Draft Stormwater Report

CAPITOL DRIVE (STH 190)

STH 16 to 0.3 Miles East of 5 Fields Road
Project No. 2025-07-73
Waukesha County, Wisconsin

January 2022

Prepared by:

M Squared Engineering, LLC

N19W6719 Commerce Ct.
Cedarburg, Wisconsin 53012
P: (262) 376-4246
msquared@msquaredengineering.com

TABLE OF CONTENTS

Appendices

INTRODUCTION

This narrative describes the drainage analysis for the Capitol Drive (STH 190) improvement project associated with Project Number 2025-07-73 in Waukesha County, Wisconsin. The project involves the rehabilitation of Capitol Drive from the STH 16 southbound off ramp (STA 8+75) to a point between Five Fields Road and Hunters Ridge Road (STA 111+00). The project will replace 2,825 feet of pavement along the western portion of the project, from Station 8+75 to Station 37+00, and mill and overlay 7,400 feet of asphalt pavement along the eastern portion of the project, from Station 37+00 to Station 111+00. The pavement rehabilitation will cover both eastbound and westbound travel lanes and will include curb ramp replacement, turning movement and turn lane improvements, and minor traffic signal improvements along the corridor. An overview of the replacement and reconstruction limits for this project can be seen in Figure 1 below. Since there will be little to no permanent increase in impervious surface within the project limits, it is not expected that any drainage improvements will be implemented.

Despite the unchanged impervious surface area, a detailed drainage review was performed at the Willow Grove Drive and Capitol Drive intersection to investigate the documented flooding at this location. Included in this review is ditch calculations, culvert calculations, a storm sewer system analysis, and recommended actions to reduce the inundation at this intersection. An aerial closeup of the intersection can be seen in Figure 2 below.

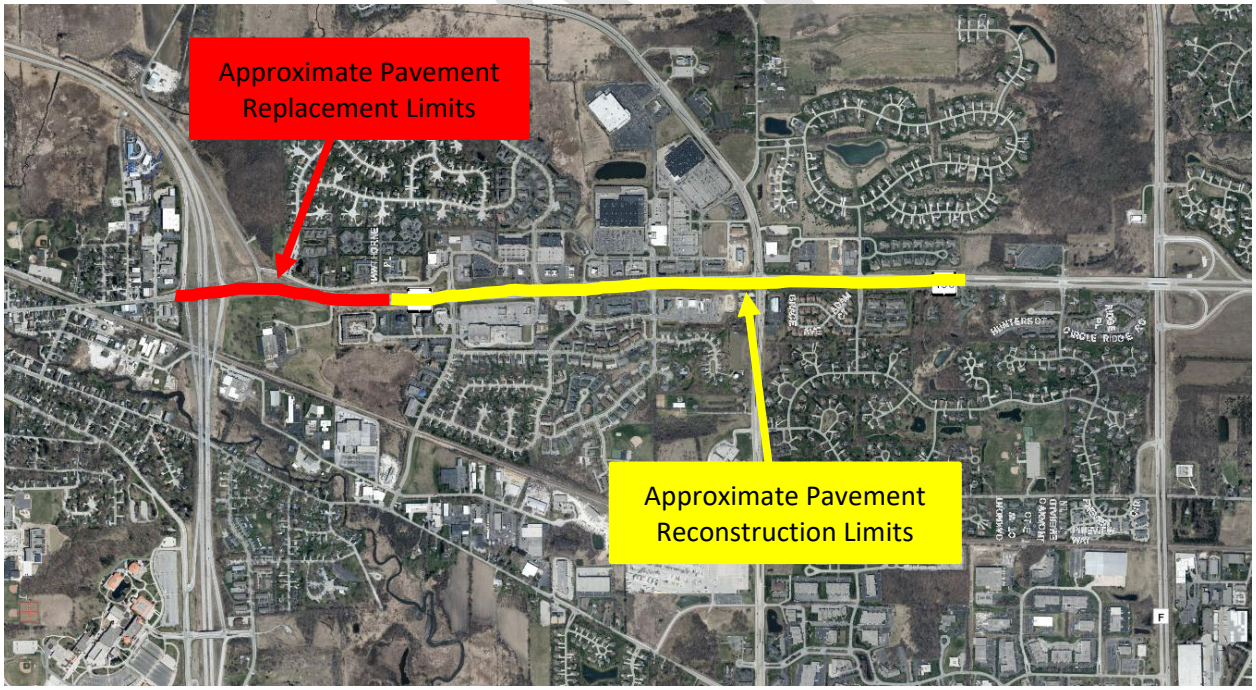


Figure 1 – Pavement Construction Limits

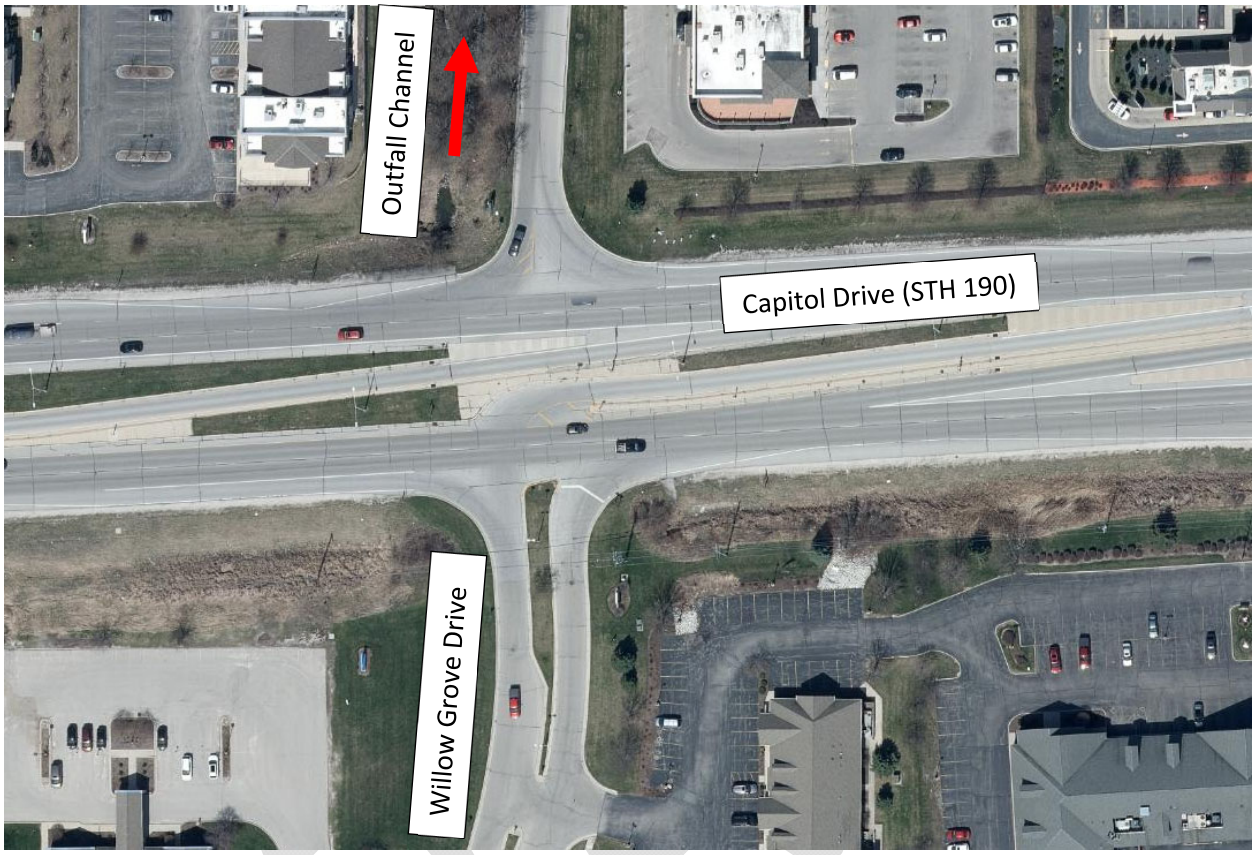


Figure 2 – Project Overview – Willow Grove Drive Intersection.

METHODOLOGY

The methodology used in developing this report, its associated calculations, and supporting information for the rehabilitation project is as follows:

1. Define the existing outfall location for the analysis area within the project corridor.
2. Delineate subbasins for each outfall where necessary.
3. Determine the existing and proposed flows at each outfall using SCS Method.
4. Evaluate the existing condition hydraulics.
5. Evaluate potential proposed improvements to rectify any existing condition deficiencies.
6. Compile a detailed report outlining the existing conditions, deficiencies found and improvements that could be made to rectify the deficiencies.
7. Complete the WisDOT spreadsheets with the above information for approval.

AVAILABLE SURVEY DATA

Survey data, including a topography file and an existing ground surface, was prepared by Ayres and Associates and provided for use with the stormwater report preparation. Additional topographic maps were obtained from the Waukesha County GIS site to supplement the available project survey. This was done to ensure that existing ground contour data was sufficient to cover the entire project site and watershed to allow for accurate hydraulic analysis. In addition to this, available As-Built and As-Designed plan sheets, provided by WisDOT, were reviewed to assist with the analysis.

HYDROLOGIC ANALYSIS

A hydrologic analysis was only necessary for this project within the outfall that drains the intersection with Capital Drive and Willow Grove Drive. No other project outfalls required a hydrologic analysis as there were no changes to the drainage areas or flow paths and no known flooding issues or other deficiencies that required analysis. An analysis of the existing and proposed flows to each project outfall were not necessary since the project does not change any flow paths or add any measurable new impervious areas.

For the one outfall that was evaluated, subbasin boundaries were defined using project corridor topographic mapping that was supplemented with GIS data. The topographic data was used to define the drainage areas, flow paths, and to calculate time of concentration. The subbasins were delineated and areas were calculated in AutoCAD. The outfall channel location can be seen in Figure 2 above.

The SCS Method was utilized to calculate 2-, 10-, 25-, 50- and 100-year flows for each subbasin for the existing condition using Autodesk Storm and Sanitary Analysis (SSA). The default boundary condition type of “normal” was used in SSA. This is due to the lack of information that we have on the existing ditches outside the project limits. Without having more detailed downstream analysis or outfall information, we could not be more specific with the tailwater / boundary condition.

The corridor includes both high- and low-density urban areas and commercial areas based on a review of the existing aerial photography available. Future development within the corridor is expected to continue as it has in the past, with new commercial developments either replacing old ones or being built on vacant land. The type and extent of future development was not considered in the design process. The intent of this analysis was to evaluate the existing conditions only, not any proposed or future conditions.

Time of concentrations were determined using the Kirpich Chart located in Chapter 13 Attachment 5.3 in the FDM, using the difference between high and low points in the subbasins with the maximum length of travel. However, for several of the drainage areas, the TR-55 method was utilized to provide a more accurate / realistic time of concentration which incorporated the hydraulically most remote point in the basin. This was broken down into sheet flow, shallow concentrated flow and channel flow. Flows calculated using the SCS TR-55 Method were then applied to the various storm sewer systems and ditches to analyze the existing conditions.

Appendix B contains the proposed plan sheets plans. The existing condition drainage area maps can be found in Appendix C. Appendix D contains the hydrologic analysis along with all the other modeling results.

HYDRAULIC ANALYSIS

The proposed project does not change any drainage flow patterns or drainage areas, and does not add any new impervious surface. As a result, a hydraulic analysis covering the project as a whole is not required for permitting. The only hydraulic analysis that was performed, as outlined below, is the analysis required to evaluate the reported flooding concerns at Willow Grove Drive. All associated analysis methods, results and related items are described in the following section.

WILLOW GROVE DRIVE INTERSECTION ANALYSIS

Overview

The intersection of Capital Drive and Willow Grove Drive has been identified by WisDOT as having a known drainage issue. There is recurring flooding that occurs in this intersection. Based on available data, the south leg of the intersection (Willow Grove Drive) is prone to overtopping of the roadway with runoff during large storm events. The exact details of this overtopping / flooding that occurs is not known. However, given the concern brought forward about the flooding at this location, WisDOT has requested that a detailed analysis of the drainage within this intersection be performed to attempt to identify the cause of the flooding and potential solutions.

The analysis was performed using the Hydrodynamic routing method. This method allows water to flow in any direction, which will give a more accurate result in a location that experiences flooding, overtopping of roadways and has multiple ditches or low points that function as minor detention basins (storage nodes in the model).

Existing Conditions

Survey of the existing storm sewer systems, ditches and other elements were utilized for the analysis. In addition, the Waukesha County GIS existing ground contours and some as-built information, supplied by WisDOT, was used and/or reviewed as a part of the analysis. This data was used to build the existing condition hydraulic model of the intersection for analysis. The modeling was then reviewed in detail to ensure that it was being analyzed in as accurate of a way as was practical.

In reviewing the available information, several interesting aspects were noted for the existing conditions. These items played into the modeling and how the drainage in the existing system functions. A brief description of each of these is included below to describe what was noticed and how it was modeled.

- There are three pipe outfalls (apron endwalls) along Capital Drive that have a surveyed invert that is below the invert of the ditch that they drain into. These locations are shown on Figure 3 below. These pipes are all located upstream of the Willow Grove Intersection and will not contribute to the potential flooding that Willow Grove experiences. This data indicates that the pipes, at their discharge point, are partially silted in along with the receiving ditch. This will result in reduced hydraulic capacity of the culverts and an obstruction to flow passing through the system. Given that this is what the survey data showed, this was left in the model to simulate the partial obstructions and the impact this would have on the overall watershed hydraulics. The presence of these was one of the reasons the model was run in Hydrodynamic model.

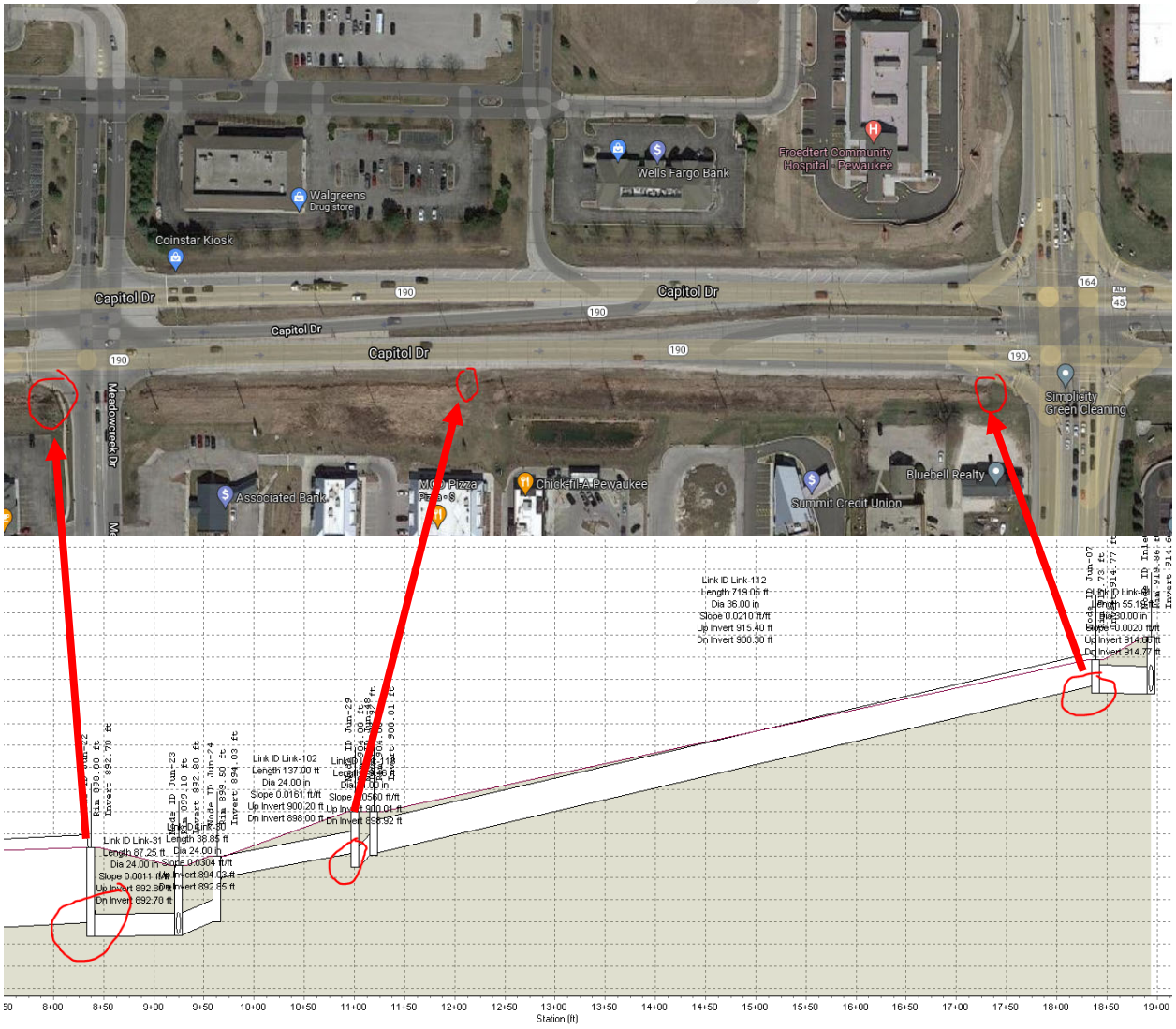


Figure 3 – Apron Endwalls Below Ditch Invert

- There were several pipes that, based on the surveyed invert elevations, were shown to be back-pitched and several inlets that showed the pipe out of the structure to be a higher elevation

than the pipe into the structure. The below Figure 4, which shows the south side of the STH 164 and Capital Drive intersection, shows some of these locations. Many of these locations appear to be a result of the structure in-flow and out-flow invert elevations getting switched around in the survey. However, without verification of this, it was determined to leave these in the model as this is what was surveyed. The back-pitched pipes were left in the model to match the surveyed inverts. Several of the pipes that had inflow elevations below the outflow elevations were left as-is (as seen below). However, several, for the sake of the modeling, were adjusted so that the inflow and outflow inverts matched. Most of the locations where this was seen were far enough away from the Willow Grove Drive intersection that they would not play a significant role in how the hydraulics, and associated flooding, of that intersection. The presence of these was one of the reasons the model was run in Hydrodynamic mode, as this would allow the model to run even with back-pitched pipes and structures with outflow elevations higher than inflow elevations.

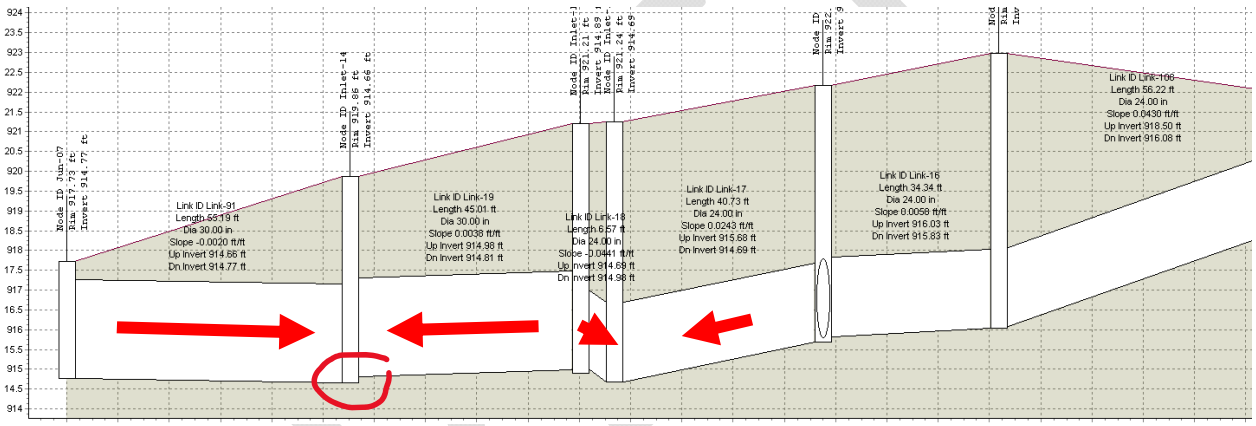


Figure 4 – Back-Pitched Pipes and Inflow/Outflow Elevation Discrepancies – STH 164 Intersection, South Side

- The existing 27" storm sewer pipe in Willow Grove Drive, shown on Figure 5, was also found to be back-pitched based on our surveyed invert elevations. This could be the result of settlement of the up-stream manhole over time. This was left in the model, as that was the data that was available from the field survey. This back-pitched pipe does affect the overall hydraulics of the system and impacts the level of flooding that may be seen in the low point on Willow Grove Drive.

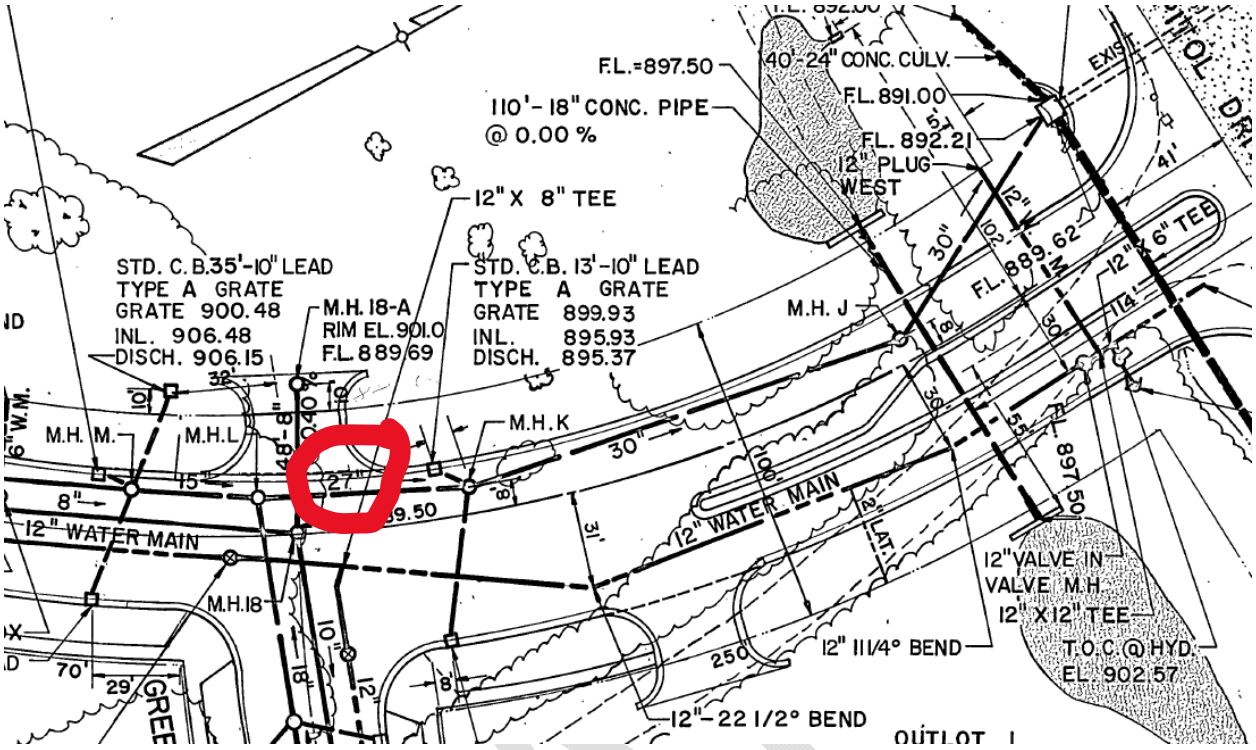


Figure 5 – Willow Grove Drive As-Built Plans - 1975

In addition to these items, there are a number of existing stormwater ponds along the project corridor within the drainage area. Existing information on these ponds, which are on private property, was not available for review. As a result, they are not considered within the hydrology or Tc calculations for the project. However, each of these ponds will have some effect on the overall peak flow that gets to the Willow Grove Intersection. See Figure 6 below for locations of many of the ponds.

Figure 6 – Existing Stormwater Pond Locations

Analysis

With the existing condition model compiled, it was run to see how the existing systems operated. The analysis was run during the 2-year, 5-year, 10-year, 25-year, 50-year and 100-year rainfall events using the SCS 24 Hour Type II distribution. All of these events were run to get a good handle on what point different areas within the analysis limits flooded.

To develop this analysis, the existing conditions model was prepared with an emphasis on determining the location of flooding within the corridor to validate the potential cause of flooding for Willow Grove Drive. Given the intent of this analysis, a detailed storm sewer system analysis including all inlets and minor storm sewer pipes was not developed. A drainage basin approach was used to perform the analysis to simplify the methodology while still providing the necessary results.

The results of this analysis can be found in Appendix D. Based on this analysis, a handful of conclusions can be developed.

1. Based on the analysis, Willow Grove Drive will flood during the 100-year storm, but does not flood during the 50-year storm or any smaller storms. The flooding occurs in the low point in the roadway profile, located about 300' south of the intersection.
2. There are several pipes in Willow Grove Drive that operate under pressure during the 5-year storm (shown as pipes in RED on the overview graphics at the start of each modeling run results found in Appendix D) and all larger storms but the inlets in Willow Grove Drive do not surcharge.
3. The roadside ditches along Capital Drive, even during the 100-year storm, do not pond up deep enough to spill water into Willow Grove Drive or back it up and surcharge it out of the storm sewer system in the low point. The 100-year storm elevation in the ditches on both sides of the intersection reaches approximately 895.00' while the low point in Willow Grove Drive is approximately 989.95'.
    - This leads to the determination that the reported flooding in Willow Grove Drive is not a result of the drainage along or under Capital Drive.
4. The original design was completed in 1975 and the as-built was completed in 1983.
    - Given how long ago that was, rainfall amounts have changed since then. Rainfall amounts and intensities have increased since that time, resulting in larger storm events occurring more often, increased flooding durations, and increased frequency of flooding beyond what was originally designed / expected.
    - We don't know what design storm was used for the original design, nor do we have any hydraulic analysis calculations or results from the original design. The older an original storm sewer design is, the more likely it is that the design may have only been intended to handle a smaller storm events (sometimes as small as the 2-year or 5-year storms). Even today, storm sewer systems are normally only designed to handle the 10-year storm. Any larger storm events are expected to result in street flooding as the inlets and pipes were not designed to handle those larger flows.
    - These two items result in more frequent flooding of intersections or roadways that may not have flooded as often historically.
5. In addition to Willow Grove Drive, there are two other locations that indicate capacity or flooding issues.

- STH 164 intersection, south leg: The inlets that are along the south leg of the STH 164 intersection with Capital Avenue have capacity issues within the pipe network. This is due to the existing surveyed conditions which show several pipes back-pitched and several inlets with pipes flowing into inlets at a lower elevation than the pipe that flows out of the inlets. However, the inlets do function for the 10-year storm without surcharging which is expected for a traditional storm sewer design. The inlets do surcharge water during the 25-year storm and larger storm events.
- South Leg of Meadowcreek Drive: There are capacity and flooding concerns for the South Leg of Meadowcreek Drive. During the 10-year storm and all larger storms, the water in the ditches along Capital Drive will pond up on the east side of the intersection, overtop into Meadowcreek Drive, flow to the low point in the road and overtop the road before continuing to flow along the ditch to the west. This is due, in part, to the pipe under Meadowcreek Drive being partially filled in (see Figure 3 above).

6. In addition, there is a small culvert under a field entrance located between Meadowcreek Drive and STH 164 that has capacity issues. We don't have a surveyed size on the culvert but we assumed it was a 24" RCP as most of the other pipes along this corridor were all 24" pipes. Given the up-stream basin that flows to this culvert, the modeling shows the culvert to be undersized and that the flow in the ditch will overtop the driveway during the 10-year and larger storms. This is partially due to the culvert and the downstream channel being partially filled in with sediment. This entrance is a field entrance that appears to be scarcely used. As a result, this is not viewed to be a major concern with the existing conditions.

The graphic shown in Figure 7 below depicts the locations along the corridor within the existing conditions model that show pipes being surcharged (functioning under pressure or over capacity) as red lines and the inlets or structures that are surcharged resulting in flooding shown as blue dots. These results are based on the 100-year storm event. This indicates the locations where there are potential flooding or capacity issues during the 100-year storm event.

Figure 7 – 100-Year SSA Modeling Graphic

Based off this analysis, the results that were seen, and given the desire to try to determine ways to improve the flooding along Willow Grove and other deficiencies within the corridor, several additional analyses were performed to help identify potential solutions. These included the following analysis:

- The hydraulic model was modified to reflect cleaning out and reshaping the existing roadside ditches so that the pipe outfalls / apron endwalls no longer discharged below grade. This was applied at the three locations shown in Figure 3 above. This modification assumes no change to the pipes; the only modification would be regrading each section of ditch to properly tie into the apron endwall inverts.
    - Results:
        - Field entrance no longer overtops in the 10-year storm.
        - Flooding is improved at Meadowcreek Drive during the 10-year storm but is not resolved. However, during larger storms, this improvement will move water downstream faster through the roadside diches making flooding slightly worse at Meadowcreek during larger events. This improvement has only minimal effect on Willow Grove.
    - Recommendation: Regrade the ditch to be reshaped to tie into the pipe outfall elevation at the downstream side of the pipes under Meadowcreek Drive but that this be the only location that is improved. If the other two ditch locations are improved, it is also recommended that the pipes under Meadowcreek Drive be upsized from 24" to 30" pipes. This will mitigate the increased flooding seen at that intersection in larger storm events and improve capacity issues at Meadowcreek Drive.
        - The results for this analysis can be found in Appendix E (including both the ditch and pipe edits).
        - It should be noted that this will not resolve the flooding issues at Meadowcreek Drive but will improve the situation. To prevent the overtopping of Meadowcreek during the 10-year storm, the two pipes would have to be increased to a 48" downstream and a 42" upstream. In addition, the pipe under Meadowcreek that ties into that pair of pipes would have to be increased from a 24" pipe to a 30" pipe. There would still be overtopping during the 25-year storm but the overtopping would be eliminated for the 10-year storm. The results from this analysis are not included in the report as this was done as quick check to see how to resolve this issue.
            - This analysis was performed in a conservative manner. There are three existing stormwater ponds located in the watershed up-stream of Meadowcreek Drive that are not accounted for in the hydrologic analysis. This will have an effect on the peak flow rates, and through this the flooding at the intersection. Without design plans for these ponds or detailed survey of these ponds (which are located on private property), an accurate detailed analysis accounting for this cannot be performed.
- The model with the modified ditches and culvert pipes noted in the recommendation above was then further modified to see is the flooding issues from the 100-year storm in Willow Grove could be resolved. The following options were implemented in this order to see if this could be resolved:

- Change slope of back-pitched pipe: Changing the slope of the back-pitched 27" pipe did not resolve the 100-year surcharging issue.
- Replacing the two 30" pipes with 36" pipes with minimum slopes of 0.7%. It was found that making these improvements, in addition to replacing the 27" pipe with a pipe that has a 0.35% positive slope resolved the surcharging issue.
  - It should be noted that detailed inlet calculations were not performed. To prevent flooding of the roadway, additional inlets would also be necessary to ensure sufficient inlet capacity is available to get the surface flow into the pipe system. A more detailed analysis to determine the number of inlets necessary was not performed at this time.
  - It should be noted that storm sewer systems are not typically designed to convey the 100-year storm. In addition, this work would be performed on a local road outside of WisDOT jurisdiction.
- The results from this analysis can be found in Appendix F.

Summary

Based on the analysis, it was determined that there is surface flooding along Willow Grove Drive. However, this surface flooding is not the result of or caused by the drainage systems along Capital Avenue. The flooding that is seen here is the result of changing design criteria, increased storm frequencies, intensities, and durations, and inadequate inlet capacity during larger storm events. It is anticipated that the primary reports of flooding of Willow Grove Drive were likely during storm events that exceeded the original design storm for the storm sewer system along the roadway. This would have resulted in surface ponding on the roadway which, when seen by the traveling public, would look like flooding but is in fact normal for larger storm events. Without more details on the nature of the flooding, further evaluation of the cause cannot be determined.

It is recommended that, at a minimum, the ditch between Willow Grove Drive and Meadowcreek Drive be regraded from the downstream end to tie in properly with the outfall apron endwall elevation for the storm sewer system under Meadowcreek Drive. Should WisDOT desire to make further improvements to remedy the potential flooding at Meadowcreek Drive, the pipes that drain under Meadowcreek conveying the ditch flow along capital from one side to the other should be upsized to 30" pipes.

At this time, it is not recommended that the storm sewer system along Willow Grove Drive be improved. It is not practical to design an urban storm sewer system for the 100-year storm. In addition, these improvements would not be on WisDOT property and based on the analysis are not the result of the drainage from WisDOT property.

WATER QUALITY TREATMENT ANALYSIS

This project was carefully reviewed against the TRANS 401 requirements. Based on this review, it is believed that this project is exempt from TRANS 401 storm water quality requirements because it is defined as a minor reconstruction of a highway. Under TRANS 401(3)(f), post-construction performance standards under Trans 401.106 do not apply to a project with "…any length of highway that does not

widen the roadbed by more than 100 feet, and for which the total length of relocated highway and any added through travel lane does not exceed 1.50 miles." This project does not meet the minimum widening or new travel lane length requirements.

As a result of this, no water quality requirements need to be met by this proposed project. However, it should be noted that several of the existing roadside ditches do function as grass swales providing some water quality benefit to the watershed in the existing condition. Since these are not being impacted by the proposed project, they will continue to provide some water quality benefit in the future as well. Since water quality treatment is not required, calculations to document these benefits were not performed.

ADDITIONAL CONSIDERATIONS

There are several additional considerations that were reviewed and accounted for in some fashion. These considerations ultimately did not change or affect the analysis or stormwater report but should be noted as they do affect ultimate design decisions.

Future Development

Future development within the project site area was not taken into consideration with the proposed analysis. There is no expected future development along this corridor or in the watershed that will drastically affect the drainage or stormwater management characteristics of the region.

Floodplains

There are no known floodplains within the project limits. A FEMA FIRM Panel showing the project limits and other pertinent data at this location is included in Appendix K.

Wetlands

There are some existing wetlands located within the project limits. The wetlands are shown on the Wisconsin DNR Surface Water Data Viewer. They have not been delineated as a part of this project as no impacts to these wetlands is anticipated as a part of this project. Should grading improvements to the existing roadside ditches be implemented as a part of this project, there is on wetland pocket between Meadowcreek Drive and STH 164 which may be impacted by this project. This potential impact would need to be evaluated if the ditch improvements are implemented. The limits of the minor wetland pockets within the project corridor can be seen in Appendix L, which contains the Wisconsin DNR Surface Water Data Viewer map showing the mapped wetlands.

Buffer Areas

A wetland delineation to document wetland or stream limits within the project limits has not been performed. However, the proposed work does not include any grading in areas that are anticipated to be considered wetlands or stream. As such, no impacts to buffer areas around these elements are anticipated.

CONCLUSIONS

This project is exempt from TRANS 401 stormwater quality requirements because it is a minor reconstruction of a highway. In addition, as there is no significant increase in impervious surface, there is no need to perform peak flow analysis as there will be no change in the peak flow that discharges to the project outfalls.

The hydraulic analysis of the Willow Grove Drive intersection showed that the reported flooding concern was only present during the 100-year storm event and was not caused or exacerbated by drainage from or the drainage systems within the WisDOT right of way. The necessary improvements to resolve this were evaluated but this is not recommended as storm sewer systems are not typically designed for the 100-year storm event.

Through the performance of this analysis, other items that do not meet WisDOT requirements were identified. These include two ditches that are over capacity during the design storm, several pipes that are back-pitched, several pipes that have their outfalls buried / silted in, and several inlets that are surcharging primarily due to the aforementioned items.

It is recommended that, at a minimum, the ditch between Willow Grove Drive and Meadowcreek Drive be regraded to tie into the outfall invert for the pipe discharging water from under Meadowcreek Drive. It is also recommended that WisDOT consider upsizing the pipes under Meadowcreek Drive and regrading the other ditches as described above to ensure there is positive drainage from all pipe inverts into all the ditches they discharge into. Additional improvements to address other items noted above are viewed to be outside the scope of this project.

This report was prepared in accordance with local, state, and federal engineering guidelines. Per the discussion above, the supporting calculations and the analysis that have been performed, the project meets or exceeds the WISDOT and WDNR requirements for stormwater management to the maximum extent practicable.

Appendix A

WisDOT Stormwater Spreadsheets

Basic Project Information

Project ID:	**2025-7-73**
Title:	**Capitol Drive**
Designer/Checker:	**David Bachhuber**
DOT Region/Firm Name:	**M Squared Engineering**
Date:	**1/31/2022**

HIGHWAY:	STH 190
LIMITS:	STH 16 to 0.3 Miles East of 5 Fields Road
COUNTY:	Waukesha
DESCRIPTION OF WORK:	Proposed pavement reconstruction, mill and overlay and drainage analysis
PROJECT MANAGER:	Amanda Imman (Ayres and Associates)
PS&E DATE:	
DESIGN STAGE	☐ **Planning** ☐ **30%** ☑ **60%** ☐ **90%** ☐ **Final**

Drainage Summary

IS THERE A SIGNIFICANT FLOW INCREASE OR DECREASE WITHIN ANY SUB BASIN OF THE PROJECT? IF YES, DESCRIBE THE CAUSE OF THE CHANGE AND WHY IT IS NECESSARY.

No there is not a significant flow increase or decrease within any sub basin of the project. The project consists of repaving the already existing concrete project limit of STH 190.

IS THERE A SIGNIFICANT IMPERVIOUS AREA CHANGE TO ANY SUB BASIN OF THE PROJECT? IF YES, DESCRIBE THE CAUSE OF THE CHANGE AND WHY IT IS NECESSARY.

There is no significant impervious area change to any sub basin of the project. Slight increase in impervious area will be due to the construction of new or slightly modified sidewalks in select areas along the project corridor. No new travel lanes or any widening is anticipated as a part of this project.

HAVE THE DRAINAGE SUB BASIN AREAS OR FLOW PATHS CHANGED SIGNIFICANTLY? IF YES, DESCRIBE THE CAUSE OF THE CHANGE AND WHY IT IS NECESSARY.

There is no change to sub basin areas or flow paths.

DESCRIBE THE PROPOSED DRAINAGE CONVEYANCE AND CONTROL SYSTEMS FOR THE PROJECT.

The proposed drainage conveyance and control systems in the proposed condition are the same as for the existing. This includes primarily ditches with some storm sewers along side streets for conveyance and grass swales for control systems. None of these are being changed.

DESCRIBE THE AQUATIC ORGANISM PASSAGE ISSUES FOR THE PROJECT, IF ANY.

N/A

IF THE DESIGN DOES NOT MEET THE DOT FDM CHAPTER 13 DRAINAGE REQUIREMENTS, EXPLAIN HOW AND WHY.

Detailed drainage system analysis including detailed ditch and inlet calculations along the corridor was not necessary as there is no increase in impervious surface as a result of this project other than a few minor sidewalk modifications and there were no known drainage issues through most of the corridor (existing conditions appear to function as desires so detailed analysis was out of scope).

There was one location, at Willow Grove Drive, that there was an expressed concern about flooding that warranted more study. This area was evaluated in detail and several deficiencies were identified and documented in the Stormwater Report. While the reported flooding concern was found to be the result of off-site drainage and not impacted by WisDOT drainage systems, several other issues were identified including back-piched pipes, silted in ditches and pipes and two ditches (upstream of Meadowcreek and upstream of the field entrance) that, as a result, do not have the capacity to convey the design storm (25-year storm). There are also several existing inlets that appear to surcharge during the design storm (25-yaer) primarily as a result of the aforementioned items. However, given the type of project that this is, repairs to these items are not included in the plans/contract at this time.

DESCRIBE WDNR COORDINATION. PROVIDE NAME OF WDNR CONTACT AND DATE, AND ATTACH ANY CORRESPONDENCE.

No WDNR coordination has taken place as it relates to Stormwater at this time.

IF THE DRAINAGE DESIGN MEETS LOCAL, MUNICIPAL OR REGIONAL GUIDELINES THAT EXCEED FDM CHAPTER 13 DRAINAGE REQUIREMENTS, EXPLAIN HOW AND WHY.

N/A

IF A SIGNIFICANT IMPACT TO THE PROJECT OCCURS DUE TO DRAINAGE, PROJECT MANAGER CONCURRENCE IS REQUIRED. (PM SIGN AND DATE)

N/A

Project Summary
Project ID: 2025-7-73
Title: Capitol Drive
Designer/Checker: David Bachhuber
DOT Region/Firm Name: M Squared Engineering
Date: 1/31/2022

HIGHWAY:	STH 190
LIMITS:	STH 16 to 0.3 Miles East of 5 Fields Road
COUNTY:	Waukesha
DESCRIPTION OF WORK:	Proposed pavement reconstruction, mill and overlay and drainage analysis
PROJECT MANAGER:	Amanda Imman (Ayres and Associates)
PS&E DATE:	0
DESIGN STAGE	60% Design Stage

Water Quality Results Discussion

Water Quality Results Summary	**Total Project Drainage Basin Area**	Grass Swales	Filter Strips	Wet Detention Ponds	Catch-basins	Street Cleaning	Biofilters	Other Devices	Untreated Areas
Drainage Area (ac)	**0.000**			0.000	0.000				0.000
ROW Drainage Area (ac)	**0.000**			0.000	0.000				0.000
Percent TSS Reduction by Treatment Type	**0.0%**			0.0%	0.0%				0.0%

Project Water Quality Objectives

☑ **THE PROJECT IS EXEMPT FROM TRANS 401 STORMWATER QUALITY REQUIREMENTS AND REQUIRES NO FURTHER WATER QUALITY INFORMATION. DESCRIBE BELOW WHY IT IS EXEMPT.**

This project is exempt from TRANS 401 per 401.03 (3) (f). This project does not widen the roadbed by more than 100'. The proposed project length is just over 1.5 miles but only a small portion of this is reconstruction and the remainder is only rehabilitation (mill and overlay). As a result, this project does not need to meet the post-construction performance standards. However, some of the existing ditches are wide enough to serve as grass swales and do provide water quality treatment in this area. Water quality calculations for these ditches was not developed as it is not required.

DESCRIBE THE STORMWATER QUALITY MANAGEMENT REQUIREMENTS PER TRANS 401 OR THE TMDL WASTELOAD ALLOCATION.

☐ **40 % Reduction** ☐ **80 % Reduction** ☑ **Other Reduction** N/A

This project is exempt.

IF THE PROJECT REQUIRES STORMWATER MANAGEMENT EXPLAIN HOW THE TRANS 401 2-YR PEAK DISCHARGE REQUIREMENT WAS MET.

This project is exempt.

HAS THE DEPARTMENT AGREED TO MEET ANY LOCAL STORMWATER QUALITY ORDINANCES OR REQUIREMENTS FOR THIS PROJECT? IF SO, DESCRIBE.

No, not at this time.

IF THE PROJECT REQUIRES STORM WATER MANAGEMENT EXPLAIN HOW THE TOTAL SUSPENDED SOLIDS REDUCTION WAS MET. Refer to Water Quality Results Summary above.

This project is exempt. However, the existing grass swales along the corridor do provide water quality treatment.

LIST THE POST CONSTRUCTION STORMWATER QUALITY CONTROL TREATMENT MEASURES FOR THE PROJECT.

