Dudley Avenue Flood Resilience Project

February 10, 2022

Prepared for the City of Newport by Fuss & O'Neill

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Executive Summary & Project Background

The residential neighborhood immediately downstream of the Pell School on Dudley Avenue has experienced substantial flooding over the years during storm events. Some neighbors have linked this flooding to past school expansions, and current plans for improvements at the school have heightened some concerns about potentially increasing flood impacts. This report summarizes an analysis looking to better understand the causes of the flooding experienced by the school's neighbors along Dudley Avenue and simultaneously considers potential alternatives that could reduce the scale and frequency of these events.

To evaluate flooding and potential solutions, hydrologic and hydraulic models were developed for existing and proposed conditions. Four storm types were evaluated for this system: the 1-inch, 2-inch, 3.4-inch, and 5-inch rainfall events (reference section 2, Storms and Flooding for a more detailed explanation). Photographs gathered from residents who have experienced frequent flooding on private properties were used as reference points during the model development both to help calibrate the model as well as observe results from actual storm events.

The analysis of the existing conditions model showed surface flooding in locations that correspond with community feedback about observed flooding locations along Dudley Avenue. In the 1- and 2-inch storms, surface flooding was observed predominantly in the backyards of several private residences along Dudley Avenue and eventually the eastern portion of Dudley Avenue near the intersection with Sagamore Street. The analysis suggests that the stormwater runoff causing this flooding does not originate from the school property, but rather originates from the eastern properties along West Main Street where there is no stormwater infrastructure. In the 3.4- and 5-inch storm event, surface flooding was observed at the same locations as mentioned above and additionally on Dexter Street north and west of the school and on the eastern school playground.

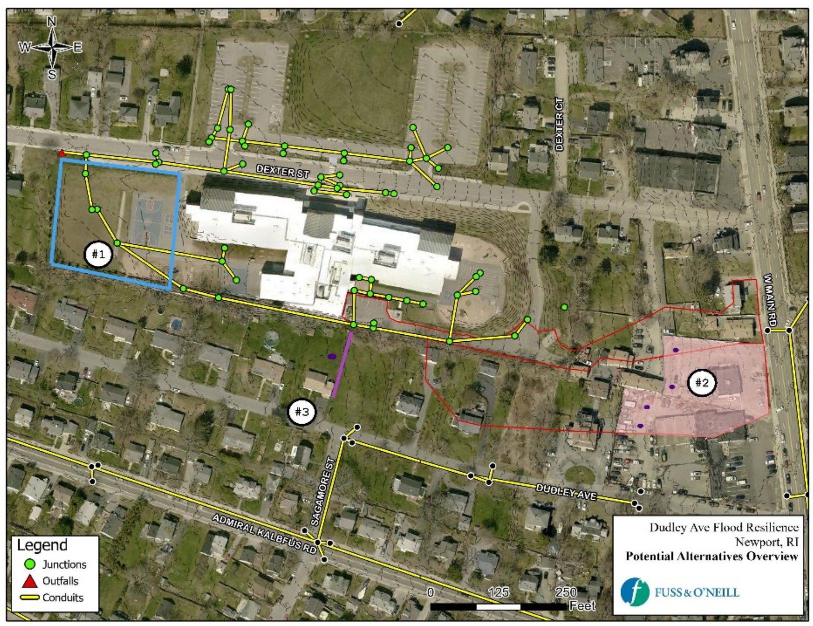

Figure ES1. Proposed Alternative Locations

The analysis does reveal a connection forming between the flooding on the southern edge of the school property and the Dudley Avenue backyards. However this connection occurs only after the flood waters in the backyards have already reached peak depth and extent. This indicates that the cause of the connection stems from the water accumulating first in the Dudley Avenue backyards and is not occurring because of water flowing south from the school property.

Several alternative structural improvements to the existing drainage system were assessed to potentially reduce flooding in the project area. Since the developed areas of the school do not appear to be the primary driver of flooding, the three alternatives were developed with an emphasis placed on addressing the runoff draining directly to the backyards of the private residences.

These alternatives include:

Alternative 1, Proposed School Stormwater Infrastructure: The City of Newport is proposing an eight-classroom expansion project at Claiborne Pell Elementary School. As part of this project, the City is proposing regrading and partial paving of the western grass field, as well as installation of new stormwater infrastructure to capture water accumulating in this area. Alternative 1 assumes that that the stormwater improvements proposed as part of the classroom expansion are complete and successfully capture all stormwater runoff originating from the field. The results indicate that the removal of the western grass field produced no significant reduction in maximum flood inundation extent, depth, or duration within the residential backyards along Dudley Avenue.

Alternative 2, Stormwater Infrastructure Along West Main Road Properties: The focus of Alternative 2 includes the installation of stormwater infrastructure (catch basins) along the western boundary of the impervious commercial area along West Main Road to capture runoff before it reaches the backyards along Dudley Avenue. The model results indicate that the proposed stormwater infrastructure improvements along West Main Road would help to reduce stormwater flooding in the backyard areas under the more frequent, lower depth storm events. It should be noted that these improvements are not in the City of Newport and coordination would be required with Middletown, RI for any further consideration.

Alternative 3, Stormwater Infrastructure on Private Property Along Dudley Avenue: The focus of Alternative 3 includes the excavation of a small swale to prevent the propagation of surface flooding from traveling west across the low-lying areas within the Dudley Avenue backyards. The swale outlets into a proposed subsurface infiltration chamber that retains approximately 2,200 ft3 of stormwater. The model results indicate that the proposed stormwater improvements within the Dudley Avenue backyards would minimally reduce maximum stormwater flooding for storm events greater than the 1-inch storm.

In addition to the alternatives examined in this study, there are opportunities for private homeowners along Dudley Avenue to implement small-scale green infrastructure practices, like swales or raingardens, on their own properties. These small-scale practices have the potential to produce localized reductions to flood depths and extents. However, these practices would produce more significant beneficial cumulative effects when implemented together with the proposed alternatives mentioned above.

The opinion of cost to implement Alternative 1 is not included in this report as the improvements included in Alternative 1 are part of the City's proposed eight-class expansion project (separate from this project) that is still under development. An Order of Magnitude level opinion of cost has been prepared for the proposed improvements as part of Alternatives 2 and Alternative 3 and range from $240,000 to $50,000 respectively.

1 What Is the Purpose of this Project?

The residential neighborhood immediately downstream of the Pell Elementary School on Dudley Avenue has experienced flooding over the years during significant storm events. Neighbors have raised concerns that this flooding could potentially be related to past school expansions, and recent plans for improvements at the school have heightened neighbors' concerns about increasing flood impacts. The purpose of this study is to better understand the causes of the flooding experienced by the Pell School downstream neighbors on Dudley Avenue and explore potential alternatives that could reduce the scale and frequency of this flooding. (Figure 1 & 2)

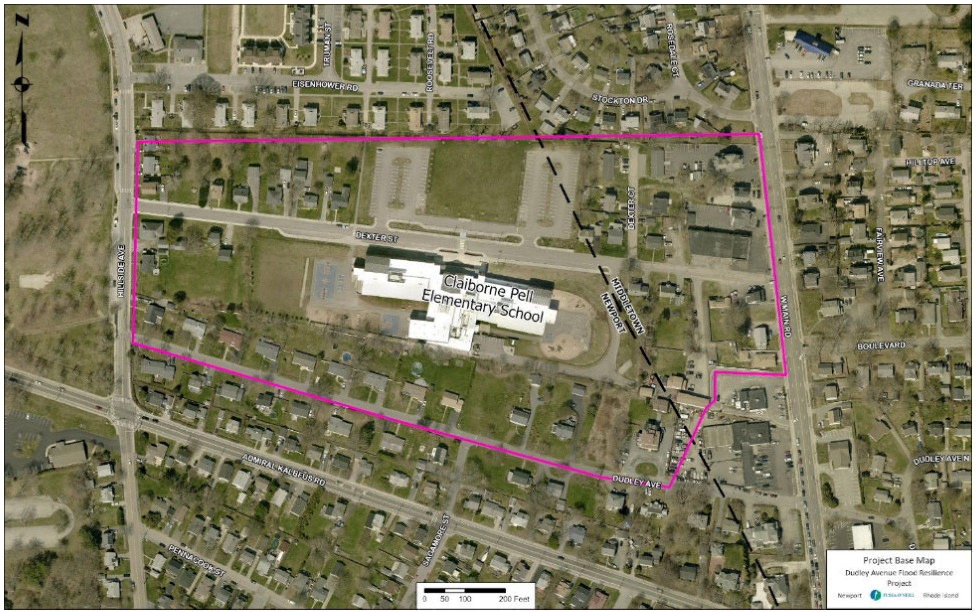

Figure 1. Dudley Avenue Project Area

Figure 2. Flooding in Rear of Private Property

2 Existing Conditions

The Dudley Avenue area drainage contains primarily medium-density residential and some commercial and school land uses. The average impervious percent in this area is currently approximately 59%. The project's drainage area extends north and east of Dudley Avenue towards the vicinity of the Dexter Street and West Main Road intersection. This drainage area generally slopes from the northeast towards the southwest. Runoff from the drainage area is collected in a closed drainage system on the school property that conveys the stormwater first to infrastructure on Dexter Street, then towards Hillside Ave and away from the system (Figure 3).

The Dudley Avenue neighborhood is in a low-lying area at the bottom of the watershed, receiving all uncaptured drainage from these upgradient areas. Several factors, including high levels of imperviousness and poor soils, exacerbate flooding in this area.

Runoff from the 17-acre drainage area travels overland before it is collected by a closed storm drainage system buried under Dexter Street and the Pell Elementary School property in this neighborhood. This system eventually discharges to municipal storm infrastructure located on Hillside Ave which convey flood flows away from the area of interest.

Figure 3. Dudley Avenue Area Drainage Area

Existing Drainage System

The existing drainage within the Pell Elementary School property generally consists of 12- to 18-inch drainage pipes that connect to 24-inch pipes along Dexter Street which convey water towards Hillside Avenue and away from the system. Due to the direction of runoff in the drainage area, the existing stormwater infrastructure on the of Dudley Avenue is downgradient was determined to not influence the flooding experienced in the private residences north of Dudley Avenue and thus was not included in this flooding analysis.

Topography

The topography of the study area generally slopes from the intersection of Dexter Street and West Main Street at the northeastern boundary of the drainage area, with water flowing in a north to south direction. One characteristic of note in the project area is that the topography between Pell Elementary School and Dudley Avenue is a natural low area that extends to Hillside Avenue (Figure 4). This low area may reflect a historic watercourse which would also be consistent with the poor soils in this area.

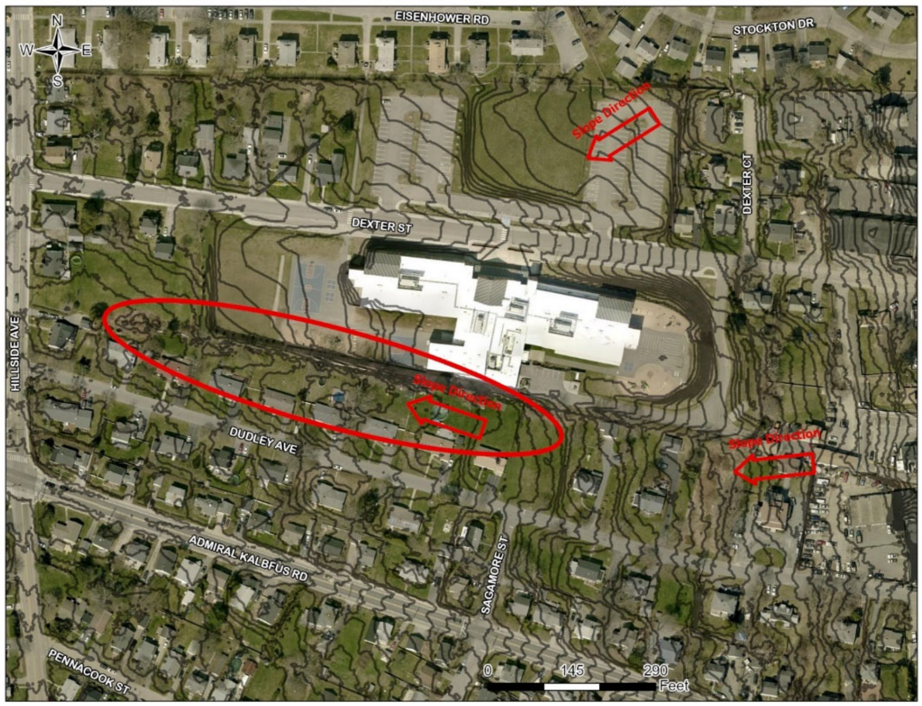

Figure 4. Elevation Contour Map

This low area presents a challenge in this watershed. Runoff will naturally want to accumulate in the low area thereby exacerbating the volume of water that needs to be managed in these areas. Additionally, there is little storm infrastructure capturing runoff originating in the eastern portion of the drainage area before it travels downgradient to this low point south of the Pell school property.

Soils

The soils in the watershed are mostly classified as Newport-Urban Land Complex and are characterized as Hydrologic Soil Group (HSG) C, which has slow infiltration capacity. In general, City of Newport soils are characterized primarily as HSG C. In comparison, HSG A and B soils have high to moderate infiltration capacity. The saturated hydraulic conductivity within the watershed could range from between 0.0 to 0.2 inches per hour; however in-situ testing is required to confirm these characterizations. As a result, there is a significant potential for runoff even from unpaved surfaces in this watershed.

Storms and Flooding

There are generally two types of storm events that are typically observed for the study area.

- **Large and sustained inland floods -** These are major floods with sustained precipitation. Recent inland floods of this type were the June 7-10, 2013 storm (5.1 inches), which was close in total rainfall to a 10-year frequency storm (5.0 inches) and the October 29-30, 2017 storm event (3.0 inches), which was close in total rainfall to a 2-year frequency storm (3.4 inches). A 10-year frequency storm is a typical standard for the design of "new" drainage systems.

Flash Floods – Flash flooding in the study area is primarily associated with summer thunderstorm systems that are characterized by large, usually isolated, thunderstorm patterns with a high intensity rainfall over a short duration. An example storm occurred on July 18, 2020, which had recorded rainfall of 1.53-inches over 5 hours.

What is a "2-Year Storm"?

A two-year frequency storm has a total amount of precipitation that has a 50% probability of being equaled or exceeded in any given year. While this storm could happen more than once in a given year, over a long period of record it would be equaled or exceeded on an average of once every two years.

For Newport, Rhode Island, a total amount of rainfall equaling 3.4-inches over a 24-hour period constitutes the 2-year rainfall amount. The typical rainfall pattern is the majority of the rain would fall within approximately 4-to-6-hour period in the middle of the 24-hour duration storm. The modeled storm events are discussed more in Section 3.

Observed Localized Flooding

A public meeting was held on October 7th, 2021. The purpose of meeting was to provide information to members of the public about this study and receive public observation and input to the study by requesting testimonials and photographs of past flooding events both during the meeting and following the meeting via email.

Photographs and narrative accounts of flooding were received from residents. The general area of concern was identified as the backyards of the private residential properties between 26 and 50 Dudley Avenue. Flood waters accumulating in this area has the potential to spill over onto Dudley Avenue near its intersection with Sagamore Street. The information gathered during these meetings was used in calibrating the SWMM model (See Section 3) which was then used to develop alternatives to address the flooding.

3 Dudley Avenue Area Drainage Model

A Storm Water Management Model (SWMM) Version 5.1.014 model was developed using PCSWMM version 7.3, for the 17-acre Dudley Avenue area drainage area, which include modeling rainfall and runoff for the entire catchment area and detailed hydraulics of the drainage system in project area.

Data Collection

A two-dimensional (2-D) surface was created within PCSWMM to model surface flooding caused by surface runoff and infrastructure surcharging within the stormwater system. Elevation data for the 2-D surface was obtained from a 1-meter digital elevation model (DEM) originating from a composite of the Spring 2011 Rhode Island Statewide USGS LiDAR[2] and contours digitized from a 2021 Perimeter and Topography survey plan[3]. One-dimensional (1-D) elements, including catch basins, manholes, and pipes, were provided as part of the City's ArcGIS storm drainage data layer. Additional 1-D elements not originally included in the City's the data layer were later added from the survey plan and supplemental drainage analysis[4]. Anecdotal and photographic evidence gathered from residents regarding frequently flooded regions were used as reference points during model development.

Modeling Approach

One-dimensional (1-D) elements, including catch basins, manholes, and pipes, were provided as part of the City of Newport's ArcGIS storm drainage data layer. Additional 1-D elements not originally included in the City's data layer were added from the survey plan and supplemental drainage analysis5. Photographic evidence gathered from residents in frequently flooded areas were used as reference points during model development both to help calibrate the model as well as observe results from an actual storm event.

Subcatchments were delineated and the average slope determined using topographic information obtained from a composite of the Spring 2011 Rhode Island Statewide USGS LiDAR and contours digitized from a 2021 Perimeter and Topography survey plan mentioned above. Subcatchments are named based on their respective outlet (Figure 5). The percent impervious value is based on the Rhode Island Department of Environmental Management impervious surface raster data layer, with impervious percentages ranging from 2 to 100%. The subcatchment widths were determined based on typical flow paths to reach the storm drain system.

The system was modeled using a combined one and two-dimensional model in which the closed drainage system connects to the land surface to model the depth and extent of flooding from surcharging catch basins and overland runoff. The hydrologic properties of the subcatchments within the modeled drainage basin were determined from available topographic, land use, soils, and hydrography data. Rainfall infiltration rates were calculated using the Modified Green-Ampt Method. Soil data from the National

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[2] 2011 U.S. Geological Survey Topographic LiDAR: LiDAR for the North East from 2010-06-15 to 2010-08-15. NOAA National Centers for Environmental Information, https://www.fisheries.noaa.gov/inport/item/49844.

[3] "Perimeter and Topography Survey for Claiborne Pell Elementary School Situated on 35 Dexter Street Newport, Rhode Island Prepared for Studio Jaed", Dated March 2021, By Garofalo & Associates, Inc. Civil & Structural Engineers/Surveyors, Providence, RI.

[4] Garcia Galuska Desousa, Consulting Engineers Inc., 2012. Revised Drainage Analysis for the New Claiborne Pell Elementary School

[5] Garcia Galuska Desousa, Consulting Engineers Inc., 2012. Revised Drainage Analysis for the New Claiborne Pell Elementary School

Cooperative Soil Survey - Web Soil Survey[6] was used to assign infiltration parameters to the soils throughout the watershed. Land use data was obtained from the Rhode Island Geographic Information System (RIGIS[7]). Modeling input is included in Attachment A.

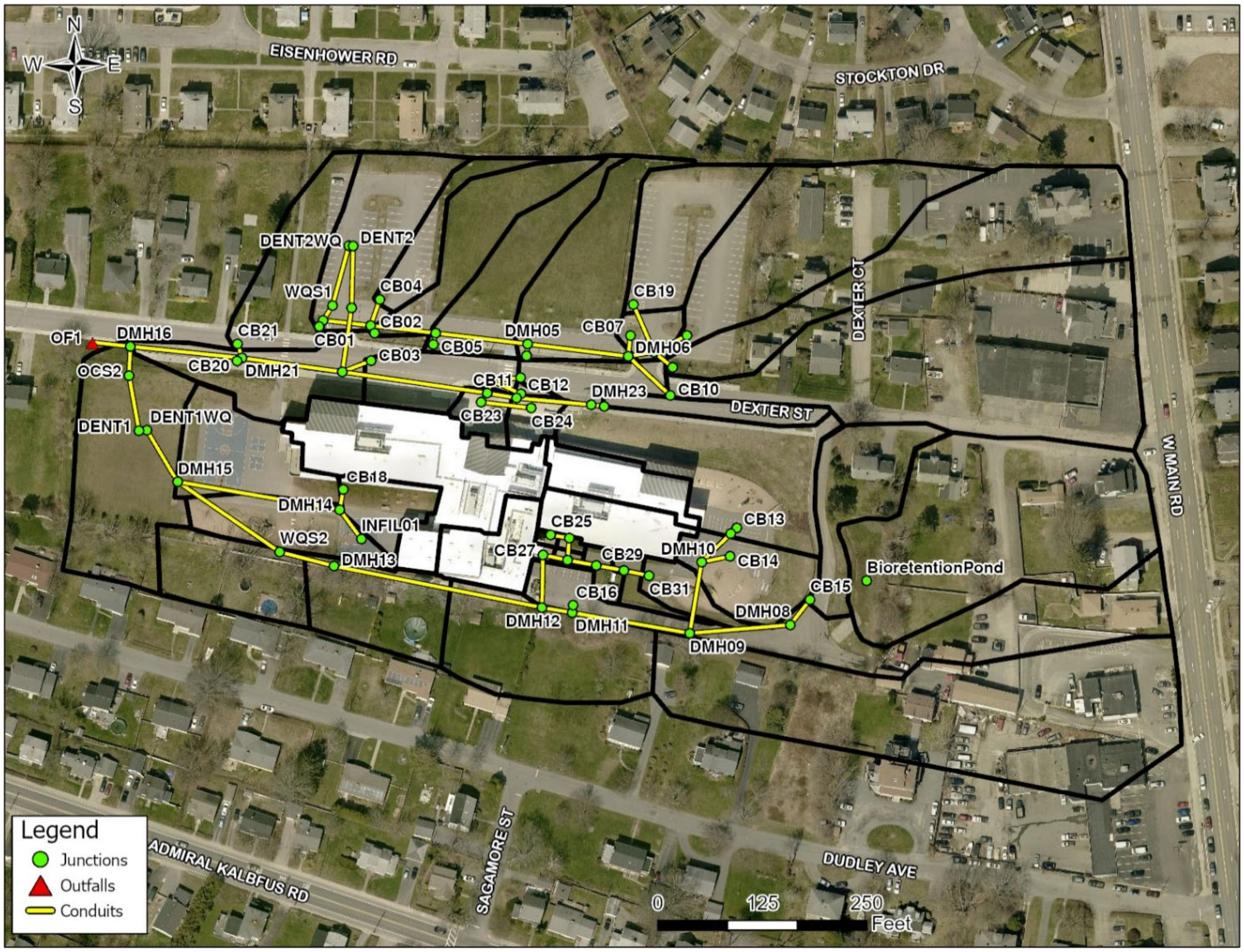

Figure 5. SWMM Model Schematic

[6] Natural Resources Conservation Service. https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

[7] RIGIS, 2021. Rhode Island Geographic Information System (RIGIS) Data Distribution System. URL: http://www.rigis.org, Environmental Data Center, University of Rhode Island, Kingston, Rhode Island (last date accessed: November 2021).

Modeled Storm Events

Analyses for the existing conditions and the proposed alternatives were run for the 1-inch, 2-inch, 3.4-inch, and 5-inch rainfall events. The rainfall depths of 3.4-inch and 5-inch correlate to the 2-year and 10-year storms and were obtained from NOAA *Atlas 14 Point Precipitation Data*[8]. The distribution of rainfall over time (referred to as hyetographs) were based on the Natural Resources Conservation Service Type III Synthetic 24-hour Rainfall Distribution[9].The design precipitation depths are summarized in *Table 1*.

Table 1. Newport Storm Events

Storm Event	Total Rainfall Depth (in)	Duration (hr)
1-inch	1.00	24
2-inch	2.00	24
2-year	3.40	24
10-year	5.03	24

Recurrence interval (also called return period) describes the probability that a specific rainfall amount over a 24-hour period will be equaled or exceeded. For example, there is a 1 in 2 chance that in any given year 3.4 inches of rain will fall on this watershed in 24 hours (NOAA 2014). The frequency this occurs is referred to as a 2-year return period or 2-year storm.

