THE ORCHARDS DRAINAGE STUDY

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Hanson Professional Services, Inc.

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Executive Summary

Residents at various locations within the Orchards developments have experienced stormwater related issues including but not limited to water in basements, water staging into yards and streets, and erosion. The purpose of the study is to analyze the existing drainage conditions occurring in the Orchards residential development and immediate downstream areas and to provide recommendations for long term solutions to reduce stormwater related issues experienced by many of the residents.

Drainage patterns are typically southwest to northeast within the study area towards Loop Creek. The upstream areas of the study area are typically characterized by steep terrain, resulting in quick reacting and high peaking runoff from rain storms. Existing creeks have been routed through storm sewer systems in some areas of the development. The presence of low lying homes nearby these drainage paths increases risks of stormwater related issues.

Locations for detailed study were established through meetings with City of Belleville staff, meetings with residents, and site investigations. Existing conditions for the study area were established for use in creating a HEC-HMS hydrologic model to estimate flow and stages within the development and golf course and a HEC-RAS hydraulic model to assess the flow capacity and characteristics of the creek downstream and through the development. These models were calibrated to a known storm from April 18, 2013 that caused drainage problems within the development.

The existing conditions model for this study estimated higher peak flows than used for previous permitting and design in the development. The 100-year flow predicted by this study for existing conditions is 1,581 cfs, while the 100-year flow used for previous design and permitting is 931 cfs. The peak flows estimated during this study are consistent with flows observed for the April 18, 2013 storm that was estimated between a 10 and 25 year event. They are also consistent with flows predicted by regression equations developed by USGS for the area.

The establishment of calibrated existing conditions modeling provided a baseline for assessing the potential impacts for recommended improvements. The locations of these improvements are identified on Figure 7-1 in Section 7 of this report. The improvements are identified by an ID used throughout the report and correspond to Figure 7-1. The recommended improvements analyzed as part of the study include:

- The construction or modification of 13 detention areas throughout the study area to reduce peak stormwater discharges (A-1, C-1, C-2, D-1, D-2, D-3, D-4, D-5, D-6, D-7, E-2, F-1, & F-2 on Figure 7-1)
- The lowering of the outlet structure on the lake near Pro Tour Drive to match the elevation identified on the original design plans (B-1 on Figure 7-1)
- Two detention areas required by permit from IDNR/OWR and located near the creek through the development
    - The installation of the inline detention area near Ben Hogan Court that was never constructed (G-1 on Figure 7-1)
    - The repair of the offline detention area near the golf course maintenance shed and Four Lakes Drive has not been maintained as is damaged (G-2 on Figure 7-2)
- The installation of additional 6’ diameter culverts at Jack Nicklaus Drive and Fairway Drive to supplement the 10’ x 8’ box culverts currently installed (H-1 and H-2 on Figure 7-1)

- Recommendations for locations experiencing localized drainage problems near homes (C-3, C-4, E-1, and F-3 on Figure 7-1)

The recommendations for detention areas will provide benefit to a large number of residents living within the development. The improvements upstream of Lake #2 (south of Pro Tour Drive) are anticipated to reduce the peak flow rates at this location about 40%.

Incorporating of each of the recommended improvements from this study is anticipated to reduce the peak flow rate at the downstream end of the study area near Loop Creek by about 15%. The overall benefit of upstream flow reduction is diluted since the watershed area that is located outside of the development accounts for about 2/3 of the peak flows at this location.

The improvement of the offline detention area and construction of the inline detention area required by existing IDNR/OWR permit will help lower water surfaces, mainly in the area of Ben Hogan Court; however, these improvements alone will not reduce the estimated water surface to acceptable levels. The improvements, in conjunction with the reduction in flow provided by additional detention storage in upstream areas would be necessary to lower the estimated water surface to acceptable levels. Additional 6' culverts are recommended at Jack Nicklaus Drive and Fairway Drive as an added measure of protection.

There are a total of 22 recommended improvements. The opinion of probable cost to implement all of the recommendations is just below $2 million dollars. The largest contribution to these costs is the earthwork quantities necessary to construct the recommended detention areas. **Given the potential restrictions for keeping material on-site, a conservative assumption of hauling excess material off-site was assumed. Also, it was assumed that each of the improvements would be constructed individually. If excess material could remain on-site, and recommended improvements were constructed in groups, the construction costs should be reduced.**

Each of the recommendations presented in the report were categorized using a ranking system that accounts for flow reduction, number of homes potentially benefiting, and potential downstream hazards from existing conditions.

The recommendations presented are conceptual in nature and are not intended for construction without more detailed design. **The proposed recommendations explored in the study are one possible solution to reduce peak flows and stages within the study area and each known area of concern.** These recommendations were chosen based on the goal of maximizing the amount of benefit they provide and minimizing the impact to the residents and golf course. Other solutions to reduce the peak flows and stages are possible but were not explored as part of this study.

There are significant unknowns that are inherent to the functionality of these systems. It is not possible to eliminate all risks of flooding given these unknowns. The accumulation of sediment and debris near the entrances to culverts or bridges severely restricts the flow of water and is possible throughout study area. There are many areas observed during this study where sediment and debris restricted the storm sewer and culverts in the development. Also, higher amounts of rainfall, stronger intensity storms, and saturated soils are possible and could produce different reactions within the study area leading to higher peak flows than discussed in this report. For these reasons, peak water surfaces observed in the field could be higher than those estimated during this analysis.

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Section 1: Project Description

1.1 Summary

The Orchards Drainage Study project area is generally located on the eastern side of the City of Belleville to the south of Mascoutah Avenue and east of Green Mount Road.

The study area encompasses the residential homes within the Orchards and Orchard Lakes sub-divisions and the surrounding area. The approximate 1.84 square mile watershed encompassing the study area is located in portions of Sections 31 & 32, Township 1N, Range 7W and Section 36, Township 1N, Range 8W in St. Clair County, Illinois.

Residents at various locations within the development have experienced, including but not limited to water in basements, water staging into yards and property, and erosion. A particular recent rainfall event has been noted by residents and the City as causing problems in the area. The storm of note for this study occurred on April 18, 2013. Records indicate the overall storm brought an estimated 5.2 inches of rain to the area in a 12 hour period, of which, 4.3 inches of rain fell in the first 6 hours. The first 6 hours of the storm is consistent with a 10 to 25-year rainfall event for the area. For reference, a summary table of typical rainfall depths for various return periods is provided in later in the Hydrologic Analysis section of the report (Section 5, Table 5-1).

The purpose of the study is to analyze the existing drainage conditions occurring in the Orchards residential development and immediate downstream areas and to provide conceptual long term solutions to reduce stormwater issues experienced by a number of the residents. Historical rainfall events noted above, as well as design storms ranging from the 2-year to the 100-year will be included as part of the analysis.

1.2 Study Area Characteristics

The Orchards golf course and subdivision was developed by Double Eagle Development, LLC. The Orchards and Orchard Lakes developments have been constructed in various stages since the late 1980's. Much of the development surrounds the Orchards golf course. Specific areas of concern addressed as part of this study are described in more detail in Section 4 of this report.

Drainage patterns are typically southwest to northeast within the study area towards Loop Creek. The upstream areas of the study area are typically characterized by steep terrain, resulting in quick reacting and high peaking runoff from rain storms. Existing creeks in the development have been routed through storm sewer systems. The presence of homes, particularly those with walk-out basements, nearby these drainage paths have increased storm water damage potential in the area.

Portions of the subdivision and infrastructure improvements were permitted by the Illinois Department of Natural Resources, Office of Water Resources (IDNR/OWR) in 2006 on the basis of construction mitigation, easements, maintenance requirements, and restrictive covenants. Based on a review of the documents and site investigation, it is evident that the required construction mitigation was only partially completed. The incorporation of these improvements and their effects has been examined as part of this study.

Figure 1-1 below is an aerial view of the study area. The outlined area at the northeast corner of the study area represents the portion of the subdivision that is located within the permit jurisdiction of IDNR/OWR.

Figure 1-1: Aerial Photograph of Study Area

The development plans for the Orchards developments were reviewed as part of this project. Related to the original drainage design in the development, the plans typically display the following note on the cover sheet:

> *"Minimum first floor elevation of each building shall be one and one half (1-1/2) feet above the street centerline elevation. This elevation shall be measured at the center of the lot frontage and for corner lots the highest street shall govern. All driveways at the property line shall be a minimum of six (6) inches above the street centerline elevation.*
>
> *Should it be difficult to meet these requirements, the lot owner shall, prior to constructing a building, retain an engineer to determine the proper grading to prevent damage from stormwater."*

From Phase 6 of the Orchards forward, the phrase *"should a walk-out or partially exposed basement be desirable"* was added to the second paragraph. From the 13th Addition of the Orchards forward, the minimum first floor elevation was increased to 2 feet above the street

centerline elevation from 1-1/2 feet. From the 16th Addition of the Orchards forward – a note requiring approval from the City Engineer for deviation from the requirements or a walk-out/partially exposed basement was added to the second paragraph

Many of the homes known to experience stormwater issues have walk-out or partially exposed basements below the street centerline elevation. The study did not confirm if homes within the development with these features have had separate drainage studies performed prior to construction. Also, the minimum first floor elevation of existing homes was not confirmed.

1.3 Scope of Study

The goal of this study is to assess the existing drainage patters within the Orchards development and provide recommendations for improvement to reduce stormwater impacts currently experienced in the development. The study analyzes the development as a whole to develop recommendations that will provide benefits throughout the study area. This study does not explore every possible solution to the impacts experienced by residents.

There are many specific areas and residences in the development that experience localized drainage problems such as isolated erosion or runoff against homes or near windows due to grading and lack of positive drainage away from the foundation. Detailed recommendations have not been provided for these areas; however, generalized recommendations have been provided and are meant as potential solutions to these concerns. These generalized recommendations are also intended to be able to be incorporated in other locations in the development with localized drainage concerns that have not been brought to the attention of the project team for this study.

The storm sewers throughout the development have not been analyzed, except in areas that provide connections between drainage basins. The proposed storage improvements and reductions in downstream peak stages should serve to improve the operation of the storm sewer system. Staging within the roadway can be expected in some areas during high-intensity storm events as the pipes were likely sized to carry flows resulting from a 5-10 year storm. Water staging in the roadway for short durations is likely the result of peak flow exceeding pipe capacity, while staging for long durations is likely a result of downstream water surfaces affecting the operation of the storm sewer. A goal of this study is to reduce the downstream water surfaces to improve the overall operation of the storm sewer system.

Section 2: Drainage Criteria

2.1 Applicable Regulations

The stormwater management requirements for a new development within the City of Belleville are governed by Chapter 60-7-10 of the City zoning code. These requirements include provisions for rainfall data and stormwater management facility requirements. For design within the City, the rainfall data used shall be the Illinois State Water Survey rainfall data for the region. New development within the City is required to have adequate detention to prevent increases in peak flow rates for storm events with a statistical return period of 10-years and 100-years (10% and 1% chance of occurring in any given year, respectively).

The Illinois Department of Natural Resources, Office of Water Resources exercises jurisdiction over construction activities in the floodway of streams having a drainage area of one square mile or more in an urban area. The floodway is defined as the portion of the floodplain where equal and opposite encroachment would result in a rise of 0.1 feet in the water surface elevation. For construction activities located within the floodway, applicants for permits must document that the proposed construction would not singularly nor cumulatively result in an increase in excess of 0.1 feet over the natural conditions water surface elevation. In cases where the existing conditions have already consumed the 0.1 ft maximum allowable increase, no additional increase in the water surface profile is allowed. Flood events up to and including the 100-year flood must be considered. Specific to the Orchards Subdivision, the portion of the floodplain subject to the IDNR/OWR regulatory criteria is limited to the area downstream of the spillway for Lake No. 2.

These regulations were utilized as a basis for quantifying potential improvements. Additional storm events, such as the 2-year, 5-year, 25-year, and 50-year storms were also included in the hydrologic modeling.

2.2 Model Selection

Hydrologic and hydraulic modeling software published by the U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center (HEC) have been selected for this analysis.

2.2.1 HEC-HMS

The Hydrologic Modeling System (HEC-HMS), published by the USACE, simulates the rainfall-runoff processes of watershed systems. This software is widely accepted by local, state, and federal agencies as an appropriate approach for engineering analyses to determine peak discharge. As a part of the Orchards Drainage Study, a HEC-HMS model was developed and implemented into the engineering analysis.

2.2.2 HEC-RAS

The River Analysis System (HEC-RAS), published by the USACE, performs one-dimensional hydraulic calculations on natural and constructed channels, and has the ability to simulate the effects of various obstructions such as bridges and culverts within a system. This software is widely accepted by local, state, and federal agencies as appropriate for the engineering analysis of stream systems and the effects of obstructions. As a part of the Orchards Drainage Study, a HEC-RAS model was developed and implemented into the engineering analysis.

2.2.3 Storm Sewer Modeling

As appropriate, the large diameter storm sewers connecting drainage basins in the development were analyzed using methodology published in the Illinois Department of Transportation Drainage Manual. Rating curves were developed for these basin connections for input into the HEC-HMS modeling.

Section 3: Data Collection

3.1 Desktop Survey

A desktop survey was conducted for the purpose of obtaining characteristic basin data for use in the modeling effort. The following data were obtained for use in the analysis:

- USGS Topographic Map – Freeburg, IL Quadrangle
- Soils Information – Natural Resource Conservation Service Web Soil Survey
- Rainfall Information
  - Design Volume – ISWS Bulletin 70
  - Design Distribution – ISWS Circular 173
  - Historical Rainfall – National Weather Service
- 2012 6-inch Orthophotos available from the East-West Council of Governments
- Land use information for Curve Numbers and Manning's n-value development

3.2 Orchards Development Plans and Supporting Data

The City provided copies of the existing development plans and record drawings for the Orchards. These plans were utilized to identify design characteristics of the development as well as identify storm sewer and drainage structure measurements key to the analysis.

As noted previously, portions of the Orchards development near the downstream end were under IDNR/OWR permit jurisdiction. A copy of the HEC-RAS model submitted as part of this permit application process was obtained by the project team for use in the analysis.

3.3 Homeowner Meetings and Input

The project team met with the City of Belleville during the qualification and proposal phases of the project to identify areas of concern within the development. These areas were known to the City based on previous stormwater complaints.

To ensure that each area of concern within the developments was identified for analysis, a public meeting was conducted at the Orchards Golf Course club house on the evening of August 22, 2013. At this meeting, the purpose of the analysis was explained to the residents by the City and the project team. The project team solicited feedback from the residents through discussion with an aerial of the project area, comment forms, and submission photos and videos. The project team set up an online location where the residents could upload documents, photos, and videos to assist the project team in identifying areas of concern. Assistance with submission of documents was provided by the Orchards Homeowners Association. These resident submittals were very helpful in assisting the project team with the identification of areas of concern throughout the development.

3.4 Field Investigations

Multiple site investigations were conducted by the project team over the course of the project duration. The purpose of these site investigations were to investigate locations identified by residents as areas of concern, confirm the drainage patterns throughout the area, identify the characteristics of connections between basins, and identify areas for potential improvements such as storage. Dimensions and configurations of features identified on the design plans and record drawings were confirmed during the site visit.

3.5 Topographic Information

Elevation data was available from the State of Illinois for the project area. These datasets consisted of 3-ft resolution Light Imaging, Detection and Ranging (LIDAR) and 3-ft resolution Digital Elevation Model (DEM) of the project area. These data allowed the project team to efficiently determine the boundaries of each of the sub-basins encompassing the project area, determine locations of existing and for proposed storage areas, as well as identify the limits of staging for each of the analyzed storm events. Figure 3-1 is a representation of the DEM showing key crossings and the elevation changes throughout the study area

To supplement the LIDAR and DEM data covering the entire project area, additional topographic survey was gathered by the project team through the use of GPS equipment. Key locations throughout the development including storm sewers, culverts, drainage structures, berms, and roads were obtained to identify specific locations in more detail for the analysis. Low entry elevations of homes in affected areas identified by the residents and the City of Belleville were also gathered as part of the surveying.

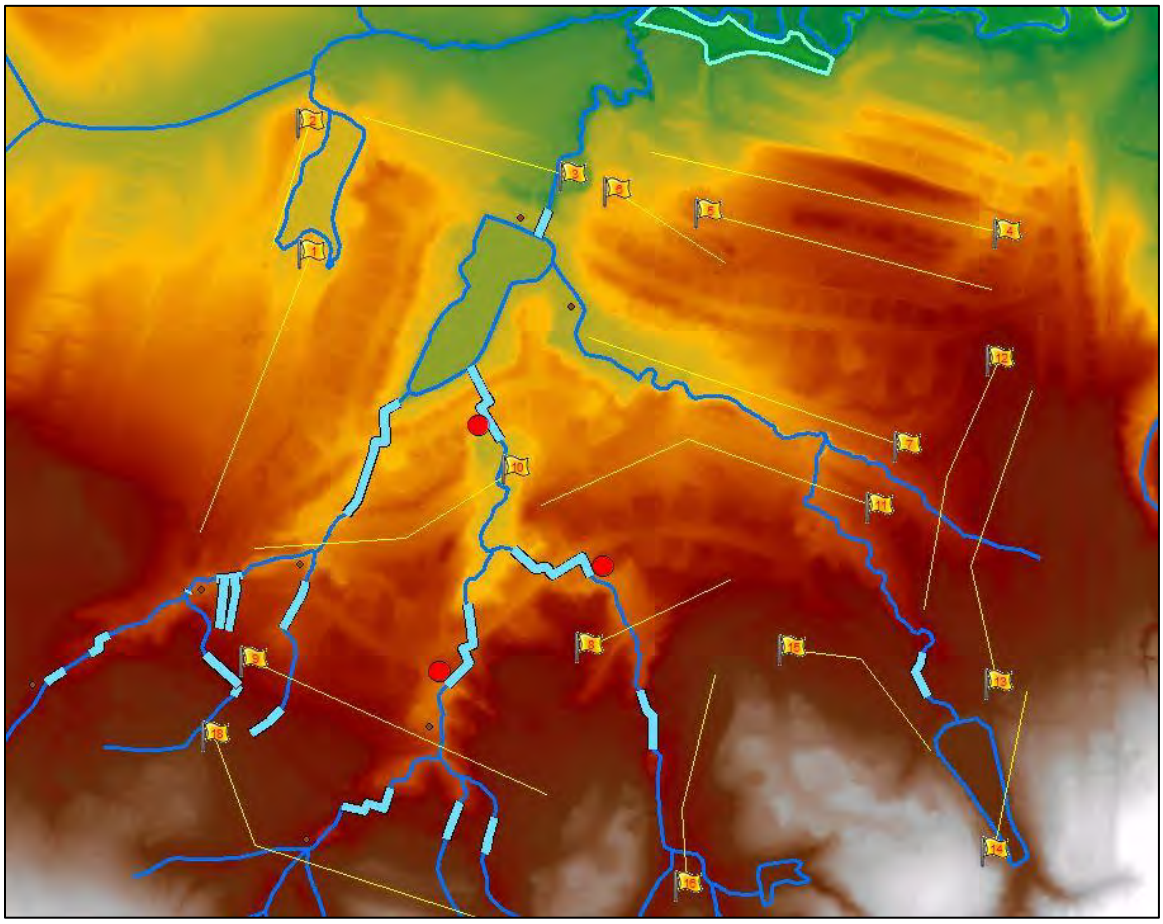


Figure 3-1: Digital Elevation Model (DEM) Representation of Study Area

Section 4: Areas of Concern & Potential Solutions

The overall study area encompasses the Orchard Lakes subdivision, the Orchards subdivision, the Orchards Golf Course, and downstream areas to Loop Creek. The drainage characteristics throughout these areas were analyzed as part of this study. The potential solutions that were explored as part of this study are identified as well.

4.1 General Concerns

During the data collection and site investigations, general concerns were identified within the study area.

4.1.1 Debris and Maintenance

Many culverts entrances and inlets were observed to be obstructed with debris and sediment. This debris restricts the flow capacity of the system and increases the risk of stormwater related issues in upstream areas. In particular, the culvert beneath Pro Tour Drive near 10th Fairway Drive, and the culverts downstream of the 7th Tee and upstream of the lake near Pro Tour Drive were blocked by debris and sediment, as shown in Figures 4-1 and 4-2, respectively.

Also, foot bridges across drainage ways were observed in many areas. These foot bridge reduce the flow capacity of channels and serve to catch debris and increase the upstream water surface upstream.

Figure 4-1: Upstream culvert entrance beneath Pro Tour Drive near 10th Fairway Drive

Figure 4-2: Culvert beneath Cart Path downstream of 7th Tee

4.1.2 Walkout Basements

The construction of many of the walkout basements in the development are near the locations of creeks and culverts. Per the developer's plans, locations with exposed basements should have been studied for drainage prior to construction. It is unknown if this occurred for the homes in the development experiencing stormwater issues.

The proposed improvements will not eliminate the risk for flooding at these locations. Grading improvements should be considered at locations where stormwater related issues have occurred in the past. Specific recommendations are provided later in this report.

4.1.3 Inefficient Grading/Construction in Easements

Many homes experiencing water flowing against foundations and near basement windows, that are not a result of water staging behind a culvert or structure, appear to have grading from the rear of yards and/or the golf course towards the house. Grading improvements should be considered to ensure positive drainage away from homes and to swales that can direct water to the nearest collection point such as a culvert or an inlet.

Also, features including landscaping, driveway additions, putting greens, basketball courts, and swing sets have been observed in drainage easements. These easements are typically located at the rear or at the side of a lot and usually contain a swale or a storm sewer. These areas were intended to convey runoff and it is normal to see water flowing through these areas during

rain events. The construction of improvements in these areas often reduces the flow capacity in the system and may cause issues for nearby residents.

In addition, some swales appear to have been filled in or have settled over time which can cause adverse impacts to nearby residents. Where this is the case, swales should be restored to provide a defined channel to convey flow. Figure 4-3 shows the homes located behind Four Lakes Drive and the grading of the swale and areas adjacent to homes that allows water to stage near foundations.

Figure 4-3: Swale behind Homes along Four Lakes Drive

4.2 Key Impact Locations

Key areas of impact within the overall study area were identified through meetings with City of Belleville staff, meetings with residents of the developments, golf course staff, and site investigation. Specific improvements were given a unique identification based on location. The details and estimated costs for each specific recommendation are discussed later in this report in Sections 5 through 7. An overall map identifying each improvement location within the development is provided later in the report as Figure 7-1 in Section 7. A summary of the key areas studied including drainage concerns, observed conditions, and general solutions that were studied is provided below:

4.2.1 Orchard Lakes Subdivision

a. Concerns: Residents on Orchards Lakes Circle, west of the 2nd (eastern) entrance off of Golf Course Drive have experienced ponding in their yard in the vicinity of an area inlet. Runoff from fields located south of Golf Course drive is routed through the storm sewer.
b. Observations: Evidence of ponding was observed on a white fence surrounding the yard. Sedimentation was observed in the storm sewer downstream of the orchard and near the home.
c. Possible Solutions: Provide detention upstream of this area to attenuate the flows from the fields, as well as manage sedimentation from the fields, especially after winter when the fields are not vegetated and have increased runoff and sedimentation potential. Ensure storm sewers through subdivision are maintained and cleared of debris on a regular basis.
d. Improvement ID: A-1

Figure 4-4: Orchard Lakes Area of Concern

4.2.2 Double Eagle Circle

a. Concerns: A resident is concerned with water being routed from higher areas of the development and ponding in the common ground behind their home.
b. Observations: The common area is serving as a detention area for stormwater attenuation. The detention area appears to be functioning correctly. The berm surrounding the detention area is below the low entry elevation of the nearby homes; therefore, water can flow out of the detention area and to the north before reaching the low entry elevation of the nearby homes. A low flow concrete swale has been installed and the pipe appears to be clear of debris.
c. Possible Solution: Ensure that detention area is maintained on a regular basis.
d. Improvement ID: N/A, none recommended

Figure 4-5: Double Eagle Circle Detention Area

4.2.3 18th Fairway Drive

a. Concerns: Drainage from steep hills behind homes is causing erosion and ponding in the back yards of homes on 18th Fairway Drive
b. Observations: Erosion and evidence of ponding has been observed. Walls and grading features have been constructed to support walk out basements in the rear yards. These modifications increase the risk of stormwater impacting basements by providing a low point for water to stage and collect. Residents have also installed rip rap in erosion prone areas, and have provided sand bags for protection of low entry points.
c. Possible Solutions: Install grading improvements and erosion control measures to direct flow away from the homes. Provide dedicated drainage measures such as swales and erosion protection in the rear of the back yards to direct stormwater flow away from the homes. Proposed improvements in this area will likely require removal of landscaping and trees at the rear of some yards.
d. Improvement ID: E-1

Figure 4-6: Back Yard along 18th Fairway Drive

Figure 4-7: Back Yard along 18th Fairway Drive

4.2.4 8th Green Court Area (near 9th Hole)

a. Concerns: Stormwater impacting homes in the area near the golf course. Residents have commented that recent tee box construction has filled in previous storage areas and has exacerbated stormwater concerns.
b. Observations: Residents have constructed berms surrounding homes, and other grading improvements around homes to protect low water entry points. Historical aerial photography shows that tee box construction has filled in areas near an existing creek previously functioning as storage. The downstream storm sewer carrying the creek to the north has junction boxes and sharp changes in flow direction. Stormwater issues in this area are exacerbated by the presence of walk-out basements near the drainage ways.
c. Possible Solutions: Increase the storage capacity within and upstream of the area which will serve to attenuate the flow rates during peak storm events. The reduced flow will decrease the impact caused by the downstream restrictions in the storm sewer. Grading improvements and berms to protect low entry points, especially walk-out basements, are recommended for added protection of low lying homes.
d. Improvement ID: D-4 (with benefits of upstream improvements D-5 through D-7)

Figure 4-8: 9th Tee Box Upstream of 8th Green Court

4.2.5 10th Fairway Drive (east of 8th Green)

a. Concerns: Stormwater impacting homes in the area near the golf course
b. Observations: Residents have worked with the golf course to raise the cart path in the area to provide storage on the golf course. Residents have also constructed berms around their homes to prevent water from the creek from entering the low entry points on the residences. The creek channel bank, including installed rip-rap, has been eroded by recent storms. The downstream storm sewer carrying the creek to the north has junction boxes and sharp changes in flow direction. Stormwater related issues in this area are exacerbated by the presence of walk-out basements near the drainage ways.
c. Possible Solutions: Increase the storage capacity within and upstream of the area which will serve to attenuate the flow rates during peak storm events. The reduced flow will decrease the impact caused by the downstream restrictions in the storm sewer. Provide erosion protection for the creek banks. Constructing grading improvements and berms to protect low entry points, especially walk-out basements is recommended. Ensure storm sewers and the creek in the area are maintained and cleared of debris on a regular basis. Consider removing the foot bridge near the home which can collect debris and increase upstream water surface elevations.
d. Improvement ID: D-2* (with benefit of upstream improvement D-3)

**Improvement D-2 was already constructed by the homeowner and golf course. It was included with identification since it was analyzed in the proposed conditions.*

Figure 4-9: Area Downstream of 8th Hole

4.2.6 10th Fairway Drive (near 8th Tee Box)

a. Concerns: Water ponding in the back yard causing water to enter basement.
b. Observations: Back yard is flat and provides inefficient route for drainage to enter the storm sewer system downstream of the 8th Tee Box.
c. Possible Solutions: Provide a swale near the tee box to route drainage away from the homes and to the storm sewer. Also consider the addition of yard drains that tie to the storm sewer to capture flow near the tee box and keep water away from the home.
d. Improvement ID: C-3

Figure 4-10: 10th Fairway Drive near 8th Tee Box

4.2.7 11th Fairway Drive (upstream of Main Lake near 10th Hole)

a. Concerns: Staging water impacting homes in the area near the golf course
b. Observations: Residents have constructed berms surrounding homes, and other grading improvements or have deployed sand bags around homes to protect low water entry points from stormwater. The downstream storm sewer carrying the creek to the north has junction boxes and sharp changes in flow direction. Debris was observed near the entrance to the storm sewer. Stormwater issues in this area are exacerbated by the presence of walk-out basements near the drainage ways. One patio elevation, now protected by an outer wall, was measured to be below the top elevation of the adjacent culvert.
c. Possible Solutions: Increase the storage capacity within and upstream of the area which will serve to attenuate the flow rates during peak storm events. The reduced flow will decrease the impact caused by the downstream restrictions in the storm sewer by serving to lower the water surface upstream of the pipe. Grading improvements and berms to protect low entry points, especially walk-out basements are recommended and have been implemented in some locations. Ensure storm sewers and the creek in the area are maintained and cleared of debris on a regular basis.
d. Improvement ID: D-1 (this area will also benefit from upstream improvements D-2 through D-7)

Figure 4-11: 11th Fairway Drive near 10th Hole

4.2.8 11th Fairway Court (upstream of Main Lake near 7th Tee)

a. Concerns: Water staging onto property in the area during major storm events. Water levels from the downstream lake back up into the area of the 7th Tee.
b. Observations: Inconsistent and heavily vegetated channel routing water to the lake. Sediment was observed obstructing the capacities of downstream pipes. Stormwater related issues in this area are exacerbated by the presence of walk-out basements near the drainage ways.
c. Possible Solutions: Increase the storage capacity within and upstream of the area which will serve to attenuate the flow rates during peak storm events. Provide increased linear storage in the creek south of the 7th Hole. Overall attenuation of storm events throughout the development will serve to reduce the peak flows to the lake south of Pro Tour Drive. Grading improvements and berms to protect low entry points, especially walk-out basements are recommended as added protection. Ensure the creek downstream of this area is maintained and cleared of debris on a regular basis.
d. Improvement ID: C-1 (will also benefit from upstream improvement C-2)

Figure 4-12: Upstream of Main Lake near 7th Tee

4.2.9 Fairway Drive (east of 13th Hole)

a. Concerns: Residents are concerned with water ponding in their backyards that enters a catch basin and flows to the west.
b. Observations: The back yards on the east side of Fairway Drive contain a swale that drains to a catch basin and then is routed to the west across Fairway Drive between two homes and into a detention area. Some residents have constructed features such as walls, basketball courts, and play areas in the swale.
c. Possible Solutions: The area appears to be functioning as a swale. Water will stage near catch basin, especially during high intensity rainfall events. It is recommended that the storm sewer is maintained on a regular basis and ensure that the catch basin is kept free of debris.
d. Improvement ID: N/A, none recommended

Figure 4-13: Swale Behind Homes on Fairway Drive

4.2.10 Four Lakes Drive (near 4th Tee)

a. Concerns: There is a drainage swale located in the back yards close to homes. Water is able to stage near the homes during larger storm events.
b. Observations: The swale collects runoff from the yards as well as the golf course. A retaining wall, between the golf course and the homes has been constructed at the back of the yards. The golf course is higher than the elevation of the homes and yard. It also appears that landscaping has been installed within the swale and west of the wall near the downstream end.
c. Possible Solutions: The addition of linear detention near the cart path on the golf course would serve to reduce the peak flows to the swale. Ensure that rear yards are graded away from the homes towards the swale at the rear of the lot. Remove any landscaping that is installed in the drainage ways. Ensure that the swale is maintained and kept free of debris and landscaping and is functioning at full capacity.
d. Improvement ID: F-2 & F-3

Figure 4-14: Four Lakes Drive near 4th Tee

4.2.11 Four Lakes Drive (near 4th Hole)

a. Concerns: Erosion of the bank downstream of the cart path near the pond at the 4th Green. Ponding in the yards near this area.
b. Observations: The small pond adjacent to the 4th Green has little to no storage capacity. The outfall structure in an ineffective circular metal pipe which causes overflows of the cart path and erosion of the bank downstream of the pond towards the existing area inlet. The grading in the yards does not allow for efficient drainage path to enter the nearby area inlets.
c. Possible Solutions: Remove the pond and provide a dry detention area for storing upstream runoff. Incorporate a structure and piping arrangement to connect directly to the downstream area inlet, reducing flow over the berm and its erosion potential. Grade away from the downstream homes to provide swales for more efficient drainage and a lower path for drainage to enter the storm sewer.
d. Improvement ID: F-1

Figure 4-15: Four Lakes Drive near 4th Hole

4.2.12 Pro Tour Drive (south of 5th Green)

a. Concerns: Water staging in the street and ponding in the yards.
b. Observations: The water staging in the street was possibly caused by downstream water surface levels at the outfall in the creek near the 7th Fairway, as well as the capacity of the pipe crossing the golf course to this location. The rainfall exceeded the 10-year event so water staging in the street is a possibility since storm sewer pipes are typically designed to a 5 to 10-year flow. Much of the grading in the backyards is away from the inlets to the storm sewer system. Grading in the back yards is towards the homes in some cases and does not provide for efficient movement of water away from homes.
c. Possible Solutions: Grade areas around the homes to provide positive drainage paths away from homes and towards the storm sewer. A shallow swale in the back yard and between homes would direct runoff away from the homes. For the stormwater issues in the street, overall improvements to the system such as increased detention would serve to lower the downstream water levels and provide an opportunity for the storm sewer to function more efficiently.
d. Improvement ID: C-4

Figure 4-16: Pro Tour Drive (south of 5th Green)

4.2.13 Pro Tour Drive near 11th Fairway Drive

e. Concerns: Potential for water staging above low entry elevations
f. Observations: Homes in these areas appeared to have low entry elevations that could be at risk during large storm events. This area was not identified by residents. The potential risks were identified during stormwater modeling
g. Possible Solutions: Provide an upstream detention area to reduce the flow of water in this area and reduce the risk for nearby homes.
h. Improvement ID: E-2

Figure 4-17: Pro Tour Drive near 11th Fairway Drive

4.2,14 Fairway Drive (north of creek)

a. Concerns: Excessive runoff from the fields to the west and behind the Fairway Drive crossing was staging into the yards and above low entry elevations on homes located on Fairway Drive. The greatest impacts were observed during storms that occur in the spring, when the fields were not vegetated.
b. Observations: Water staging upstream of the culvert on Fairway drive has the potential to stage into the yards and against homes.
c. Possible Solutions: Recommended detention in upstream areas is intended to reduce the peak flows and stages near this area. Additional improvements to the capacity of the downstream system at Fairway Drive are also recommended.
d. Improvement ID: G-1, G-2, H-1, and all upstream improvements for flow reduction within the development

Figure 4-18: Homes near Creek Crossing Fairway Drive

4.2.15 Jack Nicklaus Drive (north of intersection with Arnold Palmer Drive)

a. Concerns: A resident has constructed features in their back yard including landscaping, a wall, and a putting green. Upstream residents have indicated that the construction of these features has blocked the drainage swale in the back yard and they are seeing increased ponding in the yards as a result.
b. Observations: The features in the backyard have been constructed over a swale intended to direct drainage from the back yards to the east and appear to have been constructed in a drainage easement shown on the development plans.
c. Possible Solutions: The features causing restrictions appear to have been constructed in an easement reserved for drainage.
d. Improvement ID: I-1

4.2.16 Ben Hogan Court (west of creek)

a. Concerns: During major storm events, the water surface elevation in the creek inundates adjacent properties and results in stormwater impacting basements.
b. Observations: Requirements for clearing and grading of the creek east of Ben Hogan Court were included in the approved IDNR/OWN permit agreement. This clearing and grading, is intended to provide storage capacity in the system, as well as lower the water surface of the creek in the area has not occurred.
c. Possible Solutions: Complete the clearing and grading work that was a requirement of the permit. Upstream improvements to add storage would serve to reduce the peak flows in the area, which will also contribute to decreased water surface elevations. Maintain the area on a regular basis. Increase the capacity of the crossing of Jack Nicklaus Drive.
d. Improvement ID: G-1, G-2, H-2, and all upstream improvements for flow reduction within the development

Figure 4-19: Back Yard on Ben Hogan Court

4.2.17 Plum Hill School Road (north of development)

a. Concerns: During major storm events, the water surface elevation of the upstream tributary to Loop Creek inundates adjacent property along Plum Hill Road.
b. Observations: There are significant vegetation restrictions in the reaches of Loop Creek downstream of the Orchards.
c. Possible Solutions: Reduce the peak flows to the creek from upstream areas by providing detention storage upstream. Maintenance of Loop Creek downstream of the Orchards to provide additional flow capacity.
d. Improvement ID: No specific improvement recommended for this location – this location, outside of the City of Belleville limits, is anticipated to see benefit from the upstream reductions in flow to the creek.

4.3 Key Drainage Features

Key drainage features in the study area were considered as part of the analysis. Summaries of these features are provided below.

4.3.1 Loop Creek

The Orchards developments and golf course drain to the north and enter into Loop Creek near its crossing of Plum Hill School Road. The water surface levels of this creek provide the tailwater conditions that affect portions of the development that are located directly upstream. Loop Creek serves as the downstream boundary condition for the analysis.

Improvement ID: N/A, none recommended

4.3.2 Railroad Trestle

An abandoned railroad trestle that formerly carried the Louisville and Nashville Railroad is located downstream of Jack Nicklaus Drive and the remaining portions of the Orchards developments. The railroad trestle location has been added to the analysis to assess its impacts to the upstream system and is pictured in Figure 4-20. Water surfaces upstream in the Orchards development are primarily influenced by the crossings of Jack Nicklaus and Fairway Drives.

Improvement ID: N/A, none recommended

Figure 4-20: Railroad Trestle Downstream of Development

4.3.3 Permitted Areas for Detention

As part of the IDNR/OWR permit requirements, two detention areas were to be constructed along the tributary to Loop Creek. An inline detention area was proposed in the area of Jack Nicklaus Drive and Ben Hogan Court. The detention area involved clearing of the trees as well as grading of the creek to lower the bottom through the area. The goal was provide a level pool to lower the water surface elevation of the creek during major storm events to protect the nearby homes. This detention area was never constructed. The general outline of this detention area is provided in Figure 4-21.

Improvement ID: G-1

Figure 4-21: Inline Detention Area near Ben Hogan Court

A second detention area, offline, was proposed for the area northwest of Fourlakes Drive and Slammer Drive. The goal of this detention area was to shave the peak of the storm by capturing excess flow in the creek and slowing releasing the runoff after the storm had passed. The general outline of this detention area is provided in Figure 4-22. The detention area appears to have been excavated; however, a concrete weir structure, to divert water from the creek does not appear to have been constructed. In addition, this detention area does not appear to have been maintained as required by the IDNR/OWR permit, evidenced by the vegetation and the presence of a large hole that has developed in the berm between the creek and the detention area witnessed during a site visit and shown in Figure 4-23. The impacts of these detention areas have been included in the analysis.

Improvement ID: G-2

Figure 4-22: Offline Detention Area near Fourlakes Drive


Figure 4-23: Breach in Berm at Offline Detention Area near Fourlakes Drive

4.3.4 Lake South of Pro Tour Drive (Lake #2)

The lake located south of Pro Tour Drive and north of 11th Fairway Drive (Lake #2) captures drainage from the majority of the property encompassing Orchards development and golf course. Areas just upstream of this lake are some of the most impacted areas as evidenced by resident submittals and discussions with City of Belleville staff. The outfall structure captures debris during larger storm events, reducing the effective discharge capacity. The storage and discharge capacity of the lake are a key consideration in the drainage analysis being performed as part of this project.

The outfall of the lake was not constructed according to the construction plans for the lake reviewed as part of this study. Based on GPS survey collected as part of the study, the structure crest elevation of the lake is approximately 1.5 feet above the design crest elevation. This serves to raise the level of the lake during major storm events, remove storage that would work to reduce downstream flow rates, as well as increase the risk of overtopping Pro Tour Drive. Modifications to this structure are recommended for these reasons.

Improvement ID: B-1

Figure 4-24: Lake South of Pro Tour Drive (Lake #2)

Figure 4-25: Lake South of Pro Tour Drive

4.3.5 Lake South of Golf Course Drive

The lake south of Golf Course drive captures a sizable drainage area in the southeast corner of the development. This lake, according to golf course staff, is utilized to provide additional irrigation capacity to the golf course during times of dry weather. Given the location of this lake at the upstream end of the system, the opportunity to provide additional storage in this area could be beneficial as it would serve to reduce peak flows throughout the downstream areas of the system. Improvements to the storage capacity of this lake had been considered as part of the analysis. However, the existing storage capacity of the lake, along with the amount of flow discharged from this lake provided minimal benefit for the cost and therefore was not recommended.

Improvement ID: N/A, none recommended

Figure 4-26: Lake South of Golf Course Drive

Section 5: Hydrologic Analysis

5.1 Hydrologic Model Input

5.1.1 Sub-basin Delineation

The drainage sub-basins for the project were delineated using topographic information available for the area. The boundaries and connection points for these sub-basins were field verified. Sub-basins were generally established in relation to key areas of concern and at locations where storage areas in the forms of lakes or detention was considered. Figure 5-1 illustrates the study area and sub-basins for this analysis.

5.1.2 Unit Hydrograph Method

The SCS method was chosen to develop unit runoff hydrographs for the project. The SCS method was developed by the National Resource Conservation Service (NRCS, formerly Soil Conservation Service or SCS) for use in sub-basins 2,000 acres or less.

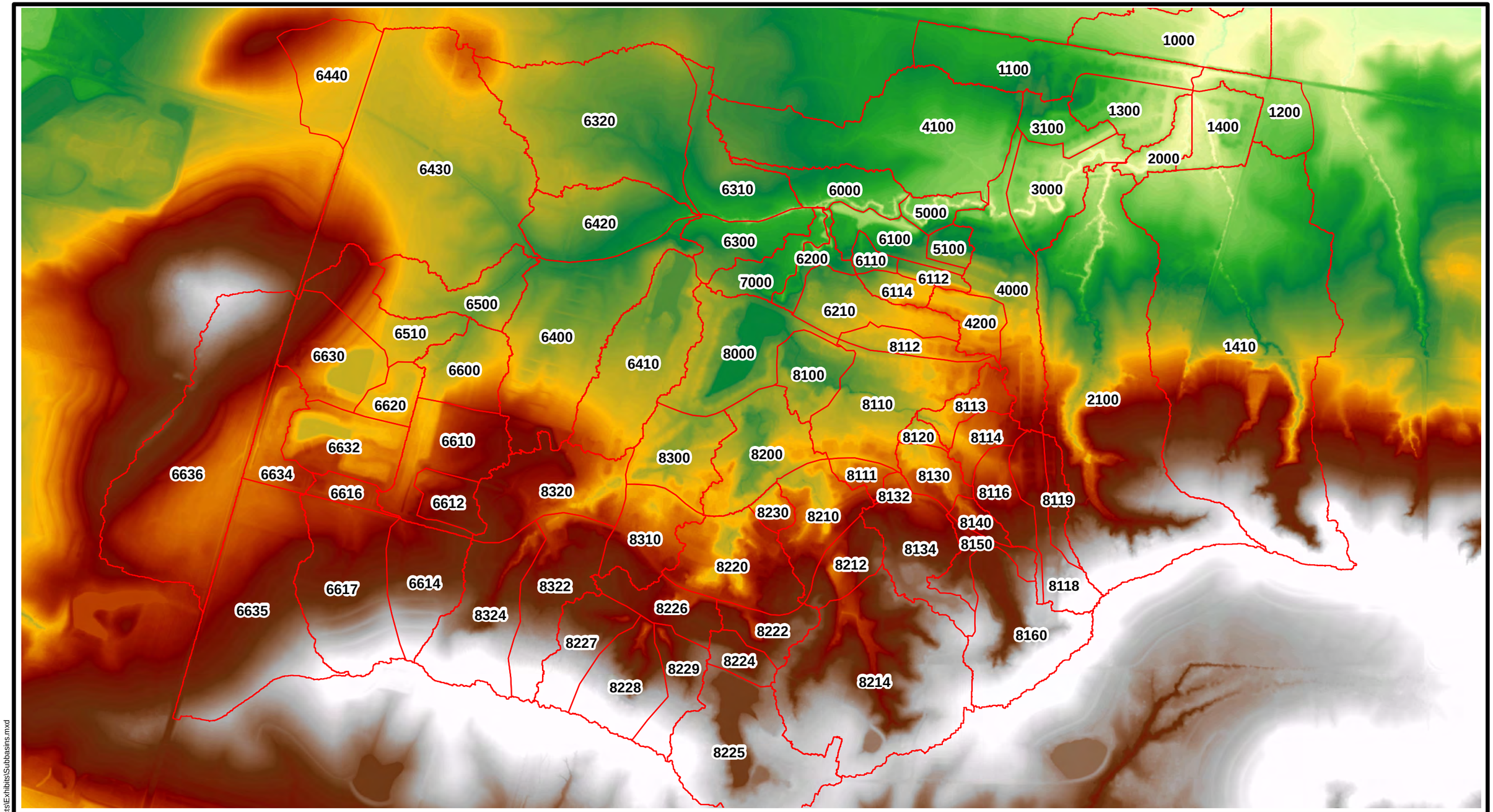
5.1.3 Rainfall Depth and Duration

The purpose of this study is to reduce the existing stormwater impacts within the Orchards. A variety of design storms were analyzed as part of the study. The City of Belleville Code of Ordinances specifies the 10-year and 100-year storms for use in stormwater design for new developments. The 2-year, 5-year, 25-year and 50-year rainfall totals were added to the HEC-HMS model to provide the ability for further analysis. The rainfall depths for each of these storms were obtained from Illinois State Water Survey Bulletin 70. Table 5-1 summarizes the rainfall depths for each of the design storms.

Table 5-1: Rainfall Depth

Frequency	1-hr (in)	2-hr (in)	3-hr (in)	6-hr (in)	12-hr (in)	24-hr (in)	48-hr (in)	72-hr (in)
2-year	1.6	2.0	2.1	2.5	2.9	3.3	3.6	3.9
5-year	2.0	2.6	2.8	3.3	3.7	4.2	4.5	5.0
10-year	2.4	3.0	3.2	3.8	4.5	4.9	5.4	5.8
25-year	3.0	3.8	4.0	4.9	5.8	6.5	6.7	7.1
50-year	3.5	4.4	4.8	5.8	6.5	7.5	7.6	8.5
100-year	4.0	5.3	5.5	6.5	7.5	9.0	9.1	10.1

The Huff rainfall distributions available in Illinois State Water Survey Circular 173 were used in a critical storm duration analysis in HEC-HMS to determine the appropriate peak flows for the study. The applicable Huff rainfall distribution tables for input into the model have been included in Appendix A. For the 10-year and 100-year storms used for detailed analysis, the 2-hr storm is the critical duration resulting in the highest flow rates.



LEGEND

Sub-basins

0 1,000 2,000 Feet

N W E S

HANSON
Hanson Professional Services Inc.

Sub-basin Location Map

ORCHARDS SUBDIVISION FLOOD STUDY
CITY OF BELLEVILLE, ILLINOIS

13L0054 **Figure 5-1**

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Existing rainfall for the April 18th storm, 5.2 inches, was also simulated for this analysis and provided in Appendix A. The 4.3 inches in the first 6 hours is consistent with the 10-25 year event as evidenced in Table 5-1.

5.1.4 Land Use and Soil Storage

Precipitation losses were estimated using the NRCS curve number (CN) method from Technical Release-55. To determine an appropriate CN, typical land use throughout the study area was estimated using aerial photography. Soils information was obtained from the NRCS Soil Survey Data for St. Clair County to determine the Hydrologic Soils Groups present within the basin. A composite curve number was estimated for each drainage sub-basin within the study based on the individual land uses and soils present within each sub-basin. Land use exhibits are provided in Appendix B.

5.2 Hydrologic Modeling Results

5.2.1 Existing Conditions

A hydrologic model was created in HEC-HMS to simulate existing conditions in the Orchards development. These conditions were calibrated to the existing storm that occurred April 18, 2013 where observed rainfall volume was between a 10 and 25-year storm. Rainfall totals for the 2, 5, 10, 25, 50, and 100-year storms were simulated in the model to establish a baseline for proposed improvements. The 10-year and 100-year storms were analyzed in detail for the proposed recommendations.

The HEC-HMS model for existing conditions included 80 sub-basins encompassing 1.8 square miles (1154 acres). A map identifying the sub-basins is provided as Figure 5-1. Sub-basins were delineated to define contributing areas to key points in the system such as crossings of roadways, lake or detention outfalls, and sewer outfalls to the creek. Storage areas were added where significant staging of water was known to occur, typically in areas on the golf course, behind major culvert crossings of roadways, and existing detention areas. Routing reaches were added to estimate travel time between basins where runoff had to travel significant distances to reach the next key point in the system. A summary of the HMS input is provided in Appendix B.

5.2.1.1 Calibration

The HEC-HMS model was calibrated to the April 18, 2013 storm. The Lake near Pro Tour Drive was a key location in this calibration as the approximate water surface was identified in photos and discussions with the City and residents. This lake collects a large portion of the Orchards development and the stages estimated in the model for this lake were consistent with the observations.

Key points upstream in the system were also checked for consistency; however, the impacts to water surface elevations caused by debris and obstructions observed during the site visits to the area could not be accurately quantified in these upstream areas.

CN predicts the amount of precipitation losses in the system. When precipitation losses are lower, storms will produce higher rates of stormwater runoff when compared to storms with the same rainfall amount but higher values of precipitation losses. Generally, precipitation losses were found to be lower in the study area. Since the major storms in the system occur earlier in the year, the surrounding agricultural fields were still bare from the winter time, reducing the amount of rainfall captured by vegetation, and the ground was typically more saturated,

reducing the soil storage potential. These factors would result in more runoff since precipitation losses would be minimized.

5.2.1.2 Design Storm Analysis

The following areas were identified as key areas for the purposes of the hydrologic analysis. Table 5-2 identifies each of these locations and describes the significance for the analysis. As applicable, the Improvement ID for each improvement is provided in Table 5-2. Full peak flow results for each location are provided in Appendix C.

Table 5-2: Key HEC-HMS Analysis Locations

HEC-HMS Element ID	Significance	Existing Conditions				Critical Low Entry/ Overtopping Elevation (ft)
		10-year		100-year		
		Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	
S_6617	Runoff from south orchard into Orchard Lakes – proposed for dry detention (A-1)	20	517.7	53	518.98	518.81 Golf Course Dr.
S_8000	Lake south of Pro Tour Drive (Lake #2) (B-1)	167	482.37	470	483.79	483.49 Pro Tour Dr.
J_8110 (ex) **S_8110 (pr)**	Creek to Lake #2 south of 7th Hole on Golf Course – proposed for detention (C-1)	57	n/a	189	n/a	n/a
S_8200	Area near 10th Fairway with water in basement – berm constructed around rear patio (D-1)	75	486.55	155	490.33	488.53 Home
S_8210	Area south of 10th Fairway Drive with water in basement – berm constructed on golf course (D-2)	31	496.02	79	498.60	499.28 Home
S_8220	Area near 8th Green Court with water in basement – berm constructed around patio (D-4)	37	497.70	77	501.86	502.13 Home
S_8227 **S_8228** **S_8229**	Areas south of 18th Fairway proposed for dry detention (D-5 to D-7)	5.0 6.1 3.9	521.14 513.23 515.29	18.3 22.6 14.6	522.49 514.93 516.46	529.0 Fairway Overtop
S_8214	Area near 16th Fairway and Green proposed for dry detention (D-3)	21	519.09	60	522.02	530.0 Fairway Overtop (prop)
S_8300	Area upstream of Lake #2 with stormwater concerns	69	491.45	172	493.09	492.03 Home
S_8320	Wooded area south of the clubhouse proposed for dry detention (E-2)	51	499.64	124	504.07	506.0 Pro Tour Dr.
S_4200	Existing lake near 4th Green (Four Lakes Drive) proposed for conversion to dry detention (F-1)	5	498.64	18	499.0	498.6 Cart Path Overtop
6114 (ex) **S_6114 (pr)**	Proposed dry detention upstream of Four Lakes Drive to reduce flow near retaining wall (F-2)	6	n/a	12	n/a	n/a
J_8114 (ex) **S_8114 (pr)**	Upstream end of creek to Lake #2 southeast of 7th Hole on Golf Course proposed for dry detention (C-2)	16	n/a	58	n/a	n/a

5.2.2 Proposed Improvements

Three types of improvements were proposed in the areas simulated as part of the HEC-HMS modeling. A structure modification is proposed at Lake #2 near Pro Tour Drive while a total of 12 detention areas are proposed. These recommendations were quantified in the HEC-HMS modeling. The third type of improvement, grading to provide positive drainage away homes was not quantified in the HEC-HMS modeling. A summary of each improvement is provided below. An overall map identifying each improvement location within the development is provided as Figure 7-1 in Section 7 of this report.

5.2.2.1 Structure Modification – Lake #2 (south of Pro Tour Drive)

B-1: Storage Area (S_8000) – The existing control structure does not match the reviewed plans provided for the Lake. The overflow/pool elevation in the plans is 479.0 ft. Based on field measurements, the existing overflow/pool elevation is approximately 480.8 ft. The recommendation is to modify the existing structure to meet the original plans, which will lower the pool elevation of the lake, provide additional storage, and reduce the risk of the overtopping of Pro Tour Drive. Modification of this structure may require dredging of the lake for aesthetic purposes as a secondary project. Due to the unknown condition of the bottom of the lake, the requirements for dredging were not explored.

5.2.2.2 Detention Areas

A total of 12 detention areas are proposed as part of the recommendations. To minimize disruption to nearby residents and the operation of the existing golf course, the recommended detention areas are dry impoundments, meant only to hold water after storms and reduce peak discharges by slowing the release of stormwater to downstream areas. Also, these improvements are recommended for areas that would provide benefit for many downstream residents. The water surface was only proposed to be raised for storage purposes in areas that did not have homes upstream at risk of flooding.

Table 5-3 on the following page summarizes the proposed structures and improvement ID for each detention area.

Table 5-3: HEC-HMS Structure Information for Storage Areas

HEC-HMS Element ID	Improv. ID	Low Flow Invert (ft)	Low Flow Structure Desc.	High Flow Invert (ft)	High Flow Structure Desc.	Emer. Overflow Invert (ft)	Emer. Overflow Structure Desc.
S_6617	A-1	515.5	19"x30" RCP	517.8	2' Weir	518.8	Road
S_8000*	B-1	479.0	7'x7' Drop Spillway	n/a	n/a	483.5	Road
J_8110 (ex) **S_8110 (pr)**	C-1	483.5	12" Orifice	488.5	3' Weir	491.0	Berm
S_8200**	D-1	483.1	66" CMP	n/a	n/a	n/a	n/a
S_8210B**	D-2	497.9	42" HDPE	n/a	n/a	503.1	Cart Path
S_8220B**	D-4	499.8	42" CMP	n/a	n/a	504.9	Cart Path
S_8227 **S_8228** **S_8229**	D-5 D-6 D-7	520.2 512.2 514.35	6" Orifice 6" Orifice 6" Orifice	525.0	1' Weir	526.0	Catch Basin
S_8214	D-3	516.5	12" Orifice	n/a	n/a	530.0	Fairway
S_8320	E-2		24" CMP	n/a	n/a	506.0	Road
S_4200	F-1	493.0	9" Orifice	497.4	3' Weir	498.6	Cart Path
6114 (ex) **S_6114 (pr)**	F-2	484.7	12" CMP	n/a	n/a	487.0	Cart Path
J_8114 (ex) **S_8114 (pr)**	C-2	505.0	12" Orifice	n/a	n/a	514.0	Cart Path

**Existing Structure - modification is proposed*
***Existing Structures - no changes to existing structures, culverts, or cart path elevations is proposed, only addition of upstream storage*

Each recommended detention area is described in more detail below. The improvement ID corresponds to the tables in this section, as well as the estimates of probable cost and recommended prioritization detailed in Section 7. Figure 7-1 in Section 7 shows the proposed location for each of these recommendations.

- Orchard Lakes (A)
  - A-1: Storage Area S_6617 – The recommendation is to provide a storage area upstream of Golf Course Drive with an approximate 1.4 acre footprint to reduce peak flows for more frequent events. The area upstream of the existing pipe crossing could be widened and a control structure added to the upstream end of the pipe. Coordination and approval from the existing property owner would be required for this improvement.

- 8100 Basins upstream of Lake #2 (C)

    - C-1: Storage Area S_8110 – The recommendation is to widen and clear around the existing creek to provide storage for peak flow attenuation upstream of the nearest homes by the 7th Tee. A berm could be constructed across the existing creek and a control structure with a low flow orifice and high flow weir could be installed to regulate discharge from upstream areas. This improvement could be constructed away from the existing fairways.

    - C-2: Storage Area S_8114 – The recommendation is to raise a cart path as a berm to create a detention area to provide storage for peak flow attenuation near the upstream ends of the watershed. This detention area is proposed to be located southwest of the 7th Hole. A berm could be constructed and a control structure with a low flow orifice or culvert could be installed to regulate discharge from upstream areas.

- 8200 Basins upstream of Lake #2 (D)

    - D-1: Storage Area S_8200 – The recommendation is to widen the creek upstream of the cart path near the 10th Hole to provide additional storage at lower elevations for heavy rainfall events. No pipe or structure modifications are proposed

    - D-2: Storage Area S_8210A/B – The recommendation is to provide detention storage upstream of the cart path. The Golf Course and homeowner have implemented this improvement – no modifications to this recent construction are proposed.

    - D-3: Storage Area S_8214 – The recommendation is to construct a berm across the 16th Fairway to provide a storage area to detain water on the fairway, and below the 16th Green during heavy rainfalls. A control structure with a low flow orifice could be installed to regulate discharge from the detention area.

    - D-4: Storage Area S_8220A/B – The recommendation is to widen the creek upstream of the cart path near the 9th Tee Box to provide additional storage at lower elevations for heavy rainfall events. No pipe or structure modifications are proposed.

    - D-5: Storage Area S_8227 – The recommendation is to provide a control structure with a low flow orifice and high flow weir in this existing low spot south of the 18th Fairway. Clearing and some grading would be necessary as well.

    - D-6: Storage Area S_8228 – The recommendation is to provide a control structure with a low flow orifice and high flow weir in this existing low spot south of the 18th Fairway. Clearing and some grading would be necessary as well.

    - D-7: Storage Area S_8229 – The recommendation is to provide a control structure with a low flow orifice and high flow weir in this existing low spot south of the 18th Fairway. Clearing and some grading would be necessary as well.

- 8300 Basins upstream of Lake #2 (D)

    - E-2: Storage Area S_8320 – The recommendation is to excavate a detention area upstream of Pro Tour Drive and south of the golf course clubhouse with a 1.0 acre footprint. A control structure with a 24" pipe would serve to reduce the peak discharges to the downstream basins.

- Four Lakes Drive Area (F)

    - F-1: Storage Area S_4200 – The existing pond overtops the existing cart path and causes erosion on the downstream side of the slope. The recommendation is to convert this pond to a dry detention area and control the discharge with a structure to discourage over-topping of the cart path and reduce the erosion potential. Runoff is also directed towards some homes in this area. Additional grading improvements such as swales should be implemented downstream of this area as necessary to ensure positive drainage away from homes.

    - F-2: Storage Area S_6114 – The area drains to the rear yards of homes on Four Lakes Drive. The installation of a detention area on the backside of the cart path is recommended to reduce some of the peak flows experienced in this area.

5.2.2.3 Grading Improvements

Grading improvements are recommended in areas where drainage issues are caused by inefficient grading which was observed near homes causing water to be directed towards the foundation and basement windows. Each recommendation is provided in more detail below.

- 8100 Basins upstream of Lake #2 (C)

    - C-3: Basin 8111 – Runoff is directed towards existing homes near the 8th Tee Box. The recommendation is to re-grade the area to ensure positive drainage away from the house and provide a swale near the rear of the yard/tee box to route drainage to an existing storm inlet. Yard drains could also be considered for collecting water from the Tee Box.

    - C-4: Basin 8112 – Runoff is directed towards existing homes near the 5th Hole. Existing inlets and pipes near the homes collect runoff from the golf course but are located higher than the yards and are not able to collect runoff which is directed towards the homes. The recommendation is to re-grade the area to ensure positive drainage away from the house and provide a swale near the rear of the yard and between homes to route drainage to the existing storm sewer inlets in the street.

- 8300 Basins upstream of Lake #2 (D)

    - E-1: Basin 8322 – Runoff is directed towards existing homes which are located near on the downstream side of a hill. Previous grading to facilitate walkout basements exacerbates the problem by providing a low point for water to collect. The recommendation is to re-grade the rear of the yards to incorporate

conveyance features to keep the flow of much of the runoff away from the homes. The conveyance features could consist of swales and berms constructed at the rear of the yards to keep the majority of flow away from the homes. Construction of these improvements would entail removal of some landscaping and vegetation for some residents. The incorporation of erosion control measures for the conveyance is recommended due to the slopes. Some residents have started constructing these types of improvements.

- Four Lakes Drive Area (F)
    - F-3: Basin 6110 – There are drainage concerns in the rear yards behind the homes on Four Lakes Drive and the retaining wall of the golf course. An existing swale, within an easement, is meant to provide drainage for these areas. It is recommended that the swale is re-graded in this area to increase conveyance. Landscaping observed in this drainage easement should be removed as it restricts the flow of water. Also, re-grading of the areas adjacent to homes may be necessary to ensure positive drainage away from the foundation and towards the swale.
- Jack Nicklaus Drive (I)
    - I-1: A resident has constructed a practice putting green within a drainage easement in the rear of their yard that restricts the flow of water from upstream neighbors. It is recommended that the conveyance capacity of the swale be restored through the area.

5.2.2.4 Results – Flows

The anticipated flow reductions in these key areas are estimated in Table 5-4 below. Complete results for each basin in the HEC-HMS modeling is provided in Appendix C.

Table 5-4: HEC-HMS Modeling Flow Comparison

HEC-HMS Element ID	10-year Existing Flow (cfs)	10-year Proposed Flow (cfs)	Peak Flow Reduction (%)	100-year Existing Flow (cfs)	100-year Proposed Flow (cfs)	Peak Flow Reduction (%)
S_6617	17	4	76%	53	20	62%
S_8000	168	104	38%	470	279	40%
J_8110 (ex)/S_8110 (pr)	57	13	77%	189	43	77%
S_8200	75	48	36%	155	112	28%
S_8210A	31	17	45%	79	39	51%
S_8220A	37	22	41%	77	58	25%
S_8227	5	2	60%	18	4	78%
S_8228	6	2	67%	23	3	87%
S_8229	4	2	50%	15	2	87%
S_8214	21	8	62%	60	11	82%
S_8300	69	38	46%	172	88	49%
S_8320	51	26	49%	124	46	63%
S_4200	5	4	20%	18	15	17%
6114 (ex)/S_6114 (pr)	6	4	33%	12	10	17%
J_8114 (ex)/S_8114 (pr)	16	8	50%	58	10	83%

If the recommended improvements are implemented, each location identified in the table is anticipated to see a reduction in flow. The peak flows reductions to Lake #2 (S_8000) are estimated at 38% for the 10-year storm and at 40% for the 100-year storm. This lake is a major contributor to downstream areas. The proposed detention located near the Clubhouse (S_8320), the 7th Hole (S_8110 and S_8114), the 16th Hole (S_8214), and the 18th Hole (S_8227 to S_8229) are key locations that provide significant flow reductions to the benefit of downstream areas.

5.2.2.5 Results – Stages

The anticipated stage reductions in these key areas are estimated in Table 5-5 below. Complete results for each basin in the HEC-HMS modeling is provided in Appendix C.

Table 5-5: HEC-HMS Modeling Stage Comparison

HEC-HMS Element ID	10-year Existing Stage (ft)	10-year Proposed Stage (ft)	100-year Existing Stage (ft)	100-year Proposed Stage (ft)	Critical/ Low Entry Elevation
S_6617	517.70	516.85	518.98	518.42	n/a
S_8000*	482.92	480.13	483.79	481.18	483.49 (road)
J_8110 (ex) **S_8110 (pr)**	n/a	489.13	n/a	490.83	n/a
S_8200*	486.55	485.80	490.33	487.90	488.53
S_8210A*	496.02	495.46	498.60	496.37	499.28
S_8220A*	497.70	497.12	501.86	499.20	502.13
S_8227** **S_8228**** **S_8229****	521.14 513.23 515.29	522.45 516.43 517.34	522.49 514.93 516.46	525.55 520.86 520.62	529.0 (fairway)
S_8214**	519.09	521.45	522.02	525.29	530.0 (fairway)
S_8300	491.45	490.50	493.09	492.01	492.03
S_8320	499.64	500.21	504.07	505.74	506.0 (road)
S_4200	498.64	497.35	499.0	498.48	498.6 (cart path)
6114 (ex) **S_6114 (pr)**	n/a	486.40	n/a	487.49	n/a
J_8114 (ex) **S_8114 (pr)**	n/a	509.44	n/a	512.92	n/a

**Key areas with known stormwater impacts to basements from water staging behind culverts*
***Stage is higher to provide additional storage - no homes at risk upstream*

5.2.2.6 Inundation Areas

The results of the analysis were exported to GIS to provide a graphical representation of the estimated reduction in inundation area achieved through the proposed improvements in the key areas of the development. Figures 5-2 and 5-3 represent the estimated reduction in inundation areas through incorporation of the recommendations for the 10-year and 100-year storm, respectively.

Legend

- Improvements 100-Year Storm
- Existing 100-Year Storm
- Recommended_Embankments

0 200 400 800 1,200 Feet

N W E S

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100-Year 2-Hour Storm Flood Areas

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13L0054 **Figure 5-3**

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Legend

- Improvements 10-Year Storm
- Existing 10-Year Storm
- Recommended_Embankments

0 200 400 800 1,200 Feet

N W E S

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10-Year 2-Hour Storm Flood Areas

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13L0054 **Figure 5-2**

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5.3 Summary

The recommendations presented are conceptual in nature and are not indented for construction without detailed design. The proposed recommendations explored in the HEC-HMS modeling are one possible solution to reduce peak flows and stages within the development. These recommendations were chosen based on the goal of maximizing the amount of benefit they provide and minimizing the impact to the residents and golf course. Other solutions to reduce the peak flows and stages are possible but were not explored as part of this study.

The results of the HEC-HMS indicate an anticipated reduction in peak flows and peak stages with the incorporation of the proposed improvements detailed in Section 5.2.2. Approximately 1/3 of the total flow to downstream areas near Loop Creek passes through Lake #2. Overall reduction in stage to Lake #2 (Pro Tour Drive) could be achieved with the decrease in peak flows and modification of the existing control structure, which was not constructed at the elevation identified in the plans.

For each of the known locations with walkout basements that have stormwater issues due to water staging behind culverts, the 100-year stage with recommended improvements incorporated is estimated to be below the low entry elevations of the nearby homes. However, there are significant unknowns that are inherent to the functionality of these systems.

The proposed improvements will not remove all risk of flooding. First and foremost, the accumulation of sediment and debris near the entrances to culverts severely restricts the flow of water and has been witnessed at various locations throughout the development. Sediment and debris at culvert entrances was observed at many locations throughout the development. Also, the design storms used in this analysis consist of rainfall totals and intensities that have been established for use in design in the State of Illinois. Finally, the moisture conditions of the soil will influence the amount of runoff produced. Higher amounts of rainfall and stronger intensity storms are possible and could produce different reactions within the study area. For these reasons, peak stages observed in the field could be different than those estimated during this analysis.

Therefore, it is recommended that improvements such as berms and grading to protect low entry points including basement doors or windows be constructed with freeboard to provide an additional factor of safety. Also, it is recommended to use the existing stage for design as the timeline and probability for implementation of recommendations is unknown at this time.

Section 6: Hydraulic Analysis

6.1 Hydraulic Model Input

An unsteady flow HEC-RAS model was developed to simulate the water surface downstream of the lake near Pro Tour drive and downstream of the Orchard Lakes. The HEC-RAS model covers the area downstream of the lake to the point where the creek meets Loop Creek near Plum Hill School Road. The creek was analyzed to assess the effects of various culvert and bridge structures that are in place as well as analyze the effects of addition storage proposed for the creek. Using unsteady flow calculations allows for the analysis of the water surface to changing flow rates and the effects of storage in the creek system. A description of this model is provided in the sections to follow. Figure 6-1 provides a schematic of the HEC-RAS model with an aerial background. The HEC-RAS input data is included in Appendix D.

6.2 Geometric Data

The geometric data was developed using topographic information for the area. DEM data noted previously and used to delineate sub-basins for the HEC-HMS modeling was also used to create a surface for the HEC-RAS modeling. Field investigation, GPS surveying, and existing development plans were used to confirm crossing information. Field investigation and previous studies were to develop representative channel and overbank roughness coefficients for the analysis. The geometric data developed was checked against an existing HEC-RAS model developed for the IDNR/OWR permitting of the downstream areas of the Orchards. The HEC-RAS input data is included in Appendix D.

6.2.1 Cross-Sections

A topographic surface was created in ArcGIS using the DEM data. Through creating a surface, typical cross-sections were able to be cut and exported for use in the HEC-RAS modeling. Cross-sections were cut at representative locations along the study reach. The advantage of using a program such as ArcGIS for developing cross-sections is that the geometric information is exported to HEC-RAS in the coordinate system in which it was created; therefore, the HEC-RAS results can be paired with an aerial background for presentation purposes. The HEC-RAS input data is included in Appendix D.