N/A

REGIONAL STORMWATER ENGINEER CONCURRENCE (SIGN AND DATE)

Appendix B

Proposed Project Plan Sheets

2

N

EXISTING R/W

BLEND ASPHALT INTO NEW CONCRETE WITH NEW 2% CROSS SLOPE

STH 16 EB OFF RAMP

SEE NOTES IN TYPICAL SECTIONS FOR SURFACE TYPE

BEGIN CONSTRUCTION STA. 8+50

INSTALL MONOTUBE SIGNAL

STH 190 (CAPITOL DRIVE)

BEGIN PROJECT STA. 8+75
SAWCUT REQUIRED
MATCH EXISTING

30'

10'WB'

12'WB'

8'WB'

8'EB'

10'EB'

12'EB'

6'EB'

35'

STH 190 (CAPITOL DRIVE)

BLEND ASPHALT INTO NEW CONCRETE WITH NEW 2% CROSS SLOPE

INSTALL MONOTUBE SIGNAL

CONCRETE SIDEWALK

BEGIN PAVEMENT REPLACEMENT STA 9+10

REMOVE STONE WALL

INSTALL MONOTUBE SIGNAL

EXISTING R/W

STH 16 EB ON RAMP

LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-01

PLOT DATE : 11/10/2021 12:42 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT

WISDOT/CADDS SHEET 42

2

2

N

STH 16 WB ON RAMP

STH 16 WB ON RAMP

CECELIA DRIVE

STH 190 (CAPITOL DRIVE)

STH 190 (CAPITOL DRIVE)

14'WB'

16'WB'

18'WB'

20'WB'

14'EB'

16'EB'

18'EB'

20'EB'

CONCRETE SIDEWALK

CONCRETE SIDEWALK

REPLACE ASPHALT WITH CONCRETE SIDEWALK

STH 16 WB OFF RAMP

EXISTING R/W

4B1

6

7A

D

C

A

B

LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-02

PLOT DATE : 11/10/2021 12:42 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT

2

2

N

EXISTING R/W

STH 190 (CAPITOL DRIVE)

20'WB'

22'WB'

24'WB'

26'WB'

20'EB'

22'EB'

24'EB'

26'EB'

STH 190 (CAPITOL DRIVE)

EXISTING R/W

LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-03

PLOT DATE : 11/10/2021 12:42 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT

2

2

N

EXISTING R/W

STH 190 (CAPITOL DRIVE)

28'WB'

30'WB'

32'WB'

34'W

28'EB'

30'EB'

32'EB'

STH 190 (CAPITOL DRIVE)

EXISTING R/W

SIGN

POST

MH

INL

FLAG

XXXXXXXXX

LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-04

PLOT DATE : 11/10/2021 12:42 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT

WISDOT/CADDS SHEET 42

2

2

N

END PAVEMENT REPLACEMENT
BEGIN RESURFACING
STA. 37+00

34'WB' 36'WB' 38'WB' 40'WB'

STH 190 (CAPITOL DRIVE)

34'EB' 36'EB' 38'EB' 40'EB'

STH 190 (CAPITOL DRIVE)

END PAVEMENT REPLACEMENT
BEGIN RESURFACING
STA. 37+00

EXISTING R/W

SIGN MH INL POST W RIPRAP

LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-05

PLOT DATE : 11/10/2021 12:42 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT

2

2

N

GEORGETOWNE DRIVE

EXISTING R/W

INSTALL MONOTUBE SIGNAL

EXISTING R/W

4B1

2

C A

A C

6

25'

STH 190 (CAPITOL DRIVE)

40'WB' 42'WB' 40' 44'WB' 46'WB'

INSTALL MONOTUBE SIGNAL

C A

5

RAMPS APPEAR COMPLIANT AND GOOD CONDITION

40'EB' 42'EB' 44'EB' 46'EB'

STH 190 (CAPITOL DRIVE)

A C A B A 40' C A

5

2

INSTALL MONOTUBE SIGNAL

EXISTING R/W

INSTALL MONOTUBE SIGNAL

EXISTING R/W

FOREST GROVE DRIVE

LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-06

PLOT DATE : 11/10/2021 12:42 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT

2

2

N

EXISTING R/W

STH 190 (CAPITOL DRIVE)

48'WB' 50'WB' 52'WB' 54'WB'

48'EB' 50'EB' 52'EB' 54'EB'

STH 190 (CAPITOL DRIVE)

EXISTING R/W

LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-07

PLOT DATE : 11/10/2021 12:43 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT

2

2

WESTFIELD WAY

STH 190 (CAPITOL DRIVE)

WILLOW GROVE DRIVE

EXISTING R/W

INSTALL MONOTUBE SIGNAL

54'WB' 56'WB' 58'WB' 60'WB'

54'EB' 56'EB' 58'EB' 60'EB'

30'

40'

35'

N

LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-08

PLOT DATE : 11/10/2021 12:43 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT

2

2

N

EXISTING R/W

STH 190 (CAPITOL DRIVE)

62'WB' 64'WB' 66'WB' 68'WB'

62'EB' 64'EB' 66'EB' 68'EB'

STH 190 (CAPITOL DRIVE)

EXISTING R/W

WILLOW GROVE DRIVE

RIPRAP

FLAG

LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-09

PLOT DATE : 11/10/2021 12:43 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT

2

2

N

MOVE MEDIAN NOSE BACK OUT OF CROSSWALK

INSTALL MONOTUBE SIGNAL

INSTALL MONOTUBE SIGNAL

EXISTING R/W

STH 190 (CAPITOL DRIVE)

68'WB' 70'WB' 72'WB' 74'WB'

68'EB' 70'EB' 72'EB' 74'EB'

STH 190 (CAPITOL DRIVE)

INSTALL MONOTUBE SIGNAL

ADDRESS DRAINAGE CONCERN HERE

INSTALL MONOTUBE SIGNAL

MEADOWCREEK DRIVE

LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-10

PLOT DATE : 11/10/2021 12:43 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT

2

2

N

EXISTING R/W

STH 190 (CAPITOL DRIVE)

76'WB'

78'WB'

80'WB'

82'W

76'EB'

78'EB'

80'EB'

82'E

STH 190 (CAPITOL DRIVE)

EXISTING R/W

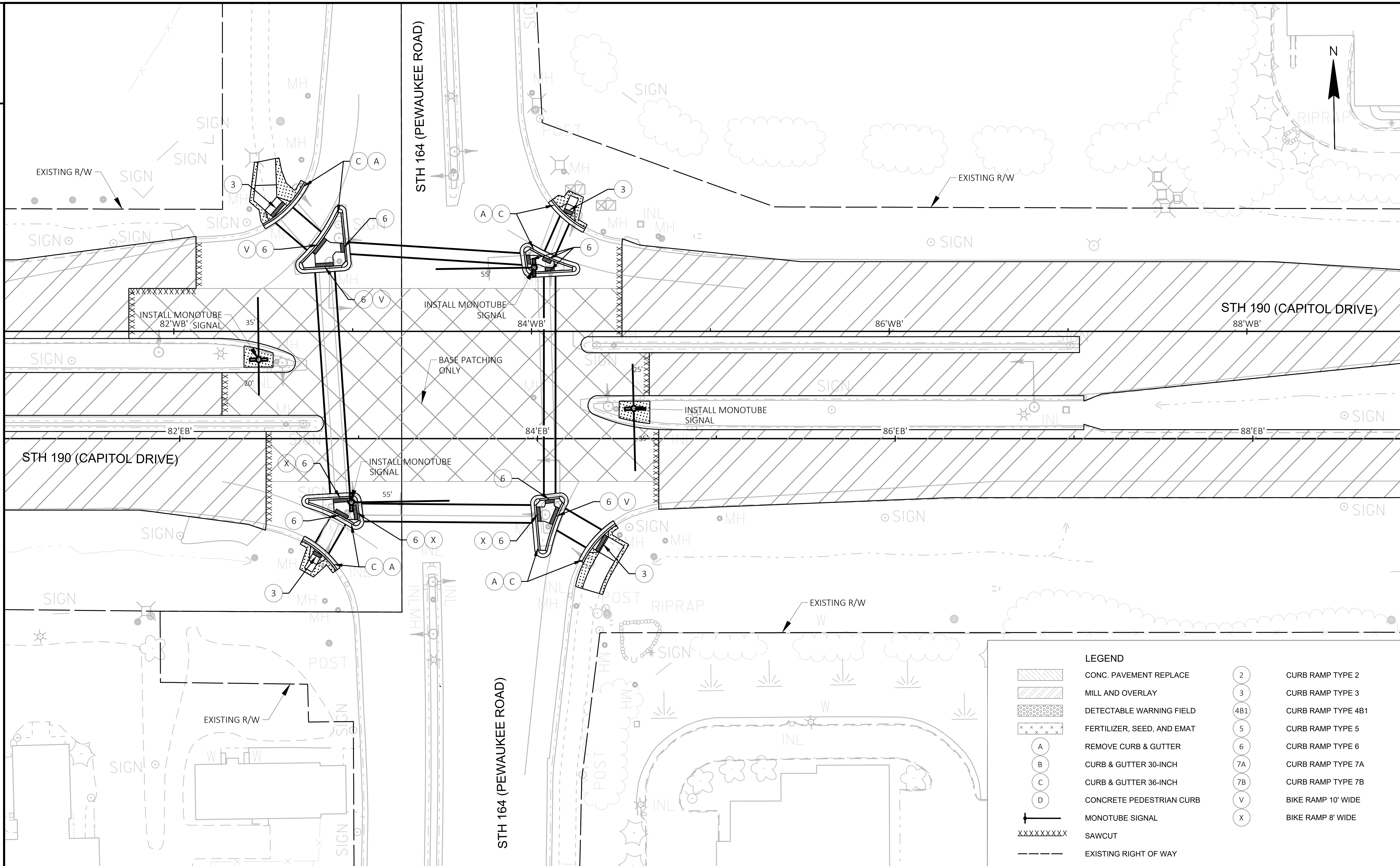
LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-11

PLOT DATE : 11/10/2021 12:43 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT


N
STH 164 (PEWAUKEE ROAD)
STH 190 (CAPITOL DRIVE)
STH 190 (CAPITOL DRIVE)
STH 164 (PEWAUKEE ROAD)
EXISTING R/W
EXISTING R/W
EXISTING R/W
EXISTING R/W
INSTALL MONOTUBE SIGNAL
INSTALL MONOTUBE SIGNAL
INSTALL MONOTUBE SIGNAL
INSTALL MONOTUBE SIGNAL
BASE PATCHING ONLY
82'WB'
84'WB'
86'WB'
88'WB'
82'EB'
84'EB'
86'EB'
88'EB'
55'
35'
20'
25'
35'
55'
RIPRAP
RIPRAP
LEGEND
CONC. PAVEMENT REPLACE
MILL AND OVERLAY
DETECTABLE WARNING FIELD
FERTILIZER, SEED, AND EMAT
A REMOVE CURB & GUTTER
B CURB & GUTTER 30-INCH
C CURB & GUTTER 36-INCH
D CONCRETE PEDESTRIAN CURB
MONOTUBE SIGNAL
XXXXXXXXX SAWCUT
EXISTING RIGHT OF WAY
2 CURB RAMP TYPE 2
3 CURB RAMP TYPE 3
4B1 CURB RAMP TYPE 4B1
5 CURB RAMP TYPE 5
6 CURB RAMP TYPE 6
7A CURB RAMP TYPE 7A
7B CURB RAMP TYPE 7B
V BIKE RAMP 10' WIDE
X BIKE RAMP 8' WIDE

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-12
PLOT DATE : 11/10/2021 12:43 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT
WISDOT/CADDS SHEET 42

2

2

N

RIPRAP

RIPRAP

W

SIGN

SIGN

EXISTING R/W

SIGN

W

SIGN

MH

SIGN

SIGN

SIGN

88'WB'

90'WB'

92'WB'

94'WB'

STH 190 (CAPITOL DRIVE)

SIGN

SIGN

SIGN

SIGN

MH

SIGN

SIGN

SIGN

SIGN

SIGN

SIGN

SIGN

SIGN

SIGN

SIGN

SIGN

88'EB'

90'EB'

92'EB'

94'EB'

STH 190 (CAPITOL DRIVE)

SIGN

SIGN

SIGN

SIGN

SIGN

SIGN

EXISTING R/W

A/C

A/C

A/C

A/C

W

W

W

LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-13

PLOT DATE : 11/10/2021 12:43 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT

WISDOT/CADDS SHEET 42

2

2

HIGHFIELD ROAD

N

EXISTING R/W

EXISTING R/W

STH 190 (CAPITOL DRIVE)

96'WB' 98'WB' 100'WB' 102'WB'

96'EB' 98'EB' 100'EB' 102'EB'

STH 190 (CAPITOL DRIVE)

5 FIELDS ROAD

EXISTING R/W

EXISTING R/W

LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-14

PLOT DATE : 11/10/2021 12:43 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT

WISDOT/CADDS SHEET 42

2

2

N

EXISTING R/W

STH 190 (CAPITOL DRIVE)

102'WB' 104'WB' 106'WB' 108'WB'

102'EB' 104'EB' 106'EB' 108'EB'

STH 190 (CAPITOL DRIVE)

EXISTING R/W

SIGN

TRAFFIC MONITORING

POST

A/C

W

XXXXXXXXXXXXXX

LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-15

PLOT DATE : 11/10/2021 12:43 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT

2

2

N

EXISTING R/W

END CONSTRUCTION
STA. 110+95

110'WB' 112'WB' 114'WB' 116'WB'

END PROJECT
STA. 111+00
SAWCUT REQUIRED
MATCH EXISTING

110'EB' 112'EB' 114'EB' 116'EB'

STH 190 (CAPITOL DRIVE)

XXXXXXXXXXXXXXXXXXXX

POST

SIGN

INL

EXISTING R/W

LEGEND

	CONC. PAVEMENT REPLACE	2	CURB RAMP TYPE 2
	MILL AND OVERLAY	3	CURB RAMP TYPE 3
	DETECTABLE WARNING FIELD	4B1	CURB RAMP TYPE 4B1
	FERTILIZER, SEED, AND EMAT	5	CURB RAMP TYPE 5
A	REMOVE CURB & GUTTER	6	CURB RAMP TYPE 6
B	CURB & GUTTER 30-INCH	7A	CURB RAMP TYPE 7A
C	CURB & GUTTER 36-INCH	7B	CURB RAMP TYPE 7B
D	CONCRETE PEDESTRIAN CURB	V	BIKE RAMP 10' WIDE
	MONOTUBE SIGNAL	X	BIKE RAMP 8' WIDE
XXXXXXXXX	SAWCUT		
	EXISTING RIGHT OF WAY		

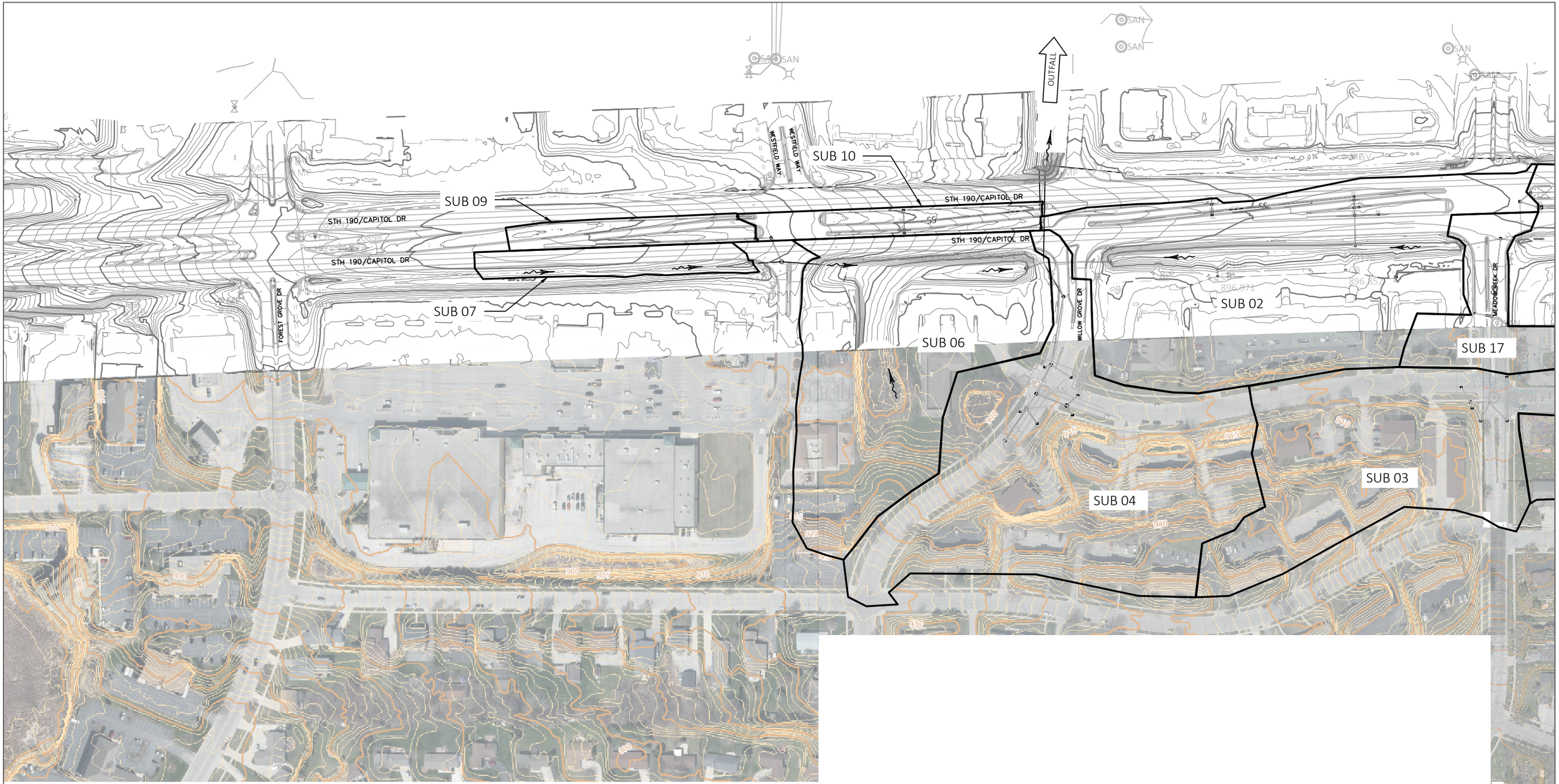
PROJECT NO: 2025-07-73	HWY: STH 190	COUNTY: WAUKESHA	PLAN DETAILS	SHEET	E

FILE NAME : I:\47\470337 STH 190 - CAPITOL DRIVE\C3D\SHEETSPLAN\2025-07-73_021201-PD.DWG
LAYOUT NAME - 50-16

PLOT DATE : 11/10/2021 12:43 PM PLOT BY : KRUEGER, KIRK PLOT NAME : PLOT SCALE : 1 IN:50 FT

Appendix C

Existing Condition Drainage Area Map



LEGEND

EXISTING DRAINAGE AREAS

EXISTING SURFACE

GIS CONTOURS

DATE	DESCRIPTION OF REVISION

NORTH ARROW:

PROJECT:
STH 190 CAPITOL DRIVE
STH 16 TO 0.3 E OF 5 FIELDS RD
STH190
WAUKESHA, WI

PROJECT #: 2025-07-73

DATE: 01/28/2022

DRAWN BY: POOJA PATEL

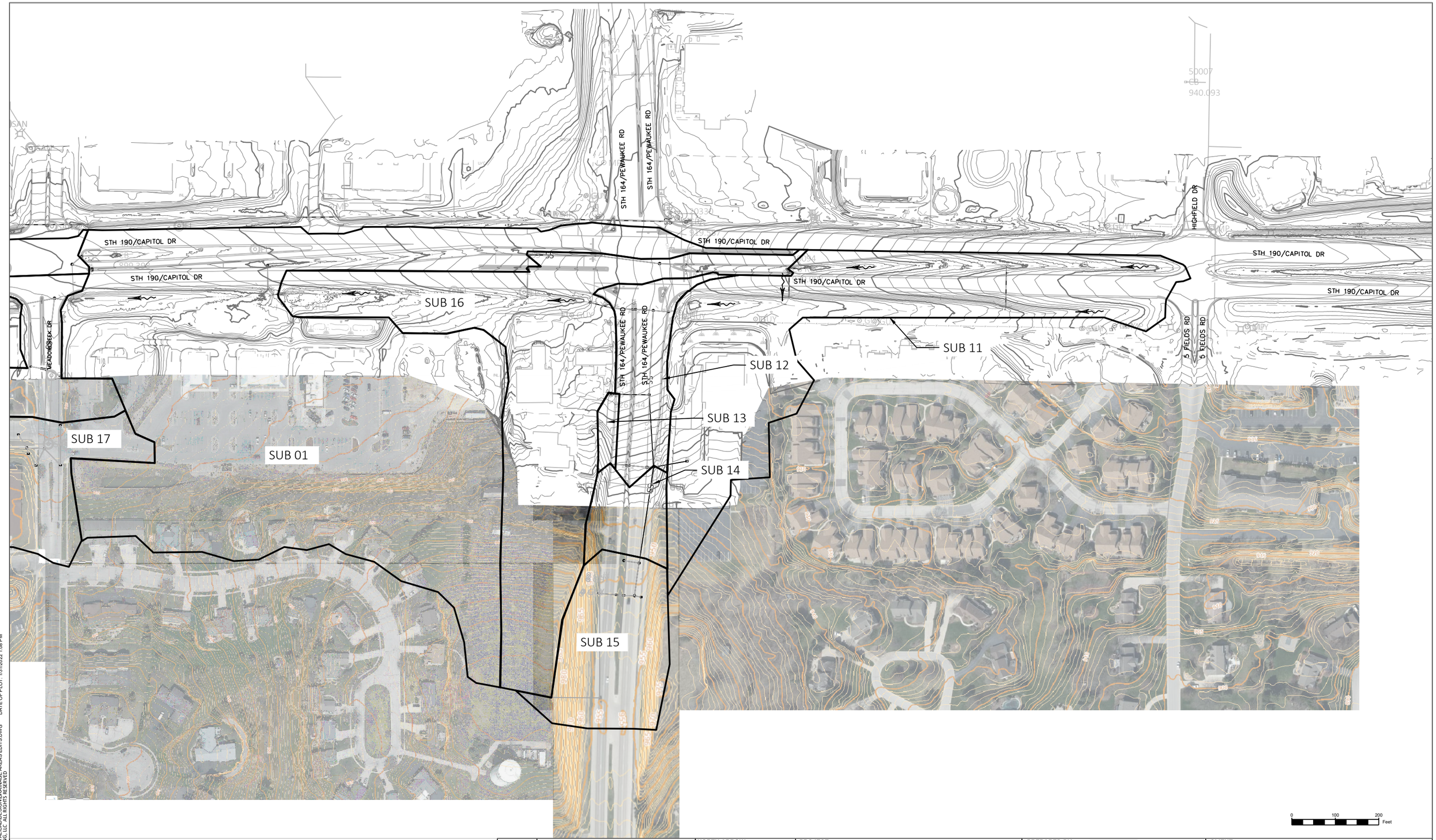
CHECKED BY: DAVID BACHHUBER

PREPARED BY:
M SQUARED ENGINEERING LLC
N19W6719 COMMERCE CT
CEDARBURG, WI 53012
MSQUAREDENGINEERING.COM
(262)376-4246

CLIENT: STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION

DRAWING TITLE: EXISTING DRAINAGE AREAS - WEST

SHEET: 1



LEGEND

EXISTING DRAINAGE AREAS

EXISTING SURFACE

GIS CONTOURS

DATE	DESCRIPTION OF REVISION

NORTH ARROW: N

PROJECT:
STH 190 CAPITOL DRIVE
STH 16 TO 0.3 E OF 5 FIELDS RD
STH190
WAUKESHA, WI

PROJECT #: 2025-07-73

DATE: 01/28/2022

DRAWN BY: POOJA PATEL

CHECKED BY: DAVID BACHHUBER

PREPARED BY:
M SQUARED ENGINEERING LLC
N19W6719 COMMERCE CT
CEDARBURG, WI 53012
MSQUAREDENGINEERING.COM
(262)376-4246

CLIENT: STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION

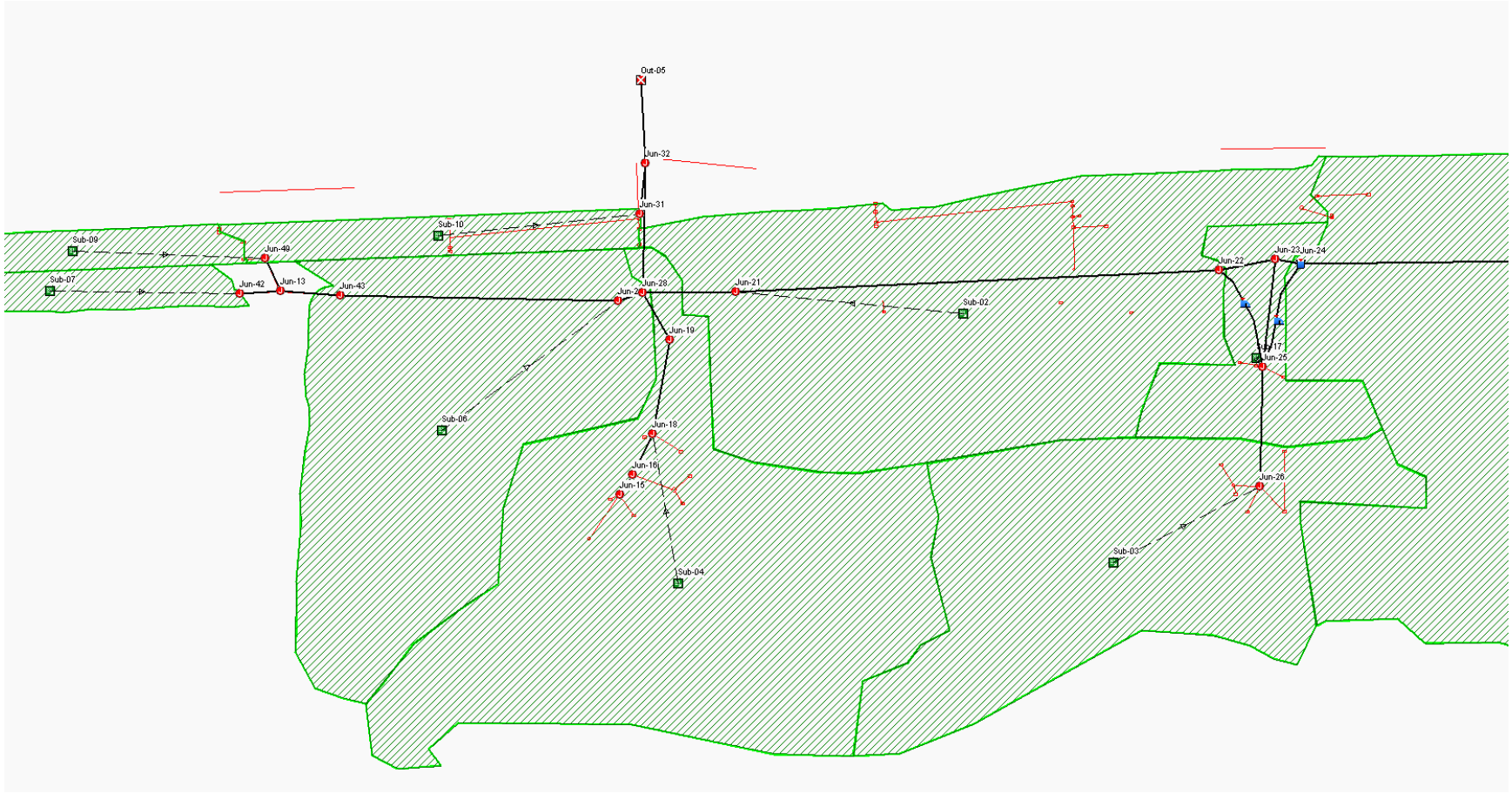
DRAWING TITLE: EXISTING DRAINAGE AREAS - EAST

SHEET: 2

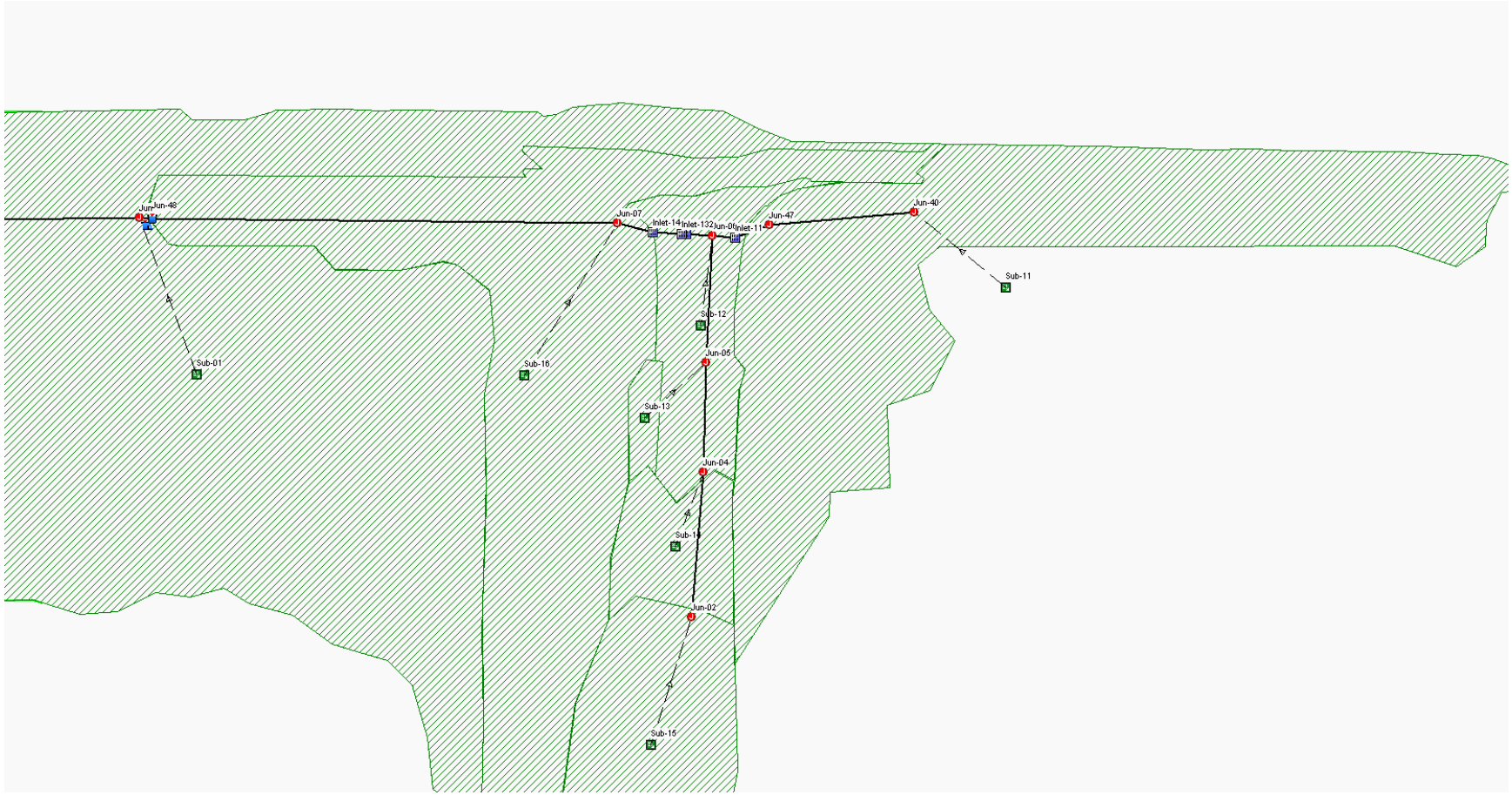
Appendix D

Autodesk Storm and Sanitary Analysis (SSA) - Existing Conditions

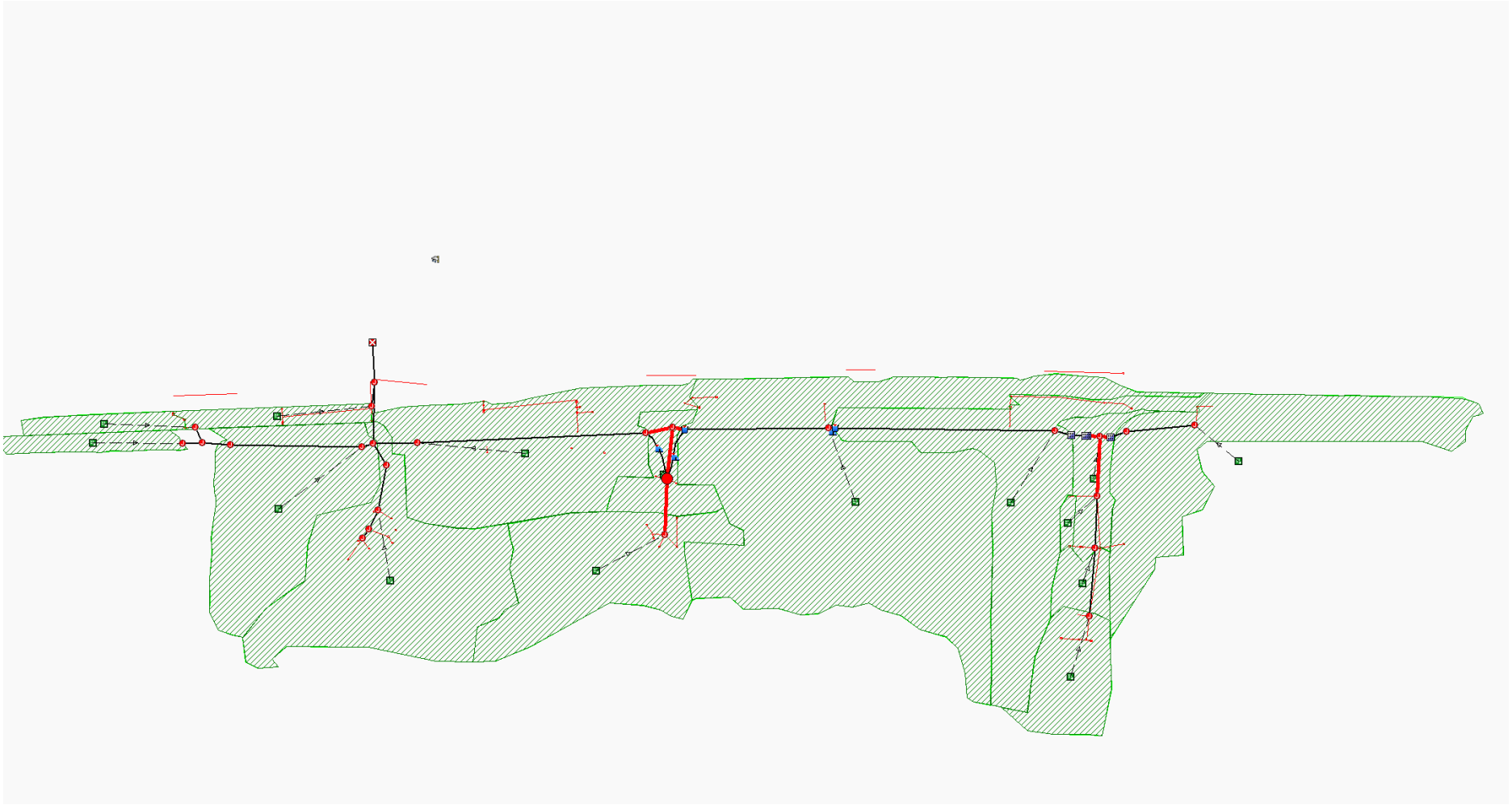
SSA Layout with Node and Basin ID



SSA Layout with Node and Basin ID



2-Year
Overview Map



2-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	2 year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	918.40	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.89	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	901.90	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00

Inlet-14	FHWA HEC-22 GENERIC	N/A		On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-12	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-13	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-14	- 0.0200	0.0160	0.0620	2.00	2.00	

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	1.6058	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.4692	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.1000	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0170
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	0.5922	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.0891	0.0130
Link-63	Jun-18	Jun-16	CONDUIT	68.8	0.0145	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	268.44
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1991.59
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	419.20
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	40.94
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.00	2.00	1	3.14	0.50	39.43
Link-31	CIRCULAR	2.00	2.00	1	3.14	0.50	7.66
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	2.50	2.50	1	4.91	0.63	31.56
Link-60	CIRCULAR	2.50	2.50	1	4.91	0.63	12.24
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	3.73
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

********** Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	14.222	2.690
Surface Runoff	0.071	0.014
Continuity Error (%)	-0.001	

********** Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	8.624	2.810
Initial Stored Volume	0.000	0.000

Final Stored Volume 0.014 0.005
Continuity Error (%) ..... -0.006

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00
> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00

2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00

Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	hh:mm:ss
Sub-01	2.69	1.80	34.36	91.230	0	00:17:27
Sub-02	2.69	2.02	20.02	93.700	0	00:09:15
Sub-03	2.69	1.32	10.13	84.860	0	00:07:12
Sub-04	2.69	1.51	18.34	87.580	0	00:05:00
Sub-06	2.69	1.75	15.34	90.630	0	00:05:18
Sub-07	2.69	0.17	0.08	57.270	0	00:05:49
Sub-09	2.69	1.69	1.82	89.910	0	00:05:30
Sub-10	2.69	2.04	2.66	93.940	0	00:05:00
Sub-11	2.69	1.60	13.96	88.660	0	00:10:37
Sub-12	2.69	2.39	4.71	97.350	0	00:05:00
Sub-13	2.69	1.70	0.45	90.000	0	00:05:00
Sub-14	2.69	1.73	2.16	90.310	0	00:05:00
Sub-15	2.69	1.53	5.35	87.740	0	00:05:00
Sub-16	2.69	0.86	7.94	77.020	0	00:08:15
Sub-17	2.69	2.15	4.52	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.03	0.46	941.00	0	11:58	0	0	0:00:00
Jun-04	0.03	0.46	930.13	0	11:58	0	0	0:00:00
Jun-05	0.06	6.37	923.27	0	11:56	0	0	0:00:00
Jun-06	0.09	4.01	919.69	0	11:56	0	0	0:00:00
Jun-07	0.70	1.71	916.48	0	12:03	0	0	0:00:00
Jun-13	0.03	0.49	911.32	0	11:57	0	0	0:00:00
Jun-15	0.00	0.25	894.49	0	11:58	0	0	0:00:00
Jun-16	0.03	1.85	894.48	0	11:58	0	0	0:00:00
Jun-18	0.13	2.21	894.48	0	11:58	0	0	0:00:00
Jun-19	0.08	1.68	893.57	0	11:58	0	0	0:00:00
Jun-20	0.06	1.14	893.17	0	12:03	0	0	0:00:00
Jun-21	0.20	2.27	892.71	0	12:06	0	0	0:00:00
Jun-22	1.23	2.76	895.46	0	12:22	0	0	0:00:00
Jun-23	1.21	5.74	898.54	0	12:20	0	0	0:00:00
Jun-25	0.88	5.88	899.06	0	12:20	0	0	0:00:00
Jun-26	0.11	3.88	899.07	0	12:20	0	0	0:00:00
Jun-28	0.17	2.11	891.42	0	12:04	0	0	0:00:00
Jun-29	1.27	2.42	901.34	0	12:06	0	0	0:00:00
Jun-31	0.02	0.27	900.12	0	11:58	0	0	0:00:00
Jun-32	0.19	2.18	887.58	0	12:04	0	0	0:00:00
Jun-40	0.01	0.21	923.39	0	12:02	0	0	0:00:00
Jun-42	0.01	0.07	913.26	0	12:04	0	0	0:00:00
Jun-43	0.00	0.05	907.37	0	12:00	0	0	0:00:00
Jun-47	0.05	1.15	919.65	0	12:05	0	0	0:00:00

Jun-49	0.03	0.59	912.16	0	11:58	0	0	0:00:00
Out-05	0.19	2.05	886.55	0	12:04	0	0	0:00:00
Jun-24	0.23	5.46	899.49	0	12:20	0	0	0:00:00
Jun-48	0.31	2.31	902.32	0	12:10	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	hh:mm
Jun-02	JUNCTION	5.28	5.28	0	11:58	0.00		
Jun-04	JUNCTION	2.13	7.39	0	11:58	0.00		
Jun-05	JUNCTION	0.44	7.82	0	11:58	0.00		
Jun-06	JUNCTION	4.62	19.94	0	12:02	0.00		
Jun-07	JUNCTION	7.93	27.86	0	12:02	0.00		
Jun-13	JUNCTION	0.00	1.81	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.10	0	11:55	0.00		
Jun-16	JUNCTION	0.00	0.32	0	11:53	0.00		
Jun-18	JUNCTION	18.14	18.14	0	11:58	0.00		
Jun-19	JUNCTION	0.00	17.98	0	11:58	0.00		
Jun-20	JUNCTION	15.26	16.86	0	11:58	0.00		
Jun-21	JUNCTION	20.02	44.60	0	12:02	0.00		
Jun-22	JUNCTION	0.00	33.81	0	12:20	0.00		
Jun-23	JUNCTION	0.00	30.69	0	12:19	0.00		
Jun-25	JUNCTION	4.43	14.41	0	11:58	0.00		
Jun-26	JUNCTION	10.02	10.02	0	12:00	0.00		
Jun-28	JUNCTION	0.00	68.96	0	12:03	0.00		
Jun-29	JUNCTION	34.35	54.34	0	12:06	0.00		
Jun-31	JUNCTION	2.60	2.60	0	11:58	0.00		
Jun-32	JUNCTION	0.00	70.73	0	12:03	0.00		
Jun-40	JUNCTION	13.94	13.94	0	12:02	0.00		
Jun-42	JUNCTION	0.08	0.08	0	12:04	0.00		
Jun-43	JUNCTION	0.00	1.81	0	11:58	0.00		
Jun-47	JUNCTION	0.00	13.90	0	12:02	0.00		
Jun-49	JUNCTION	1.81	1.81	0	11:58	0.00		
Out-05	OUTFALL	0.00	70.73	0	12:04	0.00		
Jun-24	STORAGE	0.00	54.20	0	12:06	0.00		
Jun-48	STORAGE	0.00	27.68	0	12:03	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	hh:mm
Inlet-11	2.02	923.13	0.15	0	11:56
Inlet-12	2.02	921.39	0.15	0	11:54
Inlet-13	2.02	921.36	0.15	0	12:02
Inlet-14	2.02	920.01	0.15	0	12:02

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.000	0
Inlet-12	0.00	0.00	-	-	-	0.000	0
Inlet-13	0.00	0.00	-	-	-	0.000	0
Inlet-14	0.00	0.00	-	-	-	0.000	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days	hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³
Jun-24	39.977	48	0	12:20	0.679	1	31.76	0.00	0:00:00	0.000
Jun-48	0.903	12	0	12:10	0.012	0	21.76	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	77.18	2.87	70.73
System	77.18	2.87	70.73

****
Link Flow Summary
****

Link ID	Element	Time of	Maximum	Length	Peak Flow	Design	Ratio of	Ratio of	Total	Reported

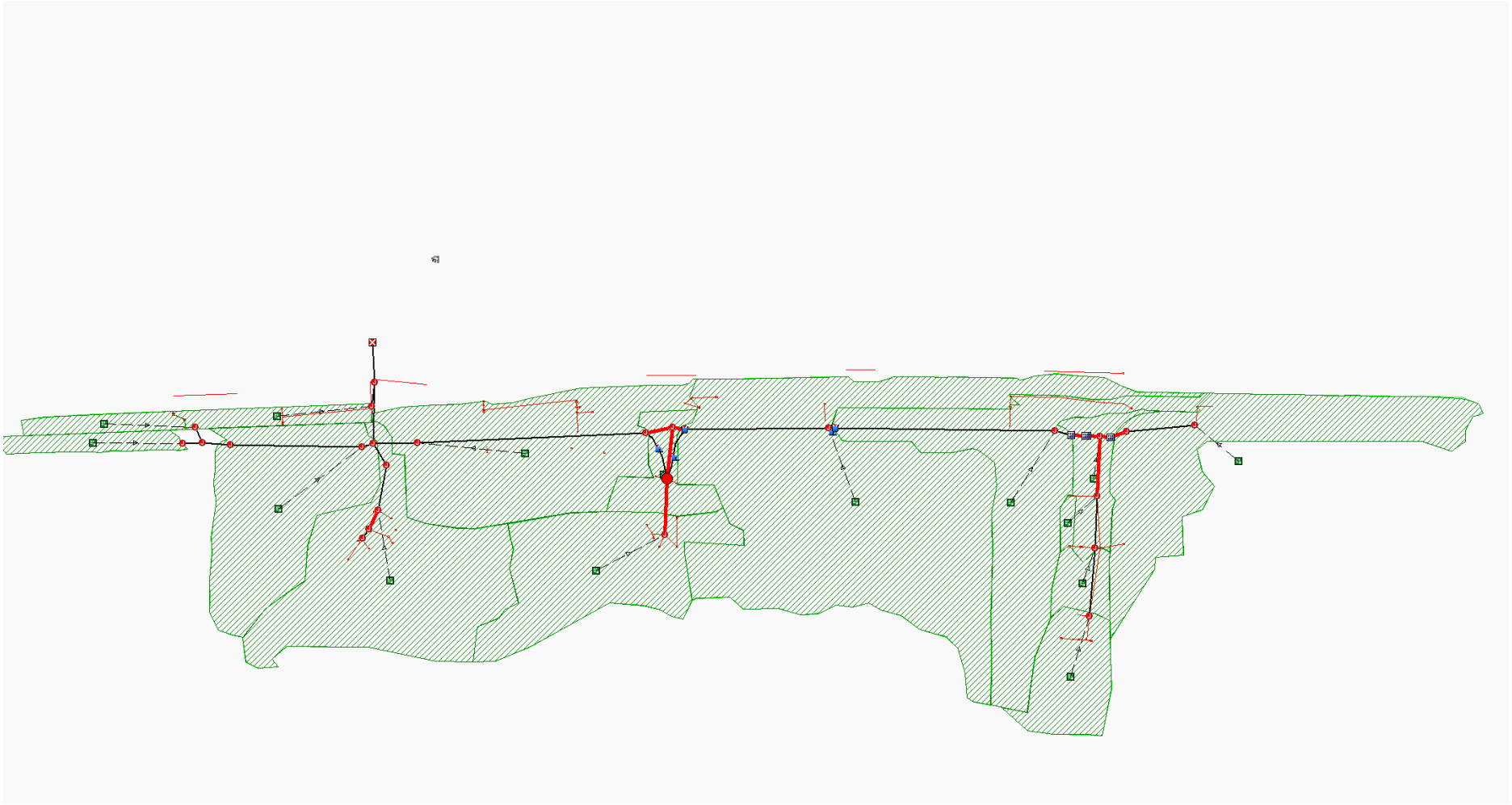
	Type	Peak Flow Occurrence days	hh:mm	Velocity Attained ft/sec	Factor	during Analysis cfs	Flow Capacity cfs	Maximum /Design Flow	Maximum Flow Depth	Time Surcharged minutes	Condition
Link-07	CONDUIT	0	11:58	9.92	1.00	5.27	49.45	0.11	0.23	0	Calculated
Link-102	CHANNEL	0	12:06	3.69	1.00	54.20	268.44	0.20	0.61	0	Calculated
Link-103	CHANNEL	0	12:00	0.11	1.00	1.72	4187.65	0.00	0.12	0	Calculated
Link-106	CHANNEL	0	12:04	3.78	1.00	70.73	328.75	0.22	0.53	0	Calculated
Link-107	CHANNEL	0	12:02	1.04	1.00	13.90	4186.34	0.00	0.13	0	Calculated
Link-108	CONDUIT	0	12:08	5.33	1.00	13.61	46.94	0.29	0.79	0	Calculated
Link-110	CONDUIT	0	11:58	10.91	1.00	2.60	37.47	0.07	0.33	0	Calculated
Link-111	CHANNEL	0	12:22	2.04	1.00	33.65	1991.59	0.02	0.23	0	Calculated
Link-112	CHANNEL	0	12:03	3.33	1.00	27.68	419.20	0.07	0.50	0	Calculated
Link-113	CONDUIT	0	12:12	6.93	1.08	21.76	40.94	0.53	1.00	16	SURCHARGED
Link-114	CONDUIT	0	11:58	3.43	1.00	1.81	4.93	0.37	0.44	0	Calculated
Link-13	CONDUIT	0	11:58	7.41	1.00	7.38	62.45	0.12	0.62	0	Calculated
Link-15	CONDUIT	0	11:56	3.41	1.00	7.86	17.20	0.46	1.00	10	SURCHARGED
Link-16	CONDUIT	0	12:08	4.33	1.00	13.61	17.26	0.79	1.00	18	SURCHARGED
Link-17	CONDUIT	0	11:56	6.36	1.00	19.99	35.27	0.57	1.00	20	SURCHARGED
Link-18	CONDUIT	0	11:56	6.54	3.52	20.56	47.53	0.43	1.00	19	SURCHARGED
Link-19	CONDUIT	0	12:02	4.11	1.00	19.94	25.21	0.79	0.96	0	Calculated
Link-30	CONDUIT	0	12:41	7.51	1.00	23.59	39.43	0.60	1.00	80	SURCHARGED
Link-31	CONDUIT	0	12:19	9.77	1.00	30.69	7.66	4.01	1.00	98	SURCHARGED
Link-32	CONDUIT	0	11:58	4.44	1.00	13.96	10.12	1.38	1.00	91	SURCHARGED
Link-37	CONDUIT	0	12:00	3.19	1.00	10.02	21.80	0.46	1.00	52	SURCHARGED
Link-57	CONDUIT	0	12:03	8.59	1.00	13.09	37.51	0.35	0.49	0	Calculated
Link-58	CONDUIT	0	12:06	7.26	1.00	42.68	77.99	0.55	0.59	0	Calculated
Link-59	CONDUIT	0	11:58	5.77	1.00	17.97	31.56	0.57	0.61	0	Calculated
Link-60	CONDUIT	0	11:58	4.69	1.00	17.98	12.24	1.47	0.73	0	> CAPACITY
Link-63	CONDUIT	0	12:05	0.24	1.00	0.38	3.73	0.10	0.82	0	Calculated
Link-67	CONDUIT	0	11:55	0.44	1.00	0.10	6.58	0.01	0.35	0	Calculated
Link-91	CONDUIT	0	12:02	4.57	1.00	19.94	18.31	1.09	0.84	0	> CAPACITY
Link-93	CONDUIT	0	12:04	2.27	1.00	0.08	19.77	0.00	0.11	0	Calculated
Link-94	CONDUIT	0	11:58	8.57	1.00	1.81	20.61	0.09	0.18	0	Calculated
Link-98	CONDUIT	0	12:04	10.71	1.00	68.96	224.33	0.31	0.43	0	Calculated
Weir-01	WEIR	0	00:00			0.00			0.00		
Weir-02	WEIR	0	12:20			3.13			0.34		
Weir-03	WEIR	0	12:20			11.54			0.66		