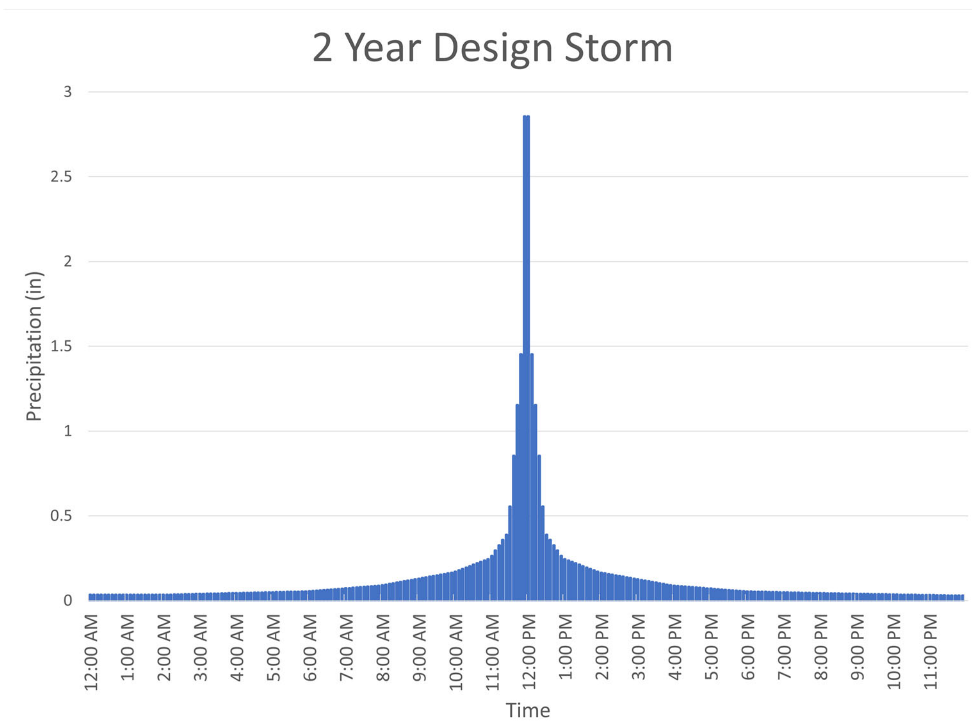

Figure 6. 2 Year Storm Event Hyetographs Model Input

[8] National Weather Service. (2015). *NOAA Atlas 14 Precipitation-Frequency Atlas of the United States, Volume 10 Version 2.0: Northeastern States (Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, Vermont)*. Department of Commerce, National Oceanic & Atmospheric Administration. Silver Springs, Maryland.

[9] Natural Resources Conservation Service. (June 1986). *Technical Release 55: Urban Hydrology for Small Watersheds*. U.S. Department of Agriculture, Washington D.C.

Model Calibration

The model calibration was checked using photographs taken by private residential property owners during recent historical storms. Figure 7 is a photograph of the backyard of 46 Dudley showing flooding conditions during the April 14th, 2020 storm event. This event produced a recorded 1.01 inches of rainfall which is comparable to the modeled 1-inch storm event. The simulation model results are 8 inches of maximum flooding depth at this location, which is comparable to the estimated depth of water captured in this photograph. It is possible that the photograph was not taken at exactly the peak flood depth of the storm, so there is room for minor discrepancies between model results and the flood depth in the photograph.

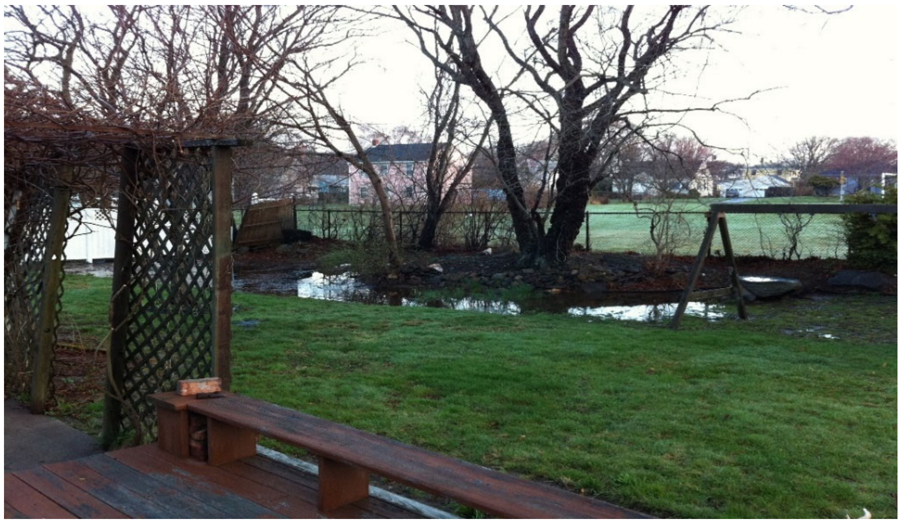

Figure 7. Backyard of 46 Dudley Avenue on April 14, 2020

The photograph in Figure 8 depicts backyard flooding during the March 2nd, 2018 storm event. This event produced a recorded 3.02 inches of rainfall which is comparable to the modeled 2-year storm event (3.4 inches). The simulation model results are 10 inches of maximum flooding depth at this location, which is comparable to the estimated depth of water captured in this photograph. Again, it is possible that the photograph was not taken at exactly the peak flood depth of the storm, so there is room for minor discrepancies between model results and the flood depth in the photograph.

Figure 8. Backyard of 46 Dudley Avenue on March 2, 2020

Existing Conditions Results

The PCSWMM model of the Dudley Avenue watershed was used to analyze flooding issues observed in the region. The results of the existing conditions model identified and confirmed key areas of expected flooding in the watershed and were used as a baseline for assessing the effectiveness of proposed stormwater infrastructure and green infrastructure improvements. As the water surcharges out of the storm drainage system, it begins to flow over the land surface following the topography. Water that flows down the roadways may re-enter the drainage system downstream if the catch basin structures lower in the system are not surcharging during that model timestep. Figures 9 through 12 depict the maximum simulated flooding depths across the project area for the 1-inch, 2-inch, 2-year, and 10-year frequency storm events. It should be noted that the accumulation and conveyance of stormwater runoff prior to entering model elements (i.e. catch basins, surface channels, etc.) is not shown on the figures.
The results of the existing conditions model showed surface flooding at the following locations for the 1-inch and 2-inch storm events (Figures 9 and 10):

- The backyards of private residences between 26 Dudley Avenue and 50 Dudley Avenue.
- Runoff from the areas mentioned above eventually inundates the eastern portion of Dudley Avene near the intersection with Sagamore Street.

For the 2- and 10-year storm event, the results of the existing conditions model showed surface flooding at the following locations (Figures 11 and 12):

- The backyards of private residences between 26 Dudley Avenue and 50 Dudley Avenue.
- The eastern portion of Dudley Avene near the intersection with Sagamore Street.
- Dexter Street north and west of the school.
- Runoff originating from the bioretention pond east of the school is designed to overflow its spillway invert when necessary. This runoff travels downhill overland before being captured by infrastructure in the eastern school playground as the original design intended.

The simulated storm events, under the existing conditions, result in runoff water that flows from the eastern portion of the drainage area through the Dudley Avenue backyards influenced by the low topography between the Pell Elementary School boundary and Dudley Avenue. This is primarily due to the significant percentage of the overall watershed area that is located east of Dudley Avenue, and in the school's western grass field, that flows unobstructed towards the private residential backyards on Dudley Avenue. Runoff from approximately 24% (4 acres) of the total watershed area flows unobstructed towards the private residential back yards. The maximum depth of flooding of 11 inches occurs in a low area behind 46 Dudley Avenue for the 10-year storm. This area corresponds to a low point in the topography. Although the flooding in this area is the most severe, there are other areas around the project area that flood, including the private residents east along Dudley Avenue.

The analysis does show a connection forming between the flooding on the southern edge of the school property and the Dudley Avenue backyards (Figure 11 & 12). However, this connection occurs only after the flood waters in the backyards have already reached peak depth and extent. This indicates that the cause of the connection stems from the water accumulating first in the Dudley Avenue backyards and is not occurring because of water flowing south from the school property.

Figure 9. Simulated Peak Flooding Depths under Existing Conditions (1-inch Storm Event)

Figure 10. Simulated Peak Flooding Depths under Existing Conditions (2-inch Storm Event)

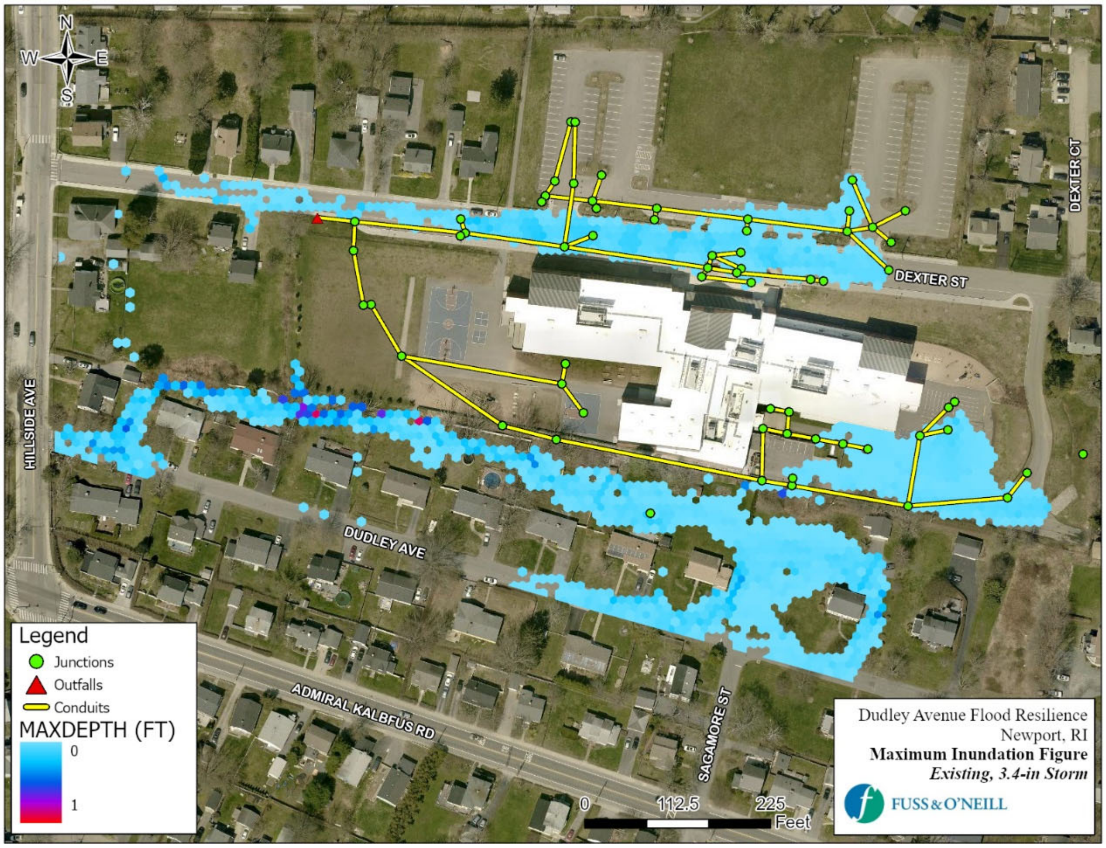

Figure 11. Simulated Peak Flooding Depths under Existing Conditions (2-Year Storm Event)

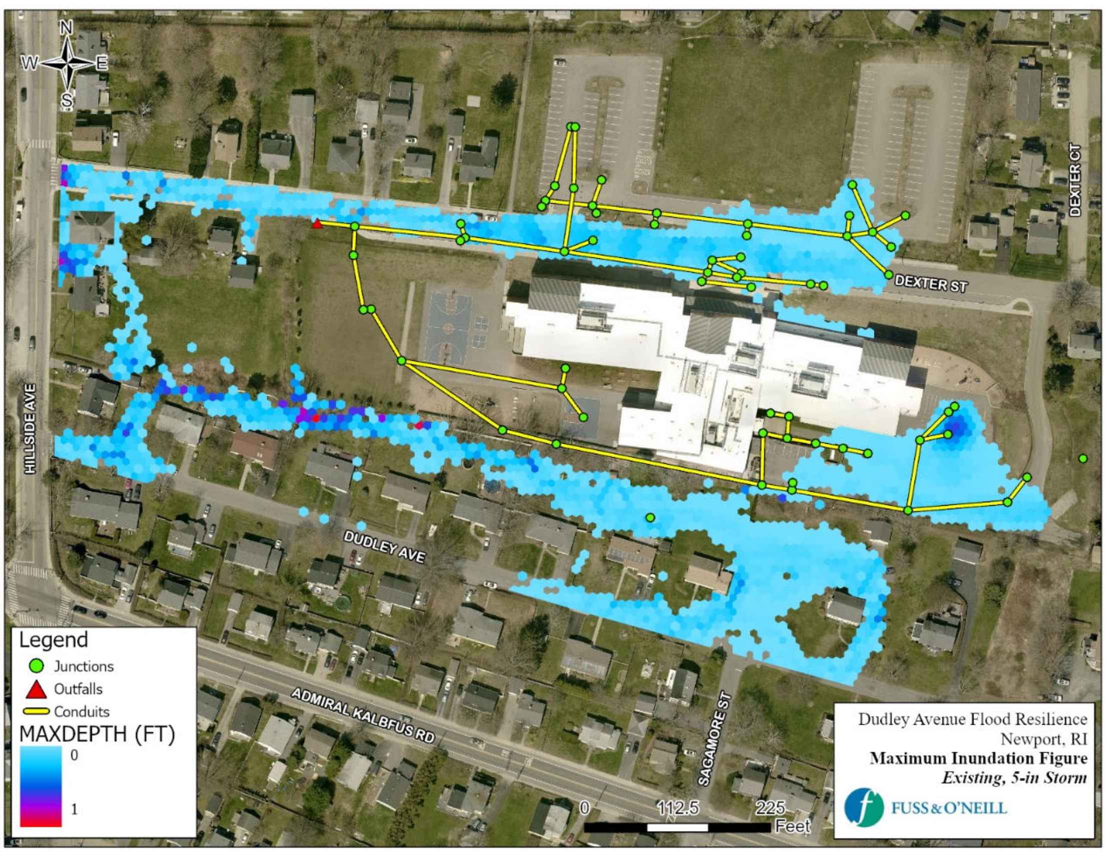

Figure 12. Simulated Peak Flooding Depths under Existing Conditions (10-Year Storm Event)

4 Potential Drainage System Improvements

The assessment of stormwater management alternatives, which is discussed below, investigates new stormwater infrastructure improvements, and includes an order of magnitude level cost estimate. The three alternatives were developed with an emphasis placed on addressing nuisance flooding in the backyards of the private residences along Dudley Avenue. All three alternatives focused on installation of new stormwater infrastructure to allow for more efficient capture and retention of stormwater runoff prior to reaching the low-lying backyards. Discharging additional stormwater runoff to the City of Newport's existing stormwater infrastructure on Dudley Avenue was evaluated but not analyzed within the modeled alternatives to prevent increases to peak flows within the existing municipal stormwater system and exacerbating flooding downstream. Additional non-modeled alternative opportunities with considerations of discharging to the existing municipal stormwater systems are described at the end of this section.

Descriptions of the modeled alternatives are included in the sections below. For reference, overview schematics of the three modeled Alternatives are presented as a Figure 13 below. This figure depicts the locations of the two reference points within the backyards where flood depths and duration graphs were calculated. The graphs of the simulated results at these two reference points follow the description of each alternative. It should be noted that the accumulation and conveyance of stormwater runoff prior to entering model elements (i.e. catch basins, surface channels, etc.) is not shown on the figures. The alternatives studied include:

- **Alternative 1 Proposed School Stormwater Infrastructure:** Reduce runoff from western grass field of Pell Elementary School.
- **Alternative 2, Stormwater Infrastructure Along West Main Road Properties:** Reduce runoff from eastern impervious commercial area.
- **Alternative 3, Stormwater Infrastructure on Private Property Along Dudley Avenue:** Reduce peak flood depths by capturing flood water within subsurface infiltration chambers.

Each alternative and corresponding model results are described in section below. Other alternatives considered, but not modeled are described at the end of the section.

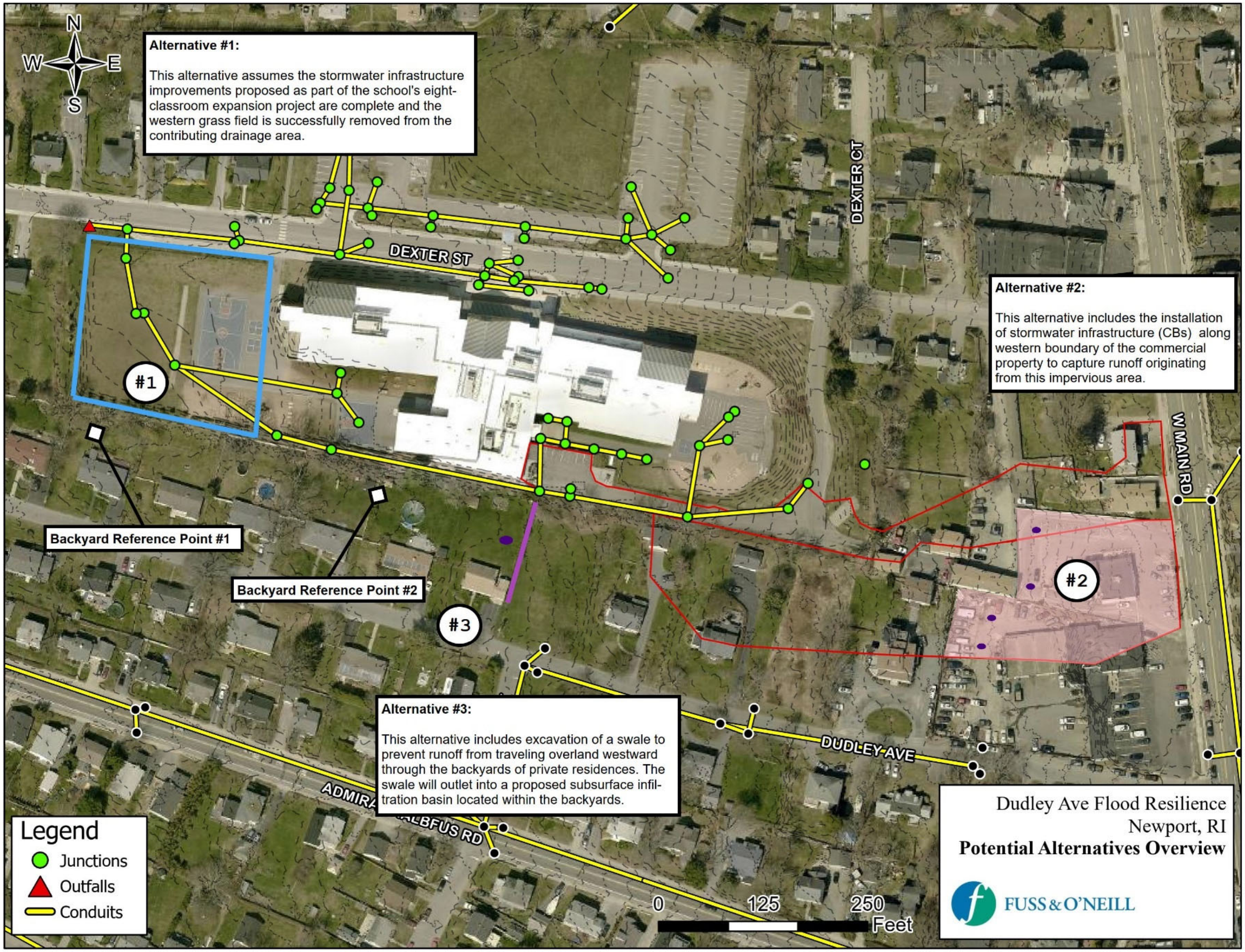

Figure 13. Overview of Alternative Scenarios

Alternative 1: Proposed School Stormwater Infrastructure

The focus of Alternative 1 was to evaluate the significance of the contribution of stormwater runoff originating from the school's western grass field. This grass field currently slopes towards the southwest, and any precipitation that falls on the field flows southwest downhill, towards the backyards of the private residences. The City of Newport is proposing an eight-classroom expansion project at Claiborne Pell Elementary School. As part of this project, the City is proposing regrading and partial paving of the western grass field, as well as installation of new stormwater infrastructure to capture water accumulating in this area.

Alternative 1 assumes that that the stormwater improvements proposed as part of the classroom expansion are complete and successfully capture all stormwater runoff originating from the field, as designed, thereby removing the school's western grass field from the drainage area contributing stormwater runoff to the private residences along Dudley Avenue.

The results of the Alternative 1 PCSWMM analyses indicate that the removal of the western grass field from the contributing drainage area produced no significant reduction in maximum flood inundation extent, depth, or duration within the residential backyards along Dudley Avenue for any of the four modeled storm events.

The maximum extents of surface flooding for each of the four modeled storm events are provided as Figures 14-17.

Figure 14. Simulated Peak Flooding Depths under Alternative 1 (1-inch Storm Event)

Figure 15. Simulated Peak Flooding Depths under Alternative 1 (2-inch Storm Event)

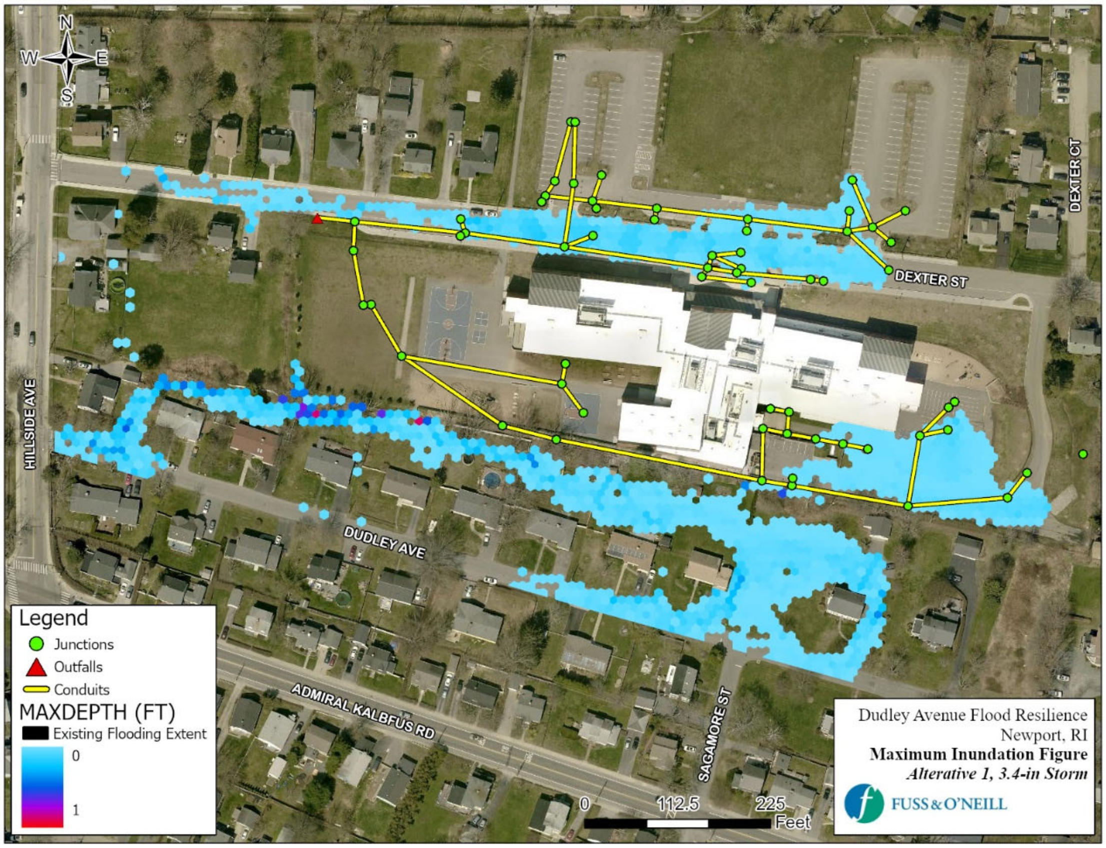

Figure 16. Simulated Peak Flooding Depths under Alternative 1 (2-Year Storm Event)

Figure 17. Simulated Peak Flooding Depths under Alternative 1 (10-Year Storm Event)

Alternative 2: Stormwater Infrastructure Along West Main Road Properties

The focus of Alternative 2 was to evaluate the significance of the contribution of stormwater runoff originating from the eastern impervious commercial parking area along West Main Road. This area currently slopes towards the southwest, and any precipitation that falls on the pavement flows southwest downhill, towards the backyards of the private residences along Dudley Avenue. Alternative 2 includes the installation of stormwater infrastructure (catch basins) along the western boundary of the impervious commercial area to capture runoff before it reaches the backyards. Additionally, Alternative 2 includes the school stormwater infrastructure improvements proposed within Alternative 1.

