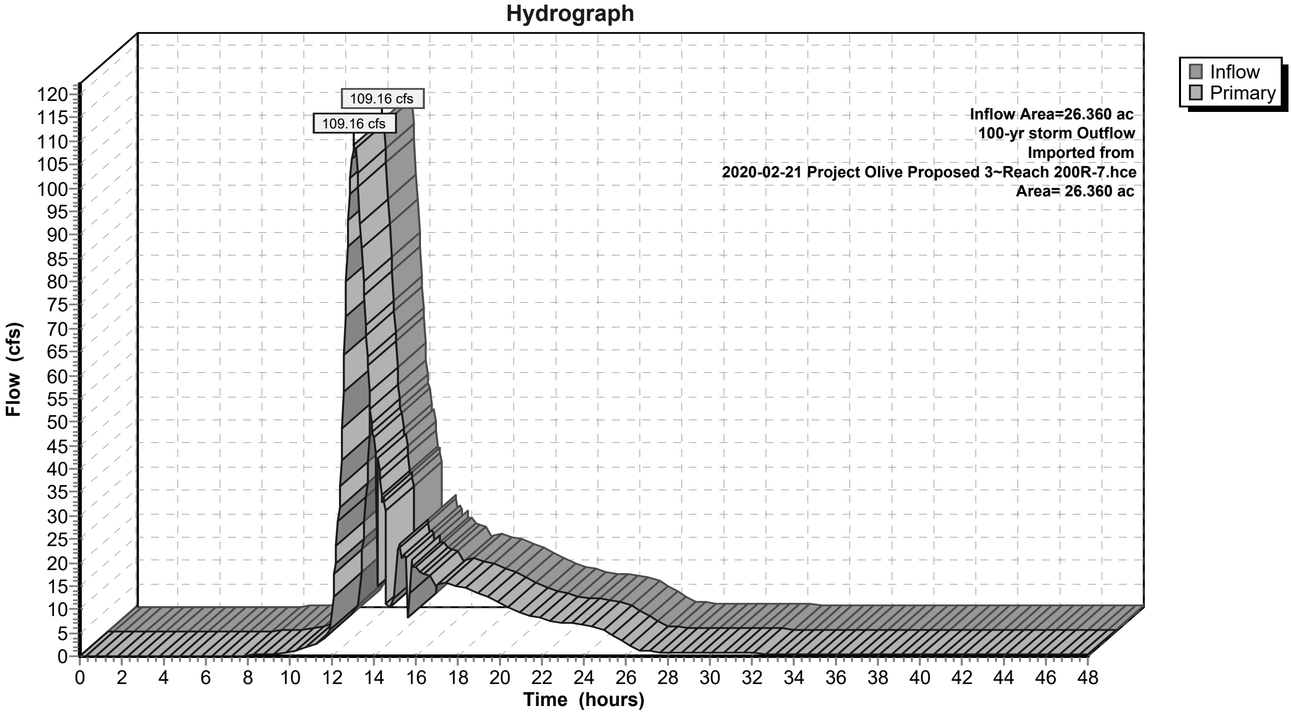
Summary for Link 200R-7: from 200R-7

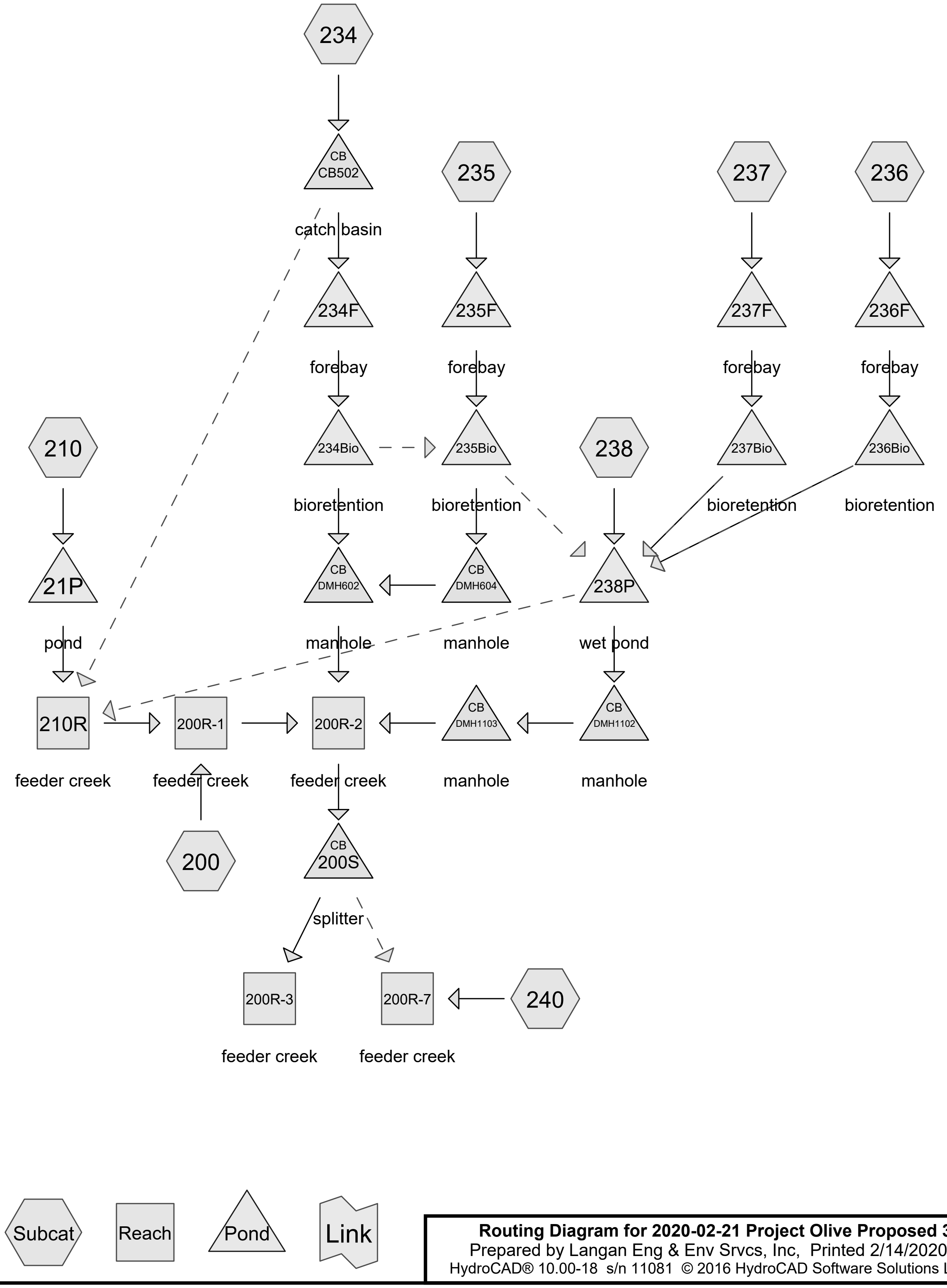
Inflow Area = 26.360 ac, 0.00% Impervious, Inflow Depth > 11.35" for 100-yr storm event
Inflow = 109.16 cfs @ 13.05 hrs, Volume= 24.924 af
Primary = 109.16 cfs @ 13.05 hrs, Volume= 24.924 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

100-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 3~Reach 200R-7.hce

Link 200R-7: from 200R-7





Routing Diagram for 2020-02-21 Project Olive Proposed 3
Prepared by Langan Eng & Env Srvcs, Inc, Printed 2/14/2020
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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment200: Runoff Area=67.500 ac 6.03% Impervious Runoff Depth=0.54"
Flow Length=1,193' Tc=84.6 min CN=83 Runoff=13.67 cfs 3.054 af

Subcatchment210: Runoff Area=3.440 ac 0.00% Impervious Runoff Depth=0.54"
Flow Length=289' Tc=19.4 min CN=83 Runoff=1.97 cfs 0.156 af

Subcatchment234: Runoff Area=7.860 ac 82.06% Impervious Runoff Depth=1.26"
Tc=6.0 min CN=95 Runoff=16.41 cfs 0.828 af

Subcatchment235: Runoff Area=10.030 ac 72.98% Impervious Runoff Depth=1.18"
Tc=6.0 min CN=94 Runoff=19.85 cfs 0.989 af

Subcatchment236: Runoff Area=7.500 ac 80.53% Impervious Runoff Depth=1.26"
Tc=6.0 min CN=95 Runoff=15.66 cfs 0.791 af

Subcatchment237: Runoff Area=11.240 ac 71.53% Impervious Runoff Depth=1.18"
Tc=6.0 min CN=94 Runoff=22.25 cfs 1.108 af

Subcatchment238: Runoff Area=3.580 ac 0.00% Impervious Runoff Depth=0.97"
Flow Length=219' Tc=9.9 min CN=91 Runoff=5.24 cfs 0.288 af

Subcatchment240: Runoff Area=26.360 ac 0.00% Impervious Runoff Depth=0.39"
Flow Length=1,835' Tc=114.9 min CN=79 Runoff=2.76 cfs 0.865 af

Reach 200R-1: feeder creek Avg. Flow Depth=0.61' Max Vel=1.88 fps Inflow=13.67 cfs 3.067 af
n=0.030 L=381.0' S=0.0034 '/' Capacity=468.14 cfs Outflow=13.63 cfs 3.067 af

Reach 200R-2: feeder creek Avg. Flow Depth=0.65' Max Vel=1.78 fps Inflow=14.26 cfs 5.058 af
n=0.030 L=1,357.0' S=0.0029 '/' Capacity=430.19 cfs Outflow=13.79 cfs 5.027 af

Reach 200R-3: feeder creek Avg. Flow Depth=0.61' Max Vel=1.75 fps Inflow=14.35 cfs 3.711 af
n=0.030 L=248.0' S=0.0030 '/' Capacity=437.78 cfs Outflow=12.75 cfs 3.707 af

Reach 200R-7: feeder creek Avg. Flow Depth=0.70' Max Vel=1.37 fps Inflow=14.99 cfs 3.179 af
n=0.030 L=157.0' S=0.0016 '/' Capacity=319.81 cfs Outflow=11.68 cfs 3.176 af

Reach 210R: feeder creek Avg. Flow Depth=0.11' Max Vel=0.64 fps Inflow=1.53 cfs 0.013 af
n=0.030 L=318.0' S=0.0034 '/' Capacity=467.05 cfs Outflow=0.74 cfs 0.013 af

Pond 21P: pond Peak Elev=586.22' Storage=6,780 cf Inflow=1.97 cfs 0.156 af
Outflow=0.00 cfs 0.000 af

Pond 200S: splitter Peak Elev=575.95' Inflow=13.79 cfs 5.027 af
Primary=14.35 cfs 3.711 af Secondary=12.24 cfs 2.314 af Outflow=13.79 cfs 5.027 af

Pond 234Bio: bioretention Peak Elev=585.45' Storage=20,749 cf Inflow=13.62 cfs 0.789 af
Primary=0.27 cfs 0.620 af Secondary=0.00 cfs 0.000 af Outflow=0.27 cfs 0.620 af

```
Pond 234F: forebay                    Peak Elev=585.45'  Storage=12,284 cf   Inflow=14.89 cfs  0.815 af
                                                                             Outflow=13.62 cfs  0.789 af

Pond 235Bio: bioretention             Peak Elev=585.19'  Storage=27,050 cf   Inflow=19.18 cfs  0.974 af
                      Primary=0.29 cfs  0.807 af   Secondary=0.00 cfs  0.000 af   Outflow=0.29 cfs  0.807 af

Pond 235F: forebay                    Peak Elev=585.19'  Storage=11,134 cf   Inflow=19.85 cfs  0.989 af
                                                                             Outflow=19.18 cfs  0.974 af

Pond 236Bio: bioretention             Peak Elev=586.72'  Storage=14,657 cf   Inflow=14.94 cfs  0.791 af
                      Primary=4.61 cfs  0.784 af   Secondary=0.00 cfs  0.000 af   Outflow=4.61 cfs  0.784 af

Pond 236F: forebay                    Peak Elev=587.03'  Storage=15,143 cf   Inflow=15.66 cfs  0.791 af
                                                                             Outflow=14.94 cfs  0.791 af

Pond 237Bio: bioretention             Peak Elev=586.73'  Storage=21,567 cf   Inflow=21.80 cfs  1.108 af
                      Primary=4.72 cfs  1.098 af   Secondary=0.00 cfs  0.000 af   Outflow=4.72 cfs  1.098 af

Pond 237F: forebay                    Peak Elev=587.16'  Storage=13,193 cf   Inflow=22.25 cfs  1.108 af
                                                                             Outflow=21.80 cfs  1.108 af

Pond 238P: wet pond                  Peak Elev=582.88'  Storage=551,084 cf   Inflow=12.05 cfs  2.171 af
                      Primary=0.21 cfs  0.564 af   Secondary=0.00 cfs  0.000 af   Outflow=0.21 cfs  0.564 af

Pond CB502: catch basin                                 Peak Elev=586.86'   Inflow=16.41 cfs  0.828 af
                    Primary=14.89 cfs  0.815 af   Secondary=1.53 cfs  0.013 af   Outflow=16.41 cfs  0.828 af

Pond DMH1102: manhole                                    Peak Elev=581.85'   Inflow=0.21 cfs  0.564 af
                         18.0"  Round Culvert  n=0.013  L=248.0'  S=0.0035 '/'   Outflow=0.21 cfs  0.564 af

Pond DMH1103: manhole                                    Peak Elev=580.98'   Inflow=0.21 cfs  0.564 af
                         18.0"  Round Culvert  n=0.013  L=176.0'  S=0.0042 '/'   Outflow=0.21 cfs  0.564 af

Pond DMH602: manhole                                     Peak Elev=580.80'   Inflow=0.56 cfs  1.426 af
                          18.0"  Round Culvert  n=0.013  L=74.0'  S=0.0058 '/'   Outflow=0.56 cfs  1.426 af

Pond DMH604: manhole                                     Peak Elev=581.17'   Inflow=0.29 cfs  0.807 af
                         15.0"  Round Culvert  n=0.013  L=105.0'  S=0.0039 '/'   Outflow=0.29 cfs  0.807 af

         Total Runoff Area = 137.510 ac   Runoff Volume = 8.077 af   Average Runoff Depth = 0.70"
                                76.79% Pervious = 105.590 ac     23.21% Impervious = 31.920 ac
```

Summary for Subcatchment 200:

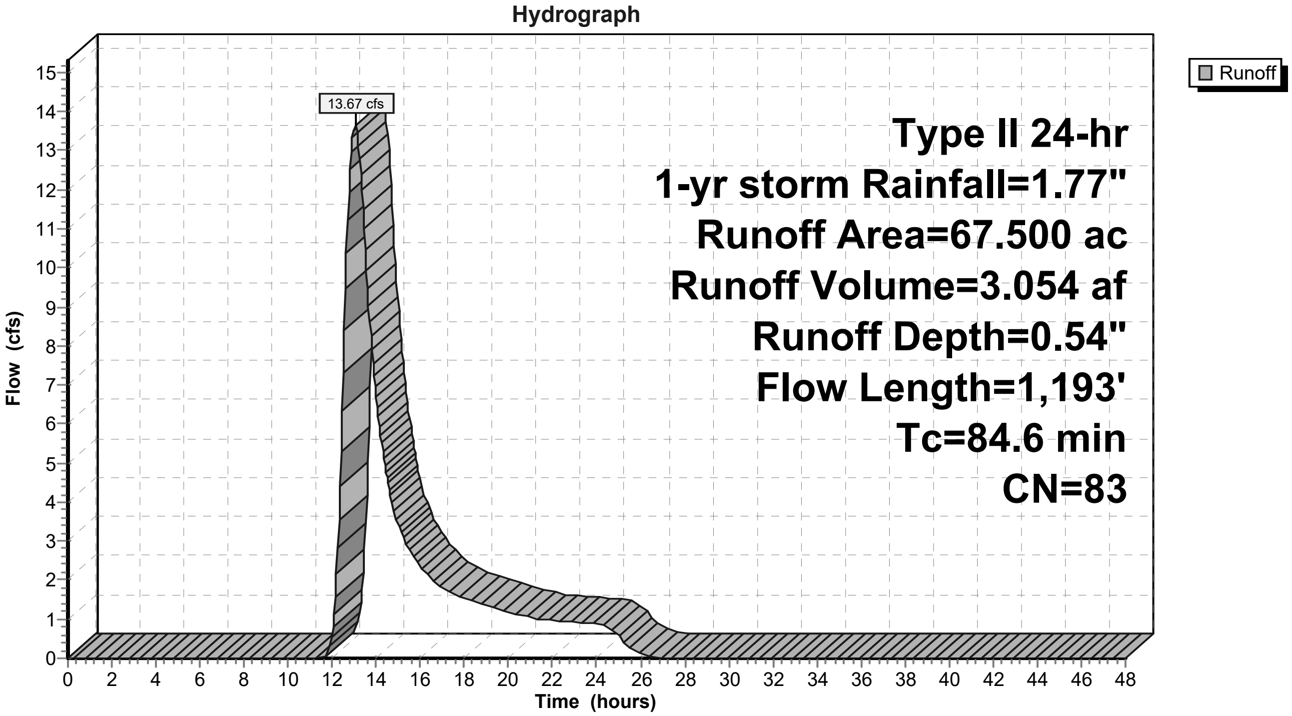
Runoff = 13.67 cfs @ 13.04 hrs, Volume= 3.054 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	15.620	84	50-75% Grass cover, Fair, HSG D
	2.530	79	Woods, Fair, HSG D
	0.230	98	Paved parking, HSG D
	0.030	98	Roofs, HSG D
	0.780	98	Water Surface, 0% imp, HSG D
*	8.770	84	50-75% Grass cover, Fair, HSG D (offsite)
*	33.440	79	Woods, Fair, HSG D (offsite)
*	1.770	98	Paved parking, HSG D (offsite)
*	2.040	98	Roofs, HSG D (offsite)
*	1.960	91	Gravel roads, HSG D (offsite)
*	0.330	98	Water Surface, 0% imp, HSG D (offsite)
	67.500	83	Weighted Average
	63.430		93.97% Pervious Area
	4.070		6.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.7	100	0.0100	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
49.7	1,055	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	38	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
84.6	1,193	Total			

Subcatchment 200:



Summary for Subcatchment 210:

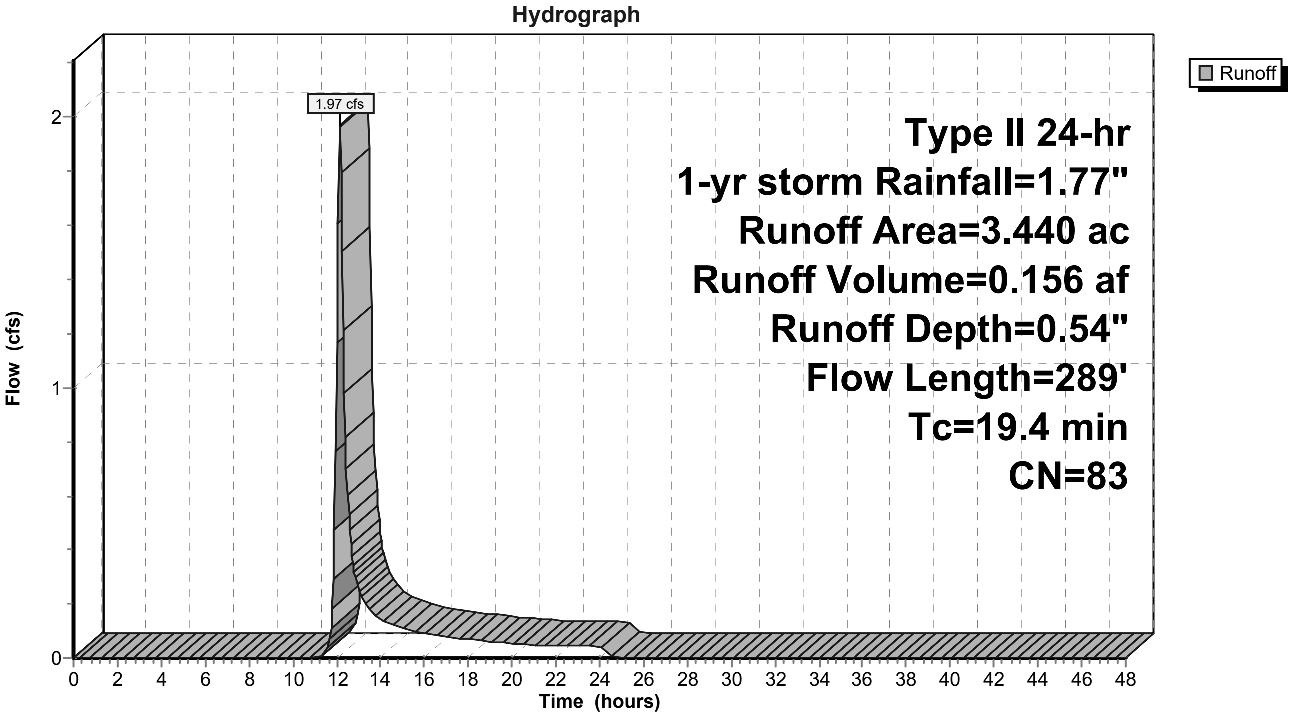
Runoff = 1.97 cfs @ 12.14 hrs, Volume= 0.156 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
2.920	84	50-75% Grass cover, Fair, HSG D
0.520	79	Woods, Fair, HSG D
3.440	83	Weighted Average
3.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.8	100	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
3.6	189	0.0160	0.89		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
19.4	289	Total			

Subcatchment 210:



Summary for Subcatchment 234:

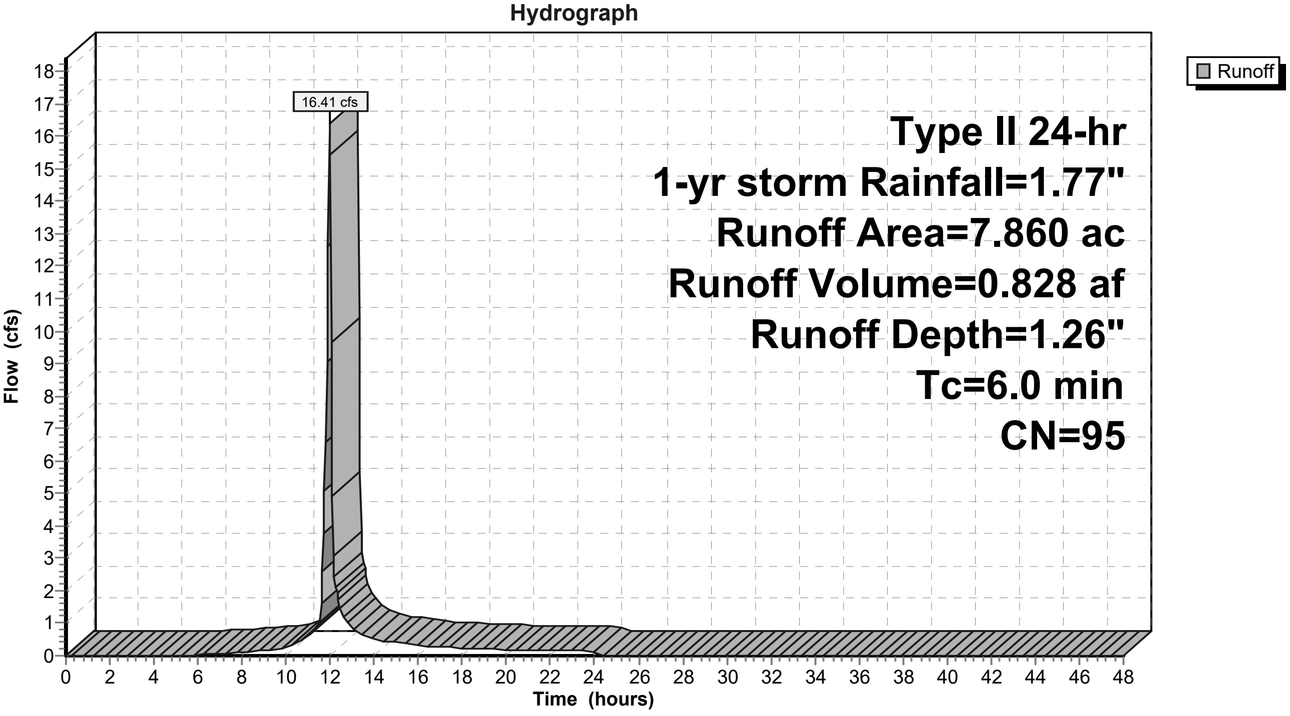
Runoff = 16.41 cfs @ 11.97 hrs, Volume= 0.828 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
1.410	84	50-75% Grass cover, Fair, HSG D
3.540	98	Paved parking, HSG D
2.910	98	Roofs, HSG D
7.860	95	Weighted Average
1.410		17.94% Pervious Area
6.450		82.06% Impervious Area

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

Subcatchment 234:



Summary for Subcatchment 235:

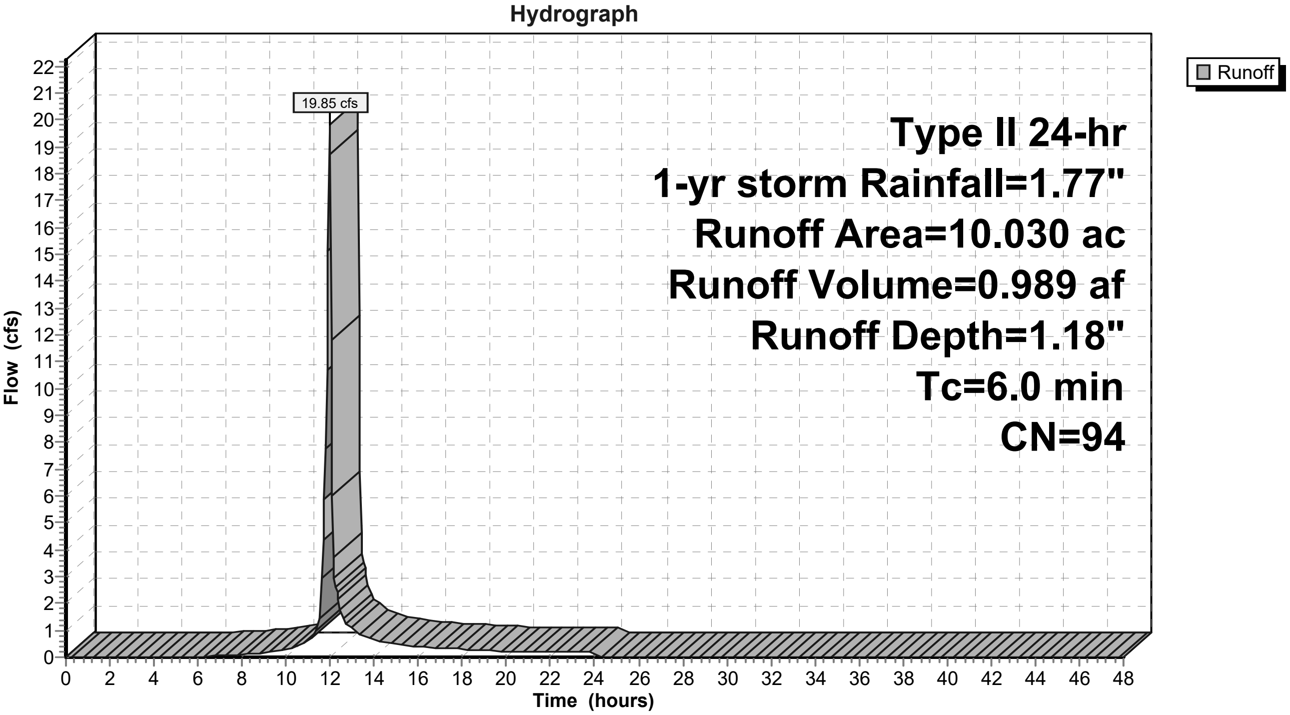
Runoff = 19.85 cfs @ 11.97 hrs, Volume= 0.989 af, Depth= 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
2.710	84	50-75% Grass cover, Fair, HSG D
4.850	98	Paved parking, HSG D
2.470	98	Roofs, HSG D
10.030	94	Weighted Average
2.710		27.02% Pervious Area
7.320		72.98% Impervious Area

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

Subcatchment 235:



Summary for Subcatchment 236:

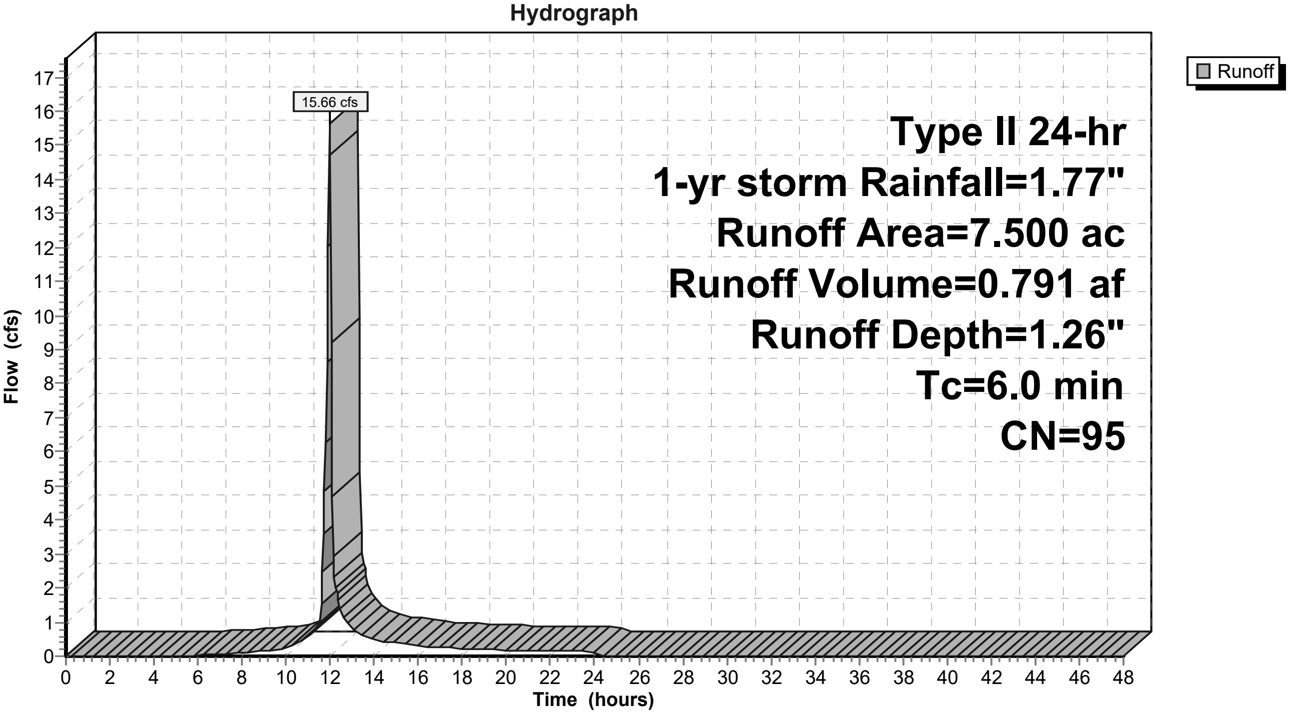
Runoff = 15.66 cfs @ 11.97 hrs, Volume= 0.791 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
1.460	84	50-75% Grass cover, Fair, HSG D
2.130	98	Paved parking, HSG D
3.910	98	Roofs, HSG D
7.500	95	Weighted Average
1.460		19.47% Pervious Area
6.040		80.53% Impervious Area

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

Subcatchment 236:



Summary for Subcatchment 237:

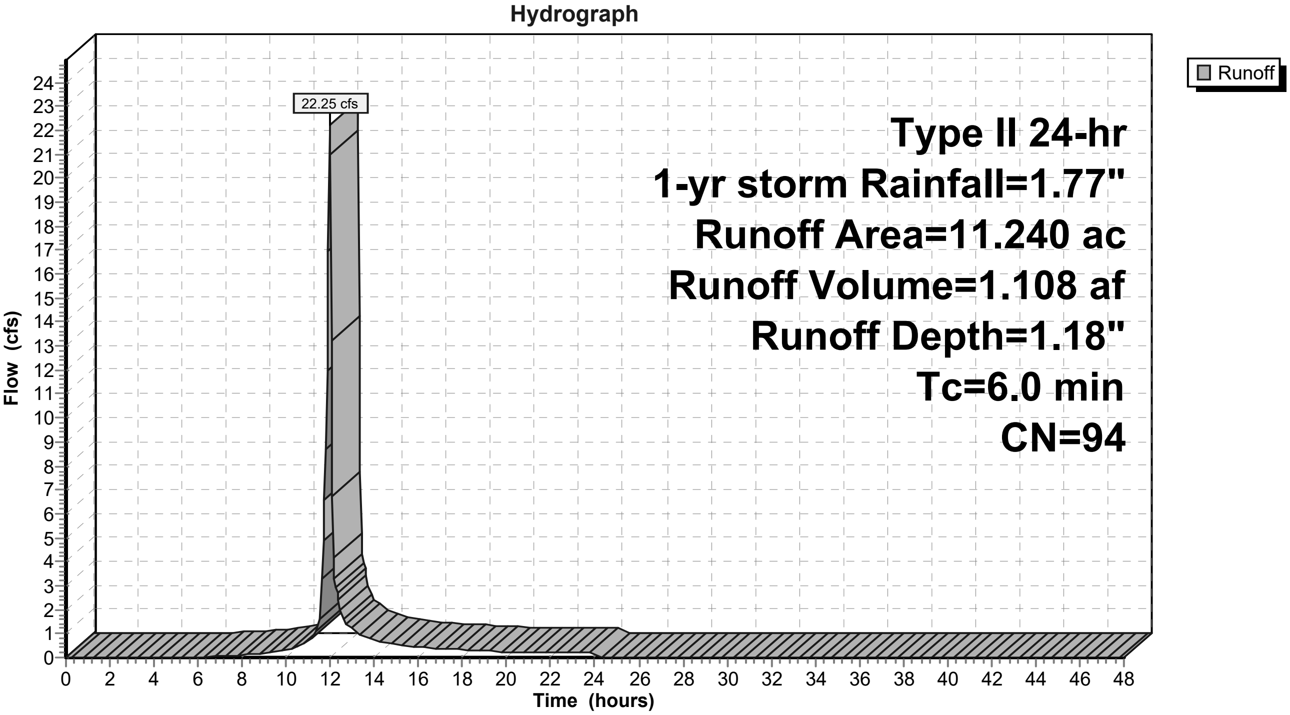
Runoff = 22.25 cfs @ 11.97 hrs, Volume= 1.108 af, Depth= 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
3.200	84	50-75% Grass cover, Fair, HSG D
8.040	98	Paved parking, HSG D
11.240	94	Weighted Average
3.200		28.47% Pervious Area
8.040		71.53% Impervious Area

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

Subcatchment 237:



Summary for Subcatchment 238:

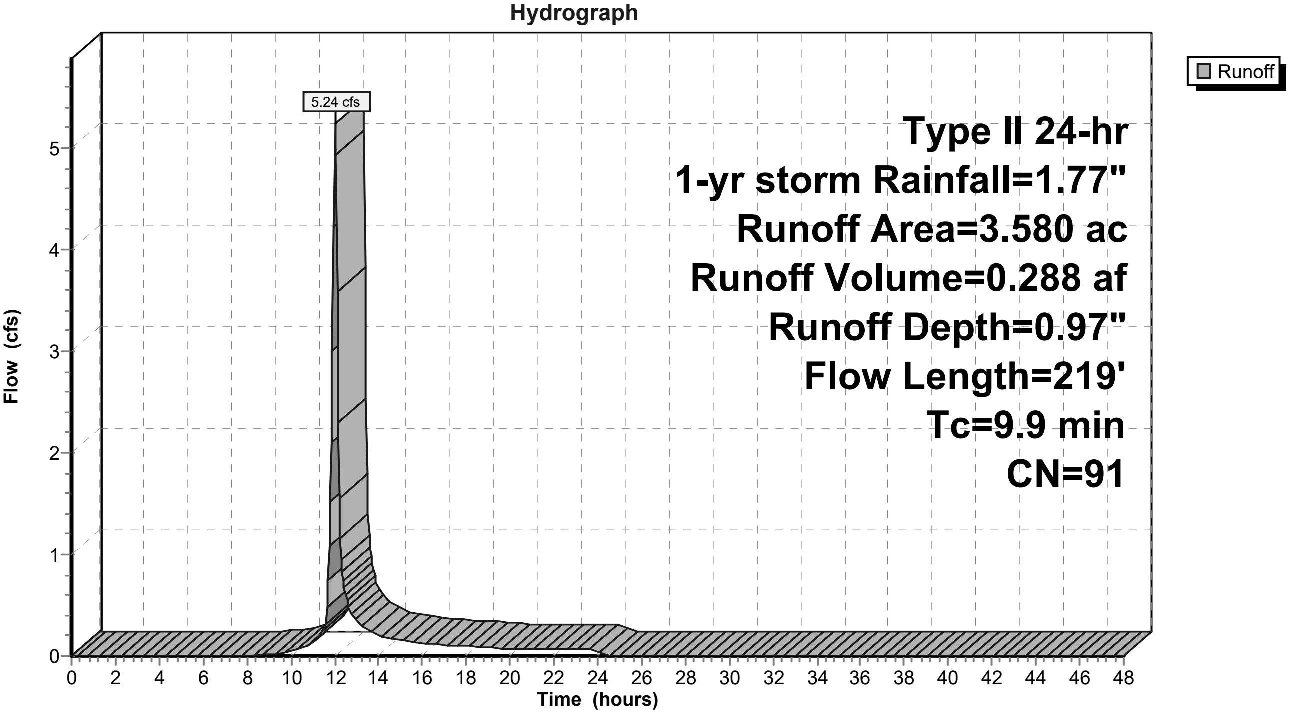
Runoff = 5.24 cfs @ 12.01 hrs, Volume= 0.288 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
1.820	84	50-75% Grass cover, Fair, HSG D
1.760	98	Water Surface, 0% imp, HSG D
3.580	91	Weighted Average
3.580		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.0500	0.20		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
1.5	99	0.0250	1.11		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0100	4.02	2.19	**Pipe Channel, C-D** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
9.9	219	Total			

Subcatchment 238:



Summary for Subcatchment 240:

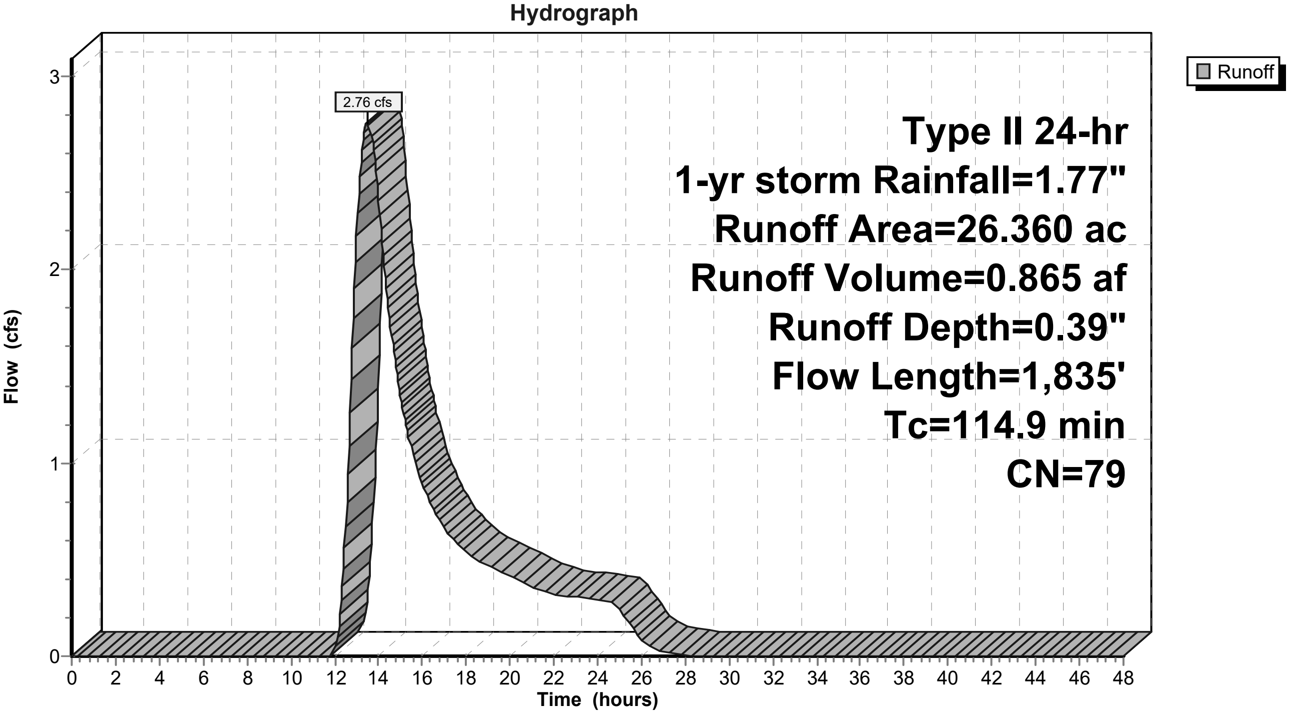
Runoff = 2.76 cfs @ 13.47 hrs, Volume= 0.865 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	0.620	84	50-75% Grass cover, Fair, HSG D
	16.500	79	Woods, Fair, HSG D
*	9.240	79	Woods, Fair, HSG D (offsite)
	26.360	79	Weighted Average
	26.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.7	100	0.0100	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
80.0	1,698	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	37	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
114.9	1,835	Total			

Subcatchment 240:



Summary for Reach 200R-1: feeder creek

Inflow Area =	70.940 ac,	5.74% Impervious, Inflow Depth =	0.52"	for 1-yr storm event
Inflow =	13.67 cfs @	13.04 hrs, Volume=	3.067 af	
Outflow =	13.63 cfs @	13.07 hrs, Volume=	3.067 af, Atten= 0%, Lag= 1.9 min	

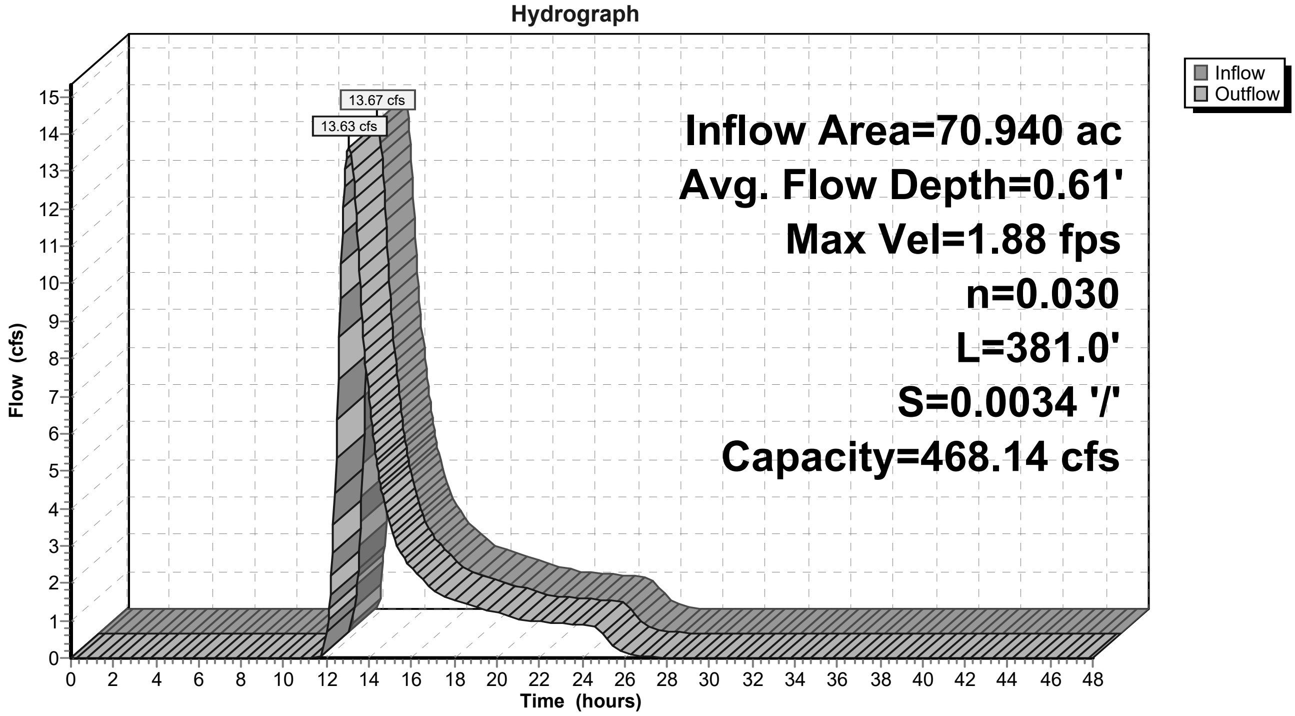
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.88 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 8.1 min

Peak Storage= 2,765 cf @ 13.07 hrs
Average Depth at Peak Storage= 0.61'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 468.14 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 381.0' Slope= 0.0034 '/'
Inlet Invert= 580.46', Outlet Invert= 579.16'

‡

Reach 200R-1: feeder creek



Summary for Reach 200R-2: feeder creek

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 0.55" for 1-yr storm event
Inflow = 14.26 cfs @ 13.07 hrs, Volume= 5.058 af
Outflow = 13.79 cfs @ 13.23 hrs, Volume= 5.027 af, Atten= 3%, Lag= 9.2 min

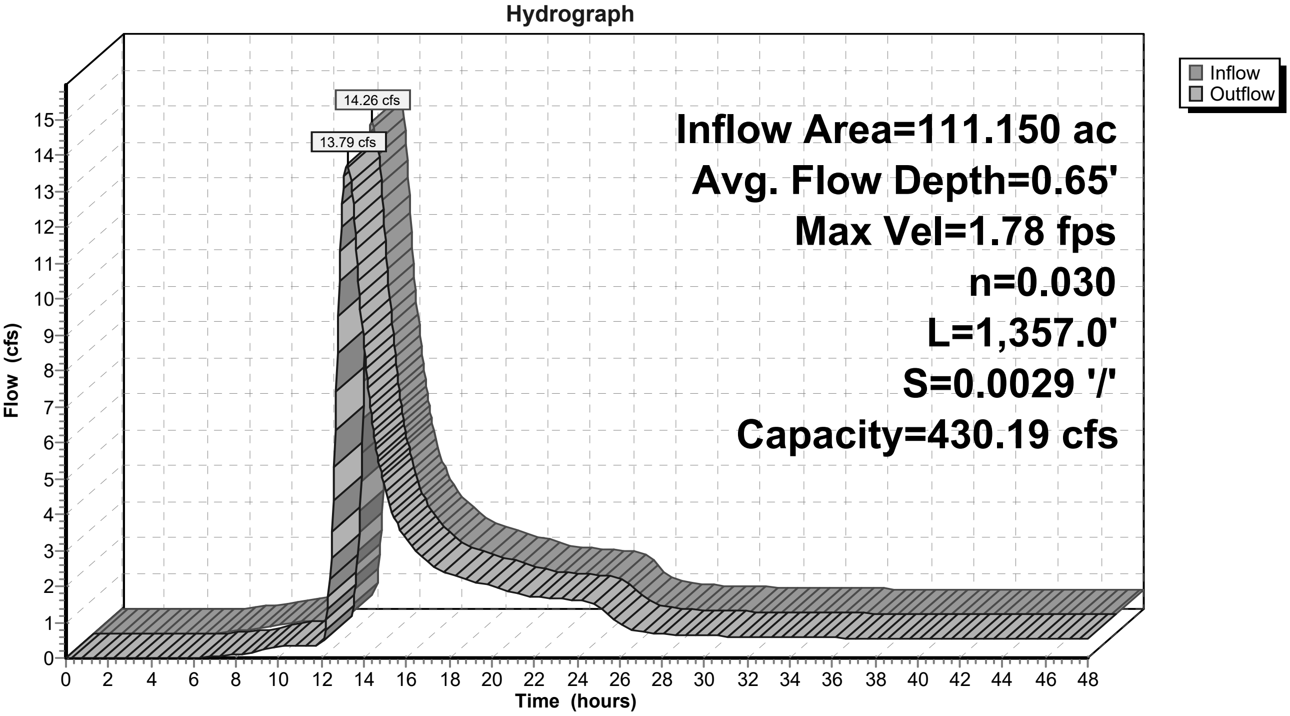
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.78 fps, Min. Travel Time= 12.7 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 33.1 min

Peak Storage= 10,496 cf @ 13.23 hrs
Average Depth at Peak Storage= 0.65'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 430.19 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 1,357.0' Slope= 0.0029 '/'
Inlet Invert= 579.16', Outlet Invert= 575.25'

‡

Reach 200R-2: feeder creek



Summary for Reach 200R-3: feeder creek

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 0.40" for 1-yr storm event
Inflow = 14.35 cfs @ 13.37 hrs, Volume= 3.711 af
Outflow = 12.75 cfs @ 13.41 hrs, Volume= 3.707 af, Atten= 11%, Lag= 2.2 min

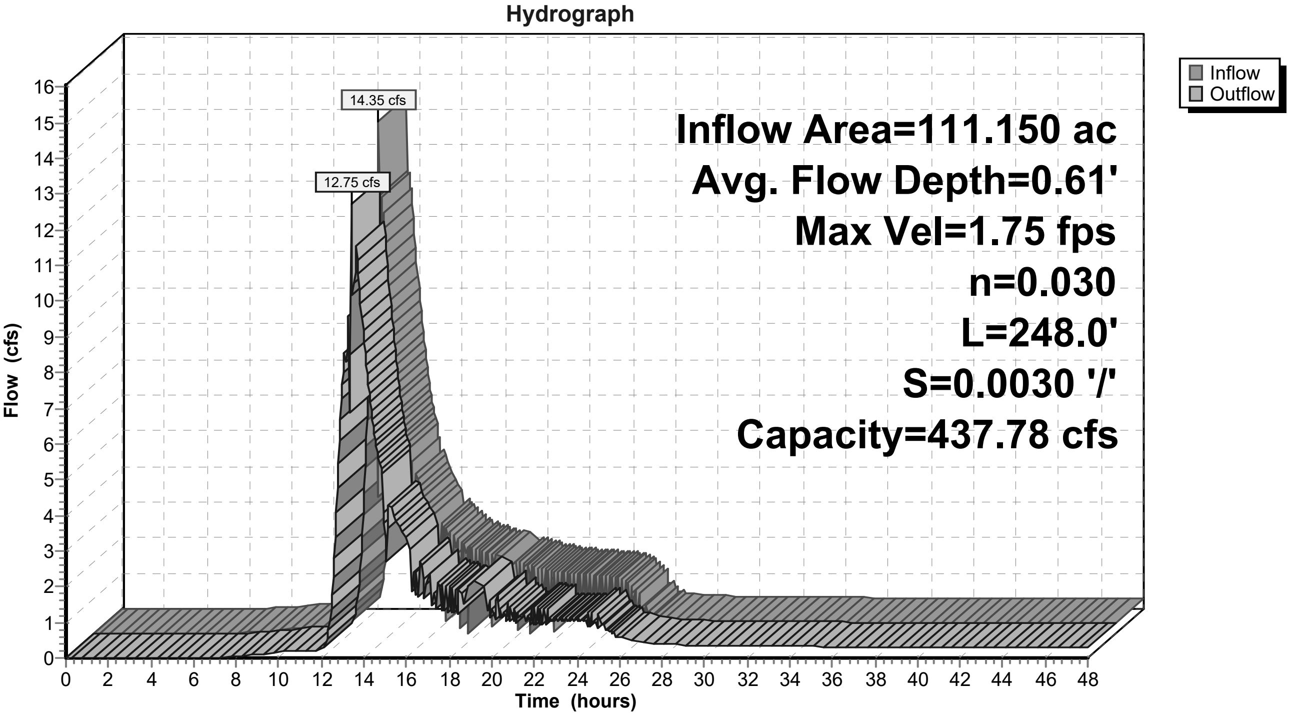
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.75 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 6.9 min

Peak Storage= 1,800 cf @ 13.41 hrs
Average Depth at Peak Storage= 0.61'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 437.78 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 248.0' Slope= 0.0030 '/'
Inlet Invert= 575.25', Outlet Invert= 574.51'

‡

Reach 200R-3: feeder creek



Summary for Reach 200R-7: feeder creek

Inflow Area = 26.360 ac, 0.00% Impervious, Inflow Depth > 1.45" for 1-yr storm event
Inflow = 14.99 cfs @ 13.55 hrs, Volume= 3.179 af
Outflow = 11.68 cfs @ 13.72 hrs, Volume= 3.176 af, Atten= 22%, Lag= 10.0 min

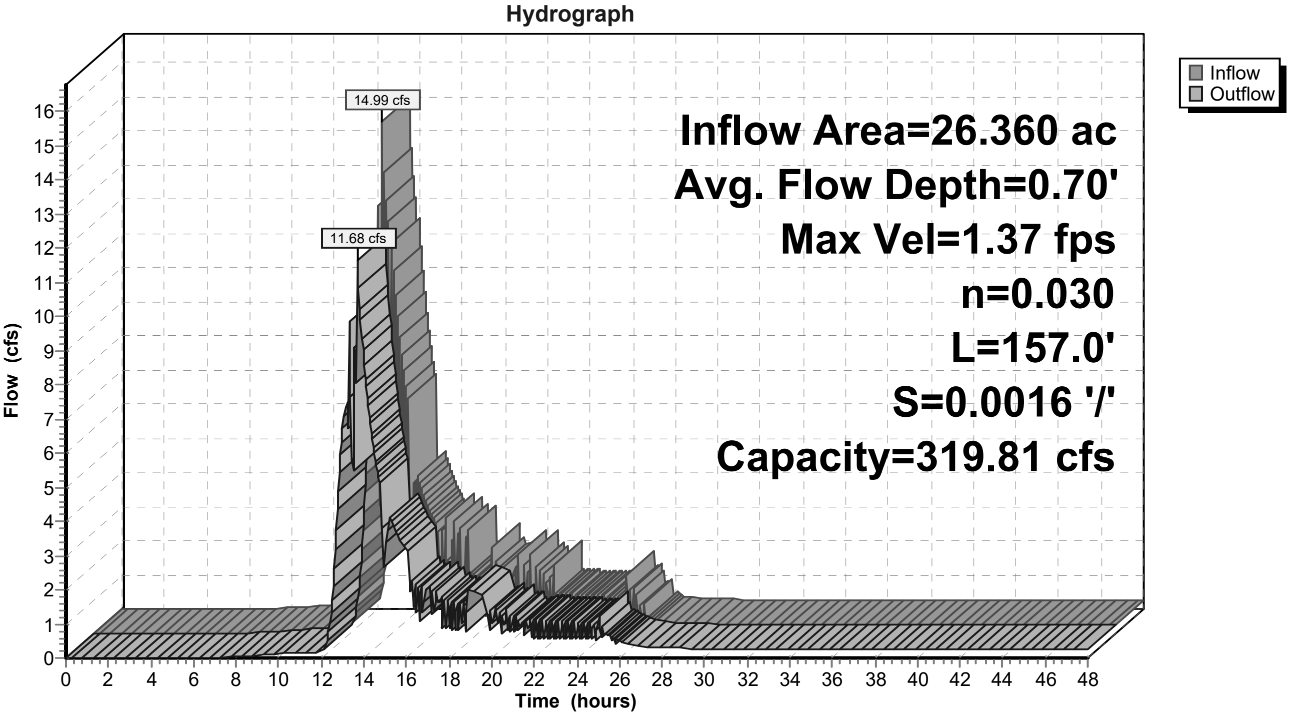
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.37 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.45 fps, Avg. Travel Time= 5.8 min

Peak Storage= 1,326 cf @ 13.72 hrs
Average Depth at Peak Storage= 0.70'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 319.81 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 157.0' Slope= 0.0016 '/'
Inlet Invert= 575.25', Outlet Invert= 575.00'

‡

Reach 200R-7: feeder creek



Summary for Reach 210R: feeder creek

Inflow Area =	3.440 ac,	0.00% Impervious,	Inflow Depth = 0.05"	for 1-yr storm event	
Inflow =	1.53 cfs @	11.96 hrs,	Volume=	0.013 af	
Outflow =	0.74 cfs @	12.02 hrs,	Volume=	0.013 af,	Atten= 52%, Lag= 3.4 min

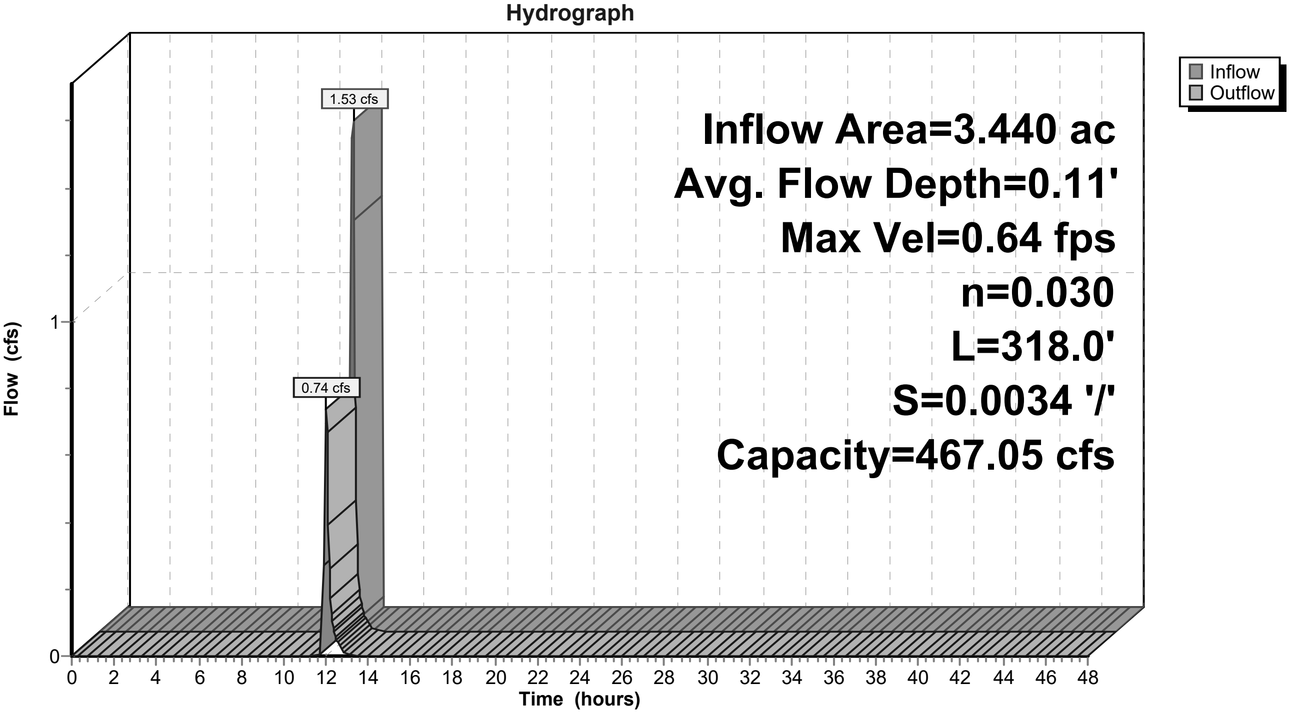
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 0.64 fps, Min. Travel Time= 8.3 min
Avg. Velocity = 0.36 fps, Avg. Travel Time= 14.9 min

Peak Storage= 362 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 467.05 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 318.0' Slope= 0.0034 '/'
Inlet Invert= 581.54', Outlet Invert= 580.46'

‡

Reach 210R: feeder creek



Summary for Pond 21P: pond

Inflow Area = 3.440 ac, 0.00% Impervious, Inflow Depth = 0.54" for 1-yr storm event
Inflow = 1.97 cfs @ 12.14 hrs, Volume= 0.156 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.22' @ 25.15 hrs Surf.Area= 31,268 sf Storage= 6,780 cf
Flood Elev= 587.00' Surf.Area= 36,973 sf Storage= 33,304 cf

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

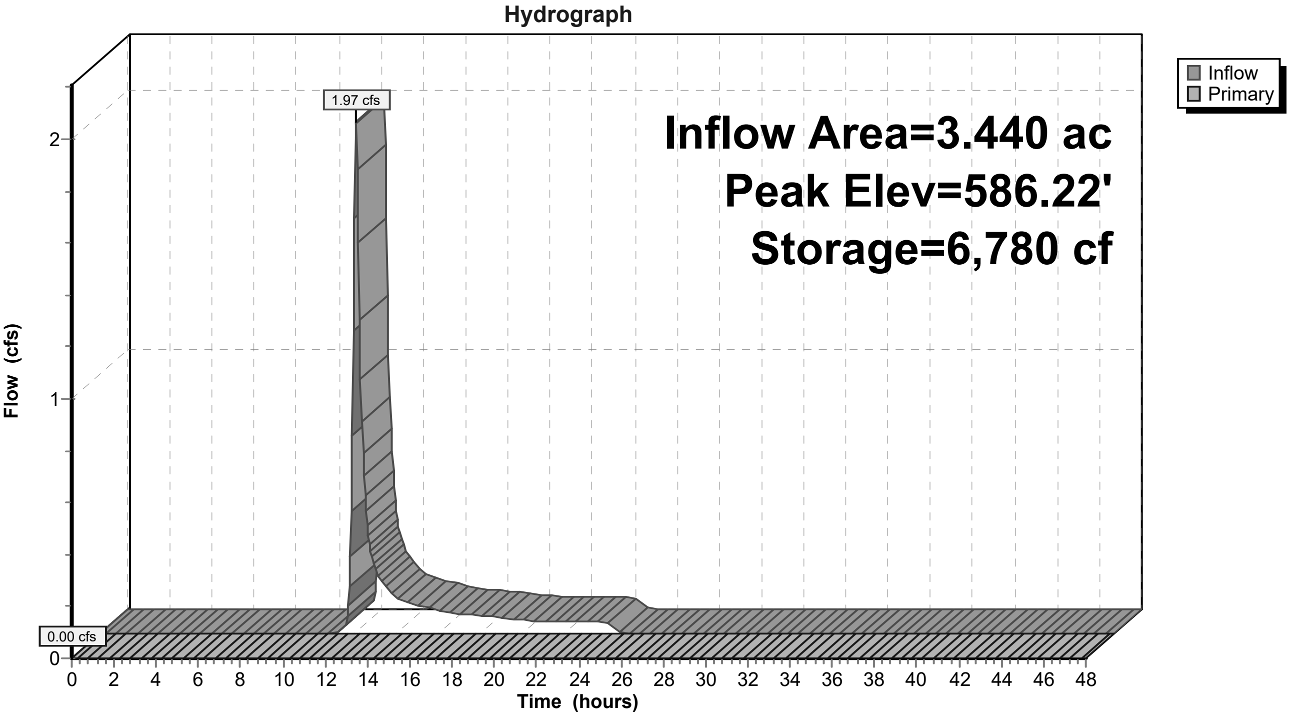
Volume	Invert	Avail.Storage	Storage Description
#1	586.00'	33,304 cf	**pond (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
586.00	29,634	0	0
587.00	36,973	33,304	33,304

Device	Routing	Invert	Outlet Devices
#1	Primary	586.70'	**100.0' long x 8.0' breadth overflow weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=586.00' TW=581.54' (Dynamic Tailwater)
↰**1=overflow weir** (Controls 0.00 cfs)

Pond 21P: pond



Summary for Pond 200S: splitter

```
Inflow Area =      111.150 ac, 28.72% Impervious, Inflow Depth >  0.54"   for 1-yr storm event
Inflow      =       13.79 cfs @  13.23 hrs, Volume=        5.027 af
Outflow     =       13.79 cfs @  13.23 hrs, Volume=        5.027 af, Atten= 0%, Lag= 0.0 min
Primary     =       14.35 cfs @  13.37 hrs, Volume=        3.711 af
Secondary   =       12.24 cfs @  13.55 hrs, Volume=        2.314 af
```

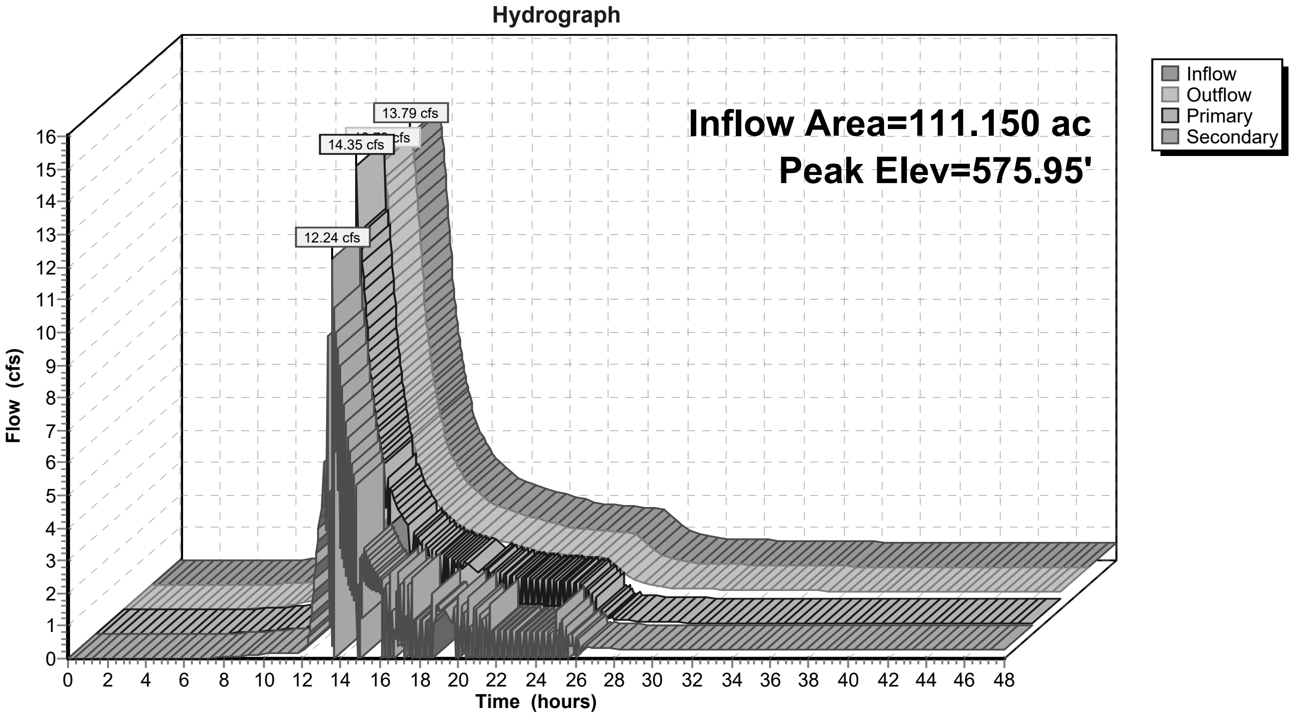
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 575.95' @ 13.41 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	575.25'	**162.0 deg x 10.0' long x 4.00' rise splitter1** Cv= 2.47 (C= 3.09)
#2	Secondary	575.25'	**162.0 deg x 10.0' long x 4.00' rise splitter2** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=11.83 cfs @ 13.37 hrs HW=575.88' TW=575.78' (Dynamic Tailwater)
└─**1=splitter1** (Weir Controls 11.83 cfs @ 1.34 fps)

Secondary OutFlow Max=0.00 cfs @ 13.55 hrs HW=575.80' TW=575.85' (Dynamic Tailwater)
└─**2=splitter2** (Controls 0.00 cfs)

Pond 200S: splitter



Summary for Pond 234Bio: bioretention

```
Inflow Area =       7.860 ac, 82.06% Impervious, Inflow Depth >  1.20"   for 1-yr storm event
Inflow      =     13.62 cfs @  11.98 hrs, Volume=        0.789 af
Outflow     =      0.27 cfs @  17.15 hrs, Volume=        0.620 af, Atten= 98%, Lag= 310.0 min
Primary     =      0.27 cfs @  17.15 hrs, Volume=        0.620 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= 0.05 hrs / 3
Peak Elev= 585.45' @ 17.15 hrs   Surf.Area= 22,644 sf   Storage= 20,749 cf
Flood Elev= 587.00'   Surf.Area= 25,515 sf   Storage= 57,991 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 660.6 min ( 1,541.5 - 880.9 )

Volume      Invert    Avail.Storage   Storage Description
   #1       584.50'       57,991 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

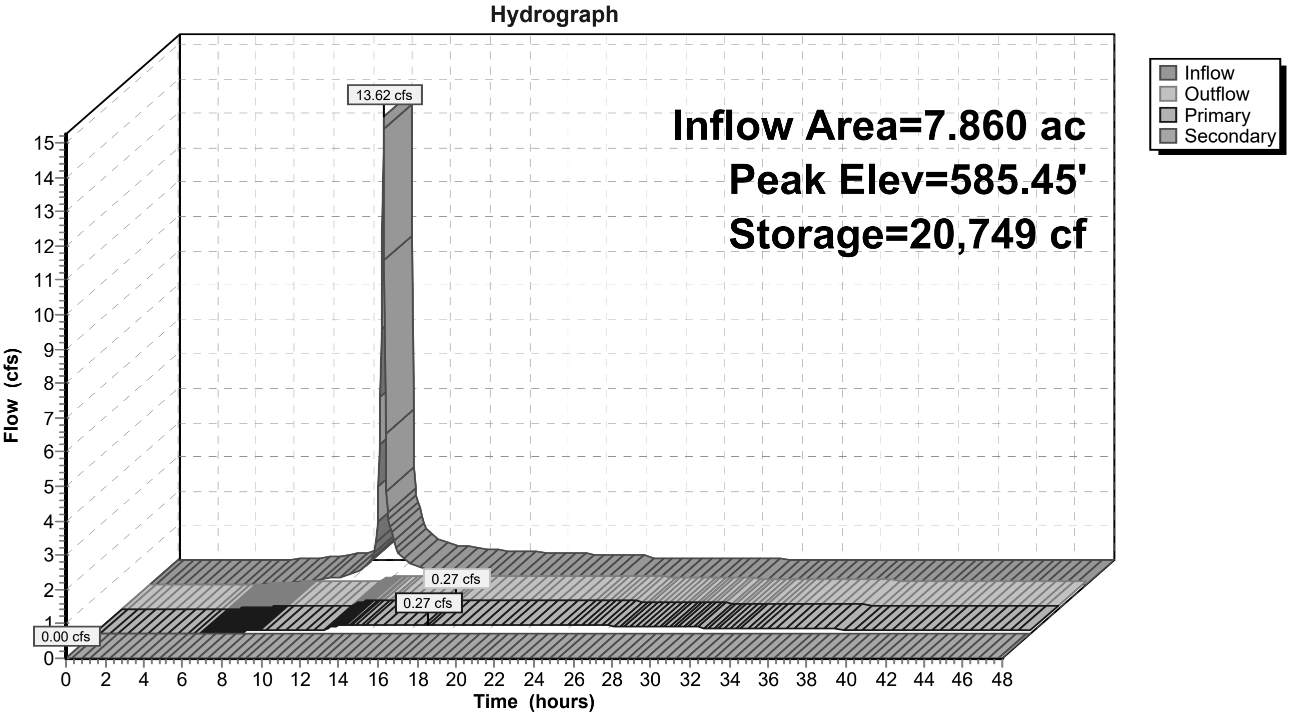
 Elevation      Surf.Area        Inc.Store       Cum.Store
    (feet)          (sq-ft)     (cubic-feet)    (cubic-feet)
    584.50          20,920                0               0
    586.00          23,635           33,416          33,416
    587.00          25,515           24,575          57,991

Device  Routing          Invert   Outlet Devices
   #1   Primary         581.08'   15.0"  Round Culvert
                                  L= 12.0'   CPP, square edge headwall,  Ke= 0.500
                                  Inlet / Outlet Invert= 581.08' / 580.98'   S= 0.0083 '/'   Cc= 0.900
                                  n= 0.012  Concrete pipe, finished,  Flow Area= 1.23 sf
   #2   Device 1        581.08'   6.0" Vert. Underdrain   C= 0.600
   #3   Device 1        585.00'   3.0" Vert. Orifice   C= 0.600
   #4   Device 1        586.50'   48.0" x 30.0" Horiz. Grate   C= 0.600
                                  Limited to weir flow at low heads
   #5   Device 2        584.50'   0.250 in/hr Exfiltration through bioretention media over Surface area
   #6   Secondary       586.00'   162.0 deg x 10.0' long x 1.00' rise overflow weir Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.27 cfs @ 17.15 hrs  HW=585.45'  TW=580.80'   (Dynamic Tailwater)
↑└─1=Culvert  (Passes 0.27 cfs of 11.44 cfs potential flow)
   ↑├─2=Underdrain  (Passes 0.13 cfs of 1.92 cfs potential flow)
   │ ↑└─5=Exfiltration through bioretention media(Exfiltration Controls 0.13 cfs)
   ├─3=Orifice  (Orifice Controls 0.14 cfs @ 2.76 fps)
   └─4=Grate  ( Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=584.50'  TW=584.50'   (Dynamic Tailwater)
↑└─6=overflow weir  ( Controls 0.00 cfs)
```

Pond 234Bio: bioretention



Summary for Pond 234F: forebay

Inflow Area = 7.860 ac, 82.06% Impervious, Inflow Depth = 1.24" for 1-yr storm event
Inflow = 14.89 cfs @ 11.97 hrs, Volume= 0.815 af
Outflow = 13.62 cfs @ 11.98 hrs, Volume= 0.789 af, Atten= 8%, Lag= 0.8 min
Primary = 13.62 cfs @ 11.98 hrs, Volume= 0.789 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.50' Surf.Area= 3,193 sf Storage= 8,951 cf
Peak Elev= 585.45' @ 17.15 hrs Surf.Area= 3,807 sf Storage= 12,284 cf (3,334 cf above start)
Flood Elev= 587.00' Surf.Area= 4,895 sf Storage= 18,993 cf (10,042 cf above start)

Plug-Flow detention time= 254.6 min calculated for 0.583 af (71% of inflow)
Center-of-Mass det. time= 81.7 min (880.9 - 799.2)

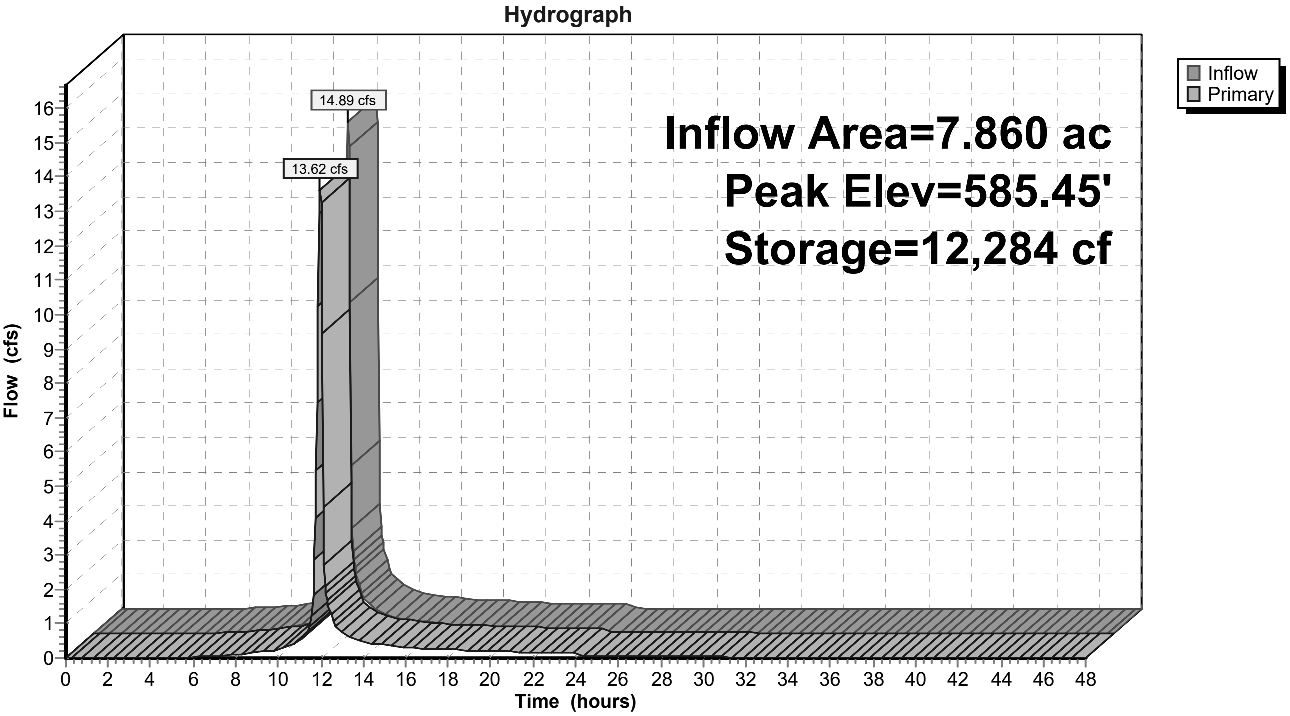
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	18,993 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	965	0	0
582.00	1,800	2,765	2,765
584.00	2,870	4,670	7,435
586.00	4,160	7,030	14,465
587.00	4,895	4,528	18,993

Device	Routing	Invert	Outlet Devices
#1	Primary	584.50'	**162.0 deg x 10.0' long x 2.50' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=13.21 cfs @ 11.98 hrs HW=585.13' TW=585.00' (Dynamic Tailwater)
└─**1=overflow weir** (Weir Controls 13.21 cfs @ 1.51 fps)

Pond 234F: forebay



Summary for Pond 235Bio: bioretention

```
Inflow Area =       10.030 ac,  72.98% Impervious,  Inflow Depth >   1.17"    for  1-yr storm event
Inflow      =       19.18 cfs @   11.99 hrs,  Volume=          0.974 af
Outflow     =        0.29 cfs @   18.13 hrs,  Volume=          0.807 af,  Atten= 98%,  Lag= 368.9 min
Primary     =        0.29 cfs @   18.13 hrs,  Volume=          0.807 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= 0.05 hrs / 3
Peak Elev= 585.19' @ 18.13 hrs   Surf.Area= 39,945 sf   Storage= 27,050 cf
Flood Elev= 587.00'   Surf.Area= 44,755 sf   Storage= 103,550 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 787.0 min ( 1,649.2 - 862.2 )

Volume       Invert     Avail.Storage   Storage Description
   #1         584.50'       103,550 cf  Custom Stage Data (Prismatic)Listed below (Recalc)

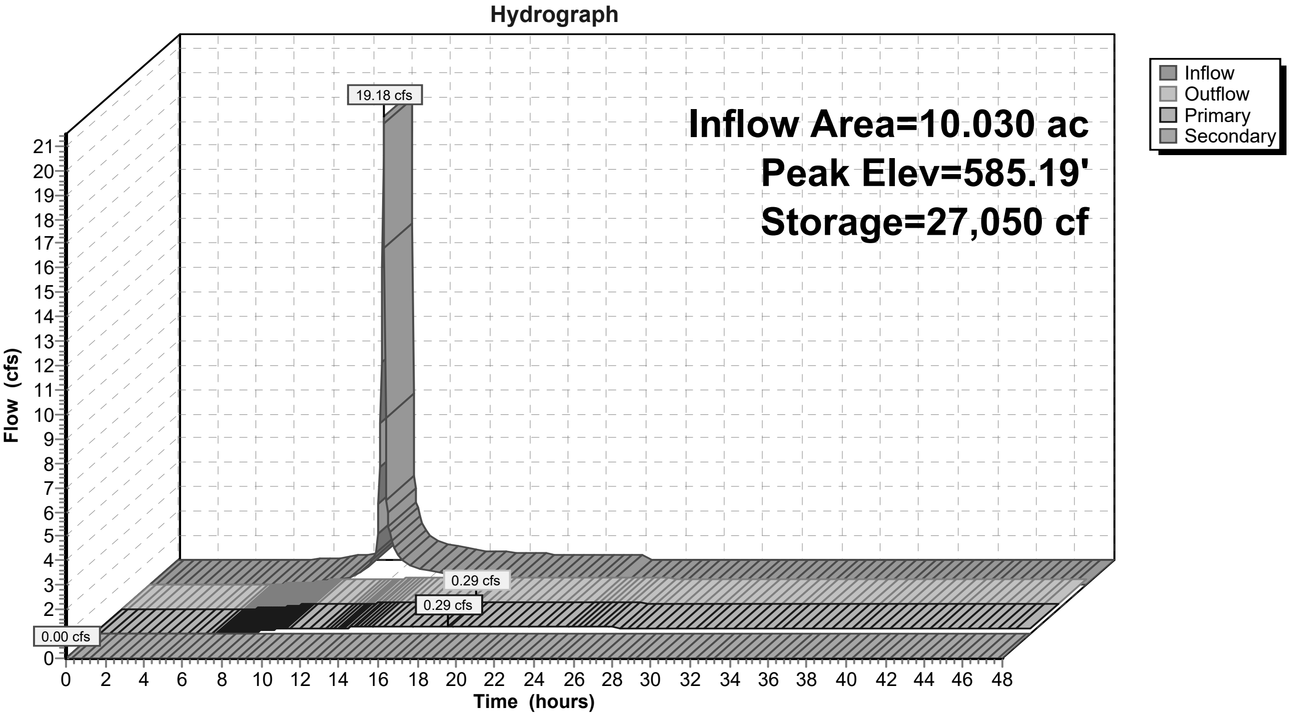
 Elevation           Surf.Area           Inc.Store          Cum.Store
    (feet)              (sq-ft)        (cubic-feet)       (cubic-feet)
    584.50               38,130                   0                  0
    586.00               42,060              60,143             60,143
    587.00               44,755              43,408            103,550

Device   Routing             Invert   Outlet Devices
   #1    Primary            581.08'   15.0"  Round Culvert
                                      L= 66.0'   CPP, square edge headwall,  Ke= 0.500
                                      Inlet / Outlet Invert= 581.08' / 580.84'   S= 0.0036 '/'   Cc= 0.900
                                      n= 0.012  Concrete pipe, finished,  Flow Area= 1.23 sf
   #2    Device 1           581.08'   6.0" Vert. Underdrain   C= 0.600
   #3    Device 1           585.00'   3.0" Vert. Orifice   C= 0.600
   #4    Device 1           586.50'   48.0" x 30.0" Horiz. Grate   C= 0.600
                                      Limited to weir flow at low heads
   #5    Device 2           584.50'   0.250 in/hr Exfiltration through bioretention media over Surface area
   #6    Secondary          586.00'   162.0 deg x 10.0' long x 1.00' rise overflow weir Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.29 cfs @ 18.13 hrs  HW=585.19'  TW=581.17'   (Dynamic Tailwater)
└─1=Culvert  (Passes 0.29 cfs of 10.35 cfs potential flow)
   ├─2=Underdrain  (Passes 0.23 cfs of 1.86 cfs potential flow)
   │  └─5=Exfiltration through bioretention media(Exfiltration Controls 0.23 cfs)
   ├─3=Orifice  (Orifice Controls 0.06 cfs @ 1.50 fps)
   └─4=Grate  ( Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=584.50'  TW=582.00'   (Dynamic Tailwater)
└─6=overflow weir  ( Controls 0.00 cfs)
```

Pond 235Bio: bioretention



Summary for Pond 235F: forebay

```
Inflow Area =      10.030 ac, 72.98% Impervious,  Inflow Depth =   1.18"    for  1-yr storm event
Inflow      =      19.85 cfs @   11.97 hrs,  Volume=          0.989 af
Outflow     =      19.18 cfs @   11.99 hrs,  Volume=          0.974 af,  Atten= 3%,  Lag= 1.1 min
Primary     =      19.18 cfs @   11.99 hrs,  Volume=          0.974 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.50' Surf.Area= 3,168 sf Storage= 8,782 cf
Peak Elev= 585.19' @ 18.13 hrs Surf.Area= 3,621 sf Storage= 11,134 cf (2,352 cf above start)
Flood Elev= 587.00' Surf.Area= 4,885 sf Storage= 18,788 cf (10,006 cf above start)

Plug-Flow detention time= 193.4 min calculated for 0.772 af (78% of inflow)
Center-of-Mass det. time= 56.9 min (862.2 - 805.3)

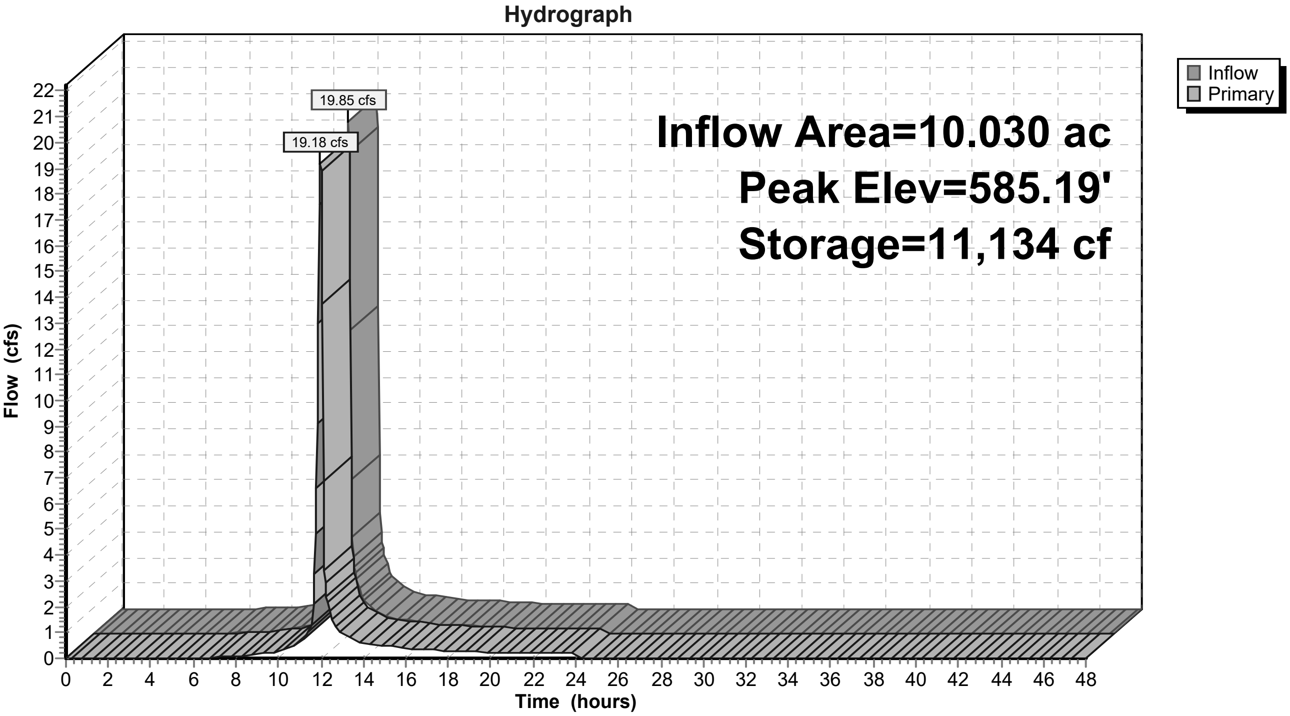
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	18,788 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	910	0	0
582.00	1,765	2,675	2,675
584.00	2,840	4,605	7,280
586.00	4,150	6,990	14,270
587.00	4,885	4,518	18,788

Device	Routing	Invert	Outlet Devices
#1	Primary	584.50'	**162.0 deg x 10.0' long x 2.50' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=18.54 cfs @ 11.99 hrs HW=585.14' TW=584.83' (Dynamic Tailwater)
↑—**1=overflow weir** (Weir Controls 18.54 cfs @ 2.07 fps)

Pond 235F: forebay



Summary for Pond 236Bio: bioretention

```
Inflow Area =       7.500 ac, 80.53% Impervious, Inflow Depth =  1.26"   for 1-yr storm event
Inflow      =     14.94 cfs @  11.99 hrs, Volume=         0.791 af
Outflow     =      4.61 cfs @  12.15 hrs, Volume=         0.784 af, Atten= 69%, Lag= 9.7 min
Primary     =      4.61 cfs @  12.15 hrs, Volume=         0.784 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= 0.05 hrs / 3
Peak Elev= 586.72' @ 12.15 hrs Surf.Area= 21,182 sf Storage= 14,657 cf
Flood Elev= 588.00' Surf.Area= 24,415 sf Storage= 43,765 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 436.8 min (1,242.9 - 806.2)

Volume	Invert	Avail.Storage	Storage Description
#1	586.00'	43,765 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

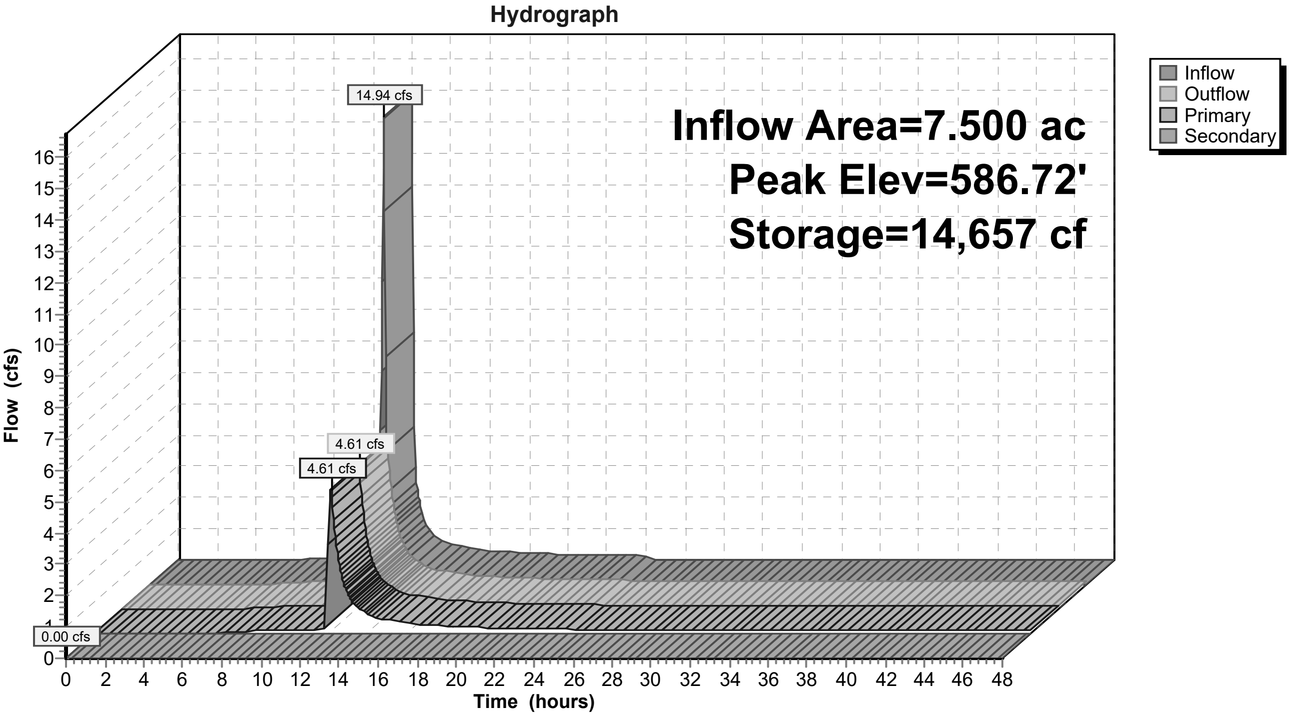
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
586.00	19,350	0	0
588.00	24,415	43,765	43,765

Device	Routing	Invert	Outlet Devices
#1	Primary	582.58'	**24.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 582.58' / 582.43' S= 0.0038 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	582.58'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	586.50'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	586.00'	**0.250 in/hr Exfiltration through bioretention media over Surface area**
#5	Secondary	587.00'	**162.0 deg x 10.0' long x 1.00' rise overflow weir** Cv= 2.47 (C= 3.09)

```
Primary OutFlow Max=4.58 cfs @ 12.15 hrs  HW=586.72'  TW=582.18'   (Dynamic Tailwater)
└─1=Culvert (Passes 4.58 cfs of 26.82 cfs potential flow)
   ├─2=Underdrain (Passes 0.12 cfs of 1.87 cfs potential flow)
   │  └─4=Exfiltration through bioretention media(Exfiltration Controls 0.12 cfs)
   └─3=Grate (Weir Controls 4.46 cfs @ 1.54 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=586.00'  TW=582.00'   (Dynamic Tailwater)
└─5=overflow weir ( Controls 0.00 cfs)
```

Pond 236Bio: bioretention



Summary for Pond 236F: forebay

Inflow Area = 7.500 ac, 80.53% Impervious, Inflow Depth = 1.26" for 1-yr storm event
Inflow = 15.66 cfs @ 11.97 hrs, Volume= 0.791 af
Outflow = 14.94 cfs @ 11.99 hrs, Volume= 0.791 af, Atten= 5%, Lag= 1.6 min
Primary = 14.94 cfs @ 11.99 hrs, Volume= 0.791 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 586.50' Surf.Area= 4,521 sf Storage= 12,637 cf
Peak Elev= 587.03' @ 12.00 hrs Surf.Area= 4,981 sf Storage= 15,143 cf (2,506 cf above start)
Flood Elev= 588.00' Surf.Area= 5,830 sf Storage= 20,400 cf (7,763 cf above start)

Plug-Flow detention time= 185.5 min calculated for 0.500 af (63% of inflow)
Center-of-Mass det. time= 8.2 min (806.2 - 797.9)

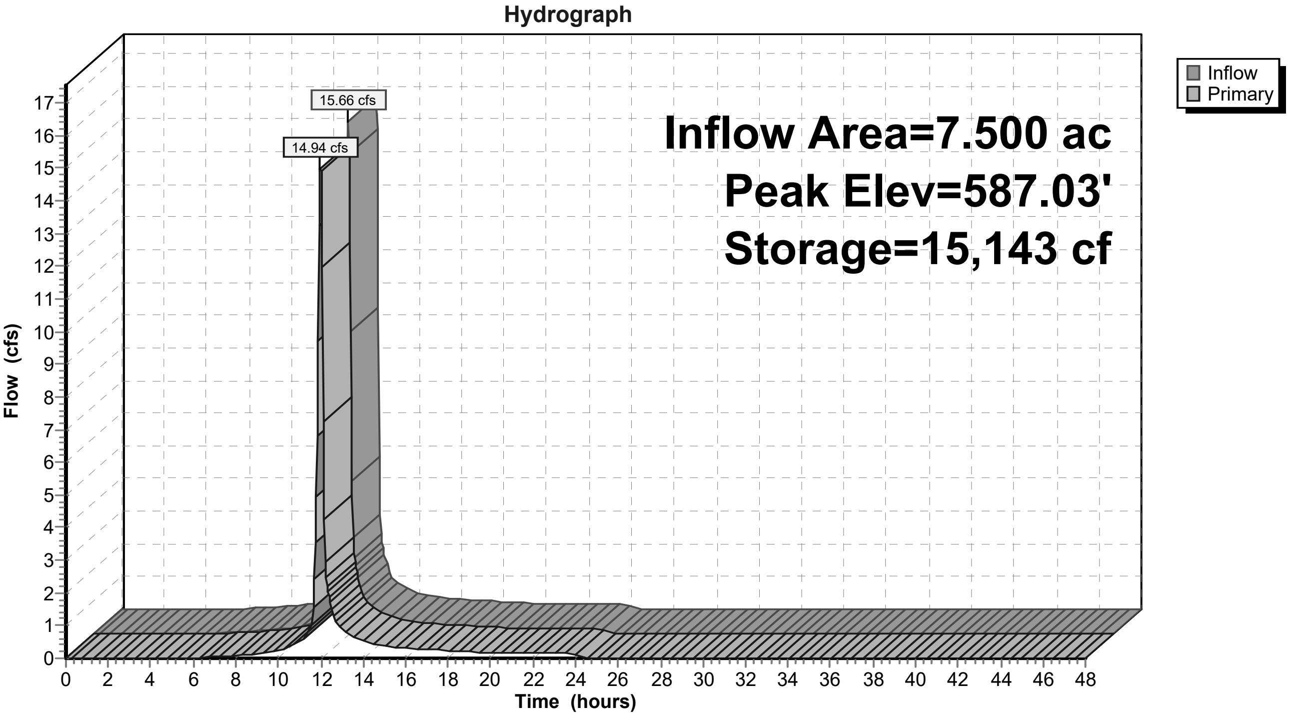
Volume	Invert	Avail.Storage	Storage Description
#1	582.00'	20,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
582.00	1,270	0	0
584.00	2,565	3,835	3,835
586.00	4,085	6,650	10,485
588.00	5,830	9,915	20,400

Device	Routing	Invert	Outlet Devices
#1	Primary	586.50'	**162.0 deg x 10.0' long x 2.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=14.68 cfs @ 11.99 hrs HW=587.02' TW=586.54' (Dynamic Tailwater)
↑—**1=overflow weir** (Weir Controls 14.68 cfs @ 2.12 fps)

Pond 236F: forebay



Summary for Pond 237Bio: bioretention

```
Inflow Area =       11.240 ac,  71.53% Impervious,  Inflow Depth =   1.18"    for  1-yr storm event
Inflow      =       21.80 cfs @   11.99 hrs,  Volume=          1.108 af
Outflow     =        4.72 cfs @   12.17 hrs,  Volume=          1.098 af,  Atten= 78%,  Lag= 11.2 min
Primary     =        4.72 cfs @   12.17 hrs,  Volume=          1.098 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= 0.05 hrs / 3
Peak Elev= 586.73' @ 12.17 hrs   Surf.Area= 30,673 sf   Storage= 21,567 cf
Flood Elev= 588.00'   Surf.Area= 33,965 sf   Storage= 62,765 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 462.8 min ( 1,274.0 - 811.1 )

Volume        Invert      Avail.Storage   Storage Description
   #1         586.00'         62,765 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

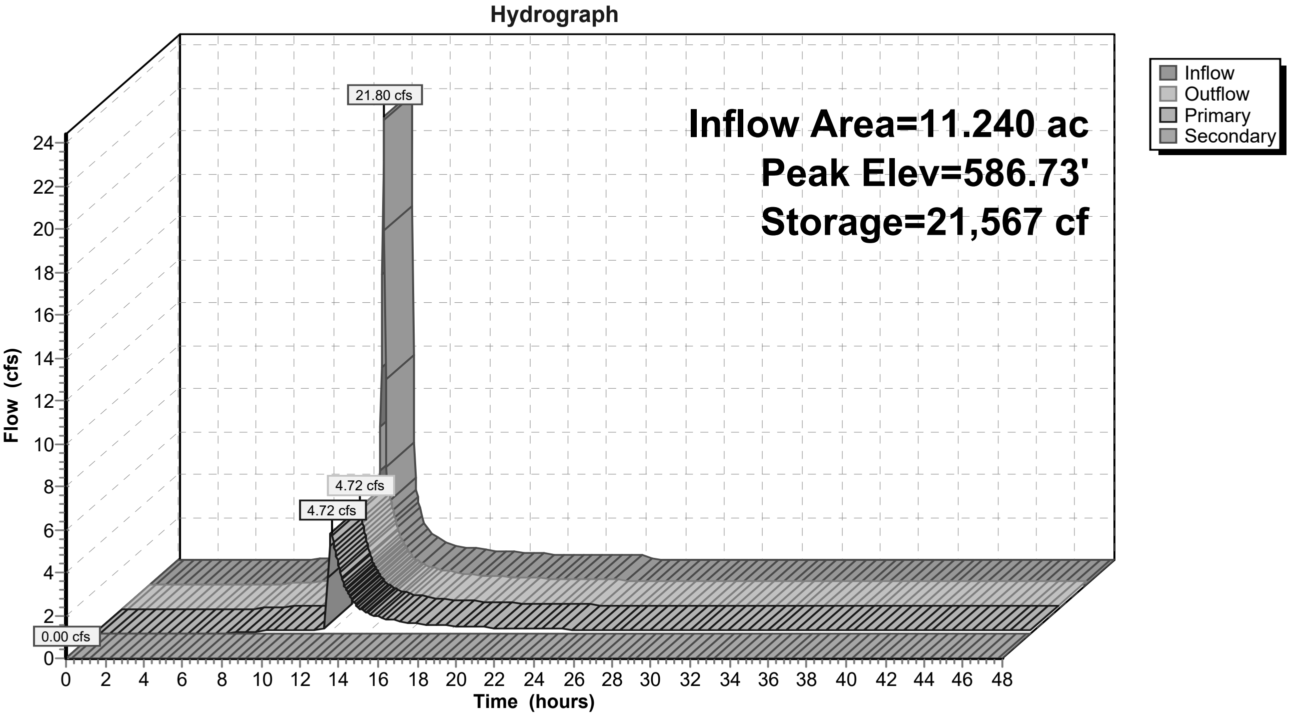
 Elevation          Surf.Area            Inc.Store          Cum.Store
    (feet)              (sq-ft)         (cubic-feet)        (cubic-feet)
    586.00             28,800                    0                   0
    588.00             33,965               62,765              62,765

Device   Routing              Invert   Outlet Devices
   #1    Primary             582.58'   24.0"  Round Culvert
                                       L= 37.0'   CPP, square edge headwall,  Ke= 0.500
                                       Inlet / Outlet Invert= 582.58' / 582.43'   S= 0.0041 '/'   Cc= 0.900
                                       n= 0.012  Concrete pipe, finished,  Flow Area= 3.14 sf
   #2    Device 1            582.58'   6.0" Vert. Underdrain   C= 0.600
   #3    Device 1            586.50'   48.0" x 30.0" Horiz. Grate   C= 0.600
                                       Limited to weir flow at low heads
   #4    Device 2            586.00'   0.250 in/hr Exfiltration through bioretention media over Surface area
   #5    Secondary           587.00'   162.0 deg x 10.0' long x 1.00' rise overflow weir Cv= 2.47 (C= 3.09)

Primary OutFlow Max=4.65 cfs @ 12.17 hrs  HW=586.72'  TW=582.19'   (Dynamic Tailwater)
└─1=Culvert  (Passes 4.65 cfs of 26.82 cfs potential flow)
   ├─2=Underdrain  (Passes 0.18 cfs of 1.87 cfs potential flow)
   │  └─4=Exfiltration through bioretention media(Exfiltration Controls 0.18 cfs)
   └─3=Grate  (Weir Controls 4.48 cfs @ 1.54 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=586.00'  TW=582.00'   (Dynamic Tailwater)
└─5=overflow weir  ( Controls 0.00 cfs)
```

Pond 237Bio: bioretention



Summary for Pond 237F: forebay

Inflow Area = 11.240 ac, 71.53% Impervious, Inflow Depth = 1.18" for 1-yr storm event
Inflow = 22.25 cfs @ 11.97 hrs, Volume= 1.108 af
Outflow = 21.80 cfs @ 11.99 hrs, Volume= 1.108 af, Atten= 2%, Lag= 1.3 min
Primary = 21.80 cfs @ 11.99 hrs, Volume= 1.108 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 586.50' Surf.Area= 3,658 sf Storage= 10,648 cf
Peak Elev= 587.16' @ 11.99 hrs Surf.Area= 4,106 sf Storage= 13,193 cf (2,545 cf above start)
Flood Elev= 588.00' Surf.Area= 4,685 sf Storage= 16,905 cf (6,257 cf above start)

Plug-Flow detention time= 133.7 min calculated for 0.863 af (78% of inflow)
Center-of-Mass det. time= 5.9 min (811.1 - 805.3)

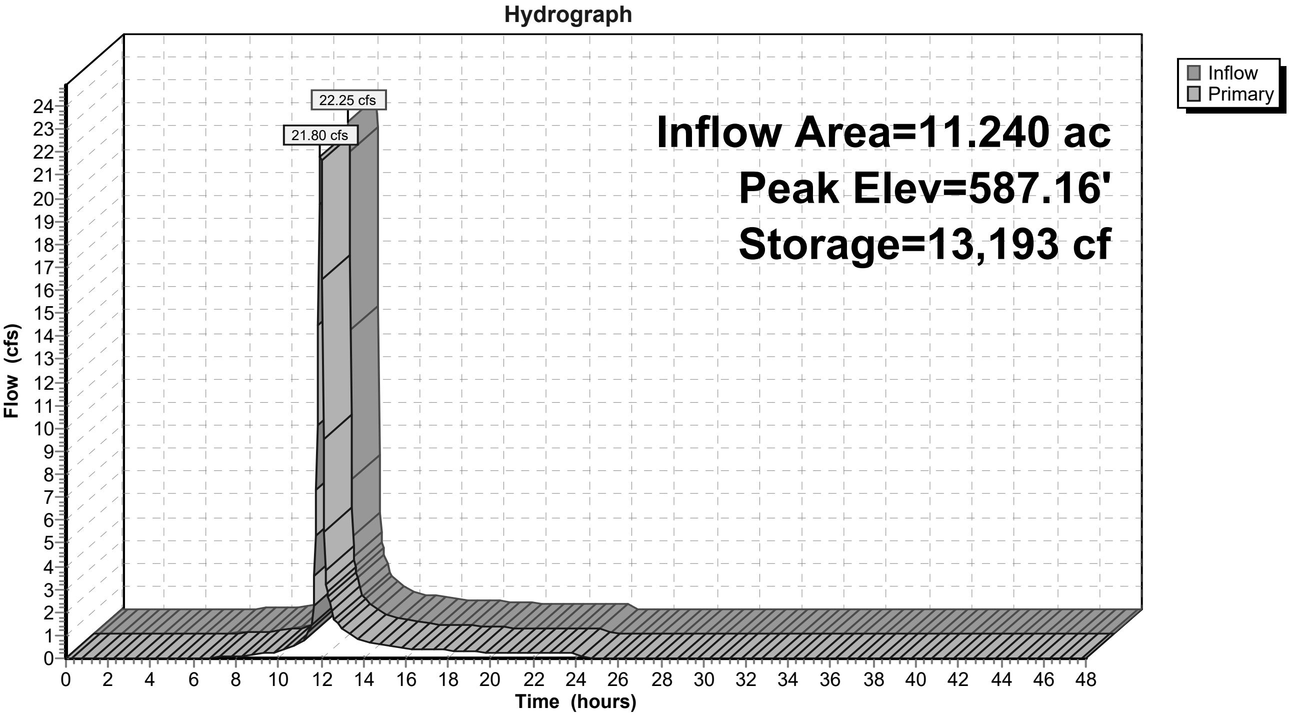
Volume	Invert	Avail.Storage	Storage Description
#1	582.00'	16,905 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
582.00	1,250	0	0
584.00	2,170	3,420	3,420
586.00	3,315	5,485	8,905
588.00	4,685	8,000	16,905

Device	Routing	Invert	Outlet Devices
#1	Primary	586.50'	**162.0 deg x 10.0' long x 2.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=21.18 cfs @ 11.99 hrs HW=587.14' TW=586.52' (Dynamic Tailwater)
↰**1=overflow weir** (Weir Controls 21.18 cfs @ 2.34 fps)

Pond 237F: forebay



Summary for Pond 238P: wet pond

```
Inflow Area =       22.320 ac, 63.08% Impervious, Inflow Depth >  1.17"   for 1-yr storm event
Inflow      =       12.05 cfs @  12.11 hrs, Volume=        2.171 af
Outflow     =        0.21 cfs @  48.00 hrs, Volume=        0.564 af, Atten= 98%, Lag= 2,153.1 min
Primary     =        0.21 cfs @  48.00 hrs, Volume=        0.564 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= 0.05 hrs / 3
Starting Elev= 582.00' Surf.Area= 76,680 sf Storage= 481,118 cf
Peak Elev= 582.88' @ 48.00 hrs Surf.Area= 82,485 sf Storage= 551,084 cf (69,966 cf above start)
Flood Elev= 587.00' Surf.Area= 106,960 sf Storage= 943,710 cf (462,593 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 646.9 min (1,850.4 - 1,203.5)

Volume	Invert	Avail.Storage	Storage Description
#1	570.00'	943,710 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

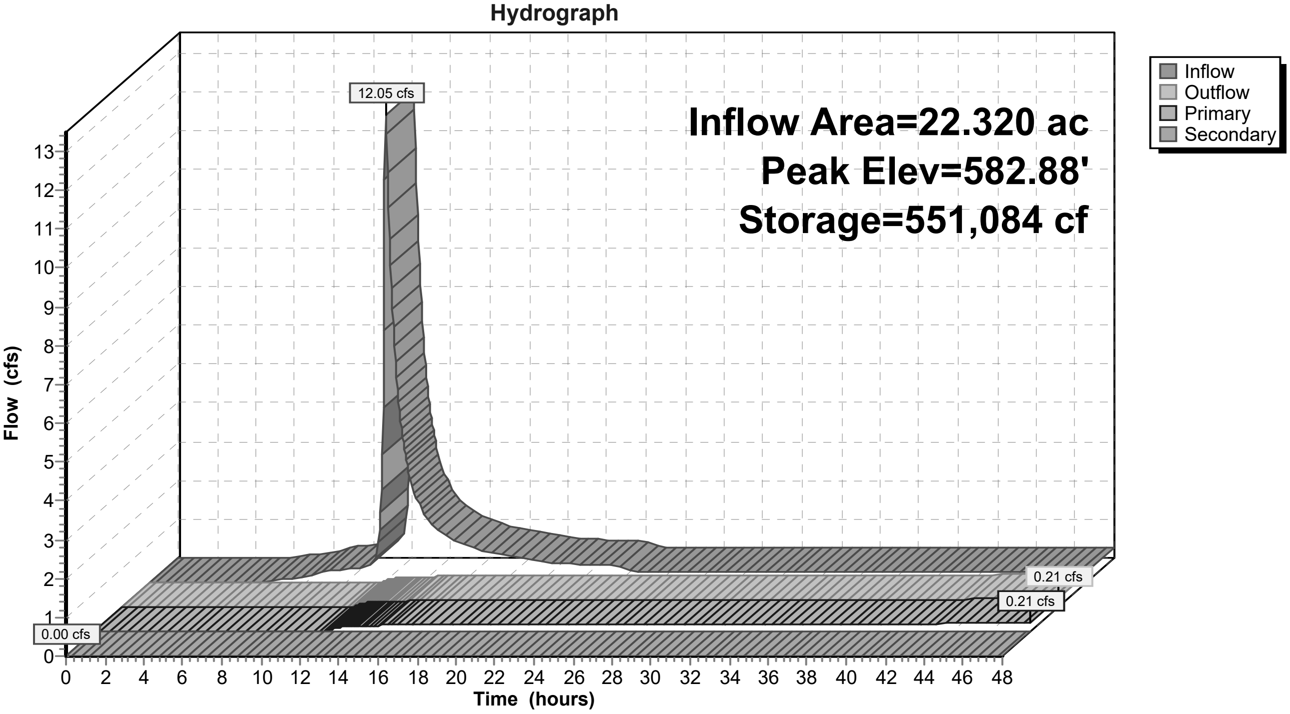
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
570.00	20,830	0	0
572.00	26,450	47,280	47,280
574.00	32,175	58,625	105,905
576.00	38,000	70,175	176,080
578.00	43,925	81,925	258,005
580.00	49,950	93,875	351,880
580.50	51,475	25,356	377,236
581.00	70,230	30,426	407,663
582.00	76,680	73,455	481,118
584.00	89,885	166,565	647,683
586.00	101,775	191,660	839,343
587.00	106,960	104,368	943,710

Device	Routing	Invert	Outlet Devices
#1	Primary	582.00'	**18.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 582.00' / 581.60' S= 0.0160 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	582.00'	**3.0" Vert. Orifice (internal)** C= 0.600
#3	Device 1	583.90'	**48.0" W x 6.0" H Vert. Weir (internal)** C= 0.600
#4	Device 1	585.00'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	586.00'	**162.0 deg x 15.0' long x 1.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.21 cfs @ 48.00 hrs HW=582.88' TW=581.85' (Dynamic Tailwater)
- **1=Culvert** (Passes 0.21 cfs of 3.33 cfs potential flow)
  - **2=Orifice (internal)** (Orifice Controls 0.21 cfs @ 4.18 fps)
  - **3=Weir (internal)** (Controls 0.00 cfs)
  - **4=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=582.00' TW=581.54' (Dynamic Tailwater)
- **5=overflow weir** (Controls 0.00 cfs)

Pond 238P: wet pond



Summary for Pond CB502: catch basin

```
Inflow Area =      7.860 ac,  82.06% Impervious,  Inflow Depth =   1.26"    for  1-yr storm event
Inflow       =      16.41 cfs @   11.97 hrs,  Volume=          0.828 af
Outflow      =      16.41 cfs @   11.97 hrs,  Volume=          0.828 af,  Atten= 0%,  Lag= 0.0 min
Primary      =      14.89 cfs @   11.97 hrs,  Volume=          0.815 af
Secondary =          1.53 cfs @   11.96 hrs,  Volume=          0.013 af
```

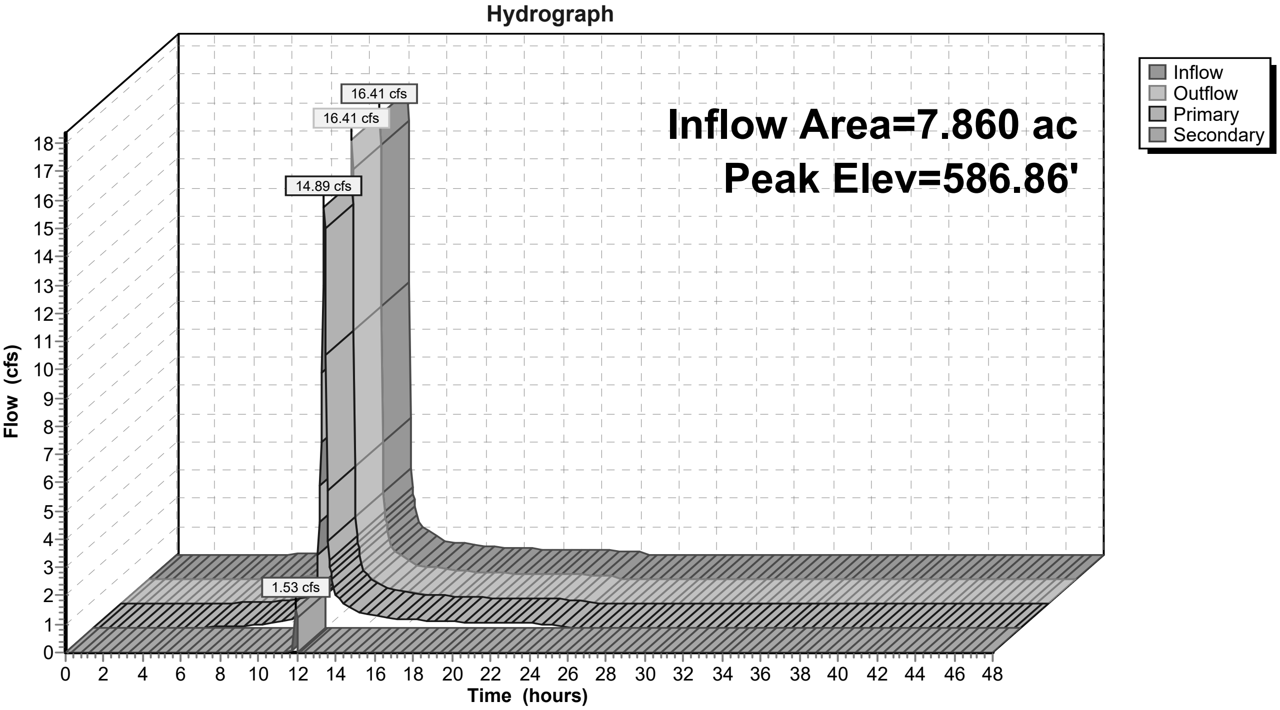
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.86' @ 11.97 hrs
Flood Elev= 591.16'

```
Device  Routing        Invert   Outlet Devices
   #1   Primary       584.93'   30.0"  Round Culvert
                                L= 98.0'   CPP, square edge headwall,  Ke= 0.500
                                Inlet / Outlet Invert= 584.93' / 584.50'   S= 0.0044 '/'   Cc= 0.900
                                n= 0.013  Corrugated PE, smooth interior,  Flow Area= 4.91 sf
   #2   Secondary     586.35'   24.0"  Round Culvert
                                L= 42.0'   CPP, square edge headwall,  Ke= 0.500
                                Inlet / Outlet Invert= 586.35' / 585.00'   S= 0.0321 '/'   Cc= 0.900
                                n= 0.013  Corrugated PE, smooth interior,  Flow Area= 3.14 sf
```

Primary OutFlow Max=14.54 cfs @ 11.97 hrs HW=586.83' TW=585.11' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 14.54 cfs @ 5.02 fps)

Secondary OutFlow Max=1.40 cfs @ 11.96 hrs HW=586.84' TW=581.61' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 1.40 cfs @ 2.37 fps)

Pond CB502: catch basin



Summary for Pond DMH1102: manhole

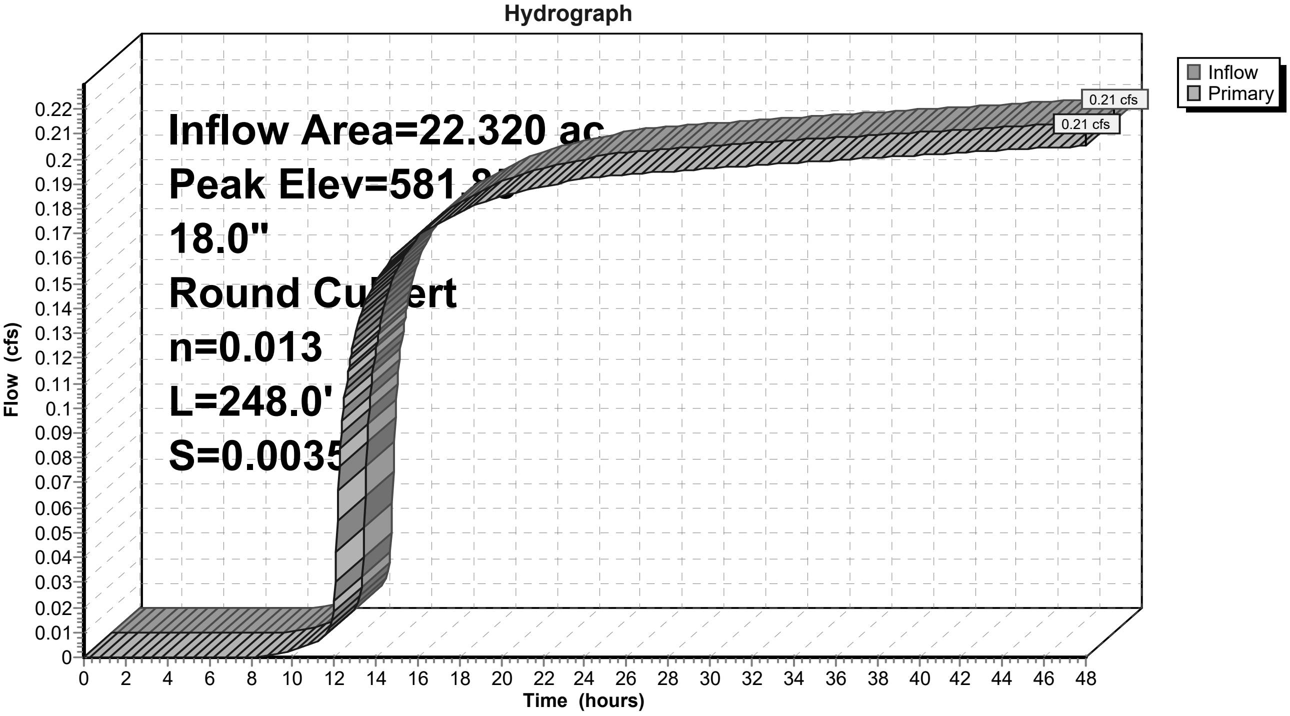
Inflow Area = 22.320 ac, 63.08% Impervious, Inflow Depth > 0.30" for 1-yr storm event
Inflow = 0.21 cfs @ 48.00 hrs, Volume= 0.564 af
Outflow = 0.21 cfs @ 48.00 hrs, Volume= 0.564 af, Atten= 0%, Lag= 0.0 min
Primary = 0.21 cfs @ 48.00 hrs, Volume= 0.564 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 581.85' @ 48.00 hrs
Flood Elev= 587.84'

Device	Routing	Invert	Outlet Devices
#1	Primary	581.60'	**18.0" Round Culvert** L= 248.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 581.60' / 580.74' S= 0.0035 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.21 cfs @ 48.00 hrs HW=581.85' TW=580.98' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.21 cfs @ 1.58 fps)

Pond DMH1102: manhole



Summary for Pond DMH1103: manhole

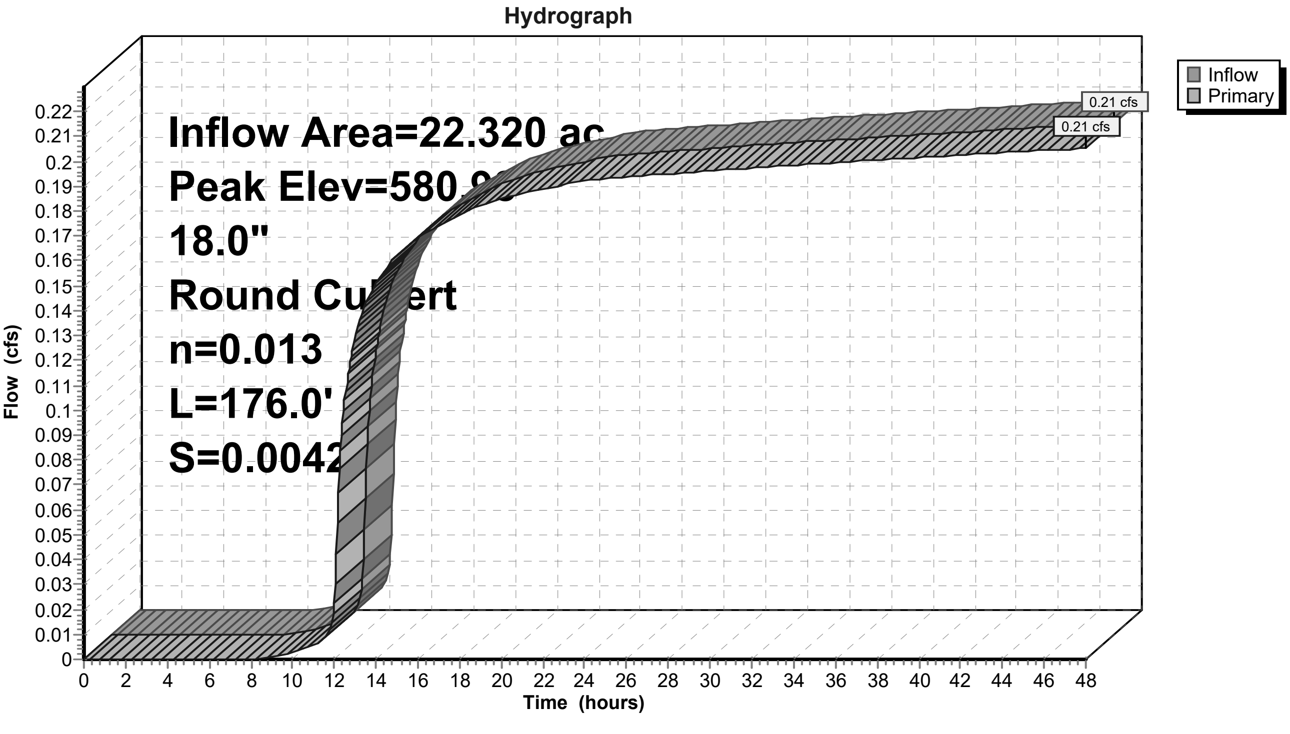
Inflow Area = 22.320 ac, 63.08% Impervious, Inflow Depth > 0.30" for 1-yr storm event
Inflow = 0.21 cfs @ 48.00 hrs, Volume= 0.564 af
Outflow = 0.21 cfs @ 48.00 hrs, Volume= 0.564 af, Atten= 0%, Lag= 0.0 min
Primary = 0.21 cfs @ 48.00 hrs, Volume= 0.564 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 580.98' @ 48.00 hrs
Flood Elev= 588.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	580.74'	**18.0" Round Culvert** L= 176.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.74' / 580.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.21 cfs @ 48.00 hrs HW=580.98' TW=579.26' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.21 cfs @ 1.72 fps)

Pond DMH1103: manhole



Summary for Pond DMH602: manhole

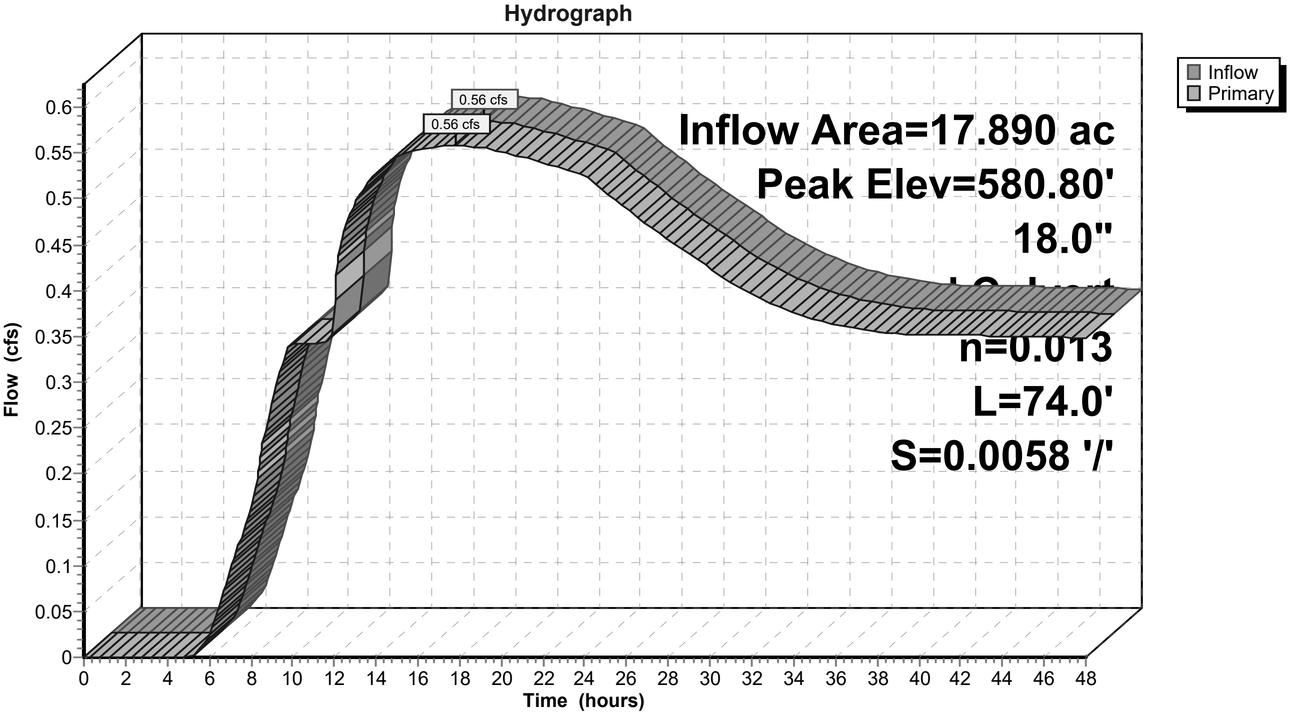
```
Inflow Area =        17.890 ac, 76.97% Impervious, Inflow Depth >  0.96"   for  1-yr storm event
Inflow      =         0.56 cfs @  17.78 hrs, Volume=          1.426 af
Outflow     =         0.56 cfs @  17.77 hrs, Volume=          1.426 af,  Atten= 0%,  Lag= 0.0 min
Primary     =         0.56 cfs @  17.77 hrs, Volume=          1.426 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 580.80' @ 17.77 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	580.43'	**18.0" Round Culvert** L= 74.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.43' / 580.00' S= 0.0058 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.56 cfs @ 17.77 hrs HW=580.80' TW=579.39' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.56 cfs @ 2.49 fps)

Pond DMH602: manhole



Summary for Pond DMH604: manhole

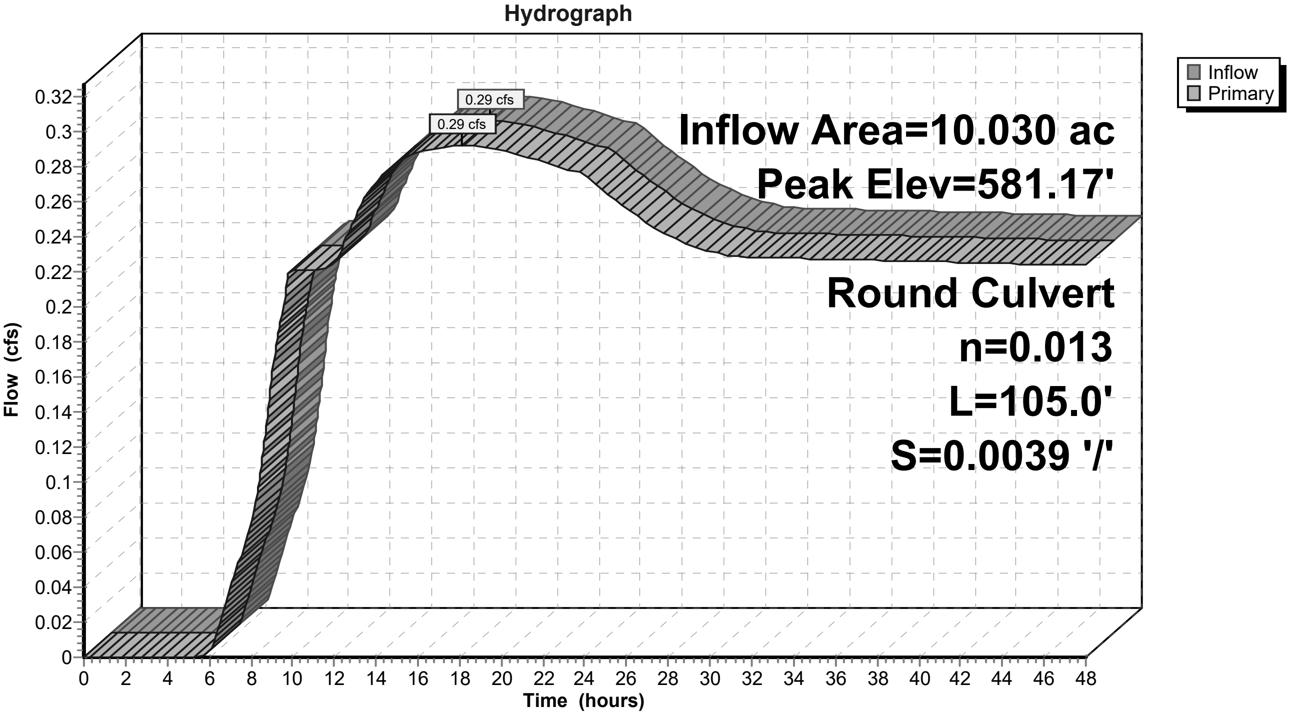
Inflow Area =	10.030 ac, 72.98% Impervious, Inflow Depth > 0.97" for 1-yr storm event				
Inflow =	0.29 cfs @	18.13 hrs,	Volume=	0.807 af	
Outflow =	0.29 cfs @	18.12 hrs,	Volume=	0.807 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.29 cfs @	18.12 hrs,	Volume=	0.807 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 581.17' @ 18.08 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	580.84'	**15.0" Round Culvert** L= 105.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.84' / 580.43' S= 0.0039 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.29 cfs @ 18.12 hrs HW=581.17' TW=580.80' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.29 cfs @ 1.71 fps)

Pond DMH604: manhole



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment200: Runoff Area=67.500 ac 6.03% Impervious Runoff Depth=1.43"
Flow Length=1,193' Tc=84.6 min CN=83 Runoff=39.18 cfs 8.046 af

Subcatchment210: Runoff Area=3.440 ac 0.00% Impervious Runoff Depth=1.43"
Flow Length=289' Tc=19.4 min CN=83 Runoff=5.52 cfs 0.410 af

Subcatchment234: Runoff Area=7.860 ac 82.06% Impervious Runoff Depth=2.43"
Tc=6.0 min CN=95 Runoff=30.29 cfs 1.592 af

Subcatchment235: Runoff Area=10.030 ac 72.98% Impervious Runoff Depth=2.33"
Tc=6.0 min CN=94 Runoff=37.64 cfs 1.948 af

Subcatchment236: Runoff Area=7.500 ac 80.53% Impervious Runoff Depth=2.43"
Tc=6.0 min CN=95 Runoff=28.90 cfs 1.519 af

Subcatchment237: Runoff Area=11.240 ac 71.53% Impervious Runoff Depth=2.33"
Tc=6.0 min CN=94 Runoff=42.18 cfs 2.183 af

Subcatchment238: Runoff Area=3.580 ac 0.00% Impervious Runoff Depth=2.05"
Flow Length=219' Tc=9.9 min CN=91 Runoff=10.90 cfs 0.612 af

Subcatchment240: Runoff Area=26.360 ac 0.00% Impervious Runoff Depth=1.17"
Flow Length=1,835' Tc=114.9 min CN=79 Runoff=9.69 cfs 2.579 af

Reach 200R-1: feeder creek Avg. Flow Depth=1.11' Max Vel=2.64 fps Inflow=39.19 cfs 8.137 af
n=0.030 L=381.0' S=0.0034 '/' Capacity=468.14 cfs Outflow=39.16 cfs 8.137 af

Reach 200R-2: feeder creek Avg. Flow Depth=1.17' Max Vel=2.50 fps Inflow=40.21 cfs 11.351 af
n=0.030 L=1,357.0' S=0.0029 '/' Capacity=430.19 cfs Outflow=39.55 cfs 11.313 af

Reach 200R-3: feeder creek Avg. Flow Depth=1.16' Max Vel=2.53 fps Inflow=39.55 cfs 9.508 af
n=0.030 L=248.0' S=0.0030 '/' Capacity=437.78 cfs Outflow=39.61 cfs 9.503 af

Reach 200R-7: feeder creek Avg. Flow Depth=1.43' Max Vel=2.07 fps Inflow=48.46 cfs 8.160 af
n=0.030 L=157.0' S=0.0016 '/' Capacity=319.81 cfs Outflow=42.26 cfs 8.157 af

Reach 210R: feeder creek Avg. Flow Depth=0.38' Max Vel=1.41 fps Inflow=7.15 cfs 0.091 af
n=0.030 L=318.0' S=0.0034 '/' Capacity=467.05 cfs Outflow=6.00 cfs 0.091 af

Pond 21P: pond Peak Elev=586.56' Storage=17,863 cf Inflow=5.52 cfs 0.410 af
Outflow=0.00 cfs 0.000 af

Pond 200S: splitter Peak Elev=576.55' Inflow=39.55 cfs 11.313 af
Primary=39.55 cfs 9.508 af Secondary=39.62 cfs 5.581 af Outflow=39.55 cfs 11.313 af

Pond 234Bio: bioretention Peak Elev=586.08' Storage=35,410 cf Inflow=20.16 cfs 1.451 af
Primary=0.37 cfs 0.962 af Secondary=0.78 cfs 0.185 af Outflow=1.15 cfs 1.147 af

Pond 234F: forebay Peak Elev=586.08' Storage=14,818 cf Inflow=23.14 cfs 1.501 af
Outflow=20.16 cfs 1.451 af

Pond 235Bio: bioretention Peak Elev=586.04' Storage=61,766 cf Inflow=36.00 cfs 2.077 af
Primary=0.47 cfs 1.351 af Secondary=0.24 cfs 0.073 af Outflow=0.71 cfs 1.423 af

Pond 235F: forebay Peak Elev=586.04' Storage=14,431 cf Inflow=37.64 cfs 1.948 af
Outflow=36.00 cfs 1.892 af

Pond 236Bio: bioretention Peak Elev=587.06' Storage=21,966 cf Inflow=27.30 cfs 1.519 af
Primary=18.01 cfs 1.505 af Secondary=0.47 cfs 0.003 af Outflow=18.47 cfs 1.508 af

Pond 236F: forebay Peak Elev=587.32' Storage=16,621 cf Inflow=28.90 cfs 1.519 af
Outflow=27.30 cfs 1.519 af

Pond 237Bio: bioretention Peak Elev=587.15' Storage=34,769 cf Inflow=40.96 cfs 2.183 af
Primary=22.35 cfs 2.146 af Secondary=1.86 cfs 0.020 af Outflow=24.22 cfs 2.166 af

Pond 237F: forebay Peak Elev=587.50' Storage=14,635 cf Inflow=42.18 cfs 2.183 af
Outflow=40.96 cfs 2.183 af

Pond 238P: wet pond Peak Elev=583.84' Storage=633,599 cf Inflow=52.30 cfs 4.360 af
Primary=0.31 cfs 0.902 af Secondary=0.00 cfs 0.000 af Outflow=0.31 cfs 0.902 af

Pond CB502: catch basin Peak Elev=587.53' Inflow=30.29 cfs 1.592 af
Primary=23.14 cfs 1.501 af Secondary=7.15 cfs 0.091 af Outflow=30.29 cfs 1.592 af

Pond DMH1102: manhole Peak Elev=581.91' Inflow=0.31 cfs 0.902 af
18.0" Round Culvert n=0.013 L=248.0' S=0.0035 '/' Outflow=0.31 cfs 0.902 af

Pond DMH1103: manhole Peak Elev=581.03' Inflow=0.31 cfs 0.902 af
18.0" Round Culvert n=0.013 L=176.0' S=0.0042 '/' Outflow=0.31 cfs 0.902 af

Pond DMH602: manhole Peak Elev=580.88' Inflow=0.83 cfs 2.313 af
18.0" Round Culvert n=0.013 L=74.0' S=0.0058 '/' Outflow=0.83 cfs 2.313 af

Pond DMH604: manhole Peak Elev=581.26' Inflow=0.47 cfs 1.351 af
15.0" Round Culvert n=0.013 L=105.0' S=0.0039 '/' Outflow=0.47 cfs 1.351 af

Total Runoff Area = 137.510 ac Runoff Volume = 18.889 af Average Runoff Depth = 1.65"
76.79% Pervious = 105.590 ac 23.21% Impervious = 31.920 ac

Summary for Subcatchment 200:

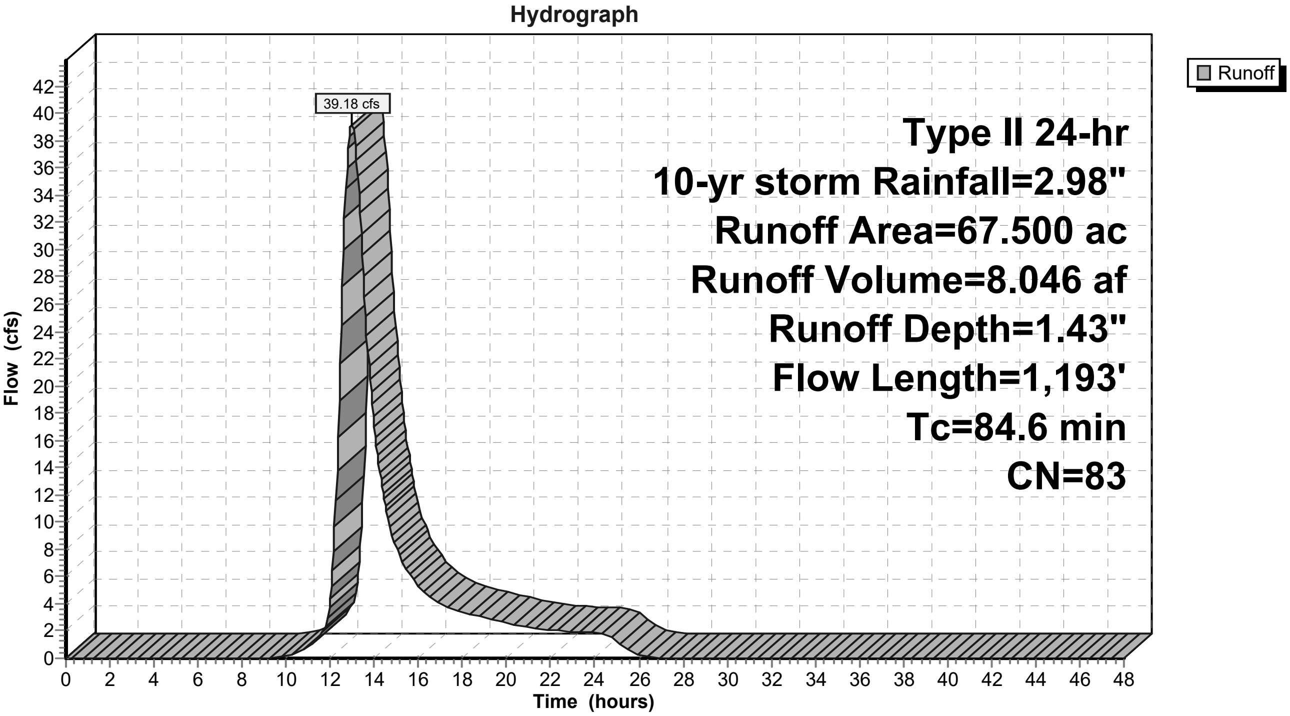
Runoff = 39.18 cfs @ 12.97 hrs, Volume= 8.046 af, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	15.620	84	50-75% Grass cover, Fair, HSG D
	2.530	79	Woods, Fair, HSG D
	0.230	98	Paved parking, HSG D
	0.030	98	Roofs, HSG D
	0.780	98	Water Surface, 0% imp, HSG D
*	8.770	84	50-75% Grass cover, Fair, HSG D (offsite)
*	33.440	79	Woods, Fair, HSG D (offsite)
*	1.770	98	Paved parking, HSG D (offsite)
*	2.040	98	Roofs, HSG D (offsite)
*	1.960	91	Gravel roads, HSG D (offsite)
*	0.330	98	Water Surface, 0% imp, HSG D (offsite)
	67.500	83	Weighted Average
	63.430		93.97% Pervious Area
	4.070		6.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.7	100	0.0100	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
49.7	1,055	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	38	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
84.6	1,193	Total			

Subcatchment 200:



Summary for Subcatchment 210:

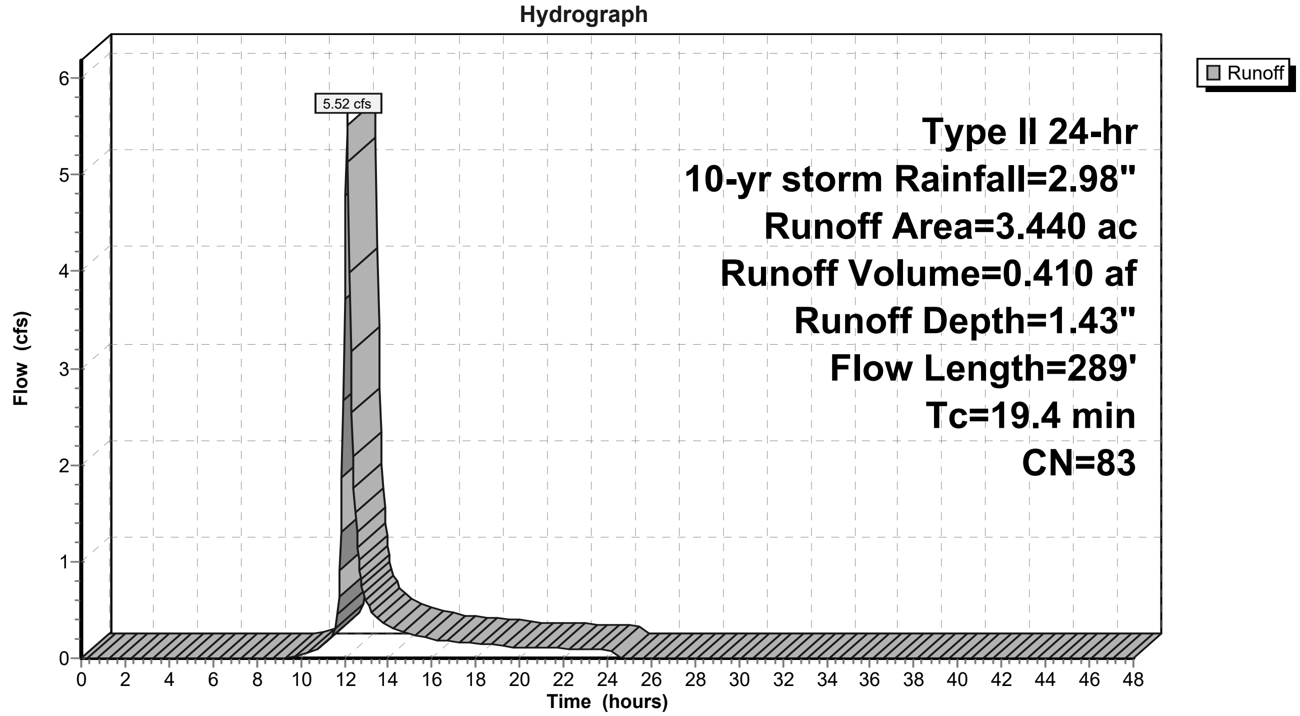
Runoff = 5.52 cfs @ 12.12 hrs, Volume= 0.410 af, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
2.920	84	50-75% Grass cover, Fair, HSG D
0.520	79	Woods, Fair, HSG D
3.440	83	Weighted Average
3.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.8	100	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
3.6	189	0.0160	0.89		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
19.4	289	Total			

Subcatchment 210:



Summary for Subcatchment 234:

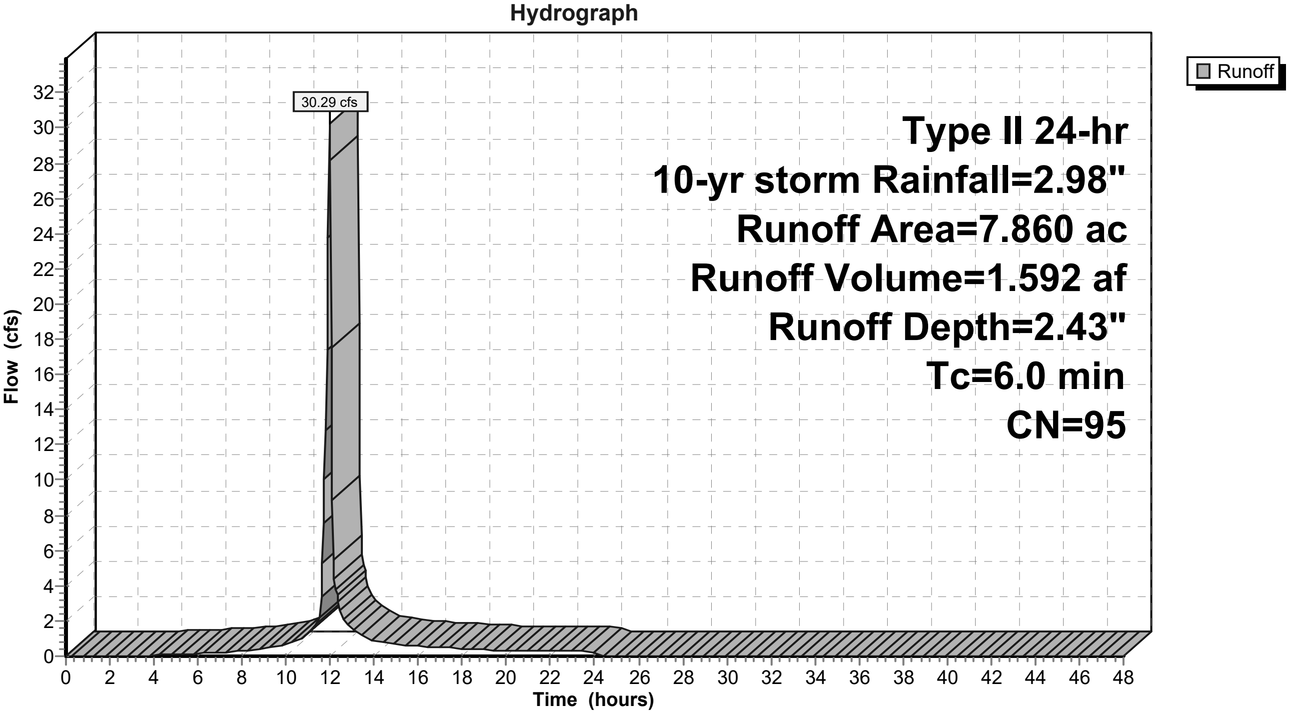
Runoff = 30.29 cfs @ 11.96 hrs, Volume= 1.592 af, Depth= 2.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
1.410	84	50-75% Grass cover, Fair, HSG D
3.540	98	Paved parking, HSG D
2.910	98	Roofs, HSG D
7.860	95	Weighted Average
1.410		17.94% Pervious Area
6.450		82.06% Impervious Area

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

Subcatchment 234:



Summary for Subcatchment 235:

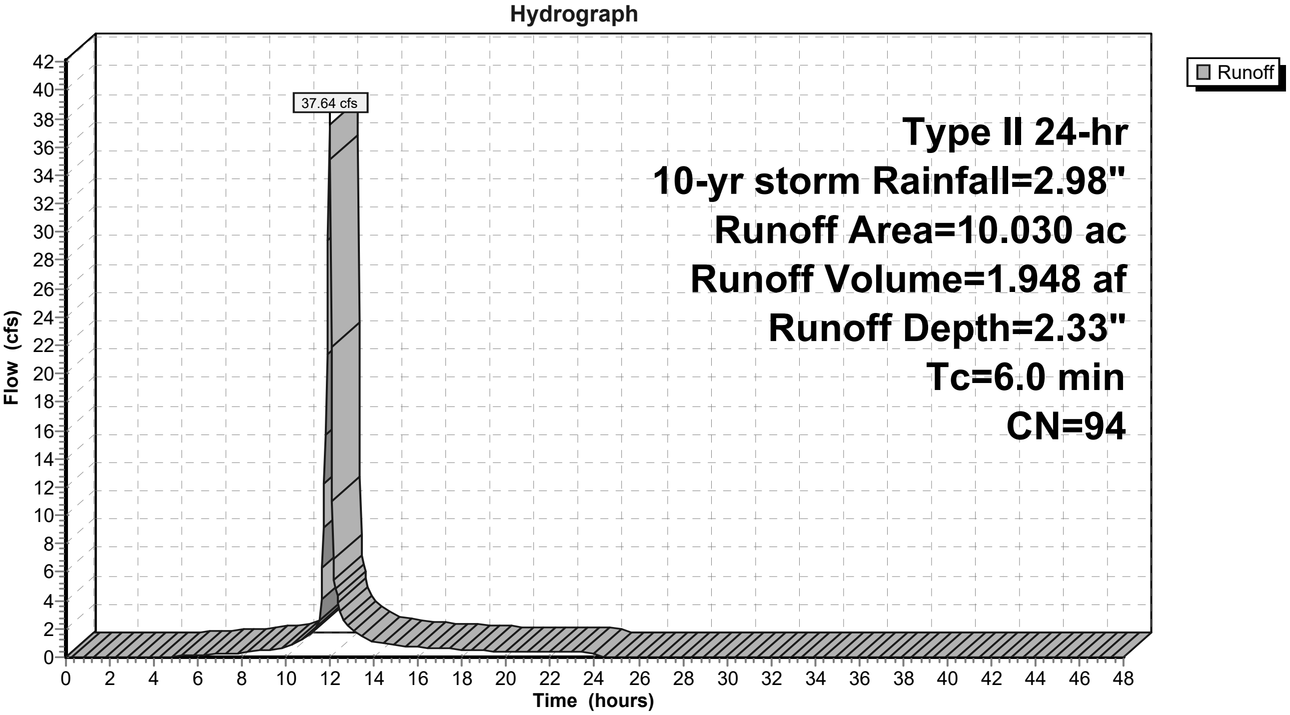
Runoff = 37.64 cfs @ 11.96 hrs, Volume= 1.948 af, Depth= 2.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
2.710	84	50-75% Grass cover, Fair, HSG D
4.850	98	Paved parking, HSG D
2.470	98	Roofs, HSG D
10.030	94	Weighted Average
2.710		27.02% Pervious Area
7.320		72.98% Impervious Area

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

Subcatchment 235:



Summary for Subcatchment 236:

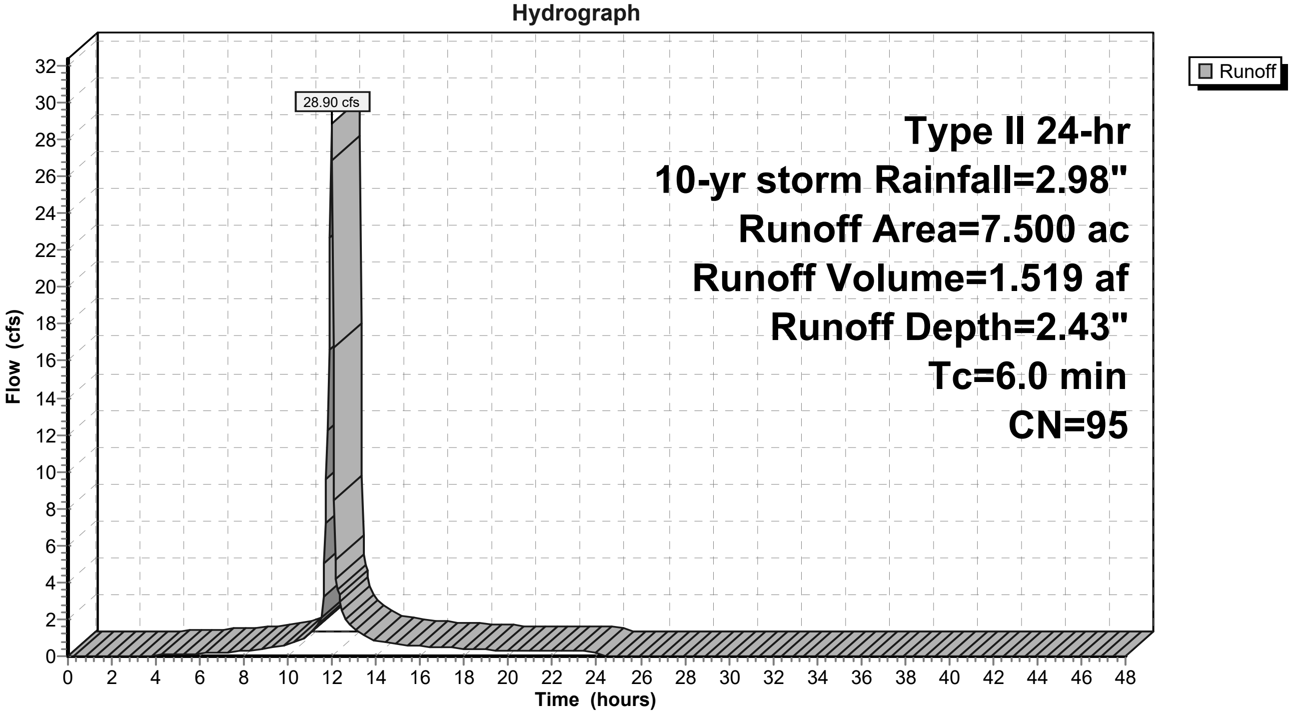
Runoff = 28.90 cfs @ 11.96 hrs, Volume= 1.519 af, Depth= 2.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
1.460	84	50-75% Grass cover, Fair, HSG D
2.130	98	Paved parking, HSG D
3.910	98	Roofs, HSG D
7.500	95	Weighted Average
1.460		19.47% Pervious Area
6.040		80.53% Impervious Area

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

Subcatchment 236:



Summary for Subcatchment 237:

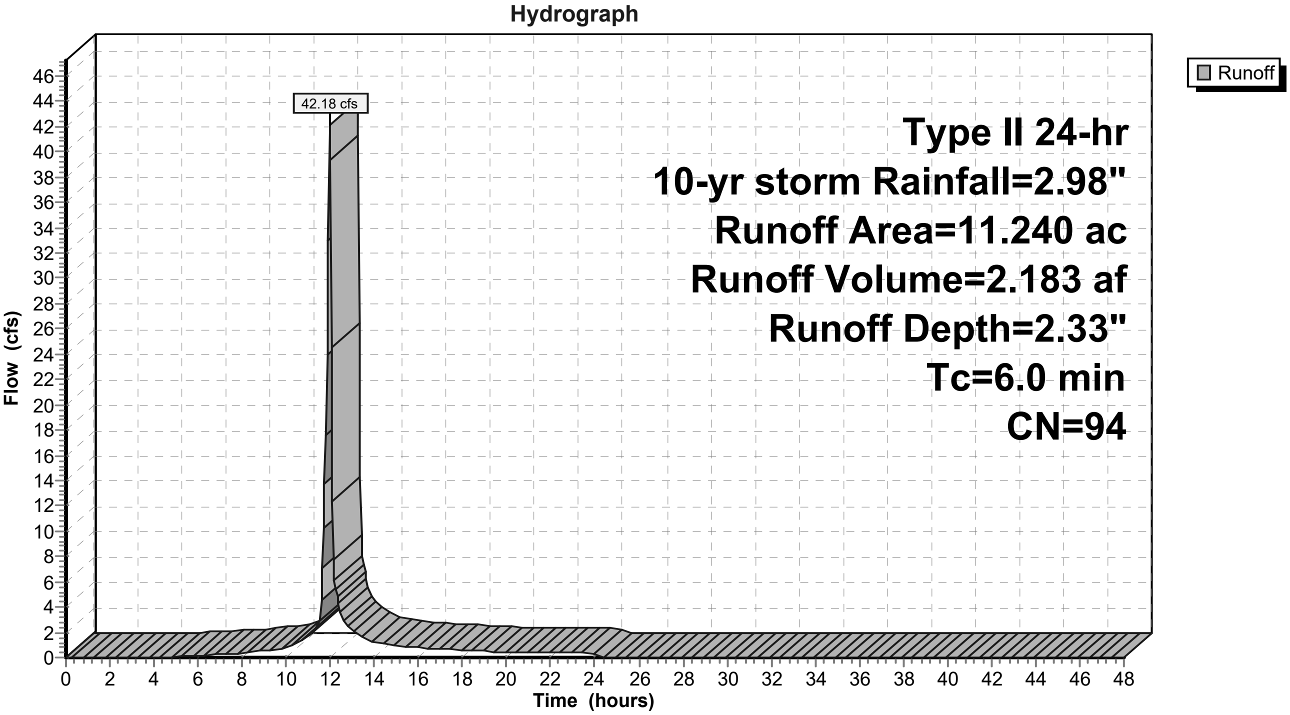
Runoff = 42.18 cfs @ 11.96 hrs, Volume= 2.183 af, Depth= 2.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
3.200	84	50-75% Grass cover, Fair, HSG D
8.040	98	Paved parking, HSG D
11.240	94	Weighted Average
3.200		28.47% Pervious Area
8.040		71.53% Impervious Area

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

Subcatchment 237:



Summary for Subcatchment 238:

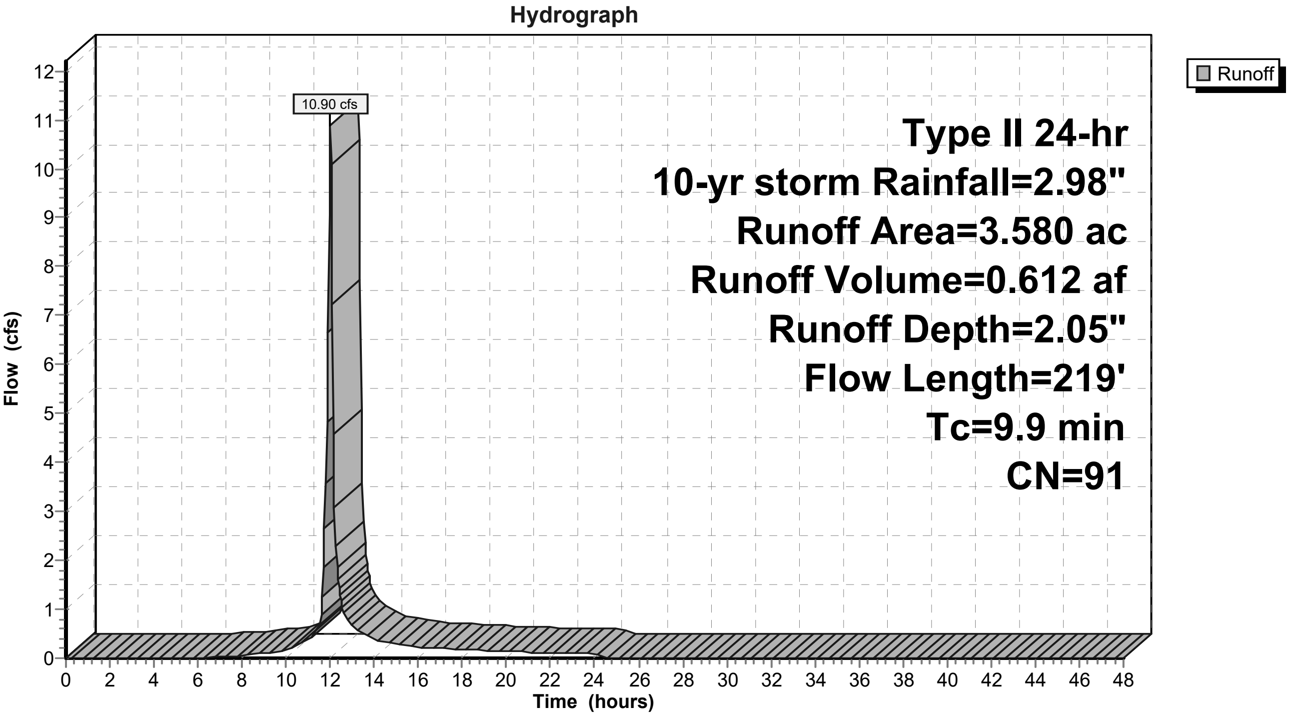
Runoff = 10.90 cfs @ 12.01 hrs, Volume= 0.612 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
1.820	84	50-75% Grass cover, Fair, HSG D
1.760	98	Water Surface, 0% imp, HSG D
3.580	91	Weighted Average
3.580		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.0500	0.20		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
1.5	99	0.0250	1.11		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0100	4.02	2.19	**Pipe Channel, C-D** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
9.9	219	Total			

Subcatchment 238:



Summary for Subcatchment 240:

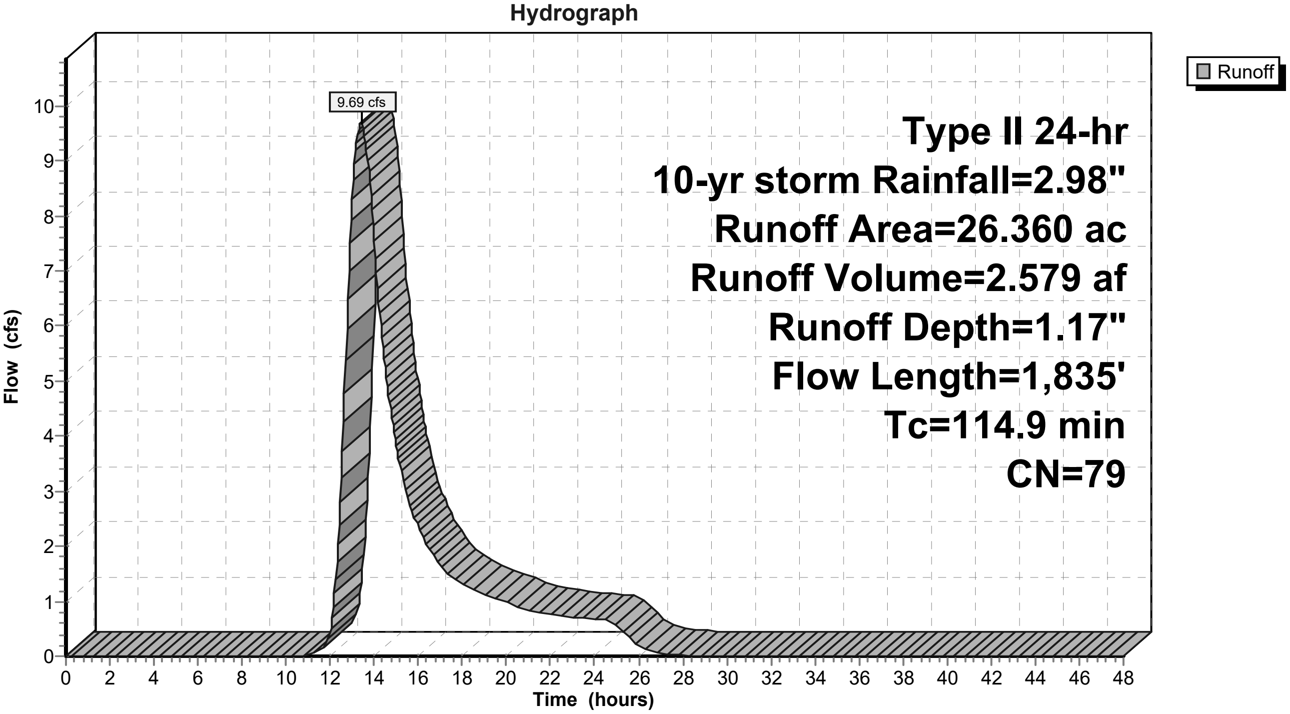
Runoff = 9.69 cfs @ 13.40 hrs, Volume= 2.579 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	0.620	84	50-75% Grass cover, Fair, HSG D
	16.500	79	Woods, Fair, HSG D
*	9.240	79	Woods, Fair, HSG D (offsite)
	26.360	79	Weighted Average
	26.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.7	100	0.0100	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
80.0	1,698	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	37	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
114.9	1,835	Total			

Subcatchment 240:



Summary for Reach 200R-1: feeder creek

Inflow Area =	70.940 ac,	5.74% Impervious,	Inflow Depth = 1.38"	for 10-yr storm event	
Inflow =	39.19 cfs @	12.97 hrs,	Volume=	8.137 af	
Outflow =	39.16 cfs @	13.00 hrs,	Volume=	8.137 af,	Atten= 0%, Lag= 1.8 min

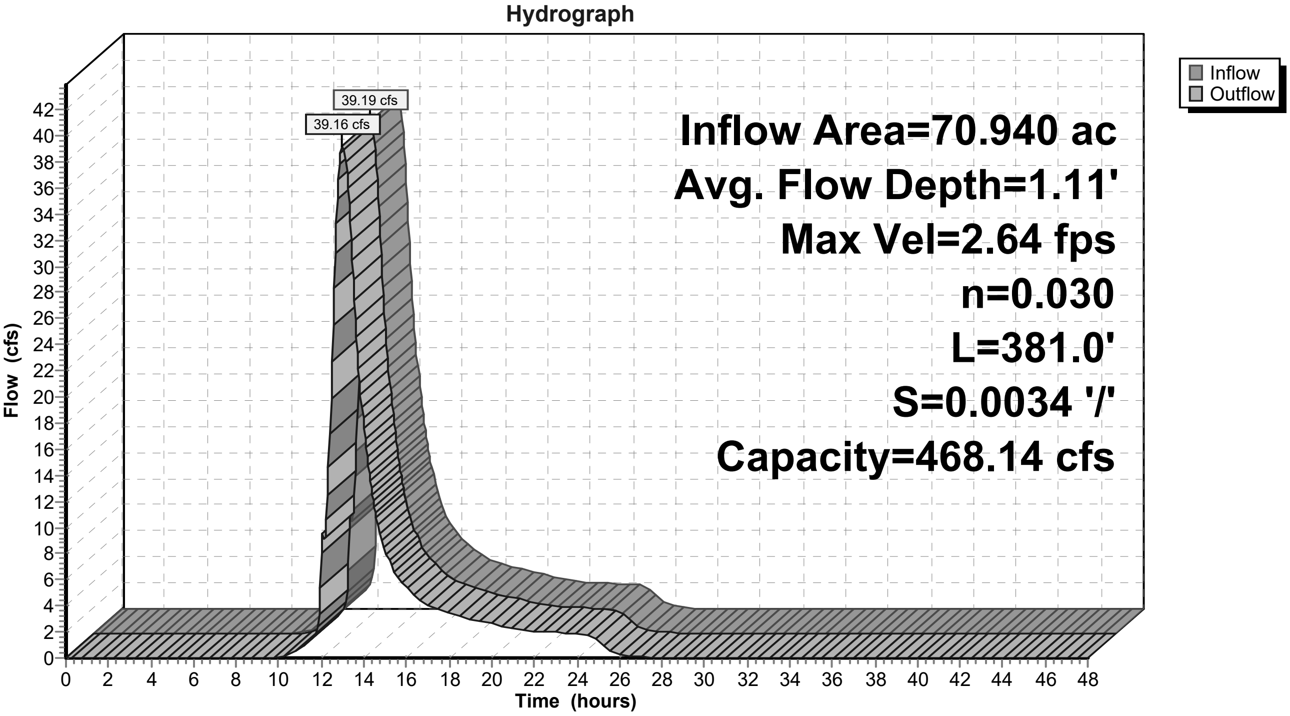
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.64 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 6.4 min

Peak Storage= 5,654 cf @ 13.00 hrs
Average Depth at Peak Storage= 1.11'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 468.14 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 381.0' Slope= 0.0034 '/'
Inlet Invert= 580.46', Outlet Invert= 579.16'

‡

Reach 200R-1: feeder creek



Summary for Reach 200R-2: feeder creek

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 1.23" for 10-yr storm event
Inflow = 40.21 cfs @ 13.00 hrs, Volume= 11.351 af
Outflow = 39.55 cfs @ 13.12 hrs, Volume= 11.313 af, Atten= 2%, Lag= 7.0 min

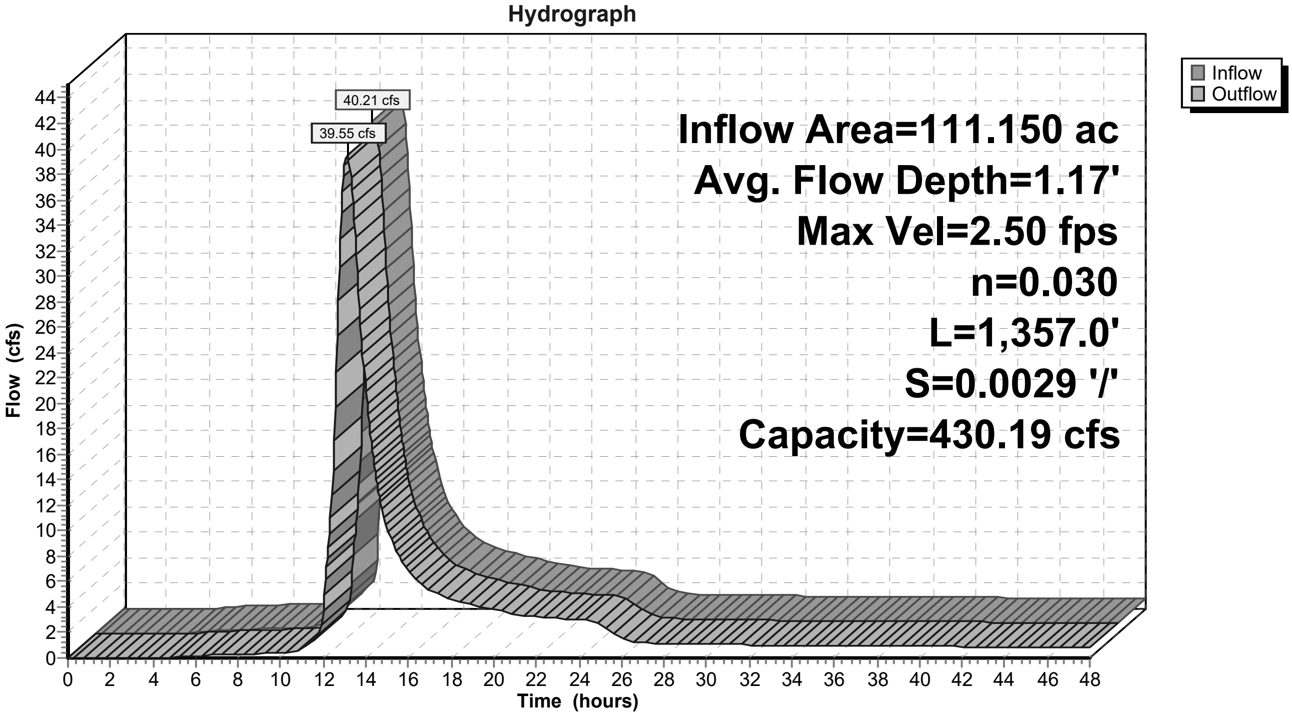
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.50 fps, Min. Travel Time= 9.1 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 26.7 min

Peak Storage= 21,495 cf @ 13.12 hrs
Average Depth at Peak Storage= 1.17'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 430.19 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 1,357.0' Slope= 0.0029 '/'
Inlet Invert= 579.16', Outlet Invert= 575.25'

‡

Reach 200R-2: feeder creek



Summary for Reach 200R-3: feeder creek

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 1.03" for 10-yr storm event
Inflow = 39.55 cfs @ 13.12 hrs, Volume= 9.508 af
Outflow = 39.61 cfs @ 13.00 hrs, Volume= 9.503 af, Atten= 0%, Lag= 0.0 min

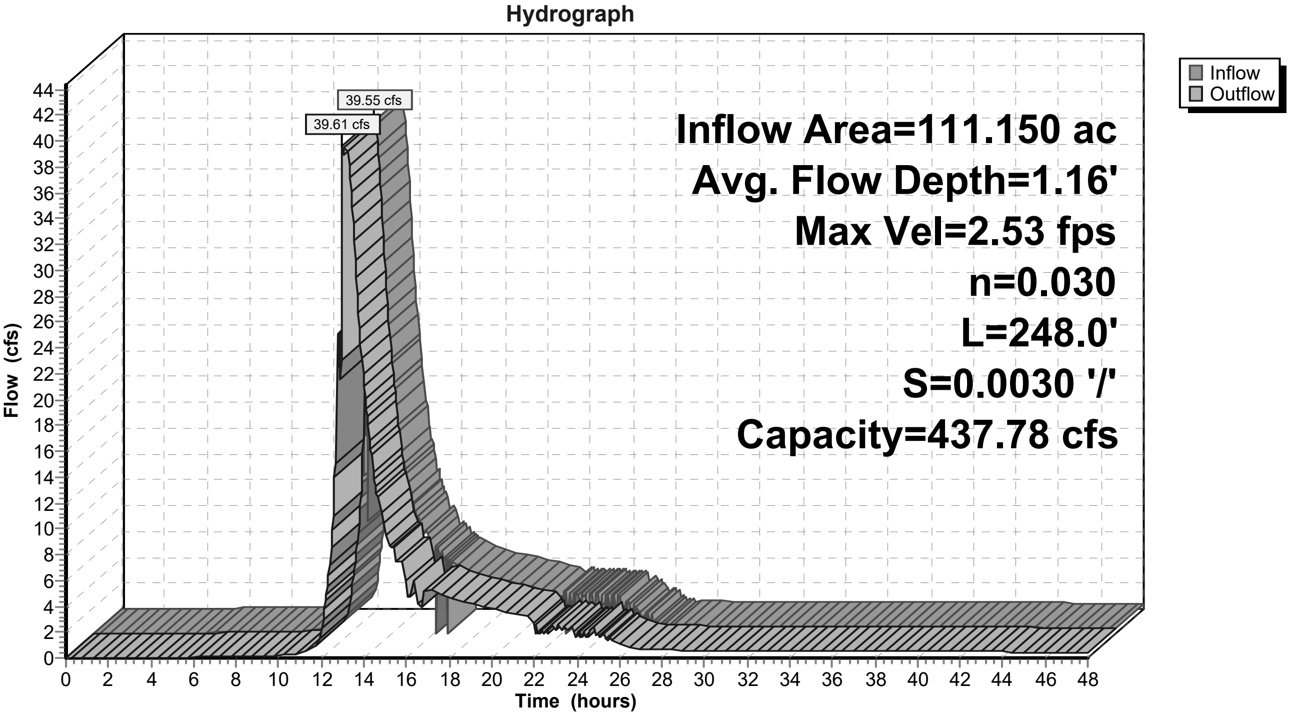
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.53 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.76 fps, Avg. Travel Time= 5.5 min

Peak Storage= 3,885 cf @ 13.00 hrs
Average Depth at Peak Storage= 1.16'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 437.78 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 248.0' Slope= 0.0030 '/'
Inlet Invert= 575.25', Outlet Invert= 574.51'

‡

Reach 200R-3: feeder creek



Summary for Reach 200R-7: feeder creek

```
Inflow Area =        26.360 ac,    0.00% Impervious,  Inflow Depth >   3.71"    for  10-yr storm event
Inflow       =        48.46 cfs @   13.20 hrs,  Volume=              8.160 af
Outflow      =        42.26 cfs @   13.17 hrs,  Volume=              8.157 af,  Atten= 13%,  Lag= 0.0 min
```

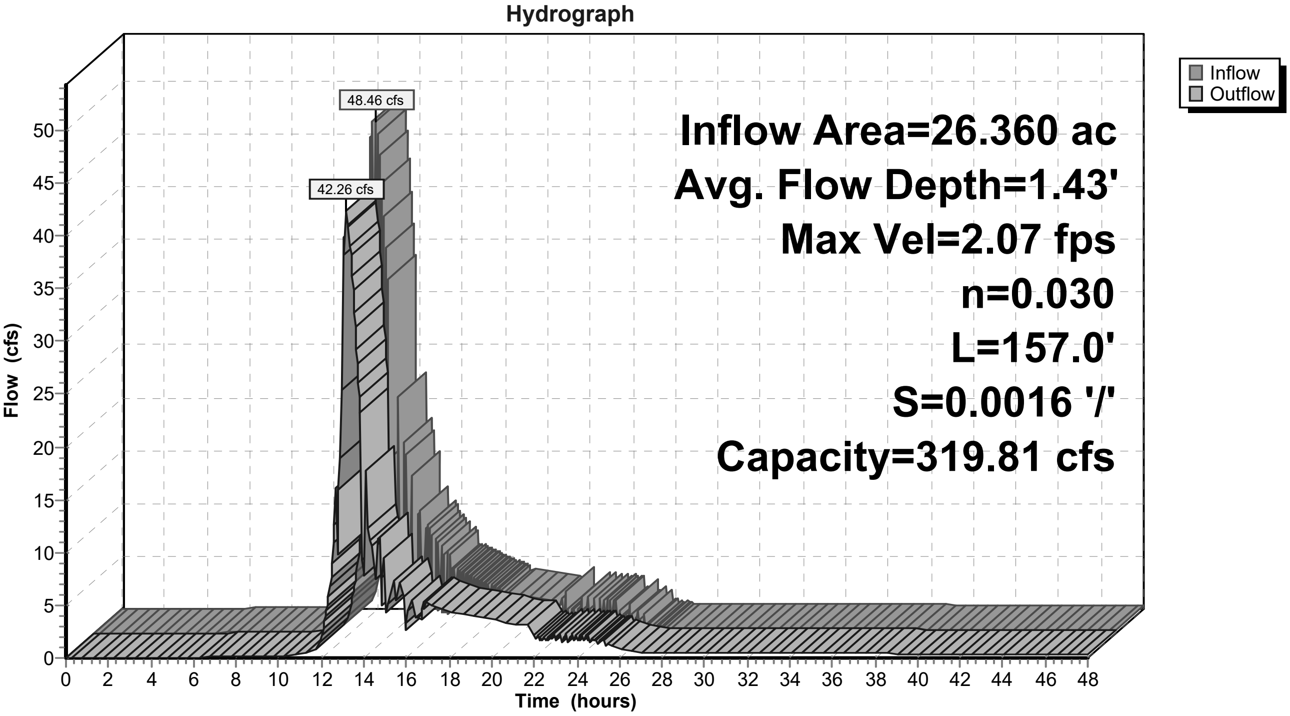
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.07 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.58 fps, Avg. Travel Time= 4.5 min

Peak Storage= 3,204 cf @ 13.17 hrs
Average Depth at Peak Storage= 1.43'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 319.81 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 157.0' Slope= 0.0016 '/'
Inlet Invert= 575.25', Outlet Invert= 575.00'

‡

Reach 200R-7: feeder creek



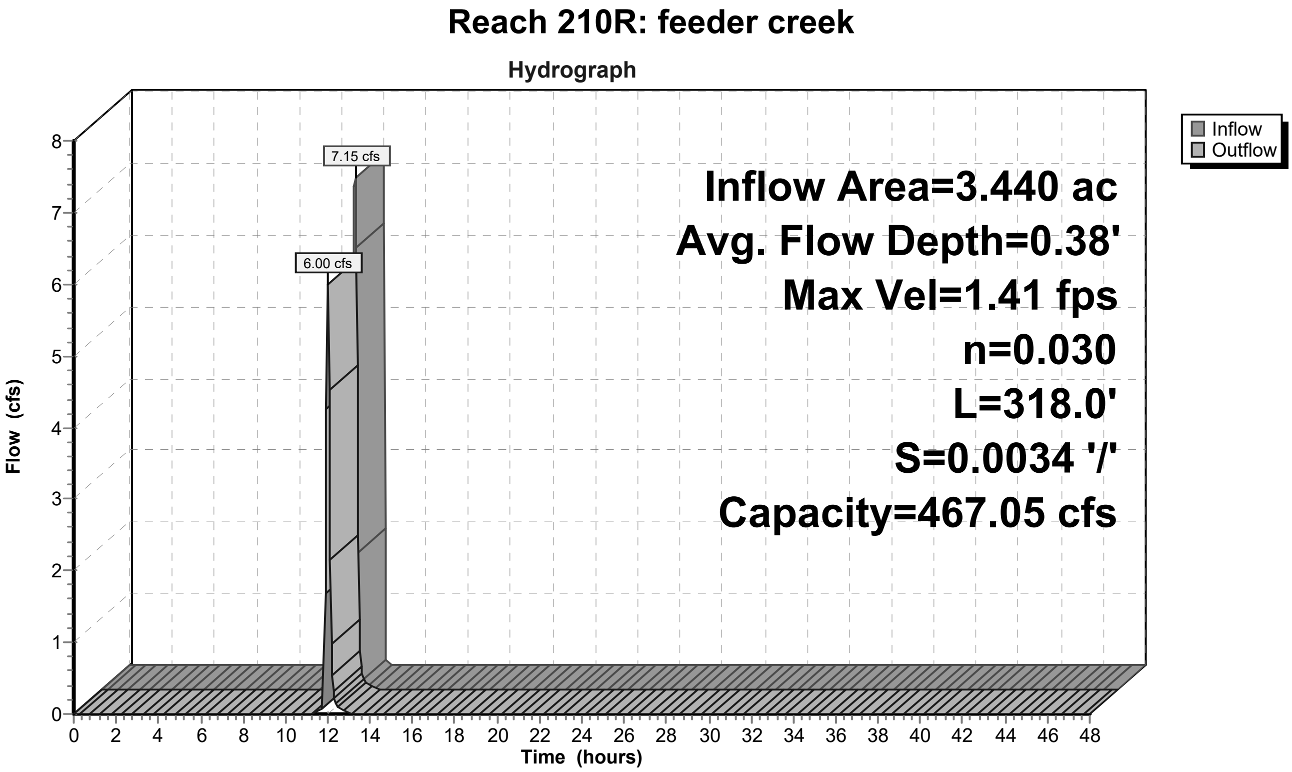
Summary for Reach 210R: feeder creek

Inflow Area	=	3.440 ac,	0.00% Impervious, Inflow Depth = 0.32"	for 10-yr storm event	
Inflow	=	7.15 cfs @	11.96 hrs, Volume=	0.091 af	
Outflow	=	6.00 cfs @	12.00 hrs, Volume=	0.091 af,	Atten= 16%, Lag= 2.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.41 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.43 fps, Avg. Travel Time= 12.4 min

Peak Storage= 1,349 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 467.05 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 318.0' Slope= 0.0034 '/'
Inlet Invert= 581.54', Outlet Invert= 580.46'



Summary for Pond 21P: pond

```
Inflow Area =        3.440 ac,   0.00% Impervious,  Inflow Depth =   1.43"    for  10-yr storm event
Inflow      =       5.52 cfs @   12.12 hrs,  Volume=          0.410 af
Outflow     =       0.00 cfs @    0.00 hrs,  Volume=          0.000 af,  Atten= 100%,  Lag= 0.0 min
Primary     =       0.00 cfs @    0.00 hrs,  Volume=          0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.56' @ 25.15 hrs   Surf.Area= 33,769 sf   Storage= 17,863 cf
Flood Elev= 587.00'   Surf.Area= 36,973 sf   Storage= 33,304 cf

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

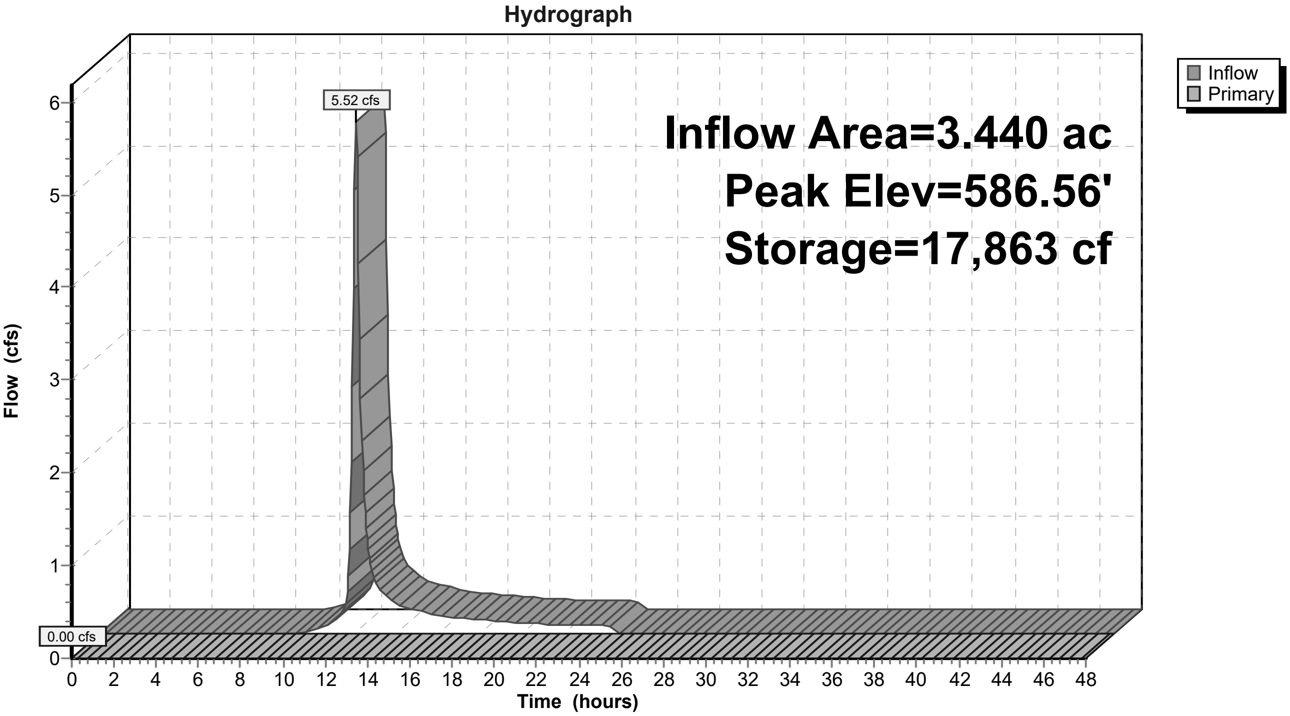
Volume      Invert     Avail.Storage   Storage Description
   #1      586.00'        33,304 cf    pond (Prismatic)Listed below (Recalc)

 Elevation       Surf.Area        Inc.Store       Cum.Store
    (feet)          (sq-ft)     (cubic-feet)     (cubic-feet)
    586.00          29,634                0               0
    587.00          36,973           33,304          33,304

Device   Routing        Invert   Outlet Devices
   #1    Primary       586.70'   100.0' long  x 8.0' breadth overflow weir
                                 Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                 2.50  3.00  3.50  4.00  4.50  5.00  5.50
                                 Coef. (English)  2.43  2.54  2.70  2.69  2.68  2.68  2.66  2.64  2.64
                                 2.64  2.65  2.65  2.66  2.66  2.68  2.70  2.74

Primary OutFlow  Max=0.00 cfs @ 0.00 hrs  HW=586.00'  TW=581.54'   (Dynamic Tailwater)
└─1=overflow weir  ( Controls 0.00 cfs)
```

Pond 21P: pond



Summary for Pond 200S: splitter

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 1.22" for 10-yr storm event
Inflow = 39.55 cfs @ 13.12 hrs, Volume= 11.313 af
Outflow = 39.55 cfs @ 13.12 hrs, Volume= 11.313 af, Atten= 0%, Lag= 0.0 min
Primary = 39.55 cfs @ 13.12 hrs, Volume= 9.508 af
Secondary = 39.62 cfs @ 13.10 hrs, Volume= 5.581 af

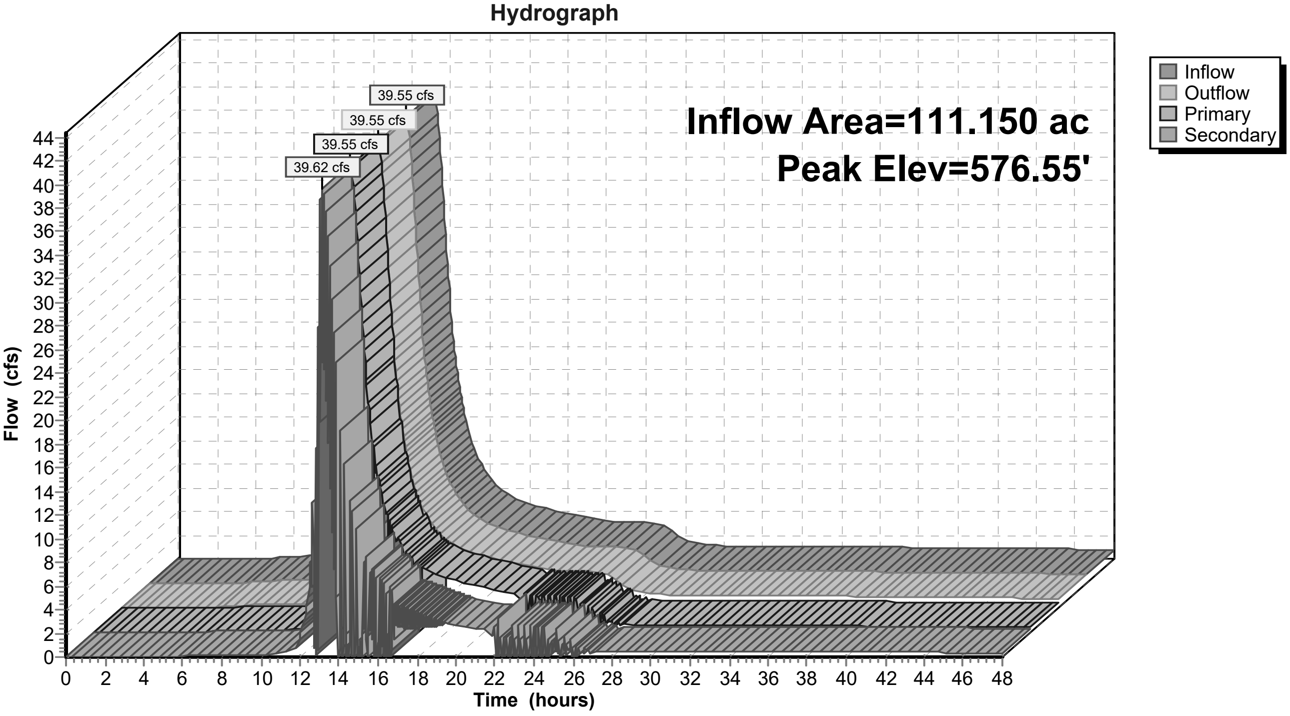
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 576.55' @ 13.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	575.25'	**162.0 deg x 10.0' long x 4.00' rise splitter1** Cv= 2.47 (C= 3.09)
#2	Secondary	575.25'	**162.0 deg x 10.0' long x 4.00' rise splitter2** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=30.59 cfs @ 13.12 hrs HW=576.50' TW=576.41' (Dynamic Tailwater)
↳**1=splitter1** (Weir Controls 30.59 cfs @ 1.36 fps)

Secondary OutFlow Max=0.00 cfs @ 13.10 hrs HW=576.54' TW=576.61' (Dynamic Tailwater)
↳**2=splitter2** (Controls 0.00 cfs)

Pond 200S: splitter



Summary for Pond 234Bio: bioretention

```
Inflow Area =       7.860 ac, 82.06% Impervious, Inflow Depth >  2.22"   for 10-yr storm event
Inflow      =     20.16 cfs @  11.97 hrs, Volume=          1.451 af
Outflow     =      1.15 cfs @  13.46 hrs, Volume=          1.147 af, Atten= 94%, Lag= 89.6 min
Primary     =      0.37 cfs @  13.46 hrs, Volume=          0.962 af
Secondary   =      0.78 cfs @  13.46 hrs, Volume=          0.185 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.08' @ 13.46 hrs  Surf.Area= 23,793 sf  Storage= 35,410 cf
Flood Elev= 587.00'  Surf.Area= 25,515 sf  Storage= 57,991 cf

Plug-Flow detention time= 747.2 min calculated for 1.146 af (79% of inflow)
Center-of-Mass det. time= 605.1 min ( 1,466.1 - 861.0 )

Volume      Invert    Avail.Storage  Storage Description
  #1       584.50'        57,991 cf  Custom Stage Data (Prismatic)Listed below (Recalc)

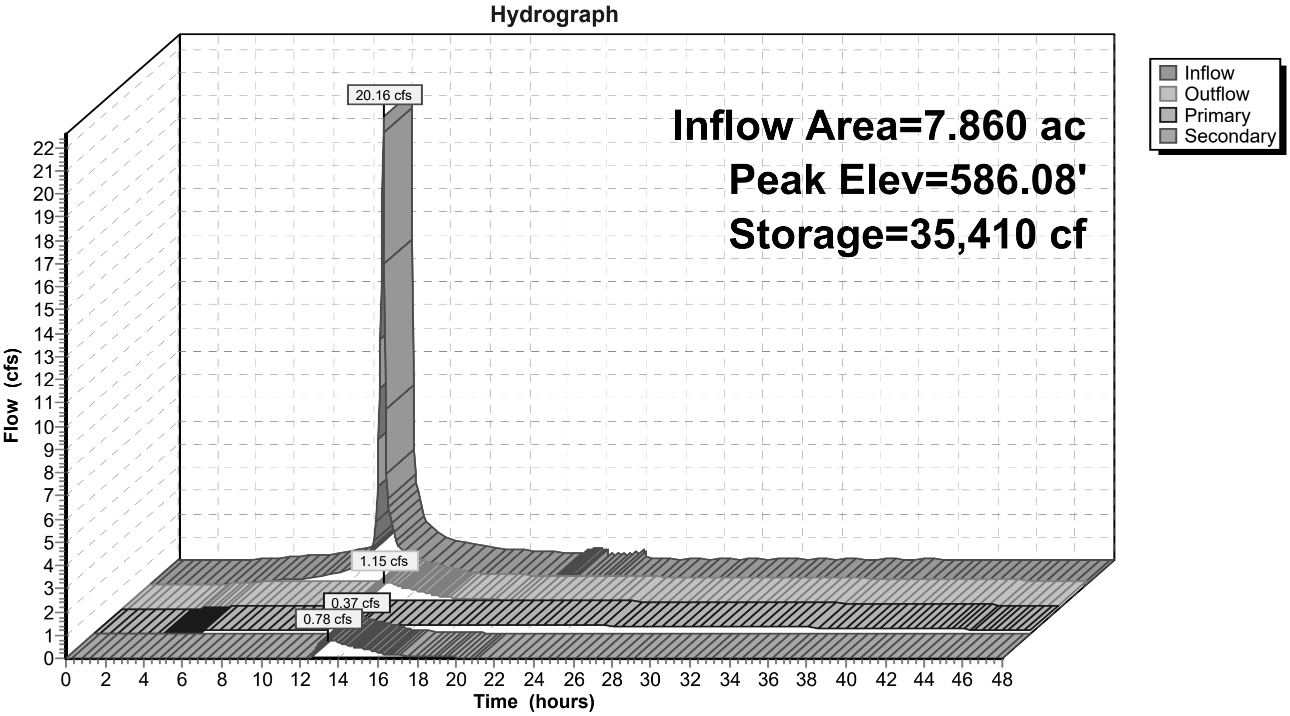
 Elevation        Surf.Area        Inc.Store       Cum.Store
   (feet)           (sq-ft)      (cubic-feet)    (cubic-feet)
   584.50            20,920                0               0
   586.00            23,635           33,416          33,416
   587.00            25,515           24,575          57,991

Device  Routing       Invert  Outlet Devices
  #1    Primary      581.08'  15.0"  Round Culvert
                              L= 12.0'  CPP, square edge headwall, Ke= 0.500
                              Inlet / Outlet Invert= 581.08' / 580.98'  S= 0.0083 '/'  Cc= 0.900
                              n= 0.012  Concrete pipe, finished, Flow Area= 1.23 sf
  #2    Device 1     581.08'  6.0" Vert. Underdrain  C= 0.600
  #3    Device 1     585.00'  3.0" Vert. Orifice  C= 0.600
  #4    Device 1     586.50'  48.0" x 30.0" Horiz. Grate  C= 0.600
                              Limited to weir flow at low heads
  #5    Device 2     584.50'  0.250 in/hr Exfiltration through bioretention media over Surface area
  #6    Secondary    586.00'  162.0 deg x 10.0' long x 1.00' rise overflow weir Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.37 cfs @ 13.46 hrs  HW=586.08'  TW=580.88'  (Dynamic Tailwater)
└─1=Culvert  (Passes 0.37 cfs of 12.37 cfs potential flow)
   ├─2=Underdrain  (Passes 0.14 cfs of 2.06 cfs potential flow)
   │  └─5=Exfiltration through bioretention media(Exfiltration Controls 0.14 cfs)
   ├─3=Orifice  (Orifice Controls 0.23 cfs @ 4.72 fps)
   └─4=Grate  ( Controls 0.00 cfs)

Secondary OutFlow Max=0.78 cfs @ 13.46 hrs  HW=586.08'  TW=585.83'  (Dynamic Tailwater)
└─6=overflow weir  (Weir Controls 0.78 cfs @ 0.89 fps)
```

Pond 234Bio: bioretention



Summary for Pond 234F: forebay

Inflow Area = 7.860 ac, 82.06% Impervious, Inflow Depth = 2.29" for 10-yr storm event
Inflow = 23.14 cfs @ 11.96 hrs, Volume= 1.501 af
Outflow = 20.16 cfs @ 11.97 hrs, Volume= 1.451 af, Atten= 13%, Lag= 0.3 min
Primary = 20.16 cfs @ 11.97 hrs, Volume= 1.451 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.50' Surf.Area= 3,193 sf Storage= 8,951 cf
Peak Elev= 586.08' @ 13.46 hrs Surf.Area= 4,222 sf Storage= 14,818 cf (5,867 cf above start)
Flood Elev= 587.00' Surf.Area= 4,895 sf Storage= 18,993 cf (10,042 cf above start)

Plug-Flow detention time= 201.4 min calculated for 1.244 af (83% of inflow)
Center-of-Mass det. time= 77.4 min (861.0 - 783.7)

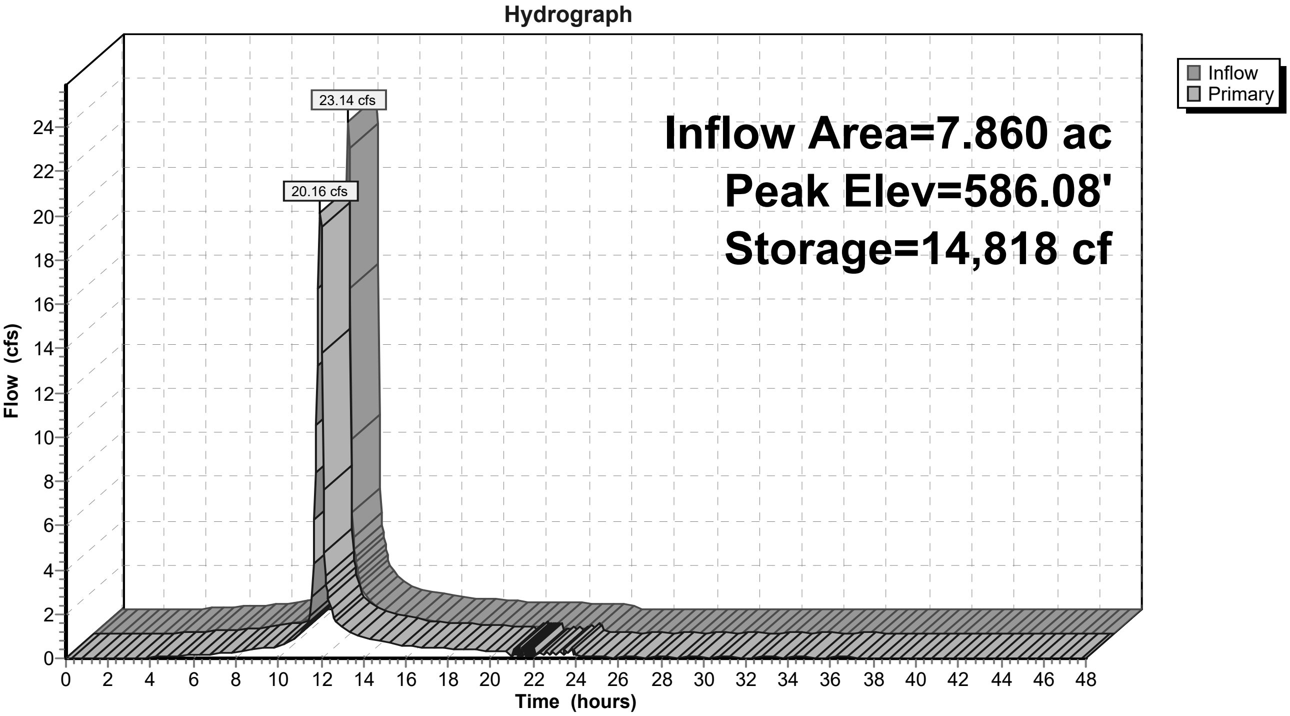
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	18,993 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	965	0	0
582.00	1,800	2,765	2,765
584.00	2,870	4,670	7,435
586.00	4,160	7,030	14,465
587.00	4,895	4,528	18,993

Device	Routing	Invert	Outlet Devices
#1	Primary	584.50'	**162.0 deg x 10.0' long x 2.50' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=19.65 cfs @ 11.97 hrs HW=585.57' TW=585.51' (Dynamic Tailwater)
↑—**1=overflow weir** (Weir Controls 19.65 cfs @ 1.10 fps)

Pond 234F: forebay



Summary for Pond 235Bio: bioretention

Inflow Area = 10.030 ac, 72.98% Impervious, Inflow Depth > 2.48" for 10-yr storm event
Inflow = 36.00 cfs @ 11.98 hrs, Volume= 2.077 af
Outflow = 0.71 cfs @ 17.13 hrs, Volume= 1.423 af, Atten= 98%, Lag= 308.9 min
Primary = 0.47 cfs @ 17.13 hrs, Volume= 1.351 af
Secondary = 0.24 cfs @ 17.13 hrs, Volume= 0.073 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.04' @ 17.13 hrs Surf.Area= 42,164 sf Storage= 61,766 cf
Flood Elev= 587.00' Surf.Area= 44,755 sf Storage= 103,550 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 758.7 min (1,602.2 - 843.4)

Volume	Invert	Avail.Storage	Storage Description
#1	584.50'	103,550 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

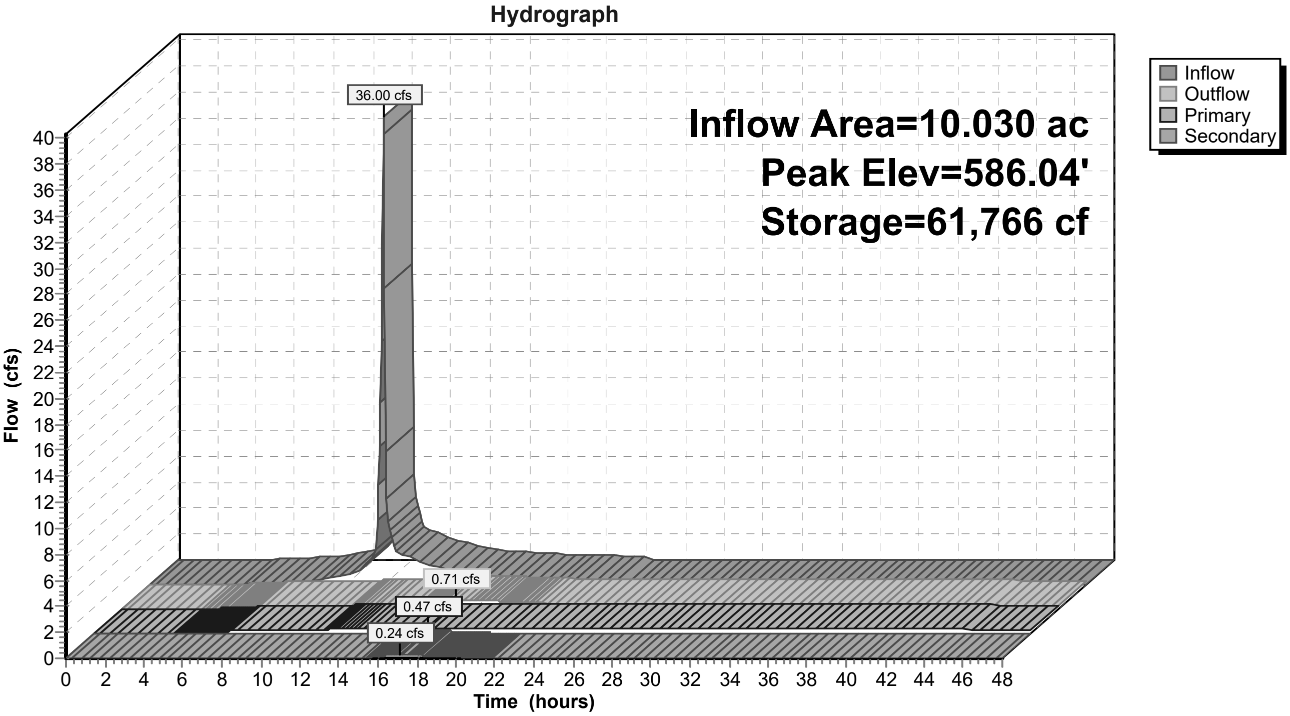
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.50	38,130	0	0
586.00	42,060	60,143	60,143
587.00	44,755	43,408	103,550

Device	Routing	Invert	Outlet Devices
#1	Primary	581.08'	**15.0" Round Culvert** L= 66.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 581.08' / 580.84' S= 0.0036 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	581.08'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	585.00'	**3.0" Vert. Orifice** C= 0.600
#4	Device 1	586.50'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	584.50'	**0.250 in/hr Exfiltration through bioretention media over Surface area**
#6	Secondary	586.00'	**162.0 deg x 10.0' long x 1.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.47 cfs @ 17.13 hrs HW=586.04' TW=581.26' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.47 cfs of 11.67 cfs potential flow)
  ├─**2=Underdrain** (Passes 0.24 cfs of 2.05 cfs potential flow)
  │ └─**5=Exfiltration through bioretention media** (Exfiltration Controls 0.24 cfs)
  ├─**3=Orifice** (Orifice Controls 0.23 cfs @ 4.60 fps)
  └─**4=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.24 cfs @ 17.13 hrs HW=586.04' TW=583.63' (Dynamic Tailwater)
└─**6=overflow weir** (Weir Controls 0.24 cfs @ 0.60 fps)

Pond 235Bio: bioretention



Summary for Pond 235F: forebay

Inflow Area = 10.030 ac, 72.98% Impervious, Inflow Depth = 2.33" for 10-yr storm event
Inflow = 37.64 cfs @ 11.96 hrs, Volume= 1.948 af
Outflow = 36.00 cfs @ 11.98 hrs, Volume= 1.892 af, Atten= 4%, Lag= 0.8 min
Primary = 36.00 cfs @ 11.98 hrs, Volume= 1.892 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.50' Surf.Area= 3,168 sf Storage= 8,782 cf
Peak Elev= 586.04' @ 17.14 hrs Surf.Area= 4,178 sf Storage= 14,431 cf (5,649 cf above start)
Flood Elev= 587.00' Surf.Area= 4,885 sf Storage= 18,788 cf (10,006 cf above start)

Plug-Flow detention time= 150.2 min calculated for 1.690 af (87% of inflow)
Center-of-Mass det. time= 52.8 min (839.1 - 786.2)

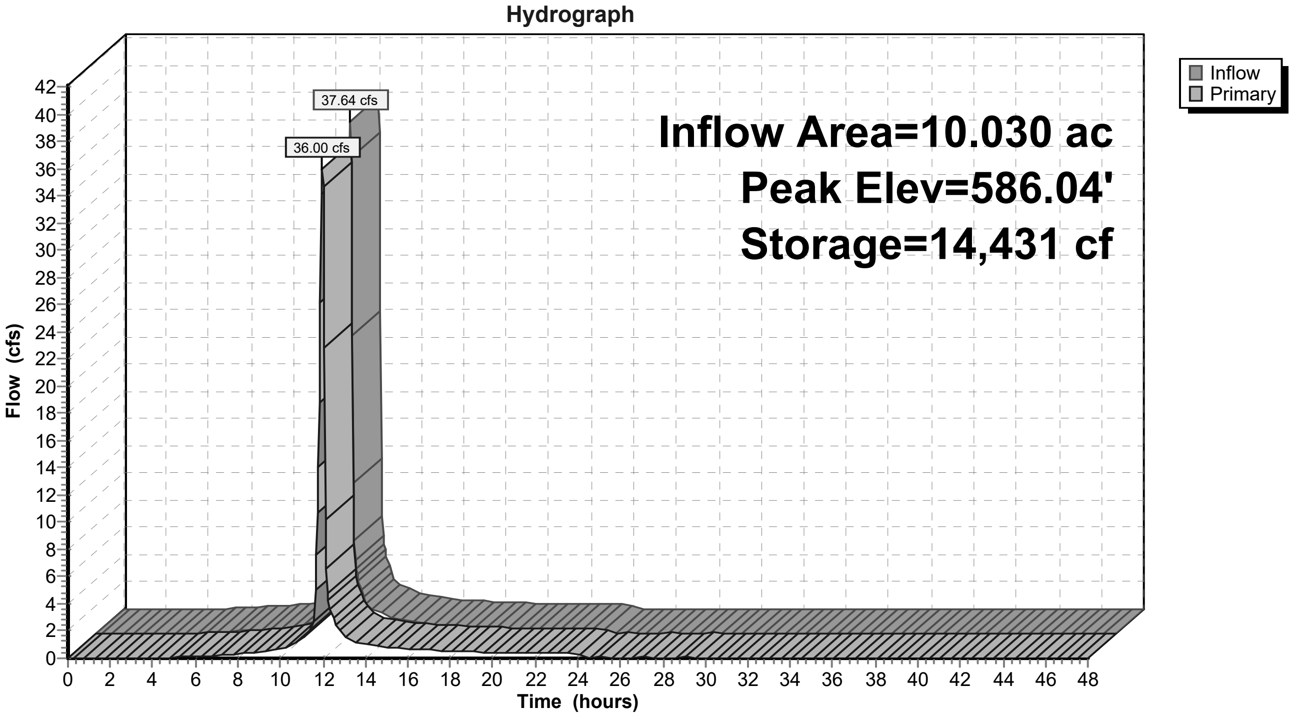
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	18,788 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	910	0	0
582.00	1,765	2,675	2,675
584.00	2,840	4,605	7,280
586.00	4,150	6,990	14,270
587.00	4,885	4,518	18,788

Device	Routing	Invert	Outlet Devices
#1	Primary	584.50'	**162.0 deg x 10.0' long x 2.50' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=34.68 cfs @ 11.98 hrs HW=585.51' TW=585.26' (Dynamic Tailwater)
└─**1=overflow weir** (Weir Controls 34.68 cfs @ 2.09 fps)

Pond 235F: forebay



Summary for Pond 236Bio: bioretention

```
Inflow Area =       7.500 ac, 80.53% Impervious, Inflow Depth =  2.43"   for 10-yr storm event
Inflow      =     27.30 cfs @  11.99 hrs, Volume=          1.519 af
Outflow     =     18.47 cfs @  12.06 hrs, Volume=          1.508 af, Atten= 32%, Lag= 4.7 min
Primary     =     18.01 cfs @  12.06 hrs, Volume=          1.505 af
Secondary =        0.47 cfs @  12.06 hrs, Volume=          0.003 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 587.06' @ 12.06 hrs   Surf.Area= 22,038 sf   Storage= 21,966 cf
Flood Elev= 588.00'   Surf.Area= 24,415 sf   Storage= 43,765 cf

Plug-Flow detention time= 246.3 min calculated for 1.507 af (99% of inflow)
Center-of-Mass det. time= 243.0 min ( 1,029.9 - 786.9 )

Volume      Invert     Avail.Storage   Storage Description
   #1       586.00'        43,765 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

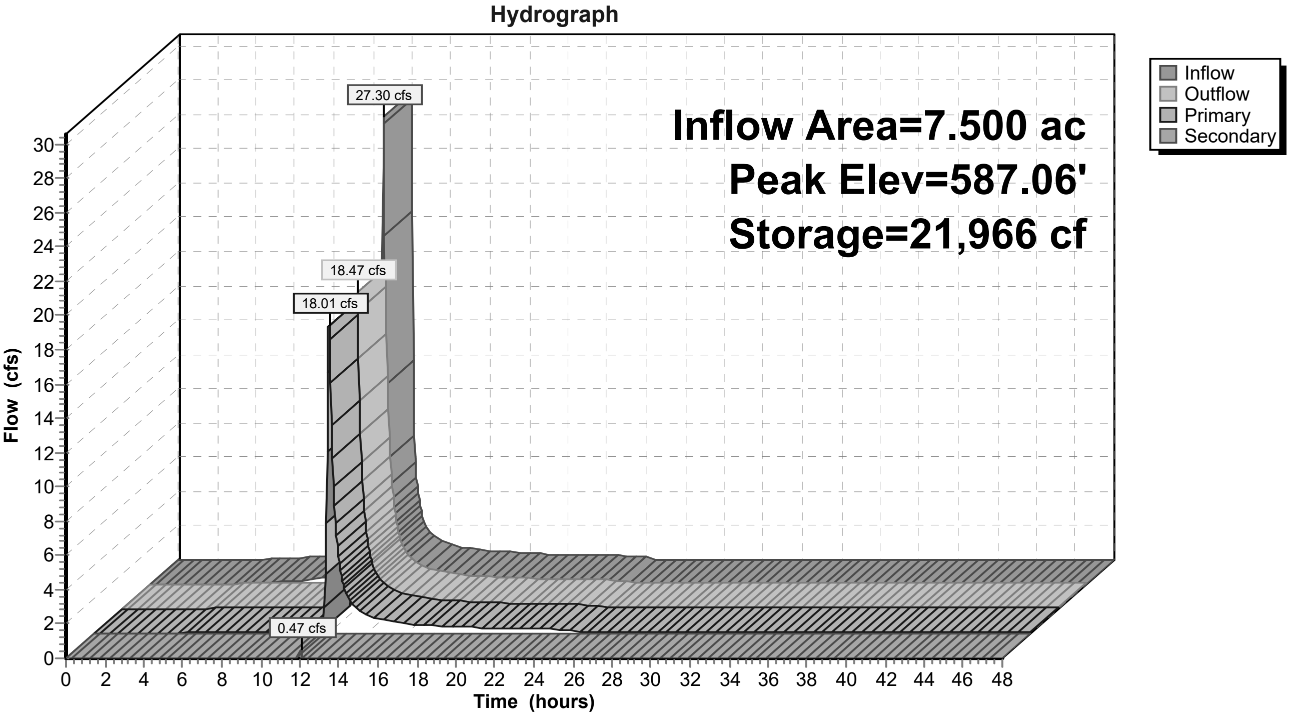
 Elevation        Surf.Area         Inc.Store        Cum.Store
   (feet)            (sq-ft)      (cubic-feet)     (cubic-feet)
   586.00            19,350                 0                0
   588.00            24,415            43,765           43,765

Device   Routing           Invert   Outlet Devices
   #1    Primary          582.58'   24.0"  Round Culvert
                                    L= 39.0'   CPP, square edge headwall,  Ke= 0.500
                                    Inlet / Outlet Invert= 582.58' / 582.43'   S= 0.0038 '/'   Cc= 0.900
                                    n= 0.012  Concrete pipe, finished,  Flow Area= 3.14 sf
   #2    Device 1         582.58'   6.0" Vert. Underdrain   C= 0.600
   #3    Device 1         586.50'   48.0" x 30.0" Horiz. Grate   C= 0.600
                                    Limited to weir flow at low heads
   #4    Device 2         586.00'   0.250 in/hr Exfiltration through bioretention media over Surface area
   #5    Secondary        587.00'   162.0 deg x 10.0' long x 1.00' rise overflow weir Cv= 2.47 (C= 3.09)

Primary OutFlow Max=17.67 cfs @ 12.06 hrs  HW=587.05'  TW=582.50'   (Dynamic Tailwater)
└─1=Culvert  (Passes 17.67 cfs of 28.20 cfs potential flow)
    ├─2=Underdrain  (Passes 0.13 cfs of 1.94 cfs potential flow)
    │   └─4=Exfiltration through bioretention media(Exfiltration Controls 0.13 cfs)
    └─3=Grate  (Weir Controls 17.54 cfs @ 2.43 fps)

Secondary OutFlow Max=0.41 cfs @ 12.06 hrs  HW=587.06'  TW=582.49'   (Dynamic Tailwater)
└─5=overflow weir  (Weir Controls 0.41 cfs @ 0.72 fps)
```

Pond 236Bio: bioretention



Summary for Pond 236F: forebay

```
Inflow Area =       7.500 ac,  80.53% Impervious,  Inflow Depth =   2.43"    for  10-yr storm event
Inflow      =      28.90 cfs @   11.96 hrs,  Volume=          1.519 af
Outflow     =      27.30 cfs @   11.99 hrs,  Volume=          1.519 af,  Atten= 6%,  Lag= 1.3 min
Primary     =      27.30 cfs @   11.99 hrs,  Volume=          1.519 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 586.50'   Surf.Area= 4,521 sf   Storage= 12,637 cf
Peak Elev= 587.32' @ 12.00 hrs   Surf.Area= 5,234 sf   Storage= 16,621 cf   (3,984 cf above start)
Flood Elev= 588.00'   Surf.Area= 5,830 sf   Storage= 20,400 cf   (7,763 cf above start)

Plug-Flow detention time= 129.4 min calculated for 1.227 af (81% of inflow)
Center-of-Mass det. time= 7.0 min ( 786.9 - 779.9 )

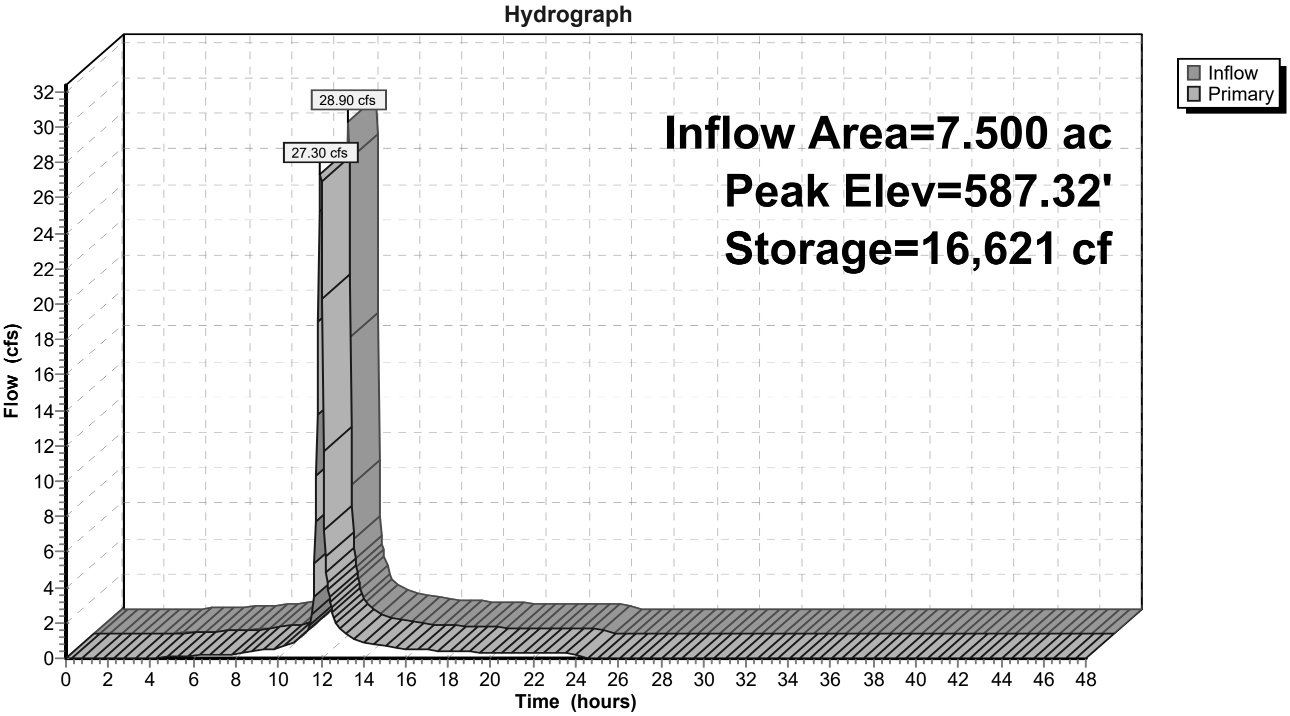
Volume        Invert     Avail.Storage   Storage Description
   #1         582.00'         20,400 cf  Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation          Surf.Area          Inc.Store         Cum.Store
    (feet)            (sq-ft)       (cubic-feet)      (cubic-feet)
    582.00              1,270                  0                 0
    584.00              2,565              3,835             3,835
    586.00              4,085              6,650            10,485
    588.00              5,830              9,915            20,400

Device   Routing            Invert   Outlet Devices
   #1    Primary           586.50'   162.0 deg x 10.0' long x 2.00' rise overflow weir Cv= 2.47 (C= 3.09)

Primary OutFlow  Max=26.48 cfs @ 11.99 hrs  HW=587.30'  TW=586.97'   (Dynamic Tailwater)
└─1=overflow weir  (Weir Controls 26.48 cfs @ 2.20 fps)
```

Pond 236F: forebay



Summary for Pond 237Bio: bioretention

Inflow Area = 11.240 ac, 71.53% Impervious, Inflow Depth = 2.33" for 10-yr storm event
Inflow = 40.96 cfs @ 11.98 hrs, Volume= 2.183 af
Outflow = 24.22 cfs @ 12.07 hrs, Volume= 2.166 af, Atten= 41%, Lag= 5.3 min
Primary = 22.35 cfs @ 12.07 hrs, Volume= 2.146 af
Secondary = 1.86 cfs @ 12.07 hrs, Volume= 0.020 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 587.15' @ 12.07 hrs Surf.Area= 31,765 sf Storage= 34,769 cf
Flood Elev= 588.00' Surf.Area= 33,965 sf Storage= 62,765 cf

Plug-Flow detention time= 255.3 min calculated for 2.164 af (99% of inflow)
Center-of-Mass det. time= 251.4 min (1,042.6 - 791.2)

Volume	Invert	Avail.Storage	Storage Description
#1	586.00'	62,765 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

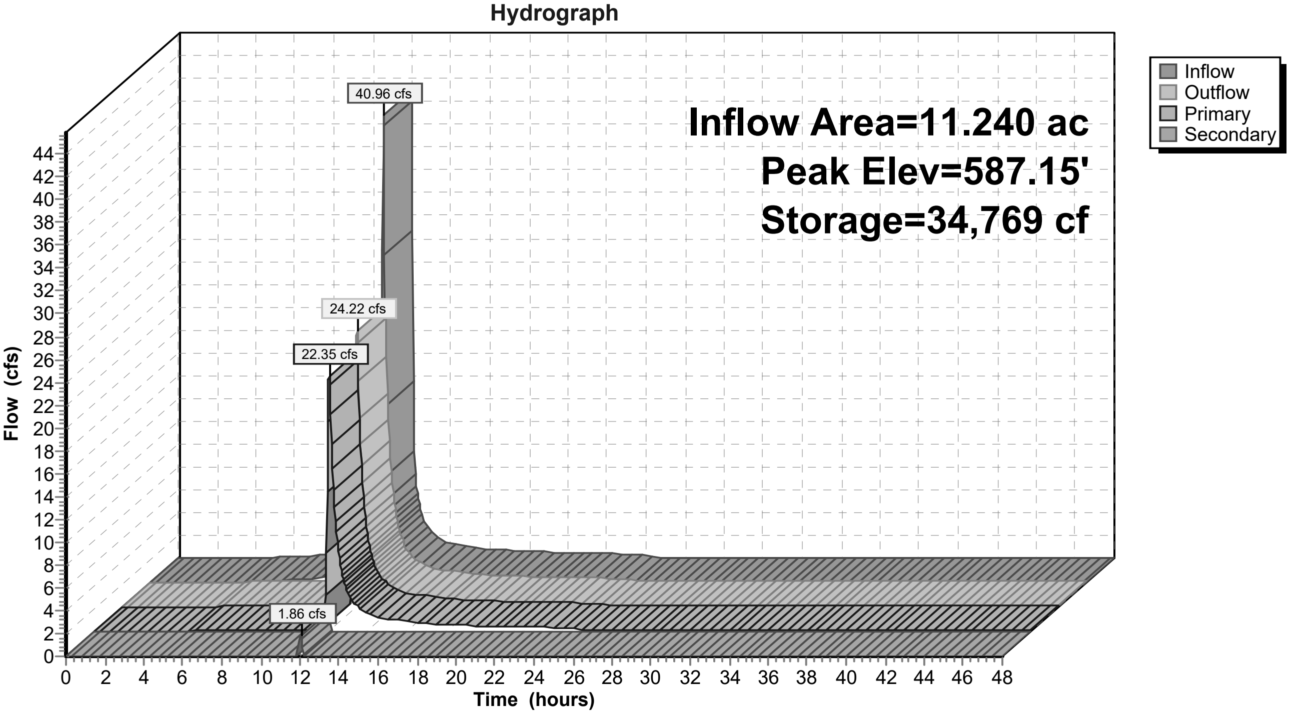
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
586.00	28,800	0	0
588.00	33,965	62,765	62,765

Device	Routing	Invert	Outlet Devices
#1	Primary	582.58'	**24.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 582.58' / 582.43' S= 0.0041 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	582.58'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	586.50'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	586.00'	**0.250 in/hr Exfiltration through bioretention media over Surface area**
#5	Secondary	587.00'	**162.0 deg x 10.0' long x 1.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=21.86 cfs @ 12.07 hrs HW=587.14' TW=582.51' (Dynamic Tailwater)
└─**1=Culvert** (Passes 21.86 cfs of 28.53 cfs potential flow)
  ├─**2=Underdrain** (Passes 0.18 cfs of 1.96 cfs potential flow)
  │ └─**4=Exfiltration through bioretention media** (Exfiltration Controls 0.18 cfs)
  └─**3=Grate** (Weir Controls 21.68 cfs @ 2.61 fps)

Secondary OutFlow Max=1.70 cfs @ 12.07 hrs HW=587.14' TW=582.51' (Dynamic Tailwater)
└─**5=overflow weir** (Weir Controls 1.70 cfs @ 1.13 fps)

Pond 237Bio: bioretention



Summary for Pond 237F: forebay

```
Inflow Area =      11.240 ac, 71.53% Impervious,  Inflow Depth =  2.33"   for  10-yr storm event
Inflow      =     42.18 cfs @  11.96 hrs,  Volume=          2.183 af
Outflow     =     40.96 cfs @  11.98 hrs,  Volume=          2.183 af,  Atten= 3%,  Lag= 1.0 min
Primary     =     40.96 cfs @  11.98 hrs,  Volume=          2.183 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 586.50'  Surf.Area= 3,658 sf  Storage= 10,648 cf
Peak Elev= 587.50' @ 11.99 hrs  Surf.Area= 4,340 sf  Storage= 14,635 cf  (3,987 cf above start)
Flood Elev= 588.00'  Surf.Area= 4,685 sf  Storage= 16,905 cf  (6,257 cf above start)

Plug-Flow detention time= 89.9 min calculated for 1.937 af (89% of inflow)
Center-of-Mass det. time= 5.0 min ( 791.2 - 786.2 )

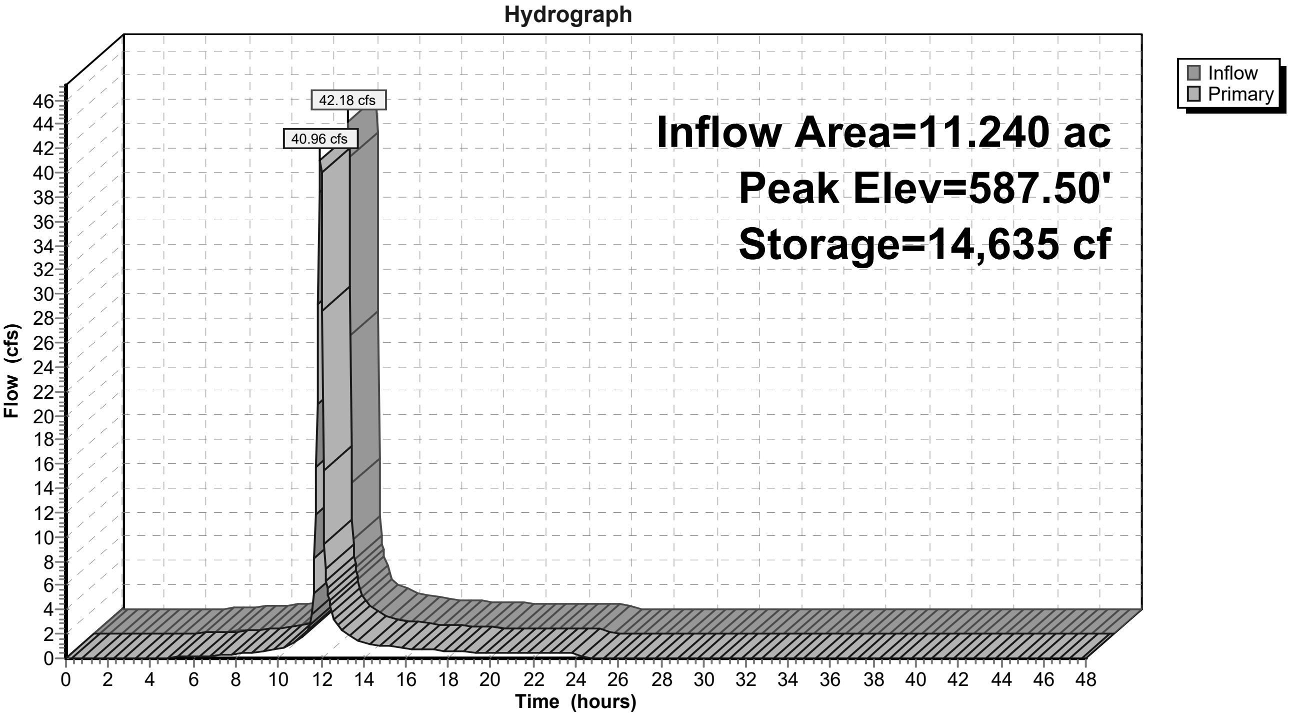
Volume      Invert    Avail.Storage  Storage Description
  #1       582.00'        16,905 cf  Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation      Surf.Area       Inc.Store      Cum.Store
    (feet)        (sq-ft)    (cubic-feet)   (cubic-feet)
    582.00          1,250               0              0
    584.00          2,170           3,420          3,420
    586.00          3,315           5,485          8,905
    588.00          4,685           8,000         16,905

Device  Routing          Invert   Outlet Devices
  #1    Primary         586.50'   162.0 deg x 10.0' long x 2.00' rise overflow weir Cv= 2.47 (C= 3.09)

Primary OutFlow Max=39.55 cfs @ 11.98 hrs  HW=587.48'  TW=587.02'   (Dynamic Tailwater)
└─1=overflow weir  (Weir Controls 39.55 cfs @ 2.51 fps)
```

Pond 237F: forebay



Summary for Pond 238P: wet pond

Inflow Area = 22.320 ac, 63.08% Impervious, Inflow Depth > 2.34" for 10-yr storm event
Inflow = 52.30 cfs @ 12.06 hrs, Volume= 4.360 af
Outflow = 0.31 cfs @ 25.01 hrs, Volume= 0.902 af, Atten= 99%, Lag= 777.0 min
Primary = 0.31 cfs @ 25.01 hrs, Volume= 0.902 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= 0.05 hrs / 3
Starting Elev= 582.00' Surf.Area= 76,680 sf Storage= 481,118 cf
Peak Elev= 583.84' @ 25.01 hrs Surf.Area= 88,844 sf Storage= 633,599 cf (152,481 cf above start)
Flood Elev= 587.00' Surf.Area= 106,960 sf Storage= 943,710 cf (462,593 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 811.7 min (1,817.1 - 1,005.5)

Volume	Invert	Avail.Storage	Storage Description
#1	570.00'	943,710 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

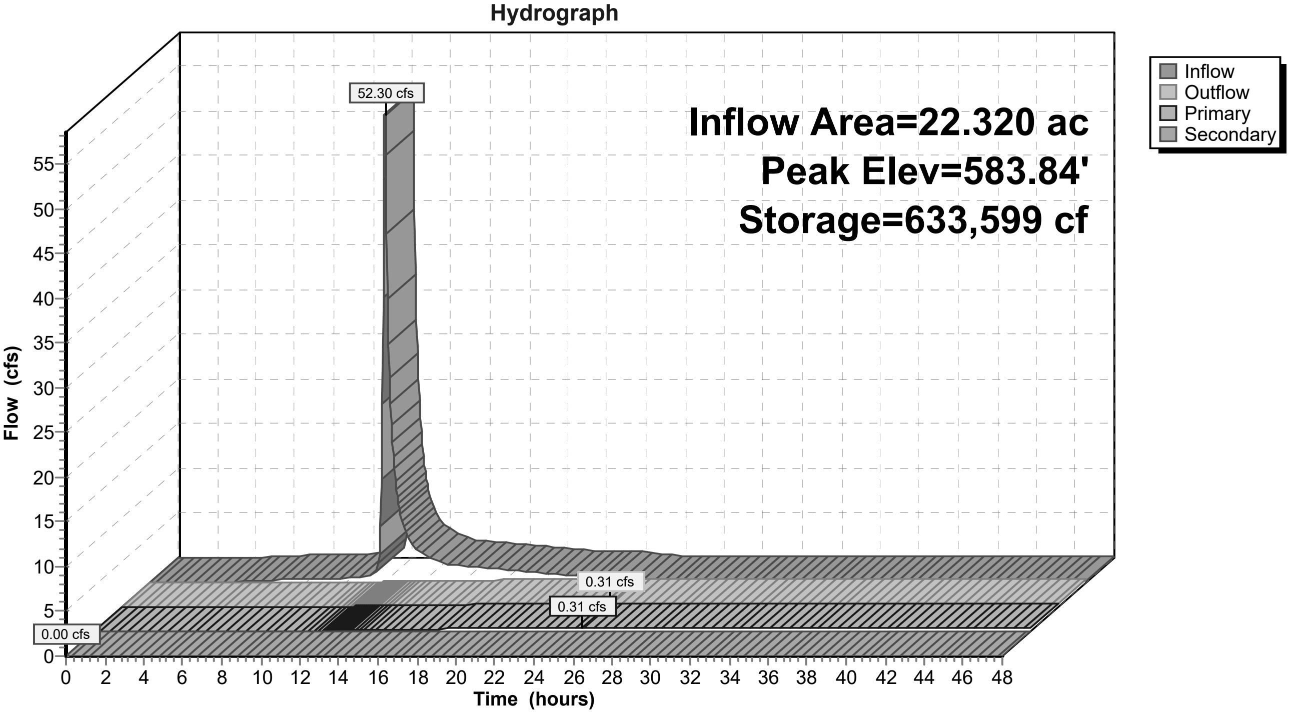
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
570.00	20,830	0	0
572.00	26,450	47,280	47,280
574.00	32,175	58,625	105,905
576.00	38,000	70,175	176,080
578.00	43,925	81,925	258,005
580.00	49,950	93,875	351,880
580.50	51,475	25,356	377,236
581.00	70,230	30,426	407,663
582.00	76,680	73,455	481,118
584.00	89,885	166,565	647,683
586.00	101,775	191,660	839,343
587.00	106,960	104,368	943,710

Device	Routing	Invert	Outlet Devices
#1	Primary	582.00'	**18.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 582.00' / 581.60' S= 0.0160 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	582.00'	**3.0" Vert. Orifice (internal)** C= 0.600
#3	Device 1	583.90'	**48.0" W x 6.0" H Vert. Weir (internal)** C= 0.600
#4	Device 1	585.00'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	586.00'	**162.0 deg x 15.0' long x 1.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.31 cfs @ 25.01 hrs HW=583.84' TW=581.91' (Dynamic Tailwater)
└—**1=Culvert** (Passes 0.31 cfs of 8.89 cfs potential flow)
  —**2=Orifice (internal)** (Orifice Controls 0.31 cfs @ 6.31 fps)
  —**3=Weir (internal)** (Controls 0.00 cfs)
  └—**4=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=582.00' TW=581.54' (Dynamic Tailwater)
└—**5=overflow weir** (Controls 0.00 cfs)

Pond 238P: wet pond



Summary for Pond CB502: catch basin

Inflow Area =	7.860 ac,	82.06% Impervious,	Inflow Depth = 2.43"	for 10-yr storm event		
Inflow =	30.29 cfs @	11.96 hrs,	Volume=	1.592 af		
Outflow =	30.29 cfs @	11.96 hrs,	Volume=	1.592 af,	Atten= 0%,	Lag= 0.0 min
Primary =	23.14 cfs @	11.96 hrs,	Volume=	1.501 af		
Secondary =	7.15 cfs @	11.96 hrs,	Volume=	0.091 af		

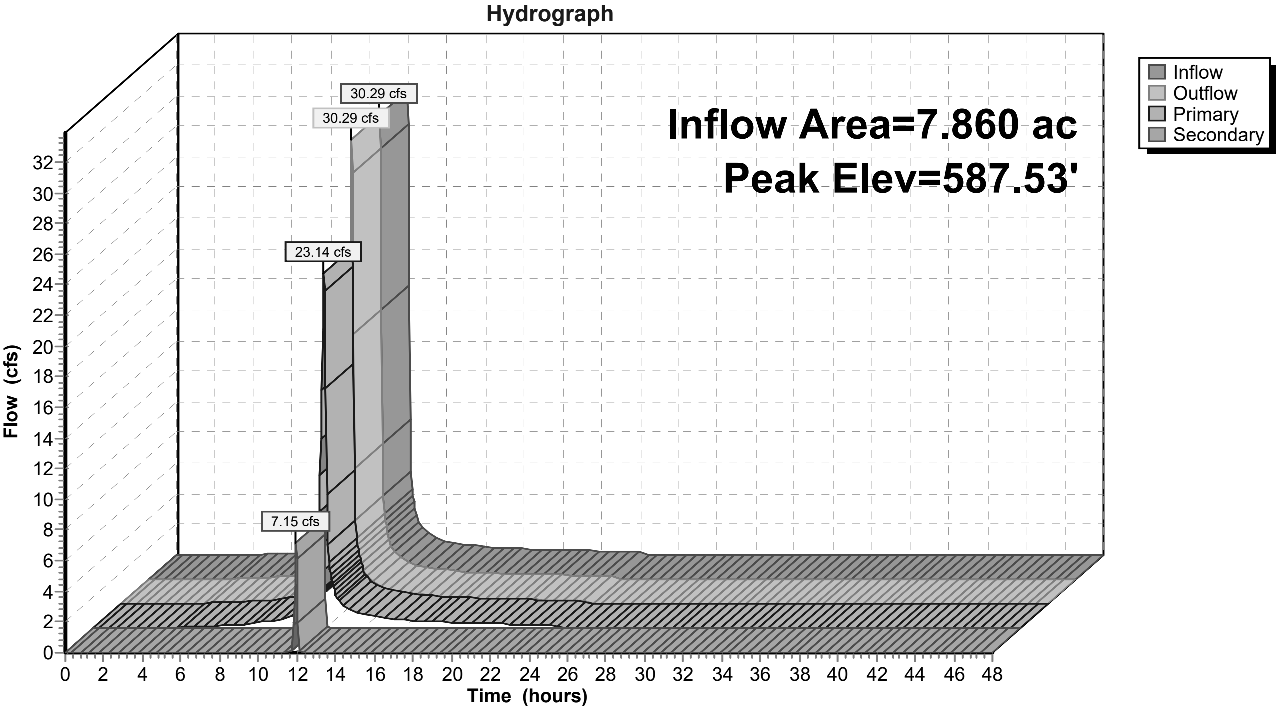
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 587.53' @ 11.96 hrs
Flood Elev= 591.16'

Device	Routing	Invert	Outlet Devices
#1	Primary	584.93'	**30.0" Round Culvert** L= 98.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 584.93' / 584.50' S= 0.0044 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Secondary	586.35'	**24.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 586.35' / 585.00' S= 0.0321 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=22.70 cfs @ 11.96 hrs HW=587.50' TW=585.55' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 22.70 cfs @ 5.60 fps)

Secondary OutFlow Max=6.80 cfs @ 11.96 hrs HW=587.50' TW=581.87' (Dynamic Tailwater)
↳**2=Culvert** (Inlet Controls 6.80 cfs @ 3.65 fps)

Pond CB502: catch basin



Summary for Pond DMH1102: manhole

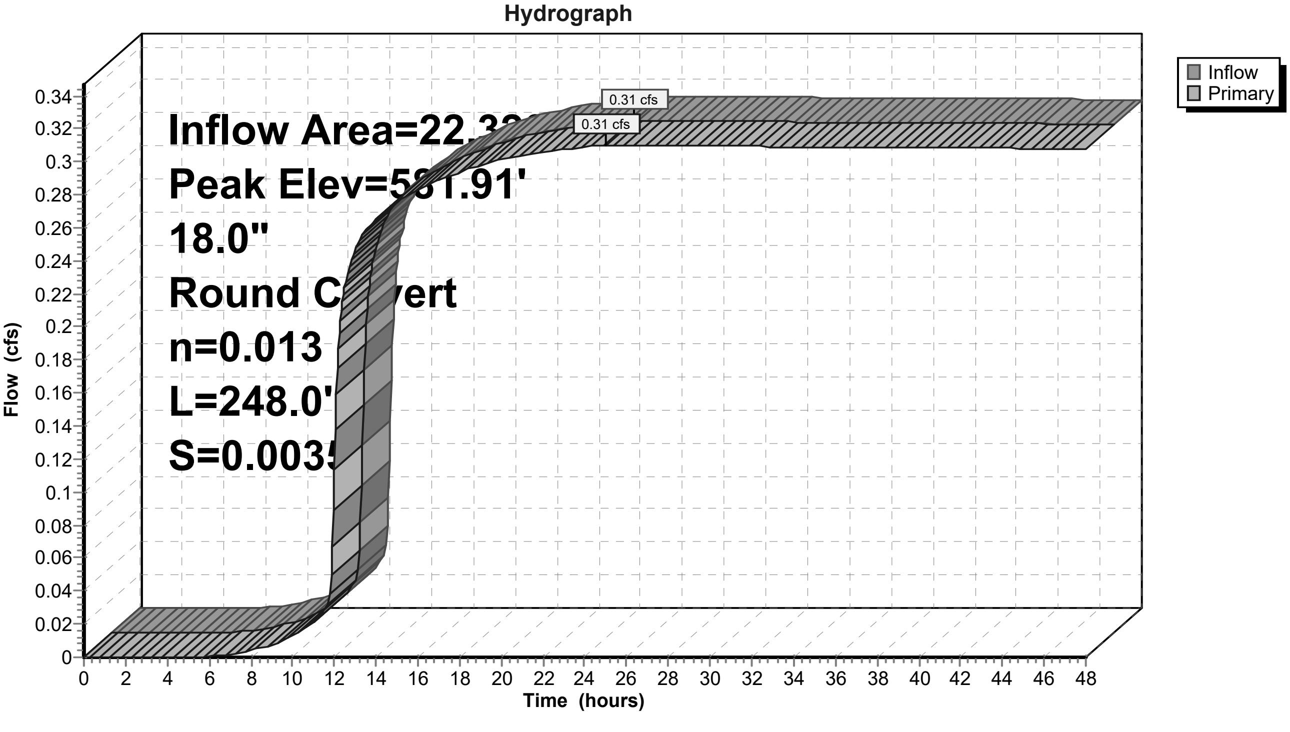
Inflow Area = 22.320 ac, 63.08% Impervious, Inflow Depth > 0.48" for 10-yr storm event
Inflow = 0.31 cfs @ 25.01 hrs, Volume= 0.902 af
Outflow = 0.31 cfs @ 25.03 hrs, Volume= 0.902 af, Atten= 0%, Lag= 1.5 min
Primary = 0.31 cfs @ 25.03 hrs, Volume= 0.902 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 581.91' @ 25.03 hrs
Flood Elev= 587.84'

Device	Routing	Invert	Outlet Devices
#1	Primary	581.60'	**18.0" Round Culvert** L= 248.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 581.60' / 580.74' S= 0.0035 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.31 cfs @ 25.03 hrs HW=581.91' TW=581.03' (Dynamic Tailwater)
↰**1=Culvert** (Outlet Controls 0.31 cfs @ 1.78 fps)

Pond DMH1102: manhole



Summary for Pond DMH1103: manhole

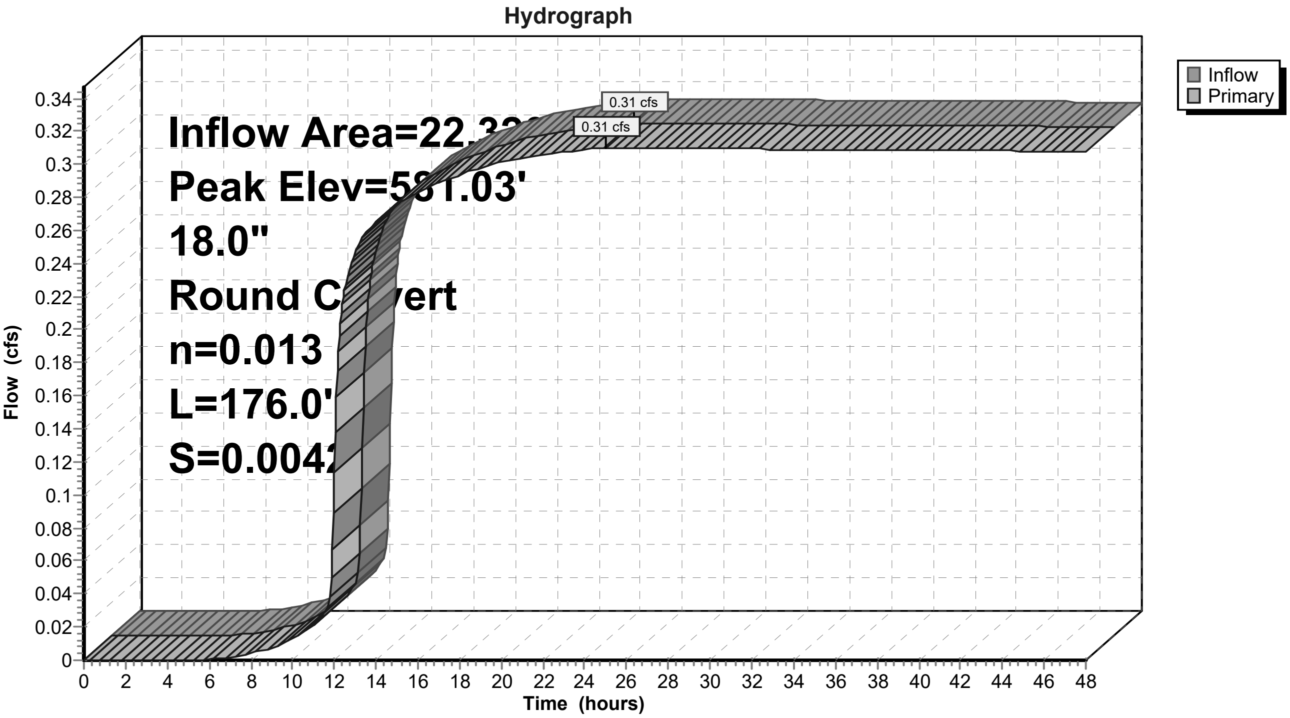
Inflow Area = 22.320 ac, 63.08% Impervious, Inflow Depth > 0.48" for 10-yr storm event
Inflow = 0.31 cfs @ 25.03 hrs, Volume= 0.902 af
Outflow = 0.31 cfs @ 25.04 hrs, Volume= 0.902 af, Atten= 0%, Lag= 0.5 min
Primary = 0.31 cfs @ 25.04 hrs, Volume= 0.902 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 581.03' @ 25.04 hrs
Flood Elev= 588.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	580.74'	**18.0" Round Culvert** L= 176.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.74' / 580.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.31 cfs @ 25.04 hrs HW=581.03' TW=579.41' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 0.31 cfs @ 1.94 fps)

Pond DMH1103: manhole



Summary for Pond DMH602: manhole

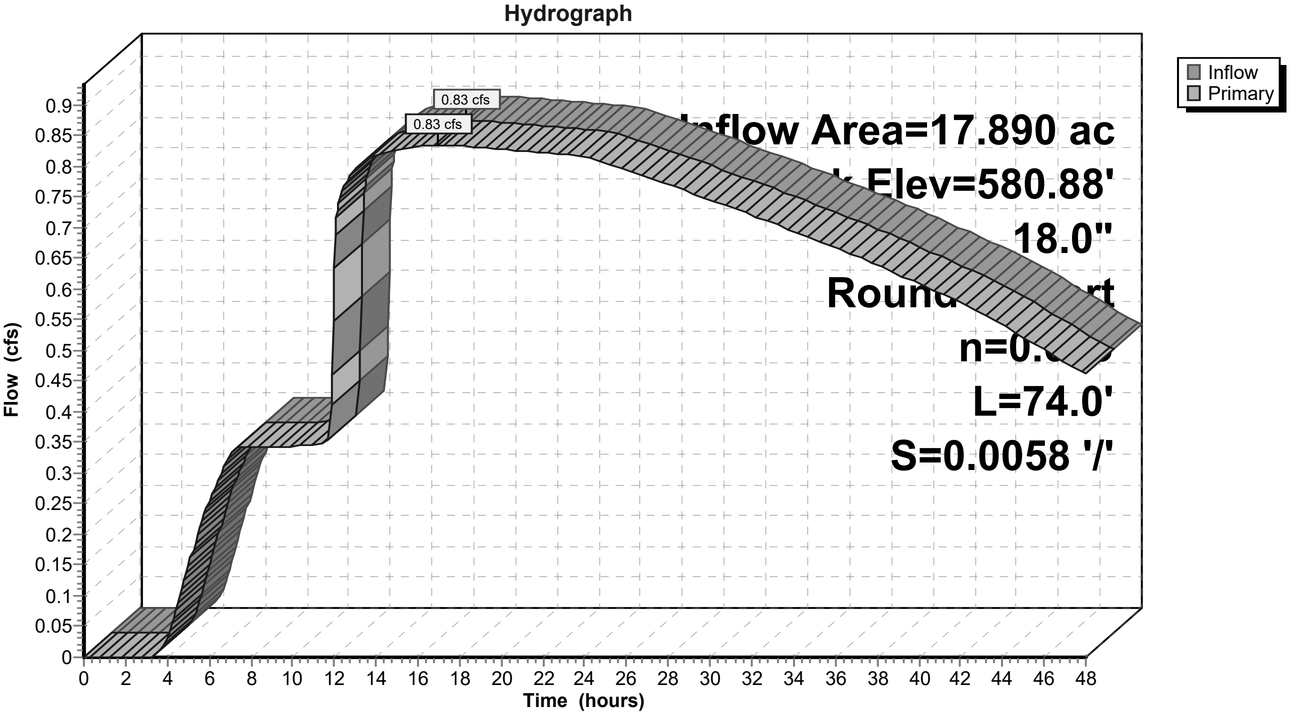
Inflow Area =	17.890 ac, 76.97% Impervious, Inflow Depth > 1.55" for 10-yr storm event			
Inflow =	0.83 cfs @	16.99 hrs, Volume=	2.313 af	
Outflow =	0.83 cfs @	16.99 hrs, Volume=	2.313 af,	Atten= 0%, Lag= 0.2 min
Primary =	0.83 cfs @	16.99 hrs, Volume=	2.313 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 580.88' @ 16.99 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	580.43'	**18.0" Round Culvert** L= 74.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.43' / 580.00' S= 0.0058 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.83 cfs @ 16.99 hrs HW=580.88' TW=579.53' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.83 cfs @ 2.76 fps)

Pond DMH602: manhole



Summary for Pond DMH604: manhole

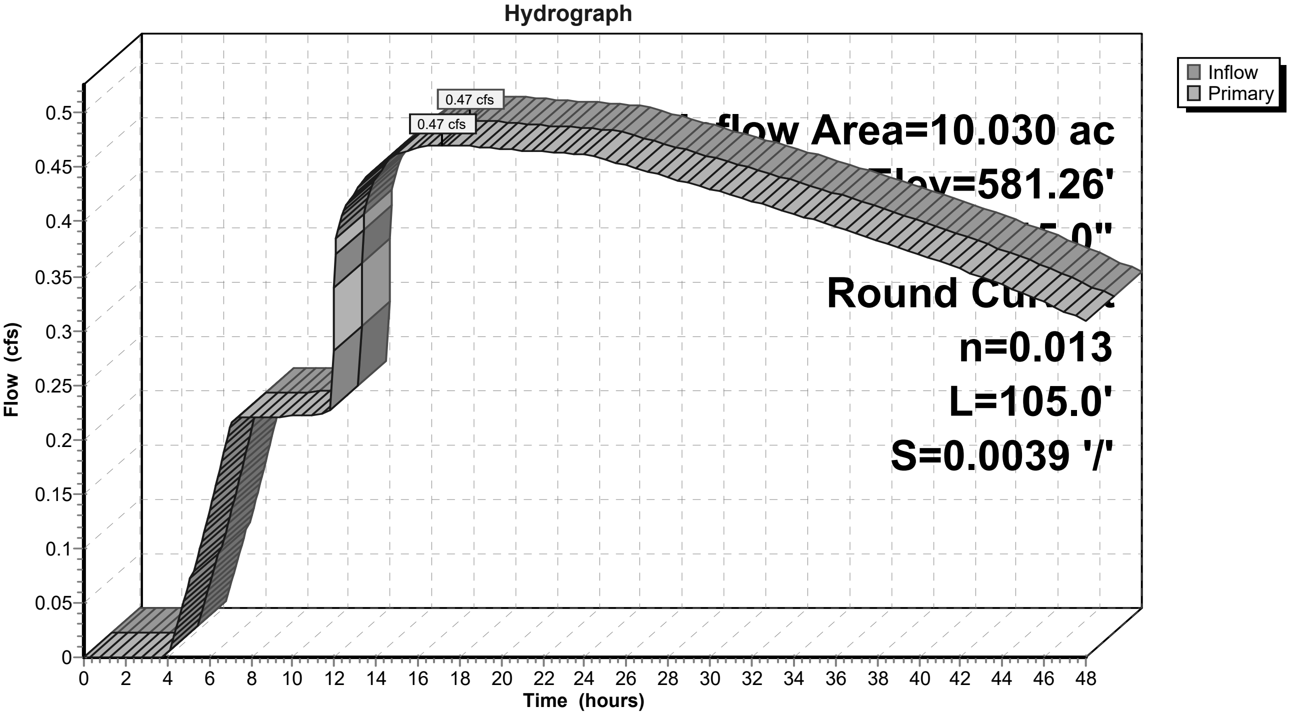
```
Inflow Area =       10.030 ac,  72.98% Impervious,  Inflow Depth >   1.62"    for  10-yr storm event
Inflow       =       0.47 cfs @   17.13 hrs,  Volume=            1.351 af
Outflow      =       0.47 cfs @   17.13 hrs,  Volume=            1.351 af,  Atten= 0%,  Lag= 0.2 min
Primary      =       0.47 cfs @   17.13 hrs,  Volume=            1.351 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 581.26' @ 17.10 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	580.84'	**15.0" Round Culvert** L= 105.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.84' / 580.43' S= 0.0039 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.47 cfs @ 17.13 hrs HW=581.26' TW=580.88' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.47 cfs @ 1.94 fps)

Pond DMH604: manhole



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment200: Runoff Area=67.500 ac 6.03% Impervious Runoff Depth=3.02"
Flow Length=1,193' Tc=84.6 min CN=83 Runoff=84.43 cfs 16.991 af

Subcatchment210: Runoff Area=3.440 ac 0.00% Impervious Runoff Depth=3.02"
Flow Length=289' Tc=19.4 min CN=83 Runoff=11.67 cfs 0.866 af

Subcatchment234: Runoff Area=7.860 ac 82.06% Impervious Runoff Depth=4.25"
Tc=6.0 min CN=95 Runoff=51.14 cfs 2.785 af

Subcatchment235: Runoff Area=10.030 ac 72.98% Impervious Runoff Depth=4.14"
Tc=6.0 min CN=94 Runoff=64.43 cfs 3.461 af

Subcatchment236: Runoff Area=7.500 ac 80.53% Impervious Runoff Depth=4.25"
Tc=6.0 min CN=95 Runoff=48.80 cfs 2.657 af

Subcatchment237: Runoff Area=11.240 ac 71.53% Impervious Runoff Depth=4.14"
Tc=6.0 min CN=94 Runoff=72.20 cfs 3.878 af

Subcatchment238: Runoff Area=3.580 ac 0.00% Impervious Runoff Depth=3.82"
Flow Length=219' Tc=9.9 min CN=91 Runoff=19.60 cfs 1.139 af

Subcatchment240: Runoff Area=26.360 ac 0.00% Impervious Runoff Depth=2.66"
Flow Length=1,835' Tc=114.9 min CN=79 Runoff=22.90 cfs 5.834 af

Reach 200R-1: feeder creek Avg. Flow Depth=1.70' Max Vel=3.33 fps Inflow=85.38 cfs 17.653 af
n=0.030 L=381.0' S=0.0034 '/' Capacity=468.14 cfs Outflow=85.37 cfs 17.653 af

Reach 200R-2: feeder creek Avg. Flow Depth=1.85' Max Vel=3.21 fps Inflow=93.36 cfs 26.514 af
n=0.030 L=1,357.0' S=0.0029 '/' Capacity=430.19 cfs Outflow=92.45 cfs 26.474 af

Reach 200R-3: feeder creek Avg. Flow Depth=1.83' Max Vel=3.25 fps Inflow=92.45 cfs 25.064 af
n=0.030 L=248.0' S=0.0030 '/' Capacity=437.78 cfs Outflow=92.43 cfs 25.059 af

Reach 200R-7: feeder creek Avg. Flow Depth=2.35' Max Vel=2.72 fps Inflow=113.87 cfs 25.116 af
n=0.030 L=157.0' S=0.0016 '/' Capacity=319.81 cfs Outflow=108.66 cfs 25.113 af

Reach 210R: feeder creek Avg. Flow Depth=0.69' Max Vel=2.00 fps Inflow=17.86 cfs 0.662 af
n=0.030 L=318.0' S=0.0034 '/' Capacity=467.05 cfs Outflow=16.72 cfs 0.662 af

Pond 21P: pond Peak Elev=586.73' Storage=23,509 cf Inflow=11.67 cfs 0.866 af
Outflow=1.12 cfs 0.348 af

Pond 200S: splitter Peak Elev=577.19' Inflow=92.45 cfs 26.474 af
Primary=92.45 cfs 25.064 af Secondary=92.40 cfs 19.282 af Outflow=92.45 cfs 26.474 af

Pond 234Bio: bioretention Peak Elev=586.53' Storage=46,084 cf Inflow=28.86 cfs 2.421 af
Primary=0.59 cfs 1.032 af Secondary=9.13 cfs 1.069 af Outflow=9.55 cfs 2.100 af

Pond 234F: forebay Peak Elev=586.53' Storage=16,768 cf Inflow=33.29 cfs 2.471 af
Outflow=28.86 cfs 2.421 af

Pond 235Bio: bioretention Peak Elev=586.49' Storage=81,098 cf Inflow=65.00 cfs 4.471 af
Primary=0.53 cfs 1.436 af Secondary=13.24 cfs 2.346 af Outflow=13.76 cfs 3.782 af

Pond 235F: forebay Peak Elev=586.49' Storage=16,401 cf Inflow=64.43 cfs 3.461 af
Outflow=59.36 cfs 3.402 af

Pond 236Bio: bioretention Peak Elev=587.33' Storage=28,014 cf Inflow=46.80 cfs 2.657 af
Primary=29.36 cfs 2.549 af Secondary=6.88 cfs 0.095 af Outflow=36.22 cfs 2.644 af

Pond 236F: forebay Peak Elev=587.64' Storage=18,355 cf Inflow=48.80 cfs 2.657 af
Outflow=46.80 cfs 2.657 af

Pond 237Bio: bioretention Peak Elev=587.56' Storage=47,929 cf Inflow=70.35 cfs 3.878 af
Primary=30.16 cfs 3.565 af Secondary=16.38 cfs 0.291 af Outflow=46.54 cfs 3.856 af

Pond 237F: forebay Peak Elev=587.90' Storage=16,452 cf Inflow=72.20 cfs 3.878 af
Outflow=70.35 cfs 3.878 af

Pond 238P: wet pond Peak Elev=584.98' Storage=738,506 cf Inflow=107.43 cfs 9.985 af
Primary=9.06 cfs 6.393 af Secondary=0.00 cfs 0.000 af Outflow=9.06 cfs 6.358 af

Pond CB502: catch basin Peak Elev=588.73' Inflow=51.14 cfs 2.785 af
Primary=33.29 cfs 2.471 af Secondary=17.86 cfs 0.313 af Outflow=51.14 cfs 2.785 af

Pond DMH1102: manhole Peak Elev=585.34' Inflow=9.06 cfs 6.393 af
18.0" Round Culvert n=0.013 L=248.0' S=0.0035 '/' Outflow=9.06 cfs 6.393 af

Pond DMH1103: manhole Peak Elev=583.44' Inflow=9.06 cfs 6.393 af
18.0" Round Culvert n=0.013 L=176.0' S=0.0042 '/' Outflow=9.06 cfs 6.393 af

Pond DMH602: manhole Peak Elev=581.15' Inflow=1.12 cfs 2.468 af
18.0" Round Culvert n=0.013 L=74.0' S=0.0058 '/' Outflow=1.12 cfs 2.468 af

Pond DMH604: manhole Peak Elev=581.36' Inflow=0.53 cfs 1.436 af
15.0" Round Culvert n=0.013 L=105.0' S=0.0039 '/' Outflow=0.53 cfs 1.436 af

Total Runoff Area = 137.510 ac Runoff Volume = 37.611 af Average Runoff Depth = 3.28"
76.79% Pervious = 105.590 ac 23.21% Impervious = 31.920 ac

Summary for Subcatchment 200:

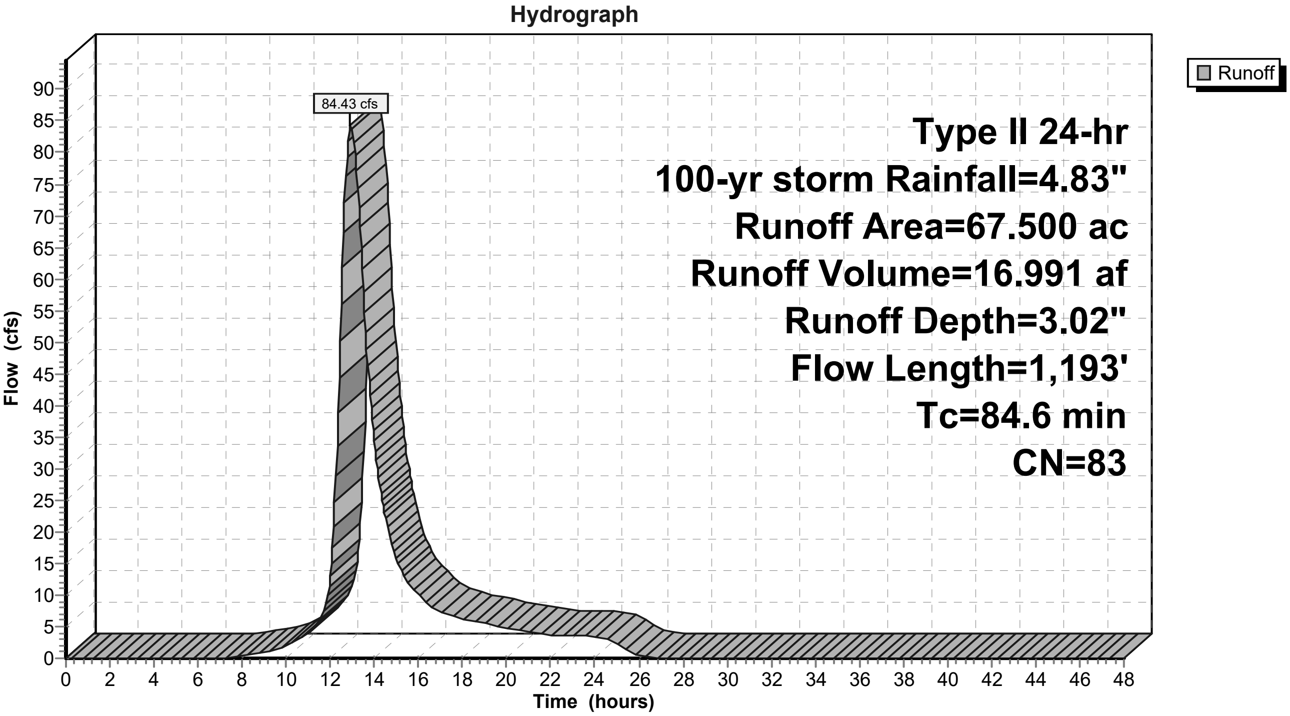
Runoff = 84.43 cfs @ 12.92 hrs, Volume= 16.991 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	15.620	84	50-75% Grass cover, Fair, HSG D
	2.530	79	Woods, Fair, HSG D
	0.230	98	Paved parking, HSG D
	0.030	98	Roofs, HSG D
	0.780	98	Water Surface, 0% imp, HSG D
*	8.770	84	50-75% Grass cover, Fair, HSG D (offsite)
*	33.440	79	Woods, Fair, HSG D (offsite)
*	1.770	98	Paved parking, HSG D (offsite)
*	2.040	98	Roofs, HSG D (offsite)
*	1.960	91	Gravel roads, HSG D (offsite)
*	0.330	98	Water Surface, 0% imp, HSG D (offsite)
	67.500	83	Weighted Average
	63.430		93.97% Pervious Area
	4.070		6.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.7	100	0.0100	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
49.7	1,055	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	38	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
84.6	1,193	Total			

Subcatchment 200:



Summary for Subcatchment 210:

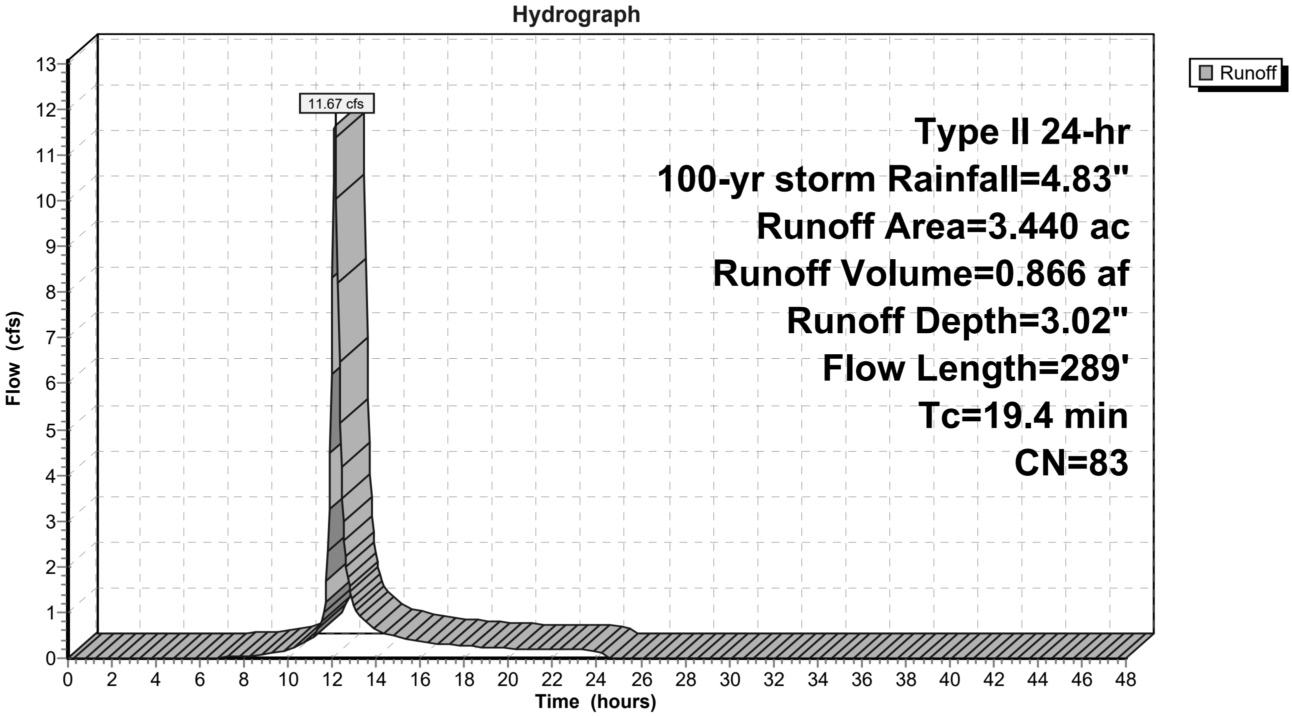
Runoff = 11.67 cfs @ 12.12 hrs, Volume= 0.866 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
2.920	84	50-75% Grass cover, Fair, HSG D
0.520	79	Woods, Fair, HSG D
3.440	83	Weighted Average
3.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.8	100	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
3.6	189	0.0160	0.89		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
19.4	289	Total			

Subcatchment 210:



Summary for Subcatchment 234:

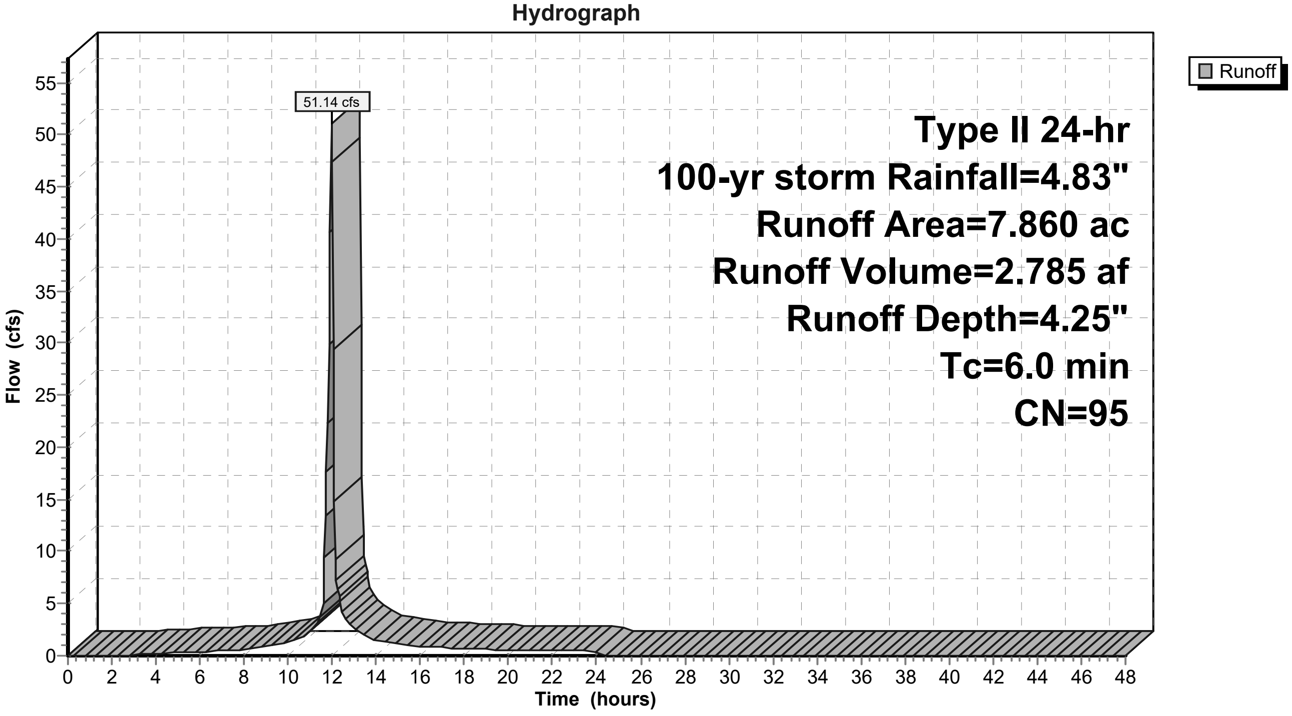
Runoff = 51.14 cfs @ 11.96 hrs, Volume= 2.785 af, Depth= 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
1.410	84	50-75% Grass cover, Fair, HSG D
3.540	98	Paved parking, HSG D
2.910	98	Roofs, HSG D
7.860	95	Weighted Average
1.410		17.94% Pervious Area
6.450		82.06% Impervious Area

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

Subcatchment 234:



Summary for Subcatchment 235:

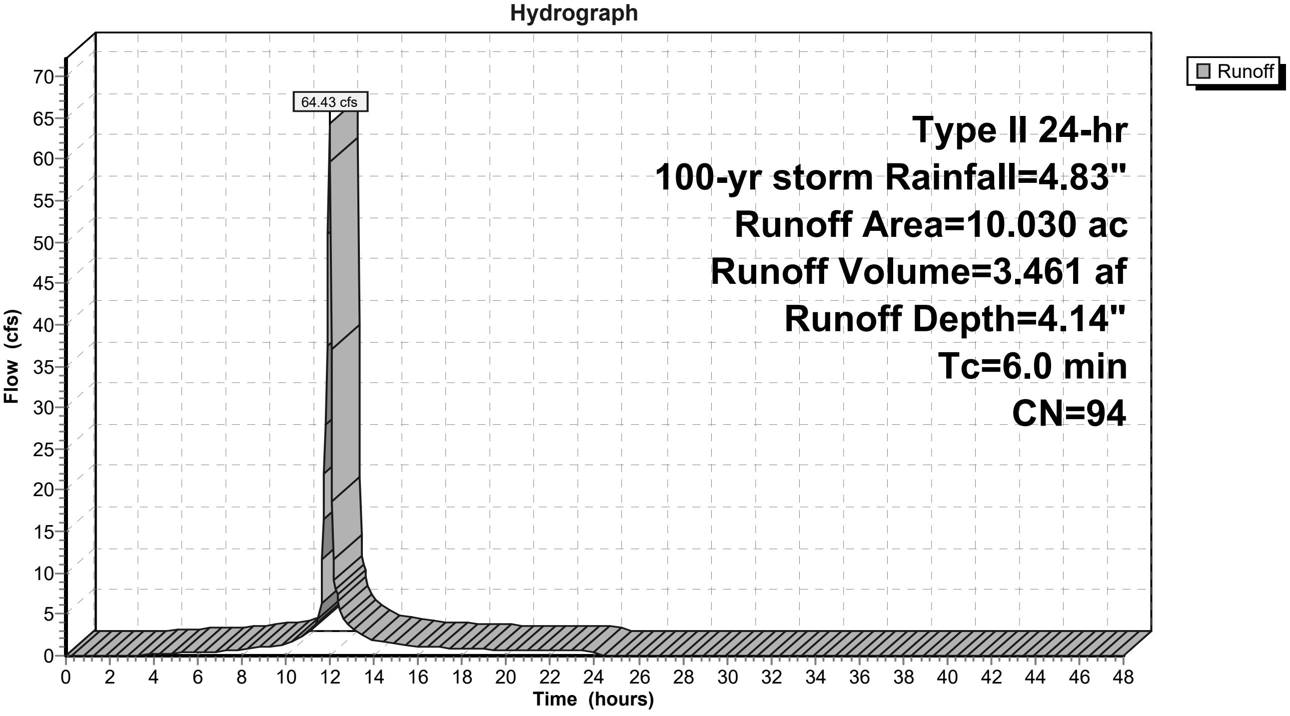
Runoff = 64.43 cfs @ 11.96 hrs, Volume= 3.461 af, Depth= 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
2.710	84	50-75% Grass cover, Fair, HSG D
4.850	98	Paved parking, HSG D
2.470	98	Roofs, HSG D
10.030	94	Weighted Average
2.710		27.02% Pervious Area
7.320		72.98% Impervious Area

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

Subcatchment 235:



Summary for Subcatchment 236:

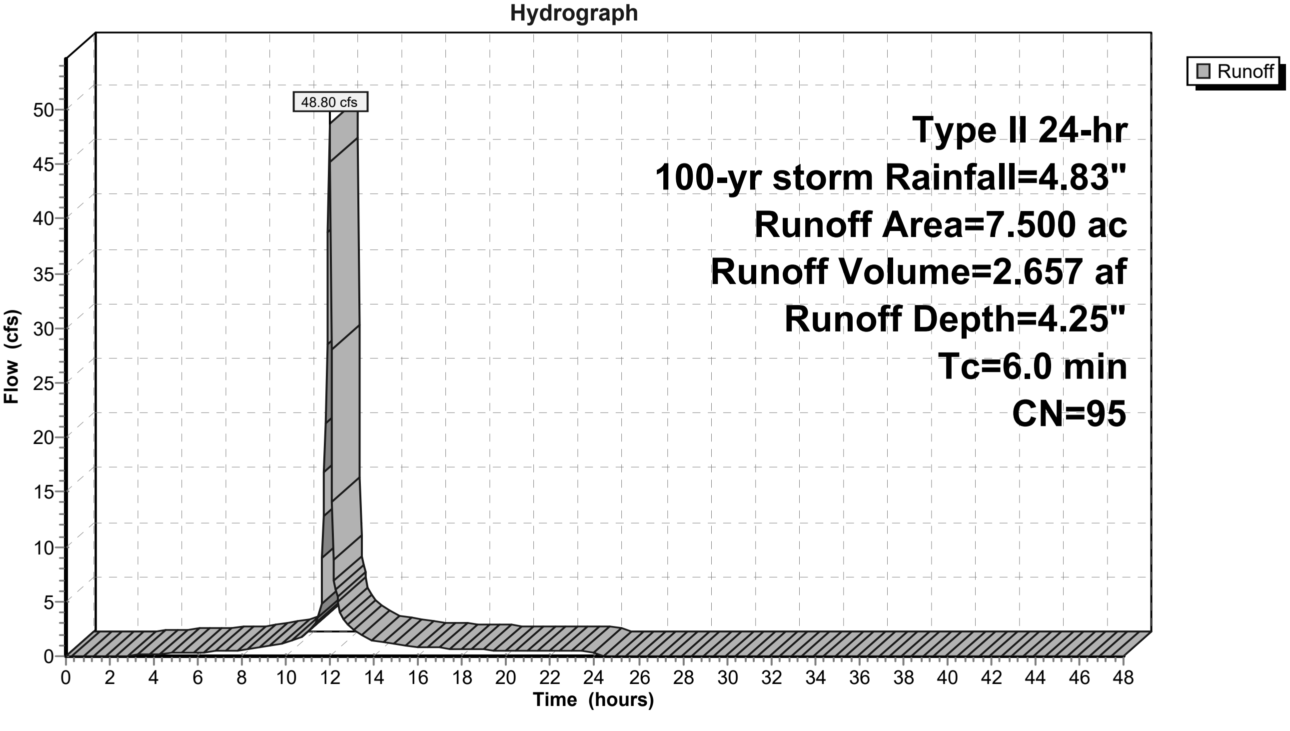
Runoff = 48.80 cfs @ 11.96 hrs, Volume= 2.657 af, Depth= 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
1.460	84	50-75% Grass cover, Fair, HSG D
2.130	98	Paved parking, HSG D
3.910	98	Roofs, HSG D
7.500	95	Weighted Average
1.460		19.47% Pervious Area
6.040		80.53% Impervious Area

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

Subcatchment 236:



Summary for Subcatchment 237:

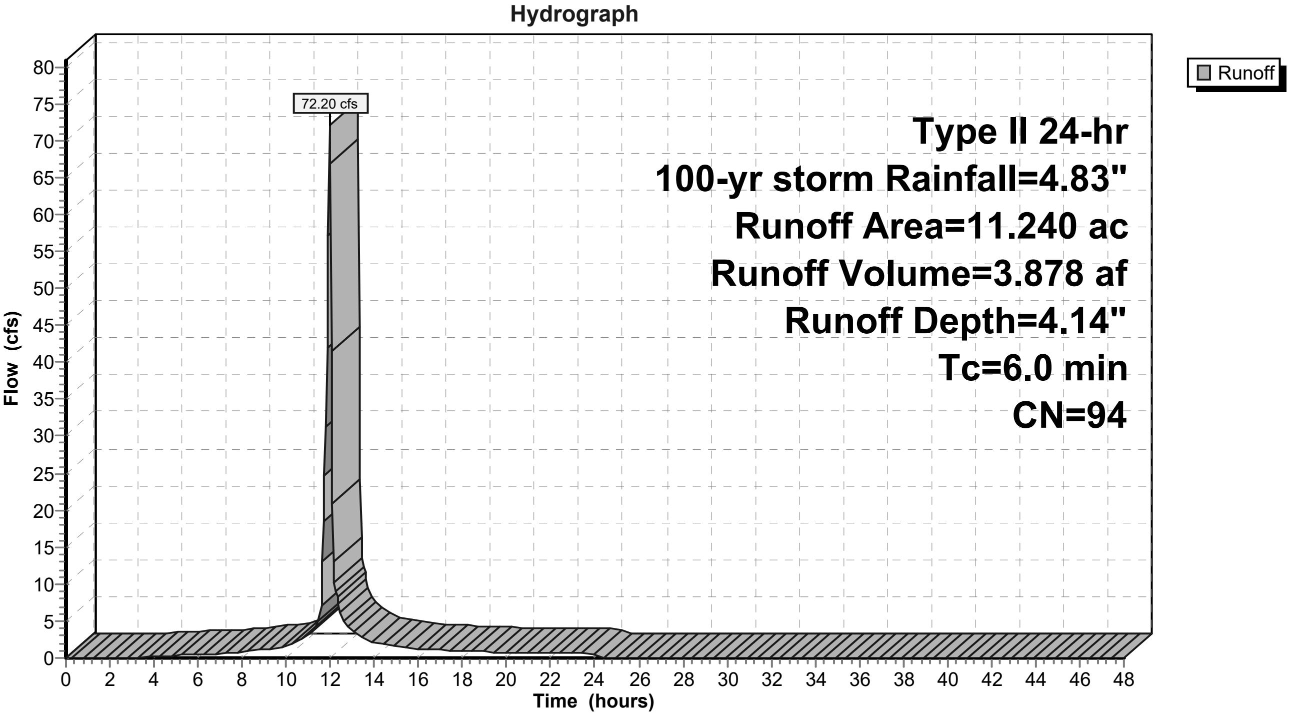
Runoff = 72.20 cfs @ 11.96 hrs, Volume= 3.878 af, Depth= 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
3.200	84	50-75% Grass cover, Fair, HSG D
8.040	98	Paved parking, HSG D
11.240	94	Weighted Average
3.200		28.47% Pervious Area
8.040		71.53% Impervious Area

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

Subcatchment 237:



Summary for Subcatchment 238:

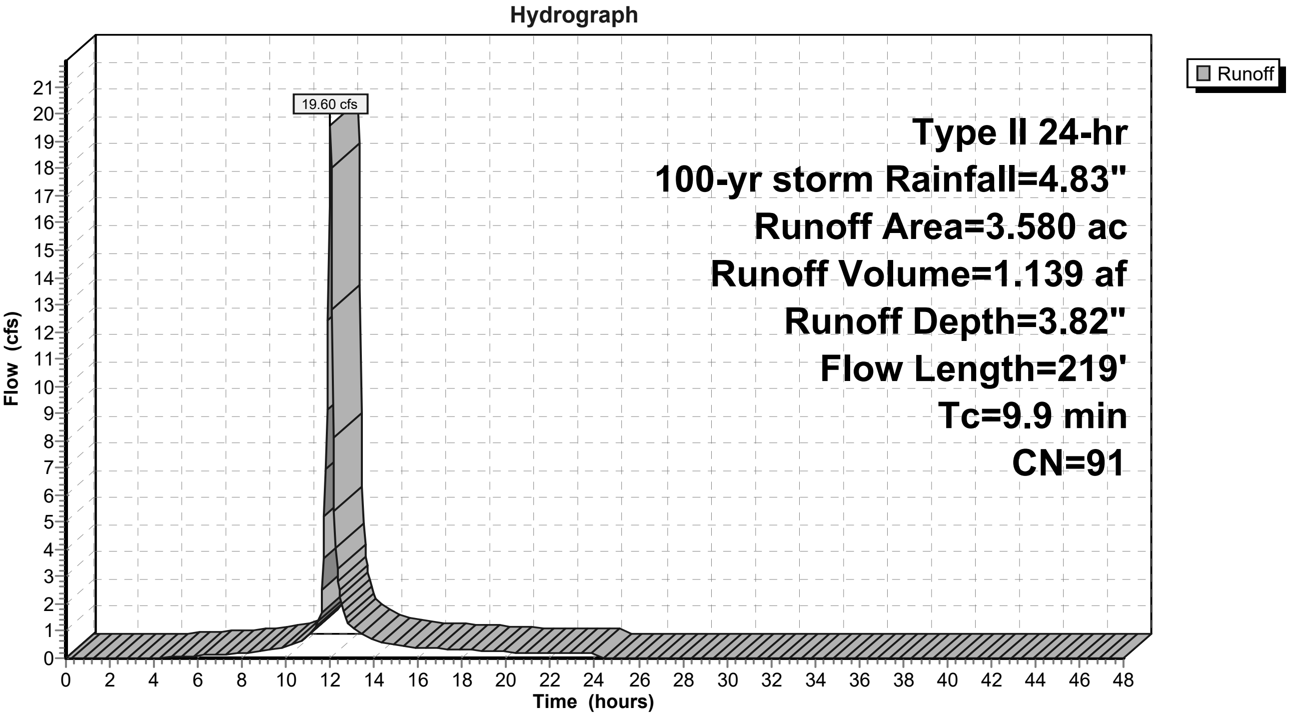
Runoff = 19.60 cfs @ 12.01 hrs, Volume= 1.139 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
1.820	84	50-75% Grass cover, Fair, HSG D
1.760	98	Water Surface, 0% imp, HSG D
3.580	91	Weighted Average
3.580		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.0500	0.20		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
1.5	99	0.0250	1.11		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0100	4.02	2.19	**Pipe Channel, C-D** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
9.9	219	Total			

Subcatchment 238:



Summary for Subcatchment 240:

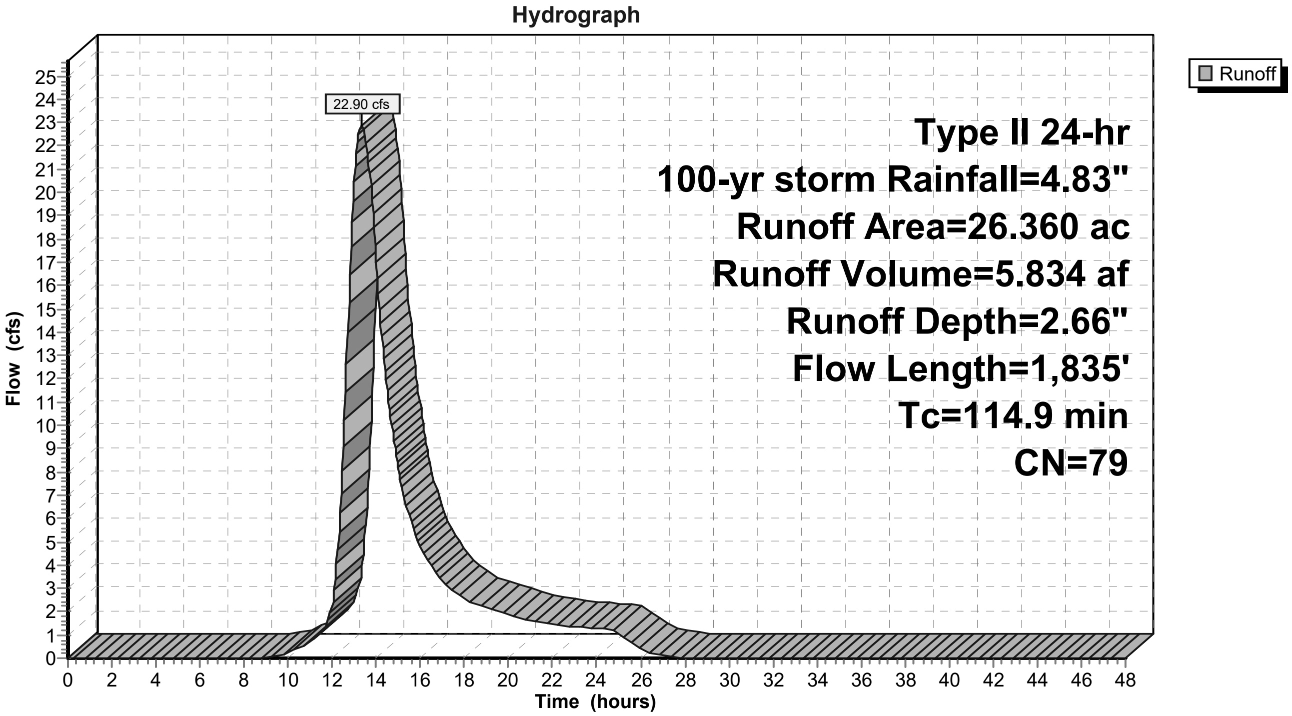
Runoff = 22.90 cfs @ 13.38 hrs, Volume= 5.834 af, Depth= 2.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	0.620	84	50-75% Grass cover, Fair, HSG D
	16.500	79	Woods, Fair, HSG D
*	9.240	79	Woods, Fair, HSG D (offsite)
	26.360	79	Weighted Average
	26.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.7	100	0.0100	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
80.0	1,698	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	37	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
114.9	1,835	Total			

Subcatchment 240:



Summary for Reach 200R-1: feeder creek