****
Highest Flow Instability Indexes
****
Link Link-113 (2)
Link Link-102 (1)
Link Link-112 (1)

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:17:46 2022
Analysis ended on: Thu Jan 27 16:17:57 2022
Total elapsed time: 00:00:11

5-Year
Overview Map



5-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	5-Year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	918.40	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.89	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	901.90	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00

Inlet-14	FHWA HEC-22 GENERIC	N/A		On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-12	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-13	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-14	- 0.0200	0.0160	0.0620	2.00	2.00	

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	1.6058	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.4692	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.1000	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0170
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	0.5922	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.0891	0.0130
Link-63	Jun-18	Jun-16	CONDUIT	68.8	0.0145	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	268.44
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1991.59
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	419.20
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	40.94
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.00	2.00	1	3.14	0.50	39.43
Link-31	CIRCULAR	2.00	2.00	1	3.14	0.50	7.66
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	2.50	2.50	1	4.91	0.63	31.56
Link-60	CIRCULAR	2.50	2.50	1	4.91	0.63	12.24
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	3.73
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	18.504	3.500
Surface Runoff	0.103	0.020
Continuity Error (%)	-0.001	

Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	12.435	4.052
Initial Stored Volume	0.000	0.000

Final Stored Volume 0.014 0.005
Continuity Error (%) ..... -0.004

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00
> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00

2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00

Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	3.50	2.56	48.18	91.230	0	00:17:27
Sub-02	3.50	2.81	27.28	93.700	0	00:09:15
Sub-03	3.50	2.00	15.37	84.860	0	00:07:12
Sub-04	3.50	2.23	26.81	87.580	0	00:05:00
Sub-06	3.50	2.51	21.63	90.630	0	00:05:18
Sub-07	3.50	0.43	0.40	57.270	0	00:05:49
Sub-09	3.50	2.44	2.59	89.910	0	00:05:30
Sub-10	3.50	2.83	3.61	93.940	0	00:05:00
Sub-11	3.50	2.33	20.14	88.660	0	00:10:37
Sub-12	3.50	3.19	6.20	97.350	0	00:05:00
Sub-13	3.50	2.44	0.63	90.000	0	00:05:00
Sub-14	3.50	2.48	3.05	90.310	0	00:05:00
Sub-15	3.50	2.25	7.81	87.740	0	00:05:00
Sub-16	3.50	1.43	13.50	77.020	0	00:08:15
Sub-17	3.50	2.95	6.07	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.03	0.56	941.10	0	11:58	0	0	0:00:00
Jun-04	0.03	0.56	930.23	0	11:58	0	0	0:00:00
Jun-05	0.09	8.58	925.48	0	11:53	0	0	0:00:00
Jun-06	0.12	4.71	920.39	0	11:53	0	0	0:00:00
Jun-07	0.74	1.83	916.60	0	12:03	0	0	0:00:00
Jun-13	0.03	0.64	911.47	0	11:58	0	0	0:00:00
Jun-15	0.00	1.12	895.36	0	11:58	0	0	0:00:00
Jun-16	0.04	2.73	895.36	0	11:58	0	0	0:00:00
Jun-18	0.15	3.08	895.35	0	11:57	0	0	0:00:00
Jun-19	0.10	2.33	894.22	0	11:58	0	0	0:00:00
Jun-20	0.08	1.47	893.50	0	12:03	0	0	0:00:00
Jun-21	0.25	2.81	893.25	0	12:07	0	0	0:00:00
Jun-22	1.29	3.03	895.73	0	12:20	0	0	0:00:00
Jun-23	1.30	6.29	899.09	0	12:18	0	0	0:00:00
Jun-25	0.97	6.50	899.68	0	12:18	0	0	0:00:00
Jun-26	0.16	5.01	900.20	0	11:57	0	0	0:00:00
Jun-28	0.21	2.53	891.84	0	12:03	0	0	0:00:00
Jun-29	1.32	2.52	901.44	0	12:03	0	0	0:00:00
Jun-31	0.02	0.31	900.16	0	11:57	0	0	0:00:00
Jun-32	0.24	2.48	887.88	0	12:03	0	0	0:00:00
Jun-40	0.01	0.27	923.45	0	12:02	0	0	0:00:00
Jun-42	0.01	0.15	913.34	0	12:04	0	0	0:00:00
Jun-43	0.00	0.07	907.39	0	12:00	0	0	0:00:00
Jun-47	0.07	2.47	920.97	0	12:07	0	0	0:00:00

Jun-49	0.04	0.74	912.31	0	11:58	0	0	0:00:00
Out-05	0.23	2.33	886.83	0	12:03	0	0	0:00:00
Jun-24	0.29	6.08	900.11	0	12:18	0	0	0:00:00
Jun-48	0.34	2.84	902.85	0	12:10	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	hh:mm
Jun-02	JUNCTION	7.70	7.70	0	11:57	0.00		
Jun-04	JUNCTION	2.99	10.67	0	11:57	0.00		
Jun-05	JUNCTION	0.62	11.29	0	11:58	0.00		
Jun-06	JUNCTION	6.09	23.59	0	12:03	0.00		
Jun-07	JUNCTION	13.50	36.74	0	12:02	0.00		
Jun-13	JUNCTION	0.00	2.84	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.42	0	11:54	0.00		
Jun-16	JUNCTION	0.00	0.89	0	11:54	0.00		
Jun-18	JUNCTION	26.42	26.42	0	11:57	0.00		
Jun-19	JUNCTION	0.00	26.41	0	11:58	0.00		
Jun-20	JUNCTION	21.44	23.95	0	11:57	0.00		
Jun-21	JUNCTION	27.25	57.37	0	12:04	0.00		
Jun-22	JUNCTION	0.00	49.69	0	12:17	0.00		
Jun-23	JUNCTION	0.00	32.02	0	12:17	0.00		
Jun-25	JUNCTION	5.96	28.87	0	12:12	0.00		
Jun-26	JUNCTION	15.19	15.19	0	11:58	0.00		
Jun-28	JUNCTION	0.00	90.97	0	12:03	0.00		
Jun-29	JUNCTION	48.04	72.58	0	12:07	0.00		
Jun-31	JUNCTION	3.54	3.54	0	11:57	0.00		
Jun-32	JUNCTION	0.00	93.49	0	12:03	0.00		
Jun-40	JUNCTION	20.07	20.07	0	12:01	0.00		
Jun-42	JUNCTION	0.39	0.39	0	12:03	0.00		
Jun-43	JUNCTION	0.00	2.85	0	11:58	0.00		
Jun-47	JUNCTION	0.00	20.03	0	12:02	0.00		
Jun-49	JUNCTION	2.57	2.57	0	11:57	0.00		
Out-05	OUTFALL	0.00	93.47	0	12:03	0.00		
Jun-24	STORAGE	0.00	72.58	0	12:07	0.00		
Jun-48	STORAGE	0.00	36.50	0	12:03	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	hh:mm
Inlet-11	2.02	923.13	0.15	0	12:04
Inlet-12	2.02	921.39	0.15	0	11:53
Inlet-13	2.02	921.36	0.15	0	12:03
Inlet-14	2.02	920.01	0.15	0	12:03

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.000	0
Inlet-12	0.00	0.00	-	-	-	0.000	0
Inlet-13	0.00	0.00	-	-	-	0.000	0
Inlet-14	0.00	0.00	-	-	-	0.000	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days	hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³
Jun-24	54.501	65	0	12:18	1.101	1	46.61	0.00	0:00:00	0.000
Jun-48	2.116	28	0	12:10	0.025	0	27.68	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	79.29	4.04	93.47
System	79.29	4.04	93.47

****
Link Flow Summary
****

Link ID	Element	Time of	Maximum	Length	Peak Flow	Design	Ratio of	Ratio of	Total	Reported

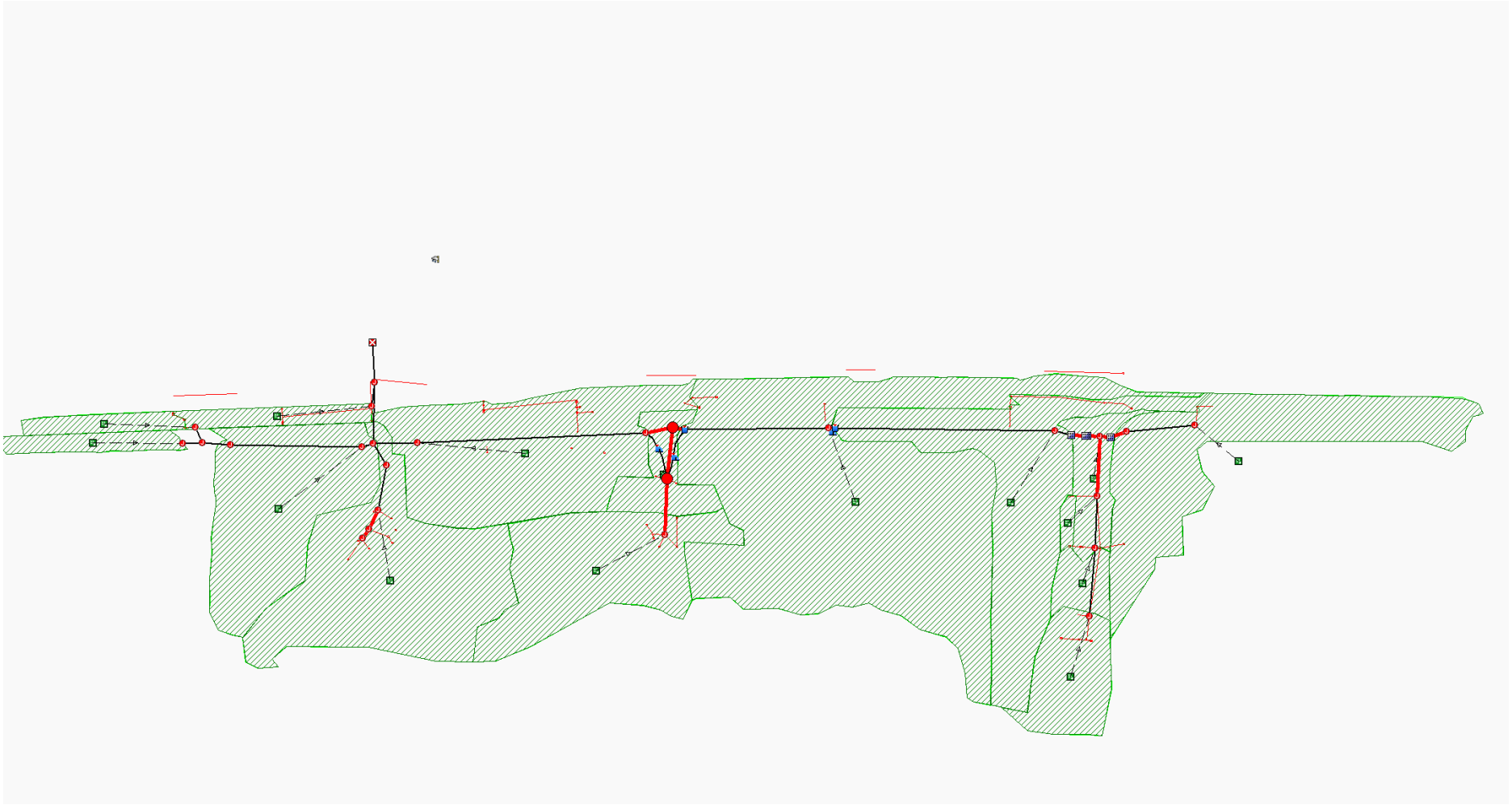
	Type	Peak Flow Occurrence days	hh:mm	Velocity Attained ft/sec	Factor	during Analysis cfs	Flow Capacity cfs	Maximum /Design Flow	Maximum Flow Depth	Time Surcharged minutes	Condition
Link-07	CONDUIT	0	11:58	10.98	1.00	7.68	49.45	0.16	0.27	0	Calculated
Link-102	CHANNEL	0	12:07	3.88	1.00	72.58	268.44	0.27	0.79	0	Calculated
Link-103	CHANNEL	0	12:00	0.14	1.00	2.72	4187.65	0.00	0.15	0	Calculated
Link-106	CHANNEL	0	12:03	4.04	1.00	93.47	328.75	0.28	0.60	0	Calculated
Link-107	CHANNEL	0	12:02	1.04	1.00	20.03	4186.34	0.00	0.25	0	Calculated
Link-108	CONDUIT	0	12:10	5.57	1.00	17.49	46.94	0.37	1.00	11	SURCHARGED
Link-110	CONDUIT	0	11:57	10.56	1.00	3.54	37.47	0.09	0.45	0	Calculated
Link-111	CHANNEL	0	12:20	1.98	1.00	49.55	1991.59	0.02	0.29	0	Calculated
Link-112	CHANNEL	0	12:03	3.36	1.00	36.50	419.20	0.09	0.61	0	Calculated
Link-113	CONDUIT	0	12:16	8.24	1.08	25.90	40.94	0.63	1.00	32	SURCHARGED
Link-114	CONDUIT	0	11:58	3.71	1.00	2.57	4.93	0.52	0.55	0	Calculated
Link-13	CONDUIT	0	11:58	7.26	1.00	10.67	62.45	0.17	0.64	0	Calculated
Link-15	CONDUIT	0	11:58	3.59	1.00	11.29	17.20	0.66	1.00	23	SURCHARGED
Link-16	CONDUIT	0	12:10	5.57	1.00	17.50	17.26	1.01	1.00	31	SURCHARGED
Link-17	CONDUIT	0	12:03	7.51	1.00	23.58	35.27	0.67	1.00	32	SURCHARGED
Link-18	CONDUIT	0	12:03	7.51	3.52	23.58	47.53	0.50	1.00	32	SURCHARGED
Link-19	CONDUIT	0	12:03	4.80	1.00	23.58	25.21	0.94	1.00	7	SURCHARGED
Link-30	CONDUIT	0	12:56	7.47	1.00	23.45	39.43	0.59	1.00	101	SURCHARGED
Link-31	CONDUIT	0	12:17	10.19	1.00	32.02	7.66	4.18	1.00	126	SURCHARGED
Link-32	CONDUIT	0	11:55	5.33	1.00	16.76	10.12	1.66	1.00	113	SURCHARGED
Link-37	CONDUIT	0	11:58	4.84	1.00	15.19	21.80	0.70	1.00	71	SURCHARGED
Link-57	CONDUIT	0	12:03	9.20	1.00	18.77	37.51	0.50	0.62	0	Calculated
Link-58	CONDUIT	0	12:07	7.59	1.00	55.79	77.99	0.72	0.72	0	Calculated
Link-59	CONDUIT	0	11:58	6.16	1.00	26.35	31.56	0.83	0.81	0	Calculated
Link-60	CONDUIT	0	11:58	5.61	1.00	26.41	12.24	2.16	0.92	0	> CAPACITY
Link-63	CONDUIT	0	11:54	0.22	1.00	0.89	3.73	0.24	1.00	7	SURCHARGED
Link-67	CONDUIT	0	11:54	0.95	1.00	0.42	6.58	0.06	0.95	0	Calculated
Link-91	CONDUIT	0	12:03	5.22	1.00	23.59	18.31	1.29	0.87	0	> CAPACITY
Link-93	CONDUIT	0	12:04	3.17	1.00	0.39	19.77	0.02	0.20	0	Calculated
Link-94	CONDUIT	0	11:58	9.13	1.00	2.85	20.61	0.14	0.24	0	Calculated
Link-98	CONDUIT	0	12:03	11.36	1.00	90.98	224.33	0.41	0.50	0	Calculated
Weir-01	WEIR	0	12:10			2.08			0.11		
Weir-02	WEIR	0	12:18			17.67			0.75		
Weir-03	WEIR	0	12:27			25.70			1.00		

****
Highest Flow Instability Indexes
****
Link Link-113 (2)

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:19:33 2022
Analysis ended on: Thu Jan 27 16:19:44 2022
Total elapsed time: 00:00:11

10-Year
Overview Map



10-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	10-Year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	918.40	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.89	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	901.90	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00

Inlet-14	FHWA HEC-22 GENERIC	N/A		On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-12	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-13	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-14	- 0.0200	0.0160	0.0620	2.00	2.00	

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	1.6058	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.4692	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.1000	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0170
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	0.5922	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.0891	0.0130
Link-63	Jun-18	Jun-16	CONDUIT	68.8	0.0145	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	268.44
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1991.59
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	419.20
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	40.94
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.00	2.00	1	3.14	0.50	39.43
Link-31	CIRCULAR	2.00	2.00	1	3.14	0.50	7.66
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	2.50	2.50	1	4.91	0.63	31.56
Link-60	CIRCULAR	2.50	2.50	1	4.91	0.63	12.24
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	3.73
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

********** Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	20.196	3.820
Surface Runoff	0.116	0.022
Continuity Error (%)	-0.001	

********** Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	14.009	4.565
Initial Stored Volume	0.000	0.000

Final Stored Volume 0.014 0.005
Continuity Error (%) ..... -0.006

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00
> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00

2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00

Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	3.82	2.87	53.66	91.230	0	00:17:27
Sub-02	3.82	3.12	30.13	93.700	0	00:09:15
Sub-03	3.82	2.29	17.49	84.860	0	00:07:12
Sub-04	3.82	2.52	30.19	87.580	0	00:05:00
Sub-06	3.82	2.81	24.09	90.630	0	00:05:18
Sub-07	3.82	0.55	0.55	57.270	0	00:05:49
Sub-09	3.82	2.74	2.89	89.910	0	00:05:30
Sub-10	3.82	3.14	3.99	93.940	0	00:05:00
Sub-11	3.82	2.62	22.60	88.660	0	00:10:37
Sub-12	3.82	3.51	6.79	97.350	0	00:05:00
Sub-13	3.82	2.75	0.71	90.000	0	00:05:00
Sub-14	3.82	2.78	3.40	90.310	0	00:05:00
Sub-15	3.82	2.54	8.78	87.740	0	00:05:00
Sub-16	3.82	1.67	15.86	77.020	0	00:08:15
Sub-17	3.82	3.26	6.68	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.03	0.60	941.14	0	11:58	0	0	0:00:00
Jun-04	0.04	0.59	930.26	0	11:58	0	0	0:00:00
Jun-05	0.10	6.34	923.24	0	11:52	0	0	0:00:00
Jun-06	0.14	4.93	920.61	0	12:06	0	0	0:00:00
Jun-07	0.74	1.87	916.64	0	12:03	0	0	0:00:00
Jun-13	0.04	0.71	911.54	0	11:58	0	0	0:00:00
Jun-15	0.01	1.55	895.79	0	11:58	0	0	0:00:00
Jun-16	0.05	3.16	895.79	0	11:57	0	0	0:00:00
Jun-18	0.17	3.52	895.79	0	11:57	0	0	0:00:00
Jun-19	0.10	2.62	894.52	0	11:58	0	0	0:00:00
Jun-20	0.08	1.61	893.64	0	12:03	0	0	0:00:00
Jun-21	0.27	3.10	893.54	0	12:09	0	0	0:00:00
Jun-22	1.31	3.10	895.80	0	12:19	0	0	0:00:00
Jun-23	1.33	6.45	899.25	0	12:18	0	0	0:00:00
Jun-25	1.00	6.62	899.80	0	12:17	0	0	0:00:00
Jun-26	0.18	5.49	900.68	0	11:57	0	0	0:00:00
Jun-28	0.23	2.68	891.99	0	12:04	0	0	0:00:00
Jun-29	1.33	2.57	901.49	0	12:07	0	0	0:00:00
Jun-31	0.02	0.33	900.18	0	11:57	0	0	0:00:00
Jun-32	0.26	2.58	887.98	0	12:03	0	0	0:00:00
Jun-40	0.01	0.29	923.47	0	12:02	0	0	0:00:00
Jun-42	0.01	0.17	913.36	0	12:02	0	0	0:00:00
Jun-43	0.00	0.08	907.40	0	11:59	0	0	0:00:00
Jun-47	0.08	2.99	921.49	0	12:07	0	0	0:00:00

Jun-49	0.04	0.79	912.36	0	11:58	0	0	0:00:00
Out-05	0.25	2.42	886.92	0	12:03	0	0	0:00:00
Jun-24	0.32	6.33	900.36	0	12:18	0	0	0:00:00
Jun-48	0.36	2.96	902.97	0	12:09	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	hh:mm
Jun-02	JUNCTION	8.65	8.65	0	11:57	0.00		
Jun-04	JUNCTION	3.35	11.97	0	11:58	0.00		
Jun-05	JUNCTION	0.70	12.67	0	11:58	0.00		
Jun-06	JUNCTION	6.67	25.01	0	12:03	0.00		
Jun-07	JUNCTION	15.86	40.36	0	12:02	0.00		
Jun-13	JUNCTION	0.00	3.31	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.63	0	11:53	0.00		
Jun-16	JUNCTION	0.00	1.33	0	11:53	0.00		
Jun-18	JUNCTION	29.64	29.64	0	11:57	0.00		
Jun-19	JUNCTION	0.00	29.64	0	11:58	0.00		
Jun-20	JUNCTION	23.92	26.88	0	11:58	0.00		
Jun-21	JUNCTION	30.10	64.78	0	12:06	0.00		
Jun-22	JUNCTION	0.00	54.57	0	12:17	0.00		
Jun-23	JUNCTION	0.00	32.44	0	12:17	0.00		
Jun-25	JUNCTION	6.55	32.82	0	12:17	0.00		
Jun-26	JUNCTION	17.33	17.33	0	11:58	0.00		
Jun-28	JUNCTION	0.00	99.18	0	12:04	0.00		
Jun-29	JUNCTION	53.47	82.69	0	12:07	0.00		
Jun-31	JUNCTION	3.91	3.91	0	11:57	0.00		
Jun-32	JUNCTION	0.00	101.93	0	12:03	0.00		
Jun-40	JUNCTION	22.49	22.49	0	12:01	0.00		
Jun-42	JUNCTION	0.54	0.54	0	12:02	0.00		
Jun-43	JUNCTION	0.00	3.32	0	11:58	0.00		
Jun-47	JUNCTION	0.00	22.45	0	12:02	0.00		
Jun-49	JUNCTION	2.87	2.87	0	11:58	0.00		
Out-05	OUTFALL	0.00	101.91	0	12:03	0.00		
Jun-24	STORAGE	0.00	82.68	0	12:07	0.00		
Jun-48	STORAGE	0.00	40.09	0	12:03	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	hh:mm
Inlet-11	2.02	923.13	0.15	0	12:07
Inlet-12	2.02	921.39	0.15	0	12:07
Inlet-13	2.02	921.36	0.15	0	12:07
Inlet-14	2.02	920.01	0.15	0	12:06

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.000	0
Inlet-12	0.00	0.00	-	-	-	0.001	0
Inlet-13	0.00	0.00	-	-	-	0.000	0
Inlet-14	0.00	0.00	-	-	-	0.000	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days	hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³
Jun-24	61.545	74	0	12:18	1.286	2	51.10	0.00	0:00:00	0.000
Jun-48	2.483	33	0	12:09	0.031	0	31.99	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	79.89	4.50	101.91
System	79.89	4.50	101.91

****
Link Flow Summary
****

Link ID	Element	Time of	Maximum	Length	Peak Flow	Design	Ratio of	Ratio of	Total	Reported

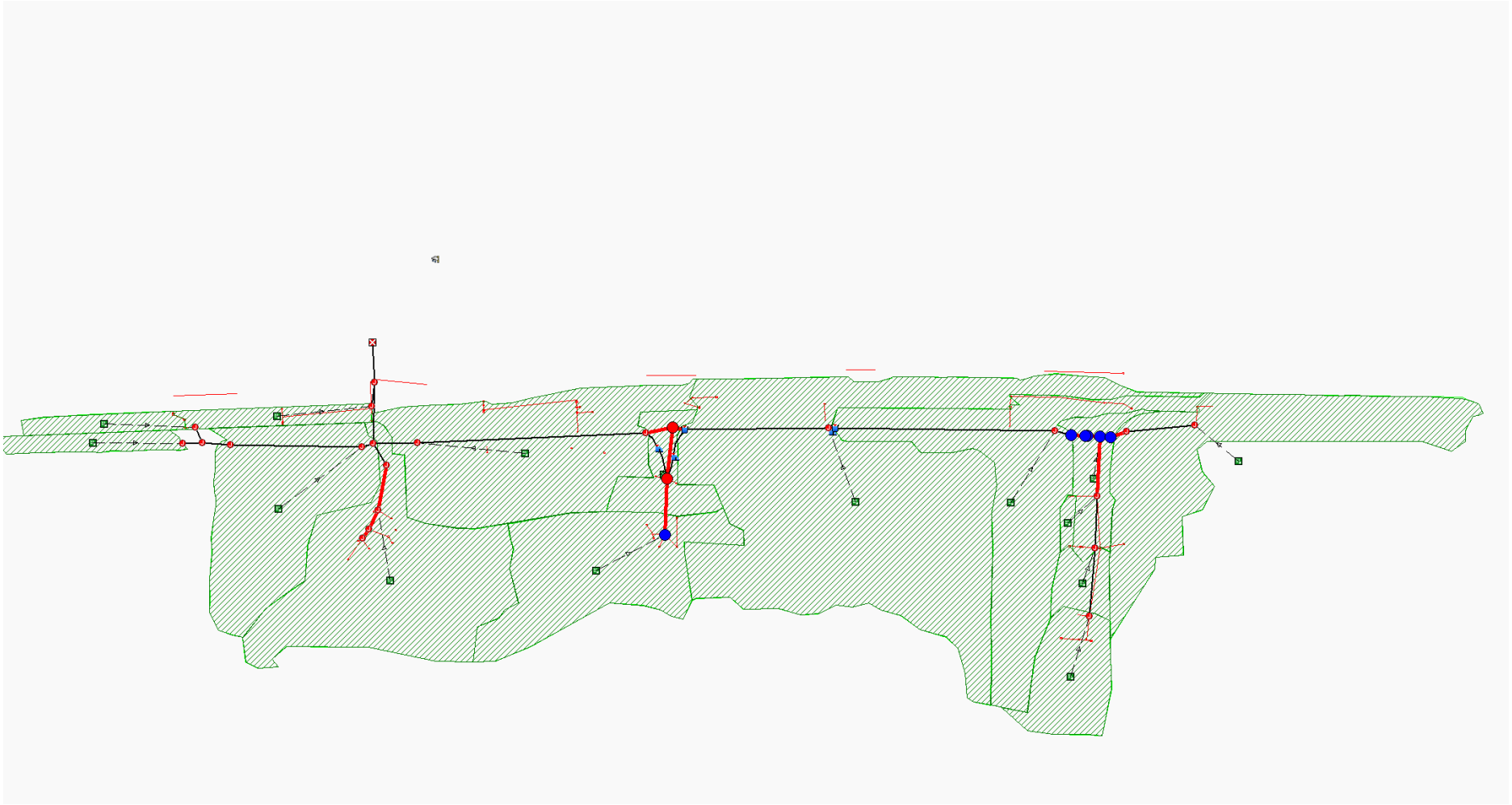
	Type	Peak Flow Occurrence days	hh:mm	Velocity Attained ft/sec	Factor	during Analysis cfs	Flow Capacity cfs	Maximum /Design Flow	Maximum Flow Depth	Time Surcharged minutes	Condition
Link-07	CONDUIT	0	11:58	11.32	1.00	8.63	49.45	0.17	0.29	0	Calculated
Link-102	CHANNEL	0	12:07	3.92	1.00	82.68	268.44	0.31	0.82	0	Calculated
Link-103	CHANNEL	0	11:59	0.14	1.00	3.18	4187.65	0.00	0.17	0	Calculated
Link-106	CHANNEL	0	12:03	4.12	1.00	101.91	328.75	0.31	0.63	0	Calculated
Link-107	CHANNEL	0	12:02	1.04	1.00	22.45	4186.34	0.01	0.30	0	Calculated
Link-108	CONDUIT	0	12:10	6.00	1.00	18.84	46.94	0.40	1.00	17	SURCHARGED
Link-110	CONDUIT	0	11:57	10.56	1.00	3.91	37.47	0.10	0.49	0	Calculated
Link-111	CHANNEL	0	12:19	1.97	1.00	54.42	1991.59	0.03	0.31	0	Calculated
Link-112	CHANNEL	0	12:03	3.35	1.00	40.09	419.20	0.10	0.64	0	Calculated
Link-113	CONDUIT	0	12:17	8.38	1.08	26.33	40.94	0.64	1.00	37	SURCHARGED
Link-114	CONDUIT	0	11:58	3.81	1.00	2.86	4.93	0.58	0.59	0	Calculated
Link-13	CONDUIT	0	11:58	7.36	1.00	11.97	62.45	0.19	0.65	0	Calculated
Link-15	CONDUIT	0	11:58	4.03	1.00	12.67	17.20	0.74	1.00	27	SURCHARGED
Link-16	CONDUIT	0	12:10	6.18	1.00	19.42	17.26	1.13	1.00	35	SURCHARGED
Link-17	CONDUIT	0	12:06	8.07	1.00	25.35	35.27	0.72	1.00	37	SURCHARGED
Link-18	CONDUIT	0	12:06	8.22	3.52	25.83	47.53	0.54	1.00	36	SURCHARGED
Link-19	CONDUIT	0	12:03	5.10	1.00	25.01	25.21	0.99	1.00	11	SURCHARGED
Link-30	CONDUIT	0	13:01	7.45	1.00	23.42	39.43	0.59	1.00	109	SURCHARGED
Link-31	CONDUIT	0	12:17	10.33	1.00	32.44	7.66	4.24	1.00	141	SURCHARGED
Link-32	CONDUIT	0	11:54	5.31	1.00	16.69	10.12	1.65	1.00	122	SURCHARGED
Link-37	CONDUIT	0	11:58	5.52	1.00	17.34	21.80	0.80	1.00	78	SURCHARGED
Link-57	CONDUIT	0	12:03	9.38	1.00	20.91	37.51	0.56	0.67	0	Calculated
Link-58	CONDUIT	0	12:10	7.68	1.00	61.78	77.99	0.79	0.78	0	Calculated
Link-59	CONDUIT	0	11:58	6.53	1.00	29.62	31.56	0.94	0.87	0	Calculated
Link-60	CONDUIT	0	11:58	6.08	1.00	29.64	12.24	2.42	0.98	0	> CAPACITY
Link-63	CONDUIT	0	11:53	0.33	1.00	1.33	3.73	0.36	1.00	10	SURCHARGED
Link-67	CONDUIT	0	11:53	0.94	1.00	0.63	6.58	0.10	1.00	4	SURCHARGED
Link-91	CONDUIT	0	12:04	5.49	1.00	25.01	18.31	1.37	0.87	0	> CAPACITY
Link-93	CONDUIT	0	12:02	3.37	1.00	0.54	19.77	0.03	0.23	0	Calculated
Link-94	CONDUIT	0	11:58	9.30	1.00	3.32	20.61	0.16	0.26	0	Calculated
Link-98	CONDUIT	0	12:04	11.56	1.00	99.17	224.33	0.44	0.53	0	Calculated
Weir-01	WEIR	0	12:09			6.05			0.21		
Weir-02	WEIR	0	12:17			22.13			0.83		
Weir-03	WEIR	0	12:19			29.32			1.00		

****
Highest Flow Instability Indexes
****
Link Link-113 (2)
Link Link-102 (1)
Link Link-112 (1)
Link Link-30 (1)

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:21:27 2022
Analysis ended on: Thu Jan 27 16:21:38 2022
Total elapsed time: 00:00:11

25-Year
Overview Map



25-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	25 year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	918.40	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.89	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	901.90	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00

Inlet-14	FHWA HEC-22 GENERIC	N/A		On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-12	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-13	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-14	- 0.0200	0.0160	0.0620	2.00	2.00	

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	1.6058	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.4692	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.1000	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0170
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	0.5922	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.0891	0.0130
Link-63	Jun-18	Jun-16	CONDUIT	68.8	0.0145	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	268.44
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1991.59
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	419.20
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	40.94
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.00	2.00	1	3.14	0.50	39.43
Link-31	CIRCULAR	2.00	2.00	1	3.14	0.50	7.66
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	2.50	2.50	1	4.91	0.63	31.56
Link-60	CIRCULAR	2.50	2.50	1	4.91	0.63	12.24
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	3.73
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	24.743	4.680
Surface Runoff	0.151	0.029
Continuity Error (%)	-0.001	

Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	18.148	5.914
Initial Stored Volume	0.000	0.000

Final Stored Volume 0.014 0.005
Continuity Error (%) ..... -0.004

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00
> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00

2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00

Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	4.68	3.70	68.37	91.230	0	00:17:27
Sub-02	4.68	3.96	37.77	93.700	0	00:09:15
Sub-03	4.68	3.06	23.25	84.860	0	00:07:12
Sub-04	4.68	3.32	39.33	87.580	0	00:05:00
Sub-06	4.68	3.63	30.75	90.630	0	00:05:18
Sub-07	4.68	0.95	1.02	57.270	0	00:05:49
Sub-09	4.68	3.56	3.71	89.910	0	00:05:30
Sub-10	4.68	3.99	4.99	93.940	0	00:05:00
Sub-11	4.68	3.43	29.23	88.660	0	00:10:37
Sub-12	4.68	4.37	8.35	97.350	0	00:05:00
Sub-13	4.68	3.57	0.91	90.000	0	00:05:00
Sub-14	4.68	3.60	4.35	90.310	0	00:05:00
Sub-15	4.68	3.34	11.43	87.740	0	00:05:00
Sub-16	4.68	2.36	22.48	77.020	0	00:08:15
Sub-17	4.68	4.11	8.30	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.04	0.70	941.24	0	11:58	0	0	0:00:00
Jun-04	0.04	0.68	930.35	0	11:56	0	0	0:00:00
Jun-05	0.13	7.19	924.09	0	11:56	0	0	0:00:00
Jun-06	0.17	6.50	922.18	0	11:56	0.03	2	0:00:00
Jun-07	0.77	1.98	916.75	0	12:01	0	0	0:00:00
Jun-13	0.04	0.89	911.72	0	11:58	0	0	0:00:00
Jun-15	0.01	3.39	897.63	0	11:57	0	0	0:00:00
Jun-16	0.07	5.01	897.64	0	11:58	0	0	0:00:00
Jun-18	0.20	5.34	897.61	0	11:58	0	0	0:00:00
Jun-19	0.12	3.48	895.37	0	11:57	0	0	0:00:00
Jun-20	0.10	2.02	894.05	0	12:04	0	0	0:00:00
Jun-21	0.33	3.88	894.32	0	12:12	0	0	0:00:00
Jun-22	1.37	3.26	895.96	0	12:19	0	0	0:00:00
Jun-23	1.41	6.81	899.61	0	12:13	0	0	0:00:00
Jun-25	1.07	6.85	900.03	0	12:17	0	0	0:00:00
Jun-26	0.22	5.53	900.72	0	11:54	0.98	13	0:00:00
Jun-28	0.27	3.04	892.35	0	12:04	0	0	0:00:00
Jun-29	1.37	2.72	901.64	0	12:06	0	0	0:00:00
Jun-31	0.03	0.37	900.22	0	11:56	0	0	0:00:00
Jun-32	0.30	2.80	888.20	0	12:03	0	0	0:00:00
Jun-40	0.02	0.33	923.51	0	12:02	0	0	0:00:00
Jun-42	0.01	0.23	913.42	0	12:02	0	0	0:00:00
Jun-43	0.00	0.10	907.42	0	11:59	0	0	0:00:00
Jun-47	0.10	4.43	922.93	0	12:08	0	0	0:00:00

Jun-49	0.05	0.95	912.52	0	11:58	0	0	0:00:00
Out-05	0.29	2.62	887.12	0	12:03	0	0	0:00:00
Jun-24	0.39	6.92	900.95	0	12:18	0	0	0:00:00
Jun-48	0.38	3.16	903.17	0	12:07	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	hh:mm
Jun-02	JUNCTION	11.21	11.21	0	11:58	0.00		
Jun-04	JUNCTION	4.26	15.46	0	11:58	0.00		
Jun-05	JUNCTION	0.89	16.47	0	11:57	0.00		
Jun-06	JUNCTION	8.21	29.47	0	12:02	2.39	0	11:56
Jun-07	JUNCTION	22.46	53.03	0	12:01	0.00		
Jun-13	JUNCTION	0.00	4.64	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.56	0	11:52	0.00		
Jun-16	JUNCTION	0.00	0.63	0	11:52	0.00		
Jun-18	JUNCTION	38.67	38.68	0	11:58	0.00		
Jun-19	JUNCTION	0.00	38.67	0	11:58	0.00		
Jun-20	JUNCTION	30.48	34.74	0	11:58	0.00		
Jun-21	JUNCTION	37.71	83.38	0	12:06	0.00		
Jun-22	JUNCTION	0.00	66.10	0	12:17	0.00		
Jun-23	JUNCTION	0.00	33.35	0	12:17	0.00		
Jun-25	JUNCTION	8.13	42.15	0	12:16	0.00		
Jun-26	JUNCTION	23.02	23.02	0	11:58	6.57	0	12:01
Jun-28	JUNCTION	0.00	118.40	0	12:04	0.00		
Jun-29	JUNCTION	68.09	111.85	0	12:06	0.00		
Jun-31	JUNCTION	4.88	4.88	0	11:56	0.00		
Jun-32	JUNCTION	0.00	121.82	0	12:03	0.00		
Jun-40	JUNCTION	29.03	29.03	0	12:01	0.00		
Jun-42	JUNCTION	1.02	1.02	0	12:01	0.00		
Jun-43	JUNCTION	0.00	4.65	0	11:58	0.00		
Jun-47	JUNCTION	0.00	29.01	0	12:02	0.00		
Jun-49	JUNCTION	3.68	3.68	0	11:58	0.00		
Out-05	OUTFALL	0.00	121.80	0	12:03	0.00		
Jun-24	STORAGE	0.00	111.70	0	12:06	0.00		
Jun-48	STORAGE	0.00	49.80	0	12:01	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	hh:mm
Inlet-11	2.02	923.13	0.15	0	11:56
Inlet-12	2.02	921.39	0.15	0	11:56
Inlet-13	2.02	921.36	0.15	0	11:58
Inlet-14	2.02	920.01	0.15	0	11:57

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.007	0
Inlet-12	0.00	0.00	-	-	-	0.015	1
Inlet-13	0.00	0.00	-	-	-	0.010	0
Inlet-14	0.00	0.00	-	-	-	0.017	1

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days	hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³
Jun-24	81.805	98	0	12:18	1.845	2	61.62	0.00	0:00:00	0.000
Jun-48	3.196	42	0	12:07	0.044	1	44.44	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	81.14	5.75	121.80
System	81.14	5.75	121.80

****
Link Flow Summary
****

Link ID	Element	Time of	Maximum	Length	Peak Flow	Design	Ratio of	Ratio of	Total	Reported

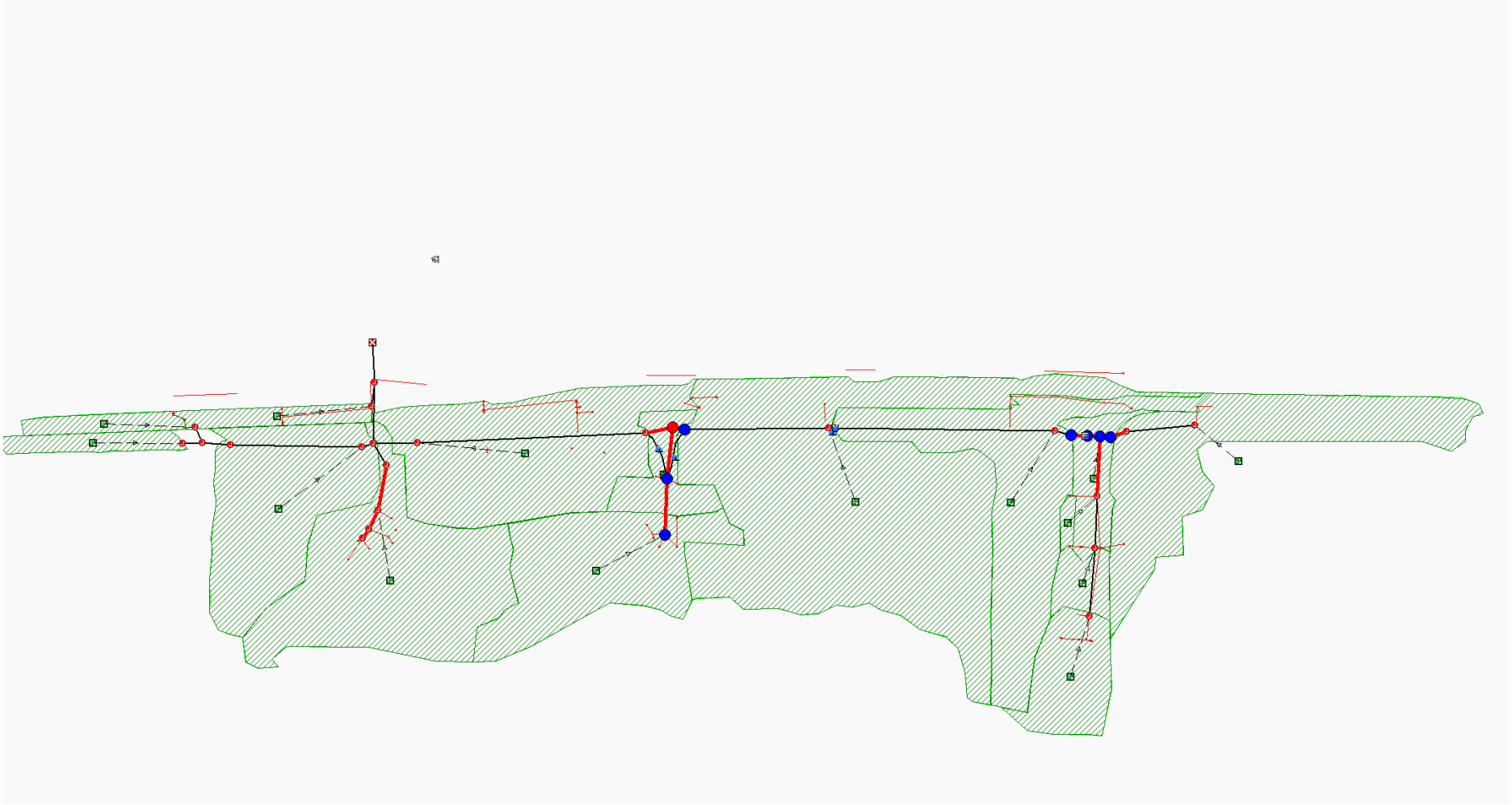
	Type	Peak Flow Occurrence days	hh:mm	Velocity Attained ft/sec	Factor	during Analysis cfs	Flow Capacity cfs	Maximum /Design Flow	Maximum Flow Depth	Time Surcharged minutes	Condition
Link-07	CONDUIT	0	11:58	12.11	1.00	11.20	49.45	0.23	0.34	0	Calculated
Link-102	CHANNEL	0	12:06	3.95	1.00	111.70	268.44	0.42	0.86	0	Calculated
Link-103	CHANNEL	0	11:59	0.17	1.00	4.50	4187.65	0.00	0.21	0	Calculated
Link-106	CHANNEL	0	12:03	4.30	1.00	121.80	328.75	0.37	0.68	0	Calculated
Link-107	CHANNEL	0	12:02	1.04	1.00	29.01	4186.34	0.01	0.44	0	Calculated
Link-108	CONDUIT	0	12:10	6.96	1.00	21.86	46.94	0.47	1.00	30	SURCHARGED
Link-110	CONDUIT	0	11:56	10.29	1.00	4.88	37.47	0.13	0.57	0	Calculated
Link-111	CHANNEL	0	12:19	1.97	1.00	65.95	1991.59	0.03	0.37	0	Calculated
Link-112	CHANNEL	0	12:01	3.37	1.00	49.80	419.20	0.12	0.70	0	Calculated
Link-113	CONDUIT	0	12:20	8.54	1.08	26.83	40.94	0.66	1.00	48	SURCHARGED
Link-114	CONDUIT	0	11:58	4.06	1.00	3.67	4.93	0.74	0.69	0	Calculated
Link-13	CONDUIT	0	11:57	7.29	1.00	15.58	62.45	0.25	0.67	0	Calculated
Link-15	CONDUIT	0	11:57	5.24	1.00	16.45	17.20	0.96	1.00	40	SURCHARGED
Link-16	CONDUIT	0	12:09	6.98	1.00	21.94	17.26	1.27	1.00	47	SURCHARGED
Link-17	CONDUIT	0	12:02	9.62	1.00	30.21	35.27	0.86	1.00	48	SURCHARGED
Link-18	CONDUIT	0	12:02	9.99	3.52	31.38	47.53	0.66	1.00	48	SURCHARGED
Link-19	CONDUIT	0	12:05	6.57	1.00	32.23	25.21	1.28	1.00	19	SURCHARGED
Link-30	CONDUIT	0	12:18	7.64	1.00	24.00	39.43	0.61	1.00	127	SURCHARGED
Link-31	CONDUIT	0	12:17	10.62	1.00	33.35	7.66	4.35	1.00	180	SURCHARGED
Link-32	CONDUIT	0	11:52	5.17	1.00	16.24	10.12	1.60	1.00	150	SURCHARGED
Link-37	CONDUIT	0	11:54	5.59	1.00	17.55	21.80	0.80	1.00	94	SURCHARGED
Link-57	CONDUIT	0	12:05	9.22	1.00	25.18	37.51	0.67	0.85	0	Calculated
Link-58	CONDUIT	0	12:12	8.28	1.00	74.65	77.99	0.96	0.89	0	Calculated
Link-59	CONDUIT	0	11:58	8.19	1.00	38.68	31.56	1.23	0.92	0	> CAPACITY
Link-60	CONDUIT	0	11:58	7.88	1.00	38.67	12.24	3.16	1.00	8	SURCHARGED
Link-63	CONDUIT	0	12:06	0.28	1.00	0.98	3.73	0.26	1.00	14	SURCHARGED
Link-67	CONDUIT	0	11:52	0.96	1.00	0.56	6.58	0.08	1.00	11	SURCHARGED
Link-91	CONDUIT	0	12:02	6.76	1.00	31.33	18.31	1.71	0.90	0	> CAPACITY
Link-93	CONDUIT	0	12:02	3.75	1.00	1.02	19.77	0.05	0.32	0	Calculated
Link-94	CONDUIT	0	11:58	9.63	1.00	4.65	20.61	0.23	0.33	0	Calculated
Link-98	CONDUIT	0	12:04	11.99	1.00	118.36	224.33	0.53	0.60	0	Calculated
Weir-01	WEIR	0	12:07			18.20			0.36		
Weir-02	WEIR	0	12:17			32.75			0.99		
Weir-03	WEIR	0	12:19			37.62			1.00		