In general, the results of the Alternative 2 PCSWMM analyses indicate that the proposed stormwater infrastructure improvements help to reduce stormwater flooding in the Dudley Avenue backyard areas under the more frequent, lower depth storm events. Summaries of the simulated flood reductions as a result of the proposed improvements are as follows:

- Reduction of maximum surface flood extent within the backyards of private residences between 26 Dudley Avenue and 50 Dudley Avenue under the 1-inch and 2-inch storm events.
- Minor reductions in flood depth and durations at both reference locations within the Dudley Avenue backyards under the 1-inch and 2-inch storm events.
- The improvements had diminishing returns under larger storms as there was no significant reduction in maximum flood extent, depth, or duration within the backyards under the 3.4-inch and 5-inch storm events.

The maximum extents of surface flooding for each of the four modeled storm events are shown in Figures 18-21 below.

This alternative faces a unique construction challenge. It should be noted that these improvements are not located within the City of Newport and are on commercial properties in Middletown, RI. Coordination would be required with the Town of Middletown, RI for any further consideration of implementation.

Figure 18. Simulated Peak Flooding Depths under Alternative 2 (1-inch Storm Event)

Figure 19. Simulated Peak Flooding Depths under Alternative 2 (2-inch Storm Event)

Figure 20. Simulated Peak Flooding Depths under Alternative 2 (2-Year Storm Event)

Figure 21. Simulated Peak Flooding Depths under Alternative 2 (10-Year Storm Event)

Alternative 3: Stormwater Infrastructure on Private Property Along Dudley Avenue

The focus of Alternative 3 was to evaluate the potential to reduce stormwater depths and durations by installing storm infrastructure directly within the backyards. Specifically, Alternative 3 includes the excavation of a small swale to prevent the propagation of surface flooding from traveling west across the low-lying areas within the backyards. The swale outlets into a subsurface infiltration chamber that retains approximately 2,200 ft^3 of stormwater. The subsurface infiltration chamber was sized based on physical construction constraints of a backyard installation as well as the constraints of the underlying groundwater table elevations. The subsurface storage aims to reduce the maximum flood extent and peak flood depths currently experienced by holding a portion of the total stormwater runoff volume. In addition, Alternative 3 includes the school stormwater infrastructure improvements proposed within Alternative 1.

The results of the Alternative 3 PCSWMM analyses indicate that the proposed stormwater improvements within the backyards would marginally reduce maximum stormwater flooding extents and depths under storm events greater than the 1-inch storm. Summaries of the simulated flood reductions as a result of the proposed improvements are as follows:

- Reduction of maximum surface flood extent, depth, and duration within the backyards of private residences between 26 Dudley Avenue and 50 Dudley Avenue under the 1-inch storm event.
- Minor reductions in flood depth and durations at both reference locations within the backyards under the 2-inch, 3.4-inch, and 5-in storm events.
- The improvements had diminishing returns under larger storms. There was no significant reduction in maximum flood extent within the backyards under the 2-inch, 3.4-inch, or 5-inch storm events.
- The subsurface infiltration basin is only filled to capacity under the 3.4- and 5-inch storm events. While increasing the total maximum volume of the underground chamber could potentially result in greater reductions in flood extents, depths, and durations during these larger storm events, the results would likely be minimal under the smaller, more frequent storms as the capacity of the underground chamber is not the limiting factor during these modeled storm events. A variety of conveyance system configurations (swales lengths and catch basin placements) were investigated within this alternative, producing less substantial results. A larger, and much more extensive conveyance system would need to be designed to collect and convey the flood water to fully utilize the capacity of the subsurface infiltration system under the more frequent storm events. The design of such a system would need to include the evaluation of a number of hydrologic and subsurface factors and constraints that are outside of this current scope of this project.

The maximum extents of surface flooding for each of the modeled storm events are provided as Figures 22-25 below.

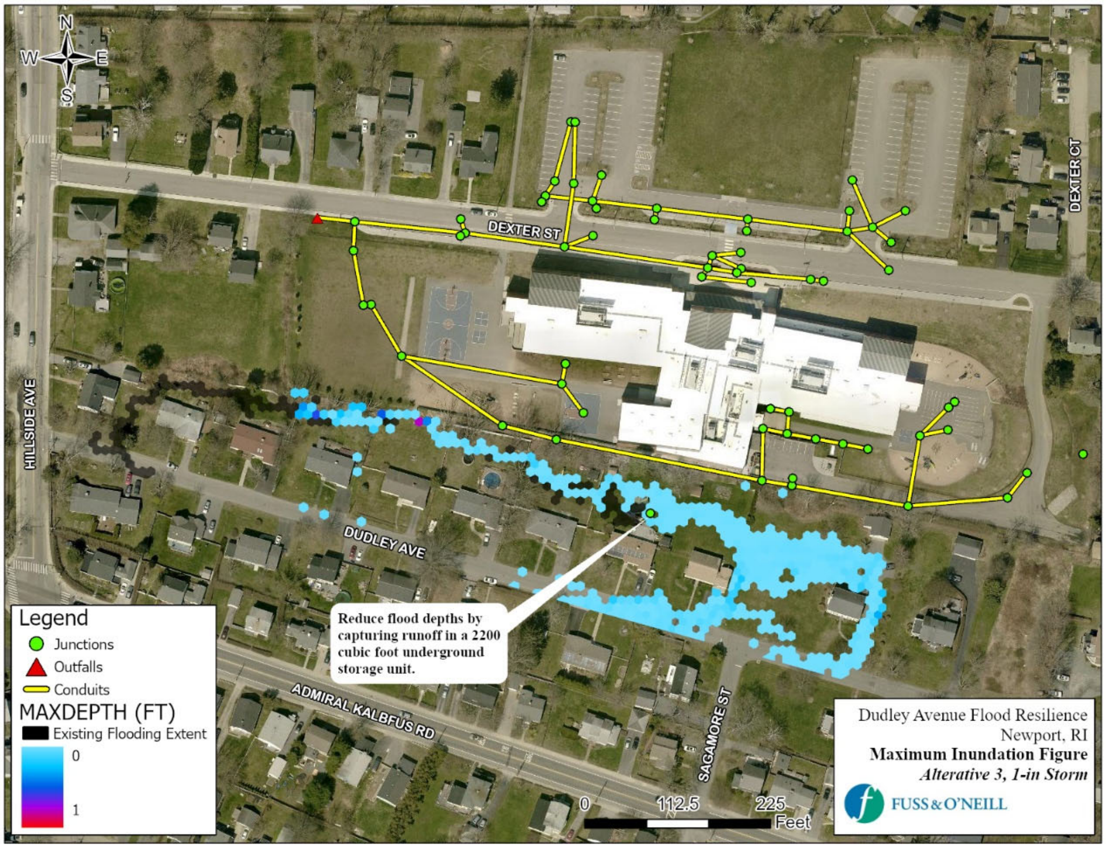

Figure 22. Simulated Peak Flooding Depths under Alternative 3 (1-inch Storm Event)

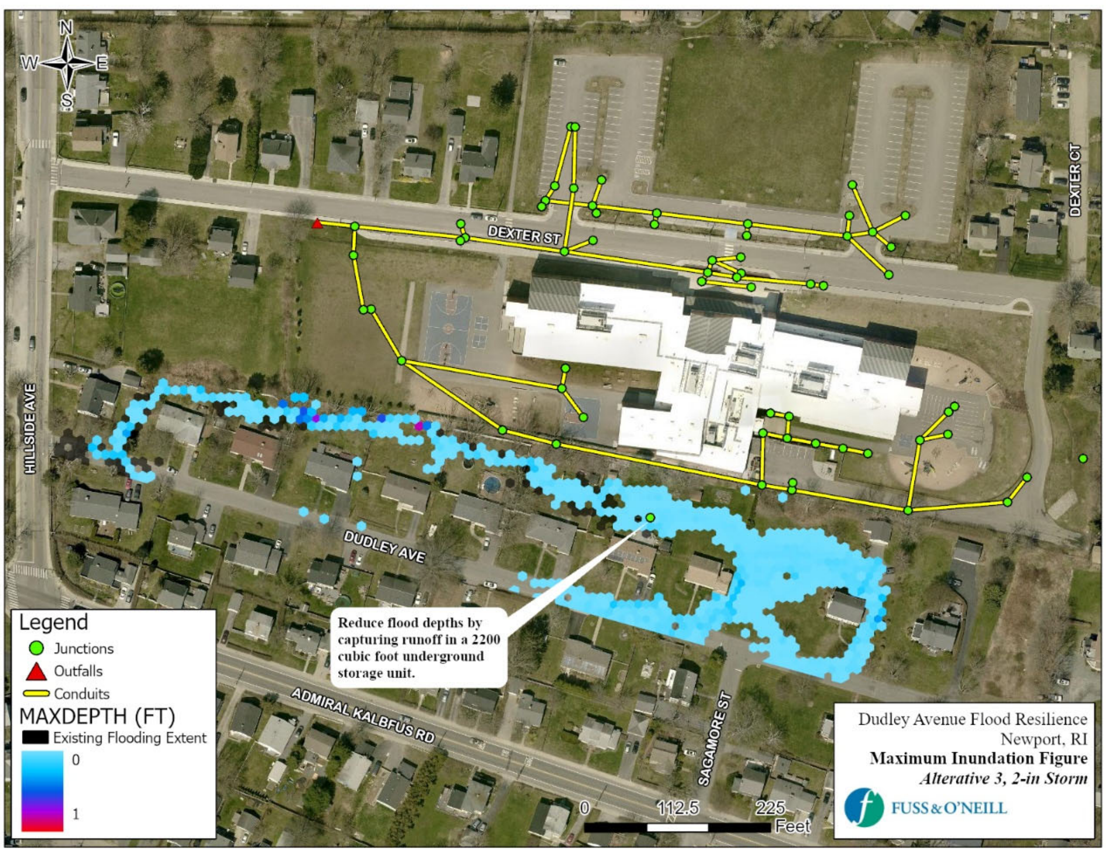

Figure 23. Simulated Peak Flooding Depths under Alternative 3 (2-inch Storm Event)

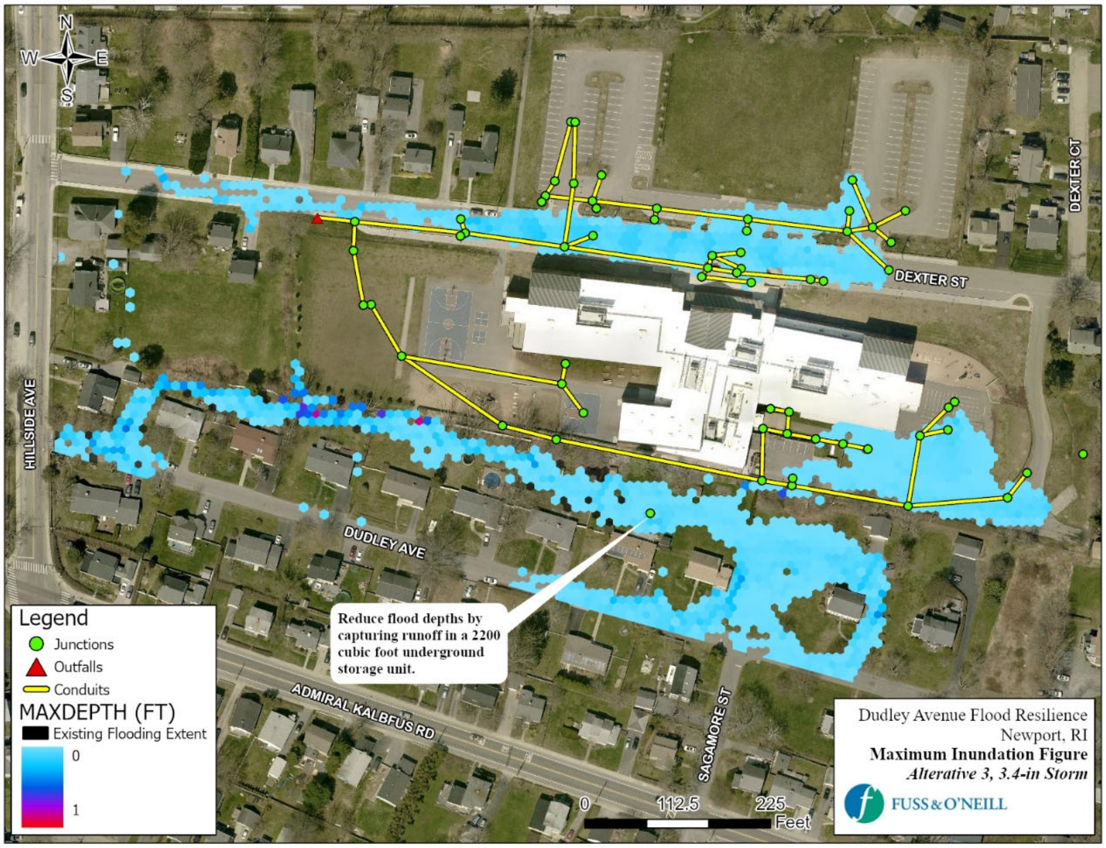

Figure 24. Simulated Peak Flooding Depths under Alternative 3 (2-Year Storm Event)

Figure 25. Simulated Peak Flooding Depths under Alternative 3 (10-Year Storm Event)

Depths and durations of flooding at the two reference locations (depicted on Figure 13) within the backyards for all existing conditions and proposed alternative model runs are provided as Figures 26-33.

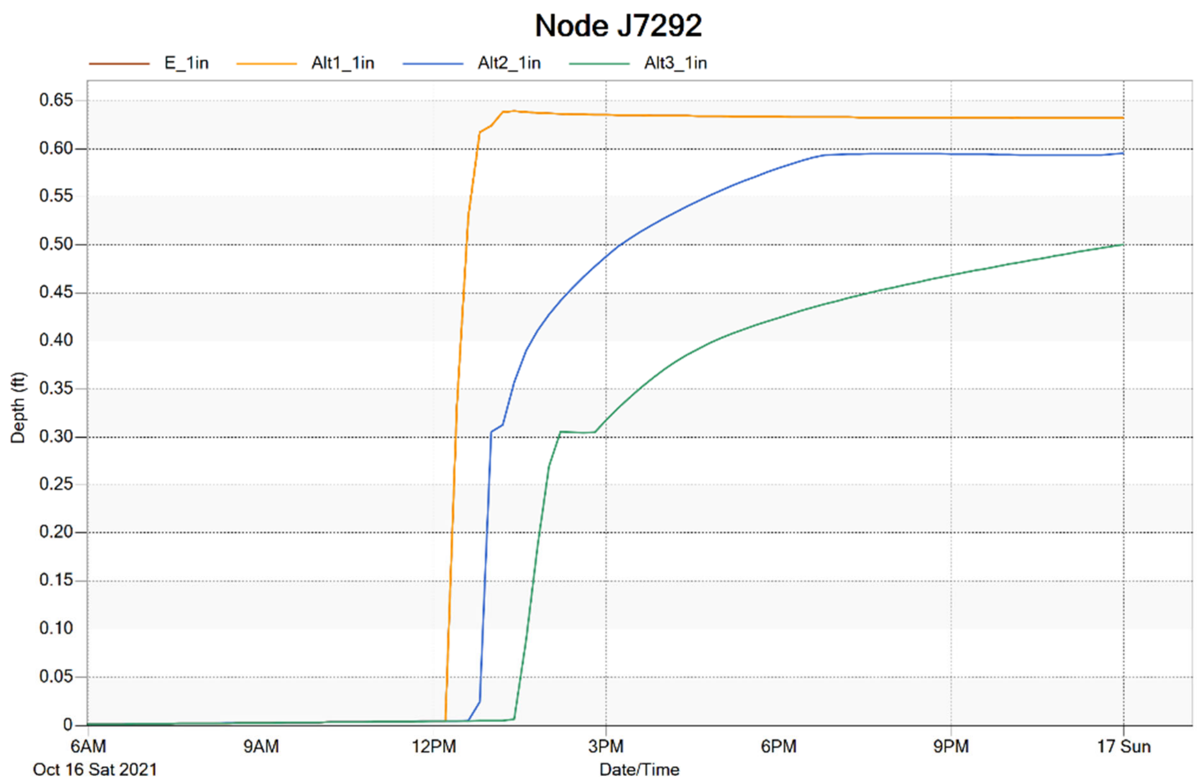

Figure 26. Flood Depths and Durations at Reference Point #1 (1-inch Storm Event)

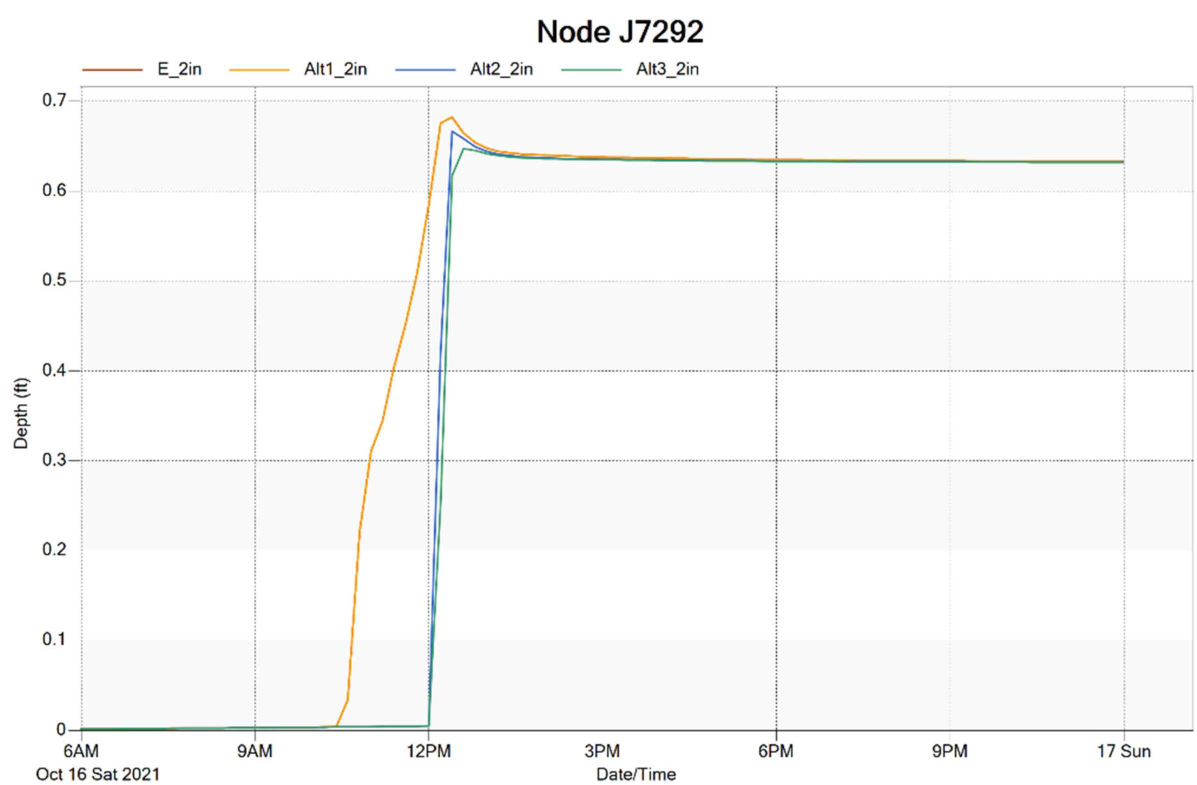

Figure 27. Flood Depths and Durations at Reference Point #1 (2-inch Storm Event)

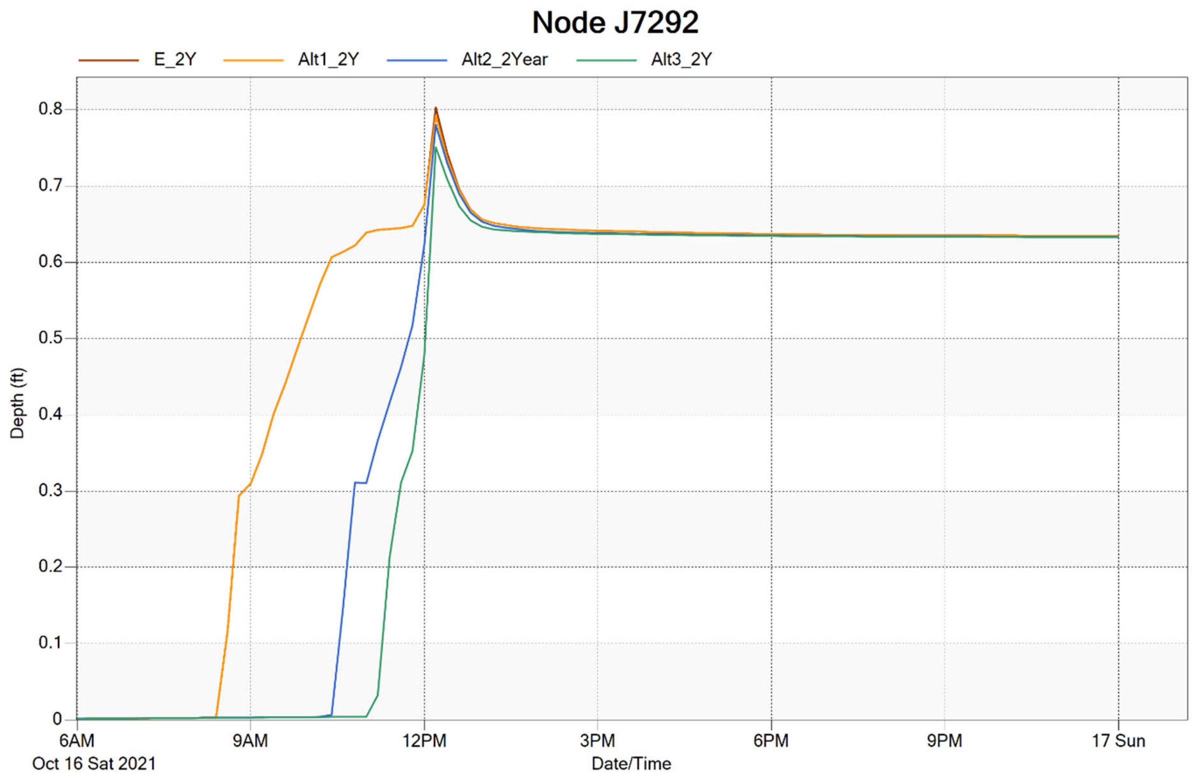

Figure 28. Flood Depths and Durations at Reference Point #1 (2-Year Storm Event)

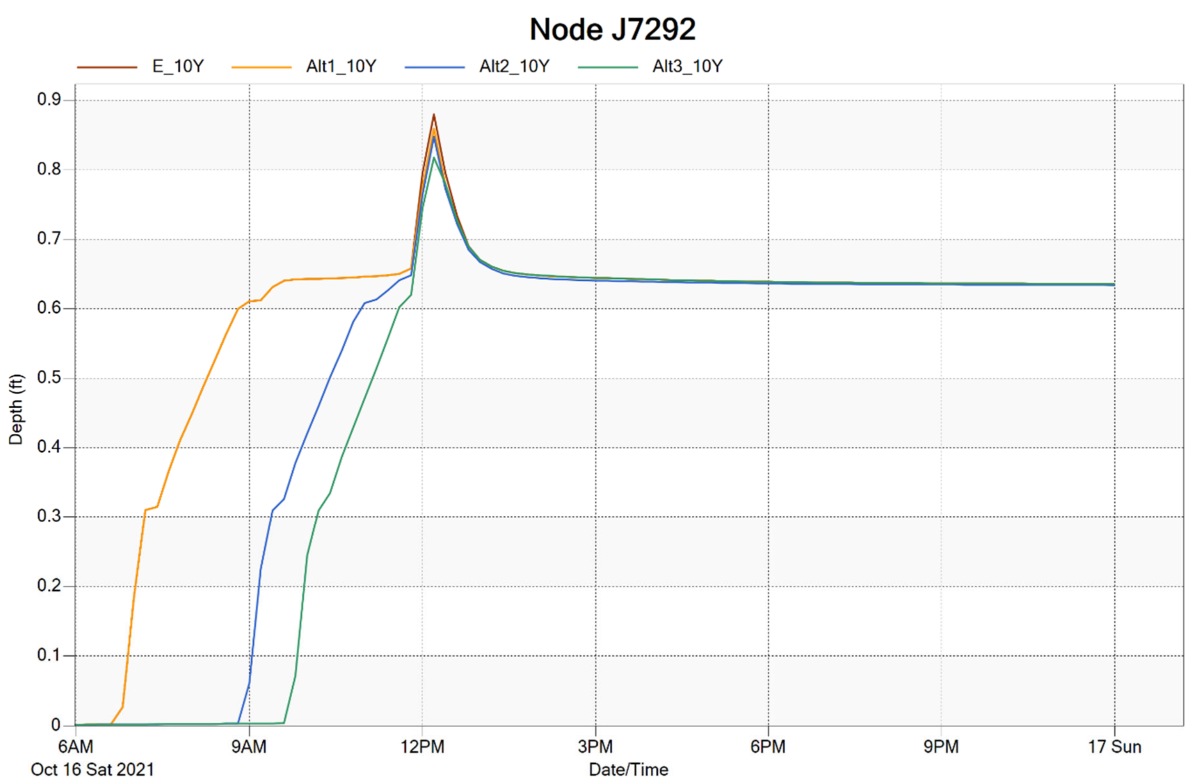

Figure 29. Flood Depths and Durations at Reference Point #1 (10-Year Storm Event)

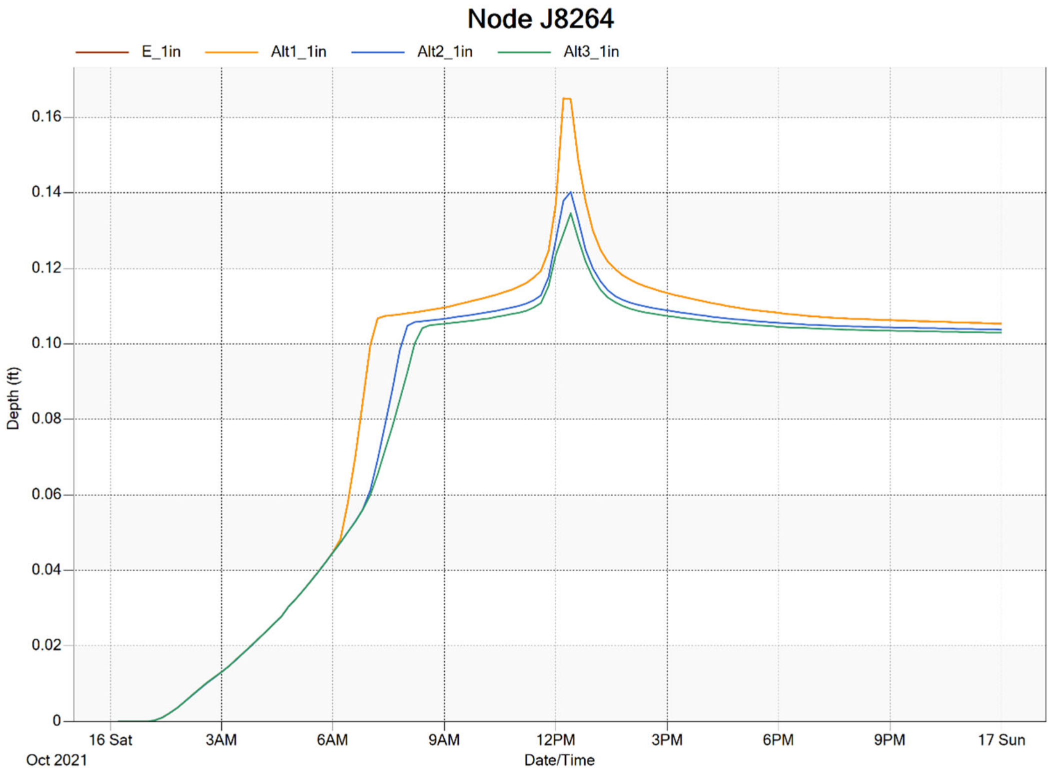

Figure 30. Flood Depths and Durations at Reference Point #2 (1-inch Storm Event)

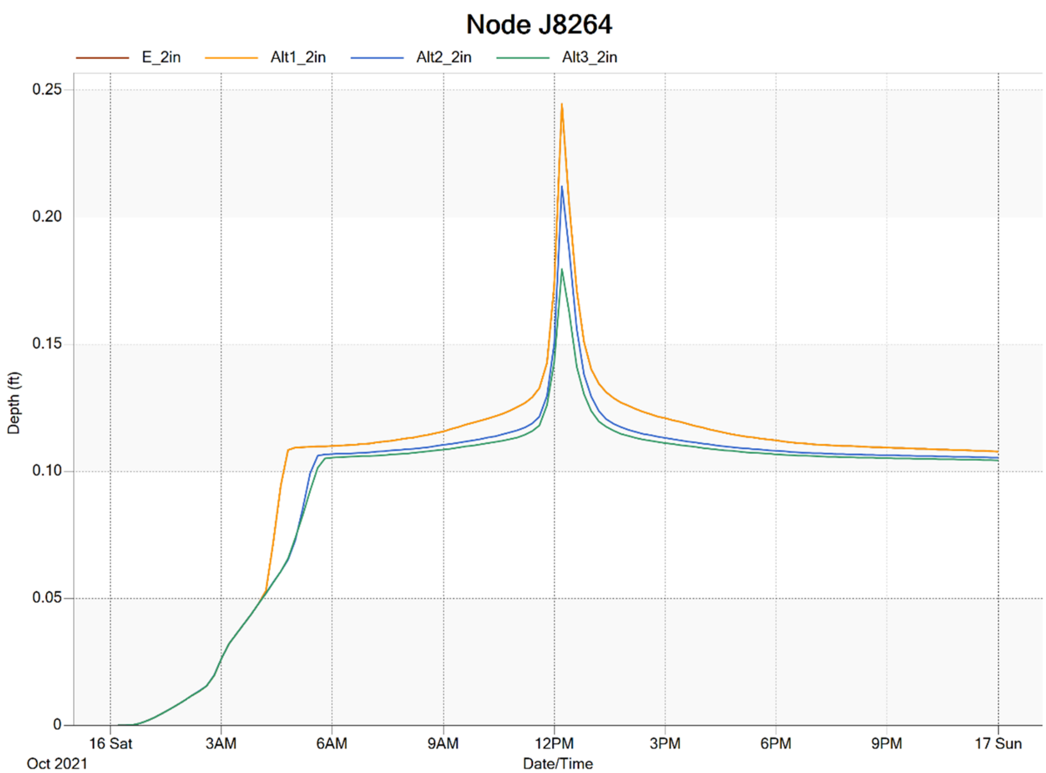

Figure 31 Flood Depths and Durations at Reference Point #2 (2-inch Storm Event)

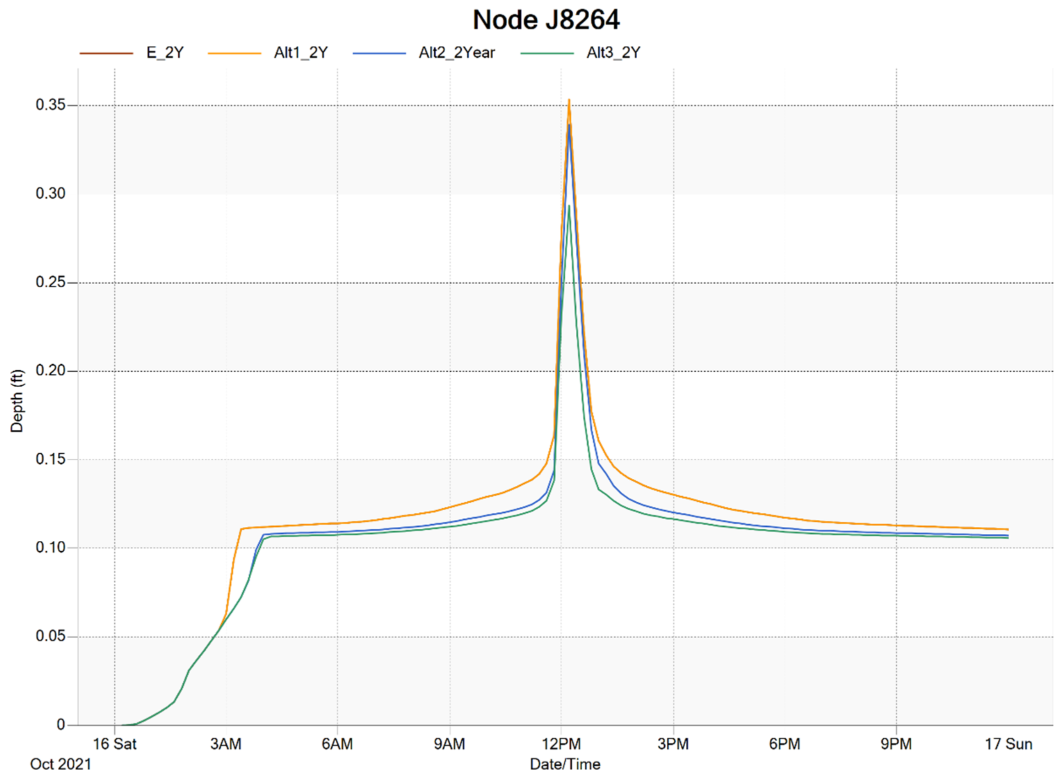

Figure 32. Flood Depths and Durations at Reference Point #2 (2-Year Storm Event)

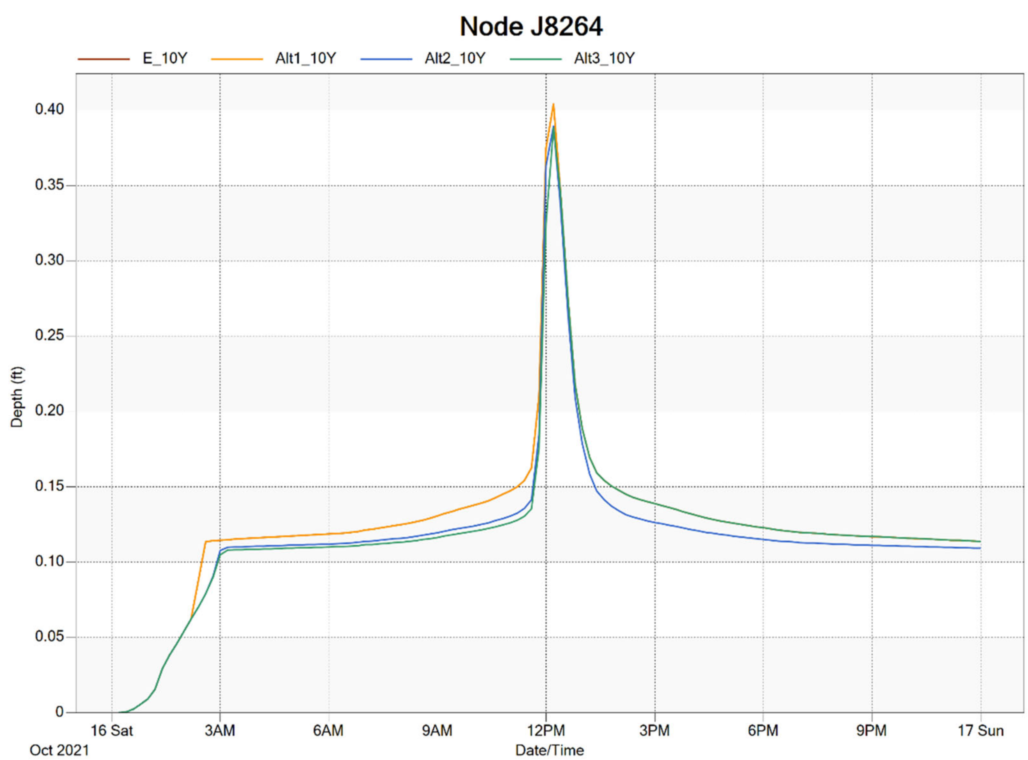

Figure 33. Flood Depths and Durations at Reference Point #2 (10-Year Storm Event)

Other Alternatives Considered

Implementation of stormwater infrastructure improvements within the backyards that connect directly into the existing municipal stormwater system were initially considered as potential project alternatives but not carried forward into the modelling analysis. Additional alternatives could be explored such as installing catch basins in low lying areas within the Dudley Avenue backyards to drain and convey flood water to the existing municipal system. Additionally, the proposed Alternative 3 could be modified by incorporating an overflow structure within the subsurface infiltration chamber that would outlet excess flows to the existing municipal system at the intersection of Dudley Avenue and Sagamore Street, thereby increasing the structure's overall capacity.

In order to fully evaluate and model the effects of these alternatives, a much larger scale hydraulic analysis effort would be necessary which is outside of the scope of this project. This analysis would need to include the entirety of the municipal stormwater system in order to assure that the added flow contributions from the proposed alternatives would not significantly impact peak flows and further exacerbate flooding issues occurring in other parts of the system. A hydraulic analysis effort of this magnitude would likely cost on the order of $250,000-$500,000.

In addition to the alternatives examined in this study, there are opportunities for private homeowners along Dudley Avenue to implement small-scale green infrastructure practices, like swales or raingardens, on their own properties. These small-scale practices have the potential to produce localized reductions to flood depths and extents. However, these practices would produce more significant beneficial cumulative effects when implemented together with the proposed alternatives mentioned above.

Summary of Costs

An Order of Magnitude level opinion of cost has been prepared for the proposed improvements as part of Alternatives 2 and 3. The improvements included in Alternative 1 are part of the City's proposed eight-class expansion project that is still under development. As a result, the total cost for Alternative 1 is not included within this report. The opinion of costs are provided in the table below; detailed back up documentation is provided in *Appendix B.* A more detailed opinion of cost should be developed as part of a future design which will allow issues such as utility conflicts and constructability to be better assessed.

Table 2: Stormwater Infrastructure Improvements
Order of Magnitude Opinion of Cost*

Description	Estimated Cost	-30%	+50%
Alternative #1	Not Calculated	Not Calculated	Not Calculated
Alternative #2	$240,000	$160,000	$350,000
Alternative #3	$50,000	$30,000	$70,000

5 Conclusion

The results of the existing conditions analysis confirmed surface flooding in locations that corresponds with community feedback. However, the existing conditions analysis suggest that stormwater runoff causing flooding under the 1- and 2-inch storms does not originate from the school property, but rather originate from the eastern portions of the drainage area without stormwater infrastructure. Under the higher intensity 3.4- and 5-inch storms, while the existing conditions analysis shows a connection forming between the flooding on the southern school property and the flooding in the backyards, this connection occurs after the flood water in the backyards of the private residences has already reached its peak depth and extent. This would suggest that the connection is the result of flood water accumulating in the backyards rather than the source of the flooding.

The results of the proposed alternative analyses have been compared to the existing conditions results to evaluate the response and efficiency of the proposed stormwater improvements. The results of the proposed conditions model show a reduction in peak flood depths and reduced durations of flooding in the backyards of the private residential properties on Dudley Avenues. The results also show that there would be no meaningful improvements in areas further upland in the watershed.

In addition to the alternatives examined in this study, there are opportunities for private homeowners along Dudley Avenue to implement small-scale green infrastructure practices, like swales or raingardens, on their own properties. These small-scale practices have the potential to produce localized reductions to flood depths and extents. However, these practices would produce more significant beneficial cumulative effects when implemented together with the proposed alternatives mentioned above.

Appendix A

SWMM Model Input Data

```
[TITLE]
;;Project Title/Notes
Existing Conditions Basemodel for Claiborne Pell Elementary School Stormwater Drainage System and

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         MODIFIED_GREEN_AMPT
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           10/16/2021
START_TIME           00:00:00
REPORT_START_DATE    10/16/2021
REPORT_START_TIME    00:00:00
END_DATE             10/17/2021
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:12:00
WET_STEP             00:12:00
DRY_STEP             00:12:00
ROUTING_STEP         0.5
RULE_STEP            00:00:00

INERTIAL_DAMPING     FULL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         1
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              4

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
10Year_5.03in    CUMULATIVE 0:06     1.0      TIMESERIES 10Year_5.03in
1Year_2.86       CUMULATIVE 0:06     1.0      TIMESERIES 1Year_2.86
2Year_3.4in      CUMULATIVE 0:06     1.0      TIMESERIES SCS_Type_III_3.4in
SCS_Type_III_1in CUMULATIVE 0:06     1.0      TIMESERIES SCS_Type_III_1in
SCS_Type_III_2in CUMULATIVE 0:06     1.0      TIMESERIES SCS_Type_III_2in

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  S
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- -
SBioretentionPond SCS_Type_III_1in BioretentionPond 1.46548 35.45    166.447  6.156    0
SCB01            SCS_Type_III_1in CB01             0.468743 84.17    90.378   2.83     0
SCB02            SCS_Type_III_1in CB02             0.370313 20.52    44.241   6.08     0
SCB03            SCS_Type_III_1in CB03             0.238517 84.18    56.639   5.863    0
```

```
SCB04            SCS_Type_III_1in CB04             0.17782  63.34    24.211   4.026    0
SCB05            SCS_Type_III_1in CB05             0.38726  40.74    47.965   4.485    0
SCB06            SCS_Type_III_1in CB06             0.535731 27.58    66.752   4.391    0
SCB07            SCS_Type_III_1in CB07             0.088744 99.54    53.554   3.322    0
SCB08            SCS_Type_III_1in CB08             0.86883  49.08    88.116   6.568    0
SCB09            SCS_Type_III_1in CB09             1.012711 62.18    77.21    6.366    0
SCB10            SCS_Type_III_1in CB10             1.808208 78.61    145.656  6.118    0
SCB11            SCS_Type_III_1in CB11             0.173435 87.75    41.764   4.362    0
SCB12            SCS_Type_III_1in CB12             0.011985 70.8     10.559   3.541    0
SCB13            SCS_Type_III_1in CB13             0.74901  25.67    167.373  10.505   0
SCB14            SCS_Type_III_1in CB14             0.291766 32.3     109.827  7.915    0
SCB15            SCS_Type_III_1in CB15             0.392417 22.44    53.584   8.12     0
SCB16            SCS_Type_III_1in CB16             0.915073 49.128   53.101   5.937    0
SCB18            SCS_Type_III_1in CB18             0.158004 81.77    58.565   2.959    0
SCB19            SCS_Type_III_1in CB19             0.407989 82.68    73.888   3.917    0
SCB20            SCS_Type_III_1in CB20             0.424693 53.99    78.415   5.399    0
SCB21            SCS_Type_III_1in CB21             0.401173 58.79    59.696   3.899    0
SCB22            SCS_Type_III_1in CB22             0.128954 40.24    20.793   4.924    0
SCB23            SCS_Type_III_1in CB23             0.084257 100      57.093   4.912    0
SCB24            SCS_Type_III_1in CB24             0.080453 78.48    76.245   2.78     0
SCB25            SCS_Type_III_1in CB25             0.010208 100      27.218   0.279    0
SCB26            SCS_Type_III_1in CB26             0.012529 100      20.7     0.987    0
SCB27            SCS_Type_III_1in CB27             0.221182 99.31    74.229   3.575    0
SCB28            SCS_Type_III_1in CB28             0.014923 100      33.814   1.485    0
SCB29            SCS_Type_III_1in CB29             0.049416 100      40.352   1.716    0
SCB30            SCS_Type_III_1in CB30             0.059407 79.23    18.359   1.216    0
SCB31            SCS_Type_III_1in CB31             0.111778 26.34    33.351   3.911    0
SDMH10           SCS_Type_III_1in DMH10            0.217367 97.39    45.685   0.367    0
SDMH14           SCS_Type_III_1in DMH14            0.288943 3.03     70.289   5.46     0
SDMH15           SCS_Type_III_1in DMH15            0.388265 4.44     116.698  4.341    0
SDMH23           SCS_Type_III_1in DMH23            0.209088 96.79    33.843   0.1      0
SINFIL01         SCS_Type_III_1in INFIL01          0.698785 96.09    111.951  9.602    0
SRunOff01        SCS_Type_III_1in RunOff01         0.769005 1.84     143.189  5.869    0
SRunOff02        SCS_Type_III_1in RunOff02         1.811274 65.912   125.86   5.917    0
SRunOff03        SCS_Type_III_1in RunOff03         0.626662 7.31     106.835  7.511    0
SRunOff04        SCS_Type_III_1in RunOff04         0.379143 9.93     94.445   9.838    0
SRunOff05        SCS_Type_III_1in RunOff05         0.355106 4.22     138.07   9.004    0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
SBioretentionPond 0.01      0.1        0.05       0.05       20.211     OUTLET
SCB01            0.01       0.1        0.05       0.05       0          OUTLET
SCB02            0.01       0.1        0.05       0.05       0          OUTLET
SCB03            0.01       0.1        0.05       0.05       8.337      OUTLET
SCB04            0.01       0.1        0.05       0.05       0          OUTLET
SCB05            0.01       0.1        0.05       0.05       0          OUTLET
SCB06            0.01       0.1        0.05       0.05       0          OUTLET
SCB07            0.01       0.1        0.05       0.05       0          OUTLET
SCB08            0.01       0.1        0.05       0.05       19.628     OUTLET
SCB09            0.01       0.1        0.05       0.05       17.057     OUTLET
SCB10            0.01       0.1        0.05       0.05       23.974     OUTLET
SCB11            0.01       0.1        0.05       0.05       0          OUTLET
SCB12            0.01       0.1        0.05       0.05       0          OUTLET
SCB13            0.01       0.1        0.05       0.05       0          OUTLET
SCB14            0.01       0.1        0.05       0.05       2.196      OUTLET
SCB15            0.01       0.1        0.05       0.05       37.388     OUTLET
SCB16            0.01       0.1        0.05       0.05       16.897     OUTLET
SCB18            0.01       0.1        0.05       0.05       0.683      OUTLET
SCB19            0.01       0.1        0.05       0.05       0          OUTLET
SCB20            0.01       0.1        0.05       0.05       5.565      OUTLET
SCB21            0.01       0.1        0.05       0.05       11.544     OUTLET
SCB22            0.01       0.1        0.05       0.05       0          OUTLET
SCB23            0.01       0.1        0.05       0.05       0          OUTLET
```

```
SCB24            0.01       0.1        0.05       0.05       0          OUTLET
SCB25            0.01       0.1        0.05       0.05       2.575      OUTLET
SCB26            0.01       0.1        0.05       0.05       0          OUTLET
SCB27            0.01       0.1        0.05       0.05       0          OUTLET
SCB28            0.01       0.1        0.05       0.05       0          OUTLET
SCB29            0.01       0.1        0.05       0.05       0          OUTLET
SCB30            0.01       0.1        0.05       0.05       0          OUTLET
SCB31            0.01       0.1        0.05       0.05       0          OUTLET
SDMH10           0.01       0.1        0.05       0.05       0          OUTLET
SDMH14           0.01       0.1        0.05       0.05       0          OUTLET
SDMH15           0.01       0.1        0.05       0.05       8.863      OUTLET
SDMH23           0.01       0.1        0.05       0.05       0          OUTLET
SINFIL01         0.01       0.1        0.05       0.05       0          OUTLET
SRunOff01        0.01       0.1        0.05       0.05       0          OUTLET
SRunOff02        0.01       0.1        0.05       0.05       24.594     OUTLET
SRunOff03        0.01       0.1        0.05       0.05       42.74      OUTLET
SRunOff04        0.01       0.1        0.05       0.05       23.809     OUTLET
SRunOff05        0.01       0.1        0.05       0.05       0          OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
SBioretentionPond 6.57      0.27       0.171
SCB01            4.544      0.804      0.239
SCB02            4.356      0.853      0.245
SCB03            4.33       0.86       0.246
SCB04            4.586      0.792      0.237
SCB05            4.344      0.856      0.246
SCB06            4.402      0.841      0.244
SCB07            4.679      0.768      0.234
SCB08            6.568      0.271      0.171
SCB09            6.558      0.273      0.171
SCB10            6.56       0.273      0.171
SCB11            4.33       0.86       0.246
SCB12            4.33       0.86       0.246
SCB13            4.8        0.736      0.23
SCB14            4.33       0.86       0.246
SCB15            6.404      0.314      0.177
SCB16            5.952      0.433      0.192
SCB18            4.33       0.86       0.246
SCB19            5.928      0.439      0.193
SCB20            5.116      0.653      0.22
SCB21            5.114      0.653      0.22
SCB22            5.923      0.441      0.193
SCB23            4.33       0.86       0.246
SCB24            4.33       0.86       0.246
SCB25            4.33       0.86       0.246
SCB26            4.33       0.86       0.246
SCB27            4.33       0.86       0.246
SCB28            4.33       0.86       0.246
SCB29            4.33       0.86       0.246
SCB30            4.33       0.86       0.246
SCB31            4.33       0.86       0.246
SDMH10           4.33       0.86       0.246
SDMH14           4.33       0.86       0.246
SDMH15           4.408      0.839      0.243
SDMH23           4.33       0.86       0.246
SINFIL01         4.33       0.86       0.246
SRunOff01        5.144      0.646      0.219
SRunOff02        6.545      0.277      0.172
SRunOff03        6.228      0.36       0.182
SRunOff04        5.929      0.439      0.192
SRunOff05        6.029      0.412      0.189
```

```
[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
CB01             87.2       3          0          30         0
CB02             88.5       2.9        0          30         0
CB03             86.9       3.4        0          30         0
CB04             88.9       3.2        0          30         0
CB05             90.1       2.6        0          30         0
CB06             92.1       2.6        0          30         0
CB07             97.3       3          0          30         0
CB08             98.1       3.4        0          30         0
CB09             97.1       3.3        0          30         0
CB10             97.1       3.6        0          30         0
......
Too many junction entities (11240 in total).

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OF1              76.3       FREE                        NO
OF10             109.56     FREE                        NO
OF100            81.96      FREE                        NO
OF101            81.92      FREE                        NO
OF102            81.39      FREE                        NO
OF103            81.31      FREE                        NO
OF104            81.2       FREE                        NO
OF105            80.84      FREE                        NO
OF106            80.95      FREE                        NO
OF107            81.17      FREE                        NO
OF108            80.78      FREE                        NO
OF109            80.33      FREE                        NO
OF11             106.14     FREE                        NO
OF110            80.5       FREE                        NO
OF111            80.13      FREE                        NO
OF112            80.24      FREE                        NO
OF113            80.15      FREE                        NO
OF114            79.56      FREE                        NO
OF115            79.74      FREE                        NO
OF116            79.93      FREE                        NO
OF117            79.42      FREE                        NO
OF118            79.37      FREE                        NO
OF119            79.44      FREE                        NO
OF12             106.36     FREE                        NO
OF120            79.1       FREE                        NO
OF121            79.15      FREE                        NO
OF122            78.94      FREE                        NO
OF123            78.8       FREE                        NO
OF124            78.52      FREE                        NO
OF125            78.48      FREE                        NO
OF126            78.42      FREE                        NO
OF127            78.39      FREE                        NO
OF128            78.39      FREE                        NO
OF129            78.46      FREE                        NO
OF13             104.5      FREE                        NO
OF130            78.12      FREE                        NO
OF131            78.06      FREE                        NO
OF132            78.26      FREE                        NO
OF133            78.44      FREE                        NO
OF134            78.26      FREE                        NO
OF135            78.12      FREE                        NO
OF136            78.35      FREE                        NO
OF137            77.76      FREE                        NO
OF138            78.12      FREE                        NO
OF139            77.6       FREE                        NO
```