6.2.2 Structures

The four structures spanning the creeks studied in the HEC-RAS analysis were included in the modeling to assess their impact on the water surface profile within and downstream of the development:

- A cart path crossing between 3rd &4th Hole (downstream of lake on near Pro Tour Drive)
- The 10'x8' box culvert beneath Fairway Drive constructed as part of the 16th addition
- The 10'x8' box culvert beneath Jack Nicklaus Drive constructed as part of the 16th addition
- The railroad trestle that carried the former Louisville and Nashville Railroad

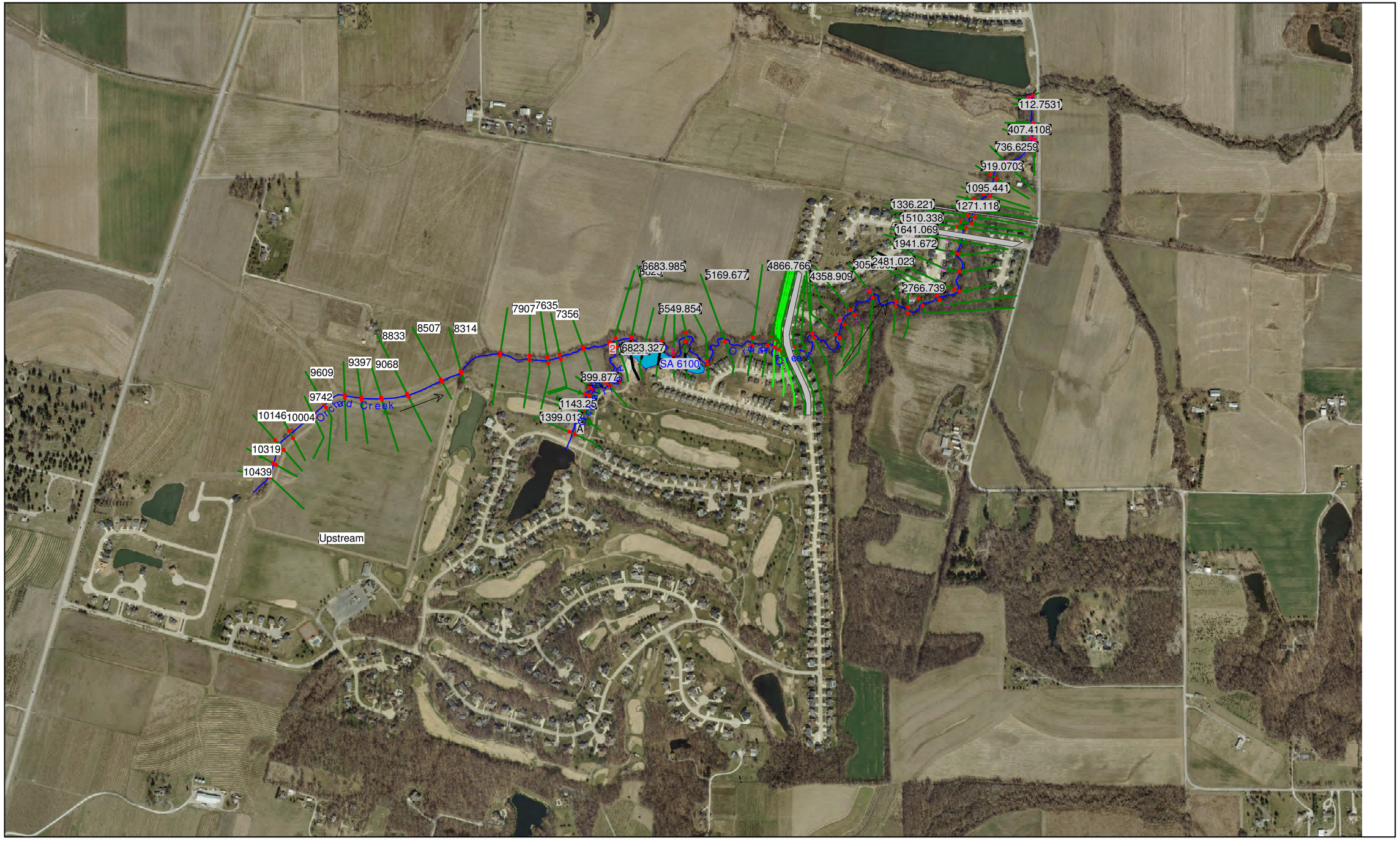

Figure 6-1: HEC-RAS Model Schematic

6.2.3 Channel and Overbank Roughness (Manning's n-value)

Channel and overbank roughness coefficients (Manning's n-values) were developed from site investigation, aerial photography review, and vegetation characteristics. Channel n-values were typically in the 0.035 to 0.045 range, while n-values in the overbank areas ranged from 0.040 in areas with low vegetation to 0.120 in areas with heavy vegetation. The n-values developed for this analysis were consistent to those developed during the previous IDNR-OWR permit modeling. The HEC-RAS input data is included in Appendix D.

6.3 Boundary Conditions

6.3.1 Downstream

The downstream boundary conditions were set at a constant elevation for the analysis. For the April 18, 2013 and the 10-year flows, a constant elevation of 453-ft was used. For the 100-year flow, a constant elevation of 455-ft was used, consistent with the IDNR-OWR permit modeling for the development. Changing the downstream starting water surface elevation downstream in in the model was investigated to ensure the validity of this assumption. Changing the downstream surface does not have an impact on water surface elevations upstream in the development. The water surface profile in the creek near development upstream of Jack Nicklaus Drive and upstream of Fairway Drive to the maintenance shed are mainly influenced by the capacity of the culverts crossing these roadways.

6.3.2 Flow Hydrographs

An unsteady flow HEC-RAS model was created for this project and required the input of flow hydrographs to the creek. HEC-RAS has the ability to directly import flow hydrographs from the HEC-HMS model using the DSS file system. Inflow hydrographs were imported using this method.

6.4 Hydraulic Modeling Results

6.4.1 Existing Conditions

An existing conditions model was created to simulate current conditions for the creek. The estimated flows from the April 18, 2013 storm were input into the existing conditions modeling. The model was calibrated to known water surface elevations observed during this historical storm. After calibration, the 10-year and 100-year flows were input to provide a baseline assessment of the system to compare the impacts of the proposed improvements.

6.4.1.1 Flows

Peak flows at various points along the path of the creek are provided in Table 6.1 below. These flows area a result of the inflow hydrographs developed in HEC-HMS and the routing of flow performed using HEC-RAS hydraulic calculations. Detailed results from the HEC-RAS modeling are provided in Appendix E.

Table 6-1: HEC-RAS Existing Condition Flows

River Station	Location Description	Peak Flow (cfs)		
		April 18, 2013	10-year	100-year
6825	Upstream of inline detention area near maintenance shed	606	452	1,170
4472	Upstream of Fairway Drive Bridge	645	513	1,269
1641	Upstream of Jack Nicklaus Drive Culvert	805	618	1,500
270	Downstream end of model at Loop Creek and Plum Hill Road	843	647	1,581

As discussed previously, the April 18, 2013 storm was estimated to have been between a 10 and 25-year storm and the estimated flows are consistent with that observation. The 100-year flows, with a peak of 1,582 cfs at the downstream end of the analysis are much higher than the flows estimated in the IDNR-OWR permit model for the development. The previous model for the development estimated a 100-year flow of 931 cfs, or about 59% of the current estimate.

The USGS StreamStats program allows for predictions of peak flow rates for ungauged basins using established regression equations for the State of Illinois. As a secondary check, the StreamStats program was utilized to estimate peak flows for the overall study area. Table 6-2 below is a summary of the StreamStats report for the 1.8 square mile study area. The StreamStats report is provided in Appendix F.

Table 6-2: USGS Illinois StreamStats Summary

Return Period (year)	Flow (cfs)
2	284
5	546
10	751
25	1030
50	1260
100	1500
500	2060

The 100-year peak flow developed for this area is within 10% of the flow estimated through the USGS regression equations. In addition, the predicted 10-year flow is within 15%, and the estimated April 18, 2013 flow is between a 10 and 25-year flow as noted previously.

6.4.1.2 Stages

As noted, the estimated flow rates for this study are higher than predicted by previous modeling and studies. Therefore, predicted stages through the watershed are higher than those predicted during design and permitting of the development. Table 6-3 provides a summary of key water surface elevations along the creek. A profile plot of the creek and estimated water surface elevations for the calibration modeling is provided as Figures 6-2. Detailed results from the HEC-RAS modeling are provided in Appendix E.

Table 6-3: HEC-RAS Existing Condition Stages

River Station	Location	Peak Stage (ft)			Observed Low Entry Elev.
		April 18, 2013	10-year	100-year	
1941	Ben Hogan Ct.	458.08	457.20	***459.61***	***459.44***
2126	Ben Hogan Ct.	458.20	457.40	459.71	459.75
2317	Ben Hogan Ct.	458.31	457.60	***459.75***	***459.15***
4717	Fairway Dr.	464.26	463.20	***465.75***	***465.20***

The water surfaces for the 100-year storm would potentially reach the level of the low entry elevation of multiple homes along the creek with the current conditions in the study area. These locations are identified in bold in Table 6-3. The observed low entry was typically a basement window for these homes.

Please note that the observed low entry elevations represent current conditions at the time of this study. Grading modifications to yards and reconfiguration of basement window elevations were observed during site investigation. Therefore, homes that may have received water through a low entry point in April 2013 may now have a higher low entry elevation at this time.

6.4.2 Proposed Improvements

The proposed improvements analyzed as part of the HEC-RAS modeling are generally described below. The improvement ID corresponds to the estimates of probable cost and recommended prioritization detailed in Section 7. Figure 7-1 in Section 7 shows the proposed location for each of these recommendations.

1. The reduction in flow provided by the addition of improvements proposed within the upstream development, analyzed in the HEC-HMS modeling, and discussed previously in Section 5 of this report
    a. If each of the improvements were implemented upstream, the flow rates from the Lake #2 south of Pro Tour Drive would be reduced by approximately 40%
    b. The overall effect on the flow rates near Fairway Drive and Ben Hogan Court, however would be a reduction of approximately 15%, due to the amount of agricultural land outside of the development that drains to the creek
    c. The reductions in flow were included as part of the HEC-RAS model for proposed conditions

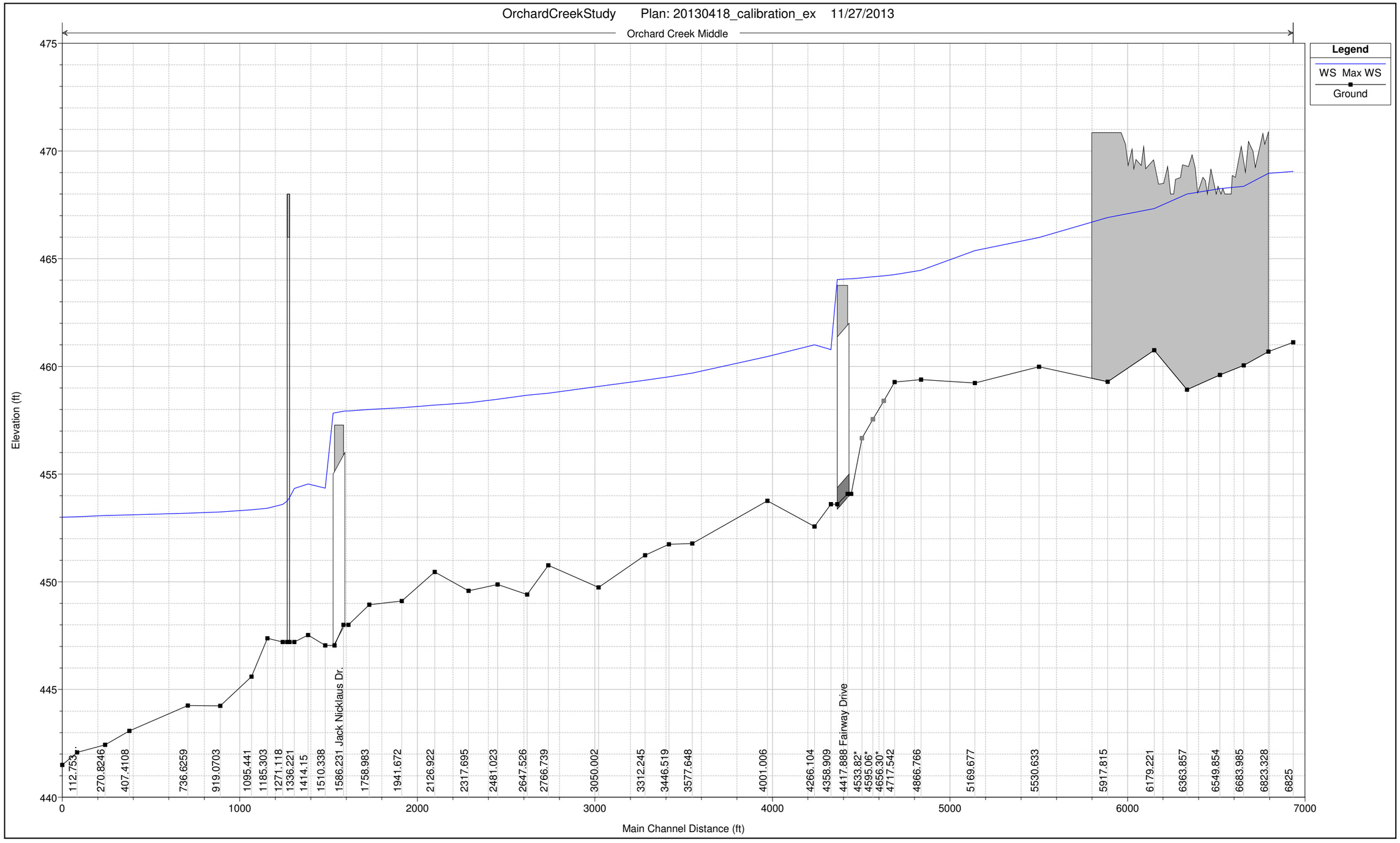

Figure 6-2: HEC-RAS Calibration Model Profile

2. The addition of an inline detention area, never constructed, to the area east of Ben Hogan Court that was a requirement of the IDNR-OWR permit for the downstream areas of the development.
    a. The purpose of this detention area was to provide additional storage for the watershed and lower the water surface by creating a nearly level pool in the area of Ben Hogan Court
    b. The incorporation of this inline storage area was included as part of the HEC-RAS model for proposed conditions
    c. Improvement ID: G-1

3. The addition of 6-ft diameter culverts at Fairway Drive and Jack Nicklaus Drive, adjacent to the existing 10-ft x 8-ft box culverts.
    a. A 6-ft diameter culvert was previously permitted by IDNR/OWR at Fairway Drive to prevent staging of water in nearby agricultural fields. This culvert was not installed; rather, IDNR/OWR permitted staging of water in the agricultural fields after an easement was obtained from the owner. (Improvement ID: H-1)
    b. A 6-ft diameter culvert at Jack Nicklaus Drive was not previously proposed (Improvement ID: H-2)
    c. These two culverts were included in the HEC-RAS modeling for proposed conditions
    d. Based on the increased peak flow rates estimated for each storm, including the 100-year storm, these culverts are recommended to provide additional lowering of the predicted stages below the low entry elevation of homes along Fairway Drive and Ben Hogan Court

4. The maintenance and repair off-line detention area located behind the golf course maintenance shed and Slammer Drive
    a. The detention area was constructed, but appears to not have been maintained based on overgrown areas and a breach in the storage area levee.
    b. A breach of the storage area was observed during field investigation for this study which would allow flow to freely flow back and forth between the storage area and creek and reducing the effectiveness of the storage area
    c. The berm surrounding the detention pond should be repaired and raised to grade to ensure that it functions as intended to capture and store peak flows from the adjacent creek
    d. The repair of the berm and raising it to proposed grade was included in the HEC-RAS modeling for proposed conditions
    e. Improvement ID: G-2

6.4.2.1 Flows

The predicted flows incorporating the proposed upstream improvements, along with the estimated existing flows in parenthesis for comparison, are summarized in Table 6-4 below. Detailed results from the HEC-RAS modeling are provided in Appendix E.

Table 6-4: HEC-RAS Proposed Condition Flows

River Station	Location Description	Peak Flow (cfs)	
		10-year	100-year
6825	Upstream of inline detention area near maintenance shed	373 (452)	844 (1,170)
4472	Upstream of Fairway Drive Bridge	427 (513)	957 (1,269)
1641	Upstream of Jack Nicklaus Drive Culvert	517 (618)	1,290 (1,500)
270	Downstream end of model at Loop Creek and Plum Hill Road	546 (647)	1,374 (1,581)

As discussed previously, the overall reductions in flow in the creek, especially in the downstream areas, are typically about 15% after incorporating the improvements. The upstream improvements discussed in Section 5 are beneficial to the areas that they serve in the development; however, their benefits to downstream areas are somewhat diluted by the large areas outside of the development that contribute to the creek.

The ability to add large detention and storage areas to these mainly agricultural areas outside of the development would be very beneficial to attenuate peak discharges in the areas of Fairway Drive and Ben Hogan Court. The addition of detention in those areas was not explored as part of this study due to the improbability of constructing detention in those areas due to current land ownership and maintenance concerns in the future.

6.4.2.2 Stages

Table 6-5 provides a summary of key water surface elevations along the creek after incorporating the proposed conditions. For comparison purposes, the predicted water surface elevations for the addition of culverts is added in italics while existing conditions are provided in parenthesis. Profile plots comparing the change in estimated water surface elevation for both the 10-year and 100-year storm events are provided as Figures 6-3 and 6-4, respectively. Detailed results from the HEC-RAS modeling are provided in Appendix E.

Table 6-5: HEC-RAS Proposed Condition Stages

River Station	Location	Peak Stage (ft)		Observed Low Entry Elev.
		10-year	100-year	
1941	Ben Hogan Ct.	456.10 / *455.07* (457.20)	458.91 / *458.74* (459.61)	459.44
2126	Ben Hogan Ct.	456.10 / *455.10* (457.40)	458.92 / *458.76* (459.71)	459.75
2317	Ben Hogan Ct.	456.11 / *455.18* (457.60)	458.92 / *458.80* (459.75)	459.15
4717	Fairway Dr.	461.92 / *461.86* (463.20)	465.04 / *464.77* (465.75)	465.20

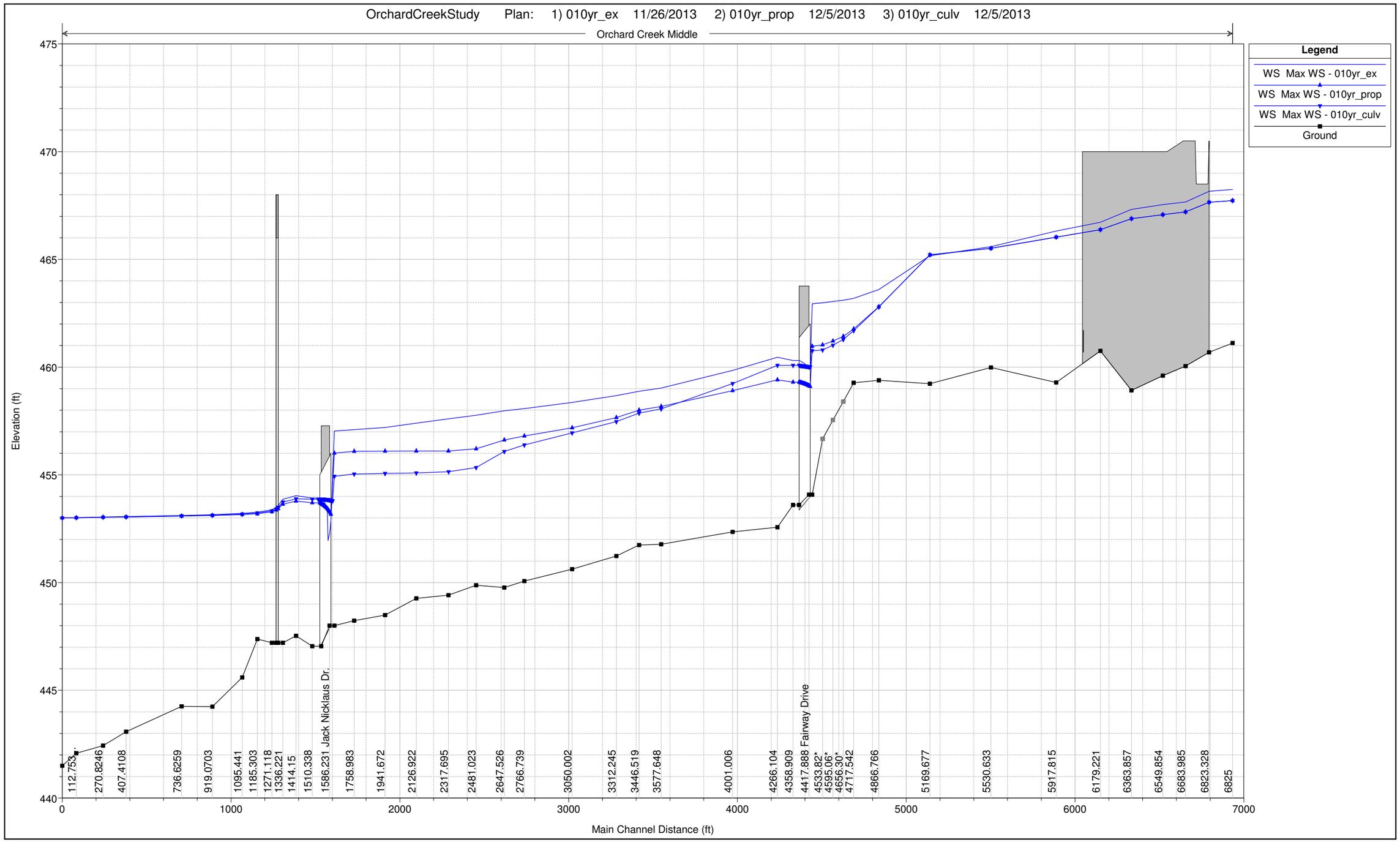

Figure 6-3: HEC-RAS 10-year Model Profile

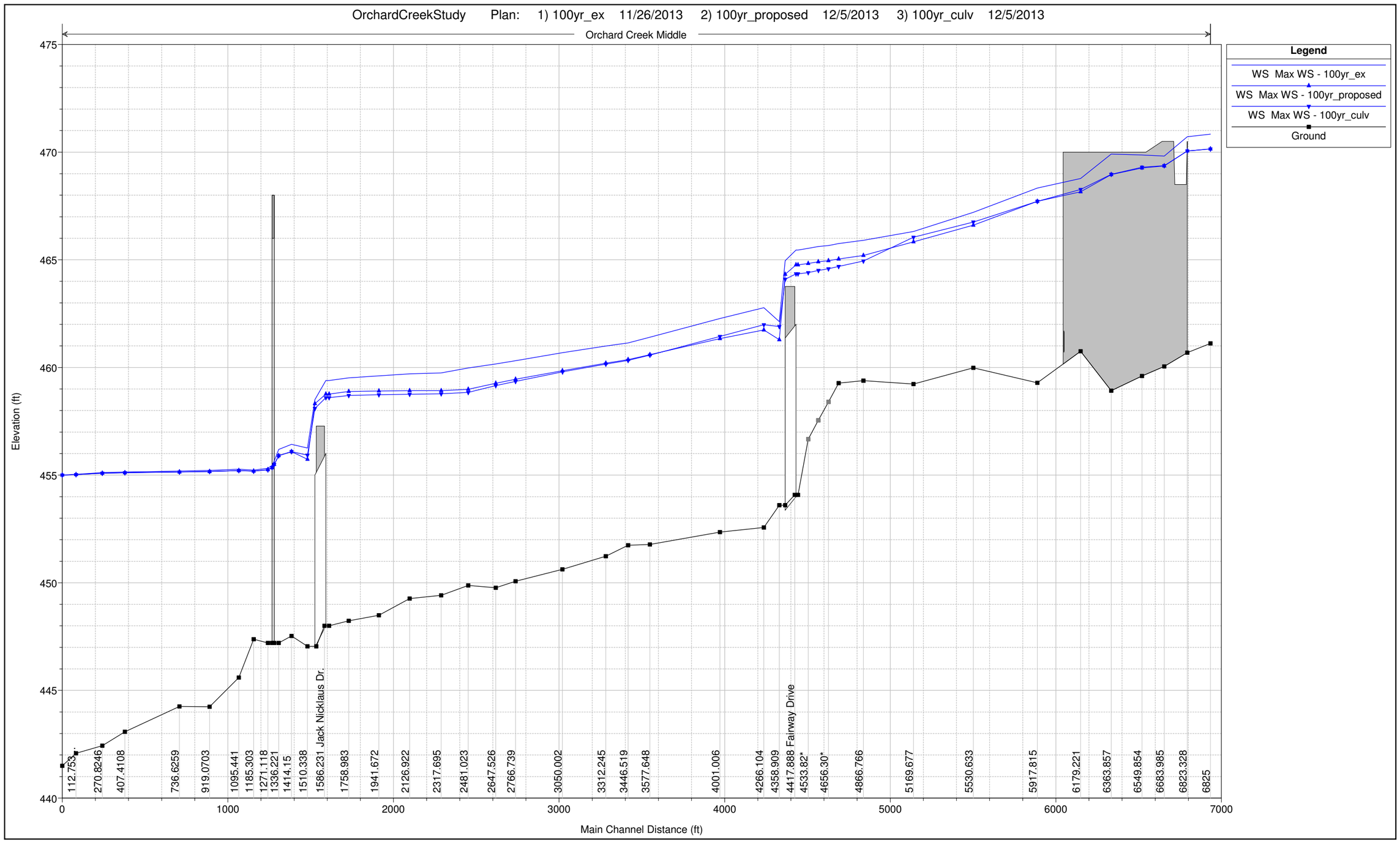

Figure 6-4: HEC-RAS 100-year Model Profile

6.4.2.3 Inundation Maps

Figures 6-5 and 6-6 identify the estimated reduction in inundation area in the downstream areas of the Orchards achieved through the proposed improvements for the 10-year and 100-year peak flows, respectively. The inundation maps do not account for the impacts that may be caused by debris at entrances to inlet and culverts.

For the 10-year storm, the estimated inundation area near the creek east of Ben Hogan Court is reduced with the recommended improvements. Improvements in water surface elevation upstream of Fairway Drive are also anticipated.

For the 100-year storm, the estimated inundation areas are reduced on and around the area of Ben Hogan Court and upstream of Fairway Drive. The stages for the proposed conditions are estimated to encroach into yards along the creek in some areas but are estimated to be below the low entry elevation measured for homes brought to the attention of the project team. The recommended culverts at Fairway Drive and Jack Nicklaus Drive will provide additional benefit for these areas.

6.5 Summary

The incorporation of each of the proposed improvements discussed in this section as well as in Section 5 would lower the estimated 100-year water surface below the low entry elevations at the stations noted in Tables 6-3 and 6-5. The assumption with the analysis is that each of the proposed improvements discussed in Sections 5 and 6 would be completed.

As noted previously during discussion of the HEC-HMS results, there are significant unknowns that are inherent to the functionality of these systems. The accumulation of sediment and debris near the entrances to culverts or bridges severely restricts the flow of water and is possible throughout the HEC-RAS study reach. Also, higher amounts of rainfall, stronger intensity storms, and saturated soils are possible and could produce different reactions within the study area leading to higher peak flows in the creek. For these reasons, peak stages observed in the field could be different than those estimated during this analysis.

Therefore, it is recommended that any improvements such as berms and grading to protect low entry points such as basement doors or windows be constructed with freeboard to provide an additional factor of safety. Also, it is recommended to use the existing stage for design as the timeline and probability for implementation of recommendations is unknown at this time.

There are other opportunities for drainage improvements within the watershed, some of which have been discussed but not analyzed such as addition of detention storage on agricultural lands outside and upstream of the existing development. The analysis in this study represents one possible set of solutions to the issues experienced in the area.

Legend

- Recommended_Embankments
- Improvements & Culverts 10-Year Storm
- Improvements 10-Year Storm
- Existing 10-Year Storm

0 200 400 800 1,200 Feet

N W E S

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10-Year 2-Hour Storm Flood Areas

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13L0054 **Figure 6-5**

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Legend

- Recommended_Embankments
- Improvements & Culverts 100-Year Storm
- Improvements 100-Year Storm
- Existing 100-Year Storm

0 200 400 800 1,200 Feet

N W E S

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100-Year 2-Hour Storm Flood Areas

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13L0054 **Figure 6-6**

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Section 7: Recommendations

Recommendations to reduce stormwater within the Orchards have been developed based on the results of the hydrologic and hydraulic modeling efforts and were detailed in Sections 5 and 6. These recommendations can generally fall into one of four categories: additional storage, storm sewer improvements, structure modification, and grading improvements.

7.1 Recommended Improvements

The locations of the recommended improvements are detailed on Figure 7-1. The details of each improvement are discussed in Sections 5 and 6 of this report.

7.2 Opinion of Probable Cost

Opinions of probable costs were prepared for each of the recommended improvements. The following assumptions were made in preparing these estimates:

- Each improvement would be constructed individually. If projects are grouped together, a savings in costs could be realized; however, **given the unknown schedule and probability of improvements, a conservative estimate had to be provided.**
- Earthwork is a major contributor to the overall cost of the recommendations. Hauling of excess material is a significant factor in the overall opinion of cost. Given the unknown constraints for the properties in the area, the wasting of excess material on-site was not considered. **The cost of many of the recommendations should be reduced if material from the improvements could remain on-site.**

Table 7-1 summarizes the estimated costs of the proposed improvements. Appendix G provides quantity calculations for the estimated costs.

7.3 Priority Phasing Recommendations

Each of the recommendations presented in the report were categorized using a ranking system that accounts for flow reduction, number of homes potentially benefiting, and potential downstream hazards from existing conditions. The results are presented in Table 7-1.

7.4 Key Observations Summary

Some key observations noted during the preparation of this report are summarized below for reference:

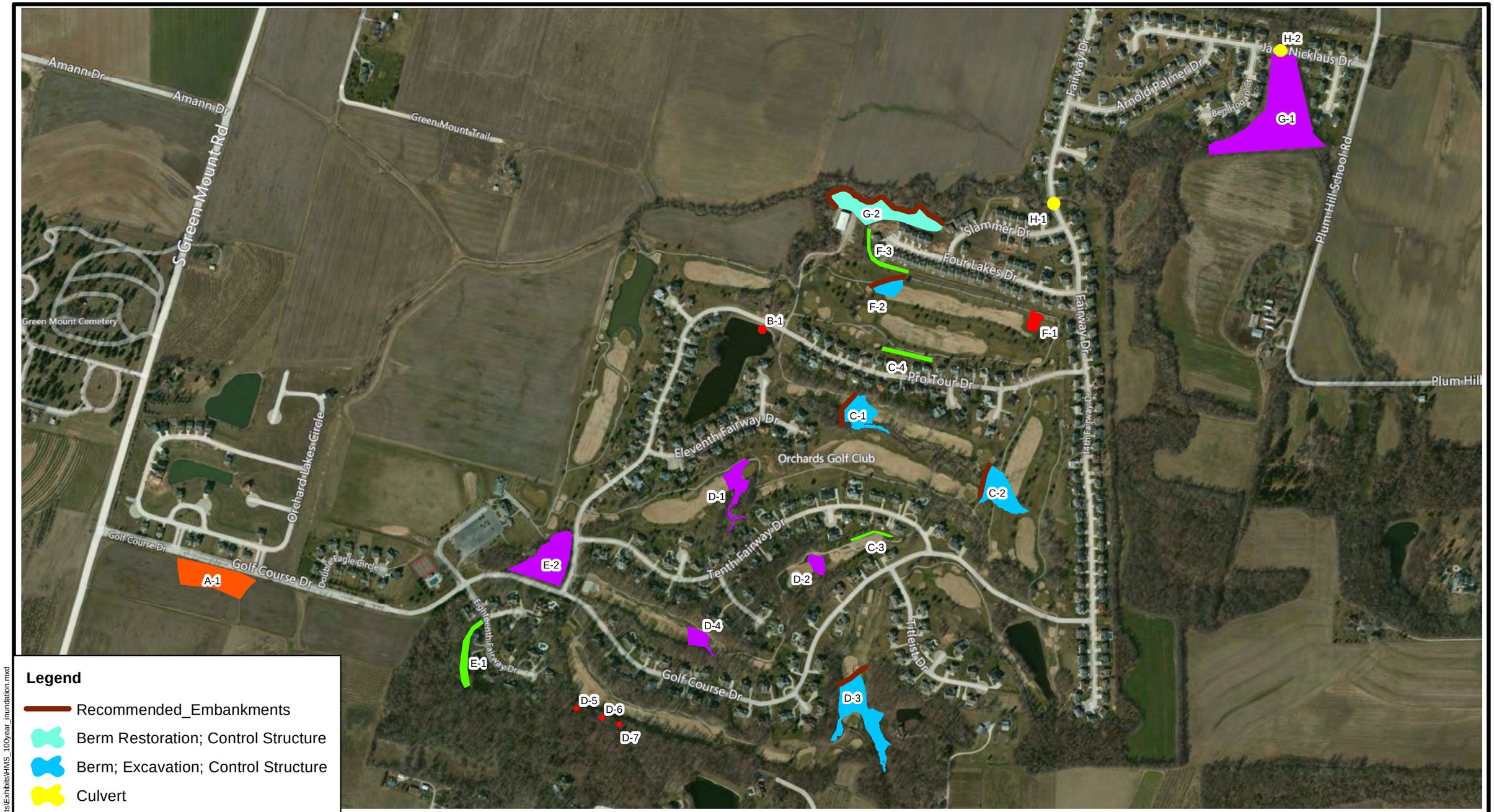
- Flows estimated for this study are higher than those used in previous design and permitting for the development. For example, the peak 100-year flow at the downstream end of the study is estimated at 1,586 cfs for this study, while previous permitting efforts used an estimated a peak flow of 931 cfs. The development of the flows previously used for design and permitting was not explored in detail. The flow rates developed for this study were checked against observed conditions and USGS developed regressions equations for the region.
- Approximately 2/3 of the peak flow for the 100-year storm originates from the drainage area located outside of the development.
- Peak flows, which are typically observed in the spring, are exacerbated by the lack of vegetation on adjacent agricultural fields.
- The measured elevations of the outfall structure on Lake #2 (south of Pro Tour Drive) are more than 1.5' higher than those shown on the design plans for the lake. This

decreases the amount of storage capacity available and increases the risks of overtopping the roadway.

- Debris and sedimentation in culverts was observed in many areas throughout the development. The impacts resulting from these issues cannot be accurately quantified in the stormwater modeling but is known to cause impacts.
- The off-line detention area for the creek, located near the golf course maintenance shed and Four Lakes Drive, has not been maintained. A breach was observed, reducing its functionality as a storage area during peak flows. This detention area and its maintenance was a requirement of IDNR/OWR permitting
- The in-line detention area for the creek near Ben Hogan Drive was never constructed in accordance with the IDNR/OWR permitting.
- Landscaping, grading, basketball hoops, swing sets, putting greens, and other obstructions were observed in areas of the development that are under drainage easement. These obstructions can cause adverse impacts to neighbors both in the upstream and downstream directions.
- Foot bridges across the drainage ways in the development were observed in areas that are prone to stormwater issues. These bridges can collect debris and raise the water surface in the areas.
- Many homes, prone to stormwater issues, have walk-out basements at elevations near the banks of a creek through the development or near the inlet or outlet of a large culvert. Based on a review of the development plans, homes with walk-out or exposed basements were recommended to have a separate drainage study prior to construction. It is unknown if these drainage studies were ever performed.
- Homes prone to stormwater issues should consider the installation of berms and other grading improvements that have already been installed at some locations in the development. The improvements should be designed to meet existing conditions due to the unknown timeline and probability for implementing the recommendations of this report. Freeboard should be added to account for unknown variables such as debris that can impact water surface elevations.
- Ensure future development that contributes to the Orchards is designed and constructed per applicable regulations and does not increase potential for flooding within the Orchards subdivisions.

Table 7-1: Opinion of Probable Cost and Prioritization Matrix

Improvement ID	Description	Opinion of Cost	10 year Peak Flow Reduction (cfs)	100 year Peak Flow Reduction (cfs)	Homes potentially Benefiting	Flow Reduction Weighting	Potential Flood Damage reduction weighting	Existing Hazard Factor	Benefit Score	Ranking
B1	Lake 2 spillway mod	$ 3,038	0	0	11	0	220	10	2200	1
E2	Excavation	$ 151,200	25	78	13	515	260	2	1550	2
G2	Off line storage	$ 155,088	0	200	11	1000	220	1	1220	3
C1	Berm, control structure, excavation	$ 256,255	36	98	11	670	220	1	890	4
F1	Modify spillway; regrading	$ 33,395	1	3	3	20	60	10	800	5
D3	Berm control structure, excavation	$ 74,701	13	49	13	310	260	1	570	6
A1	Excavation, control structure	$ 119,030	13	33	14	230	280	1	510	7
C2	Berm, controll structure, excavation	$ 165,905	8	48	11	280	220	1	500	8
D6	Excavation; Clearing; Control Structure	$ 28,731	4	20	11	120	220	1	340	9
D5	Excavation; Clearing; Control Structure	$ 26,171	3	14	11	85	220	1	305	10
D2	Excavation	$ -	7	0	13	35	260	1	295	11
D7	Excavation; Clearing; Control Structure	$ 26,971	2	13	11	75	220	1	295	12
D4	Excavation	$ 29,344	6	0	11	30	220	1	250	13
D1	Excavation	$ 11,504	0	0	12	0	240	1	240	14
H2	6ft culvert Jack Nicklaus Drive	$ 74,665			11	0	220	1	220	15
G1	In line storage	$ 580,184			11	0	220	1	220	16
F2	Berm; Control Structure; Excavation	$ 60,327	2	2	3	20	60	1	80	17
C3	Regrading	$ 12,400			3	0	60	1	60	18
F3	Regrading	$ 12,400			3	0	60	1	60	19
E1	Regrading	$ 18,000			2	0	40	1	40	20
C4	Regrading	$ 12,400			1	0	20	1	20	21
H1	6 ft culvert Fairway Drive	$ 74,665			1	0	20	1	20	22
I1	Regrading	$ 12,561			0	0	0	1	0	23



Legend

- Recommended_Embankments
- Berm Restoration; Control Structure
- Berm; Excavation; Control Structure
- Culvert
- Excavation Only
- Modify Control Structure
- Excavation; Control Structure
- Regrading

0 200 400 800 1,200
Feet

N
W E
S

HANSON
Hanson Professional Services Inc.

Recommended Improvements

ORCHARDS SUBDIVISION FLOOD STUDY
CITY OF BELLEVILLE, ILLINOIS

13L0054 **Figure 7-1**

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Section 8: References

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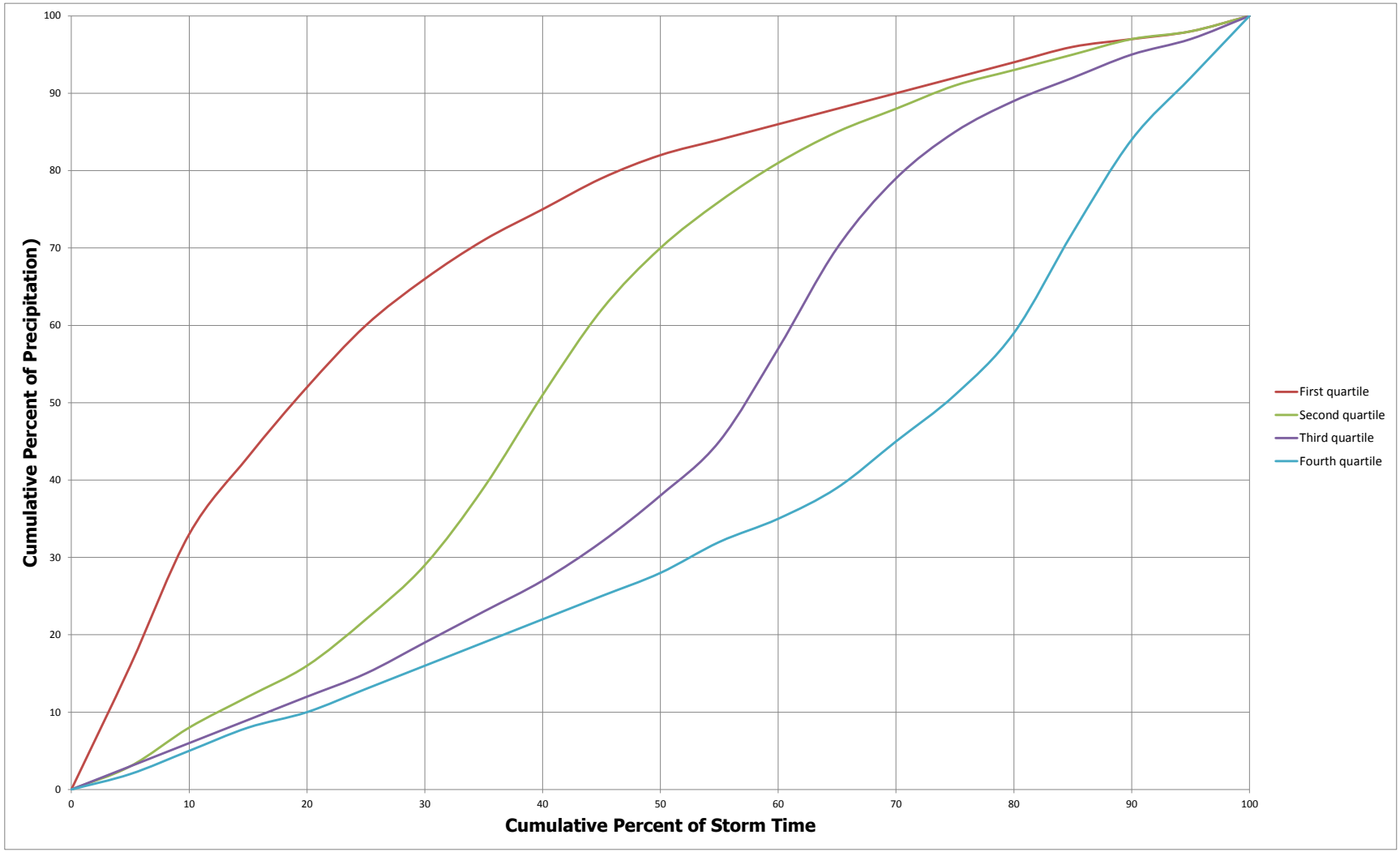
Appendix A: Rainfall Data

Gonzalez Companies, LLC
1750 Brentwood Blvd
Suite 300
St. Louis, MO 63114

Median Time Distributions of Heavy Storm Rainfall in Illinois at a Point (<10 sq. mi) from ISWS Circular 173 - Time Distributions of Heavy Rainstorms in Illinois



Gonzalez Companies, LLC
1750 Brentwood Blvd
Suite 300
St. Louis, MO 63114

2-year storm - Belleville, IL

First Quartile													Second Quartile			Third Quartile			Fourth Quartile					
P=	1.6-in		P=	2.0-in		P=	2.1-in		P=	2.5-in			P=	2.9-in		P=	3.3-in		P=	3.6-in		P=	3.9-in	
1-hour			2-hour			3-hour			6-hour				12-hour			24-hour			48-hour			72-hour		
Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)		Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)
3	0.26	0.26	6	0.32	0.32	10	0.38	0.38	15	0.33	0.33		30	0.07	0.07	60	0.08	0.08	120	0.06	0.06	180	0.07	0.07
6	0.53	0.27	12	0.66	0.34	20	0.74	0.36	30	0.68	0.35		60	0.18	0.11	120	0.17	0.08	240	0.14	0.08	360	0.16	0.09
9	0.69	0.16	18	0.86	0.20	30	0.97	0.23	45	0.95	0.27		90	0.29	0.11	180	0.25	0.08	360	0.23	0.09	540	0.25	0.10
12	0.83	0.14	24	1.04	0.18	40	1.17	0.20	60	1.15	0.20		120	0.39	0.10	240	0.33	0.08	480	0.31	0.08	720	0.34	0.08
15	0.96	0.13	30	1.20	0.16	50	1.33	0.16	75	1.33	0.18		150	0.49	0.11	300	0.41	0.08	600	0.38	0.07	900	0.41	0.07
18	1.06	0.10	36	1.32	0.12	60	1.46	0.13	90	1.50	0.17		180	0.64	0.15	360	0.50	0.08	720	0.47	0.09	1080	0.51	0.10
21	1.14	0.08	42	1.42	0.10	70	1.56	0.10	105	1.63	0.13		210	0.81	0.17	420	0.61	0.11	840	0.56	0.09	1260	0.60	0.10
24	1.20	0.06	48	1.50	0.08	80	1.65	0.09	120	1.73	0.11		240	1.03	0.23	480	0.72	0.11	960	0.65	0.09	1440	0.70	0.10
27	1.26	0.06	54	1.58	0.08	90	1.72	0.07	135	1.83	0.09		270	1.31	0.27	540	0.83	0.11	1080	0.74	0.09	1620	0.80	0.10
30	1.31	0.05	60	1.64	0.06	100	1.77	0.05	150	1.91	0.08		300	1.59	0.28	600	0.95	0.12	1200	0.83	0.09	1800	0.90	0.10
33	1.34	0.03	66	1.68	0.04	110	1.82	0.05	165	1.99	0.08		330	1.84	0.25	660	1.09	0.14	1320	0.92	0.09	1980	0.99	0.10
36	1.38	0.03	72	1.72	0.04	120	1.86	0.05	180	2.05	0.06		360	2.03	0.19	720	1.25	0.17	1440	1.01	0.09	2160	1.09	0.10
39	1.41	0.03	78	1.76	0.04	130	1.91	0.05	195	2.09	0.04		390	2.18	0.15	780	1.45	0.19	1560	1.13	0.12	2340	1.22	0.13
42	1.44	0.03	84	1.80	0.04	140	1.96	0.05	210	2.13	0.04		420	2.30	0.13	840	1.75	0.30	1680	1.22	0.10	2520	1.33	0.10
45	1.47	0.03	90	1.84	0.04	150	2.00	0.05	225	2.18	0.04		450	2.41	0.11	900	2.10	0.35	1800	1.33	0.11	2700	1.44	0.12
48	1.50	0.03	96	1.88	0.04	160	2.03	0.03	240	2.22	0.04		480	2.49	0.09	960	2.41	0.31	1920	1.48	0.14	2880	1.60	0.16
51	1.54	0.03	102	1.92	0.04	170	2.06	0.02	255	2.26	0.04		510	2.57	0.07	1020	2.64	0.23	2040	1.66	0.18	3060	1.79	0.20
54	1.55	0.02	108	1.94	0.02	180	2.10	0.04	270	2.30	0.04		540	2.64	0.07	1080	2.81	0.16	2160	1.84	0.18	3240	1.99	0.19
57	1.57	0.02	114	1.96	0.02				285	2.34	0.04		570	2.69	0.05	1140	2.92	0.11	2280	2.08	0.24	3420	2.25	0.26
60	1.60	0.03	120	2.00	0.04				300	2.38	0.04		600	2.74	0.05	1200	3.00	0.09	2400	2.44	0.36	3600	2.64	0.39
									315	2.41	0.03		630	2.78	0.05	1260	3.09	0.08	2520	2.81	0.37	3780	3.04	0.40
									330	2.43	0.02		660	2.82	0.04	1320	3.16	0.07	2640	3.12	0.31	3960	3.38	0.34
									345	2.46	0.03		690	2.85	0.03	1380	3.22	0.06	2760	3.36	0.24	4140	3.64	0.26
									360	2.50	0.04		720	2.90	0.05	1440	3.30	0.08	2880	3.60	0.24	4320	3.90	0.26

5-year storm - Belleville, IL

First Quartile													Second Quartile			Third Quartile			Fourth Quartile					
P=	2.0-in		P=	2.6-in		P=	2.8-in		P=	3.3-in			P=	3.7-in		P=	4.2-in		P=	4.5-in		P=	5.0-in	
1-hour			2-hour			3-hour			6-hour				12-hour			24-hour			48-hour			72-hour		
Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)		Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)
3	0.32	0.32	6	0.42	0.42	10	0.50	0.50	15	0.44	0.44		30	0.09	0.09	60	0.11	0.11	120	0.08	0.08	180	0.08	0.08
6	0.66	0.34	12	0.86	0.44	20	0.99	0.49	30	0.90	0.46		60	0.23	0.14	120	0.21	0.11	240	0.18	0.11	360	0.20	0.12
9	0.86	0.20	18	1.12	0.26	30	1.29	0.30	45	1.25	0.35		90	0.37	0.14	180	0.32	0.11	360	0.29	0.11	540	0.33	0.13
12	1.04	0.18	24	1.35	0.23	40	1.56	0.27	60	1.52	0.26		120	0.49	0.12	240	0.42	0.11	480	0.39	0.10	720	0.43	0.11
15	1.20	0.16	30	1.56	0.21	50	1.77	0.22	75	1.76	0.24		150	0.63	0.14	300	0.53	0.11	600	0.47	0.08	900	0.53	0.09
18	1.32	0.12	36	1.72	0.16	60	1.94	0.17	90	1.98	0.22		180	0.81	0.19	360	0.63	0.11	720	0.59	0.11	1080	0.65	0.13
21	1.42	0.10	42	1.85	0.13	70	2.08	0.13	105	2.15	0.17		210	1.03	0.22	420	0.77	0.14	840	0.70	0.11	1260	0.78	0.13
24	1.50	0.08	48	1.95	0.10	80	2.20	0.12	120	2.29	0.14		240	1.32	0.29	480	0.91	0.14	960	0.81	0.11	1440	0.90	0.13
27	1.58	0.08	54	2.05	0.10	90	2.30	0.10	135	2.41	0.12		270	1.67	0.35	540	1.05	0.14	1080	0.92	0.11	1620	1.03	0.13
30	1.64	0.06	60	2.13	0.08	100	2.36	0.06	150	2.52	0.11		300	2.02	0.36	600	1.20	0.15	1200	1.04	0.11	1800	1.15	0.13
33	1.68	0.04	66	2.18	0.05	110	2.42	0.06	165	2.62	0.10		330	2.34	0.32	660	1.39	0.18	1320	1.15	0.11	1980	1.28	0.13
36	1.72	0.04	72	2.24	0.05	120	2.48	0.06	180	2.71	0.08		360	2.59	0.25	720	1.60	0.21	1440	1.26	0.11	2160	1.40	0.13
39	1.76	0.04	78	2.29	0.05	130	2.54	0.06	195	2.76	0.06		390	2.78	0.19	780	1.84	0.25	1560	1.41	0.15	2340	1.57	0.17
42	1.80	0.04	84	2.34	0.05	140	2.61	0.06	210	2.82	0.06		420	2.94	0.16	840	2.23	0.39	1680	1.53	0.12	2520	1.70	0.13
45	1.84	0.04	90	2.39	0.05	150	2.67	0.06	225	2.87	0.06		450	3.07	0.14	900	2.67	0.44	1800	1.67	0.14	2700	1.85	0.15
48	1.88	0.04	96	2.44	0.05	160	2.71	0.04	240	2.93	0.05		480	3.18	0.11	960	3.07	0.40	1920	1.85	0.18	2880	2.05	0.20
51	1.92	0.04	102	2.50	0.05	170	2.74	0.03	255	2.98	0.06		510	3.27	0.09	1020	3.36	0.29	2040	2.07	0.23	3060	2.30	0.25
54	1.94	0.02	108	2.52	0.03	180	2.80	0.06	270	3.04	0.05		540	3.37	0.09	1080	3.57	0.21	2160	2.30	0.22	3240	2.55	0.25
57	1.96	0.02	114	2.55	0.03				285	3.09	0.05		570	3.43	0.06	1140	3.71	0.14	2280	2.60	0.30	3420	2.88	0.33
60	2.00	0.04	120	2.60	0.05				300	3.15	0.06		600	3.49	0.06	1200	3.82	0.11	2400	3.05	0.45	3600	3.38	0.50
									315	3.18	0.04		630	3.55	0.06	1260	3.93	0.11	2520	3.51	0.46	3780	3.90	0.52
									330	3.21	0.03		660	3.60	0.05	1320	4.02	0.09	2640	3.90	0.39	3960	4.33	0.43
									345	3.25	0.03		690	3.64	0.04	1380	4.10	0.08	2760	4.20	0.30	4140	4.67	0.33
									360	3.30	0.05		720	3.70	0.06	1440	4.20	0.11	2880	4.50	0.30	4320	5.00	0.33

Gonzalez Companies, LLC
1750 Brentwood Blvd
Suite 300
St. Louis, MO 63114

10-year storm - Belleville, IL

First Quartile												Second Quartile			Third Quartile			Fourth Quartile					
P=	2.4-in		P=	3.0-in		P=	3.2-in		P=	3.8-in		P=	4.5-in		P=	4.9-in		P=	5.4-in		P=	5.8-in	
1-hour			2-hour			3-hour			6-hour			12-hour			24-hour			48-hour			72-hour		
Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)
3	0.38	0.38	6	0.48	0.48	10	0.57	0.57	15	0.51	0.51	30	0.11	0.11	60	0.12	0.12	120	0.09	0.09	180	0.10	0.10
6	0.79	0.41	12	0.99	0.51	20	1.13	0.55	30	1.04	0.53	60	0.29	0.17	120	0.25	0.12	240	0.22	0.13	360	0.23	0.14
9	1.03	0.24	18	1.29	0.30	30	1.47	0.34	45	1.44	0.41	90	0.45	0.17	180	0.37	0.12	360	0.35	0.14	540	0.38	0.15
12	1.25	0.22	24	1.56	0.27	40	1.78	0.31	60	1.75	0.30	120	0.60	0.15	240	0.49	0.12	480	0.47	0.12	720	0.50	0.13
15	1.44	0.19	30	1.80	0.24	50	2.03	0.25	75	2.03	0.28	150	0.77	0.17	300	0.61	0.12	600	0.57	0.10	900	0.61	0.11
18	1.58	0.14	36	1.98	0.18	60	2.22	0.19	90	2.28	0.25	180	0.99	0.23	360	0.74	0.12	720	0.70	0.14	1080	0.75	0.15
21	1.70	0.12	42	2.13	0.15	70	2.37	0.15	105	2.47	0.19	210	1.25	0.26	420	0.90	0.16	840	0.84	0.14	1260	0.90	0.15
24	1.80	0.10	48	2.25	0.12	80	2.51	0.14	120	2.63	0.16	240	1.61	0.35	480	1.06	0.16	960	0.97	0.14	1440	1.04	0.15
27	1.90	0.10	54	2.37	0.12	90	2.62	0.11	135	2.77	0.14	270	2.03	0.42	540	1.23	0.16	1080	1.11	0.14	1620	1.19	0.15
30	1.97	0.07	60	2.46	0.09	100	2.70	0.07	150	2.90	0.13	300	2.46	0.44	600	1.40	0.18	1200	1.24	0.14	1800	1.33	0.15
33	2.02	0.05	66	2.52	0.06	110	2.77	0.07	165	3.02	0.12	330	2.85	0.39	660	1.62	0.21	1320	1.38	0.14	1980	1.48	0.15
36	2.06	0.05	72	2.58	0.06	120	2.84	0.07	180	3.12	0.09	360	3.15	0.30	720	1.86	0.25	1440	1.51	0.14	2160	1.62	0.15
39	2.11	0.05	78	2.64	0.06	130	2.91	0.07	195	3.18	0.06	390	3.38	0.23	780	2.15	0.29	1560	1.69	0.18	2340	1.82	0.19
42	2.16	0.05	84	2.70	0.06	140	2.98	0.07	210	3.24	0.06	420	3.57	0.20	840	2.60	0.45	1680	1.84	0.14	2520	1.97	0.15
45	2.21	0.05	90	2.76	0.06	150	3.05	0.07	225	3.31	0.06	450	3.74	0.17	900	3.11	0.51	1800	2.00	0.16	2700	2.15	0.17
48	2.26	0.05	96	2.82	0.06	160	3.10	0.05	240	3.37	0.06	480	3.87	0.14	960	3.58	0.47	1920	2.21	0.22	2880	2.38	0.23
51	2.30	0.05	102	2.88	0.06	170	3.13	0.04	255	3.43	0.06	510	3.98	0.11	1020	3.92	0.34	2040	2.48	0.27	3060	2.67	0.29
54	2.33	0.02	108	2.91	0.03	180	3.20	0.07	270	3.50	0.06	540	4.10	0.11	1080	4.17	0.24	2160	2.75	0.27	3240	2.96	0.29
57	2.35	0.02	114	2.94	0.03				285	3.56	0.06	570	4.17	0.07	1140	4.33	0.16	2280	3.11	0.36	3420	3.34	0.39
60	2.40	0.05	120	3.00	0.06				300	3.62	0.06	600	4.25	0.08	1200	4.46	0.13	2400	3.65	0.54	3600	3.92	0.58
									315	3.67	0.04	630	4.32	0.07	1260	4.58	0.12	2520	4.21	0.56	3780	4.52	0.60
									330	3.70	0.03	660	4.38	0.06	1320	4.69	0.11	2640	4.68	0.47	3960	5.03	0.50
									345	3.74	0.04	690	4.43	0.05	1380	4.78	0.09	2760	5.04	0.36	4140	5.41	0.39
									360	3.80	0.06	720	4.50	0.07	1440	4.90	0.12	2880	5.40	0.36	4320	5.80	0.39

25-year storm - Belleville, IL

First Quartile												Second Quartile			Third Quartile			Fourth Quartile					
P=	3.0-in		P=	3.8-in		P=	4.0-in		P=	4.9-in		P=	5.8-in		P=	6.5-in		P=	6.7-in		P=	7.1-in	
1-hour			2-hour			3-hour			6-hour			12-hour			24-hour			48-hour			72-hour		
Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)
3	0.48	0.48	6	0.61	0.61	10	0.72	0.72	15	0.65	0.65	30	0.15	0.15	60	0.16	0.16	120	0.11	0.11	180	0.12	0.12
6	0.99	0.51	12	1.25	0.65	20	1.41	0.69	30	1.34	0.69	60	0.37	0.22	120	0.33	0.16	240	0.27	0.16	360	0.28	0.17
9	1.29	0.30	18	1.63	0.38	30	1.84	0.43	45	1.86	0.52	90	0.58	0.21	180	0.49	0.16	360	0.44	0.17	540	0.46	0.18
12	1.56	0.27	24	1.98	0.34	40	2.22	0.38	60	2.25	0.39	120	0.77	0.19	240	0.65	0.16	480	0.58	0.15	720	0.62	0.15
15	1.80	0.24	30	2.28	0.30	50	2.53	0.31	75	2.61	0.36	150	0.99	0.21	300	0.81	0.16	600	0.70	0.12	900	0.75	0.13
18	1.98	0.18	36	2.51	0.23	60	2.77	0.24	90	2.94	0.33	180	1.28	0.29	360	0.98	0.16	720	0.87	0.17	1080	0.92	0.18
21	2.13	0.15	42	2.70	0.19	70	2.96	0.19	105	3.19	0.25	210	1.61	0.34	420	1.19	0.22	840	1.04	0.17	1260	1.10	0.18
24	2.25	0.12	48	2.85	0.15	80	3.14	0.18	120	3.40	0.21	240	2.07	0.45	480	1.41	0.22	960	1.21	0.17	1440	1.28	0.18
27	2.37	0.12	54	3.00	0.15	90	3.28	0.14	135	3.58	0.18	270	2.61	0.54	540	1.63	0.22	1080	1.37	0.17	1620	1.46	0.18
30	2.46	0.09	60	3.12	0.11	100	3.37	0.09	150	3.74	0.16	300	3.17	0.56	600	1.86	0.24	1200	1.54	0.17	1800	1.63	0.18
33	2.52	0.06	66	3.19	0.08	110	3.46	0.09	165	3.90	0.16	330	3.67	0.50	660	2.15	0.28	1320	1.71	0.17	1980	1.81	0.18
36	2.58	0.06	72	3.27	0.08	120	3.55	0.09	180	4.02	0.12	360	4.06	0.39	720	2.47	0.33	1440	1.88	0.17	2160	1.99	0.18
39	2.64	0.06	78	3.34	0.08	130	3.64	0.09	195	4.10	0.08	390	4.35	0.29	780	2.85	0.38	1560	2.10	0.22	2340	2.22	0.24
42	2.70	0.06	84	3.42	0.08	140	3.72	0.09	210	4.18	0.08	420	4.60	0.25	840	3.45	0.60	1680	2.28	0.18	2520	2.41	0.19
45	2.76	0.06	90	3.50	0.08	150	3.81	0.09	225	4.26	0.08	450	4.81	0.21	900	4.13	0.68	1800	2.48	0.20	2700	2.63	0.21
48	2.82	0.06	96	3.57	0.08	160	3.87	0.06	240	4.34	0.08	480	4.99	0.17	960	4.75	0.62	1920	2.75	0.27	2880	2.91	0.28
51	2.88	0.06	102	3.65	0.08	170	3.92	0.04	255	4.43	0.08	510	5.13	0.15	1020	5.20	0.46	2040	3.08	0.34	3060	3.27	0.36
54	2.91	0.03	108	3.69	0.04	180	4.00	0.08	270	4.51	0.08	540	5.28	0.15	1080	5.53	0.32	2160	3.42	0.34	3240	3.62	0.35
57	2.94	0.03	114	3.72	0.04				285	4.59	0.08	570	5.37	0.10	1140	5.74	0.22	2280	3.86	0.45	3420	4.09	0.47
60	3.00	0.06	120	3.80	0.08				300	4.67	0.08	600	5.47	0.10	1200	5.92	0.17	2400	4.53	0.67	3600	4.80	0.71
									315	4.73	0.06	630	5.57	0.10	1260	6.08	0.16	2520	5.23	0.69	3780	5.54	0.73
									330	4.77	0.04	660	5.65	0.08	1320	6.22	0.14	2640	5.81	0.58	3960	6.15	0.62
									345	4.82	0.05	690	5.70	0.06	1380	6.34	0.12	2760	6.25	0.45	4140	6.63	0.47
									360	4.90	0.08	720	5.80	0.10	1440	6.50	0.16	2880	6.70	0.45	4320	7.10	0.47

Gonzalez Companies, LLC
1750 Brentwood Blvd
Suite 300
St. Louis, MO 63114

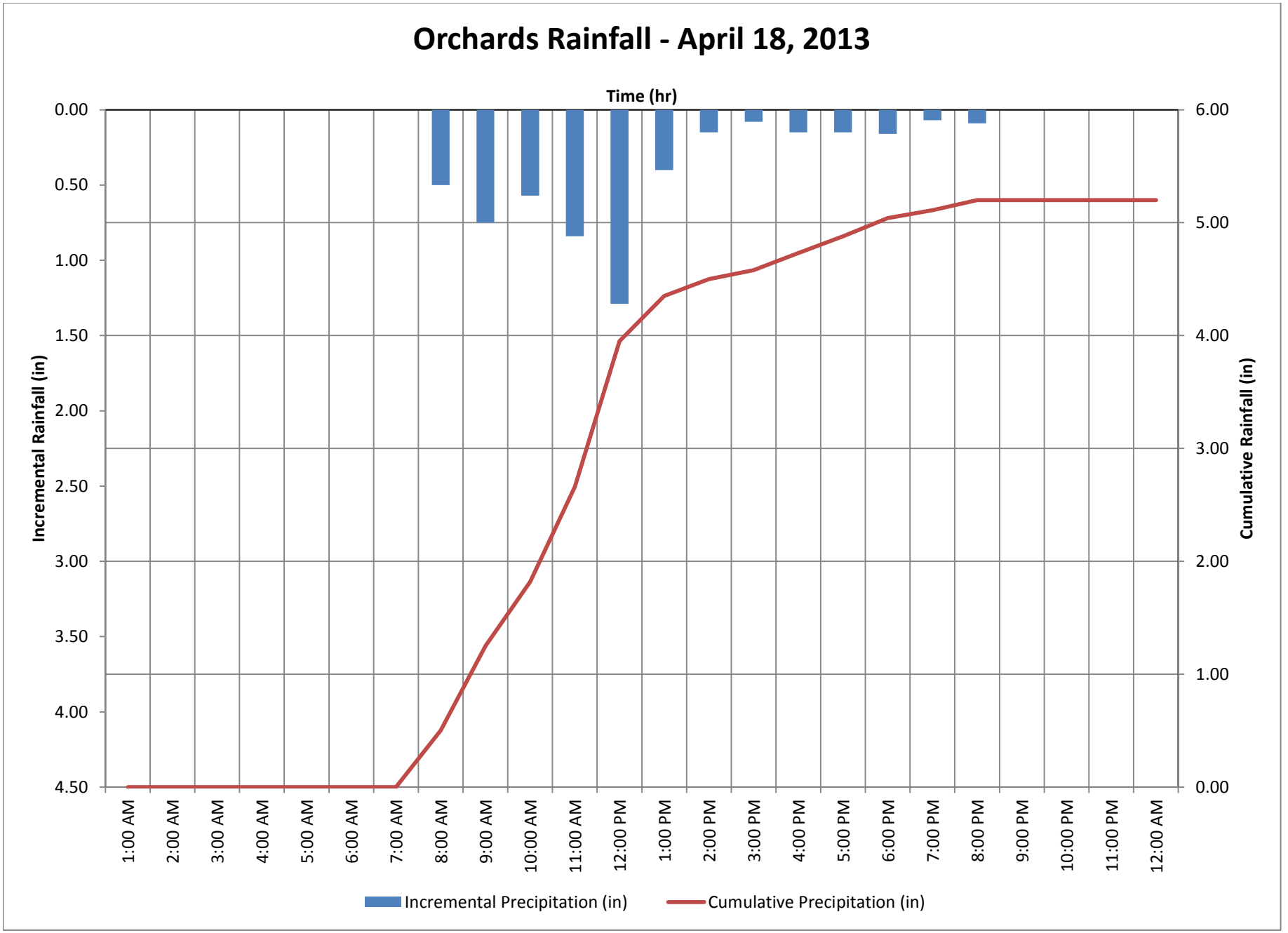
50-year storm - Belleville, IL

First Quartile													Second Quartile			Third Quartile			Fourth Quartile					
P=	3.5-in		P=	4.4-in		P=	4.8-in		P=	5.8-in		P=	6.5-in		P=	7.5-in		P=	7.6-in		P=	8.5-in	
1-hour			2-hour			3-hour			6-hour			12-hour			24-hour			48-hour			72-hour		
Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)
3	0.56	0.56	6	0.70	0.70	10	0.86	0.86	15	0.77	0.77	30	0.16	0.16	60	0.19	0.19	120	0.13	0.13	180	0.14	0.14
6	1.16	0.60	12	1.45	0.75	20	1.69	0.83	30	1.59	0.81	60	0.41	0.25	120	0.38	0.19	240	0.30	0.18	360	0.34	0.20
9	1.51	0.35	18	1.89	0.44	30	2.21	0.52	45	2.20	0.62	90	0.65	0.24	180	0.56	0.19	360	0.49	0.19	540	0.55	0.21
12	1.82	0.32	24	2.29	0.40	40	2.67	0.46	60	2.67	0.46	120	0.87	0.22	240	0.75	0.19	480	0.66	0.16	720	0.74	0.18
15	2.10	0.28	30	2.64	0.35	50	3.04	0.37	75	3.09	0.43	150	1.11	0.24	300	0.94	0.19	600	0.80	0.14	900	0.89	0.16
18	2.31	0.21	36	2.90	0.26	60	3.33	0.29	90	3.48	0.39	180	1.43	0.33	360	1.13	0.19	720	0.99	0.19	1080	1.11	0.21
21	2.49	0.18	42	3.12	0.22	70	3.56	0.23	105	3.77	0.29	210	1.81	0.38	420	1.38	0.25	840	1.18	0.19	1260	1.32	0.21
24	2.63	0.14	48	3.30	0.18	80	3.77	0.21	120	4.02	0.25	240	2.32	0.51	480	1.63	0.25	960	1.37	0.19	1440	1.53	0.21
27	2.77	0.14	54	3.48	0.18	90	3.94	0.17	135	4.23	0.21	270	2.93	0.61	540	1.88	0.25	1080	1.56	0.19	1620	1.74	0.21
30	2.87	0.11	60	3.61	0.13	100	4.04	0.11	150	4.43	0.19	300	3.55	0.63	600	2.15	0.28	1200	1.75	0.19	1800	1.96	0.21
33	2.94	0.07	66	3.70	0.09	110	4.15	0.11	165	4.61	0.18	330	4.12	0.56	660	2.48	0.32	1320	1.94	0.19	1980	2.17	0.21
36	3.01	0.07	72	3.78	0.09	120	4.26	0.11	180	4.76	0.15	360	4.55	0.43	720	2.85	0.38	1440	2.13	0.19	2160	2.38	0.21
39	3.08	0.07	78	3.87	0.09	130	4.36	0.11	195	4.85	0.10	390	4.88	0.33	780	3.29	0.44	1560	2.38	0.25	2340	2.66	0.28
42	3.15	0.07	84	3.96	0.09	140	4.47	0.11	210	4.95	0.10	420	5.16	0.28	840	3.98	0.69	1680	2.58	0.20	2520	2.89	0.23
45	3.22	0.07	90	4.05	0.09	150	4.58	0.11	225	5.05	0.10	450	5.40	0.24	900	4.76	0.79	1800	2.81	0.23	2700	3.15	0.26
48	3.29	0.07	96	4.14	0.09	160	4.65	0.07	240	5.14	0.10	480	5.59	0.20	960	5.48	0.71	1920	3.12	0.30	2880	3.49	0.34
51	3.36	0.07	102	4.22	0.09	170	4.70	0.05	255	5.24	0.10	510	5.75	0.16	1020	6.00	0.53	2040	3.50	0.38	3060	3.91	0.43
54	3.40	0.04	108	4.27	0.04	180	4.80	0.10	270	5.34	0.10	540	5.92	0.16	1080	6.38	0.37	2160	3.88	0.38	3240	4.34	0.42
57	3.43	0.03	114	4.31	0.04				285	5.43	0.10	570	6.02	0.11	1140	6.63	0.25	2280	4.38	0.51	3420	4.90	0.57
60	3.50	0.07	120	4.40	0.09				300	5.53	0.10	600	6.13	0.11	1200	6.83	0.20	2400	5.14	0.76	3600	5.75	0.85
									315	5.60	0.07	630	6.24	0.11	1260	7.01	0.19	2520	5.93	0.79	3780	6.63	0.88
									330	5.65	0.05	660	6.33	0.09	1320	7.18	0.16	2640	6.59	0.66	3960	7.37	0.74
									345	5.70	0.06	690	6.39	0.07	1380	7.31	0.14	2760	7.09	0.51	4140	7.93	0.57
									360	5.80	0.10	720	6.50	0.11	1440	7.50	0.19	2880	7.60	0.51	4320	8.50	0.57