```
Inflow Area =        70.940 ac,    5.74% Impervious,  Inflow Depth =   2.99"    for  100-yr storm event
Inflow       =       85.38 cfs @   12.93 hrs,  Volume=           17.653 af
Outflow      =       85.37 cfs @   12.96 hrs,  Volume=           17.653 af,  Atten= 0%,  Lag= 1.7 min
```

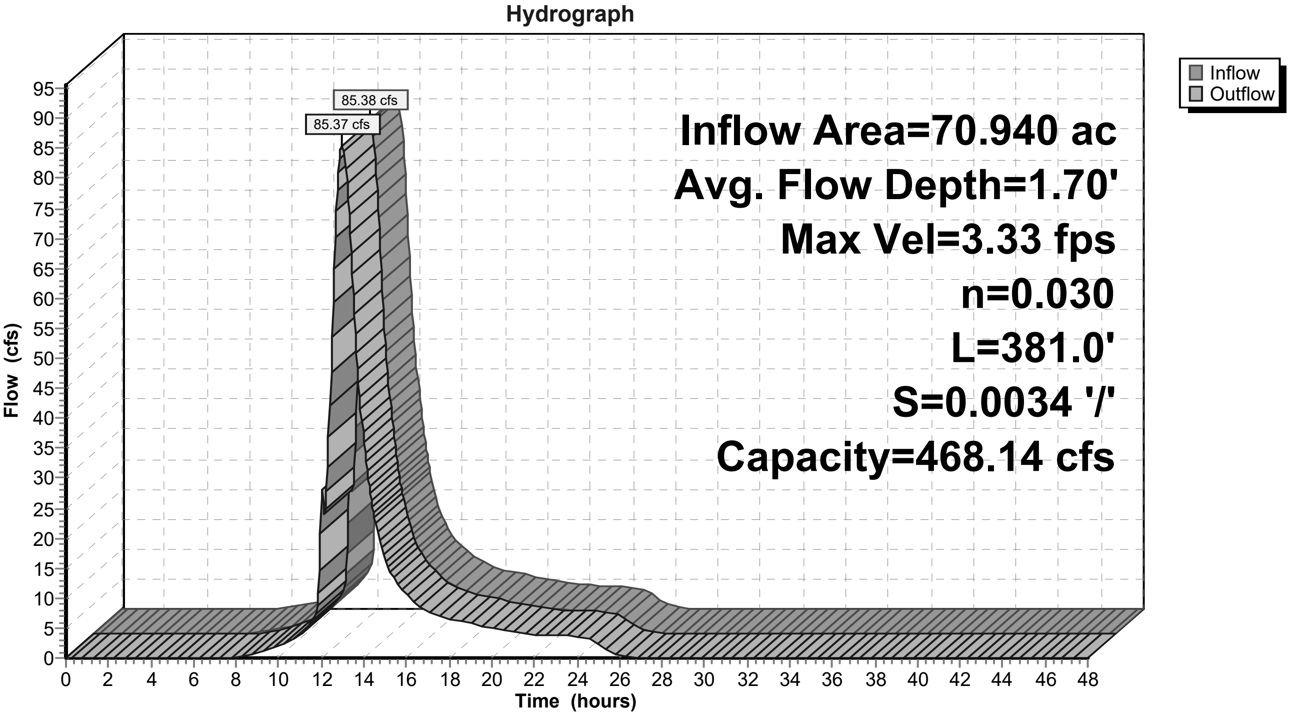
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.33 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.95 fps, Avg. Travel Time= 6.7 min

Peak Storage= 9,762 cf @ 12.96 hrs
Average Depth at Peak Storage= 1.70'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 468.14 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 381.0' Slope= 0.0034 '/'
Inlet Invert= 580.46', Outlet Invert= 579.16'

‡

Reach 200R-1: feeder creek



Summary for Reach 200R-2: feeder creek

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 2.86" for 100-yr storm event
Inflow = 93.36 cfs @ 12.98 hrs, Volume= 26.514 af
Outflow = 92.45 cfs @ 13.07 hrs, Volume= 26.474 af, Atten= 1%, Lag= 5.8 min

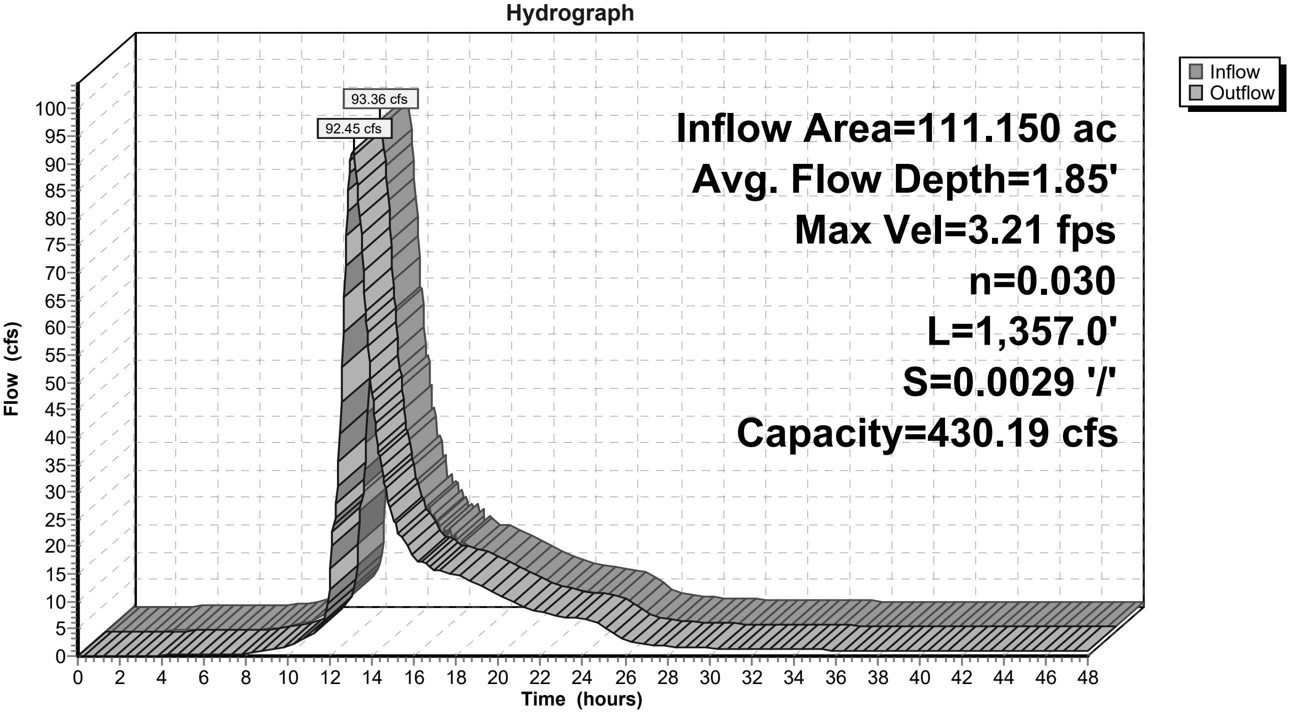
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.21 fps, Min. Travel Time= 7.0 min
Avg. Velocity = 1.05 fps, Avg. Travel Time= 21.5 min

Peak Storage= 39,079 cf @ 13.07 hrs
Average Depth at Peak Storage= 1.85'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 430.19 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 1,357.0' Slope= 0.0029 '/'
Inlet Invert= 579.16', Outlet Invert= 575.25'

‡

Reach 200R-2: feeder creek



Summary for Reach 200R-3: feeder creek

Inflow Area = 111.150 ac, 28.72% Impervious, Inflow Depth > 2.71" for 100-yr storm event
Inflow = 92.45 cfs @ 13.07 hrs, Volume= 25.064 af
Outflow = 92.43 cfs @ 13.09 hrs, Volume= 25.059 af, Atten= 0%, Lag= 0.8 min

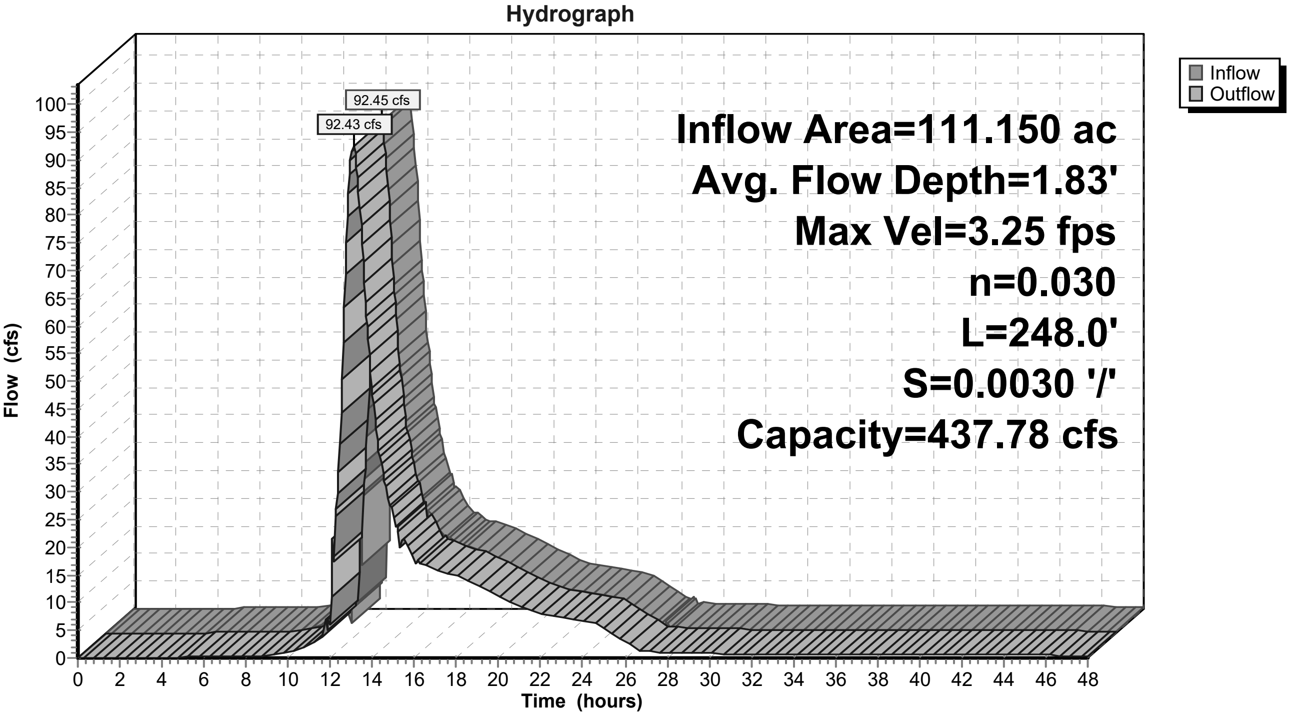
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.25 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 4.2 min

Peak Storage= 7,052 cf @ 13.09 hrs
Average Depth at Peak Storage= 1.83'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 437.78 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 248.0' Slope= 0.0030 '/'
Inlet Invert= 575.25', Outlet Invert= 574.51'

‡

Reach 200R-3: feeder creek



Summary for Reach 200R-7: feeder creek

Inflow Area = 26.360 ac, 0.00% Impervious, Inflow Depth > 11.43" for 100-yr storm event
Inflow = 113.87 cfs @ 13.15 hrs, Volume= 25.116 af
Outflow = 108.66 cfs @ 13.05 hrs, Volume= 25.113 af, Atten= 5%, Lag= 0.0 min

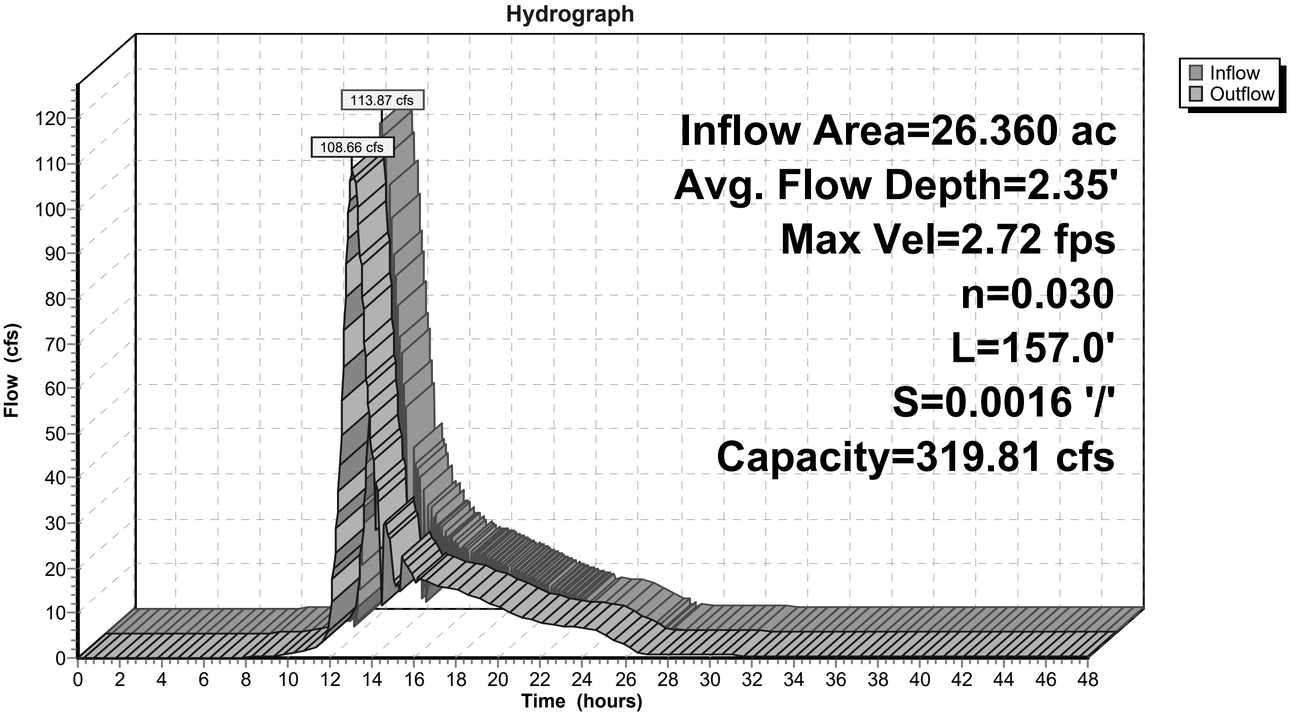
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.72 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.76 fps, Avg. Travel Time= 3.4 min

Peak Storage= 6,282 cf @ 13.05 hrs
Average Depth at Peak Storage= 2.35'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 319.81 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 157.0' Slope= 0.0016 '/'
Inlet Invert= 575.25', Outlet Invert= 575.00'

‡

Reach 200R-7: feeder creek



Summary for Reach 210R: feeder creek

Inflow Area =	3.440 ac,	0.00% Impervious, Inflow Depth = 2.31"		for 100-yr storm event
Inflow =	17.86 cfs @	11.96 hrs, Volume=	0.662 af	
Outflow =	16.72 cfs @	11.99 hrs, Volume=	0.662 af, Atten= 6%, Lag= 1.7 min	

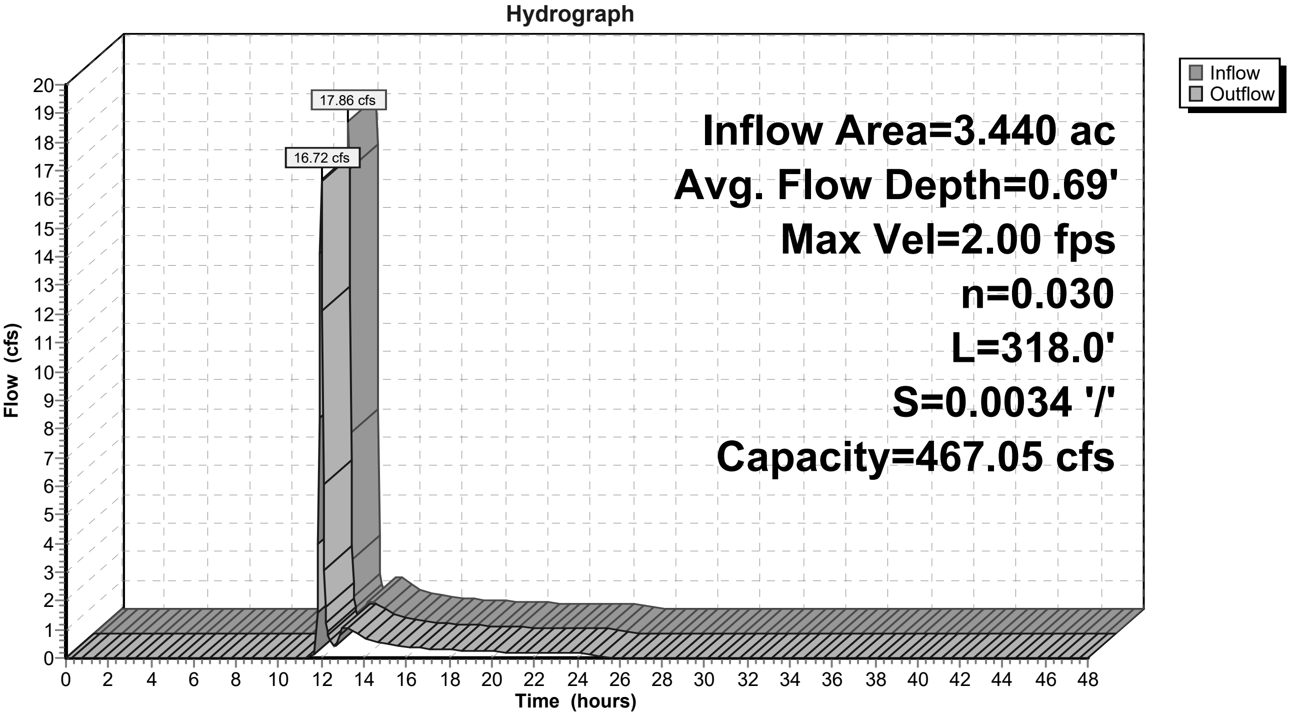
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.00 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 12.7 min

Peak Storage= 2,649 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.69'
Bank-Full Depth= 4.00' Flow Area= 88.0 sf, Capacity= 467.05 cfs

10.00' x 4.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 34.00'
Length= 318.0' Slope= 0.0034 '/'
Inlet Invert= 581.54', Outlet Invert= 580.46'

‡

Reach 210R: feeder creek



Summary for Pond 21P: pond

Inflow Area = 3.440 ac, 0.00% Impervious, Inflow Depth = 3.02" for 100-yr storm event
Inflow = 11.67 cfs @ 12.12 hrs, Volume= 0.866 af
Outflow = 1.12 cfs @ 13.01 hrs, Volume= 0.348 af, Atten= 90%, Lag= 53.3 min
Primary = 1.12 cfs @ 13.01 hrs, Volume= 0.348 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.73' @ 13.01 hrs Surf.Area= 34,975 sf Storage= 23,509 cf
Flood Elev= 587.00' Surf.Area= 36,973 sf Storage= 33,304 cf

Plug-Flow detention time= 306.6 min calculated for 0.348 af (40% of inflow)
Center-of-Mass det. time= 183.7 min (1,007.9 - 824.2)

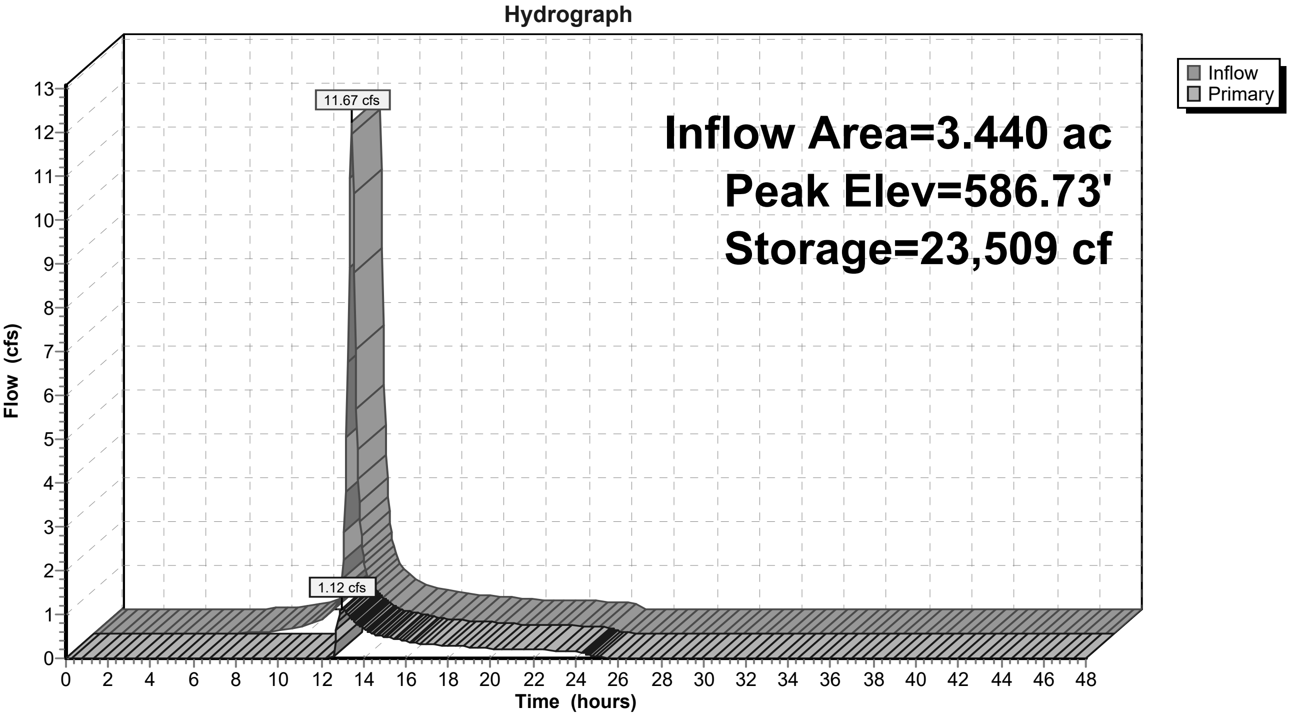
Volume	Invert	Avail.Storage	Storage Description
#1	586.00'	33,304 cf	**pond (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
586.00	29,634	0	0
587.00	36,973	33,304	33,304

Device	Routing	Invert	Outlet Devices
#1	Primary	586.70'	**100.0' long x 8.0' breadth overflow weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=1.12 cfs @ 13.01 hrs HW=586.73' TW=581.68' (Dynamic Tailwater)
└─**1=overflow weir** (Weir Controls 1.12 cfs @ 0.40 fps)

Pond 21P: pond



Summary for Pond 200S: splitter

Inflow Area =	111.150 ac, 28.72% Impervious,	Inflow Depth > 2.86"	for 100-yr storm event	
Inflow =	92.45 cfs @	13.07 hrs, Volume=	26.474 af	
Outflow =	92.45 cfs @	13.07 hrs, Volume=	26.474 af,	Atten= 0%, Lag= 0.0 min
Primary =	92.45 cfs @	13.07 hrs, Volume=	25.064 af	
Secondary =	92.40 cfs @	13.05 hrs, Volume=	19.282 af	

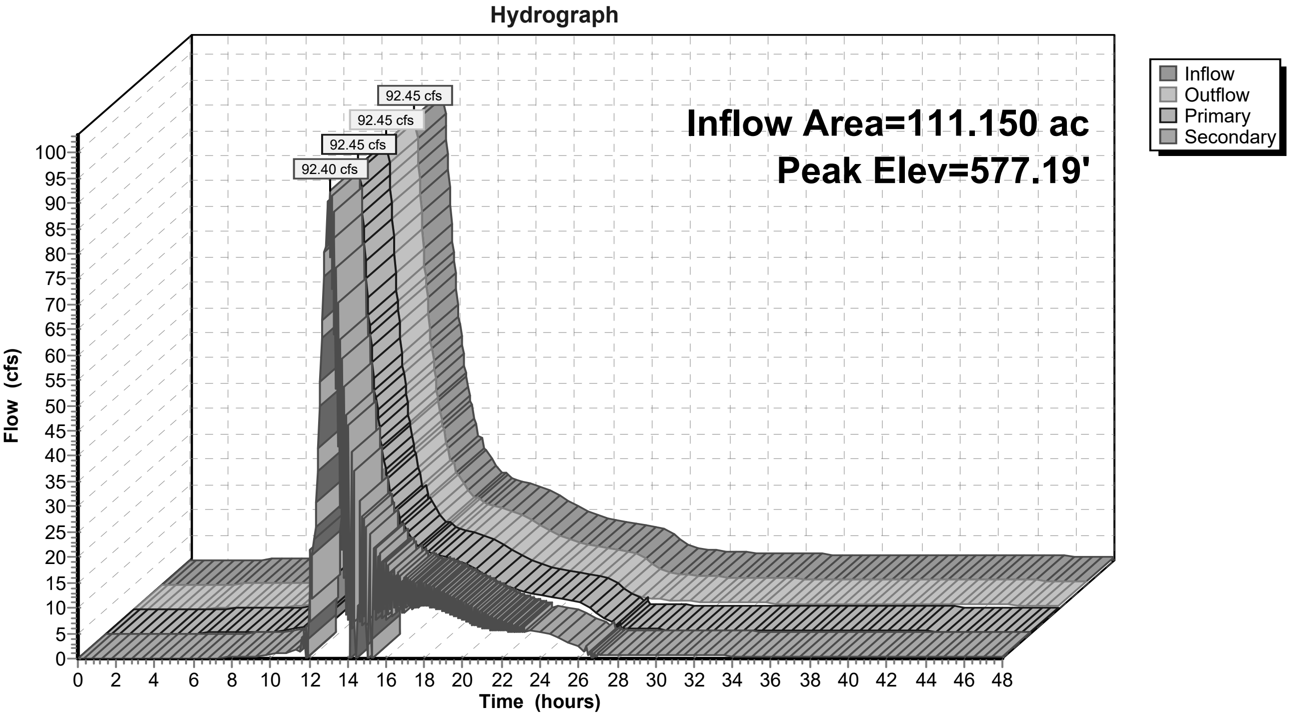
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 577.19' @ 13.35 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	575.25'	**162.0 deg x 10.0' long x 4.00' rise splitter1** Cv= 2.47 (C= 3.09)
#2	Secondary	575.25'	**162.0 deg x 10.0' long x 4.00' rise splitter2** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.00 cfs @ 13.07 hrs HW=576.90' TW=577.08' (Dynamic Tailwater)
└─**1=splitter1** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 13.05 hrs HW=576.88' TW=577.60' (Dynamic Tailwater)
└─**2=splitter2** (Controls 0.00 cfs)

Pond 200S: splitter



Summary for Pond 234Bio: bioretention

```
Inflow Area =       7.860 ac, 82.06% Impervious, Inflow Depth >  3.70"   for 100-yr storm event
Inflow      =      28.86 cfs @  11.97 hrs, Volume=          2.421 af
Outflow     =       9.55 cfs @  12.06 hrs, Volume=          2.100 af, Atten= 67%, Lag= 5.8 min
Primary     =       0.59 cfs @  12.18 hrs, Volume=          1.032 af
Secondary   =       9.13 cfs @  12.06 hrs, Volume=          1.069 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.53' @ 12.18 hrs   Surf.Area= 24,622 sf   Storage= 46,084 cf
Flood Elev= 587.00'   Surf.Area= 25,515 sf   Storage= 57,991 cf

Plug-Flow detention time= 468.8 min calculated for 2.098 af (87% of inflow)
Center-of-Mass det. time= 372.7 min ( 1,197.9 - 825.2 )

Volume      Invert    Avail.Storage   Storage Description
  #1       584.50'        57,991 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

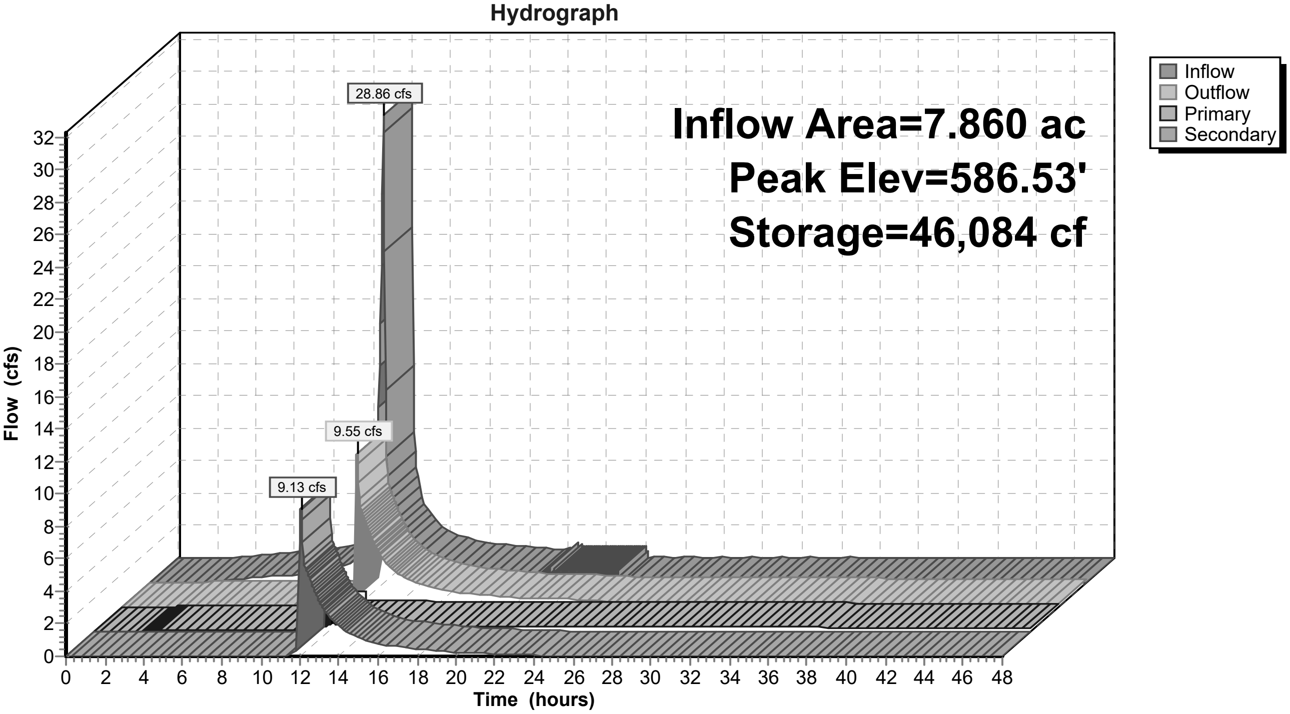
Elevation        Surf.Area        Inc.Store        Cum.Store
   (feet)          (sq-ft)     (cubic-feet)     (cubic-feet)
   584.50           20,920                0                0
   586.00           23,635           33,416           33,416
   587.00           25,515           24,575           57,991

Device   Routing        Invert   Outlet Devices
  #1     Primary       581.08'   15.0"  Round Culvert
                                 L= 12.0'   CPP, square edge headwall,  Ke= 0.500
                                 Inlet / Outlet Invert= 581.08' / 580.98'   S= 0.0083 '/'   Cc= 0.900
                                 n= 0.012  Concrete pipe, finished,  Flow Area= 1.23 sf
  #2     Device 1      581.08'   6.0" Vert. Underdrain   C= 0.600
  #3     Device 1      585.00'   3.0" Vert. Orifice   C= 0.600
  #4     Device 1      586.50'   48.0" x 30.0" Horiz. Grate   C= 0.600
                                 Limited to weir flow at low heads
  #5     Device 2      584.50'   0.250 in/hr Exfiltration through bioretention media over Surface area
  #6     Secondary     586.00'   162.0 deg x 10.0' long x 1.00' rise overflow weir Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.59 cfs @ 12.18 hrs  HW=586.52'  TW=580.96'   (Dynamic Tailwater)
└─1=Culvert  (Passes 0.59 cfs of 12.97 cfs potential flow)
   ├─2=Underdrain  (Passes 0.14 cfs of 2.15 cfs potential flow)
   │  └─5=Exfiltration through bioretention media(Exfiltration Controls 0.14 cfs)
   ├─3=Orifice  (Orifice Controls 0.28 cfs @ 5.70 fps)
   └─4=Grate  (Weir Controls 0.16 cfs @ 0.51 fps)

Secondary OutFlow Max=8.91 cfs @ 12.06 hrs  HW=586.48'  TW=586.36'   (Dynamic Tailwater)
└─6=overflow weir  (Weir Controls 8.91 cfs @ 1.44 fps)
```

Pond 234Bio: bioretention



Summary for Pond 234F: forebay

```
Inflow Area =        7.860 ac, 82.06% Impervious, Inflow Depth =  3.77"   for 100-yr storm event
Inflow      =       33.29 cfs @  11.96 hrs, Volume=         2.471 af
Outflow     =       28.86 cfs @  11.97 hrs, Volume=         2.421 af, Atten= 13%, Lag= 0.5 min
Primary     =       28.86 cfs @  11.97 hrs, Volume=         2.421 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.50' Surf.Area= 3,193 sf Storage= 8,951 cf
Peak Elev= 586.53' @ 12.17 hrs Surf.Area= 4,549 sf Storage= 16,768 cf (7,817 cf above start)
Flood Elev= 587.00' Surf.Area= 4,895 sf Storage= 18,993 cf (10,042 cf above start)

Plug-Flow detention time= 146.0 min calculated for 2.215 af (90% of inflow)
Center-of-Mass det. time= 53.8 min (825.2 - 771.5)

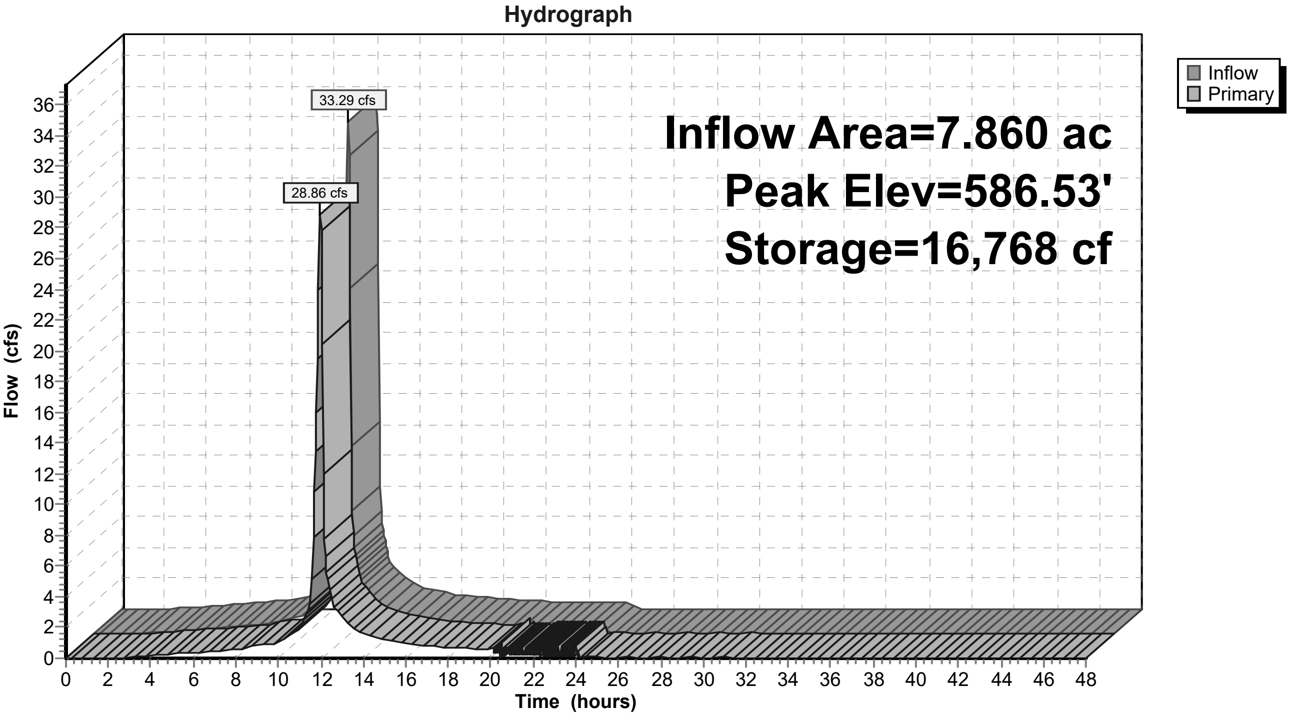
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	18,993 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	965	0	0
582.00	1,800	2,765	2,765
584.00	2,870	4,670	7,435
586.00	4,160	7,030	14,465
587.00	4,895	4,528	18,993

Device	Routing	Invert	Outlet Devices
#1	Primary	584.50'	**162.0 deg x 10.0' long x 2.50' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=26.49 cfs @ 11.97 hrs HW=586.26' TW=586.24' (Dynamic Tailwater)
└─**1=overflow weir** (Weir Controls 26.49 cfs @ 0.71 fps)

Pond 234F: forebay



Summary for Pond 235Bio: bioretention

Inflow Area =	10.030 ac, 72.98% Impervious, Inflow Depth > 5.35" for 100-yr storm event			
Inflow =	65.00 cfs @	11.98 hrs, Volume=	4.471 af	
Outflow =	13.76 cfs @	12.25 hrs, Volume=	3.782 af,	Atten= 79%, Lag= 16.3 min
Primary =	0.53 cfs @	12.25 hrs, Volume=	1.436 af	
Secondary =	13.24 cfs @	12.25 hrs, Volume=	2.346 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 586.49' @ 12.25 hrs Surf.Area= 43,382 sf Storage= 81,098 cf
Flood Elev= 587.00' Surf.Area= 44,755 sf Storage= 103,550 cf

Plug-Flow detention time= 406.7 min calculated for 3.778 af (84% of inflow)
Center-of-Mass det. time= 324.7 min (1,142.6 - 817.9)

Volume	Invert	Avail.Storage	Storage Description
#1	584.50'	103,550 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

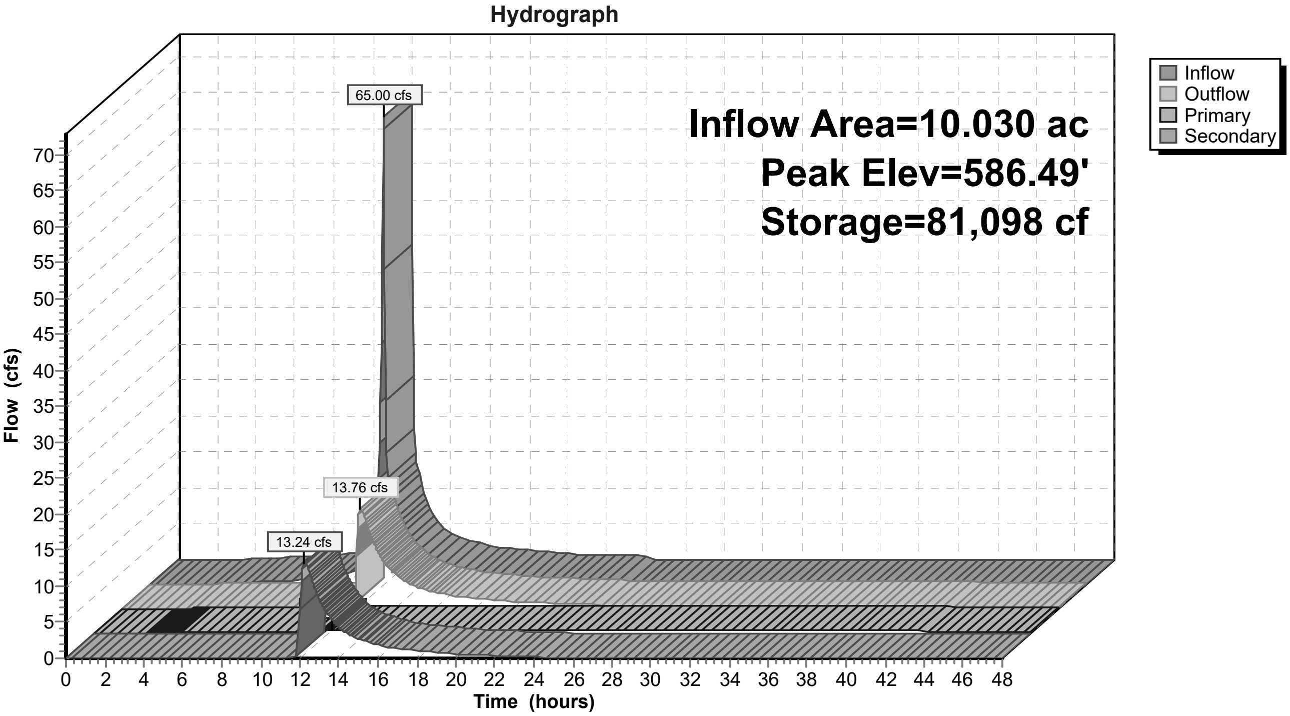
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.50	38,130	0	0
586.00	42,060	60,143	60,143
587.00	44,755	43,408	103,550

Device	Routing	Invert	Outlet Devices
#1	Primary	581.08'	**15.0" Round Culvert** L= 66.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 581.08' / 580.84' S= 0.0036 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	581.08'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	585.00'	**3.0" Vert. Orifice** C= 0.600
#4	Device 1	586.50'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	584.50'	**0.250 in/hr Exfiltration through bioretention media over Surface area**
#6	Secondary	586.00'	**162.0 deg x 10.0' long x 1.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.53 cfs @ 12.25 hrs HW=586.49' TW=581.30' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.53 cfs of 12.32 cfs potential flow)
  ↑—**2=Underdrain** (Passes 0.25 cfs of 2.15 cfs potential flow)
    ↑—**5=Exfiltration through bioretention media** (Exfiltration Controls 0.25 cfs)
  —**3=Orifice** (Orifice Controls 0.28 cfs @ 5.63 fps)
  —**4=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=13.23 cfs @ 12.25 hrs HW=586.49' TW=583.95' (Dynamic Tailwater)
↑—**6=overflow weir** (Weir Controls 13.23 cfs @ 2.06 fps)

Pond 235Bio: bioretention



Summary for Pond 235F: forebay

Inflow Area = 10.030 ac, 72.98% Impervious, Inflow Depth = 4.14" for 100-yr storm event
Inflow = 64.43 cfs @ 11.96 hrs, Volume= 3.461 af
Outflow = 59.36 cfs @ 11.97 hrs, Volume= 3.402 af, Atten= 8%, Lag= 0.3 min
Primary = 59.36 cfs @ 11.97 hrs, Volume= 3.402 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 584.50' Surf.Area= 3,168 sf Storage= 8,782 cf
Peak Elev= 586.49' @ 12.25 hrs Surf.Area= 4,512 sf Storage= 16,401 cf (7,619 cf above start)
Flood Elev= 587.00' Surf.Area= 4,885 sf Storage= 18,788 cf (10,006 cf above start)

Plug-Flow detention time= 100.3 min calculated for 3.201 af (92% of inflow)
Center-of-Mass det. time= 34.1 min (805.0 - 771.0)

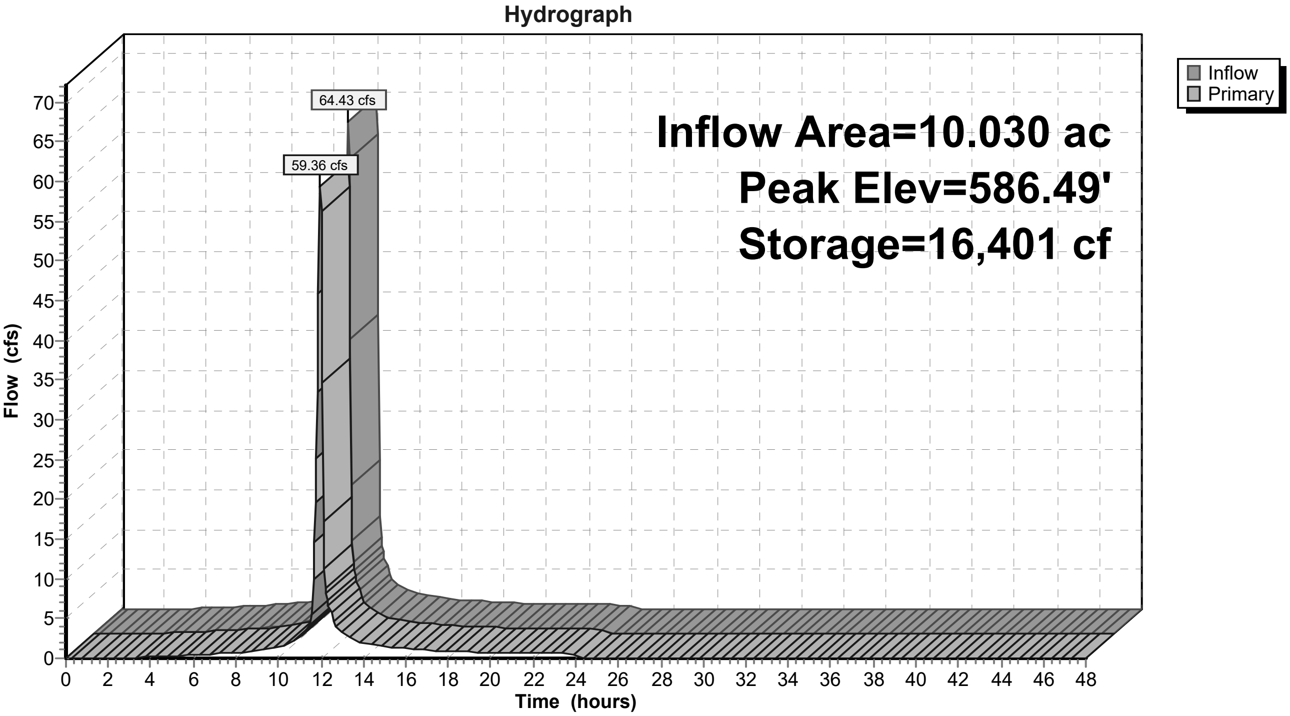
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	18,788 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	910	0	0
582.00	1,765	2,675	2,675
584.00	2,840	4,605	7,280
586.00	4,150	6,990	14,270
587.00	4,885	4,518	18,788

Device	Routing	Invert	Outlet Devices
#1	Primary	584.50'	**162.0 deg x 10.0' long x 2.50' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=58.33 cfs @ 11.97 hrs HW=586.12' TW=585.95' (Dynamic Tailwater)
↳**1=overflow weir** (Weir Controls 58.33 cfs @ 1.79 fps)

Pond 235F: forebay



Summary for Pond 236Bio: bioretention

Inflow Area = 7.500 ac, 80.53% Impervious, Inflow Depth = 4.25" for 100-yr storm event
Inflow = 46.80 cfs @ 11.98 hrs, Volume= 2.657 af
Outflow = 36.22 cfs @ 12.04 hrs, Volume= 2.644 af, Atten= 23%, Lag= 3.5 min
Primary = 29.36 cfs @ 12.03 hrs, Volume= 2.549 af
Secondary = 6.88 cfs @ 12.04 hrs, Volume= 0.095 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 587.33' @ 12.04 hrs Surf.Area= 22,723 sf Storage= 28,014 cf
Flood Elev= 588.00' Surf.Area= 24,415 sf Storage= 43,765 cf

Plug-Flow detention time= 157.3 min calculated for 2.641 af (99% of inflow)
Center-of-Mass det. time= 155.3 min (926.8 - 771.5)

Volume	Invert	Avail.Storage	Storage Description
#1	586.00'	43,765 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

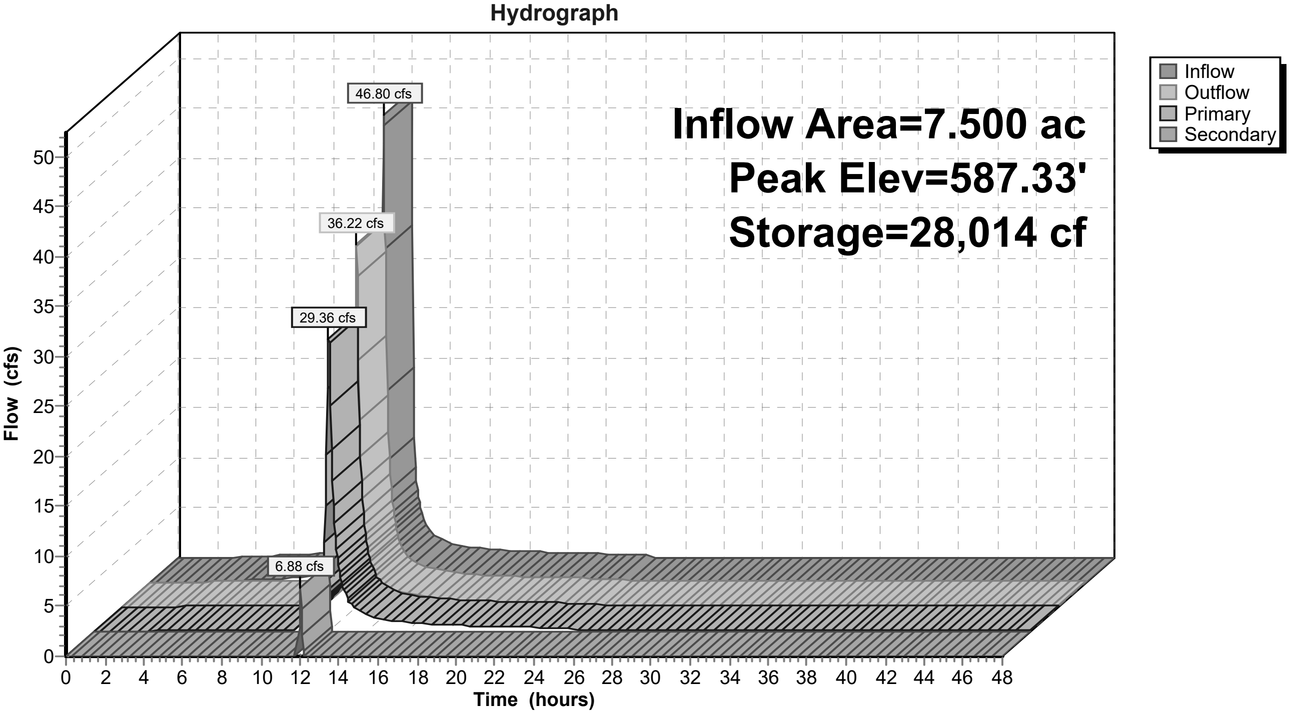
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
586.00	19,350	0	0
588.00	24,415	43,765	43,765

Device	Routing	Invert	Outlet Devices
#1	Primary	582.58'	**24.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 582.58' / 582.43' S= 0.0038 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	582.58'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	586.50'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	586.00'	**0.250 in/hr Exfiltration through bioretention media over Surface area**
#5	Secondary	587.00'	**162.0 deg x 10.0' long x 1.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=29.25 cfs @ 12.03 hrs HW=587.32' TW=583.17' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 29.25 cfs @ 9.31 fps)
  ├─**2=Underdrain** (Passes < 1.93 cfs potential flow)
  │ └─**4=Exfiltration through bioretention media**(Passes < 0.13 cfs potential flow)
  └─**3=Grate** (Passes < 31.47 cfs potential flow)

Secondary OutFlow Max=6.65 cfs @ 12.04 hrs HW=587.32' TW=583.22' (Dynamic Tailwater)
└─**5=overflow weir** (Weir Controls 6.65 cfs @ 1.70 fps)

Pond 236Bio: bioretention



Summary for Pond 236F: forebay

Inflow Area = 7.500 ac, 80.53% Impervious, Inflow Depth = 4.25" for 100-yr storm event
Inflow = 48.80 cfs @ 11.96 hrs, Volume= 2.657 af
Outflow = 46.80 cfs @ 11.98 hrs, Volume= 2.657 af, Atten= 4%, Lag= 1.1 min
Primary = 46.80 cfs @ 11.98 hrs, Volume= 2.657 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 586.50' Surf.Area= 4,521 sf Storage= 12,637 cf
Peak Elev= 587.64' @ 11.99 hrs Surf.Area= 5,515 sf Storage= 18,355 cf (5,718 cf above start)
Flood Elev= 588.00' Surf.Area= 5,830 sf Storage= 20,400 cf (7,763 cf above start)

Plug-Flow detention time= 98.3 min calculated for 2.367 af (89% of inflow)
Center-of-Mass det. time= 6.0 min (771.5 - 765.5)

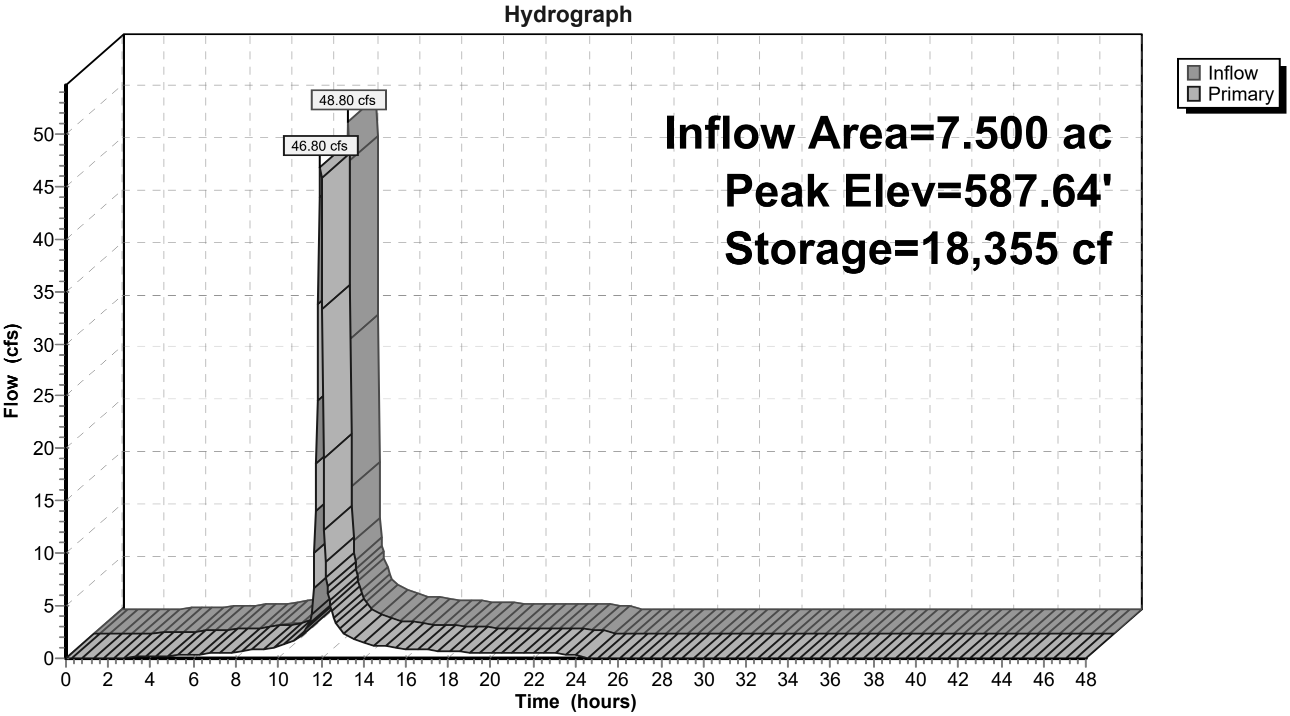
Volume	Invert	Avail.Storage	Storage Description
#1	582.00'	20,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
582.00	1,270	0	0
584.00	2,565	3,835	3,835
586.00	4,085	6,650	10,485
588.00	5,830	9,915	20,400

Device	Routing	Invert	Outlet Devices
#1	Primary	586.50'	**162.0 deg x 10.0' long x 2.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=45.20 cfs @ 11.98 hrs HW=587.62' TW=587.26' (Dynamic Tailwater)
↑**1=overflow weir** (Weir Controls 45.20 cfs @ 2.38 fps)

Pond 236F: forebay



Summary for Pond 237Bio: bioretention

Inflow Area = 11.240 ac, 71.53% Impervious, Inflow Depth = 4.14" for 100-yr storm event
Inflow = 70.35 cfs @ 11.98 hrs, Volume= 3.878 af
Outflow = 46.54 cfs @ 12.05 hrs, Volume= 3.856 af, Atten= 34%, Lag= 4.6 min
Primary = 30.16 cfs @ 12.05 hrs, Volume= 3.565 af
Secondary = 16.38 cfs @ 12.05 hrs, Volume= 0.291 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 587.56' @ 12.05 hrs Surf.Area= 32,818 sf Storage= 47,929 cf
Flood Elev= 588.00' Surf.Area= 33,965 sf Storage= 62,765 cf

Plug-Flow detention time= 162.8 min calculated for 3.856 af (99% of inflow)
Center-of-Mass det. time= 158.9 min (934.1 - 775.2)

Volume	Invert	Avail.Storage	Storage Description
#1	586.00'	62,765 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

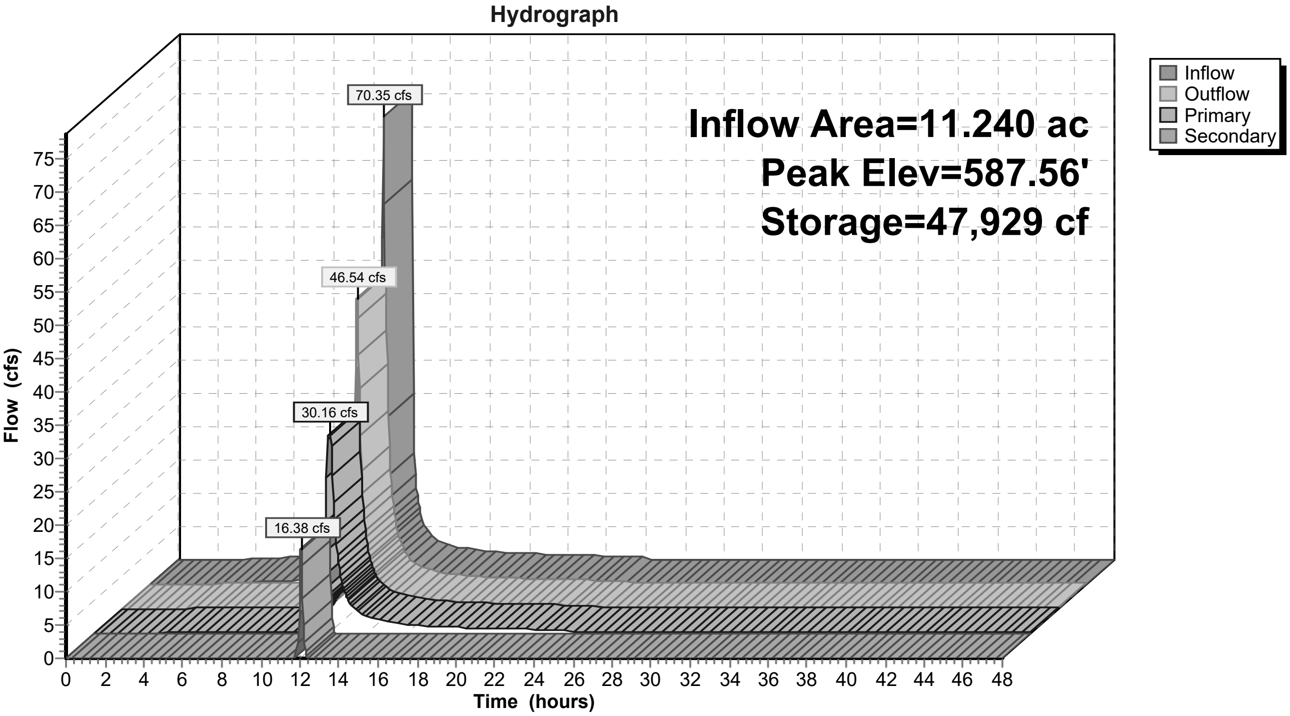
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
586.00	28,800	0	0
588.00	33,965	62,765	62,765

Device	Routing	Invert	Outlet Devices
#1	Primary	582.58'	**24.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 582.58' / 582.43' S= 0.0041 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	582.58'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	586.50'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	586.00'	**0.250 in/hr Exfiltration through bioretention media over Surface area**
#5	Secondary	587.00'	**162.0 deg x 10.0' long x 1.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=30.15 cfs @ 12.05 hrs HW=587.55' TW=583.27' (Dynamic Tailwater)
- **1=Culvert** (Inlet Controls 30.15 cfs @ 9.60 fps)
  - **2=Underdrain** (Passes < 1.96 cfs potential flow)
    - **4=Exfiltration through bioretention media** (Passes < 0.19 cfs potential flow)
  - **3=Grate** (Passes < 45.84 cfs potential flow)

Secondary OutFlow Max=16.18 cfs @ 12.05 hrs HW=587.55' TW=583.27' (Dynamic Tailwater)
- **5=overflow weir** (Weir Controls 16.18 cfs @ 2.17 fps)

Pond 237Bio: bioretention



Summary for Pond 237F: forebay

Inflow Area = 11.240 ac, 71.53% Impervious, Inflow Depth = 4.14" for 100-yr storm event
Inflow = 72.20 cfs @ 11.96 hrs, Volume= 3.878 af
Outflow = 70.35 cfs @ 11.98 hrs, Volume= 3.878 af, Atten= 3%, Lag= 0.8 min
Primary = 70.35 cfs @ 11.98 hrs, Volume= 3.878 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 586.50' Surf.Area= 3,658 sf Storage= 10,648 cf
Peak Elev= 587.90' @ 11.99 hrs Surf.Area= 4,618 sf Storage= 16,452 cf (5,804 cf above start)
Flood Elev= 588.00' Surf.Area= 4,685 sf Storage= 16,905 cf (6,257 cf above start)

Plug-Flow detention time= 63.8 min calculated for 3.630 af (94% of inflow)
Center-of-Mass det. time= 4.2 min (775.2 - 771.0)

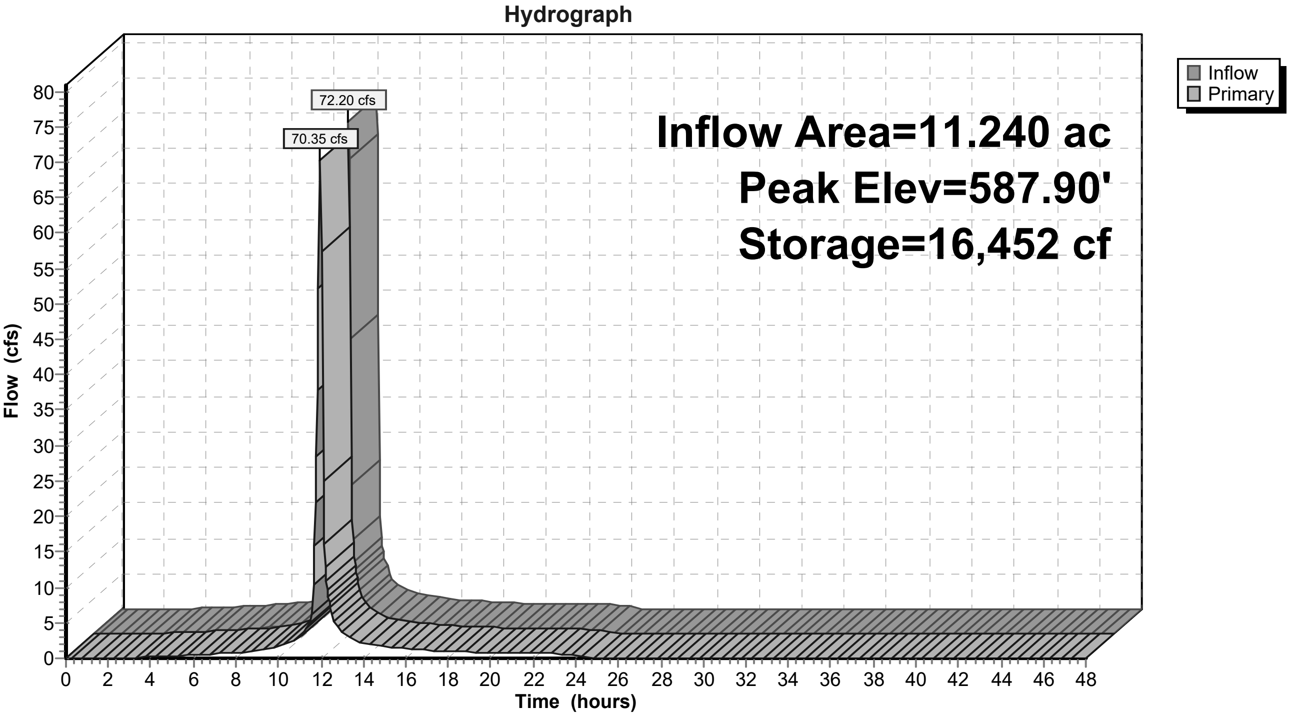
Volume	Invert	Avail.Storage	Storage Description
#1	582.00'	16,905 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
582.00	1,250	0	0
584.00	2,170	3,420	3,420
586.00	3,315	5,485	8,905
588.00	4,685	8,000	16,905

Device	Routing	Invert	Outlet Devices
#1	Primary	586.50'	**162.0 deg x 10.0' long x 2.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=67.85 cfs @ 11.98 hrs HW=587.87' TW=587.41' (Dynamic Tailwater)
↳**1=overflow weir** (Weir Controls 67.85 cfs @ 2.65 fps)

Pond 237F: forebay



Summary for Pond 238P: wet pond

```
Inflow Area =      22.320 ac, 63.08% Impervious, Inflow Depth >  5.37"   for 100-yr storm event
Inflow      =    107.43 cfs @  12.05 hrs, Volume=         9.985 af
Outflow     =      9.06 cfs @  14.84 hrs, Volume=         6.358 af, Atten= 92%, Lag= 167.3 min
Primary     =      9.06 cfs @  14.84 hrs, Volume=         6.393 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= 0.05 hrs / 3
Starting Elev= 582.00' Surf.Area= 76,680 sf Storage= 481,118 cf
Peak Elev= 584.98' @ 14.78 hrs Surf.Area= 95,704 sf Storage= 738,506 cf (257,389 cf above start)
Flood Elev= 587.00' Surf.Area= 106,960 sf Storage= 943,710 cf (462,593 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 304.4 min (1,205.0 - 900.6)

Volume	Invert	Avail.Storage	Storage Description
#1	570.00'	943,710 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

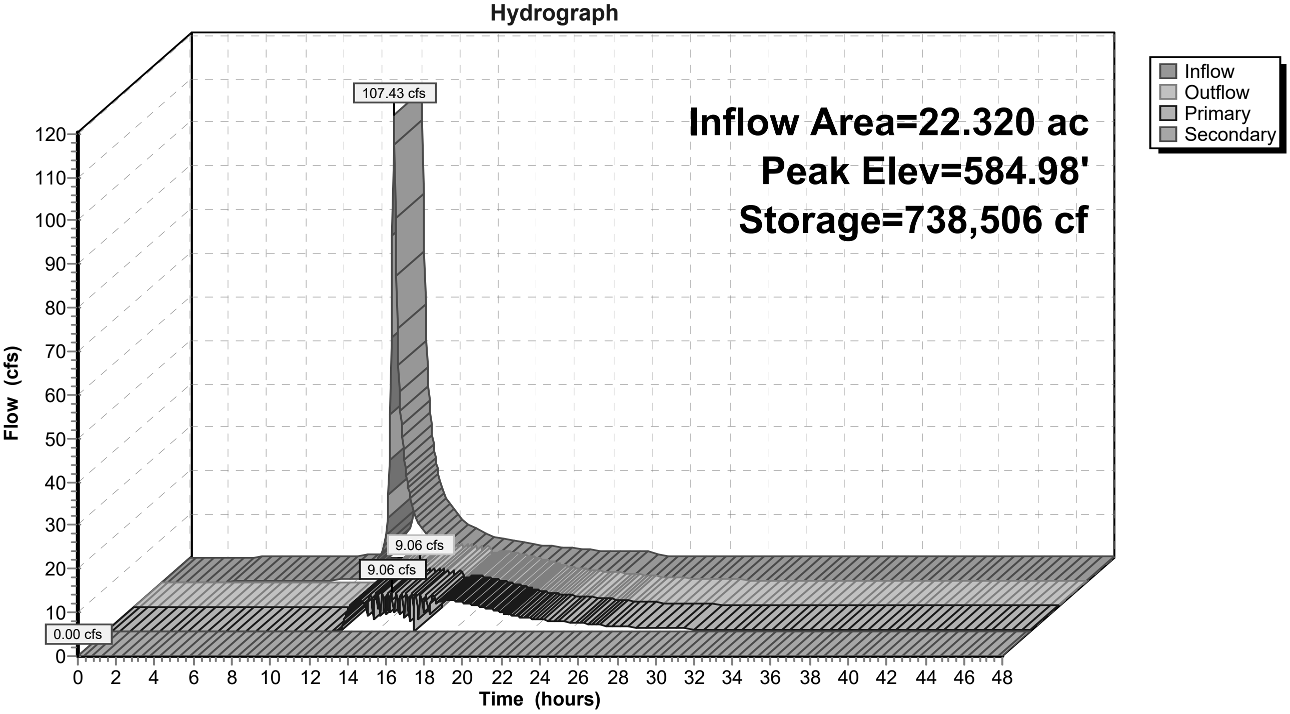
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
570.00	20,830	0	0
572.00	26,450	47,280	47,280
574.00	32,175	58,625	105,905
576.00	38,000	70,175	176,080
578.00	43,925	81,925	258,005
580.00	49,950	93,875	351,880
580.50	51,475	25,356	377,236
581.00	70,230	30,426	407,663
582.00	76,680	73,455	481,118
584.00	89,885	166,565	647,683
586.00	101,775	191,660	839,343
587.00	106,960	104,368	943,710

Device	Routing	Invert	Outlet Devices
#1	Primary	582.00'	**18.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 582.00' / 581.60' S= 0.0160 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	582.00'	**3.0" Vert. Orifice (internal)** C= 0.600
#3	Device 1	583.90'	**48.0" W x 6.0" H Vert. Weir (internal)** C= 0.600
#4	Device 1	585.00'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	586.00'	**162.0 deg x 15.0' long x 1.00' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=5.19 cfs @ 14.84 hrs HW=584.98' TW=584.60' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 5.19 cfs @ 2.94 fps)
  ├─**2=Orifice (internal)** (Passes < 0.14 cfs potential flow)
  ├─**3=Weir (internal)** (Passes < 5.88 cfs potential flow)
  └─**4=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=582.00' TW=581.54' (Dynamic Tailwater)
└─**5=overflow weir** (Controls 0.00 cfs)

Pond 238P: wet pond



Summary for Pond CB502: catch basin

```
Inflow Area =       7.860 ac,  82.06% Impervious,  Inflow Depth =   4.25"    for  100-yr storm event
Inflow      =      51.14 cfs @   11.96 hrs,  Volume=          2.785 af
Outflow     =      51.14 cfs @   11.96 hrs,  Volume=          2.785 af,  Atten= 0%,  Lag= 0.0 min
Primary     =      33.29 cfs @   11.96 hrs,  Volume=          2.471 af
Secondary =        17.86 cfs @   11.96 hrs,  Volume=          0.313 af
```

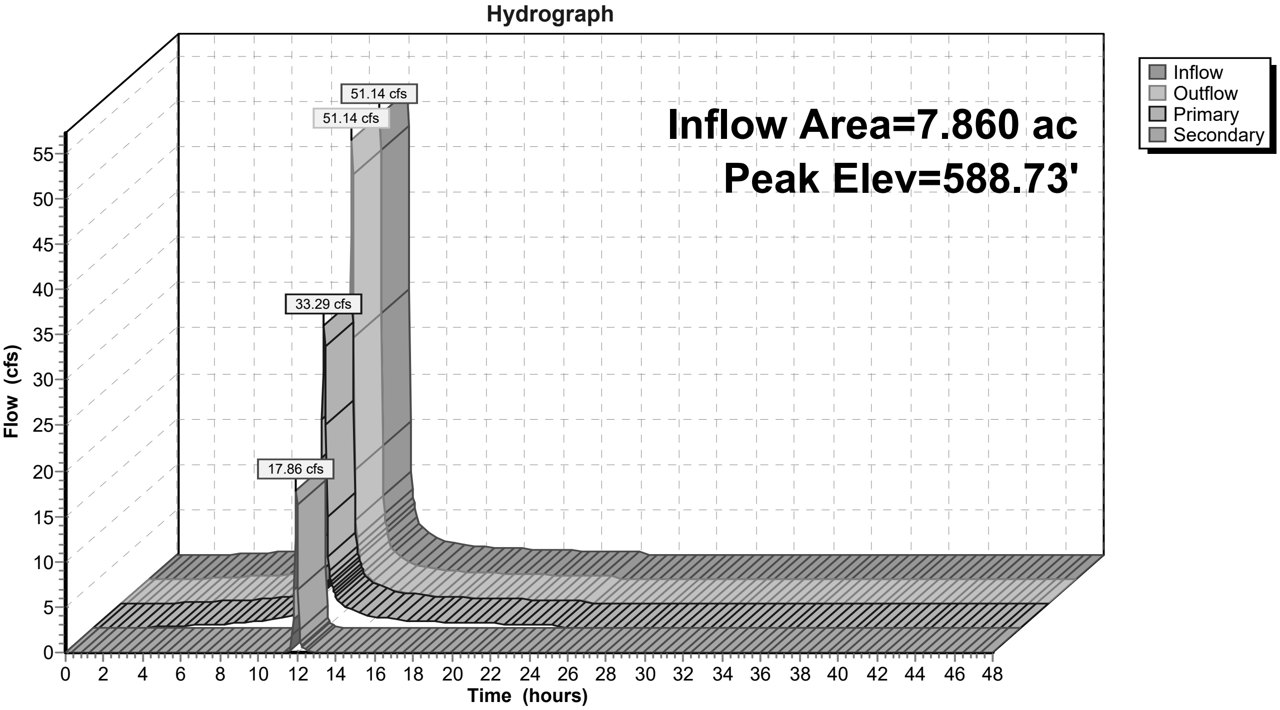
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 588.73' @ 11.96 hrs
Flood Elev= 591.16'

Device	Routing	Invert	Outlet Devices
#1	Primary	584.93'	**30.0" Round Culvert** L= 98.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 584.93' / 584.50' S= 0.0044 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Secondary	586.35'	**24.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 586.35' / 585.00' S= 0.0321 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=32.71 cfs @ 11.96 hrs HW=588.66' TW=586.24' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 32.71 cfs @ 6.66 fps)

Secondary OutFlow Max=17.21 cfs @ 11.96 hrs HW=588.64' TW=582.18' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 17.21 cfs @ 5.48 fps)

Pond CB502: catch basin



Summary for Pond DMH1102: manhole

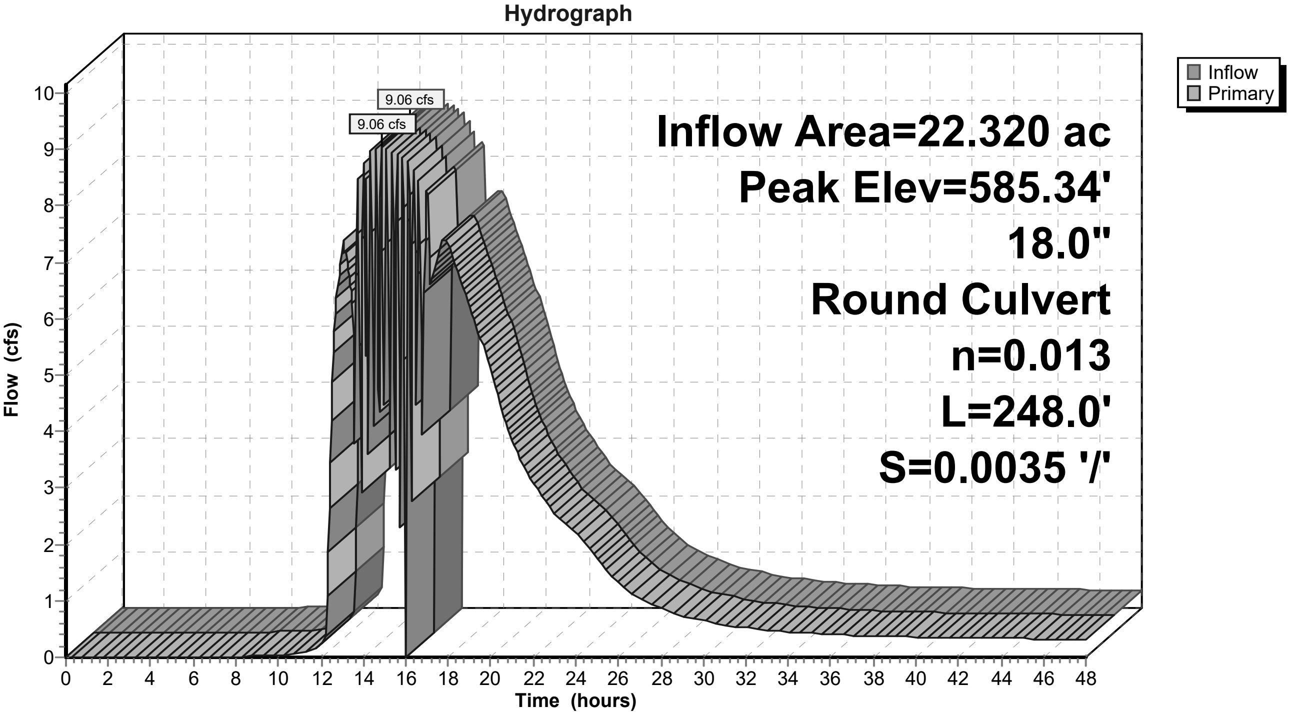
Inflow Area =	22.320 ac, 63.08% Impervious, Inflow Depth > 3.44" for 100-yr storm event				
Inflow =	9.06 cfs @	14.84 hrs, Volume=	6.393 af		
Outflow =	9.06 cfs @	14.84 hrs, Volume=	6.393 af,	Atten= 0%,	Lag= 0.0 min
Primary =	9.06 cfs @	14.84 hrs, Volume=	6.393 af		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 585.34' @ 14.15 hrs
Flood Elev= 587.84'

Device	Routing	Invert	Outlet Devices
#1	Primary	581.60'	**18.0" Round Culvert** L= 248.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 581.60' / 580.74' S= 0.0035 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=6.47 cfs @ 14.84 hrs HW=584.60' TW=583.35' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 6.47 cfs @ 3.66 fps)

Pond DMH1102: manhole



Summary for Pond DMH1103: manhole

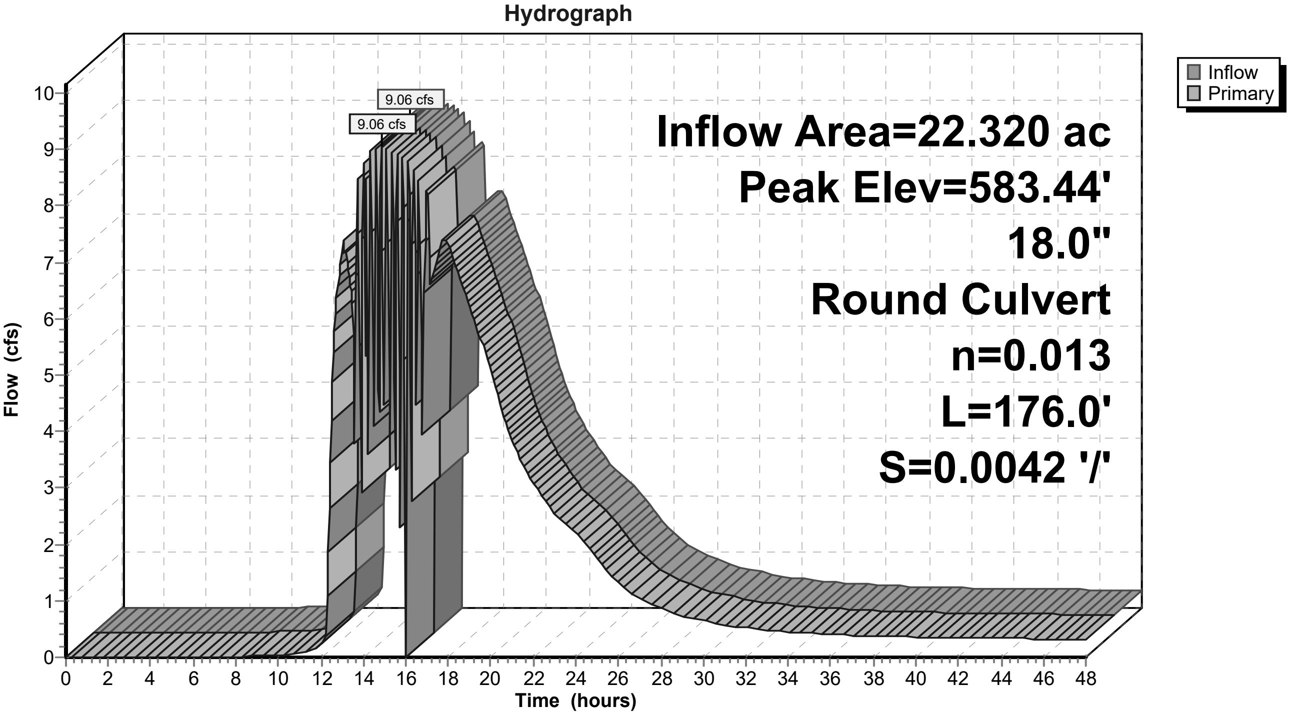
```
Inflow Area =        22.320 ac,  63.08% Impervious,  Inflow Depth >   3.44"    for  100-yr storm event
Inflow       =        9.06 cfs @   14.84 hrs,  Volume=            6.393 af
Outflow      =        9.06 cfs @   14.84 hrs,  Volume=            6.393 af,  Atten= 0%,  Lag= 0.0 min
Primary      =        9.06 cfs @   14.84 hrs,  Volume=            6.393 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 583.44' @ 14.84 hrs
Flood Elev= 588.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	580.74'	**18.0" Round Culvert** L= 176.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.74' / 580.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=8.87 cfs @ 14.84 hrs HW=583.35' TW=580.12' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 8.87 cfs @ 5.02 fps)

Pond DMH1103: manhole



Summary for Pond DMH602: manhole

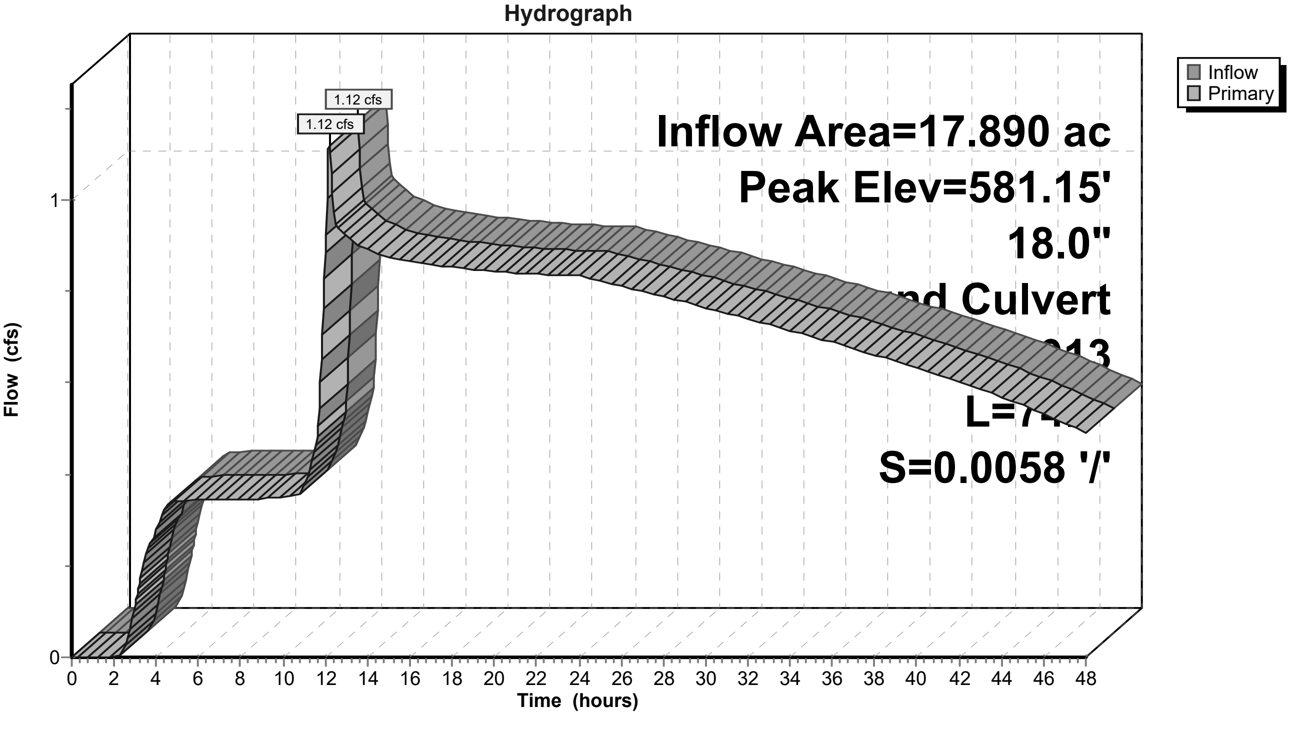
Inflow Area = 17.890 ac, 76.97% Impervious, Inflow Depth > 1.66" for 100-yr storm event
Inflow = 1.12 cfs @ 12.18 hrs, Volume= 2.468 af
Outflow = 1.12 cfs @ 12.18 hrs, Volume= 2.468 af, Atten= 0%, Lag= 0.0 min
Primary = 1.12 cfs @ 12.18 hrs, Volume= 2.468 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 581.15' @ 13.07 hrs
Flood Elev= 587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	580.43'	**18.0" Round Culvert** L= 74.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.43' / 580.00' S= 0.0058 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.11 cfs @ 12.18 hrs HW=580.96' TW=580.05' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 1.11 cfs @ 2.98 fps)

Pond DMH602: manhole



Summary for Pond DMH604: manhole

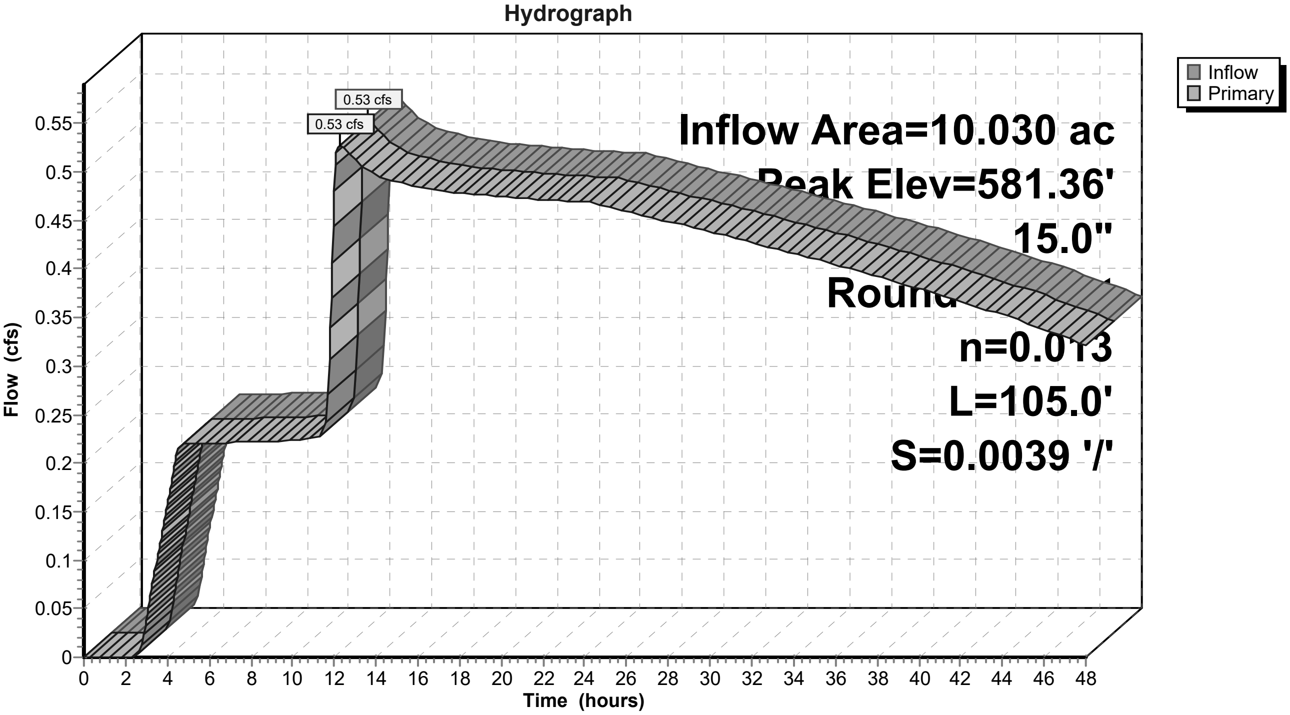
Inflow Area =	10.030 ac, 72.98% Impervious, Inflow Depth > 1.72"		for 100-yr storm event
Inflow =	0.53 cfs @ 12.25 hrs, Volume=	1.436 af	
Outflow =	0.53 cfs @ 12.25 hrs, Volume=	1.436 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.53 cfs @ 12.25 hrs, Volume=	1.436 af	

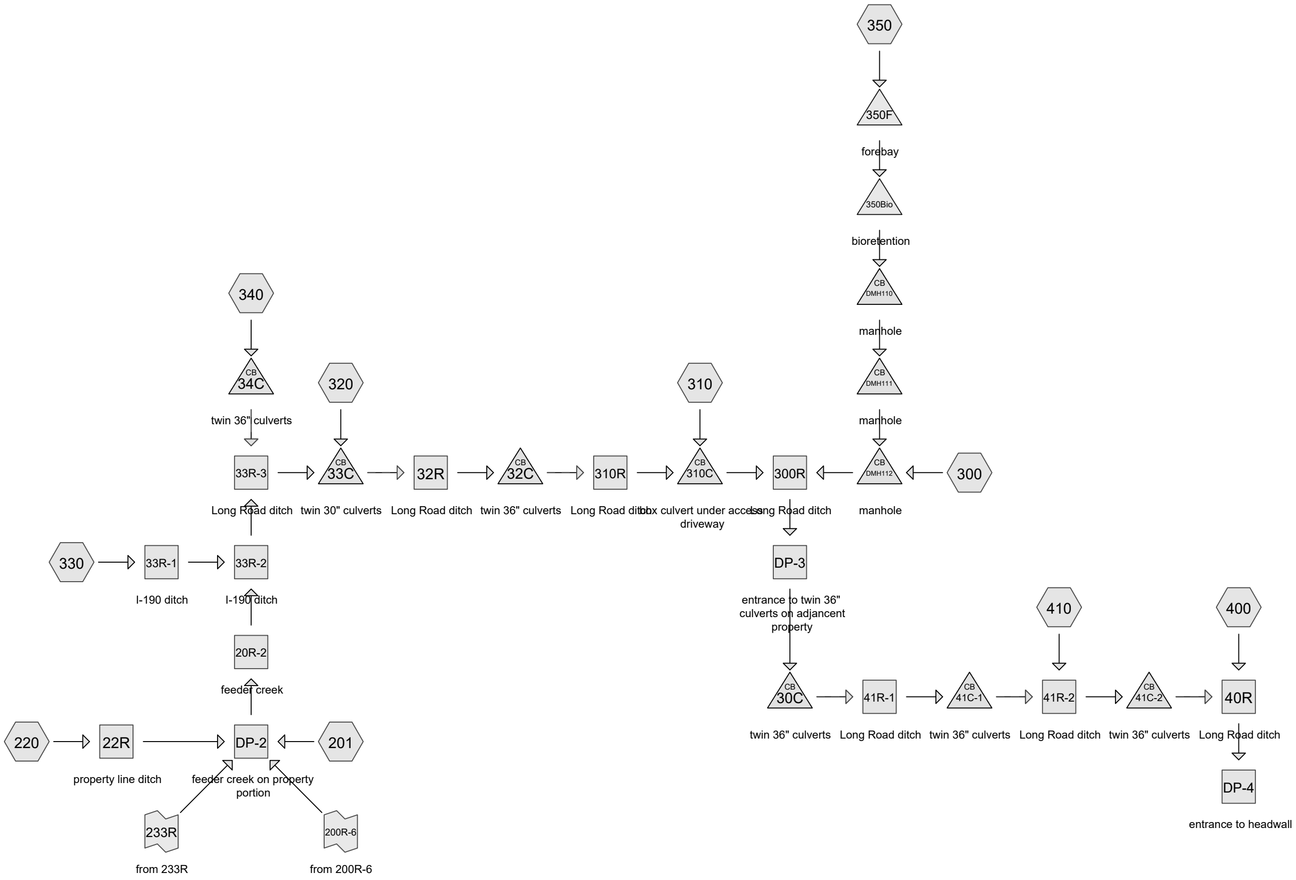
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 581.36' @ 13.06 hrs
Flood Elev= 587.00'

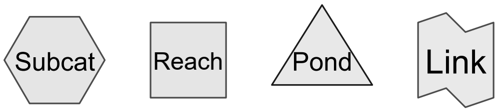
Device	Routing	Invert	Outlet Devices
#1	Primary	580.84'	**15.0" Round Culvert** L= 105.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.84' / 580.43' S= 0.0039 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.53 cfs @ 12.25 hrs HW=581.30' TW=580.95' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.53 cfs @ 1.93 fps)

Pond DMH604: manhole







Routing Diagram for 2020-02-21 Project Olive Proposed 4
Prepared by Langan Eng & Env Srvcs, Inc, Printed 2/14/2020
HydroCAD® 10.00-18 s/n 11081 © 2016 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 4
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment201: Runoff Area=1.280 ac 0.00% Impervious Runoff Depth=0.46"
Flow Length=363' Tc=16.5 min CN=81 Runoff=0.67 cfs 0.050 af

Subcatchment220: Runoff Area=3.650 ac 0.00% Impervious Runoff Depth=0.50"
Flow Length=1,119' Slope=0.0050 '/' Tc=55.2 min CN=82 Runoff=0.92 cfs 0.153 af

Subcatchment300: Runoff Area=2.520 ac 24.21% Impervious Runoff Depth=0.73"
Tc=6.0 min CN=87 Runoff=3.20 cfs 0.153 af

Subcatchment310: Runoff Area=0.630 ac 20.63% Impervious Runoff Depth=0.63"
Flow Length=261' Tc=12.1 min CN=85 Runoff=0.55 cfs 0.033 af

Subcatchment320: Runoff Area=3.290 ac 53.19% Impervious Runoff Depth=0.97"
Flow Length=626' Tc=30.2 min CN=91 Runoff=2.73 cfs 0.265 af

Subcatchment330: Runoff Area=16.720 ac 20.57% Impervious Runoff Depth=0.73"
Flow Length=33' Slope=0.1400 '/' Tc=6.0 min CN=87 Runoff=21.26 cfs 1.017 af

Subcatchment340: Runoff Area=0.640 ac 42.19% Impervious Runoff Depth=0.90"
Tc=6.0 min CN=90 Runoff=0.99 cfs 0.048 af

Subcatchment350: Runoff Area=1.870 ac 65.24% Impervious Runoff Depth=1.11"
Tc=6.0 min CN=93 Runoff=3.50 cfs 0.172 af

Subcatchment400: Runoff Area=38.360 ac 1.17% Impervious Runoff Depth=0.54"
Flow Length=2,815' Tc=125.8 min CN=83 Runoff=5.74 cfs 1.736 af

Subcatchment410: Runoff Area=2.130 ac 18.78% Impervious Runoff Depth=0.68"
Flow Length=267' Tc=13.0 min CN=86 Runoff=1.96 cfs 0.121 af

Reach 20R-2: feeder creek Avg. Flow Depth=0.66' Max Vel=1.89 fps Inflow=12.44 cfs 6.461 af
n=0.030 L=245.0' S=0.0033 '/' Capacity=97.70 cfs Outflow=12.40 cfs 6.455 af

Reach 22R: property line ditch Avg. Flow Depth=0.09' Max Vel=0.93 fps Inflow=0.92 cfs 0.153 af
n=0.030 L=1,402.0' S=0.0086 '/' Capacity=157.20 cfs Outflow=0.72 cfs 0.153 af

Reach 32R: Long Road ditch Avg. Flow Depth=1.10' Max Vel=1.27 fps Inflow=15.75 cfs 7.756 af
n=0.030 L=47.0' S=0.0009 '/' Capacity=49.57 cfs Outflow=15.76 cfs 7.754 af

Reach 33R-1: I-190 ditch Avg. Flow Depth=0.43' Max Vel=1.54 fps Inflow=21.26 cfs 1.017 af
n=0.030 L=3,824.0' S=0.0036 '/' Capacity=102.11 cfs Outflow=6.21 cfs 1.017 af

Reach 33R-2: I-190 ditch Avg. Flow Depth=0.68' Max Vel=2.01 fps Inflow=14.55 cfs 7.471 af
n=0.030 L=509.0' S=0.0036 '/' Capacity=101.88 cfs Outflow=13.87 cfs 7.457 af

Reach 33R-3: Long Road ditch Avg. Flow Depth=0.68' Max Vel=2.01 fps Inflow=13.94 cfs 7.505 af
n=0.030 L=509.0' S=0.0036 '/' Capacity=101.88 cfs Outflow=13.84 cfs 7.491 af

Reach 40R: Long Road ditch Avg. Flow Depth=1.19' Max Vel=1.44 fps Inflow=19.92 cfs 9.960 af
n=0.030 L=81.0' S=0.0010 '/' Capacity=53.40 cfs Outflow=19.93 cfs 9.957 af

Reach 41R-1: Long Road ditch Avg. Flow Depth=0.70' Max Vel=2.31 fps Inflow=16.53 cfs 8.111 af
n=0.030 L=63.0' S=0.0046 '/' Capacity=115.28 cfs Outflow=16.47 cfs 8.109 af

Reach 41R-2: Long Road ditch Avg. Flow Depth=1.10' Max Vel=1.40 fps Inflow=17.40 cfs 8.230 af
n=0.030 L=127.0' S=0.0010 '/' Capacity=54.36 cfs Outflow=17.31 cfs 8.225 af

Reach 300R: Long Road ditch Avg. Flow Depth=1.08' Max Vel=1.37 fps Inflow=16.53 cfs 8.112 af
n=0.030 L=20.0' S=0.0010 '/' Capacity=53.73 cfs Outflow=16.53 cfs 8.111 af

Reach 310R: Long Road ditch Avg. Flow Depth=0.62' Max Vel=2.55 fps Inflow=15.76 cfs 7.754 af
n=0.030 L=45.0' S=0.0064 '/' Capacity=136.40 cfs Outflow=15.70 cfs 7.753 af

Reach DP-2: feeder creek on property portion Inflow=12.44 cfs 6.461 af
Outflow=12.44 cfs 6.461 af

Reach DP-3: entrance to twin 36" culverts on adjancent property Inflow=16.53 cfs 8.111 af
Outflow=16.53 cfs 8.111 af

Reach DP-4: entrance to headwall Inflow=19.93 cfs 9.957 af
Outflow=19.93 cfs 9.957 af

Pond 30C: twin 36" culverts Peak Elev=566.80' Inflow=16.53 cfs 8.111 af
Primary=11.11 cfs 7.211 af Secondary=5.42 cfs 0.900 af Outflow=16.53 cfs 8.111 af

Pond 32C: twin 36" culverts Peak Elev=566.94' Inflow=15.76 cfs 7.754 af
Primary=7.89 cfs 4.180 af Secondary=7.87 cfs 3.573 af Outflow=15.76 cfs 7.754 af

Pond 33C: twin 30" culverts Peak Elev=567.40' Inflow=15.75 cfs 7.756 af
Primary=7.87 cfs 3.796 af Secondary=7.88 cfs 3.960 af Outflow=15.75 cfs 7.756 af

Pond 34C: twin 36" culverts Peak Elev=571.87' Inflow=0.99 cfs 0.048 af
Primary=0.50 cfs 0.024 af Secondary=0.50 cfs 0.024 af Outflow=0.99 cfs 0.048 af

Pond 41C-1: twin 36" culverts Peak Elev=566.24' Inflow=16.47 cfs 8.109 af
Primary=8.49 cfs 4.677 af Secondary=7.99 cfs 3.433 af Outflow=16.47 cfs 8.109 af

Pond 41C-2: twin 36" culverts Peak Elev=566.27' Inflow=17.31 cfs 8.225 af
Primary=8.65 cfs 4.112 af Secondary=8.65 cfs 4.112 af Outflow=17.31 cfs 8.225 af

Pond 310C: box culvert under access driveway Peak Elev=566.05' Inflow=15.97 cfs 7.786 af
72.0" x 24.0" Box Culvert n=0.012 L=105.0' S=0.0010 '/' Outflow=15.97 cfs 7.786 af

Pond 350Bio: bioretention Peak Elev=571.45' Storage=4,696 cf Inflow=2.96 cfs 0.172 af
Outflow=0.06 cfs 0.172 af

Pond 350F: forebay Peak Elev=571.70' Storage=15,490 cf Inflow=3.50 cfs 0.172 af
Outflow=2.96 cfs 0.172 af

Pond DMH110: manhole Peak Elev=566.84' Inflow=0.06 cfs 0.172 af
15.0" Round Culvert n=0.013 L=109.0' S=0.0073 '/' Outflow=0.06 cfs 0.172 af

Pond DMH111: manhole Peak Elev=566.19' Inflow=0.06 cfs 0.172 af
15.0" Round Culvert n=0.013 L=104.0' S=0.0075 '/' Outflow=0.06 cfs 0.172 af

Pond DMH112: manhole Peak Elev=566.17' Inflow=3.26 cfs 0.326 af
18.0" Round Culvert n=0.013 L=31.0' S=0.0042 '/' Outflow=3.26 cfs 0.326 af

Link 1-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 2~Reach 200R-6.hce Inflow=11.25 cfs 4.047 af
Area= 152.510 ac 20.93% Imperv. Primary=11.25 cfs 4.047 af

Link 1-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 2~Reach 233R.hce Inflow=6.89 cfs 2.212 af
Area= 33.760 ac 73.79% Imperv. Primary=6.89 cfs 2.212 af

Total Runoff Area = 71.090 ac Runoff Volume = 3.747 af Average Runoff Depth = 0.63"
88.37% Pervious = 62.820 ac 11.63% Impervious = 8.270 ac

Summary for Subcatchment 201:

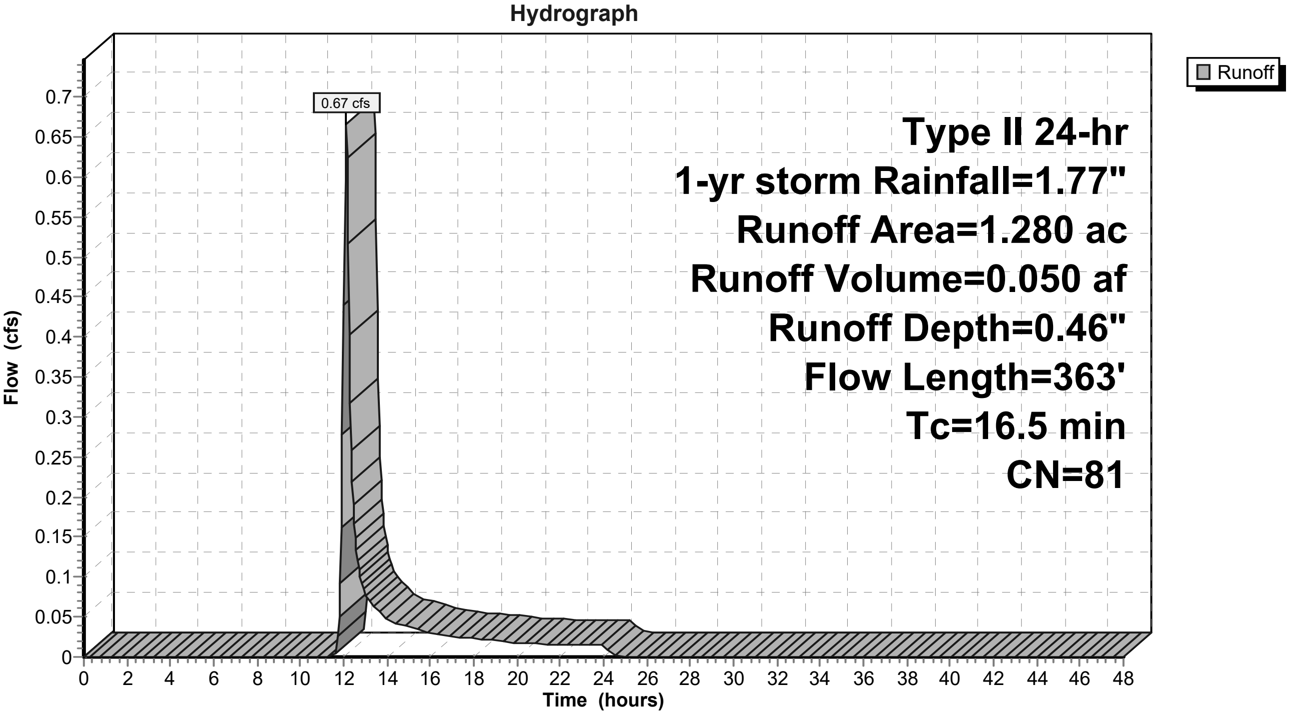
Runoff = 0.67 cfs @ 12.11 hrs, Volume= 0.050 af, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	0.370	84	50-75% Grass cover, Fair, HSG D
	0.870	79	Woods, Fair, HSG D
	0.030	98	Water Surface, 0% imp, HSG D
*	0.010	84	50-75% Grass cover, Fair, HSG D (offsite)
	1.280	81	Weighted Average
	1.280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	33	0.3300	0.34		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
9.8	67	0.0150	0.11		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 2.13"
5.1	263	0.0150	0.86		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
16.5	363	Total			

Subcatchment 201:



Summary for Subcatchment 220:

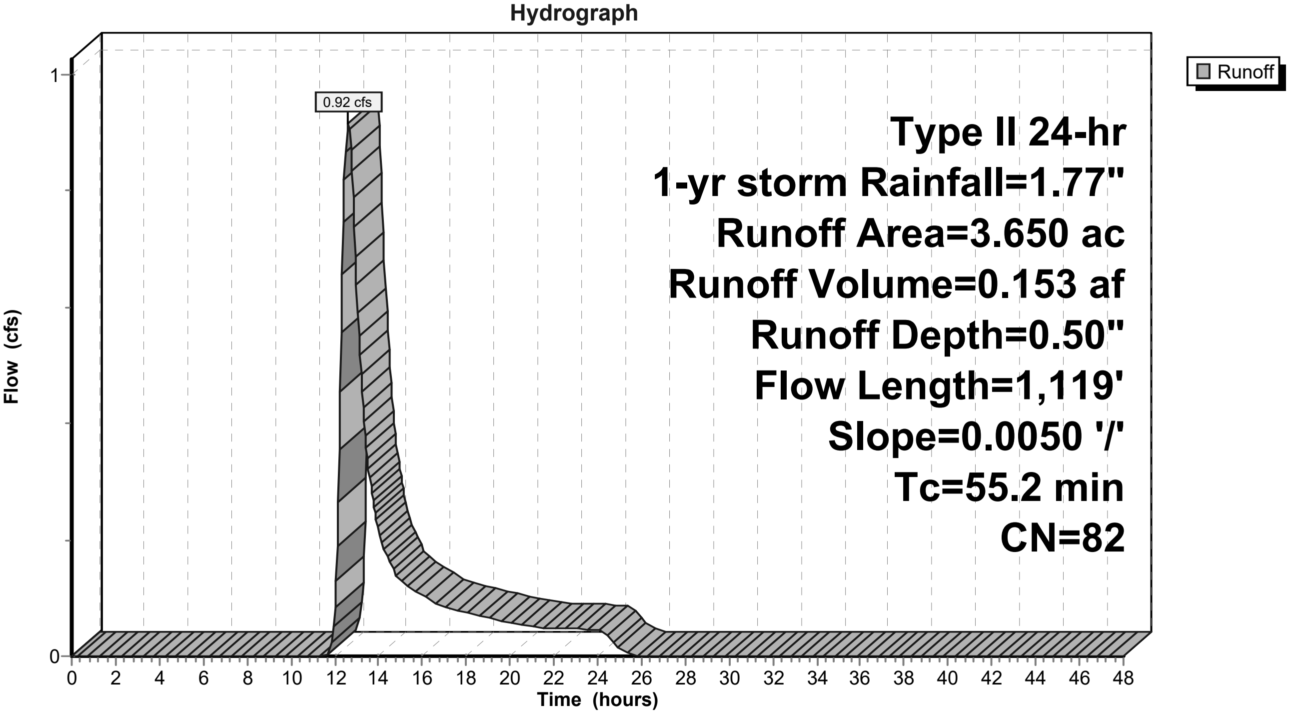
Runoff = 0.92 cfs @ 12.62 hrs, Volume= 0.153 af, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	0.830	84	50-75% Grass cover, Fair, HSG D
	1.410	79	Woods, Fair, HSG D
*	0.770	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.490	79	Woods, Fair, HSG D (offsite)
*	0.150	98	Water Surface, 0% imp, HSG D (offsite)
	3.650	82	Weighted Average
	3.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0050	0.08		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
34.3	1,019	0.0050	0.49		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
55.2	1,119	Total			

Subcatchment 220:



Summary for Subcatchment 300:

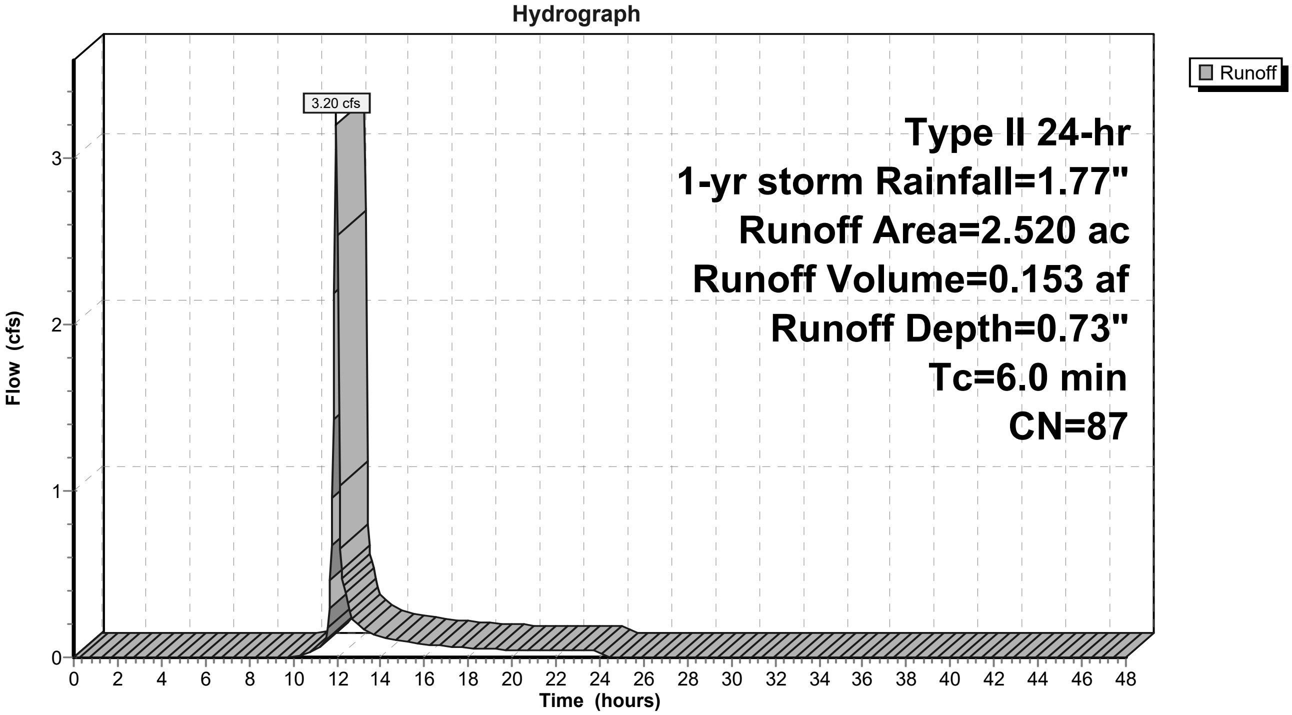
Runoff = 3.20 cfs @ 11.98 hrs, Volume= 0.153 af, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	1.480	84	50-75% Grass cover, Fair, HSG D
	0.510	98	Paved parking, HSG D
*	0.420	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.100	98	Paved parking, HSG D (offsite)
*	0.010	98	Water Surface, 0% imp, HSG D (offsite)
	2.520	87	Weighted Average
	1.910		75.79% Pervious Area
	0.610		24.21% Impervious Area

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

Subcatchment 300:



Summary for Subcatchment 310:

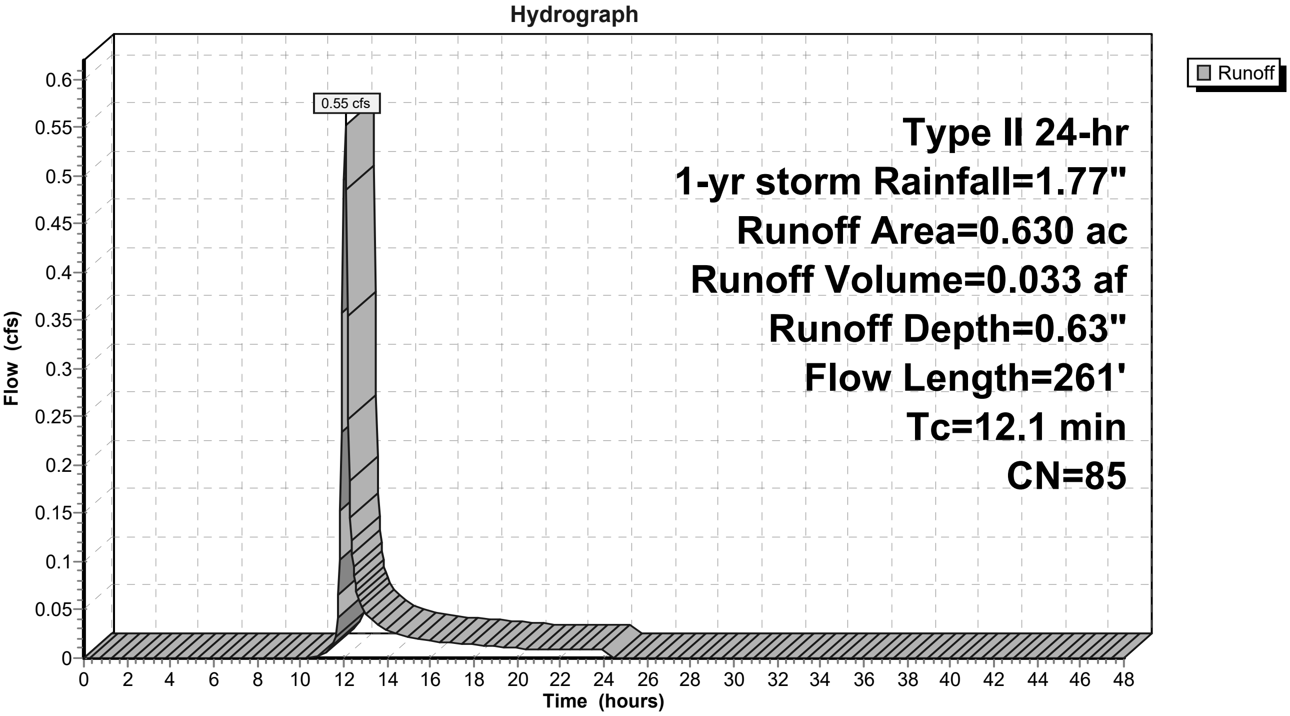
Runoff = 0.55 cfs @ 12.05 hrs, Volume= 0.033 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	0.160	84	50-75% Grass cover, Fair, HSG D
	0.010	98	Water Surface, 0% imp, HSG D
*	0.310	79	50-75% Grass cover, Fair, HSG C (offsite)
*	0.130	98	Paved parking, HSG D (offsite)
*	0.010	79	Woods, Fair, HSG D (offsite)
*	0.010	98	Water Surface, 0% imp, HSG D (offsite)
	0.630	85	Weighted Average
	0.500		79.37% Pervious Area
	0.130		20.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	100	0.0300	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
1.9	161	0.0400	1.40		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
12.1	261	Total			

Subcatchment 310:



Summary for Subcatchment 320:

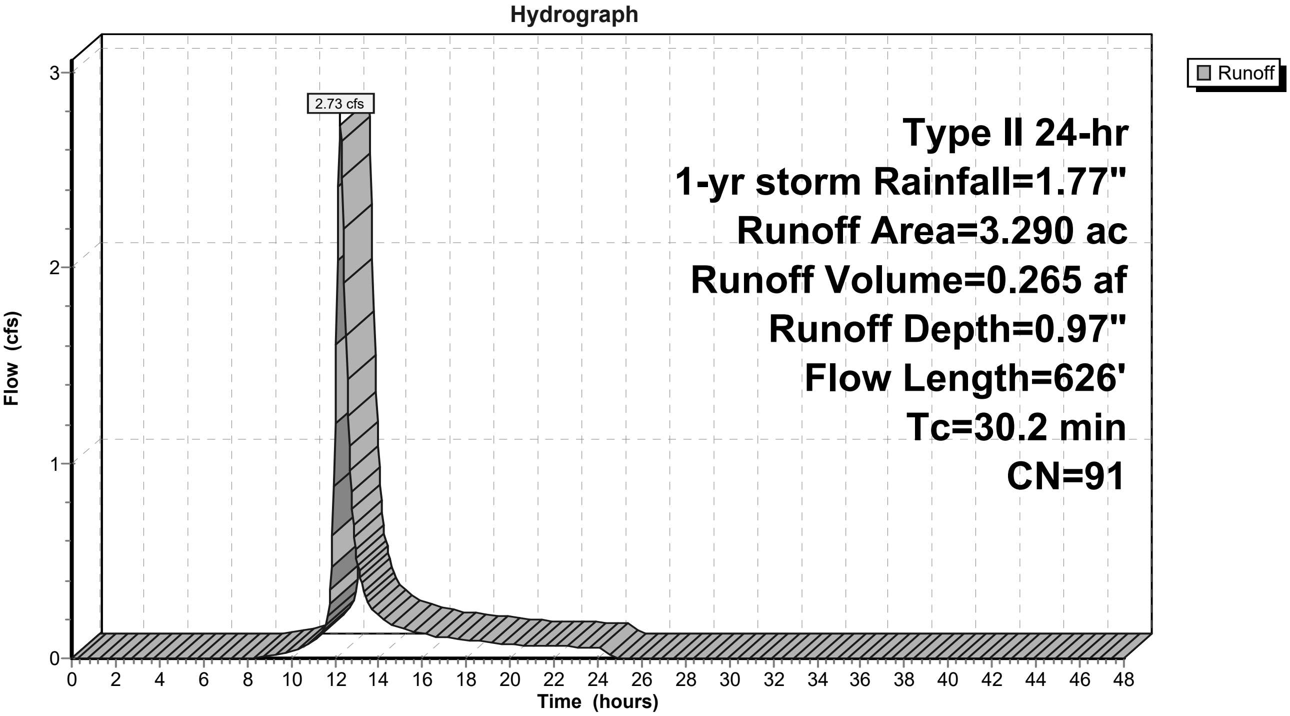
Runoff = 2.73 cfs @ 12.25 hrs, Volume= 0.265 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
1.530	84	50-75% Grass cover, Fair, HSG D
1.130	98	Water Surface, HSG D
0.620	98	Roofs, HSG D
0.010	98	Water Surface, 0% imp, HSG D
3.290	91	Weighted Average
1.540		46.81% Pervious Area
1.750		53.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	100	0.0300	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
16.6	171	0.0006	0.17		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
2.7	277	0.0070	1.70		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.7	78	0.0800	1.98		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
30.2	626	Total			

Subcatchment 320:



Summary for Subcatchment 330:

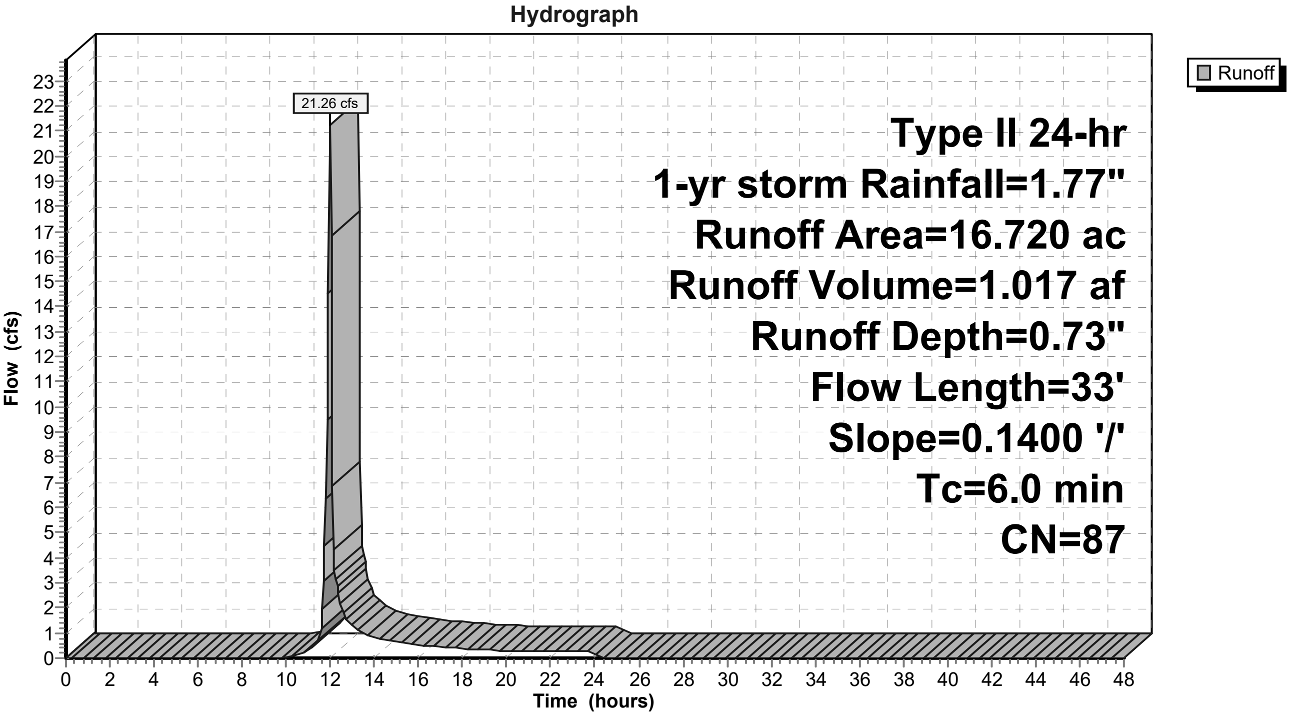
Runoff = 21.26 cfs @ 11.98 hrs, Volume= 1.017 af, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	0.050	84	50-75% Grass cover, Fair, HSG D
	0.620	79	Woods, Fair, HSG D
*	11.780	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.350	79	Woods, Fair, HSG D (offsite)
*	2.850	98	Paved parking, HSG D (offsite)
*	0.590	98	Roofs, HSG D (offsite)
*	0.010	91	Gravel roads, HSG D (offiste)
*	0.470	98	Water Surface, 0% imp, HSG D (offsite)
	16.720	87	Weighted Average
	13.280		79.43% Pervious Area
	3.440		20.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	33	0.1400	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.3	33	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 330:



Summary for Subcatchment 340:

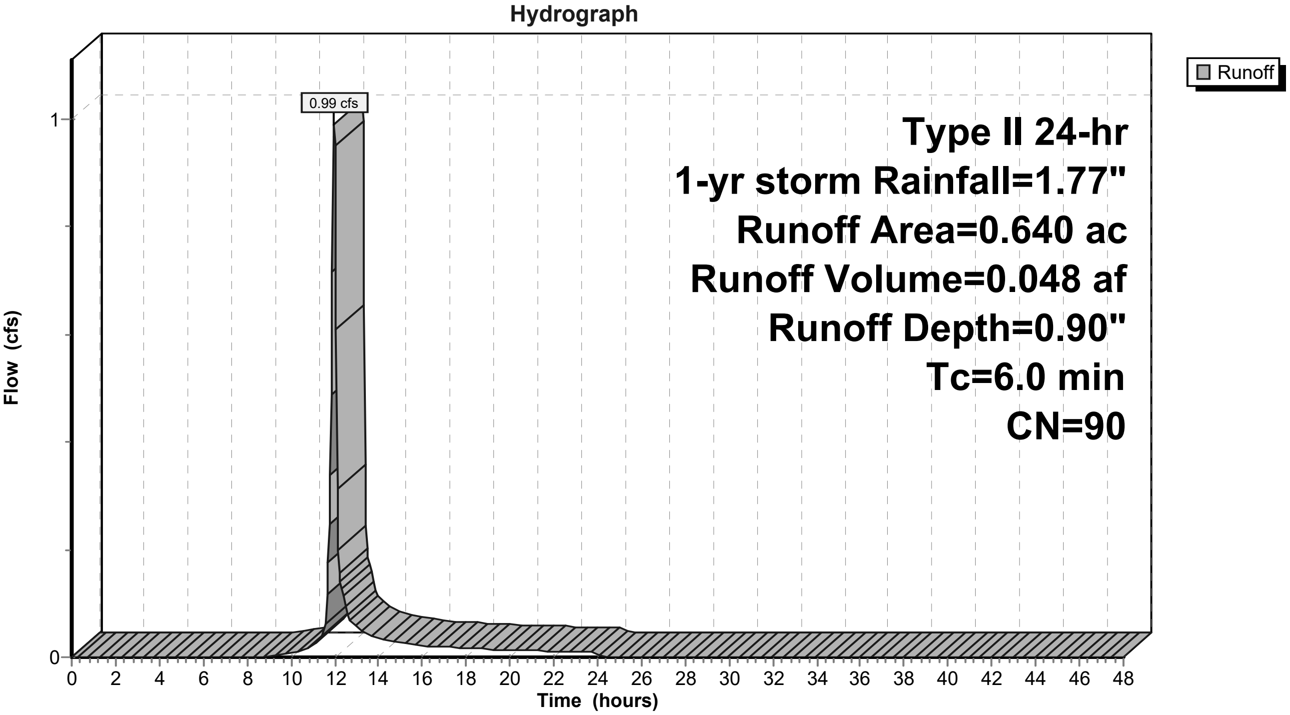
Runoff = 0.99 cfs @ 11.97 hrs, Volume= 0.048 af, Depth= 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
*	0.350	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.270	98	Paved parking, HSG D (offsite)
*	0.020	98	Water Surface, 0% imp, HSG D (offsite)
	0.640	90	Weighted Average
	0.370		57.81% Pervious Area
	0.270		42.19% Impervious Area

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

Subcatchment 340:



Summary for Subcatchment 350:

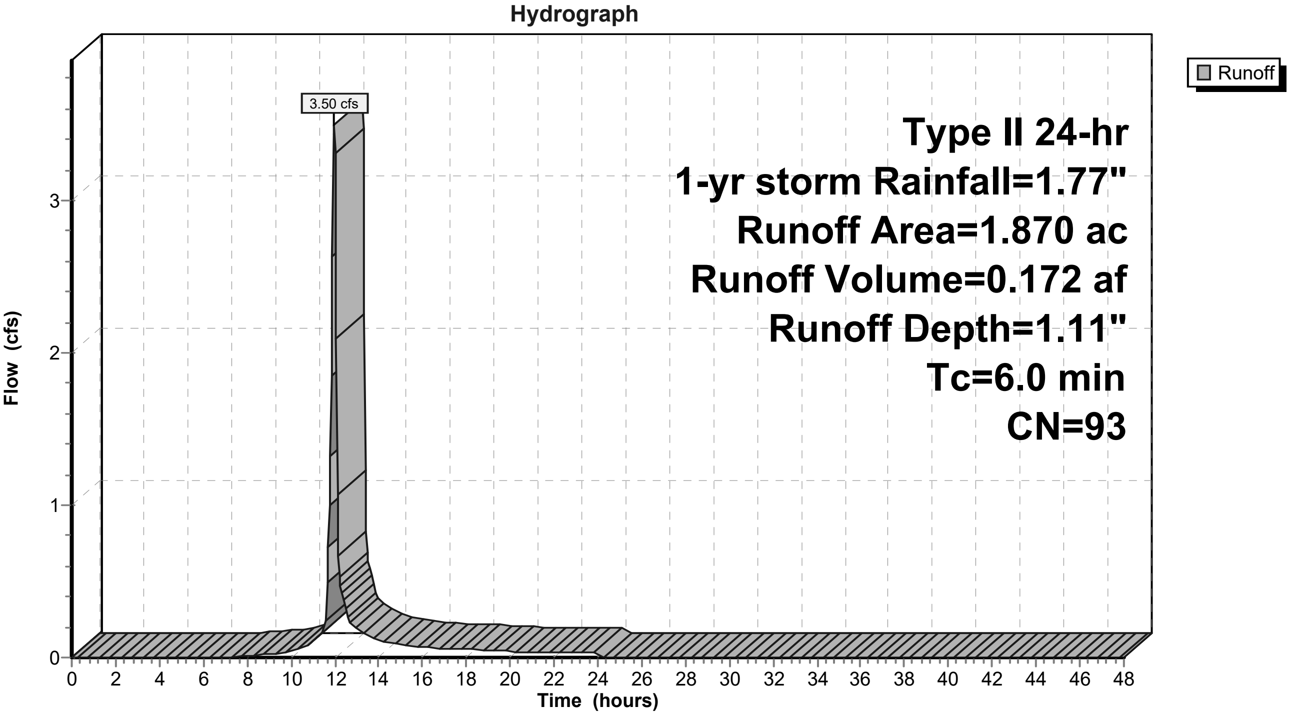
Runoff = 3.50 cfs @ 11.97 hrs, Volume= 0.172 af, Depth= 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

Area (ac)	CN	Description
0.650	84	50-75% Grass cover, Fair, HSG D
1.220	98	Paved parking, HSG D
1.870	93	Weighted Average
0.650		34.76% Pervious Area
1.220		65.24% Impervious Area

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

Subcatchment 350:



Summary for Subcatchment 400:

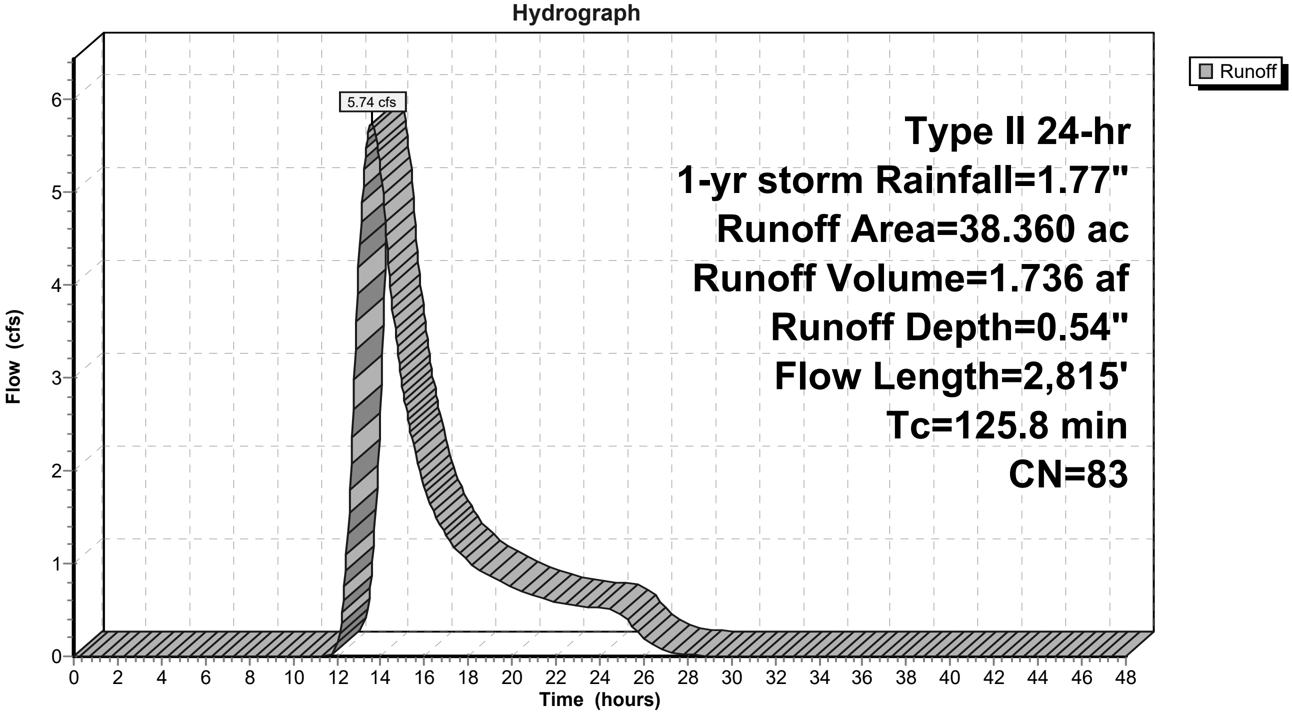
Runoff = 5.74 cfs @ 13.57 hrs, Volume= 1.736 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
	2.420	79	50-75% Grass cover, Fair, HSG C
	0.230	98	Paved parking, HSG D
	0.240	73	Woods, Fair, HSG C
	14.170	84	50-75% Grass cover, Fair, HSG D
	6.170	79	Woods, Fair, HSG D
*	0.390	79	50-75% Grass cover, Fair, HSG C (offsite)
*	0.300	73	Woods, Fair, HSG C (offsite)
*	14.170	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.030	79	Woods, Fair, HSG D (offsite)
*	0.130	98	Paved parking, HSG D (offsite)
*	0.090	98	Roofs, HSG D (offsite)
*	0.020	98	Water Surface, 0% imp, HSG D (offsite)
	38.360	83	Weighted Average
	37.910		98.83% Pervious Area
	0.450		1.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.1	100	0.0070	0.04		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
72.2	1,370	0.0040	0.32		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	91	0.1500	2.71		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
10.1	378	0.0080	0.63		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
2.8	876	0.0160	5.26	57.86	**Channel Flow, E-F** Area= 11.0 sf Perim= 14.3' r= 0.77' n= 0.030 Earth, grassed & winding
125.8	2,815	Total			

Subcatchment 400:



Summary for Subcatchment 410:

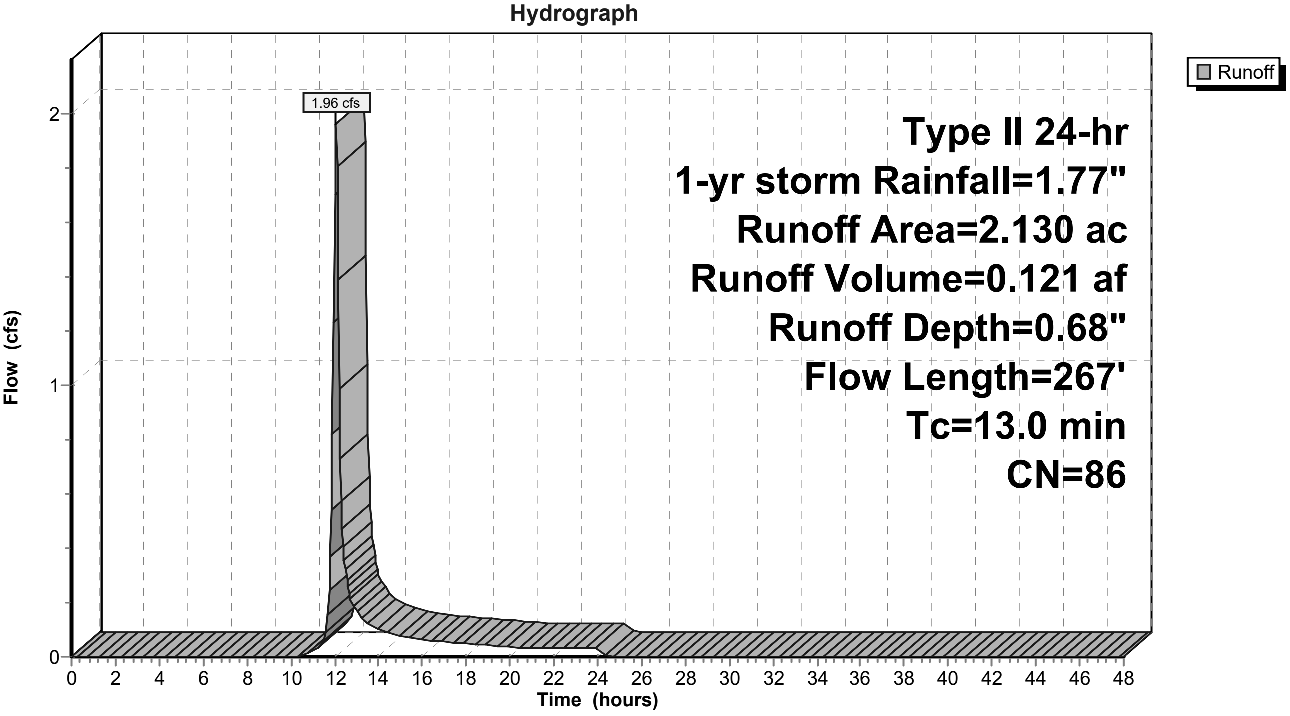
Runoff = 1.96 cfs @ 12.06 hrs, Volume= 0.121 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr storm Rainfall=1.77"

	Area (ac)	CN	Description
*	1.430	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.210	98	Paved parking, HSG D (offsite)
*	0.190	98	Roofs, HSG D (offsite)
*	0.260	79	Woods, Fair, HSG D (offsite)
*	0.040	98	Water Surface, 0% imp, HSG D (offsite)
	2.130	86	Weighted Average
	1.730		81.22% Pervious Area
	0.400		18.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0270	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.3	167	0.0300	1.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
13.0	267	Total			

Subcatchment 410:



Summary for Reach 20R-2: feeder creek

Inflow Area = 191.200 ac, 29.72% Impervious, Inflow Depth > 0.41" for 1-yr storm event
Inflow = 12.44 cfs @ 13.73 hrs, Volume= 6.461 af
Outflow = 12.40 cfs @ 13.76 hrs, Volume= 6.455 af, Atten= 0%, Lag= 1.2 min

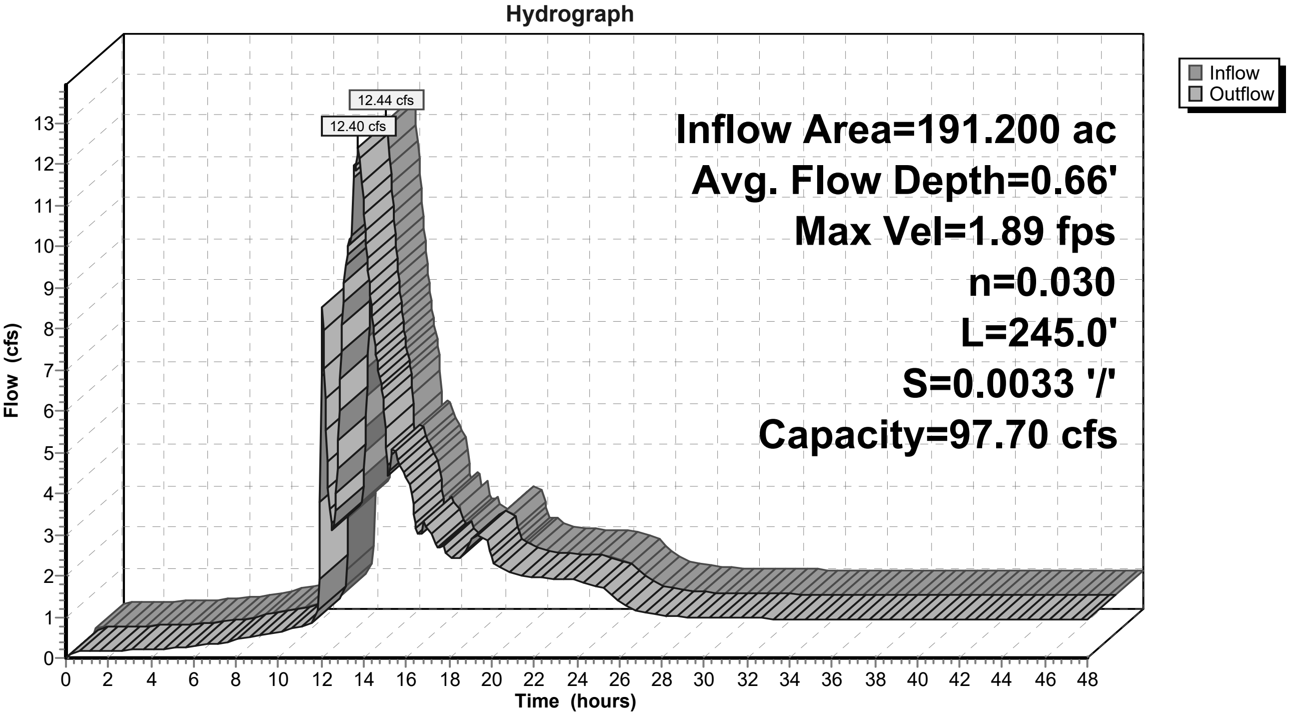
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.89 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 4.9 min

Peak Storage= 1,609 cf @ 13.76 hrs
Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 97.70 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 245.0' Slope= 0.0033 '/'
Inlet Invert= 572.00', Outlet Invert= 571.19'