OF14	104.98	FREE	NO
OF15	105.41	FREE	NO
OF16	105.71	FREE	NO
OF17	109.67	FREE	NO
OF18	104.37	FREE	NO
OF19	103.82	FREE	NO
OF2	108.59	FREE	NO
OF20	103.9	FREE	NO
OF21	103.08	FREE	NO
OF22	103.72	FREE	NO
OF23	109.71	FREE	NO
OF24	101.92	FREE	NO
OF25	102.33	FREE	NO
OF26	100.52	FREE	NO
OF27	100.87	FREE	NO
OF28	100.15	FREE	NO
OF29	99.51	FREE	NO
OF3	108.36	FREE	NO
OF30	99.73	FREE	NO
OF31	98.16	FREE	NO
OF32	98.45	FREE	NO
OF33	98.82	FREE	NO
OF34	97.57	FREE	NO
OF35	111.02	FREE	NO
OF36	96.81	FREE	NO
OF37	97.47	FREE	NO
OF38	97.63	FREE	NO
OF39	96.55	FREE	NO
OF4	108.48	FREE	NO
OF40	111.22	FREE	NO
OF41	95.9	FREE	NO
OF42	95.54	FREE	NO
OF43	95.01	FREE	NO
OF44	111.47	FREE	NO
OF45	95.08	FREE	NO
OF46	94.16	FREE	NO
OF47	93.37	FREE	NO
OF48	93.7	FREE	NO
OF49	94.13	FREE	NO
OF5	109.44	FREE	NO
OF50	111.87	FREE	NO
OF51	93.14	FREE	NO
OF52	92.43	FREE	NO
OF53	92.82	FREE	NO
OF54	91.89	FREE	NO
OF55	112.1	FREE	NO
OF56	91.34	FREE	NO
OF57	91.93	FREE	NO
OF58	112.26	FREE	NO
OF59	90.65	FREE	NO
OF6	106.64	FREE	NO
OF60	89.46	FREE	NO
OF61	90.12	FREE	NO
OF62	90.42	FREE	NO
OF63	112.56	FREE	NO
OF64	88.52	FREE	NO
OF65	88.91	FREE	NO
OF66	112.59	FREE	NO
OF67	112.88	FREE	NO
OF68	87.03	FREE	NO
OF69	86.71	FREE	NO
OF7	107.05	FREE	NO
OF70	86.88	FREE	NO
OF71	113.24	FREE	NO

```
OF72             85.7       FREE                        NO
OF73             86.16      FREE                        NO
OF74             86.29      FREE                        NO
OF75             85.66      FREE                        NO
OF76             85.25      FREE                        NO
OF77             85.36      FREE                        NO
OF78             85.52      FREE                        NO
OF79             85.09      FREE                        NO
OF8              107.47     FREE                        NO
OF80             84.81      FREE                        NO
OF81             85.11      FREE                        NO
OF82             84.58      FREE                        NO
OF83             84.44      FREE                        NO
OF84             84.71      FREE                        NO
OF85             84.78      FREE                        NO
OF86             113.38     FREE                        NO
OF87             84.01      FREE                        NO
OF88             83.83      FREE                        NO
OF89             84.19      FREE                        NO
OF9              107.72     FREE                        NO
OF90             83.5       FREE                        NO
OF91             83.5       FREE                        NO
OF92             83.79      FREE                        NO
OF93             83.24      FREE                        NO
OF94             82.76      FREE                        NO
OF95             83.1       FREE                        NO
OF96             83.35      FREE                        NO
OF97             82.38      FREE                        NO
OF98             82.18      FREE                        NO
OF99             81.58      FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A
;;-------------- -------- ---------- ---------- ---------- ---------------------------- --------
BioretentionPond 103      4          0          TABULAR    BioretentionPond           0        0
DENT1            81.01    3          0          TABULAR    DENT1                      0        0
DENT1WQ          79.76    4.5        0          TABULAR    DENT2WQ                    0        0
DENT2            85.14    3          0          TABULAR    DENT2                      0        0
DENT2WQ          83.89    4.5        0          TABULAR    DENT2WQ                    0        0
INFIL01          86.5     5.5        0          TABULAR    INFIL01                    30       0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  In
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- --
C1               J11174           J11178           5.288      0.035      0          0          0
C10              J11164           J11173           6.275      0.035      0          0          0
C100             J11139           J11118           5.889      0.035      0          0          0
C1000            J10796           J10747           6.196      0.035      0          0          0
C10000           J7595            J7727            5.889      0.035      0          0          0
C10001           J7729            J7728            5.889      0.035      0          0          0
C10002           J7595            J7728            5.889      0.035      0          0          0
C10003           J7596            J7728            5.858      0.035      0          0          0
C10004           J7739            J7740            5.994      0.035      0          0          0
C10005           J7739            J7738            6.234      0.035      0          0          0
......
Too many conduit entities (32386 in total).

[ORIFICES]
;;Name           From Node        To Node          Type         Offset     Qcoeff     Gated    Cl
;;-------------- ---------------- ---------------- ------------ ---------- ---------- -------- --
OR1              CB15             J8465            BOTTOM       2.8        0.8        NO       0
OR10             CB26             J7333            BOTTOM       3.76       0.8        NO       0
OR11             CB25             J7207            BOTTOM       3.363      0.8        NO       0
OR12             CB18             J6468            BOTTOM       3.7        0.8        NO       0
```

```
OR13             CB07             J3623            BOTTOM       3          0.8        NO       0
OR14             CB05             J3899            BOTTOM       2.6        0.8        NO       0
OR15             CB04             J2987            BOTTOM       3.2        0.8        NO       0
OR16             CB01             J3437            BOTTOM       3          0.8        NO       0
OR17             CB08             J3630            BOTTOM       3.4        0.8        NO       0
OR18             CB09             J4340            BOTTOM       3.868      0.8        NO       0
OR19             CB10             J4885            BOTTOM       3.6        0.8        NO       0
OR2              CB14             J7611            BOTTOM       3.418      0.8        NO       0
OR20             CB19             J3017            BOTTOM       3.3        0.8        NO       0
OR21             CB03             J4169            BOTTOM       3.4        0.8        NO       0
OR22             CB20             J4153            BOTTOM       3.5        0.8        NO       0
OR23             CB21             J3876            BOTTOM       3.137      0.8        NO       0
OR24             CB06             J4055            BOTTOM       2.675      0.8        NO       0
OR25             CB02             J3592            BOTTOM       2.9        0.8        NO       0
OR26             CB22             J5009            BOTTOM       2.9        0.8        NO       0
OR27             CB12             J4736            BOTTOM       4.035      0.8        NO       0
OR28             CB11             J4456            BOTTOM       3.928      0.8        NO       0
OR29             CB23             J4994            BOTTOM       4.1        0.8        NO       0
OR3              CB13             J7087            BOTTOM       3.753      0.8        NO       0
OR30             CB24             J5137            BOTTOM       3.544      0.8        NO       0
OR31             RunOff01         J6922            BOTTOM       0.1        1          NO       0
OR32             RunOff02         J9844            BOTTOM       0.21       1          NO       0
OR33             RunOff03         J9222            BOTTOM       0.1        1          NO       0
OR34             RunOff04         J8407            BOTTOM       0.33       1          NO       0
OR35             RunOff05         J7978            BOTTOM       0.35       1          NO       0
OR36             BioretentionPond J9137            BOTTOM       3.5        0.8        NO       0
OR37             INFIL01          J7324            BOTTOM       7.033      1          NO       0
OR4              CB16             J8578            BOTTOM       3.901      0.8        NO       0
OR5              CB27             J7591            BOTTOM       5.731      0.8        NO       0
OR6              CB28             J7727            BOTTOM       4.6        0.8        NO       0
OR7              CB29             J7730            BOTTOM       4.237      0.8        NO       0
OR8              CB30             J7872            BOTTOM       4.839      0.8        NO       0
OR9              CB31             J8017            BOTTOM       3.598      0.8        NO       0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culver
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ------
C1               RECT_OPEN    30               5.875      2          0          1
C10              RECT_OPEN    30               5.705      2          0          1
C100             RECT_OPEN    30               4.907      2          0          1
C1000            RECT_OPEN    30               5.633      2          0          1
C10000           RECT_OPEN    30               4.907      2          0          1
C10001           RECT_OPEN    30               4.907      2          0          1
C10002           RECT_OPEN    30               4.907      2          0          1
C10003           RECT_OPEN    30               4.882      2          0          1
C10004           RECT_OPEN    30               6.66       1          0          1
C10005           RECT_OPEN    30               7.793      1          0          1
......
Too many conduit entities (32386 in total).
OR1              RECT_CLOSED  30               10         0          0
OR10             RECT_CLOSED  30               10         0          0
OR11             RECT_CLOSED  30               10         0          0
OR12             RECT_CLOSED  30               10         0          0
OR13             RECT_CLOSED  30               10         0          0
OR14             RECT_CLOSED  30               10         0          0
OR15             RECT_CLOSED  30               10         0          0
OR16             RECT_CLOSED  30               10         0          0
OR17             RECT_CLOSED  30               10         0          0
OR18             RECT_CLOSED  30               10         0          0
OR19             RECT_CLOSED  30               10         0          0
OR2              RECT_CLOSED  30               10         0          0
OR20             RECT_CLOSED  30               10         0          0
OR21             RECT_CLOSED  30               10         0          0
OR22             RECT_CLOSED  30               10         0          0
```

```
OR23             RECT_CLOSED  30              10         0          0
OR24             RECT_CLOSED  30              10         0          0
OR25             RECT_CLOSED  30              10         0          0
OR26             RECT_CLOSED  30              10         0          0
OR27             RECT_CLOSED  30              10         0          0
OR28             RECT_CLOSED  30              10         0          0
OR29             RECT_CLOSED  30              10         0          0
OR3              RECT_CLOSED  30              10         0          0
OR30             RECT_CLOSED  30              10         0          0
OR31             RECT_CLOSED  30              10         0          0
OR32             RECT_CLOSED  30              10         0          0
OR33             RECT_CLOSED  30              10         0          0
OR34             RECT_CLOSED  30              10         0          0
OR35             RECT_CLOSED  30              10         0          0
OR36             RECT_CLOSED  30              10         0          0
OR37             RECT_CLOSED  30              10         0          0
OR4              RECT_CLOSED  30              10         0          0
OR5              RECT_CLOSED  30              10         0          0
OR6              RECT_CLOSED  30              10         0          0
OR7              RECT_CLOSED  30              10         0          0
OR8              RECT_CLOSED  30              10         0          0
OR9              RECT_CLOSED  30              10         0          0

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate  Seepage
;;-------------- ---------- ---------- ---------- ---------- ----------
C3616            0.5        0          0          NO         0
C3617            0.5        0          0          NO         0
C3618            0.5        0          0          NO         0
C3619            0.5        0          0          NO         0
C3620            0.5        0          0          NO         0
C3621            0.5        0          0          NO         0
C3622            0.5        0          0          NO         0
C3623            0.5        0          0          NO         0
C3624            0.5        0          0          NO         0
C3625            0.5        0          0          NO         0
......
Too many conduit entities (32386 in total).

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
;Bioretention Pond, data from RIDEM Report here: "F:\P2021\0588\A10\background\client data\2012-0
BioretentionPond Storage    0          354
BioretentionPond            1.999      354
BioretentionPond            2          1073
BioretentionPond            3          2526
BioretentionPond            4          4112

;DENT1 Just the storage area of pipes on easter side of Detention Basin #1 from this plan here: "
DENT1            Storage    0          1844.04
DENT1                       3          1844.04

;DENT2 Just the storage area of pipes on easter side of Detention BAsin #2 from this plan here: "
DENT2            Storage    0          3528.36
DENT2                       3          3528.36

;Storage Volume for the WQ portion of the Detention Basin #2 without pipes  from this document :
DENT2WQ          Storage    0          915
DENT2WQ                     1.25       915
DENT2WQ                     4.25       1445.167059

;Storage Curve for infilitration basin according to this plan: "F:\P2021\0588\A10\background\clie
INFIL01          Storage    0          1330.56
```

```
INFIL01                      5.5        1330.56

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;SCS_Type_III_5.03in design storm, total rainfall = 5.03 in, rain interval = 6 minutes, rain unit
10Year_5.03in               0:00       0.00503
10Year_5.03in               0:06       0.01006
10Year_5.03in               0:12       0.01509
10Year_5.03in               0:18       0.02012
10Year_5.03in               0:24       0.02515
10Year_5.03in               0:30       0.03018
10Year_5.03in               0:36       0.03521
10Year_5.03in               0:42       0.04024
10Year_5.03in               0:48       0.04527
10Year_5.03in               0:54       0.0503
10Year_5.03in               1:00       0.05533
10Year_5.03in               1:06       0.06036
10Year_5.03in               1:12       0.06539
10Year_5.03in               1:18       0.07042
10Year_5.03in               1:24       0.07545
10Year_5.03in               1:30       0.08048
10Year_5.03in               1:36       0.08551
10Year_5.03in               1:42       0.09054
10Year_5.03in               1:48       0.09557
10Year_5.03in               1:54       0.1006
10Year_5.03in               2:00       0.10568
10Year_5.03in               2:06       0.11081
10Year_5.03in               2:12       0.11604
10Year_5.03in               2:18       0.12132
10Year_5.03in               2:24       0.12671
10Year_5.03in               2:30       0.13214
10Year_5.03in               2:36       0.13767
10Year_5.03in               2:42       0.14325
10Year_5.03in               2:48       0.14894
10Year_5.03in               2:54       0.15467
10Year_5.03in               3:00       0.16051
10Year_5.03in               3:06       0.16639
10Year_5.03in               3:12       0.17238
10Year_5.03in               3:18       0.17841
10Year_5.03in               3:24       0.18455
10Year_5.03in               3:30       0.19074
10Year_5.03in               3:36       0.19703
10Year_5.03in               3:42       0.20336
10Year_5.03in               3:48       0.2098
10Year_5.03in               3:54       0.21629
10Year_5.03in               4:00       0.22288
10Year_5.03in               4:06       0.22952
10Year_5.03in               4:12       0.23626
10Year_5.03in               4:18       0.24305
10Year_5.03in               4:24       0.24994
10Year_5.03in               4:30       0.25688
10Year_5.03in               4:36       0.26392
10Year_5.03in               4:42       0.27102
10Year_5.03in               4:48       0.27821
10Year_5.03in               4:54       0.28545
10Year_5.03in               5:00       0.2928
10Year_5.03in               5:06       0.30019
10Year_5.03in               5:12       0.30769
10Year_5.03in               5:18       0.31523
10Year_5.03in               5:24       0.32288
10Year_5.03in               5:30       0.33057
10Year_5.03in               5:36       0.33837
10Year_5.03in               5:42       0.34621
```

10Year_5.03in	5:48	0.35416
10Year_5.03in	5:54	0.36216
10Year_5.03in	6:00	0.37036
10Year_5.03in	6:06	0.37876
10Year_5.03in	6:12	0.38746
10Year_5.03in	6:18	0.39636
10Year_5.03in	6:24	0.40557
10Year_5.03in	6:30	0.41498
10Year_5.03in	6:36	0.42468
10Year_5.03in	6:42	0.43459
10Year_5.03in	6:48	0.4448
10Year_5.03in	6:54	0.45522
10Year_5.03in	7:00	0.46593
10Year_5.03in	7:06	0.47684
10Year_5.03in	7:12	0.48806
10Year_5.03in	7:18	0.49948
10Year_5.03in	7:24	0.5112
10Year_5.03in	7:30	0.52312
10Year_5.03in	7:36	0.53534
10Year_5.03in	7:42	0.54777
10Year_5.03in	7:48	0.56049
10Year_5.03in	7:54	0.57342
10Year_5.03in	8:00	0.5868
10Year_5.03in	8:06	0.60073
10Year_5.03in	8:12	0.61527
10Year_5.03in	8:18	0.63036
10Year_5.03in	8:24	0.64605
10Year_5.03in	8:30	0.6623
10Year_5.03in	8:36	0.67915
10Year_5.03in	8:42	0.69655
10Year_5.03in	8:48	0.71456
10Year_5.03in	8:54	0.73312
10Year_5.03in	9:00	0.75229
10Year_5.03in	9:06	0.772
10Year_5.03in	9:12	0.79233
10Year_5.03in	9:18	0.8132
10Year_5.03in	9:24	0.83468
10Year_5.03in	9:30	0.85671
10Year_5.03in	9:36	0.87934
10Year_5.03in	9:42	0.90253
10Year_5.03in	9:48	0.92632
10Year_5.03in	9:54	0.95067
10Year_5.03in	10:00	0.97592
10Year_5.03in	10:06	1.00238
10Year_5.03in	10:12	1.03004
10Year_5.03in	10:18	1.05892
10Year_5.03in	10:24	1.089
10Year_5.03in	10:30	1.12028
10Year_5.03in	10:36	1.15278
10Year_5.03in	10:42	1.18648
10Year_5.03in	10:48	1.22138
10Year_5.03in	10:54	1.2575
10Year_5.03in	11:00	1.29653
10Year_5.03in	11:06	1.34019
10Year_5.03in	11:12	1.38848
10Year_5.03in	11:18	1.4414
10Year_5.03in	11:24	1.49894
10Year_5.03in	11:30	1.58093
10Year_5.03in	11:36	1.70718
10Year_5.03in	11:42	1.8777
10Year_5.03in	11:48	2.09248
10Year_5.03in	11:54	2.515
10Year_5.03in	12:00	2.93752
10Year_5.03in	12:06	3.1523

10Year_5.03in	12:12	3.32282
10Year_5.03in	12:18	3.44907
10Year_5.03in	12:24	3.53106
10Year_5.03in	12:30	3.5886
10Year_5.03in	12:36	3.64152
10Year_5.03in	12:42	3.68981
10Year_5.03in	12:48	3.73347
10Year_5.03in	12:54	3.7725
10Year_5.03in	13:00	3.80862
10Year_5.03in	13:06	3.84352
10Year_5.03in	13:12	3.87722
10Year_5.03in	13:18	3.90972
10Year_5.03in	13:24	3.941
10Year_5.03in	13:30	3.97108
10Year_5.03in	13:36	3.99996
10Year_5.03in	13:42	4.02762
10Year_5.03in	13:48	4.05408
10Year_5.03in	13:54	4.07933
10Year_5.03in	14:00	4.10368
10Year_5.03in	14:06	4.12747
10Year_5.03in	14:12	4.15066
10Year_5.03in	14:18	4.17329
10Year_5.03in	14:24	4.19532
10Year_5.03in	14:30	4.2168
10Year_5.03in	14:36	4.23767
10Year_5.03in	14:42	4.258
10Year_5.03in	14:48	4.27771
10Year_5.03in	14:54	4.29688
10Year_5.03in	15:00	4.31544
10Year_5.03in	15:06	4.33345
10Year_5.03in	15:12	4.35085
10Year_5.03in	15:18	4.3677
10Year_5.03in	15:24	4.38395
10Year_5.03in	15:30	4.39964
10Year_5.03in	15:36	4.41473
10Year_5.03in	15:42	4.42927
10Year_5.03in	15:48	4.4432
10Year_5.03in	15:54	4.45658
10Year_5.03in	16:00	4.46956
10Year_5.03in	16:06	4.48223
10Year_5.03in	16:12	4.49471
10Year_5.03in	16:18	4.50688
10Year_5.03in	16:24	4.51885
10Year_5.03in	16:30	4.53052
10Year_5.03in	16:36	4.54199
10Year_5.03in	16:42	4.55316
10Year_5.03in	16:48	4.56412
10Year_5.03in	16:54	4.57479
10Year_5.03in	17:00	4.58525
10Year_5.03in	17:06	4.59541
10Year_5.03in	17:12	4.60537
10Year_5.03in	17:18	4.61502
10Year_5.03in	17:24	4.62448
10Year_5.03in	17:30	4.63364
10Year_5.03in	17:36	4.64259
10Year_5.03in	17:42	4.65124
10Year_5.03in	17:48	4.65969
10Year_5.03in	17:54	4.66784
10Year_5.03in	18:00	4.67584
10Year_5.03in	18:06	4.68379
10Year_5.03in	18:12	4.69163
10Year_5.03in	18:18	4.69943
10Year_5.03in	18:24	4.70712
10Year_5.03in	18:30	4.71477