****
Highest Flow Instability Indexes
****
Link Link-113 (2)
Link Link-30 (1)
Link Link-31 (1)
Link Link-18 (1)
Link Link-17 (1)

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:22:32 2022
Analysis ended on: Thu Jan 27 16:22:43 2022
Total elapsed time: 00:00:11

50-Year
Overview Map



50-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	50-Year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	918.40	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.89	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	901.90	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00

Inlet-14	FHWA HEC-22 GENERIC	N/A		On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-12	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-13	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-14	- 0.0200	0.0160	0.0620	2.00	2.00	

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	1.6058	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.4692	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.1000	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0170
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	0.5922	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.0891	0.0130
Link-63	Jun-18	Jun-16	CONDUIT	68.8	0.0145	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	268.44
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1991.59
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	419.20
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	40.94
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.00	2.00	1	3.14	0.50	39.43
Link-31	CIRCULAR	2.00	2.00	1	3.14	0.50	7.66
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	2.50	2.50	1	4.91	0.63	31.56
Link-60	CIRCULAR	2.50	2.50	1	4.91	0.63	12.24
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	3.73
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	26.963	5.100
Surface Runoff	0.169	0.032
Continuity Error (%)	-0.001	

Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	19.933	6.495
Initial Stored Volume	0.000	0.000

Final Stored Volume 0.014 0.005
Continuity Error (%) ..... -0.003

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00
> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00

2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00

Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	5.10	4.10	75.43	91.230	0	00:17:27
Sub-02	5.10	4.37	41.47	93.700	0	00:09:15
Sub-03	5.10	3.45	26.09	84.860	0	00:07:12
Sub-04	5.10	3.72	43.81	87.580	0	00:05:00
Sub-06	5.10	4.04	33.97	90.630	0	00:05:18
Sub-07	5.10	1.18	1.29	57.270	0	00:05:49
Sub-09	5.10	3.96	4.10	89.910	0	00:05:30
Sub-10	5.10	4.40	5.47	93.940	0	00:05:00
Sub-11	5.10	3.83	32.46	88.660	0	00:10:37
Sub-12	5.10	4.79	9.12	97.350	0	00:05:00
Sub-13	5.10	3.97	1.00	90.000	0	00:05:00
Sub-14	5.10	4.01	4.81	90.310	0	00:05:00
Sub-15	5.10	3.74	12.72	87.740	0	00:05:00
Sub-16	5.10	2.71	25.82	77.020	0	00:08:15
Sub-17	5.10	4.53	9.09	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.04	0.74	941.28	0	11:58	0	0	0:00:00
Jun-04	0.04	0.77	930.44	0	11:58	0	0	0:00:00
Jun-05	0.14	7.43	924.33	0	11:47	0	0	0:00:00
Jun-06	0.19	6.50	922.18	0	11:57	0.16	7	0:00:00
Jun-07	0.78	2.02	916.79	0	12:02	0	0	0:00:00
Jun-13	0.05	0.98	911.81	0	11:58	0	0	0:00:00
Jun-15	0.02	4.37	898.61	0	11:57	0	0	0:00:00
Jun-16	0.08	5.99	898.62	0	11:57	0	0	0:00:00
Jun-18	0.21	6.32	898.59	0	11:57	0	0	0:00:00
Jun-19	0.13	3.92	895.82	0	11:57	0	0	0:00:00
Jun-20	0.11	2.28	894.31	0	12:04	0	0	0:00:00
Jun-21	0.35	4.20	894.64	0	12:11	0	0	0:00:00
Jun-22	1.39	3.29	895.99	0	12:14	0	0	0:00:00
Jun-23	1.44	6.89	899.69	0	12:12	0	0	0:00:00
Jun-25	1.10	6.91	900.09	0	12:11	0.06	13	0:00:00
Jun-26	0.23	5.53	900.72	0	11:53	1.67	15	0:00:00
Jun-28	0.28	3.20	892.51	0	12:04	0	0	0:00:00
Jun-29	1.38	2.79	901.71	0	12:08	0	0	0:00:00
Jun-31	0.03	0.38	900.23	0	11:56	0	0	0:00:00
Jun-32	0.31	2.89	888.29	0	12:04	0	0	0:00:00
Jun-40	0.02	0.35	923.53	0	12:02	0	0	0:00:00
Jun-42	0.02	0.26	913.45	0	12:00	0	0	0:00:00
Jun-43	0.00	0.11	907.43	0	11:59	0	0	0:00:00
Jun-47	0.12	5.00	923.50	0	12:08	0	0	0:00:00

Jun-49	0.05	1.04	912.61	0	11:58	0	0	0:00:00
Out-05	0.30	2.70	887.20	0	12:04	0	0	0:00:00
Jun-24	0.42	6.97	901.00	0	12:11	2.81	9	0:00:00
Jun-48	0.40	3.22	903.23	0	12:06	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	hh:mm
Jun-02	JUNCTION	12.48	12.48	0	11:58	0.00		
Jun-04	JUNCTION	4.71	17.17	0	11:58	0.00		
Jun-05	JUNCTION	0.98	18.28	0	11:57	0.00		
Jun-06	JUNCTION	8.95	32.37	0	12:03	4.34	0	12:04
Jun-07	JUNCTION	25.79	57.38	0	11:59	0.00		
Jun-13	JUNCTION	0.00	5.32	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.28	0	11:52	0.00		
Jun-16	JUNCTION	0.00	0.55	0	11:50	0.00		
Jun-18	JUNCTION	43.00	43.00	0	11:58	0.00		
Jun-19	JUNCTION	0.00	42.99	0	11:57	0.00		
Jun-20	JUNCTION	33.69	38.63	0	11:58	0.00		
Jun-21	JUNCTION	41.44	91.42	0	12:05	0.00		
Jun-22	JUNCTION	0.00	68.33	0	12:11	0.00		
Jun-23	JUNCTION	0.00	33.51	0	12:11	0.00		
Jun-25	JUNCTION	8.94	45.80	0	12:07	1.31	0	12:08
Jun-26	JUNCTION	25.88	25.88	0	11:58	10.30	0	12:00
Jun-28	JUNCTION	0.00	127.13	0	12:03	0.00		
Jun-29	JUNCTION	75.07	124.66	0	12:06	0.00		
Jun-31	JUNCTION	5.36	5.36	0	11:56	0.00		
Jun-32	JUNCTION	0.00	130.58	0	12:04	0.00		
Jun-40	JUNCTION	32.25	32.25	0	12:02	0.00		
Jun-42	JUNCTION	1.28	1.28	0	12:00	0.00		
Jun-43	JUNCTION	0.00	5.34	0	11:58	0.00		
Jun-47	JUNCTION	0.00	32.24	0	12:02	0.00		
Jun-49	JUNCTION	4.08	4.08	0	11:58	0.00		
Out-05	OUTFALL	0.00	130.54	0	12:04	0.00		
Jun-24	STORAGE	0.00	124.55	0	12:06	42.45	0	12:11
Jun-48	STORAGE	0.00	54.32	0	12:02	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	hh:mm
Inlet-11	2.02	923.13	0.15	0	11:57
Inlet-12	2.02	921.39	0.15	0	11:52
Inlet-13	2.02	921.36	0.15	0	11:58
Inlet-14	2.02	920.01	0.15	0	11:57

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.009	1
Inlet-12	0.00	0.00	-	-	-	0.017	2
Inlet-13	0.00	0.00	-	-	-	0.003	0
Inlet-14	0.00	0.00	-	-	-	0.015	1

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days	hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³
Jun-24	83.634	100	0	12:11	2.031	2	62.37	0.00	0:00:00	0.000
Jun-48	3.439	46	0	12:06	0.050	1	49.62	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	81.61	6.27	130.54
System	81.61	6.27	130.54

****
Link Flow Summary
****

Link ID	Element	Time of	Maximum	Length	Peak Flow	Design	Ratio of	Ratio of	Total	Reported

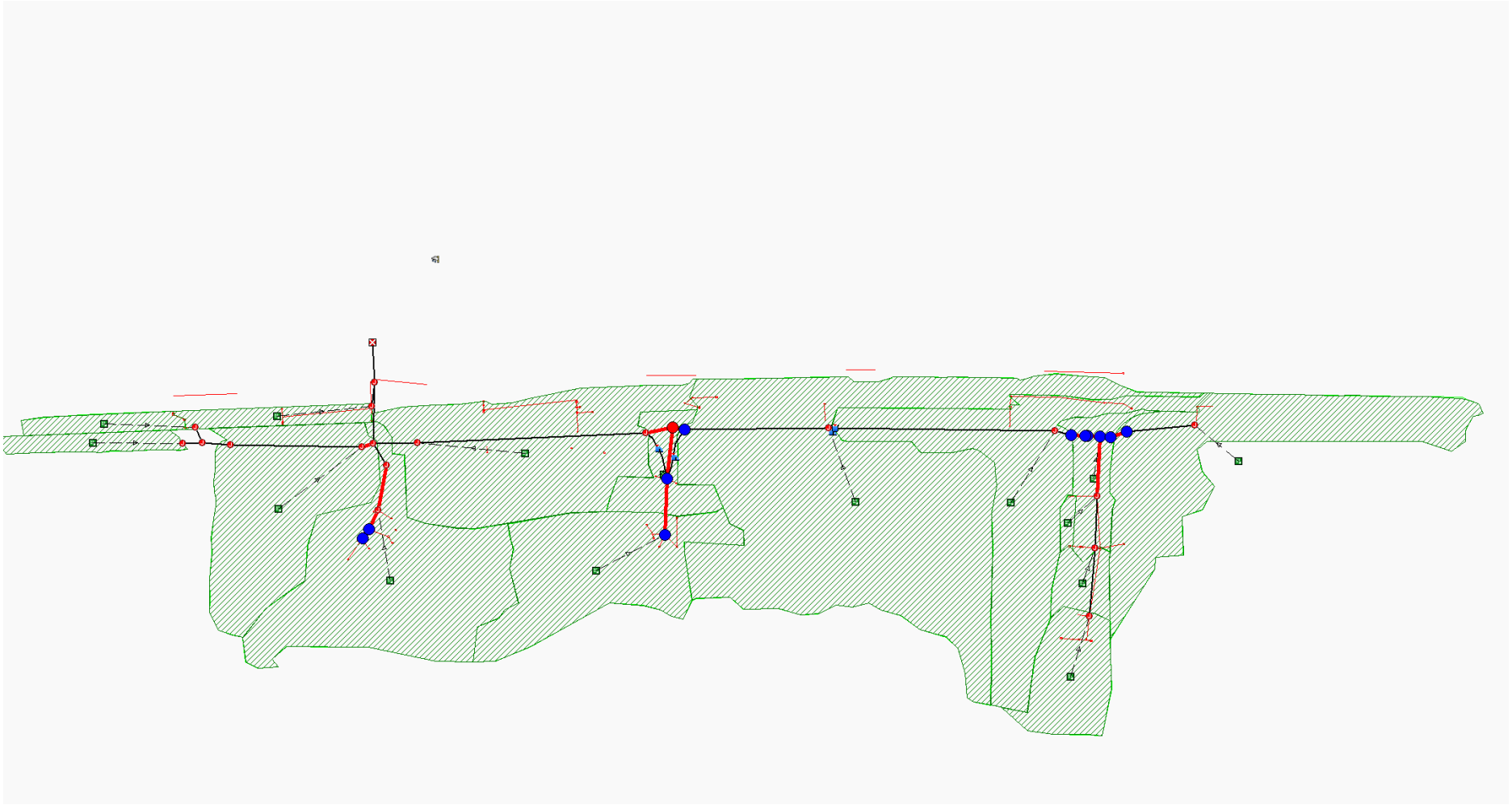
	Type	Peak Flow Occurrence days	hh:mm	Velocity Attained ft/sec	Factor	during Analysis cfs	Flow Capacity cfs	Maximum /Design Flow	Maximum Flow Depth	Time Surcharged minutes	Condition
Link-07	CONDUIT	0	11:58	12.44	1.00	12.47	49.45	0.25	0.36	0	Calculated
Link-102	CHANNEL	0	12:06	3.96	1.00	124.55	268.44	0.46	0.88	0	Calculated
Link-103	CHANNEL	0	11:59	0.17	1.00	5.18	4187.65	0.00	0.24	0	Calculated
Link-106	CHANNEL	0	12:04	4.37	1.00	130.54	328.75	0.40	0.70	0	Calculated
Link-107	CHANNEL	0	12:02	1.05	1.00	32.24	4186.34	0.01	0.49	0	Calculated
Link-108	CONDUIT	0	12:12	7.33	1.00	23.03	46.94	0.49	1.00	35	SURCHARGED
Link-110	CONDUIT	0	11:56	10.31	1.00	5.36	37.47	0.14	0.61	0	Calculated
Link-111	CHANNEL	0	12:14	1.97	1.00	68.03	1991.59	0.03	0.39	0	Calculated
Link-112	CHANNEL	0	12:02	3.39	1.00	54.32	419.20	0.13	0.72	0	Calculated
Link-113	CONDUIT	0	12:22	8.59	1.08	26.99	40.94	0.66	1.00	53	SURCHARGED
Link-114	CONDUIT	0	11:58	4.17	1.00	4.06	4.93	0.82	0.74	0	Calculated
Link-13	CONDUIT	0	11:57	7.50	1.00	17.30	62.45	0.28	0.69	0	Calculated
Link-15	CONDUIT	0	11:57	5.80	1.00	18.22	17.20	1.06	1.00	44	SURCHARGED
Link-16	CONDUIT	0	12:12	7.31	1.00	22.98	17.26	1.33	1.00	52	SURCHARGED
Link-17	CONDUIT	0	12:05	9.69	1.00	30.44	35.27	0.86	1.00	54	SURCHARGED
Link-18	CONDUIT	0	12:04	10.30	3.52	32.37	47.53	0.68	1.00	53	SURCHARGED
Link-19	CONDUIT	0	12:04	6.63	1.00	32.48	25.21	1.29	1.00	24	SURCHARGED
Link-30	CONDUIT	0	12:20	7.69	1.00	24.17	39.43	0.61	1.00	136	SURCHARGED
Link-31	CONDUIT	0	12:11	10.66	1.00	33.50	7.66	4.37	1.00	201	SURCHARGED
Link-32	CONDUIT	0	11:50	5.18	1.00	16.28	10.12	1.61	1.00	163	SURCHARGED
Link-37	CONDUIT	0	11:53	5.58	1.00	17.53	21.80	0.80	1.00	100	SURCHARGED
Link-57	CONDUIT	0	12:04	9.08	1.00	26.62	37.51	0.71	0.89	0	Calculated
Link-58	CONDUIT	0	12:12	8.81	1.00	80.38	77.99	1.03	0.92	0	> CAPACITY
Link-59	CONDUIT	0	11:58	8.99	1.00	43.00	31.56	1.36	0.94	0	> CAPACITY
Link-60	CONDUIT	0	11:57	8.76	1.00	42.99	12.24	3.51	1.00	10	SURCHARGED
Link-63	CONDUIT	0	12:06	0.28	1.00	0.99	3.73	0.26	1.00	15	SURCHARGED
Link-67	CONDUIT	0	12:05	0.93	1.00	0.46	6.58	0.07	1.00	12	SURCHARGED
Link-91	CONDUIT	0	11:59	6.82	1.00	31.75	18.31	1.73	0.90	0	> CAPACITY
Link-93	CONDUIT	0	12:00	3.81	1.00	1.28	19.77	0.06	0.36	0	Calculated
Link-94	CONDUIT	0	11:58	9.75	1.00	5.34	20.61	0.26	0.36	0	Calculated
Link-98	CONDUIT	0	12:04	12.15	1.00	127.08	224.33	0.57	0.63	0	Calculated
Weir-01	WEIR	0	12:06			23.40			0.41		
Weir-02	WEIR	0	12:11			34.84			1.00		
Weir-03	WEIR	0	12:20			38.20			1.00		

****
Highest Flow Instability Indexes
****
Link Link-113 (2)
Link Link-30 (2)
Link Link-31 (1)
Link Link-18 (1)
Link Link-17 (1)

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:23:31 2022
Analysis ended on: Thu Jan 27 16:23:42 2022
Total elapsed time: 00:00:11

100-Year
Overview Map



100-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	100 year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	918.40	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.89	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	901.90	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00

Inlet-14	FHWA HEC-22 GENERIC	N/A		On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-12	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-13	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-14	- 0.0200	0.0160	0.0620	2.00	2.00	

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	1.6058	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.4692	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.1000	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0170
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	0.5922	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.0891	0.0130
Link-63	Jun-18	Jun-16	CONDUIT	68.8	0.0145	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	268.44
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1991.59
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	419.20
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	40.94
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.00	2.00	1	3.14	0.50	39.43
Link-31	CIRCULAR	2.00	2.00	1	3.14	0.50	7.66
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	2.50	2.50	1	4.91	0.63	31.56
Link-60	CIRCULAR	2.50	2.50	1	4.91	0.63	12.24
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	3.73
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	33.043	6.250
Surface Runoff	0.217	0.041
Continuity Error (%)	-0.001	

Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	24.464	7.972
Initial Stored Volume	0.000	0.000

Final Stored Volume 0.014 0.005
Continuity Error (%) ..... -0.003

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00
> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00

2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00

Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	6.25	5.23	94.87	91.230	0	00:17:27
Sub-02	6.25	5.51	51.58	93.700	0	00:09:15
Sub-03	6.25	4.52	33.87	84.860	0	00:07:12
Sub-04	6.25	4.82	55.97	87.580	0	00:05:00
Sub-06	6.25	5.16	42.81	90.630	0	00:05:18
Sub-07	6.25	1.85	2.16	57.270	0	00:05:49
Sub-09	6.25	5.08	5.19	89.910	0	00:05:30
Sub-10	6.25	5.54	6.79	93.940	0	00:05:00
Sub-11	6.25	4.94	41.31	88.660	0	00:10:37
Sub-12	6.25	5.93	11.21	97.350	0	00:05:00
Sub-13	6.25	5.09	1.27	90.000	0	00:05:00
Sub-14	6.25	5.12	6.07	90.310	0	00:05:00
Sub-15	6.25	4.84	16.24	87.740	0	00:05:00
Sub-16	6.25	3.70	35.16	77.020	0	00:08:15
Sub-17	6.25	5.67	11.25	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.05	0.85	941.39	0	11:58	0	0	0:00:00
Jun-04	0.05	1.03	930.70	0	11:58	0	0	0:00:00
Jun-05	0.17	8.60	925.50	0	12:12	0	0	0:00:00
Jun-06	0.22	6.50	922.18	0	11:53	1.82	13	0:00:00
Jun-07	0.80	2.11	916.88	0	12:01	0	0	0:00:00
Jun-13	0.05	1.27	912.10	0	11:58	0	0	0:00:00
Jun-15	0.03	5.59	899.83	0	12:00	0.34	11	0:00:00
Jun-16	0.11	7.32	899.95	0	11:55	0.08	3	0:00:00
Jun-18	0.25	7.77	900.04	0	11:56	0	0	0:00:00
Jun-19	0.16	4.57	896.46	0	11:55	0	0	0:00:00
Jun-20	0.13	3.05	895.08	0	12:05	0	0	0:00:00
Jun-21	0.40	4.95	895.39	0	12:09	0	0	0:00:00
Jun-22	1.44	3.32	896.02	0	12:10	0	0	0:00:00
Jun-23	1.52	6.95	899.75	0	12:08	0	0	0:00:00
Jun-25	1.18	7.04	900.22	0	12:07	0.23	24	0:00:00
Jun-26	0.27	5.53	900.72	0	11:50	3.77	19	0:00:00
Jun-28	0.32	3.72	893.03	0	12:04	0	0	0:00:00
Jun-29	1.42	3.12	902.04	0	12:06	0	0	0:00:00
Jun-31	0.03	0.43	900.28	0	11:56	0	0	0:00:00
Jun-32	0.36	3.15	888.55	0	12:04	0	0	0:00:00
Jun-40	0.02	0.74	923.92	0	12:04	0	0	0:00:00
Jun-42	0.02	0.33	913.52	0	11:58	0	0	0:00:00
Jun-43	0.01	0.13	907.45	0	11:59	0	0	0:00:00
Jun-47	0.14	5.40	923.90	0	12:04	0.96	5	0:00:00

Jun-49	0.06	1.37	912.94	0	11:58	0	0	0:00:00
Out-05	0.35	2.92	887.42	0	12:04	0	0	0:00:00
Jun-24	0.49	6.97	901.00	0	12:05	13.38	18	0:00:00
Jun-48	0.42	3.33	903.34	0	12:05	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	hh:mm
Jun-02	JUNCTION	15.93	15.93	0	11:58	0.00		
Jun-04	JUNCTION	5.93	21.84	0	11:58	0.00		
Jun-05	JUNCTION	1.24	23.08	0	11:58	0.00		
Jun-06	JUNCTION	11.02	44.35	0	12:02	14.86	0	12:02
Jun-07	JUNCTION	35.09	64.59	0	12:00	0.00		
Jun-13	JUNCTION	0.00	7.28	0	11:58	0.00		
Jun-15	JUNCTION	0.00	4.96	0	11:55	4.96	0	11:55
Jun-16	JUNCTION	0.00	9.24	0	12:05	2.38	0	11:58
Jun-18	JUNCTION	54.77	54.77	0	11:56	0.00		
Jun-19	JUNCTION	0.00	48.79	0	11:56	0.00		
Jun-20	JUNCTION	42.33	49.19	0	11:58	0.00		
Jun-21	JUNCTION	51.51	110.52	0	12:04	0.00		
Jun-22	JUNCTION	0.00	71.05	0	12:07	0.00		
Jun-23	JUNCTION	0.00	33.69	0	12:05	0.00		
Jun-25	JUNCTION	11.06	50.44	0	12:05	4.22	0	12:04
Jun-26	JUNCTION	33.70	33.70	0	11:58	20.30	0	11:59
Jun-28	JUNCTION	0.00	153.08	0	12:04	0.00		
Jun-29	JUNCTION	94.32	154.07	0	12:04	0.00		
Jun-31	JUNCTION	6.65	6.65	0	11:56	0.00		
Jun-32	JUNCTION	0.00	157.30	0	12:04	0.00		
Jun-40	JUNCTION	40.99	40.99	0	12:00	0.00		
Jun-42	JUNCTION	2.14	2.14	0	11:58	0.00		
Jun-43	JUNCTION	0.00	7.29	0	11:58	0.00		
Jun-47	JUNCTION	0.00	40.96	0	12:04	22.26	0	12:04
Jun-49	JUNCTION	5.15	5.15	0	11:58	0.00		
Out-05	OUTFALL	0.00	157.26	0	12:04	0.00		
Jun-24	STORAGE	0.00	153.20	0	12:06	94.86	0	12:06
Jun-48	STORAGE	0.00	63.92	0	12:01	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	hh:mm
Inlet-11	2.02	923.13	0.15	0	11:55
Inlet-12	2.02	921.39	0.15	0	11:52
Inlet-13	2.02	921.36	0.15	0	11:53
Inlet-14	2.02	920.01	0.15	0	11:53

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.031	4
Inlet-12	0.00	0.00	-	-	-	0.046	2
Inlet-13	0.00	0.00	-	-	-	0.013	0
Inlet-14	0.00	0.00	-	-	-	0.023	1

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days	hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³
Jun-24	83.634	100	0	12:05	2.400	3	61.98	0.00	0:00:00	0.000
Jun-48	3.930	52	0	12:05	0.063	1	59.96	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	82.63	7.60	157.26
System	82.63	7.60	157.26

****
Link Flow Summary
****

Link ID	Element	Time of	Maximum	Length	Peak Flow	Design	Ratio of	Ratio of	Total	Reported

	Type	Peak Flow Occurrence days	hh:mm	Velocity Attained ft/sec	Factor	during Analysis cfs	Flow Capacity cfs	Maximum /Design Flow	Maximum Flow Depth	Time Surcharged minutes	Condition
Link-07	CONDUIT	0	11:58	13.19	1.00	15.92	49.45	0.32	0.41	0	Calculated
Link-102	CHANNEL	0	12:06	3.93	1.00	153.20	268.44	0.57	0.96	0	Calculated
Link-103	CHANNEL	0	11:59	0.19	1.00	7.11	4187.65	0.00	0.32	0	Calculated
Link-106	CHANNEL	0	12:04	4.57	1.00	157.26	328.75	0.48	0.76	0	Calculated
Link-107	CHANNEL	0	12:04	1.05	1.00	40.96	4186.34	0.01	0.57	0	Calculated
Link-108	CONDUIT	0	12:12	7.64	1.00	23.99	46.94	0.51	1.00	44	SURCHARGED
Link-110	CONDUIT	0	11:56	9.56	1.00	6.65	37.47	0.18	0.64	0	Calculated
Link-111	CHANNEL	0	12:10	1.96	1.00	70.59	1991.59	0.04	0.44	0	Calculated
Link-112	CHANNEL	0	12:01	3.31	1.00	63.92	419.20	0.15	0.75	0	Calculated
Link-113	CONDUIT	0	12:26	8.64	1.08	27.14	40.94	0.66	1.00	63	SURCHARGED
Link-114	CONDUIT	0	11:58	4.48	1.00	5.14	4.93	1.04	0.88	0	> CAPACITY
Link-13	CONDUIT	0	11:58	8.58	1.00	21.84	62.45	0.35	0.76	0	Calculated
Link-15	CONDUIT	0	11:58	7.35	1.00	23.08	17.20	1.34	1.00	54	SURCHARGED
Link-16	CONDUIT	0	12:15	7.53	1.00	23.67	17.26	1.37	1.00	61	SURCHARGED
Link-17	CONDUIT	0	12:05	11.06	1.00	34.74	35.27	0.99	1.00	63	SURCHARGED
Link-18	CONDUIT	0	12:05	10.55	3.52	33.15	47.53	0.70	1.00	62	SURCHARGED
Link-19	CONDUIT	0	12:06	6.78	1.00	33.29	25.21	1.32	1.00	34	SURCHARGED
Link-30	CONDUIT	0	12:23	7.67	1.00	24.10	39.43	0.61	1.00	163	SURCHARGED
Link-31	CONDUIT	0	12:05	10.72	1.00	33.68	7.66	4.40	1.00	283	SURCHARGED
Link-32	CONDUIT	0	11:47	5.13	1.00	16.12	10.12	1.59	1.00	201	SURCHARGED
Link-37	CONDUIT	0	11:51	5.59	1.00	17.58	21.80	0.81	1.00	114	SURCHARGED
Link-57	CONDUIT	0	12:05	9.89	1.00	30.79	37.51	0.82	1.00	4	SURCHARGED
Link-58	CONDUIT	0	12:10	9.95	1.00	92.55	77.99	1.19	0.99	0	> CAPACITY
Link-59	CONDUIT	0	11:56	10.10	1.00	48.79	31.56	1.55	0.96	0	> CAPACITY
Link-60	CONDUIT	0	11:56	9.94	1.00	48.79	12.24	3.98	1.00	14	SURCHARGED
Link-63	CONDUIT	0	12:05	2.32	1.00	9.24	3.73	2.48	1.00	19	SURCHARGED
Link-67	CONDUIT	0	12:05	7.53	1.00	9.24	6.58	1.40	1.00	16	SURCHARGED
Link-91	CONDUIT	0	12:05	6.92	1.00	32.55	18.31	1.78	0.92	0	> CAPACITY
Link-93	CONDUIT	0	11:58	4.01	1.00	2.14	19.77	0.11	0.48	0	Calculated
Link-94	CONDUIT	0	11:58	10.06	1.00	7.29	20.61	0.35	0.46	0	Calculated
Link-98	CONDUIT	0	12:04	12.60	1.00	152.98	224.33	0.68	0.72	0	Calculated
Weir-01	WEIR	0	12:05			35.33			0.49		
Weir-02	WEIR	0	12:07			37.41			1.00		
Weir-03	WEIR	0	12:26			37.91			1.00		

****
Highest Flow Instability Indexes
****
Link Link-30 (2)
Link Link-31 (2)
Link Link-113 (2)
Link Link-32 (1)
Link Link-18 (1)

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:24:39 2022
Analysis ended on: Thu Jan 27 16:24:50 2022
Total elapsed time: 00:00:11

Appendix E

Autodesk SSA – Existing Conditions – Ditch & Meadowcreek Pipe Improvements

2-Year
Overview Map

2-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55-DitchMod.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	2 year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	917.77	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.89	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	900.70	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00

Inlet-14	FHWA HEC-22 GENERIC	N/A		On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-12	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-13	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-14	- 0.0200	0.0160	0.0620	2.00	2.00	

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	0.6715	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.3065	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.0124	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0150
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	0.5922	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.0891	0.0130
Link-63	Jun-18	Jun-16	CONDUIT	68.8	0.0145	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	173.59
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1609.60
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	410.36
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	46.40
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.50	2.50	1	4.91	0.63	71.48
Link-31	CIRCULAR	2.50	2.50	1	4.91	0.63	13.89
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	2.50	2.50	1	4.91	0.63	31.56
Link-60	CIRCULAR	2.50	2.50	1	4.91	0.63	12.24
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	3.73
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	14.222	2.690
Surface Runoff	0.071	0.014
Continuity Error (%)	-0.001	

Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	8.586	2.798
Initial Stored Volume	0.000	0.000

Final Stored Volume 0.001 0.000
Continuity Error (%) ..... -0.001

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00
> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00

2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00

Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	2.69	1.80	34.36	91.230	0	00:17:27
Sub-02	2.69	2.02	20.02	93.700	0	00:09:15
Sub-03	2.69	1.32	10.13	84.860	0	00:07:12
Sub-04	2.69	1.51	18.34	87.580	0	00:05:00
Sub-06	2.69	1.75	15.34	90.630	0	00:05:18
Sub-07	2.69	0.17	0.08	57.270	0	00:05:49
Sub-09	2.69	1.69	1.82	89.910	0	00:05:30
Sub-10	2.69	2.04	2.66	93.940	0	00:05:00
Sub-11	2.69	1.60	13.96	88.660	0	00:10:37
Sub-12	2.69	2.39	4.71	97.350	0	00:05:00
Sub-13	2.69	1.70	0.45	90.000	0	00:05:00
Sub-14	2.69	1.73	2.16	90.310	0	00:05:00
Sub-15	2.69	1.53	5.35	87.740	0	00:05:00
Sub-16	2.69	0.86	7.94	77.020	0	00:08:15
Sub-17	2.69	2.15	4.52	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.03	0.46	941.00	0	11:58	0	0	0:00:00
Jun-04	0.03	0.46	930.13	0	11:58	0	0	0:00:00
Jun-05	0.06	6.16	923.06	0	11:56	0	0	0:00:00
Jun-06	0.09	3.83	919.51	0	11:56	0	0	0:00:00
Jun-07	0.13	1.10	915.87	0	12:03	0	0	0:00:00
Jun-13	0.03	0.49	911.32	0	11:57	0	0	0:00:00
Jun-15	0.00	0.25	894.49	0	11:58	0	0	0:00:00
Jun-16	0.03	1.85	894.48	0	11:58	0	0	0:00:00
Jun-18	0.13	2.21	894.48	0	11:58	0	0	0:00:00
Jun-19	0.08	1.68	893.57	0	11:58	0	0	0:00:00
Jun-20	0.06	1.14	893.17	0	12:03	0	0	0:00:00
Jun-21	0.20	2.72	893.16	0	12:08	0	0	0:00:00
Jun-22	0.20	1.90	894.60	0	12:17	0	0	0:00:00
Jun-23	0.30	4.26	897.06	0	12:15	0	0	0:00:00
Jun-25	0.17	4.31	897.49	0	12:04	0	0	0:00:00
Jun-26	0.07	2.71	897.90	0	12:02	0	0	0:00:00
Jun-28	0.17	2.28	891.59	0	12:04	0	0	0:00:00
Jun-29	0.18	1.45	900.37	0	12:06	0	0	0:00:00
Jun-31	0.02	0.27	900.12	0	11:58	0	0	0:00:00
Jun-32	0.19	2.31	887.71	0	12:04	0	0	0:00:00
Jun-40	0.01	0.21	923.39	0	12:02	0	0	0:00:00
Jun-42	0.01	0.07	913.26	0	12:04	0	0	0:00:00
Jun-43	0.00	0.05	907.37	0	12:00	0	0	0:00:00
Jun-47	0.05	1.11	919.61	0	12:05	0	0	0:00:00

Jun-49	0.03	0.59	912.16	0	11:58	0	0	0:00:00
Out-05	0.18	2.17	886.67	0	12:04	0	0	0:00:00
Jun-24	0.15	4.54	898.57	0	12:15	0	0	0:00:00
Jun-48	0.09	1.83	901.84	0	12:07	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	hh:mm
Jun-02	JUNCTION	5.28	5.28	0	11:58	0.00		
Jun-04	JUNCTION	2.13	7.39	0	11:58	0.00		
Jun-05	JUNCTION	0.44	7.82	0	11:58	0.00		
Jun-06	JUNCTION	4.62	20.51	0	11:56	0.00		
Jun-07	JUNCTION	7.93	28.10	0	12:02	0.00		
Jun-13	JUNCTION	0.00	1.81	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.10	0	11:55	0.00		
Jun-16	JUNCTION	0.00	0.32	0	11:53	0.00		
Jun-18	JUNCTION	18.13	18.13	0	11:58	0.00		
Jun-19	JUNCTION	0.00	17.98	0	11:58	0.00		
Jun-20	JUNCTION	15.26	16.86	0	11:58	0.00		
Jun-21	JUNCTION	20.01	58.08	0	12:04	0.00		
Jun-22	JUNCTION	0.00	43.97	0	12:15	0.00		
Jun-23	JUNCTION	0.00	43.97	0	12:15	0.00		
Jun-25	JUNCTION	4.43	14.44	0	11:58	0.00		
Jun-26	JUNCTION	10.02	10.02	0	11:59	0.00		
Jun-28	JUNCTION	0.00	77.83	0	12:04	0.00		
Jun-29	JUNCTION	34.35	58.96	0	12:06	0.00		
Jun-31	JUNCTION	2.60	2.60	0	11:57	0.00		
Jun-32	JUNCTION	0.00	79.51	0	12:04	0.00		
Jun-40	JUNCTION	13.94	13.94	0	12:02	0.00		
Jun-42	JUNCTION	0.08	0.08	0	12:04	0.00		
Jun-43	JUNCTION	0.00	1.81	0	11:58	0.00		
Jun-47	JUNCTION	0.00	13.90	0	12:02	0.00		
Jun-49	JUNCTION	1.81	1.81	0	11:58	0.00		
Out-05	OUTFALL	0.00	79.49	0	12:04	0.00		
Jun-24	STORAGE	0.00	58.72	0	12:06	0.00		
Jun-48	STORAGE	0.00	27.94	0	12:03	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	hh:mm
Inlet-11	2.02	923.13	0.15	0	11:56
Inlet-12	2.02	921.39	0.15	0	11:56
Inlet-13	2.02	921.36	0.15	0	12:02
Inlet-14	2.02	920.01	0.15	0	12:02

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.000	0
Inlet-12	0.00	0.00	-	-	-	0.000	0
Inlet-13	0.00	0.00	-	-	-	0.000	0
Inlet-14	0.00	0.00	-	-	-	0.000	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days	hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³
Jun-24	23.709	28	0	12:15	0.236	0	41.52	0.00	0:00:00	0.000
Jun-48	0.390	5	0	12:07	0.003	0	24.86	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	75.63	2.89	79.49
System	75.63	2.89	79.49

****
Link Flow Summary
****

Link ID	Element	Time of	Maximum	Length	Peak Flow	Design	Ratio of	Ratio of	Total	Reported

	Type	Peak Flow Occurrence days	hh:mm	Velocity Attained ft/sec	Factor	during Analysis cfs	Flow Capacity cfs	Maximum /Design Flow	Maximum Flow Depth	Time Surcharged minutes	Condition
Link-07	CONDUIT	0	11:58	9.92	1.00	5.27	49.45	0.11	0.23	0	Calculated
Link-102	CHANNEL	0	12:06	2.98	1.00	58.72	173.59	0.34	0.63	0	Calculated
Link-103	CHANNEL	0	12:00	0.11	1.00	1.72	4187.65	0.00	0.12	0	Calculated
Link-106	CHANNEL	0	12:04	3.89	1.00	79.49	328.75	0.24	0.56	0	Calculated
Link-107	CHANNEL	0	12:02	1.05	1.00	13.90	4186.34	0.00	0.12	0	Calculated
Link-108	CONDUIT	0	12:08	5.42	1.00	13.60	46.94	0.29	0.78	0	Calculated
Link-110	CONDUIT	0	11:58	10.66	1.00	2.60	37.47	0.07	0.37	0	Calculated
Link-111	CHANNEL	0	12:17	1.84	1.00	43.88	1609.60	0.03	0.29	0	Calculated
Link-112	CHANNEL	0	12:03	3.75	1.00	27.94	410.36	0.07	0.43	0	Calculated
Link-113	CONDUIT	0	12:07	9.04	1.17	24.86	46.40	0.54	0.82	0	Calculated
Link-114	CONDUIT	0	11:58	3.43	1.00	1.81	4.93	0.37	0.44	0	Calculated
Link-13	CONDUIT	0	11:58	7.49	1.00	7.38	62.45	0.12	0.62	0	Calculated
Link-15	CONDUIT	0	11:56	3.48	1.00	8.13	17.20	0.47	1.00	9	SURCHARGED
Link-16	CONDUIT	0	12:08	4.33	1.00	13.60	17.26	0.79	1.00	17	SURCHARGED
Link-17	CONDUIT	0	11:56	6.50	1.00	20.42	35.27	0.58	1.00	19	SURCHARGED
Link-18	CONDUIT	0	11:56	6.72	3.52	21.12	47.53	0.44	1.00	17	SURCHARGED
Link-19	CONDUIT	0	12:02	4.30	1.00	20.19	25.21	0.80	0.92	0	Calculated
Link-30	CONDUIT	0	12:16	8.45	1.00	41.46	71.48	0.58	1.00	37	SURCHARGED
Link-31	CONDUIT	0	12:15	9.61	1.00	43.97	13.89	3.17	0.88	0	> CAPACITY
Link-32	CONDUIT	0	11:58	4.46	1.00	14.02	10.12	1.38	1.00	47	SURCHARGED
Link-37	CONDUIT	0	11:58	3.19	1.00	10.02	21.80	0.46	1.00	11	SURCHARGED
Link-57	CONDUIT	0	12:03	8.59	1.00	13.09	37.51	0.35	0.49	0	Calculated
Link-58	CONDUIT	0	12:08	7.55	1.00	53.68	77.99	0.69	0.69	0	Calculated
Link-59	CONDUIT	0	11:58	5.77	1.00	17.97	31.56	0.57	0.61	0	Calculated
Link-60	CONDUIT	0	11:58	4.69	1.00	17.98	12.24	1.47	0.73	0	> CAPACITY
Link-63	CONDUIT	0	12:05	0.24	1.00	0.38	3.73	0.10	0.82	0	Calculated
Link-67	CONDUIT	0	11:55	0.42	1.00	0.10	6.58	0.01	0.35	0	Calculated
Link-91	CONDUIT	0	12:02	5.78	1.00	20.19	18.31	1.10	0.68	0	> CAPACITY
Link-93	CONDUIT	0	12:04	2.27	1.00	0.08	19.77	0.00	0.11	0	Calculated
Link-94	CONDUIT	0	11:58	8.57	1.00	1.81	20.61	0.09	0.18	0	Calculated
Link-98	CONDUIT	0	12:04	10.99	1.00	77.83	224.33	0.35	0.46	0	Calculated
Weir-01	WEIR	0	00:00			0.00			0.00		
Weir-02	WEIR	0	00:00			0.00			0.00		
Weir-03	WEIR	0	12:15			0.07			0.04		

****
Highest Flow Instability Indexes
****
All links are stable.

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:26:24 2022
Analysis ended on: Thu Jan 27 16:26:35 2022
Total elapsed time: 00:00:11

5-Year
Overview Map

5-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55-DitchMod.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	5-Year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	917.77	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.89	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	900.70	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00

Inlet-14	FHWA HEC-22 GENERIC	N/A		On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-12	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-13	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-14	- 0.0200	0.0160	0.0620	2.00	2.00	

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	0.6715	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.3065	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.0124	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0150
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	0.5922	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.0891	0.0130
Link-63	Jun-18	Jun-16	CONDUIT	68.8	0.0145	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	173.59
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1609.60
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	410.36
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	46.40
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.50	2.50	1	4.91	0.63	71.48
Link-31	CIRCULAR	2.50	2.50	1	4.91	0.63	13.89
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	2.50	2.50	1	4.91	0.63	31.56
Link-60	CIRCULAR	2.50	2.50	1	4.91	0.63	12.24
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	3.73
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	18.504	3.500
Surface Runoff	0.103	0.020
Continuity Error (%)	-0.001	

Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	12.394	4.039
Initial Stored Volume	0.000	0.000

Final Stored Volume 0.001 0.000
Continuity Error (%) ..... -0.000

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00
> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00

2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00

Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	3.50	2.56	48.18	91.230	0	00:17:27
Sub-02	3.50	2.81	27.28	93.700	0	00:09:15
Sub-03	3.50	2.00	15.37	84.860	0	00:07:12
Sub-04	3.50	2.23	26.81	87.580	0	00:05:00
Sub-06	3.50	2.51	21.63	90.630	0	00:05:18
Sub-07	3.50	0.43	0.40	57.270	0	00:05:49
Sub-09	3.50	2.44	2.59	89.910	0	00:05:30
Sub-10	3.50	2.83	3.61	93.940	0	00:05:00
Sub-11	3.50	2.33	20.14	88.660	0	00:10:37
Sub-12	3.50	3.19	6.20	97.350	0	00:05:00
Sub-13	3.50	2.44	0.63	90.000	0	00:05:00
Sub-14	3.50	2.48	3.05	90.310	0	00:05:00
Sub-15	3.50	2.25	7.81	87.740	0	00:05:00
Sub-16	3.50	1.43	13.50	77.020	0	00:08:15
Sub-17	3.50	2.95	6.07	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.03	0.56	941.10	0	11:58	0	0	0:00:00
Jun-04	0.03	0.56	930.23	0	11:58	0	0	0:00:00
Jun-05	0.09	9.13	926.03	0	11:53	0	0	0:00:00
Jun-06	0.12	4.48	920.16	0	11:53	0	0	0:00:00
Jun-07	0.15	1.22	915.99	0	12:02	0	0	0:00:00
Jun-13	0.03	0.64	911.47	0	11:58	0	0	0:00:00
Jun-15	0.00	1.12	895.36	0	11:58	0	0	0:00:00
Jun-16	0.04	2.73	895.36	0	11:58	0	0	0:00:00
Jun-18	0.15	3.09	895.36	0	11:58	0	0	0:00:00
Jun-19	0.10	2.33	894.22	0	11:58	0	0	0:00:00
Jun-20	0.08	1.47	893.50	0	12:03	0	0	0:00:00
Jun-21	0.25	3.30	893.74	0	12:08	0	0	0:00:00
Jun-22	0.24	2.10	894.80	0	12:18	0	0	0:00:00
Jun-23	0.38	5.40	898.20	0	12:16	0	0	0:00:00
Jun-25	0.24	5.89	899.07	0	12:16	0	0	0:00:00
Jun-26	0.12	4.79	899.98	0	11:59	0	0	0:00:00
Jun-28	0.21	2.72	892.03	0	12:04	0	0	0:00:00
Jun-29	0.21	1.59	900.51	0	12:06	0	0	0:00:00
Jun-31	0.02	0.31	900.16	0	11:58	0	0	0:00:00
Jun-32	0.24	2.60	888.00	0	12:04	0	0	0:00:00
Jun-40	0.01	0.27	923.45	0	12:02	0	0	0:00:00
Jun-42	0.01	0.15	913.34	0	12:04	0	0	0:00:00
Jun-43	0.00	0.07	907.39	0	12:00	0	0	0:00:00
Jun-47	0.07	2.40	920.90	0	12:06	0	0	0:00:00

Jun-49	0.04	0.74	912.31	0	11:58	0	0	0:00:00
Out-05	0.23	2.43	886.93	0	12:04	0	0	0:00:00
Jun-24	0.21	5.52	899.55	0	12:17	0	0	0:00:00
Jun-48	0.11	2.39	902.40	0	12:09	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	hh:mm
Jun-02	JUNCTION	7.70	7.70	0	11:58	0.00		
Jun-04	JUNCTION	2.99	10.67	0	11:58	0.00		
Jun-05	JUNCTION	0.62	11.29	0	11:58	0.00		
Jun-06	JUNCTION	6.09	23.89	0	12:03	0.00		
Jun-07	JUNCTION	13.50	37.08	0	12:01	0.00		
Jun-13	JUNCTION	0.00	2.84	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.35	0	11:54	0.00		
Jun-16	JUNCTION	0.00	0.77	0	11:53	0.00		
Jun-18	JUNCTION	26.42	26.42	0	11:58	0.00		
Jun-19	JUNCTION	0.00	26.41	0	11:58	0.00		
Jun-20	JUNCTION	21.44	23.95	0	11:58	0.00		
Jun-21	JUNCTION	27.25	71.83	0	12:03	0.00		
Jun-22	JUNCTION	0.00	56.03	0	12:16	0.00		
Jun-23	JUNCTION	0.00	52.79	0	12:16	0.00		
Jun-25	JUNCTION	5.96	21.12	0	11:58	0.00		
Jun-26	JUNCTION	15.19	15.19	0	11:58	0.00		
Jun-28	JUNCTION	0.00	100.97	0	12:04	0.00		
Jun-29	JUNCTION	48.05	76.52	0	12:06	0.00		
Jun-31	JUNCTION	3.54	3.54	0	11:58	0.00		
Jun-32	JUNCTION	0.00	103.27	0	12:04	0.00		
Jun-40	JUNCTION	20.07	20.07	0	12:01	0.00		
Jun-42	JUNCTION	0.39	0.39	0	12:03	0.00		
Jun-43	JUNCTION	0.00	2.85	0	11:58	0.00		
Jun-47	JUNCTION	0.00	20.03	0	12:02	0.00		
Jun-49	JUNCTION	2.58	2.58	0	11:58	0.00		
Out-05	OUTFALL	0.00	103.27	0	12:04	0.00		
Jun-24	STORAGE	0.00	76.26	0	12:06	0.00		
Jun-48	STORAGE	0.00	36.86	0	12:02	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	hh:mm
Inlet-11	2.02	923.13	0.15	0	12:03
Inlet-12	2.02	921.39	0.15	0	11:53
Inlet-13	2.02	921.36	0.15	0	12:03
Inlet-14	2.02	920.01	0.15	0	12:03

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.000	0
Inlet-12	0.00	0.00	-	-	-	0.000	0
Inlet-13	0.00	0.00	-	-	-	0.000	0
Inlet-14	0.00	0.00	-	-	-	0.000	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days	hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³
Jun-24	41.240	49	0	12:17	0.569	1	52.73	0.00	0:00:00	0.000
Jun-48	1.049	14	0	12:09	0.009	0	29.29	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	77.62	4.13	103.27
System	77.62	4.13	103.27

****
Link Flow Summary
****

Link ID	Element	Time of	Maximum	Length	Peak Flow	Design	Ratio of	Ratio of	Total	Reported

	Type	Peak Flow Occurrence days	hh:mm	Velocity Attained ft/sec	Factor	during Analysis cfs	Flow Capacity cfs	Maximum /Design Flow	Maximum Flow Depth	Time Surcharged minutes	Condition
Link-07	CONDUIT	0	11:58	10.98	1.00	7.68	49.45	0.16	0.27	0	Calculated
Link-102	CHANNEL	0	12:06	3.18	1.00	76.26	173.59	0.44	0.72	0	Calculated
Link-103	CHANNEL	0	12:00	0.14	1.00	2.72	4187.65	0.00	0.15	0	Calculated
Link-106	CHANNEL	0	12:04	4.14	1.00	103.27	328.75	0.31	0.63	0	Calculated
Link-107	CHANNEL	0	12:02	1.05	1.00	20.03	4186.34	0.00	0.24	0	Calculated
Link-108	CONDUIT	0	12:10	5.61	1.00	17.61	46.94	0.38	1.00	10	SURCHARGED
Link-110	CONDUIT	0	11:58	10.47	1.00	3.54	37.47	0.09	0.48	0	Calculated
Link-111	CHANNEL	0	12:18	1.79	1.00	55.71	1609.60	0.03	0.33	0	Calculated
Link-112	CHANNEL	0	12:02	3.72	1.00	36.86	410.36	0.09	0.54	0	Calculated
Link-113	CONDUIT	0	12:11	10.31	1.17	29.29	46.40	0.63	0.90	0	Calculated
Link-114	CONDUIT	0	11:58	3.71	1.00	2.57	4.93	0.52	0.55	0	Calculated
Link-13	CONDUIT	0	11:58	7.30	1.00	10.67	62.45	0.17	0.64	0	Calculated
Link-15	CONDUIT	0	11:58	3.59	1.00	11.29	17.20	0.66	1.00	21	SURCHARGED
Link-16	CONDUIT	0	12:10	5.61	1.00	17.61	17.26	1.02	1.00	30	SURCHARGED
Link-17	CONDUIT	0	12:03	7.61	1.00	23.89	35.27	0.68	1.00	31	SURCHARGED
Link-18	CONDUIT	0	12:03	7.61	3.52	23.89	47.53	0.50	1.00	29	SURCHARGED
Link-19	CONDUIT	0	12:03	4.89	1.00	23.89	25.21	0.95	0.98	0	Calculated
Link-30	CONDUIT	0	12:34	8.58	1.00	42.13	71.48	0.59	1.00	55	SURCHARGED
Link-31	CONDUIT	0	12:16	11.19	1.00	52.79	13.89	3.80	0.92	0	> CAPACITY
Link-32	CONDUIT	0	11:57	6.25	1.00	19.64	10.12	1.94	1.00	66	SURCHARGED
Link-37	CONDUIT	0	11:58	4.84	1.00	15.19	21.80	0.70	1.00	42	SURCHARGED
Link-57	CONDUIT	0	12:03	9.07	1.00	18.77	37.51	0.50	0.64	0	Calculated
Link-58	CONDUIT	0	12:08	7.72	1.00	65.27	77.99	0.84	0.82	0	Calculated
Link-59	CONDUIT	0	11:58	6.16	1.00	26.35	31.56	0.83	0.81	0	Calculated
Link-60	CONDUIT	0	11:58	5.61	1.00	26.41	12.24	2.16	0.92	0	> CAPACITY
Link-63	CONDUIT	0	11:53	0.21	1.00	0.77	3.73	0.21	1.00	7	SURCHARGED
Link-67	CONDUIT	0	11:54	0.94	1.00	0.35	6.58	0.05	0.95	0	Calculated
Link-91	CONDUIT	0	12:03	6.11	1.00	23.89	18.31	1.30	0.74	0	> CAPACITY
Link-93	CONDUIT	0	12:04	3.17	1.00	0.39	19.77	0.02	0.20	0	Calculated
Link-94	CONDUIT	0	11:58	9.13	1.00	2.85	20.61	0.14	0.24	0	Calculated
Link-98	CONDUIT	0	12:04	11.61	1.00	100.96	224.33	0.45	0.54	0	Calculated
Weir-01	WEIR	0	00:00			0.00			0.00		
Weir-02	WEIR	0	12:16			3.23			0.35		
Weir-03	WEIR	0	12:17			13.41			0.70		

****
Highest Flow Instability Indexes
****
All links are stable.

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:28:19 2022
Analysis ended on: Thu Jan 27 16:28:30 2022
Total elapsed time: 00:00:11

10-Year
Overview Map

10-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55-DitchMod.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	10-Year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	917.77	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.89	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	900.70	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00

Inlet-14	FHWA HEC-22 GENERIC	N/A		On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-12	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-13	- 0.0200	0.0160	0.0620	2.00	2.00	
Inlet-14	- 0.0200	0.0160	0.0620	2.00	2.00	

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	0.6715	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.3065	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.0124	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0150
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	0.5922	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.0891	0.0130
Link-63	Jun-18	Jun-16	CONDUIT	68.8	0.0145	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	173.59
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1609.60
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	410.36
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	46.40
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.50	2.50	1	4.91	0.63	71.48
Link-31	CIRCULAR	2.50	2.50	1	4.91	0.63	13.89
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	2.50	2.50	1	4.91	0.63	31.56
Link-60	CIRCULAR	2.50	2.50	1	4.91	0.63	12.24
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	3.73
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	20.196	3.820
Surface Runoff	0.116	0.022
Continuity Error (%)	-0.001	

Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	13.938	4.542
Initial Stored Volume	0.000	0.000

Final Stored Volume 0.001 0.000
Continuity Error (%) ..... -0.000

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00
> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00

2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00

Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	hh:mm:ss
Sub-01	3.82	2.87	53.66	91.230	0	00:17:27
Sub-02	3.82	3.12	30.13	93.700	0	00:09:15
Sub-03	3.82	2.29	17.49	84.860	0	00:07:12
Sub-04	3.82	2.52	30.19	87.580	0	00:05:00
Sub-06	3.82	2.81	24.09	90.630	0	00:05:18
Sub-07	3.82	0.55	0.55	57.270	0	00:05:49
Sub-09	3.82	2.74	2.89	89.910	0	00:05:30
Sub-10	3.82	3.14	3.99	93.940	0	00:05:00
Sub-11	3.82	2.62	22.60	88.660	0	00:10:37
Sub-12	3.82	3.51	6.79	97.350	0	00:05:00
Sub-13	3.82	2.75	0.71	90.000	0	00:05:00
Sub-14	3.82	2.78	3.40	90.310	0	00:05:00
Sub-15	3.82	2.54	8.78	87.740	0	00:05:00
Sub-16	3.82	1.67	15.86	77.020	0	00:08:15
Sub-17	3.82	3.26	6.68	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.04	0.60	941.14	0	11:58	0	0	0:00:00
Jun-04	0.04	0.59	930.26	0	11:58	0	0	0:00:00
Jun-05	0.10	6.58	923.48	0	11:52	0	0	0:00:00
Jun-06	0.14	4.83	920.51	0	12:03	0	0	0:00:00
Jun-07	0.16	1.26	916.03	0	12:02	0	0	0:00:00
Jun-13	0.04	0.71	911.54	0	11:58	0	0	0:00:00
Jun-15	0.01	1.55	895.79	0	11:58	0	0	0:00:00
Jun-16	0.05	3.16	895.79	0	11:58	0	0	0:00:00
Jun-18	0.17	3.52	895.79	0	11:58	0	0	0:00:00
Jun-19	0.11	2.62	894.52	0	11:58	0	0	0:00:00
Jun-20	0.09	1.61	893.64	0	12:03	0	0	0:00:00
Jun-21	0.28	3.58	894.02	0	12:09	0	0	0:00:00
Jun-22	0.26	2.20	894.90	0	12:17	0	0	0:00:00
Jun-23	0.41	5.59	898.39	0	12:16	0	0	0:00:00
Jun-25	0.28	6.19	899.37	0	12:15	0	0	0:00:00
Jun-26	0.14	5.33	900.52	0	11:58	0	0	0:00:00
Jun-28	0.23	2.86	892.17	0	12:03	0	0	0:00:00
Jun-29	0.22	1.63	900.55	0	12:06	0	0	0:00:00
Jun-31	0.02	0.33	900.18	0	11:58	0	0	0:00:00
Jun-32	0.26	2.69	888.09	0	12:03	0	0	0:00:00
Jun-40	0.01	0.29	923.47	0	12:02	0	0	0:00:00
Jun-42	0.01	0.17	913.36	0	12:02	0	0	0:00:00
Jun-43	0.00	0.08	907.40	0	11:59	0	0	0:00:00
Jun-47	0.08	2.92	921.42	0	12:07	0	0	0:00:00

Jun-49	0.04	0.79	912.36	0	11:58	0	0	0:00:00
Out-05	0.25	2.51	887.01	0	12:03	0	0	0:00:00
Jun-24	0.23	5.75	899.78	0	12:16	0	0	0:00:00
Jun-48	0.13	2.61	902.62	0	12:10	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	hh:mm
Jun-02	JUNCTION	8.65	8.65	0	11:58	0.00		
Jun-04	JUNCTION	3.35	11.97	0	11:58	0.00		
Jun-05	JUNCTION	0.70	12.67	0	11:58	0.00		
Jun-06	JUNCTION	6.67	25.33	0	12:03	0.00		
Jun-07	JUNCTION	15.86	40.70	0	12:02	0.00		
Jun-13	JUNCTION	0.00	3.31	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.61	0	11:53	0.00		
Jun-16	JUNCTION	0.00	1.27	0	11:53	0.00		
Jun-18	JUNCTION	29.64	29.64	0	11:58	0.00		
Jun-19	JUNCTION	0.00	29.64	0	11:58	0.00		
Jun-20	JUNCTION	23.92	26.88	0	11:58	0.00		
Jun-21	JUNCTION	30.10	77.27	0	12:02	0.00		
Jun-22	JUNCTION	0.00	62.54	0	12:15	0.00		
Jun-23	JUNCTION	0.00	53.99	0	12:15	0.00		
Jun-25	JUNCTION	6.55	23.86	0	11:58	0.00		
Jun-26	JUNCTION	17.33	17.33	0	11:58	0.00		
Jun-28	JUNCTION	0.00	108.54	0	12:03	0.00		
Jun-29	JUNCTION	53.48	83.25	0	12:06	0.00		
Jun-31	JUNCTION	3.91	3.91	0	11:58	0.00		
Jun-32	JUNCTION	0.00	111.27	0	12:03	0.00		
Jun-40	JUNCTION	22.49	22.49	0	12:02	0.00		
Jun-42	JUNCTION	0.54	0.54	0	12:02	0.00		
Jun-43	JUNCTION	0.00	3.32	0	11:58	0.00		
Jun-47	JUNCTION	0.00	22.45	0	12:02	0.00		
Jun-49	JUNCTION	2.87	2.87	0	11:58	0.00		
Out-05	OUTFALL	0.00	111.25	0	12:03	0.00		
Jun-24	STORAGE	0.00	83.64	0	12:06	0.00		
Jun-48	STORAGE	0.00	40.45	0	12:02	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	hh:mm
Inlet-11	2.02	923.13	0.15	0	12:04
Inlet-12	2.02	921.39	0.15	0	12:04
Inlet-13	2.02	921.36	0.15	0	12:03
Inlet-14	2.02	920.01	0.15	0	12:03

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.000	0
Inlet-12	0.00	0.00	-	-	-	0.000	0
Inlet-13	0.00	0.00	-	-	-	0.000	0
Inlet-14	0.00	0.00	-	-	-	0.000	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days	hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³
Jun-24	46.191	55	0	12:16	0.720	1	58.74	0.00	0:00:00	0.000
Jun-48	1.500	20	0	12:10	0.015	0	30.88	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	78.22	4.74	111.25
System	78.22	4.74	111.25

****
Link Flow Summary
****

Link ID	Element	Time of	Maximum	Length	Peak Flow	Design	Ratio of	Ratio of	Total	Reported

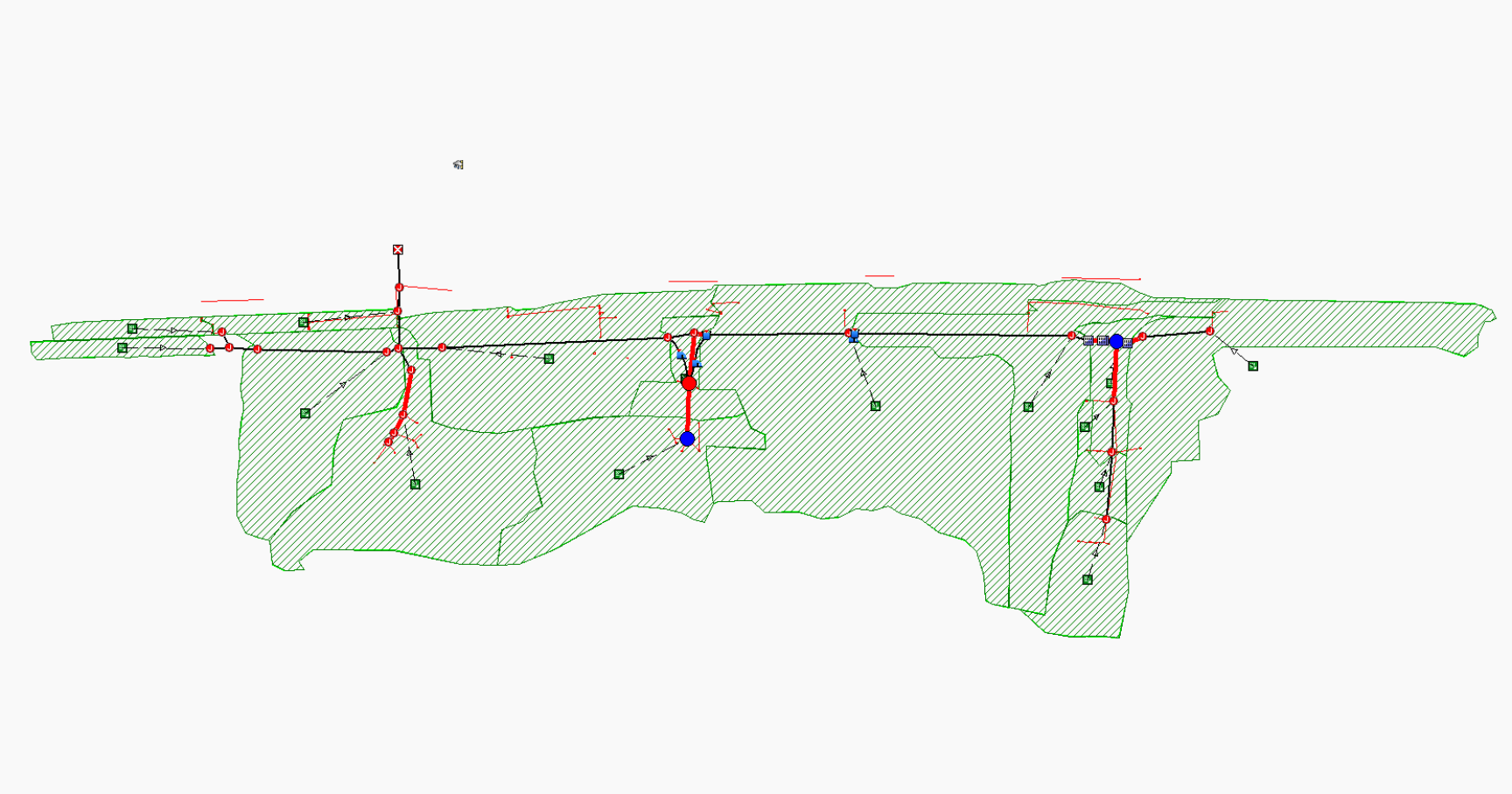
	Type	Peak Flow Occurrence days	hh:mm	Velocity Attained ft/sec	Factor	during Analysis cfs	Flow Capacity cfs	Maximum /Design Flow	Maximum Flow Depth	Time Surcharged minutes	Condition
Link-07	CONDUIT	0	11:58	11.32	1.00	8.63	49.45	0.17	0.29	0	Calculated
Link-102	CHANNEL	0	12:06	3.25	1.00	83.64	173.59	0.48	0.79	0	Calculated
Link-103	CHANNEL	0	11:59	0.14	1.00	3.18	4187.65	0.00	0.17	0	Calculated
Link-106	CHANNEL	0	12:03	4.21	1.00	111.25	328.75	0.34	0.65	0	Calculated
Link-107	CHANNEL	0	12:02	1.05	1.00	22.45	4186.34	0.01	0.29	0	Calculated
Link-108	CONDUIT	0	12:10	5.95	1.00	18.68	46.94	0.40	1.00	17	SURCHARGED
Link-110	CONDUIT	0	11:58	10.37	1.00	3.91	37.47	0.10	0.52	0	Calculated
Link-111	CHANNEL	0	12:17	1.78	1.00	62.13	1609.60	0.04	0.36	0	Calculated
Link-112	CHANNEL	0	12:02	3.68	1.00	40.45	410.36	0.10	0.58	0	Calculated
Link-113	CONDUIT	0	12:10	10.78	1.17	30.88	46.40	0.67	0.91	0	Calculated
Link-114	CONDUIT	0	11:58	3.81	1.00	2.86	4.93	0.58	0.59	0	Calculated
Link-13	CONDUIT	0	11:58	7.39	1.00	11.97	62.45	0.19	0.65	0	Calculated
Link-15	CONDUIT	0	11:58	4.03	1.00	12.67	17.20	0.74	1.00	26	SURCHARGED
Link-16	CONDUIT	0	12:10	5.95	1.00	18.68	17.26	1.08	1.00	34	SURCHARGED
Link-17	CONDUIT	0	12:03	8.06	1.00	25.33	35.27	0.72	1.00	36	SURCHARGED
Link-18	CONDUIT	0	12:03	8.06	3.52	25.33	47.53	0.53	1.00	34	SURCHARGED
Link-19	CONDUIT	0	12:03	5.16	1.00	25.33	25.21	1.00	1.00	0	> CAPACITY
Link-30	CONDUIT	0	12:38	8.58	1.00	42.13	71.48	0.59	1.00	61	SURCHARGED
Link-31	CONDUIT	0	12:15	11.30	1.00	53.99	13.89	3.89	0.94	0	> CAPACITY
Link-32	CONDUIT	0	11:56	6.41	1.00	20.13	10.12	1.99	1.00	72	SURCHARGED
Link-37	CONDUIT	0	11:58	5.52	1.00	17.34	21.80	0.80	1.00	47	SURCHARGED
Link-57	CONDUIT	0	12:03	8.95	1.00	20.83	37.51	0.56	0.71	0	Calculated
Link-58	CONDUIT	0	12:09	7.83	1.00	69.37	77.99	0.89	0.87	0	Calculated
Link-59	CONDUIT	0	11:58	6.53	1.00	29.62	31.56	0.94	0.87	0	Calculated
Link-60	CONDUIT	0	11:58	6.08	1.00	29.64	12.24	2.42	0.98	0	> CAPACITY
Link-63	CONDUIT	0	11:53	0.32	1.00	1.27	3.73	0.34	1.00	10	SURCHARGED
Link-67	CONDUIT	0	11:53	0.95	1.00	0.61	6.58	0.09	1.00	4	SURCHARGED
Link-91	CONDUIT	0	12:03	6.40	1.00	25.33	18.31	1.38	0.75	0	> CAPACITY
Link-93	CONDUIT	0	12:02	3.37	1.00	0.54	19.77	0.03	0.23	0	Calculated
Link-94	CONDUIT	0	11:58	9.30	1.00	3.32	20.61	0.16	0.26	0	Calculated
Link-98	CONDUIT	0	12:04	11.77	1.00	108.54	224.33	0.48	0.56	0	Calculated
Weir-01	WEIR	0	00:00			0.00			0.00		
Weir-02	WEIR	0	12:15			8.54			0.54		
Weir-03	WEIR	0	12:16			19.00			0.85		

****
Highest Flow Instability Indexes
****
All links are stable.

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:29:25 2022
Analysis ended on: Thu Jan 27 16:29:36 2022
Total elapsed time: 00:00:11

25-Year
Overview Map



25-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55-DitchMod.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	25 year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	917.77	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.89	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	900.70	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00
Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-12	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-13	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-14	-	0.0200	0.0160	0.0620	2.00	2.00

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	0.6715	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.3065	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.0124	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0150
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	0.5922	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.0891	0.0130
Link-63	Jun-18	Jun-16	CONDUIT	68.8	0.0145	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	173.59
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1609.60
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	410.36
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	46.40
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.50	2.50	1	4.91	0.63	71.48
Link-31	CIRCULAR	2.50	2.50	1	4.91	0.63	13.89
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	2.50	2.50	1	4.91	0.63	31.56
Link-60	CIRCULAR	2.50	2.50	1	4.91	0.63	12.24
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	3.73
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

Runoff Quantity Continuity	Volume acre-ft	Depth inches
Total Precipitation	24.743	4.680
Surface Runoff	0.151	0.029
Continuity Error (%)	-0.001	

Flow Routing Continuity	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	18.119	5.904
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.001	0.000
Continuity Error (%)	-0.000	

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00

> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C

Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	4.68	3.70	68.37	91.230	0	00:17:27
Sub-02	4.68	3.96	37.77	93.700	0	00:09:15
Sub-03	4.68	3.06	23.25	84.860	0	00:07:12
Sub-04	4.68	3.32	39.33	87.580	0	00:05:00
Sub-06	4.68	3.63	30.75	90.630	0	00:05:18
Sub-07	4.68	0.95	1.02	57.270	0	00:05:49
Sub-09	4.68	3.56	3.71	89.910	0	00:05:30
Sub-10	4.68	3.99	4.99	93.940	0	00:05:00
Sub-11	4.68	3.43	29.23	88.660	0	00:10:37
Sub-12	4.68	4.37	8.35	97.350	0	00:05:00
Sub-13	4.68	3.57	0.91	90.000	0	00:05:00
Sub-14	4.68	3.60	4.35	90.310	0	00:05:00
Sub-15	4.68	3.34	11.43	87.740	0	00:05:00

Sub-16	4.68	2.36	22.48	77.020	0	00:08:15
Sub-17	4.68	4.11	8.30	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.04	0.70	941.24	0	11:58	0	0	0:00:00
Jun-04	0.04	0.68	930.35	0	11:58	0	0	0:00:00
Jun-05	0.13	6.73	923.63	0	12:03	0	0	0:00:00
Jun-06	0.18	6.50	922.18	0	11:59	0.01	1	0:00:00
Jun-07	0.18	1.36	916.13	0	12:02	0	0	0:00:00
Jun-13	0.04	0.89	911.72	0	11:58	0	0	0:00:00
Jun-15	0.01	3.40	897.64	0	11:57	0	0	0:00:00
Jun-16	0.07	5.01	897.64	0	11:57	0	0	0:00:00
Jun-18	0.20	5.34	897.61	0	11:58	0	0	0:00:00
Jun-19	0.13	3.48	895.37	0	11:57	0	0	0:00:00
Jun-20	0.10	2.05	894.08	0	12:04	0	0	0:00:00
Jun-21	0.33	4.36	894.80	0	12:17	0	0	0:00:00
Jun-22	0.30	2.46	895.16	0	12:17	0	0	0:00:00
Jun-23	0.48	6.01	898.81	0	12:17	0	0	0:00:00
Jun-25	0.34	6.57	899.75	0	12:14	0	0	0:00:00
Jun-26	0.18	5.53	900.72	0	11:54	0.65	11	0:00:00
Jun-28	0.27	3.19	892.50	0	12:04	0	0	0:00:00
Jun-29	0.25	1.73	900.65	0	12:03	0	0	0:00:00
Jun-31	0.03	0.37	900.22	0	11:56	0	0	0:00:00
Jun-32	0.30	2.89	888.29	0	12:03	0	0	0:00:00
Jun-40	0.02	0.33	923.51	0	12:02	0	0	0:00:00
Jun-42	0.01	0.23	913.42	0	12:02	0	0	0:00:00
Jun-43	0.00	0.10	907.42	0	11:59	0	0	0:00:00
Jun-47	0.11	4.32	922.82	0	12:08	0	0	0:00:00
Jun-49	0.05	0.95	912.52	0	11:58	0	0	0:00:00
Out-05	0.29	2.69	887.19	0	12:03	0	0	0:00:00
Jun-24	0.29	6.30	900.33	0	12:16	0	0	0:00:00
Jun-48	0.15	3.00	903.01	0	12:08	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
Jun-02	JUNCTION	11.21	11.21	0	11:58	0.00		
Jun-04	JUNCTION	4.26	15.46	0	11:58	0.00		
Jun-05	JUNCTION	0.89	16.38	0	11:57	0.00		
Jun-06	JUNCTION	8.21	29.78	0	12:03	1.25	0	12:04
Jun-07	JUNCTION	22.46	53.34	0	12:00	0.00		
Jun-13	JUNCTION	0.00	4.64	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.59	0	11:52	0.00		
Jun-16	JUNCTION	0.00	0.62	0	11:52	0.00		
Jun-18	JUNCTION	38.68	38.68	0	11:58	0.00		
Jun-19	JUNCTION	0.00	38.67	0	11:58	0.00		
Jun-20	JUNCTION	30.48	34.74	0	11:58	0.00		
Jun-21	JUNCTION	37.71	92.26	0	12:06	0.00		
Jun-22	JUNCTION	0.00	76.62	0	12:14	0.00		
Jun-23	JUNCTION	0.00	56.25	0	12:14	0.00		
Jun-25	JUNCTION	8.13	34.97	0	12:07	0.00		
Jun-26	JUNCTION	23.02	23.02	0	11:58	5.20	0	11:58
Jun-28	JUNCTION	0.00	126.39	0	12:04	0.00		
Jun-29	JUNCTION	68.09	106.82	0	12:06	0.00		
Jun-31	JUNCTION	4.88	4.88	0	11:56	0.00		
Jun-32	JUNCTION	0.00	129.82	0	12:02	0.00		
Jun-40	JUNCTION	29.03	29.03	0	12:02	0.00		
Jun-42	JUNCTION	1.02	1.02	0	12:02	0.00		
Jun-43	JUNCTION	0.00	4.65	0	11:58	0.00		
Jun-47	JUNCTION	0.00	29.01	0	12:02	0.00		
Jun-49	JUNCTION	3.68	3.68	0	11:58	0.00		
Out-05	OUTFALL	0.00	129.78	0	12:03	0.00		
Jun-24	STORAGE	0.00	108.07	0	12:06	0.00		
Jun-48	STORAGE	0.00	50.10	0	12:02	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	Time of Maximum Depth Occurrence hh:mm
Inlet-11	2.02	923.13	0.15	0	11:59
Inlet-12	2.02	921.39	0.15	0	11:57
Inlet-13	2.02	921.36	0.15	0	12:00
Inlet-14	2.02	920.01	0.15	0	12:00

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.004	0
Inlet-12	0.00	0.00	-	-	-	0.005	1
Inlet-13	0.00	0.00	-	-	-	0.000	0
Inlet-14	0.00	0.00	-	-	-	0.003	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³

Jun-24	60.563	72	0	12:16	1.094	1	71.63	0.00	0:00:00	0.000
Jun-48	2.616	35	0	12:08	0.030	0	41.12	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	79.44	6.10	129.78
System	79.44	6.10	129.78

****
Link Flow Summary
****

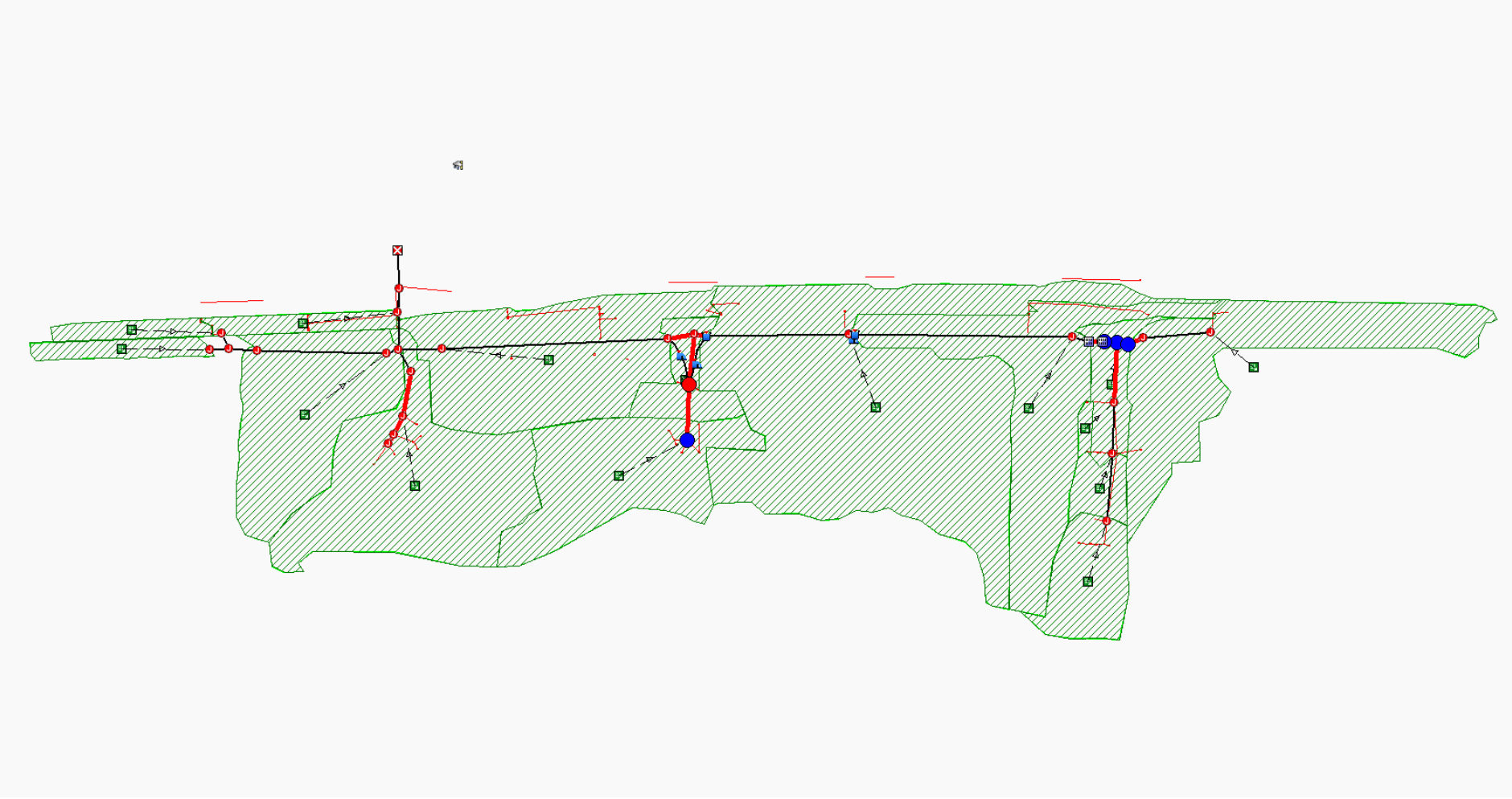
Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained ft/sec	Length Factor	Peak Flow during Analysis cfs	Design Flow Capacity cfs	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
Link-07	CONDUIT	0 11:58	12.11	1.00	11.20	49.45	0.23	0.34	0	Calculated
Link-102	CHANNEL	0 12:06	3.36	1.00	108.07	173.59	0.62	0.93	0	Calculated
Link-103	CHANNEL	0 11:59	0.17	1.00	4.50	4187.65	0.00	0.21	0	Calculated
Link-106	CHANNEL	0 12:03	4.37	1.00	129.78	328.75	0.39	0.70	0	Calculated
Link-107	CHANNEL	0 12:02	1.05	1.00	29.01	4186.34	0.01	0.43	0	Calculated
Link-108	CONDUIT	0 12:10	6.96	1.00	21.88	46.94	0.47	1.00	29	SURCHARGED
Link-110	CONDUIT	0 11:56	10.17	1.00	4.88	37.47	0.13	0.60	0	Calculated
Link-111	CHANNEL	0 12:17	1.78	1.00	76.24	1609.60	0.05	0.43	0	Calculated
Link-112	CHANNEL	0 12:02	3.70	1.00	50.10	410.36	0.12	0.67	0	Calculated
Link-113	CONDUIT	0 12:08	11.01	1.17	33.20	46.40	0.72	0.93	0	Calculated
Link-114	CONDUIT	0 11:58	4.06	1.00	3.67	4.93	0.74	0.69	0	Calculated
Link-13	CONDUIT	0 11:57	7.34	1.00	15.49	62.45	0.25	0.67	0	Calculated
Link-15	CONDUIT	0 11:57	5.22	1.00	16.40	17.20	0.95	1.00	38	SURCHARGED
Link-16	CONDUIT	0 12:10	7.04	1.00	22.12	17.26	1.28	1.00	46	SURCHARGED
Link-17	CONDUIT	0 12:03	9.79	1.00	30.74	35.27	0.87	1.00	47	SURCHARGED
Link-18	CONDUIT	0 12:03	10.10	3.52	31.73	47.53	0.67	1.00	45	SURCHARGED
Link-19	CONDUIT	0 12:00	6.43	1.00	31.58	25.21	1.25	1.00	7	SURCHARGED
Link-30	CONDUIT	0 12:15	8.55	1.00	41.99	71.48	0.59	1.00	74	SURCHARGED
Link-31	CONDUIT	0 12:14	11.48	1.00	56.24	13.89	4.05	0.99	0	> CAPACITY
Link-32	CONDUIT	0 11:54	6.39	1.00	20.09	10.12	1.98	1.00	85	SURCHARGED
Link-37	CONDUIT	0 11:55	5.79	1.00	18.21	21.80	0.84	1.00	60	SURCHARGED
Link-57	CONDUIT	0 12:06	8.83	1.00	24.83	37.51	0.66	0.89	0	Calculated
Link-58	CONDUIT	0 12:17	9.07	1.00	83.10	77.99	1.07	0.92	0	> CAPACITY
Link-59	CONDUIT	0 11:58	8.19	1.00	38.67	31.56	1.23	0.92	0	> CAPACITY
Link-60	CONDUIT	0 11:58	7.88	1.00	38.67	12.24	3.16	1.00	8	SURCHARGED
Link-63	CONDUIT	0 12:06	0.28	1.00	0.98	3.73	0.26	1.00	14	SURCHARGED
Link-67	CONDUIT	0 11:52	0.97	1.00	0.59	6.58	0.09	1.00	11	SURCHARGED
Link-91	CONDUIT	0 12:04	7.66	1.00	31.06	18.31	1.70	0.77	0	> CAPACITY
Link-93	CONDUIT	0 12:02	3.75	1.00	1.02	19.77	0.05	0.32	0	Calculated
Link-94	CONDUIT	0 11:58	9.63	1.00	4.65	20.61	0.23	0.33	0	Calculated
Link-98	CONDUIT	0 12:04	12.14	1.00	126.34	224.33	0.56	0.62	0	Calculated
Weir-01	WEIR	0 12:08			7.93			0.24		
Weir-02	WEIR	0 12:14			20.39			0.80		
Weir-03	WEIR	0 12:16			29.65			1.00		

****
Highest Flow Instability Indexes
****
Link Link-18 (2)
Link Link-17 (2)
Link Link-15 (2)
Link Link-16 (2)
Link Link-19 (1)

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:36:05 2022
Analysis ended on: Thu Jan 27 16:36:18 2022
Total elapsed time: 00:00:13

50-Year
Overview Map



50-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55-DitchMod.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	50-Year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	917.77	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.89	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	900.70	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00
Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-12	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-13	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-14	-	0.0200	0.0160	0.0620	2.00	2.00

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	0.6715	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.3065	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.0124	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0150
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	0.5922	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.0891	0.0130
Link-63	Jun-18	Jun-16	CONDUIT	68.8	0.0145	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	173.59
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1609.60
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	410.36
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	46.40
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.50	2.50	1	4.91	0.63	71.48
Link-31	CIRCULAR	2.50	2.50	1	4.91	0.63	13.89
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	2.50	2.50	1	4.91	0.63	31.56
Link-60	CIRCULAR	2.50	2.50	1	4.91	0.63	12.24
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	3.73
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

Runoff Quantity Continuity	Volume acre-ft	Depth inches
Total Precipitation	26.963	5.100
Surface Runoff	0.169	0.032
Continuity Error (%)	-0.001	

Flow Routing Continuity	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	20.152	6.567
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.001	0.000
Continuity Error (%)	-0.000	

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00

> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C

Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	5.10	4.10	75.43	91.230	0	00:17:27
Sub-02	5.10	4.37	41.47	93.700	0	00:09:15
Sub-03	5.10	3.45	26.09	84.860	0	00:07:12
Sub-04	5.10	3.72	43.81	87.580	0	00:05:00
Sub-06	5.10	4.04	33.97	90.630	0	00:05:18
Sub-07	5.10	1.18	1.29	57.270	0	00:05:49
Sub-09	5.10	3.96	4.10	89.910	0	00:05:30
Sub-10	5.10	4.40	5.47	93.940	0	00:05:00
Sub-11	5.10	3.83	32.46	88.660	0	00:10:37
Sub-12	5.10	4.79	9.12	97.350	0	00:05:00
Sub-13	5.10	3.97	1.00	90.000	0	00:05:00
Sub-14	5.10	4.01	4.81	90.310	0	00:05:00
Sub-15	5.10	3.74	12.72	87.740	0	00:05:00

Sub-16	5.10	2.71	25.82	77.020	0	00:08:15
Sub-17	5.10	4.53	9.09	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.04	0.74	941.28	0	11:58	0	0	0:00:00
Jun-04	0.05	0.76	930.43	0	11:58	0	0	0:00:00
Jun-05	0.15	8.44	925.34	0	12:10	0	0	0:00:00
Jun-06	0.20	6.50	922.18	0	11:57	0.08	5	0:00:00
Jun-07	0.19	1.41	916.18	0	12:02	0	0	0:00:00
Jun-13	0.05	0.98	911.81	0	11:58	0	0	0:00:00
Jun-15	0.02	4.37	898.61	0	11:57	0	0	0:00:00
Jun-16	0.08	5.98	898.61	0	11:57	0	0	0:00:00
Jun-18	0.21	6.32	898.59	0	11:56	0	0	0:00:00
Jun-19	0.14	3.92	895.82	0	11:57	0	0	0:00:00
Jun-20	0.11	2.32	894.35	0	12:04	0	0	0:00:00
Jun-21	0.37	4.63	895.07	0	12:18	0	0	0:00:00
Jun-22	0.32	2.66	895.36	0	12:17	0	0	0:00:00
Jun-23	0.51	6.20	899.00	0	12:16	0	0	0:00:00
Jun-25	0.38	6.69	899.87	0	12:15	0	0	0:00:00
Jun-26	0.20	5.53	900.72	0	11:53	1.28	14	0:00:00
Jun-28	0.29	3.34	892.65	0	12:04	0	0	0:00:00
Jun-29	0.26	1.94	900.86	0	12:12	0	0	0:00:00
Jun-31	0.03	0.38	900.23	0	11:56	0	0	0:00:00
Jun-32	0.32	2.97	888.37	0	12:02	0	0	0:00:00
Jun-40	0.02	0.35	923.53	0	12:02	0	0	0:00:00
Jun-42	0.02	0.26	913.45	0	12:00	0	0	0:00:00
Jun-43	0.00	0.11	907.43	0	11:59	0	0	0:00:00
Jun-47	0.13	4.97	923.47	0	12:08	0	0	0:00:00
Jun-49	0.05	1.04	912.61	0	11:58	0	0	0:00:00
Out-05	0.31	2.76	887.26	0	12:02	0	0	0:00:00
Jun-24	0.32	6.55	900.58	0	12:16	0	0	0:00:00
Jun-48	0.17	3.09	903.10	0	12:07	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
Jun-02	JUNCTION	12.48	12.48	0	11:58	0.00		
Jun-04	JUNCTION	4.71	17.17	0	11:58	0.00		
Jun-05	JUNCTION	0.98	18.27	0	11:57	0.00		
Jun-06	JUNCTION	8.95	32.04	0	12:03	3.06	0	12:04
Jun-07	JUNCTION	25.79	56.34	0	11:59	0.00		
Jun-13	JUNCTION	0.00	5.32	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.28	0	11:51	0.00		
Jun-16	JUNCTION	0.00	0.55	0	11:50	0.00		
Jun-18	JUNCTION	43.00	43.00	0	11:58	0.00		
Jun-19	JUNCTION	0.00	42.99	0	11:58	0.00		
Jun-20	JUNCTION	33.69	38.62	0	11:58	0.00		
Jun-21	JUNCTION	41.44	97.10	0	12:02	0.00		
Jun-22	JUNCTION	0.00	81.11	0	12:15	0.00		
Jun-23	JUNCTION	0.00	55.97	0	12:15	0.00		
Jun-25	JUNCTION	8.94	38.65	0	12:14	0.00		
Jun-26	JUNCTION	25.88	25.88	0	11:58	8.28	0	11:58
Jun-28	JUNCTION	0.00	134.30	0	12:03	0.00		
Jun-29	JUNCTION	75.06	120.89	0	12:06	0.00		
Jun-31	JUNCTION	5.36	5.36	0	11:56	0.00		
Jun-32	JUNCTION	0.00	138.09	0	12:02	0.00		
Jun-40	JUNCTION	32.25	32.25	0	12:01	0.00		
Jun-42	JUNCTION	1.28	1.28	0	12:00	0.00		
Jun-43	JUNCTION	0.00	5.34	0	11:58	0.00		
Jun-47	JUNCTION	0.00	32.24	0	12:02	0.00		
Jun-49	JUNCTION	4.07	4.07	0	11:58	0.00		
Out-05	OUTFALL	0.00	138.07	0	12:02	0.00		
Jun-24	STORAGE	0.00	121.13	0	12:05	0.00		
Jun-48	STORAGE	0.00	54.75	0	12:02	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	Time of Maximum Depth Occurrence hh:mm
Inlet-11	2.02	923.13	0.15	0	11:57
Inlet-12	2.02	921.39	0.15	0	11:56
Inlet-13	2.02	921.36	0.15	0	11:57
Inlet-14	2.02	920.01	0.15	0	11:58

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.008	1
Inlet-12	0.00	0.00	-	-	-	0.010	1
Inlet-13	0.00	0.00	-	-	-	0.002	0
Inlet-14	0.00	0.00	-	-	-	0.003	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³

Jun-24	68.671	82	0	12:16	1.369	2	75.66	0.00	0:00:00	0.000
Jun-48	2.943	39	0	12:07	0.040	1	46.57	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	79.93	6.90	138.07
System	79.93	6.90	138.07

****
Link Flow Summary
****

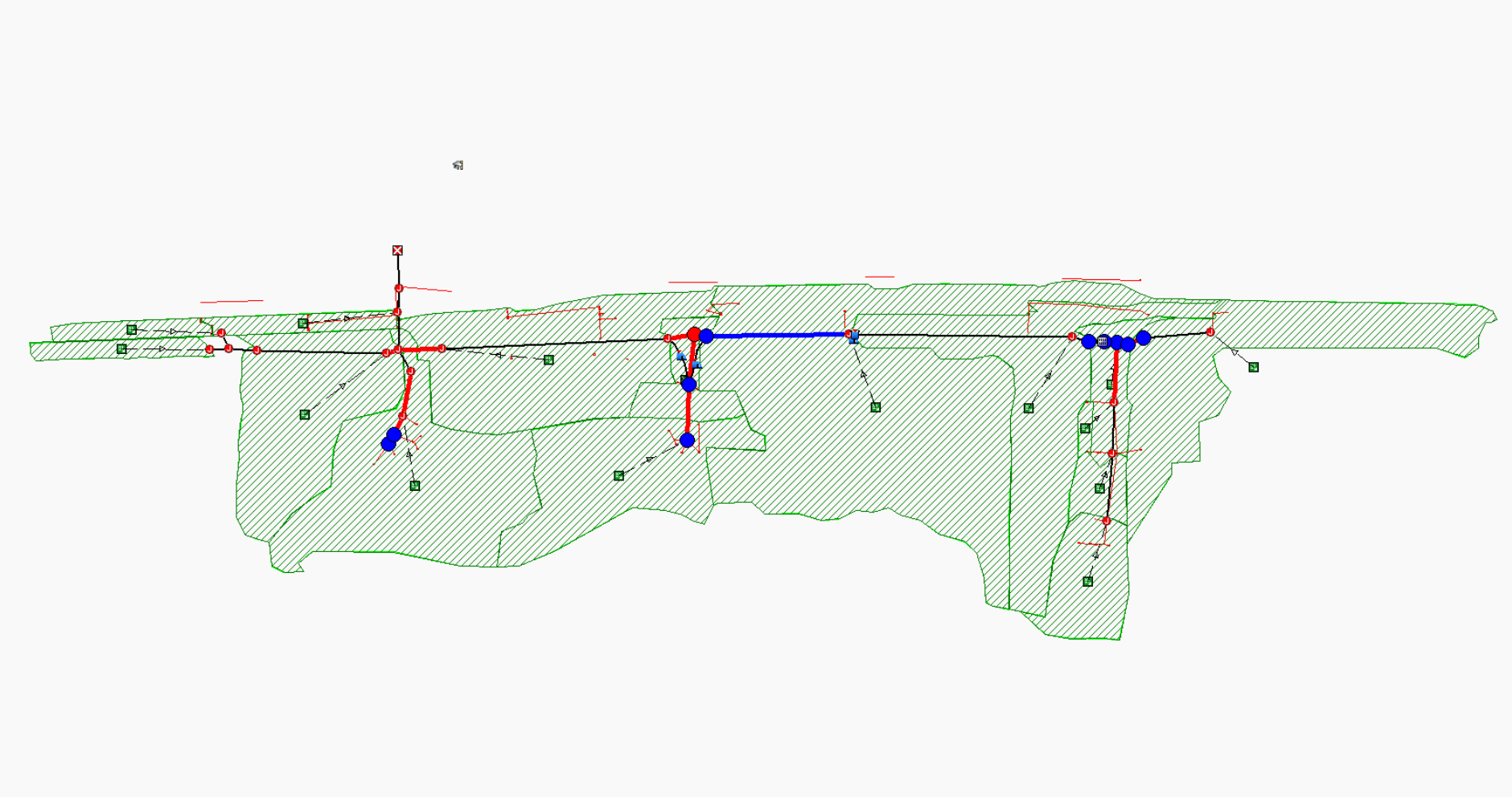
Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained ft/sec	Length Factor	Peak Flow during Analysis cfs	Design Flow Capacity cfs	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
Link-07	CONDUIT	0 11:58	12.44	1.00	12.47	49.45	0.25	0.36	0	Calculated
Link-102	CHANNEL	0 12:05	3.39	1.00	121.13	173.59	0.70	0.99	0	Calculated
Link-103	CHANNEL	0 11:59	0.17	1.00	5.18	4187.65	0.00	0.24	0	Calculated
Link-106	CHANNEL	0 12:02	4.43	1.00	138.07	328.75	0.42	0.72	0	Calculated
Link-107	CHANNEL	0 12:02	1.06	1.00	32.24	4186.34	0.01	0.49	0	Calculated
Link-108	CONDUIT	0 12:11	7.46	1.00	23.43	46.94	0.50	1.00	34	SURCHARGED
Link-110	CONDUIT	0 11:56	10.19	1.00	5.36	37.47	0.14	0.63	0	Calculated
Link-111	CHANNEL	0 12:17	1.78	1.00	80.61	1609.60	0.05	0.46	0	Calculated
Link-112	CHANNEL	0 12:02	3.70	1.00	54.75	410.36	0.13	0.69	0	Calculated
Link-113	CONDUIT	0 12:06	10.93	1.17	33.47	46.40	0.72	0.99	0	Calculated
Link-114	CONDUIT	0 11:58	4.17	1.00	4.06	4.93	0.82	0.74	0	Calculated
Link-13	CONDUIT	0 11:57	7.47	1.00	17.29	62.45	0.28	0.69	0	Calculated
Link-15	CONDUIT	0 11:58	5.81	1.00	18.26	17.20	1.06	1.00	43	SURCHARGED
Link-16	CONDUIT	0 12:11	7.48	1.00	23.51	17.26	1.36	1.00	51	SURCHARGED
Link-17	CONDUIT	0 12:04	9.91	1.00	31.14	35.27	0.88	1.00	52	SURCHARGED
Link-18	CONDUIT	0 12:04	10.31	3.52	32.38	47.53	0.68	1.00	50	SURCHARGED
Link-19	CONDUIT	0 12:04	6.80	1.00	33.23	25.21	1.32	1.00	11	SURCHARGED
Link-30	CONDUIT	0 12:16	8.66	1.00	42.52	71.48	0.59	1.00	80	SURCHARGED
Link-31	CONDUIT	0 12:15	11.40	1.00	55.97	13.89	4.03	1.00	24	SURCHARGED
Link-32	CONDUIT	0 11:53	6.36	1.00	19.97	10.12	1.97	1.00	92	SURCHARGED
Link-37	CONDUIT	0 11:54	5.79	1.00	18.17	21.80	0.83	1.00	66	SURCHARGED
Link-57	CONDUIT	0 12:05	8.88	1.00	26.28	37.51	0.70	0.93	0	Calculated
Link-58	CONDUIT	0 12:18	9.51	1.00	87.75	77.99	1.13	0.94	0	> CAPACITY
Link-59	CONDUIT	0 11:57	8.99	1.00	43.00	31.56	1.36	0.94	0	> CAPACITY
Link-60	CONDUIT	0 11:58	8.76	1.00	42.99	12.24	3.51	1.00	10	SURCHARGED
Link-63	CONDUIT	0 12:06	0.28	1.00	1.00	3.73	0.27	1.00	15	SURCHARGED
Link-67	CONDUIT	0 12:05	0.93	1.00	0.48	6.58	0.07	1.00	12	SURCHARGED
Link-91	CONDUIT	0 11:58	7.64	1.00	30.89	18.31	1.69	0.78	0	> CAPACITY
Link-93	CONDUIT	0 12:00	3.81	1.00	1.28	19.77	0.06	0.36	0	Calculated
Link-94	CONDUIT	0 11:58	9.75	1.00	5.34	20.61	0.26	0.36	0	Calculated
Link-98	CONDUIT	0 12:04	12.28	1.00	134.24	224.33	0.60	0.65	0	Calculated
Weir-01	WEIR	0 12:07			13.32			0.31		
Weir-02	WEIR	0 12:15			25.14			0.88		
Weir-03	WEIR	0 12:17			33.15			1.00		

****
Highest Flow Instability Indexes
****
Link Link-18 (1)
Link Link-17 (1)

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:41:39 2022
Analysis ended on: Thu Jan 27 16:41:52 2022
Total elapsed time: 00:00:13

100-Year
Overview Map



100-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55-DitchMod.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	100 year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	917.77	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.89	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	900.70	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00
Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-12	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-13	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-14	-	0.0200	0.0160	0.0620	2.00	2.00

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	0.6715	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.3065	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.0124	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0150
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	0.5922	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.0891	0.0130
Link-63	Jun-18	Jun-16	CONDUIT	68.8	0.0145	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	173.59
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1609.60
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	410.36
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	46.40
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.50	2.50	1	4.91	0.63	71.48
Link-31	CIRCULAR	2.50	2.50	1	4.91	0.63	13.89
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	2.50	2.50	1	4.91	0.63	31.56
Link-60	CIRCULAR	2.50	2.50	1	4.91	0.63	12.24
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	3.73
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

Runoff Quantity Continuity	Volume acre-ft	Depth inches
Total Precipitation	33.043	6.250
Surface Runoff	0.217	0.041
Continuity Error (%)	-0.001	

Flow Routing Continuity	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	25.346	8.259
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.001	0.000
Continuity Error (%)	-0.000	

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00

> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C

Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	6.25	5.23	94.87	91.230	0	00:17:27
Sub-02	6.25	5.51	51.58	93.700	0	00:09:15
Sub-03	6.25	4.52	33.87	84.860	0	00:07:12
Sub-04	6.25	4.82	55.97	87.580	0	00:05:00
Sub-06	6.25	5.16	42.81	90.630	0	00:05:18
Sub-07	6.25	1.85	2.16	57.270	0	00:05:49
Sub-09	6.25	5.08	5.19	89.910	0	00:05:30
Sub-10	6.25	5.54	6.79	93.940	0	00:05:00
Sub-11	6.25	4.94	41.31	88.660	0	00:10:37
Sub-12	6.25	5.93	11.21	97.350	0	00:05:00
Sub-13	6.25	5.09	1.27	90.000	0	00:05:00
Sub-14	6.25	5.12	6.07	90.310	0	00:05:00
Sub-15	6.25	4.84	16.24	87.740	0	00:05:00

Sub-16	6.25	3.70	35.16	77.020	0	00:08:15
Sub-17	6.25	5.67	11.25	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.05	0.85	941.39	0	11:58	0	0	0:00:00
Jun-04	0.05	1.03	930.70	0	11:58	0	0	0:00:00
Jun-05	0.18	9.21	926.11	0	12:15	0	0	0:00:00
Jun-06	0.23	6.50	922.18	0	11:54	1.64	12	0:00:00
Jun-07	0.21	1.50	916.27	0	12:00	0	0	0:00:00
Jun-13	0.06	1.27	912.10	0	11:58	0	0	0:00:00
Jun-15	0.03	5.59	899.83	0	12:00	0.34	11	0:00:00
Jun-16	0.11	7.32	899.95	0	11:55	0.08	3	0:00:00
Jun-18	0.25	7.78	900.05	0	11:55	0	0	0:00:00
Jun-19	0.16	4.55	896.45	0	11:55	0	0	0:00:00
Jun-20	0.13	3.09	895.12	0	12:05	0	0	0:00:00
Jun-21	0.42	5.28	895.72	0	12:16	0	0	0:00:00
Jun-22	0.36	3.19	895.89	0	12:16	0	0	0:00:00
Jun-23	0.58	6.62	899.42	0	12:12	0	0	0:00:00
Jun-25	0.44	6.92	900.10	0	12:11	0.07	8	0:00:00
Jun-26	0.23	5.53	900.72	0	11:51	3.26	18	0:00:00
Jun-28	0.33	3.78	893.09	0	12:04	0	0	0:00:00
Jun-29	0.29	2.67	901.59	0	12:10	0	0	0:00:00
Jun-31	0.03	0.43	900.28	0	11:56	0	0	0:00:00
Jun-32	0.36	3.17	888.57	0	12:04	0	0	0:00:00
Jun-40	0.02	0.73	923.91	0	12:04	0	0	0:00:00
Jun-42	0.02	0.33	913.52	0	11:58	0	0	0:00:00
Jun-43	0.01	0.13	907.45	0	11:59	0	0	0:00:00
Jun-47	0.15	5.40	923.90	0	12:04	0.89	5	0:00:00
Jun-49	0.06	1.37	912.94	0	11:58	0	0	0:00:00
Out-05	0.35	2.94	887.44	0	12:04	0	0	0:00:00
Jun-24	0.37	6.97	901.00	0	12:10	2.89	7	0:00:00
Jun-48	0.20	3.26	903.27	0	12:06	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
Jun-02	JUNCTION	15.93	15.93	0	11:58	0.00		
Jun-04	JUNCTION	5.93	21.84	0	11:58	0.00		
Jun-05	JUNCTION	1.24	23.08	0	11:58	0.00		
Jun-06	JUNCTION	11.02	44.18	0	12:02	14.03	0	12:02
Jun-07	JUNCTION	35.09	65.25	0	12:00	0.00		
Jun-13	JUNCTION	0.00	7.28	0	11:58	0.00		
Jun-15	JUNCTION	0.00	4.96	0	11:55	4.96	0	11:55
Jun-16	JUNCTION	0.00	9.23	0	12:05	2.39	0	11:58
Jun-18	JUNCTION	54.77	54.77	0	11:56	0.00		
Jun-19	JUNCTION	0.00	48.79	0	11:55	0.00		
Jun-20	JUNCTION	42.33	49.18	0	11:58	0.00		
Jun-21	JUNCTION	51.51	110.84	0	12:04	0.00		
Jun-22	JUNCTION	0.00	90.13	0	12:10	0.00		
Jun-23	JUNCTION	0.00	55.32	0	12:10	0.00		
Jun-25	JUNCTION	11.06	49.00	0	12:09	2.03	0	12:09
Jun-26	JUNCTION	33.70	33.70	0	11:58	17.64	0	12:00
Jun-28	JUNCTION	0.00	155.61	0	12:04	0.00		
Jun-29	JUNCTION	94.32	152.10	0	12:05	0.00		
Jun-31	JUNCTION	6.65	6.65	0	11:56	0.00		
Jun-32	JUNCTION	0.00	159.91	0	12:04	0.00		
Jun-40	JUNCTION	40.99	40.99	0	12:00	0.00		
Jun-42	JUNCTION	2.14	2.14	0	11:58	0.00		
Jun-43	JUNCTION	0.00	7.29	0	11:58	0.00		
Jun-47	JUNCTION	0.00	40.96	0	12:01	21.44	0	12:05
Jun-49	JUNCTION	5.15	5.15	0	11:58	0.00		
Out-05	OUTFALL	0.00	159.89	0	12:04	0.00		
Jun-24	STORAGE	0.00	144.66	0	12:06	47.06	0	12:10
Jun-48	STORAGE	0.00	64.61	0	12:00	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	Time of Maximum Depth Occurrence hh:mm
Inlet-11	2.02	923.13	0.15	0	11:55
Inlet-12	2.02	921.39	0.15	0	11:53
Inlet-13	2.02	921.36	0.15	0	12:05
Inlet-14	2.02	920.01	0.15	0	11:54

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.018	3
Inlet-12	0.00	0.00	-	-	-	0.023	1
Inlet-13	0.00	0.00	-	-	-	0.004	0
Inlet-14	0.00	0.00	-	-	-	0.005	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³

Jun-24	83.634	100	0	12:10	1.754	2	81.53	0.00	0:00:00	0.000
Jun-48	3.604	48	0	12:06	0.051	1	57.88	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	80.91	8.33	159.89
System	80.91	8.33	159.89

****
Link Flow Summary
****

Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained ft/sec	Length Factor	Peak Flow during Analysis cfs	Design Flow Capacity cfs	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
Link-07	CONDUIT	0 11:58	13.19	1.00	15.92	49.45	0.32	0.41	0	Calculated
Link-102	CHANNEL	0 12:06	3.43	1.00	144.66	173.59	0.83	1.00	24	FLOODED
Link-103	CHANNEL	0 11:59	0.19	1.00	7.11	4187.65	0.00	0.32	0	Calculated
Link-106	CHANNEL	0 12:04	4.59	1.00	159.89	328.75	0.49	0.76	0	Calculated
Link-107	CHANNEL	0 12:01	1.06	1.00	40.96	4186.34	0.01	0.57	0	Calculated
Link-108	CONDUIT	0 12:13	7.54	1.00	23.69	46.94	0.50	1.00	43	SURCHARGED
Link-110	CONDUIT	0 11:56	9.20	1.00	6.65	37.47	0.18	0.64	0	Calculated
Link-111	CHANNEL	0 12:20	1.78	1.00	88.39	1609.60	0.05	0.53	0	Calculated
Link-112	CHANNEL	0 12:00	3.72	1.00	64.61	410.36	0.16	0.74	0	Calculated
Link-113	CONDUIT	0 12:02	10.76	1.17	33.61	46.40	0.72	1.00	24	SURCHARGED
Link-114	CONDUIT	0 11:58	4.48	1.00	5.14	4.93	1.04	0.88	0	> CAPACITY
Link-13	CONDUIT	0 11:58	8.57	1.00	21.84	62.45	0.35	0.76	0	Calculated
Link-15	CONDUIT	0 11:58	7.35	1.00	23.08	17.20	1.34	1.00	52	SURCHARGED
Link-16	CONDUIT	0 12:11	7.58	1.00	23.81	17.26	1.38	1.00	60	SURCHARGED
Link-17	CONDUIT	0 12:05	10.98	1.00	34.49	35.27	0.98	1.00	61	SURCHARGED
Link-18	CONDUIT	0 12:05	10.73	3.52	33.72	47.53	0.71	1.00	59	SURCHARGED
Link-19	CONDUIT	0 12:05	6.78	1.00	33.27	25.21	1.32	1.00	18	SURCHARGED
Link-30	CONDUIT	0 12:18	8.78	1.00	43.09	71.48	0.60	1.00	93	SURCHARGED
Link-31	CONDUIT	0 12:10	11.27	1.00	55.30	13.89	3.98	1.00	46	SURCHARGED
Link-32	CONDUIT	0 11:49	6.34	1.00	19.92	10.12	1.97	1.00	106	SURCHARGED
Link-37	CONDUIT	0 11:51	5.81	1.00	18.26	21.80	0.84	1.00	79	SURCHARGED
Link-57	CONDUIT	0 12:05	9.87	1.00	30.90	37.51	0.82	1.00	6	SURCHARGED
Link-58	CONDUIT	0 12:16	10.48	1.00	98.05	77.99	1.26	1.00	0	> CAPACITY
Link-59	CONDUIT	0 11:56	10.10	1.00	48.79	31.56	1.55	0.96	0	> CAPACITY
Link-60	CONDUIT	0 11:55	9.94	1.00	48.79	12.24	3.98	1.00	14	SURCHARGED
Link-63	CONDUIT	0 12:05	2.32	1.00	9.23	3.73	2.47	1.00	19	SURCHARGED
Link-67	CONDUIT	0 12:05	7.52	1.00	9.23	6.58	1.40	1.00	16	SURCHARGED
Link-91	CONDUIT	0 12:05	8.08	1.00	33.51	18.31	1.83	0.80	0	> CAPACITY
Link-93	CONDUIT	0 11:58	4.01	1.00	2.14	19.77	0.11	0.48	0	Calculated
Link-94	CONDUIT	0 11:58	10.06	1.00	7.29	20.61	0.35	0.46	0	Calculated
Link-98	CONDUIT	0 12:04	12.63	1.00	155.53	224.33	0.69	0.73	0	Calculated
Weir-01	WEIR	0 12:06			27.22			0.44		
Weir-02	WEIR	0 12:11			34.89			1.00		
Weir-03	WEIR	0 12:18			38.45			1.00		

****
Highest Flow Instability Indexes
****
Link Link-18 (2)
Link Link-17 (2)
Link Link-16 (2)
Link Link-15 (2)
Link Link-19 (1)

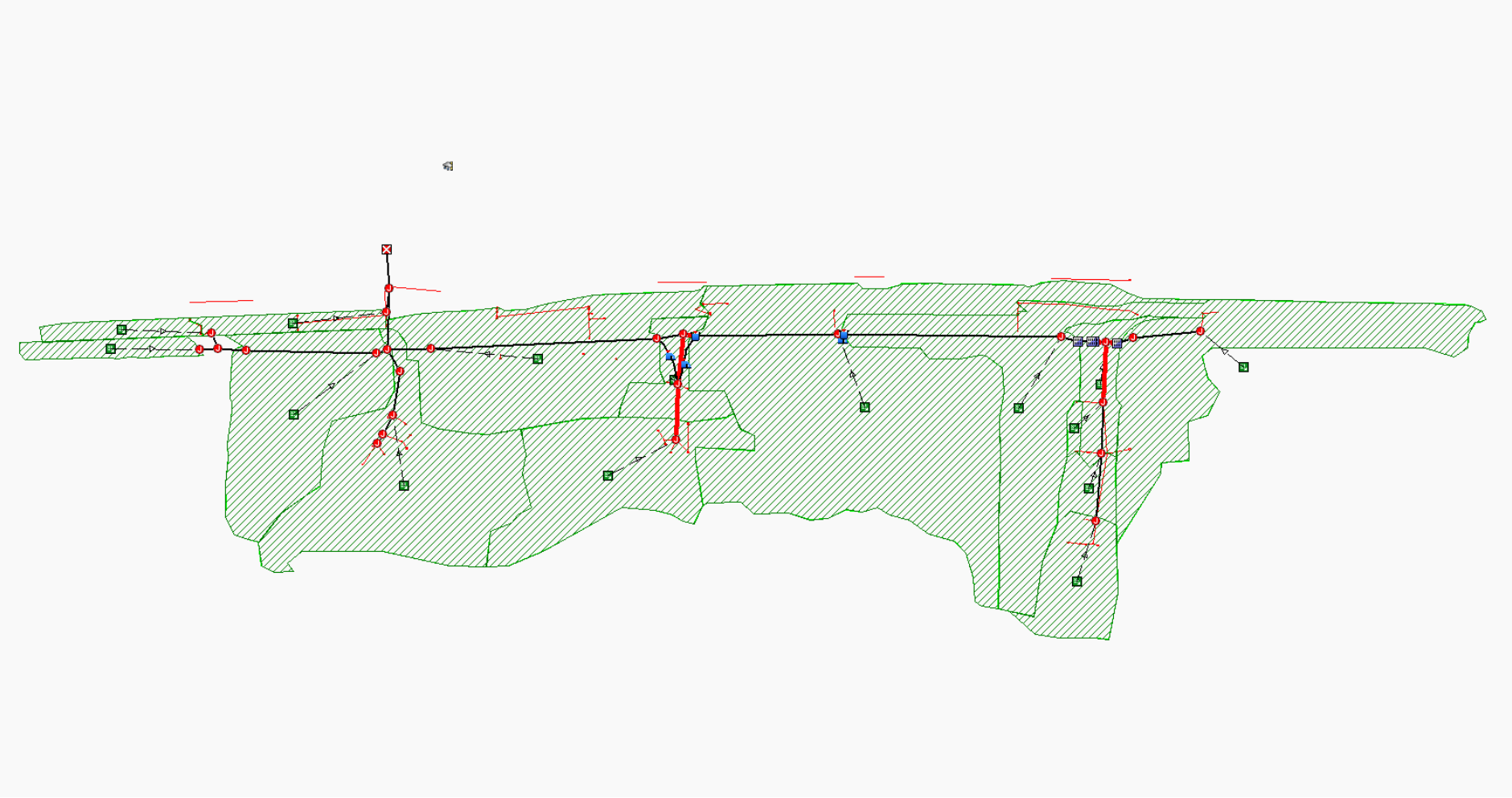
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:43:20 2022
Analysis ended on: Thu Jan 27 16:43:32 2022
Total elapsed time: 00:00:12

Appendix F

Autodesk SSA – Existing Conditions – Ditch, Meadowcreek Pipe and Willow Grove Pipe Improvements

2-Year
Overview Map



2-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55-Further Mod.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	2 year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	917.77	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.10	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	900.70	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00
Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-12	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-13	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-14	-	0.0200	0.0160	0.0620	2.00	2.00

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	0.6715	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.3065	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.0124	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0150
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	1.0811	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.7335	0.0130
Link-63	Jun-16	Jun-18	CONDUIT	68.8	0.3777	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	173.59
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1609.60
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	410.36
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	46.40
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.50	2.50	1	4.91	0.63	71.48
Link-31	CIRCULAR	2.50	2.50	1	4.91	0.63	13.89
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	3.00	3.00	1	7.07	0.75	69.35
Link-60	CIRCULAR	3.00	3.00	1	7.07	0.75	57.12
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	19.03
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

********** Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	14.222	2.690
Surface Runoff	0.071	0.014
Continuity Error (%)	-0.001	

********** Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	8.584	2.797
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.001	0.000
Continuity Error (%)	-0.001	

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00

> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C

Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	2.69	1.80	34.36	91.230	0	00:17:27
Sub-02	2.69	2.02	20.02	93.700	0	00:09:15
Sub-03	2.69	1.32	10.13	84.860	0	00:07:12
Sub-04	2.69	1.51	18.34	87.580	0	00:05:00
Sub-06	2.69	1.75	15.34	90.630	0	00:05:18
Sub-07	2.69	0.17	0.08	57.270	0	00:05:49
Sub-09	2.69	1.69	1.82	89.910	0	00:05:30
Sub-10	2.69	2.04	2.66	93.940	0	00:05:00
Sub-11	2.69	1.60	13.96	88.660	0	00:10:37
Sub-12	2.69	2.39	4.71	97.350	0	00:05:00
Sub-13	2.69	1.70	0.45	90.000	0	00:05:00
Sub-14	2.69	1.73	2.16	90.310	0	00:05:00
Sub-15	2.69	1.53	5.35	87.740	0	00:05:00

Sub-16	2.69	0.86	7.94	77.020	0	00:08:15
Sub-17	2.69	2.15	4.52	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.03	0.46	941.00	0	11:58	0	0	0:00:00
Jun-04	0.03	0.46	930.13	0	11:58	0	0	0:00:00
Jun-05	0.06	6.16	923.06	0	11:56	0	0	0:00:00
Jun-06	0.09	3.83	919.51	0	11:56	0	0	0:00:00
Jun-07	0.13	1.10	915.87	0	12:03	0	0	0:00:00
Jun-13	0.03	0.49	911.32	0	11:57	0	0	0:00:00
Jun-15	0.00	0.00	894.24	0	00:00	0	0	0:00:00
Jun-16	0.01	1.00	893.63	0	11:58	0	0	0:00:00
Jun-18	0.07	1.36	893.63	0	11:58	0	0	0:00:00
Jun-19	0.06	1.31	892.41	0	11:58	0	0	0:00:00
Jun-20	0.06	1.14	893.17	0	12:03	0	0	0:00:00
Jun-21	0.20	2.72	893.16	0	12:08	0	0	0:00:00
Jun-22	0.20	1.90	894.60	0	12:17	0	0	0:00:00
Jun-23	0.30	4.26	897.06	0	12:15	0	0	0:00:00
Jun-25	0.17	4.31	897.49	0	12:04	0	0	0:00:00
Jun-26	0.07	2.71	897.90	0	12:02	0	0	0:00:00
Jun-28	0.17	2.28	891.59	0	12:04	0	0	0:00:00
Jun-29	0.18	1.45	900.37	0	12:06	0	0	0:00:00
Jun-31	0.02	0.27	900.12	0	11:58	0	0	0:00:00
Jun-32	0.19	2.30	887.70	0	12:04	0	0	0:00:00
Jun-40	0.01	0.21	923.39	0	12:02	0	0	0:00:00
Jun-42	0.01	0.07	913.26	0	12:04	0	0	0:00:00
Jun-43	0.00	0.05	907.37	0	12:00	0	0	0:00:00
Jun-47	0.05	1.11	919.61	0	12:05	0	0	0:00:00
Jun-49	0.03	0.59	912.16	0	11:58	0	0	0:00:00
Out-05	0.18	2.16	886.66	0	12:04	0	0	0:00:00
Jun-24	0.15	4.54	898.57	0	12:15	0	0	0:00:00
Jun-48	0.09	1.83	901.84	0	12:07	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
Jun-02	JUNCTION	5.28	5.28	0	11:58	0.00		
Jun-04	JUNCTION	2.13	7.39	0	11:58	0.00		
Jun-05	JUNCTION	0.44	7.82	0	11:58	0.00		
Jun-06	JUNCTION	4.62	20.51	0	11:56	0.00		
Jun-07	JUNCTION	7.93	28.10	0	12:02	0.00		
Jun-13	JUNCTION	0.00	1.81	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.00	0	00:00	0.00		
Jun-16	JUNCTION	0.00	0.18	0	11:52	0.00		
Jun-18	JUNCTION	18.13	18.13	0	11:58	0.00		
Jun-19	JUNCTION	0.00	18.06	0	11:58	0.00		
Jun-20	JUNCTION	15.26	16.86	0	11:58	0.00		
Jun-21	JUNCTION	20.01	58.08	0	12:04	0.00		
Jun-22	JUNCTION	0.00	43.97	0	12:15	0.00		
Jun-23	JUNCTION	0.00	43.97	0	12:15	0.00		
Jun-25	JUNCTION	4.43	14.44	0	11:58	0.00		
Jun-26	JUNCTION	10.02	10.02	0	11:59	0.00		
Jun-28	JUNCTION	0.00	77.43	0	12:04	0.00		
Jun-29	JUNCTION	34.35	58.96	0	12:06	0.00		
Jun-31	JUNCTION	2.60	2.60	0	11:57	0.00		
Jun-32	JUNCTION	0.00	79.09	0	12:04	0.00		
Jun-40	JUNCTION	13.94	13.94	0	12:02	0.00		
Jun-42	JUNCTION	0.08	0.08	0	12:04	0.00		
Jun-43	JUNCTION	0.00	1.81	0	11:58	0.00		
Jun-47	JUNCTION	0.00	13.90	0	12:02	0.00		
Jun-49	JUNCTION	1.81	1.81	0	11:58	0.00		
Out-05	OUTFALL	0.00	79.08	0	12:04	0.00		
Jun-24	STORAGE	0.00	58.72	0	12:06	0.00		
Jun-48	STORAGE	0.00	27.94	0	12:03	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	Time of Maximum Depth Occurrence hh:mm
Inlet-11	2.02	923.13	0.15	0	11:56
Inlet-12	2.02	921.39	0.15	0	11:56
Inlet-13	2.02	921.36	0.15	0	12:02
Inlet-14	2.02	920.01	0.15	0	12:02

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.000	0
Inlet-12	0.00	0.00	-	-	-	0.000	0
Inlet-13	0.00	0.00	-	-	-	0.000	0
Inlet-14	0.00	0.00	-	-	-	0.000	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³

Jun-24	23.709	28	0	12:15	0.236	0	41.52	0.00	0:00:00	0.000
Jun-48	0.390	5	0	12:07	0.003	0	24.86	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	75.63	2.89	79.08
System	75.63	2.89	79.08

****
Link Flow Summary
****

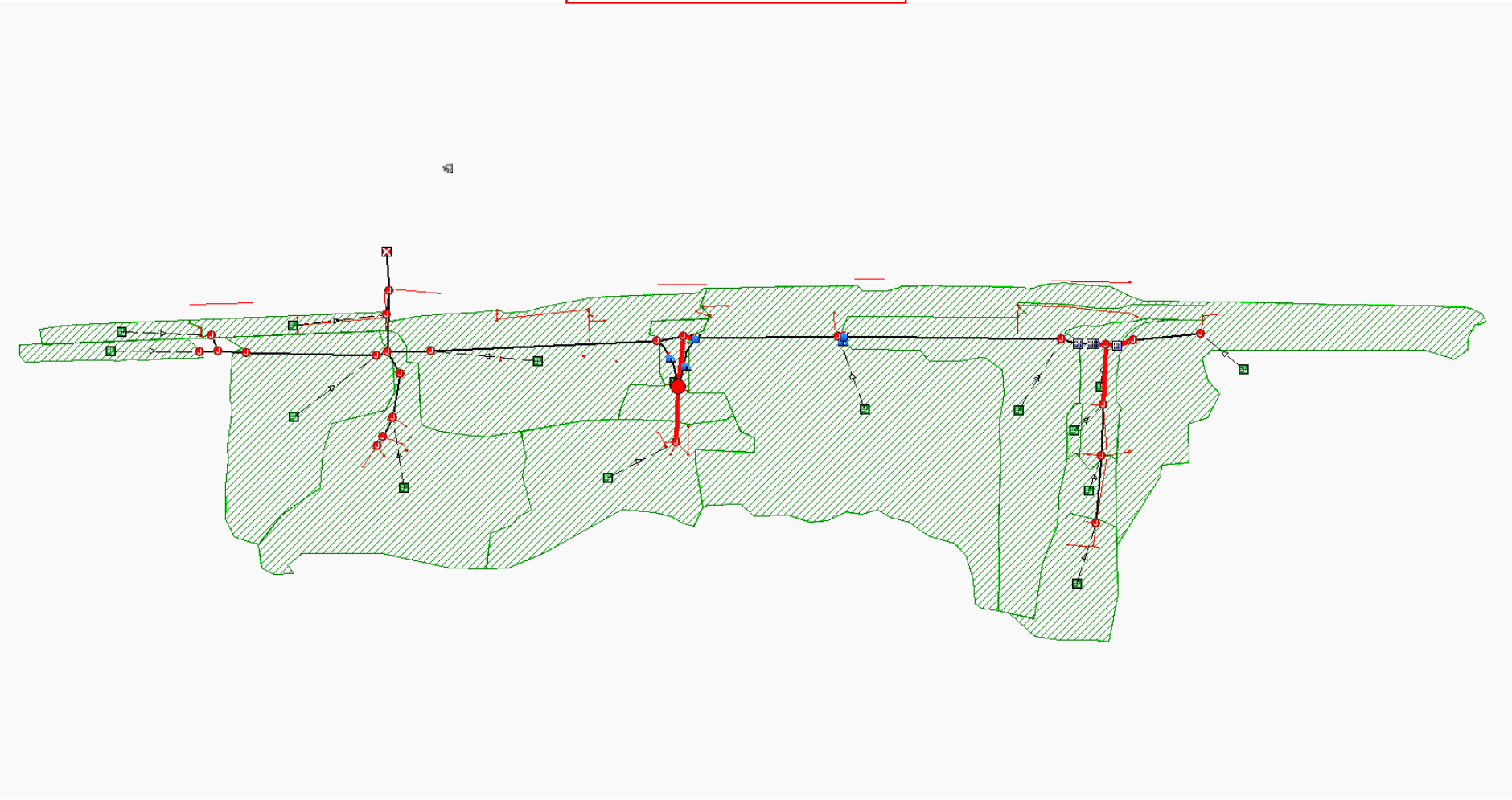
Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained ft/sec	Length Factor	Peak Flow during Analysis cfs	Design Flow Capacity cfs	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
Link-07	CONDUIT	0 11:58	9.92	1.00	5.27	49.45	0.11	0.23	0	Calculated
Link-102	CHANNEL	0 12:06	2.98	1.00	58.72	173.59	0.34	0.63	0	Calculated
Link-103	CHANNEL	0 12:00	0.11	1.00	1.72	4187.65	0.00	0.12	0	Calculated
Link-106	CHANNEL	0 12:04	3.88	1.00	79.08	328.75	0.24	0.56	0	Calculated
Link-107	CHANNEL	0 12:02	1.05	1.00	13.90	4186.34	0.00	0.12	0	Calculated
Link-108	CONDUIT	0 12:08	5.42	1.00	13.60	46.94	0.29	0.78	0	Calculated
Link-110	CONDUIT	0 11:58	10.61	1.00	2.60	37.47	0.07	0.37	0	Calculated
Link-111	CHANNEL	0 12:17	1.84	1.00	43.88	1609.60	0.03	0.29	0	Calculated
Link-112	CHANNEL	0 12:03	3.75	1.00	27.94	410.36	0.07	0.43	0	Calculated
Link-113	CONDUIT	0 12:07	9.04	1.17	24.86	46.40	0.54	0.82	0	Calculated
Link-114	CONDUIT	0 11:58	3.43	1.00	1.81	4.93	0.37	0.44	0	Calculated
Link-13	CONDUIT	0 11:58	7.49	1.00	7.38	62.45	0.12	0.62	0	Calculated
Link-15	CONDUIT	0 11:56	3.48	1.00	8.13	17.20	0.47	1.00	9	SURCHARGED
Link-16	CONDUIT	0 12:08	4.33	1.00	13.60	17.26	0.79	1.00	17	SURCHARGED
Link-17	CONDUIT	0 11:56	6.50	1.00	20.42	35.27	0.58	1.00	19	SURCHARGED
Link-18	CONDUIT	0 11:56	6.72	3.52	21.12	47.53	0.44	1.00	17	SURCHARGED
Link-19	CONDUIT	0 12:02	4.30	1.00	20.19	25.21	0.80	0.92	0	Calculated
Link-30	CONDUIT	0 12:16	8.45	1.00	41.46	71.48	0.58	1.00	37	SURCHARGED
Link-31	CONDUIT	0 12:15	9.61	1.00	43.97	13.89	3.17	0.88	0	> CAPACITY
Link-32	CONDUIT	0 11:58	4.46	1.00	14.02	10.12	1.38	1.00	47	SURCHARGED
Link-37	CONDUIT	0 11:58	3.19	1.00	10.02	21.80	0.46	1.00	11	SURCHARGED
Link-57	CONDUIT	0 12:03	8.59	1.00	13.09	37.51	0.35	0.49	0	Calculated
Link-58	CONDUIT	0 12:08	7.55	1.00	53.66	77.99	0.69	0.69	0	Calculated
Link-59	CONDUIT	0 11:58	6.99	1.00	18.00	69.35	0.26	0.43	0	Calculated
Link-60	CONDUIT	0 11:58	6.28	1.00	18.06	57.12	0.32	0.43	0	Calculated
Link-63	CONDUIT	0 12:04	0.23	1.00	0.27	19.03	0.01	0.50	0	Calculated
Link-67	CONDUIT	0 00:00	0.00	1.00	0.00	6.58	0.00	0.00	0	Calculated
Link-91	CONDUIT	0 12:02	5.78	1.00	20.19	18.31	1.10	0.68	0	> CAPACITY
Link-93	CONDUIT	0 12:04	2.27	1.00	0.08	19.77	0.00	0.11	0	Calculated
Link-94	CONDUIT	0 11:58	8.57	1.00	1.81	20.61	0.09	0.18	0	Calculated
Link-98	CONDUIT	0 12:04	10.98	1.00	77.41	224.33	0.35	0.46	0	Calculated
Weir-01	WEIR	0 00:00			0.00			0.00		
Weir-02	WEIR	0 00:00			0.00			0.00		
Weir-03	WEIR	0 12:15			0.07			0.04		

****
Highest Flow Instability Indexes
****
All links are stable.

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:48:43 2022
Analysis ended on: Thu Jan 27 16:48:56 2022
Total elapsed time: 00:00:13

5-Year
Overview Map



5-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55-Further Mod.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	5-Year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	917.77	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.10	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	900.70	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00
Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-12	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-13	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-14	-	0.0200	0.0160	0.0620	2.00	2.00

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	0.6715	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.3065	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.0124	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0150
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	1.0811	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.7335	0.0130
Link-63	Jun-16	Jun-18	CONDUIT	68.8	0.3777	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	173.59
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1609.60
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	410.36
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	46.40
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.50	2.50	1	4.91	0.63	71.48
Link-31	CIRCULAR	2.50	2.50	1	4.91	0.63	13.89
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	3.00	3.00	1	7.07	0.75	69.35
Link-60	CIRCULAR	3.00	3.00	1	7.07	0.75	57.12
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	19.03
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	18.504	3.500
Surface Runoff	0.103	0.020
Continuity Error (%)	-0.001	

Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	12.393	4.038
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.001	0.000
Continuity Error (%)	-0.000	

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00

> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C

Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	hh:mm:ss
Sub-01	3.50	2.56	48.18	91.230	0	00:17:27
Sub-02	3.50	2.81	27.28	93.700	0	00:09:15
Sub-03	3.50	2.00	15.37	84.860	0	00:07:12
Sub-04	3.50	2.23	26.81	87.580	0	00:05:00
Sub-06	3.50	2.51	21.63	90.630	0	00:05:18
Sub-07	3.50	0.43	0.40	57.270	0	00:05:49
Sub-09	3.50	2.44	2.59	89.910	0	00:05:30
Sub-10	3.50	2.83	3.61	93.940	0	00:05:00
Sub-11	3.50	2.33	20.14	88.660	0	00:10:37
Sub-12	3.50	3.19	6.20	97.350	0	00:05:00
Sub-13	3.50	2.44	0.63	90.000	0	00:05:00
Sub-14	3.50	2.48	3.05	90.310	0	00:05:00
Sub-15	3.50	2.25	7.81	87.740	0	00:05:00

Sub-16	3.50	1.43	13.50	77.020	0	00:08:15
Sub-17	3.50	2.95	6.07	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.03	0.56	941.10	0	11:58	0	0	0:00:00
Jun-04	0.03	0.56	930.23	0	11:58	0	0	0:00:00
Jun-05	0.09	9.13	926.03	0	11:53	0	0	0:00:00
Jun-06	0.12	4.48	920.16	0	11:53	0	0	0:00:00
Jun-07	0.15	1.22	915.99	0	12:02	0	0	0:00:00
Jun-13	0.03	0.64	911.47	0	11:58	0	0	0:00:00
Jun-15	0.00	0.00	894.24	0	00:00	0	0	0:00:00
Jun-16	0.01	1.39	894.02	0	11:58	0	0	0:00:00
Jun-18	0.08	1.75	894.02	0	11:58	0	0	0:00:00
Jun-19	0.08	1.71	892.81	0	11:58	0	0	0:00:00
Jun-20	0.08	1.47	893.50	0	12:03	0	0	0:00:00
Jun-21	0.25	3.30	893.74	0	12:08	0	0	0:00:00
Jun-22	0.24	2.10	894.80	0	12:18	0	0	0:00:00
Jun-23	0.38	5.40	898.20	0	12:16	0	0	0:00:00
Jun-25	0.24	5.89	899.07	0	12:16	0	0	0:00:00
Jun-26	0.12	4.79	899.98	0	11:59	0	0	0:00:00
Jun-28	0.21	2.71	892.02	0	12:04	0	0	0:00:00
Jun-29	0.21	1.59	900.51	0	12:06	0	0	0:00:00
Jun-31	0.02	0.31	900.16	0	11:58	0	0	0:00:00
Jun-32	0.24	2.60	888.00	0	12:04	0	0	0:00:00
Jun-40	0.01	0.27	923.45	0	12:02	0	0	0:00:00
Jun-42	0.01	0.15	913.34	0	12:04	0	0	0:00:00
Jun-43	0.00	0.07	907.39	0	12:00	0	0	0:00:00
Jun-47	0.07	2.40	920.90	0	12:06	0	0	0:00:00
Jun-49	0.04	0.74	912.31	0	11:58	0	0	0:00:00
Out-05	0.23	2.43	886.93	0	12:04	0	0	0:00:00
Jun-24	0.21	5.52	899.55	0	12:17	0	0	0:00:00
Jun-48	0.11	2.39	902.40	0	12:09	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
Jun-02	JUNCTION	7.70	7.70	0	11:58	0.00		
Jun-04	JUNCTION	2.99	10.67	0	11:58	0.00		
Jun-05	JUNCTION	0.62	11.29	0	11:58	0.00		
Jun-06	JUNCTION	6.09	23.89	0	12:03	0.00		
Jun-07	JUNCTION	13.50	37.08	0	12:01	0.00		
Jun-13	JUNCTION	0.00	2.84	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.00	0	00:00	0.00		
Jun-16	JUNCTION	0.00	0.28	0	11:52	0.00		
Jun-18	JUNCTION	26.42	26.42	0	11:58	0.00		
Jun-19	JUNCTION	0.00	26.32	0	11:58	0.00		
Jun-20	JUNCTION	21.44	23.95	0	11:58	0.00		
Jun-21	JUNCTION	27.25	71.83	0	12:03	0.00		
Jun-22	JUNCTION	0.00	56.03	0	12:16	0.00		
Jun-23	JUNCTION	0.00	52.79	0	12:16	0.00		
Jun-25	JUNCTION	5.96	21.12	0	11:58	0.00		
Jun-26	JUNCTION	15.19	15.19	0	11:58	0.00		
Jun-28	JUNCTION	0.00	100.51	0	12:03	0.00		
Jun-29	JUNCTION	48.05	76.52	0	12:06	0.00		
Jun-31	JUNCTION	3.54	3.54	0	11:58	0.00		
Jun-32	JUNCTION	0.00	102.85	0	12:03	0.00		
Jun-40	JUNCTION	20.07	20.07	0	12:01	0.00		
Jun-42	JUNCTION	0.39	0.39	0	12:03	0.00		
Jun-43	JUNCTION	0.00	2.85	0	11:58	0.00		
Jun-47	JUNCTION	0.00	20.03	0	12:02	0.00		
Jun-49	JUNCTION	2.58	2.58	0	11:58	0.00		
Out-05	OUTFALL	0.00	102.84	0	12:04	0.00		
Jun-24	STORAGE	0.00	76.26	0	12:06	0.00		
Jun-48	STORAGE	0.00	36.86	0	12:02	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	Time of Maximum Depth Occurrence hh:mm
Inlet-11	2.02	923.13	0.15	0	12:03
Inlet-12	2.02	921.39	0.15	0	11:53
Inlet-13	2.02	921.36	0.15	0	12:03
Inlet-14	2.02	920.01	0.15	0	12:03

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.000	0
Inlet-12	0.00	0.00	-	-	-	0.000	0
Inlet-13	0.00	0.00	-	-	-	0.000	0
Inlet-14	0.00	0.00	-	-	-	0.000	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³

Jun-24	41.240	49	0	12:17	0.569	1	52.73	0.00	0:00:00	0.000
Jun-48	1.049	14	0	12:09	0.009	0	29.29	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	77.62	4.13	102.84
System	77.62	4.13	102.84

****
Link Flow Summary
****

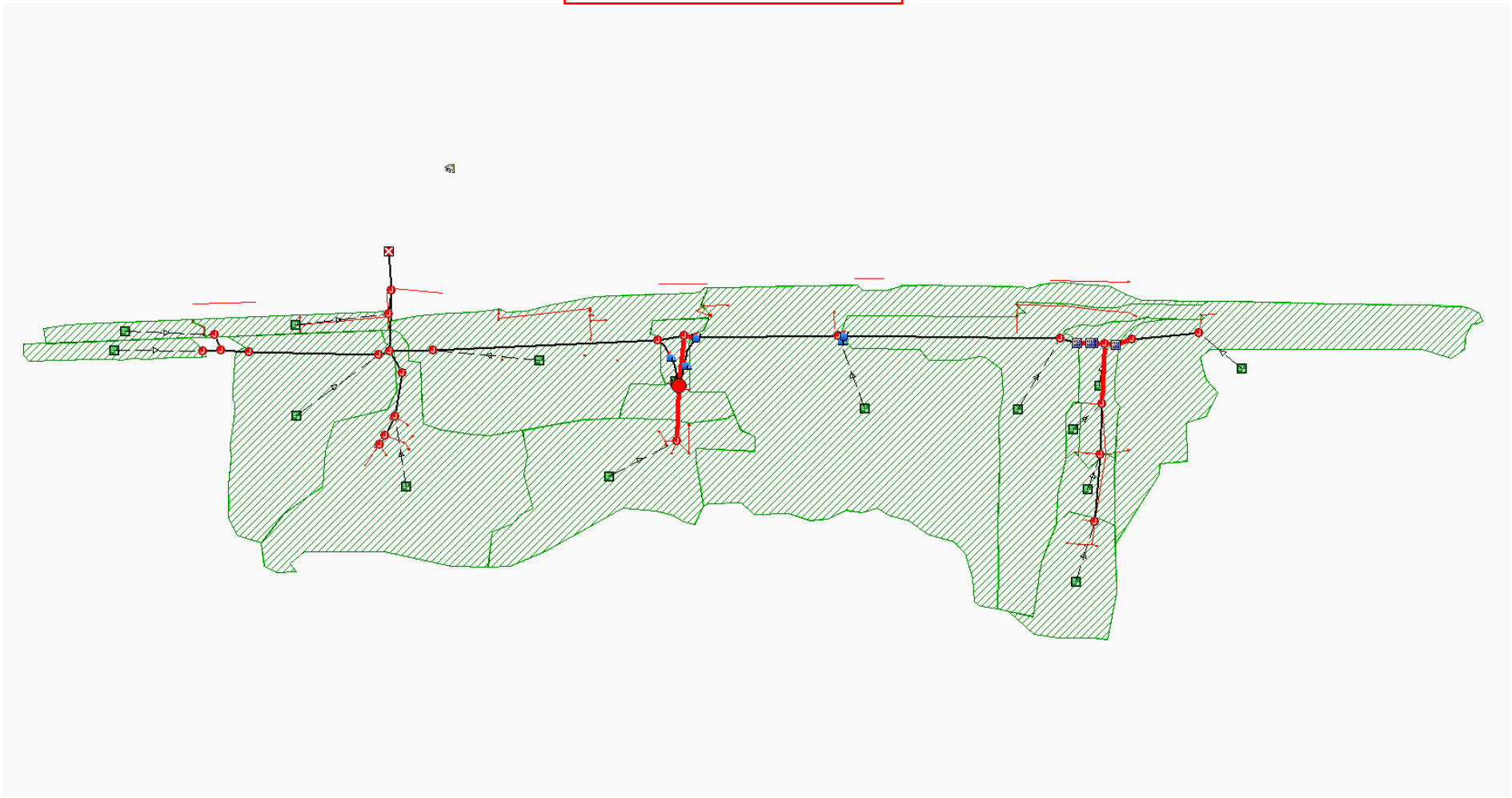
Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained ft/sec	Length Factor	Peak Flow during Analysis cfs	Design Flow Capacity cfs	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
Link-07	CONDUIT	0 11:58	10.98	1.00	7.68	49.45	0.16	0.27	0	Calculated
Link-102	CHANNEL	0 12:06	3.18	1.00	76.26	173.59	0.44	0.72	0	Calculated
Link-103	CHANNEL	0 12:00	0.14	1.00	2.72	4187.65	0.00	0.15	0	Calculated
Link-106	CHANNEL	0 12:04	4.13	1.00	102.84	328.75	0.31	0.63	0	Calculated
Link-107	CHANNEL	0 12:02	1.05	1.00	20.03	4186.34	0.00	0.24	0	Calculated
Link-108	CONDUIT	0 12:10	5.61	1.00	17.61	46.94	0.38	1.00	10	SURCHARGED
Link-110	CONDUIT	0 11:58	10.45	1.00	3.54	37.47	0.09	0.48	0	Calculated
Link-111	CHANNEL	0 12:18	1.79	1.00	55.71	1609.60	0.03	0.33	0	Calculated
Link-112	CHANNEL	0 12:02	3.72	1.00	36.86	410.36	0.09	0.54	0	Calculated
Link-113	CONDUIT	0 12:11	10.31	1.17	29.29	46.40	0.63	0.90	0	Calculated
Link-114	CONDUIT	0 11:58	3.71	1.00	2.57	4.93	0.52	0.55	0	Calculated
Link-13	CONDUIT	0 11:58	7.30	1.00	10.67	62.45	0.17	0.64	0	Calculated
Link-15	CONDUIT	0 11:58	3.59	1.00	11.29	17.20	0.66	1.00	21	SURCHARGED
Link-16	CONDUIT	0 12:10	5.61	1.00	17.61	17.26	1.02	1.00	30	SURCHARGED
Link-17	CONDUIT	0 12:03	7.61	1.00	23.89	35.27	0.68	1.00	31	SURCHARGED
Link-18	CONDUIT	0 12:03	7.61	3.52	23.89	47.53	0.50	1.00	29	SURCHARGED
Link-19	CONDUIT	0 12:03	4.89	1.00	23.89	25.21	0.95	0.98	0	Calculated
Link-30	CONDUIT	0 12:34	8.58	1.00	42.13	71.48	0.59	1.00	55	SURCHARGED
Link-31	CONDUIT	0 12:16	11.19	1.00	52.79	13.89	3.80	0.92	0	> CAPACITY
Link-32	CONDUIT	0 11:57	6.25	1.00	19.64	10.12	1.94	1.00	66	SURCHARGED
Link-37	CONDUIT	0 11:58	4.84	1.00	15.19	21.80	0.70	1.00	42	SURCHARGED
Link-57	CONDUIT	0 12:03	9.08	1.00	18.77	37.51	0.50	0.64	0	Calculated
Link-58	CONDUIT	0 12:08	7.72	1.00	65.24	77.99	0.84	0.82	0	Calculated
Link-59	CONDUIT	0 11:58	7.10	1.00	26.23	69.35	0.38	0.56	0	Calculated
Link-60	CONDUIT	0 11:58	6.57	1.00	26.32	57.12	0.46	0.56	0	Calculated
Link-63	CONDUIT	0 12:04	0.23	1.00	0.35	19.03	0.02	0.67	0	Calculated
Link-67	CONDUIT	0 00:00	0.00	1.00	0.00	6.58	0.00	0.07	0	Calculated
Link-91	CONDUIT	0 12:03	6.11	1.00	23.89	18.31	1.30	0.74	0	> CAPACITY
Link-93	CONDUIT	0 12:04	3.17	1.00	0.39	19.77	0.02	0.20	0	Calculated
Link-94	CONDUIT	0 11:58	9.13	1.00	2.85	20.61	0.14	0.24	0	Calculated
Link-98	CONDUIT	0 12:04	11.60	1.00	100.50	224.33	0.45	0.54	0	Calculated
Weir-01	WEIR	0 00:00			0.00			0.00		
Weir-02	WEIR	0 12:16			3.23			0.35		
Weir-03	WEIR	0 12:17			13.41			0.70		

****
Highest Flow Instability Indexes
****
All links are stable.

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:50:47 2022
Analysis ended on: Thu Jan 27 16:51:00 2022
Total elapsed time: 00:00:13

10-Year Overview Map



10-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55-Further Mod.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	10-Year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	917.77	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.10	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	900.70	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00
Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-12	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-13	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-14	-	0.0200	0.0160	0.0620	2.00	2.00

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	0.6715	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.3065	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.0124	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0150
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	1.0811	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.7335	0.0130
Link-63	Jun-16	Jun-18	CONDUIT	68.8	0.3777	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	173.59
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1609.60
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	410.36
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	46.40
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.50	2.50	1	4.91	0.63	71.48
Link-31	CIRCULAR	2.50	2.50	1	4.91	0.63	13.89
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	3.00	3.00	1	7.07	0.75	69.35
Link-60	CIRCULAR	3.00	3.00	1	7.07	0.75	57.12
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	19.03
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

********** Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	20.196	3.820
Surface Runoff	0.116	0.022
Continuity Error (%)	-0.001	

********** Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	13.938	4.542
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.001	0.000
Continuity Error (%)	-0.000	

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00

> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C

Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	hh:mm:ss
Sub-01	3.82	2.87	53.66	91.230	0	00:17:27
Sub-02	3.82	3.12	30.13	93.700	0	00:09:15
Sub-03	3.82	2.29	17.49	84.860	0	00:07:12
Sub-04	3.82	2.52	30.19	87.580	0	00:05:00
Sub-06	3.82	2.81	24.09	90.630	0	00:05:18
Sub-07	3.82	0.55	0.55	57.270	0	00:05:49
Sub-09	3.82	2.74	2.89	89.910	0	00:05:30
Sub-10	3.82	3.14	3.99	93.940	0	00:05:00
Sub-11	3.82	2.62	22.60	88.660	0	00:10:37
Sub-12	3.82	3.51	6.79	97.350	0	00:05:00
Sub-13	3.82	2.75	0.71	90.000	0	00:05:00
Sub-14	3.82	2.78	3.40	90.310	0	00:05:00
Sub-15	3.82	2.54	8.78	87.740	0	00:05:00

Sub-16	3.82	1.67	15.86	77.020	0	00:08:15
Sub-17	3.82	3.26	6.68	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Flooded Time minutes	Retention Time hh:mm:ss
Jun-02	0.04	0.60	941.14	0	11:58	0	0	0:00:00
Jun-04	0.04	0.59	930.26	0	11:58	0	0	0:00:00
Jun-05	0.10	6.58	923.48	0	11:52	0	0	0:00:00
Jun-06	0.14	4.83	920.51	0	12:03	0	0	0:00:00
Jun-07	0.16	1.26	916.03	0	12:02	0	0	0:00:00
Jun-13	0.04	0.71	911.54	0	11:58	0	0	0:00:00
Jun-15	0.00	0.00	894.24	0	00:00	0	0	0:00:00
Jun-16	0.01	1.55	894.18	0	11:58	0	0	0:00:00
Jun-18	0.09	1.91	894.18	0	11:58	0	0	0:00:00
Jun-19	0.09	1.87	892.97	0	11:58	0	0	0:00:00
Jun-20	0.09	1.61	893.64	0	12:03	0	0	0:00:00
Jun-21	0.28	3.58	894.02	0	12:09	0	0	0:00:00
Jun-22	0.26	2.20	894.90	0	12:17	0	0	0:00:00
Jun-23	0.41	5.59	898.39	0	12:16	0	0	0:00:00
Jun-25	0.28	6.19	899.37	0	12:15	0	0	0:00:00
Jun-26	0.14	5.33	900.52	0	11:58	0	0	0:00:00
Jun-28	0.23	2.86	892.17	0	12:03	0	0	0:00:00
Jun-29	0.22	1.63	900.55	0	12:06	0	0	0:00:00
Jun-31	0.02	0.33	900.18	0	11:58	0	0	0:00:00
Jun-32	0.26	2.69	888.09	0	12:03	0	0	0:00:00
Jun-40	0.01	0.29	923.47	0	12:02	0	0	0:00:00
Jun-42	0.01	0.17	913.36	0	12:02	0	0	0:00:00
Jun-43	0.00	0.08	907.40	0	11:59	0	0	0:00:00
Jun-47	0.08	2.92	921.42	0	12:07	0	0	0:00:00
Jun-49	0.04	0.79	912.36	0	11:58	0	0	0:00:00
Out-05	0.25	2.51	887.01	0	12:03	0	0	0:00:00
Jun-24	0.23	5.75	899.78	0	12:16	0	0	0:00:00
Jun-48	0.13	2.61	902.62	0	12:10	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
Jun-02	JUNCTION	8.65	8.65	0	11:58	0.00		
Jun-04	JUNCTION	3.35	11.97	0	11:58	0.00		
Jun-05	JUNCTION	0.70	12.67	0	11:58	0.00		
Jun-06	JUNCTION	6.67	25.33	0	12:03	0.00		
Jun-07	JUNCTION	15.86	40.70	0	12:02	0.00		
Jun-13	JUNCTION	0.00	3.31	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.00	0	00:00	0.00		
Jun-16	JUNCTION	0.00	0.31	0	11:52	0.00		
Jun-18	JUNCTION	29.64	29.64	0	11:58	0.00		
Jun-19	JUNCTION	0.00	29.54	0	11:58	0.00		
Jun-20	JUNCTION	23.92	26.88	0	11:58	0.00		
Jun-21	JUNCTION	30.10	77.27	0	12:02	0.00		
Jun-22	JUNCTION	0.00	62.54	0	12:15	0.00		
Jun-23	JUNCTION	0.00	53.99	0	12:15	0.00		
Jun-25	JUNCTION	6.55	23.86	0	11:58	0.00		
Jun-26	JUNCTION	17.33	17.33	0	11:58	0.00		
Jun-28	JUNCTION	0.00	108.50	0	12:03	0.00		
Jun-29	JUNCTION	53.47	83.25	0	12:06	0.00		
Jun-31	JUNCTION	3.91	3.91	0	11:58	0.00		
Jun-32	JUNCTION	0.00	111.27	0	12:03	0.00		
Jun-40	JUNCTION	22.49	22.49	0	12:02	0.00		
Jun-42	JUNCTION	0.54	0.54	0	12:02	0.00		
Jun-43	JUNCTION	0.00	3.32	0	11:58	0.00		
Jun-47	JUNCTION	0.00	22.45	0	12:02	0.00		
Jun-49	JUNCTION	2.87	2.87	0	11:58	0.00		
Out-05	OUTFALL	0.00	111.24	0	12:03	0.00		
Jun-24	STORAGE	0.00	83.64	0	12:06	0.00		
Jun-48	STORAGE	0.00	40.45	0	12:02	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	Time of Maximum Depth Occurrence hh:mm
Inlet-11	2.02	923.13	0.15	0	12:05
Inlet-12	2.02	921.39	0.15	0	12:03
Inlet-13	2.02	921.36	0.15	0	12:03
Inlet-14	2.02	920.01	0.15	0	12:03

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.000	0
Inlet-12	0.00	0.00	-	-	-	0.000	0
Inlet-13	0.00	0.00	-	-	-	0.000	0
Inlet-14	0.00	0.00	-	-	-	0.000	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³

Jun-24	46.192	55	0	12:16	0.720	1	58.74	0.00	0:00:00	0.000
Jun-48	1.500	20	0	12:10	0.015	0	30.88	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	78.22	4.74	111.24
System	78.22	4.74	111.24

****
Link Flow Summary
****

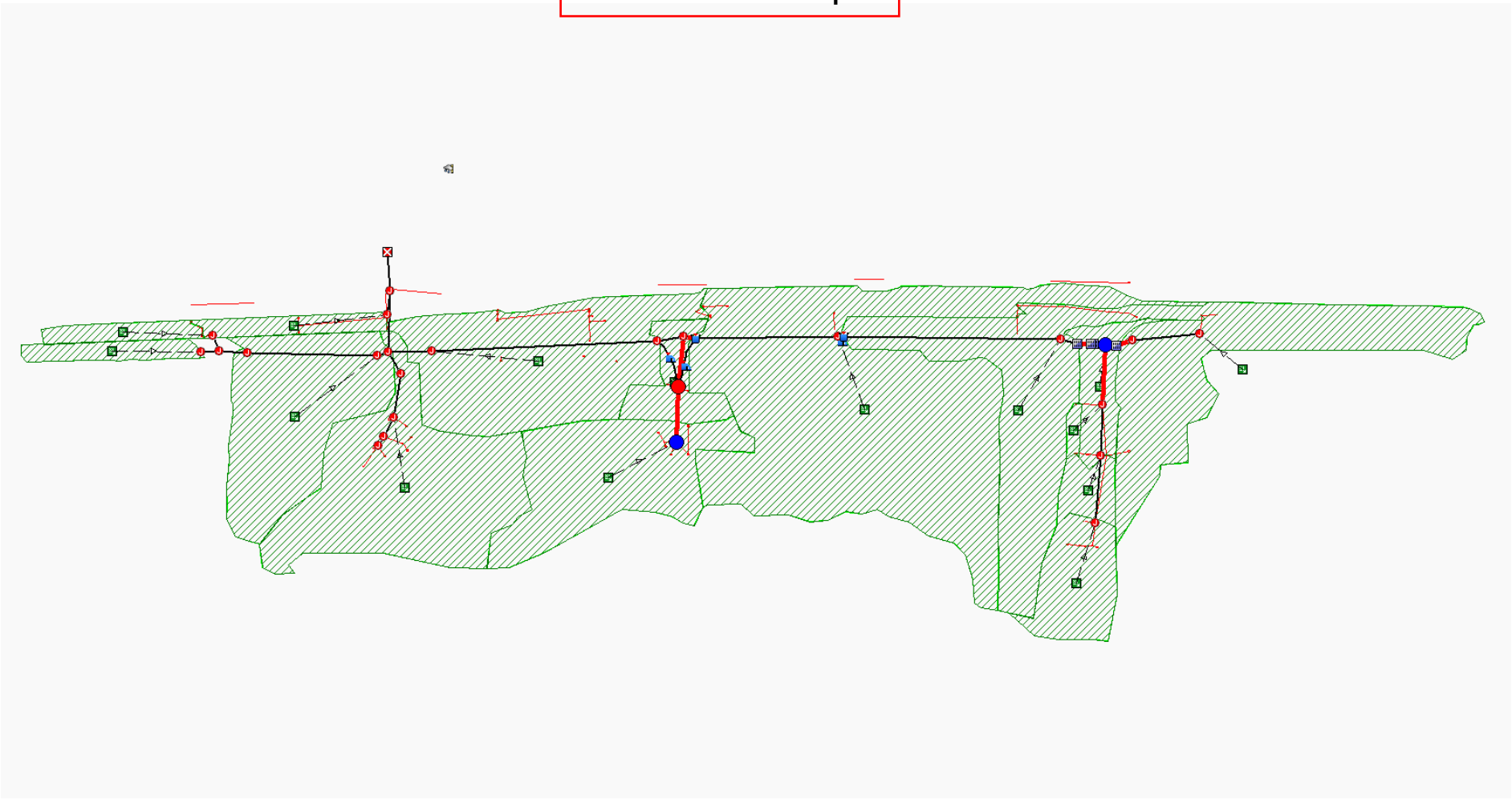
Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained ft/sec	Length Factor	Peak Flow during Analysis cfs	Design Flow Capacity cfs	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
Link-07	CONDUIT	0 11:58	11.32	1.00	8.63	49.45	0.17	0.29	0	Calculated
Link-102	CHANNEL	0 12:06	3.25	1.00	83.64	173.59	0.48	0.79	0	Calculated
Link-103	CHANNEL	0 11:59	0.14	1.00	3.18	4187.65	0.00	0.17	0	Calculated
Link-106	CHANNEL	0 12:03	4.21	1.00	111.24	328.75	0.34	0.65	0	Calculated
Link-107	CHANNEL	0 12:02	1.05	1.00	22.45	4186.34	0.01	0.29	0	Calculated
Link-108	CONDUIT	0 12:10	5.95	1.00	18.68	46.94	0.40	1.00	17	SURCHARGED
Link-110	CONDUIT	0 11:58	10.34	1.00	3.91	37.47	0.10	0.52	0	Calculated
Link-111	CHANNEL	0 12:17	1.78	1.00	62.13	1609.60	0.04	0.36	0	Calculated
Link-112	CHANNEL	0 12:02	3.68	1.00	40.45	410.36	0.10	0.58	0	Calculated
Link-113	CONDUIT	0 12:10	10.78	1.17	30.88	46.40	0.67	0.91	0	Calculated
Link-114	CONDUIT	0 11:58	3.81	1.00	2.86	4.93	0.58	0.59	0	Calculated
Link-13	CONDUIT	0 11:58	7.39	1.00	11.97	62.45	0.19	0.65	0	Calculated
Link-15	CONDUIT	0 11:58	4.03	1.00	12.67	17.20	0.74	1.00	26	SURCHARGED
Link-16	CONDUIT	0 12:10	5.95	1.00	18.68	17.26	1.08	1.00	34	SURCHARGED
Link-17	CONDUIT	0 12:03	8.06	1.00	25.33	35.27	0.72	1.00	36	SURCHARGED
Link-18	CONDUIT	0 12:03	8.06	3.52	25.33	47.53	0.53	1.00	34	SURCHARGED
Link-19	CONDUIT	0 12:03	5.16	1.00	25.33	25.21	1.00	1.00	0	> CAPACITY
Link-30	CONDUIT	0 12:38	8.58	1.00	42.13	71.48	0.59	1.00	61	SURCHARGED
Link-31	CONDUIT	0 12:15	11.30	1.00	53.99	13.89	3.89	0.94	0	> CAPACITY
Link-32	CONDUIT	0 11:56	6.41	1.00	20.13	10.12	1.99	1.00	72	SURCHARGED
Link-37	CONDUIT	0 11:58	5.52	1.00	17.34	21.80	0.80	1.00	47	SURCHARGED
Link-57	CONDUIT	0 12:03	9.01	1.00	20.83	37.51	0.56	0.71	0	Calculated
Link-58	CONDUIT	0 12:09	7.83	1.00	69.36	77.99	0.89	0.87	0	Calculated
Link-59	CONDUIT	0 11:57	7.09	1.00	29.41	69.35	0.42	0.61	0	Calculated
Link-60	CONDUIT	0 11:58	6.61	1.00	29.54	57.12	0.52	0.61	0	Calculated
Link-63	CONDUIT	0 12:04	0.21	1.00	0.40	19.03	0.02	0.75	0	Calculated
Link-67	CONDUIT	0 00:00	0.00	1.00	0.00	6.58	0.00	0.13	0	Calculated
Link-91	CONDUIT	0 12:03	6.40	1.00	25.33	18.31	1.38	0.75	0	> CAPACITY
Link-93	CONDUIT	0 12:02	3.37	1.00	0.54	19.77	0.03	0.23	0	Calculated
Link-94	CONDUIT	0 11:58	9.30	1.00	3.32	20.61	0.16	0.26	0	Calculated
Link-98	CONDUIT	0 12:03	11.77	1.00	108.50	224.33	0.48	0.56	0	Calculated
Weir-01	WEIR	0 00:00			0.00			0.00		
Weir-02	WEIR	0 12:15			8.54			0.55		
Weir-03	WEIR	0 12:16			19.00			0.85		

****
Highest Flow Instability Indexes
****
All links are stable.

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:55:51 2022
Analysis ended on: Thu Jan 27 16:56:04 2022
Total elapsed time: 00:00:13

25-Year Overview Map



25-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55-Further Mod.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	25 year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	917.77	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.10	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	900.70	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00
Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-12	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-13	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-14	-	0.0200	0.0160	0.0620	2.00	2.00

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	0.6715	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.3065	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.0124	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0150
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	1.0811	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.7335	0.0130
Link-63	Jun-16	Jun-18	CONDUIT	68.8	0.3777	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	173.59
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1609.60
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	410.36
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	46.40
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.50	2.50	1	4.91	0.63	71.48
Link-31	CIRCULAR	2.50	2.50	1	4.91	0.63	13.89
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	3.00	3.00	1	7.07	0.75	69.35
Link-60	CIRCULAR	3.00	3.00	1	7.07	0.75	57.12
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	19.03
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

********** Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	24.743	4.680
Surface Runoff	0.151	0.029
Continuity Error (%)	-0.001	

********** Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	18.123	5.906
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.001	0.000
Continuity Error (%)	-0.000	

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00

> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C

Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	4.68	3.70	68.37	91.230	0	00:17:27
Sub-02	4.68	3.96	37.77	93.700	0	00:09:15
Sub-03	4.68	3.06	23.25	84.860	0	00:07:12
Sub-04	4.68	3.32	39.33	87.580	0	00:05:00
Sub-06	4.68	3.63	30.75	90.630	0	00:05:18
Sub-07	4.68	0.95	1.02	57.270	0	00:05:49
Sub-09	4.68	3.56	3.71	89.910	0	00:05:30
Sub-10	4.68	3.99	4.99	93.940	0	00:05:00
Sub-11	4.68	3.43	29.23	88.660	0	00:10:37
Sub-12	4.68	4.37	8.35	97.350	0	00:05:00
Sub-13	4.68	3.57	0.91	90.000	0	00:05:00
Sub-14	4.68	3.60	4.35	90.310	0	00:05:00
Sub-15	4.68	3.34	11.43	87.740	0	00:05:00

Sub-16	4.68	2.36	22.48	77.020	0	00:08:15
Sub-17	4.68	4.11	8.30	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.04	0.70	941.24	0	11:58	0	0	0:00:00
Jun-04	0.04	0.68	930.35	0	11:58	0	0	0:00:00
Jun-05	0.13	6.68	923.58	0	11:49	0	0	0:00:00
Jun-06	0.18	6.50	922.18	0	11:58	0.01	1	0:00:00
Jun-07	0.18	1.36	916.13	0	12:02	0	0	0:00:00
Jun-13	0.04	0.89	911.72	0	11:58	0	0	0:00:00
Jun-15	0.00	0.44	894.68	0	11:58	0	0	0:00:00
Jun-16	0.02	2.04	894.67	0	11:58	0	0	0:00:00
Jun-18	0.11	2.40	894.67	0	11:58	0	0	0:00:00
Jun-19	0.10	2.32	893.42	0	11:58	0	0	0:00:00
Jun-20	0.10	2.05	894.08	0	12:04	0	0	0:00:00
Jun-21	0.33	4.36	894.80	0	12:17	0	0	0:00:00
Jun-22	0.30	2.46	895.16	0	12:17	0	0	0:00:00
Jun-23	0.48	6.02	898.82	0	12:16	0	0	0:00:00
Jun-25	0.34	6.57	899.75	0	12:15	0	0	0:00:00
Jun-26	0.18	5.53	900.72	0	11:54	0.65	11	0:00:00
Jun-28	0.27	3.20	892.51	0	12:03	0	0	0:00:00
Jun-29	0.25	1.73	900.65	0	12:03	0	0	0:00:00
Jun-31	0.03	0.37	900.22	0	11:56	0	0	0:00:00
Jun-32	0.30	2.89	888.29	0	12:03	0	0	0:00:00
Jun-40	0.02	0.33	923.51	0	12:02	0	0	0:00:00
Jun-42	0.01	0.23	913.42	0	12:02	0	0	0:00:00
Jun-43	0.00	0.10	907.42	0	11:59	0	0	0:00:00
Jun-47	0.11	4.32	922.82	0	12:08	0	0	0:00:00
Jun-49	0.05	0.95	912.52	0	11:58	0	0	0:00:00
Out-05	0.29	2.69	887.19	0	12:03	0	0	0:00:00
Jun-24	0.29	6.30	900.33	0	12:16	0	0	0:00:00
Jun-48	0.15	3.00	903.01	0	12:08	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
Jun-02	JUNCTION	11.21	11.21	0	11:58	0.00		
Jun-04	JUNCTION	4.26	15.46	0	11:58	0.00		
Jun-05	JUNCTION	0.89	16.37	0	11:57	0.00		
Jun-06	JUNCTION	8.21	30.51	0	12:04	1.41	0	11:59
Jun-07	JUNCTION	22.46	53.12	0	12:02	0.00		
Jun-13	JUNCTION	0.00	4.64	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.13	0	11:54	0.00		
Jun-16	JUNCTION	0.00	0.41	0	11:53	0.00		
Jun-18	JUNCTION	38.68	38.68	0	11:58	0.00		
Jun-19	JUNCTION	0.00	38.55	0	11:58	0.00		
Jun-20	JUNCTION	30.48	34.74	0	11:58	0.00		
Jun-21	JUNCTION	37.71	92.25	0	12:05	0.00		
Jun-22	JUNCTION	0.00	76.64	0	12:14	0.00		
Jun-23	JUNCTION	0.00	56.25	0	12:14	0.00		
Jun-25	JUNCTION	8.13	34.97	0	12:07	0.00		
Jun-26	JUNCTION	23.02	23.02	0	11:58	5.20	0	11:58
Jun-28	JUNCTION	0.00	126.89	0	12:03	0.00		
Jun-29	JUNCTION	68.09	106.96	0	12:06	0.00		
Jun-31	JUNCTION	4.88	4.88	0	11:56	0.00		
Jun-32	JUNCTION	0.00	130.40	0	12:03	0.00		
Jun-40	JUNCTION	29.03	29.03	0	12:02	0.00		
Jun-42	JUNCTION	1.02	1.02	0	12:02	0.00		
Jun-43	JUNCTION	0.00	4.65	0	11:58	0.00		
Jun-47	JUNCTION	0.00	29.01	0	12:02	0.00		
Jun-49	JUNCTION	3.68	3.68	0	11:58	0.00		
Out-05	OUTFALL	0.00	130.38	0	12:03	0.00		
Jun-24	STORAGE	0.00	108.21	0	12:06	0.00		
Jun-48	STORAGE	0.00	50.09	0	12:02	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	Time of Maximum Depth Occurrence hh:mm
Inlet-11	2.02	923.13	0.15	0	12:00
Inlet-12	2.02	921.39	0.15	0	11:58
Inlet-13	2.02	921.36	0.15	0	12:00
Inlet-14	2.02	920.01	0.15	0	11:59

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.003	0
Inlet-12	0.00	0.00	-	-	-	0.005	1
Inlet-13	0.00	0.00	-	-	-	0.001	0
Inlet-14	0.00	0.00	-	-	-	0.002	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³

Jun-24	60.589	72	0	12:16	1.096	1	71.64	0.00	0:00:00	0.000
Jun-48	2.620	35	0	12:08	0.031	0	41.19	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	79.44	6.10	130.38
System	79.44	6.10	130.38

****
Link Flow Summary
****

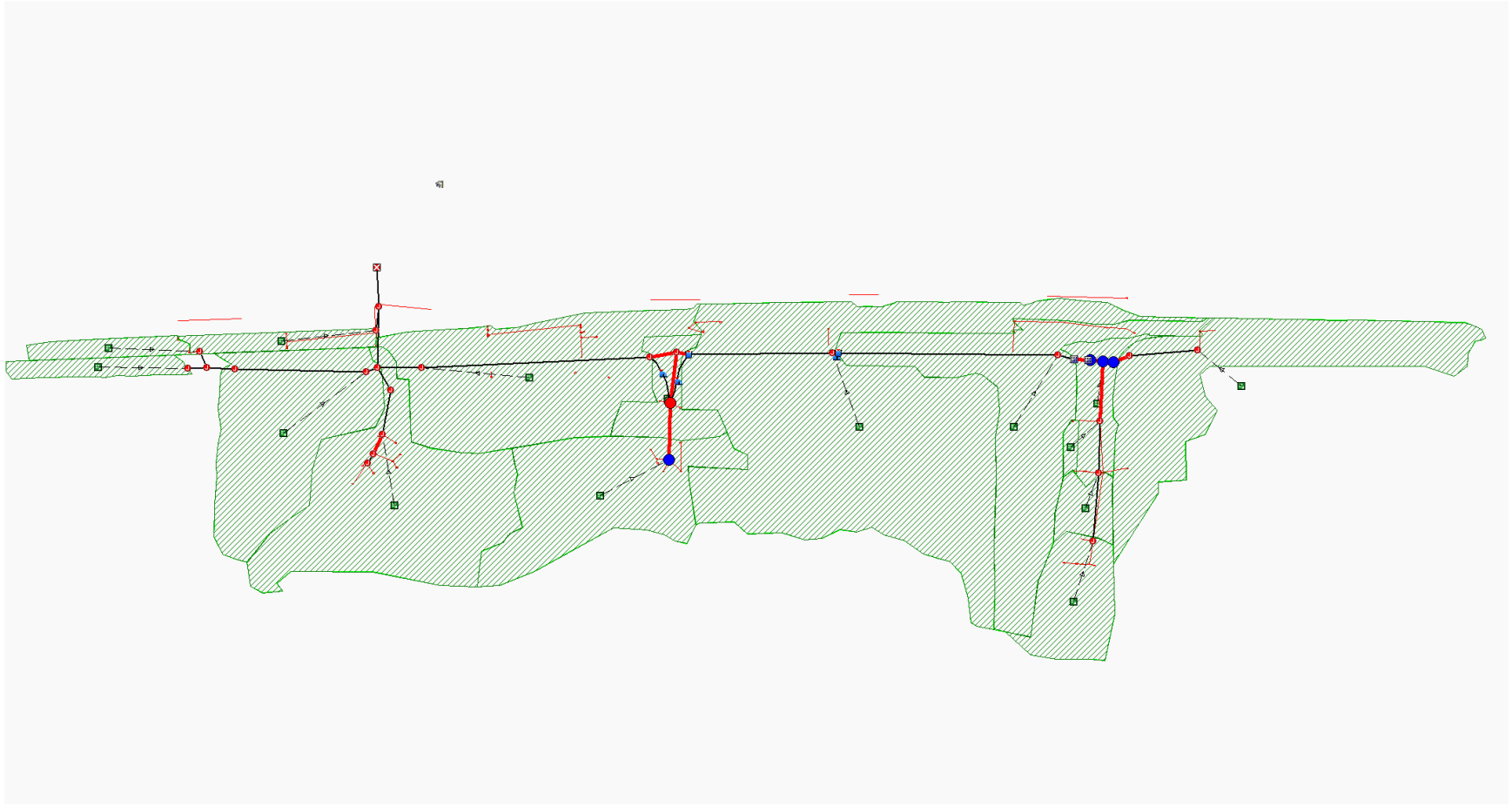
Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained ft/sec	Length Factor	Peak Flow during Analysis cfs	Design Flow Capacity cfs	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
Link-07	CONDUIT	0 11:58	12.11	1.00	11.20	49.45	0.23	0.34	0	Calculated
Link-102	CHANNEL	0 12:06	3.36	1.00	108.21	173.59	0.62	0.93	0	Calculated
Link-103	CHANNEL	0 11:59	0.17	1.00	4.50	4187.65	0.00	0.21	0	Calculated
Link-106	CHANNEL	0 12:03	4.37	1.00	130.38	328.75	0.40	0.70	0	Calculated
Link-107	CHANNEL	0 12:02	1.05	1.00	29.01	4186.34	0.01	0.43	0	Calculated
Link-108	CONDUIT	0 12:10	6.93	1.00	21.76	46.94	0.46	1.00	29	SURCHARGED
Link-110	CONDUIT	0 11:56	10.14	1.00	4.88	37.47	0.13	0.60	0	Calculated
Link-111	CHANNEL	0 12:17	1.78	1.00	76.26	1609.60	0.05	0.43	0	Calculated
Link-112	CHANNEL	0 12:02	3.70	1.00	50.09	410.36	0.12	0.67	0	Calculated
Link-113	CONDUIT	0 12:08	11.01	1.17	33.20	46.40	0.72	0.93	0	Calculated
Link-114	CONDUIT	0 11:58	4.06	1.00	3.67	4.93	0.74	0.69	0	Calculated
Link-13	CONDUIT	0 11:57	7.34	1.00	15.48	62.45	0.25	0.67	0	Calculated
Link-15	CONDUIT	0 11:58	5.22	1.00	16.41	17.20	0.95	1.00	38	SURCHARGED
Link-16	CONDUIT	0 12:11	6.94	1.00	21.79	17.26	1.26	1.00	46	SURCHARGED
Link-17	CONDUIT	0 12:04	9.83	1.00	30.88	35.27	0.88	1.00	47	SURCHARGED
Link-18	CONDUIT	0 12:03	9.96	3.52	31.29	47.53	0.66	1.00	45	SURCHARGED
Link-19	CONDUIT	0 12:03	6.49	1.00	31.88	25.21	1.26	1.00	8	SURCHARGED
Link-30	CONDUIT	0 12:15	8.55	1.00	41.99	71.48	0.59	1.00	74	SURCHARGED
Link-31	CONDUIT	0 12:14	11.48	1.00	56.24	13.89	4.05	0.99	0	> CAPACITY
Link-32	CONDUIT	0 11:54	6.39	1.00	20.09	10.12	1.98	1.00	85	SURCHARGED
Link-37	CONDUIT	0 11:55	5.79	1.00	18.21	21.80	0.84	1.00	60	SURCHARGED
Link-57	CONDUIT	0 12:06	8.87	1.00	24.90	37.51	0.66	0.89	0	Calculated
Link-58	CONDUIT	0 12:17	9.07	1.00	83.11	77.99	1.07	0.92	0	> CAPACITY
Link-59	CONDUIT	0 11:58	7.19	1.00	38.37	69.35	0.55	0.75	0	Calculated
Link-60	CONDUIT	0 11:58	6.74	1.00	38.55	57.12	0.67	0.77	0	Calculated
Link-63	CONDUIT	0 12:04	0.25	1.00	0.54	19.03	0.03	0.95	0	Calculated
Link-67	CONDUIT	0 11:58	0.72	1.00	0.14	6.58	0.02	0.51	0	Calculated
Link-91	CONDUIT	0 12:02	7.79	1.00	31.67	18.31	1.73	0.77	0	> CAPACITY
Link-93	CONDUIT	0 12:02	3.75	1.00	1.02	19.77	0.05	0.32	0	Calculated
Link-94	CONDUIT	0 11:58	9.63	1.00	4.65	20.61	0.23	0.33	0	Calculated
Link-98	CONDUIT	0 12:03	12.14	1.00	126.89	224.33	0.57	0.62	0	Calculated
Weir-01	WEIR	0 12:08			7.99			0.24		
Weir-02	WEIR	0 12:14			20.40			0.80		
Weir-03	WEIR	0 12:16			29.66			1.00		

****
Highest Flow Instability Indexes
****
Link Link-18 (2)
Link Link-17 (2)
Link Link-15 (2)
Link Link-16 (2)
Link Link-19 (1)

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 16:58:39 2022
Analysis ended on: Thu Jan 27 16:58:51 2022
Total elapsed time: 00:00:12

50-Year
Overview Map



50-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55-Further Mod.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	50-Year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	917.77	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.10	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	900.70	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00
Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-12	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-13	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-14	-	0.0200	0.0160	0.0620	2.00	2.00

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	0.6715	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.3065	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.0124	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0150
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	1.0811	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.7335	0.0130
Link-63	Jun-16	Jun-18	CONDUIT	68.8	0.3777	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	173.59
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1609.60
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	410.36
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	46.40
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.50	2.50	1	4.91	0.63	71.48
Link-31	CIRCULAR	2.50	2.50	1	4.91	0.63	13.89
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	3.00	3.00	1	7.07	0.75	69.35
Link-60	CIRCULAR	3.00	3.00	1	7.07	0.75	57.12
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	19.03
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

********** Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	26.963	5.100
Surface Runoff	0.169	0.032
Continuity Error (%)	-0.001	

********** Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	20.155	6.568
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.001	0.000
Continuity Error (%)	-0.000	

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00

> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C

Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	5.10	4.10	75.43	91.230	0	00:17:27
Sub-02	5.10	4.37	41.47	93.700	0	00:09:15
Sub-03	5.10	3.45	26.09	84.860	0	00:07:12
Sub-04	5.10	3.72	43.81	87.580	0	00:05:00
Sub-06	5.10	4.04	33.97	90.630	0	00:05:18
Sub-07	5.10	1.18	1.29	57.270	0	00:05:49
Sub-09	5.10	3.96	4.10	89.910	0	00:05:30
Sub-10	5.10	4.40	5.47	93.940	0	00:05:00
Sub-11	5.10	3.83	32.46	88.660	0	00:10:37
Sub-12	5.10	4.79	9.12	97.350	0	00:05:00
Sub-13	5.10	3.97	1.00	90.000	0	00:05:00
Sub-14	5.10	4.01	4.81	90.310	0	00:05:00
Sub-15	5.10	3.74	12.72	87.740	0	00:05:00

Sub-16	5.10	2.71	25.82	77.020	0	00:08:15
Sub-17	5.10	4.53	9.09	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.04	0.74	941.28	0	11:58	0	0	0:00:00
Jun-04	0.05	0.76	930.43	0	11:58	0	0	0:00:00
Jun-05	0.15	9.43	926.33	0	12:07	0	0	0:00:00
Jun-06	0.20	6.50	922.18	0	11:55	0.08	6	0:00:00
Jun-07	0.19	1.41	916.18	0	12:02	0	0	0:00:00
Jun-13	0.05	0.98	911.81	0	11:58	0	0	0:00:00
Jun-15	0.00	0.72	894.96	0	11:58	0	0	0:00:00
Jun-16	0.02	2.33	894.96	0	11:57	0	0	0:00:00
Jun-18	0.12	2.69	894.96	0	11:58	0	0	0:00:00
Jun-19	0.11	2.56	893.66	0	11:58	0	0	0:00:00
Jun-20	0.11	2.33	894.36	0	12:04	0	0	0:00:00
Jun-21	0.36	4.63	895.07	0	12:18	0	0	0:00:00
Jun-22	0.32	2.66	895.36	0	12:17	0	0	0:00:00
Jun-23	0.51	6.23	899.03	0	12:16	0	0	0:00:00
Jun-25	0.38	6.69	899.87	0	12:15	0	0	0:00:00
Jun-26	0.20	5.53	900.72	0	11:53	1.28	14	0:00:00
Jun-28	0.29	3.36	892.67	0	12:03	0	0	0:00:00
Jun-29	0.26	1.94	900.86	0	12:11	0	0	0:00:00
Jun-31	0.03	0.38	900.23	0	11:56	0	0	0:00:00
Jun-32	0.32	2.98	888.38	0	12:03	0	0	0:00:00
Jun-40	0.02	0.35	923.53	0	12:02	0	0	0:00:00
Jun-42	0.02	0.26	913.45	0	12:00	0	0	0:00:00
Jun-43	0.00	0.11	907.43	0	11:59	0	0	0:00:00
Jun-47	0.13	4.96	923.46	0	12:08	0	0	0:00:00
Jun-49	0.05	1.04	912.61	0	11:58	0	0	0:00:00
Out-05	0.31	2.77	887.27	0	12:03	0	0	0:00:00
Jun-24	0.32	6.56	900.59	0	12:16	0	0	0:00:00
Jun-48	0.17	3.09	903.10	0	12:07	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
Jun-02	JUNCTION	12.48	12.48	0	11:58	0.00		
Jun-04	JUNCTION	4.71	17.17	0	11:58	0.00		
Jun-05	JUNCTION	0.98	18.23	0	11:57	0.00		
Jun-06	JUNCTION	8.95	32.27	0	12:03	3.07	0	12:04
Jun-07	JUNCTION	25.79	57.52	0	11:59	0.00		
Jun-13	JUNCTION	0.00	5.32	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.23	0	11:54	0.00		
Jun-16	JUNCTION	0.00	0.62	0	11:53	0.00		
Jun-18	JUNCTION	43.00	43.00	0	11:58	0.00		
Jun-19	JUNCTION	0.00	42.87	0	11:58	0.00		
Jun-20	JUNCTION	33.69	38.62	0	11:58	0.00		
Jun-21	JUNCTION	41.44	97.12	0	12:03	0.00		
Jun-22	JUNCTION	0.00	81.14	0	12:15	0.00		
Jun-23	JUNCTION	0.00	55.98	0	12:15	0.00		
Jun-25	JUNCTION	8.94	38.67	0	12:14	0.00		
Jun-26	JUNCTION	25.88	25.88	0	11:58	8.28	0	11:58
Jun-28	JUNCTION	0.00	135.16	0	12:03	0.00		
Jun-29	JUNCTION	75.07	121.11	0	12:06	0.00		
Jun-31	JUNCTION	5.36	5.36	0	11:56	0.00		
Jun-32	JUNCTION	0.00	139.00	0	12:03	0.00		
Jun-40	JUNCTION	32.25	32.25	0	12:01	0.00		
Jun-42	JUNCTION	1.28	1.28	0	12:00	0.00		
Jun-43	JUNCTION	0.00	5.34	0	11:58	0.00		
Jun-47	JUNCTION	0.00	32.24	0	12:02	0.00		
Jun-49	JUNCTION	4.07	4.07	0	11:58	0.00		
Out-05	OUTFALL	0.00	138.98	0	12:03	0.00		
Jun-24	STORAGE	0.00	121.33	0	12:05	0.00		
Jun-48	STORAGE	0.00	54.79	0	12:02	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	Time of Maximum Depth Occurrence hh:mm
Inlet-11	2.02	923.13	0.15	0	12:03
Inlet-12	2.02	921.39	0.15	0	11:55
Inlet-13	2.02	921.36	0.15	0	11:58
Inlet-14	2.02	920.01	0.15	0	11:55

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.006	1
Inlet-12	0.00	0.00	-	-	-	0.010	1
Inlet-13	0.00	0.00	-	-	-	0.002	0
Inlet-14	0.00	0.00	-	-	-	0.005	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³

Jun-24	68.719	82	0	12:16	1.367	2	75.69	0.00	0:00:00	0.000
Jun-48	2.952	39	0	12:07	0.040	1	46.74	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	79.92	6.90	138.98
System	79.92	6.90	138.98

****
Link Flow Summary
****

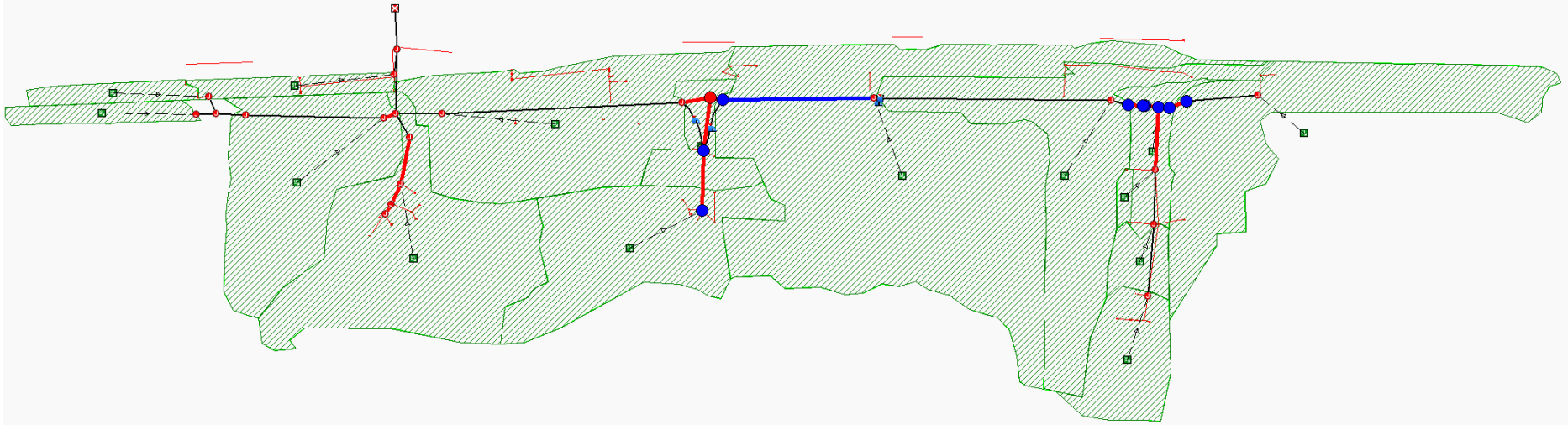
Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained ft/sec	Length Factor	Peak Flow during Analysis cfs	Design Flow Capacity cfs	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
Link-07	CONDUIT	0 11:58	12.44	1.00	12.47	49.45	0.25	0.36	0	Calculated
Link-102	CHANNEL	0 12:05	3.39	1.00	121.33	173.59	0.70	0.99	0	Calculated
Link-103	CHANNEL	0 11:59	0.17	1.00	5.18	4187.65	0.00	0.24	0	Calculated
Link-106	CHANNEL	0 12:03	4.44	1.00	138.98	328.75	0.42	0.72	0	Calculated
Link-107	CHANNEL	0 12:02	1.06	1.00	32.24	4186.34	0.01	0.49	0	Calculated
Link-108	CONDUIT	0 12:09	7.39	1.00	23.23	46.94	0.49	1.00	34	SURCHARGED
Link-110	CONDUIT	0 11:56	10.15	1.00	5.36	37.47	0.14	0.63	0	Calculated
Link-111	CHANNEL	0 12:17	1.78	1.00	80.63	1609.60	0.05	0.46	0	Calculated
Link-112	CHANNEL	0 12:02	3.70	1.00	54.79	410.36	0.13	0.69	0	Calculated
Link-113	CONDUIT	0 12:06	10.93	1.17	33.49	46.40	0.72	0.99	0	Calculated
Link-114	CONDUIT	0 11:58	4.17	1.00	4.06	4.93	0.82	0.74	0	Calculated
Link-13	CONDUIT	0 11:57	7.47	1.00	17.25	62.45	0.28	0.69	0	Calculated
Link-15	CONDUIT	0 11:57	5.81	1.00	18.24	17.20	1.06	1.00	43	SURCHARGED
Link-16	CONDUIT	0 12:10	7.47	1.00	23.48	17.26	1.36	1.00	51	SURCHARGED
Link-17	CONDUIT	0 11:58	9.84	1.00	30.92	35.27	0.88	1.00	52	SURCHARGED
Link-18	CONDUIT	0 12:04	10.25	3.52	32.20	47.53	0.68	1.00	50	SURCHARGED
Link-19	CONDUIT	0 12:05	6.58	1.00	32.29	25.21	1.28	1.00	12	SURCHARGED
Link-30	CONDUIT	0 12:16	8.66	1.00	42.53	71.48	0.60	1.00	80	SURCHARGED
Link-31	CONDUIT	0 12:15	11.40	1.00	55.98	13.89	4.03	1.00	24	SURCHARGED
Link-32	CONDUIT	0 11:53	6.36	1.00	19.97	10.12	1.97	1.00	92	SURCHARGED
Link-37	CONDUIT	0 11:54	5.78	1.00	18.17	21.80	0.83	1.00	66	SURCHARGED
Link-57	CONDUIT	0 12:06	8.91	1.00	26.30	37.51	0.70	0.93	0	Calculated
Link-58	CONDUIT	0 12:18	9.51	1.00	87.77	77.99	1.13	0.94	0	> CAPACITY
Link-59	CONDUIT	0 11:58	7.18	1.00	42.70	69.35	0.62	0.82	0	Calculated
Link-60	CONDUIT	0 11:58	6.76	1.00	42.87	57.12	0.75	0.86	0	Calculated
Link-63	CONDUIT	0 12:04	0.26	1.00	0.63	19.03	0.03	1.00	3	SURCHARGED
Link-67	CONDUIT	0 11:54	0.97	1.00	0.23	6.58	0.04	0.73	0	Calculated
Link-91	CONDUIT	0 11:59	7.80	1.00	31.95	18.31	1.74	0.78	0	> CAPACITY
Link-93	CONDUIT	0 12:00	3.81	1.00	1.28	19.77	0.06	0.36	0	Calculated
Link-94	CONDUIT	0 11:58	9.75	1.00	5.34	20.61	0.26	0.36	0	Calculated
Link-98	CONDUIT	0 12:03	12.29	1.00	135.17	224.33	0.60	0.65	0	Calculated
Weir-01	WEIR	0 12:07			13.48			0.31		
Weir-02	WEIR	0 12:15			25.16			0.88		
Weir-03	WEIR	0 12:17			33.17			1.00		

****
Highest Flow Instability Indexes
****
Link Link-18 (2)
Link Link-16 (2)
Link Link-17 (2)
Link Link-15 (2)
Link Link-19 (2)

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 19:48:05 2022
Analysis ended on: Thu Jan 27 19:48:18 2022
Total elapsed time: 00:00:13

100-Year Overview Map



100-Year Analysis Results

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.206 (Build 0)

****
Project Description
****
File Name ..... Willow Grove Analysis SCS Method R4 TR-55-Further Mod.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. SCS TR-55
Time of Concentration..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date SEP-14-2021 00:00:00
Ending Date SEP-16-2021 00:00:00
Report Time Step 00:02:00

****
Element Count
****
Number of rain gages 1
Number of subbasins 15
Number of nodes 32
Number of links 34

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	100 year	CUMULATIVE	6.00

****
Subbasin Summary
****

Subbasin ID	Total Area acres	Peak Rate Factor
Sub-01	16.49	484.00
Sub-02	7.26	484.00
Sub-03	5.16	484.00
Sub-04	7.63	484.00
Sub-06	5.62	484.00
Sub-07	0.79	484.00
Sub-09	0.69	484.00
Sub-10	0.85	484.00
Sub-11	6.42	484.00
Sub-12	1.37	484.00
Sub-13	0.17	484.00
Sub-14	0.79	484.00
Sub-15	2.21	484.00
Sub-16	6.60	484.00
Sub-17	1.39	484.00

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-02	JUNCTION	940.54	947.04	0.00	
Jun-04	JUNCTION	929.67	936.97	0.00	
Jun-05	JUNCTION	916.90	927.85	0.00	
Jun-06	JUNCTION	915.68	922.18	0.00	
Jun-07	JUNCTION	914.77	917.77	0.00	
Jun-13	JUNCTION	910.83	914.77	0.00	
Jun-15	JUNCTION	894.24	899.34	2500.00	
Jun-16	JUNCTION	892.63	899.95	0.00	
Jun-18	JUNCTION	892.27	900.56	0.00	
Jun-19	JUNCTION	891.10	902.08	0.00	
Jun-20	JUNCTION	892.03	899.00	0.00	
Jun-21	JUNCTION	890.44	898.57	0.00	
Jun-22	JUNCTION	892.70	900.70	0.00	
Jun-23	JUNCTION	892.80	899.10	0.00	
Jun-25	JUNCTION	893.18	900.05	5000.00	
Jun-26	JUNCTION	895.19	900.72	0.00	
Jun-28	JUNCTION	889.31	902.95	0.00	
Jun-29	JUNCTION	898.92	904.00	0.00	
Jun-31	JUNCTION	899.85	904.15	0.00	
Jun-32	JUNCTION	885.40	901.62	0.00	
Jun-40	JUNCTION	923.18	928.58	0.00	
Jun-42	JUNCTION	913.19	915.50	0.00	
Jun-43	JUNCTION	907.32	912.32	0.00	
Jun-47	JUNCTION	918.50	923.90	0.00	
Jun-49	JUNCTION	911.57	916.27	0.00	
Out-05	OUTFALL	884.50	888.50	0.00	
Jun-24	STORAGE	894.03	901.00	0.00	
Jun-48	STORAGE	900.01	904.00	0.00	

****
Inlet Summary
****

Inlet ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation ft	Inlet Rim Elevation ft	Ponded Area ft²	Initial Water Elevation ft	Grate Clogging Factor %
Inlet-11	FHWA HEC-22 GENERIC	N/A	On Sag	1	916.03	922.98	10.00	916.03	0.00
Inlet-12	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.69	921.24	10.00	914.69	0.00
Inlet-13	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.89	921.21	10.00	914.89	0.00
Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	914.66	919.86	10.00	914.66	0.00

****
Roadway and Gutter Summary
****

Inlet ID	Roadway Longitudinal Slope ft/ft	Roadway Cross Slope ft/ft	Roadway Manning's Roughness	Gutter Cross Slope ft/ft	Gutter Width ft	Gutter Depression in
Inlet-11	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-12	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-13	-	0.0200	0.0160	0.0620	2.00	2.00
Inlet-14	-	0.0200	0.0160	0.0620	2.00	2.00

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-07	Jun-02	Jun-04	CONDUIT	221.2	4.7778	0.0130
Link-102	Jun-29	Jun-24	CHANNEL	137.0	0.6715	0.0350
Link-103	Jun-43	Jun-20	CHANNEL	423.6	3.6096	0.0320
Link-106	Jun-32	Out-05	CHANNEL	127.6	0.7052	0.0350
Link-107	Jun-40	Jun-47	CHANNEL	225.3	2.0768	0.0300
Link-108	Jun-47	Inlet-11	CONDUIT	56.2	4.3045	0.0130
Link-110	Jun-31	Jun-32	CONDUIT	77.0	16.9373	0.0150
Link-111	Jun-22	Jun-21	CHANNEL	737.4	0.3065	0.0350
Link-112	Jun-07	Jun-48	CHANNEL	719.0	2.0124	0.0350
Link-113	Jun-48	Jun-29	CONDUIT	19.5	5.6012	0.0150
Link-114	Jun-49	Jun-13	CONDUIT	55.4	0.7767	0.0150
Link-13	Jun-04	Jun-05	CONDUIT	166.9	7.6213	0.0130
Link-15	Jun-05	Jun-06	CONDUIT	193.8	0.5780	0.0130
Link-16	Inlet-11	Jun-06	CONDUIT	34.3	0.5824	0.0130
Link-17	Jun-06	Inlet-12	CONDUIT	40.7	2.4306	0.0130
Link-18	Inlet-13	Inlet-12	CONDUIT	6.6	4.4140	0.0130
Link-19	Inlet-13	Inlet-14	CONDUIT	45.0	0.3777	0.0130
Link-30	Jun-24	Jun-23	CONDUIT	38.9	3.0373	0.0130
Link-31	Jun-23	Jun-22	CONDUIT	87.3	0.1146	0.0130
Link-32	Jun-25	Jun-23	CONDUIT	164.8	0.2003	0.0130
Link-37	Jun-26	Jun-25	CONDUIT	182.0	0.9288	0.0130
Link-57	Jun-20	Jun-28	CONDUIT	39.6	2.7497	0.0130
Link-58	Jun-21	Jun-28	CONDUIT	141.5	0.6008	0.0130
Link-59	Jun-19	Jun-28	CONDUIT	83.3	1.0811	0.0130
Link-60	Jun-18	Jun-19	CONDUIT	145.9	0.7335	0.0130
Link-63	Jun-16	Jun-18	CONDUIT	68.8	0.3777	0.0130
Link-67	Jun-15	Jun-16	CONDUIT	37.6	1.0383	0.0130
Link-91	Jun-07	Inlet-14	CONDUIT	55.2	0.1993	0.0130
Link-93	Jun-42	Jun-13	CONDUIT	61.8	3.5437	0.0130
Link-94	Jun-13	Jun-43	CONDUIT	91.2	3.8508	0.0130
Link-98	Jun-28	Jun-32	CONDUIT	196.7	1.3013	0.0130
Weir-01	Jun-48	Jun-29	WEIR			
Weir-02	Jun-25	Jun-22	WEIR			
Weir-03	Jun-24	Jun-25	WEIR			

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-07	CIRCULAR	2.00	2.00	1	3.14	0.50	49.45
Link-102	TRIANGULAR	2.00	50.00	1	50.00	1.00	173.59
Link-103	TRAPEZOIDAL	5.00	57.50	1	206.25	3.49	4187.65
Link-106	TRAPEZOIDAL	4.00	25.00	1	56.00	2.11	328.75
Link-107	TRAPEZOIDAL	5.40	67.12	1	248.72	3.62	4186.34
Link-108	CIRCULAR	2.00	2.00	1	3.14	0.50	46.94
Link-110	CIRCULAR	1.50	1.50	1	1.77	0.38	37.47
Link-111	TRAPEZOIDAL	8.00	66.00	1	272.00	3.99	1609.60
Link-112	TRIANGULAR	3.00	35.00	1	52.50	1.48	410.36
Link-113	CIRCULAR	2.00	2.00	1	3.14	0.50	46.40
Link-114	CIRCULAR	1.25	1.25	1	1.23	0.31	4.93
Link-13	CIRCULAR	2.00	2.00	1	3.14	0.50	62.45
Link-15	CIRCULAR	2.00	2.00	1	3.14	0.50	17.20
Link-16	CIRCULAR	2.00	2.00	1	3.14	0.50	17.26
Link-17	CIRCULAR	2.00	2.00	1	3.14	0.50	35.27
Link-18	CIRCULAR	2.00	2.00	1	3.14	0.50	47.53
Link-19	CIRCULAR	2.50	2.50	1	4.91	0.63	25.21
Link-30	CIRCULAR	2.50	2.50	1	4.91	0.63	71.48
Link-31	CIRCULAR	2.50	2.50	1	4.91	0.63	13.89
Link-32	CIRCULAR	2.00	2.00	1	3.14	0.50	10.12
Link-37	CIRCULAR	2.00	2.00	1	3.14	0.50	21.80
Link-57	CIRCULAR	2.00	2.00	1	3.14	0.50	37.51
Link-58	CIRCULAR	3.50	3.50	1	9.62	0.88	77.99
Link-59	CIRCULAR	3.00	3.00	1	7.07	0.75	69.35
Link-60	CIRCULAR	3.00	3.00	1	7.07	0.75	57.12
Link-63	CIRCULAR	2.25	2.25	1	3.98	0.56	19.03
Link-67	CIRCULAR	1.25	1.25	1	1.23	0.31	6.58
Link-91	CIRCULAR	2.50	2.50	1	4.91	0.63	18.31
Link-93	CIRCULAR	1.50	1.50	1	1.77	0.38	19.77
Link-94	CIRCULAR	1.50	1.50	1	1.77	0.38	20.61
Link-98	CIRCULAR	4.50	4.50	1	15.90	1.13	224.33

********** Runoff Quantity Continuity **********	Volume acre-ft	Depth inches
Total Precipitation	33.043	6.250
Surface Runoff	0.217	0.041
Continuity Error (%)	-0.001	

********** Flow Routing Continuity **********	Volume acre-ft	Volume Mgallons
External Inflow	0.000	0.000
External Outflow	25.355	8.262
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.001	0.000
Continuity Error (%)	-0.001	

****
Composite Curve Number Computations Report
****

Subbasin Sub-01

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	2.10	D	84.00
Paved parking & roofs	2.76	D	98.00
Urban commercial, 85% imp	8.47	D	95.00
> 75% grass cover, Good	3.16	D	80.00
Composite Area & Weighted CN	16.49		91.23

Subbasin Sub-02

Soil/Surface Description	Area (acres)	Soil Group	CN
Urban commercial, 85% imp	3.94	D	95.00
> 75% grass cover, Good	1.08	D	80.00
Paved parking & roofs	2.24	D	98.00
Composite Area & Weighted CN	7.26		93.70

Subbasin Sub-03

Soil/Surface Description	Area (acres)	Soil Group	CN
1 acre lots, 20% impervious	4.76	D	84.00
Urban commercial, 85% imp	0.40	D	95.00
Composite Area & Weighted CN	5.16		84.86

Subbasin Sub-04

Soil/Surface Description	Area (acres)	Soil Group	CN
1/4 acre lots, 38% impervious	7.23	D	87.00
Paved parking & roofs	0.40	D	98.00
Composite Area & Weighted CN	7.63		87.58

Subbasin Sub-06

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	2.66	D	98.00
Urban commercial, 85% imp	0.00	D	95.00
50 - 75% grass cover, Fair	2.96	D	84.00
Composite Area & Weighted CN	5.62		90.63

Subbasin Sub-07

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.46	D	98.00
-	0.33	-	0.00
Composite Area & Weighted CN	0.79		57.27

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	0.38	D	98.00
> 75% grass cover, Good	0.31	D	80.00
Composite Area & Weighted CN	0.69		89.91

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
-	0.60	-	98.00
50 - 75% grass cover, Fair	0.25	D	84.00
Composite Area & Weighted CN	0.85		93.94

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved roads with curbs & sewers	3.09	D	98.00
> 75% grass cover, Good	3.33	D	80.00
Composite Area & Weighted CN	6.42		88.66

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.32	D	98.00
> 75% grass cover, Good	0.05	D	80.00
Composite Area & Weighted CN	1.37		97.35

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.09	D	98.00
> 75% grass cover, Good	0.07	D	80.00
Composite Area & Weighted CN	0.17		90.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.46	D	98.00
> 75% grass cover, Good	0.34	D	80.00
Composite Area & Weighted CN	0.79		90.31

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	0.95	D	98.00
> 75% grass cover, Good	1.26	D	80.00
Composite Area & Weighted CN	2.21		87.74

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
-	2.46	-	72.00
> 75% grass cover, Good	4.14	D	80.00
Composite Area & Weighted CN	6.60		77.02

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Paved parking & roofs	1.17	D	98.00

> 75% grass cover, Good	0.23	D	80.00
Composite Area & Weighted CN	1.39		95.07

****
SCS TR-55 Time of Concentration Computations Report
****

Sheet Flow Equation

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where:

Tc = Time of Concentration (hrs)
n = Manning's Roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hrs)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's Roughness

Subbasin Sub-01

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	100.00	0.00	0.00
Slope (%):	4.50	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.14	0.00	0.00
Computed Flow Time (minutes):	11.60	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	640.00	287.00	0.00
Slope (%):	10.60	3.20	0.00
Surface Type:	Unpaved	Paved	Unpaved
Velocity (ft/sec):	5.25	3.64	0.00
Computed Flow Time (minutes):	2.03	1.31	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.03	0.00	0.00
Flow Length (ft):	500.00	0.00	0.00
Channel Slope (%):	1.45	0.00	0.00
Cross Section Area (ft²):	5.00	0.00	0.00
Wetted Perimeter (ft):	12.00	0.00	0.00
Velocity (ft/sec):	3.34	0.00	0.00
Computed Flow Time (minutes):	2.50	0.00	0.00
Total TOC (minutes):	17.45		

Subbasin Sub-02

User-Defined TOC override (minutes): 9.26

Subbasin Sub-03

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.30	0.00	0.00
Flow Length (ft):	50.00	0.00	0.00
Slope (%):	12.00	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	5.21	0.00	0.00

Shallow Concentrated Flow Computations

	Subarea A	Subarea B	Subarea C
Flow Length (ft):	322.00	0.00	0.00
Slope (%):	6.21	0.00	0.00
Surface Type:	Unpaved	Unpaved	Unpaved
Velocity (ft/sec):	4.02	0.00	0.00
Computed Flow Time (minutes):	1.33	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C

Manning's Roughness:	0.01	0.00	0.00
Flow Length (ft):	439.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	11.21	0.00	0.00
Computed Flow Time (minutes):	0.65	0.00	0.00
Total TOC (minutes):	7.20		

Subbasin Sub-04

User-Defined TOC override (minutes): 5.00

Subbasin Sub-06

User-Defined TOC override (minutes): 5.31

Subbasin Sub-07

User-Defined TOC override (minutes): 5.83

Subbasin Sub-09

User-Defined TOC override (minutes): 5.50

Subbasin Sub-10

User-Defined TOC override (minutes): 5.00

Subbasin Sub-11

Sheet Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.25	0.00	0.00
Flow Length (ft):	62.00	0.00	0.00
Slope (%):	7.40	0.00	0.00
2 yr, 24 hr Rainfall (in):	2.70	2.70	2.70
Velocity (ft/sec):	0.16	0.00	0.00
Computed Flow Time (minutes):	6.49	0.00	0.00

Channel Flow Computations

	Subarea A	Subarea B	Subarea C
Manning's Roughness:	0.04	0.00	0.00
Flow Length (ft):	1033.00	0.00	0.00
Channel Slope (%):	2.41	0.00	0.00
Cross Section Area (ft²):	2.00	0.00	0.00
Wetted Perimeter (ft):	4.00	0.00	0.00
Velocity (ft/sec):	4.16	0.00	0.00
Computed Flow Time (minutes):	4.14	0.00	0.00
Total TOC (minutes):	10.62		

Subbasin Sub-12

User-Defined TOC override (minutes): 5.00

Subbasin Sub-13

User-Defined TOC override (minutes): 5.00

Subbasin Sub-14

User-Defined TOC override (minutes): 5.00

Subbasin Sub-15

User-Defined TOC override (minutes): 5.00

Subbasin Sub-16

User-Defined TOC override (minutes): 8.26

Subbasin Sub-17

User-Defined TOC override (minutes): 5.00

****
Subbasin Runoff Summary
****

Subbasin ID	Total Precip in	Total Runoff in	Peak Runoff cfs	Weighted Curve Number	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	6.25	5.23	94.87	91.230	0	00:17:27
Sub-02	6.25	5.51	51.58	93.700	0	00:09:15
Sub-03	6.25	4.52	33.87	84.860	0	00:07:12
Sub-04	6.25	4.82	55.97	87.580	0	00:05:00
Sub-06	6.25	5.16	42.81	90.630	0	00:05:18
Sub-07	6.25	1.85	2.16	57.270	0	00:05:49
Sub-09	6.25	5.08	5.19	89.910	0	00:05:30
Sub-10	6.25	5.54	6.79	93.940	0	00:05:00
Sub-11	6.25	4.94	41.31	88.660	0	00:10:37
Sub-12	6.25	5.93	11.21	97.350	0	00:05:00
Sub-13	6.25	5.09	1.27	90.000	0	00:05:00
Sub-14	6.25	5.12	6.07	90.310	0	00:05:00
Sub-15	6.25	4.84	16.24	87.740	0	00:05:00

Sub-16	6.25	3.70	35.16	77.020	0	00:08:15
Sub-17	6.25	5.67	11.25	95.070	0	00:05:00

****
Node Depth Summary
****

Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-02	0.05	0.85	941.39	0	11:58	0	0	0:00:00
Jun-04	0.05	1.03	930.70	0	11:58	0	0	0:00:00
Jun-05	0.18	8.20	925.10	0	11:56	0	0	0:00:00
Jun-06	0.23	6.50	922.18	0	11:54	1.67	12	0:00:00
Jun-07	0.21	1.50	916.27	0	12:00	0	0	0:00:00
Jun-13	0.06	1.27	912.10	0	11:58	0	0	0:00:00
Jun-15	0.01	2.14	896.38	0	11:55	0	0	0:00:00
Jun-16	0.03	3.74	896.37	0	11:58	0	0	0:00:00
Jun-18	0.14	4.10	896.37	0	11:58	0	0	0:00:00
Jun-19	0.14	3.36	894.46	0	11:58	0	0	0:00:00
Jun-20	0.13	3.09	895.12	0	12:05	0	0	0:00:00
Jun-21	0.42	5.28	895.72	0	12:16	0	0	0:00:00
Jun-22	0.36	3.19	895.89	0	12:16	0	0	0:00:00
Jun-23	0.58	6.62	899.42	0	12:13	0	0	0:00:00
Jun-25	0.44	6.92	900.10	0	12:11	0.06	8	0:00:00
Jun-26	0.23	5.53	900.72	0	11:51	3.26	18	0:00:00
Jun-28	0.33	3.73	893.04	0	12:03	0	0	0:00:00
Jun-29	0.29	2.66	901.58	0	12:10	0	0	0:00:00
Jun-31	0.03	0.43	900.28	0	11:56	0	0	0:00:00
Jun-32	0.36	3.15	888.55	0	12:02	0	0	0:00:00
Jun-40	0.02	0.73	923.91	0	12:04	0	0	0:00:00
Jun-42	0.02	0.33	913.52	0	11:58	0	0	0:00:00
Jun-43	0.01	0.13	907.45	0	11:59	0	0	0:00:00
Jun-47	0.15	5.40	923.90	0	12:04	0.90	5	0:00:00
Jun-49	0.06	1.37	912.94	0	11:58	0	0	0:00:00
Out-05	0.35	2.93	887.43	0	12:02	0	0	0:00:00
Jun-24	0.37	6.97	901.00	0	12:10	2.86	7	0:00:00
Jun-48	0.20	3.26	903.27	0	12:06	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
Jun-02	JUNCTION	15.93	15.93	0	11:58	0.00		
Jun-04	JUNCTION	5.93	21.84	0	11:58	0.00		
Jun-05	JUNCTION	1.24	23.08	0	11:58	0.00		
Jun-06	JUNCTION	11.02	44.20	0	12:02	14.05	0	12:02
Jun-07	JUNCTION	35.09	65.25	0	12:00	0.00		
Jun-13	JUNCTION	0.00	7.28	0	11:58	0.00		
Jun-15	JUNCTION	0.00	0.66	0	11:54	0.00		
Jun-16	JUNCTION	0.00	0.77	0	11:52	0.00		
Jun-18	JUNCTION	54.77	54.78	0	11:56	0.00		
Jun-19	JUNCTION	0.00	54.79	0	11:56	0.00		
Jun-20	JUNCTION	42.33	49.18	0	11:58	0.00		
Jun-21	JUNCTION	51.51	111.42	0	12:04	0.00		
Jun-22	JUNCTION	0.00	90.13	0	12:10	0.00		
Jun-23	JUNCTION	0.00	55.32	0	12:10	0.00		
Jun-25	JUNCTION	11.06	48.98	0	12:09	2.00	0	12:09
Jun-26	JUNCTION	33.70	33.70	0	11:58	17.63	0	12:00
Jun-28	JUNCTION	0.00	153.23	0	12:03	0.00		
Jun-29	JUNCTION	94.32	152.07	0	12:05	0.00		
Jun-31	JUNCTION	6.65	6.65	0	11:56	0.00		
Jun-32	JUNCTION	0.00	158.10	0	12:02	0.00		
Jun-40	JUNCTION	40.99	40.99	0	12:00	0.00		
Jun-42	JUNCTION	2.14	2.14	0	11:58	0.00		
Jun-43	JUNCTION	0.00	7.29	0	11:58	0.00		
Jun-47	JUNCTION	0.00	40.96	0	12:01	21.54	0	12:05
Jun-49	JUNCTION	5.15	5.15	0	11:58	0.00		
Out-05	OUTFALL	0.00	158.09	0	12:02	0.00		
Jun-24	STORAGE	0.00	144.64	0	12:06	46.58	0	12:10
Jun-48	STORAGE	0.00	64.60	0	12:00	0.00		

****
Inlet Depth Summary
****

Inlet ID	Max Gutter Spread during Peak Flow ft	Max Gutter Water Elev during Peak Flow ft	Max Gutter Water Depth during Peak Flow ft	Time of Maximum Depth Occurrence days	Time of Maximum Depth Occurrence hh:mm
Inlet-11	2.02	923.13	0.15	0	11:55
Inlet-12	2.02	921.39	0.15	0	11:53
Inlet-13	2.02	921.36	0.15	0	11:55
Inlet-14	2.02	920.01	0.15	0	11:53

****
Inlet Flow Summary
****

Inlet ID	Peak Flow cfs	Peak Lateral Flow cfs	Peak Flow Intercepted by Inlet cfs	Peak Flow Bypassing Inlet cfs	Inlet Efficiency during Peak Flow %	Total Flooding acre-in	Total Time Flooded minutes
Inlet-11	0.00	0.00	-	-	-	0.025	3
Inlet-12	0.00	0.00	-	-	-	0.028	2
Inlet-13	0.00	0.00	-	-	-	0.010	0
Inlet-14	0.00	0.00	-	-	-	0.008	0

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded Volume 1000 ft³	Maximum Ponded Volume (%)	Time of Max Ponded Volume days hh:mm	Average Ponded Volume 1000 ft³	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft³

Jun-24	83.634	100	0	12:10	1.757	2	81.54	0.00	0:00:00	0.000
Jun-48	3.600	48	0	12:06	0.051	1	57.84	0.00	0:00:00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-05	80.91	8.35	158.09
System	80.91	8.35	158.09

****
Link Flow Summary
****

Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained ft/sec	Length Factor	Peak Flow during Analysis cfs	Design Flow Capacity cfs	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
Link-07	CONDUIT	0 11:58	13.19	1.00	15.92	49.45	0.32	0.41	0	Calculated
Link-102	CHANNEL	0 12:06	3.43	1.00	144.64	173.59	0.83	1.00	24	FLOODED
Link-103	CHANNEL	0 11:59	0.19	1.00	7.11	4187.65	0.00	0.32	0	Calculated
Link-106	CHANNEL	0 12:02	4.57	1.00	158.09	328.75	0.48	0.76	0	Calculated
Link-107	CHANNEL	0 12:01	1.06	1.00	40.96	4186.34	0.01	0.57	0	Calculated
Link-108	CONDUIT	0 12:13	7.58	1.00	23.81	46.94	0.51	1.00	43	SURCHARGED
Link-110	CONDUIT	0 11:56	9.16	1.00	6.65	37.47	0.18	0.64	0	Calculated
Link-111	CHANNEL	0 12:20	1.78	1.00	88.38	1609.60	0.05	0.53	0	Calculated
Link-112	CHANNEL	0 12:00	3.72	1.00	64.60	410.36	0.16	0.74	0	Calculated
Link-113	CONDUIT	0 12:02	10.76	1.17	33.60	46.40	0.72	1.00	24	SURCHARGED
Link-114	CONDUIT	0 11:58	4.48	1.00	5.14	4.93	1.04	0.88	0	> CAPACITY
Link-13	CONDUIT	0 11:58	8.60	1.00	21.84	62.45	0.35	0.76	0	Calculated
Link-15	CONDUIT	0 11:58	7.35	1.00	23.08	17.20	1.34	1.00	52	SURCHARGED
Link-16	CONDUIT	0 12:12	7.70	1.00	24.18	17.26	1.40	1.00	60	SURCHARGED
Link-17	CONDUIT	0 12:05	11.34	1.00	35.62	35.27	1.01	1.00	61	SURCHARGED
Link-18	CONDUIT	0 12:05	10.63	3.52	33.39	47.53	0.70	1.00	59	SURCHARGED
Link-19	CONDUIT	0 12:05	6.73	1.00	33.06	25.21	1.31	1.00	17	SURCHARGED
Link-30	CONDUIT	0 12:18	8.78	1.00	43.09	71.48	0.60	1.00	93	SURCHARGED
Link-31	CONDUIT	0 12:10	11.27	1.00	55.31	13.89	3.98	1.00	46	SURCHARGED
Link-32	CONDUIT	0 11:49	6.34	1.00	19.92	10.12	1.97	1.00	106	SURCHARGED
Link-37	CONDUIT	0 11:51	5.81	1.00	18.26	21.80	0.84	1.00	79	SURCHARGED
Link-57	CONDUIT	0 12:06	9.81	1.00	30.66	37.51	0.82	1.00	7	SURCHARGED
Link-58	CONDUIT	0 12:16	10.48	1.00	98.01	77.99	1.26	0.99	0	> CAPACITY
Link-59	CONDUIT	0 11:56	8.04	1.00	54.83	69.35	0.79	0.97	0	Calculated
Link-60	CONDUIT	0 11:56	7.75	1.00	54.79	57.12	0.96	1.00	4	SURCHARGED
Link-63	CONDUIT	0 12:04	0.26	1.00	0.92	19.03	0.05	1.00	10	SURCHARGED
Link-67	CONDUIT	0 11:54	1.12	1.00	0.66	6.58	0.10	1.00	6	SURCHARGED
Link-91	CONDUIT	0 12:05	8.06	1.00	32.62	18.31	1.78	0.80	0	> CAPACITY
Link-93	CONDUIT	0 11:58	4.01	1.00	2.14	19.77	0.11	0.48	0	Calculated
Link-94	CONDUIT	0 11:58	10.06	1.00	7.29	20.61	0.35	0.46	0	Calculated
Link-98	CONDUIT	0 12:03	12.55	1.00	153.22	224.33	0.68	0.72	0	Calculated
Weir-01	WEIR	0 12:06			27.13			0.44		
Weir-02	WEIR	0 12:11			34.87			1.00		
Weir-03	WEIR	0 12:18			38.45			1.00		

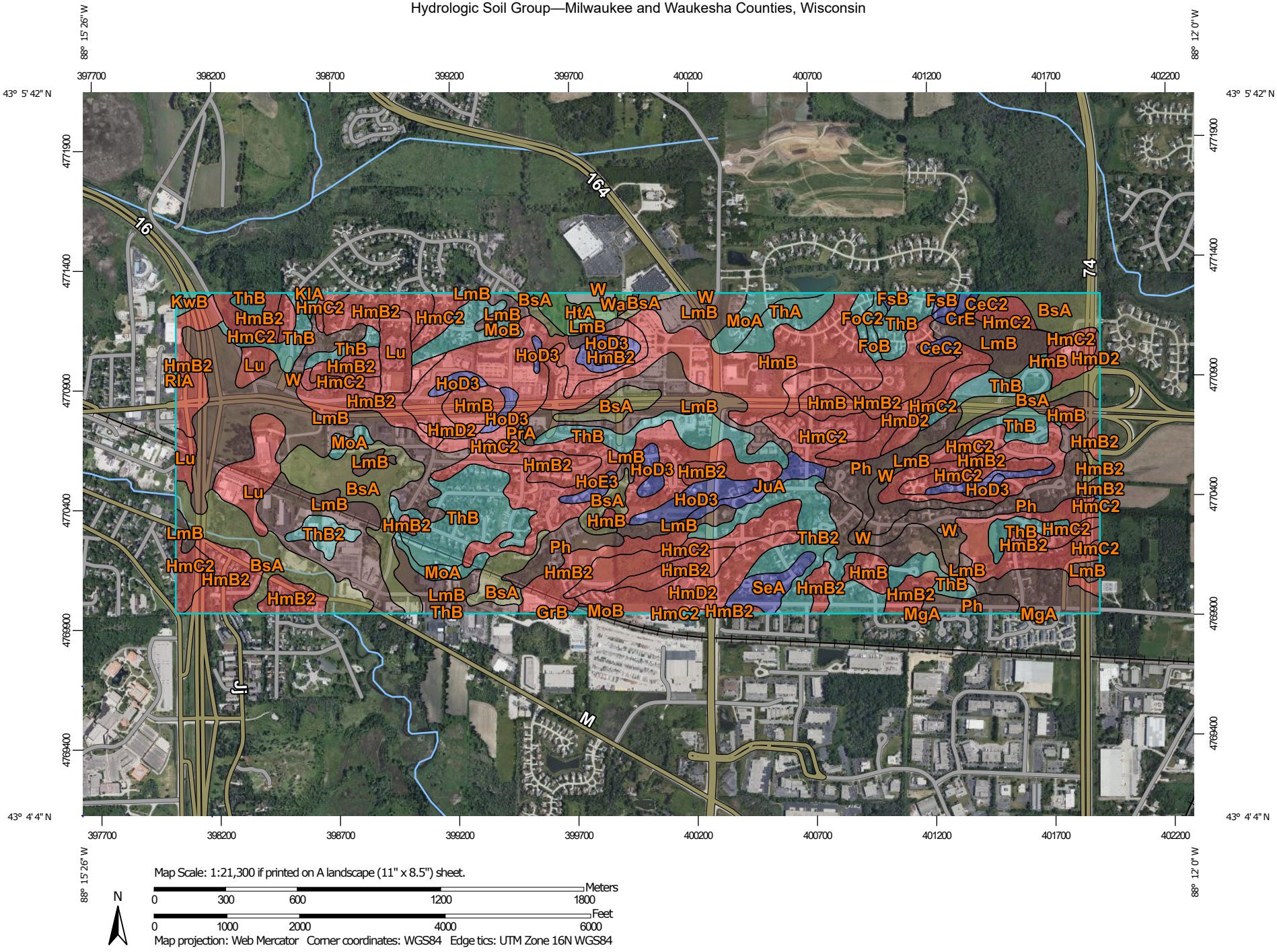
****
Highest Flow Instability Indexes
****
Link Link-18 (1)
Link Link-17 (1)
Link Link-16 (1)
Link Link-15 (1)
Link Link-30 (1)

WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-07.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-22.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-25.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-40.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-43.
WARNING 002 : Max/rim elevation (depth) increased to account for connecting conduit height dimensions for Node Jun-47.

Analysis began on: Thu Jan 27 19:49:50 2022
Analysis ended on: Thu Jan 27 19:50:02 2022
Total elapsed time: 00:00:12

Appendix G

NRCS Hydrologic Soil Group



Map Scale: 1:21,300 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 300 600 1200 1800

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Milwaukee and Waukesha Counties, Wisconsin
Survey Area Data: Version 17, Sep 10, 2021

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

Date(s) aerial images were photographed: May 20, 2020—Aug 20, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BsA	Brookston silt loam, 0 to 2 percent slopes	C/D	116.6	9.1%
CeB	Casco loam, 2 to 6 percent slopes	B	1.3	0.1%
CeC2	Casco loam, 6 to 12 percent slopes, eroded	B	3.7	0.3%
CrE	Casco-Rodman complex, 20 to 30 percent slopes	B	1.8	0.1%
FoB	Fox loam, 2 to 6 percent slopes	C	3.5	0.3%
FoC2	Fox loam, 6 to 12 percent slopes, eroded	C	2.9	0.2%
FsB	Fox silt loam, 2 to 6 percent slopes	B	2.4	0.2%
GrB	Grays silt loam, 2 to 6 percent slopes	B	0.4	0.0%
HmB	Hochheim loam, 2 to 6 percent slopes	D	96.2	7.5%
HmB2	Hochheim loam, 2 to 6 percent slopes, eroded	D	201.6	15.7%
HmC2	Hochheim loam, 6 to 12 percent slopes, eroded	D	197.4	15.3%
HmD2	Hochheim loam, 12 to 20 percent slopes, eroded	D	42.3	3.3%
HoC3	Hochheim soils, 6 to 12 percent slopes, severely eroded	B	0.2	0.0%
HoD3	Hochheim soils, 12 to 20 percent slopes, severely eroded	B	31.7	2.5%
HoE3	Hochheim soils, 20 to 30 percent slopes, severely eroded	B	4.8	0.4%
HtA	Houghton muck, 0 to 2 percent slopes	A/D	10.4	0.8%
JuA	Juneau silt loam, 1 to 3 percent slopes	B	7.3	0.6%
KlA	Kendall silt loam, 1 to 3 percent slopes	C	1.5	0.1%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
KwB	Knowles silt loam, 2 to 6 percent slopes	C	2.3	0.2%
LmB	Lamartine silt loam, 0 to 3 percent slopes	B/D	249.3	19.4%
Lu	Loamy land	D	37.2	2.9%
MgA	Martinton silt loam, 1 to 3 percent slopes	C	0.2	0.0%
MoA	Mayville silt loam, 0 to 2 percent slopes	C	16.5	1.3%
MoB	Mayville silt loam, 2 to 6 percent slopes	C	13.6	1.1%
Ph	Pella silt loam, 0 to 2 percent slopes	B/D	57.8	4.5%
PrA	Pistakee silt loam, 1 to 3 percent slopes	C	0.5	0.0%
RlA	Ritchey silt loam, mottled subsoil variant, 1 to 3 percent	C	0.3	0.0%
SeA	St. Charles silt loam, gravelly subtratum, 0 to 2 percent slopes	B	9.7	0.7%
ShB	Saylesville silt loam, 2 to 6 percent slopes	C	0.0	0.0%
ThA	Theresa silt loam, 0 to 2 percent slopes	C	11.1	0.9%
ThB	Theresa silt loam, 2 to 6 percent slopes	C	123.5	9.6%
ThB2	Theresa silt loam, 2 to 6 percent slopes, eroded	C	33.7	2.6%
W	Water		4.6	0.4%
Wa	Wallkill silt loam	B/D	0.8	0.1%
Totals for Area of Interest			**1,287.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix H

FEMA Firm Panel

88°15'W 43°5'44.12"N

88°13'7.09"W 43°3'38.44"N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **12/2/2021 12:51 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 500 feet 1:6,000

0 250 500 1,000 1,500 2,000 Feet

0 50 100 200 300 400 Meters

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL **203** OF **478**

Panel Contains:

COMMUNITY	NUMBER	PANEL
VILLAGE OF PEWAUKEE	550489	0203
CITY OF PEWAUKEE	550192	0203

MAP NUMBER
55133C0203G
EFFECTIVE DATE
November 05, 2014

Appendix I

Wisconsin DNR Surface Water Data Viewer – Mapped Wetland Limits

Surface Water Data Viewer Map

Legend

🟩 Wetland Class Areas

Wetland Class Points

- △ Dammed pond
- ▣ Excavated pond
- Filled/drained wetland
- Wetland too small to delineate
- 🟥 Filled excavated pond

▨ Filled Points

▨ Wetland Class Areas

▨ Filled Areas

🟩 Wetland Class Areas

Wetland Class Points

- △ Dammed pond
- ▣ Excavated pond
- Filled/drained wetland
- Wetland too small to delineate
- 🟥 Filled excavated pond

▨ Filled Points

▨ Wetland Class Areas

▨ Filled Areas

◆ Wetland Identifications and Confirmations

☐ Municipality

☐ State Boundaries

☐ County Boundaries

Major Roads

- — Interstate Highway
- — State Highway
- — US Highway

County and Local Roads

- — County HWY
- — Local Road

Railroads

Tribal Lands

Rivers and Streams

Intermittent Streams

🟦 Lakes and Open water

☐ Index to EN_Image_Basemap_Leaf_Off

0.3 0 0.13 0.3 Miles

1:7,920

NAD_1983_HARN_Wisconsin_TM

Notes