‡

Reach 20R-2: feeder creek



Summary for Reach 22R: property line ditch

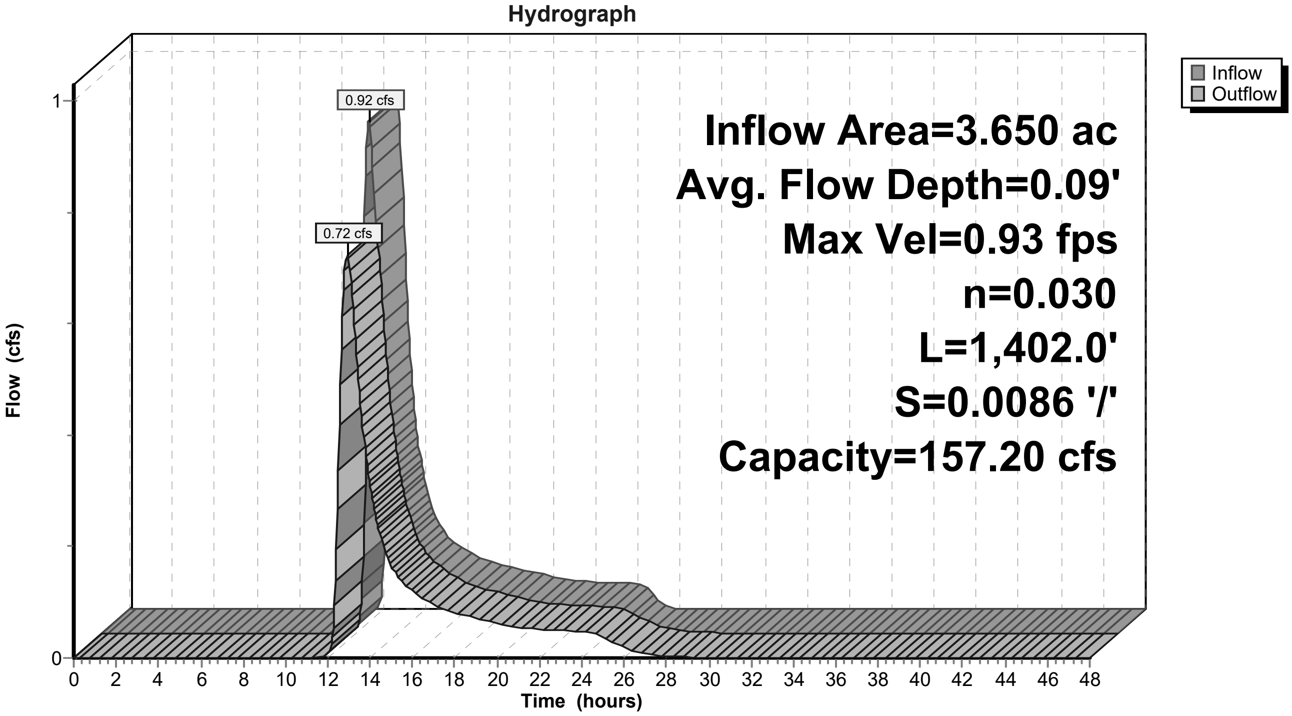
```
Inflow Area =       3.650 ac,    0.00% Impervious,  Inflow Depth =   0.50"    for  1-yr storm event
Inflow      =       0.92 cfs @   12.62 hrs,  Volume=          0.153 af
Outflow     =       0.72 cfs @   12.92 hrs,  Volume=          0.153 af,  Atten= 21%,  Lag= 18.1 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 0.93 fps, Min. Travel Time= 25.2 min
Avg. Velocity = 0.40 fps, Avg. Travel Time= 57.7 min

Peak Storage= 1,091 cf @ 12.92 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 157.20 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 1,402.0' Slope= 0.0086 '/'
Inlet Invert= 584.00', Outlet Invert= 572.00'

Reach 22R: property line ditch



Summary for Reach 32R: Long Road ditch

Inflow Area = 211.850 ac, 29.40% Impervious, Inflow Depth > 0.44" for 1-yr storm event
Inflow = 15.75 cfs @ 12.22 hrs, Volume= 7.756 af
Outflow = 15.76 cfs @ 12.22 hrs, Volume= 7.754 af, Atten= 0%, Lag= 0.4 min

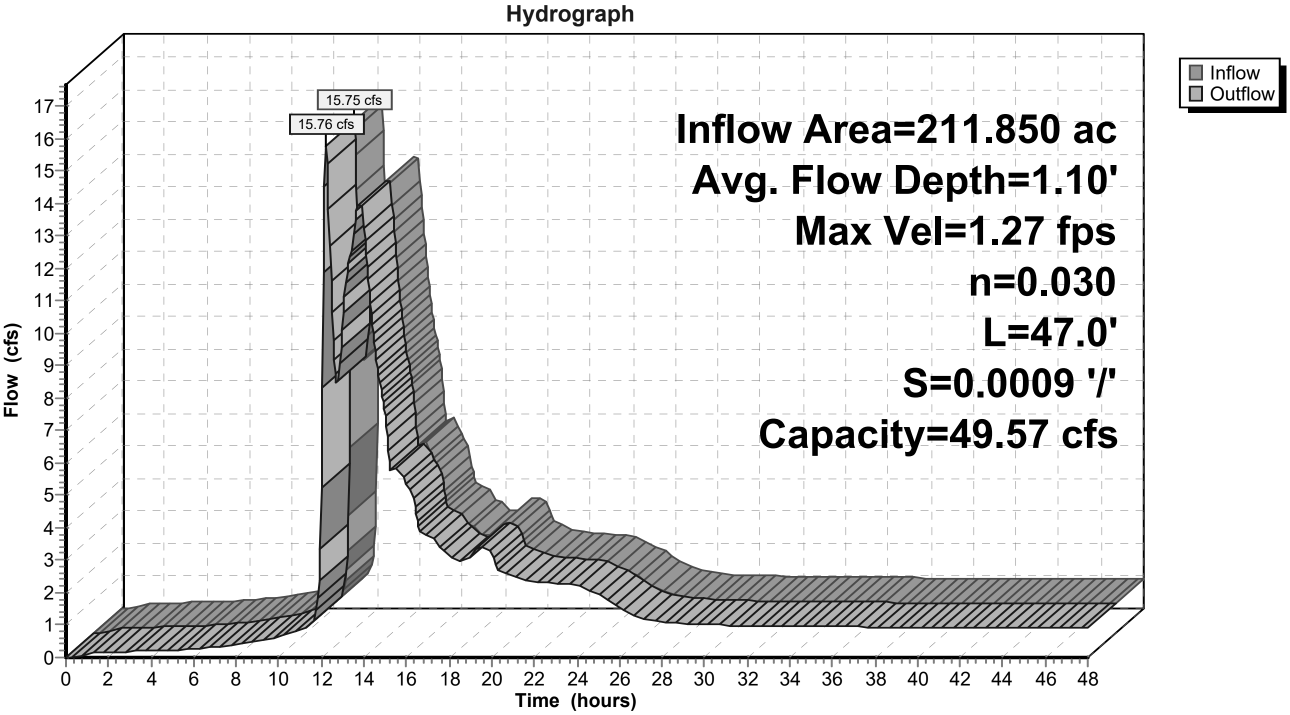
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.27 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 1.4 min

Peak Storage= 581 cf @ 12.22 hrs
Average Depth at Peak Storage= 1.10'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 49.57 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 47.0' Slope= 0.0009 '/'
Inlet Invert= 565.64', Outlet Invert= 565.60'

‡

Reach 32R: Long Road ditch



Summary for Reach 33R-1: I-190 ditch

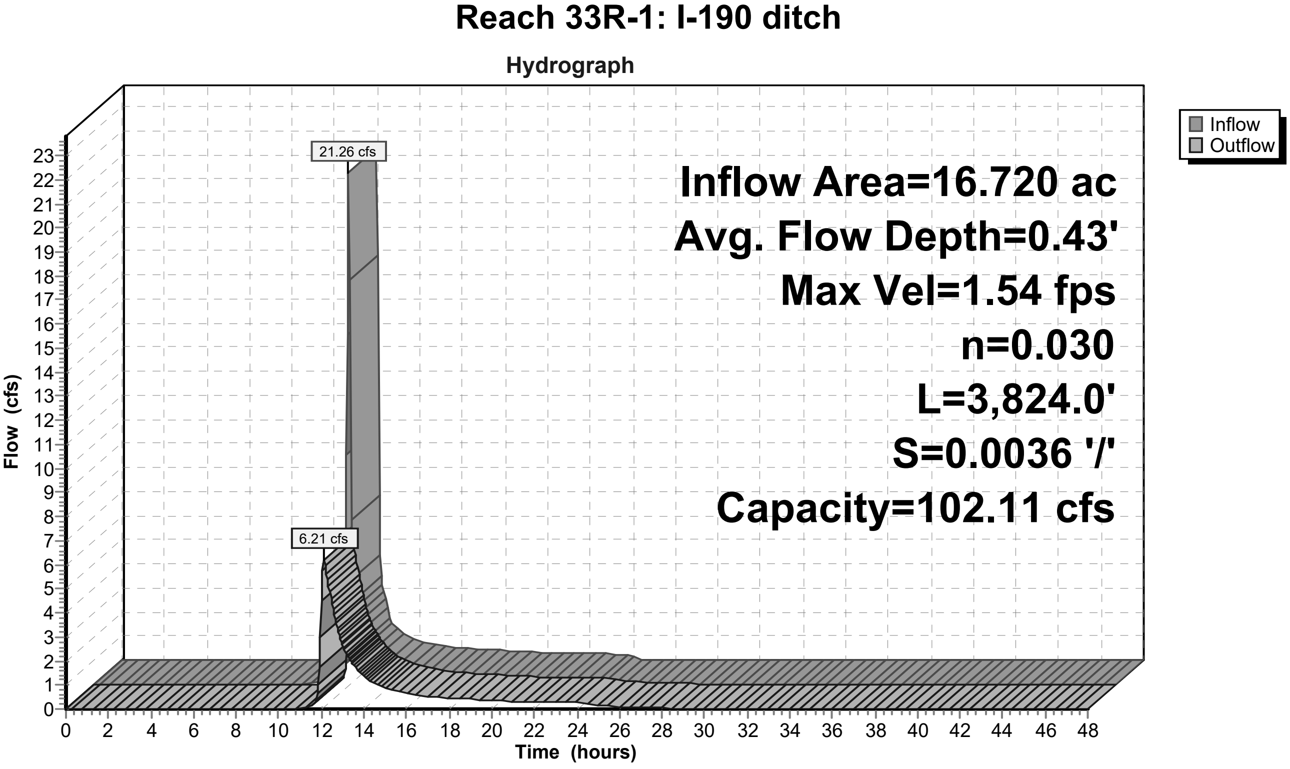
Inflow Area = 16.720 ac, 20.57% Impervious, Inflow Depth = 0.73" for 1-yr storm event
Inflow = 21.26 cfs @ 11.98 hrs, Volume= 1.017 af
Outflow = 6.21 cfs @ 12.12 hrs, Volume= 1.017 af, Atten= 71%, Lag= 8.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.54 fps, Min. Travel Time= 41.3 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 165.1 min

Peak Storage= 15,360 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 102.11 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 3,824.0' Slope= 0.0036 '/'
Inlet Invert= 585.00', Outlet Invert= 571.19'

‡



Summary for Reach 33R-2: I-190 ditch

Inflow Area = 207.920 ac, 28.99% Impervious, Inflow Depth > 0.43" for 1-yr storm event
Inflow = 14.55 cfs @ 12.07 hrs, Volume= 7.471 af
Outflow = 13.87 cfs @ 13.78 hrs, Volume= 7.457 af, Atten= 5%, Lag= 102.6 min

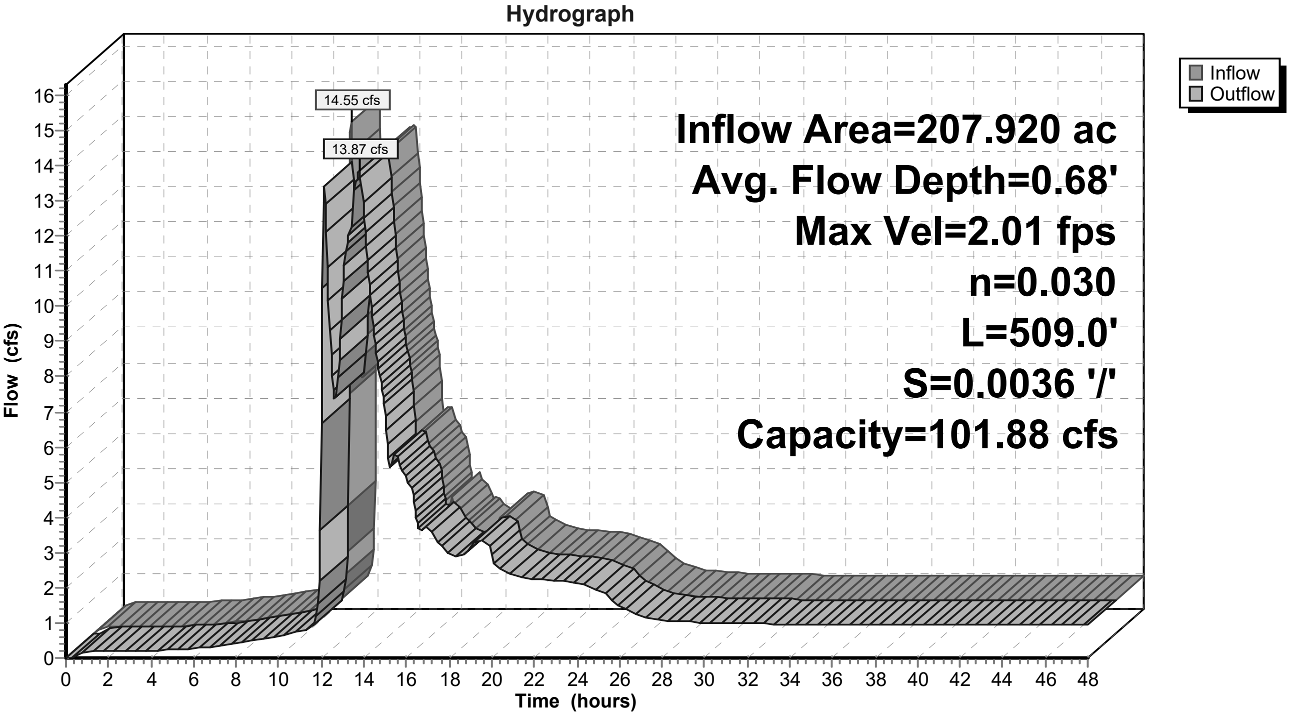
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.01 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.88 fps, Avg. Travel Time= 9.7 min

Peak Storage= 3,505 cf @ 13.78 hrs
Average Depth at Peak Storage= 0.68'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 101.88 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 509.0' Slope= 0.0036 '/'
Inlet Invert= 571.19', Outlet Invert= 569.36'

‡

Reach 33R-2: I-190 ditch



Summary for Reach 33R-3: Long Road ditch

Inflow Area =	208.560 ac, 29.03% Impervious, Inflow Depth > 0.43"	for 1-yr storm event	
Inflow =	13.94 cfs @ 13.79 hrs, Volume=	7.505 af	
Outflow =	13.84 cfs @ 13.82 hrs, Volume=	7.491 af, Atten= 1%, Lag= 1.7 min	

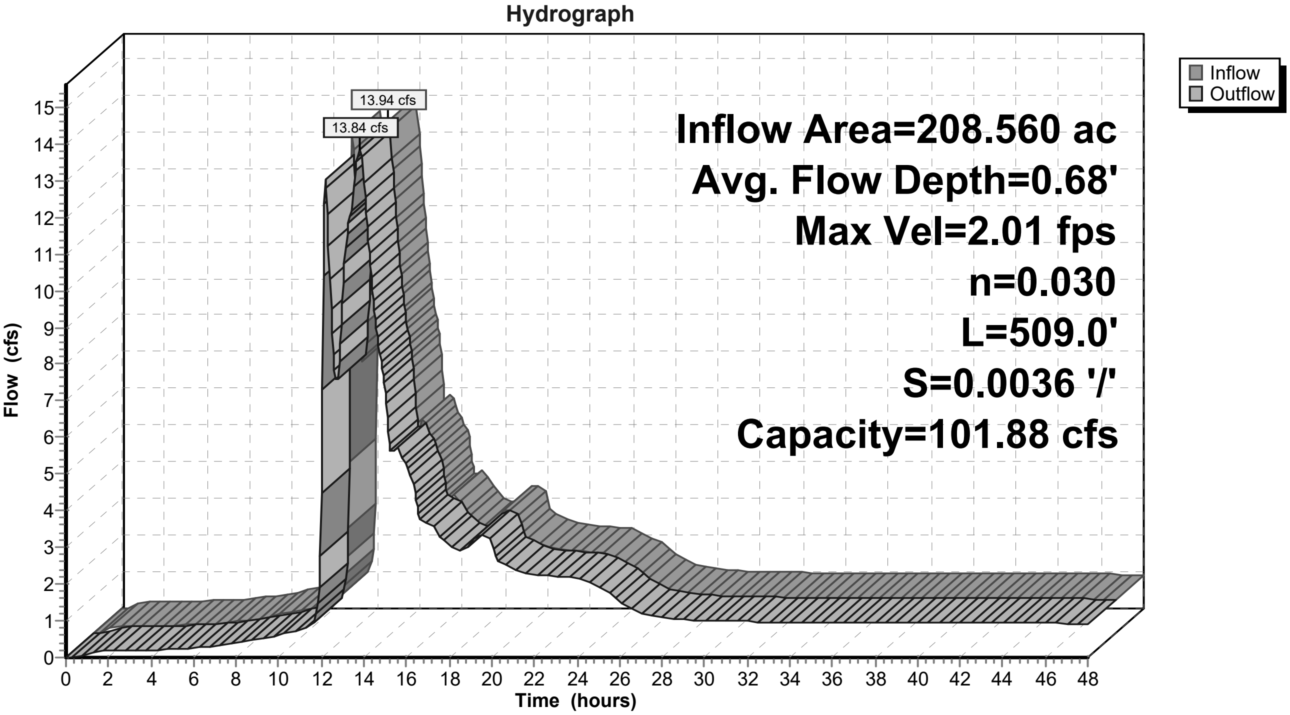
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.01 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.88 fps, Avg. Travel Time= 9.6 min

Peak Storage= 3,500 cf @ 13.82 hrs
Average Depth at Peak Storage= 0.68'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 101.88 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 509.0' Slope= 0.0036 '/'
Inlet Invert= 571.19', Outlet Invert= 569.36'

‡

Reach 33R-3: Long Road ditch



Summary for Reach 40R: Long Road ditch

Inflow Area =	257.360 ac, 25.30% Impervious,	Inflow Depth > 0.46"	for 1-yr storm event	
Inflow =	19.92 cfs @	13.82 hrs, Volume=	9.960 af	
Outflow =	19.93 cfs @	13.83 hrs, Volume=	9.957 af,	Atten= 0%, Lag= 0.5 min

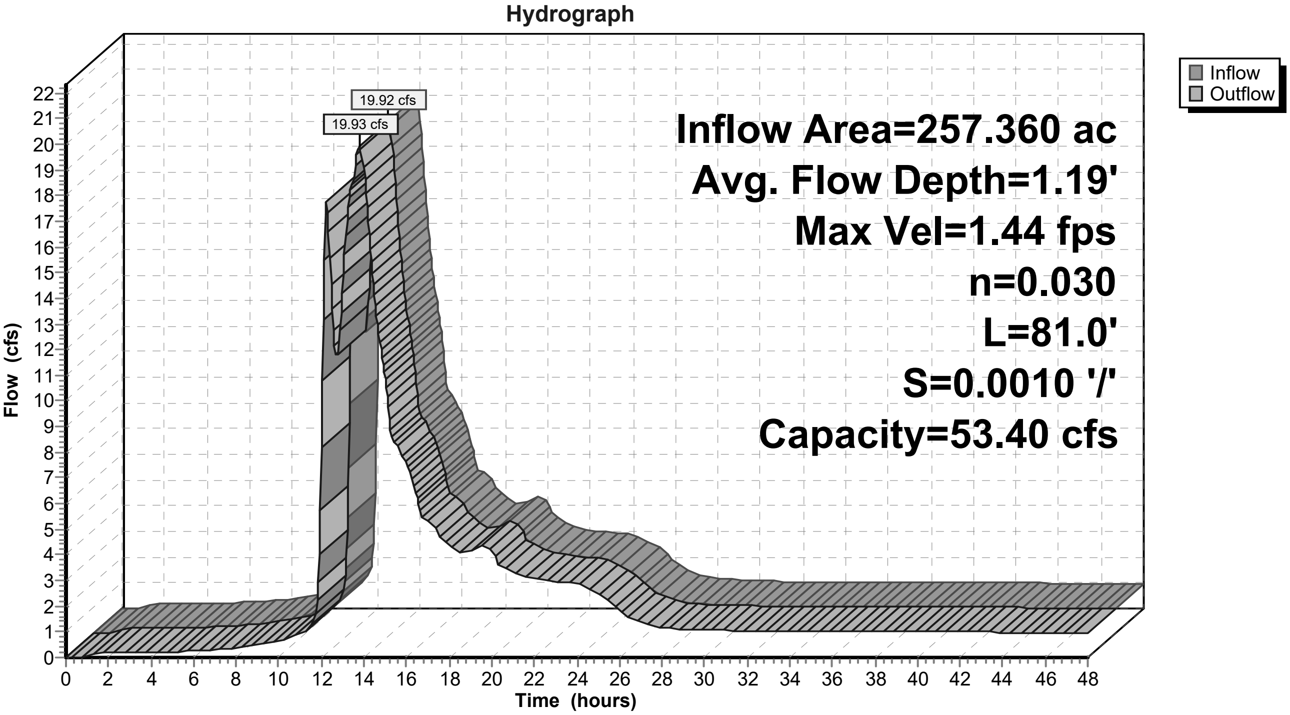
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.44 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 2.2 min

Peak Storage= 1,121 cf @ 13.83 hrs
Average Depth at Peak Storage= 1.19'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 53.40 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 81.0' Slope= 0.0010 '/'
Inlet Invert= 564.47', Outlet Invert= 564.39'

‡

Reach 40R: Long Road ditch



Summary for Reach 41R-1: Long Road ditch

Inflow Area = 216.870 ac, 29.63% Impervious, Inflow Depth > 0.45" for 1-yr storm event
Inflow = 16.53 cfs @ 12.22 hrs, Volume= 8.111 af
Outflow = 16.47 cfs @ 12.23 hrs, Volume= 8.109 af, Atten= 0%, Lag= 0.3 min

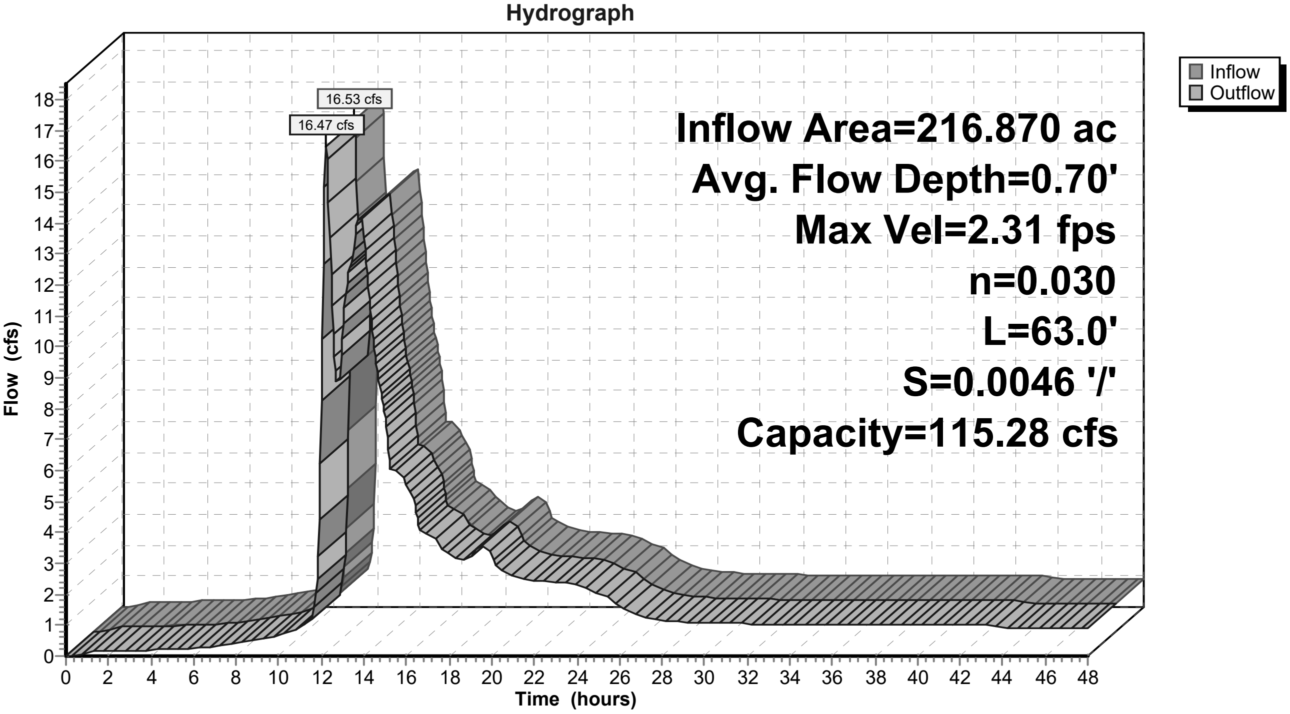
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.31 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 1.1 min

Peak Storage= 448 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.70'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 115.28 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 63.0' Slope= 0.0046 '/'
Inlet Invert= 564.87', Outlet Invert= 564.58'

‡

Reach 41R-1: Long Road ditch



Summary for Reach 41R-2: Long Road ditch

Inflow Area =	219.000 ac, 29.52% Impervious,	Inflow Depth > 0.45"		for 1-yr storm event
Inflow =	17.40 cfs @	12.21 hrs, Volume=	8.230 af	
Outflow =	17.31 cfs @	12.23 hrs, Volume=	8.225 af,	Atten= 1%, Lag= 1.1 min

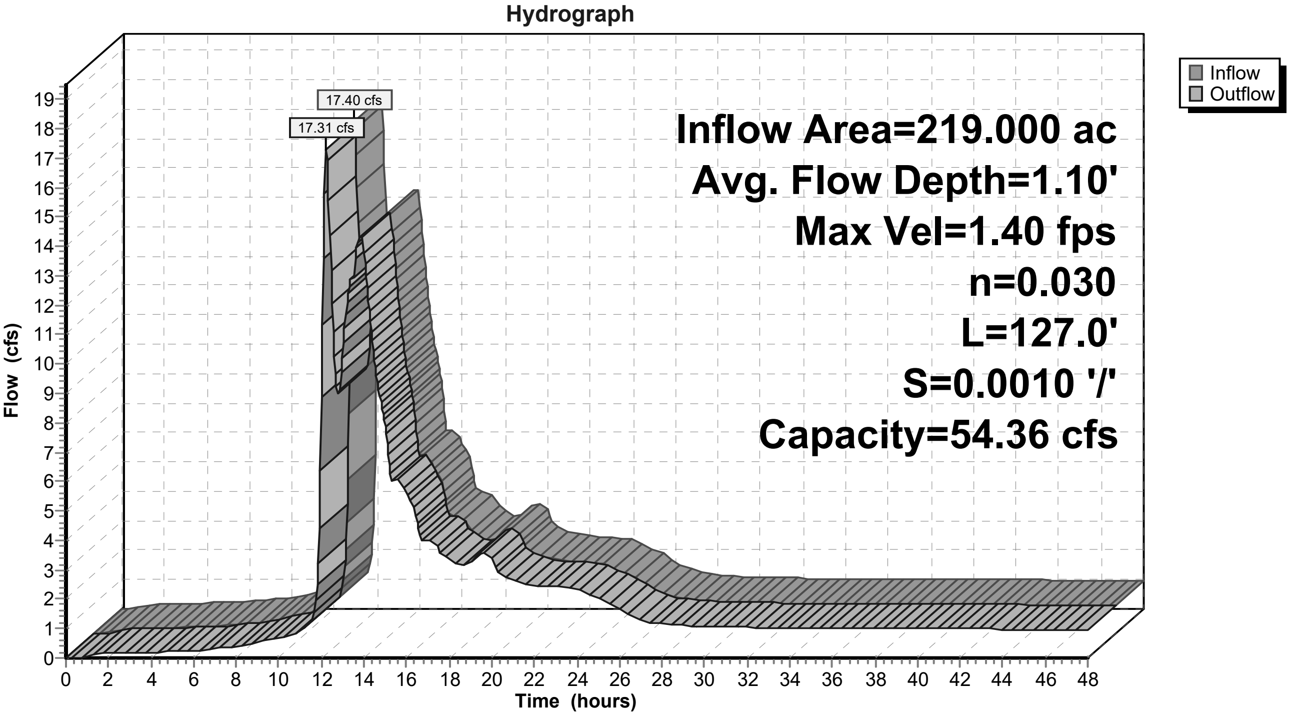
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.40 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 3.5 min

Peak Storage= 1,572 cf @ 12.23 hrs
Average Depth at Peak Storage= 1.10'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 54.36 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 127.0' Slope= 0.0010 '/'
Inlet Invert= 564.66', Outlet Invert= 564.53'

‡

Reach 41R-2: Long Road ditch



Summary for Reach 300R: Long Road ditch

Inflow Area = 216.870 ac, 29.63% Impervious, Inflow Depth > 0.45" for 1-yr storm event
Inflow = 16.53 cfs @ 12.22 hrs, Volume= 8.112 af
Outflow = 16.53 cfs @ 12.22 hrs, Volume= 8.111 af, Atten= 0%, Lag= 0.1 min

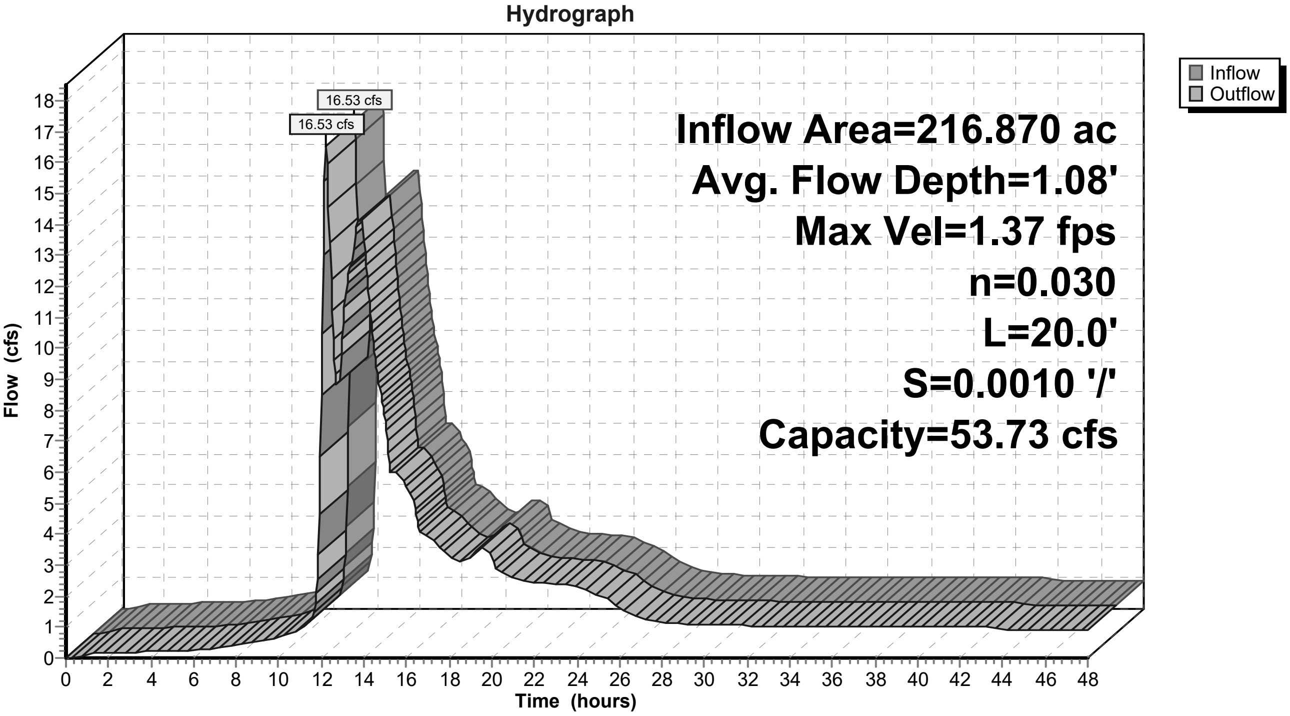
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.37 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 0.6 min

Peak Storage= 242 cf @ 12.22 hrs
Average Depth at Peak Storage= 1.08'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 53.73 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 20.0' Slope= 0.0010 '/'
Inlet Invert= 564.70', Outlet Invert= 564.68'

‡

Reach 300R: Long Road ditch



Summary for Reach 310R: Long Road ditch

Inflow Area = 211.850 ac, 29.40% Impervious, Inflow Depth > 0.44" for 1-yr storm event
Inflow = 15.76 cfs @ 12.22 hrs, Volume= 7.754 af
Outflow = 15.70 cfs @ 12.23 hrs, Volume= 7.753 af, Atten= 0%, Lag= 0.2 min

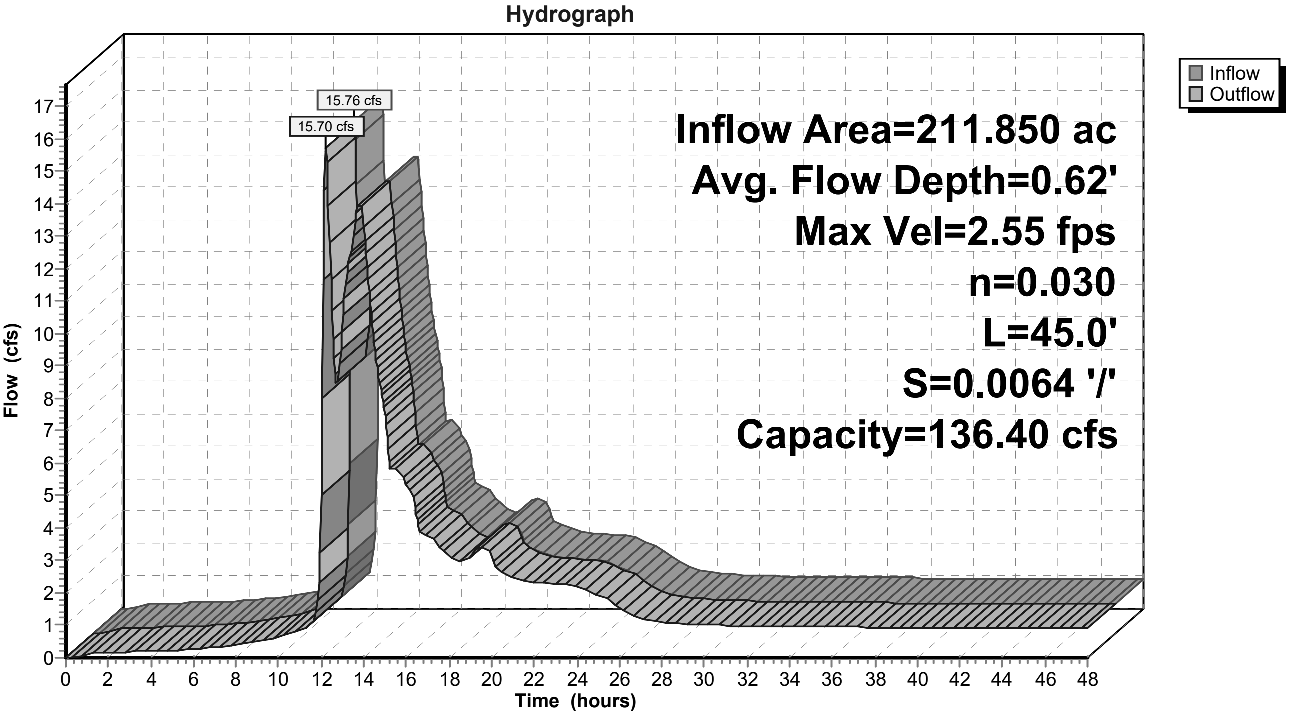
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.55 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 0.7 min

Peak Storage= 277 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.62'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 136.40 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 45.0' Slope= 0.0064 '/'
Inlet Invert= 565.09', Outlet Invert= 564.80'

‡

Reach 310R: Long Road ditch

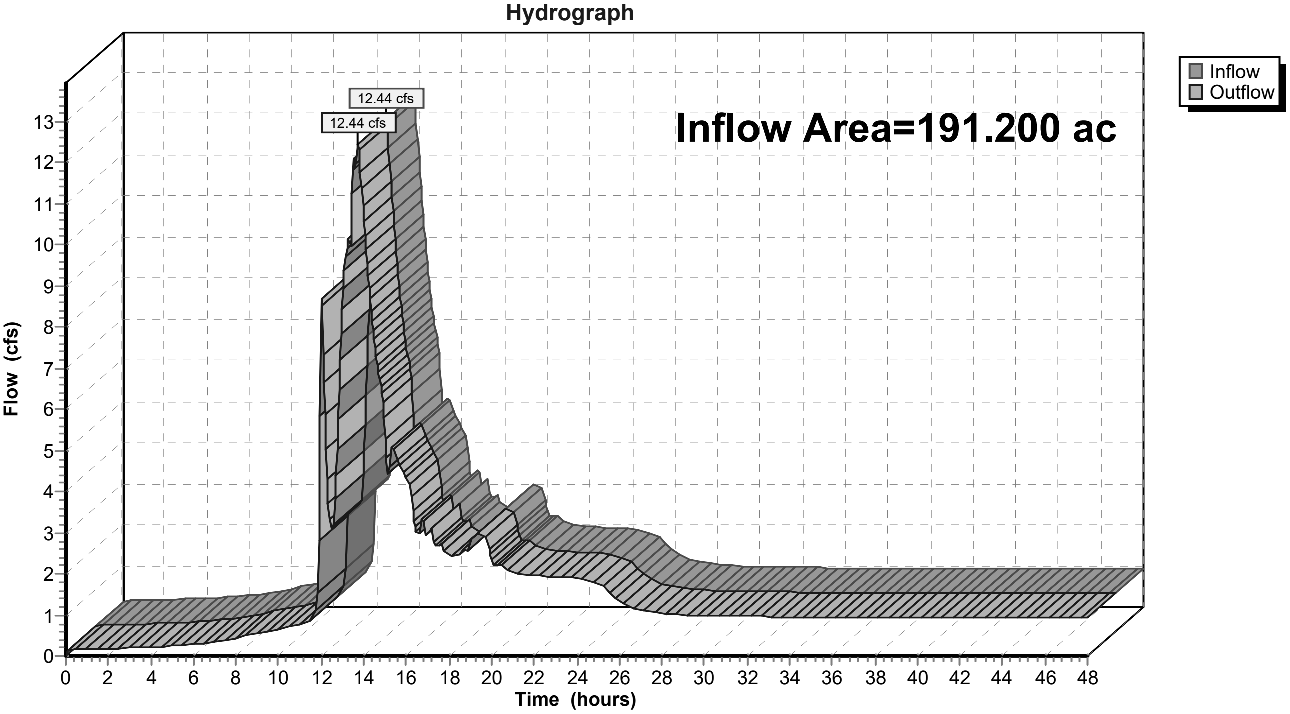


Summary for Reach DP-2: feeder creek on property portion

Inflow Area = 191.200 ac, 29.72% Impervious, Inflow Depth > 0.41" for 1-yr storm event
Inflow = 12.44 cfs @ 13.73 hrs, Volume= 6.461 af
Outflow = 12.44 cfs @ 13.73 hrs, Volume= 6.461 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-2: feeder creek on property portion

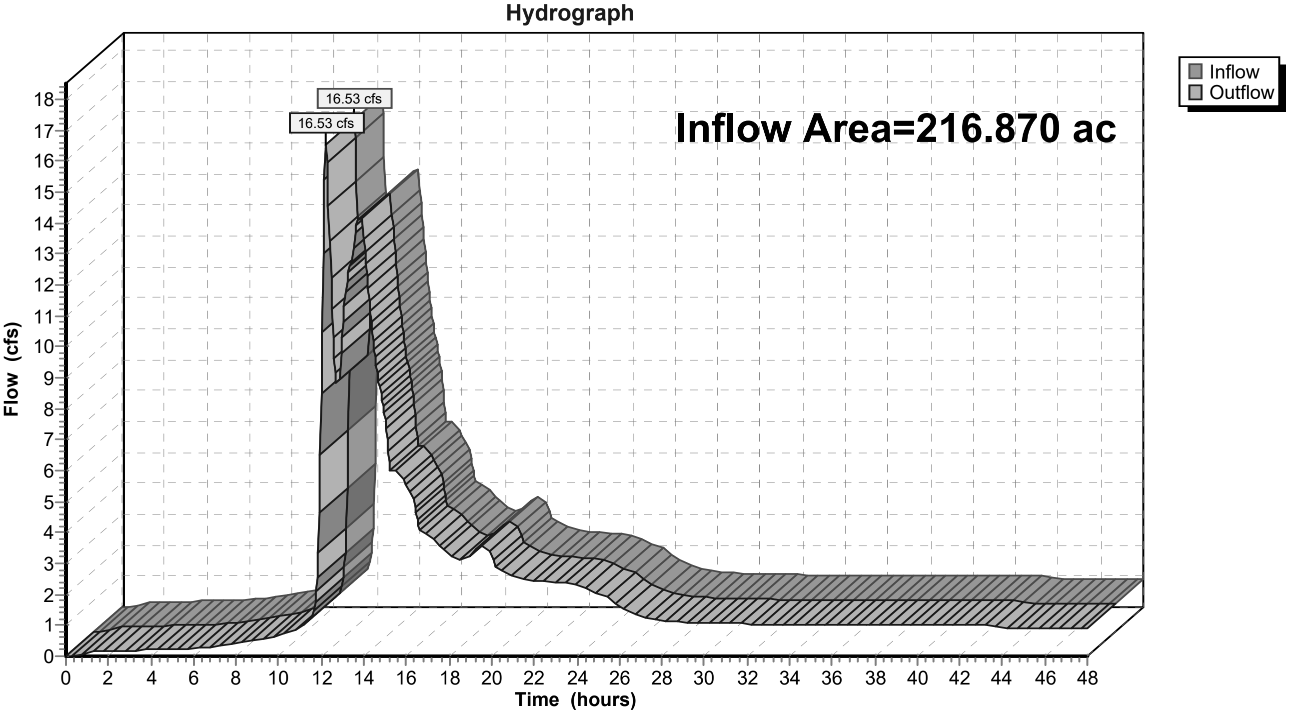


Summary for Reach DP-3: entrance to twin 36" culverts on adjancent property

Inflow Area =	216.870 ac, 29.63% Impervious, Inflow Depth > 0.45" for 1-yr storm event			
Inflow =	16.53 cfs @	12.22 hrs, Volume=	8.111 af	
Outflow =	16.53 cfs @	12.22 hrs, Volume=	8.111 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-3: entrance to twin 36" culverts on adjancent property

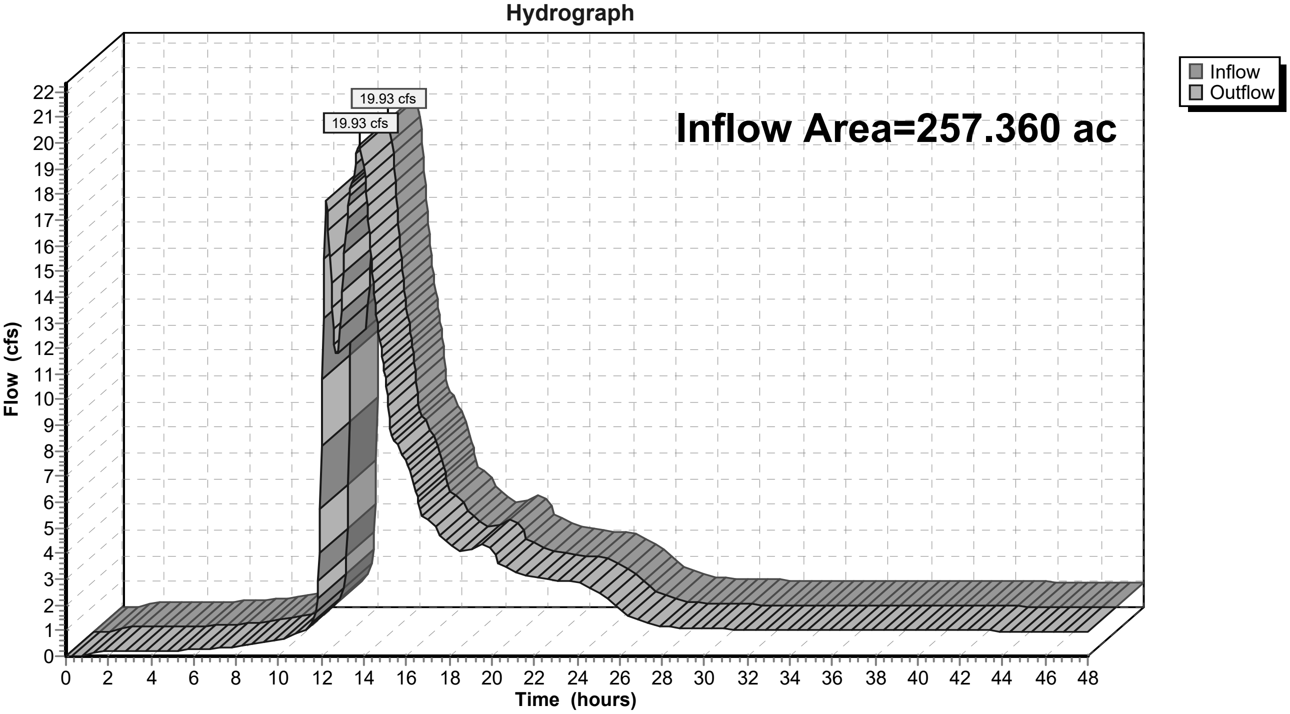


Summary for Reach DP-4: entrance to headwall

```
Inflow Area =      257.360 ac, 25.30% Impervious, Inflow Depth >  0.46"   for  1-yr storm event
Inflow      =       19.93 cfs @  13.83 hrs, Volume=          9.957 af
Outflow     =       19.93 cfs @  13.83 hrs, Volume=          9.957 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-4: entrance to headwall



Summary for Pond 30C: twin 36" culverts

Inflow Area = 216.870 ac, 29.63% Impervious, Inflow Depth > 0.45" for 1-yr storm event
Inflow = 16.53 cfs @ 12.22 hrs, Volume= 8.111 af
Outflow = 16.53 cfs @ 12.22 hrs, Volume= 8.111 af, Atten= 0%, Lag= 0.0 min
Primary = 11.11 cfs @ 12.22 hrs, Volume= 7.211 af
Secondary = 5.42 cfs @ 12.22 hrs, Volume= 0.900 af

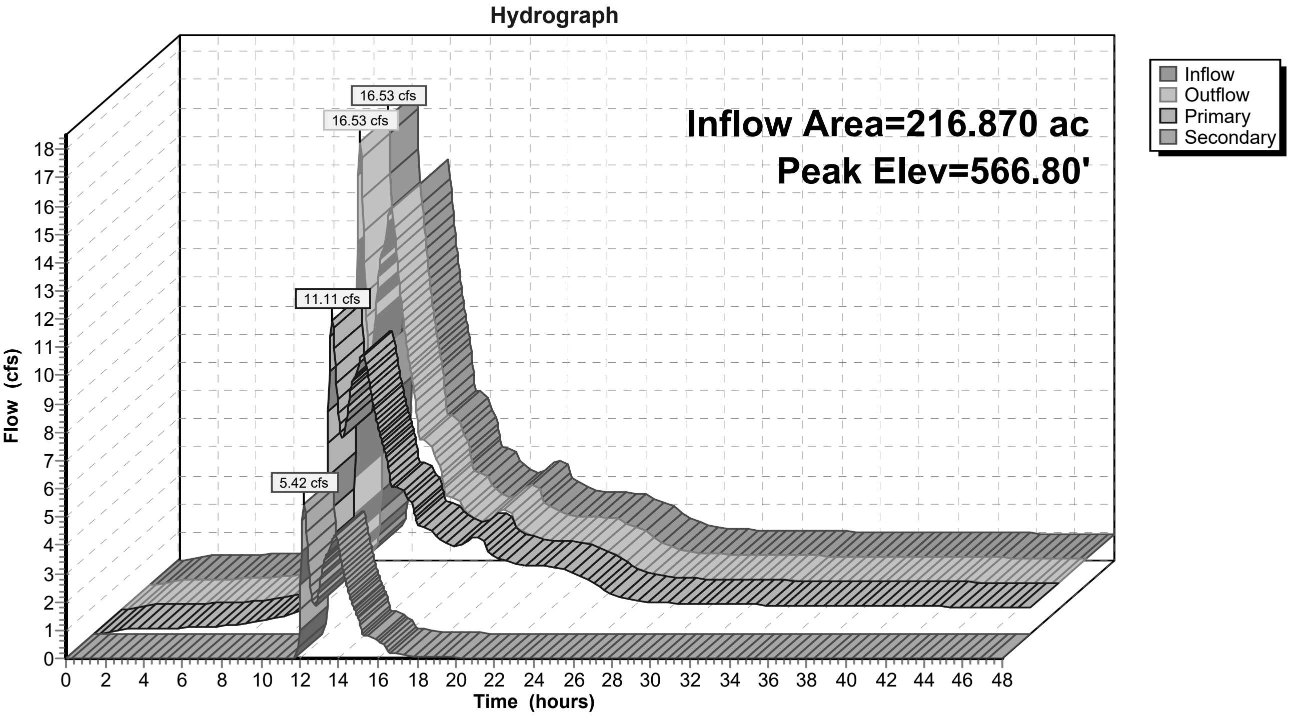
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 566.80' @ 12.22 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.97'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.76' / 564.97' S= -0.0035 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	565.78'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.78' / 564.87' S= 0.0152 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=11.03 cfs @ 12.22 hrs HW=566.79' TW=565.57' (Dynamic Tailwater)
└—**1=Culvert** (Barrel Controls 11.03 cfs @ 3.06 fps)

Secondary OutFlow Max=5.36 cfs @ 12.22 hrs HW=566.79' TW=565.57' (Dynamic Tailwater)
└—**2=Culvert** (Barrel Controls 5.36 cfs @ 3.82 fps)

Pond 30C: twin 36" culverts



Summary for Pond 32C: twin 36" culverts

Inflow Area =	211.850 ac,	29.40% Impervious,	Inflow Depth > 0.44"	for 1-yr storm event
Inflow =	15.76 cfs @	12.22 hrs, Volume=	7.754 af	
Outflow =	15.76 cfs @	12.22 hrs, Volume=	7.754 af,	Atten= 0%, Lag= 0.0 min
Primary =	7.89 cfs @	12.22 hrs, Volume=	4.180 af	
Secondary =	7.87 cfs @	12.22 hrs, Volume=	3.573 af	

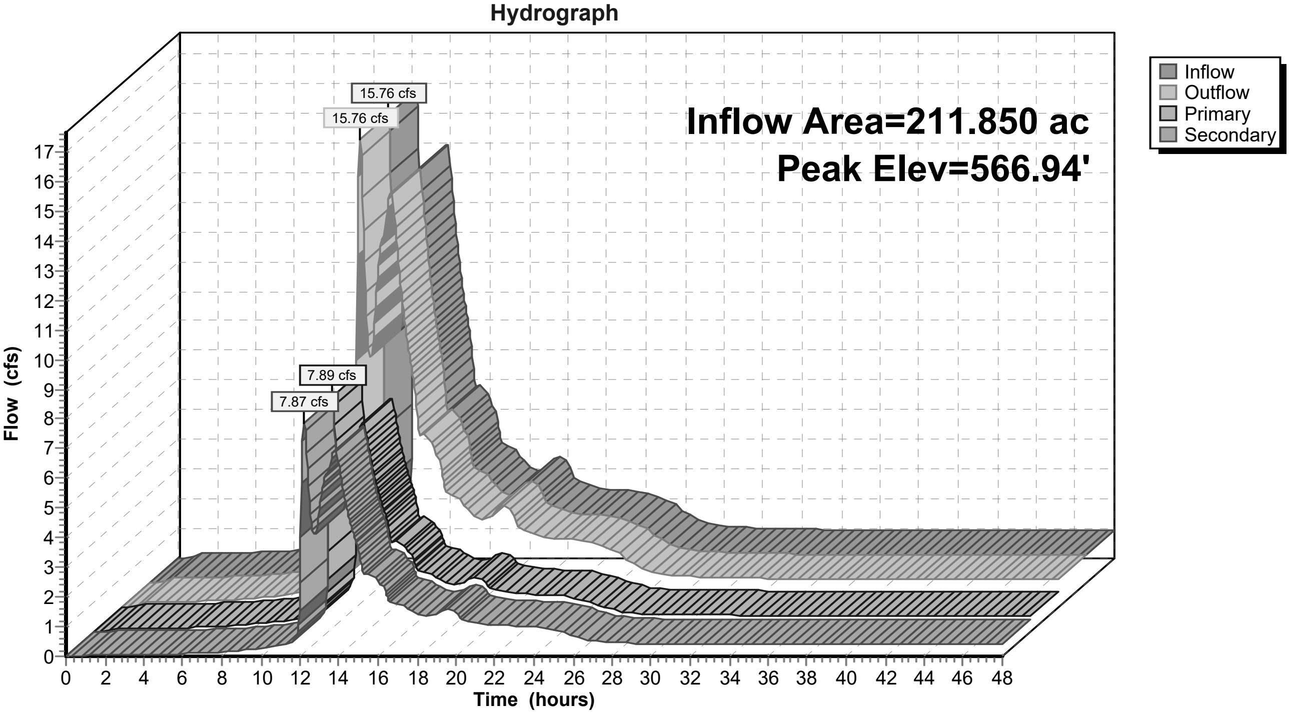
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 566.94' @ 12.22 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	565.68'	**36.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.68' / 565.25' S= 0.0055 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#2	Secondary	565.73'	**36.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.73' / 565.09' S= 0.0082 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=7.82 cfs @ 12.22 hrs HW=566.93' TW=565.71' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 7.82 cfs @ 4.14 fps)

Secondary OutFlow Max=7.79 cfs @ 12.22 hrs HW=566.93' TW=565.71' (Dynamic Tailwater)
└**2=Culvert** (Inlet Controls 7.79 cfs @ 2.95 fps)

Pond 32C: twin 36" culverts



Summary for Pond 33C: twin 30" culverts

Inflow Area = 211.850 ac, 29.40% Impervious, Inflow Depth > 0.44" for 1-yr storm event
Inflow = 15.75 cfs @ 12.22 hrs, Volume= 7.756 af
Outflow = 15.75 cfs @ 12.22 hrs, Volume= 7.756 af, Atten= 0%, Lag= 0.0 min
Primary = 7.87 cfs @ 12.22 hrs, Volume= 3.796 af
Secondary = 7.88 cfs @ 12.22 hrs, Volume= 3.960 af

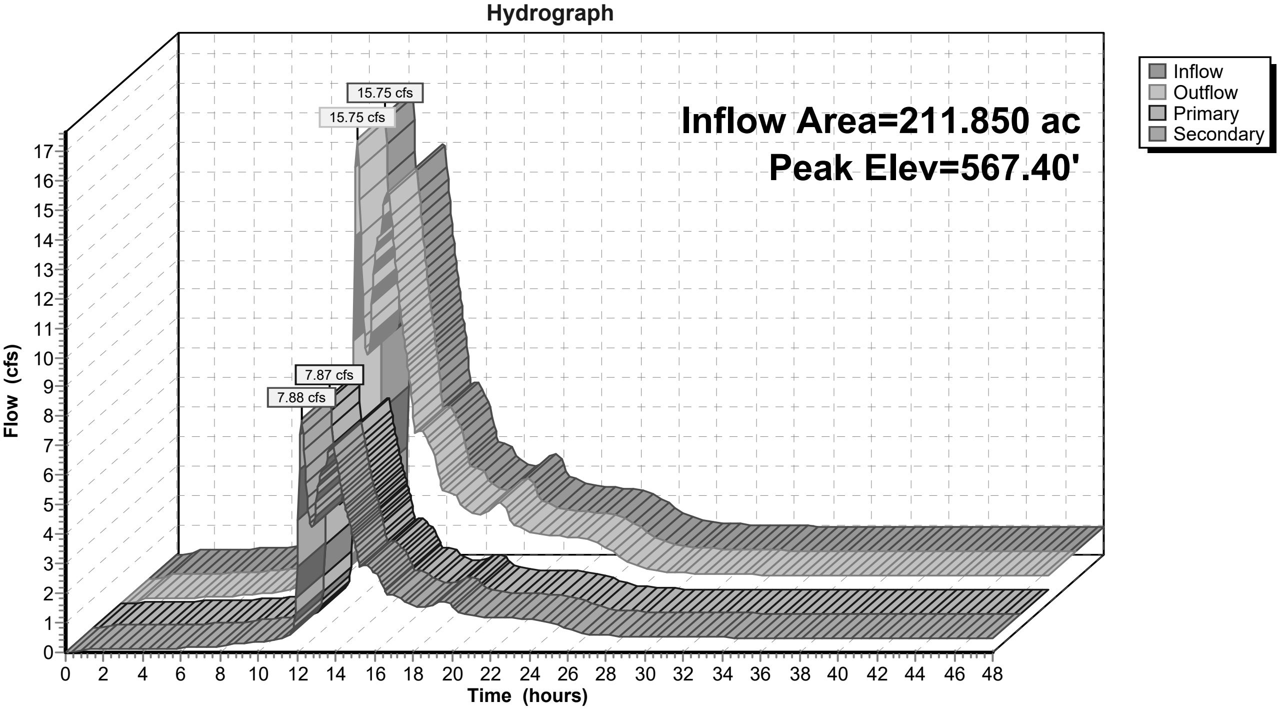
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 567.40' @ 12.22 hrs
Flood Elev= 571.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	565.70'	**30.0" Round Culvert** L= 140.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.70' / 565.64' S= 0.0004 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Secondary	565.65'	**30.0" Round Culvert** L= 140.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.64' / 565.65' S= -0.0001 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=7.81 cfs @ 12.22 hrs HW=567.39' TW=566.73' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 7.81 cfs @ 3.13 fps)

Secondary OutFlow Max=7.82 cfs @ 12.22 hrs HW=567.39' TW=566.73' (Dynamic Tailwater)
↑—**2=Culvert** (Barrel Controls 7.82 cfs @ 2.99 fps)

Pond 33C: twin 30" culverts



Summary for Pond 34C: twin 36" culverts

Inflow Area = 0.640 ac, 42.19% Impervious, Inflow Depth = 0.90" for 1-yr storm event
Inflow = 0.99 cfs @ 11.97 hrs, Volume= 0.048 af
Outflow = 0.99 cfs @ 11.97 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min
Primary = 0.50 cfs @ 11.97 hrs, Volume= 0.024 af
Secondary = 0.50 cfs @ 11.97 hrs, Volume= 0.024 af

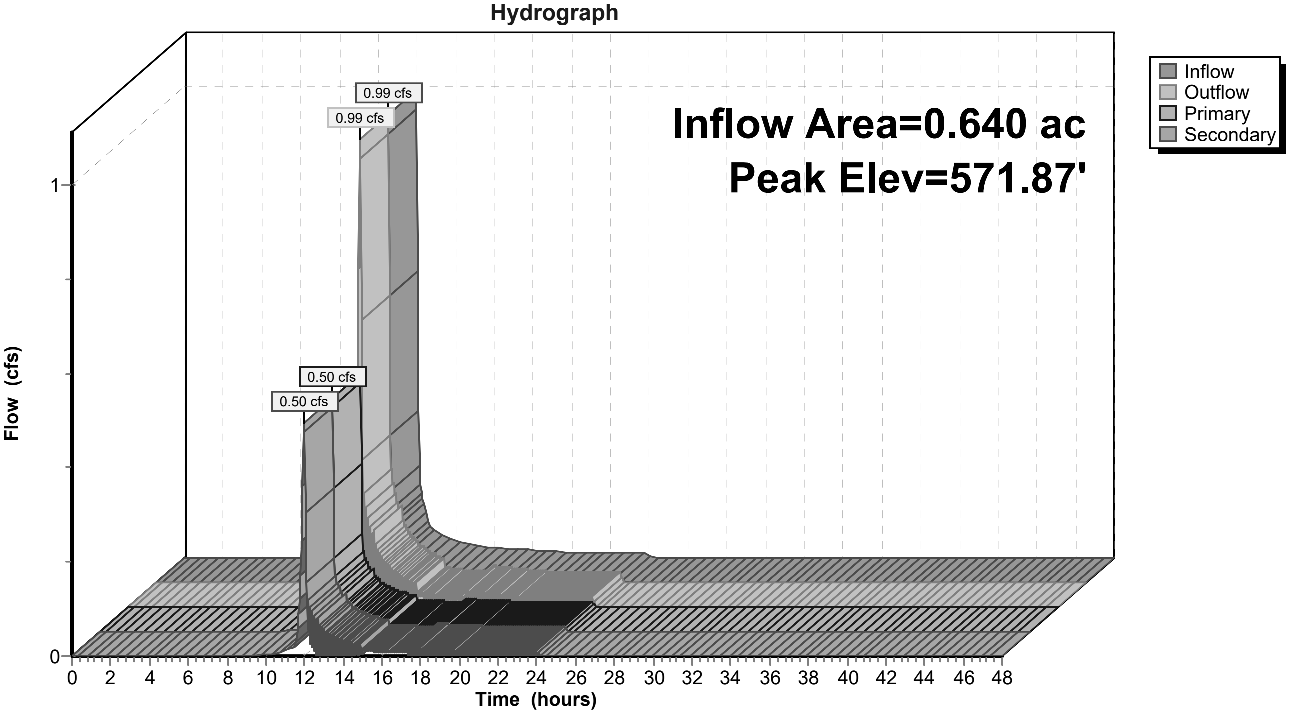
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 571.87' @ 13.80 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	567.07'	**36.0" Round Culvert** L= 91.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 567.07' / 566.90' S= 0.0019 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#2	Secondary	567.17'	**36.0" Round Culvert** L= 91.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 567.17' / 566.89' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=0.48 cfs @ 11.97 hrs HW=571.50' TW=571.50' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.48 cfs @ 0.07 fps)

Secondary OutFlow Max=0.48 cfs @ 11.97 hrs HW=571.50' TW=571.50' (Dynamic Tailwater)
└**2=Culvert** (Inlet Controls 0.48 cfs @ 0.07 fps)

Pond 34C: twin 36" culverts



Summary for Pond 41C-1: twin 36" culverts

```
Inflow Area =      216.870 ac, 29.63% Impervious, Inflow Depth >  0.45"   for 1-yr storm event
Inflow      =       16.47 cfs @  12.23 hrs, Volume=          8.109 af
Outflow     =       16.47 cfs @  12.23 hrs, Volume=          8.109 af, Atten= 0%, Lag= 0.0 min
Primary     =        8.49 cfs @  12.23 hrs, Volume=          4.677 af
Secondary   =        7.99 cfs @  12.23 hrs, Volume=          3.433 af
```

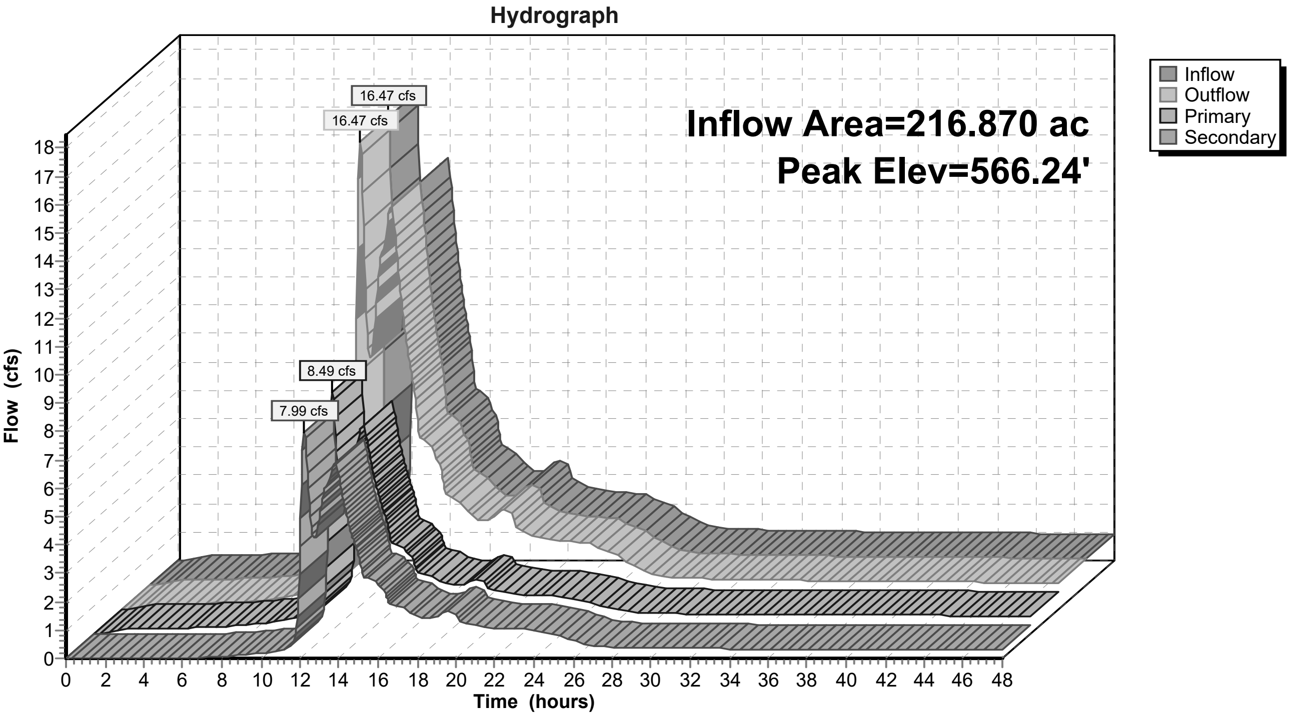
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 566.24' @ 12.23 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.66'	**36.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.58' / 564.66' S= -0.0027 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	564.87'	**36.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.63' / 564.87' S= -0.0080 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=8.44 cfs @ 12.23 hrs HW=566.24' TW=565.75' (Dynamic Tailwater)
└—**1=Culvert** (Barrel Controls 8.44 cfs @ 3.05 fps)

Secondary OutFlow Max=7.94 cfs @ 12.23 hrs HW=566.24' TW=565.75' (Dynamic Tailwater)
└—**2=Culvert** (Barrel Controls 7.94 cfs @ 2.99 fps)

Pond 41C-1: twin 36" culverts



Summary for Pond 41C-2: twin 36" culverts

Inflow Area = 219.000 ac, 29.52% Impervious, Inflow Depth > 0.45" for 1-yr storm event
Inflow = 17.31 cfs @ 12.23 hrs, Volume= 8.225 af
Outflow = 17.31 cfs @ 12.23 hrs, Volume= 8.225 af, Atten= 0%, Lag= 0.0 min
Primary = 8.65 cfs @ 12.23 hrs, Volume= 4.112 af
Secondary = 8.65 cfs @ 12.23 hrs, Volume= 4.112 af

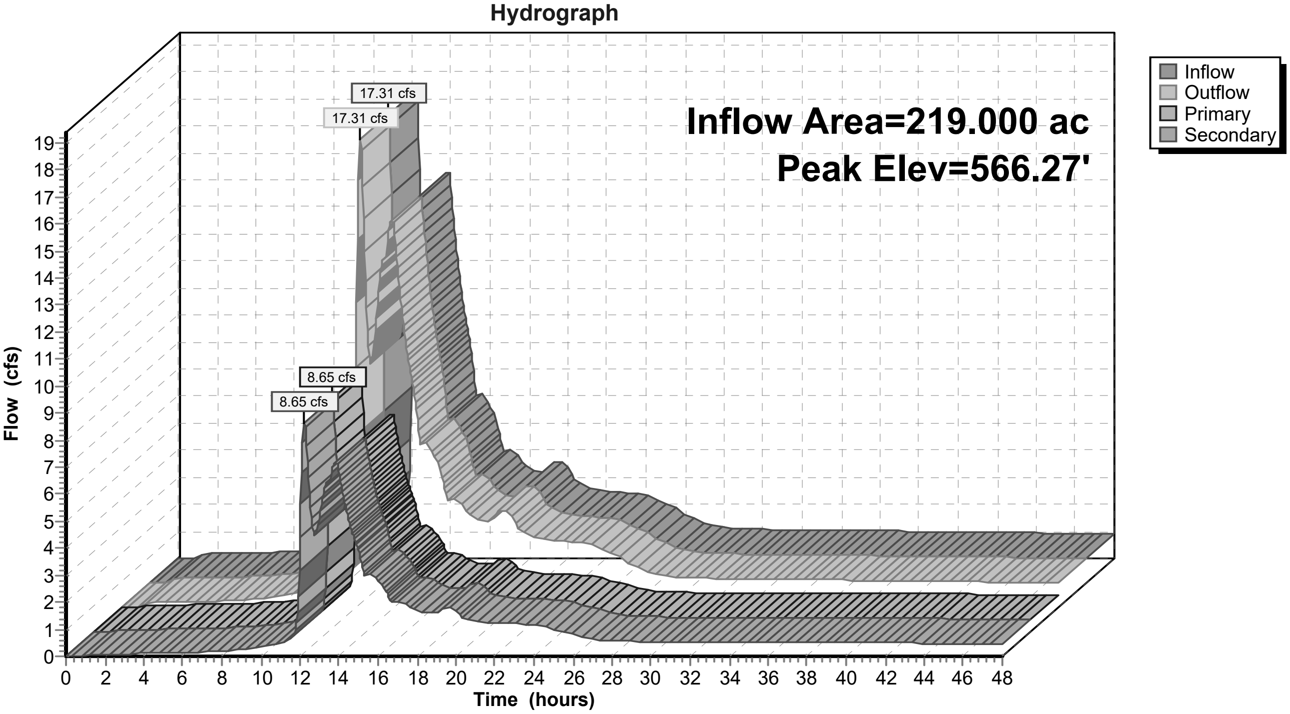
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 566.27' @ 12.23 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.53'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.53' / 564.47' S= 0.0010 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	564.53'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.53' / 564.47' S= 0.0010 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=8.61 cfs @ 12.23 hrs HW=566.27' TW=565.59' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 8.61 cfs @ 2.92 fps)

Secondary OutFlow Max=8.61 cfs @ 12.23 hrs HW=566.27' TW=565.59' (Dynamic Tailwater)
└─**2=Culvert** (Barrel Controls 8.61 cfs @ 2.92 fps)

Pond 41C-2: twin 36" culverts



Summary for Pond 310C: box culvert under access driveway

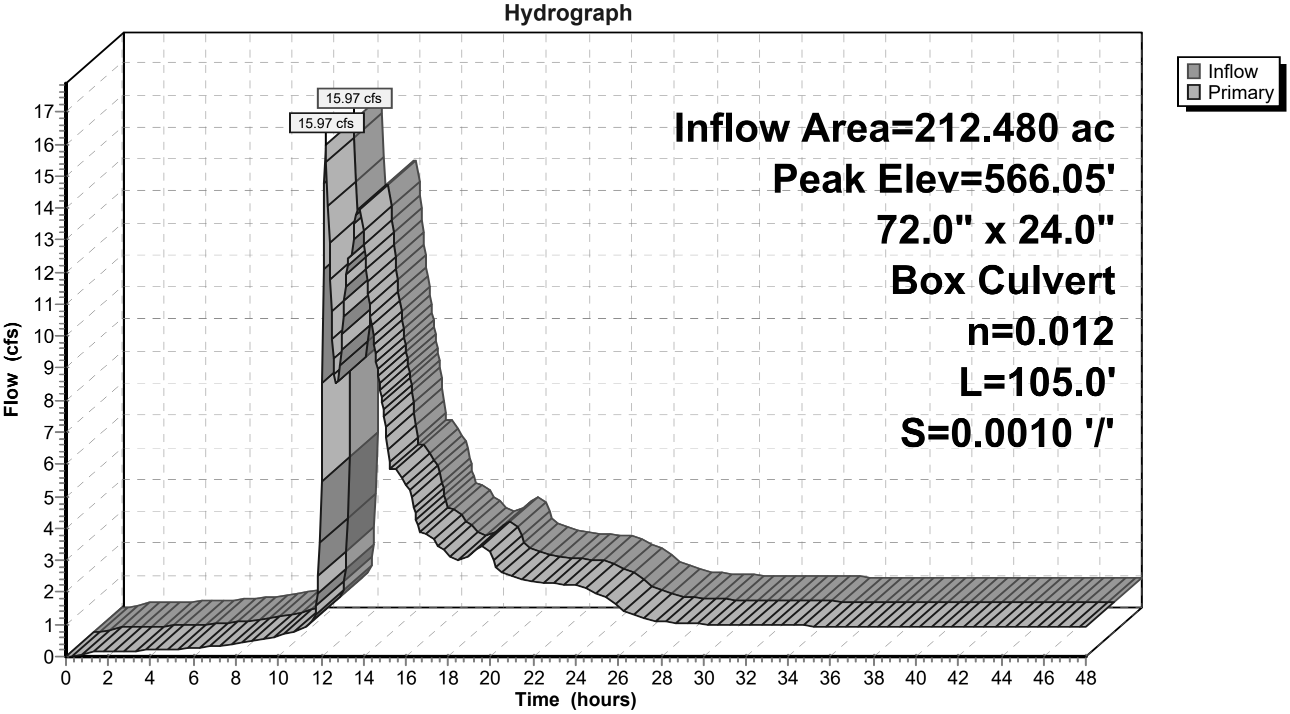
Inflow Area =	212.480 ac, 29.38% Impervious, Inflow Depth > 0.44" for 1-yr storm event				
Inflow =	15.97 cfs @	12.22 hrs, Volume=	7.786 af		
Outflow =	15.97 cfs @	12.22 hrs, Volume=	7.786 af,	Atten= 0%,	Lag= 0.0 min
Primary =	15.97 cfs @	12.22 hrs, Volume=	7.786 af		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 566.05' @ 12.22 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.80'	**72.0" W x 24.0" H Box Culvert** L= 105.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 564.80' / 564.70' S= 0.0010 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.00 sf

Primary OutFlow Max=15.83 cfs @ 12.22 hrs HW=566.04' TW=565.77' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 15.83 cfs @ 2.83 fps)

Pond 310C: box culvert under access driveway



Summary for Pond 350Bio: bioretention

Inflow Area = 1.870 ac, 65.24% Impervious, Inflow Depth = 1.11" for 1-yr storm event
Inflow = 2.96 cfs @ 12.02 hrs, Volume= 0.172 af
Outflow = 0.06 cfs @ 17.01 hrs, Volume= 0.172 af, Atten= 98%, Lag= 299.6 min
Primary = 0.06 cfs @ 17.01 hrs, Volume= 0.172 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 571.45' @ 17.01 hrs Surf.Area= 10,841 sf Storage= 4,696 cf
Flood Elev= 573.00' Surf.Area= 13,645 sf Storage= 23,660 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 760.7 min (1,586.7 - 826.0)

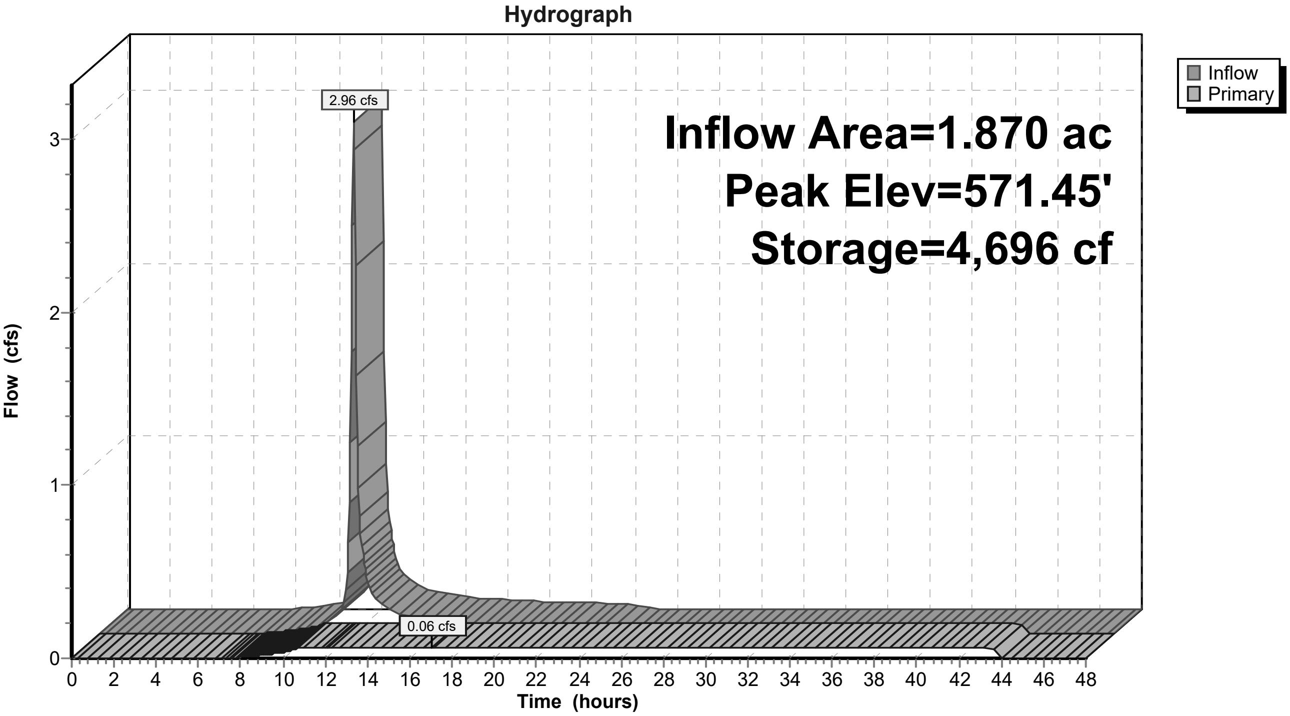
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	23,660 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.00	10,045	0	0
572.00	11,815	10,930	10,930
573.00	13,645	12,730	23,660

Device	Routing	Invert	Outlet Devices
#1	Primary	567.58'	**12.0" Round Culvert** L= 81.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 567.58' / 566.98' S= 0.0074 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	567.58'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	571.50'	**3.0" Vert. Orifice** C= 0.600
#4	Device 1	572.25'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	571.00'	**0.250 in/hr Exfiltration through bioretention media over Surface area**

Primary OutFlow Max=0.06 cfs @ 17.01 hrs HW=571.45' TW=566.84' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.06 cfs of 6.13 cfs potential flow)
  ├─**2=Underdrain** (Passes 0.06 cfs of 1.80 cfs potential flow)
  │ └─**5=Exfiltration through bioretention media**(Exfiltration Controls 0.06 cfs)
  ├─**3=Orifice** (Controls 0.00 cfs)
  └─**4=Grate** (Controls 0.00 cfs)

Pond 350Bio: bioretention



Summary for Pond 350F: forebay

```
Inflow Area =      1.870 ac, 65.24% Impervious, Inflow Depth =  1.11"   for 1-yr storm event
Inflow      =     3.50 cfs @  11.97 hrs, Volume=          0.172 af
Outflow     =     2.96 cfs @  12.02 hrs, Volume=          0.172 af, Atten= 15%, Lag= 2.9 min
Primary     =     2.96 cfs @  12.02 hrs, Volume=          0.172 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Starting Elev= 571.50'  Surf.Area= 5,131 sf  Storage= 14,463 cf
Peak Elev= 571.70' @ 12.02 hrs  Surf.Area= 5,310 sf  Storage= 15,490 cf  (1,027 cf above start)
Flood Elev= 573.00'  Surf.Area= 6,575 sf  Storage= 23,223 cf  (8,759 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 14.1 min ( 826.0 - 811.9 )

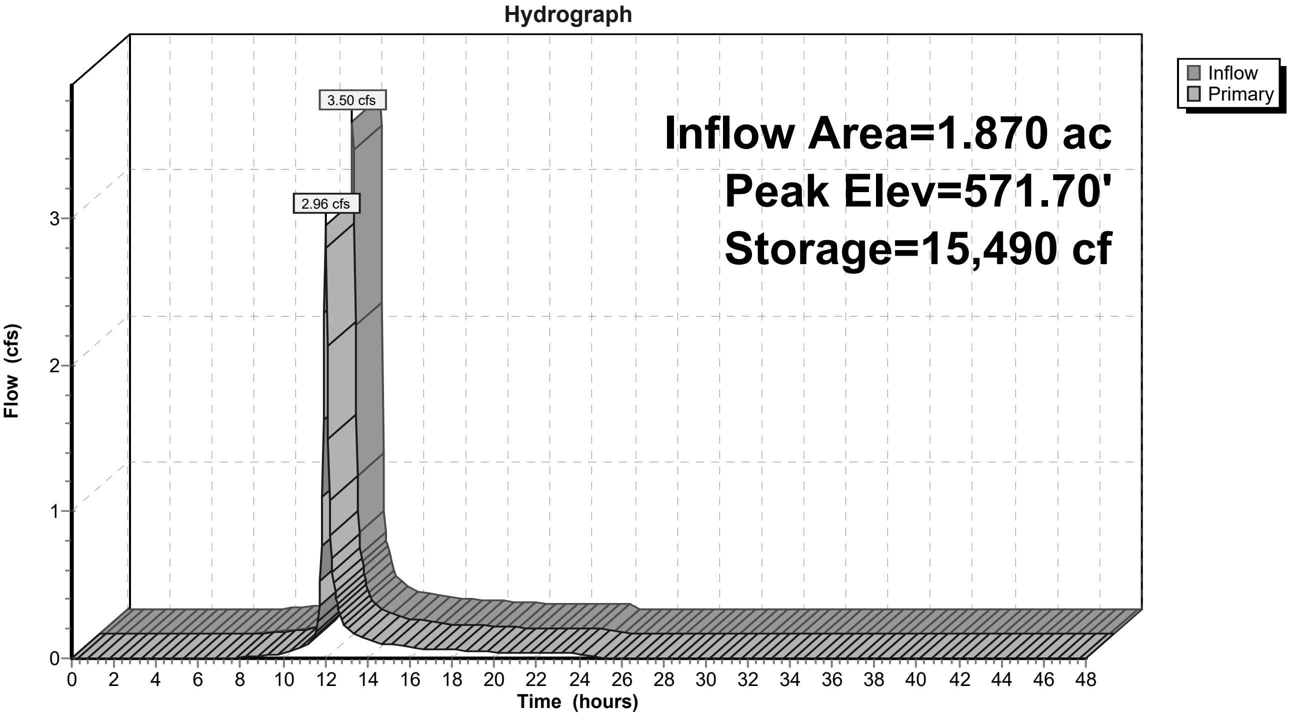
Volume     Invert    Avail.Storage  Storage Description
  #1      567.00'       23,223 cf  Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation      Surf.Area       Inc.Store      Cum.Store
    (feet)         (sq-ft)    (cubic-feet)   (cubic-feet)
    567.00           1,480               0              0
    568.00           2,185           1,833          1,833
    570.00           3,770           5,955          7,788
    572.00           5,585           9,355         17,143
    573.00           6,575           6,080         23,223

Device  Routing        Invert  Outlet Devices
  #1    Primary       571.50'  162.0 deg x 10.0' long x 1.50' rise overflow weir Cv= 2.47 (C= 3.09)

Primary OutFlow  Max=2.88 cfs @ 12.02 hrs  HW=571.69'  TW=571.17'  (Dynamic Tailwater)
└─1=overflow weir  (Weir Controls 2.88 cfs @ 1.33 fps)
```

Pond 350F: forebay



Summary for Pond DMH110: manhole

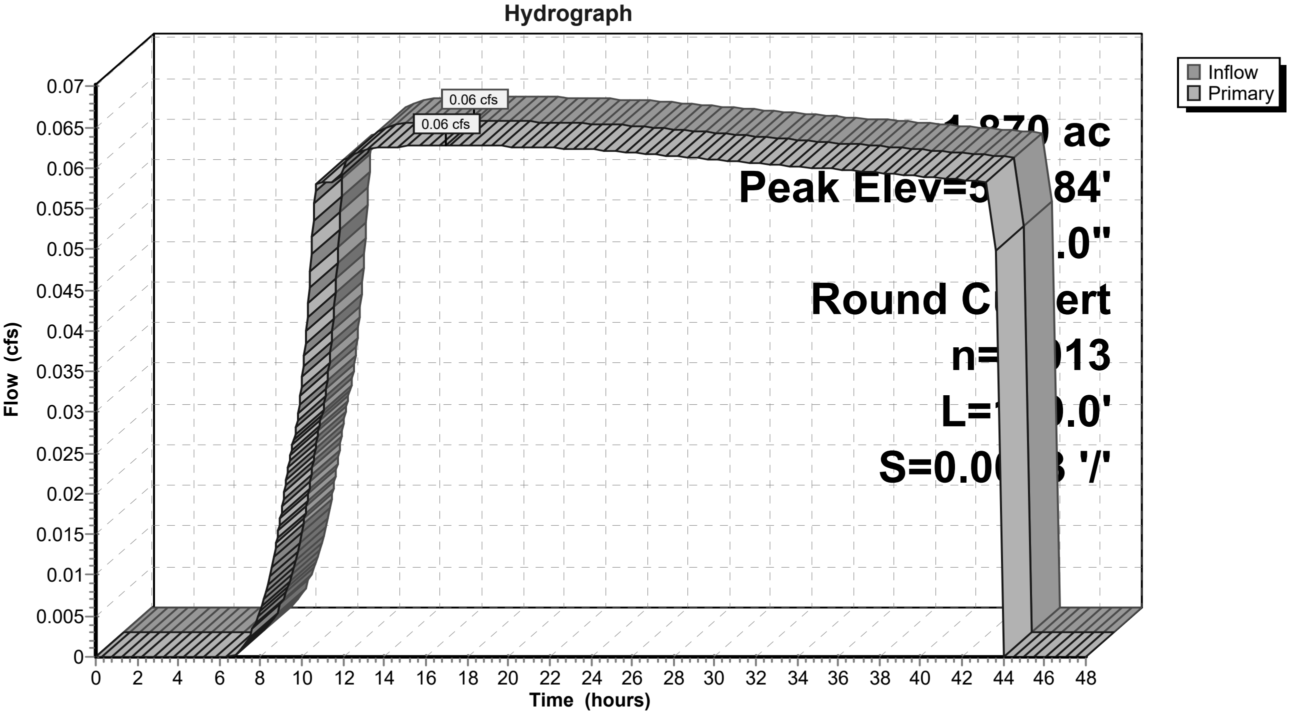
```
Inflow Area =      1.870 ac, 65.24% Impervious, Inflow Depth =  1.11"   for 1-yr storm event
Inflow      =     0.06 cfs @  17.01 hrs, Volume=          0.172 af
Outflow     =     0.06 cfs @  17.00 hrs, Volume=          0.172 af, Atten= 0%, Lag= 0.0 min
Primary     =     0.06 cfs @  17.00 hrs, Volume=          0.172 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 566.84' @ 11.98 hrs
Flood Elev= 573.04'

Device  Routing      Invert  Outlet Devices
  #1    Primary     566.71'  15.0" Round Culvert
                             L= 109.0'  CPP, square edge headwall, Ke= 0.500
                             Inlet / Outlet Invert= 566.71' / 565.91'  S= 0.0073 '/'  Cc= 0.900
                             n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.06 cfs @ 17.00 hrs HW=566.84' TW=566.04'  (Dynamic Tailwater)
└─1=Culvert (Outlet Controls 0.06 cfs @ 1.47 fps)
```

Pond DMH110: manhole



Summary for Pond DMH111: manhole

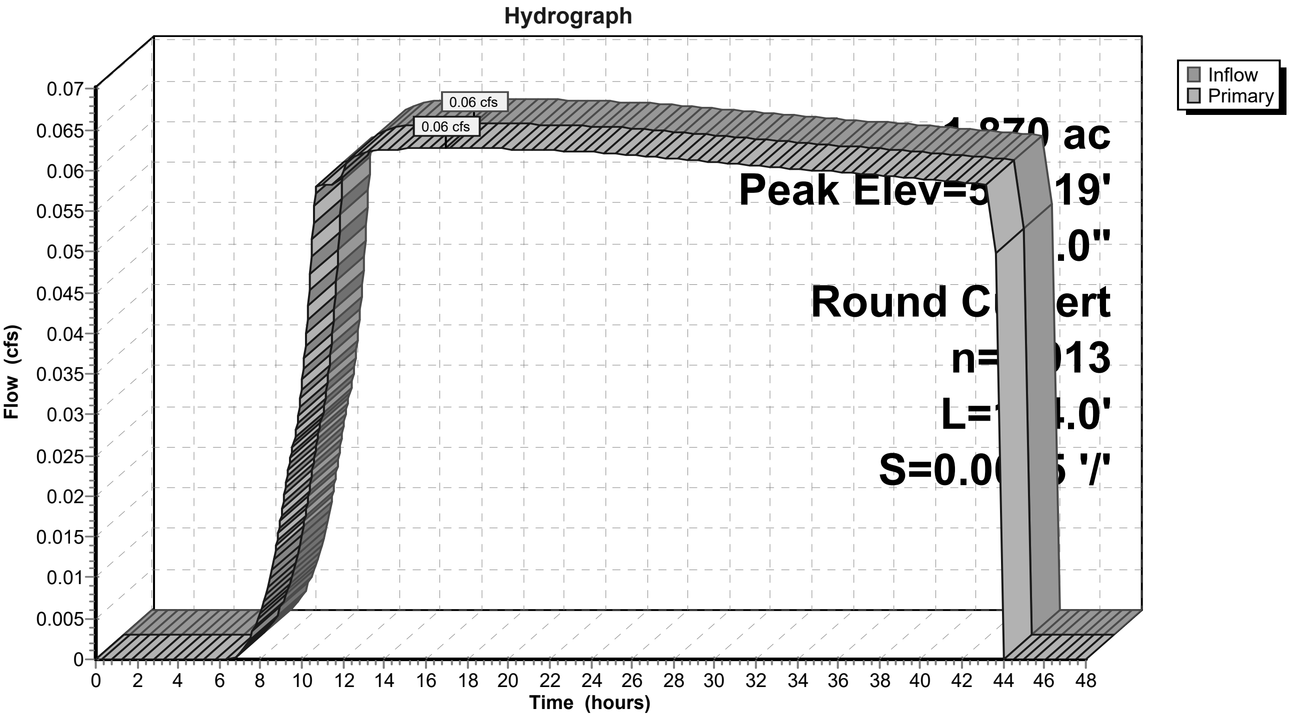
Inflow Area = 1.870 ac, 65.24% Impervious, Inflow Depth = 1.11" for 1-yr storm event
Inflow = 0.06 cfs @ 17.00 hrs, Volume= 0.172 af
Outflow = 0.06 cfs @ 17.00 hrs, Volume= 0.172 af, Atten= 0%, Lag= 0.0 min
Primary = 0.06 cfs @ 17.00 hrs, Volume= 0.172 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 566.19' @ 11.98 hrs
Flood Elev= 571.44'

Device	Routing	Invert	Outlet Devices
#1	Primary	565.91'	**15.0" Round Culvert** L= 104.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 565.91' / 565.13' S= 0.0075 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.06 cfs @ 17.00 hrs HW=566.04' TW=565.33' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.06 cfs @ 1.43 fps)

Pond DMH111: manhole



Summary for Pond DMH112: manhole

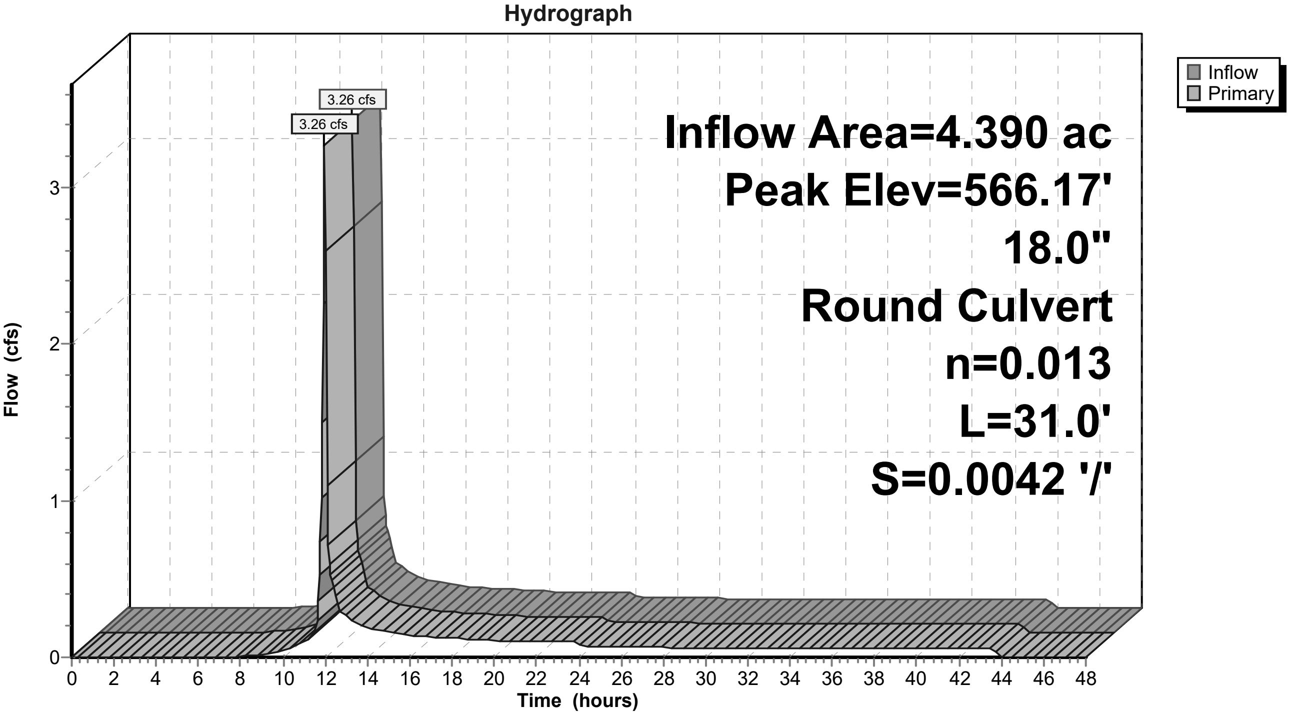
```
Inflow Area =      4.390 ac,  41.69% Impervious,  Inflow Depth =   0.89"    for  1-yr storm event
Inflow       =     3.26 cfs @   11.98 hrs,  Volume=          0.326 af
Outflow      =     3.26 cfs @   11.98 hrs,  Volume=          0.326 af,  Atten= 0%,  Lag= 0.0 min
Primary      =     3.26 cfs @   11.98 hrs,  Volume=          0.326 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 566.17' @ 11.98 hrs
Flood Elev= 570.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	565.13'	**18.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 565.13' / 565.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.13 cfs @ 11.98 hrs HW=566.15' TW=565.40' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 3.13 cfs @ 3.47 fps)

Pond DMH112: manhole



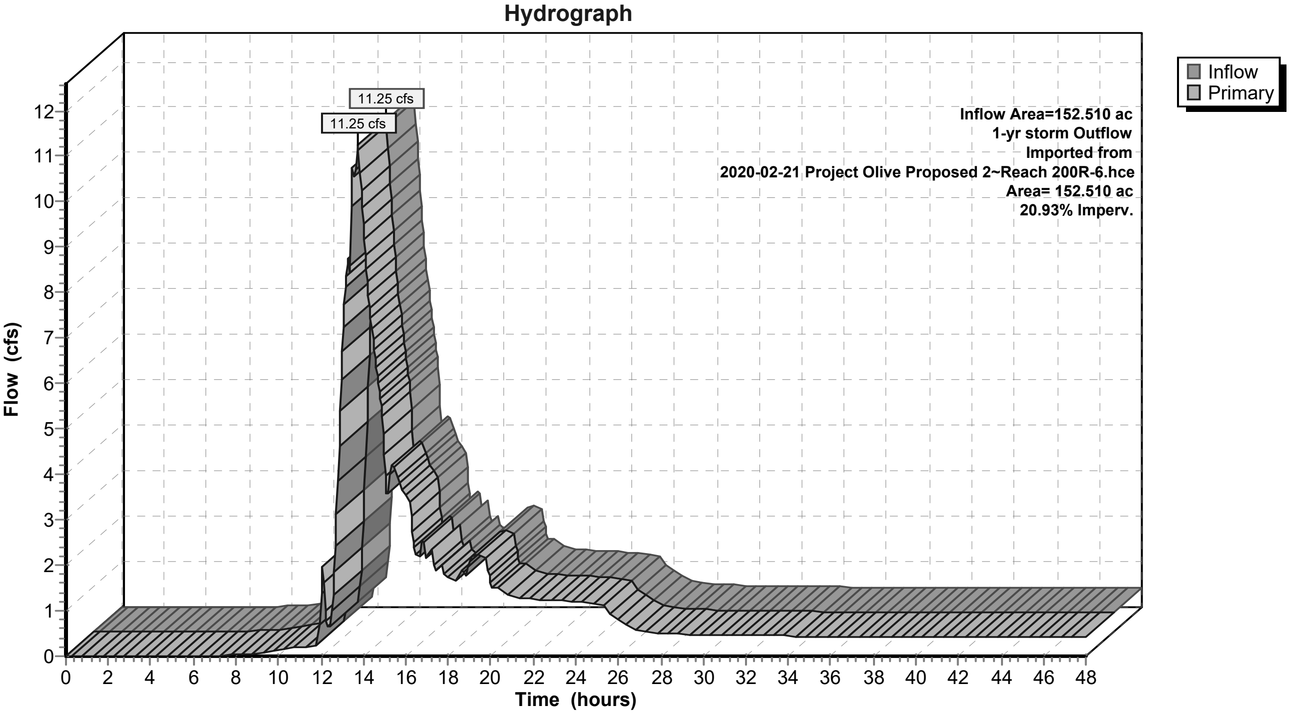
Summary for Link 200R-6: from 200R-6

Inflow Area = 152.510 ac, 20.93% Impervious, Inflow Depth > 0.32" for 1-yr storm event
Inflow = 11.25 cfs @ 13.74 hrs, Volume= 4.047 af
Primary = 11.25 cfs @ 13.74 hrs, Volume= 4.047 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

1-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 2~Reach 200R-6.hce

Link 200R-6: from 200R-6



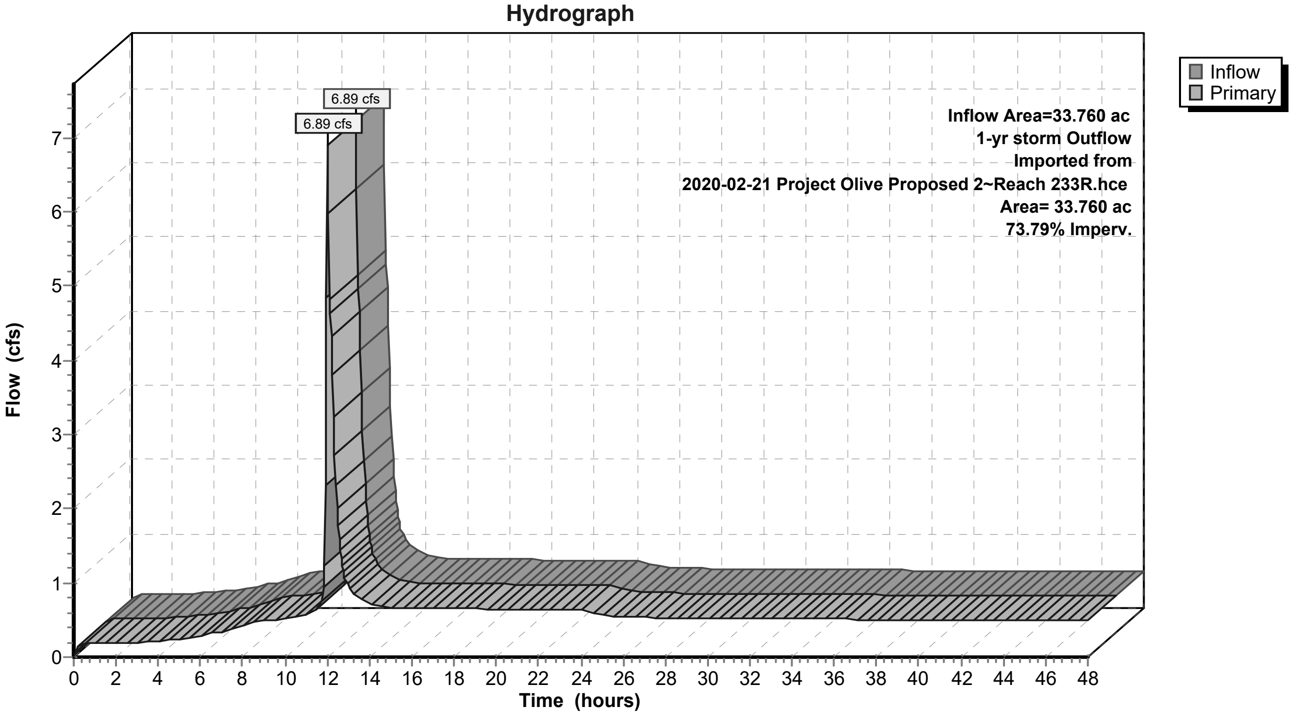
Summary for Link 233R: from 233R

Inflow Area = 33.760 ac, 73.79% Impervious, Inflow Depth > 0.79" for 1-yr storm event
Inflow = 6.89 cfs @ 12.01 hrs, Volume= 2.212 af
Primary = 6.89 cfs @ 12.01 hrs, Volume= 2.212 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

1-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 2~Reach 233R.hce

Link 233R: from 233R



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 4
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment201: Runoff Area=1.280 ac 0.00% Impervious Runoff Depth=1.30"
Flow Length=363' Tc=16.5 min CN=81 Runoff=2.02 cfs 0.138 af

Subcatchment220: Runoff Area=3.650 ac 0.00% Impervious Runoff Depth=1.36"
Flow Length=1,119' Slope=0.0050 '/' Tc=55.2 min CN=82 Runoff=2.76 cfs 0.415 af

Subcatchment300: Runoff Area=2.520 ac 24.21% Impervious Runoff Depth=1.72"
Tc=6.0 min CN=87 Runoff=7.40 cfs 0.362 af

Subcatchment310: Runoff Area=0.630 ac 20.63% Impervious Runoff Depth=1.57"
Flow Length=261' Tc=12.1 min CN=85 Runoff=1.40 cfs 0.083 af

Subcatchment320: Runoff Area=3.290 ac 53.19% Impervious Runoff Depth=2.05"
Flow Length=626' Tc=30.2 min CN=91 Runoff=5.78 cfs 0.563 af

Subcatchment330: Runoff Area=16.720 ac 20.57% Impervious Runoff Depth=1.72"
Flow Length=33' Slope=0.1400 '/' Tc=6.0 min CN=87 Runoff=49.11 cfs 2.399 af

Subcatchment340: Runoff Area=0.640 ac 42.19% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=90 Runoff=2.11 cfs 0.105 af

Subcatchment350: Runoff Area=1.870 ac 65.24% Impervious Runoff Depth=2.23"
Tc=6.0 min CN=93 Runoff=6.82 cfs 0.348 af

Subcatchment400: Runoff Area=38.360 ac 1.17% Impervious Runoff Depth=1.43"
Flow Length=2,815' Tc=125.8 min CN=83 Runoff=16.52 cfs 4.573 af

Subcatchment410: Runoff Area=2.130 ac 18.78% Impervious Runoff Depth=1.65"
Flow Length=267' Tc=13.0 min CN=86 Runoff=4.81 cfs 0.292 af

Reach 20R-2: feeder creek Avg. Flow Depth=1.31' Max Vel=2.77 fps Inflow=43.27 cfs 15.799 af
n=0.030 L=245.0' S=0.0033 '/' Capacity=97.70 cfs Outflow=43.09 cfs 15.789 af

Reach 22R: property line ditch Avg. Flow Depth=0.20' Max Vel=1.47 fps Inflow=2.76 cfs 0.415 af
n=0.030 L=1,402.0' S=0.0086 '/' Capacity=157.20 cfs Outflow=2.48 cfs 0.415 af

Reach 32R: Long Road ditch Avg. Flow Depth=2.07' Max Vel=1.80 fps Inflow=53.42 cfs 18.816 af
n=0.030 L=47.0' S=0.0009 '/' Capacity=49.57 cfs Outflow=52.97 cfs 18.814 af

Reach 33R-1: I-190 ditch Avg. Flow Depth=0.85' Max Vel=2.28 fps Inflow=49.11 cfs 2.399 af
n=0.030 L=3,824.0' S=0.0036 '/' Capacity=102.11 cfs Outflow=20.45 cfs 2.399 af

Reach 33R-2: I-190 ditch Avg. Flow Depth=1.37' Max Vel=2.96 fps Inflow=52.27 cfs 18.188 af
n=0.030 L=509.0' S=0.0036 '/' Capacity=101.88 cfs Outflow=49.37 cfs 18.169 af

Reach 33R-3: Long Road ditch Avg. Flow Depth=1.36' Max Vel=2.94 fps Inflow=50.18 cfs 18.273 af
n=0.030 L=509.0' S=0.0036 '/' Capacity=101.88 cfs Outflow=48.59 cfs 18.254 af

Reach 40R: Long Road ditch Avg. Flow Depth=2.22' Max Vel=2.00 fps Inflow=64.65 cfs 24.411 af
n=0.030 L=81.0' S=0.0010 '/' Capacity=53.40 cfs Outflow=64.67 cfs 24.406 af

Reach 41R-1: Long Road ditch Avg. Flow Depth=1.37' Max Vel=3.35 fps Inflow=55.84 cfs 19.556 af
n=0.030 L=63.0' S=0.0046 '/' Capacity=115.28 cfs Outflow=55.88 cfs 19.554 af

Reach 41R-2: Long Road ditch Avg. Flow Depth=2.10' Max Vel=1.99 fps Inflow=59.96 cfs 19.846 af
n=0.030 L=127.0' S=0.0010 '/' Capacity=54.36 cfs Outflow=59.54 cfs 19.838 af

Reach 300R: Long Road ditch Avg. Flow Depth=2.04' Max Vel=1.93 fps Inflow=56.16 cfs 19.557 af
n=0.030 L=20.0' S=0.0010 '/' Capacity=53.73 cfs Outflow=55.84 cfs 19.556 af

Reach 310R: Long Road ditch Avg. Flow Depth=1.22' Max Vel=3.72 fps Inflow=52.97 cfs 18.814 af
n=0.030 L=45.0' S=0.0064 '/' Capacity=136.40 cfs Outflow=53.01 cfs 18.812 af

Reach DP-2: feeder creek on property portion Inflow=43.27 cfs 15.799 af
Outflow=43.27 cfs 15.799 af

Reach DP-3: entrance to twin 36" culverts on adjancent property Inflow=55.84 cfs 19.556 af
Outflow=55.84 cfs 19.556 af

Reach DP-4: entrance to headwall Inflow=64.67 cfs 24.406 af
Outflow=64.67 cfs 24.406 af

Pond 30C: twin 36" culverts Peak Elev=568.38' Inflow=55.84 cfs 19.556 af
Primary=28.79 cfs 14.821 af Secondary=27.05 cfs 4.735 af Outflow=55.84 cfs 19.556 af

Pond 32C: twin 36" culverts Peak Elev=568.25' Inflow=52.97 cfs 18.814 af
Primary=25.91 cfs 9.681 af Secondary=27.06 cfs 9.133 af Outflow=52.97 cfs 18.814 af

Pond 33C: twin 30" culverts Peak Elev=569.73' Inflow=53.42 cfs 18.816 af
Primary=26.71 cfs 9.336 af Secondary=26.71 cfs 9.481 af Outflow=53.42 cfs 18.816 af

Pond 34C: twin 36" culverts Peak Elev=572.55' Inflow=2.11 cfs 0.105 af
Primary=1.06 cfs 0.052 af Secondary=1.06 cfs 0.052 af Outflow=2.12 cfs 0.105 af

Pond 41C-1: twin 36" culverts Peak Elev=567.85' Inflow=55.88 cfs 19.554 af
Primary=28.18 cfs 10.442 af Secondary=27.70 cfs 9.112 af Outflow=55.88 cfs 19.554 af

Pond 41C-2: twin 36" culverts Peak Elev=568.15' Inflow=59.54 cfs 19.838 af
Primary=29.77 cfs 9.919 af Secondary=29.77 cfs 9.919 af Outflow=59.54 cfs 19.838 af

Pond 310C: box culvert under access driveway Peak Elev=567.61' Inflow=53.98 cfs 18.895 af
72.0" x 24.0" Box Culvert n=0.012 L=105.0' S=0.0010 '/' Outflow=53.98 cfs 18.895 af

Pond 350Bio: bioretention Peak Elev=571.77' Storage=8,274 cf Inflow=6.14 cfs 0.348 af
Outflow=0.16 cfs 0.301 af

Pond 350F: forebay Peak Elev=571.81' Storage=16,094 cf Inflow=6.82 cfs 0.348 af
Outflow=6.14 cfs 0.348 af

Pond DMH110: manhole Peak Elev=567.04' Inflow=0.16 cfs 0.301 af
15.0" Round Culvert n=0.013 L=109.0' S=0.0073 '/' Outflow=0.16 cfs 0.301 af

Pond DMH111: manhole Peak Elev=567.02' Inflow=0.16 cfs 0.301 af
15.0" Round Culvert n=0.013 L=104.0' S=0.0075 '/' Outflow=0.16 cfs 0.301 af

Pond DMH112: manhole Peak Elev=567.02' Inflow=7.46 cfs 0.662 af
18.0" Round Culvert n=0.013 L=31.0' S=0.0042 '/' Outflow=7.46 cfs 0.662 af

Link 10-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 2~Reach 200R-6.hce Inflow=39.74 cfs 11.042 af
Area= 152.510 ac 20.93% Imperv. Primary=39.74 cfs 11.042 af

Link 10-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 2~Reach 233R.hce Inflow=23.74 cfs 4.204 af
Area= 33.760 ac 73.79% Imperv. Primary=23.74 cfs 4.204 af

Total Runoff Area = 71.090 ac Runoff Volume = 9.277 af Average Runoff Depth = 1.57"
88.37% Pervious = 62.820 ac 11.63% Impervious = 8.270 ac

Summary for Subcatchment 201:

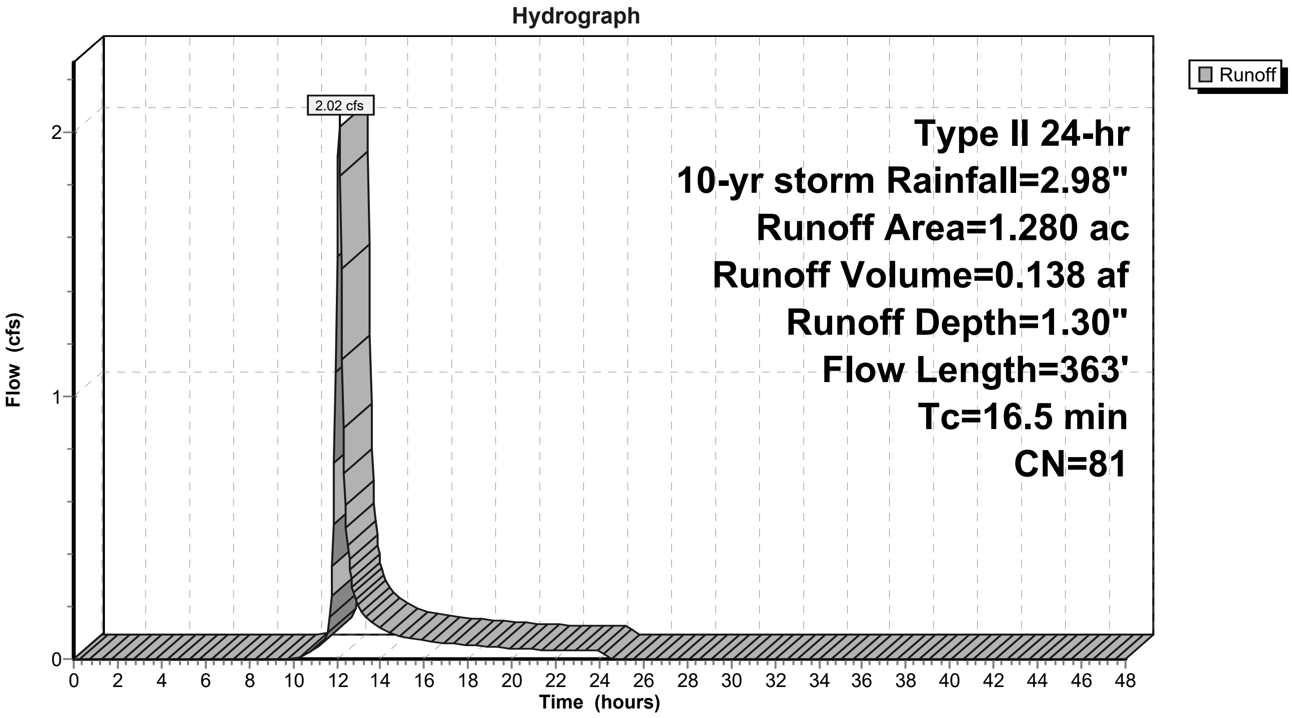
Runoff = 2.02 cfs @ 12.09 hrs, Volume= 0.138 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	0.370	84	50-75% Grass cover, Fair, HSG D
	0.870	79	Woods, Fair, HSG D
	0.030	98	Water Surface, 0% imp, HSG D
*	0.010	84	50-75% Grass cover, Fair, HSG D (offsite)
	1.280	81	Weighted Average
	1.280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	33	0.3300	0.34		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
9.8	67	0.0150	0.11		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 2.13"
5.1	263	0.0150	0.86		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
16.5	363	Total			

Subcatchment 201:



Summary for Subcatchment 220:

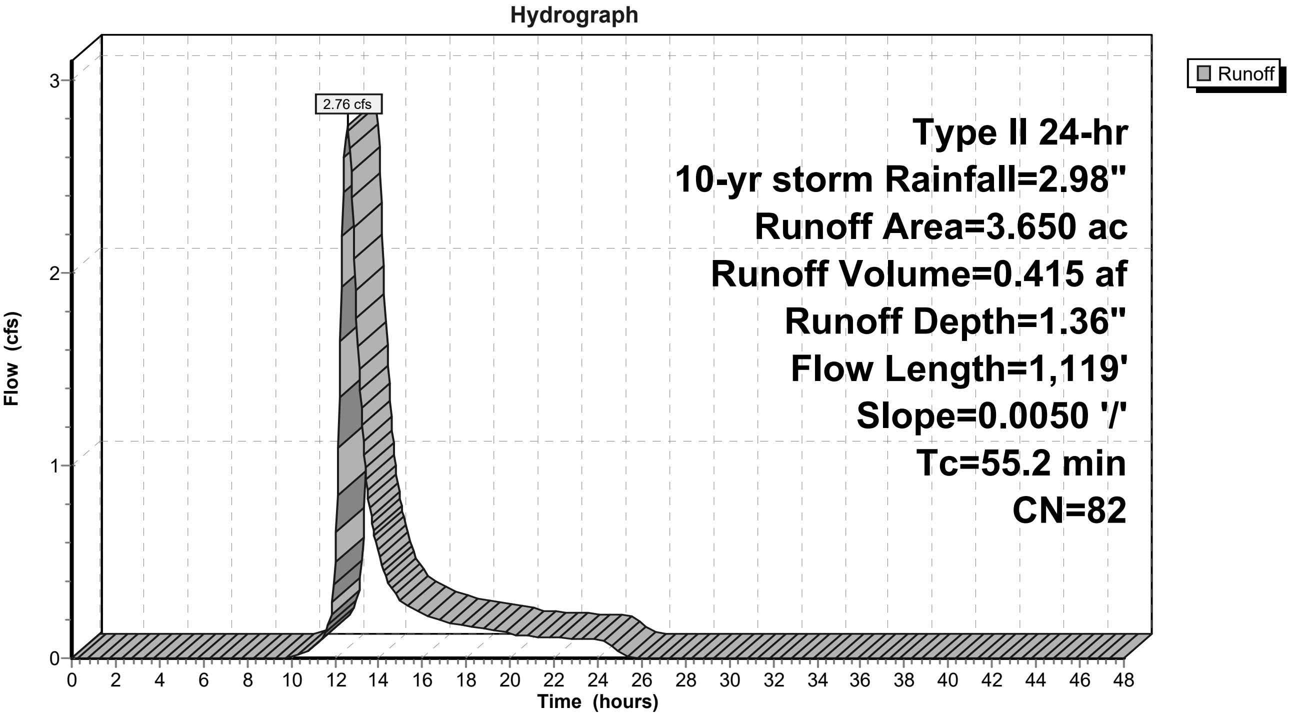
Runoff = 2.76 cfs @ 12.58 hrs, Volume= 0.415 af, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	0.830	84	50-75% Grass cover, Fair, HSG D
	1.410	79	Woods, Fair, HSG D
*	0.770	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.490	79	Woods, Fair, HSG D (offsite)
*	0.150	98	Water Surface, 0% imp, HSG D (offsite)
	3.650	82	Weighted Average
	3.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0050	0.08		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
34.3	1,019	0.0050	0.49		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
55.2	1,119	Total			

Subcatchment 220:



Summary for Subcatchment 300:

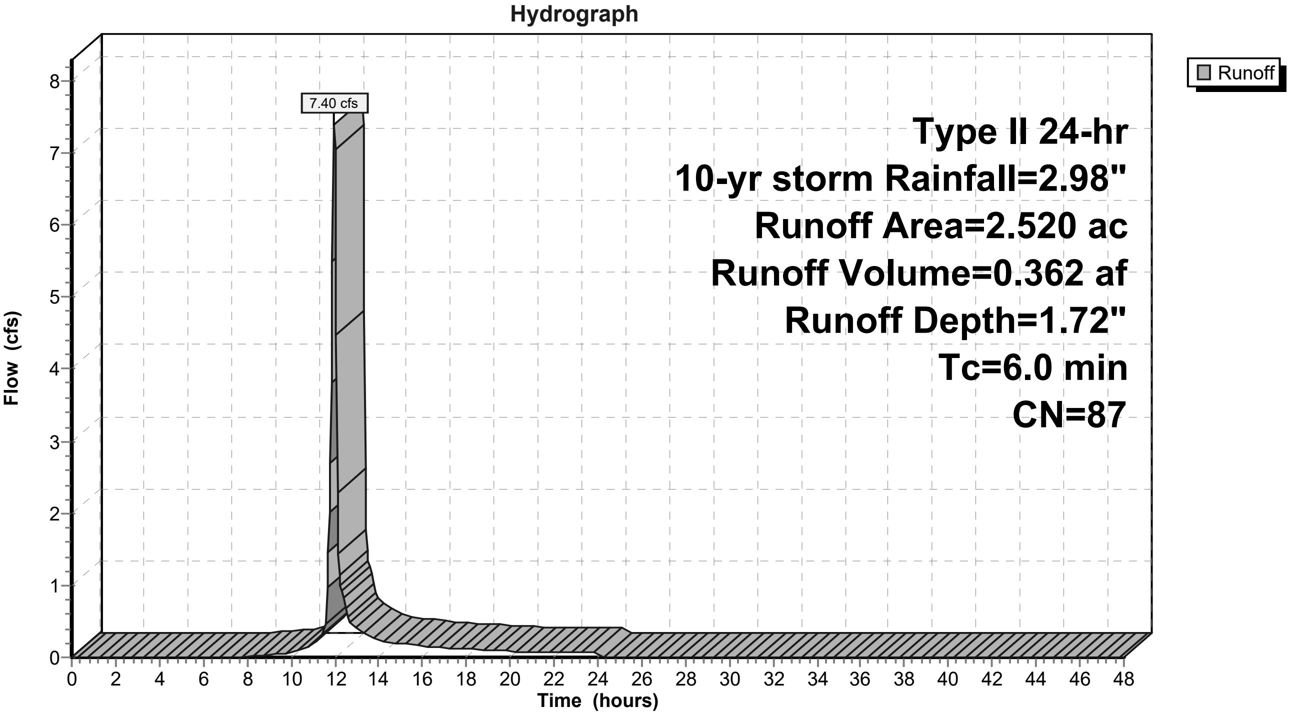
Runoff = 7.40 cfs @ 11.97 hrs, Volume= 0.362 af, Depth= 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	1.480	84	50-75% Grass cover, Fair, HSG D
	0.510	98	Paved parking, HSG D
*	0.420	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.100	98	Paved parking, HSG D (offsite)
*	0.010	98	Water Surface, 0% imp, HSG D (offsite)
	2.520	87	Weighted Average
	1.910		75.79% Pervious Area
	0.610		24.21% Impervious Area

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

Subcatchment 300:



Summary for Subcatchment 310:

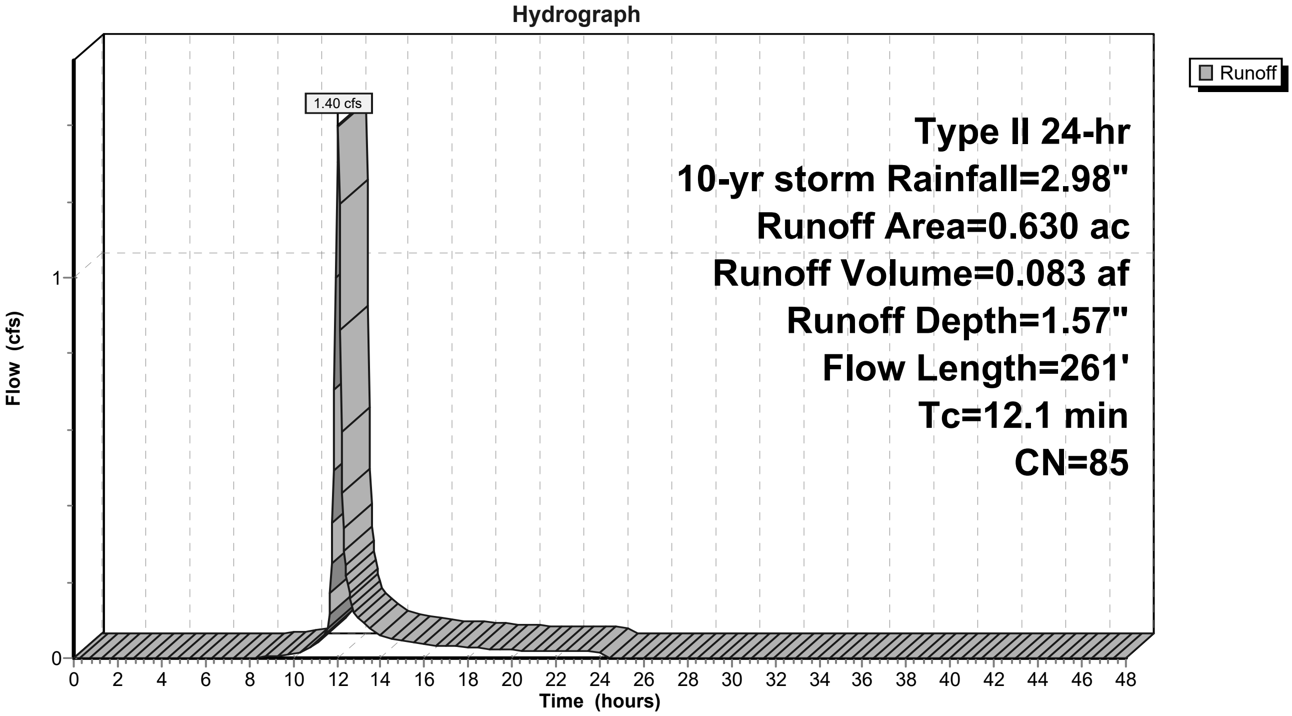
Runoff = 1.40 cfs @ 12.04 hrs, Volume= 0.083 af, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	0.160	84	50-75% Grass cover, Fair, HSG D
	0.010	98	Water Surface, 0% imp, HSG D
*	0.310	79	50-75% Grass cover, Fair, HSG C (offsite)
*	0.130	98	Paved parking, HSG D (offsite)
*	0.010	79	Woods, Fair, HSG D (offsite)
*	0.010	98	Water Surface, 0% imp, HSG D (offsite)
	0.630	85	Weighted Average
	0.500		79.37% Pervious Area
	0.130		20.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	100	0.0300	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
1.9	161	0.0400	1.40		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
12.1	261	Total			

Subcatchment 310:



Summary for Subcatchment 320:

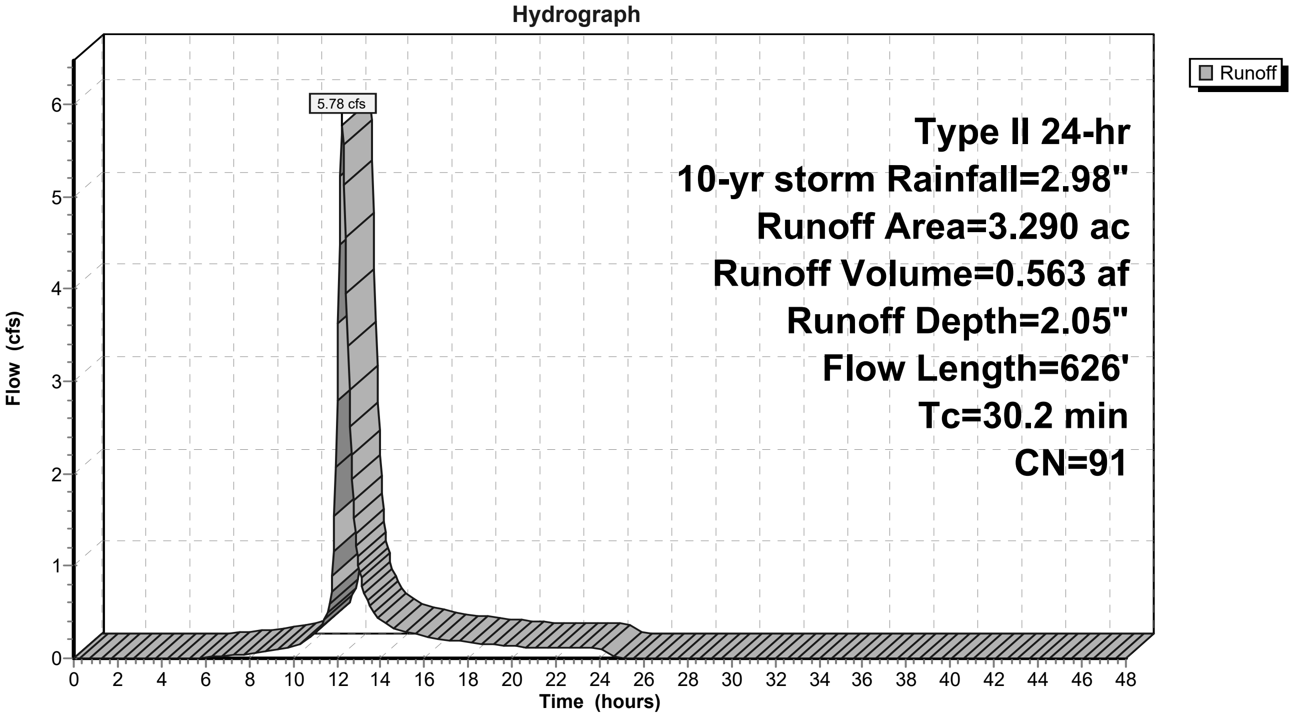
Runoff = 5.78 cfs @ 12.24 hrs, Volume= 0.563 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
1.530	84	50-75% Grass cover, Fair, HSG D
1.130	98	Water Surface, HSG D
0.620	98	Roofs, HSG D
0.010	98	Water Surface, 0% imp, HSG D
3.290	91	Weighted Average
1.540		46.81% Pervious Area
1.750		53.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	100	0.0300	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
16.6	171	0.0006	0.17		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
2.7	277	0.0070	1.70		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.7	78	0.0800	1.98		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
30.2	626	Total			

Subcatchment 320:



Summary for Subcatchment 330:

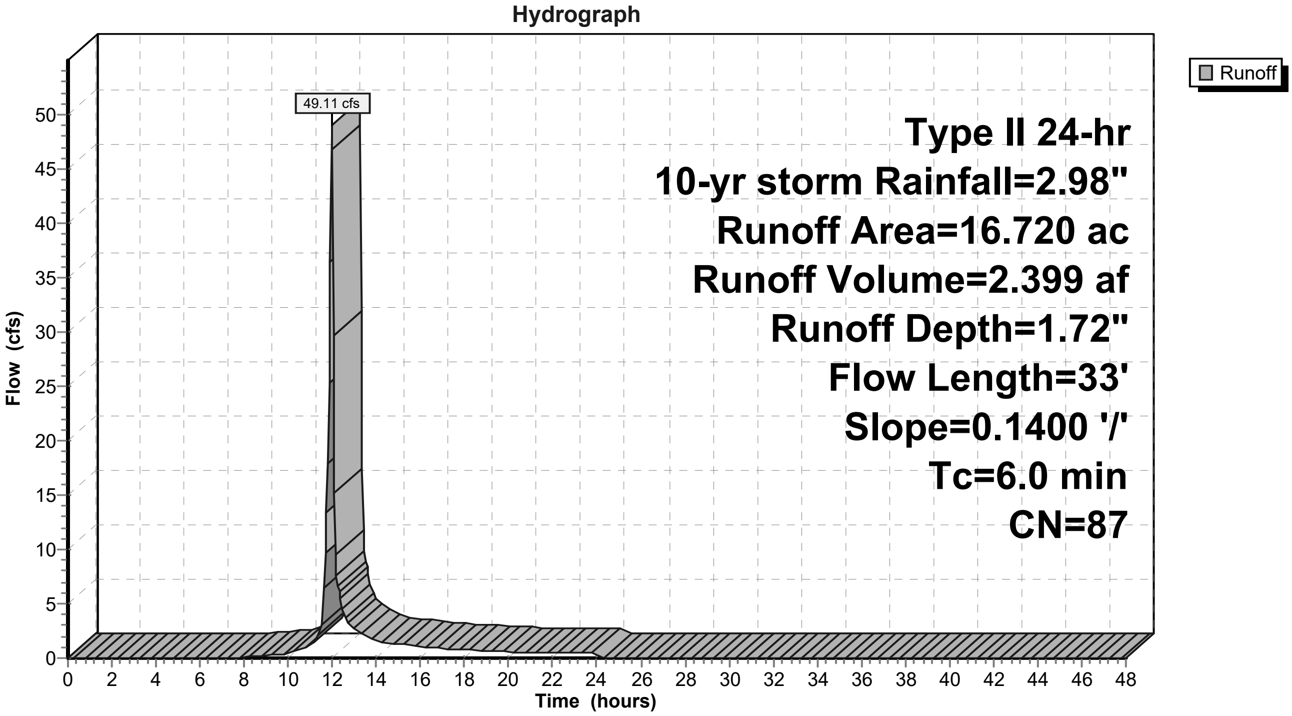
Runoff = 49.11 cfs @ 11.97 hrs, Volume= 2.399 af, Depth= 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	0.050	84	50-75% Grass cover, Fair, HSG D
	0.620	79	Woods, Fair, HSG D
*	11.780	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.350	79	Woods, Fair, HSG D (offsite)
*	2.850	98	Paved parking, HSG D (offsite)
*	0.590	98	Roofs, HSG D (offsite)
*	0.010	91	Gravel roads, HSG D (offiste)
*	0.470	98	Water Surface, 0% imp, HSG D (offsite)
	16.720	87	Weighted Average
	13.280		79.43% Pervious Area
	3.440		20.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	33	0.1400	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.3	33	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 330:



Summary for Subcatchment 340:

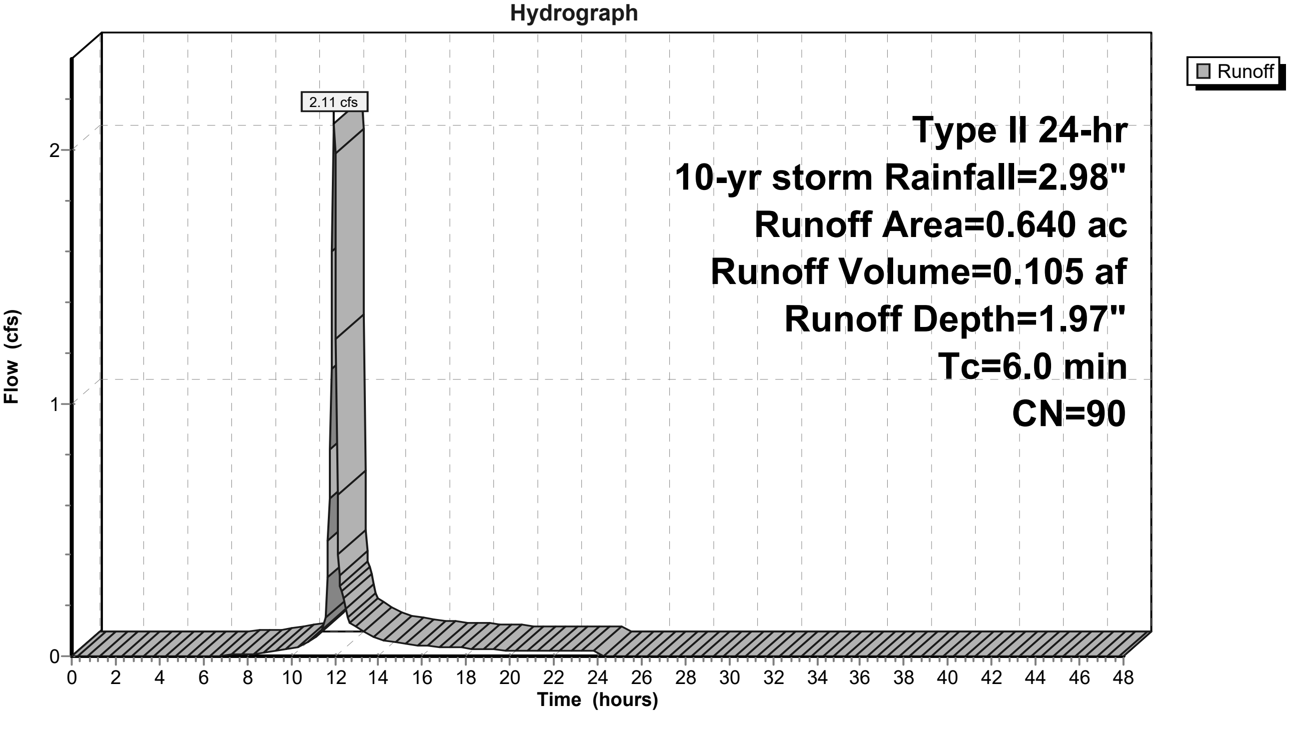
Runoff = 2.11 cfs @ 11.97 hrs, Volume= 0.105 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
*	0.350	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.270	98	Paved parking, HSG D (offsite)
*	0.020	98	Water Surface, 0% imp, HSG D (offsite)
	0.640	90	Weighted Average
	0.370		57.81% Pervious Area
	0.270		42.19% Impervious Area

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

Subcatchment 340:



Summary for Subcatchment 350:

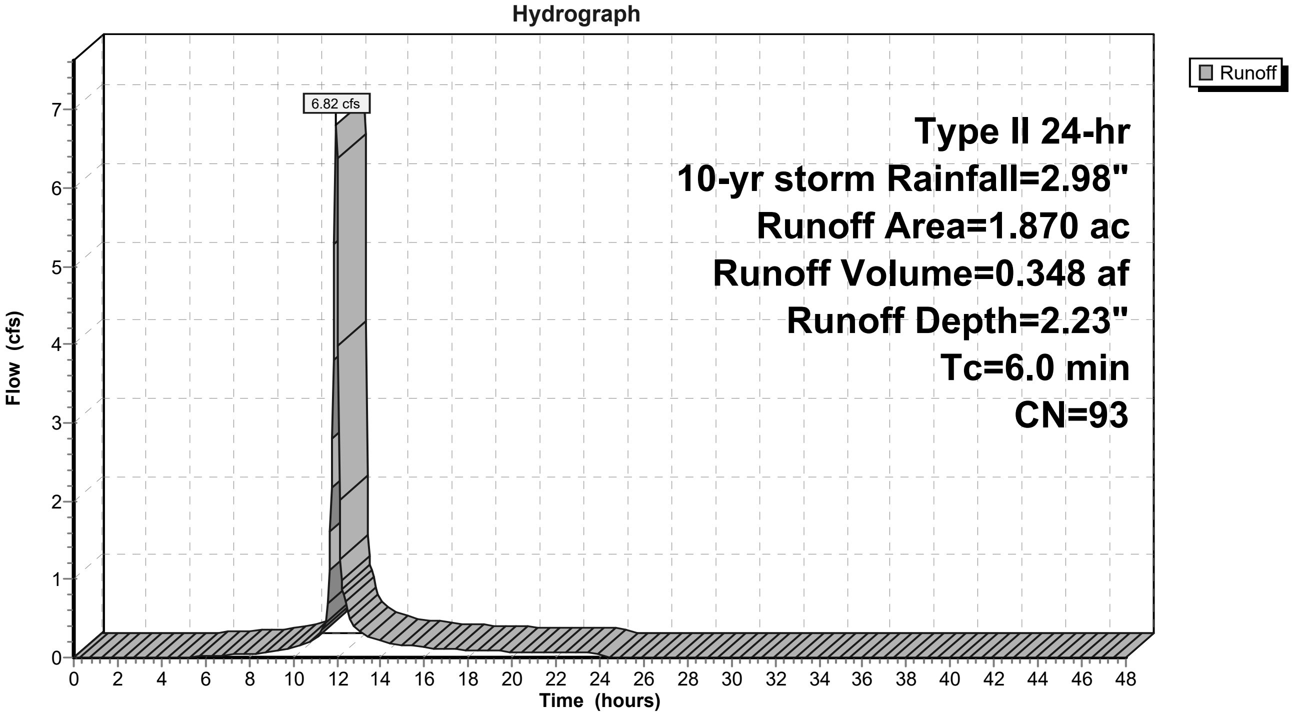
Runoff = 6.82 cfs @ 11.96 hrs, Volume= 0.348 af, Depth= 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

Area (ac)	CN	Description
0.650	84	50-75% Grass cover, Fair, HSG D
1.220	98	Paved parking, HSG D
1.870	93	Weighted Average
0.650		34.76% Pervious Area
1.220		65.24% Impervious Area

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

Subcatchment 350:



Summary for Subcatchment 400:

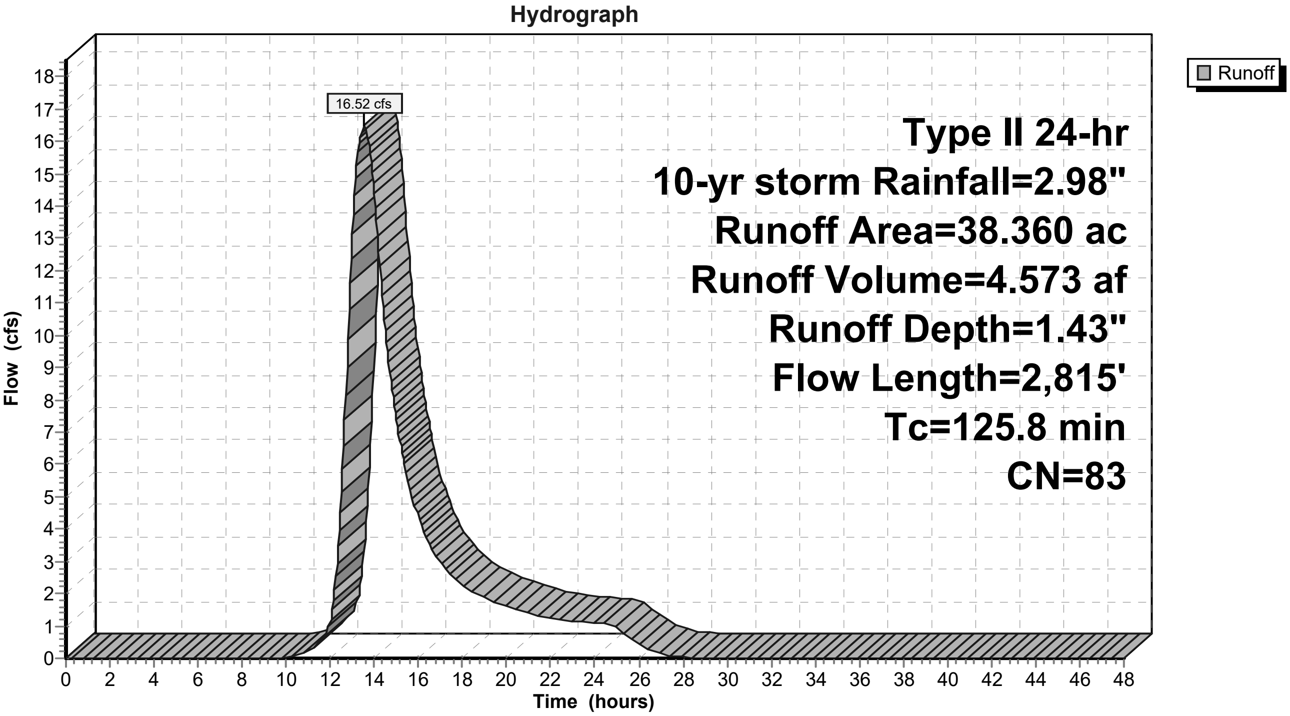
Runoff = 16.52 cfs @ 13.54 hrs, Volume= 4.573 af, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
	2.420	79	50-75% Grass cover, Fair, HSG C
	0.230	98	Paved parking, HSG D
	0.240	73	Woods, Fair, HSG C
	14.170	84	50-75% Grass cover, Fair, HSG D
	6.170	79	Woods, Fair, HSG D
*	0.390	79	50-75% Grass cover, Fair, HSG C (offsite)
*	0.300	73	Woods, Fair, HSG C (offsite)
*	14.170	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.030	79	Woods, Fair, HSG D (offsite)
*	0.130	98	Paved parking, HSG D (offsite)
*	0.090	98	Roofs, HSG D (offsite)
*	0.020	98	Water Surface, 0% imp, HSG D (offsite)
	38.360	83	Weighted Average
	37.910		98.83% Pervious Area
	0.450		1.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.1	100	0.0070	0.04		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
72.2	1,370	0.0040	0.32		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	91	0.1500	2.71		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
10.1	378	0.0080	0.63		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
2.8	876	0.0160	5.26	57.86	**Channel Flow, E-F** Area= 11.0 sf Perim= 14.3' r= 0.77' n= 0.030 Earth, grassed & winding
125.8	2,815	Total			

Subcatchment 400:



Summary for Subcatchment 410:

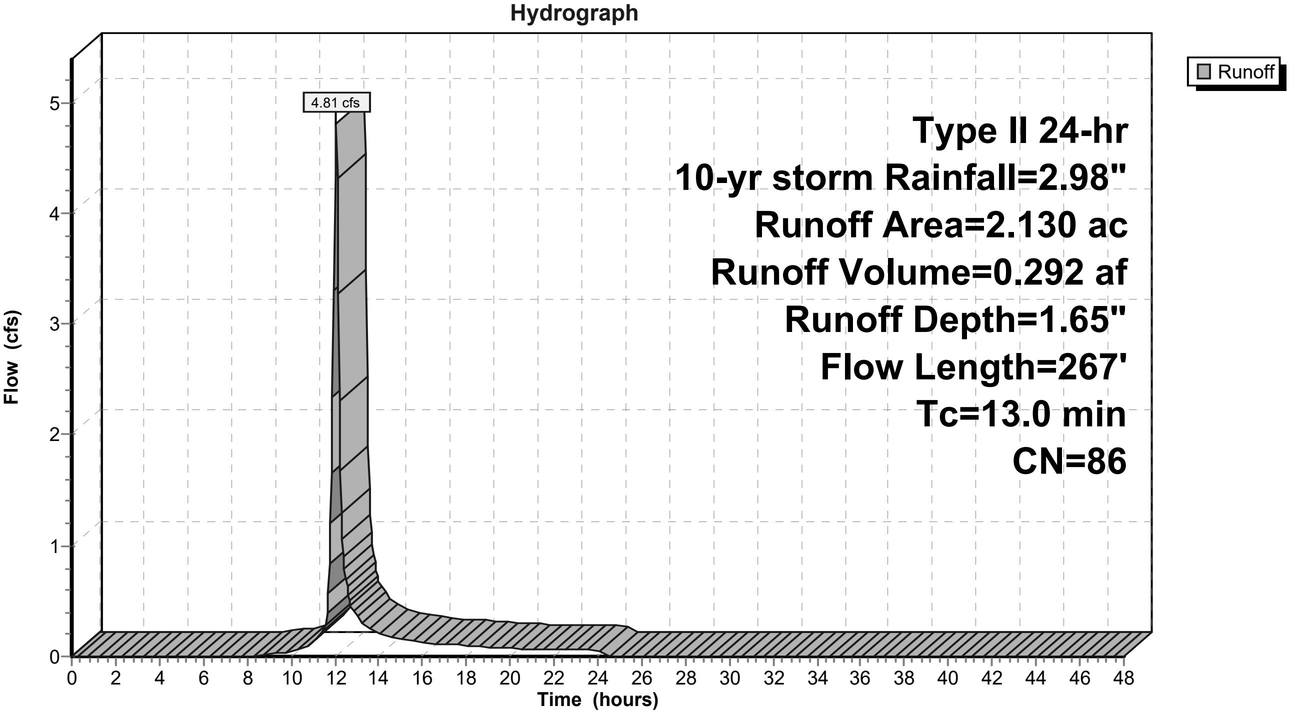
Runoff = 4.81 cfs @ 12.05 hrs, Volume= 0.292 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr storm Rainfall=2.98"

	Area (ac)	CN	Description
*	1.430	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.210	98	Paved parking, HSG D (offsite)
*	0.190	98	Roofs, HSG D (offsite)
*	0.260	79	Woods, Fair, HSG D (offsite)
*	0.040	98	Water Surface, 0% imp, HSG D (offsite)
	2.130	86	Weighted Average
	1.730		81.22% Pervious Area
	0.400		18.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0270	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.3	167	0.0300	1.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
13.0	267	Total			

Subcatchment 410:



Summary for Reach 20R-2: feeder creek

Inflow Area = 191.200 ac, 29.72% Impervious, Inflow Depth > 0.99" for 10-yr storm event
Inflow = 43.27 cfs @ 13.21 hrs, Volume= 15.799 af
Outflow = 43.09 cfs @ 13.24 hrs, Volume= 15.789 af, Atten= 0%, Lag= 1.4 min

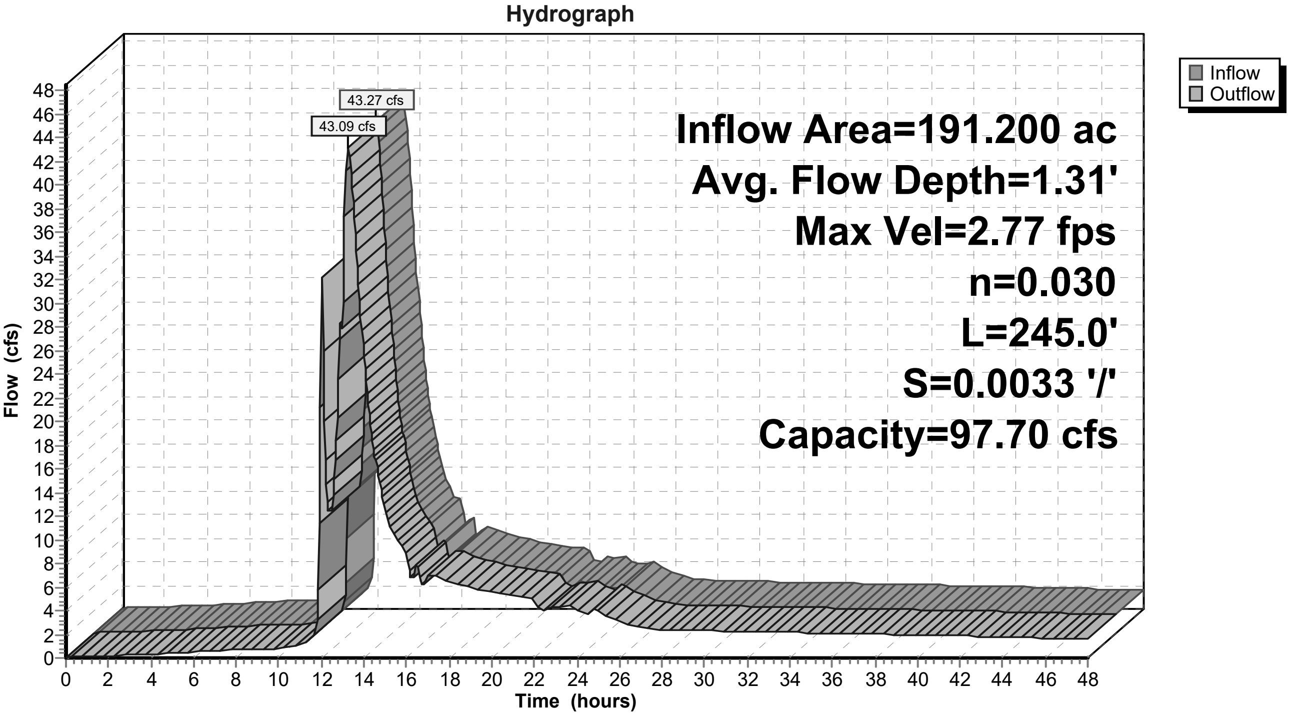
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.77 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.09 fps, Avg. Travel Time= 3.7 min

Peak Storage= 3,815 cf @ 13.24 hrs
Average Depth at Peak Storage= 1.31'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 97.70 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 245.0' Slope= 0.0033 '/'
Inlet Invert= 572.00', Outlet Invert= 571.19'

‡

Reach 20R-2: feeder creek



Summary for Reach 22R: property line ditch

Inflow Area =	3.650 ac,	0.00% Impervious, Inflow Depth = 1.36"	for 10-yr storm event		
Inflow =	2.76 cfs @	12.58 hrs, Volume=	0.415 af		
Outflow =	2.48 cfs @	12.77 hrs, Volume=	0.415 af,	Atten= 10%,	Lag= 11.6 min

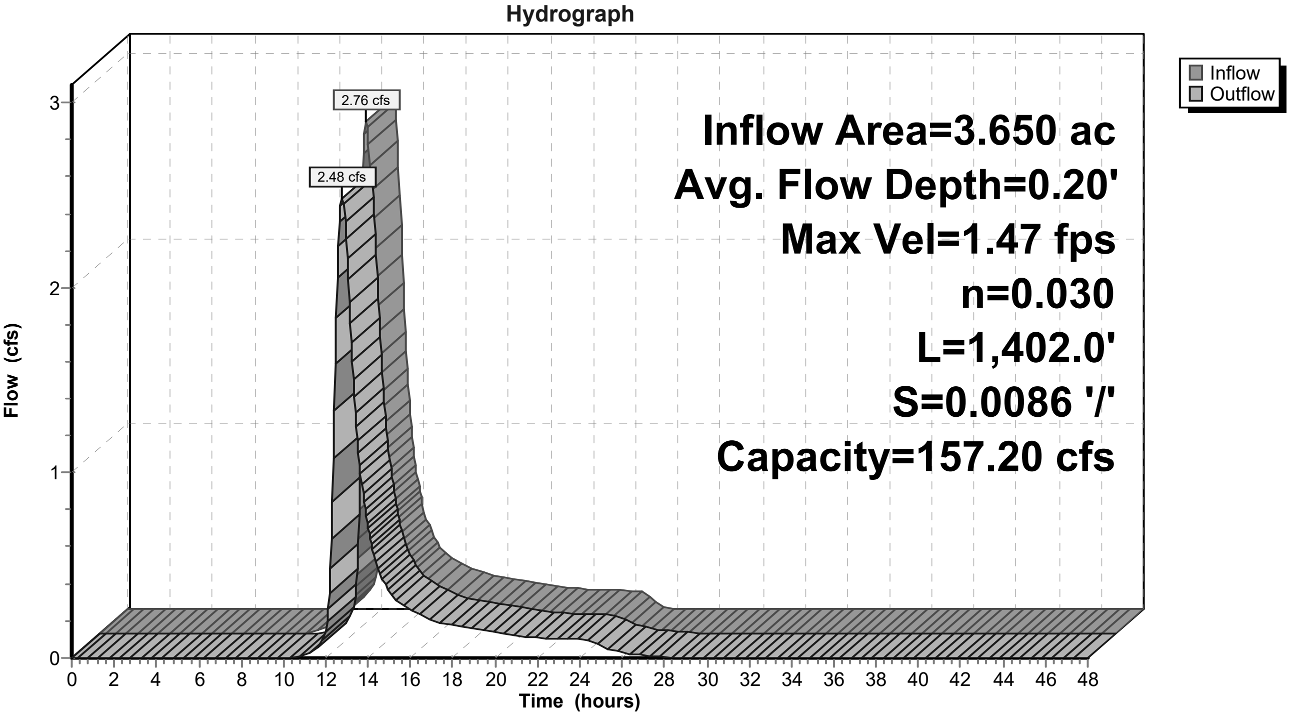
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.47 fps, Min. Travel Time= 15.9 min
Avg. Velocity = 0.50 fps, Avg. Travel Time= 47.1 min

Peak Storage= 2,359 cf @ 12.77 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 157.20 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 1,402.0' Slope= 0.0086 '/'
Inlet Invert= 584.00', Outlet Invert= 572.00'

‡

Reach 22R: property line ditch



Summary for Reach 32R: Long Road ditch

Inflow Area =	211.850 ac, 29.40% Impervious,	Inflow Depth > 1.07"	for 10-yr storm event	
Inflow =	53.42 cfs @	12.12 hrs, Volume=	18.816 af	
Outflow =	52.97 cfs @	12.13 hrs, Volume=	18.814 af,	Atten= 1%, Lag= 0.5 min

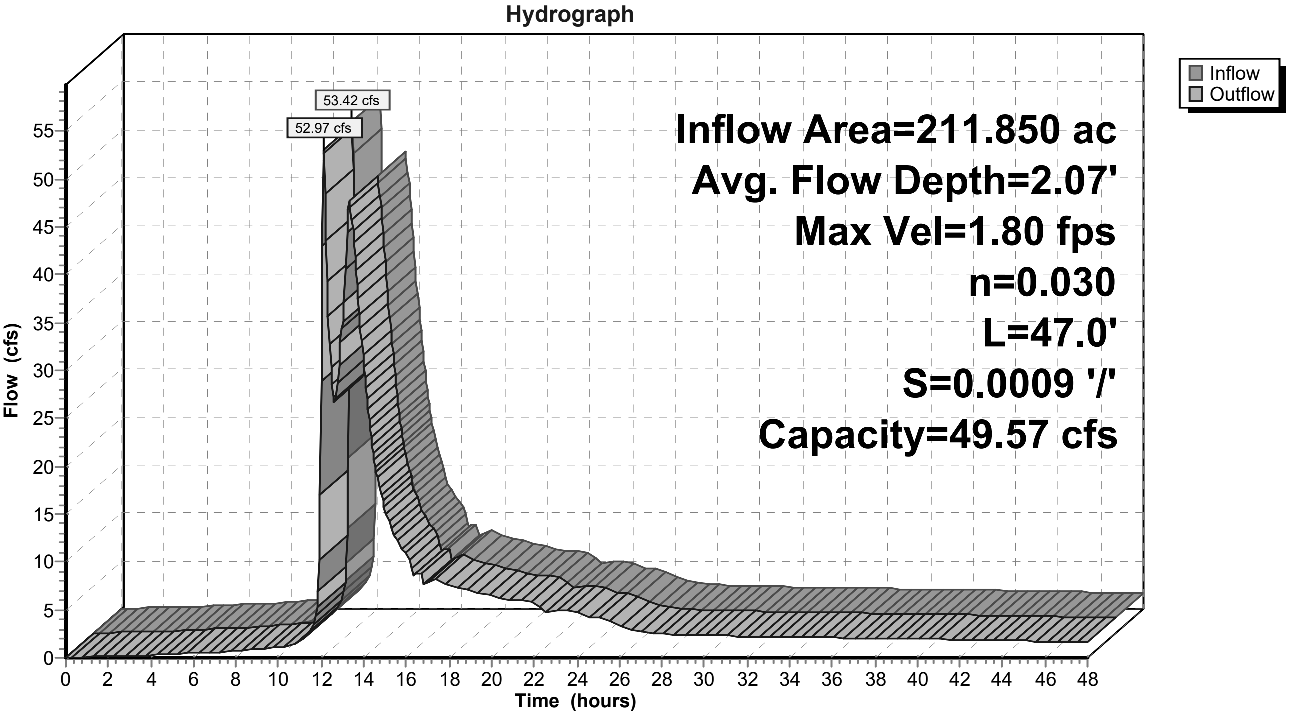
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.80 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 1.1 min

Peak Storage= 1,382 cf @ 12.13 hrs
Average Depth at Peak Storage= 2.07'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 49.57 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 47.0' Slope= 0.0009 '/'
Inlet Invert= 565.64', Outlet Invert= 565.60'

‡

Reach 32R: Long Road ditch



Summary for Reach 33R-1: I-190 ditch

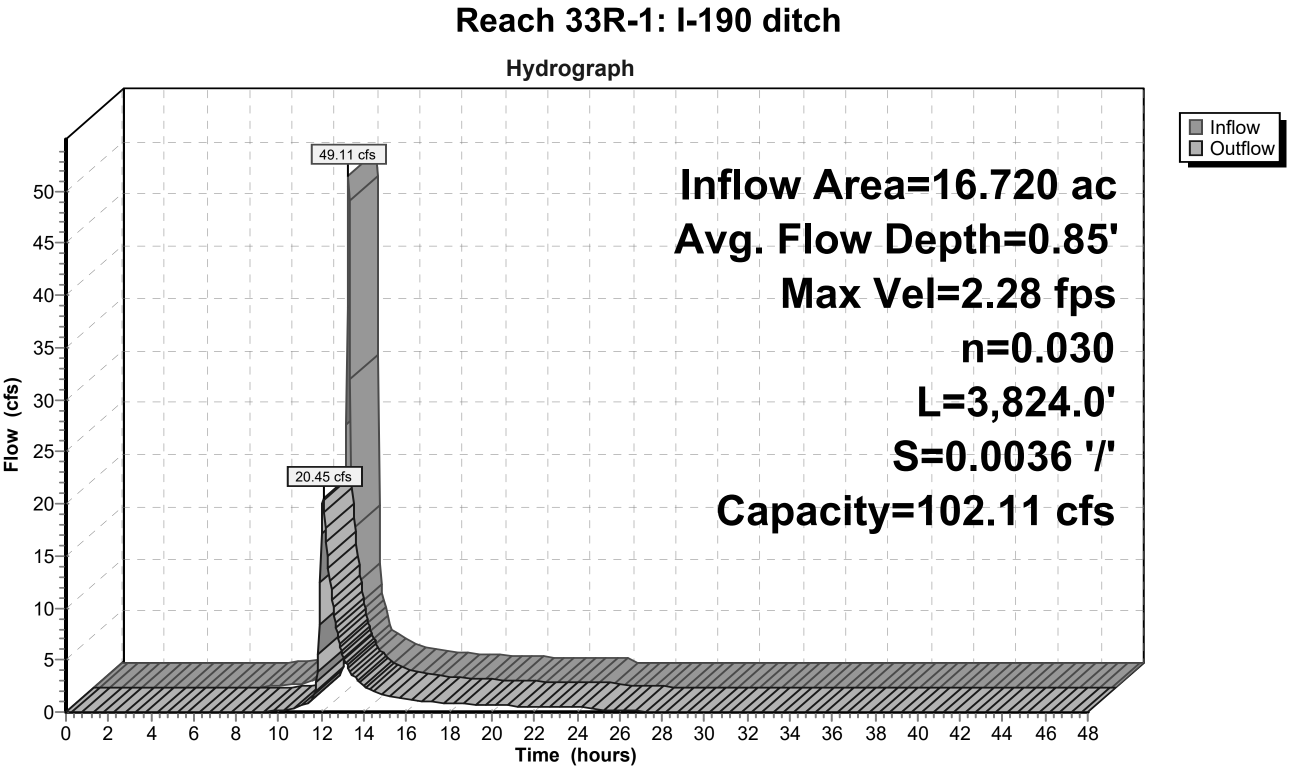
Inflow Area = 16.720 ac, 20.57% Impervious, Inflow Depth = 1.72" for 10-yr storm event
Inflow = 49.11 cfs @ 11.97 hrs, Volume= 2.399 af
Outflow = 20.45 cfs @ 12.09 hrs, Volume= 2.399 af, Atten= 58%, Lag= 7.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.28 fps, Min. Travel Time= 28.0 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 137.3 min

Peak Storage= 34,291 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.85'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 102.11 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 3,824.0' Slope= 0.0036 '/'
Inlet Invert= 585.00', Outlet Invert= 571.19'

‡



Summary for Reach 33R-2: I-190 ditch

Inflow Area = 207.920 ac, 28.99% Impervious, Inflow Depth > 1.05" for 10-yr storm event
Inflow = 52.27 cfs @ 12.05 hrs, Volume= 18.188 af
Outflow = 49.37 cfs @ 12.08 hrs, Volume= 18.169 af, Atten= 6%, Lag= 2.3 min

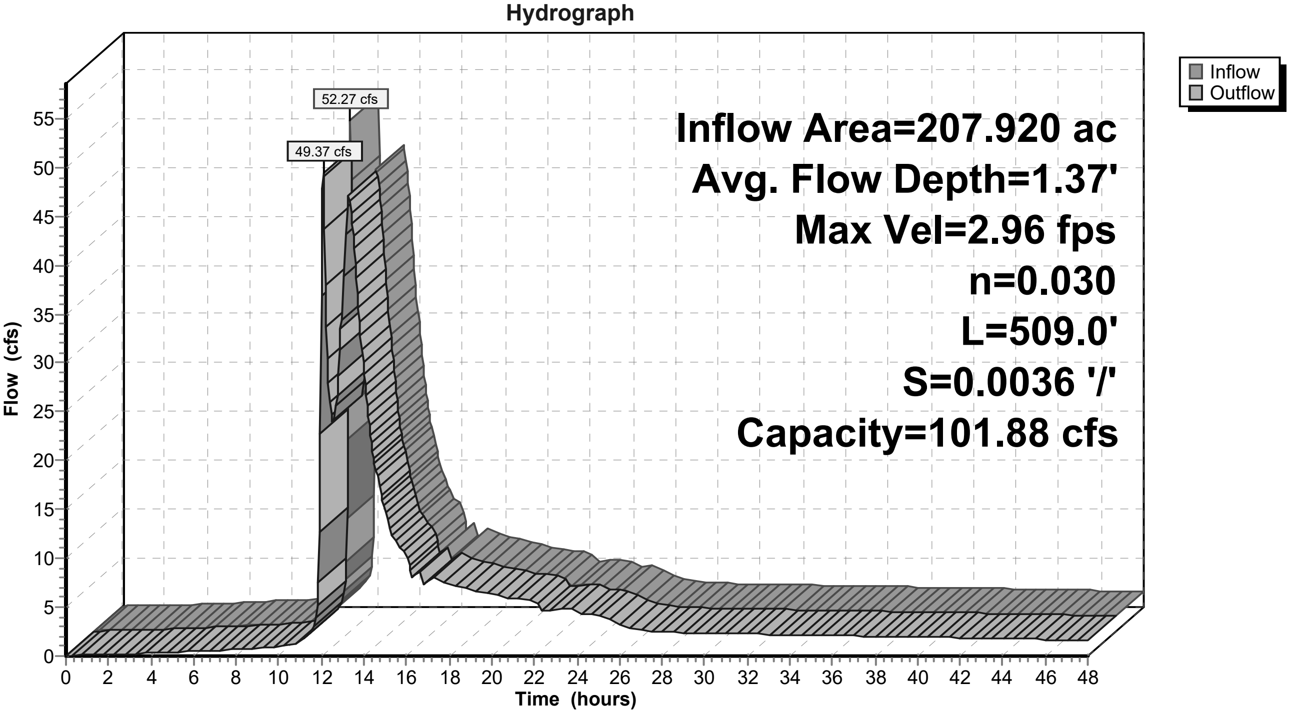
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.96 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 1.15 fps, Avg. Travel Time= 7.4 min

Peak Storage= 8,475 cf @ 12.08 hrs
Average Depth at Peak Storage= 1.37'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 101.88 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 509.0' Slope= 0.0036 '/'
Inlet Invert= 571.19', Outlet Invert= 569.36'

‡

Reach 33R-2: I-190 ditch



Summary for Reach 33R-3: Long Road ditch

Inflow Area =	208.560 ac, 29.03% Impervious, Inflow Depth > 1.05"	for 10-yr storm event	
Inflow =	50.18 cfs @ 12.08 hrs, Volume=	18.273 af	
Outflow =	48.59 cfs @ 12.12 hrs, Volume=	18.254 af, Atten= 3%, Lag= 2.4 min	

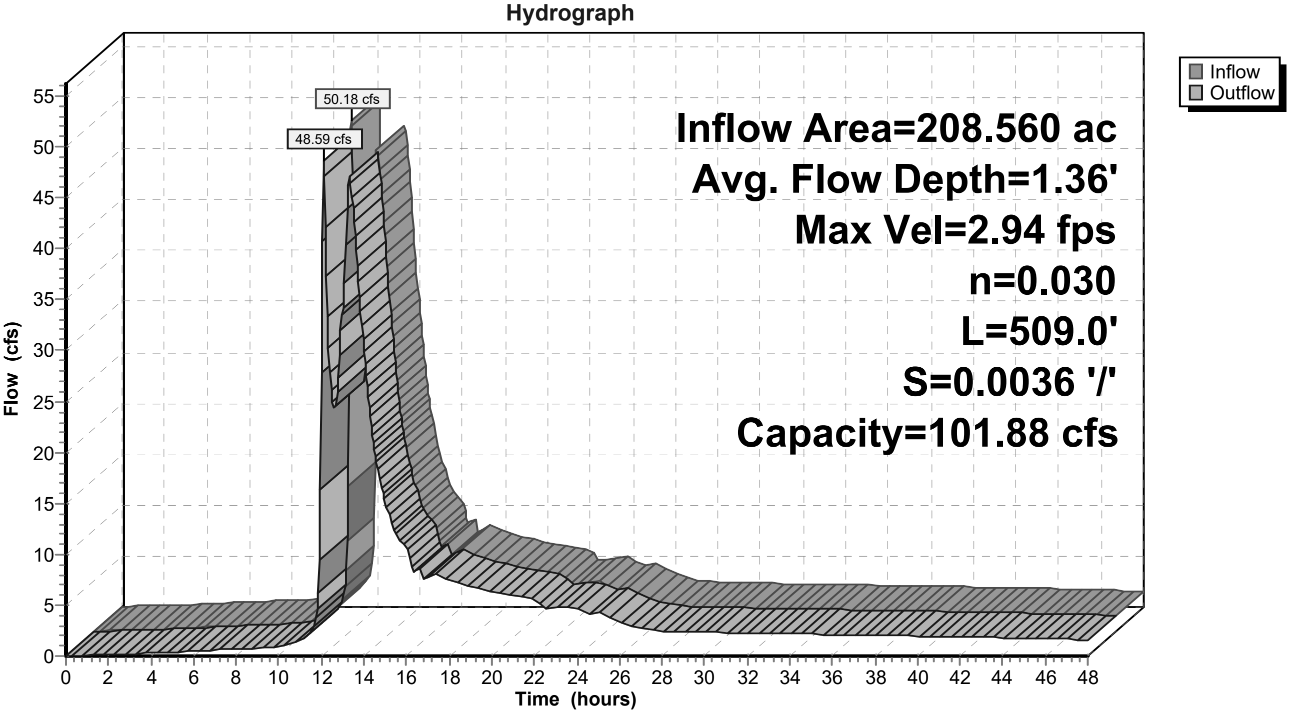
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.94 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 1.15 fps, Avg. Travel Time= 7.3 min

Peak Storage= 8,381 cf @ 12.12 hrs
Average Depth at Peak Storage= 1.36'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 101.88 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 509.0' Slope= 0.0036 '/'
Inlet Invert= 571.19', Outlet Invert= 569.36'

‡

Reach 33R-3: Long Road ditch



Summary for Reach 40R: Long Road ditch

Inflow Area = 257.360 ac, 25.30% Impervious, Inflow Depth > 1.14" for 10-yr storm event
Inflow = 64.65 cfs @ 13.35 hrs, Volume= 24.411 af
Outflow = 64.67 cfs @ 13.36 hrs, Volume= 24.406 af, Atten= 0%, Lag= 0.5 min

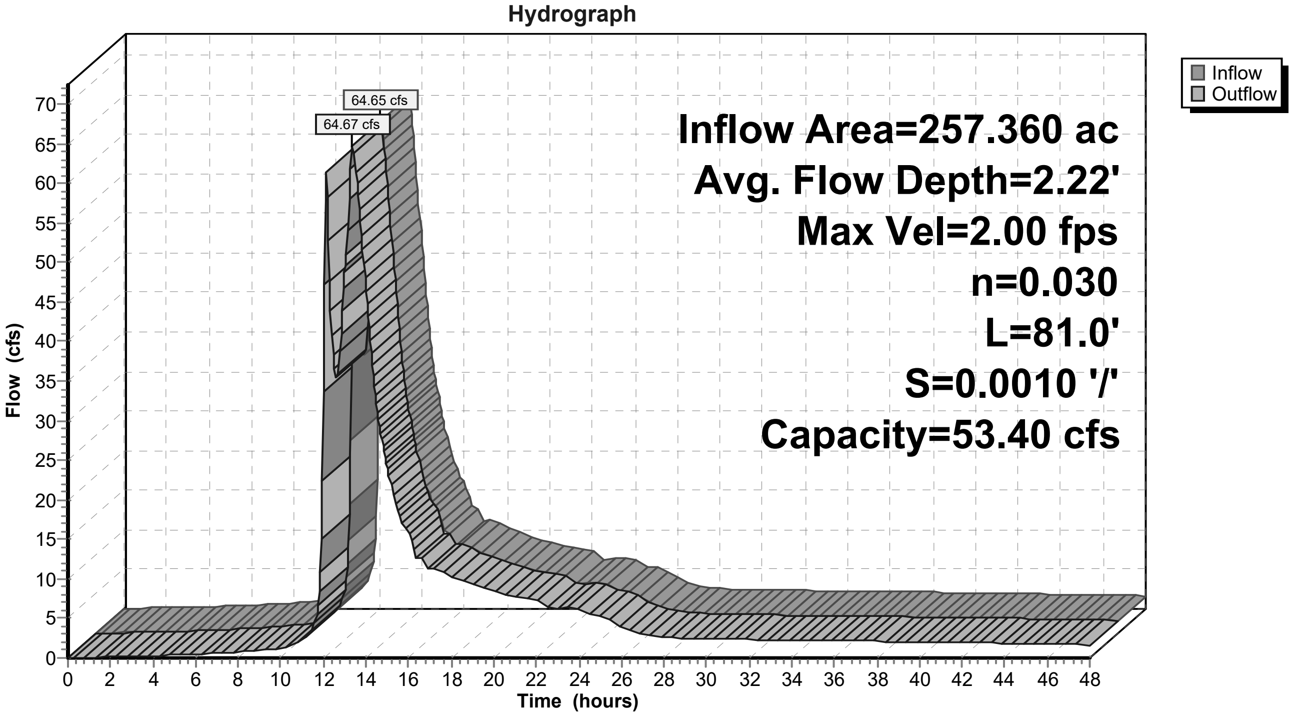
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.00 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 1.7 min

Peak Storage= 2,615 cf @ 13.36 hrs
Average Depth at Peak Storage= 2.22'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 53.40 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 81.0' Slope= 0.0010 '/'
Inlet Invert= 564.47', Outlet Invert= 564.39'

‡

Reach 40R: Long Road ditch



Summary for Reach 41R-1: Long Road ditch

Inflow Area =	216.870 ac,	29.63% Impervious,	Inflow Depth > 1.08"	for 10-yr storm event	
Inflow =	55.84 cfs @	12.13 hrs,	Volume=	19.556 af	
Outflow =	55.88 cfs @	12.13 hrs,	Volume=	19.554 af,	Atten= 0%, Lag= 0.3 min

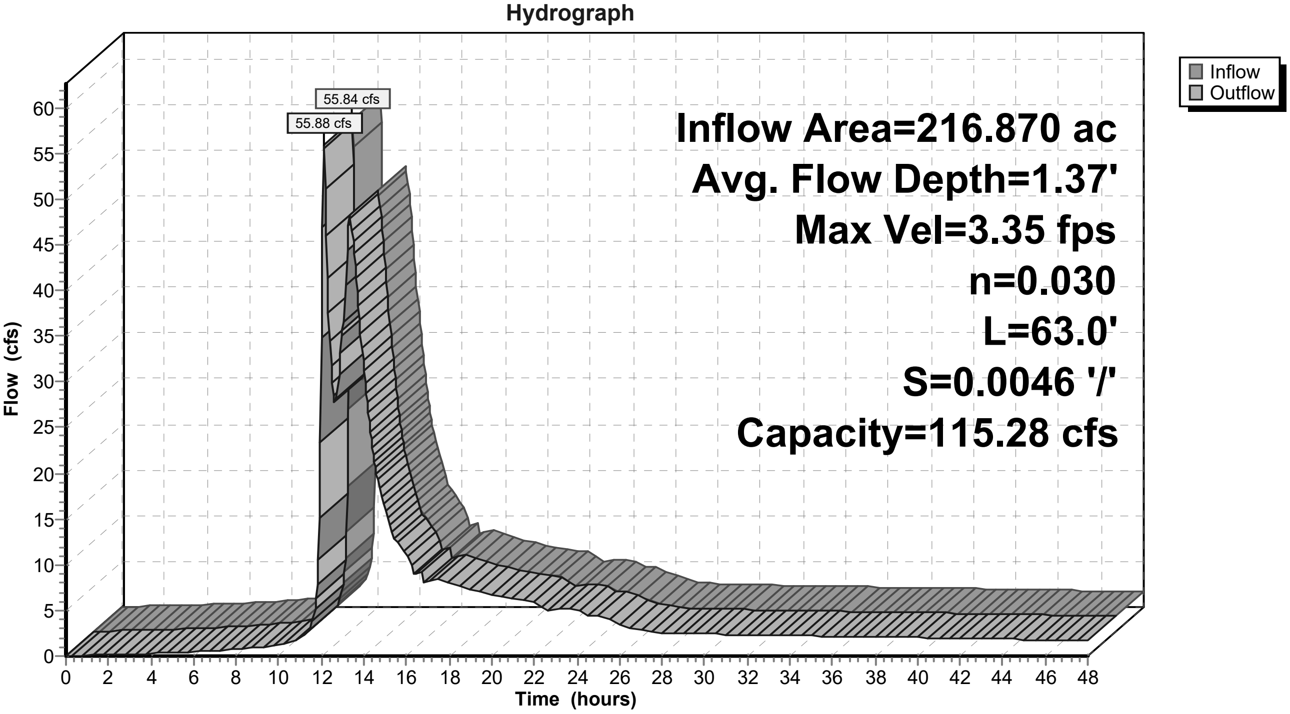
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 3.35 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.28 fps, Avg. Travel Time= 0.8 min

Peak Storage= 1,049 cf @ 12.13 hrs
Average Depth at Peak Storage= 1.37'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 115.28 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 63.0' Slope= 0.0046 '/'
Inlet Invert= 564.87', Outlet Invert= 564.58'

‡

Reach 41R-1: Long Road ditch



Summary for Reach 41R-2: Long Road ditch

Inflow Area = 219.000 ac, 29.52% Impervious, Inflow Depth > 1.09" for 10-yr storm event
Inflow = 59.96 cfs @ 12.12 hrs, Volume= 19.846 af
Outflow = 59.54 cfs @ 12.14 hrs, Volume= 19.838 af, Atten= 1%, Lag= 1.0 min

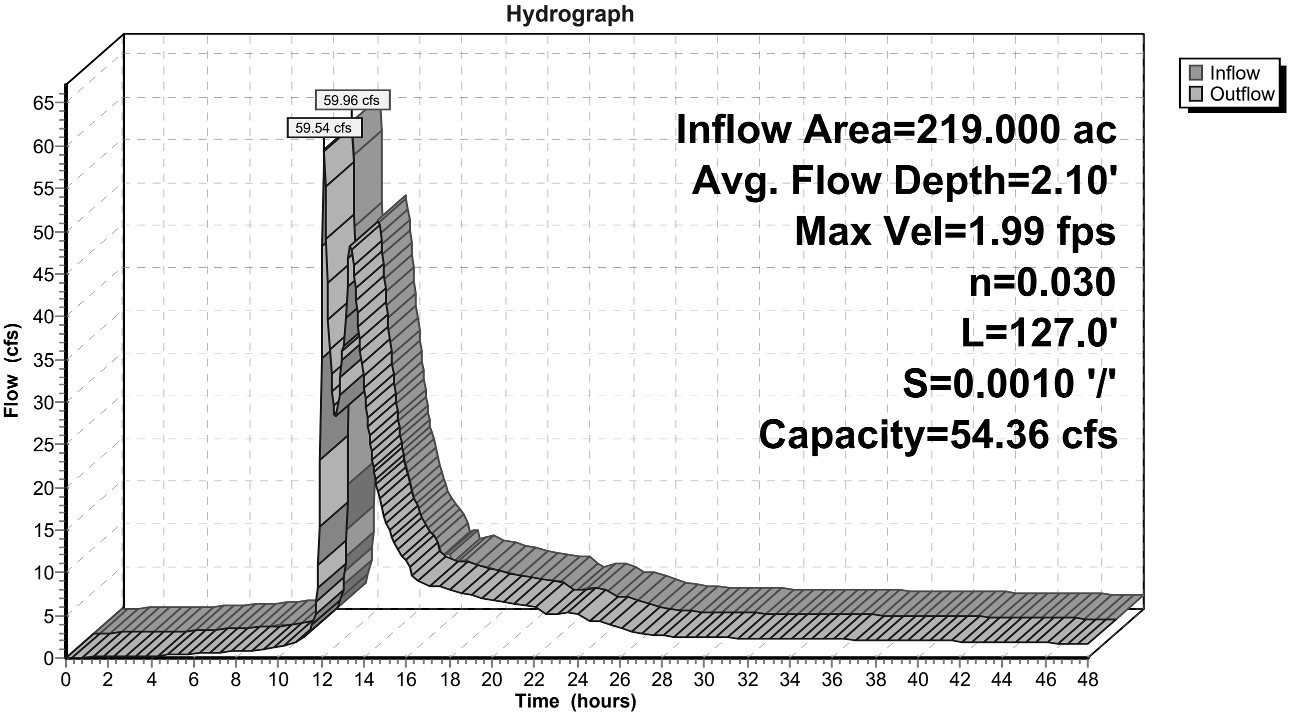
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.99 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 2.7 min

Peak Storage= 3,802 cf @ 12.14 hrs
Average Depth at Peak Storage= 2.10'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 54.36 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 127.0' Slope= 0.0010 '/'
Inlet Invert= 564.66', Outlet Invert= 564.53'

‡

Reach 41R-2: Long Road ditch



Summary for Reach 300R: Long Road ditch

Inflow Area = 216.870 ac, 29.63% Impervious, Inflow Depth > 1.08" for 10-yr storm event
Inflow = 56.16 cfs @ 12.12 hrs, Volume= 19.557 af
Outflow = 55.84 cfs @ 12.13 hrs, Volume= 19.556 af, Atten= 1%, Lag= 0.2 min

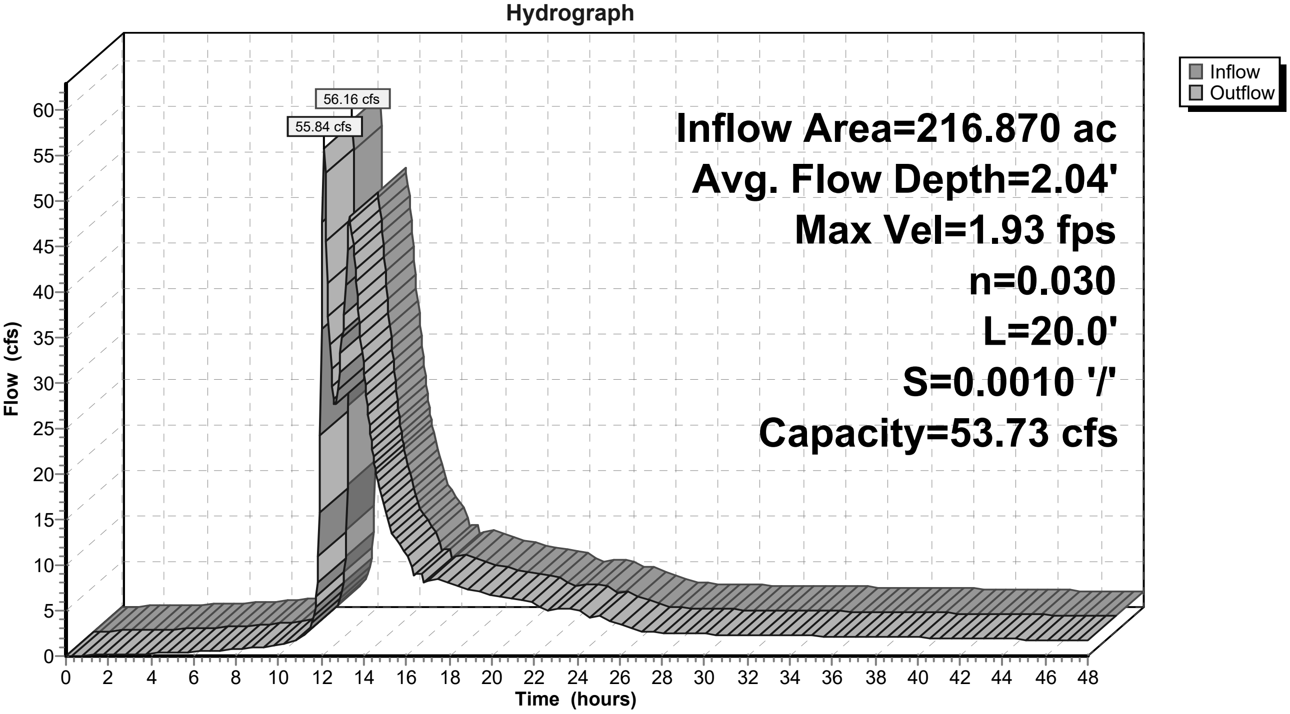
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.93 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 0.4 min

Peak Storage= 576 cf @ 12.13 hrs
Average Depth at Peak Storage= 2.04'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 53.73 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 20.0' Slope= 0.0010 '/'
Inlet Invert= 564.70', Outlet Invert= 564.68'

‡

Reach 300R: Long Road ditch



Summary for Reach 310R: Long Road ditch

Inflow Area =	211.850 ac, 29.40% Impervious, Inflow Depth > 1.07" for 10-yr storm event				
Inflow =	52.97 cfs @	12.13 hrs, Volume=	18.814 af		
Outflow =	53.01 cfs @	12.13 hrs, Volume=	18.812 af,	Atten= 0%,	Lag= 0.2 min

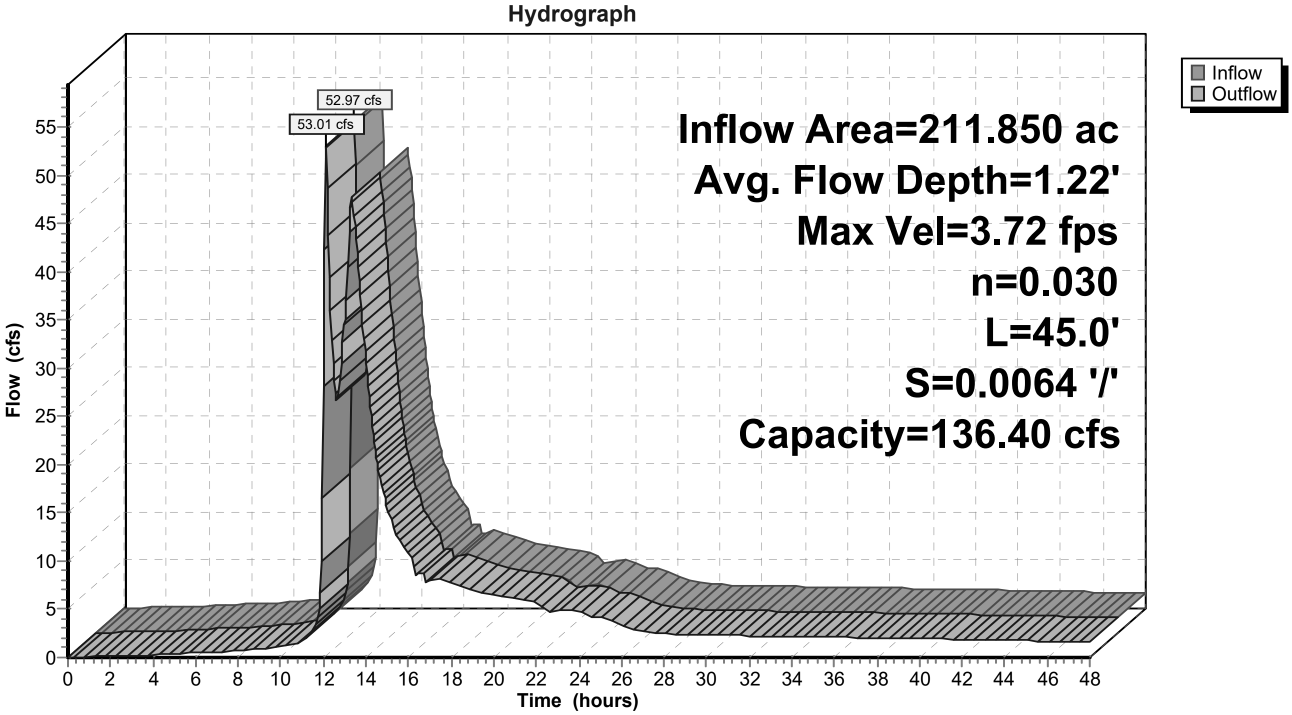
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 3.72 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.41 fps, Avg. Travel Time= 0.5 min

Peak Storage= 641 cf @ 12.13 hrs
Average Depth at Peak Storage= 1.22'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 136.40 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 45.0' Slope= 0.0064 '/'
Inlet Invert= 565.09', Outlet Invert= 564.80'

‡

Reach 310R: Long Road ditch

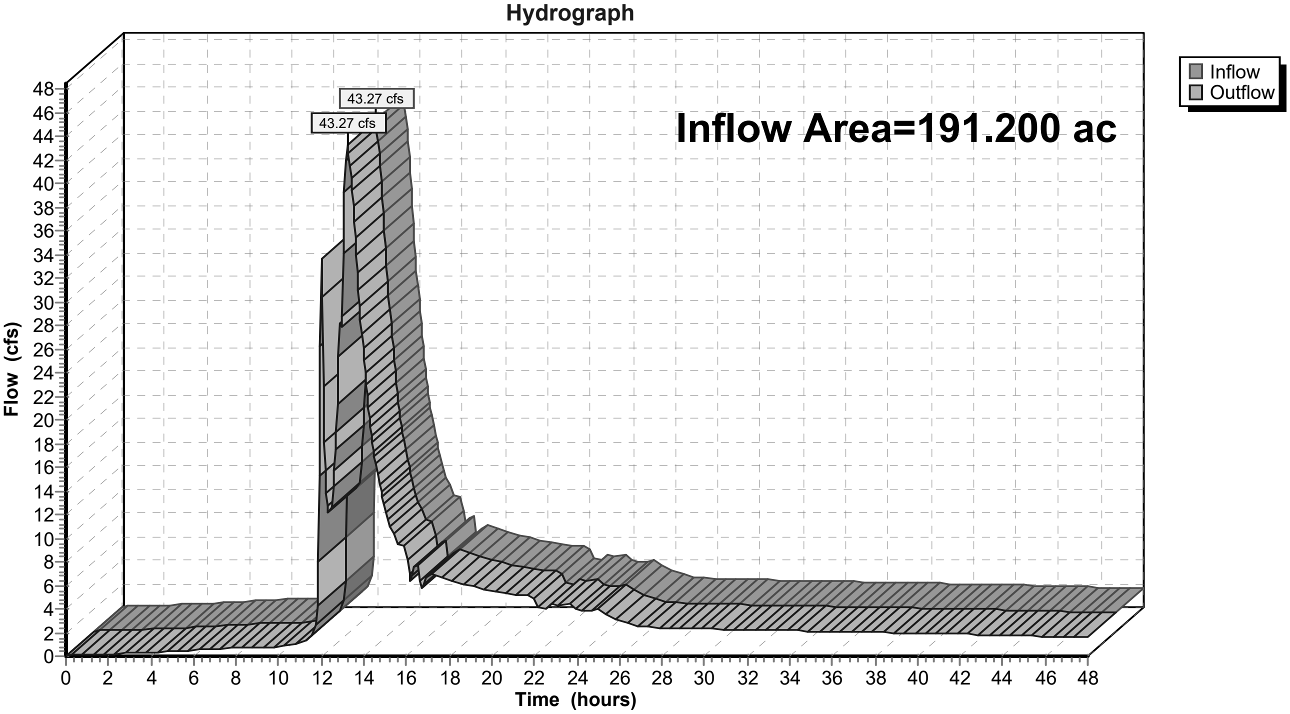


Summary for Reach DP-2: feeder creek on property portion