100-year storm - Belleville, IL

First Quartile													Second Quartile			Third Quartile			Fourth Quartile					
P=	4.0-in		P=	5.3-in		P=	5.5-in		P=	6.5-in		P=	7.5-in		P=	9.0-in		P=	9.1-in		P=	10.1-in	
1-hour			2-hour			3-hour			6-hour			12-hour			24-hour			48-hour			72-hour		
Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)	Time (min)	Cumul. Rainfall (in)	Increm. Rainfall (in)
3	0.64	0.64	6	0.85	0.85	10	0.98	0.98	15	0.87	0.87	30	0.19	0.19	60	0.23	0.23	120	0.06	0.06	180	0.17	0.17
6	1.32	0.68	12	1.75	0.90	20	1.94	0.95	30	1.78	0.91	60	0.48	0.29	120	0.45	0.23	240	0.14	0.08	360	0.40	0.24
9	1.72	0.40	18	2.28	0.53	30	2.53	0.59	45	2.47	0.69	90	0.75	0.28	180	0.68	0.23	360	0.23	0.09	540	0.66	0.25
12	2.08	0.36	24	2.76	0.48	40	3.06	0.53	60	2.99	0.52	120	1.00	0.25	240	0.90	0.23	480	0.31	0.08	720	0.88	0.22
15	2.40	0.32	30	3.18	0.42	50	3.48	0.43	75	3.47	0.48	150	1.28	0.28	300	1.13	0.23	600	0.38	0.07	900	1.06	0.19
18	2.64	0.24	36	3.50	0.32	60	3.81	0.33	90	3.90	0.43	180	1.65	0.38	360	1.35	0.23	720	0.47	0.09	1080	1.31	0.25
21	2.84	0.20	42	3.76	0.27	70	4.08	0.26	105	4.23	0.33	210	2.09	0.44	420	1.65	0.30	840	0.56	0.09	1260	1.57	0.25
24	3.00	0.16	48	3.98	0.21	80	4.32	0.24	120	4.51	0.28	240	2.68	0.59	480	1.95	0.30	960	0.65	0.09	1440	1.82	0.25
27	3.16	0.16	54	4.19	0.21	90	4.51	0.19	135	4.75	0.24	270	3.38	0.70	540	2.25	0.30	1080	0.74	0.09	1620	2.07	0.25
30	3.28	0.12	60	4.35	0.16	100	4.63	0.12	150	4.96	0.22	300	4.10	0.73	600	2.58	0.33	1200	0.83	0.09	1800	2.32	0.25
33	3.36	0.08	66	4.45	0.11	110	4.75	0.12	165	5.17	0.21	330	4.75	0.65	660	2.97	0.39	1320	0.92	0.09	1980	2.58	0.25
36	3.44	0.08	72	4.56	0.11	120	4.88	0.12	180	5.33	0.16	360	5.25	0.50	720	3.42	0.45	1440	1.01	0.09	2160	2.83	0.25
39	3.52	0.08	78	4.66	0.11	130	5.00	0.12	195	5.44	0.11	390	5.63	0.38	780	3.95	0.53	1560	1.13	0.12	2340	3.16	0.34
42	3.60	0.08	84	4.77	0.11	140	5.12	0.12	210	5.55	0.11	420	5.95	0.33	840	4.77	0.83	1680	1.22	0.10	2520	3.43	0.27
45	3.68	0.08	90	4.88	0.11	150	5.24	0.12	225	5.66	0.11	450	6.23	0.27	900	5.72	0.94	1800	1.33	0.11	2700	3.74	0.30
48	3.76	0.08	96	4.98	0.11	160	5.32	0.08	240	5.76	0.11	480	6.45	0.23	960	6.57	0.85	1920	1.48	0.14	2880	4.14	0.40
51	3.84	0.08	102	5.09	0.11	170	5.38	0.06	255	5.87	0.11	510	6.64	0.19	1020	7.20	0.63	2040	1.66	0.18	3060	4.65	0.51
54	3.88	0.04	108	5.14	0.05	180	5.50	0.12	270	5.98	0.11	540	6.83	0.19	1080	7.65	0.45	2160	1.84	0.18	3240	5.15	0.50
57	3.92	0.04	114	5.19	0.05				285	6.09	0.11	570	6.95	0.12	1140	7.95	0.30	2280	2.08	0.24	3420	5.82	0.67
60	4.00	0.08	120	5.30	0.11				300	6.20	0.11	600	7.08	0.13	1200	8.19	0.24	2400	2.44	0.36	3600	6.83	1.01
									315	6.27	0.08	630	7.20	0.12	1260	8.42	0.23	2520	2.81	0.37	3780	7.88	1.04
									330	6.33	0.05	660	7.30	0.10	1320	8.61	0.19	2640	3.12	0.31	3960	8.75	0.88
									345	6.39	0.07	690	7.38	0.08	1380	8.78	0.17	2760	3.36	0.24	4140	9.43	0.67
									360	6.50	0.11	720	7.50	0.13	1440	9.00	0.23	2880	3.60	0.24	4320	10.10	0.67

Time CDT		KBLV Precipitation (in)	Events	Conditions	Incremental Orchards Precip (in)	Cumulative Orchards Precip (in)
12:55 AM	1:00 AM	0		Partly Cloudy	0.00	0.00
1:55 AM	2:00 AM	0		Clear	0.00	0.00
2:55 AM	3:00 AM	0		Partly Cloudy	0.00	0.00
3:55 AM	4:00 AM	0		Mostly Cloudy	0.00	0.00
4:55 AM	5:00 AM	0		Mostly Cloudy	0.00	0.00
5:55 AM	6:00 AM	0		Mostly Cloudy	0.00	0.00
6:55 AM	7:00 AM	0	Rain	Light Rain	0.00	0.00
7:55 AM	8:00 AM	0.5	Fog-Rain-Thunderstorm	Heavy Thunderstorms and Rain	0.50	0.50
8:55 AM	9:00 AM	0.75	Rain-Thunderstorm	Rain	0.75	1.25
9:55 AM	10:00 AM	0.57	Rain-Thunderstorm	Heavy Thunderstorms and Rain	0.57	1.82
10:55 AM	11:00 AM	0.84	Rain-Thunderstorm	Heavy Thunderstorms and Rain	0.84	2.66
11:55 AM	12:00 PM	1.29	Fog-Rain-Thunderstorm	Heavy Thunderstorms and Rain	1.29	3.95
12:55 PM	1:00 PM	0.4	Rain-Thunderstorm	Light Thunderstorms and Rain	0.40	4.35
1:55 PM	2:00 PM	0.15	Rain	Light Rain	0.15	4.50
2:55 PM	3:00 PM	0.08	Rain	Light Rain	0.08	4.58
3:55 PM	4:00 PM	0.15	Rain	Light Rain	0.15	4.73
4:55 PM	5:00 PM	0.15	Rain	Light Rain	0.15	4.88
5:55 PM	6:00 PM	0.16	Rain	Light Rain	0.16	5.04
6:55 PM	7:00 PM	0.07	Rain	Rain	0.07	5.11
7:55 PM	8:00 PM	0.09	Rain	Light Rain	0.09	5.20
8:55 PM	9:00 PM	0		Overcast	0.00	5.20
9:55 PM	10:00 PM	0		Overcast	0.00	5.20
10:55 PM	11:00 PM	0		Mostly Cloudy	0.00	5.20
11:55 PM	12:00 AM	0		Overcast	0.00	5.20
		5.20			**5.20**	


Orchards Rainfall - April 18, 2013
Time (hr)
Incremental Rainfall (in)
Cumulative Rainfall (in)
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 AM
Incremental Precipitation (in)
Cumulative Precipitation (in)

Appendix B: HEC-HMS Model Input

```
Basin: OrchardsExist_SCS
     Description: Orchard Subbasin Existing
Conditions
     Last Modified Date: 21 November 2013
     Last Modified Time: 16:55:21
     Version: 3.5
     Filepath Separator: \
     Unit System: English
     Missing Flow To Zero: No
     Enable Flow Ratio: No
     Allow Blending: No
     Compute Local Flow At Junctions: No

     Enable Sediment Routing: No

     Enable Quality Routing: No
End:

Subbasin: 8228
     Canvas X: 2366034.818427705
     Canvas Y: 661261.6838308896
     Area: 0.0184
     Downstream: S_8228

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 68

     Transform: SCS
     Lag: 3
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8228
     Canvas X: 2366079.62519809
     Canvas Y: 661660.4640873156
     Downstream: S_8226

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8228
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 2.5
     Number Barrels: 1
     Culvert Length: 130
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 511.9
     Outlet Invert Elevation: 511.0
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8227
     Canvas X: 2365551.1084228144
     Canvas Y: 661660.7234617407
     Area: 0.0149
     Downstream: S_8227

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 68

     Transform: SCS
     Lag: 4
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8227
     Canvas X: 2365918.3208247046
     Canvas Y: 661821.7684607013
     Downstream: S_8226

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8227
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 2.5
     Number Barrels: 1
     Culvert Length: 300
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 519.90
     Outlet Invert Elevation: 511
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8229
     Canvas X: 2366422.981696898
     Canvas Y: 661397.5164356022
     Area: 0.0118
```

```
     Downstream: S_8229

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 68

     Transform: SCS
     Lag: 4
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8229
     Canvas X: 2366281.255664822
     Canvas Y: 661691.828826585
     Downstream: S_8226

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8229
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 2.5
     Number Barrels: 1
     Culvert Length: 180
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 514.2
     Outlet Invert Elevation: 511
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8226
     Canvas X: 2365895.917439512
     Canvas Y: 662081.647728934
     Area: 0.0119
     Downstream: S_8226

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 7
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8226
     Canvas X: 2366321.259269184
     Canvas Y: 661934.2856222756
     Downstream: S_8220

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8226
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 3
     Number Barrels: 1
     Culvert Length: 342
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 505.15
     Outlet Invert Elevation: 501.97
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8225
     Canvas X: 2367482.0771111385
     Canvas Y: 660599.8361864837
     Area: 0.0410
     Downstream: S_8225

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 13
     Curve Number: 68

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8225
     Canvas X: 2366872.7050339035
```

```
     Canvas Y: 661288.5678931206
     Downstream: S_8224

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Elevation: 554.3
     Elevation-Area Table: S_8225
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 1.25
     Number Barrels: 1
     Culvert Length: 100
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 554.3
     Outlet Invert Elevation: 540
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8224
     Canvas X: 2366697.9586294023
     Canvas Y: 661651.5027332386
     Area: 0.0060
     Downstream: S_8224

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 68

     Transform: SCS
     Lag: 7
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8224
     Canvas X: 2367002.64466802
     Canvas Y: 661561.8891924687
     Downstream: S_8222

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8224
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 2.5
     Number Barrels: 1
     Culvert Length: 130
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 520.8
     Outlet Invert Elevation: 517.5
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8222
     Canvas X: 2367387.98289333
     Canvas Y: 661711.0440920301
     Area: 0.0091
     Downstream: S_8222

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8222
     Canvas X: 2366904.069773173
     Canvas Y: 661866.5752310862
     Downstream: S_8220

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8222
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 3
     Number Barrels: 1
     Culvert Length: 428
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
```

```
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 513.56
     Outlet Invert Elevation: 503.78
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8220
     Canvas X: 2366536.6542560165
     Canvas Y: 662529.7154327834
     Area: 0.0246
     Downstream: S_8220

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 7
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8220
     Canvas X: 2366841.340294634
     Canvas Y: 662526.527313036
     Reference Flow: 72
     Rating Table Name: S_8220
     Downstream: S_8200

     Route: Modified Puls
     Routing Curve: Elevation-Area-Outflow
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8220
     Elevation-Outflow Table: S_8220
     Primary Table: Elevation-Outflow
End:

Subbasin: 8214
     Canvas X: 2367925.6641379497
     Canvas Y: 660989.6550888327
     Area: 0.0701
     Downstream: S_8214

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 68

     Transform: SCS
     Lag: 7
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8214
     Canvas X: 2367840.531274218
     Canvas Y: 661957.4813291474
     Downstream: S_8212

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8214
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 3
     Number Barrels: 1
     Culvert Length: 347
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 516.52
     Outlet Invert Elevation: 507.81
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8212
     Canvas X: 2368019.7583557577
     Canvas Y: 662427.9524181891
     Area: 0.0100
     Downstream: S_8212

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8212
     Canvas X: 2367656.82351564
     Canvas Y: 662298.0127840728
     Downstream: S_8210

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
```

```
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8212
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 1
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 3
     Number Barrels: 1
     Culvert Length: 263
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.013
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 506.96
     Outlet Invert Elevation: 505.65
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8210
     Canvas X: 2367432.7896637153
     Canvas Y: 662315.9354922269
     Area: 0.0167
     Downstream: S_8210

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8210
     Canvas X: 2367477.5964341
     Canvas Y: 662965.6336628083
     Reference Flow: 80
     Rating Table Name: S_8210
     Downstream: S_8200

     Route: Modified Puls
     Routing Curve: Elevation-Area-Outflow
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8210
     Elevation-Outflow Table: S_8210
     Primary Table: Elevation-Outflow
End:

Subbasin: 8200
     Canvas X: 2367432.7896637153
     Canvas Y: 663238.9549621565
     Area: 0.0221
     Downstream: S_8200

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 8
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8230
     Canvas X: 2367199.7944577136
     Canvas Y: 662669.9089782678
     Area: 0.0035
     Downstream: S_8200

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 3
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8200
     Canvas X: 2367087.7775317514
     Canvas Y: 663382.3366273883
     Reference Flow: 143
     Rating Table Name: S_8200
     Downstream: S_8000

     Route: Modified Puls
     Routing Curve: Elevation-Area-Outflow
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8200
     Elevation-Outflow Table: S_8200
     Primary Table: Elevation-Outflow
End:

Subbasin: 8160
     Canvas X: 2369014.468658304
     Canvas Y: 661536.297687529
     Area: 0.0307
     Downstream: S_8160

     Canopy: None

     Surface: None

     LossRate: SCS
```

```
     Percent Impervious Area: 10
     Curve Number: 73

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8160
     Canvas X: 2368992.0652731117
     Canvas Y: 662347.3002314963
     Downstream: S_8150

     Route: Modified Puls
     Routing Curve: Elevation-Area-Outflow
     Initial Elevation: 541.2
     Elevation-Area Table: S_8160
     Elevation-Outflow Table: S_8160
     Primary Table: Elevation-Outflow
End:

Subbasin: 8150
     Canvas X: 2368679.2012874624
     Canvas Y: 662119.5308129289
     Area: 0.0075
     Downstream: S_8150

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 68

     Transform: SCS
     Lag: 3
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8150
     Canvas X: 2368875.5676701106
     Canvas Y: 662504.1239278435
     Downstream: J8140

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8150
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 1
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 1.5
     Number Barrels: 1
     Culvert Length: 110
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.013
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 519.93
     Outlet Invert Elevation: 516.0
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8140
     Canvas X: 2369063.7561057275
     Canvas Y: 662566.8534063825
     Area: 0.0036
     Downstream: J8140

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 68

     Transform: SCS
     Lag: 3
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J8140
     Canvas X: 2368855.224597048
     Canvas Y: 662724.2003569559
     Downstream: R8140
End:

Reach: R8140
     Canvas X: 2368417.2505536037
     Canvas Y: 663264.0288291079
     From Canvas X: 2368855.224597048
     From Canvas Y: 662724.2003569559
     Downstream: J8130

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 540
     Energy Slope: 0.02
     Shape: Trapezoid
     Mannings n: 0.040
     Number of Increments: 2
     Width: 1
     Side Slope: 3
     Channel Loss: None
End:

Subbasin: 8134
     Canvas X: 2368342.36710253
     Canvas Y: 662118.7857025331
     Area: 0.0202
     Downstream: J8132

     Canopy: None
```

```
     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8132
     Canvas X: 2368117.438657599
     Canvas Y: 662858.5369983788
     Area: 0.0014
     Downstream: J8132

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 4
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J8132
     Canvas X: 2368264.468910542
     Canvas Y: 663034.856364515
     Downstream: R8132
End:

Reach: R8132
     Canvas X: 2368417.2505536037
     Canvas Y: 663264.0288291079
     From Canvas X: 2368264.468910542
     From Canvas Y: 663034.856364515
     Downstream: J8130

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 130
     Energy Slope: 0.038
     Shape: Circular
     Mannings n: 0.013
     Number of Increments: 2
     Width: 2
     Channel Loss: None
End:

Subbasin: 8130
     Canvas X: 2368512.6328299926
     Canvas Y: 662898.423507231
     Area: 0.0080
     Downstream: J8130

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 4
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J8130
     Canvas X: 2368417.2505536037
     Canvas Y: 663264.0288291079
     Downstream: R8130
End:

Reach: R8130
     Canvas X: 2368378.7748716087
     Canvas Y: 663555.2372601754
     From Canvas X: 2368417.2505536037
     From Canvas Y: 663264.0288291079
     Downstream: J8120

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 180
     Energy Slope: 0.01
     Shape: Triangular
     Mannings n: 0.035
     Number of Increments: 2
     Side Slope: 6
     Channel Loss: None
End:

Subbasin: 8118
     Canvas X: 2369507.3431325383
     Canvas Y: 662329.3775233423
     Area: 0.0140
     Downstream: S_8118

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8119
     Canvas X: 2369583.5146421925
     Canvas Y: 663005.9597561548
     Area: 0.0057
     Downstream: S_8118
```

```
     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8118
     Canvas X: 2369350.519436191
     Canvas Y: 663126.9380361941
     Downstream: J8116

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8118
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 1
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 1
     Number Barrels: 1
     Culvert Length: 85
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.013
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 515.47
     Outlet Invert Elevation: 514.88
     End Conduit:

     Dam Top: Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Length: 25
     Top Elevation: 520.6
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8116
     Canvas X: 2369328.116050998
     Canvas Y: 662526.527313036
     Area: 0.0104
     Downstream: J8116

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 70

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J8116
     Canvas X: 2368982.542632933
     Canvas Y: 663180.125436692
     Downstream: R8116
End:

Reach: R8116
     Canvas X: 2368783.9264969523
     Canvas Y: 663348.1852440601
     From Canvas X: 2368982.542632933
     From Canvas Y: 663180.125436692
     Downstream: J8114

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 360
     Energy Slope: 0.015
     Shape: Trapezoid
     Mannings n: 0.035
     Number of Increments: 2
     Width: 1
     Side Slope: 5
     Channel Loss: None
End:

Subbasin: 8114
     Canvas X: 2369148.8889694586
     Canvas Y: 663431.6240748117
     Area: 0.0071
     Downstream: J8114

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 70

     Transform: SCS
     Lag: 7
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J8114
     Canvas X: 2368783.9264969523
     Canvas Y: 663348.1852440601
     Downstream: R8114
End:

Reach: R8114
```

```
     Canvas X: 2368378.7748716087
     Canvas Y: 663555.2372601754
     From Canvas X: 2368783.9264969523
     From Canvas Y: 663348.1852440601
     Downstream: J8120

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 450
     Energy Slope: 0.015
     Shape: Trapezoid
     Mannings n: 0.035
     Number of Increments: 2
     Width: 3
     Side Slope: 3
     Channel Loss: None
End:

Subbasin: 8113
     Canvas X: 2368948.09383594
     Canvas Y: 663700.5779143132
     Area: 0.0076
     Downstream: J8120

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 70

     Transform: SCS
     Lag: 10
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8120
     Canvas X: 2368535.036215185
     Canvas Y: 663346.4912110803
     Area: 0.0022
     Downstream: J8120

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 70

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J8120
     Canvas X: 2368378.7748716087
     Canvas Y: 663555.2372601754
     Downstream: R8120
End:

Reach: R8120
     Canvas X: 2367839.9243757357
     Canvas Y: 663794.2040955562
     From Canvas X: 2368378.7748716087
     From Canvas Y: 663555.2372601754
     Downstream: J8110

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 1000
     Energy Slope: 0.01
     Shape: Trapezoid
     Mannings n: 0.045
     Number of Increments: 2
     Width: 5
     Side Slope: 1
     Channel Loss: None
End:

Subbasin: 8110
     Canvas X: 2368561.920277416
     Canvas Y: 663906.575840892
     Area: 0.0301
     Downstream: J8110

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 14
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8112
     Canvas X: 2368521.5941840694
     Canvas Y: 664103.7256305857
     Area: 0.0070
     Downstream: R8112

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 15
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reach: R8112
     Description: Route 8112 thru sewer to
8110
```

```
     Canvas X: 2367839.9243757357
     Canvas Y: 663794.2040955562
     From Canvas X: 2368060.0844491045
     From Canvas Y: 664224.7039106251
     Downstream: J8110

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 360
     Energy Slope: 0.008
     Shape: Circular
     Mannings n: 0.024
     Number of Increments: 2
     Width: 2
     Channel Loss: None
End:

Subbasin: 8111
     Canvas X: 2368010.7970016813
     Canvas Y: 662934.2689235389
     Area: 0.0040
     Downstream: R8111

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 7
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reach: R8111
     Description: Route 8111 thru sewer thru
8110.
     Canvas X: 2367839.9243757357
     Canvas Y: 663794.2040955562
     From Canvas X: 2367843.415565462
     From Canvas Y: 663123.860944734
     Downstream: J8110

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 746
     Energy Slope: 0.013
     Shape: Circular
     Mannings n: 0.013
     Number of Increments: 2
     Width: 1.5
     Channel Loss: None
End:

Junction: J8110
     Canvas X: 2367839.9243757357
     Canvas Y: 663794.2040955562
     Downstream: S_8000
End:

Subbasin: 8324
     Canvas X: 2364668.2681893087
     Canvas Y: 661726.5252182753
     Area: 0.0287
     Downstream: S_8324

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8322
     Canvas X: 2365192.4511444685
     Canvas Y: 661750.0776280854
     Area: 0.0243
     Downstream: S_8324

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8324
     Canvas X: 2365165.5670822375
     Canvas Y: 662507.3120475909
     Downstream: S_8322

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8324
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 4
     Number Barrels: 1
     Culvert Length: 98
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
```

```
     Fill Depth:
     Inlet Invert Elevation: 511.8
     Outlet Invert Elevation: 510.62
     End Conduit:

     Dam Top: Non-Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Cross-Section: S_8324
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Reservoir: S_8322
     Canvas X: 2365385.2030159496
     Canvas Y: 662656.5791870066
     Downstream: S_8320

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8322
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 1
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 3.5
     Number Barrels: 1
     Culvert Length: 97
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 506.9
     Outlet Invert Elevation: 506
     End Conduit:

     Dam Top: Non-Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Cross-Section: S_8322
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8320
     Canvas X: 2364878.803751774
     Canvas Y: 662838.8821484394
     Area: 0.0266
     Downstream: S_8320

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8320
     Canvas X: 2365636.0381712792
     Canvas Y: 662861.2855336318
     Downstream: S_8300

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8320
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 4
     Number Barrels: 1
     Culvert Length: 97
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 496.2
     Outlet Invert Elevation: 495.58
     End Conduit:

     Dam Top: Non-Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Cross-Section: S_8320
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8300
     Canvas X: 2366496.32816267
     Canvas Y: 662910.5729810552
     Area: 0.0178
     Downstream: S_8300

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
```

```
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8310
     Canvas X: 2366022.6634063623
     Canvas Y: 662503.1399963496
     Area: 0.0161
     Downstream: S_8300

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8300
     Canvas X: 2366339.504466323
     Canvas Y: 663215.2590196729
     Downstream: S_8000

     Route: Modified Puls
     Routing Curve: Elevation-Area-Outflow
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8300
     Elevation-Outflow Table: S_8300
     Primary Table: Elevation-Outflow
End:

Subbasin: 8000
     Canvas X: 2366650.6957660043
     Canvas Y: 664399.7894768214
     Area: 0.0272
     Downstream: S_8000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 21
     Curve Number: 78

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8100
     Canvas X: 2367625.458776371
     Canvas Y: 664045.4768290853
     Area: 0.0119
     Downstream: S_8000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8000
     Canvas X: 2367233.1233378407
     Canvas Y: 664336.9786602508

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Elevation: 480.82
     Elevation-Area Table: S_8000
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Spillway: Broad-Crested Spillway
     Spillway Outlet: Main
     Spillway Crest Length: 28
     Spillway Crest Elevation: 480.82
     Spillway Coefficient: 3.1
     End Spillway:

     Dam Top: Non-Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Cross-Section: S_8000
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 6636
     Canvas X: 2362137.6120346086
     Canvas Y: 662987.725551855
     Area: 0.0748
     Downstream: S_6634

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:
```

```
Subbasin: 6635
     Canvas X: 2362743.5668106717
     Canvas Y: 662209.0714328623
     Area: 0.0541
     Downstream: S_6634

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6634
     Canvas X: 2363197.3113848264
     Canvas Y: 663018.2049730517
     Area: 0.0121
     Downstream: S_6634

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 8
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6634
     Canvas X: 2362847.977522894
     Canvas Y: 663272.8595639933
     Downstream: S_6632

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_6634
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 2
     Solution Control: Automatic
     Diameter: 4
     Number Barrels: 1
     Culvert Length: 467
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 506.91
     Outlet Invert Elevation: 500.31
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 6632
     Canvas X: 2363706.62056671
     Canvas Y: 663125.9434538347
     Area: 0.0190
     Downstream: S_6632

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 24
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6632
     Canvas X: 2363337.6978900894
     Canvas Y: 663455.6885010796
     Downstream: S_6630

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Elevation: 500.83
     Elevation-Area Table: S_6632
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 2
     Solution Control: Automatic
     Diameter: 4.5
     Number Barrels: 1
     Culvert Length: 330
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 500.83
     Outlet Invert Elevation: 500.83
     End Conduit:

     Evaporation Method: Zero Evaporation
```

```
     End Evaporation:
End:

Subbasin: 6630
     Canvas X: 2363256.07782889
     Canvas Y: 664111.9137931212
     Area: 0.0214
     Downstream: S_6630

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 70

     Transform: SCS
     Lag: 4
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6630
     Canvas X: 2363722.9445789494
     Canvas Y: 664017.2345221301
     Downstream: J6610

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Elevation: 500.83
     Elevation-Area Table: S_6630
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 3
     Number Barrels: 1
     Culvert Length: 621
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 500.83
     Outlet Invert Elevation: 494.55
     End Conduit:

     Dam Top: Non-Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Cross-Section: S_6630
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 6617
     Canvas X: 2363641.32451775
     Canvas Y: 662025.7050288692
     Area: 0.0358
     Downstream: S_6617

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6617
     Canvas X: 2363621.7357030627
     Canvas Y: 662734.1671600784
     Downstream: S_6616

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_6617
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Elliptical
     Chart Number: 29
     Scale Number: 1
     Solution Control: Automatic
     Rise: 2.5
     Span: 1.583
     Number Barrels: 2
     Culvert Length: 76
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.013
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 515.5
     Outlet Invert Elevation: 513.28
     End Conduit:

     Dam Top: Non-Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Cross-Section: S_6617
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 6616
     Canvas X: 2363334.4330876414
     Canvas Y: 662913.7312947167
     Area: 0.0047
     Downstream: S_6616
```

```
     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 12
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6616
     Canvas X: 2363608.676493271
     Canvas Y: 662907.2016898209
     Downstream: J6610_B

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_6616
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 1
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 2.5
     Number Barrels: 1
     Culvert Length: 800
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.013
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 513.3
     Outlet Invert Elevation: 505.13
     End Conduit:

     Dam Top: Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Length: 50
     Top Elevation: 518
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 6614
     Canvas X: 2364166.9577118736
     Canvas Y: 662042.029041109
     Area: 0.0205
     Downstream: S_6614

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6614
     Canvas X: 2364052.6896261945
     Canvas Y: 662587.2510499199
     Downstream: J6610_B

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_6614
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 1
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 2
     Number Barrels: 1
     Culvert Length: 55
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.013
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 521.75
     Outlet Invert Elevation: 520.2
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Junction: J6610_B
     Canvas X: 2363997.187984579
     Canvas Y: 662894.1424800289
     Downstream: J6610_A
End:

Subbasin: 6612
     Canvas X: 2364653.4132766207
     Canvas Y: 662639.4878890874
     Area: 0.0078
     Downstream: S_6612

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
```

```
     Lag: 8
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6612
     Canvas X: 2364196.340933905
     Canvas Y: 662972.4977387802
     Downstream: J6610_A

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_6612
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 1.25
     Number Barrels: 1
     Culvert Length: 76
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 517.9
     Outlet Invert Elevation: 517.5
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Junction: J6610_A
     Canvas X: 2364129.0810583695
     Canvas Y: 663131.0172390394
     Downstream: J6610
End:

Subbasin: 6610
     Canvas X: 2364823.183003915
     Canvas Y: 663243.4763419615
     Area: 0.0224
     Downstream: J6610

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 12
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6620
     Canvas X: 2363803.6718884488
     Canvas Y: 663643.5366816643
     Area: 0.0069
     Downstream: J6610

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 38
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J6610
     Description: Combined Flow for Orchard
Upper
     Canvas X: 2364352.79986269
     Canvas Y: 663867.2554859847
End:

Subbasin: 1410
     Canvas X: 2370849.722348421
     Canvas Y: 664770.8770106375
     Area: 0.1588
     Downstream: J2000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 20
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 1300
     Canvas X: 2369806.463459158
     Canvas Y: 666209.8830089014
     Area: 0.0147
     Downstream: J2000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
```

```
     Curve Number: 79

     Transform: SCS
     Lag: 10
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 1400
     Canvas X: 2371081.7133713486
     Canvas Y: 665882.5054195031
     Area: 0.0129
     Downstream: J2000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 17
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 2000
     Canvas X: 2370286.1096947878
     Canvas Y: 665676.9427470902
     Area: 0.0067
     Downstream: J2000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 3
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J2000
     Canvas X: 2370686.6174385296
     Canvas Y: 666215.3446250799
End:

Subbasin: 6320
     Canvas X: 2365575.753813542
     Canvas Y: 666113.3089872485
     Area: 0.0609
     Downstream: J6400

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 27
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6400
     Canvas X: 2365405.765942494
     Canvas Y: 664298.2772028358
     Area: 0.0498
     Downstream: J6400

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 11
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6410
     Canvas X: 2366058.300028129
     Canvas Y: 663947.3345013179
     Area: 0.0363
     Downstream: S_6410

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 9
     Curve Number: 70

     Transform: SCS
     Lag: 15
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6410
     Canvas X: 2366383.0986823547
     Canvas Y: 664777.6603247346
     Downstream: R6410
```

```
     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Elevation: 487.56
     Elevation-Area Table: S_6410
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 2
     Number Barrels: 1
     Culvert Length: 56
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 487.56
     Outlet Invert Elevation: 481
     End Conduit:

     Dam Top: Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Length: 190
     Top Elevation: 491
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Reach: R6410
     Description: Route outflow from 6410 to
Orchard thru Channel
     Canvas X: 2366533.062473673
     Canvas Y: 665248.8325196857
     From Canvas X: 2366383.0986823547
     From Canvas Y: 664777.6603247346
     Downstream: J6400

     Route: Muskingum Cunge
     Channel: Trapezoid
     Length: 225
     Energy Slope: 0.01
     Width: 2
     Side Slope: 3
     Mannings n: 0.045
     Use Variable Time Step: No
     Channel Loss: None
End:

Subbasin: 6420
     Canvas X: 2365548.336414986
     Canvas Y: 665164.666997208
     Area: 0.0250
     Downstream: J6400

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 10
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J6400
     Canvas X: 2366533.062473673
     Canvas Y: 665248.8325196857
End:

Subbasin: 2100
     Canvas X: 2369799.1390215275
     Canvas Y: 664105.37346329
     Area: 0.1138
     Downstream: J3000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 19
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 3000
     Canvas X: 2369423.975596796
     Canvas Y: 665500.1540348051
     Area: 0.0191
     Downstream: J3000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 3100
     Canvas X: 2369423.975596796
     Canvas Y: 666028.6963863815
     Area: 0.0086
     Downstream: S_3100

     Canopy: None
```

```
     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 10
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_3100
     Canvas X: 2369802.656743002
     Canvas Y: 665821.5979610104
     Downstream: J3000

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_3100
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 2
     Solution Control: Automatic
     Diameter: 1
     Number Barrels: 1
     Culvert Length: 25
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 462
     Outlet Invert Elevation: 461.75
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Junction: J3000
     Canvas X: 2370039.5474386765
     Canvas Y: 665684.415394431
End:

Subbasin: 6430
     Canvas X: 2364584.653896258
     Canvas Y: 664928.9029028508
     Area: 0.0996
     Downstream: J6500

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 16
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6440
     Canvas X: 2363382.3619290553
     Canvas Y: 666486.1856076112
     Area: 0.0208
     Downstream: R6440

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reach: R6440
     Description: Route 6440 thru channel
thru 6430 to Orchard
     Canvas X: 2365223.7732767747
     Canvas Y: 664954.8292338066
     From Canvas X: 2363693.8462936007
     From Canvas Y: 666080.0378414448
     Downstream: J6500

     Route: Muskingum Cunge
     Channel: Trapezoid
     Length: 2000
     Energy Slope: 0.0075
     Width: 0
     Side Slope: 3
     Mannings n: 0.100
     Use Variable Time Step: No
     Channel Loss: None
End:

Subbasin: 6500
     Canvas X: 2364644.839076709
     Canvas Y: 664502.5775351409
     Area: 0.0190
     Downstream: J6500

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 21
```

```
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J6500
     Canvas X: 2365223.7732767747
     Canvas Y: 664954.8292338066
End:

Subbasin: 4100
     Canvas X: 2368412.2438570326
     Canvas Y: 665973.5242954975
     Area: 0.0602
     Downstream: J4000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 35
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 4000
     Canvas X: 2369262.1030488787
     Canvas Y: 664462.600293392
     Area: 0.0290
     Downstream: S_4000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 12
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 4200
     Canvas X: 2368816.490322871
     Canvas Y: 664375.0459187928
     Area: 0.0084
     Downstream: S_4200

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 13
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_4200
     Canvas X: 2368877.6592185916
     Canvas Y: 664366.5016777874
     Downstream: S_4000

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_4200
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 1
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 1
     Number Barrels: 1
     Culvert Length: 10
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 496.74
     Outlet Invert Elevation: 496.26
     End Conduit:

     Dam Top: Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Length: 20
     Top Elevation: 498.6
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Reservoir: S_4000
     Canvas X: 2369159.3217126727
     Canvas Y: 665155.4226337465
     Downstream: J4000

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_4000
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
```

```
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 2
     Solution Control: Automatic
     Rise: 8
     Span: 10
     Diameter: 1
     Number Barrels: 1
     Culvert Length: 29
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 464.75
     Outlet Invert Elevation: 464.45
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Junction: J4000
     Canvas X: 2369066.700358133
     Canvas Y: 665310.0542529534
End:

Subbasin: 1100
     Canvas X: 2369246.8339894875
     Canvas Y: 666546.025786479
     Area: 0.0295
     Downstream: J1000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 39
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 1000
     Canvas X: 2369882.597782274
     Canvas Y: 666742.8232707125
     Area: 0.0275
     Downstream: J1000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 25
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 1200
     Canvas X: 2371561.3596069785
     Canvas Y: 665825.4046771661
     Area: 0.0127
     Downstream: J1000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 20
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J1000
     Canvas X: 2370831.7934000352
     Canvas Y: 666576.2105865364
End:

Subbasin: 6310
     Canvas X: 2366634.065397807
     Canvas Y: 665499.1592595922
     Area: 0.0202
     Downstream: J6300

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 24
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6300
     Canvas X: 2366902.755903656
     Canvas Y: 665011.129565294
     Area: 0.0128
     Downstream: J6300

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
```

```
     Curve Number: 89

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J6300
     Canvas X: 2367380.7480112244
     Canvas Y: 665286.5074324658
End:

Subbasin: 6510
     Canvas X: 2363559.1887058234
     Canvas Y: 664563.0891951574
     Area: 0.0176
     Downstream: J6600

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6600
     Canvas X: 2364515.8376541254
     Canvas Y: 663933.6005353143
     Area: 0.0153
     Downstream: J6600

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 8
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J6600
     Canvas X: 2364644.607470572
     Canvas Y: 664339.9252488666
End:

Subbasin: 6210
     Canvas X: 2368014.9255602076
     Canvas Y: 664374.2421020245
     Area: 0.0160
     Downstream: J7000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 13
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 7000
     Canvas X: 2366871.48530304
     Canvas Y: 664689.0999046618
     Area: 0.0096
     Downstream: J7000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6200
     Canvas X: 2367465.333023344
     Canvas Y: 664801.3980312577
     Area: 0.0055
     Downstream: J7000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 4
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:
```

```
Junction: J7000
     Canvas X: 2367599.009118738
     Canvas Y: 665021.7021624664
End:

Subbasin: 6000
     Canvas X: 2367626.5752255367
     Canvas Y: 665471.7418610362
     Area: 0.0122
     Downstream: J6000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J6000
     Canvas X: 2368219.7896073586
     Canvas Y: 665356.7265531502
End:

Subbasin: 6114
     Canvas X: 2368162.6144818338
     Canvas Y: 664593.2291237465
     Area: 0.0047
     Downstream: J6110

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 8
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6112
     Canvas X: 2368663.204242087
     Canvas Y: 664676.824113233
     Area: 0.0031
     Downstream: J6110

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6110
     Canvas X: 2368146.7352152313
     Canvas Y: 664776.6543762451
     Area: 0.0029
     Downstream: J6110

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 8
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J6110
     Canvas X: 2367902.8856886285
     Canvas Y: 665056.6667743677
End:

Subbasin: 6100
     Canvas X: 2368428.43221076
     Canvas Y: 664860.4021316725
     Area: 0.0100

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 5000
     Canvas X: 2368476.5145807755
     Canvas Y: 665257.8861522988
     Area: 0.0054
     Downstream: J5000

     Canopy: None
```

```
     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 2
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 5100
     Canvas X: 2368597.151134422
     Canvas Y: 664967.2617276042
     Area: 0.0040
     Downstream: J5000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J5000
     Canvas X: 2368751.1729635997
     Canvas Y: 665310.0542529534
End:

Basin Schematic Properties:
     Last View N: 664812.2342451921
     Last View S: 663919.6706284177
     Last View W: 2368409.826274851
     Last View E: 2369389.896128564
     Maximum View N: 684352.4905980602
     Maximum View S: 660048.712910749
     Maximum View W: 2355466.8499568105
     Maximum View E: 2380741.8499568105
     Extent Method: Elements
     Buffer: 0
     Draw Icons: Yes
     Draw Icon Labels: Yes
     Draw Map Objects: No
     Draw Gridlines: Yes
     Draw Flow Direction: No
     Fix Element Locations: No
     Fix Hydrologic Order: No
End:
```

```
Basin: OrchardsExist_SCS
     Description: Orchard Subbasin Existing
Conditions
     Last Modified Date: 26 November 2013
     Last Modified Time: 19:47:34
     Version: 3.5
     Filepath Separator: \
     Unit System: English
     Missing Flow To Zero: No
     Enable Flow Ratio: No
     Allow Blending: No
     Compute Local Flow At Junctions: No

     Enable Sediment Routing: No

     Enable Quality Routing: No
End:

Subbasin: 8228
     Canvas X: 2366034.818427705
     Canvas Y: 661261.6838308896
     Area: 0.0184
     Downstream: S_8228

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 68

     Transform: SCS
     Lag: 3
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8228
     Canvas X: 2366079.62519809
     Canvas Y: 661660.4640873156
     Downstream: S_8226

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8228
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Orifice
     Conduit Outlet: Main
     Orifice Coefficient: 0.6
     Orifice Area: 0.2
     Centerline Elevation: 512.15
     Number Barrels: 1
     End Conduit:

     Spillway: Broad-Crested Spillway
     Spillway Outlet: Main
     Spillway Crest Length: 1
     Spillway Crest Elevation: 525
     Spillway Coefficient: 3.1
     End Spillway:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8227
     Canvas X: 2365551.1084228144
     Canvas Y: 661660.7234617407
     Area: 0.0149
     Downstream: S_8227

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 68

     Transform: SCS
     Lag: 4
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8227
     Canvas X: 2365918.3208247046
     Canvas Y: 661821.7684607013
     Downstream: S_8226

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8227
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Orifice
     Conduit Outlet: Main
     Orifice Coefficient: 0.6
     Orifice Area: 0.2
     Centerline Elevation: 520.15
     Number Barrels: 1
     End Conduit:

     Spillway: Broad-Crested Spillway
     Spillway Outlet: Main
     Spillway Crest Length: 1
     Spillway Crest Elevation: 525
     Spillway Coefficient: 3.1
     End Spillway:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8229
     Canvas X: 2366422.981696898
     Canvas Y: 661397.5164356022
     Area: 0.0118
     Downstream: S_8229

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
```

```
     Curve Number: 68

     Transform: SCS
     Lag: 4
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8229
     Canvas X: 2366281.255664822
     Canvas Y: 661691.828826585
     Downstream: S_8226

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8229
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Orifice
     Conduit Outlet: Main
     Orifice Coefficient: 0.6
     Orifice Area: 0.2
     Centerline Elevation: 514.35
     Number Barrels: 1
     End Conduit:

     Spillway: Broad-Crested Spillway
     Spillway Outlet: Main
     Spillway Crest Length: 1
     Spillway Crest Elevation: 525
     Spillway Coefficient: 3.1
     End Spillway:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8226
     Canvas X: 2365895.917439512
     Canvas Y: 662081.647728934
     Area: 0.0119
     Downstream: S_8226

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 7
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8226
     Canvas X: 2366321.259269184
     Canvas Y: 661934.2856222756
     Downstream: S_8220B

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8226
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 3
     Number Barrels: 1
     Culvert Length: 342
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 505.15
     Outlet Invert Elevation: 501.97
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8225
     Canvas X: 2367482.0771111385
     Canvas Y: 660599.8361864837
     Area: 0.0410
     Downstream: S_8225

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 13
     Curve Number: 68

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8225
     Canvas X: 2366872.7050339035
     Canvas Y: 661288.5678931206
     Downstream: S_8224

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Elevation: 554.3
     Elevation-Area Table: S_8225
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
```

```
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 1.25
     Number Barrels: 1
     Culvert Length: 100
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 554.3
     Outlet Invert Elevation: 540
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8224
     Canvas X: 2366697.9586294023
     Canvas Y: 661651.5027332386
     Area: 0.0060
     Downstream: S_8224

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 68

     Transform: SCS
     Lag: 7
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8224
     Canvas X: 2367002.64466802
     Canvas Y: 661561.8891924687
     Downstream: S_8222

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8224
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 2.5
     Number Barrels: 1
     Culvert Length: 130
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 520.8
     Outlet Invert Elevation: 517.5
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8222
     Canvas X: 2367387.98289333
     Canvas Y: 661711.0440920301
     Area: 0.0091
     Downstream: S_8222

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8222
     Canvas X: 2366904.069773173
     Canvas Y: 661866.5752310862
     Downstream: S_8220B

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8222
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 3
     Number Barrels: 1
     Culvert Length: 428
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 513.56
     Outlet Invert Elevation: 503.78
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:
```

```
Subbasin: 8220B
     Canvas X: 2366456.9977154257
     Canvas Y: 662233.9367363363
     Area: 0.0091
     Downstream: S_8220B

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 7
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8220B
     Canvas X: 2366801.977340843
     Canvas Y: 662266.4348169916
     Downstream: S_8220A

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8220B
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 3.5
     Number Barrels: 1
     Culvert Length: 20
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 499.8
     Outlet Invert Elevation: 499.6
     End Conduit:

     Dam Top: Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Length: 20
     Top Elevation: 504.85
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8220A
     Canvas X: 2366536.6542560165
     Canvas Y: 662529.7154327834
     Area: 0.0155
     Downstream: S_8220A

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 7
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8220A
     Canvas X: 2366841.340294634
     Canvas Y: 662526.527313036
     Reference Flow: 72
     Rating Table Name: S_8220
     Downstream: S_8200

     Route: Modified Puls
     Routing Curve: Elevation-Area-Outflow
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8220A
     Elevation-Outflow Table: S_8220
     Primary Table: Elevation-Outflow
End:

Subbasin: 8214
     Canvas X: 2367925.6641379497
     Canvas Y: 660989.6550888327
     Area: 0.0701
     Downstream: S_8214

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 68

     Transform: SCS
     Lag: 7
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8214
     Canvas X: 2367840.531274218
     Canvas Y: 661957.4813291474
     Downstream: S_8212

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8214
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None
```

```
     Conduit: Orifice
     Conduit Outlet: Main
     Orifice Coefficient: 0.6
     Orifice Area: 0.79
     Centerline Elevation: 517.0
     Number Barrels: 1
     End Conduit:

     Dam Top: Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Length: 80
     Top Elevation: 530
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8212
     Canvas X: 2368019.7583557577
     Canvas Y: 662427.9524181891
     Area: 0.0100
     Downstream: S_8212

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8212
     Canvas X: 2367656.82351564
     Canvas Y: 662298.0127840728
     Downstream: S_8210B

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8212
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 1
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 3
     Number Barrels: 1
     Culvert Length: 263
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.013
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 506.96
     Outlet Invert Elevation: 505.65
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8210B
     Canvas X: 2367730.6724918764
     Canvas Y: 662666.4111942872
     Area: 0.0126
     Downstream: S_8210B

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8210B
     Canvas X: 2367533.1841555866
     Canvas Y: 662923.8959871712
     Downstream: S_8210A

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8210B
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 3.5
     Number Barrels: 1
     Culvert Length: 40
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 497.93
     Outlet Invert Elevation: 497.84
     End Conduit:

     Dam Top: Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Length: 10
     Top Elevation: 503.1
     End Dam Top:
```

```
     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8210A
     Canvas X: 2367343.195376371
     Canvas Y: 662843.9007117121
     Area: 0.0041
     Downstream: S_8210A

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8210A
     Canvas X: 2367415.691094756
     Canvas Y: 663031.3896385694
     Reference Flow: 80
     Rating Table Name: S_8210
     Downstream: S_8200

     Route: Modified Puls
     Routing Curve: Elevation-Area-Outflow
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8210A
     Elevation-Outflow Table: S_8210
     Primary Table: Elevation-Outflow
End:

Subbasin: 8200
     Canvas X: 2367432.7896637153
     Canvas Y: 663238.9549621565
     Area: 0.0221
     Downstream: S_8200

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 8
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8230
     Canvas X: 2367199.7944577136
     Canvas Y: 662669.9089782678
     Area: 0.0035
     Downstream: S_8200

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 3
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8200
     Canvas X: 2367087.7775317514
     Canvas Y: 663382.3366273883
     Reference Flow: 143
     Rating Table Name: S_8200
     Downstream: S_8000

     Route: Modified Puls
     Routing Curve: Elevation-Area-Outflow
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8200
     Elevation-Outflow Table: S_8200
     Primary Table: Elevation-Outflow
End:

Subbasin: 8160
     Canvas X: 2369014.468658304
     Canvas Y: 661536.297687529
     Area: 0.0307
     Downstream: S_8160

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 10
     Curve Number: 73

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8160
     Canvas X: 2368992.0652731117
     Canvas Y: 662347.3002314963
     Downstream: S_8150

     Route: Modified Puls
     Routing Curve: Elevation-Area-Outflow
     Initial Elevation: 541.2
     Elevation-Area Table: S_8160
     Elevation-Outflow Table: S_8160
     Primary Table: Elevation-Outflow
```

```
End:

Subbasin: 8150
     Canvas X: 2368679.2012874624
     Canvas Y: 662119.5308129289
     Area: 0.0075
     Downstream: S_8150

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 68

     Transform: SCS
     Lag: 3
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8150
     Canvas X: 2368875.5676701106
     Canvas Y: 662504.1239278435
     Downstream: J8140

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8150
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 1
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 1.5
     Number Barrels: 1
     Culvert Length: 110
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.013
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 519.93
     Outlet Invert Elevation: 516.0
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8140
     Canvas X: 2369063.7561057275
     Canvas Y: 662566.8534063825
     Area: 0.0036
     Downstream: J8140

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 68

     Transform: SCS
     Lag: 3
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J8140
     Canvas X: 2368855.224597048
     Canvas Y: 662724.2003569559
     Downstream: R8140
End:

Reach: R8140
     Canvas X: 2368417.2505536037
     Canvas Y: 663264.0288291079
     From Canvas X: 2368855.224597048
     From Canvas Y: 662724.2003569559
     Downstream: J8130

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 540
     Energy Slope: 0.02
     Shape: Trapezoid
     Mannings n: 0.040
     Number of Increments: 2
     Width: 1
     Side Slope: 3
     Channel Loss: None
End:

Subbasin: 8134
     Canvas X: 2368342.36710253
     Canvas Y: 662118.7857025331
     Area: 0.0202
     Downstream: J8132

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8132
     Canvas X: 2368117.438657599
     Canvas Y: 662858.5369983788
     Area: 0.0014
     Downstream: J8132

     Canopy: None
```

```
     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 4
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J8132
     Canvas X: 2368264.468910542
     Canvas Y: 663034.856364515
     Downstream: R8132
End:

Reach: R8132
     Canvas X: 2368417.2505536037
     Canvas Y: 663264.0288291079
     From Canvas X: 2368264.468910542
     From Canvas Y: 663034.856364515
     Downstream: J8130

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 130
     Energy Slope: 0.038
     Shape: Circular
     Mannings n: 0.013
     Number of Increments: 2
     Width: 2
     Channel Loss: None
End:

Subbasin: 8130
     Canvas X: 2368512.6328299926
     Canvas Y: 662898.423507231
     Area: 0.0080
     Downstream: J8130

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 4
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J8130
     Canvas X: 2368417.2505536037
     Canvas Y: 663264.0288291079
     Downstream: R8130
End:

Reach: R8130
     Canvas X: 2368378.7748716087
     Canvas Y: 663555.2372601754
     From Canvas X: 2368417.2505536037
     From Canvas Y: 663264.0288291079
     Downstream: J8120

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 180
     Energy Slope: 0.01
     Shape: Triangular
     Mannings n: 0.035
     Number of Increments: 2
     Side Slope: 6
     Channel Loss: None
End:

Subbasin: 8118
     Canvas X: 2369507.3431325383
     Canvas Y: 662329.3775233423
     Area: 0.0140
     Downstream: S_8118

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8119
     Canvas X: 2369583.5146421925
     Canvas Y: 663005.9597561548
     Area: 0.0057
     Downstream: S_8118

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8118
     Canvas X: 2369350.519436191
     Canvas Y: 663126.9380361941
     Downstream: J8116
```

```
     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8118
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 1
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 1
     Number Barrels: 1
     Culvert Length: 85
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.013
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 515.47
     Outlet Invert Elevation: 514.88
     End Conduit:

     Dam Top: Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Length: 25
     Top Elevation: 520.6
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8116
     Canvas X: 2369328.116050998
     Canvas Y: 662526.527313036
     Area: 0.0104
     Downstream: J8116

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 70

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J8116
     Canvas X: 2368982.542632933
     Canvas Y: 663180.125436692
     Downstream: R8116
End:

Reach: R8116
     Canvas X: 2368799.9472109694
     Canvas Y: 663324.9029292276
     From Canvas X: 2368982.542632933
     From Canvas Y: 663180.125436692
     Downstream: S_8114

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 360
     Energy Slope: 0.015
     Shape: Trapezoid
     Mannings n: 0.035
     Number of Increments: 2
     Width: 1
     Side Slope: 5
     Channel Loss: None
End:

Subbasin: 8114
     Canvas X: 2369148.8889694586
     Canvas Y: 663431.6240748117
     Area: 0.0071
     Downstream: S_8114

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 70

     Transform: SCS
     Lag: 7
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8114
     Canvas X: 2368799.9472109694
     Canvas Y: 663324.9029292276
     Downstream: R8114

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8114
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Orifice
     Conduit Outlet: Main
     Orifice Coefficient: 0.6
     Orifice Area: 0.79
     Centerline Elevation: 505.5
     Number Barrels: 1
     End Conduit:

     Dam Top: Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Length: 80
     Top Elevation: 514
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:
```

```
Reach: R8114
     Canvas X: 2368378.7748716087
     Canvas Y: 663555.2372601754
     From Canvas X: 2368799.9472109694
     From Canvas Y: 663324.9029292276
     Downstream: J8120

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 450
     Energy Slope: 0.015
     Shape: Trapezoid
     Mannings n: 0.035
     Number of Increments: 2
     Width: 3
     Side Slope: 3
     Channel Loss: None
End:

Subbasin: 8113
     Canvas X: 2368948.09383594
     Canvas Y: 663700.5779143132
     Area: 0.0076
     Downstream: J8120

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 70

     Transform: SCS
     Lag: 10
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8120
     Canvas X: 2368535.036215185
     Canvas Y: 663346.4912110803
     Area: 0.0022
     Downstream: J8120

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 70

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J8120
     Canvas X: 2368378.7748716087
     Canvas Y: 663555.2372601754
     Downstream: S_8110
End:

Reservoir: S_8110
     Canvas X: 2367951.2924913582
     Canvas Y: 663731.0248947848
     Downstream: J8110

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8110
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Orifice
     Conduit Outlet: Main
     Orifice Coefficient: 0.6
     Orifice Area: 0.79
     Centerline Elevation: 484
     Number Barrels: 1
     End Conduit:

     Spillway: Broad-Crested Spillway
     Spillway Outlet: Main
     Spillway Crest Length: 3
     Spillway Crest Elevation: 488.5
     Spillway Coefficient: 3.1
     End Spillway:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8110
     Canvas X: 2368561.920277416
     Canvas Y: 663906.575840892
     Area: 0.0301
     Downstream: J8110

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 14
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8112
     Canvas X: 2368521.5941840694
     Canvas Y: 664103.7256305857
     Area: 0.0070
     Downstream: R8112

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
```

```
     Curve Number: 79

     Transform: SCS
     Lag: 15
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reach: R8112
     Description: Route 8112 thru sewer to
8110
     Canvas X: 2367839.9243757357
     Canvas Y: 663794.2040955562
     From Canvas X: 2368060.0844491045
     From Canvas Y: 664224.7039106251
     Downstream: J8110

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 360
     Energy Slope: 0.008
     Shape: Circular
     Mannings n: 0.024
     Number of Increments: 2
     Width: 2
     Channel Loss: None
End:

Subbasin: 8111
     Canvas X: 2368010.7970016813
     Canvas Y: 662934.2689235389
     Area: 0.0040
     Downstream: R8111

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 7
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reach: R8111
     Description: Route 8111 thru sewer thru
8110.
     Canvas X: 2367839.9243757357
     Canvas Y: 663794.2040955562
     From Canvas X: 2367843.415565462
     From Canvas Y: 663123.860944734
     Downstream: J8110

     Route: Kinematic Wave
     Channel: Kinematic Wave
     Length: 746
     Energy Slope: 0.013
     Shape: Circular
     Mannings n: 0.013
     Number of Increments: 2
     Width: 1.5
     Channel Loss: None
End:

Junction: J8110
     Canvas X: 2367839.9243757357
     Canvas Y: 663794.2040955562
     Downstream: S_8000
End:

Subbasin: 8324
     Canvas X: 2364668.2681893087
     Canvas Y: 661726.5252182753
     Area: 0.0287
     Downstream: S_8324

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8322
     Canvas X: 2365192.4511444685
     Canvas Y: 661750.0776280854
     Area: 0.0243
     Downstream: S_8324

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8324
     Canvas X: 2365165.5670822375
     Canvas Y: 662507.3120475909
     Downstream: S_8322

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8324
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None
```

```
     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 4
     Number Barrels: 1
     Culvert Length: 98
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 511.8
     Outlet Invert Elevation: 510.62
     End Conduit:

     Dam Top: Non-Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Cross-Section: S_8324
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Reservoir: S_8322
     Canvas X: 2365385.2030159496
     Canvas Y: 662656.5791870066
     Downstream: S_8320

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8322
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 1
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 3.5
     Number Barrels: 1
     Culvert Length: 97
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 506.9
     Outlet Invert Elevation: 506
     End Conduit:

     Dam Top: Non-Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Cross-Section: S_8322
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8320
     Canvas X: 2364878.803751774
     Canvas Y: 662838.8821484394
     Area: 0.0266
     Downstream: S_8320

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8320
     Canvas X: 2365636.0381712792
     Canvas Y: 662861.2855336318
     Downstream: S_8300

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8320
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 4
     Number Barrels: 1
     Culvert Length: 97
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 496.2
     Outlet Invert Elevation: 495.58
     End Conduit:

     Dam Top: Non-Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Cross-Section: S_8320
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 8300
     Canvas X: 2366496.32816267
     Canvas Y: 662910.5729810552
     Area: 0.0178
```

```
     Downstream: S_8300

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8310
     Canvas X: 2366022.6634063623
     Canvas Y: 662503.1399963496
     Area: 0.0161
     Downstream: S_8300

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8300
     Canvas X: 2366339.504466323
     Canvas Y: 663215.2590196729
     Downstream: S_8000

     Route: Modified Puls
     Routing Curve: Elevation-Area-Outflow
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_8300
     Elevation-Outflow Table: S_8300
     Primary Table: Elevation-Outflow
End:

Subbasin: 8000
     Canvas X: 2366650.6957660043
     Canvas Y: 664399.7894768214
     Area: 0.0272
     Downstream: S_8000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 21
     Curve Number: 78

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 8100
     Canvas X: 2367625.458776371
     Canvas Y: 664045.4768290853
     Area: 0.0119
     Downstream: S_8000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_8000
     Canvas X: 2367233.1233378407
     Canvas Y: 664336.9786602508

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Elevation: 479
     Elevation-Area Table: S_8000
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Spillway: Broad-Crested Spillway
     Spillway Outlet: Main
     Spillway Crest Length: 28
     Spillway Crest Elevation: 479.0
     Spillway Coefficient: 3.1
     End Spillway:

     Dam Top: Non-Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Cross-Section: S_8000
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 6636
     Canvas X: 2362137.6120346086
     Canvas Y: 662987.725551855
     Area: 0.0748
     Downstream: S_6634

     Canopy: None
```

```
     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6635
     Canvas X: 2362743.5668106717
     Canvas Y: 662209.0714328623
     Area: 0.0541
     Downstream: S_6634

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6634
     Canvas X: 2363197.3113848264
     Canvas Y: 663018.2049730517
     Area: 0.0121
     Downstream: S_6634

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 8
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6634
     Canvas X: 2362847.977522894
     Canvas Y: 663272.8595639933
     Downstream: S_6632

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_6634
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 2
     Solution Control: Automatic
     Diameter: 4
     Number Barrels: 1
     Culvert Length: 467
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 506.91
     Outlet Invert Elevation: 500.31
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 6632
     Canvas X: 2363706.62056671
     Canvas Y: 663125.9434538347
     Area: 0.0190
     Downstream: S_6632

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 24
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6632
     Canvas X: 2363337.6978900894
     Canvas Y: 663455.6885010796
     Downstream: S_6630

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Elevation: 500.83
     Elevation-Area Table: S_6632
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 2
```

```
     Solution Control: Automatic
     Diameter: 4.5
     Number Barrels: 1
     Culvert Length: 330
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 500.83
     Outlet Invert Elevation: 500.83
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 6630
     Canvas X: 2363256.07782889
     Canvas Y: 664111.9137931212
     Area: 0.0214
     Downstream: S_6630

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 70

     Transform: SCS
     Lag: 4
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6630
     Canvas X: 2363722.9445789494
     Canvas Y: 664017.2345221301
     Downstream: J6610

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Elevation: 500.83
     Elevation-Area Table: S_6630
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 3
     Number Barrels: 1
     Culvert Length: 621
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 500.83
     Outlet Invert Elevation: 494.55
     End Conduit:

     Dam Top: Non-Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Cross-Section: S_6630
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 6617
     Canvas X: 2363641.32451775
     Canvas Y: 662025.7050288692
     Area: 0.0358
     Downstream: S_6617

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6617
     Canvas X: 2363621.7357030627
     Canvas Y: 662734.1671600784
     Downstream: S_6616

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_6617
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Elliptical
     Chart Number: 29
     Scale Number: 1
     Solution Control: Automatic
     Rise: 2.5
     Span: 1.583
     Number Barrels: 1
     Culvert Length: 76
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 0.0
     Top Manning's n: 0.013
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 515.5
     Outlet Invert Elevation: 513.28
     End Conduit:

     Spillway: Broad-Crested Spillway
```

```
     Spillway Outlet: Main
     Spillway Crest Length: 2
     Spillway Crest Elevation: 517.8
     Spillway Coefficient: 3.1
     End Spillway:

     Dam Top: Non-Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Cross-Section: S_6617
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 6616
     Canvas X: 2363334.4330876414
     Canvas Y: 662913.7312947167
     Area: 0.0047
     Downstream: S_6616

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 12
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6616
     Canvas X: 2363608.676493271
     Canvas Y: 662907.2016898209
     Downstream: J6610_B

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_6616
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 1
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 2.5
     Number Barrels: 1
     Culvert Length: 800
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.013
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 513.3
     Outlet Invert Elevation: 505.13
     End Conduit:

     Dam Top: Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Length: 50
     Top Elevation: 518
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 6614
     Canvas X: 2364166.9577118736
     Canvas Y: 662042.029041109
     Area: 0.0205
     Downstream: S_6614

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 5
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6614
     Canvas X: 2364052.6896261945
     Canvas Y: 662587.2510499199
     Downstream: J6610_B

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_6614
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 1
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 2
     Number Barrels: 1
     Culvert Length: 55
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.013
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 521.75
     Outlet Invert Elevation: 520.2
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:
```

```
Junction: J6610_B
     Canvas X: 2363997.187984579
     Canvas Y: 662894.1424800289
     Downstream: J6610_A
End:

Subbasin: 6612
     Canvas X: 2364653.4132766207
     Canvas Y: 662639.4878890874
     Area: 0.0078
     Downstream: S_6612

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 8
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6612
     Canvas X: 2364196.340933905
     Canvas Y: 662972.4977387802
     Downstream: J6610_A

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_6612
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 1
     Solution Control: Automatic
     Diameter: 1.25
     Number Barrels: 1
     Culvert Length: 76
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 517.9
     Outlet Invert Elevation: 517.5
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Junction: J6610_A
     Canvas X: 2364129.0810583695
     Canvas Y: 663131.0172390394
     Downstream: J6610
End:

Subbasin: 6610
     Canvas X: 2364823.183003915
     Canvas Y: 663243.4763419615
     Area: 0.0224
     Downstream: J6610

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 12
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6620
     Canvas X: 2363803.6718884488
     Canvas Y: 663643.5366816643
     Area: 0.0069
     Downstream: J6610

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 38
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J6610
     Description: Combined Flow for Orchard
Upper
     Canvas X: 2364352.79986269
     Canvas Y: 663867.2554859847
End:

Subbasin: 1410
     Canvas X: 2370849.722348421
     Canvas Y: 664770.8770106375
     Area: 0.1588
     Downstream: J2000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79
```

```
     Transform: SCS
     Lag: 20
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 1300
     Canvas X: 2369806.463459158
     Canvas Y: 666209.8830089014
     Area: 0.0147
     Downstream: J2000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 10
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 1400
     Canvas X: 2371081.7133713486
     Canvas Y: 665882.5054195031
     Area: 0.0129
     Downstream: J2000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 17
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 2000
     Canvas X: 2370286.1096947878
     Canvas Y: 665676.9427470902
     Area: 0.0067
     Downstream: J2000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 3
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J2000
     Canvas X: 2370686.6174385296
     Canvas Y: 666215.3446250799
End:

Subbasin: 6320
     Canvas X: 2365575.753813542
     Canvas Y: 666113.3089872485
     Area: 0.0609
     Downstream: J6400

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 27
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6400
     Canvas X: 2365405.765942494
     Canvas Y: 664298.2772028358
     Area: 0.0498
     Downstream: J6400

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 11
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6410
     Canvas X: 2366058.300028129
     Canvas Y: 663947.3345013179
     Area: 0.0363
     Downstream: S_6410

     Canopy: None
```

```
     Surface: None

     LossRate: SCS
     Percent Impervious Area: 9
     Curve Number: 70

     Transform: SCS
     Lag: 15
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6410
     Canvas X: 2366383.0986823547
     Canvas Y: 664777.6603247346
     Downstream: R6410

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Elevation: 487.56
     Elevation-Area Table: S_6410
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 2
     Number Barrels: 1
     Culvert Length: 56
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 487.56
     Outlet Invert Elevation: 481
     End Conduit:

     Dam Top: Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Length: 190
     Top Elevation: 491
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Reach: R6410
     Description: Route outflow from 6410 to
Orchard thru Channel
     Canvas X: 2366533.062473673
     Canvas Y: 665248.8325196857
     From Canvas X: 2366383.0986823547
     From Canvas Y: 664777.6603247346
     Downstream: J6400

     Route: Muskingum Cunge
     Channel: Trapezoid
     Length: 225
     Energy Slope: 0.01
     Width: 2
     Side Slope: 3
     Mannings n: 0.045
     Use Variable Time Step: No
     Channel Loss: None
End:

Subbasin: 6420
     Canvas X: 2365548.336414986
     Canvas Y: 665164.666997208
     Area: 0.0250
     Downstream: J6400

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 10
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J6400
     Canvas X: 2366533.062473673
     Canvas Y: 665248.8325196857
End:

Subbasin: 2100
     Canvas X: 2369799.1390215275
     Canvas Y: 664105.37346329
     Area: 0.1138
     Downstream: J3000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 19
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 3000
     Canvas X: 2369423.975596796
     Canvas Y: 665500.1540348051
     Area: 0.0191
     Downstream: J3000

     Canopy: None

     Surface: None
```

```
     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 3100
     Canvas X: 2369423.975596796
     Canvas Y: 666028.6963863815
     Area: 0.0086
     Downstream: S_3100

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 10
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_3100
     Canvas X: 2369802.656743002
     Canvas Y: 665821.5979610104
     Downstream: J3000

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_3100
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 2
     Solution Control: Automatic
     Diameter: 1
     Number Barrels: 1
     Culvert Length: 25
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 462
     Outlet Invert Elevation: 461.75
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Junction: J3000
     Canvas X: 2370039.5474386765
     Canvas Y: 665684.415394431
End:

Subbasin: 6430
     Canvas X: 2364584.653896258
     Canvas Y: 664928.9029028508
     Area: 0.0996
     Downstream: J6500

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 16
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6440
     Canvas X: 2363382.3619290553
     Canvas Y: 666486.1856076112
     Area: 0.0208
     Downstream: R6440

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reach: R6440
     Description: Route 6440 thru channel
thru 6430 to Orchard
     Canvas X: 2365223.7732767747
     Canvas Y: 664954.8292338066
     From Canvas X: 2363693.8462936007
     From Canvas Y: 666080.0378414448
     Downstream: J6500

     Route: Muskingum Cunge
     Channel: Trapezoid
     Length: 2000
     Energy Slope: 0.0075
     Width: 0
```

```
     Side Slope: 3
     Mannings n: 0.100
     Use Variable Time Step: No
     Channel Loss: None
End:

Subbasin: 6500
     Canvas X: 2364644.839076709
     Canvas Y: 664502.5775351409
     Area: 0.0190
     Downstream: J6500

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 21
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J6500
     Canvas X: 2365223.7732767747
     Canvas Y: 664954.8292338066
End:

Subbasin: 4100
     Canvas X: 2368412.2438570326
     Canvas Y: 665973.5242954975
     Area: 0.0602
     Downstream: J4000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 35
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 4000
     Canvas X: 2369262.1030488787
     Canvas Y: 664462.600293392
     Area: 0.0290
     Downstream: S_4000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 12
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 4200
     Canvas X: 2368816.490322871
     Canvas Y: 664375.0459187928
     Area: 0.0084
     Downstream: S_4200

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 13
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_4200
     Canvas X: 2368877.6592185916
     Canvas Y: 664366.5016777874
     Downstream: S_4000

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_4200
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Orifice
     Conduit Outlet: Main
     Orifice Coefficient: 0.6
     Orifice Area: 0.44
     Centerline Elevation: 493.38
     Number Barrels: 1
     End Conduit:

     Spillway: Broad-Crested Spillway
     Spillway Outlet: Main
     Spillway Crest Length: 3
     Spillway Crest Elevation: 497.4
     Spillway Coefficient: 3.1
     End Spillway:

     Dam Top: Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Length: 20
     Top Elevation: 498.6
     End Dam Top:
```

```
     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Reservoir: S_4000
     Canvas X: 2369159.3217126727
     Canvas Y: 665155.4226337465
     Downstream: J4000

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_4000
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 2
     Solution Control: Automatic
     Rise: 8
     Span: 10
     Diameter: 1
     Number Barrels: 1
     Culvert Length: 29
     Entrance Loss Coefficient: 0.5
     Exit Loss Coefficient: 1
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 464.75
     Outlet Invert Elevation: 464.45
     End Conduit:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Junction: J4000
     Canvas X: 2369066.700358133
     Canvas Y: 665310.0542529534
End:

Subbasin: 1100
     Canvas X: 2369246.8339894875
     Canvas Y: 666546.025786479
     Area: 0.0295
     Downstream: J1000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 39
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 1000
     Canvas X: 2369882.597782274
     Canvas Y: 666742.8232707125
     Area: 0.0275
     Downstream: J1000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 25
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 1200
     Canvas X: 2371561.3596069785
     Canvas Y: 665825.4046771661
     Area: 0.0127
     Downstream: J1000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 20
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J1000
     Canvas X: 2370831.7934000352
     Canvas Y: 666576.2105865364
End:

Subbasin: 6310
     Canvas X: 2366634.065397807
     Canvas Y: 665499.1592595922
     Area: 0.0202
     Downstream: J6300

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 24
     Unitgraph Type: STANDARD
```

```
     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6300
     Canvas X: 2366902.755903656
     Canvas Y: 665011.129565294
     Area: 0.0128
     Downstream: J6300

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J6300
     Canvas X: 2367380.7480112244
     Canvas Y: 665286.5074324658
End:

Subbasin: 6510
     Canvas X: 2363559.1887058234
     Canvas Y: 664563.0891951574
     Area: 0.0176
     Downstream: J6600

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6600
     Canvas X: 2364515.8376541254
     Canvas Y: 663933.6005353143
     Area: 0.0153
     Downstream: J6600

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 8
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J6600
     Canvas X: 2364644.607470572
     Canvas Y: 664339.9252488666
End:

Subbasin: 6210
     Canvas X: 2368014.9255602076
     Canvas Y: 664374.2421020245
     Area: 0.0160
     Downstream: J7000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 73

     Transform: SCS
     Lag: 13
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 7000
     Canvas X: 2366871.48530304
     Canvas Y: 664689.0999046618
     Area: 0.0096
     Downstream: J7000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 6200
     Canvas X: 2367465.333023344
     Canvas Y: 664801.3980312577
     Area: 0.0055
     Downstream: J7000
```

```
     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 4
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J7000
     Canvas X: 2367599.009118738
     Canvas Y: 665021.7021624664
End:

Subbasin: 6000
     Canvas X: 2367626.5752255367
     Canvas Y: 665471.7418610362
     Area: 0.0122
     Downstream: J6000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J6000
     Canvas X: 2368219.7896073586
     Canvas Y: 665356.7265531502
End:

Subbasin: 6114
     Canvas X: 2368162.6144818338
     Canvas Y: 664593.2291237465
     Area: 0.0047
     Downstream: S_6114

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 8
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Reservoir: S_6114
     Canvas X: 2368018.269584538
     Canvas Y: 664730.9526954782
     Downstream: J6110

     Route: Controlled Outflow
     Routing Curve: Elevation-Area
     Initial Outflow Equals Inflow: Yes
     Elevation-Area Table: S_6114
     Adaptive Control: On
     Main Tailwater Condition: None
     Auxiliary Tailwater Condition: None

     Conduit: Culvert
     Conduit Outlet: Main
     Culvert Shape: Circular
     Chart Number: 2
     Scale Number: 3
     Solution Control: Automatic
     Diameter: 1
     Number Barrels: 1
     Culvert Length: 12
     Entrance Loss Coefficient: 0.9
     Exit Loss Coefficient: 1.0
     Top Manning's n: 0.024
     Bottom Manning's n:
     Bottom Depth:
     Fill Depth:
     Inlet Invert Elevation: 484.7
     Outlet Invert Elevation: 484.2
     End Conduit:

     Dam Top: Level Dam
     Dam Top Outlet: Main
     Overflow Coefficient: 2.6
     Top Length: 5
     Top Elevation: 487
     End Dam Top:

     Evaporation Method: Zero Evaporation
     End Evaporation:
End:

Subbasin: 6112
     Canvas X: 2368663.204242087
     Canvas Y: 664676.824113233
     Area: 0.0031
     Downstream: J6110

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:
```

```
Subbasin: 6110
     Canvas X: 2368146.7352152313
     Canvas Y: 664776.6543762451
     Area: 0.0029
     Downstream: J6110

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 8
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J6110
     Canvas X: 2367902.8856886285
     Canvas Y: 665056.6667743677
End:

Subbasin: 6100
     Canvas X: 2368428.43221076
     Canvas Y: 664860.4021316725
     Area: 0.0100

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 89

     Transform: SCS
     Lag: 9
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 5000
     Canvas X: 2368476.5145807755
     Canvas Y: 665257.8861522988
     Area: 0.0054
     Downstream: J5000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 2
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Subbasin: 5100
     Canvas X: 2368597.151134422
     Canvas Y: 664967.2617276042
     Area: 0.0040
     Downstream: J5000

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 79

     Transform: SCS
     Lag: 6
     Unitgraph Type: STANDARD

     Baseflow: Recession
     Recession Factor: 0.95
     Flow / Area Ratio: 1.4
     Flow to Peak Ratio: 0.1
End:

Junction: J5000
     Canvas X: 2368751.1729635997
     Canvas Y: 665310.0542529534
End:

Basin Schematic Properties:
     Last View N: 664293.7882024464
     Last View S: 663087.168110633
     Last View W: 2367508.199512108
     Last View E: 2369798.1354527758
     Maximum View N: 684352.4905980602
     Maximum View S: 660048.712910749
     Maximum View W: 2355466.8499568105
     Maximum View E: 2380741.8499568105
     Extent Method: Maps
     Buffer: 0
     Draw Icons: Yes
     Draw Icon Labels: Yes
     Draw Map Objects: No
     Draw Gridlines: Yes
     Draw Flow Direction: No
     Fix Element Locations: No
     Fix Hydrologic Order: No
     Map: hec.map.aishape.AiShapeMap
     Map File Name: maps\Hydrography.shp
     Minimum Scale: -2147483648
     Maximum Scale: 2147483647
     Map Shown: Yes
     Map: hec.map.aishape.AiShapeMap
     Map File Name: maps\RoutingReaches.shp
     Minimum Scale: -2147483648
     Maximum Scale: 2147483647
     Map Shown: Yes
     Map: hec.map.aishape.AiShapeMap
     Map File Name: maps\Culverts.shp
     Minimum Scale: -2147483648
     Maximum Scale: 2147483647
     Map Shown: Yes
     Map: hec.map.aishape.AiShapeMap
     Map File Name: maps\Subbasins.shp
     Minimum Scale: -2147483648
```

```
     Maximum Scale: 2147483647
     Map Shown: Yes
End:
```

