Appendix A

Geomorphic Assessment Report
July 2013

Conesus Lake Streambank Remediation Project
Livingston County, New York

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Prepared For:

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1.0 Introduction

As part of the larger effort to develop and implement projects intended to promote stream channel stability and remediate existing erosion issues within select segments of tributaries to Conesus Lake, Barton & Loguidice (B&L) conducted geomorphic assessments of seven designated project reaches on five of the streams draining to the lake: Wilkins Creek (Phase I and II); Densmore Creek (Phase I); North Gully Stream (Phase I); North Macmillan Creek (Phase I); and Long Point Creek (Phase I and II). Objectives of the geomorphic assessments were to provide firsthand familiarity with the form, function and processes associated with each reach, identification of specific erosional areas and features consistent with channel instability, and a general evaluation of channel position within the drainage landscape.

Data collected during the course of each assessment included survey of cross-sections and longitudinal profiles. This information is used to quantify channel form and to define hydraulics of the existing channel based upon its physical form. When coupled with pebble count and bar sampling data collected from each respective reach (which defines the existing sediment load), the data collected in this effort is used to evaluate sediment transport competency through each reach. Understanding the sediment transport regime, both in its existing and potential ("restored") condition, is a key component to designing remediation solutions that address the root processes affecting accelerated erosion. Process-based remediation projects that address channel instability and erosion issues at the systemic scale provide greater benefit, increased longevity and reduced need for maintenance over time than more localized projects that frequently attempt to address erosion symptoms in a piecemeal fashion.

The contents of this report provide a discussion of the geomorphic processes behind the ongoing erosion issues within each designated project reach, as well as a description of the existing physical character of each of these stream system through a broader lens. Data collection results are provided, along with maps supporting the data collection efforts. Photographs of each reach are provided, along with a map indicating the location and directional orientation of each photograph.

2.0 Overview of the Project Area

Conesus Lake drains a basin of slightly more than 70 square miles. The drainage pattern of the basin is dominated by the Lake proper, which occupies approximately 5.3 square miles. Topography surrounding the lake consists of a well-defined, low-gradient lake plain, which transitions outward and somewhat abruptly to an upland escarpment which generally surrounds the lake. The elevation of this escarpment, where the headwaters of the tributary streams feeding the lake are formed, varies in elevation from approximately 200 feet to more than 600 feet above the elevation of the lake. The geomorphic position of the project reaches in relationship to the transition in topographic relief that occurs between the steeper, higher elevation portions of the lake basin and the flatter lake plain contributes greatly to the existing condition of the project reaches, in terms of their physical characteristics, influencing processes, and degree of departure from the stable channel condition.

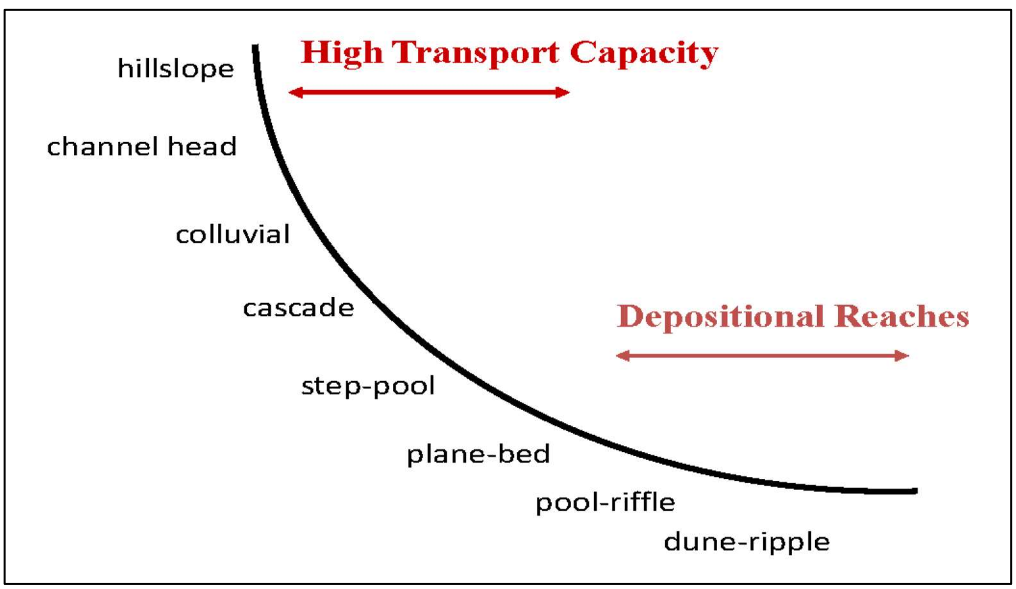


Figure 1. Reduction in channel slope from headwaters to mouth initiates changes in stream type (in terms of streambed and energy dissipation features) and a reduction in sediment transport energy. These changes are evidenced by an overall shift in channel process from erosional (degrading) to depositional (aggrading) as one proceeds downstream, along with an increase in channel sinuosity and lateral meander migration, and decrease in bed particle size.

The entire study area is located within the extreme northern limits of the Southern New York Section of the Appalachian Plateau Physiographic Province. Topographic relief across the region is strongly influenced by dissection of the plateau by numerous streams and rivers. Glacial action has advanced this action quite extensively during episodic advances and retreats of ice sheets over the geologic past. Today, the Finger Lakes (including Conesus Lake) occupy the long, narrow, U-shaped glacial troughs that formed as the ice moved across the northern limit of the plateau.

3.0 Field Assessments and Results

3.1 Wilkins Creek – Reach Description

The assessed reach of Wilkins Creek encompasses two distinct, adjacent stream segments being administered by the Livingston County Planning Department under Phase I (upstream reach) and Phase II (downstream reach) of the current Streambank Remediation Engineering project. The Phase I reach is located entirely within the Village of Livonia property, and extends approximately 543 feet from the upstream limit downstream to the border with the Town of Livonia. The entire Phase I reach is located within Livonia Village Park.

Wilkins Creek within the Phase I reach is as a B4c-type channel an average channel (bankfull) width of 14.5 feet. Upstream of the park entrance road, the stream exhibits a well-defined riffle/pool sequence and stable bed and bank features. Areas of high erosion potential or evident erosion issues upstream of the park entrance road (~station 03+28) are limited to the right bank between stations ~0+80 – 01+15, where removal of riparian vegetation and active mowing up to the stream edge has allowed for rapid undercutting and slumping of the bank. Placement of large riprap along the toe of both banks up to the floodplain elevation has effectively prevented bank erosion through the remainder of the stream corridor upstream of the park entrance road. Riparian vegetation is well-established along the entire left bank and portions of the right bank upstream of the tributary entering at station 01+37, dominated by such shrub species as dogwood, multiflora rose and honeysuckle. Downstream of the tributary, the riparian buffer is greatly depleted through the entire park area, with the exception of some trees and herbaceous vegetation that exists downstream of the park entrance road, primarily along the right bank.

Downstream of the park entrance the Wilkins Creek channel exhibits more pronounced signs of instability, primarily through the incised/entrenched nature of the channel and evidence of rapid erosion along both streambanks. Installation of a grouted riprap apron at the outlet of the culvert carrying the entrance road points to past scour control issues downstream of the culvert, which resulted in downcutting of the adjacent downstream segment. Although the scour issue immediately downstream of the culvert has been remediated by installation of the grouted rock apron, the streambanks downstream of the outlet remain excessively steep, poorly vegetated, and highly prone to frequent bank erosion. The incised and entrenched condition of the channel downstream of the culvert disconnects the stream from its floodplain, resulting in higher flow velocities when in flood and a greater bank erosion hazard. Delivery of sediment derived from extensive bed and bank erosion within this segment to the next downstream portion of Wilkins Creek (Phase II) has contributed greatly to the destabilization of that reach over time.

Figure 2. The Phase I (upstream) reach of Wilkins Creek exhibits good floodplain connectivity, well-armored streambanks, and little evidence of erosion problems.

Geomorphic assessment of the upper (Phase I) reach was conducted on December 5, 2012. Field assessment included photo documentation of existing site conditions, survey of longitudinal channel profile and cross sections, and collection of pebble count data. Site photographs and results of data collection are included in Appendix A – *Wilkins Creek (Phase I) Assessment Data – Existing Conditions*.

The Phase II reach of Wilkins Creek begins at the Town/Village of Livonia boundary (lower end of Livonia Village Park) and extends 1,825 feet downstream to the crossing of Pennemite Road. Due to the lack of landowner permission to access a portion of this reach at the time the assessment was conducted, fieldwork was limited to the first 875 feet of the Phase II reach, extending downstream from the Town/Village of Livonia boundary. Overall combined length of the Phase I and Phase II reaches of Wilkins Creek administered under this Streambank Remediation Engineering project is 2,368 feet. Geomorphic assessment was conducted through the uppermost 1,418 feet of the combined Phase I/II stream segment. Assessment of the Phase II reach is currently incomplete, pending permission from the landowner to access the remaining 950 feet of the reach extending downstream to Pennemite Road. For the sake of continuity, survey stationing for the Phase II reach of Wilkins Creek is continued from the stationing system established during geomorphic assessment of the Phase I reach immediately upstream (for example, the upstream limit of the Phase II reach begins at station 06+58 and extends downstream to station 14+18).

Figure 3. Convergent flow through the tortuous meanders found within the Phase II reach of Wilkins Creek leads to accelerated lateral channel migration and rapid erosion of the affected streambanks.

The principal stressor upon channel morphology through the Phase II reach of Wilkins Creek is the deposition of sediment derived from erosion of bed and banks through the adjacent upstream reach (specifically the portion of the stream immediately downstream of the park entrance road). The physical condition of the reach is typified by the presence of large depositional features within the active bankfull channel, and areas of localized convergent flow associated with highly-tortuous channel meanders. These meanders show evidence of rapid outward migration, as indicated by the deteriorating condition of the high, steep, poorly-vegetated and eroding streambanks associated with each. The degree of divergence from the stable condition is very high through this reach, as the increased sinuosity of the channel now promotes unchecked meander migration and subsequent high rates of bank erosion at the outside of meanders. The potential for this reach to recover naturally over time is extremely low, and would require substantial amounts of additional bank erosion until such time as the channel was able to “cut off” its meanders altogether and return to a more stable, less sinuous pattern (planform). The potential to advance this process and reestablish a stable channel planform through this reach offers much potential as a restoration approach. Valley relief through the assessed length of the Phase II reach lends itself well to reconnection of extensive floodplains, which would aid very much in the success of a planform restoration project.

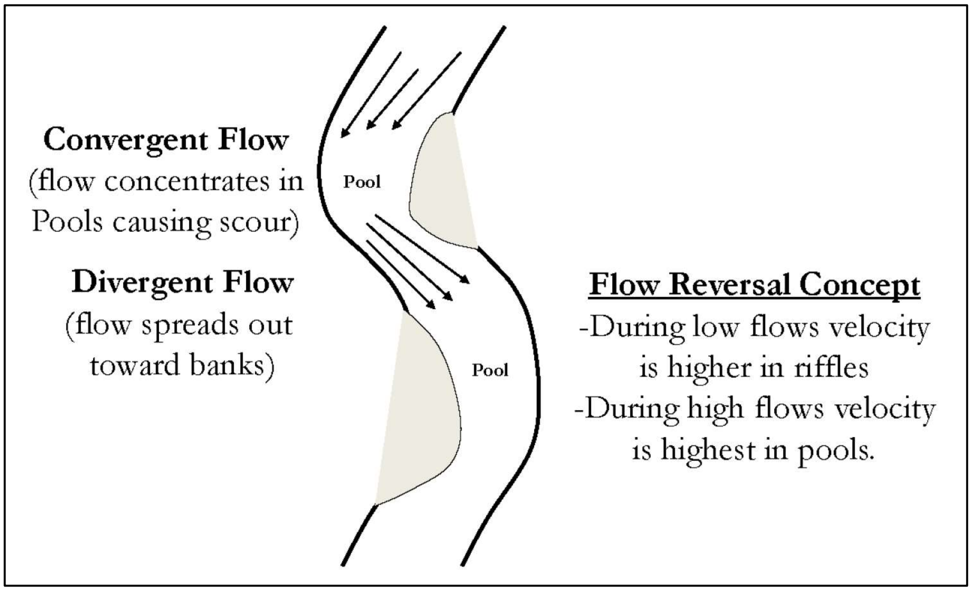


Figure 4. Convergent flow through meander pools is a typical aspect of stable channel process. The impact of convergent flow through meander pools becomes problematic when excessive bed scour and/or aggrading skews the stable channel form, heightening the degree of convergence through meander pools as channel sinuosity becomes more tortuous.

Geomorphic assessment of the Phase II reach of Wilkins Creek was conducted on December 5 & 6, 2012. Field assessment included photo documentation of existing site conditions, survey of longitudinal channel profile and cross sections, and collection of pebble count data. Site photographs and results of data collection are included in Appendix B – *Wilkins Creek (Phase II) Assessment Data – Existing Conditions*.

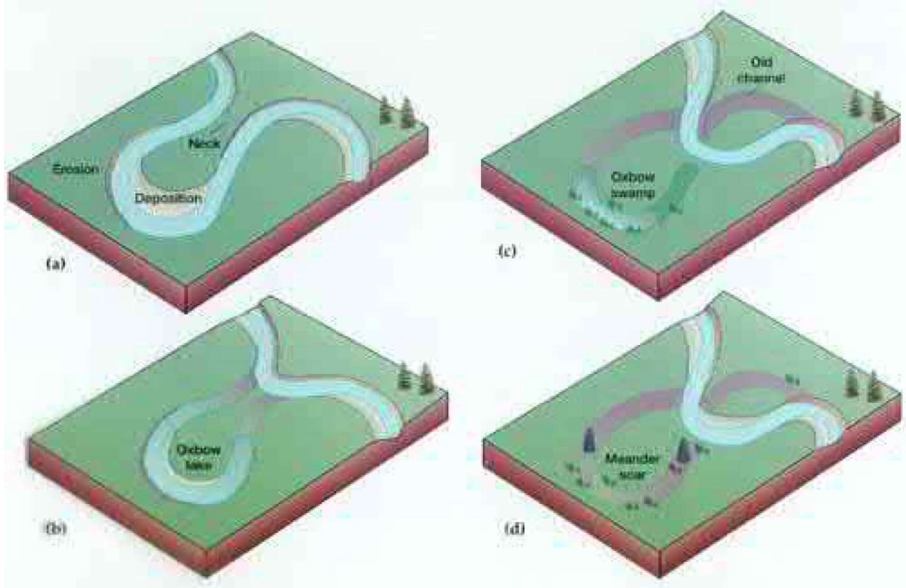


Figure 5. Common processes involved in the dissection of channel meanders and formation of oxbows.

3.2 Densmore Creek – Reach Description

The assessed reach of Densmore Creek (Phase I) extends a distance of 749 feet along the northern edge of Cleary Road. The reach is located entirely within the Town of Livonia.

The physical character of this reach is typified by a high-gradient (slope~ 3.3%), highly sinuous B4/F4b channel with a mean channel width of 21.4 feet. Lateral migration of the two primary meanders within this reach has resulted in accelerated erosion of the roadway bed, which lies immediately to the south of the stream course. The channel is moderately entrenched through the one-third of the reach. This segment is classified as a Rosgen-type “F” channel, exhibiting a high width/depth ratio, high degree of entrenchment and a disconnected floodplain. The remaining two-thirds of the reach upstream still maintains effective connectivity with its floodplain, although the outside meander banks are high, steep, and in most instances are undercut. This condition attributes to the continued erosion of streambanks during high flow events.

Figure 6. The project reach of Densmore Creek is typified by the widespread erosion of high and steep streambanks along the outside of meander bends, including encroachment upon the embankment supporting Cleary Road.

Based upon the results of the geomorphic assessment of this reach and observations on existing channel slope, planform, and associated sediment transport potential, it is likely that the existing channel is far too sinuous given the existing channel slope (~2.3%). Evaluation of the existing bed particle distribution (pebble count data) indicates that the relatively high sediment transport capacity of this reach is contributing to the rampant erosion of streambanks, particularly when coupled with the tortuous meanders and corresponding areas of convergent flow that accelerate lateral migration of the meander bends. A reduction in channel sinuosity, minimizing areas of concentrated convergent flow and coupled with reductions in the height and steepness of outside meander banks would potentially provide a viable restoration option for this impaired reach.

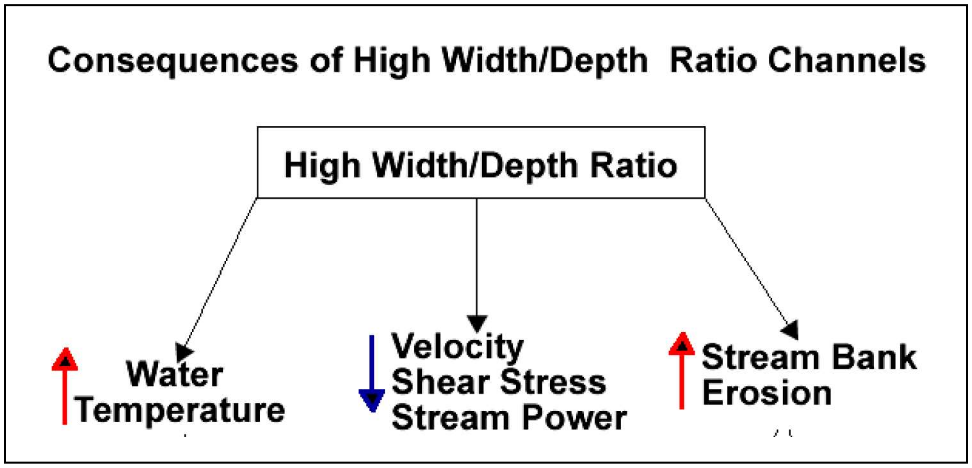


Figure 7. As the ratio of bankfull width to depth increases, the channel cross-section broadens and flattens. This aggrading condition translates to a reduction in channel slope and subsequent reduction in velocity, bed shear and sediment transport capability, which in turn promotes an increase in channel sinuosity. The increase in sinuosity is expressed through accelerated lateral migration of the stream channel and erosion of streambanks.

Geomorphic assessment of the Phase I Reach of Densmore Creek was conducted on December 5, 2012. Field assessment included photo documentation of existing site conditions, survey of longitudinal channel profile and cross sections, and collection of pebble count data. Site photographs and results of data collection are included in Appendix C – *Densmore Creek (Phase I) Assessment Data – Existing Conditions*.

3.3 North Gully Stream – Reach Description

The assessed reach of North Gully Stream (Phase I) begins at the upstream face of the East Lake Road bridge and extends upstream a distance of 655 feet. The reach is located entirely within the Town of Livonia.

The physical character of this reach is typified by a moderate-gradient (slope = 2.0%) Rosgen C3-type channel with a mean channel width of 15.5 feet. The upper 100 feet of the channel is pinned against the northern wall of the valley, and in flood erodes the toe of a very high (>35 feet) and steep bank. Erosion at the toe of this bank continually destabilizes the face of the bank, which is poorly vegetated and has been observed to fail with frequent regularity, contributing appreciable amounts of sediment to the stream system.

There is some evidence that suggests that in the past, the lower portion of this reach may have been relocated away from the northern valley wall to its current location. This work would have entailed creation of the tortuous meanders that now exist immediately upstream of the bridge at East Lake Road, as the stream course possibly was moved to the south to allow for construction of the residential property in its current location (labeled as "St. Michaels Chapel" on older USGS maps).

Figure 8. Mass wasting of this high bank represents a significant sediment source within the upper portion of the North Gully project reach.

While the outside meander banks immediately upstream of the bridge have been armored with heavy rock and exhibit little in the way of visible erosion, significant lateral channel migration above this area is resulting in rapid bank erosion. Lateral migration of two substantial meanders through the middle half of the reach (stations ~02+70 through ~04+35) results in significant bank undercutting and erosion. Continued streambank erosion in the vicinity of station 02+70 poses an eventual risk to the integrity of the gravel driveway that represents the sole connection between the landowner's residence and East Lake Road. Rapid erosion of the next downstream meander bend (in the vicinity of station 04+35) over time will threaten the safety of the residential property positioned to the north of the stream along East Lake Road. The accelerated rate of erosion and continually-deteriorating condition of these rapidly-eroding banks is complicated by the tortuous nature of the meanders through this middle portion of the reach, and the impact of concentrated convergent flow which occurs through these meanders when in flood. Given the flood velocity and corresponding erosion hazards through the lower portion of the reach, restoration of stable channel planform should be a primary component of any restoration approach to be considered for this reach. At a minimum, toe protection and reduction of bank angles through grading and revegetation of the currently eroding banks is recommended as a remediation approach.

Geomorphic assessment of the Phase I Reach of North Gully Stream was conducted on January 11, 2013. Field assessment included photo documentation of existing site conditions, survey of longitudinal channel profile and cross sections, and collection of pebble count data. Site photographs and results of data collection are included in Appendix D – *North Gully Stream (Phase I) Assessment Data – Existing Conditions*.

3.4 North Macmillan Creek – Reach Description

The assessed reach of North Macmillan Creek (Phase I) begins at the downstream face of the East Lake Road bridge and extends downstream a distance of 2,670 feet (0.5 mile). This reach encompasses the entire Phase I project reach (which begins at station 02+70 of the longitudinal profile survey), and includes an additional 270 feet immediately upstream. This stream segment was included for the purpose of providing background mapping and baseline information regarding existing stream conditions, should any future restoration/remediation work be extended upstream to include stream channel and/or bank work in the vicinity of the East Lake Road Bridge. The assessed reach is located entirely within the Town of Conesus.

Figure 9. The Phase I reach of North Macmillan Creek exhibits high rates of bank erosion associated with outside meander banks.

The physical character of this reach is typified by a low-gradient (slope = 0.8%), Rosgen F4-type channel with a mean channel width of 30.0 feet. The assessed reach exhibits striking evidence of the impacts to channel form and function that result from the deposition of excessive amounts of sediment and debris delivered from high-transport reaches further upstream through the steeper portions of the watershed. The cumulative impact of these localized erosional areas likely scattered through the steeper, higher-transport upper reaches of North Macmillan Creek result in rampant aggrading of the project reach, which is positioned on the lower-gradient lake plain (as evidenced by the project reach bed slope of < 1.0%). Large-scale and widespread deposition of sediment through the assessed reach of North Macmillan Creek has resulted in a dramatic reduction in channel slope, an increase in width/depth ratio, and increased lateral channel migration and subsequent accelerated erosion of streambanks. Observational evidence suggests that this reach is highly dynamic, in that changes in channel morphology occur regularly in response to high flow events. These changes are most often expressed by development of new, or extension of existing scour and depositional bed features and progressive erosion of streambanks, particularly along the outside of meanders where convergent flow is most concentrated when in flood.

Figure 10. Progressive lateral migration of meanders in the vicinity of Dacola Shores Road poses imminent risk to the roadway, nearby homes and other structural elements.

The extent to which channel morphology within the project reach has deviated from the stable channel form makes natural recovery of this reach, or even partial recovery with the assistance of localized bank protection measures, very unlikely over the long-term. Full-scale restoration of stable channel dimension, pattern, and planform would be required in order to provide any long-term remediation. Given the extent to which this reach is impacted by the deposition of sediment delivered to it from erosional areas much further upstream in the watershed, it is recommended that this work not be undertaken until some larger-scale project is initiated to address erosional areas further upstream that represent the root cause of the problem. Only after these causative upstream erosional areas are addressed can a long-term project aimed at remediating issues within the aggrading downstream (Phase I) reach be pursued with any reasonable expectation of long-term success. There are portions of the reach in the vicinity of stations 16+00 through 21+50 where multiple infrastructure elements (homes, sheds, utility poles, and a portion of Dacola Shores Road) are at significant risk due to the extent of bank erosion through this area. The potential for the existing channel meanders in this area to continue to migrate outward toward these structures is very high, and should be addressed by some type of short-term stabilization of this area while a more comprehensive, systemic-scale solution is pursued. Bank pins have been installed in this area, and are currently being utilized to monitor the rate of bank migration.

Geomorphic assessment of the Phase I Reach of North Macmillan Creek was conducted on January 9 & 10, 2013. Field assessment included photo documentation of existing site conditions, survey of longitudinal channel profile and cross sections, and collection of pebble count data. Site photographs and results of data collection are included in Appendix E – *North Macmillan Creek (Phase I) Assessment Data – Existing Conditions*.

3.5 Long Point Creek – Reach Description

The assessed reach of Long Point Creek (Phase II) begins at the mouth of the stream at Conesus Lake and extends upstream a distance of 2,111 feet (0.4 mile). This reach encompasses the entire Phase II project reach, which is located entirely within the Town of Geneseo.

Although administered for the purposes of this Streambank Remediation project as one entire reach, the conditions observed upstream and downstream of West Lake Road (which bisects the project reach near station 12+00) warrant separate discussions of each. The physical character of the upper Long Point

Creek reach extending 1,200 feet upstream of West Lake Road is typified by a moderate-gradient (slope= 2.1%) Rosgen F4-type channel with a mean channel width of 32.8 feet flowing through an undisturbed area of mature second-growth forest. This portion of the channel exhibits signs of progressive channel evolution, as evidenced through consecutive periods of downcutting, widening, aggrading, and lateral shifting.

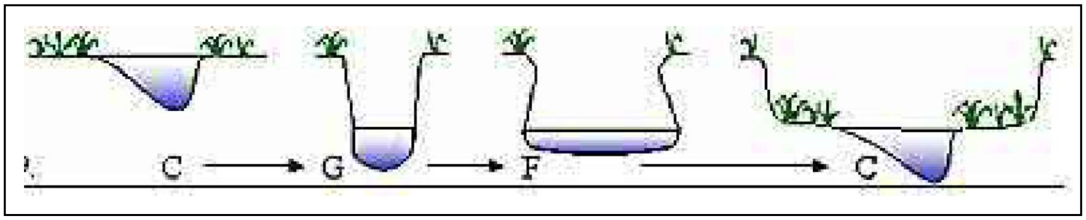


Figure 11. A graphic representation of the stream channel evolution model, illustrating the natural progression of a stable "C"-type channel. Natural channel restoration provides a means to advance impaired "G" and "F" channels to the stable end form, avoiding the extensive bed and bank erosion that would otherwise occur if the channel were allowed to evolve on its own over a very long period of time.

This evolution process is being perpetuated by up-gradient erosion and transport and subsequent downstream aggrading as a result of extensive deposition of sediment delivered from upstream sources. The assessed reach upstream of West Lake Road (approximately 1,200 feet in length) is bound nearly its entire length on both sides by steep, poorly-vegetated and actively eroding banks ranging from 3 feet to nearly 30 feet in height. The laterally-confined streambed shows signs of continual sediment aggrading and a lack of sufficient transport capacity, as indicated by the formation of extensive side-channel deposition bars and subsequent undercutting of opposing streambanks. The middle portion of this upper reach is occupied by a highly-tortuous "S"-shaped meander curve, which exhibits undercut banks and formation of well-established side-channel depositional bars (outside of those areas exposed to the highest shear when in flood). This reach acts both as an area of symptomatic channel instability (primarily due to its location in the transitional zone between high-gradient escarpment and low-gradient lake plain) and as a source of sediment to adjacent downstream reaches and to Conesus Lake as a result of widespread bank erosion occurring through the upper reach commensurate with the advance stages of channel evolution occurring there. A successful option for remediation would include approaches that essentially “fast-forward” the evolutionary process to a position of greater channel stability (such as natural channel restoration), effectively eliminating the time and extensive amounts of bank erosion and sedimentation required for the channel evolution process to progress to that point on its own.

Figure 12. Much of the upper portion of Long Point Creek exhibits extensive lateral gravel bars and significant erosion of the opposing bank, perpetuated mainly through cutting of the bank toe as the channel migrates laterally.

Downstream of West Lake Road, the nature of Long Point Creek changes significantly. The entire lower reach of Long Point Creek from the road crossing downstream to the mouth (a distance of approximately 900 feet) has been substantially altered and modified over time by man. Direct perturbations to the channel include installation of a grouted rock sill to prevent bed scour at the outlet of the West Lake Road culvert, relocation and straightening of the channel, removal of the riparian buffer, and armoring of banks with various revetments ranging from riprap and stacked stone to gravel-filled drums and timber retaining walls. These activities are linked to the construction of multiple residences, sheds, and other structures in close proximity to both streambanks, laterally confining the stream channel from the vicinity of station 15+25 downstream to the mouth. Lateral confinement of the channel in the way of buildings and other structures significantly limits the type and extent of remediation alternatives that can be pursued through this extreme lower reach of Long Point Creek.

Figure 13. The lower portion of Long Point Creek has been straightened and deepened, and is laterally confined by various constructed bank revetments intended to resist the natural process of the stream to regain stable meander geometry. Close proximity of homes and other structures to the edge of the stream greatly limit the opportunity to implement comprehensive stream stabilization measures through this reach.

Stable channel function is subsequently altered as a result of modifications to the stream channel and adjacent floodplain/overbank areas through this lower reach of Long Point Creek. Due in part to the drastically-reduced channel gradient between the bridge crossing and the mouth at Conesus Lake (channel slope <1.0%), sediment transport through this reach is nearly nonexistent. As is common and natural to very low-gradient stream reaches such as this, located just upstream of the mouth upon the relatively flat lake plain, this reach of Long Point Creek is prone to channel aggrading in response to the deposition of excessive amounts of sediment delivered from higher-transport reaches upstream through the watershed. Consequentially, the lateral migration of streambanks that occurs in response to channel aggrading presents a long-term challenge that will require continued maintenance and upkeep of the bank revetment measures currently in place. In areas where no bank revetment currently exists (such as in the vicinity of station 14+50), this process of lateral migration and bank erosion is evident along a portion of the left bank, where the stream is beginning to erode a portion of the bank that supports the gravel driveway that serves the buildings located along the north bank of the stream.

Geomorphic assessment of the Phase II Reach of Long Point Creek was conducted on October 11, 2012. Field assessment included photo documentation of existing site conditions, survey of longitudinal channel profile and cross sections, and collection of pebble count data. Site photographs and results of data collection are included in Appendix F – *Long Point Creek (Phase II) Assessment Data – Existing Conditions*.

Appendix A

Wilkins Creek (Phase I) Assessment Data
Existing Conditions

Appendix B

Wilkins Creek (Phase II) Assessment Data
Existing Conditions

Appendix B

Wilkins Creek Reconnaissance Memo
June 2015

MEMORANDUM

Memo to: Heather Ferrero, AICP
Deputy Planning Director
Livingston County Planning Department

Date: June 1, 2015

From: Shaun P. McAdams – Project Environmental Scientist

Barton & Loguidice, D.P.C.

File: 338.003.001

Subject: Initial Reconnaissance of Wilkins Creek reach downstream of East Lake Road (County Route 6)

On Monday, April 6th I had the opportunity to investigate the portion of Wilkins Creek extending from the bridge at East Lake Rd. downstream to the culvert at Wilkins Tract Rd. a distance of approximately 1,020 feet. The purpose of this initial reconnaissance was threefold:

1.) Evaluate the extent of streambank erosion along this reach, as well as provide a cursory evaluation of channel stability based upon visual observations;
2.) Identify any existing conditions or evidence of past impacts contributing to streambank erosion and/or channel instability, or lending to the likelihood of continued deterioration of streambank conditions in the future, and;
3.) Evaluate opportunities for effective erosion remediation or channel stabilization projects along this stream reach.

In walking this reach, it was evident that the primary areas of bank erosion are found along the left (in this case south) bank where the stream is pinned against the toe of a relatively high embankment (~10-15 feet in height). Through the upper half of the reach, both streambanks are affected by erosion at the toe of slope, and subsequent steepening and slumping of the streambank occurs. Because the south bank is higher, the extent of streambank erosion is greater there. Just the same, the process of stream downcutting (degrading) affects the stability of both streambanks. This condition is exacerbated by lack of a substantial riparian buffer, particularly in the near bank area (Riparian Zone 1) along the right bank. Further downstream, where the stream exhibits a more appropriate sinuosity (likely more indicative of historic alignment) the stream is well-connected to its floodplain and streambank erosion is much less significant.

Existing conditions along the upper half of this reach show some evidence of historic channel relocation and straightening. It appears the channel had previously been redirected from its original alignment to a new location pinned against the embankment to the south. In this location, the channel was likely straightened and dredged to reduce sinuosity and make the adjacent floodplain area to the north more suitable for agriculture (or later for development). Straightening of the channel has resulted in higher flood velocity and subsequent erosion of the high bank along the south side of the stream. Increased flood velocity promotes downcutting of the channel through this section, destabilizing both streambanks.

Evidence of the likely relocation and channelization of this reach, and subsequent downcutting and incision of the channel, includes visible scour and channel degrading immediately downstream of the culvert under CR 6. In addition, local topography along this section of the stream reflects movement of the stream from a location now occupied by a residential lawn to its current location, with subsequent construction of a berm along the realigned portion or the stream (likely built of gravel and sediment side-cast from excavation of the new stream channel).

Continued downcutting of the channel in this reach is also evidenced by the predominance of finer (smaller-grained) bed materials, which occurs due to the increased transport competence associated with this straightened and channelized stream segment. Because straightening and incision of the channel results in loss of floodplain connectivity and allows for increases in both flood velocity and stream power, the larger gravels and small cobbles observed within the more stable stream segments upstream and downstream are readily moved through this reach, leaving behind only finer sediments that are deposited as flood waters recede. Additionally, piles of cobbles and small boulders were observed along the stream, where they had evidently been removed from the stream by the landowner and stockpiled, or used as ornamental landscape elements. Because these large rocks provide flow resistance and grade control within the stream, their removal exacerbates the rate and extent to which the streambed is able to downcut when in flood. Again, as bed elevation is continually lowered, vertical stability of the streambanks is lost, making them more prone to failure, mass-wasting, and erosion.

Quality of the riparian buffer is relatively poor through this reach. The landowner adjacent to the north bank of the stream appears to routinely maintain the vegetation along the edge of the creek, and so while scattered larger trees are available, there are large portions of streambank that lack substantial root mass. These areas are especially prone to accelerated bank erosion.

Approximately 550 feet downstream of East Lake Road, the stream has formed an avulsion or “chute-cutoff” by partially abandoning the more sinuous primary channel during high flows, cutting straight across the toe of the high bank. The vicinity of this avulsion represents the most prominent area of streambank erosion along this reach. This feature is likely a consequence of the straightened and incised condition of the channel immediately upstream. Because flood flows are confined within the channel without adequate access to the adjacent floodplain, flow velocities are increased. This exudes a high degree of shear stress on the left bank at the entry of the meander, leading to failure of the bank in this location and formation of a 'shortcut' across the meander.

Remediation Options

The two factors contributing most to erosion of streambanks through this reach are the straightened nature of the channel and the lack of adequate floodplain access along the 600 feet of stream channel immediately downstream of East Lake Road. Any sustainable approach to reducing the potential for bank erosion should, at the very least, provide for reconnection of the stream to its adjacent floodplain, even if a more stable sinuosity cannot be returned to the channel due to potential impacts to adjacent properties. Elimination of the incised condition of the channel, namely through lowering of the adjacent bank/floodplain elevation along the right (north) bank, would reduce bank height and bank angle, and would result in lowering of flood velocity. Erosion along the higher and steeper south bank could be reduced through construction of a floodplain bench with armored toe along the lower portion of that bank. In order to maintain stable channel cross-section geometry, construction of a bench would need to be accompanied with a lateral shift of the existing channel to the north.

Any project undertaken through this reach should include measures to reduce or eliminate the incised condition. Simply armoring the banks in place would provide protection along the bank toe, but would not address further downcutting of the channel. Furthermore, addition of rock material to the channel would further reduce cross-sectional area, elevating flood velocity and contributing to consequential issues downstream of the treated reach.

If agreement could be gained from landowners along this reach, namely the property along the north bank, a restoration approach that returned a more sinuous plan form to the channel would provide great benefit in reducing the erosion potential and the associated impact to downstream properties. Increasing sinuosity, along with restoring floodplain connectivity and establishing a healthy riparian buffer, would sufficiently reduce bank erosion hazard (a measure of susceptibility to erosion), prevent further channel downcutting (which leads to loss of vertical stability along the streambanks), and reduce flood velocity through this reach. This combined approach would offer the most effective and sustainable means to limiting erosion and improving the function and character of this stream reach.

Figure 1. View upstream from East Lake Road, depicting stable channel cross-section, adequately-sized bed material, well-connected and vegetated floodplain (riparian buffer) and minimal bank erosion.

Figure 2. View facing downstream just below the East Lake Rd. Bridge. Retaining wall construction and filling of floodplain leads to channel confinement and increased flood velocity, contributing to erosion of the right bank immediately downstream.

Figure 3. Bank erosion evident immediately downstream of the rock retaining wall, exacerbated by increased velocity and lack of floodplain access.

Figure 4. View facing downstream along right (north) bank (stream is located to the left of the photo). The higher ground in the center is likely the result of a berm constructed when the stream was relocated from the lower area to the right to its present position.

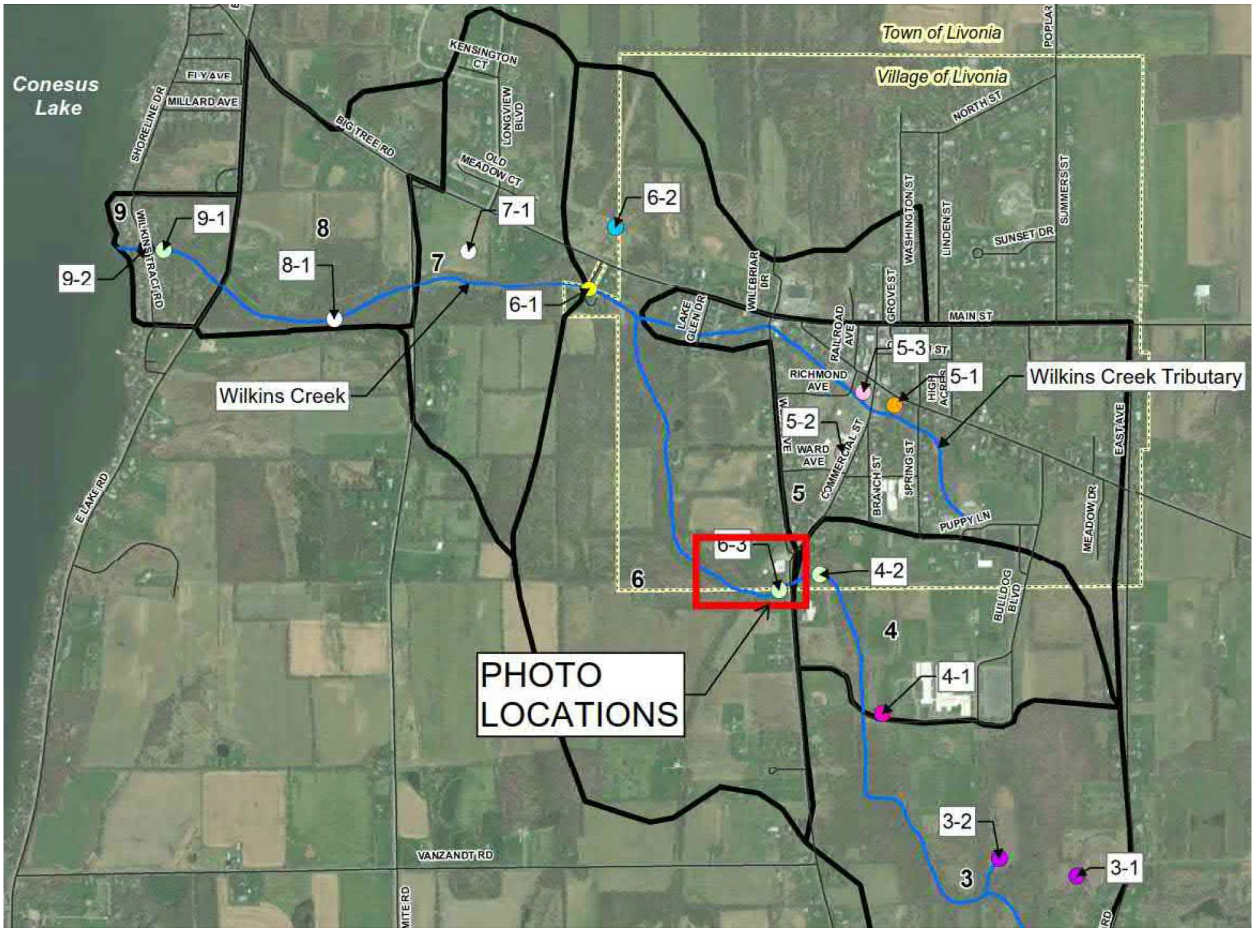
Figure 5. View facing upstream of the avulsion, or "chute-cutoff" across the first meander downstream of the straightened segment. High velocity flows from the steepened and confined channel upstream led to failure of the left bank at the head of this meander, leading to a split from the primary channel (which flows from left to right under the fallen log in the foreground of this photo).

Figure 6. Despite the absence of a riparian buffer, the lower portion of the reach immediately above the culvert on Wilkins Tract Road shows minimal bank erosion, due to a well connected floodplain and stable planform (sinuosity).

Appendix C

4212 South Livonia Road
Property Owner's Photographs

PHOTOGRAPH LOCATIONS (see map below):



Stream 2013

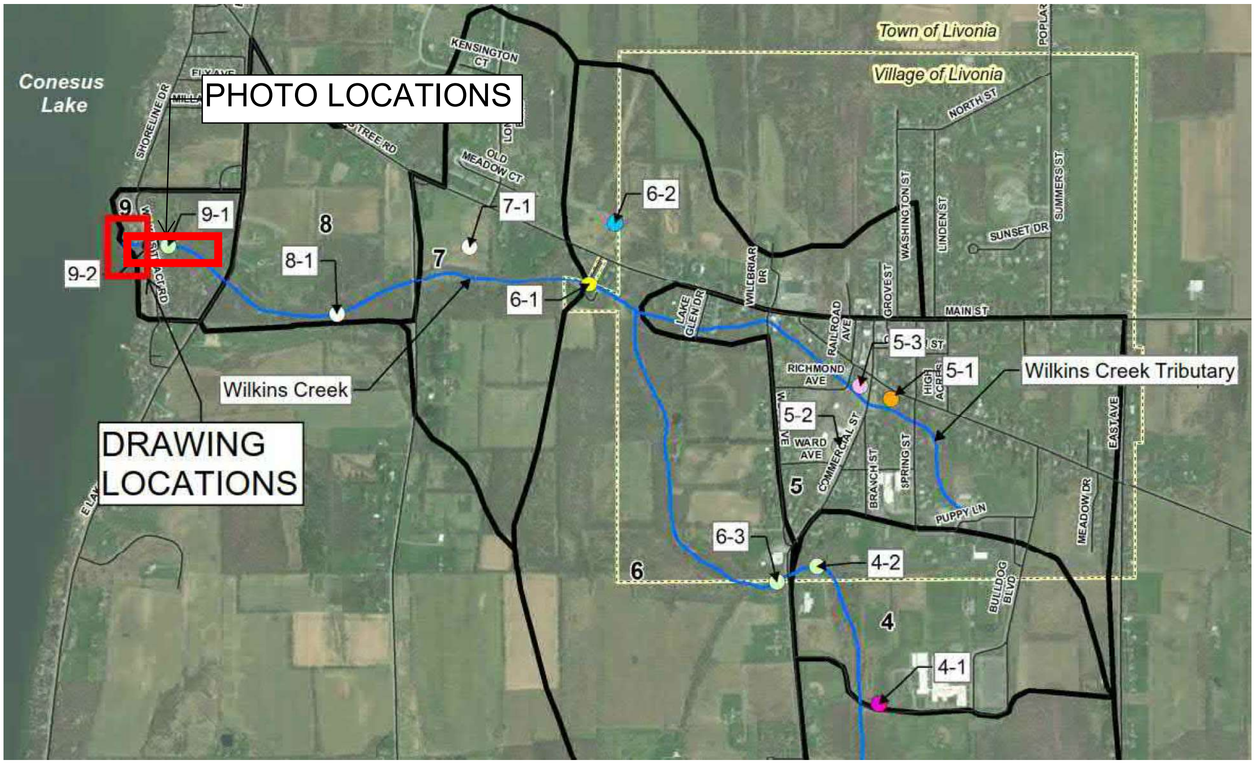
Stream 2013

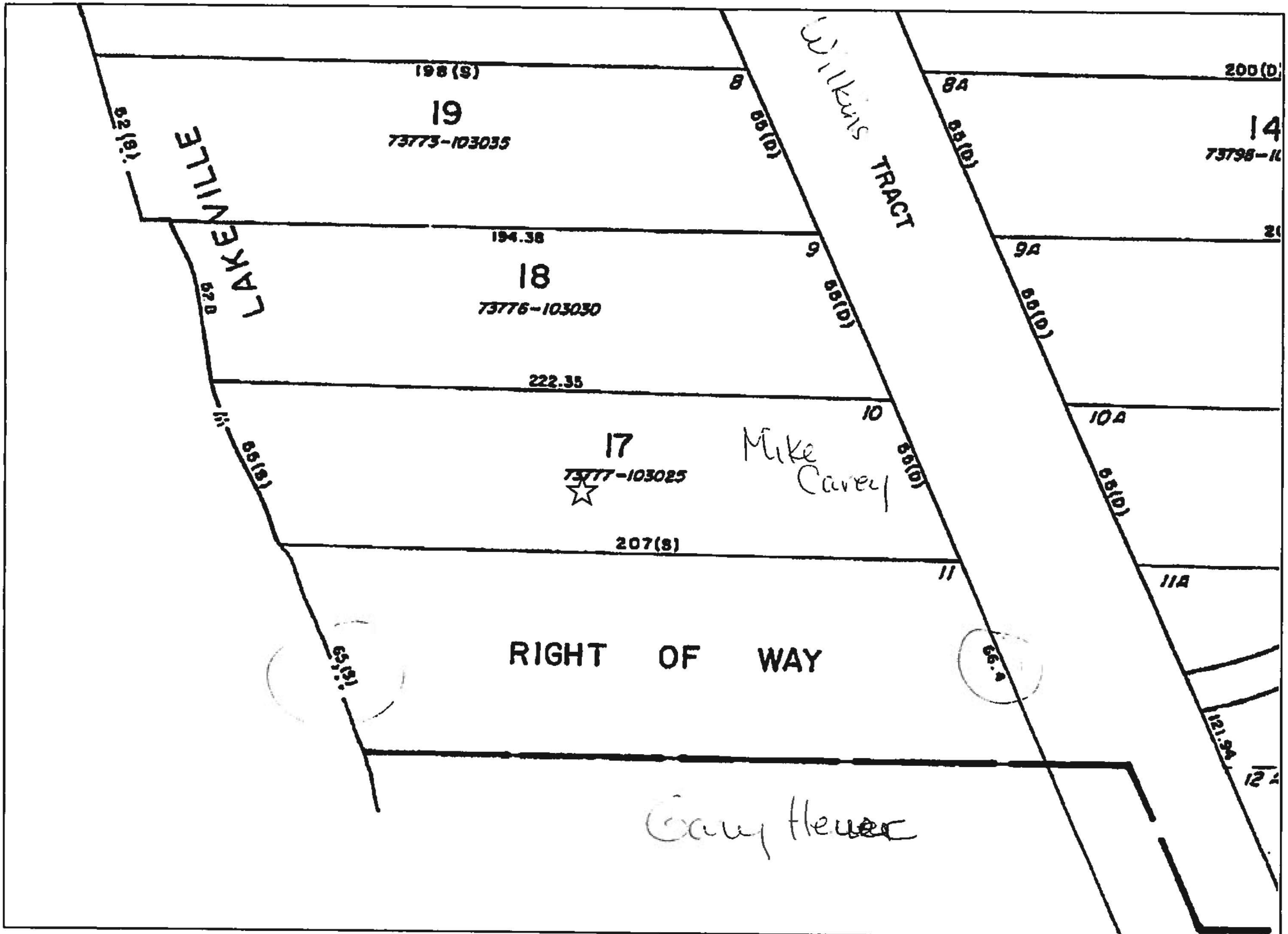
2014

Appendix D

6157 Wilkins Tract
Property Owner's Drawings and Photographs

DRAWING LOCATIONS (see map below):

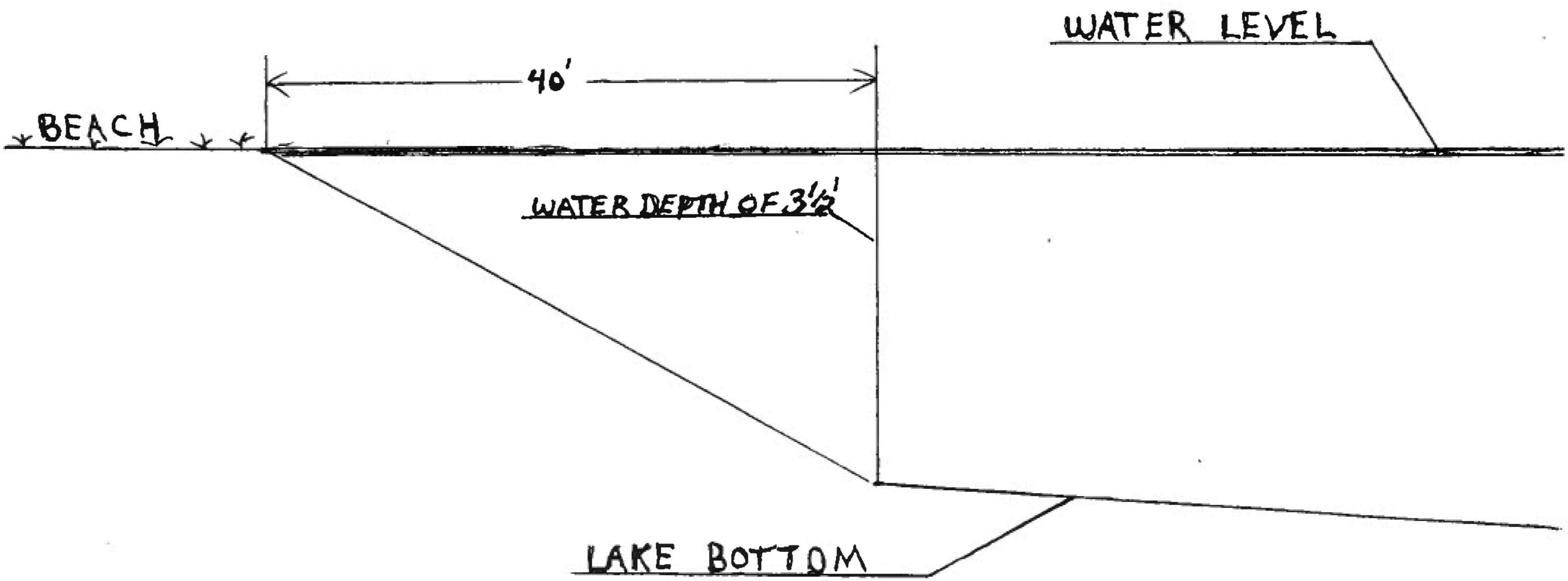




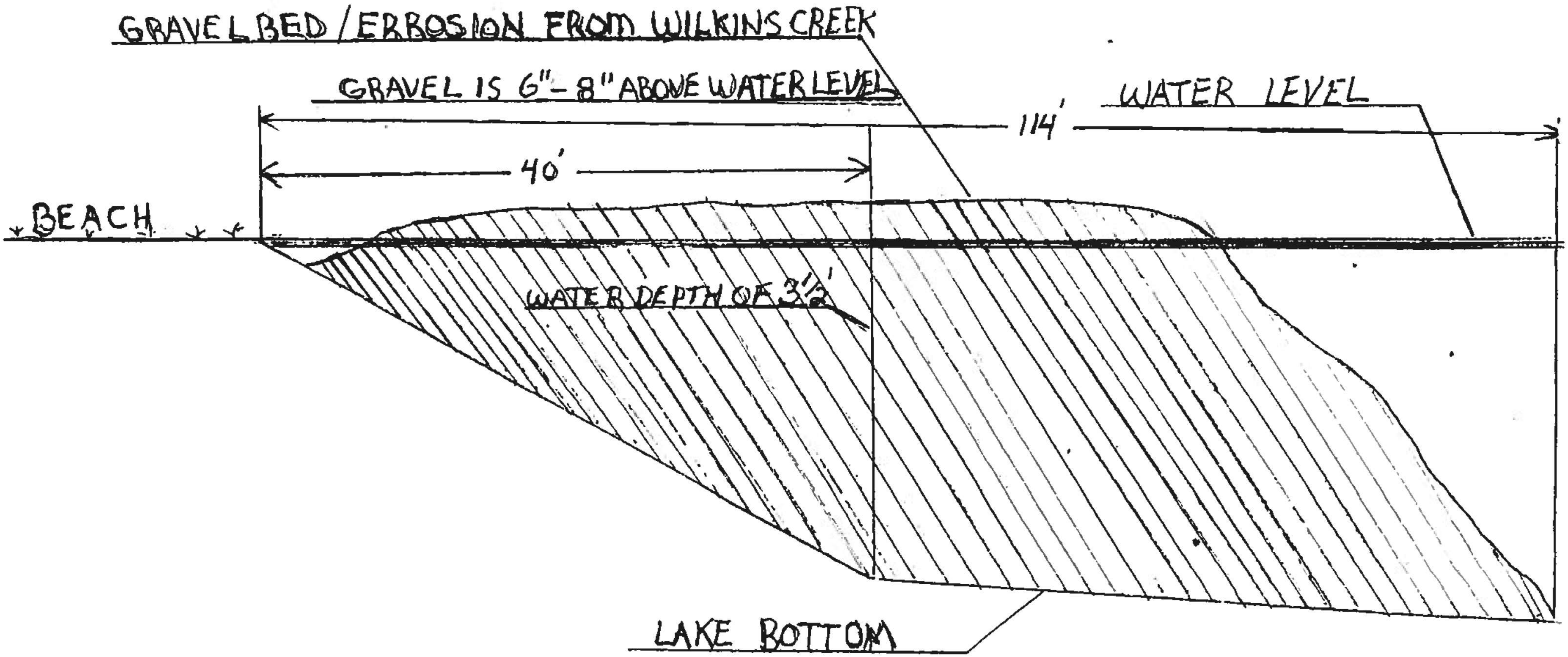
LANDATA www.ny-propdata.com - Map Name: maps/LIV/243489/074_32.tif

☆ = 6134 WILKINS TRACT

WILKINS TRACT BEACH ACCESS

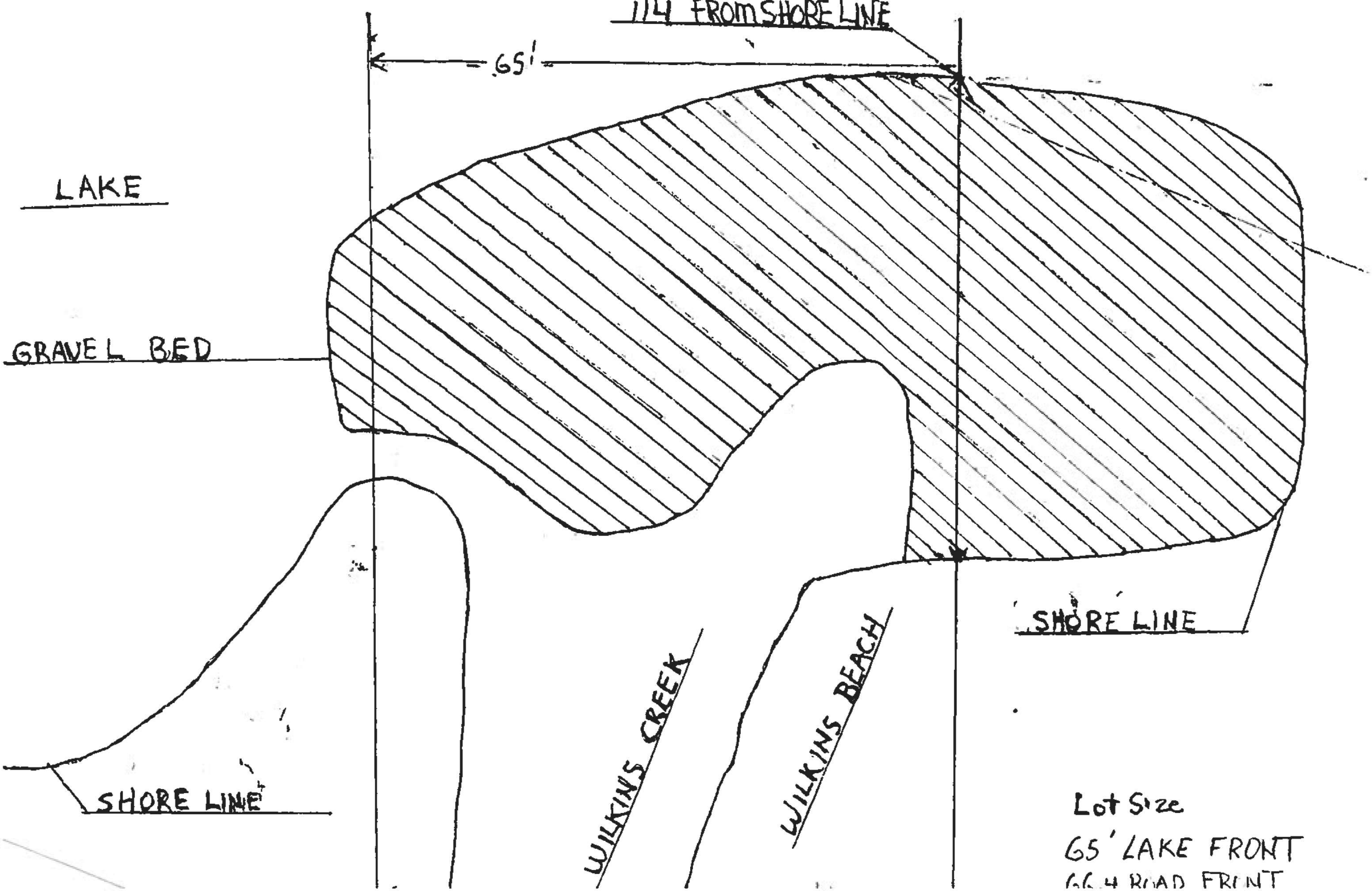


WILKINS TRACT BEACH ACCESS



WILKINS TRACT BEACH ACCESS

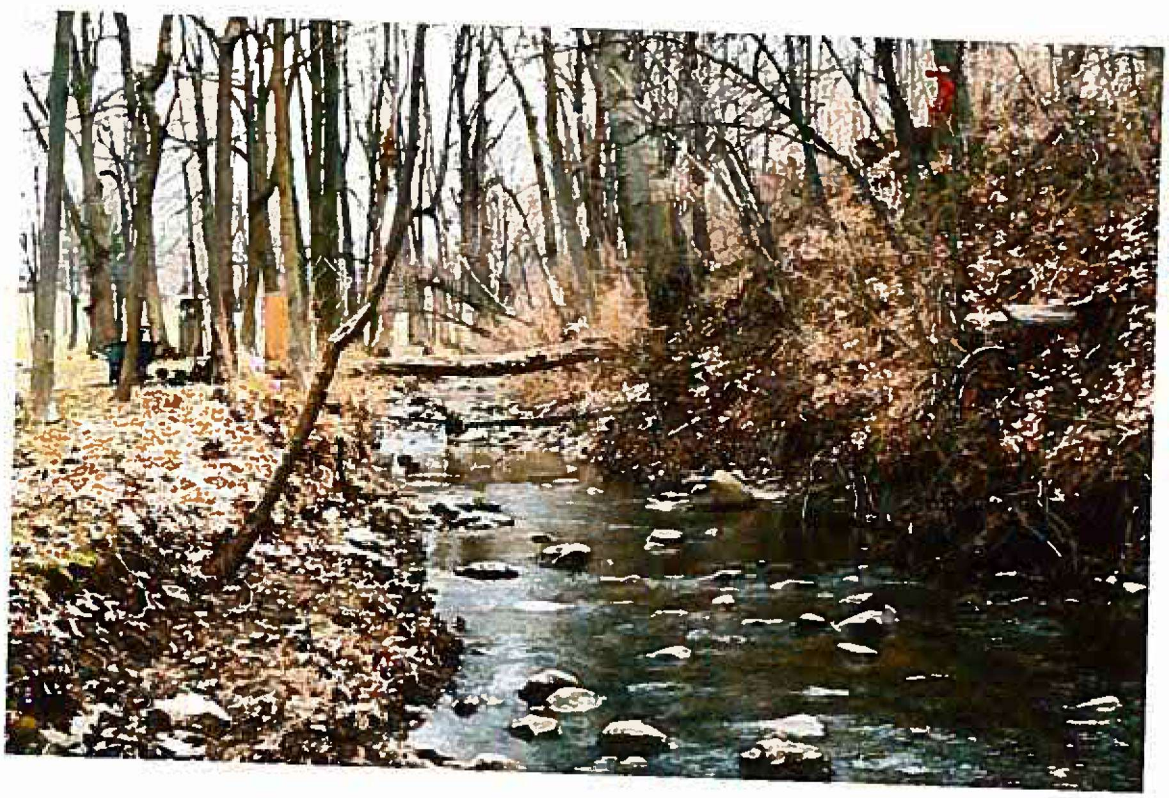
2007

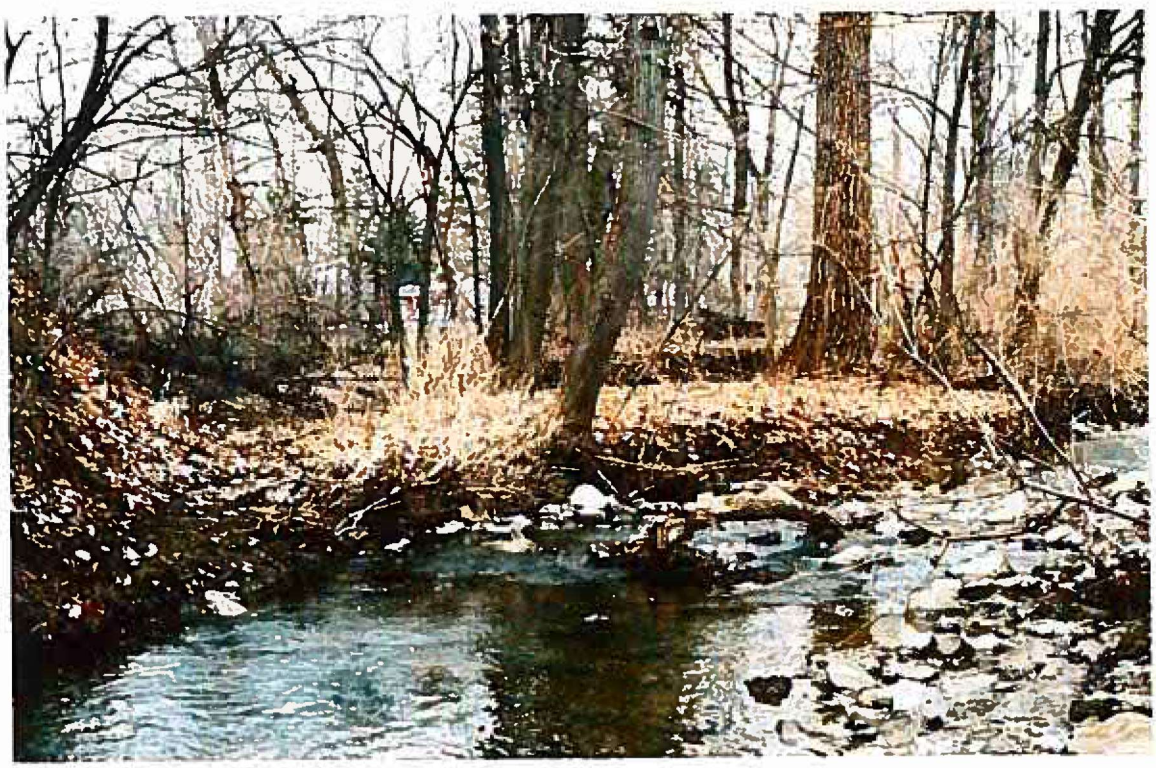


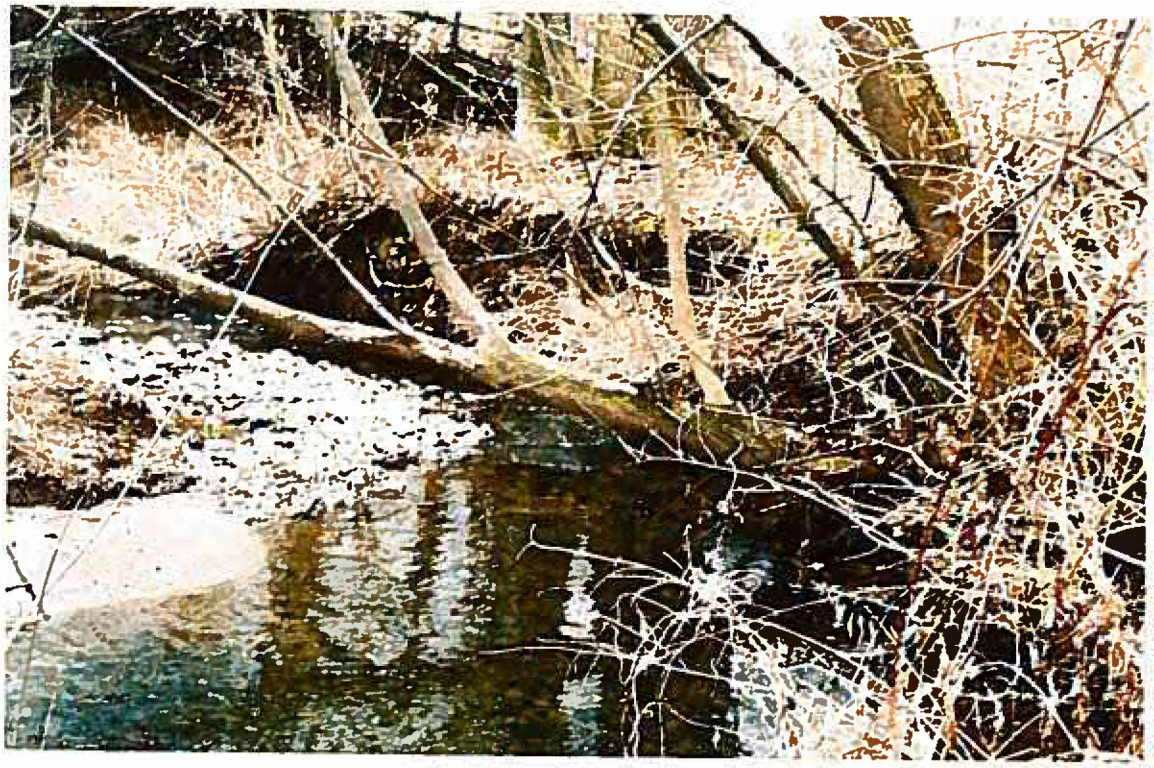
Lot Size
65' LAKE FRONT
66.4 ROAD FRONT

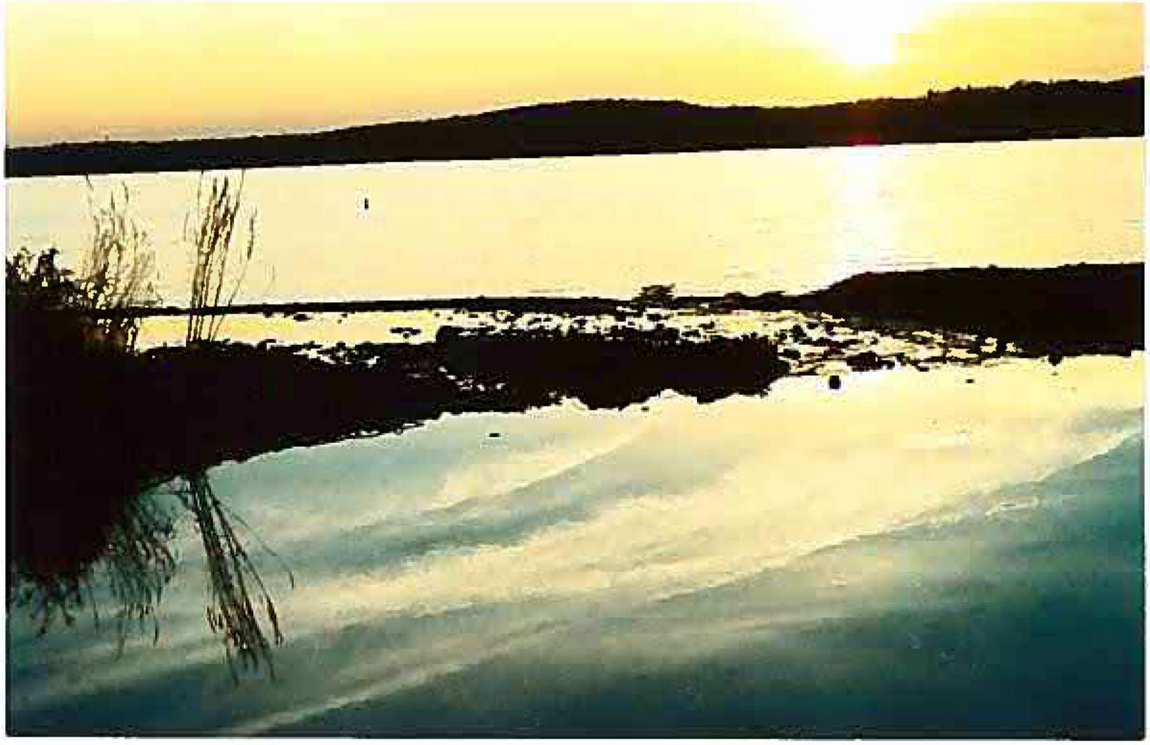

2005/06/13

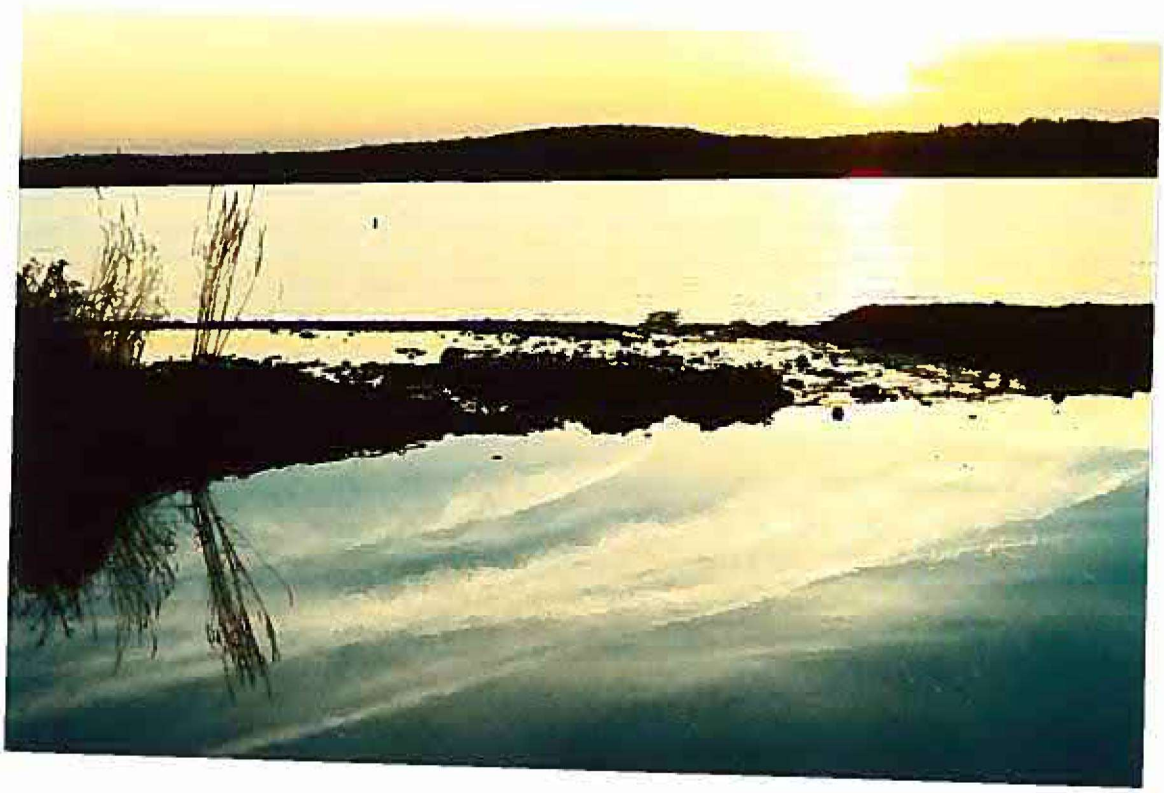

2005/06/13





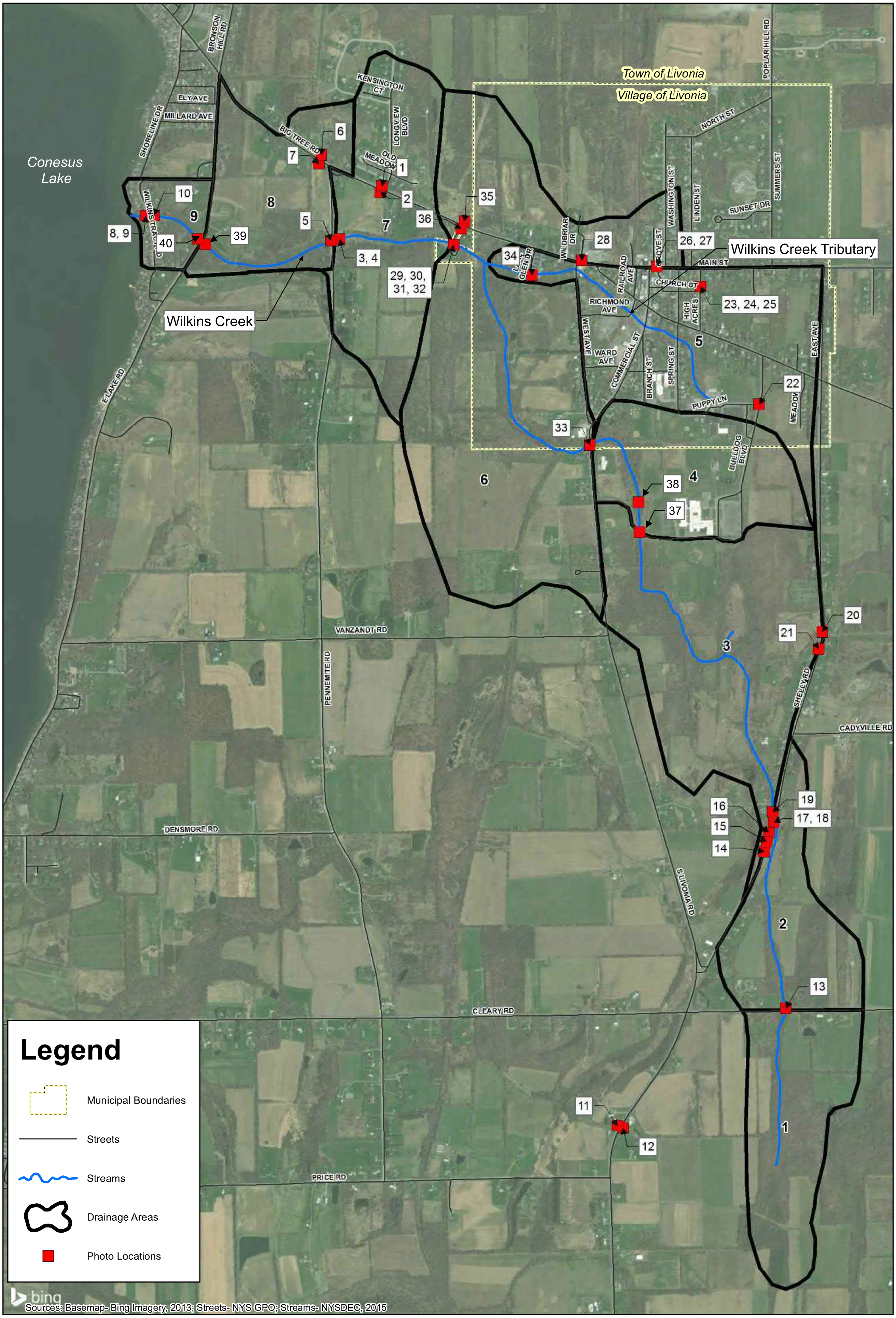






Appendix E

Project Reconnaissance Photograph Log



Barton & Loguidice, D.P.C.

Engineers • Environmental Scientists • Planners • Landscape Architects

1 inch = 1,250 feet

Livingston County
Wilkins Creek Subwatershed Stormwater Study

Photo Locations

Livingston County June 2018 New York

Figure 6

Project No. 338.008

Photo 1: looking southwest; flow from Longview across Big Tree Road towards Wilkins through wetland.

Photo 2: Culvert from Longview; looking southeast with Big Tree Rd. on the left.

Photo 3: Looking east from Pennemite Road over Wilkins Creek (looking upstream) over corrugated double barreled culvert.

Photo 4: looking west downstream on east side of Pennemite Road at double barreled culvert.

Photo 5: Looking west (downstream) at Wilkins Creek on Pennemite Rd.

Photo 6: Looking north east north of Big Tree Road towards nursing home.

Photo 7: looking south downstream of nursing home across Big Tree Rd.

Photo 8: looking west towards Conesus Lake over Wilkins Tract

Photo 9: same location as Photo 8 looking down from Wilkins Tract roadway

Photo 10: looking east from Wilkins Tract upstream towards Wilkins Creek

Photo 11: looking southwest towards culvert on west side of South Livonia Rd.

Photo 12: Looking east from South Livonia Road upstream of swale that diverts flow west

Photo 13: Looking north from Cleary Rd at downstream culvert

Photo 14: Looking east from Shelly Road 100 yards upstream of where Wilkins Creek cross Shelly Road. Wilkins Creek flows within the cow pasture.

Photo 15: Looking east from Shelly Road 30 yards upstream of where Wilkins Creek crosses Shelly Road. Wilkins Creek flows through driveway culvert.

Photo 16: Looking east from Shelly Road 10 yards upstream of where Wikins Creek crosses Shelly Road. Wilkins Creek flows through driveway culvert.

Photo 17: Looking east from Shelly Rd. at upstream culvert that crosses Shelly Rd.

Photo 18: Looking northeast at same culvert as Photo 17 to better show Wilkins Creek (dry)

Photo 19: Looking north from Shelly Rd. at downstream culvert that crosses Shelly Rd.

Photo 20: Looking west from Shelly Road at pond/wetland northeast of Wilkins Creek. Wilkins Creek does not flow to this.

Photo 21: Looking west from Shelly Rd. with wetland/pond in Photo 20 behind residents yard.

Photo 22: Looking north from Bulldog Boulevard along drainage area divide across Puppy Lane. Stone lined swale.

Photo 23: Looking south at intersection of Church Street and High Street. Stormwater flows along gutters and into storm sewer system.

Photo 24: Looking west from High Street over culvert (looking downstream)

Photo 25: Looking east towards culvert under High St. (from pictures 23 and 24)

Photo 26: Looking west on Main St. near the Village Square

Photo 27: Looking southwest on Main St. near the Village Square (same location as Photo 26)

Photo 28: Looking south across Main St. with Wild Briar Dr. on the right

Photo 29: Looking north east at double barreled culvert in Park entrance

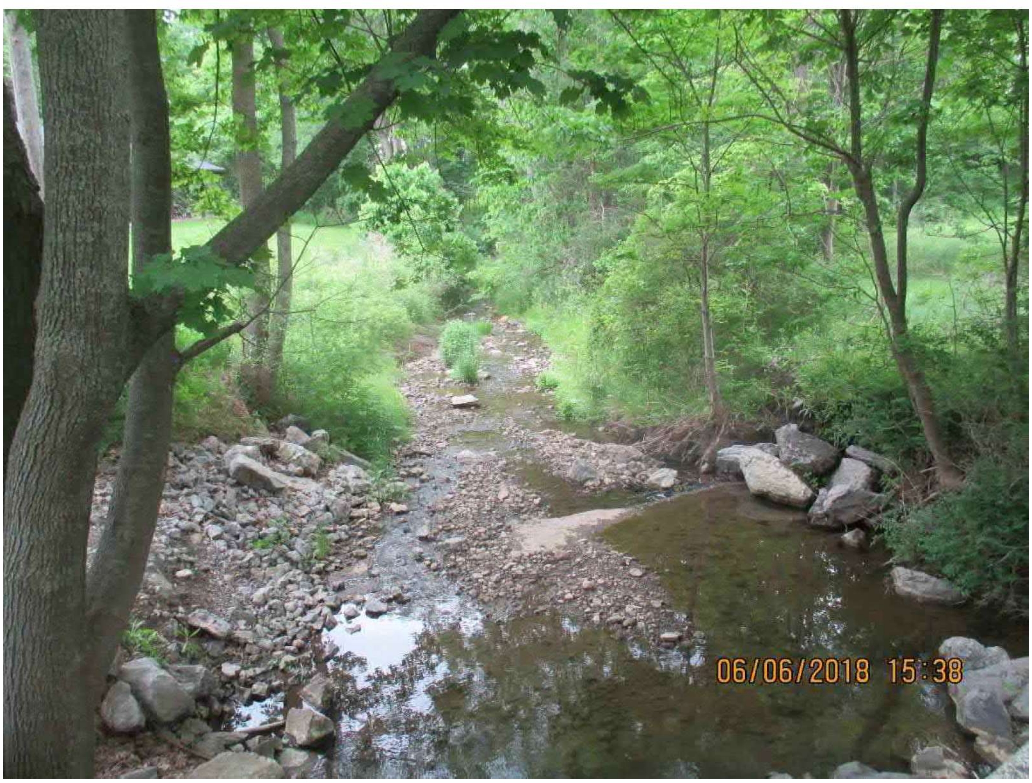


Photo 30: Looking west downstream of double barreled culvert in Photo 29.

Photo 31: Looking east upstream of double barreled culvert in Photo 29.

Photo 32: Looking southwest at culvert accepting flow north of Big Tree Rd and channelizing to confluence in Photo 30.

Photo 33: Looking east at downstream end of culvert that crosses Commercial Street

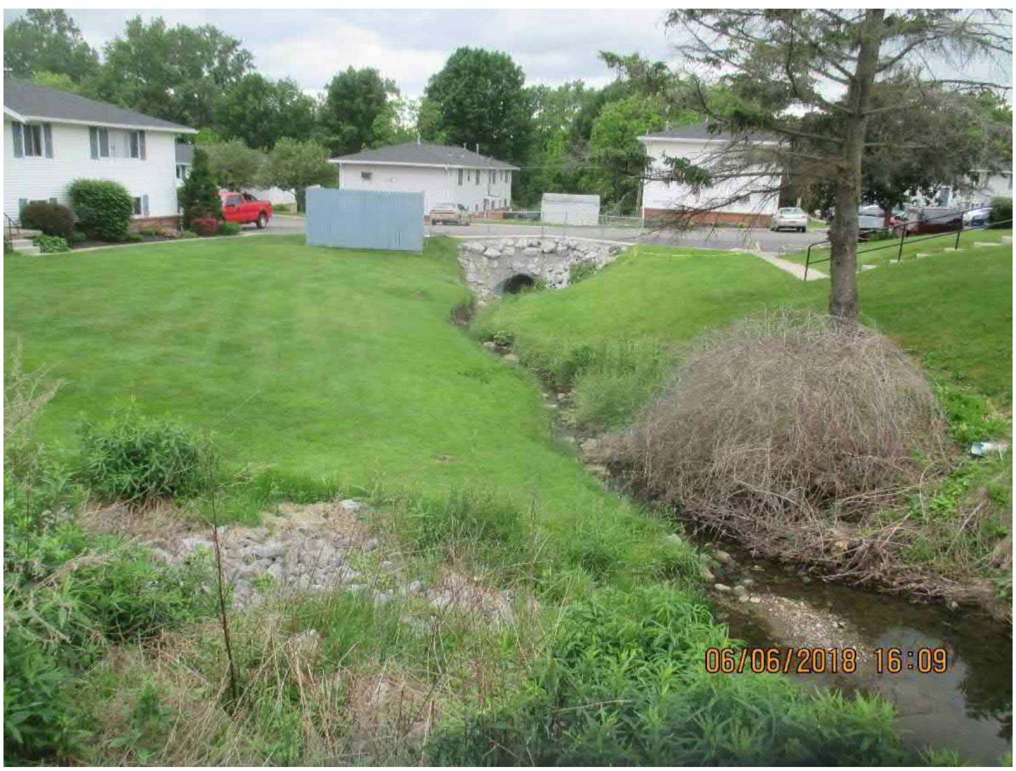


Photo 34: Looking west at culvert at apartment complex (under Lake Glen Dr.)

Photo 35: Wetland area north of Big Tree Rd.

Photo 36: Flow from wetland area (photo 35) crosses under Big Tree Rd to Photo 32

Photo 37: Looking south across School entrance at downstream section of Creek.

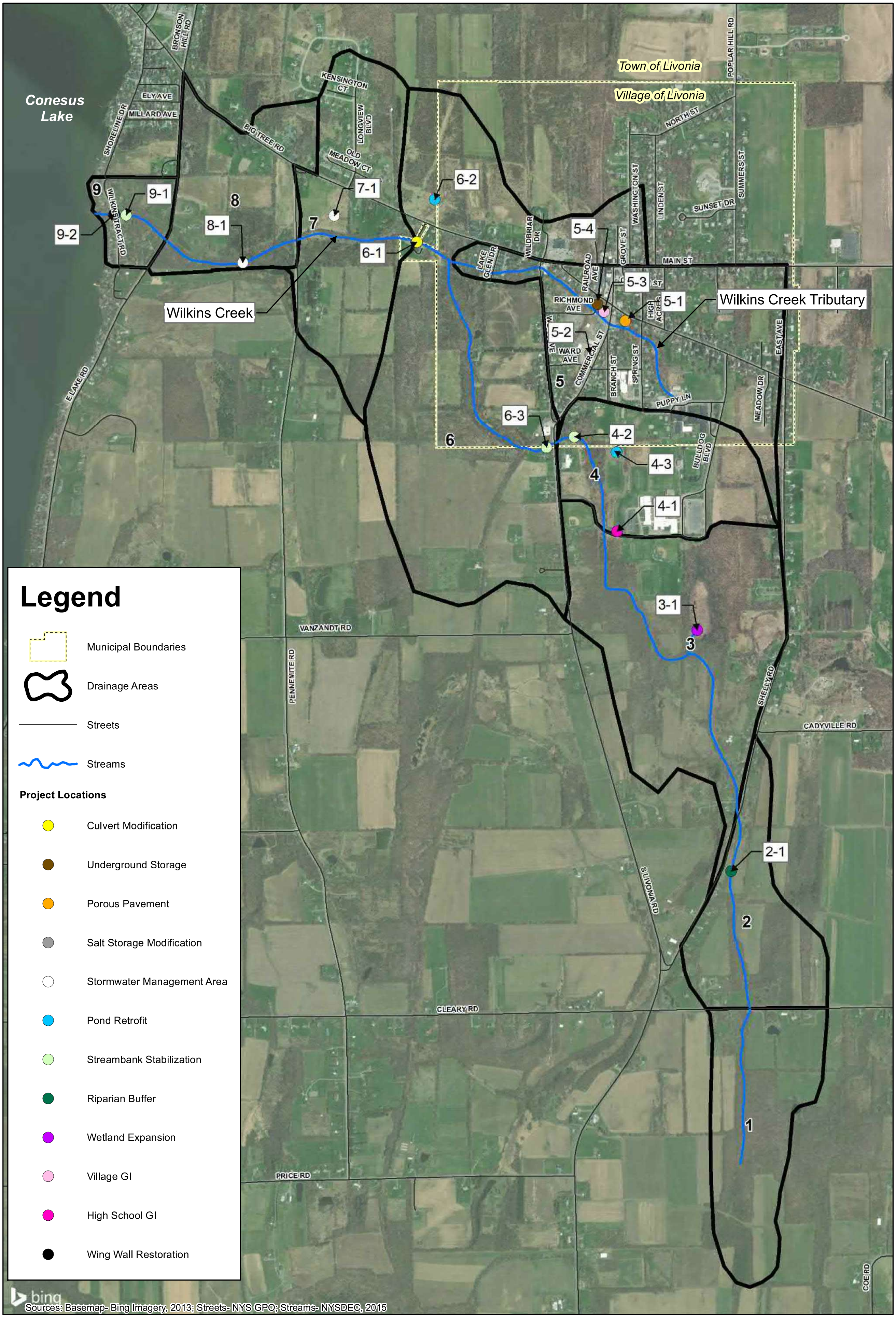
Photo 38: Looking north at Wilkins Creek 100 yards downstream of photo 37.

Photo 39: Looking east over East Lake Rd.

Photo 40: Looking west over East Lake Rd.

Appendix F

Potential Project Photograph Log



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1 inch = 1,250 feet

Livingston County
Wilkins Creek Subwatershed Stormwater Study

Potential Project Locations

Livingston County | August 2018 | New York

Figure 15

Project No. 338.008

Photo 1 (Project 9-2): Wing wall is separating from side bank even with anchor. Potential project includes wing wall restoration to prevent collapse.

Photo 2 (Project 9-1): Potential project includes streambank stabilization to reduce sediment load and property loss.

Photo 3 (Project 9-1): Lateral scour along the entire streambank with no vegetative floodplain. Trees are susceptible to falling in. Potential project includes streambank stabilization to reduce sediment load and property loss.

Photo 4 (Project 8-1): Upstream of East Lake Road Bridge. Minor bank erosion, but for most part area is defined by established floodplain, heavy vegetation, and meandering stream. Potential project includes creation of stormwater attenuation given large rural area directly upstream of severely eroded banks.

Photo 5 (Project 4-2): Lateral scour within Wilkins Creek behind Livonia Fire Department. Potential project includes streambank stabilization to reduce sediment load.

Photo 6 (Project 3-1): Existing wetland near Livonia High School. Potential project includes wetland expansion to increase stormwater attenuation improve water quality.

Photo 7 (Project 4-1): Check dams along southern swale from existing rain garden that leads to Wilkins Creek. Potential project includes swale retrofit to reduce peak loads and improve water quality and biodiversity.

Photo 8 (Project 4-1): Existing rain garden that does not appear to capture/treat much flow. Potential project includes rain garden retrofit to treat flow and tie into the proposed swale retrofit immediately downstream (see Photo 7).

Photo 9 (Project 4-1): No rooftop disconnections observed at Livonia High School. Potential project includes rooftop disconnect.

Photo 10 (Project 4-1): Small swale south of soccer fields that appears to carry flow from athletic fields to Wilkins Creek. Potential project includes swale retrofit to reduce peak flows and improve water quality and biodiversity.

Photo 11 (Project 5-2): Salt storage is not fully enclosed; salt may wash off during heavy storm events into nearby storm sewer system. Potential project includes modifying salt storage building to prevent salt runoff.

Photo 12 (Project 6-3): Streambank erosion at 4212 South Livonia Road. Potential project includes streambank stabilization to reduce sediment load and property loss.

Photo 13 (Project 6-3): Stream dam from collapsed railroad bridge. Potential project includes removal of boulders to prevent backwater effects and flooding at 4212 South Livonia Road.

Photo 14 (Project 5-3): Impervious surfaces on Main Street. Potential projects include green infrastructure and plantings to improve biodiversity and water quality.

Photo 15 (Project 5-3): Impervious surfaces on Commercial Street. Potential projects include green infrastructure and plantings to improve biodiversity and water quality.

Photo 16 (Project 5-3): Vacant gravel lot at intersection of Main Street and Commercial Street. Potential project includes green infrastructure to improve biodiversity and education.

Photo 17 (Project 5-1): Prettejohn Public Parking Lot; other lots include Gazette, Keyston, Field, and Brooks – all of which total approximately 71,000 ft^2. Potential project includes porous pavement (as appropriate) to reduce peak flows and improve water quality and education.

Photo 18 (Project 6-1): Culverts under Livonia Community Park. Potential project includes arched culvert replacement with open bottom that incorporates flood plain matching upstream and downstream conditions to reduce erosion downstream.

Photo 19 (Project 2-1): Looking east from Shelly Road 100 yards upstream of where Wilkins Creek cross Shelly Road. Wilkins Creek flows within the cow pasture. Potential project includes installation of a riparian buffer to prevent direct contact between cows and Wilkins Creek to improve water quality.

Photo 20 (Project 4-3): Looking northwest from Livonia High School parking lot towards Myers Field. Potential project includes pond retrofit adjacent to Myers Field to capture stormwater runoff from parking lot and fields and provide stormwater attenuation.

Photo 21 (Project 6-2): Open area north of Big Tree Road that contains tributary to Wilkins Creek. Potential project includes pond retrofit for stormwater attenuation to reduce peak flows.

Photo 22 (Project 7-1): Open area across Longview Blvd and Big Tree Street. Potential project includes stormwater management area that includes stormwater attenuation to reduce peak flows.

Photo 23 (Project 5-2): Salt storage is not fully enclosed; salt may wash off during heavy storm events. Potential project includes modifying salt storage building to prevent salt runoff.

Photo 24 (Project 5-4): Brooks Parking Lot; other lots include Gazette, Keyston, Field, and Brooks – all of which total approximately 71,000 ft^2. Potential project includes underground storage under Brooks Parking Lot to store up to a 10-year storm from runoff collected from the other parking lots.

Appendix G

Wilkins Creek Inspection Between the Lake and Pennemite Road Photograph Log

PHOTOGRAPH LOCATIONS (see map below):

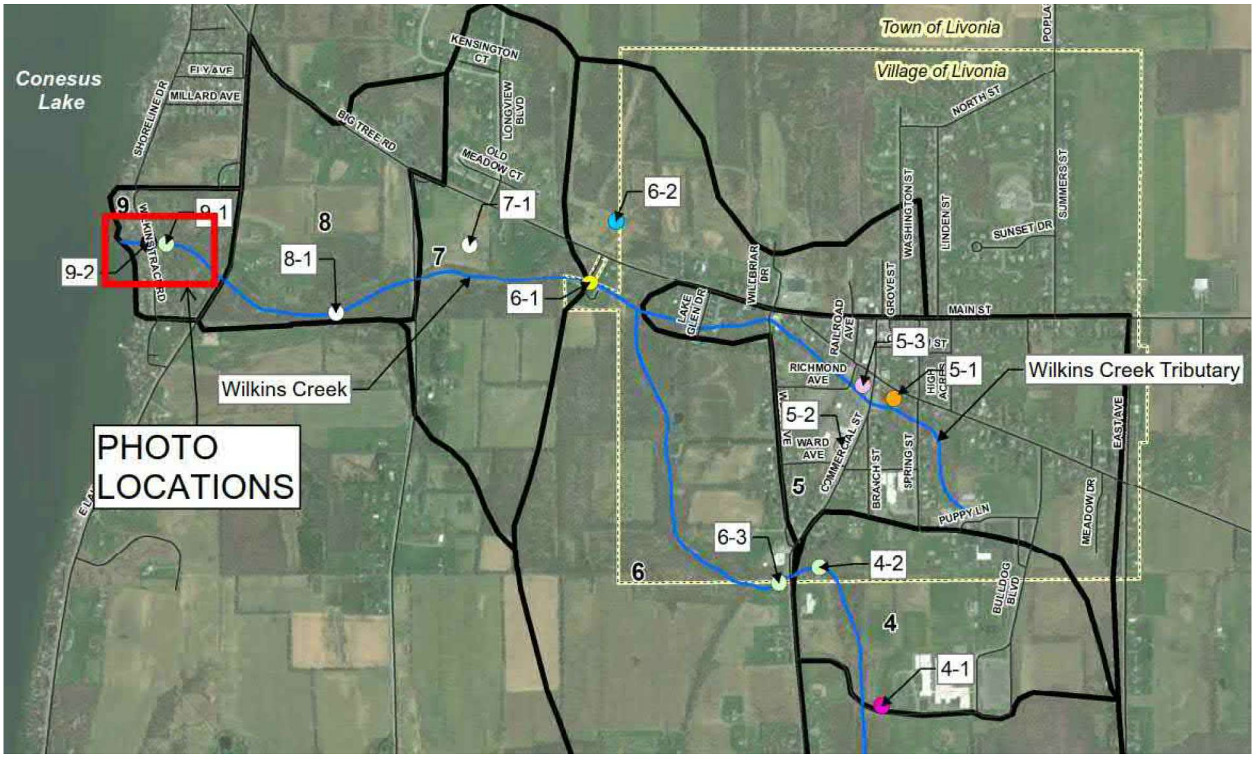


Photo 1: Right, downstream wing wall is not secure from 6144 Wilkins Tract; heavy storms slowly push it further into stream. Left wing wall already collapsed in.

Photo 2: Wing wall is separating from side bank even with anchor.

Photo 3: Property owner at 6157 Wilkins Tract quoted a Study saying 100 yd^3 of stone settled at the mouth of the Creek in 2006, and he assumes it is now 200 yd^3.

Photo 4: Same location as Photo 3. As stone settles from Creek, owners have to keep extending dock.

Photo 5: Looking downstream behind 3890 East Lake Road; severe bank lateral scour along left bank measuring approximately 40’ and 20’ high consisting of clayey loam. Presumed source of majority of Lake deposits.

Photo 6: Same location as Photo 5 (up close).

Photo 7: Looking upstream at Photo 5 and 6 location. Historic streambed observed to the right of current streambed showing the lateral movement over time.

Photo 8: Walking upstream behind 3890 East Lake Road; streambed consisting of large cobbles; lateral scour present on most banks.

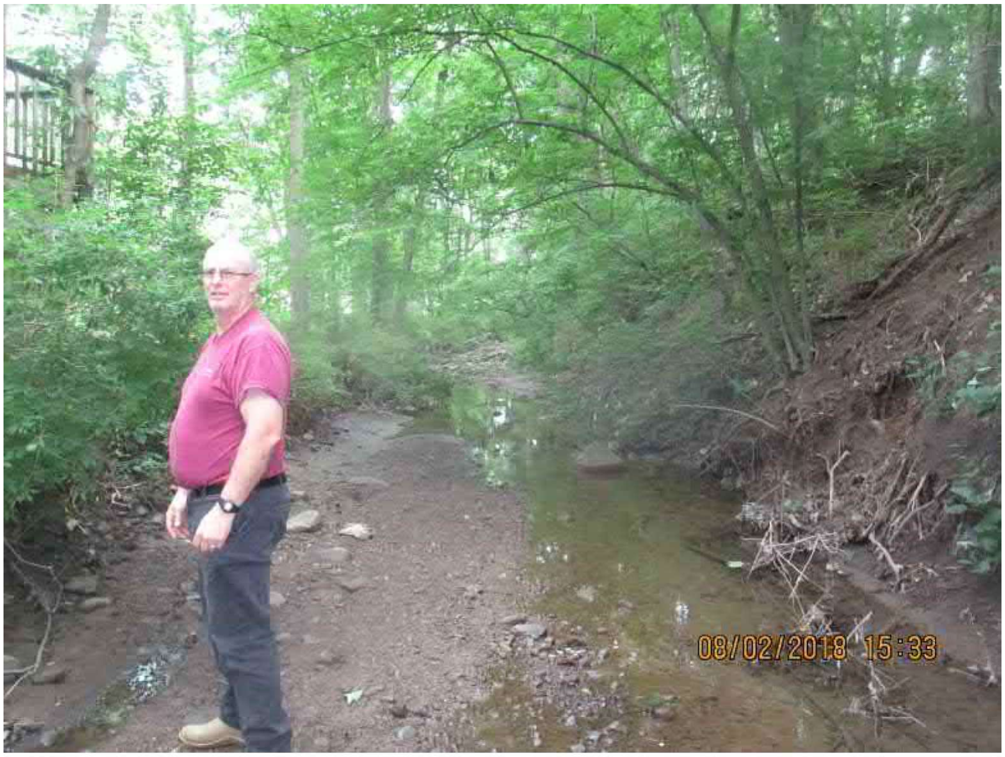


Photo 9: Lateral scour measuring approximately 30' long x 8' high causing vegetative sloughing. Gravel bars forming within the streambed causing stream migration inducing further lateral scour.

Photo 10: Lateral scour along the entire streambank with no vegetative floodplain. Trees are susceptible to falling in

Photo 11: Neighbors have taken action linking side banks with boulders to avoid losing additional property, but lateral scour still present.

Photo 12: Looking upstream at East Lake Road Bridge. Property owner at 3890 East Lake Road lined streambank with boulders to prevent lateral erosion. Most lateral erosion occurs downstream of this bridge.

Photo 13: Upstream of East Lake Road Bridge. Minor bank erosion, but for most part area is defined by established floodplain, heavy vegetation, and meandering stream.

Photo 14: Sanitary line is approximately 100’ north of Wilkins Creek upstream of East Lake Road Bridge.

Appendix H

Wilkins Creek Inspection Behind Livonia Fire Department Photograph Log

DRAWING LOCATIONS (see map below):

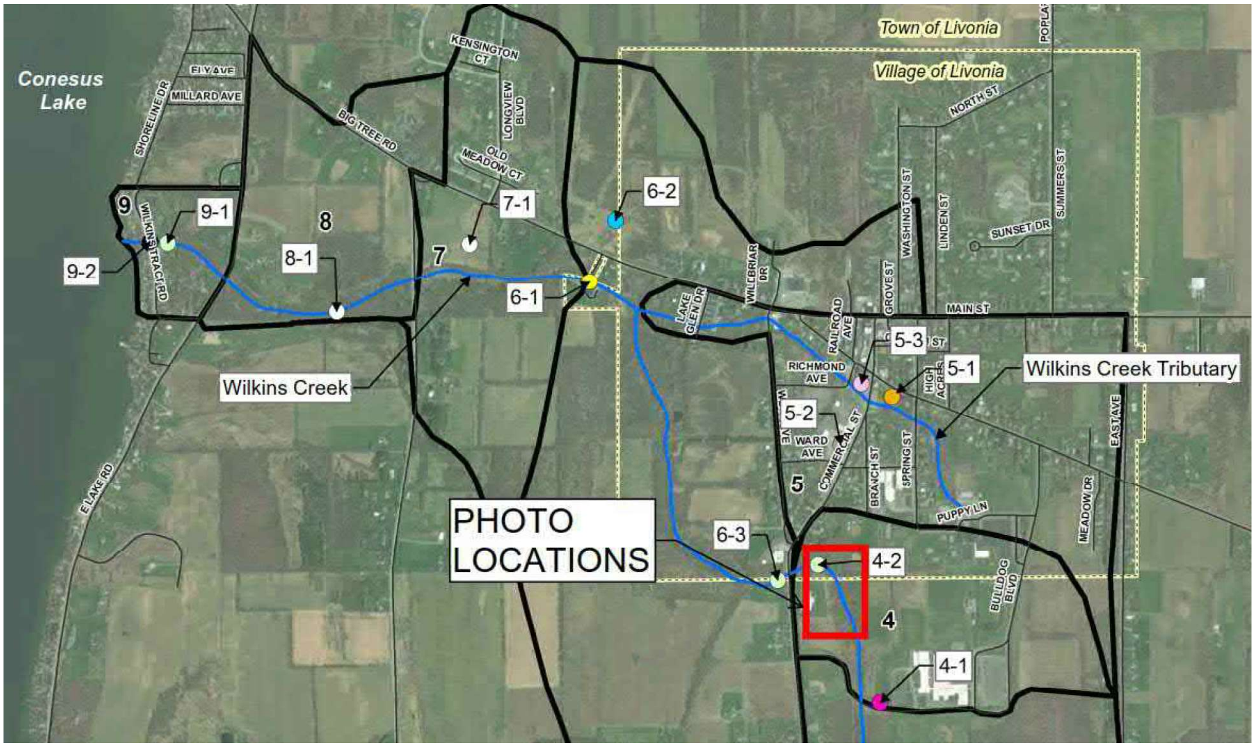


Photo 1: Looking downstream behind Livonia Fire Department; dry cobble bed with heavy vegetation

Photo 2: Looking upstream behind Livonia Fire Department; braided stream due to vegetation bar

Photo 3: Lateral scour measuring approximately 30’ long x 2’ high

Photo 4: Continuing upstream; heavy vegetation and log jams within streambed

Photo 5: Continuing upstream; heavy vegetation and log jams within streambed

Photo 6: Streambed transitions from cobble to clayey silt most likely originating from streambank erosion upstream and settles upstream of blocked flow

Photo 7: Looking east from streambed towards Livonia athletic fields; numerous eroded channels were encountered that appeared to carry flow during large storm events from the athletic fields to Wilkins Creek

Photo 8: Looking upstream behind Livonia Fire Department; standing water within Creek with lateral erosion along the right bank.

Photo 9: Looking downstream; lateral erosion around the bank measuring approximately 30' long x 2' high

Photo 10: Same location as Photo 9; lateral erosion resulting in vegetative bed sloughing

Photo 11: Looking upstream; cobble/gravel/clayey silt bed with heavy vegetative overgrowth

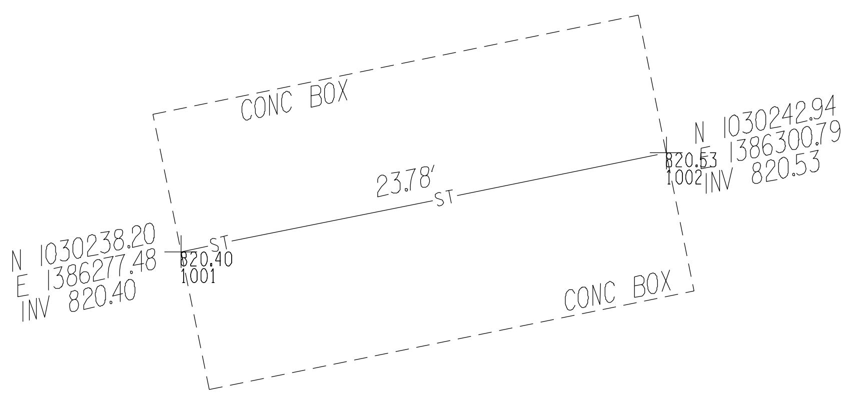
Photo 12: Lateral scour causing vegetative sloughing; lateral scour measures approximately 50’ long by 2’ high

Appendix I

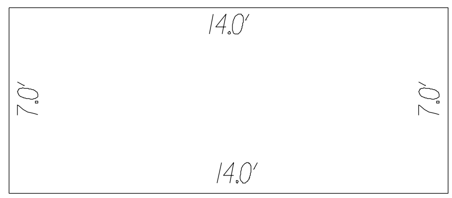
Survey Results

CULVERT OPENING SKETCH

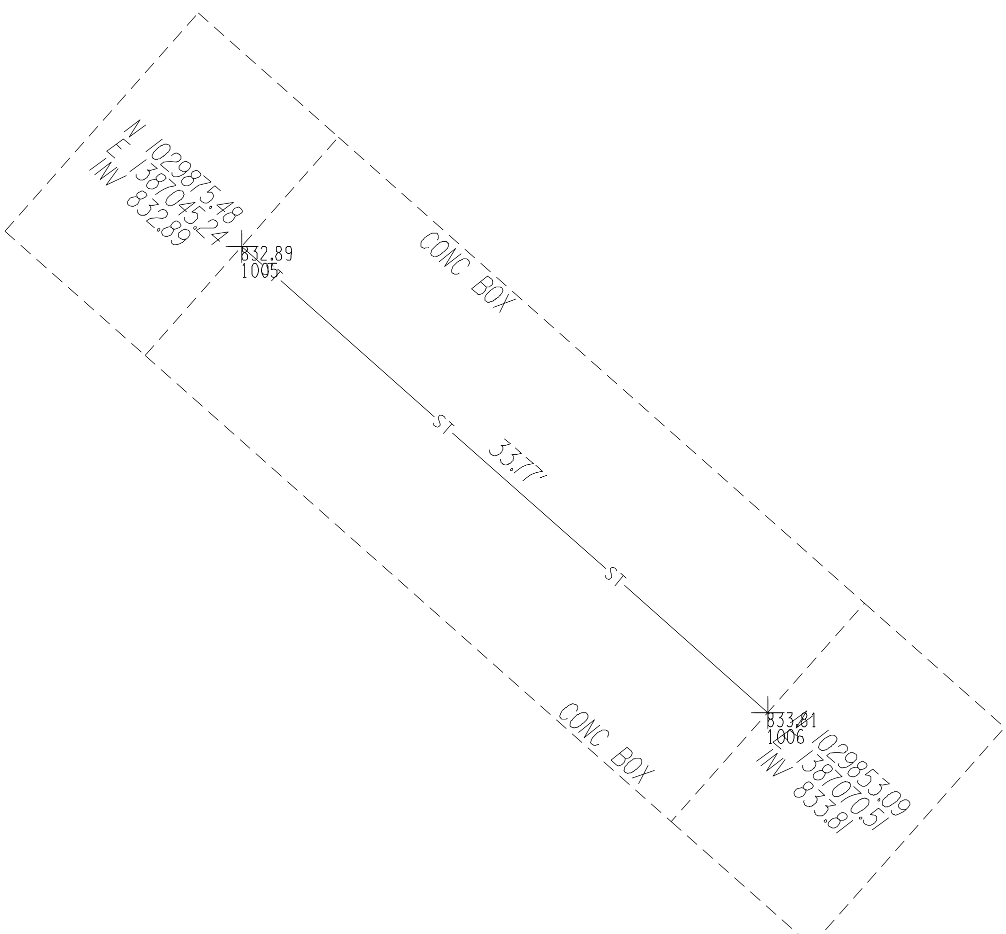
PLAN VIEW
CULVERT 1



CULVERT OPENING SKETCH

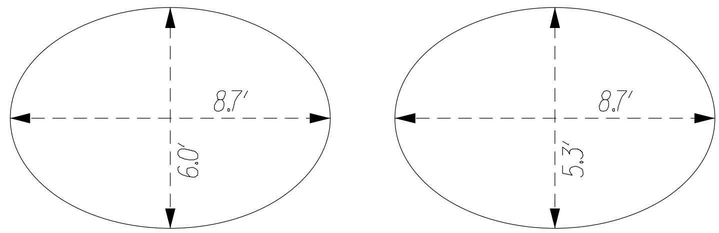


PLAN VIEW
CULVERT 2

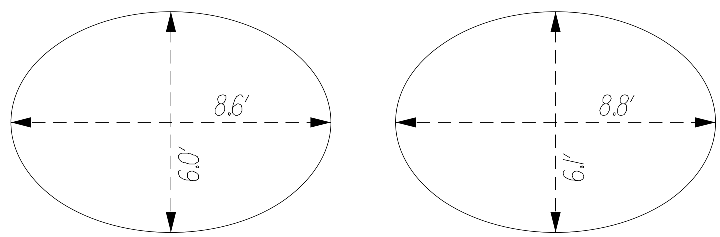


CULVERT OPENING SKETCH

WEST PIPE END

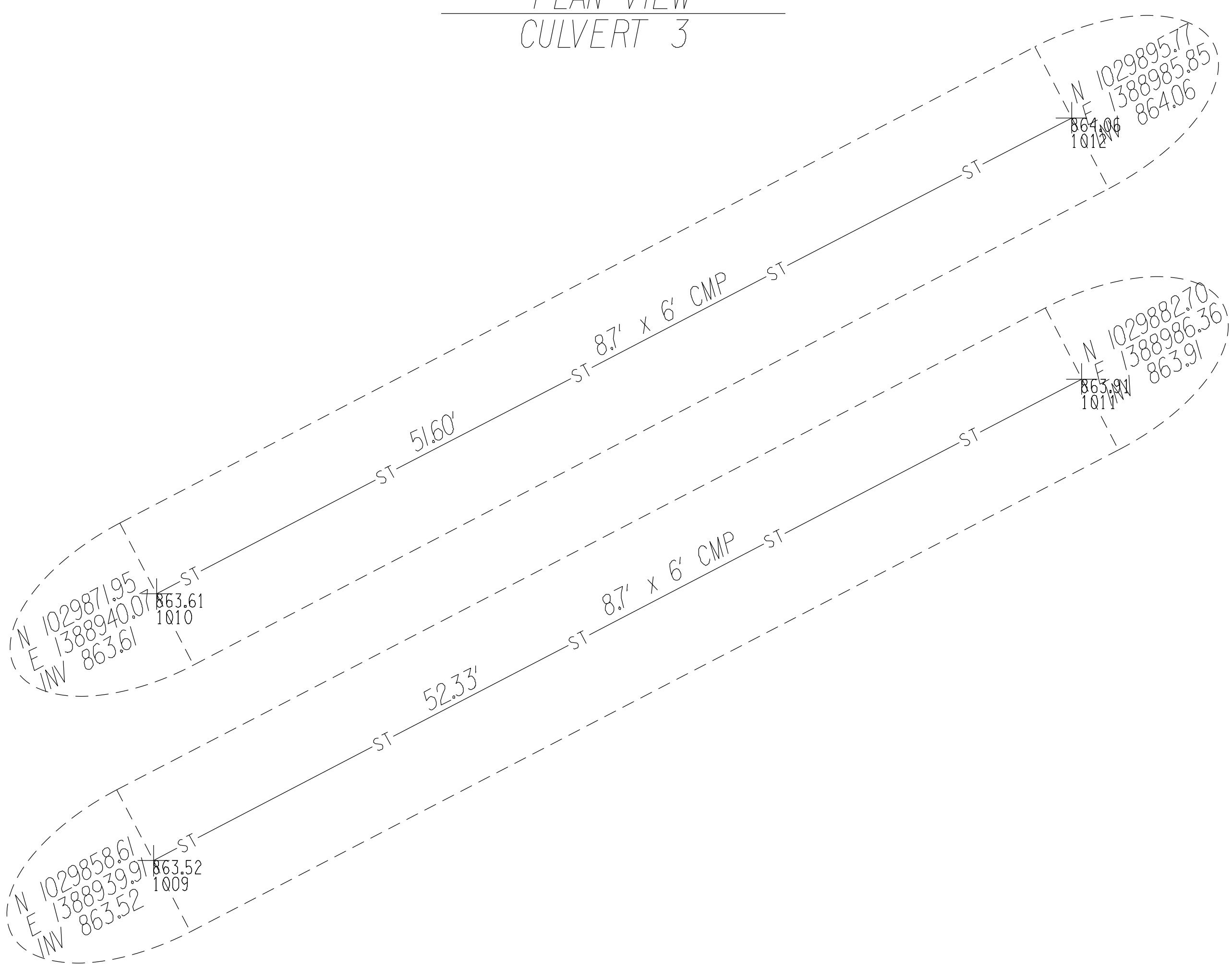


EAST PIPE END

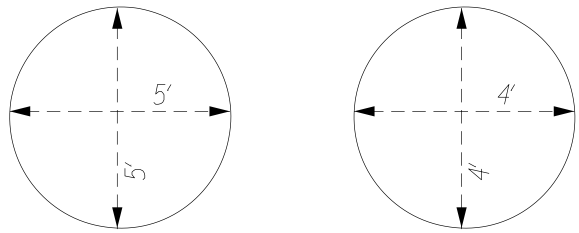


PLAN VIEW

CULVERT 3

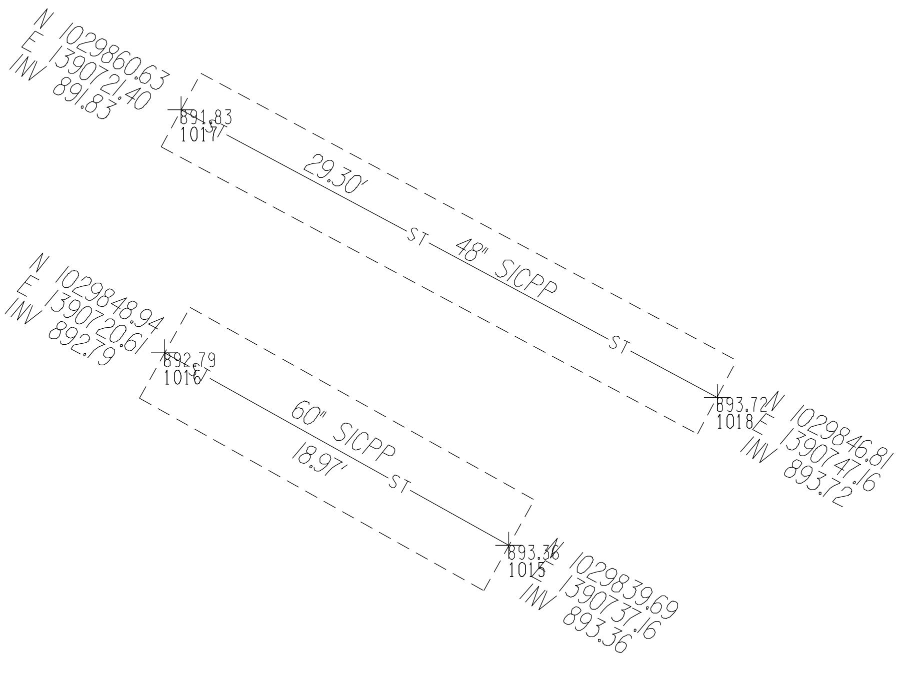


CULVERT OPENING SKETCH

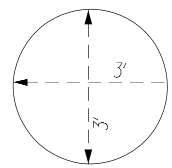


PLAN VIEW

CULVERT 4

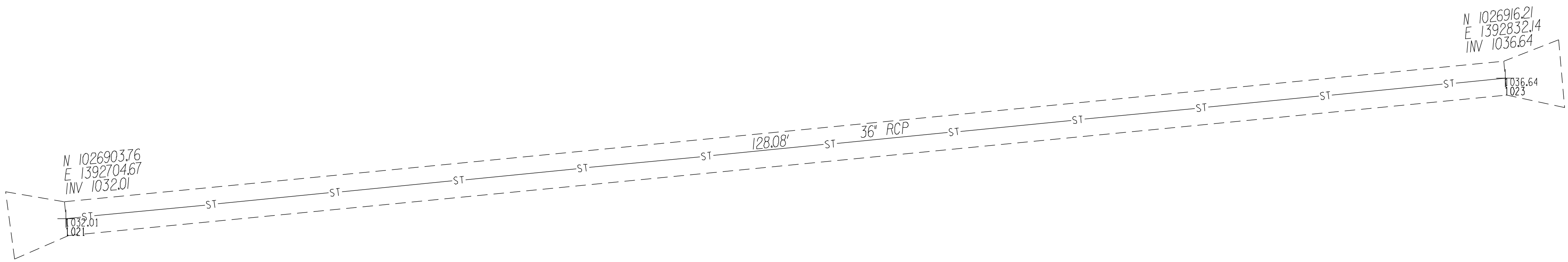


CULVERT OPENING SKETCH

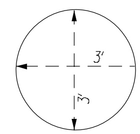


PLAN VIEW

CULVERT 5

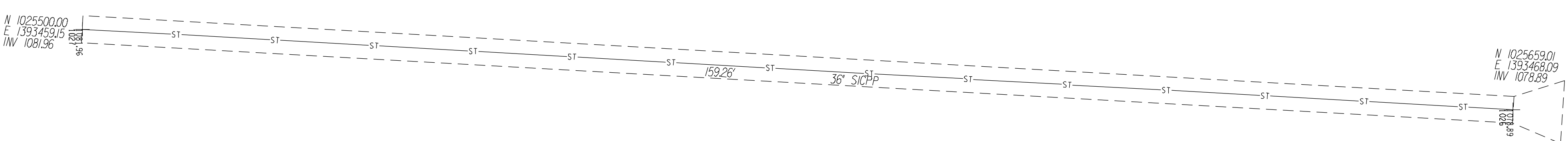


CULVERT OPENING SKETCH

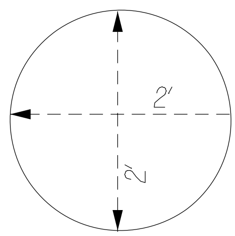


PLAN VIEW

CULVERT 6

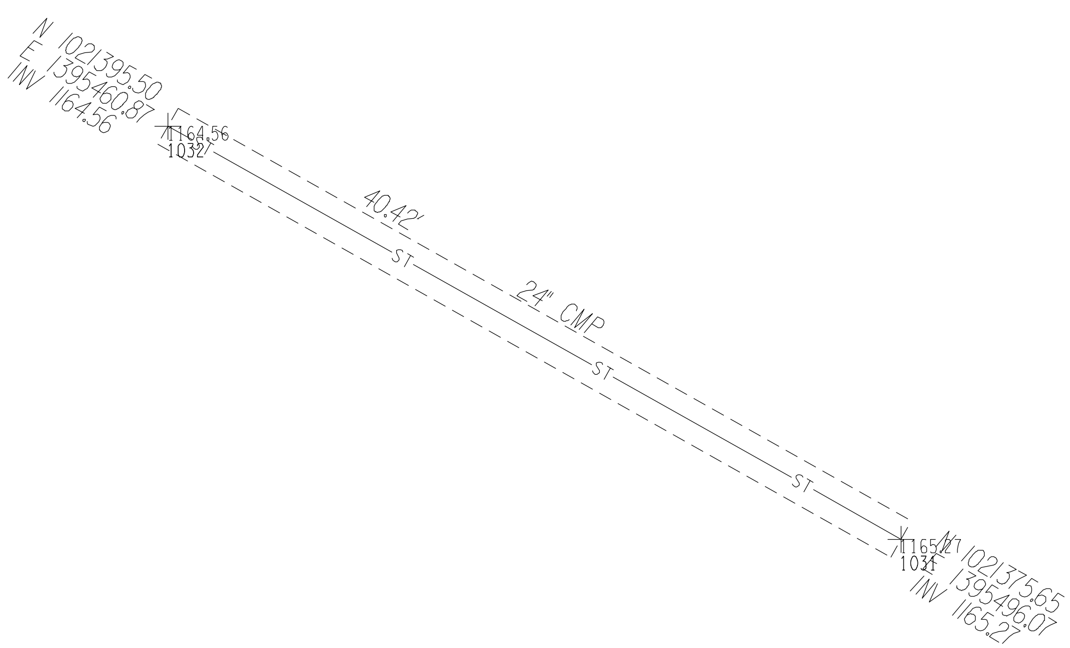


CULVERT OPENING SKETCH

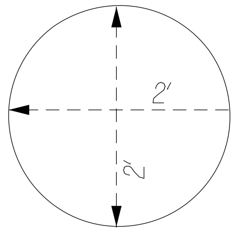


PLAN VIEW

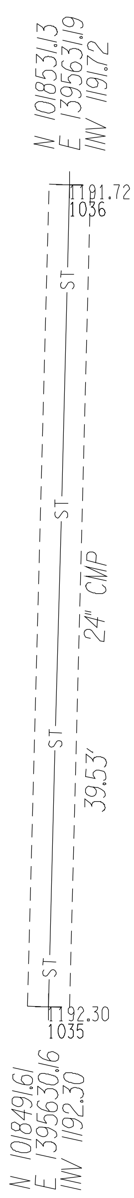
CULVERT 7



CULVERT OPENING SKETCH



PLAN VIEW
CULVERT 8



Appendix J

Precipitation Data

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New York
Location	
Longitude	77.688 degrees West
Latitude	42.822 degrees North
Elevation	0 feet
Date/Time	Wed, 27 Jun 2018 15:43:19 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.39	0.49	0.64	0.80	0.98	1yr	0.69	0.88	1.11	1.33	1.57	1.85	2.06	1yr	1.64	1.98	2.38	2.85	3.27	1yr
2yr	0.31	0.48	0.59	0.78	0.99	1.20	2yr	0.85	1.08	1.36	1.60	1.86	2.14	2.41	2yr	1.89	2.32	2.74	3.22	3.68	2yr
5yr	0.36	0.57	0.71	0.95	1.21	1.50	5yr	1.05	1.34	1.69	1.99	2.31	2.64	2.99	5yr	2.34	2.87	3.36	3.92	4.47	5yr
10yr	0.40	0.64	0.80	1.09	1.42	1.77	10yr	1.23	1.58	2.00	2.36	2.72	3.10	3.51	10yr	2.75	3.38	3.93	4.54	5.18	10yr
25yr	0.48	0.76	0.96	1.33	1.76	2.20	25yr	1.52	1.96	2.49	2.93	3.38	3.84	4.35	25yr	3.40	4.18	4.83	5.52	6.30	25yr
50yr	0.54	0.86	1.10	1.54	2.07	2.60	50yr	1.79	2.31	2.95	3.47	3.99	4.51	5.11	50yr	3.99	4.91	5.65	6.41	7.31	50yr
100yr	0.60	0.97	1.26	1.78	2.44	3.07	100yr	2.10	2.73	3.49	4.11	4.71	5.30	6.01	100yr	4.69	5.78	6.60	7.43	8.49	100yr
200yr	0.68	1.12	1.45	2.08	2.87	3.63	200yr	2.47	3.22	4.13	4.85	5.55	6.23	7.07	200yr	5.51	6.80	7.73	8.63	9.86	200yr
500yr	0.82	1.35	1.75	2.54	3.55	4.52	500yr	3.07	4.02	5.15	6.04	6.90	7.72	8.77	500yr	6.83	8.43	9.51	10.50	12.01	500yr

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.21	0.33	0.40	0.54	0.66	0.74	1yr	0.57	0.72	0.86	1.11	1.34	1.72	1.77	1yr	1.53	1.70	2.25	2.66	3.06	1yr
2yr	0.29	0.45	0.56	0.76	0.93	1.07	2yr	0.80	1.05	1.18	1.43	1.70	2.09	2.36	2yr	1.85	2.27	2.69	3.16	3.59	2yr
5yr	0.34	0.52	0.65	0.89	1.13	1.26	5yr	0.98	1.23	1.39	1.71	2.06	2.50	2.83	5yr	2.21	2.72	3.20	3.73	4.26	5yr
10yr	0.37	0.57	0.71	0.99	1.29	1.43	10yr	1.11	1.40	1.57	1.92	2.33	2.86	3.24	10yr	2.53	3.12	3.63	4.23	4.83	10yr
25yr	0.42	0.64	0.80	1.14	1.50	1.69	25yr	1.30	1.65	1.86	2.23	2.67	3.40	3.88	25yr	3.01	3.73	4.28	4.99	5.68	25yr
50yr	0.46	0.70	0.88	1.26	1.69	1.92	50yr	1.46	1.88	2.11	2.47	2.95	3.87	4.45	50yr	3.43	4.28	4.85	5.67	6.44	50yr
100yr	0.51	0.76	0.96	1.38	1.89	2.19	100yr	1.64	2.14	2.40	2.74	3.26	4.41	5.10	100yr	3.90	4.90	5.49	6.43	7.29	100yr
200yr	0.55	0.83	1.05	1.53	2.13	2.51	200yr	1.84	2.45	2.75	3.07	3.63	5.03	5.81	200yr	4.45	5.62	6.22	7.22	8.27	200yr
500yr	0.63	0.93	1.20	1.75	2.48	2.99	500yr	2.14	2.92	3.29	3.57	4.16	5.98	7.02	500yr	5.29	6.75	7.34	8.52	9.77	500yr

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.71	0.87	0.99	1yr	0.75	0.97	1.12	1.39	1.68	1.95	2.18	1yr	1.72	2.09	2.52	2.99	3.43	1yr
2yr	0.33	0.51	0.62	0.84	1.04	1.14	2yr	0.90	1.12	1.26	1.58	1.90	2.19	2.47	2yr	1.94	2.37	2.81	3.30	3.77	2yr
5yr	0.39	0.60	0.75	1.03	1.31	1.49	5yr	1.13	1.46	1.61	1.95	2.36	2.79	3.15	5yr	2.47	3.03	3.51	4.12	4.69	5yr
10yr	0.46	0.71	0.88	1.23	1.59	1.81	10yr	1.37	1.77	1.96	2.34	2.86	3.35	3.78	10yr	2.96	3.64	4.18	4.88	5.56	10yr
25yr	0.58	0.89	1.11	1.58	2.08	2.35	25yr	1.79	2.30	2.54	2.97	3.71	4.27	4.83	25yr	3.78	4.64	5.27	6.10	6.98	25yr
50yr	0.70	1.06	1.32	1.90	2.55	2.86	50yr	2.20	2.79	3.09	3.58	4.55	5.15	5.82	50yr	4.55	5.59	6.27	7.24	8.29	50yr
100yr	0.83	1.26	1.58	2.28	3.13	3.48	100yr	2.70	3.40	3.76	4.32	5.57	6.19	7.00	100yr	5.48	6.73	7.47	8.58	9.84	100yr
200yr	1.00	1.50	1.90	2.75	3.81	4.24	200yr	3.31	4.15	4.57	5.21	6.82	7.46	8.43	200yr	6.60	8.10	8.90	10.18	11.70	200yr
500yr	1.27	1.89	2.43	3.53	5.03	5.50	500yr	4.34	5.38	5.94	6.68	8.92	9.55	10.78	500yr	8.45	10.37	11.22	12.76	14.69	500yr

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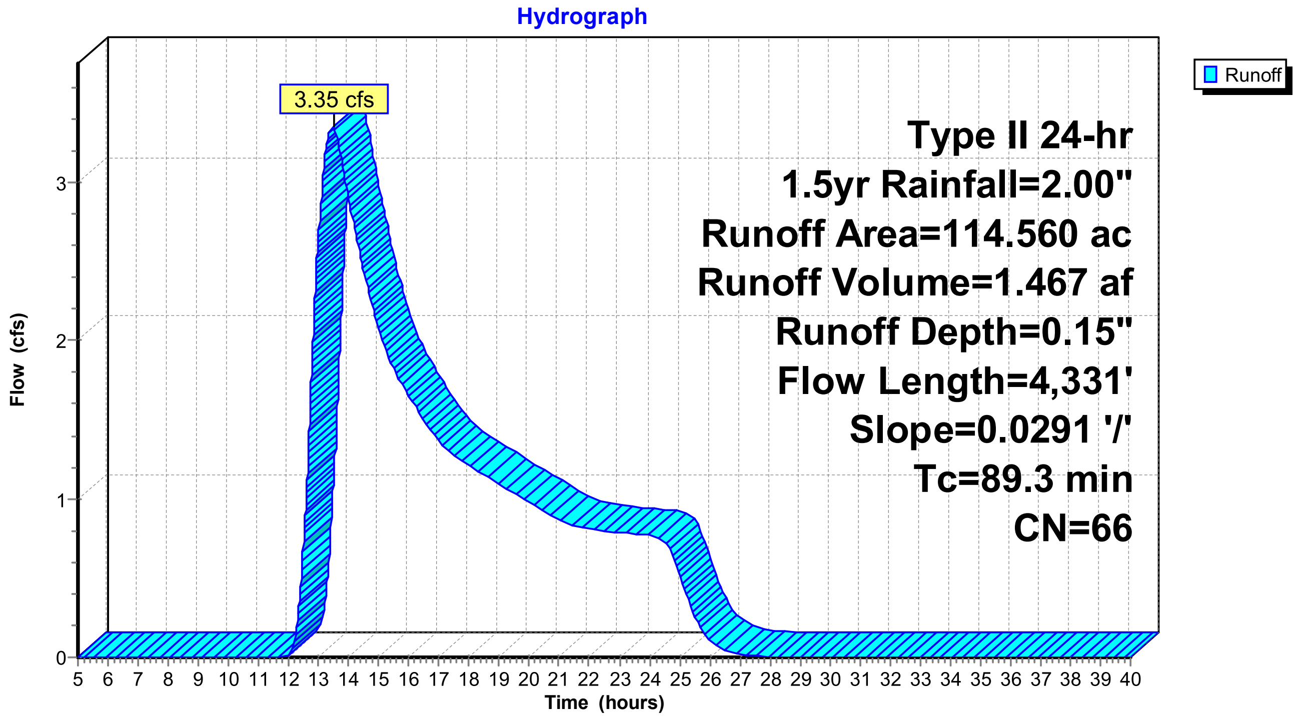
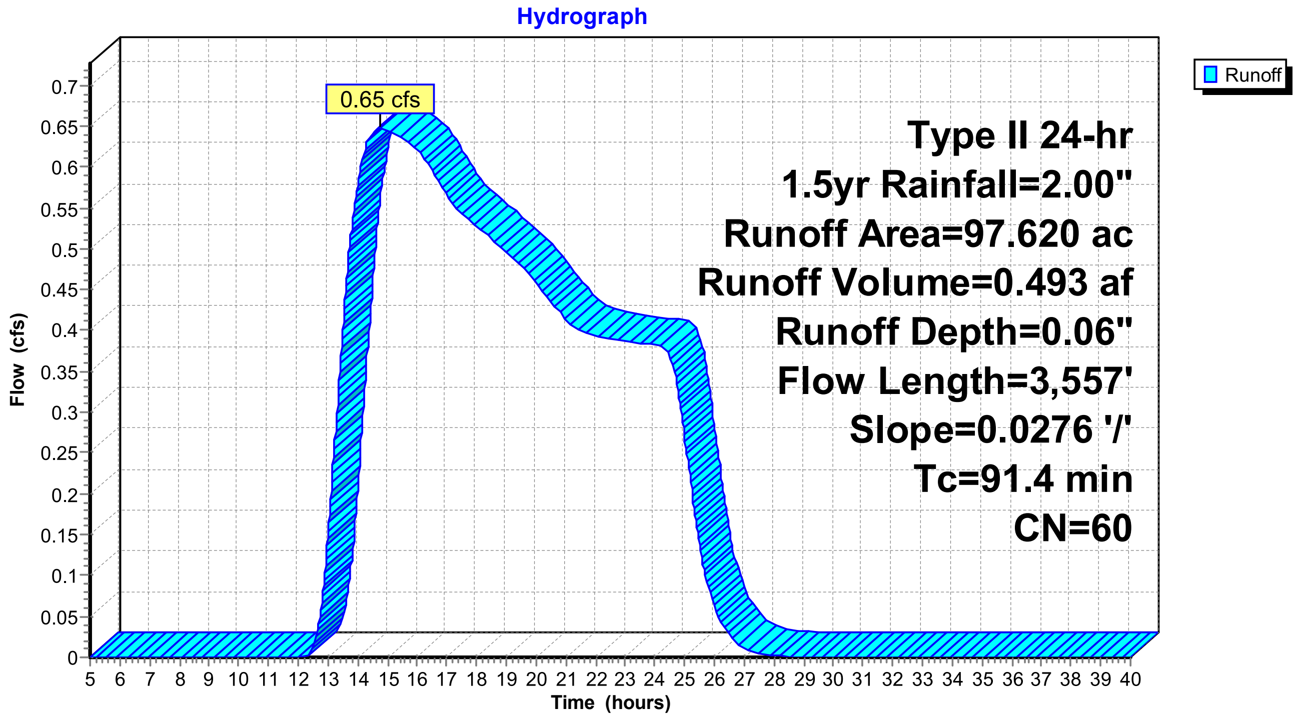
Appendix K

Existing Conditions HydroCAD®
Summary Report

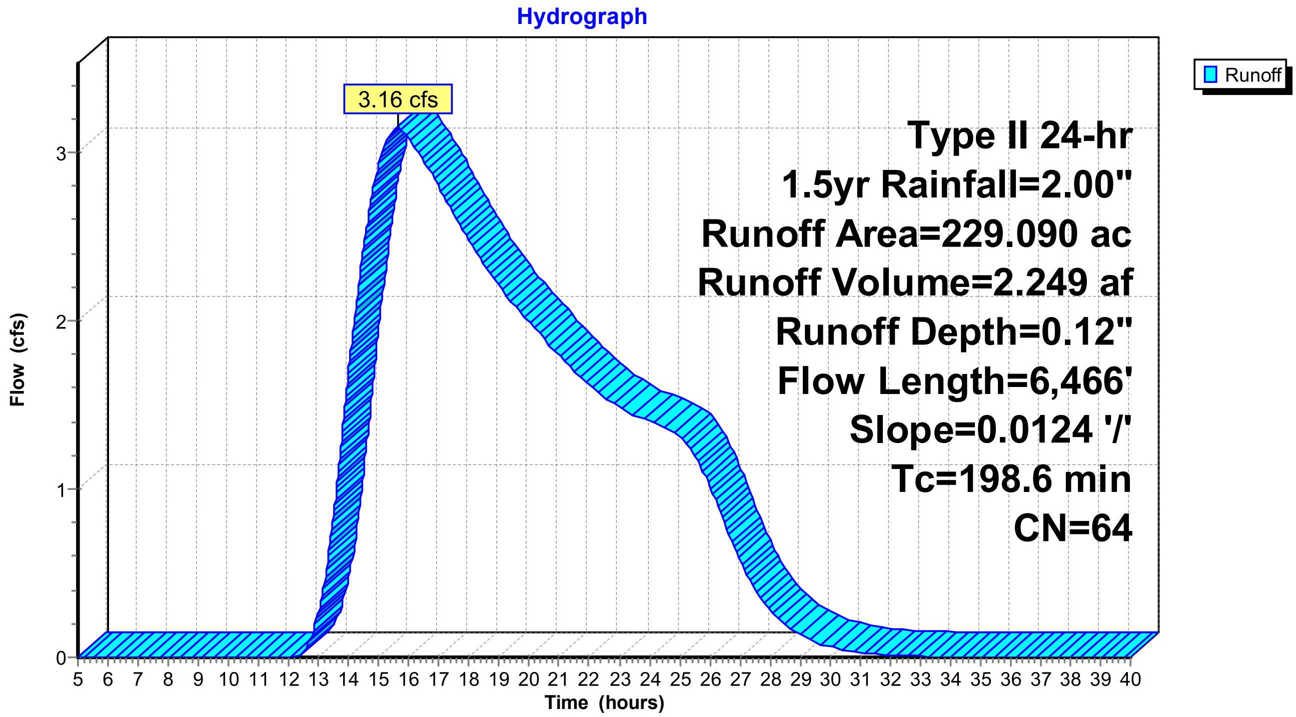
Subcatchment 1S: DA1



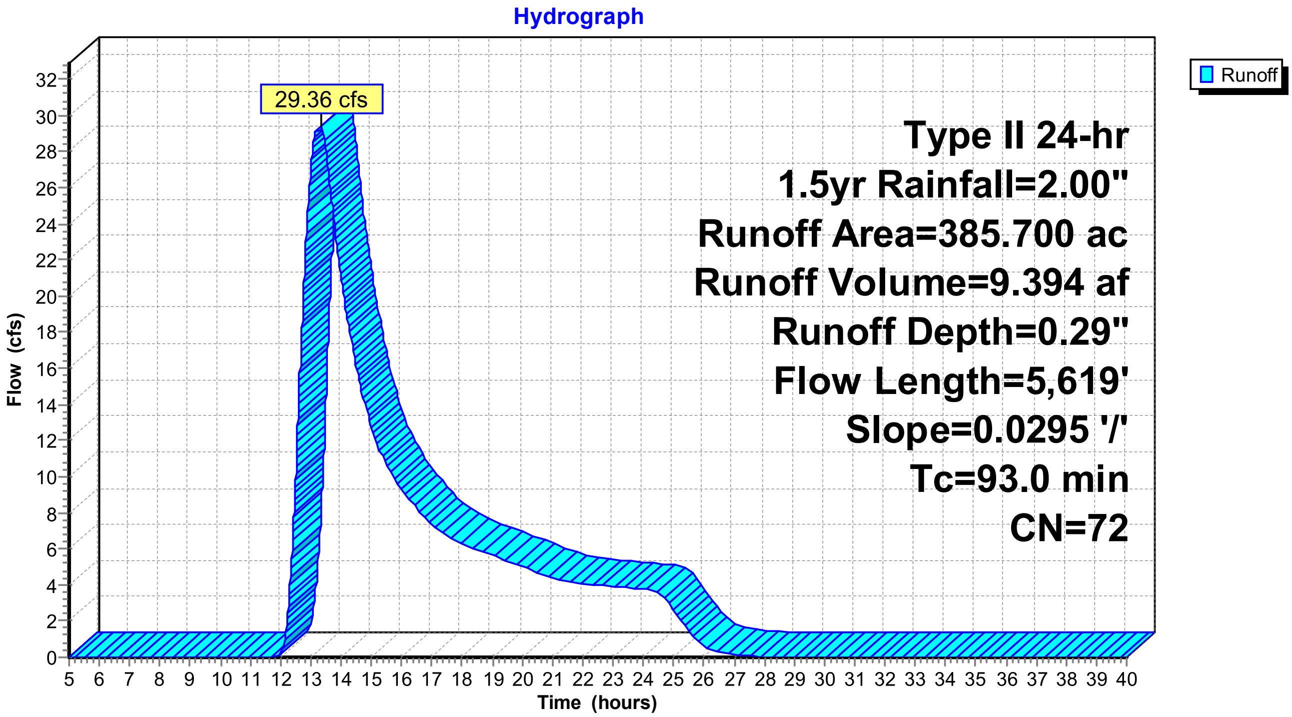
Subcatchment 2S: DA2



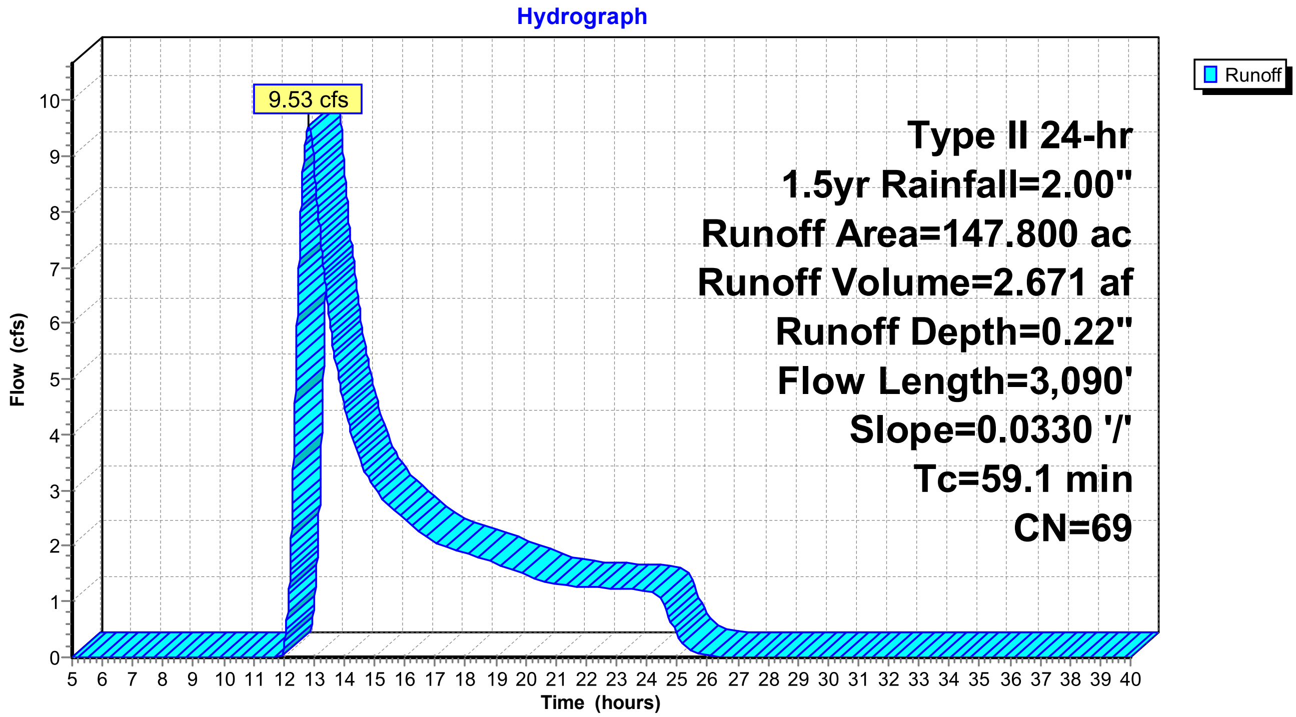
Subcatchment 8S: DA3



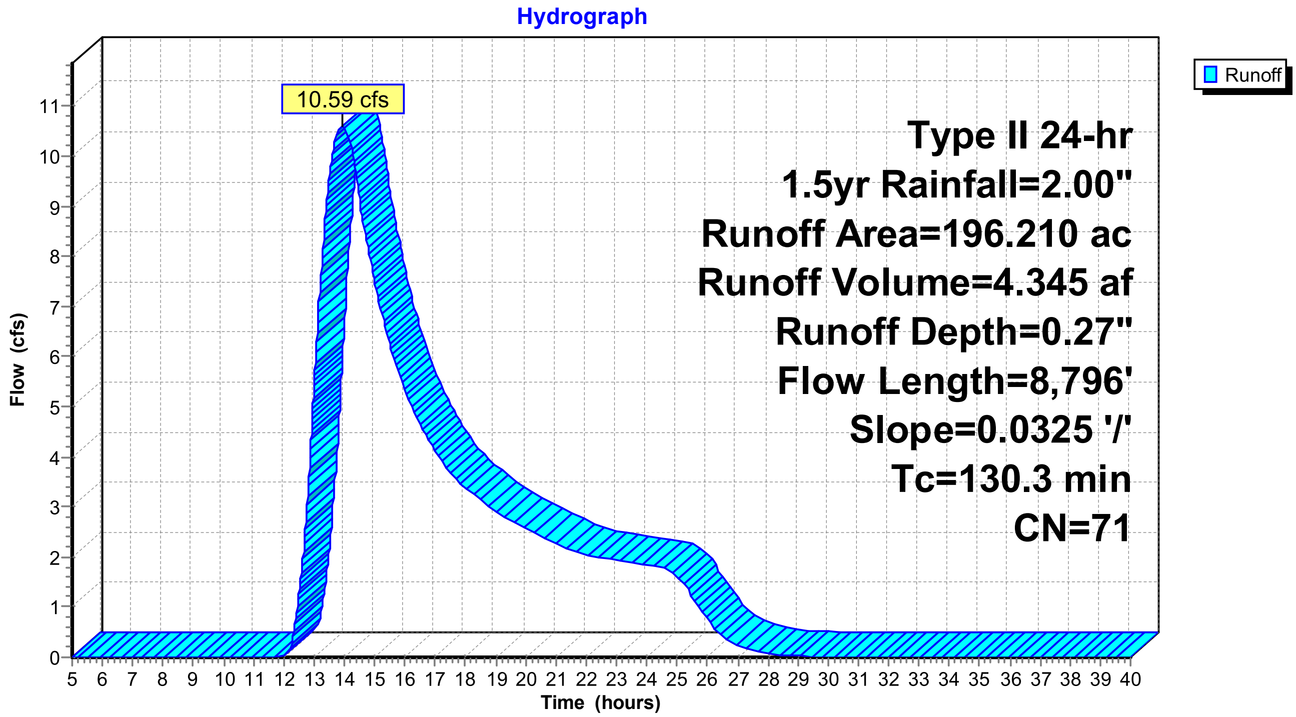
Subcatchment 12S: DA6



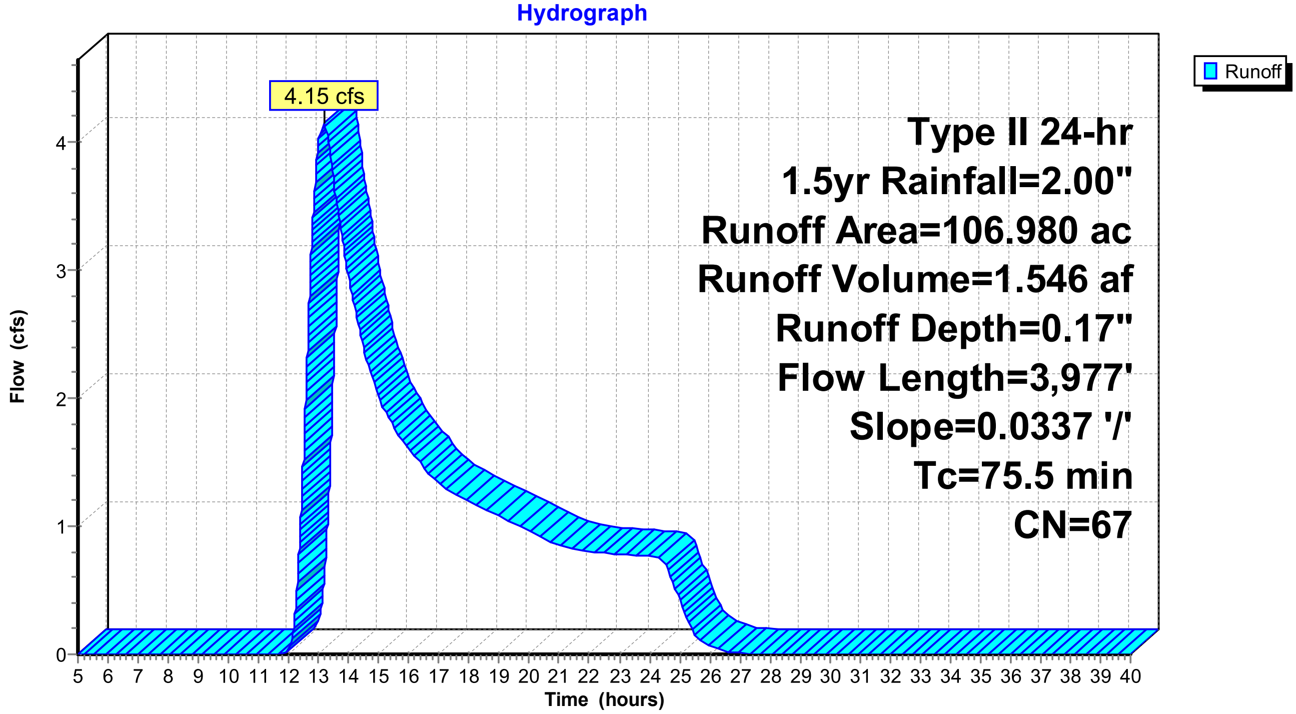
Subcatchment 13S: DA7



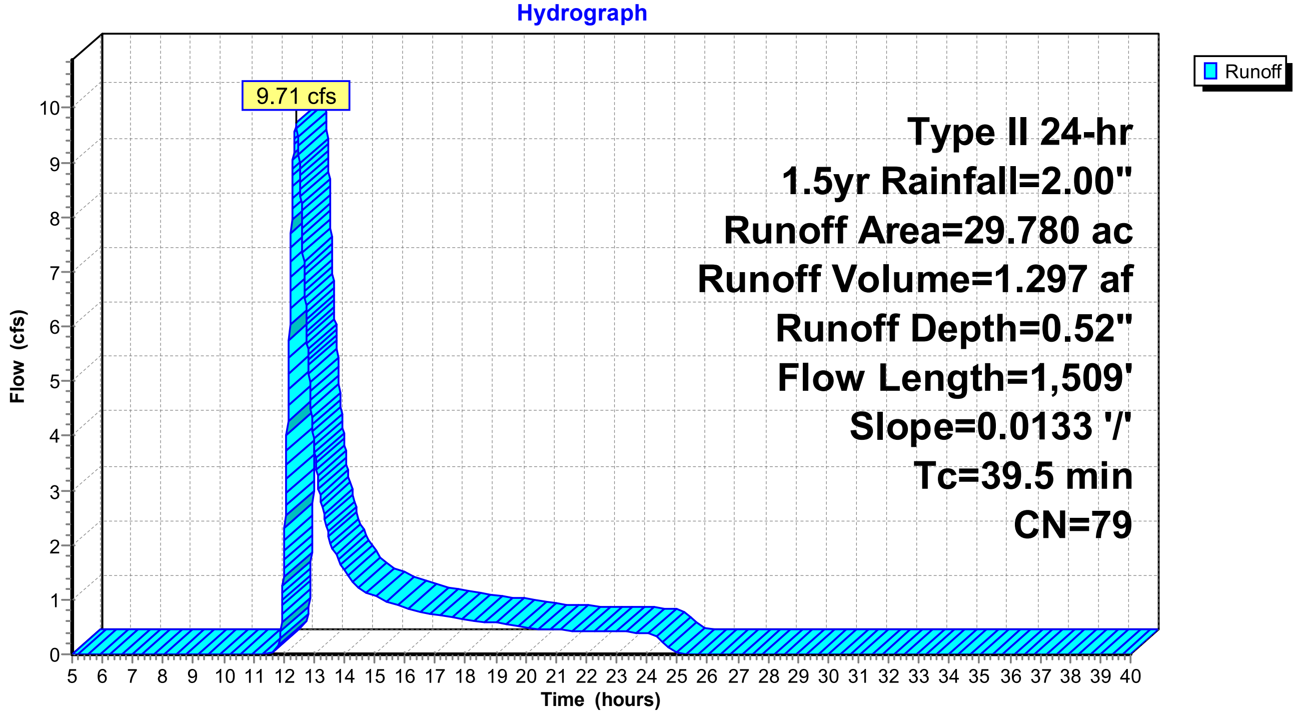
Subcatchment 15S: DA5 (Spring Creek)



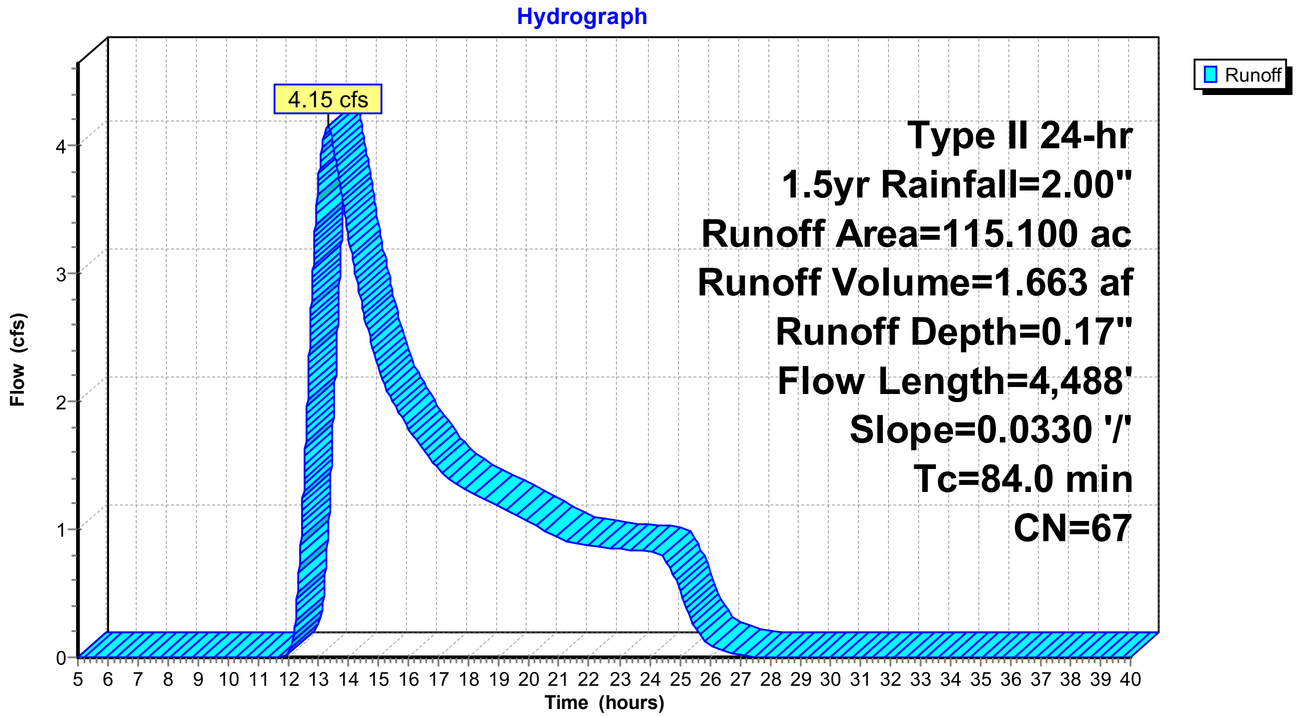
Subcatchment 20S: DA8



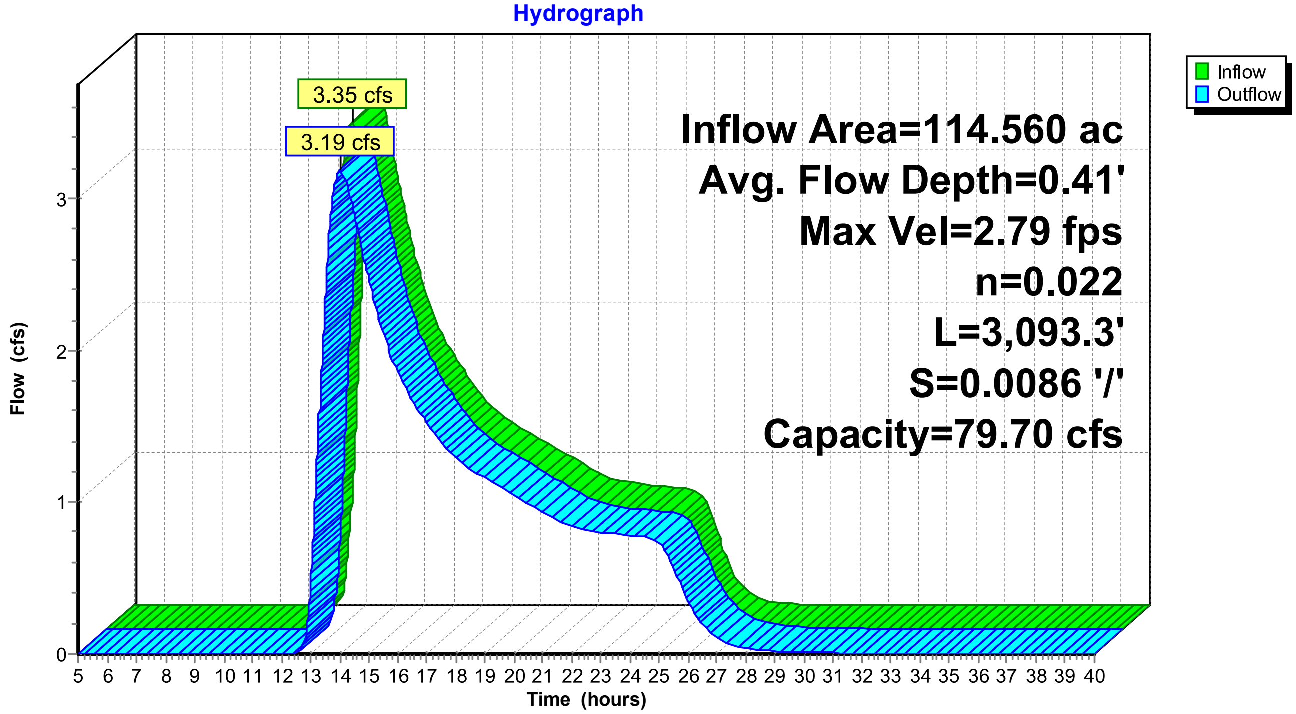
Subcatchment 23S: DA9



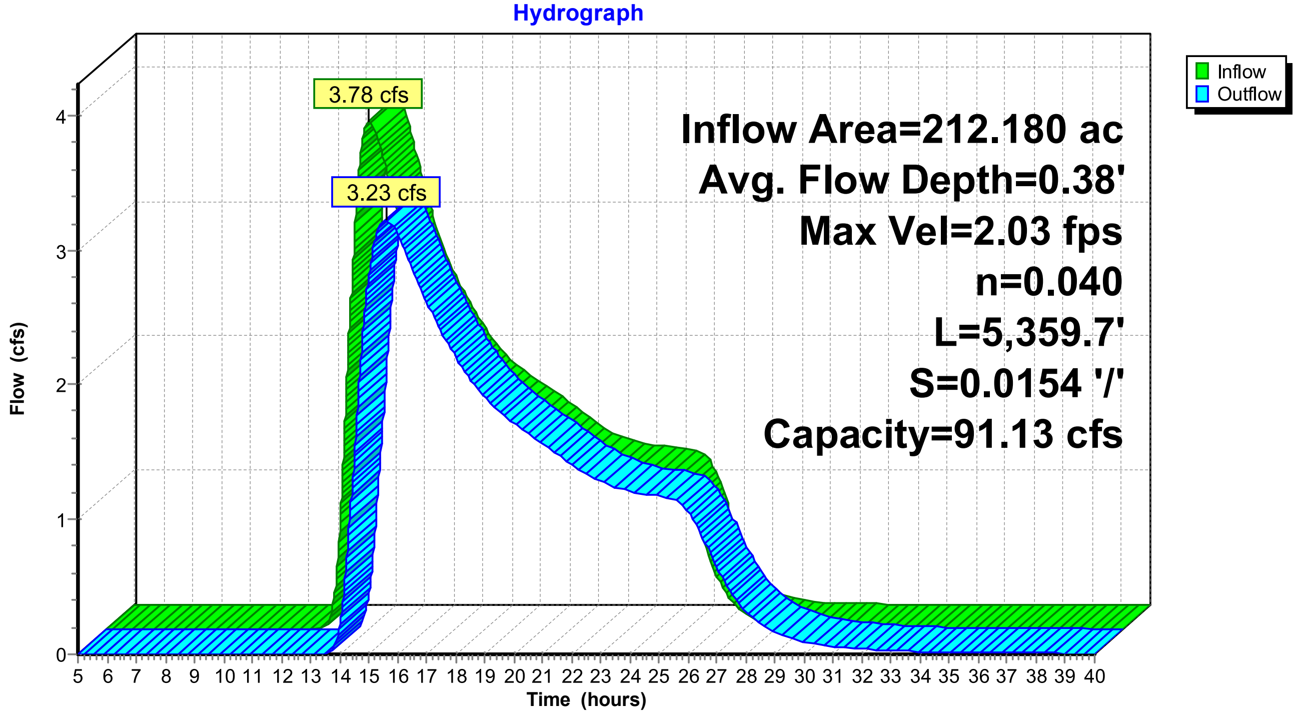
Subcatchment 31S: DA4



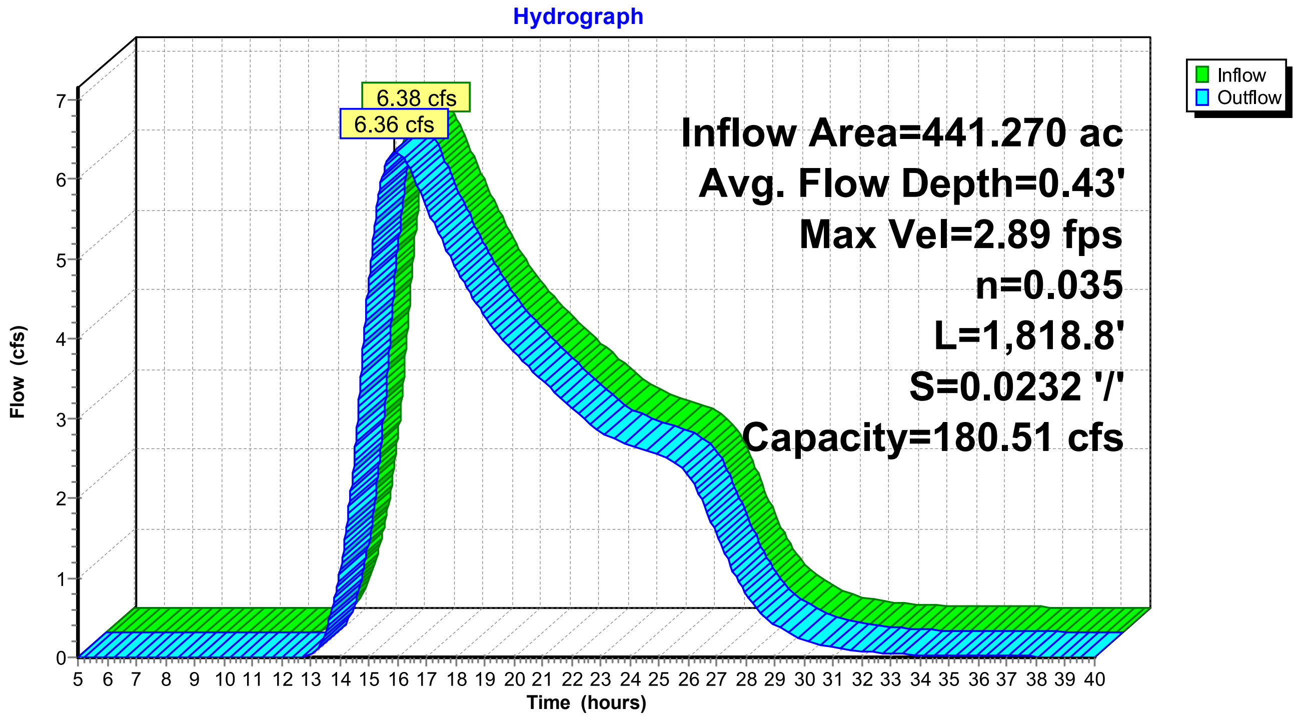
Reach 4R: Pasture



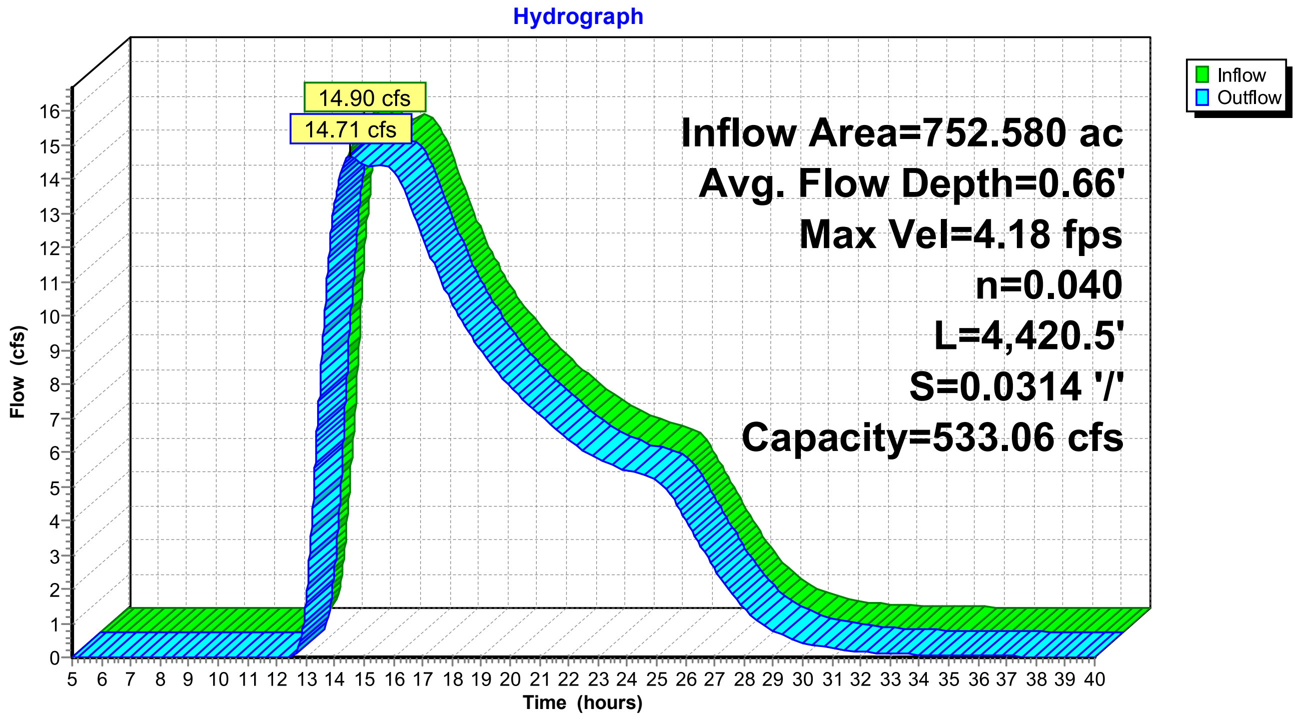
Reach 6R: Ponds



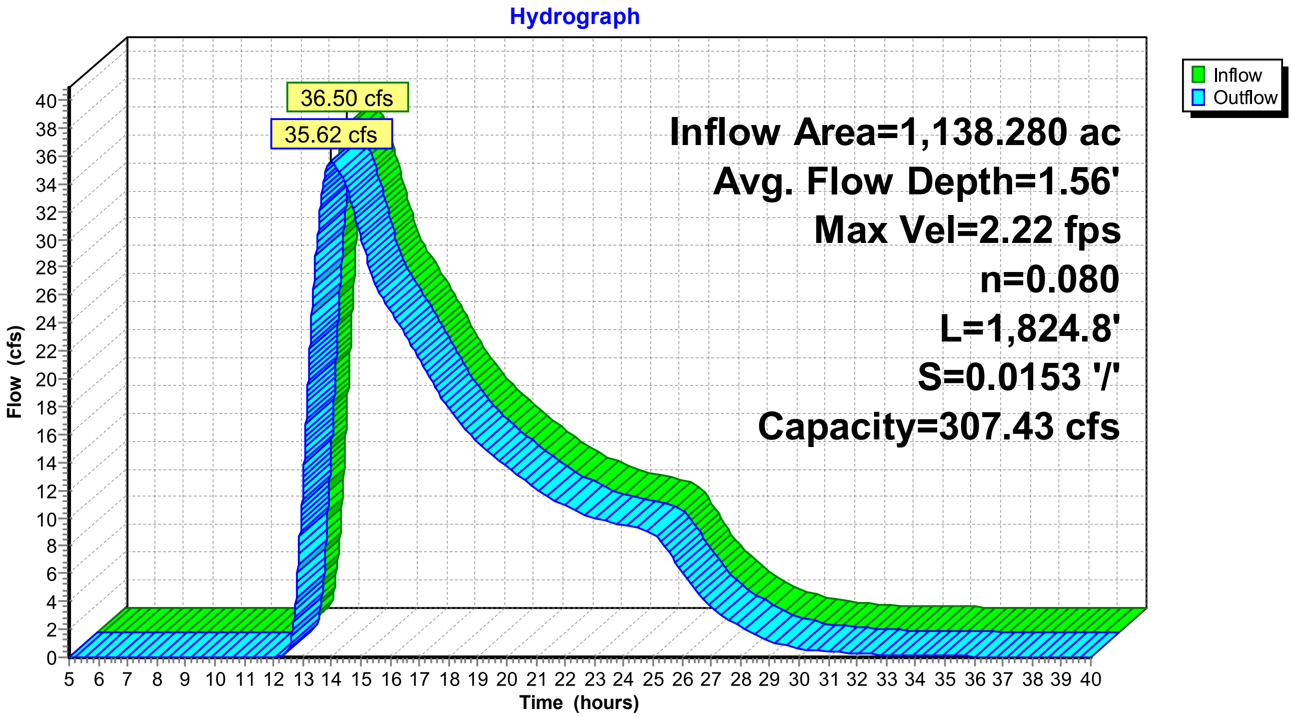
Reach 9R: School



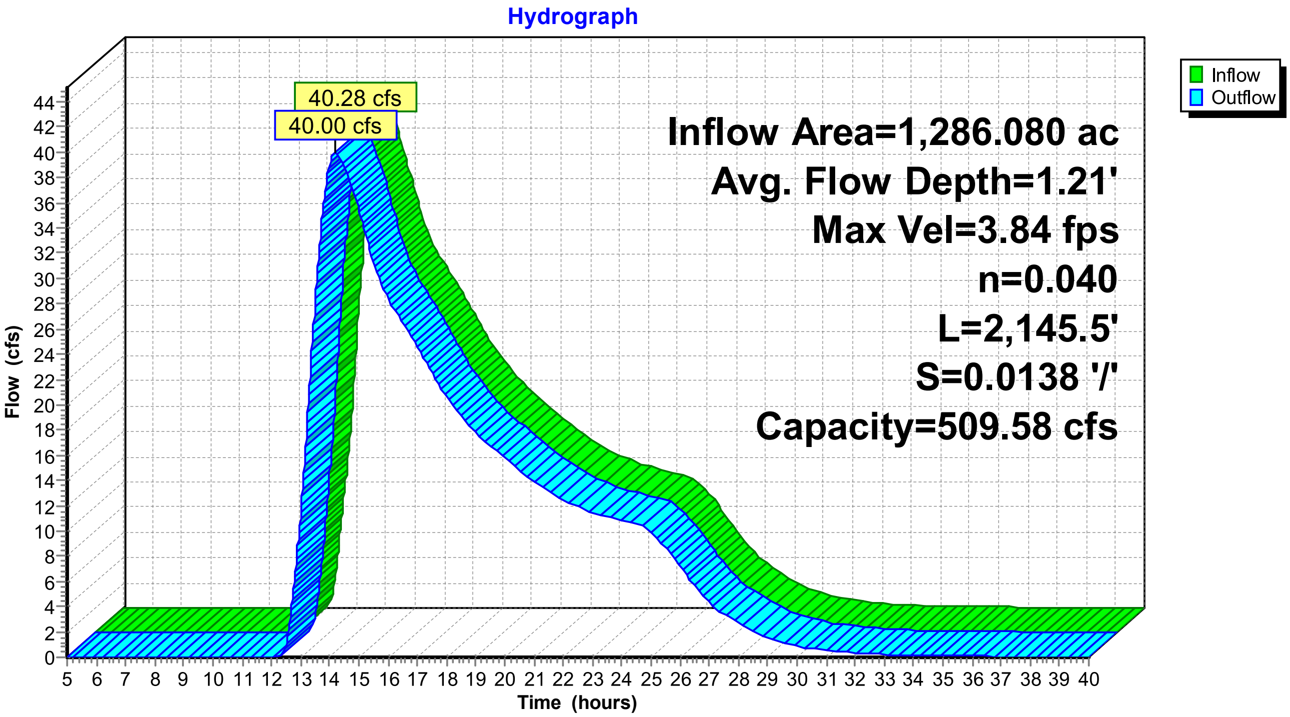
Reach 11R: Commercial



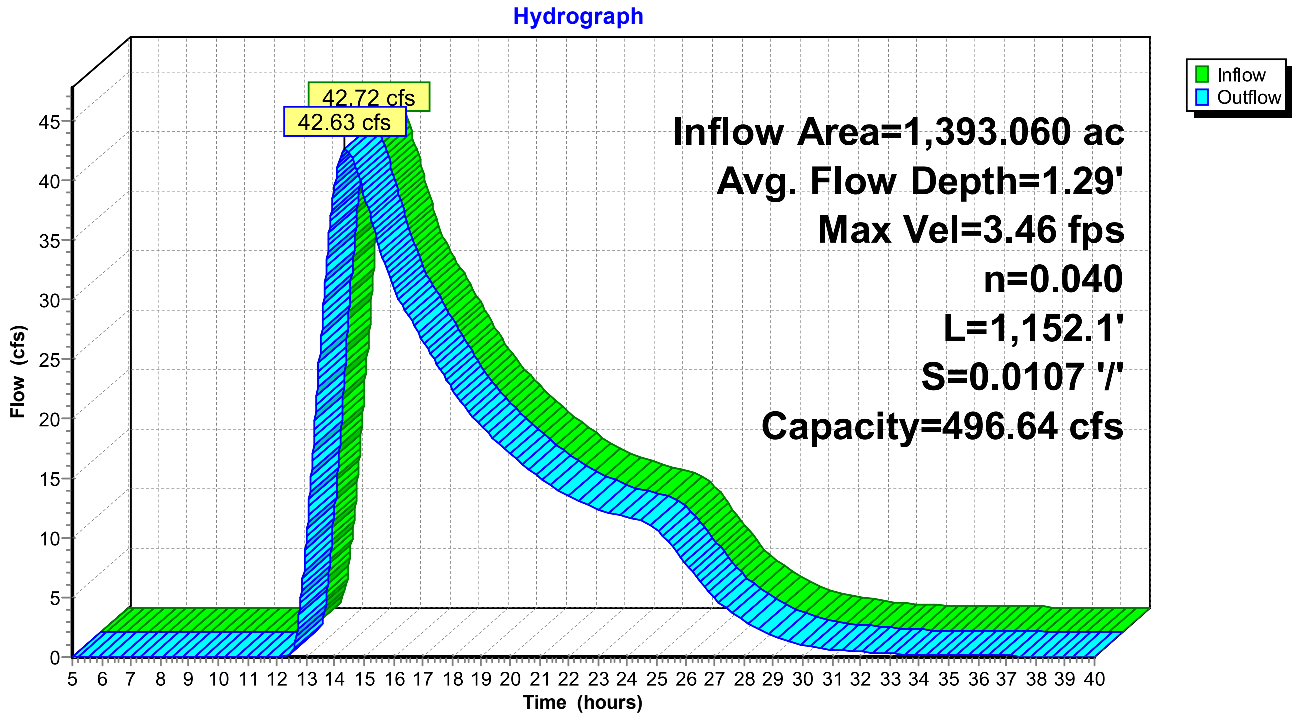
Reach 17R: Park to Penn



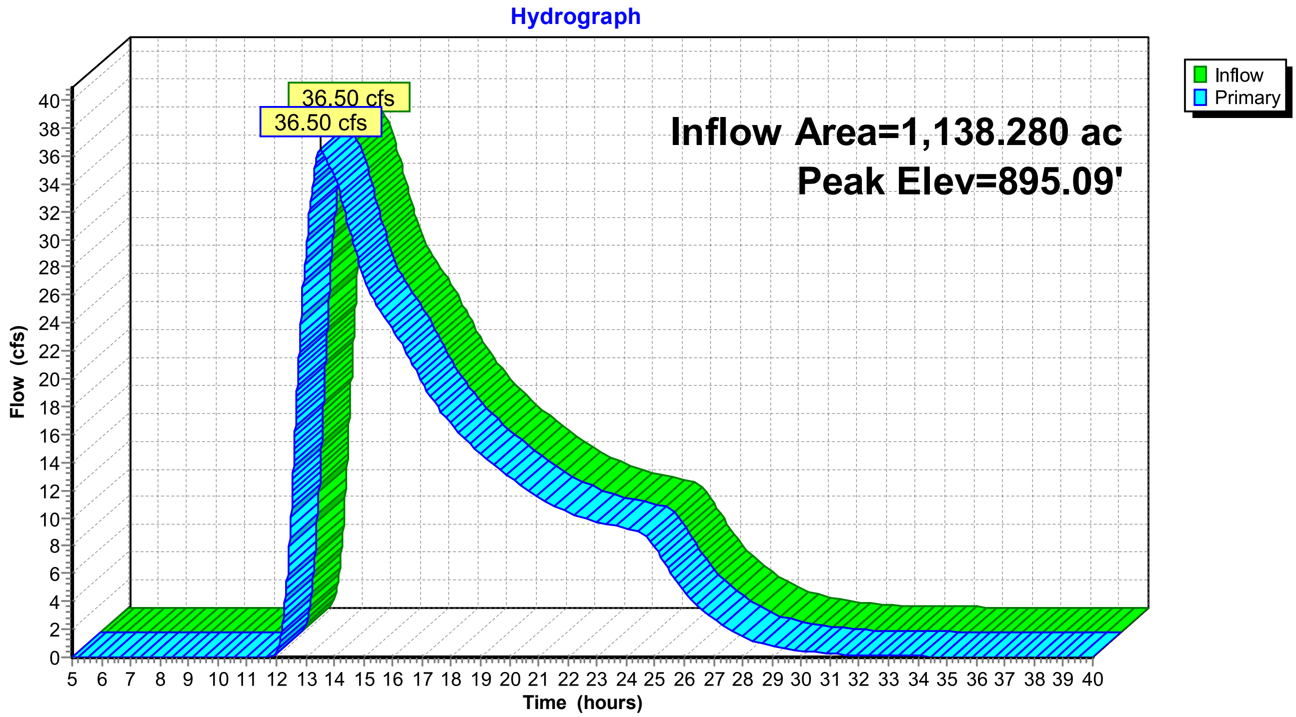
Reach 19R: E. Lake to Penn



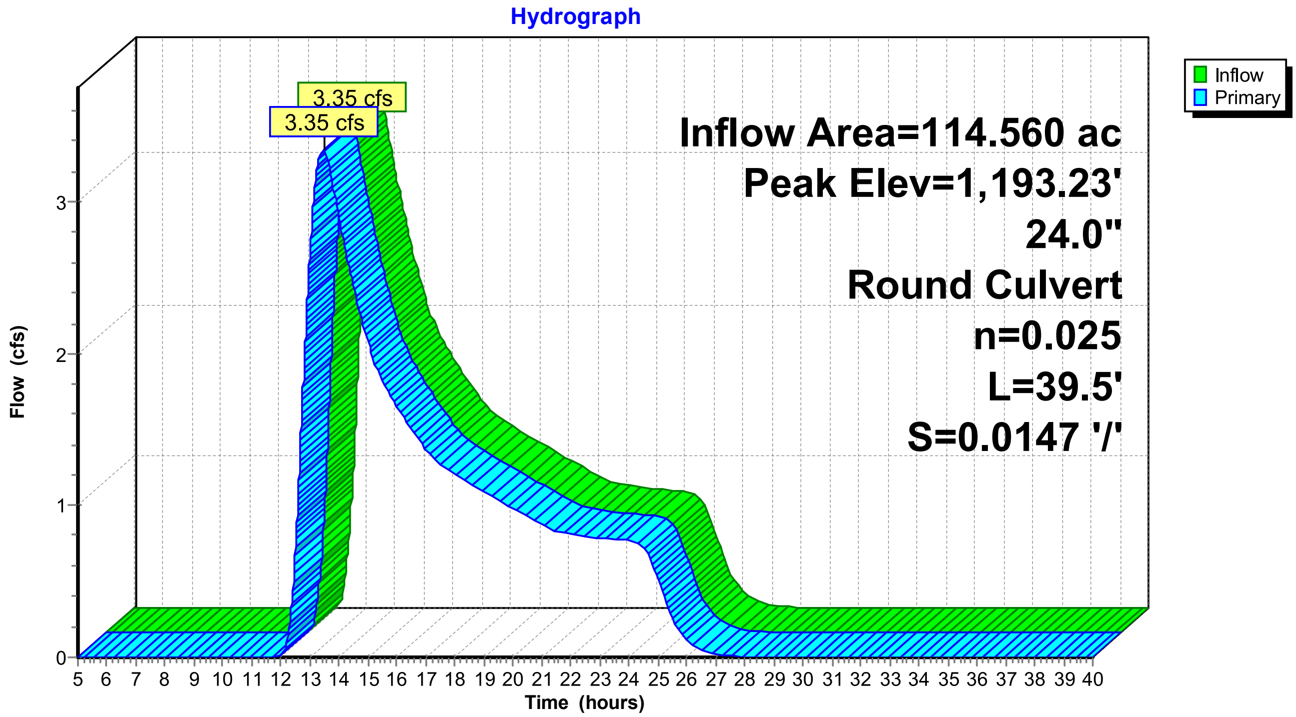
Reach 22R: Wilkins Tract to E. Lake



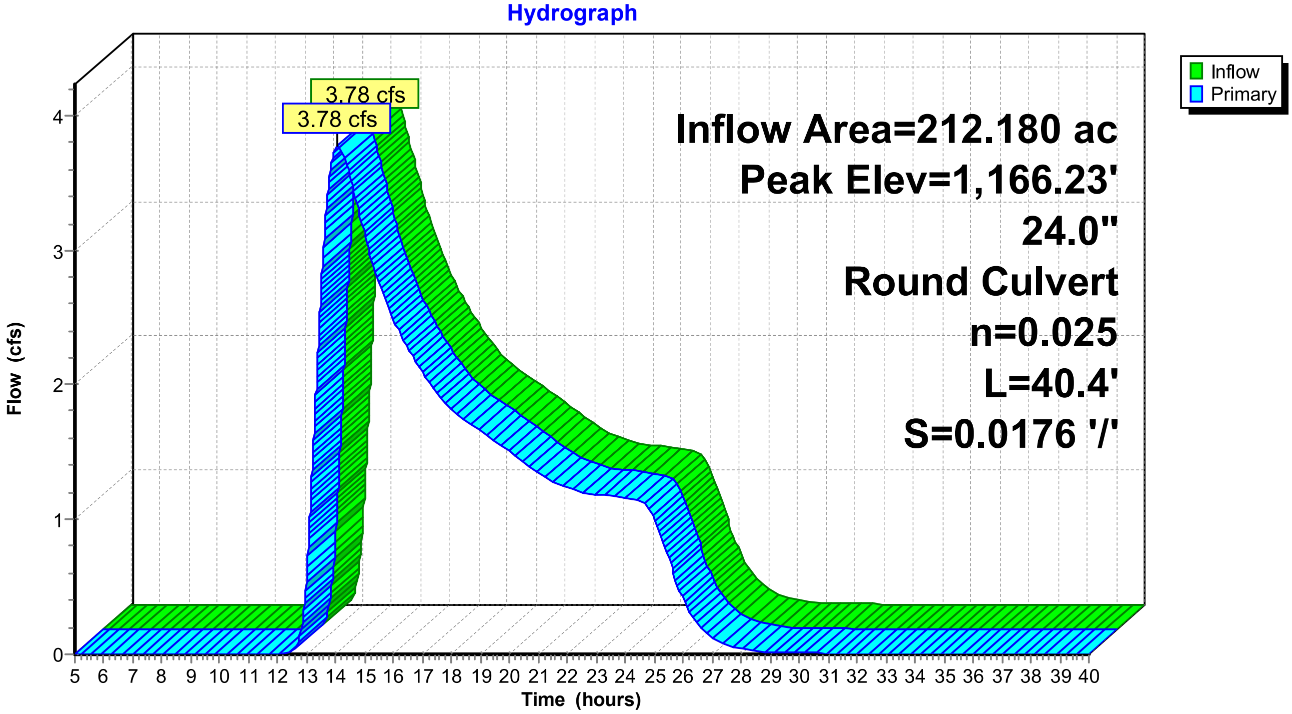
Pond 22P: Park



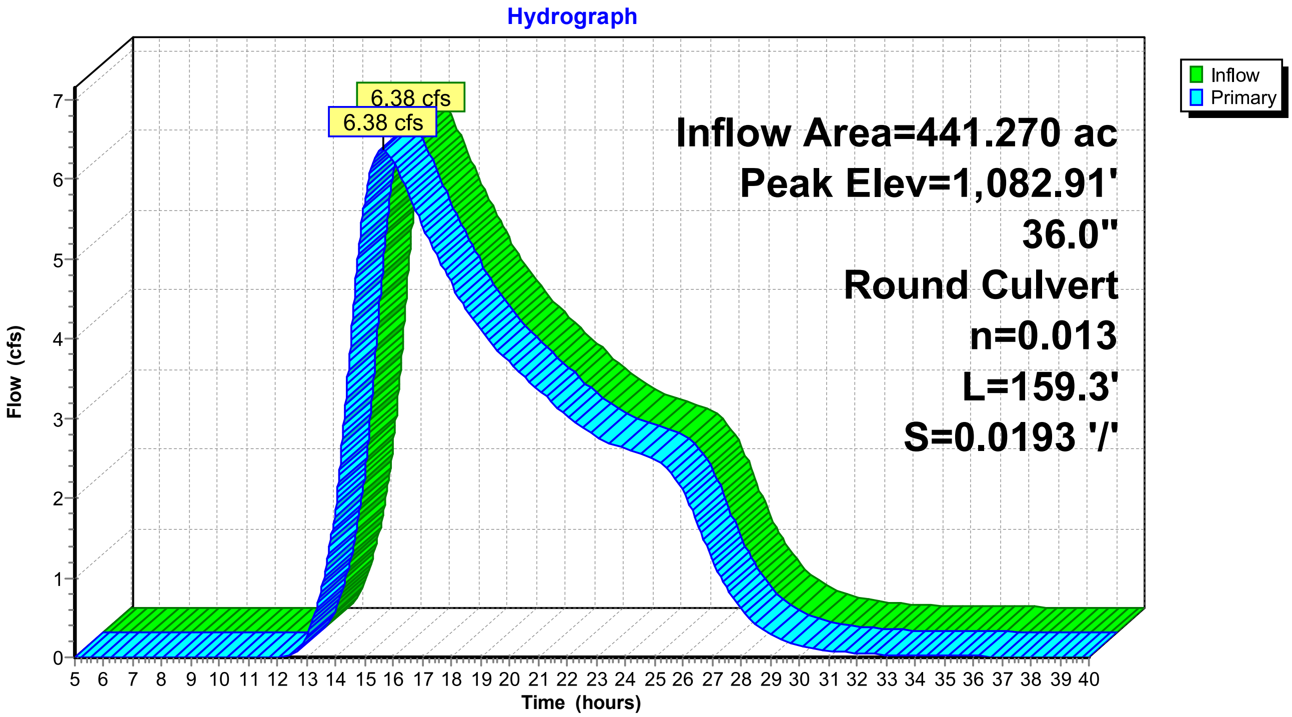
Pond 23P: Cleary Rd.



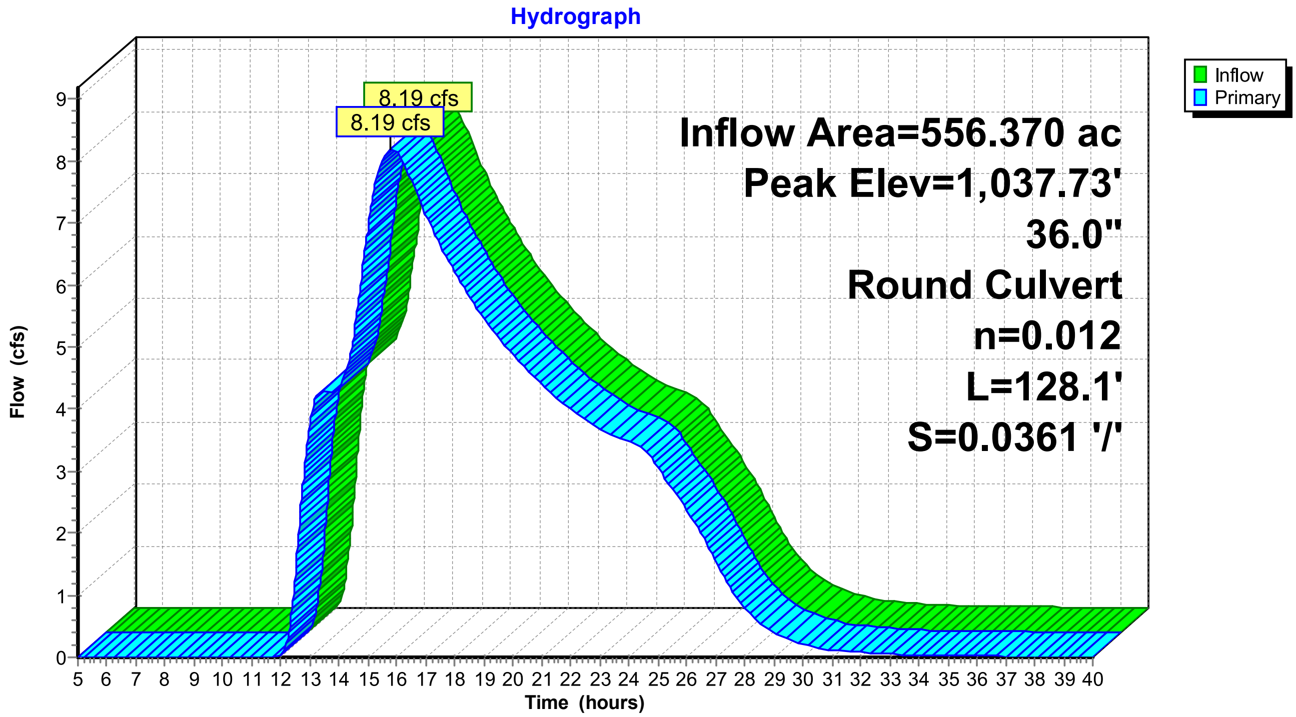
Pond 24P: Shelly Rd.



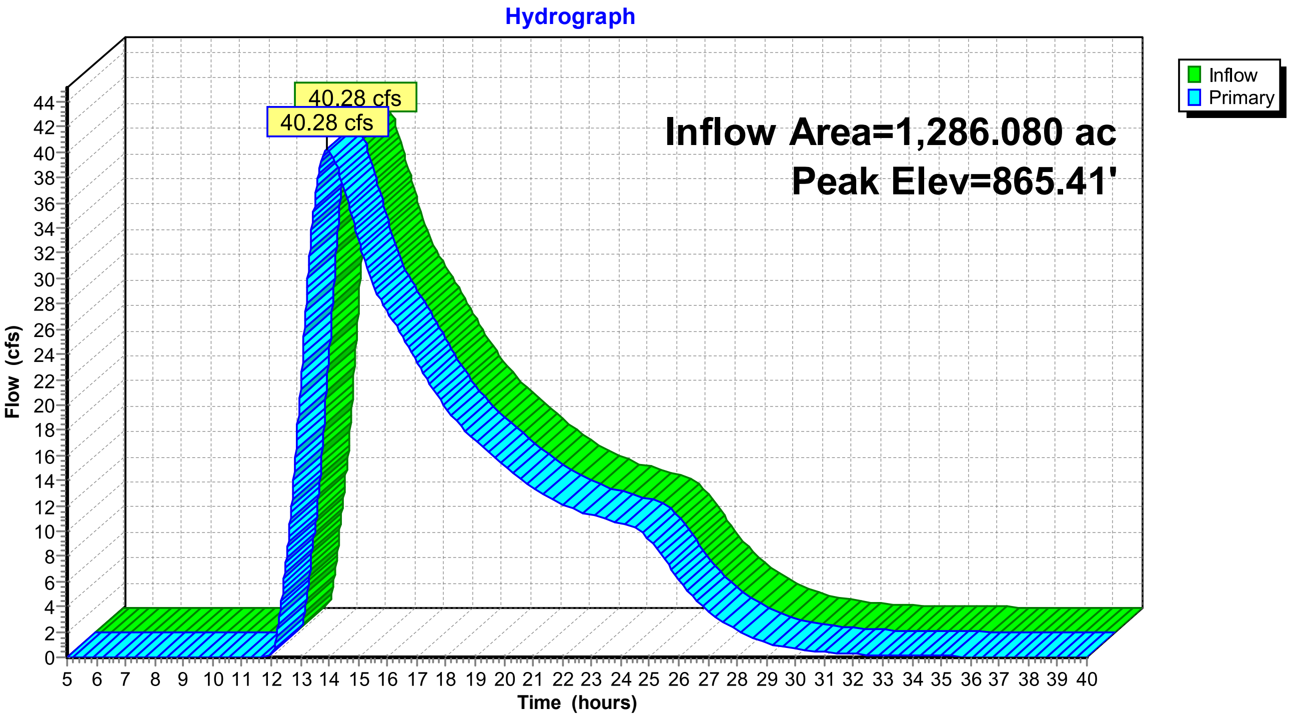
Pond 25P: School



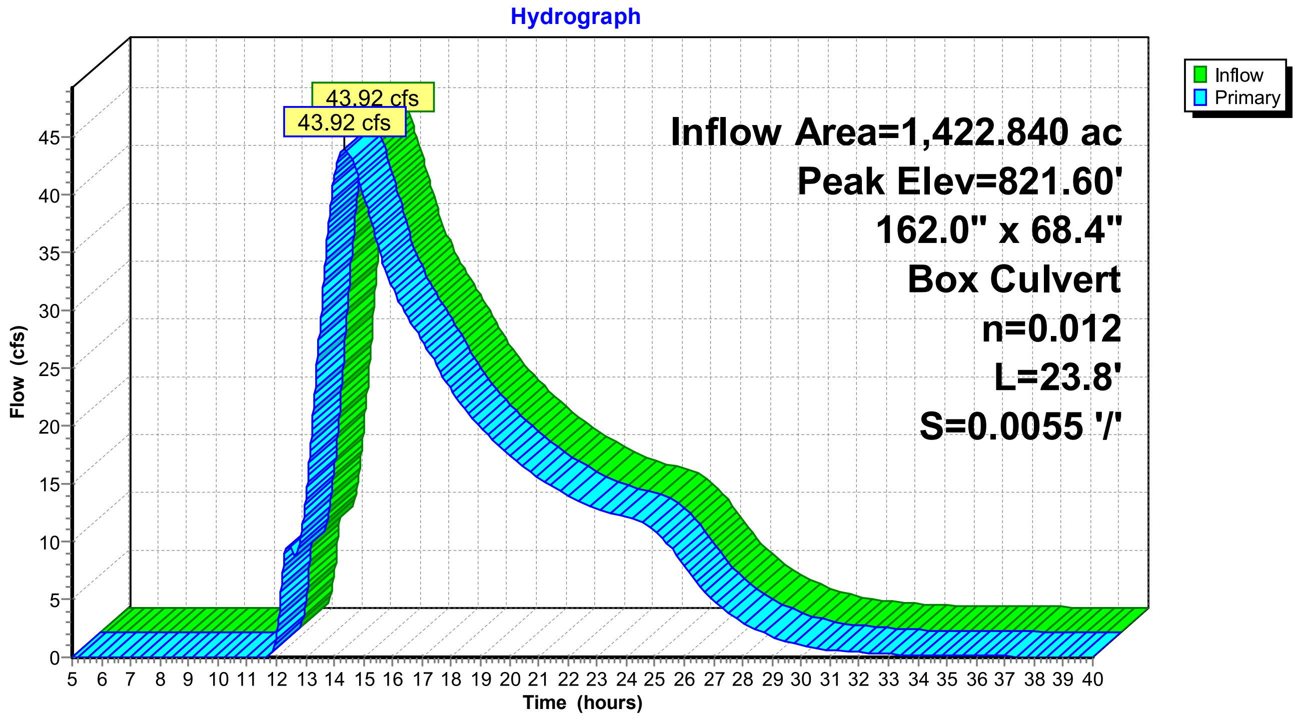
Pond 26P: Commercial St.



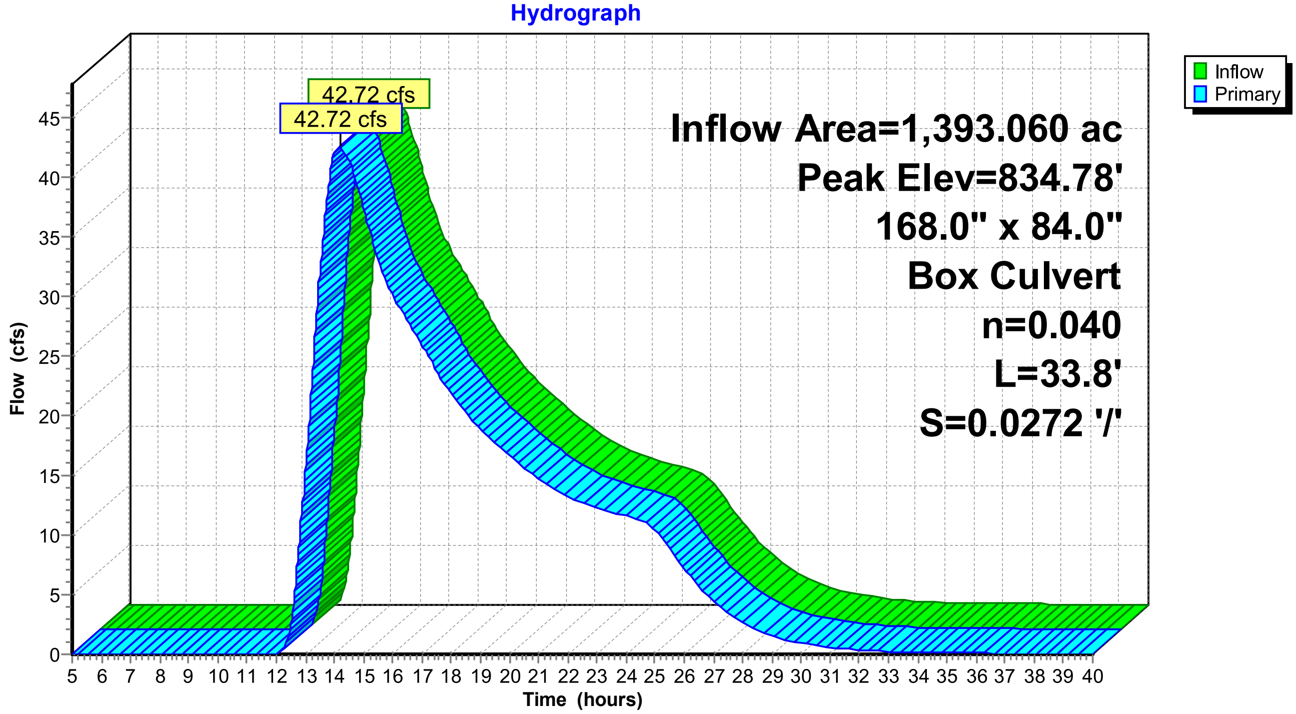
Pond 27P: Pennimite Rd



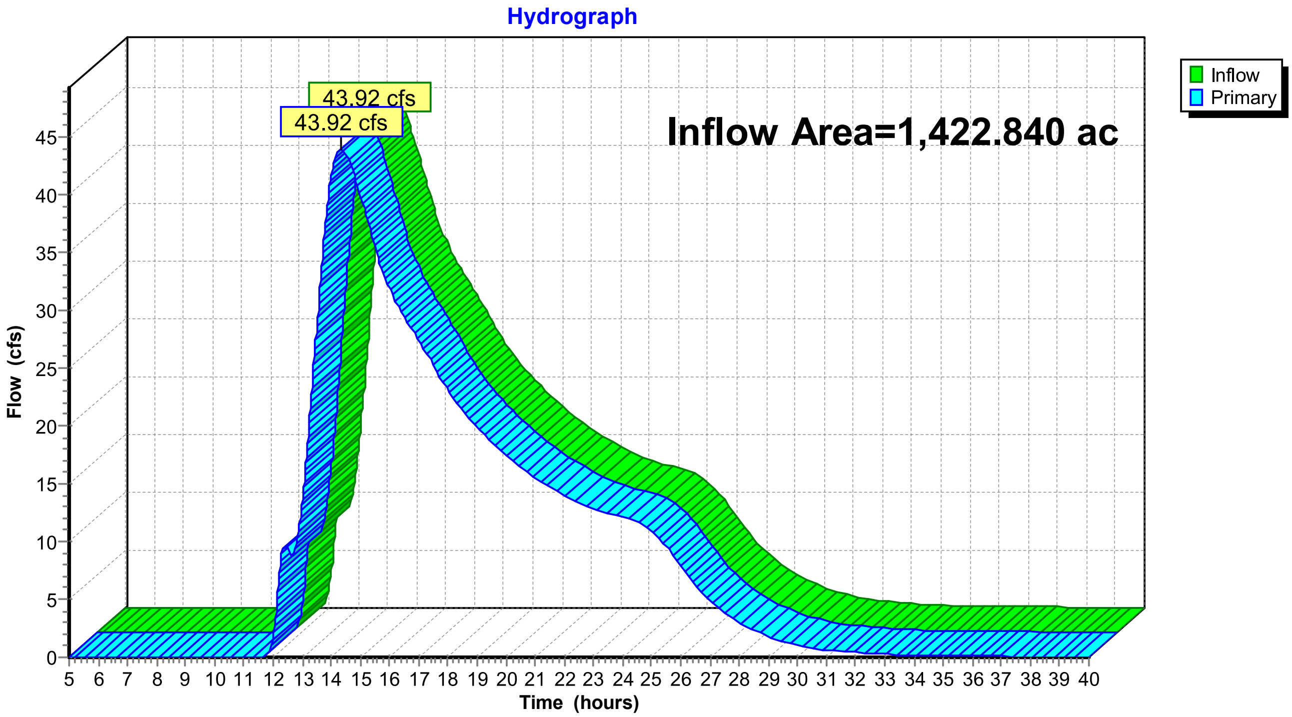
Pond 28P: Wilkins Tract



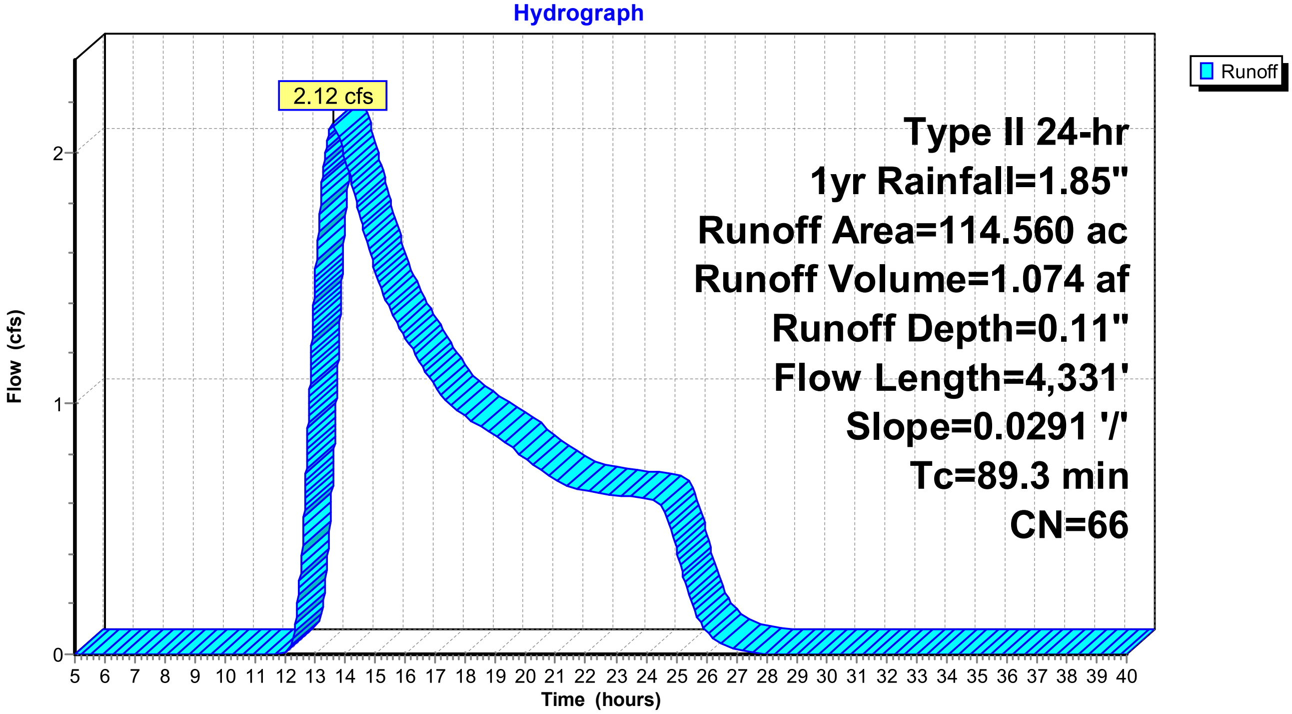
Pond 29P: E. Lake Rd.



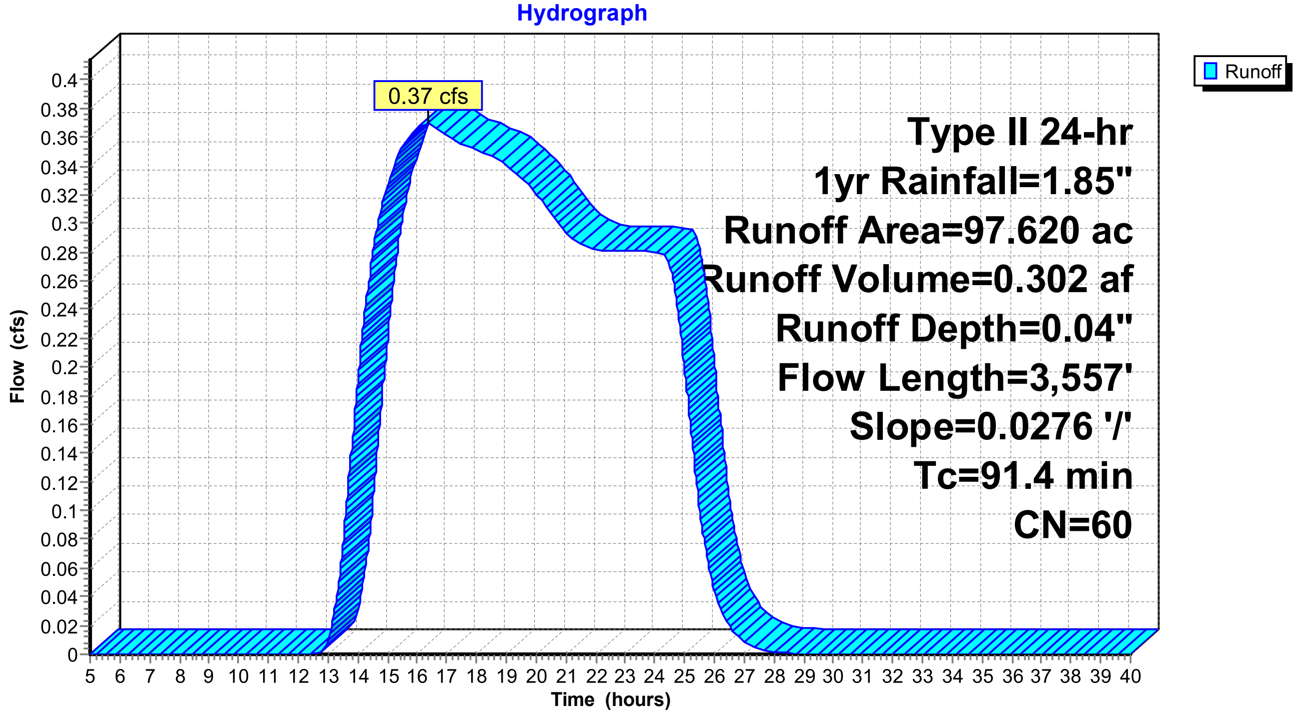
Link 30L: Conesus Lake



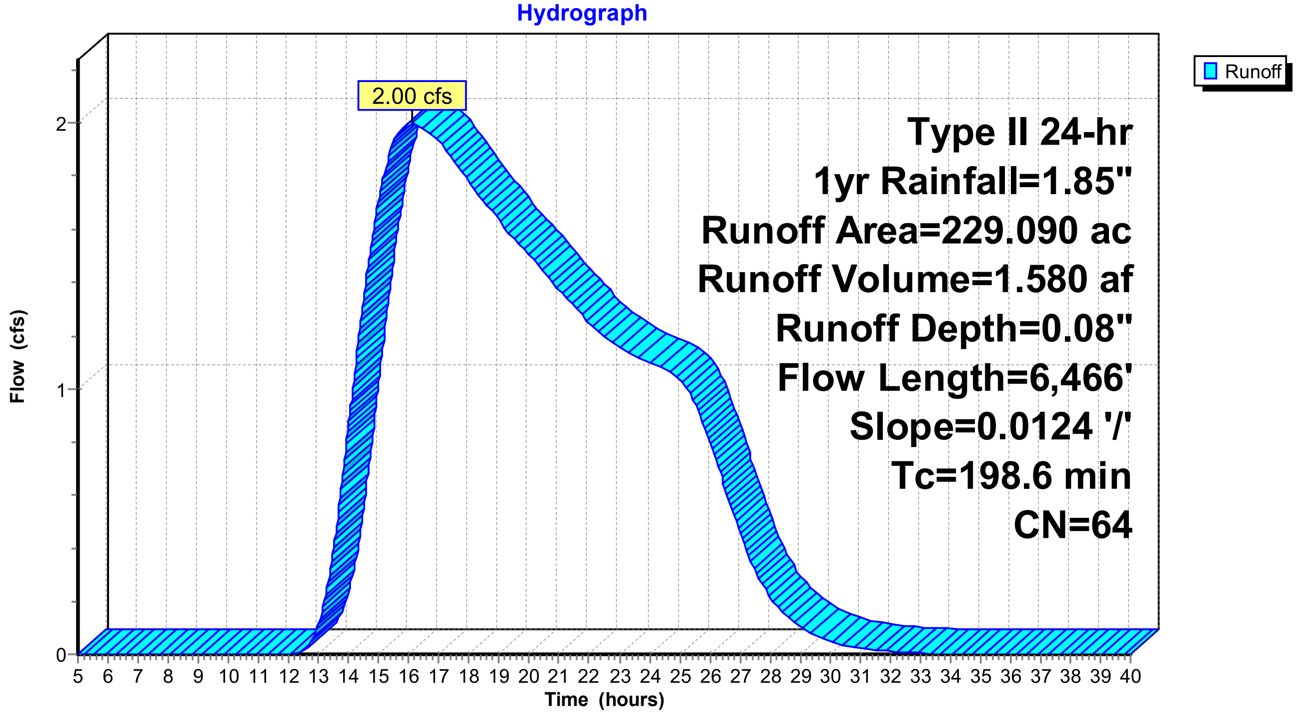
Subcatchment 1S: DA1



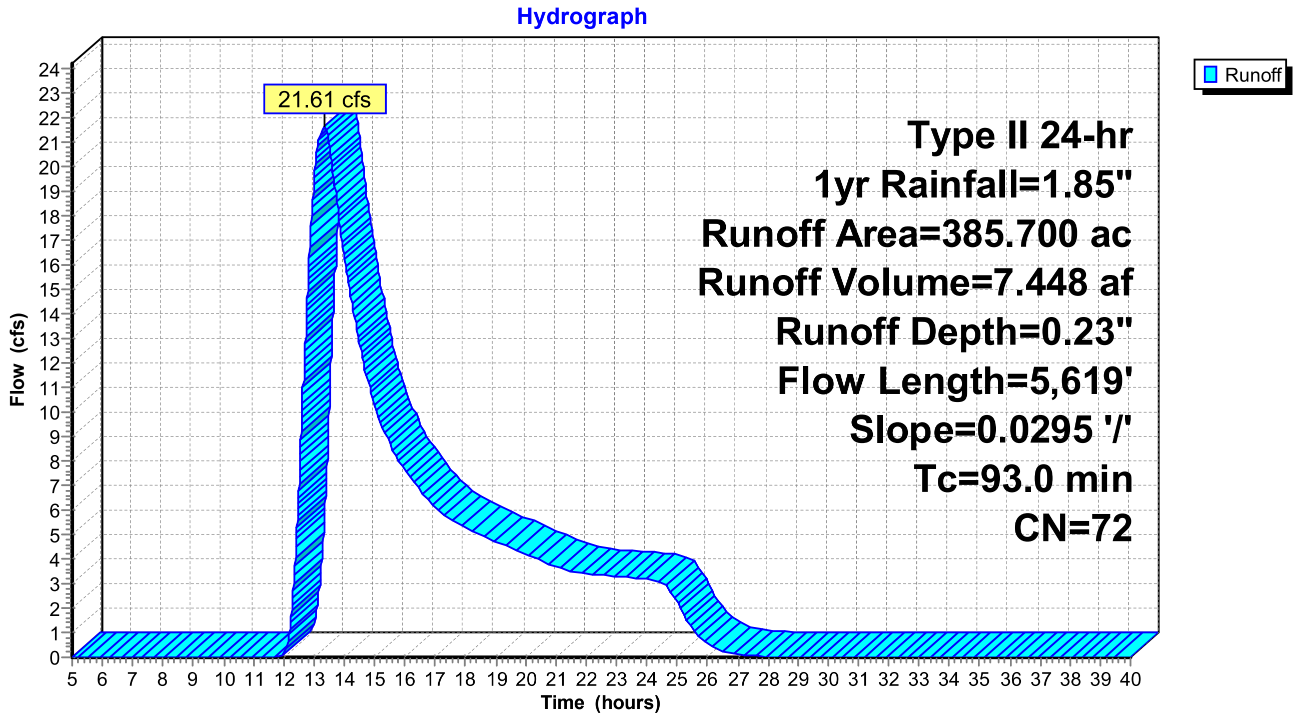
Subcatchment 2S: DA2



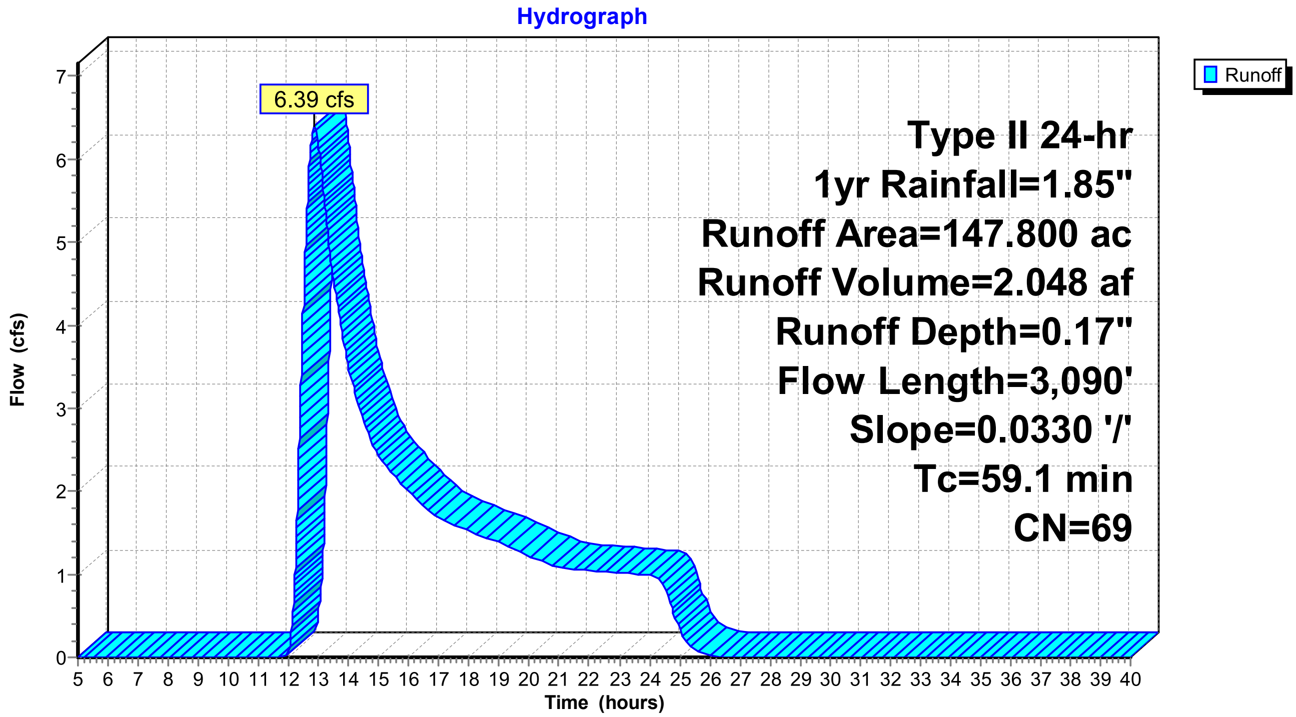
Subcatchment 8S: DA3



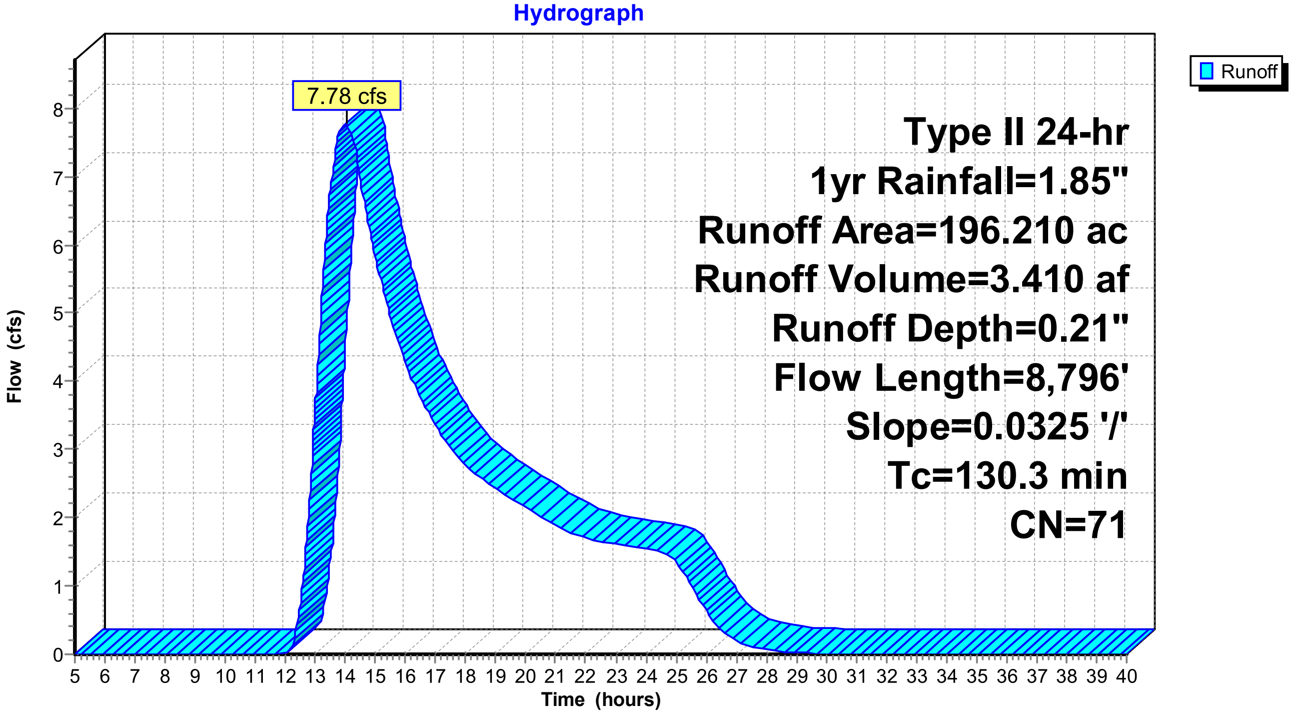
Subcatchment 12S: DA6



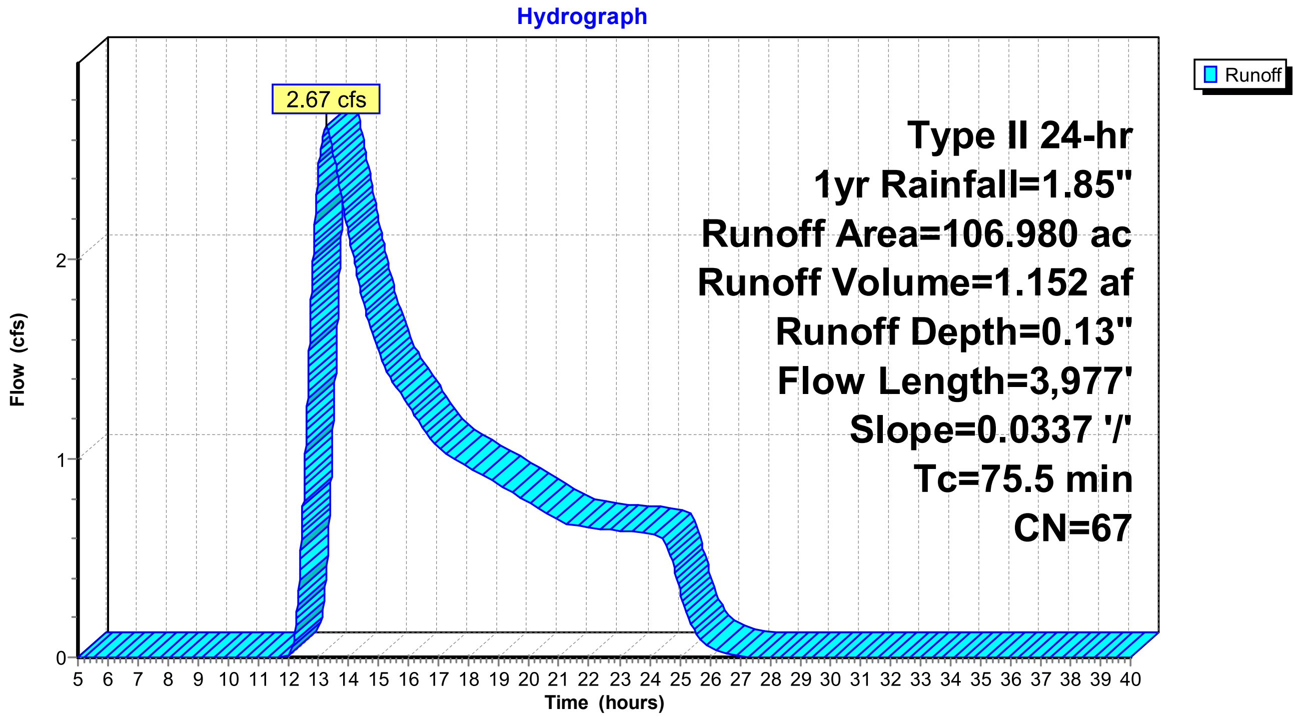
Subcatchment 13S: DA7



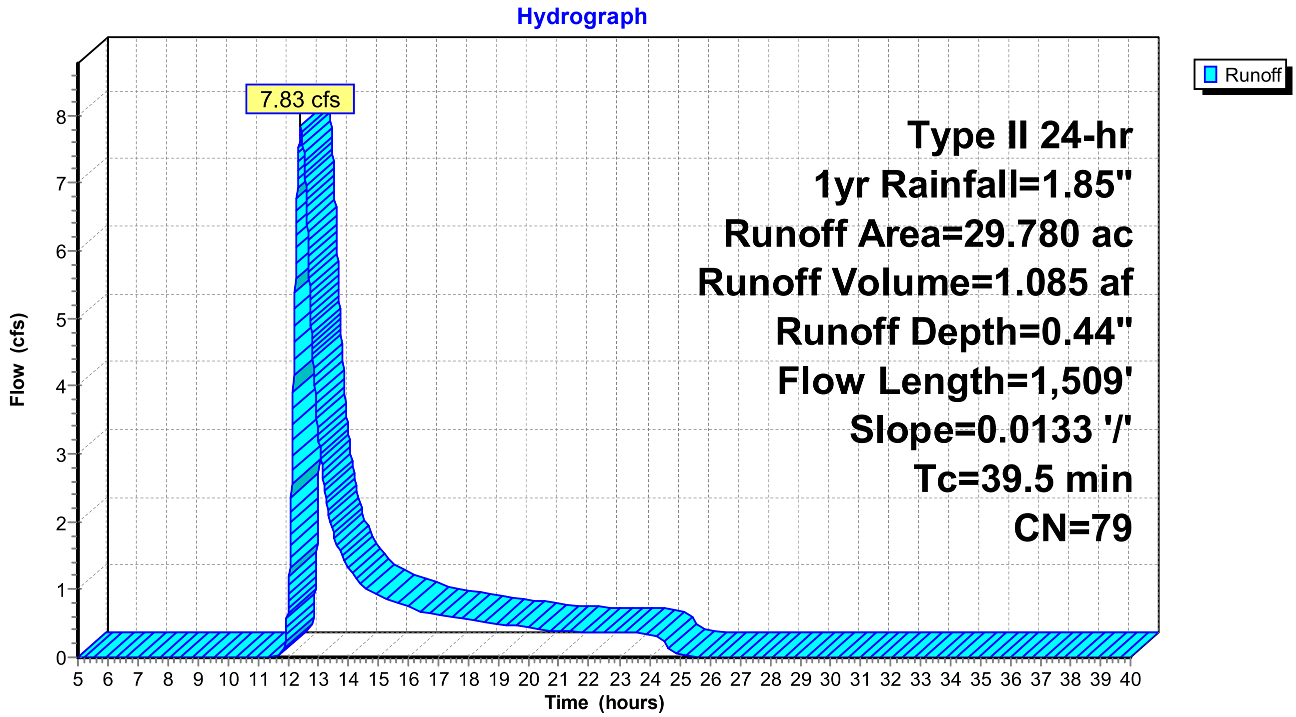
Subcatchment 15S: DA5 (Spring Creek)



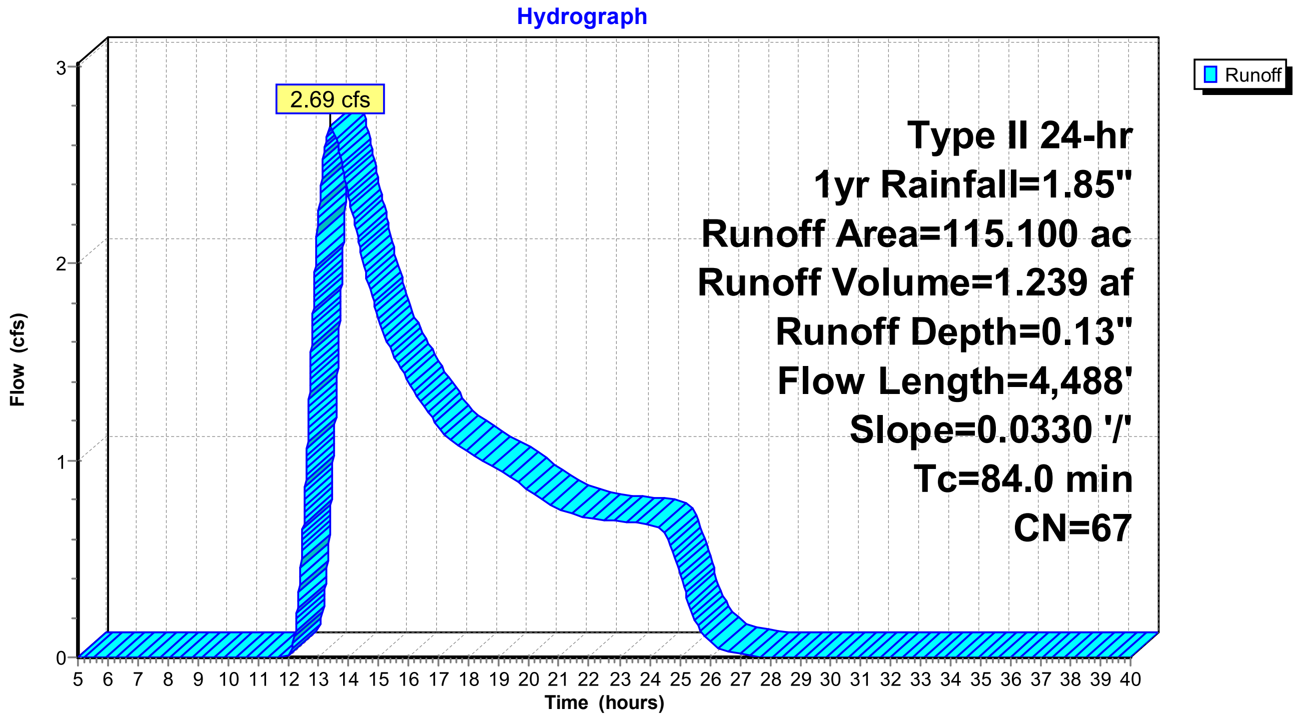
Subcatchment 20S: DA8



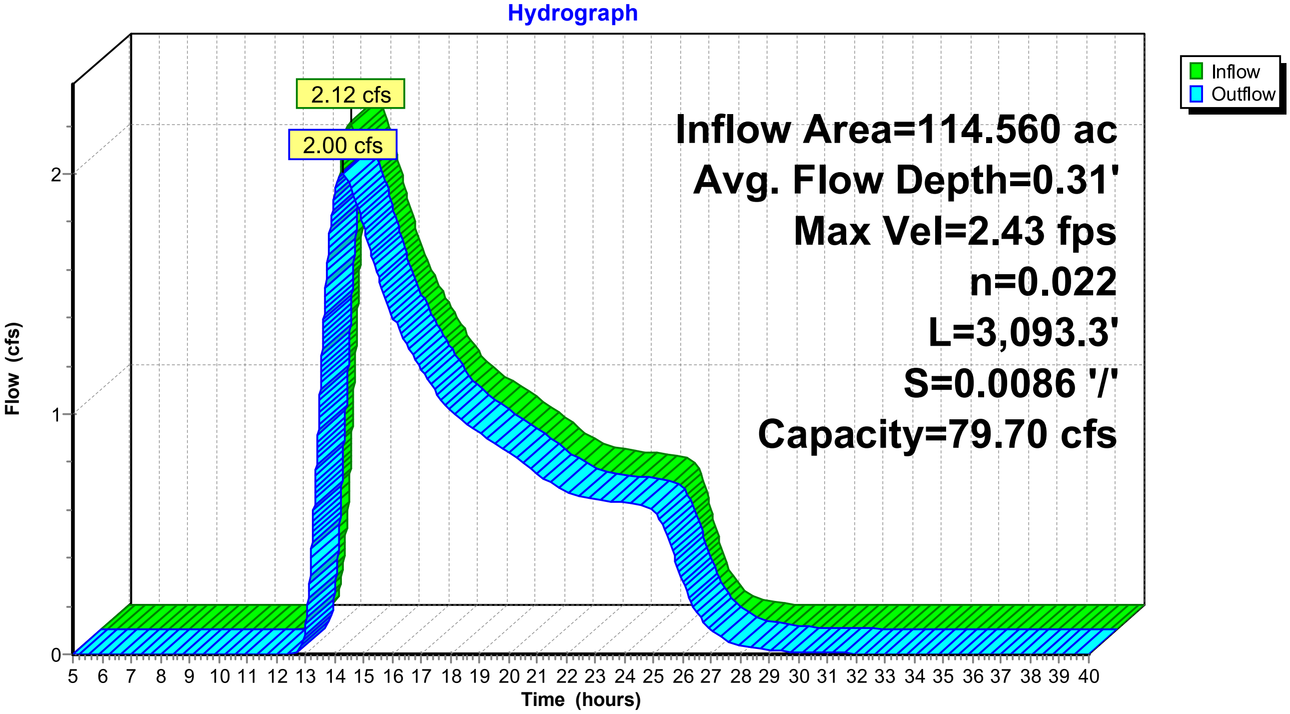
Subcatchment 23S: DA9



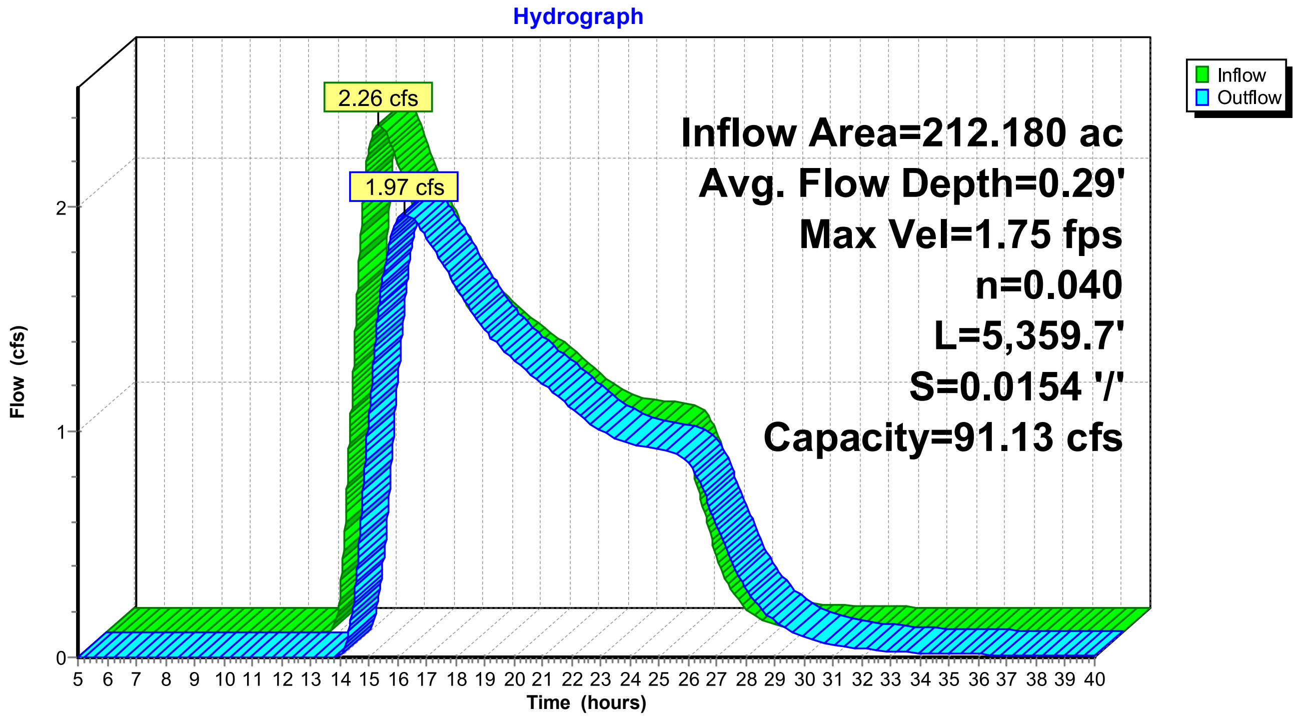
Subcatchment 31S: DA4



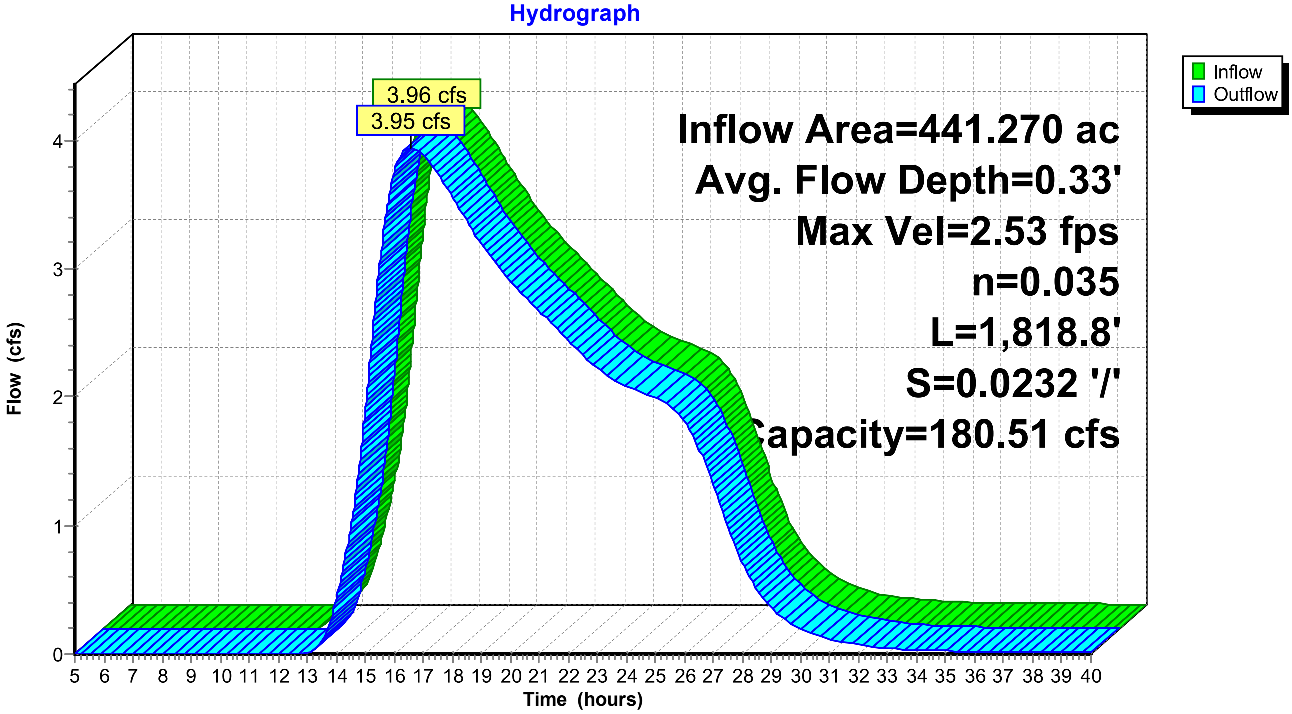
Reach 4R: Pasture



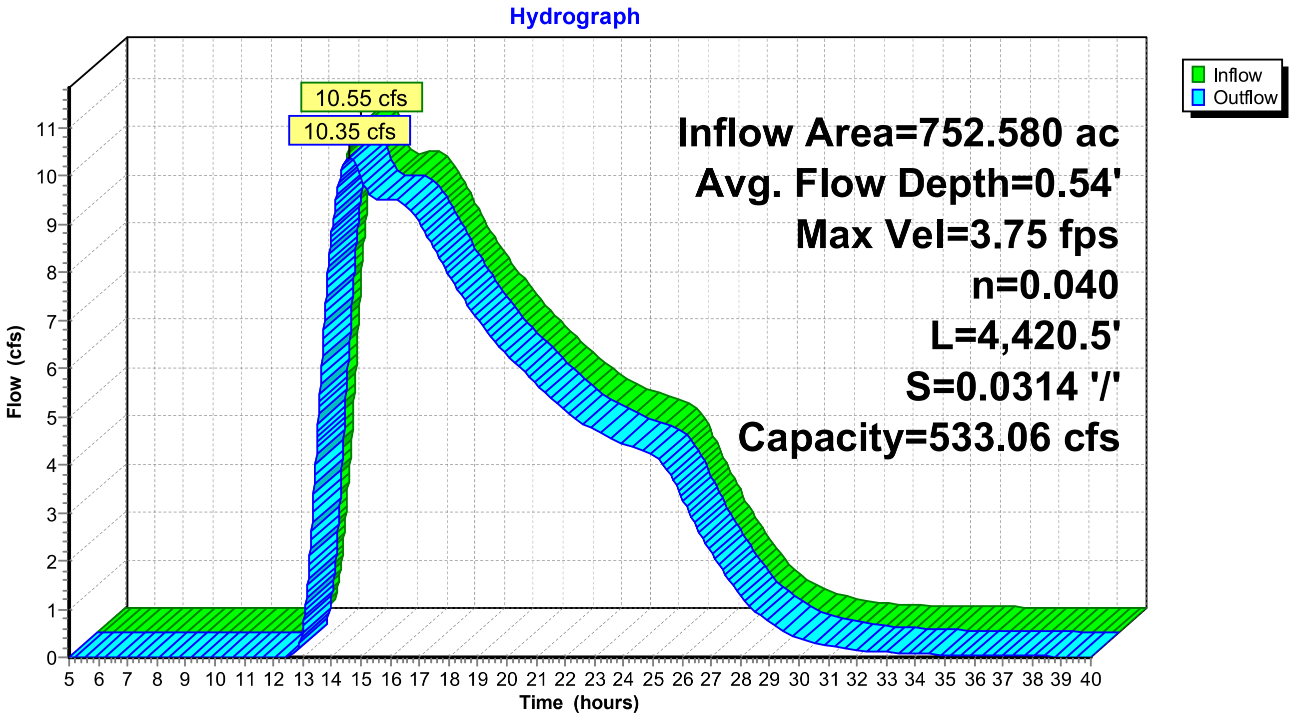
Reach 6R: Ponds



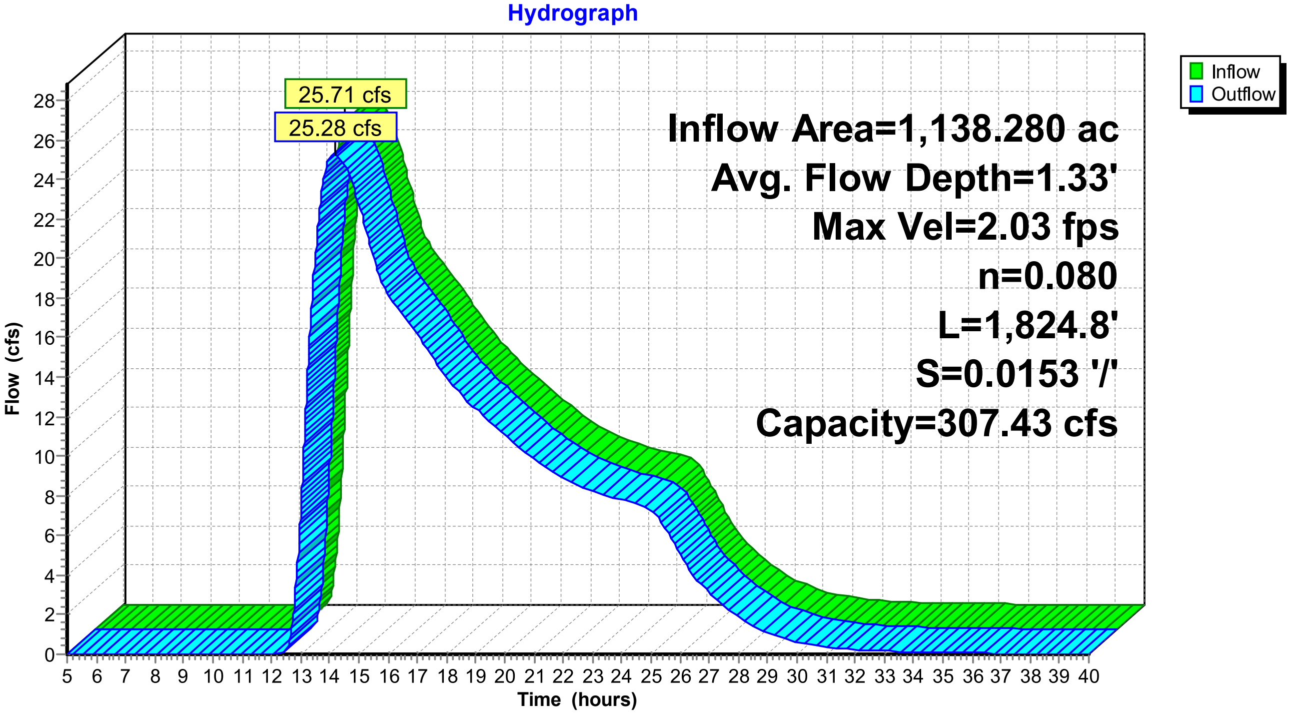
Reach 9R: School



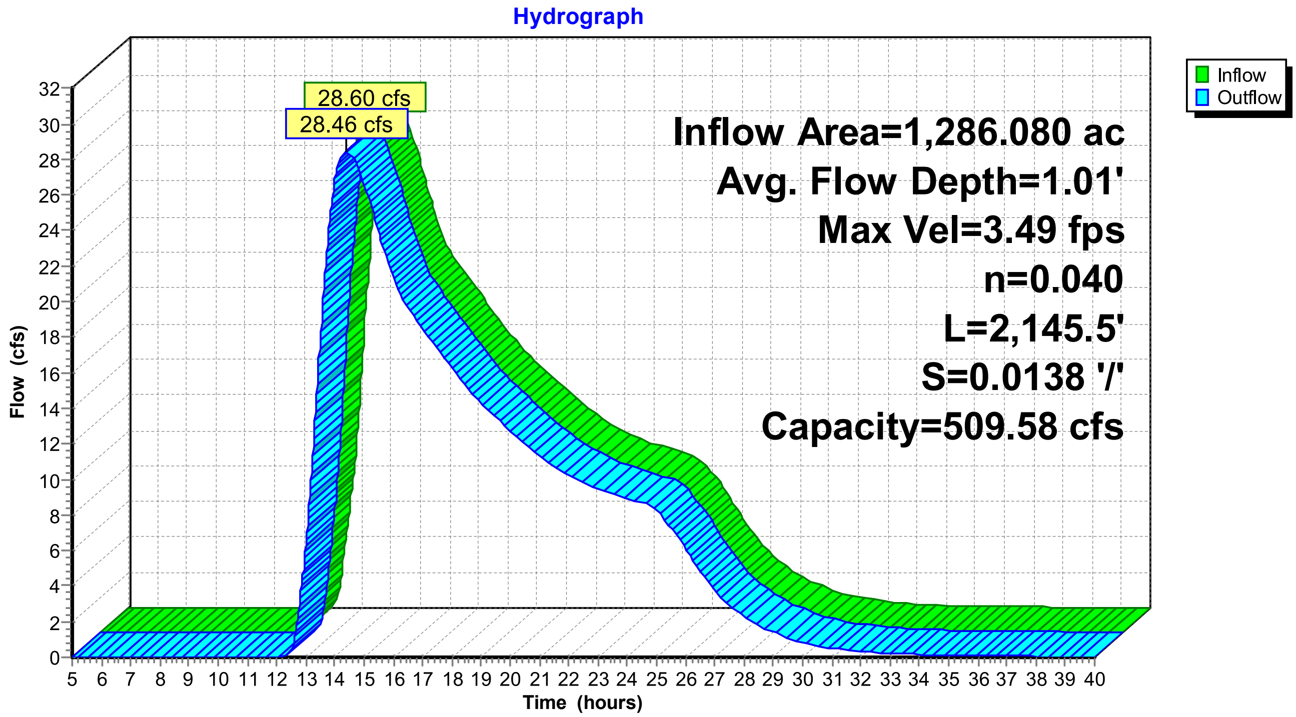
Reach 11R: Commercial



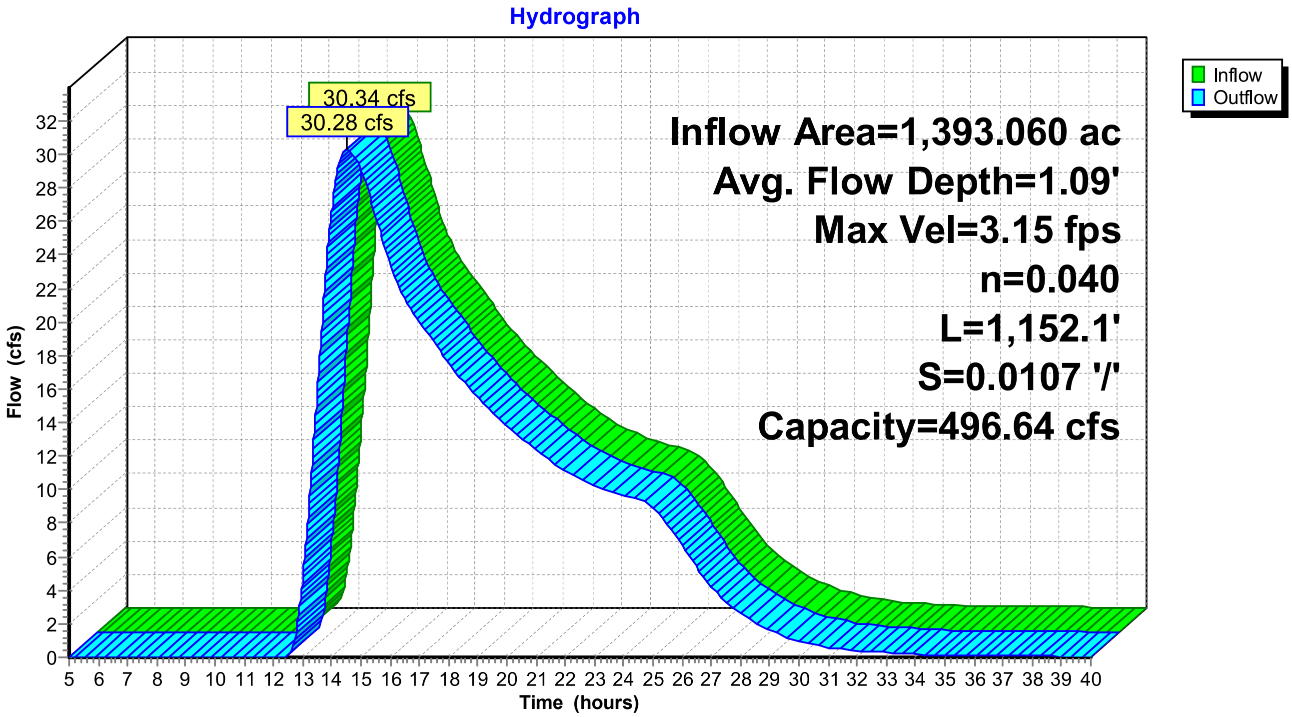
Reach 17R: Park to Penn



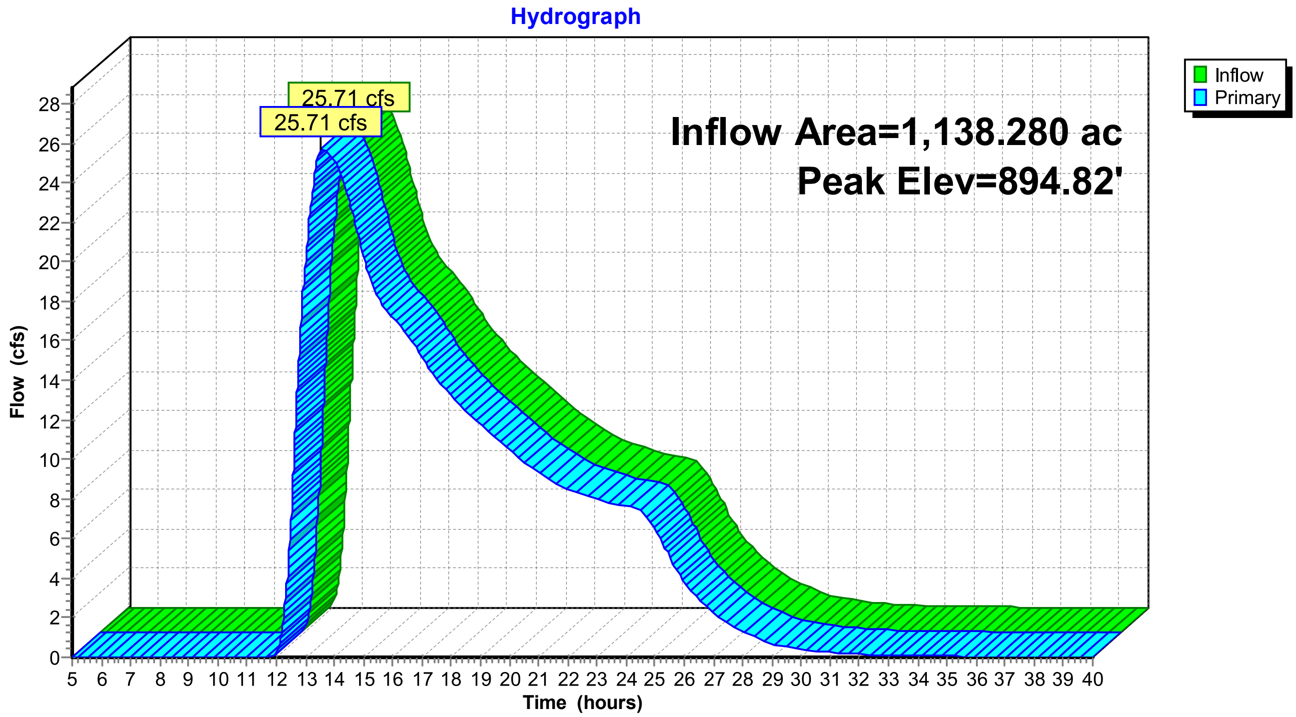
Reach 19R: E. Lake to Penn



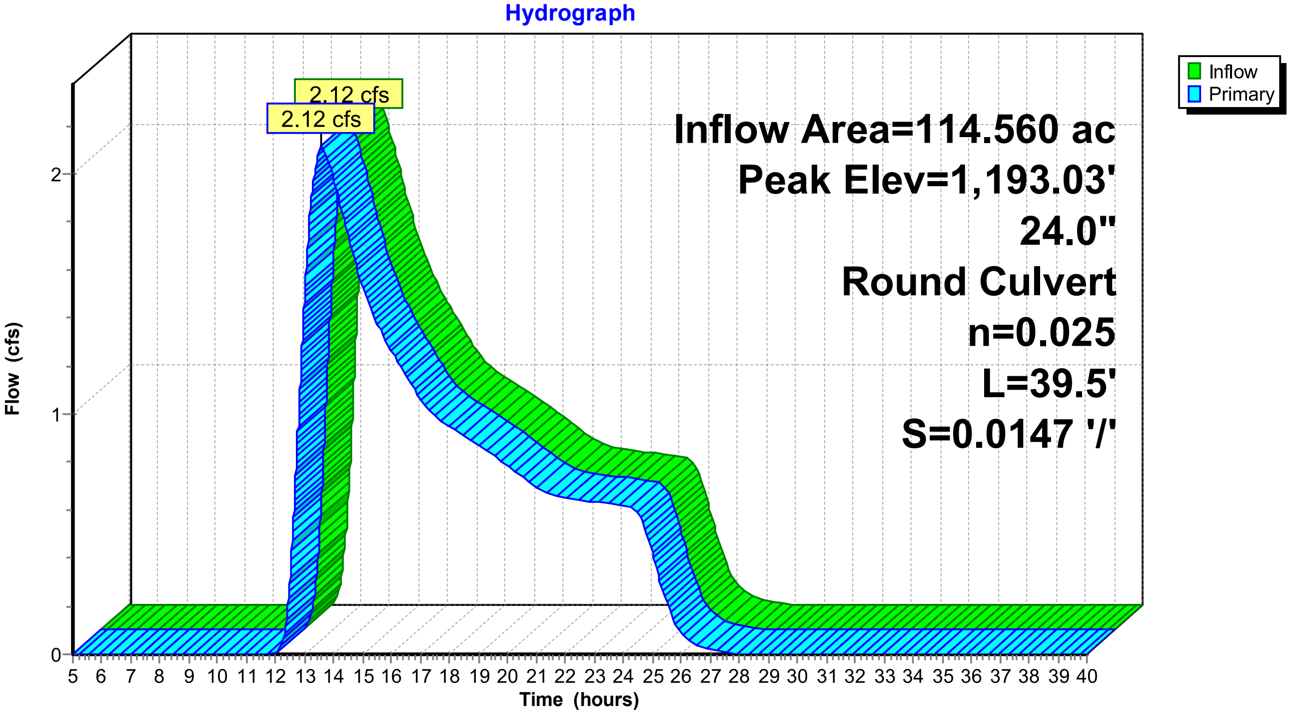
Reach 22R: Wilkins Tract to E. Lake



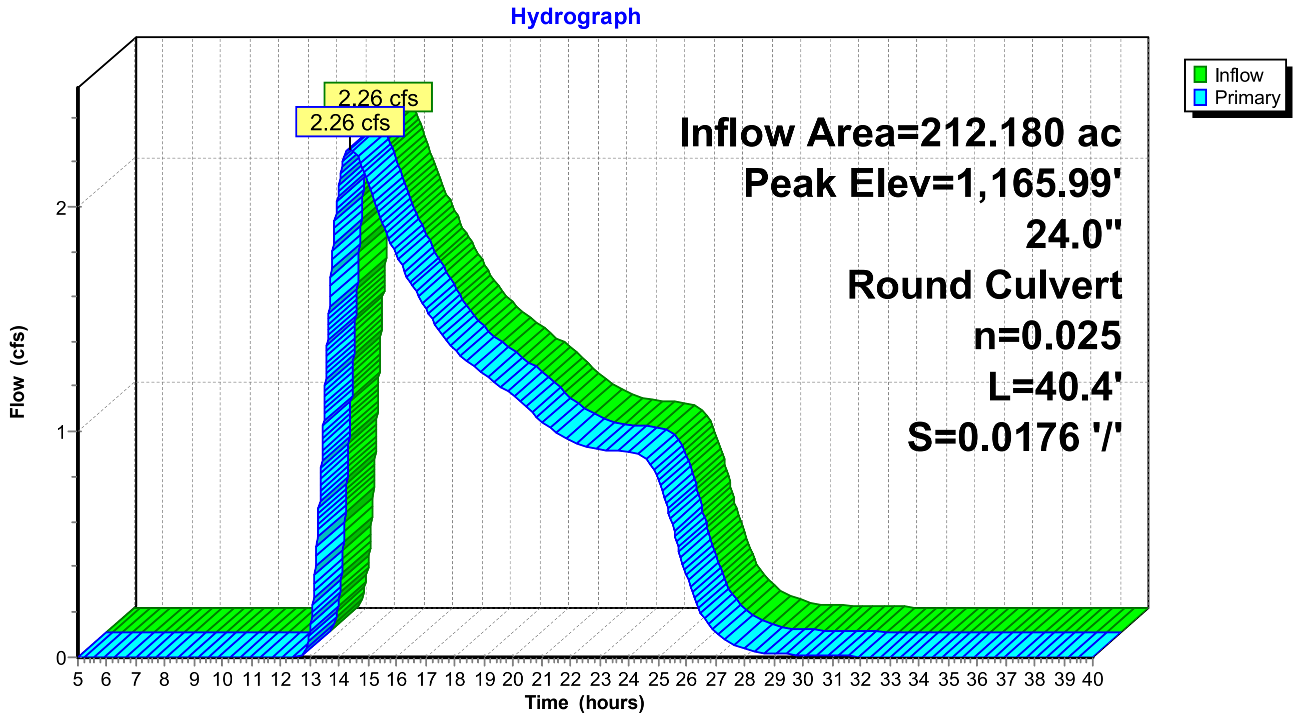
Pond 22P: Park



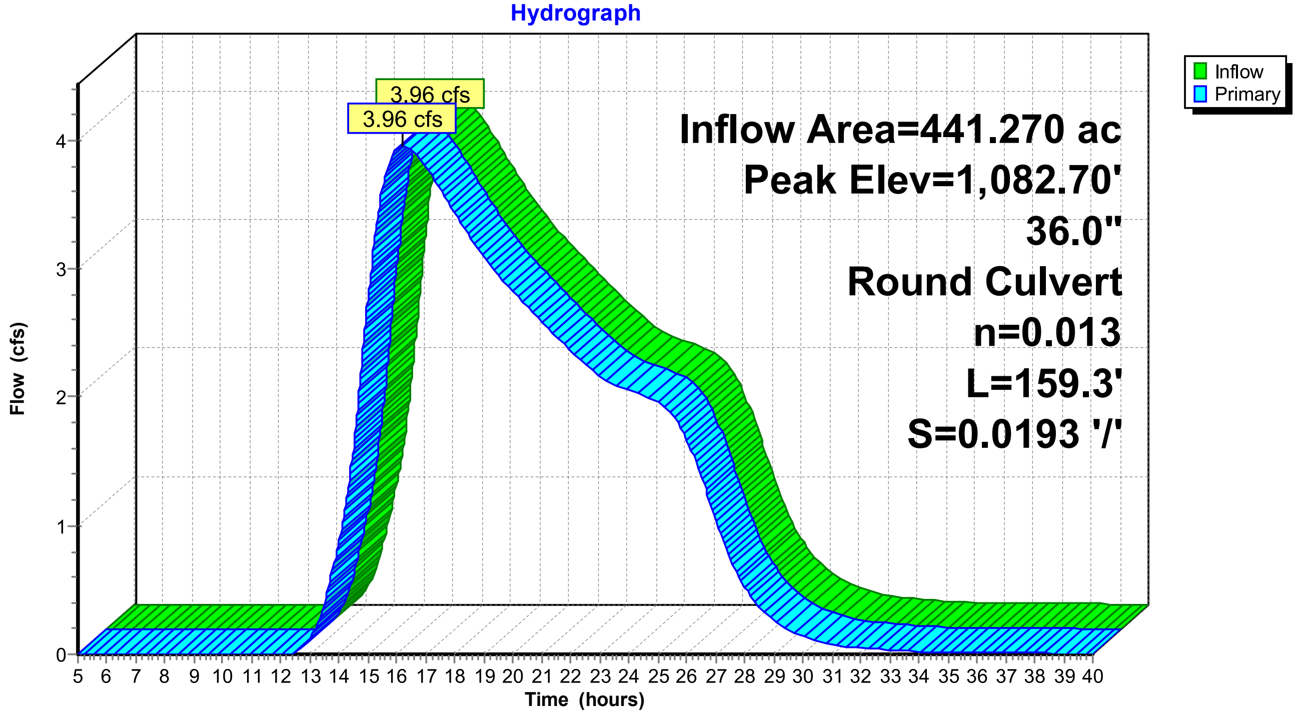
Pond 23P: Cleary Rd.



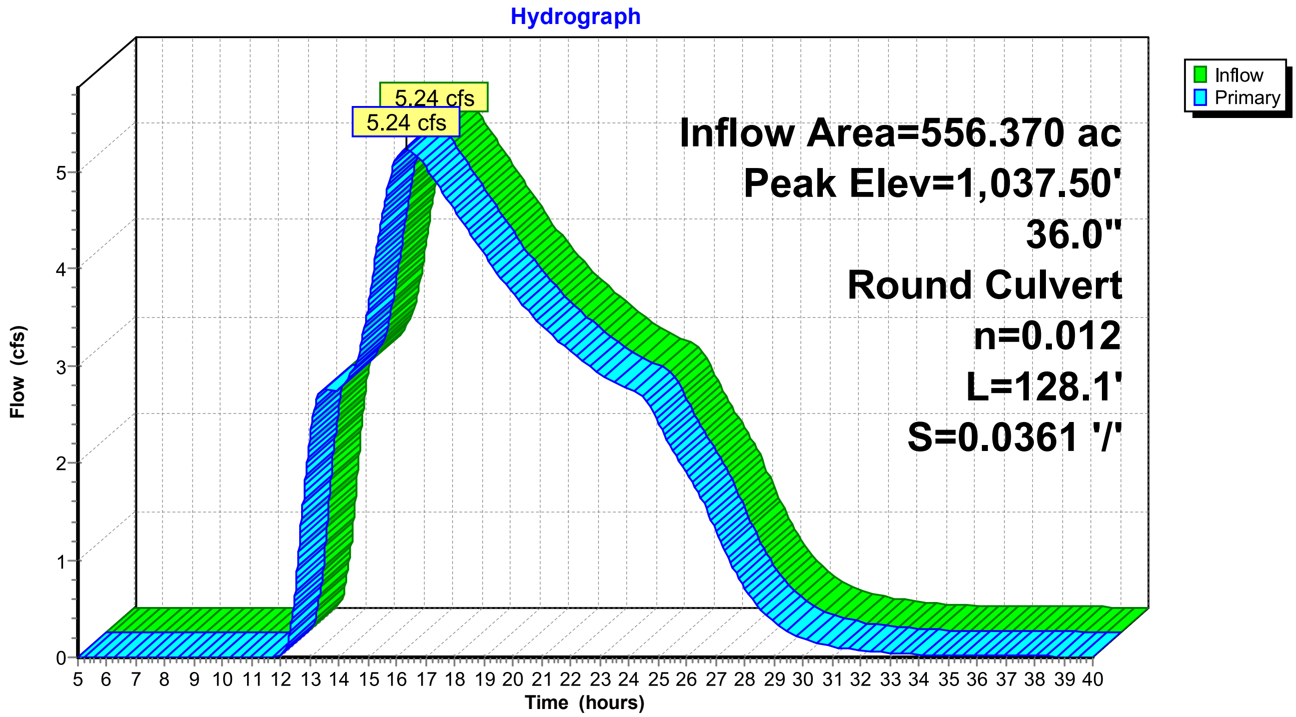
Pond 24P: Shelly Rd.



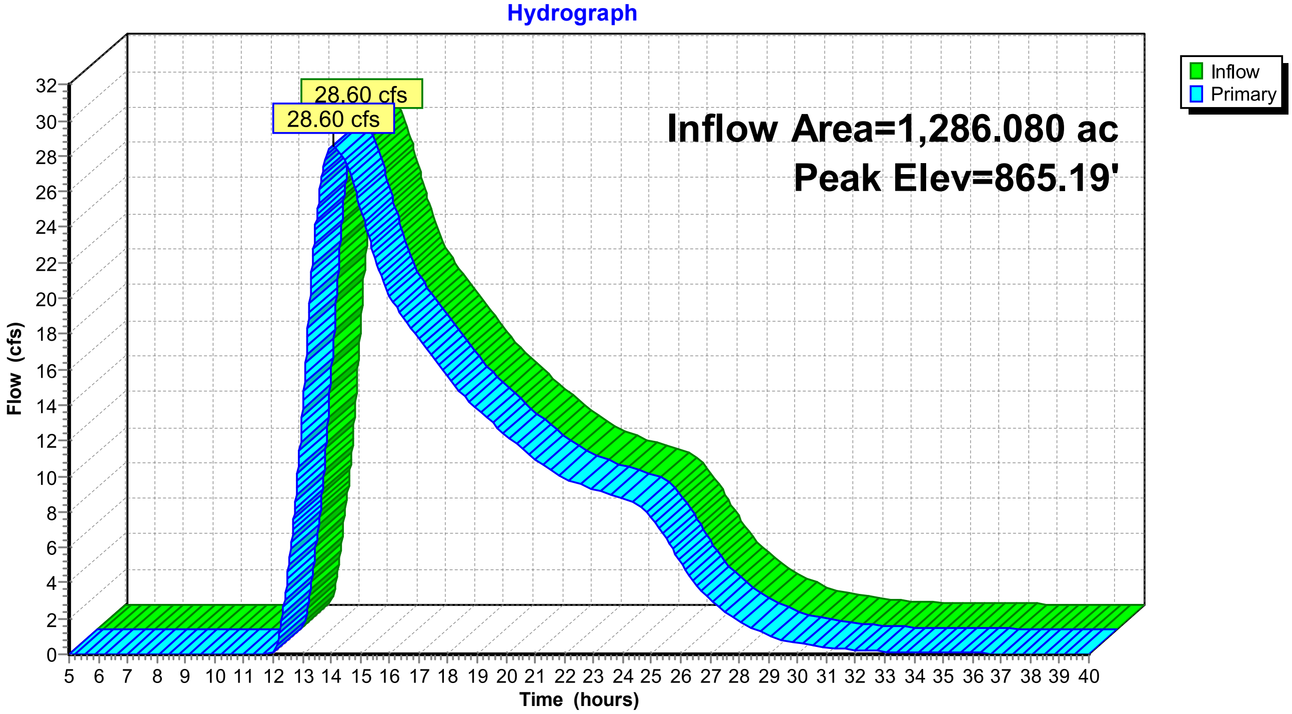
Pond 25P: School



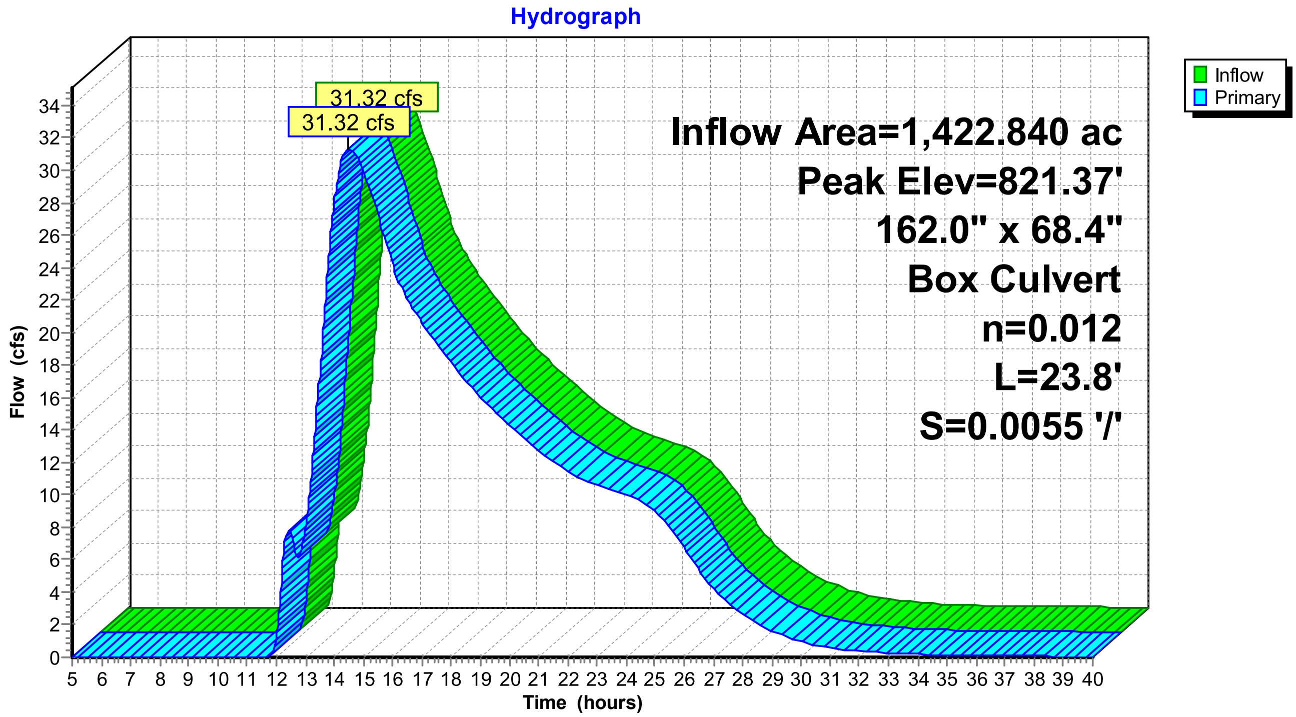
Pond 26P: Commercial St.



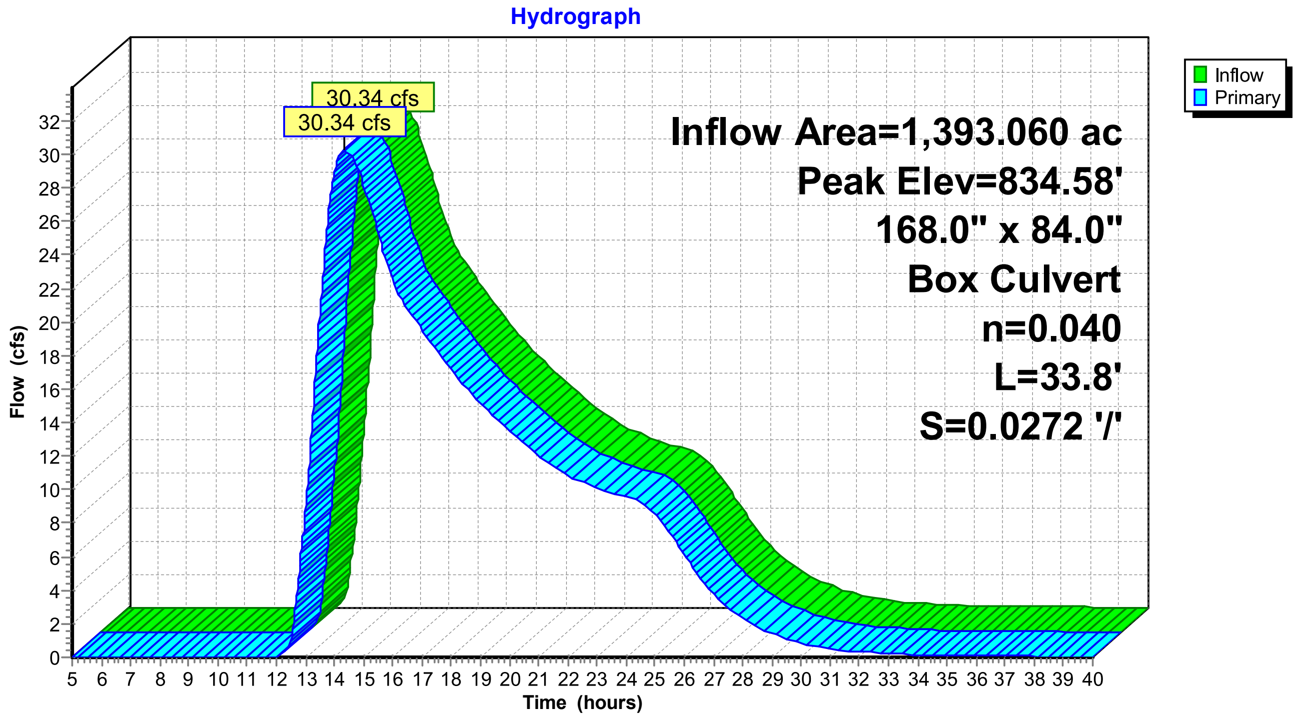
Pond 27P: Pennimite Rd



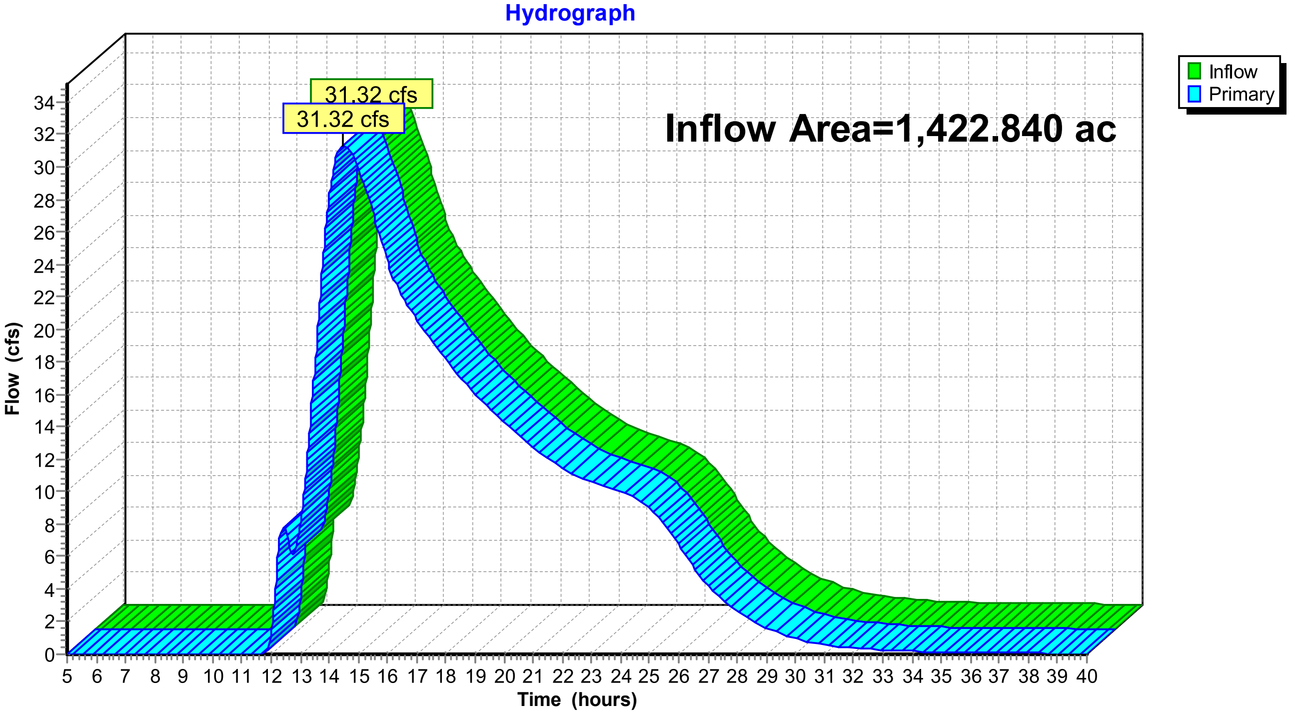
Pond 28P: Wilkins Tract



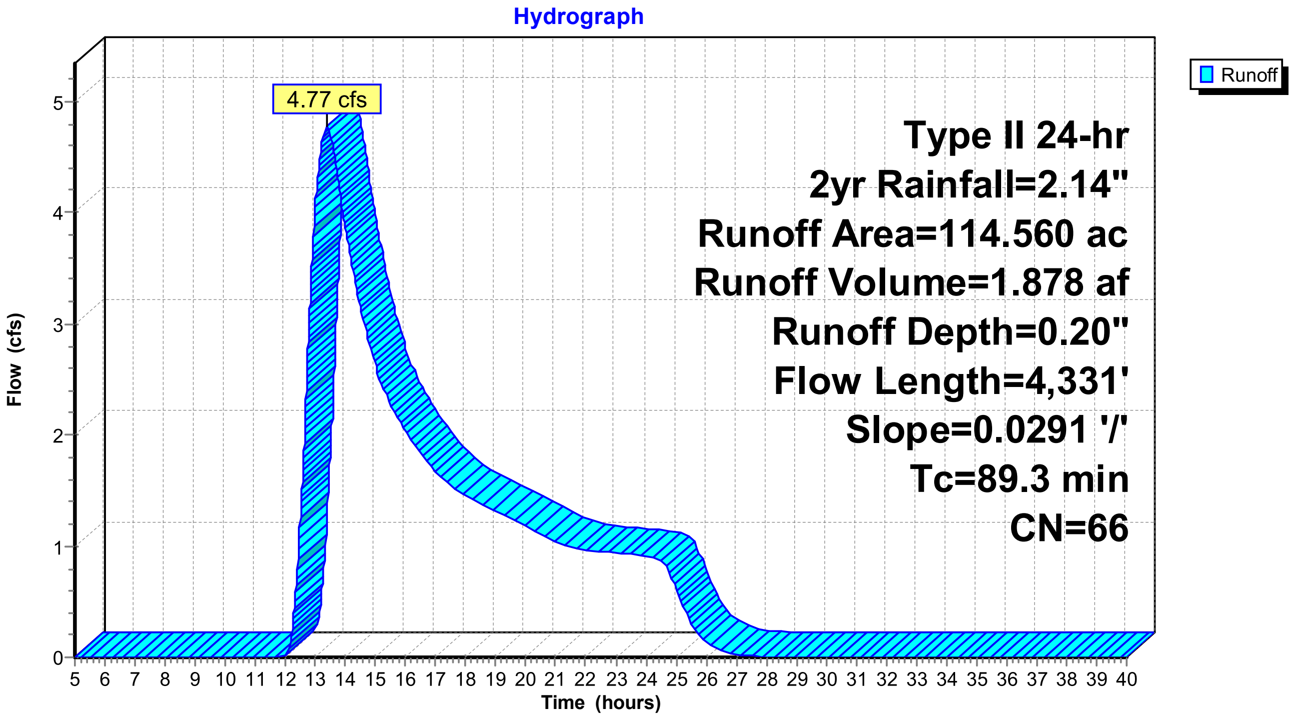
Pond 29P: E. Lake Rd.



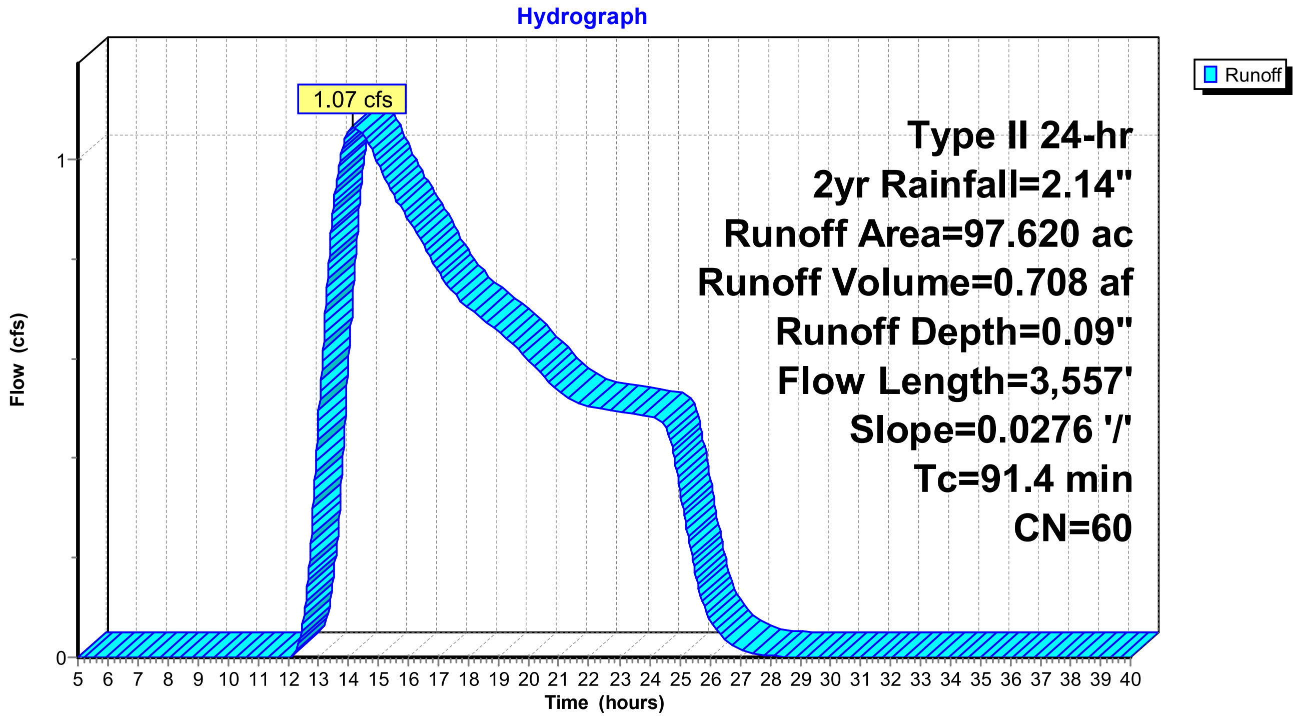
Link 30L: Conesus Lake



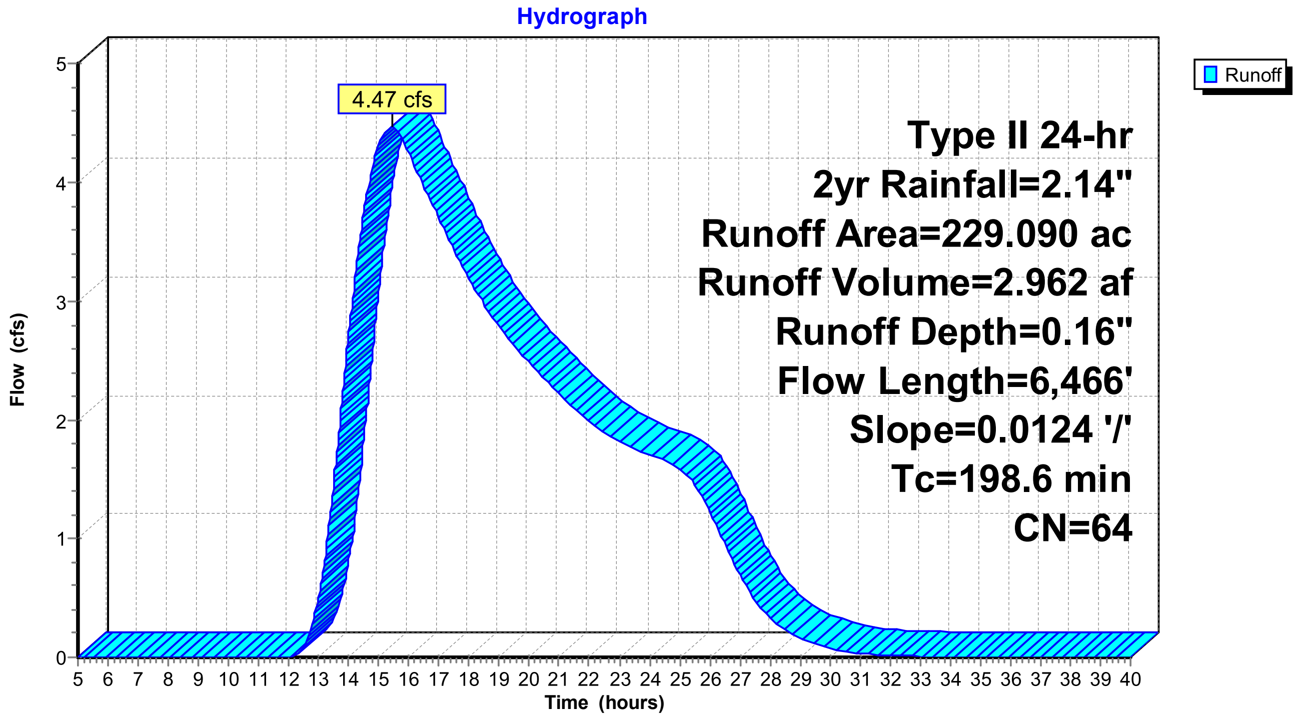
Subcatchment 1S: DA1



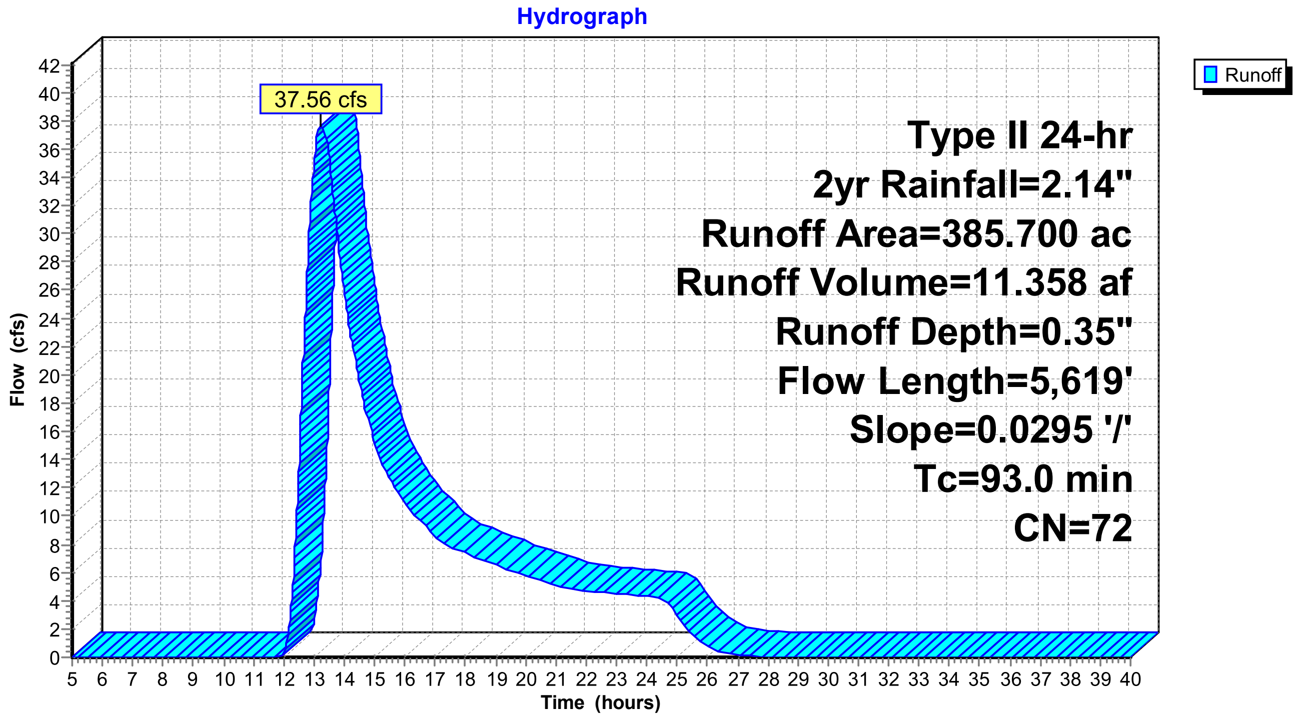
Subcatchment 2S: DA2



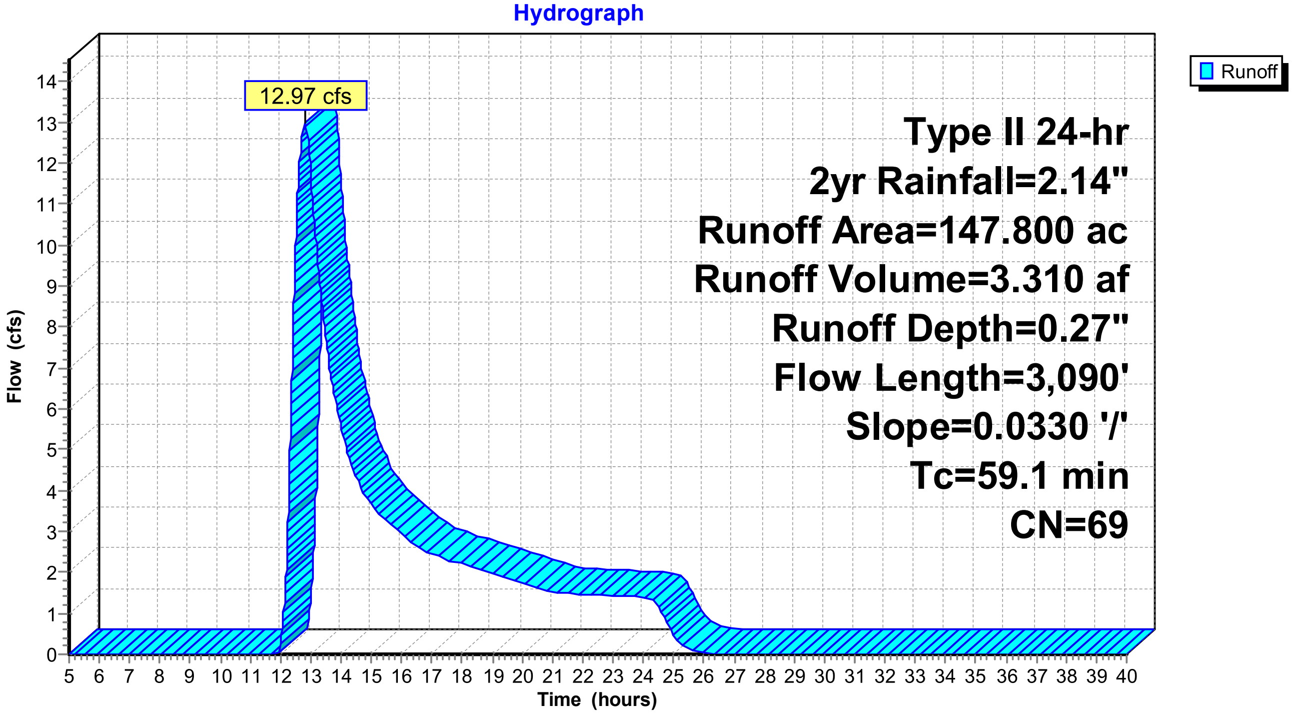
Subcatchment 8S: DA3



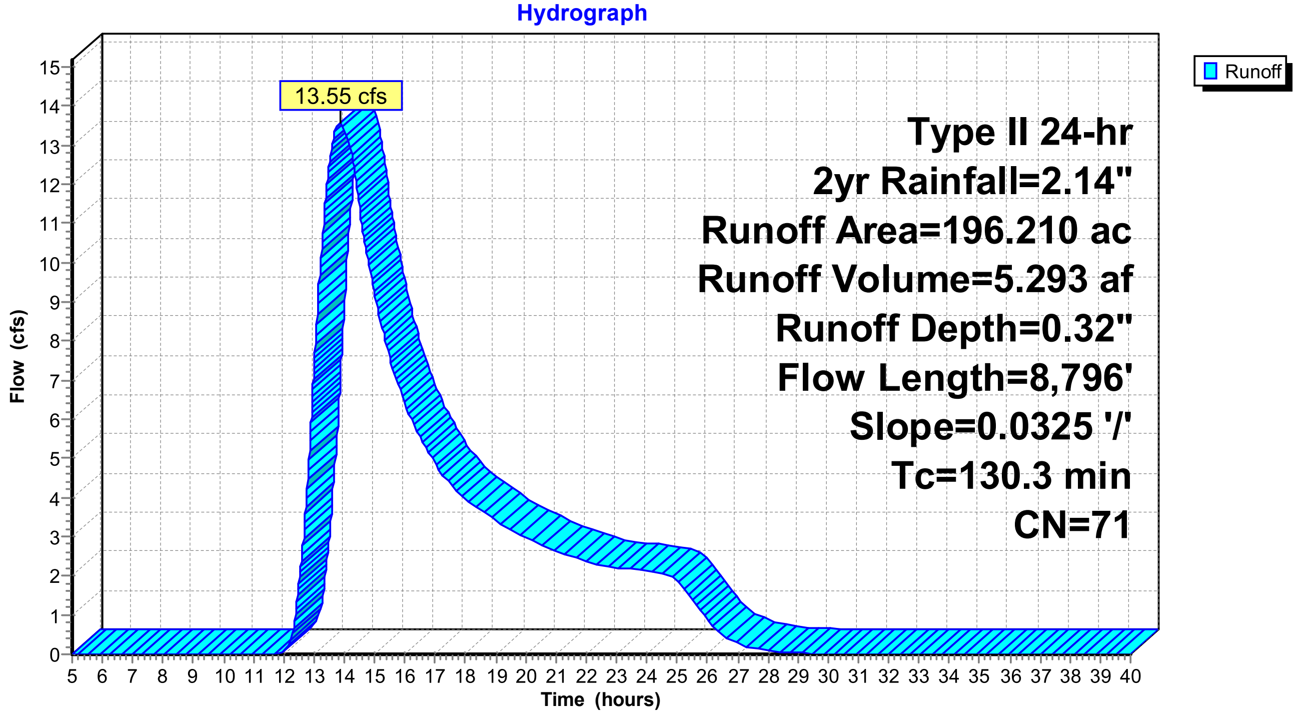
Subcatchment 12S: DA6



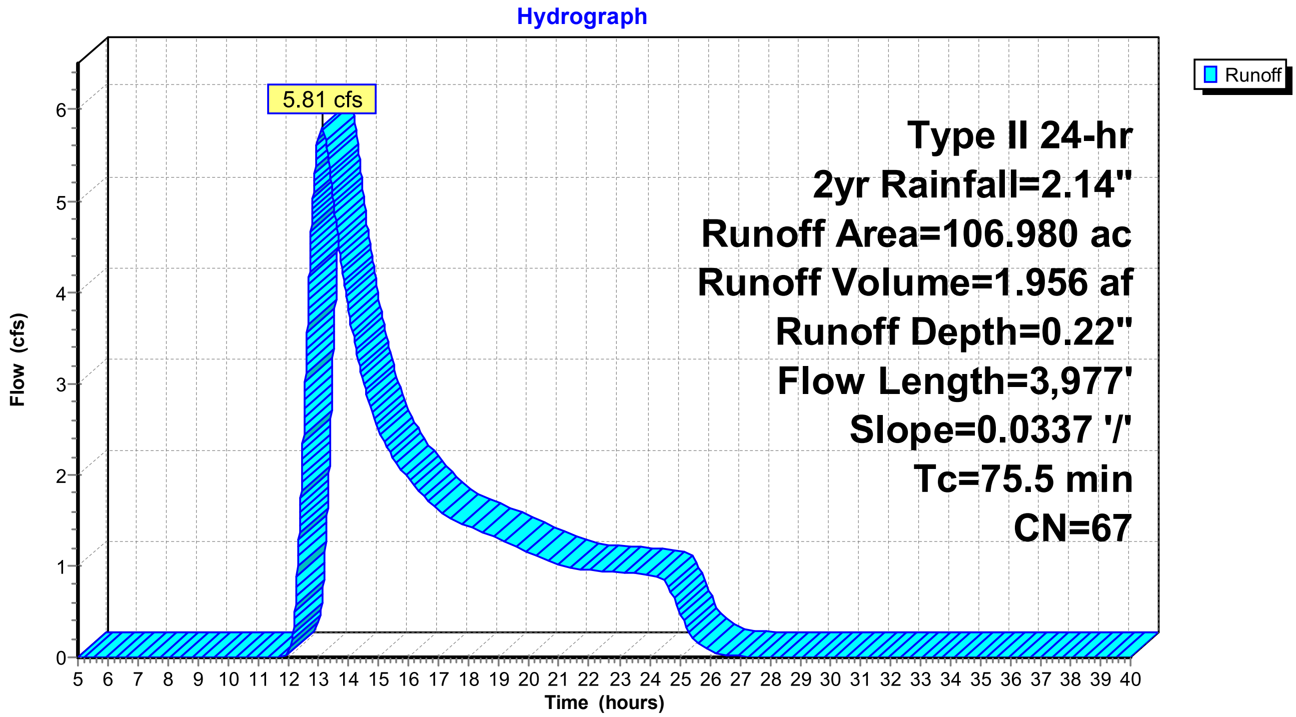
Subcatchment 13S: DA7



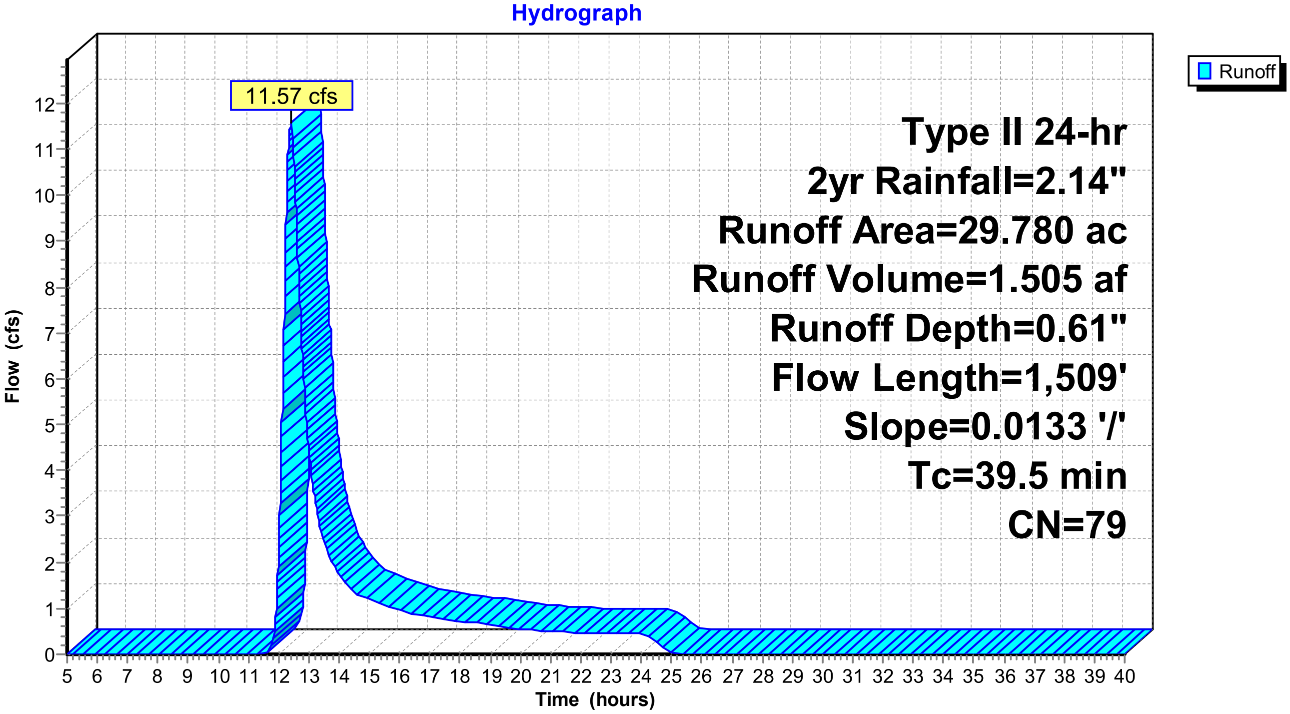
Subcatchment 15S: DA5 (Spring Creek)



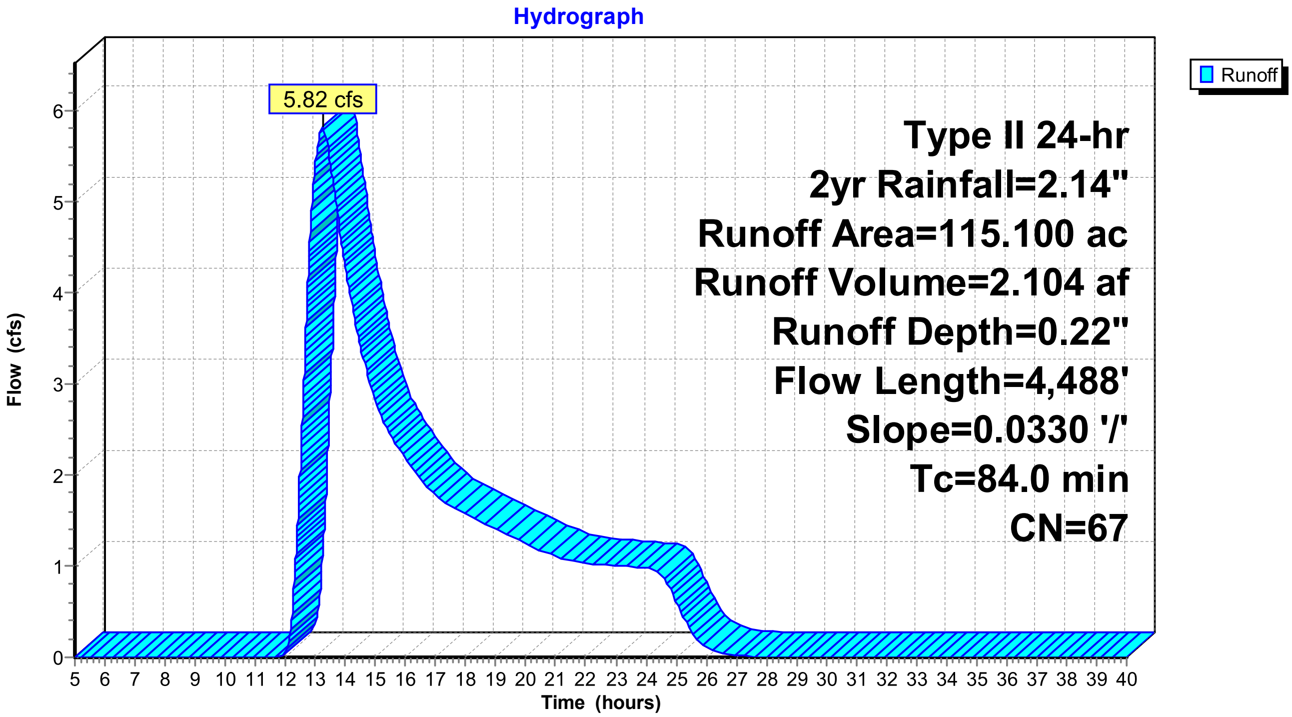
Subcatchment 20S: DA8



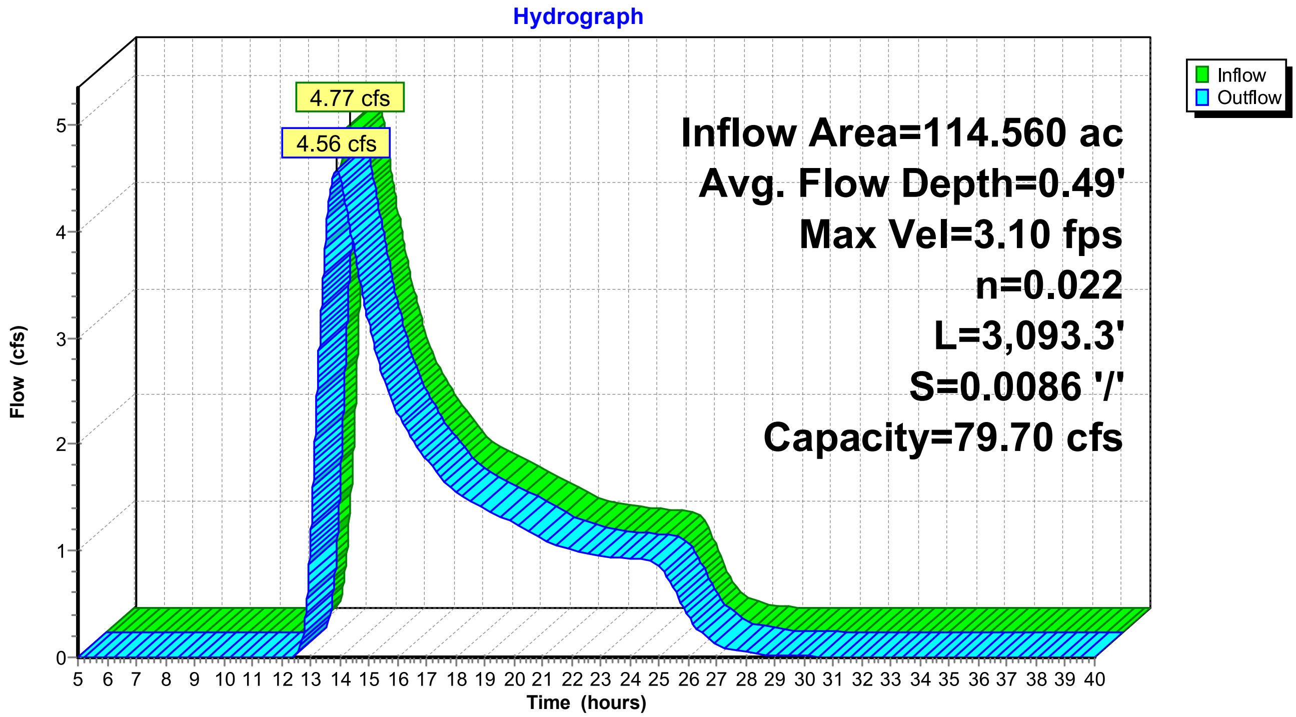
Subcatchment 23S: DA9



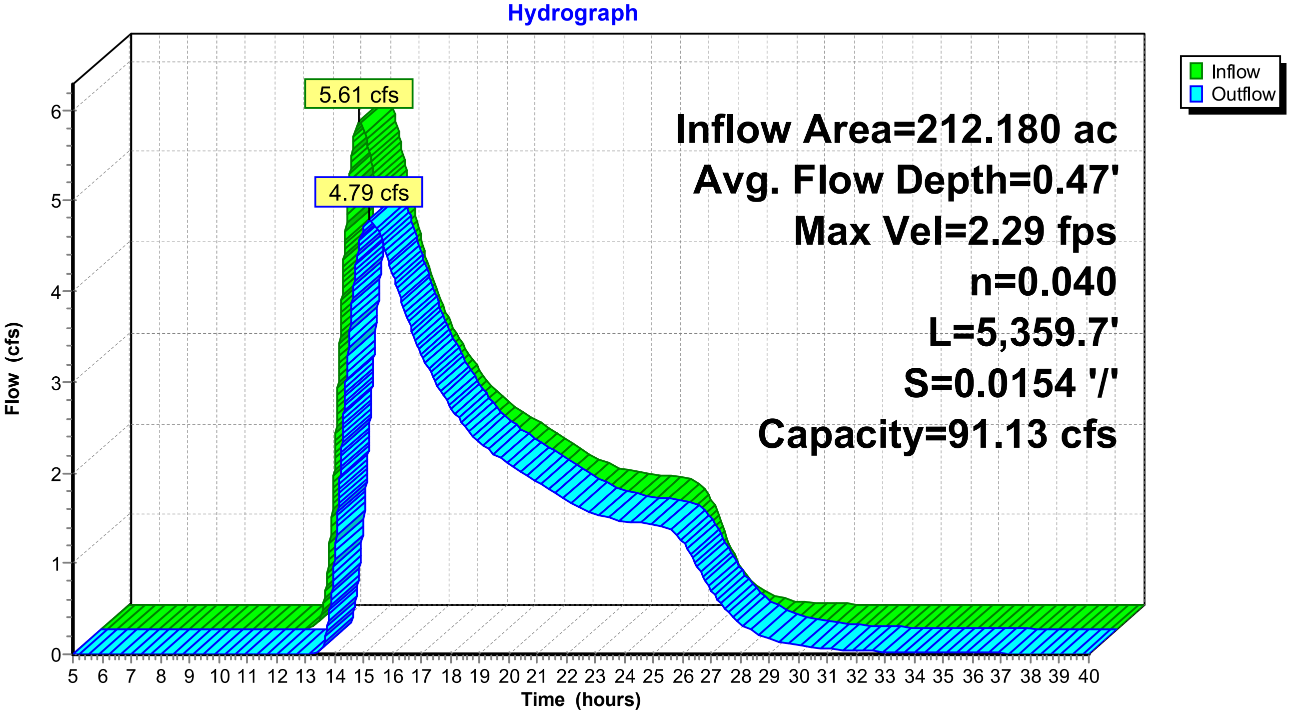
Subcatchment 31S: DA4



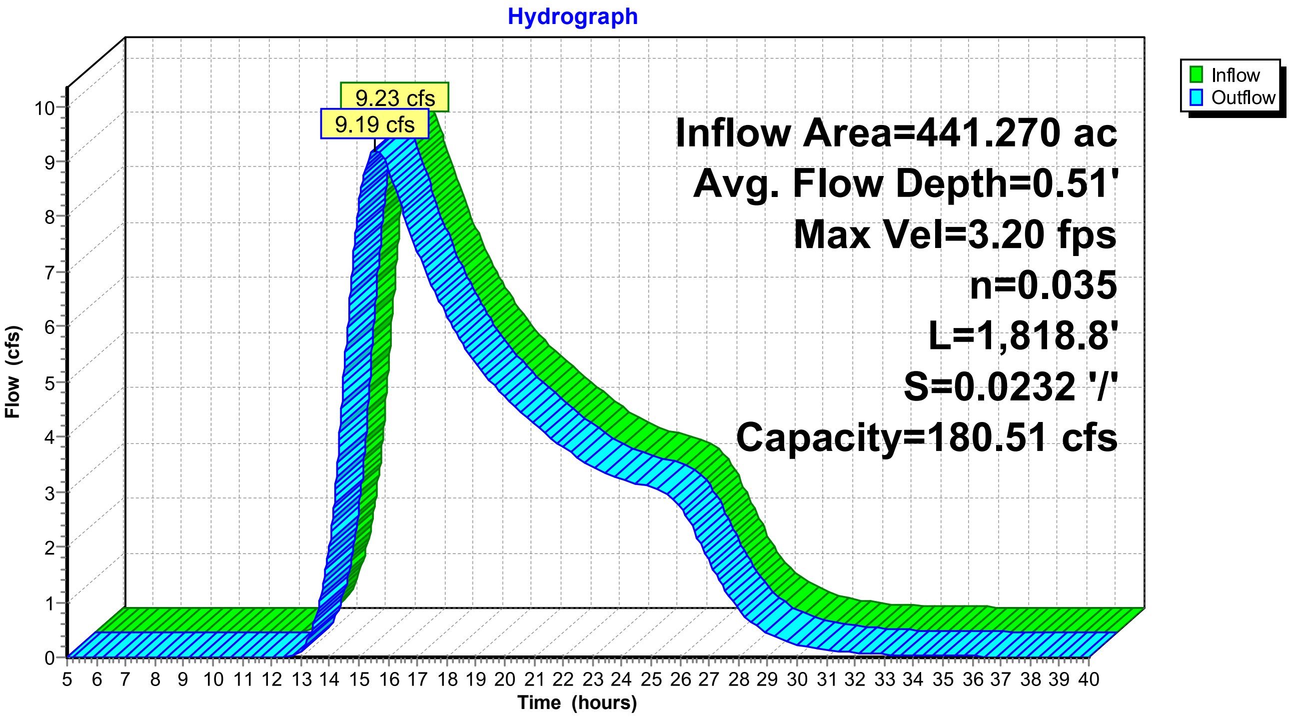
Reach 4R: Pasture



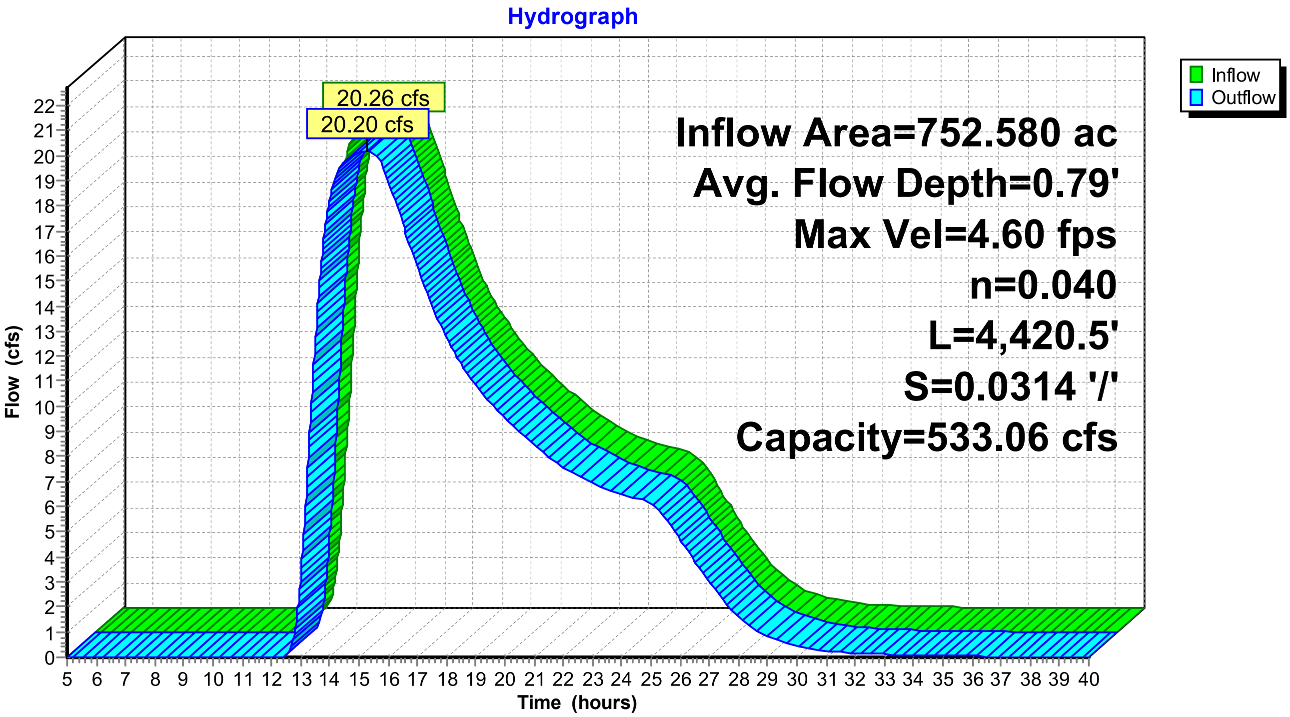
Reach 6R: Ponds



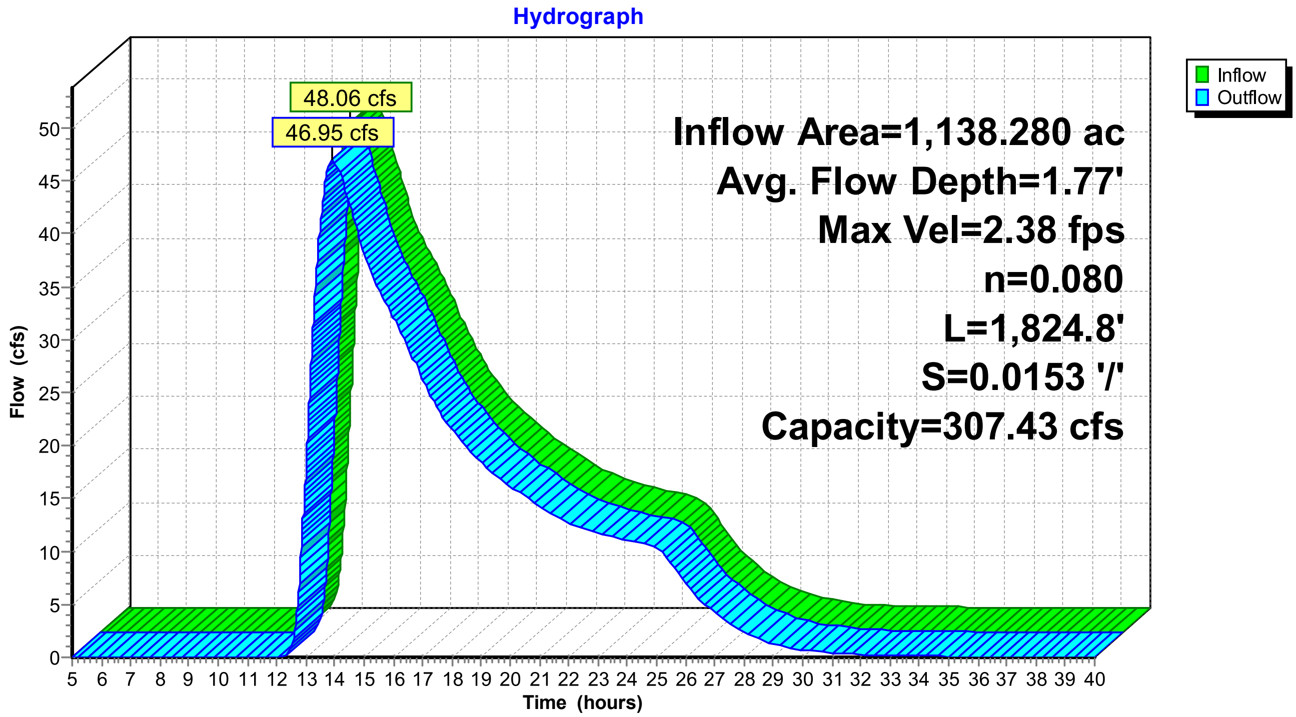
Reach 9R: School



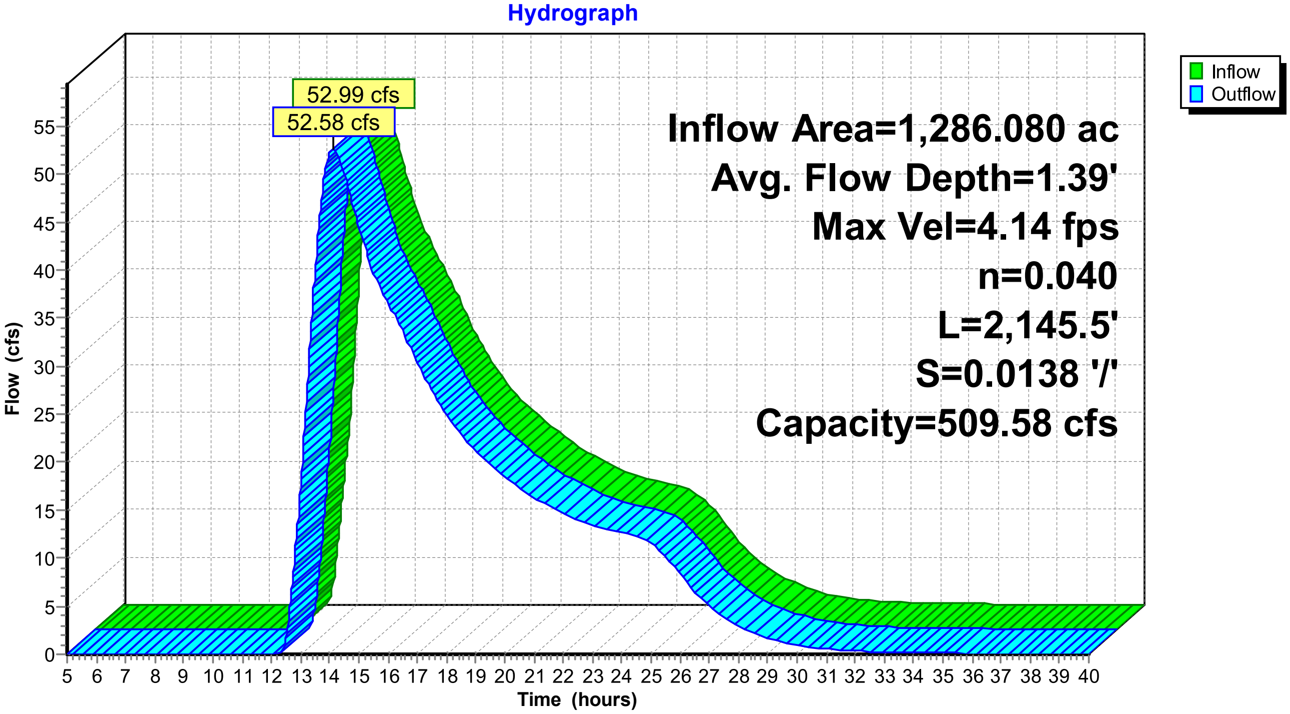
Reach 11R: Commercial



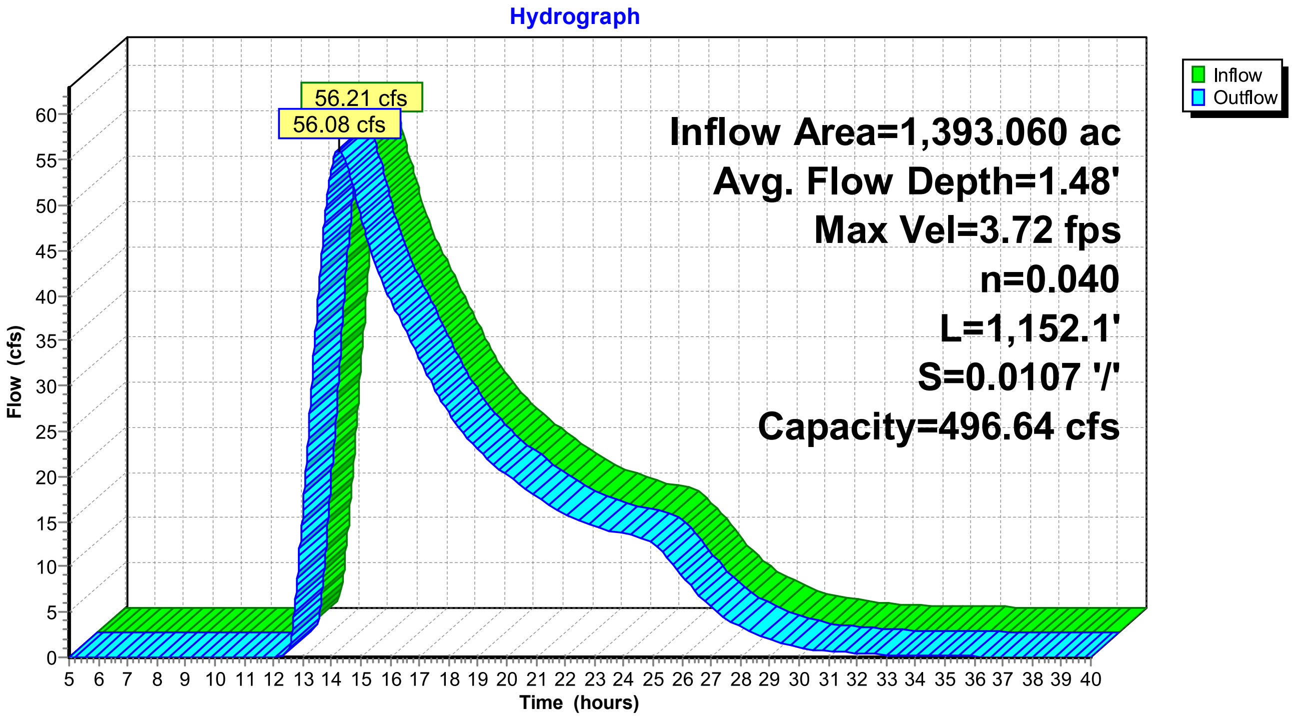
Reach 17R: Park to Penn



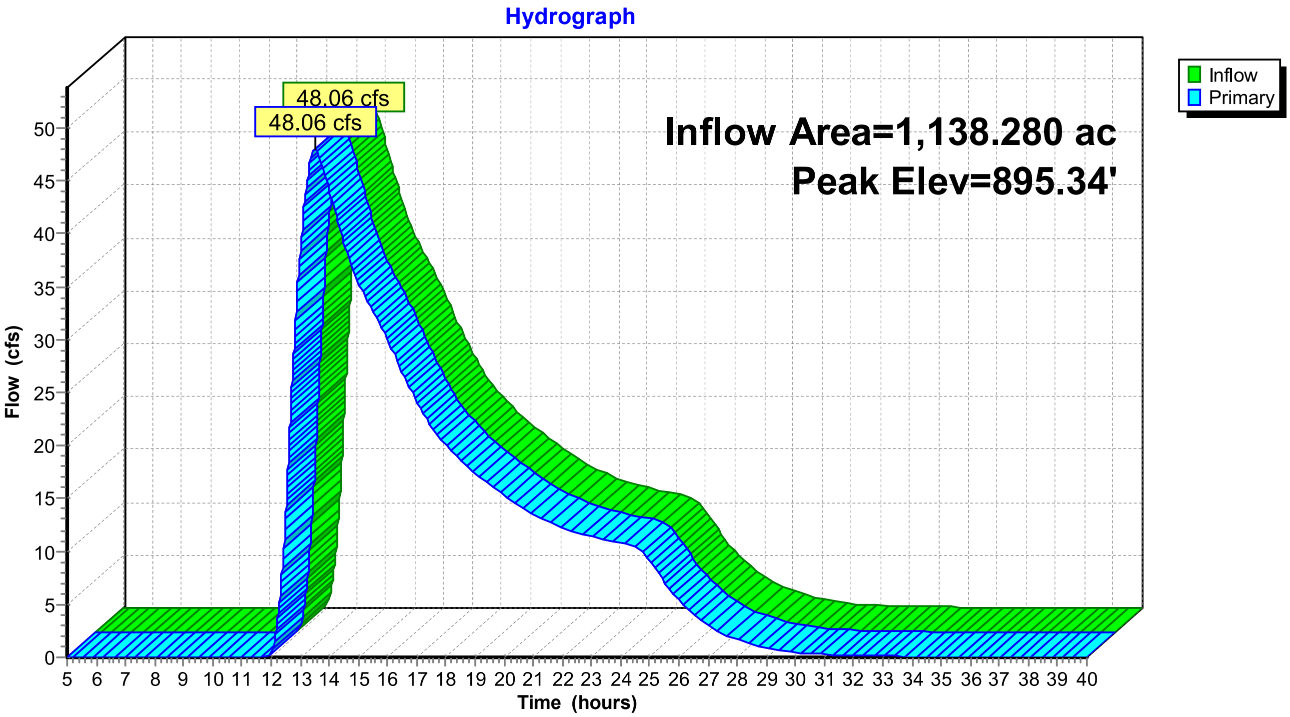
Reach 19R: E. Lake to Penn



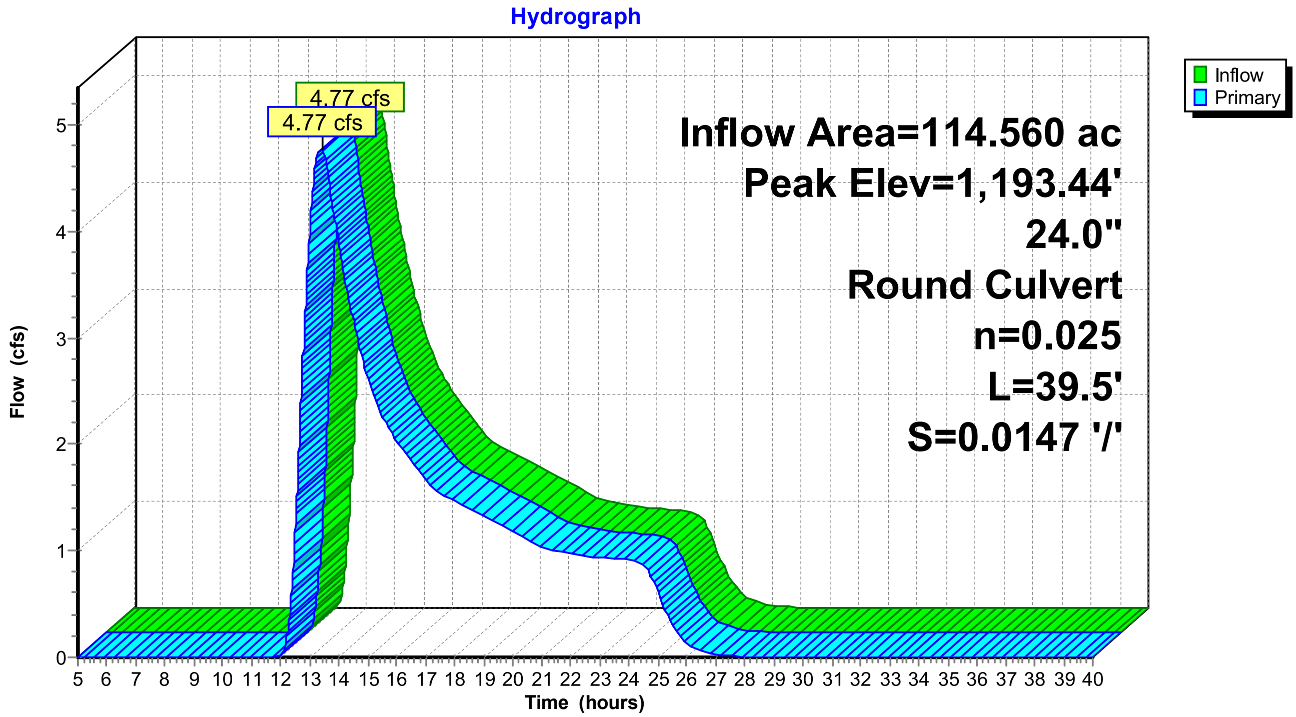
Reach 22R: Wilkins Tract to E. Lake



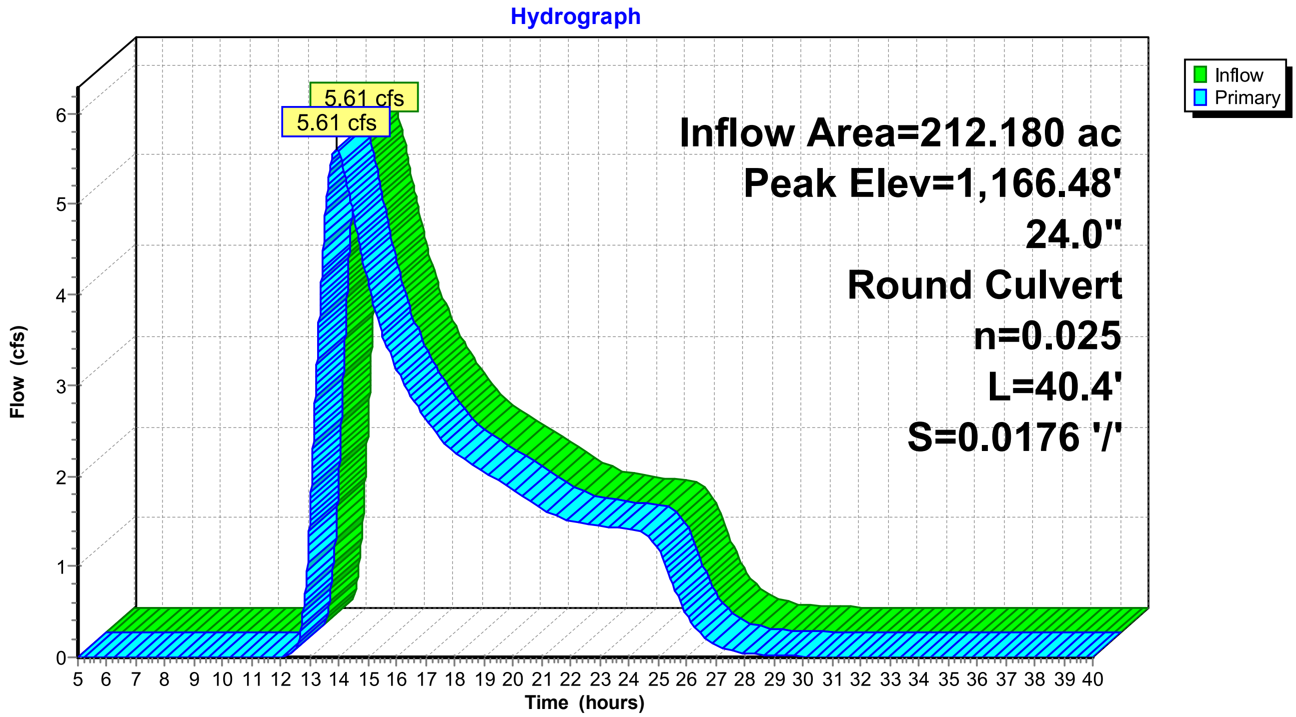
Pond 22P: Park



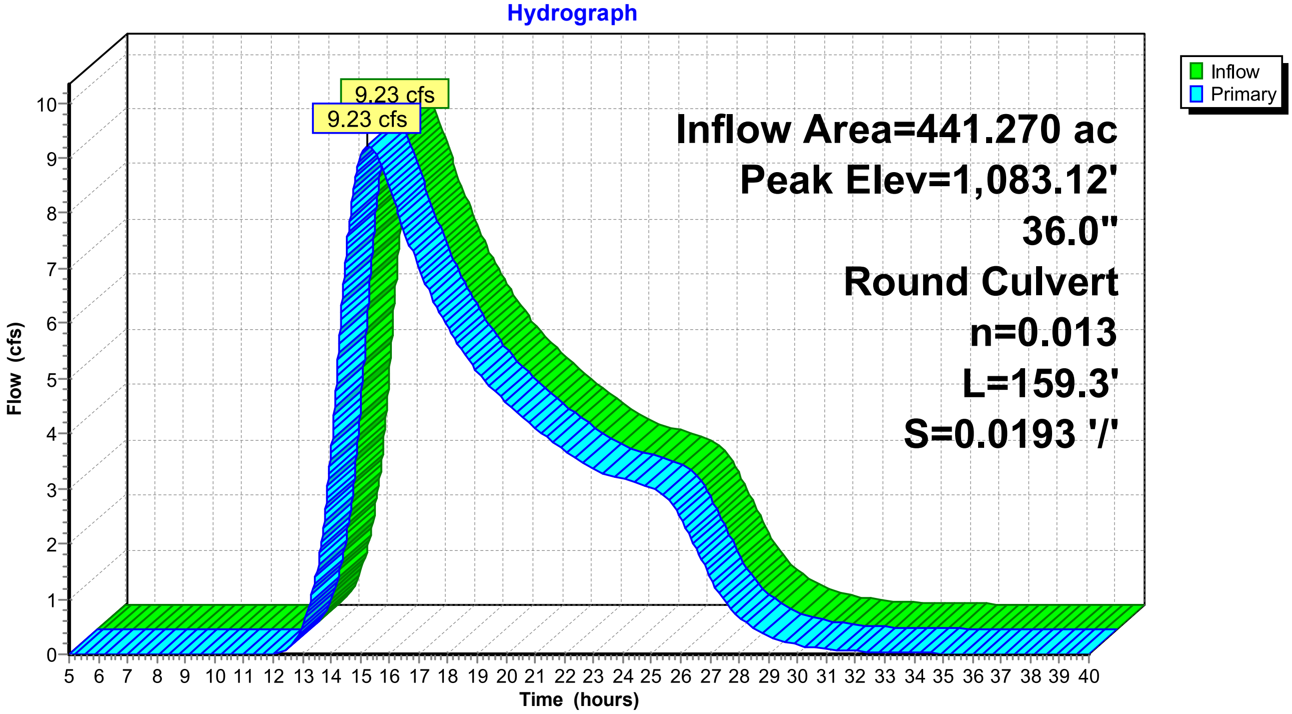
Pond 23P: Cleary Rd.



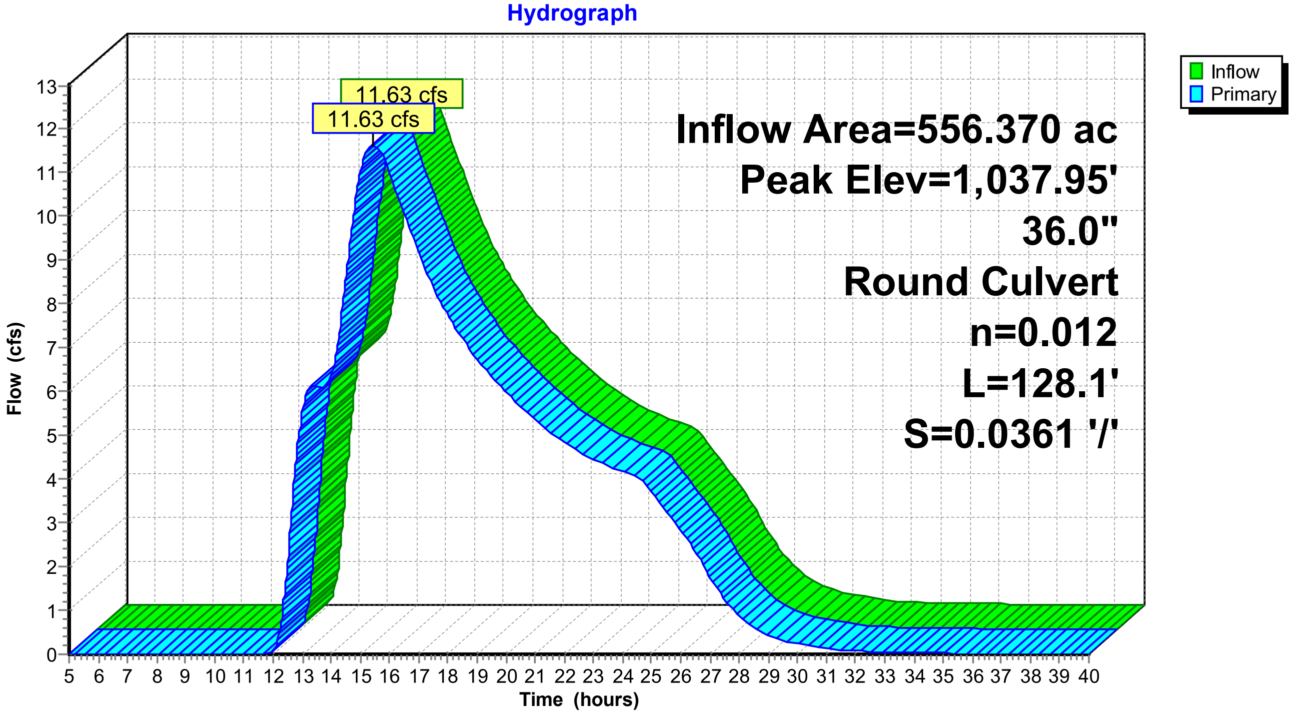
Pond 24P: Shelly Rd.



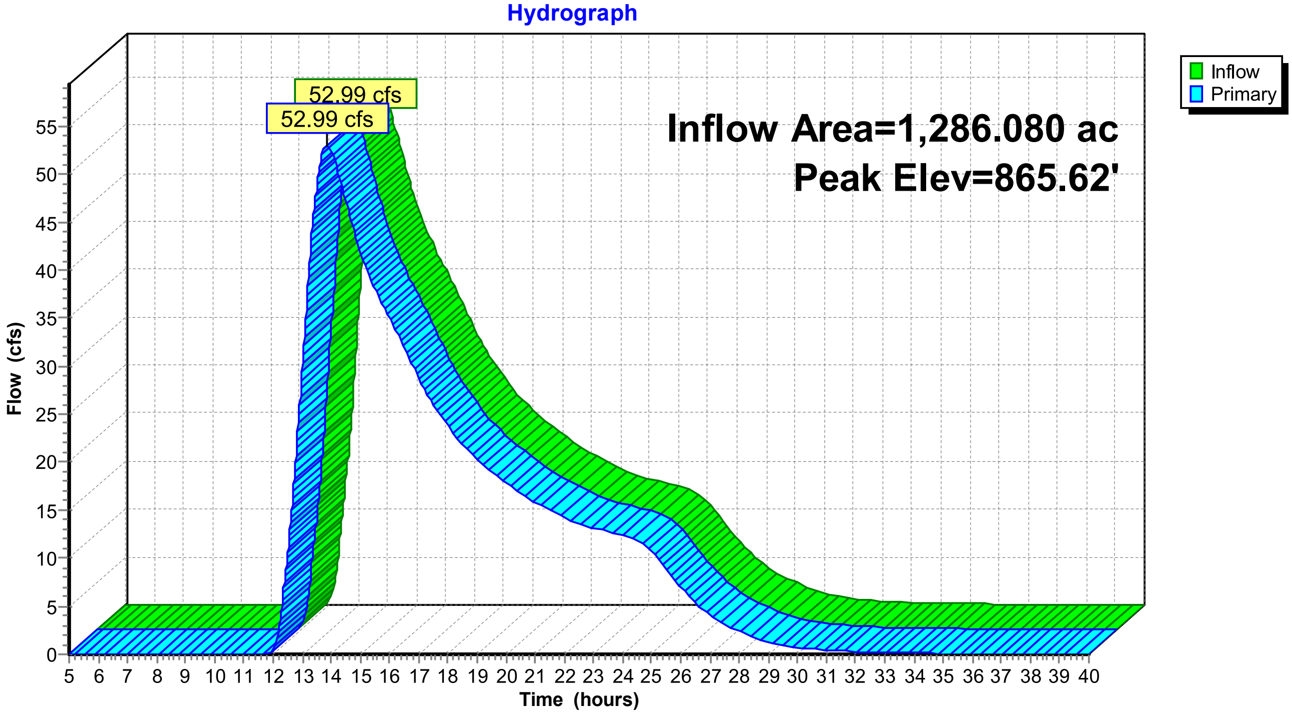
Pond 25P: School



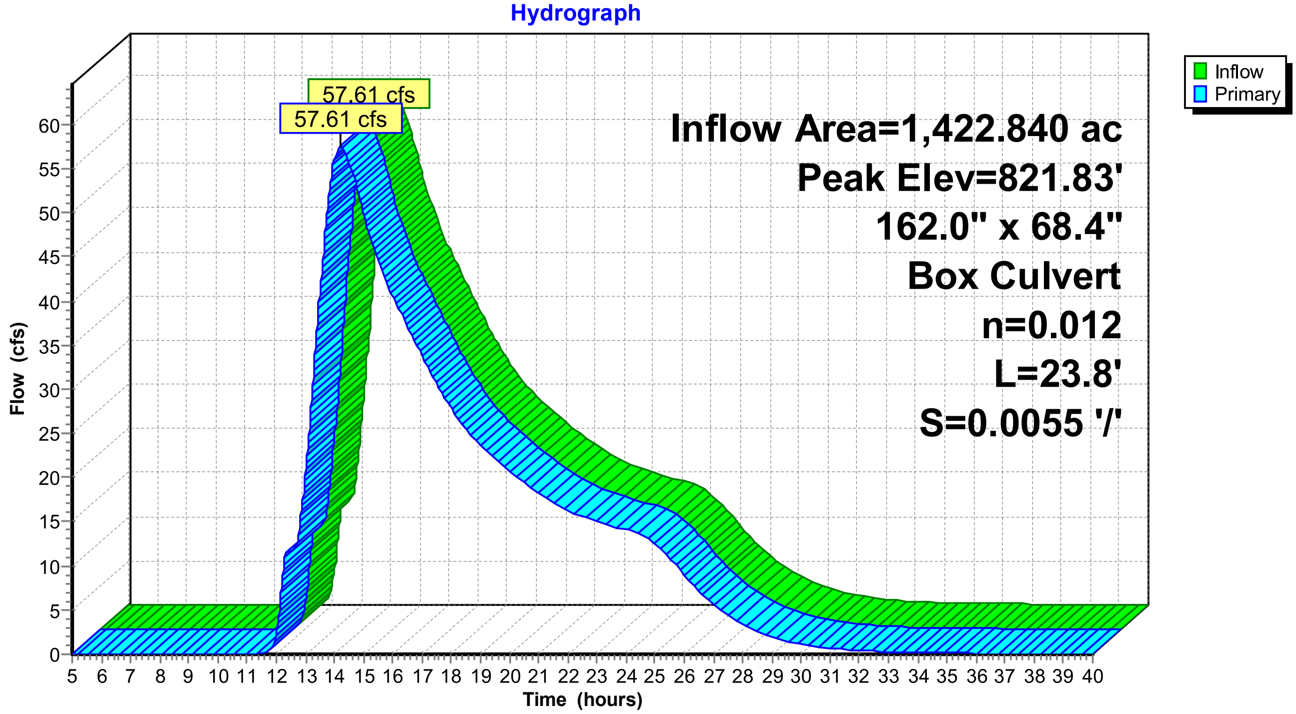
Pond 26P: Commercial St.



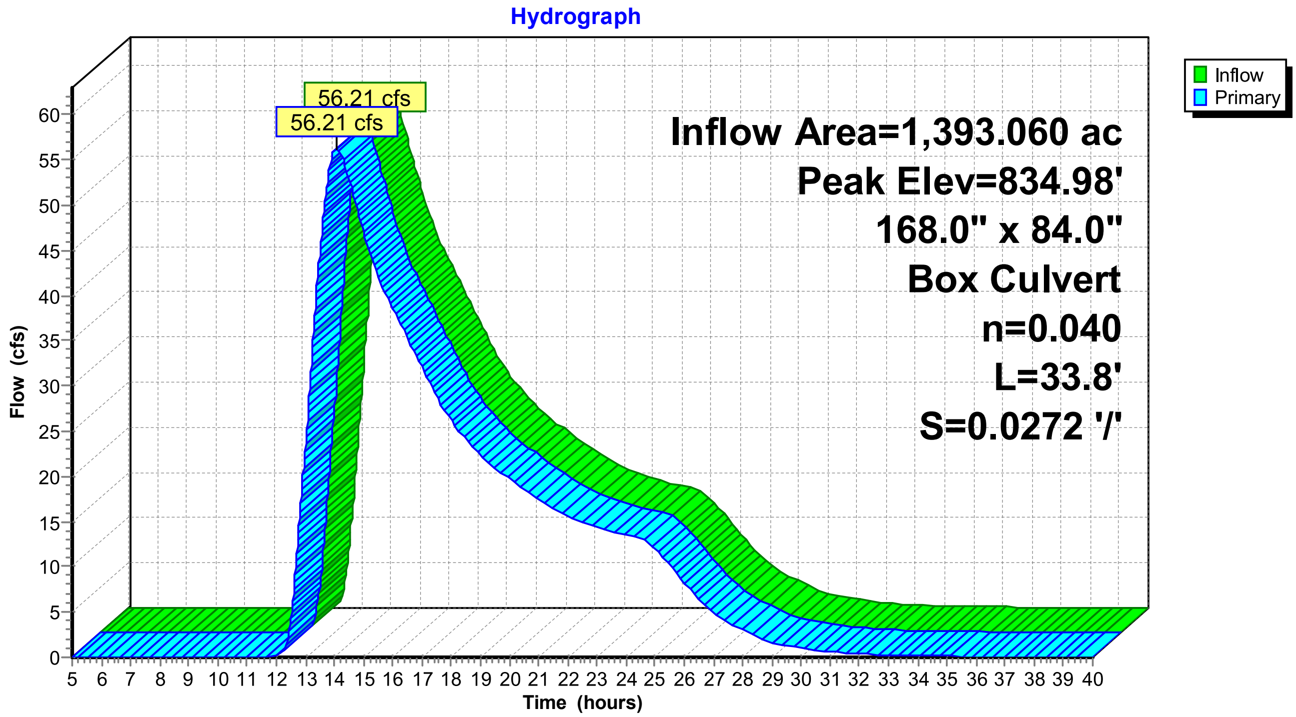
Pond 27P: Pennimite Rd



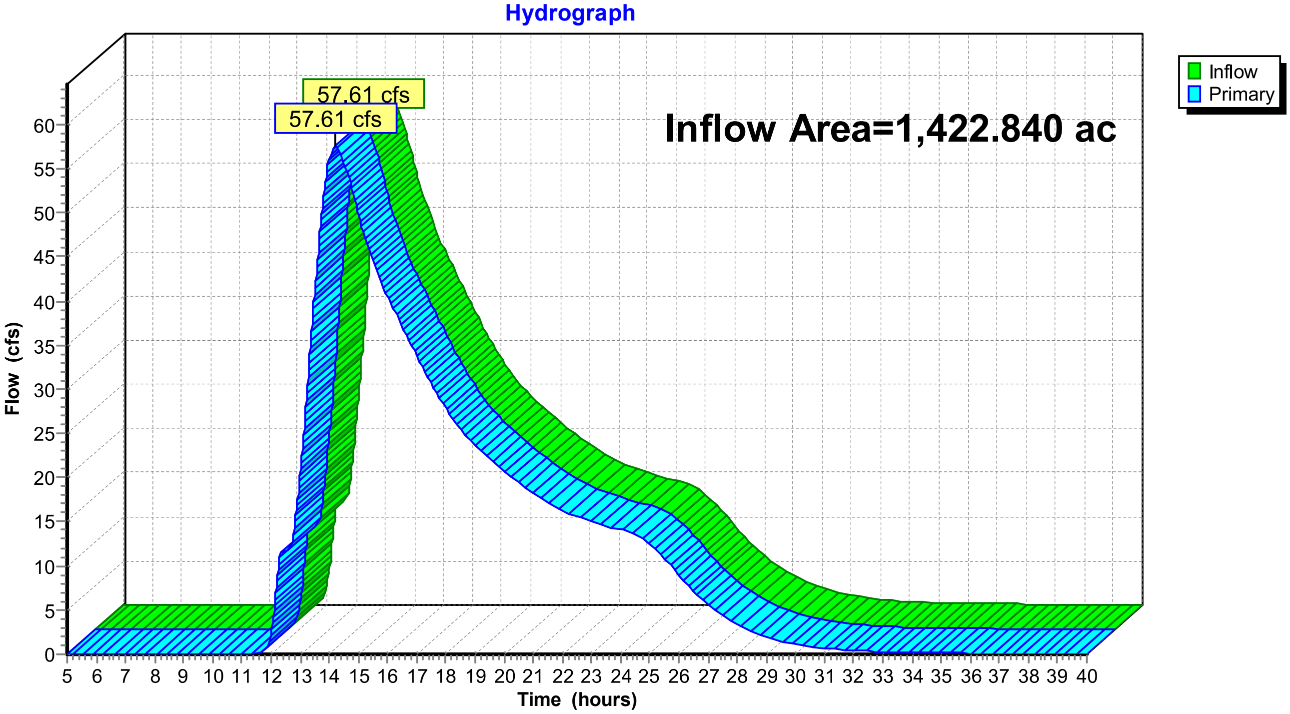
Pond 28P: Wilkins Tract



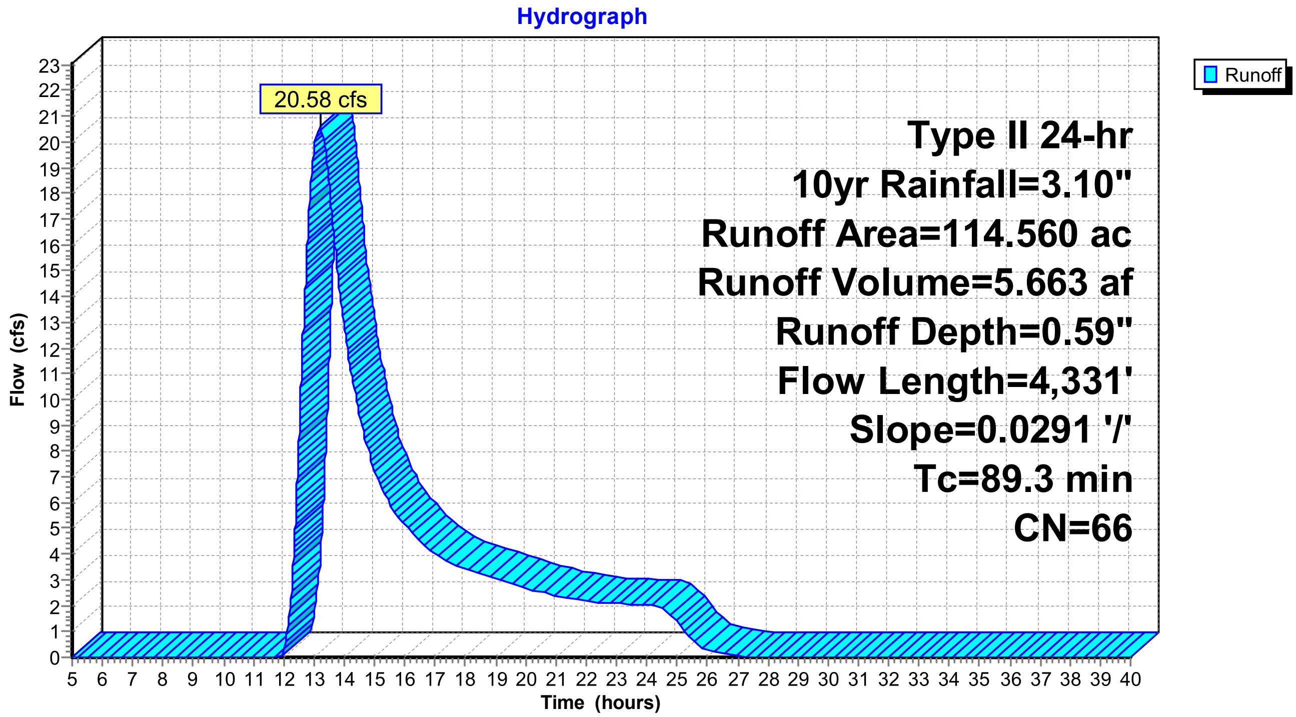
Pond 29P: E. Lake Rd.



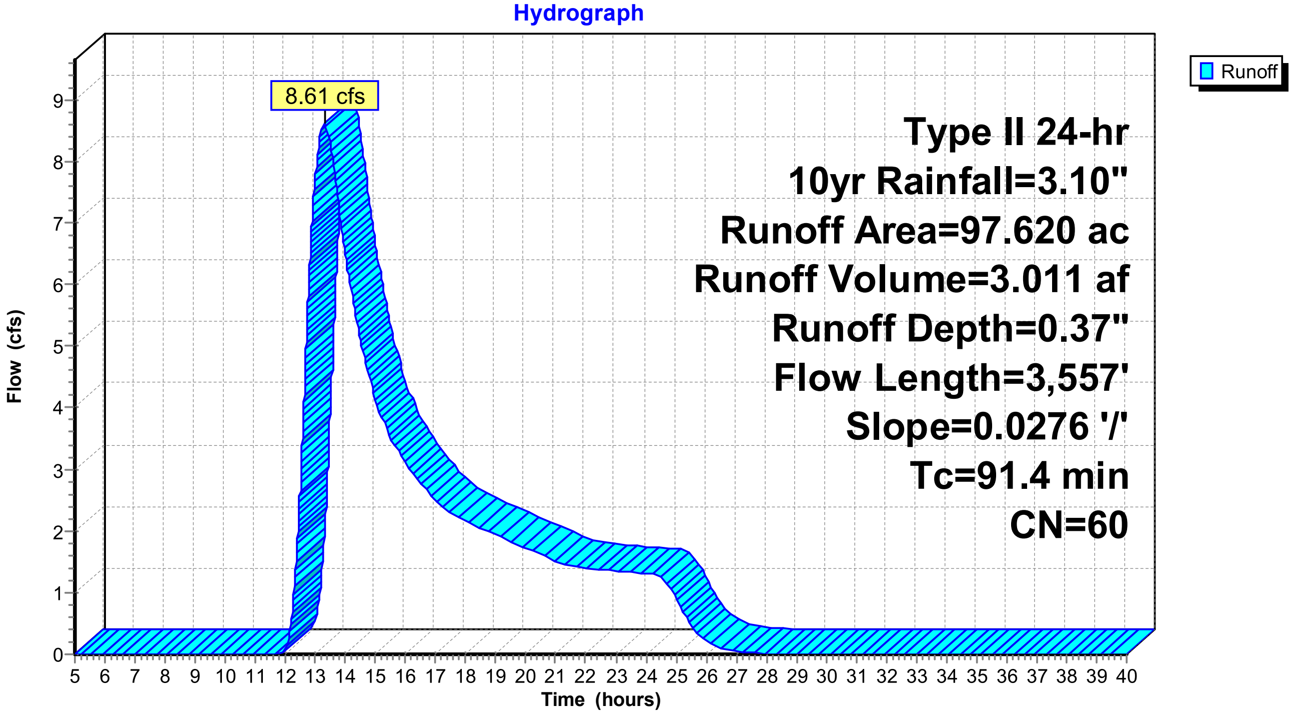
Link 30L: Conesus Lake



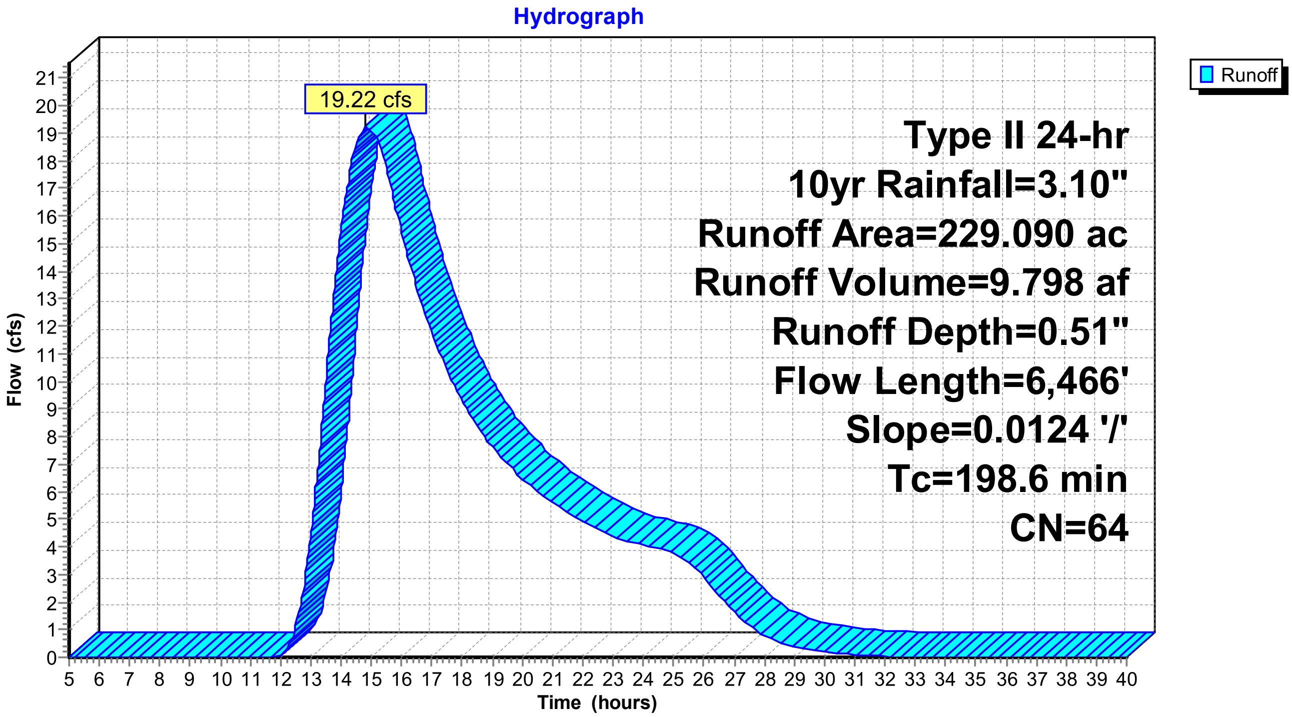
Subcatchment 1S: DA1



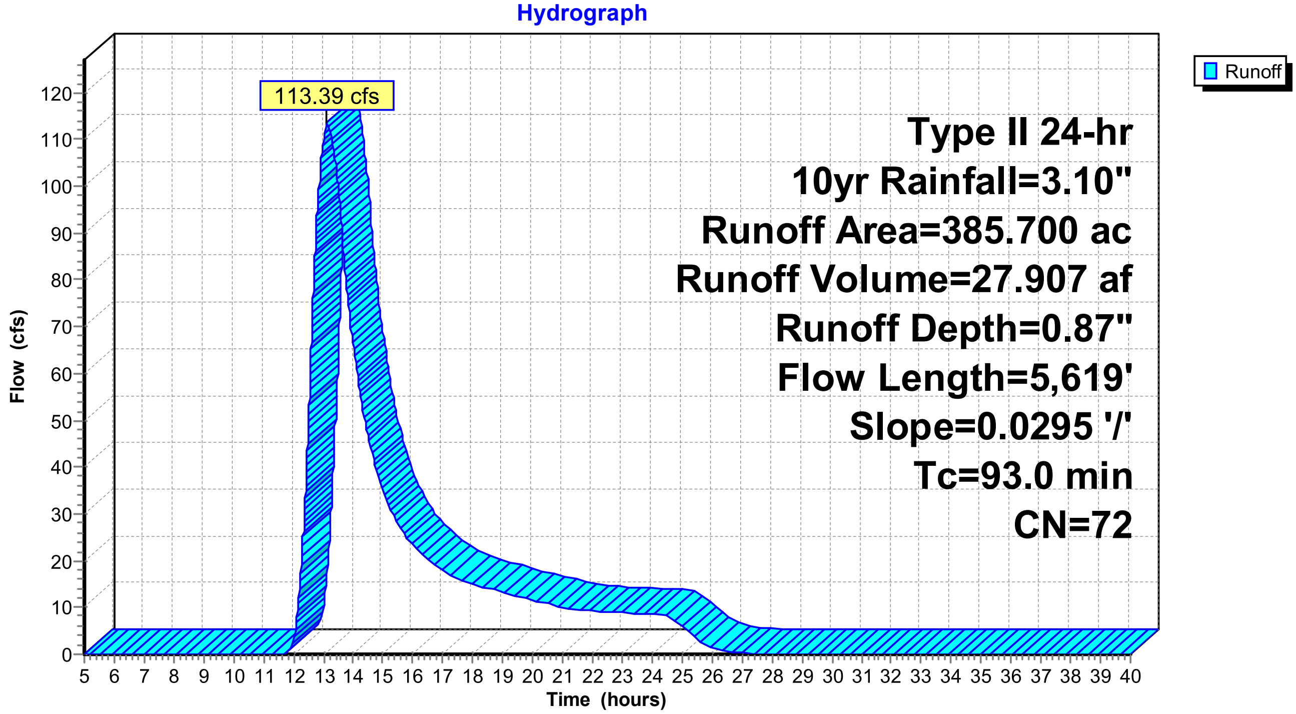
Subcatchment 2S: DA2



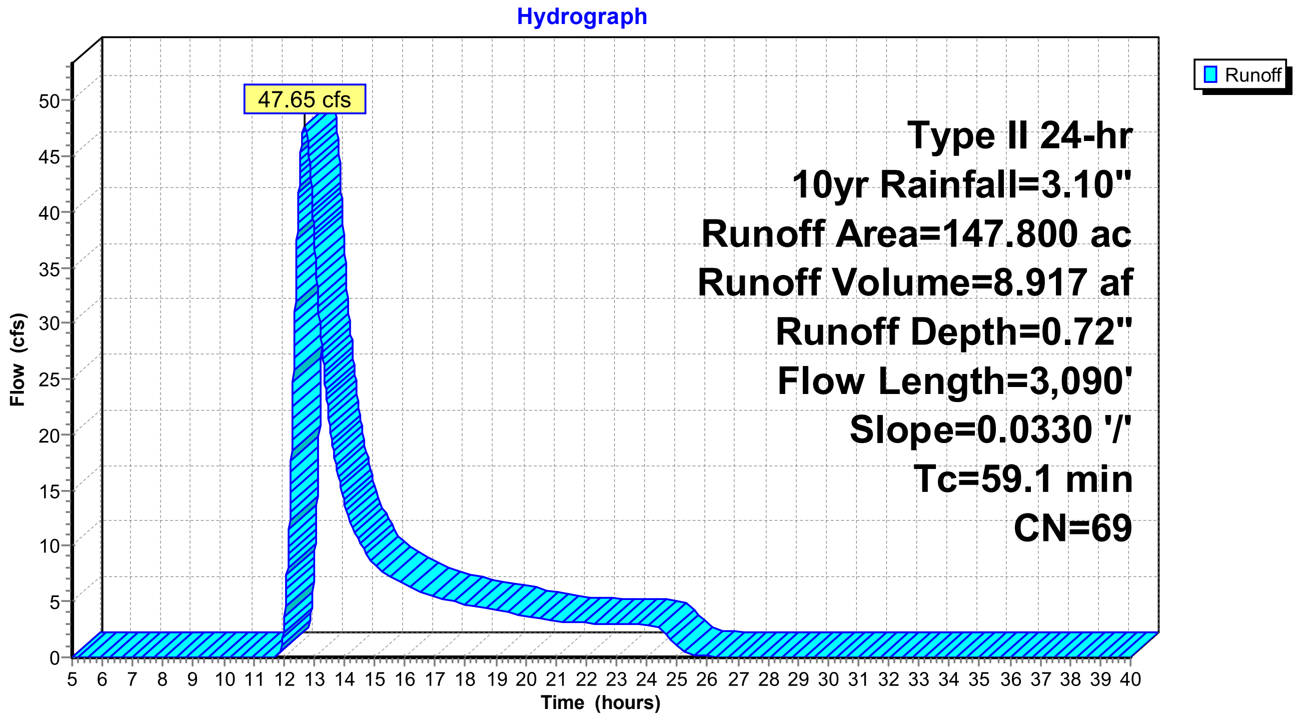
Subcatchment 8S: DA3



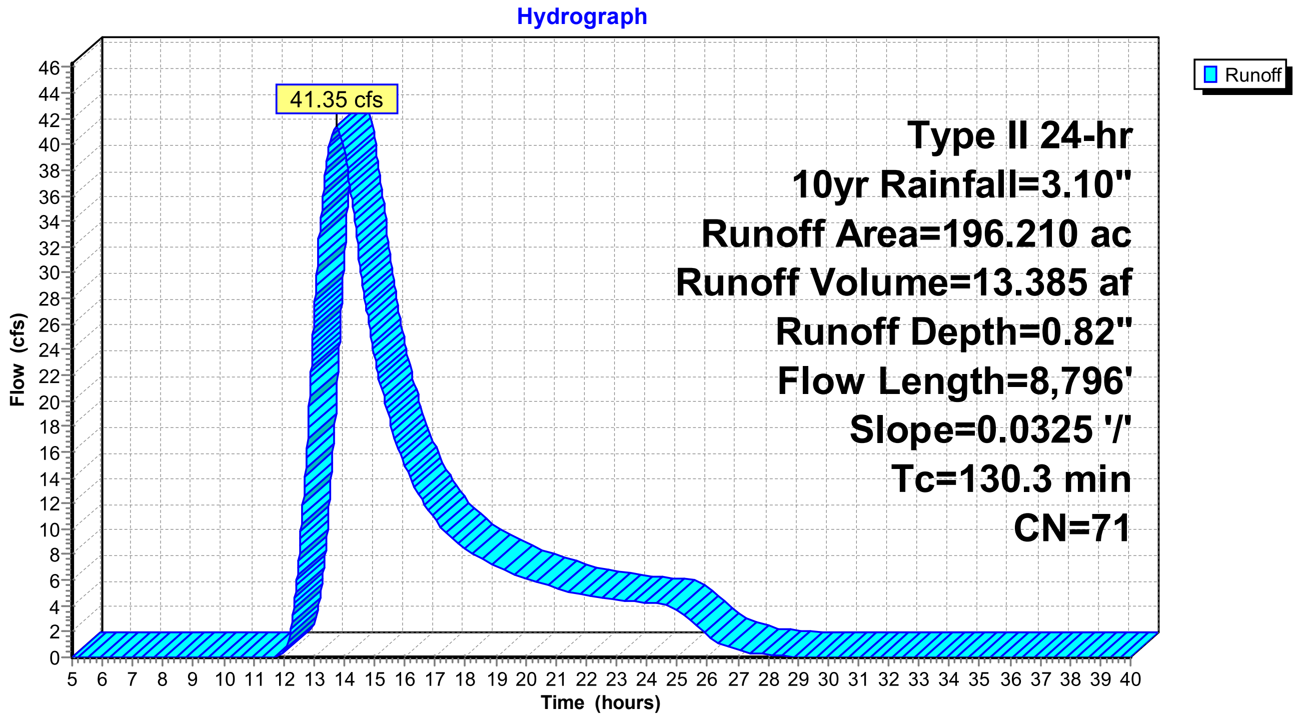
Subcatchment 12S: DA6



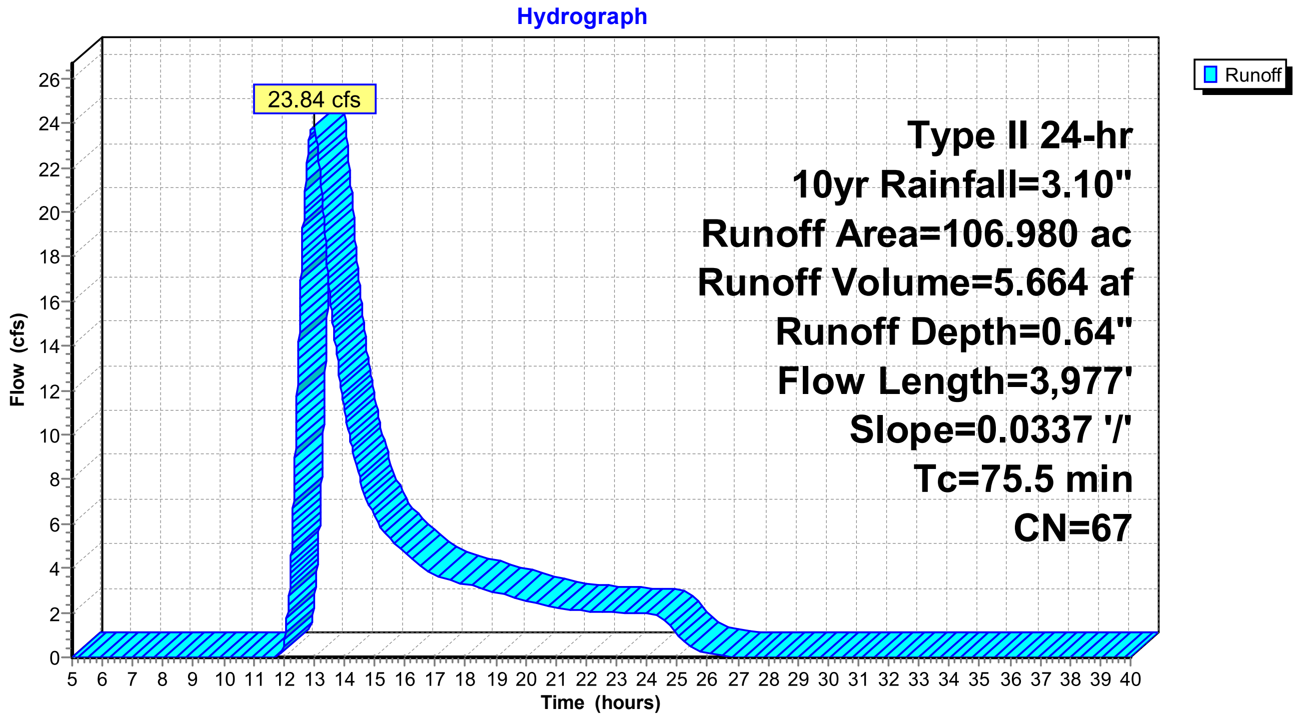
Subcatchment 13S: DA7



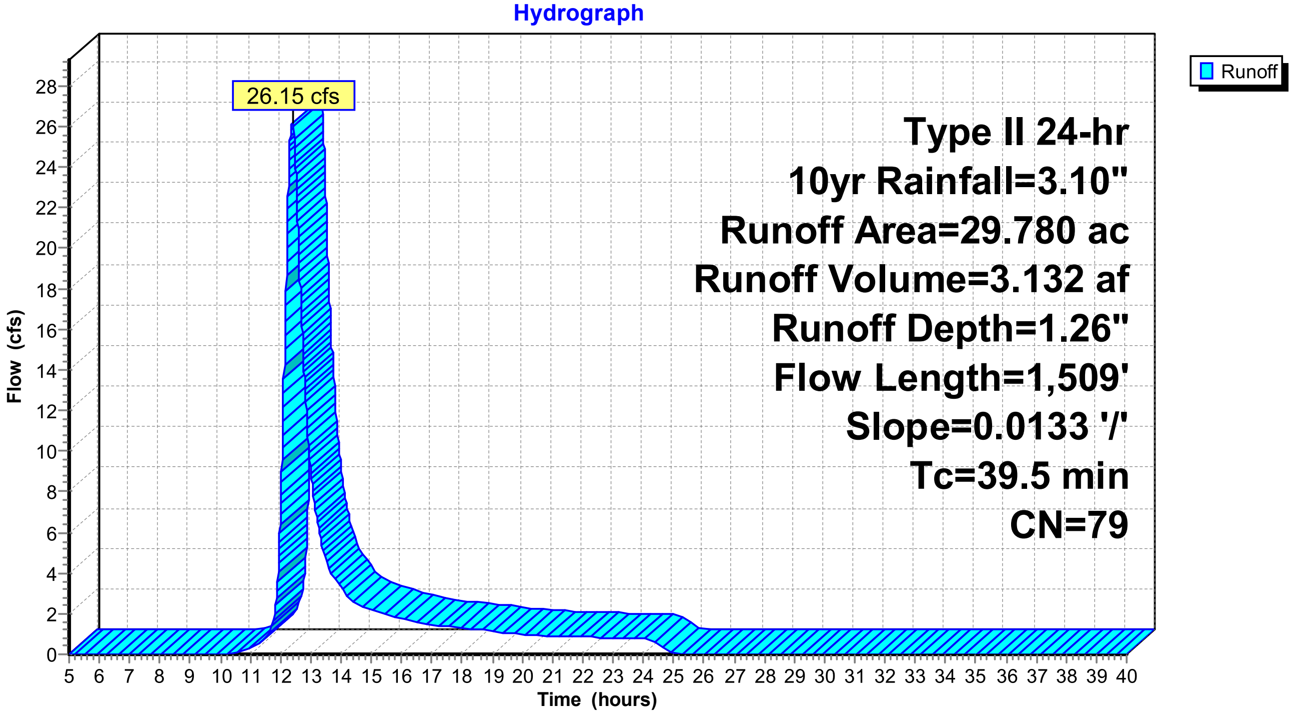
Subcatchment 15S: DA5 (Spring Creek)



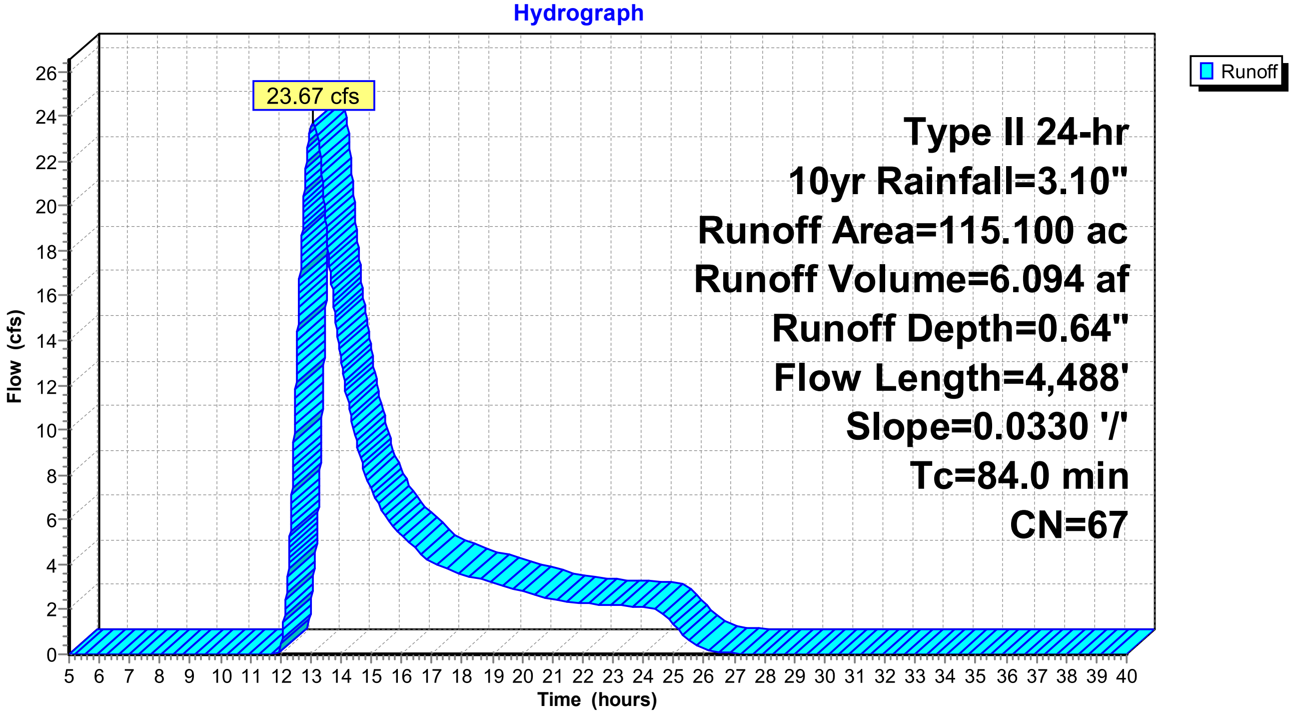
Subcatchment 20S: DA8



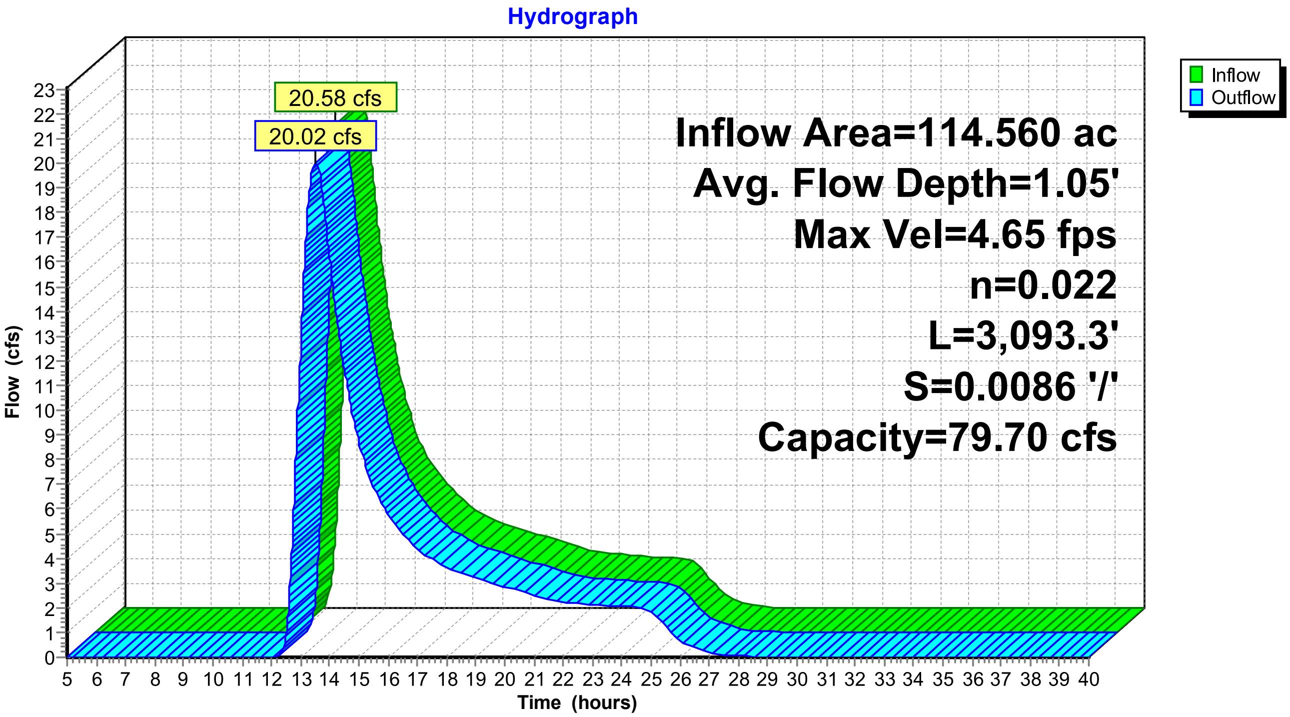
Subcatchment 23S: DA9



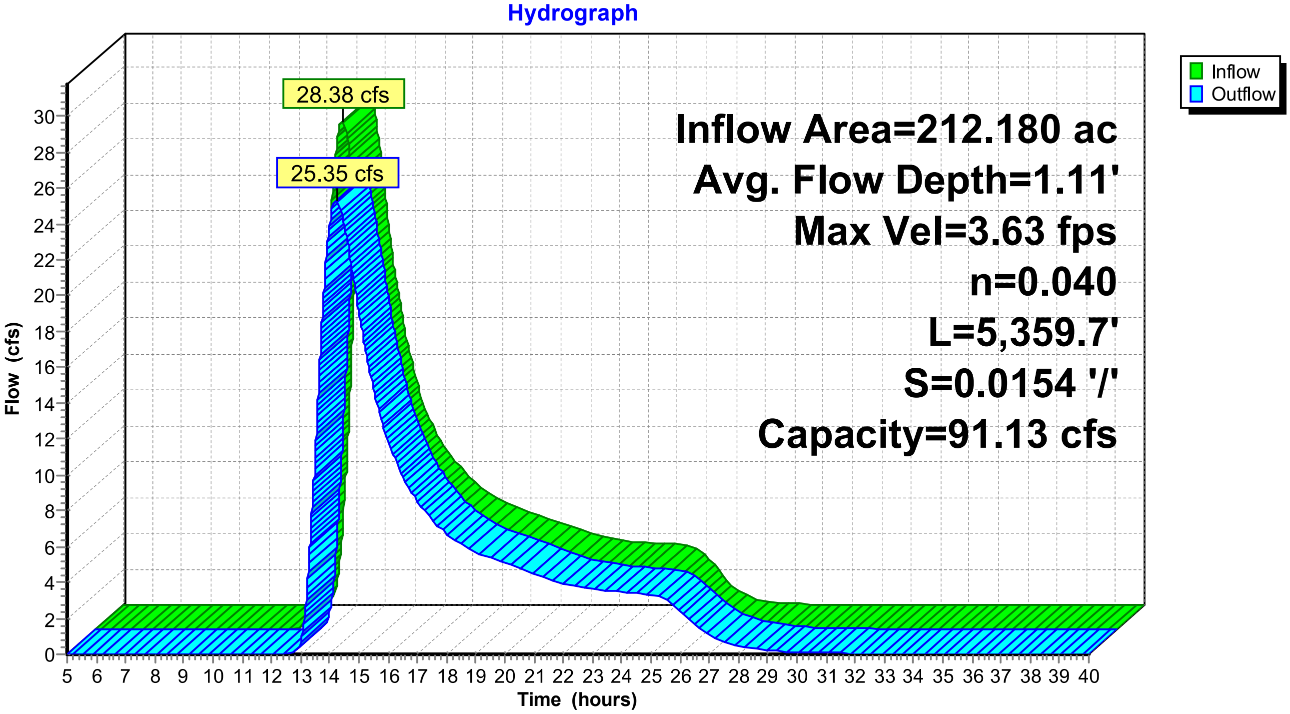
Subcatchment 31S: DA4



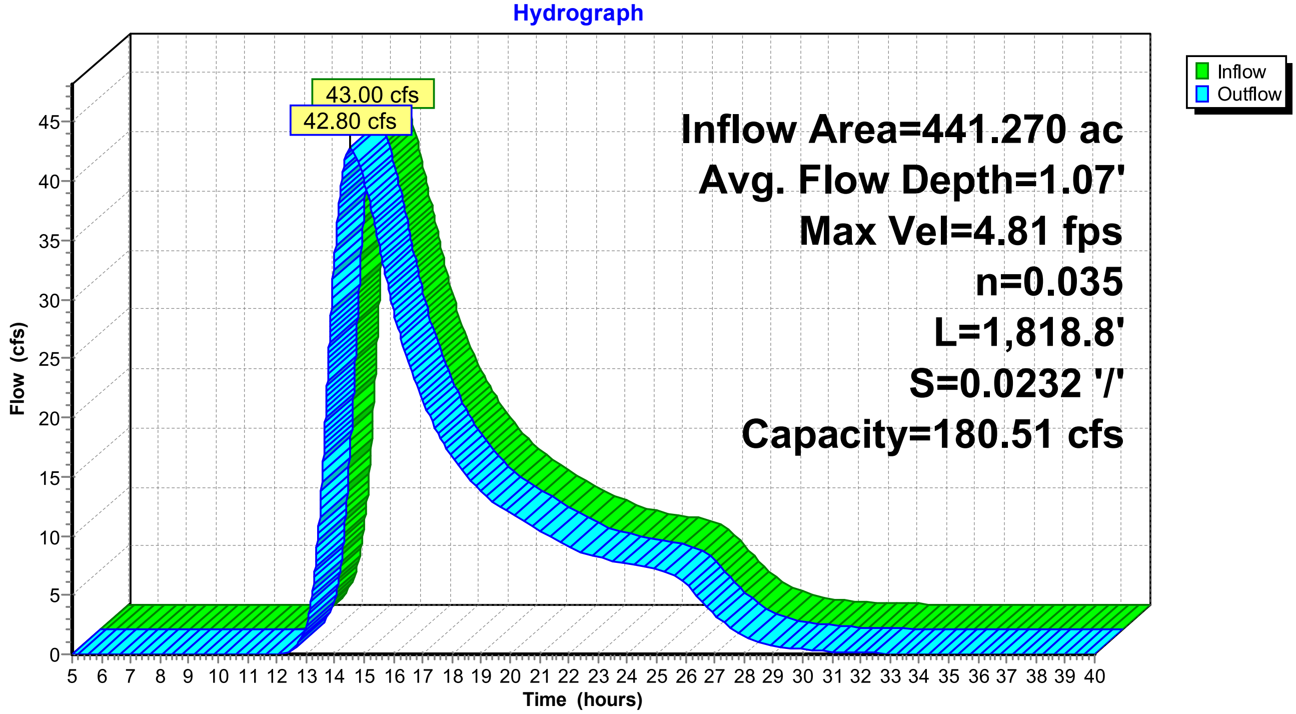
Reach 4R: Pasture



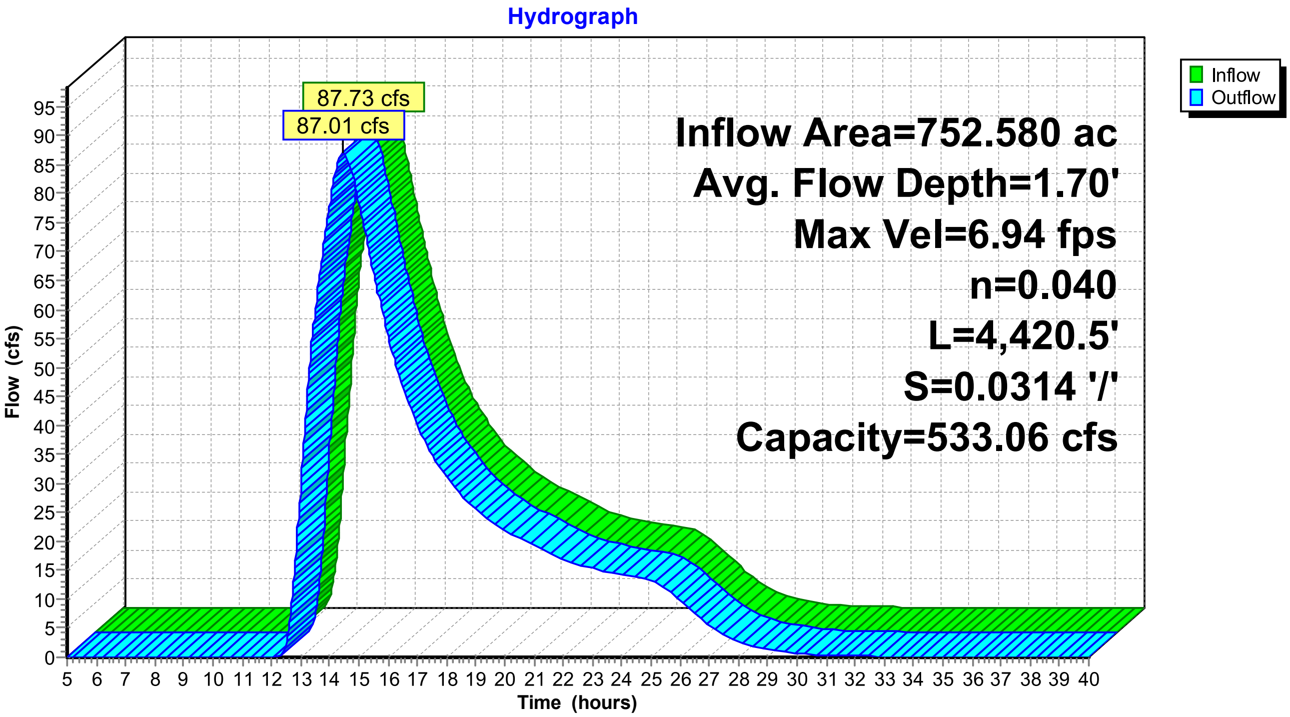
Reach 6R: Ponds



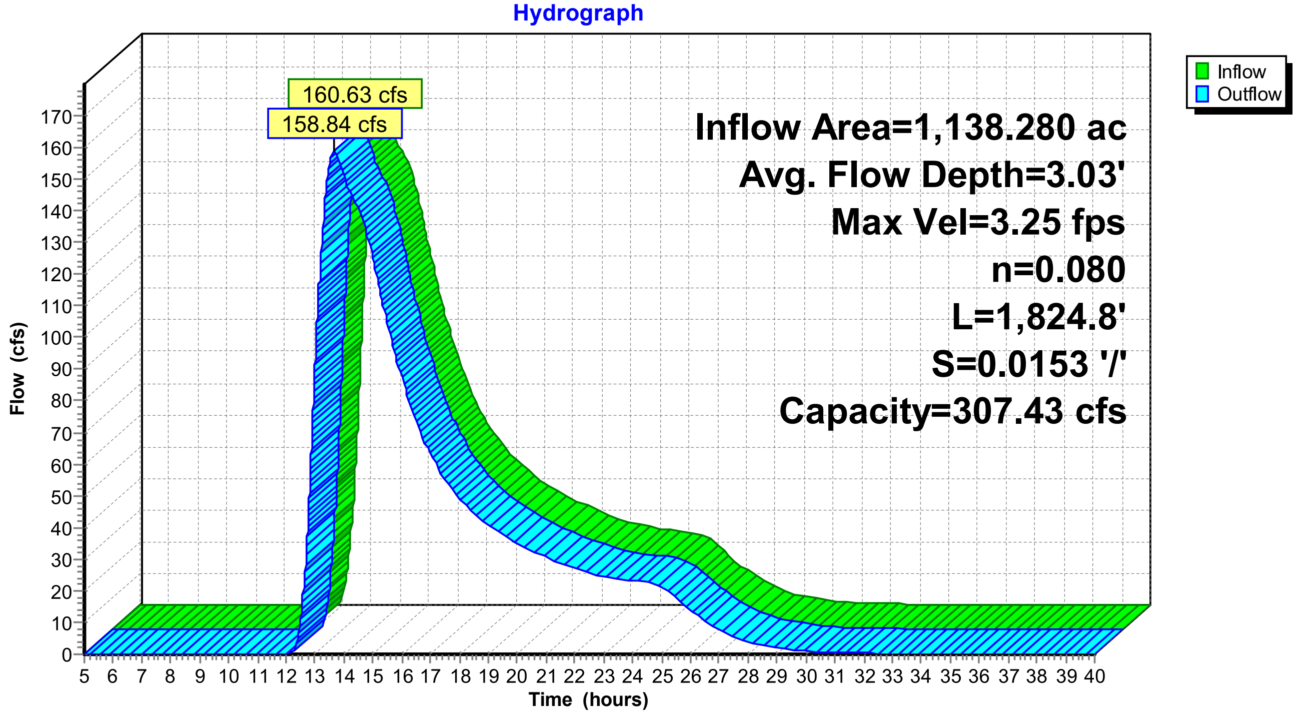
Reach 9R: School



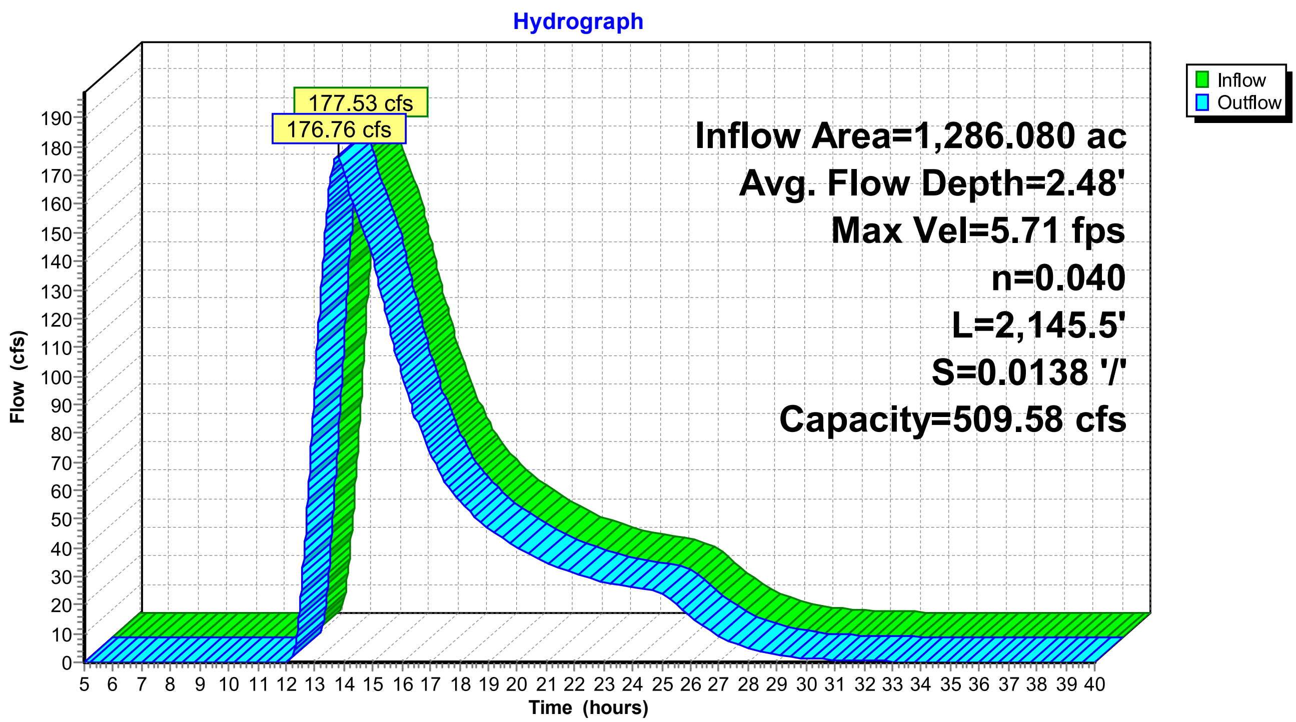
Reach 11R: Commercial



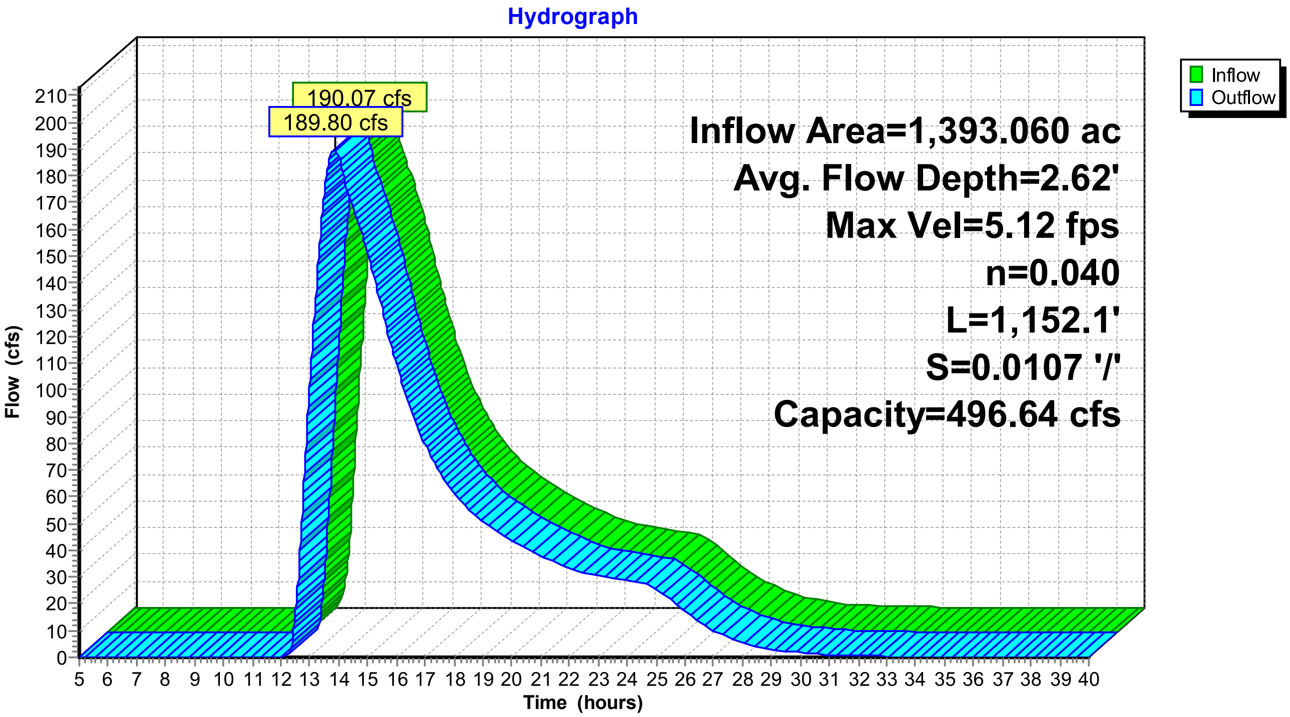
Reach 17R: Park to Penn



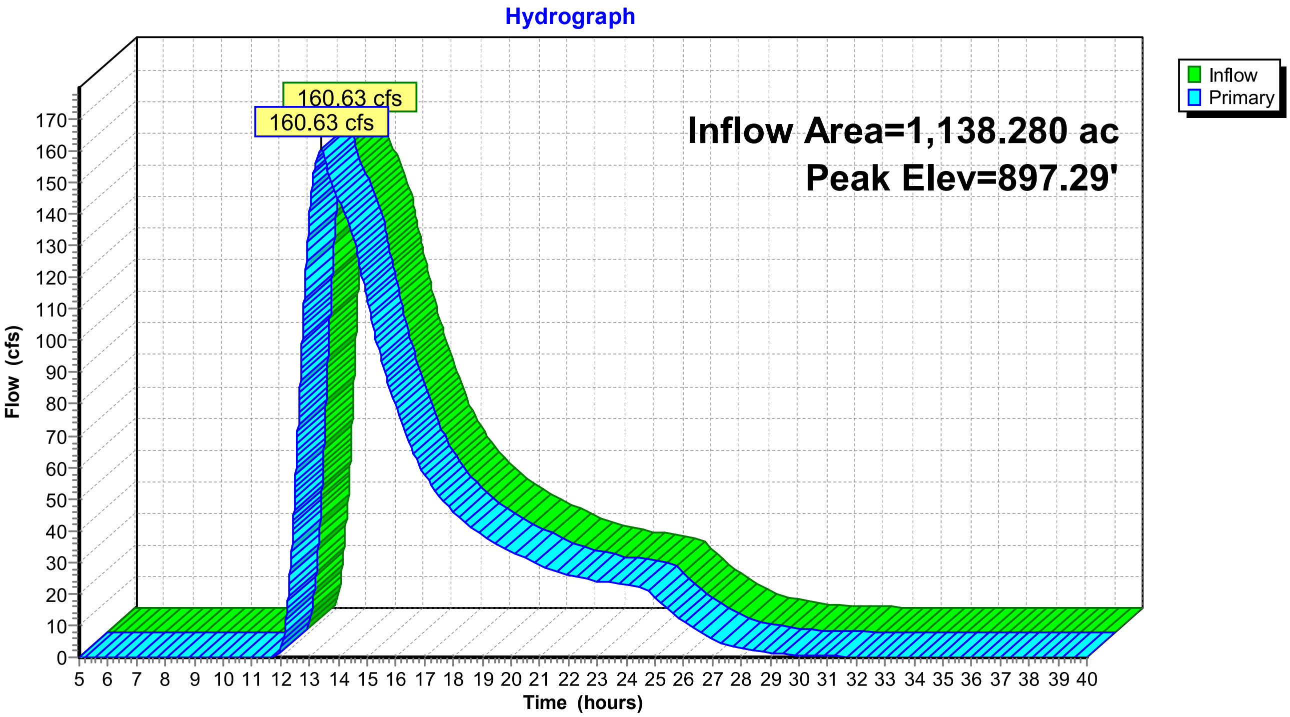
Reach 19R: E. Lake to Penn



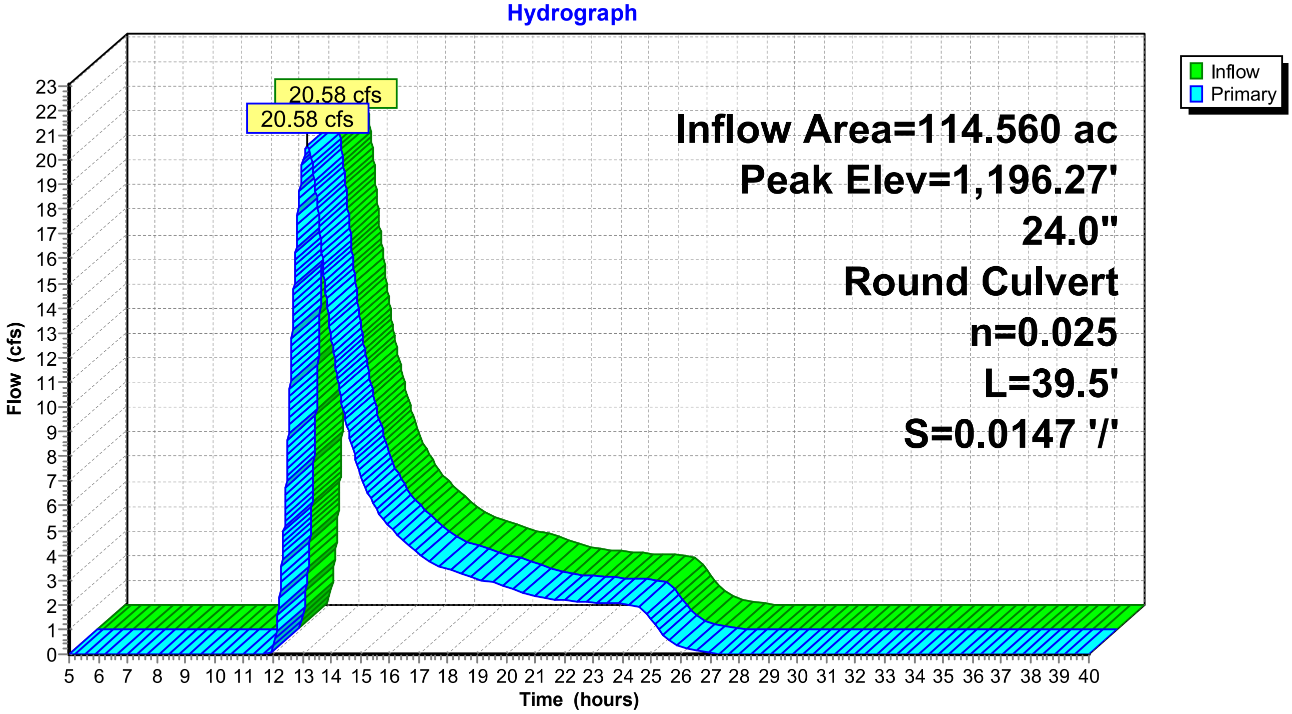
Reach 22R: Wilkins Tract to E. Lake



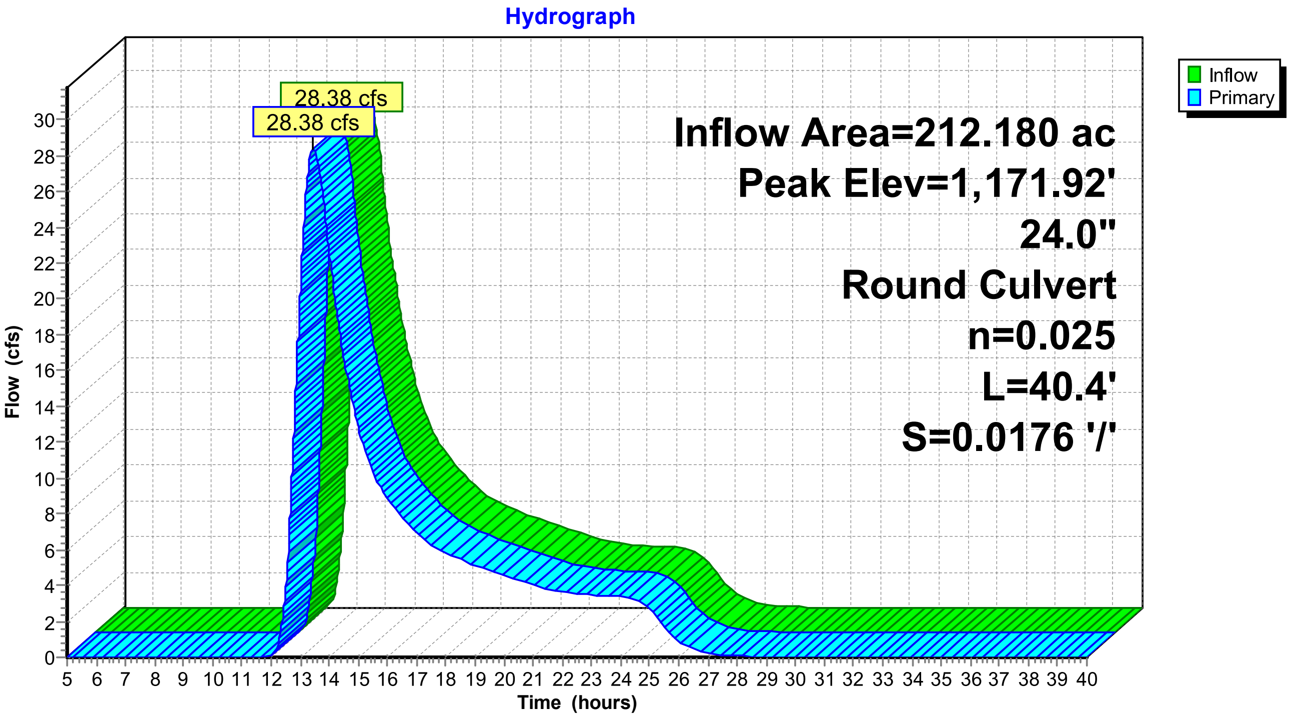
Pond 22P: Park



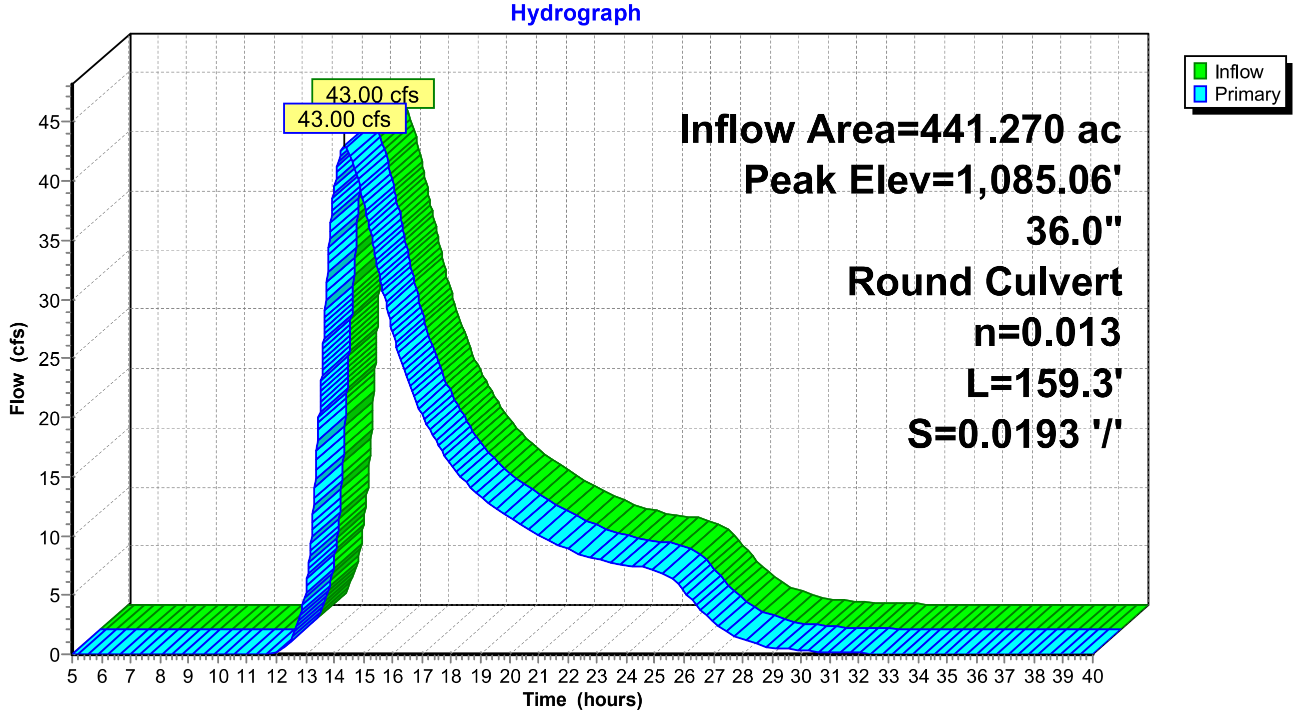
Pond 23P: Cleary Rd.



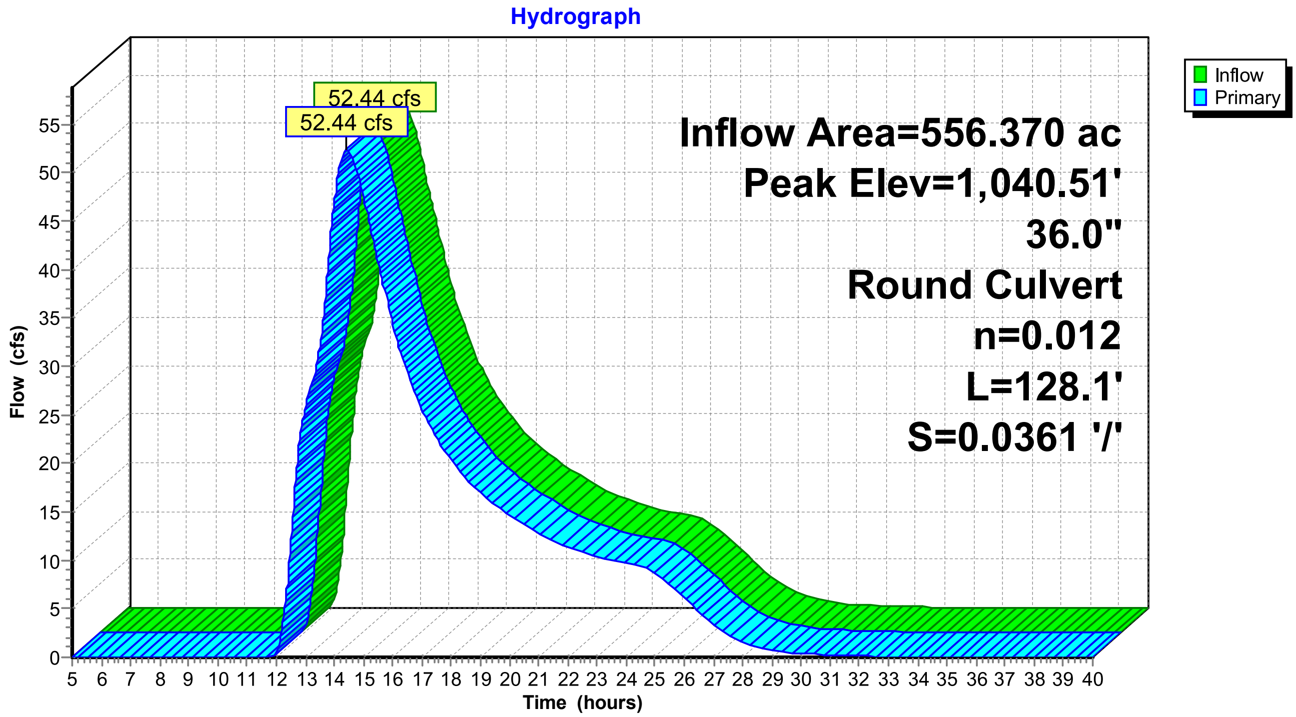
Pond 24P: Shelly Rd.



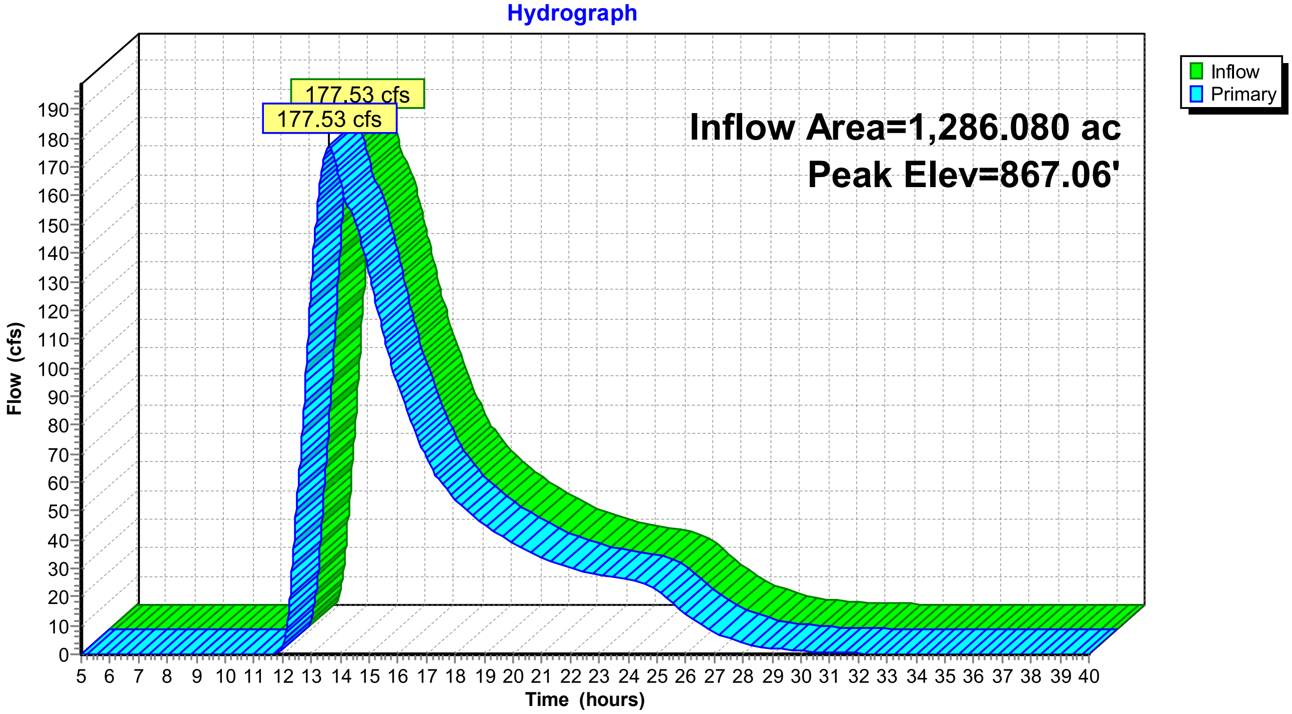
Pond 25P: School



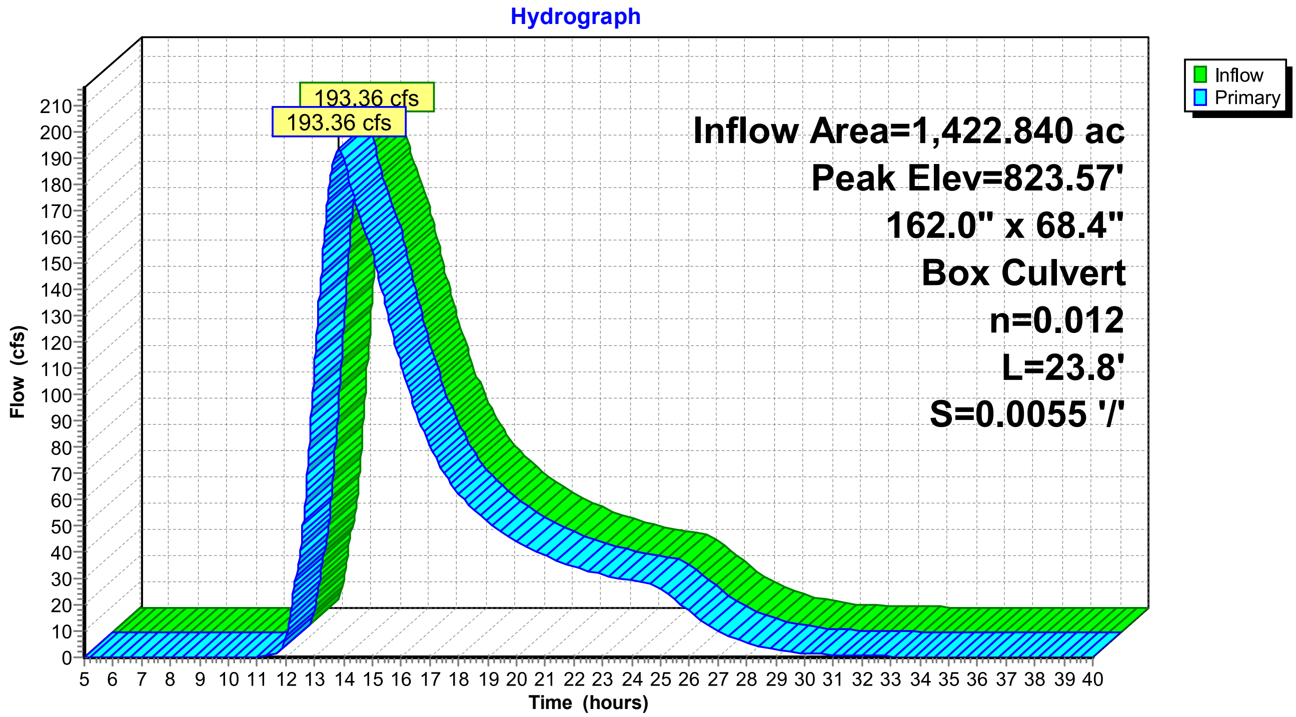
Pond 26P: Commercial St.



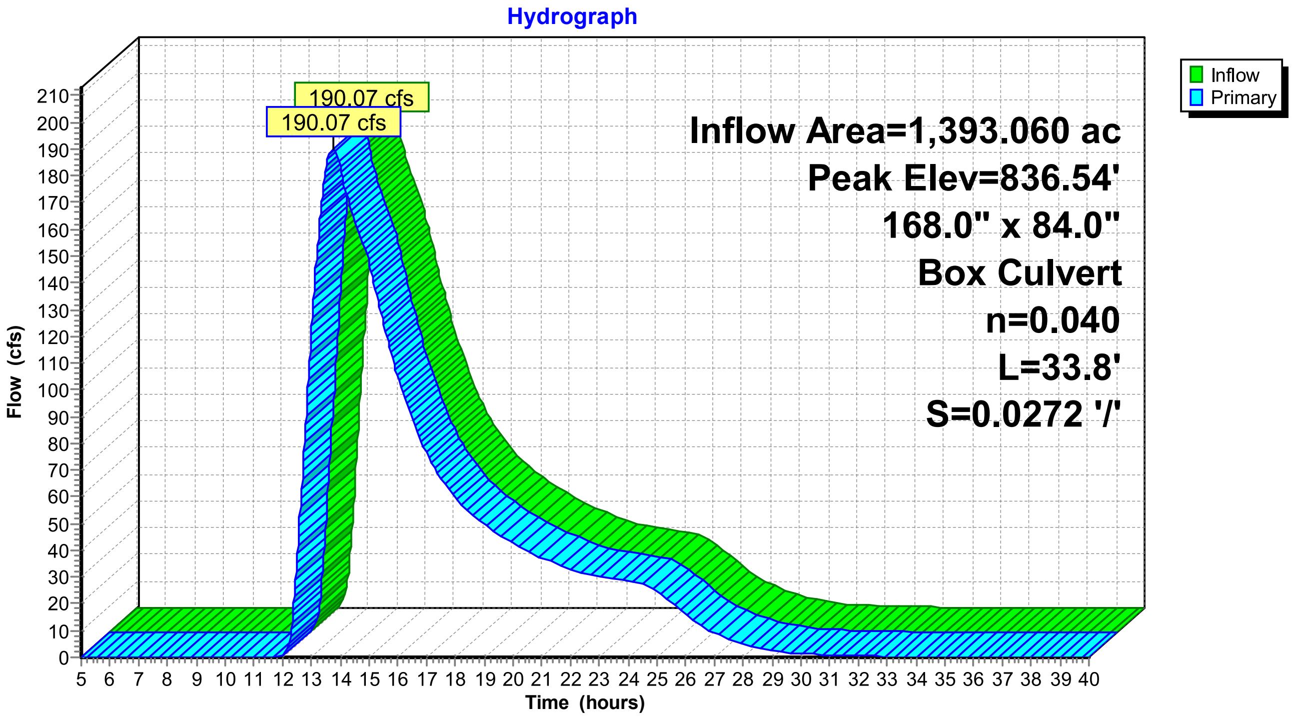
Pond 27P: Pennimite Rd



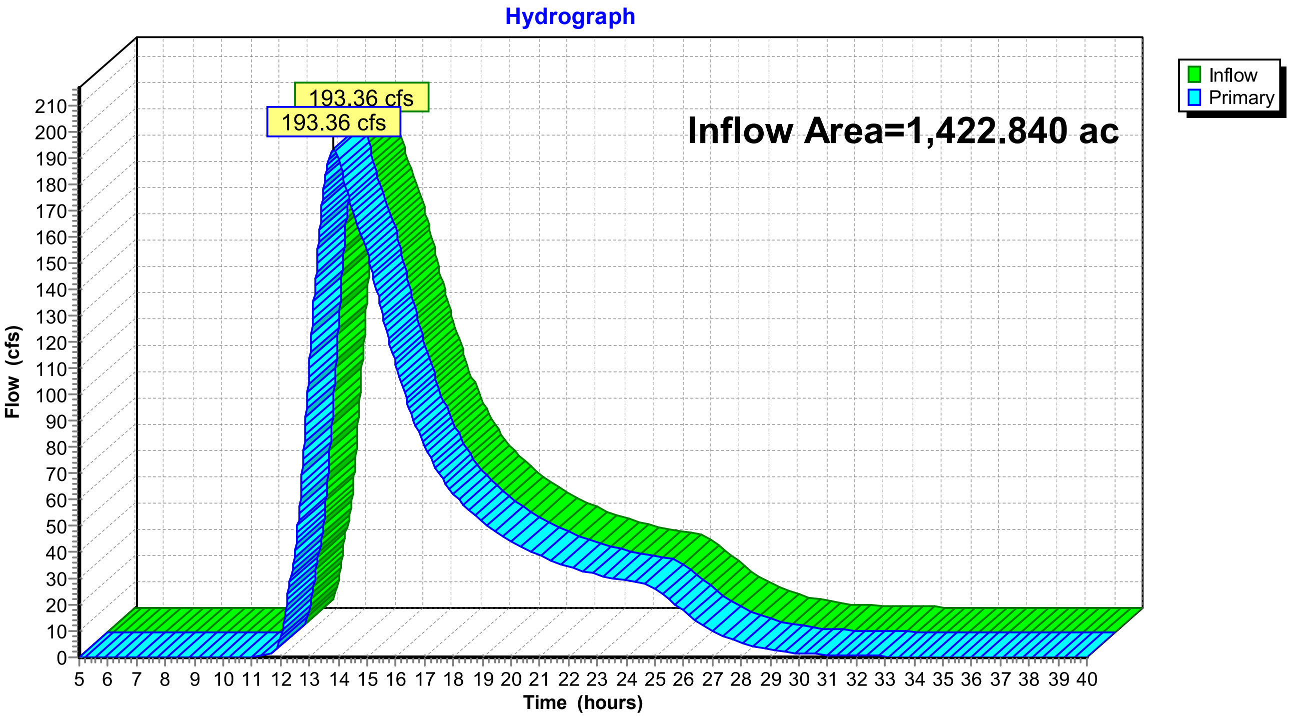
Pond 28P: Wilkins Tract



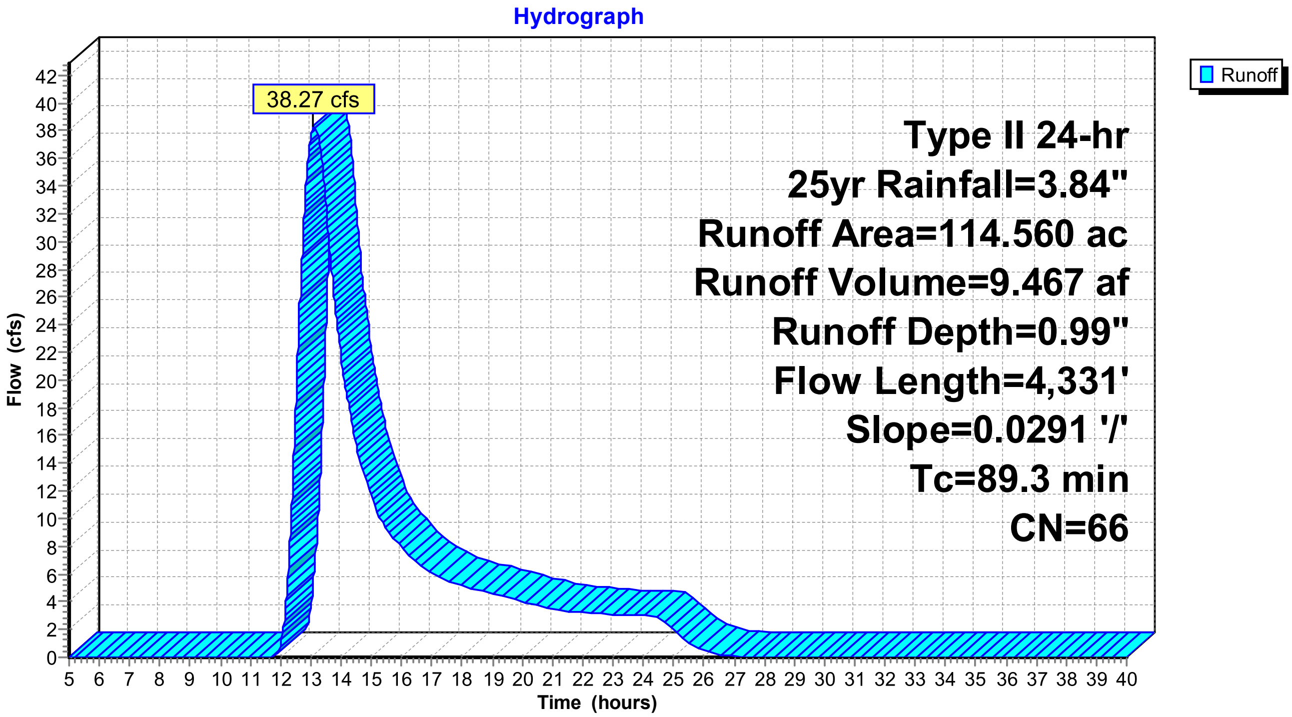
Pond 29P: E. Lake Rd.



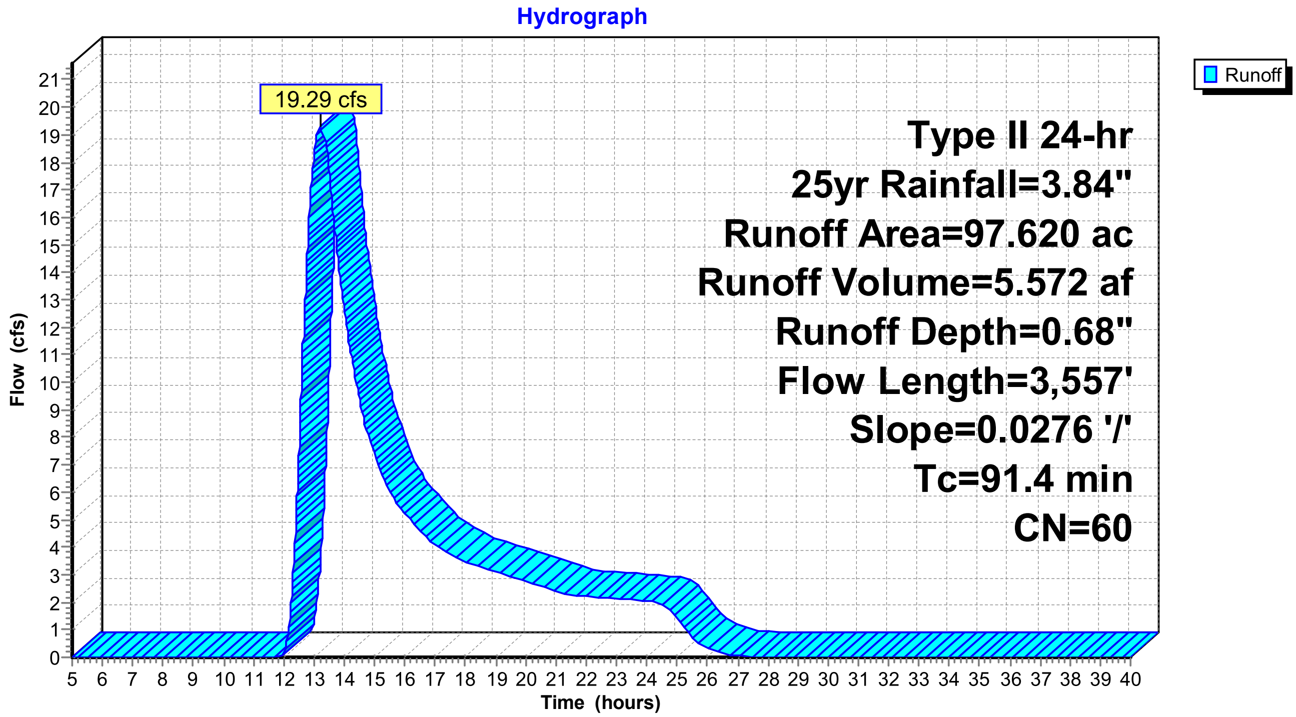
Link 30L: Conesus Lake



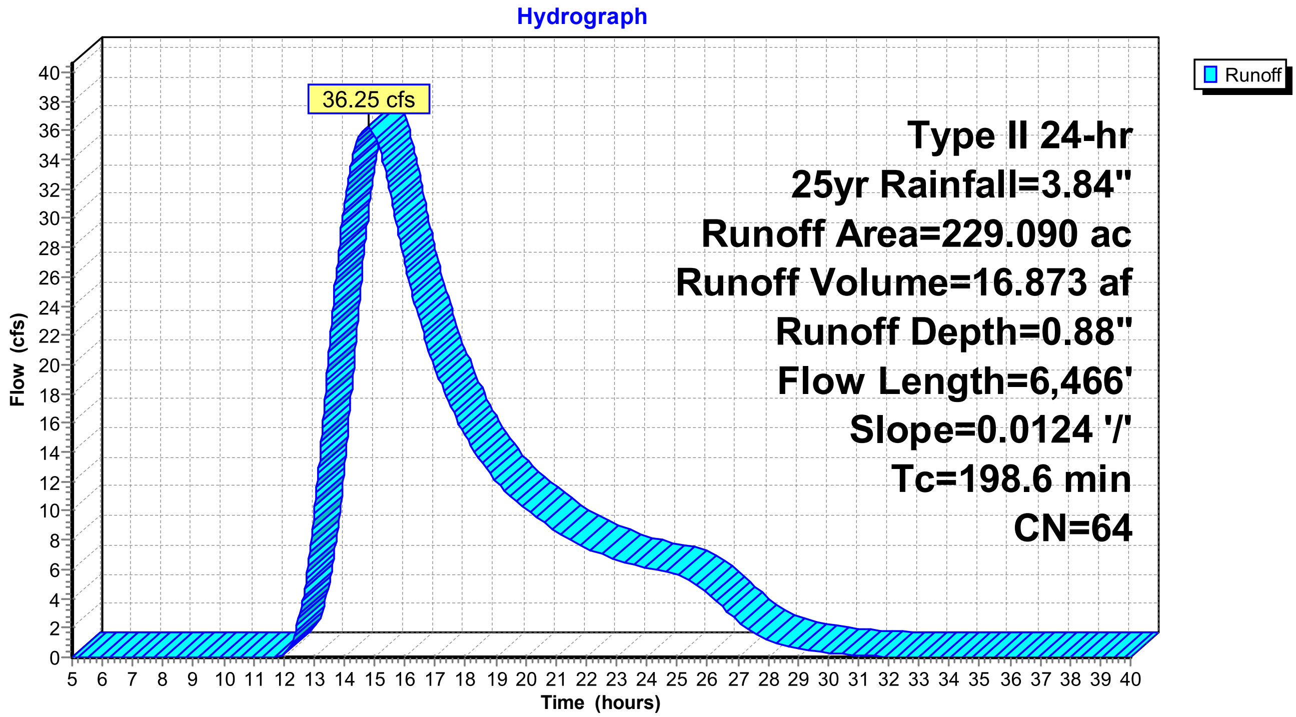
Subcatchment 1S: DA1



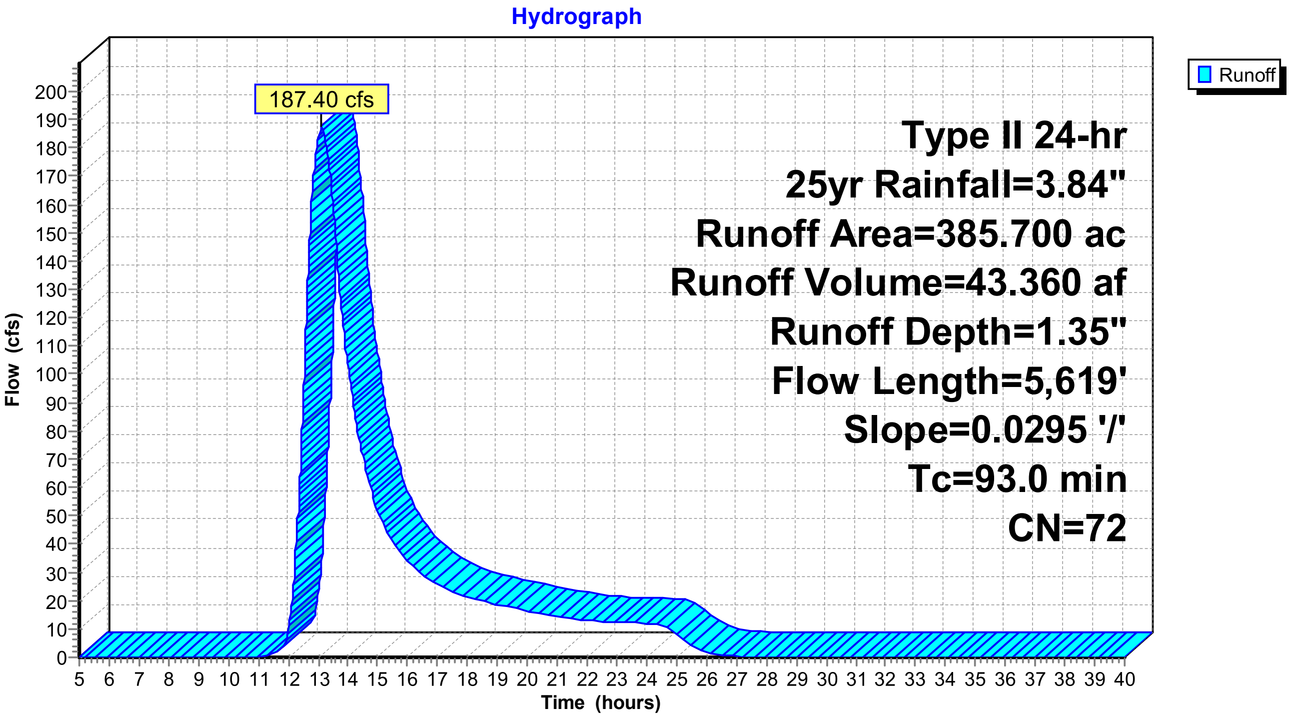
Subcatchment 2S: DA2



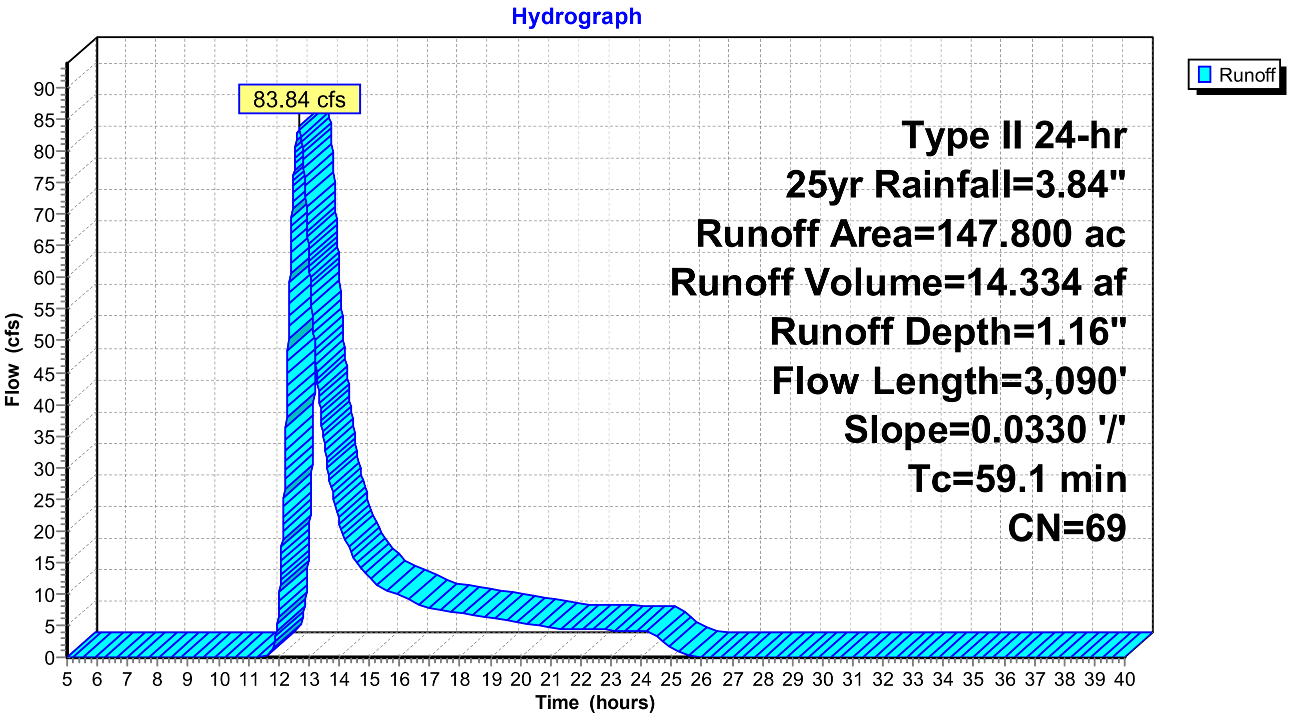
Subcatchment 8S: DA3



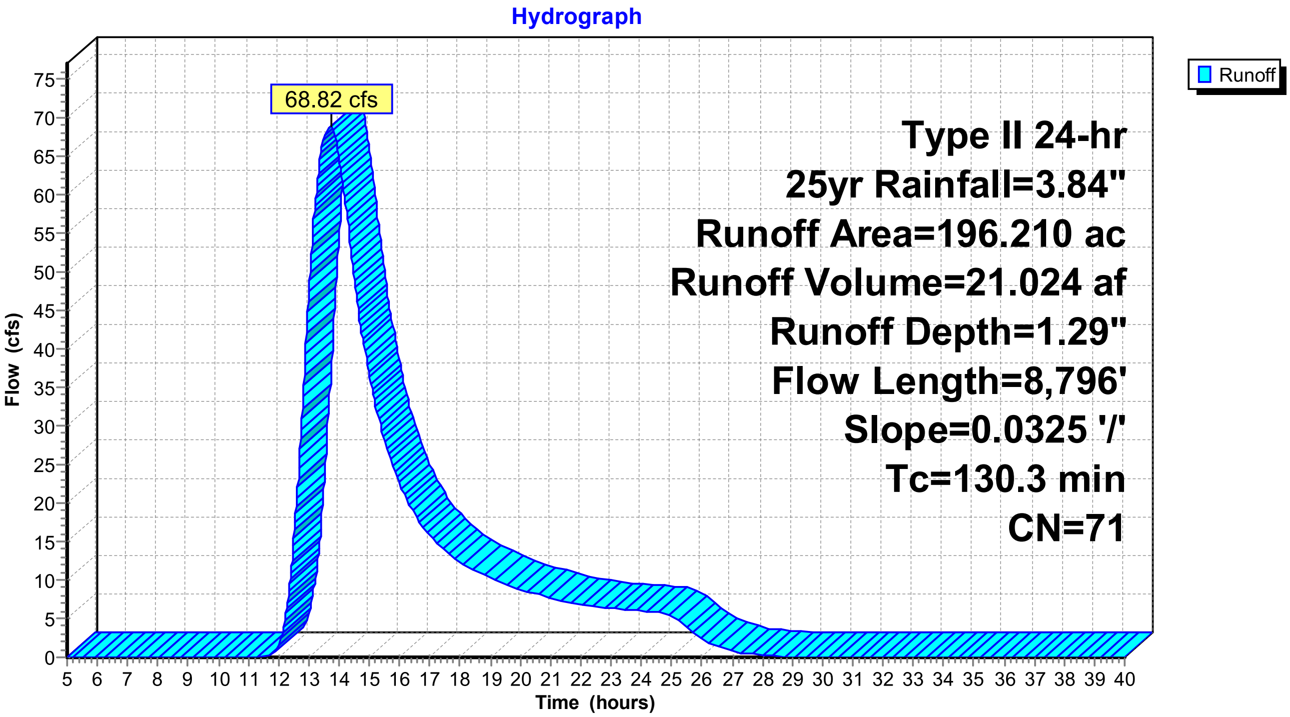
Subcatchment 12S: DA6



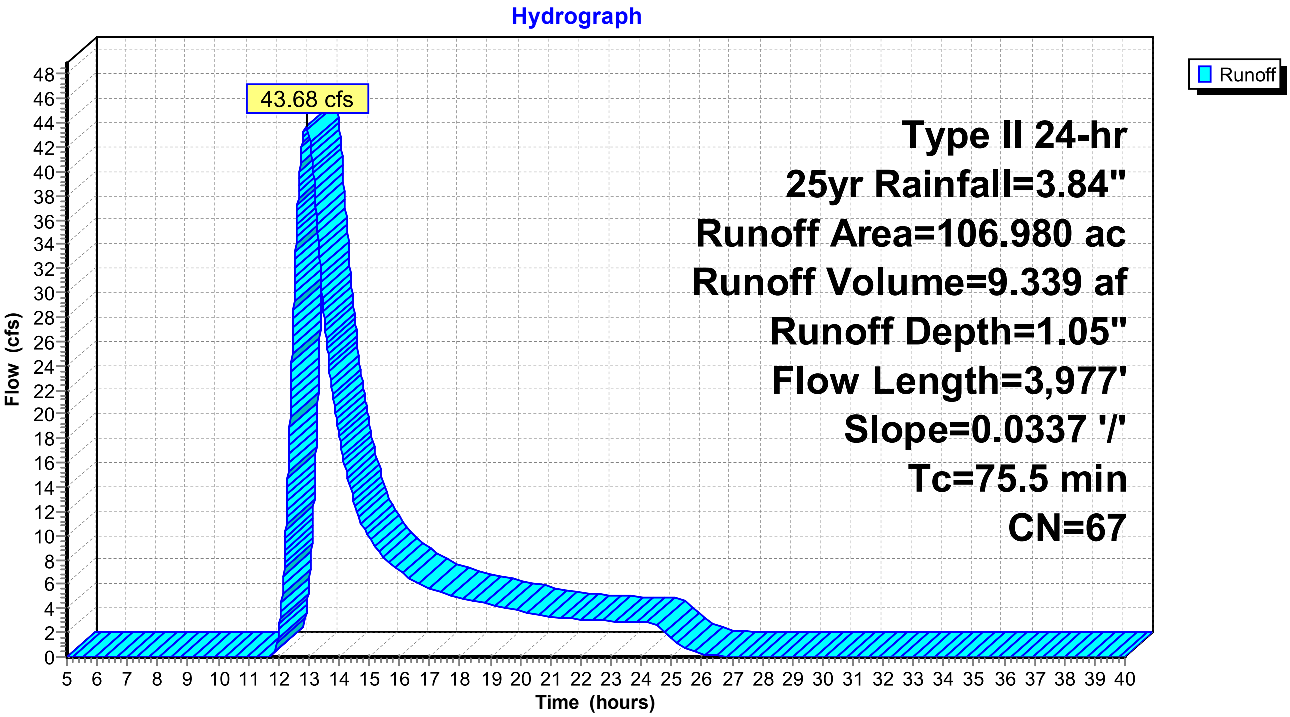
Subcatchment 13S: DA7



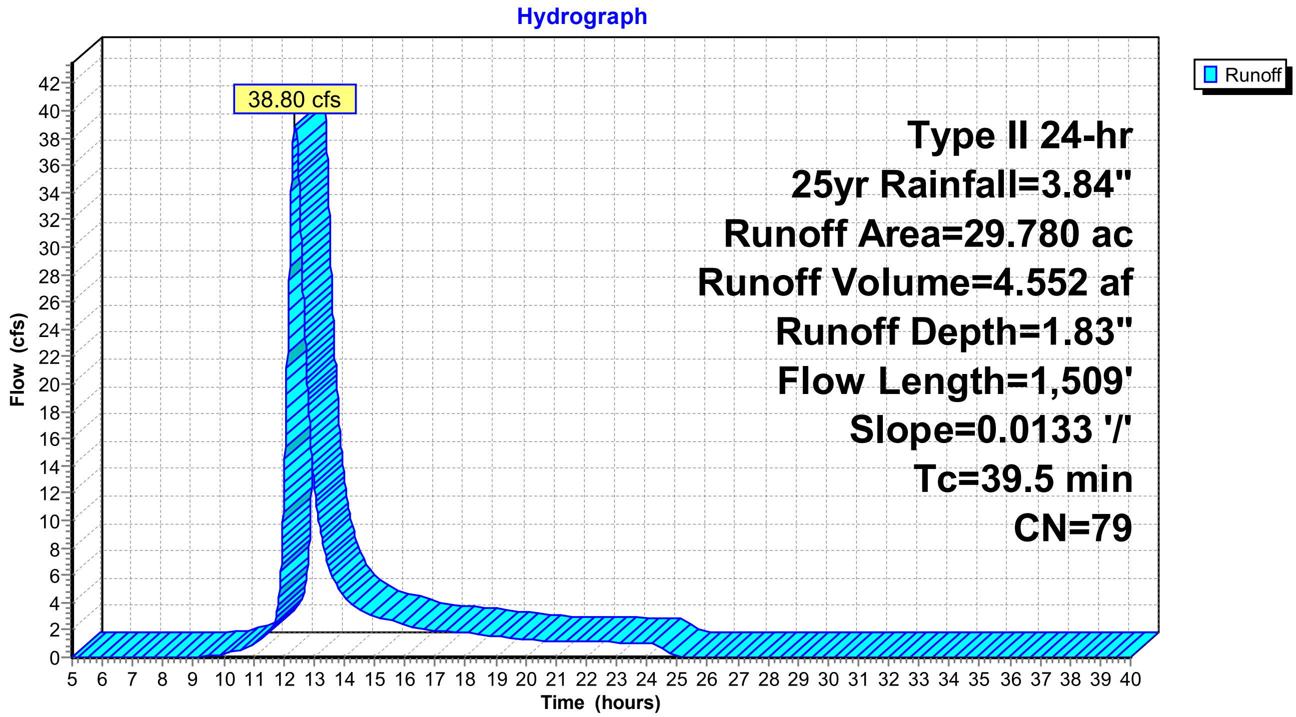
Subcatchment 15S: DA5 (Spring Creek)



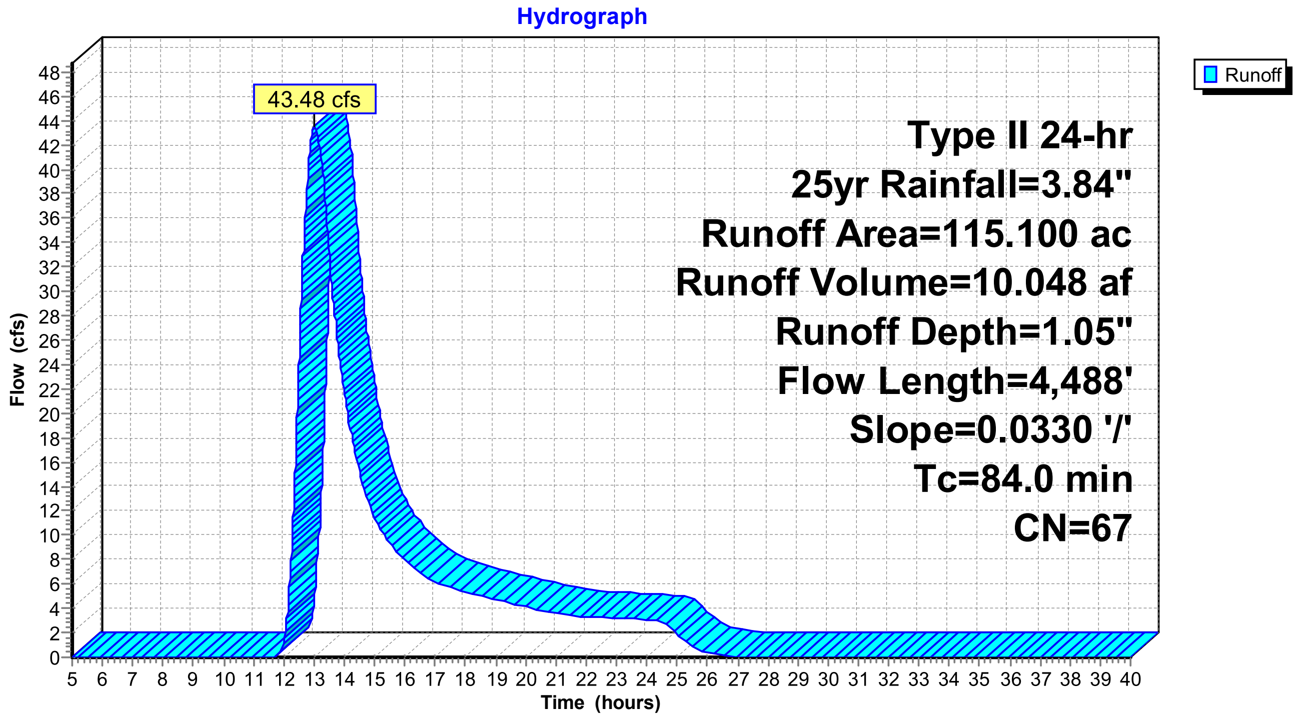
Subcatchment 20S: DA8



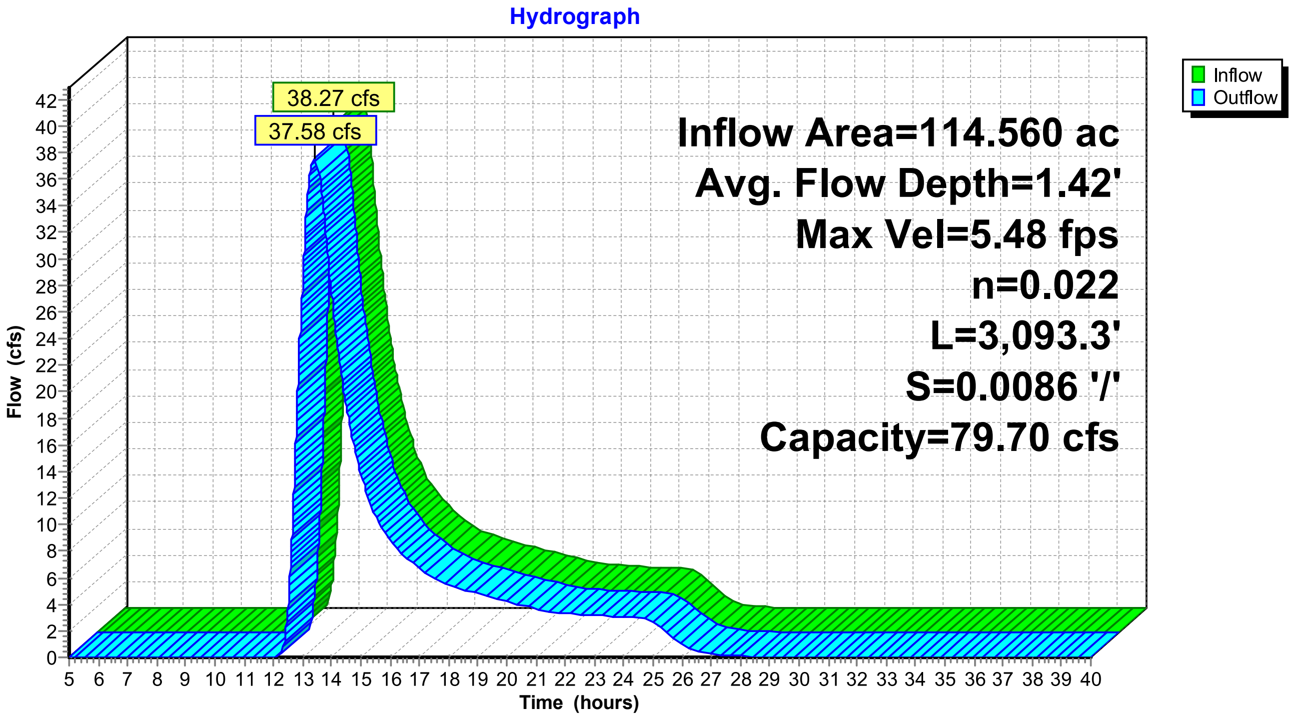
Subcatchment 23S: DA9



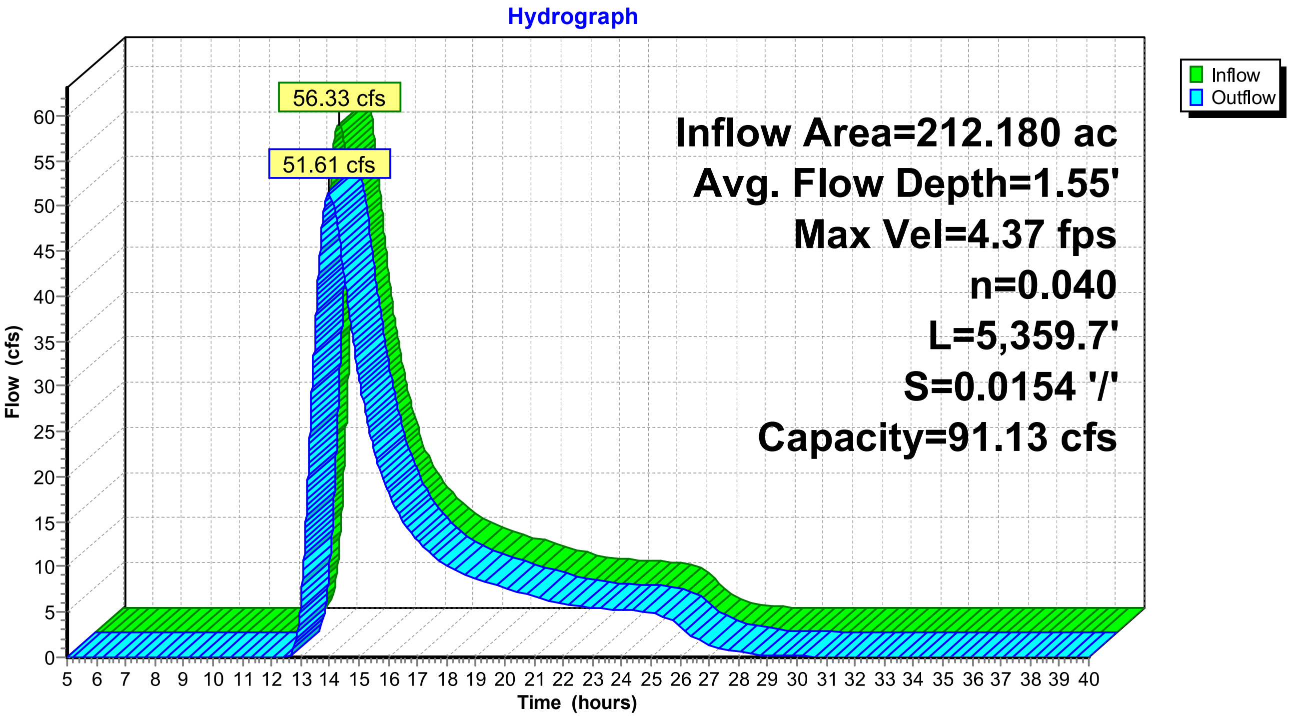
Subcatchment 31S: DA4



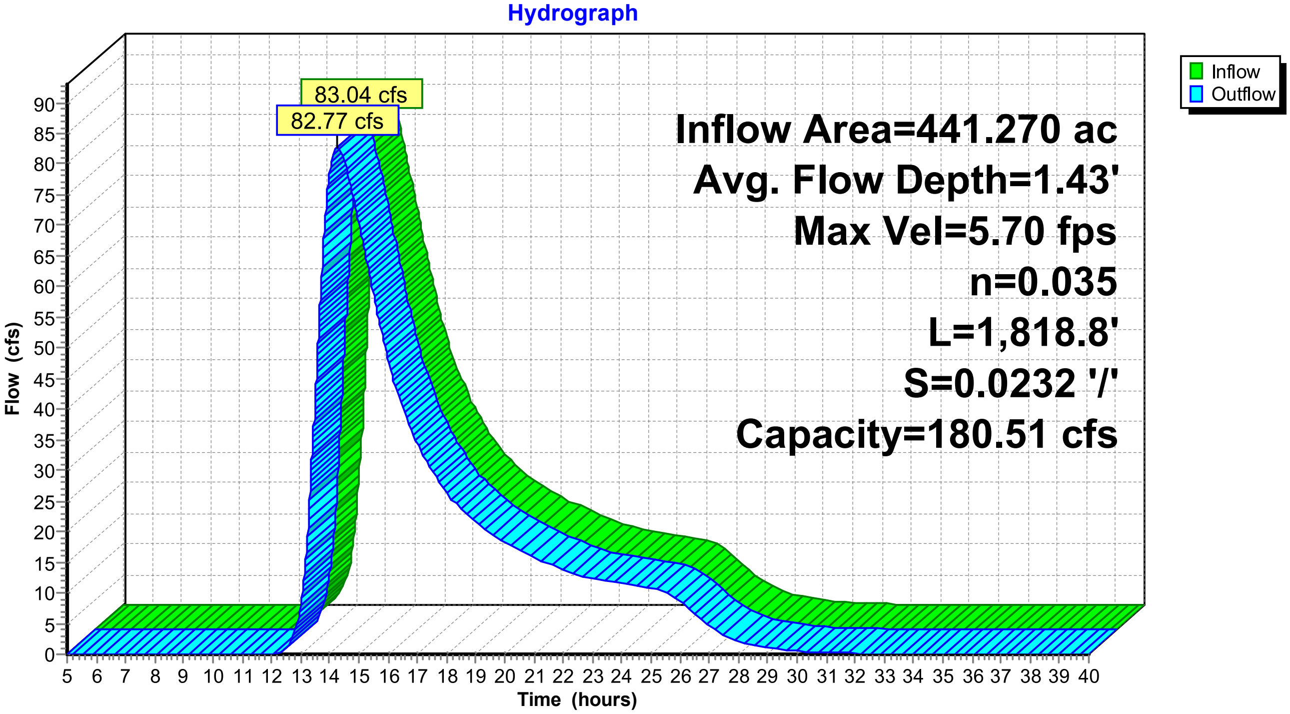
Reach 4R: Pasture



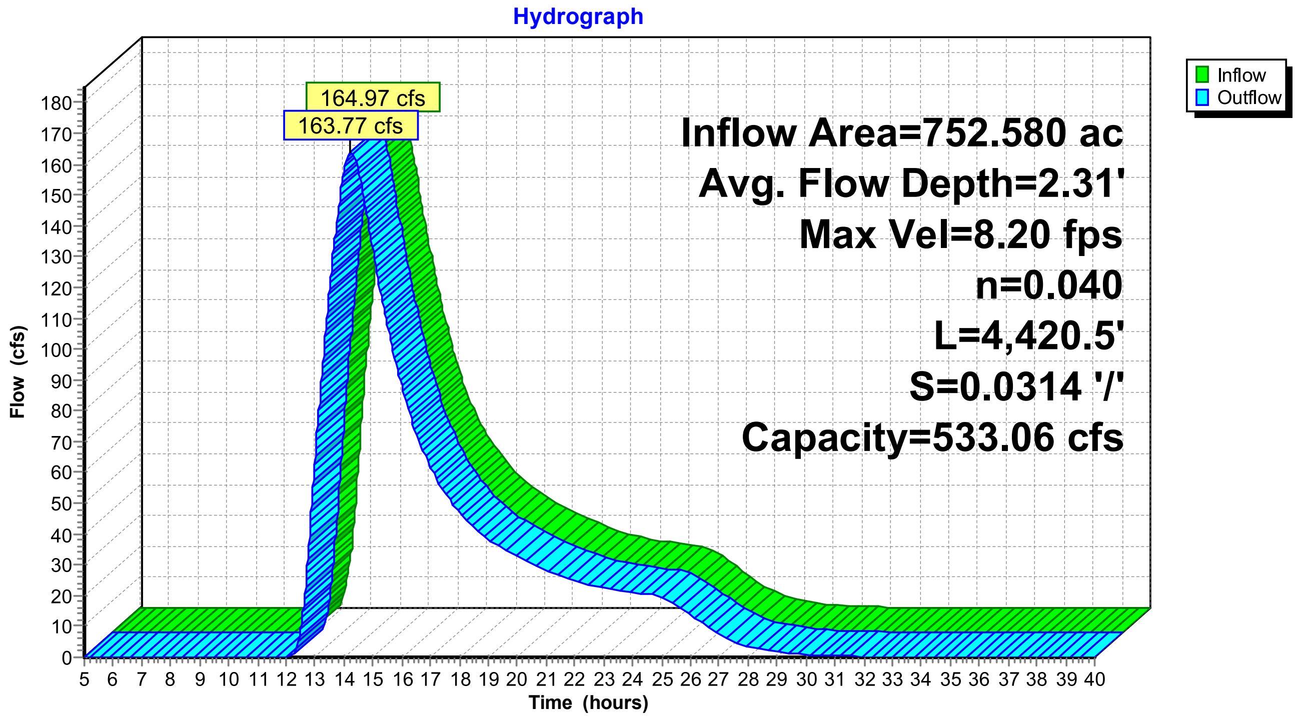
Reach 6R: Ponds



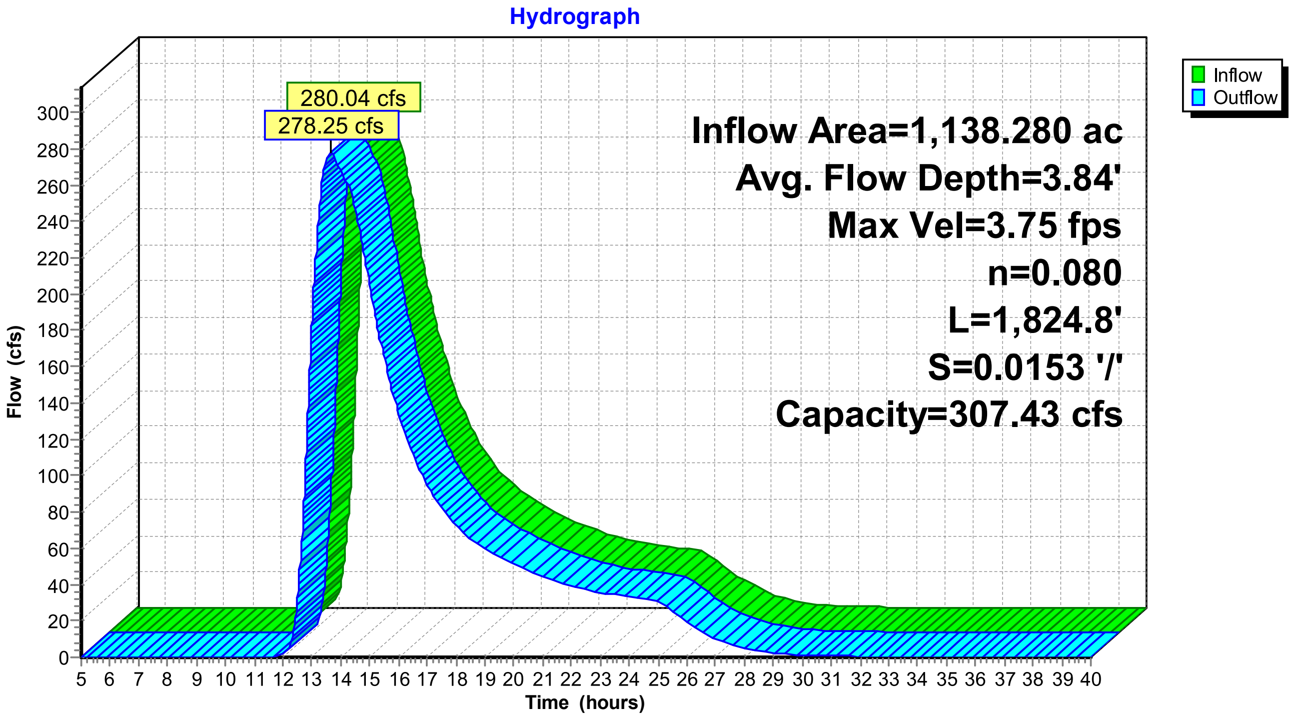
Reach 9R: School



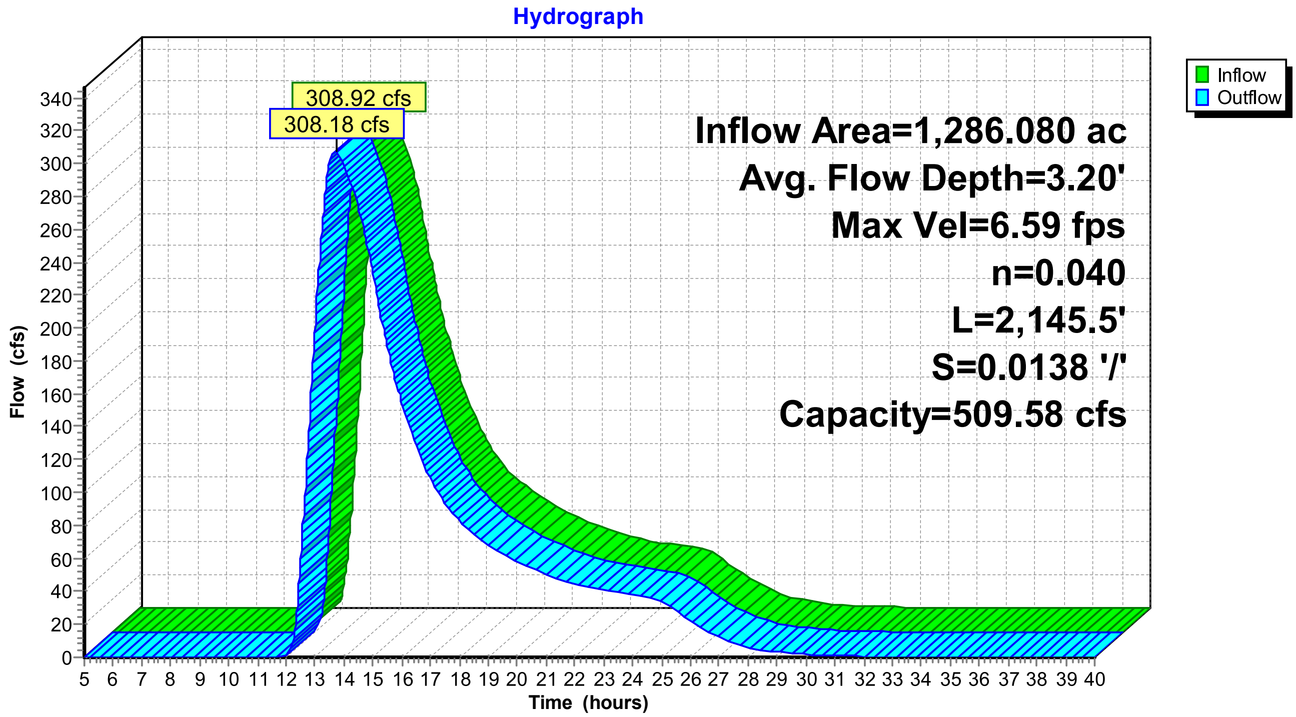
Reach 11R: Commercial



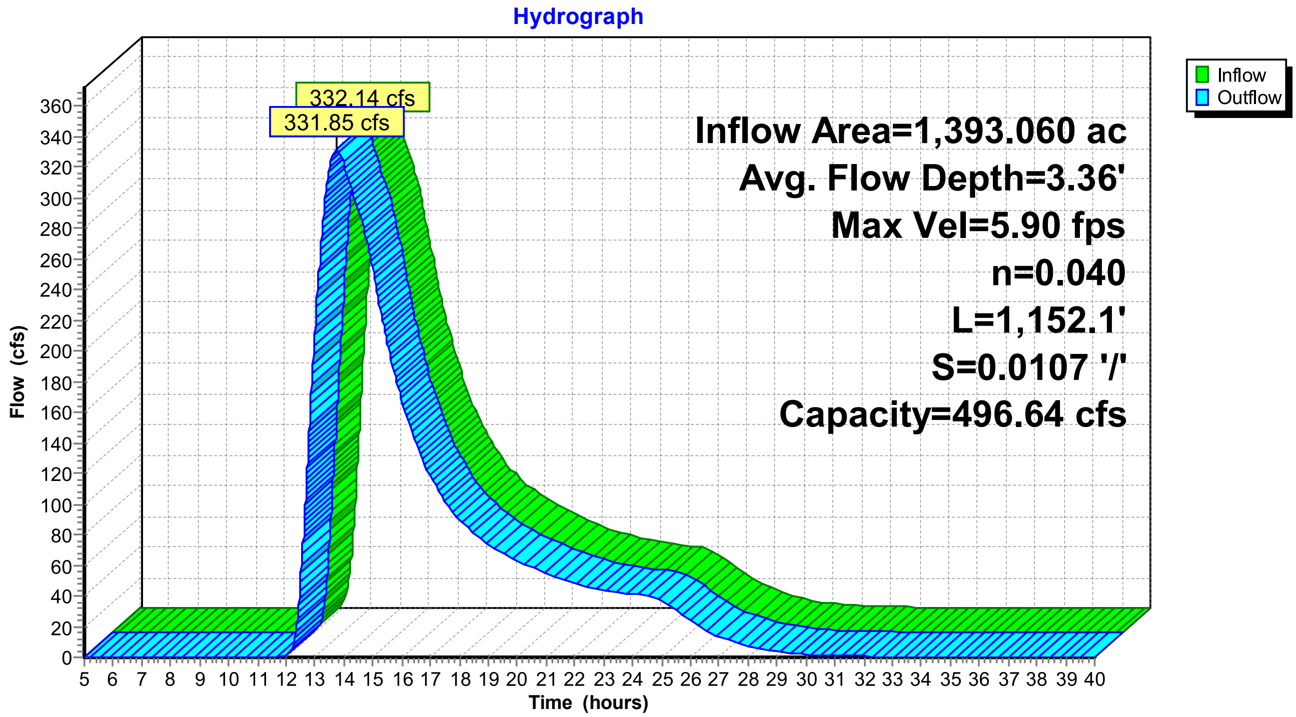
Reach 17R: Park to Penn



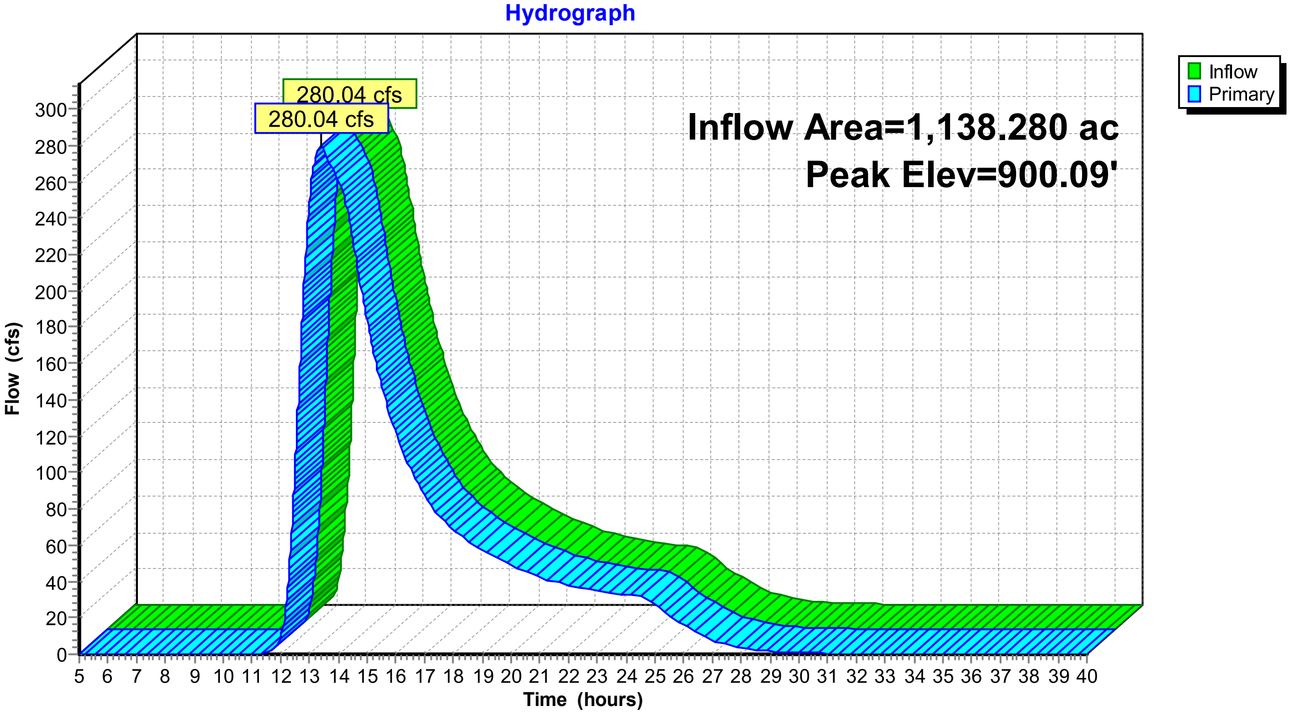
Reach 19R: E. Lake to Penn



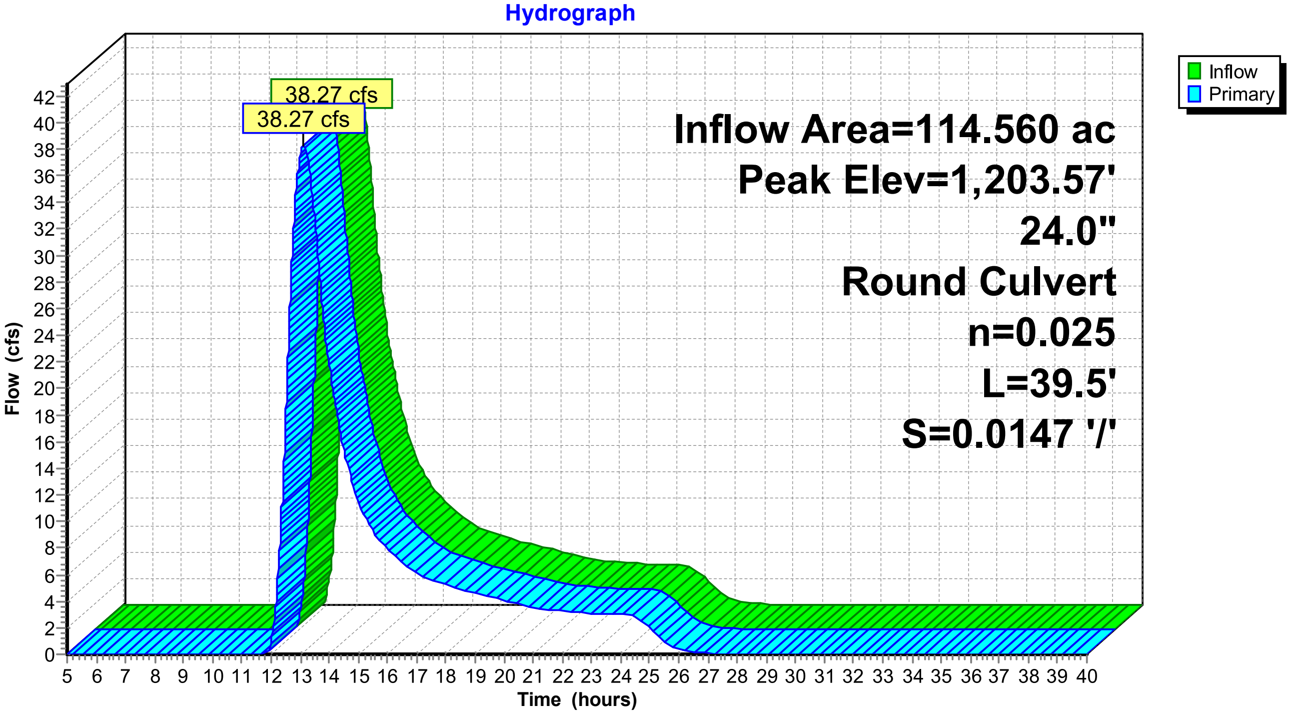
Reach 22R: Wilkins Tract to E. Lake



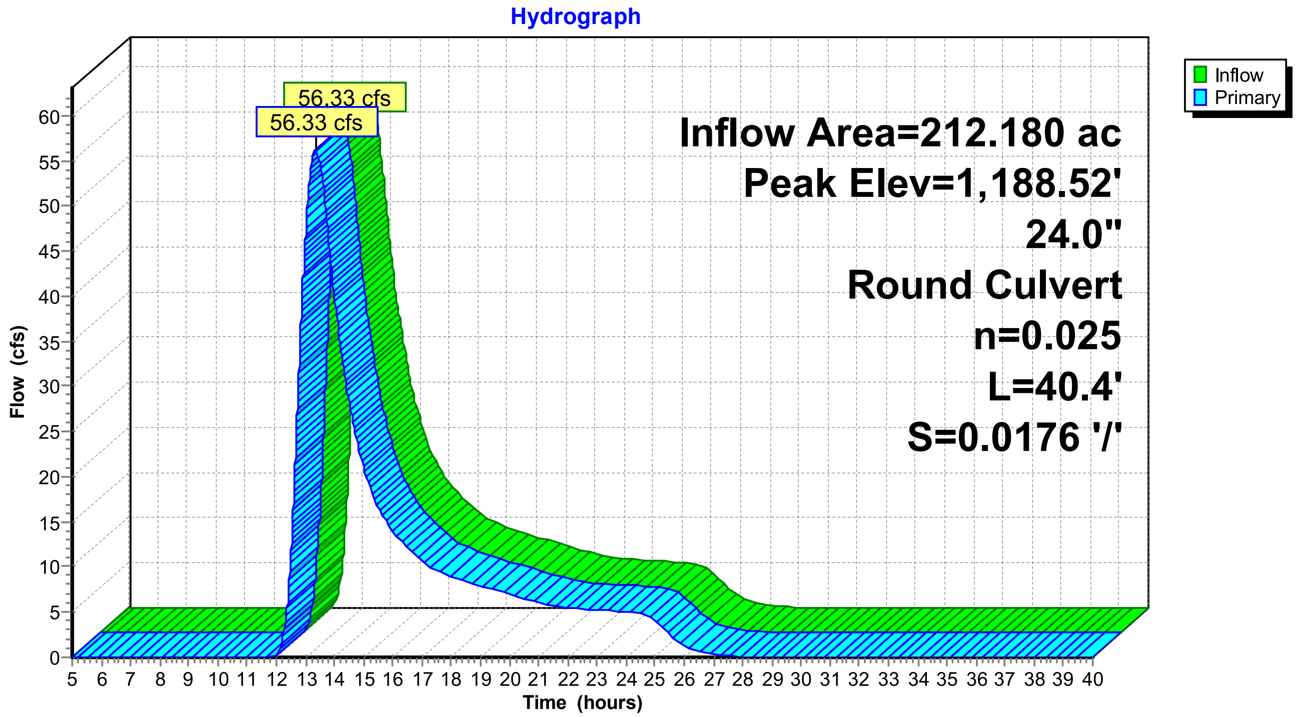
Pond 22P: Park



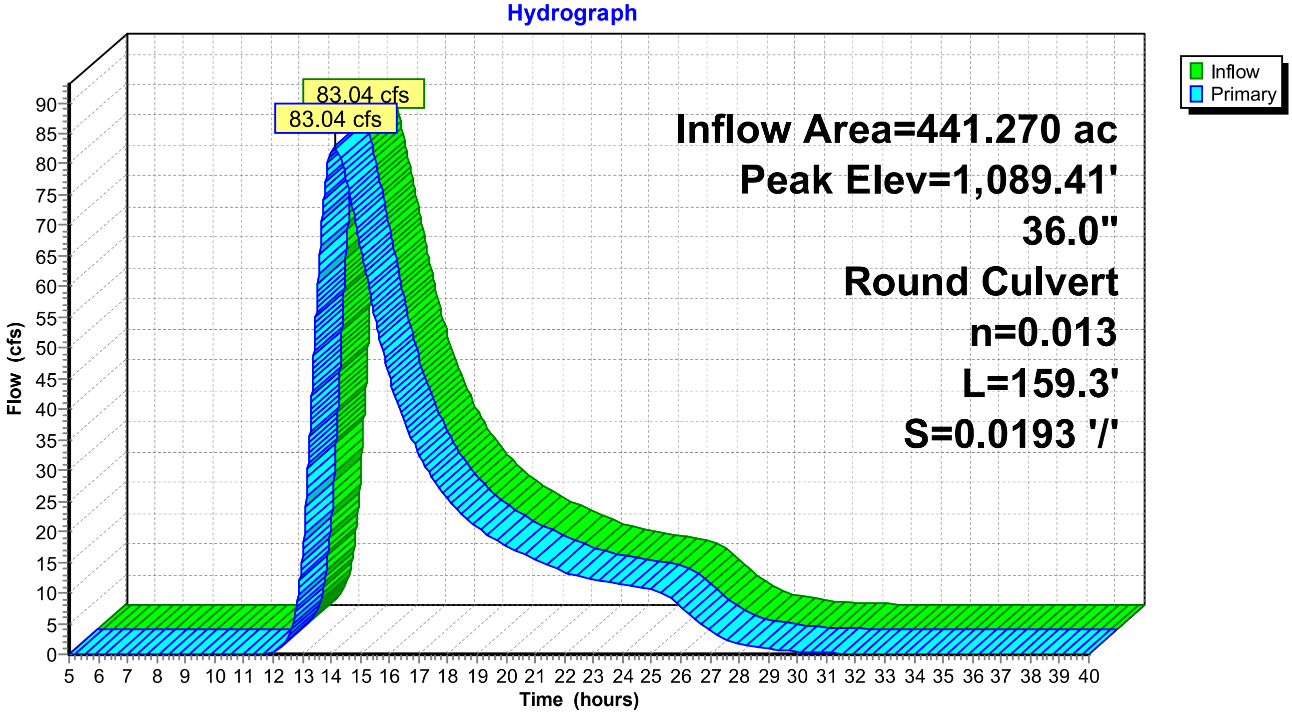
Pond 23P: Cleary Rd.



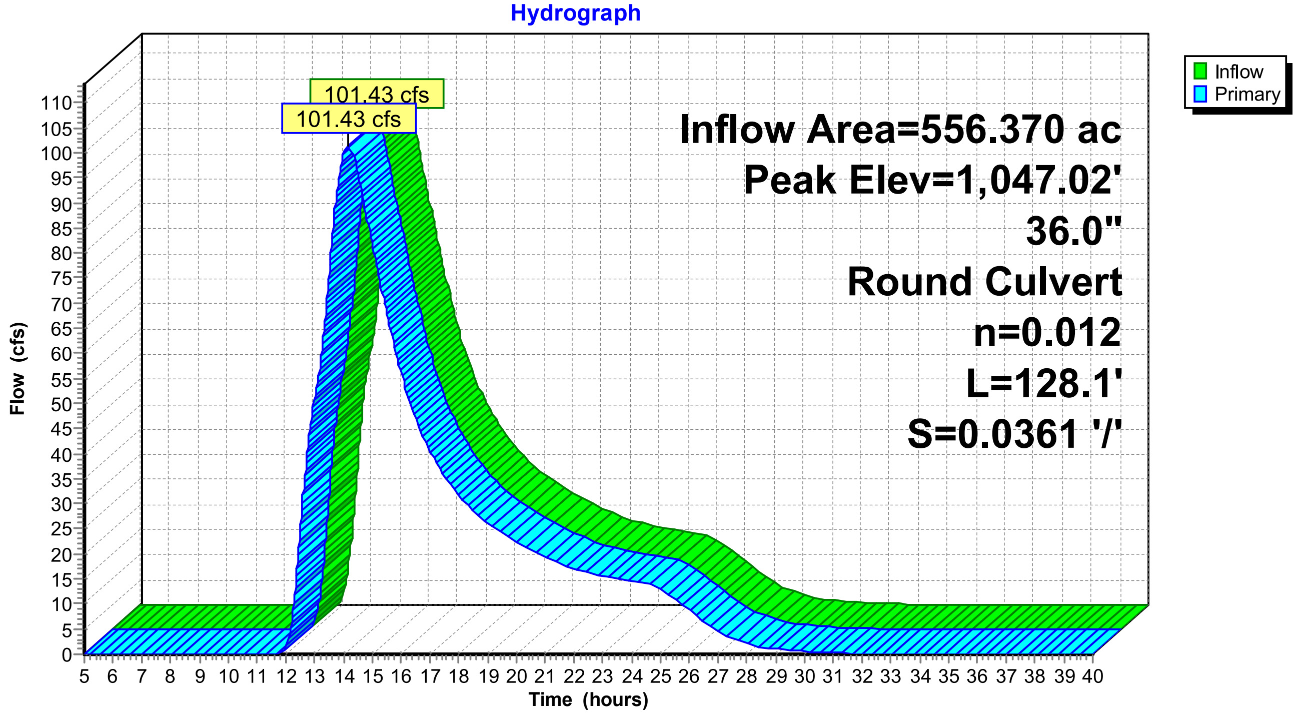
Pond 24P: Shelly Rd.



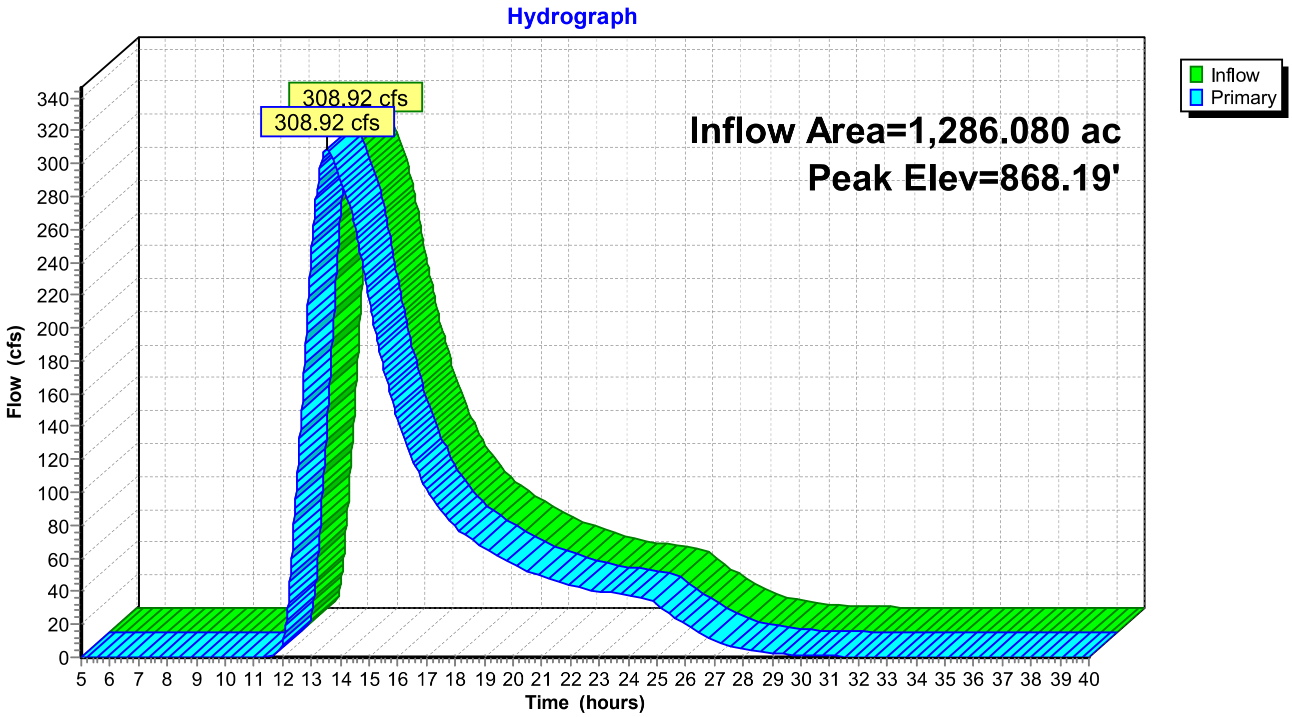
Pond 25P: School



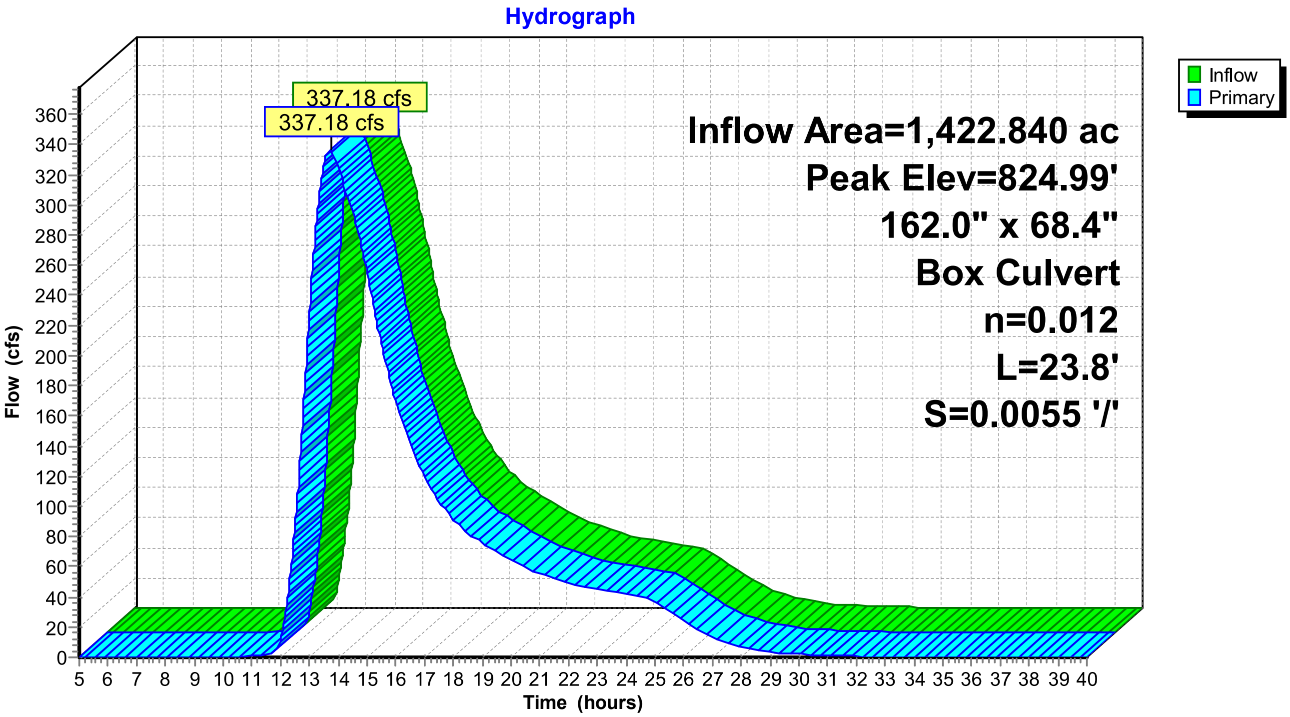
Pond 26P: Commercial St.



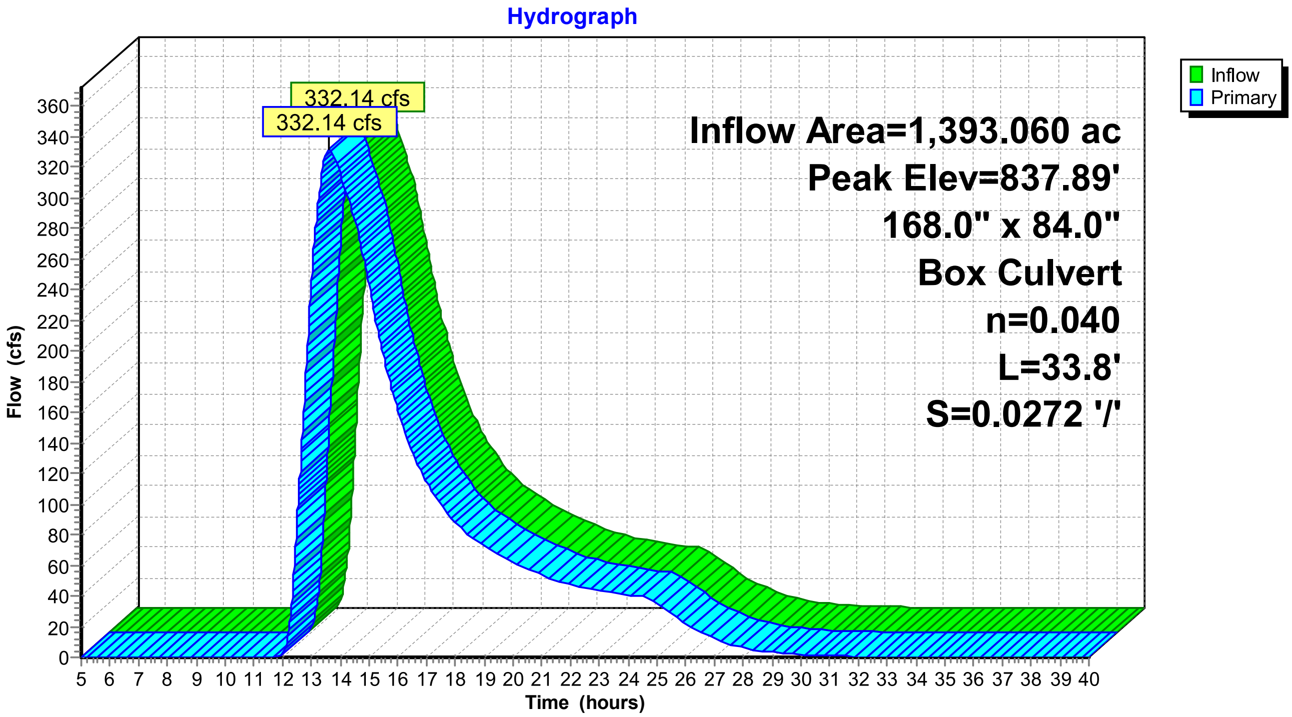
Pond 27P: Pennimite Rd



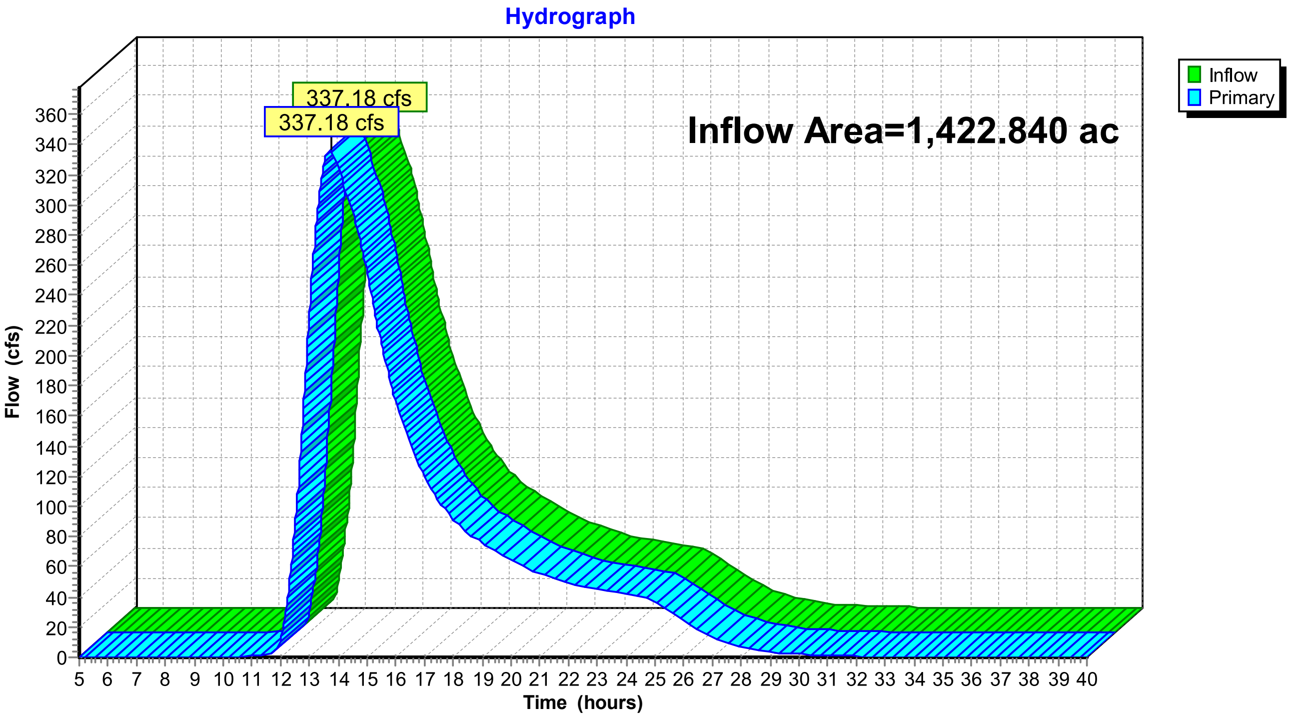
Pond 28P: Wilkins Tract



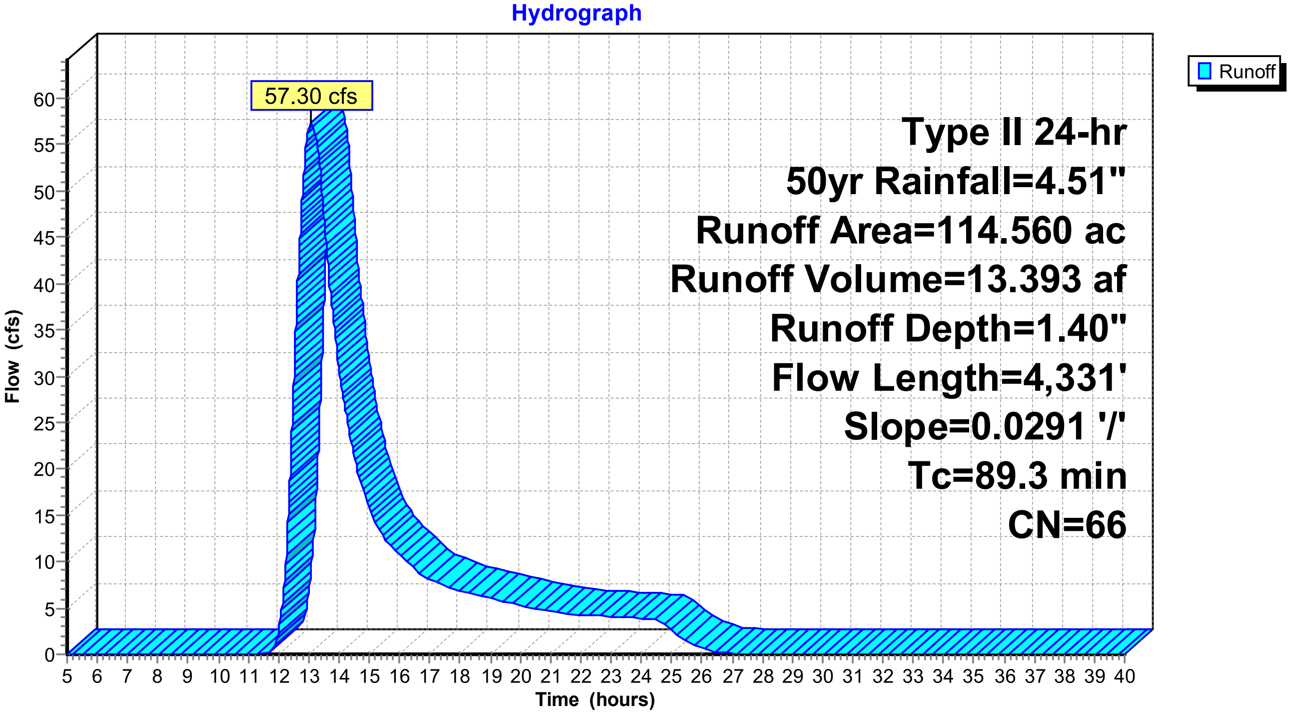
Pond 29P: E. Lake Rd.



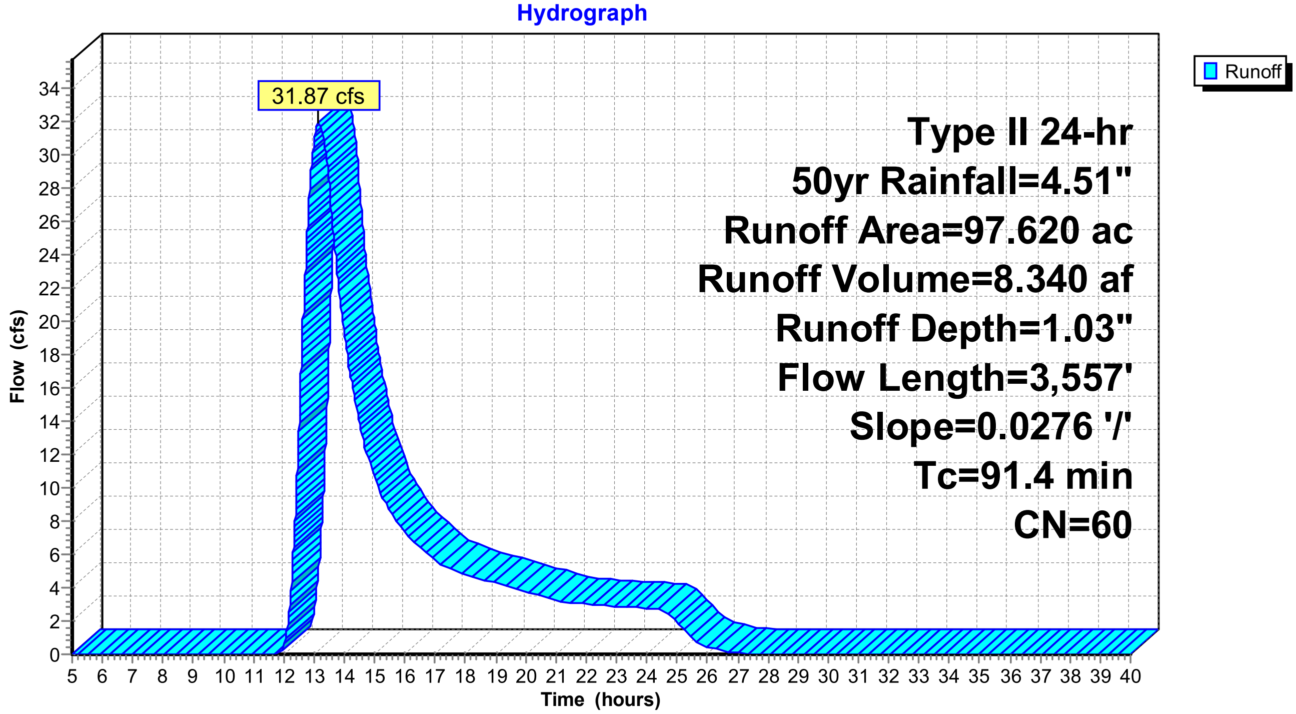
Link 30L: Conesus Lake



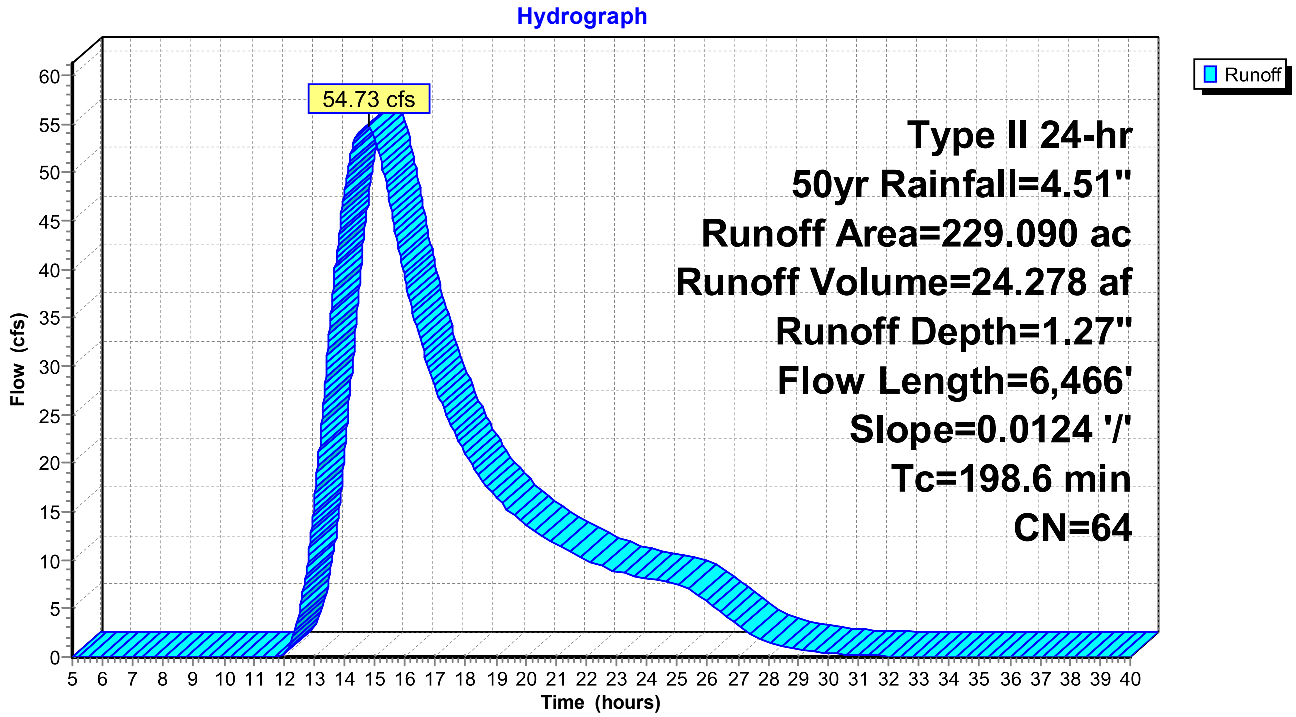
Subcatchment 1S: DA1



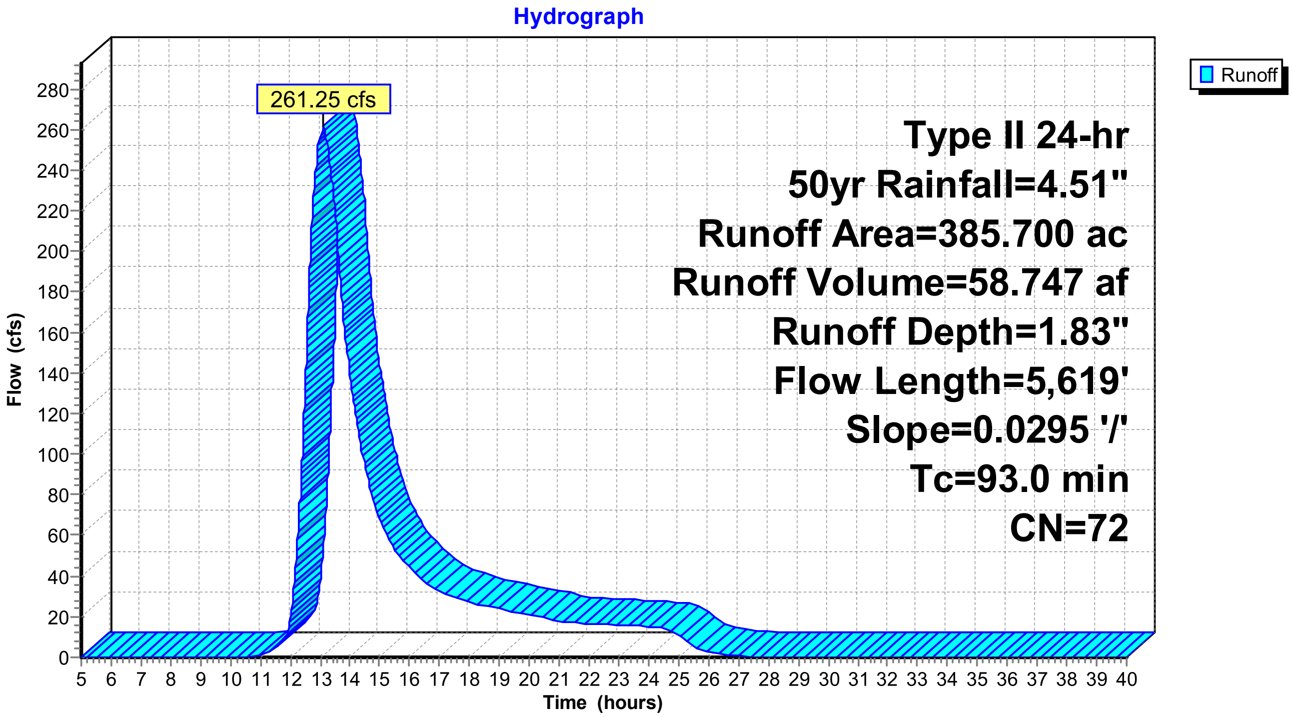
Subcatchment 2S: DA2



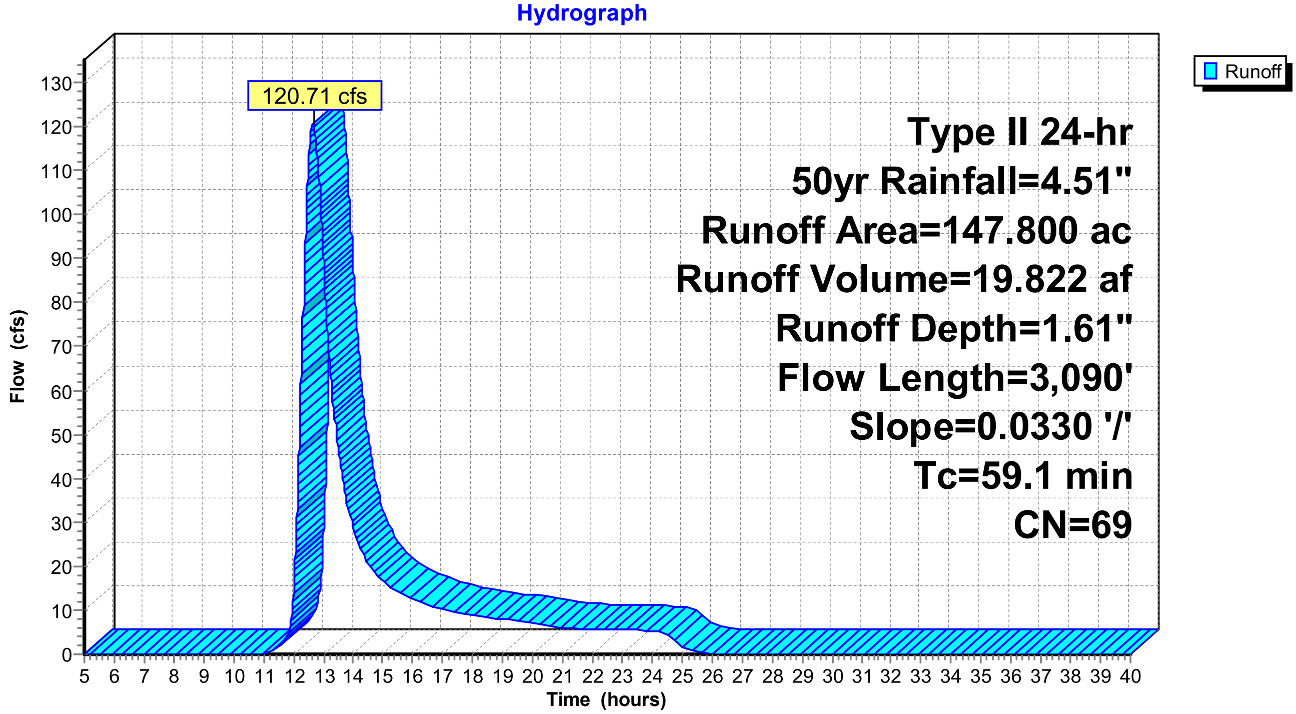
Subcatchment 8S: DA3



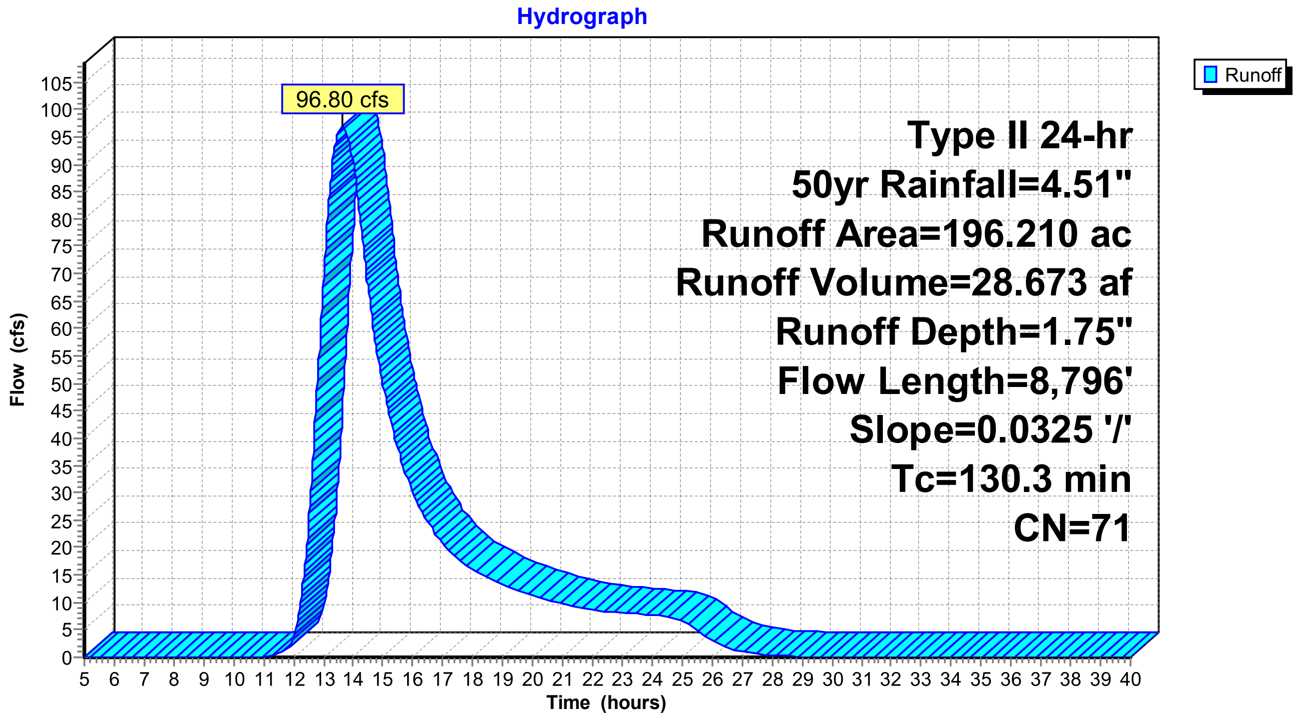
Subcatchment 12S: DA6



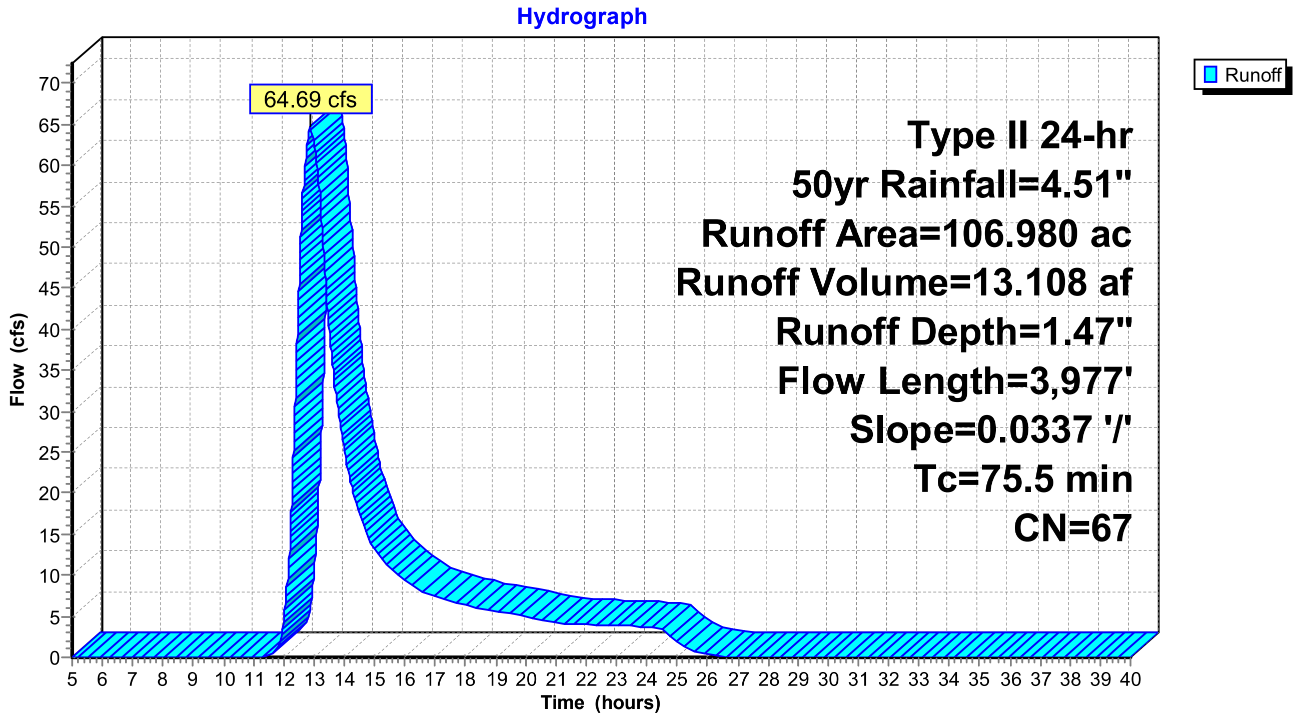
Subcatchment 13S: DA7



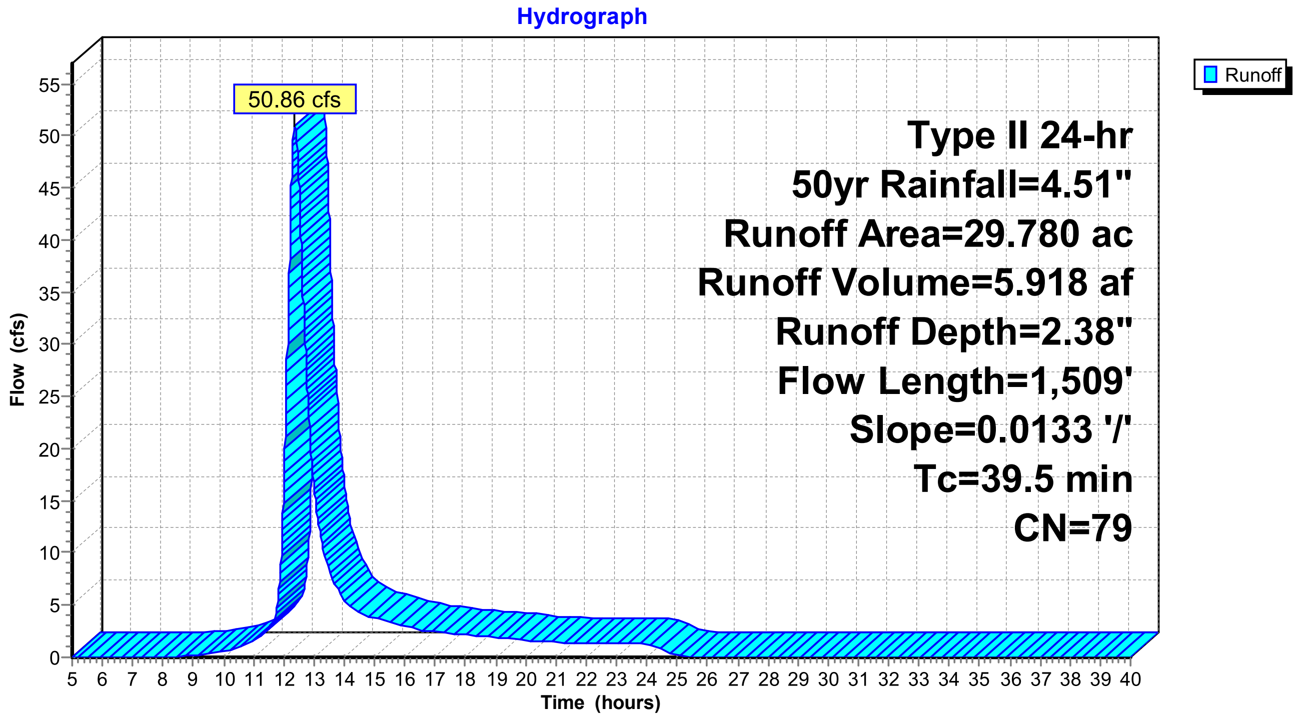
Subcatchment 15S: DA5 (Spring Creek)



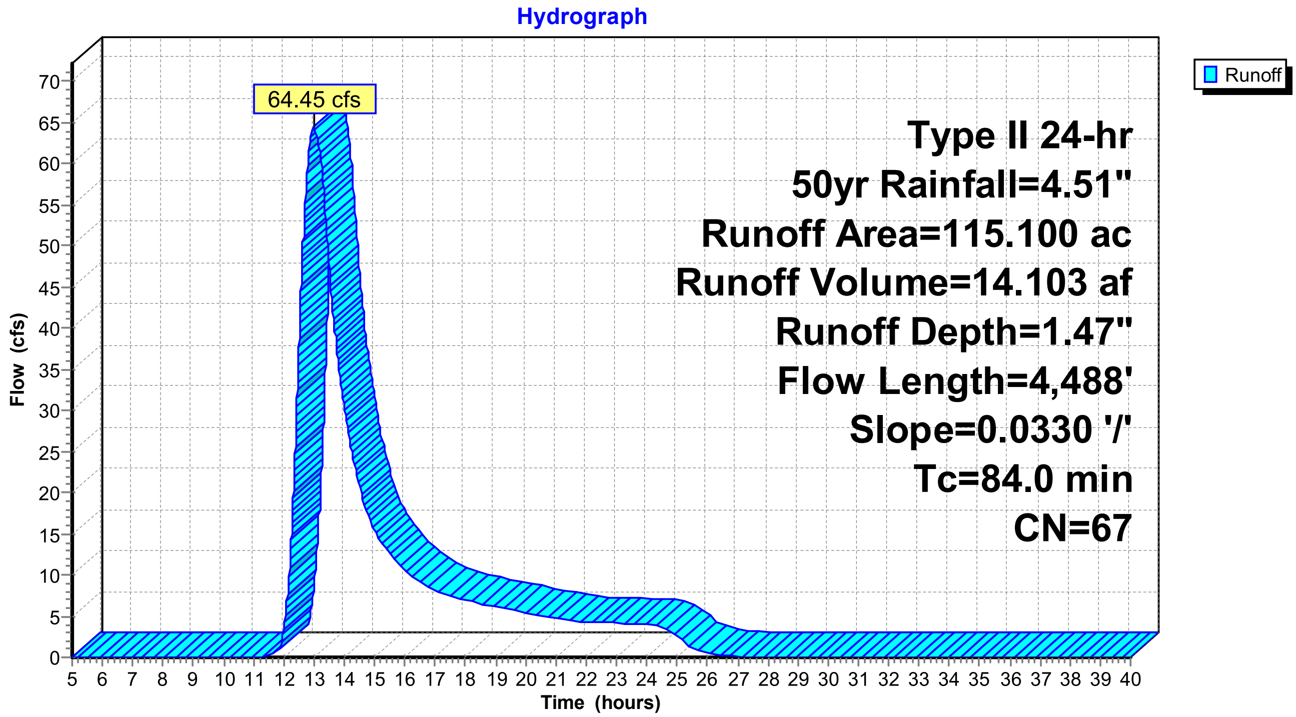
Subcatchment 20S: DA8



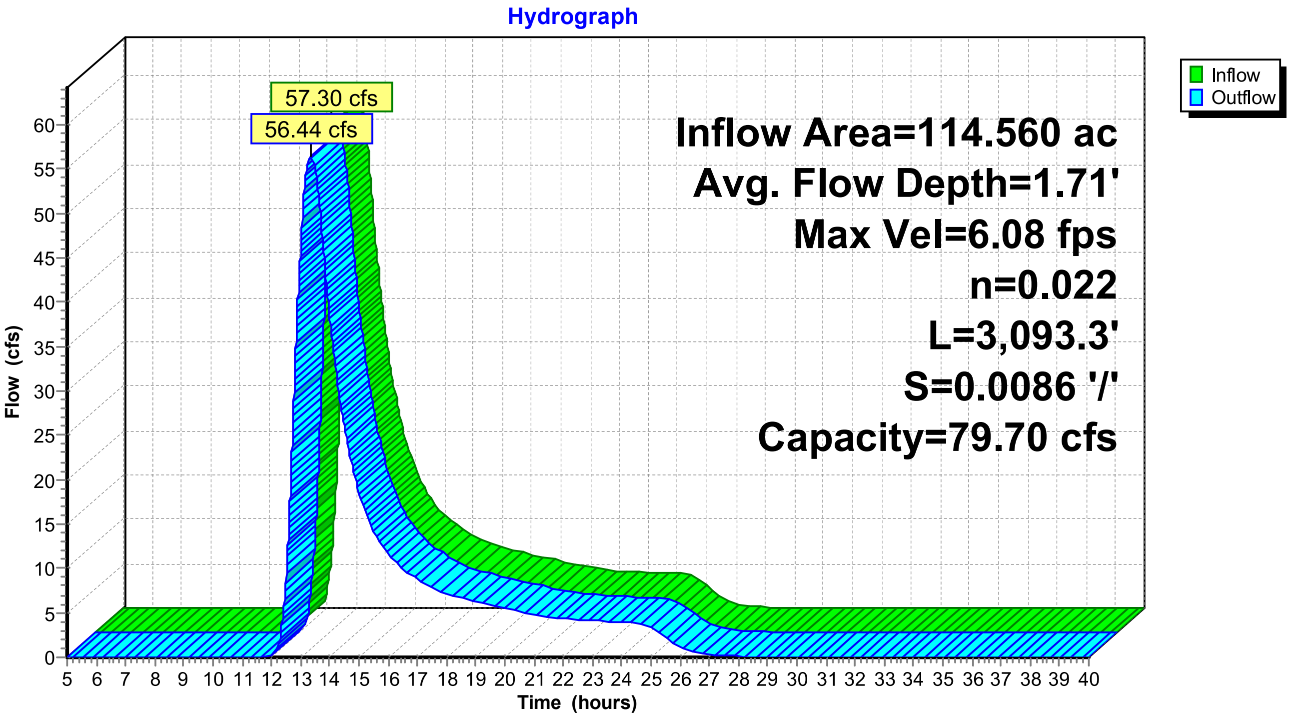
Subcatchment 23S: DA9



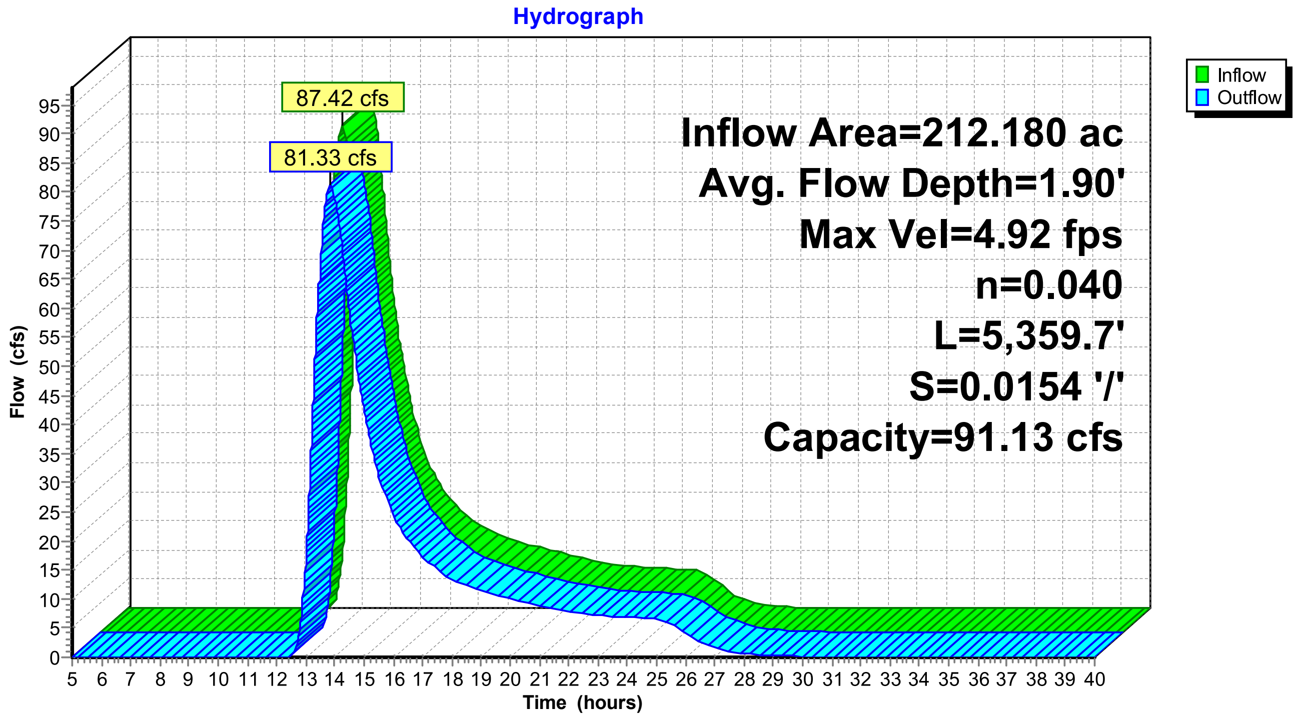
Subcatchment 31S: DA4



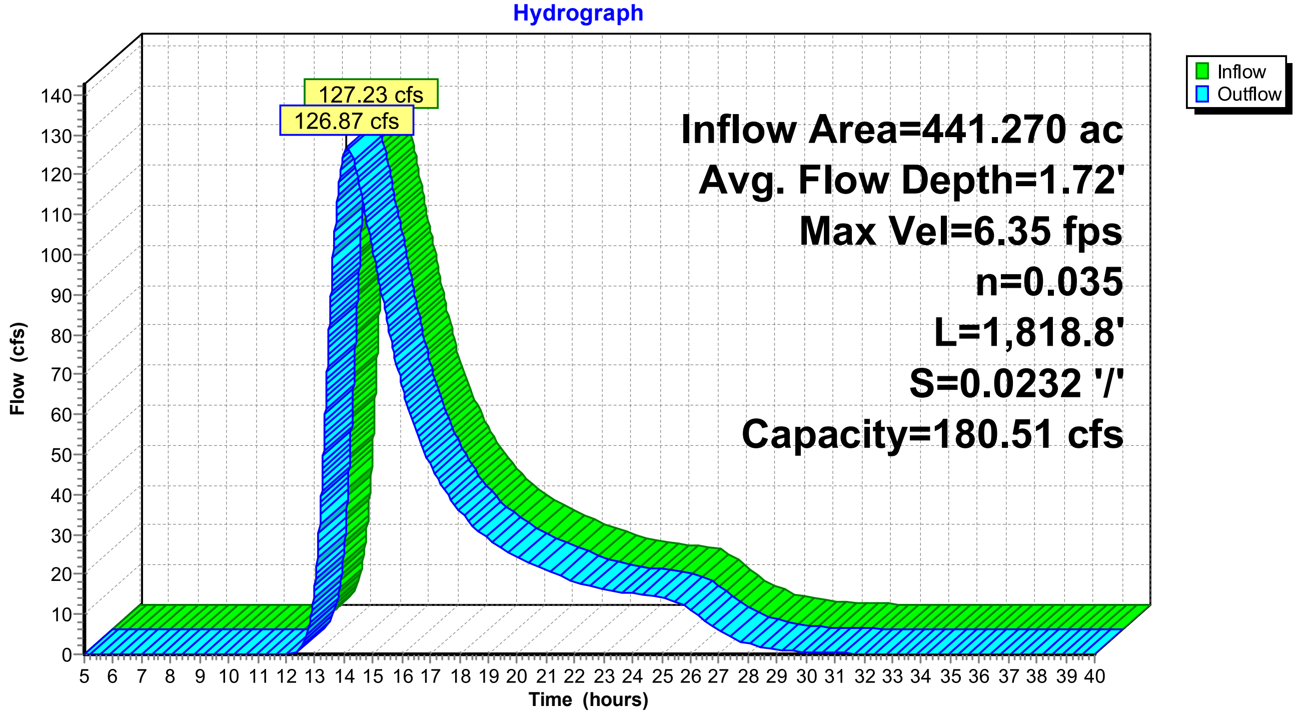
Reach 4R: Pasture



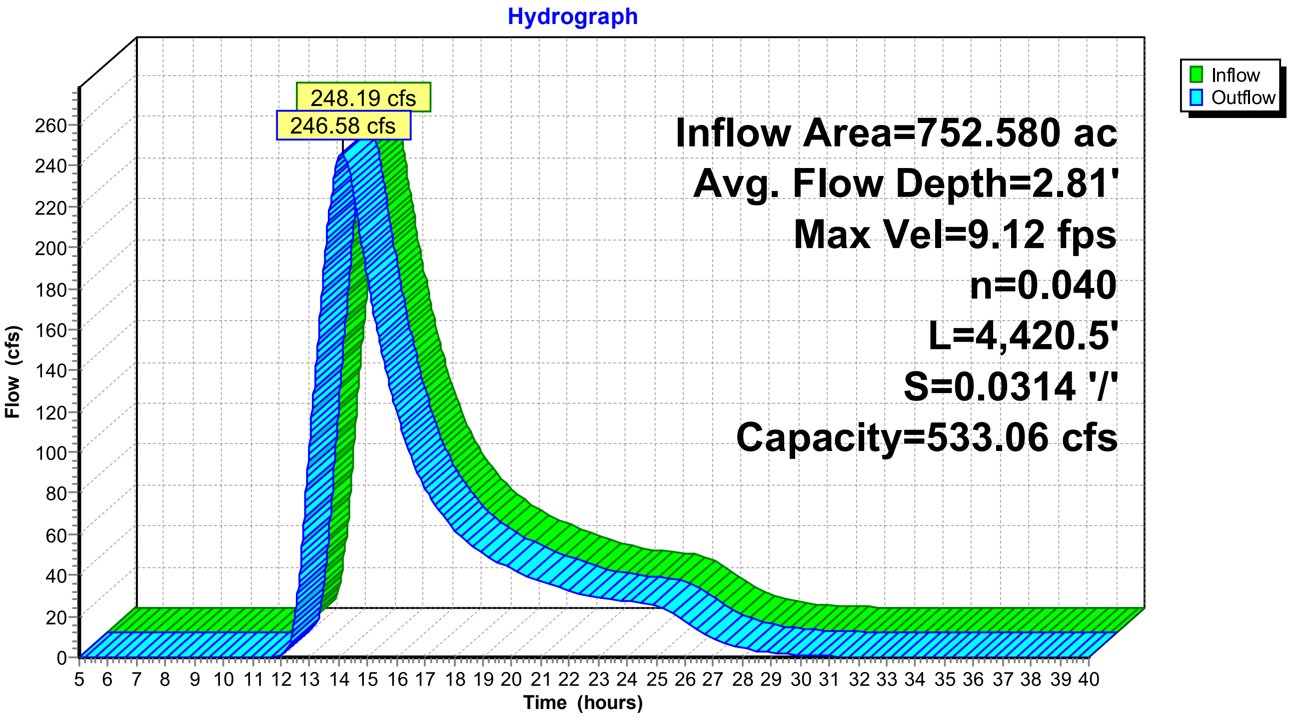
Reach 6R: Ponds



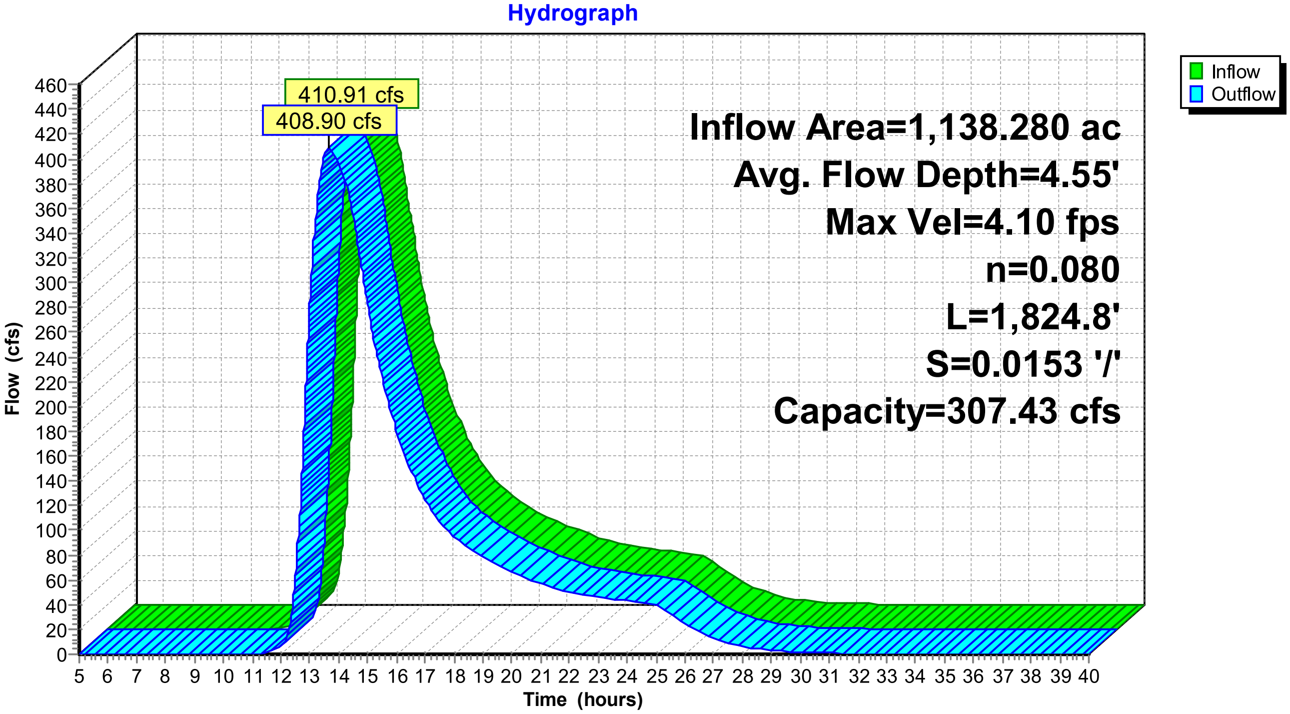
Reach 9R: School



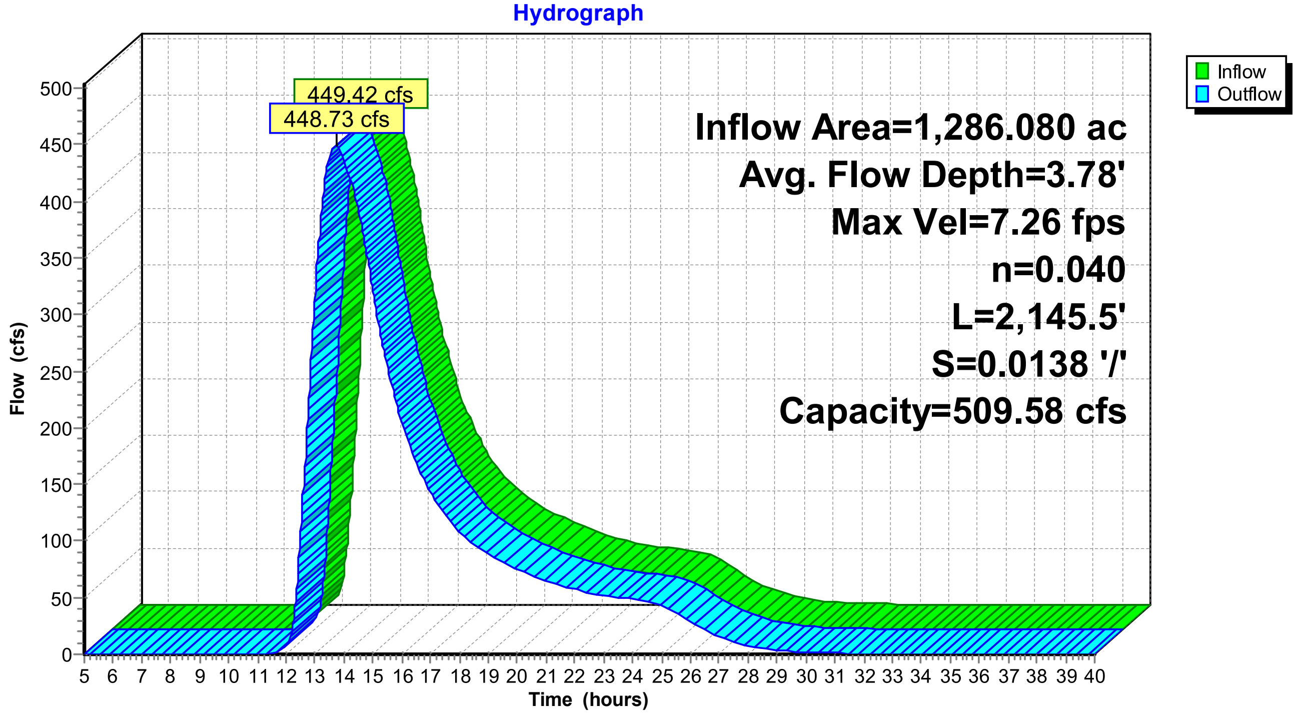
Reach 11R: Commercial



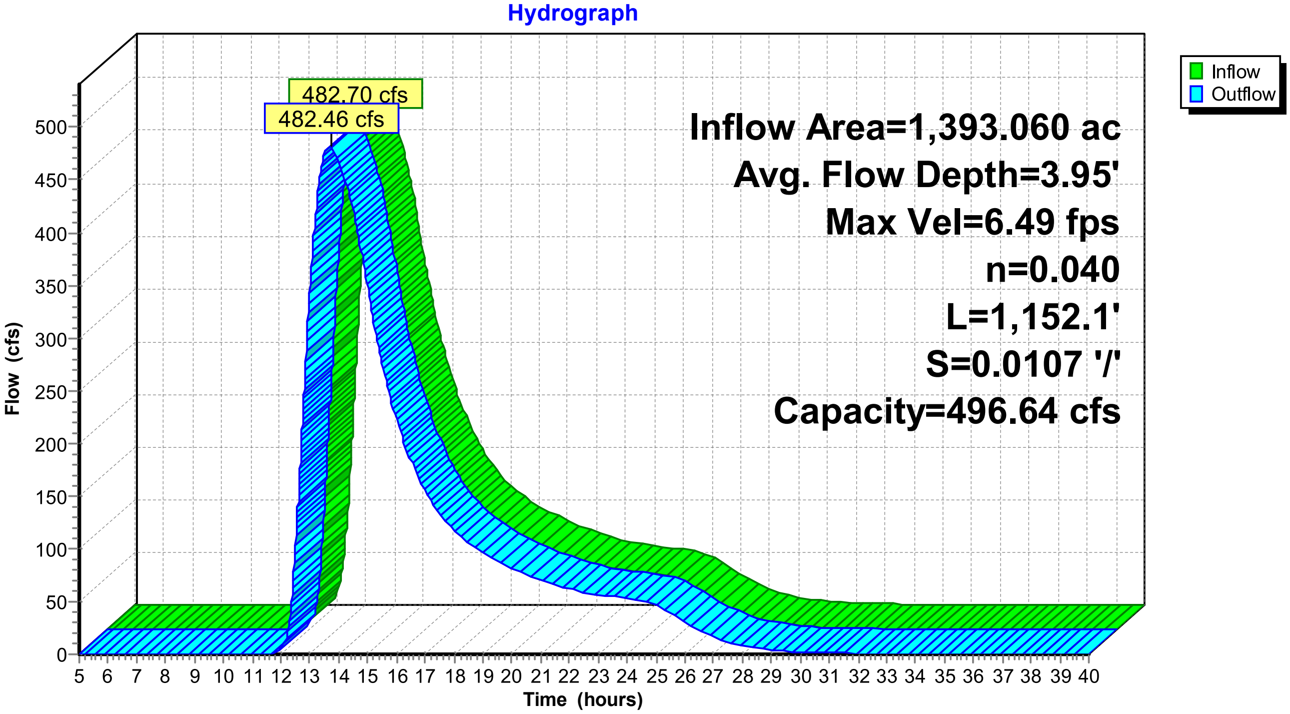
Reach 17R: Park to Penn



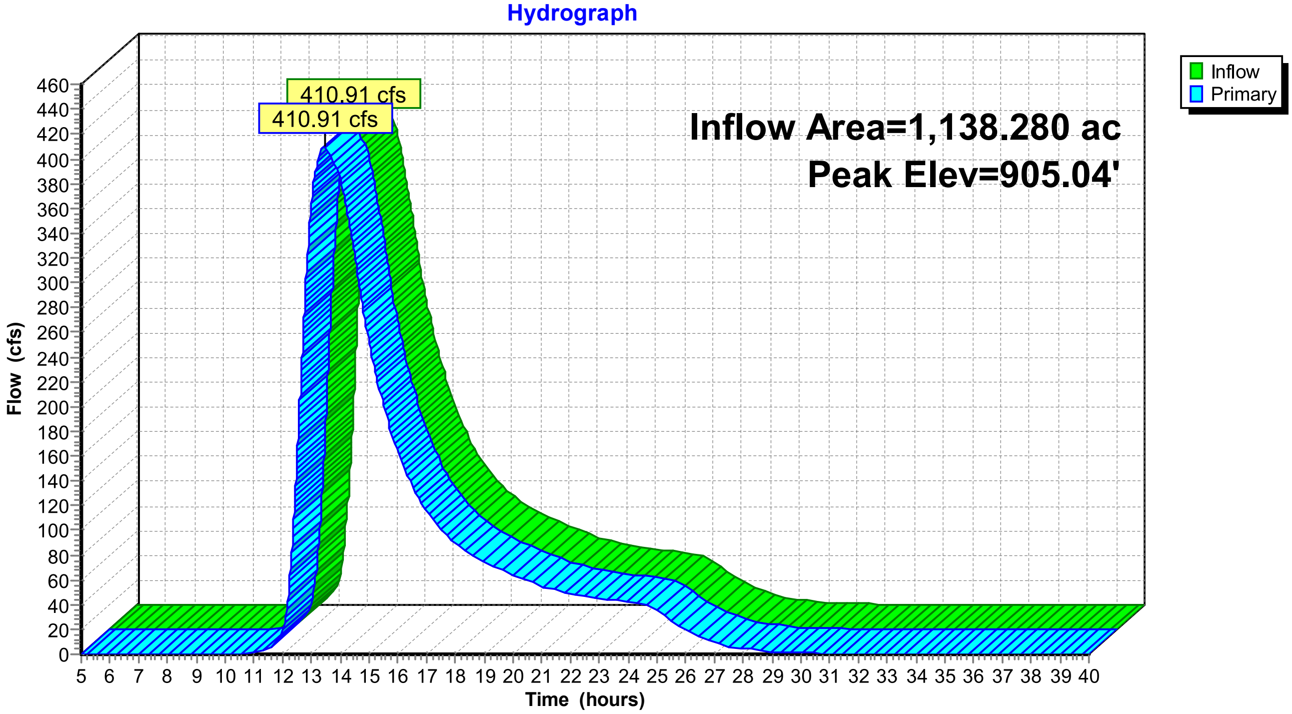
Reach 19R: E. Lake to Penn



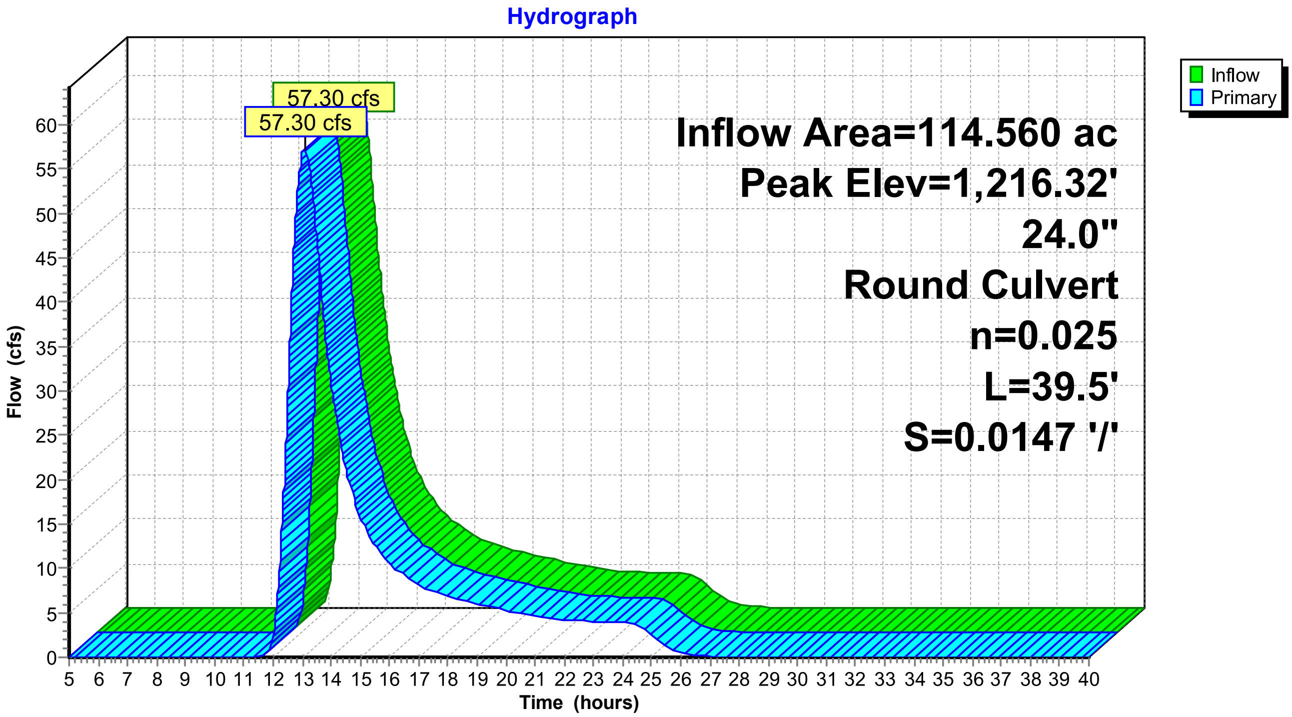
Reach 22R: Wilkins Tract to E. Lake



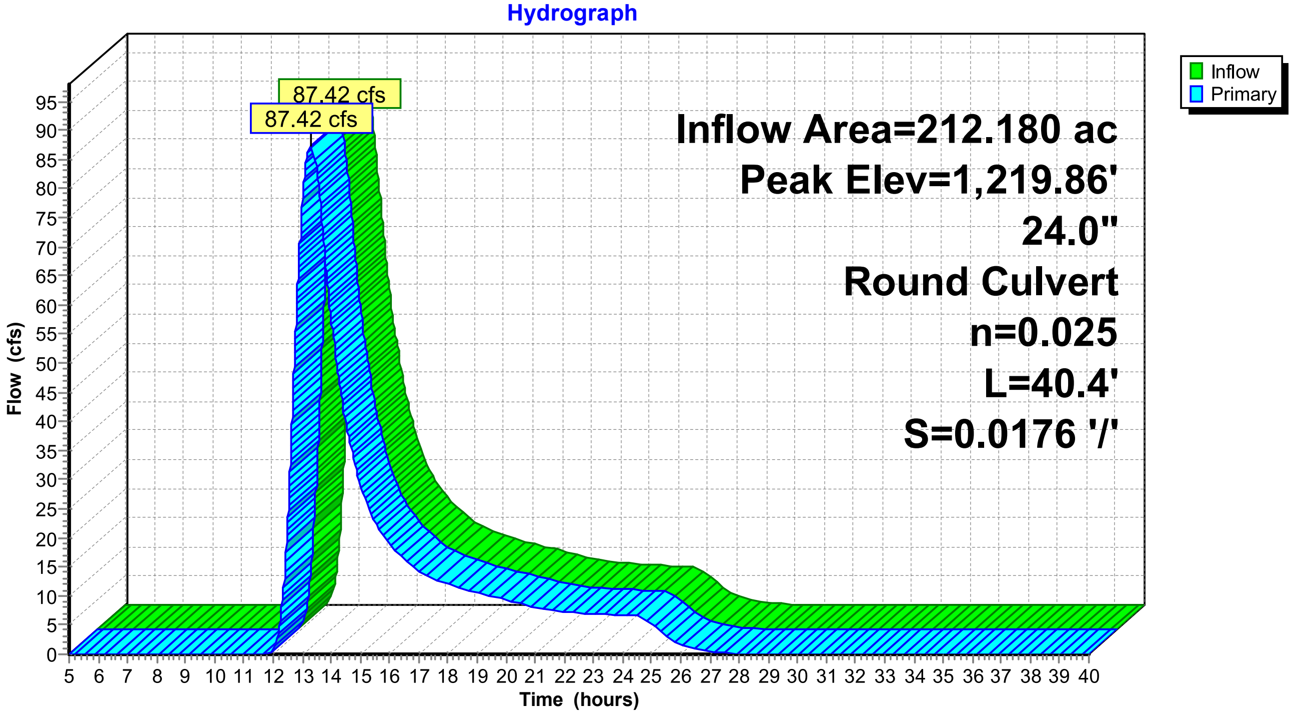
Pond 22P: Park



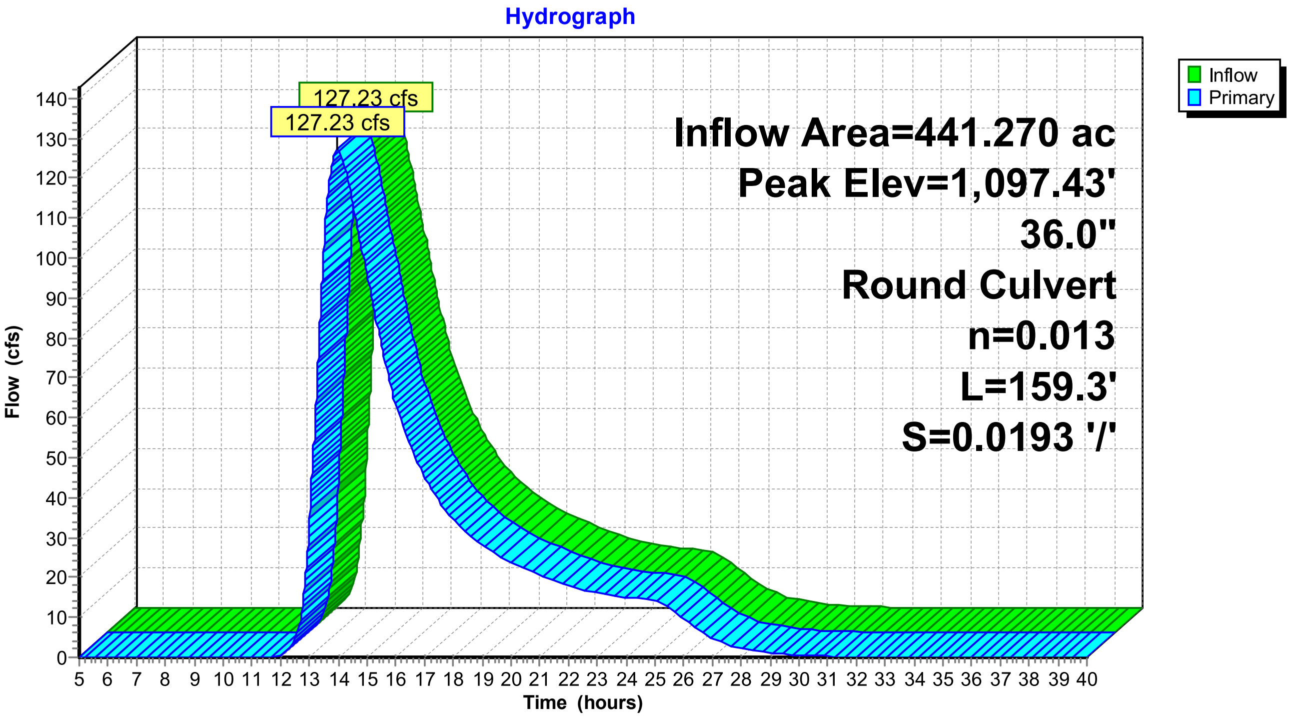
Pond 23P: Cleary Rd.



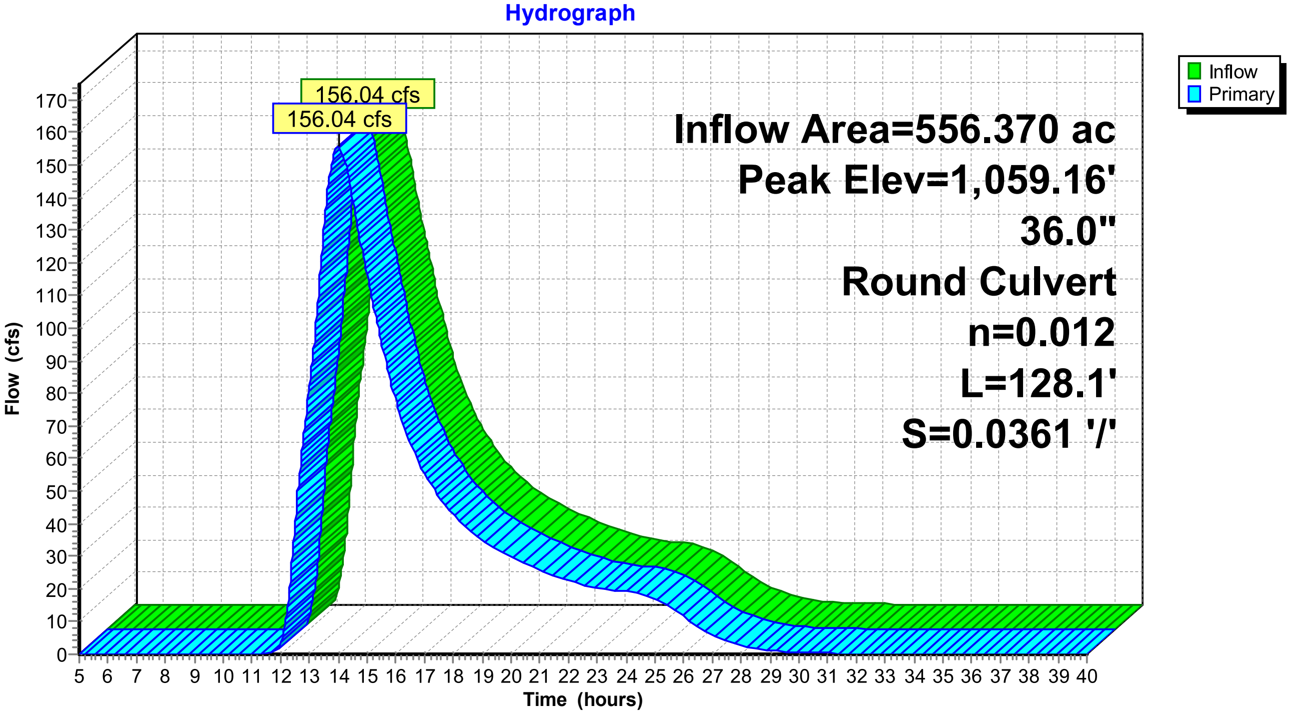
Pond 24P: Shelly Rd.



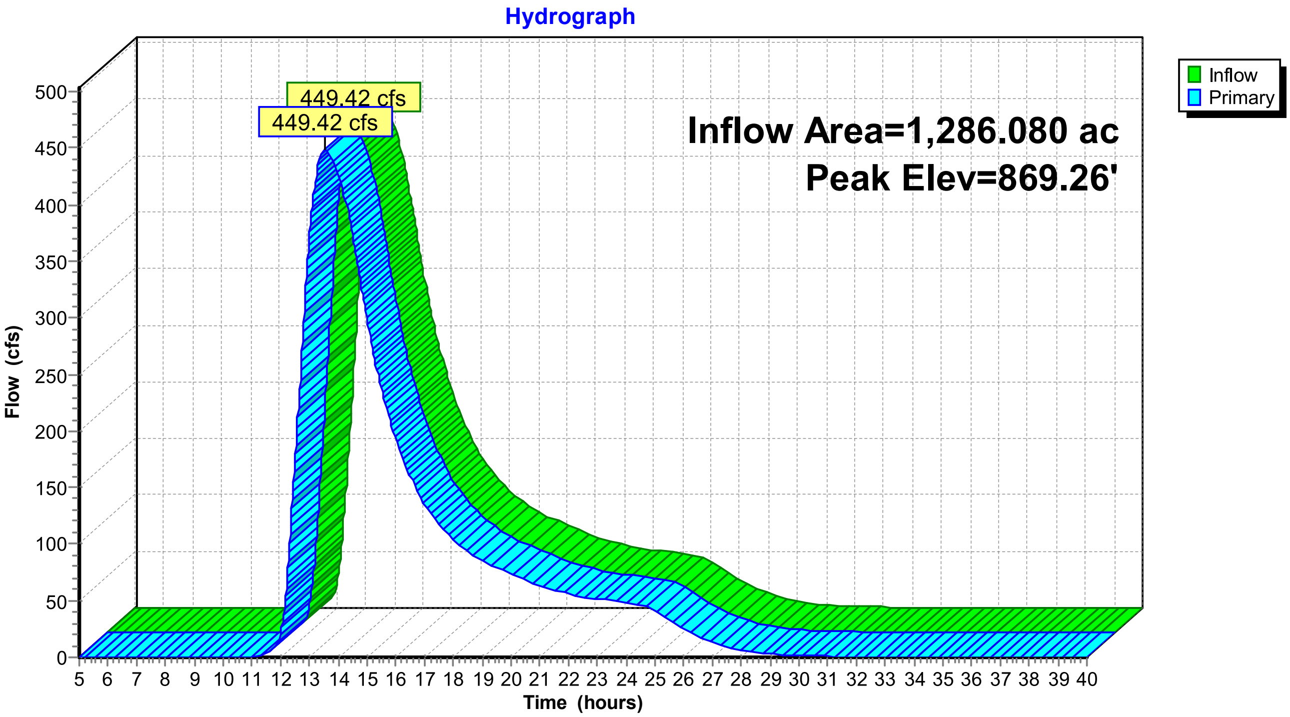
Pond 25P: School



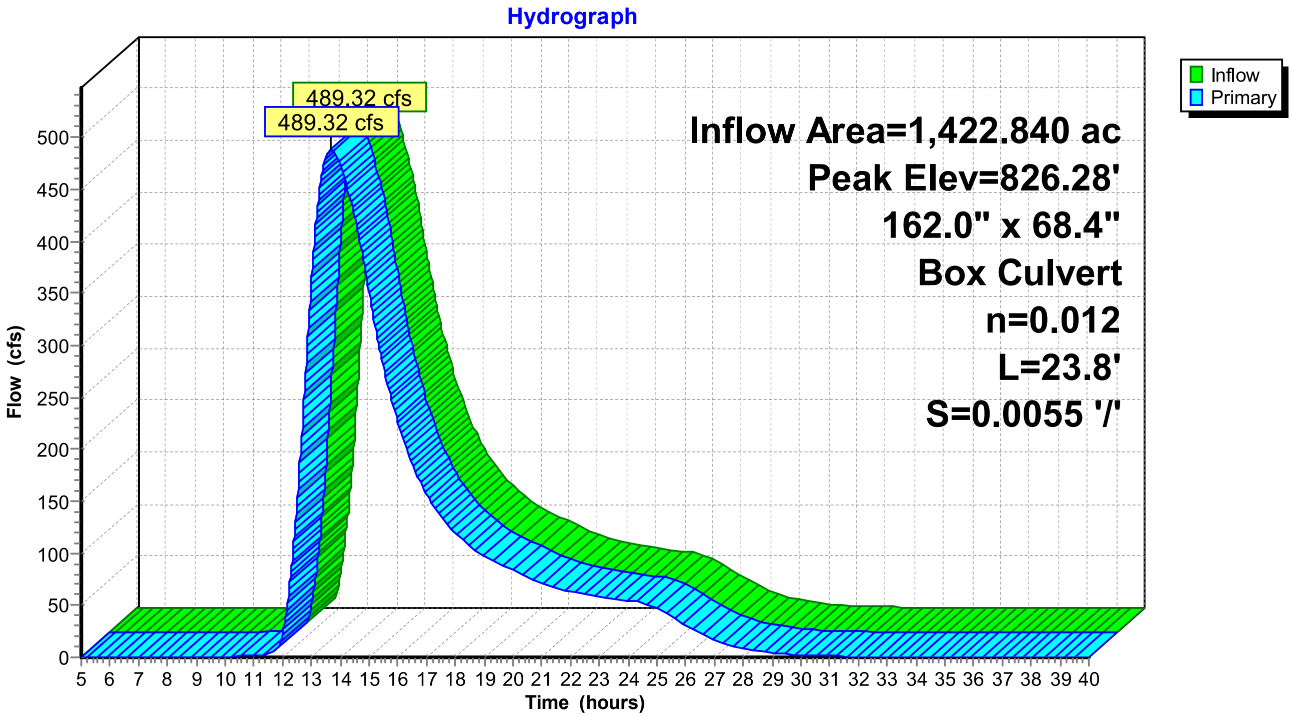
Pond 26P: Commercial St.



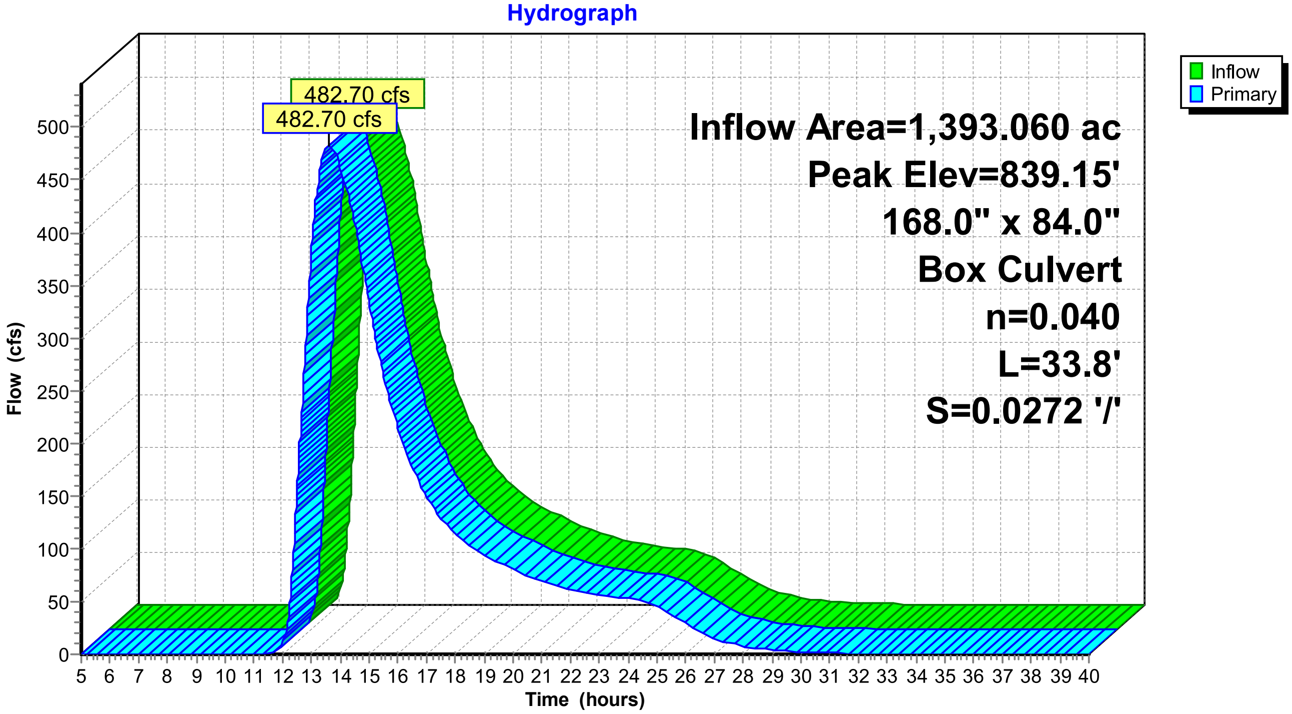
Pond 27P: Pennimite Rd



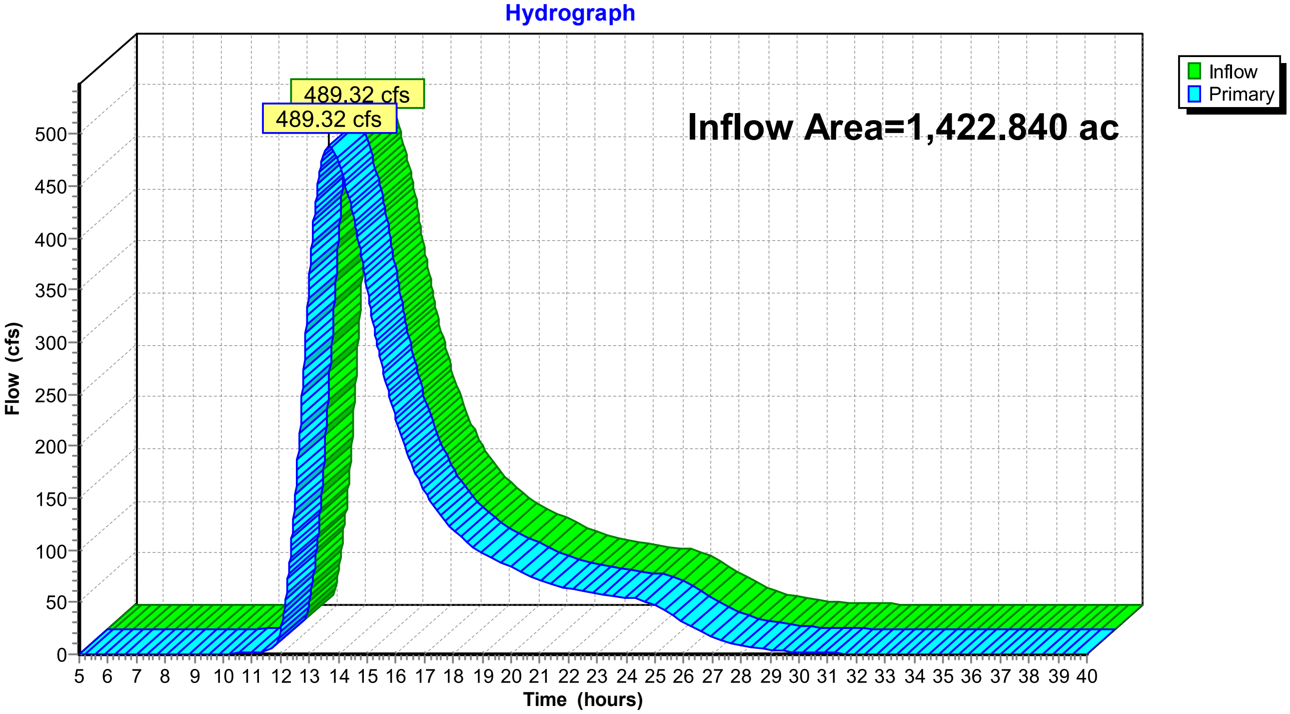
Pond 28P: Wilkins Tract



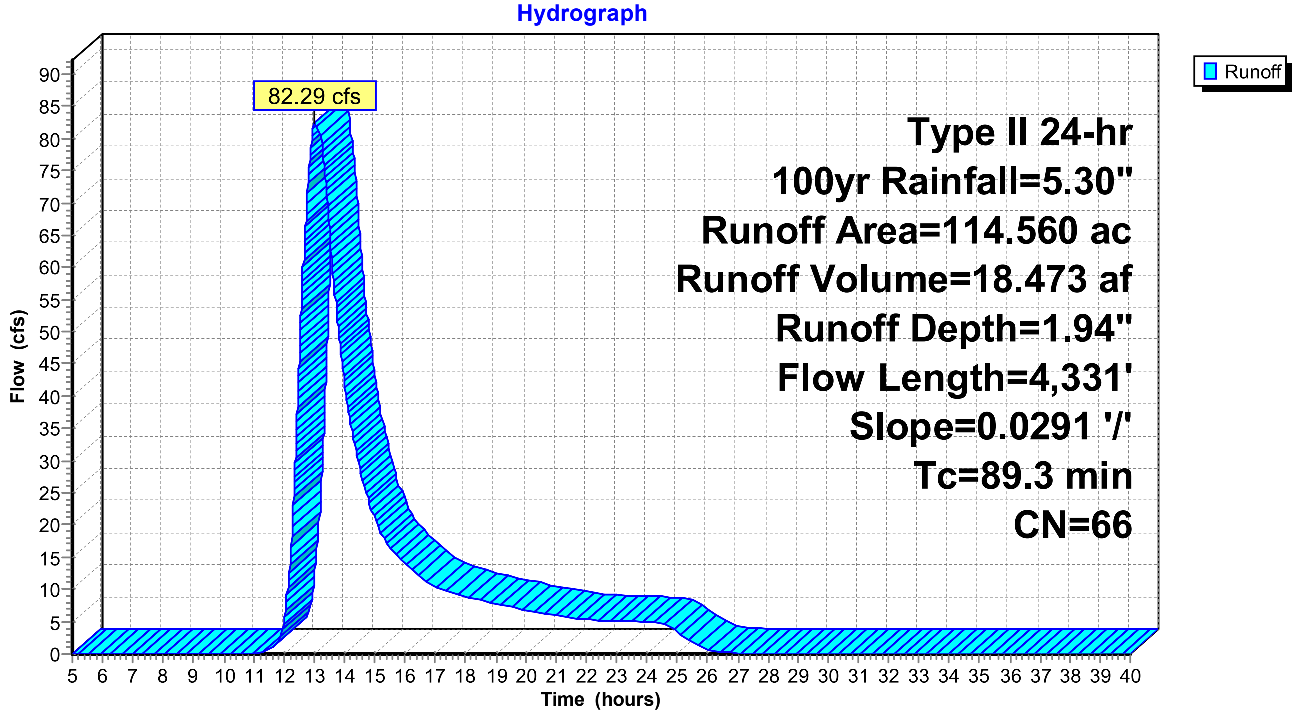
Pond 29P: E. Lake Rd.



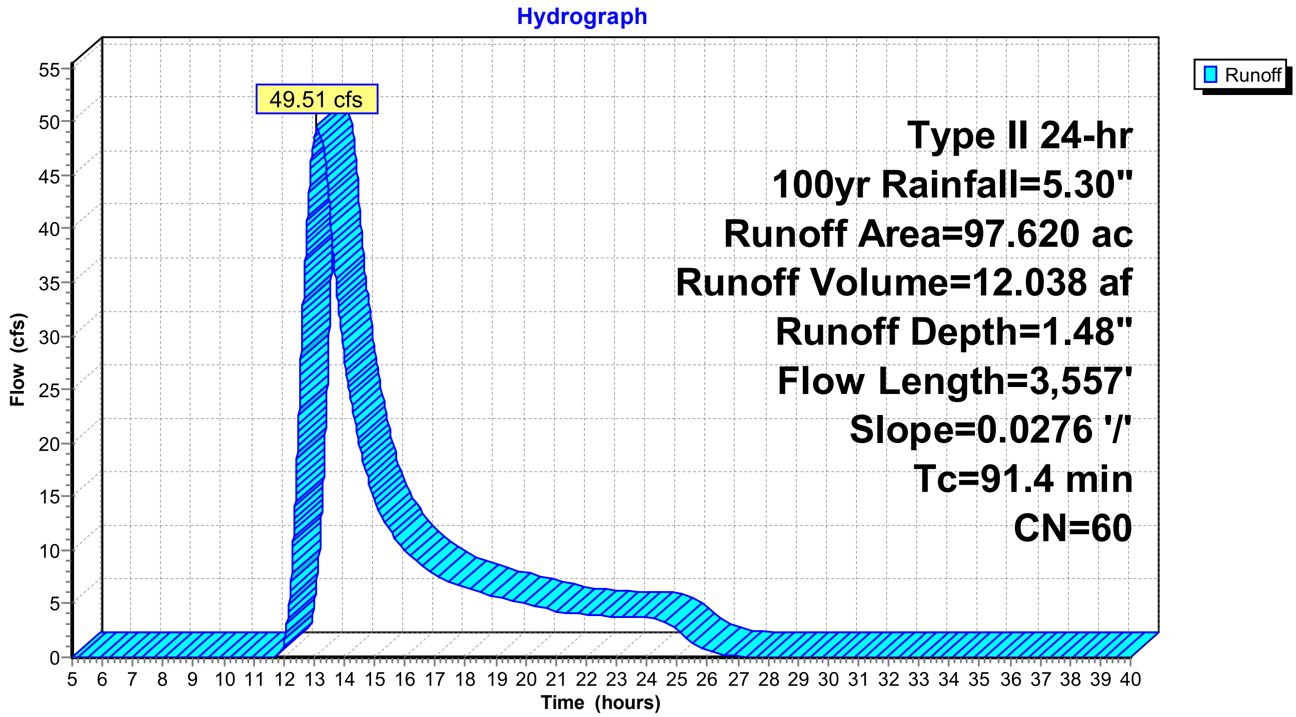
Link 30L: Conesus Lake



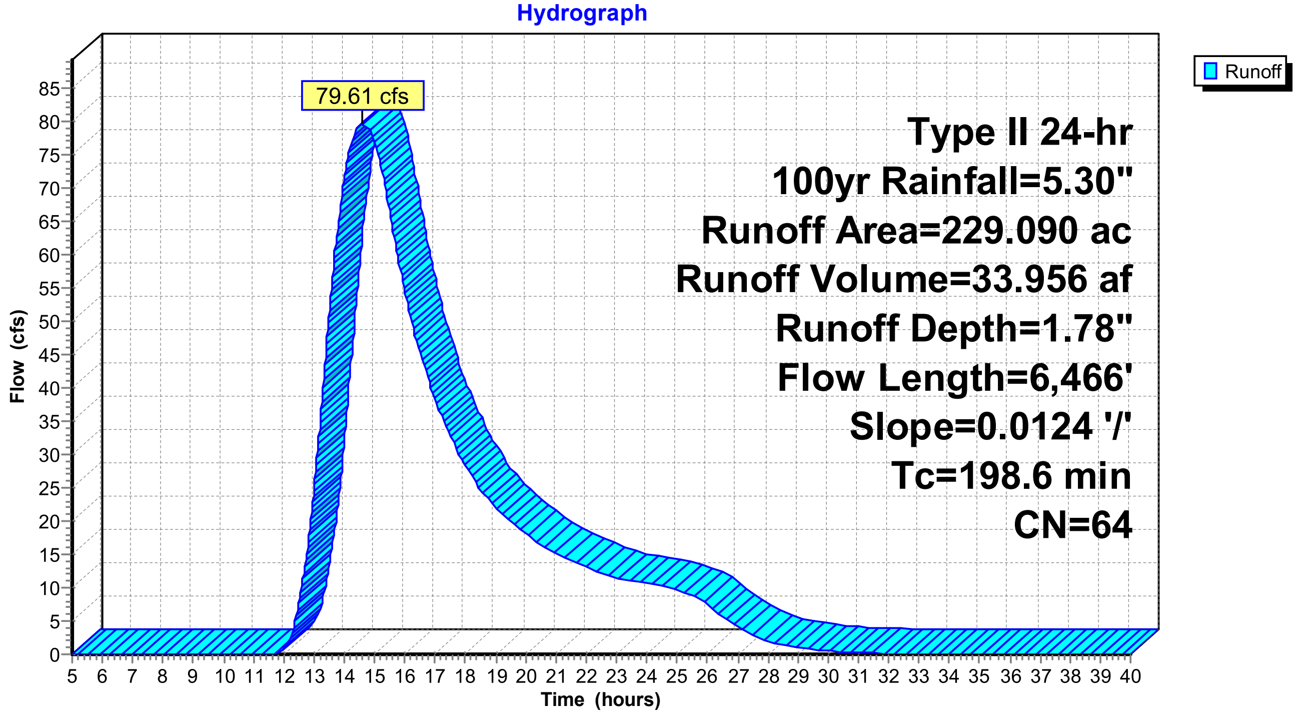
Subcatchment 1S: DA1



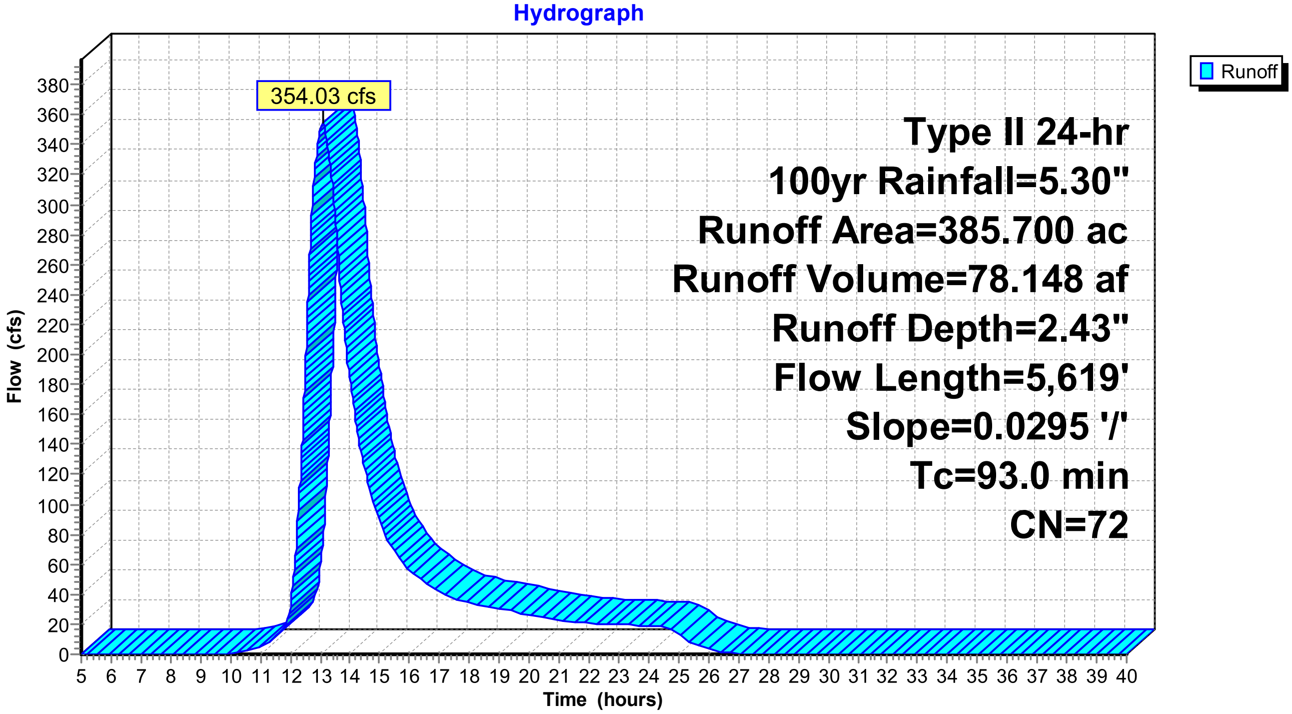
Subcatchment 2S: DA2



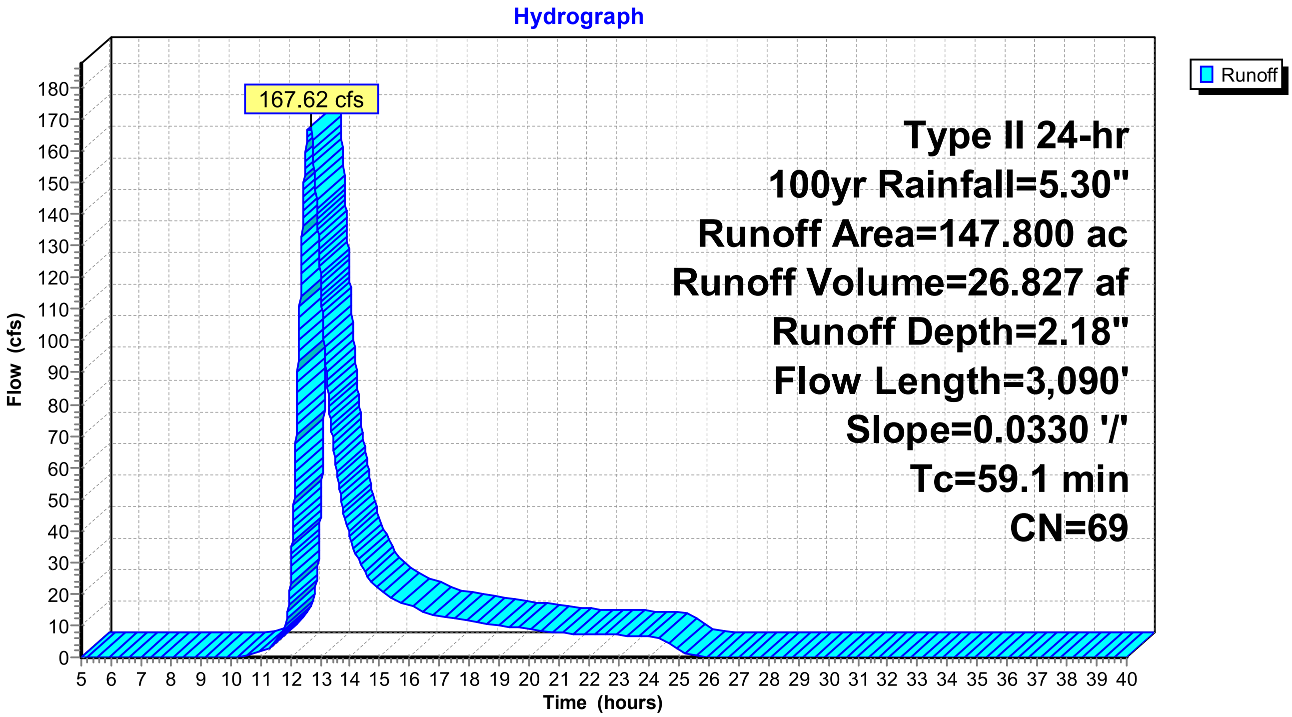
Subcatchment 8S: DA3



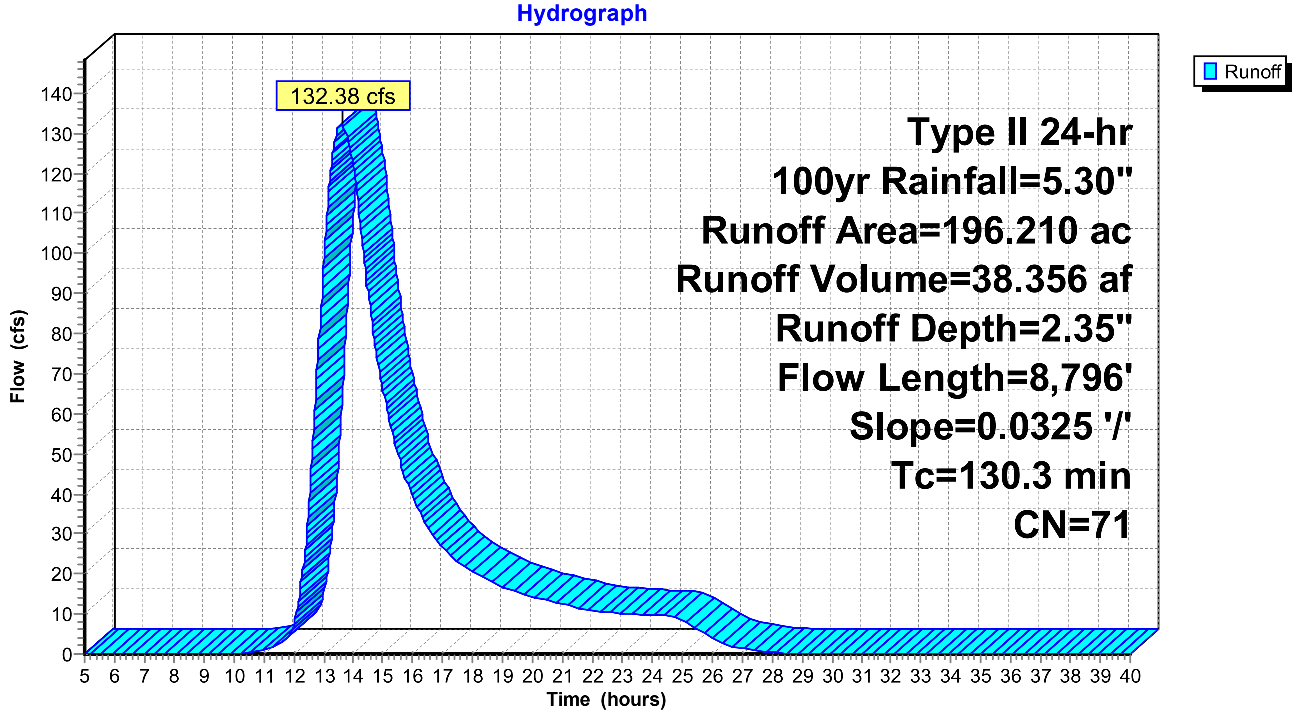
Subcatchment 12S: DA6



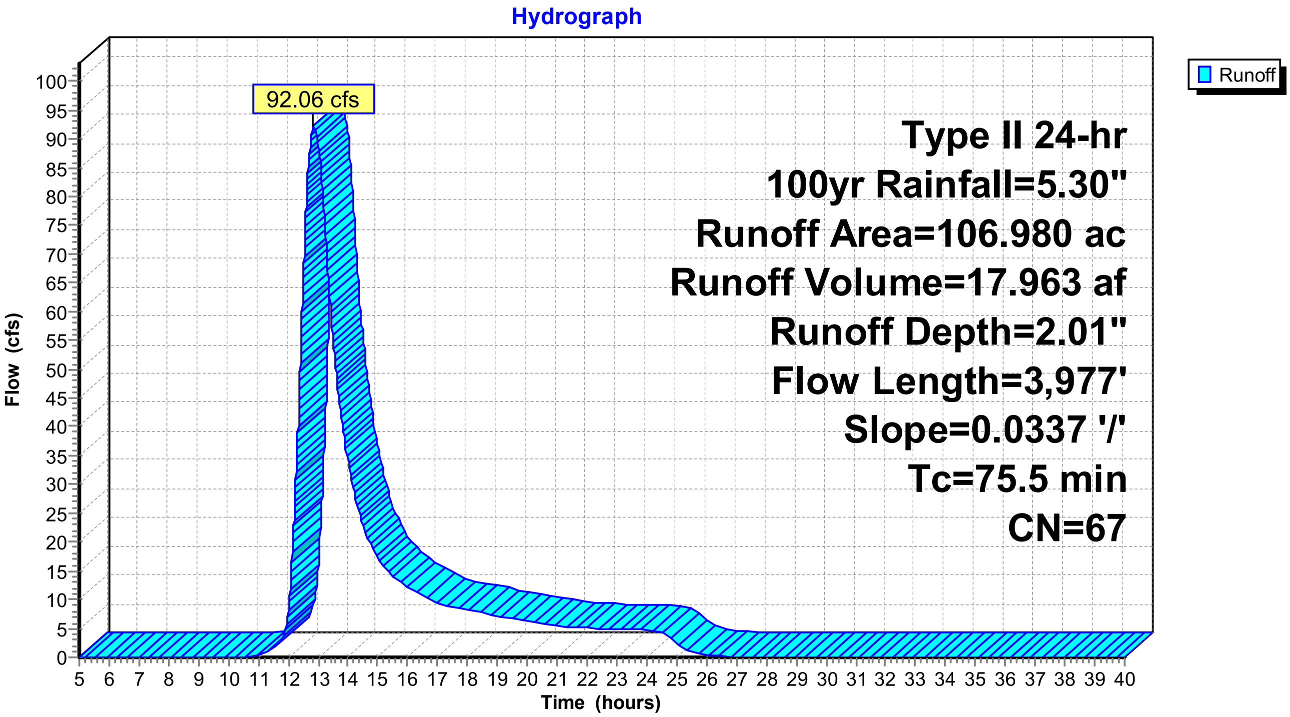
Subcatchment 13S: DA7



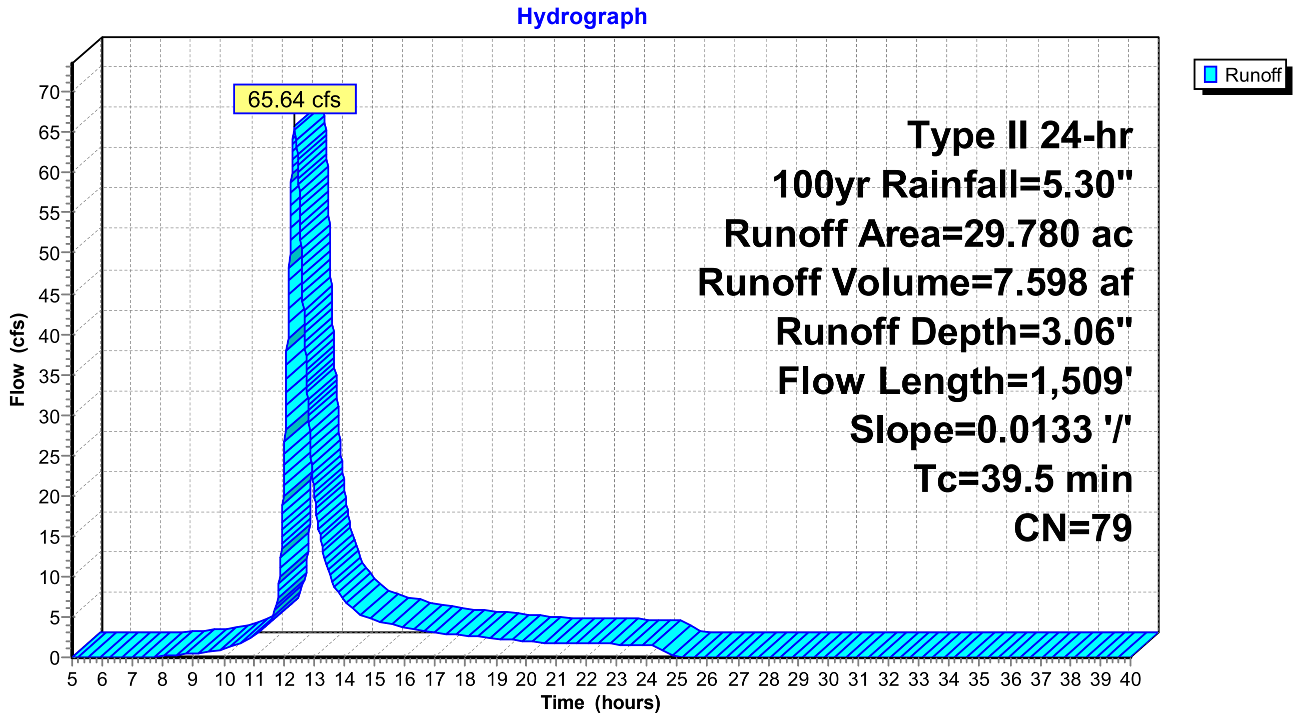
Subcatchment 15S: DA5 (Spring Creek)



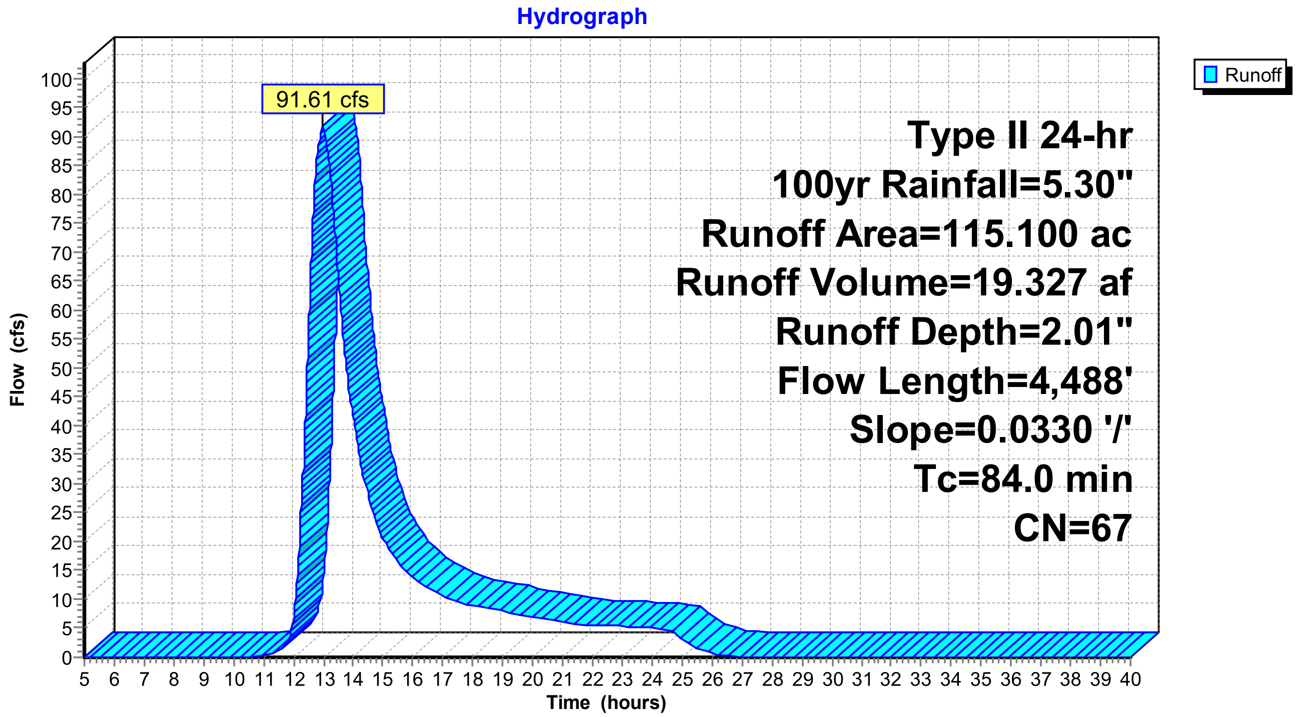
Subcatchment 20S: DA8



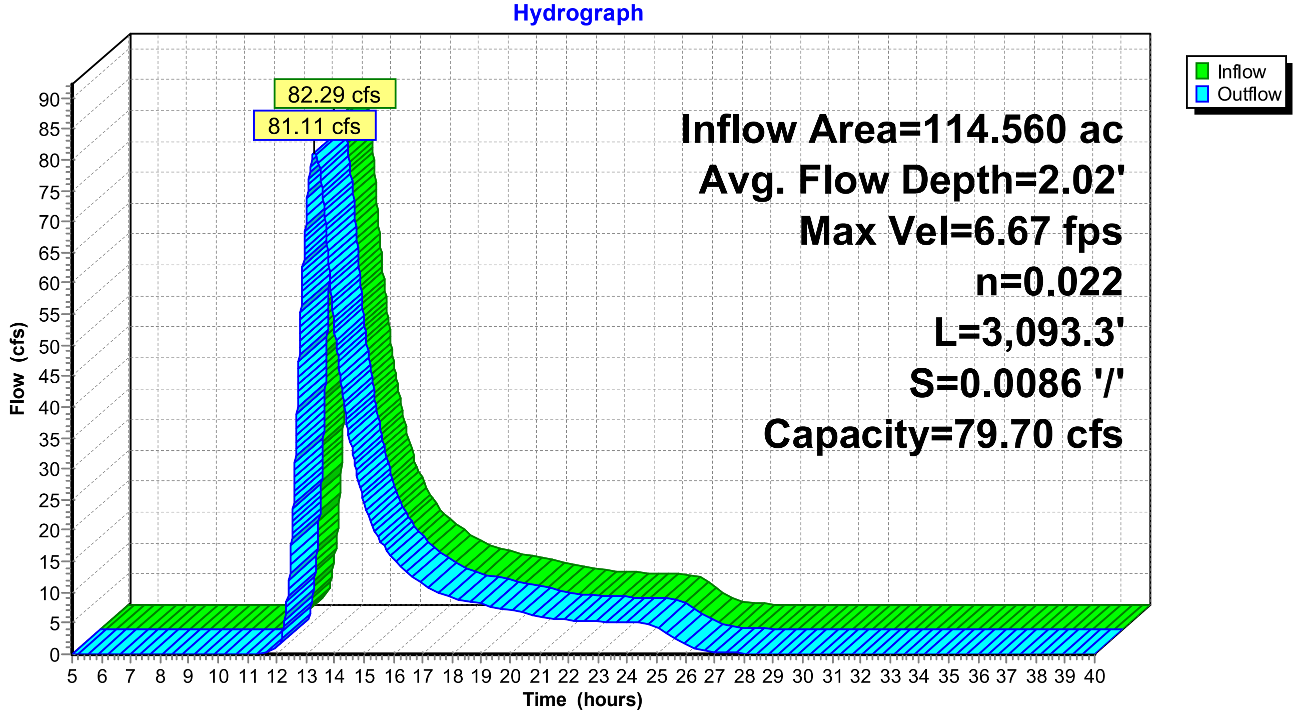
Subcatchment 23S: DA9



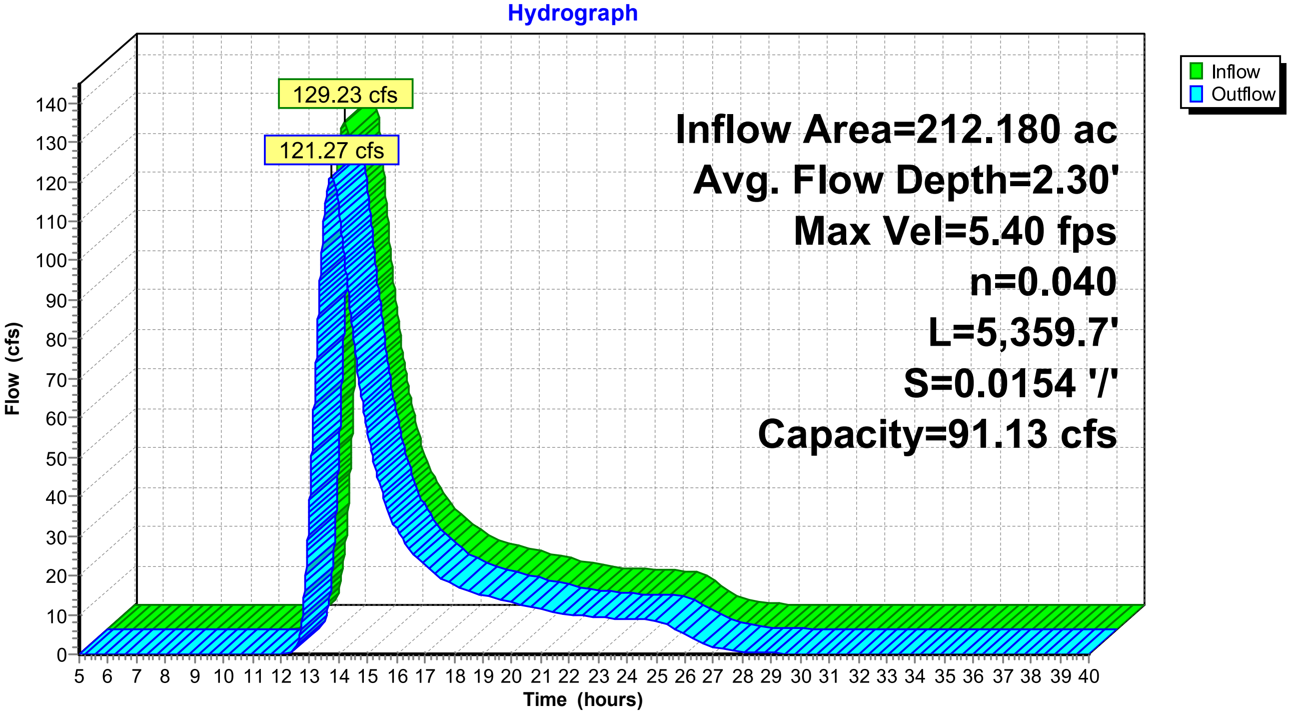
Subcatchment 31S: DA4



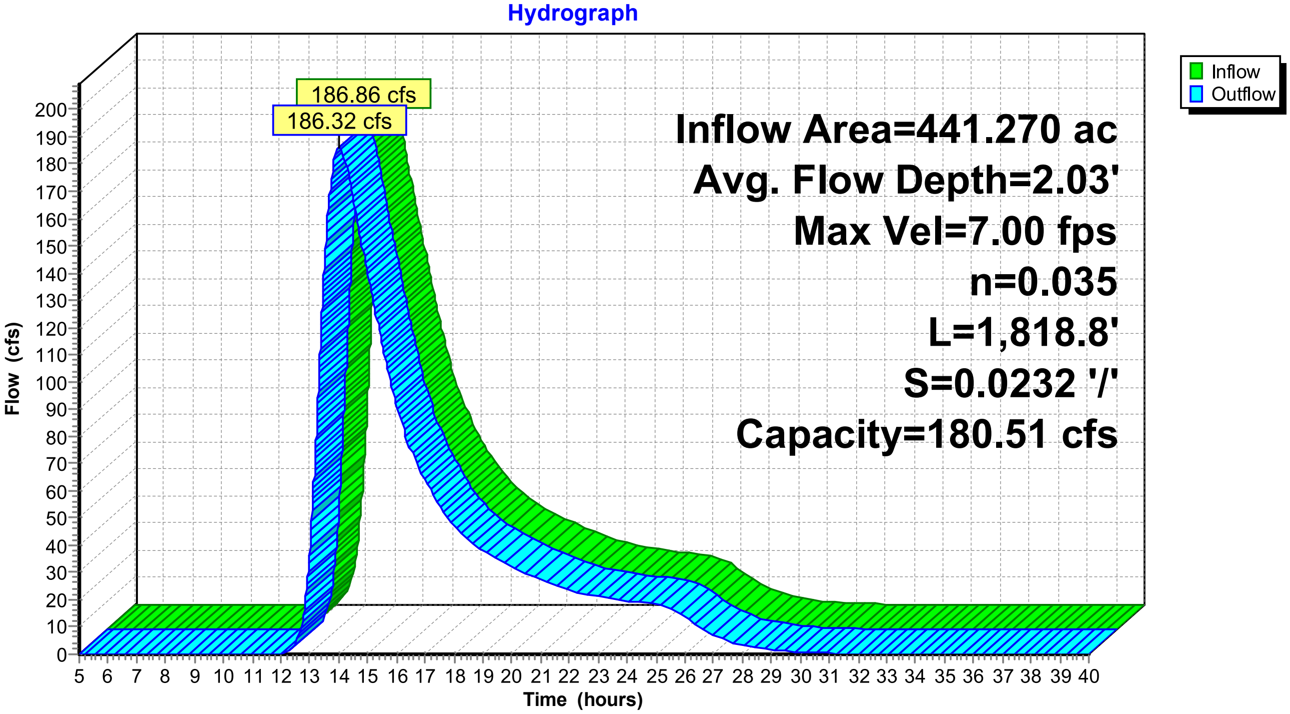
Reach 4R: Pasture



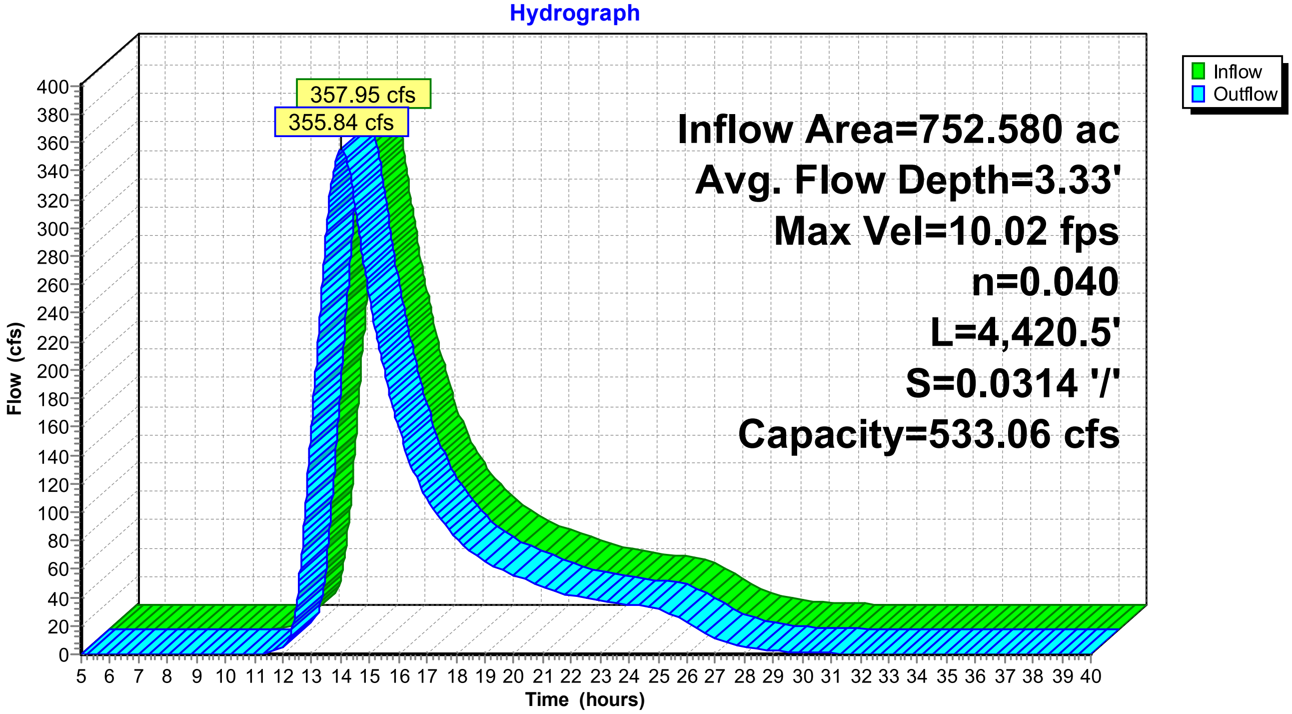
Reach 6R: Ponds



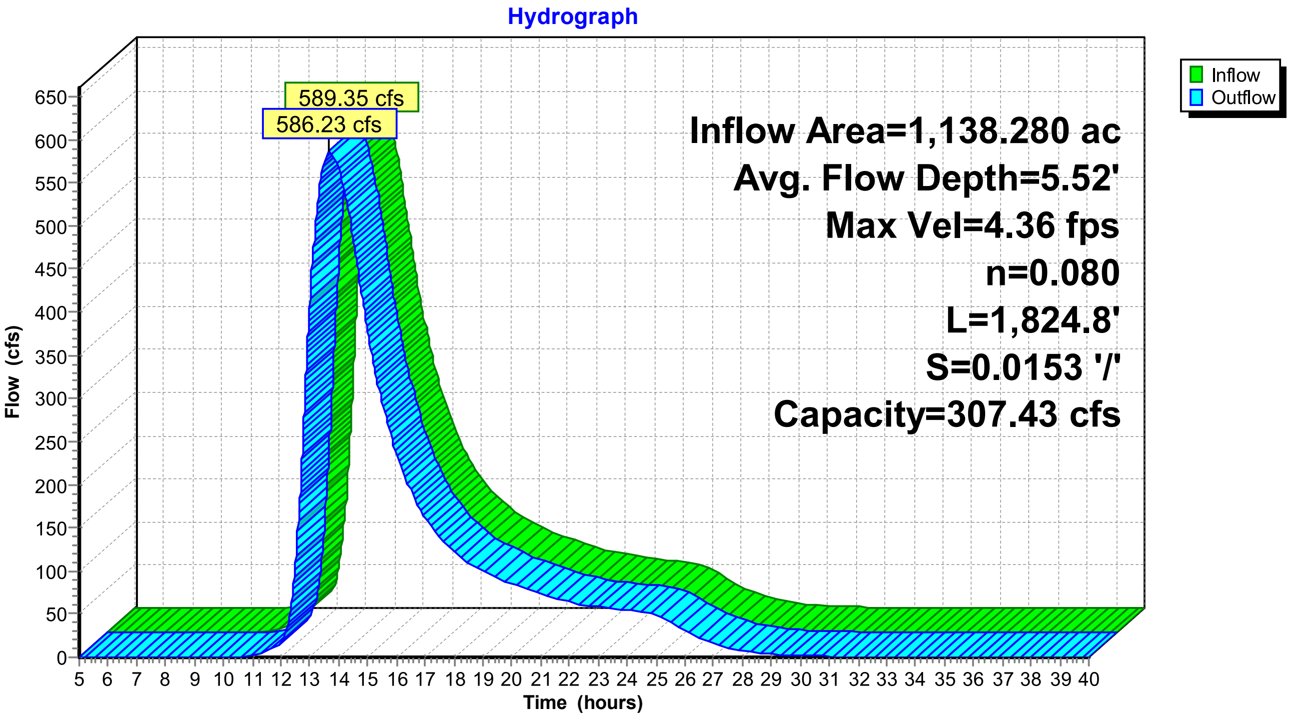
Reach 9R: School



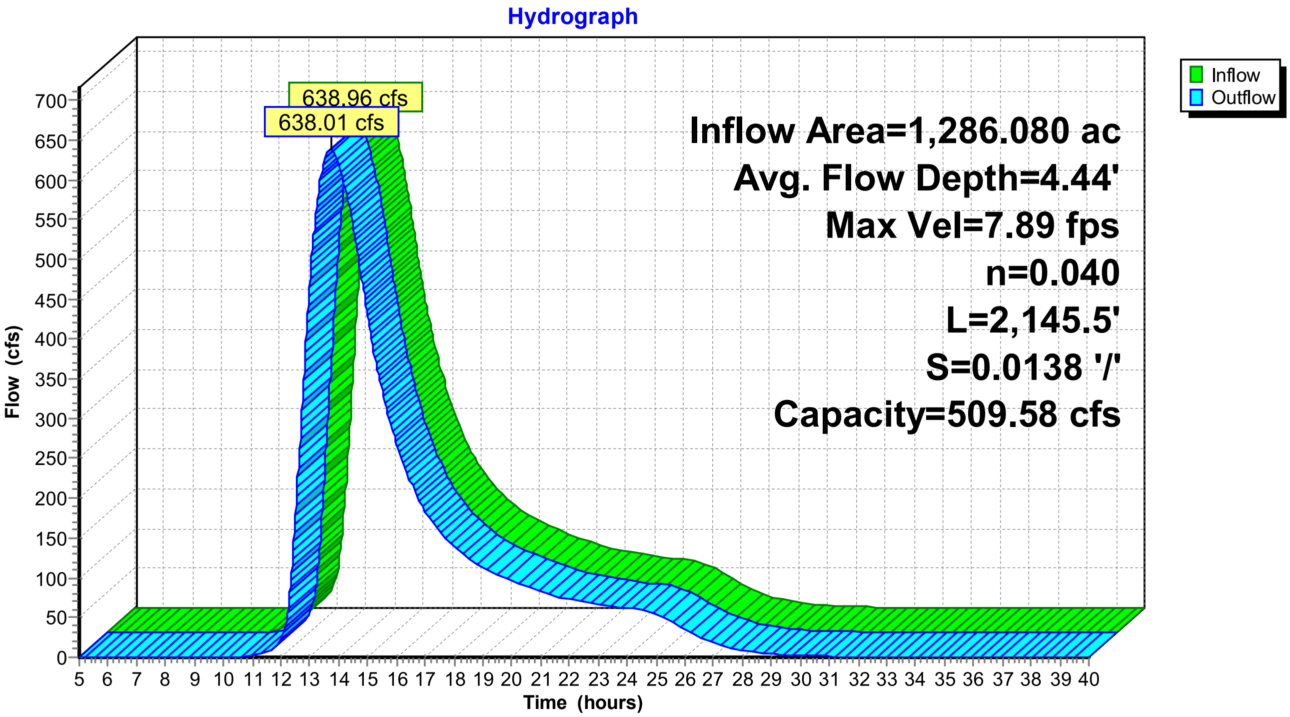
Reach 11R: Commercial



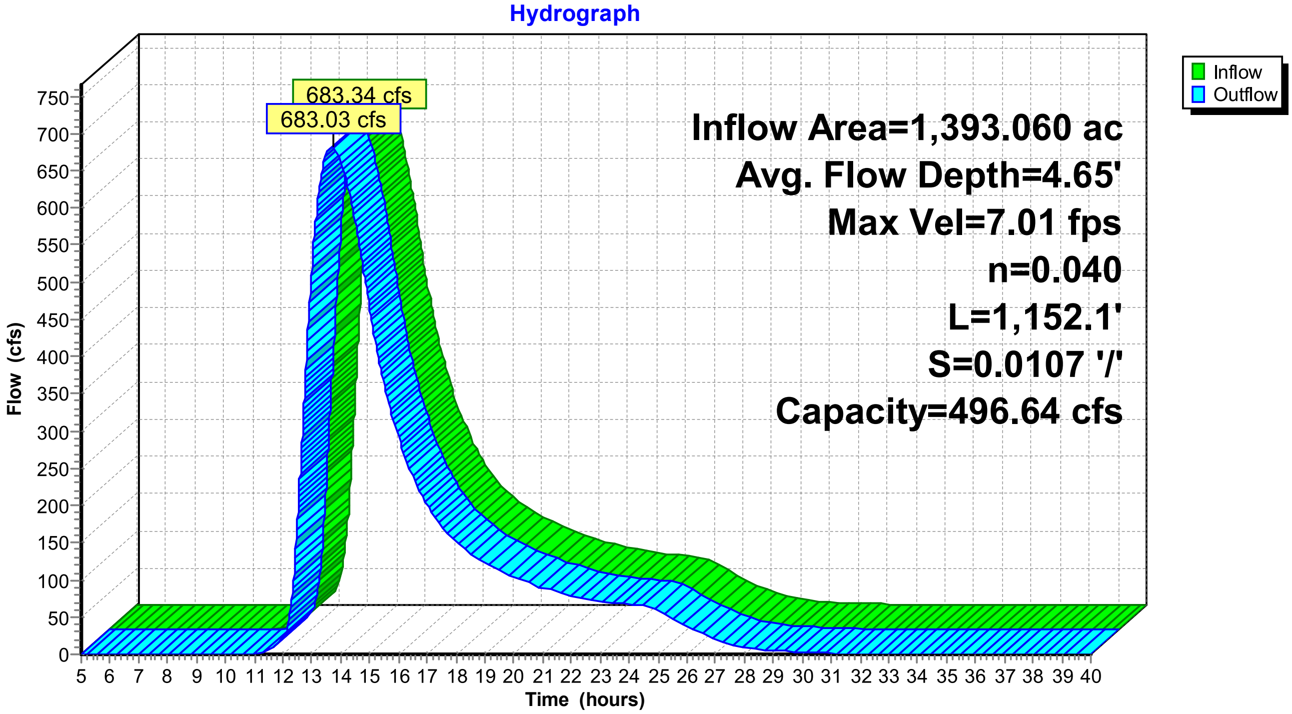
Reach 17R: Park to Penn



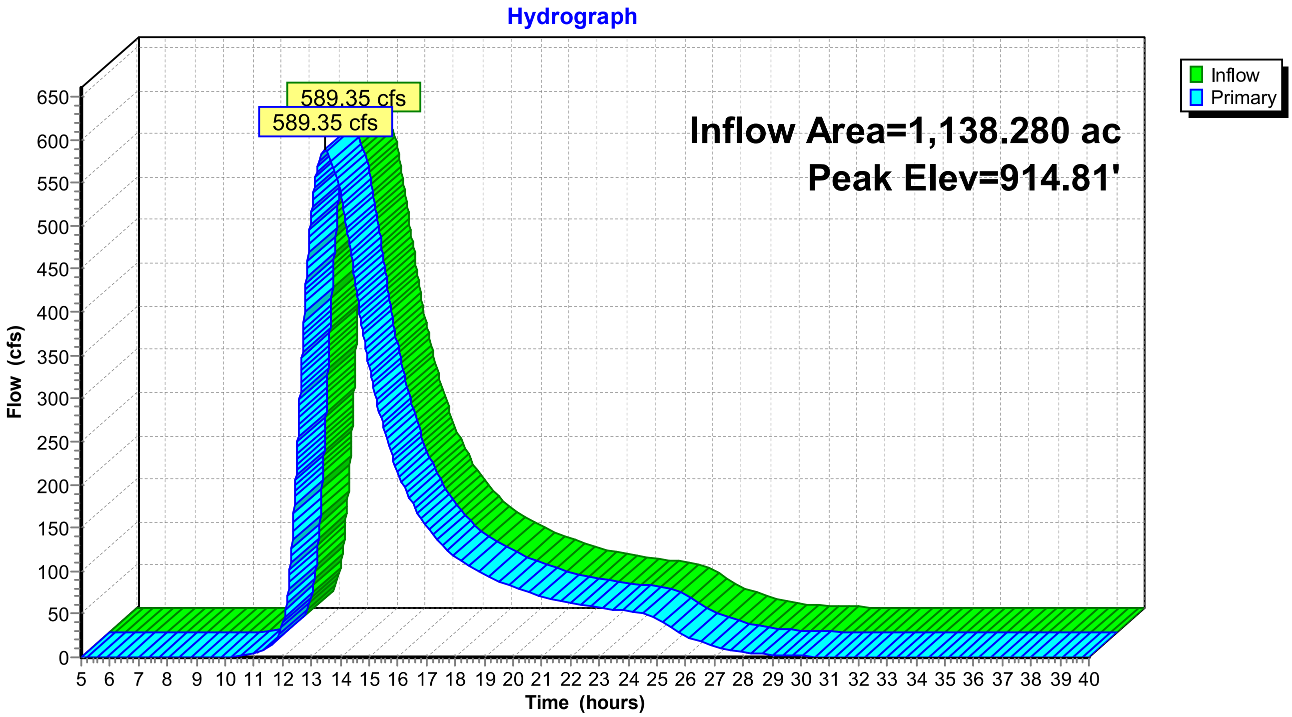
Reach 19R: E. Lake to Penn



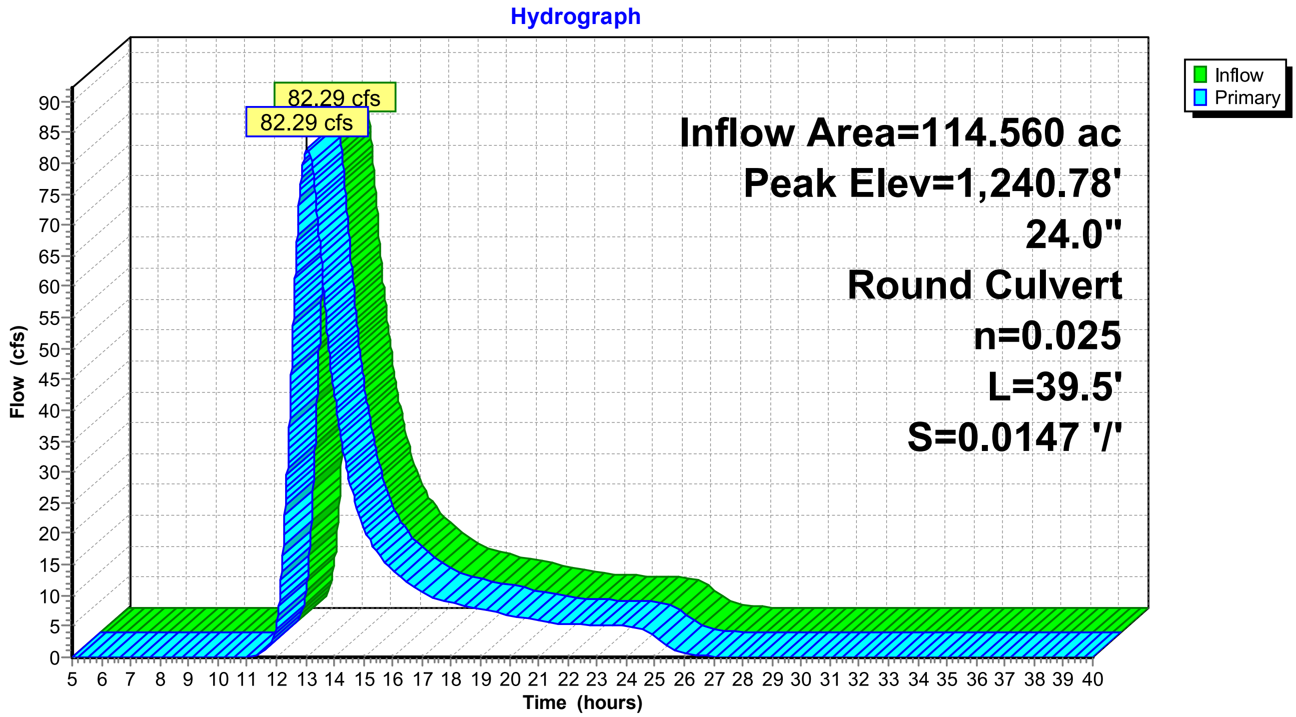
Reach 22R: Wilkins Tract to E. Lake



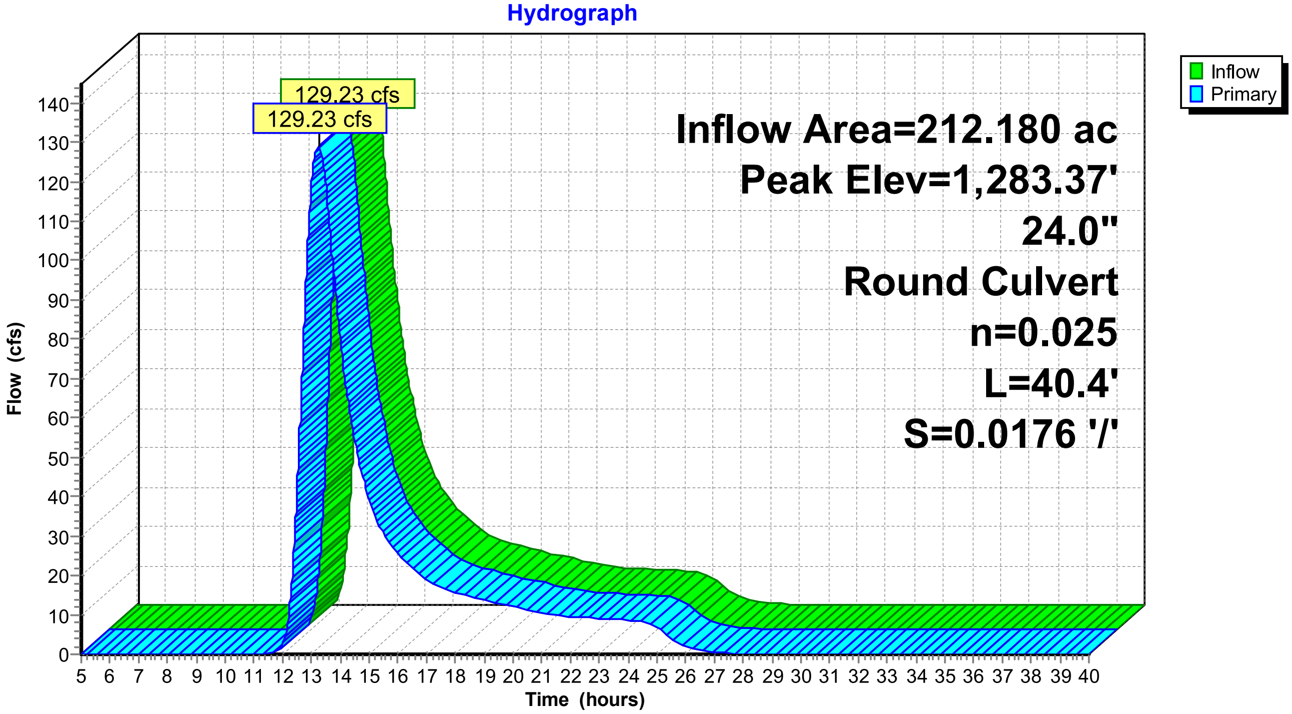
Pond 22P: Park



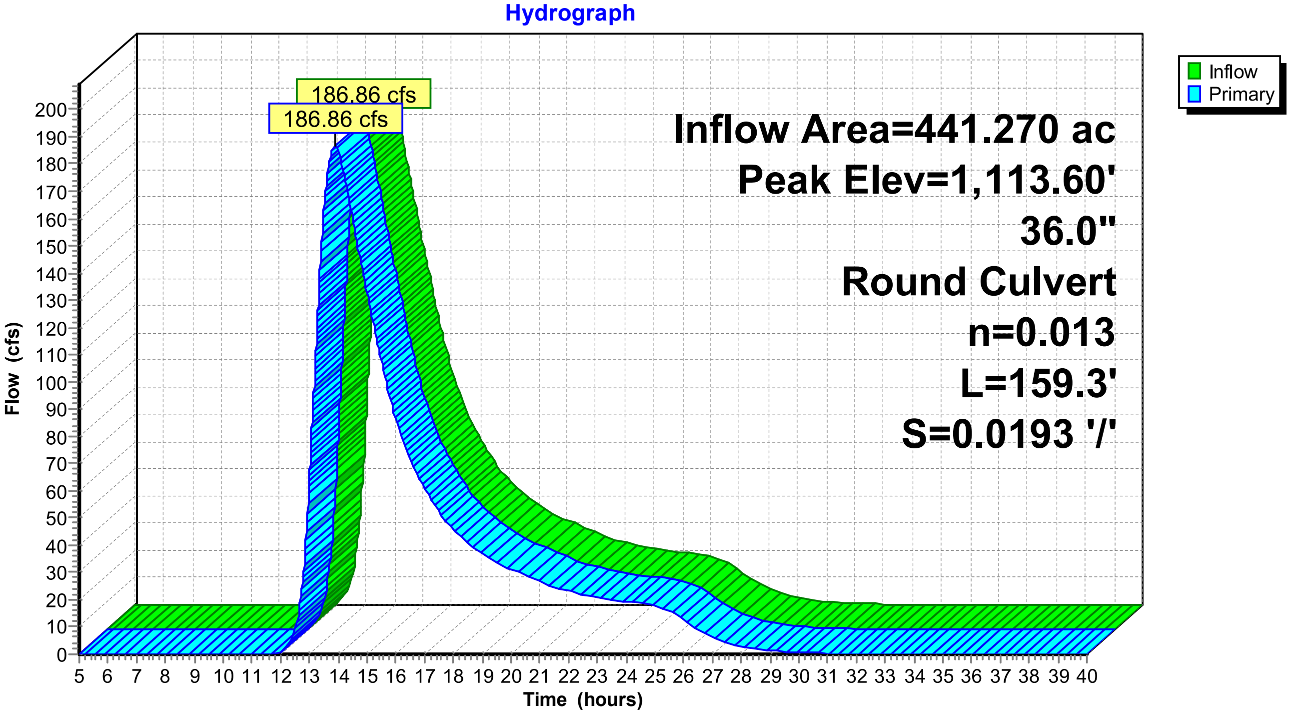
Pond 23P: Cleary Rd.



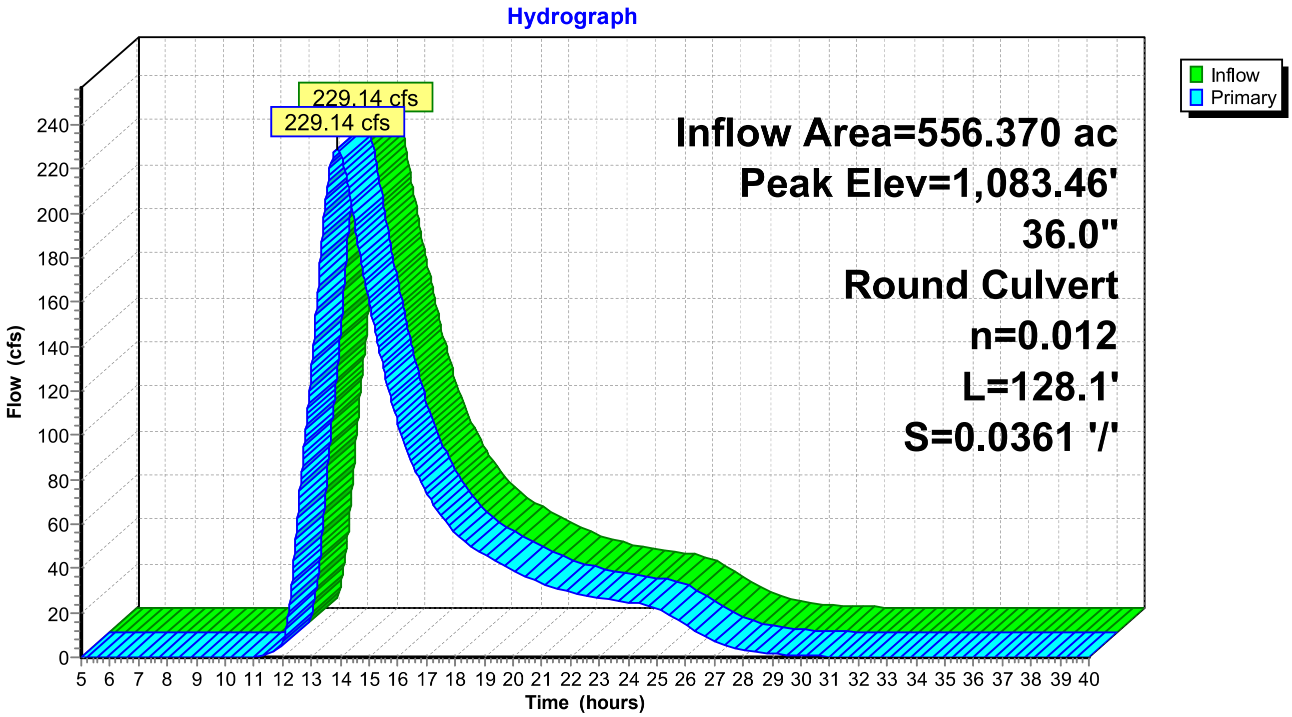
Pond 24P: Shelly Rd.



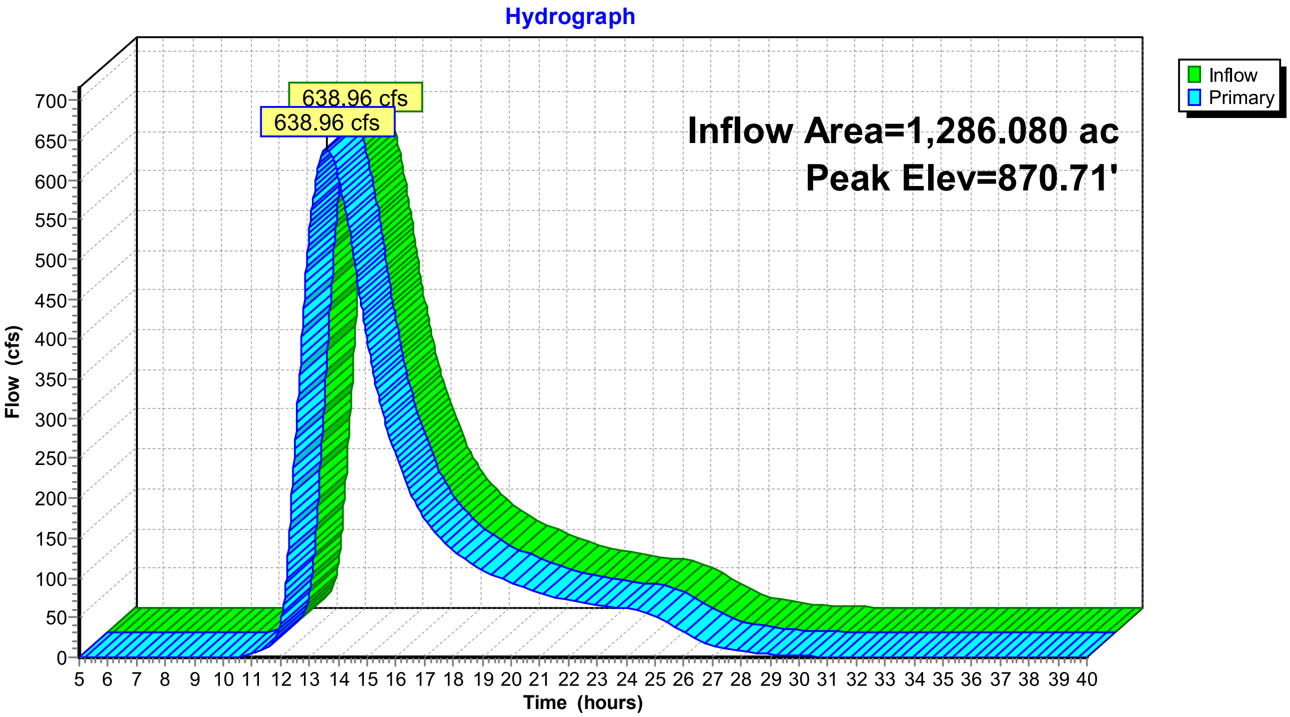
Pond 25P: School



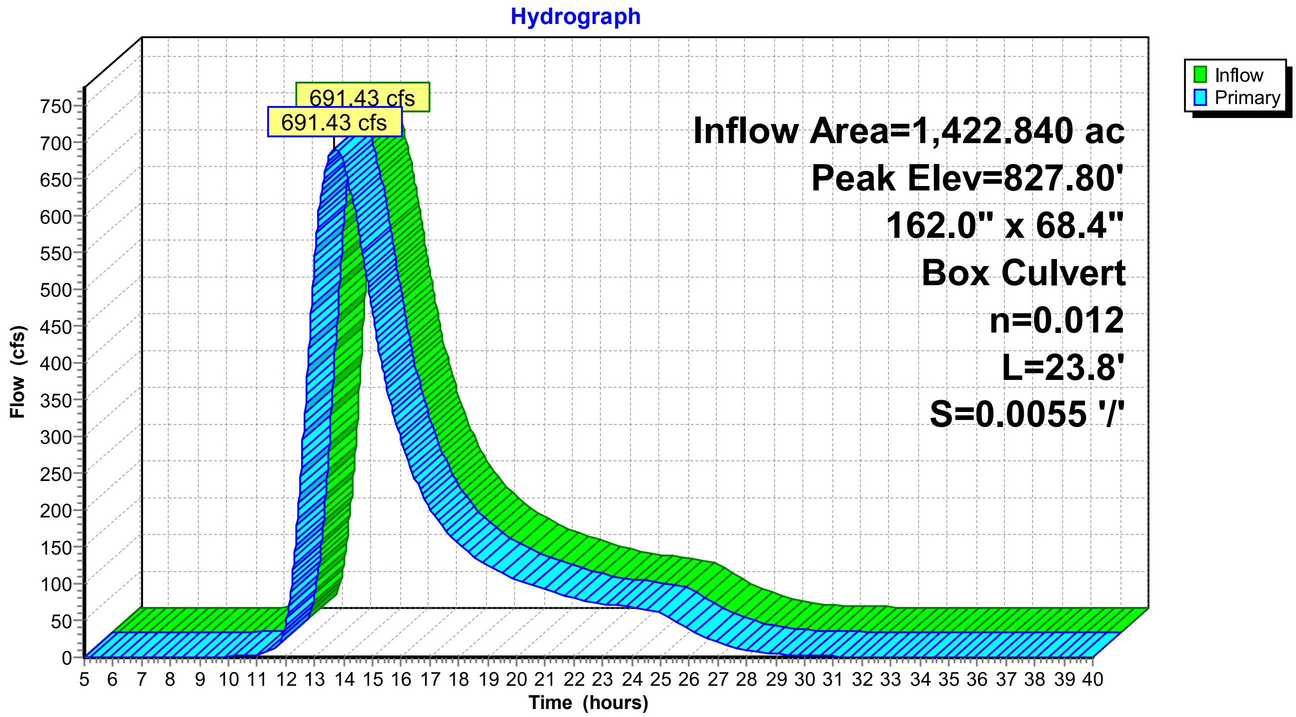
Pond 26P: Commercial St.



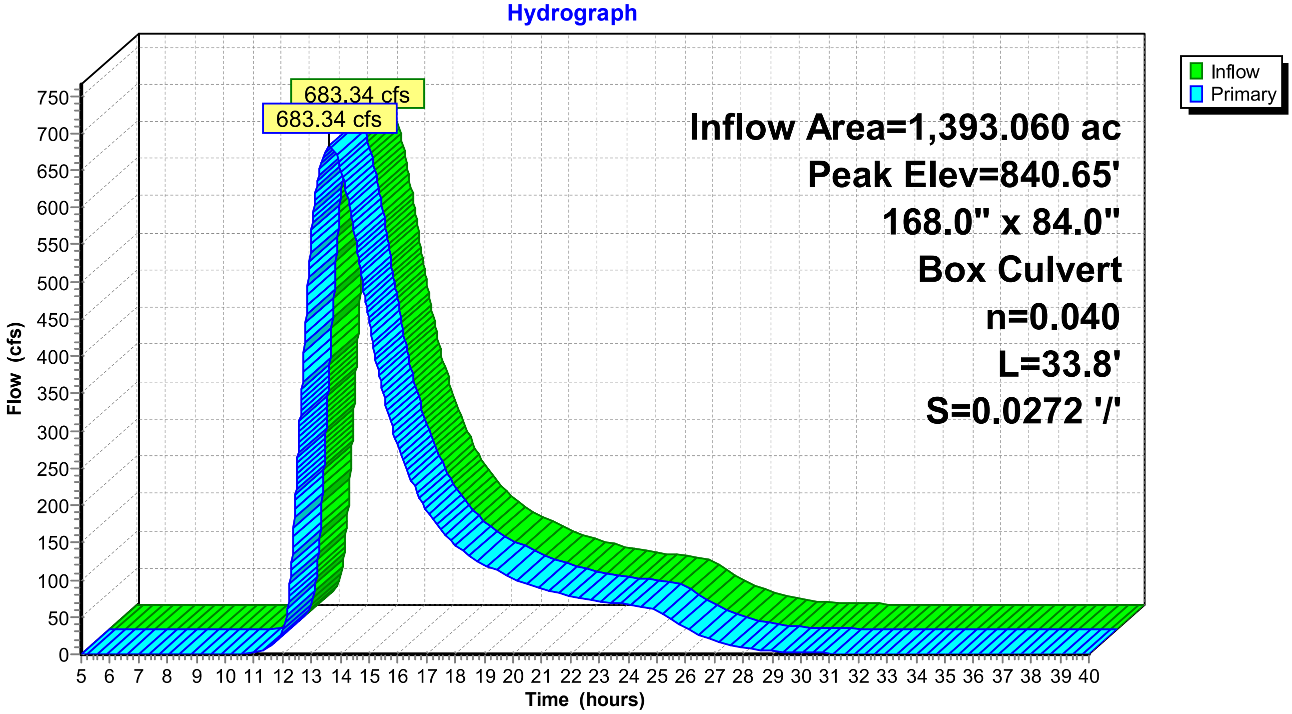
Pond 27P: Pennimite Rd



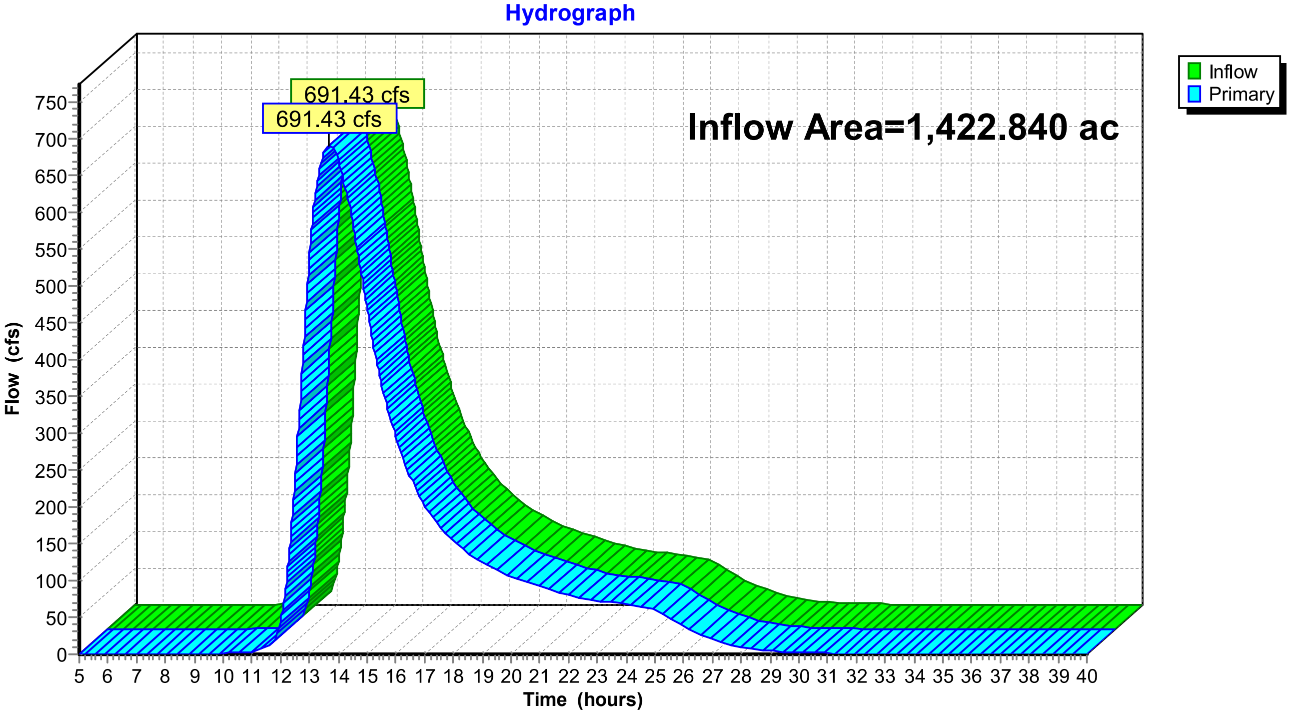
Pond 28P: Wilkins Tract



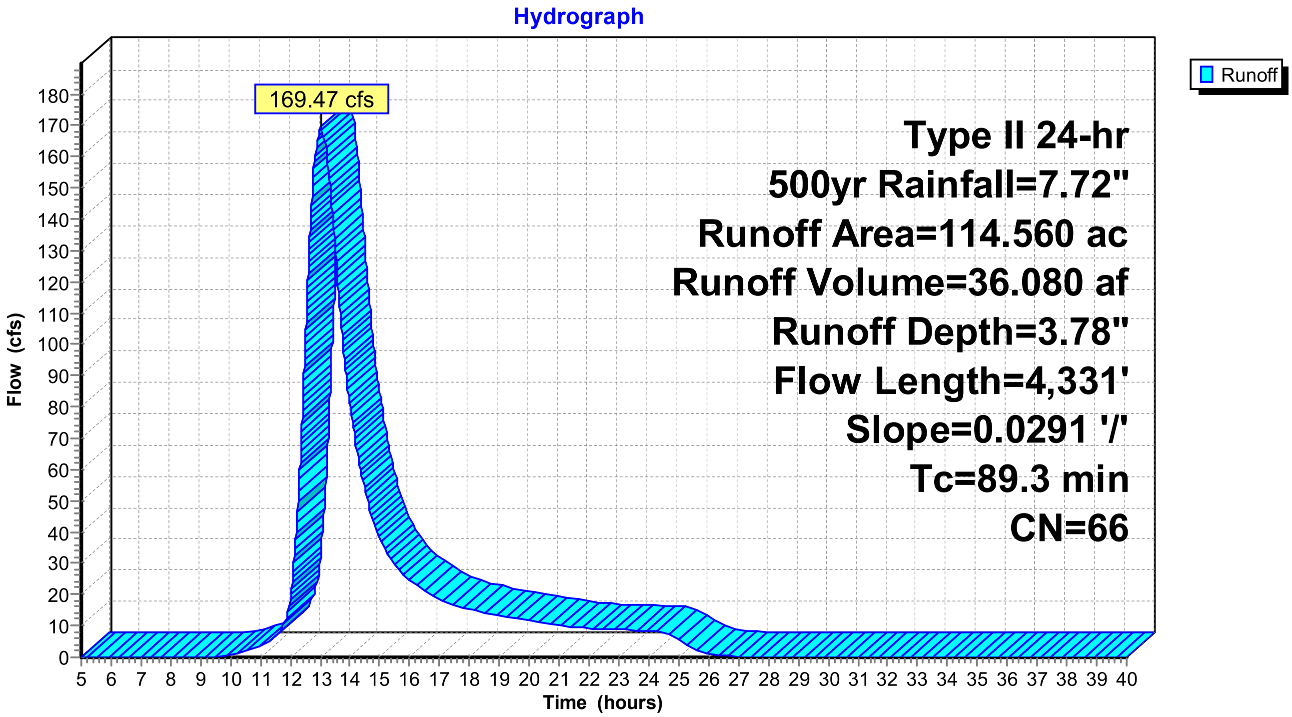
Pond 29P: E. Lake Rd.



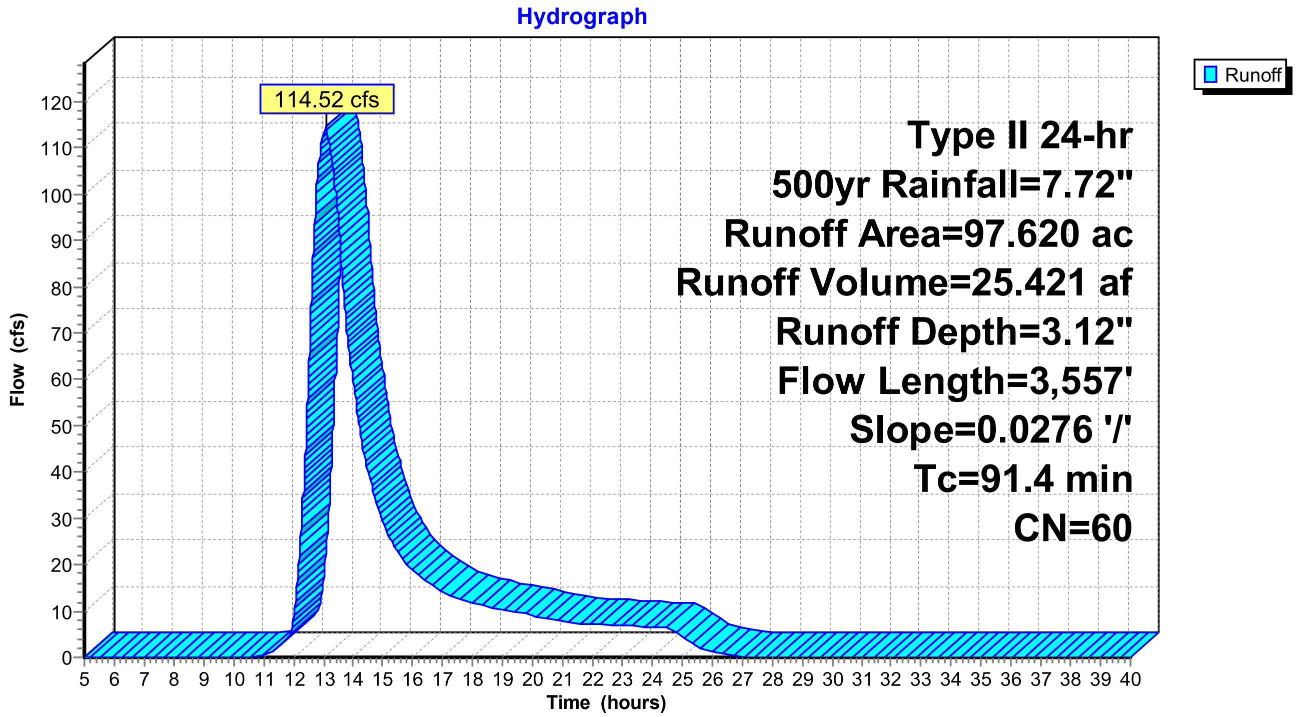
Link 30L: Conesus Lake



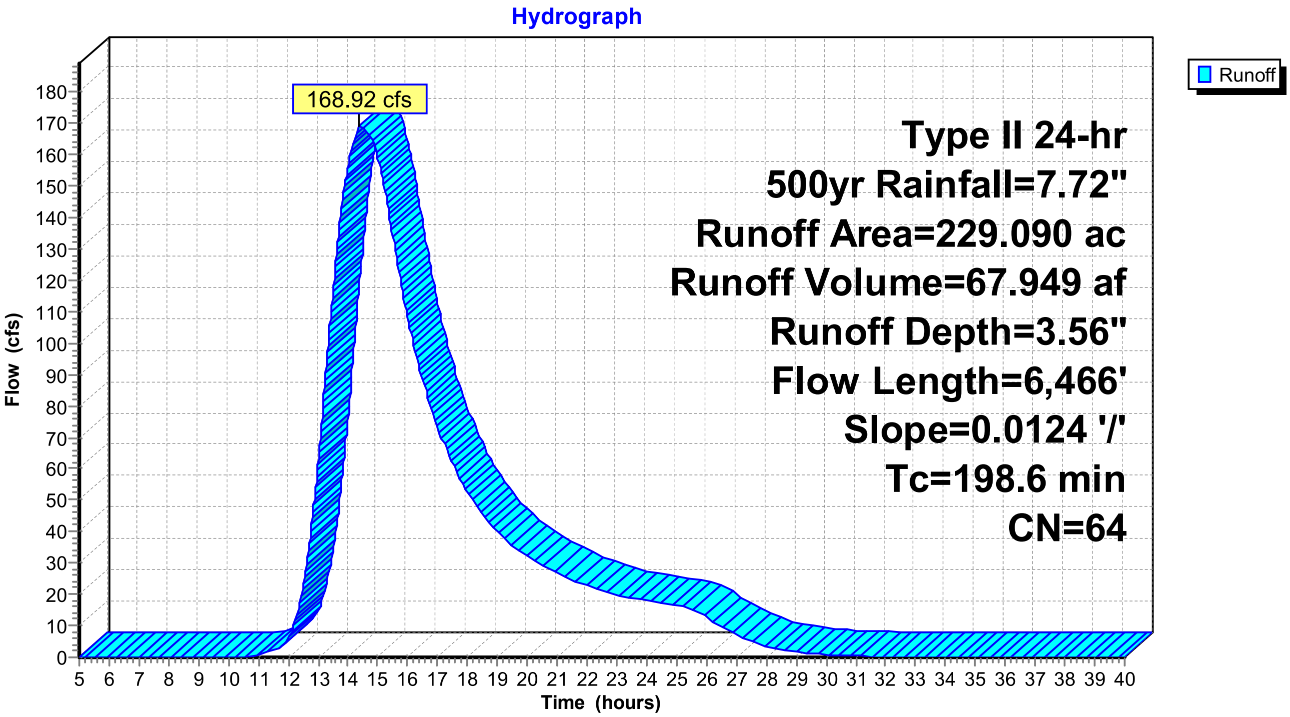
Subcatchment 1S: DA1



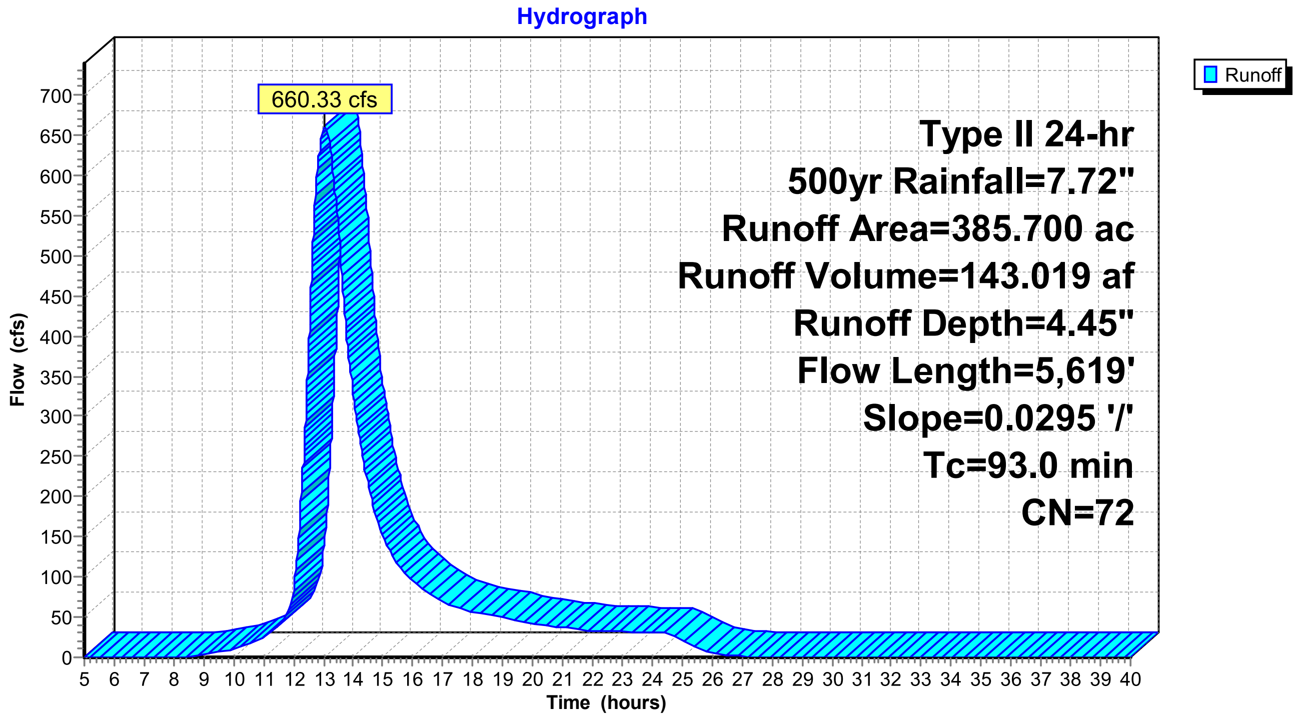
Subcatchment 2S: DA2



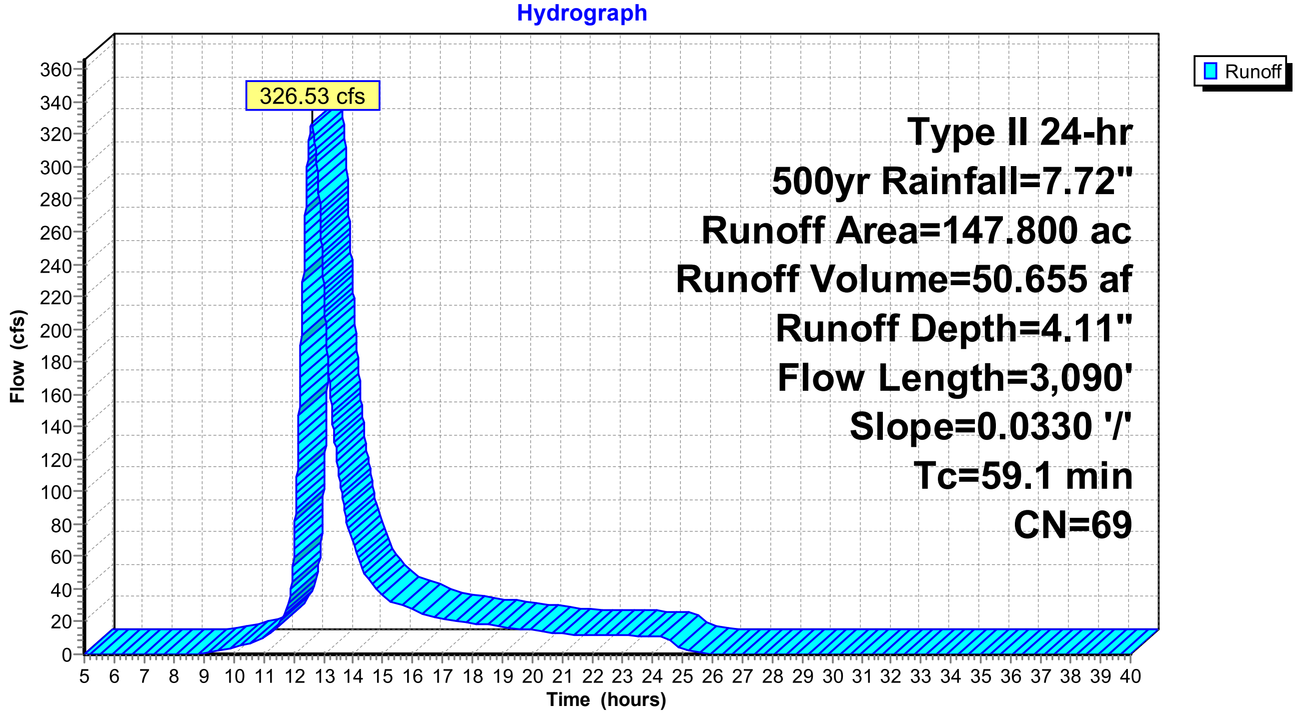
Subcatchment 8S: DA3



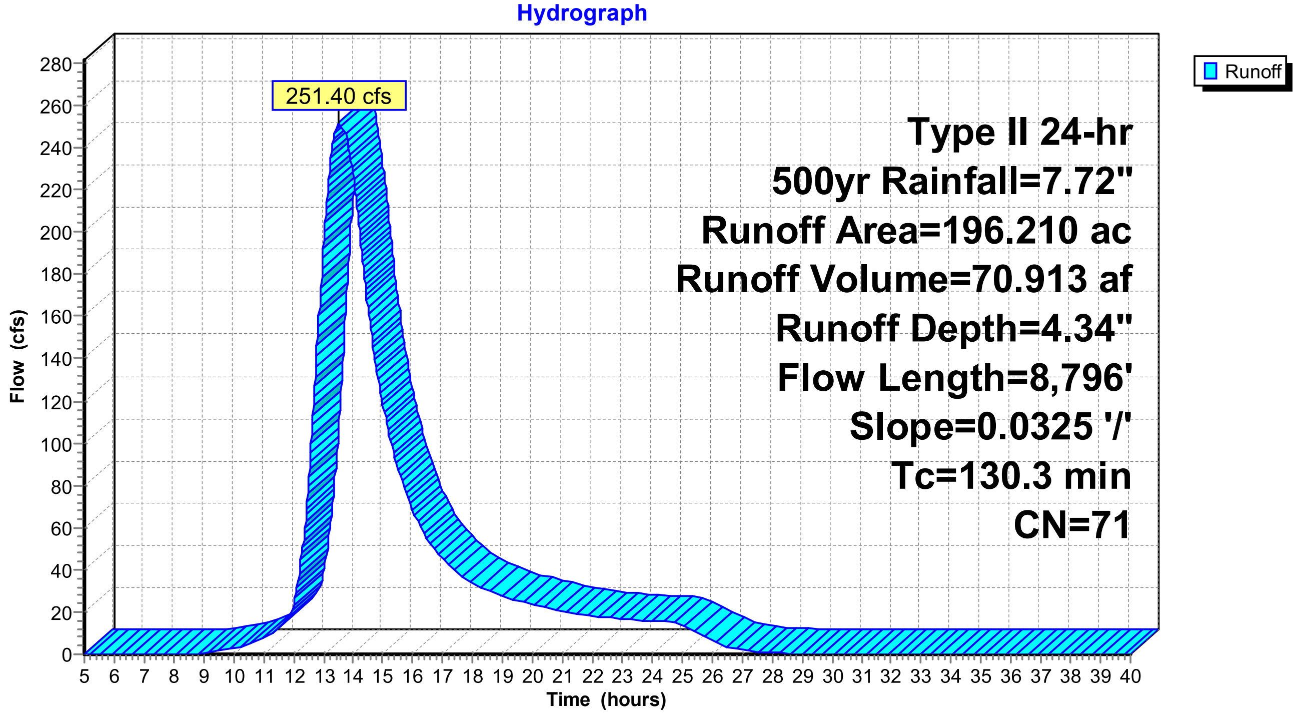
Subcatchment 12S: DA6



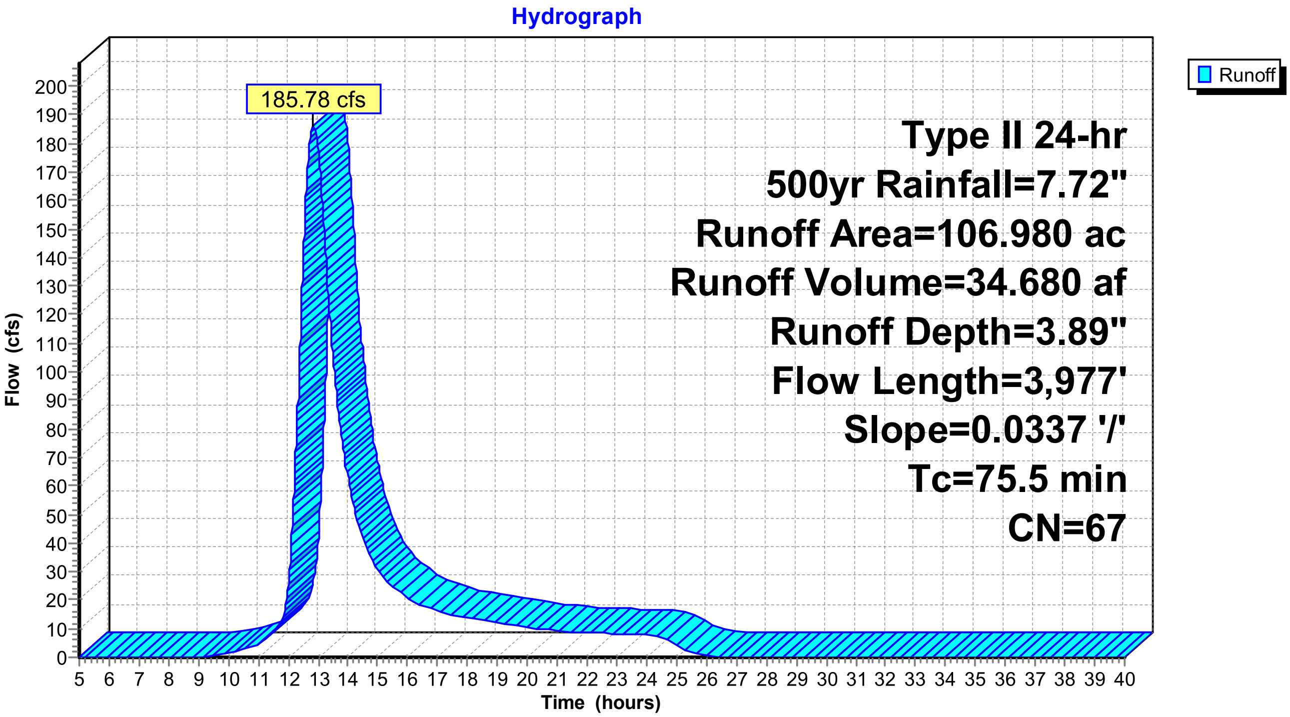
Subcatchment 13S: DA7



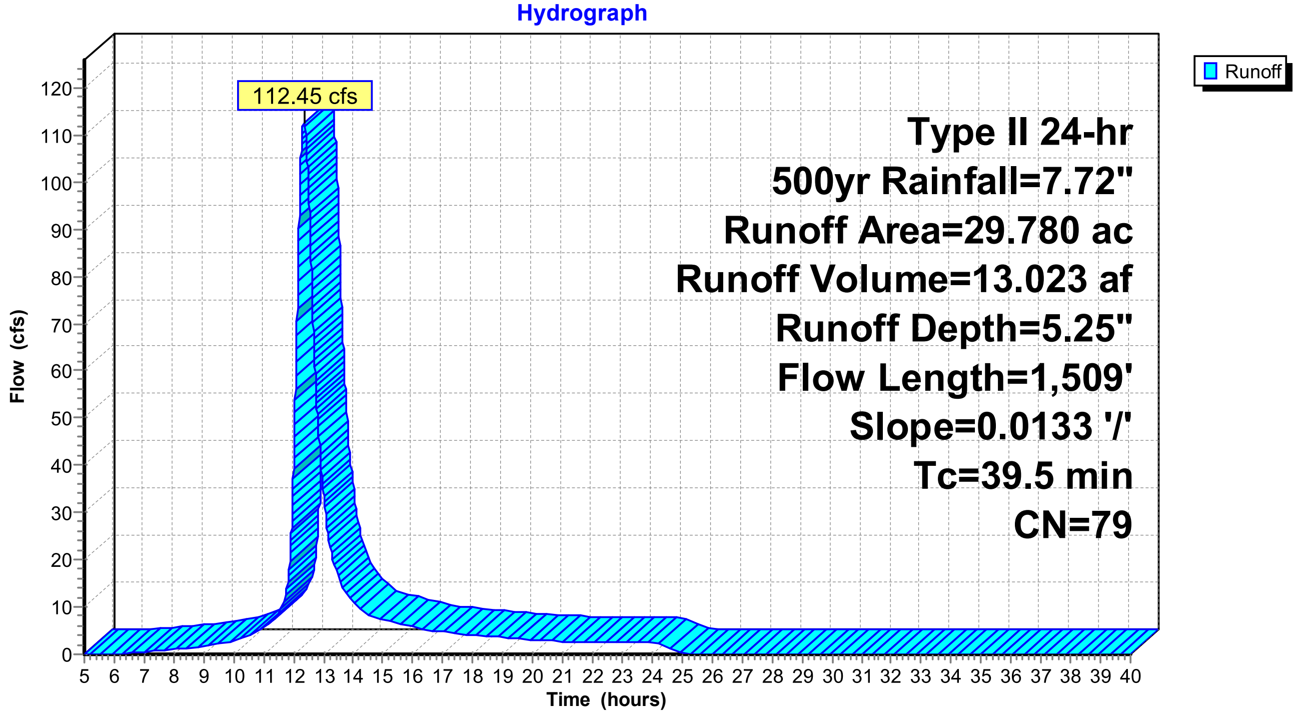
Subcatchment 15S: DA5 (Spring Creek)



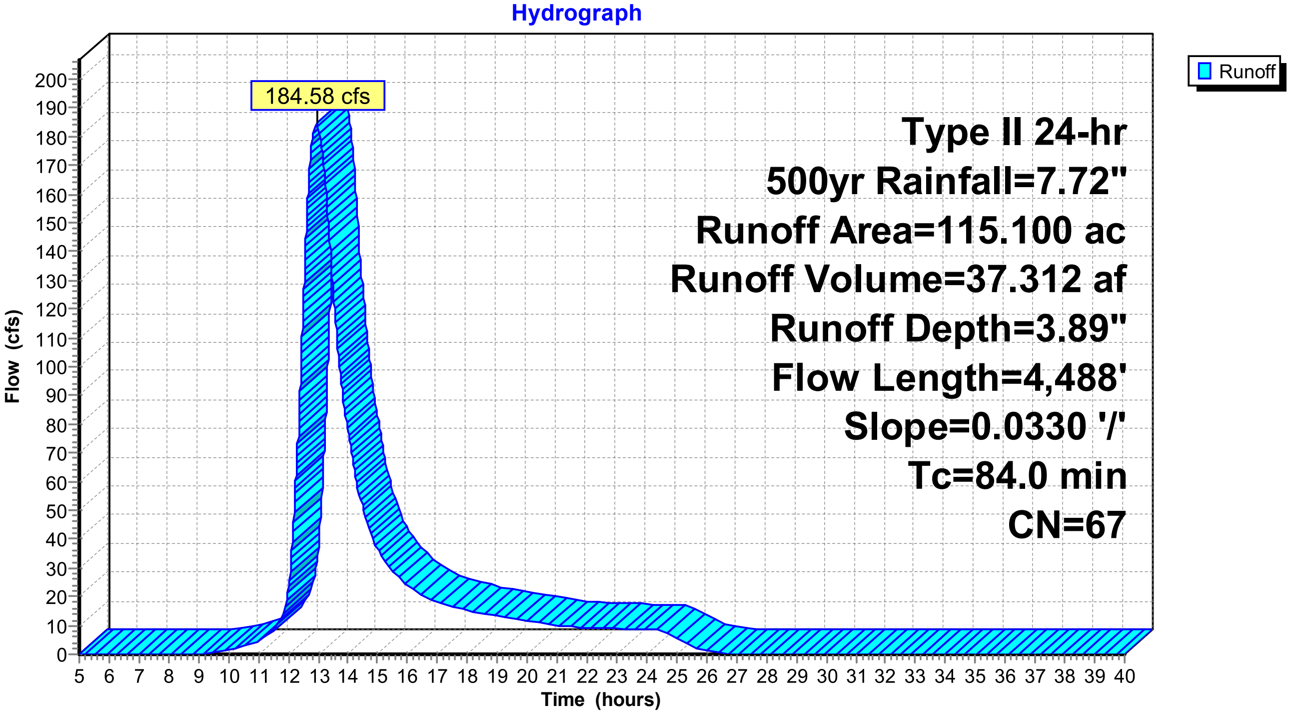
Subcatchment 20S: DA8



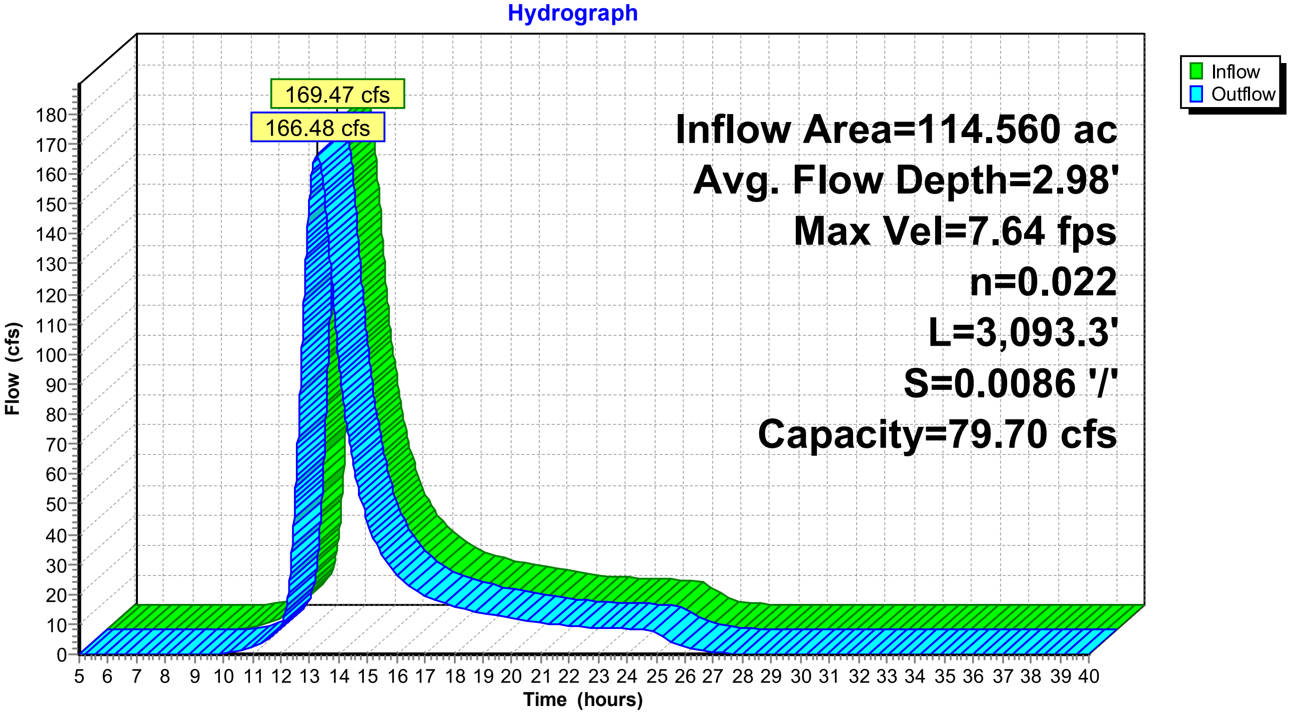
Subcatchment 23S: DA9



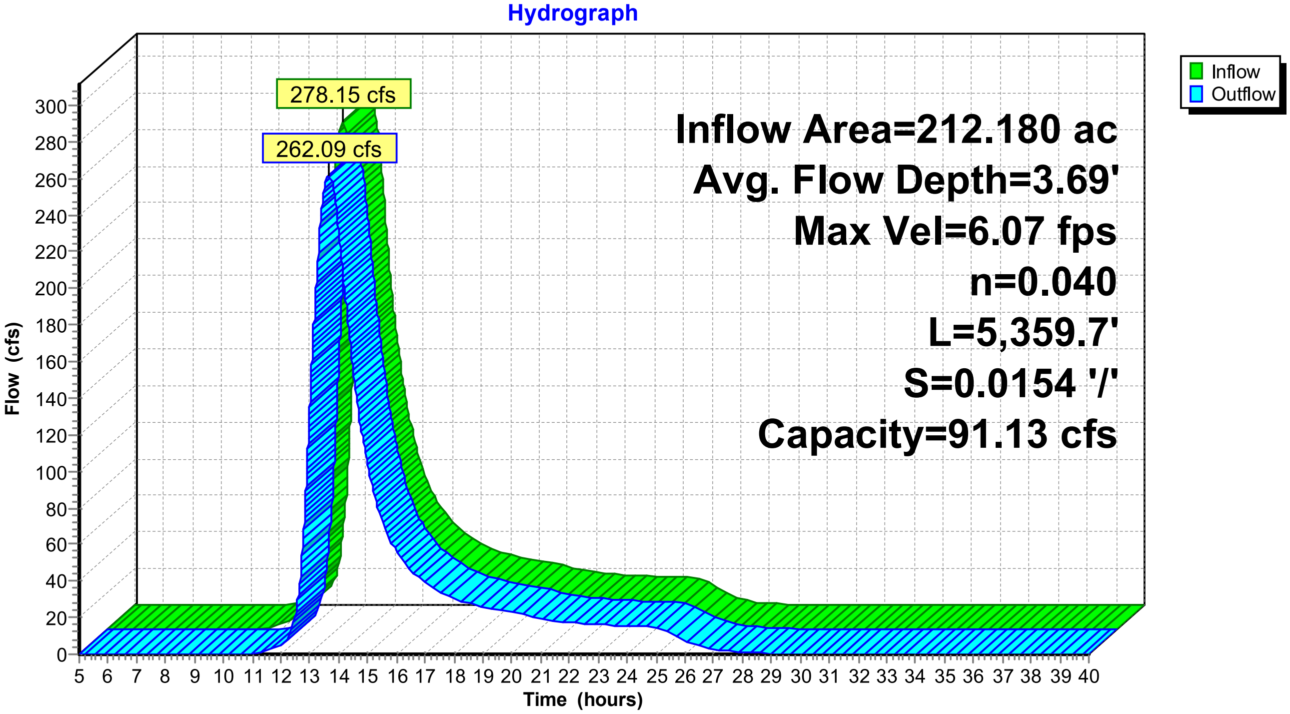
Subcatchment 31S: DA4



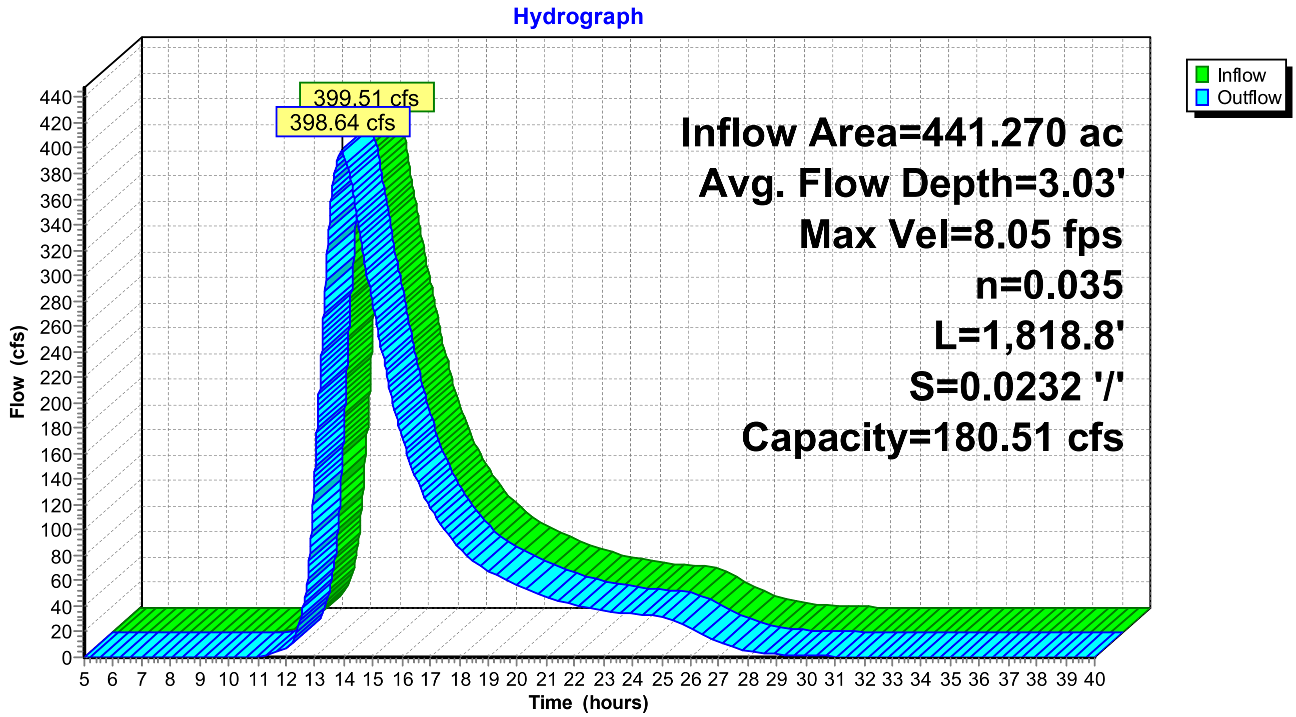
Reach 4R: Pasture



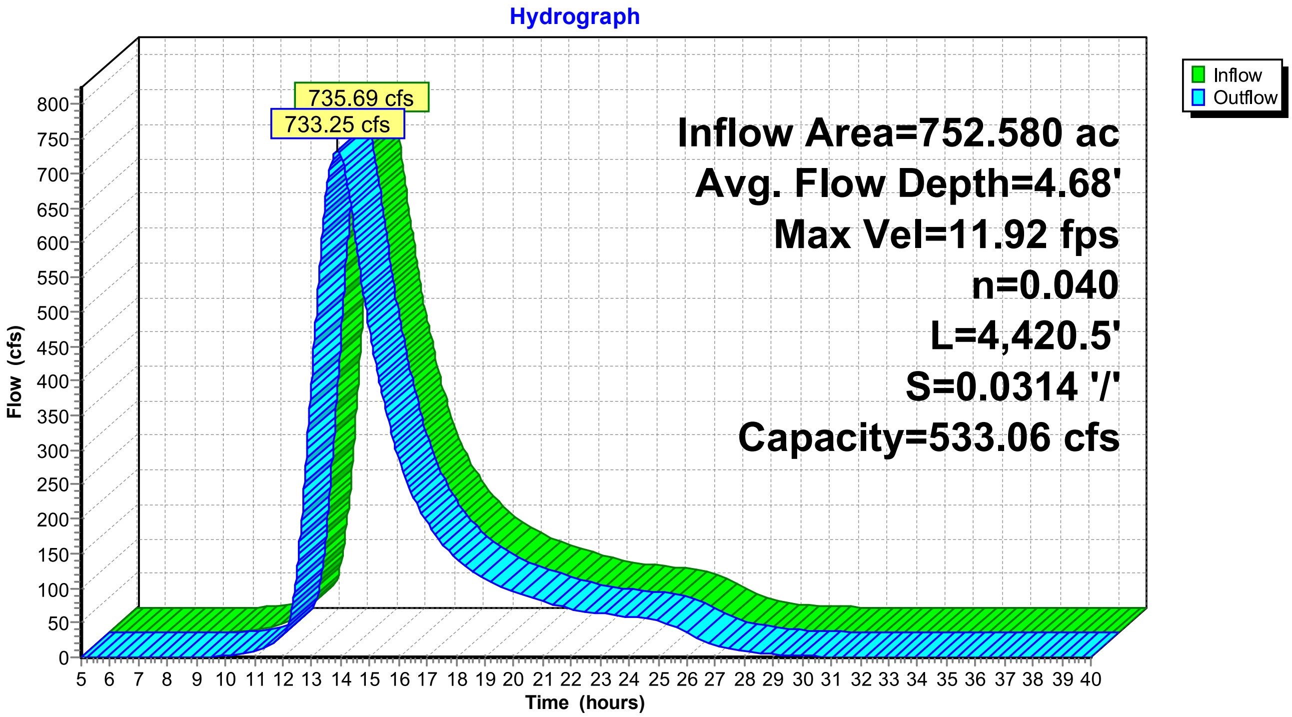
Reach 6R: Ponds



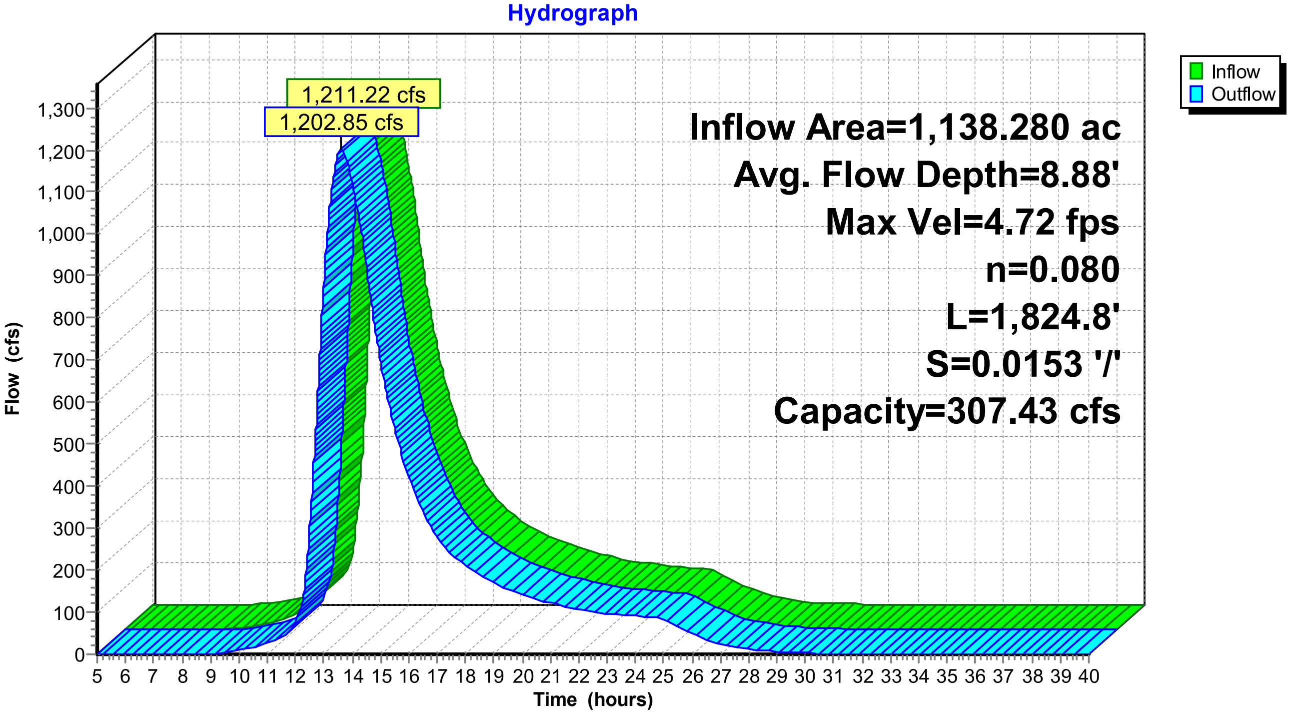
Reach 9R: School



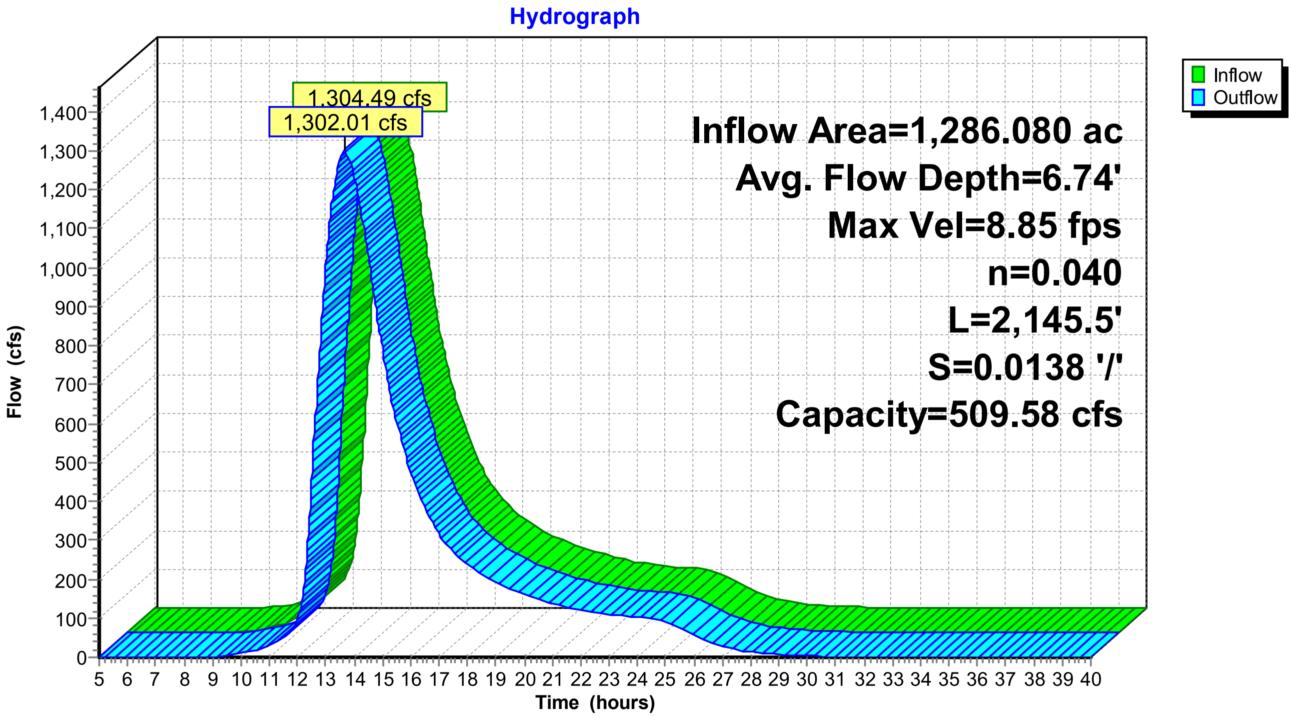
Reach 11R: Commercial



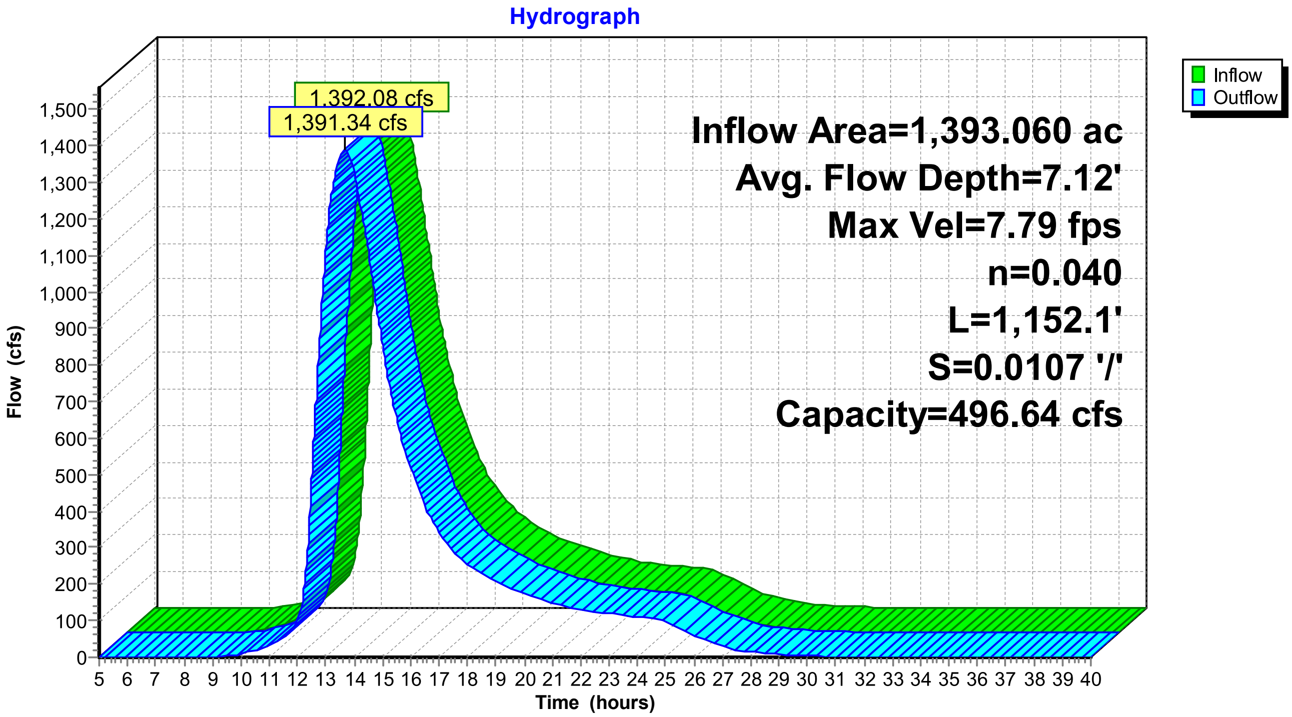
Reach 17R: Park to Penn



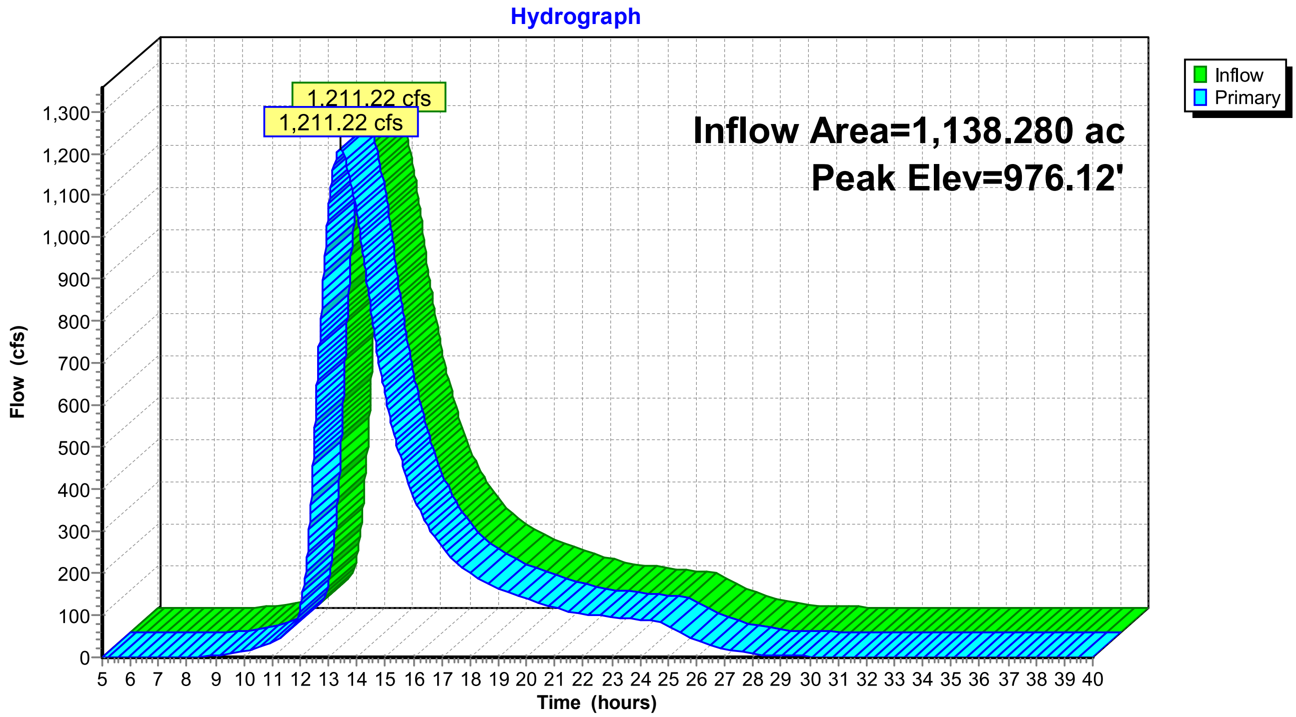
Reach 19R: E. Lake to Penn



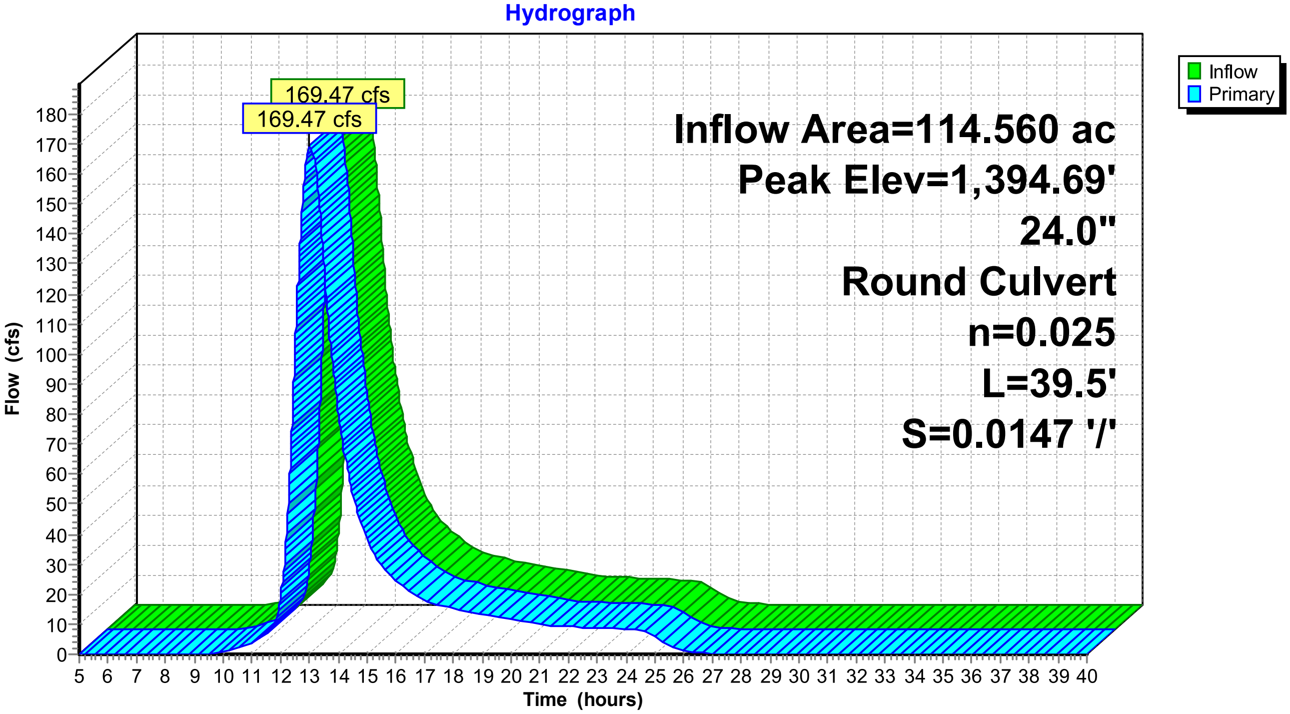
Reach 22R: Wilkins Tract to E. Lake



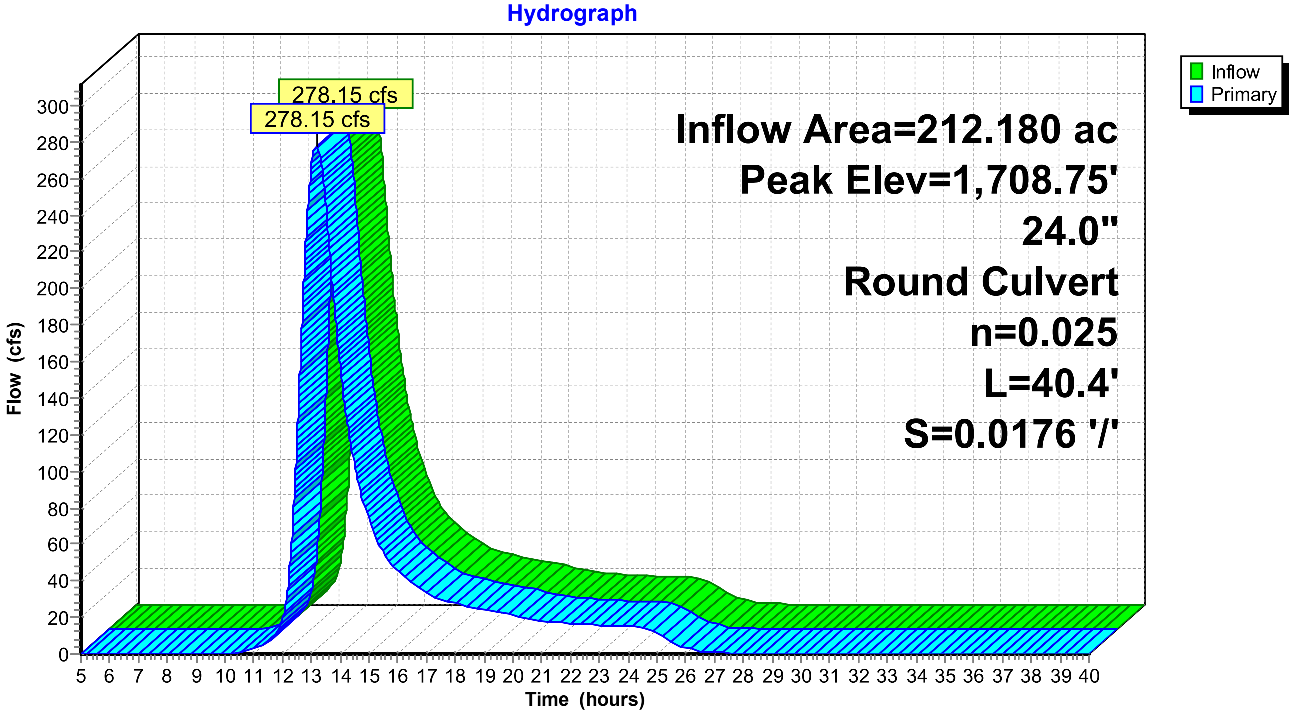
Pond 22P: Park



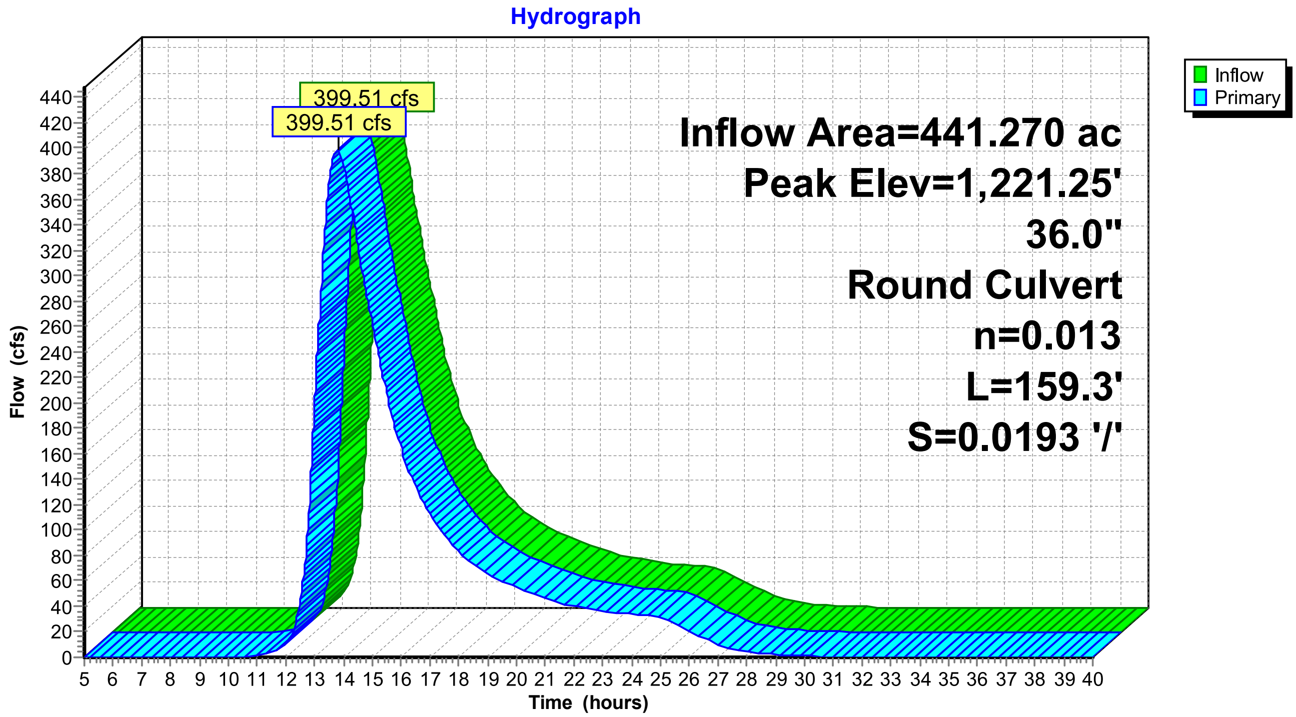
Pond 23P: Cleary Rd.



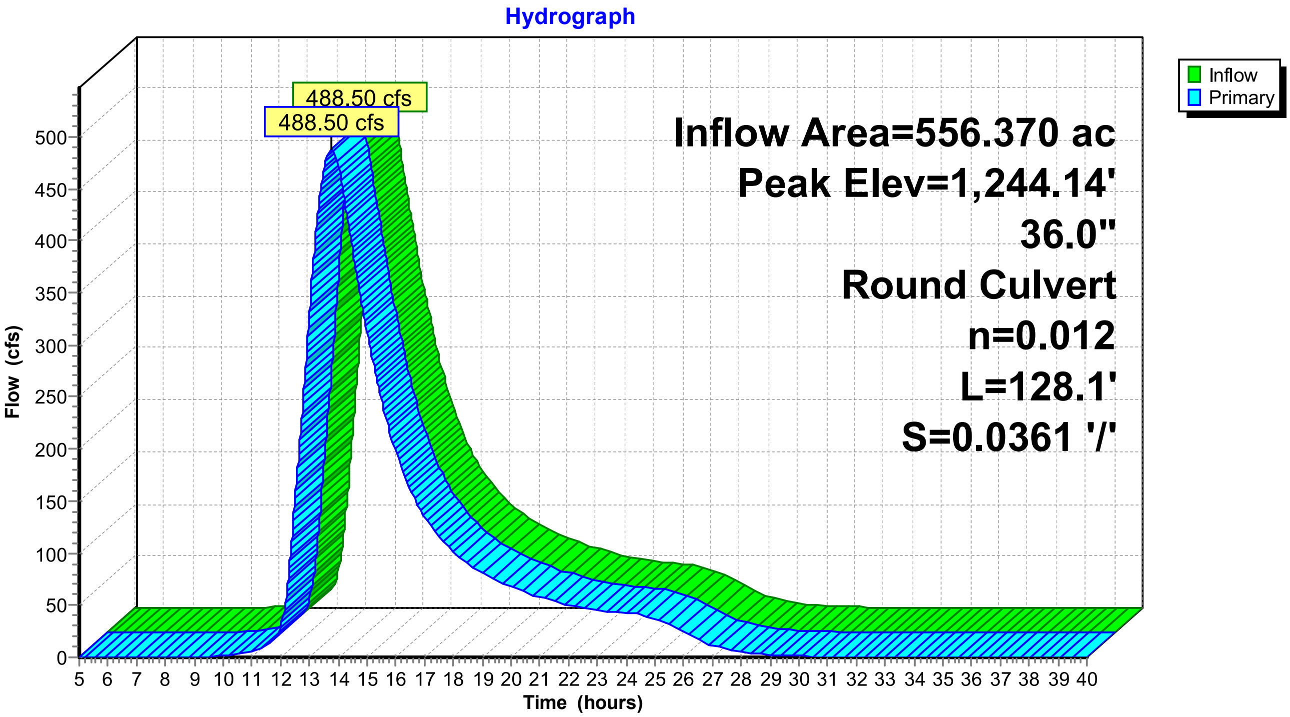
Pond 24P: Shelly Rd.



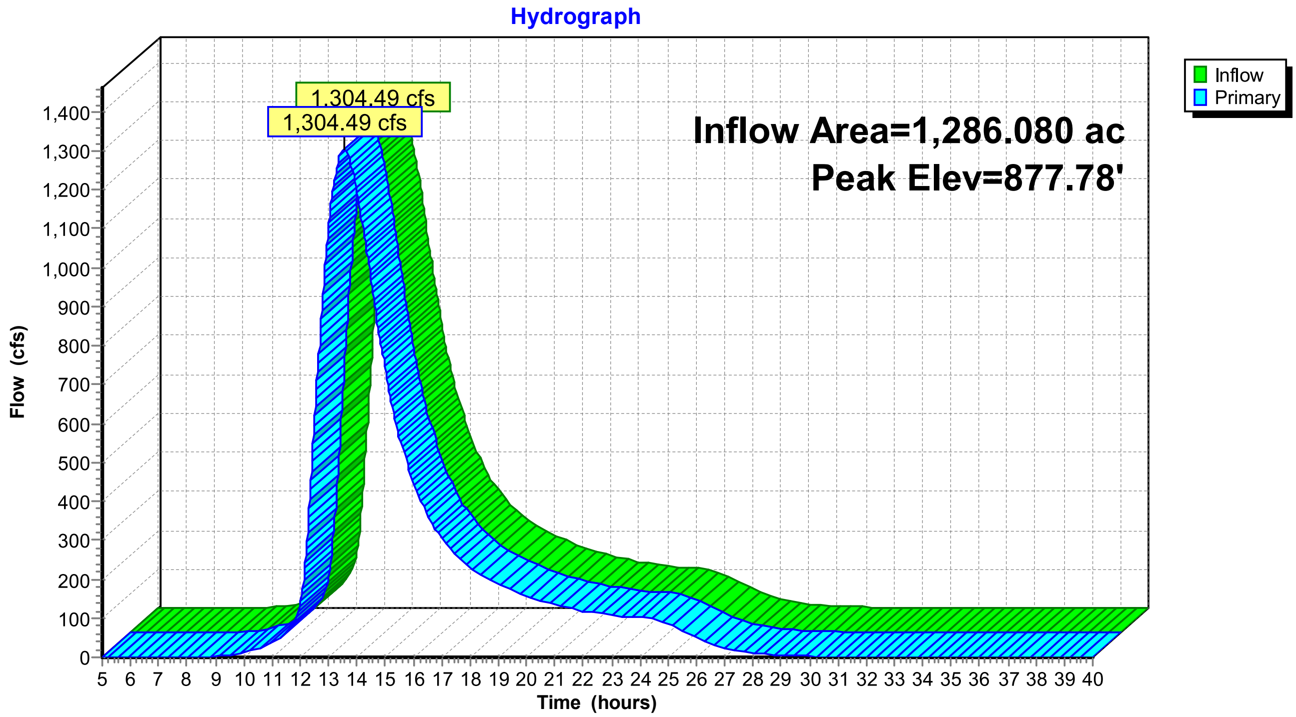
Pond 25P: School



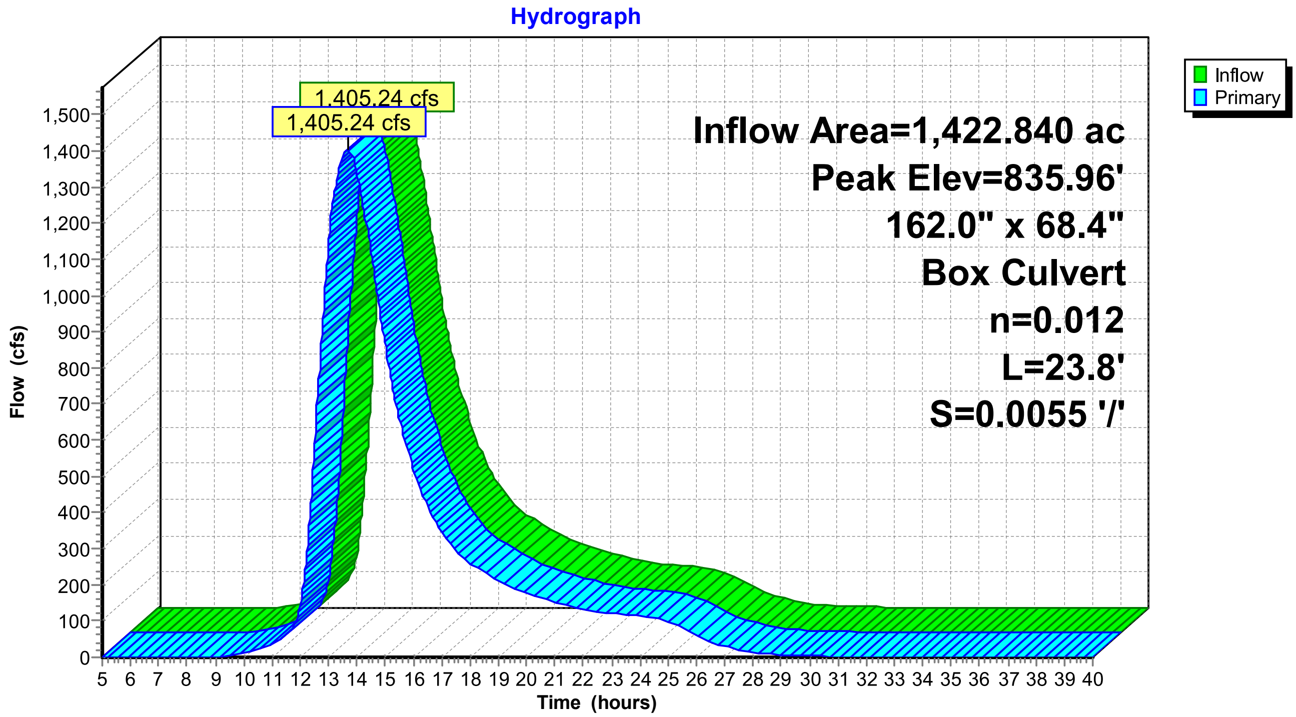
Pond 26P: Commercial St.



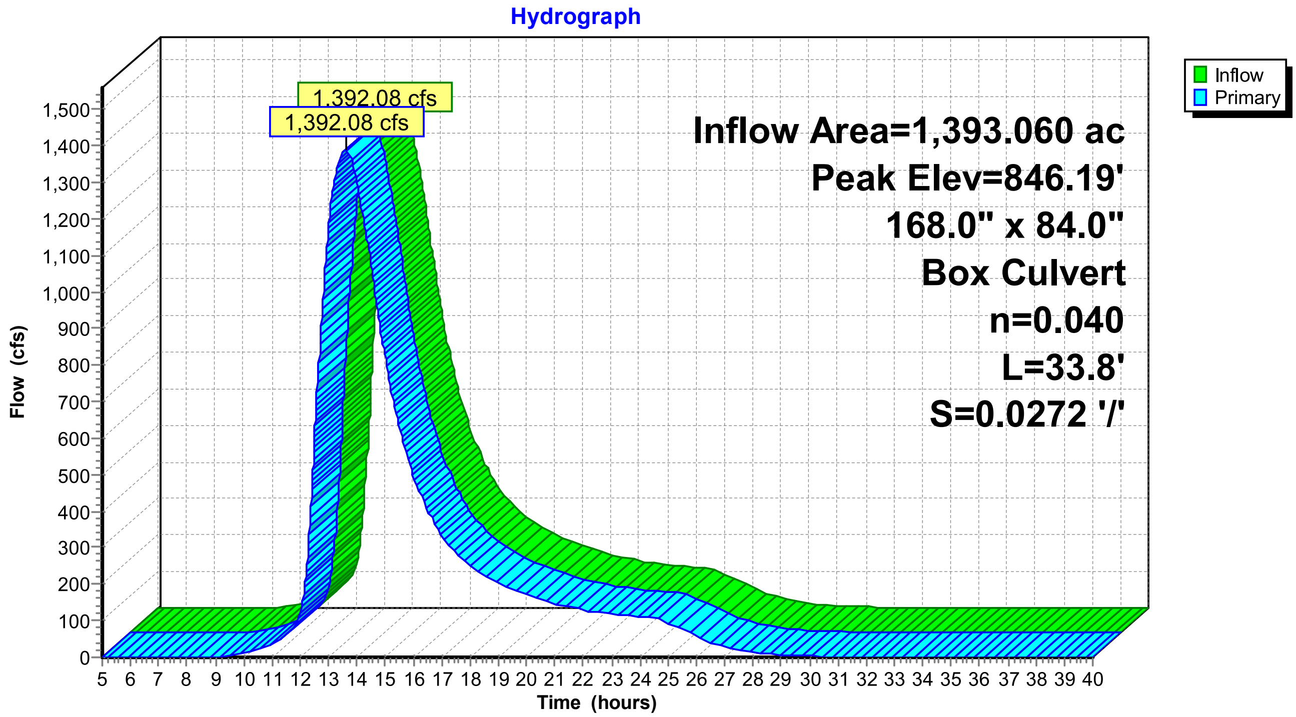
Pond 27P: Pennimite Rd



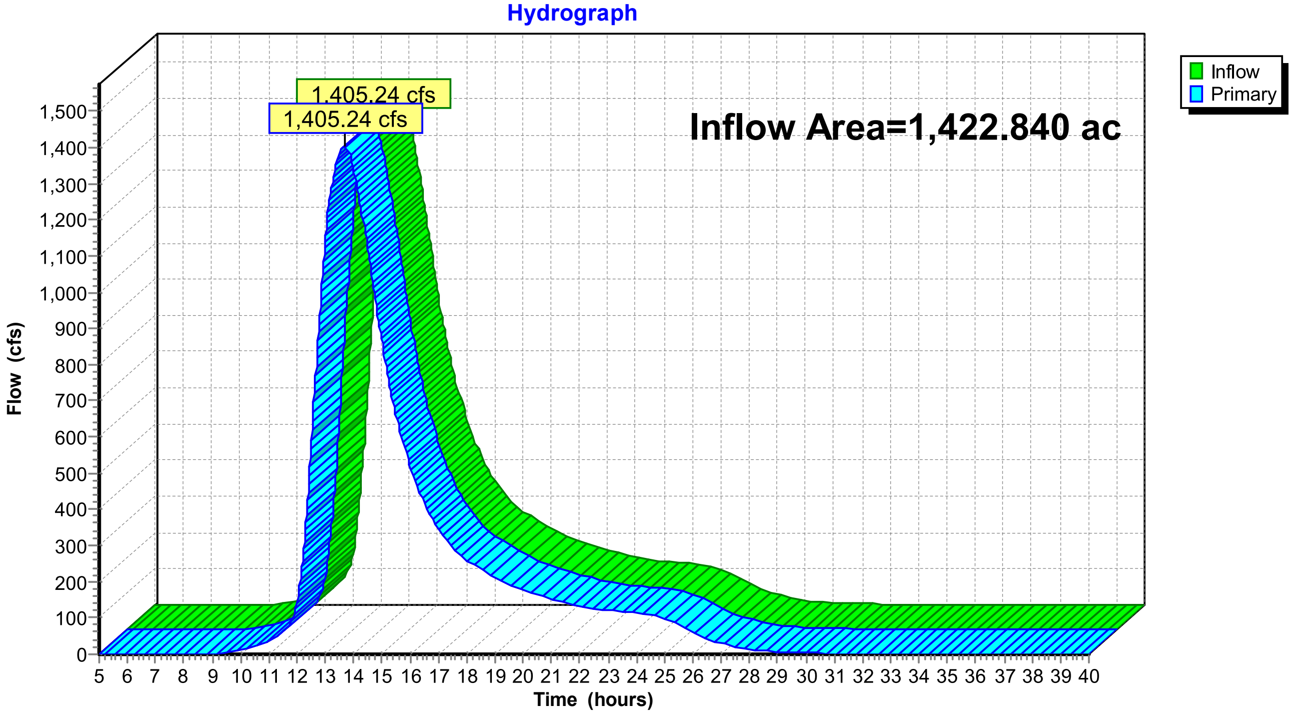
Pond 28P: Wilkins Tract



Pond 29P: E. Lake Rd.



Link 30L: Conesus Lake

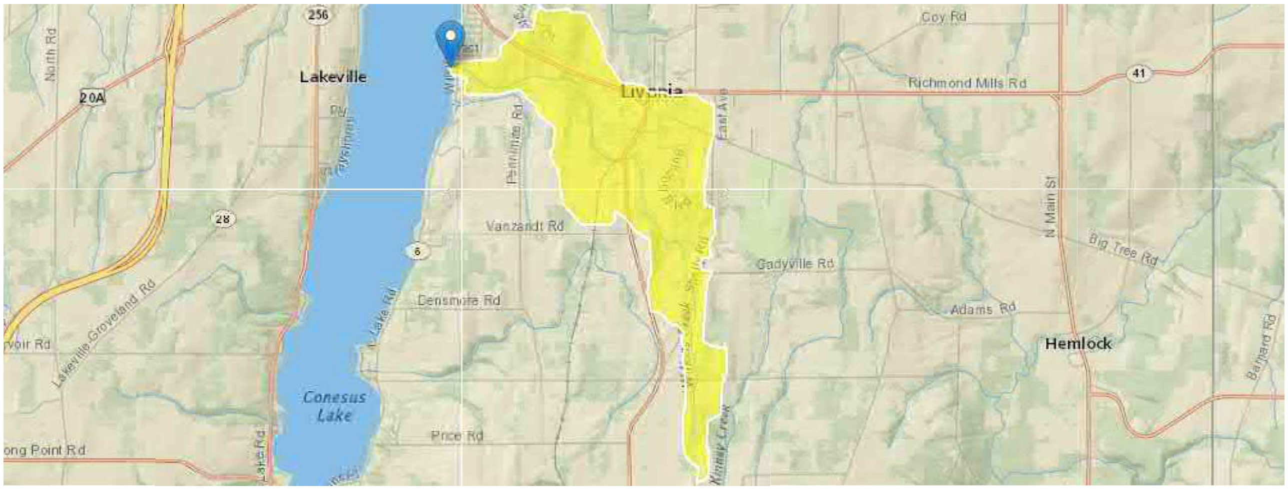


Appendix L

StreamStats Reports

StreamStats Report_Wilkins Creek

Region ID:	NY
Workspace ID:	NY20180702140226453000
Clicked Point (Latitude, Longitude):	42.82405, -77.69701
Time:	2018-07-02 10:02:40 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	2.09	square miles
SLOPERATIO	Ratio of main channel slope to basin slope as defined in SIR 2006-5112	0.3	dimensionless
EL1200	Percentage of basin at or above 1200 ft elevation	9.34	percent
STORAGE	Percentage of area of storage (lakes ponds reservoirs wetlands)	0	percent
MAR	Mean annual runoff for the period of record in inches	10.2	inches
BSLOPCM	Mean basin slope determined by summing lengths of all contours in basin mulitplying by contour interval and dividing product by drainage area	337	feet per mi
CONTOUR	Total length of all elevation contours in drainage area in miles	7.04	miles
LENGTH	Length along the main channel from the measuring location extended to the basin divide	4.45	miles
PRECIP	Mean Annual Precipitation	30.2	inches

Bankfull Statistics Parameters [Bankfull Region 7 SIR2009 5144]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	2.09	square miles	1.07	349

Bankfull Statistics Flow Report [Bankfull Region 7 SIR2009 5144]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu
Bankfull Area	25.8	ft^2	6.88	96.6
Bankfull Depth	1.7	ft	0.427	6.79
Bankfull Streamflow	65.2	ft^3/s	5.33	798
Bankfull Width	15.1	ft	3.94	58.2

Bankfull Statistics Citations

Mulvihill, C.I., Baldigo, B.P., Miller, S.J. , and DeKoskie, Douglas,2009, Bankfull Discharge and Channel Characteristics of Streams in New York State: U.S. Geological Survey Scientific Investigations Report 2009-5144, 51 p. (http://pubs.usgs.gov/sir/2009/5144/)

Peak-Flow Statistics Parameters [2006 Full Region 6]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	2.09	square miles	0.58	2467
SLOPERATIO	Slope Ratio NY	0.3	dimensionless	0.019	0.698
EL1200	Percentage of Basin Above 1200 ft	9.34	percent	0	100
STORAGE	Percent Storage	0	percent	0	5.98
MAR	Mean Annual Runoff in inches	10.2	inches	9.49	22.77

Peak-Flow Statistics Flow Report [2006 Full Region 6]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp	Equiv. Yrs.
1.25 Year Peak Flood	66.1	ft^3/s	34.7	34.7	2.3
1.5 Year Peak Flood	83.1	ft^3/s	33.3	33.3	2
2 Year Peak Flood	105	ft^3/s	32.3	32.3	1.9
5 Year Peak Flood	160	ft^3/s	32.2	32.2	2.4
10 Year Peak Flood	197	ft^3/s	32.9	32.9	3.1
25 Year Peak Flood	243	ft^3/s	34.4	34.4	3.9
50 Year Peak Flood	277	ft^3/s	35.8	35.8	4.5
100 Year Peak Flood	310	ft^3/s	37.2	37.2	4.9
200 Year Peak Flood	343	ft^3/s	39	39	5.2
500 Year Peak Flood	386	ft^3/s	41.4	41.4	5.5

Peak-Flow Statistics Citations

Lumia, Richard, Freehafer, D.A., and Smith, M.J.,2006, Magnitude and Frequency of Floods in New York: U.S. Geological Survey Scientific Investigations Report 2006–5112, 152 p. (http://pubs.usgs.gov/sir/2006/5112/)

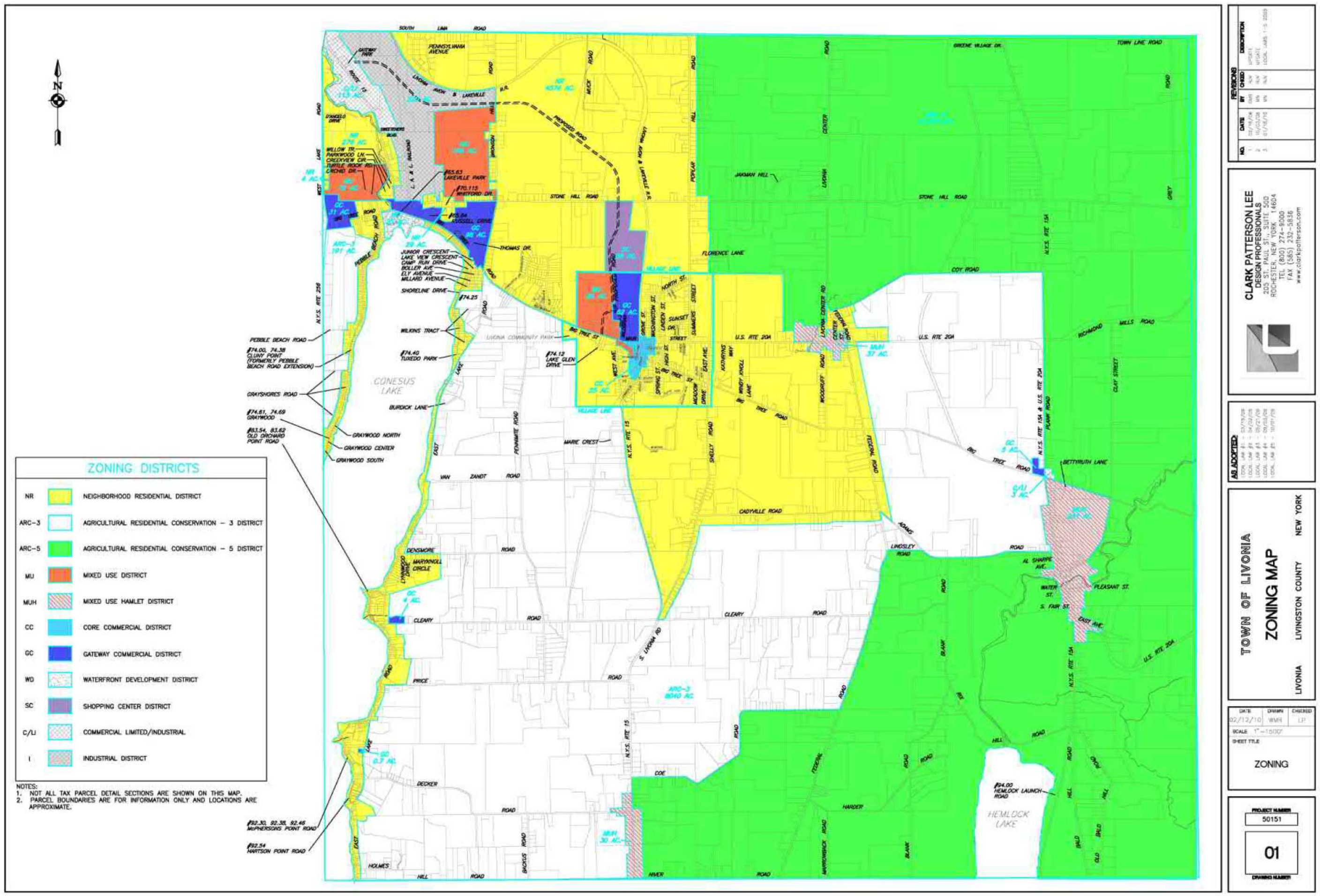
Application Version: 4.2.1

Appendix M

Livonia Zoning Map

150 Attachment 3

Town of Livonia



Appendix N

Project Retrofit Matrix

Potential Project	Photo ID	Drainage Area	Project Type	Location	Water Quantity / Flood reduction	Total Suspended Solids (TSS)	Phosphorus (P)	Nitrogen (N)	Other (Chloride, metals, debris, hydrocarbons)	Potential Owner Participation	Known Constraints (utilities, depth to groundwater, site access, soils)	Permitting	Cost	Maintenance	Fundability	Energy and Air Quality Impacts	Habitat & Biodiversity	Community & Aesthetic Benefits	Human Health Benefits	Educational Opportunities/ Visibility	Public Access	Partner Involvement	Innovation	Total
					Stormwater Benefits					**Constructability**			**Cost**			**Co-Benefits**					**Other**			
				Max Ranking:	10	12	12	5	5	10	5	5	5	5	10	2	2	2	2	2	2	2	2	100
4-1	7, 8, 9, 10	4	Highschool Green Infrastructure (GI)	Livonia Highschool	10	10	10	5	2	10	3	5	5	3	10	1	2	2	1	2	2	2	2	87
4-3	20	4	Pond Retrofit	Livonia Highschool	10	10	10	5	2	10	3	5	5	5	10	0	2	2	0	2	2	2	1	86
9-1	2 & 3	9	Streambank Stabilization	6143 Wilkins Tract, 6073 Wilkins Tract, 3890 East Lake Road, and 3900 East Lake Road	10	12	12	5	2	7	3	1	3	5	10	0	2	2	0	1	0	1	1	77
6-2	21	6	Pond Retrofit	6241 Big Tree Road and adjacent lot with Tax Map ID 74.8-1-1	10	10	10	5	2	3	3	1	5	5	10	0	2	1	0	1	1	1	1	71
5-1	17	5	Porous Pavement	Public Parking Lots (*e.g.,* Gazette, Keystone, Prettejohn, Field, Brooks)	5	5	5	2	5	10	5	5	1	3	10	1	0	2	2	2	2	2	2	69
4-2	5	4	Streambank Stabilization	Behind Livonia Fire Department on South Livonia Road (Village of Livonia property with Tax Map IDs 75.13-1-19.1 and 75.-1-45.11)	5	10	10	5	2	10	3	3	5	3	10	0	1	0	0	0	0	1	1	69
8-1	4	8	Stormwater Management Area	3895 East Lake Road and adjacent lot with Tax Map ID 74.-1-13.132 between East Lake Road and Pennemite Road	10	10	10	5	2	3	3	1	5	5	10	0	2	0	0	0	0	1	1	68
5-3	14, 15, 16	5	Village Green Infrastructure (GI)	Commercial / Main Street	5	5	5	2	5	10	5	3	1	1	10	1	2	2	1	2	2	2	2	66
7-1	22	7	Stormwater Management Area	6138 Big Tree Road	10	10	10	5	2	1	3	1	3	5	10	0	2	0.5	0	0.5	1	1	1	66
6-3	12, 13	6	Streambank Stabilization	4212 South Livonia Road	5	10	10	5	2	7	3	1	5	3	10	0	1	0.5	0.5	0	1	1	1	66
3-1	6	3	Wetland Expansion	Lot with Tax Map ID 84.-1-4.922 south of Livonia High School off Shelly Road	10	10	10	5	2	3	3	1	5	5	5	0	2	0	0	0	0	1	1	63
5-4	17	5	Underground Storage	Under Brooks Public Parking Lot	10	0	0	0	5	10	5	5	1	3	10	1	0	1	1	0	2	1	1	56
2-1	19	2	Riparian Buffer	4589 Shelly Road	0	10	10	5	2	1	3	1	5	5	5	0	2	0	2	0.5	1	0	0	52.5
6-1	18	6	Culvert Modification	Livonia Community Park off Big Tree Road	5	0	0	0	2	10	5	3	1	5	10	0	0.5	1	0	0.5	2	1	1	47
5-2	11	5	Salt Storage Modification	50 Commercial Street	0	0	0	0	5	10	5	5	5	5	0	0	0	0	2	0	2	2	0	41
9-2	1	9	Wing Wall Restoration	6144 Wilkins Tract	0	0	0	0	2	10	1	3	1	5	0	0	0	0.5	1	0.5	1	0	0	25
?	?	?	Additional projects																					

Stormwater Benefits:

Quantity:
0 - negligible reduction in peak flow.
5 - addresses localized flooding (road/culvert overtopping) or GI practice that promotes infiltration or impervious reduction 1,000 - 100,000 sf
10 - creation of stormwater attenuation or impervious reduction over 100,000 sf

TSS & P:
Streambanks:
5 - > 50'
10 - 50' to 249'
12 - 250'+
10 - Wetland & pond retrofits
5 - impervious area reduction
0 - stormwater conveyance modification

N
2 - Impervious area reduction
5 - Wetlands, riparian, & pond retrofits
5 - Roadside stabilization > 500'
5 - Park GI
2 - Streambanks (urban)
5 - Streambanks (rural)
0 - Stormwater conveyance modification

Other
2 - Rural
5 - Urban

Constructability:

Potential Owner Participation
1 - uninterested private owner or significant financial investment
3 - limited interest private owner or significant financial investment
7 - interested private owner or unknown interest level private owner
10 - public

Known Constraints
1 - Constraints identified
3 - Possible constraints identified
5 - No constraints identified

Permitting
1 - Multiple permits required (NYSDEC, ACOE, Local ROW, etc.) and Project is located on Private Property
3 - Multiple permits required (NYSDEC, ACOE, Local ROW, etc.) and Project is located on Public Property
5 - Low permitting demand anticipated

Cost:
1 - >$100,000
3 - >$50,000 < $100,000
5 - <$50,000

Maintenance
1 - >$1 per sf/year
3 - >$.50, < $1 per sf/year
5 - <$.50 per sf/year

Fundability
0- not fundable through stormwater management and flooding prevention grants (GIGP, WQIP)
5 - fundable through one of the above grants
10 - multiple funding sources identified

Co-Benefits modified from "The Value of Green Infrastructure: A Guide to Recognizing its Economic, Environmental, and Social Benefits," Center for Neighborhood Technology and American Rivers, 2010 and "Green Infrastructure Practices and Benefits", National Oceanic and Atmospheric Administration, 2014"
Co-benefits on a scale from 0 (no benefit) to 2 (significant benefit)
Energy and Air Quality Impacts includes: energy use reduction, air quality improvements and atmospheric C02 reduction
Habitat and Biodiversity includes: increases biodiversity, increases habitat connectivity, and provides pollinator habitat
Community and Aesthetic Benefits includes: improved aesthetics, increased recreational opportunities, and increased property values
Human health benefits includes health benefits and accident reduction

Other

Public Access
0 - No Access
1 - Private Property
2 - Public Property

Partner Involvement
0 - No Involvement
1 - Minor Partner Involvement
2 - 50/50 or more Partner Involvement

Innovation
0 - No innovation
5 - Minor Innovation
10 - Major Innovation

Appendix O

Cost Benefit Analyses

Cost Estimates:

Project 4-1: Rain Garden: 800 square foot rain garden at $25 per sq ft (https://home.costhelper.com/rain-garden.html)

Assume 2% O&M
Assume 20% Other cost (includes engineering)

Construction cost = $20,000*1.2 = $24,000
O&M = $24,000 * 0.02 = $500
Other cost = $4,800

Project 4-1: Swale Retrofit: 300 linear feet at $0.50 per square foot
http://www.lakesuperiorstreams.org/stormwater/toolkit/swales.html

Assume 300 linear feet @ 10' wide = 3,000 sq ft.
Assume 2% O&M
Assume 20% Other cost (includes engineering)

Construction cost = $1,500 * 1.2 = $1,800
O&M = $1,800 * 0.02 = (approx..) $100
Other cost = $400

Project 4-1: Vegetated Swale: 400 linear feet at $0.50 per square foot
http://www.lakesuperiorstreams.org/stormwater/toolkit/swales.html

Assume 400 linear feet @10' wide = 4,000 sq ft.
Assume 2% O&M
Assume 20% Other cost (includes engineering)

Construction cost = $2,000 * 1.2 = $2,400
O&M = $2,400 * 0.02 = (approx…) $100
Other Cost = $500

Project 4-3: Pond Retrofit of 34,800 square feet (0.8 acres) at $14,000 per acre
http://www.dnrec.delaware.gov/swc/wa/Documents/AppoPCSdocs/Appendix%20E%20-%20Cost%20Calculations.pdf

Assume O&M of $2,000 per year
Assume 20% Other Cost (includes engineering)

Construction cost = $11,200 * 1.2 = $13,500
O&M = $2,000
Other Cost = $2,700

Project 9-1: Streambank Stabilization: 700 linear feet (approx.. 0.14 mile) at $355,000 per mile
https://www.st.nmfs.noaa.gov/st5/Salmon_Workshop/11_Bair.pdf

Assume no O&M needed
Assume 30% Other cost (includes engineering)

Construction Cost = $49,700 * 1.2 = $60,000
Other Cost = $12,000

Project 6-2: Pond Retrofit of 80,000 square foot (1.84 acres) at $14,000 per acre
http://www.dnrec.delaware.gov/swc/wa/Documents/AppoPCSdocs/Appendix%20E%20-%20Cost%20Calculations.pdf

Assume $2,000 O&M per year
Assume 20% Other cost (includes engineering)

Construction Cost = $26,000 * 1.2 = $31,200
O&M = $2,000
Other Cost = $6,300

Project 5-1: Reduction in Impervious Area: 71,300 square feet at $8 per square foot
http://www.centurywest.com/wp-content/uploads/2013/11/Metro-Porous-Pavement-Cost-Analysis.pdf

Assume O&M of $2,000 to pressure wash once every 3 years
Assume 10% Other cost (includes engineering)

Construction cost = $570,000 * 1.2 = $684,000
O&M = $2,000
Other Cost = $57,000

Project 4-2: Streambank Stabilization at 110 linear feet (0.02 mile) at $355,000 per mile
https://www.st.nmfs.noaa.gov/st5/Salmon_Workshop/11_Bair.pdf

Assume no O&M needed
Assume 30% Other cost (includes engineering)

Construction Cost = $7,100* 1.2 = $8,500
Other Cost = $2,500

Project Project 8-1: Stormwater Management Area with 45,000 sf (1 acres) at $4,500 per acre
http://www.dnrec.delaware.gov/swc/wa/Documents/AppoPCSdocs/Appendix%20E%20-%20Cost%20Calculations.pdf

Assume O&M of $1,000 per year
Assume 20% Other Cost (includes engineering)

Construction cost = $4,500 * 1.2 = $5,400 + assumed $5,000 for grubbing
O&M = $1,000
Other Cost = $1,100

Project 5-3: Village GI at 11,000 square feet at $14 per sf
http://www.centurywest.com/wp-content/uploads/2013/11/Metro-Porous-Pavement-Cost-Analysis.pdf

Assume O&M of $2,000 to pressure wash once every 3 years
Assume 10% Other cost (includes engineering)

Construction cost = $154,000 * 1.2 = $185,000
O&M = $2,000
Other Cost = $18,500

Project 7-1: Stormwater Management Area of 150,000 square feet (3.44 acres)
http://www.dnrec.delaware.gov/swc/wa/Documents/AppoPCSdocs/Appendix%20E%20-%20Cost%20Calculations.pdf

Average cost ~ $60,000
Assume O&M at 1,500 per acre
Assume 20% Other cost (includes engineering)

Construction Cost = $60,000
O&M = 3.44 * $1,500 = $5,200
Other Cost = $12,000

Project 6-3: Streambank Stabilization at 30 linear feet (0.01 mile) at $355,000 per mile
https://www.st.nmfs.noaa.gov/st5/Salmon_Workshop/11_Bair.pdf

Assume no O&M needed
Assume 30% Other cost (includes engineering)

Construction Cost = $3,600* 1.2 = $4,400 ~ round up to $5,000
Other Cost = $1,400 ~ round up to $2,000

Project 3-1: Wetland Expansion of 100,000 sq ft (2.3 ac) at $4,500 per acre
http://www.dnrec.delaware.gov/swc/wa/Documents/AppoPCSdocs/Appendix%20E%20-%20Cost%20Calculations.pdf

Assume O&M of $1,000 per year
Assume 20% Other Cost (includes engineering)

Construction cost = $10,350 * 1.2 = $13,000 + assumed $5,000 for grubbing
O&M = $1,000
Other Cost = $7,000

Project 5-4: Underground Storage – assume storage sized to collect runoff from public parking lots (~71,300 ft^2) for a 10-year storm: two 10' diameter basins at 120' long each.
https://www3.epa.gov/region1/npdes/stormwater/ma/green-infrastructure-stormwater-bmp-cost-estimation.pdf

Assume 2% O&M
Assume 35% other cost (includes engineering and contingencies)

Construction Cost + Other Cost = $67.85 * 18,850 ft^3 = $1,279,000
Construction Cost = $831,300
Other cost = $447,700

Project 2-1: Riparian Buffer at 15,000 sq ft (0.35 ac) at $500 / acre + critical paltnings at $7,300 per acre
http://www.dnrec.delaware.gov/swc/wa/Documents/AppoPCSdocs/Appendix%20E%20-%20Cost%20Calculations.pdf

Assume O&M of $1,000 per year
Assume 20% Other Cost (includes engineering)

Construction cost = [$200 + $2600] *1.2 = $3,400
O&M = $1,000
Other Cost = $700 ~ round up to $1,000

Project 6-1: Culvert Modification with 20 linear feet (6 m) at $17,100 per meter for 10m length at 4 m2 cross sectional area
http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/SC080039_cost_culverts.sflb.ashx

Assume no O&M
Assume 20% other cost (includes engineering)

Construction cost = $171,000 * 1.2 = 205,200
Other Cost = $41,000

Project 5-2: Salt Storage Modification – assume modifying roof overhang and berm
https://www.homeadvisor.com/cost/roofing/install-a-roof/

Assume no O&M
Assume 20% other cost (includes engineering)

Construction Cost = $30,000 * 1.2 = 36,000
Other cost = $7,200

Project 9-2: Wing Wall Restoration – assume similar to Brown County case study where total cost = $136,000
https://www.ksdot.org/Assets/wwwksdotorg/bureaus/NEKansas/pdf2015/U.S.%2036%20Bridge%20Wing%20Wall%20Replacement%20Project%20to%20Begin%20in%20Brown%20County.pdf

Assume no O&M
Assume 20% other cost (includes engineering)

Construction Cost = 80% * $136,000 = 108,800
Other cost = $27,200
Excluding 20% contingency as case study found

Project 4-2

Gully and Streambank Pollutant Load Reduction	
This sheet contains two input tables: the first table is for inputing the gully dimensions, and the second is for inputing the eroding streambank dimensions.	
Gully:	**Step 1.** Specify the gully dimensions and assign each gully to a watershed. **Step 2.** Specify the time (number of years) that the gully has taken to form the current size. **Step 3.** Specify the gully stabilization (BMP) efficiency (0-1) and the gully soil textural class.
Streambank:	**Step 1.** Specify the stream bank dimensions and assign each bank to a watershed. **Step 2.** Specify the lateral recession rate (ft/yr) of the eroding streambank. Click to see "Streambank Lateral Recession Rate" table **Step 3.** Specify the streambank stabilization (BMP) efficiency (0-1) and the streambank soil textural class.

Close this sheet

1. Gully dimensions in the different watersheds

Watershed	Gully	Top Width (ft)	Bottom Width (ft)	Depth (ft)	Length (ft)	Years to Form	BMP Efficiency (0-1)	Soil Textural Class	Soil Dry Weight (ton/ft3)	Nutrient Correction Factor	Annual Load (ton)	Load Reduction (ton)

2. Impaired streambank dimensions in the different watersheds

Watershed	Strm Bank	Length (ft)	Height (ft)	Lateral Recession	Rate Range (ft/yr)	Rate (ft/yr)	BMP Efficiency (0-1)	Soil Textural Class	Soil Dry Weight (ton/ft3)	Nutrient Correction Factor	Annual Load (ton)	Load Reduction (ton)
W1	Proj. 4.2	110	2	2. Moderat	0.06 - 0.2	0.13	0.95	Silt Loam	0.0425	1	1.2155	1.1547

Project 4-2

Total Load	This is the summary of annual nutrient and sediment load for each subwatershed. This sheet is initially protected.

1. Total load by subwatershed(s)

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Reduction	P Reduction	BOD Reduction	Sediment Reduction	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	%	%	%	%
Project 4.2	3.6	1.6	7.3	1.2	3.5	1.5	6.9	1.2	0.2	0.1	0.4	0.1	95.0	95.0	95.0	95.0
W2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W4*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	3.6	1.6	7.3	1.2	3.5	1.5	6.9	1.2	0.2	0.1	0.4	0.1	95.0	95.0	95.0	95.0

2. Total load by land uses (with BMP)

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	0.00	0.00	0.00	0.00
Cropland	0.00	0.00	0.00	0.00
Pastureland	0.00	0.00	0.00	0.00
Forest	0.00	0.00	0.00	0.00
Feedlots	0.00	0.00	0.00	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	0.00	0.00	0.00	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.18	0.08	0.36	0.06
Groundwater	0.00	0.00	0.00	0.00
Total	0.18	0.08	0.36	0.06

Project 4-1

STEPL Input Sheet: Values in RED are required input. Change worksheets by clicking on tabs at the bottom. You entered 5 subwatershed(s).
This sheet is composed of eight input tables. The first four tables require users to change initial values. The next four tables (initially hidden) contain default values users may choose to change.
Step 1: Select the state and county where your watersheds are located. Select a nearby weather station. This will automatically specify values for rainfall parameters in Table 1 and USLE parameters in Table 4.
Step 2: (a) Enter land use areas in acres in Table 1; (b) enter total number of agricultural animals by type and number of months per year that manure is applied to croplands in Table 2; (c) enter values for septic system parameters in Table 3; and (d) if desired, modify USLE parameters associated with the selected county in Table 4.
Step 3: You may stop here and proceed to the BMPs sheet. If you have more detailed information on your watersheds, click the Yes button in row 10 to display optional input tables.
Step 4: (a) Specify the representative Soil Hydrologic Group (SHG) and soil nutrient concentrations in Table 5; (b) modify the curve number table by landuse and SHG in Table 6; (c) modify the nutrient concentrations (mg/L) in runoff in Table 7; and (d) specify the detailed land use distribution in the urban area in Table 8.
Step 5: Select BMPs in BMPs sheet. **Step 6**: View the estimates of loads and load reductions in Total Load and Graphs sheets.

☐ **Treat all the subwatersheds as parts of a single watershed** ☐ **Groundwater load calculation**

State	County	Weather Station
New York	Livingston	NY ROCHESTER INTL AP

1. Input watershed land use area (ac) and precipitation (in)

									Rain correction factors		
									0.765	0.292	
Watershed	Urban	Cropland	Pastureland	Forest	User Defined	Feedlots	Feedlot Percent Paved	Total	Annual Rainfall	Rain Days	Avg. Rain/Event
4.1 - Rain Garden	21.7	13	70.8	9.5	0	0	0-24%	115	34.42	134.9	0.668
4.1 - Swale Retrofit	21.7	13	70.8	9.5	0	0	0-24%	115	34.42	134.9	0.668
4.1 - Vegetated Swale	21.7	13	70.8	9.5	0	0	0-24%	115	34.42	134.9	0.668
W4	0	0	0	0	0	0	0-24%	0	34.42	134.9	0.668
W5	0	0	0	0	0	0	0-24%	0	34.42	134.9	0.668

2. Input agricultural animals

Watershed	Beef Cattle	Dairy Cattle	Swine (Hog)	Sheep	Horse	Chicken	Turkey	Duck	# of months manure applied
W1	0	0	0	0	0	0	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	

3. Input septic system and illegal direct wastewater discharge data

Watershed	No. of Septic Systems	Population per Septic System	Septic Failure Rate, %	Wastewater Direct Discharge, # of People	Direct Discharge Reduction, %
W1	0	2.43	2	0	0
W2	0	2.43	2	0	0
W3	0	2.43	2	0	0
W4	0	2.43	2	0	0
W5	0	2.43	2	0	0

4. Modify the Universal Soil Loss Equation (USLE) parameters

Watershed	Cropland					Pastureland					Forest				
	R	K	LS	C	P	R	K	LS	C	P	R	K	LS	C	P
W1	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W2	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W3	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W4	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W5	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000

Project 4-1

Optional Data Input:

5. Select average soil hydrologic group (SHG), SHG A = highest infiltration and SHG D = lowest infiltration

Watershed	SHG A	SHG B	SHG C	SHG D	SHG Selected	Soil N conc.%	Soil P conc.%	Soil BOD conc.%
W1	○	◉	○	○	B	0.150	0.066	0.300
W2	○	◉	○	○	B	0.150	0.066	0.300
W3	○	◉	○	○	B	0.150	0.066	0.300
W4	○	○	○	◉	D	0.150	0.066	0.300
W5	○	○	○	◉	D	0.150	0.066	0.300

6. Reference runoff curve number (may be modified)

SHG	A	B	C	D
Urban	83	89	92	93
Cropland	67	78	85	89
Pastureland	49	69	79	84
Forest	39	60	73	79
User Defined	50	70	80	85

6a. Detailed urban reference runoff curve number (may be modified)

Urban\SHG	A	B	C	D
Commercial	89	92	94	95
Industrial	81	88	91	93
Institutional	81	88	91	93
Transportation	98	98	98	98
Multi-Family	77	85	90	92
Single-Family	57	72	81	86
Urban-Cultivat	67	78	85	89
Vacant-Develo	77	85	90	92
Open Space	49	69	79	84

7. Nutrient concentration in runoff (mg/l)

Land use	N	P	BOD
1. L-Cropland	**1.9**	**0.3**	**4**
1a. w/ manure	8.1	2	12.3
2. M-Cropland	**2.9**	**0.4**	**6.1**
2a. w/ manure	12.2	3	18.5
3. H-Cropland	**4.4**	**0.5**	**9.2**
3a. w/ manure	18.3	4	24.6
4. Pastureland	**4**	**0.3**	**13**
5. Forest	**0.2**	**0.1**	**0.5**
6. User Defined	**0**	**0**	**0**

7a. Nutrient concentration in shallow groundwater (mg/l) (may be modified)

Landuse	N	P	BOD
Urban	1.5	0.063	0
Cropland	1.44	0.063	0
Pastureland	1.44	0.063	0
Forest	0.11	0.009	0
Feedlot	6	0.07	0
User-Defined	0	0	0

8. Input or modify urban land use distribution

Watershed	Urban Area (ac.)	Commercial %	Industrial %	Institutional %	Transportation %	Multi-Family %	Single-Family %	Urban-Cultivated %	Vacant (developed)	Open Space %	Total % Area
W1	21.7	18	0	0	0	36	46	0	0	0	100
W2	21.7	18	0	0	0	36	46	0	0	0	100
W3	21.7	18	0	0	0	36	46	0	0	0	100
W4	0	0	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0	0	0

9. Input irrigation area (ac) and irrigation amount (in)

Watershed	Total Cropland (ac)	Cropland: Acres Irrigated	Water Depth (in) per Irrigation - Before BMP	Water Depth (in) per Irrigation - After BMP	Irrigation Frequency (#/Year)
W1	13	0	0	0	0
W2	13	0	0	0	0
W3	13	0	0	0	0
W4	0	0	0	0	0
W5	0	0	0	0	0

Input Ends Here.

Project 4-1

Urban Runoff BMP and Pollutant Load Reduction

Urban BMP Tool | Close

1. Urban pollutant concentration in runoff (mg/l)

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Famil	Single-Fam	Urban-Cult	Vacant (de	Open Space
TN	2	2.5	1.8	3	2.2	2.2	1.9	1.5	1.5
TP	0.2	0.4	0.3	0.5	0.4	0.4	0.3	0.15	0.15
BOD	9.3	9	7.8	9.3	10	10	4	4	4
TSS	75	120	67	150	100	100	150	70	70

2. Urban landuse distribution

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Famil	Single-Fam	Urban-Cult	Vacant (de	Open Space
W1	3.906	0	0	0	7.812	9.982	0	0	0
W2	3.906	0	0	0	7.812	9.982	0	0	0
W3	3.906	0	0	0	7.812	9.982	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0

2a. Effective BMP application area (ac)

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Famil	Single-Fam	Urban-Cult	Vacant (de	Open Spac
W1	3.91	0	0	0	2.81	9.982	0	0	0
W2	3.91	0	0	0	3.16	9.982	0	0	0
W3	3.91	0	0	0	0.7	9.982	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0

3. Selected urban BMPs

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Famil	Single-Fam	Urban-Cult	Vacant (de	Open Space
W1	Infiltration B	0 No BMP	0 No BMP	0 No BMP	Infiltration B	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W2	User Define	0 No BMP	0 No BMP	0 No BMP	User Define	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W3	Grass Swal	0 No BMP	0 No BMP	0 No BMP	Grass Swal	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W4	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W5	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP

3a. Percentage of BMP effective area (%)

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Famil	Single-Fam	Urban-Cult	Vacant (de	Open Spac
W1	100.10241	0	0	0	35.970302	100	0	0	0
W2	100.10241	0	0	0	40.450589	100	0	0	0
W3	100.10241	0	0	0	8.9605735	100	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0

4. Pollutant loads from urban in lb/year

Watershed	Pre-BMP Load				Load Reduction				After BMP Load			
	N	P	BOD	TSS	N	P	BOD	TSS	N	P	BOD	TSS
W1	78.91715	12.480937	361.10074	3405.5675	20.817254	2.8851618	0	1046.4773	58.099896	9.5957751	361.10074	2359.0902
W2	78.91715	12.480937	361.10074	3405.5675	10.851248	2.0993067	94.576575	1099.6999	68.065901	10.38163	266.52416	2305.8676
W3	78.91715	12.480937	361.10074	3405.5675	2.5800844	0.7053785	35.899629	644.15258	76.337065	11.775558	325.20111	2761.4149
W4	0	0	0	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0	0	0	0

Project 4-1

Total Load	This is the summary of annual nutrient and sediment load for each subwatershed. This sheet is initially protected.

1. Total load by subwatershed(s)

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Reduction	P Reduction	BOD Reduction	Sediment Reduction	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	%	%	%	%
4.1 - Rain Gar	768.1	209.7	2074.6	66.6	20.8	2.9	0.0	0.5	747.3	206.8	2074.6	66.1	2.7	1.4	0.0	0.8
4.1 - Swale Re	768.1	209.7	2074.6	66.6	10.9	2.1	94.6	0.5	757.3	207.6	1980.1	66.1	1.4	1.0	4.6	0.8
4.1 - Vegetate	768.1	209.7	2074.6	66.6	2.6	0.7	35.9	0.3	765.5	209.0	2038.7	66.3	0.3	0.3	1.7	0.5
W4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	2304.3	629.0	6223.9	199.9	34.2	5.7	130.5	1.4	2270.1	623.3	6093.4	198.5	1.5	0.9	2.1	0.7

2. Total load by land uses (with BMP)

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	202.50	31.75	952.83	3.71
Cropland	654.38	259.44	1319.38	92.24
Pastureland	1403.30	327.53	3799.49	101.50
Forest	9.91	4.59	21.72	1.02
Feedlots	0.00	0.00	0.00	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	0.00	0.00	0.00	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.00	0.00	0.00	0.00
Groundwater	0.00	0.00	0.00	0.00
Total	2270.09	623.31	6093.42	198.47

Gully and Streambank Pollutant Load Reduction	
This sheet contains two input tables: the first table is for inputing the gully dimensions, and the second is for inputing the eroding streambank dimensions.	
Gully:	**Step 1.** Specify the gully dimensions and assign each gully to a watershed. **Step 2.** Specify the time (number of years) that the gully has taken to form the current size. **Step 3.** Specify the gully stabilization (BMP) efficiency (0-1) and the gully soil textural class.
Streambank:	**Step 1.** Specify the stream bank dimensions and assign each bank to a watershed. **Step 2.** Specify the lateral recession rate (ft/yr) of the eroding streambank. Click to see "Streambank Lateral Recession Rate" table **Step 3.** Specify the streambank stabilization (BMP) efficiency (0-1) and the streambank soil textural class.

Close this sheet

1. Gully dimensions in the different watersheds

Watershed	Gully	Top Width (ft)	Bottom Width (ft)	Depth (ft)	Length (ft)	Years to Form	BMP Efficiency (0-1)	Soil Textural Class	Soil Dry Weight (ton/ft3)	Nutrient Correction Factor	Annual Load (ton)	Load Reduction (ton)

2. Impaired streambank dimensions in the different watersheds

Watershed	Strm Bank	Length (ft)	Height (ft)	Lateral Recession	Rate Range (ft/yr)	Rate (ft/yr)	BMP Efficiency (0-1)	Soil Textural Class	Soil Dry Weight (ton/ft3)	Nutrient Correction Factor	Annual Load (ton)	Load Reduction (ton)
W	Project 9.1	700	4	3. Severe	0.3 - 0.5	0.4	0.95	Silt Loam	0.0425	1	47.6000	45.2200

Project 9-1

Total Load	This is the summary of annual nutrient and sediment load for each subwatershed. This sheet is initially protected.

1. Total load by subwatershed(s)

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Reduction	P Reduction	BOD Reduction	Sediment Reduction	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	%	%	%	%
Project 9.1	142.8	62.8	285.6	47.6	135.7	59.7	271.3	45.2	7.1	3.1	14.3	2.4	95.0	95.0	95.0	95.0
W2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W4*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	142.8	62.8	285.6	47.6	135.7	59.7	271.3	45.2	7.1	3.1	14.3	2.4	95.0	95.0	95.0	95.0

2. Total load by land uses (with BMP)

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	0.00	0.00	0.00	0.00
Cropland	0.00	0.00	0.00	0.00
Pastureland	0.00	0.00	0.00	0.00
Forest	0.00	0.00	0.00	0.00
Feedlots	0.00	0.00	0.00	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	0.00	0.00	0.00	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	7.14	3.14	14.28	2.38
Groundwater	0.00	0.00	0.00	0.00
Total	7.14	3.14	14.28	2.38

Project 6-3

Gully and Streambank Pollutant Load Reduction

This sheet contains two input tables: the first table is for inputing the gully dimensions, and the second is for inputing the eroding streambank dimensions.

Gully:	**Step 1.** Specify the gully dimensions and assign each gully to a watershed. **Step 2.** Specify the time (number of years) that the gully has taken to form the current size. **Step 3.** Specify the gully stabilization (BMP) efficiency (0-1) and the gully soil textural class.
Streambank:	**Step 1.** Specify the stream bank dimensions and assign each bank to a watershed. **Step 2.** Specify the lateral recession rate (ft/yr) of the eroding streambank. Click to see "Streambank Lateral Recession Rate" table **Step 3.** Specify the streambank stabilization (BMP) efficiency (0-1) and the streambank soil textural class.

Close this sheet

1. Gully dimensions in the different watersheds

Watershed	Gully	Top Width (ft)	Bottom Width (ft)	Depth (ft)	Length (ft)	Years to Form	BMP Efficiency (0-1)	Soil Textural Class	Soil Dry Weight (ton/ft3)	Nutrient Correction Factor	Annual Load (ton)	Load Reduction (ton)

2. Impaired streambank dimensions in the different watersheds

Watershed	Strm Bank	Length (ft)	Height (ft)	Lateral Recession	Rate Range (ft/yr)	Rate (ft/yr)	BMP Efficiency (0-1)	Soil Textural Class	Soil Dry Weight (ton/ft3)	Nutrient Correction Factor	Annual Load (ton)	Load Reduction (ton)
W1	Project 6.3	30	3	3. Se	0.3 - 0.5	0.4	0.95	Silt Loam	0.0425	1	1.5300	1.4535

Project 6-3

Total Load This is the summary of annual nutrient and sediment load for each subwatershed. This sheet is initially protected.

1. Total load by subwatershed(s)

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Reduction	P Reduction	BOD Reduction	Sediment Reduction	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	%	%	%	%
Project 6.3	4.6	2.0	9.2	1.5	4.4	1.9	8.7	1.5	0.2	0.1	0.5	0.1	95.0	95.0	95.0	95.0
W2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W4*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	4.6	2.0	9.2	1.5	4.4	1.9	8.7	1.5	0.2	0.1	0.5	0.1	95.0	95.0	95.0	95.0

2. Total load by land uses (with BMP)

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	0.00	0.00	0.00	0.00
Cropland	0.00	0.00	0.00	0.00
Pastureland	0.00	0.00	0.00	0.00
Forest	0.00	0.00	0.00	0.00
Feedlots	0.00	0.00	0.00	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	0.00	0.00	0.00	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.23	0.10	0.46	0.08
Groundwater	0.00	0.00	0.00	0.00
Total	0.23	0.10	0.46	0.08

Project 5-1

STEPL Input Sheet: Values in RED are required input. Change worksheets by clicking on tabs at the bottom. You entered 5 subwatershed(s).

This sheet is composed of eight input tables. The first four tables require users to change initial values. The next four tables (initially hidden) contain default values users may choose to change.

Step 1: Select the state and county where your watersheds are located. Select a nearby weather station. This will automatically specify values for rainfall parameters in Table 1 and USLE parameters in Table 4.

Step 2: (a) Enter land use areas in acres in Table 1; (b) enter total number of agricultural animals by type and number of months per year that manure is applied to croplands in Table 2;
(c) enter values for septic system parameters in Table 3; and (d) if desired, modify USLE parameters associated with the selected county in Table 4.

Step 3: You may stop here and proceed to the BMPs sheet. If you have more detailed information on your watersheds, click the Yes button in row 10 to display optional input tables.

Step 4: (a) Specify the representative Soil Hydrologic Group (SHG) and soil nutrient concentrations in Table 5; (b) modify the curve number table by landuse and SHG in Table 6;
(c) modify the nutrient concentrations (mg/L) in runoff in Table 7; and (d) specify the detailed land use distribution in the urban area in Table 8.

Step 5: Select BMPs in BMPs sheet. **Step 6**: View the estimates of loads and load reductions in Total Load and Graphs sheets.

☐ Treat all the subwatersheds as parts of a single watershed ☐ Groundwater load calculation

State	County	Weather Station
New York	Livingston	NY ROCHESTER INTL AP

1. Input watershed land use area (ac) and precipitation (in)

Rain correction factors: 0.765 | 0.292

Watershed	Urban	Cropland	Pastureland	Forest	User Defined	Feedlots	Feedlot Percent Paved	Total	Annual Rainfall	Rain Days	Avg. Rain/Event
5.1 - Porous Pavemer	1.64	0	0	0	0	0		1.64	34.42	134.9	0.668
W2	0	0	0	0	0	0		0	34.42	134.9	0.668
W3	0	0	0	0	0	0		0	34.42	134.9	0.668
W4	0	0	0	0	0	0		0	34.42	134.9	0.668
W5	0	0	0	0	0	0		0	34.42	134.9	0.668

2. Input agricultural animals

Watershed	Beef Cattle	Dairy Cattle	Swine (Hog)	Sheep	Horse	Chicken	Turkey	Duck	# of months manure applied
W1	0	0	0	0	0	0	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	

3. Input septic system and illegal direct wastewater discharge data

Watershed	No. of Septic Systems	Population per Septic System	Septic Failure Rate, %	Wastewater Direct Discharge, # of People	Direct Discharge Reduction, %
W1	0	2.43	2	0	0
W2	0	2.43	2	0	0
W3	0	2.43	2	0	0
W4	0	2.43	2	0	0
W5	0	2.43	2	0	0

4. Modify the Universal Soil Loss Equation (USLE) parameters

Watershed	Cropland					Pastureland					Forest				
	R	K	LS	C	P	R	K	LS	C	P	R	K	LS	C	P
W1	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W2	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W3	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W4	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W5	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000

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Optional Data Input:

5. Select average soil hydrologic group (SHG), SHG A = highest infiltration and SHG D = lowest infiltration

Watershed	SHG A	SHG B	SHG C	SHG D	SHG Selected	Soil N conc.%	Soil P conc.%	Soil BOD conc.%
W1	○	◉	○	○	B	0.150	0.066	0.300
W2	○	◉	○	○	B	0.150	0.066	0.300
W3	○	◉	○	○	B	0.150	0.066	0.300
W4	○	○	○	◉	D	0.150	0.066	0.300
W5	○	○	○	◉	D	0.150	0.066	0.300

6. Reference runoff curve number (may be modified)

SHG	A	B	C	D
Urban	83	89	92	93
Cropland	67	78	85	89
Pastureland	49	69	79	84
Forest	39	60	73	79
User Defined	50	70	80	85

6a. Detailed urban reference runoff curve number (may be modified)

Urban\SHG	A	B	C	D
Commercial	89	92	94	95
Industrial	81	88	91	93
Institutional	81	88	91	93
Transportation	98	98	98	98
Multi-Family	77	85	90	92
Single-Family	57	72	81	86
Urban-Cultivat	67	78	85	89
Vacant-Develo	77	85	90	92
Open Space	49	69	79	84

7. Nutrient concentration in runoff (mg/l)

Land use	N	P	BOD
1. L-Cropland	**1.9**	**0.3**	**4**
1a. w/ manure	8.1	2	12.3
2. M-Cropland	**2.9**	**0.4**	**6.1**
2a. w/ manure	12.2	3	18.5
3. H-Cropland	**4.4**	**0.5**	**9.2**
3a. w/ manure	18.3	4	24.6
4. Pastureland	**4**	**0.3**	**13**
5. Forest	**0.2**	**0.1**	**0.5**
6. User Defined	**0**	**0**	**0**

7a. Nutrient concentration in shallow groundwater (mg/l) (may be modified)

Landuse	N	P	BOD
Urban	1.5	0.063	0
Cropland	1.44	0.063	0
Pastureland	1.44	0.063	0
Forest	0.11	0.009	0
Feedlot	6	0.07	0
User-Defined	0	0	0

8. Input or modify urban land use distribution

Watershed	Urban Area (ac.)	Commercial %	Industrial %	Institutional %	Transportation %	Multi-Family %	Single-Family %	Urban-Cultivated %	Vacant (developed)	Open Space %	Total % Area
W1	1.64	100	0	0	0	0	0	0	0	0	100
W2	0	0	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0	0	0

9. Input irrigation area (ac) and irrigation amount (in)

Watershed	Total Cropland (ac)	Cropland: Acres Irrigated	Water Depth (in) per Irrigation - Before BMP	Water Depth (in) per Irrigation - After BMP	Irrigation Frequency (#/Year)
W1	0	0	0	0	0
W2	0	0	0	0	0
W3	0	0	0	0	0
W4	0	0	0	0	0
W5	0	0	0	0	0

Input Ends Here.

Project 5-1

Urban Runoff BMP and Pollutant Load Reduction

Urban BMP To(

Close

1. Urban pollutant concentration in runoff (mg/l)

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Space
TN	2	2.5	1.8	3	2.2	2.2	1.9	1.5	1.5
TP	0.2	0.4	0.3	0.5	0.4	0.4	0.3	0.15	0.15
BOD	9.3	9	7.8	9.3	10	10	4	4	4
TSS	75	120	67	150	100	100	150	70	70

2. Urban landuse distribution

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Space
W1	1.64	0	0	0	0	0	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0

2a. Effective BMP application area (ac)

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Spac
W1	1.64	0	0	0	0	0	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0

3. Selected urban BMPs

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Space
W1	Porous Pav	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W2	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W3	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W4	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W5	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP

3a. Percentage of BMP effective area (%)

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Spac
W1	100	0	0	0	0	0	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0

4. Pollutant loads from urban in lb/year

Watershed	Pre-BMP Load				Load Reduction				After BMP Load			
	N	P	BOD	TSS	N	P	BOD	TSS	N	P	BOD	TSS
W1	9.5841579	0.9584158	44.566334	359.40592	8.1465342	0.6229703	0	323.46533	1.4376237	0.3354455	44.566334	35.940592
W2	0	0	0	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0	0	0	0

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Total Load	This is the summary of annual nutrient and sediment load for each subwatershed. This sheet is initially protected.

1. Total load by subwatershed(s)

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Reduction	P Reduction	BOD Reduction	Sediment Reduction	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	%	%	%	%
Project 5.1	9.6	1.0	44.6	0.2	8.1	0.6	0.0	0.2	1.4	0.3	44.6	0.0	85.0	65.0	0.0	90.0
W2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W4*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	9.6	1.0	44.6	0.2	8.1	0.6	0.0	0.2	1.4	0.3	44.6	0.0	85.0	65.0	0.0	90.0

2. Total load by land uses (with BMP)

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	1.44	0.34	44.57	0.02
Cropland	0.00	0.00	0.00	0.00
Pastureland	0.00	0.00	0.00	0.00
Forest	0.00	0.00	0.00	0.00
Feedlots	0.00	0.00	0.00	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	0.00	0.00	0.00	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.00	0.00	0.00	0.00
Groundwater	0.00	0.00	0.00	0.00
Total	1.44	0.34	44.57	0.02

STEPL Input Sheet: Values in RED are required input. Change worksheets by clicking on tabs at the bottom. You entered 5 subwatershed(s).

This sheet is composed of eight input tables. The first four tables require users to change initial values. The next four tables (initially hidden) contain default values users may choose to change.

Step 1: Select the state and county where your watersheds are located. Select a nearby weather station. This will automatically specify values for rainfall parameters in Table 1 and USLE parameters in Table 4.

Step 2: (a) Enter land use areas in acres in Table 1; (b) enter total number of agricultural animals by type and number of months per year that manure is applied to croplands in Table 2;
(c) enter values for septic system parameters in Table 3; and (d) if desired, modify USLE parameters associated with the selected county in Table 4.

Step 3: You may stop here and proceed to the BMPs sheet. If you have more detailed information on your watersheds, click the Yes button in row 10 to display optional input tables.

Step 4: (a) Specify the representative Soil Hydrologic Group (SHG) and soil nutrient concentrations in Table 5; (b) modify the curve number table by landuse and SHG in Table 6;
(c) modify the nutrient concentrations (mg/L) in runoff in Table 7; and (d) specify the detailed land use distribution in the urban area in Table 8.

Step 5: Select BMPs in BMPs sheet. **Step 6**: View the estimates of loads and load reductions in Total Load and Graphs sheets.

☐ Treat all the subwatersheds as parts of a single watershed ☐ Groundwater load calculation

State: New York **County**: Livingston **Weather Station**: NY ROCHESTER INTL AP

1. Input watershed land use area (ac) and precipitation (in)

									Rain correction factors		
									0.765	0.292	
Watershed	Urban	Cropland	Pastureland	Forest	User Defined	Feedlots	Feedlot Percent Paved	Total	Annual Rainfall	Rain Days	Avg. Rain/Event
2.1 - Riparian Buffer	0	0.344	0	0	0	0	24%	0.344	34.42	134.9	0.668
W2	0	0	0	0	0	0	24%	0	34.42	134.9	0.668
W3	0	0	0	0	0	0	24%	0	34.42	134.9	0.668
W4	0	0	0	0	0	0	24%	0	34.42	134.9	0.668
W5	0	0	0	0	0	0	24%	0	34.42	134.9	0.668

2. Input agricultural animals

Watershed	Beef Cattle	Dairy Cattle	Swine (Hog)	Sheep	Horse	Chicken	Turkey	Duck	# of months manure applied
W1	0	0	0	0	0	0	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	

3. Input septic system and illegal direct wastewater discharge data

Watershed	No. of Septic Systems	Population per Septic System	Septic Failure Rate, %	Wastewater Direct Discharge, # of People	Direct Discharge Reduction, %
W1	0	2.43	2	0	0
W2	0	2.43	2	0	0
W3	0	2.43	2	0	0
W4	0	2.43	2	0	0
W5	0	2.43	2	0	0

4. Modify the Universal Soil Loss Equation (USLE) parameters

Watershed	Cropland					Pastureland					Forest				
	R	K	LS	C	P	R	K	LS	C	P	R	K	LS	C	P
W1	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W2	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W3	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W4	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W5	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000

Project 2-1

Optional Data Input:

5. Select average soil hydrologic group (SHG), SHG A = highest infiltration and SHG D = lowest infiltration

Watershed	SHG A	SHG B	SHG C	SHG D	SHG Selected	Soil N conc.%	Soil P conc.%	Soil BOD conc.%
W1	○	◉	○	○	B	0.150	0.066	0.300
W2	○	◉	○	○	B	0.150	0.066	0.300
W3	○	◉	○	○	B	0.150	0.066	0.300
W4	○	○	○	◉	D	0.150	0.066	0.300
W5	○	○	○	◉	D	0.150	0.066	0.300

6. Reference runoff curve number (may be modified)

SHG	A	B	C	D
Urban	83	89	92	93
Cropland	67	78	85	89
Pastureland	49	69	79	84
Forest	39	60	73	79
User Defined	50	70	80	85

6a. Detailed urban reference runoff curve number (may be modified)

Urban\SHG	A	B	C	D
Commercial	89	92	94	95
Industrial	81	88	91	93
Institutional	81	88	91	93
Transportation	98	98	98	98
Multi-Family	77	85	90	92
Single-Family	57	72	81	86
Urban-Cultivat	67	78	85	89
Vacant-Develo	77	85	90	92
Open Space	49	69	79	84

7. Nutrient concentration in runoff (mg/l)

Land use	N	P	BOD
1. L-Cropland	**1.9**	**0.3**	**4**
1a. w/ manure	8.1	2	12.3
2. M-Cropland	**2.9**	**0.4**	**6.1**
2a. w/ manure	12.2	3	18.5
3. H-Cropland	**4.4**	**0.5**	**9.2**
3a. w/ manure	18.3	4	24.6
4. Pastureland	**4**	**0.3**	**13**
5. Forest	**0.2**	**0.1**	**0.5**
6. User Defined	**0**	**0**	**0**

7a. Nutrient concentration in shallow groundwater (mg/l) (may be modified)

Landuse	N	P	BOD
Urban	1.5	0.063	0
Cropland	1.44	0.063	0
Pastureland	1.44	0.063	0
Forest	0.11	0.009	0
Feedlot	6	0.07	0
User-Defined	0	0	0

8. Input or modify urban land use distribution

Watershed	Urban Area (ac.)	Commercial %	Industrial %	Institutional %	Transportation %	Multi-Family %	Single-Family %	Urban-Cultivated %	Vacant (developed)	Open Space %	Total % Area
W1	0	100	0	0	0	0	0	0	0	0	100
W2	0	0	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0	0	0

9. Input irrigation area (ac) and irrigation amount (in)

Watershed	Total Cropland (ac)	Cropland: Acres Irrigated	Water Depth (in) per Irrigation - Before BMP	Water Depth (in) per Irrigation - After BMP	Irrigation Frequency (#/Year)
W1	0.344	0	0	0	0
W2	0	0	0	0	0
W3	0	0	0	0	0
W4	0	0	0	0	0
W5	0	0	0	0	0

Input Ends Here.

Animal

The number of animals in the 5 subwatersheds is shown below.
Nutrient contributions from these animals are used to derive loading estimates for all land uses except for urban.
Manure is assumed to be collected and applied to cropland.
Wildlife densities are required input for cropland.

1. Agricultural animals

Watershed	Beef Cattle	Dairy Cattle	Swine (Hog)	Sheep	Horse	Chicken	Turkey	Duck	AEU	# of months manure applied
W1	5	0	0	0	0	0	0	0	14.5348837	0
W2	0	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0	0
Total	5	0	0	0	0	0	0	0		

Best Management Practice Select an appropriate BMP except "Combined BMPs-Calculated" for each subwatershed in each land use table using the pull-down list-box if interactions between BMPs are not considered. Select "Combined BMPs-Calculated" if multiple BMPs and their interactions in the subwatersheds are considered; use BMP calculator (under STEPL menu) to obtain the combined BMP efficiencies and enter them in Table 7.

Urban BMP Tool

Gully and Streambank Erosion

1. BMPs and efficiencies for different pollutants on CROPLAND, ND=No Data

Watershed	**Cropland**					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0.75	0.75	ND	0.75	stabilization and fencing	100
W2	0	0	0	0		100
W3	0	0	0	0		100
W4	0	0	0	0		100
W5	0	0	0	0		100

2. BMPs and efficiencies for different pollutants on PASTURELAND, ND=No Data

Watershed	**Pastureland**					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0	0	0	0		100
W2	0	0	0	0		100
W3	0	0	0	0		100
W4	0	0	0	0		100
W5	0	0	0	0		100

3. BMPs and efficiencies for different pollutants on FOREST, ND=No Data

Watershed	**Forest**					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0	0	0	0		100
W2	0	0	0	0		100
W3	0	0	0	0		100
W4	0	0	0	0		100
W5	0	0	0	0		100

4. BMPs and efficiencies for different pollutants on USER DEFINED land use, ND=No Data

Watershed	**User Defined**					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0	0	0	0		100
W2	0	0	0	0		100
W3	0	0	0	0		100
W4	0	0	0	0		100
W5	0	0	0	0		100

5. BMPs and efficiencies for different pollutants on FEEDLOTS, ND=No Data

Watershed	**Feedlots**					
	N	P	BOD	Sediment	BMPs	%Area BMP Applied
W1	0	0	0	0		100
W2	0	0	0	0		100
W3	0	0	0	0		100
W4	0	0	0	0		100
W5	0	0	0	0		100

6. BMPs and efficiencies for different pollutants on URBAN

To change/set BMP/LID for urban land uses, click the 'Urban BMP Tool' button on the top-left of this sheet.

Project 2-1

Total Load This is the summary of annual nutrient and sediment load for each subwatershed. This sheet is initially protected.

1. Total load by subwatershed(s)

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Reduction	P Reduction	BOD Reduction	Sediment Reduction	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	%	%	%	%
Project 2.1	12.2	4.7	24.5	1.7	9.1	3.5	15.1	1.3	3.0	1.2	9.4	0.4	75.0	75.0	61.8	75.0
W2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W4*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	12.2	4.7	24.5	1.7	9.1	3.5	15.1	1.3	3.0	1.2	9.4	0.4	75.0	75.0	61.8	75.0

2. Total load by land uses (with BMP)

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	0.00	0.00	0.00	0.00
Cropland	3.04	1.17	9.36	0.42
Pastureland	0.00	0.00	0.00	0.00
Forest	0.00	0.00	0.00	0.00
Feedlots	0.00	0.00	0.00	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	0.00	0.00	0.00	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.00	0.00	0.00	0.00
Groundwater	0.00	0.00	0.00	0.00
Total	3.04	1.17	9.36	0.42

Project 6-1

STEPL Input Sheet: Values in RED are required input. Change worksheets by clicking on tabs at the bottom. You entered 5 subwatershed(s).

This sheet is composed of eight input tables. The first four tables require users to change initial values. The next four tables (initially hidden) contain default values users may choose to change.

Step 1: Select the state and county where your watersheds are located. Select a nearby weather station. This will automatically specify values for rainfall parameters in Table 1 and USLE parameters in Table 4.

Step 2: (a) Enter land use areas in acres in Table 1; (b) enter total number of agricultural animals by type and number of months per year that manure is applied to croplands in Table 2;
(c) enter values for septic system parameters in Table 3; and (d) if desired, modify USLE parameters associated with the selected county in Table 4.

Step 3: You may stop here and proceed to the BMPs sheet. If you have more detailed information on your watersheds, click the Yes button in row 10 to display optional input tables.

Step 4: (a) Specify the representative Soil Hydrologic Group (SHG) and soil nutrient concentrations in Table 5; (b) modify the curve number table by landuse and SHG in Table 6;
(c) modify the nutrient concentrations (mg/L) in runoff in Table 7; and (d) specify the detailed land use distribution in the urban area in Table 8.

Step 5: Select BMPs in BMPs sheet. **Step 6**: View the estimates of loads and load reductions in Total Load and Graphs sheets.

☐ Treat all the subwatersheds as parts of a single watershed

☐ Groundwater load calculation

State	County	Weather Station
New York	Livingston	NY ROCHESTER INTL AP

1. Input watershed land use area (ac) and precipitation (in)

Rain correction factors: 0.765 (Annual Rainfall), 0.292 (Rain Days)

Watershed	Urban	Cropland	Pastureland	Forest	User Defined	Feedlots	Feedlot Percent Paved	Total	Annual Rainfall	Rain Days	Avg. Rain/Event
6.1 - Culvert Mod	34.75	0	20.85	13.9	0	0	24%	69.5	34.42	134.9	0.668
W2	0	0	0	0	0	0	24%	0	34.42	134.9	0.668
W3	0	0	0	0	0	0	24%	0	34.42	134.9	0.668
W4	0	0	0	0	0	0	24%	0	34.42	134.9	0.668
W5	0	0	0	0	0	0	24%	0	34.42	134.9	0.668

2. Input agricultural animals

Watershed	Beef Cattle	Dairy Cattle	Swine (Hog)	Sheep	Horse	Chicken	Turkey	Duck	# of months manure applied
W1	0	0	0	0	0	0	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	

3. Input septic system and illegal direct wastewater discharge data

Watershed	No. of Septic Systems	Population per Septic System	Septic Failure Rate, %	Wastewater Direct Discharge, # of People	Direct Discharge Reduction, %
W1	0	2.43	2	0	0
W2	0	2.43	2	0	0
W3	0	2.43	2	0	0
W4	0	2.43	2	0	0
W5	0	2.43	2	0	0

4. Modify the Universal Soil Loss Equation (USLE) parameters

Watershed	Cropland					Pastureland					Forest				
	R	K	LS	C	P	R	K	LS	C	P	R	K	LS	C	P
W1	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W2	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W3	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W4	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W5	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000

Optional Data Input:

5. Select average soil hydrologic group (SHG), SHG A = highest infiltration and SHG D = lowest infiltration

Watershed	SHG A	SHG B	SHG C	SHG D	SHG Selected	Soil N conc.%	Soil P conc.%	Soil BOD conc.%
W1	○	◉	○	○	B	0.150	0.066	0.300
W2	○	◉	○	○	B	0.150	0.066	0.300
W3	○	◉	○	○	B	0.150	0.066	0.300
W4	○	○	○	◉	D	0.150	0.066	0.300
W5	○	○	○	◉	D	0.150	0.066	0.300

6. Reference runoff curve number (may be modified)

SHG	A	B	C	D
Urban	83	89	92	93
Cropland	67	78	85	89
Pastureland	49	69	79	84
Forest	39	60	73	79
User Defined	50	70	80	85

6a. Detailed urban reference runoff curve number (may be modified)

Urban\SHG	A	B	C	D
Commercial	89	92	94	95
Industrial	81	88	91	93
Institutional	81	88	91	93
Transportation	98	98	98	98
Multi-Family	77	85	90	92
Single-Family	57	72	81	86
Urban-Cultivat	67	78	85	89
Vacant-Develo	77	85	90	92
Open Space	49	69	79	84

7. Nutrient concentration in runoff (mg/l)

Land use	N	P	BOD
1. L-Cropland	**1.9**	**0.3**	**4**
1a. w/ manure	8.1	2	12.3
2. M-Cropland	**2.9**	**0.4**	**6.1**
2a. w/ manure	12.2	3	18.5
3. H-Cropland	**4.4**	**0.5**	**9.2**
3a. w/ manure	18.3	4	24.6
4. Pastureland	**4**	**0.3**	**13**
5. Forest	**0.2**	**0.1**	**0.5**
6. User Defined	**0**	**0**	**0**

7a. Nutrient concentration in shallow groundwater (mg/l) (may be modified)

Landuse	N	P	BOD
Urban	1.5	0.063	0
Cropland	1.44	0.063	0
Pastureland	1.44	0.063	0
Forest	0.11	0.009	0
Feedlot	6	0.07	0
User-Defined	0	0	0

8. Input or modify urban land use distribution

Watershed	Urban Area (ac.)	Commercial %	Industrial %	Institutional %	Transportation %	Multi-Family %	Single-Family %	Urban-Cultivated %	Vacant (developed)	Open Space %	Total % Area
W1	34.75	0	0	0	0	0	100	0	0	0	100
W2	0	0	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0	0	0

9. Input irrigation area (ac) and irrigation amount (in)

Watershed	Total Cropland (ac)	Cropland: Acres Irrigated	Water Depth (in) per Irrigation - Before BMP	Water Depth (in) per Irrigation - After BMP	Irrigation Frequency (#/Year)
W1	0	0	0	0	0
W2	0	0	0	0	0
W3	0	0	0	0	0
W4	0	0	0	0	0
W5	0	0	0	0	0

Input Ends Here.

Project 6-1

Urban Runoff BMP and Pollutant Load Reduction

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Close

1. Urban pollutant concentration in runoff (mg/l)

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Space
TN	2	2.5	1.8	3	2.2	2.2	1.9	1.5	1.5
TP	0.2	0.4	0.3	0.5	0.4	0.4	0.3	0.15	0.15
BOD	9.3	9	7.8	9.3	10	10	4	4	4
TSS	75	120	67	150	100	100	150	70	70

2. Urban landuse distribution

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Space
W1	0	0	0	0	0	34.75	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0

2a. Effective BMP application area (ac)

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Space
W1	0	0	0	0	0	34.75	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0

3. Selected urban BMPs

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Space
W1	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W2	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W3	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W4	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W5	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP

3a. Percentage of BMP effective area (%)

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Space
W1	0	0	0	0	0	100	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0

4. Pollutant loads from urban in lb/year

Watershed	Pre-BMP Load				Load Reduction				After BMP Load			
	N	P	BOD	TSS	N	P	BOD	TSS	N	P	BOD	TSS
W1	80.624275	14.658959	366.47398	3664.7398	0	0	0	0	80.624275	14.658959	366.47398	3664.7398
W2	0	0	0	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0	0	0	0

Project 6-1

Total Load	This is the summary of annual nutrient and sediment load for each subwatershed. This sheet is initially protected.

1. Total load by subwatershed(s)

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Reduction	P Reduction	BOD Reduction	Sediment Reduction	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	%	%	%	%
Project 6.1	228.0	51.1	759.5	13.2	0.6	0.3	1.3	0.2	227.3	50.9	758.3	13.0	0.3	0.5	0.2	1.6
W2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W4*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	228.0	51.1	759.5	13.2	0.6	0.3	1.3	0.2	227.3	50.9	758.3	13.0	0.3	0.5	0.2	1.6

2. Total load by land uses (with BMP)

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	80.62	14.66	366.47	1.83
Cropland	0.00	0.00	0.00	0.00
Pastureland	141.64	33.86	380.74	10.61
Forest	5.03	2.32	10.98	0.53
Feedlots	0.00	0.00	0.00	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	0.00	0.00	0.00	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.03	0.01	0.07	0.01
Groundwater	0.00	0.00	0.00	0.00
Total	227.32	50.86	758.26	12.98

Project 5-3

STEPL Input Sheet: Values in RED are required input. Change worksheets by clicking on tabs at the bottom. You entered 5 subwatershed(s).

This sheet is composed of eight input tables. The first four tables require users to change initial values. The next four tables (initially hidden) contain default values users may choose to change.

Step 1: Select the state and county where your watersheds are located. Select a nearby weather station. This will automatically specify values for rainfall parameters in Table 1 and USLE parameters in Table 4.

Step 2: (a) Enter land use areas in acres in Table 1; (b) enter total number of agricultural animals by type and number of months per year that manure is applied to croplands in Table 2; (c) enter values for septic system parameters in Table 3; and (d) if desired, modify USLE parameters associated with the selected county in Table 4.

Step 3: You may stop here and proceed to the BMPs sheet. If you have more detailed information on your watersheds, click the Yes button in row 10 to display optional input tables.

Step 4: (a) Specify the representative Soil Hydrologic Group (SHG) and soil nutrient concentrations in Table 5; (b) modify the curve number table by landuse and SHG in Table 6; (c) modify the nutrient concentrations (mg/L) in runoff in Table 7; and (d) specify the detailed land use distribution in the urban area in Table 8.

Step 5: Select BMPs in BMPs sheet. **Step 6**: View the estimates of loads and load reductions in Total Load and Graphs sheets.

☐ Treat all the subwatersheds as parts of a single watershed ☐ Groundwater load calculation

State	County	Weather Station
New York	Livingston	NY ROCHESTER INTL AP

1. Input watershed land use area (ac) and precipitation (in)

									Rain correction factors		
									0.765	0.292	
Watershed	Urban	Cropland	Pastureland	Forest	User Defined	Feedlots	Feedlot Percent Paved	Total	Annual Rainfall	Rain Days	Avg. Rain/Event
5.3 - Village Gi	0.25	0	0	0	0	0	0-24%	0.25	34.42	134.9	0.668
W2	0	0	0	0	0	0	0-24%	0	34.42	134.9	0.668
W3	0	0	0	0	0	0	0-24%	0	34.42	134.9	0.668
W4	0	0	0	0	0	0	0-24%	0	34.42	134.9	0.668
W5	0	0	0	0	0	0	0-24%	0	34.42	134.9	0.668

2. Input agricultural animals

Watershed	Beef Cattle	Dairy Cattle	Swine (Hog)	Sheep	Horse	Chicken	Turkey	Duck	# of months manure applied
W1	0	0	0	0	0	0	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	

3. Input septic system and illegal direct wastewater discharge data

Watershed	No. of Septic Systems	Population per Septic System	Septic Failure Rate, %	Wastewater Direct Discharge, # of People	Direct Discharge Reduction, %
W1	0	2.43	2	0	0
W2	0	2.43	2	0	0
W3	0	2.43	2	0	0
W4	0	2.43	2	0	0
W5	0	2.43	2	0	0

4. Modify the Universal Soil Loss Equation (USLE) parameters

Watershed	Cropland					Pastureland					Forest				
	R	K	LS	C	P	R	K	LS	C	P	R	K	LS	C	P
W1	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W2	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W3	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W4	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W5	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000

Project 5-3

Optional Data Input:

5. Select average soil hydrologic group (SHG), SHG A = highest infiltration and SHG D = lowest infiltration

Watershed	SHG A	SHG B	SHG C	SHG D	SHG Selected	Soil N conc.%	Soil P conc.%	Soil BOD conc.%
W1					B	0.150	0.066	0.300
W2					B	0.150	0.066	0.300
W3					B	0.150	0.066	0.300
W4					D	0.150	0.066	0.300
W5					D	0.150	0.066	0.300

6. Reference runoff curve number (may be modified)

SHG	A	B	C	D
Urban	83	89	92	93
Cropland	67	78	85	89
Pastureland	49	69	79	84
Forest	39	60	73	79
User Defined	50	70	80	85

6a. Detailed urban reference runoff curve number (may be modified)

Urban\SHG	A	B	C	D
Commercial	89	92	94	95
Industrial	81	88	91	93
Institutional	81	88	91	93
Transportation	98	98	98	98
Multi-Family	77	85	90	92
Single-Family	57	72	81	86
Urban-Cultivat	67	78	85	89
Vacant-Develo	77	85	90	92
Open Space	49	69	79	84

7. Nutrient concentration in runoff (mg/l)

Land use	N	P	BOD
1. L-Cropland	**1.9**	**0.3**	**4**
1a. w/ manure	8.1	2	12.3
2. M-Cropland	**2.9**	**0.4**	**6.1**
2a. w/ manure	12.2	3	18.5
3. H-Cropland	**4.4**	**0.5**	**9.2**
3a. w/ manure	18.3	4	24.6
4. Pastureland	**4**	**0.3**	**13**
5. Forest	**0.2**	**0.1**	**0.5**
6. User Defined	**0**	**0**	**0**

7a. Nutrient concentration in shallow groundwater (mg/l) (may be modified)

Landuse	N	P	BOD
Urban	1.5	0.063	0
Cropland	1.44	0.063	0
Pastureland	1.44	0.063	0
Forest	0.11	0.009	0
Feedlot	6	0.07	0
User-Defined	0	0	0

8. Input or modify urban land use distribution

Watershed	Urban Area (ac.)	Commercial %	Industrial %	Institutional %	Transportation %	Multi-Family %	Single-Family %	Urban-Cultivated %	Vacant (developed)	Open Space %	Total % Area
W1	0.25	100	0	0	0	0	0	0	0	0	100
W2	0	0	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0	0	0

9. Input irrigation area (ac) and irrigation amount (in)

Watershed	Total Cropland (ac)	Cropland: Acres Irrigated	Water Depth (in) per Irrigation - Before BMP	Water Depth (in) per Irrigation - After BMP	Irrigation Frequency (#/Year)
W1	0	0	0	0	0
W2	0	0	0	0	0
W3	0	0	0	0	0
W4	0	0	0	0	0
W5	0	0	0	0	0

Input Ends Here.

Project 5-3

Urban Runoff BMP and Pollutant Load Reduction

Close

1. Urban pollutant concentration in runoff (mg/l)

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Space
TN	2	2.5	1.8	3	2.2	2.2	1.9	1.5	1.5
TP	0.2	0.4	0.3	0.5	0.4	0.4	0.3	0.15	0.15
BOD	9.3	9	7.8	9.3	10	10	4	4	4
TSS	75	120	67	150	100	100	150	70	70

2. Urban landuse distribution

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Space
W1	0.25	0	0	0	0	0	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0

2a. Effective BMP application area (ac)

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Space
W1	0.25	0	0	0	0	0.25	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0

3. Selected urban BMPs

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Space
W1	Infiltration T	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W2	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W3	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W4	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP
W5	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP	0 No BMP

3a. Percentage of BMP effective area (%)

Landuse	Commercia	Industrial	Institutiona	Transporta	Multi-Fami	Single-Fan	Urban-Cult	Vacant (de	Open Space
W1	100	0	0	0	0	0	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0

4. Pollutant loads from urban in lb/year

Watershed	Pre-BMP Load				Load Reduction				After BMP Load			
	N	P	BOD	TSS	N	P	BOD	TSS	N	P	BOD	TSS
W1	1.4609997	0.1461	6.7936485	54.787488	0.8035498	0.08766	0	41.090616	0.6574499	0.05844	6.7936485	13.696872
W2	0	0	0	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0	0	0	0

Project 5-3

Total Load	This is the summary of annual nutrient and sediment load for each subwatershed. This sheet is initially protected.

1. Total load by subwatershed(s)

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Reduction	P Reduction	BOD Reduction	Sediment Reduction	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	%	%	%	%
W1	1.5	0.1	6.8	0.0	0.8	0.1	0.0	0.0	0.7	0.1	6.8	0.0	55.0	60.0	0.0	75.0
W2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W4*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1.5	0.1	6.8	0.0	0.8	0.1	0.0	0.0	0.7	0.1	6.8	0.0	55.0	60.0	0.0	75.0

2. Total load by land uses (with BMP)

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	0.66	0.06	6.79	0.01
Cropland	0.00	0.00	0.00	0.00
Pastureland	0.00	0.00	0.00	0.00
Forest	0.00	0.00	0.00	0.00
Feedlots	0.00	0.00	0.00	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	0.00	0.00	0.00	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.00	0.00	0.00	0.00
Groundwater	0.00	0.00	0.00	0.00
Total	0.66	0.06	6.79	0.01

Project 7-1

STEPL Input Sheet: Values in RED are required input. Change worksheets by clicking on tabs at the bottom. You entered 5 subwatershed(s).

This sheet is composed of eight input tables. The first four tables require users to change initial values. The next four tables (initially hidden) contain default values users may choose to change.

Step 1: Select the state and county where your watersheds are located. Select a nearby weather station. This will automatically specify values for rainfall parameters in Table 1 and USLE parameters in Table 4.

Step 2: (a) Enter land use areas in acres in Table 1; (b) enter total number of agricultural animals by type and number of months per year that manure is applied to croplands in Table 2;
(c) enter values for septic system parameters in Table 3; and (d) if desired, modify USLE parameters associated with the selected county in Table 4.

Step 3: You may stop here and proceed to the BMPs sheet. If you have more detailed information on your watersheds, click the Yes button in row 10 to display optional input tables.

Step 4: (a) Specify the representative Soil Hydrologic Group (SHG) and soil nutrient concentrations in Table 5; (b) modify the curve number table by landuse and SHG in Table 6;
(c) modify the nutrient concentrations (mg/L) in runoff in Table 7; and (d) specify the detailed land use distribution in the urban area in Table 8.

Step 5: Select BMPs in BMPs sheet. **Step 6**: View the estimates of loads and load reductions in Total Load and Graphs sheets.

☐ **Treat all the subwatersheds as parts of a single watershed** ☐ **Groundwater load calculation**

State	County	Weather Station
New York	Livingston	NY ROCHESTER INTL AP

1. Input watershed land use area (ac) and precipitation (in)

									Rain correction factors		
									0.765	0.292	
Watershed	Urban	Cropland	Pastureland	Forest	User Defined	Feedlots	Feedlot Percent Paved	Total	Annual Rainfall	Rain Days	Avg. Rain/Event
7.1 - SMA	34.75	20.85	13.9	0	0	0	0-24%	69.5	34.42	134.9	0.668
W2	0	0	0	0	0	0	0-24%	0	34.42	134.9	0.668
W3	0	0	0	0	0	0	0-24%	0	34.42	134.9	0.668
W4	0	0	0	0	0	0	0-24%	0	34.42	134.9	0.668
W5	0	0	0	0	0	0	0-24%	0	34.42	134.9	0.668

2. Input agricultural animals

Watershed	Beef Cattle	Dairy Cattle	Swine (Hog)	Sheep	Horse	Chicken	Turkey	Duck	# of months manure applied
W1	0	0	0	0	0	0	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	

3. Input septic system and illegal direct wastewater discharge data

Watershed	No. of Septic Systems	Population per Septic System	Septic Failure Rate, %	Wastewater Direct Discharge, # of People	Direct Discharge Reduction, %
W1	0	2.43	2	0	0
W2	0	2.43	2	0	0
W3	0	2.43	2	0	0
W4	0	2.43	2	0	0
W5	0	2.43	2	0	0

4. Modify the Universal Soil Loss Equation (USLE) parameters

Watershed	Cropland					Pastureland					Forest				
	R	K	LS	C	P	R	K	LS	C	P	R	K	LS	C	P
W1	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W2	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W3	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W4	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W5	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000

Project 7-1

Optional Data Input:

5. Select average soil hydrologic group (SHG), SHG A = highest infiltration and SHG D = lowest infiltration

Watershed	SHG A	SHG B	SHG C	SHG D	SHG Selected	Soil N conc.%	Soil P conc.%	Soil BOD conc.%
W1	○	◉	○	○	B	0.150	0.066	0.300
W2	○	◉	○	○	B	0.150	0.066	0.300
W3	○	◉	○	○	B	0.150	0.066	0.300
W4	○	○	○	◉	D	0.150	0.066	0.300
W5	○	○	○	◉	D	0.150	0.066	0.300

6. Reference runoff curve number (may be modified)

SHG	A	B	C	D
Urban	83	89	92	93
Cropland	67	78	85	89
Pastureland	49	69	79	84
Forest	39	60	73	79
User Defined	50	70	80	85

6a. Detailed urban reference runoff curve number (may be modified)

Urban\SHG	A	B	C	D
Commercial	89	92	94	95
Industrial	81	88	91	93
Institutional	81	88	91	93
Transportation	98	98	98	98
Multi-Family	77	85	90	92
Single-Family	57	72	81	86
Urban-Cultivat	67	78	85	89
Vacant-Develo	77	85	90	92
Open Space	49	69	79	84

7. Nutrient concentration in runoff (mg/l)

Land use	N	P	BOD
1. L-Cropland	**1.9**	**0.3**	**4**
1a. w/ manure	8.1	2	12.3
2. M-Cropland	**2.9**	**0.4**	**6.1**
2a. w/ manure	12.2	3	18.5
3. H-Cropland	**4.4**	**0.5**	**9.2**
3a. w/ manure	18.3	4	24.6
4. Pastureland	**4**	**0.3**	**13**
5. Forest	**0.2**	**0.1**	**0.5**
6. User Defined	**0**	**0**	**0**

7a. Nutrient concentration in shallow groundwater (mg/l) (may be modified)

Landuse	N	P	BOD
Urban	1.5	0.063	0
Cropland	1.44	0.063	0
Pastureland	1.44	0.063	0
Forest	0.11	0.009	0
Feedlot	6	0.07	0
User-Defined	0	0	0

8. Input or modify urban land use distribution

Watershed	Urban Area (ac.)	Commercial %	Industrial %	Institutional %	Transportation %	Multi-Family %	Single-Family %	Urban-Cultivated %	Vacant (developed)	Open Space %	Total % Area
W1	34.75	0	0	0	0	0	100	0	0	0	100
W2	0	0	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0	0	0

9. Input irrigation area (ac) and irrigation amount (in)

Watershed	Total Cropland (ac)	Cropland: Acres Irrigated	Water Depth (in) per Irrigation - Before BMP	Water Depth (in) per Irrigation - After BMP	Irrigation Frequency (#/Year)
W1	20.85	0	0	0	0
W2	0	0	0	0	0
W3	0	0	0	0	0
W4	0	0	0	0	0
W5	0	0	0	0	0

Input Ends Here.

Best Management Practice Select an appropriate BMP except "Combined BMPs-Calculated" for each subwatershed in each land use table using the pull-down list-box if interactions between BMPs are not considered. Select "Combined BMPs-Calculated" if multiple BMPs and their interactions in the subwatersheds are considered; use BMP calculator (under STEPL menu) to obtain the combined BMP efficiencies and enter them in Table 7.

Urban BMP Tool

Gully and Streambank Erosion

1. BMPs and efficiencies for different pollutants on CROPLAND, ND=No Data

Watershed	Cropland					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0	0	0	0	MP	100
W2	0	0	0	0	0	100
W3	0	0	0	0		100
W4	0	0	0	0	MP	100
W5	0	0	0	0	MP	100

2. BMPs and efficiencies for different pollutants on PASTURELAND, ND=No Data

Watershed	Pastureland					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0.415	0.62	0	0.387	C l BMPs-Calculated	100
W2	0	0	0	0		100
W3	0	0	0	0	MP	100
W4	0	0	0	0	MP	100
W5	0	0	0	0	MP	100

3. BMPs and efficiencies for different pollutants on FOREST, ND=No Data

Watershed	Forest					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0	0	0	0	MP	100
W2	0	0	0	0	MP	100
W3	0	0	0	0	MP	100
W4	0	0	0	0	MP	100
W5	0	0	0	0	MP	100

4. BMPs and efficiencies for different pollutants on USER DEFINED land use, ND=No Data

Watershed	User Defined					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0	0	0	0	MP	100
W2	0	0	0	0	MP	100
W3	0	0	0	0	MP	100
W4	0	0	0	0	MP	100
W5	0	0	0	0	MP	100

5. BMPs and efficiencies for different pollutants on FEEDLOTS, ND=No Data

Watershed	Feedlots					
	N	P	BOD	Sediment	BMPs	%Area BMP Applied
W1	0	0	0	0	MP	100
W2	0	0	0	0	MP	100
W3	0	0	0	0	MP	100
W4	0	0	0	0	MP	100
W5	0	0	0	0	MP	100

6. BMPs and efficiencies for different pollutants on URBAN

To change/set BMP/LID for urban land uses, click the 'Urban BMP Tool' button on the top-left of this sheet.

Project 7-1

Total Load	This is the summary of annual nutrient and sediment load for each subwatershed. This sheet is initially protected.

1. Total load by subwatershed(s)

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Reduction	P Reduction	BOD Reduction	Sediment Reduction	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	%	%	%	%
Project 7.1	544.1	184.4	1364.1	61.4	38.0	9.6	32.9	2.7	506.1	174.7	1331.3	58.7	7.0	5.2	2.4	4.5
W2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W4*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	544.1	184.4	1364.1	61.4	38.0	9.6	32.9	2.7	506.1	174.7	1331.3	58.7	7.0	5.2	2.4	4.5

2. Total load by land uses (with BMP)

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	80.62	14.66	366.47	1.83
Cropland	369.06	147.16	743.81	52.51
Pastureland	56.43	12.93	220.98	4.34
Forest	0.00	0.00	0.00	0.00
Feedlots	0.00	0.00	0.00	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	0.00	0.00	0.00	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.00	0.00	0.00	0.00
Groundwater	0.00	0.00	0.00	0.00
Total	506.11	174.75	1331.26	58.68

Project 6-2

STEPL Input Sheet: Values in RED are required input. Change worksheets by clicking on tabs at the bottom. You entered 5 subwatershed(s).
This sheet is composed of eight input tables. The first four tables require users to change initial values. The next four tables (initially hidden) contain default values users may choose to change.
Step 1: Select the state and county where your watersheds are located. Select a nearby weather station. This will automatically specify values for rainfall parameters in Table 1 and USLE parameters in Table 4.
Step 2: (a) Enter land use areas in acres in Table 1; (b) enter total number of agricultural animals by type and number of months per year that manure is applied to croplands in Table 2; (c) enter values for septic system parameters in Table 3; and (d) if desired, modify USLE parameters associated with the selected county in Table 4.
Step 3: You may stop here and proceed to the BMPs sheet. If you have more detailed information on your watersheds, click the Yes button in row 10 to display optional input tables.
Step 4: (a) Specify the representative Soil Hydrologic Group (SHG) and soil nutrient concentrations in Table 5; (b) modify the curve number table by landuse and SHG in Table 6; (c) modify the nutrient concentrations (mg/L) in runoff in Table 7; and (d) specify the detailed land use distribution in the urban area in Table 8.
Step 5: Select BMPs in BMPs sheet. **Step 6**: View the estimates of loads and load reductions in Total Load and Graphs sheets.

☐ **Treat all the subwatersheds as parts of a single watershed** ☐ **Groundwater load calculation**

State	County	Weather Station
New York	Livingston	NY ROCHESTER INTL AP

1. Input watershed land use area (ac) and precipitation (in)

									Rain correction factors		
									0.765	0.292	
Watershed	Urban	Cropland	Pastureland	Forest	User Defined	Feedlots	Feedlot Percent Paved	Total	Annual Rainfall	Rain Days	Avg. Rain/Event
6.2 - Pond Retrofit	0	48.456	16.152	16.152	0	0	24%	80.76	34.42	134.9	0.668
W2	0	0	0	0	0	0	24%	0	34.42	134.9	0.668
W3	0	0	0	0	0	0	24%	0	34.42	134.9	0.668
W4	0	0	0	0	0	0	24%	0	34.42	134.9	0.668
W5	0	0	0	0	0	0	24%	0	34.42	134.9	0.668

2. Input agricultural animals

Watershed	Beef Cattle	Dairy Cattle	Swine (Hog)	Sheep	Horse	Chicken	Turkey	Duck	# of months manure applied
W1	0	0	0	0	0	0	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	

3. Input septic system and illegal direct wastewater discharge data

Watershed	No. of Septic Systems	Population per Septic System	Septic Failure Rate, %	Wastewater Direct Discharge, # of People	Direct Discharge Reduction, %
W1	0	2.43	2	0	0
W2	0	2.43	2	0	0
W3	0	2.43	2	0	0
W4	0	2.43	2	0	0
W5	0	2.43	2	0	0

4. Modify the Universal Soil Loss Equation (USLE) parameters

Watershed	Cropland					Pastureland					Forest				
	R	K	LS	C	P	R	K	LS	C	P	R	K	LS	C	P
W1	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W2	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W3	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W4	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W5	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000

Project 6-2

Optional Data Input:

5. Select average soil hydrologic group (SHG), SHG A = highest infiltration and SHG D = lowest infiltration

Watershed	SHG A	SHG B	SHG C	SHG D	SHG Selected	Soil N conc.%	Soil P conc.%	Soil BOD conc.%
W1					B	0.150	0.066	0.300
W2					B	0.150	0.066	0.300
W3					B	0.150	0.066	0.300
W4					D	0.150	0.066	0.300
W5					D	0.150	0.066	0.300

6. Reference runoff curve number (may be modified)

SHG	A	B	C	D
Urban	83	89	92	93
Cropland	67	78	85	89
Pastureland	49	69	79	84
Forest	39	60	73	79
User Defined	50	70	80	85

6a. Detailed urban reference runoff curve number (may be modified)

Urban\SHG	A	B	C	D
Commercial	89	92	94	95
Industrial	81	88	91	93
Institutional	81	88	91	93
Transportation	98	98	98	98
Multi-Family	77	85	90	92
Single-Family	57	72	81	86
Urban-Cultivat	67	78	85	89
Vacant-Develo	77	85	90	92
Open Space	49	69	79	84

7. Nutrient concentration in runoff (mg/l)

Land use	N	P	BOD
1. L-Cropland	**1.9**	**0.3**	**4**
1a. w/ manure	8.1	2	12.3
2. M-Cropland	**2.9**	**0.4**	**6.1**
2a. w/ manure	12.2	3	18.5
3. H-Cropland	**4.4**	**0.5**	**9.2**
3a. w/ manure	18.3	4	24.6
4. Pastureland	**4**	**0.3**	**13**
5. Forest	**0.2**	**0.1**	**0.5**
6. User Defined	**0**	**0**	**0**

7a. Nutrient concentration in shallow groundwater (mg/l) (may be modified)

Landuse	N	P	BOD
Urban	1.5	0.063	0
Cropland	1.44	0.063	0
Pastureland	1.44	0.063	0
Forest	0.11	0.009	0
Feedlot	6	0.07	0
User-Defined	0	0	0

8. Input or modify urban land use distribution

Watershed	Urban Area (ac.)	Commercial %	Industrial %	Institutional %	Transportation %	Multi-Family %	Single-Family %	Urban-Cultivated %	Vacant (developed)	Open Space %	Total % Area
W1	0	100	0	0	0	0	0	0	0	0	100
W2	0	0	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0	0	0

9. Input irrigation area (ac) and irrigation amount (in)

Watershed	Total Cropland (ac)	Cropland: Acres Irrigated	Water Depth (in) per Irrigation - Before BMP	Water Depth (in) per Irrigation - After BMP	Irrigation Frequency (#/Year)
W1	48.456	0	0	0	0
W2	0	0	0	0	0
W3	0	0	0	0	0
W4	0	0	0	0	0
W5	0	0	0	0	0

Input Ends Here.

Best Management Practice Select an appropriate BMP except "Combined BMPs-Calculated" for each subwatershed in each land use table using the pull-down list-box if interactions between BMPs are not considered. Select "Combined BMPs-Calculated" if multiple BMPs and their interactions in the subwatersheds are considered; use BMP calculator (under STEPL menu) to obtain the combined BMP efficiencies and enter them in Table 7.

Urban BMP Tool | **Gully and Streambank Erosion**

1. BMPs and efficiencies for different pollutants on CROPLAND, ND=No Data

Watershed	Cropland					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0	0	0	0	0 N	100
W2	0	0	0	0	0 No BM	100
W3	0	0	0	0	0 N	100
W4	0	0	0	0	0 N	100
W5	0	0	0	0	0 N	100

2. BMPs and efficiencies for different pollutants on PASTURELAND, ND=No Data

Watershed	Pastureland					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0.35	0.45	ND	0.6	Wet Po	100
W2	0	0	0	0	0 N	100
W3	0	0	0	0	0 N	100
W4	0	0	0	0	0 N	100
W5	0	0	0	0	0 N	100

3. BMPs and efficiencies for different pollutants on FOREST, ND=No Data

Watershed	Forest					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0	0	0	0	0 N	100
W2	0	0	0	0	0 N	100
W3	0	0	0	0	0 N	100
W4	0	0	0	0	0 N	100
W5	0	0	0	0	0 N	100

4. BMPs and efficiencies for different pollutants on USER DEFINED land use, ND=No Data

Watershed	User Defined					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0	0	0	0	0 N	100
W2	0	0	0	0	0 N	100
W3	0	0	0	0	0 N	100
W4	0	0	0	0	0 N	100
W5	0	0	0	0	0 N	100

5. BMPs and efficiencies for different pollutants on FEEDLOTS, ND=No Data

Watershed	Feedlots					
	N	P	BOD	Sediment	BMPs	%Area BMP Applied
W1	0	0	0	0	0 N	100
W2	0	0	0	0	0 N	100
W3	0	0	0	0	0 N	100
W4	0	0	0	0	0 N	100
W5	0	0	0	0	0 N	100

6. BMPs and efficiencies for different pollutants on URBAN

To change/set BMP/LID for urban land uses, click the 'Urban BMP Tool' button on the top-left of this sheet.

Project 6-2

Total Load This is the summary of annual nutrient and sediment load for each subwatershed. This sheet is initially protected.

1. Total load by subwatershed(s)

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Reduction	P Reduction	BOD Reduction	Sediment Reduction	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	%	%	%	%
Project 6.2	958.7	364.5	2007.1	128.4	50.2	14.8	58.1	4.8	908.5	349.7	1949.1	123.6	5.2	4.1	2.9	3.8
W2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W4*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	958.7	364.5	2007.1	128.4	50.2	14.8	58.1	4.8	908.5	349.7	1949.1	123.6	5.2	4.1	2.9	3.8

2. Total load by land uses (with BMP)

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	0.00	0.00	0.00	0.00
Cropland	844.10	336.01	1701.40	119.78
Pastureland	58.62	11.01	235.03	3.23
Forest	5.78	2.67	12.62	0.61
Feedlots	0.00	0.00	0.00	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	0.00	0.00	0.00	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.00	0.00	0.00	0.00
Groundwater	0.00	0.00	0.00	0.00
Total	908.50	349.69	1949.06	123.61

STEPL Input Sheet:	Values in RED are required input. Change worksheets by clicking on tabs at the bottom.	You entered	5	subwatershed(s).

This sheet is composed of eight input tables. The first four tables require users to change initial values. The next four tables (initially hidden) contain default values users may choose to change.
Step 1: Select the state and county where your watersheds are located. Select a nearby weather station. This will automatically specify values for rainfall parameters in Table 1 and USLE parameters in Table 4.
Step 2: (a) Enter land use areas in acres in Table 1; (b) enter total number of agricultural animals by type and number of months per year that manure is applied to croplands in Table 2;
(c) enter values for septic system parameters in Table 3; and (d) if desired, modify USLE parameters associated with the selected county in Table 4.
Step 3: You may stop here and proceed to the BMPs sheet. If you have more detailed information on your watersheds, click the Yes button in row 10 to display optional input tables.
Step 4: (a) Specify the representative Soil Hydrologic Group (SHG) and soil nutrient concentrations in Table 5; (b) modify the curve number table by landuse and SHG in Table 6;
(c) modify the nutrient concentrations (mg/L) in runoff in Table 7; and (d) specify the detailed land use distribution in the urban area in Table 8.
Step 5: Select BMPs in BMPs sheet. **Step 6**: View the estimates of loads and load reductions in Total Load and Graphs sheets.

☐ **Treat all the subwatersheds as parts of a single watershed** ☐ **Groundwater load calculation**

State	County	Weather Station
New York	Livingston	NY ROCHESTER INTL AP

1. Input watershed land use area (ac) and precipitation (in)

									Rain correction factors		
									0.765	0.292	
Watershed	Urban	Cropland	Pastureland	Forest	User Defined	Feedlots	Feedlot Percent Paved	Total	Annual Rainfall	Rain Days	Avg. Rain/Event
4.3 - Pond Retrofit	5.785	0	12.727	4.628	0	0	24%	23.14	34.42	134.9	0.668
W2	0	0	0	0	0	0	24%	0	34.42	134.9	0.668
W3	0	0	0	0	0	0	24%	0	34.42	134.9	0.668
W4	0	0	0	0	0	0	24%	0	34.42	134.9	0.668
W5	0	0	0	0	0	0	24%	0	34.42	134.9	0.668

2. Input agricultural animals

Watershed	Beef Cattle	Dairy Cattle	Swine (Hog)	Sheep	Horse	Chicken	Turkey	Duck	# of months manure applied
W1	0	0	0	0	0	0	0	0	0
W2	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	

3. Input septic system and illegal direct wastewater discharge data

Watershed	No. of Septic Systems	Population per Septic System	Septic Failure Rate, %	Wastewater Direct Discharge, # of People	Direct Discharge Reduction, %
W1	0	2.43	2	0	0
W2	0	2.43	2	0	0
W3	0	2.43	2	0	0
W4	0	2.43	2	0	0
W5	0	2.43	2	0	0

4. Modify the Universal Soil Loss Equation (USLE) parameters

Watershed	Cropland					Pastureland					Forest				
	R	K	LS	C	P	R	K	LS	C	P	R	K	LS	C	P
W1	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W2	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W3	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W4	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000
W5	83.169	0.351	0.786	0.200	0.990	83.169	0.351	0.786	0.040	1.000	83.169	0.351	0.786	0.003	1.000

Optional Data Input:

5. Select average soil hydrologic group (SHG), SHG A = highest infiltration and SHG D = lowest infiltration

Watershed	SHG A	SHG B	SHG C	SHG D	SHG Selected	Soil N conc.%	Soil P conc.%	Soil BOD conc.%
W1	◉	○	○	○	A	0.150	0.066	0.300
W2	○	◉	○	○	B	0.150	0.066	0.300
W3	○	◉	○	○	B	0.150	0.066	0.300
W4	○	○	○	◉	D	0.150	0.066	0.300
W5	○	○	○	◉	D	0.150	0.066	0.300

6. Reference runoff curve number (may be modified)

SHG	A	B	C	D
Urban	83	89	92	93
Cropland	67	78	85	89
Pastureland	49	69	79	84
Forest	39	60	73	79
User Defined	50	70	80	85

6a. Detailed urban reference runoff curve number (may be modified)

Urban\SHG	A	B	C	D
Commercial	89	92	94	95
Industrial	81	88	91	93
Institutional	81	88	91	93
Transportatio	98	98	98	98
Multi-Family	77	85	90	92
Single-Family	57	72	81	86
Urban-Cultiva	67	78	85	89
Vacant-Devel	77	85	90	92
Open Space	49	69	79	84

7. Nutrient concentration in runoff (mg/l)

Land use	N	P	BOD
1. L-Cropland	**1.9**	**0.3**	**4**
1a. w/ manure	8.1	2	12.3
2. M-Cropland	**2.9**	**0.4**	**6.1**
2a. w/ manure	12.2	3	18.5
3. H-Cropland	**4.4**	**0.5**	**9.2**
3a. w/ manure	18.3	4	24.6
4. Pastureland	**4**	**0.3**	**13**
5. Forest	**0.2**	**0.1**	**0.5**
6. User Defined	**0**	**0**	**0**

7a. Nutrient concentration in shallow groundwater (mg/l) (may be modified)

Landuse	N	P	BOD
Urban	1.5	0.063	0
Cropland	1.44	0.063	0
Pastureland	1.44	0.063	0
Forest	0.11	0.009	0
Feedlot	6	0.07	0
User-Defined	0	0	0

8. Input or modify urban land use distribution

Watershed	Urban Area (ac.)	Commercial %	Industrial %	Institutional %	Transportation %	Multi-Family %	Single-Family %	Urban-Cultivated %	Vacant (developed)	Open Space %	Total % Area
W1	5.785	100	0	0	0	0	0	0	0	0	100
W2	0	0	0	0	0	0	0	0	0	0	0
W3	0	0	0	0	0	0	0	0	0	0	0
W4	0	0	0	0	0	0	0	0	0	0	0
W5	0	0	0	0	0	0	0	0	0	0	0

9. Input irrigation area (ac) and irrigation amount (in)

Watershed	Total Cropland (ac)	Cropland: Acres Irrigated	Water Depth (in) per Irrigation - Before BMP	Water Depth (in) per Irrigation - After BMP	Irrigation Frequency (#/Year)
W1	0	0	0	0	0
W2	0	0	0	0	0
W3	0	0	0	0	0
W4	0	0	0	0	0
W5	0	0	0	0	0

Input Ends Here.

Best Management Practice Select an appropriate BMP except "Combined BMPs-Calculated" for each subwatershed in each land use table using the pull-down list-box if interactions between BMPs are not considered. Select "Combined BMPs-Calculated" if multiple BMPs and their interactions in the subwatersheds are considered; use BMP calculator (under STEPL menu) to obtain the combined BMP efficiencies and enter them in Table 7.

Urban BMP Tool

Gully and Streambank Erosion

1. BMPs and efficiencies for different pollutants on CROPLAND, ND=No Data

Watershed	Cropland					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0	0	0	0	0 N	100
W2	0	0	0	0	0 No BM	100
W3	0	0	0	0	0 N	100
W4	0	0	0	0	0 N	100
W5	0	0	0	0	0 N	100

2. BMPs and efficiencies for different pollutants on PASTURELAND, ND=No Data

Watershed	Pastureland					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0.35	0.45	ND	0.6	Wet Po	100
W2	0	0	0	0	0 N	100
W3	0	0	0	0	0 N	100
W4	0	0	0	0	0 N	100
W5	0	0	0	0	0 N	100

3. BMPs and efficiencies for different pollutants on FOREST, ND=No Data

Watershed	Forest					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0	0	0	0	0 N	100
W2	0	0	0	0	0 N	100
W3	0	0	0	0	0 N	100
W4	0	0	0	0	0 N	100
W5	0	0	0	0	0 N	100

4. BMPs and efficiencies for different pollutants on USER DEFINED land use, ND=No Data

Watershed	User Defined					
	N	P	BOD	Sediment	BMPs	% Area BMP Applied
W1	0	0	0	0	0 N	100
W2	0	0	0	0	0 N	100
W3	0	0	0	0	0 N	100
W4	0	0	0	0	0 N	100
W5	0	0	0	0	0 N	100

5. BMPs and efficiencies for different pollutants on FEEDLOTS, ND=No Data

Watershed	Feedlots					
	N	P	BOD	Sediment	BMPs	%Area BMP Applied
W1	0	0	0	0	0 N	100
W2	0	0	0	0	0 N	100
W3	0	0	0	0	0 N	100
W4	0	0	0	0	0 N	100
W5	0	0	0	0	0 N	100

6. BMPs and efficiencies for different pollutants on URBAN

To change/set BMP/LID for urban land uses, click the 'Urban BMP Tool' button on the top-left of this sheet.

Project 4-3

Total Load	This is the summary of annual nutrient and sediment load for each subwatershed. This sheet is initially protected.

1. Total load by subwatershed(s)

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Reduction	P Reduction	BOD Reduction	Sediment Reduction	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	%	%	%	%
Project 4.3	96.5	24.8	295.0	8.2	34.6	12.5	53.5	4.5	61.8	12.2	241.5	3.7	35.9	50.6	18.1	54.7
W2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
W5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	96.5	24.8	295.0	8.2	34.6	12.5	53.5	4.5	61.8	12.2	241.5	3.7	35.9	50.6	18.1	54.7

2. Total load by land uses (with BMP)

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	27.83	2.78	129.40	0.52
Cropland	0.00	0.00	0.00	0.00
Pastureland	32.50	8.78	108.97	2.97
Forest	1.50	0.67	3.13	0.20
Feedlots	0.00	0.00	0.00	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	0.00	0.00	0.00	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.00	0.00	0.00	0.00
Groundwater	0.00	0.00	0.00	0.00
Total	61.82	12.24	241.51	3.70

Appendix P

Regulatory Review Memo

REGULATORY REVIEW SUMMARY FOR TOWN AND VILLAGE OF LIVONIA IN THE WILKINS CREEK WATERSHED

INTRODUCTION

A review of existing municipal regulations and permit application materials applicable to stormwater and water quality in the Conesus Lake Watershed was previously conducted as part of a separate project for six municipalities including the Town and Village of Livonia and the Towns of Conesus, Geneseo, Groveland, and Sparta. Objectives of the review were to evaluate development, stormwater and floodplain land use regulations and existing, related municipal permit requirements to determine how they address protection of surface and groundwater resources. Evaluation included land disturbance thresholds; temporary and permanent best management practices (BMPs); impervious surface limits; steep slope development; protection, creation, and enhancement of riparian buffers; and post-construction site stabilization and stormwater management. Municipal regulatory review included an assessment of resource protection measures in municipal zoning, subdivision, and land use ordinances beyond the basic levels of existing state and federal resource protection. This document was adopted from the previous review and includes the Town and Village of Livonia municipalities.

The evaluation process utilized a framework provided by the Genesee Finger Lakes Regional Planning Council's Local Law Assessment for Finger Lakes Water Quality (http://www.gflrpc.org/uploads/3/1/9/1/31916115/locallawsflwaterquality.pdf). Municipal regulations were evaluated to determine how they addressed forty-five BMPs. This document provides a summary of the results of municipal review and general recommendations applicable to the Town and Village of Livonia municipalities along with key recommendations for individual municipalities. A matrix detailing evaluation results for all forty-five BMPs in the Town and Village of Livonia municipalities is provided in Attachment A.

SUMMARY

In general, the Town and Village of Livonia municipalities have local laws that address activities affecting surface and groundwater resources in the Wilkins Creek Watershed. Both municipalities require a floodplain development permit, however, do not require an erosion and sediment control permit.

Table 1 synthesizes the data in Attachment A to identify seven priority recommendations applicable to the Town and Village of Livonia municipalities. Table 2 provides additional recommendations specific to a municipality.

TABLE 1 – Priority Recommendations

Recommendation		Responsible Entity	Potential Resources
1	Provide proactive training, outreach, and assistance to Code Enforcement Officers, highway department staff, and other municipal staff and board/planning/zoning board members to ensure effective and consistent application and enforcement of existing and future regulations and requirements.	Town Board/ Village Board of Trustees	Existing workshops, webinars, technical providers, local government workshops
2	Revise zoning regulations to strengthen stormwater management requirements and require the inclusion of BMPs, green infrastructure, and low impact development techniques into stormwater management plans	Town Board/ Village Board of Trustees	Genesee/Finger Lakes Regional Planning Council – www.gflrpc.org
3	Incorporate specific and enforceable stormwater management provisions into site plan review criteria, subdivision regulations, erosion and sediment control laws, and construction and design specifications to limit the creation of impervious surfaces and support "low impact development," consistent with the NYS Stormwater Management Design Manual. Including: a) green infrastructure requirements b) specific calculation standards c) provide for Post Construction Stormwater Management (PCSM) standards in critical areas d) authorize Town's/Village's fee schedule to include developer fees to cover costs for specialized review.	Town Board/ Village Board of Trustees, Planning Board, ZBA	NYSDEC, SWCD, NRCS, EPA, Genesee Finger Lakes Regional Planning Council Green Infrastructure Planning Design Guidelines – www.gflrpc.org
4	Add specific erosion and sediment control permit requirements which currently apply to disturbance of 5,000 or more square feet of soil and include plan development and review for disturbance to 10,000 or more square feet. Add requirements as follows: a) Include technical definition of erosion-susceptible and sensitive areas (critical areas) and appropriate measures/BMPs including specific decision-making guidance associated with topography and soil type, access road grades,	Town Board/ Village Board of Trustees	

	Recommendation	Responsible Entity	Potential Resources
	streambank stabilization, wetland avoidance, etc. Critical areas include steep slopes, riparian areas, streams, shoreline, lakes, wetlands, etc. b) Extend requirement for an erosion and sediment control plan to areas of disturbance equal or greater to 5,000 SF and include plan requirements for lot/disturbance sizes below 5,000 SF in critical areas as defined above c) Require pre-application meeting with Code Enforcement to definitively identify disturbance bounds and activities, and ensure adequate protections for natural resources/waterbodies for construction and silvicultural practices to include wetlands, streams, riparian buffers, steep slopes, discharges to waterbodies, etc.		NYSDEC - Stormwater regulations/SWPPP Standards - Forestry staff NYS Forestry BMPs for Water Quality Field Guide Conesus Lake Watershed Council/Finger Lakes PRISM – www.fingerlakesinvasives.org Genesee Finger Lakes Regional Planning Council – Protecting Water Resources through Local Controls and Practices
5	Add specific erosion and sediment control permit performance standards as follows: a) Extend requirement for retaining and protecting vegetation on and near disturbed sites to areas of disturbance equal or greater than 5,000 SF. b) Require common timber harvest BMPs and review of development and silvicultural plans in critical areas. c) Include pre- and post stormwater calculations in required erosion and sediment control plans. d) Require redistribution of topsoil within disturbed land for seeding and planting and require revegetation using native species e) Require pre- and post-construction runoff calculations and adopt a no-net increase standard for runoff in required erosion and sediment control plans.	Town Board/ Village Board of Trustees	NYSDEC - Stormwater regulations/SWPPP Standards - Forestry staff NYS Forestry BMPs for Water Quality Field Guide Conesus Lake Watershed Council/Finger Lakes PRISM – www.fingerlakesinvasives.org Genesee Finger Lakes Regional Planning Council – Protecting Water Resources through Local Controls and Practices

Recommendation		Responsible Entity	Potential Resources
6	Encourage cluster development in zoning regulations including incentives and specific requirements for identification of open space conservation measures.	Town Board/ Village Board of Trustees	NYS Dept. of State Resources – Guide to Planned Unit Development
7	Encourage agricultural BMPs for water quality by encouraging participation in Agriculture Environmental Management (AEM)	Town Board/ Village Board of Trustees	Livingston County SWCD, AEM https://www.nys-soilandwater.org/aem/ , Natural Resource agencies and nonprofits
8	Continue road maintenance in accordance with BMPs including and especially erosion and sediment control considerations for ditch maintenance.	Town Board/ Village Board of Trustees	Cornell Local Roads Program Technical Guide http://www.clrp.cornell.edu/
9	Minimize variances for sites with an increase in impervious area to maximize protection for floodplains and other critical areas. Consider permit review requirement for floodplains.	Town Board/ Village Board of Trustees	
10	Consider expansion of site plan review requirement based on threshold disturbance area, exclusive of the number of residential structures being developed in lakefront communities.	Town Board/Village Board of Trustees	

Additional Recommendations for Specific Municipalities

There were several recommendations that pertained specifically to the local laws of the Town and Village of Livonia municipalities. Table 2 provides a summary of these priority recommendations.

TABLE 2 – Notes and Recommendations for the Town and Village of Livonia Municipalities

Notes	Recommendations
Livonia has a land conservation section that provides a list of excellent review standards to guide land use activities in a mapped conservation district. These standards are in some instances more protective of natural resources than the erosion and sediment control laws in nearby municipalities (*i.e.,* Conesus, Geneseo and Groveland). However, no permit is required, therefore reviews may be subjective, and there are critical areas (steep slopes, wetlands, riparian areas, etc.) outside of the mapped conservation districts that also require review standards to protect surface and groundwater. Livonia does require a permit for development in floodplains.	Recommendations to Town/Village Board of Trustees – See potential resources listed in Table 1: 1. Develop a permit application for construction and disturbance in mapped conservation areas and require same permit and standards for critical areas outside of the mapped conservation areas and at certain thresholds of disturbance. Consider inclusion of standards in Erosion and Sediment Control Laws in Conesus, Geneseo and Groveland as modified per recommendations in Table 1. 2. Add stronger subdivision approval language to address preservation of natural features and design that conforms with natural boundaries and alignment of waterbodies.

Best Management Practices (BMP)		Town of Livonia		Village of Livonia	
BMP #	**Description**	**Existing Regulation or Practice**	**Notes Recommendations**	**Existing Regulation or Practice**	**Notes Recommendations**
REG	Stormwater regulations are in place	§150-116 A (5)	left to discretion and dependent on technical understanding of Joint Planning Board. Should include specific calculation standards. Provide technical assistance to support JPB in determination of adequacy	§155-116 A (5)	Left to discretion and dependent on technical understanding of Joint Planning Board. Should include specific calculation standards. Provide technical assistance to support JPB in determination of adequacy
REG	Floodplain development regulations are in place	§80-11 (permit required); §150-69 D (4)	Permit review required. local requirements satisfactory to NFIP are in place.	§93 - local requirements satisfactory to NFIP are in place. Floodplain development permit required	Existing regulations are adequate.
REG	Erosion and sediment control regulations are in place	§150-69 D - no permit review required	No permit required/primarily aimed at conservation areas only. Adequacy of standards is, in many instances, greater than that provided by Erosion and Sediment Control Law, but should be extended to all disturbances of threshold size within the Town and Village	§155-69 D - Land conservation regulations and "critical areas" (steep slopes, wetlands, etc.) identified	Adequacy of standards is, in many instances, greater than that provided by Erosion and Sediment Control Law, but is limited to Land Conservation areas. Should be extended to all disturbances of threshold size within the Town and Village.
	DEVELOPMENT				
1-24	Retain and protect trees and other natural vegetation on and near disturbed sites	§150-69 D	Primarily aimed at conservation areas only	§155-69 D	Primarily aimed at conservation areas only.
1-22	Minimize amount of land disturbance and duration of disturbance	§150-53; §150-69	Site review for areas > 1 acre	§155-53; §155-69	Site review for areas > 1 acre
1-23	Preserve natural features and conform with natural boundaries and alignment of waterbodies	§150-116 A (5); §125-7 C (10)	Add stronger subdivision approval language	§155-116 A (5); §130-7 C (10)	Provide more specific guidance regarding thresholds and boundaries for limits of disturbance and development. Would benefit from a mandatory pre-application site visit with CEO to determine existing resources and protection areas / measures to be included in land development / permit application package

Best Management Practices (BMP)		Town of Livonia		Village of Livonia	
BMP #	Description	Existing Regulation or Practice	Notes Recommendations	Existing Regulation or Practice	Notes Recommendations
1-14	Require development and continued operation of private stormwater runoff control structures	No	Provide for Post-Construction Stormwater Management (PCSM) standards, at minimum for "critical" Land Conservation areas	No	Provide for Post-Construction Stormwater Management (PCSM) standards, at minimum for "critical" Land Conservation areas
1-15	Require long term stormwater management plan	No	Consider PCSM requirements similar to SWPPP standards, at minimum for Land Conservation "critical areas"	No	Consider PCSM requirements similar to SWPPP standards, at minimum for Land Conservation "critical areas"
1-18	Effective and consistent application and enforcement of stormwater regs & requirements	No	Provide proactive training / outreach and assistance to CEO and other Town/Village decision makers (JPB, Joint Board of Appeals, etc.)	No	Provide proactive training / outreach and assistance to CEO and other Town/Village decision makers (JPB, Joint Board of Appeals, etc.)
1-20	Require entire property (existing and proposed) to be included in stormwater analysis/calculations	§150-115 B (5); §150-116 A (5)	Requirements to specify pre- and post stormwater calculations are adequate. Provide technical guidance or review support to JPB to verify calculation methods and results are accurate	§155-115 B (5); §155-116 A (5)	Requirements to specify pre- and post stormwater calculations are adequate. Provide technical guidance or review support to JPB to verify calculation methods and results are accurate
1-16	Discourage introduction of nonnative species	No	No species-specific guidance for re-establishment of vegetation provided. Should include recommended plant species (native & non-invasive) specific to applications (dogwoods and willows for streambank stabilization, for instance)	No	Should include guidance on recommended plant species (native & non-invasive) specific to applications (dogwoods and willows for streambank stabilization, for instance)
1-25	Account for topography and soil type to minimize erosion potential	§150-69 D - development in conservation area only	Recommend to extend protections to areas outside of Land Conservation "critical areas"	§155-69 D - development in conservation area only	Recommend to extend protections to areas outside of Land Conservation "critical areas"
1-26	Maintain runoff rates similar to pre-construction levels	No	standards require that adequate calculation methods be used, but "no-net" runoff increase is not specifically required. Recommend a no-net increase standard be adopted	No	Standards require that adequate calculation methods be used, but "no-net" runoff increase is not specifically required. Recommend a no-net increase standard be adopted

Best Management Practices (BMP)		Town of Livonia		Village of Livonia	
BMP #	Description	Existing Regulation or Practice	Notes Recommendations	Existing Regulation or Practice	Notes Recommendations
1-27	Minimize creation of impervious surfaces	§150-34 C/D	Indirect in Mixed Use Hamlet District	§155-32	Not directly specified, and no specific thresholds established. However, minimized impervious development is implied through standards established for Mixed Use Hamlet District
1-28	Control increased runoff caused by changes in surface conditions to minimize flooding, erosion, sedimentation, and pollutants entering water bodies prior, during, and after construction	No	These objectives are implied through various aspects of the Land Conservation regulations and code, but few design thresholds are established within Land Conservation "critical areas", and none outside of these areas.	No	These objectives are implied through various aspects of the Land Conservation regulations and code, but few design thresholds are established within Land Conservation "critical areas", and none outside of these areas.
1-29	Use temporary vegetation and mulching to protect exposed and critical areas during development	§150-53 C	extend standards to sites/disturbances less than the current 5,000 sq. ft. threshold, especially in "critical areas"	§155-53 C	Extend standards to sites/disturbances less than the current 5,000 sq. ft. threshold, especially in "critical areas."
1-30	Redistribute topsoil within disturbed land for seeding and planting	No	should be specifically required	No	Should be specifically required.
1-31	Stabilize disturbed soils as soon as possible	§150-53 C	extend standards to sites/disturbances less than the current 5,000 sq. ft. threshold, especially in "critical areas"	§155-53 C	Eextend standards to sites/disturbances less than the current 5,000 sq. ft. threshold, especially in "critical areas."
1-32	Minimize use of cut and fill operations by conforming design to existing topography	§150-107 A	verify site conditions through mandatory pre-application meeting on-site to ensure compliance with existing topography to "greatest extent possible"	§155-107 A	Vverify site conditions through mandatory pre-application meeting on-site to ensure compliance with existing topography to "greatest extent possible."
1-35	Ensure proper operation and maintenance of runoff management facilities	No	Bolster PCSM requirements for permit/plan applications to include short- and long term O&M plan for permanent BMPs and treatment / control measures	No	Bolster PCSM requirements for permit/plan applications to include short- and long term O&M plan for permanent BMPs and treatment/control measures.

Best Management Practices (BMP)		Town of Livonia		Village of Livonia	
BMP #	Description	Existing Regulation or Practice	Notes Recommendations	Existing Regulation or Practice	Notes Recommendations
1-36	Target training for contractors, inspectors, and zoning and planning officials	No	Provide a proactive education, outreach and training program to build capability and understanding at the municipal level pertaining to site and plan review, approval, and enforcement objectives, thresholds, standards and procedures	No	Provide a proactive education, outreach and training program to build capability and understanding at the municipal level pertaining to site and plan review, approval, and enforcement objectives, thresholds, standards and procedures
1-39	Encourage cluster development	§125-9	Code does not encourage cluster developments through incentives or otherwise but establishes consistency with other prevailing development regulations and sets thresholds for number of structures, etc. Developers of clustered developments are required to identify preservation measures for open space set-aside attributable to the cluster development	§155-111	Code does not encourage cluster developments through incentives or otherwise but establishes consistency with other prevailing development regulations and sets thresholds for number of structures, etc. Developers of clustered developments are required to identify preservation measures for open space set-aside attributable to the cluster development
	FORESTRY/AGRICULTURE				
2-01	Consider potential water quality impacts when selecting silviculture system	§150-69 D (6f)	provides specific guidance and limitations to timber harvest along stream corridors. Other sections require a professional timber harvest plan be prepared for each harvest site	§155-69 D (6f)	Provides specific guidance and limitations to timber harvest along stream corridors. Other sections require a professional timber harvest plan be prepared for each harvest site
2-02	Consider harvesting practices	§150-69 D (6)	see above	§155-69 D (6)	See above
2-04	Require professional review of development/silvicultural plans in high erosion hazard areas.	§150-69 D (3a)	regulations are adequate. A professional timber harvest plan is required	§155-69 D (3a)	Regulations are adequate. A professional timber harvest plan is required.
2-06	Limit grades of access roads	§150-69 D	implied as a commonly-used BMP inherent to professionally-prepared timber harvest plan	§155-69 D	Implied as a commonly-used BMP inherent to professionally-prepared timber harvest plan.
2-09	Require stormwater controls for increased runoff from ground cover modification	§150-69 D	Inclusion of typical timber harvest BMPs as part of professional harvest plan	§155-69 D	Inclusion of typical timber harvest BMPs as part of professional harvest plan.

Best Management Practices (BMP)		Town of Livonia		Village of Livonia	
BMP #	Description	Existing Regulation or Practice	Notes Recommendations	Existing Regulation or Practice	Notes Recommendations
2-10	Require site restoration plans for largescale silvicultural projects	§150-69 D (6)	Specific to stream corridors. Standards should be extended to all areas affected by silviculture practices	§155-69 D (6)	Specific to stream corridors. Standards should be extended to all areas affected by silviculture practices.
2-12	Require farms seeking agricultural value assessment to participate in AEM.	No	may have some water quality benefits	No	May have some water quality benefits.
	WATERWAYS/WETLANDS				
3-01	Operation and maintenance guidance for streams	§150-69 D (6)	Would benefit from mandatory pre-application meeting with CEO on-site to identify critical resources (stream corridors and buffers) and ensure adequate protections are provided for in permit/plan applications	§155-69 D (6)	Would benefit from mandatory pre-application meeting with CEO on-site to identify critical resources (stream corridors and buffers) and ensure adequate protections are provided for in permit/plan applications
3-03	Establish and protect riparian buffers	§150-69 D (6)	Would benefit from mandatory pre-application meeting with CEO on-site to identify critical resources (stream corridors and buffers) and ensure adequate protections are provided for in permit/plan applications	§155-69 D (6)	Would benefit from mandatory pre-application meeting with CEO on-site to identify critical resources (stream corridors and buffers) and ensure adequate protections are provided for in permit/plan applications
3-05	Attempt vegetation stabilization along streams before undertaking structural measures	No	should be considered as a standard approach, required in site plan / permit applications, and verified in the field by CEO during a pre-application site meeting	No	Should be considered as a standard approach, required in site plan / permit applications, and verified in the field by CEO during a pre-application site meeting
3-08	Use setbacks to minimize disturbance to lands adjacent to streambanks and shorelines	§150-69 D (6)	Measures are provided for maintenance of existing streamside vegetation within the riparian buffer	§150-69 D (6)	Measures are provided for maintenance of existing streamside vegetation within the riparian buffer
3-09	Prevent discharges to waterbodies that would adversely affect water	§150-69 D (7)	Provides for various types of guidance and regulations pertaining to specific pollutants / sources within Conesus (and Hemlock) Lake Watershed	§155-69 D (7)	Provides for various types of guidance and regulations pertaining to specific pollutants / sources within Conesus (and Hemlock) Lake Watershed

Best Management Practices (BMP)		Town of Livonia		Village of Livonia	
BMP #	Description	Existing Regulation or Practice	Notes Recommendations	Existing Regulation or Practice	Notes Recommendations
3-10	Consider wetlands and riparian areas and their non-point source control potential on a watershed scale	Relies on state/federal permitting; §150-69 D (2b); §150-69 D (7)	No local regulation - defers to statewide regs. Should be bolstered to meet specific protection objectives within Conesus Lake watershed	Relies on state/federal permitting; §155-69 D (2b); §155-69 D (7)	No local regulation - defers to statewide regs. Should be bolstered to meet specific protection objectives within Conesus Lake watershed
3-12	Conduct permitting and nonregulatory non-point source pollution activities in a manner that protects wetland functions	§150-69 D (7)	Specific measures are provided for increased protections within the Conesus Lake watershed regarding pollutants / sources	§155-69 D (7)	Specific measures are provided for increased protections within the Conesus Lake watershed regarding pollutants / sources.
3-13	Special zoning considerations to protect wetland areas	§150-69 D (7)	No local regulation - defers to statewide regs. Should be bolstered to meet specific protection objectives within Conesus Lake watershed	§155-69 D (7)	No local regulation - defers to statewide regs. Should be bolstered to meet specific protection objectives within Conesus Lake watershed.
	ROADS/BRIDGES				
5-01	Conduct road maintenance in accordance with best management practices including esc considerations for ditch maintenance.	No	no guidance provided. Should consider BMPs consistent with Cornell Local Roads program technical guidance	No	No guidance provided. Should consider BMPs consistent with Cornell Local Roads program technical guidance.
5-05	Develop and identify erosion/sediment control areas (steep slopes, easily erodible soils, sensitive areas)	§150-69 identifies "critical areas" afforded coverage under Land Conservation regulations	Critical areas and protections are identified. Could benefit to have these protections extended to other areas within the Conesus Lake Watershed, particularly in regard to land disturbance / erosion and sediment control practices and standards	§150-69 identifies "critical areas" afforded coverage under Land Conservation regulations	Critical areas and protections are identified. Could benefit to have these protections extended to other areas within the Conesus Lake Watershed, particularly in regard to land disturbance / erosion and sediment control practices and standards
5-07	Minimize the amount of vegetation and soil disturbance in road maintenance	No	no guidance provided. Should consider BMPs consistent with Cornell Local Roads program technical guidance	No	No guidance provided. Should consider BMPs consistent with Cornell Local Roads program technical guidance.
5-24	Target training/Cornell Local Roads Programs	No	A fundamental resource for education, outreach and technical support to roadway departments, CEOs	No	A fundamental resource for education, outreach and technical support to roadway departments, CEOs.

Tables

TABLE 1 - SOIL PROPERTIES AND QUALITIES SUMMARY

Basin	HSG	Land Use	Acres
1	A/D	005 Woods	1.10
1	A/D	006 Pasture, grassland, or range	0.18
1	B	003 Brush, brush/weed/grass mix	4.92
1	B	005 Woods	24.05
1	B	006 Pasture, grassland, or range	11.64
1	B	007 Row crops (straight row)	44.87
1	B	008 Open Space (Lawns, Parks, etc.)	0.74
1	B/D	003 Brush, brush/weed/grass mix	0.19
1	B/D	005 Woods	4.28
1	B/D	006 Pasture, grassland, or range	3.30
1	B/D	007 Row crops (straight row)	3.73
1	B/D	008 Open Space (Lawns, Parks, etc.)	0.30
1	C/D	005 Woods	9.65
1	C/D	006 Pasture, grassland, or range	2.36
1	C/D	007 Row crops (straight row)	3.18
1	C/D	008 Open Space (Lawns, Parks, etc.)	0.06
2	A	005 Woods	1.44
2	A	006 Pasture, grassland, or range	25.66
2	A/D	005 Woods	3.24
2	A/D	006 Pasture, grassland, or range	8.99
2	A/D	008 Open Space (Lawns, Parks, etc.)	0.18
2	B	005 Woods	2.86
2	B	006 Pasture, grassland, or range	33.34
2	B	008 Open Space (Lawns, Parks, etc.)	1.69
2	B/D	005 Woods	14.34
2	B/D	006 Pasture, grassland, or range	0.69
2	B/D	008 Open Space (Lawns, Parks, etc.)	0.96
2	C/D	005 Woods	1.95
2	C/D	006 Pasture, grassland, or range	2.06
2	C/D	008 Open Space (Lawns, Parks, etc.)	0.21
3	A/D	006 Pasture, grassland, or range	0.22
3	A/D	007 Row crops (straight row)	0.24
3	B	002 Meadow, cont. grass, non-grazed	4.92
3	B	003 Brush, brush/weed/grass mix	16.12
3	B	005 Woods	29.57
3	B	006 Pasture, grassland, or range	92.56
3	B	007 Row crops (straight row)	4.94
3	B	008 Open Space (Lawns, Parks, etc.)	23.62
3	B	008 Residential District (1/2 acre size lot)	2.56
3	B	008 Residential District (1/8 acre size lot)	0.28
3	B/D	002 Meadow, cont. grass, non-grazed	0.18
3	B/D	003 Brush, brush/weed/grass mix	4.99
3	B/D	005 Woods	26.47
3	B/D	006 Pasture, grassland, or range	5.20
3	B/D	007 Row crops (straight row)	0.17
3	B/D	008 Open Space (Lawns, Parks, etc.)	0.13
3	B/D	008 Residential District (1/2 acre size lot)	0.19
3	B/D	008 Residential District (1/8 acre size lot)	0.00
3	C/D	005 Woods	11.31
3	C/D	006 Pasture, grassland, or range	5.41
4	A/D	003 Brush, brush/weed/grass mix	0.03
4	A/D	005 Woods	2.86
4	A/D	006 Pasture, grassland, or range	3.10
4	A/D	007 Row crops (straight row)	0.95

TABLE 1 - SOIL PROPERTIES AND QUALITIES SUMMARY (*Continued*)

4 A/D	008 Open Space (Lawns, Parks, etc.)	0.23
4 A/D	008 Residential District (1/2 acre size lot)	0.08
4 B	002 Meadow, cont. grass, non-grazed	1.13
4 B	003 Brush, brush/weed/grass mix	3.19
4 B	005 Woods	3.45
4 B	006 Pasture, grassland, or range	42.39
4 B	007 Row crops (straight row)	12.07
4 B	008 Open Space (Lawns, Parks, etc.)	22.80
4 B	008 Residential District (1/2 acre size lot)	9.04
4 B	008 Residential District (1/8 acre size lot)	6.44
4 B	008 Urban District (Commercial & Business)	2.97
4 B/D	005 Woods	0.00
4 B/D	006 Pasture, grassland, or range	0.99
4 B/D	008 Open Space (Lawns, Parks, etc.)	0.18
4 B/D	008 Residential District (1/2 acre size lot)	0.92
4 B/D	008 Residential District (1/8 acre size lot)	1.40
4 B/D	008 Urban District (Commercial & Business)	0.88
5 A/D	008 Residential District (1/2 acre size lot)	0.07
5 B	002 Meadow, cont. grass, non-grazed	9.60
5 B	003 Brush, brush/weed/grass mix	1.51
5 B	005 Woods	6.96
5 B	006 Pasture, grassland, or range	43.50
5 B	007 Row crops (straight row)	0.16
5 B	008 Open Space (Lawns, Parks, etc.)	27.82
5 B	008 Residential District (1/2 acre size lot)	32.98
5 B	008 Residential District (1/8 acre size lot)	7.39
5 B	008 Urban District (Commercial & Business)	1.31
5 B/D	002 Meadow, cont. grass, non-grazed	1.32
5 B/D	005 Woods	5.32
5 B/D	006 Pasture, grassland, or range	0.83
5 B/D	007 Row crops (straight row)	0.43
5 B/D	008 Open Space (Lawns, Parks, etc.)	13.63
5 B/D	008 Residential District (1/2 acre size lot)	17.56
5 B/D	008 Residential District (1/8 acre size lot)	13.46
5 B/D	008 Urban District (Commercial & Business)	5.10
5 C/D	005 Woods	1.22
5 C/D	007 Row crops (straight row)	0.75
5 C/D	008 Open Space (Lawns, Parks, etc.)	2.54
5 C/D	008 Residential District (1/2 acre size lot)	1.57
5 C/D	008 Residential District (1/8 acre size lot)	1.17
6 A	003 Brush, brush/weed/grass mix	0.03
6 A	005 Woods	7.97
6 A	006 Pasture, grassland, or range	4.35
6 A	007 Row crops (straight row)	0.01
6 A/D	005 Woods	13.46
6 A/D	006 Pasture, grassland, or range	0.00
6 A/D	008 Open Space (Lawns, Parks, etc.)	0.92
6 A/D	008 Residential District (1/2 acre size lot)	0.48
6 A/D	008 Residential District (1/8 acre size lot)	0.29
6 B	002 Meadow, cont. grass, non-grazed	3.74
6 B	003 Brush, brush/weed/grass mix	2.61
6 B	005 Woods	37.04
6 B	006 Pasture, grassland, or range	64.14
6 B	007 Row crops (straight row)	40.30
6 B	008 Open Space (Lawns, Parks, etc.)	16.07

TABLE 1 - SOIL PROPERTIES AND QUALITIES SUMMARY (*Continued*)

6 B	008 Residential District (1/2 acre size lot)	4.38
6 B	008 Residential District (1/8 acre size lot)	0.59
6 B	008 Urban District (Commercial & Business)	0.08
6 B/D	002 Meadow, cont. grass, non-grazed	0.72
6 B/D	003 Brush, brush/weed/grass mix	4.58
6 B/D	005 Woods	56.37
6 B/D	006 Pasture, grassland, or range	32.32
6 B/D	007 Row crops (straight row)	26.48
6 B/D	008 Open Space (Lawns, Parks, etc.)	7.68
6 B/D	008 Residential District (1/2 acre size lot)	7.56
6 B/D	008 Residential District (1/8 acre size lot)	2.85
6 B/D	008 Urban District (Commercial & Business)	0.58
6 C/D	003 Brush, brush/weed/grass mix	1.18
6 C/D	005 Woods	7.30
6 C/D	006 Pasture, grassland, or range	14.22
6 C/D	007 Row crops (straight row)	14.64
6 C/D	008 Open Space (Lawns, Parks, etc.)	4.33
6 C/D	008 Residential District (1/2 acre size lot)	2.62
6 C/D	008 Residential District (1/8 acre size lot)	2.04
6 C/D	008 Urban District (Commercial & Business)	0.82
6 D	005 Woods	0.30
6 D	006 Pasture, grassland, or range	2.16
6 D	007 Row crops (straight row)	0.49
7 A	005 Woods	0.99
7 A	006 Pasture, grassland, or range	3.97
7 A	007 Row crops (straight row)	0.05
7 B	003 Brush, brush/weed/grass mix	4.29
7 B	005 Woods	15.63
7 B	006 Pasture, grassland, or range	35.03
7 B	007 Row crops (straight row)	24.13
7 B	008 Open Space (Lawns, Parks, etc.)	8.61
7 B	008 Residential District (1/2 acre size lot)	2.06
7 B/D	003 Brush, brush/weed/grass mix	0.07
7 B/D	006 Pasture, grassland, or range	2.79
7 C/D	005 Woods	3.88
7 C/D	006 Pasture, grassland, or range	12.33
7 C/D	007 Row crops (straight row)	3.05
7 C/D	008 Open Space (Lawns, Parks, etc.)	2.73
7 C/D	008 Residential District (1/2 acre size lot)	0.23
7 D	003 Brush, brush/weed/grass mix	0.10
7 D	005 Woods	9.17
7 D	006 Pasture, grassland, or range	9.15
7 D	007 Row crops (straight row)	8.24
7 D	008 Open Space (Lawns, Parks, etc.)	1.13
7 D	008 Residential District (1/2 acre size lot)	0.17
8 A	005 Woods	1.45
8 A	006 Pasture, grassland, or range	1.34
8 A	008 Open Space (Lawns, Parks, etc.)	0.05
8 A/D	005 Woods	0.21
8 A/D	006 Pasture, grassland, or range	0.82
8 B	003 Brush, brush/weed/grass mix	3.64
8 B	005 Woods	9.04
8 B	006 Pasture, grassland, or range	33.90
8 B	007 Row crops (straight row)	13.77
8 B	008 Open Space (Lawns, Parks, etc.)	13.23

TABLE 1 - SOIL PROPERTIES AND QUALITIES SUMMARY (*Continued*)

8 B	008 Residential District (1/2 acre size lot)	3.63
8 B	008 Residential District (1/8 acre size lot)	0.52
8 B/D	005 Woods	9.65
8 B/D	006 Pasture, grassland, or range	4.78
8 B/D	007 Row crops (straight row)	0.79
8 B/D	008 Open Space (Lawns, Parks, etc.)	0.63
8 C/D	006 Pasture, grassland, or range	5.09
8 C/D	007 Row crops (straight row)	1.09
8 D	006 Pasture, grassland, or range	2.96
8 D	008 Open Space (Lawns, Parks, etc.)	0.39
8 D	008 Residential District (1/2 acre size lot)	0.02
9 A/D	006 Pasture, grassland, or range	1.74
9 A/D	008 Open Space (Lawns, Parks, etc.)	0.69
9 A/D	008 Residential District (1/2 acre size lot)	0.12
9 B	001 Pond or Lake Surface	0.83
9 B	006 Pasture, grassland, or range	0.93
9 B	008 Open Space (Lawns, Parks, etc.)	1.90
9 B	008 Residential District (1/2 acre size lot)	0.85
9 B	008 Residential District (1/8 acre size lot)	0.12
9 B/D	001 Pond or Lake Surface	0.40
9 B/D	005 Woods	1.80
9 B/D	006 Pasture, grassland, or range	3.13
9 B/D	008 Open Space (Lawns, Parks, etc.)	1.97
9 B/D	008 Residential District (1/2 acre size lot)	2.82
9 B/D	008 Residential District (1/8 acre size lot)	0.02
9 C	006 Pasture, grassland, or range	0.03
9 D	001 Pond or Lake Surface	0.29
9 D	003 Brush, brush/weed/grass mix	1.74
9 D	005 Woods	1.40
9 D	006 Pasture, grassland, or range	4.00
9 D	008 Open Space (Lawns, Parks, etc.)	3.15
9 D	008 Residential District (1/2 acre size lot)	1.41
9 D	008 Residential District (1/8 acre size lot)	0.44

TABLE 2 - MODELED EXISTING CONDITIONS PEAK FLOWS SUMMARY TABLE

Wilkins Creek Peak Flows															
1 Year Peak Flood		1.5 Year Peak Flood		2 Year Peak Flood		10 Year Peak Flood		25 Year Peak Flood		50 Year Peak Flood		100 Year Peak Flood		500 Year Peak Flood	
StreamStats (cfs)	Modeled Results (cfs)	Stream Stats (cfs)	Modeled Results (cfs)	Stream Stats (cfs)	Modeled Results (cfs)	Stream Stats (cfs)	Modeled Results (cfs)	Stream Stats (cfs)	Modeled Results (cfs)	Stream Stats (cfs)	Modeled Results (cfs)	Stream Stats (cfs)	Modeled Results (cfs)	Stream Stats (cfs)	Modeled Results (cfs)
-	31	83	44	105	58	197	193	243	337	277	489	310	691	386	1,405

TABLE 3 - POLLUTANT LOADING RESULTS

Wilkins Creek Basin 1
Mapshed GWLF-E Output

Month	Precip (in)	Evapo Trans (in)	Gr Wat Flow (in)	Runoff (in)	Strm Flow (in)	Erosion (tons)	Sediment (tons)	Stream Sed	Stream N	Stream P	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)	Tile Drain P	Tile Drain P	Tile Drain Sed	Animal N	Animal P
Jan	2.16	0.08	1.5	0.21	1.72	0.13	0.03	0.01835	0.02	0	82.98	83.03	2.18	2.2	0	0	0	0	0
Feb	1.54	0.12	1.3	0.29	1.59	0.08	0.02	0.01855	0.02	0	76.35	76.39	2.49	2.49	0	0	0	0	0
Mar	2.82	0.37	1.96	0.47	2.43	0.84	0.18	0.02292	0.02	0	116.87	117.51	3.95	4.23	0	0	0	0	0
Apr	3.2	1.31	2.37	0.07	2.45	2.09	0.13	0.02334	0.02	0	118.41	118.87	1.94	2.14	0	0	0	0	0
May	3.47	2.91	1.61	0.06	1.67	2.45	0.21	0.01768	0.02	0	80.91	81.66	1.37	1.7	0	0	0	0	0
Jun	3.06	3.48	0.78	0.01	0.79	2.13	0.02	0.01111	0.02	0	38.36	38.4	0.55	0.57	0	0	0	0	0
Jul	3.65	3.19	0.29	0.14	0.43	3.01	0.64	0.00702	0	0	21.01	23.55	1.04	2.12	0	0	0	0	0
Aug	3.09	2.9	0.33	0.05	0.38	2.26	0.21	0.00531	0	0	19	19.82	0.57	0.93	0	0	0	0	0
Sep	3.7	2.3	0.22	0.06	0.28	2.09	0.54	0.00484	0	0	14.15	16.29	0.57	1.5	0	0	0	0	0
Oct	2.81	1.23	0.66	0.17	0.82	1.79	0.54	0.01063	0	0	39.75	41.87	1.39	2.31	0	0	0	0	0
Nov	3.04	0.49	1.37	0.24	1.61	3.67	1.25	0.01744	0.02	0	77.43	82.36	2.25	4.39	0	0	0	0	0
Dec	2.21	0.2	1.85	0.19	2.04	3.57	1.16	0.02043	0.02	0	98.59	103.11	2.29	4.25	0	0	0	0	0

Source	Area	Runoff	Erosion (tons)	Sediment (tons)	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)
Hay/Past	14.8	1.5	1.12	0.22	3.77	4.65	1.63	2.01
Cropland	49.4	2.76	22.76	4.5	89.79	107.78	10.01	17.81
Forest	44.5	1.26	0.21	0.04	2.4	2.58	0.13	0.2
Wetland	0	0	0	0	0	0	0	0
Disturbed	0	0	0	0	0	0	0	0
Turfgrass	0	0	0	0	0	0	0	0
Open_Land	0	0	0	0	0	0	0	0
Bare_Rock	0	0	0	0	0	0	0	0
Sandy_Areas	0	0	0	0	0	0	0	0
Unpaved_Road	0	0	0	0	0	0	0	0
Ld_Mixed	0	0	0	0	0	0	0	0
Md_Mixed	0	0	0	0	0	0	0	0
Hd_Mixed	0	0	0	0	0	0	0	0
Ld_Residential	0	0	0	0	0	0	0	0
Md_Residential	0	0	0	0	0	0	0	0
Hd_Residential	0	0	0	0	0	0	0	0
Farm Animals						0		0
Tile Drainage				0		0		0
Stream Bank				0.17747		0		0
Groundwater					687.84144	687.84144	8.84053	8.84053
Point Source					0	0	0	0
Septic Systems					0	0	0	0

Organisms/Month

Month	Farm Animals	WWTP	Septic Systems	Urban Areas	Wildlife	Total	Stream Flow (ft^3)	Mean Concentration (cfu/100ml)
Jan	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E+09	1.35E+09	6.78E+05	7
Feb	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E+09	1.23E+09	6.27E+05	6.9
Mar	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E+09	1.35E+09	9.57E+05	5
Apr	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E+09	1.30E+09	9.66E+05	4.8
May	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E+09	1.35E+09	6.59E+05	7.2
Jun	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E+09	1.30E+09	3.12E+05	14.8
Jul	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E+09	1.35E+09	1.70E+05	27.9
Aug	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E+09	1.35E+09	1.51E+05	31.5
Sep	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E+09	1.30E+09	1.10E+05	41.7
Oct	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E+09	1.35E+09	3.25E+05	14.6
Nov	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E+09	1.30E+09	6.36E+05	7.2
Dec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E+09	1.35E+09	8.05E+05	5.9
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+10	1.59E+10	6.40E+06	14.5
% of Total	0	0		0	1			

TABLE 3 - POLLUTANT LOADING RESULTS (*Continued*)

Wilkins Creek Basin 2
Mapshed GWLF-E Output

Month	Precip (in)	Evapo Trans (in)	Gr Wat Flow (in)	Runoff (in)	Strm Flow (in)	Erosion (tons)	Sediment (tons)	Stream Sed	Stream N	Stream P	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)	Tile Drain P	Tile Drain P	Tile Drain Sed	Animal N	Animal P
Jan	2.16	0.13	1.44	0.17	1.61	0.15	0.07	0.05851	0.07	0.02	100.82	101.06	1.96	2.01	0	0	0	0	0
Feb	1.54	0.2	1.29	0.23	1.52	0.14	0.07	0.05984	0.07	0.04	91.09	91.56	2.25	2.29	0	0	0	0	0
Mar	2.82	0.59	1.91	0.36	2.28	0.2	0.11	0.07301	0.07	0.04	135.69	136.47	3.46	3.59	0	0	0	0	0
Apr	3.2	1.76	2.18	0.06	2.23	0.37	0.1	0.07325	0.07	0.04	149.54	149.54	1.81	1.87	0	0	0	0	0
May	3.47	3.38	1.31	0.04	1.35	0.44	0.1	0.0513	0.04	0.02	89.79	89.82	1.12	1.23	0	0	0	0	0
Jun	3.06	3.53	0.54	0	0.54	0.39	0.03	0.02941	0.02	0.02	37.04	37.04	0.37	0.37	0	0	0	0	0
Jul	3.65	3.15	0.19	0.1	0.3	0.54	0.15	0.01796	0.02	0	14.53	15.3	0.73	1.04	0	0	0	0	0
Aug	3.09	2.93	0.27	0.03	0.3	0.41	0.06	0.01421	0.02	0	18.65	18.89	0.35	0.44	0	0	0	0	0
Sep	3.7	2.57	0.18	0.03	0.2	0.37	0.12	0.01259	0.02	0	12.43	12.96	0.31	0.55	0	0	0	0	0
Oct	2.81	1.58	0.46	0.13	0.58	0.35	0.14	0.02665	0.02	0.02	32.76	33.49	1.08	1.32	0	0	0	0	0
Nov	3.04	0.68	1.08	0.2	1.28	0.8	0.32	0.04824	0.04	0.02	76.41	77.8	1.92	2.51	0	0	0	0	0
Dec	2.21	0.29	1.66	0.15	1.81	0.84	0.32	0.06184	0.07	0.04	115.74	117.02	2.03	2.6	0	0	0	0	0

Source	Area	Runoff	Erosion (tons)	Sediment (tons)	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)
Hay/Past	64.2	1.5	4.94	0.97	16.36	20.24	8.58	10.76
Cropland	0	0	0	0	0	0	0	0
Forest	22.2	1.26	0.08	0.01	1.21	1.26	0.07	0.09
Wetland	0	0	0	0	0	0	0	0
Disturbed	0	0	0	0	0	0	0	0
Turfgrass	0	0	0	0	0	0	0	0
Open_Land	0	0	0	0	0	0	0	0
Bare_Rock	0	0	0	0	0	0	0	0
Sandy_Areas	0	0	0	0	0	0	0	0
Unpaved_Road	0	0	0	0	0	0	0	0
Ld_Mixed	7.4	2.01	0	0.06	1.08	3.26	0.15	0.35
Md_Mixed	0	0	0	0	0	0	0	0
Hd_Mixed	0	0	0	0	0	0	0	0
Ld_Residential	0	0	0	0	0	0	0	0
Md_Residential	0	0	0	0	0	0	0	0
Hd_Residential	0	0	0	0	0	0	0	0
Farm Animals						0		0
Tile Drainage				0		0		0
Stream Bank				0.5269		0		0
Groundwater					831.53857	831.53857	8.62006	8.62006
Point Source					0	0	0	0
Septic Systems					24.58065831	24.58065831	0	0

Organisms/Month

Month	Farm Animals	WWTP	Septic Systems	Urban Areas	Wildlife	Total	Stream Flow (ft^3)	Mean Concentration (cfu/100ml)
Jan	0.00E+00	0.00E+00	0.00E+00	6.70E+07	6.73E+08	7.40E+08	5.47E+05	4.8
Feb	0.00E+00	0.00E+00	0.00E+00	8.93E+07	6.14E+08	7.03E+08	5.17E+05	4.8
Mar	0.00E+00	0.00E+00	0.00E+00	1.41E+08	6.73E+08	8.14E+08	7.75E+05	3.7
Apr	0.00E+00	0.00E+00	0.00E+00	2.49E+07	6.52E+08	6.76E+08	7.61E+05	3.1
May	0.00E+00	0.00E+00	0.00E+00	1.65E+07	6.73E+08	6.90E+08	4.58E+05	5.3
Jun	0.00E+00	0.00E+00	0.00E+00	9.69E+05	6.52E+08	6.53E+08	1.86E+05	12.4
Jul	0.00E+00	0.00E+00	0.00E+00	3.74E+07	6.73E+08	7.11E+08	1.00E+05	25.1
Aug	0.00E+00	0.00E+00	0.00E+00	1.42E+07	6.73E+08	6.88E+08	1.00E+05	24.2
Sep	0.00E+00	0.00E+00	0.00E+00	8.49E+06	6.52E+08	6.60E+08	7.00E+04	33.3
Oct	0.00E+00	0.00E+00	0.00E+00	4.71E+07	6.73E+08	7.20E+08	1.99E+05	12.8
Nov	0.00E+00	0.00E+00	0.00E+00	7.42E+07	6.52E+08	7.26E+08	4.36E+05	5.9
Dec	0.00E+00	0.00E+00	0.00E+00	6.06E+07	6.73E+08	7.34E+08	6.17E+05	4.2
Total	0.00E+00	0.00E+00	0.00E+00	5.82E+08	7.93E+09	8.51E+09	4.77E+06	11.6
% of Total	0	0		0.068	0.932			

TABLE 3 - POLLUTANT LOADING RESULTS (*Continued*)

Wilkins Creek Basin 3
Mapshed GWLF-E Output

Month	Precip (in)	Evapo Trans (in)	Gr Wat Flow (in)	Runoff (in)	Strm Flow (in)	Erosion (tons)	Sediment (tons)	Stream Sed	Stream N	Stream P	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)	Tile Drain P	Tile Drain P	Tile Drain Sed	Animal N	Animal P
Jan	2.16	0.11	1.52	0.12	1.65	0.37	0.13	0.12296	0.13	0.07	197.51	198.11	3.88	3.95	0	0	0	0	0
Feb	1.54	0.17	1.35	0.17	1.53	0.35	0.13	0.12447	0.13	0.07	178.42	179.3	4.32	4.41	0	0	0	0	0
Mar	2.82	0.52	2.03	0.26	2.3	0.82	0.31	0.15218	0.15	0.07	267.91	269.71	6.66	7.03	0	0	0	0	0
Apr	3.2	1.61	2.33	0.04	2.37	1.85	0.26	0.15717	0.15	0.07	294.21	294.65	3.88	4.1	0	0	0	0	0
May	3.47	3.21	1.44	0.03	1.46	2.17	0.3	0.11229	0.11	0.04	181.9	182.7	2.45	2.82	0	0	0	0	0
Jun	3.06	3.54	0.64	0	0.64	1.88	0.07	0.06747	0.07	0.02	80.6	80.6	0.93	0.95	0	0	0	0	0
Jul	3.65	3.17	0.24	0.07	0.31	2.68	0.65	0.03964	0.04	0.02	33.93	36.68	1.39	2.54	0	0	0	0	0
Aug	3.09	2.92	0.31	0.02	0.33	2.01	0.19	0.03178	0.02	0.02	40.21	41.01	0.73	1.04	0	0	0	0	0
Sep	3.7	2.47	0.2	0.02	0.22	1.85	0.49	0.0277	0.02	0.02	26.9	28.92	0.62	1.48	0	0	0	0	0
Oct	2.81	1.45	0.56	0.09	0.65	1.74	0.58	0.06133	0.07	0.02	74.6	77.12	2.12	3.11	0	0	0	0	0
Nov	3.04	0.61	1.24	0.15	1.39	3.55	1.31	0.1061	0.11	0.04	162.26	167.66	3.81	6.04	0	0	0	0	0
Dec	2.21	0.26	1.79	0.11	1.89	3.67	1.29	0.13298	0.13	0.07	229.83	235.03	4.08	6.24	0	0	0	0	0
														43.71					

Source	Area	Runoff	Erosion (tons)	Sediment (tons)	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)
Hay/Past	106.3	1.5	9.83	1.94	27.05	34.79	12.46	16.12
Cropland	22.2	1.5	12.27	2.41	21.89	31.55	2.6	7.19
Forest	86.5	0.37	0.83	0.17	1.39	2.05	0.07	0.37
Wetland	0	0	0	0	0	0	0	0
Disturbed	0	0	0	0	0	0	0	0
Turfgrass	0	0	0	0	0	0	0	0
Open_Land	0	0	0	0	0	0	0	0
Bare_Rock	0	0	0	0	0	0	0	0
Sandy_Areas	0	0	0	0	0	0	0	0
Unpaved_Road	0	0	0	0	0	0	0	0
Ld_Mixed	9.9	2.01	0	0.08	1.43	4.37	0.2	0.49
Md_Mixed	0	0	0	0	0	0	0	0
Hd_Mixed	0	0	0	0	0	0	0	0
Ld_Residential	0	0	0	0	0	0	0	0
Md_Residential	0	0	0	0	0	0	0	0
Hd_Residential	0	0	0	0	0	0	0	0
Farm Animals						0		0
Tile Drainage				0		0		0
Stream Bank				1.13648		2.2		0
Groundwater					1684.99107	1684.99107	19.51089	19.51089
Point Source					0	0	0	0
Septic Systems					31.60370355	31.60370355	0	0

Organisms/Month

Month	Farm Animals	WWTP	Septic Systems	Urban Areas	Wildlife	Total	Stream Flow (ft^3)	Mean Concentration (cfu/100ml)
Jan	0.00E+00	0.00E+00	0.00E+00	4.97E+07	2.62E+09	2.67E+09	1.34E+06	7
Feb	0.00E+00	0.00E+00	0.00E+00	6.61E+07	2.39E+09	2.45E+09	1.25E+06	7
Mar	0.00E+00	0.00E+00	0.00E+00	1.05E+08	2.62E+09	2.72E+09	1.87E+06	5.1
Apr	0.00E+00	0.00E+00	0.00E+00	1.84E+07	2.53E+09	2.55E+09	1.93E+06	4.7
May	0.00E+00	0.00E+00	0.00E+00	1.20E+07	2.62E+09	2.63E+09	1.20E+06	7.8
Jun	0.00E+00	0.00E+00	0.00E+00	7.18E+05	2.53E+09	2.53E+09	5.25E+05	17
Jul	0.00E+00	0.00E+00	0.00E+00	2.78E+07	2.62E+09	2.65E+09	2.58E+05	36.2
Aug	0.00E+00	0.00E+00	0.00E+00	1.06E+07	2.62E+09	2.63E+09	2.70E+05	34.4
Sep	0.00E+00	0.00E+00	0.00E+00	6.24E+06	2.53E+09	2.54E+09	1.84E+05	48.7
Oct	0.00E+00	0.00E+00	0.00E+00	3.48E+07	2.62E+09	2.65E+09	5.34E+05	17.5
Nov	0.00E+00	0.00E+00	0.00E+00	5.50E+07	2.53E+09	2.59E+09	1.13E+06	8.1
Dec	0.00E+00	0.00E+00	0.00E+00	4.50E+07	2.62E+09	2.66E+09	1.54E+06	6.1
Total	0.00E+00	0.00E+00	0.00E+00	4.31E+08	3.09E+10	3.13E+10	1.20E+07	16.6
% of Total	0	0		0.014	0.986			

TABLE 3 - POLLUTANT LOADING RESULTS (*Continued*)

Wilkins Creek Basin 4
Mapshed GWLF-E Output

Month	Precip (in)	Evapo Trans (in)	Gr Wat Flow (in)	Runoff (in)	Strm Flow (in)	Erosion (tons)	Sediment (tons)	Stream Sed	Stream N	Stream P	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)	Tile Drain P	Tile Drain P	Tile Drain Sed	Animal N	Animal P
Jan	2.16	0.12	1.43	0.2	1.63	0.25	0.1	0.08252	0.09	0.04	104.1	107.01	1.74	2.18	0	0	0	0	0
Feb	1.54	0.19	1.27	0.26	1.53	0.25	0.1	0.08417	0.09	0.04	94.8	99.45	1.96	2.49	0	0	0	0	0
Mar	2.82	0.55	1.9	0.41	2.3	0.62	0.24	0.10242	0.11	0.04	141.8	148.04	2.84	3.73	0	0	0	0	0
Apr	3.2	1.67	2.2	0.08	2.28	1.48	0.22	0.10364	0.11	0.04	151.5	151.5	1.74	2.09	0	0	0	0	0
May	3.47	3.28	1.35	0.06	1.41	1.73	0.23	0.07487	0.07	0.04	93.41	93.41	1.06	1.39	0	0	0	0	0
Jun	3.06	3.54	0.59	0.01	0.6	1.5	0.06	0.044	0.04	0.02	40.26	40.26	0.42	0.49	0	0	0	0	0
Jul	3.65	3.15	0.21	0.11	0.32	2.13	0.53	0.02659	0.02	0.02	17.68	21.8	0.6	1.5	0	0	0	0	0
Aug	3.09	2.92	0.27	0.05	0.32	1.6	0.22	0.02083	0.02	0	19.75	21.61	0.33	0.73	0	0	0	0	0
Sep	3.7	2.5	0.19	0.04	0.22	0.6	0.2	0.01949	0.02	0	14.26	16.95	0.33	0.75	0	0	0	0	0
Oct	2.81	1.5	0.49	0.15	0.65	1.7	0.62	0.04225	0.04	0.02	38.51	44.56	1.01	2.18	0	0	0	0	0
Nov	3.04	0.64	1.13	0.22	1.36	2.69	1.11	0.07056	0.07	0.04	84.44	91.89	1.74	3.64	0	0	0	0	0
Dec	2.21	0.27	1.68	0.19	1.86	3.05	1.15	0.08801	0.09	0.04	120.97	127.91	1.9	3.86	0	0	0	0	0

Source	Area	Runoff	Erosion (tons)	Sediment (tons)	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)
Hay/Past	56.8	0.51	3.45	0.68	4.89	7.61	2.34	3.68
Cropland	19.8	1.5	14.08	2.78	19.44	30.56	2.4	7.89
Forest	7.4	0.37	0.06	0.01	0.11	0.15	0	0.02
Wetland	0	0	0	0	0	0	0	0
Disturbed	0	0	0	0	0	0	0	0
Turfgrass	0	0	0	0	0	0	0	0
Open_Land	0	0	0	0	0	0	0	0
Bare_Rock	0	0	0	0	0	0	0	0
Sandy_Areas	0	0	0	0	0	0	0	0
Unpaved_Road	0	0	0	0	0	0	0	0
Ld_Mixed	14.8	2.01	0	0.12	2.16	6.55	0.29	0.73
Md_Mixed	0	0	0	0	0	0	0	0
Hd_Mixed	9.9	9.96	0	0.42	10.71	32.47	1.37	3.4
Ld_Residential	0	0	0	0	0	0	0	0
Md_Residential	0	0	0	0	0	0	0	0
Hd_Residential	0	0	0	0	0	0	0	0
Farm Animals						0		0
Tile Drainage				0		0		0
Stream Bank				0.75949		0		0
Groundwater					841.37118	841.37118	9.28145	9.28145
Point Source					0	0	0	0
Septic Systems					45.64979401	45.64979401	0	0

Organisms/Month

Month	Farm Animals	WWTP	Septic Systems	Urban Areas	Wildlife	Total	Stream Flow (ft^3)	Mean Concentration (cfu/100ml)
Jan	0.00E+00	0.00E+00	0.00E+00	1.66E+09	2.24E+08	1.89E+09	6.43E+05	10.4
Feb	0.00E+00	0.00E+00	0.00E+00	2.02E+09	2.05E+08	2.22E+09	6.03E+05	13
Mar	0.00E+00	0.00E+00	0.00E+00	3.26E+09	2.24E+08	3.48E+09	9.10E+05	13.5
Apr	0.00E+00	0.00E+00	0.00E+00	7.97E+08	2.17E+08	1.01E+09	9.00E+05	4
May	0.00E+00	0.00E+00	0.00E+00	5.15E+08	2.24E+08	7.40E+08	5.56E+05	4.7
Jun	0.00E+00	0.00E+00	0.00E+00	8.71E+07	2.17E+08	3.04E+08	2.37E+05	4.5
Jul	0.00E+00	0.00E+00	0.00E+00	8.85E+08	2.24E+08	1.11E+09	1.28E+05	30.7
Aug	0.00E+00	0.00E+00	0.00E+00	5.34E+08	2.24E+08	7.58E+08	1.27E+05	21.2
Sep	0.00E+00	0.00E+00	0.00E+00	3.49E+08	2.17E+08	5.66E+08	8.69E+04	23
Oct	0.00E+00	0.00E+00	0.00E+00	1.22E+09	2.24E+08	1.45E+09	2.55E+05	20.1
Nov	0.00E+00	0.00E+00	0.00E+00	1.69E+09	2.17E+08	1.90E+09	5.36E+05	12.5
Dec	0.00E+00	0.00E+00	0.00E+00	1.61E+09	2.24E+08	1.84E+09	7.34E+05	8.8
Total	0.00E+00	0.00E+00	0.00E+00	1.46E+10	2.64E+09	1.73E+10	5.71E+06	13.9
% of Total	0	0		0.847	0.153			

TABLE 3 - POLLUTANT LOADING RESULTS (*Continued*)

Wilkins Creek Basin 5
Mapshed GWLF-E Output

Month	Precip (in)	Evapo Trans (in)	Gr Wat Flow (in)	Runoff (in)	Strm Flow (in)	Erosion (tons)	Sediment (tons)	Stream Sed	Stream N	Stream P	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)	Tile Drain P	Tile Drain P	Tile Drain Sed	Animal N	Animal P
Jan	2.16	0.13	1.33	0.29	1.62	0.29	0.87	0.68123	0.68	0.24	147.56	157.59	2.25	3.44	0	0	0	0	0
Feb	1.54	0.21	1.16	0.37	1.54	0.3	0.89	0.70397	0.71	0.24	133.86	149.58	2.47	3.92	0	0	0	0	0
Mar	2.82	0.61	1.73	0.58	2.31	0.36	1.09	0.8405	0.84	0.29	198.48	218.98	3.51	5.49	0	0	0	0	0
Apr	3.2	1.74	2.03	0.13	2.16	0.36	1.07	0.82857	0.84	0.29	209.17	209.17	2.23	2.87	0	0	0	0	0
May	3.47	3.28	1.28	0.09	1.37	0.25	0.82	0.62362	0.62	0.22	129.74	129.74	1.37	1.74	0	0	0	0	0
Jun	3.06	3.52	0.56	0.01	0.57	0.1	0.46	0.3603	0.35	0.13	55.87	55.87	0.57	0.73	0	0	0	0	0
Jul	3.65	3.14	0.19	0.16	0.35	0.06	0.36	0.22218	0.22	0.07	24.82	32.85	0.73	1.34	0	0	0	0	0
Aug	3.09	2.91	0.24	0.08	0.33	0.08	0.25	0.17055	0.18	0.07	27.43	31.48	0.49	0.86	0	0	0	0	0
Sep	3.7	2.44	0.18	0.06	0.24	0.08	0.26	0.17877	0.18	0.07	21.56	27.87	0.53	1.01	0	0	0	0	0
Oct	2.81	1.54	0.48	0.23	0.7	0.2	0.6	0.38775	0.4	0.13	57.23	70	1.37	2.38	0	0	0	0	0
Nov	3.04	0.68	1.06	0.31	1.37	0.31	0.93	0.58688	0.6	0.2	119.25	132.96	2.18	3.55	0	0	0	0	0
Dec	2.21	0.3	1.56	0.27	1.83	0.36	1.09	0.71239	0.71	0.24	172.67	184.95	2.6	4.1	0	0	0	0	0

Source	Area	Runoff	Erosion (tons)	Sediment (tons)	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)
Hay/Past	61.8	0.51	2.66	0.52	5.31	7.41	1.92	2.65
Cropland	0	0	0	0	0	0	0	0
Forest	17.3	0.37	0.09	0.02	0.29	0.35	0.02	0.04
Wetland	0	0	0	0	0	0	0	0
Disturbed	0	0	0	0	0	0	0	0
Turfgrass	0	0	0	0	0	0	0	0
Open_Land	0	0	0	0	0	0	0	0
Bare_Rock	0	0	0	0	0	0	0	0
Sandy_Areas	0	0	0	0	0	0	0	0
Unpaved_Road	0	0	0	0	0	0	0	0
Ld_Mixed	89	2.01	0	0.69	12.96	39.31	1.72	4.32
Md_Mixed	0	0	0	0	0	0	0	0
Hd_Mixed	27.2	9.96	0	1.15	29.48	89.31	3.75	9.35
Ld_Residential	0	0	0	0	0	0	0	0
Md_Residential	0	0	0	0	0	0	0	0
Hd_Residential	0	0	0	0	0	0	0	0
Farm Animals						0		0
Tile Drainage				0		0		0
Stream Bank				6.29639		6.61		2.2
Groundwater					980.61498	980.61498	12.89703	12.89703
Point Source					0	0	0	0
Septic Systems					277.4102867	277.4102867	0	0

Organisms/Month

Month	Farm Animals	WWTP	Septic Systems	Urban Areas	Wildlife	Total	Stream Flow (ft^3)	Mean Concentration (cfu/100ml)
Jan	0.00E+00	0.00E+00	0.00E+00	1.55E+10	5.24E+08	1.60E+10	1.15E+06	49.2
Feb	0.00E+00	0.00E+00	0.00E+00	1.95E+10	4.77E+08	2.00E+10	1.09E+06	64.7
Mar	0.00E+00	0.00E+00	0.00E+00	3.08E+10	5.24E+08	3.13E+10	1.64E+06	67.4
Apr	0.00E+00	0.00E+00	0.00E+00	7.09E+09	5.07E+08	7.60E+09	1.53E+06	17.5
May	0.00E+00	0.00E+00	0.00E+00	5.34E+09	5.24E+08	5.86E+09	9.72E+05	21.3
Jun	0.00E+00	0.00E+00	0.00E+00	7.19E+08	5.07E+08	1.23E+09	4.04E+05	10.7
Jul	0.00E+00	0.00E+00	0.00E+00	8.22E+09	5.24E+08	8.74E+09	2.47E+05	124.8
Aug	0.00E+00	0.00E+00	0.00E+00	4.54E+09	5.24E+08	5.06E+09	2.30E+05	77.7
Sep	0.00E+00	0.00E+00	0.00E+00	3.21E+09	5.07E+08	3.71E+09	1.66E+05	78.9
Oct	0.00E+00	0.00E+00	0.00E+00	1.21E+10	5.24E+08	1.26E+10	5.01E+05	88.9
Nov	0.00E+00	0.00E+00	0.00E+00	1.61E+10	5.07E+08	1.66E+10	9.70E+05	60.3
Dec	0.00E+00	0.00E+00	0.00E+00	1.46E+10	5.24E+08	1.52E+10	1.30E+06	41.2
Total	0.00E+00	0.00E+00	0.00E+00	1.38E+11	6.17E+09	1.44E+11	1.02E+07	58.6
% of Total	0	0		0.957	0.043			

TABLE 3 - POLLUTANT LOADING RESULTS (*Continued*)

Wilkins Creek Basin 6
Mapshed GWLF-E Output

Month	Precip (in)	Evapo Trans (in)	Gr Wat Flow (in)	Runoff (in)	Strm Flow (in)	Erosion (tons)	Sediment (tons)	Stream Sed	Stream N	Stream P	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)	Tile Drain P	Tile Drain P	Tile Drain Sed	Animal N	Animal P
Jan	2.16	0.1	1.57	0.11	1.68	0.76	0.25	0.22694	0.22	0.11	356.88	359.66	5.58	6.02	0	0	0	0	0
Feb	1.54	0.16	1.39	0.15	1.54	0.72	0.25	0.22809	0.22	0.11	321.48	325.95	6.02	6.55	0	0	0	0	0
Mar	2.82	0.47	2.08	0.23	2.31	2	0.69	0.2783	0.29	0.13	484.4	491.72	8.99	10.36	0	0	0	0	0
Apr	3.2	1.51	2.41	0.04	2.44	4.84	0.58	0.29226	0.29	0.13	530.19	530.19	6.31	6.97	0	0	0	0	0
May	3.47	3.06	1.52	0.02	1.54	5.67	0.68	0.21261	0.22	0.11	334.86	335.61	3.99	4.87	0	0	0	0	0
Jun	3.06	3.44	0.7	0	0.7	4.93	0.14	0.13016	0.13	0.07	152.6	152.6	1.68	1.72	0	0	0	0	0
Jul	3.65	3.15	0.28	0.06	0.35	6.98	1.64	0.07608	0.07	0.04	69.56	77.58	1.81	4.67	0	0	0	0	0
Aug	3.09	2.89	0.36	0.02	0.37	5.22	0.5	0.06333	0.07	0.02	80.25	82.87	1.12	1.98	0	0	0	0	0
Sep	3.7	2.4	0.25	0.02	0.27	1.94	0.78	0.05715	0.07	0.02	57.43	61.73	0.95	2.34	0	0	0	0	0
Oct	2.81	1.37	0.69	0.09	0.78	5.2	1.66	0.1291	0.13	0.07	161.36	170.17	3.17	6.11	0	0	0	0	0
Nov	3.04	0.57	1.36	0.13	1.5	8.93	3.27	0.20642	0.2	0.09	313.39	328.4	5.62	11.24	0	0	0	0	0
Dec	2.21	0.24	1.87	0.09	1.96	9.88	3.34	0.2485	0.24	0.11	420.31	435.17	6.13	11.86	0	0	0	0	0

Source	Area	Runoff	Erosion (tons)	Sediment (tons)	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)
Hay/Past	116.1	0.51	8.23	1.61	9.99	16.45	4.63	7.72
Cropland	86.5	1.5	47.98	9.39	85.1	122.69	10.21	28.15
Forest	133.4	0.37	0.84	0.17	2.16	2.82	0.11	0.42
Wetland	0	0	0	0	0	0	0	0
Disturbed	0	0	0	0	0	0	0	0
Turfgrass	0	0	0	0	0	0	0	0
Open_Land	0	0	0	0	0	0	0	0
Bare_Rock	0	0	0	0	0	0	0	0
Sandy_Areas	0	0	0	0	0	0	0	0
Unpaved_Road	0	0	0	0	0	0	0	0
Ld_Mixed	34.6	2.01	0	0.28	5.05	15.3	0.66	1.68
Md_Mixed	0	0	0	0	0	0	0	0
Hd_Mixed	4.9	9.96	0	0.21	5.36	16.23	0.68	1.7
Ld_Residential	0	0	0	0	0	0	0	0
Md_Residential	0	0	0	0	0	0	0	0
Hd_Residential	0	0	0	0	0	0	0	0
Farm Animals						0		0
Tile Drainage				0		0		0
Stream Bank				2.1495		2.2		0
Groundwater					3067.15553	3067.15553	35.05346	35.05346
Point Source					0	0	0	0
Septic Systems					108.8572011	108.8572011	0	0

Organisms/Month

Month	Farm Animals	WWTP	Septic Systems	Urban Areas	Wildlife	Total	Stream Flow (ft^3)	Mean Concentration (cfu/100ml)
Jan	0.00E+00	0.00E+00	0.00E+00	7.11E+08	4.04E+09	4.75E+09	2.29E+06	7.3
Feb	0.00E+00	0.00E+00	0.00E+00	8.99E+08	3.68E+09	4.58E+09	2.09E+06	7.7
Mar	0.00E+00	0.00E+00	0.00E+00	1.44E+09	4.04E+09	5.48E+09	3.15E+06	6.1
Apr	0.00E+00	0.00E+00	0.00E+00	3.05E+08	3.91E+09	4.21E+09	3.33E+06	4.5
May	0.00E+00	0.00E+00	0.00E+00	1.95E+08	4.04E+09	4.23E+09	2.10E+06	7.1
Jun	0.00E+00	0.00E+00	0.00E+00	2.45E+07	3.91E+09	3.93E+09	9.58E+05	14.5
Jul	0.00E+00	0.00E+00	0.00E+00	3.88E+08	4.04E+09	4.43E+09	4.72E+05	33.1
Aug	0.00E+00	0.00E+00	0.00E+00	1.93E+08	4.04E+09	4.23E+09	5.11E+05	29.3
Jul	0.00E+00	0.00E+00	0.00E+00	3.88E+08	4.04E+09	4.43E+09	4.72E+05	33.1
Aug	0.00E+00	0.00E+00	0.00E+00	1.93E+08	4.04E+09	4.23E+09	5.11E+05	29.3
Sep	0.00E+00	0.00E+00	0.00E+00	1.20E+08	3.91E+09	4.03E+09	3.63E+05	39.2
Oct	0.00E+00	0.00E+00	0.00E+00	5.07E+08	4.04E+09	4.55E+09	1.06E+06	15.2
Nov	0.00E+00	0.00E+00	0.00E+00	7.51E+08	3.91E+09	4.66E+09	2.04E+06	8.1
Dec	0.00E+00	0.00E+00	0.00E+00	6.69E+08	4.04E+09	4.71E+09	2.67E+06	6.2

TABLE 3 - POLLUTANT LOADING RESULTS (*Continued*)

Wilkins Creek Basin 7
Online Mapshed GWLF-E Output

Month	Precip (in)	Evapo Trar	Gr Wat Flo	Runoff (in)	Strm Flow	Erosion (to	Sediment (	Stream Se	Stream N	Stream P	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)	Tile Drain I	Tile Drain I	Tile Drain S	Animal N	Animal P
Jan	2.39	0.13	0.93	0.24	1.17	0.31	0.08	0.05303	0.04	0.04	25.49	38.67	2.73	5	0	0	0	12.52	2.05
Feb	2.21	0.17	1.29	0.46	1.76	0.51	0.13	0.07512	0.04	0.04	35.65	49.58	5.75	8.22	0	0	0	12.7	2.07
Mar	2.48	0.62	1.98	0.44	2.41	0.84	0.19	0.08674	0.07	0.07	42.13	49.6	5.75	7.61	0	0	0	6.04	1.32
Apr	2.74	1.68	1.88	0.1	1.99	1.58	0.2	0.08107	0.04	0.04	26.19	32.47	2.03	3.64	0	0	0	5.64	1.17
May	2.93	3.87	1.14	0.03	1.17	8.34	0.22	0.05548	0.04	0.04	14.29	23.02	0.86	3.04	0	0	0	8.62	1.72
Jun	3.28	5.44	0.47	0.06	0.53	11.45	0.9	0.03429	0.02	0.02	8.44	18.56	0.95	4.83	0	0	0	8.09	1.61
Jul	2.89	3.65	0.18	0.03	0.2	9.58	0.76	0.01884	0.02	0.02	3.73	12.76	0.42	3.84	0	0	0	7.41	1.46
Aug	3.78	3.56	0.06	0.06	0.11	13.04	1.19	0.01287	0	0	3.9	15.5	0.68	5.53	0	0	0	8.64	1.74
Sep	3.23	2.63	0.02	0.07	0.09	12.51	2.05	0.00985	0	0	4.17	22.27	0.9	9.02	0	0	0	13.38	2.8
Oct	2.76	1.63	0.04	0.07	0.11	7.51	2.47	0.0103	0	0	4.21	18.3	0.84	8.86	0	0	0	7.78	1.59
Nov	3.38	0.75	0.11	0.15	0.26	8.6	3.14	0.0166	0	0.02	8.49	27.49	1.7	11.86	0	0	0	10.78	1.92
Dec	3.2	0.26	0.65	0.33	0.97	29.29	9.66	0.0446	0.02	0.02	22.38	58.36	3.95	31.15	0	0	0	11.46	1.96

Source	Area (acre	Runoff	Erosion (to	Sediment (	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)
Hay/Past	64.2	1.69	24.33	4.8	23.5	35.71	10.91	23.68
Cropland	35.8	3.15	79.09	15.6	72.86	112.59	11.38	52.91
Forest	33.1	1.41	0.13	0.02	2.01	2.07	0.11	0.18
Wetland	0	0	0	0	0	0	0	0
Disturbed	0	0	0	0	0	0	0	0
Turfgrass	0	0	0	0	0	0	0	0
Open_Lanc	0	0	0	0	0	0	0	0
Bare_Rock	0	0	0	0	0	0	0	0
Sandy_Are	0	0	0	0	0	0	0	0
Unpaved_F	0	0	0	0	0	0	0	0
Ld_Mixed	14.6	2.25	0	0.07	1.17	3.51	0.15	0.37
Md_Mixed	0	7.73	0	0	0	0	0	0
Hd_Mixed	0	11.43	0	0	0	0	0	0
Ld_Resider	0	2.25	0	0	0	0	0	0
Md_Reside	0	4.18	0	0	0	0	0	0
Hd_Reside	0	6	0	0	0	0	0	0
Farm Anim						113.07		21.41
Tile Draina				0		0		0
Stream Bar				0.49935		0		0
Groundwat					99.51655	99.51655	4.03445	4.03445
Point Sourc					0	0	0	0
Septic Syst					0	0	0	0

Organisms/Month

Month	Farm Anim	WWTP	Septic Syst	Urban Are	Wildlife	Total	Stream Flo	Mean Concentration (cfu/100ml)
Jan	8.69E+11	0	0	2.01E+08	1E+09	8.7E+11	627000	4902.7
Feb	8.81E+11	0	0	3.72E+08	9.13E+08	8.82E+11	943000	3304.3
Mar	1.38E+12	0	0	3.54E+08	1E+09	1.38E+12	1290000	3758
Apr	1.14E+12	0	0	95900000	9.7E+08	1.14E+12	1070000	3767.4
May	1.62E+12	0	0	17200000	1E+09	1.62E+12	626000	9160.2
Jun	1.49E+12	0	0	38000000	9.7E+08	1.49E+12	284000	18545.8
Jul	1.33E+12	0	0	6590000	1E+09	1.33E+12	110000	42731.3
Aug	1.63E+12	0	0	37300000	1E+09	1.63E+12	60400	95222.3
Sep	2.78E+12	0	0	31300000	9.7E+08	2.78E+12	51200	191811.4
Oct	1.51E+12	0	0	56000000	1E+09	1.51E+12	60600	87987.1
Nov	1.23E+12	0	0	1.27E+08	9.7E+08	1.24E+12	138000	31672.9
Dec	1.05E+12	0	0	2.68E+08	1E+09	1.05E+12	522000	7130.3
Total	1.69E+13	0	0	1.6E+09	1.18E+10	1.69E+13	5780000	41666.1
% of Total	0.999	0		0	0.001			

TABLE 3 - POLLUTANT LOADING RESULTS (*Continued*)

Wilkins Creek Basin 8
Mapshed GWLF-E Output

Month	Precip (in)	Evapo Trans (in)	Gr Wat Flow (in)	Runoff (in)	Strm Flow (in)	Erosion (tons)	Sediment (tons)	Stream Sed	Stream N	Stream P	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)	Tile Drain P	Tile Drain P	Tile Drain Sed	Animal N	Animal P
Jan	2.51	0.11	1.8	0.27	2.07	0.32	0.12	0.09948	0.11	0.07	134.48	135.65	2.91	3.11	0	0	0	0	0
Feb	1.67	0.17	1.47	0.26	1.74	0.25	0.1	0.09471	0.09	0.04	111.64	113.14	2.65	2.84	0	0	0	0	0
Mar	2.74	0.52	2.05	0.41	2.46	0.78	0.26	0.11148	0.11	0.07	156.31	158.82	3.92	4.48	0	0	0	0	0
Apr	2.99	1.53	2.13	0.02	2.15	2.11	0.11	0.1048	0.11	0.07	150.33	150.33	1.65	1.72	0	0	0	0	0
May	3.47	2.47	1.38	0.03	1.41	2.76	0.23	0.0769	0.07	0.04	98.17	98.59	1.19	1.57	0	0	0	0	0
Jun	3.12	2.75	0.76	0.02	0.77	2.46	0.11	0.05303	0.04	0.02	53.86	53.9	0.64	0.79	0	0	0	0	0
Jul	3.39	2.7	0.59	0.09	0.67	3.08	0.6	0.0448	0.04	0.02	43.89	46.19	0.95	2.12	0	0	0	0	0
Aug	3.42	2.8	0.57	0.01	0.58	3.05	0.15	0.04217	0.04	0.02	40.54	41.03	0.49	0.77	0	0	0	0	0
Sep	3.66	2.16	0.81	0.04	0.85	2.2	0.63	0.05566	0.07	0.02	58.84	61.11	0.86	2.07	0	0	0	0	0
Oct	2.73	1.36	1.29	0.09	1.39	1.22	0.5	0.07753	0.09	0.04	94.05	95.81	1.52	2.45	0	0	0	0	0
Nov	3.09	0.6	1.52	0.21	1.73	4.86	1.8	0.08875	0.09	0.04	113.34	121.14	2.36	6.04	0	0	0	0	0
Dec	2.43	0.24	1.91	0.21	2.11	6.36	2.3	0.10045	0.11	0.07	140.68	150.33	2.62	7.36	0	0	0	0	0

Source	Area	Runoff	Erosion (tons)	Sediment (tons)	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)
Hay/Past	42	1.43	2.56	0.51	10.19	12.21	5.36	6.48
Cropland	17.3	2.64	26.7	5.27	30.03	51.1	4.08	15.85
Forest	27.2	1.19	0.19	0.03	1.39	1.54	0.07	0.15
Wetland	0	0	0	0	0	0	0	0
Disturbed	0	0	0	0	0	0	0	0
Turfgrass	0	0	0	0	0	0	0	0
Open_Land	0	0	0	0	0	0	0	0
Bare_Rock	0	0	0	0	0	0	0	0
Sandy_Areas	0	0	0	0	0	0	0	0
Unpaved_Road	0	0	0	0	0	0	0	0
Ld_Mixed	19.8	1.99	0	0.15	3	9.06	0.4	0.99
Md_Mixed	0	0	0	0	0	0	0	0
Hd_Mixed	0	0	0	0	0	0	0	0
Ld_Residential	0	0	0	0	0	0	0	0
Md_Residential	0	0	0	0	0	0	0	0
Hd_Residential	0	0	0	0	0	0	0	0
Farm Animals						0		0
Tile Drainage				0		0		0
Stream Bank				0.95019		0		0
Groundwater					1088.92796	1088.92796	11.83881	11.83881
Point Source					0	0	0	0
Septic Systems					63.20740709	63.20740709	0	0

Organisms/Month

Month	Farm Animals	WWTP	Septic Systems	Urban Areas	Wildlife	Total	Stream Flow (ft^3)	Mean Concentration (cfu/100ml)
Jan	0.00E+00	0.00E+00	0.00E+00	5.86E+08	8.23E+08	1.41E+09	7.99E+05	6.2
Feb	0.00E+00	0.00E+00	0.00E+00	5.76E+08	7.50E+08	1.33E+09	6.70E+05	7
Mar	0.00E+00	0.00E+00	0.00E+00	9.00E+08	8.23E+08	1.72E+09	9.49E+05	6.4
Apr	0.00E+00	0.00E+00	0.00E+00	5.93E+07	7.96E+08	8.56E+08	8.28E+05	3.6
May	0.00E+00	0.00E+00	0.00E+00	8.36E+07	8.23E+08	9.06E+08	5.44E+05	5.9
Jun	0.00E+00	0.00E+00	0.00E+00	3.27E+07	7.96E+08	8.29E+08	2.98E+05	9.8
Jul	0.00E+00	0.00E+00	0.00E+00	1.88E+08	8.23E+08	1.01E+09	2.60E+05	13.7
Aug	0.00E+00	0.00E+00	0.00E+00	2.88E+07	8.23E+08	8.52E+08	2.23E+05	13.5
Sep	0.00E+00	0.00E+00	0.00E+00	7.10E+07	7.96E+08	8.67E+08	3.30E+05	9.3
Oct	0.00E+00	0.00E+00	0.00E+00	1.87E+08	8.23E+08	1.01E+09	5.35E+05	6.7
Nov	0.00E+00	0.00E+00	0.00E+00	4.55E+08	7.96E+08	1.25E+09	6.67E+05	6.6
Dec	0.00E+00	0.00E+00	0.00E+00	4.65E+08	8.23E+08	1.29E+09	8.15E+05	5.6
Total	0.00E+00	0.00E+00	0.00E+00	3.63E+09	9.70E+09	1.33E+10	6.92E+06	7.9
% of Total	0	0		0.273	0.727			

TABLE 3 - POLLUTANT LOADING RESULTS (*Continued*)

Wilkins Creek Basin 9
Online Mapshed GWLF-E Output

Month	Precip (in)	Evapo Trar	Gr Wat Flo	Runoff (in)	Strm Flow	Erosion (to	Sediment (	Stream Se	Stream N	Stream P	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)	Tile Drain I	Tile Drain I	Tile Drain S	Animal N	Animal P
Jan	2.39	0.14	0.6	0.29	0.89	0.1	0.04	0.04457	0.02	0.02	2.8	5.03	0.24	0.64	0	0	0	1.76	0.29
Feb	2.21	0.19	0.98	0.54	1.52	0.17	0.08	0.06908	0.04	0.04	3.59	6.24	0.46	0.93	0	0	0	1.79	0.29
Mar	2.48	0.68	1.7	0.52	2.22	0.19	0.09	0.08384	0.04	0.07	5.14	6.92	0.49	0.88	0	0	0	0.84	0.18
Apr	2.74	1.84	1.7	0.15	1.85	0.14	0.09	0.08212	0.04	0.04	4.21	5.2	0.22	0.49	0	0	0	0.79	0.15
May	2.93	3.82	1.04	0.03	1.07	0.3	0.07	0.05368	0.04	0.04	2.36	3.22	0.09	0.35	0	0	0	1.21	0.24
Jun	3.28	5.52	0.45	0.07	0.52	0.41	0.08	0.03386	0.02	0.02	1.17	2.23	0.09	0.37	0	0	0	1.12	0.22
Jul	2.89	4.69	0.18	0.02	0.2	0.34	0.04	0.0191	0.02	0.02	0.49	1.37	0.02	0.26	0	0	0	1.04	0.2
Aug	3.78	3.52	0.06	0.07	0.13	0.46	0.07	0.01399	0	0	0.4	1.74	0.07	0.4	0	0	0	1.21	0.24
Sep	3.23	2.5	0.02	0.07	0.09	0.44	0.09	0.0106	0	0	0.29	2.07	0.07	0.57	0	0	0	1.87	0.4
Oct	2.76	1.61	0.04	0.09	0.13	0.26	0.12	0.01232	0	0	0.49	2.05	0.09	0.53	0	0	0	1.08	0.22
Nov	3.38	0.76	0.06	0.19	0.25	0.39	0.18	0.01799	0.02	0.02	0.84	3.11	0.15	0.77	0	0	0	1.52	0.26
Dec	3.2	0.27	0.35	0.39	0.74	1.17	0.49	0.03882	0.02	0.02	2.01	5.27	0.33	1.63	0	0	0	1.61	0.26

Source	Area (acre	Runoff	Erosion (to	Sediment (	Dis N (lbs)	Tot N (lbs)	Dis P (lbs)	Tot P (lbs)
Hay/Past	8.9	1.69	4.35	0.86	3.26	5.45	1.5	3.79
Cropland	0	0	0	0	0	0	0	0
Forest	3.7	2.63	0.02	0	0.42	0.42	0.02	0.02
Wetland	1.2	5.05	0	0	0.26	0.26	0.02	0.02
Disturbed	0	0	0	0	0	0	0	0
Turfgrass	0	0	0	0	0	0	0	0
Open_Lanc	0	0	0	0	0	0	0	0
Bare_Rock	0	0	0	0	0	0	0	0
Sandy_Are	0	0	0	0	0	0	0	0
Unpaved_F	0	0	0	0	0	0	0	0
Ld_Mixed	12.6	2.25	0	0.06	1.04	3.15	0.13	0.35
Md_Mixed	0.7	7.73	0	0.02	0.26	0.77	0.02	0.09
Hd_Mixed	0	11.43	0	0	0	0	0	0
Ld_Resider	0	2.25	0	0	0	0	0	0
Md_Reside	0	4.18	0	0	0	0	0	0
Hd_Reside	0	6	0	0	0	0	0	0
Farm Anim						15.85		2.96
Tile Draina				0		0		0
Stream Bar				0.4795		0		0
Groundwat					15.03551	15.03551	0.61729	0.61729
Point Sourc					0	0	0	0
Septic Syst					3.552386	3.552386	0	0

Organisms/Month

Month	Farm Anim	WWTP	Septic Syst	Urban Are	Wildlife	Total	Stream Flo	Mean Concentration (cfu/100ml)
Jan	1.24E+11	0	0	1.04E+09	1.12E+08	1.25E+11	87900	5020.9
Feb	1.25E+11	0	0	1.9E+09	1.02E+08	1.27E+11	150000	3003.3
Mar	1.96E+11	0	0	1.83E+09	1.12E+08	1.98E+11	219000	3186.6
Apr	1.62E+11	0	0	5.63E+08	1.09E+08	1.62E+11	182000	3149.7
May	2.31E+11	0	0	98000000	1.12E+08	2.32E+11	106000	7726.9
Jun	2.13E+11	0	0	2E+08	1.09E+08	2.13E+11	50900	14770.9
Jul	1.89E+11	0	0	43800000	1.12E+08	1.89E+11	20000	33350.6
Aug	2.32E+11	0	0	2.1E+08	1.12E+08	2.32E+11	12600	65317.1
Sep	3.96E+11	0	0	1.88E+08	1.09E+08	3.97E+11	9410	148889.3
Oct	2.15E+11	0	0	3.39E+08	1.12E+08	2.16E+11	12500	60844.6
Nov	1.76E+11	0	0	6.99E+08	1.09E+08	1.77E+11	24500	25470.7
Dec	1.5E+11	0	0	1.39E+09	1.12E+08	1.51E+11	73500	7274.5
Total	2.41E+12	0	0	8.51E+09	1.32E+09	2.42E+12	948000	31500.4
% of Total	0.996	0		0.004	0.001			