```
Inflow Area =      191.200 ac,  29.72% Impervious,  Inflow Depth >   0.99"    for  10-yr storm event
Inflow      =       43.27 cfs @   13.21 hrs,  Volume=          15.799 af
Outflow     =       43.27 cfs @   13.21 hrs,  Volume=          15.799 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-2: feeder creek on property portion

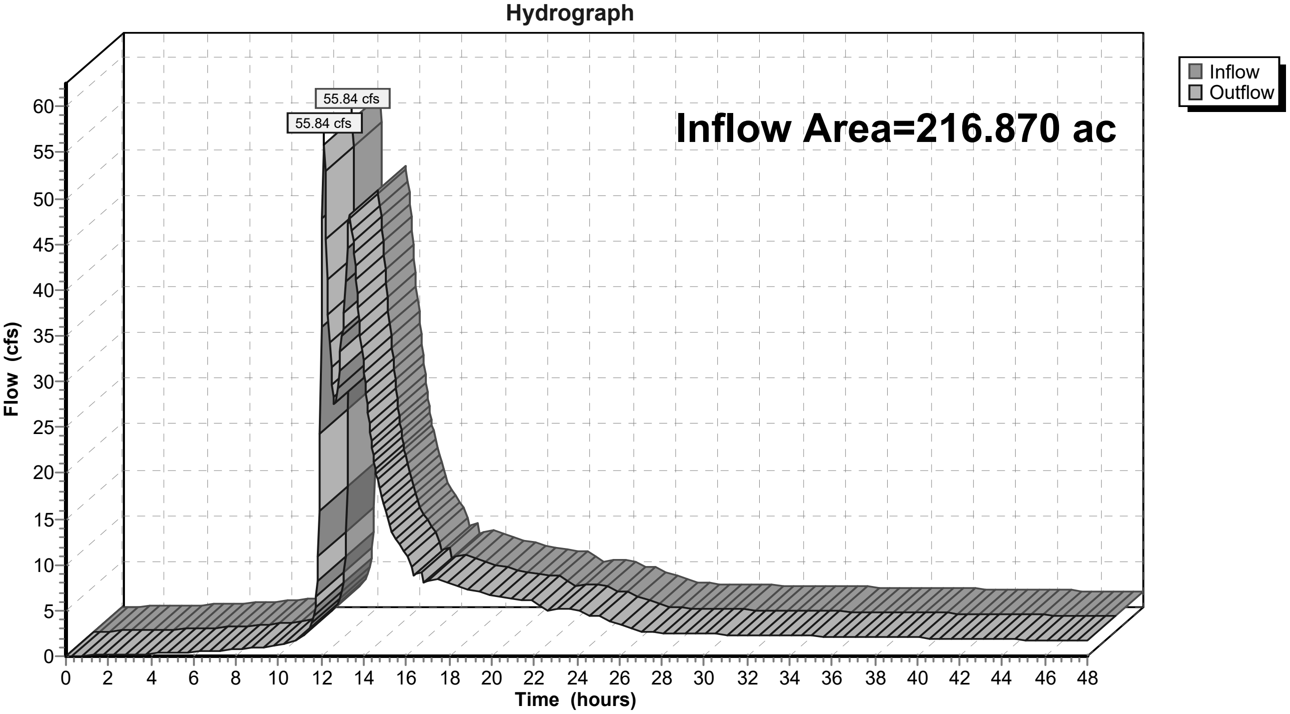


Summary for Reach DP-3: entrance to twin 36" culverts on adjancent property

Inflow Area =	216.870 ac,	29.63% Impervious,	Inflow Depth > 1.08"	for 10-yr storm event
Inflow =	55.84 cfs @	12.13 hrs, Volume=	19.556 af	
Outflow =	55.84 cfs @	12.13 hrs, Volume=	19.556 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-3: entrance to twin 36" culverts on adjancent property

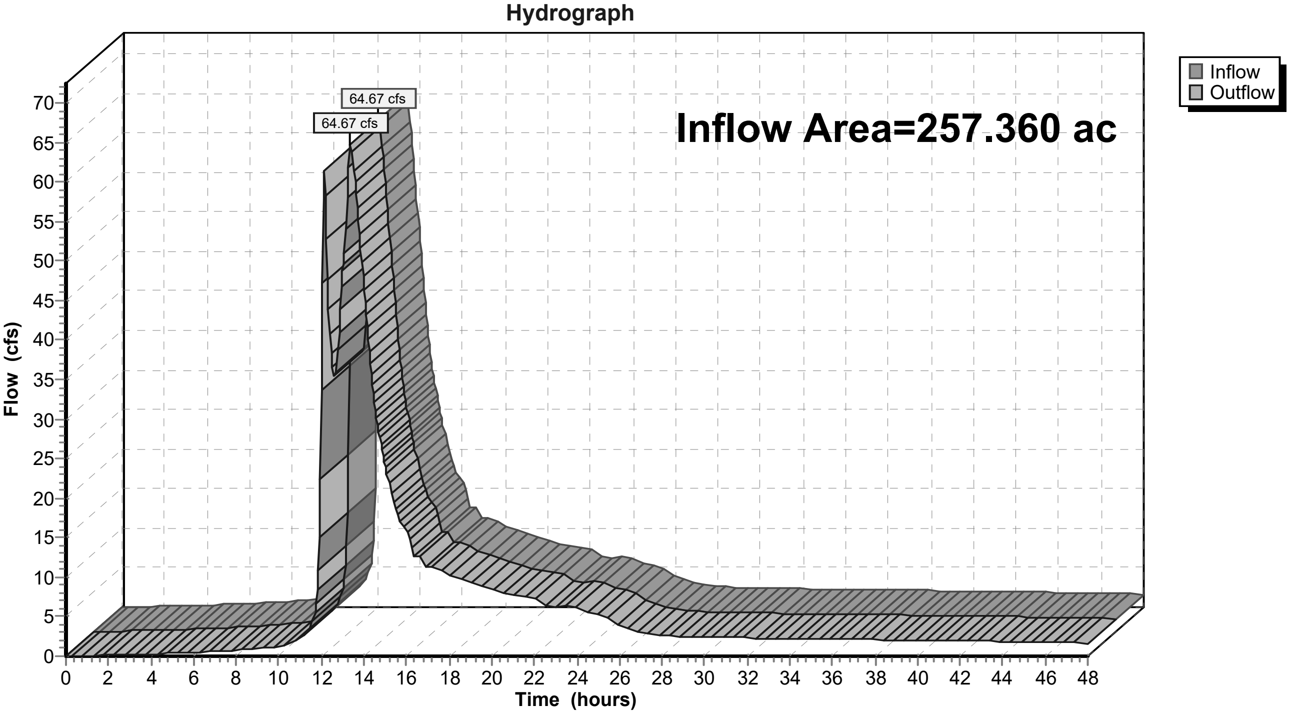


Summary for Reach DP-4: entrance to headwall

```
Inflow Area =      257.360 ac, 25.30% Impervious, Inflow Depth >   1.14"    for  10-yr storm event
Inflow      =       64.67 cfs @   13.36 hrs,  Volume=          24.406 af
Outflow     =       64.67 cfs @   13.36 hrs,  Volume=          24.406 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-4: entrance to headwall



Summary for Pond 30C: twin 36" culverts

Inflow Area = 216.870 ac, 29.63% Impervious, Inflow Depth > 1.08" for 10-yr storm event
Inflow = 55.84 cfs @ 12.13 hrs, Volume= 19.556 af
Outflow = 55.84 cfs @ 12.13 hrs, Volume= 19.556 af, Atten= 0%, Lag= 0.0 min
Primary = 28.79 cfs @ 12.13 hrs, Volume= 14.821 af
Secondary = 27.05 cfs @ 12.13 hrs, Volume= 4.735 af

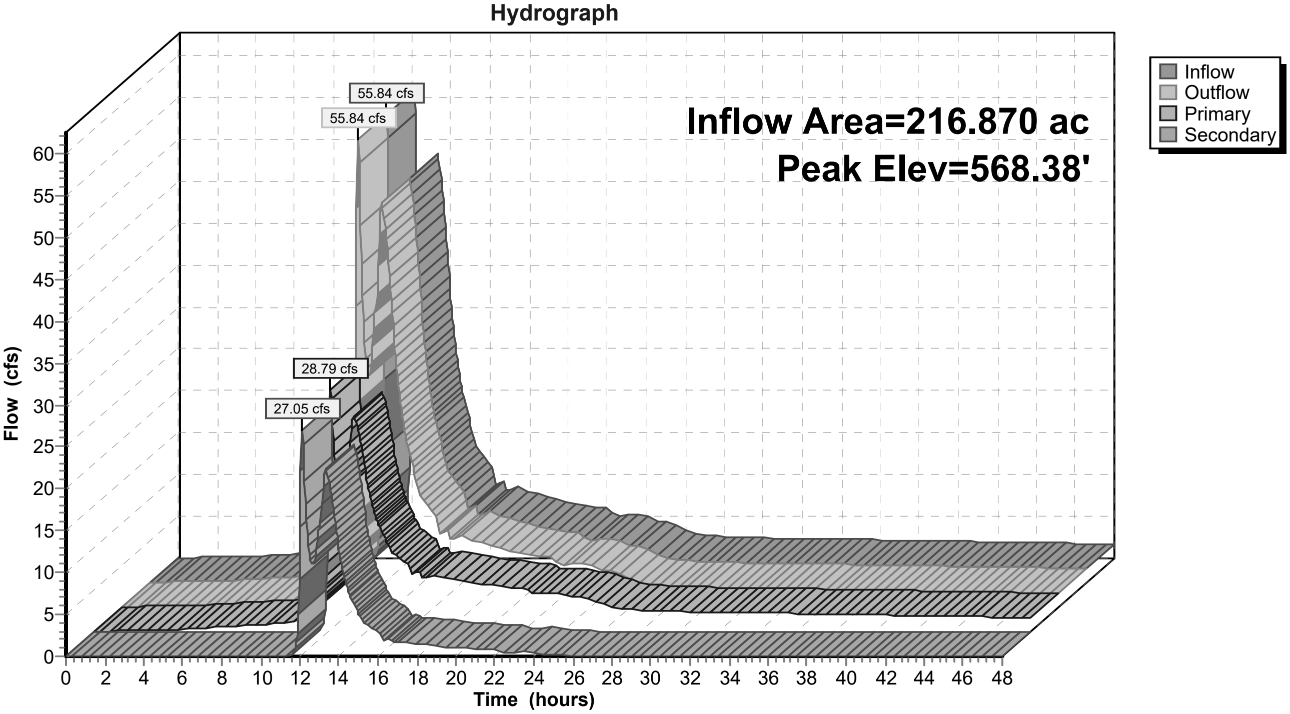
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 568.38' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.97'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.76' / 564.97' S= -0.0035 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	565.78'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.78' / 564.87' S= 0.0152 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=28.56 cfs @ 12.13 hrs HW=568.35' TW=566.24' (Dynamic Tailwater)
↰**1=Culvert** (Barrel Controls 28.56 cfs @ 4.27 fps)

Secondary OutFlow Max=26.69 cfs @ 12.13 hrs HW=568.35' TW=566.24' (Dynamic Tailwater)
↰**2=Culvert** (Barrel Controls 26.69 cfs @ 5.55 fps)

Pond 30C: twin 36" culverts



Summary for Pond 32C: twin 36" culverts

```
Inflow Area =      211.850 ac, 29.40% Impervious, Inflow Depth >  1.07"   for 10-yr storm event
Inflow      =       52.97 cfs @  12.13 hrs, Volume=         18.814 af
Outflow     =       52.97 cfs @  12.13 hrs, Volume=         18.814 af, Atten= 0%, Lag= 0.0 min
Primary     =       25.91 cfs @  12.13 hrs, Volume=          9.681 af
Secondary   =       27.06 cfs @  12.13 hrs, Volume=          9.133 af

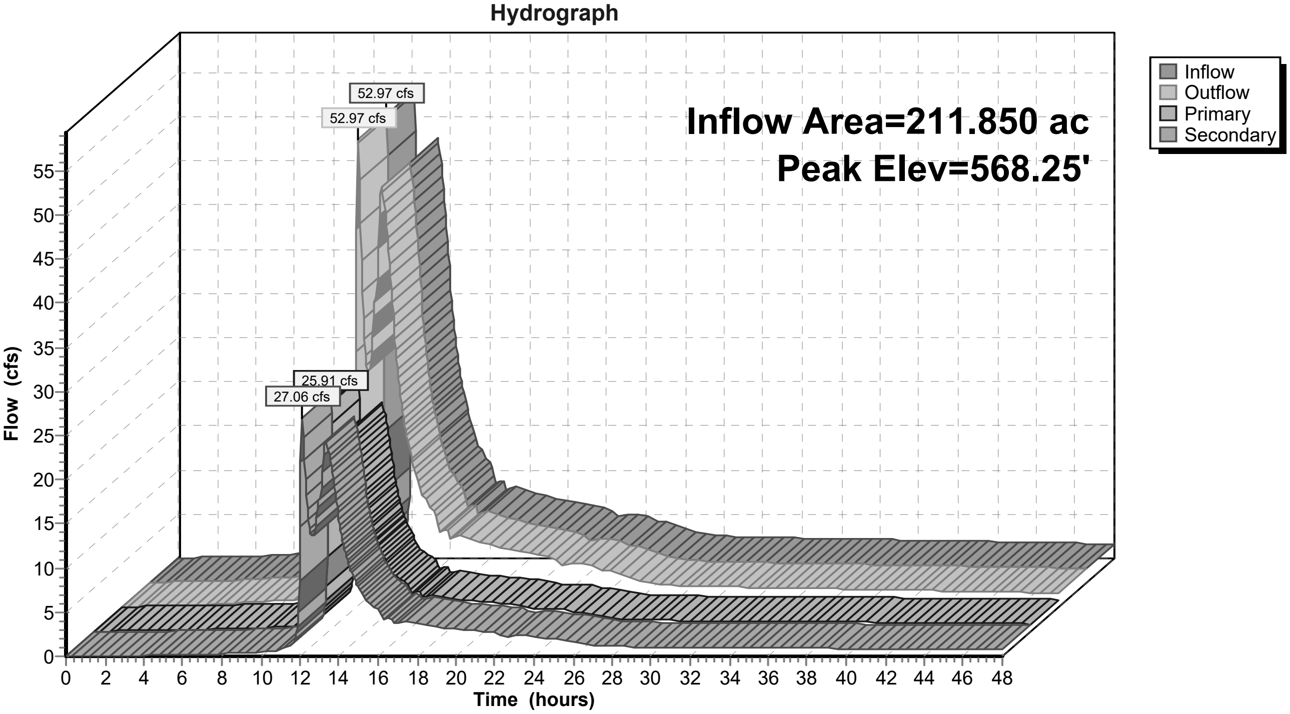
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 568.25' @ 12.13 hrs

Device  Routing        Invert  Outlet Devices
  #1    Primary       565.68'  36.0"  Round Culvert
                               L= 78.0'   CPP, projecting, no headwall,  Ke= 0.900
                               Inlet / Outlet Invert= 565.68' / 565.25'   S= 0.0055 '/'   Cc= 0.900
                               n= 0.013  Corrugated PE, smooth interior,  Flow Area= 7.07 sf
  #2    Secondary     565.73'  36.0"  Round Culvert
                               L= 78.0'   CPP, projecting, no headwall,  Ke= 0.900
                               Inlet / Outlet Invert= 565.73' / 565.09'   S= 0.0082 '/'   Cc= 0.900
                               n= 0.013  Corrugated PE, smooth interior,  Flow Area= 7.07 sf

Primary OutFlow Max=25.63 cfs @ 12.13 hrs  HW=568.23'  TW=566.30'   (Dynamic Tailwater)
└─1=Culvert  (Barrel Controls 25.63 cfs @ 5.38 fps)

Secondary OutFlow Max=26.78 cfs @ 12.13 hrs  HW=568.23'  TW=566.30'   (Dynamic Tailwater)
└─2=Culvert  (Inlet Controls 26.78 cfs @ 4.25 fps)
```

Pond 32C: twin 36" culverts



Summary for Pond 33C: twin 30" culverts

Inflow Area =	211.850 ac, 29.40% Impervious, Inflow Depth > 1.07" for 10-yr storm event			
Inflow =	53.42 cfs @	12.12 hrs, Volume=	18.816 af	
Outflow =	53.42 cfs @	12.12 hrs, Volume=	18.816 af,	Atten= 0%, Lag= 0.0 min
Primary =	26.71 cfs @	12.12 hrs, Volume=	9.336 af	
Secondary =	26.71 cfs @	12.12 hrs, Volume=	9.481 af	

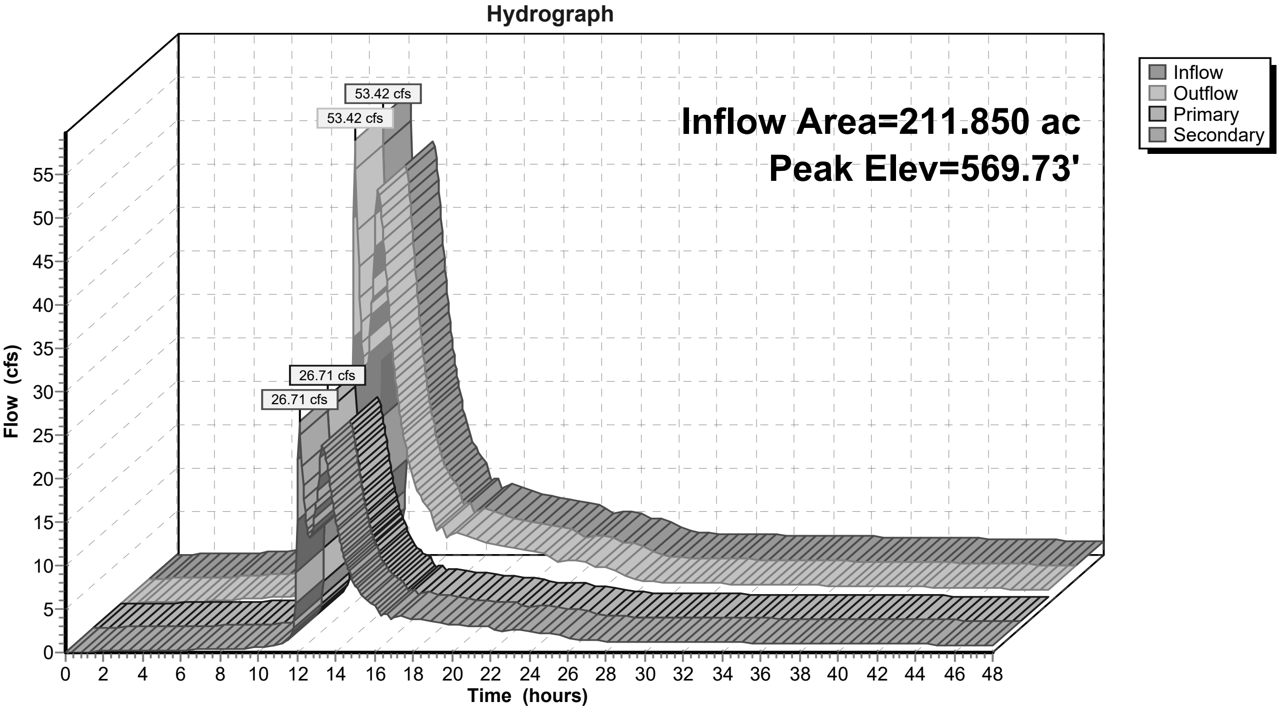
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 569.73' @ 12.12 hrs
Flood Elev= 571.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	565.70'	**30.0" Round Culvert** L= 140.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.70' / 565.64' S= 0.0004 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Secondary	565.65'	**30.0" Round Culvert** L= 140.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.64' / 565.65' S= -0.0001 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=26.20 cfs @ 12.12 hrs HW=569.67' TW=567.70' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 26.20 cfs @ 5.34 fps)

Secondary OutFlow Max=26.20 cfs @ 12.12 hrs HW=569.67' TW=567.70' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 26.20 cfs @ 5.34 fps)

Pond 33C: twin 30" culverts



Summary for Pond 34C: twin 36" culverts

Inflow Area =	0.640 ac, 42.19% Impervious, Inflow Depth = 1.97" for 10-yr storm event			
Inflow =	2.11 cfs @	11.97 hrs, Volume=	0.105 af	
Outflow =	2.12 cfs @	11.97 hrs, Volume=	0.105 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.06 cfs @	11.97 hrs, Volume=	0.052 af	
Secondary =	1.06 cfs @	11.97 hrs, Volume=	0.052 af	

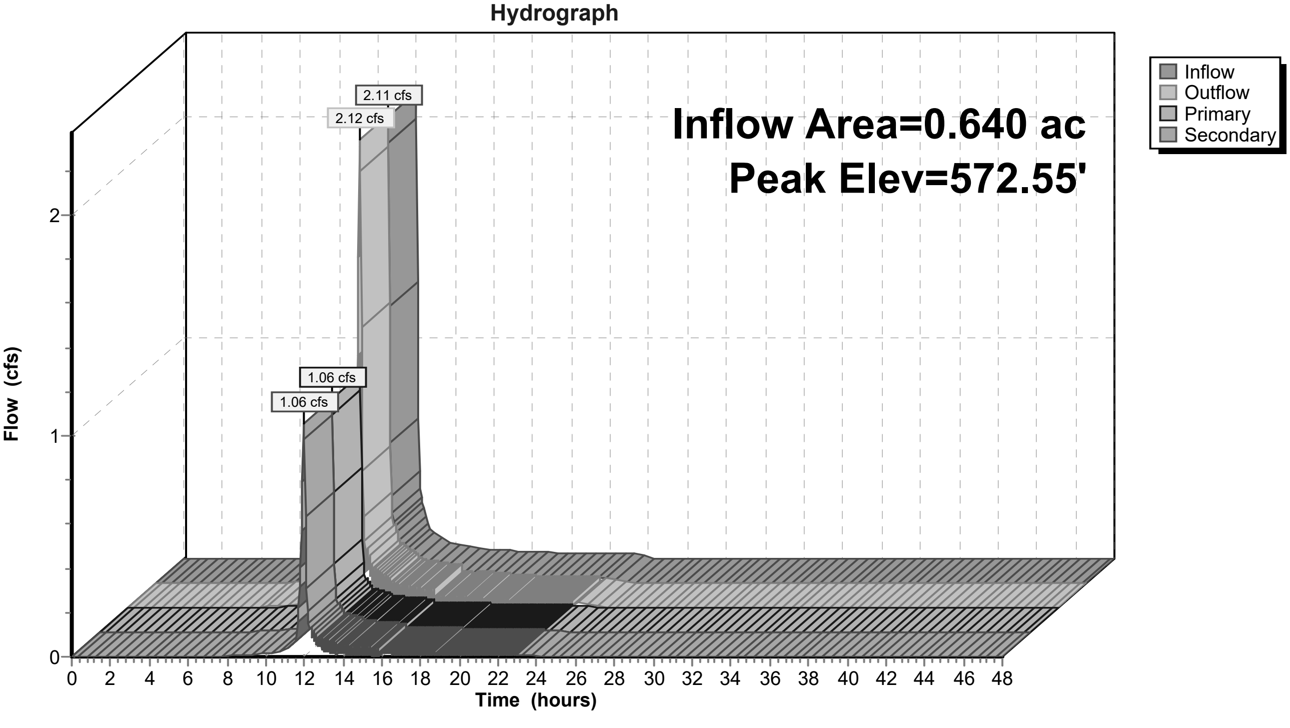
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 572.55' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	567.07'	**36.0" Round Culvert** L= 91.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 567.07' / 566.90' S= 0.0019 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#2	Secondary	567.17'	**36.0" Round Culvert** L= 91.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 567.17' / 566.89' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=1.03 cfs @ 11.97 hrs HW=572.02' TW=572.02' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.03 cfs @ 0.15 fps)

Secondary OutFlow Max=1.03 cfs @ 11.97 hrs HW=572.02' TW=572.02' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 1.03 cfs @ 0.15 fps)

Pond 34C: twin 36" culverts



Summary for Pond 41C-1: twin 36" culverts

```
Inflow Area =      216.870 ac, 29.63% Impervious, Inflow Depth >  1.08"    for  10-yr storm event
Inflow      =       55.88 cfs @  12.13 hrs, Volume=          19.554 af
Outflow     =       55.88 cfs @  12.13 hrs, Volume=          19.554 af,  Atten= 0%,  Lag= 0.0 min
Primary     =       28.18 cfs @  12.13 hrs, Volume=          10.442 af
Secondary   =       27.70 cfs @  12.13 hrs, Volume=           9.112 af
```

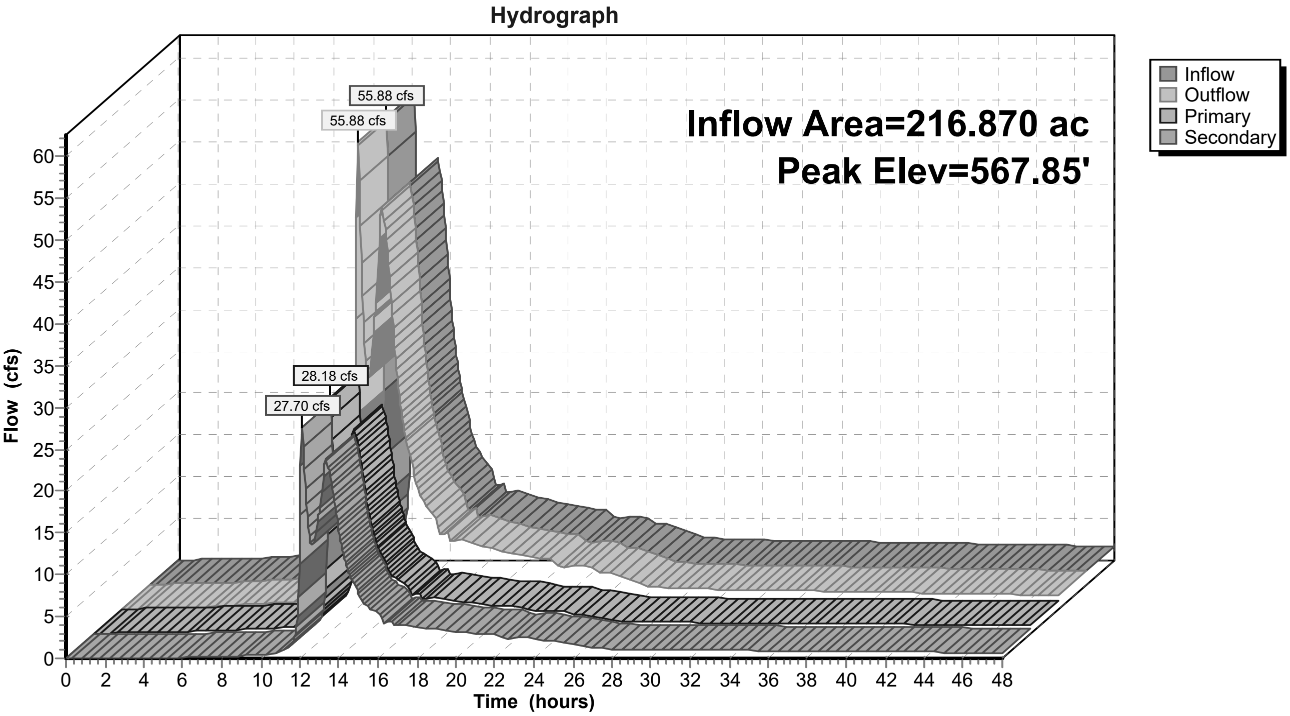
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 567.85' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.66'	**36.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.58' / 564.66' S= -0.0027 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	564.87'	**36.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.63' / 564.87' S= -0.0080 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=28.00 cfs @ 12.13 hrs HW=567.83' TW=566.74' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 28.00 cfs @ 3.96 fps)

Secondary OutFlow Max=27.40 cfs @ 12.13 hrs HW=567.83' TW=566.74' (Dynamic Tailwater)
↑—**2=Culvert** (Barrel Controls 27.40 cfs @ 4.52 fps)

Pond 41C-1: twin 36" culverts



Summary for Pond 41C-2: twin 36" culverts

Inflow Area = 219.000 ac, 29.52% Impervious, Inflow Depth > 1.09" for 10-yr storm event
Inflow = 59.54 cfs @ 12.14 hrs, Volume= 19.838 af
Outflow = 59.54 cfs @ 12.14 hrs, Volume= 19.838 af, Atten= 0%, Lag= 0.0 min
Primary = 29.77 cfs @ 12.14 hrs, Volume= 9.919 af
Secondary = 29.77 cfs @ 12.14 hrs, Volume= 9.919 af

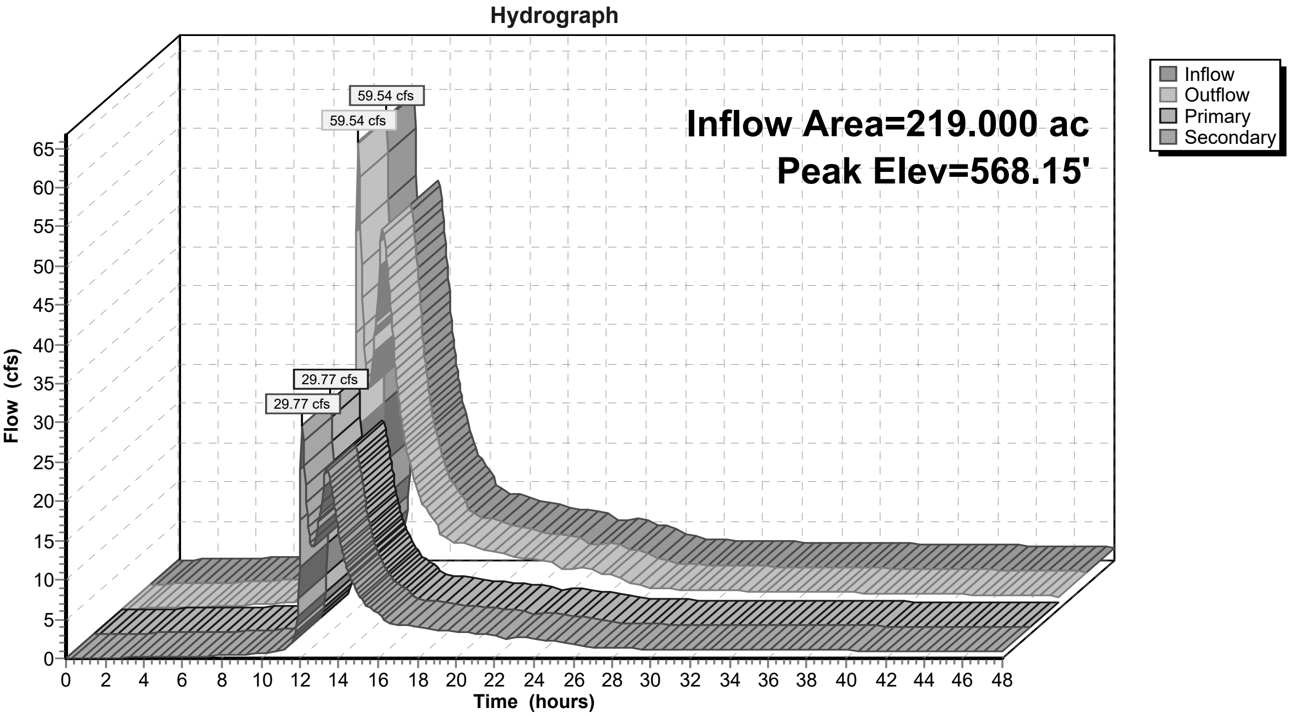
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 568.15' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.53'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.53' / 564.47' S= 0.0010 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	564.53'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.53' / 564.47' S= 0.0010 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=29.53 cfs @ 12.14 hrs HW=568.13' TW=566.61' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 29.53 cfs @ 4.41 fps)

Secondary OutFlow Max=29.53 cfs @ 12.14 hrs HW=568.13' TW=566.61' (Dynamic Tailwater)
└─**2=Culvert** (Barrel Controls 29.53 cfs @ 4.41 fps)

Pond 41C-2: twin 36" culverts



Summary for Pond 310C: box culvert under access driveway

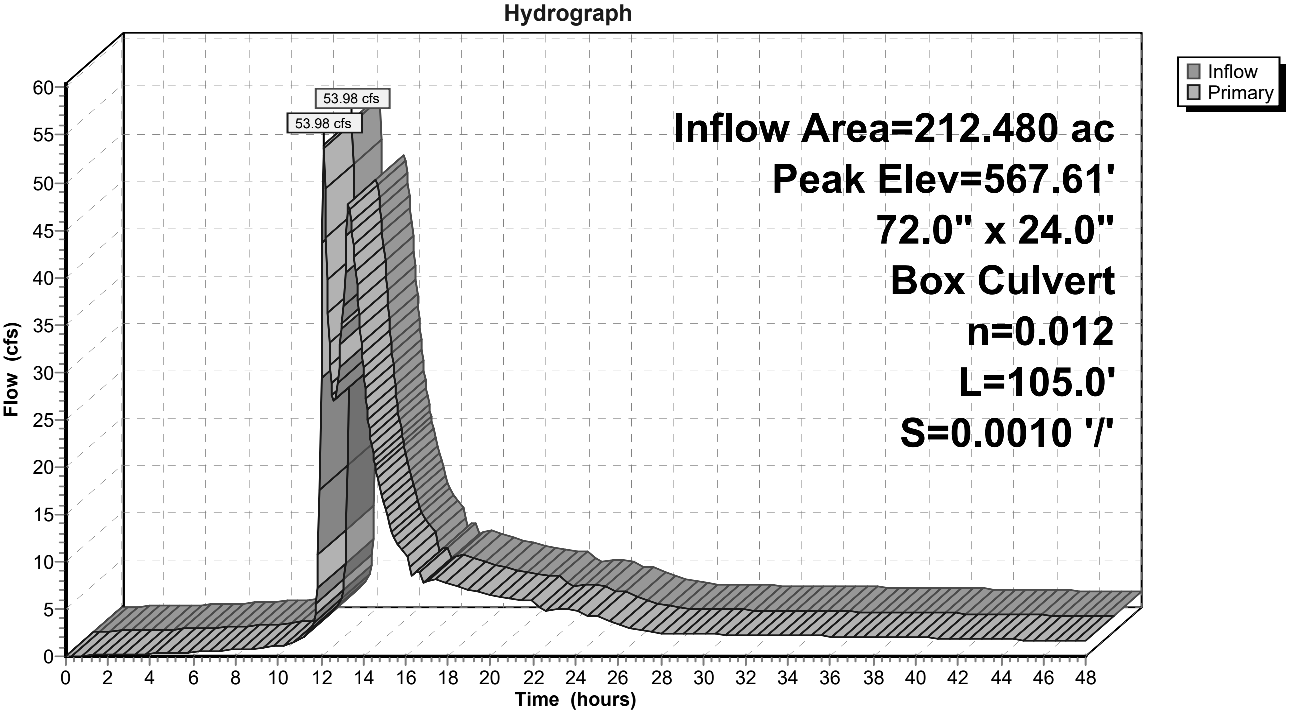
Inflow Area =	212.480 ac,	29.38% Impervious,	Inflow Depth > 1.07"	for 10-yr storm event	
Inflow =	53.98 cfs @	12.13 hrs,	Volume=	18.895 af	
Outflow =	53.98 cfs @	12.13 hrs,	Volume=	18.895 af,	Atten= 0%, Lag= 0.0 min
Primary =	53.98 cfs @	12.13 hrs,	Volume=	18.895 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 567.61' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.80'	**72.0" W x 24.0" H Box Culvert** L= 105.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 564.80' / 564.70' S= 0.0010 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.00 sf

Primary OutFlow Max=53.39 cfs @ 12.13 hrs HW=567.58' TW=566.73' (Dynamic Tailwater)
↑**—1=Culvert** (Inlet Controls 53.39 cfs @ 4.45 fps)

Pond 310C: box culvert under access driveway



Summary for Pond 350Bio: bioretention

Inflow Area = 1.870 ac, 65.24% Impervious, Inflow Depth = 2.23" for 10-yr storm event
Inflow = 6.14 cfs @ 12.00 hrs, Volume= 0.348 af
Outflow = 0.16 cfs @ 15.16 hrs, Volume= 0.301 af, Atten= 97%, Lag= 189.6 min
Primary = 0.16 cfs @ 15.16 hrs, Volume= 0.301 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 571.77' @ 15.16 hrs Surf.Area= 11,410 sf Storage= 8,274 cf
Flood Elev= 573.00' Surf.Area= 13,645 sf Storage= 23,660 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 628.4 min (1,497.3 - 869.0)

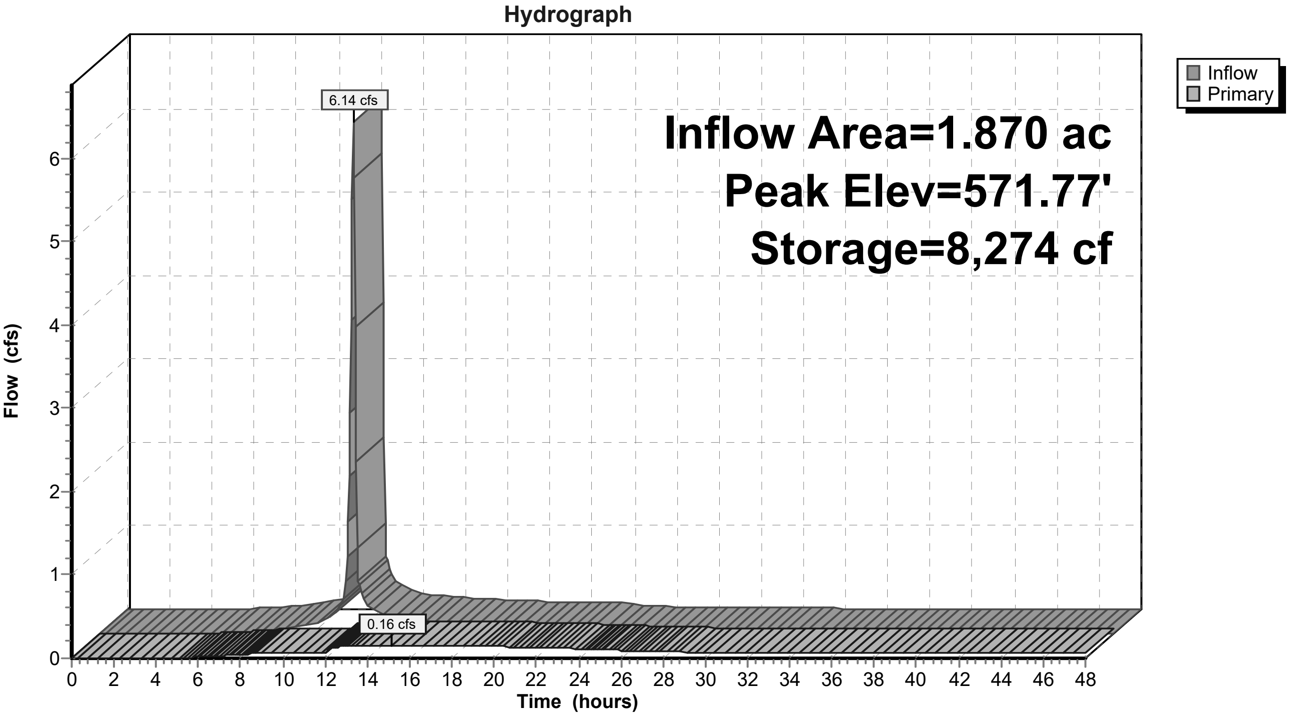
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	23,660 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.00	10,045	0	0
572.00	11,815	10,930	10,930
573.00	13,645	12,730	23,660

Device	Routing	Invert	Outlet Devices
#1	Primary	567.58'	**12.0" Round Culvert** L= 81.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 567.58' / 566.98' S= 0.0074 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	567.58'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	571.50'	**3.0" Vert. Orifice** C= 0.600
#4	Device 1	572.25'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	571.00'	**0.250 in/hr Exfiltration through bioretention media over Surface area**

Primary OutFlow Max=0.16 cfs @ 15.16 hrs HW=571.77' TW=566.91' (Dynamic Tailwater)
└—**1=Culvert** (Passes 0.16 cfs of 6.41 cfs potential flow)
  ├—**2=Underdrain** (Passes 0.07 cfs of 1.88 cfs potential flow)
  │ └—**5=Exfiltration through bioretention media** (Exfiltration Controls 0.07 cfs)
  ├—**3=Orifice** (Orifice Controls 0.09 cfs @ 1.84 fps)
  └—**4=Grate** (Controls 0.00 cfs)

Pond 350Bio: bioretention



Summary for Pond 350F: forebay

Inflow Area = 1.870 ac, 65.24% Impervious, Inflow Depth = 2.23" for 10-yr storm event
Inflow = 6.82 cfs @ 11.96 hrs, Volume= 0.348 af
Outflow = 6.14 cfs @ 12.00 hrs, Volume= 0.348 af, Atten= 10%, Lag= 2.3 min
Primary = 6.14 cfs @ 12.00 hrs, Volume= 0.348 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Starting Elev= 571.50' Surf.Area= 5,131 sf Storage= 14,463 cf
Peak Elev= 571.81' @ 12.00 hrs Surf.Area= 5,412 sf Storage= 16,094 cf (1,630 cf above start)
Flood Elev= 573.00' Surf.Area= 6,575 sf Storage= 23,223 cf (8,759 cf above start)

Plug-Flow detention time= 1,275.6 min calculated for 0.016 af (5% of inflow)
Center-of-Mass det. time= 77.0 min (869.0 - 792.0)

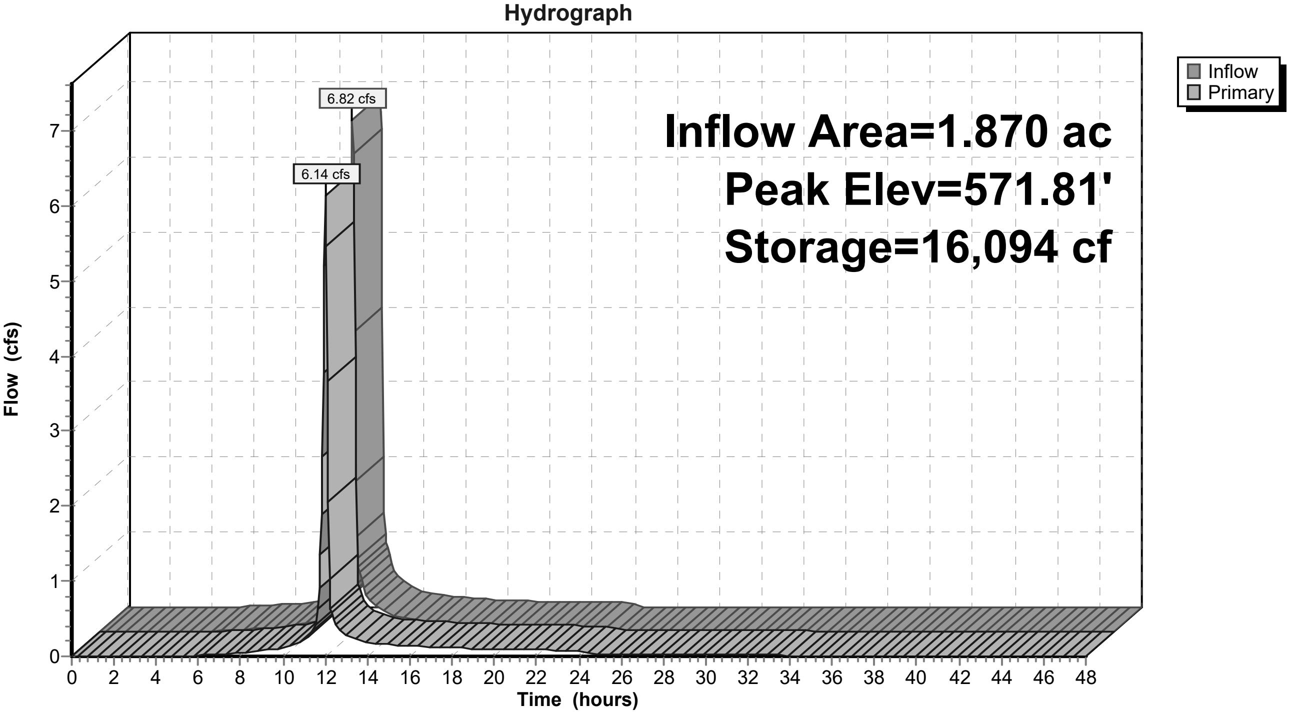
Volume	Invert	Avail.Storage	Storage Description
#1	567.00'	23,223 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
567.00	1,480	0	0
568.00	2,185	1,833	1,833
570.00	3,770	5,955	7,788
572.00	5,585	9,355	17,143
573.00	6,575	6,080	23,223

Device	Routing	Invert	Outlet Devices
#1	Primary	571.50'	**162.0 deg x 10.0' long x 1.50' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=6.08 cfs @ 12.00 hrs HW=571.81' TW=571.44' (Dynamic Tailwater)
└─**1=overflow weir** (Weir Controls 6.08 cfs @ 1.66 fps)

Pond 350F: forebay



Summary for Pond DMH110: manhole

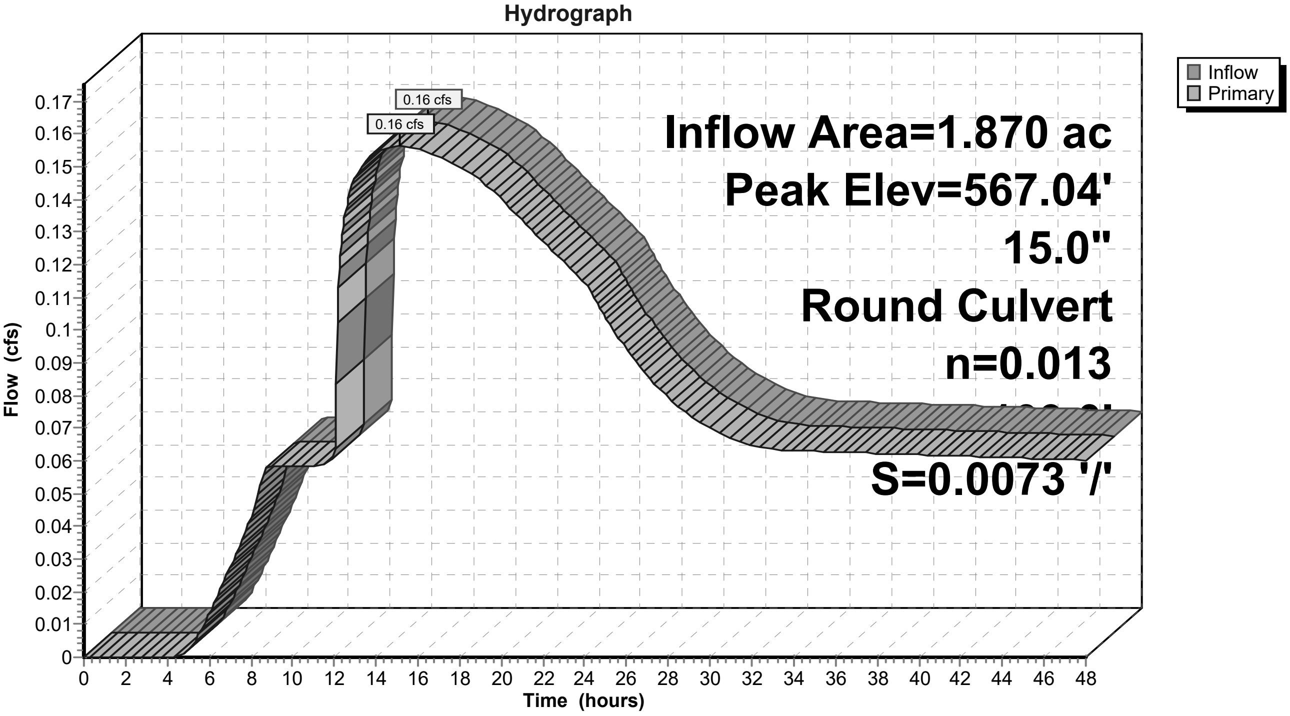
Inflow Area = 1.870 ac, 65.24% Impervious, Inflow Depth > 1.93" for 10-yr storm event
Inflow = 0.16 cfs @ 15.16 hrs, Volume= 0.301 af
Outflow = 0.16 cfs @ 15.16 hrs, Volume= 0.301 af, Atten= 0%, Lag= 0.0 min
Primary = 0.16 cfs @ 15.16 hrs, Volume= 0.301 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 567.04' @ 12.00 hrs
Flood Elev= 573.04'

Device	Routing	Invert	Outlet Devices
#1	Primary	566.71'	**15.0" Round Culvert** L= 109.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 566.71' / 565.91' S= 0.0073 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.16 cfs @ 15.16 hrs HW=566.91' TW=566.14' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.16 cfs @ 1.88 fps)

Pond DMH110: manhole



Summary for Pond DMH111: manhole

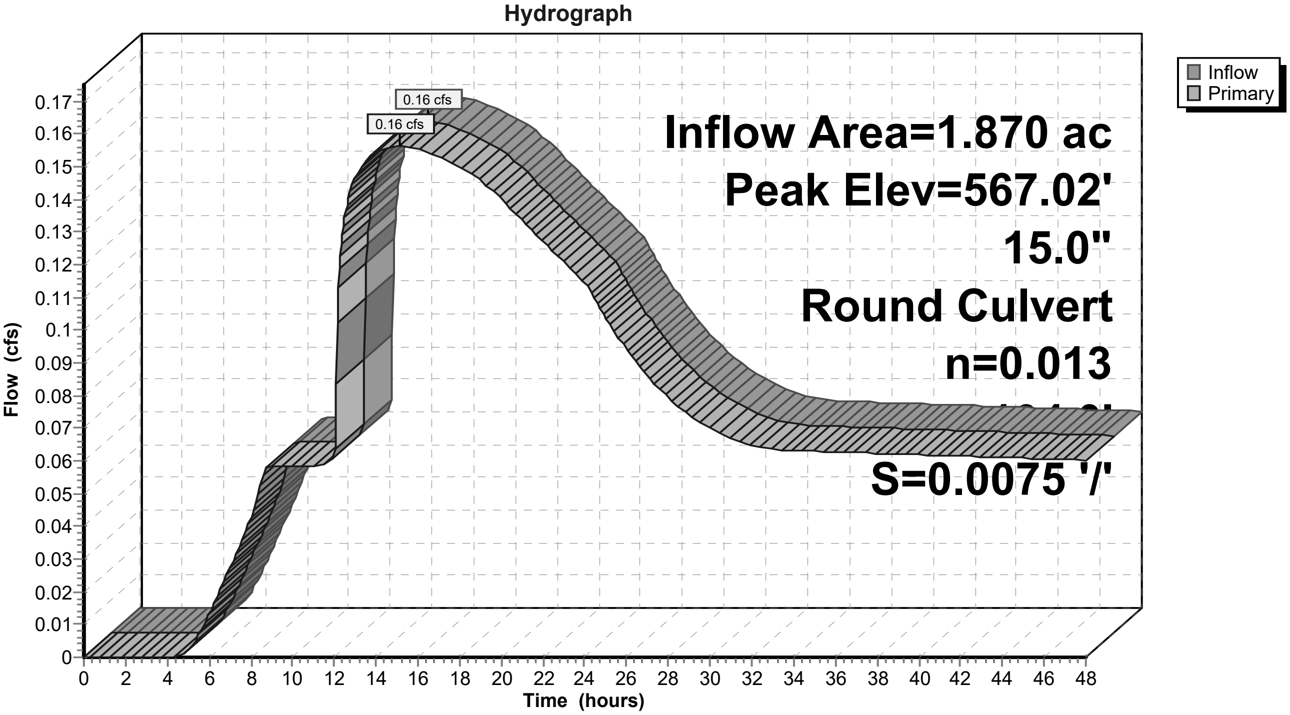
Inflow Area = 1.870 ac, 65.24% Impervious, Inflow Depth > 1.93" for 10-yr storm event
Inflow = 0.16 cfs @ 15.16 hrs, Volume= 0.301 af
Outflow = 0.16 cfs @ 15.16 hrs, Volume= 0.301 af, Atten= 0%, Lag= 0.0 min
Primary = 0.16 cfs @ 15.16 hrs, Volume= 0.301 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 567.02' @ 11.99 hrs
Flood Elev= 571.44'

Device	Routing	Invert	Outlet Devices
#1	Primary	565.91'	**15.0" Round Culvert** L= 104.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 565.91' / 565.13' S= 0.0075 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.16 cfs @ 15.16 hrs HW=566.14' TW=565.74' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.16 cfs @ 1.51 fps)

Pond DMH111: manhole



Summary for Pond DMH112: manhole

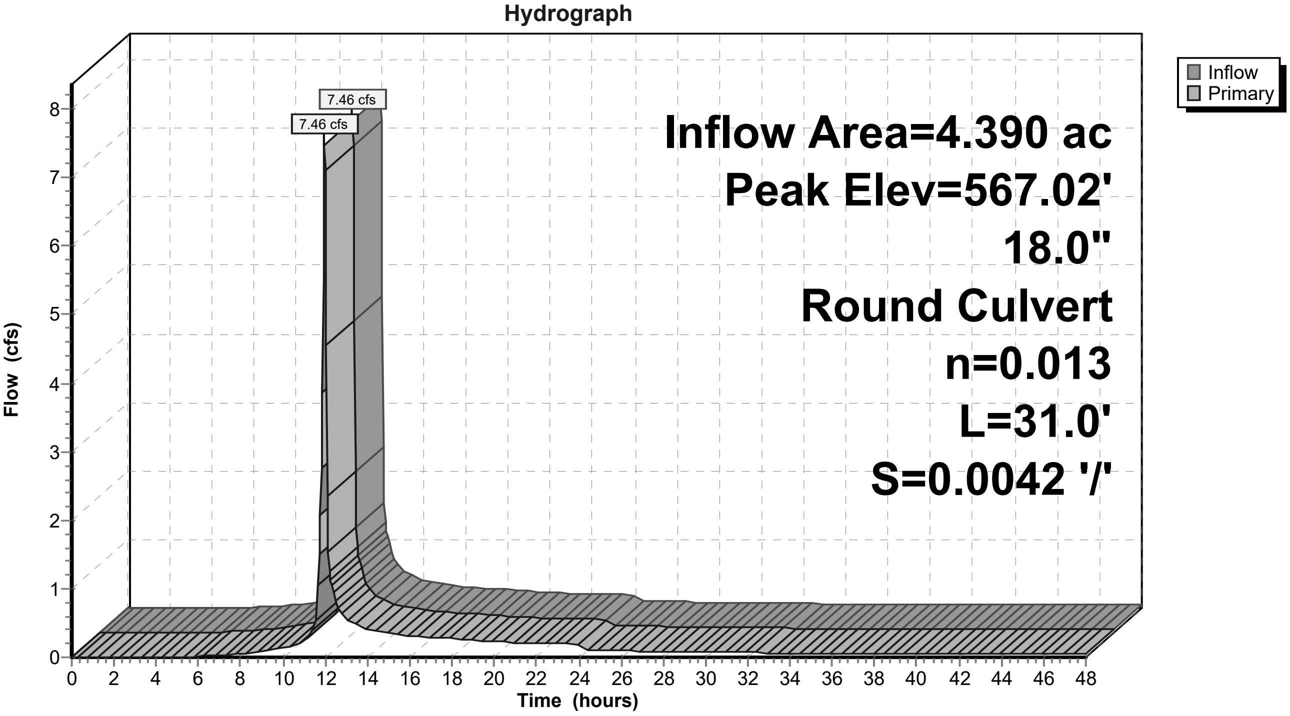
Inflow Area =	4.390 ac, 41.69% Impervious, Inflow Depth > 1.81" for 10-yr storm event			
Inflow =	7.46 cfs @	11.97 hrs, Volume=	0.662 af	
Outflow =	7.46 cfs @	11.97 hrs, Volume=	0.662 af,	Atten= 0%, Lag= 0.0 min
Primary =	7.46 cfs @	11.97 hrs, Volume=	0.662 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 567.02' @ 11.99 hrs
Flood Elev= 570.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	565.13'	**18.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 565.13' / 565.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=7.47 cfs @ 11.97 hrs HW=566.96' TW=566.14' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 7.47 cfs @ 4.40 fps)

Pond DMH112: manhole



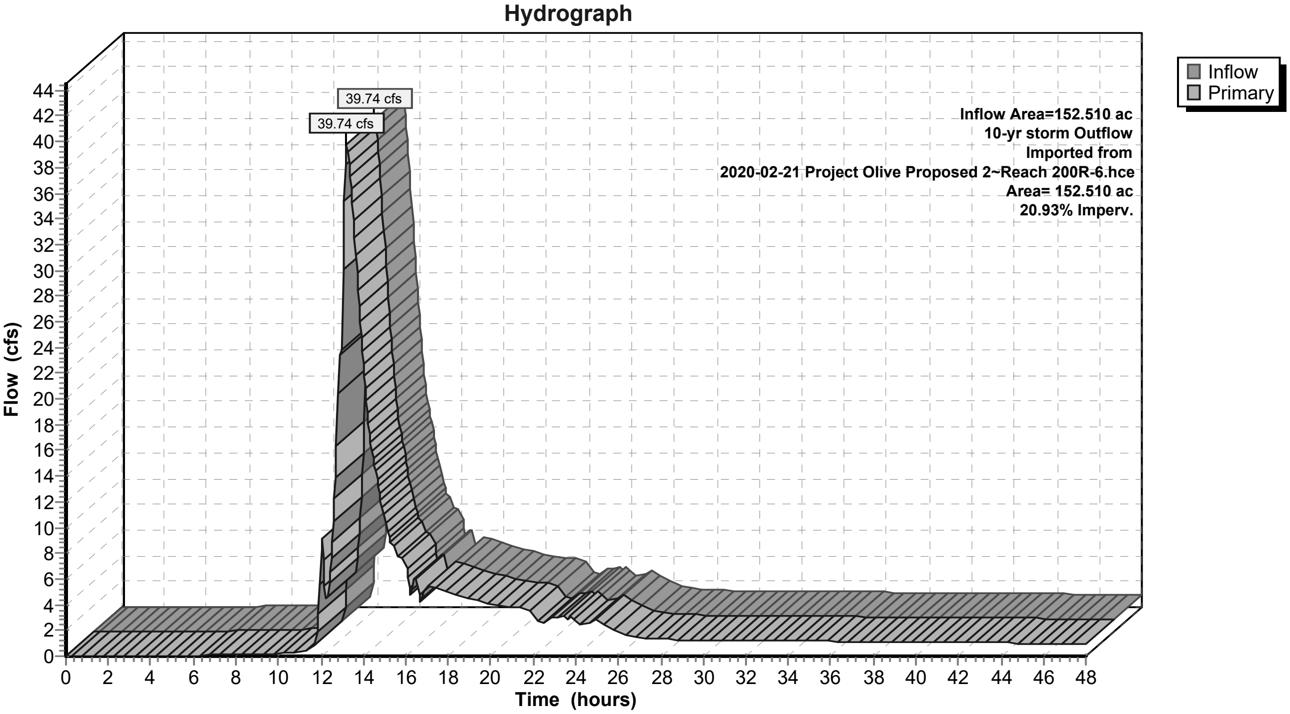
Summary for Link 200R-6: from 200R-6

```
Inflow Area =      152.510 ac,  20.93% Impervious,  Inflow Depth >   0.87"    for  10-yr storm event
Inflow       =       39.74 cfs @   13.22 hrs,  Volume=           11.042 af
Primary      =       39.74 cfs @   13.22 hrs,  Volume=           11.042 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

10-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 2~Reach 200R-6.hce

Link 200R-6: from 200R-6



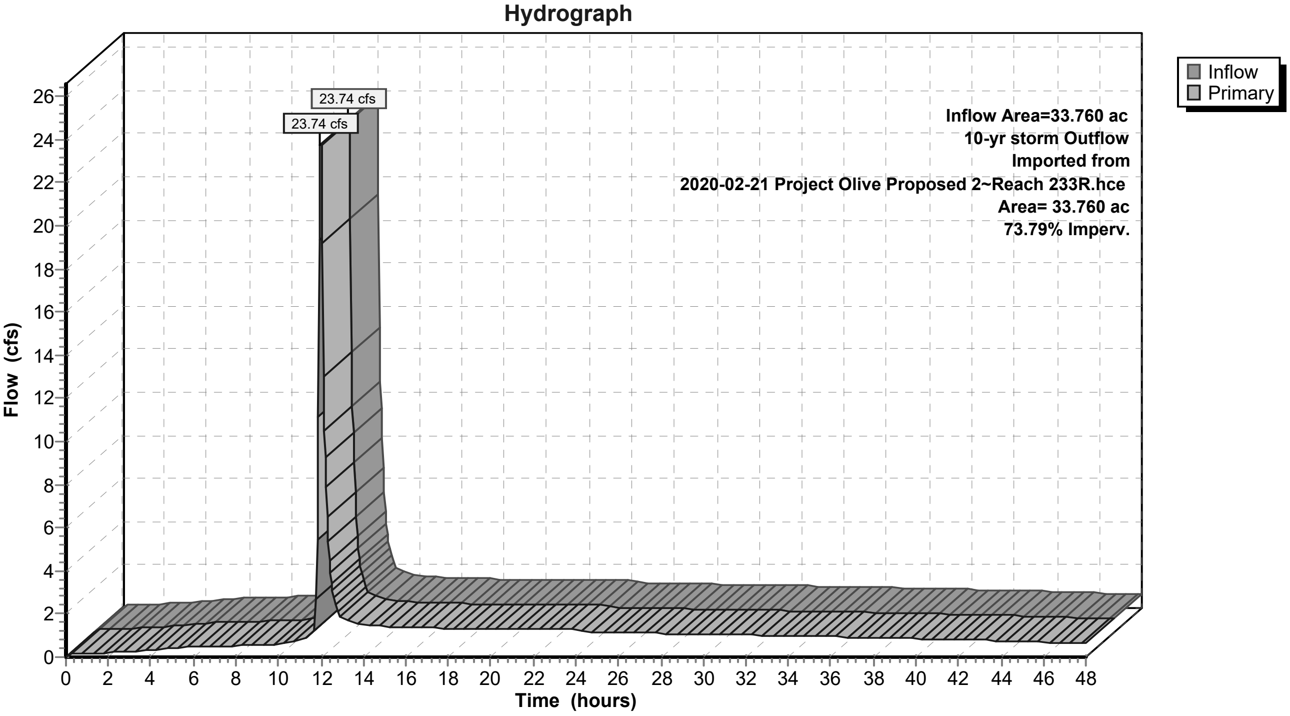
Summary for Link 233R: from 233R

Inflow Area = 33.760 ac, 73.79% Impervious, Inflow Depth > 1.49" for 10-yr storm event
Inflow = 23.74 cfs @ 12.00 hrs, Volume= 4.204 af
Primary = 23.74 cfs @ 12.00 hrs, Volume= 4.204 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

10-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 2~Reach 233R.hce

Link 233R: from 233R



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 4
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment201: Runoff Area=1.280 ac 0.00% Impervious Runoff Depth=2.84"
Flow Length=363' Tc=16.5 min CN=81 Runoff=4.45 cfs 0.302 af

Subcatchment220: Runoff Area=3.650 ac 0.00% Impervious Runoff Depth=2.93"
Flow Length=1,119' Slope=0.0050 '/' Tc=55.2 min CN=82 Runoff=6.07 cfs 0.890 af

Subcatchment300: Runoff Area=2.520 ac 24.21% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=87 Runoff=14.22 cfs 0.716 af

Subcatchment310: Runoff Area=0.630 ac 20.63% Impervious Runoff Depth=3.21"
Flow Length=261' Tc=12.1 min CN=85 Runoff=2.81 cfs 0.169 af

Subcatchment320: Runoff Area=3.290 ac 53.19% Impervious Runoff Depth=3.82"
Flow Length=626' Tc=30.2 min CN=91 Runoff=10.53 cfs 1.047 af

Subcatchment330: Runoff Area=16.720 ac 20.57% Impervious Runoff Depth=3.41"
Flow Length=33' Slope=0.1400 '/' Tc=6.0 min CN=87 Runoff=94.33 cfs 4.748 af

Subcatchment340: Runoff Area=0.640 ac 42.19% Impervious Runoff Depth=3.71"
Tc=6.0 min CN=90 Runoff=3.85 cfs 0.198 af

Subcatchment350: Runoff Area=1.870 ac 65.24% Impervious Runoff Depth=4.03"
Tc=6.0 min CN=93 Runoff=11.84 cfs 0.628 af

Subcatchment400: Runoff Area=38.360 ac 1.17% Impervious Runoff Depth=3.02"
Flow Length=2,815' Tc=125.8 min CN=83 Runoff=35.51 cfs 9.656 af

Subcatchment410: Runoff Area=2.130 ac 18.78% Impervious Runoff Depth=3.31"
Flow Length=267' Tc=13.0 min CN=86 Runoff=9.50 cfs 0.587 af

Reach 20R-2: feeder creek Avg. Flow Depth=2.07' Max Vel=3.55 fps Inflow=104.69 cfs 44.372 af
n=0.030 L=245.0' S=0.0033 '/' Capacity=97.70 cfs Outflow=104.66 cfs 44.352 af

Reach 22R: property line ditch Avg. Flow Depth=0.32' Max Vel=1.99 fps Inflow=6.07 cfs 0.890 af
n=0.030 L=1,402.0' S=0.0086 '/' Capacity=157.20 cfs Outflow=5.69 cfs 0.890 af

Reach 32R: Long Road ditch Avg. Flow Depth=3.60' Max Vel=2.13 fps Inflow=127.16 cfs 50.266 af
n=0.030 L=47.0' S=0.0009 '/' Capacity=49.57 cfs Outflow=127.32 cfs 50.260 af

Reach 33R-1: I-190 ditch Avg. Flow Depth=1.34' Max Vel=2.92 fps Inflow=94.33 cfs 4.748 af
n=0.030 L=3,824.0' S=0.0036 '/' Capacity=102.11 cfs Outflow=47.14 cfs 4.747 af

Reach 33R-2: I-190 ditch Avg. Flow Depth=2.19' Max Vel=3.79 fps Inflow=123.71 cfs 49.100 af
n=0.030 L=509.0' S=0.0036 '/' Capacity=101.88 cfs Outflow=120.67 cfs 49.061 af

Reach 33R-3: Long Road ditch Avg. Flow Depth=2.17' Max Vel=3.79 fps Inflow=122.73 cfs 49.258 af
n=0.030 L=509.0' S=0.0036 '/' Capacity=101.88 cfs Outflow=118.93 cfs 49.219 af

```
Reach 40R: Long Road ditch           Avg. Flow Depth=3.83'   Max Vel=2.31 fps   Inflow=149.49 cfs  61.889 af
                          n=0.030   L=81.0'   S=0.0010 '/'   Capacity=53.40 cfs   Outflow=149.46 cfs  61.879 af

Reach 41R-1: Long Road ditch         Avg. Flow Depth=2.17'   Max Vel=4.28 fps   Inflow=134.28 cfs  51.664 af
                          n=0.030   L=63.0'   S=0.0046 '/'   Capacity=115.28 cfs   Outflow=134.34 cfs  51.660 af

Reach 41R-2: Long Road ditch         Avg. Flow Depth=3.65'   Max Vel=2.34 fps   Inflow=142.83 cfs  52.247 af
                          n=0.030   L=127.0'   S=0.0010 '/'   Capacity=54.36 cfs   Outflow=142.48 cfs  52.232 af

Reach 300R: Long Road ditch          Avg. Flow Depth=3.53'   Max Vel=2.30 fps   Inflow=134.22 cfs  51.667 af
                          n=0.030   L=20.0'   S=0.0010 '/'   Capacity=53.73 cfs   Outflow=134.28 cfs  51.664 af

Reach 310R: Long Road ditch          Avg. Flow Depth=1.93'   Max Vel=4.78 fps   Inflow=127.32 cfs  50.260 af
                          n=0.030   L=45.0'   S=0.0064 '/'   Capacity=136.40 cfs   Outflow=127.41 cfs  50.257 af

Reach DP-2: feeder creek on property portion                                  Inflow=104.69 cfs  44.372 af
                                                                              Outflow=104.69 cfs  44.372 af

Reach DP-3: entrance to twin 36" culverts on adjancent property               Inflow=134.28 cfs  51.664 af
                                                                              Outflow=134.28 cfs  51.664 af

Reach DP-4: entrance to headwall                                              Inflow=149.46 cfs  61.879 af
                                                                              Outflow=149.46 cfs  61.879 af

Pond 30C: twin 36" culverts                          Peak Elev=573.40'   Inflow=134.28 cfs  51.664 af
              Primary=67.79 cfs  33.140 af   Secondary=66.49 cfs  18.524 af   Outflow=134.28 cfs  51.664 af

Pond 32C: twin 36" culverts                          Peak Elev=572.82'   Inflow=127.32 cfs  50.260 af
              Primary=63.80 cfs  25.359 af   Secondary=63.52 cfs  24.901 af   Outflow=127.32 cfs  50.260 af

Pond 33C: twin 30" culverts                          Peak Elev=580.85'   Inflow=127.16 cfs  50.266 af
              Primary=63.58 cfs  25.085 af   Secondary=63.58 cfs  25.181 af   Outflow=127.16 cfs  50.266 af

Pond 34C: twin 36" culverts                             Peak Elev=573.36'   Inflow=3.85 cfs  0.198 af
                   Primary=1.97 cfs  0.099 af   Secondary=1.97 cfs  0.099 af   Outflow=3.95 cfs  0.197 af

Pond 41C-1: twin 36" culverts                        Peak Elev=574.56'   Inflow=134.34 cfs  51.660 af
              Primary=67.17 cfs  26.511 af   Secondary=67.17 cfs  25.149 af   Outflow=134.34 cfs  51.660 af

Pond 41C-2: twin 36" culverts                        Peak Elev=575.28'   Inflow=142.48 cfs  52.232 af
              Primary=71.24 cfs  26.116 af   Secondary=71.24 cfs  26.116 af   Outflow=142.48 cfs  52.232 af

Pond 310C: box culvert under access driveway         Peak Elev=573.27'   Inflow=129.71 cfs  50.426 af
                72.0" x 24.0"  Box Culvert  n=0.012  L=105.0'  S=0.0010 '/'   Outflow=129.71 cfs  50.426 af

Pond 350Bio: bioretention                  Peak Elev=572.26'  Storage=14,037 cf   Inflow=9.61 cfs  0.628 af
                                                                                Outflow=0.29 cfs  0.525 af

Pond 350F: forebay                        Peak Elev=572.26'  Storage=18,616 cf   Inflow=11.84 cfs  0.628 af
                                                                                Outflow=9.61 cfs  0.628 af
```

Pond DMH110: manhole Peak Elev=570.27' Inflow=0.29 cfs 0.525 af
15.0" Round Culvert n=0.013 L=109.0' S=0.0073 '/' Outflow=0.29 cfs 0.525 af

Pond DMH111: manhole Peak Elev=570.27' Inflow=0.29 cfs 0.525 af
15.0" Round Culvert n=0.013 L=104.0' S=0.0075 '/' Outflow=0.29 cfs 0.525 af

Pond DMH112: manhole Peak Elev=570.26' Inflow=14.38 cfs 1.241 af
18.0" Round Culvert n=0.013 L=31.0' S=0.0042 '/' Outflow=14.38 cfs 1.241 af

Link 100-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 2~Reach 200R-6.hce Inflow=93.07 cfs 35.130 af
Area= 152.510 ac 20.93% Imperv. Primary=93.07 cfs 35.130 af

Link 100-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 2~Reach 233R.hce Inflow=52.43 cfs 8.048 af
Area= 33.760 ac 73.79% Imperv. Primary=52.43 cfs 8.048 af

Total Runoff Area = 71.090 ac Runoff Volume = 18.941 af Average Runoff Depth = 3.20"
88.37% Pervious = 62.820 ac 11.63% Impervious = 8.270 ac

Summary for Subcatchment 201:

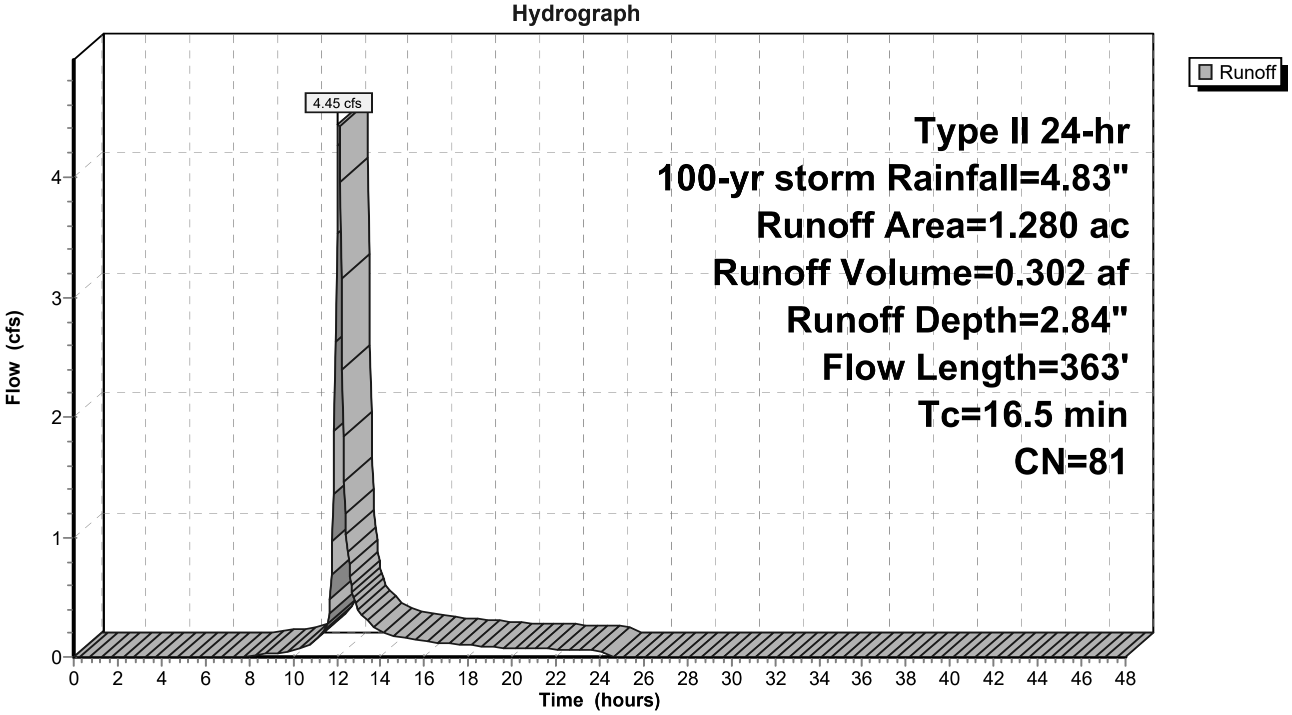
Runoff = 4.45 cfs @ 12.09 hrs, Volume= 0.302 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	0.370	84	50-75% Grass cover, Fair, HSG D
	0.870	79	Woods, Fair, HSG D
	0.030	98	Water Surface, 0% imp, HSG D
*	0.010	84	50-75% Grass cover, Fair, HSG D (offsite)
	1.280	81	Weighted Average
	1.280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	33	0.3300	0.34		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
9.8	67	0.0150	0.11		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 2.13"
5.1	263	0.0150	0.86		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
16.5	363	Total			

Subcatchment 201:



Summary for Subcatchment 220:

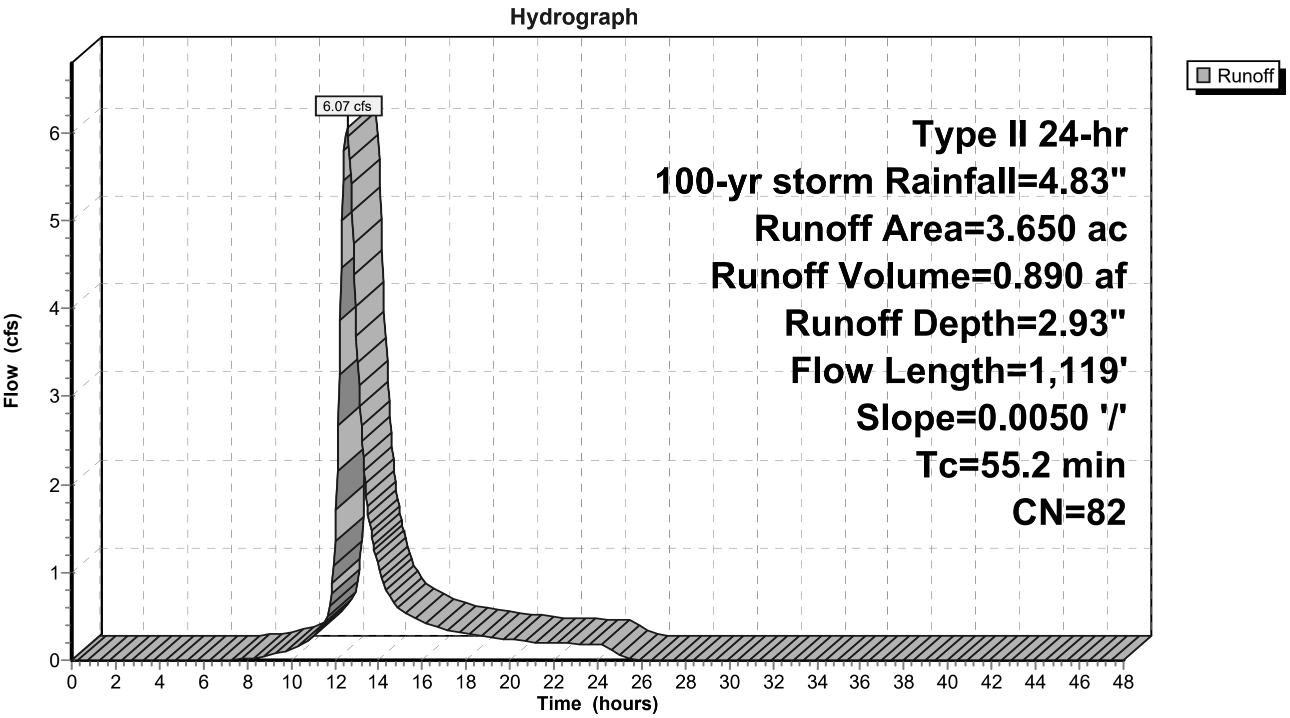
Runoff = 6.07 cfs @ 12.56 hrs, Volume= 0.890 af, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	0.830	84	50-75% Grass cover, Fair, HSG D
	1.410	79	Woods, Fair, HSG D
*	0.770	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.490	79	Woods, Fair, HSG D (offsite)
*	0.150	98	Water Surface, 0% imp, HSG D (offsite)
	3.650	82	Weighted Average
	3.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0050	0.08		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
34.3	1,019	0.0050	0.49		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
55.2	1,119	Total			

Subcatchment 220:



Summary for Subcatchment 300:

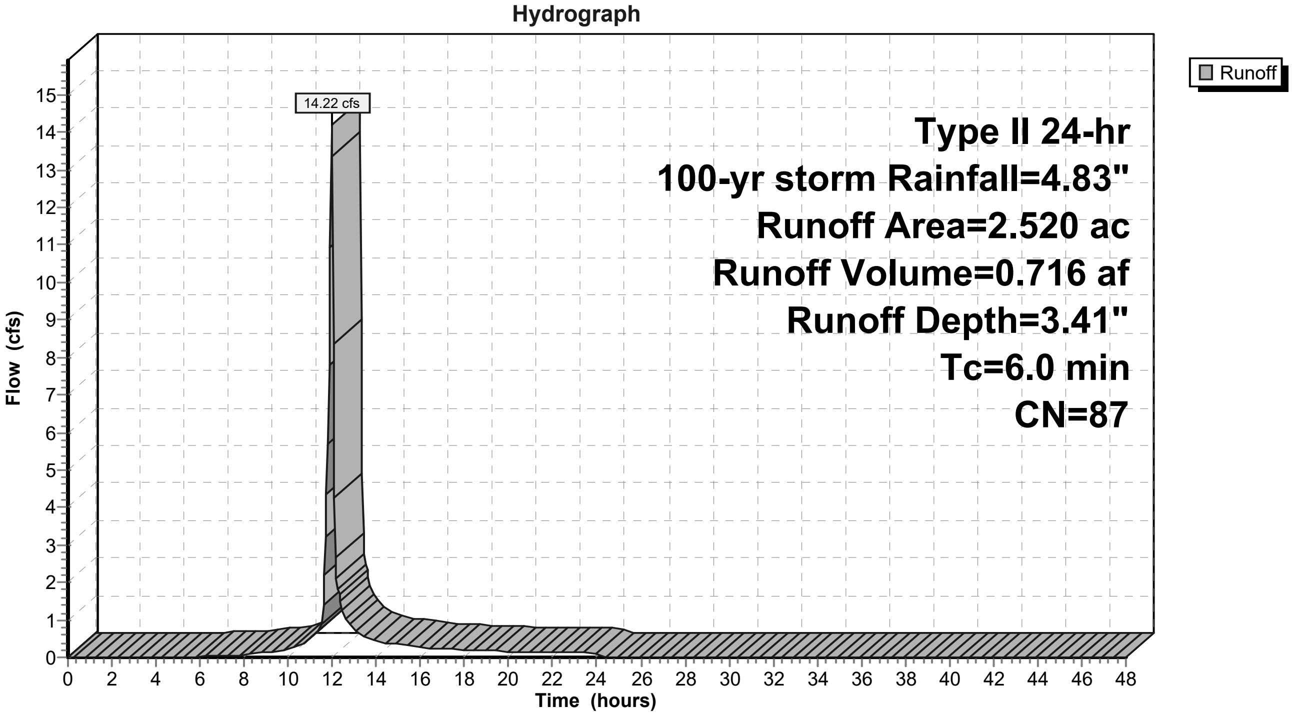
Runoff = 14.22 cfs @ 11.97 hrs, Volume= 0.716 af, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	1.480	84	50-75% Grass cover, Fair, HSG D
	0.510	98	Paved parking, HSG D
*	0.420	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.100	98	Paved parking, HSG D (offsite)
*	0.010	98	Water Surface, 0% imp, HSG D (offsite)
	2.520	87	Weighted Average
	1.910		75.79% Pervious Area
	0.610		24.21% Impervious Area

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

Subcatchment 300:



Summary for Subcatchment 310:

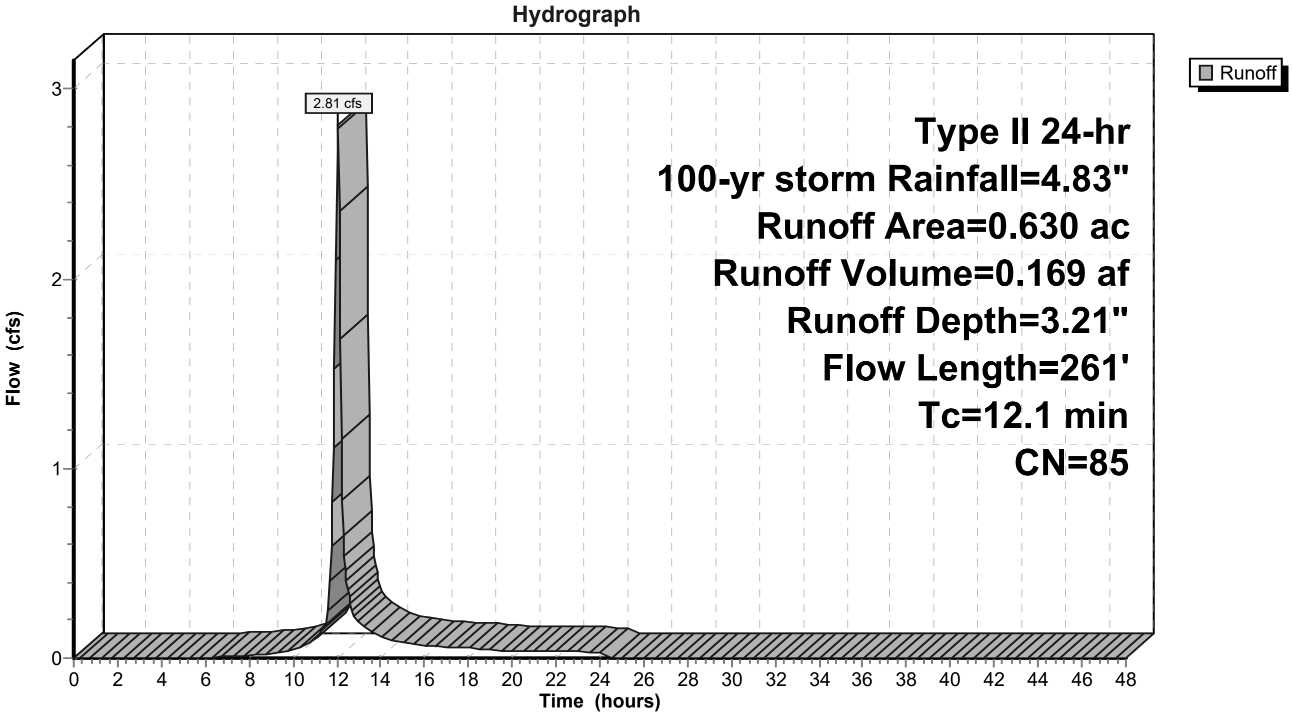
Runoff = 2.81 cfs @ 12.04 hrs, Volume= 0.169 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	0.160	84	50-75% Grass cover, Fair, HSG D
	0.010	98	Water Surface, 0% imp, HSG D
*	0.310	79	50-75% Grass cover, Fair, HSG C (offsite)
*	0.130	98	Paved parking, HSG D (offsite)
*	0.010	79	Woods, Fair, HSG D (offsite)
*	0.010	98	Water Surface, 0% imp, HSG D (offsite)
	0.630	85	Weighted Average
	0.500		79.37% Pervious Area
	0.130		20.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	100	0.0300	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
1.9	161	0.0400	1.40		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
12.1	261	Total			

Subcatchment 310:



Summary for Subcatchment 320:

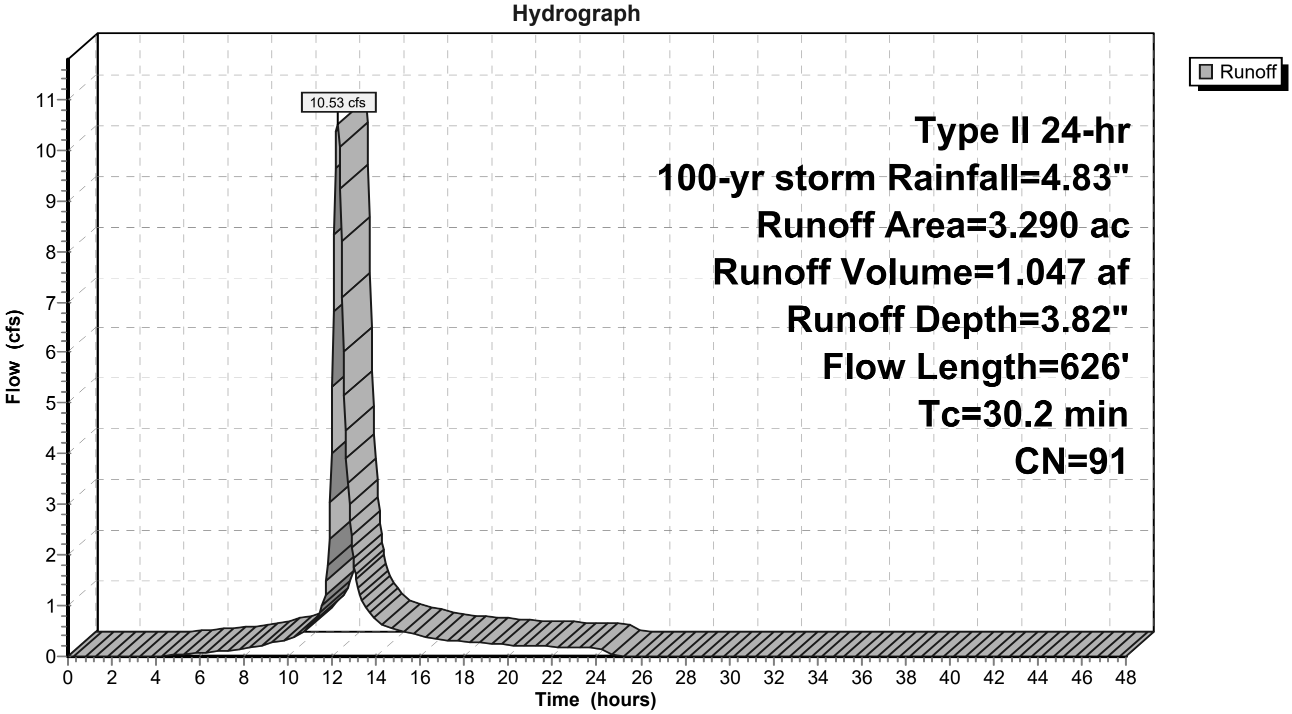
Runoff = 10.53 cfs @ 12.24 hrs, Volume= 1.047 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
1.530	84	50-75% Grass cover, Fair, HSG D
1.130	98	Water Surface, HSG D
0.620	98	Roofs, HSG D
0.010	98	Water Surface, 0% imp, HSG D
3.290	91	Weighted Average
1.540		46.81% Pervious Area
1.750		53.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	100	0.0300	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
16.6	171	0.0006	0.17		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
2.7	277	0.0070	1.70		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.7	78	0.0800	1.98		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
30.2	626	Total			

Subcatchment 320:



Summary for Subcatchment 330:

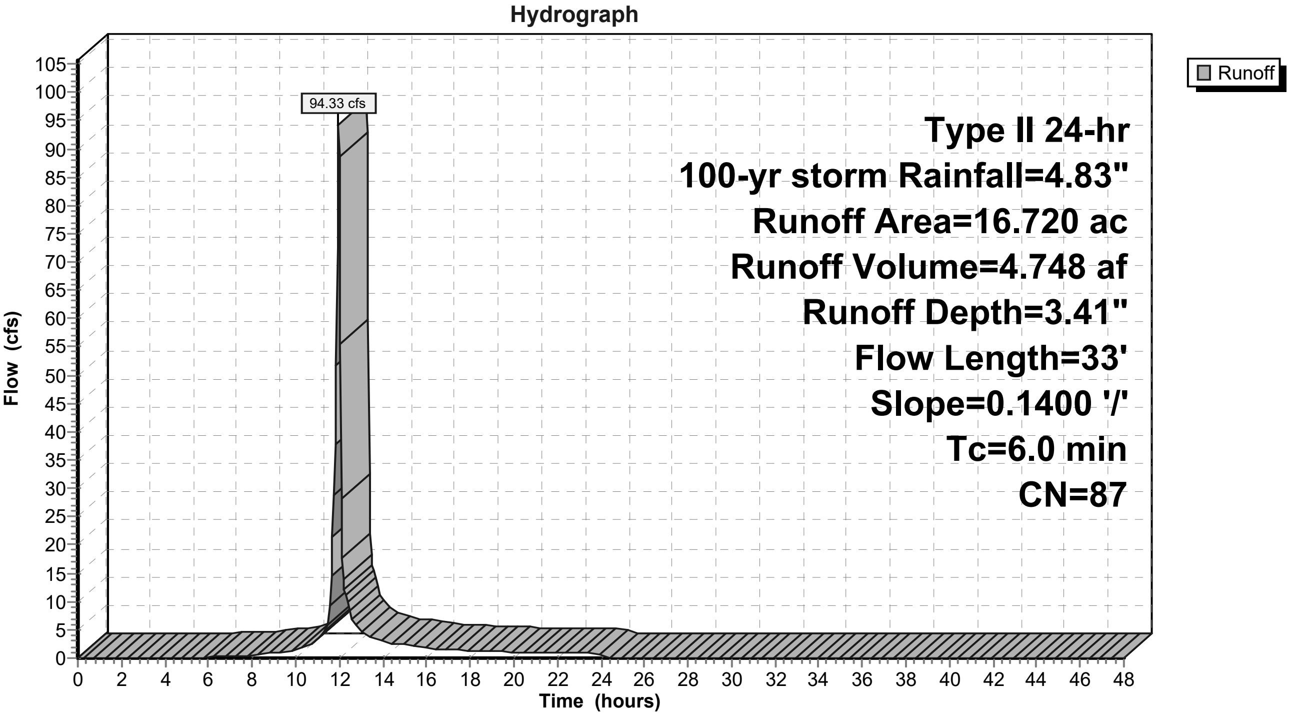
Runoff = 94.33 cfs @ 11.97 hrs, Volume= 4.748 af, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	0.050	84	50-75% Grass cover, Fair, HSG D
	0.620	79	Woods, Fair, HSG D
*	11.780	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.350	79	Woods, Fair, HSG D (offsite)
*	2.850	98	Paved parking, HSG D (offsite)
*	0.590	98	Roofs, HSG D (offsite)
*	0.010	91	Gravel roads, HSG D (offiste)
*	0.470	98	Water Surface, 0% imp, HSG D (offsite)
	16.720	87	Weighted Average
	13.280		79.43% Pervious Area
	3.440		20.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	33	0.1400	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.3	33	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 330:



Summary for Subcatchment 340:

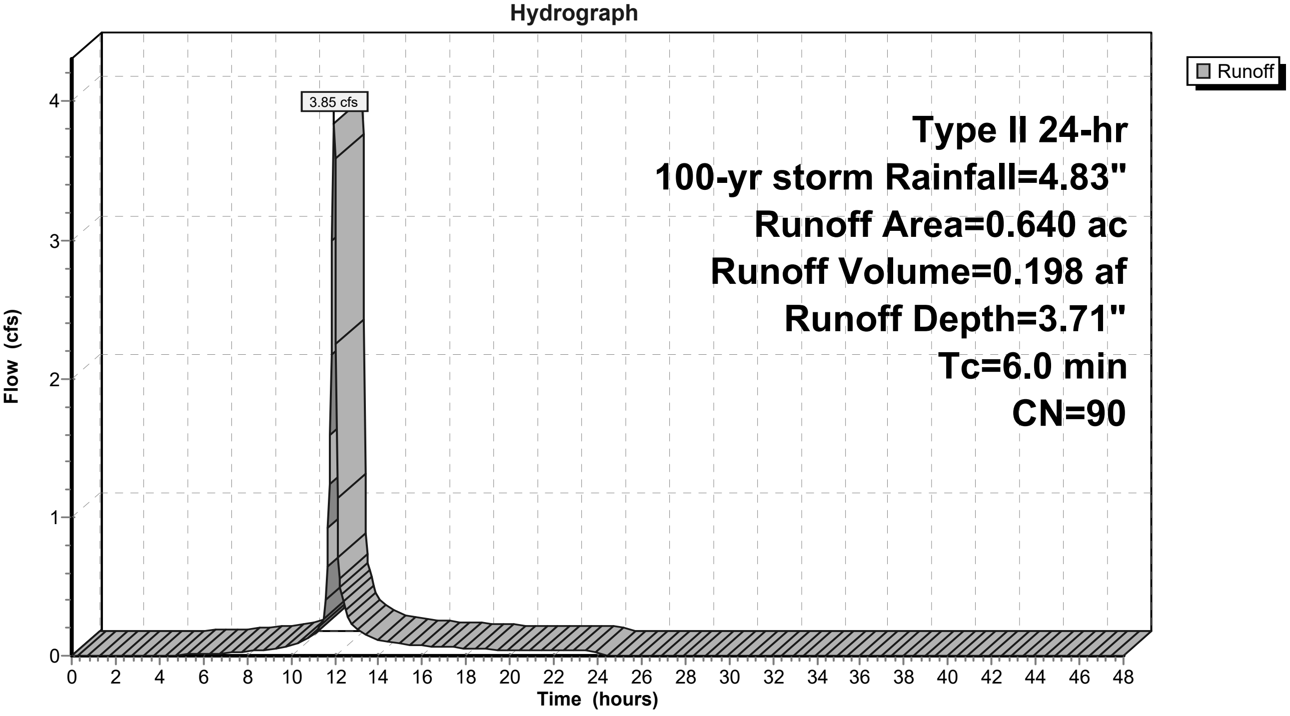
Runoff = 3.85 cfs @ 11.96 hrs, Volume= 0.198 af, Depth= 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
*	0.350	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.270	98	Paved parking, HSG D (offsite)
*	0.020	98	Water Surface, 0% imp, HSG D (offsite)
	0.640	90	Weighted Average
	0.370		57.81% Pervious Area
	0.270		42.19% Impervious Area

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

Subcatchment 340:



Summary for Subcatchment 350:

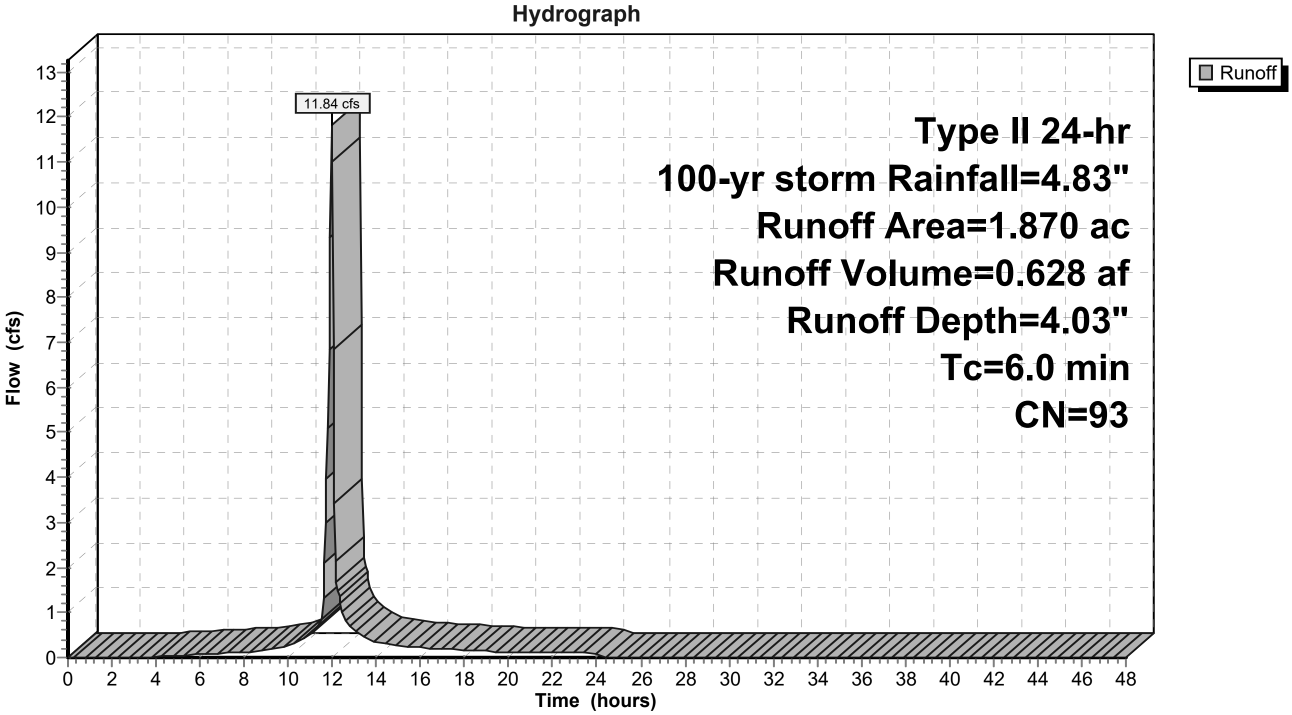
Runoff = 11.84 cfs @ 11.96 hrs, Volume= 0.628 af, Depth= 4.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

Area (ac)	CN	Description
0.650	84	50-75% Grass cover, Fair, HSG D
1.220	98	Paved parking, HSG D
1.870	93	Weighted Average
0.650		34.76% Pervious Area
1.220		65.24% Impervious Area

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

Subcatchment 350:



Summary for Subcatchment 400:

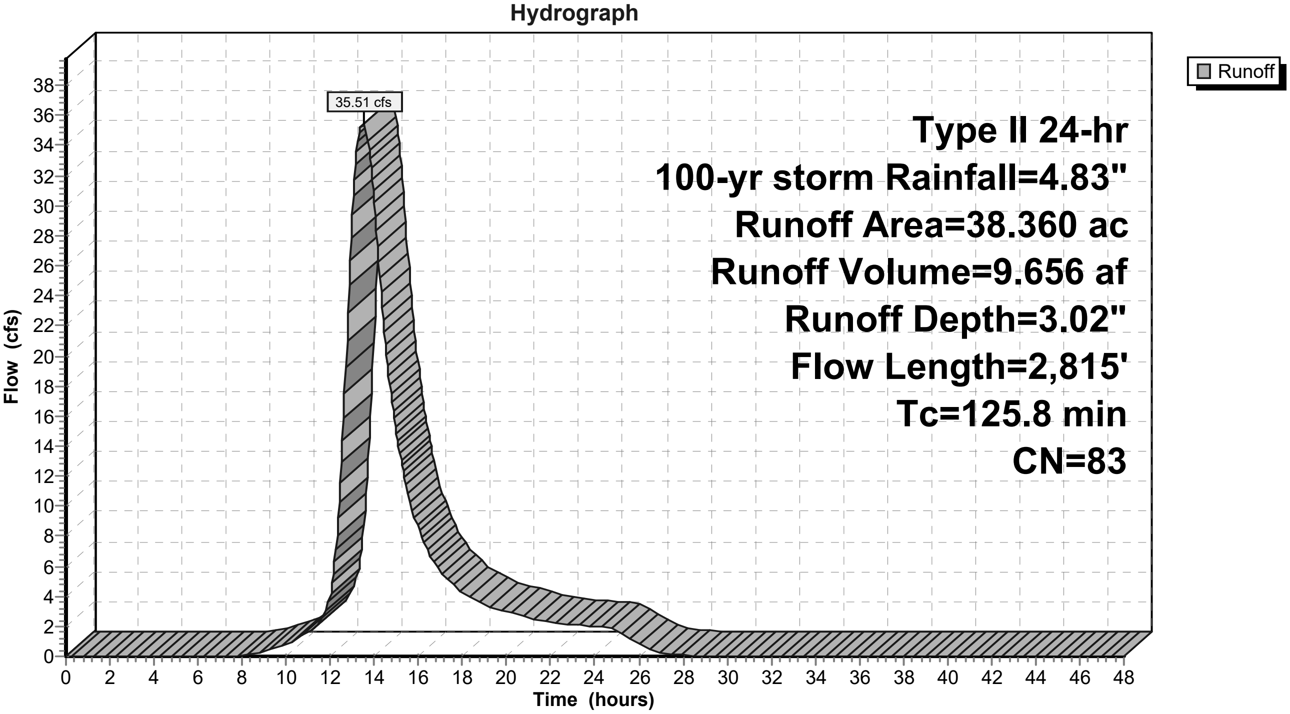
Runoff = 35.51 cfs @ 13.55 hrs, Volume= 9.656 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
	2.420	79	50-75% Grass cover, Fair, HSG C
	0.230	98	Paved parking, HSG D
	0.240	73	Woods, Fair, HSG C
	14.170	84	50-75% Grass cover, Fair, HSG D
	6.170	79	Woods, Fair, HSG D
*	0.390	79	50-75% Grass cover, Fair, HSG C (offsite)
*	0.300	73	Woods, Fair, HSG C (offsite)
*	14.170	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.030	79	Woods, Fair, HSG D (offsite)
*	0.130	98	Paved parking, HSG D (offsite)
*	0.090	98	Roofs, HSG D (offsite)
*	0.020	98	Water Surface, 0% imp, HSG D (offsite)
	38.360	83	Weighted Average
	37.910		98.83% Pervious Area
	0.450		1.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.1	100	0.0070	0.04		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 2.13"
72.2	1,370	0.0040	0.32		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	91	0.1500	2.71		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
10.1	378	0.0080	0.63		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
2.8	876	0.0160	5.26	57.86	**Channel Flow, E-F** Area= 11.0 sf Perim= 14.3' r= 0.77' n= 0.030 Earth, grassed & winding
125.8	2,815	Total			

Subcatchment 400:



Summary for Subcatchment 410:

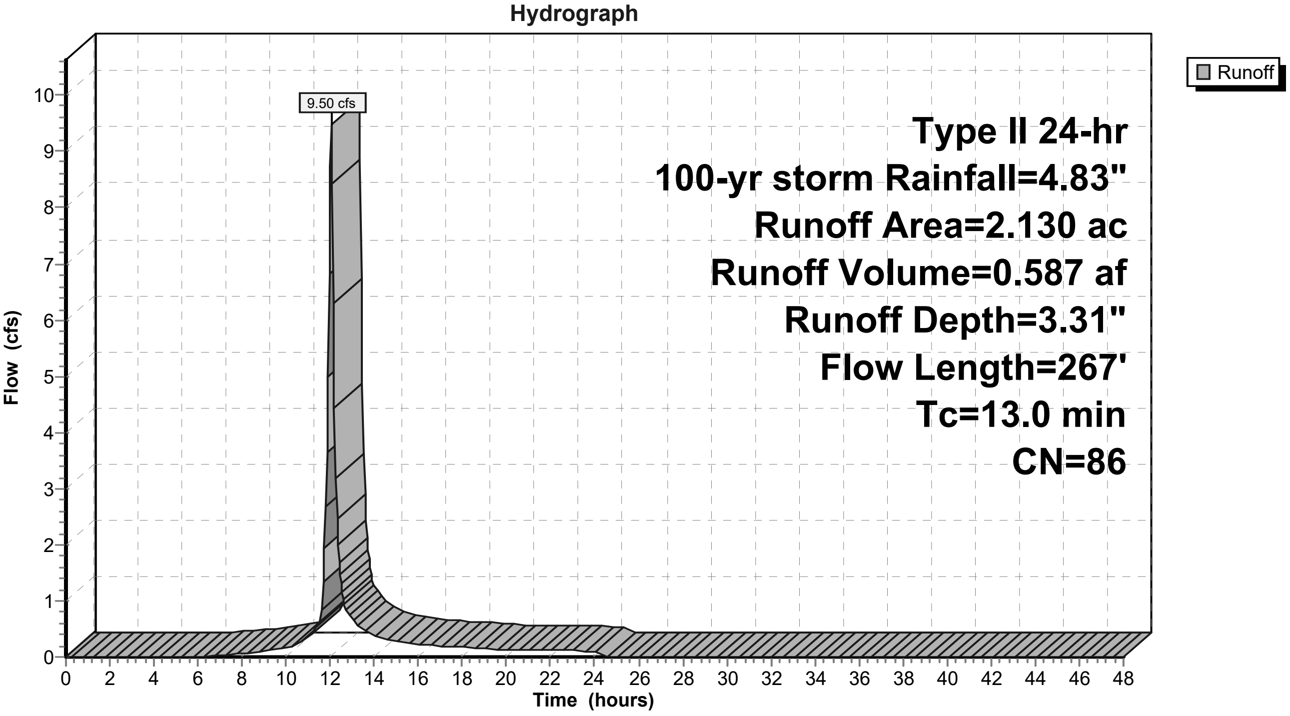
Runoff = 9.50 cfs @ 12.05 hrs, Volume= 0.587 af, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr storm Rainfall=4.83"

	Area (ac)	CN	Description
*	1.430	84	50-75% Grass cover, Fair, HSG D (offsite)
*	0.210	98	Paved parking, HSG D (offsite)
*	0.190	98	Roofs, HSG D (offsite)
*	0.260	79	Woods, Fair, HSG D (offsite)
*	0.040	98	Water Surface, 0% imp, HSG D (offsite)
	2.130	86	Weighted Average
	1.730		81.22% Pervious Area
	0.400		18.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0270	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.13"
2.3	167	0.0300	1.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
13.0	267	Total			

Subcatchment 410:



Summary for Reach 20R-2: feeder creek

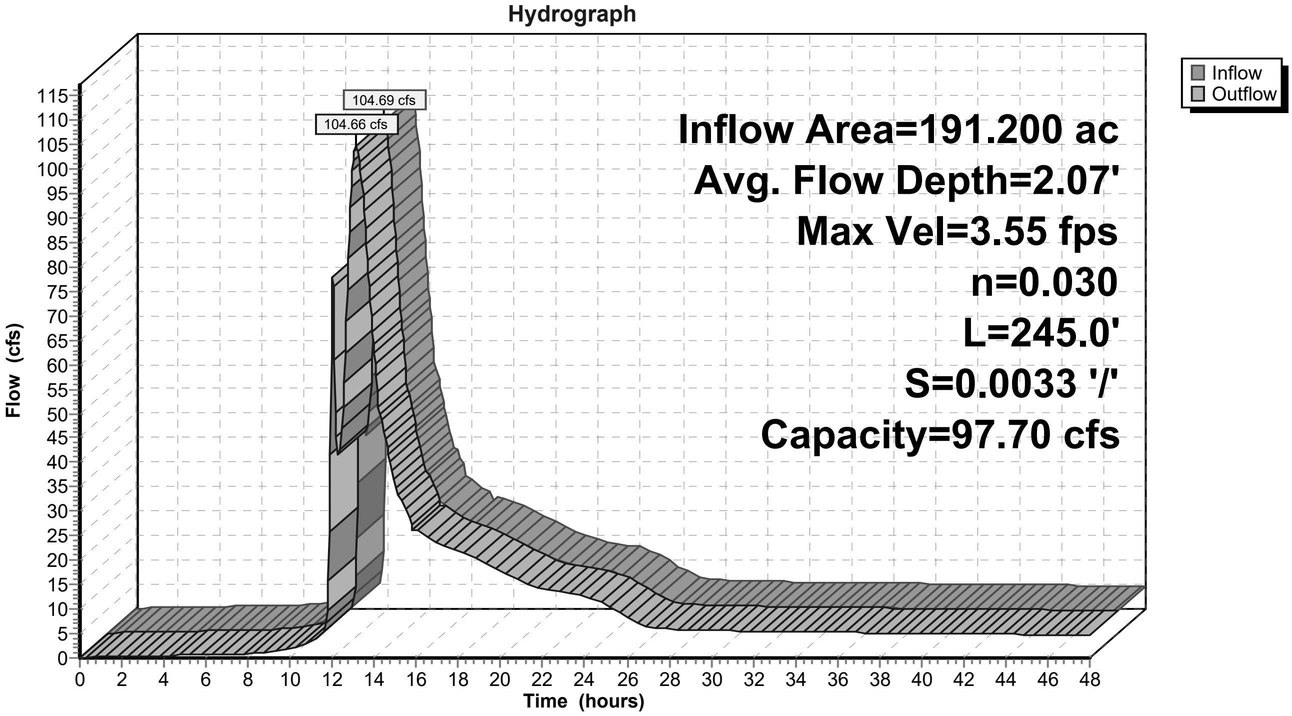
Inflow Area = 191.200 ac, 29.72% Impervious, Inflow Depth > 2.78" for 100-yr storm event
Inflow = 104.69 cfs @ 13.13 hrs, Volume= 44.372 af
Outflow = 104.66 cfs @ 13.14 hrs, Volume= 44.352 af, Atten= 0%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 3.55 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.51 fps, Avg. Travel Time= 2.7 min

Peak Storage= 7,215 cf @ 13.14 hrs
Average Depth at Peak Storage= 2.07'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 97.70 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 245.0' Slope= 0.0033 '/'
Inlet Invert= 572.00', Outlet Invert= 571.19'

Reach 20R-2: feeder creek



Summary for Reach 22R: property line ditch

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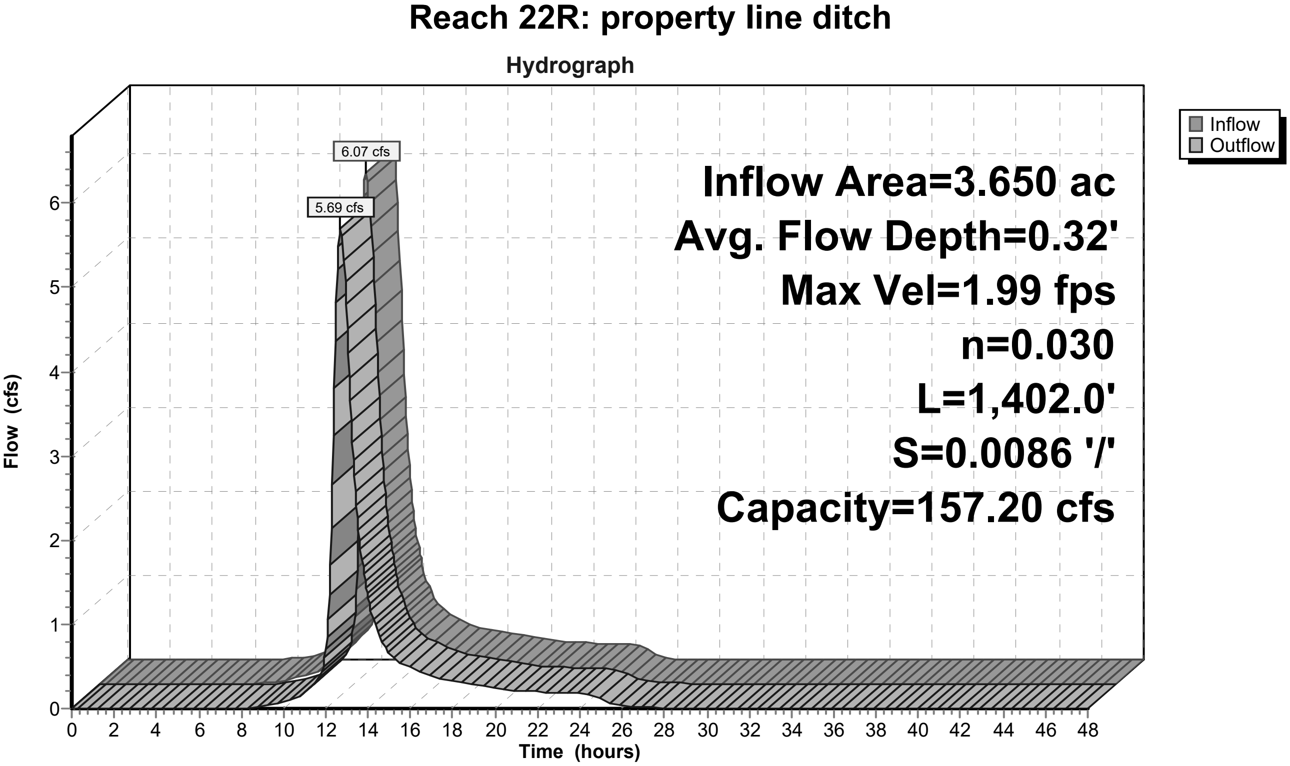
Inflow Area =        3.650 ac,   0.00% Impervious,  Inflow Depth =   2.93"    for  100-yr storm event
Inflow      =       6.07 cfs @   12.56 hrs,  Volume=          0.890 af
Outflow     =       5.69 cfs @   12.70 hrs,  Volume=          0.890 af,  Atten= 6%,  Lag= 8.5 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 1.99 fps, Min. Travel Time= 11.8 min
Avg. Velocity = 0.58 fps, Avg. Travel Time= 40.0 min

Peak Storage= 4,013 cf @ 12.70 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 157.20 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 1,402.0' Slope= 0.0086 '/'
Inlet Invert= 584.00', Outlet Invert= 572.00'

‡



Summary for Reach 32R: Long Road ditch

Inflow Area = 211.850 ac, 29.40% Impervious, Inflow Depth > 2.85" for 100-yr storm event
Inflow = 127.16 cfs @ 12.10 hrs, Volume= 50.266 af
Outflow = 127.32 cfs @ 12.10 hrs, Volume= 50.260 af, Atten= 0%, Lag= 0.3 min

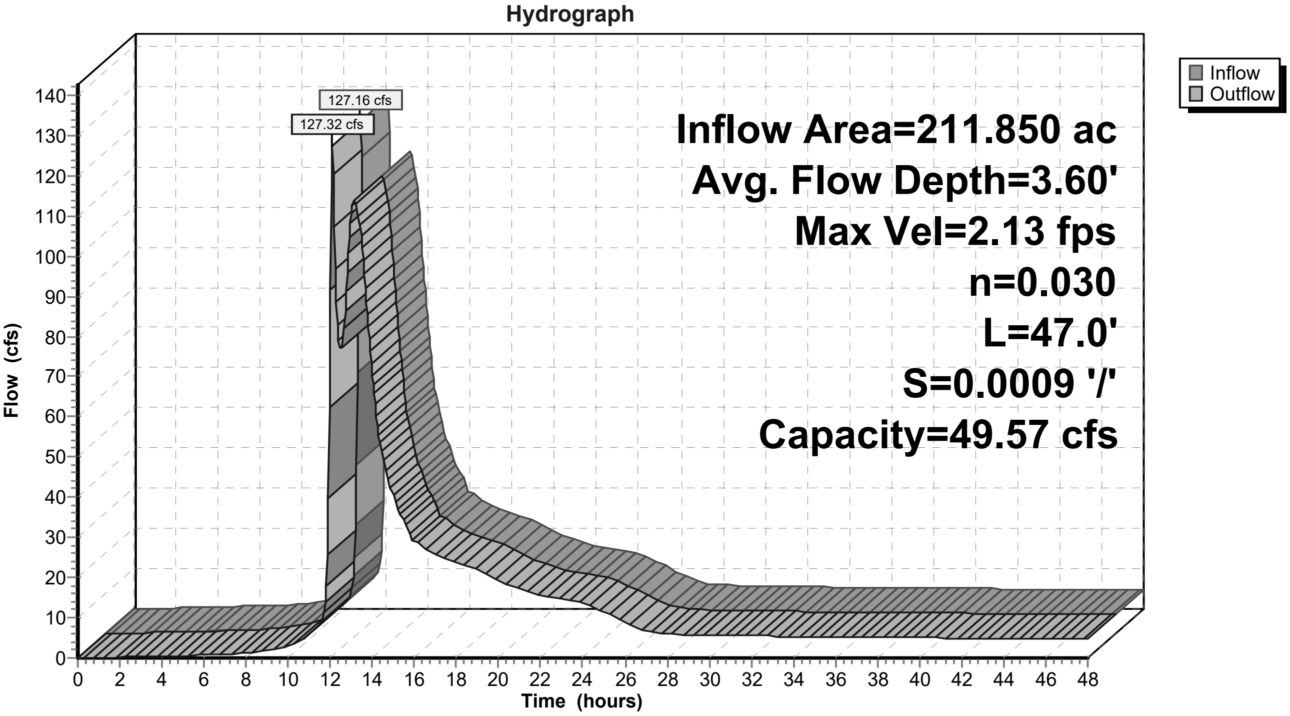
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.13 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 0.8 min

Peak Storage= 2,815 cf @ 12.10 hrs
Average Depth at Peak Storage= 3.60'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 49.57 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 47.0' Slope= 0.0009 '/'
Inlet Invert= 565.64', Outlet Invert= 565.60'

‡

Reach 32R: Long Road ditch



Summary for Reach 33R-1: I-190 ditch

Inflow Area =	16.720 ac, 20.57% Impervious, Inflow Depth = 3.41"	for 100-yr storm event	
Inflow =	94.33 cfs @ 11.97 hrs, Volume=	4.748 af	
Outflow =	47.14 cfs @ 12.07 hrs, Volume=	4.747 af, Atten= 50%, Lag= 6.1 min	

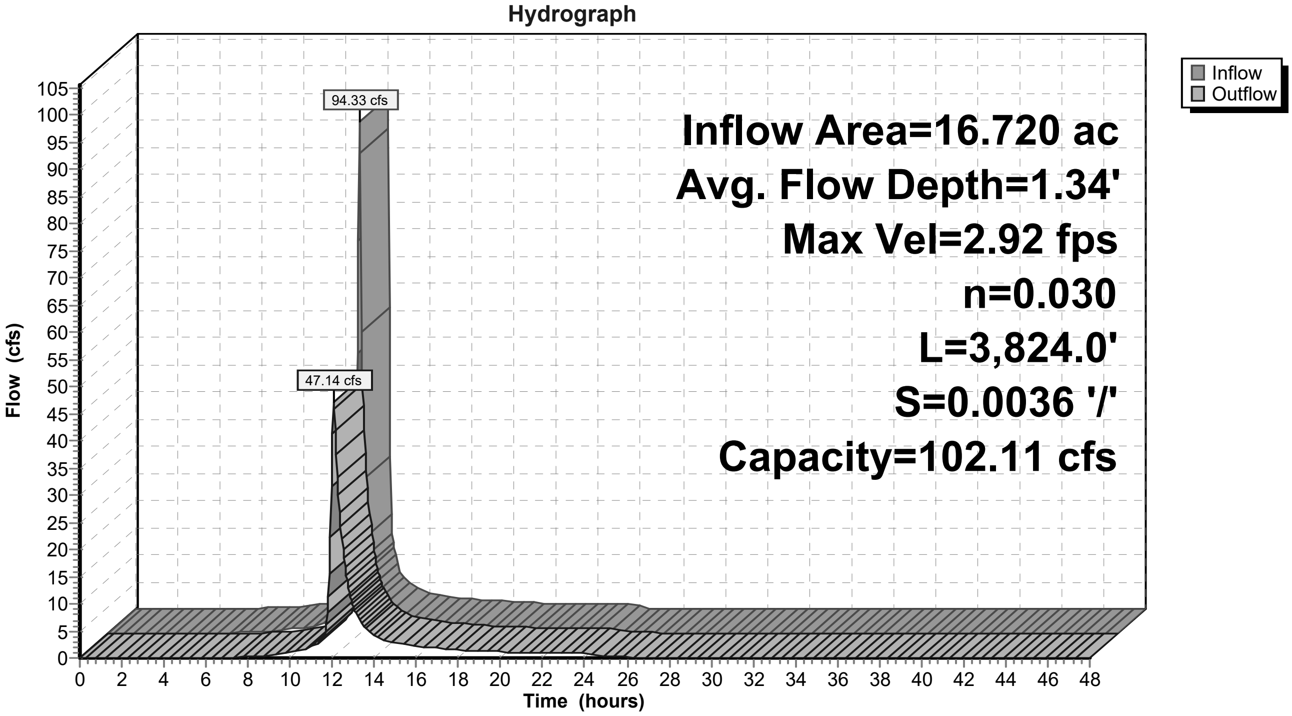
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.92 fps, Min. Travel Time= 21.8 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 115.1 min

Peak Storage= 61,518 cf @ 12.07 hrs
Average Depth at Peak Storage= 1.34'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 102.11 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 3,824.0' Slope= 0.0036 '/'
Inlet Invert= 585.00', Outlet Invert= 571.19'

‡

Reach 33R-1: I-190 ditch



Summary for Reach 33R-2: I-190 ditch

Inflow Area = 207.920 ac, 28.99% Impervious, Inflow Depth > 2.83" for 100-yr storm event
Inflow = 123.71 cfs @ 12.03 hrs, Volume= 49.100 af
Outflow = 120.67 cfs @ 12.06 hrs, Volume= 49.061 af, Atten= 2%, Lag= 1.8 min

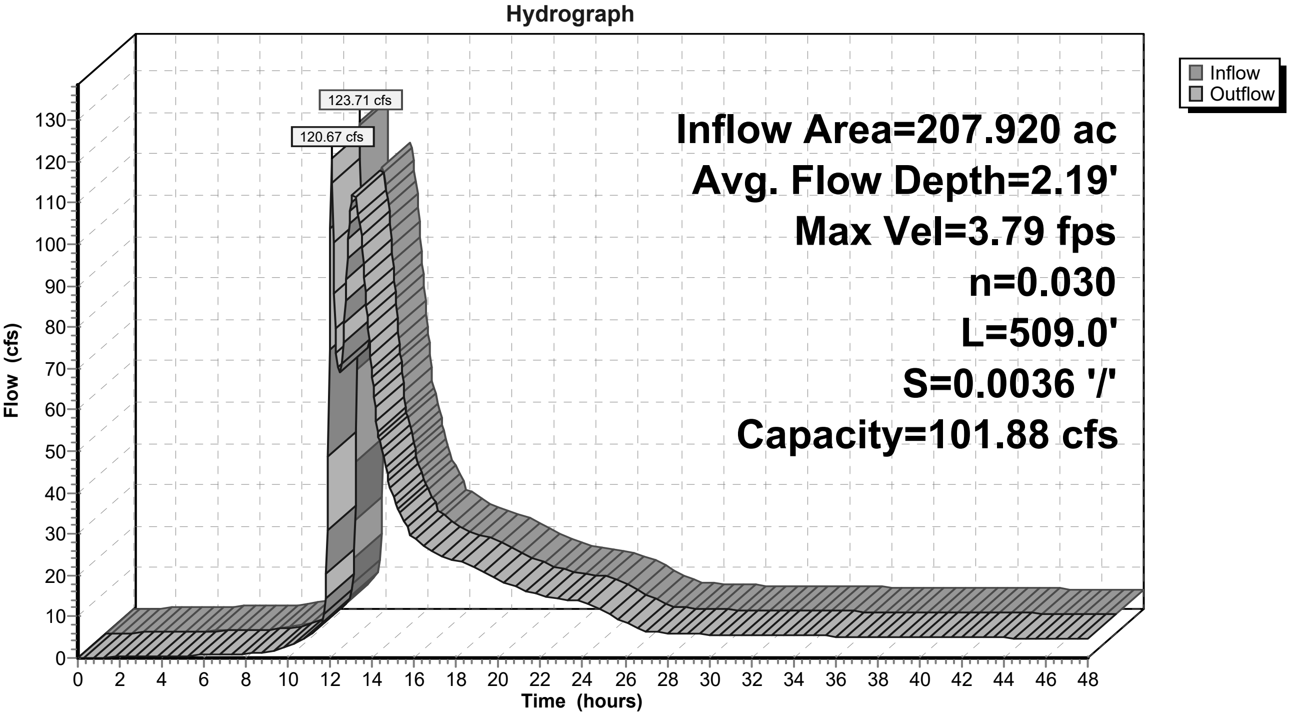
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 3.79 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.59 fps, Avg. Travel Time= 5.3 min

Peak Storage= 16,160 cf @ 12.06 hrs
Average Depth at Peak Storage= 2.19'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 101.88 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 509.0' Slope= 0.0036 '/'
Inlet Invert= 571.19', Outlet Invert= 569.36'

‡

Reach 33R-2: I-190 ditch



Summary for Reach 33R-3: Long Road ditch

Inflow Area = 208.560 ac, 29.03% Impervious, Inflow Depth > 2.83" for 100-yr storm event
Inflow = 122.73 cfs @ 12.06 hrs, Volume= 49.258 af
Outflow = 118.93 cfs @ 12.09 hrs, Volume= 49.219 af, Atten= 3%, Lag= 2.0 min

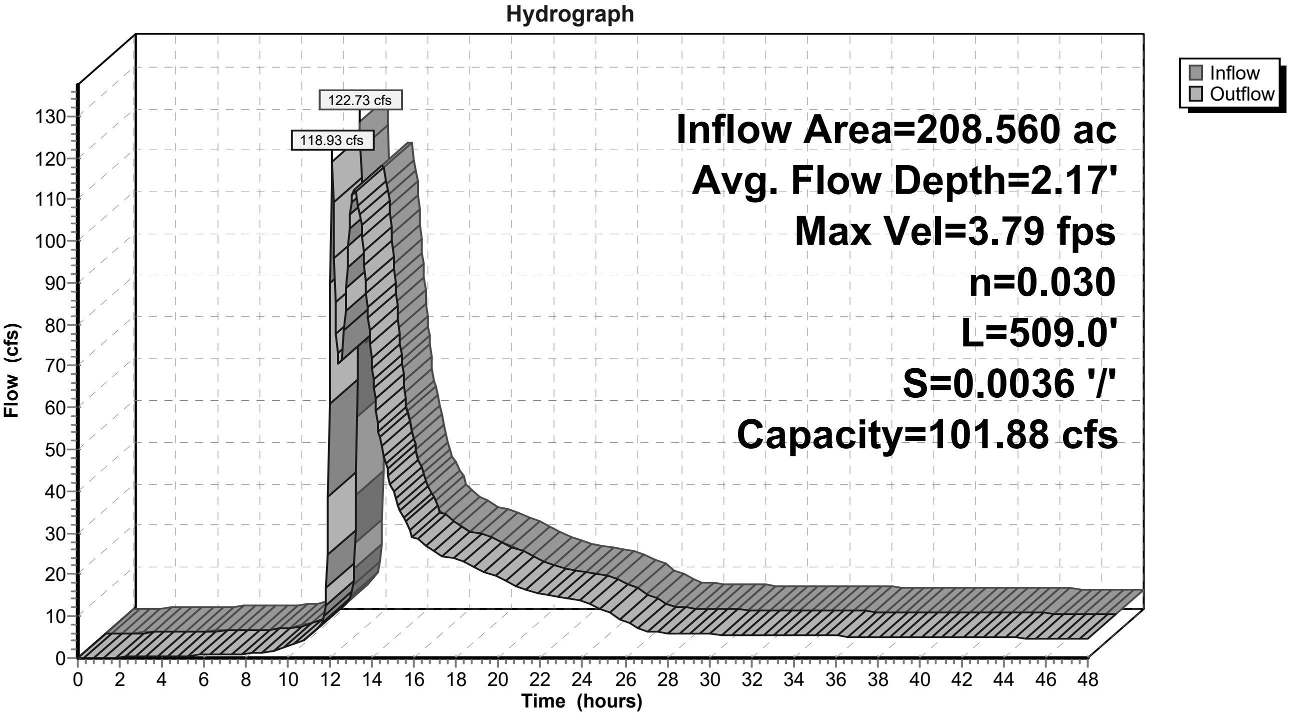
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 3.79 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.59 fps, Avg. Travel Time= 5.3 min

Peak Storage= 15,983 cf @ 12.09 hrs
Average Depth at Peak Storage= 2.17'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 101.88 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 509.0' Slope= 0.0036 '/'
Inlet Invert= 571.19', Outlet Invert= 569.36'

‡

Reach 33R-3: Long Road ditch



Summary for Reach 40R: Long Road ditch

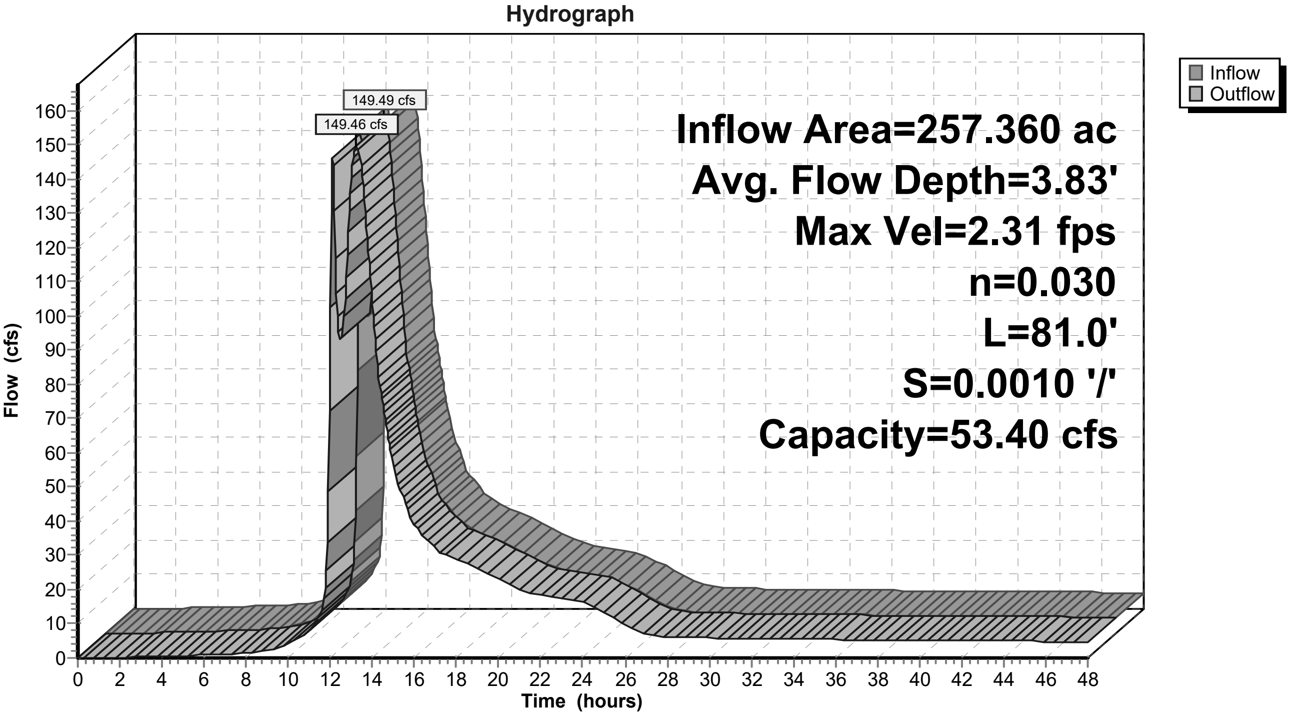
Inflow Area = 257.360 ac, 25.30% Impervious, Inflow Depth > 2.89" for 100-yr storm event
Inflow = 149.49 cfs @ 13.24 hrs, Volume= 61.889 af
Outflow = 149.46 cfs @ 13.24 hrs, Volume= 61.879 af, Atten= 0%, Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.31 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 1.3 min

Peak Storage= 5,230 cf @ 13.24 hrs
Average Depth at Peak Storage= 3.83'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 53.40 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 81.0' Slope= 0.0010 '/'
Inlet Invert= 564.47', Outlet Invert= 564.39'

Reach 40R: Long Road ditch



Summary for Reach 41R-1: Long Road ditch

Inflow Area = 216.870 ac, 29.63% Impervious, Inflow Depth > 2.86" for 100-yr storm event
Inflow = 134.28 cfs @ 12.10 hrs, Volume= 51.664 af
Outflow = 134.34 cfs @ 12.10 hrs, Volume= 51.660 af, Atten= 0%, Lag= 0.2 min

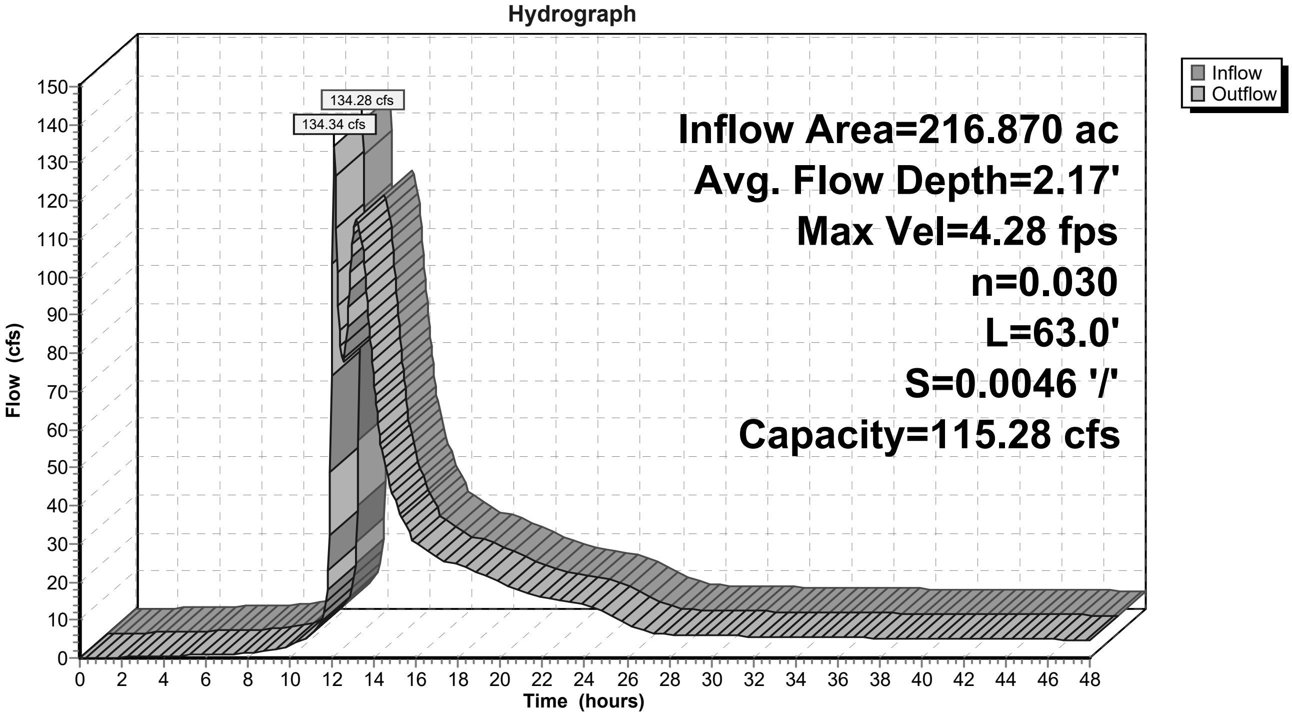
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 4.28 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.76 fps, Avg. Travel Time= 0.6 min

Peak Storage= 1,976 cf @ 12.10 hrs
Average Depth at Peak Storage= 2.17'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 115.28 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 63.0' Slope= 0.0046 '/'
Inlet Invert= 564.87', Outlet Invert= 564.58'

‡

Reach 41R-1: Long Road ditch



Summary for Reach 41R-2: Long Road ditch

Inflow Area = 219.000 ac, 29.52% Impervious, Inflow Depth > 2.86" for 100-yr storm event
Inflow = 142.83 cfs @ 12.10 hrs, Volume= 52.247 af
Outflow = 142.48 cfs @ 12.11 hrs, Volume= 52.232 af, Atten= 0%, Lag= 0.8 min

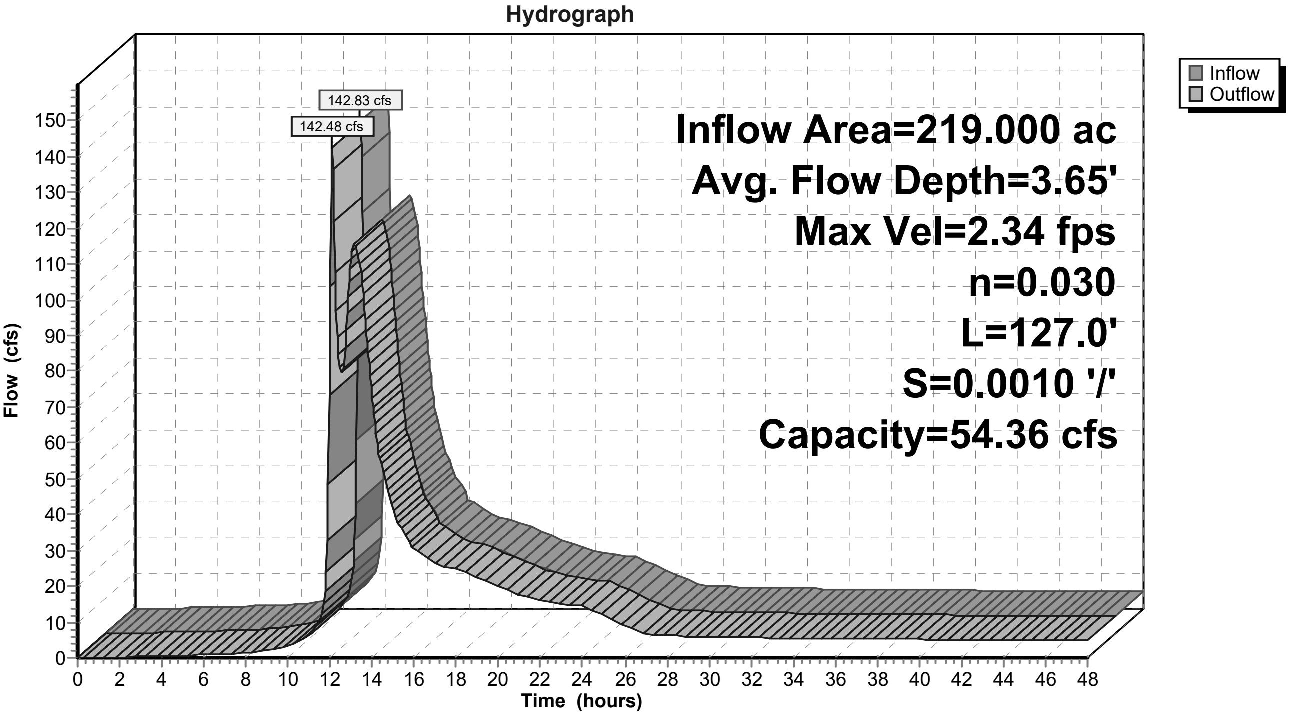
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.34 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.06 fps, Avg. Travel Time= 2.0 min

Peak Storage= 7,741 cf @ 12.11 hrs
Average Depth at Peak Storage= 3.65'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 54.36 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 127.0' Slope= 0.0010 '/'
Inlet Invert= 564.66', Outlet Invert= 564.53'

‡

Reach 41R-2: Long Road ditch



Summary for Reach 300R: Long Road ditch

Inflow Area =	216.870 ac, 29.63% Impervious, Inflow Depth > 2.86" for 100-yr storm event			
Inflow =	134.22 cfs @	12.09 hrs, Volume=	51.667 af	
Outflow =	134.28 cfs @	12.10 hrs, Volume=	51.664 af,	Atten= 0%, Lag= 0.1 min

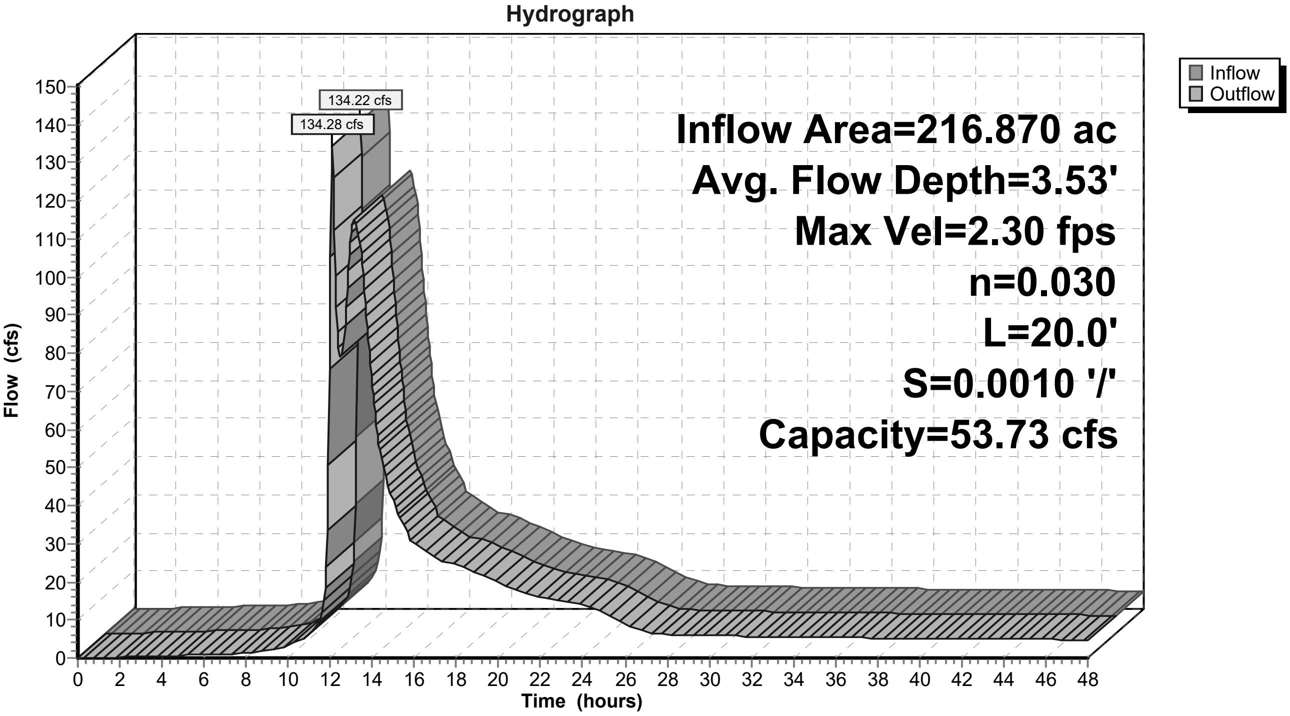
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 2.30 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.04 fps, Avg. Travel Time= 0.3 min

Peak Storage= 1,169 cf @ 12.10 hrs
Average Depth at Peak Storage= 3.53'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 53.73 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 20.0' Slope= 0.0010 '/'
Inlet Invert= 564.70', Outlet Invert= 564.68'

‡

Reach 300R: Long Road ditch



Summary for Reach 310R: Long Road ditch

Inflow Area = 211.850 ac, 29.40% Impervious, Inflow Depth > 2.85" for 100-yr storm event
Inflow = 127.32 cfs @ 12.10 hrs, Volume= 50.260 af
Outflow = 127.41 cfs @ 12.11 hrs, Volume= 50.257 af, Atten= 0%, Lag= 0.1 min

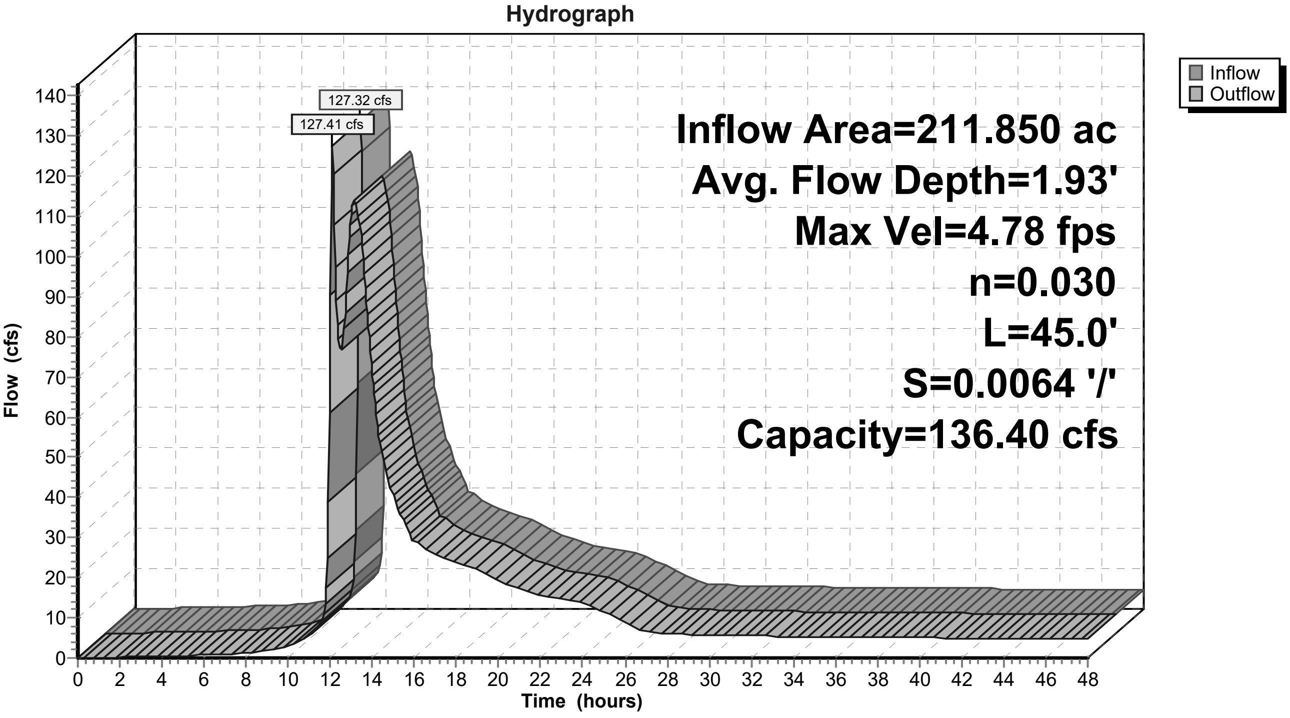
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 4.78 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.95 fps, Avg. Travel Time= 0.4 min

Peak Storage= 1,199 cf @ 12.11 hrs
Average Depth at Peak Storage= 1.93'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 136.40 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 45.0' Slope= 0.0064 '/'
Inlet Invert= 565.09', Outlet Invert= 564.80'

‡

Reach 310R: Long Road ditch

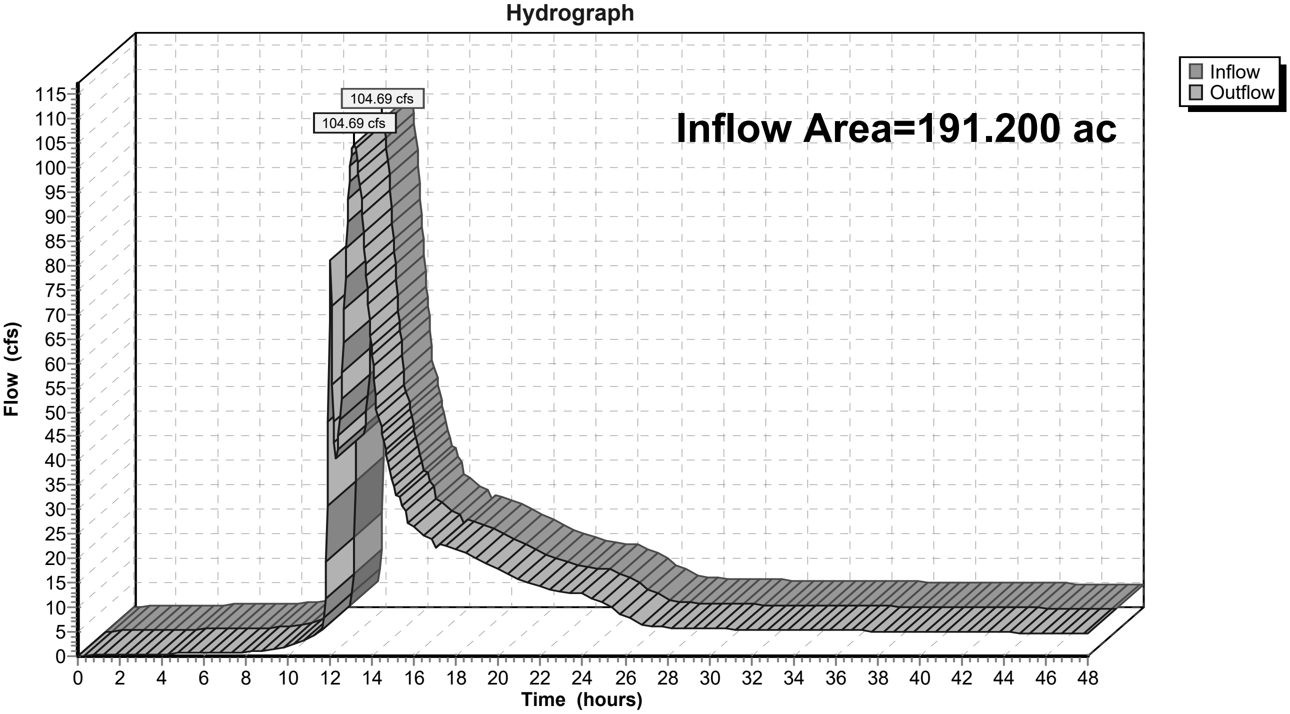


Summary for Reach DP-2: feeder creek on property portion

```
Inflow Area =       191.200 ac,  29.72% Impervious,  Inflow Depth >   2.78"    for  100-yr storm event
Inflow       =     104.69 cfs @   13.13 hrs,  Volume=           44.372 af
Outflow      =     104.69 cfs @   13.13 hrs,  Volume=           44.372 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-2: feeder creek on property portion

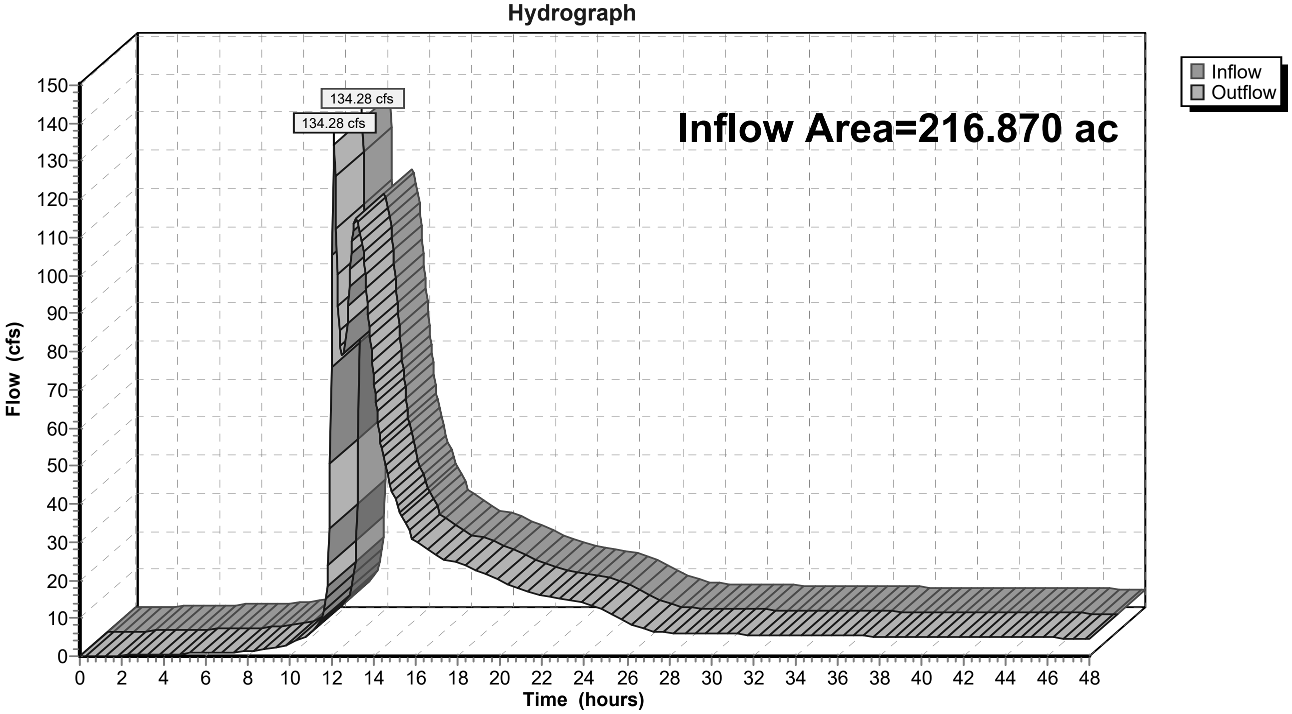


Summary for Reach DP-3: entrance to twin 36" culverts on adjancent property

```
Inflow Area =      216.870 ac, 29.63% Impervious, Inflow Depth >  2.86"   for 100-yr storm event
Inflow      =     134.28 cfs @  12.10 hrs, Volume=         51.664 af
Outflow     =     134.28 cfs @  12.10 hrs, Volume=         51.664 af, Atten= 0%, Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-3: entrance to twin 36" culverts on adjancent property

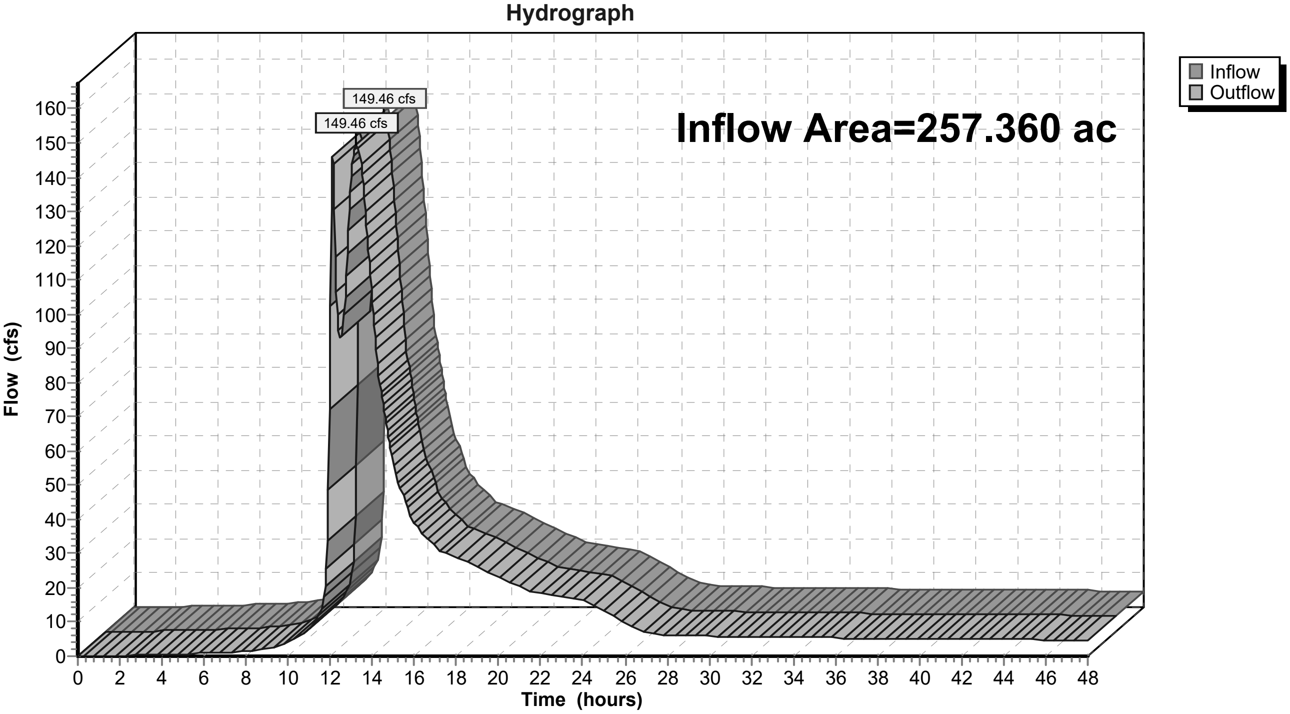


Summary for Reach DP-4: entrance to headwall

Inflow Area = 257.360 ac, 25.30% Impervious, Inflow Depth > 2.89" for 100-yr storm event
Inflow = 149.46 cfs @ 13.24 hrs, Volume= 61.879 af
Outflow = 149.46 cfs @ 13.24 hrs, Volume= 61.879 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4

Reach DP-4: entrance to headwall



Summary for Pond 30C: twin 36" culverts

Inflow Area =	216.870 ac,	29.63% Impervious,	Inflow Depth > 2.86"	for 100-yr storm event	
Inflow =	134.28 cfs @	12.10 hrs,	Volume=	51.664 af	
Outflow =	134.28 cfs @	12.10 hrs,	Volume=	51.664 af,	Atten= 0%, Lag= 0.0 min
Primary =	67.79 cfs @	12.10 hrs,	Volume=	33.140 af	
Secondary =	66.49 cfs @	12.10 hrs,	Volume=	18.524 af	

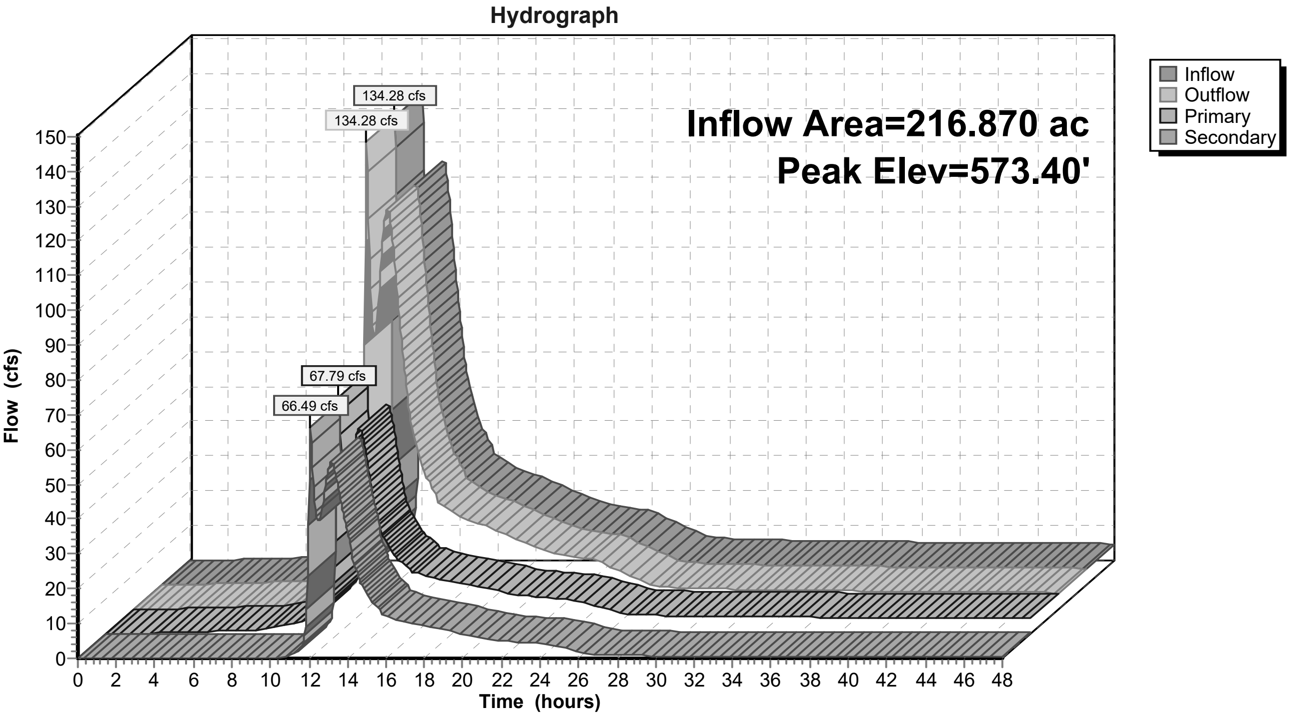
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 573.40' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.97'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.76' / 564.97' S= -0.0035 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	565.78'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.78' / 564.87' S= 0.0152 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=67.57 cfs @ 12.10 hrs HW=573.36' TW=567.03' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 67.57 cfs @ 9.56 fps)

Secondary OutFlow Max=66.27 cfs @ 12.10 hrs HW=573.36' TW=567.03' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 66.27 cfs @ 9.37 fps)

Pond 30C: twin 36" culverts



Summary for Pond 32C: twin 36" culverts

```
Inflow Area =      211.850 ac, 29.40% Impervious, Inflow Depth >  2.85"   for 100-yr storm event
Inflow       =     127.32 cfs @  12.10 hrs, Volume=          50.260 af
Outflow      =     127.32 cfs @  12.10 hrs, Volume=          50.260 af, Atten= 0%, Lag= 0.0 min
Primary      =      63.80 cfs @  12.10 hrs, Volume=          25.359 af
Secondary =         63.52 cfs @  12.10 hrs, Volume=          24.901 af
```

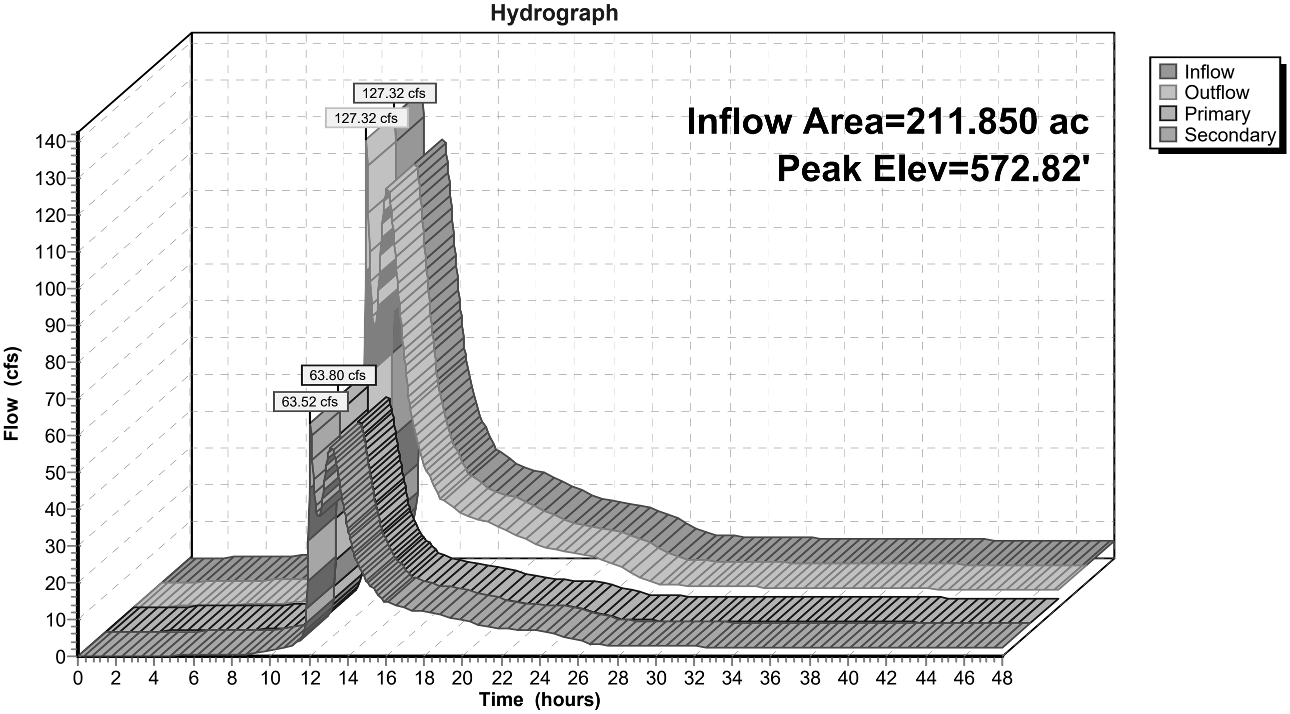
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 572.82' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	565.68'	**36.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.68' / 565.25' S= 0.0055 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#2	Secondary	565.73'	**36.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 565.73' / 565.09' S= 0.0082 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=63.54 cfs @ 12.10 hrs HW=572.77' TW=567.02' (Dynamic Tailwater)
└—**1=Culvert** (Inlet Controls 63.54 cfs @ 8.99 fps)

Secondary OutFlow Max=63.25 cfs @ 12.10 hrs HW=572.77' TW=567.02' (Dynamic Tailwater)
└—**2=Culvert** (Inlet Controls 63.25 cfs @ 8.95 fps)

Pond 32C: twin 36" culverts



Summary for Pond 33C: twin 30" culverts

```
Inflow Area =      211.850 ac, 29.40% Impervious, Inflow Depth >  2.85"   for 100-yr storm event
Inflow      =     127.16 cfs @  12.10 hrs, Volume=        50.266 af
Outflow     =     127.16 cfs @  12.10 hrs, Volume=        50.266 af, Atten= 0%, Lag= 0.0 min
Primary     =      63.58 cfs @  12.10 hrs, Volume=        25.085 af
Secondary   =      63.58 cfs @  12.10 hrs, Volume=        25.181 af

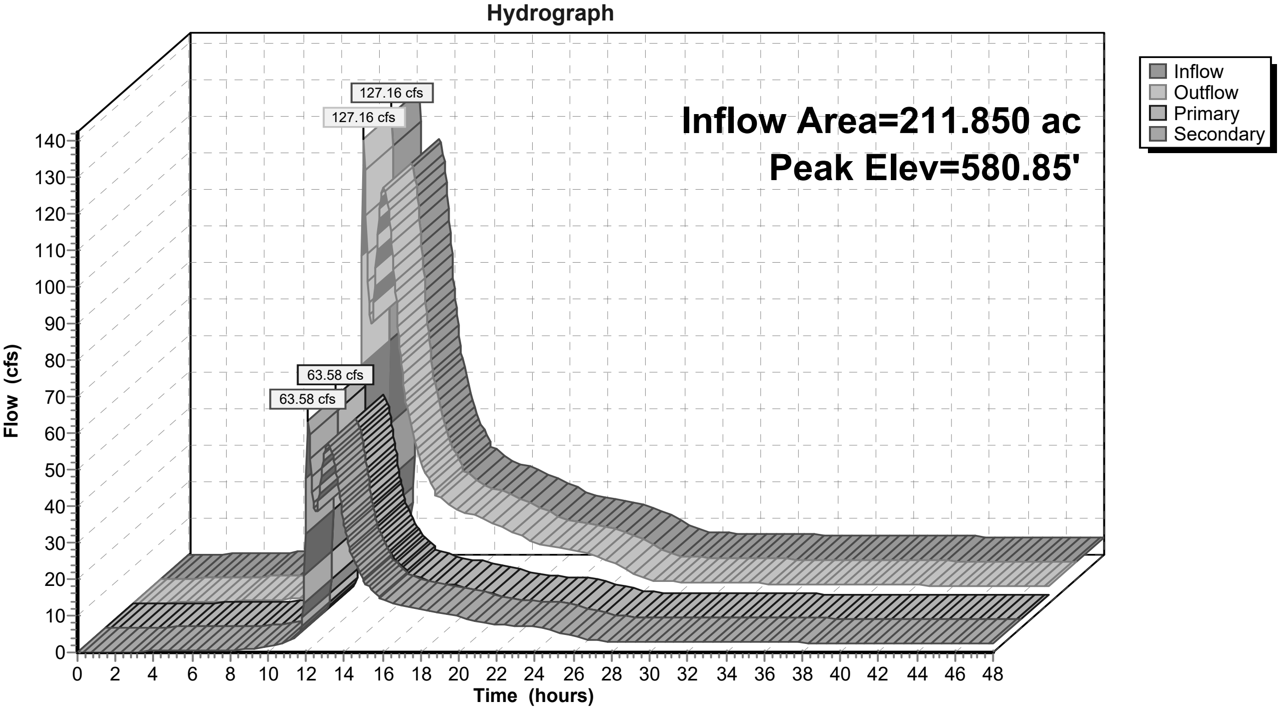
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 580.85' @ 12.10 hrs
Flood Elev= 571.00'

Device  Routing       Invert  Outlet Devices
  #1    Primary      565.70'  30.0" Round Culvert
                              L= 140.0'  CPP, projecting, no headwall,  Ke= 0.900
                              Inlet / Outlet Invert= 565.70' / 565.64'  S= 0.0004 '/'  Cc= 0.900
                              n= 0.013  Corrugated PE, smooth interior,  Flow Area= 4.91 sf
  #2    Secondary    565.65'  30.0" Round Culvert
                              L= 140.0'  CPP, projecting, no headwall,  Ke= 0.900
                              Inlet / Outlet Invert= 565.64' / 565.65'  S= -0.0001 '/'  Cc= 0.900
                              n= 0.013  Corrugated PE, smooth interior,  Flow Area= 4.91 sf

Primary OutFlow Max=63.44 cfs @ 12.10 hrs  HW=580.79'  TW=569.23'  (Dynamic Tailwater)
 └─1=Culvert  (Inlet Controls 63.44 cfs @ 12.92 fps)

Secondary OutFlow Max=63.44 cfs @ 12.10 hrs  HW=580.79'  TW=569.23'  (Dynamic Tailwater)
 └─2=Culvert  (Inlet Controls 63.44 cfs @ 12.92 fps)
```

Pond 33C: twin 30" culverts



Summary for Pond 34C: twin 36" culverts

```
Inflow Area =      0.640 ac,  42.19% Impervious,  Inflow Depth =   3.71"    for  100-yr storm event
Inflow      =      3.85 cfs @  11.96 hrs,  Volume=         0.198 af
Outflow     =      3.95 cfs @  11.96 hrs,  Volume=         0.197 af,  Atten= 0%,  Lag= 0.0 min
Primary     =      1.97 cfs @  11.96 hrs,  Volume=         0.099 af
Secondary   =      1.97 cfs @  11.96 hrs,  Volume=         0.099 af
```

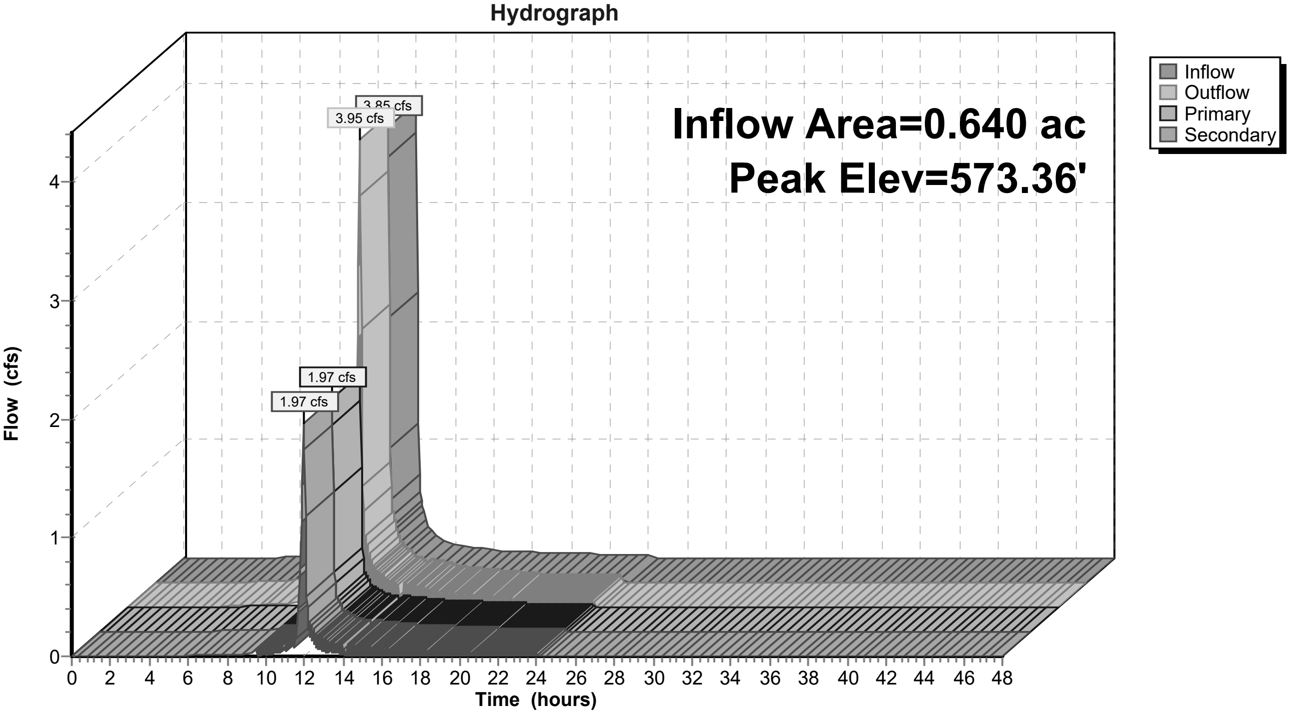
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 573.36' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	567.07'	**36.0" Round Culvert** L= 91.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 567.07' / 566.90' S= 0.0019 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#2	Secondary	567.17'	**36.0" Round Culvert** L= 91.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 567.17' / 566.89' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=1.92 cfs @ 11.96 hrs HW=572.80' TW=572.80' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.92 cfs @ 0.27 fps)

Secondary OutFlow Max=1.92 cfs @ 11.96 hrs HW=572.80' TW=572.80' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 1.92 cfs @ 0.27 fps)

Pond 34C: twin 36" culverts



Summary for Pond 41C-1: twin 36" culverts

Inflow Area = 216.870 ac, 29.63% Impervious, Inflow Depth > 2.86" for 100-yr storm event
Inflow = 134.34 cfs @ 12.10 hrs, Volume= 51.660 af
Outflow = 134.34 cfs @ 12.10 hrs, Volume= 51.660 af, Atten= 0%, Lag= 0.0 min
Primary = 67.17 cfs @ 12.10 hrs, Volume= 26.511 af
Secondary = 67.17 cfs @ 12.10 hrs, Volume= 25.149 af

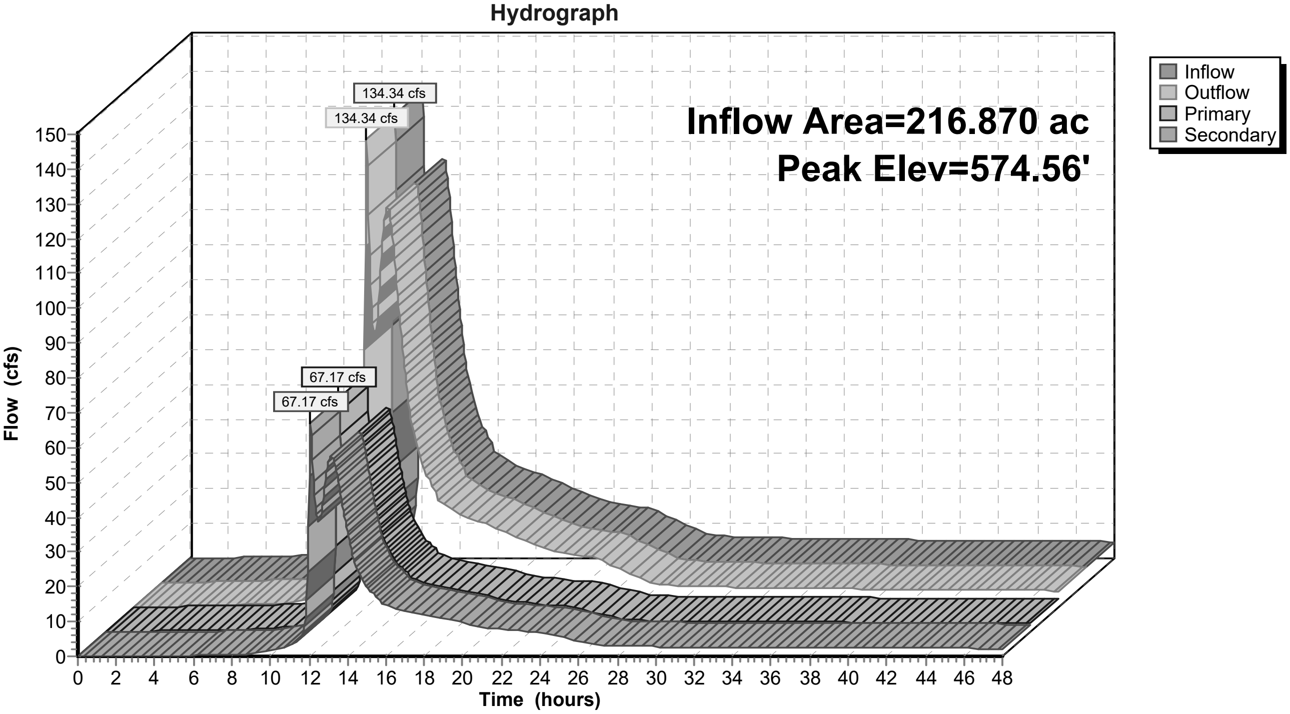
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 574.56' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.66'	**36.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.58' / 564.66' S= -0.0027 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	564.87'	**36.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.63' / 564.87' S= -0.0080 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=67.17 cfs @ 12.10 hrs HW=574.56' TW=568.31' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 67.17 cfs @ 9.50 fps)

Secondary OutFlow Max=67.17 cfs @ 12.10 hrs HW=574.56' TW=568.31' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 67.17 cfs @ 9.50 fps)

Pond 41C-1: twin 36" culverts



Summary for Pond 41C-2: twin 36" culverts

```
Inflow Area =      219.000 ac, 29.52% Impervious, Inflow Depth >  2.86"   for 100-yr storm event
Inflow      =     142.48 cfs @  12.11 hrs, Volume=         52.232 af
Outflow     =     142.48 cfs @  12.11 hrs, Volume=         52.232 af, Atten= 0%, Lag= 0.0 min
Primary     =      71.24 cfs @  12.11 hrs, Volume=         26.116 af
Secondary   =      71.24 cfs @  12.11 hrs, Volume=         26.116 af
```

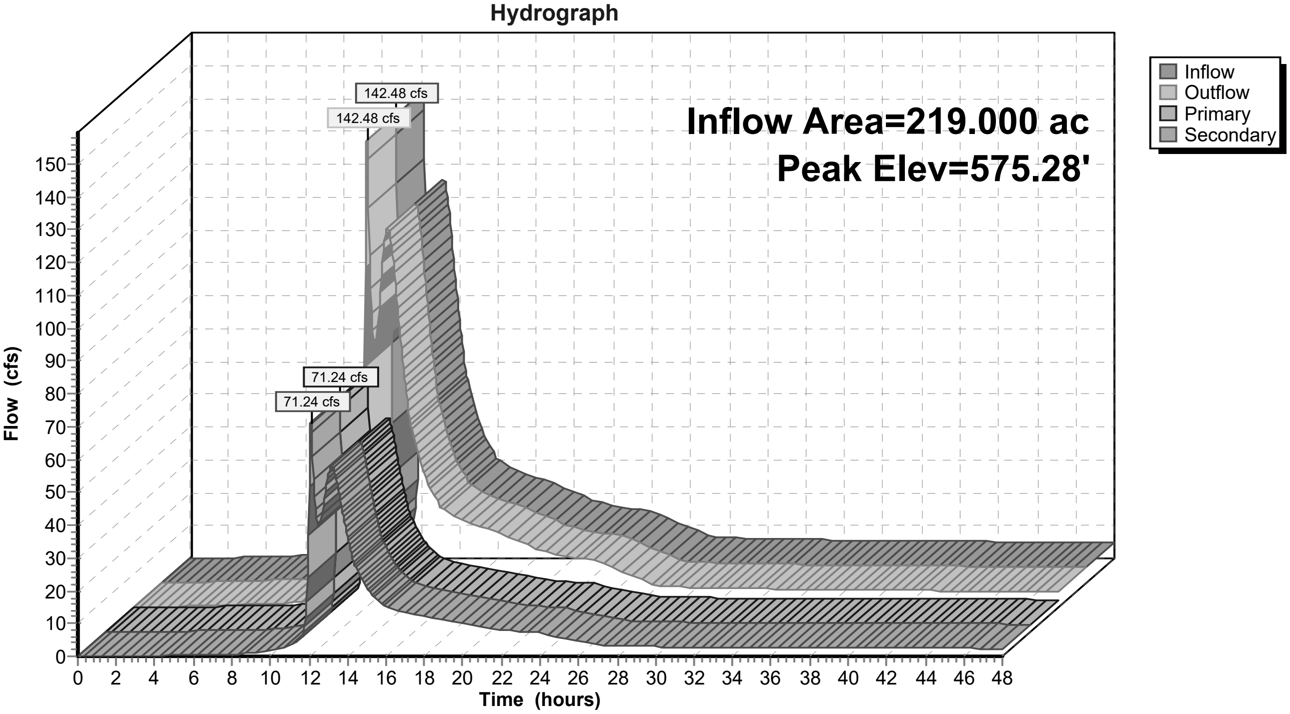
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 575.28' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.53'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.53' / 564.47' S= 0.0010 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	564.53'	**36.0" Round Culvert** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 564.53' / 564.47' S= 0.0010 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=70.63 cfs @ 12.11 hrs HW=575.14' TW=568.23' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 70.63 cfs @ 9.99 fps)

Secondary OutFlow Max=70.63 cfs @ 12.11 hrs HW=575.14' TW=568.23' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 70.63 cfs @ 9.99 fps)

Pond 41C-2: twin 36" culverts



Summary for Pond 310C: box culvert under access driveway

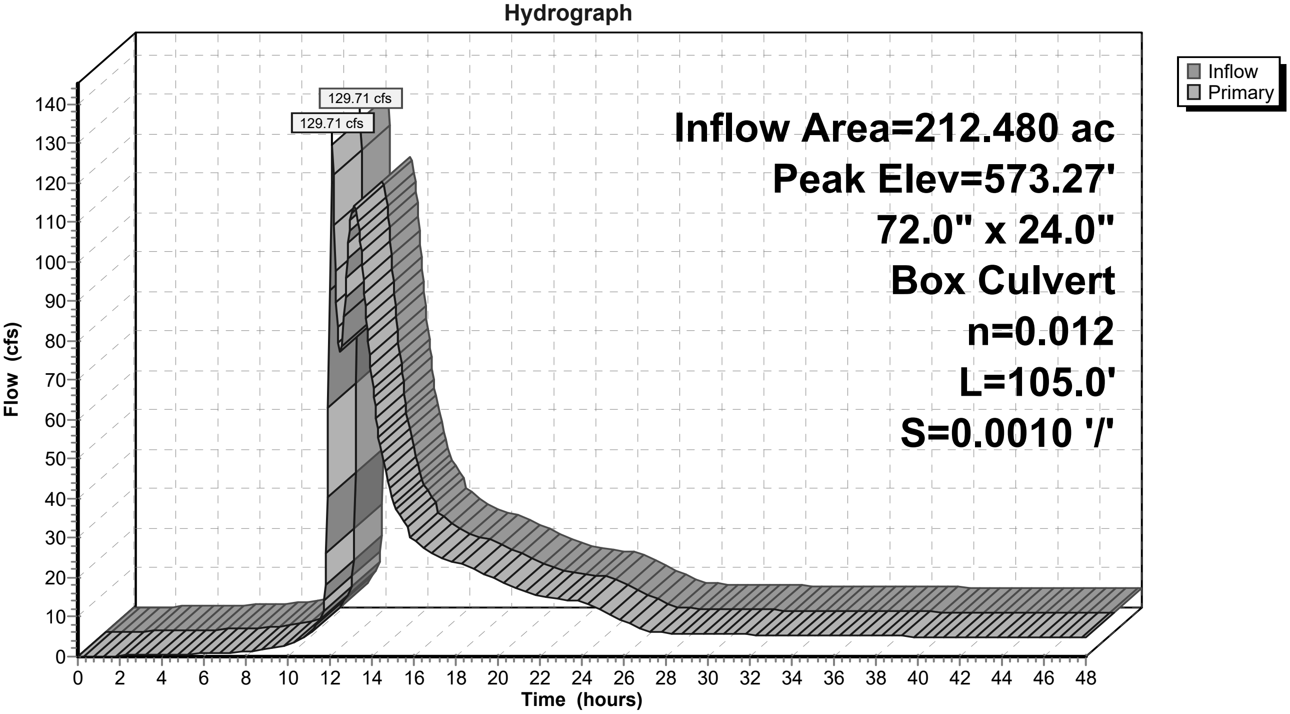
```
Inflow Area =      212.480 ac,  29.38% Impervious,  Inflow Depth >  2.85"    for  100-yr storm event
Inflow      =     129.71 cfs @   12.10 hrs,  Volume=          50.426 af
Outflow     =     129.71 cfs @   12.10 hrs,  Volume=          50.426 af,  Atten= 0%,  Lag= 0.0 min
Primary     =     129.71 cfs @   12.10 hrs,  Volume=          50.426 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 573.27' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	564.80'	**72.0" W x 24.0" H Box Culvert** L= 105.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 564.80' / 564.70' S= 0.0010 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.00 sf

Primary OutFlow Max=129.14 cfs @ 12.10 hrs HW=573.21' TW=568.22' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 129.14 cfs @ 10.76 fps)

Pond 310C: box culvert under access driveway



Summary for Pond 350Bio: bioretention

Inflow Area = 1.870 ac, 65.24% Impervious, Inflow Depth = 4.03" for 100-yr storm event
Inflow = 9.61 cfs @ 11.98 hrs, Volume= 0.628 af
Outflow = 0.29 cfs @ 14.72 hrs, Volume= 0.525 af, Atten= 97%, Lag= 164.6 min
Primary = 0.29 cfs @ 14.72 hrs, Volume= 0.525 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 572.26' @ 14.72 hrs Surf.Area= 12,287 sf Storage= 14,037 cf
Flood Elev= 573.00' Surf.Area= 13,645 sf Storage= 23,660 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 513.6 min (1,445.5 - 931.9)

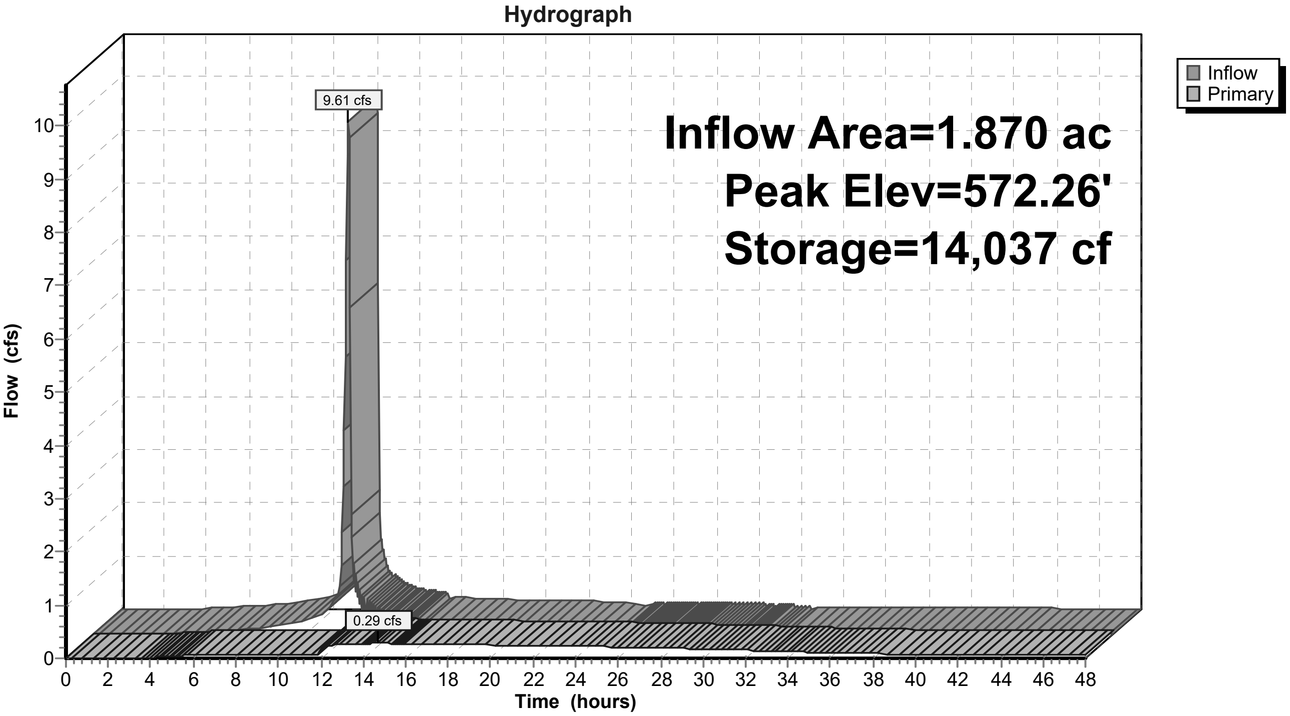
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	23,660 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.00	10,045	0	0
572.00	11,815	10,930	10,930
573.00	13,645	12,730	23,660

Device	Routing	Invert	Outlet Devices
#1	Primary	567.58'	**12.0" Round Culvert** L= 81.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 567.58' / 566.98' S= 0.0074 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	567.58'	**6.0" Vert. Underdrain** C= 0.600
#3	Device 1	571.50'	**3.0" Vert. Orifice** C= 0.600
#4	Device 1	572.25'	**48.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	571.00'	**0.250 in/hr Exfiltration through bioretention media over Surface area**

Primary OutFlow Max=0.29 cfs @ 14.72 hrs HW=572.26' TW=567.02' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.29 cfs of 6.81 cfs potential flow)
  ↑—**2=Underdrain** (Passes 0.07 cfs of 1.99 cfs potential flow)
    ↑—**5=Exfiltration through bioretention media** (Exfiltration Controls 0.07 cfs)
  —**3=Orifice** (Orifice Controls 0.19 cfs @ 3.83 fps)
  —**4=Grate** (Weir Controls 0.03 cfs @ 0.29 fps)

Pond 350Bio: bioretention



Summary for Pond 350F: forebay

Inflow Area = 1.870 ac, 65.24% Impervious, Inflow Depth = 4.03" for 100-yr storm event
Inflow = 11.84 cfs @ 11.96 hrs, Volume= 0.628 af
Outflow = 9.61 cfs @ 11.98 hrs, Volume= 0.628 af, Atten= 19%, Lag= 1.0 min
Primary = 9.61 cfs @ 11.98 hrs, Volume= 0.628 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Starting Elev= 571.50' Surf.Area= 5,131 sf Storage= 14,463 cf
Peak Elev= 572.26' @ 14.74 hrs Surf.Area= 5,840 sf Storage= 18,616 cf (4,152 cf above start)
Flood Elev= 573.00' Surf.Area= 6,575 sf Storage= 23,223 cf (8,759 cf above start)

Plug-Flow detention time= 565.4 min calculated for 0.296 af (47% of inflow)
Center-of-Mass det. time= 156.0 min (931.9 - 775.9)

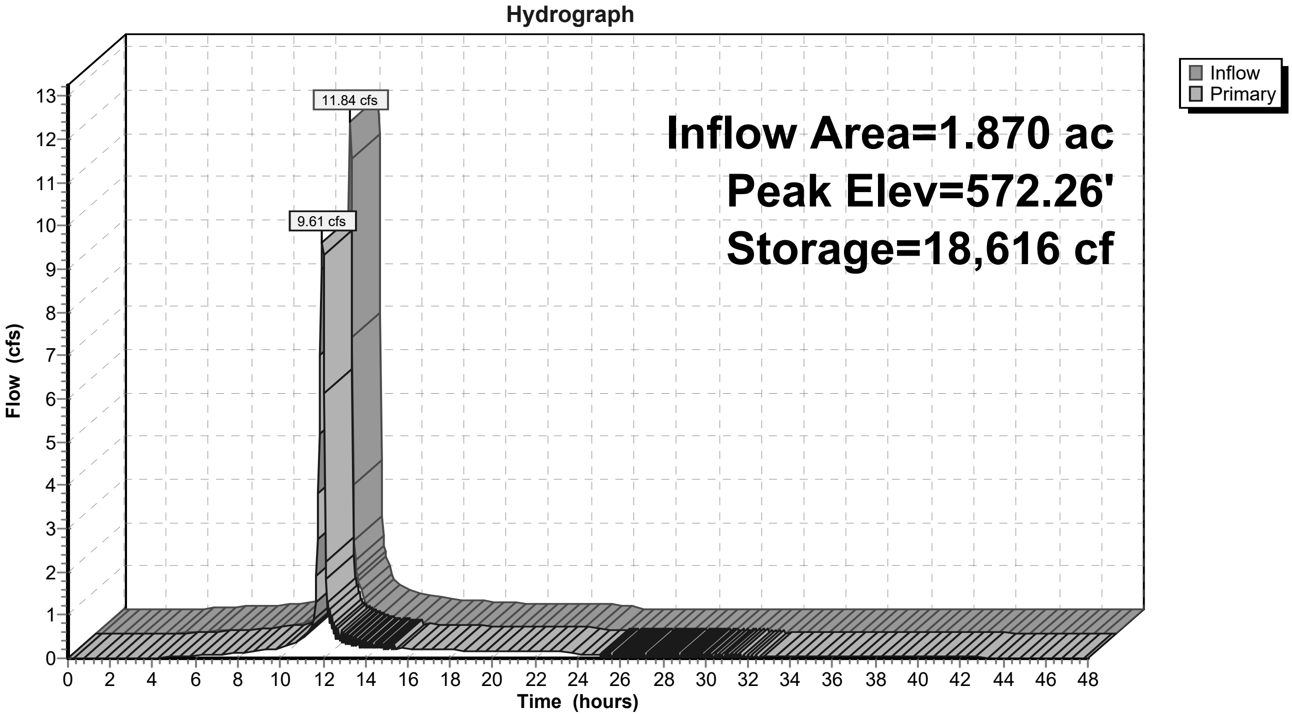
Volume	Invert	Avail.Storage	Storage Description
#1	567.00'	23,223 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
567.00	1,480	0	0
568.00	2,185	1,833	1,833
570.00	3,770	5,955	7,788
572.00	5,585	9,355	17,143
573.00	6,575	6,080	23,223

Device	Routing	Invert	Outlet Devices
#1	Primary	571.50'	**162.0 deg x 10.0' long x 1.50' rise overflow weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=9.38 cfs @ 11.98 hrs HW=571.97' TW=571.83' (Dynamic Tailwater)
↑—**1=overflow weir** (Weir Controls 9.38 cfs @ 1.54 fps)

Pond 350F: forebay



Summary for Pond DMH110: manhole

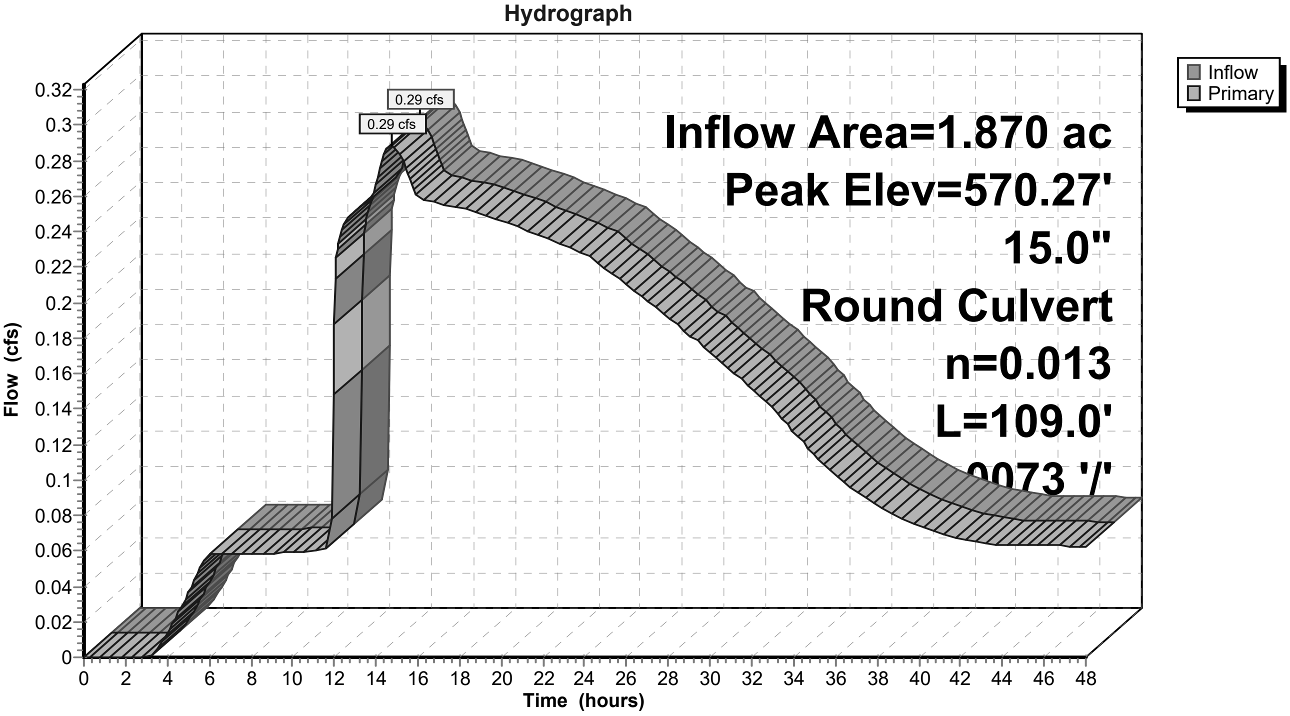
Inflow Area =	1.870 ac,	65.24% Impervious,	Inflow Depth > 3.37"	for 100-yr storm event	
Inflow =	0.29 cfs @	14.72 hrs,	Volume=	0.525 af	
Outflow =	0.29 cfs @	14.72 hrs,	Volume=	0.525 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.29 cfs @	14.72 hrs,	Volume=	0.525 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 570.27' @ 11.99 hrs
Flood Elev= 573.04'

Device	Routing	Invert	Outlet Devices
#1	Primary	566.71'	**15.0" Round Culvert** L= 109.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 566.71' / 565.91' S= 0.0073 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.29 cfs @ 14.72 hrs HW=567.02' TW=566.59' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.29 cfs @ 1.80 fps)

Pond DMH110: manhole



Summary for Pond DMH111: manhole

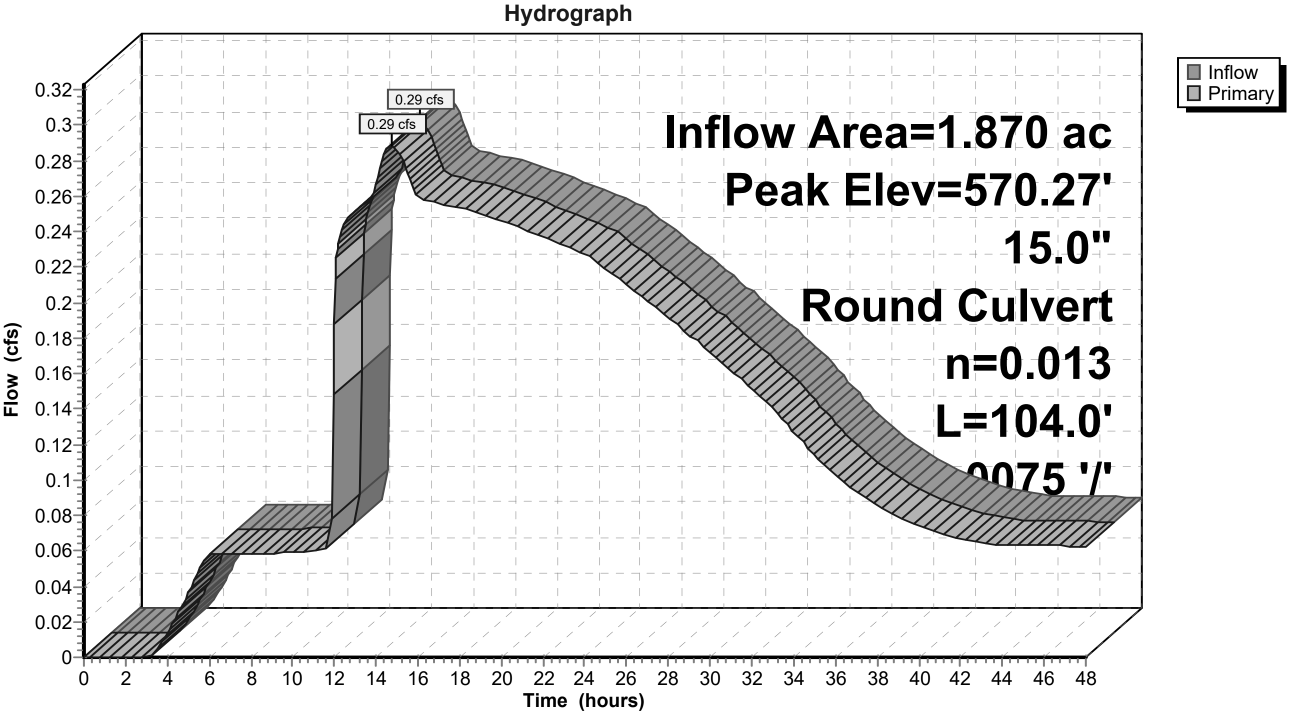
```
Inflow Area =      1.870 ac,  65.24% Impervious,  Inflow Depth >   3.37"    for  100-yr storm event
Inflow      =     0.29 cfs @   14.72 hrs,  Volume=          0.525 af
Outflow     =     0.29 cfs @   14.72 hrs,  Volume=          0.525 af,  Atten= 0%,  Lag= 0.0 min
Primary     =     0.29 cfs @   14.72 hrs,  Volume=          0.525 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 570.27' @ 11.99 hrs
Flood Elev= 571.44'

Device	Routing	Invert	Outlet Devices
#1	Primary	565.91'	**15.0" Round Culvert** L= 104.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 565.91' / 565.13' S= 0.0075 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.29 cfs @ 14.72 hrs HW=566.59' TW=566.56' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.29 cfs @ 0.62 fps)

Pond DMH111: manhole



Summary for Pond DMH112: manhole

Inflow Area =	4.390 ac, 41.69% Impervious, Inflow Depth > 3.39" for 100-yr storm event			
Inflow =	14.38 cfs @	11.97 hrs, Volume=	1.241 af	
Outflow =	14.38 cfs @	11.97 hrs, Volume=	1.241 af,	Atten= 0%, Lag= 0.0 min
Primary =	14.38 cfs @	11.97 hrs, Volume=	1.241 af	

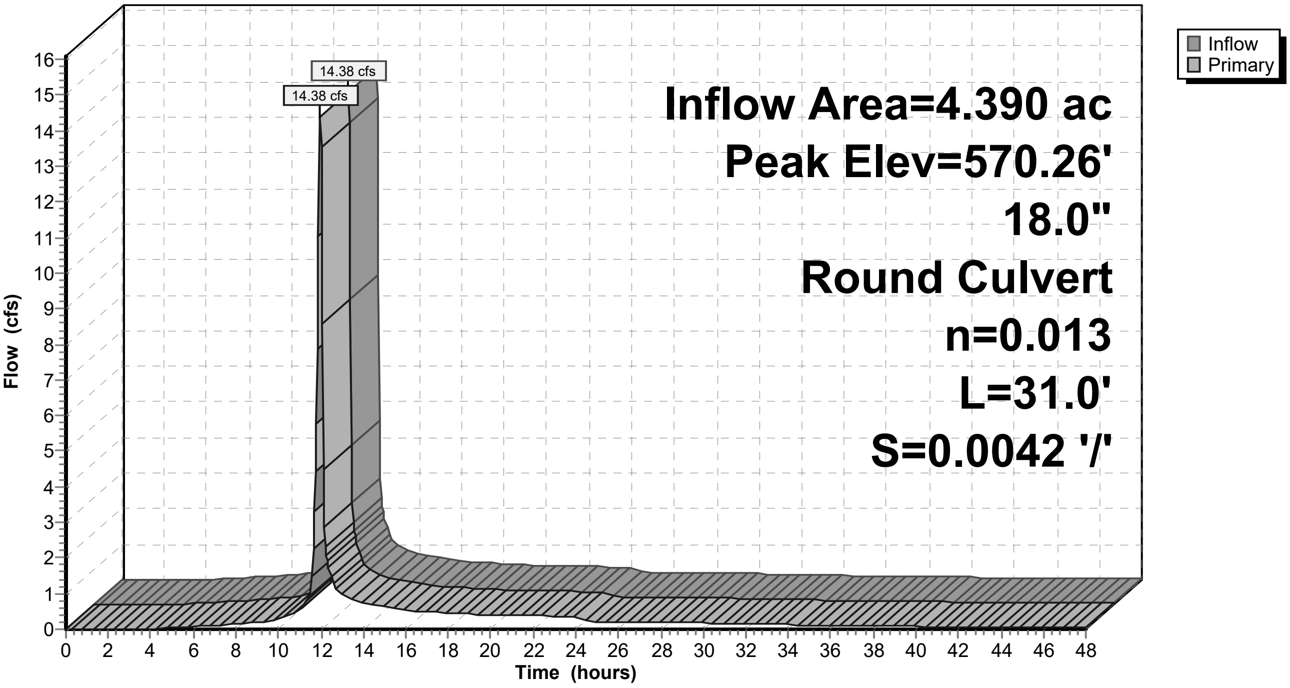
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 570.26' @ 11.99 hrs
Flood Elev= 570.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	565.13'	**18.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 565.13' / 565.00' S= 0.0042 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=13.96 cfs @ 11.97 hrs HW=570.00' TW=567.31' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 13.96 cfs @ 7.90 fps)

Pond DMH112: manhole

Hydrograph



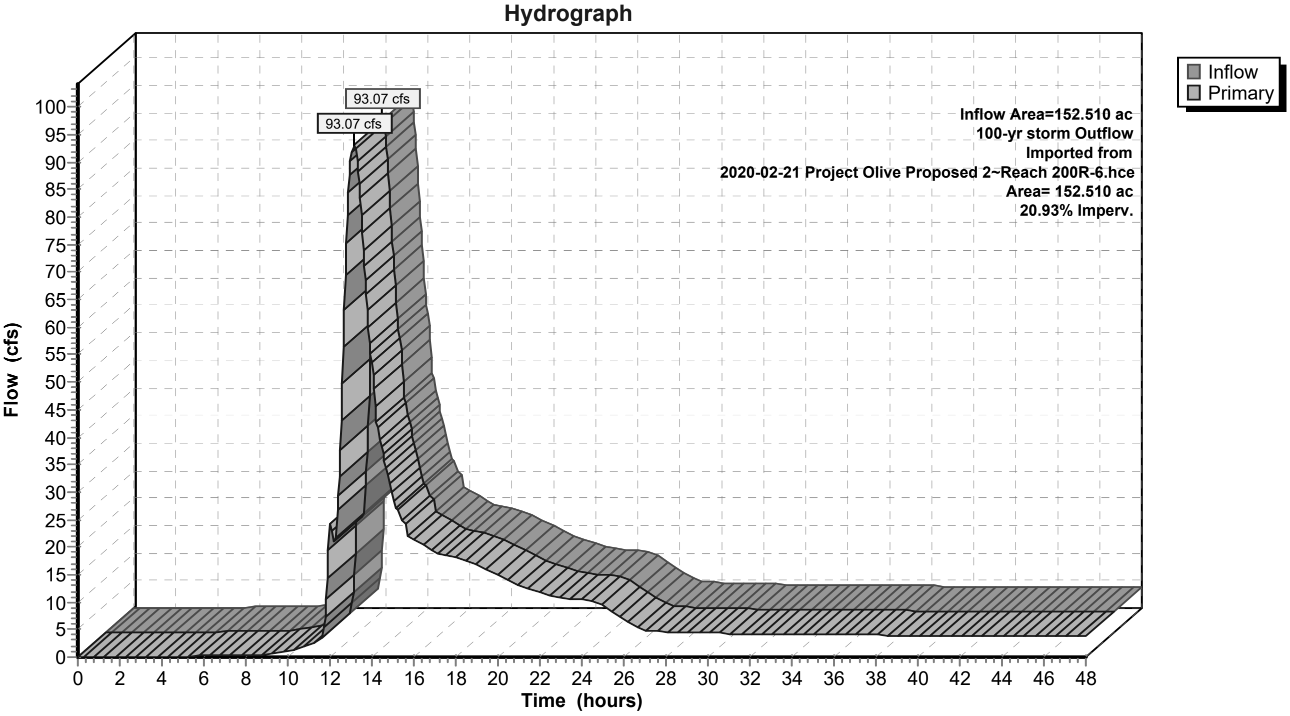
Summary for Link 200R-6: from 200R-6

Inflow Area = 152.510 ac, 20.93% Impervious, Inflow Depth > 2.76" for 100-yr storm event
Inflow = 93.07 cfs @ 13.15 hrs, Volume= 35.130 af
Primary = 93.07 cfs @ 13.15 hrs, Volume= 35.130 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

100-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 2~Reach 200R-6.hce

Link 200R-6: from 200R-6



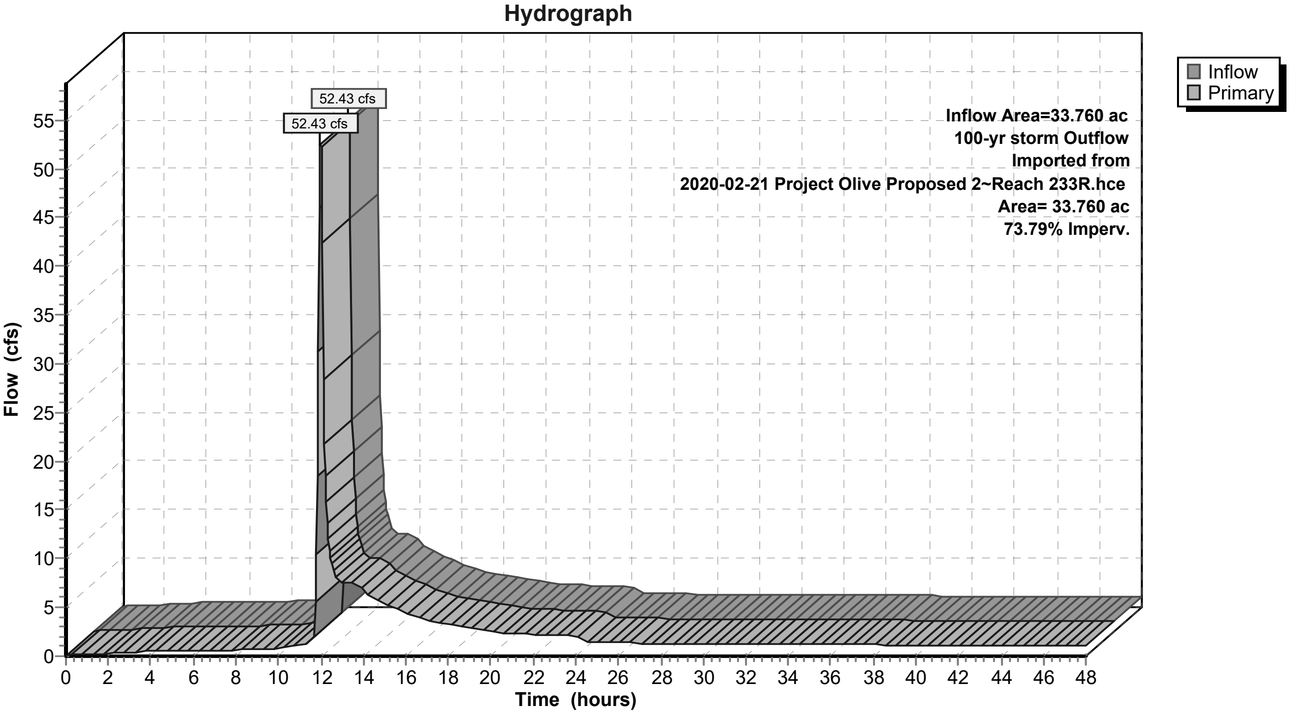
Summary for Link 233R: from 233R

Inflow Area =	33.760 ac,	73.79% Impervious,	Inflow Depth > 2.86"	for 100-yr storm event	
Inflow =	52.43 cfs @	11.99 hrs,	Volume=	8.048 af	
Primary =	52.43 cfs @	11.99 hrs,	Volume=	8.048 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

100-yr storm Outflow Imported from 2020-02-21 Project Olive Proposed 2~Reach 233R.hce

Link 233R: from 233R

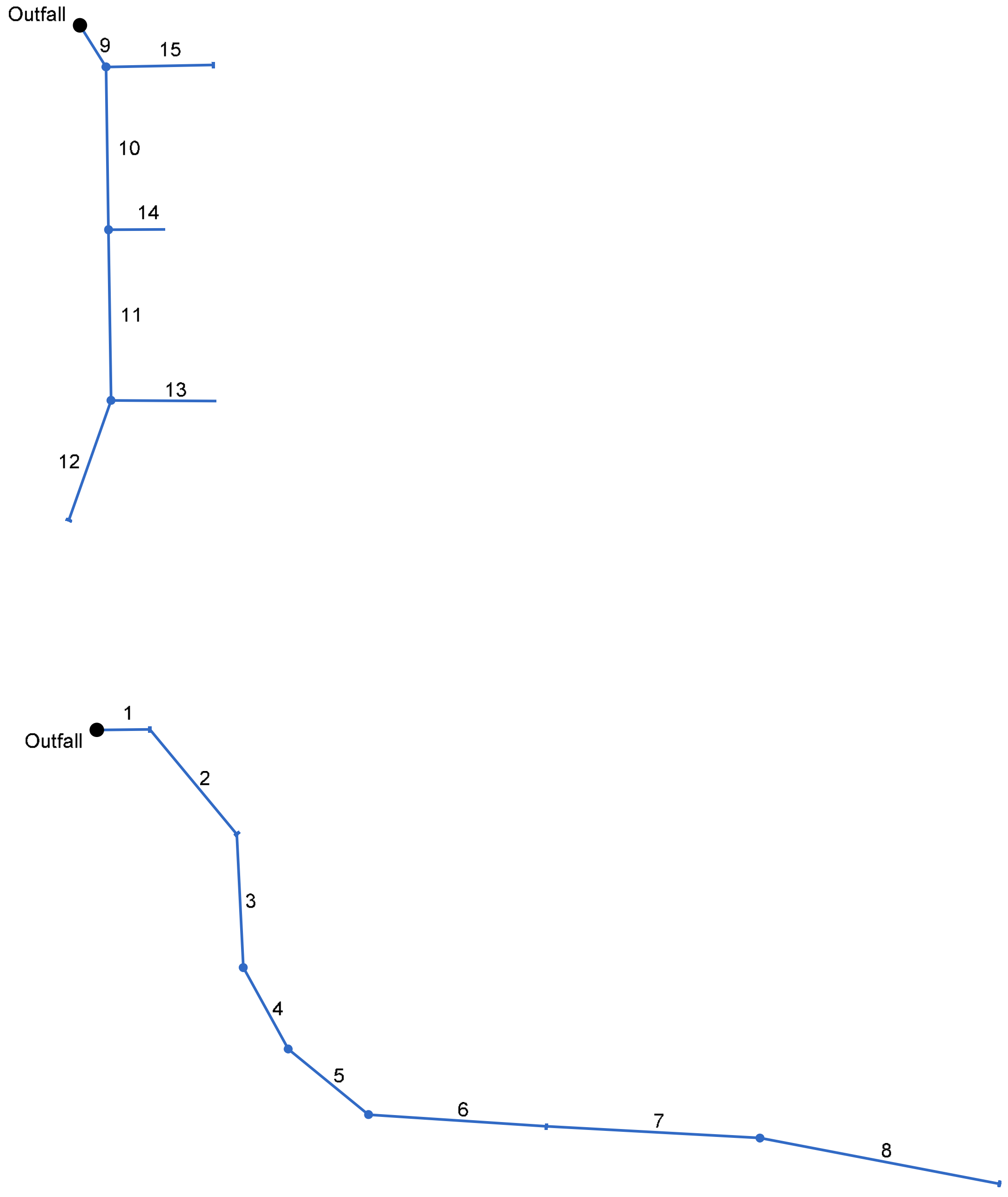


Project Olive
2780 Long Road
Town of Grand Island, New York

Appendix H

Hydraulic Analysis

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Network 100.stm	Number of lines: 15	Date: 2/6/2020

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	33.498	-0.615	Comb	0.00	0.08	0.90	6.0	571.50	0.57	571.69	18	Cir	0.013	1.22	575.91	CB-102 to HW-101
2	1	86.554	50.939	Comb	0.00	0.48	0.90	6.0	571.69	0.59	572.20	18	Cir	0.013	0.98	575.87	CB-103 to CB-102
3	2	85.029	36.930	MH	0.00	0.00	0.00	0.0	572.49	1.27	573.57	15	Cir	0.013	0.49	577.41	
4	3	59.233	-26.023	MH	0.00	0.00	0.00	0.0	573.57	1.99	574.75	15	Cir	0.013	0.43	578.57	DMH-105 to DMH-104
5	4	65.905		MH	0.00	0.00	0.00	0.0	574.75	2.00	576.07	15	Cir	0.013	0.63	579.88	DMH-106 to DMH-105
6	5	113.051	-35.528	Comb	0.00	0.34	0.90	0.0	576.07	2.00	578.33	15	Cir	0.013	0.50	581.71	CB-107 to DMH-106
7	6	135.695	-0.668	MH	0.00	0.00	0.00	0.0	578.33	1.48	580.34	15	Cir	0.013	0.16	583.79	DMH-108 to CB-107
8	7	154.671	7.736	Comb	0.00	0.26	0.90	6.0	580.34	1.47	582.62	15	Cir	0.013	1.00	586.00	CB-109 to DMH-108
9	End	31.270	58.037	MH	0.00	0.00	0.00	0.0	565.00	0.42	565.13	18	Cir	0.013	0.88	570.12	
10	9		31.100	MH	0.00	0.00	0.00	0.0	565.13	0.75	565.91	15	Cir	0.013	1.00	571.41	DMH-111 to DMH-112
11	10	108.630	0.001	MH	0.00	0.00	0.00	0.0	565.91	0.74	566.71	15	Cir	0.013	1.00	573.04	DMH-110 to DMH-111
12	11	80.943	20.231	Grate	0.19	0.00	0.00	0.0	566.98	0.74	567.58	12	Cir	0.013	1.00	572.25	
13	11	68.027	-88.701	Comb	0.00	0.35	0.75	6.0	566.71	2.19	568.20	15	Cir	0.013	1.00	571.70	CB-113 to DMH-110
14	10	37.002	-89.485	Comb	0.00	0.14	0.90	6.0	566.16	3.62	567.50	12	Cir	0.013	1.00	570.67	
15	9	67.983		Comb	0.00	0.43	0.75	6.0	565.13	0.43	565.42	15	Cir	0.013	1.00	568.76	CB-115 to DMH-112

Project File: Network 100.stm	Number of lines: 15	Date: 2/6/2020

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	18	4.57	571.50	572.32	0.82	0.99	4.62	0.33	572.65	0.000	33.498	571.69	572.51	0.82**	0.99	4.62	0.33	572.84	0.000	0.000	n/a	1.22	n/a
2	18	4.31	571.69	572.51	0.82	0.95	4.36	0.32	572.83	0.000	86.554	572.20	573.00 j	0.80**	0.95	4.53	0.32	573.31	0.000	0.000	n/a	0.98	n/a
3	15	2.42	572.49	573.00	0.51	0.46	5.21	0.25	573.24	0.000	85.029	573.57	574.19	0.62**	0.61	3.97	0.25	574.44	0.000	0.000	n/a	0.49	0.12
4	15	2.44	573.57	574.19	0.62	0.61	4.01	0.25	574.44	0.000	59.233	574.75	575.38	0.63**	0.61	3.98	0.25	575.62	0.000	0.000	n/a	0.43	0.11
5	15	2.47	574.75	575.38	0.63	0.61	4.03	0.25	575.62	0.000	65.905	576.07	576.70	0.63**	0.62	4.00	0.25	576.95	0.000	0.000	n/a	0.63	n/a
6	15	2.52	576.07	576.70	0.63	0.62	4.07	0.25	576.95	0.000	113.051	578.33	578.96	0.63**	0.63	4.02	0.25	579.22	0.000	0.000	n/a	0.50	0.13
7	15	1.13	578.33	578.96	0.63	0.36	1.81	0.15	579.12	0.000	135.695	580.34	580.76 j	0.42**	0.36	3.14	0.15	580.91	0.000	0.000	n/a	0.16	0.02
8	15	1.17	580.34	580.76	0.42	0.36	3.25	0.16	580.92	0.000	154.671	582.62	583.05	0.43**	0.37	3.17	0.16	583.20	0.000	0.000	n/a	1.00	0.16
9	18	3.53	565.00	565.77	0.77	0.91	3.86	0.23	566.00	0.413	31.270	565.13	565.90	0.77	0.91	3.87	0.23	566.13	0.415	0.414	0.129	0.88	0.20
10	15	2.06	565.13	566.10	0.97	0.55	2.01	0.22	566.32	0.000	103.630	565.91	566.48 j	0.57**	0.55	3.77	0.22	566.70	0.000	0.000	n/a	1.00	n/a
11	15	1.49	565.91	566.48	0.57	0.44	2.72	0.18	566.66	0.000	108.630	566.71	567.19 j	0.48**	0.44	3.40	0.18	567.37	0.000	0.000	n/a	1.00	0.18
12	12	0.19	566.98	567.19	0.21	0.10	1.56	0.06	567.25	0.000	80.943	567.58	567.76 j	0.18**	0.10	2.00	0.06	567.82	0.000	0.000	n/a	1.00	n/a
13	15	1.32	566.71	567.19	0.48	0.40	3.01	0.17	567.36	0.000	68.027	568.20	568.65 j	0.45**	0.40	3.28	0.17	568.82	0.000	0.000	n/a	1.00	n/a
14	12	0.63	566.16	566.48	0.32	0.22	2.90	0.12	566.60	0.000	37.002	567.50	567.83	0.33**	0.23	2.79	0.12	567.95	0.000	0.000	n/a	1.00	n/a
15	15	1.62	565.13	566.10	0.97	1.03	1.58	0.04	566.14	0.069	67.983	565.42	566.14	0.72	0.74	2.19	0.07	566.22	0.155	0.112	0.076	1.00	0.07

Project File: Network 100.stm

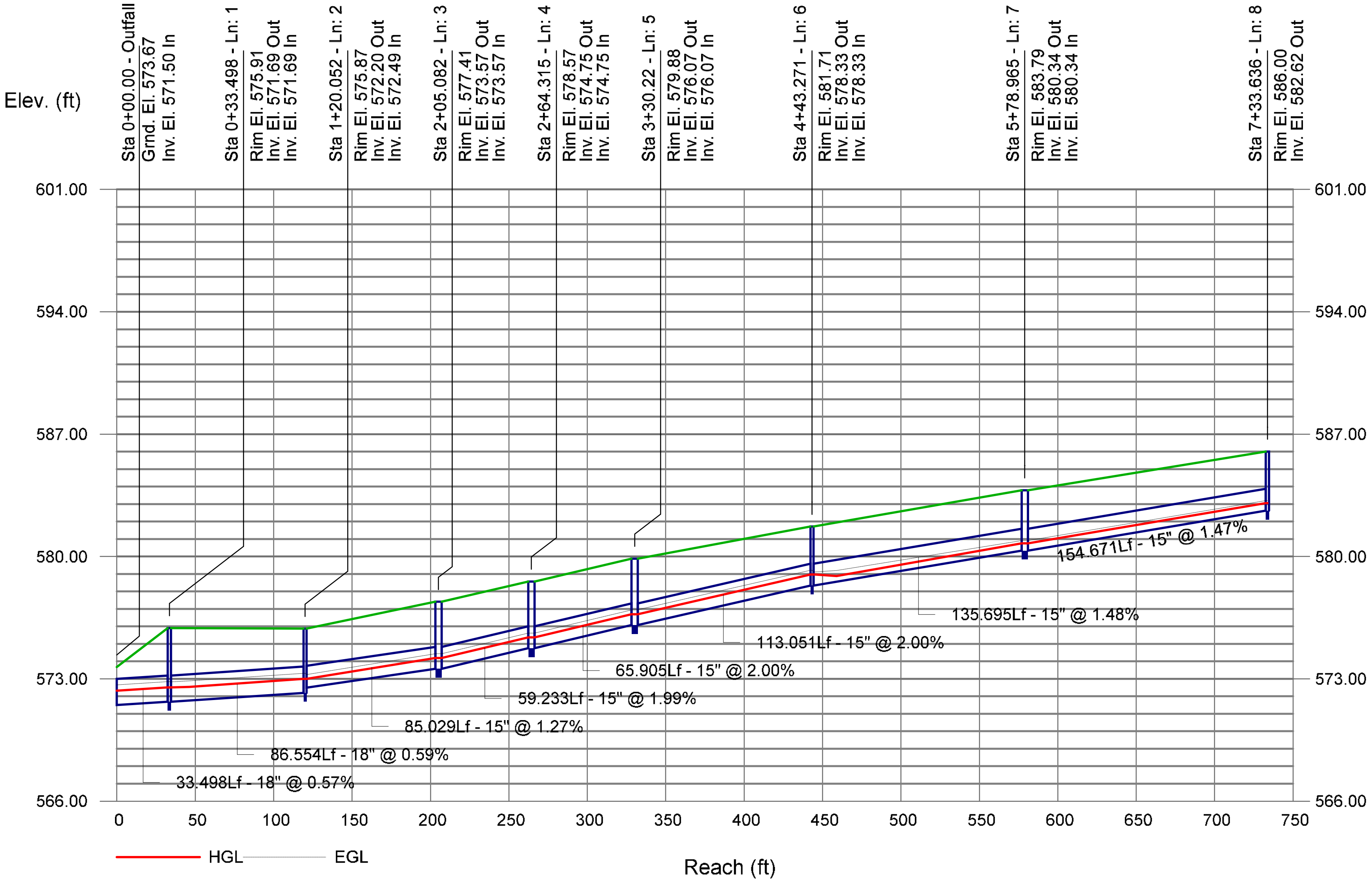
Number of lines: 15

Run Date: 2/6/2020

Notes: ; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

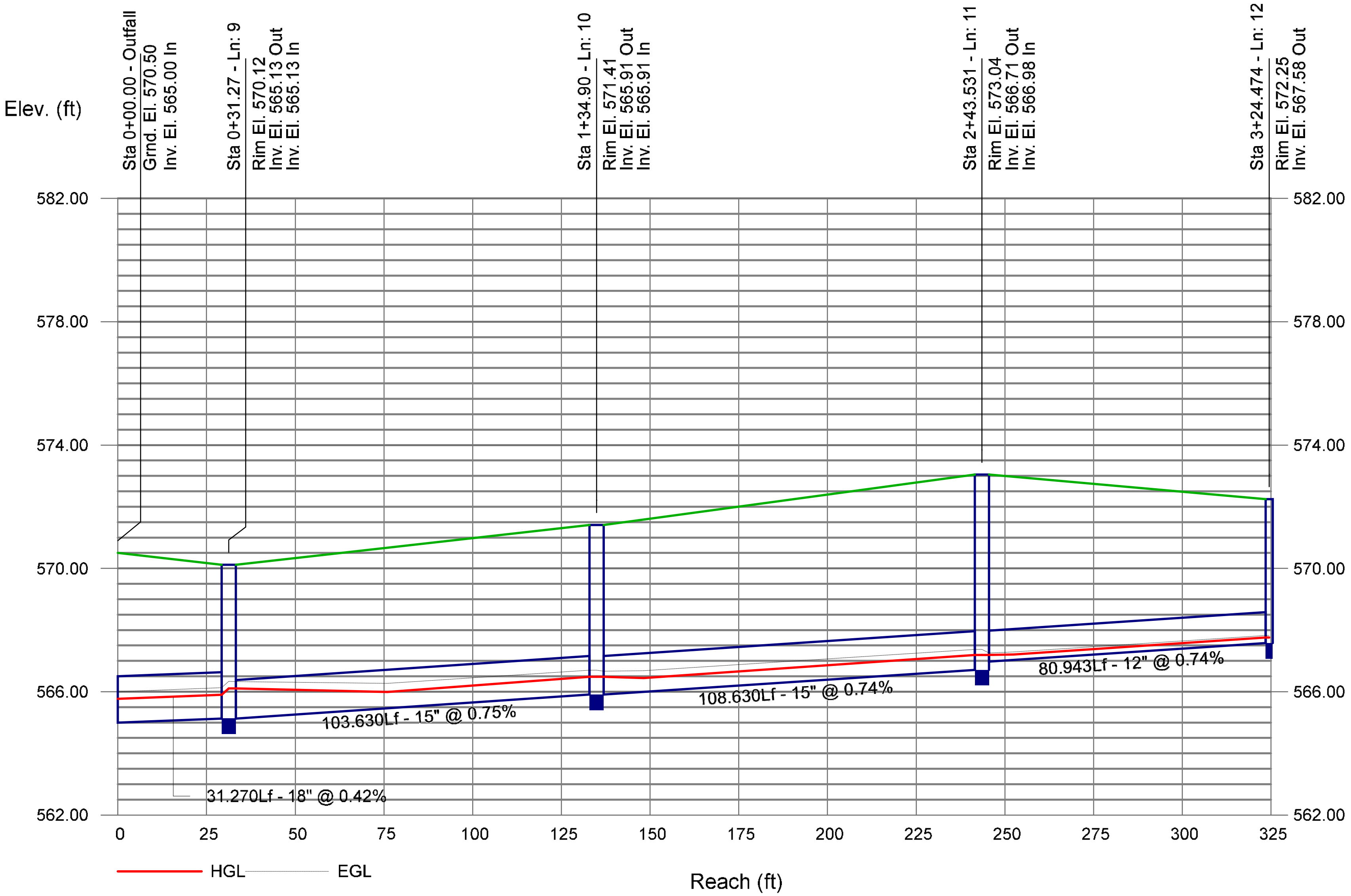
Storm Sewer Profile

Proj. file: Network 100.stm



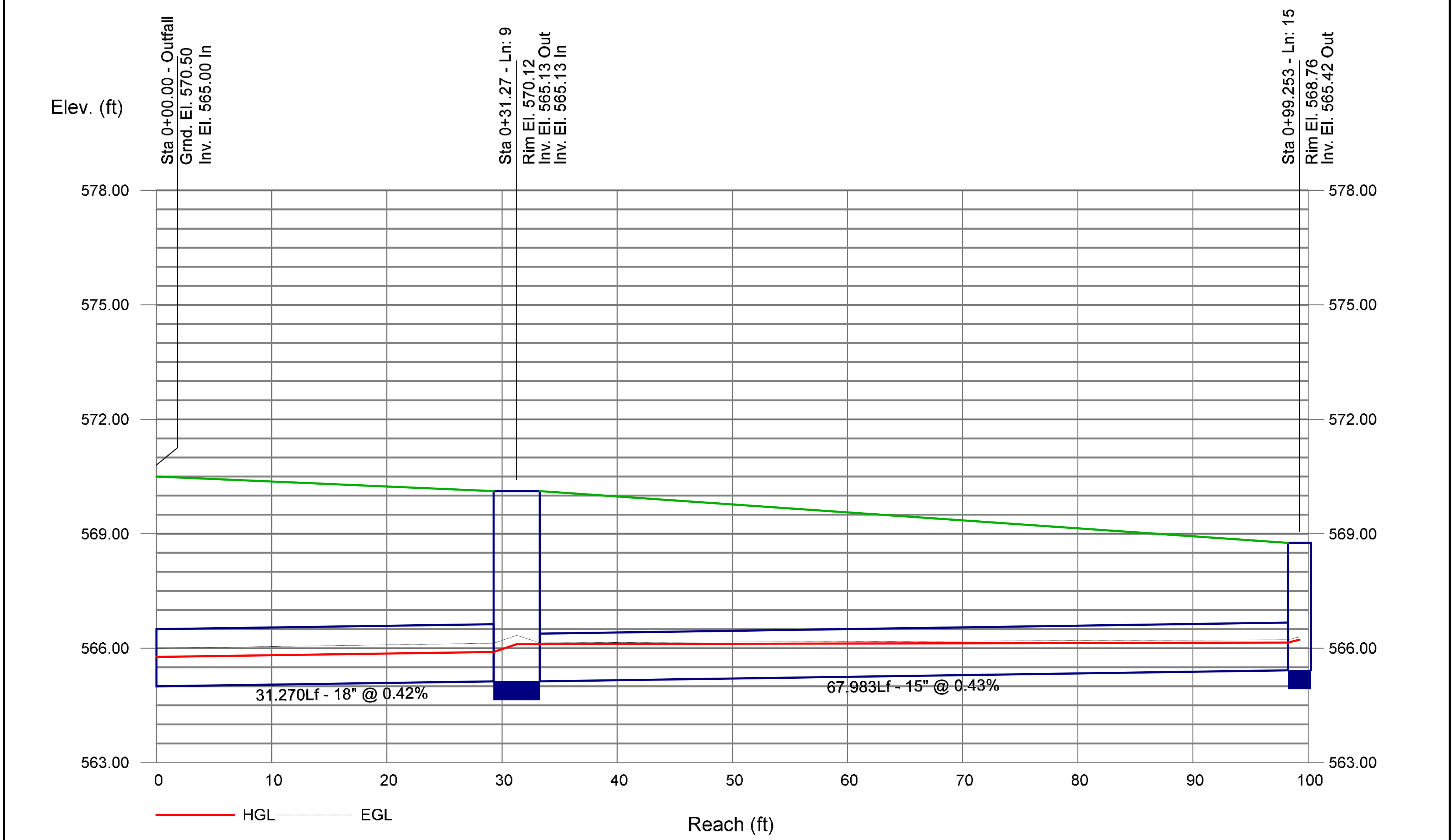
Storm Sewer Profile

Proj. file: Network 100.stm



Storm Sewer Profile

Proj. file: Network 100.stm



Storm Sewer Profile

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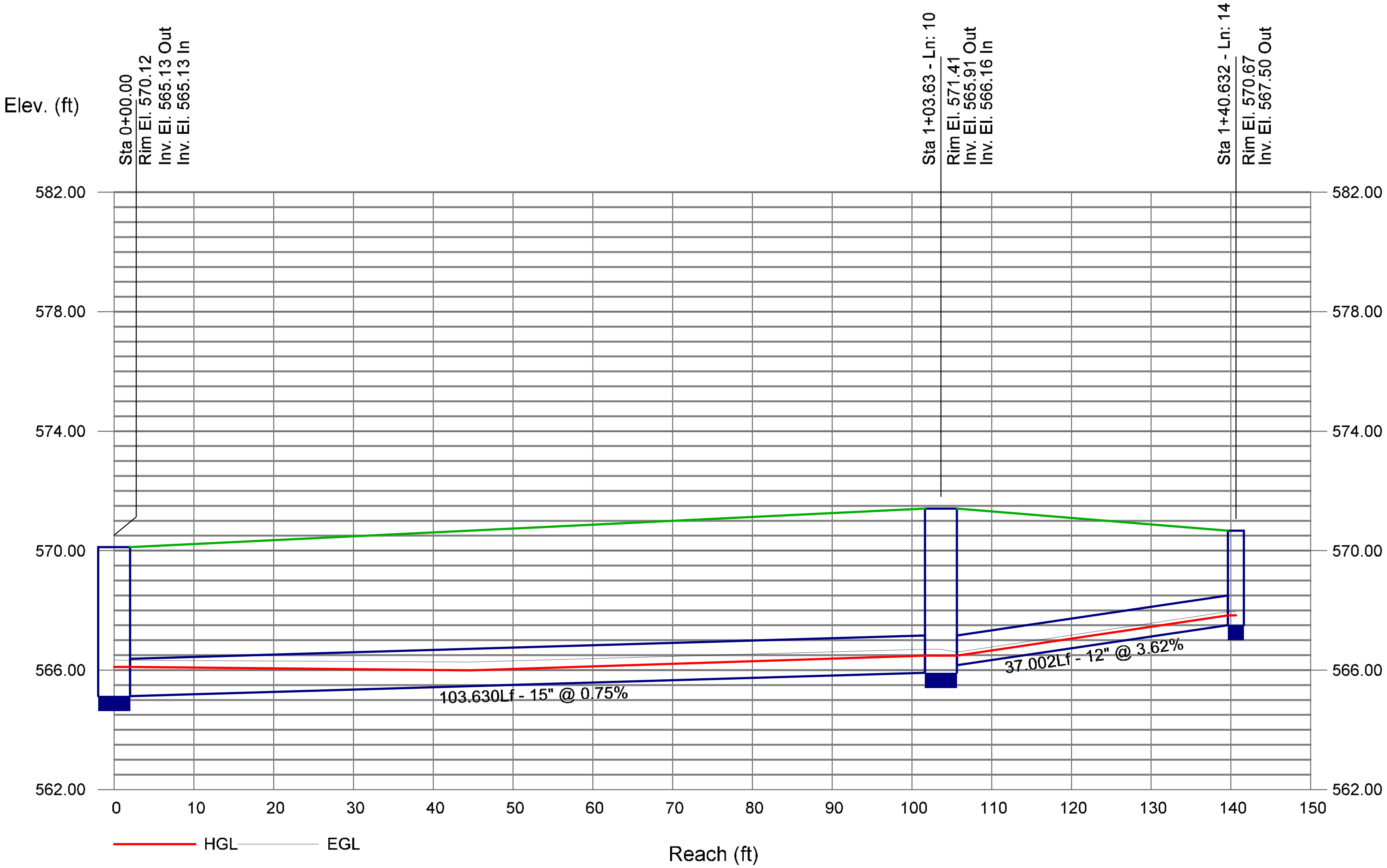

Storm Sewer Profile

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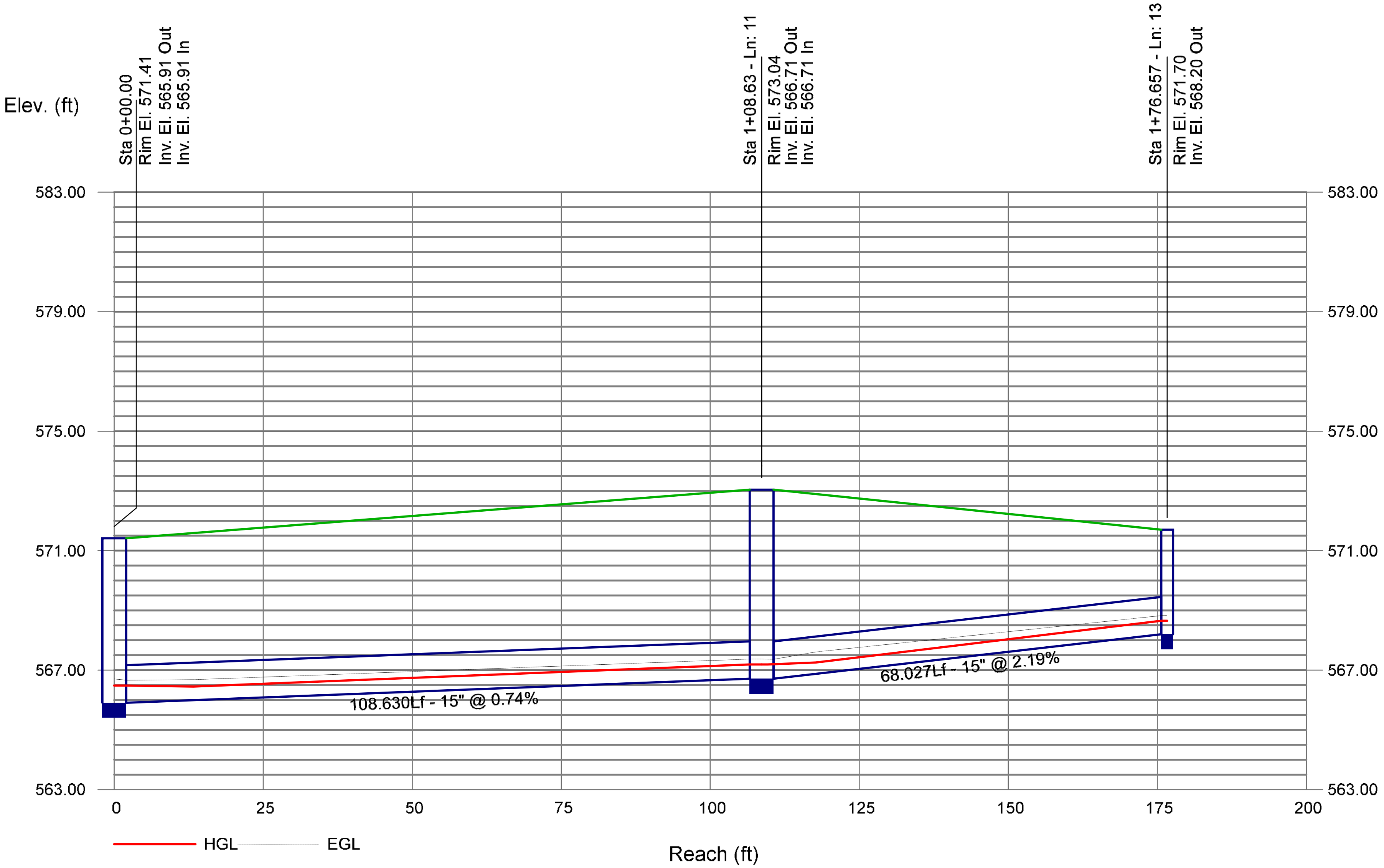
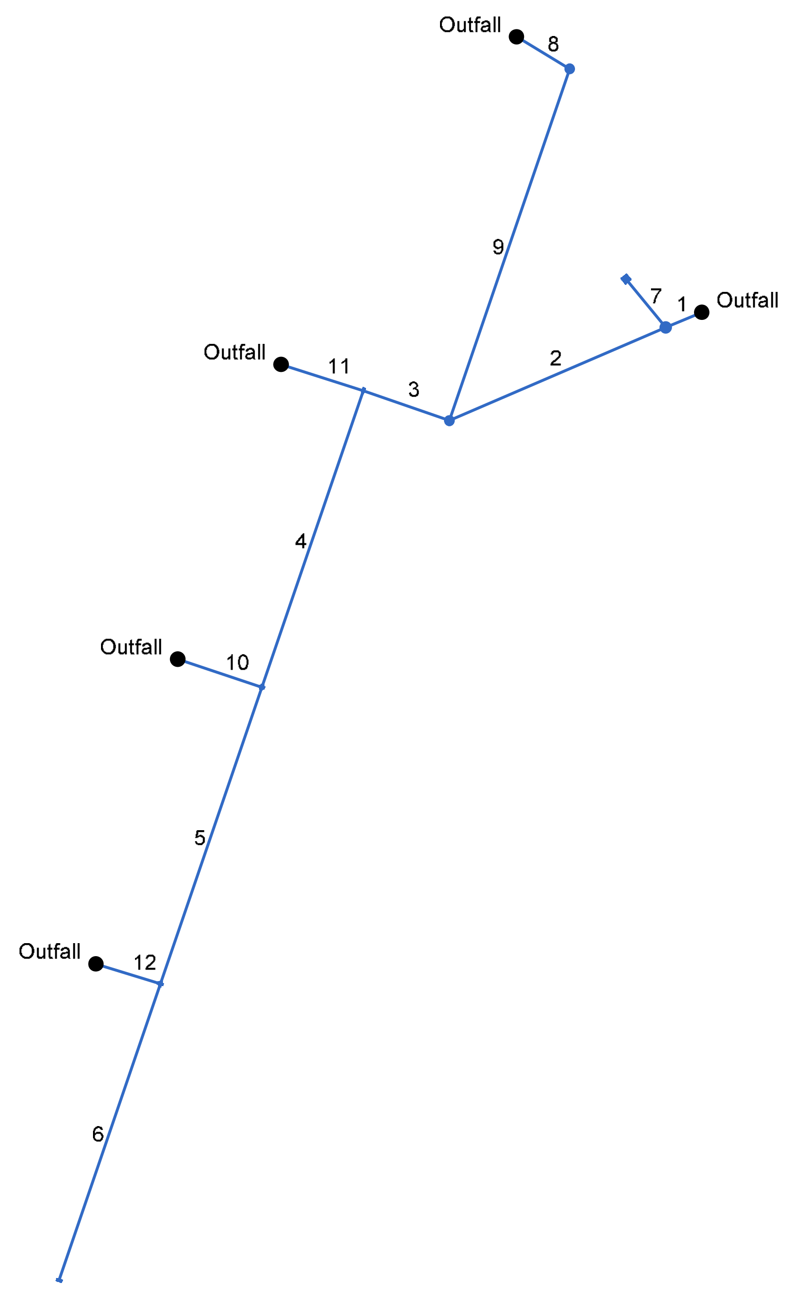


Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Network 200.stm	Number of lines: 12	Date: 2/7/2020

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	24.907	157.066	MH	0.00	0.00	0.00	0.0	584.00	0.80	584.20	24	Cir	0.013	0.97	593.41	DMH-202 to HW-201
2	1	149.740	-0.461	MH	0.00	0.00	0.00	0.0	584.20	0.79	585.39	24	Cir	0.013	0.72	593.07	DMH-203 to DMH-202
3	2	58.002	42.700	Comb	0.00	0.52	0.90	6.0	585.39	0.81	585.86	24	Cir	0.013	1.50	592.40	CB-204 to DMH-203
4	3	199.996	-90.498	Comb	0.00	0.96	0.90	6.0	585.86	0.48	586.82	24	Cir	0.013	0.50	592.40	
5	4		0.000	Comb	0.00	0.97	0.90	6.0	586.82	0.48	587.78	24	Cir	0.013	0.50	592.40	
6	5		0.000	Comb	0.00	1.01	0.90	6.0	587.78	0.48	588.74	24	Cir	0.013	1.00	592.40	
7	1	39.977	73.681	Comb	0.00	0.54	0.69	6.0	585.36	8.58	588.79	18	Cir	0.013	1.00	592.28	CB-213 to DMH-202
8	End	39.610	31.239	MH	0.00	0.00	0.00	0.0	585.00	0.43	585.17	18	Cir	0.013	0.98	591.88	DMH-212 to HW-211
9	8	237.144	77.568	MH	3.40	0.00	0.00	0.0	585.17	0.43	586.19	18	Cir	0.013	1.00	593.07	DMH-203 to DMH-212
10	End	56.367	18.537	Comb	8.50	0.00	0.00	0.0	585.00	5.00	587.82	18	Cir	0.013	1.00	592.40	
11	End	54.888	17.762	Comb	8.50	0.00	0.00	0.0	585.00	3.39	586.86	18	Cir	0.013	1.00	592.40	CB-204 to HW-210
12	End	42.885	17.273	Comb	8.50	0.00	0.00	0.0	585.00	8.81	588.78	18	Cir	0.013	1.00	592.40	CB-206 to HW-208

Project File: Network 200.stm

Number of lines: 12

Date: 2/7/2020

Hydraulic Grade Line Computations

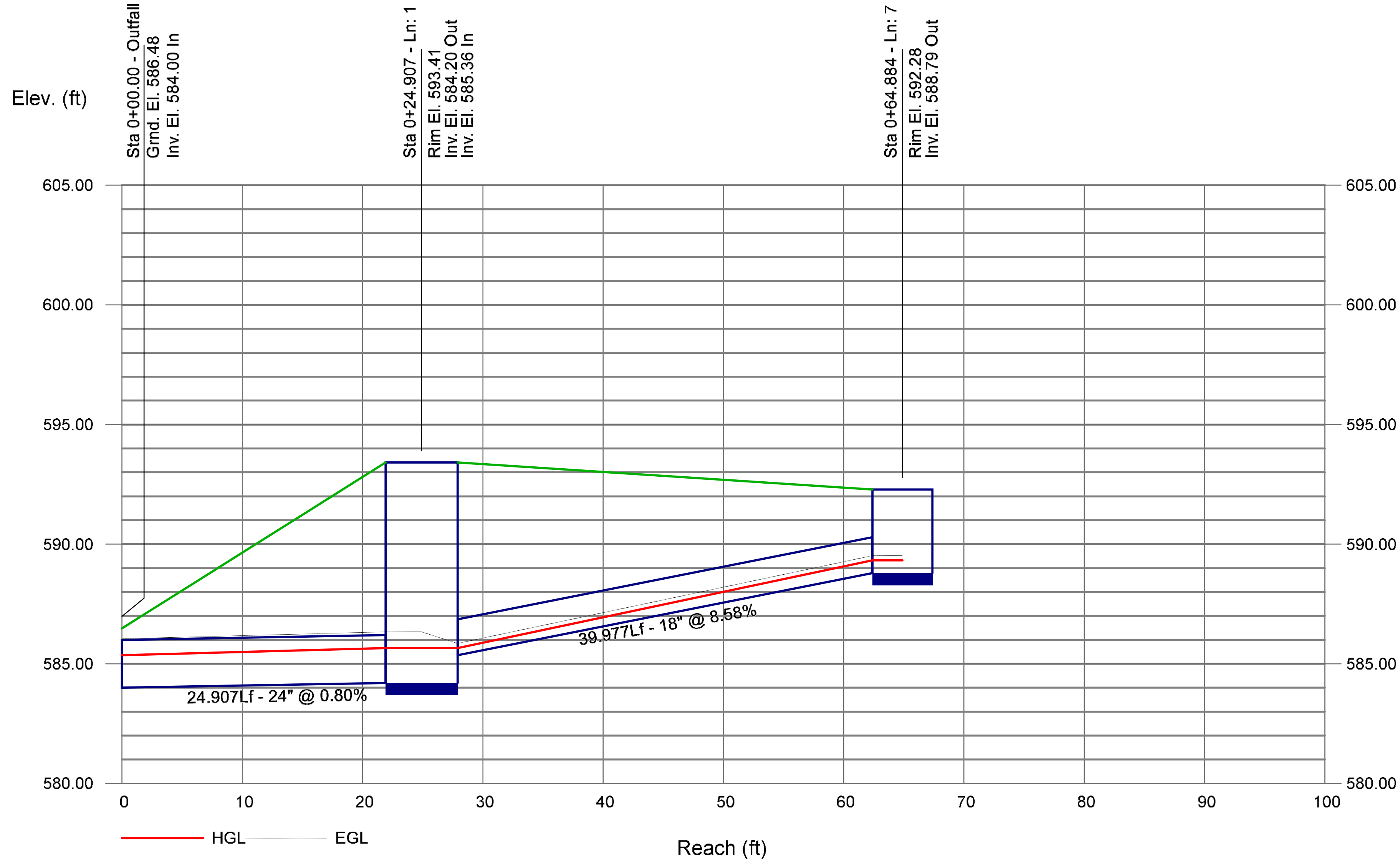
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	24	16.24	584.00	585.35	1.35	2.27	7.17	0.69	586.04	0.000	24.907	584.20	585.65	1.45**	2.44	6.65	0.69	586.34	0.000	0.000	n/a	0.97	n/a
2	24	14.77	584.20	585.65	1.45	2.32	6.05	0.63	586.28	0.000	149.740	585.39	586.77 j	1.38**	2.32	6.37	0.63	587.40	0.000	0.000	n/a	0.72	n/a
3	24	14.87	585.39	586.77	1.38	2.32	6.41	0.63	587.41	0.000	58.002	585.86	587.25	1.39**	2.33	6.39	0.63	587.88	0.000	0.000	n/a	1.50	n/a
4	24	12.99	585.86	587.25	1.39*	2.33	5.57	0.48	587.73	0.480	199.996	586.82	588.21	1.39	2.33	5.58	0.48	588.69	0.480	0.480	0.960	0.50	0.24
5	24	9.09	586.82	588.45	1.63	1.72	3.31	0.17	588.62	0.163	200.000	587.78	588.86	1.08**	1.73	5.25	0.43	589.29	0.499	0.331	0.662	0.50	0.21
6	24	4.89	587.78	589.07	1.29	1.13	2.27	0.29	589.37	0.000	200.004	588.74	589.52 j	0.78**	1.13	4.32	0.29	589.81	0.000	0.000	n/a	1.00	0.29
7	18	2.00	585.36	585.65	0.29	0.24	8.29	0.20	585.85	0.000	39.977	588.79	589.32	0.53**	0.56	3.56	0.20	589.52	0.000	0.000	n/a	1.00	n/a
8	18	3.40	585.00	585.75	0.75	0.88	3.85	0.23	585.98	0.419	39.610	585.17	585.91	0.74	0.87	3.89	0.24	586.15	0.431	0.425	0.168	0.98	0.23
9	18	3.40	585.17	586.14	0.97	0.81	2.80	0.12	586.27	0.184	237.144	586.19	586.89	0.70**	0.81	4.18	0.27	587.16	0.525	0.354	n/a	1.00	0.27
10	18	8.50	585.00	585.62	0.62*	0.70	12.22	0.55	586.18	0.000	56.367	587.82	588.95	1.13**	1.43	5.96	0.55	589.50	0.000	0.000	n/a	1.00	n/a
11	18	8.50	585.00	585.70	0.70	0.81	10.51	0.55	586.25	0.000	54.888	586.86	587.99	1.13**	1.43	5.96	0.55	588.54	0.000	0.000	n/a	1.00	n/a
12	18	8.50	585.00	585.54	0.54	0.57	14.84	0.55	586.09	0.000	42.885	588.78	589.91	1.13**	1.43	5.96	0.55	590.46	0.000	0.000	n/a	1.00	n/a