10Year_5.03in	18:36	4.72231
10Year_5.03in	18:42	4.72981
10Year_5.03in	18:48	4.7372
10Year_5.03in	18:54	4.74455
10Year_5.03in	19:00	4.75179
10Year_5.03in	19:06	4.75898
10Year_5.03in	19:12	4.76608
10Year_5.03in	19:18	4.77312
10Year_5.03in	19:24	4.78006
10Year_5.03in	19:30	4.78695
10Year_5.03in	19:36	4.79374
10Year_5.03in	19:42	4.80048
10Year_5.03in	19:48	4.80712
10Year_5.03in	19:54	4.81371
10Year_5.03in	20:00	4.8202
10Year_5.03in	20:06	4.82669
10Year_5.03in	20:12	4.83308
10Year_5.03in	20:18	4.83941
10Year_5.03in	20:24	4.8457
10Year_5.03in	20:30	4.85194
10Year_5.03in	20:36	4.85807
10Year_5.03in	20:42	4.86421
10Year_5.03in	20:48	4.87025
10Year_5.03in	20:54	4.87628
10Year_5.03in	21:00	4.88222
10Year_5.03in	21:06	4.8881
10Year_5.03in	21:12	4.89394
10Year_5.03in	21:18	4.89972
10Year_5.03in	21:24	4.90541
10Year_5.03in	21:30	4.91109
10Year_5.03in	21:36	4.91667
10Year_5.03in	21:42	4.92226
10Year_5.03in	21:48	4.92774
10Year_5.03in	21:54	4.93317
10Year_5.03in	22:00	4.93855
10Year_5.03in	22:06	4.94389
10Year_5.03in	22:12	4.94912
10Year_5.03in	22:18	4.95435
10Year_5.03in	22:24	4.95948
10Year_5.03in	22:30	4.96461
10Year_5.03in	22:36	4.96964
10Year_5.03in	22:42	4.97462
10Year_5.03in	22:48	4.97955
10Year_5.03in	22:54	4.98443
10Year_5.03in	23:00	4.98921
10Year_5.03in	23:06	4.99399
10Year_5.03in	23:12	4.99866
10Year_5.03in	23:18	5.00334
10Year_5.03in	23:24	5.00792
10Year_5.03in	23:30	5.01245
10Year_5.03in	23:36	5.01692
10Year_5.03in	23:42	5.02135
10Year_5.03in	23:48	5.02567
10Year_5.03in	23:54	5.03

;SCS_Type_III_2.86in design storm, total rainfall = 2.86 in, rain interval = 6 minutes, rain unit

1Year_2.86	0:00	0.00286
1Year_2.86	0:06	0.00572
1Year_2.86	0:12	0.00858
1Year_2.86	0:18	0.01144
1Year_2.86	0:24	0.0143
1Year_2.86	0:30	0.01716
1Year_2.86	0:36	0.02002
1Year_2.86	0:42	0.02288

1Year_2.86	0:48	0.02574
1Year_2.86	0:54	0.0286
1Year_2.86	1:00	0.03146
1Year_2.86	1:06	0.03432
1Year_2.86	1:12	0.03718
1Year_2.86	1:18	0.04004
1Year_2.86	1:24	0.0429
1Year_2.86	1:30	0.04576
1Year_2.86	1:36	0.04862
1Year_2.86	1:42	0.05148
1Year_2.86	1:48	0.05434
1Year_2.86	1:54	0.0572
1Year_2.86	2:00	0.06009
1Year_2.86	2:06	0.06301
1Year_2.86	2:12	0.06598
1Year_2.86	2:18	0.06898
1Year_2.86	2:24	0.07204
1Year_2.86	2:30	0.07513
1Year_2.86	2:36	0.07828
1Year_2.86	2:42	0.08145
1Year_2.86	2:48	0.08468
1Year_2.86	2:54	0.08794
1Year_2.86	3:00	0.09126
1Year_2.86	3:06	0.09461
1Year_2.86	3:12	0.09801
1Year_2.86	3:18	0.10144
1Year_2.86	3:24	0.10493
1Year_2.86	3:30	0.10845
1Year_2.86	3:36	0.11203
1Year_2.86	3:42	0.11563
1Year_2.86	3:48	0.11929
1Year_2.86	3:54	0.12298
1Year_2.86	4:00	0.12673
1Year_2.86	4:06	0.1305
1Year_2.86	4:12	0.13433
1Year_2.86	4:18	0.1382
1Year_2.86	4:24	0.14211
1Year_2.86	4:30	0.14606
1Year_2.86	4:36	0.15006
1Year_2.86	4:42	0.1541
1Year_2.86	4:48	0.15819
1Year_2.86	4:54	0.1623
1Year_2.86	5:00	0.16648
1Year_2.86	5:06	0.17068
1Year_2.86	5:12	0.17495
1Year_2.86	5:18	0.17924
1Year_2.86	5:24	0.18358
1Year_2.86	5:30	0.18796
1Year_2.86	5:36	0.19239
1Year_2.86	5:42	0.19685
1Year_2.86	5:48	0.20137
1Year_2.86	5:54	0.20592
1Year_2.86	6:00	0.21058
1Year_2.86	6:06	0.21536
1Year_2.86	6:12	0.22031
1Year_2.86	6:18	0.22537
1Year_2.86	6:24	0.2306
1Year_2.86	6:30	0.23595
1Year_2.86	6:36	0.24147
1Year_2.86	6:42	0.2471
1Year_2.86	6:48	0.25291
1Year_2.86	6:54	0.25883
1Year_2.86	7:00	0.26492
1Year_2.86	7:06	0.27113

1Year_2.86	7:12	0.27751
1Year_2.86	7:18	0.284
1Year_2.86	7:24	0.29066
1Year_2.86	7:30	0.29744
1Year_2.86	7:36	0.30439
1Year_2.86	7:42	0.31145
1Year_2.86	7:48	0.31869
1Year_2.86	7:54	0.32604
1Year_2.86	8:00	0.33365
1Year_2.86	8:06	0.34157
1Year_2.86	8:12	0.34984
1Year_2.86	8:18	0.35842
1Year_2.86	8:24	0.36734
1Year_2.86	8:30	0.37658
1Year_2.86	8:36	0.38616
1Year_2.86	8:42	0.39605
1Year_2.86	8:48	0.40629
1Year_2.86	8:54	0.41684
1Year_2.86	9:00	0.42774
1Year_2.86	9:06	0.43895
1Year_2.86	9:12	0.45051
1Year_2.86	9:18	0.46238
1Year_2.86	9:24	0.47459
1Year_2.86	9:30	0.48712
1Year_2.86	9:36	0.49999
1Year_2.86	9:42	0.51317
1Year_2.86	9:48	0.5267
1Year_2.86	9:54	0.54054
1Year_2.86	10:00	0.5549
1Year_2.86	10:06	0.56994
1Year_2.86	10:12	0.58567
1Year_2.86	10:18	0.60209
1Year_2.86	10:24	0.61919
1Year_2.86	10:30	0.63698
1Year_2.86	10:36	0.65545
1Year_2.86	10:42	0.67462
1Year_2.86	10:48	0.69447
1Year_2.86	10:54	0.715
1Year_2.86	11:00	0.73719
1Year_2.86	11:06	0.76202
1Year_2.86	11:12	0.78947
1Year_2.86	11:18	0.81956
1Year_2.86	11:24	0.85228
1Year_2.86	11:30	0.8989
1Year_2.86	11:36	0.97068
1Year_2.86	11:42	1.06764
1Year_2.86	11:48	1.18976
1Year_2.86	11:54	1.43
1Year_2.86	12:00	1.67024
1Year_2.86	12:06	1.79236
1Year_2.86	12:12	1.88932
1Year_2.86	12:18	1.9611
1Year_2.86	12:24	2.00772
1Year_2.86	12:30	2.04044
1Year_2.86	12:36	2.07053
1Year_2.86	12:42	2.09798
1Year_2.86	12:48	2.12281
1Year_2.86	12:54	2.145
1Year_2.86	13:00	2.16553
1Year_2.86	13:06	2.18538
1Year_2.86	13:12	2.20455
1Year_2.86	13:18	2.22302
1Year_2.86	13:24	2.24081
1Year_2.86	13:30	2.25791

1Year_2.86	13:36	2.27433
1Year_2.86	13:42	2.29006
1Year_2.86	13:48	2.3051
1Year_2.86	13:54	2.31946
1Year_2.86	14:00	2.3333
1Year_2.86	14:06	2.34683
1Year_2.86	14:12	2.36001
1Year_2.86	14:18	2.37288
1Year_2.86	14:24	2.38541
1Year_2.86	14:30	2.39762
1Year_2.86	14:36	2.40949
1Year_2.86	14:42	2.42105
1Year_2.86	14:48	2.43226
1Year_2.86	14:54	2.44316
1Year_2.86	15:00	2.45371
1Year_2.86	15:06	2.46395
1Year_2.86	15:12	2.47384
1Year_2.86	15:18	2.48342
1Year_2.86	15:24	2.49266
1Year_2.86	15:30	2.50158
1Year_2.86	15:36	2.51016
1Year_2.86	15:42	2.51843
1Year_2.86	15:48	2.52635
1Year_2.86	15:54	2.53396
1Year_2.86	16:00	2.54134
1Year_2.86	16:06	2.54855
1Year_2.86	16:12	2.55564
1Year_2.86	16:18	2.56256
1Year_2.86	16:24	2.56937
1Year_2.86	16:30	2.576
1Year_2.86	16:36	2.58252
1Year_2.86	16:42	2.58887
1Year_2.86	16:48	2.59511
1Year_2.86	16:54	2.60117
1Year_2.86	17:00	2.60712
1Year_2.86	17:06	2.6129
1Year_2.86	17:12	2.61856
1Year_2.86	17:18	2.62405
1Year_2.86	17:24	2.62943
1Year_2.86	17:30	2.63463
1Year_2.86	17:36	2.63972
1Year_2.86	17:42	2.64464
1Year_2.86	17:48	2.64945
1Year_2.86	17:54	2.65408
1Year_2.86	18:00	2.65863
1Year_2.86	18:06	2.66315
1Year_2.86	18:12	2.66761
1Year_2.86	18:18	2.67204
1Year_2.86	18:24	2.67642
1Year_2.86	18:30	2.68076
1Year_2.86	18:36	2.68505
1Year_2.86	18:42	2.68932
1Year_2.86	18:48	2.69352
1Year_2.86	18:54	2.6977
1Year_2.86	19:00	2.70181
1Year_2.86	19:06	2.7059
1Year_2.86	19:12	2.70994
1Year_2.86	19:18	2.71394
1Year_2.86	19:24	2.71789
1Year_2.86	19:30	2.7218
1Year_2.86	19:36	2.72567
1Year_2.86	19:42	2.7295
1Year_2.86	19:48	2.73327
1Year_2.86	19:54	2.73702

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1Year_2.86                20:00     2.74071
1Year_2.86                20:06     2.7444
1Year_2.86                20:12     2.74803
1Year_2.86                20:18     2.75163
1Year_2.86                20:24     2.75521
1Year_2.86                20:30     2.75876
1Year_2.86                20:36     2.76225
1Year_2.86                20:42     2.76573
1Year_2.86                20:48     2.76917
1Year_2.86                20:54     2.7726
1Year_2.86                21:00     2.77597
1Year_2.86                21:06     2.77932
1Year_2.86                21:12     2.78264
1Year_2.86                21:18     2.78593
1Year_2.86                21:24     2.78916
1Year_2.86                21:30     2.79239
1Year_2.86                21:36     2.79556
1Year_2.86                21:42     2.79874
1Year_2.86                21:48     2.80186
1Year_2.86                21:54     2.80494
1Year_2.86                22:00     2.80801
1Year_2.86                22:06     2.81104
1Year_2.86                22:12     2.81401
1Year_2.86                22:18     2.81699
1Year_2.86                22:24     2.8199
1Year_2.86                22:30     2.82282
1Year_2.86                22:36     2.82568
1Year_2.86                22:42     2.82851
1Year_2.86                22:48     2.83131
1Year_2.86                22:54     2.83409
1Year_2.86                23:00     2.83681
1Year_2.86                23:06     2.83952
1Year_2.86                23:12     2.84218
1Year_2.86                23:18     2.84484
1Year_2.86                23:24     2.84744
1Year_2.86                23:30     2.85002
1Year_2.86                23:36     2.85256
1Year_2.86                23:42     2.85508
1Year_2.86                23:48     2.85754
1Year_2.86                23:54     2.86

;SCS_Type_III_3.4in design storm, total rainfall = 3.4 in, rain interval = 6 minutes, rain units
2_Year_3.4in              0:00      0.034
2_Year_3.4in              0:06      0.034
2_Year_3.4in              0:12      0.034
2_Year_3.4in              0:18      0.034
2_Year_3.4in              0:24      0.034
2_Year_3.4in              0:30      0.034
2_Year_3.4in              0:36      0.034
2_Year_3.4in              0:42      0.034
2_Year_3.4in              0:48      0.034
2_Year_3.4in              0:54      0.034
2_Year_3.4in              1:00      0.034
2_Year_3.4in              1:06      0.034
2_Year_3.4in              1:12      0.034
2_Year_3.4in              1:18      0.034
2_Year_3.4in              1:24      0.034
2_Year_3.4in              1:30      0.034
2_Year_3.4in              1:36      0.034
2_Year_3.4in              1:42      0.034
2_Year_3.4in              1:48      0.034
2_Year_3.4in              1:54      0.034
2_Year_3.4in              2:00      0.03434
2_Year_3.4in              2:06      0.03468
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2_Year_3.4in	2:12	0.03536
2_Year_3.4in	2:18	0.0357
2_Year_3.4in	2:24	0.03638
2_Year_3.4in	2:30	0.03672
2_Year_3.4in	2:36	0.0374
2_Year_3.4in	2:42	0.03774
2_Year_3.4in	2:48	0.03842
2_Year_3.4in	2:54	0.03876
2_Year_3.4in	3:00	0.03944
2_Year_3.4in	3:06	0.03978
2_Year_3.4in	3:12	0.04046
2_Year_3.4in	3:18	0.0408
2_Year_3.4in	3:24	0.04148
2_Year_3.4in	3:30	0.04182
2_Year_3.4in	3:36	0.0425
2_Year_3.4in	3:42	0.04284
2_Year_3.4in	3:48	0.04352
2_Year_3.4in	3:54	0.04386
2_Year_3.4in	4:00	0.04454
2_Year_3.4in	4:06	0.04488
2_Year_3.4in	4:12	0.04556
2_Year_3.4in	4:18	0.0459
2_Year_3.4in	4:24	0.04658
2_Year_3.4in	4:30	0.04692
2_Year_3.4in	4:36	0.0476
2_Year_3.4in	4:42	0.04794
2_Year_3.4in	4:48	0.04862
2_Year_3.4in	4:54	0.04896
2_Year_3.4in	5:00	0.04964
2_Year_3.4in	5:06	0.04998
2_Year_3.4in	5:12	0.05066
2_Year_3.4in	5:18	0.051
2_Year_3.4in	5:24	0.05168
2_Year_3.4in	5:30	0.05202
2_Year_3.4in	5:36	0.0527
2_Year_3.4in	5:42	0.05304
2_Year_3.4in	5:48	0.05372
2_Year_3.4in	5:54	0.05406
2_Year_3.4in	6:00	0.05542
2_Year_3.4in	6:06	0.05678
2_Year_3.4in	6:12	0.05882
2_Year_3.4in	6:18	0.06018
2_Year_3.4in	6:24	0.06222
2_Year_3.4in	6:30	0.06358
2_Year_3.4in	6:36	0.06562
2_Year_3.4in	6:42	0.06698
2_Year_3.4in	6:48	0.06902
2_Year_3.4in	6:54	0.07038
2_Year_3.4in	7:00	0.07242
2_Year_3.4in	7:06	0.07378
2_Year_3.4in	7:12	0.07582
2_Year_3.4in	7:18	0.07718
2_Year_3.4in	7:24	0.07922
2_Year_3.4in	7:30	0.08058
2_Year_3.4in	7:36	0.08262
2_Year_3.4in	7:42	0.08398
2_Year_3.4in	7:48	0.08602
2_Year_3.4in	7:54	0.08738
2_Year_3.4in	8:00	0.09044
2_Year_3.4in	8:06	0.09418
2_Year_3.4in	8:12	0.09826
2_Year_3.4in	8:18	0.102
2_Year_3.4in	8:24	0.10608
2_Year_3.4in	8:30	0.10982

2_Year_3.4in	8:36	0.1139
2_Year_3.4in	8:42	0.11764
2_Year_3.4in	8:48	0.12172
2_Year_3.4in	8:54	0.12546
2_Year_3.4in	9:00	0.12954
2_Year_3.4in	9:06	0.13328
2_Year_3.4in	9:12	0.13736
2_Year_3.4in	9:18	0.1411
2_Year_3.4in	9:24	0.14518
2_Year_3.4in	9:30	0.14892
2_Year_3.4in	9:36	0.153
2_Year_3.4in	9:42	0.15674
2_Year_3.4in	9:48	0.16082
2_Year_3.4in	9:54	0.16456
2_Year_3.4in	10:00	0.17068
2_Year_3.4in	10:06	0.17884
2_Year_3.4in	10:12	0.187
2_Year_3.4in	10:18	0.19516
2_Year_3.4in	10:24	0.20332
2_Year_3.4in	10:30	0.21148
2_Year_3.4in	10:36	0.21964
2_Year_3.4in	10:42	0.2278
2_Year_3.4in	10:48	0.23596
2_Year_3.4in	10:54	0.24412
2_Year_3.4in	11:00	0.26384
2_Year_3.4in	11:06	0.29512
2_Year_3.4in	11:12	0.3264
2_Year_3.4in	11:18	0.35768
2_Year_3.4in	11:24	0.38896
2_Year_3.4in	11:30	0.5542
2_Year_3.4in	11:36	0.8534
2_Year_3.4in	11:42	1.1526
2_Year_3.4in	11:48	1.4518
2_Year_3.4in	11:54	2.856
2_Year_3.4in	12:00	2.856
2_Year_3.4in	12:06	1.4518
2_Year_3.4in	12:12	1.1526
2_Year_3.4in	12:18	0.8534
2_Year_3.4in	12:24	0.5542
2_Year_3.4in	12:30	0.38896
2_Year_3.4in	12:36	0.35768
2_Year_3.4in	12:42	0.3264
2_Year_3.4in	12:48	0.29512
2_Year_3.4in	12:54	0.26384
2_Year_3.4in	13:00	0.24412
2_Year_3.4in	13:06	0.23596
2_Year_3.4in	13:12	0.2278
2_Year_3.4in	13:18	0.21964
2_Year_3.4in	13:24	0.21148
2_Year_3.4in	13:30	0.20332
2_Year_3.4in	13:36	0.19516
2_Year_3.4in	13:42	0.187
2_Year_3.4in	13:48	0.17884
2_Year_3.4in	13:54	0.17068
2_Year_3.4in	14:00	0.16456
2_Year_3.4in	14:06	0.16082
2_Year_3.4in	14:12	0.15674
2_Year_3.4in	14:18	0.153
2_Year_3.4in	14:24	0.14892
2_Year_3.4in	14:30	0.14518
2_Year_3.4in	14:36	0.1411
2_Year_3.4in	14:42	0.13736
2_Year_3.4in	14:48	0.13328
2_Year_3.4in	14:54	0.12954

2_Year_3.4in	15:00	0.12546
2_Year_3.4in	15:06	0.12172
2_Year_3.4in	15:12	0.11764
2_Year_3.4in	15:18	0.1139
2_Year_3.4in	15:24	0.10982
2_Year_3.4in	15:30	0.10608
2_Year_3.4in	15:36	0.102
2_Year_3.4in	15:42	0.09826
2_Year_3.4in	15:48	0.09418
2_Year_3.4in	15:54	0.09044
2_Year_3.4in	16:00	0.08772
2_Year_3.4in	16:06	0.08568
2_Year_3.4in	16:12	0.08432
2_Year_3.4in	16:18	0.08228
2_Year_3.4in	16:24	0.08092
2_Year_3.4in	16:30	0.07888
2_Year_3.4in	16:36	0.07752
2_Year_3.4in	16:42	0.07548
2_Year_3.4in	16:48	0.07412
2_Year_3.4in	16:54	0.07208
2_Year_3.4in	17:00	0.07072
2_Year_3.4in	17:06	0.06868
2_Year_3.4in	17:12	0.06732
2_Year_3.4in	17:18	0.06528
2_Year_3.4in	17:24	0.06392
2_Year_3.4in	17:30	0.06188
2_Year_3.4in	17:36	0.06052
2_Year_3.4in	17:42	0.05848
2_Year_3.4in	17:48	0.05712
2_Year_3.4in	17:54	0.05508
2_Year_3.4in	18:00	0.05406
2_Year_3.4in	18:06	0.05372
2_Year_3.4in	18:12	0.05304
2_Year_3.4in	18:18	0.0527
2_Year_3.4in	18:24	0.05202
2_Year_3.4in	18:30	0.05168
2_Year_3.4in	18:36	0.051
2_Year_3.4in	18:42	0.05066
2_Year_3.4in	18:48	0.04998
2_Year_3.4in	18:54	0.04964
2_Year_3.4in	19:00	0.04896
2_Year_3.4in	19:06	0.04862
2_Year_3.4in	19:12	0.04794
2_Year_3.4in	19:18	0.0476
2_Year_3.4in	19:24	0.04692
2_Year_3.4in	19:30	0.04658
2_Year_3.4in	19:36	0.0459
2_Year_3.4in	19:42	0.04556
2_Year_3.4in	19:48	0.04488
2_Year_3.4in	19:54	0.04454
2_Year_3.4in	20:00	0.04386
2_Year_3.4in	20:06	0.04386
2_Year_3.4in	20:12	0.04318
2_Year_3.4in	20:18	0.04284
2_Year_3.4in	20:24	0.0425
2_Year_3.4in	20:30	0.04216
2_Year_3.4in	20:36	0.04148
2_Year_3.4in	20:42	0.04148
2_Year_3.4in	20:48	0.0408
2_Year_3.4in	20:54	0.0408
2_Year_3.4in	21:00	0.04012
2_Year_3.4in	21:06	0.03978
2_Year_3.4in	21:12	0.03944
2_Year_3.4in	21:18	0.0391

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2_Year_3.4in              21:24      0.03842
2_Year_3.4in              21:30      0.03842
2_Year_3.4in              21:36      0.03774
2_Year_3.4in              21:42      0.03774
2_Year_3.4in              21:48      0.03706
2_Year_3.4in              21:54      0.03672
2_Year_3.4in              22:00      0.03638
2_Year_3.4in              22:06      0.03604
2_Year_3.4in              22:12      0.03536
2_Year_3.4in              22:18      0.03536
2_Year_3.4in              22:24      0.03468
2_Year_3.4in              22:30      0.03468
2_Year_3.4in              22:36      0.034
2_Year_3.4in              22:42      0.03366
2_Year_3.4in              22:48      0.03332
2_Year_3.4in              22:54      0.03298
2_Year_3.4in              23:00      0.0323
2_Year_3.4in              23:06      0.0323
2_Year_3.4in              23:12      0.03162
2_Year_3.4in              23:18      0.03162
2_Year_3.4in              23:24      0.03094
2_Year_3.4in              23:30      0.0306
2_Year_3.4in              23:36      0.03026
2_Year_3.4in              23:42      0.02992
2_Year_3.4in              23:48      0.02924
2_Year_3.4in              23:54      0.02924

;SCS_Type_III_1in design storm, total rainfall = 1 in, rain interval = 6 minutes, rain units = in
SCS_Type_III_1in          0:00       0.001
SCS_Type_III_1in          0:06       0.002
SCS_Type_III_1in          0:12       0.003
SCS_Type_III_1in          0:18       0.004
SCS_Type_III_1in          0:24       0.005
SCS_Type_III_1in          0:30       0.006
SCS_Type_III_1in          0:36       0.007
SCS_Type_III_1in          0:42       0.008
SCS_Type_III_1in          0:48       0.009
SCS_Type_III_1in          0:54       0.01
SCS_Type_III_1in          1:00       0.011
SCS_Type_III_1in          1:06       0.012
SCS_Type_III_1in          1:12       0.013
SCS_Type_III_1in          1:18       0.014
SCS_Type_III_1in          1:24       0.015
SCS_Type_III_1in          1:30       0.016
SCS_Type_III_1in          1:36       0.017
SCS_Type_III_1in          1:42       0.018
SCS_Type_III_1in          1:48       0.019
SCS_Type_III_1in          1:54       0.02
SCS_Type_III_1in          2:00       0.02101
SCS_Type_III_1in          2:06       0.02203
SCS_Type_III_1in          2:12       0.02307
SCS_Type_III_1in          2:18       0.02412
SCS_Type_III_1in          2:24       0.02519
SCS_Type_III_1in          2:30       0.02627
SCS_Type_III_1in          2:36       0.02737
SCS_Type_III_1in          2:42       0.02848
SCS_Type_III_1in          2:48       0.02961
SCS_Type_III_1in          2:54       0.03075
SCS_Type_III_1in          3:00       0.03191
SCS_Type_III_1in          3:06       0.03308
SCS_Type_III_1in          3:12       0.03427
SCS_Type_III_1in          3:18       0.03547
SCS_Type_III_1in          3:24       0.03669
SCS_Type_III_1in          3:30       0.03792
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SCS_Type_III_1in	3:36	0.03917
SCS_Type_III_1in	3:42	0.04043
SCS_Type_III_1in	3:48	0.04171
SCS_Type_III_1in	3:54	0.043
SCS_Type_III_1in	4:00	0.04431
SCS_Type_III_1in	4:06	0.04563
SCS_Type_III_1in	4:12	0.04697
SCS_Type_III_1in	4:18	0.04832
SCS_Type_III_1in	4:24	0.04969
SCS_Type_III_1in	4:30	0.05107
SCS_Type_III_1in	4:36	0.05247
SCS_Type_III_1in	4:42	0.05388
SCS_Type_III_1in	4:48	0.05531
SCS_Type_III_1in	4:54	0.05675
SCS_Type_III_1in	5:00	0.05821
SCS_Type_III_1in	5:06	0.05968
SCS_Type_III_1in	5:12	0.06117
SCS_Type_III_1in	5:18	0.06267
SCS_Type_III_1in	5:24	0.06419
SCS_Type_III_1in	5:30	0.06572
SCS_Type_III_1in	5:36	0.06727
SCS_Type_III_1in	5:42	0.06883
SCS_Type_III_1in	5:48	0.07041
SCS_Type_III_1in	5:54	0.072
SCS_Type_III_1in	6:00	0.07363
SCS_Type_III_1in	6:06	0.0753
SCS_Type_III_1in	6:12	0.07703
SCS_Type_III_1in	6:18	0.0788
SCS_Type_III_1in	6:24	0.08063
SCS_Type_III_1in	6:30	0.0825
SCS_Type_III_1in	6:36	0.08443
SCS_Type_III_1in	6:42	0.0864
SCS_Type_III_1in	6:48	0.08843
SCS_Type_III_1in	6:54	0.0905
SCS_Type_III_1in	7:00	0.09263
SCS_Type_III_1in	7:06	0.0948
SCS_Type_III_1in	7:12	0.09703
SCS_Type_III_1in	7:18	0.0993
SCS_Type_III_1in	7:24	0.10163
SCS_Type_III_1in	7:30	0.104
SCS_Type_III_1in	7:36	0.10643
SCS_Type_III_1in	7:42	0.1089
SCS_Type_III_1in	7:48	0.11143
SCS_Type_III_1in	7:54	0.114
SCS_Type_III_1in	8:00	0.11666
SCS_Type_III_1in	8:06	0.11943
SCS_Type_III_1in	8:12	0.12232
SCS_Type_III_1in	8:18	0.12532
SCS_Type_III_1in	8:24	0.12844
SCS_Type_III_1in	8:30	0.13167
SCS_Type_III_1in	8:36	0.13502
SCS_Type_III_1in	8:42	0.13848
SCS_Type_III_1in	8:48	0.14206
SCS_Type_III_1in	8:54	0.14575
SCS_Type_III_1in	9:00	0.14956
SCS_Type_III_1in	9:06	0.15348
SCS_Type_III_1in	9:12	0.15752
SCS_Type_III_1in	9:18	0.16167
SCS_Type_III_1in	9:24	0.16594
SCS_Type_III_1in	9:30	0.17032
SCS_Type_III_1in	9:36	0.17482
SCS_Type_III_1in	9:42	0.17943
SCS_Type_III_1in	9:48	0.18416
SCS_Type_III_1in	9:54	0.189

SCS_Type_III_1in	10:00	0.19402
SCS_Type_III_1in	10:06	0.19928
SCS_Type_III_1in	10:12	0.20478
SCS_Type_III_1in	10:18	0.21052
SCS_Type_III_1in	10:24	0.2165
SCS_Type_III_1in	10:30	0.22272
SCS_Type_III_1in	10:36	0.22918
SCS_Type_III_1in	10:42	0.23588
SCS_Type_III_1in	10:48	0.24282
SCS_Type_III_1in	10:54	0.25
SCS_Type_III_1in	11:00	0.25776
SCS_Type_III_1in	11:06	0.26644
SCS_Type_III_1in	11:12	0.27604
SCS_Type_III_1in	11:18	0.28656
SCS_Type_III_1in	11:24	0.298
SCS_Type_III_1in	11:30	0.3143
SCS_Type_III_1in	11:36	0.3394
SCS_Type_III_1in	11:42	0.3733
SCS_Type_III_1in	11:48	0.416
SCS_Type_III_1in	11:54	0.5
SCS_Type_III_1in	12:00	0.584
SCS_Type_III_1in	12:06	0.6267
SCS_Type_III_1in	12:12	0.6606
SCS_Type_III_1in	12:18	0.6857
SCS_Type_III_1in	12:24	0.702
SCS_Type_III_1in	12:30	0.71344
SCS_Type_III_1in	12:36	0.72396
SCS_Type_III_1in	12:42	0.73356
SCS_Type_III_1in	12:48	0.74224
SCS_Type_III_1in	12:54	0.75
SCS_Type_III_1in	13:00	0.75718
SCS_Type_III_1in	13:06	0.76412
SCS_Type_III_1in	13:12	0.77082
SCS_Type_III_1in	13:18	0.77728
SCS_Type_III_1in	13:24	0.7835
SCS_Type_III_1in	13:30	0.78948
SCS_Type_III_1in	13:36	0.79522
SCS_Type_III_1in	13:42	0.80072
SCS_Type_III_1in	13:48	0.80598
SCS_Type_III_1in	13:54	0.811
SCS_Type_III_1in	14:00	0.81584
SCS_Type_III_1in	14:06	0.82057
SCS_Type_III_1in	14:12	0.82518
SCS_Type_III_1in	14:18	0.82968
SCS_Type_III_1in	14:24	0.83406
SCS_Type_III_1in	14:30	0.83833
SCS_Type_III_1in	14:36	0.84248
SCS_Type_III_1in	14:42	0.84652
SCS_Type_III_1in	14:48	0.85044
SCS_Type_III_1in	14:54	0.85425
SCS_Type_III_1in	15:00	0.85794
SCS_Type_III_1in	15:06	0.86152
SCS_Type_III_1in	15:12	0.86498
SCS_Type_III_1in	15:18	0.86833
SCS_Type_III_1in	15:24	0.87156
SCS_Type_III_1in	15:30	0.87468
SCS_Type_III_1in	15:36	0.87768
SCS_Type_III_1in	15:42	0.88057
SCS_Type_III_1in	15:48	0.88334
SCS_Type_III_1in	15:54	0.886
SCS_Type_III_1in	16:00	0.88858
SCS_Type_III_1in	16:06	0.8911
SCS_Type_III_1in	16:12	0.89358
SCS_Type_III_1in	16:18	0.896

SCS_Type_III_1in	16:24	0.89838
SCS_Type_III_1in	16:30	0.9007
SCS_Type_III_1in	16:36	0.90298
SCS_Type_III_1in	16:42	0.9052
SCS_Type_III_1in	16:48	0.90738
SCS_Type_III_1in	16:54	0.9095
SCS_Type_III_1in	17:00	0.91158
SCS_Type_III_1in	17:06	0.9136
SCS_Type_III_1in	17:12	0.91558
SCS_Type_III_1in	17:18	0.9175
SCS_Type_III_1in	17:24	0.91938
SCS_Type_III_1in	17:30	0.9212
SCS_Type_III_1in	17:36	0.92298
SCS_Type_III_1in	17:42	0.9247
SCS_Type_III_1in	17:48	0.92638
SCS_Type_III_1in	17:54	0.928
SCS_Type_III_1in	18:00	0.92959
SCS_Type_III_1in	18:06	0.93117
SCS_Type_III_1in	18:12	0.93273
SCS_Type_III_1in	18:18	0.93428
SCS_Type_III_1in	18:24	0.93581
SCS_Type_III_1in	18:30	0.93733
SCS_Type_III_1in	18:36	0.93883
SCS_Type_III_1in	18:42	0.94032
SCS_Type_III_1in	18:48	0.94179
SCS_Type_III_1in	18:54	0.94325
SCS_Type_III_1in	19:00	0.94469
SCS_Type_III_1in	19:06	0.94612
SCS_Type_III_1in	19:12	0.94753
SCS_Type_III_1in	19:18	0.94893
SCS_Type_III_1in	19:24	0.95031
SCS_Type_III_1in	19:30	0.95168
SCS_Type_III_1in	19:36	0.95303
SCS_Type_III_1in	19:42	0.95437
SCS_Type_III_1in	19:48	0.95569
SCS_Type_III_1in	19:54	0.957
SCS_Type_III_1in	20:00	0.95829
SCS_Type_III_1in	20:06	0.95958
SCS_Type_III_1in	20:12	0.96085
SCS_Type_III_1in	20:18	0.96211
SCS_Type_III_1in	20:24	0.96336
SCS_Type_III_1in	20:30	0.9646
SCS_Type_III_1in	20:36	0.96582
SCS_Type_III_1in	20:42	0.96704
SCS_Type_III_1in	20:48	0.96824
SCS_Type_III_1in	20:54	0.96944
SCS_Type_III_1in	21:00	0.97062
SCS_Type_III_1in	21:06	0.97179
SCS_Type_III_1in	21:12	0.97295
SCS_Type_III_1in	21:18	0.9741
SCS_Type_III_1in	21:24	0.97523
SCS_Type_III_1in	21:30	0.97636
SCS_Type_III_1in	21:36	0.97747
SCS_Type_III_1in	21:42	0.97858
SCS_Type_III_1in	21:48	0.97967
SCS_Type_III_1in	21:54	0.98075
SCS_Type_III_1in	22:00	0.98182
SCS_Type_III_1in	22:06	0.98288
SCS_Type_III_1in	22:12	0.98392
SCS_Type_III_1in	22:18	0.98496
SCS_Type_III_1in	22:24	0.98598
SCS_Type_III_1in	22:30	0.987
SCS_Type_III_1in	22:36	0.988
SCS_Type_III_1in	22:42	0.98899

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SCS_Type_III_1in            22:48      0.98997
SCS_Type_III_1in            22:54      0.99094
SCS_Type_III_1in            23:00      0.99189
SCS_Type_III_1in            23:06      0.99284
SCS_Type_III_1in            23:12      0.99377
SCS_Type_III_1in            23:18      0.9947
SCS_Type_III_1in            23:24      0.99561
SCS_Type_III_1in            23:30      0.99651
SCS_Type_III_1in            23:36      0.9974
SCS_Type_III_1in            23:42      0.99828
SCS_Type_III_1in            23:48      0.99914
SCS_Type_III_1in            23:54      1

;SCS_Type_III_2in design storm, total rainfall = 2 in, rain interval = 6 minutes, rain units = in
SCS_Type_III_2in            0:00       0.002
SCS_Type_III_2in            0:06       0.004
SCS_Type_III_2in            0:12       0.006
SCS_Type_III_2in            0:18       0.008
SCS_Type_III_2in            0:24       0.01
SCS_Type_III_2in            0:30       0.012
SCS_Type_III_2in            0:36       0.014
SCS_Type_III_2in            0:42       0.016
SCS_Type_III_2in            0:48       0.018
SCS_Type_III_2in            0:54       0.02
SCS_Type_III_2in            1:00       0.022
SCS_Type_III_2in            1:06       0.024
SCS_Type_III_2in            1:12       0.026
SCS_Type_III_2in            1:18       0.028
SCS_Type_III_2in            1:24       0.03
SCS_Type_III_2in            1:30       0.032
SCS_Type_III_2in            1:36       0.034
SCS_Type_III_2in            1:42       0.036
SCS_Type_III_2in            1:48       0.038
SCS_Type_III_2in            1:54       0.04
SCS_Type_III_2in            2:00       0.04202
SCS_Type_III_2in            2:06       0.04406
SCS_Type_III_2in            2:12       0.04614
SCS_Type_III_2in            2:18       0.04824
SCS_Type_III_2in            2:24       0.05038
SCS_Type_III_2in            2:30       0.05254
SCS_Type_III_2in            2:36       0.05474
SCS_Type_III_2in            2:42       0.05696
SCS_Type_III_2in            2:48       0.05922
SCS_Type_III_2in            2:54       0.0615
SCS_Type_III_2in            3:00       0.06382
SCS_Type_III_2in            3:06       0.06616
SCS_Type_III_2in            3:12       0.06854
SCS_Type_III_2in            3:18       0.07094
SCS_Type_III_2in            3:24       0.07338
SCS_Type_III_2in            3:30       0.07584
SCS_Type_III_2in            3:36       0.07834
SCS_Type_III_2in            3:42       0.08086
SCS_Type_III_2in            3:48       0.08342
SCS_Type_III_2in            3:54       0.086
SCS_Type_III_2in            4:00       0.08862
SCS_Type_III_2in            4:06       0.09126
SCS_Type_III_2in            4:12       0.09394
SCS_Type_III_2in            4:18       0.09664
SCS_Type_III_2in            4:24       0.09938
SCS_Type_III_2in            4:30       0.10214
SCS_Type_III_2in            4:36       0.10494
SCS_Type_III_2in            4:42       0.10776
SCS_Type_III_2in            4:48       0.11062
SCS_Type_III_2in            4:54       0.1135
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SCS_Type_III_2in	5:00	0.11642
SCS_Type_III_2in	5:06	0.11936
SCS_Type_III_2in	5:12	0.12234
SCS_Type_III_2in	5:18	0.12534
SCS_Type_III_2in	5:24	0.12838
SCS_Type_III_2in	5:30	0.13144
SCS_Type_III_2in	5:36	0.13454
SCS_Type_III_2in	5:42	0.13766
SCS_Type_III_2in	5:48	0.14082
SCS_Type_III_2in	5:54	0.144
SCS_Type_III_2in	6:00	0.14726
SCS_Type_III_2in	6:06	0.1506
SCS_Type_III_2in	6:12	0.15406
SCS_Type_III_2in	6:18	0.1576
SCS_Type_III_2in	6:24	0.16126
SCS_Type_III_2in	6:30	0.165
SCS_Type_III_2in	6:36	0.16886
SCS_Type_III_2in	6:42	0.1728
SCS_Type_III_2in	6:48	0.17686
SCS_Type_III_2in	6:54	0.181
SCS_Type_III_2in	7:00	0.18526
SCS_Type_III_2in	7:06	0.1896
SCS_Type_III_2in	7:12	0.19406
SCS_Type_III_2in	7:18	0.1986
SCS_Type_III_2in	7:24	0.20326
SCS_Type_III_2in	7:30	0.208
SCS_Type_III_2in	7:36	0.21286
SCS_Type_III_2in	7:42	0.2178
SCS_Type_III_2in	7:48	0.22286
SCS_Type_III_2in	7:54	0.228
SCS_Type_III_2in	8:00	0.23332
SCS_Type_III_2in	8:06	0.23886
SCS_Type_III_2in	8:12	0.24464
SCS_Type_III_2in	8:18	0.25064
SCS_Type_III_2in	8:24	0.25688
SCS_Type_III_2in	8:30	0.26334
SCS_Type_III_2in	8:36	0.27004
SCS_Type_III_2in	8:42	0.27696
SCS_Type_III_2in	8:48	0.28412
SCS_Type_III_2in	8:54	0.2915
SCS_Type_III_2in	9:00	0.29912
SCS_Type_III_2in	9:06	0.30696
SCS_Type_III_2in	9:12	0.31504
SCS_Type_III_2in	9:18	0.32334
SCS_Type_III_2in	9:24	0.33188
SCS_Type_III_2in	9:30	0.34064
SCS_Type_III_2in	9:36	0.34964
SCS_Type_III_2in	9:42	0.35886
SCS_Type_III_2in	9:48	0.36832
SCS_Type_III_2in	9:54	0.378
SCS_Type_III_2in	10:00	0.38804
SCS_Type_III_2in	10:06	0.39856
SCS_Type_III_2in	10:12	0.40956
SCS_Type_III_2in	10:18	0.42104
SCS_Type_III_2in	10:24	0.433
SCS_Type_III_2in	10:30	0.44544
SCS_Type_III_2in	10:36	0.45836
SCS_Type_III_2in	10:42	0.47176
SCS_Type_III_2in	10:48	0.48564
SCS_Type_III_2in	10:54	0.5
SCS_Type_III_2in	11:00	0.51552
SCS_Type_III_2in	11:06	0.53288
SCS_Type_III_2in	11:12	0.55208
SCS_Type_III_2in	11:18	0.57312

SCS_Type_III_2in	11:24	0.596
SCS_Type_III_2in	11:30	0.6286
SCS_Type_III_2in	11:36	0.6788
SCS_Type_III_2in	11:42	0.7466
SCS_Type_III_2in	11:48	0.832
SCS_Type_III_2in	11:54	1
SCS_Type_III_2in	12:00	1.168
SCS_Type_III_2in	12:06	1.2534
SCS_Type_III_2in	12:12	1.3212
SCS_Type_III_2in	12:18	1.3714
SCS_Type_III_2in	12:24	1.404
SCS_Type_III_2in	12:30	1.42688
SCS_Type_III_2in	12:36	1.44792
SCS_Type_III_2in	12:42	1.46712
SCS_Type_III_2in	12:48	1.48448
SCS_Type_III_2in	12:54	1.5
SCS_Type_III_2in	13:00	1.51436
SCS_Type_III_2in	13:06	1.52824
SCS_Type_III_2in	13:12	1.54164
SCS_Type_III_2in	13:18	1.55456
SCS_Type_III_2in	13:24	1.567
SCS_Type_III_2in	13:30	1.57896
SCS_Type_III_2in	13:36	1.59044
SCS_Type_III_2in	13:42	1.60144
SCS_Type_III_2in	13:48	1.61196
SCS_Type_III_2in	13:54	1.622
SCS_Type_III_2in	14:00	1.63168
SCS_Type_III_2in	14:06	1.64114
SCS_Type_III_2in	14:12	1.65036
SCS_Type_III_2in	14:18	1.65936
SCS_Type_III_2in	14:24	1.66812
SCS_Type_III_2in	14:30	1.67666
SCS_Type_III_2in	14:36	1.68496
SCS_Type_III_2in	14:42	1.69304
SCS_Type_III_2in	14:48	1.70088
SCS_Type_III_2in	14:54	1.7085
SCS_Type_III_2in	15:00	1.71588
SCS_Type_III_2in	15:06	1.72304
SCS_Type_III_2in	15:12	1.72996
SCS_Type_III_2in	15:18	1.73666
SCS_Type_III_2in	15:24	1.74312
SCS_Type_III_2in	15:30	1.74936
SCS_Type_III_2in	15:36	1.75536
SCS_Type_III_2in	15:42	1.76114
SCS_Type_III_2in	15:48	1.76668
SCS_Type_III_2in	15:54	1.772
SCS_Type_III_2in	16:00	1.77716
SCS_Type_III_2in	16:06	1.7822
SCS_Type_III_2in	16:12	1.78716
SCS_Type_III_2in	16:18	1.792
SCS_Type_III_2in	16:24	1.79676
SCS_Type_III_2in	16:30	1.8014
SCS_Type_III_2in	16:36	1.80596
SCS_Type_III_2in	16:42	1.8104
SCS_Type_III_2in	16:48	1.81476
SCS_Type_III_2in	16:54	1.819
SCS_Type_III_2in	17:00	1.82316
SCS_Type_III_2in	17:06	1.8272
SCS_Type_III_2in	17:12	1.83116
SCS_Type_III_2in	17:18	1.835
SCS_Type_III_2in	17:24	1.83876
SCS_Type_III_2in	17:30	1.8424
SCS_Type_III_2in	17:36	1.84596
SCS_Type_III_2in	17:42	1.8494

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SCS_Type_III_2in            17:48      1.85276
SCS_Type_III_2in            17:54      1.856
SCS_Type_III_2in            18:00      1.85918
SCS_Type_III_2in            18:06      1.86234
SCS_Type_III_2in            18:12      1.86546
SCS_Type_III_2in            18:18      1.86856
SCS_Type_III_2in            18:24      1.87162
SCS_Type_III_2in            18:30      1.87466
SCS_Type_III_2in            18:36      1.87766
SCS_Type_III_2in            18:42      1.88064
SCS_Type_III_2in            18:48      1.88358
SCS_Type_III_2in            18:54      1.8865
SCS_Type_III_2in            19:00      1.88938
SCS_Type_III_2in            19:06      1.89224
SCS_Type_III_2in            19:12      1.89506
SCS_Type_III_2in            19:18      1.89786
SCS_Type_III_2in            19:24      1.90062
SCS_Type_III_2in            19:30      1.90336
SCS_Type_III_2in            19:36      1.90606
SCS_Type_III_2in            19:42      1.90874
SCS_Type_III_2in            19:48      1.91138
SCS_Type_III_2in            19:54      1.914
SCS_Type_III_2in            20:00      1.91658
SCS_Type_III_2in            20:06      1.91916
SCS_Type_III_2in            20:12      1.9217
SCS_Type_III_2in            20:18      1.92422
SCS_Type_III_2in            20:24      1.92672
SCS_Type_III_2in            20:30      1.9292
SCS_Type_III_2in            20:36      1.93164
SCS_Type_III_2in            20:42      1.93408
SCS_Type_III_2in            20:48      1.93648
SCS_Type_III_2in            20:54      1.93888
SCS_Type_III_2in            21:00      1.94124
SCS_Type_III_2in            21:06      1.94358
SCS_Type_III_2in            21:12      1.9459
SCS_Type_III_2in            21:18      1.9482
SCS_Type_III_2in            21:24      1.95046
SCS_Type_III_2in            21:30      1.95272
SCS_Type_III_2in            21:36      1.95494
SCS_Type_III_2in            21:42      1.95716
SCS_Type_III_2in            21:48      1.95934
SCS_Type_III_2in            21:54      1.9615
SCS_Type_III_2in            22:00      1.96364
SCS_Type_III_2in            22:06      1.96576
SCS_Type_III_2in            22:12      1.96784
SCS_Type_III_2in            22:18      1.96992
SCS_Type_III_2in            22:24      1.97196
SCS_Type_III_2in            22:30      1.974
SCS_Type_III_2in            22:36      1.976
SCS_Type_III_2in            22:42      1.97798
SCS_Type_III_2in            22:48      1.97994
SCS_Type_III_2in            22:54      1.98188
SCS_Type_III_2in            23:00      1.98378
SCS_Type_III_2in            23:06      1.98568
SCS_Type_III_2in            23:12      1.98754
SCS_Type_III_2in            23:18      1.9894
SCS_Type_III_2in            23:24      1.99122
SCS_Type_III_2in            23:30      1.99302
SCS_Type_III_2in            23:36      1.9948
SCS_Type_III_2in            23:42      1.99656
SCS_Type_III_2in            23:48      1.99828
SCS_Type_III_2in            23:54      2

;SCS_Type_III_3.4in design storm, total rainfall = 3.4 in, rain interval = 6 minutes, rain units
```

SCS_Type_III_3.4in	0:00	0.0034
SCS_Type_III_3.4in	0:06	0.0068
SCS_Type_III_3.4in	0:12	0.0102
SCS_Type_III_3.4in	0:18	0.0136
SCS_Type_III_3.4in	0:24	0.017
SCS_Type_III_3.4in	0:30	0.0204
SCS_Type_III_3.4in	0:36	0.0238
SCS_Type_III_3.4in	0:42	0.0272
SCS_Type_III_3.4in	0:48	0.0306
SCS_Type_III_3.4in	0:54	0.034
SCS_Type_III_3.4in	1:00	0.0374
SCS_Type_III_3.4in	1:06	0.0408
SCS_Type_III_3.4in	1:12	0.0442
SCS_Type_III_3.4in	1:18	0.0476
SCS_Type_III_3.4in	1:24	0.051
SCS_Type_III_3.4in	1:30	0.0544
SCS_Type_III_3.4in	1:36	0.0578
SCS_Type_III_3.4in	1:42	0.0612
SCS_Type_III_3.4in	1:48	0.0646
SCS_Type_III_3.4in	1:54	0.068
SCS_Type_III_3.4in	2:00	0.07143
SCS_Type_III_3.4in	2:06	0.0749
SCS_Type_III_3.4in	2:12	0.07844
SCS_Type_III_3.4in	2:18	0.08201
SCS_Type_III_3.4in	2:24	0.08565
SCS_Type_III_3.4in	2:30	0.08932
SCS_Type_III_3.4in	2:36	0.09306
SCS_Type_III_3.4in	2:42	0.09683
SCS_Type_III_3.4in	2:48	0.10067
SCS_Type_III_3.4in	2:54	0.10455
SCS_Type_III_3.4in	3:00	0.10849
SCS_Type_III_3.4in	3:06	0.11247
SCS_Type_III_3.4in	3:12	0.11652
SCS_Type_III_3.4in	3:18	0.1206
SCS_Type_III_3.4in	3:24	0.12475
SCS_Type_III_3.4in	3:30	0.12893
SCS_Type_III_3.4in	3:36	0.13318
SCS_Type_III_3.4in	3:42	0.13746
SCS_Type_III_3.4in	3:48	0.14181
SCS_Type_III_3.4in	3:54	0.1462
SCS_Type_III_3.4in	4:00	0.15065
SCS_Type_III_3.4in	4:06	0.15514
SCS_Type_III_3.4in	4:12	0.1597
SCS_Type_III_3.4in	4:18	0.16429
SCS_Type_III_3.4in	4:24	0.16895
SCS_Type_III_3.4in	4:30	0.17364
SCS_Type_III_3.4in	4:36	0.1784
SCS_Type_III_3.4in	4:42	0.18319
SCS_Type_III_3.4in	4:48	0.18805
SCS_Type_III_3.4in	4:54	0.19295
SCS_Type_III_3.4in	5:00	0.19791
SCS_Type_III_3.4in	5:06	0.20291
SCS_Type_III_3.4in	5:12	0.20798
SCS_Type_III_3.4in	5:18	0.21308
SCS_Type_III_3.4in	5:24	0.21825
SCS_Type_III_3.4in	5:30	0.22345
SCS_Type_III_3.4in	5:36	0.22872
SCS_Type_III_3.4in	5:42	0.23402
SCS_Type_III_3.4in	5:48	0.23939
SCS_Type_III_3.4in	5:54	0.2448
SCS_Type_III_3.4in	6:00	0.25034
SCS_Type_III_3.4in	6:06	0.25602
SCS_Type_III_3.4in	6:12	0.2619
SCS_Type_III_3.4in	6:18	0.26792

SCS_Type_III_3.4in	6:24	0.27414
SCS_Type_III_3.4in	6:30	0.2805
SCS_Type_III_3.4in	6:36	0.28706
SCS_Type_III_3.4in	6:42	0.29376
SCS_Type_III_3.4in	6:48	0.30066
SCS_Type_III_3.4in	6:54	0.3077
SCS_Type_III_3.4in	7:00	0.31494
SCS_Type_III_3.4in	7:06	0.32232
SCS_Type_III_3.4in	7:12	0.3299
SCS_Type_III_3.4in	7:18	0.33762
SCS_Type_III_3.4in	7:24	0.34554
SCS_Type_III_3.4in	7:30	0.3536
SCS_Type_III_3.4in	7:36	0.36186
SCS_Type_III_3.4in	7:42	0.37026
SCS_Type_III_3.4in	7:48	0.37886
SCS_Type_III_3.4in	7:54	0.3876
SCS_Type_III_3.4in	8:00	0.39664
SCS_Type_III_3.4in	8:06	0.40606
SCS_Type_III_3.4in	8:12	0.41589
SCS_Type_III_3.4in	8:18	0.42609
SCS_Type_III_3.4in	8:24	0.4367
SCS_Type_III_3.4in	8:30	0.44768
SCS_Type_III_3.4in	8:36	0.45907
SCS_Type_III_3.4in	8:42	0.47083
SCS_Type_III_3.4in	8:48	0.483
SCS_Type_III_3.4in	8:54	0.49555
SCS_Type_III_3.4in	9:00	0.5085
SCS_Type_III_3.4in	9:06	0.52183
SCS_Type_III_3.4in	9:12	0.53557
SCS_Type_III_3.4in	9:18	0.54968
SCS_Type_III_3.4in	9:24	0.5642
SCS_Type_III_3.4in	9:30	0.57909
SCS_Type_III_3.4in	9:36	0.59439
SCS_Type_III_3.4in	9:42	0.61006
SCS_Type_III_3.4in	9:48	0.62614
SCS_Type_III_3.4in	9:54	0.6426
SCS_Type_III_3.4in	10:00	0.65967
SCS_Type_III_3.4in	10:06	0.67755
SCS_Type_III_3.4in	10:12	0.69625
SCS_Type_III_3.4in	10:18	0.71577
SCS_Type_III_3.4in	10:24	0.7361
SCS_Type_III_3.4in	10:30	0.75725
SCS_Type_III_3.4in	10:36	0.77921
SCS_Type_III_3.4in	10:42	0.80199
SCS_Type_III_3.4in	10:48	0.82559
SCS_Type_III_3.4in	10:54	0.85
SCS_Type_III_3.4in	11:00	0.87638
SCS_Type_III_3.4in	11:06	0.9059
SCS_Type_III_3.4in	11:12	0.93854
SCS_Type_III_3.4in	11:18	0.9743
SCS_Type_III_3.4in	11:24	1.0132
SCS_Type_III_3.4in	11:30	1.06862
SCS_Type_III_3.4in	11:36	1.15396
SCS_Type_III_3.4in	11:42	1.26922
SCS_Type_III_3.4in	11:48	1.4144
SCS_Type_III_3.4in	11:54	1.7
SCS_Type_III_3.4in	12:00	1.9856
SCS_Type_III_3.4in	12:06	2.13078
SCS_Type_III_3.4in	12:12	2.24604
SCS_Type_III_3.4in	12:18	2.33138
SCS_Type_III_3.4in	12:24	2.3868
SCS_Type_III_3.4in	12:30	2.4257
SCS_Type_III_3.4in	12:36	2.46146
SCS_Type_III_3.4in	12:42	2.4941

SCS_Type_III_3.4in	12:48	2.52362
SCS_Type_III_3.4in	12:54	2.55
SCS_Type_III_3.4in	13:00	2.57441
SCS_Type_III_3.4in	13:06	2.59801
SCS_Type_III_3.4in	13:12	2.62079
SCS_Type_III_3.4in	13:18	2.64275
SCS_Type_III_3.4in	13:24	2.6639
SCS_Type_III_3.4in	13:30	2.68423
SCS_Type_III_3.4in	13:36	2.70375
SCS_Type_III_3.4in	13:42	2.72245
SCS_Type_III_3.4in	13:48	2.74033
SCS_Type_III_3.4in	13:54	2.7574
SCS_Type_III_3.4in	14:00	2.77386
SCS_Type_III_3.4in	14:06	2.78994
SCS_Type_III_3.4in	14:12	2.80561
SCS_Type_III_3.4in	14:18	2.82091
SCS_Type_III_3.4in	14:24	2.8358
SCS_Type_III_3.4in	14:30	2.85032
SCS_Type_III_3.4in	14:36	2.86443
SCS_Type_III_3.4in	14:42	2.87817
SCS_Type_III_3.4in	14:48	2.8915
SCS_Type_III_3.4in	14:54	2.90445
SCS_Type_III_3.4in	15:00	2.917
SCS_Type_III_3.4in	15:06	2.92917
SCS_Type_III_3.4in	15:12	2.94093
SCS_Type_III_3.4in	15:18	2.95232
SCS_Type_III_3.4in	15:24	2.9633
SCS_Type_III_3.4in	15:30	2.97391
SCS_Type_III_3.4in	15:36	2.98411
SCS_Type_III_3.4in	15:42	2.99394
SCS_Type_III_3.4in	15:48	3.00336
SCS_Type_III_3.4in	15:54	3.0124
SCS_Type_III_3.4in	16:00	3.02117
SCS_Type_III_3.4in	16:06	3.02974
SCS_Type_III_3.4in	16:12	3.03817
SCS_Type_III_3.4in	16:18	3.0464
SCS_Type_III_3.4in	16:24	3.05449
SCS_Type_III_3.4in	16:30	3.06238
SCS_Type_III_3.4in	16:36	3.07013
SCS_Type_III_3.4in	16:42	3.07768
SCS_Type_III_3.4in	16:48	3.08509
SCS_Type_III_3.4in	16:54	3.0923
SCS_Type_III_3.4in	17:00	3.09937
SCS_Type_III_3.4in	17:06	3.10624
SCS_Type_III_3.4in	17:12	3.11297
SCS_Type_III_3.4in	17:18	3.1195
SCS_Type_III_3.4in	17:24	3.12589
SCS_Type_III_3.4in	17:30	3.13208
SCS_Type_III_3.4in	17:36	3.13813
SCS_Type_III_3.4in	17:42	3.14398
SCS_Type_III_3.4in	17:48	3.14969
SCS_Type_III_3.4in	17:54	3.1552
SCS_Type_III_3.4in	18:00	3.16061
SCS_Type_III_3.4in	18:06	3.16598
SCS_Type_III_3.4in	18:12	3.17128
SCS_Type_III_3.4in	18:18	3.17655
SCS_Type_III_3.4in	18:24	3.18175
SCS_Type_III_3.4in	18:30	3.18692
SCS_Type_III_3.4in	18:36	3.19202
SCS_Type_III_3.4in	18:42	3.19709
SCS_Type_III_3.4in	18:48	3.20209
SCS_Type_III_3.4in	18:54	3.20705
SCS_Type_III_3.4in	19:00	3.21195
SCS_Type_III_3.4in	19:06	3.21681

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SCS_Type_III_3.4in            19:12      3.2216
SCS_Type_III_3.4in            19:18      3.22636
SCS_Type_III_3.4in            19:24      3.23105
SCS_Type_III_3.4in            19:30      3.23571
SCS_Type_III_3.4in            19:36      3.2403
SCS_Type_III_3.4in            19:42      3.24486
SCS_Type_III_3.4in            19:48      3.24935
SCS_Type_III_3.4in            19:54      3.2538
SCS_Type_III_3.4in            20:00      3.25819
SCS_Type_III_3.4in            20:06      3.26257
SCS_Type_III_3.4in            20:12      3.26689
SCS_Type_III_3.4in            20:18      3.27117
SCS_Type_III_3.4in            20:24      3.27542
SCS_Type_III_3.4in            20:30      3.27964
SCS_Type_III_3.4in            20:36      3.28379
SCS_Type_III_3.4in            20:42      3.28794
SCS_Type_III_3.4in            20:48      3.29202
SCS_Type_III_3.4in            20:54      3.2961
SCS_Type_III_3.4in            21:00      3.30011
SCS_Type_III_3.4in            21:06      3.30409
SCS_Type_III_3.4in            21:12      3.30803
SCS_Type_III_3.4in            21:18      3.31194
SCS_Type_III_3.4in            21:24      3.31578
SCS_Type_III_3.4in            21:30      3.31962
SCS_Type_III_3.4in            21:36      3.3234
SCS_Type_III_3.4in            21:42      3.32717
SCS_Type_III_3.4in            21:48      3.33088
SCS_Type_III_3.4in            21:54      3.33455
SCS_Type_III_3.4in            22:00      3.33819
SCS_Type_III_3.4in            22:06      3.34179
SCS_Type_III_3.4in            22:12      3.34533
SCS_Type_III_3.4in            22:18      3.34886
SCS_Type_III_3.4in            22:24      3.35233
SCS_Type_III_3.4in            22:30      3.3558
SCS_Type_III_3.4in            22:36      3.3592
SCS_Type_III_3.4in            22:42      3.36257
SCS_Type_III_3.4in            22:48      3.3659
SCS_Type_III_3.4in            22:54      3.3692
SCS_Type_III_3.4in            23:00      3.37243
SCS_Type_III_3.4in            23:06      3.37566
SCS_Type_III_3.4in            23:12      3.37882
SCS_Type_III_3.4in            23:18      3.38198
SCS_Type_III_3.4in            23:24      3.38507
SCS_Type_III_3.4in            23:30      3.38813
SCS_Type_III_3.4in            23:36      3.39116
SCS_Type_III_3.4in            23:42      3.39415
SCS_Type_III_3.4in            23:48      3.39708
SCS_Type_III_3.4in            23:54      3.4

[REPORT]
;;Reporting Options
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Node       CB01             Connect2D
Node       CB02             Connect2D
Node       CB03             Connect2D
Node       CB04             Connect2D
Node       CB05             Connect2D
Node       CB06             Connect2D
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Node       CB07             Connect2D
Node       CB08             Connect2D
Node       CB09             Connect2D
Node       CB10             Connect2D
......
Too many tags (43714 in total).

[MAP]
DIMENSIONS       380659.396282754 154407.039167156 382441.571121633 155363.667722307
UNITS            Feet

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
CB01             381328.147         155109.63
CB02             381394.467         155101.764
CB03             381390.252         155068.783
CB04             381400.76          155142.064
CB05             381464.78          155088.21
CB06             381576.482         155074.655
CB07             381700.77          155098.859
CB08             381768.421         155098.98
CB09             381751.236         155060.738
CB10             381748.452         155027.094
......
Too many junction entities (11240 in total).

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[POLYGONS]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
SBioretentionPond 381983.211         154878.981
SBioretentionPond 381999.074         154878.311
SBioretentionPond 382008.686         154877.603
SBioretentionPond 382022.795         154883.902
SBioretentionPond 382029.22          154911.616
SBioretentionPond 382035.458         154936.094
SBioretentionPond 382038.517         154949.884
SBioretentionPond 382043.366         154963.217
SBioretentionPond 382087.609         154982.612
SBioretentionPond 382142.156         154975.945
SBioretentionPond 382191.855         154975.945
SBioretentionPond 382303.372         154960.793
SBioretentionPond 382318.524         154931.701
SBioretentionPond 382334.888         154843.214
SBioretentionPond 382271.856         154794.122
SBioretentionPond 382169.43          154805.032
SBioretentionPond 382134.884         154785.031
SBioretentionPond 382009.941         154726.739
SBioretentionPond 382006.545         154724.291
SBioretentionPond 381999.224         154725.96
SBioretentionPond 381990.637         154727.917
SBioretentionPond 381978.528         154733.76
SBioretentionPond 381978.074         154733.991
SBioretentionPond 381971.776         154744.321
SBioretentionPond 381968.752         154754.147
SBioretentionPond 381965.981         154765.233
SBioretentionPond 381963.839         154772.918
SBioretentionPond 381960.816         154780.602
SBioretentionPond 381963.461         154801.136
SBioretentionPond 381962.957         154822.426
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SBioretentionPond	381957.036	154845.605
SBioretentionPond	381951.745	154857.699
SBioretentionPond	381949.604	154865.131
SBioretentionPond	381950.486	154870.8
SBioretentionPond	381983.211	154878.981
SCB01	381326.59	155104.01
SCB01	381318.112	155119.884
SCB01	381321.919	155140.3
SCB01	381331.608	155176.981
SCB01	381343.027	155217.468
SCB01	381356.869	155249.996
SCB01	381378.324	155319.206
SCB01	381456.184	155316.783
SCB01	381512.392	155311.721
SCB01	381487.64	155295.102
SCB01	381414.092	155174.527
SCB01	381393.584	155143.764
SCB01	381397.827	155137.753
SCB01	381414.8	155127.852
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SCB23	381554.144	154963.311
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SCB23	381508.951	154981.877
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SCB28	381612.274	154844.04
SCB28	381645.397	154836.003
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SCB28	381606.153	154825.725
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SCB29	381693.511	154812.779
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SRunOff04        381310.054         154837.68
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SRunOff05        381310.054         154837.68
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[SYMBOLS]
;;Gage           X-Coord            Y-Coord
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Appendix B

Order of Magnitude Level Opinion of Cost

FUSS & O'NEILL, INC.

146 HARTFORD ROAD
MANCHESTER, CONNECTICUT

OPINION OF CONSTRUCTION COST		DATE PREPARED :	13-Jan-22
Type:	**Order of Magnitude**		
PROJECT :	Dudley Avenue Flood Resilience Project	Alternative #2	
LOCATION :	Newport, Rhode Island		
DESCRIPTION:	Opinion of Construction Cost		
DRAWING NO. :	20210588.A10	ESTIMATOR: SAH	CHECKED BY: MG

OPINION OF CONSTRUCTION COST - ORDER OF MAGNITUDE: An opinion of cost made without detailed engineering data. Costs may be estimated by comparison with similar projects. It is normally expected that an estimate of this type would be accurate within plus 50% or minus 30%. Since Fuss & O'Neill has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor(s)' methods of determining prices, or over competitive bidding or market conditions, Fuss & O'Neill's opinion of probable Total Project Costs and Construction Costs are made on the basis of Fuss & O'Neill's experience and qualifiations and represent Fuss & O'Neill's best judgment as an experienced and qualified professional engineer, familiar with the construction industry; but Fuss & O'Neill cannot and does not guarantee that proposals, bids or actual Total Project or Construction Costs will not vary from opinions of probable cost prepared by Fuss & O'Neill. If prior to the bidding or negotiating Phase the Owner wishes greater assurance as to Total Project or Construction Costs, the Owner shall employ an independent cost estimator.

ITEM NO.	ITEM	UNIT MEAS.	NO. UNITS	PER UNIT	TOTAL COST
WATER CONTROL					
	Control of Water	L.S.	1	$ 10,000.00	$10,000.00
STORMWATER DRAINAGE STRUCTURE IMPROVEMENTS					
	24" CPP Pipe & Fittings	L.F.	700	$ 120.00	$84,000.00
	Precast Concrete Catch Basins & Misc. Materials	EA	6	$ 5,500.00	$33,000.00
	Precast Concrete Manholes & Misc. Materials	EA	2	$ 6,000.00	$12,000.00
EARTHWORK					
	Excavation & Stockpiling (Drainage Structures)	C.Y.	750	$ 25.00	$18,750.00
	Removal of Pavement and Rigid Base	S.Y	125	$ 25.00	$3,125.00
	Class 12.5 HMA Pavement Replacment	TON	30	$ 300.00	$9,000.00
	Gravel Subbase	C.Y.	85	$ 100.00	$8,500.00
	Disposal of Unsuitable Materials	C.Y.	75	$ 25.00	$1,875.00
	SUBTOTAL				$180,250.00
	CONTINGENCY (30%)				$54,075.00
	TOTAL COST (ROUNDED TO NEAREST $1,000)				$234,000.00
			-30%	**to**	**+50%**
			$163,800.00		$351,000.00

FUSS & O'NEILL, INC.

146 HARTFORD ROAD
MANCHESTER, CONNECTICUT

OPINION OF CONSTRUCTION COST	DATE PREPARED :	13-Jan-22
Type: Order of Magnitude		
PROJECT : Dudley Avenue Flood Resilience Project	Alternative #3	
LOCATION : Newport, Rhode Island		
DESCRIPTION: Opinion of Construction Cost		
DRAWING NO. : 20210588.A10	ESTIMATOR: SAH	CHECKED BY: MG

OPINION OF CONSTRUCTION COST - ORDER OF MAGNITUDE: An opinion of cost made without detailed engineering data. Costs may be estimated by comparison with similar projects. It is normally expected that an estimate of this type would be accurate within plus 50% or minus 30%. Since Fuss & O'Neill has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor(s)' methods of determining prices, or over competitive bidding or market conditions, Fuss & O'Neill's opinion of probable Total Project Costs and Construction Costs are made on the basis of Fuss & O'Neill's experience and qualifiations and represent Fuss & O'Neill's best judgment as an experienced and qualified professional engineer, familiar with the construction industry; but Fuss & O'Neill cannot and does not guarantee that proposals, bids or actual Total Project or Construction Costs will not vary from opinions of probable cost prepared by Fuss & O'Neill. If prior to the bidding or negotiating Phase the Owner wishes greater assurance as to Total Project or Construction Costs, the Owner shall employ an independent cost estimator.

ITEM NO.	ITEM	UNIT MEAS.	NO. UNITS	PER UNIT	TOTAL COST
WATER CONTROL					
	Control of Water	L.S.	1	$ 10,000.00	$10,000.00
STORMWATER DRAINAGE STRUCTURE IMPROVEMENTS					
	Precast Concrete Catch Basins & Misc. Materials	EA	1	$ 5,500.00	$5,500.00
	Subsurface Infilltration Chambers	SF	500	$ 35.00	$17,500.00
	(Includes excavation, stone, fabric, chambers)				
EARTHWORK					
	Excavation & Stockpiling (for Trench and CB)	C.Y.	40	$ 25.00	$1,000.00
	Topsoil, grass, seeding ground	SY	100	$ 8.00	$800.00
	Disposal of Unsuitable Materials	C.Y.	4	$ 25.00	$100.00
	SUBTOTAL				$34,900.00
	CONTINGENCY (30%)				$10,470.00
	TOTAL COST (ROUNDED TO NEAREST $1,000)				$45,000.00
			-30%	**to**	**+50%**
			$31,500.00		$67,500.00

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ALT 3