Appendix C: HEC-HMS Results

		Existing 4/18/2013 Storm Event			Existing 100-year 2-hour Storm Event			Existing 010-year 2-hour Storm Event		
Component No.	Type	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
1000	Sub-basin	17.0			39.3			14.7		
1100	Sub-basin	16.8			35.6			13.3		
1200	Sub-basin	9.6			27.4			12.2		
1300	Sub-basin	9.7			26.3			9.7		
1400	Sub-basin	9.9			29.3			13.2		
1410	Sub-basin	100.2			244.9			90.5		
2000	Sub-basin	5.2			18.8			8.4		
2100	Sub-basin	86.5			249.7			110.5		
3000	Sub-basin	12.7			37.6			13.6		
3100	Sub-basin	5.7			15.4			5.7		
4000	Sub-basin	22.4			71.3			31.4		
4100	Sub-basin	42.7			104.8			47.2		
4200	Sub-basin	6.5			20.0			9.1		
5000	Sub-basin	3.6			10.8			4.0		
5100	Sub-basin	2.7			7.9			2.8		
6000	Sub-basin	9.5			32.0			14.4		
6100	Sub-basin	7.8			26.2			11.8		
6110	Sub-basin	2.3			7.7			3.5		
6112	Sub-basin	2.4			8.1			3.7		
6114	Sub-basin	3.6			12.4			5.6		
6200	Sub-basin	4.3			15.4			6.9		
6210	Sub-basin	9.0			22.1			6.9		
6300	Sub-basin	10.0			34.3			15.8		
6310	Sub-basin	15.1			40.8			18.6		
6320	Sub-basin	44.9			118.0			52.7		
6400	Sub-basin	32.6			87.0			32.6		
6410	Sub-basin	19.7			48.1			15.8		
6420	Sub-basin	16.4			44.8			16.6		
6430	Sub-basin	64.1			164.5			59.9		
6440	Sub-basin	16.1			54.5			24.5		
6500	Sub-basin	14.3			39.9			18.1		
6510	Sub-basin	13.6			46.1			20.7		
6600	Sub-basin	10.1			29.0			10.2		
6610	Sub-basin	17.3			55.1			24.3		
6612	Sub-basin	6.1			20.6			9.4		
6614	Sub-basin	13.7			41.0			15.1		
6616	Sub-basin	3.1			8.2			3.0		

		Existing 4/18/2013 Storm Event			Existing 100-year 2-hour Storm Event			Existing 010-year 2-hour Storm Event		
Component No.	Type	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
6617	Sub-basin	20.8			56.2			17.0		
6620	Sub-basin	4.0			8.4			3.1		
6630	Sub-basin	11.6			30.4			8.4		
6632	Sub-basin	14.2			38.4			17.5		
6634	Sub-basin	7.0			17.9			5.7		
6635	Sub-basin	31.5			84.9			25.7		
6636	Sub-basin	58.2			210.0			93.4		
7000	Sub-basin	6.3			17.7			6.4		
8000	Sub-basin	18.6			57.7			23.6		
8100	Sub-basin	6.9			18.7			5.6		
8110	Sub-basin	16.9			40.8			12.9		
8111	Sub-basin	2.7			7.7			2.7		
8112	Sub-basin	4.5			11.8			4.2		
8113	Sub-basin	4.0			9.7			2.8		
8114	Sub-basin	3.8			9.5			2.7		
8116	Sub-basin	5.6			14.3			4.0		
8118	Sub-basin	9.3			27.6			10.0		
8119	Sub-basin	3.8			11.2			4.1		
8120	Sub-basin	1.2			3.1			0.9		
8130	Sub-basin	4.7			12.9			3.9		
8132	Sub-basin	0.8			2.3			0.7		
8134	Sub-basin	11.6			28.9			9.3		
8140	Sub-basin	1.9			4.7			1.2		
8150	Sub-basin	3.9			9.7			2.6		
8160	Sub-basin	18.7			54.1			18.9		
8200	Sub-basin	12.8			32.7			10.4		
8210	Sub-basin	9.8			26.9			8.1		
8212	Sub-basin	5.8			15.7			4.7		
8214	Sub-basin	35.5			84.6			23.1		
8220	Sub-basin	14.3			37.6			11.6		
8222	Sub-basin	5.3			14.6			4.4		
8224	Sub-basin	3.0			7.2			2.0		
8225	Sub-basin	22.3			57.7			19.1		
8226	Sub-basin	6.9			18.2			5.6		
8227	Sub-basin	7.7			19.3			5.1		
8228	Sub-basin	9.5			23.8			6.3		
8229	Sub-basin	6.1			15.3			4.0		

		Existing 4/18/2013 Storm Event			Existing 100-year 2-hour Storm Event			Existing 010-year 2-hour Storm Event		
Component No.	Type	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
8230	Sub-basin	2.1			5.6			1.7		
8300	Sub-basin	11.8			35.0			12.7		
8310	Sub-basin	9.4			25.3			7.6		
8320	Sub-basin	17.5			49.2			17.8		
8322	Sub-basin	16.1			47.8			17.3		
8324	Sub-basin	19.1			57.4			21.1		
J1000	Junction	42.9			94.5			37.1		
J2000	Junction	125.0			302.7			116.8		
J3000	Junction	101.3			283.1			123.5		
J4000	Junction	51.2			114.0			54.5		
J5000	Junction	6.3			18.7			6.8		
J6000	Junction	9.5			32.0			14.4		
J6110	Junction	8.3			28.2			12.8		
J6300	Junction	25.0			65.3			29.5		
J6400	Junction	96.9			236.4			97.5		
J6500	Junction	94.2			254.2			101.2		
J6600	Junction	23.8			75.1			30.8		
J6610	Junction	97.3			144.6			60.2		
J6610_A	Junction	41.2			89.6			34.9		
J6610_B	Junction	37.5			84.8			31.7		
J7000	Junction	19.7			51.1			18.5		
J8110	Junction	82.9			189.0			56.5		
J8114	Junction	22.3			58.0			16.0		
J8116	Junction	18.6			50.2			13.9		
J8120	Junction	59.6			132.1			38.2		
J8130	Junction	32.2			62.1			19.2		
J8132	Junction	12.4			31.1			10.0		
J8140	Junction	15.3			21.4			7.7		
R6410	Reach	4.8			8.1			2.0		
R6440	Reach	16.0			50.0			23.2		
R8111	Reach	2.6			7.5			2.7		
R8112	Reach	4.5			11.6			4.2		
R8114	Reach	22.3			57.8			15.7		
R8116	Reach	18.5			48.9			13.4		
R8120	Reach	58.8			129.8			37.7		
R8130	Reach	32.1			61.9			19.2		
R8132	Reach	12.4			31.0			10.0		

		Existing 4/18/2013 Storm Event			Existing 100-year 2-hour Storm Event			Existing 010-year 2-hour Storm Event		
Component No.	Type	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
R8140	Reach	15.1			21.4			7.7		
S_3100	Reach	2.3	1.718	463.13	3.1	2.090	463.62	1.4	1.476	462.81
S_3100-OUTLET-1	Storage Outlet	2.3			3.1			1.4		
S_4000	Storage	8.7	3.291	474.25	10.2	6.171	477.54	7.9	2.265	472.71
S_4000-OUTLET-1	Storage Outlet	8.7			10.2			7.9		
S_4200	Storage	6.3	0.495	498.71	18.0	0.578	499.00	4.8	0.477	498.64
S_4200-DAMTOP-1	Dam Top	1.8			13.1			0.5		
S_4200-OUTLET-1	Storage Outlet	4.4			4.9			4.3		
S_6410	Storage	4.8	2.828	488.87	8.1	4.032	489.33	2.0	1.578	488.37
S_6410-DAMTOP-1	Dam Top	0.0			0.0			0.0		
S_6410-OUTLET-1	Storage Outlet	4.8			8.1			2.0		
S_6612	Storage	3.8	0.921	519.61	5.3	1.424	520.72	3.4	0.834	519.37
S_6612-OUTLET-1	Storage Outlet	3.8			5.3			3.4		
S_6614	Dam Top	13.6	0.016	523.96	29.6	0.382	526.59	14.3	0.017	524.03
S_6614-OUTLET-1	Storage Outlet	13.6			29.6			14.3		
S_6616	Storage	23.8	0.000	516.06	55.2	0.337	518.19	19.4	0.000	515.73
S_6616-DAMTOP-1	Dam Top	0.0			11.0			0.0		
S_6616-OUTLET-1	Storage Outlet	23.8			44.2			19.4		
S_6617	Storage	20.8	0.021	517.70	53.0	0.065	518.98	16.7	0.018	517.44
S_6617-DAMTOP-1	Dam Top	0.0			10.7			0.0		
S_6617-OUTLET-1	Storage Outlet	20.8			42.3			16.7		
S_6630	Storage	46.1	12.074	504.97	85.9	14.899	505.66	31.5	7.717	503.77
S_6630-DAMTOP-1	Dam Top	5.9			44.6			0.0		
S_6630-OUTLET-1	Storage Outlet	40.2			41.3			31.5		
S_6632	Storage	72.8	8.452	506.12	91.4	13.041	507.52	61.8	6.862	505.44
S_6632-OUTLET-1	Storage Outlet	72.8			91.4			61.8		
S_6634	Dam Top	88.9	1.176	511.69	103.9	10.040	513.36	90.1	1.350	511.75
S_6634-OUTLET-1	Storage Outlet	88.9			103.9			90.1		
S_8000	Storage	264.8	13.291	482.92	470.2	18.010	483.79	167.3	10.551	482.37
S_8000-DAMTOP-1	Dam Top	0.0			25.0			0.0		
S_8000-SPILL-1	Spillway	264.8			445.2			167.3		
S_8118	Storage	13.0	0.286	520.81	35.9	0.359	521.18	10.2	0.274	520.75
S_8118-DAMTOP-1	Dam Top	6.5			29.1			3.7		
S_8118-OUTLET-1	Storage Outlet	6.5			6.8			6.5		
S_8150	Storage	13.4	0.054	523.21	19.7	0.286	525.83	7.1	0.028	521.66
S_8150-OUTLET-1	Storage Outlet	13.4			19.7			7.1		
S_8160	Storage	10.4	1.726	542.22	16.9	2.591	542.63	5.8	1.095	541.90

		Existing 4/18/2013 Storm Event			Existing 100-year 2-hour Storm Event			Existing 010-year 2-hour Storm Event		
Component No.	Type	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
S_8200	Storage	106.1	0.755	487.56	155.1	4.148	490.33	75.4	0.246	486.55
S_8210	Storage	49.5	0.013	496.78	79.0	0.481	498.60	30.6	0.005	496.02
S_8212	Storage	39.8	0.014	510.38	69.4	0.178	513.59	24.6	0.007	509.52
S_8212-OUTLET-1	Storage Outlet	39.8			69.4			24.6		
S_8214	Storage	34.4	0.558	519.98	60.2	1.500	522.12	21.1	0.415	519.09
S_8214-OUTLET-1	Storage Outlet	34.4			60.2			21.1		
S_8220	Storage	50.7	0.086	498.33	77.3	2.037	501.86	36.6	0.028	497.70
S_8222	Storage	9.2	0.000	515.04	20.3	0.001	515.85	6.1	0.000	514.75
S_8222-OUTLET-1	Storage Outlet	9.2			20.3			6.1		
S_8224	Storage	3.9	0.005	521.88	7.4	0.010	522.34	2.0	0.002	521.57
S_8224-OUTLET-1	Storage Outlet	3.9			7.4			2.0		
S_8225	Storage	2.1	5.244	555.31	5.3	9.008	556.08	1.7	4.666	555.18
S_8225-OUTLET-1	Storage Outlet	2.1			5.3			1.7		
S_8226	Storage	29.8	0.185	508.00	59.8	0.719	515.74	20.1	0.146	507.39
S_8226-OUTLET-1	Storage Outlet	29.8			59.8			20.1		
S_8227	Storage	7.7	0.001	521.47	18.3	0.001	522.49	5.0	0.000	521.14
S_8227-OUTLET-1	Storage Outlet	7.7			18.3			5.0		
S_8228	Storage	9.5	0.001	513.59	22.6	0.001	514.93	6.1	0.000	513.23
S_8228-OUTLET-1	Storage Outlet	9.5			22.6			6.1		
S_8229	Storage	6.0	0.000	515.57	14.6	0.001	516.46	3.9	0.000	515.29
S_8229-OUTLET-1	Storage Outlet	6.0			14.6			3.9		
S_8300	Storage	73.5	0.119	491.60	172.2	0.530	493.09	68.6	0.107	491.45
S_8320	Storage	52.3	0.005	499.68	124.8	0.617	504.07	51.3	0.005	499.64
S_8320-DAMTOP-1	Dam Top	0.0			0.0			0.0		
S_8320-OUTLET-1	Storage Outlet	52.3			124.8			51.3		
S_8322	Storage	35.0	0.017	509.79	97.6	0.100	512.11	34.7	0.016	509.77
S_8322-DAMTOP-1	Dam Top	0.0			24.4			0.0		
S_8322-OUTLET-1	Storage Outlet	35.0			73.2			34.7		
S_8324	Storage	35.1	0.002	514.56	99.1	0.035	517.07	36.6	0.002	514.63
S_8324-DAMTOP-1	Dam Top	0.0			0.0			0.0		
S_8324-OUTLET-1	Storage Outlet	35.1			99.1			36.6		

Component No.	Type	Improvement ID	Proposed 100-year 2-hour Storm Event			Proposed 010-year 2-hour Storm Event		
			Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
1000	Sub-basin		39.3			14.7		
1100	Sub-basin		35.6			13.3		
1200	Sub-basin		27.4			12.2		
1300	Sub-basin		26.3			9.7		
1400	Sub-basin		29.3			13.2		
1410	Sub-basin		244.9			90.5		
2000	Sub-basin		18.8			8.4		
2100	Sub-basin		249.7			110.5		
3000	Sub-basin		37.6			13.6		
3100	Sub-basin		15.4			5.7		
4000	Sub-basin		71.3			31.4		
4100	Sub-basin		104.8			47.2		
4200	Sub-basin		20.0			9.1		
5000	Sub-basin		10.8			4.0		
5100	Sub-basin		7.9			2.8		
6000	Sub-basin		32.0			14.4		
6100	Sub-basin		26.2			11.8		
6110	Sub-basin	F-3	7.7			3.5		
6112	Sub-basin		8.1			3.7		
6114	Sub-basin		12.4			5.6		
6200	Sub-basin		15.4			6.9		
6210	Sub-basin		22.1			6.9		
6300	Sub-basin		34.3			15.8		
6310	Sub-basin		40.8			18.6		
6320	Sub-basin		118.0			52.7		
6400	Sub-basin		87.0			32.6		
6410	Sub-basin		48.1			15.8		
6420	Sub-basin		44.8			16.6		
6430	Sub-basin		164.5			59.9		
6440	Sub-basin		54.5			24.5		
6500	Sub-basin		39.9			18.1		
6510	Sub-basin		46.1			20.7		
6600	Sub-basin		29.0			10.2		
6610	Sub-basin		55.1			24.3		
6612	Sub-basin		20.6			9.4		

Component No.	Type	Improvement ID	Proposed 100-year 2-hour Storm Event			Proposed 010-year 2-hour Storm Event		
			Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
6614	Sub-basin		41.0			15.1		
6616	Sub-basin		8.2			3.0		
6617	Sub-basin		56.2			17.0		
6620	Sub-basin		8.4			3.1		
6630	Sub-basin		30.4			8.4		
6632	Sub-basin		38.4			17.5		
6634	Sub-basin		17.9			5.7		
6635	Sub-basin		84.9			25.7		
6636	Sub-basin		210.0			93.4		
7000	Sub-basin		17.7			6.4		
8000	Sub-basin		57.7			23.6		
8100	Sub-basin		18.7			5.6		
8110	Sub-basin		40.8			12.9		
8111	Sub-basin	C-3	7.7			2.7		
8112	Sub-basin	C-4	11.8			4.2		
8113	Sub-basin		9.7			2.8		
8114	Sub-basin		9.5			2.7		
8116	Sub-basin		14.3			4.0		
8118	Sub-basin		27.6			10.0		
8119	Sub-basin		11.2			4.1		
8120	Sub-basin		3.1			0.9		
8130	Sub-basin		12.9			3.9		
8132	Sub-basin		2.3			0.7		
8134	Sub-basin		28.9			9.3		
8140	Sub-basin		4.7			1.2		
8150	Sub-basin		9.7			2.6		
8160	Sub-basin		54.1			18.9		
8200	Sub-basin		32.7			10.4		
8210A	Sub-basin		6.6			2.0		
8210B	Sub-basin		20.3			6.1		
8212	Sub-basin		15.7			4.7		
8214	Sub-basin		84.6			23.1		
8220A	Sub-basin		23.7			7.3		
8220B	Sub-basin		13.9			4.3		
8222	Sub-basin		14.6			4.4		

Component No.	Type	Improvement ID	Proposed 100-year 2-hour Storm Event			Proposed 010-year 2-hour Storm Event		
			Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
8224	Sub-basin		7.2			2.0		
8225	Sub-basin		57.7			19.1		
8226	Sub-basin		18.2			5.6		
8227	Sub-basin		19.3			5.1		
8228	Sub-basin		23.8			6.3		
8229	Sub-basin		15.3			4.0		
8230	Sub-basin		5.6			1.7		
8300	Sub-basin		35.0			12.7		
8310	Sub-basin		25.3			7.6		
8320	Sub-basin		49.2			17.8		
8322	Sub-basin	E-1	47.8			17.3		
8324	Sub-basin		57.4			21.1		
J1000	Junction		94.5			37.1		
J2000	Junction		302.7			116.8		
J3000	Junction		283.1			123.5		
J4000	Junction		113.9			54.6		
J5000	Junction		18.7			6.8		
J6000	Junction		32.0			14.4		
J6110	Junction		22.8			10.1		
J6300	Junction		65.3			29.5		
J6400	Junction		236.4			97.5		
J6500	Junction		254.2			101.2		
J6600	Junction		75.1			30.8		
J6610	Junction		106.4			46.1		
J6610_A	Junction		53.9			20.4		
J6610_B	Junction		48.8			17.7		
J7000	Junction		51.1			18.5		
J8110	Junction		73.7			26.0		
J8116	Junction		50.2			13.9		
J8120	Junction		82.6			28.8		
J8130	Junction		62.1			19.2		
J8132	Junction		31.1			10.0		
J8140	Junction		21.4			7.7		
R6410	Reach		8.1			2.0		
R6440	Reach		50.0			23.2		

Component No.	Type	Improvement ID	Proposed 100-year 2-hour Storm Event			Proposed 010-year 2-hour Storm Event		
			Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
R8111	Reach		7.5			2.7		
R8112	Reach		11.6			4.2		
R8114	Reach		10.4			7.5		
R8116	Reach		48.9			13.4		
R8120	Reach		129.8			37.7		
R8130	Reach		61.9			19.2		
R8132	Reach		31.0			10.0		
R8140	Reach		21.4			7.7		
S_3100	Storage		3.1	2.090	463.62	1.4	1.475	462.80
S_3100-OUTLET-1	Storage Outlet		3.1			1.4		
S_4000	Storage		10.3	6.245	477.61	8.0	2.324	472.82
S_4000-OUTLET-1	Storage Outlet		10.3			8.0		
S_4200	Storage	F-1	15.2	0.548	498.48	4.2	0.312	497.35
S_4200-DAMTOP-1	Dam Top		0.0			0.0		
S_4200-OUTLET-1	Storage Outlet		4.8			4.2		
S_4200-SPILL-1	Spillway		10.4			0.0		
S_6114	Storage	F-2	9.5	0.266	487.49	3.6	0.114	486.40
S_6114-DAMTOP-1	Dam Top		4.5			0.0		
S_6114-OUTLET-1	Storage Outlet		5.0			3.6		
S_6410	Storage		8.1	4.032	489.33	2.0	1.578	488.37
S_6410-DAMTOP-1	Dam Top		0.0			0.0		
S_6410-OUTLET-1	Storage Outlet		8.1			2.0		
S_6612	Storage		5.3	1.424	520.72	3.5	0.834	519.37
S_6612-OUTLET-1	Storage Outlet		5.3			3.5		
S_6614	Storage		29.6	0.382	526.59	14.3	0.017	524.03
S_6614-OUTLET-1	Storage Outlet		29.6			14.3		
S_6616	Storage		23.3	0.000	516.02	5.5	0.000	514.49
S_6616-DAMTOP-1	Dam Top		0.0			0.0		
S_6616-OUTLET-1	Storage Outlet		23.3			5.5		
S_6617	Storage	A-1	19.4	2.896	518.42	4.4	1.344	516.85
S_6617-DAMTOP-1	Dam Top		0.0			0.0		
S_6617-OUTLET-1	Storage Outlet		16.4			4.4		
S_6617-SPILL-1	Spillway		3.0			0.0		
S_6630	Storage		83.3	14.800	505.64	28.1	7.111	503.56
S_6630-DAMTOP-1	Dam Top		42.0			0.0		

Component No.	Type	Improvement ID	Proposed 100-year 2-hour Storm Event			Proposed 010-year 2-hour Storm Event		
			Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
S_6630-OUTLET-1	Storage Outlet		41.3			28.1		
S_6632	Storage		90.4	12.788	507.43	57.5	6.419	505.23
S_6632-OUTLET-1	Storage Outlet		90.4			57.5		
S_6634	Storage		103.9	10.040	513.36	90.1	1.350	511.75
S_6634-OUTLET-1	Storage Outlet		103.9			90.1		
S_8000	Storage	B-1	279.3	10.026	481.18	104.4	5.235	480.13
S_8000-DAMTOP-1	Dam Top		0.0			0.0		
S_8000-SPILL-1	Spillway		279.3			104.4		
S_8110	Storage	C-1	43.0	5.285	490.83	13.3	2.740	489.13
S_8110-OUTLET-1	Storage Outlet		9.9			8.6		
S_8110-SPILL-1	Spillway		33.1			4.7		
S_8114	Storage	C-2	10.4	3.525	512.92	7.6	0.710	509.44
S_8114-DAMTOP-1	Dam Top		0.0			0.0		
S_8114-OUTLET-1	Storage Outlet		10.4			7.6		
S_8118	Storage		35.9	0.359	521.18	10.2	0.273	520.75
S_8118-DAMTOP-1	Dam Top		29.1			3.7		
S_8118-OUTLET-1	Storage Outlet		6.8			6.5		
S_8150	Storage		19.7	0.286	525.83	7.1	0.028	521.65
S_8150-OUTLET-1	Storage Outlet		19.7			7.1		
S_8160	Storage		16.9	2.591	542.63	5.8	1.095	541.90
S_8200	Storage	D-1	112.4	1.715	487.90	47.9	0.510	485.80
S_8210A	Storage	D-2	39.2	0.009	496.37	16.5	0.003	495.46
S_8210B	Storage		34.6	0.557	501.04	15.0	0.147	499.88
S_8210B-DAMTOP-1	Dam Top		0.0			0.0		
S_8210B-OUTLET-1	Storage		34.6			15.0		
S_8212	Storage		23.4	0.007	509.44	10.6	0.003	508.56
S_8212-OUTLET-1	Storage Outlet		23.4			10.6		
S_8214	Storage	D-3	11.0	6.240	525.29	8.0	1.270	521.45
S_8214-DAMTOP-1	Dam Top		0.0			0.0		
S_8214-OUTLET-1	Storage Outlet		11.0			8.0		
S_8220A	Storage	D-4	57.5	0.359	499.20	22.2	0.011	497.12
S_8220B	Storage		47.0	0.941	503.52	16.8	0.377	501.87
S_8220B-DAMTOP-1	Dam Top		0.0			0.0		
S_8220B-OUTLET-1	Storage Outlet		47.0			16.8		
S_8222	Storage		20.3	0.001	515.85	6.1	0.000	514.75

Component No.	Type	Improvement ID	Proposed 100-year 2-hour Storm Event			Proposed 010-year 2-hour Storm Event		
			Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
S_8222-OUTLET-1	Storage Outlet		20.3			6.1		
S_8224	Storage		7.4	0.010	522.34	2.0	0.002	521.57
S_8224-OUTLET-1	Storage Outlet		7.4			2.0		
S_8225	Storage		5.3	9.008	556.08	1.7	4.661	555.18
S_8225-OUTLET-1	Storage Outlet		5.3			1.7		
S_8226	Storage		23.0	0.158	507.57	9.4	0.097	506.62
S_8226-OUTLET-1	Storage Outlet		23.0			9.4		
S_8227	Storage	D-5	3.5	1.339	525.55	1.5	0.322	522.45
S_8227-OUTLET-1	Storage Outlet		2.2			1.5		
S_8227-SPILL-1	Spillway		1.3			0.0		
S_8228	Storage	D-6	2.8	1.677	520.86	2.0	0.359	516.43
S_8228-OUTLET-1	Storage Outlet		2.8			2.0		
S_8228-SPILL-1	Spillway		0.0			0.0		
S_8229	Storage	D-7	2.4	0.996	520.62	1.7	0.190	517.34
S_8229-OUTLET-1	Storage Outlet		2.4			1.7		
S_8229-SPILL-1	Spillway		0.0			0.0		
S_8300	Storage		87.5	0.153	492.01	38.2	0.045	490.50
S_8320	Storage		46.1	6.973	505.74	26.2	2.231	500.21
S_8320-DAMTOP-1	Dam Top		0.0			0.0		
S_8320-OUTLET-1	Storage Outlet		46.1			26.2		
S_8322	Storage		97.6	0.100	512.11	34.7	0.016	509.77
S_8322-DAMTOP-1	Dam Top		24.4			0.0		
S_8322-OUTLET-1	Storage Outlet		73.2			34.7		
S_8324	Storage		99.1	0.035	517.07	36.6	0.002	514.62
S_8324-DAMTOP-1	Dam Top		0.0			0.0		
S_8324-OUTLET-1	Storage Outlet		99.1			36.6		

Existing Component No.	Proposed Component No.	Type	Compare Pro-Exist 100yr 2hr			Compare Pro-Exist 010yr 2hr		
			Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
1000	1000	Sub-basin	0.00			0.00		
1100	1100	Sub-basin	0.00			0.00		
1200	1200	Sub-basin	0.00			0.00		
1300	1300	Sub-basin	0.00			0.00		
1400	1400	Sub-basin	0.00			0.00		
1410	1410	Sub-basin	0.00			0.00		
2000	2000	Sub-basin	0.00			0.00		
2100	2100	Sub-basin	0.00			0.00		
3000	3000	Sub-basin	0.00			0.00		
3100	3100	Sub-basin	0.00			0.00		
4000	4000	Sub-basin	0.00			0.00		
4100	4100	Sub-basin	0.00			0.00		
4200	4200	Sub-basin	0.00			0.00		
5000	5000	Sub-basin	0.00			0.00		
5100	5100	Sub-basin	0.00			0.00		
6000	6000	Sub-basin	0.00			0.00		
6100	6100	Sub-basin	0.00			0.00		
6110	6110	Sub-basin	0.00			0.00		
6112	6112	Sub-basin	0.00			0.00		
6114	6114	Sub-basin	0.00			0.00		
6200	6200	Sub-basin	0.00			0.00		
6210	6210	Sub-basin	0.00			0.00		
6300	6300	Sub-basin	0.00			0.00		
6310	6310	Sub-basin	0.00			0.00		
6320	6320	Sub-basin	0.00			0.00		
6400	6400	Sub-basin	0.00			0.00		
6410	6410	Sub-basin	0.00			0.00		
6420	6420	Sub-basin	0.00			0.00		
6430	6430	Sub-basin	0.00			0.00		
6440	6440	Sub-basin	0.00			0.00		
6500	6500	Sub-basin	0.00			0.00		

Existing Component No.	Proposed Component No.	Type	Compare Pro-Exist 100yr 2hr			Compare Pro-Exist 010yr 2hr		
			Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
6510	6510	Sub-basin	0.00			0.00		
6600	6600	Sub-basin	0.00			0.00		
6610	6610	Sub-basin	0.00			0.00		
6612	6612	Sub-basin	0.00			0.00		
6614	6614	Sub-basin	0.00			0.00		
6616	6616	Sub-basin	0.00			0.00		
6617	6617	Sub-basin	0.00			0.00		
6620	6620	Sub-basin	0.00			0.00		
6630	6630	Sub-basin	0.00			0.00		
6632	6632	Sub-basin	0.00			0.00		
6634	6634	Sub-basin	0.00			0.00		
6635	6635	Sub-basin	0.00			0.00		
6636	6636	Sub-basin	0.00			0.00		
7000	7000	Sub-basin	0.00			0.00		
8000	8000	Sub-basin	0.00			0.00		
8100	8100	Sub-basin	0.00			0.00		
8110	8110	Sub-basin	0.00			0.00		
8111	8111	Sub-basin	0.00			0.00		
8112	8112	Sub-basin	0.00			0.00		
8113	8113	Sub-basin	0.00			0.00		
8114	8114	Sub-basin	0.00			0.00		
8116	8116	Sub-basin	0.00			0.00		
8118	8118	Sub-basin	0.00			0.00		
8119	8119	Sub-basin	0.00			0.00		
8120	8120	Sub-basin	0.00			0.00		
8130	8130	Sub-basin	0.00			0.00		
8132	8132	Sub-basin	0.00			0.00		
8134	8134	Sub-basin	0.00			0.00		
8140	8140	Sub-basin	0.00			0.00		
8150	8150	Sub-basin	0.00			0.00		
8160	8160	Sub-basin	0.00			0.00		

Existing Component No.	Proposed Component No.	Type	Compare Pro-Exist 100yr 2hr			Compare Pro-Exist 010yr 2hr		
			Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
8200	8200	Sub-basin	0.00			0.00		
8210	8210A	Sub-basin	-20.27			-6.10		
	8210B	Sub-basin						
8212	8212	Sub-basin	0.00			0.00		
8214	8214	Sub-basin	0.00			0.00		
8220	8220A	Sub-basin	-13.89			-4.30		
	8220B	Sub-basin						
8222	8222	Sub-basin	0.00			0.00		
8224	8224	Sub-basin	0.00			0.00		
8225	8225	Sub-basin	0.00			0.00		
8226	8226	Sub-basin	0.00			0.00		
8227	8227	Sub-basin	0.00			0.00		
8228	8228	Sub-basin	0.00			0.00		
8229	8229	Sub-basin	0.00			0.00		
8230	8230	Sub-basin	0.00			0.00		
8300	8300	Sub-basin	0.00			0.00		
8310	8310	Sub-basin	0.00			0.00		
8320	8320	Sub-basin	0.00			0.00		
8322	8322	Sub-basin	0.00			0.00		
8324	8324	Sub-basin	0.00			0.00		
J1000	J1000	Junction	0.00			0.00		
J2000	J2000	Junction	0.00			0.00		
J3000	J3000	Junction	0.00			0.00		
J4000	J4000	Junction	-0.05			0.08		
J5000	J5000	Junction	0.00			0.00		
J6000	J6000	Junction	0.00			0.00		
J6110	J6110	Junction	-5.42			-2.69		
J6300	J6300	Junction	0.00			0.00		
J6400	J6400	Junction	0.00			0.00		
J6500	J6500	Junction	0.00			0.00		
J6600	J6600	Junction	0.00			0.00		

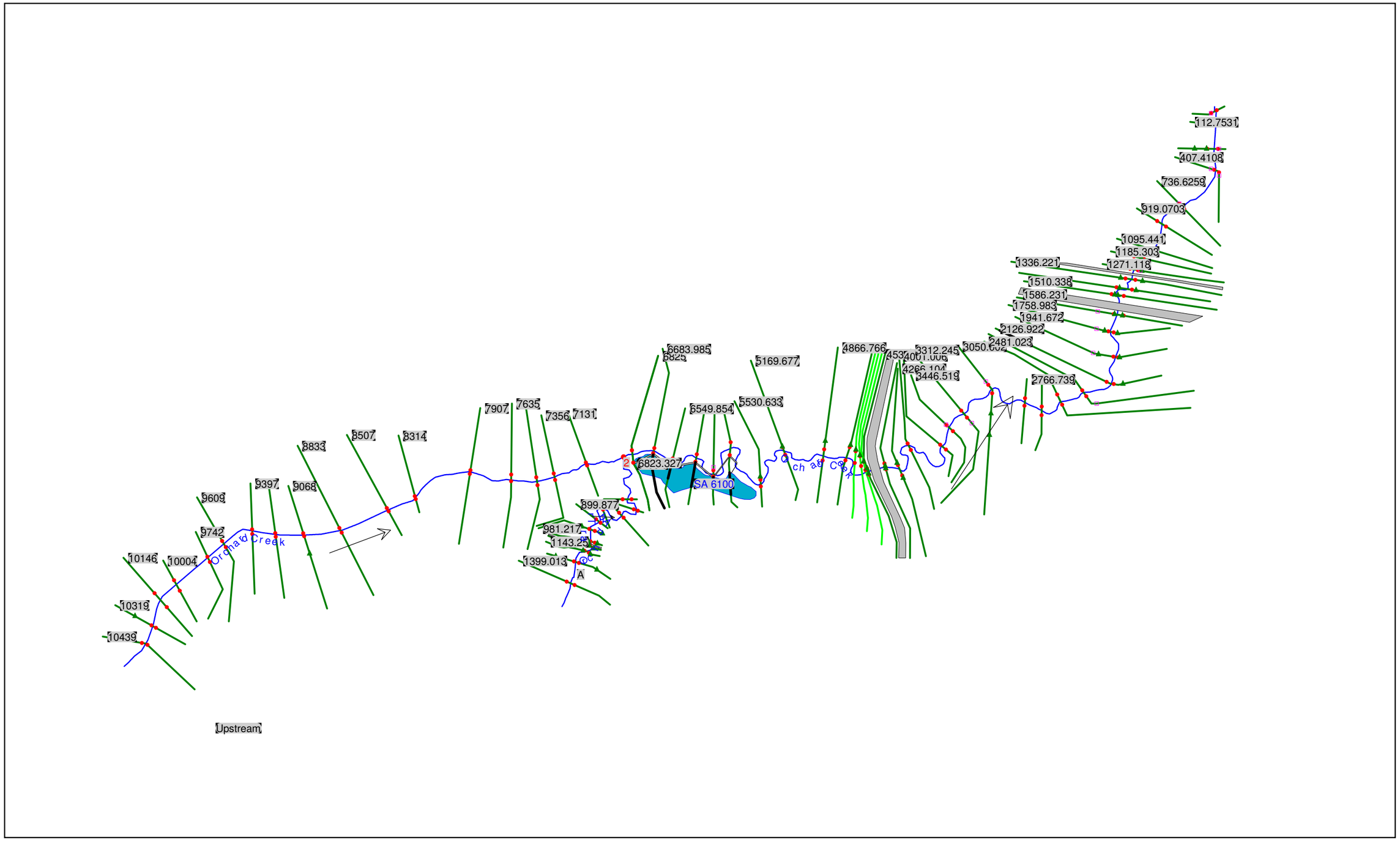
Existing Component No.	Proposed Component No.	Type	Compare Pro-Exist 100yr 2hr			Compare Pro-Exist 010yr 2hr		
			Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
J6610	J6610	Junction	-38.17			-14.10		
J6610_A	J6610_A	Junction	-35.74			-14.50		
J6610_B	J6610_B	Junction	-35.94			-14.03		
J7000	J7000	Junction	0.00			0.00		
J8110	J8110	Junction	-115.32			-30.55		
J8114	*J8114 removed*	Junction						
J8116	J8116	Junction	0.00			-0.03		
J8120	J8120	Junction	-49.46			-9.35		
J8130	J8130	Junction	0.00			0.00		
J8132	J8132	Junction	0.00			0.00		
J8140	J8140	Junction	0.00			0.00		
R6410	R6410	Reach	0.00			0.00		
R6440	R6440	Reach	0.00			0.00		
R8111	R8111	Reach	0.00			0.00		
R8112	R8112	Reach	0.00			0.00		
R8114	R8114	Reach	-47.40			-8.20		
R8116	R8116	Reach	0.00			0.00		
R8120	R8120	Reach	-0.01			-0.01		
R8130	R8130	Reach	0.00			0.00		
R8132	R8132	Reach	0.00			0.00		
R8140	R8140	Reach	0.00			0.00		
S_3100	S_3100	Storage	0.00	0.00	0.00	0.00	0.00	0.00
S_3100-OUTLET-1	S_3100-OUTLET-1	Storage Outlet	0.00			0.00		
S_4000	S_4000	Storage	0.03	0.07	0.07	0.08	0.06	0.11
S_4000-OUTLET-1	S_4000-OUTLET-1	Storage Outlet	0.03			0.08		
S_4200	S_4200	Storage	-2.80	-0.03	-0.52	-0.56	-0.17	-1.29
S_4200-DAMTOP-1	S_4200-DAMTOP-1	Dam Top	-13.07			-0.49		
S_4200-OUTLET-1	S_4200-OUTLET-1	Storage Outlet	-0.11			-0.07		
	S_4200-SPILL-1	Spillway						
	S_6114	Storage		0.27			0.11	
	S_6114-DAMTOP-1	Dam Top						

Existing Component No.	Proposed Component No.	Type	Compare Pro-Exist 100yr 2hr			Compare Pro-Exist 010yr 2hr		
			Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
	S_6114-OUTLET-1	Storage Outlet						
S_6410	S_6410	Storage	0.00	0.00	0.00	0.00	0.00	0.00
S_6410-DAMTOP-1	S_6410-DAMTOP-1	Dam Top	0.00			0.00		
S_6410-OUTLET-1	S_6410-OUTLET-1	Storage Outlet	0.00			0.00		
S_6612	S_6612	Storage	0.00	0.00	0.00	0.01	0.00	0.00
S_6612-OUTLET-1	S_6612-OUTLET-1	Storage Outlet	0.00			0.01		
S_6614	S_6614	Storage	0.00	0.00	0.00	0.00	0.00	0.00
S_6614-OUTLET-1	S_6614-OUTLET-1	Storage Outlet	0.00			0.00		
S_6616	S_6616	Storage	-31.90	-0.34	-2.17	-13.92	0.00	-1.24
S_6616-DAMTOP-1	S_6616-DAMTOP-1	Dam Top	-10.96			0.00		
S_6616-OUTLET-1	S_6616-OUTLET-1	Storage Outlet	-20.94			-13.92		
S_6617	S_6617	Storage	-33.67	2.83	-0.57	-12.34	1.33	-0.58
S_6617-DAMTOP-1	S_6617-DAMTOP-1	Dam Top	-10.73			0.00		
S_6617-OUTLET-1	S_6617-OUTLET-1	Storage Outlet	-25.93			-12.34		
	S_6617-SPILL-1	Spillway						
S_6630	S_6630	Storage	-2.63	-0.10	-0.02	-3.41	-0.61	-0.21
S_6630-DAMTOP-1	S_6630-DAMTOP-1	Dam Top	-2.59			0.00		
S_6630-OUTLET-1	S_6630-OUTLET-1	Storage Outlet	-0.04			-3.41		
S_6632	S_6632	Storage	-1.05	-0.25	-0.09	-4.34	-0.44	-0.22
S_6632-OUTLET-1	S_6632-OUTLET-1	Storage Outlet	-1.05			-4.34		
S_6634	S_6634	Storage	0.00	0.00	0.00	0.00	0.00	0.00
S_6634-OUTLET-1	S_6634-OUTLET-1	Storage Outlet	0.00			0.00		
S_8000	S_8000	Storage	-190.91	-7.98	-2.61	-62.97	-5.32	-2.24
S_8000-DAMTOP-1	S_8000-DAMTOP-1	Dam Top	-25.00			0.00		
S_8000-SPILL-1	S_8000-SPILL-1	Spillway	-165.91			-62.97		
	S_8110	Storage		5.29			2.74	
	S_8110-OUTLET-1	Storage Outlet						
	S_8110-SPILL-1	Spillway						
	S_8114	Storage		3.53			0.71	
	S_8114-DAMTOP-1	Dam Top						
	S_8114-OUTLET-1	Storage Outlet						

Existing Component No.	Proposed Component No.	Type	Compare Pro-Exist 100yr 2hr			Compare Pro-Exist 010yr 2hr		
			Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
S_8118	S_8118	Storage	0.00	0.00	0.00	-0.03	0.00	0.00
S_8118-DAMTOP-1	S_8118-DAMTOP-1	Dam Top	0.00			-0.04		
S_8118-OUTLET-1	S_8118-OUTLET-1	Storage Outlet	0.00			0.01		
S_8150	S_8150	Storage	0.00	0.00	0.00	0.00	0.00	0.00
S_8150-OUTLET-1	S_8150-OUTLET-1	Storage Outlet	0.00			0.00		
S_8160	S_8160	Storage	0.00	0.00	0.00	0.00	0.00	0.00
S_8200	S_8200	Storage	-42.72	-2.43	-2.43	-27.56	0.26	-0.75
S_8210	S_8210A	Storage	-39.73		-2.23	-14.08		-0.56
	S_8210B	Storage		0.56			0.15	
	S_8210B-DAMTOP-1	Dam Top						
	S_8210B-OUTLET-1	Storage Outlet						
S_8212	S_8212	Storage	-46.02	-0.17	-4.14	-13.94	0.00	-0.96
S_8212-OUTLET-1	S_8212-OUTLET-1	Storage Outlet	-46.02			-13.94		
S_8214	S_8214	Storage	-49.26	4.74	3.18	-13.03	0.85	2.36
	S_8214-DAMTOP-1	Dam Top						
S_8214-OUTLET-1	S_8214-OUTLET-1	Storage Outlet	-49.26			-13.03		
S_8220	S_8220A	Storage	-19.73		-2.66	-14.45		-0.58
	S_8220B	Storage		0.94			0.38	
	S_8220B-DAMTOP-1	Dam Top						
	S_8220B-OUTLET-1	Storage Outlet						
S_8222	S_8222	Storage	0.00	0.00	0.00	0.00	0.00	0.00
S_8222-OUTLET-1	S_8222-OUTLET-1	Storage Outlet	0.00			0.00		
S_8224	S_8224	Storage	0.00	0.00	0.00	0.00	0.00	0.00
S_8224-OUTLET-1	S_8224-OUTLET-1	Storage Outlet	0.00			0.00		
S_8225	S_8225	Storage	0.00	0.00	0.00	0.00	-0.01	0.00
S_8225-OUTLET-1	S_8225-OUTLET-1	Storage Outlet	0.00			0.00		
S_8226	S_8226	Storage	-36.78	-0.56	-8.17	-10.64	-0.05	-0.77
S_8226-OUTLET-1	S_8226-OUTLET-1	Storage Outlet	-36.78			-10.64		
S_8227	S_8227	Storage	-14.84	1.34	3.06	-3.51	0.32	1.31
S_8227-OUTLET-1	S_8227-OUTLET-1	Storage Outlet	-16.09			-3.51		
	S_8227-SPILL-1	Spillway						

Existing Component No.	Proposed Component No.	Type	Compare Pro-Exist 100yr 2hr			Compare Pro-Exist 010yr 2hr		
			Discharge (cfs)	Storage (acre-ft)	Elevation (ft)	Discharge (cfs)	Storage (acre-ft)	Elevation (ft)
S_8228	S_8228	Storage	-19.80	1.68	5.93	-4.14	0.36	3.20
S_8228-OUTLET-1	S_8228-OUTLET-1	Storage Outlet	-19.80			-4.14		
	S_8228-SPILL-1	Spillway						
S_8229	S_8229	Storage	-12.18	0.99	4.16	-2.27	0.19	2.05
S_8229-OUTLET-1	S_8229-OUTLET-1	Storage Outlet	-12.18			-2.27		
	S_8229-SPILL-1	Spillway						
S_8300	S_8300	Storage	-84.69	-0.38	-1.08	-30.35	-0.06	-0.95
S_8320	S_8320	Storage	-78.68	6.36	1.67	-25.10	2.23	0.57
S_8320-DAMTOP-1	S_8320-DAMTOP-1	Dam Top	0.00			0.00		
S_8320-OUTLET-1	S_8320-OUTLET-1	Storage Outlet	-78.68			-25.10		
S_8322	S_8322	Storage	0.00	0.00	0.00	-0.01	0.00	0.00
S_8322-DAMTOP-1	S_8322-DAMTOP-1	Dam Top	0.00			0.00		
S_8322-OUTLET-1	S_8322-OUTLET-1	Storage Outlet	0.00			-0.01		
S_8324	S_8324	Storage	0.00	0.00	0.00	-0.05	0.00	0.00
S_8324-DAMTOP-1	S_8324-DAMTOP-1	Dam Top	0.00			0.00		
S_8324-OUTLET-1	S_8324-OUTLET-1	Storage Outlet	0.00			-0.05		

Appendix D: HEC-RAS Model Input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1941.672
2126.922
2481.023
3050.602
3312.245
4866.766
4534
4001.006
4266.104
3446.519
2766.739
6683.985
6825
5169.677
5530.633
6549.854
7907
7635
7356
7131
8507
8314
8833
9397
9068
9609
9742
10146
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10439
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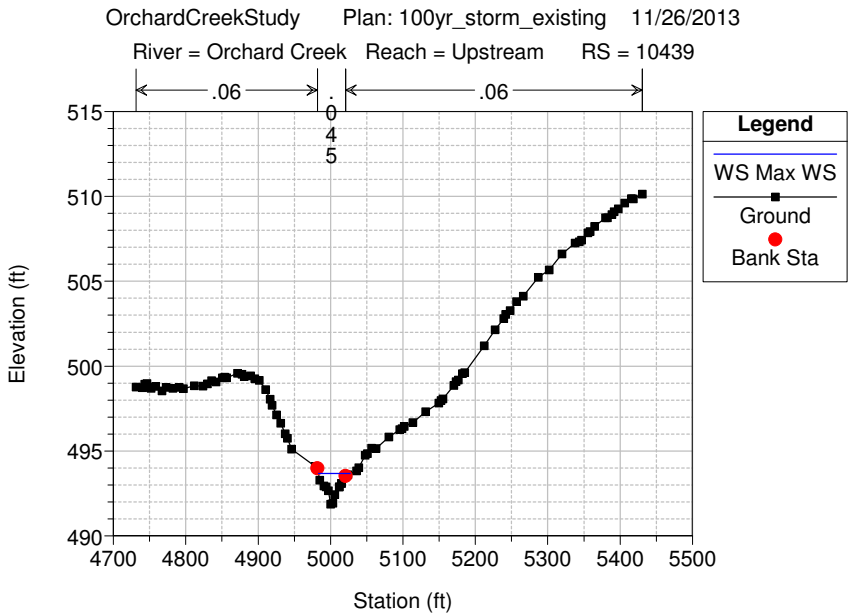
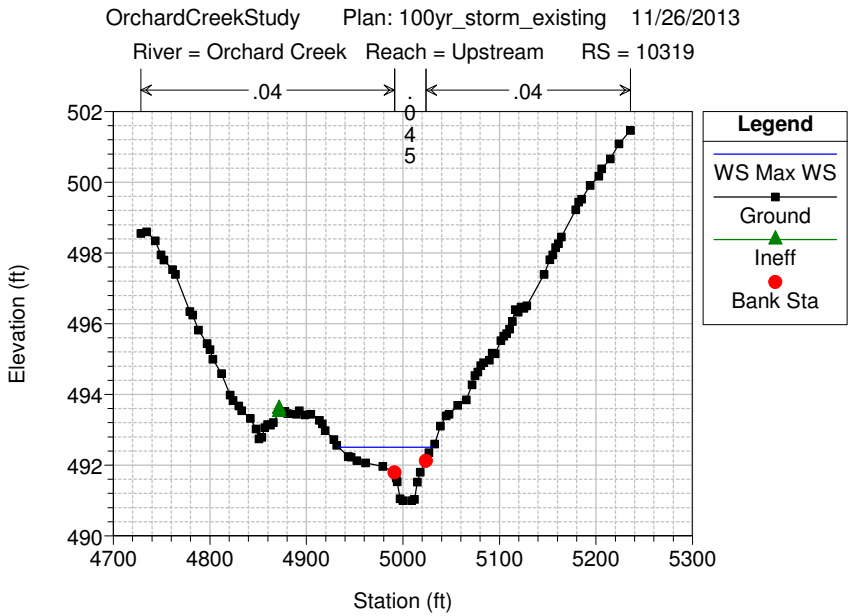
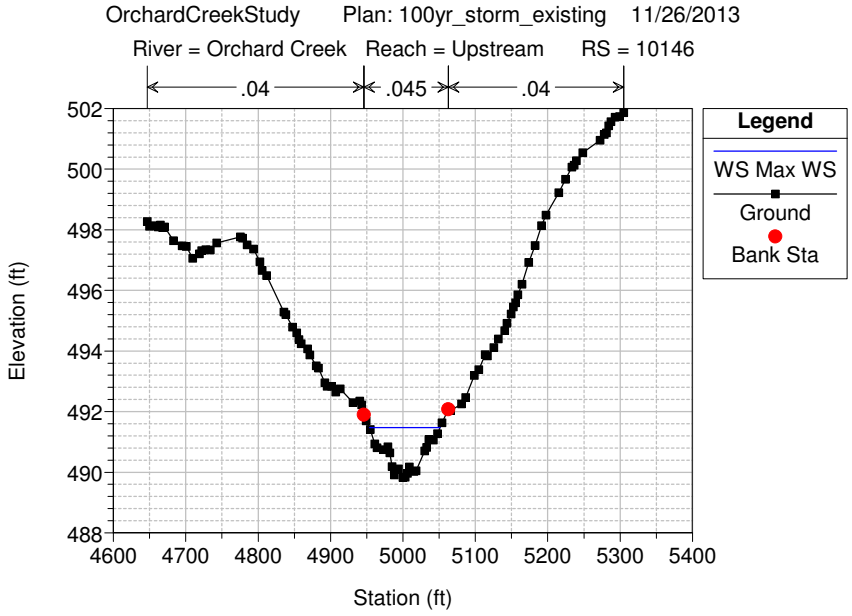
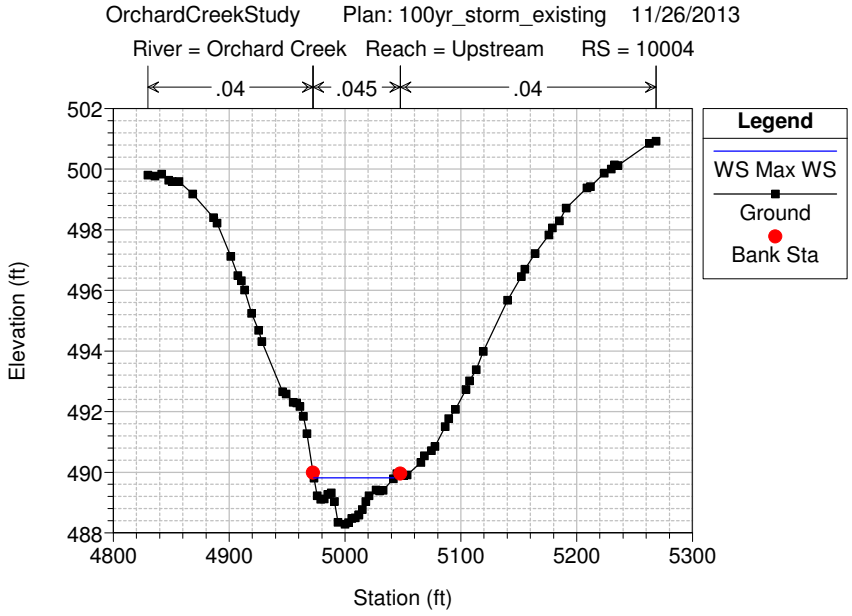
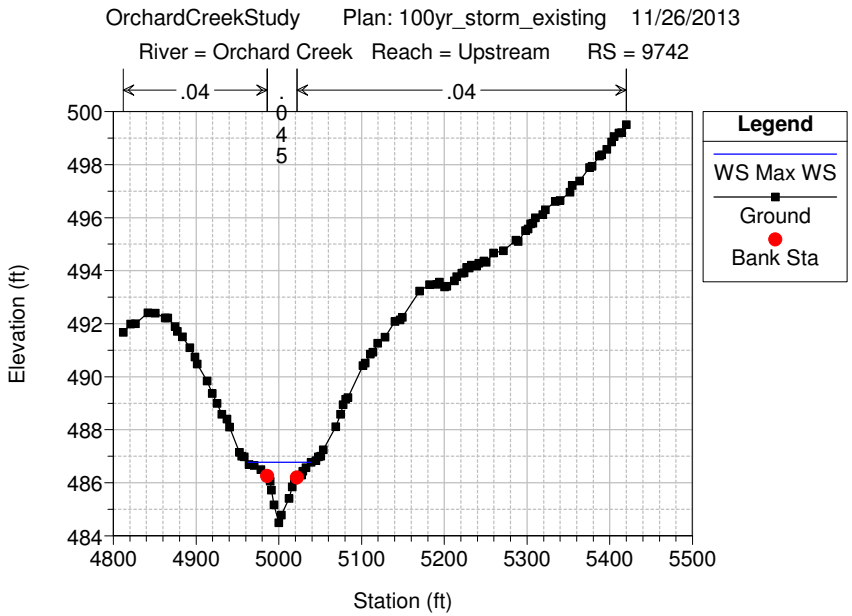
SA 6100
899.877
981.217
1143.25
1399.013
Orchard Creek
Upstream

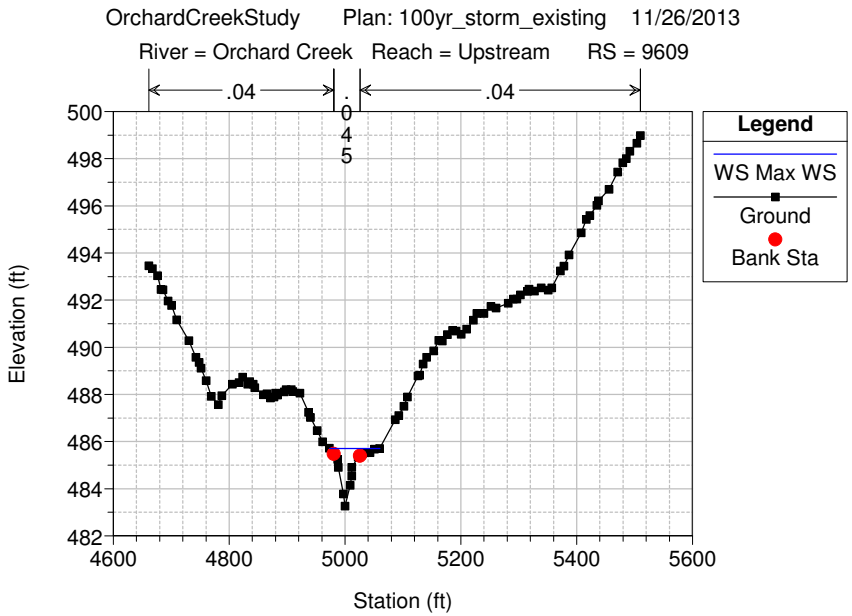

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 10439
.06
.045
.06
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)


OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 10319
.04
.045
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 10146
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)


OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 10004
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)


OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 9742
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
500
498
496
494
492
490
488
486
484
4800
4900
5000
5100
5200
5300
5400
5500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River = Orchard Creek Reach = Upstream RS = 9609
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
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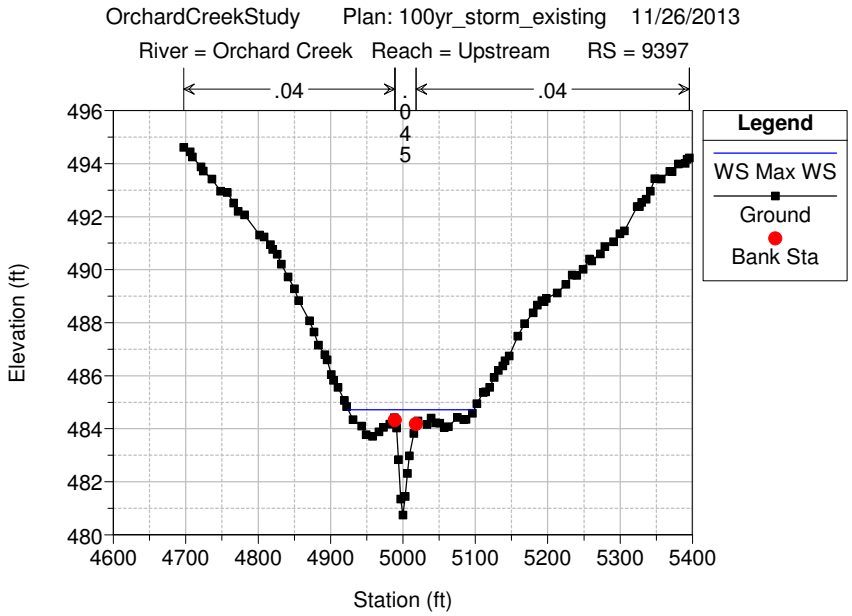
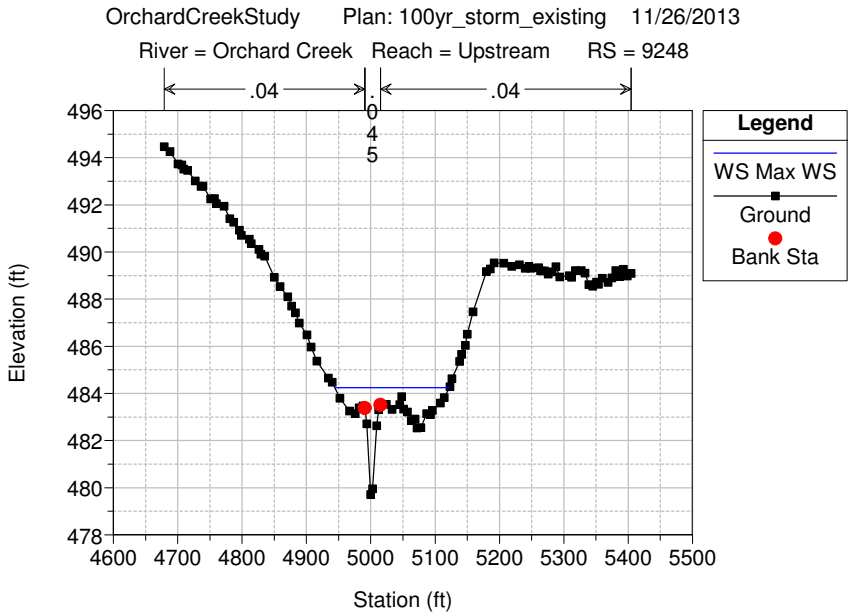
498
496
494
492
490
488
486
484
482
4600
4800
5000
5200
5400
5600


OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 9397
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
496
494
492
490
488
486
484
482
480
4600
4700
4800
4900
5000
5100
5200
5300
5400


OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 9248
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
496
494
492
490
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486
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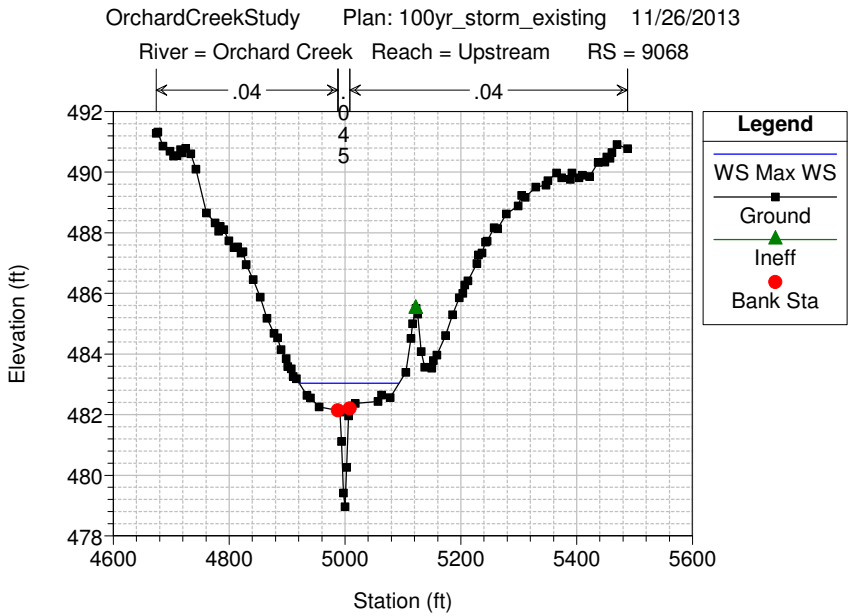
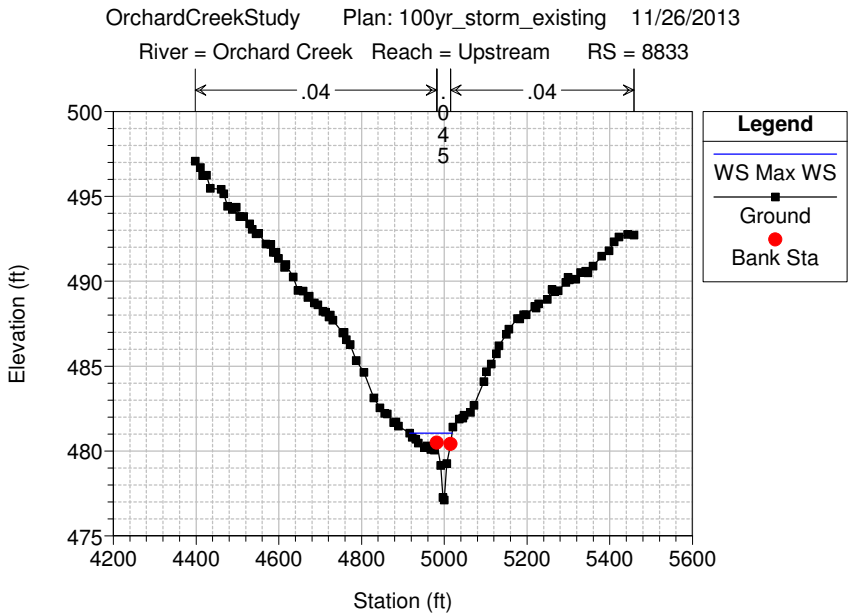
482
480
478
4600
4700
4800
4900
5000
5100
5200
5300
5400
5500


OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 9068
.04
.04
0
4
5
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
492
490
488
486
484
482
480
478
4600
4800
5000
5200
5400
5600


OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 8833
.04
.04
0
4
5
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
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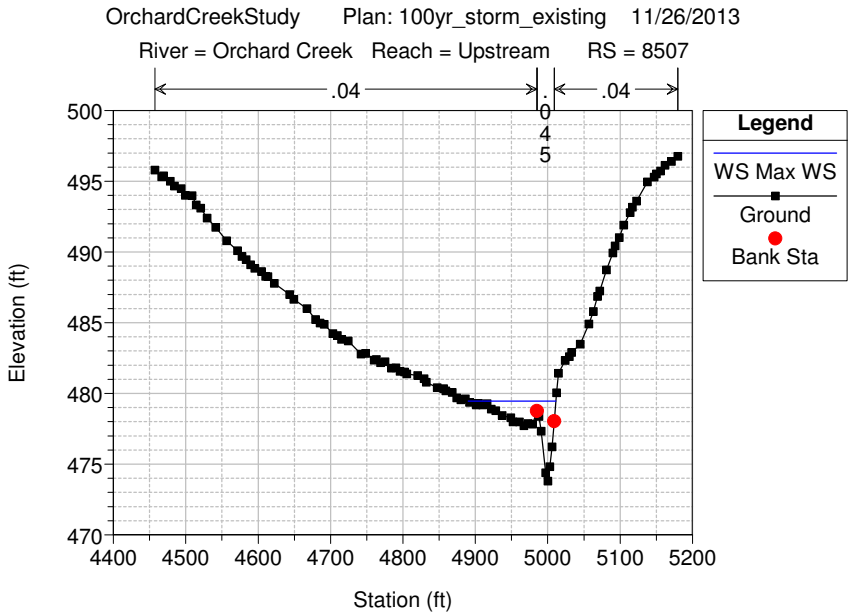
495
490
485
480
475
4200
4400
4600
4800
5000
5200
5400
5600


OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 8507
.04
.04
0
4
5
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
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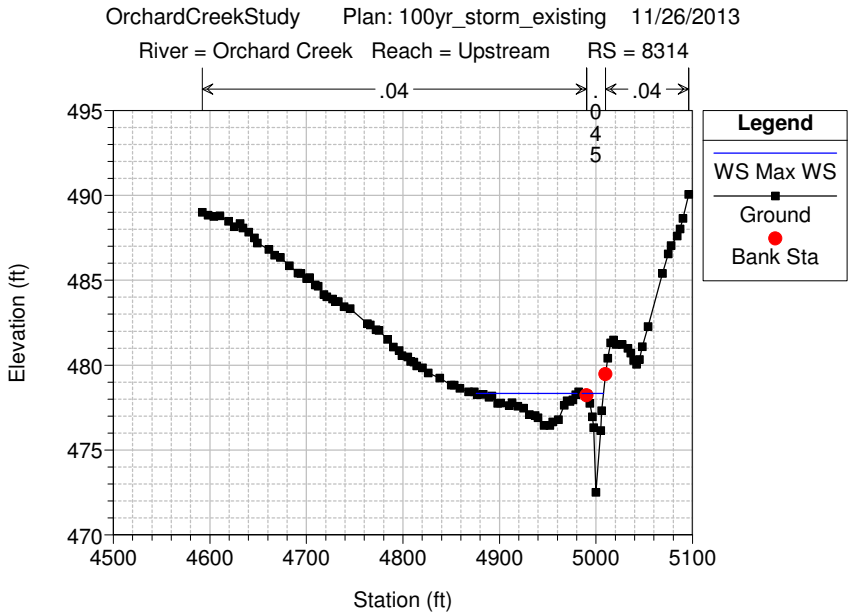
485
480
475
470
4400
4500
4600
4700
4800
4900
5000
5100
5200


OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 8314
.04
.04
0
4
5
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
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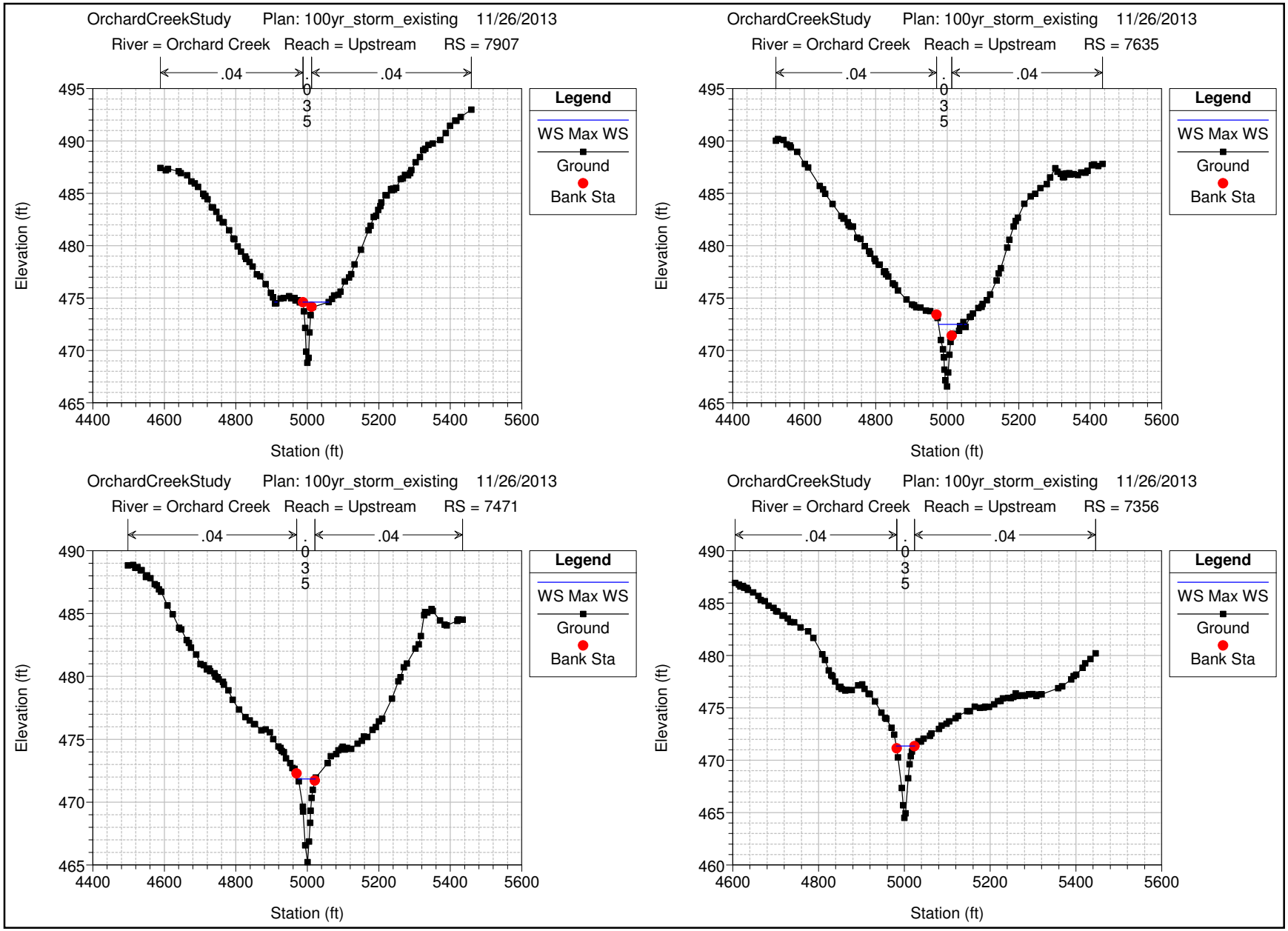
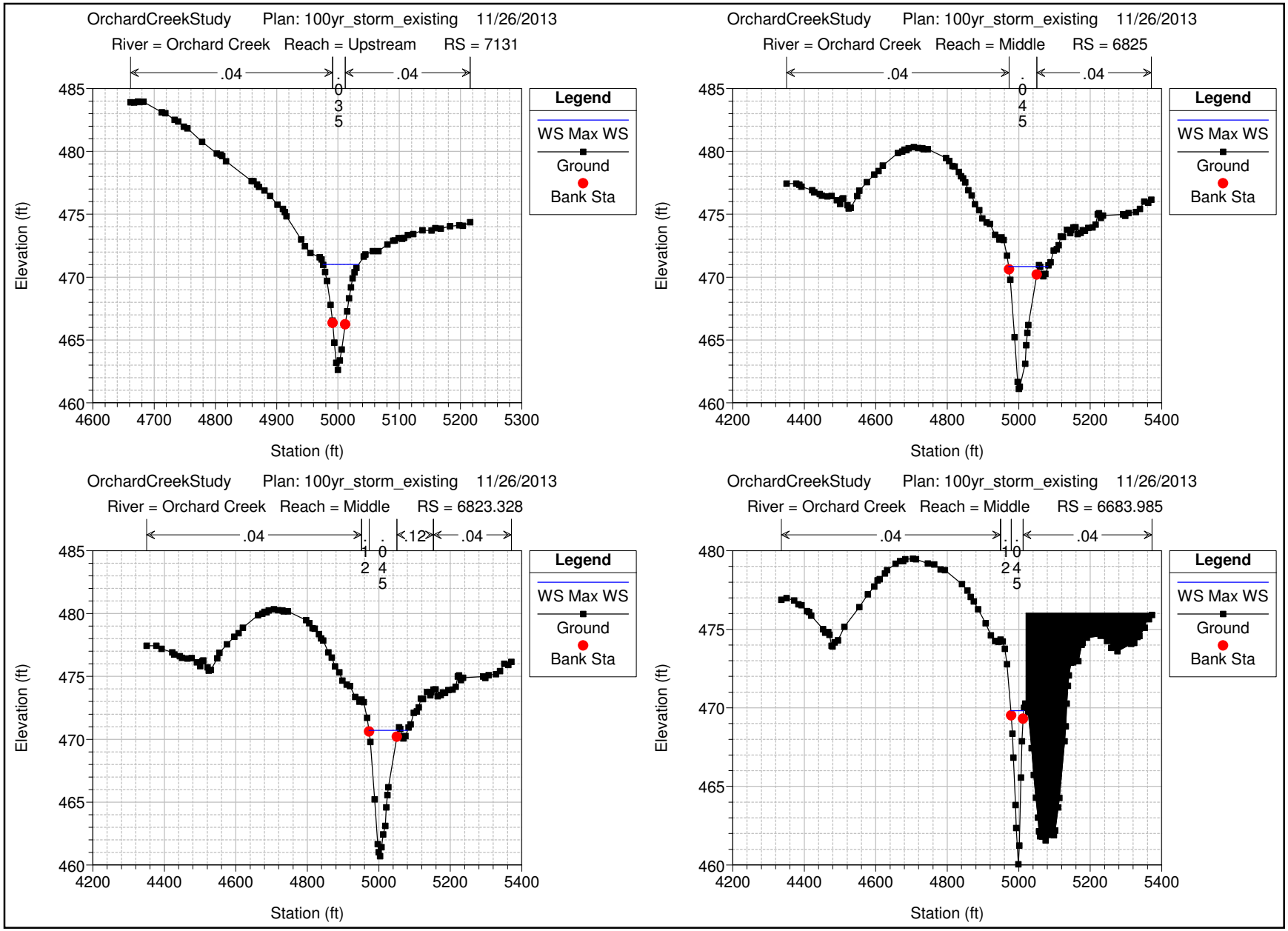
490
485
480
475
470
4500
4600
4700
4800
4900
5000
5100


OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 7907
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 7635
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 7471
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Upstream RS = 7356
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)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River = Orchard Creek Reach = Upstream RS = 7131
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.04
.035
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 6825
.04
.04
.045
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 6823.328
.04
.12
.04
.1
.045
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 6683.985
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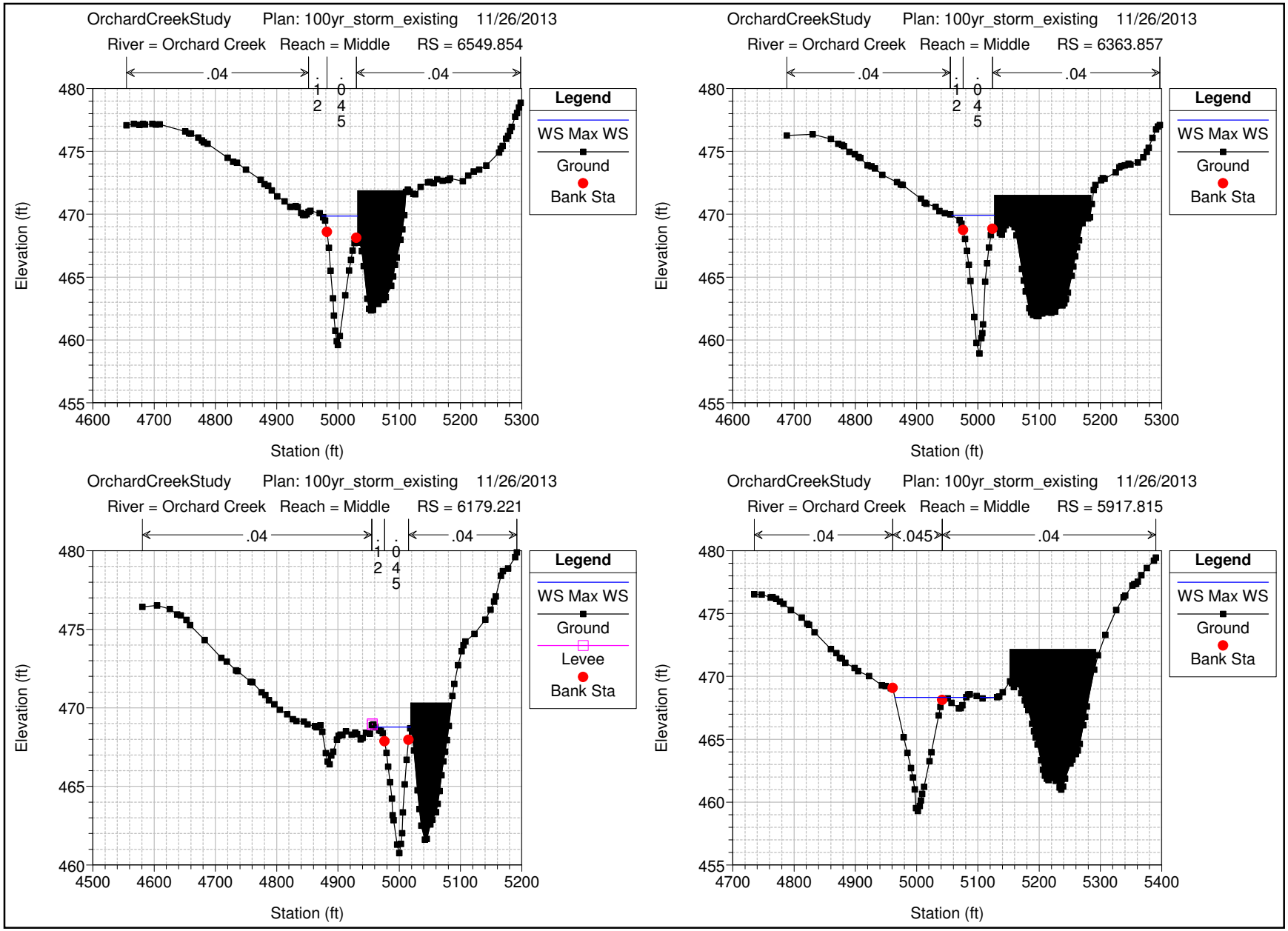
.04
.1
.045
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)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River = Orchard Creek Reach = Middle RS = 6549.854
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.12
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 6363.857
.04
.12
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 6179.221
.04
.12
.045
.04
Legend
WS Max WS
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 5917.815
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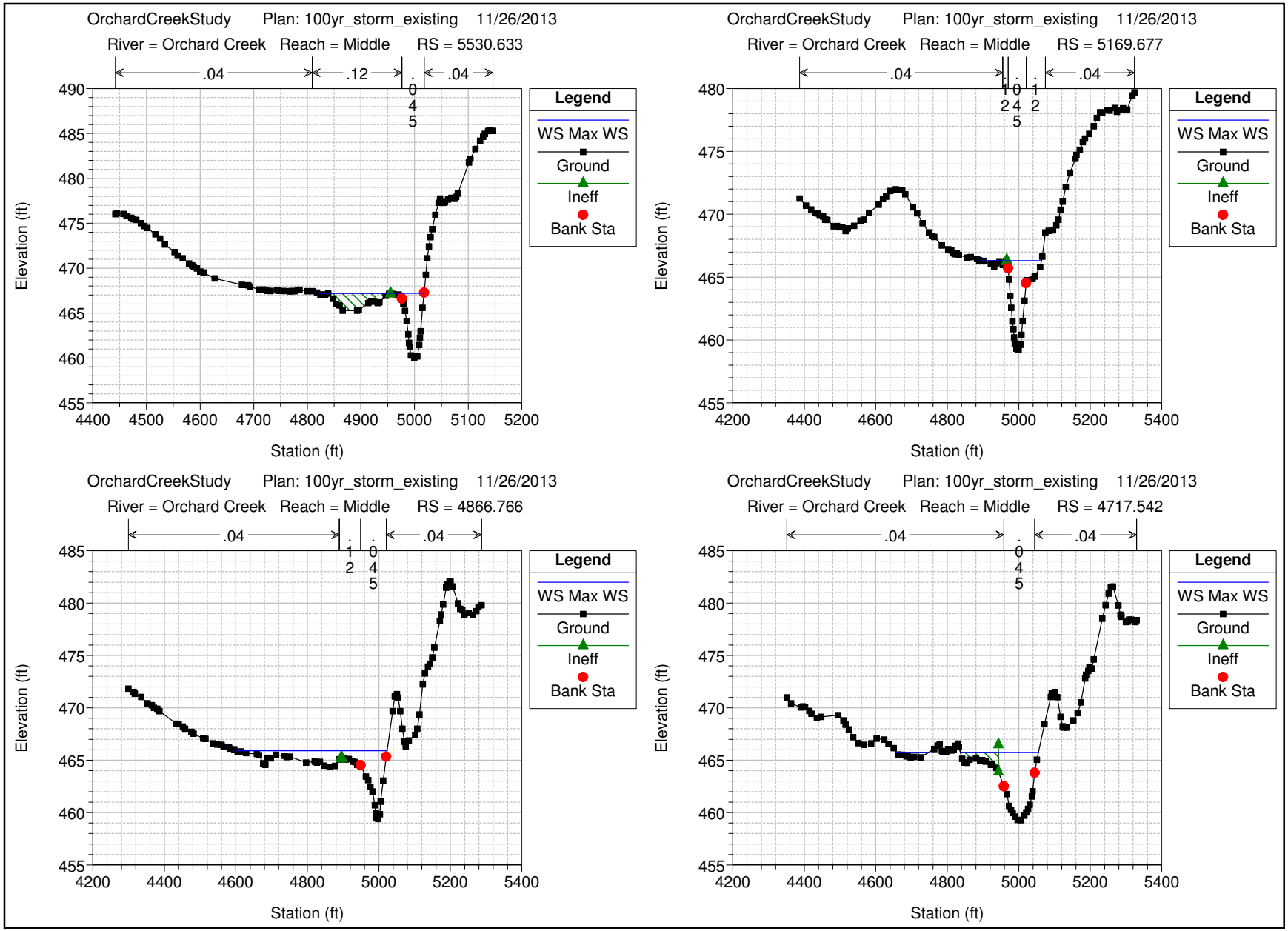
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)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River = Orchard Creek Reach = Middle RS = 5530.633
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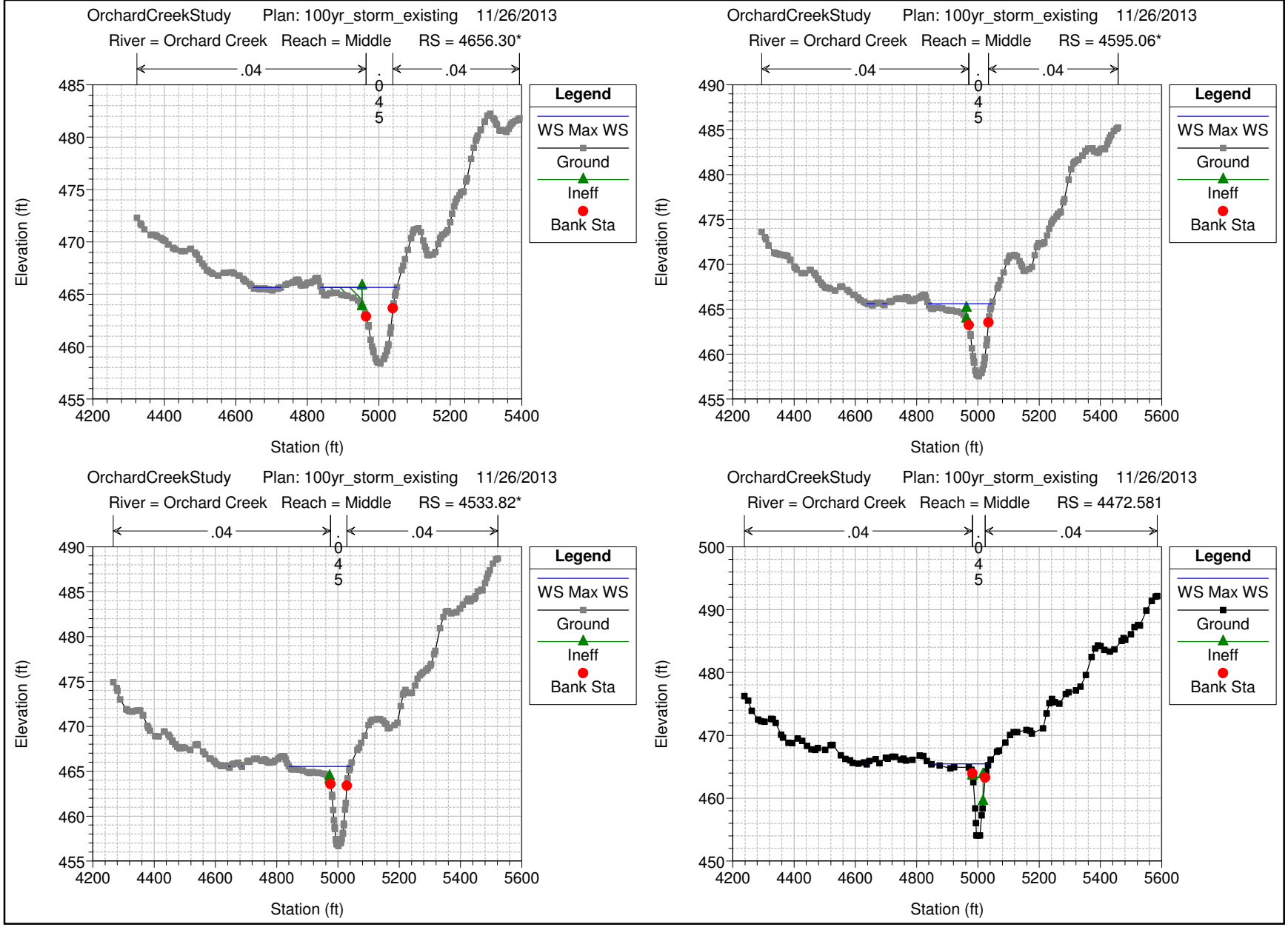
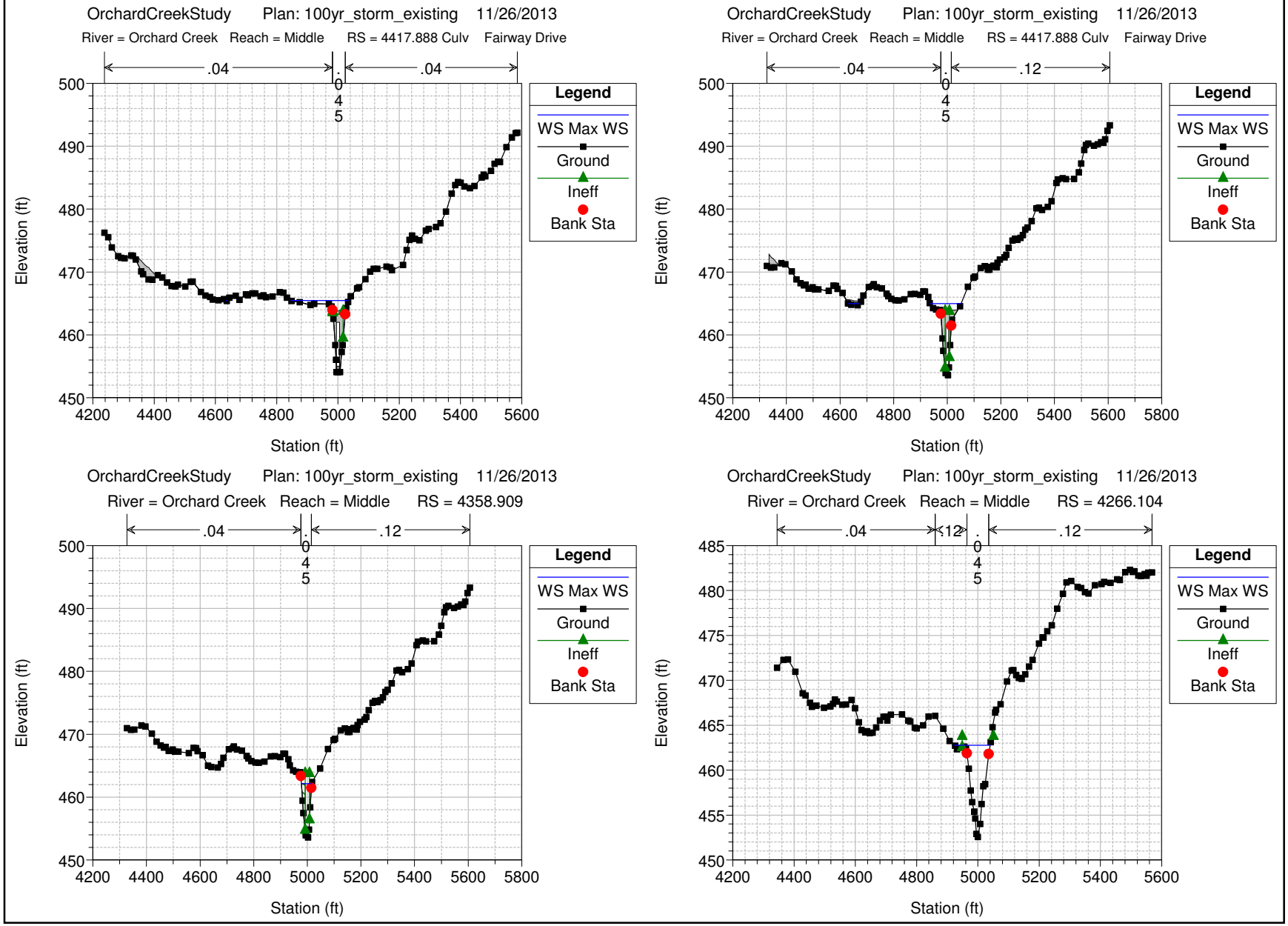
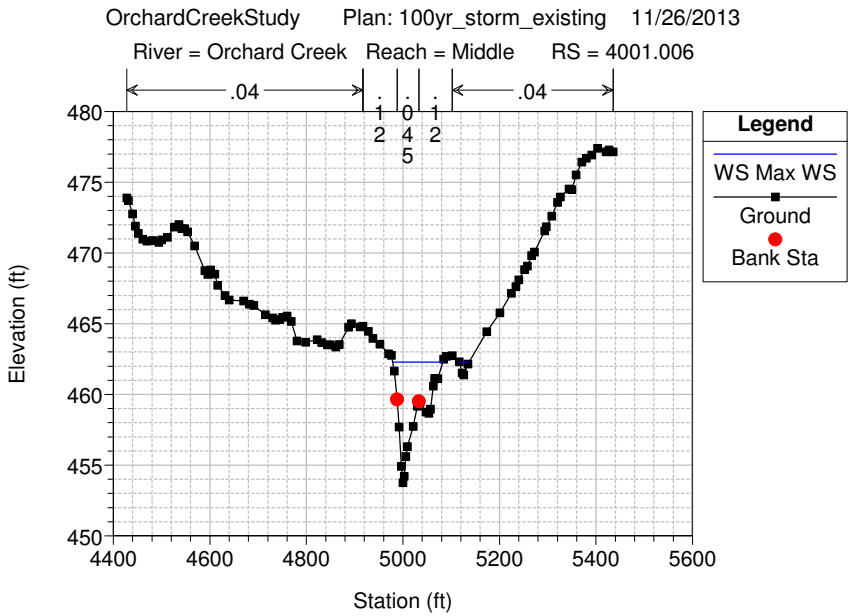
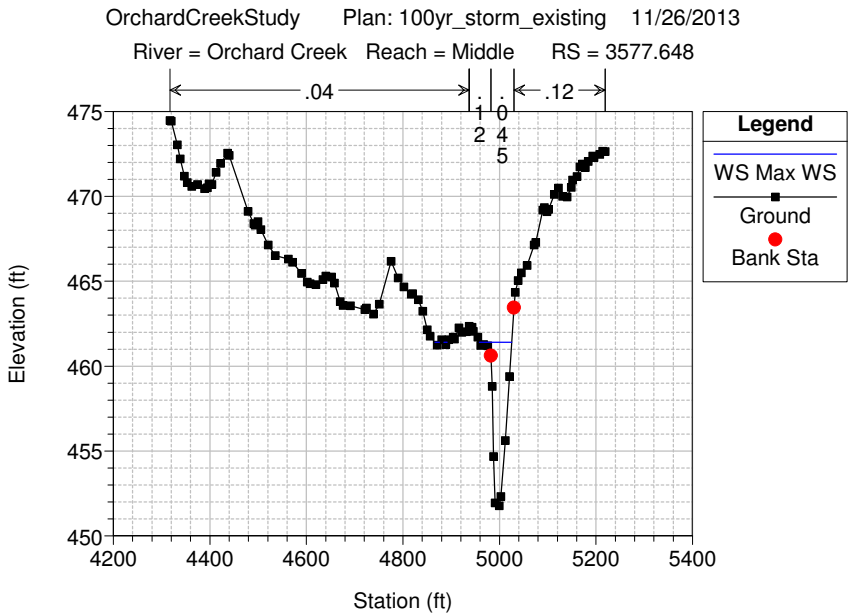
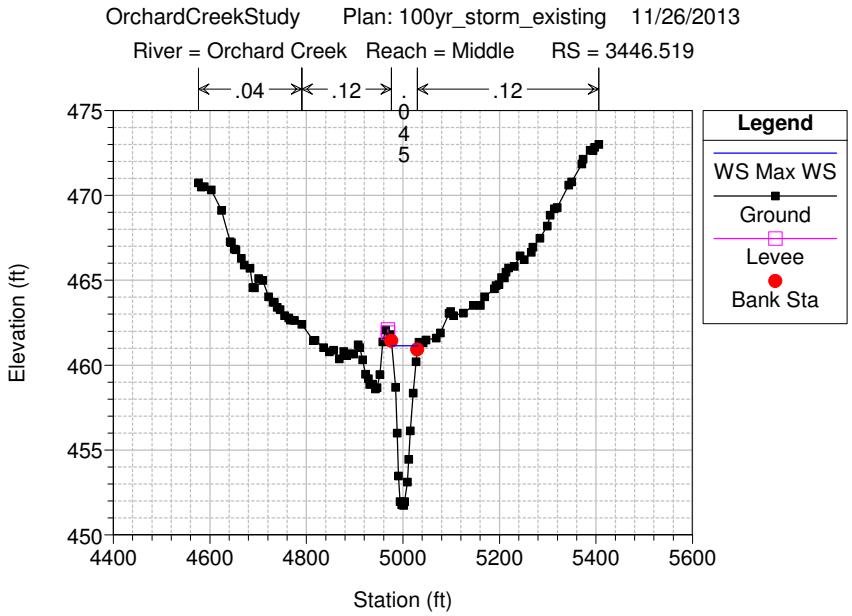
.12
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 5169.677
.04
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 4866.766
.04
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 4717.542
.04
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

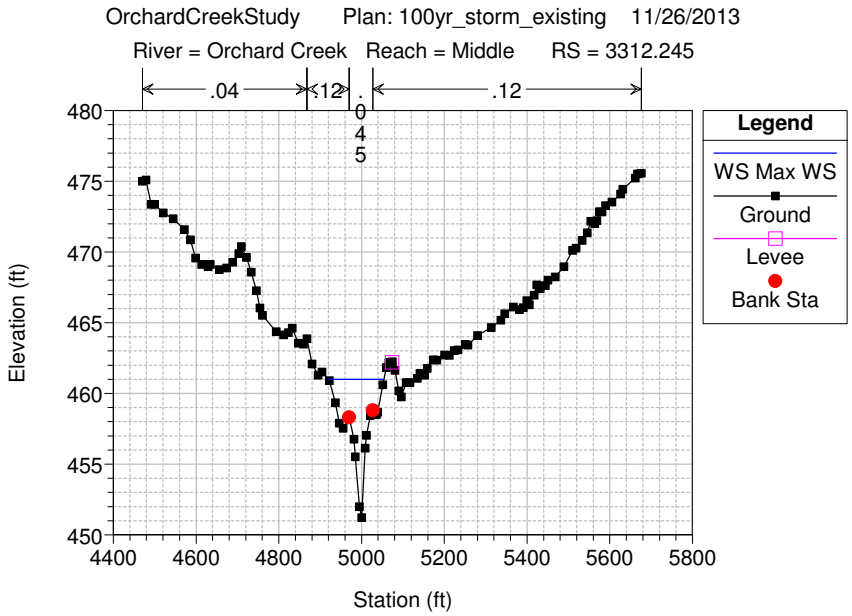

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 4656.30*
.04
.045
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 4595.06*
.04
.045
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 4533.82*
.04
.045
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 4472.581
.04
.045
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

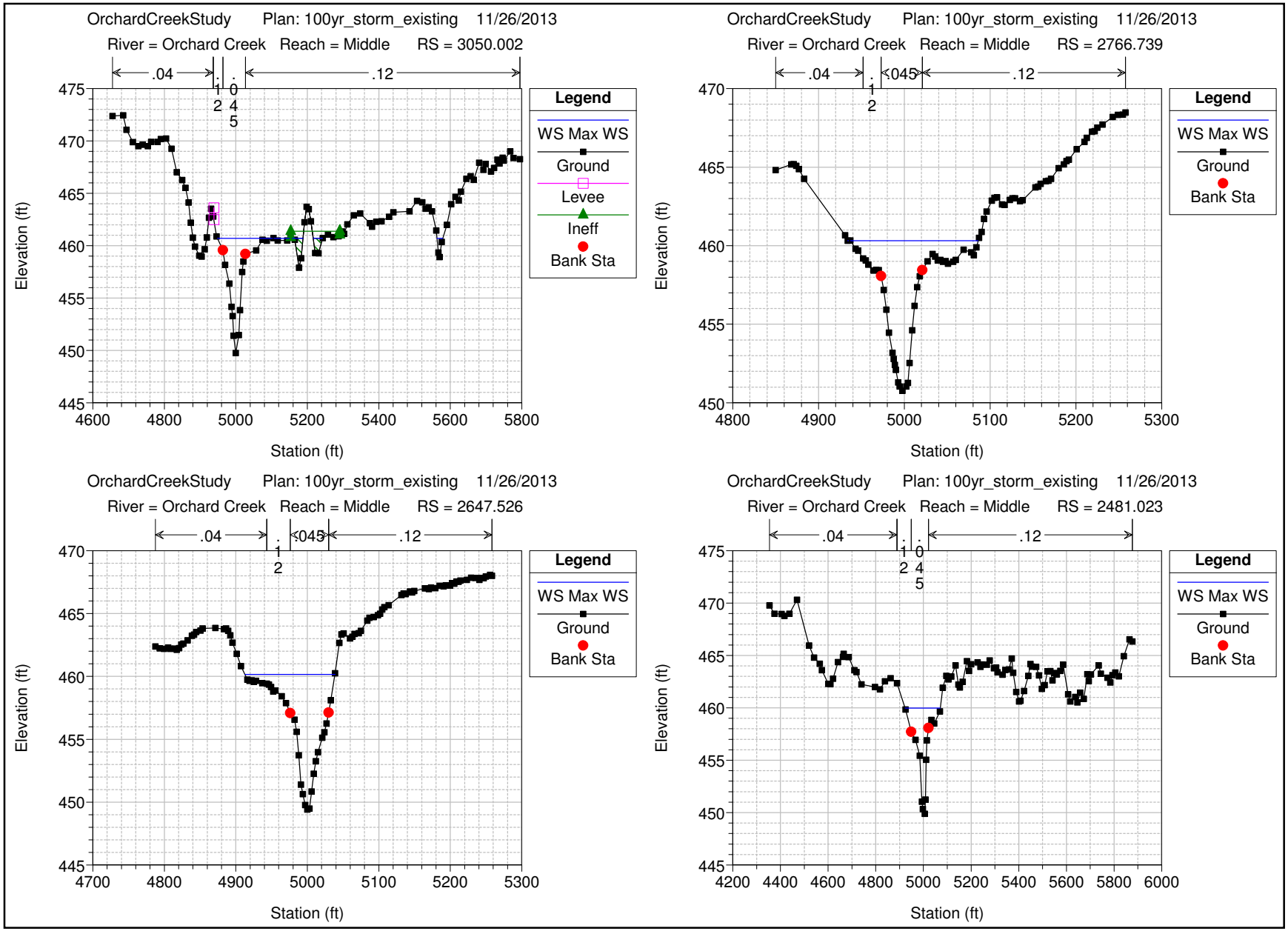

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 4417.888 Culv Fairway Drive
.04
.045
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 4417.888 Culv Fairway Drive
.04
.045
.12
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 4358.909
.04
.045
.12
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 4266.104
.04
.12
.045
.12
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

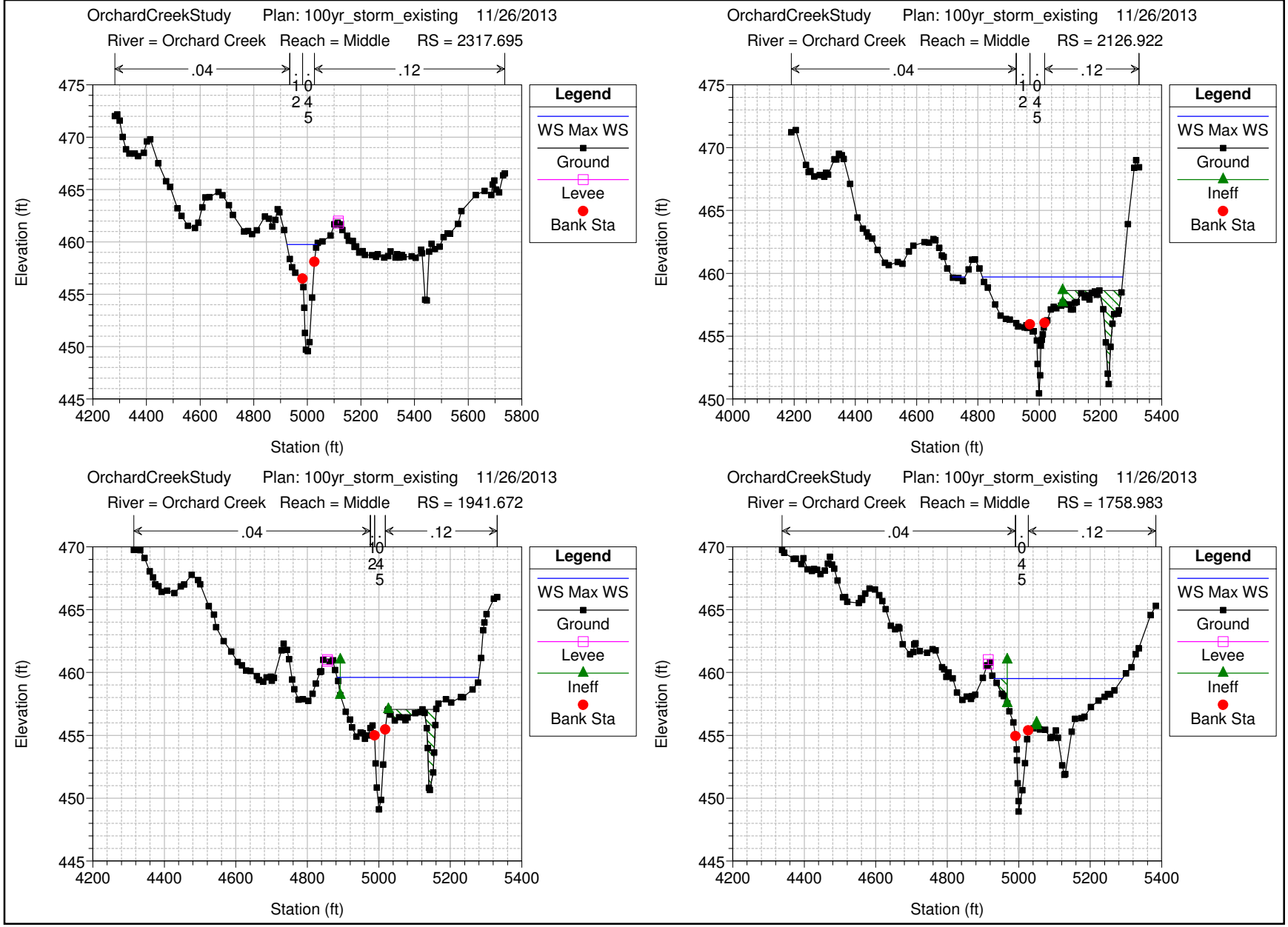

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 4001.006
.04
.12
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
480
475
470
465
460
455
450
4400
4600
4800
5000
5200
5400
5600

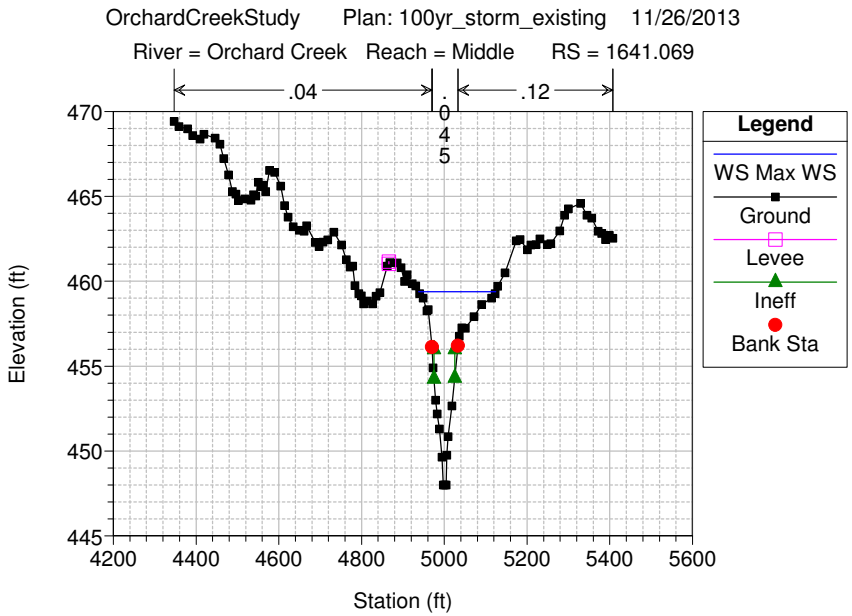

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 3577.648
.04
.12
.045
.12
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
475
470
465
460
455
450
4200
4400
4600
4800
5000
5200
5400

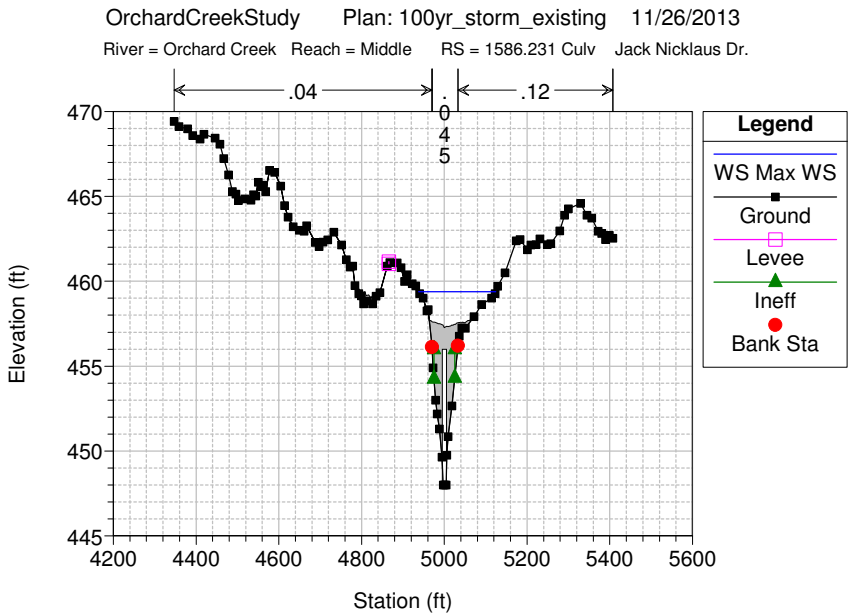

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 3446.519
.04
.12
.045
.12
Legend
WS Max WS
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
475
470
465
460
455
450
4400
4600
4800
5000
5200
5400
5600

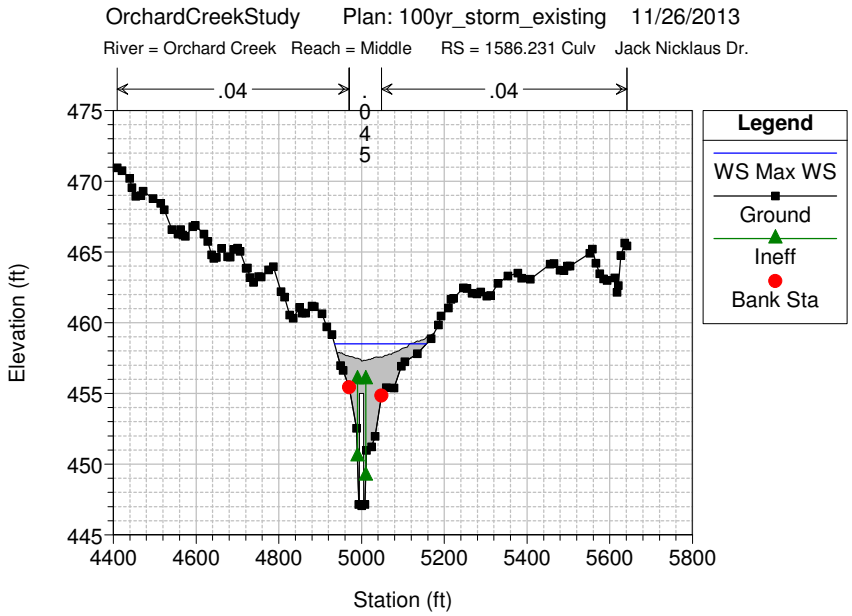

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 3312.245
.04
.12
.045
.12
Legend
WS Max WS
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
480
475
470
465
460
455
450
4400
4600
4800
5000
5200
5400
5600
5800

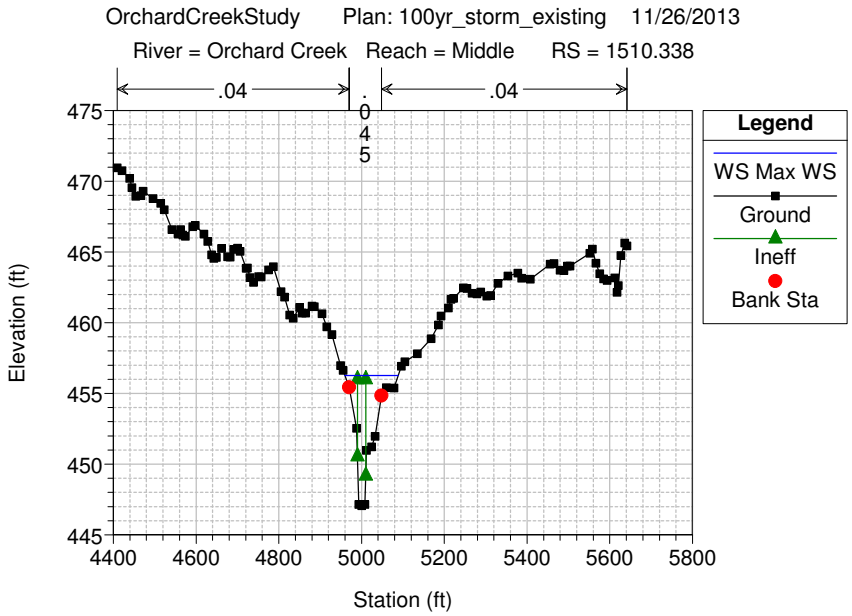

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 3050.002
.04
.12
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 2766.739
.04
.045
.12
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 2647.526
.04
.045
.12
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 2481.023
.04
.12
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)

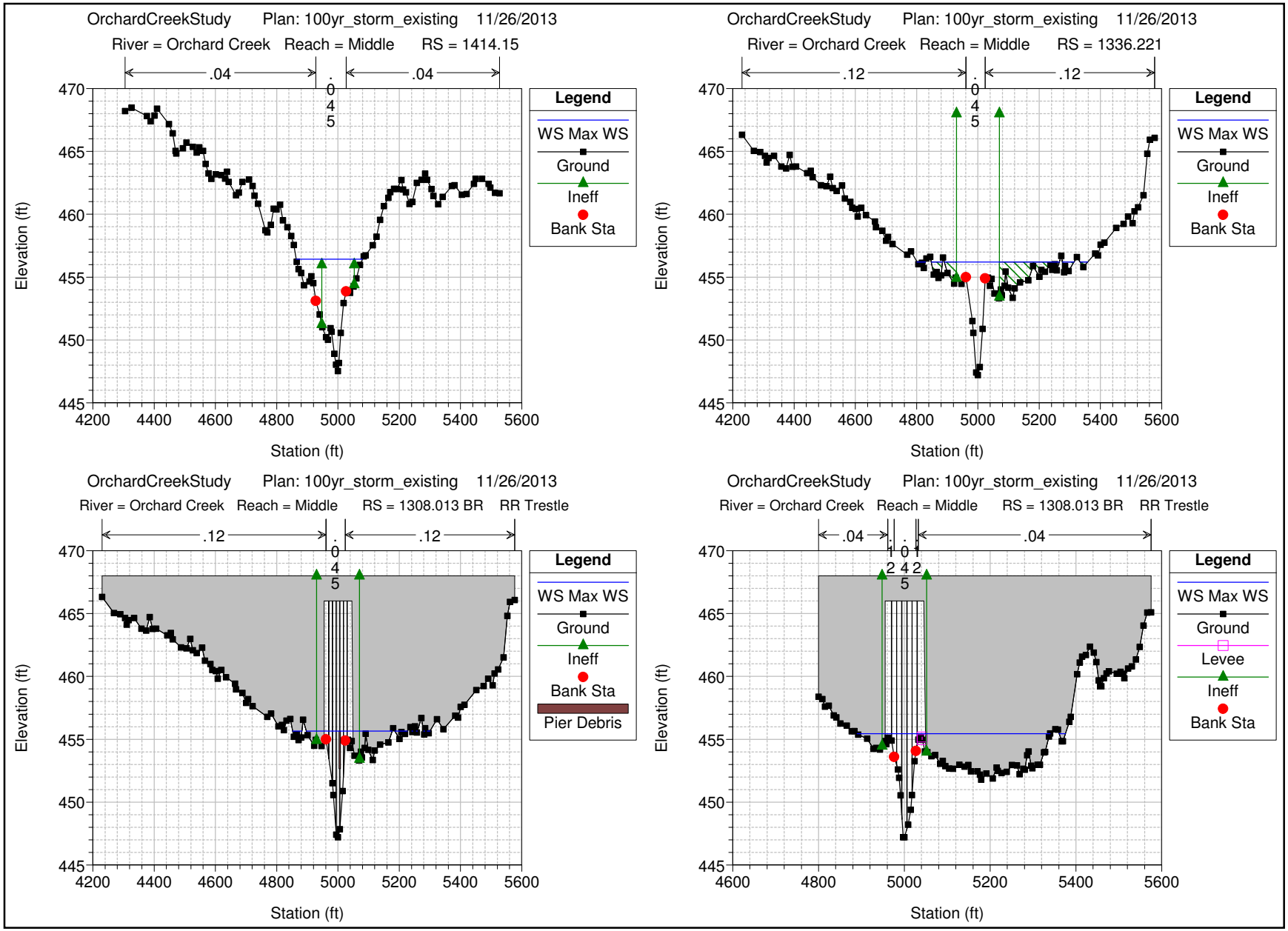

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 2317.695
.04
.12
Legend
WS Max WS
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 2126.922
.04
.12
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 1941.672
.04
.12
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 1758.983
.04
.12
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

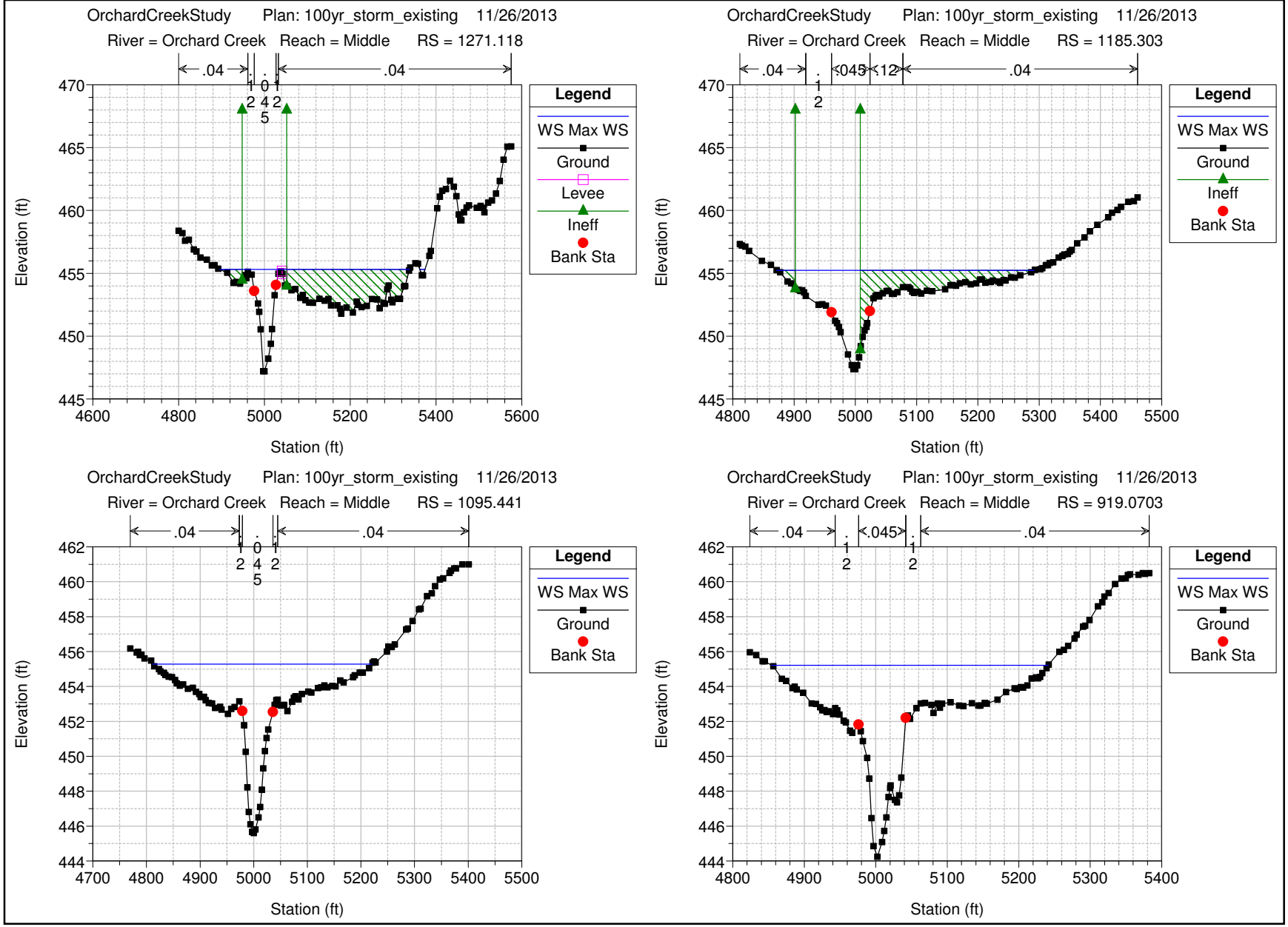

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 1641.069
.04
.045
.12
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta

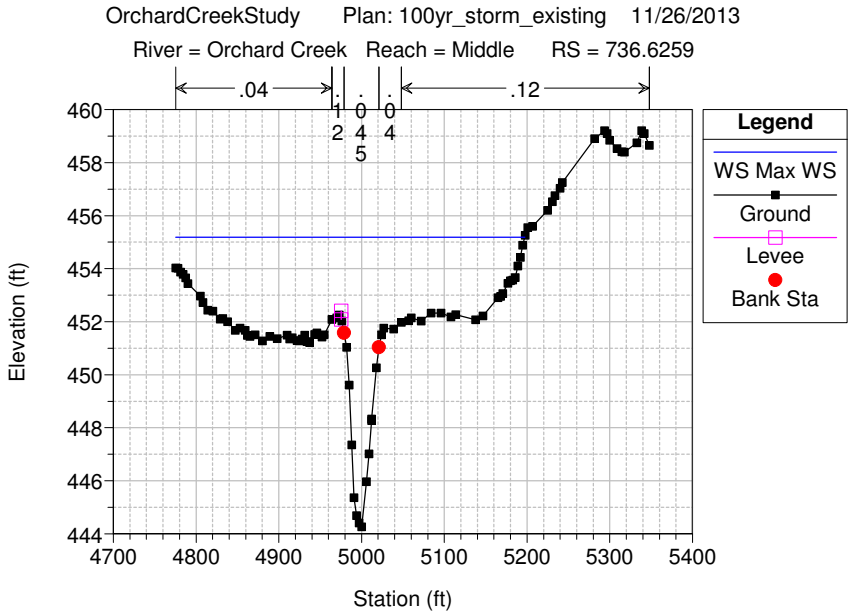

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 1586.231 Culv Jack Nicklaus Dr.
.04
.045
.12
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta

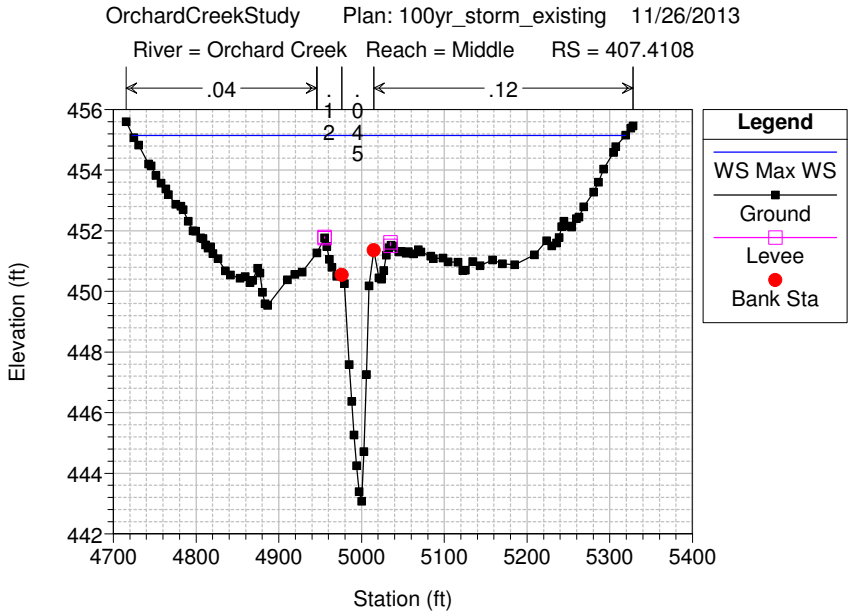

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 1586.231 Culv Jack Nicklaus Dr.
.04
.045
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta

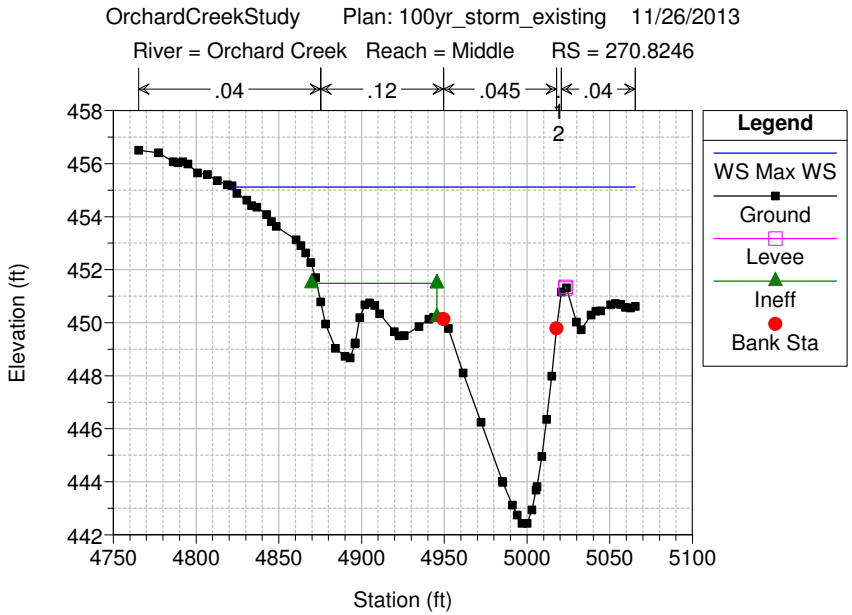

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 1510.338
.04
.045
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta

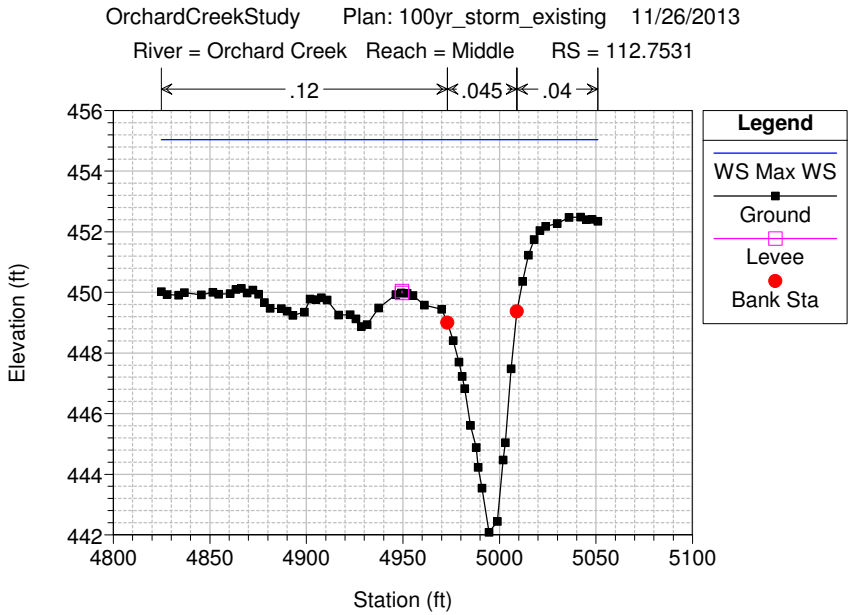

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 1414.15
.04
.045
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 1336.221
.12
.045
.12
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 1308.013 BR RR Trestle
.12
.045
.12
Legend
WS Max WS
Ground
Ineff
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 1308.013 BR RR Trestle
.04
.1
.042
.04
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

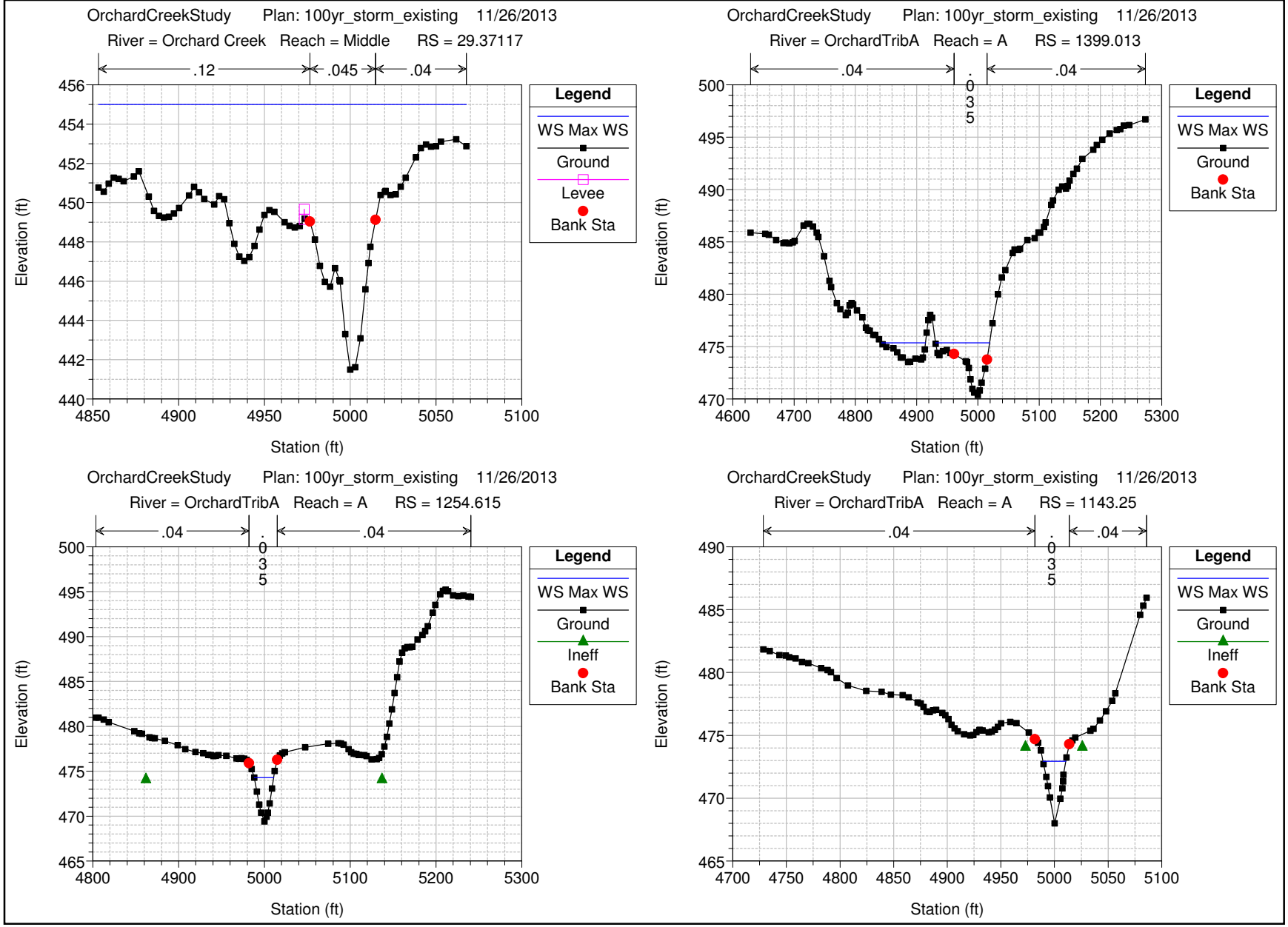

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 1271.118
.04
.04
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 1185.303
.04
.04
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 1095.441
.04
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 919.0703
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)

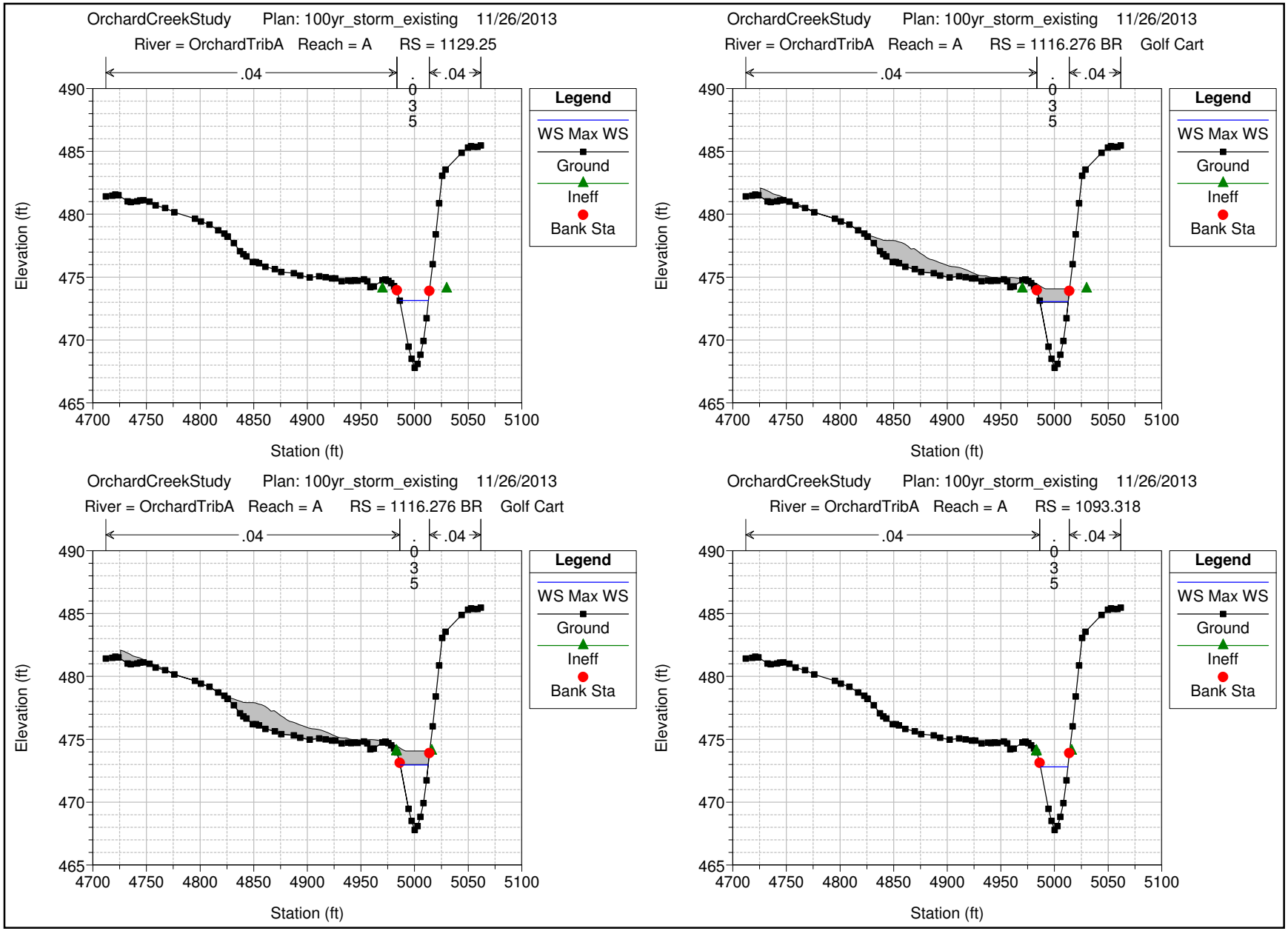

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 736.6259
.04
.12
Legend
WS Max WS
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

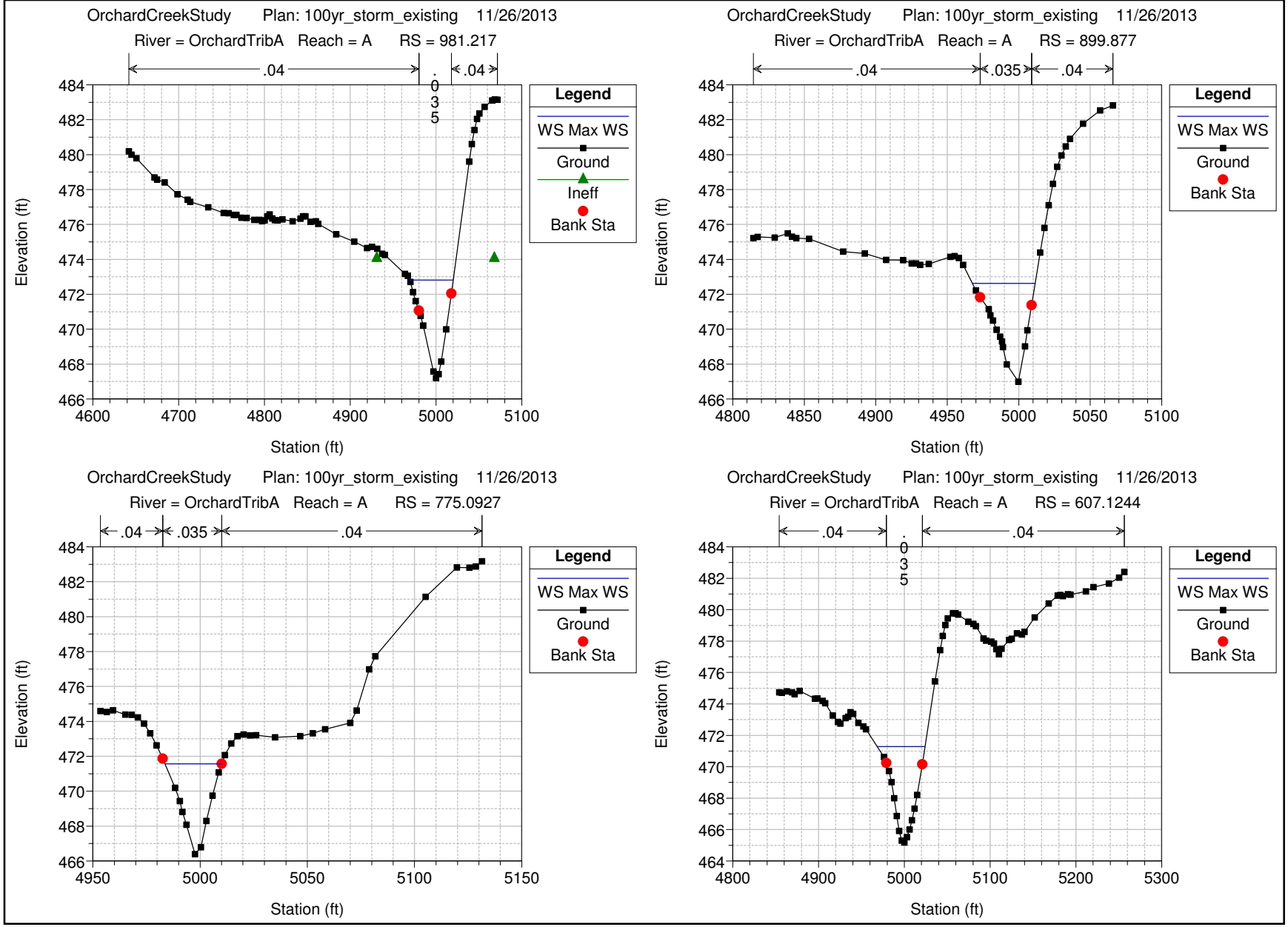

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 407.4108
.04
.12
Legend
WS Max WS
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

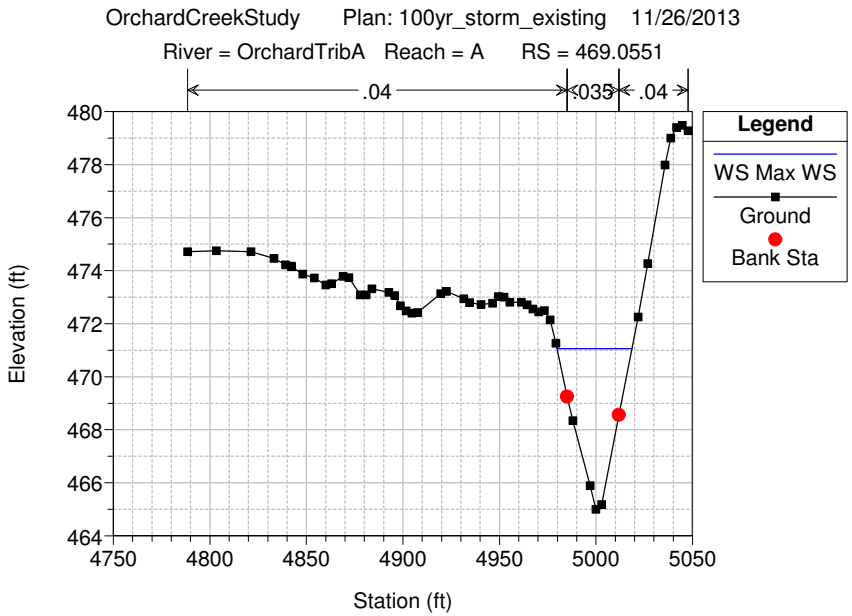

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 270.8246
.04
.12
.045
.04
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

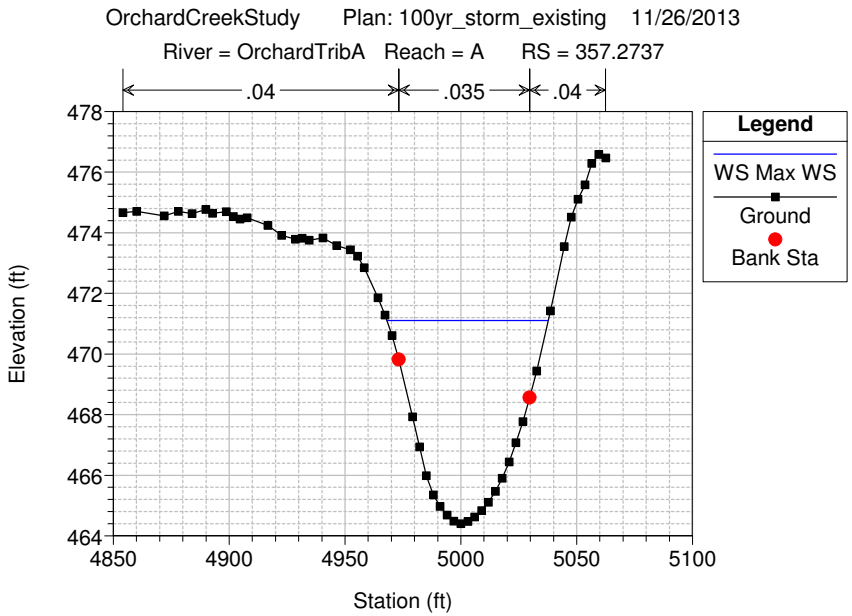

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 112.7531
.12
.045
.04
Legend
WS Max WS
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

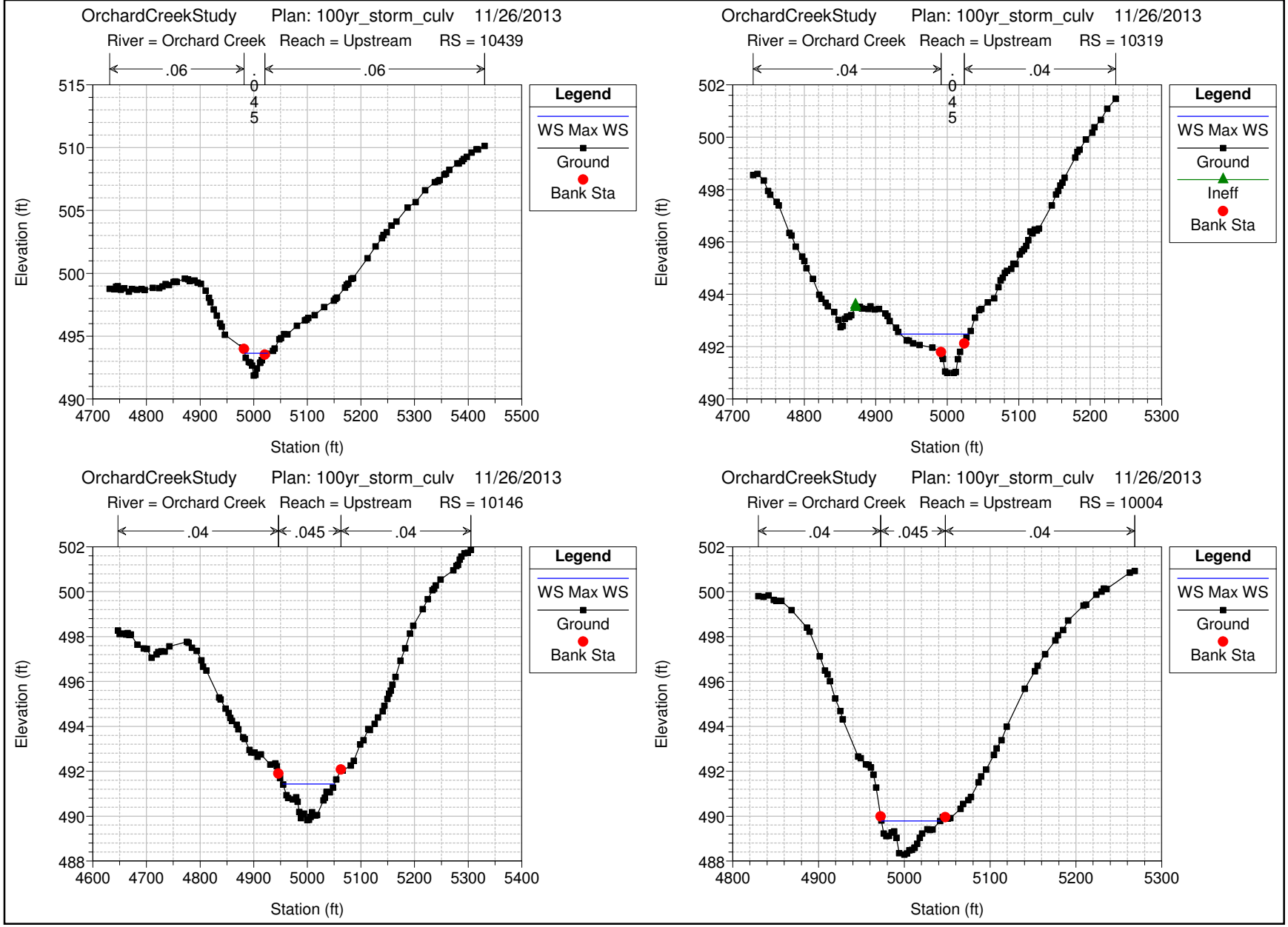

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = Orchard Creek Reach = Middle RS = 29.37117
.12
.045
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Levee
Bank Sta
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = OrchardTribA Reach = A RS = 1399.013
.04
.035
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Bank Sta
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = OrchardTribA Reach = A RS = 1254.615
.04
.035
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = OrchardTribA Reach = A RS = 1143.25
.04
.035
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta

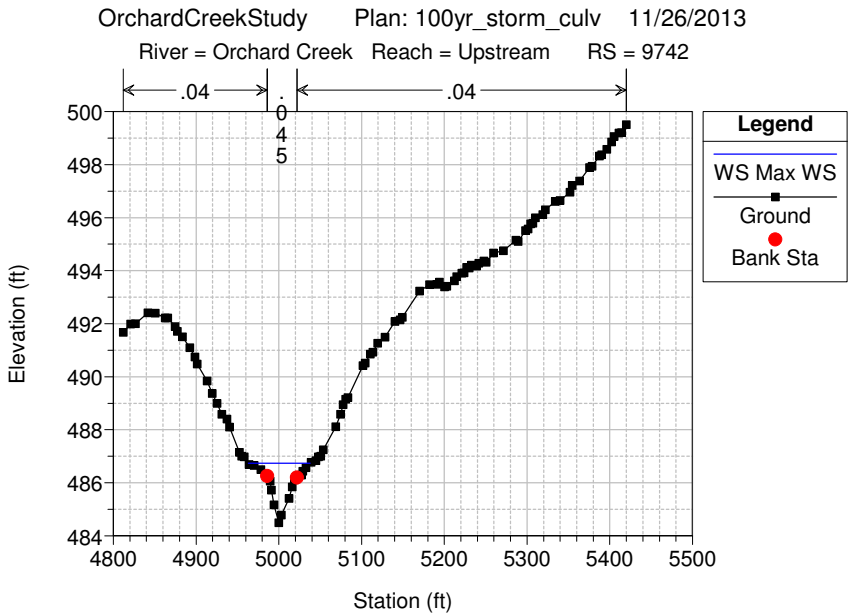

OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = OrchardTribA Reach = A RS = 1129.25
.04
.035
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
490
485
480
475
470
465
4700
4750
4800
4850
4900
4950
5000
5050
5100
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = OrchardTribA Reach = A RS = 1116.276 BR Golf Cart
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = OrchardTribA Reach = A RS = 1116.276 BR Golf Cart
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = OrchardTribA Reach = A RS = 1093.318


OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = OrchardTribA Reach = A RS = 981.217
.04
.035
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = OrchardTribA Reach = A RS = 899.877
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = OrchardTribA Reach = A RS = 775.0927
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = OrchardTribA Reach = A RS = 607.1244
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)


OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = OrchardTribA Reach = A RS = 469.0551
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
480
478
476
474
472
470
468
466
464
4750
4800
4850
4900
4950
5000
5050


OrchardCreekStudy Plan: 100yr_storm_existing 11/26/2013
River = OrchardTribA Reach = A RS = 357.2737
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
478
476
474
472
470
468
466
464
4850
4900
4950
5000
5050
5100


OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 10439
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Bank Sta
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 10319
.04
.045
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 10146
.04
.045
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Bank Sta
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 10004
.04
.045
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Bank Sta


OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 9742
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
500
498
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494
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490
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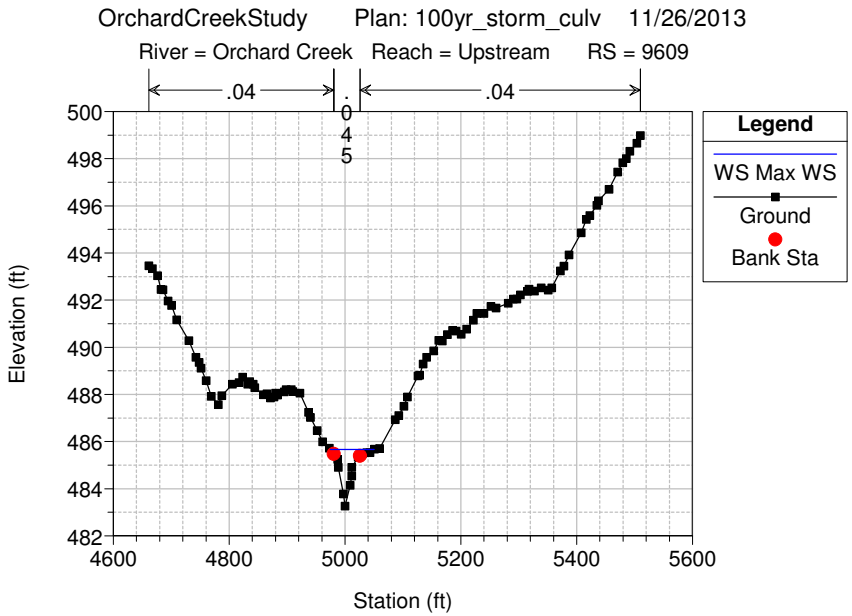
5500


OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 9609
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
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496
494
492
490
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482
4600
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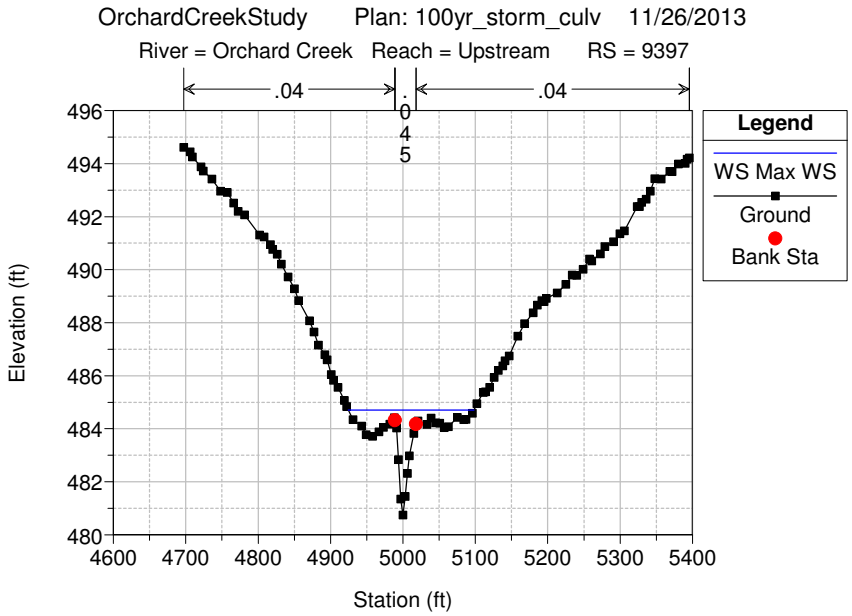
5200
5400
5600


OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 9397
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
496
494
492
490
488
486
484
482
480
4600
4700
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4900
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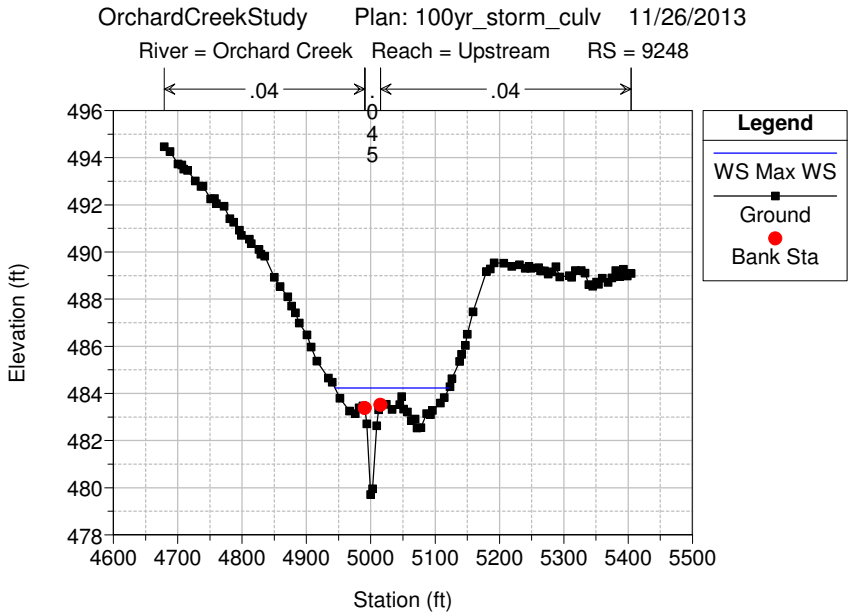
5100
5200
5300
5400


OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 9248
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
496
494
492
490
488
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480
478
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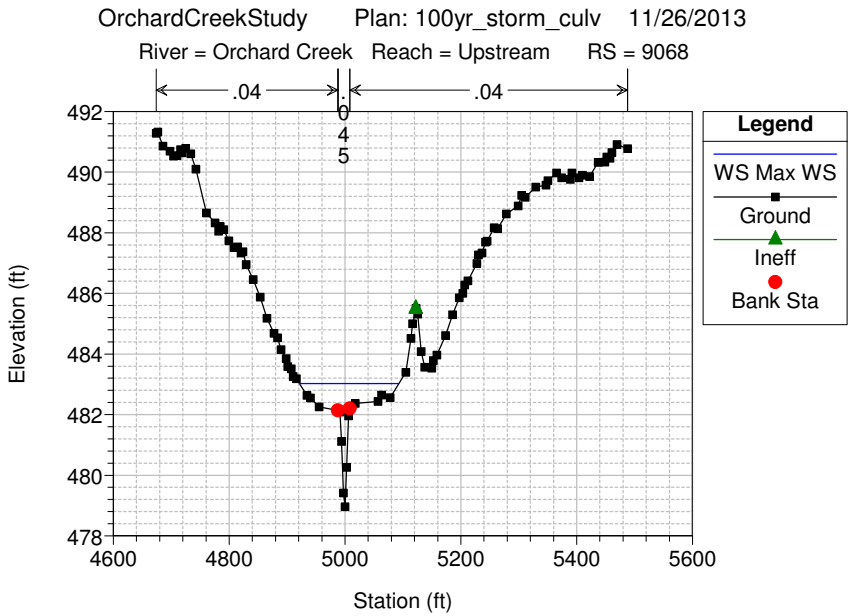
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 9068
.04
.045
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
492
490
488
486
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4600
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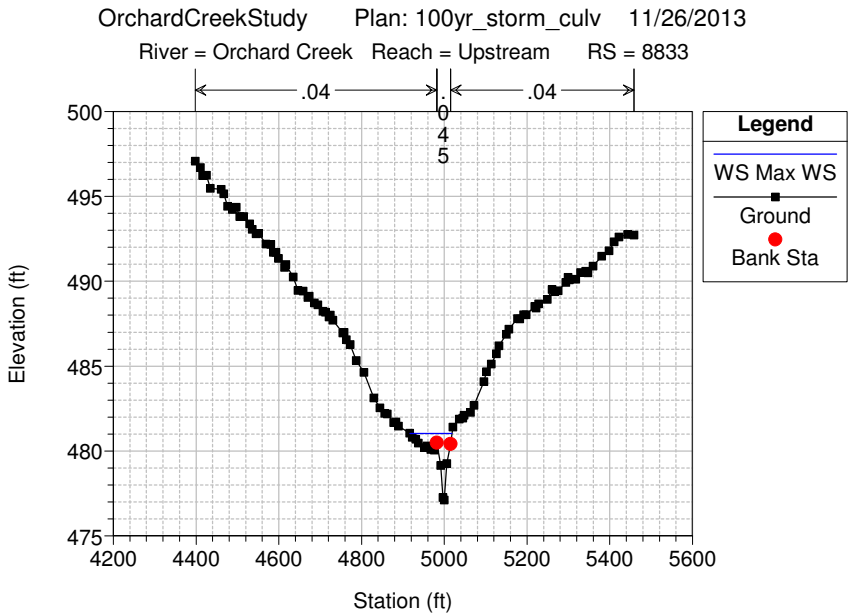
5400
5600


OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 8833
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
500
495
490
485
480
475
4200
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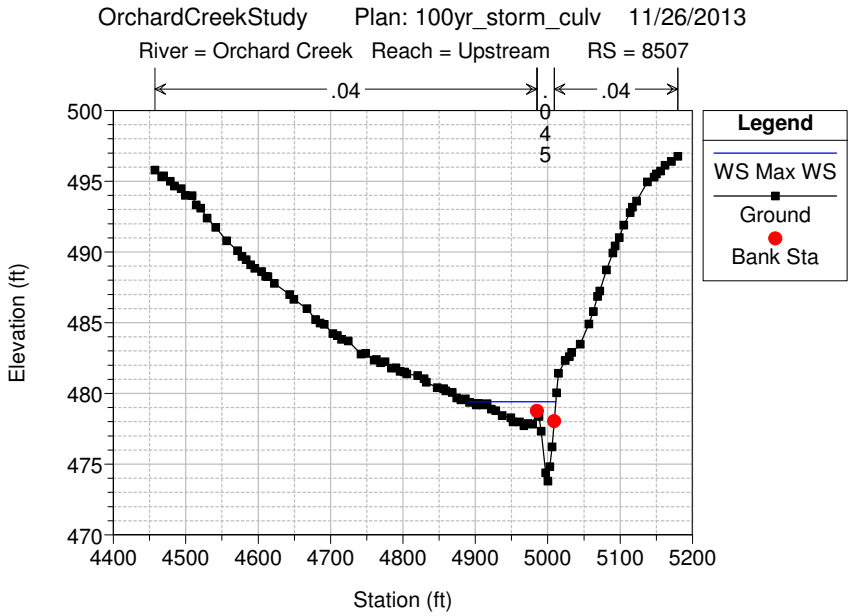
4600
4800
5000
5200
5400
5600


OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 8507
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
500
495
490
485
480
475
470
4400
4500
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4700
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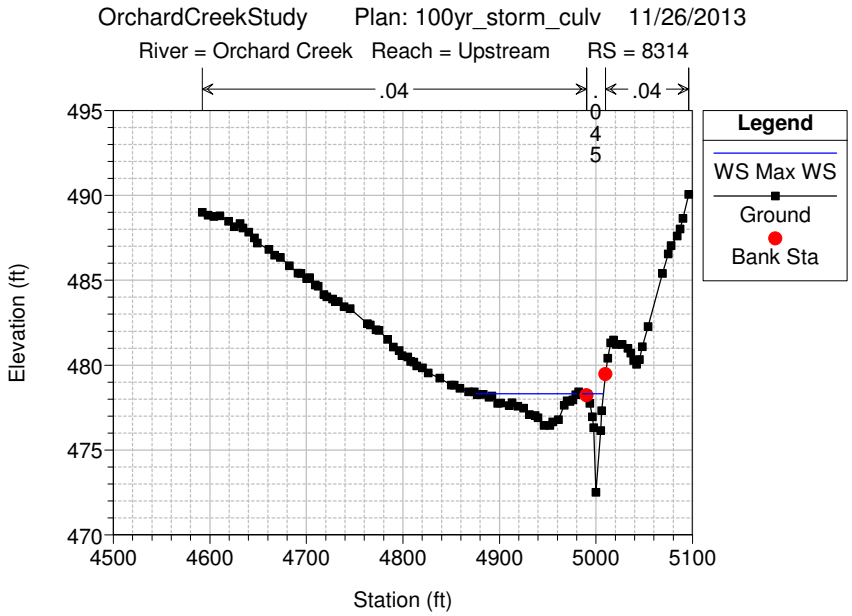
5200


OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 8314
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
495
490
485
480
475
470
4500
4600
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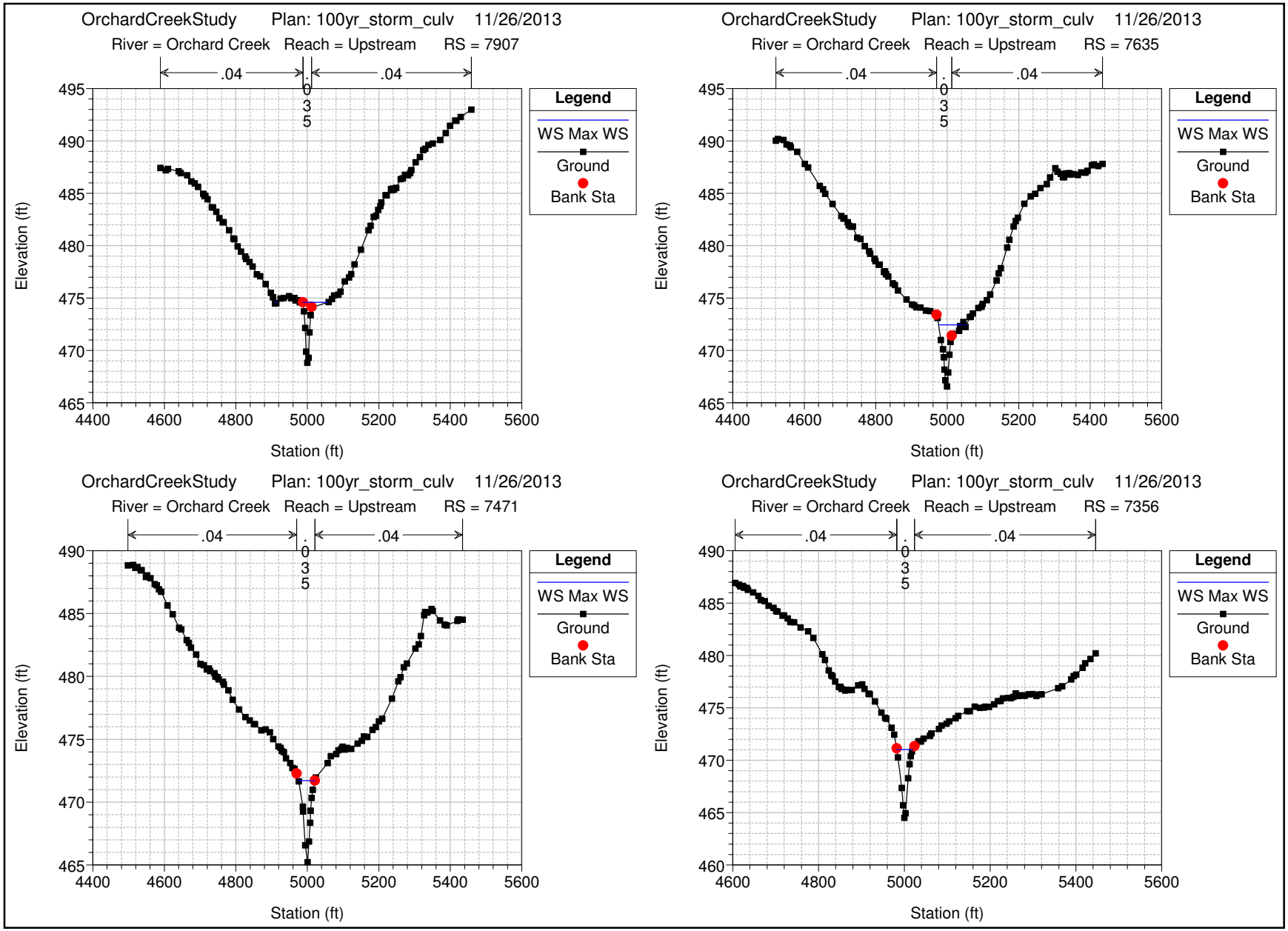
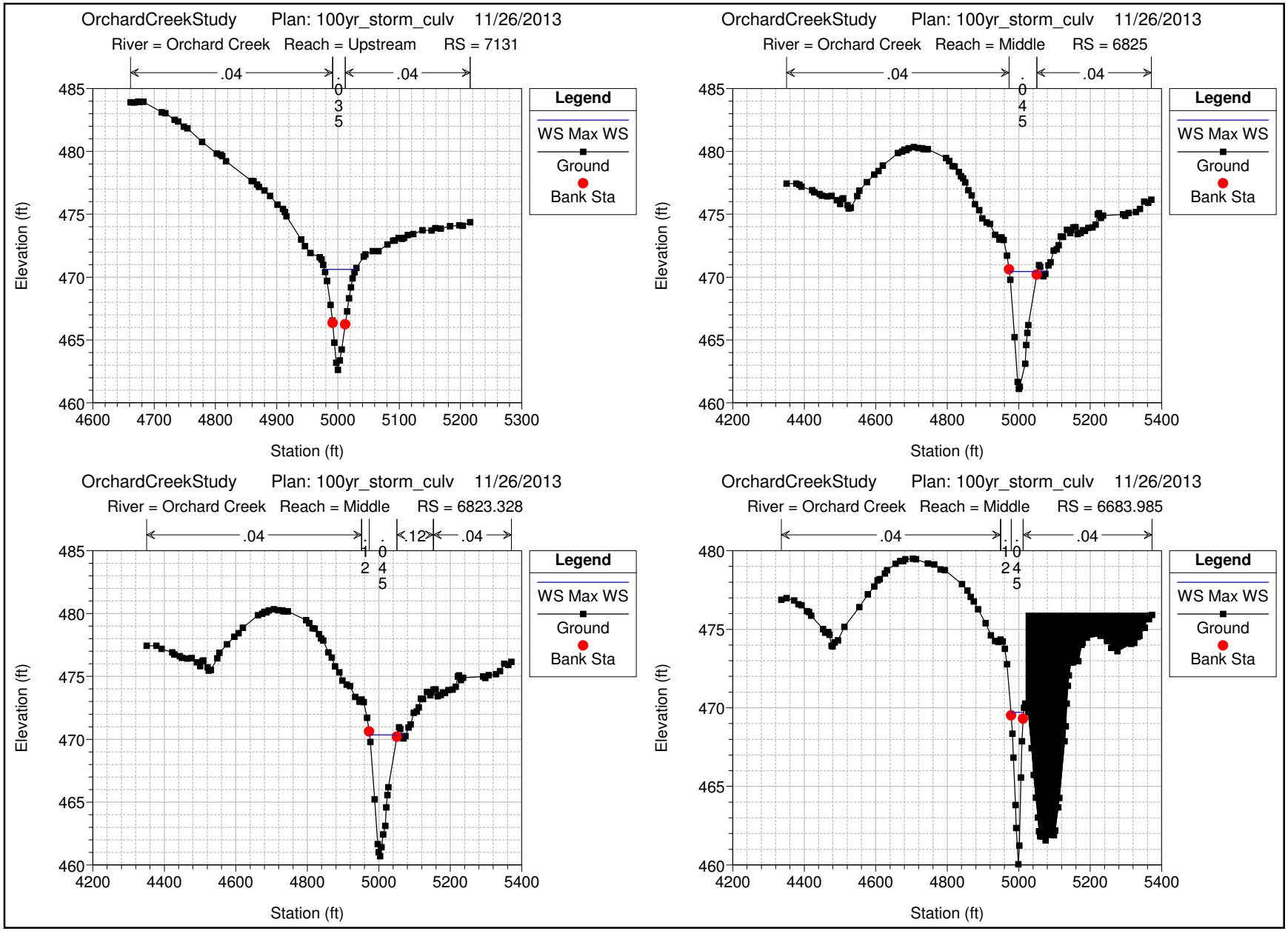
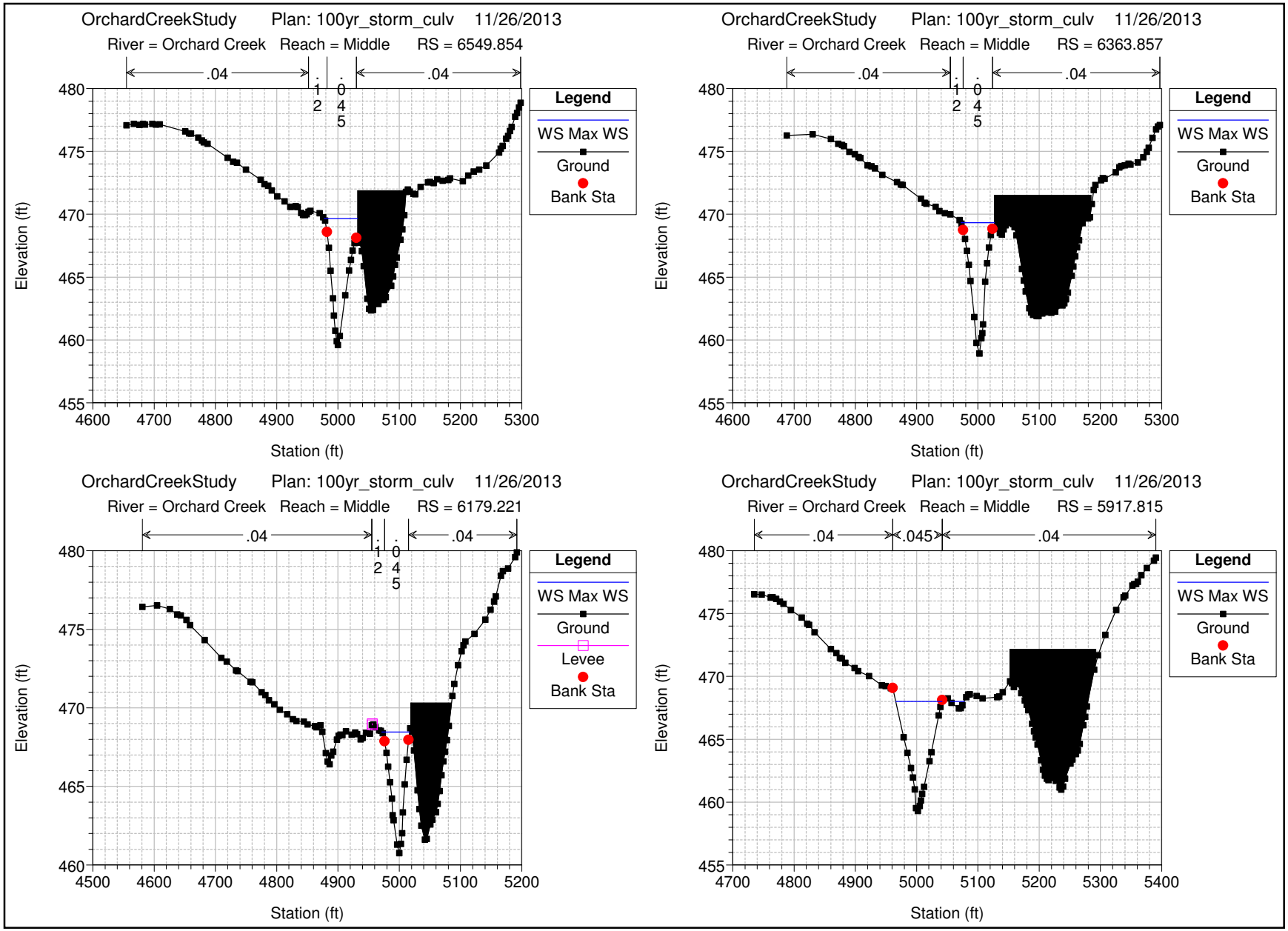
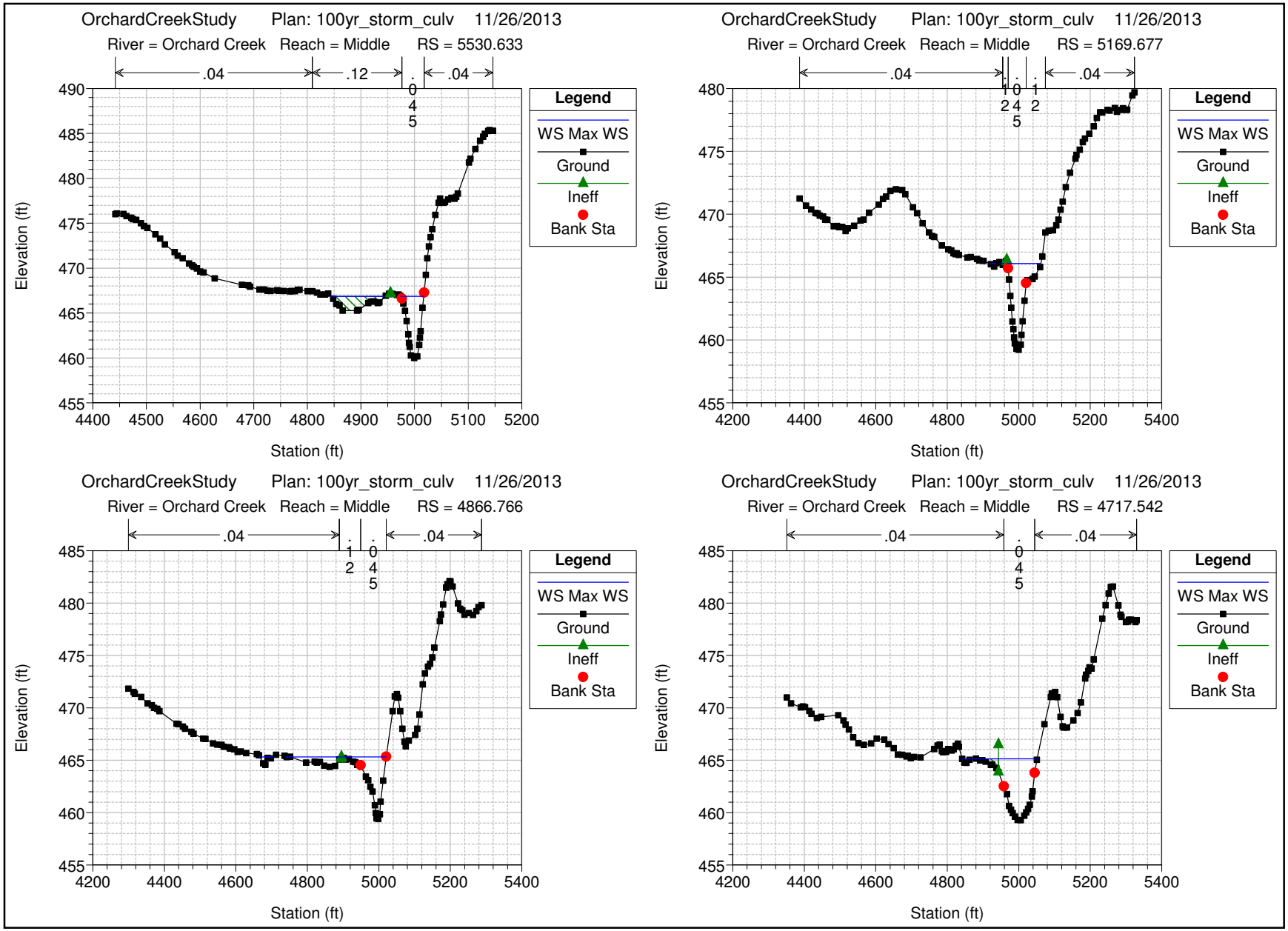
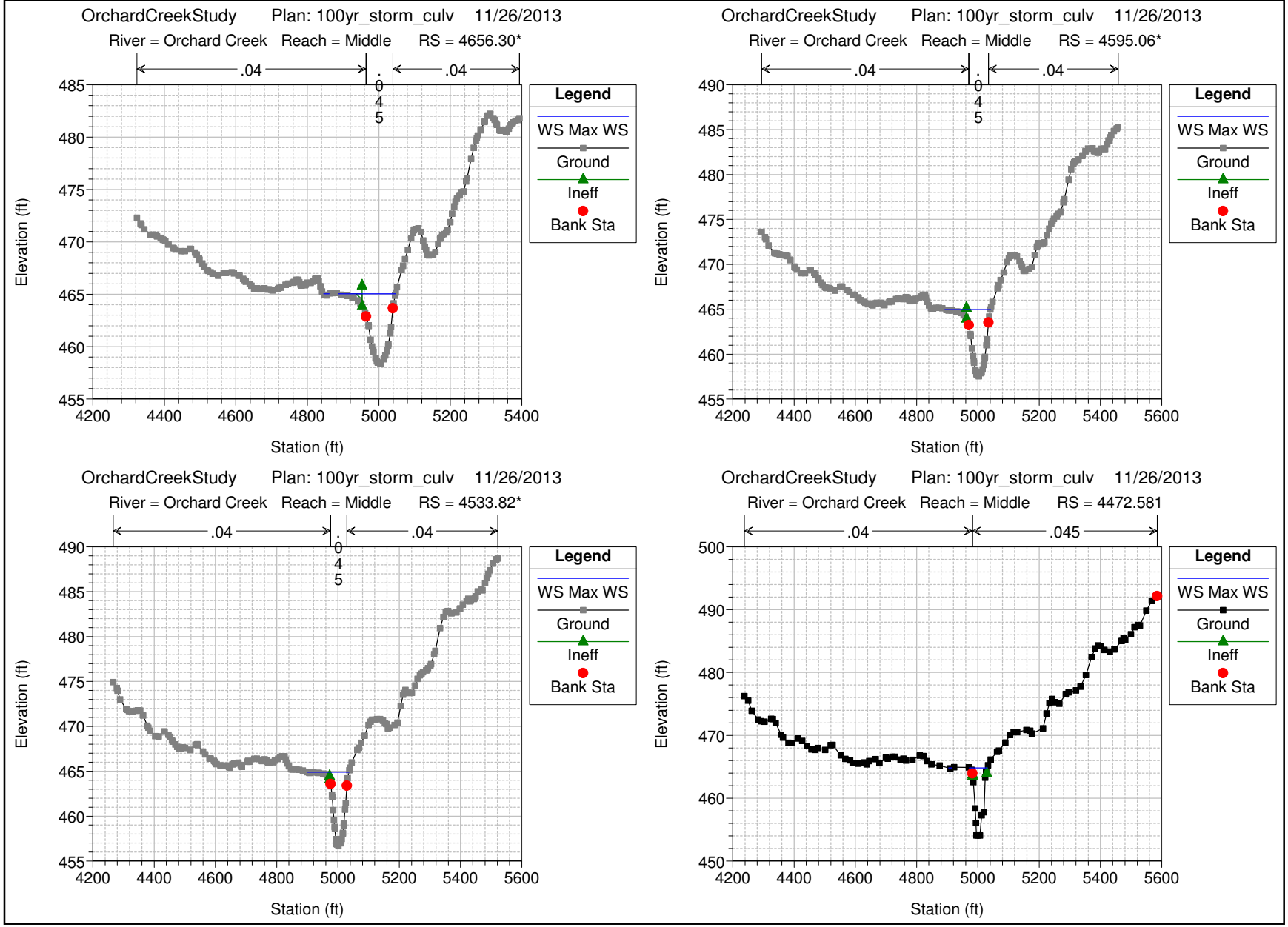
4900
5000
5100

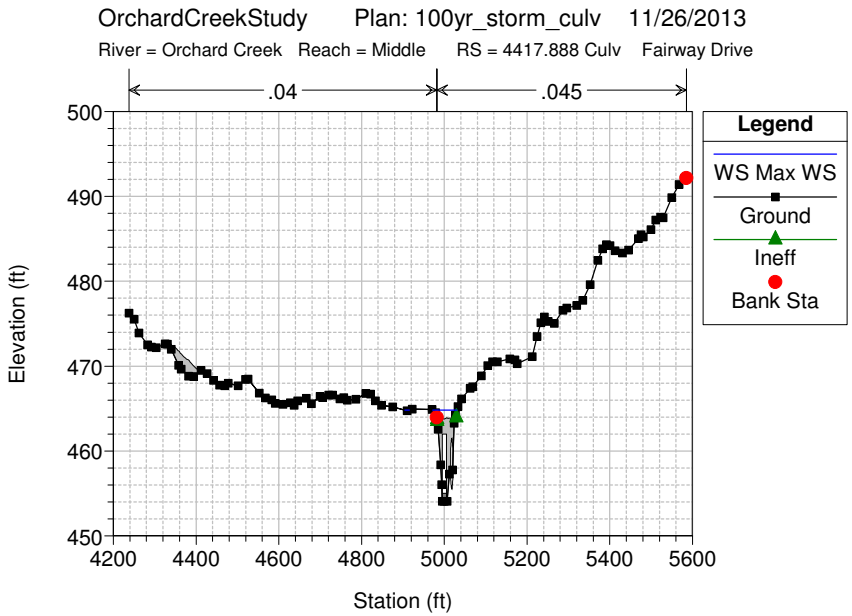

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 7907
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 7635
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 7471
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 7356
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)

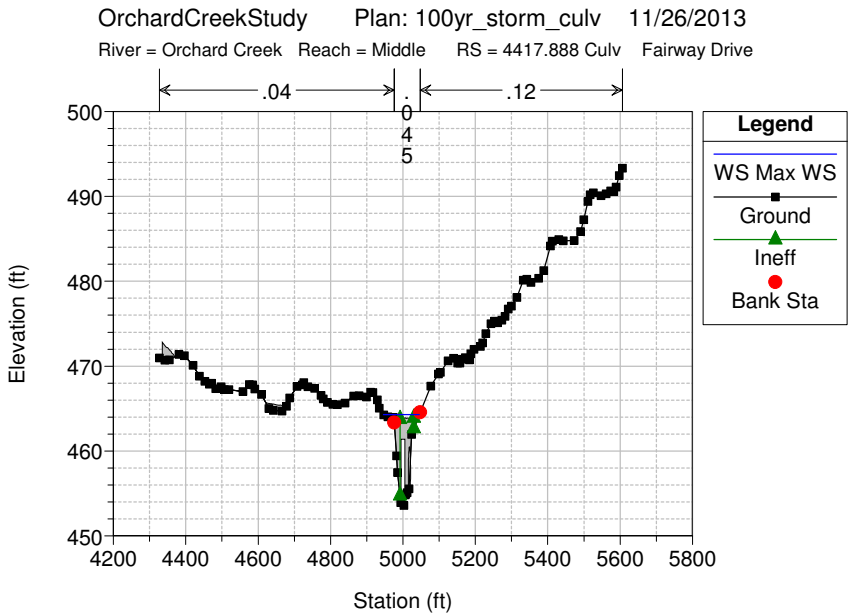

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Upstream RS = 7131
.04
.04
.035
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 6825
.04
.04
.045
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 6823.328
.04
.12
.04
.12
.045
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 6683.985
.04
.04
.1024.5
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)

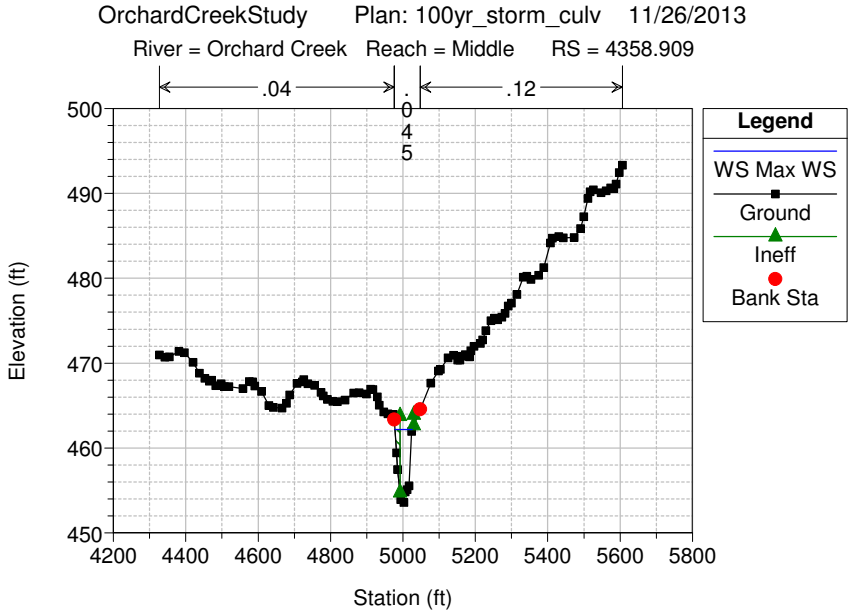

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 6549.854
.04
.12
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 6363.857
.04
.12
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 6179.221
.04
.12
.045
.04
Legend
WS Max WS
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 5917.815
.04
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)

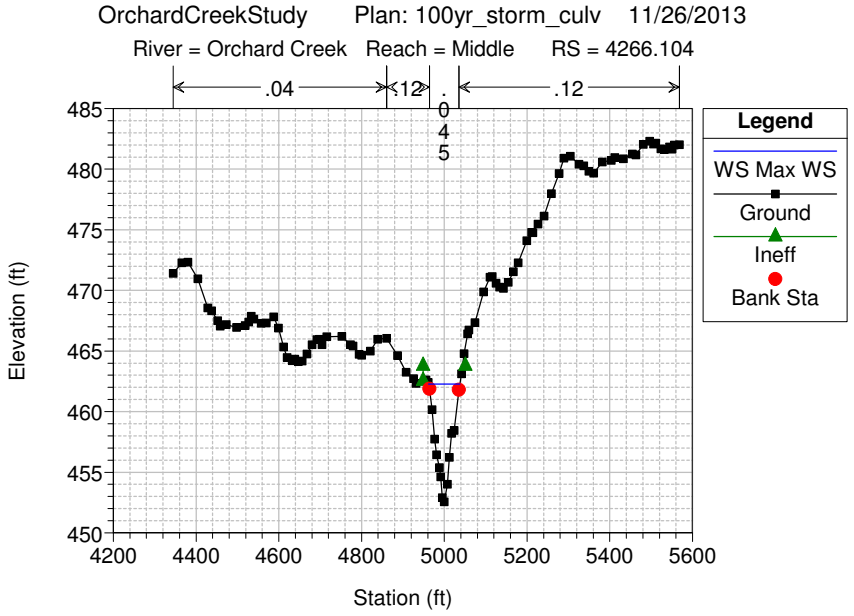

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 5530.633
.04
.12
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 5169.677
.04
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 4866.766
.04
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 4717.542
.04
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

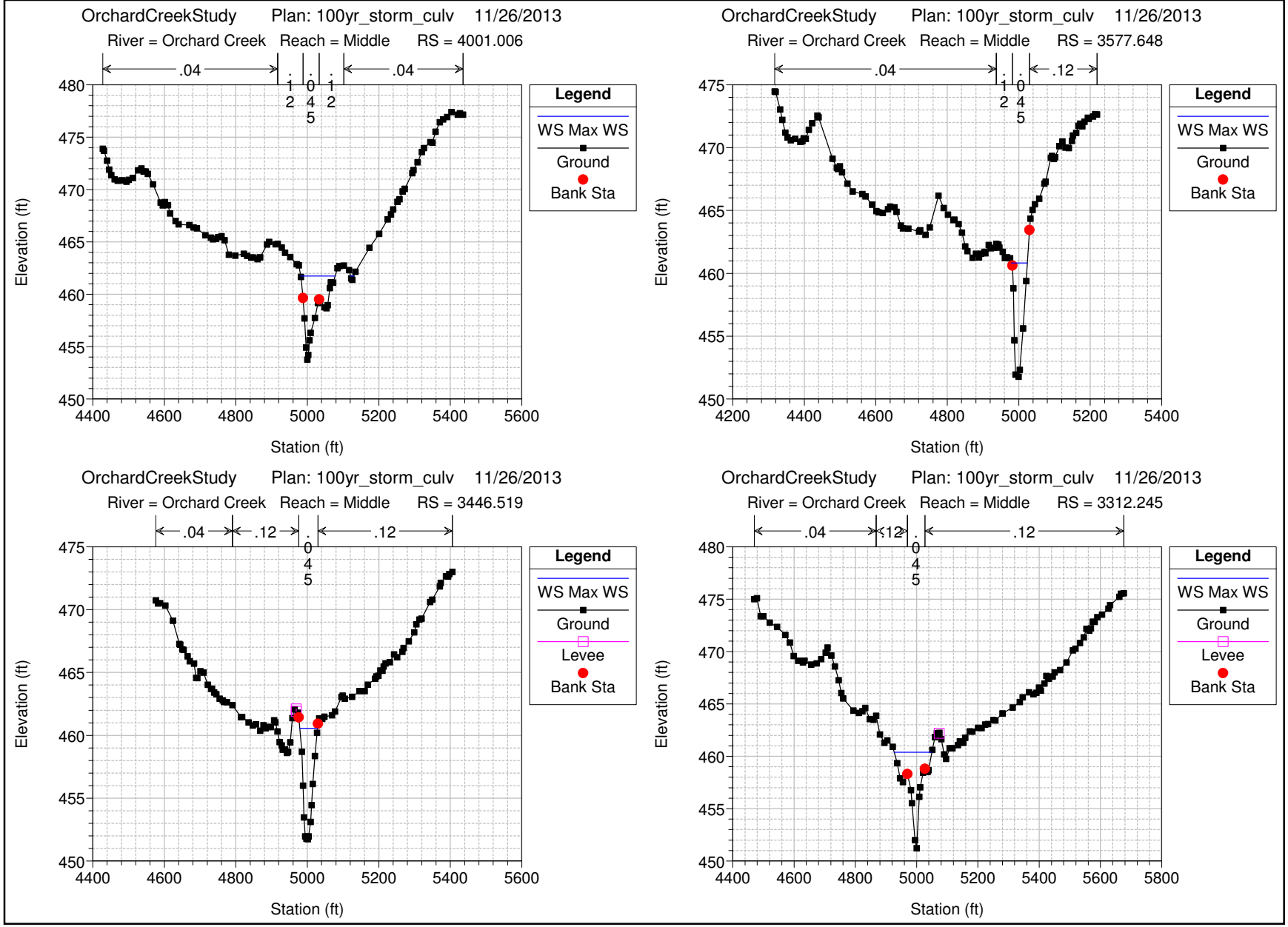

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 4656.30*
.04
.045
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 4595.06*
.04
.045
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 4533.82*
.04
.045
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 4472.581
.04
.045
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

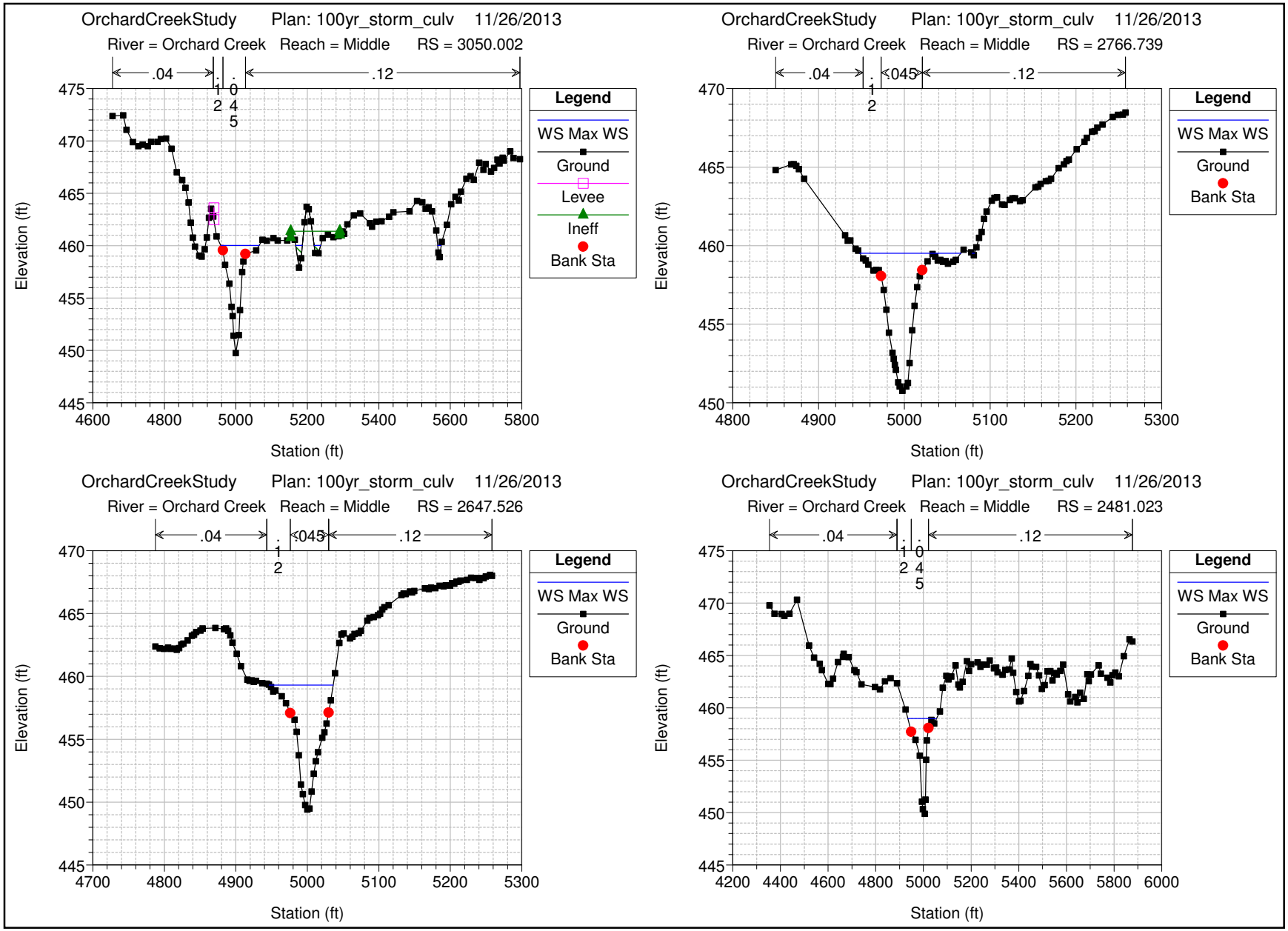

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 4417.888 Culv Fairway Drive
.04
.045
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

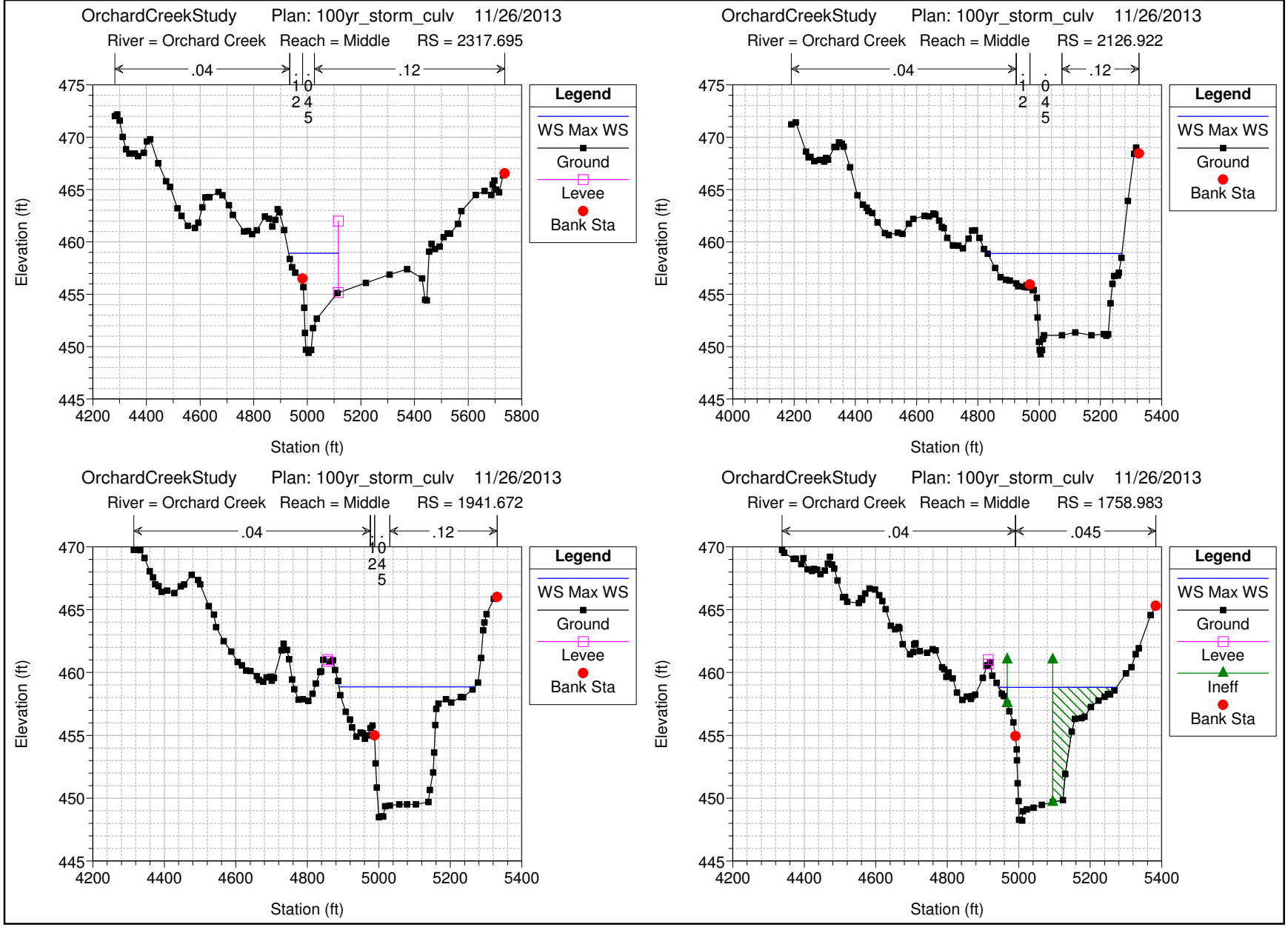

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 4417.888 Culv Fairway Drive
.04
.045
.12
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

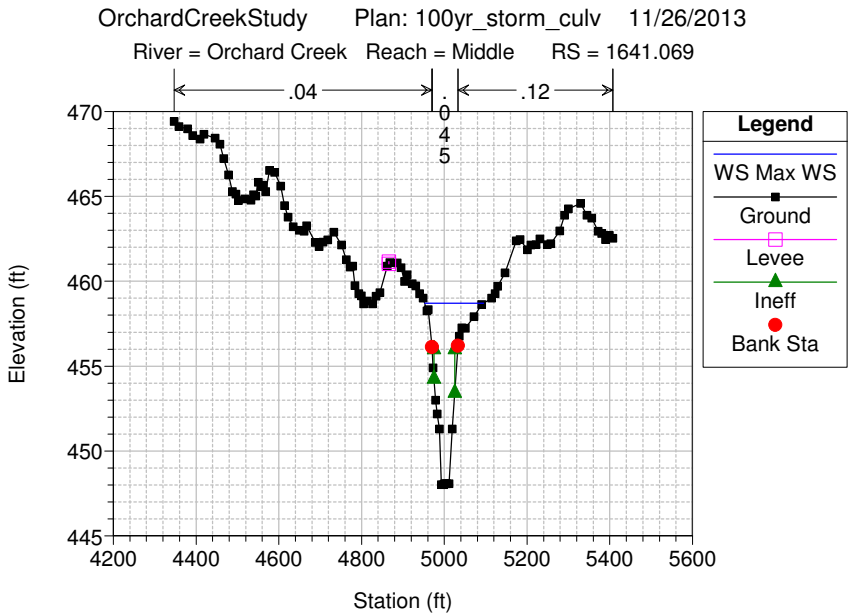

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 4358.909
.04
.045
.12
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

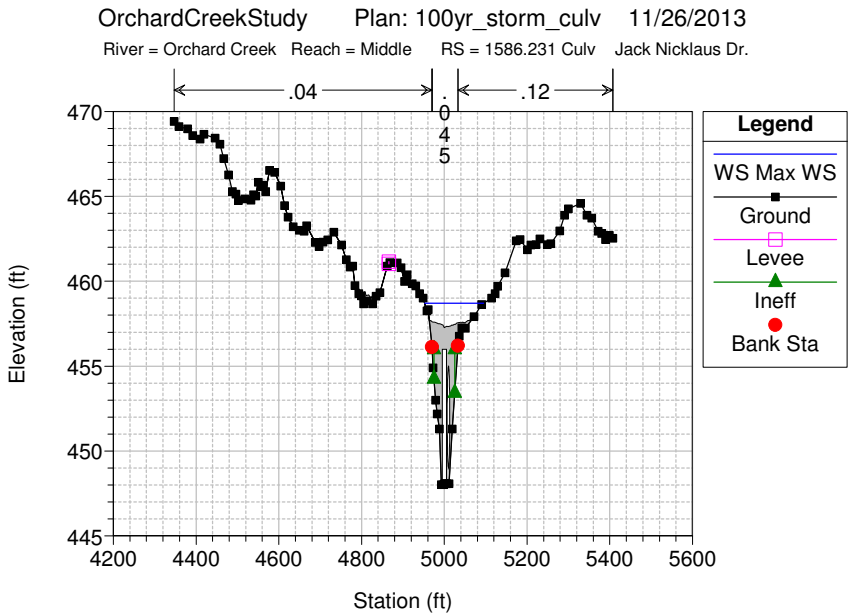

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 4266.104
.04
.12
.045
.12
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

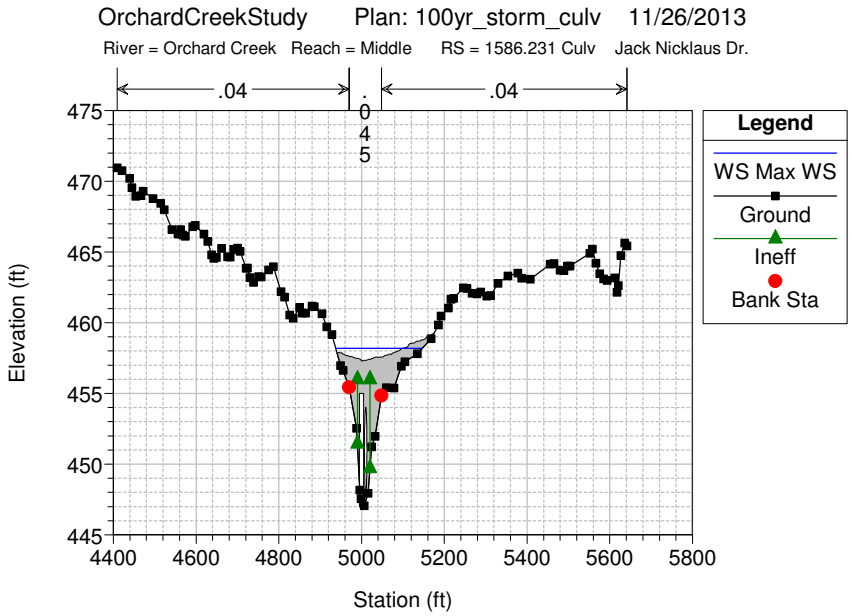

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 4001.006
.04
.12
.045
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 3577.648
.04
.12
.045
.12
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 3446.519
.04
.12
.045
.12
Legend
WS Max WS
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 3312.245
.04
.12
.045
.12
Legend
WS Max WS
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

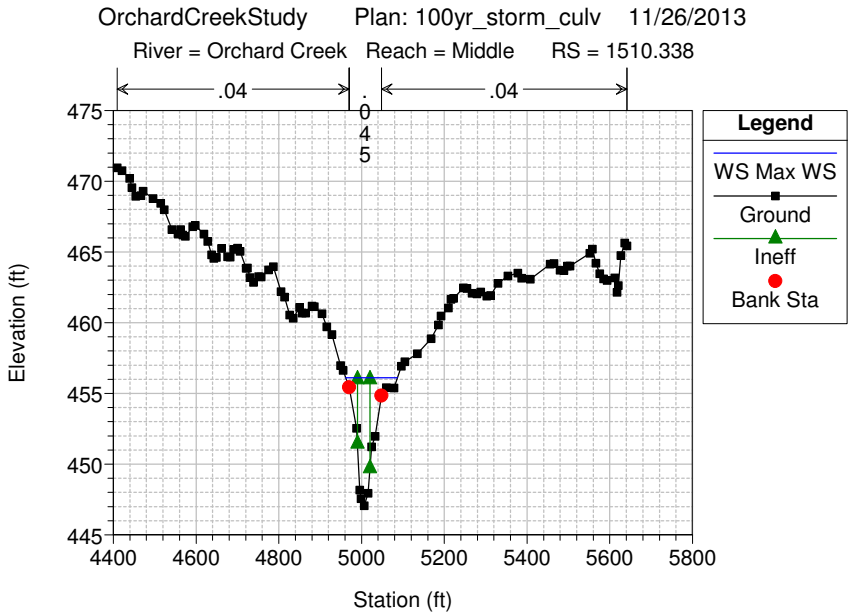

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 3050.002
.04
.12
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 2766.739
.04
.045
.12
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 2647.526
.04
.045
.12
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 2481.023
.04
.12
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)

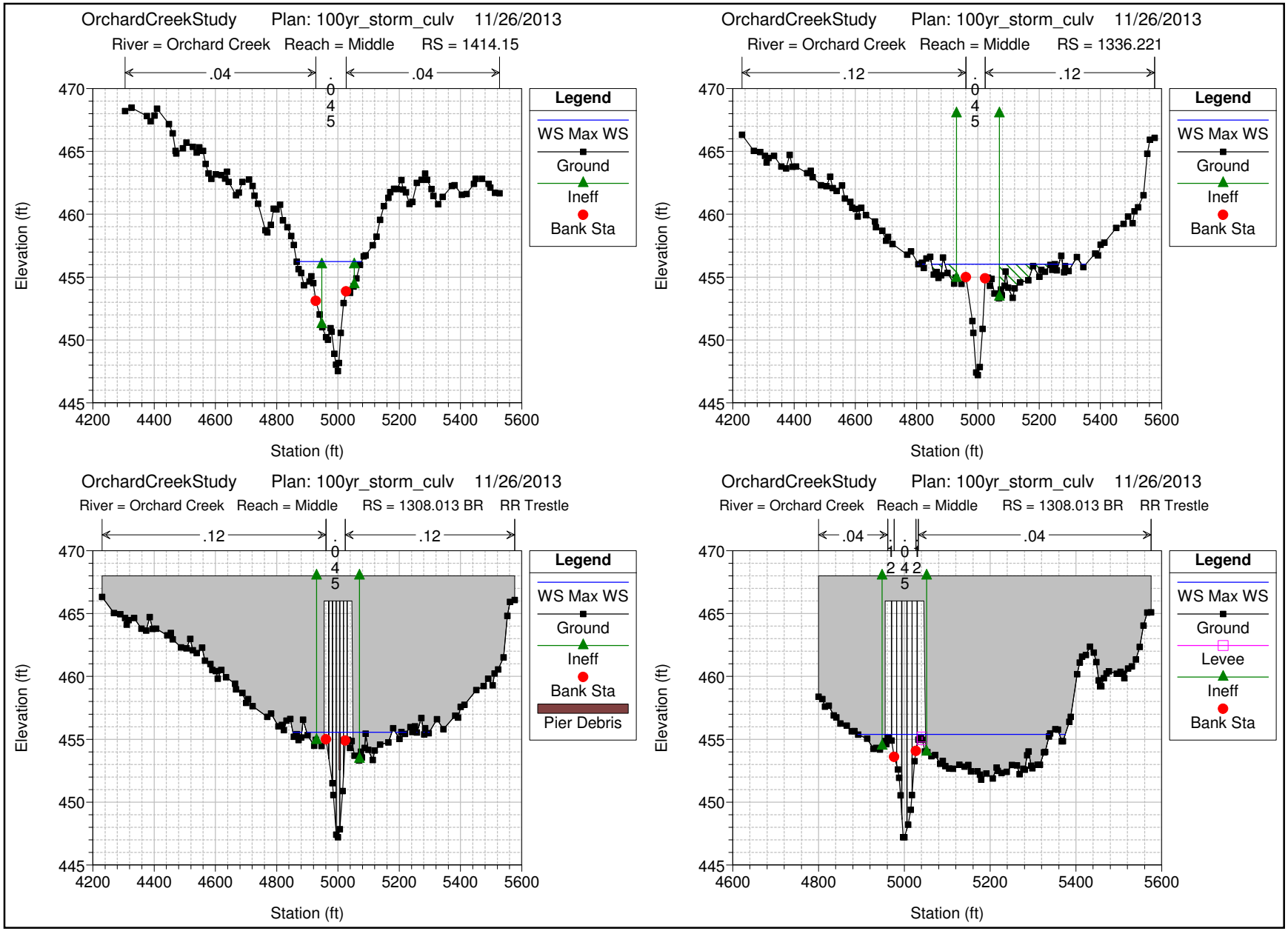

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 2317.695
.04
.12
Legend
WS Max WS
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 2126.922
.04
.12
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 1941.672
.04
.12
Legend
WS Max WS
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 1758.983
.04
.045
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

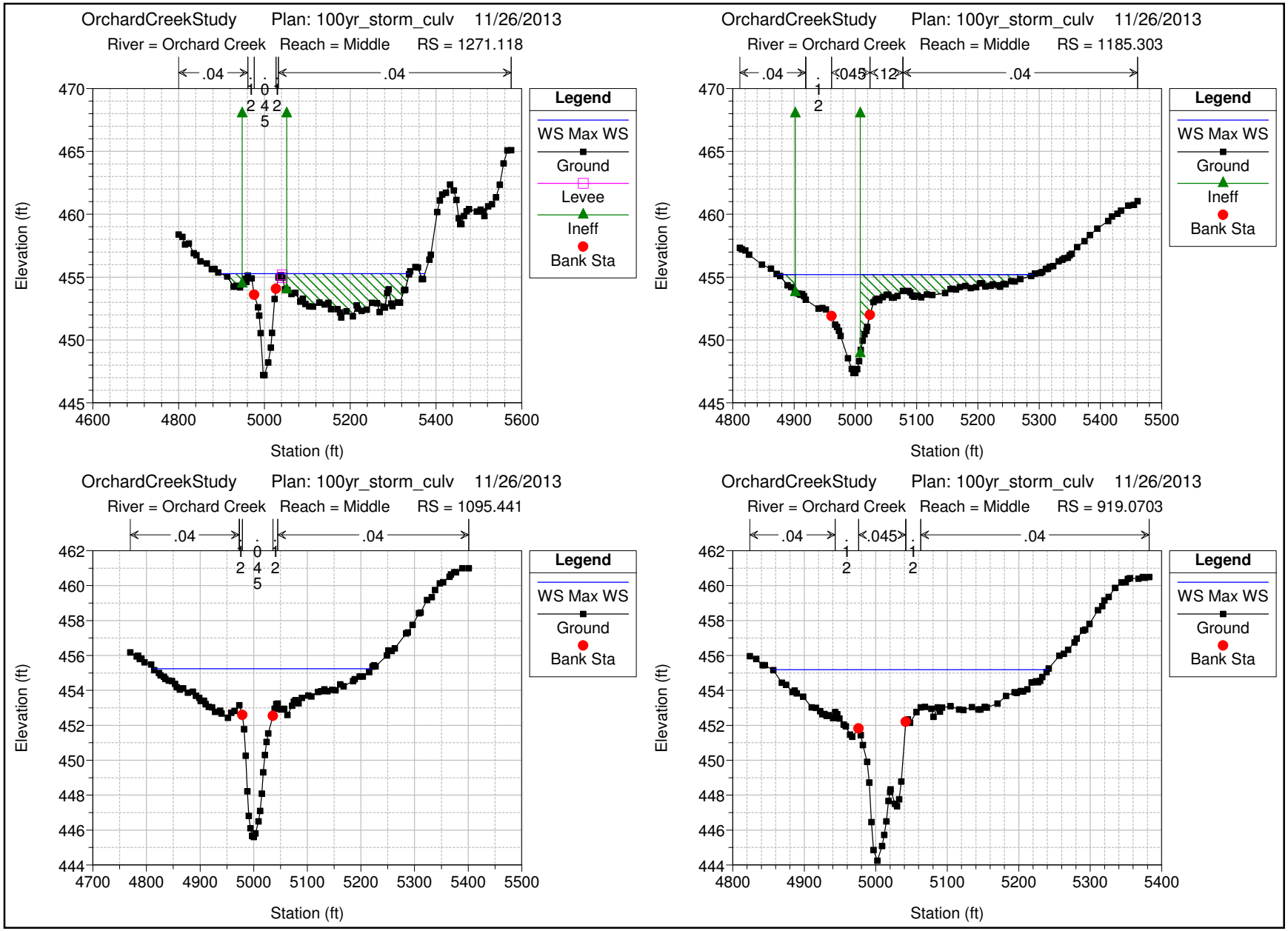

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 1641.069
.04
.045
.12
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta

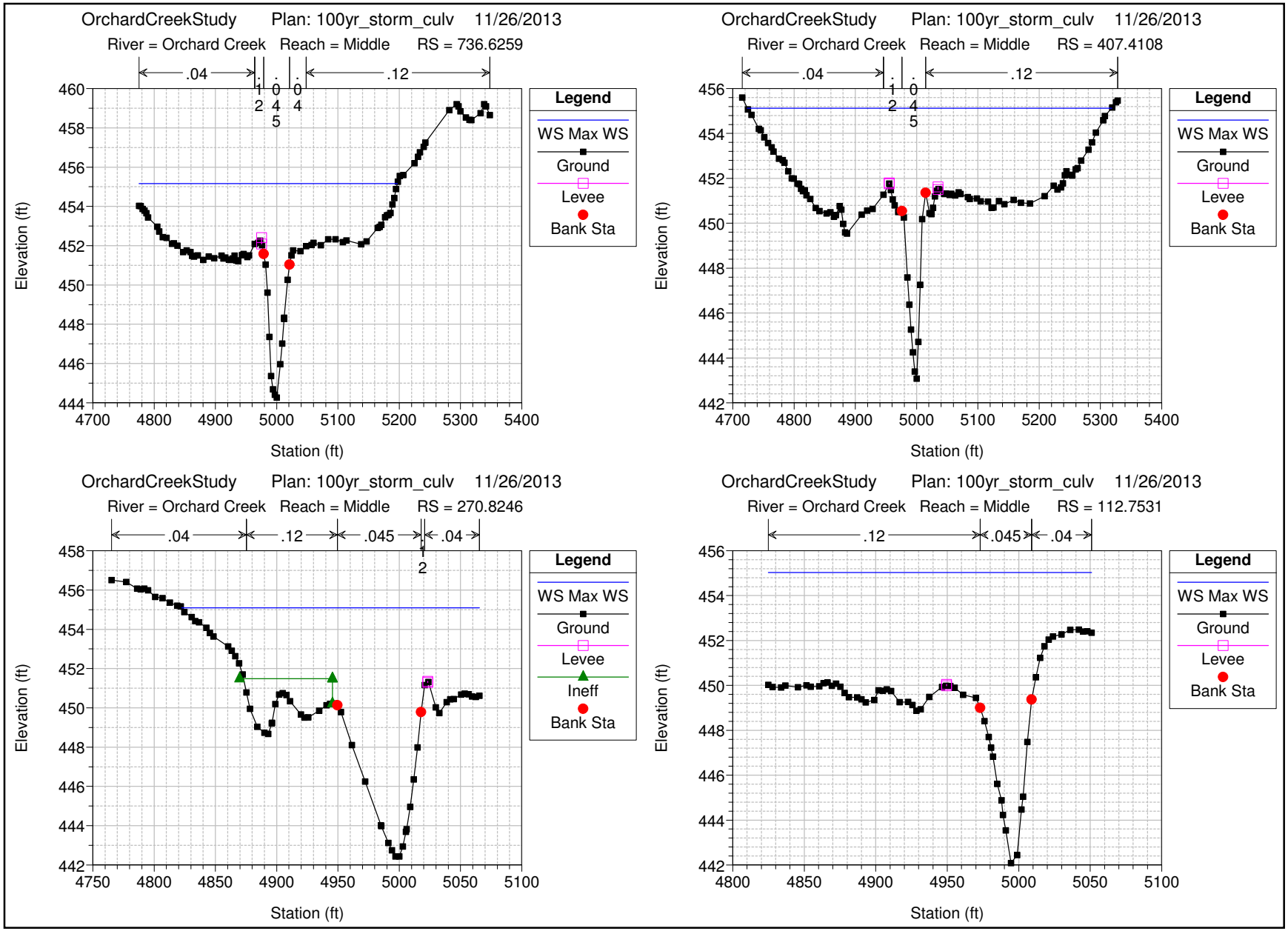

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 1586.231 Culv Jack Nicklaus Dr.
.04
.045
.12
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta

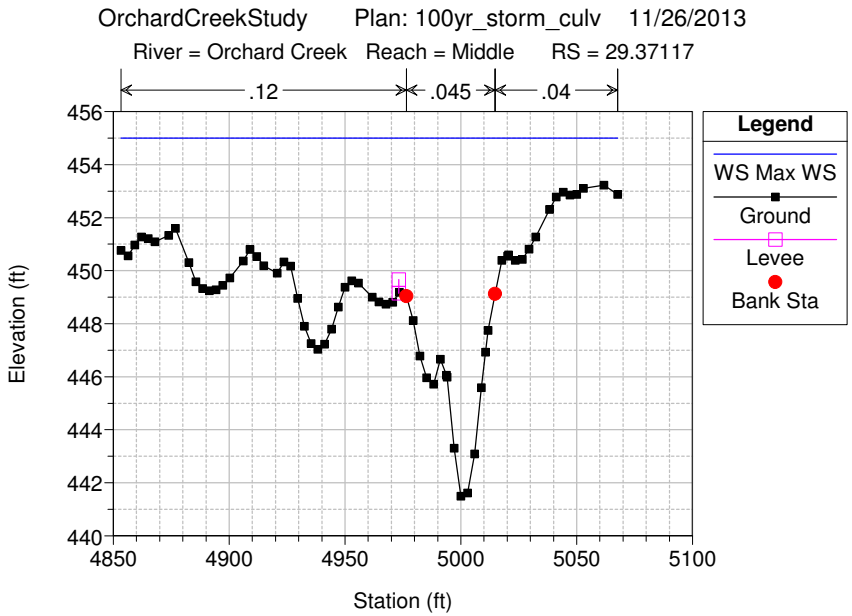

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 1586.231 Culv Jack Nicklaus Dr.
.04
.045
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta

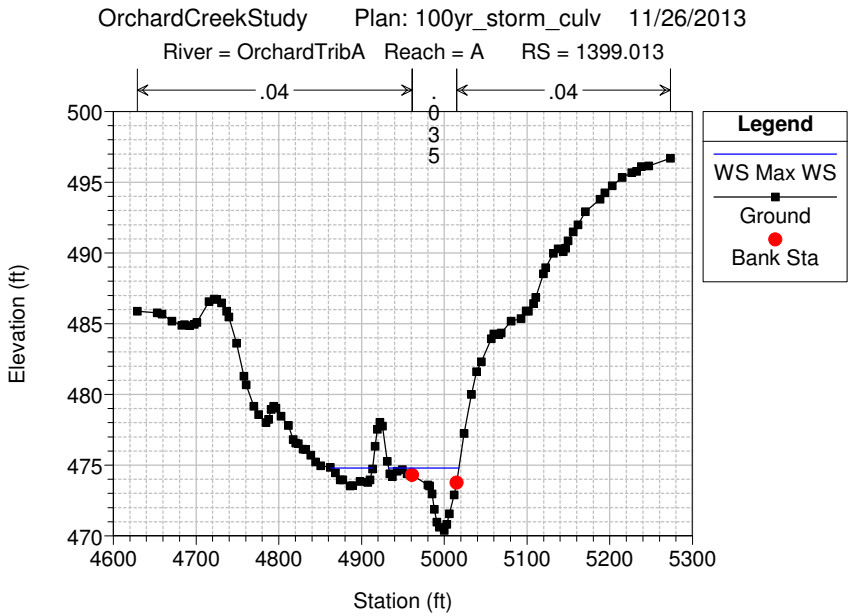

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 1510.338
.04
.045
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta

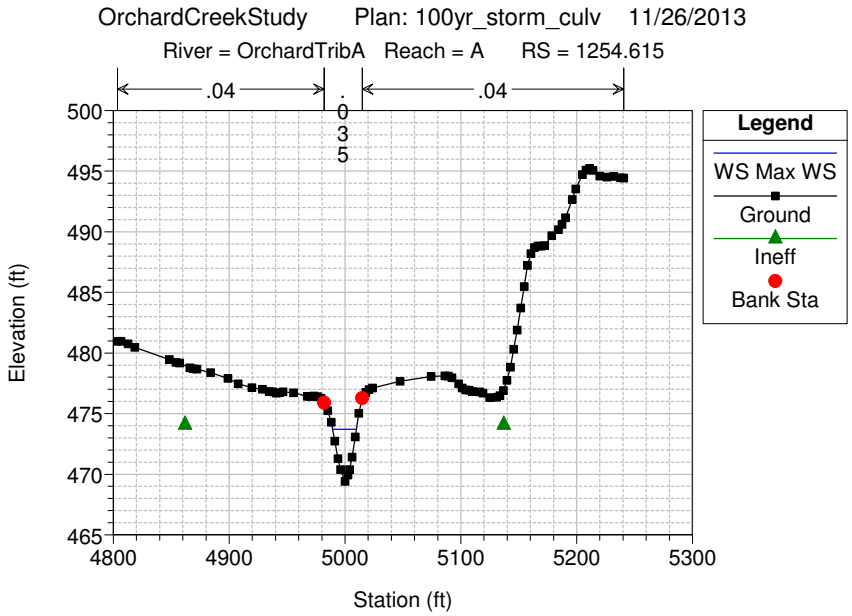

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 1414.15
.04
.045
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 1336.221
.12
.045
.12
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 1308.013 BR RR Trestle
.12
.045
.12
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta
Pier Debris
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 1308.013 BR RR Trestle
.04
.1
.2
.4
.2
.5
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta

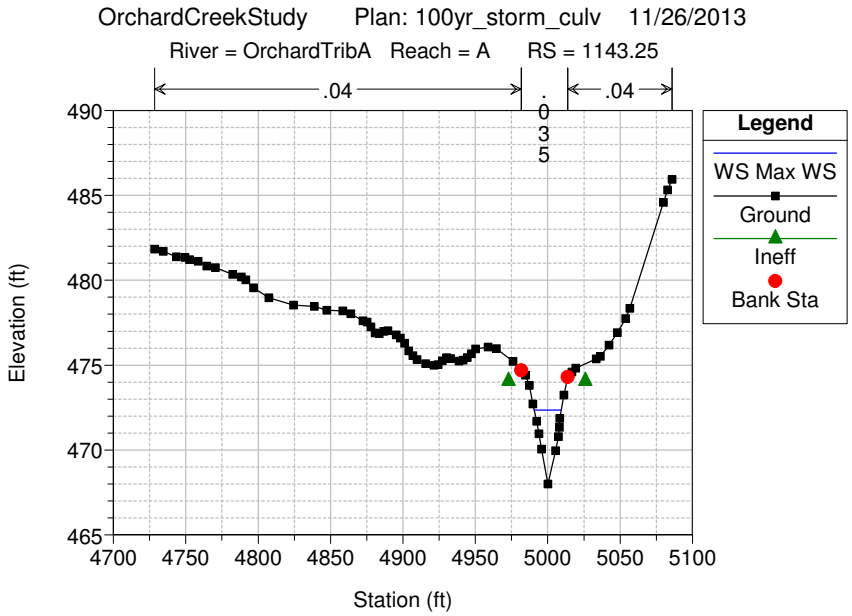

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 1271.118
.04 .1 .2 .045 .1 .2 .04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 1185.303
.04 .1 .2 .045 .12 .04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 1095.441
.04 .1 .2 .045 .1 .2 .04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Bank Sta
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 919.0703
.04 .1 .2 .045 .1 .2 .04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Bank Sta

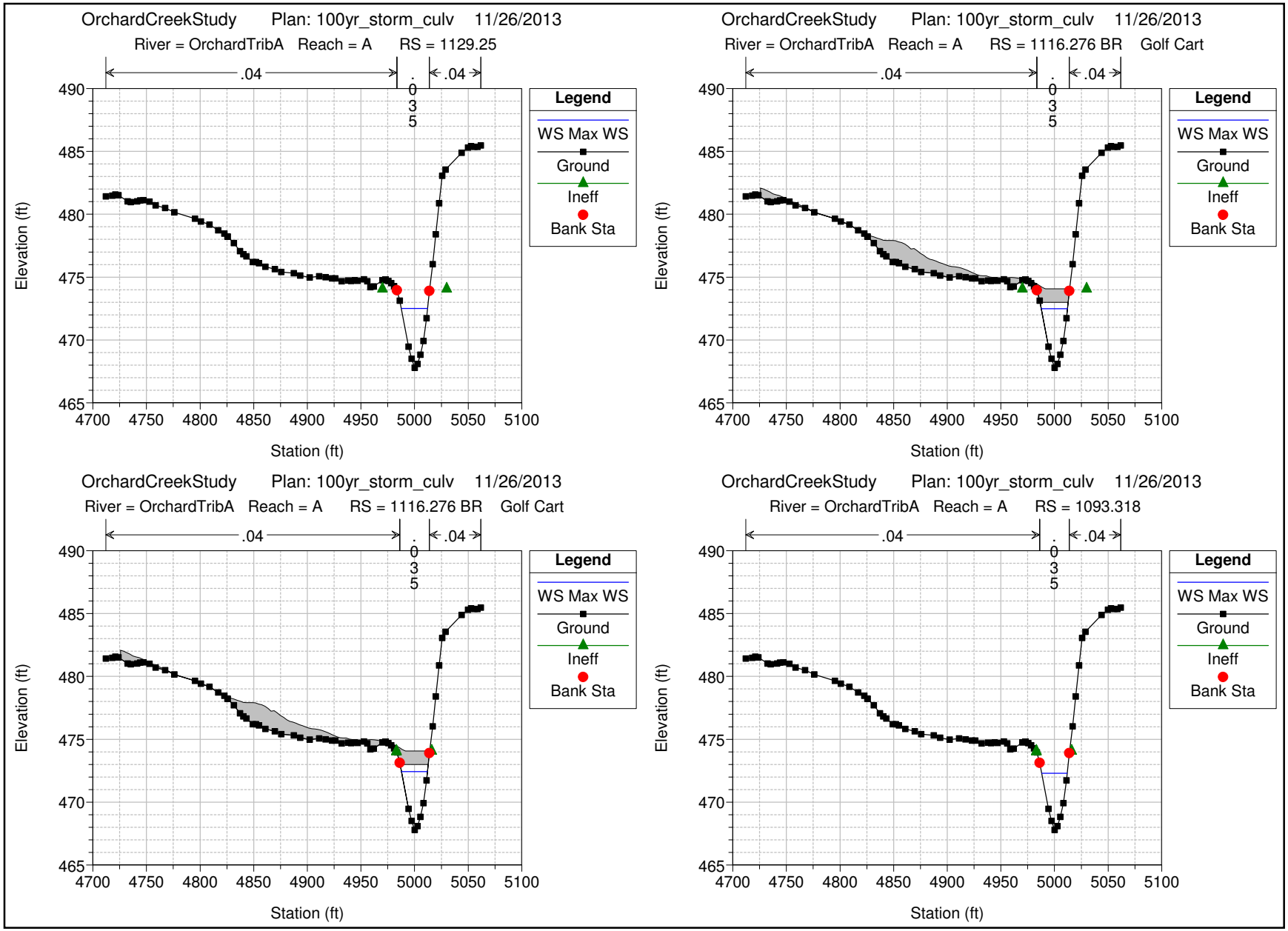

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 736.6259
.04 .12
.1 2 .0 4 5 .0 4
Elevation (ft)
460 458 456 454 452 450 448 446 444
4700 4800 4900 5000 5100 5200 5300 5400
Station (ft)
Legend
WS Max WS
Ground
Levee
Bank Sta
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 407.4108
.04 .12
.1 2 .0 4 5
Elevation (ft)
456 454 452 450 448 446 444 442
4700 4800 4900 5000 5100 5200 5300 5400
Station (ft)
Legend
WS Max WS
Ground
Levee
Bank Sta
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 270.8246
.04 .12 .045 .04
2
Elevation (ft)
458 456 454 452 450 448 446 444 442
4750 4800 4850 4900 4950 5000 5050 5100
Station (ft)
Legend
WS Max WS
Ground
Levee
Ineff
Bank Sta
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 112.7531
.12 .045 .04
Elevation (ft)
456 454 452 450 448 446 444 442
4800 4850 4900 4950 5000 5050 5100
Station (ft)
Legend
WS Max WS
Ground
Levee
Bank Sta

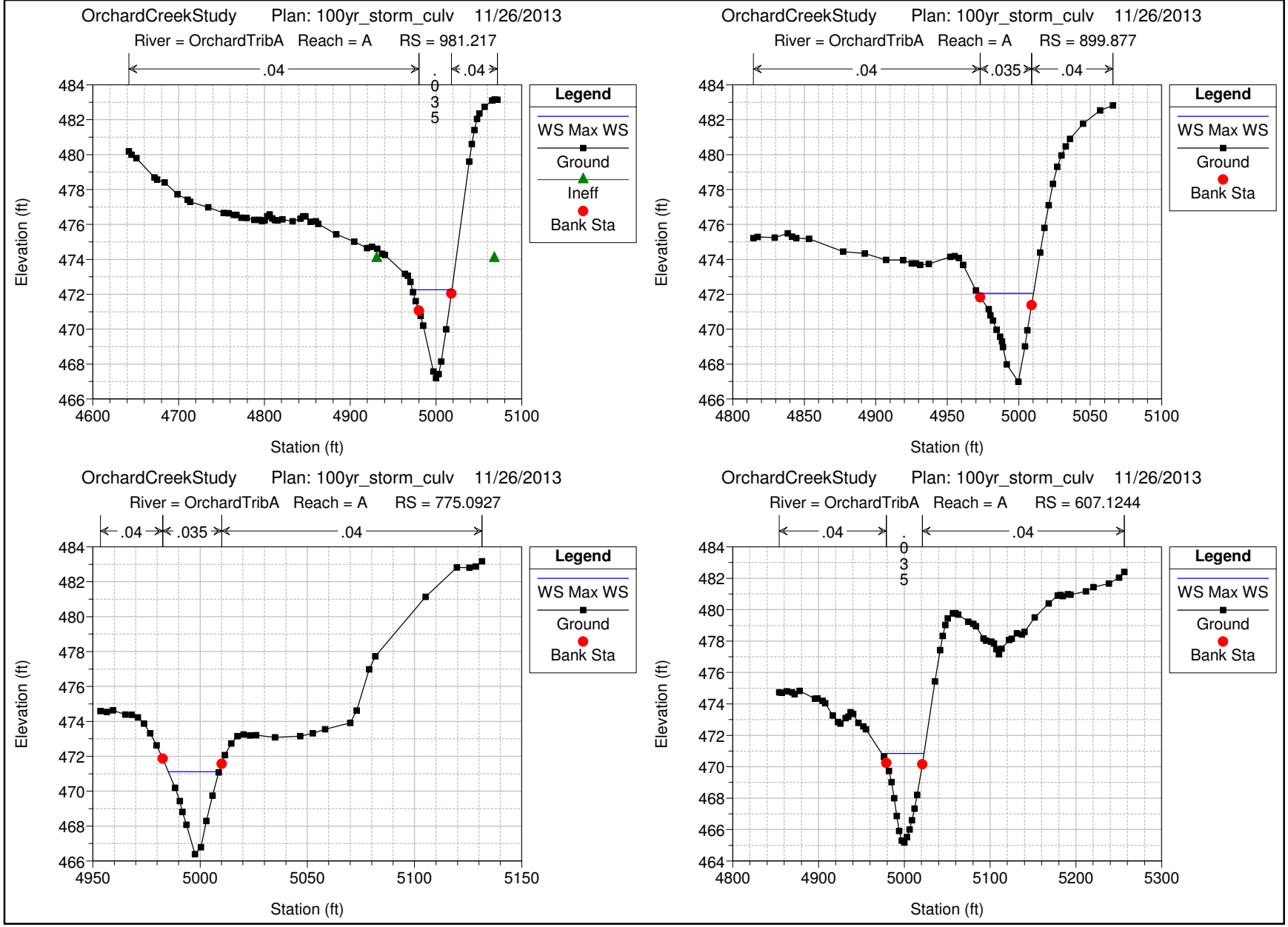

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = Orchard Creek Reach = Middle RS = 29.37117
.12
.045
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Levee
Bank Sta

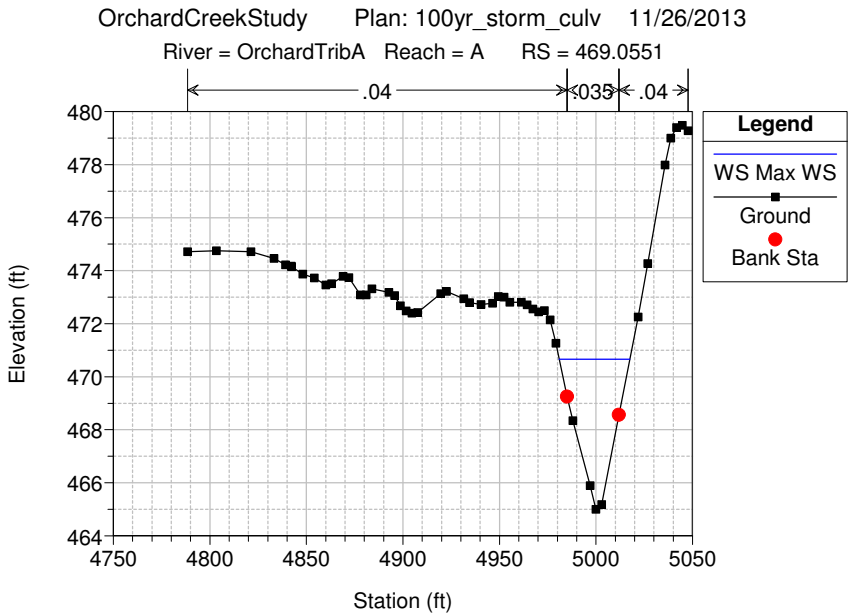

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = OrchardTribA Reach = A RS = 1399.013
.04
.035
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Bank Sta

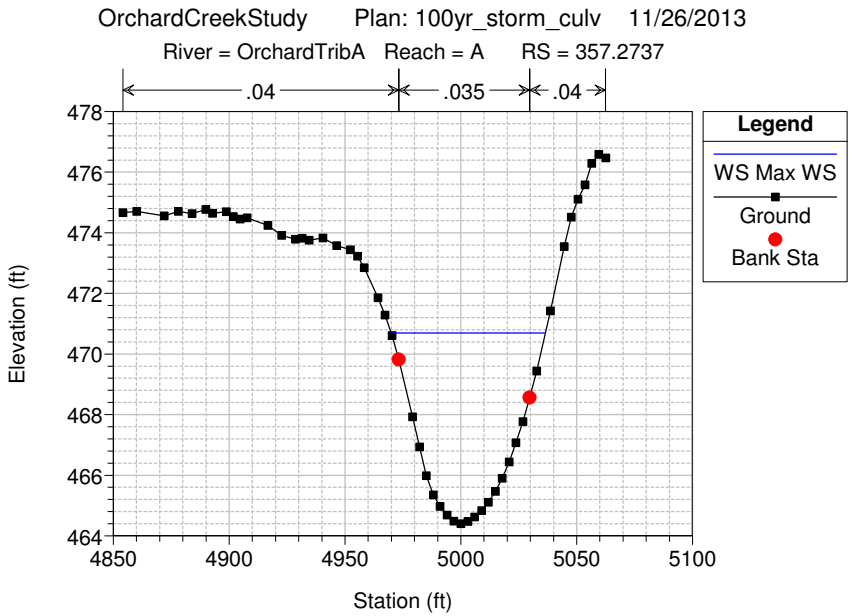

OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = OrchardTribA Reach = A RS = 1254.615
.04
.035
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta


OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = OrchardTribA Reach = A RS = 1143.25
.04
.035
.04
Elevation (ft)
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta


OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = OrchardTribA Reach = A RS = 1129.25
.04
.035
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = OrchardTribA Reach = A RS = 1116.276 BR Golf Cart
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = OrchardTribA Reach = A RS = 1116.276 BR Golf Cart
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = OrchardTribA Reach = A RS = 1093.318


OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = OrchardTribA Reach = A RS = 981.217
.04
.035
.04
Legend
WS Max WS
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = OrchardTribA Reach = A RS = 899.877
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = OrchardTribA Reach = A RS = 775.0927
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = OrchardTribA Reach = A RS = 607.1244
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)


OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = OrchardTribA Reach = A RS = 469.0551
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
480
478
476
474
472
470
468
466
464
4750
4800
4850
4900
4950
5000
5050


OrchardCreekStudy Plan: 100yr_storm_culv 11/26/2013
River = OrchardTribA Reach = A RS = 357.2737
.04
.035
.04
Legend
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
478
476
474
472
470
468
466
464
4850
4900
4950
5000
5050
5100

Appendix E: HEC-RAS Results

HEC-RAS Profile: Max WS

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
OrchardTribA	A	1399.013	Max WS	20130418_ex	264.84	470.39	474.26		474.36	0.001935	2.68	110.99	97.05	0.36
OrchardTribA	A	1399.013	Max WS	010yr_ex	167.17	470.39	473.57		473.68	0.001798	2.68	62.37	37.79	0.35
OrchardTribA	A	1399.013	Max WS	100yr_ex	469.96	470.39	475.35		475.42	0.000791	2.35	259.09	159.66	0.25
OrchardTribA	A	1399.013	Max WS	100yr_proposed	279.09	470.39	474.35		474.45	0.001792	2.63	120.43	106.53	0.35
OrchardTribA	A	1399.013	Max WS	010yr_prop	104.34	470.39	472.87		472.97	0.001964	2.51	41.65	26.50	0.35
OrchardTribA	A	1399.013	Max WS	100yr_culv	279.09	470.39	474.35		474.45	0.001792	2.63	120.43	106.53	0.35
OrchardTribA	A	1399.013	Max WS	010yr_culv	104.35	470.39	472.87		472.97	0.001965	2.51	41.64	26.50	0.35
OrchardTribA	A	1254.615	Max WS	20130418_ex	264.73	469.40	473.21		473.82	0.008394	6.28	42.15	18.94	0.74
OrchardTribA	A	1254.615	Max WS	010yr_ex	167.14	469.40	472.57		473.03	0.007974	5.44	30.70	16.57	0.70
OrchardTribA	A	1254.615	Max WS	100yr_ex	469.82	469.40	474.28		475.11	0.008278	7.30	64.39	22.62	0.76
OrchardTribA	A	1254.615	Max WS	100yr_proposed	279.01	469.40	473.30		473.93	0.008312	6.35	43.94	19.26	0.74
OrchardTribA	A	1254.615	Max WS	010yr_prop	104.16	469.40	472.01		472.35	0.007666	4.72	22.08	14.44	0.67
OrchardTribA	A	1254.615	Max WS	100yr_culv	279.04	469.40	473.30		473.93	0.008314	6.35	43.94	19.26	0.74
OrchardTribA	A	1254.615	Max WS	010yr_culv	104.17	469.40	472.01		472.35	0.007681	4.72	22.06	14.44	0.67
OrchardTribA	A	1143.25	Max WS	20130418_ex	264.70	468.00	471.84		472.76	0.014208	7.72	34.30	16.33	0.94
OrchardTribA	A	1143.25	Max WS	010yr_ex	167.10	468.00	471.16	471.11	471.92	0.015480	6.98	23.93	14.37	0.95
OrchardTribA	A	1143.25	Max WS	100yr_ex	469.76	468.00	472.95		474.07	0.013056	8.52	55.11	21.29	0.93
OrchardTribA	A	1143.25	Max WS	100yr_proposed	279.00	468.00	471.93		472.87	0.014044	7.78	35.86	16.72	0.94
OrchardTribA	A	1143.25	Max WS	010yr_prop	104.41	468.00	470.62	470.58	471.23	0.016764	6.30	16.58	12.46	0.96
OrchardTribA	A	1143.25	Max WS	100yr_culv	279.00	468.00	471.93		472.87	0.014044	7.78	35.86	16.72	0.94
OrchardTribA	A	1143.25	Max WS	010yr_culv	104.36	468.00	470.62	470.57	471.23	0.016766	6.30	16.58	12.46	0.96
OrchardTribA	A	1129.25	Max WS	20130418_ex	264.70	467.79	471.98	470.59	472.31	0.003768	4.62	57.29	22.54	0.51
OrchardTribA	A	1129.25	Max WS	010yr_ex	167.06	467.79	471.25	469.96	471.49	0.003602	4.00	41.72	19.83	0.49
OrchardTribA	A	1129.25	Max WS	100yr_ex	469.76	467.79	473.15	471.56	473.61	0.003902	5.46	85.96	26.68	0.54
OrchardTribA	A	1129.25	Max WS	100yr_proposed	278.99	467.79	472.09	470.67	472.43	0.003729	4.67	59.75	22.92	0.51
OrchardTribA	A	1129.25	Max WS	010yr_prop	104.83	467.79	470.62	469.44	470.81	0.003542	3.49	30.04	17.47	0.47
OrchardTribA	A	1129.25	Max WS	100yr_culv	278.99	467.79	472.09	470.67	472.43	0.003729	4.67	59.75	22.92	0.51
OrchardTribA	A	1129.25	Max WS	010yr_culv	104.84	467.79	470.62	469.44	470.81	0.003546	3.49	30.03	17.47	0.47
OrchardTribA	A	1116.276			Bridge									
OrchardTribA	A	1093.318	Max WS	20130418_ex	264.67	467.79	471.77		472.16	0.004786	5.04	52.55	21.78	0.57
OrchardTribA	A	1093.318	Max WS	010yr_ex	167.03	467.79	471.05		471.35	0.004678	4.40	37.96	19.10	0.55
OrchardTribA	A	1093.318	Max WS	100yr_ex	469.76	467.79	472.81		473.38	0.005246	6.09	77.11	25.45	0.62
OrchardTribA	A	1093.318	Max WS	100yr_proposed	278.99	467.79	471.88		472.28	0.004663	5.06	55.10	22.19	0.57
OrchardTribA	A	1093.318	Max WS	010yr_prop	104.32	467.79	470.43		470.67	0.004800	3.88	26.86	16.77	0.54
OrchardTribA	A	1093.318	Max WS	100yr_culv	278.98	467.79	471.88		472.28	0.004663	5.06	55.10	22.19	0.57
OrchardTribA	A	1093.318	Max WS	010yr_culv	104.32	467.79	470.43		470.67	0.004803	3.88	26.86	16.77	0.54
OrchardTribA	A	981.217	Max WS	20130418_ex	264.60	467.19	471.68		471.80	0.001216	2.75	97.27	41.14	0.30
OrchardTribA	A	981.217	Max WS	010yr_ex	167.01	467.19	470.92		471.01	0.001315	2.43	68.61	33.61	0.30
OrchardTribA	A	981.217	Max WS	100yr_ex	469.77	467.19	472.82		472.98	0.001113	3.30	149.35	50.77	0.30
OrchardTribA	A	981.217	Max WS	100yr_proposed	278.98	467.19	471.81		471.93	0.001159	2.75	102.77	42.29	0.30
OrchardTribA	A	981.217	Max WS	010yr_prop	104.27	467.19	470.26		470.33	0.001275	2.15	48.44	27.88	0.29
OrchardTribA	A	981.217	Max WS	100yr_culv	278.97	467.19	471.81		471.93	0.001158	2.75	102.77	42.29	0.30
OrchardTribA	A	981.217	Max WS	010yr_culv	104.32	467.19	470.26		470.33	0.001276	2.15	48.43	27.88	0.29

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
OrchardTribA	A	899.877	Max WS	20130418_ex	264.57	466.99	471.47		471.66	0.002297	3.47	76.34	33.02	0.40
OrchardTribA	A	899.877	Max WS	010yr_ex	167.00	466.99	470.72		470.87	0.002237	3.09	54.10	27.09	0.38
OrchardTribA	A	899.877	Max WS	100yr_ex	469.79	466.99	472.62		472.86	0.001933	3.99	120.72	43.81	0.39
OrchardTribA	A	899.877	Max WS	100yr_proposed	278.98	466.99	471.62		471.80	0.002183	3.44	81.24	34.57	0.39
OrchardTribA	A	899.877	Max WS	010yr_prop	104.23	466.99	470.08		470.20	0.002118	2.72	38.39	22.34	0.37
OrchardTribA	A	899.877	Max WS	100yr_culv	278.95	466.99	471.62		471.80	0.002182	3.44	81.25	34.57	0.39
OrchardTribA	A	899.877	Max WS	010yr_culv	104.30	466.99	470.08		470.20	0.002121	2.72	38.39	22.34	0.37
OrchardTribA	A	775.0927	Max WS	20130418_ex	264.40	466.40	470.25		470.98	0.011179	6.86	38.54	18.73	0.84
OrchardTribA	A	775.0927	Max WS	010yr_ex	166.87	466.40	469.55		470.16	0.011610	6.27	26.60	15.18	0.83
OrchardTribA	A	775.0927	Max WS	100yr_ex	464.11	466.40	471.57		472.29	0.008108	6.81	68.14	26.53	0.75
OrchardTribA	A	775.0927	Max WS	100yr_proposed	278.41	466.40	470.78		471.28	0.006700	5.67	49.08	21.68	0.66
OrchardTribA	A	775.0927	Max WS	010yr_prop	104.25	466.40	468.96		469.46	0.012294	5.68	18.37	12.76	0.83
OrchardTribA	A	775.0927	Max WS	100yr_culv	278.52	466.40	470.78		471.28	0.006709	5.68	49.07	21.68	0.66
OrchardTribA	A	775.0927	Max WS	010yr_culv	104.26	466.40	468.96		469.46	0.012295	5.68	18.37	12.76	0.83
OrchardTribA	A	607.1244	Max WS	20130418_ex	263.96	465.17	469.66		469.77	0.001177	2.72	97.16	36.91	0.30
OrchardTribA	A	607.1244	Max WS	010yr_ex	166.37	465.17	468.87		468.96	0.001100	2.36	70.40	31.38	0.28
OrchardTribA	A	607.1244	Max WS	100yr_ex	462.41	465.17	471.29		471.41	0.000730	2.79	170.93	55.82	0.25
OrchardTribA	A	607.1244	Max WS	100yr_proposed	278.15	465.17	470.50		470.57	0.000569	2.12	131.30	44.72	0.21
OrchardTribA	A	607.1244	Max WS	010yr_prop	98.03	465.17	468.24		468.30	0.000897	1.90	51.72	27.61	0.24
OrchardTribA	A	607.1244	Max WS	100yr_culv	278.17	465.17	470.50		470.57	0.000570	2.13	131.28	44.72	0.21
OrchardTribA	A	607.1244	Max WS	010yr_culv	98.39	465.17	468.24		468.30	0.000903	1.90	51.73	27.61	0.24
OrchardTribA	A	469.0551	Max WS	20130418_ex	263.10	465.00	469.27		469.51	0.002814	3.98	66.57	28.75	0.45
OrchardTribA	A	469.0551	Max WS	010yr_ex	154.96	465.00	468.49		468.67	0.002810	3.36	46.10	24.16	0.43
OrchardTribA	A	469.0551	Max WS	100yr_ex	459.36	465.00	471.06		471.28	0.001286	3.88	127.00	38.82	0.33
OrchardTribA	A	469.0551	Max WS	100yr_proposed	276.20	465.00	470.35		470.47	0.000888	2.85	100.97	34.84	0.27
OrchardTribA	A	469.0551	Max WS	010yr_prop	86.31	465.00	467.96		468.06	0.001946	2.53	34.16	20.88	0.35
OrchardTribA	A	469.0551	Max WS	100yr_culv	276.63	465.00	470.35		470.47	0.000890	2.86	100.97	34.84	0.27
OrchardTribA	A	469.0551	Max WS	010yr_culv	86.19	465.00	467.96		468.06	0.001941	2.52	34.16	20.88	0.35
OrchardTribA	A	357.2737	Max WS	20130418_ex	278.97	464.40	469.26		469.29	0.000263	1.52	183.99	57.13	0.15
OrchardTribA	A	357.2737	Max WS	010yr_ex	167.21	464.40	468.44		468.46	0.000218	1.20	139.35	51.73	0.13
OrchardTribA	A	357.2737	Max WS	100yr_ex	494.42	464.40	471.11		471.15	0.000187	1.70	301.04	69.72	0.13
OrchardTribA	A	357.2737	Max WS	100yr_proposed	301.10	464.40	470.36		470.39	0.000119	1.22	251.29	64.36	0.10
OrchardTribA	A	357.2737	Max WS	010yr_prop	98.28	464.40	467.91		467.92	0.000137	0.87	112.89	48.07	0.10
OrchardTribA	A	357.2737	Max WS	100yr_culv	301.54	464.40	470.37		470.39	0.000120	1.22	251.31	64.36	0.10
OrchardTribA	A	357.2737	Max WS	010yr_culv	98.28	464.40	467.91		467.92	0.000137	0.87	112.90	48.07	0.10
Orchard Creek	Upstream	10439	Max WS	20130418_ex	97.31	491.87	493.47		493.70	0.021574	3.83	25.41	35.98	0.80
Orchard Creek	Upstream	10439	Max WS	010yr_ex	60.14	491.87	493.31		493.45	0.017142	3.06	19.68	32.92	0.70
Orchard Creek	Upstream	10439	Max WS	100yr_ex	144.57	491.87	493.67		493.97	0.021353	4.39	33.26	43.88	0.83
Orchard Creek	Upstream	10439	Max WS	100yr_proposed	106.43	491.87	493.52		493.76	0.021560	3.93	27.06	36.82	0.81
Orchard Creek	Upstream	10439	Max WS	010yr_prop	46.13	491.87	493.17		493.31	0.018045	2.97	15.52	29.02	0.72
Orchard Creek	Upstream	10439	Max WS	100yr_culv	106.43	491.87	493.52		493.76	0.021560	3.93	27.06	36.82	0.81
Orchard Creek	Upstream	10439	Max WS	010yr_culv	46.13	491.87	493.17		493.31	0.018045	2.97	15.52	29.02	0.72

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Orchard Creek	Upstream	10319	Max WS	20130418_ex	97.21	491.00	492.21		492.34	0.010222	3.03	37.29	77.82	0.57
Orchard Creek	Upstream	10319	Max WS	010yr_ex	60.08	491.00	492.03		492.14	0.009628	2.61	24.74	56.08	0.54
Orchard Creek	Upstream	10319	Max WS	100yr_ex	143.58	491.00	492.50		492.60	0.005827	2.77	62.91	97.04	0.45
Orchard Creek	Upstream	10319	Max WS	100yr_proposed	106.06	491.00	492.34		492.44	0.006416	2.64	48.18	87.33	0.46
Orchard Creek	Upstream	10319	Max WS	010yr_prop	46.02	491.00	491.96		492.04	0.007615	2.24	21.36	42.55	0.48
Orchard Creek	Upstream	10319	Max WS	100yr_culv	106.07	491.00	492.34		492.44	0.006417	2.64	48.18	87.33	0.46
Orchard Creek	Upstream	10319	Max WS	010yr_culv	46.02	491.00	491.96		492.04	0.007616	2.24	21.36	42.55	0.48
Orchard Creek	Upstream	10146	Max WS	20130418_ex	120.67	489.83	491.14		491.21	0.006570	2.07	58.32	85.68	0.44
Orchard Creek	Upstream	10146	Max WS	010yr_ex	88.55	489.83	491.05		491.09	0.004825	1.75	50.61	75.85	0.38
Orchard Creek	Upstream	10146	Max WS	100yr_ex	208.41	489.83	491.47		491.56	0.005727	2.35	88.78	97.37	0.43
Orchard Creek	Upstream	10146	Max WS	100yr_proposed	171.45	489.83	491.33		491.41	0.006269	2.27	75.38	92.76	0.44
Orchard Creek	Upstream	10146	Max WS	010yr_prop	74.59	489.83	490.98		491.02	0.004672	1.63	45.72	74.29	0.37
Orchard Creek	Upstream	10146	Max WS	100yr_culv	171.44	489.83	491.33		491.41	0.006268	2.27	75.38	92.76	0.44
Orchard Creek	Upstream	10146	Max WS	010yr_culv	74.60	489.83	490.98		491.02	0.004672	1.63	45.72	74.29	0.37
Orchard Creek	Upstream	10004	Max WS	20130418_ex	120.65	488.29	489.54		489.71	0.020174	3.30	36.52	61.61	0.76
Orchard Creek	Upstream	10004	Max WS	010yr_ex	88.69	488.29	489.43		489.57	0.019757	2.96	29.91	58.45	0.73
Orchard Creek	Upstream	10004	Max WS	100yr_ex	208.36	488.29	489.82		490.04	0.018471	3.82	54.56	69.30	0.76
Orchard Creek	Upstream	10004	Max WS	100yr_proposed	170.79	488.29	489.71		489.91	0.018959	3.62	47.23	66.42	0.76
Orchard Creek	Upstream	10004	Max WS	010yr_prop	74.53	488.29	489.34		489.48	0.019129	2.94	25.35	48.94	0.72
Orchard Creek	Upstream	10004	Max WS	100yr_culv	170.84	488.29	489.71		489.91	0.019001	3.62	47.21	66.41	0.76
Orchard Creek	Upstream	10004	Max WS	010yr_culv	74.53	488.29	489.34		489.48	0.019129	2.94	25.35	48.94	0.72
Orchard Creek	Upstream	9742	Max WS	20130418_ex	120.58	484.49	486.48		486.62	0.007605	3.03	41.41	51.35	0.51
Orchard Creek	Upstream	9742	Max WS	010yr_ex	88.32	484.49	486.29		486.40	0.008282	2.76	32.20	42.00	0.52
Orchard Creek	Upstream	9742	Max WS	100yr_ex	208.10	484.49	486.78		487.00	0.009077	3.88	60.19	76.42	0.58
Orchard Creek	Upstream	9742	Max WS	100yr_proposed	171.51	484.49	486.65		486.85	0.009196	3.65	50.74	64.21	0.58
Orchard Creek	Upstream	9742	Max WS	010yr_prop	74.41	484.49	486.13		486.25	0.009025	2.80	26.60	31.40	0.54
Orchard Creek	Upstream	9742	Max WS	100yr_culv	171.49	484.49	486.65		486.85	0.009192	3.65	50.75	64.22	0.58
Orchard Creek	Upstream	9742	Max WS	010yr_culv	74.41	484.49	486.13		486.25	0.009026	2.80	26.60	31.40	0.54
Orchard Creek	Upstream	9609	Max WS	20130418_ex	120.55	483.26	485.37		485.55	0.013083	3.41	35.32	40.49	0.64
Orchard Creek	Upstream	9609	Max WS	010yr_ex	88.24	483.26	485.18		485.33	0.009876	3.06	28.80	31.32	0.56
Orchard Creek	Upstream	9609	Max WS	100yr_ex	208.17	483.26	485.70		485.95	0.013125	4.03	55.57	86.38	0.67
Orchard Creek	Upstream	9609	Max WS	100yr_proposed	170.43	483.26	485.58		485.80	0.013266	3.76	46.81	68.72	0.66
Orchard Creek	Upstream	9609	Max WS	010yr_prop	74.15	483.26	485.05		485.19	0.009618	2.98	24.86	27.53	0.55
Orchard Creek	Upstream	9609	Max WS	100yr_culv	170.50	483.26	485.58		485.80	0.013296	3.76	46.79	68.69	0.66
Orchard Creek	Upstream	9609	Max WS	010yr_culv	74.25	483.26	485.05		485.19	0.009650	2.99	24.85	27.52	0.55
Orchard Creek	Upstream	9397	Max WS	20130418_ex	120.33	480.75	484.19		484.28	0.003312	2.50	56.51	90.60	0.35
Orchard Creek	Upstream	9397	Max WS	010yr_ex	85.51	480.75	484.06		484.12	0.002159	2.00	47.17	60.20	0.28
Orchard Creek	Upstream	9397	Max WS	100yr_ex	208.04	480.75	484.72		484.77	0.001715	2.15	136.87	174.07	0.27
Orchard Creek	Upstream	9397	Max WS	100yr_proposed	171.27	480.75	484.65		484.69	0.001472	1.95	124.47	171.62	0.24
Orchard Creek	Upstream	9397	Max WS	010yr_prop	72.92	480.75	484.00		484.05	0.001759	1.80	43.97	51.70	0.26
Orchard Creek	Upstream	9397	Max WS	100yr_culv	171.25	480.75	484.65		484.69	0.001471	1.95	124.47	171.62	0.24
Orchard Creek	Upstream	9397	Max WS	010yr_culv	72.93	480.75	484.00		484.05	0.001760	1.80	43.97	51.70	0.26
Orchard Creek	Upstream	9248	Max WS	20130418_ex	213.75	479.71	483.69		483.79	0.003706	2.97	101.51	152.80	0.38

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Orchard Creek	Upstream	9248	Max WS	010yr_ex	176.86	479.71	483.64		483.72	0.003012	2.63	93.98	149.39	0.34
Orchard Creek	Upstream	9248	Max WS	100yr_ex	459.71	479.71	484.24		484.35	0.003300	3.32	193.51	177.76	0.37
Orchard Creek	Upstream	9248	Max WS	100yr_proposed	422.48	479.71	484.20		484.30	0.003097	3.18	186.36	176.26	0.36
Orchard Creek	Upstream	9248	Max WS	010yr_prop	168.47	479.71	483.62		483.70	0.002906	2.57	91.36	148.18	0.33
Orchard Creek	Upstream	9248	Max WS	100yr_culv	422.47	479.71	484.20		484.30	0.003097	3.18	186.36	176.26	0.36
Orchard Creek	Upstream	9248	Max WS	010yr_culv	168.57	479.71	483.62		483.70	0.002910	2.57	91.34	148.18	0.33
Orchard Creek	Upstream	9068	Max WS	20130418_ex	213.58	478.96	482.56	482.61	482.89	0.011847	5.00	58.58	120.59	0.67
Orchard Creek	Upstream	9068	Max WS	010yr_ex	186.50	478.96	482.48	482.54	482.81	0.012008	4.89	49.54	114.55	0.67
Orchard Creek	Upstream	9068	Max WS	100yr_ex	460.18	478.96	483.04		483.31	0.009523	5.27	133.13	172.41	0.62
Orchard Creek	Upstream	9068	Max WS	100yr_proposed	422.20	478.96	482.98		483.26	0.009660	5.22	123.54	168.72	0.62
Orchard Creek	Upstream	9068	Max WS	010yr_prop	172.57	478.96	482.44	481.94	482.77	0.011732	4.76	45.39	111.72	0.66
Orchard Creek	Upstream	9068	Max WS	100yr_culv	422.20	478.96	482.98		483.26	0.009660	5.22	123.54	168.72	0.62
Orchard Creek	Upstream	9068	Max WS	010yr_culv	172.57	478.96	482.44	481.94	482.77	0.011732	4.76	45.39	111.72	0.66
Orchard Creek	Upstream	8833	Max WS	20130418_ex	213.52	477.12	480.40		480.69	0.011199	4.37	54.30	72.56	0.64
Orchard Creek	Upstream	8833	Max WS	010yr_ex	186.43	477.12	480.24		480.54	0.012206	4.44	43.81	52.94	0.67
Orchard Creek	Upstream	8833	Max WS	100yr_ex	459.65	477.12	481.05		481.37	0.009292	5.06	111.77	102.60	0.62
Orchard Creek	Upstream	8833	Max WS	100yr_proposed	421.94	477.12	480.97		481.29	0.009465	4.98	103.92	100.29	0.62
Orchard Creek	Upstream	8833	Max WS	010yr_prop	172.46	477.12	480.16		480.46	0.012382	4.41	39.87	42.07	0.67
Orchard Creek	Upstream	8833	Max WS	100yr_culv	421.93	477.12	480.97		481.29	0.009465	4.98	103.92	100.29	0.62
Orchard Creek	Upstream	8833	Max WS	010yr_culv	172.48	477.12	480.16		480.46	0.012389	4.41	39.86	42.06	0.67
Orchard Creek	Upstream	8507	Max WS	20130418_ex	210.25	473.79	478.71		478.81	0.002226	2.80	93.26	79.24	0.31
Orchard Creek	Upstream	8507	Max WS	010yr_ex	185.99	473.79	478.60		478.70	0.002076	2.69	84.91	74.76	0.29
Orchard Creek	Upstream	8507	Max WS	100yr_ex	457.93	473.79	479.45		479.61	0.002957	3.78	164.73	120.80	0.37
Orchard Creek	Upstream	8507	Max WS	100yr_proposed	419.97	473.79	479.37		479.52	0.002889	3.67	155.13	118.67	0.36
Orchard Creek	Upstream	8507	Max WS	010yr_prop	172.02	473.79	478.55		478.64	0.001921	2.58	81.28	72.73	0.28
Orchard Creek	Upstream	8507	Max WS	100yr_culv	420.46	473.79	479.37		479.52	0.002899	3.68	155.05	118.63	0.36
Orchard Creek	Upstream	8507	Max WS	010yr_culv	172.02	473.79	478.55		478.64	0.001921	2.58	81.28	72.73	0.28
Orchard Creek	Upstream	8314	Max WS	20130418_ex	212.12	472.50	477.68		477.89	0.008960	4.30	62.36	69.13	0.52
Orchard Creek	Upstream	8314	Max WS	010yr_ex	185.98	472.50	477.57		477.78	0.008842	4.23	55.68	59.61	0.51
Orchard Creek	Upstream	8314	Max WS	100yr_ex	457.90	472.50	478.33		478.56	0.009623	4.60	125.66	126.80	0.56
Orchard Creek	Upstream	8314	Max WS	100yr_proposed	420.40	472.50	478.28		478.49	0.009440	4.49	118.87	122.48	0.55
Orchard Creek	Upstream	8314	Max WS	010yr_prop	171.94	472.50	477.52		477.72	0.008507	4.13	52.41	55.83	0.50
Orchard Creek	Upstream	8314	Max WS	100yr_culv	420.47	472.50	478.28		478.49	0.009452	4.50	118.83	122.45	0.55
Orchard Creek	Upstream	8314	Max WS	010yr_culv	171.93	472.50	477.52		477.72	0.008507	4.13	52.41	55.83	0.50
Orchard Creek	Upstream	7907	Max WS	20130418_ex	306.66	468.83	473.07		474.01	0.012408	7.80	39.33	16.16	0.88
Orchard Creek	Upstream	7907	Max WS	010yr_ex	281.45	468.83	472.91		473.82	0.012405	7.65	36.81	15.57	0.88
Orchard Creek	Upstream	7907	Max WS	100yr_ex	689.40	468.83	474.61	475.18	475.97	0.013815	9.49	82.90	80.88	0.98
Orchard Creek	Upstream	7907	Max WS	100yr_proposed	651.80	468.83	474.54	475.07	475.86	0.013636	9.31	77.22	69.06	0.97
Orchard Creek	Upstream	7907	Max WS	010yr_prop	267.14	468.83	472.82		473.70	0.012372	7.55	35.39	15.23	0.87
Orchard Creek	Upstream	7907	Max WS	100yr_culv	651.83	468.83	474.54	475.07	475.86	0.013640	9.31	77.21	69.04	0.97
Orchard Creek	Upstream	7907	Max WS	010yr_culv	267.14	468.83	472.82		473.70	0.012373	7.55	35.39	15.23	0.87
Orchard Creek	Upstream	7635	Max WS	20130418_ex	306.51	466.56	470.72		471.25	0.007711	5.84	52.45	24.95	0.71
Orchard Creek	Upstream	7635	Max WS	010yr_ex	281.04	466.56	470.48		471.04	0.008470	6.02	46.69	22.71	0.74

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Orchard Creek	Upstream	7635	Max WS	100yr_ex	687.39	466.56	472.49		473.02	0.004963	5.97	128.36	72.41	0.61
Orchard Creek	Upstream	7635	Max WS	100yr_proposed	650.65	466.56	472.33		472.87	0.005355	6.05	117.16	65.10	0.63
Orchard Creek	Upstream	7635	Max WS	010yr_prop	266.66	466.56	470.37		470.93	0.008630	6.04	44.18	21.66	0.74
Orchard Creek	Upstream	7635	Max WS	100yr_culv	650.44	466.56	472.33		472.87	0.005351	6.05	117.17	65.11	0.63
Orchard Creek	Upstream	7635	Max WS	010yr_culv	266.93	466.56	470.37		470.94	0.008649	6.04	44.18	21.66	0.75
Orchard Creek	Upstream	7471	Max WS	20130418_ex	306.40	465.23	470.01		470.34	0.003636	4.60	66.54	25.59	0.50
Orchard Creek	Upstream	7471	Max WS	010yr_ex	279.88	465.23	469.66		470.02	0.004074	4.82	58.06	22.57	0.53
Orchard Creek	Upstream	7471	Max WS	100yr_ex	683.72	465.23	471.85		472.27	0.004010	5.19	131.81	48.41	0.55
Orchard Creek	Upstream	7471	Max WS	100yr_proposed	650.07	465.23	471.60		472.05	0.004499	5.41	120.08	43.52	0.57
Orchard Creek	Upstream	7471	Max WS	010yr_prop	266.71	465.23	469.53		469.89	0.004221	4.83	55.21	21.99	0.54
Orchard Creek	Upstream	7471	Max WS	100yr_culv	650.07	465.23	471.60		472.05	0.004499	5.41	120.08	43.52	0.57
Orchard Creek	Upstream	7471	Max WS	010yr_culv	266.74	465.23	469.53		469.89	0.004226	4.83	55.19	21.98	0.54
Orchard Creek	Upstream	7356	Max WS	20130418_ex	306.23	464.50	469.55		469.91	0.004090	4.83	63.38	24.52	0.53
Orchard Creek	Upstream	7356	Max WS	010yr_ex	270.84	464.50	468.94		469.41	0.006032	5.46	49.59	21.30	0.63
Orchard Creek	Upstream	7356	Max WS	100yr_ex	631.12	464.50	471.36		471.78	0.003954	5.21	121.22	43.16	0.54
Orchard Creek	Upstream	7356	Max WS	100yr_proposed	648.70	464.50	470.77		471.44	0.006385	6.57	98.74	34.13	0.68
Orchard Creek	Upstream	7356	Max WS	010yr_prop	262.77	464.50	468.65		469.22	0.007907	6.03	43.57	19.73	0.72
Orchard Creek	Upstream	7356	Max WS	100yr_culv	648.65	464.50	470.77		471.44	0.006383	6.57	98.75	34.13	0.68
Orchard Creek	Upstream	7356	Max WS	010yr_culv	262.35	464.50	468.65		469.21	0.007881	6.02	43.58	19.73	0.71
Orchard Creek	Upstream	7131	Max WS	20130418_ex	327.20	462.63	469.21		469.34	0.000613	2.93	126.06	37.53	0.23
Orchard Creek	Upstream	7131	Max WS	010yr_ex	286.27	462.63	468.42		468.57	0.000898	3.16	98.33	32.32	0.27
Orchard Creek	Upstream	7131	Max WS	100yr_ex	675.76	462.63	471.02		471.24	0.000782	4.07	208.96	58.04	0.28
Orchard Creek	Upstream	7131	Max WS	100yr_proposed	554.33	462.63	470.30		470.50	0.000820	3.87	171.55	46.91	0.28
Orchard Creek	Upstream	7131	Max WS	010yr_prop	277.90	462.63	467.93		468.12	0.001325	3.54	83.31	29.31	0.32
Orchard Creek	Upstream	7131	Max WS	100yr_culv	554.16	462.63	470.30		470.51	0.000819	3.87	171.57	46.92	0.28
Orchard Creek	Upstream	7131	Max WS	010yr_culv	277.99	462.63	467.93		468.12	0.001325	3.54	83.31	29.31	0.32
Orchard Creek	Middle	6825	Max WS	20130418_ex	606.24	461.12	469.05		469.12	0.000655	2.16	280.24	66.09	0.19
Orchard Creek	Middle	6825	Max WS	010yr_ex	452.40	461.12	468.25		468.31	0.000610	1.97	229.81	59.17	0.18
Orchard Creek	Middle	6825	Max WS	100yr_ex	1169.65	461.12	470.84		470.96	0.000833	2.83	423.08	106.63	0.22
Orchard Creek	Middle	6825	Max WS	100yr_proposed	844.04	461.12	470.15		470.23	0.000674	2.36	358.14	79.91	0.19
Orchard Creek	Middle	6825	Max WS	010yr_prop	373.14	461.12	467.73		467.78	0.000591	1.86	200.34	54.72	0.17
Orchard Creek	Middle	6825	Max WS	100yr_culv	843.72	461.12	470.15		470.24	0.000674	2.36	358.14	79.97	0.19
Orchard Creek	Middle	6825	Max WS	010yr_culv	373.39	461.12	467.73		467.78	0.000593	1.86	200.26	54.72	0.17
Orchard Creek	Middle	6823.328	Max WS	20130418_ex	606.16	460.69	468.96		469.03	0.000661	2.18	278.42	65.31	0.19
Orchard Creek	Middle	6823.328	Max WS	010yr_ex	452.22	460.69	468.16		468.22	0.000609	1.97	229.04	58.44	0.18
Orchard Creek	Middle	6823.328	Max WS	100yr_ex	1169.56	460.69	470.72		470.85	0.000880	2.88	414.60	102.01	0.22
Orchard Creek	Middle	6823.328	Max WS	100yr_proposed	841.32	460.69	470.05		470.14	0.000679	2.37	355.10	74.99	0.19
Orchard Creek	Middle	6823.328	Max WS	010yr_prop	372.97	460.69	467.65		467.70	0.000584	1.86	200.19	54.03	0.17
Orchard Creek	Middle	6823.328	Max WS	100yr_culv	840.64	460.69	470.06		470.14	0.000678	2.37	355.18	75.00	0.19
Orchard Creek	Middle	6823.328	Max WS	010yr_culv	373.12	460.69	467.65		467.70	0.000585	1.86	200.19	54.03	0.17
Orchard Creek	Middle	6823.327			Lat Struct									
Orchard Creek	Middle	6683.985	Max WS	20130418_ex	605.75	460.05	468.36		468.75	0.004146	5.05	120.04	27.96	0.43

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Orchard Creek	Middle	6683.985	Max WS	010yr_ex	452.04	460.05	467.67		467.97	0.003537	4.45	101.67	25.31	0.39
Orchard Creek	Middle	6683.985	Max WS	100yr_ex	1097.04	460.05	469.82		470.50	0.005717	6.63	166.13	36.23	0.52
Orchard Creek	Middle	6683.985	Max WS	100yr_proposed	848.82	460.05	469.36		469.85	0.004650	5.65	150.21	32.70	0.46
Orchard Creek	Middle	6683.985	Max WS	010yr_prop	371.02	460.05	467.20		467.47	0.003261	4.11	90.28	23.79	0.37
Orchard Creek	Middle	6683.985	Max WS	100yr_culv	825.21	460.05	469.37		469.84	0.004350	5.47	150.75	32.81	0.45
Orchard Creek	Middle	6683.985	Max WS	010yr_culv	370.57	460.05	467.20		467.47	0.003253	4.10	90.28	23.79	0.37
Orchard Creek	Middle	6549.854	Max WS	20130418_ex	590.65	459.60	468.26		468.39	0.001266	2.94	201.05	49.21	0.25
Orchard Creek	Middle	6549.854	Max WS	010yr_ex	451.82	459.60	467.54		467.65	0.001126	2.68	168.81	41.65	0.23
Orchard Creek	Middle	6549.854	Max WS	100yr_ex	994.89	459.60	469.86		470.06	0.001232	3.56	284.71	57.93	0.26
Orchard Creek	Middle	6549.854	Max WS	100yr_proposed	848.73	459.60	469.26		469.44	0.001297	3.40	252.08	52.26	0.26
Orchard Creek	Middle	6549.854	Max WS	010yr_prop	370.10	459.60	467.08		467.17	0.001004	2.46	150.30	38.48	0.22
Orchard Creek	Middle	6549.854	Max WS	100yr_culv	803.70	459.60	469.30		469.46	0.001134	3.19	254.16	52.39	0.25
Orchard Creek	Middle	6549.854	Max WS	010yr_culv	370.32	459.60	467.08		467.17	0.001005	2.46	150.31	38.48	0.22
Orchard Creek	Middle	6363.857	Max WS	20130418_ex	588.94	458.92	468.00		468.15	0.001340	3.13	188.34	40.86	0.26
Orchard Creek	Middle	6363.857	Max WS	010yr_ex	451.81	458.92	467.32		467.44	0.001136	2.79	162.03	36.67	0.23
Orchard Creek	Middle	6363.857	Max WS	100yr_ex	663.19	458.92	469.91		470.00	0.000569	2.38	286.51	69.60	0.17
Orchard Creek	Middle	6363.857	Max WS	100yr_proposed	848.48	458.92	468.96		469.17	0.001714	3.67	231.52	52.22	0.29
Orchard Creek	Middle	6363.857	Max WS	010yr_prop	369.36	458.92	466.89		466.99	0.000972	2.52	146.74	34.34	0.21
Orchard Creek	Middle	6363.857	Max WS	100yr_culv	820.98	458.92	468.97		469.17	0.001591	3.54	232.14	52.29	0.28
Orchard Creek	Middle	6363.857	Max WS	010yr_culv	369.24	458.92	466.89		466.99	0.000971	2.52	146.74	34.34	0.21
Orchard Creek	Middle	6179.221	Max WS	20130418_ex	588.44	460.75	467.33		467.67	0.004074	4.67	125.90	35.23	0.44
Orchard Creek	Middle	6179.221	Max WS	010yr_ex	451.78	460.75	466.72		467.01	0.003745	4.28	105.60	31.60	0.41
Orchard Creek	Middle	6179.221	Max WS	100yr_ex	1095.01	460.75	468.78		469.34	0.004742	6.02	186.83	57.67	0.49
Orchard Creek	Middle	6179.221	Max WS	100yr_proposed	848.11	460.75	468.16		468.61	0.004614	5.40	157.33	41.40	0.47
Orchard Creek	Middle	6179.221	Max WS	010yr_prop	368.25	460.75	466.38		466.61	0.003259	3.87	95.11	29.76	0.38
Orchard Creek	Middle	6179.221	Max WS	100yr_culv	785.56	460.75	468.27		468.64	0.003606	4.86	162.10	42.52	0.42
Orchard Creek	Middle	6179.221	Max WS	010yr_culv	367.72	460.75	466.38		466.61	0.003246	3.86	95.16	29.77	0.38
Orchard Creek	Middle	5917.815	Max WS	20130418_ex	588.29	459.29	466.91		467.00	0.000936	2.40	245.17	64.93	0.22
Orchard Creek	Middle	5917.815	Max WS	010yr_ex	451.67	459.29	466.32		466.39	0.000852	2.17	208.24	59.79	0.20
Orchard Creek	Middle	5917.815	Max WS	100yr_ex	1158.66	459.29	468.33		468.50	0.001407	3.30	364.61	138.46	0.27
Orchard Creek	Middle	5917.815	Max WS	100yr_proposed	850.02	459.29	467.72		467.84	0.001141	2.83	302.50	85.30	0.24
Orchard Creek	Middle	5917.815	Max WS	010yr_prop	364.57	459.29	466.03		466.09	0.000694	1.90	191.48	57.31	0.18
Orchard Creek	Middle	5917.815	Max WS	100yr_culv	850.67	459.29	467.72		467.84	0.001141	2.83	302.71	85.41	0.24
Orchard Creek	Middle	5917.815	Max WS	010yr_culv	364.10	459.29	466.03		466.09	0.000691	1.90	191.66	57.33	0.18
Orchard Creek	Middle	5530.633	Max WS	20130418_ex	593.82	459.98	465.98		466.26	0.002964	4.23	140.44	91.78	0.38
Orchard Creek	Middle	5530.633	Max WS	010yr_ex	445.89	459.98	465.59		465.78	0.002177	3.52	126.63	72.61	0.32
Orchard Creek	Middle	5530.633	Max WS	100yr_ex	1168.55	459.98	467.20		467.80	0.005128	6.18	192.85	197.69	0.51
Orchard Creek	Middle	5530.633	Max WS	100yr_proposed	859.07	459.98	466.61		467.03	0.004245	5.22	164.56	134.24	0.46
Orchard Creek	Middle	5530.633	Max WS	010yr_prop	370.72	459.98	465.51		465.65	0.001590	2.99	123.95	69.56	0.27
Orchard Creek	Middle	5530.633	Max WS	100yr_culv	768.38	459.98	466.75		467.07	0.003060	4.51	170.31	140.20	0.39
Orchard Creek	Middle	5530.633	Max WS	010yr_culv	369.78	459.98	465.52		465.66	0.001573	2.98	124.25	69.90	0.27
Orchard Creek	Middle	5169.677	Max WS	20130418_ex	593.29	459.23	465.37		465.51	0.001279	2.93	215.40	80.13	0.26
Orchard Creek	Middle	5169.677	Max WS	010yr_ex	421.40	459.23	465.17		465.24	0.000759	2.20	199.32	75.33	0.20

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Orchard Creek	Middle	5169.677	Max WS	100yr_ex	1161.39	459.23	466.32		466.63	0.002368	4.53	300.14	170.26	0.36
Orchard Creek	Middle	5169.677	Max WS	100yr_proposed	630.99	459.23	465.83		465.95	0.001016	2.77	254.74	90.71	0.23
Orchard Creek	Middle	5169.677	Max WS	010yr_prop	370.65	459.23	465.21		465.26	0.000569	1.91	202.28	76.23	0.17
Orchard Creek	Middle	5169.677	Max WS	100yr_culv	670.74	459.23	466.05		466.17	0.000968	2.79	274.51	113.54	0.23
Orchard Creek	Middle	5169.677	Max WS	010yr_culv	369.71	459.23	465.22		465.28	0.000560	1.90	203.33	76.55	0.17
Orchard Creek	Middle	4866.766	Max WS	20130418_ex	592.28	459.39	464.46		464.69	0.004595	3.84	154.22	94.96	0.45
Orchard Creek	Middle	4866.766	Max WS	010yr_ex	458.60	459.39	463.60		463.91	0.007621	4.46	102.82	52.41	0.56
Orchard Creek	Middle	4866.766	Max WS	100yr_ex	1155.23	459.39	465.91		466.03	0.001781	3.22	540.18	422.42	0.30
Orchard Creek	Middle	4866.766	Max WS	100yr_proposed	851.45	459.39	465.20		465.46	0.003859	4.11	220.65	282.61	0.43
Orchard Creek	Middle	4866.766	Max WS	010yr_prop	371.68	459.39	462.81		463.28	0.013597	5.53	67.24	38.22	0.73
Orchard Creek	Middle	4866.766	Max WS	100yr_culv	856.83	459.39	464.95		465.27	0.005248	4.55	193.33	213.13	0.49
Orchard Creek	Middle	4866.766	Max WS	010yr_culv	369.75	459.39	462.79		463.27	0.013808	5.55	66.57	37.99	0.74
Orchard Creek	Middle	4717.542	Max WS	20130418_ex	594.41	459.27	464.26		464.31	0.000504	1.78	342.00	110.13	0.16
Orchard Creek	Middle	4717.542	Max WS	010yr_ex	460.85	459.27	463.20		463.25	0.000919	1.96	236.48	92.04	0.21
Orchard Creek	Middle	4717.542	Max WS	100yr_ex	1161.37	459.27	465.75		465.84	0.000581	2.39	503.23	308.84	0.18
Orchard Creek	Middle	4717.542	Max WS	100yr_proposed	857.08	459.27	465.04		465.11	0.000534	2.08	424.74	182.02	0.17
Orchard Creek	Middle	4717.542	Max WS	010yr_prop	374.17	459.27	461.77		461.92	0.004376	3.11	120.23	70.42	0.42
Orchard Creek	Middle	4717.542	Max WS	100yr_culv	862.39	459.27	464.69		464.77	0.000720	2.29	387.45	132.58	0.20
Orchard Creek	Middle	4717.542	Max WS	010yr_culv	372.56	459.27	461.69		461.86	0.004987	3.25	114.78	69.64	0.45
Orchard Creek	Middle	4656.30*	Max WS	20130418_ex	645.25	458.40	464.20		464.27	0.000567	2.02	324.81	94.97	0.17
Orchard Creek	Middle	4656.30*	Max WS	010yr_ex	513.87	458.40	463.11		463.18	0.000975	2.20	233.37	75.74	0.22
Orchard Creek	Middle	4656.30*	Max WS	100yr_ex	1269.43	458.40	465.66		465.78	0.000761	2.86	459.98	292.09	0.21
Orchard Creek	Middle	4656.30*	Max WS	100yr_proposed	957.24	458.40	464.96		465.05	0.000696	2.50	393.17	161.16	0.20
Orchard Creek	Middle	4656.30*	Max WS	010yr_prop	427.05	458.40	461.42		461.62	0.004441	3.53	120.85	58.94	0.43
Orchard Creek	Middle	4656.30*	Max WS	100yr_culv	963.30	458.40	464.59		464.70	0.000930	2.75	359.14	110.36	0.23
Orchard Creek	Middle	4656.30*	Max WS	010yr_culv	425.92	458.40	461.29		461.51	0.005420	3.78	112.80	57.86	0.48
Orchard Creek	Middle	4595.06*	Max WS	20130418_ex	645.29	457.54	464.16		464.23	0.000575	2.16	301.46	77.56	0.18
Orchard Creek	Middle	4595.06*	Max WS	010yr_ex	513.86	457.54	463.05		463.13	0.000870	2.27	226.09	62.06	0.21
Orchard Creek	Middle	4595.06*	Max WS	100yr_ex	1269.34	457.54	465.62		465.74	0.000761	2.99	508.49	247.98	0.21
Orchard Creek	Middle	4595.06*	Max WS	100yr_proposed	957.22	457.54	464.90		465.02	0.000753	2.74	357.69	140.41	0.21
Orchard Creek	Middle	4595.06*	Max WS	010yr_prop	427.06	457.54	461.21		461.39	0.003238	3.44	124.27	49.47	0.38
Orchard Creek	Middle	4595.06*	Max WS	100yr_culv	963.25	457.54	464.51		464.64	0.000998	2.99	327.17	89.04	0.24
Orchard Creek	Middle	4595.06*	Max WS	010yr_culv	425.85	457.54	461.02		461.23	0.004034	3.70	115.03	48.33	0.42
Orchard Creek	Middle	4533.82*	Max WS	20130418_ex	645.28	456.67	464.11		464.20	0.000638	2.39	270.85	58.95	0.19
Orchard Creek	Middle	4533.82*	Max WS	010yr_ex	513.84	456.67	462.99		463.08	0.000851	2.44	210.57	50.06	0.21
Orchard Creek	Middle	4533.82*	Max WS	100yr_ex	1269.33	456.67	465.53		465.71	0.000948	3.44	441.03	209.15	0.24
Orchard Creek	Middle	4533.82*	Max WS	100yr_proposed	957.18	456.67	464.83		464.98	0.000889	3.09	321.73	101.49	0.23
Orchard Creek	Middle	4533.82*	Max WS	010yr_prop	427.04	456.67	461.03		461.22	0.002682	3.49	122.30	40.56	0.35
Orchard Creek	Middle	4533.82*	Max WS	100yr_culv	963.15	456.67	464.40		464.58	0.001174	3.37	288.25	65.85	0.26
Orchard Creek	Middle	4533.82*	Max WS	010yr_culv	425.82	456.67	460.79		461.02	0.003349	3.77	112.95	39.50	0.39
Orchard Creek	Middle	4472.581	Max WS	20130418_ex	645.26	454.08	464.07		464.16	0.000556	2.44	265.08	44.92	0.17
Orchard Creek	Middle	4472.581	Max WS	010yr_ex	513.82	454.08	462.94		463.04	0.000573	2.48	207.24	39.08	0.17
Orchard Creek	Middle	4472.581	Max WS	100yr_ex	1269.27	454.08	465.45		465.66	0.001014	3.76	396.78	192.70	0.24

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Orchard Creek	Middle	4472.581	Max WS	100yr_proposed	957.15	454.08	464.76		464.92	0.000858	3.25	299.27	56.90	0.22
Orchard Creek	Middle	4472.581	Max WS	010yr_prop	427.03	454.08	460.97		461.10	0.001109	2.93	145.93	32.37	0.23
Orchard Creek	Middle	4472.581	Max WS	100yr_culv	963.17	454.08	464.35		464.51	0.000977	3.26	295.67	47.60	0.23
Orchard Creek	Middle	4472.581	Max WS	010yr_culv	425.81	454.08	460.76		460.88	0.001094	2.74	155.54	34.35	0.23
Orchard Creek	Middle	4417.888			Culvert									
Orchard Creek	Middle	4358.909	Max WS	20130418_ex	644.23	453.60	460.78		461.35	0.002956	6.09	105.82	33.69	0.42
Orchard Creek	Middle	4358.909	Max WS	010yr_ex	511.87	453.60	460.31		460.73	0.002385	5.21	98.31	32.33	0.37
Orchard Creek	Middle	4358.909	Max WS	100yr_ex	1261.40	453.60	462.13		463.65	0.006095	9.90	127.45	38.76	0.62
Orchard Creek	Middle	4358.909	Max WS	100yr_proposed	955.68	453.60	461.29		462.38	0.005069	8.38	114.04	35.18	0.55
Orchard Creek	Middle	4358.909	Max WS	010yr_prop	423.55	453.60	459.30		459.71	0.002964	5.15	82.21	29.40	0.40
Orchard Creek	Middle	4358.909	Max WS	100yr_culv	962.25	453.60	461.90		462.24	0.001856	4.68	205.64	45.09	0.32
Orchard Creek	Middle	4358.909	Max WS	010yr_culv	425.75	453.60	460.09		460.21	0.000933	2.84	150.07	40.38	0.22
Orchard Creek	Middle	4266.104	Max WS	20130418_ex	644.58	452.57	461.00		461.08	0.000663	2.23	289.05	65.45	0.19
Orchard Creek	Middle	4266.104	Max WS	010yr_ex	512.34	452.57	460.46		460.52	0.000591	2.01	254.58	61.67	0.17
Orchard Creek	Middle	4266.104	Max WS	100yr_ex	1261.28	452.57	462.77		462.92	0.000865	3.05	419.95	116.46	0.22
Orchard Creek	Middle	4266.104	Max WS	100yr_proposed	956.43	452.57	461.74		461.86	0.000947	2.82	339.29	70.60	0.23
Orchard Creek	Middle	4266.104	Max WS	010yr_prop	423.97	452.57	459.41		459.48	0.000870	2.19	193.36	55.07	0.21
Orchard Creek	Middle	4266.104	Max WS	100yr_culv	962.44	452.57	461.98		462.10	0.000824	2.70	356.73	72.69	0.21
Orchard Creek	Middle	4266.104	Max WS	010yr_culv	425.71	452.57	460.09		460.14	0.000525	1.83	232.14	59.15	0.16
Orchard Creek	Middle	4001.006	Max WS	20130418_ex	643.92	453.76	460.45		460.68	0.002742	3.88	197.76	76.87	0.36
Orchard Creek	Middle	4001.006	Max WS	010yr_ex	510.81	453.76	459.85		460.07	0.003390	3.81	152.36	72.87	0.39
Orchard Creek	Middle	4001.006	Max WS	100yr_ex	1257.69	453.76	462.28		462.59	0.002306	4.70	370.44	123.21	0.36
Orchard Creek	Middle	4001.006	Max WS	100yr_proposed	956.19	452.35	461.34		461.56	0.001671	3.88	305.84	90.99	0.30
Orchard Creek	Middle	4001.006	Max WS	010yr_prop	422.47	452.35	458.90		459.08	0.002349	3.35	127.56	49.97	0.33
Orchard Creek	Middle	4001.006	Max WS	100yr_culv	961.92	453.76	461.44		461.72	0.002554	4.42	279.57	93.89	0.37
Orchard Creek	Middle	4001.006	Max WS	010yr_culv	424.36	453.76	459.24		459.49	0.004775	4.06	110.45	60.20	0.45
Orchard Creek	Middle	3577.648	Max WS	20130418_ex	643.48	451.78	459.69		459.86	0.001351	3.31	194.19	38.13	0.26
Orchard Creek	Middle	3577.648	Max WS	010yr_ex	508.99	451.78	459.03		459.17	0.001202	3.00	169.84	35.51	0.24
Orchard Creek	Middle	3577.648	Max WS	100yr_ex	1250.38	451.78	461.40		461.75	0.002152	4.72	271.65	83.40	0.34
Orchard Creek	Middle	3577.648	Max WS	100yr_proposed	956.08	451.78	460.60		460.86	0.001894	4.15	230.51	41.66	0.31
Orchard Creek	Middle	3577.648	Max WS	010yr_prop	420.41	451.78	458.17		458.31	0.001361	2.99	140.84	32.69	0.25
Orchard Creek	Middle	3577.648	Max WS	100yr_culv	961.84	451.78	460.57		460.84	0.001942	4.19	229.41	41.56	0.31
Orchard Creek	Middle	3577.648	Max WS	010yr_culv	423.34	451.78	458.06		458.21	0.001486	3.09	137.07	32.34	0.26
Orchard Creek	Middle	3446.519	Max WS	20130418_ex	643.39	451.74	459.52		459.68	0.001355	3.22	199.75	42.44	0.26
Orchard Creek	Middle	3446.519	Max WS	010yr_ex	508.47	451.74	458.88		459.01	0.001178	2.93	173.83	38.24	0.24
Orchard Creek	Middle	3446.519	Max WS	100yr_ex	1246.96	451.74	461.14		461.45	0.002263	4.50	277.47	54.48	0.35
Orchard Creek	Middle	3446.519	Max WS	100yr_proposed	956.02	451.74	460.36		460.61	0.001962	4.02	237.83	48.08	0.32
Orchard Creek	Middle	3446.519	Max WS	010yr_prop	419.71	451.74	458.00		458.14	0.001350	2.95	142.22	34.25	0.26
Orchard Creek	Middle	3446.519	Max WS	100yr_culv	961.81	451.74	460.33		460.59	0.002019	4.07	236.17	47.82	0.32
Orchard Creek	Middle	3446.519	Max WS	010yr_culv	423.27	451.74	457.87		458.01	0.001500	3.08	137.63	33.75	0.27
Orchard Creek	Middle	3312.245	Max WS	20130418_ex	643.38	451.23	459.36		459.49	0.001572	2.99	258.58	106.17	0.28
Orchard Creek	Middle	3312.245	Max WS	010yr_ex	507.20	451.23	458.68		458.81	0.001965	2.98	189.28	91.83	0.30

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Orchard Creek	Middle	3312.245	Max WS	100yr_ex	1244.11	451.23	461.00		461.20	0.001512	3.77	453.99	134.40	0.29
Orchard Creek	Middle	3312.245	Max WS	100yr_proposed	955.90	451.23	460.20		460.38	0.001628	3.50	353.34	119.45	0.29
Orchard Creek	Middle	3312.245	Max WS	010yr_prop	418.25	451.23	457.66		457.86	0.003015	3.54	118.55	46.62	0.37
Orchard Creek	Middle	3312.245	Max WS	100yr_culv	961.82	451.23	460.15		460.34	0.001708	3.56	348.13	118.76	0.30
Orchard Creek	Middle	3312.245	Max WS	010yr_culv	423.12	451.23	457.47		457.70	0.003531	3.83	110.56	38.18	0.40
Orchard Creek	Middle	3050.002	Max WS	20130418_ex	643.28	449.74	459.07		459.17	0.000945	2.55	252.24	73.23	0.22
Orchard Creek	Middle	3050.002	Max WS	010yr_ex	505.44	449.74	458.36		458.45	0.000845	2.37	213.22	56.59	0.21
Orchard Creek	Middle	3050.002	Max WS	100yr_ex	1238.31	449.74	460.69		460.87	0.001164	3.43	437.01	268.45	0.25
Orchard Creek	Middle	3050.002	Max WS	100yr_proposed	952.65	450.62	459.84		460.00	0.001309	3.22	313.48	143.35	0.26
Orchard Creek	Middle	3050.002	Max WS	010yr_prop	416.16	450.62	457.18		457.30	0.001292	2.73	152.46	40.87	0.25
Orchard Creek	Middle	3050.002	Max WS	100yr_culv	960.85	449.74	459.80		459.96	0.001290	3.22	314.90	140.79	0.26
Orchard Creek	Middle	3050.002	Max WS	010yr_culv	423.10	449.74	456.95		457.07	0.001359	2.84	149.18	38.87	0.26
Orchard Creek	Middle	2766.739	Max WS	20130418_ex	642.70	450.77	458.76		458.89	0.001085	2.90	226.43	65.72	0.24
Orchard Creek	Middle	2766.739	Max WS	010yr_ex	503.52	450.77	458.08		458.19	0.001043	2.66	189.31	45.13	0.23
Orchard Creek	Middle	2766.739	Max WS	100yr_ex	1228.88	450.77	460.32		460.54	0.001358	3.93	409.10	149.69	0.28
Orchard Creek	Middle	2766.739	Max WS	100yr_proposed	928.89	450.07	459.45		459.64	0.001285	3.51	296.80	116.79	0.26
Orchard Creek	Middle	2766.739	Max WS	010yr_prop	412.03	450.07	456.81		456.93	0.001318	2.84	144.84	36.68	0.25
Orchard Creek	Middle	2766.739	Max WS	100yr_culv	949.70	450.77	459.35		459.57	0.001556	3.76	278.72	109.89	0.29
Orchard Creek	Middle	2766.739	Max WS	010yr_culv	422.79	450.77	456.39		456.57	0.002187	3.44	123.00	34.61	0.32
Orchard Creek	Middle	2647.526	Max WS	20130418_ex	716.18	449.41	458.66		458.76	0.000707	2.54	294.33	75.02	0.20
Orchard Creek	Middle	2647.526	Max WS	010yr_ex	565.30	449.41	457.97		458.06	0.000710	2.32	247.35	63.48	0.19
Orchard Creek	Middle	2647.526	Max WS	100yr_ex	1355.97	449.41	460.16		460.36	0.001018	3.62	445.63	125.95	0.25
Orchard Creek	Middle	2647.526	Max WS	100yr_proposed	1094.02	449.77	459.26		459.45	0.001149	3.48	342.61	88.68	0.26
Orchard Creek	Middle	2647.526	Max WS	010yr_prop	470.82	449.77	456.62		456.74	0.001356	2.77	170.14	46.80	0.26
Orchard Creek	Middle	2647.526	Max WS	100yr_culv	1102.76	449.41	459.16		459.35	0.001224	3.56	335.15	86.79	0.26
Orchard Creek	Middle	2647.526	Max WS	010yr_culv	495.62	449.41	456.09		456.26	0.002117	3.34	148.23	42.69	0.32
Orchard Creek	Middle	2481.023	Max WS	20130418_ex	715.73	449.88	458.48		458.60	0.001338	2.75	264.65	86.64	0.25
Orchard Creek	Middle	2481.023	Max WS	010yr_ex	560.29	449.88	457.77		457.88	0.001647	2.68	209.39	70.92	0.27
Orchard Creek	Middle	2481.023	Max WS	100yr_ex	1345.94	449.88	459.98		460.16	0.001406	3.55	451.70	147.13	0.28
Orchard Creek	Middle	2481.023	Max WS	100yr_proposed	1089.38	449.88	458.99		459.19	0.001977	3.65	318.36	120.17	0.32
Orchard Creek	Middle	2481.023	Max WS	010yr_prop	461.77	449.88	456.21		456.41	0.002633	3.60	128.43	37.94	0.34
Orchard Creek	Middle	2481.023	Max WS	100yr_culv	1102.06	449.88	458.84		459.07	0.002292	3.83	301.15	115.15	0.34
Orchard Creek	Middle	2481.023	Max WS	010yr_culv	489.30	449.88	455.34		455.71	0.004440	4.87	100.48	27.21	0.45
Orchard Creek	Middle	2317.695	Max WS	20130418_ex	715.27	449.58	458.31		458.43	0.000796	2.79	304.93	92.64	0.21
Orchard Creek	Middle	2317.695	Max WS	010yr_ex	556.30	449.58	457.60		457.70	0.000753	2.53	243.06	82.33	0.20
Orchard Creek	Middle	2317.695	Max WS	100yr_ex	1338.15	449.58	459.75		459.97	0.001164	3.93	451.05	112.50	0.26
Orchard Creek	Middle	2317.695	Max WS	100yr_proposed	1087.21	449.42	458.92		458.93	0.000061	0.87	1760.93	524.06	0.06
Orchard Creek	Middle	2317.695	Max WS	010yr_prop	451.03	449.42	456.11		456.13	0.000182	1.26	425.93	255.88	0.10
Orchard Creek	Middle	2317.695	Max WS	100yr_culv	1101.91	449.42	458.77		458.80	0.000340	1.37	866.24	184.86	0.10
Orchard Creek	Middle	2317.695	Max WS	010yr_culv	487.47	449.42	455.14		455.18	0.000738	1.61	303.56	129.77	0.19
Orchard Creek	Middle	2126.922	Max WS	20130418_ex	715.19	450.46	458.20		458.27	0.000939	2.38	480.87	376.18	0.21
Orchard Creek	Middle	2126.922	Max WS	010yr_ex	553.27	450.46	457.40		457.49	0.001797	2.82	299.62	278.95	0.29
Orchard Creek	Middle	2126.922	Max WS	100yr_ex	1337.48	450.46	459.71		459.76	0.000630	2.43	1064.55	499.02	0.19

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Orchard Creek	Middle	2126.922	Max WS	100yr_proposed	1086.80	449.27	458.92		458.92	0.000017	0.43	2349.35	439.43	0.03
Orchard Creek	Middle	2126.922	Max WS	010yr_prop	452.15	449.27	456.10		456.11	0.000017	0.27	1226.81	319.90	0.03
Orchard Creek	Middle	2126.922	Max WS	100yr_culv	1101.39	449.27	458.76		458.76	0.000053	0.51	2278.29	435.48	0.03
Orchard Creek	Middle	2126.922	Max WS	010yr_culv	486.69	449.27	455.09		455.10	0.000115	0.51	947.50	249.50	0.05
Orchard Creek	Middle	1941.672	Max WS	20130418_ex	805.45	449.11	458.08		458.14	0.000493	2.42	591.84	344.35	0.17
Orchard Creek	Middle	1941.672	Max WS	010yr_ex	618.38	449.11	457.20		457.28	0.000684	2.59	335.18	258.61	0.19
Orchard Creek	Middle	1941.672	Max WS	100yr_ex	1500.75	449.11	459.61		459.67	0.000438	2.62	1159.74	395.49	0.16
Orchard Creek	Middle	1941.672	Max WS	100yr_proposed	1289.86	448.49	458.91		458.92	0.000028	0.74	1956.43	380.65	0.04
Orchard Creek	Middle	1941.672	Max WS	010yr_prop	517.52	448.49	456.10		456.10	0.000018	0.47	1127.51	237.72	0.03
Orchard Creek	Middle	1941.672	Max WS	100yr_culv	1289.26	448.49	458.74		458.74	0.000117	0.67	1892.06	375.02	0.05
Orchard Creek	Middle	1941.672	Max WS	010yr_culv	560.56	448.49	455.06		455.07	0.000138	0.63	896.79	192.95	0.05
Orchard Creek	Middle	1758.983	Max WS	20130418_ex	805.12	448.94	458.00		458.06	0.000522	2.38	751.65	276.45	0.17
Orchard Creek	Middle	1758.983	Max WS	010yr_ex	618.16	448.94	457.10		457.16	0.000666	2.41	528.97	226.58	0.19
Orchard Creek	Middle	1758.983	Max WS	100yr_ex	1500.61	448.94	459.52		459.59	0.000589	2.93	1207.75	359.03	0.19
Orchard Creek	Middle	1758.983	Max WS	100yr_proposed	1289.84	448.23	458.89		458.91	0.000079	1.16	1032.76	331.91	0.07
Orchard Creek	Middle	1758.983	Max WS	010yr_prop	518.00	448.23	456.09		456.10	0.000043	0.67	687.92	170.72	0.05
Orchard Creek	Middle	1758.983	Max WS	100yr_culv	1289.29	448.23	458.70		458.73	0.000085	1.32	1009.21	324.33	0.08
Orchard Creek	Middle	1758.983	Max WS	010yr_culv	560.46	448.23	455.04		455.05	0.000092	0.97	574.95	156.23	0.07
Orchard Creek	Middle	1641.069	Max WS	20130418_ex	805.08	448.00	457.93		458.00	0.000410	2.13	403.84	109.57	0.15
Orchard Creek	Middle	1641.069	Max WS	010yr_ex	618.09	448.00	457.03		457.09	0.000426	1.95	320.85	72.95	0.15
Orchard Creek	Middle	1641.069	Max WS	100yr_ex	1500.51	448.00	459.39		459.53	0.000634	3.07	614.30	186.94	0.20
Orchard Creek	Middle	1641.069	Max WS	100yr_proposed	1289.78	448.00	458.76		458.89	0.000659	2.95	507.32	145.88	0.20
Orchard Creek	Middle	1641.069	Max WS	010yr_prop	517.93	448.00	456.01		456.08	0.000625	2.05	252.80	61.88	0.18
Orchard Creek	Middle	1641.069	Max WS	100yr_culv	1289.27	448.02	458.60		458.71	0.000491	2.70	537.32	134.88	0.17
Orchard Creek	Middle	1641.069	Max WS	010yr_culv	560.43	448.02	454.93		455.02	0.000679	2.36	237.68	56.41	0.19
Orchard Creek	Middle	1586.231			Culvert									
Orchard Creek	Middle	1510.338	Max WS	20130418_ex	804.92	447.05	454.35		454.89	0.002823	5.89	136.60	68.71	0.40
Orchard Creek	Middle	1510.338	Max WS	010yr_ex	618.09	447.05	453.92		454.28	0.002063	4.83	128.08	63.82	0.34
Orchard Creek	Middle	1510.338	Max WS	100yr_ex	1500.43	447.05	456.26		456.48	0.001673	3.78	422.36	128.72	0.30
Orchard Creek	Middle	1510.338	Max WS	100yr_proposed	1289.77	447.05	455.74		456.69	0.003912	7.85	164.37	115.99	0.48
Orchard Creek	Middle	1510.338	Max WS	010yr_prop	517.93	447.05	453.70		453.97	0.001630	4.19	123.64	61.27	0.30
Orchard Creek	Middle	1510.338	Max WS	100yr_culv	1289.21	447.05	455.93		456.40	0.001912	5.52	233.76	120.60	0.35
Orchard Creek	Middle	1510.338	Max WS	010yr_culv	560.42	447.05	453.87		454.03	0.001004	3.26	172.02	63.21	0.24
Orchard Creek	Middle	1414.15	Max WS	20130418_ex	804.97	447.53	454.55		454.63	0.000772	2.36	351.40	149.22	0.20
Orchard Creek	Middle	1414.15	Max WS	010yr_ex	618.08	447.53	454.04		454.10	0.000719	2.09	298.60	123.45	0.19
Orchard Creek	Middle	1414.15	Max WS	100yr_ex	1535.79	447.53	456.43		456.50	0.000492	2.32	759.45	216.11	0.17
Orchard Creek	Middle	1414.15	Max WS	100yr_proposed	1289.76	447.53	456.10		456.16	0.000447	2.13	688.76	207.57	0.16
Orchard Creek	Middle	1414.15	Max WS	010yr_prop	517.91	447.53	453.78		453.83	0.000635	1.89	274.43	105.75	0.18
Orchard Creek	Middle	1414.15	Max WS	100yr_culv	1289.19	447.53	456.09		456.16	0.000448	2.13	688.41	207.52	0.16
Orchard Creek	Middle	1414.15	Max WS	010yr_culv	560.41	447.53	453.89		453.95	0.000680	1.98	284.19	119.01	0.19
Orchard Creek	Middle	1336.221	Max WS	20130418_ex	804.93	447.21	454.34	451.06	454.53	0.002035	3.58	238.22	127.10	0.32
Orchard Creek	Middle	1336.221	Max WS	010yr_ex	618.04	447.21	453.87	450.51	454.02	0.001678	3.13	203.02	94.32	0.29

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Orchard Creek	Middle	1336.221	Max WS	100yr_ex	1507.53	447.21	456.19	452.65	456.44	0.001757	4.14	475.45	501.93	0.31
Orchard Creek	Middle	1336.221	Max WS	100yr_proposed	1289.73	447.21	455.90	452.21	456.11	0.001589	3.80	434.62	433.08	0.30
Orchard Creek	Middle	1336.221	Max WS	010yr_prop	517.89	447.21	453.64	450.18	453.76	0.001392	2.80	187.30	76.97	0.26
Orchard Creek	Middle	1336.221	Max WS	100yr_culv	1289.14	447.21	455.90	452.21	456.11	0.001589	3.80	434.37	432.66	0.30
Orchard Creek	Middle	1336.221	Max WS	010yr_culv	560.41	447.21	453.74	450.33	453.87	0.001519	2.95	193.80	85.20	0.27
Orchard Creek	Middle	1308.013			Bridge									
Orchard Creek	Middle	1271.118	Max WS	20130418_ex	804.72	447.21	453.59		453.96	0.004572	4.87	165.32	49.04	0.47
Orchard Creek	Middle	1271.118	Max WS	010yr_ex	617.60	447.21	453.38		453.63	0.003092	3.98	155.22	46.38	0.38
Orchard Creek	Middle	1271.118	Max WS	100yr_ex	1499.06	447.21	455.32		455.82	0.003824	5.77	286.92	454.71	0.46
Orchard Creek	Middle	1271.118	Max WS	100yr_proposed	1288.01	447.21	455.25		455.64	0.002983	5.05	279.74	448.07	0.40
Orchard Creek	Middle	1271.118	Max WS	010yr_prop	516.64	447.21	453.29		453.47	0.002304	3.43	150.76	45.16	0.33
Orchard Creek	Middle	1271.118	Max WS	100yr_culv	1285.78	447.21	455.25		455.63	0.002978	5.04	279.52	447.86	0.40
Orchard Creek	Middle	1271.118	Max WS	010yr_culv	559.93	447.21	453.33		453.54	0.002632	3.67	152.73	45.70	0.35
Orchard Creek	Middle	1185.303	Max WS	20130418_ex	804.15	447.38	453.41		453.67	0.002362	4.09	226.47	135.98	0.36
Orchard Creek	Middle	1185.303	Max WS	010yr_ex	616.59	447.38	453.26		453.43	0.001592	3.27	212.78	122.03	0.29
Orchard Creek	Middle	1185.303	Max WS	100yr_ex	1491.87	447.38	455.23		455.54	0.001943	4.73	415.69	419.78	0.34
Orchard Creek	Middle	1185.303	Max WS	100yr_proposed	1284.39	447.38	455.19		455.42	0.001488	4.12	410.61	416.40	0.30
Orchard Creek	Middle	1185.303	Max WS	010yr_prop	514.87	447.38	453.20		453.32	0.001180	2.79	206.85	114.77	0.25
Orchard Creek	Middle	1185.303	Max WS	100yr_culv	1282.02	447.38	455.18		455.42	0.001484	4.11	410.39	416.25	0.30
Orchard Creek	Middle	1185.303	Max WS	010yr_culv	559.14	447.38	453.23		453.36	0.001353	3.00	209.58	117.90	0.27
Orchard Creek	Middle	1095.441	Max WS	20130418_ex	843.51	445.60	453.34		453.49	0.001239	3.11	310.38	170.90	0.26
Orchard Creek	Middle	1095.441	Max WS	010yr_ex	646.98	445.60	453.21		453.31	0.000828	2.49	288.97	159.00	0.21
Orchard Creek	Middle	1095.441	Max WS	100yr_ex	1580.32	445.60	455.28		455.35	0.000579	2.69	895.58	407.47	0.19
Orchard Creek	Middle	1095.441	Max WS	100yr_proposed	1373.41	445.60	455.21		455.28	0.000469	2.41	869.62	405.04	0.17
Orchard Creek	Middle	1095.441	Max WS	010yr_prop	546.01	445.60	453.16		453.23	0.000624	2.15	279.98	154.56	0.18
Orchard Creek	Middle	1095.441	Max WS	100yr_culv	1369.02	445.60	455.21		455.27	0.000467	2.40	869.01	404.98	0.17
Orchard Creek	Middle	1095.441	Max WS	010yr_culv	591.77	445.60	453.18		453.26	0.000715	2.31	283.89	156.50	0.19
Orchard Creek	Middle	919.0703	Max WS	20130418_ex	843.47	444.24	453.25		453.32	0.000513	2.25	463.65	264.01	0.17
Orchard Creek	Middle	919.0703	Max WS	010yr_ex	647.04	444.24	453.15		453.20	0.000327	1.77	439.13	256.03	0.13
Orchard Creek	Middle	919.0703	Max WS	100yr_ex	1580.24	444.24	455.22		455.27	0.000317	2.17	1117.32	387.21	0.14
Orchard Creek	Middle	919.0703	Max WS	100yr_proposed	1373.52	444.24	455.17		455.21	0.000250	1.92	1097.61	384.30	0.12
Orchard Creek	Middle	919.0703	Max WS	010yr_prop	545.82	444.24	453.11		453.15	0.000241	1.51	428.58	252.53	0.12
Orchard Creek	Middle	919.0703	Max WS	100yr_culv	1369.00	444.24	455.16		455.20	0.000249	1.91	1097.11	384.23	0.12
Orchard Creek	Middle	919.0703	Max WS	010yr_culv	591.68	444.24	453.13		453.17	0.000278	1.63	433.19	254.06	0.12
Orchard Creek	Middle	736.6259	Max WS	20130418_ex	843.45	444.26	453.19		453.24	0.000456	2.17	652.99	374.65	0.16
Orchard Creek	Middle	736.6259	Max WS	010yr_ex	647.00	444.26	453.11		453.15	0.000293	1.72	625.55	371.12	0.13
Orchard Creek	Middle	736.6259	Max WS	100yr_ex	1580.31	444.26	455.19		455.22	0.000214	1.81	1469.58	421.99	0.11
Orchard Creek	Middle	736.6259	Max WS	100yr_proposed	1373.54	444.26	455.14		455.17	0.000168	1.60	1450.46	421.63	0.10
Orchard Creek	Middle	736.6259	Max WS	010yr_prop	545.98	444.26	453.08		453.11	0.000217	1.48	613.88	369.61	0.11
Orchard Creek	Middle	736.6259	Max WS	100yr_culv	1368.84	444.26	455.14		455.17	0.000167	1.59	1450.00	421.62	0.10
Orchard Creek	Middle	736.6259	Max WS	010yr_culv	591.74	444.26	453.10		453.12	0.000250	1.59	618.99	370.27	0.12
Orchard Creek	Middle	407.4108	Max WS	20130418_ex	843.44	443.08	453.10		453.12	0.000223	1.52	1140.91	507.21	0.11

HEC-RAS Profile: Max WS (Continued)

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Orchard Creek	Middle	407.4108	Max WS	010yr_ex	646.79	443.08	453.06		453.07	0.000137	1.19	1119.31	504.94	0.09
Orchard Creek	Middle	407.4108	Max WS	100yr_ex	1580.75	443.08	455.15		455.16	0.000128	1.40	2265.29	595.61	0.09
Orchard Creek	Middle	407.4108	Max WS	100yr_proposed	1373.86	443.08	455.11		455.12	0.000100	1.23	2243.84	593.89	0.08
Orchard Creek	Middle	407.4108	Max WS	010yr_prop	546.10	443.08	453.04		453.05	0.000100	1.01	1110.38	503.99	0.07
Orchard Creek	Middle	407.4108	Max WS	100yr_culv	1368.87	443.08	455.11		455.12	0.000099	1.23	2243.35	593.85	0.08
Orchard Creek	Middle	407.4108	Max WS	010yr_culv	591.73	443.08	453.05		453.06	0.000116	1.09	1114.26	504.40	0.08
Orchard Creek	Middle	270.8246	Max WS	20130418_ex	843.21	442.43	453.08		453.10	0.000124	1.36	875.44	204.38	0.09
Orchard Creek	Middle	270.8246	Max WS	010yr_ex	646.83	442.43	453.05		453.06	0.000075	1.05	869.00	203.93	0.07
Orchard Creek	Middle	270.8246	Max WS	100yr_ex	1580.99	442.43	455.11		455.15	0.000147	1.74	1333.14	243.06	0.10
Orchard Creek	Middle	270.8246	Max WS	100yr_proposed	1374.11	442.43	455.09		455.11	0.000112	1.52	1326.34	242.78	0.09
Orchard Creek	Middle	270.8246	Max WS	010yr_prop	546.22	442.43	453.03		453.04	0.000054	0.89	866.35	203.75	0.06
Orchard Creek	Middle	270.8246	Max WS	100yr_culv	1369.04	442.43	455.09		455.11	0.000111	1.51	1326.19	242.77	0.09
Orchard Creek	Middle	270.8246	Max WS	010yr_culv	591.46	442.43	453.04		453.05	0.000063	0.96	867.52	203.83	0.06
Orchard Creek	Middle	112.7531	Max WS	20130418_ex	843.57	442.08	453.02		453.07	0.000315	2.12	811.68	226.01	0.14
Orchard Creek	Middle	112.7531	Max WS	010yr_ex	646.40	442.08	453.01		453.04	0.000186	1.63	809.44	226.01	0.10
Orchard Creek	Middle	112.7531	Max WS	100yr_ex	1508.00	442.08	455.04		455.09	0.000300	2.42	1266.37	226.01	0.14
Orchard Creek	Middle	112.7531	Max WS	100yr_proposed	1372.41	442.08	455.03		455.07	0.000250	2.21	1263.97	226.01	0.13
Orchard Creek	Middle	112.7531	Max WS	010yr_prop	545.33	442.08	453.01		453.03	0.000133	1.37	808.54	226.01	0.09
Orchard Creek	Middle	112.7531	Max WS	100yr_culv	1368.33	442.08	455.02		455.07	0.000249	2.20	1263.92	226.01	0.13
Orchard Creek	Middle	112.7531	Max WS	010yr_culv	590.74	442.08	453.01		453.04	0.000156	1.49	808.92	226.01	0.10
Orchard Creek	Middle	29.37117	Max WS	20130418_ex	50.03	441.50	453.00	439.27	453.00	0.000001	0.12	751.22	200.32	0.01
Orchard Creek	Middle	29.37117	Max WS	010yr_ex	50.03	441.50	453.00	439.27	453.00	0.000001	0.12	751.22	200.32	0.01
Orchard Creek	Middle	29.37117	Max WS	100yr_ex	49.96	441.50	455.00	439.26	455.00	0.000000	0.08	1177.83	214.31	0.00
Orchard Creek	Middle	29.37117	Max WS	100yr_proposed	47.84	441.50	455.00	439.14	455.00	0.000000	0.08	1177.83	214.31	0.00
Orchard Creek	Middle	29.37117	Max WS	010yr_prop	47.88	441.50	453.00	439.15	453.00	0.000001	0.12	751.22	200.32	0.01
Orchard Creek	Middle	29.37117	Max WS	100yr_culv	47.84	441.50	455.00	439.14	455.00	0.000000	0.08	1177.83	214.31	0.00
Orchard Creek	Middle	29.37117	Max WS	010yr_culv	47.88	441.50	453.00	439.15	453.00	0.000001	0.12	751.22	200.32	0.01

Appendix F: StreamStats Results

USGS Illinois StreamStats

Streamstats Ungaged Site Report

Date: Wed Nov 27 2013 14:46:39 Mountain Standard Time
Site Location: Illinois
NAD27 Latitude: 38.4996 (38 29 59)
NAD27 Longitude: -89.9058 (-89 54 21)
NAD83 Latitude: 38.4997 (38 29 59)
NAD83 Longitude: -89.9059 (-89 54 21)
Drainage Area: 1.84 mi2

Peak Flow Basin Characteristics

100% Regions 5 AMS (1.84 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	1.84	0.03	9554
Stream Slope 10 and 85 Method (feet per mi)	32.176	0.81	317
Average Soil Permeability (inches per hour)	1.279	0.3	8
Region 5 Indicator enter 1 (dimensionless)	1	1	1

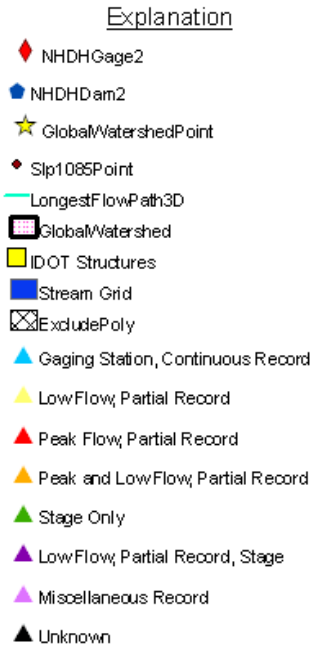
Peak Flow Streamflow Statistics

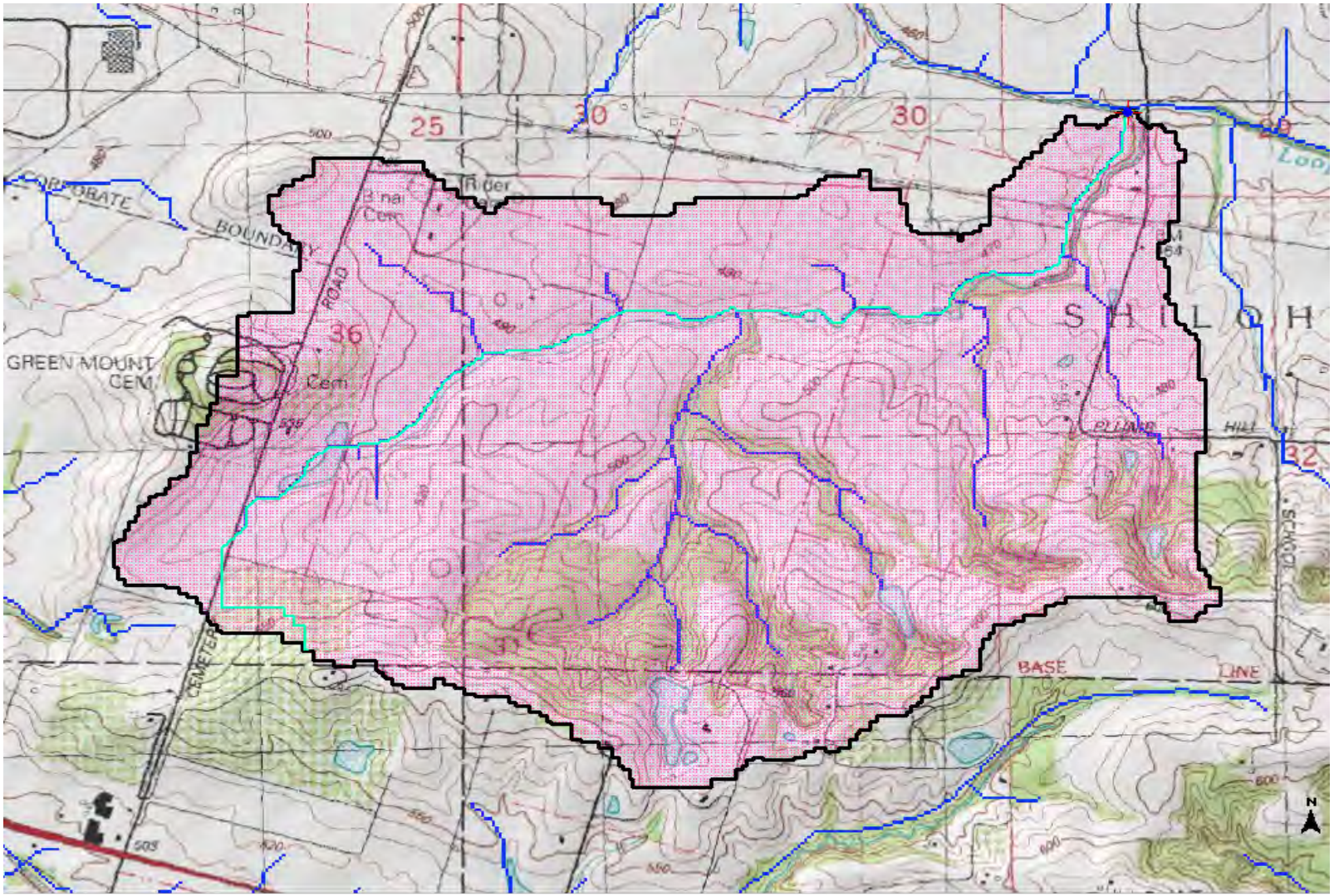
Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	284	40	2.7	152	530
PK5	546	40	3.2	291	1030
PK10	751	42	3.9	391	1440
PK25	1030	44	4.7	519	2060
PK50	1260	47	5.2	612	2600
PK100	1500	49	5.6	702	3190
PK500	2090	55	6.2	905	4830

USGS Illinois StreamStats

StreamStats Print Page

Orchards Drainage Study





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Appendix G: Opinion of Probable Costs

DESCRIPTION/NOTES	UNIT	UNIT COST
Demolition	sf	$ 4.27
Excavation Only	cy	$ 8.00
Hauling Spoil	cy	$ 8.00
Fill (from offsite)	cy	$ 10.00
Fill Compaction	cy	$ 1.00
Excavation,Onsite Fill	cy	$ 10.00
Grading/Restoration/ Seeding Only	acre	$ 6,000.00
Topsoil, seeding,& blanket	sy	$ 15.00
Clearing & Tree Removal	acre	$ 10,000.00
Riprap (RR4)	cy	$ 67.28
Roadway.	LF	$ 148.47
Pipe 0 to 36 inches	LF	$ 208.24
Pipe 42 to 66 inches	LF	$ 216.78
Pipe 42 to 66 inches	LF	$ 291.54
Pipe 90 to 96 inches	LF	$ 434.64
Inlet Headwall 36 inches or less	EA	$ 2,875.00
Outlet Headwall 36 inches or less	EA	$ 2,875.00
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00
Concrete (Flatwork)	cy	$ 250.00
Reinforced Concrete (Horizontal)	cy	$ 500.00
Reinforced Concrete (Vertical)	cy	$ 1,000.00
Drop Inlet Structure	Height (ft)	$ 1,000.00
Spillway Modification	EA	$ 2,500.00
Hand Compaction	cy	$ 2.54

A: Orchard Lakes

A-1: Storage Area S_6617 – The recommendation is to provide small detention area upstream of Golf Course Drive to reduce peak flows for more frequent events. The area upstream of the pipe crossing could be widened and a control structure added to the upstream end of the pipe.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00	6500	$ 52,000.00
Hauling Spoil	cy	$ 8.00	6500	$ 52,000.00
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	2.0	$ 12,000.00
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00	3	$ 3,000.00
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	12	$ 30.48
0	0	$ -		$ -

Total Cost $ 119,030.48

B: Lake #2 (south of Pro Tour Drive)
B-1: Storage Area S_8000 – The existing control structure does not match the plans for the Lake. The overflow/pool elevation in the plans is 479.0 ft. Based on field measurements, the existing overflow/pool elevation is approximately 480.8 ft. The recommendation is to modify the existing structure to meet the original plans.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00		$ -
Hauling Spoil	cy	$ 8.00		$ -
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00		$ -
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28	8	$ 538.24
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00	1	$ 2,500.00
Hand Compaction	cy	$ 2.54	0	$ -
0	0	$ -		$ -

Total Cost	$	3,038.24

C: 8100 Basins upstream of Lake #2

C-1: Storage Area S_8110 – The recommendation is to widen and clear around the existing creek to provide storage for peak flow attenuation upstream of the nearest homes by the 7th Tee. A berm would be constructed across the existing creek and a control structure would be installed to regulate discharge from upstream areas.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00	2598	$ 20,783.59
Hauling Spoil	cy	$ 8.00	2598	$ 20,783.59
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00	6177	$ 6,177.05
Excavation,Onsite Fill	cy	$ 10.00	6177	$ 61,770.51
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	4.0	$ 24,000.00
Topsoil, seeding,& blanket	sy	$ 15.00	3422	$ 51,325.87
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28	200	$ 13,456.00
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24	237	$ 49,275.70
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00	8	$ 8,000.00
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	269	$ 682.32
0	0	$ -		$ -

Total Cost $ 256,254.64

8755 Total Excavation

C-2: Storage Area S_8114 – The recommendation is to modify a cart path as a berm to create a detention area to provide storage for peak flow attenuation near the upstream ends of the watershed. This detention area would be located southwest 7th Hole. A berm would be constructed and a control structure would be installed to regulate discharge from upstream areas.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00		$ -
Hauling Spoil	cy	$ 8.00		$ -
Fill (from offsite)	cy	$ 10.00	5542	$ 55,418.05
Fill Compaction	cy	$ 1.00	5542	$ 5,541.81
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	2.0	$ 12,000.00
Topsoil, seeding,& blanket	sy	$ 15.00	2389	$ 35,835.91
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28	200	$ 13,456.00
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24	159	$ 33,147.55
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00	10	$ 10,000.00
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	199	$ 505.92
0	0	$ -		$ -

Total Cost				$ 165,905.23

C-3: Basin 8111 – Runoff is directed towards existing homes near the 8th Tee Box. The recommendation is to re-grade the area to ensure positive drainage away from the house and provide a swale near the rear of the yard/tee box to route drainage to an existing storm inlet.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00	25	$ 200.00
Hauling Spoil	cy	$ 8.00	25	$ 200.00
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	2.0	$ 12,000.00
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	0	$ -
0	0	$ -		$ -

Total Cost	$	12,400.00

C-4: Basin 8112 – Runoff is directed towards existing homes near the 5th Hole. The recommendation is to re-grade the area to ensure positive drainage away from the house and provide a swale near the rear of the yard and between homes to route drainage to the existing storm sewer inlets in the street.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00	25	$ 200.00
Hauling Spoil	cy	$ 8.00	25	$ 200.00
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	2.0	$ 12,000.00
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	0	$ -
0	0	$ -		$ -

Total Cost	$	12,400.00

D-1: Storage Area S_8200 – The recommendation is to widen the creek upstream of the cart path near the 10th Hole to provide additional storage at lower elevation for heavy rainfall events. No pipe or structure modifications are proposed

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00	344	$ 2,752.00
Hauling Spoil	cy	$ 8.00	344	$ 2,752.00
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	1.0	$ 6,000.00
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	0	$ -
0	0	$ -		$ -

Total Cost $ 11,504.00

D-2: Storage Area S_8210A/B – The recommendation is to provide detention storage upstream of the cart path. This improvement has been implemented by the Golf Course and homeowner – no modifications are proposed.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00		$ -
Hauling Spoil	cy	$ 8.00		$ -
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00		$ -
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	0	$ -
0	0	$ -		$ -

Total Cost $ -

D-3: Storage Area S_8214 – The recommendation is to construct a berm across the 16th Fairway to provide a storage area to detain water on the fairway, and below the 16th Green during heavy rainfalls. A control structure would be installed to regulate discharge from the detention area.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00		$ -
Hauling Spoil	cy	$ 8.00		$ -
Fill (from offsite)	cy	$ 10.00	2213	$ 22,132.27
Fill Compaction	cy	$ 1.00	2213	$ 2,213.23
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00		$ -
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28	200	$ 13,456.00
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24	156	$ 32,463.31
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00	4	$ 4,000.00
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	172	$ 436.61
0	0	$ -		$ -

Total Cost $ 74,701.42

D-4: Storage Area S_8220A/B – The recommendation is to widen the creek upstream of the cart path near the 9th Tee Box to provide additional storage at lower elevations for heavy rainfall events. No pipe or structure modifications are proposed.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00	1084	$ 8,672.00
Hauling Spoil	cy	$ 8.00	1084	$ 8,672.00
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	2.0	$ 12,000.00
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	0	$ -
0	0	$ -		$ -

Total Cost	$	29,344.00

D-5: Storage Area S_8227 – The recommendation is to provide a control structure in this existing low spot south of the 18th Fairway. Clearing and some grading would be necessary as well.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00	320	$ 2,560.00
Hauling Spoil	cy	$ 8.00	320	$ 2,560.00
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	1.0	$ 6,000.00
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00	1.0	$ 10,000.00
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00	5	$ 5,000.00
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	20	$ 50.80
0	0	$ -		$ -

Total Cost $ 26,170.80

D-6: Storage Area S_8228 – The recommendation is to provide a control structure in this existing low spot south of the 18th Fairway. Clearing and some grading would be necessary as well.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00	480	$ 3,840.00
Hauling Spoil	cy	$ 8.00	480	$ 3,840.00
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	1.0	$ 6,000.00
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00	1.0	$ 10,000.00
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00	5	$ 5,000.00
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	20	$ 50.80
0	0	$ -		$ -

Total Cost $ 28,730.80

D-7: Storage Area S_8229 – The recommendation is to provide a control structure in this existing low spot south of the 18th Fairway. Clearing and some grading would be necessary as well.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00	370	$ 2,960.00
Hauling Spoil	cy	$ 8.00	370	$ 2,960.00
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	1.0	$ 6,000.00
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00	1.0	$ 10,000.00
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00	5	$ 5,000.00
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	20	$ 50.80
0	0	$ -		$ -

Total Cost $ 26,970.80

E-1: Basin 8322 – Runoff is directed towards existing homes which are located near on the downstream side of a hill. Previous grading to facilitate walkout basements exacerbates the problem by providing a low point for water to collect. The recommendation is to re-grade the rear of the yards to incorporate conveyance to keep the flow of much of the runoff towards the rear of the yards. Erosion control for the conveyance is recommended due to the slopes. Some residents have started constructing these types of improvements.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00		$ -
Hauling Spoil	cy	$ 8.00		$ -
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	3.0	$ 18,000.00
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	0	$ -
0	0	$ -		$ -

Total Cost	$	18,000.00

E-2: Excavation of Subbasin S8320

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00	8700	$ 69,600.00
Hauling Spoil	cy	$ 8.00	8700	$ 69,600.00
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	2.0	$ 12,000.00
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	0	$ -
0	0	$ -		$ -

Total Cost $ 151,200.00

F-1: Storage Area S_4200 – The existing pond overtops the existing cart path and causes erosion on the downstream side of the slope. The recommendation is to convert this pond to a dry detention area and control the discharge with a structure to discourage over-topping of the cart path and reduce the erosion potential. Runoff is also directed towards some homes in this area. Additional grading improvements such as swales should be implemented downstream of this area as necessary to ensure positive drainage away from homes.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00	25	$ 200.00
Hauling Spoil	cy	$ 8.00	25	$ 200.00
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	1.5	$ 9,000.00
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28	200	$ 13,456.00
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24	50	$ 10,412.00
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	50	$ 127.00
0	0	$ -		$ -

Total Cost	$	33,395.00

F-2: Storage Area S_6114 – The area drains to the rear yards of homes on Four Lakes Drive. The installation of a detention area on the backside of the cart path is recommended to reduce some of the peak flows experienced in this area.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00		$ -
Hauling Spoil	cy	$ 8.00		$ -
Fill (from offsite)	cy	$ 10.00	118	$ 1,179.20
Fill Compaction	cy	$ 1.00	304	$ 303.92
Excavation,Onsite Fill	cy	$ 10.00	186	$ 1,860.00
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	0.5	$ 3,000.00
Topsoil, seeding,& blanket	sy	$ 15.00	732	$ 10,987.37
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47	240	$ 35,632.80
Pipe 0 to 36 inches	LF	$ 208.24	35	$ 7,275.25
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	35	$ 88.74
0	0	$ -		$ -

Total Cost $ 60,327.28

F-3: Basin 6110 – There are drainage concerns in the rear yards behind the homes on Four Lakes Drive and the retaining wall of the golf course. An existing swale, within an easement, is meant to provide drainage for these areas. It is recommended that the swale is re-graded in this area to increase conveyance. Landscaping observed in this drainage easement should be removed as it restricts the flow of water. Also, re-grading of the areas adjacent to homes may be necessary to ensure positive drainage away from the foundation.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00	25	$ 200.00
Hauling Spoil	cy	$ 8.00	25	$ 200.00
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	2.0	$ 12,000.00
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	0	$ -
0	0	$ -		$ -

Total Cost	$	12,400.00

G-1: In-line Detention near Ben Hogan Court – The creek in the vicinity of Ben Hogan Court was required to be widened based on permitting with IDNR/OWR. The intention of this widening was to provide a level pool to lower the water surface near the homes in this area. This widening and clearing has never been implemented and is a recommendation of this study.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00	30000	$ 240,000.00
Hauling Spoil	cy	$ 8.00	30000	$ 240,000.00
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	5.0	$ 30,000.00
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00	5.0	$ 50,000.00
Riprap (RR4)	cy	$ 67.28	300	$ 20,184.00
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	0	$ -
0	0	$ -		$ -

Total Cost	$	580,184.00

G-2: Off-line Detention behind Golf Course Maintenance Shed – An off-line detention behind the Golf Course maintenance shed was installed, but does not appear to have been maintained. Breaches in the levee separating the creek from the detention area were observed during field investigation for this project. It is recommended that this area be cleared and the berm be repaired and re-graded.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00		$ -
Hauling Spoil	cy	$ 8.00		$ -
Fill (from offsite)	cy	$ 10.00	741	$ 7,410.00
Fill Compaction	cy	$ 1.00	2222	$ 2,222.00
Excavation,Onsite Fill	cy	$ 10.00	1000	$ 10,000.00
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	2.0	$ 12,000.00
Topsoil, seeding,& blanket	sy	$ 15.00	1000	$ 15,000.00
Clearing & Tree Removal	acre	$ 10,000.00	2.0	$ 20,000.00
Riprap (RR4)	cy	$ 67.28	200	$ 13,456.00
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00	300	$ 75,000.00
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	0	$ -
0	0	$ -		$ -

Total Cost	$	155,088.00

H-1: Fairway Drive – To increase capacity at this crossing; install a secondary 6' diameter culvert adjacent to the box culvert. The culvert is anticipated to be RCP, 85' in length, with flared end sections. This culvert was previously permitted by IDNR/OWR to prevent staging of water onto adjacent agricultural fields; however, an easement was obtained to stage water in the fields in lieu of installing the culvert.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27	60	$ 256.20
Excavation Only	cy	$ 8.00	200	$ 1,600.00
Hauling Spoil	cy	$ 8.00	30	$ 240.00
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00	185	$ 185.00
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00		$ -
Topsoil, seeding,& blanket	sy	$ 15.00	200	$ 3,000.00
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47	50	$ 7,423.50
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64	85	$ 36,944.40
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00	1	$ 12,400.00
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00	1	$ 12,400.00
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	85	$ 215.90
0	0	$ -		$ -

Total Cost $ 74,665.00

H-2: Jack Nicklaus Drive – To increase capacity at this crossing; install a secondary 6' diameter culvert adjacent to the box culvert. The culvert is anticipated to be RCP, 85' in length, with flared end sections. Prior to this study, this culvert was never proposed or permitted.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27	60	$ 256.20
Excavation Only	cy	$ 8.00	200	$ 1,600.00
Hauling Spoil	cy	$ 8.00	30	$ 240.00
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00	185	$ 185.00
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00		$ -
Topsoil, seeding,& blanket	sy	$ 15.00	200	$ 3,000.00
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47	50	$ 7,423.50
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64	85	$ 36,944.40
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00	1	$ 12,400.00
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00	1	$ 12,400.00
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	85	$ 215.90
0	0	$ -		$ -

Total Cost $ 74,665.00

I-1: A resident has constructed a practice putting green within a drainage easement in the rear of their yard which restricts the flow of water from upstream neighbors. It is recommended that the conveyance capacity of the swale be restored through the area.

Description	Unit	Unit Cost	Quantity	Cost
Demolition	sf	$ 4.27		$ -
Excavation Only	cy	$ 8.00	25	$ 267.00
Hauling Spoil	cy	$ 8.00	25	$ 293.75
Fill (from offsite)	cy	$ 10.00		$ -
Fill Compaction	cy	$ 1.00		$ -
Excavation,Onsite Fill	cy	$ 10.00		$ -
Grading/Restoration/ Seeding Only	acre	$ 6,000.00	2.0	$ 12,000.00
Topsoil, seeding,& blanket	sy	$ 15.00		$ -
Clearing & Tree Removal	acre	$ 10,000.00		$ -
Riprap (RR4)	cy	$ 67.28		$ -
Roadway.	LF	$ 148.47		$ -
Pipe 0 to 36 inches	LF	$ 208.24		$ -
Pipe 42 to 66 inches	LF	$ 216.78		$ -
Pipe 42 to 66 inches	LF	$ 291.54		$ -
Pipe 90 to 96 inches	LF	$ 434.64		$ -
Inlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Outlet Headwall 36 inches or less	EA	$ 2,875.00		$ -
Inlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Outlet Headwall 42 to 66 inches	EA	$ 12,400.00		$ -
Concrete (Flatwork)	cy	$ 250.00		$ -
Reinforced Concrete (Horizontal)	cy	$ 500.00		$ -
Reinforced Concrete (Vertical)	cy	$ 1,000.00		$ -
Drop Inlet Structure	Height (ft)	$ 1,000.00		$ -
Spillway Modification	EA	$ 2,500.00		$ -
Hand Compaction	cy	$ 2.54	0	$ -
0	0	$ -		$ -

Total Cost	$	12,560.75