Project File: Network 200.stm	Number of lines: 12	Run Date: 2/7/2020

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Storm Sewer Profile

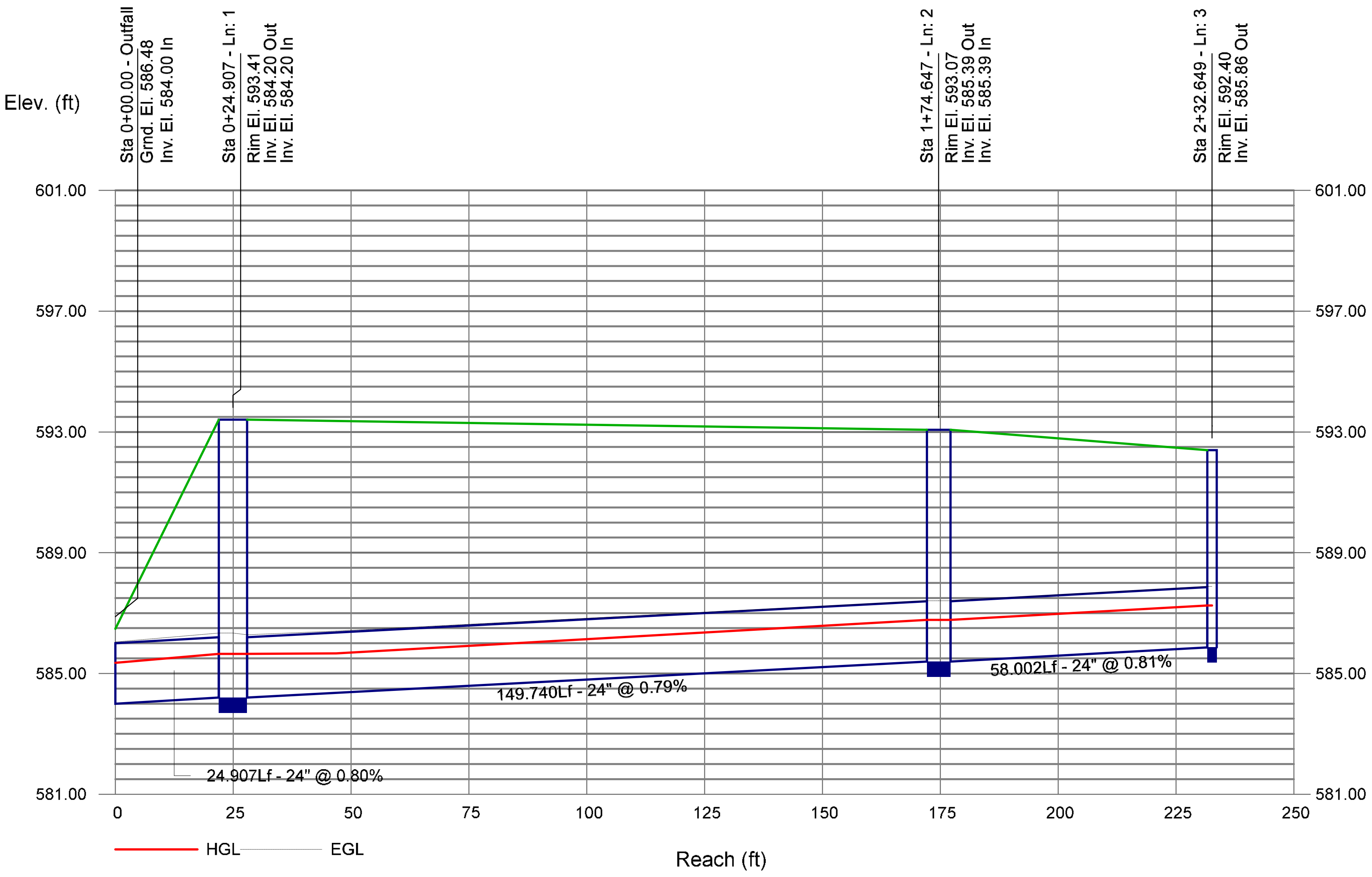
Proj. file: Network 200.stm



Storm Sewers

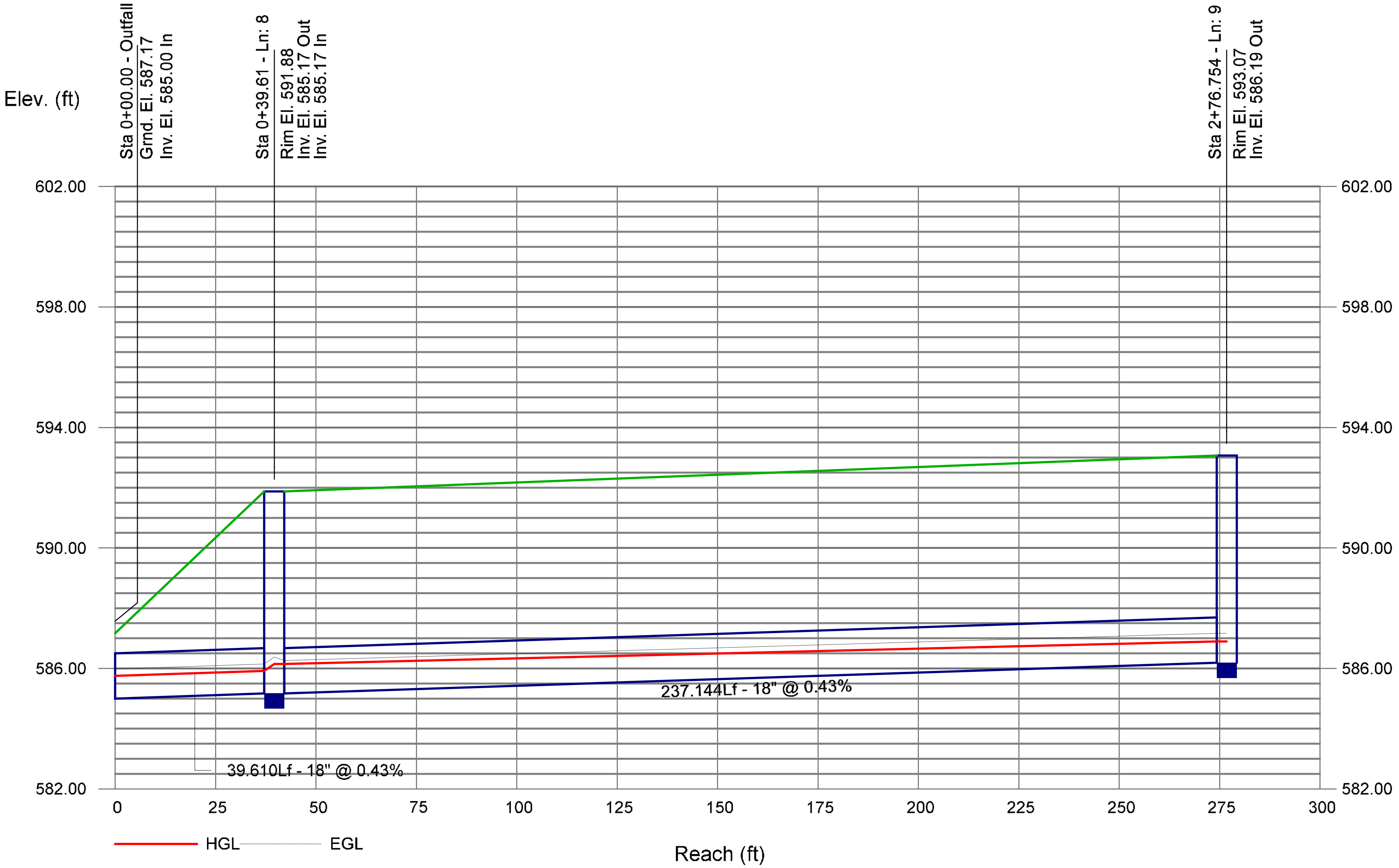
Storm Sewer Profile

Proj. file: Network 200.stm



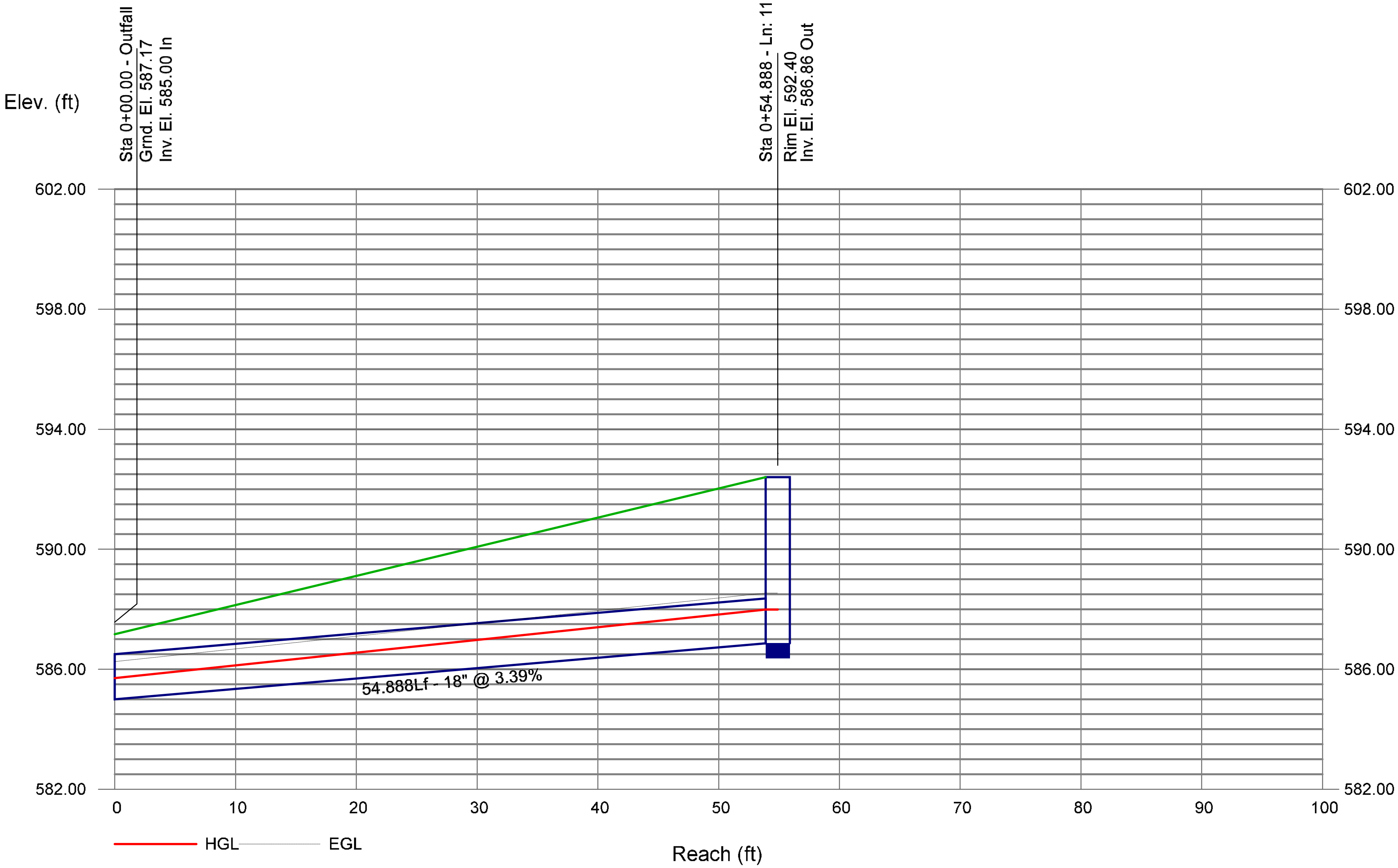
Storm Sewer Profile

Proj. file: Network 200.stm



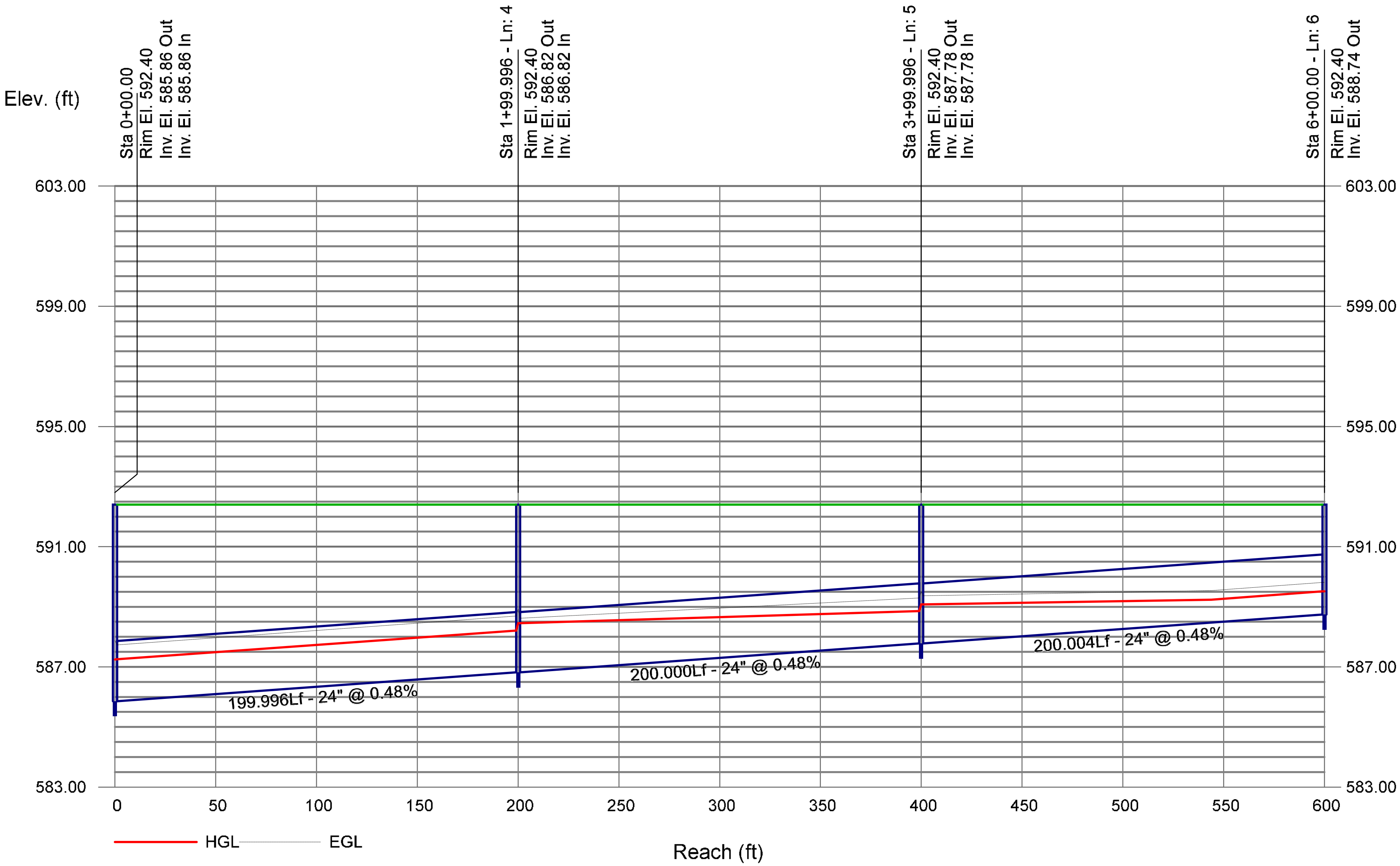
Storm Sewer Profile

Proj. file: Network 200.stm



Storm Sewer Profile

Proj. file: Network 200.stm



Storm Sewer Profile

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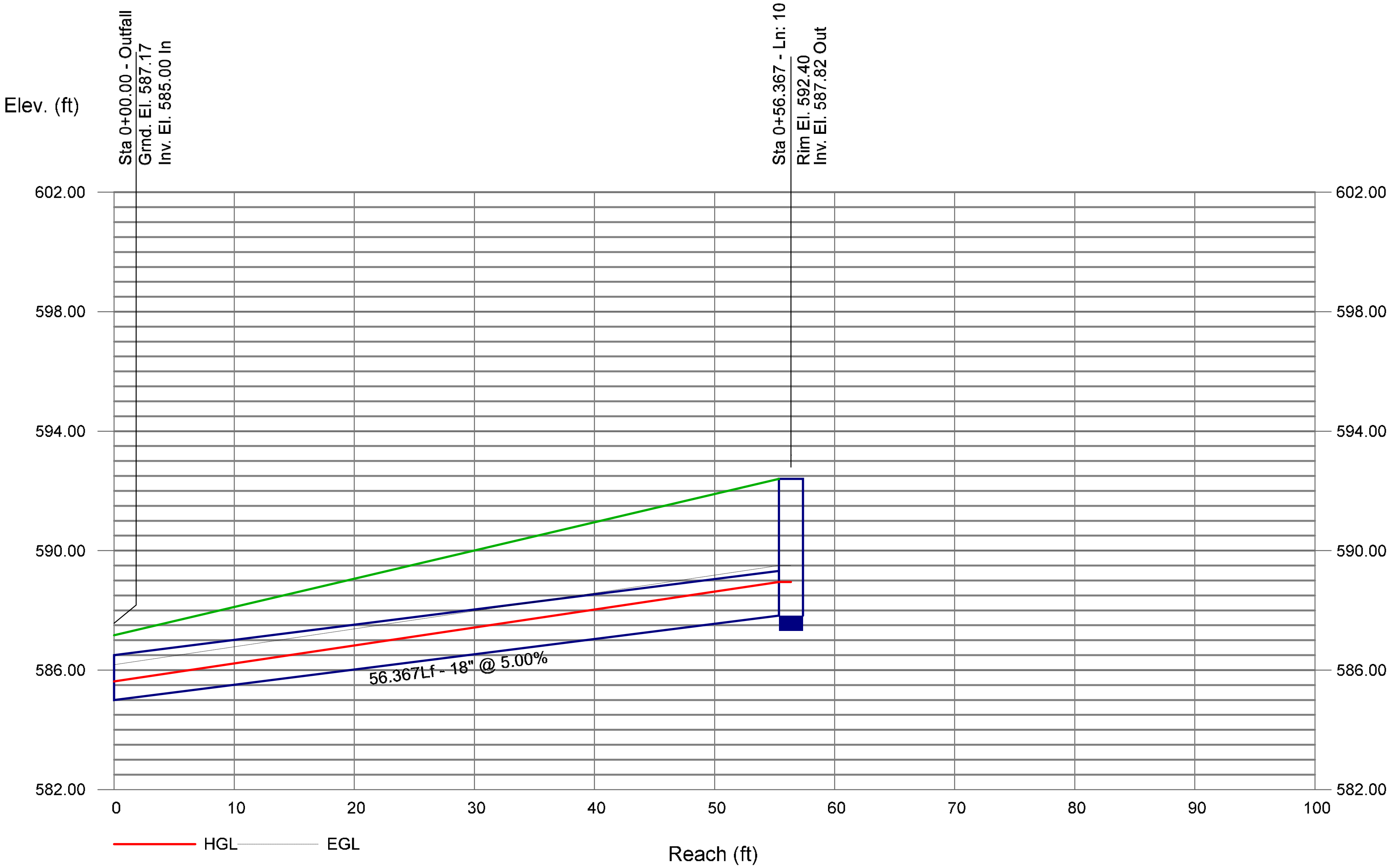

Storm Sewer Profile

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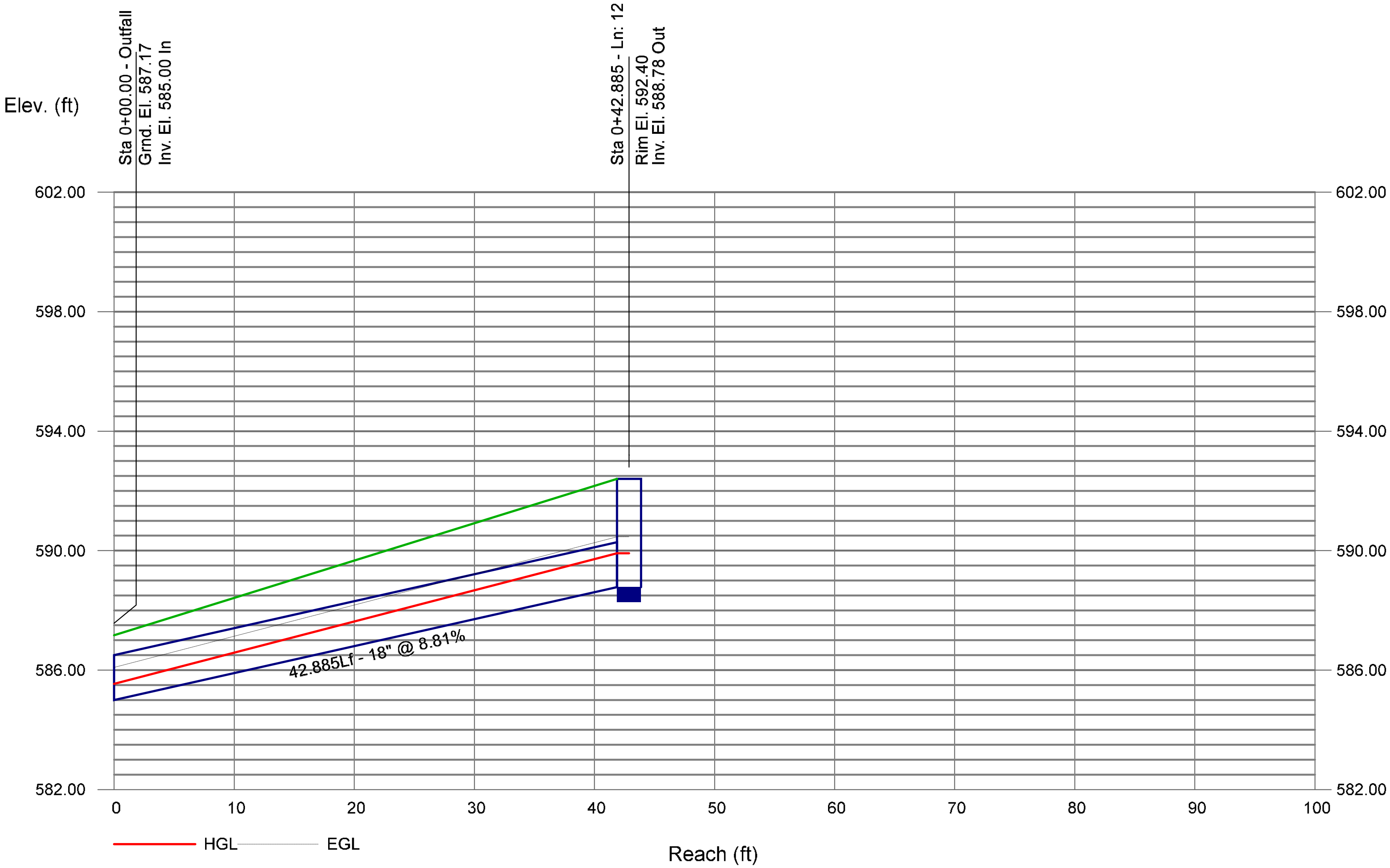
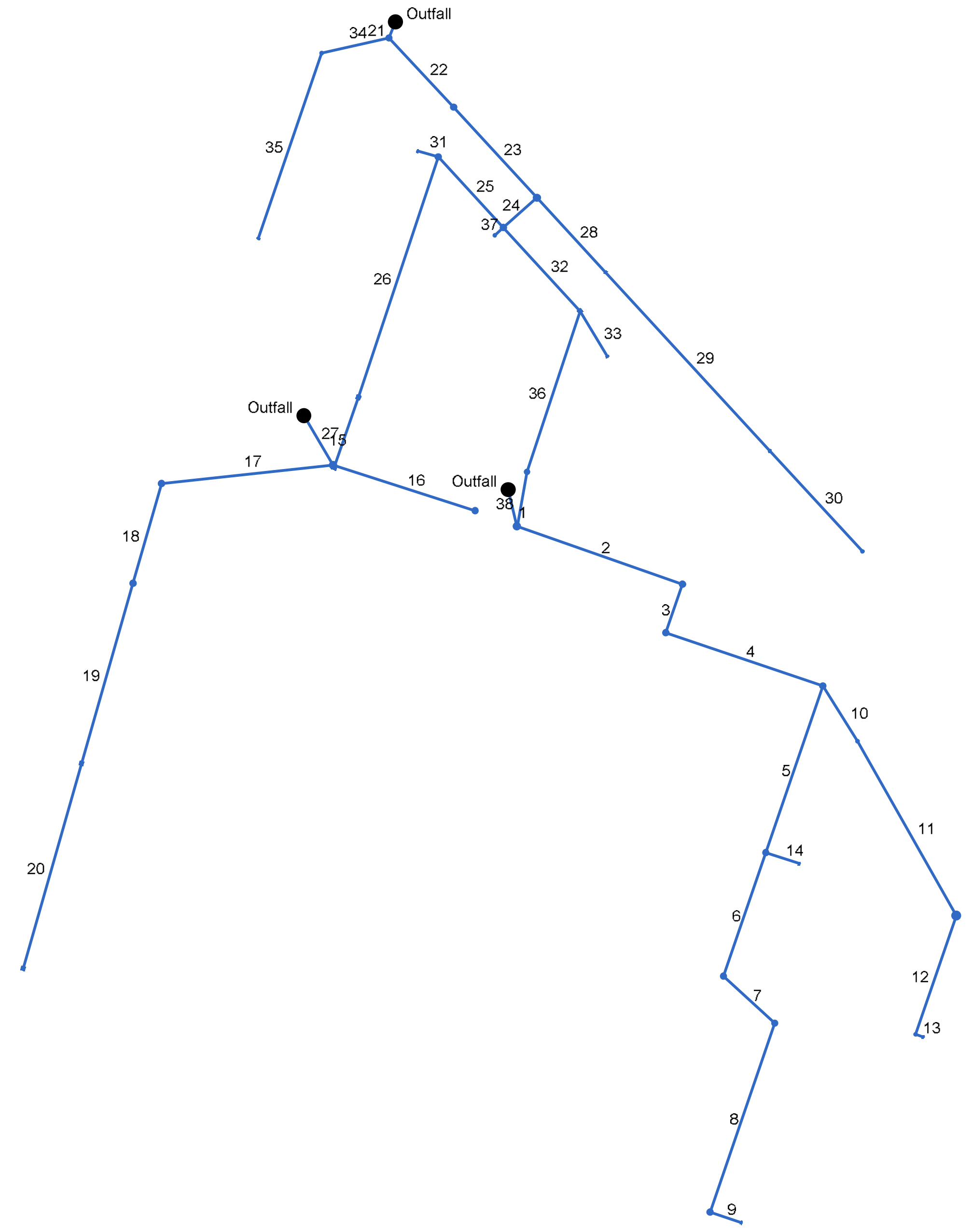


Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Network 300.stm	Number of lines: 38	Date: 2/7/2020

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	41.988	76.566	MH	0.00	0.00	0.00	0.0	584.00	0.95	584.40	36	Cir	0.013	0.87	596.93	
2	1			MH	0.00	0.85	0.90	6.0	584.40	0.73	585.82	36	Cir	0.013	1.00	595.41	DMH-303 to DMH-302
3	2	57.000	89.520	MH	0.00	0.00	0.00	0.0	585.82	0.74	586.24	36	Cir	0.013	1.00	598.84	DMH-304 to DMH-303
4	3	183.394	-90.009	MH	0.00	0.88	0.90	6.0	586.24	0.73	587.57	36	Cir	0.013	1.00	596.76	DMH-305 to DMH-304
5	4	195.393	90.009	MH	0.00	0.40	0.90	6.0	588.07	0.65	589.34	30	Cir	0.013	1.00	597.46	DMH-306 to DMH-305
6	5	144.853	0.000	MH	0.00	0.97	0.90	6.0	589.34	0.65	590.28	30	Cir	0.013	0.93	597.98	DMH-307 to DMH-306
7	6	77.098	-66.125	MH	0.00	0.55	0.90	6.0	590.28	0.65	590.78	30	Cir	0.013	0.93	597.60	DMH-308 to DMH-307
8	7	221.579	66.125	MH	0.00	1.42	0.90	6.0	590.78	0.65	592.22	30	Cir	0.013	1.00	597.96	DMH-309 to DMH-308
9	8	36.500	-90.000	Comb	0.00	0.47	0.86	6.0	593.59	0.52	593.78	15	Cir	0.013	1.00	597.15	CB-310 to DMH-309
10	4	72.278	39.222	Comb	0.00	0.21	0.90	6.0	588.00	0.59	588.43	24	Cir	0.013	0.50	595.65	CB-312 to DMH-305
11	10	222.397	2.507	Grate	0.00	2.86	0.90	6.0	588.43	0.59	589.75	24	Cir	0.013	1.18	593.92	DI-313 to CB-312
12	11	139.250	48.280	Comb	0.00	0.29	0.90	6.0	590.50	1.22	592.20	15	Cir	0.013	1.50	595.78	
13	12	9.000	-90.000	Comb	0.00	0.45	0.90	6.0	592.20	1.33	592.32	15	Cir	0.013	1.00	595.82	
14	5	39.003		Comb	0.00	0.57	0.80	6.0	590.50	5.13	592.50	15	Cir	0.013	1.00	596.28	
15	End	63.657	59.487	MH	0.00	0.00	0.00	0.0	584.00	0.69	584.44	24	Cir	0.013	1.00	594.26	DMH-216 to HW-215
16	15	165.000	-41.642	MH	0.00	0.76	0.90	6.0	587.14	2.71	591.61	24	Cir	0.013	1.00	596.89	
17	15			MH	0.00	0.00	0.00	0.0	584.44	0.40	585.20	30	Cir	0.013	0.94	593.63	DMH-217 to DMH-216
18	17	115.066	-67.998	MH	0.00	0.00	0.00	0.0	585.20	0.74	586.05	30	Cir	0.013	0.15	594.28	DMH-218 to DMH-217
19	18	207.786	0.000	MH	0.00	1.15	0.90	6.0	586.05	0.74	587.59	30	Cir	0.013	0.15	594.25	DMH-219 to DMH-218
20	19	236.833	0.000	MH	0.00	2.60	0.90	6.0	587.59	0.74	589.35	30	Cir	0.013	1.00	594.10	DMH-220 to DMH-219
21	End	19.276		Comb	0.00	0.45	0.86	6.0	575.00	0.42	575.08	36	Cir	0.013	1.92	582.23	CB-322 to HW-321
22	21	104.838	-64.933	Comb	0.00	0.47	0.67	6.0	575.08	0.42	575.52	36	Cir	0.013	0.50	580.79	
23	22		0.528	MH	0.00	0.00	0.00	0.0	575.52	0.42	576.09	36	Cir	0.013	1.00	582.63	DMH-324 to CB-323

Project File: Network 300.stm

Number of lines: 38

Date: 2/7/2020

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
24	23	49.692	90.834	MH	0.00	0.00	0.00	0.0	576.50	2.84	577.91	30	Cir	0.013	1.00	587.00	
25	24		89.046	MH	0.00	0.00	0.00	0.0	578.41	0.84	579.30	24	Cir	0.013	1.00	587.00	
26	25			MH	0.00	0.00	0.00	0.0	579.30	0.96	582.00	24	Cir	0.013	0.15	587.00	
27	26	81.707	0.828	MH	7.27	0.00	0.00	0.0	582.00	4.34	585.55	24	Cir	0.013	1.00	594.26	DMH-216 to DMH-320
28	23	112.180	0.000	Comb	0.00	0.32	0.70	6.0	577.59	1.15	578.88	18	Cir	0.013	0.50	583.05	CB-325 to DMH-324
29	28	268.772	-0.052	Comb	0.00	0.28	0.59	6.0	578.88	1.00	581.57	18	Cir	0.013	0.50	585.74	CB-326 to CB-325
30	29	151.613	0.003	Comb	0.00	0.71	0.56	6.0	581.57	1.00	583.09	18	Cir	0.013	1.00	587.25	CB-327 to CB-326
31	25	23.790	-31.541	Grate	0.46	0.00	0.00	0.0	580.30	1.18	580.58	12	Cir	0.013	1.00	585.00	
32	24	125.843	-90.819	MH	0.00	0.00	0.00	0.0	578.41	0.71	579.30	24	Cir	0.013	0.89	587.00	
33	32	58.732	11.631	Grate	1.36	0.00	0.00	0.0	580.30	0.48	580.58	12	Cir	0.013	1.00	585.00	
34	21	76.195	55.421	Comb	0.00	0.52	0.87	6.0	576.58	4.08	579.69	18	Cir	0.013	1.32	584.67	CB-328 to CB-322
35	34	217.544	-58.558	Comb	0.00	0.33	0.86	6.0	579.69	2.44	585.00	18	Cir	0.013	1.00	589.02	CB-329 to CB-328
36	32	187.847	60.684	MH	0.00	0.00	0.00	0.0	579.30	1.70	582.50	24	Cir	0.013	0.18	587.00	
37	24	12.940	-1.194	Grate	0.52	0.00	0.00	0.0	579.50	3.86	580.00	12	Cir	0.013	1.00	585.00	
38	36	61.160	-8.299	MH	13.44	0.00	0.00	6.0	582.50	4.74	585.40	24	Cir	0.013	1.00	0.00	BYPASS

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	36	40.85	584.00	585.72	1.72	4.20	9.73	0.95	586.67	0.000	41.988	584.40	586.48	2.08**	5.23	7.81	0.95	587.43	0.000	0.000	n/a	0.87	0.83
2	36	41.60	584.40	586.48	2.08	5.23	7.96	0.96	587.44	0.000		585.82	587.92	2.10**	5.28	7.88	0.96	588.88	0.000	0.000	n/a	1.00	0.96
3	36	38.23	585.82	587.92	2.10	5.04	7.24	0.90	588.81	0.000	57.000	586.24	588.25 j	2.01**	5.04	7.59	0.90	589.15	0.000	0.000	n/a	1.00	n/a
4	36	38.93	586.24	588.25	2.01	5.04	7.73	0.91	589.16	0.000	183.394	587.57	589.60	2.03**	5.09	7.65	0.91	590.51	0.000	0.000	n/a	1.00	0.91
5	30	19.08	588.07	589.60	1.53	3.02	6.06	0.62	590.22	0.000	195.393	589.34	590.82 j	1.48**	3.03	6.31	0.62	591.44	0.000	0.000	n/a	1.00	0.62
6	30	15.38	589.34	590.82	1.48	2.63	5.08	0.53	591.35	0.000	144.853	590.28	591.60 j	1.32**	2.63	5.84	0.53	592.13	0.000	0.000	n/a	0.93	0.49
7	30	11.13	590.28	591.60	1.32	2.12	4.22	0.43	592.03	0.000	77.098	590.78	591.90 j	1.12**	2.12	5.25	0.43	592.32	0.000	0.000	n/a	0.93	n/a
8	30	8.97	590.78	591.90	1.12	1.83	4.23	0.37	592.27	0.000	221.579	592.22	593.22 j	1.00**	1.83	4.91	0.37	593.59	0.000	0.000	n/a	1.00	0.37
9	15	2.17	593.59	594.19	0.60*	0.58	3.73	0.22	594.41	0.520	36.500	593.78	594.38	0.60	0.58	3.73	0.22	594.60	0.520	0.520	0.190	1.00	0.22
10	24	17.23	588.00	589.62	1.62*	2.72	6.33	0.62	590.24	0.595	72.278	588.43	590.05	1.62	2.72	6.32	0.62	590.67	0.594	0.594	0.430	0.50	0.31
11	24	16.82	588.43	590.36	1.93	3.11	5.41	0.46	590.82	0.484		589.75	591.39	1.64	2.75	6.11	0.58	591.97	0.553	0.519	1.154	1.18	0.68
12	15	3.57	590.50	592.07	1.25	0.78	2.91	0.13	592.20	0.306	139.250	592.20	592.96 j	0.76**	0.78	4.56	0.32	593.29	0.645	0.476	n/a	1.50	n/a
13	15	2.18	592.20	592.96	0.76	0.57	2.78	0.23	593.19	0.000	9.000	592.32		0.59**	0.57	3.83	0.23	593.14	0.000	0.000	n/a	1.00	n/a
14	15	2.45	590.50	590.85	0.35*	0.28	8.84	0.25	591.09	0.000	39.003	592.50	593.13	0.63**	0.62	3.99	0.25	593.37	0.000	0.000	n/a	1.00	n/a
15	24	19.21	584.00	585.68	1.68	2.82	6.82	0.72	586.40	0.692	63.657	584.44	586.12	1.68	2.82	6.82	0.72	586.84	0.692	0.692	0.440	1.00	0.72
16	24	3.68	587.14	587.56	0.42*	0.49	7.55	0.25	587.81	0.000	165.000	591.61	592.28	0.67**	0.92	3.98	0.25	592.53	0.000	0.000	n/a	1.00	0.25
17	30	16.60	584.44	586.84	2.40	4.85	3.43	0.18	587.03	0.143		585.20	587.07	1.87	3.94	4.21	0.28	587.35	0.198	0.170	0.325	0.94	0.26
18	30	16.92	585.20	587.33	2.13	2.80	3.79	0.57	587.90	0.000	115.066	586.05	587.44 j	1.39**	2.80	6.03	0.57	588.01	0.000	0.000	n/a	0.15	n/a
19	30	17.40	586.05	587.44	1.39	2.80	6.21	0.58	588.02	0.000		587.59	589.00	1.41**	2.85	6.10	0.58	589.58	0.000	0.000	n/a	0.15	0.09
20	30	12.58	587.59	589.00	1.41	2.31	4.41	0.46	589.46	0.000		589.35		1.19**	2.31	5.46	0.46	591.00	0.000	0.000	n/a	1.00	n/a
21	36	33.12	575.00	576.98	1.98	4.95	6.69	0.70	577.68	0.413	19.276	575.08	577.06	1.98	4.95	6.69	0.70	577.76	0.412	0.412	0.079	1.92	1.33
22	36	28.13	575.08	578.40	3.00	7.07	3.98	0.25	578.64	0.178	104.838	575.52	578.58	3.00	7.07	3.98	0.25	578.83	0.178	0.178	0.187	0.50	0.12

Project File: Network 300.stm	Number of lines: 38	Run Date: 2/7/2020

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

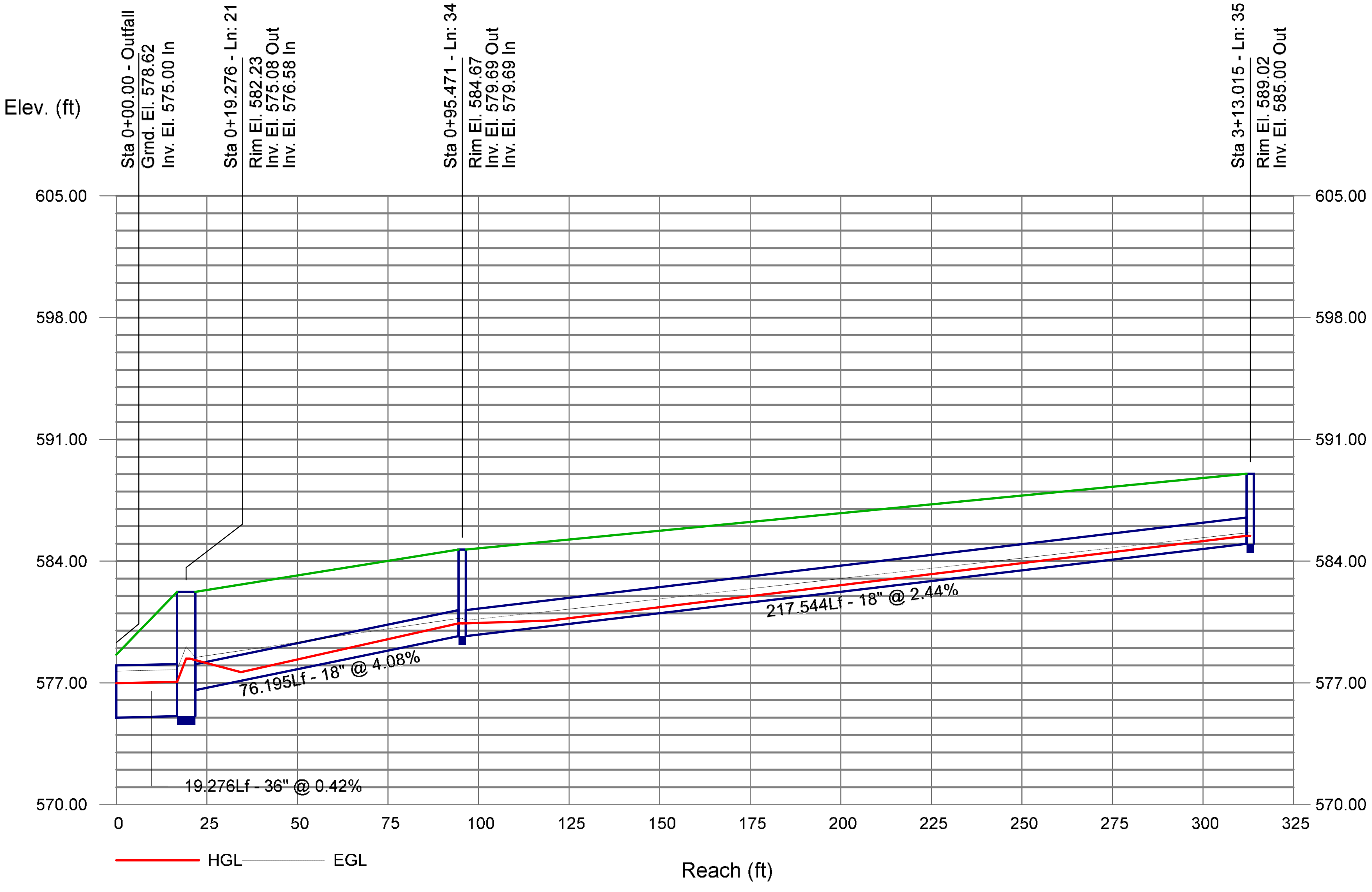
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
23	36	26.77	575.52	578.71	3.00	7.07	3.79	0.22	578.93	0.161	136.388	576.09	578.90	2.81	6.88	3.89	0.24	579.13	0.139	0.150	0.205	1.00	0.24
24	30	23.05	576.50	579.13	2.50	3.40	4.70	0.34	579.48	0.316	49.692	577.91	579.54 j	1.63**	3.40	6.79	0.72	580.26	0.545	0.430	n/a	1.00	n/a
25	24	7.73	578.41	579.54	1.13	1.55	4.21	0.39	579.93	0.000	106.337	579.30	580.29 j	0.99**	1.55	5.00	0.39	580.68	0.000	0.000	n/a	1.00	n/a
26	24	7.27	579.30	580.29	0.99	1.48	4.70	0.37	580.66	0.000		582.00	582.96 j	0.96**	1.48	4.90	0.37	583.33	0.000	0.000	n/a	0.15	0.06
27	24	7.27	582.00	582.96	0.96*	1.48	4.90	0.37	583.33	0.000	81.707	585.55	586.51	0.96**	1.48	4.90	0.37	586.88	0.000	0.000	n/a	1.00	0.37
28	18	3.82	577.59	579.13	1.50	0.88	2.16	0.07	579.21	0.133	112.180	578.88	579.63 j	0.75**	0.88	4.35	0.29	579.92	0.538	0.335	n/a	0.50	n/a
29	18	2.91	578.88	579.63	0.75	0.73	3.31	0.25	579.87	0.000		581.57		0.65**	0.73	3.98	0.25	582.46	0.000	0.000	n/a	0.50	0.12
30	18	2.14	581.57	582.22	0.65	0.59	2.93	0.20	582.42	0.000		583.09		0.55**	0.59	3.63	0.20	583.85	0.000	0.000	n/a	1.00	n/a
31	12	0.46	580.30	580.53	0.23*	0.14	3.31	0.10	580.63	0.000	23.790	580.58	580.86	0.28**	0.18	2.55	0.10	580.96	0.000	0.000	n/a	1.00	n/a
32	24	14.80	578.41	579.74	1.33*	2.21	6.69	0.63	580.37	0.000		579.30	580.69	1.39**	2.32	6.37	0.63	581.32	0.000	0.000	n/a	0.89	0.56
33	12	1.36	580.30	580.83	0.53*	0.42	3.21	0.16	580.99	0.477	58.732	580.58	581.11	0.53	0.42	3.22	0.16	581.27	0.479	0.478	0.281	1.00	0.16
34	18	3.68	576.58	578.40	1.50	0.86	2.08	0.07	578.46	0.123	76.195	579.69	580.42 j	0.73**	0.86	4.30	0.29	580.71	0.534	0.328	n/a	1.32	n/a
35	18	1.53	579.69	580.42	0.73	0.46	1.78	0.17	580.59	0.000		585.00		0.46**	0.46	3.29	0.17	585.63	0.000	0.000	n/a	1.00	n/a
36	24	13.44	579.30	580.69	1.39	2.20	5.79	0.58	581.27	0.000	187.847	582.50	583.82 j	1.32**	2.20	6.12	0.58	584.40	0.000	0.000	n/a	0.18	n/a
37	12	0.52	579.50	579.68	0.18*	0.10	5.22	0.11	579.79	0.000	12.940	580.00	580.30	0.30**	0.20	2.64	0.11	580.41	0.000	0.000	n/a	1.00	n/a
38	24	13.44	582.50	583.82	1.32*	2.20	6.12	0.58	584.40	0.000	61.160	585.40	586.72	1.32**	2.20	6.12	0.58	587.30	0.000	0.000	n/a	1.00	n/a

Project File: Network 300.stm	Number of lines: 38	Run Date: 2/7/2020

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Storm Sewer Profile

Proj. file: Network 300.stm



Storm Sewer Profile

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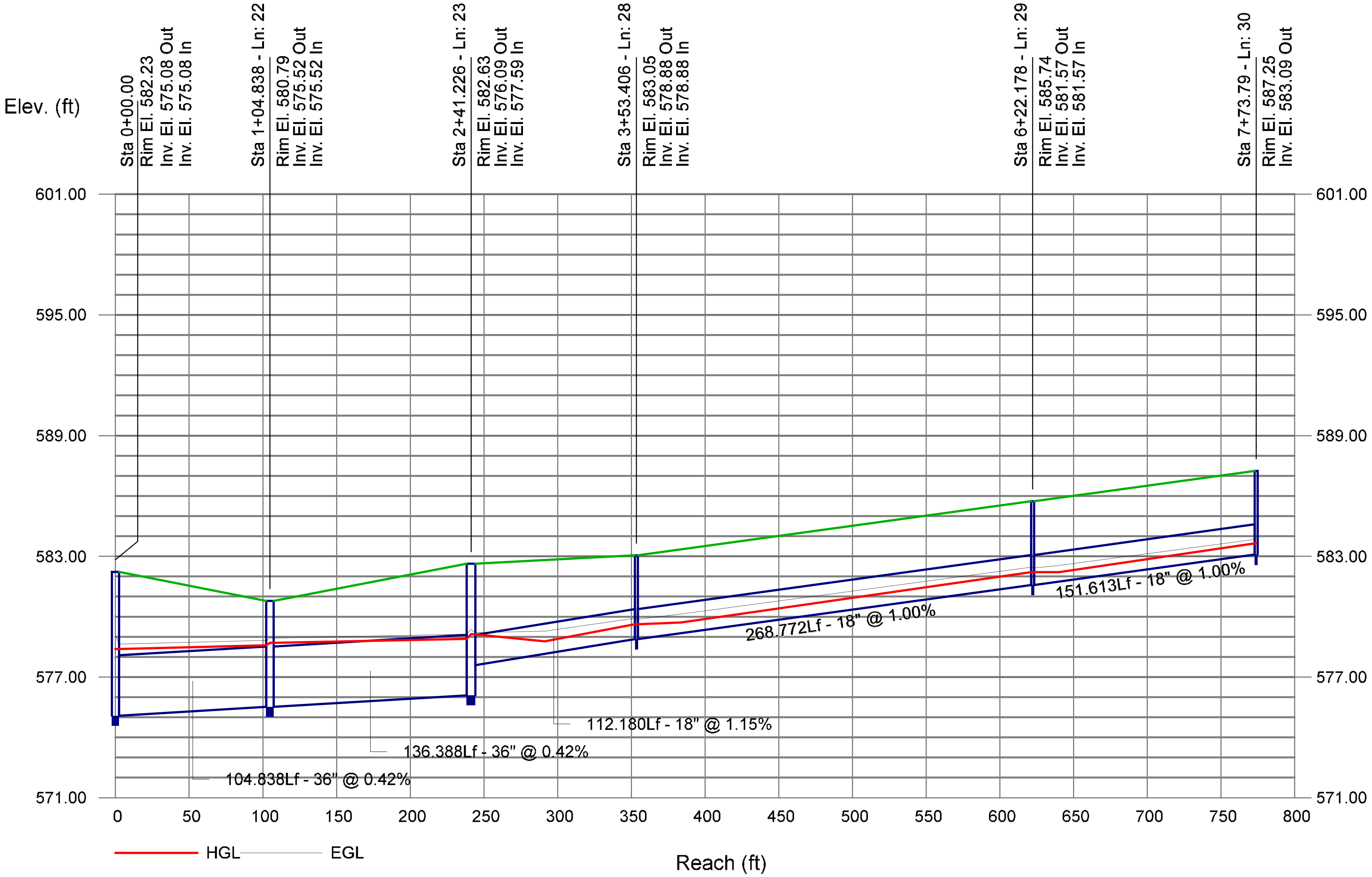

Storm Sewer Profile

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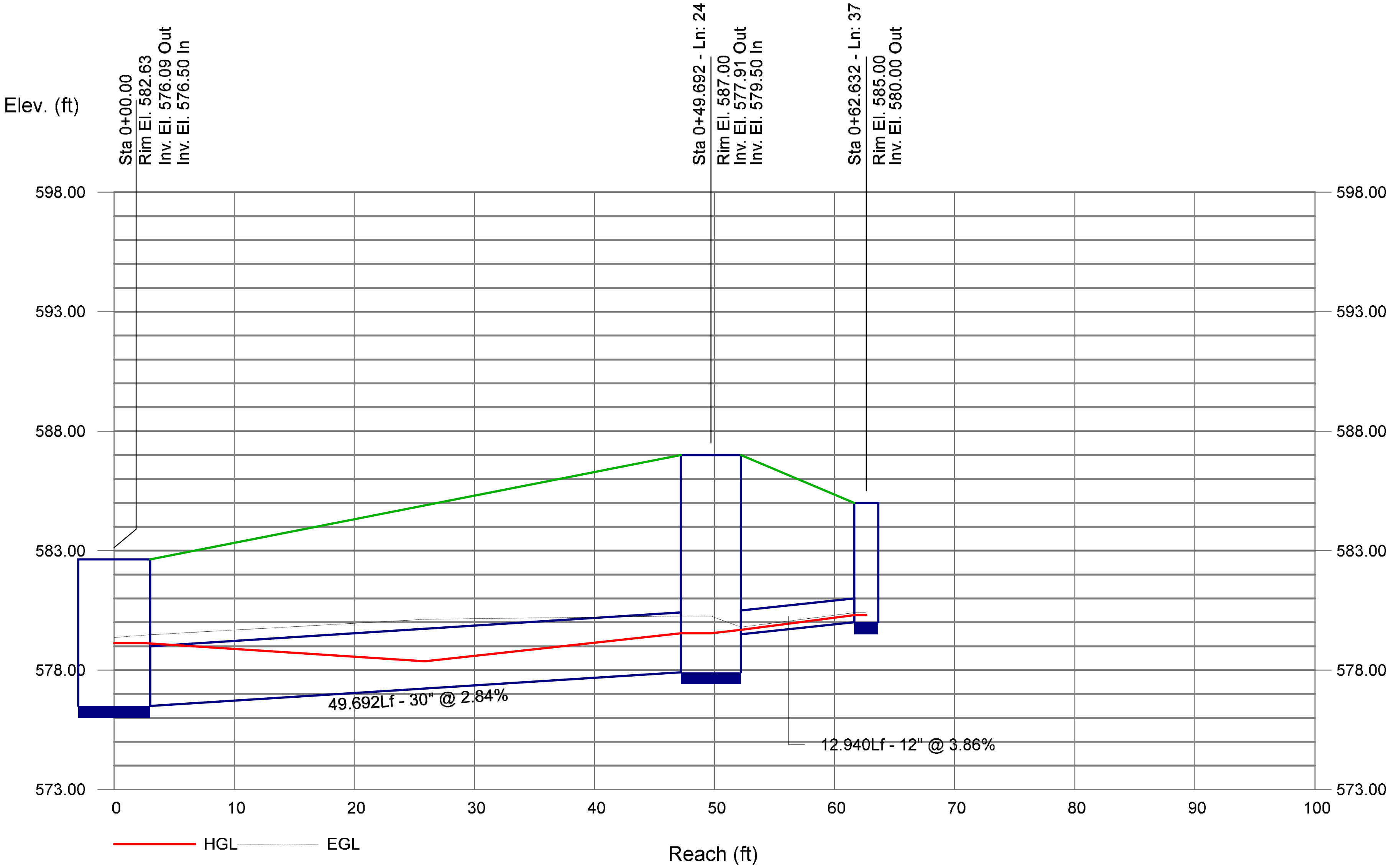

Storm Sewer Profile

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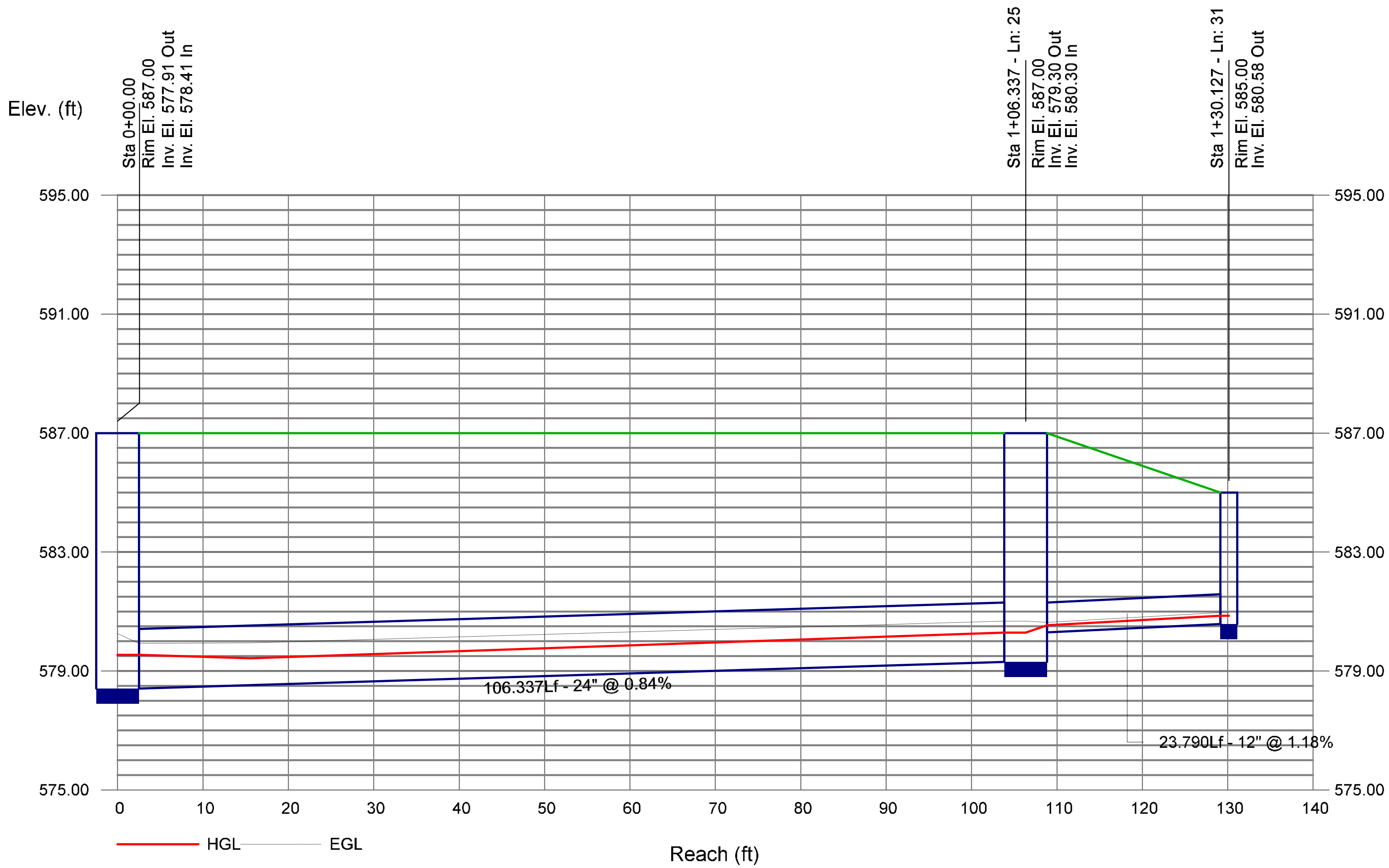

Storm Sewer Profile

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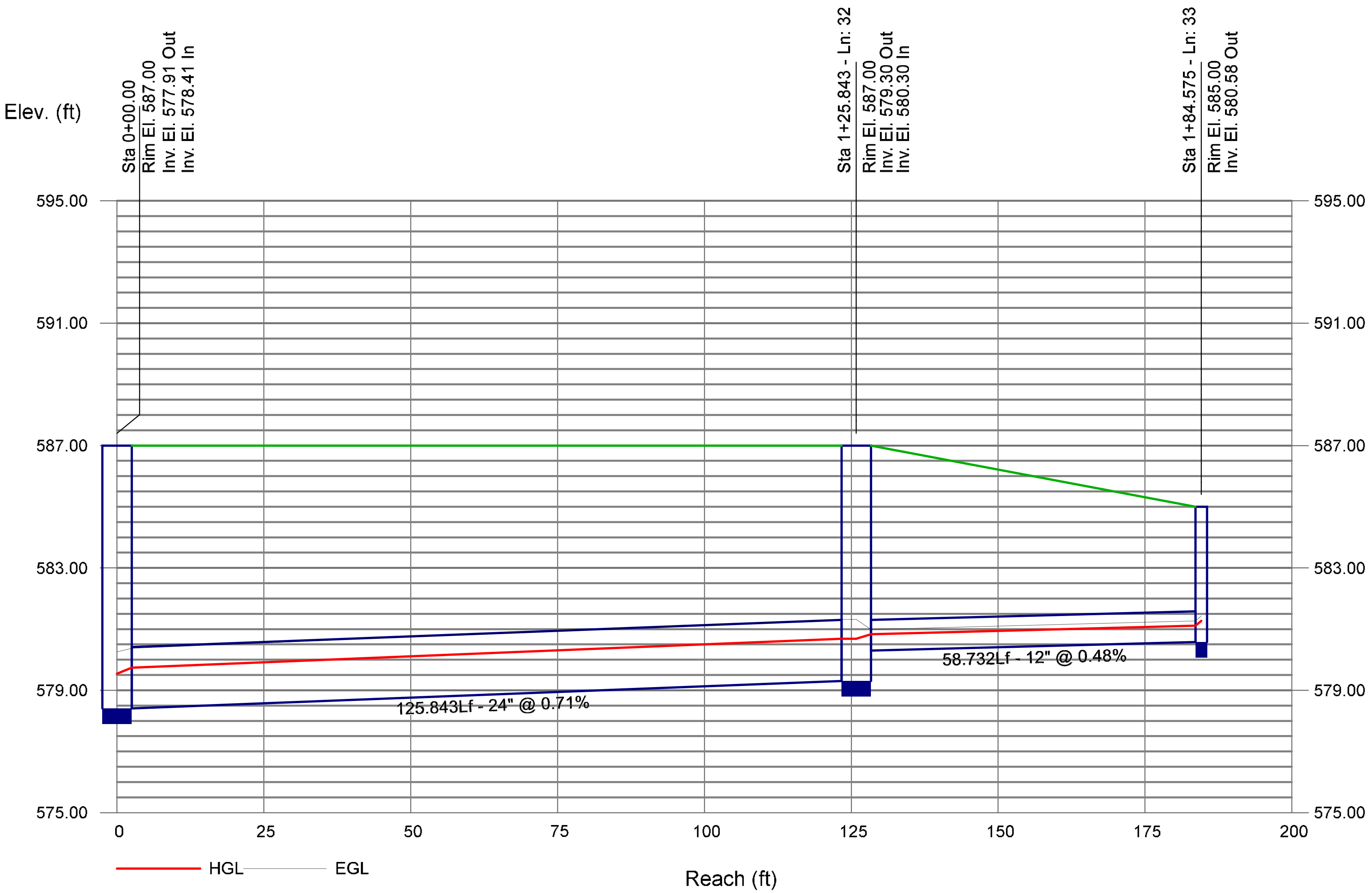

Storm Sewer Profile

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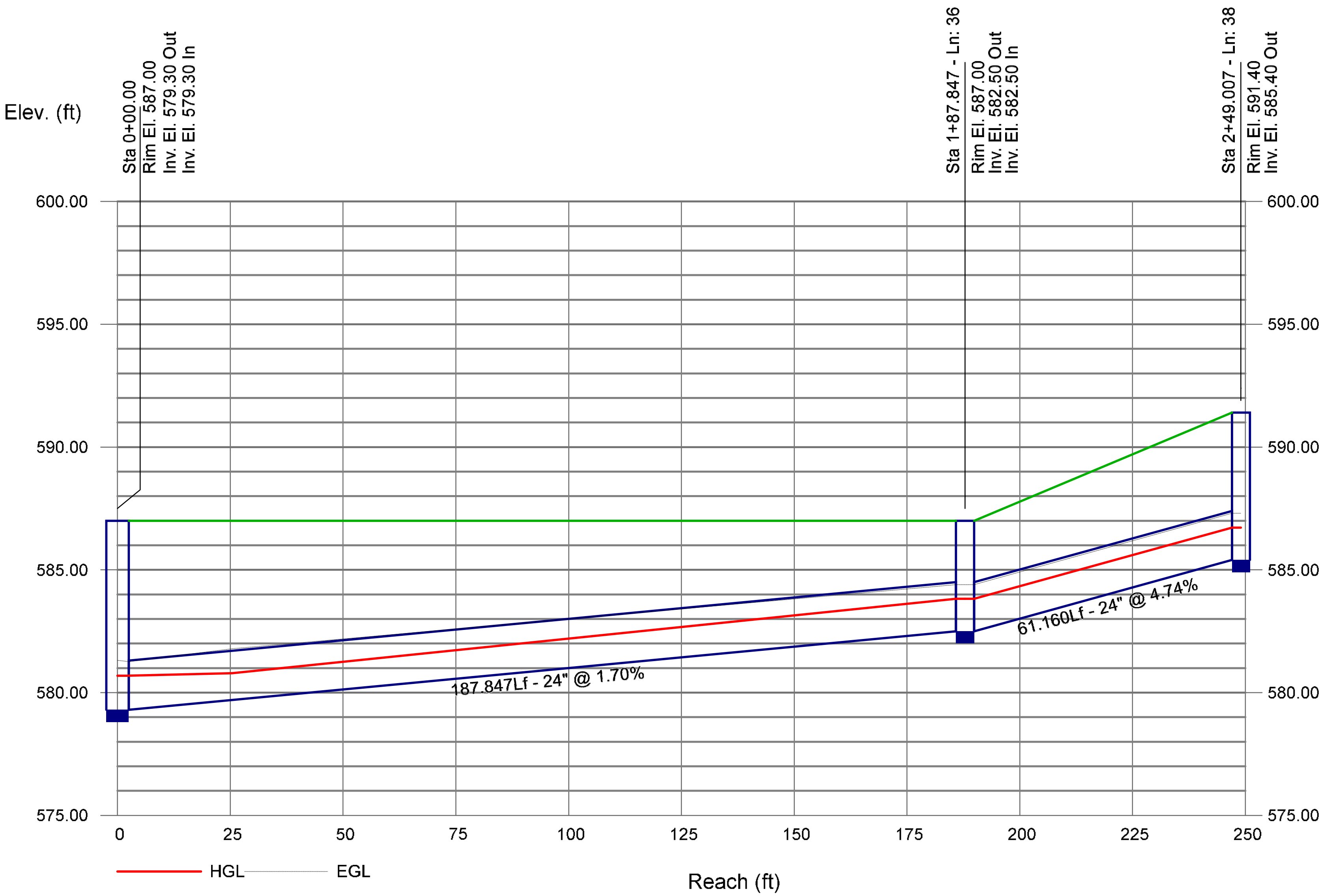

Storm Sewer Profile

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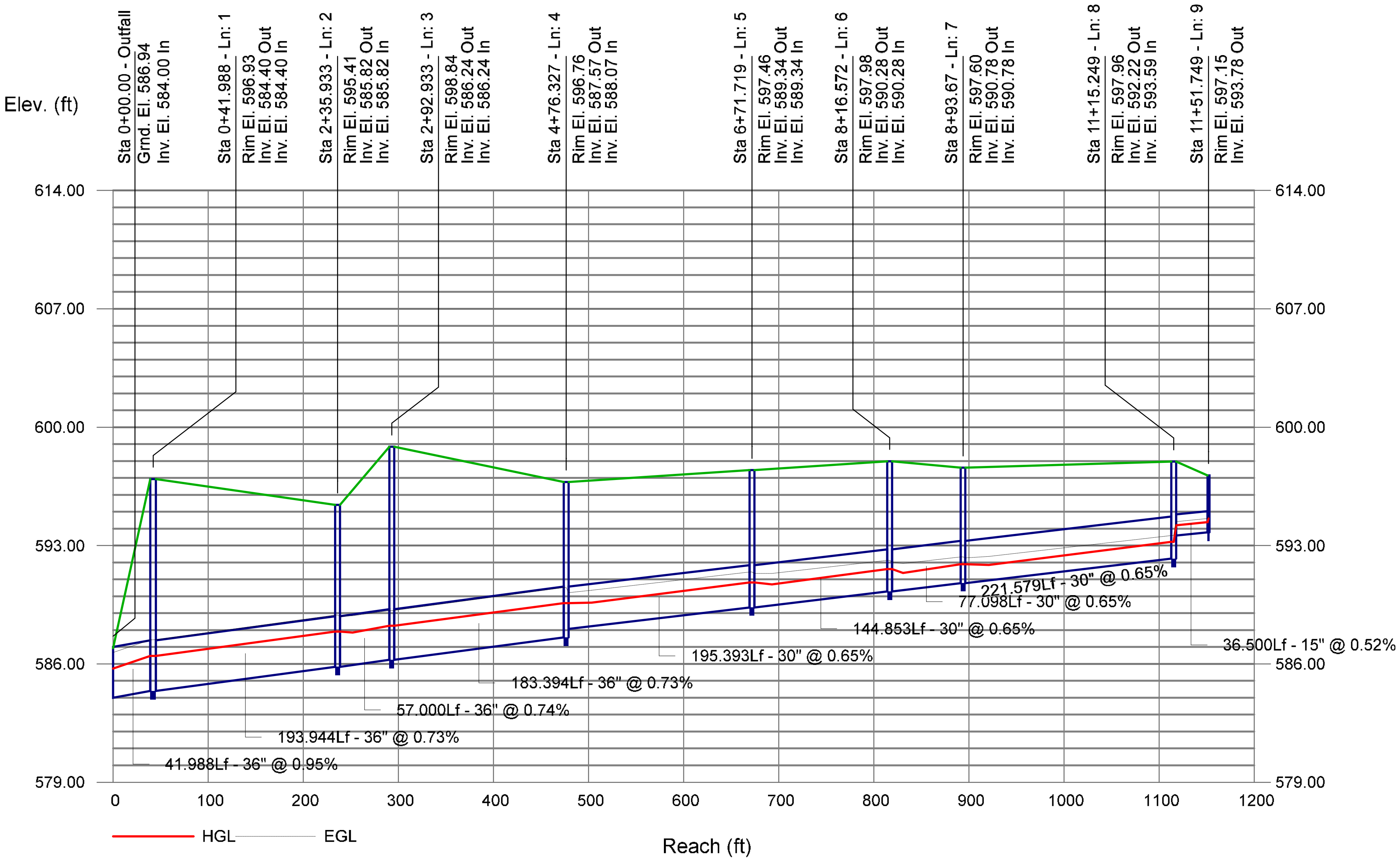

Storm Sewer Profile

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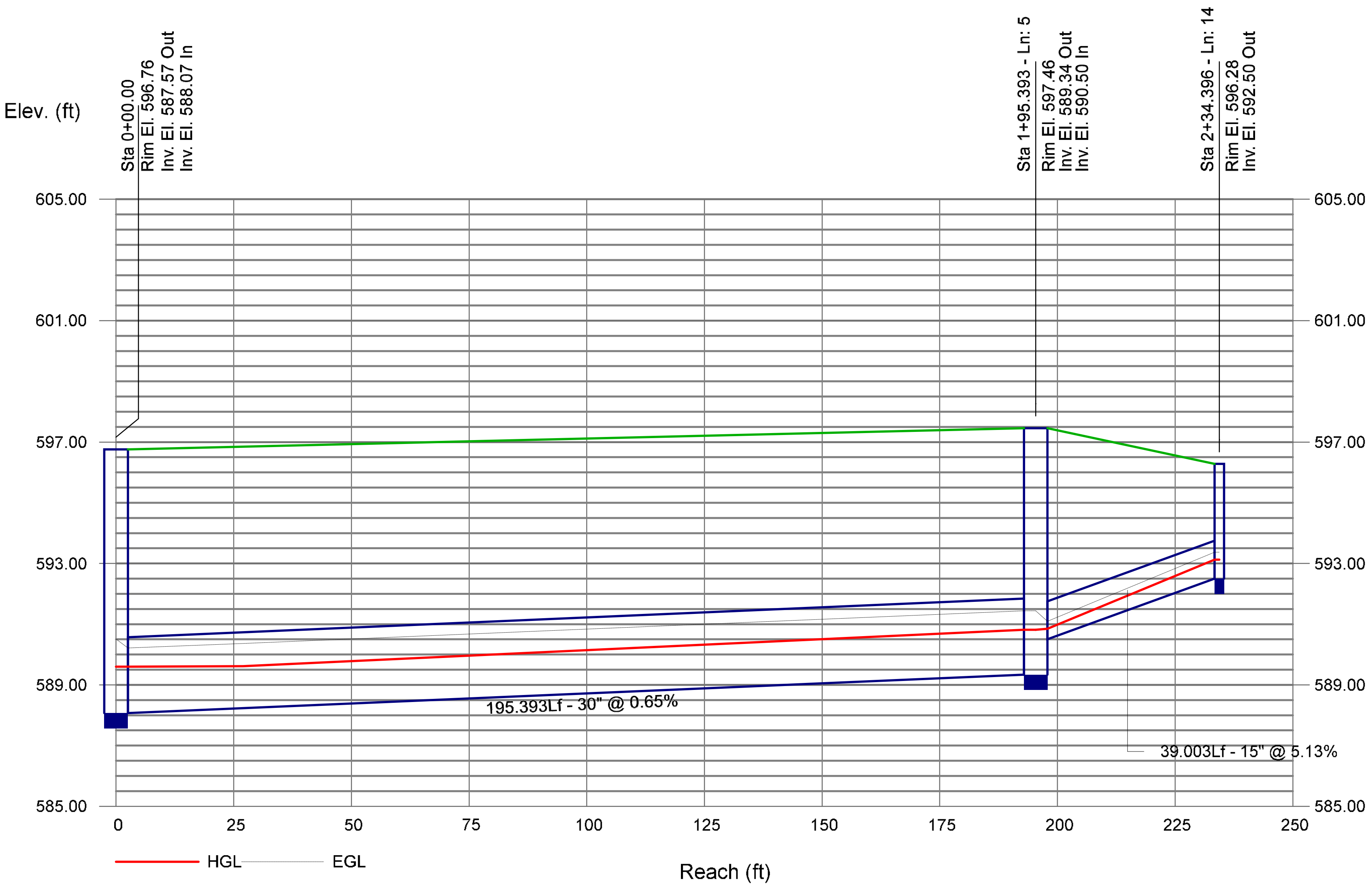

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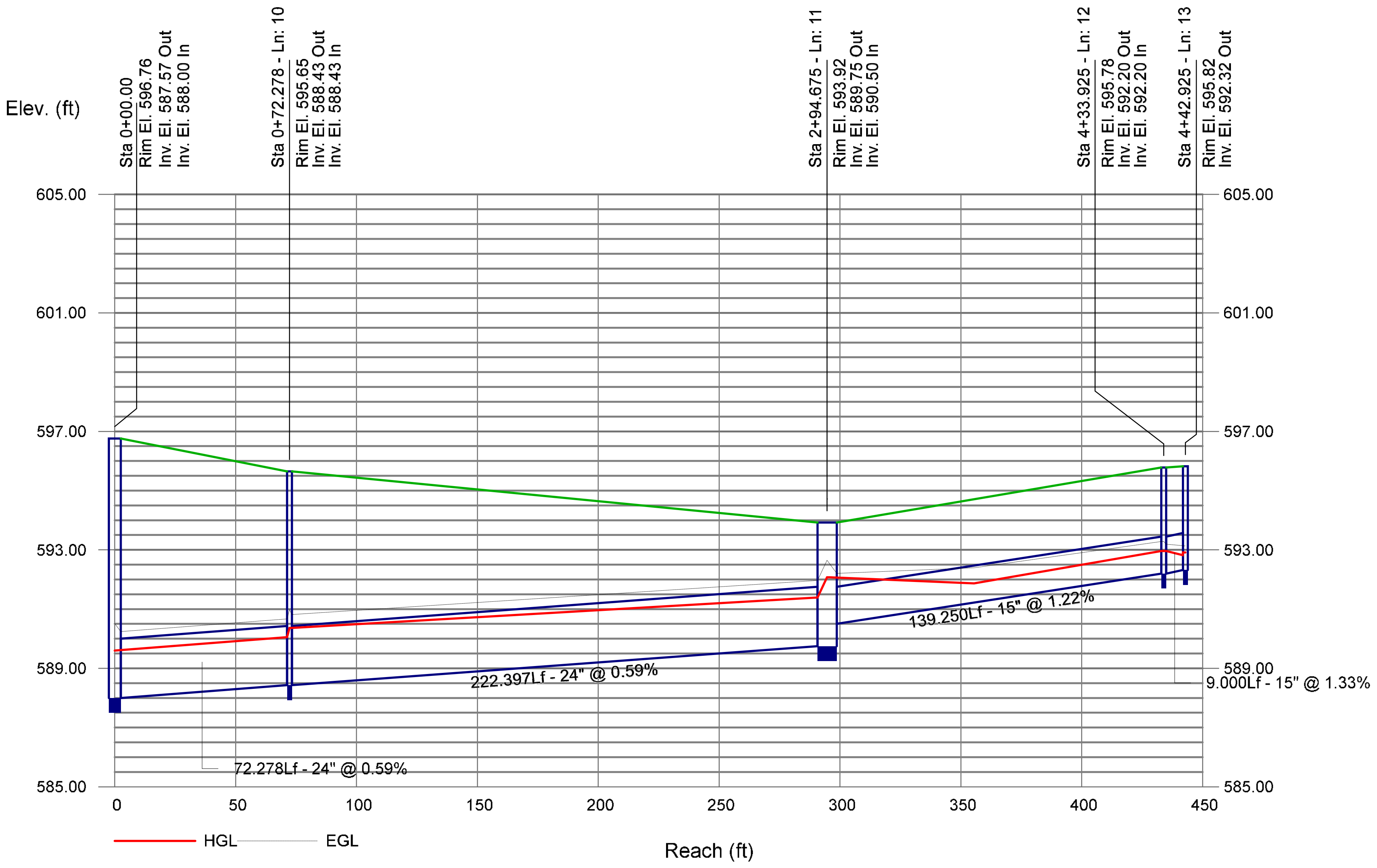

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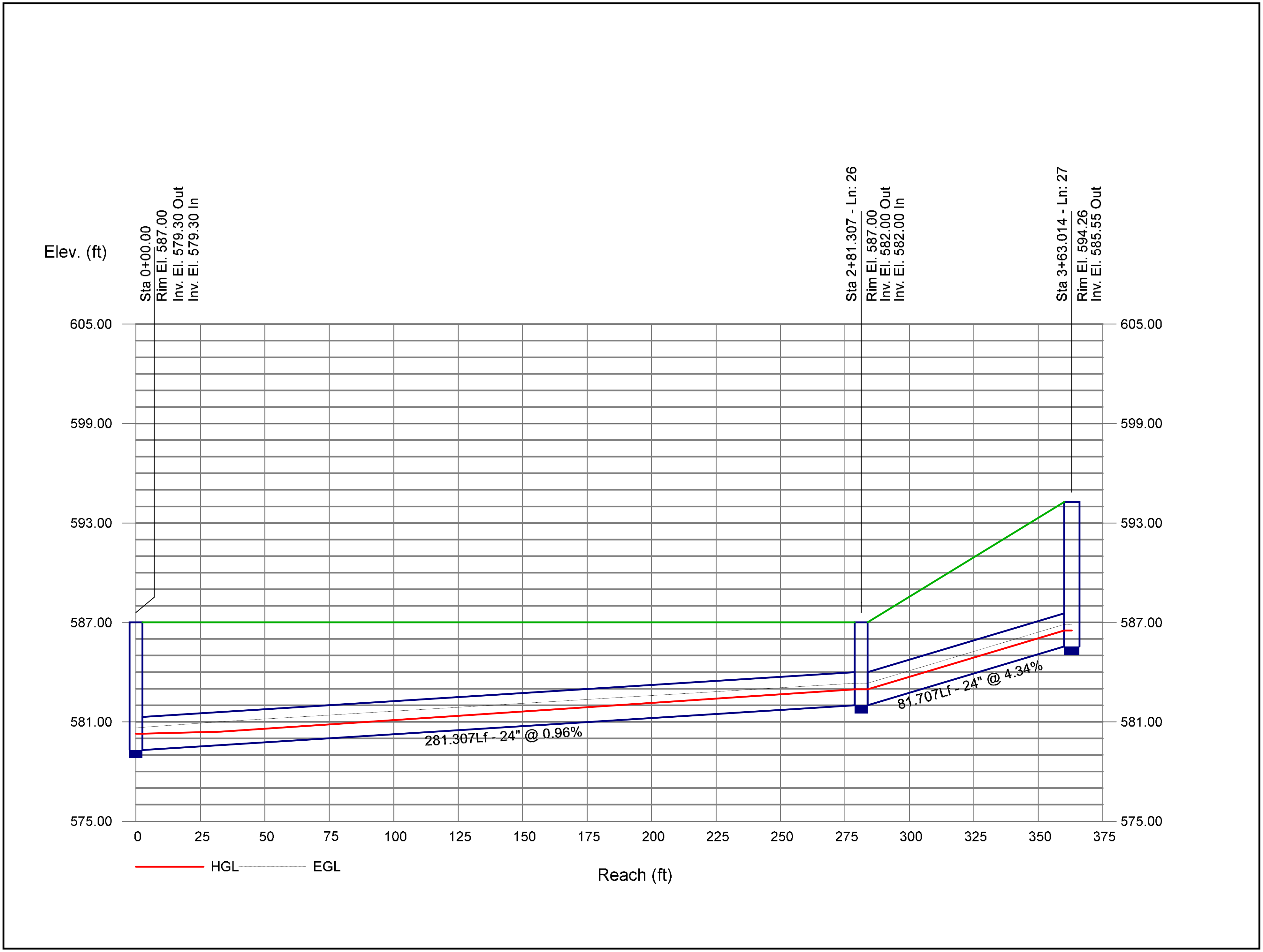

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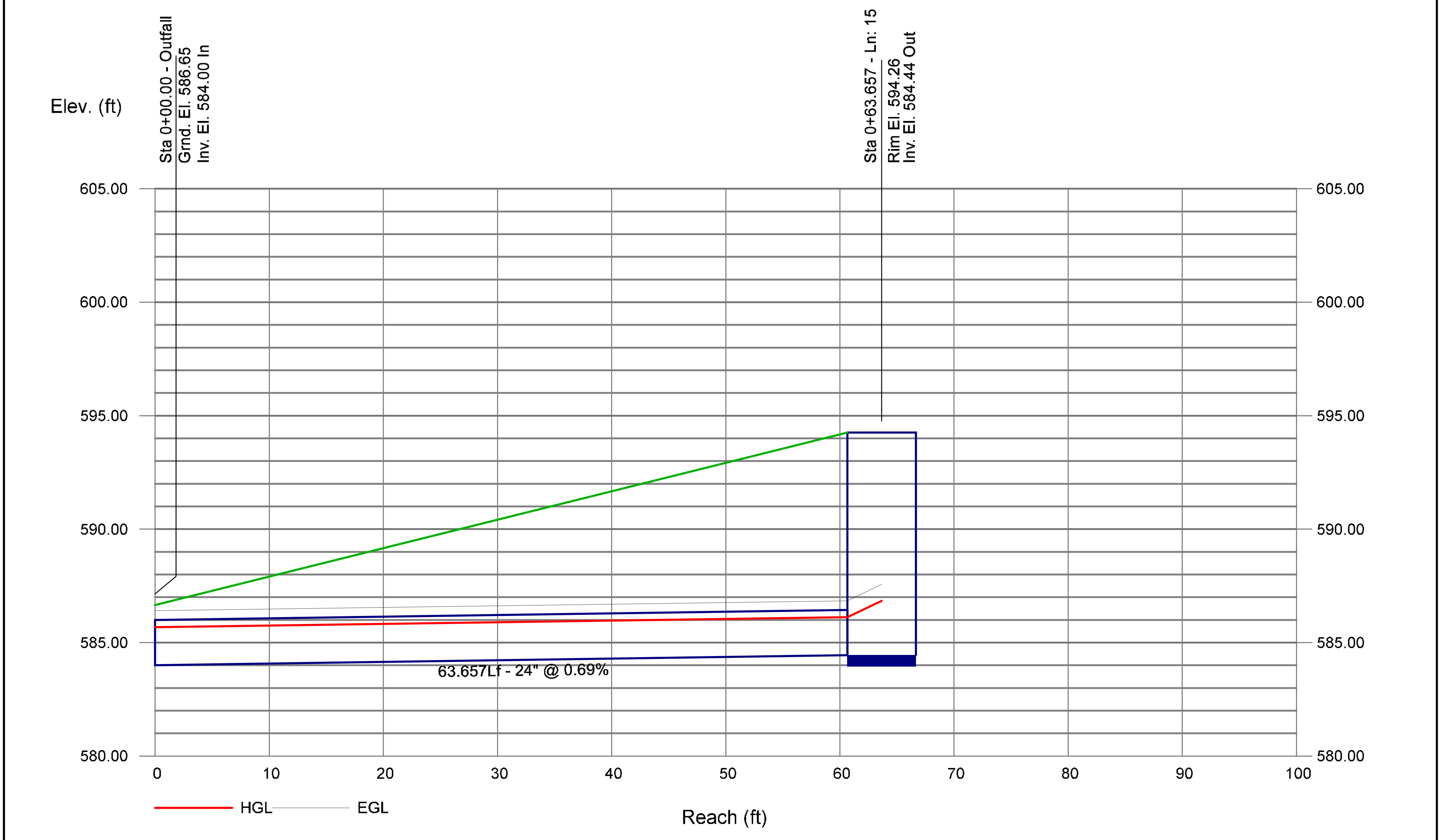

Storm Sewer Profile

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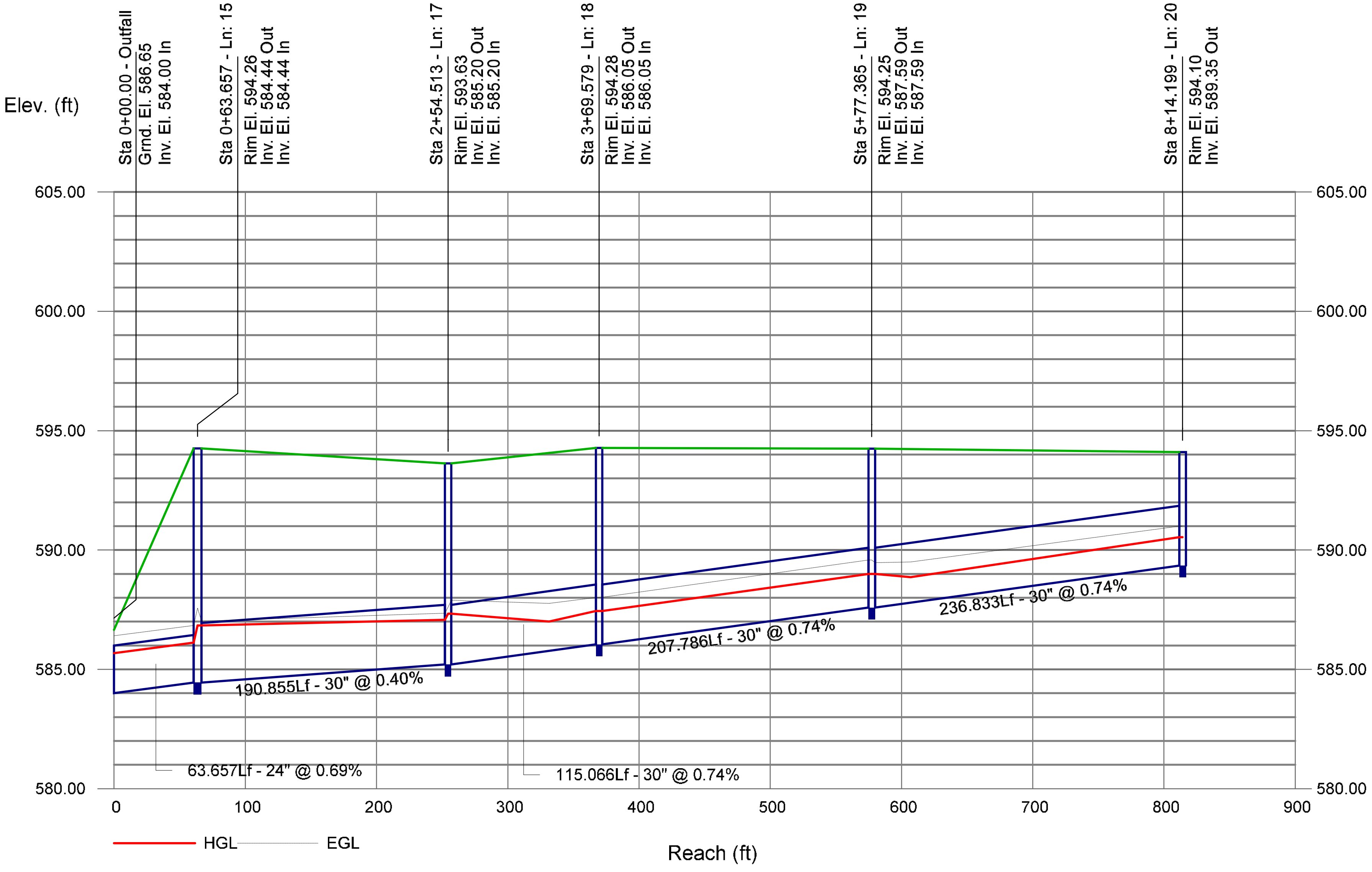
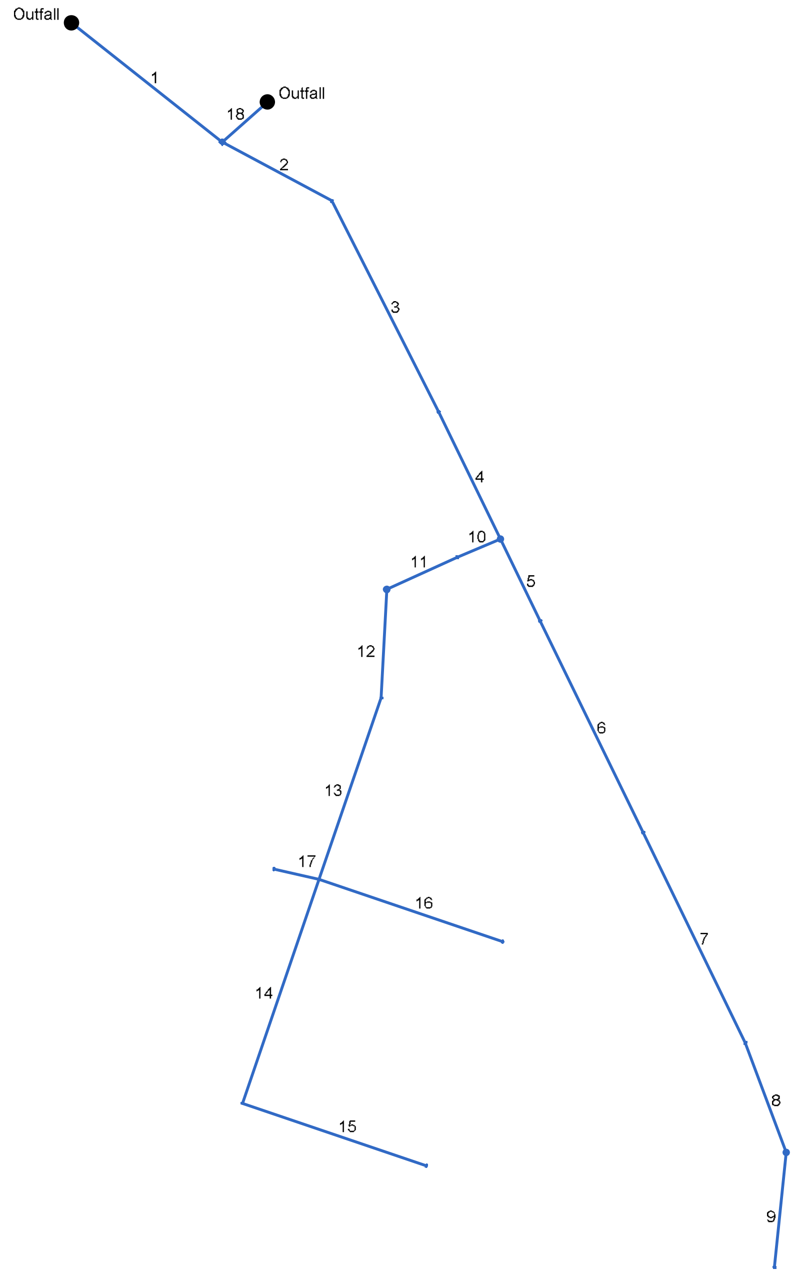


Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End		38.498	Comb	0.00	0.15	0.63	6.0	584.00	0.42	584.86	30	Cir	0.013	0.50	589.59	CB-402 to HW -401
2	1	133.088	-10.268	Comb	0.00	0.29	0.71	6.0	584.86	0.42	585.42	30	Cir	0.011	0.94	589.74	CB-403 to CB-402
3	2	252.763	35.022	Comb	0.00	0.72	0.54	6.0	585.42	0.70	587.20	30	Cir	0.011	0.50	592.25	CB-404 to CB-403
4	3	151.062	0.909	MH	0.00	0.00	0.00	0.0	587.20	1.22	589.05	30	Cir	0.011	1.00	593.76	DMH-405 to CB-404
5	4	97.330	0.000	Comb	0.00	0.38	0.65	6.0	590.01	1.00	590.98	18	Cir	0.013	0.50	594.74	CB-406 to DMH-405
6	5	251.223	0.000	Comb	0.00	0.28	0.72	6.0	591.27	1.00	593.79	15	Cir	0.013	0.50	597.25	CB-407 to CB-406
7	6	250.126	0.000	Comb	0.00	0.40	0.61	6.0	593.79	1.00	596.29	15	Cir	0.013	0.50	599.75	CB-408 to CB-407
8	7	124.806	5.463	MH	0.00	0.00	0.00	0.0	596.29	1.00	597.54	15	Cir	0.013	0.50	601.00	
9	8		26.196	Comb	0.00	0.30	0.67	6.0	597.54	1.00	598.77	15	Cir	0.013	1.00	602.15	CB-410 to DMH-409
10	4	50.074	93.033	Comb	0.00	0.86	0.79	6.0	589.50	1.72	590.36	24	Cir	0.013	0.50	594.59	
11	10	82.525	-1.823	MH	0.00	0.00	0.00	0.0	590.36	0.71	590.95	24	Cir	0.013	0.91	595.94	DMH-412 to CB-411
12	11	116.183	-62.399	Comb	0.00	0.31	0.90	6.0	590.95	0.71	591.77	24	Cir	0.013	0.50	599.50	CB-413 to DMH-412
13	12	205.100	15.835	Comb	0.00	1.08	0.90	6.0	591.77	0.71	593.22	24	Cir	0.013	2.24	598.85	CB-414 to CB-413
14	13	252.901	0.000	Comb	0.00	0.74	0.90	6.0	593.72	0.53	595.06	18	Cir	0.013	1.50	598.68	CB-415 to CB-414
15	14	207.004	-90.000	Comb	0.00	0.63	0.87	6.0	595.30	1.03	597.43	15	Cir	0.013	1.00	600.80	
16	13		-90.000	Comb	0.00	0.65	0.86	6.0	593.97	1.88	597.87	15	Cir	0.013	1.00	601.24	CB-417 to CB-414
17	13	49.252	84.203	Comb	0.00	0.43	0.80	6.0	593.97	2.09	595.00	15	Cir	0.013	1.00	598.58	CB-418 to CB-414
18	End	63.912	137.963	Comb	7.36	0.00	0.68	6.0	584.00	2.91	585.86	18	Cir	0.013	1.00	589.59	CB-402 to HW-419

Project File: Network 400.stm	Number of lines: 18	Date: 2/7/2020

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	30	23.81	584.00	585.85	1.85	3.89	6.11	0.58	586.43	0.418	204.647	584.86	586.70	1.84	3.88	6.14	0.59	587.29	0.422	0.420	0.860	0.50	0.29
2	30	23.74	584.86	587.00	2.14	3.46	5.32	0.73	587.73	0.000	133.088	585.42	587.08 j	1.66**	3.45	6.87	0.73	587.81	0.000	0.000	n/a	0.94	n/a
3	30	23.43	585.42	587.08	1.66	3.43	6.78	0.73	587.80	0.000	252.763	587.20	588.85 j	1.65**	3.43	6.83	0.73	589.57	0.000	0.000	n/a	0.50	0.36
4	30	22.07	587.20	588.85	1.65	3.31	6.44	0.69	589.54	0.000	151.062	589.05	590.65 j	1.60**	3.31	6.67	0.69	591.34	0.000	0.000	n/a	1.00	0.69
5	18	4.05	590.01	590.66	0.65*	0.73	5.55	0.31	590.96	0.000	97.330	590.98	591.75	0.77**	0.91	4.43	0.31	592.06	0.000	0.000	n/a	0.50	0.15
6	15	3.04	591.27	591.87	0.60*	0.59	5.19	0.29	592.16	0.000	251.223	593.79	594.49	0.70**	0.71	4.30	0.29	594.78	0.000	0.000	n/a	0.50	0.14
7	15	2.21	593.79	594.49	0.70	0.57	3.13	0.23	594.72	0.000	250.126	596.29	596.88 j	0.59**	0.57	3.85	0.23	597.11	0.000	0.000	n/a	0.50	n/a
8	15	1.04	596.29	596.88	0.59	0.34	1.82	0.15	597.03	0.000	124.806	597.54	597.94 j	0.40**	0.34	3.07	0.15	598.09	0.000	0.000	n/a	0.50	n/a
9	15	1.08	597.54	597.94	0.40	0.34	3.18	0.15	598.09	0.000	123.593	598.77	599.18	0.41**	0.35	3.10	0.15	599.33	0.000	0.000	n/a	1.00	n/a
10	24	18.83	589.50	590.66	1.16*	1.88	9.99	0.80	591.45	0.000	50.074	590.36	591.92	1.56**	2.63	7.16	0.80	592.72	0.000	0.000	n/a	0.50	n/a
11	24	15.82	590.36	591.92	1.56	2.41	6.02	0.67	592.59	0.000	82.525	590.95	592.38 j	1.43**	2.41	6.57	0.67	593.05	0.000	0.000	n/a	0.91	0.61
12	24	16.03	590.95	592.38	1.43	2.41	6.66	0.68	593.06	0.000	116.183	591.77	593.21	1.44**	2.43	6.61	0.68	593.89	0.000	0.000	n/a	0.50	n/a
13	24	15.08	591.77	593.21	1.44	2.35	6.22	0.64	593.85	0.000	205.100	593.22	594.62 j	1.40**	2.35	6.43	0.64	595.26	0.000	0.000	n/a	2.24	1.44
14	18	6.18	593.72	594.74	1.02*	1.28	4.82	0.36	595.10	0.530	252.901	595.06	596.08	1.02	1.29	4.81	0.36	596.44	0.529	0.529	1.338	1.50	0.54
15	15	2.95	595.30	596.62	1.25	0.69	2.40	0.09	596.71	0.208	207.004	597.43	598.12 j	0.69**	0.69	4.25	0.28	598.40	0.601	0.405	n/a	1.00	0.28
16	15	3.01	593.97	594.62	0.65	0.64	4.68	0.28	594.90	0.000	206.993	597.87	598.57	0.70**	0.70	4.28	0.28	598.85	0.000	0.000	n/a	1.00	0.28
17	15	1.85	593.97	594.62	0.65	0.51	2.88	0.21	594.82	0.000	49.252	595.00	595.54 j	0.54**	0.51	3.64	0.21	595.75	0.000	0.000	n/a	1.00	0.21
18	18	7.36	584.00	584.67	0.67*	0.76	9.64	0.48	585.15	0.000	63.912	585.86	586.91	1.05**	1.32	5.57	0.48	587.39	0.000	0.000	n/a	1.00	n/a

Project File: Network 400.stm

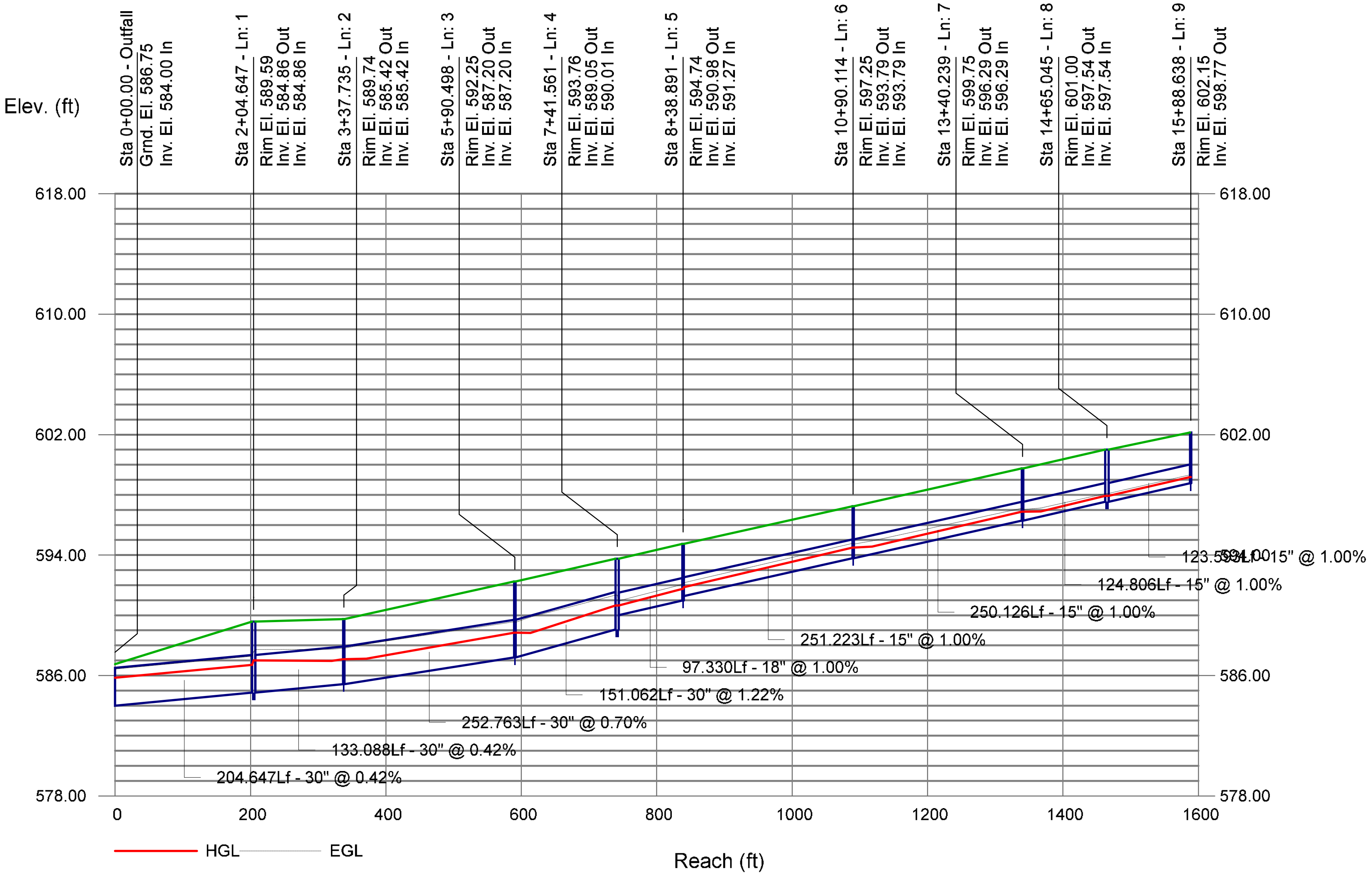
Number of lines: 18

Run Date: 2/7/2020

Notes: * Normal depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Storm Sewer Profile

Proj. file: Network 400.stm



Storm Sewer Profile

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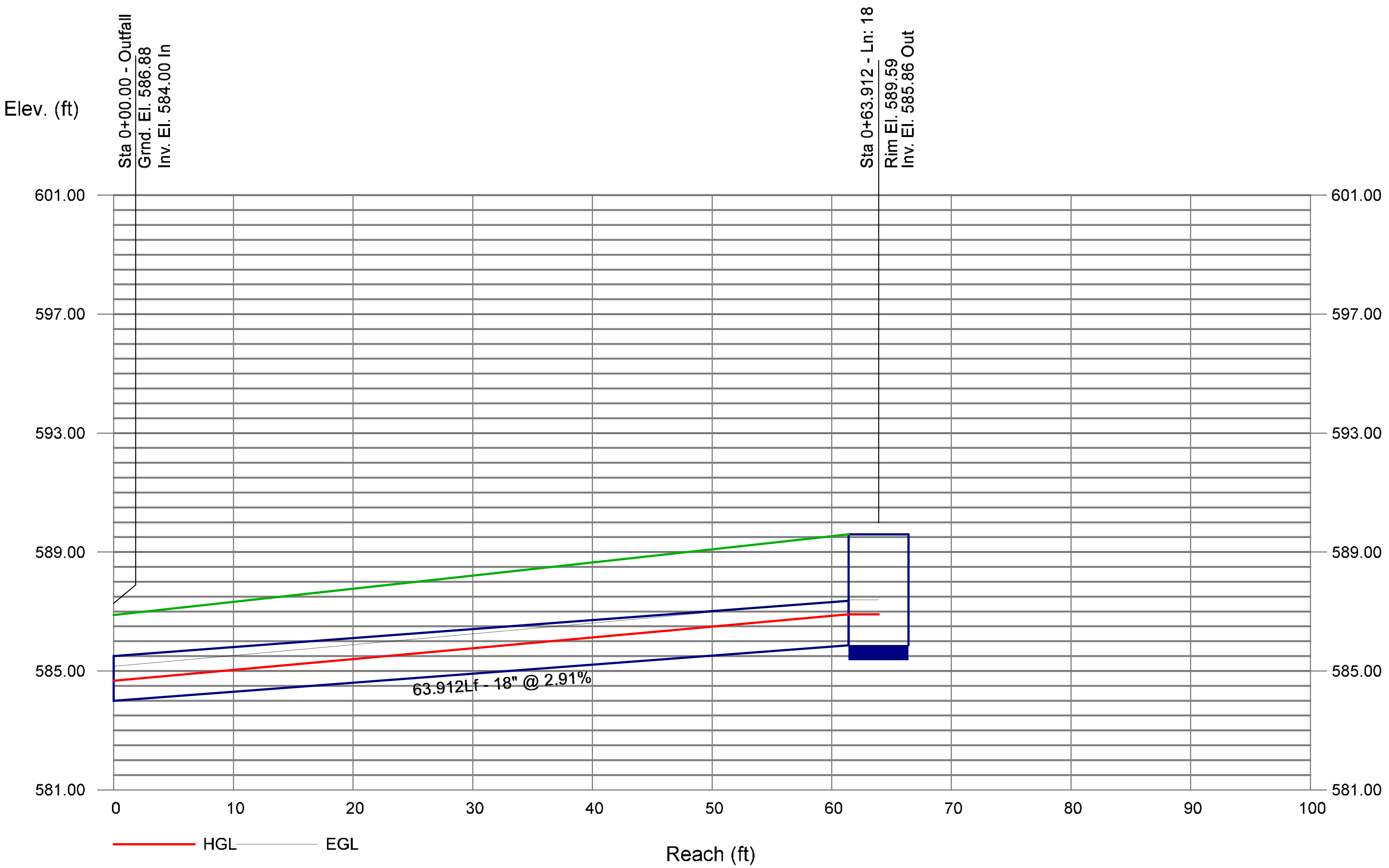

Storm Sewer Profile

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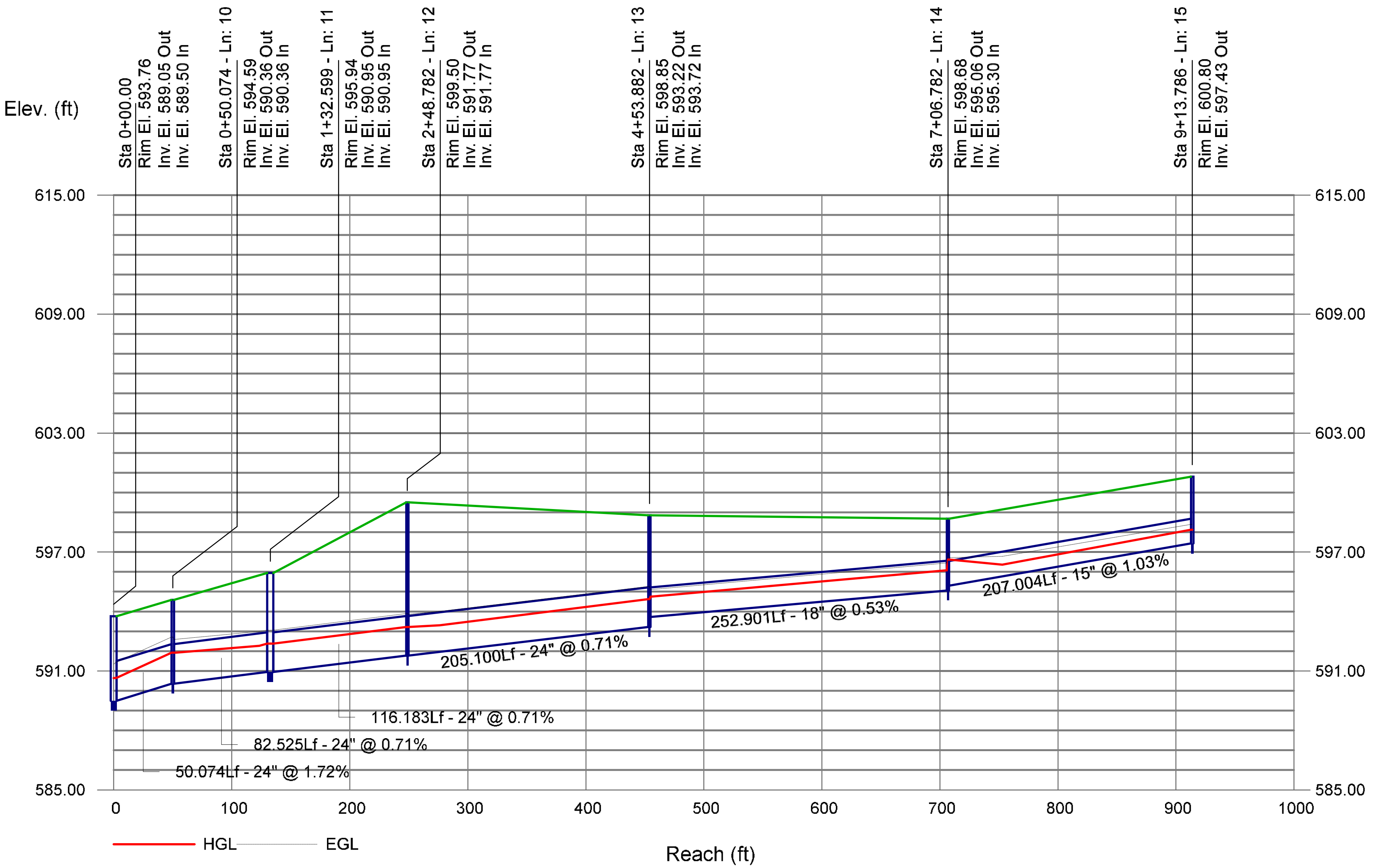

Storm Sewer Profile

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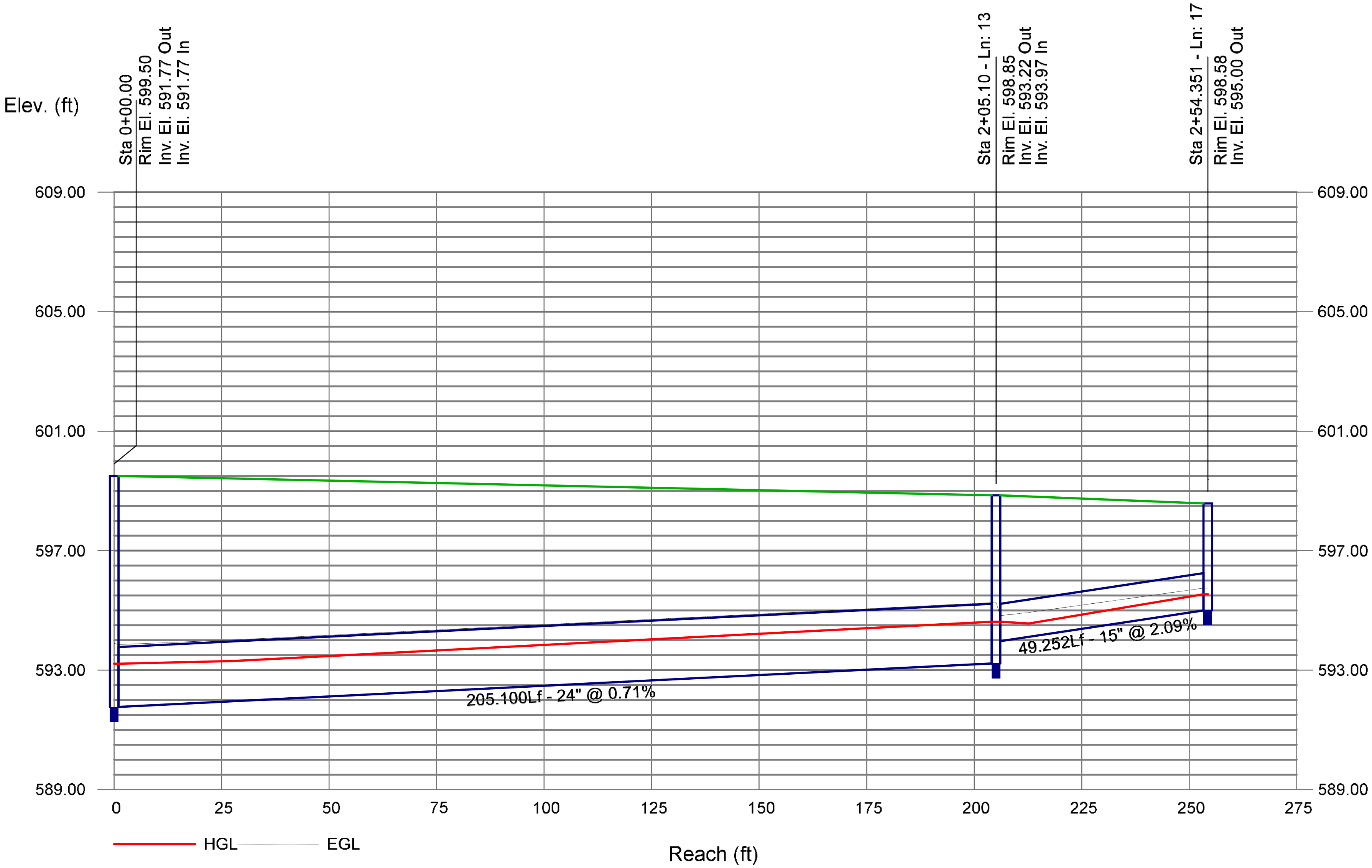

Storm Sewer Profile

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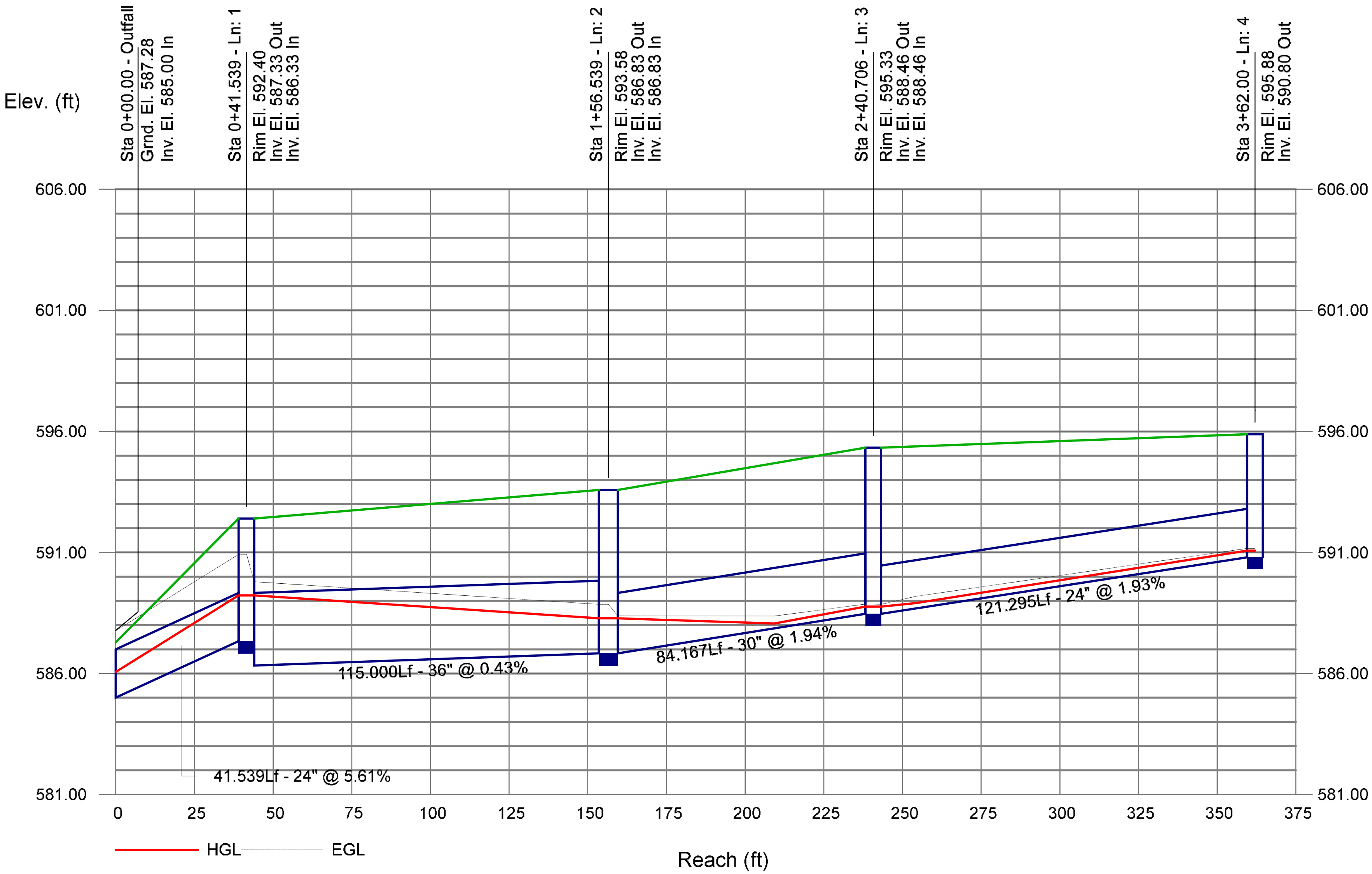
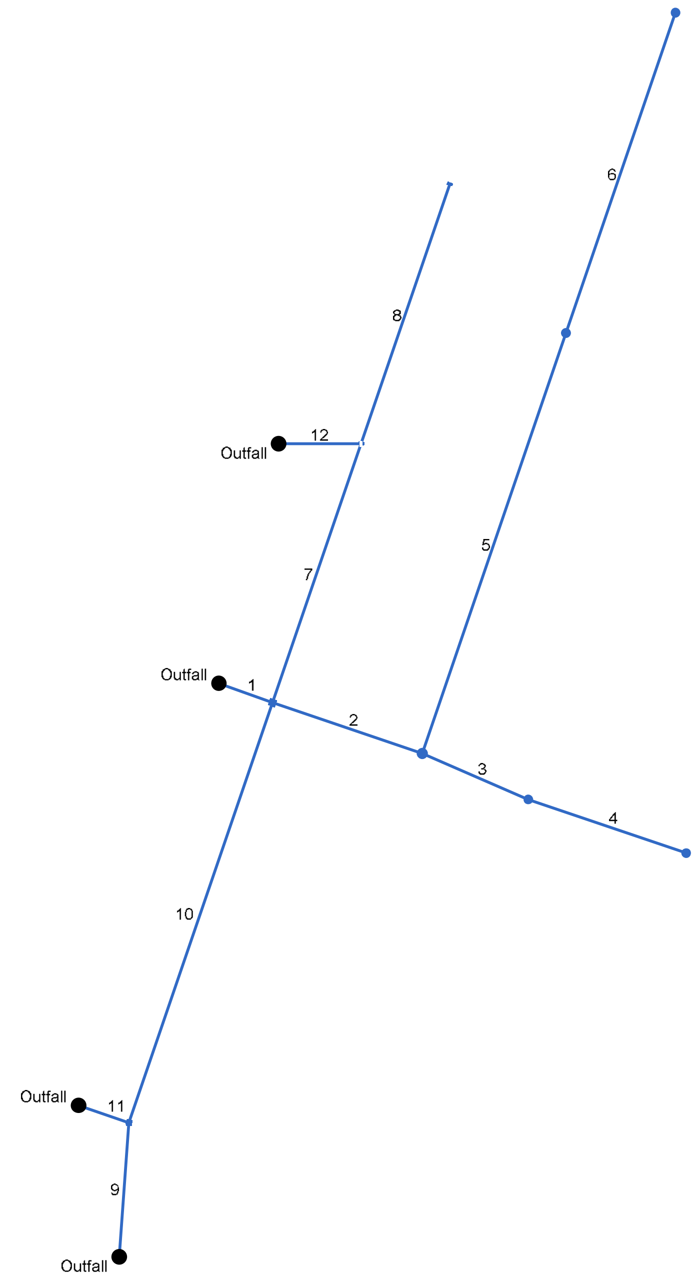


Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Network 500.stm	Number of lines: 12	Date: 2/7/2020

Storm Sewers v2018.30

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	41.539	19.946	Comb	8.50	0.00	0.00	0.0	585.00	5.61	587.33	24	Cir	0.012	1.50	592.40	CB-503 to HW-512
2	1	115.000	-1.139	MH	0.00	0.97	0.90	6.0	586.33	0.43	586.83	36	Cir	0.012	1.00	593.58	MH-504 to CB-503
3	2	84.167	4.771	MH	0.00	0.06	0.90	6.0	586.83	1.94	588.46	30	Cir	0.012	0.15	595.33	MH-507 to MH-504
4	3	121.295	-4.750	MH	0.00	0.13	0.90	6.0	588.46	1.93	590.80	24	Cir	0.012	1.00	595.88	MH-508 to MH-507
5	2	324.195	-90.000	MH	0.00	1.09	0.90	6.0	586.83	0.43	588.23	30	Cir	0.012	0.15	594.25	MH-505 to MH-504
6	5	247.158	0.000	MH	0.00	2.41	0.90	6.0	588.23	0.43	589.30	30	Cir	0.012	1.00	594.05	
7	1	200.000		Comb	0.00	0.98	0.90	6.0	587.00	0.43	587.87	30	Cir	0.012	0.50	592.40	CB-509 to CB-503
8	7	200.000	0.000	Comb	0.00	0.13	0.90	6.0	587.87	0.43	588.73	24	Cir	0.012	1.00	592.40	CB-510 to CB-509
9	End	98.243		Comb	0.00	0.84	0.87	6.0	584.50	0.44	584.93	36	Cir	0.012	0.50	591.16	CB-502 to HW-501
10	9	324.000	14.632	Comb	0.00	1.03	0.79	6.0	584.93	0.43	586.33	36	Cir	0.012	1.00	592.40	CB-503 to CB-502
11	End	38.793	18.937	Comb	8.50	0.00	0.00	0.0	585.00	3.48	586.35	18	Cir	0.012	1.00	591.16	CB-502 to HW-513
12	End	60.000	0.000	Comb	8.50	0.00	0.00	0.0	585.00	6.45	588.87	18	Cir	0.012	1.00	592.40	CB-509 to HW-511

Project File: Network 500.stm

Number of lines: 12

Date: 2/7/2020

Storm Sewers v2018.30

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	24	32.13	585.00	586.06	1.06	1.70	18.93	1.70	587.76	0.000	41.539	587.33	589.22	1.89**	3.07	10.45	1.70	590.92	0.000	0.000	n/a	1.50	n/a
2	36	20.52	586.33	589.22	2.89	3.39	2.94	0.57	589.79	0.000	115.000	586.83	588.28	1.45**	3.39	6.05	0.57	588.85	0.000	0.000	n/a	1.00	n/a
3	30	0.88	586.83	588.28	1.45	0.34	0.30	0.10	588.39	0.000	84.167	588.46	588.76 j	0.30**	0.34	2.59	0.10	588.87	0.000	0.000	n/a	0.15	0.02
4	24	0.63	588.46	588.76	0.30	0.26	2.10	0.09	588.86	0.000	121.295	590.80	591.07 j	0.27**	0.26	2.45	0.09	591.17	0.000	0.000	n/a	1.00	0.09
5	30	16.19	586.83	588.28	1.45	2.72	5.47	0.55	588.83	0.000	324.195	588.23	589.59 j	1.36**	2.72	5.94	0.55	590.14	0.000	0.000	n/a	0.15	0.08
6	30	11.66	588.23	589.59	1.36	2.19	4.28	0.44	590.03	0.000	247.158	589.30	590.44 j	1.14**	2.19	5.33	0.44	590.89	0.000	0.000	n/a	1.00	n/a
7	30	4.82	587.00	589.22	2.22	1.18	1.05	0.26	589.48	0.000	200.000	587.87	588.59	0.72**	1.18	4.09	0.26	588.85	0.000	0.000	n/a	0.50	n/a
8	24	0.63	587.87	588.59	0.72	0.26	0.61	0.09	588.69	0.000	200.000	588.73	589.00	0.27**	0.26	2.45	0.09	589.10	0.000	0.000	n/a	1.00	0.09
9	36	7.62	584.50	585.31	0.81*	1.54	4.95	0.31	585.62	0.000	98.243	584.93	585.80	0.87**	1.70	4.49	0.31	586.11	0.000	0.000	n/a	0.50	n/a
10	36	4.38	584.93	585.80	0.87	1.14	2.58	0.23	586.03	0.000	324.000	586.33	586.98 j	0.65**	1.14	3.85	0.23	587.21	0.000	0.000	n/a	1.00	0.23
11	18	8.50	585.00	585.66	0.66*	0.75	11.34	0.55	586.21	0.000	38.793	586.35	587.48	1.13**	1.43	5.96	0.55	588.03	0.000	0.000	n/a	1.00	n/a
12	18	8.50	585.00	585.56	0.56	0.60	14.13	0.55	586.11	0.000	60.000	588.87	590.00	1.13**	1.43	5.96	0.55	590.55	0.000	0.000	n/a	1.00	n/a

Project File: Network 500.stm

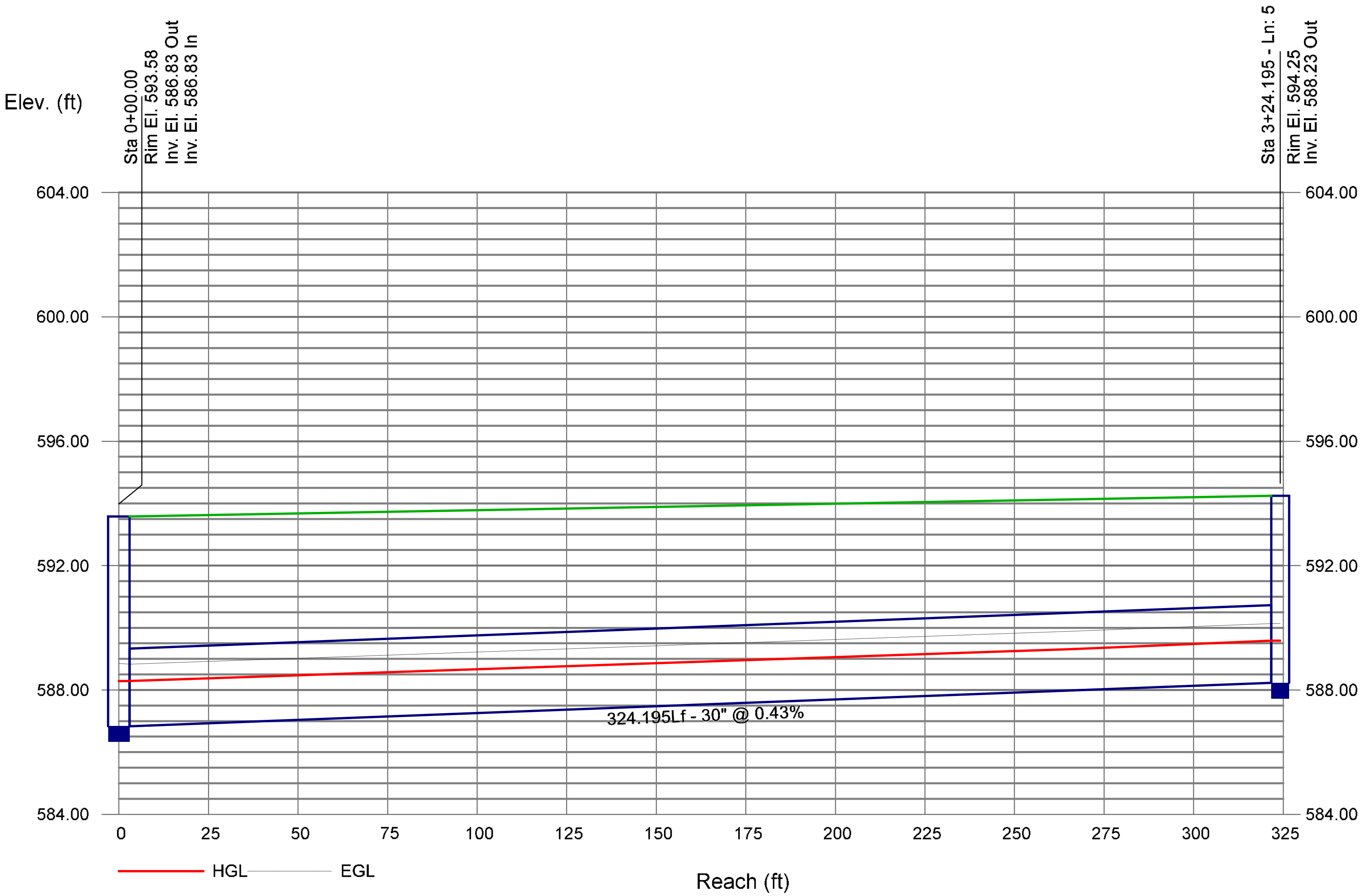
Number of lines: 12

Run Date: 2/7/2020

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

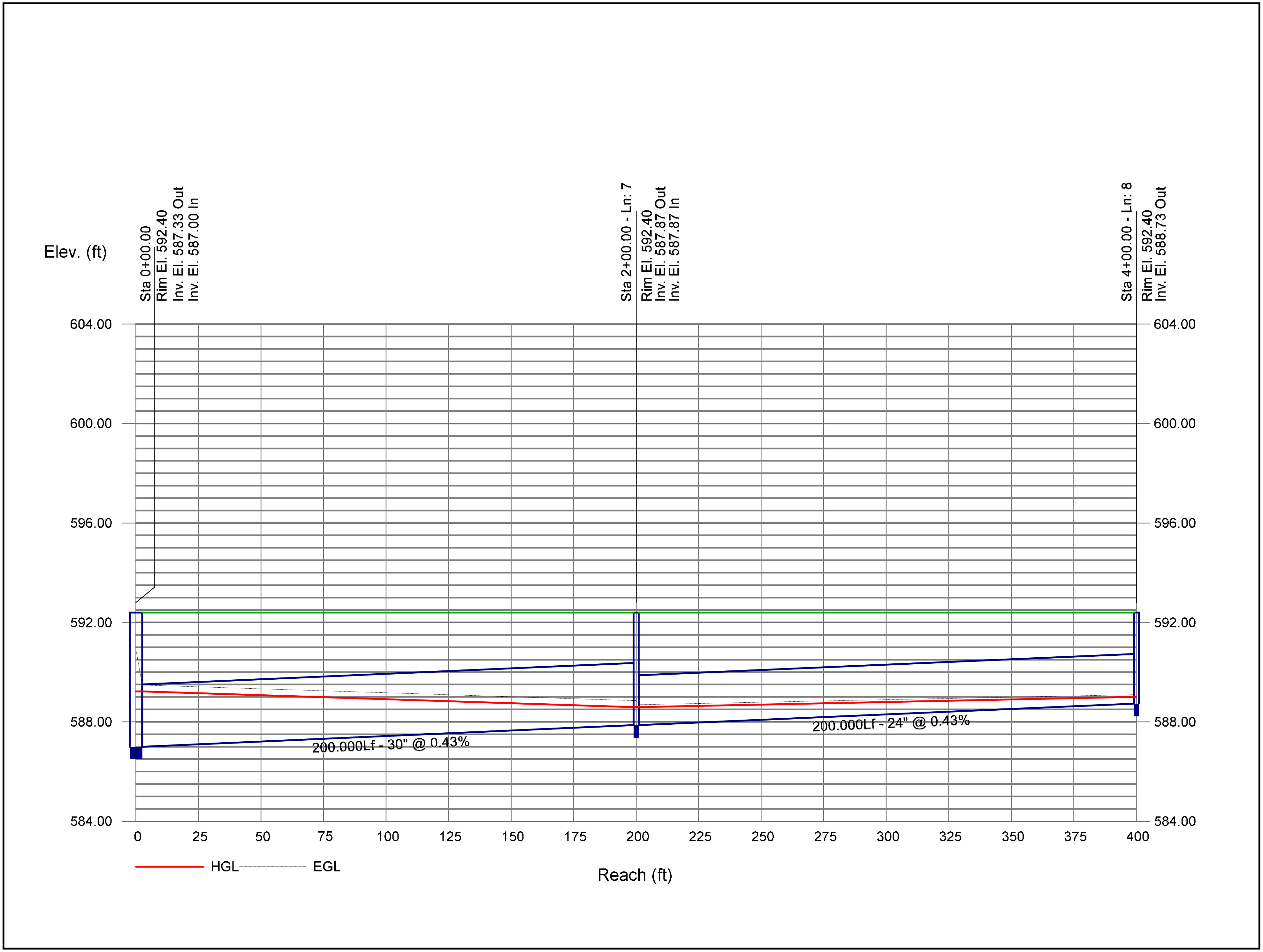
Storm Sewer Profile

Proj. file: Network 500.stm



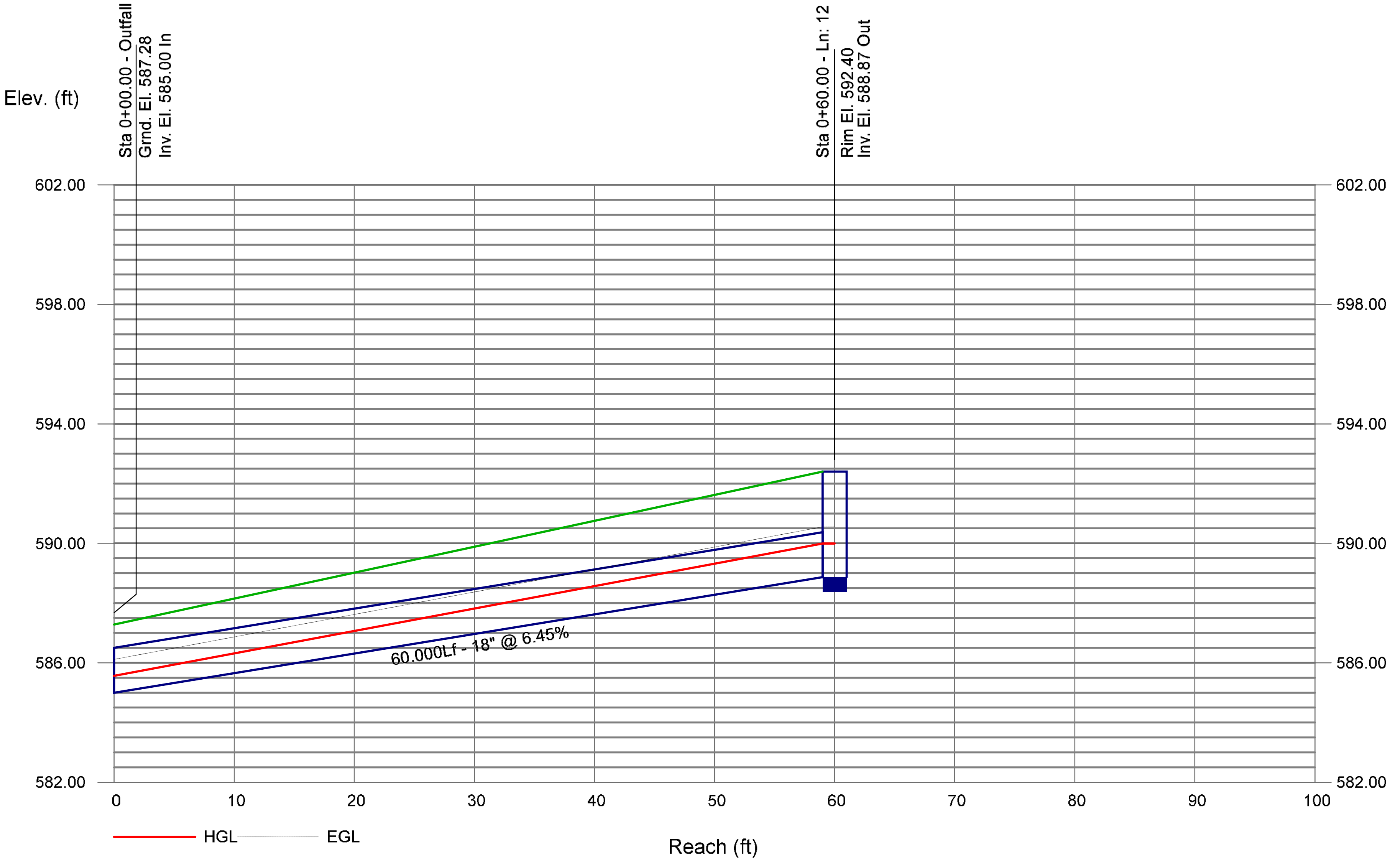
Storm Sewer Profile

Proj. file: Network 500.stm



Storm Sewer Profile

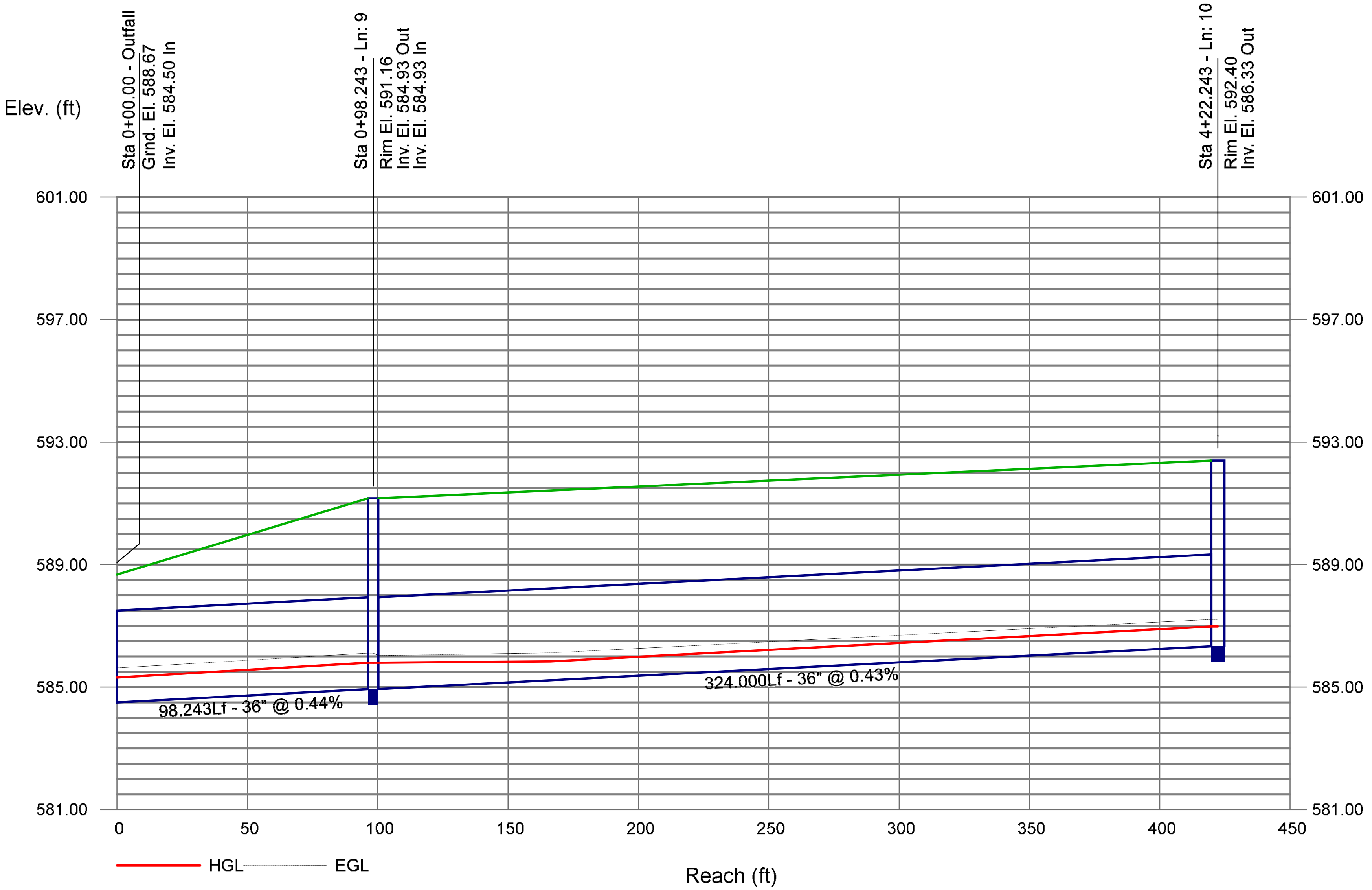
Proj. file: Network 500.stm



Storm Sewers

Storm Sewer Profile

Proj. file: Network 500.stm



Storm Sewer Profile

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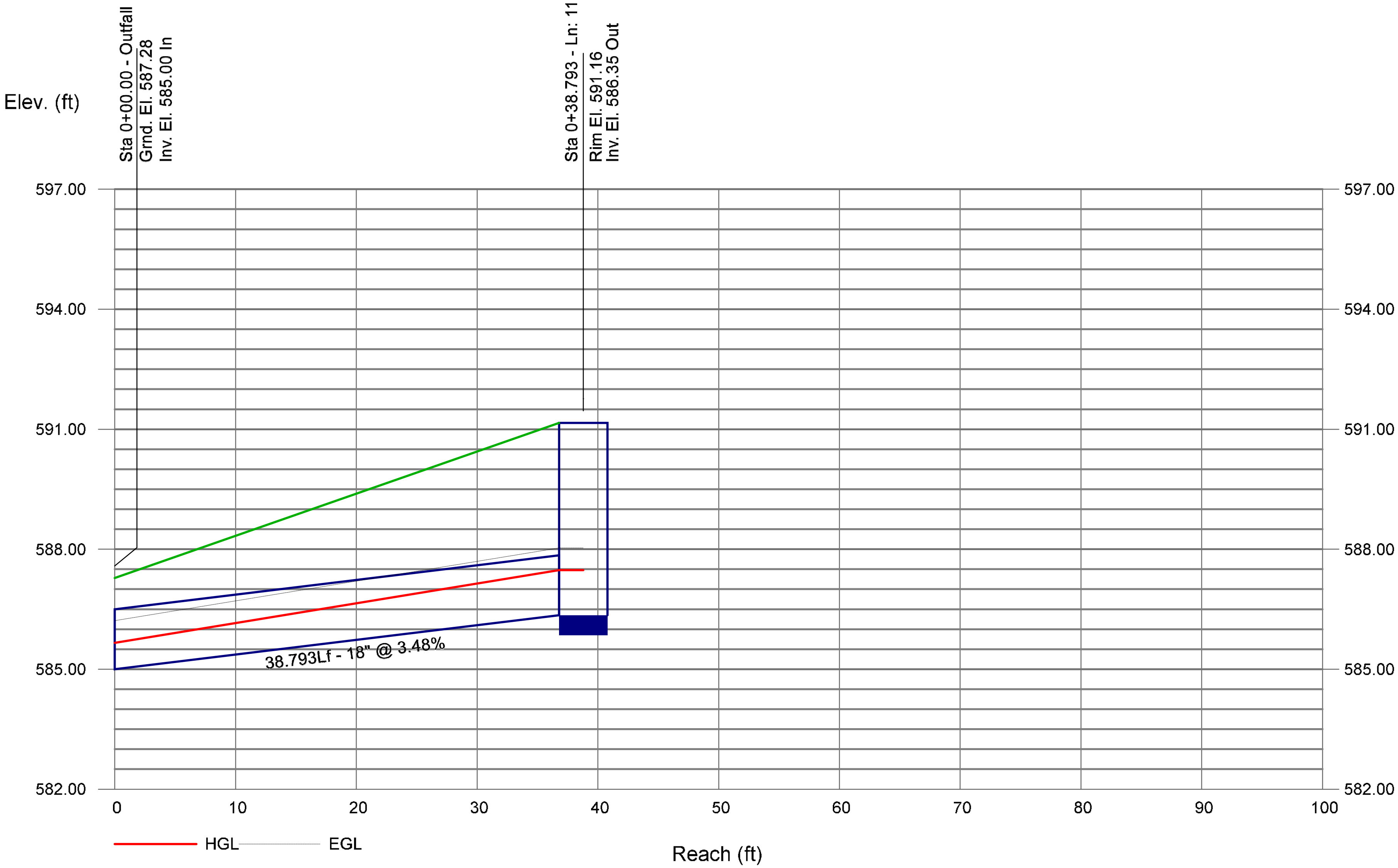
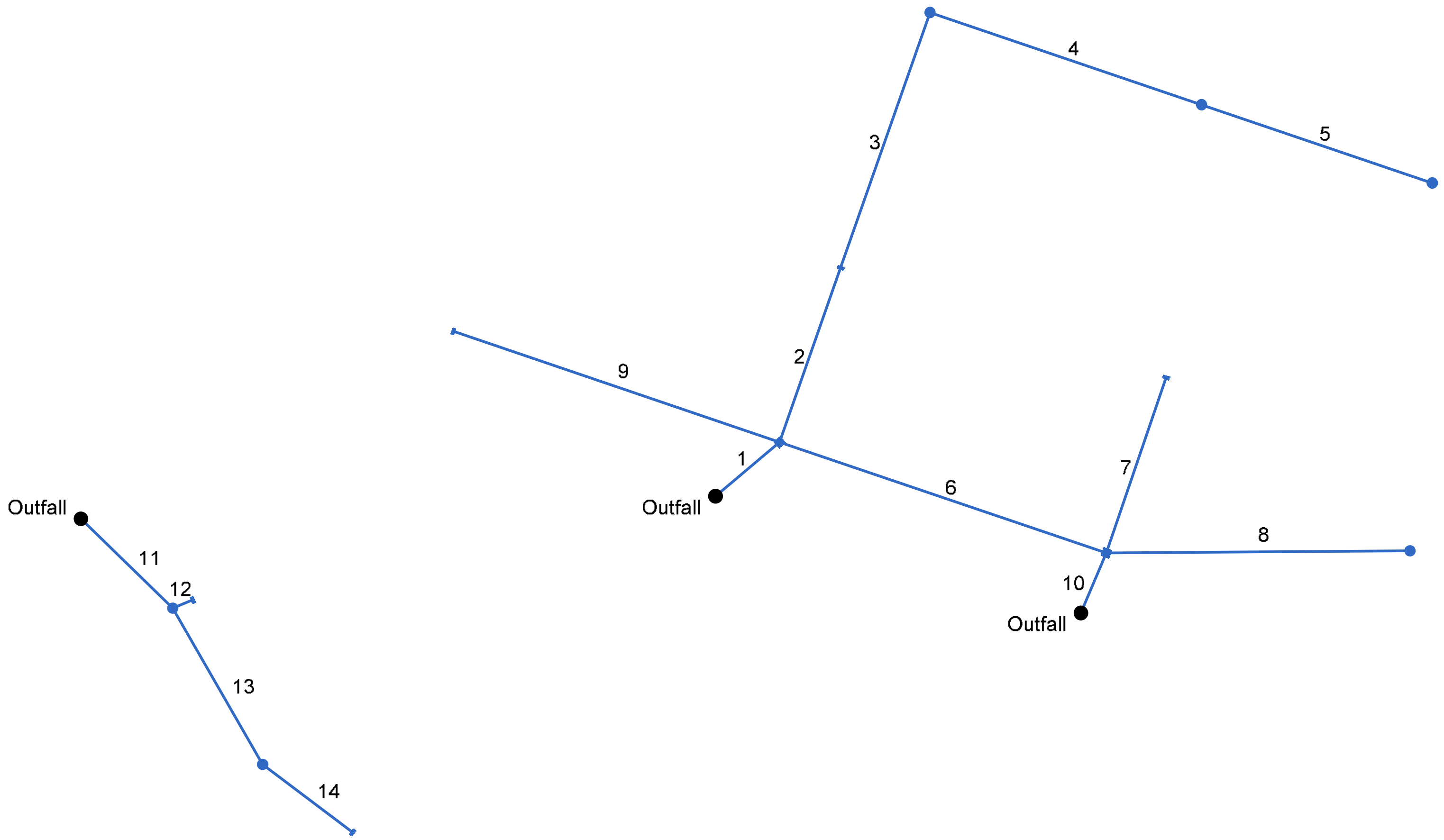


Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Network 600.stm	Number of lines: 14	Date: 2/7/2020

Storm Sewers v2018.30

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	48.669	-40.259	Comb	0.00	1.03	0.90	6.0	584.56	0.49	584.80	42	Cir	0.013	1.50	590.61	CB-607 to HW-606
2	1	107.322	-30.502	Grate	0.00	0.65	0.90	6.0	584.80	1.34	586.24	30	Cir	0.013	0.50	592.00	CB-608 to CB-607
3	2	157.185	0.000	MH	0.00	0.69	0.83	6.0	586.24	1.24	588.19	30	Cir	0.013	1.00	594.03	DMH-609 to CB-608
4	3	166.313	89.568	MH	0.00	0.78	0.90	6.0	588.19	0.42	588.89	24	Cir	0.013	0.15	594.10	DMH-610 to DMH-609
5	4	141.222	0.000	MH	0.00	0.78	0.90	6.0	588.89	0.42	589.48	24	Cir	0.013	1.00	594.23	DMH-611 to DMH-610
6	1	200.000	59.066	Comb	0.00	0.91	0.90	6.0	584.80	0.40	585.60	24	Cir	0.013	1.93	590.61	CB-612 to CB-607
7	6	107.760	-90.000	Grate	0.00	0.61	0.90	6.0	586.92	1.00	588.00	18	Cir	0.013	1.00	590.17	CB-613 to CB-612
8	6	176.000	-19.222	MH	0.00	2.01	0.62	6.0	585.60	0.40	586.30	24	Cir	0.011	1.00	589.69	CB-614 to CB-612
9	1	200.000	-120.934	Comb	0.00	1.29	0.86	6.0	585.30	0.57	586.44	24	Cir	0.013	1.00	590.61	CB-616 to CB-607
10	End	37.830	-67.137	Comb	8.50	0.00	0.00	6.0	585.00	5.55	587.10	18	Cir	0.013	1.00	590.61	CB-612 to HW-615
11	End	74.453	44.310	MH	0.00	0.00	0.00	6.0	580.00	0.58	580.43	18	Cir	0.013	0.93	587.00	DMH-602 to HW-601
12	11	12.345	-66.908	Grate	0.38	0.00	0.00	6.0	580.98	0.81	581.08	12	Cir	0.013	1.00	585.00	OCS-603 to DMH-602
13	11	104.575	15.835	MH	0.00	0.00	0.00	6.0	580.43	0.39	580.84	15	Cir	0.013	0.45	587.00	DMH-604 to DMH-602
14	13	65.537	-23.012	Grate	3.10	0.00	0.00	6.0	580.84	0.37	581.08	15	Cir	0.013	1.00	585.00	OCS-605 to DMH-604

Project File: Network 600.stm	Number of lines: 14	Date: 2/7/2020

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	42	34.55	584.56	586.45	1.89	5.06	6.52	0.73	587.18	0.000	48.669	584.80	586.62 j	1.82**	5.06	6.83	0.73	587.35	0.000	0.000	n/a	1.50	1.09
2	30	12.51	584.80	586.62	1.82	2.30	3.27	0.46	587.08	0.000	107.322	586.24	587.43 j	1.19**	2.30	5.45	0.46	587.89	0.000	0.000	n/a	0.50	0.23
3	30	9.92	586.24	587.43	1.19	1.96	4.32	0.40	587.82	0.000	157.185	588.19	589.24 j	1.05**	1.96	5.06	0.40	589.64	0.000	0.000	n/a	1.00	n/a
4	24	7.26	588.19	589.24	1.05	1.48	4.34	0.29	589.53	0.349	166.313	588.89	589.85	0.96**	1.49	4.86	0.37	590.22	0.472	0.410	0.682	0.15	0.06
5	24	3.78	588.89	589.91	1.02	0.94	2.35	0.09	589.99	0.106	141.222	589.48	590.17	0.69**	0.95	3.97	0.24	590.41	0.437	0.271	0.383	1.00	0.24
6	24	13.14	584.80	586.62	1.82	3.00	4.38	0.30	586.92	0.295	200.000	585.60	587.20	1.60	2.69	4.89	0.37	587.57	0.355	0.325	0.650	1.93	0.72
7	18	2.95	586.92	587.91	0.99	0.74	2.38	0.25	588.16	0.000	107.760	588.00	588.65 j	0.65**	0.74	4.00	0.25	588.90	0.000	0.000	n/a	1.00	n/a
8	24	6.70	585.60	587.91	2.00	3.14	2.13	0.07	587.98	0.063	176.000	586.30	588.00	1.70	2.85	2.35	0.09	588.09	0.059	0.061	0.107	1.00	0.09
9	24	5.97	585.30	586.62	1.32	1.30	2.71	0.33	586.95	0.000	200.000	586.44	587.30 j	0.86**	1.30	4.60	0.33	587.63	0.000	0.000	n/a	1.00	n/a
10	18	8.50	585.00	585.61	0.61	0.67	12.60	0.55	586.16	0.000	37.830	587.10	588.23	1.13**	1.43	5.96	0.55	588.78	0.000	0.000	n/a	1.00	n/a
11	18	3.48	580.00	580.74	0.74	0.83	4.01	0.28	581.02	0.000	74.453	580.43	581.14	0.71**	0.83	4.22	0.28	581.42	0.000	0.000	n/a	0.93	0.26
12	12	0.38	580.98	581.21	0.23*	0.14	2.74	0.09	581.30	0.000	12.345	581.08	581.33	0.25**	0.16	2.41	0.09	581.43	0.000	0.000	n/a	1.00	n/a
13	15	3.10	580.43	581.25	0.82*	0.85	3.63	0.20	581.46	0.392	104.575	580.84	581.66	0.82	0.85	3.63	0.20	581.87	0.392	0.392	0.410	0.45	0.09
14	15	3.10	580.84	581.75	0.91	0.96	3.23	0.16	581.91	0.295	65.537	581.08	581.94	0.86	0.90	3.45	0.18	582.12	0.346	0.321	0.210	1.00	0.18

Project File: Network 600.stm

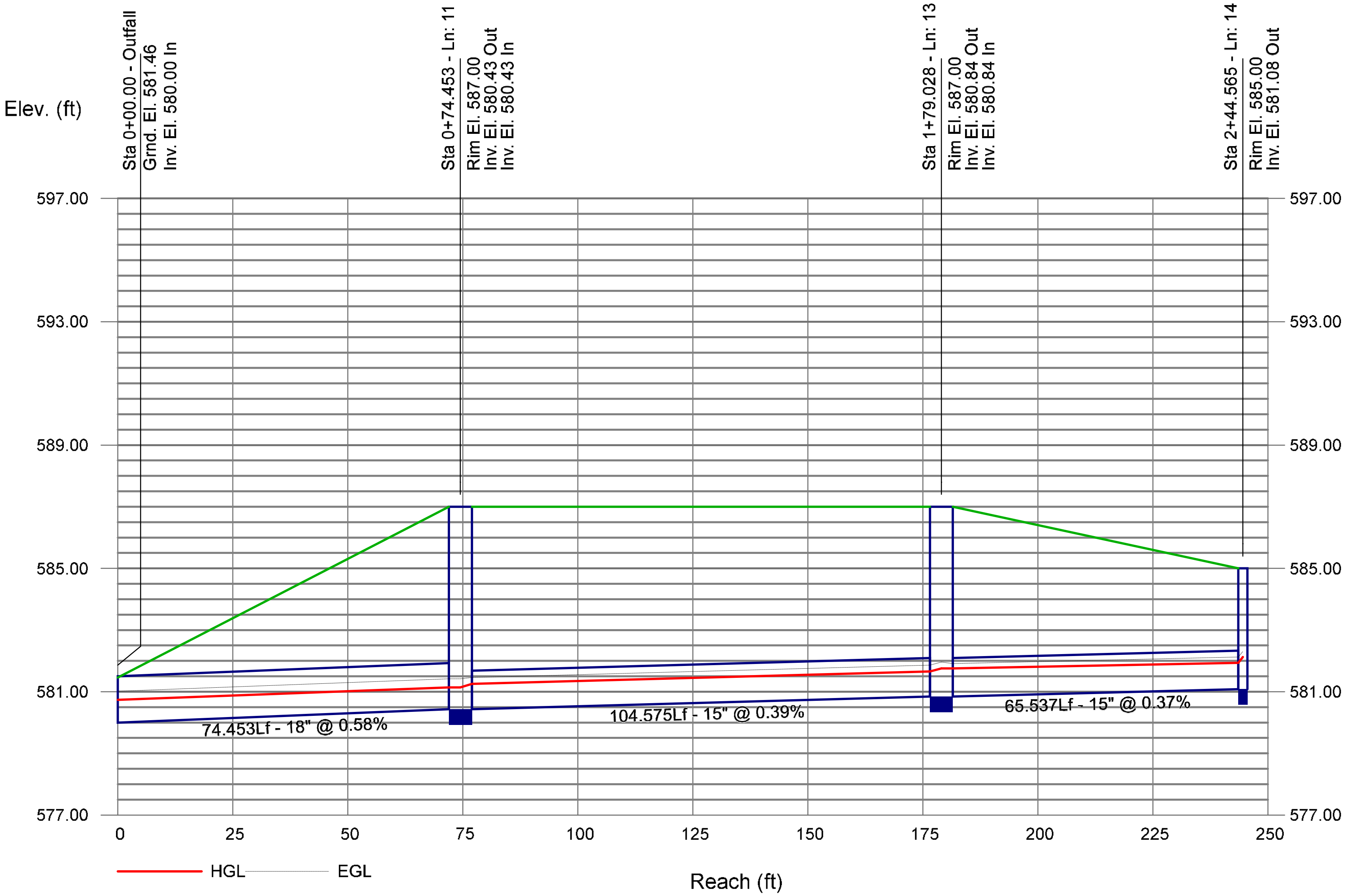
Number of lines: 14

Run Date: 2/7/2020

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

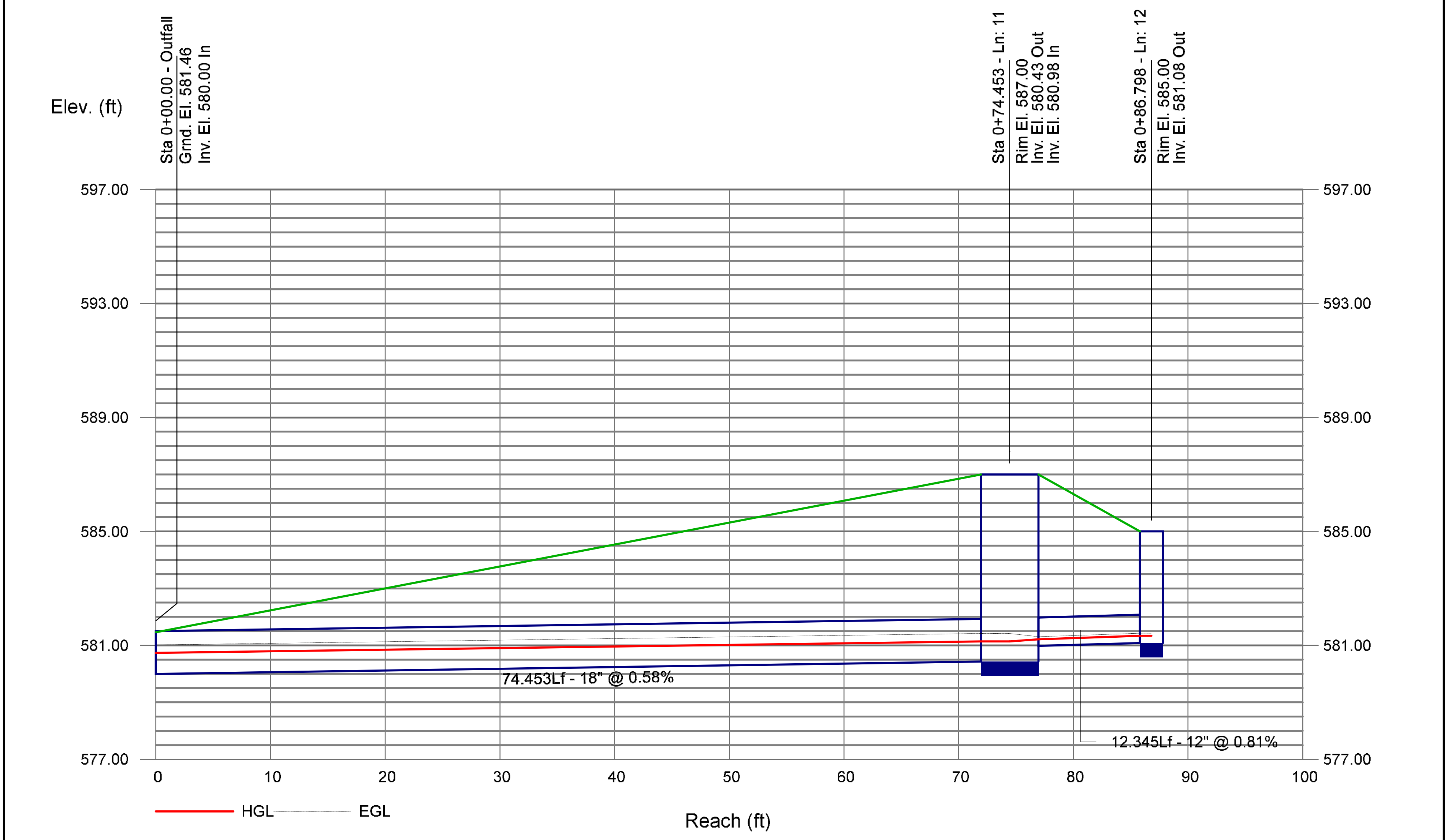
Storm Sewer Profile

Proj. file: Network 600.stm



Storm Sewer Profile

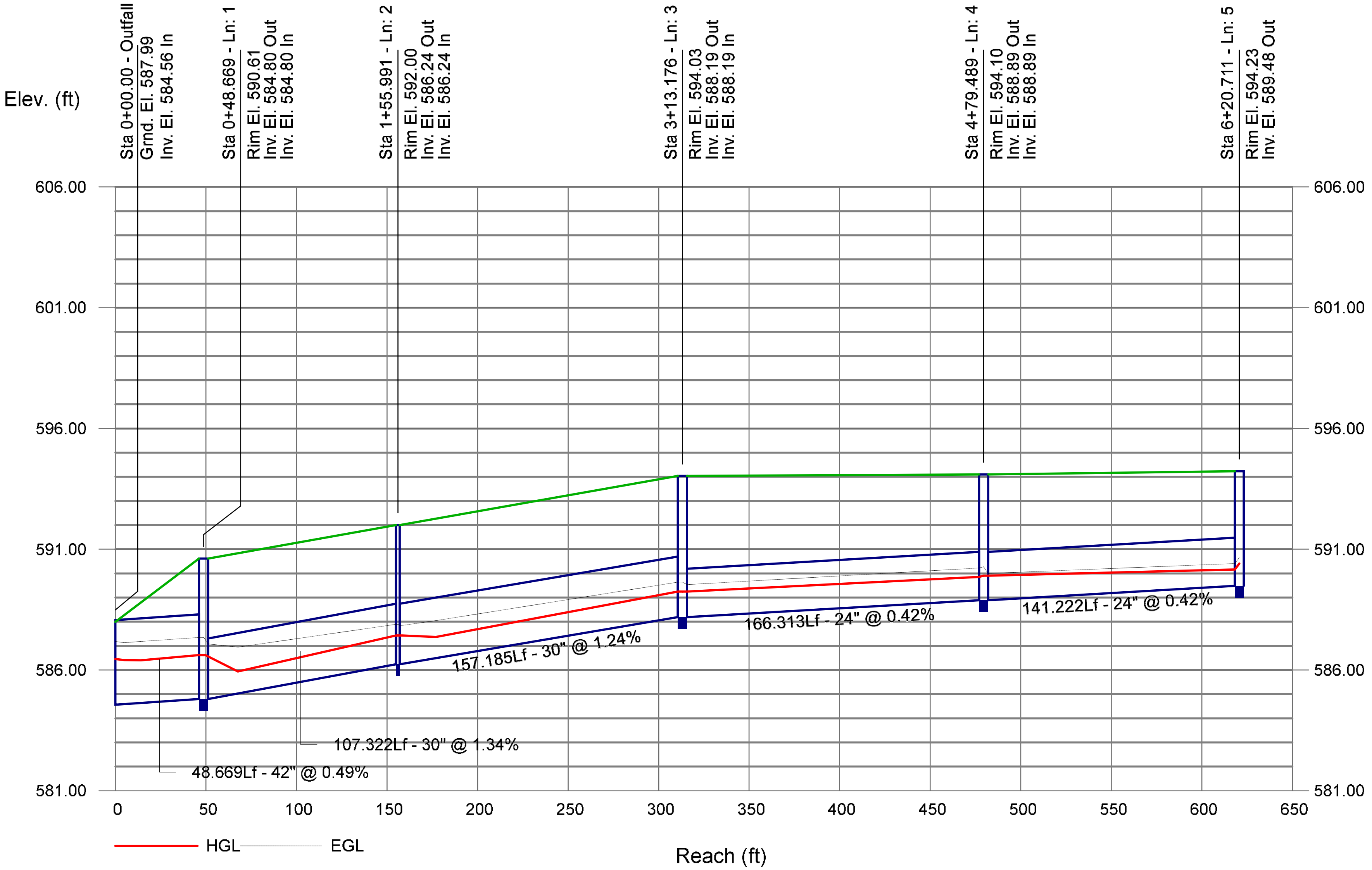
Proj. file: Network 600.stm



Storm Sewers

Storm Sewer Profile

Proj. file: Network 600.stm



Storm Sewer Profile

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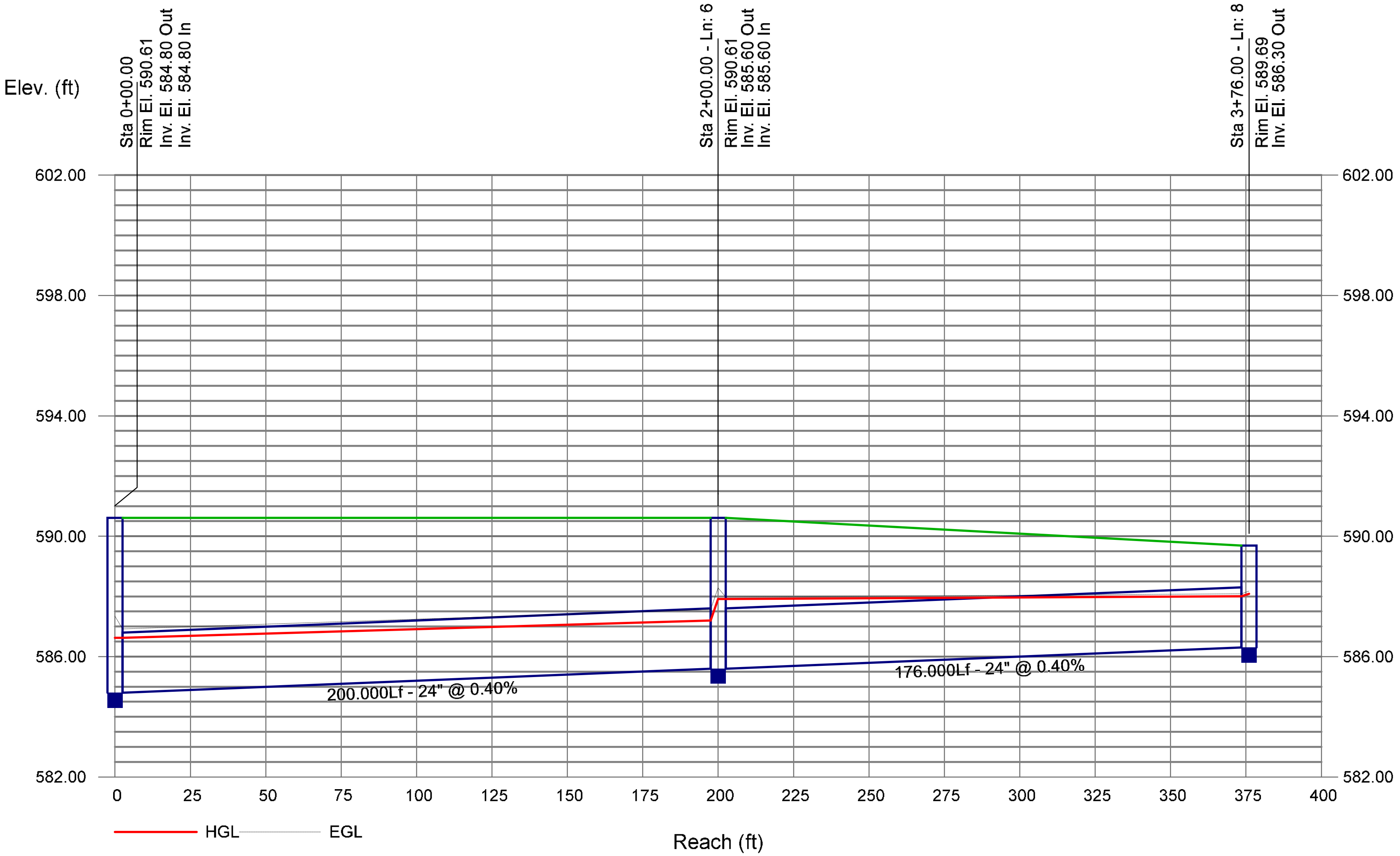

Storm Sewer Profile

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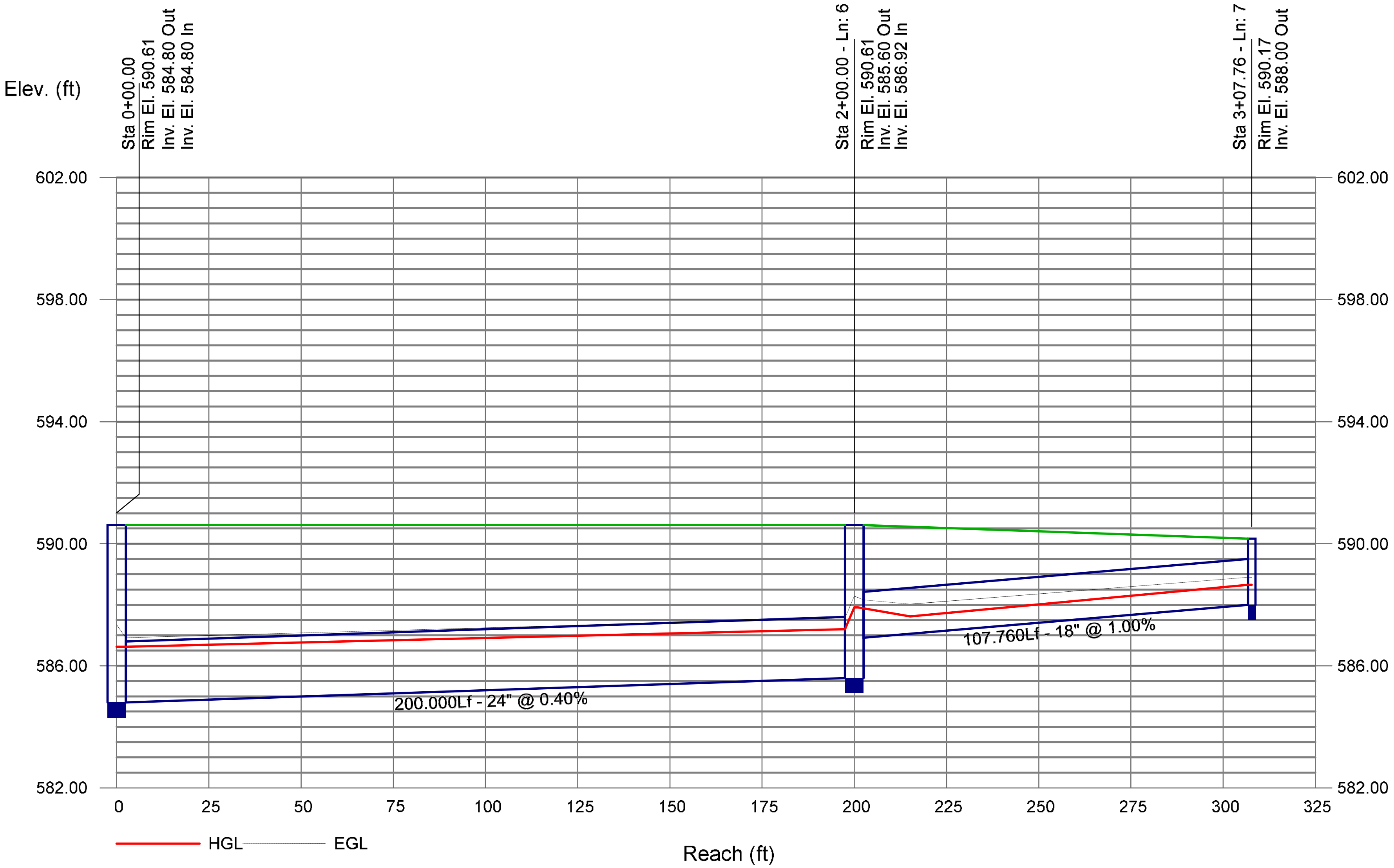

Storm Sewer Profile

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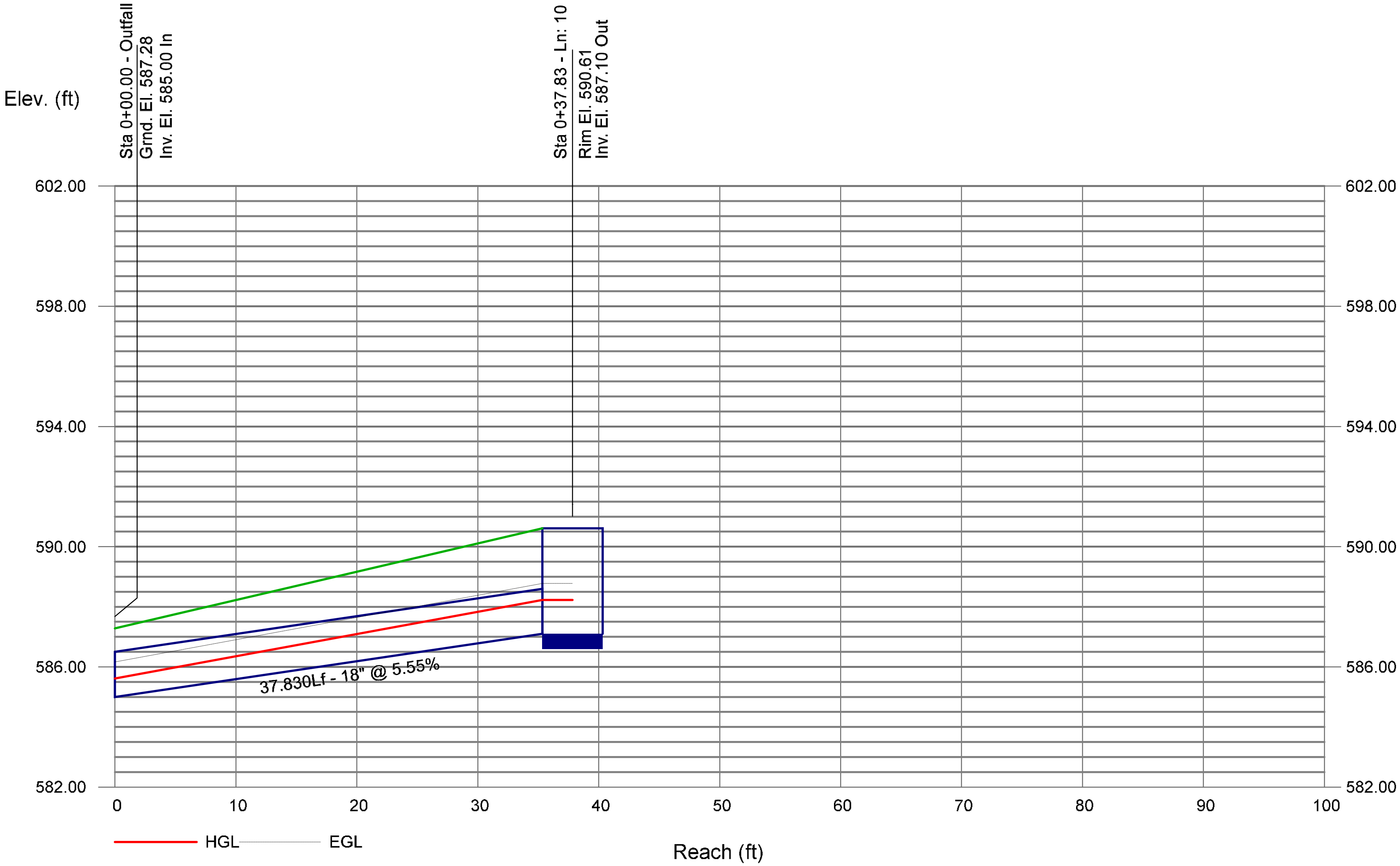

Storm Sewer Profile

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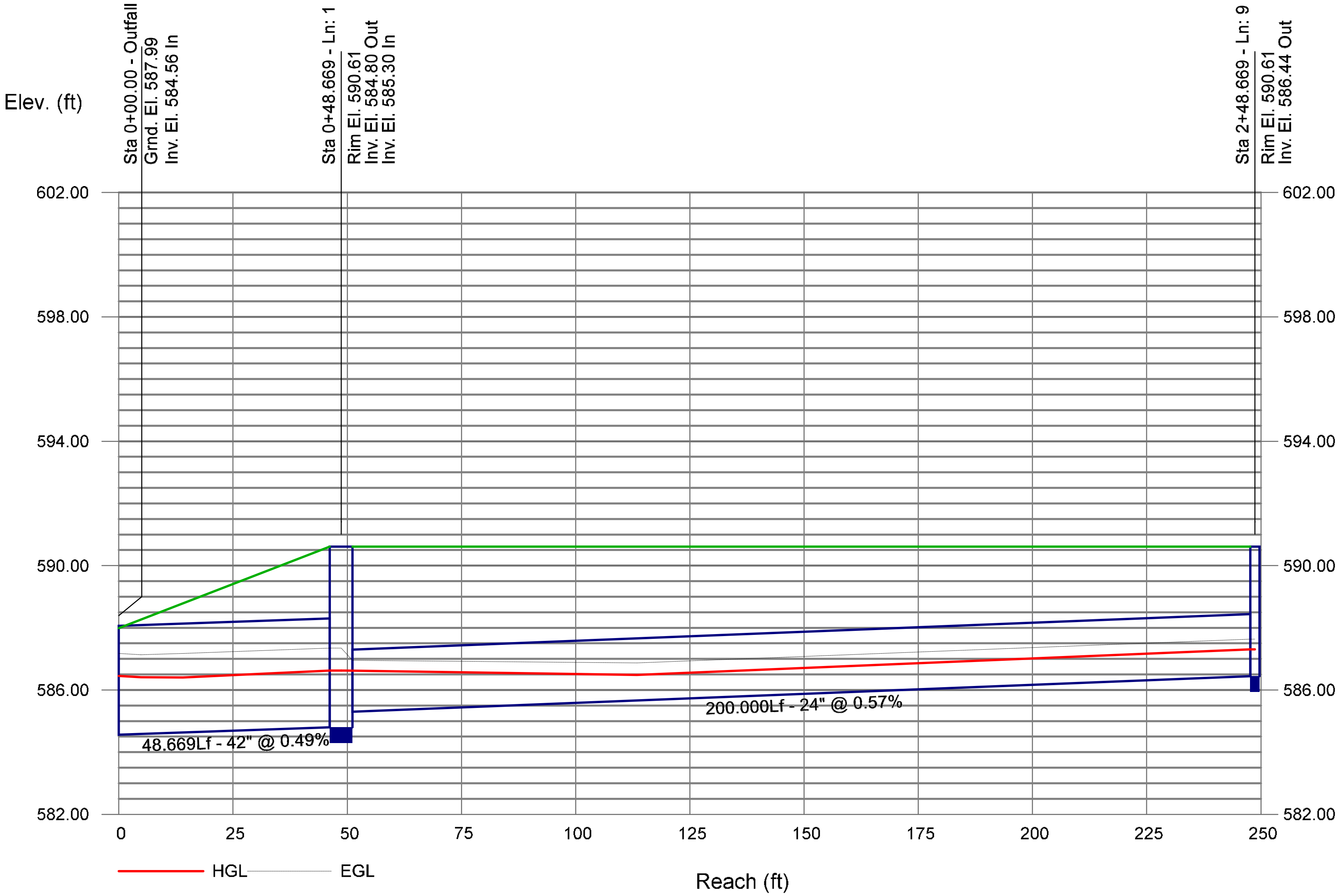
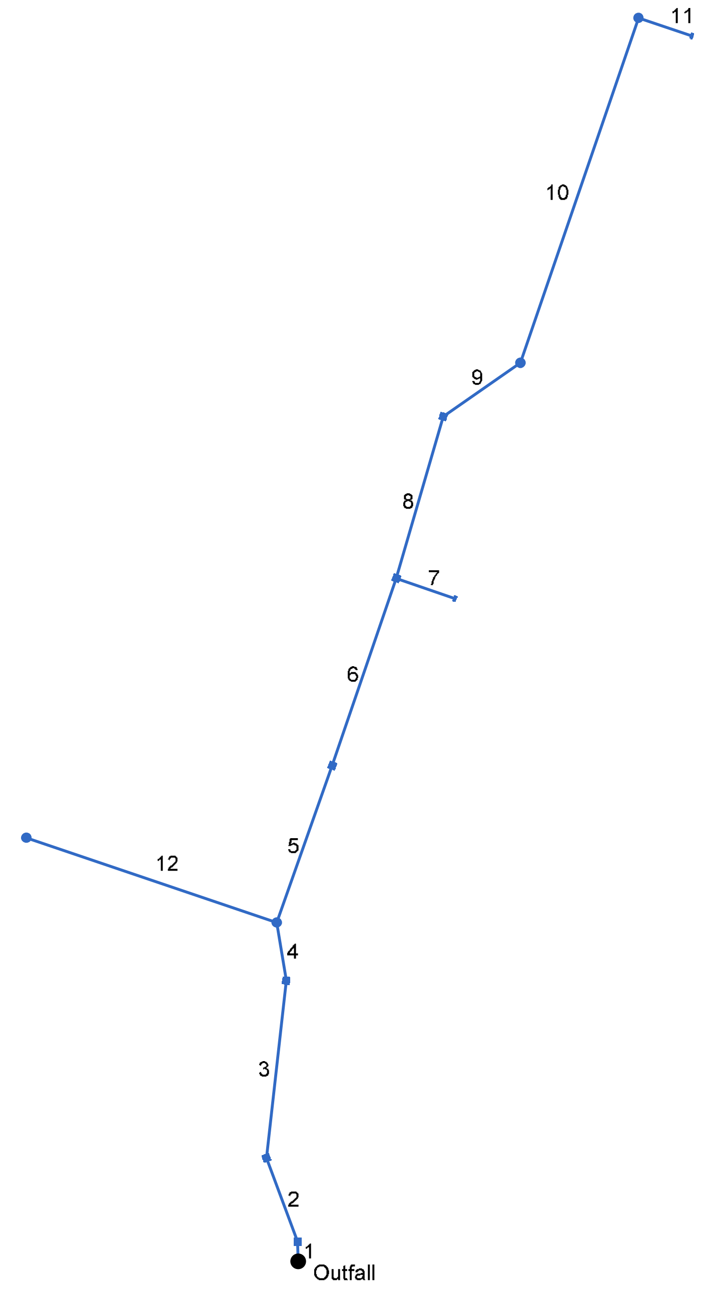


Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Network 700.stm	Number of lines: 12	Date: 2/18/2020

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	13.183		Comb	0.00	0.58	0.56	6.0	586.00	0.61	586.08	36	Cir	0.013	0.56	592.40	CB-706 to HW-705
2	1	59.707	-18.618	Comb	0.00	0.07	0.90	6.0	586.58	0.64	586.96	30	Cir	0.013	0.76	593.46	CB-707 to CB-706
3	2	119.438	26.630	Comb	0.00	0.06	0.90	6.0	586.96	0.64	587.72	30	Cir	0.013	0.50	596.22	CB-708 to CB-707
4	3	39.441	-15.500	MH	0.00	0.00	0.00	0.0	587.72	0.63	587.97	30	Cir	0.013	0.90	597.25	DMH-709 to CB-708
5	4	111.313	28.564	Comb	0.00	0.30	0.90	6.0	587.97	0.63	588.67	30	Cir	0.013	0.50	597.00	CB-710 to DMH-709
6	5	132.351	-0.636	Comb	0.00	0.50	0.90	6.0	588.67	0.63	589.51	30	Cir	0.013	1.50	596.87	CB-711 to CB-710
7	6	41.335	90.526	Comb	0.00	0.07	0.90	6.0	592.09	0.99	592.50	15	Cir	0.013	1.00	595.90	
8	6		-2.529	Comb	0.00	0.98	0.90	6.0	589.51	0.63	590.22	30	Cir	0.013	1.01	596.90	CB-713 to CB-711
9	8	62.614	38.743	MH	0.00	0.48	0.90	6.0	590.22	0.64	590.62	30	Cir	0.013	0.64	597.69	DMH-714 to CB-713
10	9	243.946	-36.150	MH	0.00	2.02	0.00	6.0	590.62	0.63	592.16	30	Cir	0.013	1.00	597.99	DMH-715 to DMH-714
11	10	37.500	90.000	Comb	0.00	0.50	0.88	6.0	593.54	0.64	593.78	15	Cir	0.013	1.00	597.15	CB-715 to DMH-715
12	4	176.103	-62.009	MH	0.00	0.25	0.90	6.0	587.93	1.66	590.86	30	Cir	0.013	1.00	595.61	DMH-716 to DMH-709

Project File: Network 700.stm

Number of lines: 12

Date: 2/18/2020

Hydraulic Grade Line Computations

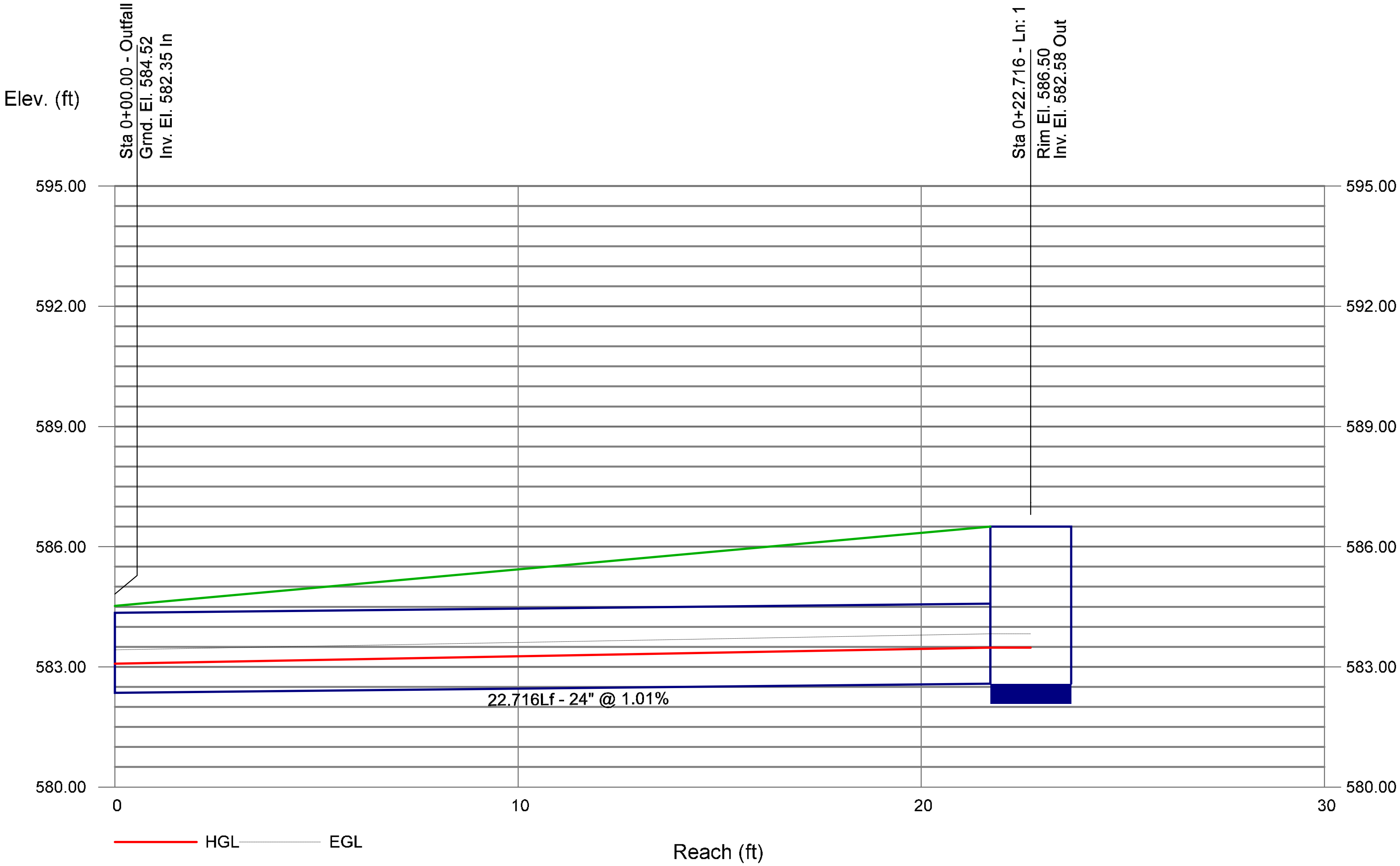
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	36	22.70	586.00	587.39	1.39	3.20	7.08	0.61	588.00	0.000	13.183	586.08	587.61	1.53**	3.63	6.25	0.61	588.22	0.000	0.000	n/a	0.56	n/a
2	30	20.49	586.58	588.01	1.43*	2.91	7.04	0.65	588.67	0.000	59.707	586.96	588.50	1.54**	3.16	6.48	0.65	589.15	0.000	0.000	n/a	0.76	n/a
3	30	20.24	586.96	588.50	1.54	3.14	6.40	0.65	589.14	0.000	119.438	587.72	589.25 j	1.53**	3.14	6.45	0.65	589.89	0.000	0.000	n/a	0.50	0.32
4	30	19.92	587.72	589.25	1.53	3.11	6.35	0.64	589.88	0.000	39.441	587.97	589.48	1.51**	3.11	6.41	0.64	590.12	0.000	0.000	n/a	0.90	0.57
5	30	18.48	587.97	589.48	1.51	2.97	5.94	0.60	590.09	0.000	111.313	588.67	590.13 j	1.46**	2.97	6.23	0.60	590.73	0.000	0.000	n/a	0.50	n/a
6	30	16.72	588.67	590.13	1.46	2.78	5.64	0.56	590.69	0.000		589.51		1.38**	2.78	6.01	0.56	591.45	0.000	0.000	n/a	1.50	0.84
7	15	0.50	592.09	592.33	0.24*	0.16	3.11	0.10	592.42	0.000	41.335	592.50	592.78	0.28**	0.20	2.50	0.10	592.87	0.000	0.000	n/a	1.00	0.10
8	30	13.10	589.51	590.89	1.38	2.37	4.71	0.48	591.37	0.000	112.783	590.22	591.44 j	1.22**	2.37	5.53	0.48	591.91	0.000	0.000	n/a	1.01	n/a
9	30	6.58	590.22	591.44	1.22	1.47	2.78	0.31	591.75	0.000	62.614	590.62	591.47 j	0.85**	1.47	4.47	0.31	591.78	0.000	0.000	n/a	0.64	n/a
10	30	3.48	590.62	591.47	0.85	0.93	2.37	0.22	591.69	0.000	243.946	592.16	592.77 j	0.61**	0.93	3.74	0.22	592.99	0.000	0.000	n/a	1.00	0.22
11	15	3.50	593.54	594.29	0.75*	0.77	4.52	0.32	594.61	0.000	37.500	593.78	594.53	0.75**	0.77	4.52	0.32	594.85	0.000	0.000	n/a	1.00	n/a
12	30	1.79	587.93	589.48	1.55	0.57	0.56	0.15	589.64	0.000	176.103	590.86	591.30 j	0.44**	0.57	3.12	0.15	591.45	0.000	0.000	n/a	1.00	0.15

Project File: Network 700.stm	Number of lines: 12	Run Date: 2/18/2020

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

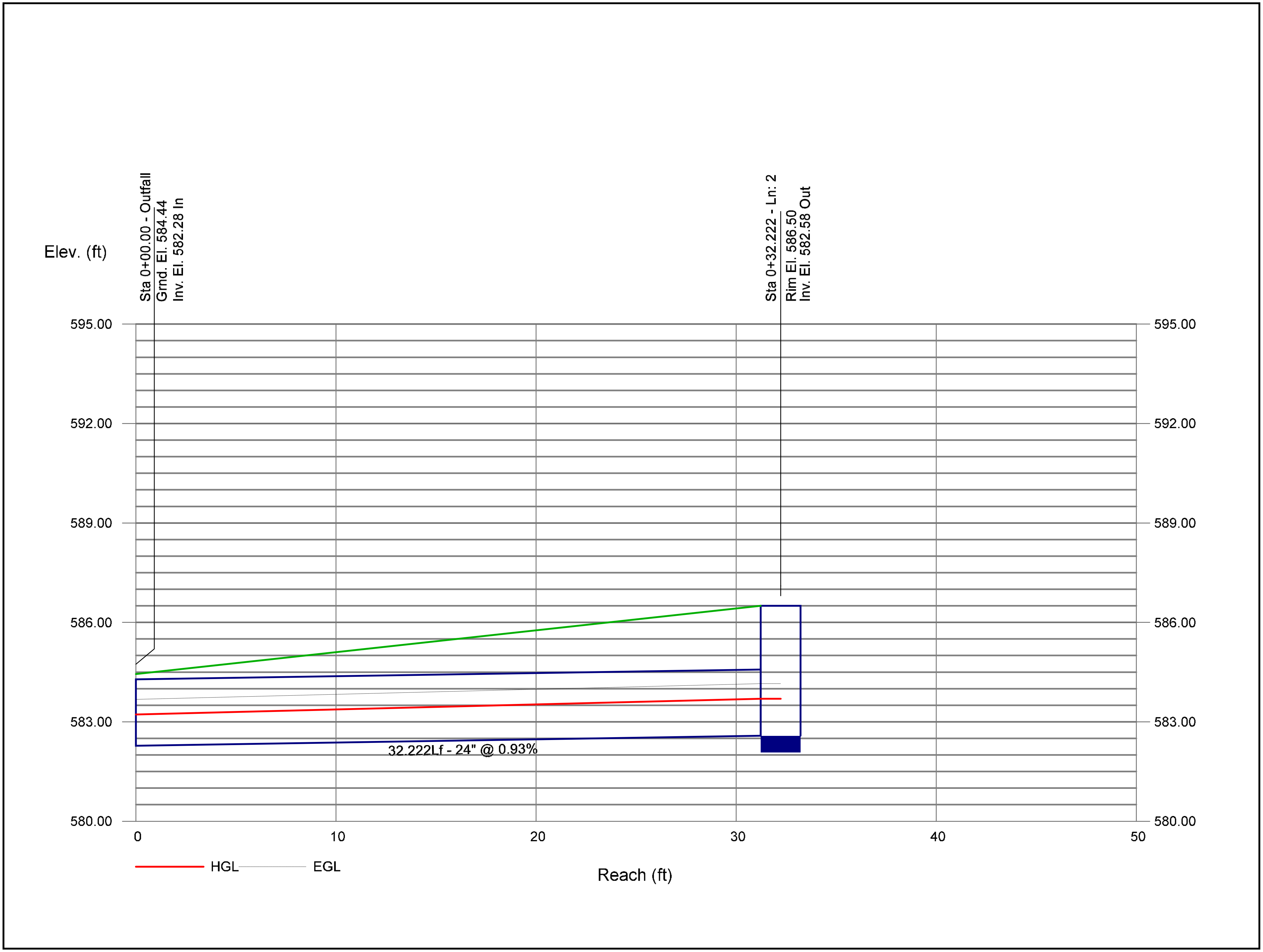
Storm Sewer Profile

Proj. file: Network 700 - HW701 AND 702.stm

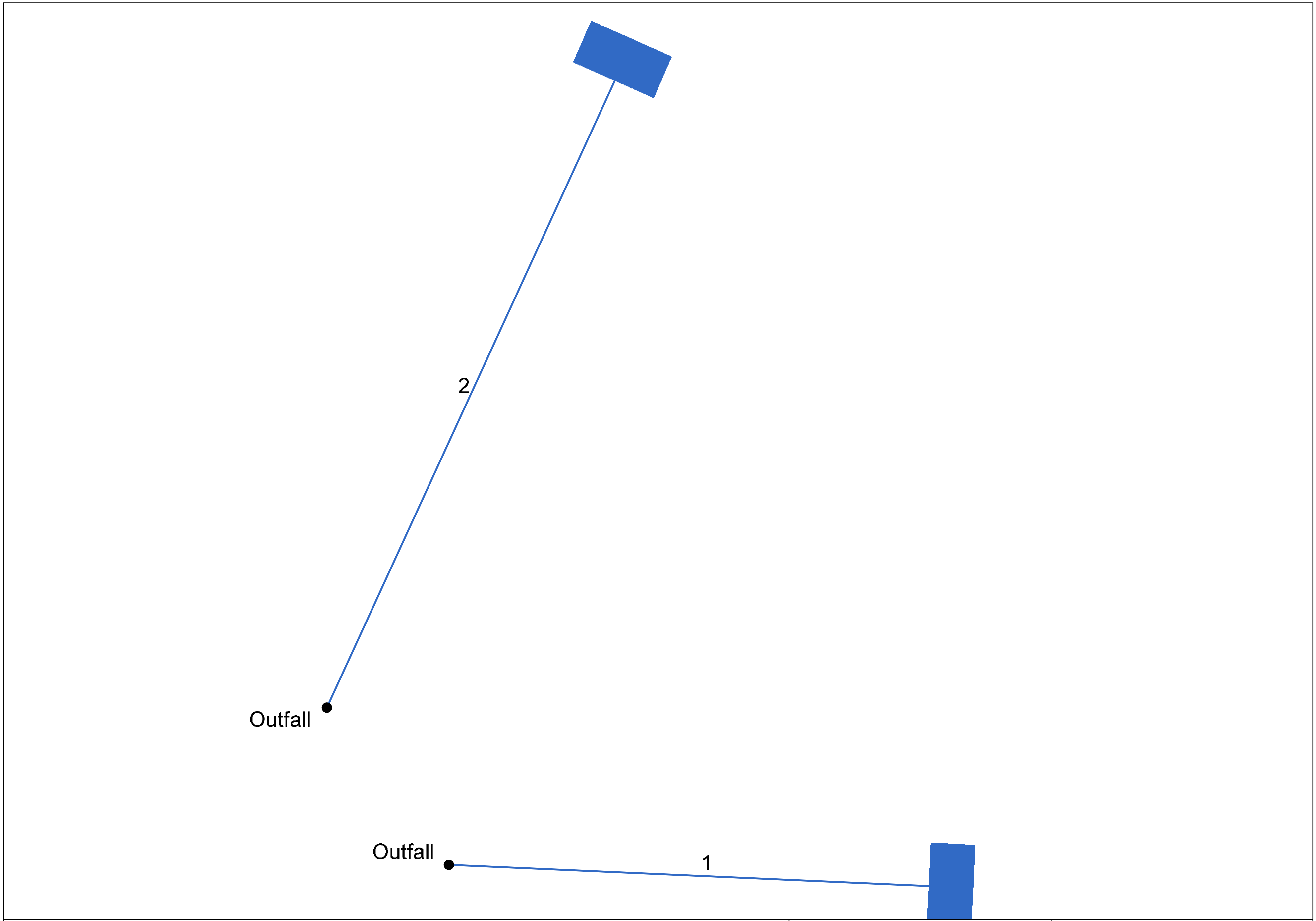


Storm Sewer Profile

Proj. file: Network 700 - HW701 AND 702.stm



Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Network 700 - HW701 AND 702.stm	Number of lines: 2	Date: 2/18/2020

Storm Sewers v2018.30

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	22.716	2.480	Grate	6.47	0.00	0.00	0.0	582.35	1.01	582.58	24	Cir	0.013	1.00	586.50	OCS-703 TO HW-702
2	End	32.222		Grate	9.77	0.00	0.00	0.0	582.28	0.93	582.58	24	Cir	0.013	1.00	586.50	OCS-704 TO HW-701

Project File: Network 700 - HW701 AND 702.stm

Number of lines: 2

Date: 2/18/2020

Hydraulic Grade Line Computations

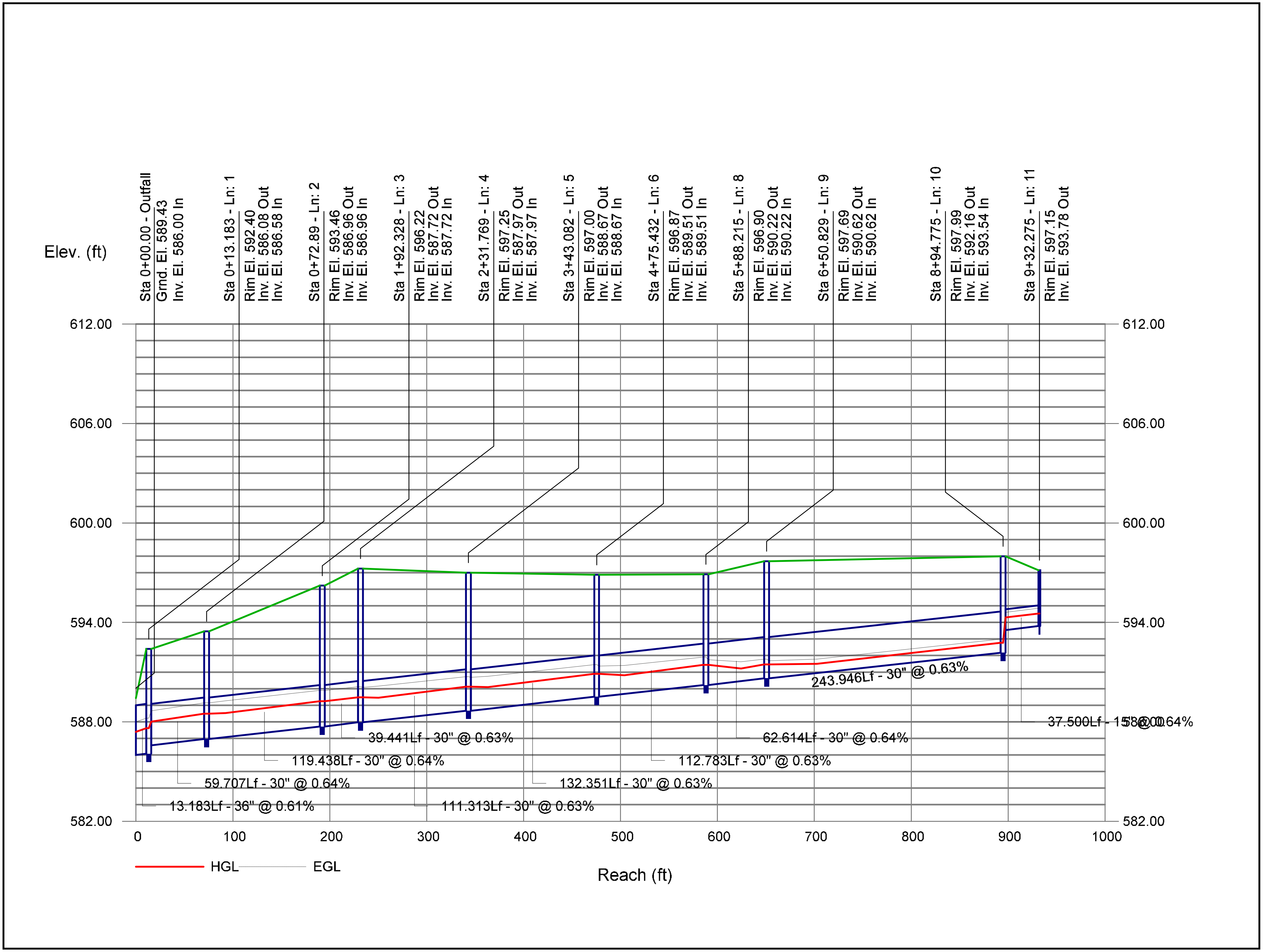
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	24	6.47	582.35	583.08	0.73	1.04	6.24	0.35	583.43	0.000	22.716	582.58	583.48	0.90**	1.37	4.72	0.35	583.83	0.000	0.000	n/a	1.00	n/a
2	24	9.77	582.28	583.22	0.94	1.45	6.73	0.46	583.68	0.000	32.222	582.58	583.70	1.12**	1.80	5.42	0.46	584.15	0.000	0.000	n/a	1.00	n/a

Project File: Network 700 - HW701 AND 702.stm	Number of lines: 2	Run Date: 2/18/2020

Notes: ; ** Critical depth. ; c = cir e = ellip b = box

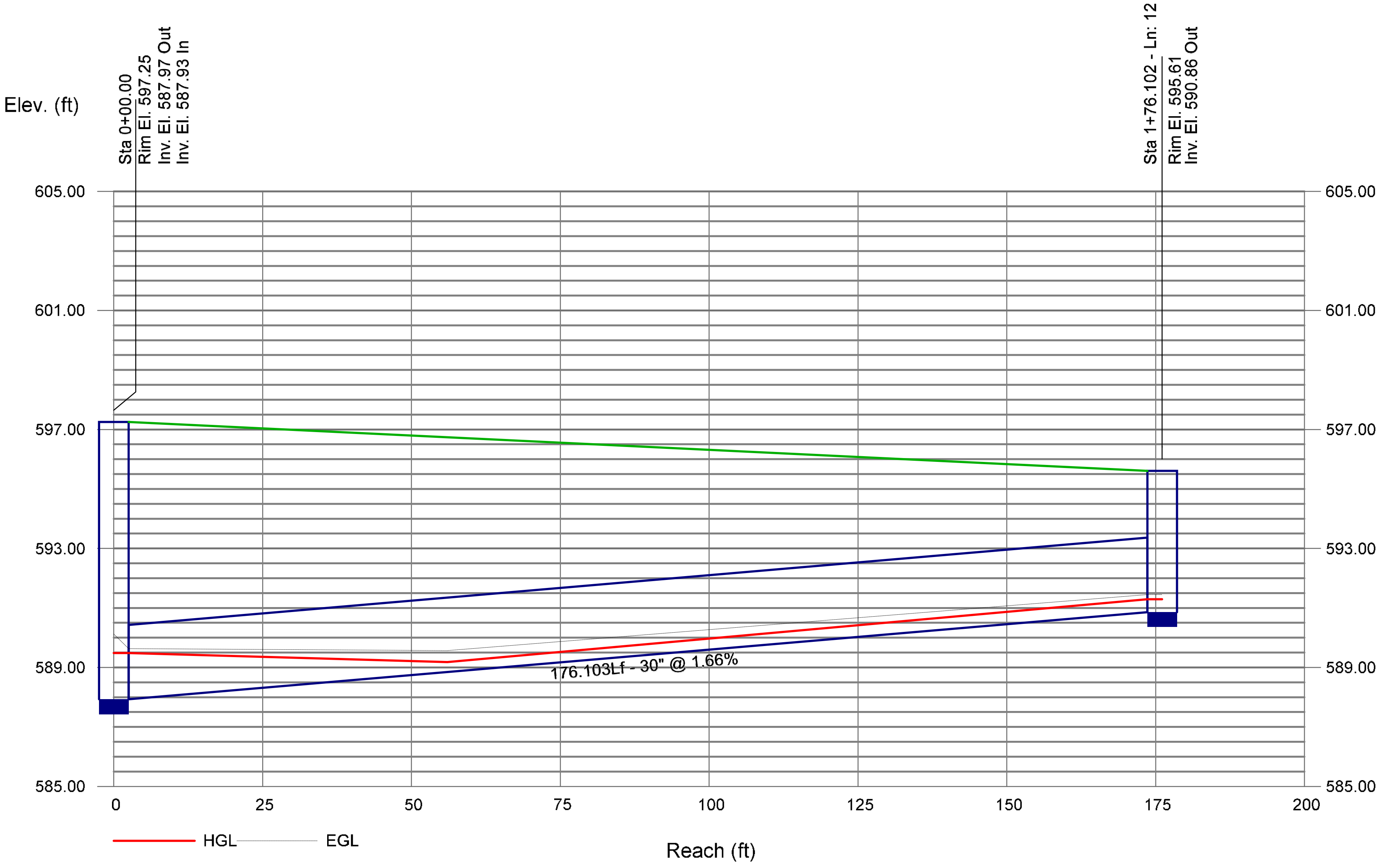
Storm Sewer Profile

Proj. file: Network 700.stm



Storm Sewer Profile

Proj. file: Network 700.stm



Storm Sewer Profile

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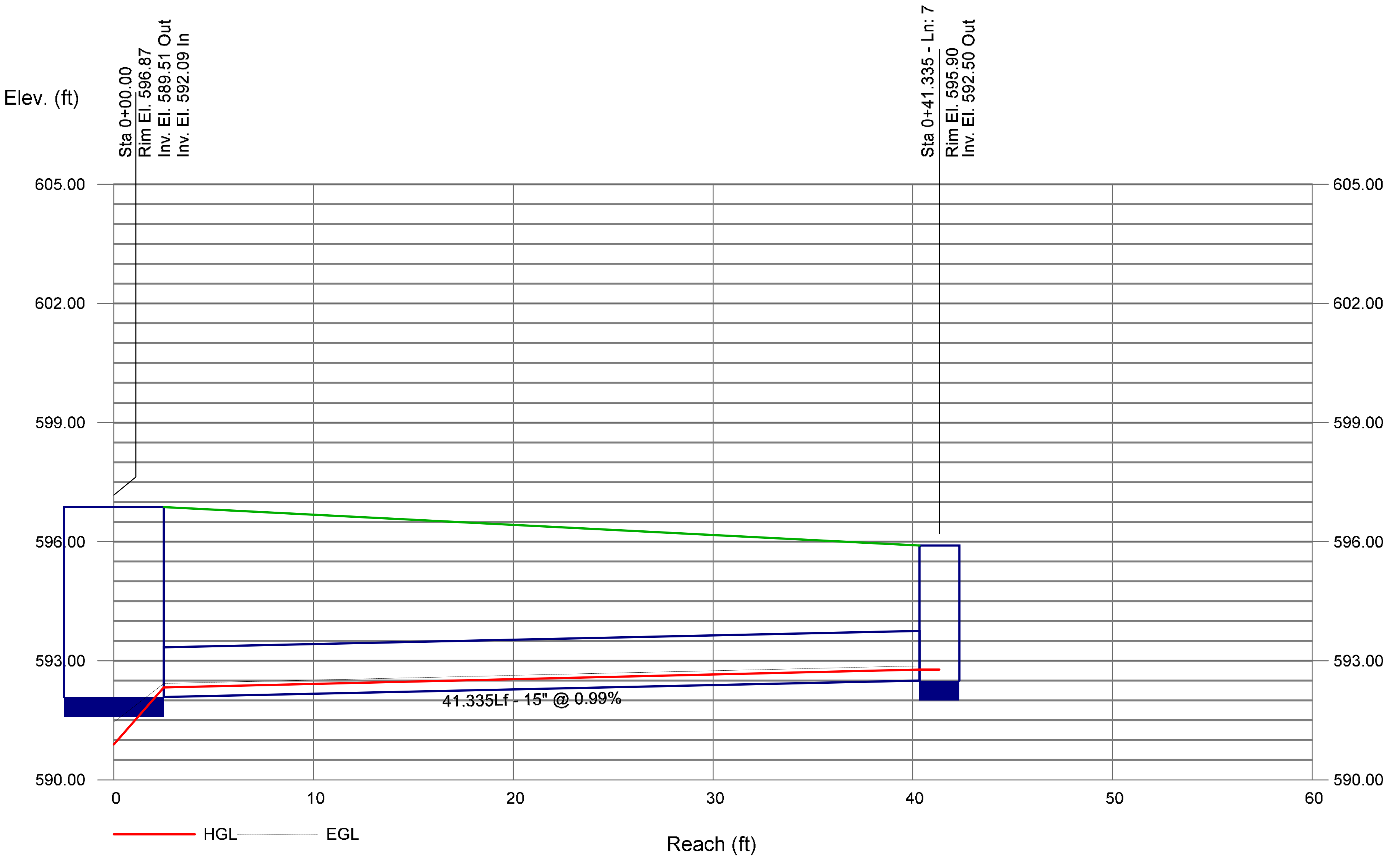
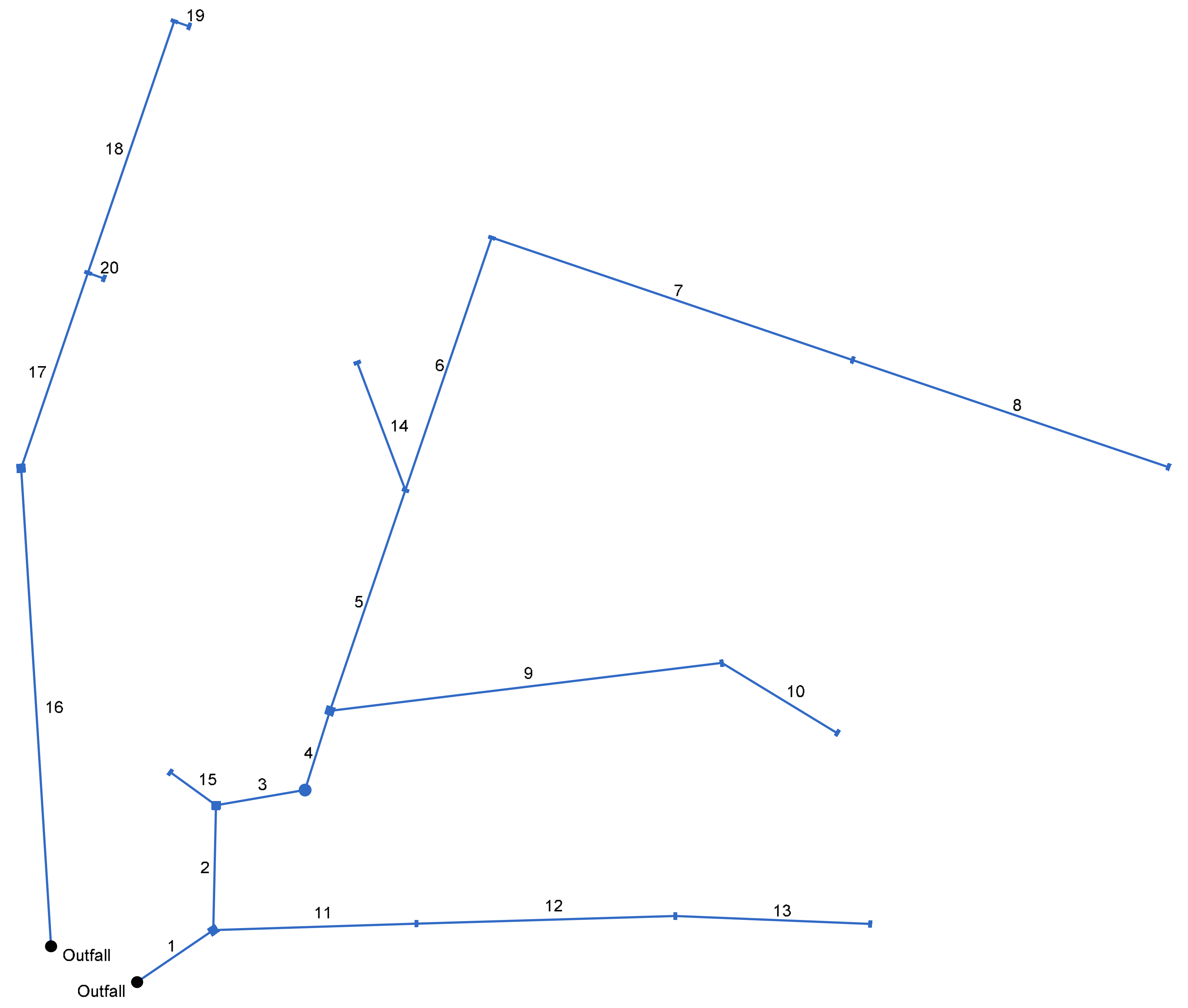


Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Network 800.stm	Number of lines: 20	Date: 2/18/2020

Storm Sewers v2018.30

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	52.097		Comb	0.00	0.76	0.60	0.0	586.84	0.54	587.12	36	Cir	0.013	1.34	592.89	CB-803 TO HW-802
2	1	70.639	-54.310	Comb	0.00	0.12	0.78	6.0	587.12	1.77	588.37	36	Cir	0.013	1.91	594.07	CB-804 TO CB-803
3	2	50.983	78.992	MH	0.00	0.00	0.00	0.0	588.87	2.26	590.02	30	Cir	0.013	0.91	595.48	DMH-805 TO CB-804
4	3	47.060	-62.874	Comb	0.00	1.57	0.89	6.0	590.02	1.08	590.53	30	Cir	0.013	1.39	595.70	CB-806 TO DMH-805
5	4	132.000	1.483	Comb	0.00	0.98	0.88	6.0	590.53	1.11	591.99	24	Cir	0.013	1.03	597.00	CB-807 TO CB-806
6	5	151.000	0.000	Comb	0.00	0.34	0.64	6.0	591.99	1.10	593.65	18	Cir	0.013	1.50	597.87	CB-808 TO CB-807
7	6	214.896	90.000	Comb	0.00	0.30	0.63	6.0	593.94	1.10	596.30	15	Cir	0.013	0.50	599.94	CB-809 TO CB-808
8	7	188.104	0.000	Comb	0.00	0.34	0.59	6.0	596.30	1.10	598.37	15	Cir	0.013	1.00	601.75	CB-810 TO CB-809
9	4	222.589	65.702	Comb	0.00	0.34	0.64	6.0	590.78	2.20	595.68	18	Cir	0.013	1.01	599.25	
10	9	76.165	38.344	Comb	0.00	0.38	0.64	6.0	595.68	1.13	596.54	15	Cir	0.013	1.00	600.11	
11	1		32.630	Comb	0.00	0.20	0.70	6.0	588.80	1.84	590.91	15	Cir	0.013	0.50	594.39	CB-819 TO CB-803
12	11	145.825	0.178	Comb	0.00	0.24	0.66	6.0	590.91	1.84	593.60	15	Cir	0.013	0.50	597.00	CB-820 TO CB-819
13	12	110.060	3.995	Comb	0.00	0.31	0.80	6.0	593.60	1.84	595.63	15	Cir	0.013	1.00	599.00	
14	5	77.080		Comb	0.00	0.28	0.85	6.0	591.99	1.30	592.99	15	Cir	0.013	1.00	596.43	
15	2	31.894		Comb	0.00	0.07	0.90	6.0	589.45	0.44	589.59	15	Cir	0.013	1.00	596.00	CB-811 TO CB-804
16	End	271.248	-93.570	Comb	0.00	0.00	0.00	0.0	586.50	0.94	589.05	36	Cir	0.013	0.65	594.70	CB-812 TO HW-801
17	16	116.854	22.377	Comb	0.00	1.34	0.86	6.0	589.05	0.60	589.75	30	Cir	0.013	1.50	594.69	
18	17		0.000	Comb	0.00	0.30	0.88	6.0	590.25	1.00	591.76	24	Cir	0.013	1.50	596.26	CB-815 TO CB-813
19	18	9.000	90.000	Comb	0.00	0.72	0.88	6.0	592.26	1.00	592.35	18	Cir	0.013	1.00	596.35	CB-816 TO CB-815
20	17	9.535	90.850	Comb	0.00	1.41	0.84	6.0	591.23	0.42	591.27	18	Cir	0.013	1.00	594.81	CB-814 TO CB-813

Project File: Network 800.stm

Number of lines: 20

Date: 2/18/2020

Hydraulic Grade Line Computations

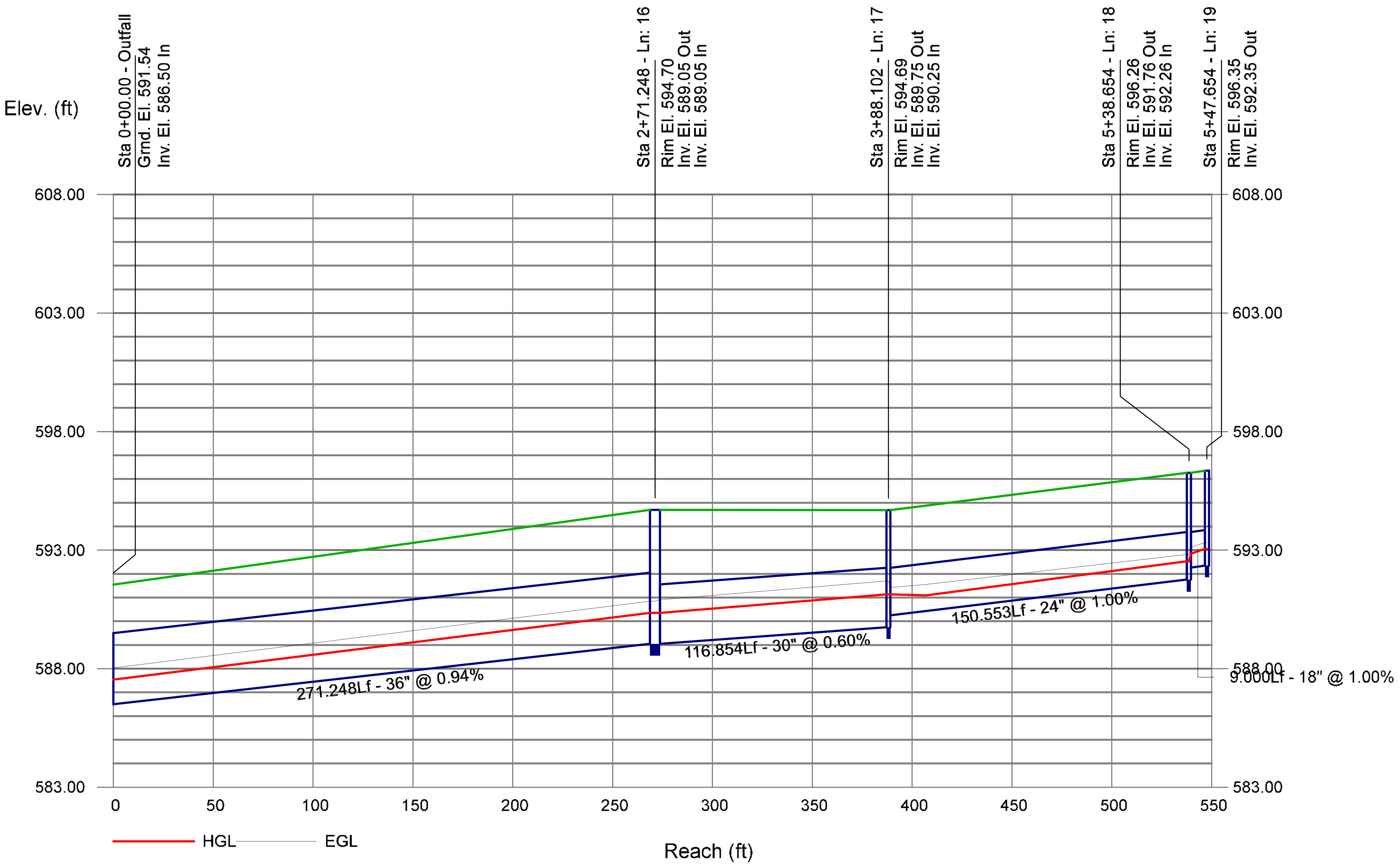
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	36	21.17	586.84	588.22	1.38	3.18	6.67	0.58	588.80	0.000	52.097	587.12	588.60	1.48**	3.47	6.11	0.58	589.18	0.000	0.000	n/a	1.34	0.78
2	36	16.84	587.12	588.60	1.48	2.97	4.86	0.50	589.10	0.000	70.639	588.37	589.68 j	1.31**	2.97	5.68	0.50	590.18	0.000	0.000	n/a	1.91	0.96
3	30	16.20	588.87	589.75	0.88*	1.53	10.57	0.55	590.29	0.000	50.983	590.02	591.38	1.36**	2.73	5.94	0.55	591.93	0.000	0.000	n/a	0.91	n/a
4	30	16.29	590.02	591.38	1.36	2.73	5.98	0.55	591.93	0.000	47.060	590.53	591.89	1.36**	2.74	5.96	0.55	592.44	0.000	0.000	n/a	1.39	n/a
5	24	7.98	590.53	591.89	1.36	1.58	3.50	0.40	592.29	0.000	132.000	591.99	592.99 j	1.00**	1.58	5.05	0.40	593.39	0.000	0.000	n/a	1.03	0.41
6	18	2.94	591.99	592.99	1.00	0.74	2.34	0.25	593.24	0.000	151.000	593.65	594.30 j	0.65**	0.74	4.00	0.25	594.55	0.000	0.000	n/a	1.50	n/a
7	15	1.97	593.94	594.40	0.46*	0.41	4.77	0.21	594.62	0.000	214.896	596.30	596.86	0.56**	0.53	3.71	0.21	597.07	0.000	0.000	n/a	0.50	n/a
8	15	1.08	596.30	596.86	0.56	0.35	2.04	0.15	597.01	0.000	188.104	598.37	598.78 j	0.41**	0.35	3.10	0.15	598.93	0.000	0.000	n/a	1.00	n/a
9	18	2.42	590.78	591.89	1.11	0.64	1.72	0.22	592.11	0.000	222.589	595.68	596.27 j	0.59**	0.64	3.76	0.22	596.49	0.000	0.000	n/a	1.01	0.22
10	15	1.31	595.68	596.27	0.59	0.40	2.30	0.17	596.44	0.000	76.165	596.54	596.99 j	0.45**	0.40	3.28	0.17	597.16	0.000	0.000	n/a	1.00	n/a
11	15	2.74	588.80	589.28	0.48*	0.43	6.31	0.27	589.55	0.000	114.634	590.91	591.57	0.66**	0.66	4.14	0.27	591.84	0.000	0.000	n/a	0.50	n/a
12	15	2.11	590.91	591.57	0.66	0.56	3.19	0.22	591.80	0.000	145.825	593.60	594.18 j	0.58**	0.56	3.80	0.22	594.40	0.000	0.000	n/a	0.50	0.11
13	15	1.33	593.60	594.18	0.58	0.40	2.40	0.17	594.35	0.000	110.060	595.63	596.09 j	0.46**	0.40	3.30	0.17	596.25	0.000	0.000	n/a	1.00	n/a
14	15	1.28	591.99	592.99	1.00	0.39	1.21	0.16	593.16	0.000	77.080	592.99	593.44 j	0.45**	0.39	3.26	0.16	593.60	0.000	0.000	n/a	1.00	0.16
15	15	0.34	589.45	589.69	0.24*	0.16	2.08	0.07	589.76	0.439	31.894	589.59	589.83	0.24	0.16	2.08	0.07	589.90	0.441	0.440	0.140	1.00	0.07
16	36	16.53	586.50	587.53	1.03*	2.16	7.65	0.49	588.03	0.000	271.248	589.05	590.35	1.30**	2.93	5.64	0.49	590.84	0.000	0.000	n/a	0.65	0.32
17	30	16.79	589.05	590.35	1.30	2.57	6.52	0.56	590.91	0.000	116.854	589.75	591.13	1.38**	2.79	6.02	0.56	591.70	0.000	0.000	n/a	1.50	0.84
18	24	4.82	590.25	591.13	0.88	1.12	3.60	0.29	591.42	0.000	150.553	591.76	592.53 j	0.77**	1.12	4.31	0.29	592.82	0.000	0.000	n/a	1.50	0.43
19	18	3.41	592.26	592.85	0.59*	0.64	5.30	0.27	593.12	0.000	9.000	592.35	593.05	0.70**	0.81	4.19	0.27	593.33	0.000	0.000	n/a	1.00	0.27
20	18	6.37	591.23	592.38	1.15*	1.46	4.38	0.30	592.68	0.420	9.535	591.27	592.42	1.15	1.46	4.38	0.30	592.72	0.420	0.420	0.040	1.00	0.30

Project File: Network 800.stm	Number of lines: 20	Run Date: 2/18/2020

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Storm Sewer Profile

Proj. file: Network 800.stm



Storm Sewer Profile

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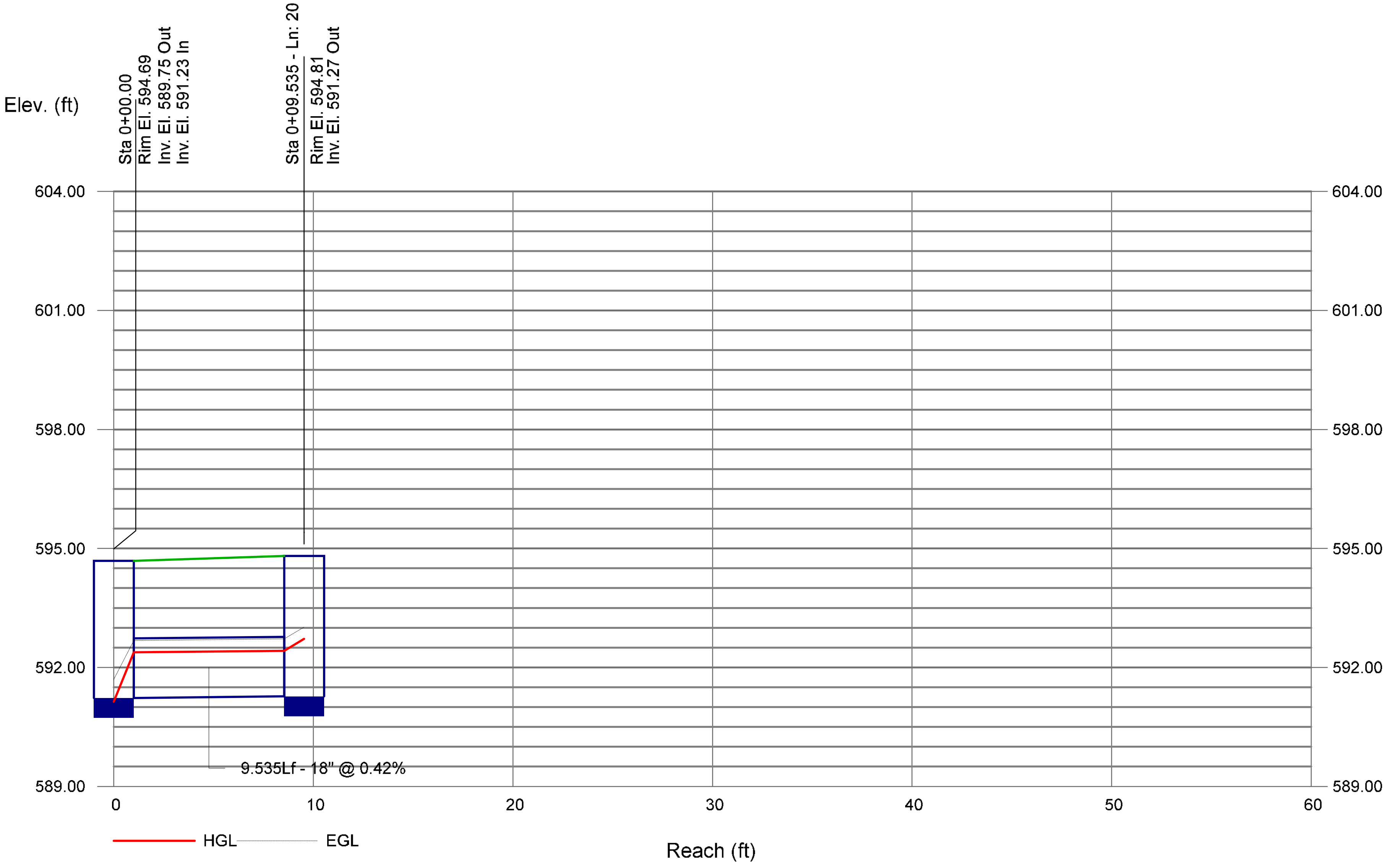

Storm Sewer Profile

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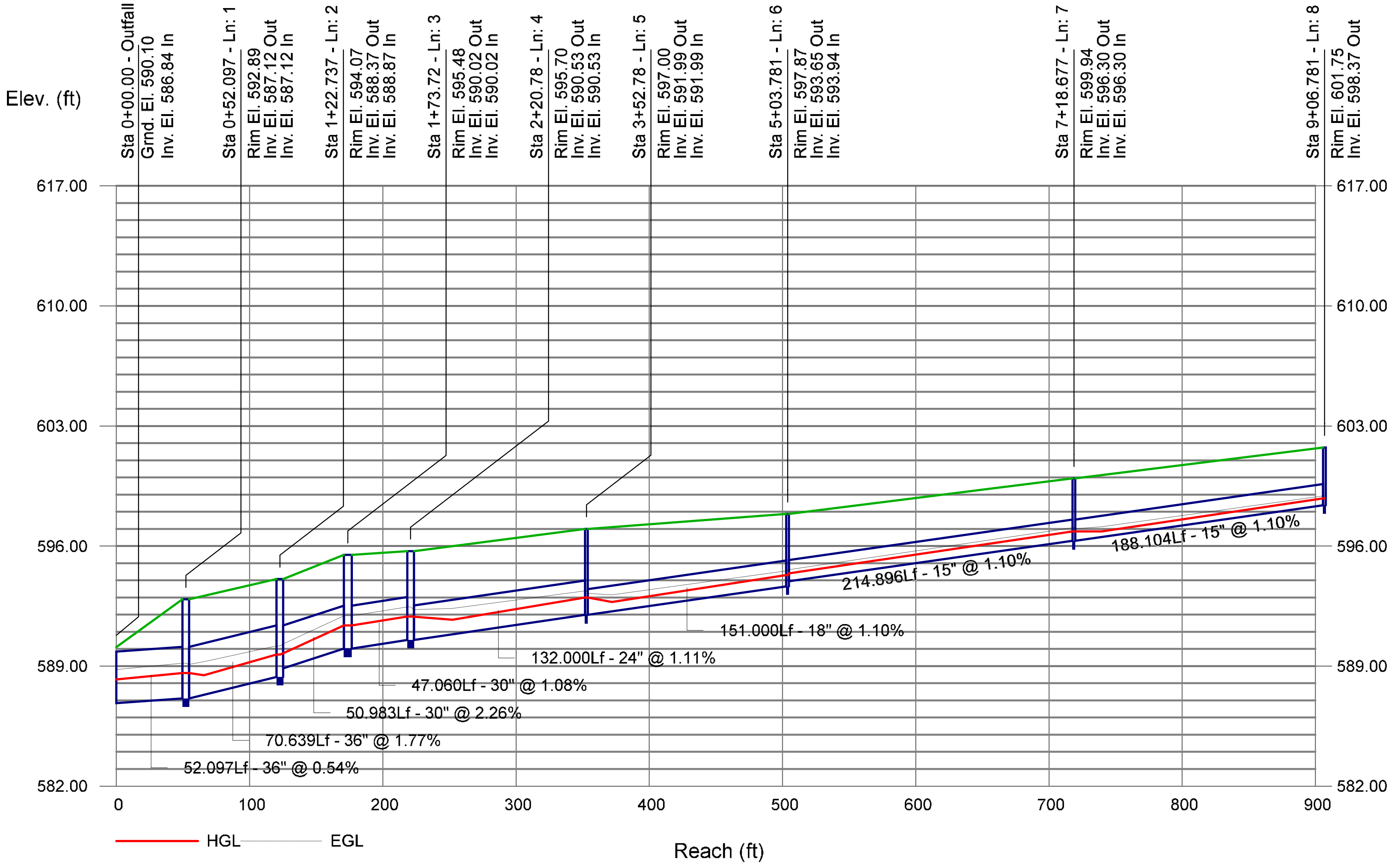

Storm Sewer Profile

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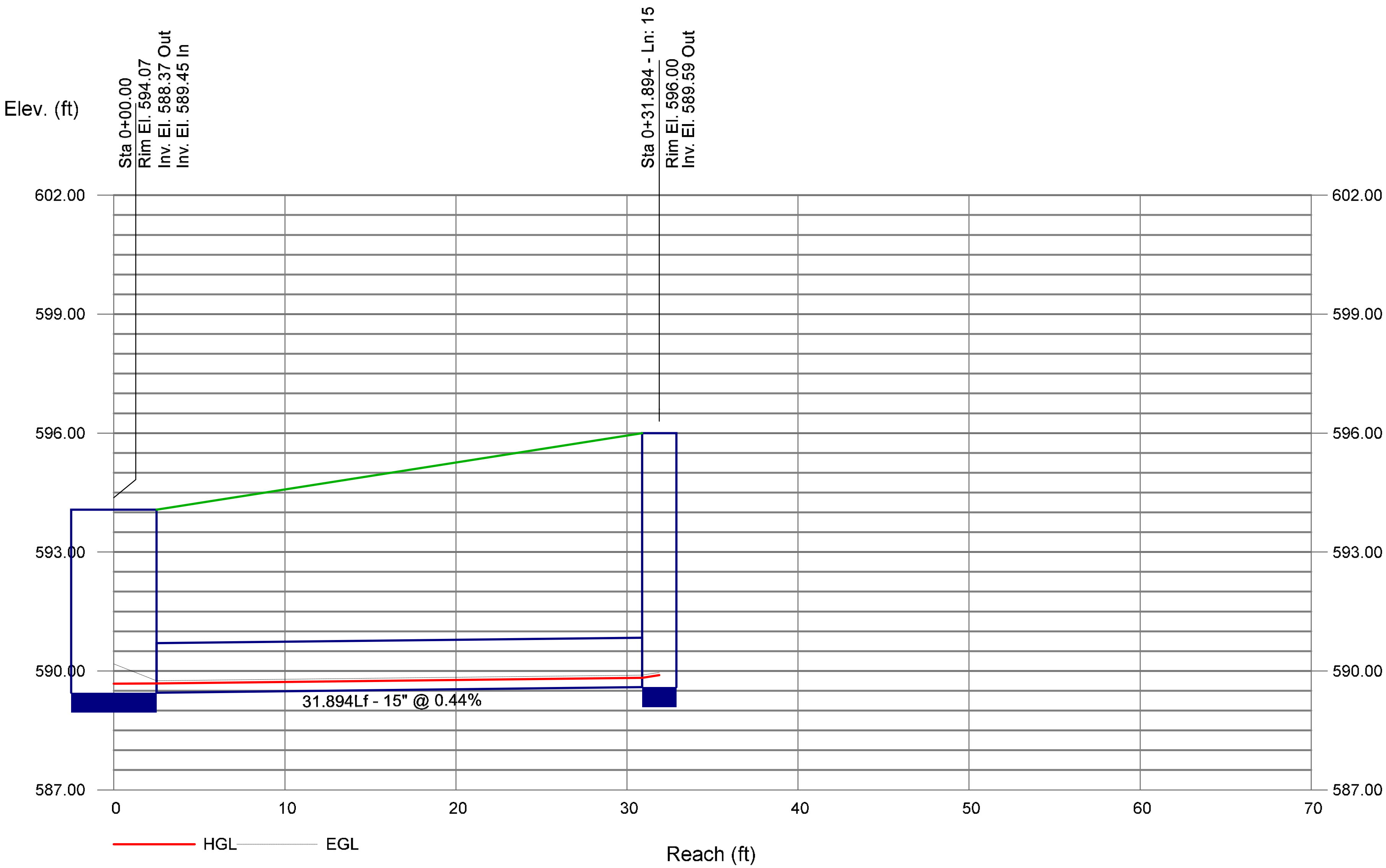
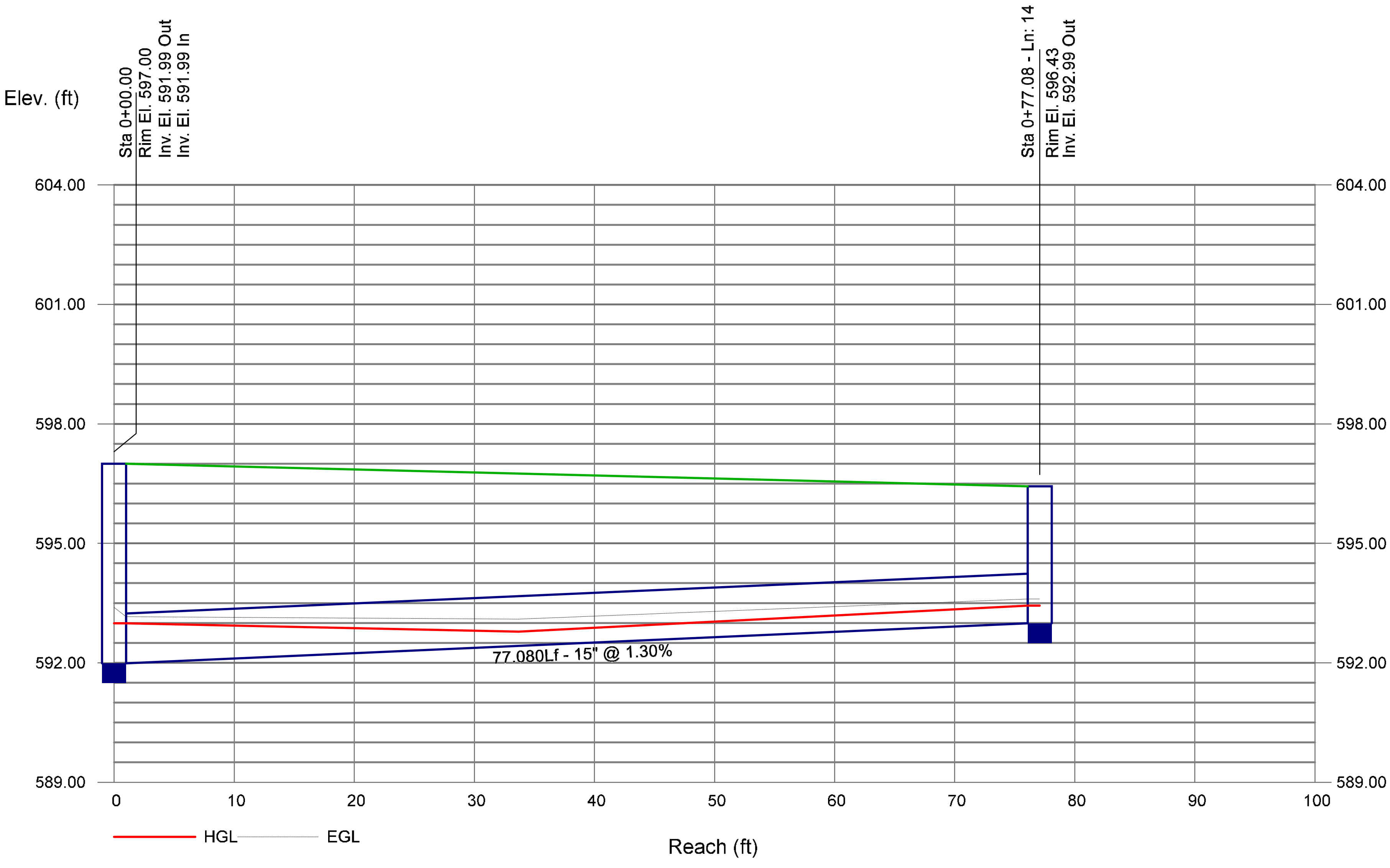


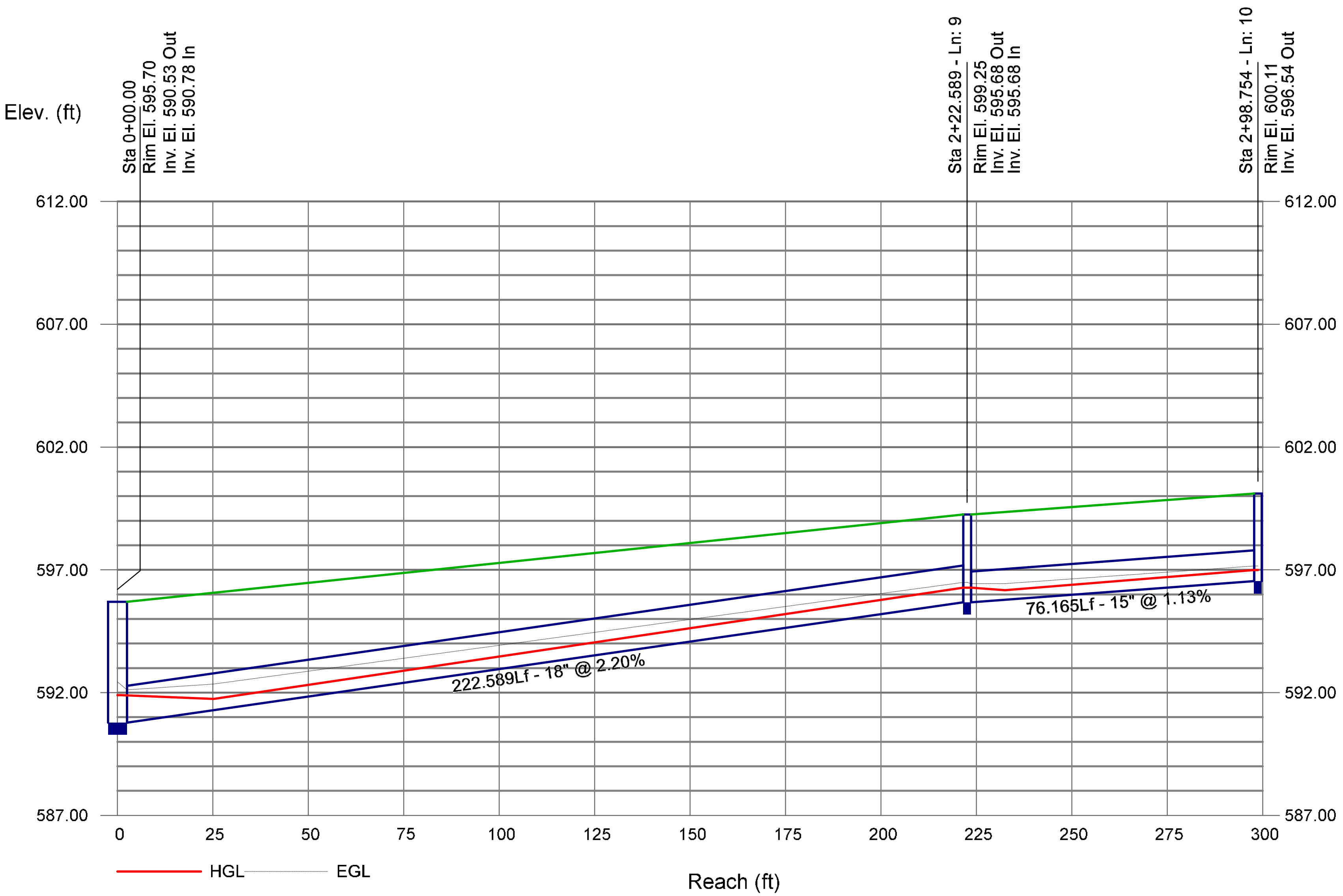
Storm Sewer Profile

Proj. file: Network 800.stm



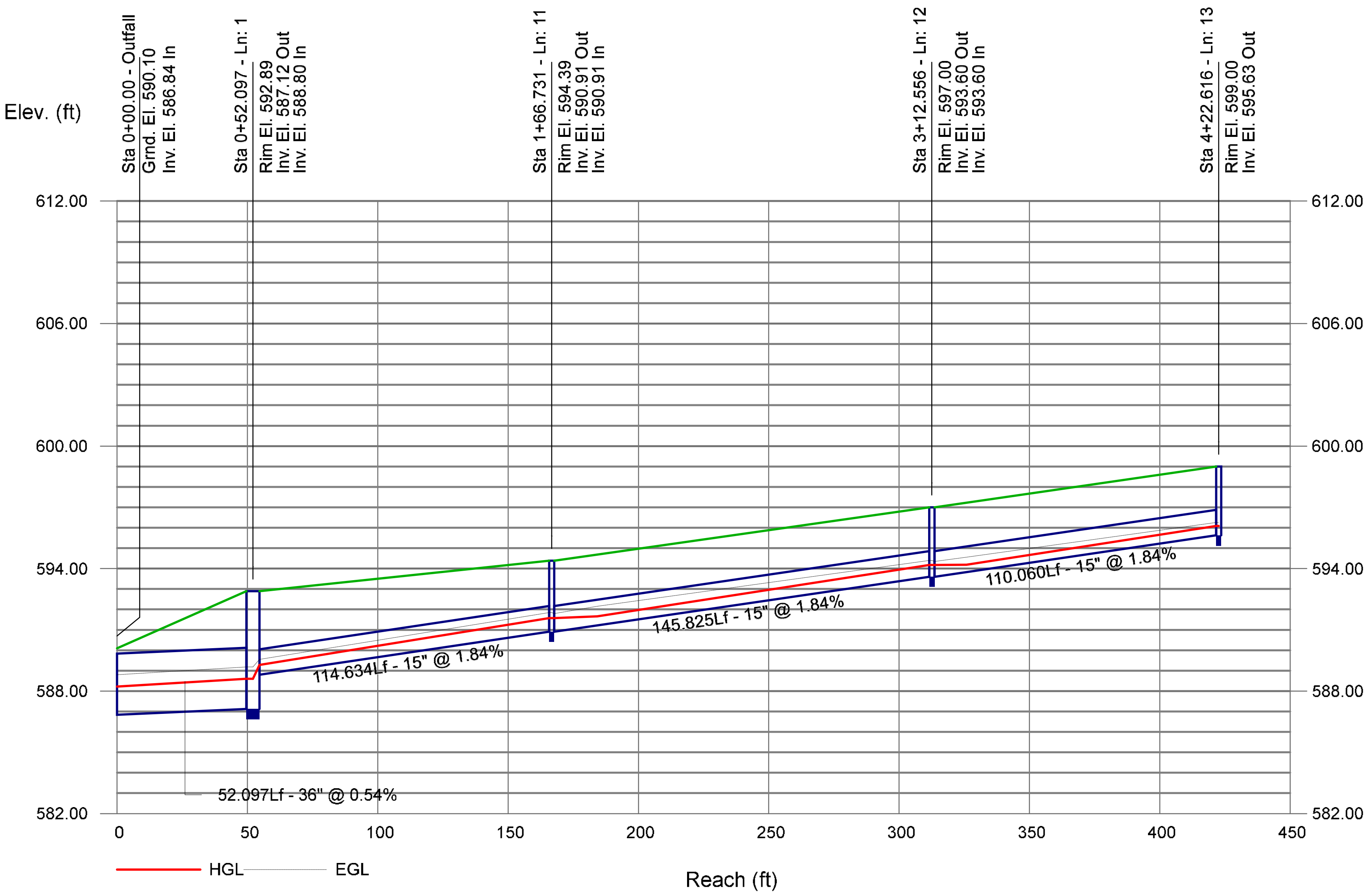
Storm Sewer Profile

Proj. file: Network 800.stm

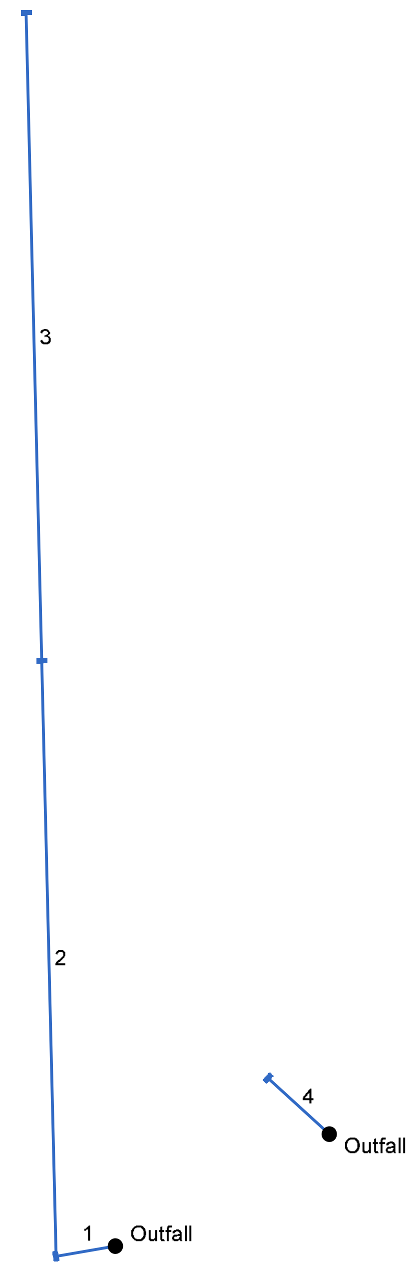


Storm Sewer Profile

Proj. file: Network 800.stm



Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Network 900.stm	Number of lines: 4	Date: 2/7/2020

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	24.053		Comb	0.00	0.17	0.90	6.0	589.50	7.28	591.25	15	Cir	0.013	1.50	594.75	CB-906 to HW-905
2	1	239.359	98.474	Comb	0.00	0.19	0.90	6.0	591.25	1.15	594.00	15	Cir	0.013	0.50	597.50	CB-907 to CB-906
3	2	260.642	0.000	Comb	0.00	0.37	0.90	6.0	594.00	1.15	597.00	15	Cir	0.013	1.00	600.50	CB-908 to CB-907
4	End	33.327	-137.317	Grate	1.29	0.00	0.00	0.0	585.00	1.74	585.58	12	Cir	0.013	1.00	589.50	OCS-904 to HW-903

Project File: Network 900.stm	Number of lines: 4	Date: 2/7/2020

Hydraulic Grade Line Computations

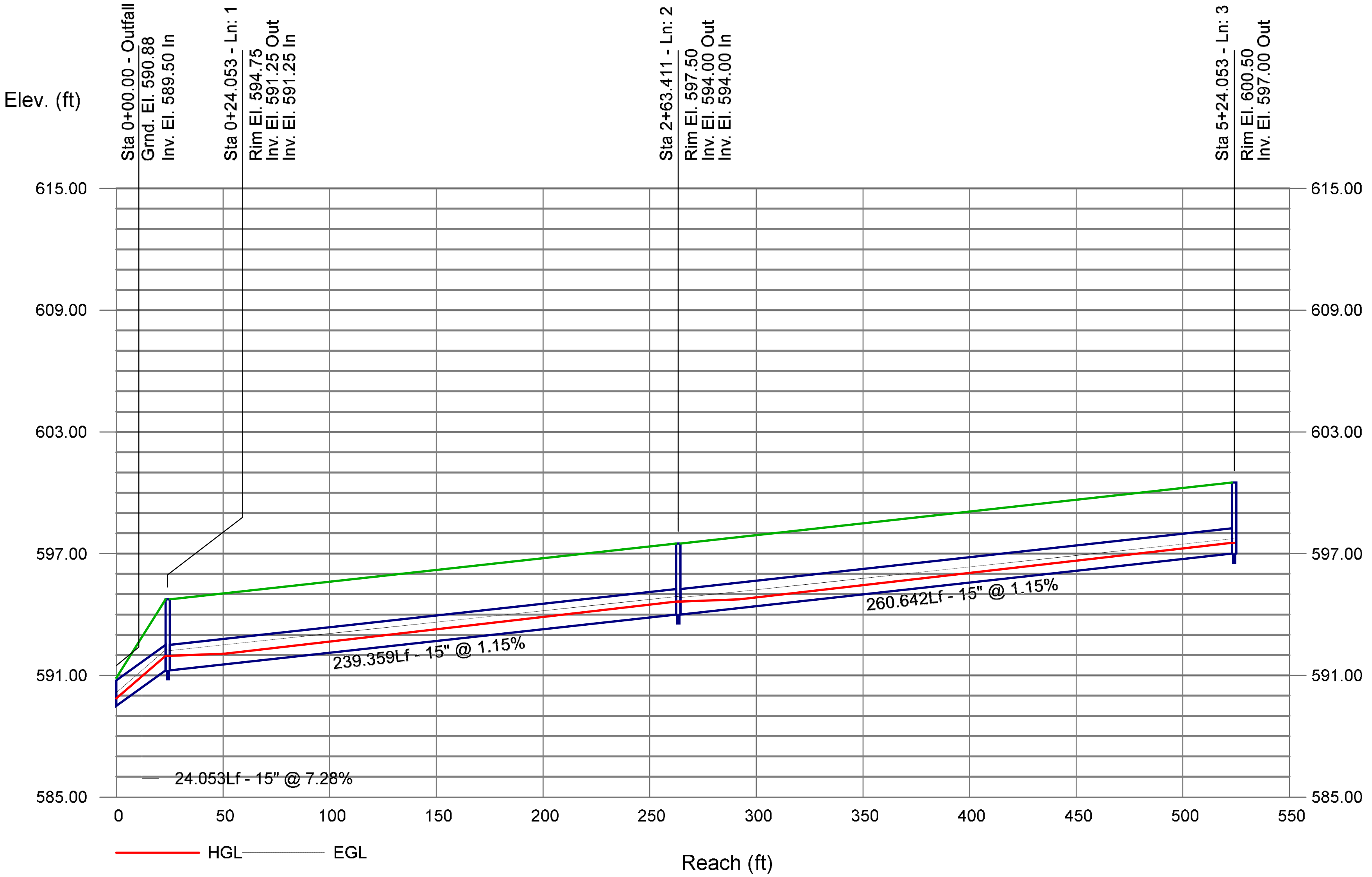
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	15	3.13	589.50	589.86	0.36	0.29	10.71	0.29	590.15	0.000	24.053	591.25	591.96	0.71**	0.72	4.34	0.29	592.26	0.000	0.000	n/a	1.50	0.44
2	15	2.53	591.25	591.96	0.71	0.63	3.50	0.25	592.21	0.000	239.359	594.00	594.64 j	0.64**	0.63	4.03	0.25	594.89	0.000	0.000	n/a	0.50	n/a
3	15	1.79	594.00	594.64	0.64	0.50	2.85	0.20	594.84	0.000	260.642	597.00	597.53 j	0.53**	0.50	3.60	0.20	597.73	0.000	0.000	n/a	1.00	0.20
4	12	1.29	585.00	585.36	0.36	0.25	5.07	0.19	585.55	0.000	33.327	585.58	586.06	0.48**	0.37	3.47	0.19	586.25	0.000	0.000	n/a	1.00	0.19

Project File: Network 900.stm	Number of lines: 4	Run Date: 2/7/2020

Notes: ; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

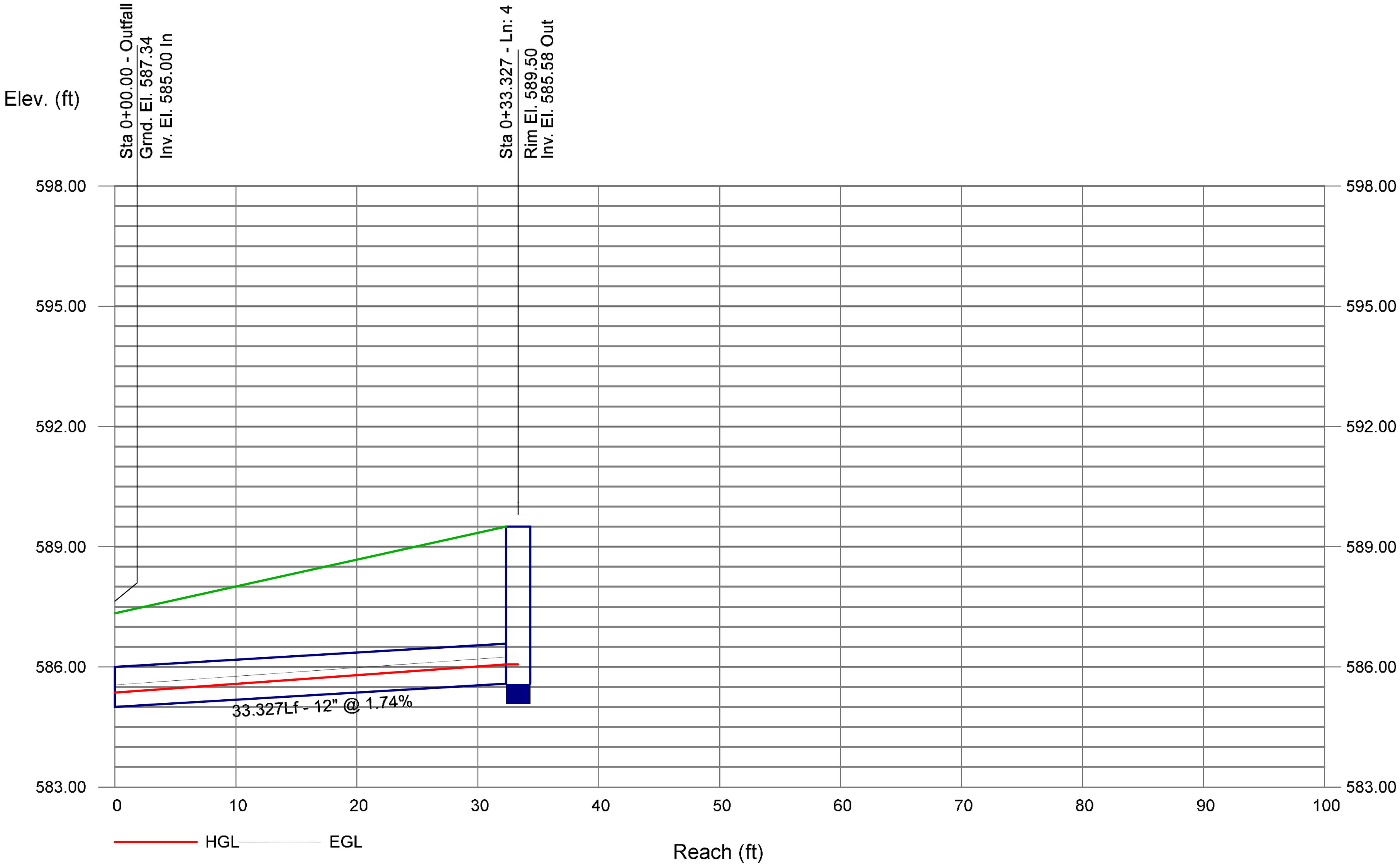
Storm Sewer Profile

Proj. file: Network 900.stm



Storm Sewer Profile

Proj. file: Network 900.stm



Project Olive
2780 Long Road
Town of Grand Island, New York

Appendix I

Post-Construction Inspection and Maintenance

Post Construction Inspection and Maintenance Site Checklist

1. **Steep Slopes (any slope 3:1 or steeper)**
   (Frequency: Annual) — **Yes No NA**

   a. Vegetation and ground cover adequate. ☐ ☐ ☐

      i. Minimum 80% ground cover. ☐ ☐ ☐
      Maintenance: Topsoil, rake and seed bare areas. Remove any dead or dying plants and decaying plant material. Replace dead and dying plants.

      ii. Excessively tall grass (greater than 6″ in height) ☐ ☐ ☐
      Maintenance: Mow slopes 3:1 or flatter to have a grass height of 4″ to 6″. Increase mowing frequency as necessary. Steep slopes planted with meadow mix as shown on the approved plans do not have to be mowed.

      iii. Unauthorized plants. ☐ ☐ ☐
      Maintenance: Remove any unauthorized plants, including roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.

   b. Slope erosion. ☐ ☐ ☐

      i. Small bare areas (min. 50 square feet). ☐ ☐ ☐
      Maintenance: Topsoil, rake and seed bare areas.

      ii. Ruts less than 12″ wide. ☐ ☐ ☐
      Maintenance: Prior to making any repairs, identify the source of erosion and correct. Protect the slopes prior to any work occurring. Backfill ruts and compact soil. Topsoil, rake and seed bare areas. Alternatively, hydroseeding can be used to seed the slope.

      iii. Ruts greater than 12″ wide. ☐ ☐ ☐
      Maintenance: Prior to making any repairs, identify the source of erosion and correct. Protect the slopes prior to any work occurring. Re-grade, backfill ruts and compact soil. Install erosion control mats on slopes 3:1 or steeper to protect the re-graded slope. Topsoil, rake and seed bare areas. Inspect on a weekly basis until 80% ground cover is achieved. Alternatively, hydroseeding can be used to seed the slope.

   c. Uneven settling ☐ ☐ ☐
   Maintenance: Visually inspect for uneven settling. Classify the settling based upon the categories below.

      i. Greater than 0″ but less than 2″ of settling. ☐ ☐ ☐
      Maintenance: No immediate action required. Re-inspect in 6 months.

      ii. Greater than 2″ but less than 4″ of settling. ☐ ☐ ☐
      Maintenance: Immediately repair. Re-grade and compact the soil. Topsoil, rake and seed the area. Re-inspect in 6 months.

Yes No NA

iii. Greater than 4" of settling. ☐ ☐ ☐
Maintenance: Immediately stabilize the area and consult a NYS Licensed Professional Engineer within 2 weeks before making any additional repairs.

2. Swales **Yes No NA**
(Frequency: Annual)

a. Inflow Points ☐ ☐ ☐
  i. Vegetation and ground cover adequate. ☐ ☐ ☐
  Maintenance: Reseed bare areas. Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use any herbicides. Topsoil, rake and seed the disturbed area by their removal.
  ii. Free from erosion/undercutting. ☐ ☐ ☐
  Maintenance: Immediately stabilize and repair any areas where erosion around has occurred. Rake and seed the area. Seed mixture shall meet the seed mixture requirements specified on the approved plans.
  iii. Rip rap in good condition. ☐ ☐ ☐
  Maintenance: Replace stone, as necessary.
  iv. No evidence of sediment buildup. ☐ ☐ ☐
  Maintenance: Remove and properly dispose of any accumulated sediment when the depth is 20% of swale design depth.

b. Check Dams ☐ ☐ ☐
  i. No evidence of sediment buildup. ☐ ☐ ☐
  Maintenance: Remove accumulated sediment behind dams when sediment depth is one-third the dam height.
  ii. Stone in good condition. ☐ ☐ ☐
  Maintenance: Replace stone, as necessary.
  iii. No evidence of erosion ☐ ☐ ☐
  Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and reseed area.

c. Energy Dissipaters ☐ ☐ ☐
  i. No evidence of sediment buildup. ☐ ☐ ☐
  Maintenance: Remove and properly dispose of any accumulated sediment when half of the void space is filled.
  ii. Rip rap in good condition. ☐ ☐ ☐
  Maintenance: Replace stone, as necessary.
  iii. No evidence of erosion. ☐ ☐ ☐
  Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and reseed.

Notes:

1. The site must be returned to the approved conditions when any repairs are made.
2. Unauthorized plants are any plants that are growing or have been installed that are not any of the plants shown on the approved plans.
3. All seed mixtures shall meet the seed mixture requirements specified on the approved plans.
4. Replace any dead or dying plants with plants specified in the planting schedule shown on the approved plans.

Comments:

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Actions to be taken:

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Post Construction Inspection and Maintenance Checklist
Stormwater Pond

1. Embankment **(Frequency: Annual)**	**Yes**	**No**	**NA**
a. Vegetation and ground cover adequate.	☐	☐	☐
i. Minimum 80% ground cover. *Maintenance: Topsoil, rake and seed bare areas. Replace dead and dying plants.*	☐	☐	☐
ii. Excessively tall grass (greater than 6” in height) *Maintenance: Mow grass to have a height of 4” to 6”. Increase mowing frequency as necessary.*	☐	☐	☐
iii. Unauthorized plants. *Maintenance: Remove any unauthorized plants, including roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐
b. Slope erosion.	☐	☐	☐
i. Small bare areas (min. 50 square feet). *Maintenance: Topsoil, rake and seed bare areas.*	☐	☐	☐
ii. Ruts less than 12” wide. *Maintenance: Prior to making any repairs, identify the source of erosion and correct. Protect the slopes prior to any work occurring. Backfill ruts and compact soil. Topsoil, rake and seed bare areas. Alternatively, hydroseeding can be used to seed the slope.*	☐	☐	☐
iii. Ruts greater than 12” wide. *Maintenance: Prior to making any repairs, identify the source of erosion and correct. Protect the slopes prior to any work occurring. Re-grade, backfill ruts and compact soil. Install erosion control mats on slopes 3:1 or steeper to protect the re-graded slope. Topsoil, rake and seed bare areas. Inspect on a weekly basis until 80% ground cover is achieved. Alternatively, hydroseeding can be used to seed the slope.*	☐	☐	☐
c. Uneven settling *Maintenance: Install permanent benchmarks or other permanent reference point in each practice to be used with as-built elevations to measure uneven settling.*	☐	☐	☐
i. Greater than 0” but less than 2” of settling. *Maintenance: No immediate action required. Re-inspect in 6 months.*	☐	☐	☐
ii. Greater than 2” but less than 4” of settling. *Maintenance: Immediately repair. Re-grade and compact the soil. Topsoil, rake and seed the area. Re-inspect in 6 months.*	☐	☐	☐

	Yes	No	NA
iii. Greater than 4" of settling. *<u>Maintenance</u>: Immediately stabilize the area and consult a NYS Licensed Professional Engineer within 2 weeks before making any additional repairs.*	☐	☐	☐
d. Animal burrows. *<u>Maintenance</u>: Fill animal burrows with similar material to the existing material and compact. Topsoil, rake and seed the area.*	☐	☐	☐
e. Cracking, bulging, or sliding of slope.	☐	☐	☐
i. Upstream face.	☐	☐	☐
ii. Downstream face.	☐	☐	☐
iii. At or beyond downstream toe.	☐	☐	☐
iv. At or beyond upstream toe.	☐	☐	☐
v. Emergency spillway. *<u>Maintenance</u>: Immediately stabilize the slope and consult an NYS Licensed Professional Engineer within 2 weeks before making any additional repairs.*	☐	☐	☐
f. Seeps/leaks at downstream face. *<u>Maintenance</u>: Look for changes in the color of the vegetation, plant species and their density to help locate the leak source.*	☐	☐	☐
g. Rip rap slope protection failure. *<u>Maintenance</u>: Stabilize slope, re-grade and compact the soil. Replace stone, as necessary.*	☐	☐	☐
i. Emergency spillway clear of any obstructions or debris. *<u>Maintenance</u>: Remove and properly dispose of any trash and debris. Remove any unauthorized plants, or any nuisance weeds and vegetation, including their roots. Do not use any herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐

2. Inflow Points
(Frequency: Annual)

	Yes	No	NA
a. Vegetation and ground cover adequate. *<u>Maintenance</u>: Reseed bare areas. Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use any herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐
b. Free from erosion/undercutting. *<u>Maintenance</u>: Immediately stabilize and repair any areas where erosion around has occurred. Topsoil, rake and seed the area.*	☐	☐	☐
c. Rip rap in good condition. *<u>Maintenance</u>: Replace stone, as necessary.*	☐	☐	☐
d. Pipes free from damage, corrosion, and sediment. *<u>Maintenance</u>: Immediately repair any damaged pipes. If pipes are severely damaged and cannot be repaired, replace the pipes. Remove and properly dispose of any sediment.*	☐	☐	☐

3. Outlet Structure/Overflow Spillway (Frequency: Annual)

	Yes	**No**	**NA**
a. Riser pipe	☐	☐	☐
i. In good condition, no need for repairs. *<u>Maintenance</u>: Repair any minor damages. Replace structure if significant damages are observed.*	☐	☐	☐
ii. Clear of sediment. *<u>Maintenance</u>: Remove and properly dispose of any accumulated sediment when at 50% of sump height.*	☐	☐	☐
iii. Clear of debris and trash. *<u>Maintenance</u>: Remove and properly dispose of any debris and trash.*	☐	☐	☐
b. Concrete outlet structure	☐	☐	☐
i. In good condition, no need for repairs.	☐	☐	☐
a. Cracks or displacement. *<u>Maintenance</u>: Repair any minor cracks. If minor displacement is observed, re-inspect in 6 months. Replace structure if major cracks or significant displacement is observed.*	☐	☐	☐
b. Minor spalling (<1"). *<u>Maintenance</u>: Repair any minor spalling.*	☐	☐	☐
c. Major spalling (rebars exposed). *<u>Maintenance</u>: Replace structure.*	☐	☐	☐
d. Joint failures. *<u>Maintenance</u>: Replace structure.*	☐	☐	☐
e. Water tightness. *<u>Maintenance</u>: Reseal structure for water tightness if minor leaks are observed. Replace structure if significant leaks are observed.*	☐	☐	☐
ii. Clear of sediment. *<u>Maintenance</u>: Remove and properly dispose of any accumulated sediment when at 50% of sump height.*	☐	☐	☐
iii. Clear of debris and trash. *<u>Maintenance</u>: Remove and properly dispose of any debris and trash.*	☐	☐	☐
iv. Pipes free from damage, corrosion, and sediment. *<u>Maintenance</u>: Immediately repair any damaged pipes. If pipes are severely damaged and cannot be repaired, replace the pipes. Remove and properly dispose of any sediment.*	☐	☐	☐
c. Low flow orifice is unobstructed. *<u>Maintenance</u>: Remove and properly dispose of any debris and trash.*	☐	☐	☐

	Yes	**No**	**NA**
d. Low flow trash rack.	☐	☐	☐
i. Clear of debris and trash.	☐	☐	☐
Maintenance: Remove and properly dispose of any debris and trash.			
ii. Clear of any corrosion.	☐	☐	☐
Maintenance: If significant corrosion is observed, replace trash rack.			
e. Weir trash rack.	☐	☐	☐
i. Clear of debris and trash.	☐	☐	☐
Maintenance: Remove and properly dispose of any debris and trash.			
ii. Clear of any corrosion.	☐	☐	☐
Maintenance: If significant corrosion is observed, replace trash rack.			
f. Control valve operational.	☐	☐	☐
Maintenance: Replace if not functioning or operational.			
g. Pond valve operational, chained and locked.	☐	☐	☐
Maintenance: Replace valve if not functioning or operational.			
h. Overflow spillway	☐	☐	☐
i. In good condition, no need for repairs.	☐	☐	☐
Maintenance: Replace any dislodged stone with the same stone type.			
ii. Clear of sediment.	☐	☐	☐
Maintenance: Remove and properly dispose of any accumulated sediment when half of the void space is filled.			
iii. Clear of debris and trash.	☐	☐	☐
Maintenance: Remove and properly dispose of any debris and trash.			
iv. No evidence of erosion.	☐	☐	☐
Maintenance: Immediately stabilize and repair any areas where erosion occurred around or below the overflow spillway. Replace stone, as necessary. Topsoil, rake and seed the area.			
v. No evidence of erosion at downstream toe of drop structure or weir spillway.	☐	☐	☐
Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and seed the area.			

4. Sediment Forebay (Frequency: Monthly)

	Yes	**No**	**NA**
a. Free of sediment.	☐	☐	☐
Maintenance: Remove and properly dispose of any accumulated sediment when at 50% of the design capacity.			

	Yes	No	NA
b. No evidence of erosion. *<u>Maintenance</u>: Immediately stabilize and repair any areas where erosion has occurred. Topsoil, rake and seed the area.*	☐	☐	☐
c. Overflow Spillway.	☐	☐	☐
i. In good working condition, no need for repairs. *<u>Maintenance</u>: Replace stone, as necessary.*	☐	☐	☐
ii. Clear of sediment. *<u>Maintenance</u>: Remove and properly dispose of any accumulated sediment when half of the void space is filled.*	☐	☐	☐
iii. Clear of trash and debris. *<u>Maintenance</u>: Remove and properly dispose of any debris and trash.*	☐	☐	☐
iv. No evidence of erosion. *<u>Maintenance</u>: Immediately stabilize and repair any areas where erosion occurred around or below the overflow spillway. Replace stone, as necessary. Topsoil, rake and seed the area.*	☐	☐	☐
v. No evidence of erosion at downstream toe of drop structure or weir spillway. *<u>Maintenance</u>: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and seed the area.*	☐	☐	☐

5. Permanent Pool (Wet Ponds)
(Frequency: Monthly)

	Yes	No	NA
a. Undesirable vegetative growth. *<u>Maintenance</u>: Mow grass to have a height of 4" to 6". Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐
b. Floating or floatable debris removal required. *<u>Maintenance</u>: Remove and properly dispose of any debris and trash.*	☐	☐	☐
c. Visible pollution. *<u>Maintenance</u>: Coordinate removal/cleanup of any oil, gas, or contaminants with the appropriate clean-up personnel.*	☐	☐	☐
d. Erosion occurring along shoreline. *<u>Maintenance</u>: Leave a 10' unmowed vegetated buffer around the perimeter of the permanent pool to help prevent shoreline erosion.*	☐	☐	☐

6. Dry Pond Areas
(Frequency: Monthly)

a. Vegetation adequate. *<u>Maintenance</u>: Topsoil, rake and seed the area.*	☐	☐	☐

Yes No NA

b. Undesirable vegetative growth. ☐ ☐ ☐
Maintenance: Mow grass to have a height of 4" to 6". Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.

c. Undesirable woody vegetation. ☐ ☐ ☐
Maintenance: Remove any undesirable woody vegetation, including their roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.

d. Low flow channels clear of obstructions. ☐ ☐ ☐
Maintenance: Remove and properly dispose of any debris and trash.

e. Standing water or wet spots. ☐ ☐ ☐
Maintenance: Re-grade areas to ensure positive drainage. Topsoil, rake and seed the area.

f. Sediment and trash accumulation. ☐ ☐ ☐
Maintenance: Remove and properly dispose of any accumulated sediment and trash.

7. Wetland Vegetation
(Frequency: Annual) **Yes No NA**

a. Vegetation health and growing. ☐ ☐ ☐
Maintenance: Remove any dead or dying plants and decaying plant material. Replace dead and dying plants.

Yes No NA

  i. Wetland maintaining 50% surface area coverage of wetland plants after second growing season. ☐ ☐ ☐
  Maintenance: If unsatisfactory, install reinforcement plants.

b. Dominant wetland plants:

  i. Survival of desired wetland plant species. ☐ ☐ ☐
  Maintenance: Remove any dead or dying plants and decaying plant material. Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use herbicides. Replace any dead and dying plants.

  ii. Distribution according to landscaping plan. ☐ ☐ ☐
  Maintenance: Install additional wetland plants as necessary.

c. Evidence of invasive species. ☐ ☐ ☐
Maintenance: Remove invasive species, including roots. Do not use herbicides. Install additional wetland plants as necessary.

d. Maintenance of adequate water depths for desired wetland plant species. ☐ ☐ ☐
Maintenance: Remove and properly dispose of any accumulated sediment that may impact the water depth.

	Yes	No	NA
e. Harvesting of emergent plantings needed. *<u>Maintenance</u>: A qualified professional shall identify the plants to be removed.*	☐	☐	☐
f. Accumulated sediment reducing pool volume significantly or plants are "choked" with sediment. *<u>Maintenance</u>: Remove and properly dispose of any accumulated sediment when at 50% of the design capacity. A bathymetric study may be necessary to determine the amount of water and accumulated sediment in the pond.*	☐	☐	☐
g. Eutrophication level of wetland. *<u>Maintenance</u>: Reduce the amount of phosphorus being applied upstream starting in early April and through September. Chemical treatments can be applied; however, consult a NYS licensed Professional Engineer prior to starting any treatments as chemical treatments may require a permit.*	☐	☐	☐

8. Miscellaneous
(Frequency: Monthly)

	Yes	No	NA
a. Encroachment on pond or easement area. *<u>Maintenance</u>: Remove any encroachments into the pond or easement area.*	☐	☐	☐

	Yes	No	NA
b. Maintenance access routes in good condition. *<u>Maintenance</u>: Repair any minor damage or erosion to the maintenance access routes. If significant damage or erosion is noted, stabilize, re-grade and re-establish the maintenance access routes in accordance with the plans.*	☐	☐	☐
c. Signs of hydrocarbon build-up. *<u>Maintenance</u>: Coordinate removal/cleanup of any oil, gas, or contaminants with the appropriate clean-up personnel.*	☐	☐	☐
d. Fence in good condition. *<u>Maintenance</u>: Replace any damaged sections of fence.*	☐	☐	☐
e. Safety signs are installed. *<u>Maintenance</u>: Replace any missing signs.*	☐	☐	☐

Notes:

1. The site must be returned to the approved conditions when any repairs are made.
2. Unauthorized plants are any plants that are growing or have been installed that are not any of the plants shown on the approved plans.
3. All seed mixtures shall meet the seed mixture requirements specified on the approved plans.
4. Replace any dead or dying plants with plants specified in the planting schedule shown on the approved plans.
5. Replaced stone shall meet the stone requirements specified on the approved plans.

Comments:

Actions to be taken:

Post Construction Inspection and Maintenance Checklist
Bioretention/Rain Gardens

1. Embankment

(Frequency: Annual)	**Yes**	**No**	**NA**
a. Vegetation and ground cover adequate.	☐	☐	☐
i. Minimum 80% ground cover. *Maintenance: Topsoil, rake and seed bare areas. Replace dead and dying plants.*	☐	☐	☐
ii. Excessively tall grass (greater than 6" in height) *Maintenance: Mow grass to have a height of 4" to 6". Increase mowing frequency as necessary.*	☐	☐	☐
iii. Unauthorized plants. *Maintenance: Remove any unauthorized plants, including roots. Do not use herbicides. Topsoil, rake and seed the area disturbed by their removal.*	☐	☐	☐
b. Slope erosion.	☐	☐	☐
i. Small bare areas (min. 50 square feet). *Maintenance: Topsoil, rake and seed bare areas.*	☐	☐	☐
ii. Ruts less than 12" wide. *Maintenance: Prior to making any repairs, identify the source of erosion and correct. Protect the slopes prior to any work occurring. Backfill ruts and compact soil. Topsoil, rake and seed bare areas. Alternatively, hydroseeding can be used to seed the slope.*	☐	☐	☐
iii. Ruts greater than 12" wide. *Maintenance: Prior to making any repairs, identify the source of erosion and correct. Protect the slopes prior to any work occurring. Re-grade, backfill ruts and compact soil. Install erosion control mats on slopes 3:1 or steeper to protect the re-graded slope. Topsoil, rake and seed bare areas. Inspect on a weekly basis until 80% ground cover is achieved. Alternatively, hydroseeding can be used to seed the slope.*	☐	☐	☐
c. Uneven settling *Maintenance: Install permanent benchmarks or other permanent reference point in each practice to be used with as-built elevations to measure uneven settling.*	☐	☐	☐
i. Greater than 0" but less than 2" of settling. *Maintenance: No immediate action required. Re-inspect in 6 months.*	☐	☐	☐
ii. Greater than 2" but less than 4" of settling. *Maintenance: Immediately repair. Re-grade and compact the soil. Topsoil, rake and seed the area. Re-inspect in 6 months.*	☐	☐	☐

		Yes	No	NA
iii.	Greater than 4″ of settling. *Maintenance: Immediately stabilize the area and consult a NYS Licensed Professional Engineer within 2 weeks before making any additional repairs.*	☐	☐	☐
d.	Animal burrows. *Maintenance: Fill animal burrows with similar material to the existing material and compact. Rake and seed the area.*	☐	☐	☐
e.	Cracking, bulging, or sliding of slope.	☐	☐	☐
i.	Upstream face.	☐	☐	☐
ii.	Downstream face.	☐	☐	☐
iii.	At or beyond downstream toe.	☐	☐	☐
iv.	At or beyond upstream toe.	☐	☐	☐
v.	Emergency spillway. *Maintenance: Immediately stabilize the slope and consult an NYS Licensed Professional Engineer within 2 weeks before making any additional repairs.*	☐	☐	☐
f.	Seeps/leaks at downstream face. *Maintenance: Look for changes in the color of the vegetation, plant species and their density to help locate the leak source.*	☐	☐	☐
g.	Rip rap slope protection failure. *Maintenance: Stabilize slope, re-grade and compact the soil. Replace stone as necessary.*	☐	☐	☐
i.	Emergency spillway clear of any obstructions or debris. *Maintenance: Remove and properly dispose of any trash and debris. Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use any herbicides. Topsoil, rake and seed the disturbed area by their removal.*	☐	☐	☐

2. Inflow Points
(Frequency: Annual)

		Yes	No	NA
a.	Vegetation and ground cover adequate. *Maintenance: Reseed bare areas. Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use any herbicides. Topsoil, rake and seed the disturbed area by their removal.*	☐	☐	☐
b.	Free from erosion/undercutting. *Maintenance: Immediately stabilize and repair any areas where erosion around has occurred. Rake and seed the area. Seed mixture shall meet the seed mixture requirements specified on the approved plans.*	☐	☐	☐
c.	Rip rap in good condition. *Maintenance: Replace stone, as necessary.*	☐	☐	☐

Yes No NA

d. Pipes free from damage, corrosion, and sediment. ☐ ☐ ☐
Maintenance: Immediately repair any damaged pipes. If pipes are severely damaged and cannot be repaired, replace the pipes. Remove and properly dispose of any sediment.

3. Outlet Structure/Overflow Spillway (Frequency: Annual)

Yes No NA

- a. Outlet structure in good condition. ☐ ☐ ☐
  - i. In good condition, no need for repairs. ☐ ☐ ☐
    - a. Cracks or displacement ☐ ☐ ☐
      Maintenance: Repair any minor cracks or displacement. Replace structure if major cracks or displacement is observed.
    - b. Minor spalling (<1”). ☐ ☐ ☐
      Maintenance: Repair any minor spalling observed.
    - c. Major spalling (rebars exposed). ☐ ☐ ☐
      Maintenance: Replace structure.
    - d. Joint failures. ☐ ☐ ☐
      Maintenance: Replace structure.
    - e. Water tightness. ☐ ☐ ☐
      Maintenance: Reseal structure for water tightness if minor leaks are observed. Replace structure if significant leaks are observed.
  - ii. Clear of sediment. ☐ ☐ ☐
    Maintenance: Remove and properly dispose of any accumulated sediment when at 50% of sump height.
  - iii. Clear of debris and trash. ☐ ☐ ☐
    Maintenance: Remove and properly dispose of any debris and trash.
  - iv. Pipes free from damage, corrosion, and sediment. ☐ ☐ ☐
    Maintenance: Immediately repair any damaged pipes. If pipes are severely damaged and cannot be repaired, replace the pipes. Remove and properly dispose of any sediment.
- b. Overflow spillway ☐ ☐ ☐
  - i. In good condition, no need for repairs. ☐ ☐ ☐
    Maintenance: Replace stone, as necessary.
  - ii. Clear of sediment. ☐ ☐ ☐
    Maintenance: Remove and properly dispose of any accumulated sediment when half of the void space is filled.
  - iii. Clear of debris and trash. ☐ ☐ ☐
    Maintenance: Remove and properly dispose of any debris and trash.

	Yes	No	NA
iv. No evidence of erosion. *Maintenance: Immediately stabilize and repair any areas where erosion occurred around or below the overflow spillway. Replace stone, as necessary. Topsoil, rake and seed the area.*	☐	☐	☐
v. No evidence of erosion at downstream toe of drop structure or weir spillway. *Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and reseed.*	☐	☐	☐

4. Check Dams/Energy Dissipaters/Swales

(Frequency: Annual)	**Yes**	**No**	**NA**
a. Check Dams	☐	☐	☐
i. No evidence of sediment buildup. *Maintenance: Remove accumulated sediment behind dams when sediment depth is one-third the dam height.*	☐	☐	☐
ii. Stone in good condition. *Maintenance: Replace stone, as necessary.*	☐	☐	☐
iii. No evidence of erosion *Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and reseed area.*	☐	☐	☐
b. Energy Dissipaters	☐	☐	☐
i. No evidence of sediment buildup. *Maintenance: Remove and properly dispose of any accumulated sediment when half of the void space is filled.*	☐	☐	☐
ii. Rip rap in good condition. *Maintenance: Replace stone, as necessary.*	☐	☐	☐
iii. No evidence of erosion. *Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and reseed.*	☐	☐	☐
c. Swales	☐	☐	☐
i. No evidence of sediment buildup. *Maintenance: Remove and properly dispose of any accumulated sediment when the depth is 20% of swale design depth.*	☐	☐	☐
ii. No evidence of erosion. *Maintenance: Immediately stabilize. Backfill any ruts and compact the soil. Topsoil, rake and seed the area.*	☐	☐	☐

5. Sediment Forebay

(Frequency: Monthly)	**Yes**	**No**	**NA**
a. Free of sediment. *Maintenance: Remove and properly dispose of any accumulated sediment when at 50% of the design capacity.*	☐	☐	☐
b. No evidence of erosion. *Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Topsoil, rake and seed the area.*	☐	☐	☐
c. Overflow Spillway.	☐	☐	☐
i. In good working condition, no need for repairs. *Maintenance: Replace stone, as necessary.*	☐	☐	☐
ii. Clear of sediment. *Maintenance: Remove and properly dispose of any accumulated sediment when half of the void space is filled.*	☐	☐	☐
iii. Clear of trash and debris. *Maintenance: Remove and properly dispose of any debris and trash.*	☐	☐	☐
iv. No evidence of erosion. *Maintenance: Immediately stabilize and repair any areas where erosion occurred around or below the overflow spillway. Replace stone, as necessary. Topsoil, rake and seed the area.*	☐	☐	☐
v. No evidence of erosion at downstream toe of drop structure or weir spillway. *Maintenance: Immediately stabilize and repair any areas where erosion has occurred. Replace stone, as necessary. Topsoil, rake and seed the area.*	☐	☐	☐

6. Debris Cleanout

(Frequency: Monthly)	**Yes**	**No**	**NA**
a. Contributing areas clean of debris. *Maintenance: Remove and properly dispose of any trash and debris.*	☐	☐	☐
b. No dumping of yard wastes into practice. *Maintenance: Remove any yard wastes. Remind any maintenance personnel, landscapers, etc. to properly dispose of any yard wastes.*	☐	☐	☐
c. Clear of debris and litter. *Maintenance: Remove and properly dispose of any trash and debris.*	☐	☐	☐

7. Bioretention Basin Vegetation

(Frequency: Monthly)	**Yes**	**No**	**NA**
a. Plant height not less than design water depth of 3”. *Maintenance: Remove any plants that have heights less than 3”. Replace with plants specified on the approved plans that have a minimum height of 3”.*	☐	☐	☐
b. Plant composition according to approved plans. *Maintenance: Remove any dead or dying plants and decaying plant material. Replace dead and dying plants.*	☐	☐	☐
c. No placement of unapproved plants. *Maintenance: Remove any unauthorized plants or any nuisance weeds and vegetation, including their roots. Do not use herbicides.*	☐	☐	☐
d. Grass height not greater than 6”. *Maintenance: Mow grass. Increase frequency of mowing as necessary to keep grass heights less than 6”.*	☐	☐	☐
e. Sparse or bare vegetation in more than 10% of bioretention area. *Maintenance: Install replacement plants, as necessary. Topsoil, rake and seed the area.*	☐	☐	☐
f. Nuisance weeds or vegetation taking over more than 25% of the basin. *Maintenance: Remove any nuisance weeds and vegetation, including their roots. Do not use any herbicides. Topsoil, rake and seed the disturbed area*	☐	☐	☐
g. Mulch is in good condition and the appropriate thickness. *Maintenance: Replace decomposed mulch to the thickness shown on the approved plans.*	☐	☐	☐

8. Bioretention Basin Dewatering

(Frequency: Monthly)	**Yes**	**No**	**NA**
a. Dewaters between storms. *Maintenance: If filter bed is clogged or draining poorly, remove top few inches of discolored filter media. Rake the remaining material and replace the removed filter bed media.*	☐	☐	☐
b. No evidence of standing water 48 or more hours after a rainfall. *Maintenance: If standing water covers more than 15% of the planting bed 48 hours after a rainfall, remove top few inches of planting bed media. Rake the filter bed media to loosen the soil. Recheck after next rainfall event. If still not dewatering fully after 48 hours, remove and replace the entire filter bed media. If problem persists, contact a NYS licensed Professional Engineer.*	☐	☐	☐

Yes No NA

c. Underdrain present and no evidence of standing water 48 or more hours after a rainfall. ☐ ☐ ☐
Maintenance: Flush underdrain system to remove any trapped sediment. If no sediment is present, remove top few inches of planting bed media. Rake the filter bed media to loosen the soil. Recheck after next rainfall event. If still not dewatering fully after 48 hours, remove entire filter bed material and check the gravel drainage layer for clogging. Replace filter bed media and gravel drainage layer with new material. If problem persists, contact a NYS licensed Professional Engineer.

9. Bioretention Basin Filter Bed Integrity
(Frequency: Annual)

Yes No NA

a. Filter bed has not been blocked or filled inappropriately. ☐ ☐ ☐
Maintenance: Remove all blockages and inappropriate fill. Restore filter bed to elevation shown on the approved plans.

b. Filter bed flat and level. ☐ ☐ ☐
Maintenance: Remove all blockages, inappropriate fill, or accumulated sediment if present. Check embankment for differential settlement. If differential settlement is noted, refer to Item 1.c for maintenance procedures. If no differential settlement is noted, rake and level the planting bed media so that it is flat and level.

c. Uneven ponding. ☐ ☐ ☐
Maintenance: Remove all blockages, inappropriate fill, or accumulated sediment if present. Check embankment for differential settlement. If differential settlement is noted, refer to Item 1.c for maintenance procedures. If no differential settlement is noted, rake and level the planting bed media so that it is flat and level.

Notes:

1. The site must be returned to the approved conditions when any repairs are made.
2. Unauthorized plants are any plants that are growing or have been installed that are not any of the plants shown on the approved plans.
3. All seed mixtures shall meet the seed mixture requirements specified on the approved plans.
4. Replace any dead or dying plants with plants specified in the planting schedule shown on the approved plans.
5. Replaced stone shall meet the stone requirements specified on the approved plans.
6. Replaced filter bed media shall meet the filter bed media requirements specified on the approved plans.
7. Replaced gravel drainage layer shall meet the gravel drainage layer requirements specified on the approved plans.

Comments:

Actions to be taken: