Preliminary

MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT FOR WATERBURY FILINGS NO. 1 & 2 EL PASO COUNTY, COLORADO

DECEMBER 2020

Prepared For:

Prepared for:
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REQUIRED MAPS AND DRAWINGS

MASTER DEVELOPMENT DRAINAGE PLAN
AND FINAL DRAINAGE REPORT FOR
WATERBURY FILINGS NO. 1 & 2
EL PASO COUNTY, COLORADO

DESIGN ENGINEER'S STATEMENT:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

____________________________________ ________________
Quentin Armijo, P.E. 37170 Date
On behalf of Terra Nova Engineering, Inc.

OWNER/DEVELOPER'S STATEMENT:

I, the owner/developer have read and will comply with all of the requirements specified in this drainage report and plan.

____________________________________ ________________
Authorized Signature Date

____
Printed Name, Title

____
Business Name

____
Address

EL PASO COUNTY:

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.

____ ______________________
Jennifer Irvine, P.E. Date
County Engineer / ECM Administrator
Conditions:

MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT FOR WATERBURY FILINGS NO. 1 & 2 EL PASO COUNTY, COLORADO

INTRODUCTION

PURPOSE

The purpose of this Master Development Drainage Plan is to identify and analyze the proposed drainage patterns, determine proposed runoff quantities, size drainage structures for conveyance of developed runoff based upon the overall development of single-family homes along with all the supporting infrastructure, while following the guidelines of the 4-step process.

This site was previously submitted as Waterbury Phase 1 Preliminary Plan with 3 separate filings by Classic Consulting Engineers & Surveyors, LLC. The Final Drainage Report for Filing 1 along with the construction drawings were approved in September of 2016 by EL Paso County Development Services and the Final Drainage Report for Filing 2 along with the construction drawings were submitted for review in September of 2017 and comments given back in September of 2017. Filing 3 had been preliminary designed but nothing submitted to EL Paso County. Since this time the owner has revised the lot layout and removed the alleys shown in Filings 1 & 2. All the public roadways have remained the same with the exception of the ROW for Saybrook Road from Stapleton to Bayshore Way, where the it changed from 65' to 89'. With these changes El Paso County Development Services has requested that we submit a new Preliminary Plan and the associated MDDP for these revisions. The site will now be developed in 2 Filings, Filing 1 & Filing 2. With the Construction drawings being submitted shortly after the Preliminary Plan the Final Drainage Report for Filings 1& 2 is also included in this analysis. The overall proposed drainage patterns do not differ much and follow the previous studies closely.

If pre-development site grading is proposed, the report needs to add sections and plans addressing that specifically.

DBPS

The Waterbury site lies within the Geich Ranch Drainage Basin, storm runoff drains southerly via 2 existing natural waterways, one bordering the site on the east and one on the west. These 2 channels eventually drain to Black Squirrel Creek and ultimately the Arkansas River.

State that there is no approved DBPS or fees in this basin. Address the portion in the Haegler basin and the Haegler-Geick diversion.

PROJECT CHARACTERISTICS

Waterbury Filings 1 & 2 consists of 61.93 acres and is part of a larger development of 322.0 acres to be developed over time and in multiple filings. A PUD Development Plan, Zoning and Conceptual plans have all been previously processed and approved with El Paso County. Filing 1 is 29.44 acres with 108 single family units, while Filing 2 is 32.44 acres 93 single family lots.

reword to address each quarter section

The site is in the southeast corner of Section 28, 29 & 33, Township 12 South, Range 64 West of the 6th Principal Meridian within El Paso County, Colorado. The site is bounded to the west by natural channel and 4-Way Ranch Filing No. 1. To the south by Stapleton Drive. To the north by unplatted land consisting of future Waterbury Filings, and to the west by a natural channel unplatted land consisting of future Waterbury Filings (See vicinity map, Appendix A).

The site consists of 100% Columbine Gravelly (19) per the USDA, NRCS web soil survey. The hydrologic soil group "A" was used to represent the soil types and determine the onsite basin overland flow. (See map in appendix)

The study area consists of undeveloped land that has existing vegetation consisting of established native grasses. A ridge running north to south splits the site with the west 1/3 draining southwest with average slopes of 0% to 3% and the remaining 2/3 drains southwest with average slopes of 0% to 3%. There are no existing on-site improvements.

The site has been analyzed in several approved studies including the following "Revision to the MDDP for Meridian Ranch, EL Paso County, Colorado", approved October 2005, and prepared by PBS&J. "Final Drainage Report for 4-Way Ranch Phase 1" by JR Engineering Dated March 2006. The "Geich Ranch Drainage Basin Planning Study" dated February 2008, and preprepared by Drexel Barrel & Co. The "Preliminary/Final Drainage Report for Meridian Ranch filing No. 3" by Tech Contractors, November 2011. The "Master Development Drainage Plan, 4-Way Ranch – Phase 1" by Advanced Design Professionals, Inc. dated January 2012. The "Preliminary Drainage Report for Waterbury (Phase 1 Preliminary Plan) dated June 2013 by Classic Consulting analyzes this area in more detail and then Classic followed up with the "Final Drainage Report for Waterbury Filing No. 1" dated September 2016 which studied a portion of the area now being developed.

As-built field survey data is the basis for the design of the drainage basins.

FLOODPLAIN STATEMENT

A portion of this site along the western edge is within a designated F.E.M.A. floodplain, as determined by Flood Insurance Rate Map No. 08041C0552G December 7, 2018 (see appendix). The floodplain is shown on the proposed Drainage Map in the appendix along with the FEAM Firmette. Lots from Filings 1 & 2 abut the channel with rear lots lines, but are set to be outside of the floodplain. As mentioned in the previously approved "Final Drainage Report for Waterbury Filing 1" dated September 2016 prepared by Classic Consulting Engineering & Surveying the floodplain was determined by Kiowa Engineering in a 2004 LOMR (04-08-0012) using a HEC-RAS analysis modeling developed flows along the channel from the 3-42" culverts under Eastonville Road south to the existing stock pond (Design Point 13) south of Stapleton Drive with proposed and existing improvements such as the proposed 42" dual culverts located at the Gilbert Road crossing and existing dual 4' x 8' box culverts at Stapleton Drive (see appendix for HEC-RAS model).

revise

State that FEMA-approved (LOMR) floodplain elevations are required to be shown on the final plats.

HYDROLOGIC ANALYSIS FOR MDDP

MAJOR DRAINAGE BASIN

Haegler also

The Waterbury Filing 1 & 2 site lies within the within the Geich Ranch Drainage Basin, storm runoff drains southerly to Sand Creek via a public piped system and then into Fountain Creek. "Geich Ranch Drainage Basin Planning Study" dated February 2008, and preprepared by Drexel Barrel & Co. is the Drainage Basin Planning Study on file for this basin.

k

drafted but not accepted by EPC

METHODOLOGY

The El Paso County Drainage Criteria Manual (EPCDCM), dated May 1994 was the resource used in this analysis with the exception for calculating the 5-year and 100-year design storm events. Chapter 6 of the City of Colorado Springs Drainage Criteria Manual (CSDCM) was referenced in determining rainfall and runoff for the proposed drainage system. Runoff was calculated using the Rational Method for developed conditions (see appendix). Runoff coefficients were calculated using weighted impervious values for each specific basin base upon Table 6.6 of the CSDCM. Table 6.5 was used for calculating intensity (see appendix).

per the EPC DCM1 Update resolution

Hydrology sections not reviewed in detail.

EXISTING MAJOR SUBBASIN DESCRIPTION (FOR MDDP)

There are 3 offsite basins that drain existing runoff onto the site from the north under Eastonville Road through culverts. There is also unplatted open space just north of the proposed Waterbury Filing No. 1 & 2.

The first culvert crossing consists of 3-42" RCP that routes runoff from a temporary sediment pond south onto the property. The "Preliminary/Final Drainage Report for Meridian Ranch filing No. 3" and shows flows of Q_5 = 28 cfs, Q_{100} = 153 cfs while the Meridian Ranch MDDP shows a 100-year flow of 185 cfs. This larger flow is used in the HEC-RAS model for downstream channel analysis and culvert design. As mentioned above in the Floodplain Statement section the natural channel along the west side of the site is a recognized FEMA floodplain. This channel drains south to Stapleton Drive where dual 4' x 8' concrete box culverts route the water south in its natural path.

The second culvert crossing is a 36" RCP culvert that drains from north to south under Eastonville Road (Basin OS-8 in Proposed Conditions) onto the undeveloped open space north of the proposed Filing 2 layout. The Meridian Ranch MDDP states the runoff is Q_5 = 5 cfs, Q_{100} = 11 cfs. The third culvert crossing (Basin OS-9 in Proposed Conditions) is another 36" RCP that routes the runoff under Eastonville Road and onto the open space. Both of these culverts along with the undeveloped open space drains south and into the channel along the easterly boundary. An analysis found that this drainage channel is a jurisdictional waters of the U.S. with associated jurisdictional wetland habitat.

In the existing condition runoff from Filing 2 sheet flows south onto Filing 1 and from here the runoff is directed southwest and southeast overland to the existing channels on the west and eastside of the site.

PROPOSED MAJOR SUBBASIN DESCRIPTION (FOR MDDP)

The overall site will be developed in several Filings with each filing requiring its own final drainage report. The Proposed Major Basin Descriptions below is for Waterbury Filings 1 & 2 development and the preliminary layout of the future filings to the north tributary to the storm drain system and detention ponds in Filings 1 & 2. This future area is shown as fully developed to analyze the ultimate storm drain capacity and pond volumes. In the section below labeled Hydrologic Analysis for Filing 1 FDR the interim condition will be discussed and how runoff is captured and routed safely to the proposed private EDB for Filings 1 & 2 construction. See the Proposed MDDP Drainage Map in the appendix for a visual representation of the below Basin descriptions.

Design Point 1 is a proposed public 6' D10-R sump inlet located in the west flowline of Saybrook drive just north of the roundabout. Basin A's 3.39 acres consists of roadway and single-family development. Runoff (Q_5 = 5 cfs, Q_{100} = 12 cfs) sheet flows into street sections and then is routed south via c&g where the inlet captures the flow.

Design Point 2 is a proposed public 4' D10-R sump inlet located in the west flowline of Saybrook drive opposite of DP 1. Basin C's 0.86 acres is comprised of roadway and single-family development. Runoff (Q_5 = 2 cfs, Q_{100} = 4 cfs) drains overland to the street and then to the inlet. Pipe run 1 an 18" RCP routes the flow to a junction at DP 1. Pipe Run 2 a public 24" RCP routes the combined flow (Q_5 = 7 cfs, Q_{100} = 15 cfs) of DP 1 & 2 down Saybrook Road and then down Bayshore Drive over to manhole junction in Sandy Neck Way.

Design Point 3 is a proposed public 4' D10-R sump inlet located in the east flowline of Sandy Neck Way. Basin B1's 2.30 acres consists of roadway and single-family development. Runoff (Q_5 = 4 cfs, Q_{100} = 8 cfs) is directed south to Design Point 3. The 4' D10-R sump inlet captures the entire flow. Pipe run 3 an 18" public RCP storm sewer routes the flow west to a manhole junction with Pipe run 4.

Design Point 4 is a proposed public 4' D10-R sump inlet located in the west flowline of Sandy Neck Way opposite of DP 3. Basin B2's 2.69 acres consists of roadway and single-family development. Runoff (Q_5 = 4 cfs, Q_{100} = 9 cfs) is routed to Design Point 4. The 4' D10-R sump inlet captures the entire flow. Pipe run 4 an 18" public RCP storm sewer routes the flow west to a manhole junction with Pipe run 3. Pipe run 5 a 24" RCP routes the combined (Q_5 = 8 cfs, Q_{100} = 17 cfs) flow of Pipe runs 3 & 4 south down Sandy Neck Way to the manhole junction with Pipe run 2. Pipe run 6 a public 30" RCP then routes the combined (Q_5 = 15 cfs, Q_{100} = 32 cfs) flow of Pipe runs 2 & 5 south down Sandy Neck Way to a junction at Design Point 5.

Design Point 5 is a proposed public 6’ D10-R sump inlet located in the west flowline of Sandy Neck Way. Runoff (Q_5 = 4 cfs, Q_{100} = 9 cfs) from Basin F’s 2.18 acres consisting of single-family development is directed to the east flow line of Sandy Neck Way and then south to the cul-de-sac bulb low point. Runoff (Q_5 = 2 cfs, Q_{100} = 5 cfs) from Basin H’s 1.13 acres consisting of single-family development is directed to the west flow line of Sandy Neck Way and then south to the cul-de-sac bulb low point. The combined flow (Q_5 = 6 cfs, Q_{100} = 14 cfs) at DP 5 is captured in the 6’ D10-R sump inlet and then is routed to the pond along with the flow from Pipe Run 6 via a proposed 36” public RCP storm sewer (Pipe run 7) to Design Point a junction with Pipe run 3. If this inlet were blocked, runoff would overtop the curb and flow sown the storm drain tract and into the proposed FSD Pond 1 (Design Point 8).

Design Point 6 is a proposed public 4’ D10-R sump inlet located in the west flowline of Saybrook Road. Runoff (Q_5 = 4 cfs, Q_{100} = 8 cfs) from Basin D’s 2.11 acres consisting of single-family development is directed to the low point in Saybrook Road. It is then routed via a proposed 18” public RCP storm sewer (Pipe run 8) to a manhole junction with Pipe run 9.

Design Point 7 is a proposed public 4’ D10-R sump inlet located opposite of DP 6 in Saybrook Road. Runoff (Q_5 = 4 cfs, Q_{100} = 8 cfs) from Basin E’s 2.18 acres consisting of roadway and single-family lots is directed via side lot line swales and C&G to the proposed inlet. The 4’ inlet captures all of the flow and Pipe run 9 a public 18” diameter RCP storm sewer routes the flow to a manhole junction at with Pipe run 8. The combined flows (Q_5 = 7 cfs, Q_{100} = 15 cfs) of Pipe runs 8 & 9 are routed south down Saybrook Road to the proposed FSD Pond 1 Design (Design Point 8).

Design Point 8 is a proposed private Full Spectrum Detention Basin called Pond 1. Design Points 1-7 are routed to the pond and treated for Water Quality and Detention along with Basin K’s 3.06 acres consisting mainly of the EDB area and rear yards. Runoff (Q_5 = 3 cfs, Q_{100} = 11 cfs) sheet flows into the EDB. The basins tributary to Design Point 21 are Basins A, B1, B2, C, D, E, F, H & K with a total area of 19.91 acres. The 100-year effective impervious area of 48.7% was calculated using UD-BMP Version 3.07 IRF spreadsheet. This information was entered into the UD-Detention_v4.03 spreadsheet and the calculation yielded a required a WQCV of 0.324 ac-ft, a EURV of 0.703 ac-ft and a 100-year detention volume of 0.650ac-ft. This gave a total required volume of 1.667 ac-ft. The top of pond is set at 6930.00, with a bottom of pond at 6923.50. The pipes and swales to the pond discharge into 2 concrete forebays (3% WQCV see calcs in appendix) with 18" high walls and a 3" notch to release minor flows into 2' wide concrete tickle channel. The trickle channel directs runoff to the proposed concrete micro-pool at the surcharge elevation of 6923.83. The bottom of the micro-pool is set at 6921.00 and the top set at 6923.50. A proposed 4' x 4' outlet box with the grate set at 6926.56, an outlet plate on the front to meet the 3-orifice requirement and an 18" outlet pipe with a restrictor plate set 7.0" above the invert will route all runoff from the pond. The metal plate will have 1 column containing 3 rows of 1-13/16" diameter orifice holes spaced 12.9" apart starting at 6923.50. The WQCV release is 0.20 cfs with a ponding elevation of 6925.14 and takes 40 hours to release. The EURV release is 0.4 cfs, with an elevation of 6926.54 and takes 70 hours to release. The 100-year detention release is 8.3 cfs, with an elevation of 6927.29 and takes 71 hours to release. A 30' long riprap emergency spillway set at 6928.00 will allow the 100-year developed peak in flow (Q_{100}= 29.1 cfs) with a depth of 0.46' (top of water = 6928.46) to be routed west into the natural channel. 1.00' freeboard is provided (see appendix). The spillway and downhill slope will be armored with d50= VH 24" riprap. Pipe Run 10A a private 18" RCP will route the pond release into the existing natural channel. (See Pond Calculations in appendix).

Design Point 9 is an existing 36" RCP culvert under Eastonville Road where Offsite Basin OS-9 discharges onto offsite Basin OS-2. Runoff (Q_5 = 8 cfs, Q_{100} = 19 cfs) from Basin OS-9's 11.80 acres consists of historic flow based upon upstream detention. Further breakdown of this flow will be discussed with analysis of Design Point 29 and the discussion for Tributary flow to the FSD Pond 3.

Design Point 10 is an existing 36" RCP culvert under Eastonville Road south of the existing High School Pond where Offsite Basin OS-8 discharges onto a future Waterbury Filing. Runoff (Q_5 = 5 cfs, Q_{100} = 11 cfs) from Basin OS-10's 3.41 acres consists of historic flow based upon upstream detention. In the ultimate buildout this flow will be piped west to the existing natural channel along the westside of Waterbury and to Offsite Basin OS-5. Until the future filings are built this flow will follow its natural channel south to the existing channel located along the eastern boundary of Filings 1 & 2. This will be discussed again in the Final Drainage Report section below.

Design Point 10A is another crossing under Eastonville Road where existing 3-42” RCP culverts route the flow (Q_5 = 28 cfs, Q_{100} = 135 cfs) from the temporary Meridian Ranch pond per the Meridian Ranch MDDP. The pipes discharge onto Offsite Basin OS-5. Offsite Basin OS-5’s 5.64 acres consists of future Waterbury rear lots, open space and the natural channel. Runoff (Q_5 = 10 cfs, Q_{100} = 23 cfs) from OS-5 sheet flows to the channel. The flow is then routed south to Design Point 11

Design Point 11 is a proposed crossing under the proposed continuation of Gilbert Drive with dual 42” RCP culverts. Basin I’s 5.66 acres consists of rear lots and the natural channel. Runoff (Q_5 = 5 cfs, Q_{100} = 19 cfs) sheet flows to the channel and is directed south Design Points 11. As mentioned above Kiowas Engineering did a HEC-RAS analysis modeling developed flows along the channel. There have been no design or layout changes to affect this model therefore this report will reference the original output data computed by this model. The combined flow of Design Points 10 & 10A along with Basins OS-5 and I is Q_5 = 53 cfs, Q_{100} = 212 cfs. This flow is routed south under Gilbert drive and onto Basin J. Basin I’s runoff is treated downstream in a proposed EDB at Design Point 13

Design Point 12 is a proposed 18” RCP culvert under Gilbert Drive that routes the runoff (Q_5 = 2 cfs, Q_{100} = 4 cfs) from offsite Basin OS-6’s 1.06 acres that is comprised of the eastern half of Thatcher Court located int 4-Way Ranch Filing 1 to the existing natural channel.

Basin J’s 1.99 acres is comprised of rear lots and the existing channel along the west boundary. Runoff (Q_5 = 4 cfs, Q_{100} = 8 cfs) sheet flows into the channel and then is routed south to Design Point 13, an on-line existing stock pond that is being converted to an EDB to provide water quality for part of 4-Way Ranch Filing No. 1 and Waterbury Basins I, J & N.

Basin N’s 0.22 acres is comprised of the proposed extension of Gilbert road form 4-Way Ranch into Waterbury. Runoff (Q_5 = 1 cfs, Q_{100} = 1 cfs) sheet flows into the channel and then is routed south to Design Point 13, an on-line existing stock pond that is being converted to an EDB to provide water quality for part of 4-Way Ranch Filing No. 1 and Waterbury Basins I, J & N.

In the previously approved “Final Drainage Report for Waterbury Filing No. 1” by Classic Consulting it was stated that there were 3 Stormwater Quality Ponds that needed to be provided for the adjacent 4-Way Ranch per conditions set forth by the Board of County Commissioners at approval of the Waterbury PUD Development Plan. Because there have been no changes to the tributary areas to these 3 Ponds and they have already been designed and constructed this report will reference the original work done by Classic Consulting. Below is a brief description of the 3 Stormwater Quality Ponds. The original approved calculations and results can be found in the appendix of the original report along with the Basin Exhibit Map.

These do not match what is shown on the drainage map on Page 301. Basins trib to Pond 1 appear to be A, B1, B2, part of C, D, E, F, H, K

Stormwater Quality Pond 1 treats 56.8 acres of 4-Way Ranch Filing No. 1 from their Basins H, I, J, S, R & 60% of L. An EDB was designed between the existing Lots 15 and 35 using a 4’ x 4’ outlet set at 6924.00 with an orifice plate with 1 column of 10-15/16” diameter holes spaced 4” apart. The forebay top is set at 6920.5 with the bottom at 6918.00. The required volume was calculated to be 0.52 ac-ft and the design volume shown is 0.66 ac-ft. The release out of the pond was calculated to be Q_5 = 13 cfs, Q_{100} = 131 cfs.

These do not match what is shown on the drainage map on Page 301. Revise.

Stormwater Quality Pond 2 treats 37.2 acres of 4-Way Ranch Filing No. 1 from their Basins F, G, K, & M. An EDB was designed along the south edge of existing Lot 15 using a 4’ x 4’ outlet set at 6918.00 with an orifice plate with 1 column of 9-13/16” diameter holes spaced 4” apart. The forebay top is set at 6915.00 with the bottom at 6914.75. The required volume was calculated to be 0.34 ac-ft and the design volume shown is 0.60 ac-ft. The release out of the pond was calculated to be Q_5 = 0.4 cfs, Q_{100} = 51 cfs.

There is a Pond 3 at Design Point 29. Revise report text and drainage map to remove pond naming discrepancies. Should it be called Off-Site SWQ Facility Pond 3?

Design Point 13 is Stormwater Quality Pond 3, an existing stock pond south of Stapleton Drive that will be converted to a EDB and treat 40.4 acres of 4-Way Ranch Filing No. 1 from their Basins OS-5, Os-6, D, E, N 40% of L, 50% of O, Q & basins I, J & N of Waterbury Filing No. 1. The EDB was designed using a 4’ x 4’ outlet set at 6907.50 with an orifice plate with 1 column of 8-1/8” diameter holes spaced 4” apart. The forebay top is set at 6915.00 with the bottom at 6914.75. The required volume was calculated to be 0.66 ac-ft and the design volume shown is 1.20 ac-ft. The release out of the pond was calculated to be Q_5 = 69 cfs, Q_{100} = 396 cfs.

These do not match what is shown on the drainage map on Page 301. Revise. Basin D and E are actually trib to Pond 1 for example.

Basin M1’s 2.90 acres is comprised of the rear yards & open space tract along Stapleton Drive along

Where can I find this?

with a portion of Saybrook Drive. Runoff (Q_5 = 5 cfs, Q_{100} = 12 cfs) sheet flows over the back yard and open space tract onto Stapleton Drive the channel and then is routed south overland. As mentioned in the "Final Drainage Report for Waterbury Filing No. 2" the area consists or pervious rear yards that sheet flow over pervious area. El Paso County reviewers commented to provide a variance for this area not treated for Water Quality.

See comment on Page 19

Basin M2's 0.47 acres is comprised of the rear yards adjacent to undeveloped land east of the site. Runoff (Q_5 = 1 cfs, Q_{100} = 2 cfs) sheet flows from the back yard onto the undeveloped. This area is not treated for water quality but is pervious area.

Design Point 14 is a low point in the knuckle of Beech Creek Drive with a proposed public 10' D10-R sump inlet. Runoff (Q_5 = 8 cfs, Q_{100} = 18 cfs) from Basin L1's 5.27 acres consisting of roadway and single-family lots is directed via side lot line swales and C&G to the proposed inlet. The 10' inlet captures all of the flow and Pipe run 11 a public 24" diameter RCP storm sewer routes the flow to a manhole junction with Pipe run 12.

Design Point 15 is a proposed public 4' D10-R sump inlet opposite of DP 14 in Beech Creek Drive Runoff (Q_5 = 8 cfs, Q_{100} = 18 cfs) from Basin L1's 5.27 acres consisting of roadway and single-family lots is directed via side lot line swales and C&G to the proposed inlet. The 4' inlet captures all of the flow and Pipe run 12 a public 18" diameter RCP storm sewer routes the flow to a manhole junction with Pipe run 11. Pipe run 13 a 30" RCP routes the combined flow (Q_5 = 11 cfs, Q_{100} = 24 cfs) of Pipe Runs 11 & 12 north in Beech Creek Drive to a manhole junction with Pipe run 14.

Design Point 16 is a proposed public 6' D10-R sump inlet located in the proposed western half of the private street of Beech Creek Drive. Runoff (Q_5 = 5 cfs, Q_{100} = 11 cfs) from Basin O1's 1.27 acres consisting of roadway and single-family lots is directed via side lot line swales and C&G to the proposed inlet. The 6' inlet captures all of the flow and Pipe run 14 a public 24" diameter RCP storm sewer routes the flow to a manhole junction with Pipe run 13. Pipe run 15 a 36" RCP routes the combined flow (Q_5 = 15 cfs, Q_{100} = 34 cfs) of Pipe Runs 13 & 14 west to a manhole junction with Pipe run 16.

Design Point 17 is a proposed public 4’ D10-R sump inlet located opposite of DP 14 in Beech Creek Drive. Runoff (Q_5 = 1 cfs, Q_{100} = 3 cfs) from Basin O2’s 0.94 acres consisting of roadway, parking, roof and landscape area sheet flows to the east flowline of Beech Creek Drive and to the proposed inlet. After being captured by the inlet Pipe run 16. Pipe run 17 routes the combined flows (Q_5 = 17 cfs, Q_{100} = 37 cfs) of Pipe runs 15 and 16 are routed west offsite via a private 36” diameter RCP to Design Point 18 a proposed private temporary EDB. This is the FSD Pond 2.

Discuss nature of this pond being temporary. Is there an estimated lifespan for it?

Design Point 18 is a proposed temporary private Full Spectrum Detention Basin called Pond 2. Design Points 14-17 are routed to the pond and treated for Water Quality and Detention along with the Basin OS-4’s 10.90 acres consisting of the EDB area and undeveloped upstream tributary area. Runoff (Q_5 = 2 cfs, Q_{100} = 16 cfs) from Basin OS-4 sheet flows into the EDB. The basins tributary to Design Point are L1, L2, O1, O2 and OS-4 with a total area of 21.93 acres. The 100-year effective impervious area of 24.5% was calculated using UD-BMP Version 3.07 IRF spreadsheet. This information was entered into the UD-Detention_v4.03 spreadsheet and the calculation yielded a required a WQCV of 0.243 ac-ft, a EURV of 0.264 ac-ft and a 100-year detention volume of 0.516 ac-ft. This gave a total required volume of 1.023 ac-ft. The top of pond is set at 6906.00, with a bottom of pond at 6899.00. The pipes and swales to the pond discharge into a concrete forebay (3% WQCV see calcs in appendix) with 18” high walls and a 3” notch to release minor flows into 2’ wide concrete tickle channel. The trickle channel directs runoff to the proposed concrete micro-pool at the surcharge elevation of 6899.33. The bottom of the micro-pool is set at 6896.50 and the top set at 6899.00. A proposed 4’ x 4’ outlet box with the grate set at 6902.06, an outlet plate on the front to meet the 3-orifice requirement and an 18” outlet pipe with a restrictor plate set 12.0” above the invert will route all runoff from the pond. The metal plate will have 1 column containing 3 rows of 1-5/16” diameter orifice holes spaced 12.2” apart starting at 6899.00. The WQCV release is 0.10 cfs with a ponding elevation of 6901.22 and takes 40 hours to release. The EURV release is 0.2 cfs, with an elevation of 6902.06 and takes 58 hours to release. The 100-year detention release is 10.6 cfs, with an elevation of 6902.66 and takes 58 hours to release. A 20’ long riprap emergency spillway set at 6904.00 will allow the 100-year developed peak in flow (Q_{100}= 20.7 cfs) with a depth of 0.47’ (top of water = 6904.47) to be routed west into the natural channel. 1.00’ freeboard is provided (see appendix). The spillway and downhill slope will be armored with d50= VH 24” riprap. Pipe Run 17A a private 18” RCP will route the pond release into the existing natural channel. (See Pond Calculations in appendix). When future filings are developed this temporary Pond 2 will be replaced with a permanent Pond as shown in the "Conceptual Drainage Report for Waterbury PUD Plan" prepared by Classic Consulting and dated November 2012.

For Design Points 19-25 this MDDP assumes the offsite basins upstream are fully developed with future Waterbury Filings.

Design Point 19 is a proposed 8' D10-R sump inlet located in the south curb of Muddy Pond Street. Runoff (Q_5 = 6 cfs, Q_{100} = 12 cfs) from Basin OS-Q1's 4.31 acres consists of future single-family development and will be directed via lot line swales and c&g onto Basin Q1. Runoff (Q_5 = 2 cfs, Q_{100} = 4 cfs) from Basin Q1's 1.04 acres is directed to the 8' inlet. The combined flow (Q_5 = 7 cfs, Q_{100} = 15 cfs) is captured in the inlet and Pipe run 18 a 24" RCP diameter storm routes the flows to a manhole junction with Pipe run 19.

Design Point 20 is a proposed 4' D10-R sump inlet located opposite of DP 19. Runoff (Q_5 = 2 cfs, Q_{100} = 4 cfs) from Basin OS-Q2's 0.94 acres consists of future single-family development and will be directed via lot line swales and c&g onto Basin Q2. Runoff (Q_5 = 2 cfs, Q_{100} = 5 cfs) from Basin Q2's 1.10 acres is directed to the 4' inlet. The combined flow (Q_5 = 3 cfs, Q_{100} = 8 cfs) is captured in the inlet and Pipe run 19 an 18" RCP diameter storm routes the flows to a manhole junction with Pipe run 18. Pipe Run 20 a 24" RCP storm routes the combined flow (Q_5 = 10 cfs, Q_{100} = 21 cfs) of Pipe runs 19 & 20 east down Muddy Pond Street east down Muddy Pond Street to a manhole junction with Pipe run 21.

Design Point 21 is a proposed 12' D10-R at-grade inlet located in the north curb of Muddy Pond Street just east of Masonboro Way intersection. Runoff (Q_5 = 11 cfs, Q_{100} = 24 cfs) from Basin OS-R's 6.05 acres consists of future single-family development and will be directed via lot line swales and c&g onto Basin R. Runoff (Q_5 = 0 cfs, Q_{100} = 1 cfs) from Basin R's 0.13 acres is directed to the 12' inlet. The combined flow (Q_5 = 11 cfs, Q_{100} = 24 cfs) is routed to the inlet and Q_5 = 5 cfs, Q_{100} = 9 cfs is captured. Pipe run 21 an 18" RCP diameter storm routes the captured flow to a manhole junction with Pipe run 20. Pipe run 22 routes the combined flow (Q_5 = 14 cfs, Q_{100} = 27 cfs) of Pipe runs 20 & 21 east down Muddy Pond Street to a manhole junction with Pipe run 25. The bypass flow

(Q_5 = 5 cfs, Q_{100} = 16 cfs) at DP 21 travels in the north flow line of Muddy Pond Street to Design Point 22.

Design Point 22 is a proposed 10' D10-R sump inlet located in the west curb of Megansett Wat. Runoff (Q_5 = 8 cfs, Q_{100} = 18 cfs) from Basin OS-S1's 5.59 acres consists of future single-family development and will be directed via lot line swales and c&g onto Basin S1. Runoff (Q_5 = 3 cfs, Q_{100} = 7 cfs) from Basin S1's 1.55 acres is directed to the 4' inlet. The combined flow (Q_5 = 15 cfs, Q_{100} = 37 cfs) of Basins OS-S1, S1 & the bypass flow from DP 21 is routed to the low point.

Design Point 23 is a proposed 10' D10-R sump inlet located opposite of DP 22. Runoff (Q_5 = 0 cfs, Q_{100} = 1 cfs) from Basin OS-S2's 0.17 acres consists of future single-family development and will be directed via lot line swales and c&g onto Basin S2. Runoff (Q_5 = 0 cfs, Q_{100} = 1 cfs) from Basin S2's 0.13 acres is directed to the 10' inlet. The combined flow at DP 23 is Q_5 = 1 cfs, Q_{100} = 1 cfs. It is presumed that the combined flow (Q_5 = 16 cfs, Q_{100} = 38 cfs) at DP 22 & 23 is evenly split between the 2-10' D10-R sump inlets. Pipe run 23 a 24" RCP diameter storm routes the flow (Q_5 = 8 cfs, Q_{100} = 19 cfs) from the inlet at DP 22 to a manhole junction with Pipe run 24. Pipe Run 24 a 24" RCP storm routes the flow (Q_5 = 8 cfs, Q_{100} = 19 cfs) to the manhole junction with Pipe run 23. Pipe Run 25 a 30" RCP routes the combined flow (Q_5 = 16 cfs, Q_{100} = 38 cfs) of Pipe runs 23 & 24 south to a manhole junction with Pipe run 22 in Muddy Pond Street. Pipe run 26 a 36" RCP then routes the combined flow (Q_5 = 27 cfs, Q_{100} = 59 cfs) of Pipe runs 22 & 25 east in Muddy Pond to a manhole junction with Pipe runs 27 & 28.

Design Point 24 is a proposed 4' D10-R sump inlet located in the south curb of Muddy Pond Street. Runoff (Q_5 = 3 cfs, Q_{100} = 6 cfs) from Basin T1's 1.42 acres consists of single-family development and will be directed via lot line swales and c&g to the 4' inlet. Pipe run 27 an 18" RCP diameter storm routes the flow from the inlet to a manhole junction with Pipe runs 26 & 28.

Design Point 25 is a proposed 4' D10-R sump inlet located opposite of DP 24. Runoff (Q_5 = 1 cfs, Q_{100} = 3 cfs) from Basin OS-T2's 0.76 acres consists of future single-family development and will be directed via lot line swales and c&g onto Basin T2. Runoff (Q_5 = 0 cfs, Q_{100} = 1 cfs) from Basin T2's 1.23 acres is directed to the 4' inlet. The combined flow at DP 25 is Q_5 = 3 cfs, Q_{100} = 7 cfs. Pipe run

28 an 18” RCP diameter storm routes the flow from the inlet to a manhole junction with Pipe runs 27 & 28. Pipe run 29 a 36” RCP then routes the combined flow (Q_5 = 32 cfs, Q_{100} = 69 cfs) of Pipe runs 26, 27 & 28 east in Muddy Pond Street and then south down Fish Camp Circle to a manhole junction with Pipe run 30.

Design Point 26 is a proposed 10’ D10-R sump inlet located in the west curb of Fish Camp Circle near the Knuckle. Runoff (Q_5 = 7 cfs, Q_{100} = 16 cfs) from Basin U1’s 4.38 acres consists of single-family development and will be directed via lot line swales and c&g to the 10’ inlet. Pipe run 30 a 24” RCP diameter storm routes the flow from the inlet to a manhole junction with Pipe run 29. Pipe run 31 transports the combined flow (Q_5 = 37 cfs, Q_{100} = 81 cfs) of Pipe runs 29 & 30.

Design Point 27 is a proposed 6’ D10-R sump inlet located opposite of DP 26. Runoff (Q_5 = 3 cfs, Q_{100} = 7 cfs) from Basin U2’s 1.89 acres consists of future single-family development and will be directed via lot line swales to the 6’ inlet. Pipe run 32 an 18” RCP diameter storm routes the flow from the inlet to a manhole junction with Pipe runs 31. Pipe run 33 a 36” RCP then routes the combined flow (Q_5 = 40 cfs, Q_{100} = 87 cfs) of Pipe runs 31 & 32 east through a Drainage Tract to FSD Pond 3.

Design Point 28 is a proposed 10’ D10-R sump inlet located in the future north curb of Sunken Meadow Road. This inlet is offsite in a future phase and will be built within a proposed drainage easement. The offsite curb and gutter in this area will also need to be built along with some temporary asphalt to direct runoff to the 10’ inlet. Runoff (Q_5 = 8 cfs, Q_{100} = 18 cfs) from Basin W’s 5.20 acres is captured in the inlet and routed to Pond 3 via Pipe run 24” RCP.

The following Basin are for future Waterbury Filings to the north and east that will be tributary to FSD Pond 3. All the basin descriptions are the same, they are comprised of future single-family development and will be directed via lot line swales and c&g to future storm drain systems the future drain systems will be routed to FSD Pond 3. The exact routes and design have not been finalized at this time but will be with a future Final Drainage Report at the time of development. Below is the summary of the flow and acreage.

Basin OS-1: 11.81 acres, Runoff (Q_5 = 18 cfs, Q_{100} = 41 cfs)

Basin OS-2: 15.90 acres Runoff (Q_5 = 22 cfs, Q_{100} = 49 cfs)

Basin OS-3A: 0.79 acres Runoff (Q_5 = 1 cfs, Q_{100} = 3 cfs)

Basin OS-3B: 5.66 acres Runoff (Q_5 = 9 cfs, Q_{100} = 20 cfs)

As mentioned above Design Point 9 is an existing 36" RCP culvert under Eastonville Road where Offsite Basin OS-9 discharges onto Offsite Basin OS-2. Runoff (Q_5 = 8 cfs, Q_{100} = 19 cfs) from Basin OS-9's 11.80 acres consists of historic flow based upon upstream detention. Runoff will be directed through the future Waterbury filings and into FSD Pond 3.

These do not match what is shown on the drainage map on Page 301. Revise.

Design Point 29 is a proposed private Full Spectrum Detention Basin called Pond 3. Design Points 19-28 and Offsite Basins OS-1, 2, 3A, 3B, 7, & 9 with a total area of 84.64 acres are routed to the pond and treated for Water Quality and Detention. The 100-year effective impervious area of 36.4% was calculated using UD-BMP Version 3.07 IRF spreadsheet. This information was entered into the UD-Detention_v4.03 spreadsheet and the calculation yielded a required a WQCV of 1.200 ac-ft, a EURV of 2.000 ac-ft and a 100-year detention volume of 2.478 ac-ft. This gave a total required volume of 5.678 ac-ft. The top of pond is set at 6930.00, with a bottom of pond at 6922.00. The pipes and swales to the pond discharge into a concrete forebay (3% WQCV see calcs in appendix) with 18" high walls and a 3" notch to release minor flows into 2' wide concrete tickle channel. The trickle channel directs runoff to the proposed concrete micro-pool at the surcharge elevation of 6922.33. The bottom of the micro-pool is set at 6899.50 and the top set at 6922.00. A proposed 6' x 6' outlet box with the grate set at 6926.59, an outlet plate on the front to meet the 3-orifice requirement and a 36" outlet pipe with a restrictor plate set 28.0" above the invert will route all runoff from the pond. The metal plate will have 1 column containing 3 rows of 2" x 3" orifice holes spaced 18.3" apart starting at 6922.00. The WQCV release is 0.60 cfs with a ponding elevation of 6924.99 and takes 40 hours to release. The EURV release is 1.0 cfs, with an elevation of 6926.59 and takes 67 hours to release. The 100-year detention release is 60.7 cfs, with an elevation of 6927.75 and takes 67 hours to release. A 60' long riprap emergency spillway set at 6928.00 will allow the 100-year developed peak in flow (Q_{100}= 155.2 cfs) with a depth of 0.88' (top of water = 6928.88) to be routed west into the natural channel. 1.12' freeboard is provided (see appendix). The spillway and downhill slope will be armored with d50= VH 24" riprap. Pipe Run 35 a private 36" RCP will route the pond release into the existing

Note that page 29 of the MS4 permit states:

100% of the applicable development site is captured, except the permittee may exclude up to 20 percent, not to exceed 1 acre, of the applicable development site area when the permittee has determined that it is not practicable to capture runoff from portions of the site that will not drain towards control measures. In addition, the permittee must also determine that the implementation of a separate control measure for that portion of the site is not practicable (e.g., driveway access that drains directly to street).

natural channel. (See Pond Calculations in appendix).

The area of Basin V plus Basin M2 exceeds 1ac. So consider utilizing Runoff Reduction for these areas until the untreated area is below 1ac.

Design Point 30 is a triple 36" RCP culvert crossing under Sunken Meadow Road. Offsite Basin OS-10's 3.41 acres consists of open space containing the natural channel. Runoff (Q_5 = 1 cfs, Q_{100} = 8 cfs) is directed south through the wetlands to the culverts. Basin V's 1.32 acres is comprised of the rear yards adjacent to the existing natural channel along the west side of the site. Runoff (Q_5 = 1 cfs, Q_{100} = 2 cfs) sheet flows from the back yard onto the undeveloped. This area is not treated for water quality but is pervious area that does not need water quality. The combined flow (Q_5 = 3 cfs, Q_{100} = 10 cfs) at DP 30 does not warrant the triple 36" RCP culverts alone but in case of failure in the "Pond 3 outlet runoff from the emergency spillway will be safely routed through the triple 36" RCP culverts (See appendix).

HYDRAULIC ANALYSIS

MAJOR DRAINAGEWAYS

As mentioned above here are 2 major drainage ways on the east and west side of the site. In the previously approved "Final Drainage Report for Waterbury Filing 1" dated September 2016 prepared by Classic Consulting Engineering & Surveying the floodplain along the west side of the site was determined by Kiowa Engineering in a 2004 LOMR (04-08-0012) using a HEC-RAS analysis modeling developed flows along the channel from the 3-42" culverts under Eastonville Road south to the existing stock pond (Design Point 13) south of Stapleton Drive with proposed and existing improvements such as the proposed 42" dual culverts located at the Gilbert Road crossing and existing dual 4' x 8' box culverts at Stapleton Drive (see appendix for HEC-RAS model). As part of the revised Preliminary Plan submittal for the site revisions an analysis of the eastern channel by ECO Systems found that this drainage channel is a jurisdictional waters of the U.S. with associated jurisdictional wetland habitat. Therefore, to comply with Section 404 of the Clean Water Act, we must meet the 404(b)(1) project review criteria, which include impact avoidance and minimization. The option the client plan to take is to minimize Project-wide impacts to 0.5-acre or less such that the pre-approved Nationwide Permits (NWP) may be used.

Address channel conditions, flow velocity, shear stresses and any necessary stabilization.

See comment letter.

HYDROLOGIC ANALYSIS FOR FILING 1 & 2 FDR

PROPSOED BASIN DESCRIPTION (FOR FDR)

The development of the overall Waterbury site will occur in several platting phases. With the design of Waterbury Filings 1 & 2 the site will have an interim condition where the area to the north will be unplatted natural open space with drainage patterns differing from the future full build out analysis in the MDDP section until such time that it is developed. Below is a description of the Design Points and the overall proposed drainage characteristics for the development of only Waterbury Filing 1 & 2. Design Points 1-18 do not have any changes to them from the description above in the MDDP section therefore these basins will not be described below. The following is a description of the Design Points 19-30 altered by the interim state of undeveloped land upstream. In all cases the design flow is less than the ultimate build-out and therefore the inlets and pipes can capture and route the flow safely

Design Point 19 is a proposed 8' D10-R sump inlet located in the south curb of Muddy Pond Street. Runoff (Q_5 = 0 cfs, Q_{100} = 1 cfs) from Basin OS-Q1's 0.33 acres consists of undeveloped land and will sheet flow onto Basin Q1. Runoff (Q_5 = 2 cfs, Q_{100} = 4 cfs) from Basin Q1's 1.04 acres is directed to the 8' inlet. The combined flow (Q_5 = 2 cfs, Q_{100} = 5 cfs) is captured in the inlet and Pipe run 18 a 24" RCP diameter storm routes the flows to a manhole junction with Pipe run 19.

Design Point 20 is a proposed 4' D10-R sump inlet located opposite of DP 19. Runoff (Q_5 = 0 cfs, Q_{100} = 1 cfs) from Basin OS-Q2's 0.22 acres consists of undeveloped land and will sheet flow onto Basin Q2. Runoff (Q_5 = 2 cfs, Q_{100} = 5 cfs) from Basin Q2's 1.10 acres is directed to the 4' inlet. The combined flow (Q_5 = 2 cfs, Q_{100} = 5 cfs) is captured in the inlet and Pipe run 19 an 18" RCP diameter storm routes the flows to a manhole junction with Pipe run 18. Pipe Run 20 a 24" RCP storm routes the combined flow (Q_5 = 4 cfs, Q_{100} = 9 cfs) of Pipe runs 19 & 20 east down Muddy Pond Street east down Muddy Pond Street to a manhole junction with Pipe run 21.

Design Point 21 is a proposed 12' D10-R at-grade inlet located in the north curb of Muddy Pond Street just east of Masonboro Way intersection. Offsite Basin OS-8' runoff of Q_5 = 5 cfs, Q_{100} = 11 cfs is discharged onto the undeveloped Basin OS-R. Runoff (Q_5 = 3 cfs, Q_{100} = 21 cfs) from Basin OS-R's 10.11 acres consists of undeveloped land and will sheet flow onto Basin R. Runoff (Q_5 = 0 cfs, Q_{100} = 1 cfs) from Basin R's 0.13 acres is directed to the 12' inlet. The combined flow (Q_5 = 9 cfs, Q_{100} = 35 cfs) is routed to the inlet and Q_5 = 5 cfs, Q_{100} = 11 cfs is captured. Pipe run 21 an 18" RCP diameter storm routes the captured flow to a manhole junction with Pipe run 20. Pipe run 22 routes the combined flow (Q_5 = 9 cfs, Q_{100} = 20 cfs) of Pipe runs 20 & 21 east down Muddy Pond Street to a manhole junction with Pipe run 25. The bypass flow (Q_5 = 4 cfs, Q_{100} = 24 cfs) at DP 21 travels in the north flow line of Muddy Pond Street to Design Point 22.

Design Point 22 is a proposed 10' D10-R sump inlet located in the west curb of Megansett Way. Runoff (Q_5 = 0 cfs, Q_{100} = 0 cfs) from Basin OS-S1's 0.14 acres consists of undeveloped land and will sheet flow onto Basin S1. Runoff (Q_5 = 3 cfs, Q_{100} = 7 cfs) from Basin S1's 1.55 acres is directed to the 4' inlet. The combined flow (Q_5 = 5 cfs, Q_{100} = 23 cfs) of Basins OS-S1, S1 & the bypass flow from DP 21 is routed to the low point.

Design Point 23 is a proposed 10' D10-R sump inlet located opposite of DP 22. Runoff (Q_5 = 1 cfs, Q_{100} = 4 cfs) from Basin OS-S2's 1.92 acres consists of future single-family development and will be directed via lot line swales and c&g onto Basin S2. Runoff (Q_5 = 0 cfs, Q_{100} = 1 cfs) from Basin S2's 0.13 acres is directed to the 10' inlet. The combined flow at DP 23 is Q_5 = 1 cfs, Q_{100} = 5 cfs. It is presumed that the combined flow (Q_5 = 6 cfs, Q_{100} = 27 cfs) at DP 22 & 23 is evenly split between the 2-10' D10-R sump inlets. Pipe run 23 a 24" RCP diameter storm routes the flow (Q_5 = 3 cfs, Q_{100} = 13 cfs) from the inlet at DP 22 to a manhole junction with Pipe run 24. Pipe Run 24 a 24" RCP storm routes the flow (Q_5 = 3 cfs, Q_{100} = 13 cfs) to the manhole junction with Pipe run 23. Pipe Run 25 a 30" RCP routes the combined flow (Q_5 = 6 cfs, Q_{100} = 27 cfs) of Pipe runs 23 & 24 south to a manhole junction with Pipe run 22 in Muddy Pond Street. Pipe run 26 a 36" RCP then routes the combined flow (Q_5 = 13 cfs, Q_{100} = 43 cfs) of Pipe runs 22 & 25 east in Muddy Pond to a manhole junction with Pipe runs 27 & 28.

Design Point 24 is a proposed 4' D10-R sump inlet located in the south curb of Muddy Pond Street. Runoff (Q_5 = 3 cfs, Q_{100} = 6 cfs) from Basin T1's 1.42 acres consists of single-family development and will be directed via lot line swales and c&g to the 4' inlet. Pipe run 27 an 18" RCP diameter storm routes the flow from the inlet to a manhole junction with Pipe runs 26 & 28.

Design Point 25 is a proposed 4’ D10-R sump inlet located opposite of DP 24. Runoff (Q_5 = 0 cfs, Q_{100} = 2 cfs) from Basin OS-T2’s 0.76 acres consists of future single-family development and will be directed via lot line swales and c&g onto Basin T2. Runoff (Q_5 = 2 cfs, Q_{100} = 5 cfs) from Basin T2’s 1.23 acres is directed to the 4’ inlet. The combined flow at DP 25 is Q_5 = 2 cfs, Q_{100} = 6 cfs. Pipe run 28 an 18” RCP diameter storm routes the flow from the inlet to a manhole junction with Pipe runs 27 & 28. Pipe run 29 a 36” RCP then routes the combined flow (Q_5 = 17 cfs, Q_{100} = 52 cfs) of Pipe runs 26, 27 & 28 east in Muddy Pond Street and then south down Fish Camp Circle to a manhole junction with Pipe run 30.

Design Point 26 is a proposed 10’ D10-R sump inlet located in the west curb of Fish Camp Circle near the Knuckle. Runoff (Q_5 = 7 cfs, Q_{100} = 16 cfs) from Basin U1’s 4.38 acres consists of single-family development and will be directed via lot line swales and c&g to the 10’ inlet. Pipe run 30 a 24” RCP diameter storm routes the flow from the inlet to a manhole junction with Pipe run 29. Pipe run 31 transports the combined flow (Q_5 = 22 cfs, Q_{100} = 64 cfs) of Pipe runs 29 & 30.

Design Point 27 is a proposed 6’ D10-R sump inlet located opposite of DP 26. Runoff (Q_5 = 3 cfs, Q_{100} = 7 cfs) from Basin U2’s 1.89 acres consists of future single-family development and will be directed via lot line swales to the 6’ inlet. Pipe run 32 an 18” RCP diameter storm routes the flow from the inlet to a manhole junction with Pipe runs 31. Pipe run 33 a 36” RCP then routes the combined flow (Q_5 = 25 cfs, Q_{100} = 70 cfs) of Pipe runs 31 & 32 east through a Drainage Tract to FSD Pond 3.

Design Point 30 is a triple 36” RCP culvert crossing under Sunken Meadow Road. Offsite Basin OS-9 discharges onto Offsite Basin OS-1. Runoff (Q_5 = 3 cfs, Q_{100} = 18 cfs) from Basin OS-9’s 11.80 acres consists of historic flow based upon upstream detention. Offsite Basin OS-1’s 41.36 acres consists of undeveloped land and open space containing the natural channel. Runoff (Q_5 = 11 cfs, Q_{100} = 74 cfs) is directed south through the wetlands to the culverts. Basin V’s 1.32 acres is comprised of the rear yards adjacent to the existing natural channel along the west side of the site. Runoff (Q_5 = 1 cfs, Q_{100} = 2 cfs) sheet flows from the back yard onto the undeveloped. This area is not treated for water quality but is pervious area that does not need water quality. The combined flow (Q_5 = 21 cfs, Q_{100} = 96 cfs) at DP 30 will be safely routed through the triple 36” RCP culverts (See appendix).

The above Design point and Basin description shows that in the interim condition all runoff can be safely routed through the proposed storms drain system.

In an effort to protect receiving water and as part of the "four step process to minimize adverse impacts of urbanization" this site was analyzed in the following manner:

1. Reduce Runoff- The proposed impervious areas on the site are surrounded by landscaping and green space areas. Additionally, the new improvements and impervious areas on the site will be routed to a proposed private Extended Detention Basin. These items will reduce the volume of runoff using ponding and infiltration.
2. Stabilize Drainageways- There are 2 existing drainageways onsite. The westerly channel has been studied in HEC-RAS model and based upon calculations velocities are within the range for stabilized flow. The easterly channel has wetlands that allow the channel to stay stabilized.
3. Provide Water Quality Capture Volume (WQCV)- The 6 Extended Detention Basin have been sized and designed to sufficiently capture the required WQCV and slowly release it though the three-hole outlet, thereby allowing solids and contaminants to settle out.
4. Consider Need for Industrial and Commercial BMPs- The proposed development is single family site; therefore, no Industrial and Commercial BMPs have been proposed.

revise

delete

DRAINAGE FEES

This site Haegler Drainage Fee Basin. El Paso County uses a method based upon impervious acreage.

The **Waterbury Filing No. 1** has a total acreage of:

29.44 ac / 108 = 0.27 ac / lot

(Per El Paso County% impervious Chart 40%)

29.44 x 40% = 11.78 Impervious acres

The following calculations are based upon the 2020 Drainage & Bridge fees:

Drainage Fees:	$10,737 x 11.78 = **$126,482**
Bridge Fees:	$1,585 x 11.78 = **$18,671**

Fee Reduction (Assumed 50% construction costs for Detention Facilities)

FSD Detention Pond 1 $68,676 x 50% = $34,338

FSD Detention Pond 2 $35,712 x 50% = $17,856

Total Deduction = $34,338 + $17,856 = $52,194 (Actual costs may vary this will be finalized prior to approval)

Filing 1 Drainage Fee Total: $126,482 - $52,194 = **$74,288**

Filing 1 Bridge Fee Total: $18,671

The **Waterbury Filing No. 2** has a total acreage of:

32.48 ac / 93 = 0.35 ac / lot

(Per El Paso County% impervious Chart 30%)

32.48 x 40% = 9.74 Impervious acres

The following calculations are based upon the 2020 Drainage & Bridge fees:

Drainage Fees: $10,737 x 9.74 = **$104,578**

Bridge Fees: $1,585 x 9.74 = **$15,438**

Fee Reduction (Assumed 50% construction costs for Detention Facilities)

FSD Detention Pond 3 $85,845 x 50% = $42,923

Total Deduction = $34,338 (Actual costs may vary this will be finalized prior to approval)

Filing 2 Drainage Fee Total: $104,578 - $42,923 = **$61,655**

Filing 2 Bridge Fee Total: $15,438

Delete. Address in respective FDRs.

SUMMARY

Site runoff and storm drain and appurtenances associated with the development of the Waterbury Filing No. 1 & 2 site will not adversely affect the surrounding and downstream developments. Runoff will be routed to the existing and proposed detention basins and reduce the runoff to be at or below historic rates mentioned above in the report via Full Spectrum Detention while slowly treating the water quality capture volume and in turn helping to stabilize the downstream channel banks. Terra Nova Engineering requests that this report satisfy the submittal requirements for the drainage analysis for Waterbury. This report and findings are in general conformance with all previously approved reports for this site.

PREPARED BY:
TERRA NOVA ENGINEERING, INC.

Quentin N. Armijo, P.E.
Vice President
Jobs/1717.00/drainage/1715.00 MMDP-FDR 1-2

reference County criteria (4 parts):
https://library.municode.com/co/el_paso_county/codes/drainage_criteria_manual

BIBLIOGRAPHY

"City of Colorado Springs Drainage Criteria Manual Volume 1", approved May 2014 and prepared by City of Colorado Springs

SCS Soils Map for El Paso County

"Revision to the MDDP for Meridian Ranch, EL Paso County, Colorado", approved October 2005, and prepared by PBS&J

"Final Drainage Report for 4-Way Ranch Phase 1" approved March 2006 prepared by JR Engineering

The "Geich Ranch Drainage Basin Planning Study" approved February 2008, preprepared by Drexel Barrel & Co

"Preliminary/Final Drainage Report for Meridian Ranch filing No. 3" approved November 2011 prepared by Tech Contractors

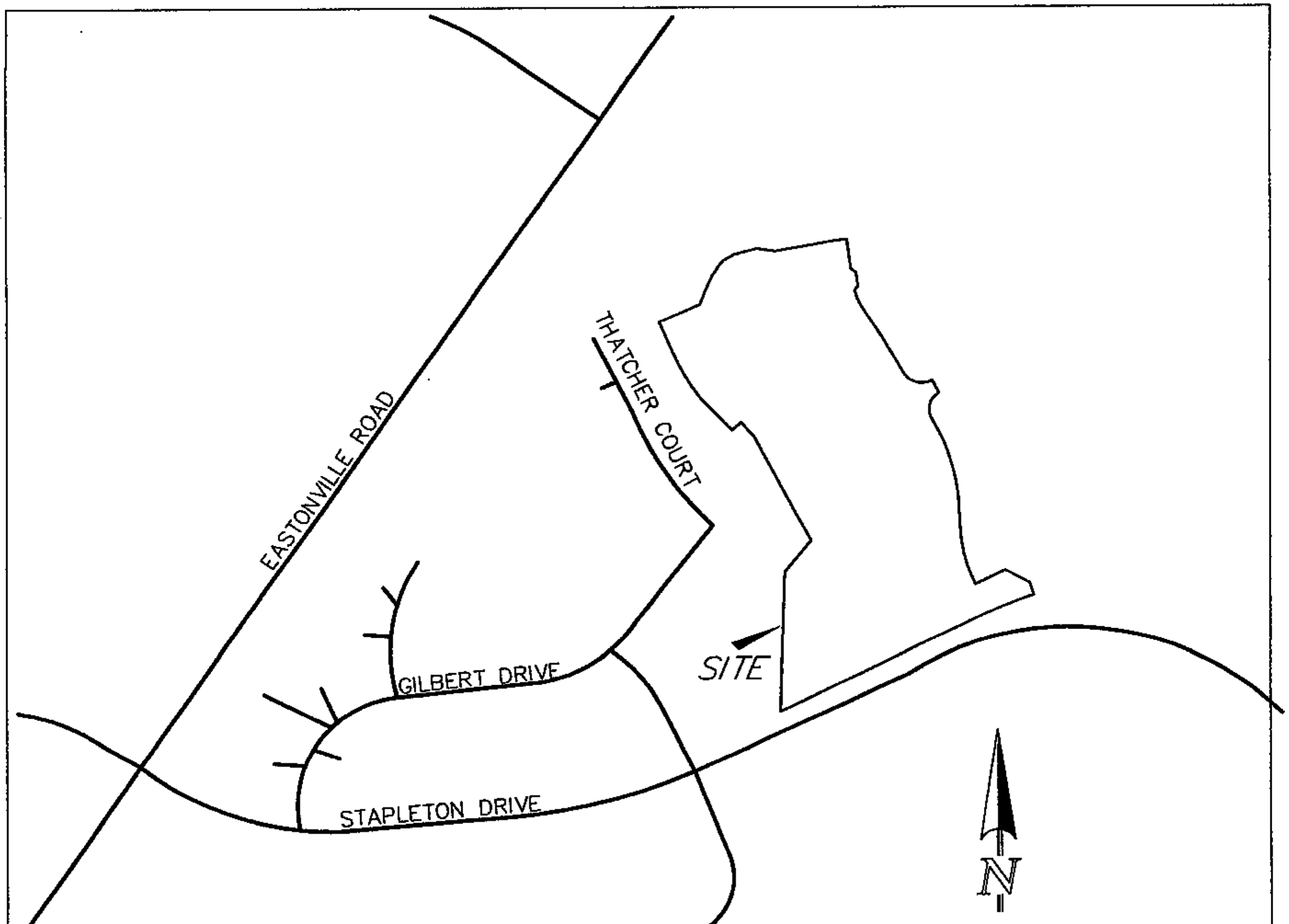
"Master Development Drainage Plan, 4-Way Ranch – Phase 1" approved January 2012 prepared by Advanced Design Professionals, Inc.

"Preliminary Drainage Report for Waterbury (Phase 1 Preliminary Plan) approved June 2013 prepared by Classic Consulting

"Final Drainage Report for Waterbury Filing No. 1" approved September 2016 prepared by Classic Consulting

APPENDIX

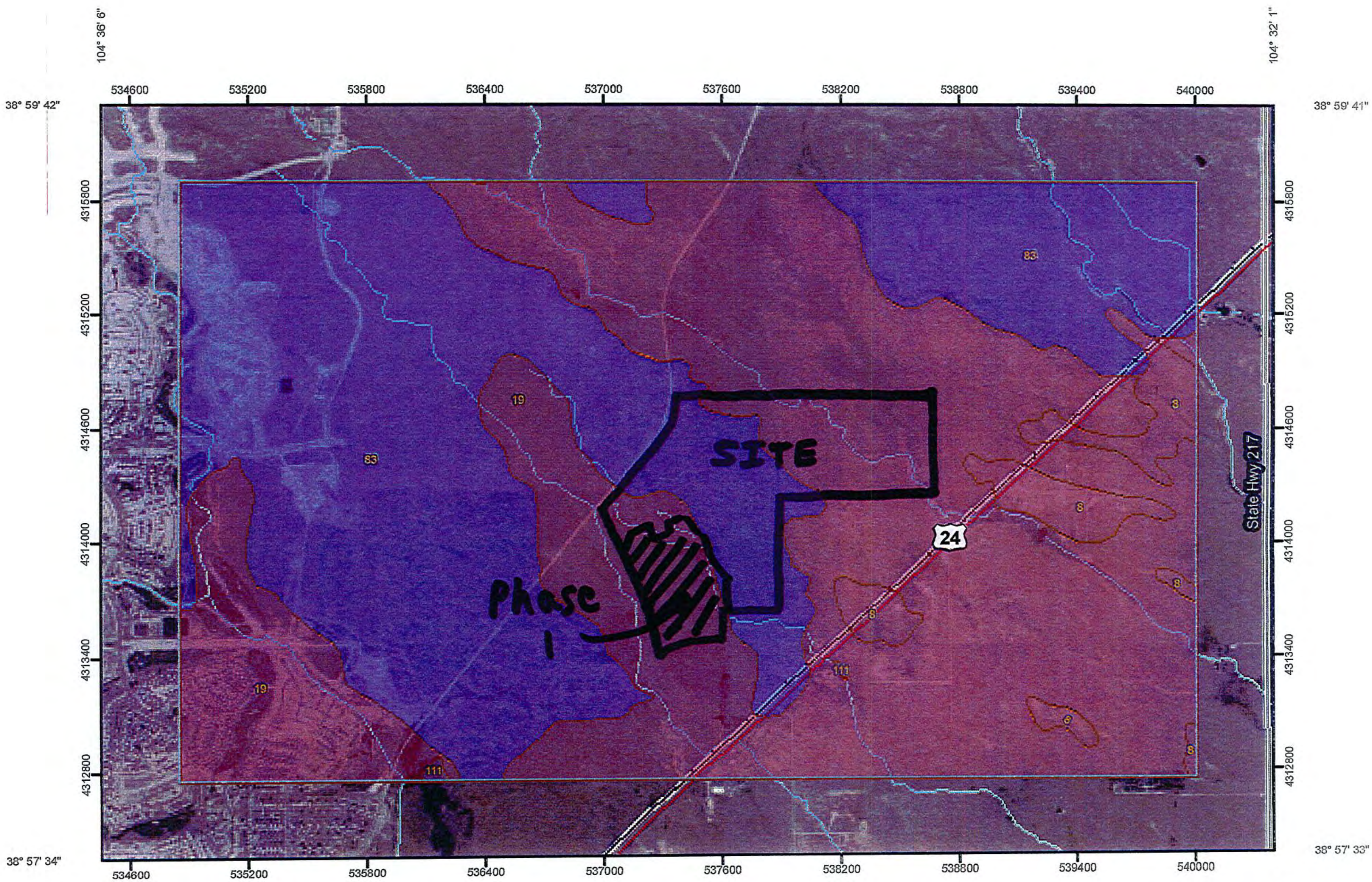
VICINTY MAP



VICINITY MAP

N.T.S

NRCS SOILS MAP



Map Scale: 1:28,200 if printed on A size (8.5" x 11") sheet.

Meters: 0 350 700 1,400 2,100

Feet: 0 1,500 3,000 6,000 9,000

N

USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:28,200 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 13N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 8, Apr 6, 2011

Date(s) aerial images were photographed: 7/29/2005; 8/17/2005; 7/2/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — El Paso County Area, Colorado (CO625)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
8	Blakeland loamy sand, 1 to 9 percent slopes	A	155.7	3.9%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	2,095.1	52.1%
83	Stapleton sandy loam, 3 to 8 percent slopes	B	1,768.2	44.0%
111	Water		3.8	0.1%
Totals for Area of Interest			**4,022.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

FEMA FIRM MAP

Provide FEMA "Firmette" or map from their website

Federal Emergency Management Agency
Washington, D.C. 20472

FEB 19 2004

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable Chuck Brown
Chairman, El Paso County
Board of Commissioners
27 East Vermijo Avenue
Colorado Springs, CO 80903-2208

IN REPLY REFER TO:

Case No.:	04-08-0012P
Community Name:	El Paso County, CO
Community No.:	080059
Effective Date of This Revision:	MAR 19 2004

Dear Mr. Brown:

The Flood Insurance Rate Map for your community has been revised by this Letter of Map Revision (LOMR). Please use the enclosed annotated map panel(s) revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals issued in your community.

Additional documents are enclosed which provide information regarding this LOMR. Please see the List of Enclosures below to determine which documents are included. Other attachments specific to this request may be included as referenced in the Determination Document. If you have any questions regarding floodplain management regulations for your community or the National Flood Insurance Program (NFIP) in general, please contact the Consultation Coordination Officer for your community. If you have any technical questions regarding this LOMR, please contact the Director, Federal Insurance and Mitigation Division of the Department of Homeland Security's Federal Emergency Management Agency (FEMA) in Denver, Colorado, at (303) 235-4830, or the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Sincerely,

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

For: Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

List of Enclosures:
Letter of Map Revision Determination Document
Annotated Flood Insurance Rate Map

cc: Mr. Kevin Stilson, P.E., CFM
Floodplain Administrator
Pikes Peak Regional Building Department

Mr. Richard N. Wray, P.E.
Principal
Kiowa Engineering Corporation

 | Issue Date: FEB 19 2004 | Effective Date: MAR 19 2004 | Case No.: 04-08-0012P | LOMR-APP

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	El Paso County Colorado (Unincorporated Areas) COMMUNITY NO.: 080059	NO PROJECT	HYDROLOGIC ANALYSIS HYDRAULIC ANALYSIS NEW TOPOGRAPHIC DATA
IDENTIFIER	Fourway Ranch Letter of Map Revision	APPROXIMATE LATITUDE & LONGITUDE: 39.974, -104.566 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

FLOODING SOURCE(S) & REVISED REACH(ES)

Haegler Ranch Tributary 1 – from approximately 1,200 feet upstream of the Cadillac and Lake City Railroad to just upstream of Eastonville Road
Haegler Ranch Tributary 1A – from the confluence with Haegler Ranch Tributary 1 to just upstream of Eastonville Road
Haegler Ranch Tributary 2 – from the confluence with Haegler Ranch Tributary 1 to just upstream of Eastonville Road
Geick Ranch Tributary 1 – from approximately 600 feet upstream to approximately 4,000 feet upstream of the Cadillac and Lake City Railroad
Geick Ranch Tributary 2 – from approximately 600 feet upstream to approximately 2,600 feet upstream of the Cadillac and Lake City Railroad

SUMMARY OF REVISIONS

Effective Flooding: Zone A
Revised Flooding: Zone A
Increases: YES
Decreases: YES

* BFEs – Base Flood Elevations

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 08041C0575 F Date: March 17, 1997	NO REVISION TO THE FLOOD INSURANCE STUDY REPORT

* FIRM – Flood Insurance Rate Map; ** FBFM – Flood Boundary and Floodway Map; *** FHBM – Flood Hazard Boundary Map

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2677 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness and Response Directorate 102061 D.A04080012 102IC

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2677 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness and Response Directorate

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Mr. Steve L. Olsen
Director, Federal Insurance and Mitigation Division
Federal Emergency Management Agency, Region VIII
Denver Federal Center, Building 710
P.O. Box 25267
Denver, CO 80225-0267
(303) 235-4830

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2677 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness and Response Directorate

102061 D.A04080012 102IC

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

This revision will become effective 30 days from the date of this letter. Any requests to review or alter this determination should be made within 30 days and must be based on scientific or technical data.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2677 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness and Response Directorate   102061 D.A04080012 102IC

HYDROLOGIC CALCULATIONS

MDDP CALCULATIONS

JOB NAME: *WATERBURY MDDP*
JOB NUMBER: *1715.00*
DATE: *12/19/20*
CALCULATED BY: *QNA*

MDDP DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	IMPERVIOUS / DEVELOPED AREA			NONIMPERVIOUS / UNDEVELOPED AREA			WEIGHTED		**WEIGHTED CA**	
		AREA (AC)	C(5)	C(100)	AREA (AC)	C(5)	C(100)	C(5)	C(100)	**CA(5)**	**CA(100)**
A	3.39	3.39	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**1.52**	**2.00**
B1	2.30	2.30	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**1.03**	**1.36**
B2	2.69	2.69	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**1.21**	**1.59**
C	0.86	0.86	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.39**	**0.51**
D	2.11	2.11	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.95**	**1.24**
E	2.18	2.18	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.98**	**1.29**
F	2.18	2.18	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.98**	**1.29**
G	NOT USED										
H	1.13	1.13	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.51**	**0.67**
I	5.66	2.14	0.45	0.59	3.53	0.09	0.36	0.23	0.45	**1.28**	**2.53**
J	1.99	1.99	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.90**	**1.17**
K	3.06	1.14	0.45	0.59	1.92	0.09	0.36	0.22	0.45	**0.69**	**1.37**
L1	5.27	5.27	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**2.37**	**3.11**
L2	2.00	2.00	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.90**	**1.18**
M1	2.90	2.90	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**1.31**	**1.71**
M2	0.47	0.47	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.21**	**0.28**
N	0.22	0.22	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.10**	**0.13**
O1	2.82	2.82	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**1.27**	**1.66**
O2	0.94	0.94	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.42**	**0.56**
P	1.18	1.18	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.53**	**0.70**
Q1	1.04	1.04	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.47**	**0.61**
Q2	1.10	1.10	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.49**	**0.65**
R	0.13	0.13	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.06**	**0.08**
S1	1.55	1.55	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.70**	**0.91**
S2	0.13	0.13	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.06**	**0.08**
T1	1.42	1.42	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.64**	**0.84**

JOB NAME: *WATERBURY MDDP*
JOB NUMBER: *1715.00*
DATE: *12/19/20*
CALCULATED BY: *QNA*

MDDP DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	IMPERVIOUS / DEVELOPED AREA			NONIMPERVIOUS / UNDEVELOPED AREA			WEIGHTED		**WEIGHTED CA**	
		AREA (AC)	C(5)	C(100)	AREA (AC)	C(5)	C(100)	C(5)	C(100)	**CA(5)**	**CA(100)**
T2	1.23	1.23	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.55**	**0.73**
U1	4.38	4.38	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**1.97**	**2.58**
U2	1.89	1.89	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.85**	**1.11**
W	5.20	5.20	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**2.34**	**3.07**
V	1.32	1.32	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.59**	**0.78**
OS-1	11.81	11.81	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**5.31**	**6.97**
OS-2	15.90	15.90	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**7.15**	**9.38**
0S-3A	0.79	0.79	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.35**	**0.47**
0S-3B	5.66	5.66	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**2.55**	**3.34**
OS-4	10.90	0.00	0.45	0.59	10.90	0.09	0.36	0.09	0.36	**0.98**	**3.92**
OS-5	5.64	5.64	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**2.54**	**3.33**
OS-6	1.06	1.06	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.48**	**0.63**
OS-7	2.82	0.00	0.45	0.59	2.82	0.09	0.36	0.09	0.36	**0.25**	**1.01**
OS-8	2.56	FLOW TAKEN FROM MERIDAIN RANCH MDDP									
OS-9	11.80	FLOW TAKEN FROM MERIDAIN RANCH MDDP									
OS-10	3.41	0.00	0.45	0.59	3.41	0.09	0.36	0.09	0.36	**0.31**	**1.23**
OS-Q1	4.31	4.31	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**1.94**	**2.54**
OS-Q2	0.94	0.94	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.42**	**0.55**
OS-R	6.05	6.05	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**2.72**	**3.57**
OS-S1	5.59	5.59	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**2.51**	**3.30**
OS-S2	0.17	0.17	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.08**	**0.10**
OS-T2	0.76	0.76	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.34**	**0.45**

JOB NAME: ***WATERBURY MDDP***
JOB NUMBER: ***1715.00***
DATE: ***12/19/20***
CALC'D BY: ***QNA***

MDDP ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(5)	CA(100)	C(5)	OVERLAND Length (ft)	Height (ft)	Tc (min)	STREET / CHANNEL FLOW Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	Tc TOTAL (min)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)
A	1.52	2.00	0.25	100	2	12.6	420	1.5%	4.3	1.6	14.3	3.54	6.03	5	12
B1	1.03	1.36	0.25	100	2	12.6	400	1.5%	4.3	1.6	14.2	3.55	6.05	4	8
B2	1.21	1.59	0.25	100	2	12.6	550	1.5%	4.3	2.1	14.8	3.49	5.93	4	9
C	0.39	0.51	0.25	20	0.5	5.3	500	2.0%	4.9	1.7	6.9	4.58	8.14	2	4
D	0.95	1.24	0.25	80	2	10.5	300	2.5%	5.5	0.9	11.4	3.87	6.69	4	8
E	0.98	1.29	0.25	100	2	12.6	400	2.5%	5.5	1.2	13.8	3.59	6.12	4	8
F	0.98	1.29	0.25	50	2	7.1	620	1.5%	4.3	2.4	9.5	4.14	7.22	4	9
G	NOT USED														
H	0.51	0.67	0.25	50	2	7.1	525	1.5%	4.3	2.0	9.2	4.19	7.33	2	5
I	1.28	2.53	0.25	80	4	8.4	250	2.0%	4.9	0.8	9.2	4.18	7.32	5	19
J	0.90	1.17	0.25	90	6	8.1	850	2.0%	4.9	2.9	10.9	3.94	6.81	4	8
K	0.69	1.37	0.25	100	18	6.1	80	1.0%	3.5	0.4	6.5	4.67	8.33	3	11
L1	2.37	3.11	0.25	100	2	12.6	860	1.4%	4.1	3.5	16.1	3.36	5.69	8	18
L2	0.90	1.18	0.25	55	1.1	9.4	860	1.4%	4.1	3.5	12.8	3.70	6.34	3	7
M1	1.31	1.71	0.25	70	1.5	10.3	200	2.0%	4.9	0.7	11.0	3.92	6.79	5	12
M2	0.21	0.28	0.25	65	3	7.7	0	0.0%	0.0	0.0	7.7	4.43	7.83	1	2
N	0.10	0.13	0.25								5.0	5.00	9.06	1	1
O1	1.27	1.66	0.25	100	3	11.1	460	1.5%	4.3	1.8	12.8	3.70	6.34	5	11
O2	0.42	0.56	0.25	100	2	12.6	850	2.0%	4.9	2.9	15.5	3.42	5.80	1	3
P	0.53	0.70	0.25	65	3	7.7	0	0.0%	0.0	0.0	7.7	4.43	7.83	2	5
Q1	0.47	0.61	0.25	55	1.3	8.9	445	2.0%	5.0	1.5	10.4	4.01	6.97	2	4
Q2	0.49	0.65	0.25	55	1.3	8.9	445	2.0%	5.0	1.5	10.4	4.01	6.97	2	5
R	0.06	0.08	0.25	100	4	10.1	700	2.0%	4.9	2.4	12.4	3.75	6.44	0	1
S1	0.70	0.91	0.25	100	6	8.8	175	2.0%	4.9	0.6	9.4	4.16	7.26	3	7

JOB NAME: ***WATERBURY MDDP***
JOB NUMBER: ***1715.00***
DATE: ***12/19/20***
CALC'D BY: ***QNA***

MDDP ~ BASIN RUNOFF SUMMARY

	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY		TOTAL FLOWS	
BASIN	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
S2	0.06	0.08	0.25								5.0	5.00	9.06	0	1
T1	0.64	0.84	0.25	55	1.1	9.4	390	2.0%	4.9	1.3	10.7	3.97	6.88	3	6
T2	0.55	0.73	0.25	100	2	12.6	245	2.0%	5.0	0.8	13.5	3.63	6.20	2	5
U1	1.97	2.58	0.25	100	2	12.6	520	2.3%	5.3	1.6	14.3	3.54	6.03	7	16
U2	0.85	1.11	0.25	100	2	12.6	385	2.3%	5.4	1.2	13.8	3.59	6.12	3	7
W	2.34	3.07	0.25	100	2	12.6	630	1.6%	4.4	2.4	15.0	3.47	5.89	8	18
V	0.59	0.78	0.25	95	6	8.4					8.4	4.31	7.58	3	6
OS-1	5.31	6.97	0.25	100	2	12.6	690	2.0%	5.0	2.3	15.0	3.47	5.90	18	41
OS-2	7.15	9.38	0.25	100	2	12.6	1700	1.8%	4.6	6.1	18.7	3.14	5.27	22	49
0S-3A	0.35	0.47	0.25	55	1.1	9.4	480	1.3%	3.9	2.0	11.4	3.87	6.68	1	3
0S-3B	2.55	3.34	0.25	100	2	12.6	480	1.3%	3.9	2.0	14.7	3.50	5.95	9	20
OS-4	0.98	3.92	0.25	800	26	30.5					30.5	2.46	4.01	2	16
OS-5	2.54	3.33	0.25	80	5	7.8	1000	2.5%	5.5	3.0	10.8	3.96	6.85	10	23
OS-6	0.48	0.63	0.25	30	0.6	6.9	900	1.8%	4.7	3.2	10.1	4.05	7.04	2	4
OS-7	0.25	1.01									5.0	5.00	9.06	1	9
OS-8	FLOW TAKEN FROM MERIDAIN RANCH MDDP													5	11
OS-9	FLOW TAKEN FROM MERIDAIN RANCH MDDP													8	19
OS-10	0.31	1.23	0.25	100	2	12.6	300	2.7%	5.7	0.9	13.5	3.62	6.19	1	8
OS-Q1	1.94	2.54	0.25	200	5	16.6	1500	1.5%	4.3	5.8	22.4	2.88	4.78	6	12
OS-Q2	0.42	0.55	0.25	50	1	8.9	900	1.5%	4.3	3.5	12.4	3.75	6.43	2	4
OS-R	2.72	3.57	0.25	50	1	8.9	850	2.7%	5.8	2.5	11.4	3.87	6.69	11	24
OS-S1	2.51	3.30	0.25	100	2	12.6	920	1.2%	3.8	4.0	16.7	3.32	5.60	8	18
OS-S2	0.08	0.10	0.25	100	2	12.6					12.6	3.72	6.39	0	1
OS-T2	0.34	0.45	0.25	100	2	12.6					12.6	3.72	6.39	1	3

JOB NAME: *WATERBURY MDDP*
JOB NUMBER: *1715.00*
DATE: *12/19/20*
CALCULATED BY: *QNA*

MDDP ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Area (AC)	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Facility Size
1	A	3.39	1.52	2.00	14.3	3.54	6.03	5	12	6' Type R Sump Inlet
2	C	0.86	0.39	0.51	6.9	4.58	8.14	2	4	4' Type R Sump Inlet
3	B1	2.30	1.03	1.36	14.2	3.55	6.05	4	8	4' Type R Sump Inlet
4	B2	2.69	1.21	1.59	14.8	3.49	5.93	4	9	4' Type R Sump Inlet
5	F & H	3.31	1.49	1.95	9.5	4.14	7.22	6	14	6' Type R Sump Inlet
6	D	2.11	0.95	1.24	11.4	3.87	6.69	4	8	4' Type R Sump Inlets
7	E	2.18	0.98	1.29	13.8	3.59	6.12	4	8	4' Type R Sump Inlets
8	DESIGN POINTS 1-7	16.84	7.58	9.94	14.8	3.49	5.93	26	59	FSD Pond 1
9	OS-9	11.80	0.00	0.00	0.0	7.12	14.19	0	0	EX 36" CMP Culvert
10	OS-8	2.56	0.00	0.00	0.0	7.12	14.19	0	0	EX 36" CMP Culvert
10A	MERIDIAN POND E RELEASE							28	135	EX 3-42" RCP Culverts
11	OS-5, I, OS-& MERIDIAN POND E RELEASE	SCS MODEL						53	212	PR 2-42" RCP Culverts
12	OS-6	1.06	0.48	0.63	10.1	4.05	7.04	2	4	18"' RCP Culvert
13	TOTAL OFFISITE EX. STOCK POND INFLOW	SCS MODEL						69	396	EX STOCK POND
14	L1	5.27	2.37	3.11	16.1	3.36	5.69	8	18	10' Type R Sump Inlet
15	L2	2.00	0.90	1.18	12.8	3.70	6.34	3	7	4' Type R Sump Inlet

JOB NAME: ***WATERBURY MDDP***
JOB NUMBER: ***1715.00***
DATE: ***12/19/20***
CALCULATED BY: ***QNA***

MDDP ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Area (AC)	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Facility Size
16	O1	2.82	1.27	1.66	12.8	3.70	6.34	5	11	6' Type R Sump Inlet
17	O2	0.94	0.42	0.56	15.5	3.42	5.80	1	3	4' Type R Sump Inlet
18	DESIGN POINTS 7-10 & BASIN 0S-4	21.93	5.95	6.51	16.1	3.36	5.69	20	37	Interim FSD Pond 2
19	Q1 & OS-Q1	5.34	2.40	3.15	22.4	2.88	4.78	7	15	8' Type R Sump Inlet
20	Q2 & OS-Q2	2.03	0.91	1.20	12.4	3.75	6.43	3	8	4' Type R Sump Inlet
21	R & OS-R	6.18	2.78	3.65	11.4	3.87	6.69	11	24	12' Type R At-grade Inlet
22	S1 & OS-S1 & DP 21 FLOW BY	7.14	4.61	6.55	16.7	3.32	5.60	15	37	10' Type R Sump Inlet
23	S2 & OS-S2	0.31	0.14	0.18	12.6	3.72	6.39	1	1	10' Type R Sump Inlet
22 & 23 SPLIT	S1, OS-S1, S2, OS-S2, & DP 21 FLOW BY	7.44	4.75	6.73	16.7	3.32	5.60	16	38	2-10' Type R Sump Inlets
24	T1	1.42	0.64	0.84	10.7	3.97	6.88	3	6	4' Type R Sump Inlets
25	T2 & OS-T2	1.99	0.90	1.18	13.5	3.63	6.20	3	7	4' Type R Sump Inlets
26	U1	4.38	1.97	2.58	14.3	3.54	6.03	7	16	10' Type R Sump Inlets
27	U2	1.89	0.85	1.11	13.8	3.59	6.12	3	7	6' Type R Sump Inlets
28	W	5.20	2.34	3.07	15.0	3.47	5.89	8	18	10' Type R Sump Inlets
29	DESIGN POINTS 19-28, OFFSITE BASINS OS-1, 2, 3A, 3B, 7, & 9	84.64	37.91	51.40	22.4	2.88	4.78	117	265	FSD POND

JOB NAME: *WATERBURY MDDP*
JOB NUMBER: *1715.00*
DATE: *12/19/20*
CALCULATED BY: *QNA*

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE.
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

MDDP ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Design Points/Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
1	DP 2	0.39	0.51	6.9	4.58	8.14	2	4	18" RCP
2	DP 1 & 2	1.91	2.51	14.3	3.54	6.03	7	15	24" RCP
3	DP 3	1.03	1.36	14.2	3.55	6.05	4	8	18" RCP
4	DP-4	1.21	1.59	14.8	3.49	5.93	4	9	18" RCP
5	DP 3 & 4	2.25	2.94	14.8	3.49	5.93	8	17	24" RCP
6	DP 1-4	4.16	5.45	14.8	3.49	5.93	15	32	30" RCP
7	DP-1-5	5.65	7.41	14.8	3.49	5.93	20	44	36" RCP
8	DP-6	0.95	1.24	11.4	3.87	6.69	4	8	18" RCP
9	DP-7	0.98	1.29	13.8	3.59	6.12	4	8	18" RCP
10	DP-6 & 7	1.97	2.58	13.8	3.59	6.12	7	16	18" RCP
10A	POND 1 RELEASE	2.95	3.87	13.8	3.59	6.12	0.4	8.3	18" RCP
11	DP-14	2.37	3.11	16.1	3.36	5.69	8	18	24" RCP
12	DP-15	0.90	1.18	12.8	3.70	6.34	3	7	18" RCP
13	DP 14 & 15	3.27	4.29	16.1	3.36	5.69	11	24	30" RCP
14	DP 16	1.27	1.66	12.8	3.70	6.34	5	11	24" RCP
15	DP 14, 15 & 16	4.54	5.95	16.1	3.36	5.69	15	34	36" RCP
16	DP 17	0.42	0.56	15.5	3.42	5.80	1	3	18" RCP
17	DP 14, 15, 16, & 17	4.97	6.51	16.1	3.36	5.69	17	37	36" RCP

JOB NAME: *WATERBURY MDDP*
JOB NUMBER: *1715.00*
DATE: *12/19/20*
CALCULATED BY: *QNA*

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE.
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

MDDP ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Design Points/Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
17A	POND 2 RELEASE						0.2	10.6	18" RCP
18	DP 19	2.40	3.15	22.4	2.88	4.78	7	15	24" RCP
19	DP 20	0.91	1.20	12.4	3.75	6.43	3	8	18" RCP
20	DP 19 & 20	3.32	4.35	22.4	2.88	4.78	10	21	24" RCP
21	DP 21 PICK UP	1.38	1.31	11.4	3.87	6.69	5	9	18" RCP
22	DP 19, 20 & 21	4.70	5.66	22.4	2.88	4.78	14	27	24" RCP
23	DP 22	2.37	3.36	16.7	3.32	5.60	8	19	24" RCP
24	DP 23	2.37	3.36	16.7	3.32	5.60	8	19	24" RCP
25	DP 22 & 23	4.75	6.73	16.7	3.32	5.60	16	38	30" RCP
26	DP 19 -23	9.45	12.39	22.4	2.88	4.78	27	59	36" RCP
27	DP 24	0.64	0.84	10.7	3.97	6.88	3	6	18" RCP
28	DP 25	0.90	1.18	13.5	3.63	6.20	3	7	18" RCP
29	DP 19-25	10.99	14.40	22.4	2.88	4.78	32	69	36" RCP
30	DP 26	1.97	2.58	14.3	3.54	6.03	7	16	24" RCP
31	DP 19-26	12.96	16.99	22.4	2.89	4.79	37	81	36" RCP
32	DP 27	0.85	1.11	13.8	3.59	6.12	3	7	18" RCP
33	DP 19-27	13.80	18.10	22.4	2.88	4.78	40	87	36" RCP

FDR CALCULATIONS

JOB NAME: *WATERBURY FDR*
JOB NUMBER: *1715.00*
DATE: *12/19/20*
CALCULATED BY: *QNA*

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	IMPERVIOUS / DEVELOPED AREA			NONIMPERVIOUS / UNDEVELOPED AREA			WEIGHTED		**WEIGHTED CA**	
		AREA (AC)	C(5)	C(100)	AREA (AC)	C(5)	C(100)	C(5)	C(100)	**CA(5)**	**CA(100)**
A	3.39	3.39	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**1.52**	**2.00**
B1	2.30	2.30	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**1.03**	**1.36**
B2	2.69	2.69	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**1.21**	**1.59**
C	0.86	0.86	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.39**	**0.51**
D	2.11	2.11	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.95**	**1.24**
E	2.18	2.18	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.98**	**1.29**
F	2.18	2.18	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.98**	**1.29**
G	0.66	0.66	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.30**	**0.39**
H	1.13	1.13	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.51**	**0.67**
I	5.66	2.14	0.45	0.59	3.53	0.09	0.36	0.23	0.45	**1.28**	**2.53**
J	1.99	1.99	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.90**	**1.17**
K	3.06	1.14	0.45	0.59	1.92	0.09	0.36	0.22	0.45	**0.69**	**1.37**
L1	5.27	5.27	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**2.37**	**3.11**
L2	2.00	2.00	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.90**	**1.18**
M1	2.90	2.90	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**1.31**	**1.71**
M2	0.47	0.47	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.21**	**0.28**
N	0.22	0.22	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.10**	**0.13**
O1	2.82	2.82	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**1.27**	**1.66**
O2	0.94	0.94	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.42**	**0.56**
P	1.18	1.18	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.53**	**0.70**
Q1	1.04	1.04	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.47**	**0.61**
Q2	1.10	1.10	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.49**	**0.65**
R	0.13	0.13	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.06**	**0.08**
S1	1.55	1.55	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.70**	**0.91**
S2	0.13	0.13	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.06**	**0.08**
T1	1.42	1.42	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.64**	**0.84**

JOB NAME: ***WATERBURY FDR***
JOB NUMBER: ***1715.00***
DATE: ***12/19/20***
CALCULATED BY: ***QNA***

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	IMPERVIOUS / DEVELOPED AREA			NONIMPERVIOUS / UNDEVELOPED AREA			WEIGHTED		**WEIGHTED CA**	
		AREA (AC)	C(5)	C(100)	AREA (AC)	C(5)	C(100)	C(5)	C(100)	**CA(5)**	**CA(100)**
T2	1.23	1.23	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.55**	**0.73**
U1	4.38	4.38	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**1.97**	**2.58**
U2	1.89	1.89	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.85**	**1.11**
W	5.20	5.20	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**2.34**	**3.07**
V	1.32	1.32	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.59**	**0.78**
OS-1	**41.36**	**0.00**	**0.45**	**0.59**	**41.36**	**0.09**	**0.36**	**0.09**	**0.36**	**3.72**	**14.89**
OS-4	10.90	0.00	0.45	0.59	10.90	0.09	0.36	0.09	0.36	**0.98**	**3.92**
OS-5	5.64	5.64	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**2.54**	**3.33**
OS-6	1.06	1.06	0.45	0.59	0.00	0.09	0.36	0.45	0.59	**0.48**	**0.63**
OS-7	**3.64**	**0.00**	**0.45**	**0.59**	**3.64**	**0.09**	**0.36**	**0.09**	**0.36**	**0.33**	**1.31**
OS-8	2.56	FLOW TAKEN FROM MERIDAIN RANCH MDDP									
OS-9	11.80	FLOW TAKEN FROM MERIDAIN RANCH MDDP									
OS-Q1	**0.33**	**0.00**	**0.45**	**0.59**	**0.33**	**0.09**	**0.36**	**0.09**	**0.36**	**0.03**	**0.12**
OS-Q2	**0.22**	**0.00**	**0.45**	**0.59**	**0.22**	**0.09**	**0.36**	**0.09**	**0.36**	**0.02**	**0.08**
OS-R	**10.11**	**0.00**	**0.45**	**0.59**	**10.11**	**0.09**	**0.36**	**0.09**	**0.36**	**0.91**	**3.64**
OS-S1	**0.14**	**0.00**	**0.45**	**0.59**	**0.14**	**0.09**	**0.36**	**0.09**	**0.36**	**0.01**	**0.05**
OS-S2	**1.92**	**0.00**	**0.45**	**0.59**	**1.92**	**0.09**	**0.36**	**0.09**	**0.36**	**0.17**	**0.69**
OS-T2	**0.76**	**0.00**	**0.45**	**0.59**	**0.76**	**0.09**	**0.36**	**0.09**	**0.36**	**0.07**	**0.27**

JOB NAME: *WATERBURY FDR*
JOB NUMBER: *1715.00*
DATE: *12/19/20*
CALC'D BY: *QNA*

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY		TOTAL FLOWS	
BASIN	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
A	1.52	2.00	0.25	100	2	12.6	420	1.5%	4.3	1.6	14.3	3.54	6.03	5	12
B1	1.03	1.36	0.25	100	2	12.6	400	1.5%	4.3	1.6	14.2	3.55	6.05	4	8
B2	1.21	1.59	0.25	100	2	12.6	550	1.5%	4.3	2.1	14.8	3.49	5.93	4	9
C	0.39	0.51	0.25	20	0.5	5.3	500	2.0%	4.9	1.7	6.9	4.58	8.14	2	4
D	0.95	1.24	0.25	80	2	10.5	300	2.5%	5.5	0.9	11.4	3.87	6.69	4	8
E	0.98	1.29	0.25	100	2	12.6	400	2.5%	5.5	1.2	13.8	3.59	6.12	4	8
F	0.98	1.29	0.25	50	2	7.1	620	1.5%	4.3	2.4	9.5	4.14	7.22	4	9
G	0.30	0.39	0.25	25	2	4.0	620	1.0%	3.4	3.0	7.0	4.57	8.12	1	3
H	0.51	0.67	0.25	50	2	7.1	525	1.5%	4.3	2.0	9.2	4.19	7.33	2	5
I	1.28	2.53	0.25	80	4	8.4	250	2.0%	4.9	0.8	9.2	4.18	7.32	5	19
J	0.90	1.17	0.25	90	6	8.1	850	2.0%	4.9	2.9	10.9	3.94	6.81	4	8
K	0.69	1.37	0.25	100	18	6.1	80	1.0%	3.5	0.4	6.5	4.67	8.33	3	11
L1	2.37	3.11	0.25	100	2	12.6	860	1.4%	4.1	3.5	16.1	3.36	5.69	8	18
L2	0.90	1.18	0.25	55	1.1	9.4	860	1.4%	4.1	3.5	12.8	3.70	6.34	3	7
M1	1.31	1.71	0.25	70	1.5	10.3	200	2.0%	4.9	0.7	11.0	3.92	6.79	5	12
M2	0.21	0.28	0.25	65	3	7.7	0	0.0%	0.0	0.0	7.7	4.43	7.83	1	2
N	0.10	0.13	0.25								5.0	5.00	9.06	1	1
O1	1.27	1.66	0.25	100	3	11.1	460	1.5%	4.3	1.8	12.8	3.70	6.34	5	11
O2	0.42	0.56	0.25	100	2	12.6	850	2.0%	4.9	2.9	15.5	3.42	5.80	1	3
P	0.53	0.70	0.25	65	3	7.7	0	0.0%	0.0	0.0	7.7	4.43	7.83	2	5
Q1	0.47	0.61	0.25	55	1.3	8.9	445	2.0%	5.0	1.5	10.4	4.01	6.97	2	4
Q2	0.49	0.65	0.25	55	1.3	8.9	445	2.0%	5.0	1.5	10.4	4.01	6.97	2	5
R	0.06	0.08	0.25	100	4	10.1	700	2.0%	4.9	2.4	12.4	3.75	6.44	0	1
S1	0.70	0.91	0.25	100	6	8.8	175	2.0%	4.9	0.6	9.4	4.16	7.26	3	7

JOB NAME: ***WATERBURY FDR***
JOB NUMBER: ***1715.00***
DATE: ***12/19/20***
CALC'D BY: ***QNA***

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY		TOTAL FLOWS	
BASIN	CA(5)	CA(100)	C(5)	Length *(ft)*	Height *(ft)*	Tc *(min)*	Length *(ft)*	Slope *(%)*	Velocity *(fps)*	Tc *(min)*	TOTAL *(min)*	I(5) *(in/hr)*	I(100) *(in/hr)*	Q(5) *(cfs)*	Q(100) *(cfs)*
S2	0.06	0.08	0.25								5.0	5.00	9.06	**0**	**1**
T1	0.64	0.84	0.25	55	1.1	9.4	390	2.0%	4.9	1.3	10.7	3.97	6.88	**3**	**6**
T2	0.55	0.73	0.25	100	2	12.6	245	2.0%	5.0	0.8	13.5	3.63	6.20	**2**	**5**
U1	1.97	2.58	0.25	100	2	12.6	520	2.3%	5.3	1.6	14.3	3.54	6.03	**7**	**16**
U2	0.85	1.11	0.25	100	2	12.6	385	2.3%	5.4	1.2	13.8	3.59	6.12	**3**	**7**
W	2.34	3.07	0.25	100	2	12.6	630	1.6%	4.4	2.4	15.0	3.47	5.89	**8**	**18**
V	0.59	0.78	0.25	95	6	8.4					8.4	4.31	7.58	**3**	**6**
OS-1	**3.72**	**14.89**	**0.25**	**100**	**2**	**12.6**	**2700**	**2.3%**	**5.3**	**8.5**	**21.1**	**2.97**	**4.94**	**11**	**74**
OS-4	0.98	3.92	0.25	800	26	30.5					30.5	2.46	4.01	**2**	**16**
OS-5	2.54	3.33	0.25	600	18	27.1					27.1	2.62	4.30	**7**	**14**
OS-6	0.48	0.63	0.25	30	0.6	6.9	900	1.8%	4.7	3.2	10.1	4.05	7.04	**2**	**4**
OS-7	**0.33**	**1.31**	**0.25**								**5.0**	**5.00**	**9.06**	**2**	**12**
OS-8	FLOW TAKEN FROM MERIDAIN RANCH MDDP													**5**	**11**
OS-9	FLOW TAKEN FROM MERIDAIN RANCH MDDP													**8**	**19**
OS-Q1	**0.03**	**0.12**	**0.25**	**100**	**2**	**12.6**	**135**	**1.5%**	**4.3**	**0.5**	**13.2**	**3.66**	**6.27**	**0**	**1**
OS-Q2	**0.02**	**0.08**	**0.25**	**50**	**1**	**8.9**	**135**	**1.5%**	**4.3**	**0.5**	**9.5**	**4.14**	**7.24**	**0**	**1**
OS-R	**0.91**	**3.64**	**0.25**	**100**	**2**	**12.6**	**850**	**2.7%**	**5.8**	**2.5**	**15.1**	**3.46**	**5.87**	**3**	**21**
OS-S1	**0.01**	**0.05**									**5.0**	**5.00**	**9.06**	**0**	**0**
OS-S2	**0.17**	**0.69**	**0.25**	**100**	**2.5**	**11.7**	**275**	**2.9%**	**6.0**	**0.8**	**12.5**	**3.74**	**6.42**	**1**	**4**
OS-T2	**0.07**	**0.27**									**5.0**	**5.00**	**9.06**	**0**	**2**

JOB NAME: *WATERBURY FDR*
JOB NUMBER: *1715.00*
DATE: *12/19/20*
CALCULATED BY: *QNA*

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Area (AC)	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Facility Size
						I(5)	I(100)	Q(5)	Q(100)	
1	A	3.39	1.52	2.00	14.3	3.54	6.03	5	12	6' Type R Sump Inlet
2	C	0.86	0.39	0.51	6.9	4.58	8.14	2	4	4' Type R Sump Inlet
3	B1	2.30	1.03	1.36	14.2	3.55	6.05	4	8	4' Type R Sump Inlet
4	B2	2.69	1.21	1.59	14.8	3.49	5.93	4	9	4' Type R Sump Inlet
5	F & H	3.31	1.49	1.95	9.5	4.14	7.22	6	14	6' Type R Sump Inlet
6	D	2.11	0.95	1.24	11.4	3.87	6.69	4	8	4' Type R Sump Inlets
7	E	2.18	0.98	1.29	13.8	3.59	6.12	4	8	4' Type R Sump Inlets
8	DESIGN POINTS 1-7	16.84	7.58	9.94	14.8	3.49	5.93	26	59	FSD Pond 1
9	OS-9	0.14	0.01	0.05	5.0	5.00	9.06	0	0	EX 36" CMP Culvert
10	OS-8	10.11	0.91	3.64	15.1	3.46	5.87	3	21	EX 36" CMP Culvert
10A	MERIDIAN POND E RELEASE							28	135	EX 3-42" RCP Culverts
11	OS-5, I, OS-& MERIDIAN POND E RELEASE	SCS MODEL						53	212	PR 2-42" RCP Culverts
12	OS-6	0.33	0.48	0.63	10.1	4.05	7.04	2	4	18"' RCP Culvert
13	TOTAL OFFSITE EX. STOCK POND INFLOW	SCS MODEL						69	396	EX STOCK POND
14	L1	5.27	2.37	3.11	16.1	3.36	5.69	8	18	10' Type R Sump Inlet
15	L2	2.00	0.90	1.18	12.8	3.70	6.34	3	7	4' Type R Sump Inlet

JOB NAME: *WATERBURY FDR*
JOB NUMBER: *1715.00*
DATE: *12/19/20*
CALCULATED BY: *QNA*

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Area (AC)	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Facility Size
						I(5)	I(100)	Q(5)	Q(100)	
16	O1	2.82	1.27	1.66	12.8	3.70	6.34	5	11	6' Type R Sump Inlet
17	O2	0.94	0.42	0.56	15.5	3.42	5.80	1	3	4' Type R Sump Inlet
18	DESIGN POINTS 7-10 & BASIN 0S-4	21.93	4.97	6.51	16.1	3.36	5.69	17	37	Interim FSD Pond 2
19	**Q1 & OS-Q1**	**1.36**	**0.50**	**0.73**	**13.2**	**3.66**	**6.27**	**2**	**5**	**8' Type R Sump Inlet**
20	**Q2 & OS-Q2**	**1.32**	**0.51**	**0.73**	**9.5**	**4.14**	**7.24**	**2**	**5**	**4' Type R Sump Inlet**
21	**R, OS-R & OS-8**	**10.24**	**0.97**	**3.72**	**12.4**	**3.75**	**6.44**	**9**	**35**	**12' Type R At-grade Inlet**
22	**S1 & OS-S1 & DP 21 FLOW BY**	**1.69**	**1.74**	**4.67**	**21.1**	**2.97**	**4.94**	**5**	**23**	**10' Type R Sump Inlet**
23	**S2 & OS-S2**	**0.13**	**0.23**	**0.77**	**12.5**	**3.74**	**6.42**	**1**	**5**	**10' Type R Sump Inlet**
22 & 23 SPLIT	**S1, OS-S1, S2, OS-S2, & DP 21 FLOW BY**	**1.82**	**1.98**	**5.44**	**21.1**	**2.97**	**4.94**	**6**	**27**	**2-10' Type R Sump Inlets**
24	**T1**	**1.42**	**0.64**	**0.84**	**10.7**	**3.97**	**6.88**	**3**	**6**	**4' Type R Sump Inlets**
25	**T2 & OS-T2**	**1.99**	**0.62**	**1.00**	**13.5**	**3.63**	**6.20**	**2**	**6**	**4' Type R Sump Inlets**
26	**U1**	**4.38**	**1.97**	**2.58**	**14.3**	**3.54**	**6.03**	**7**	**16**	**10' Type R Sump Inlets**
27	**U2**	**1.89**	**0.85**	**1.11**	**13.8**	**3.59**	**6.12**	**3**	**7**	**6' Type R Sump Inlets**
28	**W**	**5.20**	**2.34**	**3.07**	**15.0**	**3.47**	**5.89**	**8**	**18**	**10' Type R Sump Inlets**
29	**DESIGN POINTS 19-28 & OS-7**	**30.94**	**10.97**	**19.99**	**21.1**	**2.97**	**4.94**	**33**	**99**	**FSD POND**

JOB NAME: *WATERBURY FDR*
JOB NUMBER: *1715.00*
DATE: *12/19/20*
CALCULATED BY: *QNA*

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE.
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Design Points/Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
1	DP 2	0.39	0.51	6.9	4.58	8.14	2	4	18" RCP
2	DP 1 & 2	1.91	2.51	14.3	3.54	6.03	7	15	24" RCP
3	DP 3	1.03	1.36	14.2	3.55	6.05	4	8	18" RCP
4	DP-4	1.21	1.59	14.8	3.49	5.93	4	9	18" RCP
5	DP 3 & 4	2.25	2.94	14.8	3.49	5.93	8	17	24" RCP
6	DP 1-4	4.16	5.45	14.8	3.49	5.93	15	32	30" RCP
7	DP-1-5	5.65	7.41	14.8	3.49	5.93	20	44	36" RCP
8	DP-6	0.95	1.24	11.4	3.87	6.69	4	8	18" RCP
9	DP-7	0.98	1.29	13.8	3.59	6.12	4	8	18" RCP
10	DP-6 & 7	1.93	2.53	13.8	3.59	6.12	7	15	18" RCP
10A	Pond 1 Release						0.4	8.3	18" RCP
11	DP-14	2.37	3.11	16.1	3.36	5.69	8	18	24" RCP
12	DP-15	0.90	1.18	12.8	3.70	6.34	3	7	18" RCP
13	DP 14 & 15	3.27	4.29	16.1	3.36	5.69	11	24	30" RCP

JOB NAME: *WATERBURY FDR*
JOB NUMBER: *1715.00*
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* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE.
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Design Points/Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
14	DP 16	1.27	1.66	12.8	3.70	6.34	5	11	24" RCP
15	DP 14, 15 & 16	4.54	5.95	16.1	3.36	5.69	15	34	36" RCP
16	DP 17	0.42	0.56	15.5	3.42	5.80	1	3	18" RCP
17	DP 14, 15, 16, & 17	4.97	6.51	16.1	3.36	5.69	17	37	36" RCP
17A	Pond 2 Release						0.2	10.6	18" RCP
18	**DP 19**	**0.50**	**0.73**	**13.2**	**3.66**	**6.27**	**2**	**5**	**24" RCP**
19	**DP 20**	**0.51**	**0.73**	**9.5**	**4.14**	**7.24**	**2**	**5**	**18" RCP**
20	**DP 19 & 20**	**1.01**	**1.46**	**13.2**	**3.66**	**6.27**	**4**	**9**	**24" RCP**
21	**DP 21 PICK UP**	**1.34**	**1.72**	**12.4**	**3.75**	**6.44**	**5**	**11**	**18" RCP**
22	**DP 19, 20 & 21**	**2.35**	**3.18**	**13.2**	**3.66**	**6.27**	**9**	**20**	**24" RCP**
23	**DP 22**	**0.99**	**2.72**	**21.1**	**2.97**	**4.94**	**3**	**13**	**24" RCP**
24	**DP 23**	**0.99**	**2.72**	**21.1**	**2.97**	**4.94**	**3**	**13**	**24" RCP**
25	**DP 22 & 23**	**1.98**	**5.44**	**21.1**	**2.97**	**4.94**	**6**	**27**	**30" RCP**
26	**DP 19 -23**	**4.32**	**8.62**	**21.1**	**2.97**	**4.94**	**13**	**43**	**36" RCP**

JOB NAME: *WATERBURY FDR*
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DATE: *12/19/20*
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* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE.
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Design Points/Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
27	DP 24	0.64	0.84	10.7	3.97	6.88	3	6	18" RCP
28	DP 25	0.62	1.00	13.5	3.63	6.20	2	6	18" RCP
29	DP 19-25	5.59	10.46	21.1	2.97	4.94	17	52	36" RCP
30	DP 26	1.97	2.58	14.3	3.54	6.03	7	16	24" RCP
31	DP 19-26	7.56	13.04	21.1	2.97	4.94	22	64	36" RCP
32	27	0.85	1.11	15.0	3.47	5.89	3	7	18" RCP

HYDRAULIC CALCULATIONS

INLET CALCULATIONS

(Not checked with this review)

JOB NAME: ***WATERBURY MDDP***
JOB NUMBER: ***1715.00***
DATE: ***12/17/20***
CALCULATED BY: ***QNA***

DESIGN POINT 1

Total Flow:

Q_5 = **5** cfs
Q_{100} = **12** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.
D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **6** foot inlet required

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 2

Total Flow:

Q_5 = **2** cfs

Q_{100} = **4** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **4** foot inlet required

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 3

Total Flow:

Q_5 = **4** cfs

Q_{100} = **8** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **4** foot inlet required

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 4

Total Flow:

Q_5 = **4** cfs

Q_{100} = **9** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **4** foot inlet required

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 5

Total Flow:

Q_5 = **6** cfs

Q_{100} = **14** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **6** foot inlet required

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 6

Total Flow:

Q_5 = **4** cfs

Q_{100} = **8** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **4** foot inlet required

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 7

Total Flow:

Q_5 = **4** cfs

Q_{100} = **8** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **4** foot inlet required

JOB NAME:	*WATERBURY MDDP*
JOB NUMBER:	*1715.00*
DATE:	*12/17/20*
CALCULATED BY:	*QNA*

DESIGN POINT 14

Total Flow: Q_5 = **8** cfs
Q_{100} = **18** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.
D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **6** foot inlet required

100-Year Event: **10** foot inlet required

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 15

Total Flow: Q_5 = **3** cfs

Q_{100} = **7** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **4** foot inlet required

JOB NAME:	*WATERBURY MDDP*
JOB NUMBER:	*1715.00*
DATE:	*12/17/20*
CALCULATED BY:	*QNA*

DESIGN POINT 16

Total Flow:

Q_5 = **5** cfs

Q_{100} = **11** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.

a = 3 in.

Clogging Factor = 1.25

Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **4** foot inlet required

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 17

Total Flow: Q_5 = **1** cfs

Q_{100} = **3** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **4** foot inlet required

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 19

Total Flow:

Q_5 = **7** cfs

Q_{100} = **15** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **6** foot inlet required

100-Year Event: **8** foot inlet required

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 20

Total Flow:

Q_5 = **3** cfs

Q_{100} = **8** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.

a = 3 in.

Clogging Factor = 1.25

Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **4** foot inlet required

DESIGN POINT 21

5-YR FLOW

Q(5)	11	I(5)	3.9		
DEPTH	0.37	Fr	1.78	Inlet size ? L(i) =	**12**
SPREAD	17.6	L(1)	24.1	If Li < L(2) then Qi =	5
CROSS SLOPE	2.0%	L(2)	14.5	If Li > L(2) then Qi =	6
STREET SLOPE	1.8%	L(3)	51.7	FB =	5
				CA(eqv.)=	1.40

100-YR FLOW

Q(100)	24	I(100)	6.7		
DEPTH	0.49	Fr	1.88	Inlet size ? L(i) =	**12**
SPREAD	23.1	L(1)	33.4	If Li < L(2) then Qi =	9
CROSS SLOPE	2.0%	L(2)	20.1	If Li > L(2) then Qi =	12
STREET SLOPE	1.8%	L(3)	71.6	FB =	16
				CA(eqv.)=	2.34

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 22 & 23 SPLIT

Total Flow: Q_5 = **8** cfs

Q_{100} = **19** cfs

(Assume even split of flows at lowpoint for prelim. inlet sizing)

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.

a = 3 in.

Clogging Factor = 1.25

Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **6** foot inlet required

100-Year Event: **10** foot inlet required

JOB NAME:	*WATERBURY MDDP*
JOB NUMBER:	*1715.00*
DATE:	*12/17/20*
CALCULATED BY:	*QNA*

DESIGN POINT 22 & 23 SPLIT

Total Flow: Q_5 = **8** cfs

Q_{100} = **19** cfs

(Assume even split of flows at lowpoint inlet sizing)

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.

a = 3 in.

Clogging Factor = 1.25

Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **6** foot inlet required

100-Year Event: **10** foot inlet required

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 24

Total Flow:

Q_5 = **3** cfs

Q_{100} = **6** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **4** foot inlet required

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 25

Total Flow:

Q_5 = **3** cfs
Q_{100} = **7** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.
D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **4** foot inlet required

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 26

Total Flow: Q_5 = **7** cfs

Q_{100} = **16** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.

a = 3 in.

Clogging Factor = 1.25

Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **6** foot inlet required

100-Year Event: **8** foot inlet required

JOB NAME:	*WATERBURY MDDP*
JOB NUMBER:	*1715.00*
DATE:	*12/17/20*
CALCULATED BY:	*QNA*

DESIGN POINT 27

Total Flow: Q_5 = **3** cfs

Q_{100} = **7** cfs

(Assume even split of flows at lowpoint for prelim. inlet sizing)

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **4** foot inlet required

JOB NAME:	***WATERBURY MDDP***
JOB NUMBER:	***1715.00***
DATE:	***12/17/20***
CALCULATED BY:	***QNA***

DESIGN POINT 28

Total Flow: Q_5 = **8** cfs

Q_{100} = **18** cfs

Max. allowable ponding depth:
(Residential street, ramp curb)

D_5 = 0.50 ft.

D_{100} = 0.75 ft.

Std. Type R curb inlet detail:

Qi = 1.7(Li+1.8(W))(dmax + a)^1.85

W = 2 ft.
a = 3 in.

Clogging Factor = 1.25
Li (1.25) = Length of inlet opening

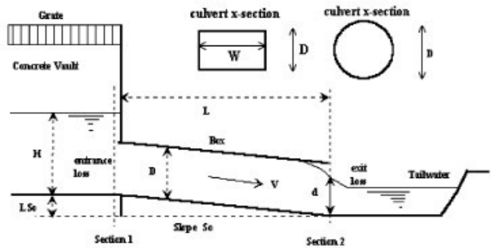
Curb inlet sizing:

5-Year Event: **6** foot inlet required

100-Year Event: **10** foot inlet required

CULVERT STAGE-DISCHARGE SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: WATERBURY FILING 1
Basin ID: Design Point 30- Triple 36" RCP Culverts
Status:



Also provide for DP11

Design Information (Input):

Circular Culvert:	Barrel Diameter in Inches	D =	36	inches
	Inlet Edge Type (choose from pull-down list)		Grooved End Projection	
OR:				
Box Culvert:	Barrel Height (Rise) in Feet	Height (Rise) =		ft.
	Barrel Width (Span) in Feet	Width (Span) =		ft.
	Inlet Edge Type (choose from pull-down list)		Square Edge w/ 90-15 Deg. Headwall	
	Number of Barrels	No =	3	
	Inlet Elevation at Culvert Invert	Inlet Elev =	6920	ft. elev.
	Outlet Elevation at Culvert Invert **OR** Slope of Culvert (ft v./ft h.)	Outlet Elev =	6919	ft. elev.
	Culvert Length in Feet	L =	130	ft.
	Manning's Roughness	n =	0.013	
	Bend Loss Coefficient	K_b =	0	
	Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	0.93
Sum of All Loss Coefficients	K_s =	2.13
Orifice Inlet Condition Coefficient	C_d =	0.95
Minimum Energy Condition Coefficient	KE_{low} =	-0.0132

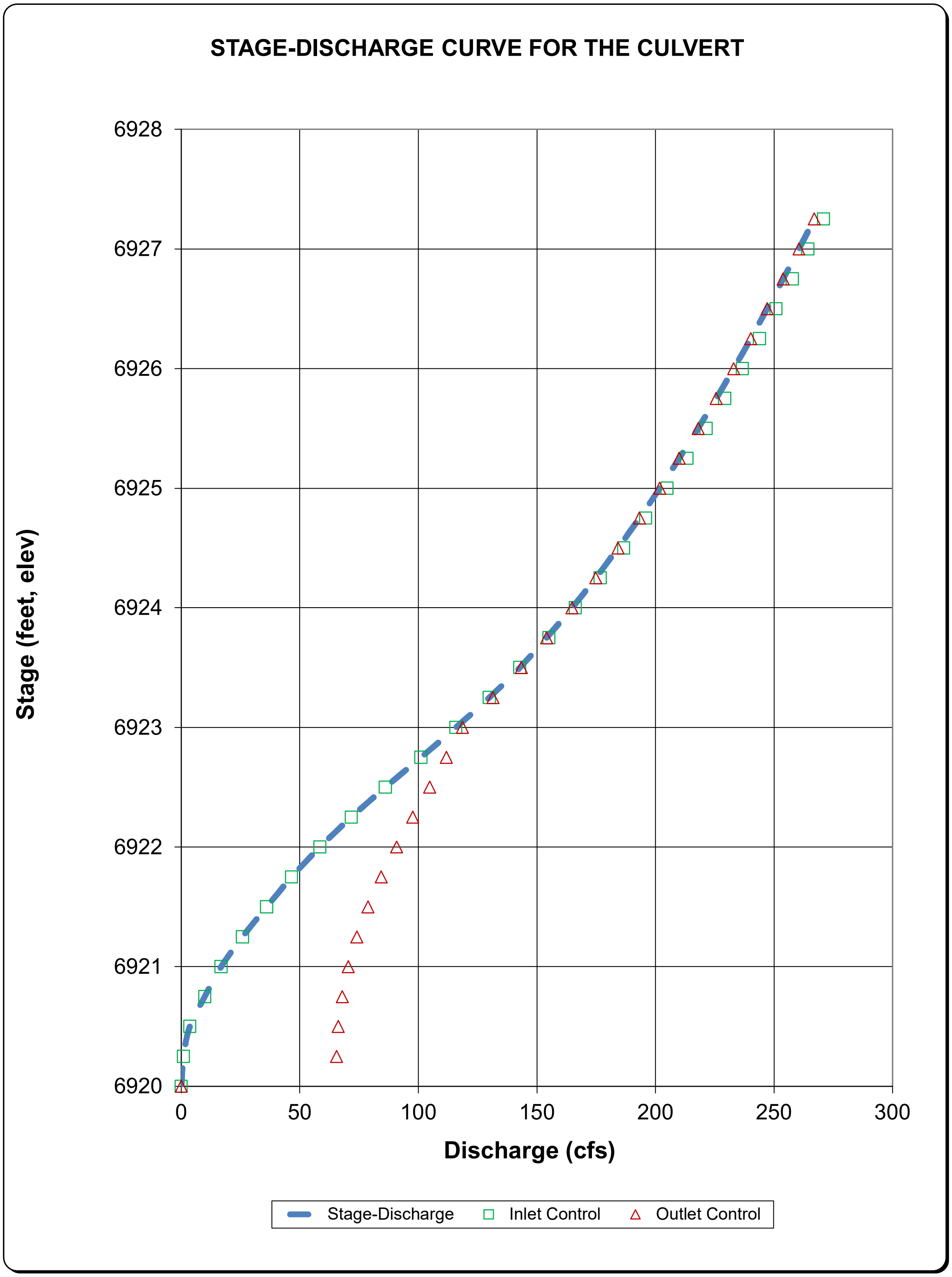
Calculations of Culvert Capacity (output):

Water Surface Elevation (ft., linked)	Tailwater Surface Elevation ft	Culvert Inlet-Control Flowrate cfs	Culvert Outlet-Control Flowrate cfs	Controlling Culvert Flowrate cfs (output)	Inlet Equation Used:	Flow Control Used
6920.00		0.00	0.00	**0.00**	No Flow (WS < inlet)	N/A
6920.25		0.90	65.46	**0.90**	Min. Energy. Eqn.	INLET
6920.50		3.60	66.25	**3.60**	Min. Energy. Eqn.	INLET
6920.75		9.90	67.92	**9.90**	Min. Energy. Eqn.	INLET
6921.00		16.80	70.46	**16.80**	Min. Energy. Eqn.	INLET
6921.25		25.80	74.06	**25.80**	Min. Energy. Eqn.	INLET
6921.50		36.00	78.71	**36.00**	Min. Energy. Eqn.	INLET
6921.75		46.50	84.33	**46.50**	Regression Eqn.	INLET
6922.00		58.50	90.82	**58.50**	Regression Eqn.	INLET
6922.25		71.70	97.66	**71.70**	Regression Eqn.	INLET
6922.50		86.10	104.77	**86.10**	Regression Eqn.	INLET
6922.75		101.10	111.79	**101.10**	Regression Eqn.	INLET
6923.00		115.80	118.55	**115.80**	Regression Eqn.	INLET
6923.25		129.90	131.45	**129.90**	Regression Eqn.	INLET
6923.50		142.80	143.38	**142.80**	Regression Eqn.	INLET
6923.75		155.10	154.08	**154.08**	Regression Eqn.	OUTLET
6924.00		166.20	164.79	**164.79**	Regression Eqn.	OUTLET
6924.25		176.70	174.79	**174.79**	Regression Eqn.	OUTLET
6924.50		186.60	184.18	**184.18**	Regression Eqn.	OUTLET
6924.75		195.90	193.22	**193.22**	Regression Eqn.	OUTLET
6925.00		204.90	201.82	**201.82**	Regression Eqn.	OUTLET
6925.25		213.30	209.98	**209.98**	Regression Eqn.	OUTLET
6925.50		221.40	217.97	**217.97**	Regression Eqn.	OUTLET
6925.75		229.20	225.60	**225.60**	Regression Eqn.	OUTLET
6926.00		236.70	232.97	**232.97**	Regression Eqn.	OUTLET
6926.25		243.90	240.17	**240.17**	Regression Eqn.	OUTLET
6926.50		250.80	247.10	**247.10**	Regression Eqn.	OUTLET
6926.75		257.70	253.85	**253.85**	Regression Eqn.	OUTLET
6927.00		264.30	260.52	**260.52**	Regression Eqn.	OUTLET
6927.25		270.90	266.93	**266.93**	Regression Eqn.	OUTLET

Processing Time: 00.91 Seconds

CULVERT STAGE-DISCHARGE SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: WATERBURY FILING 1
Basin ID: Design Point 30- Triple 36" RCP Culverts



PIPE CALCULATIONS

These sheets are fine for normal depth calculations, but system HGL calculations are needed as well.

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Check out our spreadsheet version of this calculator Download Spreadsheet Open Google Sheets version View All Spreadsheets

Pipe run 1

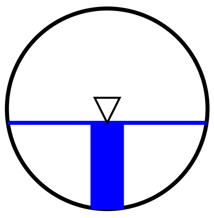
18" RCP @ 1.00%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	43	%

Results

Flow, Q	4.0349	cfs
Velocity, v	5.5533	ft/sec
Velocity head, h_v	0.4793	ft H2O
Flow area	0.7266	ft^2
Wetted perimeter	2.1455	ft
Hydraulic radius	0.3387	ft
Top width, T	1.4852	ft
Froude number, F	1.40	
Shear stress (tractive force), tau	0.2114	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 2

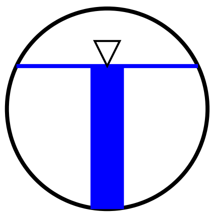
24" RCP @ 0.60%

Inputs

Pipe diameter, d_0	24	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	.6	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	71.3	%

Results

Flow, Q	15.0220	cfs
Velocity, v	6.2691	ft/sec
Velocity head, h_v	0.6108	ft H2O
Flow area	2.3963	ft^2
Wetted perimeter	4.0217	ft
Hydraulic radius	0.5958	ft
Top width, T	1.8094	ft
Froude number, F	0.96	
Shear stress (tractive force), tau	0.2232	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 3

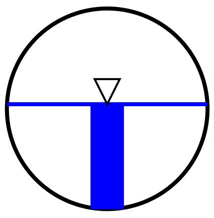
18" RCP @ 2.00%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	2	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	52.3	%

Results

Flow, Q	8.0101	cfs
Velocity, v	8.5644	ft/sec
Velocity head, h_v	1.1400	ft H2O
Flow area	0.9353	ft^2
Wetted perimeter	2.4252	ft
Hydraulic radius	0.3857	ft
Top width, T	1.4984	ft
Froude number, F	1.91	
Shear stress (tractive force), tau	0.4815	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 4

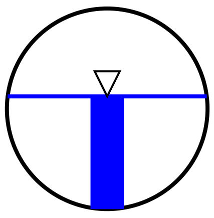
18" RCP @ 2.00%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	2	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	56.2	%

Results

Flow, Q	9.0077	cfs
Velocity, v	8.8079	ft/sec
Velocity head, h_v	1.2057	ft H2O
Flow area	1.0227	ft^2
Wetted perimeter	2.5426	ft
Hydraulic radius	0.4022	ft
Top width, T	1.4884	ft
Froude number, F	1.87	
Shear stress (tractive force), tau	0.5022	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 5

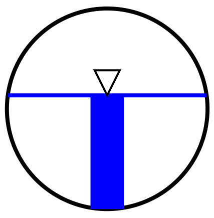
24" RCP @ 1.5%

Inputs

Pipe diameter, d_0	24	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1.5	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	56.7	%

Results

Flow, Q	17.0392	cfs
Velocity, v	9.2708	ft/sec
Velocity head, h_v	1.3358	ft H2O
Flow area	1.8380	ft^2
Wetted perimeter	3.4104	ft
Hydraulic radius	0.5389	ft
Top width, T	1.9819	ft
Froude number, F	1.70	
Shear stress (tractive force), tau	0.5047	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 6

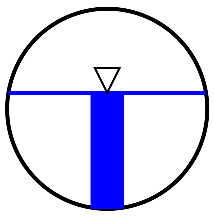
30" RCP @ 0.7%

Inputs

Pipe diameter, d_0	30	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1.5	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	58	%

Results

Flow, Q	32.0201	cfs
Velocity, v	10.8464	ft/sec
Velocity head, h_v	1.8284	ft H2O
Flow area	2.9523	ft^2
Wetted perimeter	4.3287	ft
Hydraulic radius	0.6820	ft
Top width, T	2.4678	ft
Froude number, F	1.75	
Shear stress (tractive force), tau	0.6387	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 7

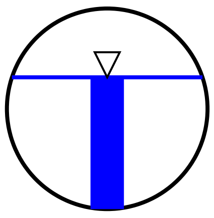
36" RCP @ 0.74%

Inputs

Pipe diameter, d_0	36	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	.74	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	65.7	%

Results

Flow, Q	44.0607	cfs
Velocity, v	8.9490	ft/sec
Velocity head, h_v	1.2446	ft H2O
Flow area	4.9238	ft^2
Wetted perimeter	5.6705	ft
Hydraulic radius	0.8683	ft
Top width, T	2.8482	ft
Froude number, F	1.20	
Shear stress (tractive force), tau	0.4011	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 8

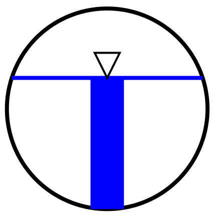
18" RCP @ 1.00%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	65.4	%

Results

Flow, Q	8.0145	cfs
Velocity, v	6.5452	ft/sec
Velocity head, h_v	0.6658	ft H2O
Flow area	1.2245	ft^2
Wetted perimeter	2.8258	ft
Hydraulic radius	0.4333	ft
Top width, T	1.4271	ft
Froude number, F	1.25	
Shear stress (tractive force), tau	0.2705	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 9

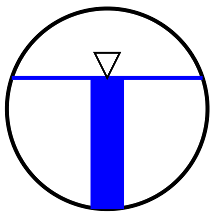
18" RCP @ 1.00%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	65.4	%

Results

Flow, Q	8.0145	cfs
Velocity, v	6.5452	ft/sec
Velocity head, h_v	0.6658	ft H2O
Flow area	1.2245	ft^2
Wetted perimeter	2.8258	ft
Hydraulic radius	0.4333	ft
Top width, T	1.4271	ft
Froude number, F	1.25	
Shear stress (tractive force), tau	0.2705	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 10

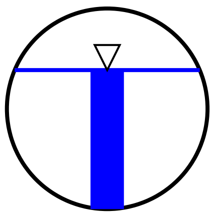
18" RCP @ 3.00%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	3	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	69.3	%

Results

Flow, Q	15.0311	cfs
Velocity, v	11.5027	ft/sec
Velocity head, h_v	2.0564	ft H2O
Flow area	1.3068	ft^2
Wetted perimeter	2.9506	ft
Hydraulic radius	0.4429	ft
Top width, T	1.3837	ft
Froude number, F	2.09	
Shear stress (tractive force), tau	0.8295	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 10A

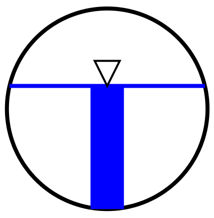
18' RCP @ 1%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	61.4	%

Results

Flow, Q	7.3079	cfs
Velocity, v	6.4228	ft/sec
Velocity head, h_v	0.6411	ft H2O
Flow area	1.1378	ft^2
Wetted perimeter	2.7012	ft
Hydraulic radius	0.4212	ft
Top width, T	1.4605	ft
Froude number, F	1.28	
Shear stress (tractive force), tau	0.2630	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 11

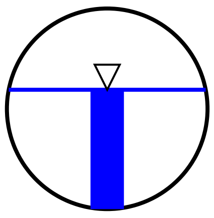
24" RCP @ 1.00%

Inputs

Pipe diameter, d_0	24	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	59.5	%

Results

Flow, Q	15.0032	cfs
Velocity, v	7.7001	ft/sec
Velocity head, h_v	0.9215	ft H2O
Flow area	1.9485	ft^2
Wetted perimeter	3.5239	ft
Hydraulic radius	0.5529	ft
Top width, T	1.9635	ft
Froude number, F	1.36	
Shear stress (tractive force), tau	0.3452	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 12

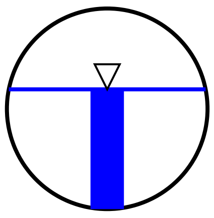
18" RCP @ 1.00%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	59.7	%

Results

Flow, Q	7.0025	cfs
Velocity, v	6.3635	ft/sec
Velocity head, h_v	0.6294	ft H2O
Flow area	1.1005	ft^2
Wetted perimeter	2.6490	ft
Hydraulic radius	0.4154	ft
Top width, T	1.4715	ft
Froude number, F	1.30	
Shear stress (tractive force), tau	0.2593	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 13

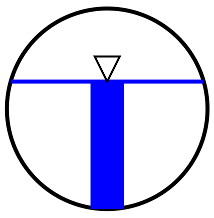
30" RCP @ 1.00%

Inputs

Pipe diameter, d_0	30	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	63.6	%

Results

Flow, Q	30.0630	cfs
Velocity, v	9.1275	ft/sec
Velocity head, h_v	1.2948	ft H2O
Flow area	3.2938	ft^2
Wetted perimeter	4.6156	ft
Hydraulic radius	0.7136	ft
Top width, T	2.4057	ft
Froude number, F	1.38	
Shear stress (tractive force), tau	0.4455	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 14

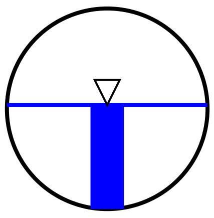
24" RCP @ 1.00%

Inputs

Pipe diameter, d_0	24	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	51.9	%

Results

Flow, Q	12.0430	cfs
Velocity, v	7.3133	ft/sec
Velocity head, h_v	0.8312	ft H2O
Flow area	1.6468	ft^2
Wetted perimeter	3.2176	ft
Hydraulic radius	0.5118	ft
Top width, T	1.9985	ft
Froude number, F	1.42	
Shear stress (tractive force), tau	0.3195	psf



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Pipe run 15

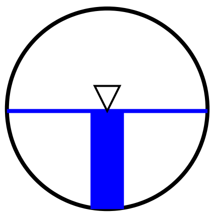
36" RCP @ 1.00%

Inputs

Pipe diameter, d_0	36	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	48.9	%

Results

Flow, Q	32.1044	cfs
Velocity, v	9.3457	ft/sec
Velocity head, h_v	1.3575	ft H2O
Flow area	3.4353	ft^2
Wetted perimeter	4.6463	ft
Hydraulic radius	0.7393	ft
Top width, T	2.9992	ft
Froude number, F	1.54	
Shear stress (tractive force), tau	0.4616	psf



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Pipe run 16

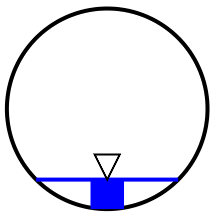
18" RCP @ 17.80%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	17.8	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	14.7	%

Results

Flow, Q	2.0660	cfs
Velocity, v	12.7995	ft/sec
Velocity head, h_v	2.5462	ft H2O
Flow area	0.1614	ft^2
Wetted perimeter	1.1804	ft
Hydraulic radius	0.1367	ft
Top width, T	1.0623	ft
Froude number, F	5.83	
Shear stress (tractive force), tau	1.5195	psf



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Pipe run 17

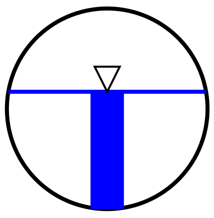
36" RCP @ 0.70%

Inputs

Pipe diameter, d_0	36	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	0.7	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	58.5	%

Results

Flow, Q	36.0498	cfs
Velocity, v	8.3925	ft/sec
Velocity head, h_v	1.0947	ft H2O
Flow area	4.2956	ft^2
Wetted perimeter	5.2248	ft
Hydraulic radius	0.8221	ft
Top width, T	2.9563	ft
Froude number, F	1.23	
Shear stress (tractive force), tau	0.3593	psf



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Pipe Run 17A

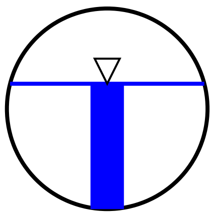
18" RCP @ 2.00%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	2	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	62.5	%

Results

Flow, Q	10.6124	cfs
Velocity, v	9.1342	ft/sec
Velocity head, h_v	1.2967	ft H2O
Flow area	1.1619	ft^2
Wetted perimeter	2.7352	ft
Hydraulic radius	0.4248	ft
Top width, T	1.4524	ft
Froude number, F	1.80	
Shear stress (tractive force), tau	0.5304	psf



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Pipe run 18

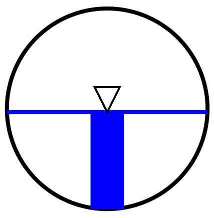
24" RCP @ 2.00%

Inputs

Pipe diameter, d_0	24	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	2	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	48.3	%

Results

Flow, Q	15.0762	cfs
Velocity, v	10.0323	ft/sec
Velocity head, h_v	1.5642	ft H2O
Flow area	1.5028	ft^2
Wetted perimeter	3.0735	ft
Hydraulic radius	0.4889	ft
Top width, T	1.9988	ft
Froude number, F	2.04	
Shear stress (tractive force), tau	0.6105	psf



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Pipe run 19

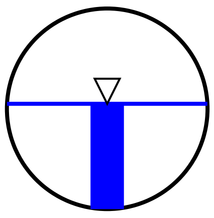
18" RCP @ 2.00%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	2	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	52.5	%

Results

Flow, Q	8.0610	cfs
Velocity, v	8.5777	ft/sec
Velocity head, h_v	1.1435	ft H2O
Flow area	0.9398	ft^2
Wetted perimeter	2.4312	ft
Hydraulic radius	0.3865	ft
Top width, T	1.4981	ft
Froude number, F	1.91	
Shear stress (tractive force), tau	0.4826	psf



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Pipe run 20

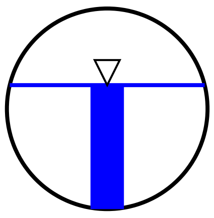
24" RCP @ 1.75%

Inputs

Pipe diameter, d_0	24	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1.75	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	61.8	%

Results

Flow, Q	21.0236	cfs
Velocity, v	10.3142	ft/sec
Velocity head, h_v	1.6534	ft H2O
Flow area	2.0384	ft^2
Wetted perimeter	3.6181	ft
Hydraulic radius	0.5634	ft
Top width, T	1.9435	ft
Froude number, F	1.78	
Shear stress (tractive force), tau	0.6155	psf



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Pipe run 21

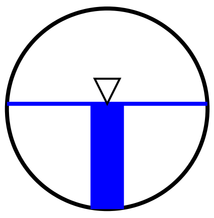
18" RCP @ 2.0%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	2	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	52.5	%

Results

Flow, Q	8.0610	cfs
Velocity, v	8.5777	ft/sec
Velocity head, h_v	1.1435	ft H2O
Flow area	0.9398	ft^2
Wetted perimeter	2.4312	ft
Hydraulic radius	0.3865	ft
Top width, T	1.4981	ft
Froude number, F	1.91	
Shear stress (tractive force), tau	0.4826	psf



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Pipe run 22

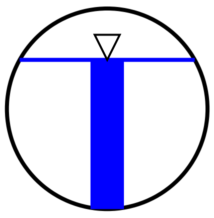
24" RCP @ 1.75%

Inputs

Pipe diameter, d_0	24	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1.75	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	74.4	%

Results

Flow, Q	27.0312	cfs
Velocity, v	10.7846	ft/sec
Velocity head, h_v	1.8076	ft H2O
Flow area	2.5066	ft^2
Wetted perimeter	4.1611	ft
Hydraulic radius	0.6024	ft
Top width, T	1.7457	ft
Froude number, F	1.59	
Shear stress (tractive force), tau	0.6581	psf



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Pipe run 24

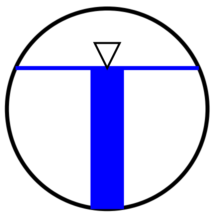
24" RCP @ 1.00%

Inputs

Pipe diameter, d_0	24	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	70.3	%

Results

Flow, Q	19.0443	cfs
Velocity, v	8.0702	ft/sec
Velocity head, h_v	1.0122	ft H2O
Flow area	2.3599	ft^2
Wetted perimeter	3.9777	ft
Hydraulic radius	0.5933	ft
Top width, T	1.8277	ft
Froude number, F	1.25	
Shear stress (tractive force), tau	0.3704	psf



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Pipe run 24

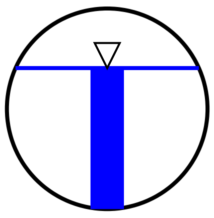
24" RCP @ 1.00%

Inputs

Pipe diameter, d_0	24	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	70.3	%

Results

Flow, Q	19.0443	cfs
Velocity, v	8.0702	ft/sec
Velocity head, h_v	1.0122	ft H2O
Flow area	2.3599	ft^2
Wetted perimeter	3.9777	ft
Hydraulic radius	0.5933	ft
Top width, T	1.8277	ft
Froude number, F	1.25	
Shear stress (tractive force), tau	0.3704	psf



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Pipe run 25

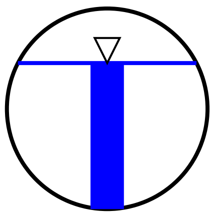
30" RCP @ 1.00%

Inputs

Pipe diameter, d_0	30	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	72.8	%

Results

Flow, Q	36.0904	cfs
Velocity, v	9.4275	ft/sec
Velocity head, h_v	1.3813	ft H2O
Flow area	3.8284	ft^2
Wetted perimeter	5.1107	ft
Hydraulic radius	0.7491	ft
Top width, T	2.2249	ft
Froude number, F	1.27	
Shear stress (tractive force), tau	0.4676	psf



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Pipe run 26

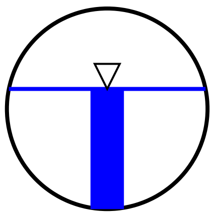
36" RCP @ 1.75%

Inputs

Pipe diameter, d_0	36	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1.75	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	59.9	%

Results

Flow, Q	59.1220	cfs
Velocity, v	13.3781	ft/sec
Velocity head, h_v	2.7816	ft H2O
Flow area	4.4195	ft^2
Wetted perimeter	5.3103	ft
Hydraulic radius	0.8322	ft
Top width, T	2.9406	ft
Froude number, F	1.92	
Shear stress (tractive force), tau	0.9092	psf



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Pipe run 27

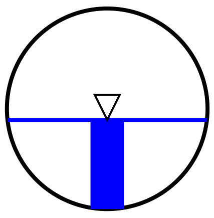
18" RCP @ 2.00%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	2	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	44.5	%

Results

Flow, Q	6.0659	cfs
Velocity, v	7.9810	ft/sec
Velocity head, h_v	0.9899	ft H2O
Flow area	0.7601	ft^2
Wetted perimeter	2.1908	ft
Hydraulic radius	0.3469	ft
Top width, T	1.4909	ft
Froude number, F	1.97	
Shear stress (tractive force), tau	0.4332	psf



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Pipe run 28

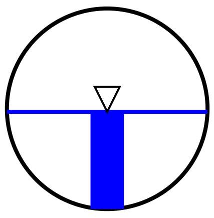
18" RCP @ 2.00%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	2	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	48.5	%

Results

Flow, Q	7.0503	cfs
Velocity, v	8.2965	ft/sec
Velocity head, h_v	1.0698	ft H2O
Flow area	0.8498	ft^2
Wetted perimeter	2.3112	ft
Hydraulic radius	0.3677	ft
Top width, T	1.4993	ft
Froude number, F	1.94	
Shear stress (tractive force), tau	0.4591	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

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Pipe run 29

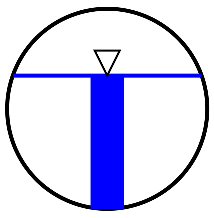
36" RCP @ 1.75%

Inputs

Pipe diameter, d_0	36	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	1.75	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	66.6	%

Results

Flow, Q	69.0619	cfs
Velocity, v	13.8118	ft/sec
Velocity head, h_v	2.9648	ft H2O
Flow area	5.0004	ft^2
Wetted perimeter	5.7276	ft
Hydraulic radius	0.8730	ft
Top width, T	2.8298	ft
Froude number, F	1.83	
Shear stress (tractive force), tau	0.9538	psf



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Pipe run 30

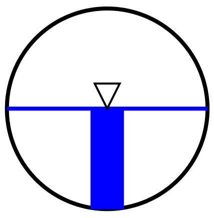
24" RCP @ 2%

Inputs

Pipe diameter, d_0	24	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	2	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	50.1	%

Results

Flow, Q	16.0492	cfs
Velocity, v	10.1916	ft/sec
Velocity head, h_v	1.6143	ft H2O
Flow area	1.5748	ft^2
Wetted perimeter	3.1456	ft
Hydraulic radius	0.5006	ft
Top width, T	2.0000	ft
Froude number, F	2.03	
Shear stress (tractive force), tau	0.6251	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

Check out our spreadsheet version of this calculator Download Spreadsheet Open Google Sheets version View All Spreadsheets

Pipe run 31

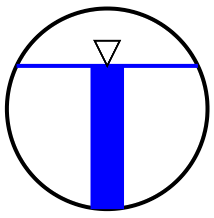
36" RCP @ 2%

Inputs

Pipe diameter, d_0	36	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	2	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	71.4	%

Results

Flow, Q	81.0062	cfs
Velocity, v	15.0023	ft/sec
Velocity head, h_v	3.4979	ft H2O
Flow area	5.3998	ft^2
Wetted perimeter	6.0392	ft
Hydraulic radius	0.8941	ft
Top width, T	2.7113	ft
Froude number, F	1.87	
Shear stress (tractive force), tau	1.1164	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

Check out our spreadsheet version of this calculator Download Spreadsheet Open Google Sheets version View All Spreadsheets

Pipe run 32

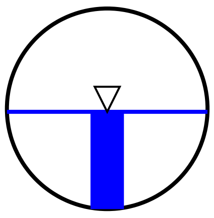
18" RCP @ 2%

Inputs

Pipe diameter, d_0	18	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	2	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	48.5	%

Results

Flow, Q	7.0503	cfs
Velocity, v	8.2965	ft/sec
Velocity head, h_v	1.0698	ft H2O
Flow area	0.8498	ft^2
Wetted perimeter	2.3112	ft
Hydraulic radius	0.3677	ft
Top width, T	1.4993	ft
Froude number, F	1.94	
Shear stress (tractive force), tau	0.4591	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

Check out our spreadsheet version of this calculator Download Spreadsheet Open Google Sheets version View All Spreadsheets

Pipe run 33

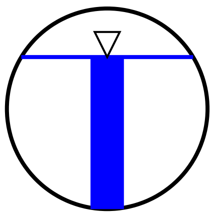
36" RCP @ 2%

Inputs

Pipe diameter, d_0	36	in
Manning roughness, n	0.013	
Pressure slope (possibly ? equal to pipe slope), S_0	2	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	75.8	%

Results

Flow, Q	87.0601	cfs
Velocity, v	15.1448	ft/sec
Velocity head, h_v	3.5647	ft H2O
Flow area	5.7488	ft^2
Wetted perimeter	6.3388	ft
Hydraulic radius	0.9069	ft
Top width, T	2.5697	ft
Froude number, F	1.79	
Shear stress (tractive force), tau	1.1323	psf



Manning Formula Uniform Pipe Flow at Given Slope and Depth

Check out our spreadsheet version of this calculator Download Spreadsheet Open Google Sheets version View All Spreadsheets

Pipe run 34

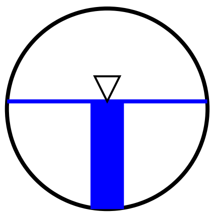
24" RCP @ 2.00%

Inputs

Pipe diameter, d_0	24	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	2	% rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	53.7	%

Results

Flow, Q	18.0202	cfs
Velocity, v	10.4853	ft/sec
Velocity head, h_v	1.7087	ft H2O
Flow area	1.7187	ft^2
Wetted perimeter	3.2897	ft
Hydraulic radius	0.5224	ft
Top width, T	1.9945	ft
Froude number, F	1.99	
Shear stress (tractive force), tau	0.6523	psf



No pond details were provided on Plans and these calcs are not reviewed at this overlot grading review stage. So these calcs were not reviewed at this time, but will be at the final plat review stage.

FULL SPECTRUM DETENTION & WATER QUALITY CALCULATIONS

POND TRIBUTARY AREA

POND 1 TRIB AREA	19.91 AC	BASINS A, B1, B2, C, D ,E, F, H, & K	DCIA	4.10
(DP 8)			UIA	5.60
			RPA	7.15
			SPA	3.06
				11.80
POND 2 TRIB AREA	21.93 AC	BASINS L1, L2, O1, O2, & OS-4	DCIA	2.21
(DP 18)			UIA	3.52
			RPA	5.30
			SPA	10.90
POND 3 TRIB AREA	84.64 AC	BASINS Q1, Q2, R, S1, S2, T1, T2, U1, U2, W, OS-1, OS-2,	DCIA	11.30
(DP 29)		OS-3A, 0S-3B, OS-Q1, OS-Q2, OS-4, OS-S1, OS-S2, OS-T2,	UIA	22.09
		OS-7, & OS-9	RPA	47.10
			SPA	4.16

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

Designer:	QNA
Company:	Terra Nova Engineering
Date:	December 16, 2020
Project:	WATERBURY FILING 1 POND 1
Location:	POND 1 Design Point 8 Full Spectrum Detention 19.91 Acres

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.43	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event		
Max Intensity for Optional User Defined Storm	0		

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	**DP 9 FSD**													
Receiving Pervious Area Soil Type	Loamy Sand													
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	19.91													
Directly Connected Impervious Area (DCIA, acres)	4.10													
Unconnected Impervious Area (UIA, acres)	5.60													
Receiving Pervious Area (RPA, acres)	7.15													
Separate Pervious Area (SPA, acres)	3.06													
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C													

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	19.905													
Directly Connected Impervious Area (DCIA, %)	20.6%													
Unconnected Impervious Area (UIA, %)	28.1%													
Receiving Pervious Area (RPA, %)	35.9%													
Separate Pervious Area (SPA, %)	15.4%													
A_R (RPA / UIA)	1.276													
I_a Check	0.440													
f / I for WQCV Event:	4.5													
f / I for 5-Year Event:	0.5													
f / I for 100-Year Event:	0.4													
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	0.57													
IRF for 5-Year Event:	0.88													
IRF for 100-Year Event:	0.90													
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	48.7%													
Effective Imperviousness for WQCV Event:	36.7%													
Effective Imperviousness for 5-Year Event:	45.3%													
Effective Imperviousness for 100-Year Event:	46.0%													
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	15.7%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	5.5%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	**48.7%**
Total Site Effective Imperviousness for WQCV Event:	**36.7%**
Total Site Effective Imperviousness for 5-Year Event:	**45.3%**
Total Site Effective Imperviousness for 100-Year Event:	**46.0%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.

** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected   Worksheet Protected

Stormwater Facility Name: **Waterbury Filing No. 1 & 2 EDB Pond 1 D8 8**

Facility Location & Jurisdiction: **Stapleton Dr. & Bandernero Dr Intersection**

User Input: Watershed Characteristics

Watershed Slope =	0.012	ft/ft
Watershed Length =	1935	ft
Watershed Area =	19.91	acres
Watershed Imperviousness =	46.0%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent

Location for 1-hr Rainfall Depths (use dropdown):

User Input

WQCV Treatment Method = *Extended Detention*

User Defined Stage [ft]	User Defined Area [ft^2]	User Defined Stage [ft]	User Defined Discharge [cfs]
0.00	100	0.00	0.00
0.25	3,176	0.25	0.04
0.50	6,253	0.50	0.06
0.75	8,372	0.75	0.07
1.00	10,492	1.00	0.09
1.25	12,612	1.25	0.14
1.50	14,732	1.50	0.17
1.75	16,852	1.75	0.19
2.00	18,972	2.00	0.21
2.25	21,092	2.25	0.27
2.50	23,212	2.50	0.30
2.75	25,435	2.75	0.33
3.00	27,658	3.00	0.36
3.25	29,881	3.25	3.70
3.50	32,105	3.50	7.91
3.75	34,328	3.75	8.21
4.00	36,551	4.00	8.50
4.25	38,744	4.25	8.78
4.50	40,997	4.50	9.06
4.75	43,176	4.75	20.80
5.00	45,355	5.00	42.67
5.25	47,534	5.25	71.79
5.50	49,712	5.50	107.27
5.75	51,891	5.75	148.67
6.00	54,070	6.00	195.73
6.25	56,249	6.25	248.30
6.50	58,428	6.50	306.29

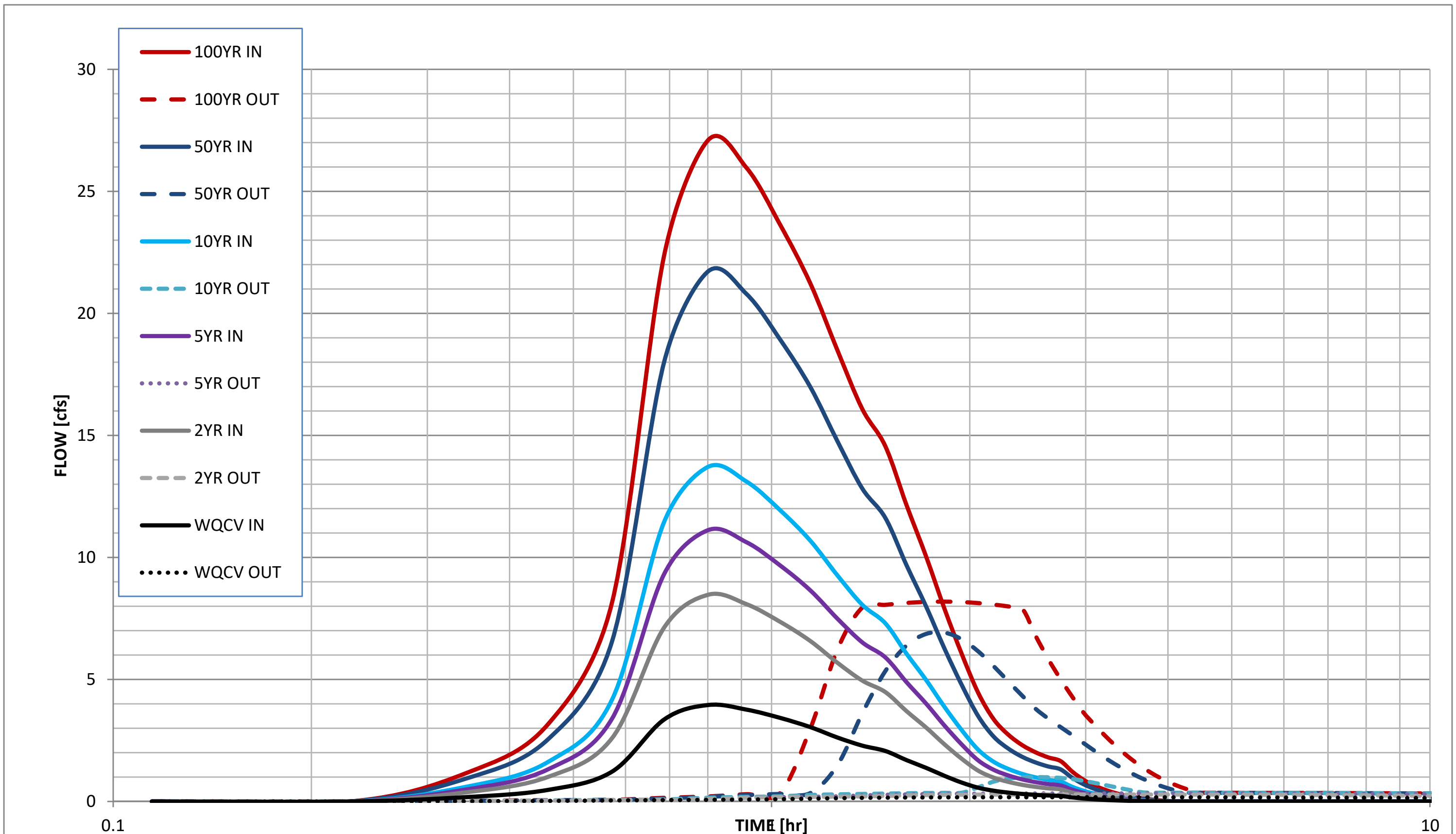
Submit SDI worksheets separately from this report.

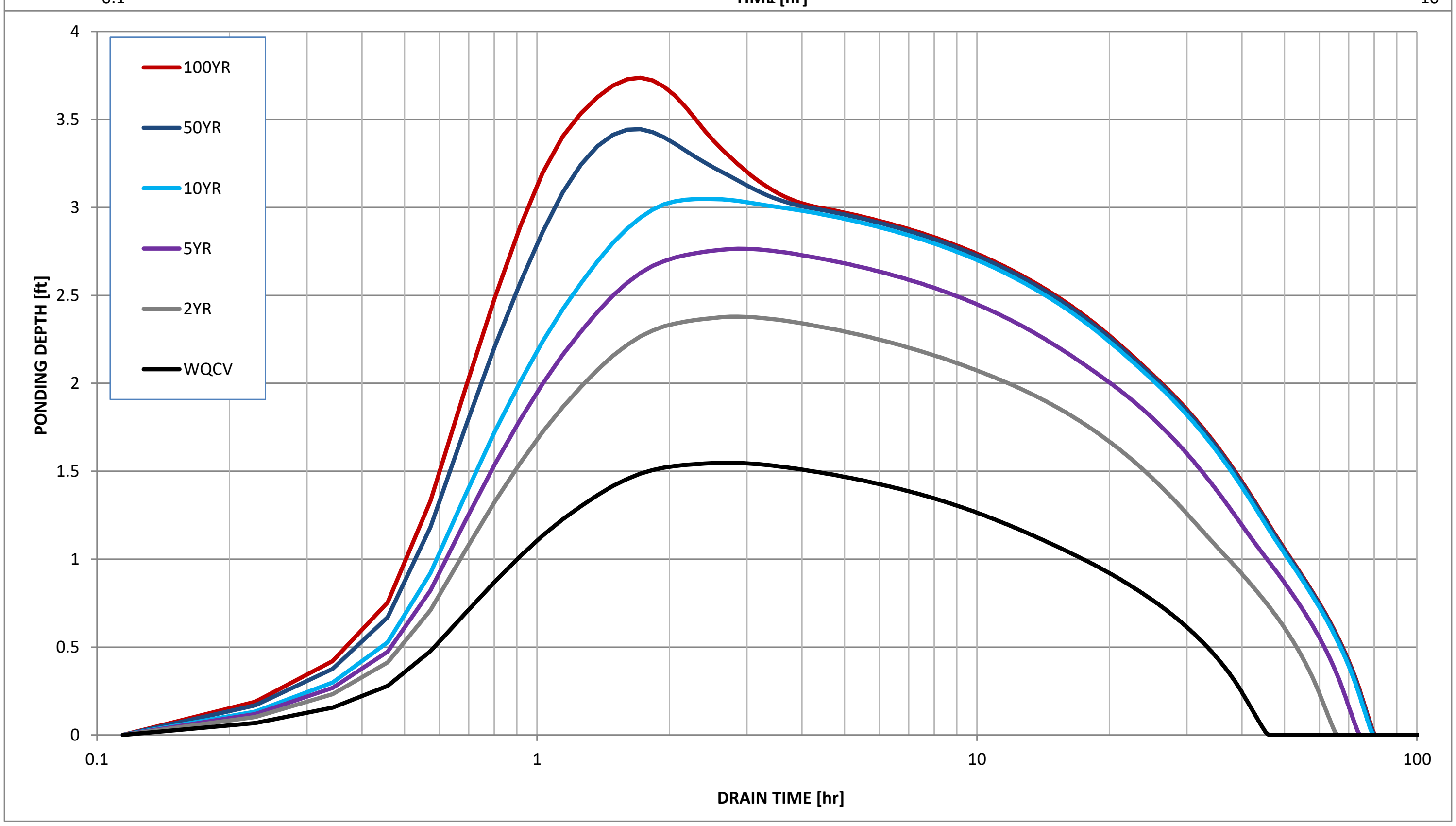
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
create a new stormwater facility, and
attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	1.19	1.50	1.75	2.25	2.52	in
Calculated Runoff Volume =	0.324	0.702	0.924	1.142	1.820	2.278	acre-ft
OPTIONAL Override Runoff Volume =							acre-ft
Inflow Hydrograph Volume =	0.324	0.702	0.924	1.142	1.819	2.277	acre-ft
Time to Drain 97% of Inflow Volume =	39.7	56.6	**63.4**	67.4	64.0	61.7	hours
Time to Drain 99% of Inflow Volume =	42.2	60.6	68.1	72.9	71.5	**70.7**	hours
Maximum Ponding Depth =	1.55	2.38	2.77	3.05	3.44	3.74	ft
Maximum Ponded Area =	0.35	0.51	0.59	0.64	0.72	**0.78**	acres
Maximum Volume Stored =	0.292	0.645	0.858	1.032	1.305	1.523	acre-ft

Stormwater Detention and Infiltration Design Data Sheet



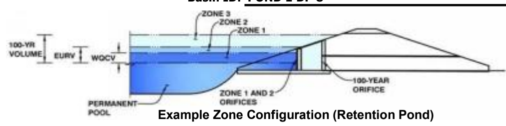


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **WATERBURY**

Basin ID: **POND 1 DP 8**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**			
Watershed Area =	19.91	acres		
Watershed Length =	1,935	ft		
Watershed Length to Centroid =	800	ft		
Watershed Slope =	0.012	ft/ft		
Watershed Imperviousness =	45.99%	percent		
Percentage Hydrologic Soil Group A =	100.0%	percent		
Percentage Hydrologic Soil Group B =	0.0%	percent		
Percentage Hydrologic Soil Groups C/D =	0.0%	percent		
Target WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	User Input			

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.324	acre-feet	0.324	acre-feet
Excess Urban Runoff Volume (EURV) =	1.027	acre-feet	1.027	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.779	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.040	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.248	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.600	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.942	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	2.383	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3 in.) =	3.110	acre-feet	3.00	inches
Approximate 2-yr Detention Volume =	0.661	acre-feet		
Approximate 5-yr Detention Volume =	0.871	acre-feet		
Approximate 10-yr Detention Volume =	1.068	acre-feet		
Approximate 25-yr Detention Volume =	1.313	acre-feet		
Approximate 50-yr Detention Volume =	1.472	acre-feet		
Approximate 100-yr Detention Volume =	1.677	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.324	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.703	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.650	acre-feet
Total Detention Basin Volume =	1.677	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	100	0.002		
6923.75	--	0.25	--	--	--	3,176	0.073	409	0.009
6924.00	--	0.50	--	--	--	6,253	0.144	1,588	0.036
6924.25	--	0.75	--	--	--	8,372	0.192	3,416	0.078
6924.50	--	1.00	--	--	--	10,492	0.241	5,774	0.133
6924.75	--	1.25	--	--	--	12,612	0.290	8,662	0.199
6925.00	--	1.50	--	--	--	14,732	0.338	12,080	0.277
6925.25	--	1.75	--	--	--	16,852	0.387	16,028	0.368
6925.50	--	2.00	--	--	--	18,972	0.436	20,506	0.471
6925.75	--	2.25	--	--	--	21,092	0.484	25,514	0.586
6926.00	--	2.50	--	--	--	23,212	0.533	31,052	0.713
6926.25	--	2.75	--	--	--	25,435	0.584	37,133	0.852
6926.50	--	3.00	--	--	--	27,658	0.635	43,769	1.005
6926.75	--	3.25	--	--	--	29,881	0.686	50,962	1.170
6927.00	--	3.50	--	--	--	32,105	0.737	58,710	1.348
6927.25	--	3.75	--	--	--	34,328	0.788	67,014	1.538
6927.50	--	4.00	--	--	--	36,551	0.839	75,874	1.742
6927.75	--	4.25	--	--	--	38,744	0.889	85,286	1.958
6928.00	--	4.50	--	--	--	40,997	0.941	95,254	2.187
6928.25	--	4.75	--	--	--	43,176	0.991	105,775	2.428
6928.50	--	5.00	--	--	--	45,355	1.041	116,842	2.682
6928.75	--	5.25	--	--	--	47,534	1.091	128,453	2.949
6929.00	--	5.50	--	--	--	49,712	1.141	140,608	3.228
6929.25	--	5.75	--	--	--	51,891	1.191	153,309	3.519
6929.50	--	6.00	--	--	--	54,070	1.241	166,554	3.824
6929.75	--	6.25	--	--	--	56,249	1.291	180,344	4.140
6930.00	--	6.50	--	--	--	58,428	1.341	194,678	4.469
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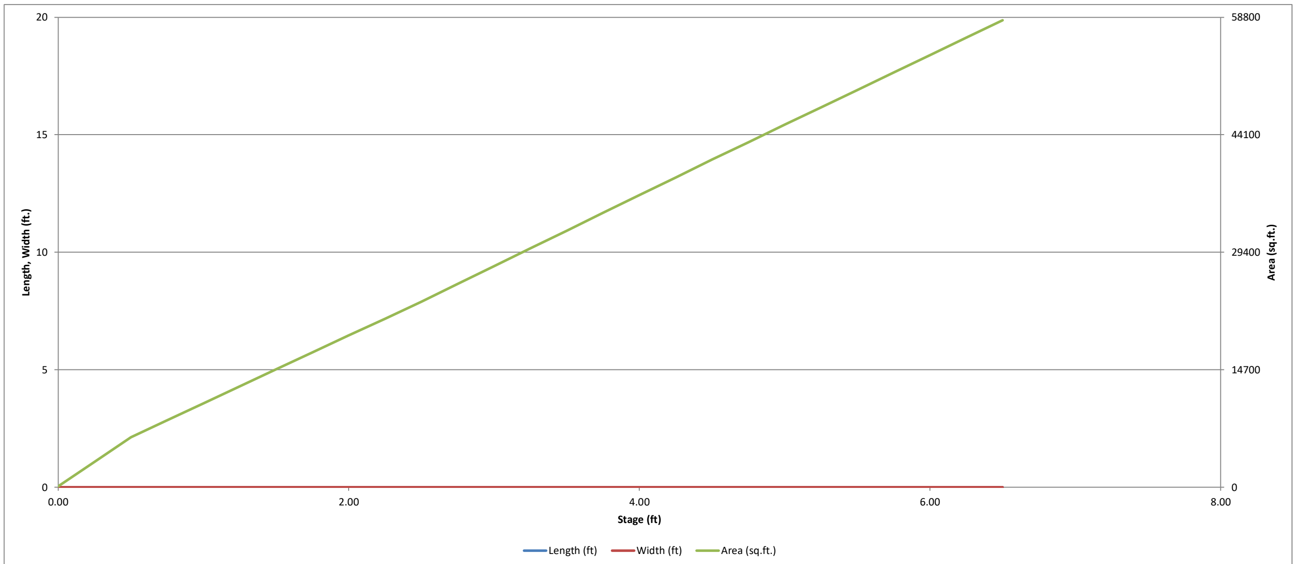
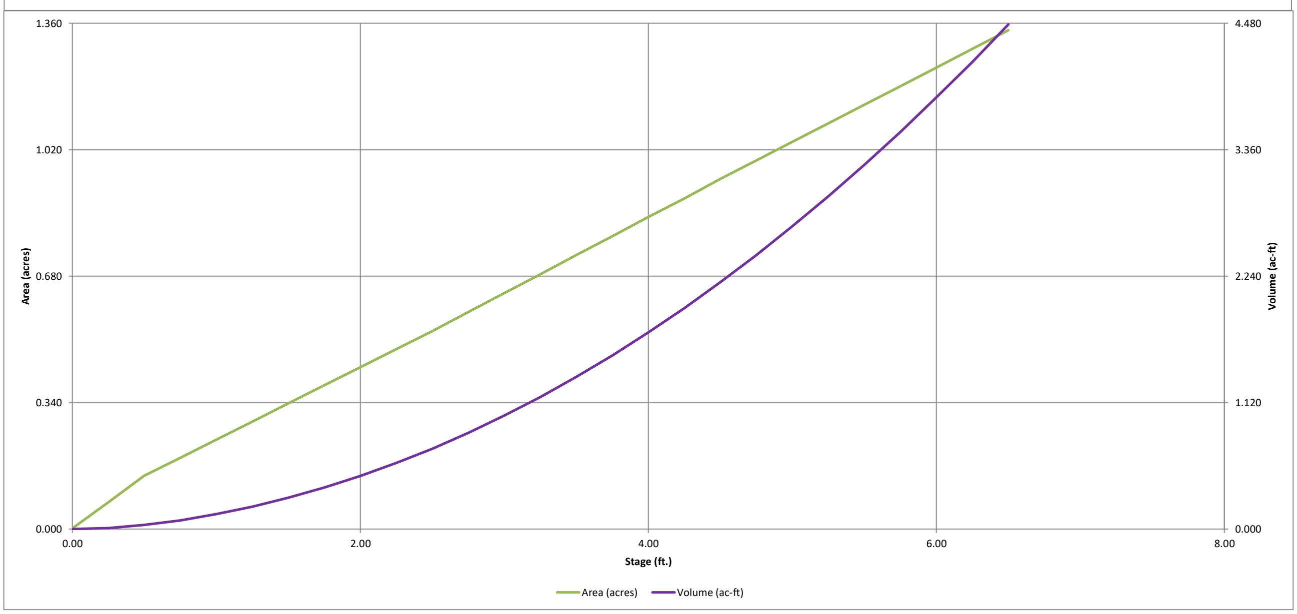
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

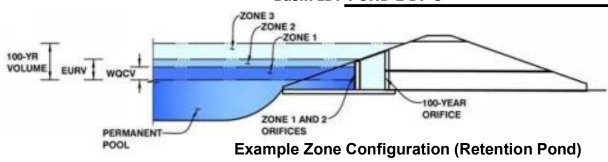




DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: **WATERBURY**
Basin ID: **POND 1 DP 8**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.64	0.324	Orifice Plate
Zone 2 (EURV)	3.04	0.703	Orifice Plate
Zone 3 (100-year)	3.93	0.650	Weir&Pipe (Restrict)
Total (all zones)		1.677	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Calculated Parameters for Plate

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.792E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.04	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	12.90	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.58	sq. inches (diameter = 1-13/16 inches)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.01	2.03					
Orifice Area (sq. inches)	2.58	2.58	2.58					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.04	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.04	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	12.22	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.20	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	5.60	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.10	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.92	N/A	ft^2
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.39	N/A	feet
Restrictor Plate Height Above Pipe Invert =	8.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.23	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage=	4.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.46	feet
Spillway Crest Length =	30.00	feet	Stage at Top of Freeboard =	5.96	feet
Spillway End Slopes =	3.00	H:V	Basin Area at Top of Freeboard =	1.23	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.77	acre-ft

Routed Hydrograph Results

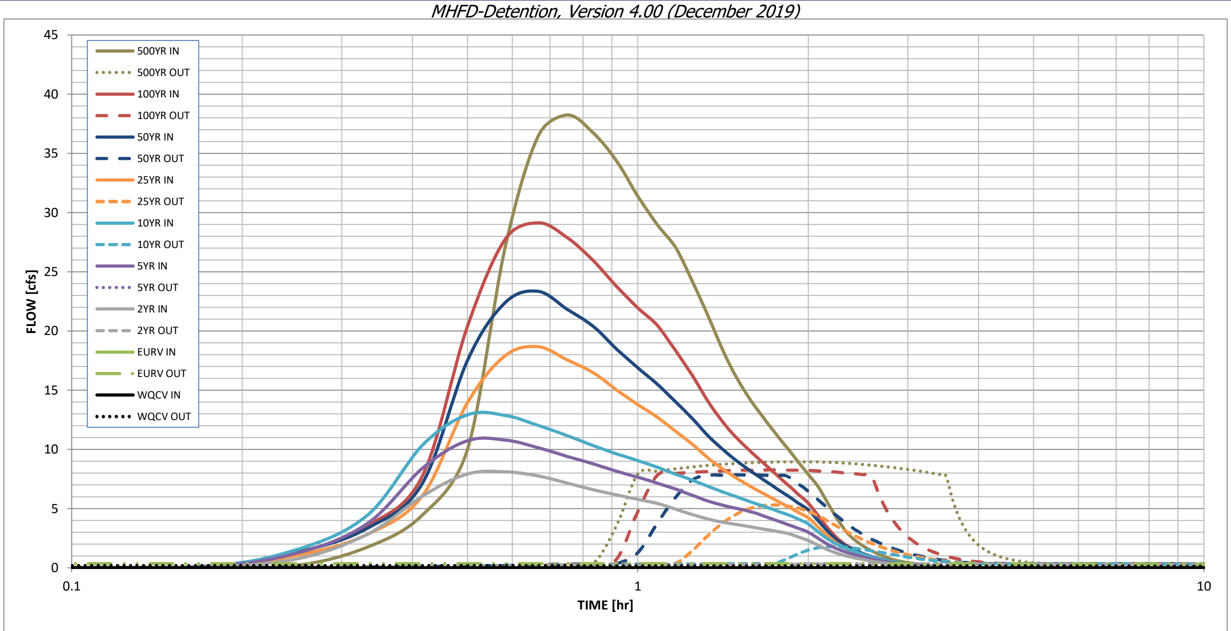
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

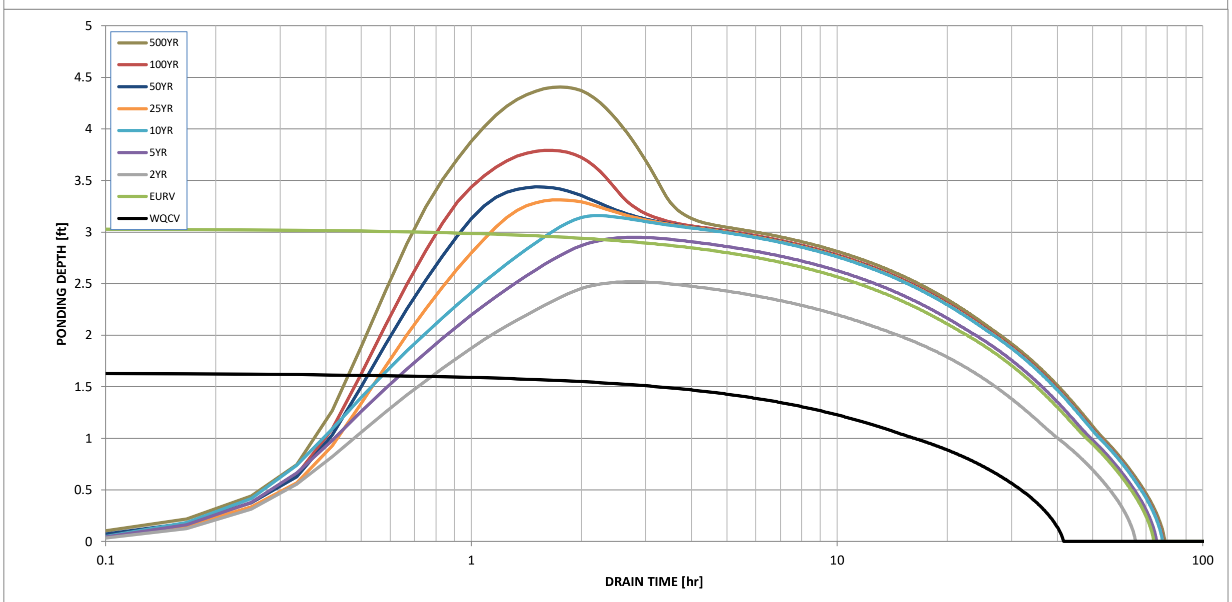
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.00
CUHP Runoff Volume (acre-ft) =	0.324	1.027	0.779	1.040	1.248	1.600	1.942	2.383	3.110
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.779	1.040	1.248	1.600	1.942	2.383	3.110
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.3	2.5	5.0	8.4	13.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.01	0.13	0.25	0.42	0.69
Peak Inflow Q (cfs) =	N/A	N/A	8.1	10.8	12.9	18.7	23.3	29.1	38.2
Peak Outflow Q (cfs) =	0.2	0.4	0.3	0.4	1.8	5.3	7.8	8.3	9.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.8	6.5	2.1	1.6	1.0	0.7
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.4	0.7	0.7	0.8
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	65	59	66	68	66	64	62	59
Time to Drain 99% of Inflow Volume (hours) =	**40**	70	62	71	73	72	72	71	70
Maximum Ponding Depth (ft) =	1.64	3.04	2.52	2.95	3.16	3.31	3.44	3.79	4.41
Area at Maximum Ponding Depth (acres) =	0.37	0.64	0.53	0.62	0.67	0.70	0.72	0.80	0.92
Maximum Volume Stored (acre-ft) =	0.327	1.030	0.718	0.967	1.102	1.211	1.297	1.570	2.094

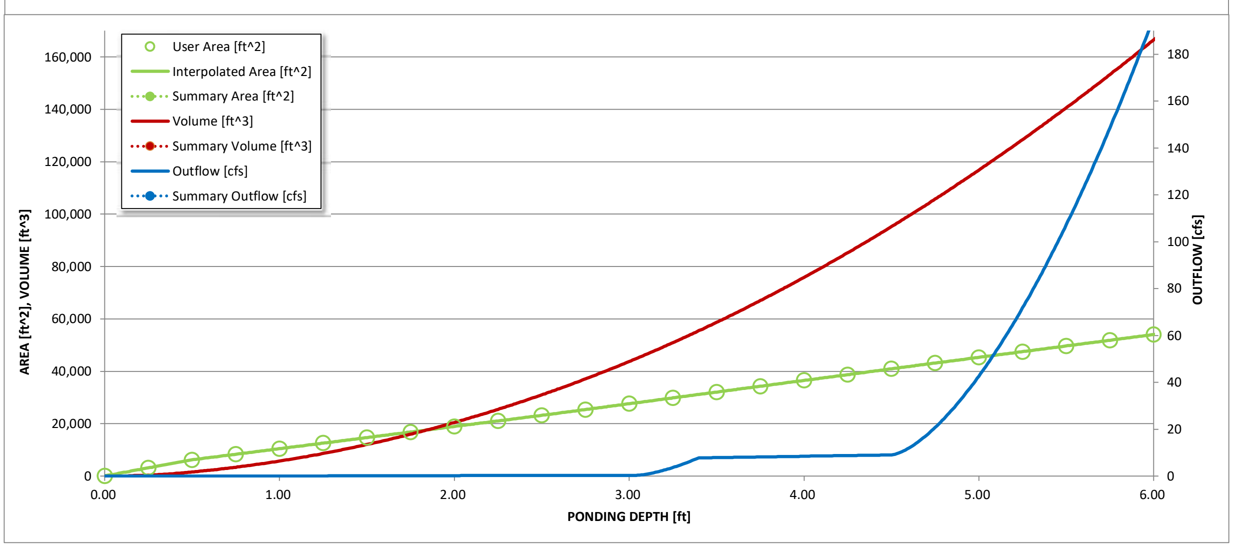
This should be <1

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval
5.00 min

SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.01	0.22
0:15:00	0.00	0.00	0.76	1.24	1.55	1.05	1.32	1.28	1.76
0:20:00	0.00	0.00	2.85	3.77	4.47	2.84	3.35	3.57	4.47
0:25:00	0.00	0.00	6.07	8.41	10.36	6.09	7.13	7.76	10.00
0:30:00	0.00	0.00	7.93	10.74	12.92	13.96	17.53	20.40	27.11
0:35:00	0.00	0.00	8.10	10.80	12.88	17.93	22.40	27.76	36.45
0:40:00	0.00	0.00	7.75	10.14	12.02	18.67	23.35	29.14	38.24
0:45:00	0.00	0.00	7.15	9.41	11.17	17.56	21.85	27.90	36.75
0:50:00	0.00	0.00	6.61	8.78	10.33	16.49	20.42	25.97	34.37
0:55:00	0.00	0.00	6.15	8.17	9.63	15.04	18.50	23.78	31.38
1:00:00	0.00	0.00	5.78	7.65	9.05	13.78	16.88	21.95	28.96
1:05:00	0.00	0.00	5.43	7.15	8.48	12.69	15.49	20.45	27.03
1:10:00	0.00	0.00	4.94	6.65	7.91	11.53	14.01	18.31	24.12
1:15:00	0.00	0.00	4.48	6.11	7.39	10.40	12.57	16.18	21.20
1:20:00	0.00	0.00	4.10	5.62	6.87	9.24	11.11	14.00	18.25
1:25:00	0.00	0.00	3.84	5.27	6.39	8.30	9.94	12.23	15.92
1:30:00	0.00	0.00	3.64	5.00	5.96	7.52	8.98	10.90	14.14
1:35:00	0.00	0.00	3.45	4.74	5.57	6.87	8.17	9.81	12.67
1:40:00	0.00	0.00	3.27	4.39	5.20	6.28	7.44	8.84	11.37
1:45:00	0.00	0.00	3.10	4.03	4.85	5.73	6.77	7.94	10.16
1:50:00	0.00	0.00	2.92	3.69	4.52	5.21	6.12	7.08	9.00
1:55:00	0.00	0.00	2.62	3.36	4.14	4.71	5.49	6.25	7.89
2:00:00	0.00	0.00	2.31	3.01	3.70	4.22	4.88	5.47	6.85
2:05:00	0.00	0.00	1.89	2.48	3.03	3.45	3.96	4.39	5.46
2:10:00	0.00	0.00	1.52	1.99	2.43	2.70	3.08	3.36	4.14
2:15:00	0.00	0.00	1.23	1.61	1.99	2.06	2.33	2.50	3.07
2:20:00	0.00	0.00	1.01	1.33	1.65	1.63	1.84	1.93	2.36
2:25:00	0.00	0.00	0.84	1.10	1.37	1.32	1.48	1.52	1.84
2:30:00	0.00	0.00	0.69	0.91	1.14	1.07	1.20	1.20	1.45
2:35:00	0.00	0.00	0.57	0.75	0.93	0.87	0.97	0.95	1.14
2:40:00	0.00	0.00	0.46	0.61	0.76	0.70	0.78	0.74	0.88
2:45:00	0.00	0.00	0.38	0.49	0.61	0.56	0.62	0.58	0.68
2:50:00	0.00	0.00	0.31	0.40	0.49	0.44	0.49	0.45	0.53
2:55:00	0.00	0.00	0.25	0.32	0.39	0.35	0.39	0.37	0.43
3:00:00	0.00	0.00	0.20	0.25	0.31	0.28	0.32	0.30	0.35
3:05:00	0.00	0.00	0.16	0.20	0.25	0.22	0.25	0.23	0.27
3:10:00	0.00	0.00	0.12	0.15	0.19	0.17	0.19	0.18	0.21
3:15:00	0.00	0.00	0.09	0.11	0.14	0.13	0.14	0.13	0.16
3:20:00	0.00	0.00	0.06	0.08	0.10	0.09	0.10	0.09	0.11
3:25:00	0.00	0.00	0.04	0.05	0.07	0.06	0.07	0.06	0.07
3:30:00	0.00	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.04
3:35:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02
3:40:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
	0.00	100	0.002	0	0.000	0.00
	0.25	3,176	0.073	409	0.009	0.04
	0.50	6,253	0.144	1,588	0.036	0.06
	0.75	8,372	0.192	3,416	0.078	0.07
	1.00	10,492	0.241	5,774	0.133	0.09
	1.25	12,612	0.290	8,662	0.199	0.14
	1.50	14,732	0.338	12,080	0.277	0.17
	1.75	16,852	0.387	16,028	0.368	0.19
	2.00	18,972	0.436	20,506	0.471	0.21
	2.25	21,092	0.484	25,514	0.586	0.27
	2.50	23,212	0.533	31,052	0.713	0.30
	2.75	25,435	0.584	37,133	0.852	0.33
	3.00	27,658	0.635	43,769	1.005	0.36
	3.25	29,881	0.686	50,962	1.170	3.70
	3.50	32,105	0.737	58,710	1.348	7.91
	3.75	34,328	0.788	67,014	1.538	8.21
	4.00	36,551	0.839	75,874	1.742	8.50
	4.25	38,744	0.889	85,286	1.958	8.78
	4.50	40,997	0.941	95,254	2.187	9.06
	4.75	43,176	0.991	105,775	2.428	20.80
	5.00	45,355	1.041	116,842	2.682	42.67
	5.25	47,534	1.091	128,453	2.949	71.79
	5.50	49,712	1.141	140,608	3.228	107.27
	5.75	51,891	1.191	153,309	3.519	148.67
	6.00	54,070	1.241	166,554	3.824	195.73
	6.25	56,249	1.291	180,344	4.140	248.30
	6.50	58,428	1.341	194,678	4.469	306.29

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator
LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.43	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer: QNA
Company: Terra Nova Engineering
Date: December 16, 2020
Project: WATERBURY FILING 1 POND 2
Location: POND 2 Design Point 18 Full Spectrum Detention 19.91 Acres

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	**DP 9 FSD**													
Receiving Pervious Area Soil Type	Loamy Sand													
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	21.93													
Directly Connected Impervious Area (DCIA, acres)	2.21													
Unconnected Impervious Area (UIA, acres)	3.52													
Receiving Pervious Area (RPA, acres)	5.30													
Separate Pervious Area (SPA, acres)	10.90													
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C													

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	21.935													
Directly Connected Impervious Area (DCIA, %)	10.1%													
Unconnected Impervious Area (UIA, %)	16.0%													
Receiving Pervious Area (RPA, %)	24.2%													
Separate Pervious Area (SPA, %)	49.7%													
A_R (RPA / UIA)	1.506													
I_a Check	0.400													
f / I for WQCV Event:	4.5													
f / I for 5-Year Event:	0.5													
f / I for 100-Year Event:	0.4													
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	0.55													
IRF for 5-Year Event:	0.87													
IRF for 100-Year Event:	0.90													
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	26.1%													
Effective Imperviousness for WQCV Event:	18.9%													
Effective Imperviousness for 5-Year Event:	24.1%													
Effective Imperviousness for 100-Year Event:	24.5%													
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	20.0%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	6.7%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	**26.1%**
Total Site Effective Imperviousness for WQCV Event:	**18.9%**
Total Site Effective Imperviousness for 5-Year Event:	**24.1%**
Total Site Effective Imperviousness for 100-Year Event:	**24.5%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.
** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.
*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected Worksheet Protected

Stormwater Facility Name: **Waterbury Filing No. 1 & 2 EDB Pond 2 DP 18**

Facility Location & Jurisdiction: **Stapleton Dr. & Bandernero Dr Intersection**

User Input: Watershed Characteristics

Watershed Slope =	0.014	ft/ft
Watershed Length =	1425	ft
Watershed Area =	21.93	acres
Watershed Imperviousness =	24.5%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent

Location for 1-hr Rainfall Depths (use dropdown):

User Input

WQCV Treatment Method = *Extended Detention*

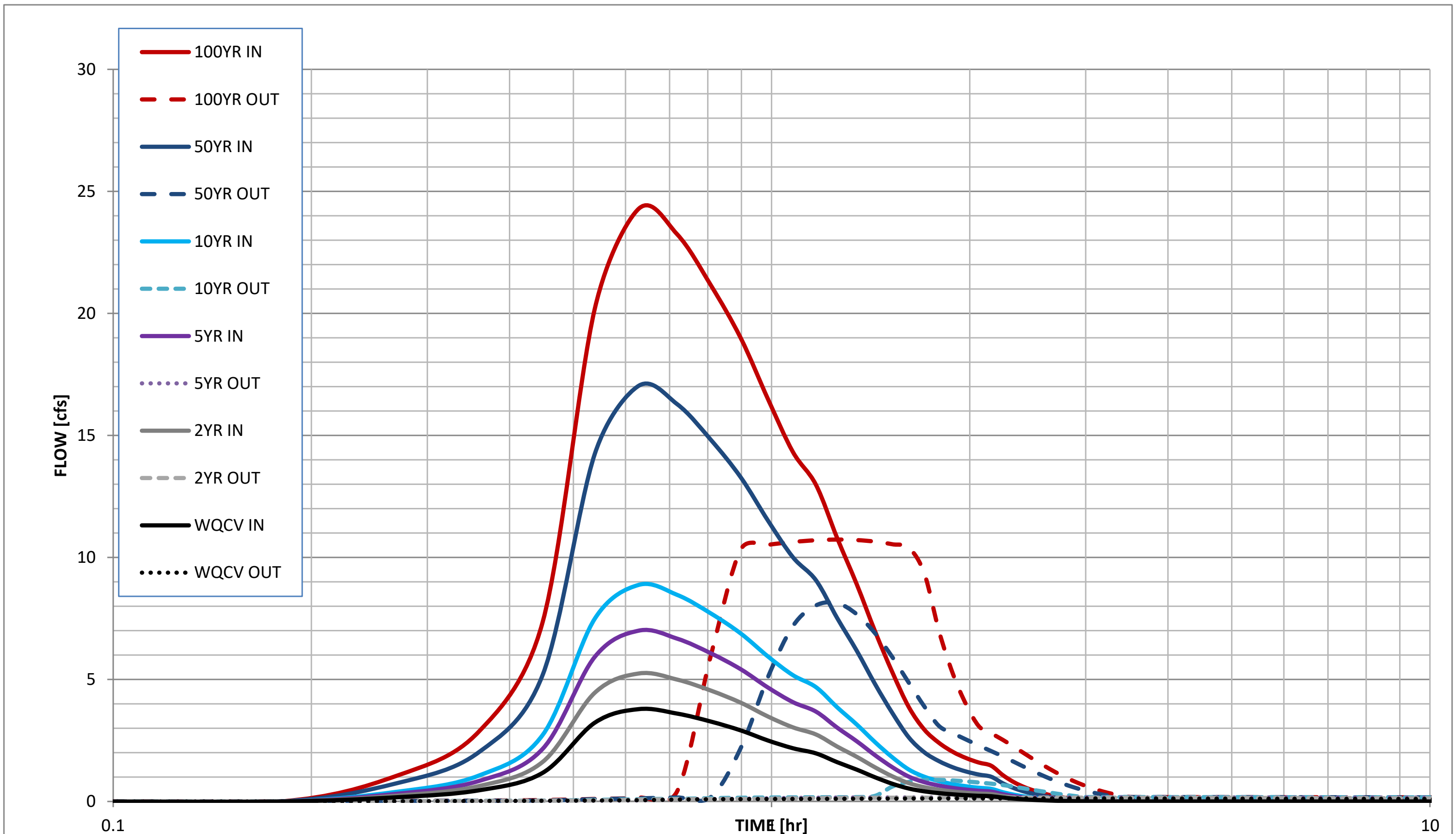
User Defined Stage [ft]	User Defined Area [ft^2]	User Defined Stage [ft]	User Defined Discharge [cfs]
0.00	100	0.00	0.00
0.25	942	0.25	0.02
0.50	1,784	0.50	0.03
0.75	2,626	0.75	0.04
1.00	3,468	1.00	0.04
1.25	5,034	1.25	0.07
1.50	6,600	1.50	0.09
1.75	8,166	1.75	0.10
2.00	9,732	2.00	0.11
2.25	11,297	2.25	0.14
2.50	12,863	2.50	0.16
2.75	14,429	2.75	0.17
3.00	15,995	3.00	0.18
3.25	19,602	3.25	3.05
3.50	23,209	3.50	10.28
3.75	26,815	3.75	10.76
4.00	30,422	4.00	11.17
4.25	34,029	4.25	11.57
4.50	37,636	4.50	11.96
4.75	41,243	4.75	12.33
5.00	44,850	5.00	12.70
5.25	48,650	5.25	20.77
5.50	52,450	5.50	35.88
5.75	56,251	5.75	56.20
6.00	60,051	6.00	81.25
6.25	63,851	6.25	110.80
6.50	67,652	6.50	144.75
6.75	71,452	6.75	183.06
7.00	75,252	7.00	225.73

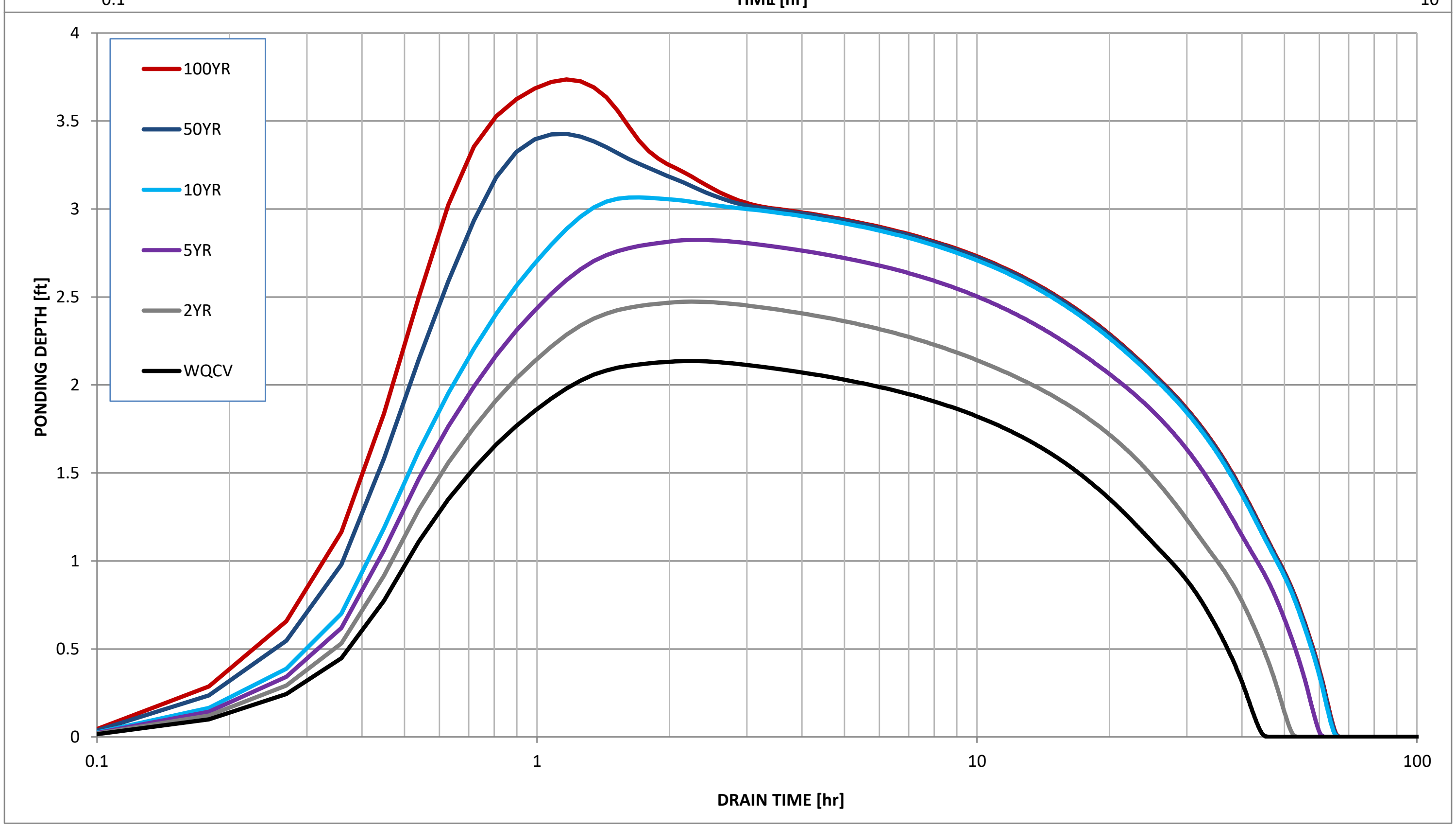
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
create a new stormwater facility, and
attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	1.19	1.50	1.75	2.25	2.52	in
Calculated Runoff Volume =	0.243	0.338	0.453	0.576	1.113	1.594	acre-ft
OPTIONAL Override Runoff Volume =							acre-ft
Inflow Hydrograph Volume =	0.243	0.338	0.452	0.575	1.113	1.594	acre-ft
Time to Drain 97% of Inflow Volume =	38.7	45.1	**51.9**	55.2	50.7	46.6	hours
Time to Drain 99% of Inflow Volume =	41.3	48.3	55.9	59.9	57.9	**56.2**	hours
Maximum Ponding Depth =	2.14	2.47	2.82	3.07	3.43	3.74	ft
Maximum Ponded Area =	0.24	0.29	0.34	0.39	0.51	**0.61**	acres
Maximum Volume Stored =	0.223	0.313	0.423	0.511	0.671	0.844	acre-ft

Stormwater Detention and Infiltration Design Data Sheet



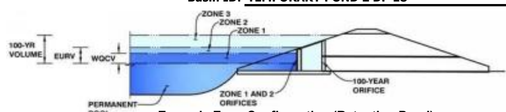


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **WATERBURY**

Basin ID: **TEMPORARY POND 2 DP 18**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**			
Watershed Area =	21.93	acres		
Watershed Length =	1,425	ft		
Watershed Length to Centroid =	650	ft		
Watershed Slope =	0.014	ft/ft		
Watershed Imperviousness =	24.48%	percent		
Percentage Hydrologic Soil Group A =	100.0%	percent		
Percentage Hydrologic Soil Group B =	0.0%	percent		
Percentage Hydrologic Soil Groups C/D =	0.0%	percent		
Target WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	User Input			

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.243	acre-feet	0.243	acre-feet
Excess Urban Runoff Volume (EURV) =	0.507	acre-feet	0.507	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.337	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.474	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.597	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.950	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.282	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.730	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3 in.) =	2.465	acre-feet	3.00	inches
Approximate 2-yr Detention Volume =	0.316	acre-feet		
Approximate 5-yr Detention Volume =	0.424	acre-feet		
Approximate 10-yr Detention Volume =	0.535	acre-feet		
Approximate 25-yr Detention Volume =	0.684	acre-feet		
Approximate 50-yr Detention Volume =	0.806	acre-feet		
Approximate 100-yr Detention Volume =	1.023	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.243	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.264	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.516	acre-feet
Total Detention Basin Volume =	1.023	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	100	0.002		
6899.25	--	0.25	--	--	--	942	0.022	130	0.003
6899.50	--	0.50	--	--	--	1,784	0.041	471	0.011
6899.75	--	0.75	--	--	--	2,626	0.060	1,022	0.023
6900.00	--	1.00	--	--	--	3,468	0.080	1,784	0.041
6900.25	--	1.25	--	--	--	5,034	0.116	2,847	0.065
6900.50	--	1.50	--	--	--	6,600	0.152	4,301	0.099
6900.75	--	1.75	--	--	--	8,166	0.187	6,147	0.141
6901.00	--	2.00	--	--	--	9,732	0.223	8,384	0.192
6901.25	--	2.25	--	--	--	11,297	0.259	11,013	0.253
6901.50	--	2.50	--	--	--	12,863	0.295	14,033	0.322
6901.75	--	2.75	--	--	--	14,429	0.331	17,444	0.400
6902.00	--	3.00	--	--	--	15,995	0.367	21,247	0.488
6902.25	--	3.25	--	--	--	19,602	0.450	25,697	0.590
6902.50	--	3.50	--	--	--	23,209	0.533	31,048	0.713
6902.75	--	3.75	--	--	--	26,815	0.616	37,301	0.856
6903.00	--	4.00	--	--	--	30,422	0.698	44,456	1.021
6903.25	--	4.25	--	--	--	34,029	0.781	52,512	1.206
6903.50	--	4.50	--	--	--	37,636	0.864	61,470	1.411
6903.75	--	4.75	--	--	--	41,243	0.947	71,330	1.638
6904.00	--	5.00	--	--	--	44,850	1.030	82,092	1.885
6904.25	--	5.25	--	--	--	48,650	1.117	93,779	2.153
6904.50	--	5.50	--	--	--	52,450	1.204	106,417	2.443
6904.75	--	5.75	--	--	--	56,251	1.291	120,004	2.755
6905.00	--	6.00	--	--	--	60,051	1.379	134,542	3.089
6905.25	--	6.25	--	--	--	63,851	1.466	150,030	3.444
6905.50	--	6.50	--	--	--	67,652	1.553	166,468	3.822
6905.75	--	6.75	--	--	--	71,452	1.640	183,856	4.221
6906.00	--	7.00	--	--	--	75,252	1.728	202,194	4.642
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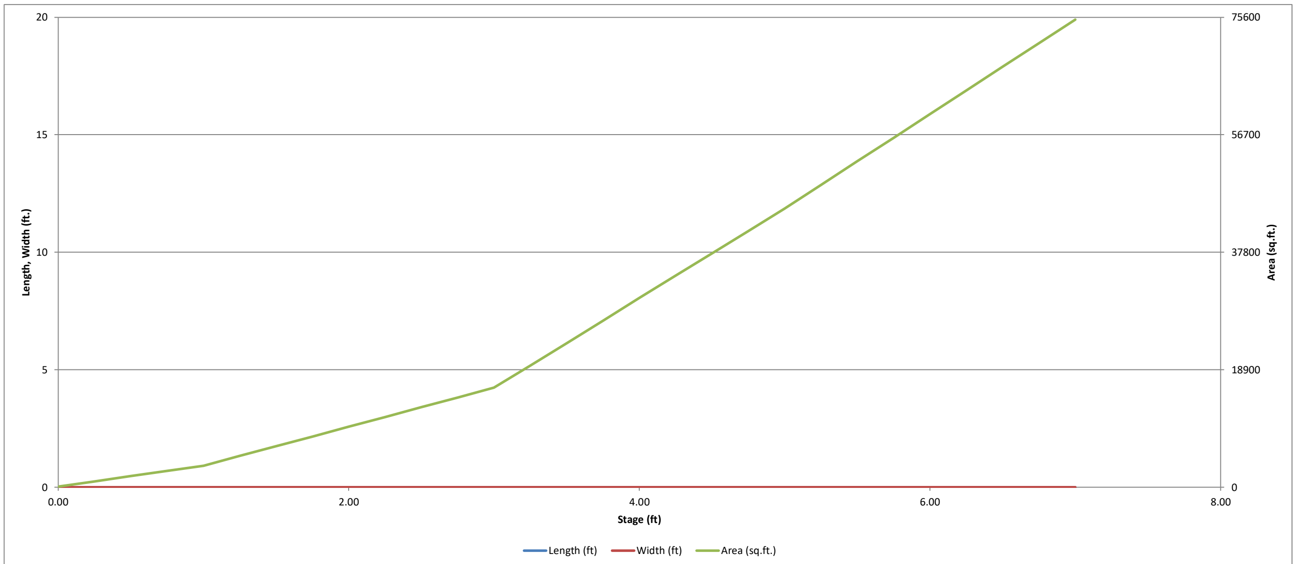
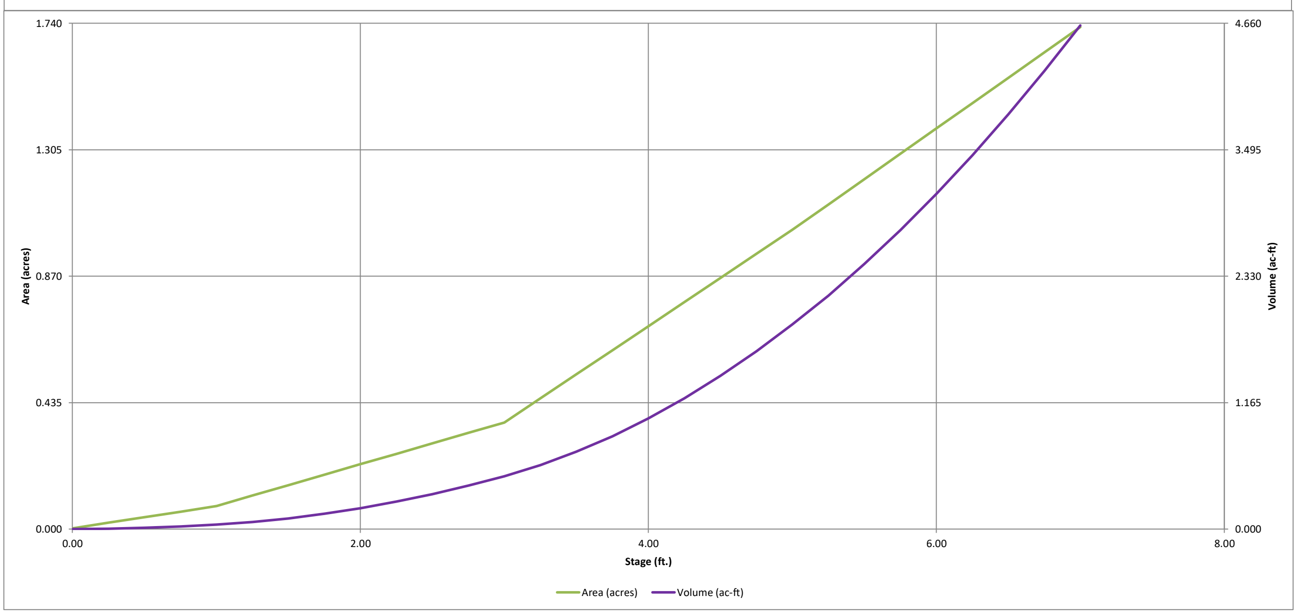
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

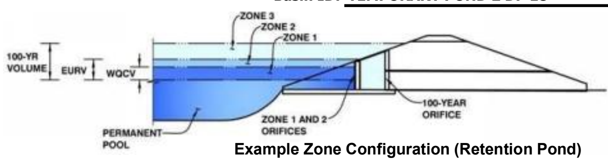




DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: WATERBURY
Basin ID: TEMPORARY POND 2 DP 18



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.22	0.243	Orifice Plate
Zone 2 (EURV)	3.06	0.264	Orifice Plate
Zone 3 (100-year)	4.01	0.516	Weir&Pipe (Restrict)
Total (all zones)		1.023	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.06	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	12.20	inches
Orifice Plate: Orifice Area per Row =	1.34	sq. inches (diameter = 1-5/16 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	9.306E-03	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.02	2.04					
Orifice Area (sq. inches)	1.34	1.34	1.34					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.06	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	3.06	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	8.95	N/A	
Overflow Grate Open Area w/o Debris =	11.20	N/A	ft^2
Overflow Grate Open Area w/ Debris =	5.60	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	12.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	1.25	N/A	ft^2
Outlet Orifice Centroid =	0.56	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.91	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	20.00	feet
Spillway End Slopes =	3.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.47	feet
Stage at Top of Freeboard =	6.47	feet
Basin Area at Top of Freeboard =	1.54	acres
Basin Volume at Top of Freeboard =	3.78	acre-ft

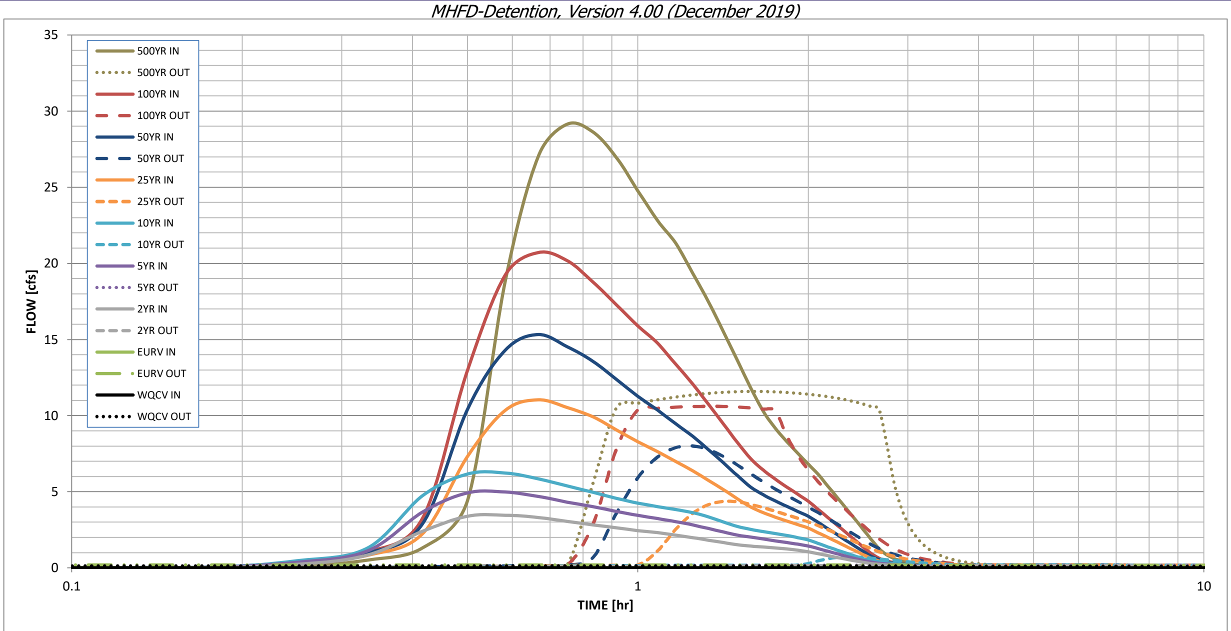
Routed Hydrograph Results

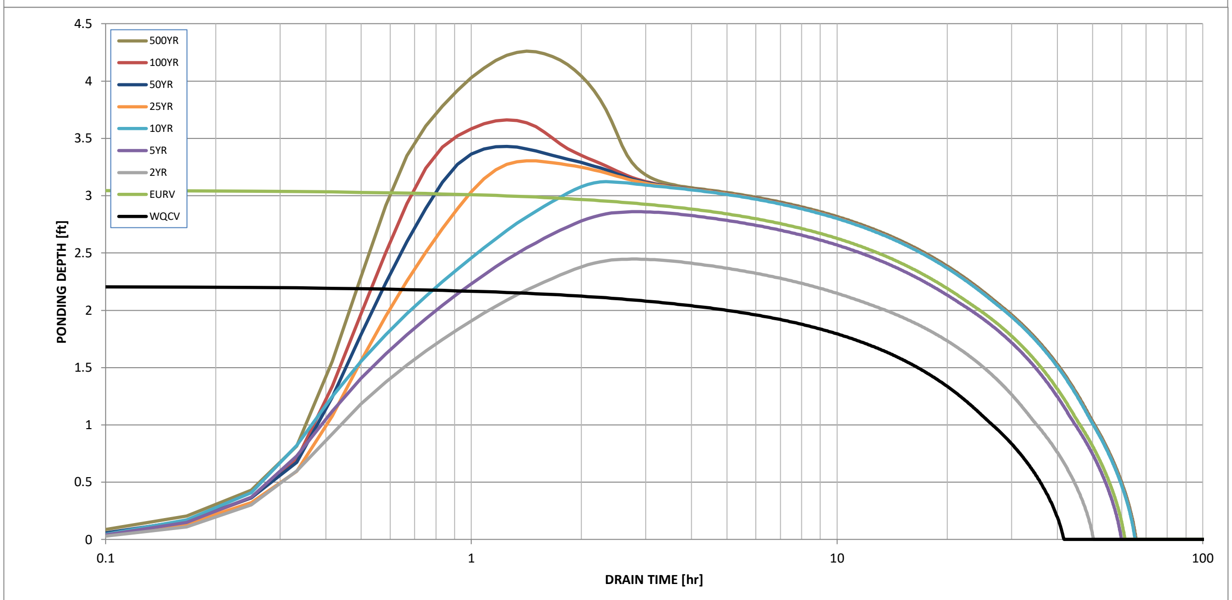
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

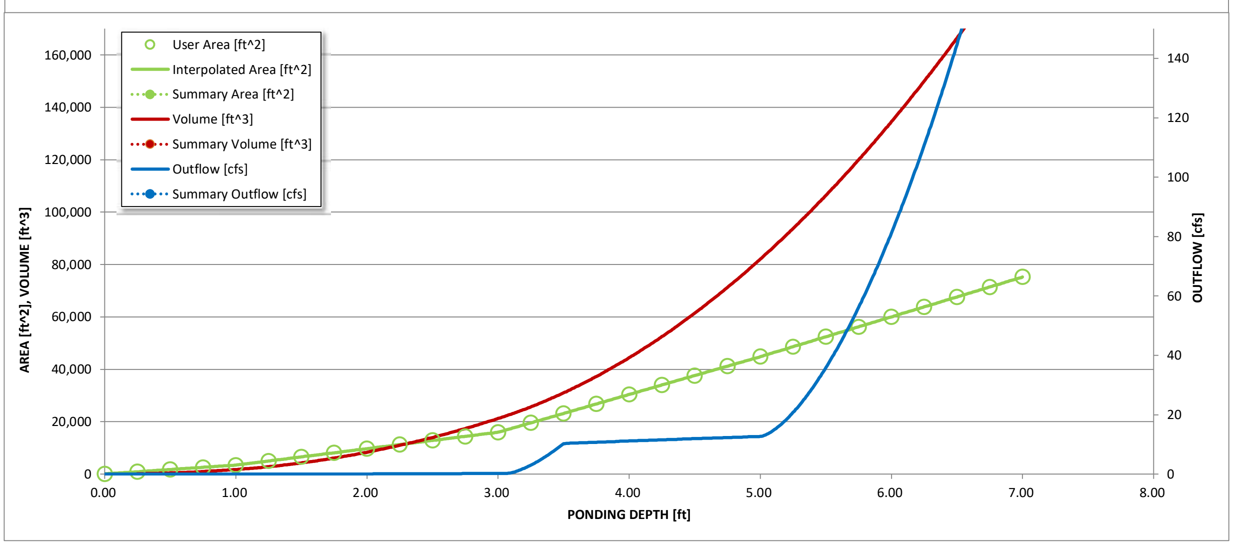
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.00
CUHP Runoff Volume (acre-ft) =	0.243	0.507	0.337	0.474	0.597	0.950	1.282	1.730	2.465
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.337	0.474	0.597	0.950	1.282	1.730	2.465
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.3	0.4	3.8	7.5	12.3	19.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.02	0.17	0.34	0.56	0.90
Peak Inflow Q (cfs) =	N/A	N/A	3.5	5.0	6.2	11.0	15.3	20.7	29.1
Peak Outflow Q (cfs) =	0.1	0.2	0.2	0.2	0.7	4.4	8.0	10.6	11.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	1.8	1.2	1.1	0.9	0.6
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.4	0.7	0.9	1.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	37	54	45	53	57	54	51	48	44
Time to Drain 99% of Inflow Volume (hours) =	**40**	58	48	57	62	60	59	58	55
Maximum Ponding Depth (ft) =	2.22	3.06	2.45	2.86	3.12	3.30	3.43	3.66	4.26
Area at Maximum Ponding Depth (acres) =	0.26	0.39	0.29	0.35	0.41	0.47	0.51	0.59	0.78
Maximum Volume Stored (acre-ft) =	0.245	0.510	0.305	0.438	0.534	0.613	0.676	0.802	1.213

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.07
	0:15:00	0.00	0.00	0.23	0.37	0.46	0.31	0.39	0.38	0.52
	0:20:00	0.00	0.00	0.84	1.11	1.31	0.83	0.98	1.04	1.30
	0:25:00	0.00	0.00	2.40	3.66	4.73	2.23	2.87	3.24	4.43
	0:30:00	0.00	0.00	3.39	4.93	6.16	7.31	10.41	12.98	18.83
	0:35:00	0.00	0.00	3.46	4.98	6.23	10.35	14.30	19.23	27.02
	0:40:00	0.00	0.00	3.31	4.69	5.84	11.03	15.32	20.71	29.15
	0:45:00	0.00	0.00	3.05	4.32	5.38	10.53	14.52	20.18	28.63
	0:50:00	0.00	0.00	2.83	4.01	4.96	9.92	13.57	18.78	26.96
	0:55:00	0.00	0.00	2.62	3.70	4.57	9.06	12.38	17.28	24.77
	1:00:00	0.00	0.00	2.45	3.44	4.25	8.29	11.28	15.90	22.82
	1:05:00	0.00	0.00	2.31	3.23	4.02	7.63	10.36	14.76	21.32
	1:10:00	0.00	0.00	2.15	3.04	3.82	6.98	9.46	13.37	19.35
	1:15:00	0.00	0.00	1.98	2.82	3.63	6.37	8.64	12.07	17.47
	1:20:00	0.00	0.00	1.82	2.58	3.34	5.74	7.76	10.73	15.50
	1:25:00	0.00	0.00	1.66	2.35	3.01	5.14	6.90	9.45	13.61
	1:30:00	0.00	0.00	1.52	2.14	2.72	4.53	6.05	8.23	11.81
	1:35:00	0.00	0.00	1.42	2.02	2.53	4.00	5.30	7.16	10.27
	1:40:00	0.00	0.00	1.36	1.89	2.38	3.62	4.79	6.40	9.17
	1:45:00	0.00	0.00	1.30	1.77	2.25	3.33	4.39	5.82	8.29
	1:50:00	0.00	0.00	1.25	1.66	2.12	3.08	4.04	5.31	7.52
	1:55:00	0.00	0.00	1.15	1.55	1.99	2.84	3.71	4.83	6.81
	2:00:00	0.00	0.00	1.06	1.44	1.83	2.61	3.39	4.38	6.14
	2:05:00	0.00	0.00	0.93	1.26	1.60	2.30	2.98	3.84	5.37
	2:10:00	0.00	0.00	0.80	1.09	1.38	2.00	2.57	3.31	4.63
	2:15:00	0.00	0.00	0.68	0.92	1.16	1.70	2.18	2.81	3.91
	2:20:00	0.00	0.00	0.57	0.76	0.96	1.41	1.80	2.31	3.21
	2:25:00	0.00	0.00	0.46	0.62	0.78	1.14	1.44	1.83	2.54
	2:30:00	0.00	0.00	0.36	0.48	0.61	0.87	1.09	1.37	1.88
	2:35:00	0.00	0.00	0.28	0.37	0.48	0.64	0.77	0.94	1.27
	2:40:00	0.00	0.00	0.23	0.30	0.39	0.45	0.54	0.64	0.86
	2:45:00	0.00	0.00	0.19	0.26	0.33	0.34	0.40	0.46	0.62
	2:50:00	0.00	0.00	0.16	0.21	0.28	0.27	0.32	0.35	0.46
	2:55:00	0.00	0.00	0.14	0.18	0.23	0.22	0.25	0.26	0.34
	3:00:00	0.00	0.00	0.11	0.15	0.19	0.17	0.20	0.20	0.26
	3:05:00	0.00	0.00	0.10	0.12	0.16	0.14	0.16	0.16	0.19
	3:10:00	0.00	0.00	0.08	0.10	0.13	0.12	0.13	0.12	0.15
	3:15:00	0.00	0.00	0.07	0.08	0.11	0.09	0.11	0.10	0.12
	3:20:00	0.00	0.00	0.05	0.07	0.08	0.08	0.09	0.08	0.09
	3:25:00	0.00	0.00	0.04	0.05	0.07	0.06	0.07	0.06	0.07
	3:30:00	0.00	0.00	0.03	0.04	0.05	0.05	0.05	0.05	0.06
	3:35:00	0.00	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.04
	3:40:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.03
	3:45:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02
	3:50:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:55:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
	0.00	100	0.002	0	0.000	0.00
	0.25	942	0.022	130	0.003	0.02
	0.50	1,784	0.041	471	0.011	0.03
	0.75	2,626	0.060	1,022	0.023	0.04
	1.00	3,468	0.080	1,784	0.041	0.04
	1.25	5,034	0.116	2,847	0.065	0.07
	1.50	6,600	0.152	4,301	0.099	0.09
	1.75	8,166	0.187	6,147	0.141	0.10
	2.00	9,732	0.223	8,384	0.192	0.11
	2.25	11,297	0.259	11,013	0.253	0.14
	2.50	12,863	0.295	14,033	0.322	0.16
	2.75	14,429	0.331	17,444	0.400	0.17
	3.00	15,995	0.367	21,247	0.488	0.18
	3.25	19,602	0.450	25,697	0.590	3.05
	3.50	23,209	0.533	31,048	0.713	10.28
	3.75	26,815	0.616	37,301	0.856	10.76
	4.00	30,422	0.698	44,456	1.021	11.17
	4.25	34,029	0.781	52,512	1.206	11.57
	4.50	37,636	0.864	61,470	1.411	11.96
	4.75	41,243	0.947	71,330	1.638	12.33
	5.00	44,850	1.030	82,092	1.885	12.70
	5.25	48,650	1.117	93,779	2.153	20.77
	5.50	52,450	1.204	106,417	2.443	35.88
	5.75	56,251	1.291	120,004	2.755	56.20
	6.00	60,051	1.379	134,542	3.089	81.25
	6.25	63,851	1.466	150,030	3.444	110.80
	6.50	67,652	1.553	166,468	3.822	144.75
	6.75	71,452	1.640	183,856	4.221	183.06
	7.00	75,252	1.728	202,194	4.642	225.73

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator
LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

Designer:	QNA
Company:	Terra Nova Engineering
Date:	December 17, 2020
Project:	WATERBURY FILING 1 POND 2
Location:	POND 3 Design Point 29 Full Spectrum Detention 76.61 Acres

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.43	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event		
Max Intensity for Optional User Defined Storm	0		

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	**DP 9 FSD**													
Receiving Pervious Area Soil Type	Loamy Sand													
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	84.64													
Directly Connected Impervious Area (DCIA, acres)	11.30													
Unconnected Impervious Area (UIA, acres)	22.09													
Receiving Pervious Area (RPA, acres)	47.10													
Separate Pervious Area (SPA, acres)	4.16													
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C													

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	84.645													
Directly Connected Impervious Area (DCIA, %)	13.3%													
Unconnected Impervious Area (UIA, %)	26.1%													
Receiving Pervious Area (RPA, %)	55.6%													
Separate Pervious Area (SPA, %)	4.9%													
A_R (RPA / UIA)	2.132													
I_a Check	0.320													
f / I for WQCV Event:	4.5													
f / I for 5-Year Event:	0.5													
f / I for 100-Year Event:	0.4													
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	0.50													
IRF for 5-Year Event:	0.86													
IRF for 100-Year Event:	0.88													
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	39.4%													
Effective Imperviousness for WQCV Event:	26.5%													
Effective Imperviousness for 5-Year Event:	35.8%													
Effective Imperviousness for 100-Year Event:	36.4%													
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	21.5%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	7.7%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	**39.4%**
Total Site Effective Imperviousness for WQCV Event:	**26.5%**
Total Site Effective Imperviousness for 5-Year Event:	**35.8%**
Total Site Effective Imperviousness for 100-Year Event:	**36.4%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.

** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected Worksheet Protected

Stormwater Facility Name: **Waterbury Filing No. 1 & 2 EDB Pond 3 DP 29**

Facility Location & Jurisdiction: **Stapleton Dr. & Bandernero Dr Intersection**

User Input: Watershed Characteristics

Watershed Slope =	0.022	ft/ft
Watershed Length =	2265	ft
Watershed Area =	84.64	acres
Watershed Imperviousness =	36.4%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent

Location for 1-hr Rainfall Depths (use dropdown):

User Input

WQCV Treatment Method = *Extended Detention*

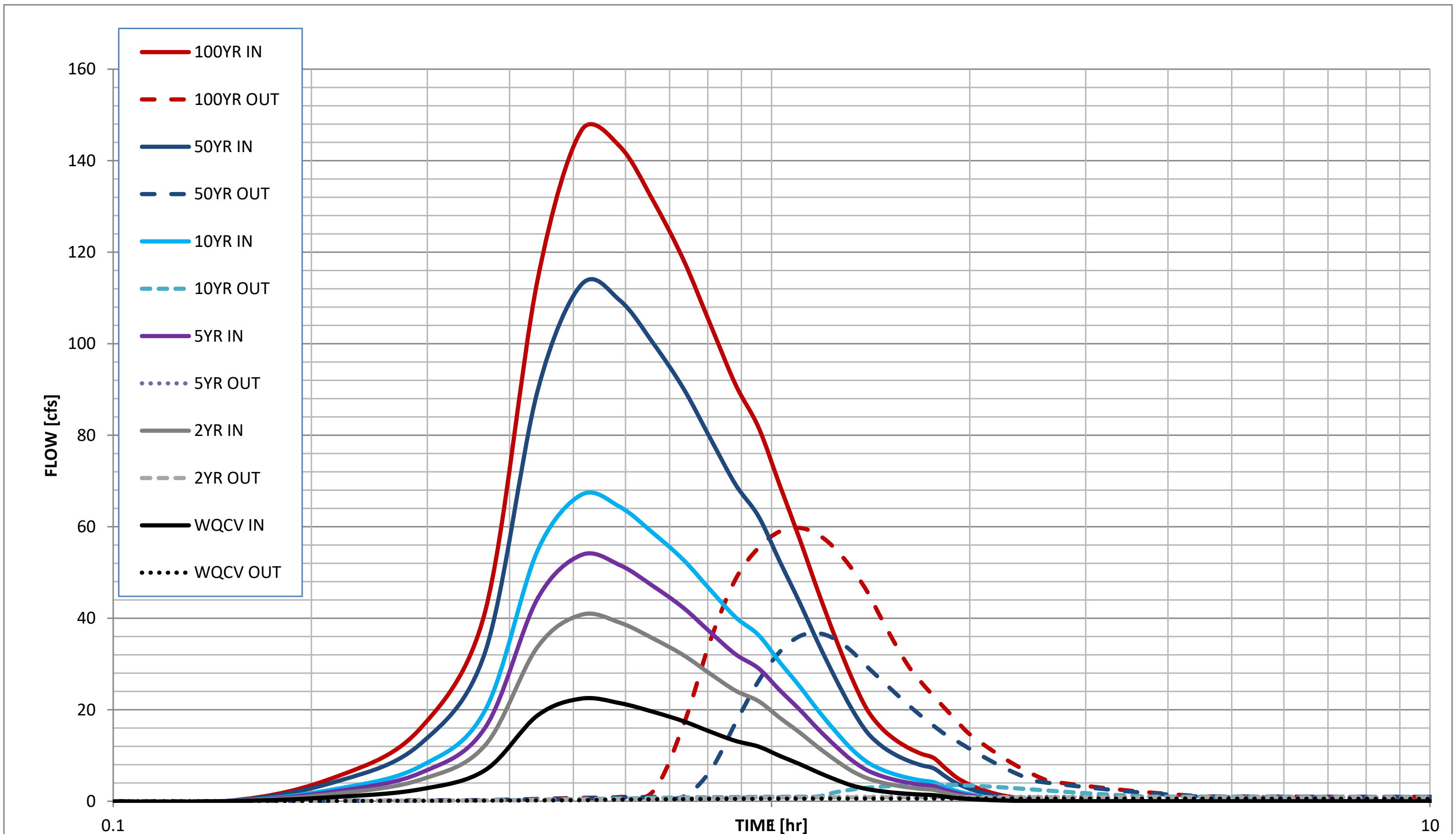
User Defined Stage [ft]	User Defined Area [ft^2]	User Defined Stage [ft]	User Defined Discharge [cfs]
0.00	100	0.00	0.00
0.25	2,785	0.25	0.10
0.50	5,470	0.50	0.14
0.75	8,155	0.75	0.18
1.00	10,840	1.00	0.20
1.25	13,525	1.25	0.23
1.50	16,210	1.50	0.25
1.75	18,895	1.75	0.37
2.00	21,580	2.00	0.43
2.25	26,334	2.25	0.48
2.50	31,088	2.50	0.53
2.75	35,842	2.75	0.57
3.00	40,596	3.00	0.60
3.25	45,530	3.25	0.73
3.50	50,105	3.50	0.81
3.75	54,895	3.75	0.87
4.00	59,613	4.00	0.93
4.25	62,301	4.25	0.98
4.50	64,989	4.50	1.03
4.75	67,677	4.75	4.39
5.00	70,365	5.00	14.71
5.25	73,504	5.25	28.91
5.50	75,742	5.50	46.13
5.75	78,430	5.75	60.71
6.00	81,118	6.00	62.35
6.25	82,113	6.25	74.47
6.50	83,503	6.50	111.77
6.75	84,696	6.75	163.81
7.00	85,888	7.00	227.74
7.25	87,081	7.25	302.17
7.50	88,274	7.50	386.27
7.75	89,466	7.75	479.48
8.00	90,659	8.00	581.41

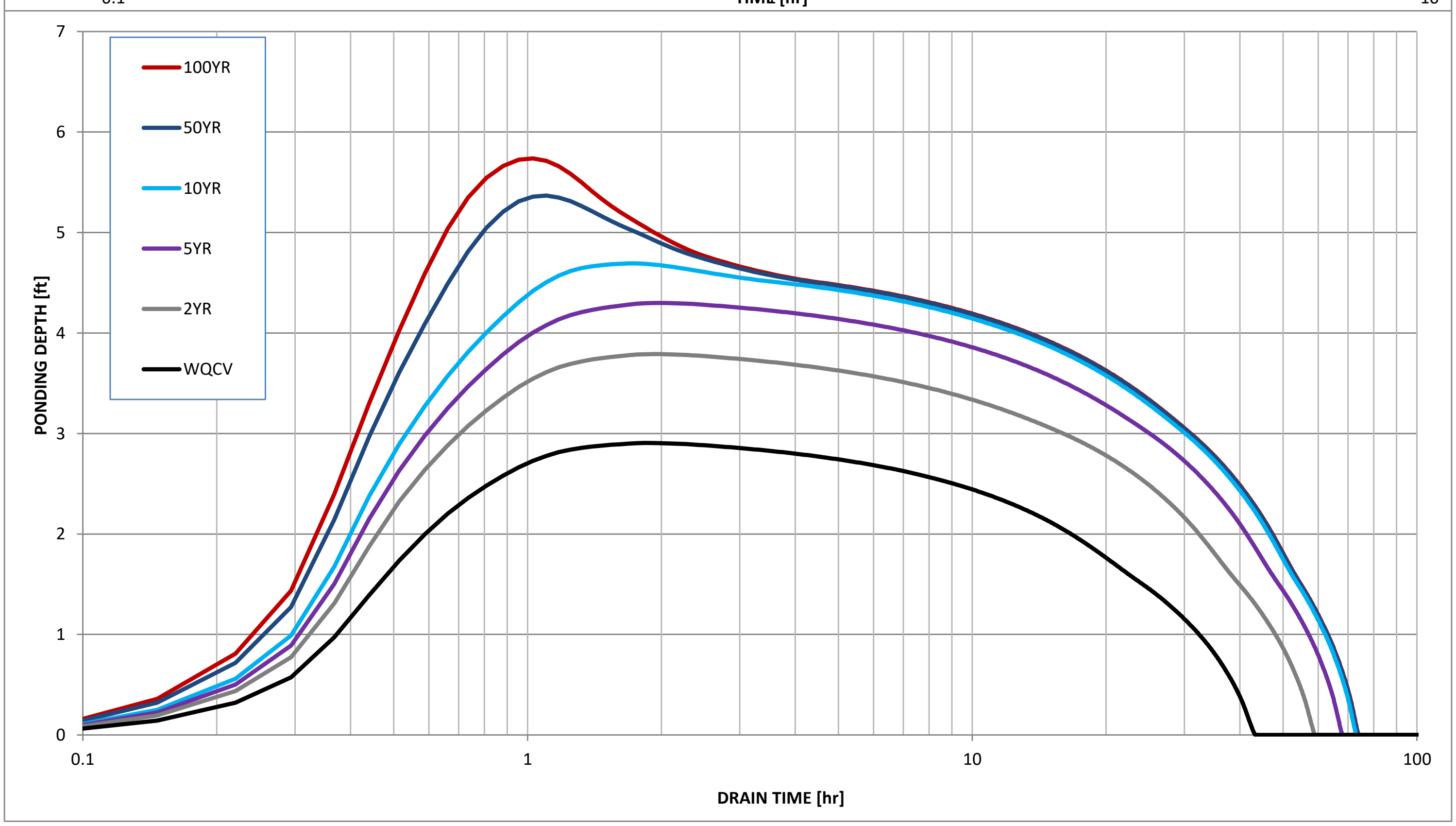
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
create a new stormwater facility, and
attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	1.19	1.50	1.75	2.25	2.52	in
Calculated Runoff Volume =	1.201	2.198	2.914	3.638	6.209	8.116	acre-ft
OPTIONAL Override Runoff Volume =							acre-ft
Inflow Hydrograph Volume =	1.200	2.197	2.913	3.638	6.202	8.109	acre-ft
Time to Drain 97% of Inflow Volume =	38.4	51.9	**59.5**	63.2	59.5	56.7	hours
Time to Drain 99% of Inflow Volume =	40.7	55.4	63.8	68.2	67.0	**65.8**	hours
Maximum Ponding Depth =	2.91	3.79	4.30	4.69	5.37	5.74	ft
Maximum Ponded Area =	0.89	1.27	1.44	1.54	1.71	**1.80**	acres
Maximum Volume Stored =	1.118	2.078	2.770	3.359	4.457	5.103	acre-ft

Stormwater Detention and Infiltration Design Data Sheet



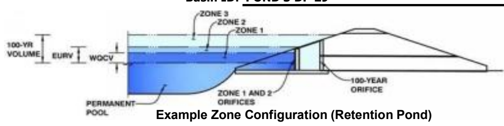


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **WATERBURY**

Basin ID: **POND 3 DP 29**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**			
Watershed Area =	84.64	acres		
Watershed Length =	2,265	ft		
Watershed Length to Centroid =	850	ft		
Watershed Slope =	0.022	ft/ft		
Watershed Imperviousness =	36.43%	percent		
Percentage Hydrologic Soil Group A =	100.0%	percent		
Percentage Hydrologic Soil Group B =	0.0%	percent		
Percentage Hydrologic Soil Groups C/D =	0.0%	percent		
Target WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	User Input			

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.200	acre-feet	1.200	acre-feet
Excess Urban Runoff Volume (EURV) =	3.200	acre-feet	3.200	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.401	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	3.254	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	3.937	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	5.380	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	6.757	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	8.574	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3 in.) =	11.535	acre-feet	3.00	inches
Approximate 2-yr Detention Volume =	2.064	acre-feet		
Approximate 5-yr Detention Volume =	2.739	acre-feet		
Approximate 10-yr Detention Volume =	3.392	acre-feet		
Approximate 25-yr Detention Volume =	4.234	acre-feet		
Approximate 50-yr Detention Volume =	4.820	acre-feet		
Approximate 100-yr Detention Volume =	5.678	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.200	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.000	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.478	acre-feet
Total Detention Basin Volume =	5.678	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	100	0.002		
6922.25	--	0.25	--	--	--	2,785	0.064	360	0.008
6922.50	--	0.50	--	--	--	5,470	0.126	1,392	0.032
6922.75	--	0.75	--	--	--	8,155	0.187	3,095	0.071
6923.00	--	1.00	--	--	--	10,840	0.249	5,470	0.126
6923.25	--	1.25	--	--	--	13,525	0.310	8,515	0.195
6923.50	--	1.50	--	--	--	16,210	0.372	12,232	0.281
6923.75	--	1.75	--	--	--	18,895	0.434	16,620	0.382
6924.00	--	2.00	--	--	--	21,580	0.495	21,680	0.498
6924.25	--	2.25	--	--	--	26,334	0.605	27,669	0.635
6924.50	--	2.50	--	--	--	31,088	0.714	34,847	0.800
6924.75	--	2.75	--	--	--	35,842	0.823	43,213	0.992
6925.00	--	3.00	--	--	--	40,596	0.932	52,768	1.211
6925.25	--	3.25	--	--	--	45,530	1.045	63,533	1.459
6925.50	--	3.50	--	--	--	50,105	1.150	75,488	1.733
6925.75	--	3.75	--	--	--	54,895	1.260	88,613	2.034
6926.00	--	4.00	--	--	--	59,613	1.369	102,926	2.363
6926.25	--	4.25	--	--	--	62,301	1.430	118,166	2.713
6926.50	--	4.50	--	--	--	64,989	1.492	134,077	3.078
6926.75	--	4.75	--	--	--	67,677	1.554	150,660	3.459
6927.00	--	5.00	--	--	--	70,365	1.615	167,915	3.855
6927.25	--	5.25	--	--	--	73,504	1.687	185,899	4.268
6927.50	--	5.50	--	--	--	75,742	1.739	204,555	4.696
6927.75	--	5.75	--	--	--	78,430	1.801	223,826	5.138
6928.00	--	6.00	--	--	--	81,118	1.862	243,770	5.596
6928.25	--	6.25	--	--	--	82,113	1.885	264,174	6.065
6928.50	--	6.50	--	--	--	83,503	1.917	284,876	6.540
6928.75	--	6.75	--	--	--	84,696	1.944	305,900	7.023
6929.00	--	7.00	--	--	--	85,888	1.972	327,223	7.512
6929.25	--	7.25	--	--	--	87,081	1.999	348,845	8.008
6929.50	--	7.50	--	--	--	88,274	2.026	370,764	8.512
6929.75	--	7.75	--	--	--	89,466	2.054	392,981	9.022
6930.00	--	8.00	--	--	--	90,659	2.081	415,497	9.538
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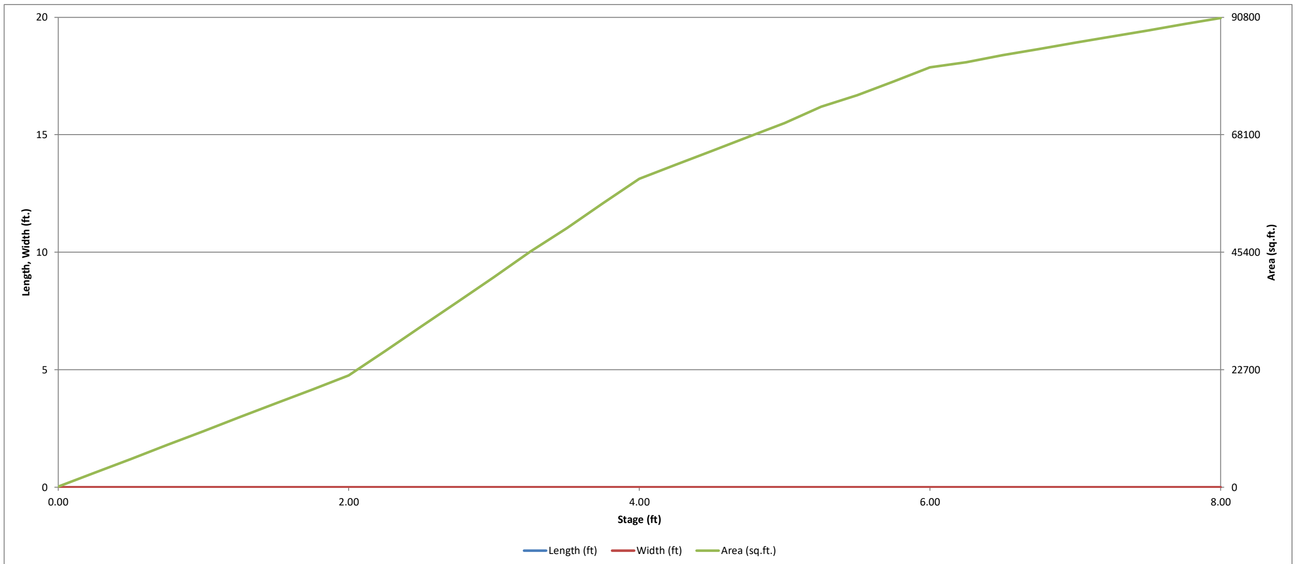
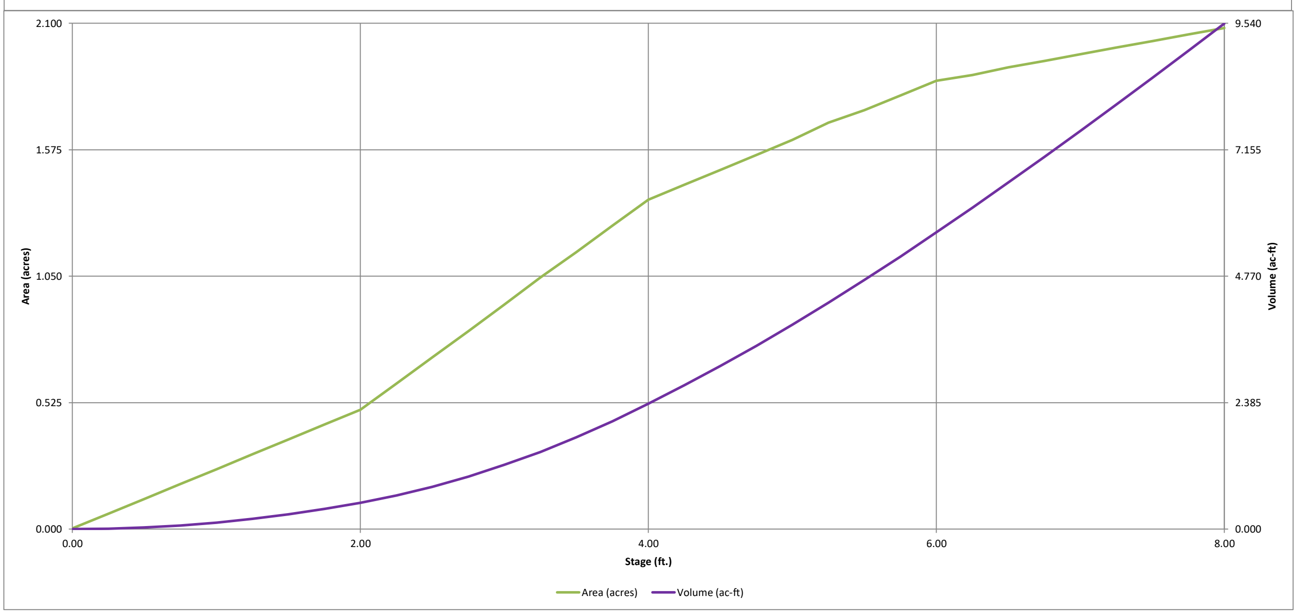
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

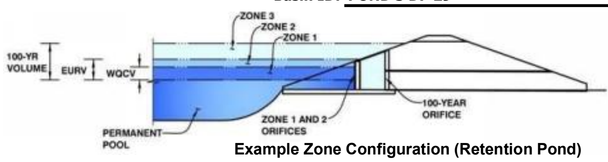




DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: **WATERBURY**
Basin ID: **POND 3 DP 29**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.99	1.200	Orifice Plate
Zone 2 (EURV)	4.59	2.000	Orifice Plate
Zone 3 (100-year)	6.05	2.478	Weir&Pipe (Restrict)
Total (all zones)		5.678	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Calculated Parameters for Plate

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	4.229E-02	ft^2
Depth at top of Zone using Orifice Plate =	4.59	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	18.30	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	6.09	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.53	3.06					
Orifice Area (sq. inches)	6.09	6.09	6.09					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.59	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.59	N/A	feet
Overflow Weir Front Edge Length =	6.00		feet	Overflow Weir Slope Length =	6.00		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	4.27	N/A	
Horiz. Length of Weir Sides =	6.00		feet	Overflow Grate Open Area w/o Debris =	25.20	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	12.60	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.10	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	5.90	N/A	ft^2
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	1.28	N/A	feet
Restrictor Plate Height Above Pipe Invert =	28.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.16	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage=	6.10	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.88	feet
Spillway Crest Length =	60.00	feet	Stage at Top of Freeboard =	7.98	feet
Spillway End Slopes =	3.00	H:V	Basin Area at Top of Freeboard =	2.08	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	9.48	acre-ft

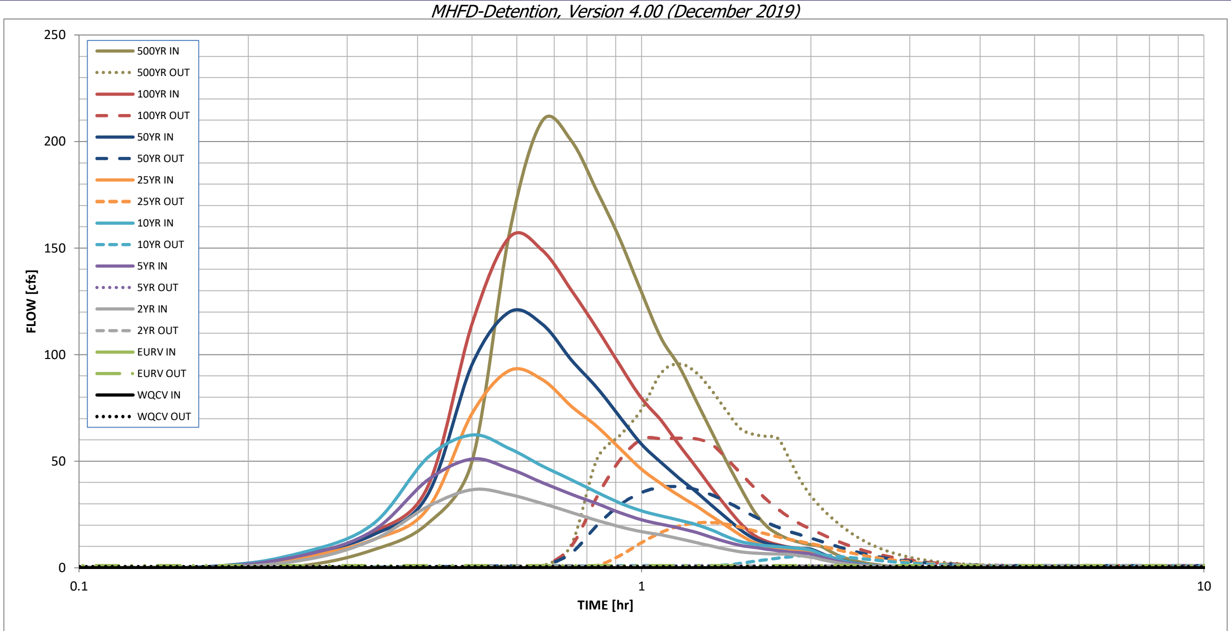
Routed Hydrograph Results

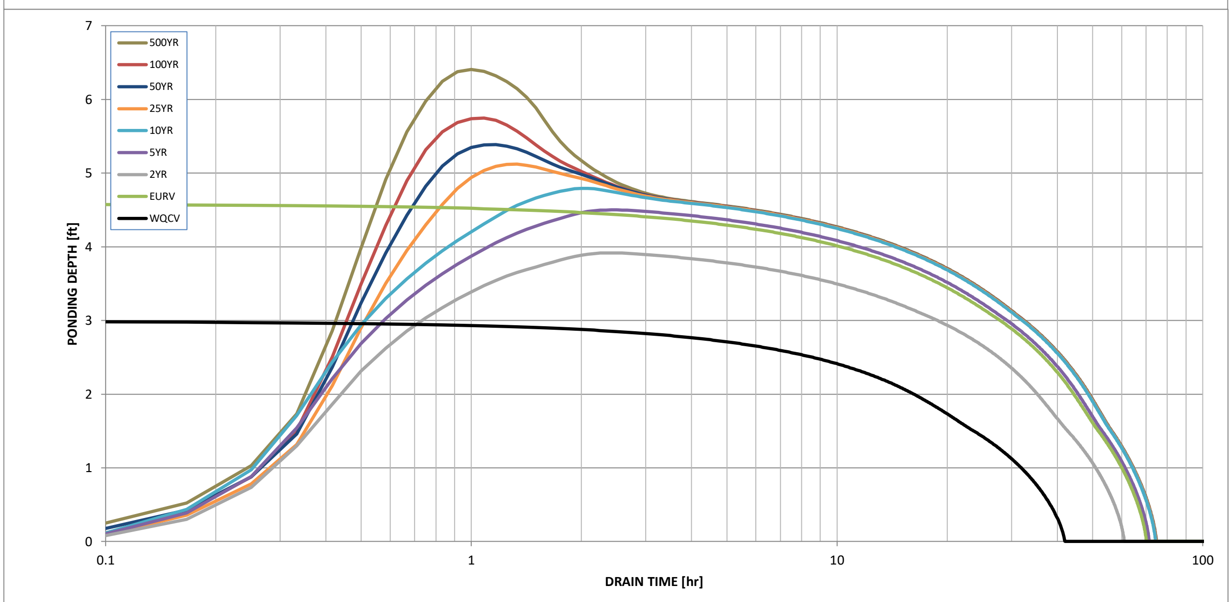
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

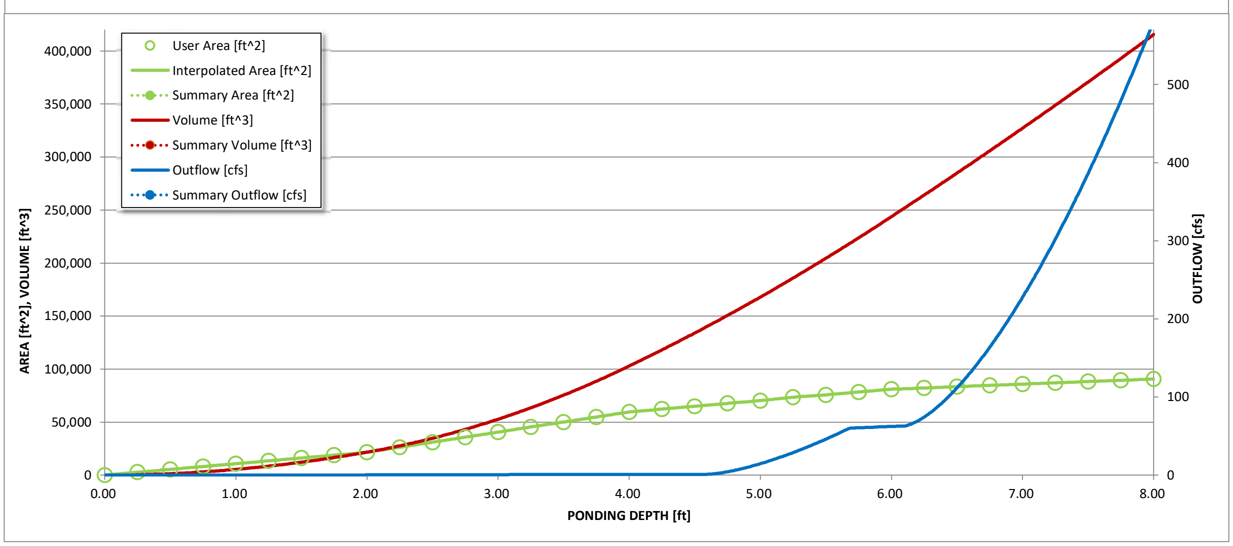
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.00
CUHP Runoff Volume (acre-ft) =	1.200	3.200	2.401	3.254	3.937	5.380	6.757	8.574	11.535
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.401	3.254	3.937	5.380	6.757	8.574	11.535
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	1.6	2.2	20.4	40.5	66.1	105.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.24	0.48	0.78	1.24
Peak Inflow Q (cfs) =	N/A	N/A	36.6	51.0	62.3	92.6	120.2	155.2	209.7
Peak Outflow Q (cfs) =	0.6	1.0	0.9	1.0	5.9	21.2	38.0	60.7	95.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	2.7	1.0	0.9	0.9	0.9
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.2	0.8	1.5	2.4	2.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	62	54	63	65	62	60	58	54
Time to Drain 99% of Inflow Volume (hours) =	**40**	67	58	68	70	69	68	67	65
Maximum Ponding Depth (ft) =	2.99	4.59	3.92	4.50	4.79	5.12	5.39	5.75	6.41
Area at Maximum Ponding Depth (acres) =	0.93	1.51	1.33	1.49	1.56	1.65	1.71	1.80	1.90
Maximum Volume Stored (acre-ft) =	1.202	3.213	2.241	3.078	3.521	4.051	4.489	5.120	6.349

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.04	1.05
	0:15:00	0.00	0.00	3.55	5.78	7.24	4.91	6.22	6.07	8.29
	0:20:00	0.00	0.00	13.09	17.30	20.59	13.13	15.43	16.56	20.61
	0:25:00	0.00	0.00	28.60	41.05	51.54	27.53	34.09	37.78	49.74
	0:30:00	0.00	0.00	36.65	50.97	62.26	72.28	95.24	114.32	157.82
	0:35:00	0.00	0.00	34.27	46.36	55.82	92.56	120.16	155.22	209.74
	0:40:00	0.00	0.00	30.17	39.93	47.69	88.20	114.24	148.92	200.51
	0:45:00	0.00	0.00	25.93	34.55	41.27	75.86	97.58	130.36	176.82
	0:50:00	0.00	0.00	22.25	30.08	35.45	66.28	84.50	112.23	153.86
	0:55:00	0.00	0.00	19.19	25.80	30.31	55.81	70.56	94.82	129.20
	1:00:00	0.00	0.00	16.92	22.52	26.70	46.18	57.98	79.53	107.82
	1:05:00	0.00	0.00	15.39	20.38	24.34	39.43	49.42	69.13	94.60
	1:10:00	0.00	0.00	13.57	18.64	22.31	33.85	42.05	57.65	78.56
	1:15:00	0.00	0.00	11.79	16.56	20.30	29.04	35.64	47.27	63.76
	1:20:00	0.00	0.00	10.14	14.22	17.65	24.11	29.23	37.40	49.89
	1:25:00	0.00	0.00	8.65	12.13	14.65	19.63	23.40	28.58	37.60
	1:30:00	0.00	0.00	7.48	10.46	12.26	15.30	17.82	20.87	26.87
	1:35:00	0.00	0.00	6.84	9.63	11.04	11.93	13.70	15.36	19.61
	1:40:00	0.00	0.00	6.57	8.73	10.33	10.10	11.53	12.39	15.70
	1:45:00	0.00	0.00	6.41	7.95	9.82	9.08	10.31	10.71	13.33
	1:50:00	0.00	0.00	6.31	7.39	9.46	8.44	9.54	9.62	11.79
	1:55:00	0.00	0.00	5.64	6.96	9.02	8.00	9.02	8.88	10.76
	2:00:00	0.00	0.00	4.98	6.48	8.28	7.72	8.69	8.35	10.02
	2:05:00	0.00	0.00	3.90	5.10	6.48	6.08	6.81	6.43	7.64
	2:10:00	0.00	0.00	2.93	3.81	4.82	4.49	5.01	4.69	5.55
	2:15:00	0.00	0.00	2.20	2.85	3.58	3.33	3.72	3.47	4.09
	2:20:00	0.00	0.00	1.64	2.12	2.64	2.47	2.75	2.58	3.04
	2:25:00	0.00	0.00	1.21	1.55	1.93	1.80	2.00	1.88	2.20
	2:30:00	0.00	0.00	0.87	1.10	1.39	1.29	1.42	1.35	1.57
	2:35:00	0.00	0.00	0.62	0.78	1.00	0.93	1.03	0.97	1.13
	2:40:00	0.00	0.00	0.42	0.54	0.69	0.65	0.72	0.67	0.78
	2:45:00	0.00	0.00	0.26	0.36	0.44	0.43	0.46	0.43	0.49
	2:50:00	0.00	0.00	0.14	0.21	0.25	0.25	0.26	0.24	0.27
	2:55:00	0.00	0.00	0.06	0.10	0.11	0.12	0.12	0.11	0.11
	3:00:00	0.00	0.00	0.02	0.03	0.03	0.03	0.03	0.03	0.02
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
	0.00	100	0.002	0	0.000	0.00
	0.25	2,785	0.064	360	0.008	0.10
	0.50	5,470	0.126	1,392	0.032	0.14
	0.75	8,155	0.187	3,095	0.071	0.18
	1.00	10,840	0.249	5,470	0.126	0.20
	1.25	13,525	0.310	8,515	0.195	0.23
	1.50	16,210	0.372	12,232	0.281	0.25
	1.75	18,895	0.434	16,620	0.382	0.37
	2.00	21,580	0.495	21,680	0.498	0.43
	2.25	26,334	0.605	27,669	0.635	0.48
	2.50	31,088	0.714	34,847	0.800	0.53
	2.75	35,842	0.823	43,213	0.992	0.57
	3.00	40,596	0.932	52,768	1.211	0.60
	3.25	45,530	1.045	63,533	1.459	0.73
	3.50	50,105	1.150	75,488	1.733	0.81
	3.75	54,895	1.260	88,613	2.034	0.87
	4.00	59,613	1.369	102,926	2.363	0.93
	4.25	62,301	1.430	118,166	2.713	0.98
	4.50	64,989	1.492	134,077	3.078	1.03
	4.75	67,677	1.554	150,660	3.459	4.39
	5.00	70,365	1.615	167,915	3.855	14.71
	5.25	73,504	1.687	185,899	4.268	28.91
	5.50	75,742	1.739	204,555	4.696	46.13
	5.75	78,430	1.801	223,826	5.138	60.71
	6.00	81,118	1.862	243,770	5.596	62.35
	6.25	82,113	1.885	264,174	6.065	74.47
	6.50	83,503	1.917	284,876	6.540	111.77
	6.75	84,696	1.944	305,900	7.023	163.81
	7.00	85,888	1.972	327,223	7.512	227.74
	7.25	87,081	1.999	348,845	8.008	302.17
	7.50	88,274	2.026	370,764	8.512	386.27
	7.75	89,466	2.054	392,981	9.022	479.48
	8.00	90,659	2.081	415,497	9.538	581.41

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

HEC-RAS ANALYSIS

Project Summary	
Title	Waterbury Phase 1 - Drainage Report
Engineer	MAW
Company	CCES
Date	7/6/2016

Notes	2 year SCS Model

Table of Contents

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
4 WAY BASINS D, E, N, Q, (50%)O	Post-Development 2 YEAR	2	0.630	6.150	5.45
4-WAY BASINS F, G, K, M	Post-Development 2 YEAR	2	0.363	6.150	1.91
4-WAY BASINS H, I, J, L, R, S	Post-Development 2 YEAR	2	0.555	6.100	3.57
A BASINS	Post-Development 2 YEAR	2	0.711	6.100	9.78
BASIN OS5, I, N	Post-Development 2 YEAR	2	0.293	6.150	2.51
Basin J OS-6	Post-Development 2 YEAR	2	0.064	6.050	0.89
FG08	Post-Development 2 YEAR	2	3.709	6.150	39.20
FG09	Post-Development 2 YEAR	2	0.967	6.100	13.67
FG10	Post-Development 2 YEAR	2	0.895	6.100	12.21
FG11	Post-Development 2 YEAR	2	1.613	6.050	26.19
FG12	Post-Development 2 YEAR	2	1.123	6.050	16.95
FG13	Post-Development 2 YEAR	2	1.031	6.200	9.50
FG14	Post-Development 2 YEAR	2	1.182	6.150	12.59
FG25	Post-Development 2 YEAR	2	1.296	6.150	15.65
FG26	Post-Development 2 YEAR	2	1.709	6.150	18.55
FG27	Post-Development 2 YEAR	2	1.975	6.050	30.23
FG28	Post-Development 2 YEAR	2	2.698	6.150	32.37
FG32	Post-Development 2 YEAR	2	3.308	6.100	43.12
FG33	Post-Development 2 YEAR	2	4.279	6.050	74.56

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
4 WAY RELEASE	Post-Development 2 YEAR	2	17.203	8.150	19.20
G17	Post-Development 2 YEAR	2	7.278	6.150	17.25

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
G18	Post-Development 2 YEAR	2	10.962	6.100	63.23

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
EXIST. STOCK POND (IN)	Post-Development 2 YEAR	2	18.392	8.100	19.22	(N/A)	(N/A)
EXIST. STOCK POND (OUT)	Post-Development 2 YEAR	2	17.203	8.150	19.20	6,907.13	1.237
INLINE POND 1 (IN)	Post-Development 2 YEAR	2	16.493	8.100	17.68	(N/A)	(N/A)
INLINE POND 1 (OUT)	Post-Development 2 YEAR	2	16.493	8.150	17.67	6,937.09	0.025
POND D (IN)	Post-Development 2 YEAR	2	10.520	6.100	124.02	(N/A)	(N/A)
POND D (OUT)	Post-Development 2 YEAR	2	5.982	10.200	5.11	7,053.21	5.538
POND E (IN)	Post-Development 2 YEAR	2	21.187	6.050	174.97	(N/A)	(N/A)
POND E (OUT)	Post-Development 2 YEAR	2	16.480	8.150	18.35	6,966.63	7.059
POND HS (IN)	Post-Development 2 YEAR	2	2.698	6.150	32.37	(N/A)	(N/A)
POND HS (OUT)	Post-Development 2 YEAR	2	2.639	6.500	10.49	6,969.04	0.869
SWQ POND 1 (IN)	Post-Development 2 YEAR	2	0.836	6.100	3.57	(N/A)	(N/A)
SWQ POND 1 (OUT)	Post-Development 2 YEAR	2	0.496	15.100	0.36	6,923.38	0.402
SWQ POND 2 (IN)	Post-Development 2 YEAR	2	0.363	6.150	1.91	(N/A)	(N/A)

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
SWQ POND 2 (OUT)	Post-Development 2 YEAR	2	0.191	20.200	0.14	6,916.51	0.184
Waterbury Pond A (IN)	Post-Development 2 YEAR	2	0.711	6.100	9.78	(N/A)	(N/A)
Waterbury Pond A (OUT)	Post-Development 2 YEAR	2	0.530	8.350	0.39	6,926.84	0.378

Time-Depth Curve: TYPEIIA 24HR (2.0 in)	
Label	TYPEIIA 24HR (2.0 in)
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.250 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
1.250	0.0	0.0	0.0	0.0	0.0
2.500	0.0	0.0	0.0	0.0	0.1
3.750	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.2	0.2	0.8	1.4
6.250	1.5	1.5	1.5	1.6	1.6
7.500	1.6	1.6	1.6	1.7	1.7
8.750	1.7	1.7	1.7	1.7	1.7
10.000	1.7	1.7	1.7	1.7	1.8
11.250	1.8	1.8	1.8	1.8	1.8
12.500	1.8	1.8	1.8	1.8	1.8
13.750	1.8	1.8	1.8	1.8	1.9
15.000	1.9	1.9	1.9	1.9	1.9
16.250	1.9	1.9	1.9	1.9	1.9
17.500	1.9	1.9	1.9	1.9	1.9
18.750	1.9	1.9	1.9	2.0	2.0
20.000	2.0	2.0	2.0	2.0	2.0
21.250	2.0	2.0	2.0	2.0	2.0
22.500	2.0	2.0	2.0	2.0	2.0
23.750	2.0	2.0	(N/A)	(N/A)	(N/A)

Subsection: Elevation-Area Volume Curve
Label: EXIST. STOCK POND

Return Event: 2 years
Storm Event: TYPEIIA 24HR (2.0 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,904.00	0.0000	0.23	0.00	0.000	0.000
6,906.00	0.0000	0.43	0.97	0.650	0.650
6,908.00	0.0000	0.79	1.80	1.202	1.852
6,910.00	0.0000	1.29	3.09	2.060	3.911

Subsection: Elevation-Area Volume Curve | Return Event: 2 years
Label: SWQ POND 1 | Storm Event: TYPEIIA 24HR (2.0 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,920.50	0.0000	0.00	0.00	0.000	0.000
6,921.00	0.0000	0.01	0.01	0.002	0.002
6,922.00	0.0000	0.11	0.11	0.055	0.055
6,923.00	0.0000	0.33	0.63	0.210	0.265
6,924.00	0.0000	0.47	1.19	0.398	0.663
6,925.00	0.0000	0.55	1.53	0.509	1.173

Subsection: Elevation-Area Volume Curve

Label: SWQ POND 2

Return Event: 2 years

Storm Event: TYPEIIA 24HR (2.0 in)

Elevation (ft)	Planimeter (ft²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,914.75	0.0000	0.00	0.00	0.000	0.000
6,915.25	0.0000	0.03	0.03	0.005	0.005
6,916.00	0.0000	0.19	0.19	0.079	0.079
6,918.00	0.0000	0.34	0.78	0.523	0.602
6,919.00	0.0000	0.40	1.11	0.370	0.972

Subsection: Elevation-Area Volume Curve
Label: Waterbury Pond A

Return Event: 2 years
Storm Event: TYPEIIA 24HR (2.0 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,921.00	0.0000	0.00	0.00	0.000	0.000
6,922.00	0.0000	0.00	0.01	0.002	0.002
6,924.00	0.0000	0.00	0.01	0.005	0.007
6,926.00	0.0000	0.22	0.24	0.160	0.167
6,928.00	0.0000	0.41	0.92	0.612	0.779
6,930.00	0.0000	0.54	1.42	0.946	1.725
6,931.00	0.0000	0.61	1.73	0.578	2.303

Subsection: Outlet Input Data
Label: Exist. Stock Pond

Return Event: 2 years
Storm Event: TYPEIIA 24HR (2.0 in)

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,904.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,910.00 ft

Spot Elevations

SpotElevation (ft)
6,908.13

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,907.50	6,910.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,904.75	6,910.00
Culvert-Circular	Culvert - 1	Forward	TW	6,904.50	6,910.00
Irregular Weir	Weir - 1	Forward	TW	6,907.00	6,910.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Weir - 1
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
100.00	0.00
109.00	-3.00
170.00	-3.00
220.00	-2.00
320.00	0.00

Lowest Elevation	6,907.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Riser - 1
Structure Type: Inlet Box

Number of Openings	1
Elevation	6,907.50 ft
Orifice Area	10.4000 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - 1
Structure Type: Orifice-Area

Number of Openings	8
Elevation	6,904.75 ft
Orifice Area	0.0069 ft²
Top Elevation	6,907.50 ft
Datum Elevation	6,904.75 ft
Orifice Coefficient	0.600

Structure ID: Culvert - 1
Structure Type: Culvert-Circular

Number of Barrels	1
Diameter	24.0 in
Length	77.00 ft
Length (Computed Barrel)	77.00 ft
Slope (Computed)	0.006 ft/ft

Outlet Control Data

Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.092
T2 ratio (HW/D)	1.194
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,906.68 ft	T1 Flow	15.55 ft³/s
T2 Elevation	6,906.89 ft	T2 Flow	17.77 ft³/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,921.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,931.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,928.50	6,931.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,923.50	6,931.00
Culvert-Circular	Culvert - 1	Forward	TW	6,920.80	6,931.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	15
Elevation	6,923.50 ft
Orifice Area	0.0036 ft²
Top Elevation	6,928.50 ft
Datum Elevation	6,923.50 ft
Orifice Coefficient	0.600

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	6,928.50 ft
Orifice Area	12.8000 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	75.00 ft
Length (Computed Barrel)	75.00 ft
Slope (Computed)	0.011 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317

Inlet Control Data	
Y	0.6900
T1 ratio (HW/D)	1.090
T2 ratio (HW/D)	1.192
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,922.98 ft	T1 Flow	15.55 ft³/s
T2 Elevation	6,923.18 ft	T2 Flow	17.77 ft³/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,920.50 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,925.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,924.00	6,925.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,920.50	6,925.00
Culvert-Circular	Culvert - 1	Forward	TW	6,920.00	6,925.00
Irregular Weir	Weir - 1	Forward	TW	6,924.00	6,925.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Subsection: Outlet Input Data
Label: SWQ Pond 1

Return Event: 2 years
Storm Event: TYPEIIA 24HR (2.0 in)

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	6,924.00 ft
Orifice Area	12.8000 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	10
Elevation	6,920.50 ft
Orifice Area	0.0048 ft²
Top Elevation	6,924.00 ft
Datum Elevation	6,920.50 ft
Orifice Coefficient	0.600

Structure ID: Culvert - 1
Structure Type: Culvert-Circular

Number of Barrels	1
Diameter	24.0 in
Length	26.07 ft
Length (Computed Barrel)	26.07 ft
Slope (Computed)	0.019 ft/ft

Outlet Control Data

Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data

Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.086
T2 ratio (HW/D)	1.188
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,922.17 ft	T1 Flow	15.55 ft³/s
T2 Elevation	6,922.38 ft	T2 Flow	17.77 ft³/s

Structure ID: Weir - 1
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
100.00	0.00
104.00	-1.00
156.00	-1.00
160.00	0.00

Lowest Elevation	6,924.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,914.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,919.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,918.00	6,919.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,914.75	6,919.00
Culvert-Circular	Culvert - 1	Forward	TW	6,914.75	6,919.00
Irregular Weir	Weir - 1	Forward	TW	6,918.00	6,919.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Riser - 1
Structure Type: Inlet Box

Number of Openings	1
Elevation	6,918.00 ft
Orifice Area	12.8000 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - 1
Structure Type: Orifice-Area

Number of Openings	9
Elevation	6,914.75 ft
Orifice Area	0.0036 ft²
Top Elevation	6,918.00 ft
Datum Elevation	6,914.75 ft
Orifice Coefficient	0.600

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	23.00 ft
Length (Computed Barrel)	23.00 ft
Slope (Computed)	0.011 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.090
T2 ratio (HW/D)	1.192
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,916.93 ft	T1 Flow	15.55 ft^3/s
T2 Elevation	6,917.13 ft	T2 Flow	17.77 ft^3/s

Structure ID: Weir - 1
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
100.00	0.00
106.00	-1.00
156.00	-1.00
162.00	0.00

Lowest Elevation	6,918.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

Subsection: Elevation-Volume-Flow Table (Pond)
Label: EXIST. STOCK POND

Return Event: 2 years
Storm Event: TYPEIIA 24HR (2.0 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	6,904.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft^3/s
Flow (Initial Infiltration)	0.00 ft^3/s
Flow (Initial, Total)	0.00 ft^3/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
6,904.00	0.00	0.000	0.23	0.00	0.00	0.00
6,904.50	0.00	0.126	0.27	0.00	0.00	60.93
6,904.75	0.00	0.197	0.30	0.00	0.00	95.52
6,905.00	0.04	0.275	0.32	0.00	0.04	133.06
6,905.50	0.12	0.449	0.37	0.00	0.12	217.33
6,906.00	0.20	0.650	0.43	0.00	0.20	314.63
6,906.50	0.29	0.884	0.51	0.00	0.29	428.30
6,907.00	0.36	1.161	0.60	0.00	0.36	562.09
6,907.50	75.07	1.482	0.69	0.00	75.07	792.30
6,908.00	243.87	1.852	0.79	0.00	243.87	1,140.02
6,908.13	305.87	1.956	0.82	0.00	305.87	1,252.63
6,908.50	516.71	2.275	0.90	0.00	516.71	1,617.63
6,909.00	886.56	2.756	1.02	0.00	886.56	2,220.65
6,909.50	1,357.52	3.301	1.15	0.00	1,357.52	2,955.03
6,910.00	1,927.84	3.911	1.29	0.00	1,927.84	3,820.87

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	6,920.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
6,920.50	0.00	0.000	0.00	0.00	0.00	0.00
6,921.00	0.06	0.002	0.01	0.00	0.06	1.05
6,921.50	0.12	0.016	0.05	0.00	0.12	8.01
6,922.00	0.18	0.055	0.11	0.00	0.18	26.80
6,922.50	0.25	0.133	0.21	0.00	0.25	64.42
6,923.00	0.31	0.265	0.33	0.00	0.31	128.65
6,923.50	0.37	0.447	0.40	0.00	0.37	216.55
6,924.00	0.43	0.663	0.47	0.00	0.43	321.38
6,924.50	61.32	0.908	0.51	0.00	61.32	500.73
6,925.00	176.90	1.173	0.55	0.00	176.90	744.43

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	6,914.75 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
6,914.75	0.00	0.000	0.00	0.00	0.00	0.00
6,915.25	0.04	0.005	0.03	0.00	0.04	2.49
6,915.75	0.08	0.041	0.12	0.00	0.08	19.69
6,916.25	0.12	0.129	0.21	0.00	0.12	62.41
6,916.75	0.16	0.240	0.24	0.00	0.16	116.55
6,917.25	0.20	0.370	0.28	0.00	0.20	179.44
6,917.75	0.26	0.520	0.32	0.00	0.26	251.74
6,918.00	0.27	0.602	0.34	0.00	0.27	291.61
6,918.25	20.91	0.689	0.35	0.00	20.91	354.27
6,918.75	111.66	0.873	0.38	0.00	111.66	534.43
6,919.00	174.96	0.972	0.40	0.00	174.96	645.19

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	6,921.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
6,921.00	0.00	0.000	0.00	0.00	0.00	0.00
6,921.50	0.00	0.001	0.00	0.00	0.00	0.56
6,922.00	0.00	0.002	0.00	0.00	0.00	1.11
6,922.50	0.00	0.003	0.00	0.00	0.00	1.67
6,923.00	0.00	0.005	0.00	0.00	0.00	2.22
6,923.50	0.00	0.006	0.00	0.00	0.00	2.78
6,924.00	0.06	0.007	0.00	0.00	0.06	3.39
6,924.50	0.12	0.012	0.02	0.00	0.12	6.09
6,925.00	0.17	0.034	0.07	0.00	0.17	16.46
6,925.50	0.23	0.082	0.13	0.00	0.23	39.76
6,926.00	0.29	0.167	0.22	0.00	0.29	81.25
6,926.50	0.35	0.286	0.26	0.00	0.35	138.57
6,927.00	0.41	0.426	0.30	0.00	0.41	206.50
6,927.50	0.47	0.590	0.35	0.00	0.47	285.92
6,928.00	0.52	0.779	0.41	0.00	0.52	377.73
6,928.50	0.58	0.990	0.44	0.00	0.58	479.94
6,929.00	4.85	1.218	0.47	0.00	4.85	594.34
6,929.50	12.64	1.463	0.51	0.00	12.64	720.55
6,930.00	22.67	1.725	0.54	0.00	22.67	857.59
6,930.50	34.46	2.005	0.58	0.00	34.46	1,005.00
6,931.00	47.73	2.303	0.61	0.00	47.73	1,162.46

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Project Summary

Title	Waterbury Phase 1 - Drainage Report
Engineer	MAW
Company	CCES
Date	7/6/2016

Notes	5 year SCS Model

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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
4 WAY BASINS D, E, N, Q, (50%)O	Post-Development 5 YEAR	5	1.358	6.150	15.36
4-WAY BASINS F, J, K, M	Post-Development 5 YEAR	5	0.946	6.150	9.57
4-WAY BASINS H, I, J, L, R, S	Post-Development 5 YEAR	5	1.446	6.100	17.68
A BASINS	Post-Development 5 YEAR	5	1.212	6.100	17.48
BASIN OS5, I, N	Post-Development 5 YEAR	5	0.633	6.150	7.14
Basin J OS-6	Post-Development 5 YEAR	5	0.139	6.050	2.32
FG08	Post-Development 5 YEAR	5	7.119	6.150	86.00
FG09	Post-Development 5 YEAR	5	1.794	6.050	27.48
FG10	Post-Development 5 YEAR	5	1.678	6.100	24.73
FG11	Post-Development 5 YEAR	5	2.772	6.050	46.50
FG12	Post-Development 5 YEAR	5	1.914	6.050	30.28
FG13	Post-Development 5 YEAR	5	2.048	6.150	22.45
FG14	Post-Development 5 YEAR	5	2.393	6.100	30.96
FG25	Post-Development 5 YEAR	5	2.333	6.100	30.76
FG26	Post-Development 5 YEAR	5	3.294	6.150	40.61
FG27	Post-Development 5 YEAR	5	3.609	6.050	59.22
FG28	Post-Development 5 YEAR	5	4.600	6.150	58.43
FG32	Post-Development 5 YEAR	5	6.000	6.100	84.87
FG33	Post-Development 5 YEAR	5	6.899	6.050	119.74

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
4 WAY RELEASE	Post-Development 5 YEAR	5	38.688	7.150	69.33
G17	Post-Development 5 YEAR	5	16.990	6.250	35.13

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
G18	Post-Development 5 YEAR	5	23.894	6.100	128.10

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
EXIST. STOCK POND (IN)	Post-Development 5 YEAR	5	39.892	7.100	69.42	(N/A)	(N/A)
EXIST. STOCK POND (OUT)	Post-Development 5 YEAR	5	38.688	7.150	69.33	6,907.46	1.456
INLINE POND 1 (IN)	Post-Development 5 YEAR	5	32.982	7.150	53.46	(N/A)	(N/A)
INLINE POND 1 (OUT)	Post-Development 5 YEAR	5	32.982	7.200	53.45	6,938.15	0.109
POND D (IN)	Post-Development 5 YEAR	5	19.718	6.100	258.91	(N/A)	(N/A)
POND D (OUT)	Post-Development 5 YEAR	5	14.656	6.950	28.13	7,054.04	8.700
POND E (IN)	Post-Development 5 YEAR	5	41.303	6.050	331.70	(N/A)	(N/A)
POND E (OUT)	Post-Development 5 YEAR	5	35.890	7.200	63.87	6,967.46	12.015
POND HS (IN)	Post-Development 5 YEAR	5	4.600	6.150	58.43	(N/A)	(N/A)
POND HS (OUT)	Post-Development 5 YEAR	5	4.510	6.450	22.94	6,969.68	1.493
SWQ POND 1 (IN)	Post-Development 5 YEAR	5	4.988	6.100	17.77	(N/A)	(N/A)
SWQ POND 1 (OUT)	Post-Development 5 YEAR	5	4.351	7.100	13.34	6,924.11	0.713
SWQ POND 2 (IN)	Post-Development 5 YEAR	5	0.946	6.150	9.57	(N/A)	(N/A)

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
SWQ POND 2 (OUT)	Post-Development 5 YEAR	5	0.360	20.000	0.35	6,918.00	0.602
Waterbury Pond A (IN)	Post-Development 5 YEAR	5	1.212	6.100	17.48	(N/A)	(N/A)
Waterbury Pond A (OUT)	Post-Development 5 YEAR	5	0.720	10.100	0.51	6,927.86	0.722

Time-Depth Curve: TYPEIIA 24HR (2.6 in)	
Label	TYPEIIA 24HR (2.6 in)
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	5 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.250 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
1.250	0.0	0.0	0.0	0.0	0.0
2.500	0.0	0.0	0.1	0.1	0.1
3.750	0.1	0.1	0.1	0.1	0.1
5.000	0.2	0.2	0.3	1.0	1.8
6.250	1.9	2.0	2.0	2.0	2.1
7.500	2.1	2.1	2.1	2.1	2.2
8.750	2.2	2.2	2.2	2.2	2.2
10.000	2.2	2.2	2.3	2.3	2.3
11.250	2.3	2.3	2.3	2.3	2.3
12.500	2.3	2.3	2.4	2.4	2.4
13.750	2.4	2.4	2.4	2.4	2.4
15.000	2.4	2.4	2.4	2.4	2.4
16.250	2.5	2.5	2.5	2.5	2.5
17.500	2.5	2.5	2.5	2.5	2.5
18.750	2.5	2.5	2.5	2.5	2.5
20.000	2.5	2.6	2.6	2.6	2.6
21.250	2.6	2.6	2.6	2.6	2.6
22.500	2.6	2.6	2.6	2.6	2.6
23.750	2.6	2.6	(N/A)	(N/A)	(N/A)

Subsection: Elevation-Area Volume Curve
Label: EXIST. STOCK POND

Return Event: 5 years
Storm Event: TYPEIIA 24HR (2.6 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,904.00	0.0000	0.23	0.00	0.000	0.000
6,906.00	0.0000	0.43	0.97	0.650	0.650
6,908.00	0.0000	0.79	1.80	1.202	1.852
6,910.00	0.0000	1.29	3.09	2.060	3.911

Subsection: Elevation-Area Volume Curve
Label: SWQ POND 1

Return Event: 5 years
Storm Event: TYPEIIA 24HR (2.6 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,920.50	0.0000	0.00	0.00	0.000	0.000
6,921.00	0.0000	0.01	0.01	0.002	0.002
6,922.00	0.0000	0.11	0.11	0.055	0.055
6,923.00	0.0000	0.33	0.63	0.210	0.265
6,924.00	0.0000	0.47	1.19	0.398	0.663
6,925.00	0.0000	0.55	1.53	0.509	1.173

Subsection: Elevation-Area Volume Curve
Label: SWQ POND 2

Return Event: 5 years
Storm Event: TYPEIIA 24HR (2.6 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,914.75	0.0000	0.00	0.00	0.000	0.000
6,915.25	0.0000	0.03	0.03	0.005	0.005
6,916.00	0.0000	0.19	0.19	0.079	0.079
6,918.00	0.0000	0.34	0.78	0.523	0.602
6,919.00	0.0000	0.40	1.11	0.370	0.972

Subsection: Elevation-Area Volume Curve
Label: Waterbury Pond A

Return Event: 5 years
Storm Event: TYPEIIA 24HR (2.6 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,921.00	0.0000	0.00	0.00	0.000	0.000
6,922.00	0.0000	0.00	0.01	0.002	0.002
6,924.00	0.0000	0.00	0.01	0.005	0.007
6,926.00	0.0000	0.22	0.24	0.160	0.167
6,928.00	0.0000	0.41	0.92	0.612	0.779
6,930.00	0.0000	0.54	1.42	0.946	1.725
6,931.00	0.0000	0.61	1.73	0.578	2.303

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,904.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,910.00 ft

Spot Elevations

SpotElevation (ft)
6,908.13

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,907.50	6,910.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,904.75	6,910.00
Culvert-Circular	Culvert - 1	Forward	TW	6,904.50	6,910.00
Irregular Weir	Weir - 1	Forward	TW	6,907.00	6,910.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Weir - 1
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
100.00	0.00
109.00	-3.00
170.00	-3.00
220.00	-2.00
320.00	0.00

Lowest Elevation	6,907.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Riser - 1
Structure Type: Inlet Box

Number of Openings	1
Elevation	6,907.50 ft
Orifice Area	10.4000 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - 1
Structure Type: Orifice-Area

Number of Openings	8
Elevation	6,904.75 ft
Orifice Area	0.0069 ft²
Top Elevation	6,907.50 ft
Datum Elevation	6,904.75 ft
Orifice Coefficient	0.600

Structure ID: Culvert - 1
Structure Type: Culvert-Circular

Number of Barrels	1
Diameter	24.0 in
Length	77.00 ft
Length (Computed Barrel)	77.00 ft
Slope (Computed)	0.006 ft/ft

Outlet Control Data

Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.092
T2 ratio (HW/D)	1.194
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,906.68 ft	T1 Flow	15.55 ft³/s
T2 Elevation	6,906.89 ft	T2 Flow	17.77 ft³/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,921.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,931.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,928.50	6,931.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,923.50	6,931.00
Culvert-Circular	Culvert - 1	Forward	TW	6,920.80	6,931.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	15
Elevation	6,923.50 ft
Orifice Area	0.0036 ft²
Top Elevation	6,928.50 ft
Datum Elevation	6,923.50 ft
Orifice Coefficient	0.600

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	6,928.50 ft
Orifice Area	12.8000 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	75.00 ft
Length (Computed Barrel)	75.00 ft
Slope (Computed)	0.011 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317

Inlet Control Data	
Y	0.6900
T1 ratio (HW/D)	1.090
T2 ratio (HW/D)	1.192
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,922.98 ft	T1 Flow	15.55 ft³/s
T2 Elevation	6,923.18 ft	T2 Flow	17.77 ft³/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,920.50 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,925.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,924.00	6,925.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,920.50	6,925.00
Culvert-Circular	Culvert - 1	Forward	TW	6,920.00	6,925.00
Irregular Weir	Weir - 1	Forward	TW	6,924.00	6,925.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	6,924.00 ft
Orifice Area	12.8000 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	10
Elevation	6,920.50 ft
Orifice Area	0.0048 ft²
Top Elevation	6,924.00 ft
Datum Elevation	6,920.50 ft
Orifice Coefficient	0.600

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	26.07 ft
Length (Computed Barrel)	26.07 ft
Slope (Computed)	0.019 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.086
T2 ratio (HW/D)	1.188
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,922.17 ft	T1 Flow	15.55 ft³/s
T2 Elevation	6,922.38 ft	T2 Flow	17.77 ft³/s

Structure ID: Weir - 1
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
100.00	0.00
104.00	-1.00
156.00	-1.00
160.00	0.00

Lowest Elevation	6,924.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,914.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,919.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,918.00	6,919.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,914.75	6,919.00
Culvert-Circular	Culvert - 1	Forward	TW	6,914.75	6,919.00
Irregular Weir	Weir - 1	Forward	TW	6,918.00	6,919.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Subsection: Outlet Input Data
Label: SWQ Pond 2

Return Event: 5 years
Storm Event: TYPEIIA 24HR (2.6 in)

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	6,918.00 ft
Orifice Area	12.8000 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	9
Elevation	6,914.75 ft
Orifice Area	0.0036 ft²
Top Elevation	6,918.00 ft
Datum Elevation	6,914.75 ft
Orifice Coefficient	0.600

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	23.00 ft
Length (Computed Barrel)	23.01 ft
Slope (Computed)	-0.033 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.112
T2 ratio (HW/D)	1.214
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,916.97 ft	T1 Flow	15.55 ft³/s
T2 Elevation	6,917.18 ft	T2 Flow	17.77 ft³/s

Structure ID: Weir - 1
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
100.00	0.00
106.00	-1.00
156.00	-1.00
162.00	0.00

Lowest Elevation	6,918.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

Subsection: Elevation-Volume-Flow Table (Pond)
Label: EXIST. STOCK POND

Return Event: 5 years
Storm Event: TYPEIIA 24HR (2.6 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	6,904.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
6,904.00	0.00	0.000	0.23	0.00	0.00	0.00
6,904.50	0.00	0.126	0.27	0.00	0.00	60.93
6,904.75	0.00	0.197	0.30	0.00	0.00	95.52
6,905.00	0.04	0.275	0.32	0.00	0.04	133.06
6,905.50	0.12	0.449	0.37	0.00	0.12	217.33
6,906.00	0.20	0.650	0.43	0.00	0.20	314.63
6,906.50	0.29	0.884	0.51	0.00	0.29	428.30
6,907.00	0.36	1.161	0.60	0.00	0.36	562.09
6,907.50	75.07	1.482	0.69	0.00	75.07	792.30
6,908.00	243.87	1.852	0.79	0.00	243.87	1,140.02
6,908.13	305.87	1.956	0.82	0.00	305.87	1,252.63
6,908.50	516.71	2.275	0.90	0.00	516.71	1,617.63
6,909.00	886.56	2.756	1.02	0.00	886.56	2,220.65
6,909.50	1,357.52	3.301	1.15	0.00	1,357.52	2,955.03
6,910.00	1,927.84	3.911	1.29	0.00	1,927.84	3,820.87

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	6,920.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
6,920.50	0.00	0.000	0.00	0.00	0.00	0.00
6,921.00	0.06	0.002	0.01	0.00	0.06	1.05
6,921.50	0.12	0.016	0.05	0.00	0.12	8.01
6,922.00	0.18	0.055	0.11	0.00	0.18	26.80
6,922.50	0.25	0.133	0.21	0.00	0.25	64.42
6,923.00	0.31	0.265	0.33	0.00	0.31	128.65
6,923.50	0.37	0.447	0.40	0.00	0.37	216.55
6,924.00	0.43	0.663	0.47	0.00	0.43	321.38
6,924.50	61.32	0.908	0.51	0.00	61.32	500.73
6,925.00	176.90	1.173	0.55	0.00	176.90	744.43

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	6,914.75 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
6,914.75	0.00	0.000	0.00	0.00	0.00	0.00
6,915.25	0.00	0.005	0.03	0.00	0.00	2.45
6,915.75	0.02	0.041	0.12	0.00	0.02	19.64
6,916.25	0.07	0.129	0.21	0.00	0.07	62.36
6,916.75	0.11	0.240	0.24	0.00	0.11	116.50
6,917.25	0.17	0.370	0.28	0.00	0.17	179.40
6,917.75	0.22	0.520	0.32	0.00	0.22	251.70
6,918.00	0.24	0.602	0.34	0.00	0.24	291.58
6,918.25	20.87	0.689	0.35	0.00	20.87	354.23
6,918.75	111.63	0.873	0.38	0.00	111.63	534.39
6,919.00	174.91	0.972	0.40	0.00	174.91	645.14

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	6,921.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
6,921.00	0.00	0.000	0.00	0.00	0.00	0.00
6,921.50	0.00	0.001	0.00	0.00	0.00	0.56
6,922.00	0.00	0.002	0.00	0.00	0.00	1.11
6,922.50	0.00	0.003	0.00	0.00	0.00	1.67
6,923.00	0.00	0.005	0.00	0.00	0.00	2.22
6,923.50	0.00	0.006	0.00	0.00	0.00	2.78
6,924.00	0.06	0.007	0.00	0.00	0.06	3.39
6,924.50	0.12	0.012	0.02	0.00	0.12	6.09
6,925.00	0.17	0.034	0.07	0.00	0.17	16.46
6,925.50	0.23	0.082	0.13	0.00	0.23	39.76
6,926.00	0.29	0.167	0.22	0.00	0.29	81.25
6,926.50	0.35	0.286	0.26	0.00	0.35	138.57
6,927.00	0.41	0.426	0.30	0.00	0.41	206.50
6,927.50	0.47	0.590	0.35	0.00	0.47	285.92
6,928.00	0.52	0.779	0.41	0.00	0.52	377.73
6,928.50	0.58	0.990	0.44	0.00	0.58	479.94
6,929.00	4.85	1.218	0.47	0.00	4.85	594.34
6,929.50	12.64	1.463	0.51	0.00	12.64	720.55
6,930.00	22.67	1.725	0.54	0.00	22.67	857.59
6,930.50	34.46	2.005	0.58	0.00	34.46	1,005.00
6,931.00	47.73	2.303	0.61	0.00	47.73	1,162.46

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Project Summary	
Title	Waterbury Phase 1 - Drainage Report
Engineer	MAW
Company	CCES
Date	7/6/2016

Notes	100 year SCS Model

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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
4 WAY BASINS D, E, N, Q (50%)O	Post-Development 100 YEAR	100	4.459	6.100	60.75
4-WAY BASINS F, G, K, M	Post-Development 100 YEAR	100	3.726	6.100	52.94
4-WAY BASINS H, I, J, L, R, S	Post-Development 100 YEAR	100	5.693	6.050	91.21
A BASINS	Post-Development 100 YEAR	100	3.004	6.050	44.87
BASIN OS5, I, N	Post-Development 100 YEAR	100	2.079	6.100	28.25
Basin J, OS-6	Post-Development 100 YEAR	100	0.456	6.050	8.14
FG08	Post-Development 100 YEAR	100	20.511	6.100	278.75
FG09	Post-Development 100 YEAR	100	4.964	6.050	80.98
FG10	Post-Development 100 YEAR	100	4.700	6.050	75.10
FG11	Post-Development 100 YEAR	100	6.949	6.050	117.19
FG12	Post-Development 100 YEAR	100	4.746	6.050	77.10
FG13	Post-Development 100 YEAR	100	6.138	6.150	77.95
FG14	Post-Development 100 YEAR	100	7.336	6.100	107.44
FG25	Post-Development 100 YEAR	100	6.214	6.100	88.74
FG26	Post-Development 100 YEAR	100	9.539	6.100	132.96
FG27	Post-Development 100 YEAR	100	9.794	6.050	165.74
FG28	Post-Development 100 YEAR	100	11.406	6.100	154.75
FG32	Post-Development 100 YEAR	100	16.129	6.050	240.72
FG33	Post-Development 100 YEAR	100	15.853	6.000	271.41

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
4 WAY RELEASE	Post-Development 100 YEAR	100	127.556	6.200	396.12
G17	Post-Development 100 YEAR	100	55.751	6.200	179.81

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
G18	Post-Development 100 YEAR	100	75.084	6.100	443.03

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
EXIST. STOCK POND (IN)	Post-Development 100 YEAR	100	128.794	6.200	395.44	(N/A)	(N/A)
EXIST. STOCK POND (OUT)	Post-Development 100 YEAR	100	127.556	6.200	396.12	6,908.29	2.089
INLINE POND 1 (IN)	Post-Development 100 YEAR	100	87.165	6.500	212.23	(N/A)	(N/A)
INLINE POND 1 (OUT)	Post-Development 100 YEAR	100	87.165	6.750	207.73	6,941.92	1.212
POND D (IN)	Post-Development 100 YEAR	100	55.344	6.050	787.29	(N/A)	(N/A)
POND D (OUT)	Post-Development 100 YEAR	100	49.537	6.550	137.40	7,056.69	25.125
POND E (IN)	Post-Development 100 YEAR	100	118.291	6.050	971.63	(N/A)	(N/A)
POND E (OUT)	Post-Development 100 YEAR	100	111.575	6.600	316.33	6,969.72	29.584
POND HS (IN)	Post-Development 100 YEAR	100	11.406	6.100	154.75	(N/A)	(N/A)
POND HS (OUT)	Post-Development 100 YEAR	100	11.224	6.350	77.69	6,971.51	3.793
SWQ POND 1 (IN)	Post-Development 100 YEAR	100	32.183	6.100	132.55	(N/A)	(N/A)
SWQ POND 1 (OUT)	Post-Development 100 YEAR	100	31.516	6.150	131.35	6,924.80	1.066
SWQ POND 2 (IN)	Post-Development 100 YEAR	100	3.726	6.100	52.94	(N/A)	(N/A)

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
SWQ POND 2 (OUT)	Post-Development 100 YEAR	100	3.123	6.150	50.71	6,918.41	0.748
Waterbury Pond A (IN)	Post-Development 100 YEAR	100	3.004	6.050	44.87	(N/A)	(N/A)
Waterbury Pond A (OUT)	Post-Development 100 YEAR	100	2.107	6.400	11.93	6,929.45	1.440

Time-Depth Curve: TYPEIIA 24HR (4.4 in)	
Label	TYPEIIA 24HR (4.4 in)
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.250 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
1.250	0.0	0.0	0.0	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.750	0.1	0.1	0.2	0.2	0.2
5.000	0.3	0.3	0.4	1.8	3.1
6.250	3.2	3.3	3.4	3.4	3.5
7.500	3.5	3.6	3.6	3.6	3.7
8.750	3.7	3.7	3.7	3.7	3.8
10.000	3.8	3.8	3.8	3.8	3.9
11.250	3.9	3.9	3.9	3.9	3.9
12.500	3.9	4.0	4.0	4.0	4.0
13.750	4.0	4.0	4.1	4.1	4.1
15.000	4.1	4.1	4.1	4.1	4.1
16.250	4.1	4.2	4.2	4.2	4.2
17.500	4.2	4.2	4.2	4.2	4.2
18.750	4.3	4.3	4.3	4.3	4.3
20.000	4.3	4.3	4.3	4.3	4.3
21.250	4.3	4.3	4.4	4.4	4.4
22.500	4.4	4.4	4.4	4.4	4.4
23.750	4.4	4.4	(N/A)	(N/A)	(N/A)

Subsection: Elevation-Area Volume Curve
Label: EXIST. STOCK POND

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,904.00	0.0000	0.23	0.00	0.000	0.000
6,906.00	0.0000	0.43	0.97	0.650	0.650
6,908.00	0.0000	0.79	1.80	1.202	1.852
6,910.00	0.0000	1.29	3.09	2.060	3.911

Subsection: Elevation-Area Volume Curve
Label: SWQ POND 1

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,920.50	0.0000	0.00	0.00	0.000	0.000
6,921.00	0.0000	0.01	0.01	0.002	0.002
6,922.00	0.0000	0.11	0.11	0.055	0.055
6,923.00	0.0000	0.33	0.63	0.210	0.265
6,924.00	0.0000	0.47	1.19	0.398	0.663
6,925.00	0.0000	0.55	1.53	0.509	1.173

Subsection: Elevation-Area Volume Curve
Label: SWQ POND 2

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,914.75	0.0000	0.00	0.00	0.000	0.000
6,915.25	0.0000	0.03	0.03	0.005	0.005
6,916.00	0.0000	0.19	0.19	0.079	0.079
6,918.00	0.0000	0.34	0.78	0.523	0.602
6,919.00	0.0000	0.40	1.11	0.370	0.972

Subsection: Elevation-Area Volume Curve
Label: Waterbury Pond A

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,921.00	0.0000	0.00	0.00	0.000	0.000
6,922.00	0.0000	0.00	0.01	0.002	0.002
6,924.00	0.0000	0.00	0.01	0.005	0.007
6,926.00	0.0000	0.22	0.24	0.160	0.167
6,928.00	0.0000	0.41	0.92	0.612	0.779
6,930.00	0.0000	0.54	1.42	0.946	1.725
6,931.00	0.0000	0.61	1.73	0.578	2.303

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,904.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,910.00 ft

Spot Elevations

SpotElevation (ft)
6,908.13

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,907.50	6,910.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,904.75	6,910.00
Culvert-Circular	Culvert - 1	Forward	TW	6,904.50	6,910.00
Irregular Weir	Weir - 1	Forward	TW	6,907.00	6,910.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Weir - 1
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
100.00	0.00
109.00	-3.00
170.00	-3.00
220.00	-2.00
320.00	0.00

Lowest Elevation	6,907.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Riser - 1
Structure Type: Inlet Box

Number of Openings	1
Elevation	6,907.50 ft
Orifice Area	10.4000 ft^2
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Subsection: Outlet Input Data
Label: Exist. Stock Pond

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	77.00 ft
Length (Computed Barrel)	77.00 ft
Slope (Computed)	0.006 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.092
T2 ratio (HW/D)	1.194
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,906.68 ft	T1 Flow	15.55 ft^3/s
T2 Elevation	6,906.89 ft	T2 Flow	17.77 ft^3/s

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	8
Elevation	6,904.75 ft
Orifice Area	0.0069 ft^2
Top Elevation	6,907.50 ft
Datum Elevation	6,904.75 ft
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,921.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,931.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,928.50	6,931.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,923.50	6,931.00
Culvert-Circular	Culvert - 1	Forward	TW	6,920.80	6,931.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	15
Elevation	6,923.50 ft
Orifice Area	0.0036 ft²
Top Elevation	6,928.50 ft
Datum Elevation	6,923.50 ft
Orifice Coefficient	0.600

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	6,928.50 ft
Orifice Area	12.8000 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	75.00 ft
Length (Computed Barrel)	75.00 ft
Slope (Computed)	0.011 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317

Inlet Control Data	
Y	0.6900
T1 ratio (HW/D)	1.090
T2 ratio (HW/D)	1.192
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,922.98 ft	T1 Flow	15.55 ft³/s
T2 Elevation	6,923.18 ft	T2 Flow	17.77 ft³/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,920.50 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,925.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,924.00	6,925.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,920.50	6,925.00
Culvert-Circular	Culvert - 1	Forward	TW	6,920.00	6,925.00
Irregular Weir	Weir - 1	Forward	TW	6,924.00	6,925.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	6,924.00 ft
Orifice Area	12.8000 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	10
Elevation	6,920.50 ft
Orifice Area	0.0048 ft²
Top Elevation	6,924.00 ft
Datum Elevation	6,920.50 ft
Orifice Coefficient	0.600

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	26.07 ft
Length (Computed Barrel)	26.07 ft
Slope (Computed)	0.019 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.086
T2 ratio (HW/D)	1.188
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,922.17 ft	T1 Flow	15.55 ft³/s
T2 Elevation	6,922.38 ft	T2 Flow	17.77 ft³/s

Structure ID: Weir - 1
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
100.00	0.00
104.00	-1.00
156.00	-1.00
160.00	0.00

Lowest Elevation	6,924.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,914.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,919.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,918.00	6,919.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,914.75	6,919.00
Culvert-Circular	Culvert - 1	Forward	TW	6,914.75	6,919.00
Irregular Weir	Weir - 1	Forward	TW	6,918.00	6,919.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	6,918.00 ft
Orifice Area	12.8000 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	9
Elevation	6,914.75 ft
Orifice Area	0.0036 ft²
Top Elevation	6,918.00 ft
Datum Elevation	6,914.75 ft
Orifice Coefficient	0.600

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	23.00 ft
Length (Computed Barrel)	23.00 ft
Slope (Computed)	0.011 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	0.000
T2 ratio (HW/D)	1.192
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,914.75 ft	T1 Flow	15.55 ft³/s
T2 Elevation	6,917.13 ft	T2 Flow	17.77 ft³/s

Structure ID: Weir - 1
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
100.00	0.00
106.00	-1.00
156.00	-1.00
162.00	0.00

Lowest Elevation	6,918.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

Subsection: Elevation-Volume-Flow Table (Pond)
Label: EXIST. STOCK POND

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	6,904.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
6,904.00	0.00	0.000	0.23	0.00	0.00	0.00
6,904.50	0.00	0.126	0.27	0.00	0.00	60.93
6,904.75	0.00	0.197	0.30	0.00	0.00	95.52
6,905.00	0.04	0.275	0.32	0.00	0.04	133.06
6,905.50	0.12	0.449	0.37	0.00	0.12	217.33
6,906.00	0.20	0.650	0.43	0.00	0.20	314.63
6,906.50	0.29	0.884	0.51	0.00	0.29	428.30
6,907.00	0.36	1.161	0.60	0.00	0.36	562.09
6,907.50	75.07	1.482	0.69	0.00	75.07	792.30
6,908.00	243.87	1.852	0.79	0.00	243.87	1,140.02
6,908.13	305.87	1.956	0.82	0.00	305.87	1,252.63
6,908.50	516.71	2.275	0.90	0.00	516.71	1,617.63
6,909.00	886.56	2.756	1.02	0.00	886.56	2,220.65
6,909.50	1,357.52	3.301	1.15	0.00	1,357.52	2,955.03
6,910.00	1,927.84	3.911	1.29	0.00	1,927.84	3,820.87

Subsection: Elevation-Volume-Flow Table (Pond)
Label: SWQ POND 1

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	6,920.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
6,920.50	0.00	0.000	0.00	0.00	0.00	0.00
6,921.00	0.06	0.002	0.01	0.00	0.06	1.05
6,921.50	0.12	0.016	0.05	0.00	0.12	8.01
6,922.00	0.18	0.055	0.11	0.00	0.18	26.80
6,922.50	0.25	0.133	0.21	0.00	0.25	64.42
6,923.00	0.31	0.265	0.33	0.00	0.31	128.65
6,923.50	0.37	0.447	0.40	0.00	0.37	216.55
6,924.00	0.43	0.663	0.47	0.00	0.43	321.38
6,924.50	61.32	0.908	0.51	0.00	61.32	500.73
6,925.00	176.90	1.173	0.55	0.00	176.90	744.43

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	6,914.75 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
6,914.75	0.00	0.000	0.00	0.00	0.00	0.00
6,915.25	0.04	0.005	0.03	0.00	0.04	2.49
6,915.75	0.08	0.041	0.12	0.00	0.08	19.69
6,916.25	0.12	0.129	0.21	0.00	0.12	62.41
6,916.75	0.16	0.240	0.24	0.00	0.16	116.55
6,917.25	0.20	0.370	0.28	0.00	0.20	179.44
6,917.75	0.26	0.520	0.32	0.00	0.26	251.74
6,918.00	0.27	0.602	0.34	0.00	0.27	291.61
6,918.25	20.91	0.689	0.35	0.00	20.91	354.27
6,918.75	111.66	0.873	0.38	0.00	111.66	534.43
6,919.00	174.96	0.972	0.40	0.00	174.96	645.19

Subsection: Elevation-Volume-Flow Table (Pond)
Label: Waterbury Pond A

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	6,921.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
6,921.00	0.00	0.000	0.00	0.00	0.00	0.00
6,921.50	0.00	0.001	0.00	0.00	0.00	0.56
6,922.00	0.00	0.002	0.00	0.00	0.00	1.11
6,922.50	0.00	0.003	0.00	0.00	0.00	1.67
6,923.00	0.00	0.005	0.00	0.00	0.00	2.22
6,923.50	0.00	0.006	0.00	0.00	0.00	2.78
6,924.00	0.06	0.007	0.00	0.00	0.06	3.39
6,924.50	0.12	0.012	0.02	0.00	0.12	6.09
6,925.00	0.17	0.034	0.07	0.00	0.17	16.46
6,925.50	0.23	0.082	0.13	0.00	0.23	39.76
6,926.00	0.29	0.167	0.22	0.00	0.29	81.25
6,926.50	0.35	0.286	0.26	0.00	0.35	138.57
6,927.00	0.41	0.426	0.30	0.00	0.41	206.50
6,927.50	0.47	0.590	0.35	0.00	0.47	285.92
6,928.00	0.52	0.779	0.41	0.00	0.52	377.73
6,928.50	0.58	0.990	0.44	0.00	0.58	479.94
6,929.00	4.85	1.218	0.47	0.00	4.85	594.34
6,929.50	12.64	1.463	0.51	0.00	12.64	720.55
6,930.00	22.67	1.725	0.54	0.00	22.67	857.59
6,930.50	34.46	2.005	0.58	0.00	34.46	1,005.00
6,931.00	47.73	2.303	0.61	0.00	47.73	1,162.46

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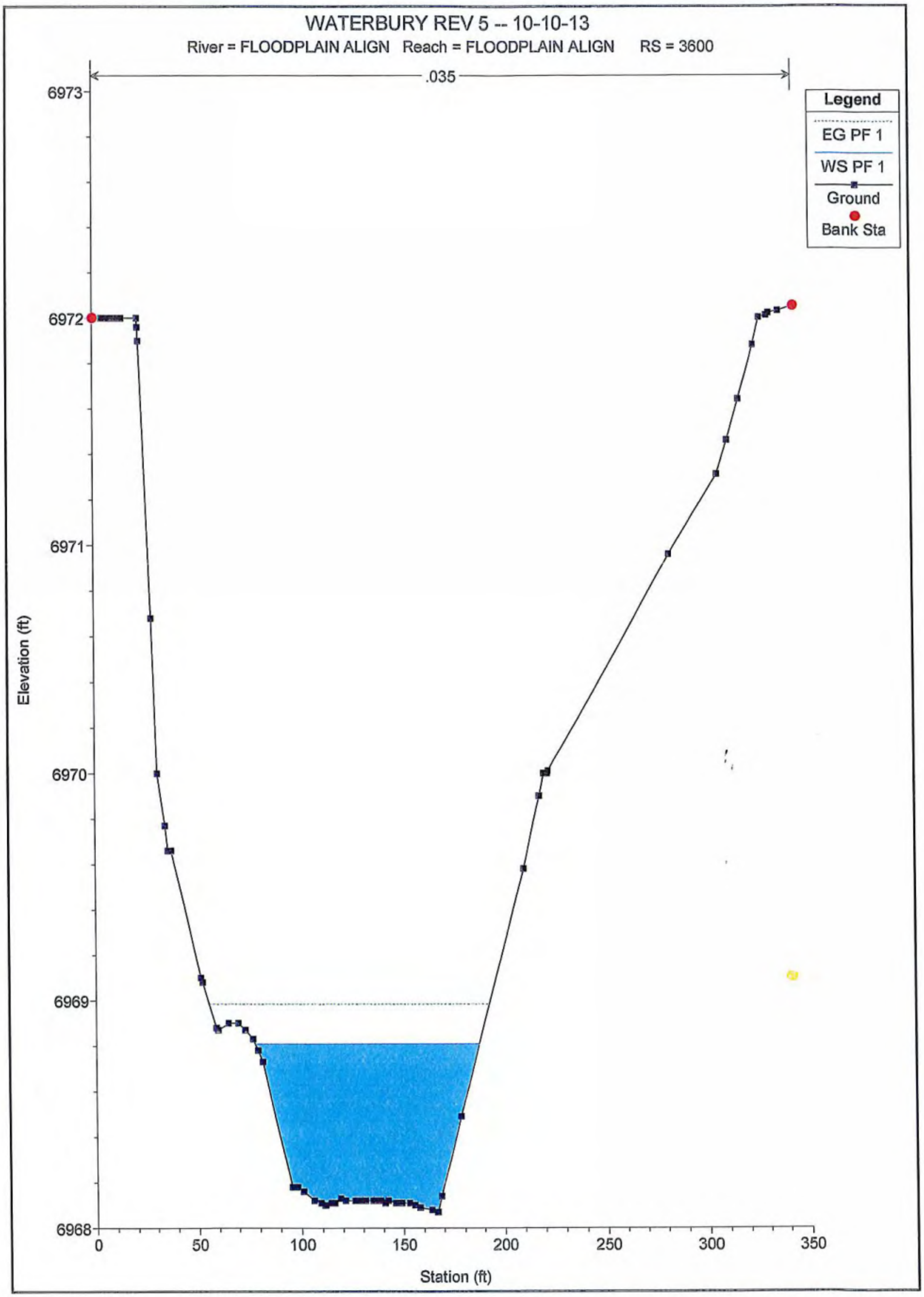
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Ground
Bank Sta
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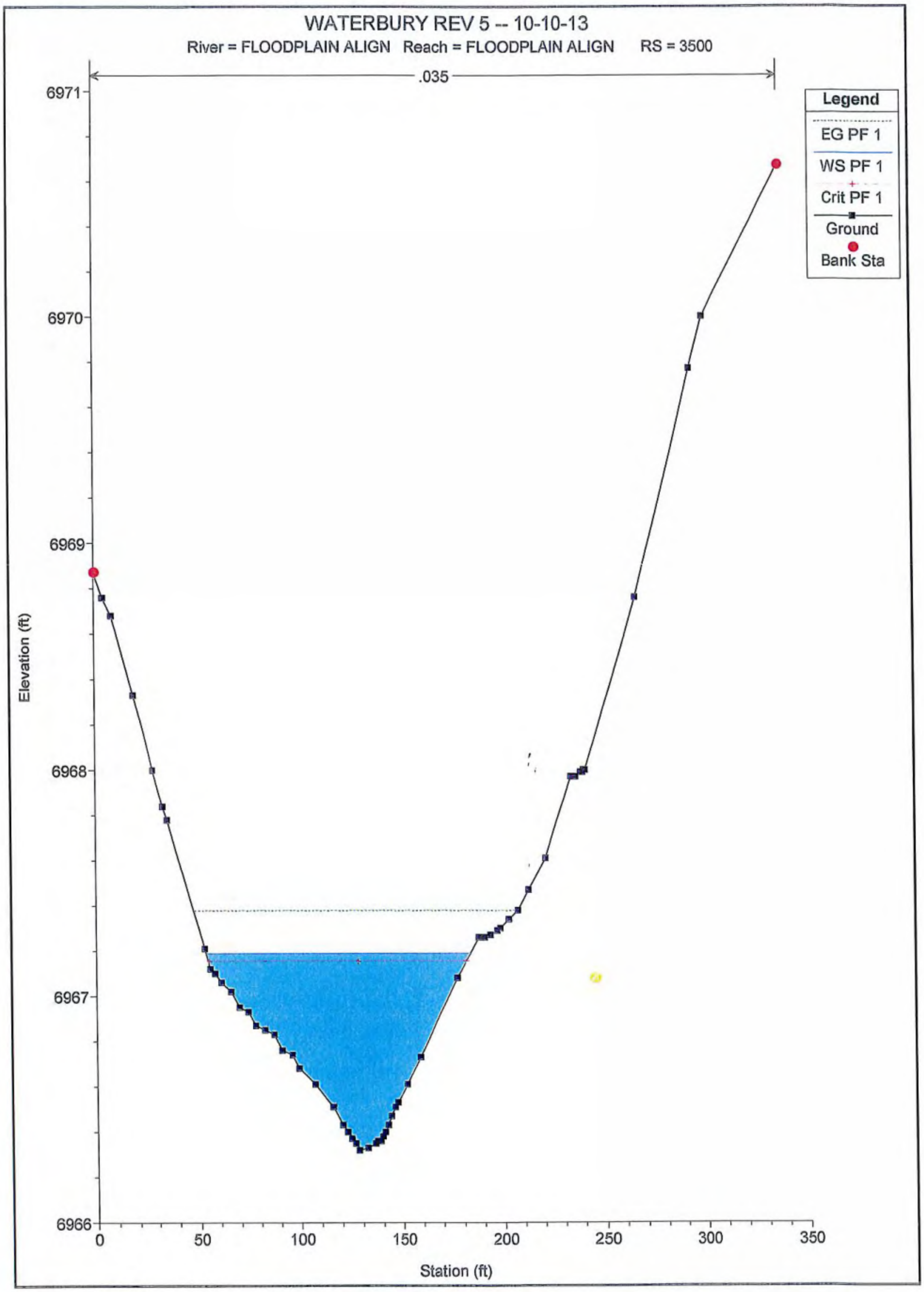
Station (ft)



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Ground
Bank Sta
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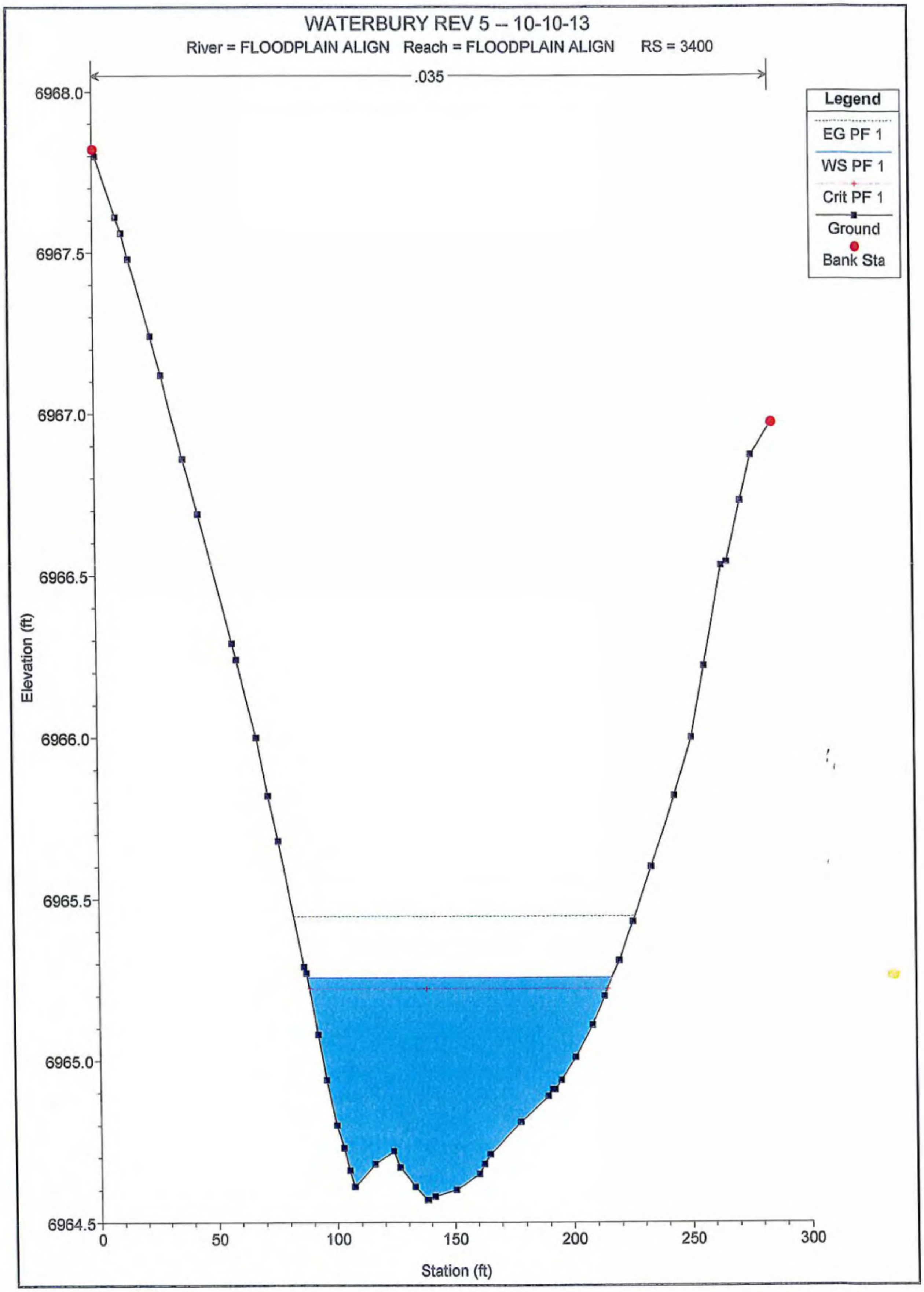
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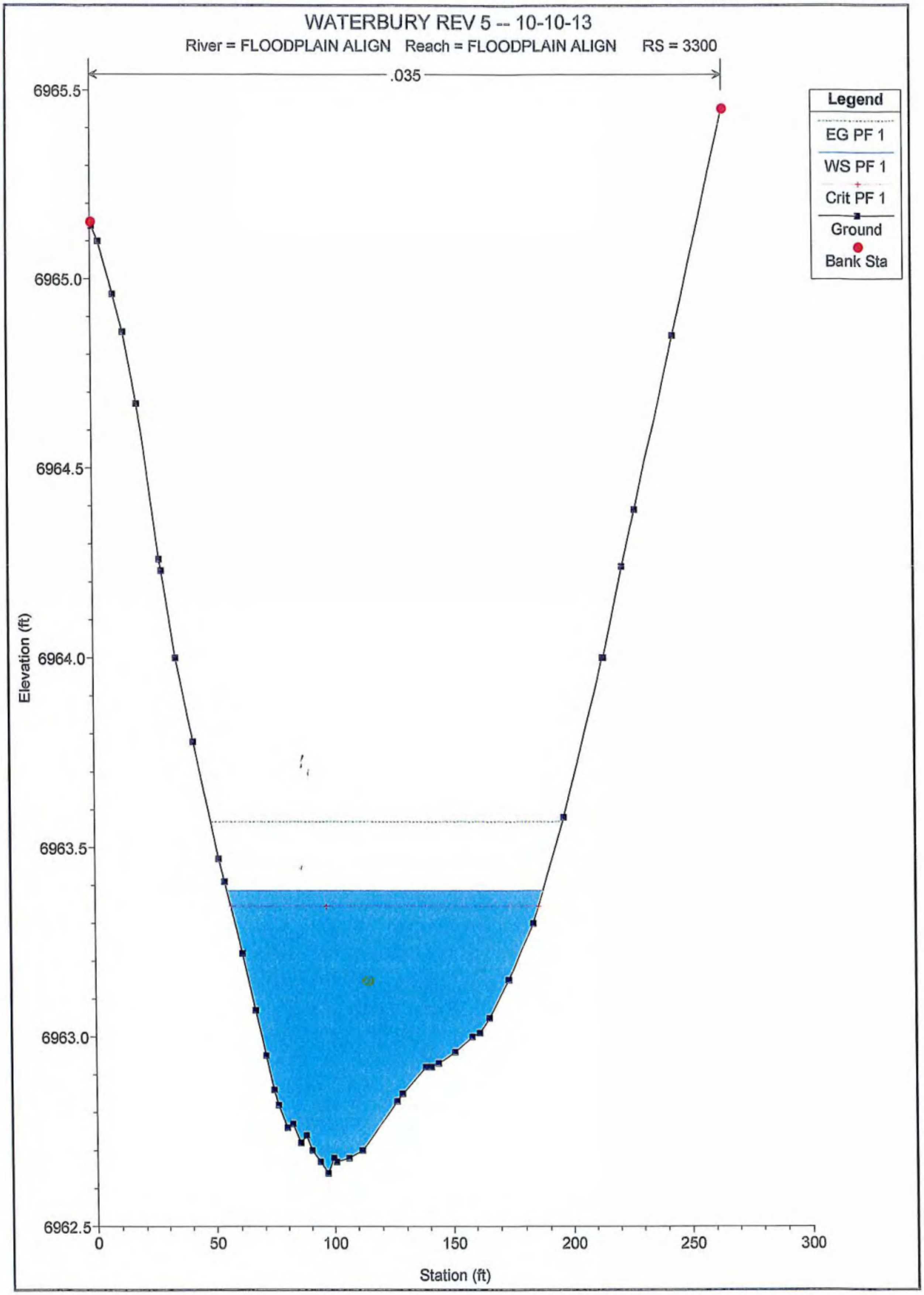

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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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6965.0
6964.5
6964.0
6963.5
6963.0
6962.5
Station (ft)
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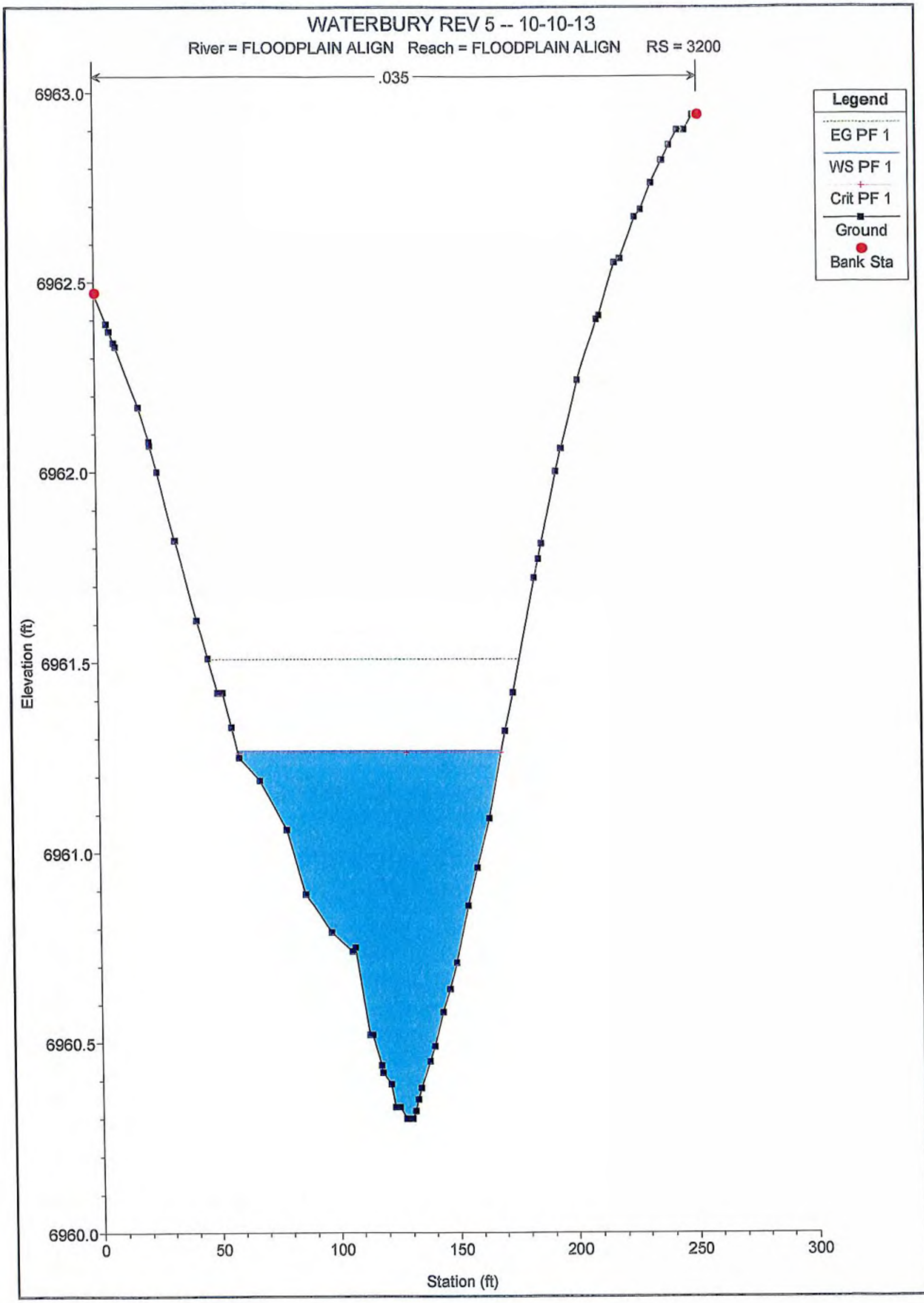
50
100
150
200
250
300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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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200
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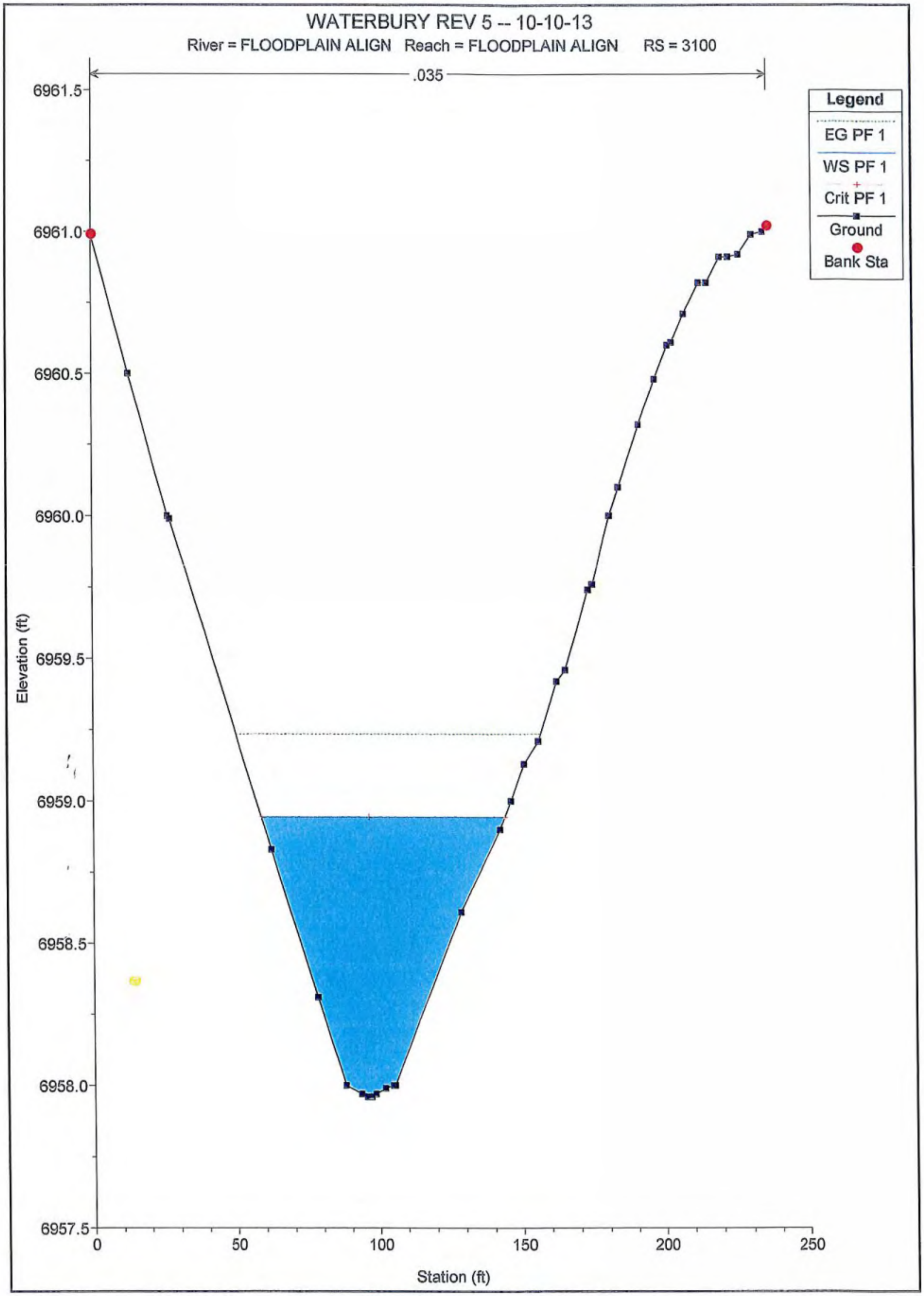
300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Crit PF 1
Ground
Bank Sta
Elevation (ft)
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6960.5
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Station (ft)
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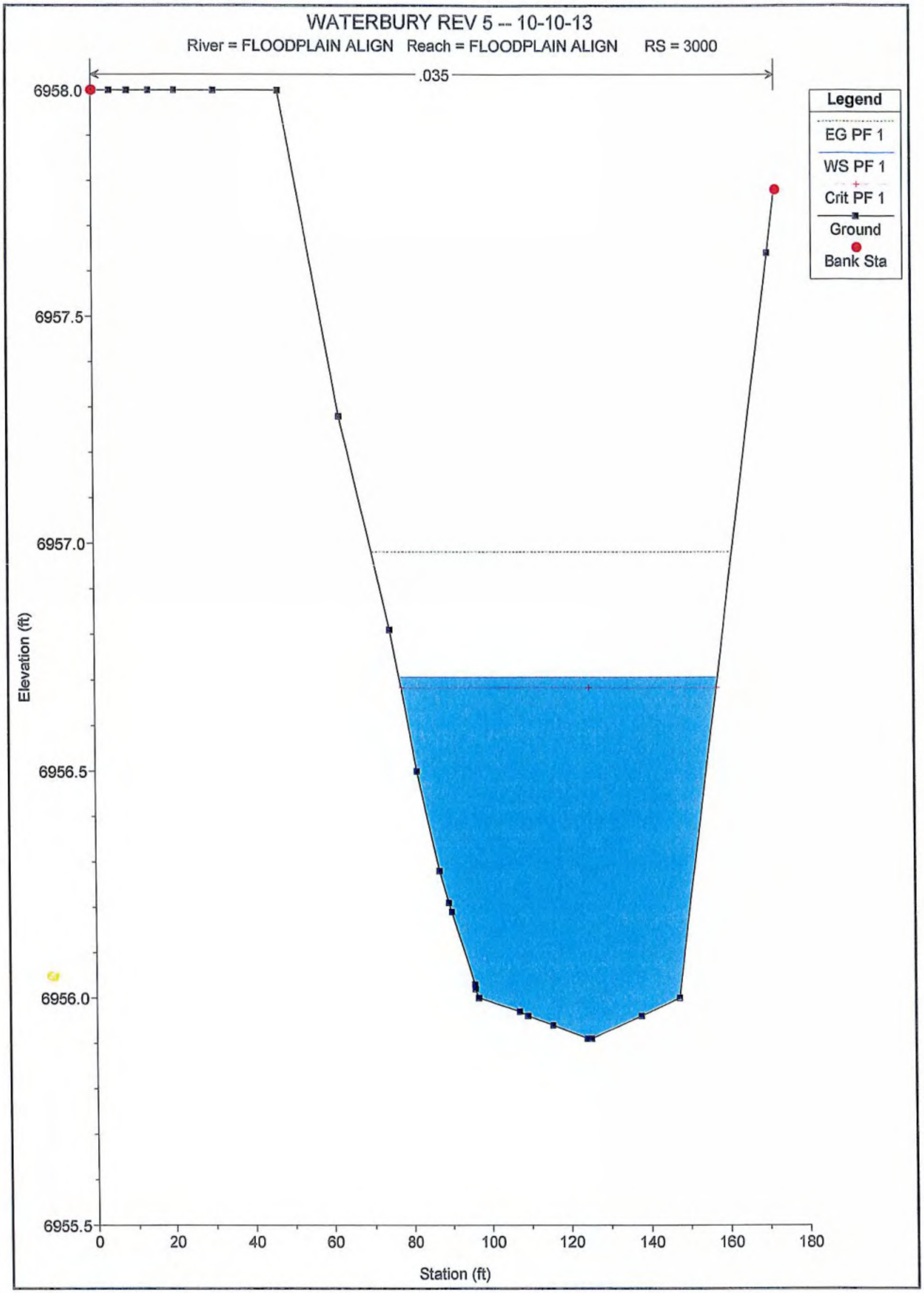
100
150
200
250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WS PF 1
Crit PF 1
Ground
Bank Sta
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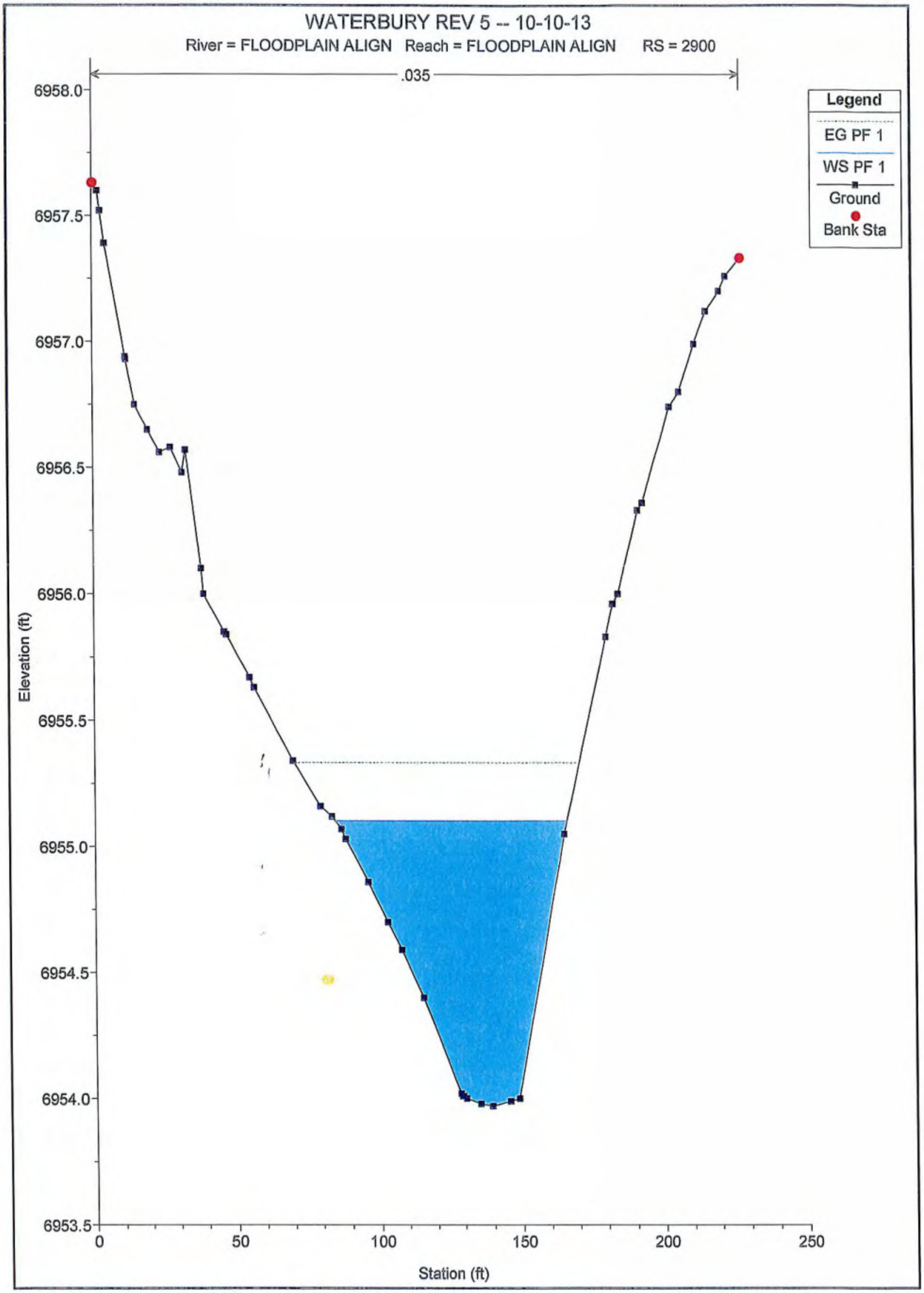
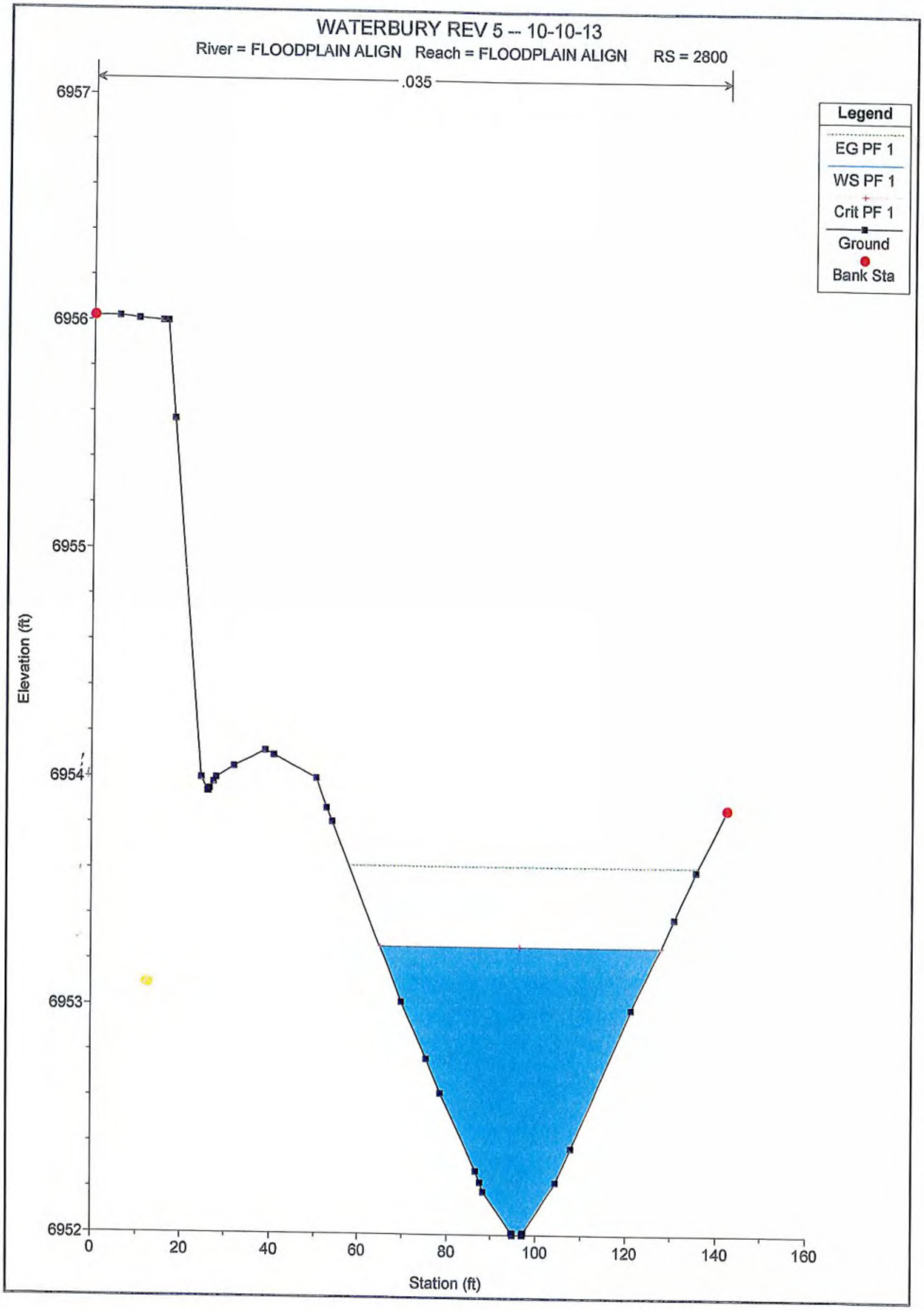
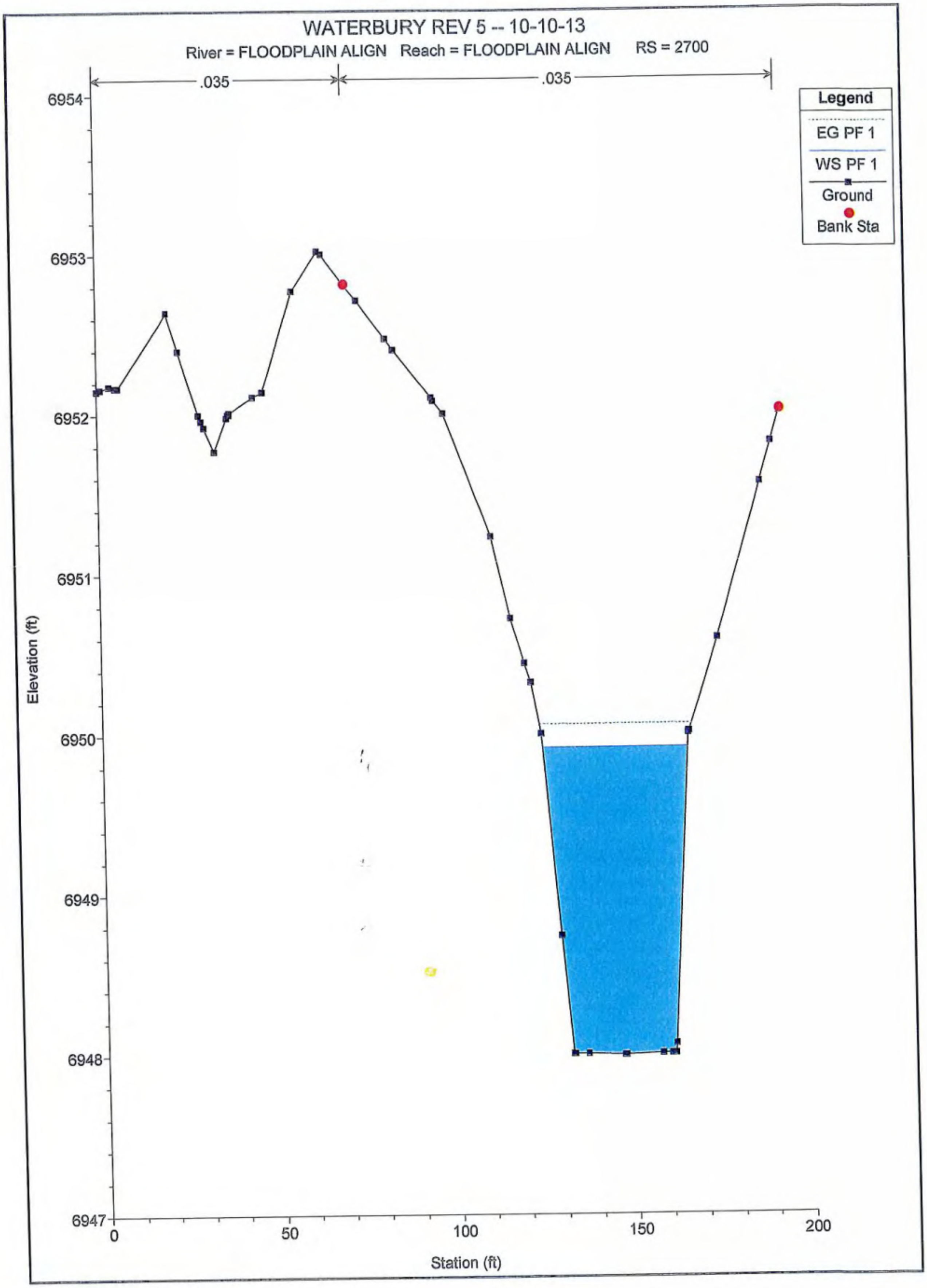
6957.5
6957.0
6956.5
6956.0
6955.5
Station (ft)
0
20
40
60
80
100
120
140
160
180



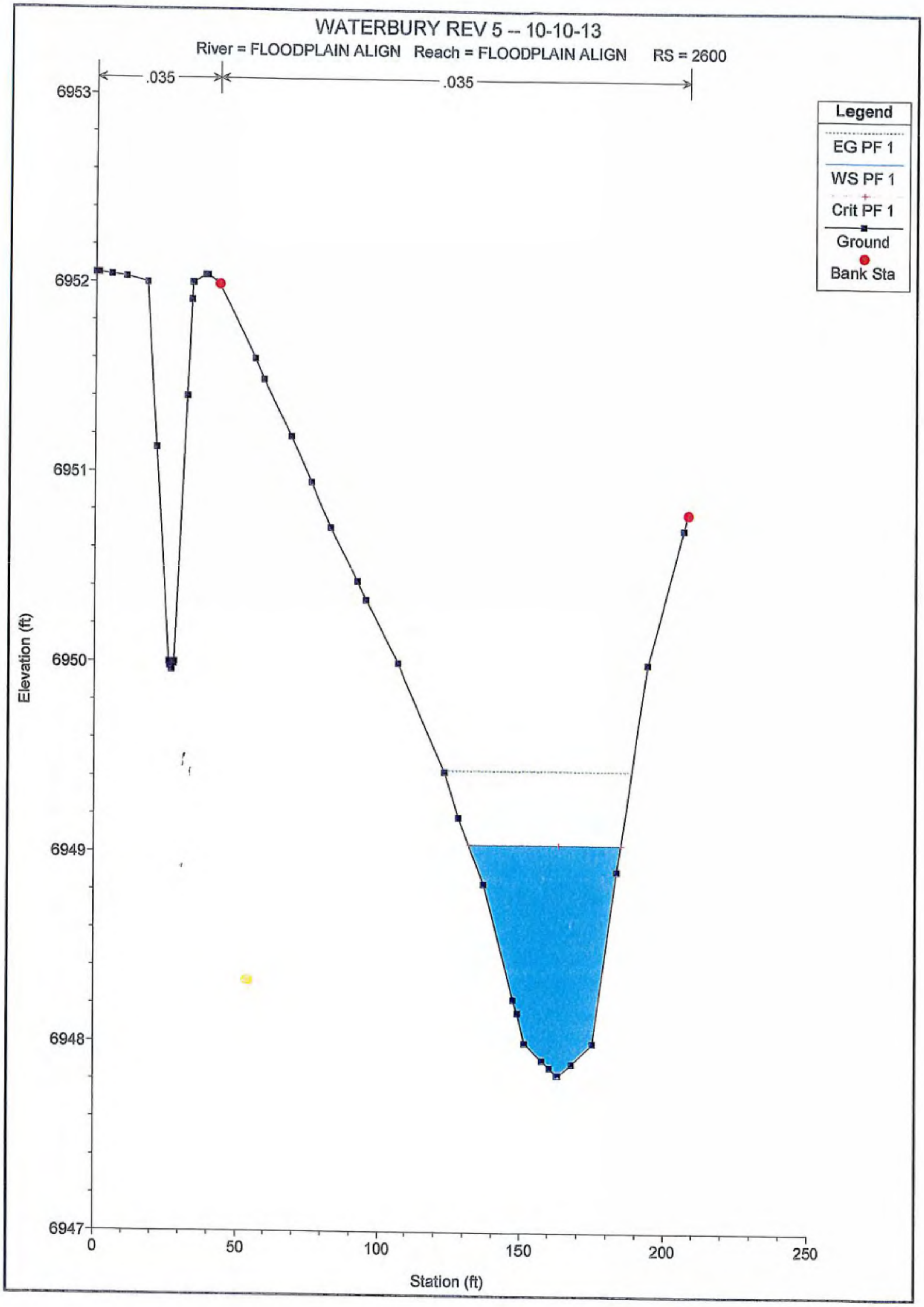
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 2900
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
6958.0
6957.5
6957.0
6956.5
6956.0
6955.5
6955.0
6954.5
6954.0
6953.5
0
50
100
150
200
250
Station (ft)

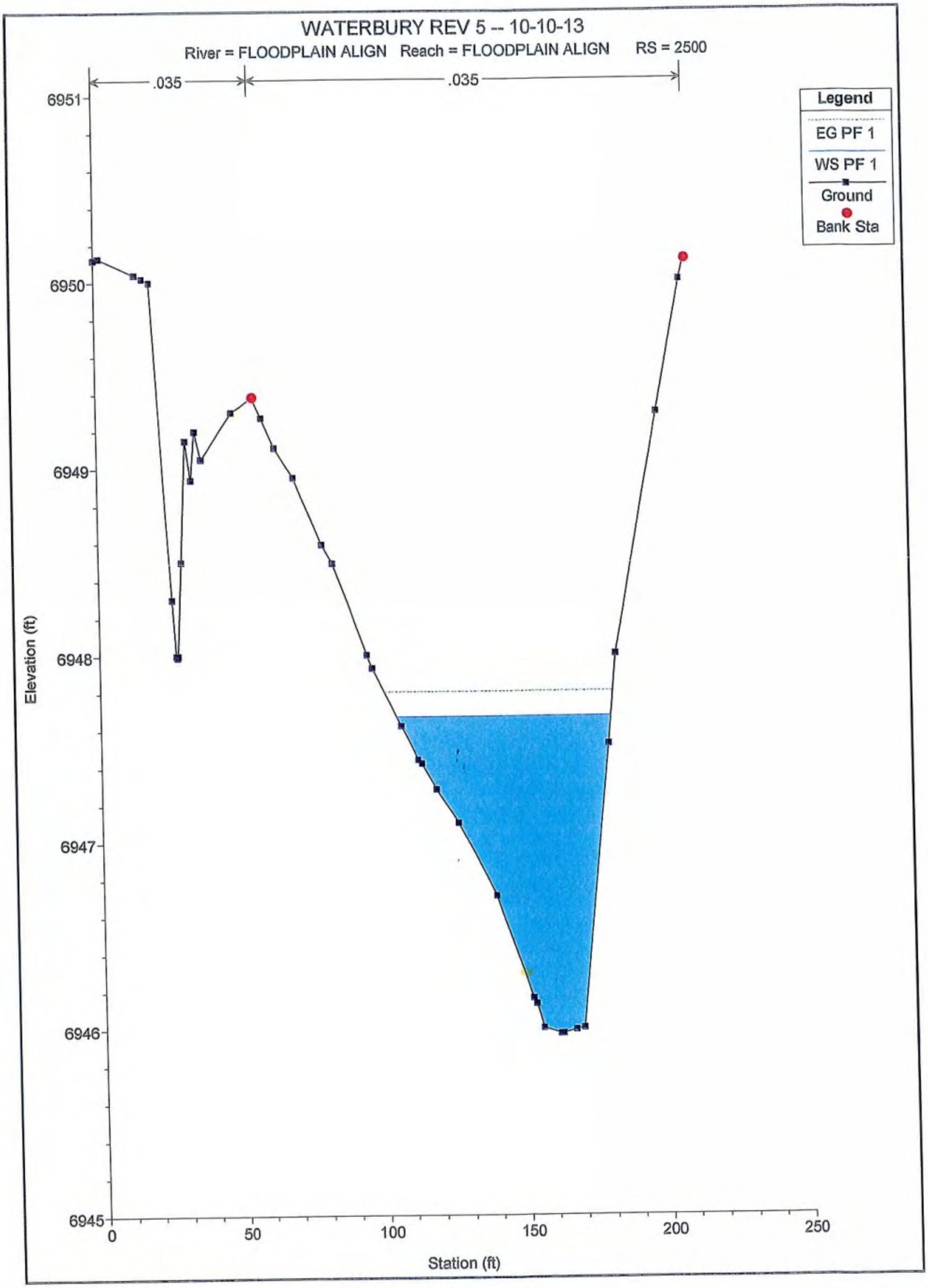


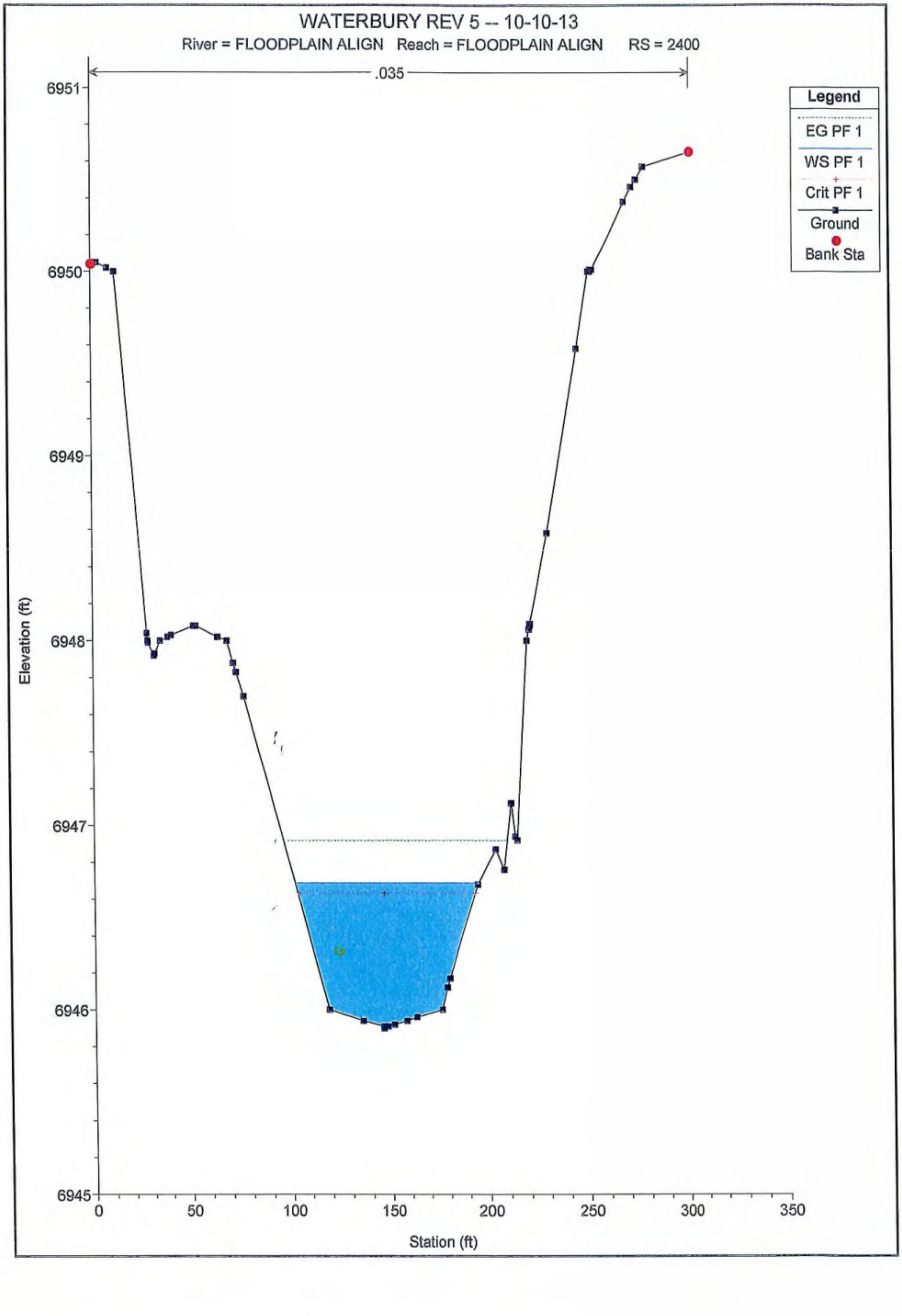
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 2800
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
6957
6956
6955
6954
6953
6952
0
20
40
60
80
100
120
140
160



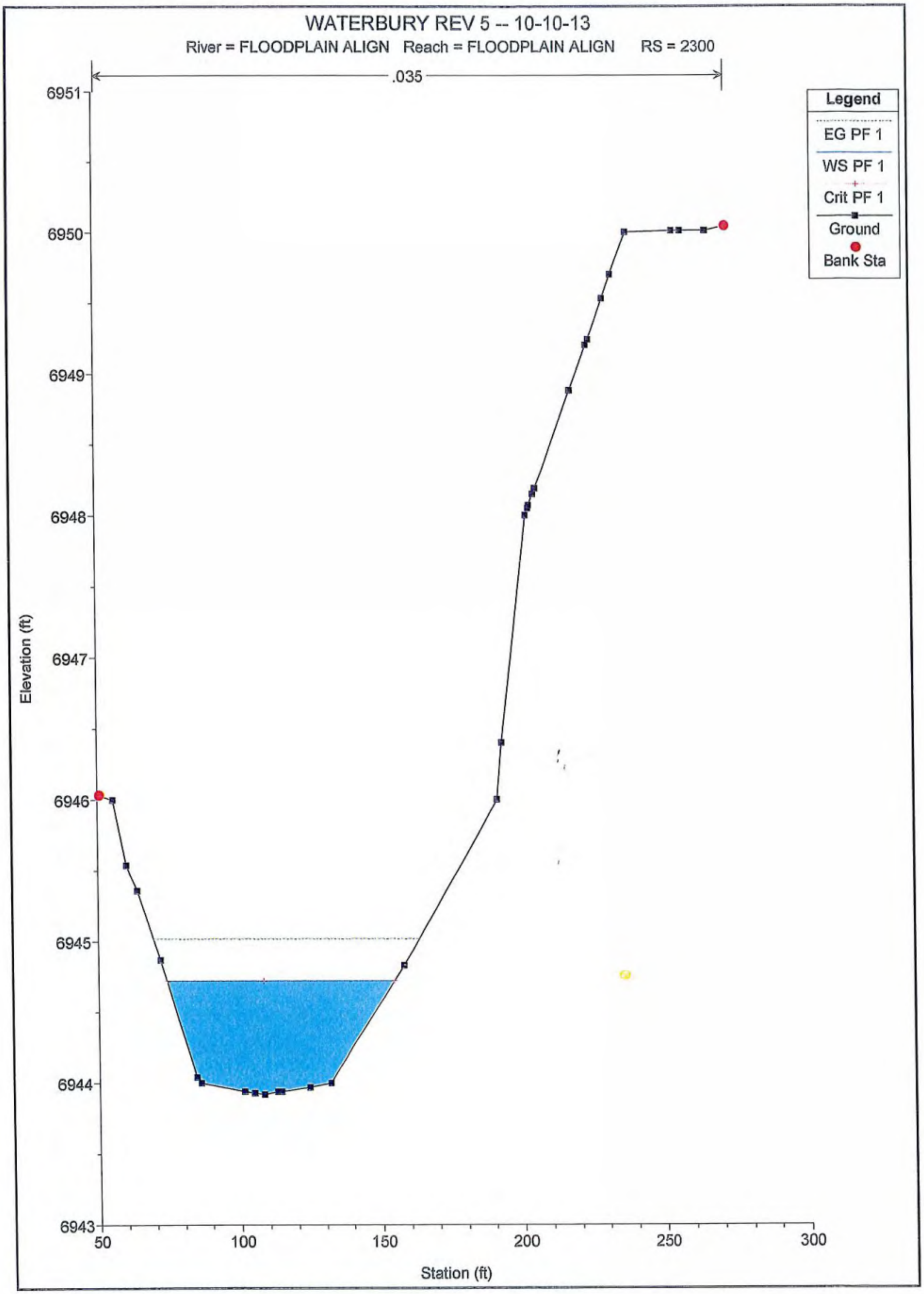
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 2700
.035
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
6954
6953
6952
6951
6950
6949
6948
6947
Elevation (ft)
0
50
100
150
200
Station (ft)

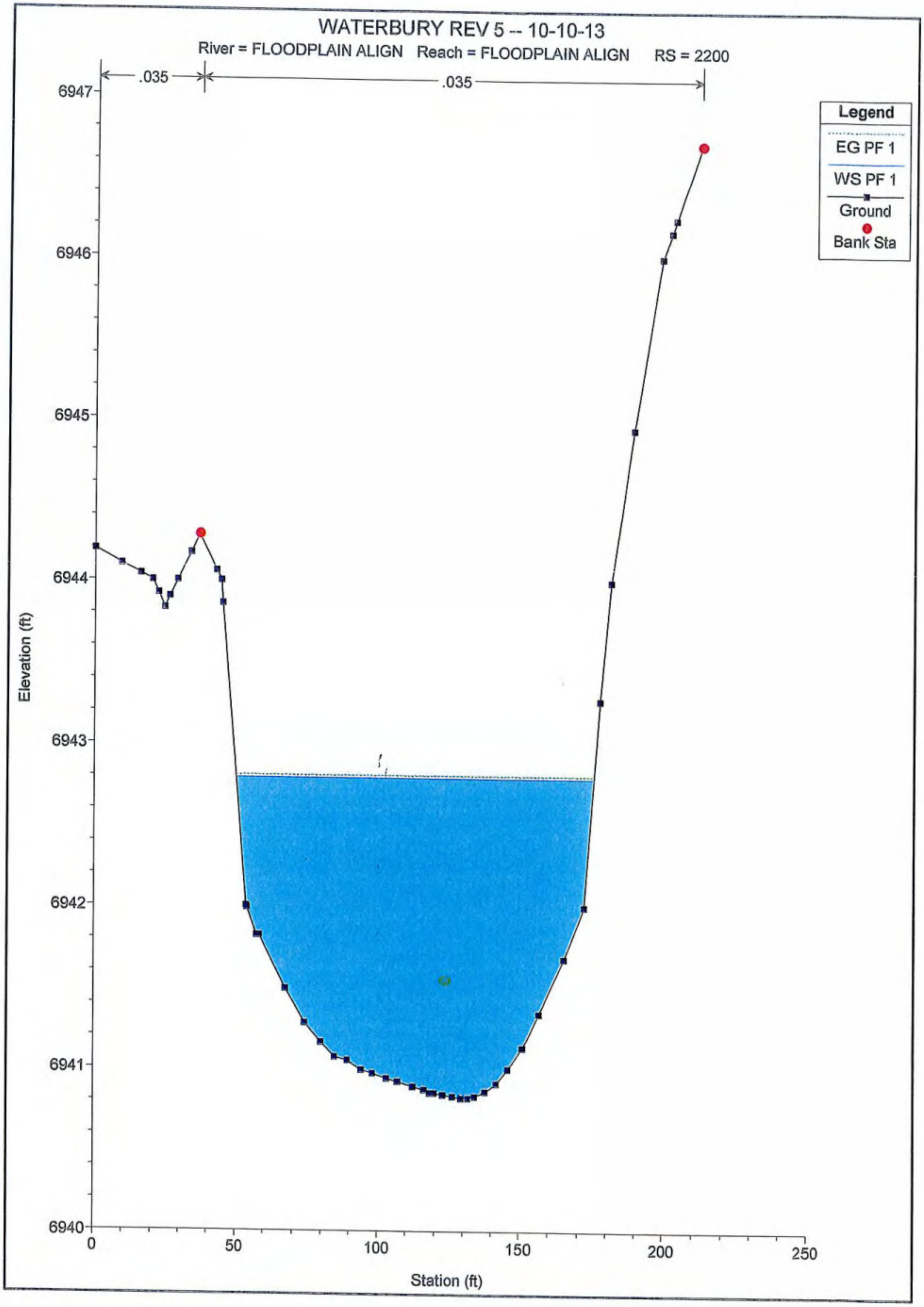

WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 2600
.035
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6953
6952
6951
6950
6949
6948
6947
Station (ft)
0
50
100
150
200
250

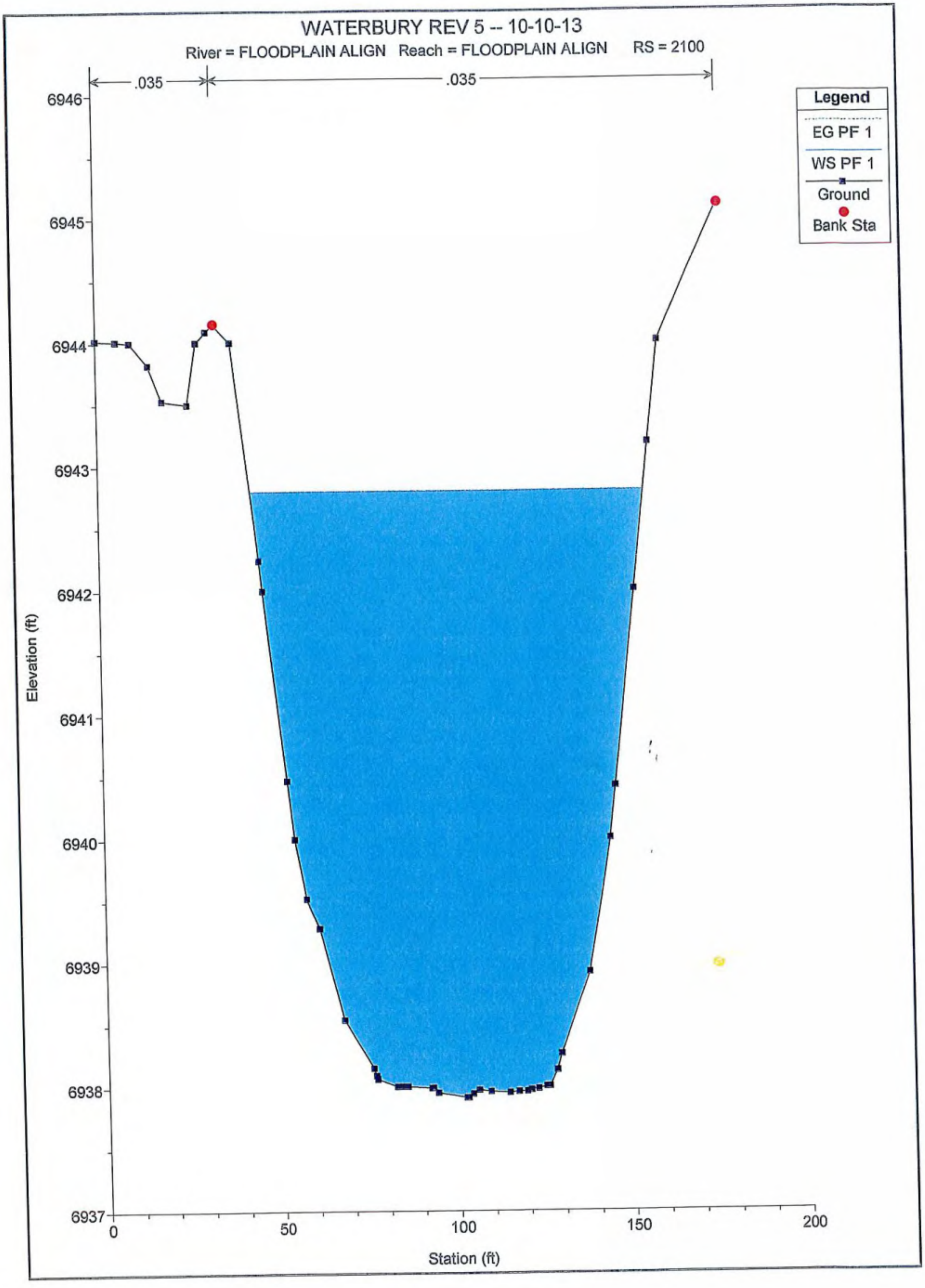

WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 2500
.035
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
6951
6950
6949
6948
6947
6946
6945
0
50
100
150
200
250
Station (ft)



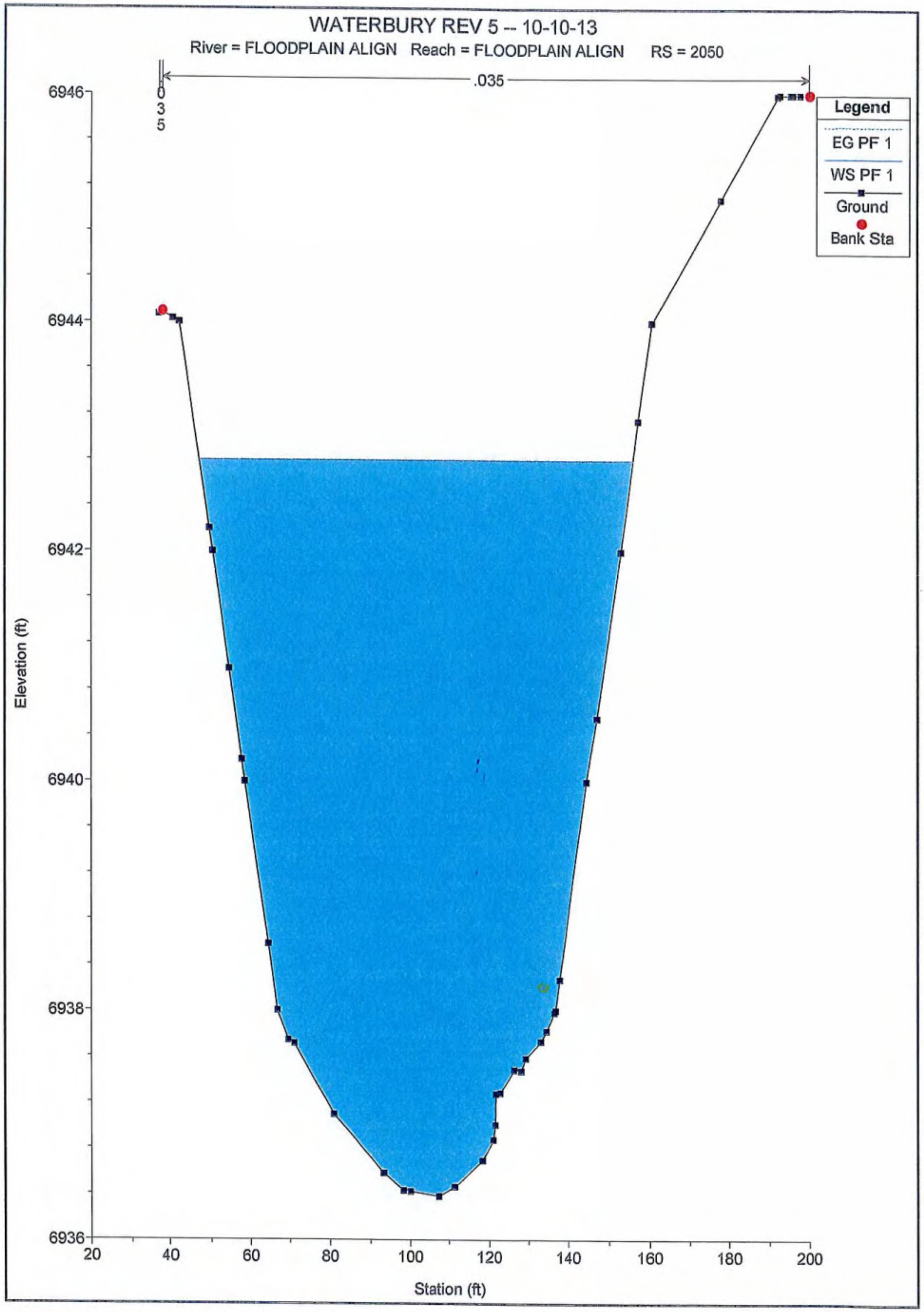
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 2400
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6945
6946
6947
6948
6949
6950
6951
Station (ft)
0
50
100
150
200
250
300
350

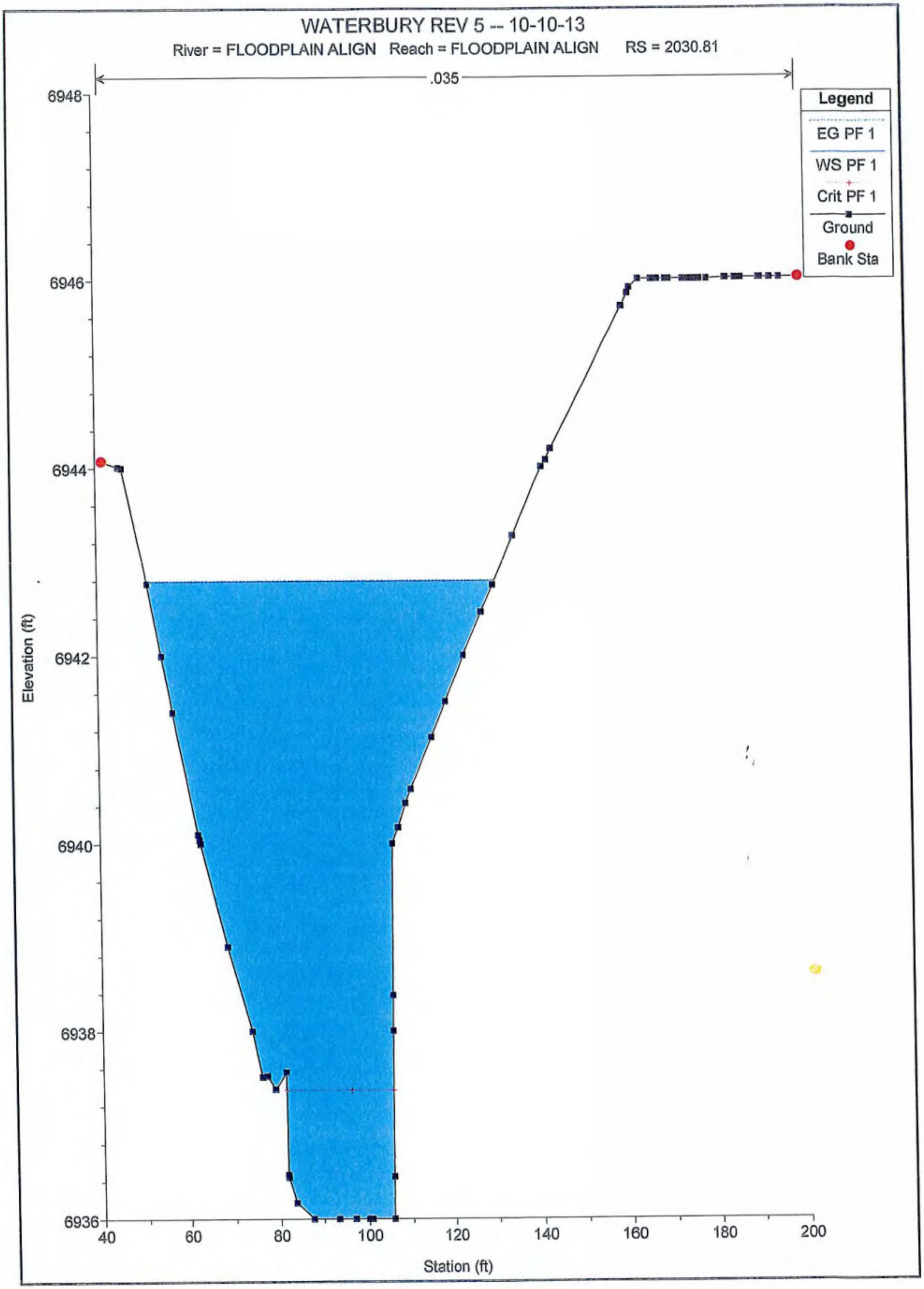

WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 2300
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6951
6950
6949
6948
6947
6946
6945
6944
6943
Station (ft)
50
100
150
200
250
300


WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 2200
.035
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
6947
6946
6945
6944
6943
6942
6941
6940
0
50
100
150
200
250
Station (ft)

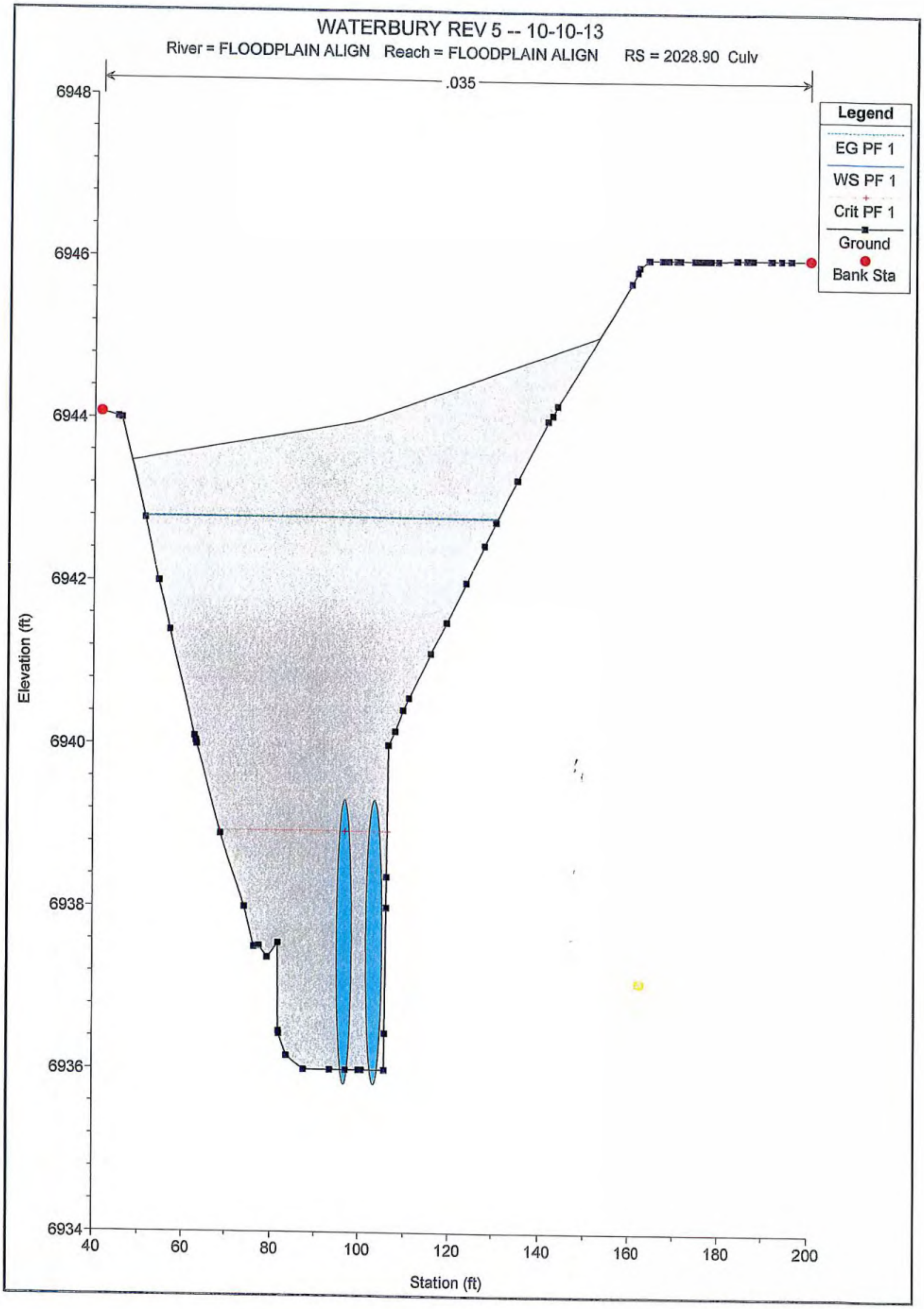


WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 2100
.035
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
6946
6945
6944
6943
6942
6941
6940
6939
6938
6937
0
50
100
150
200
Station (ft)

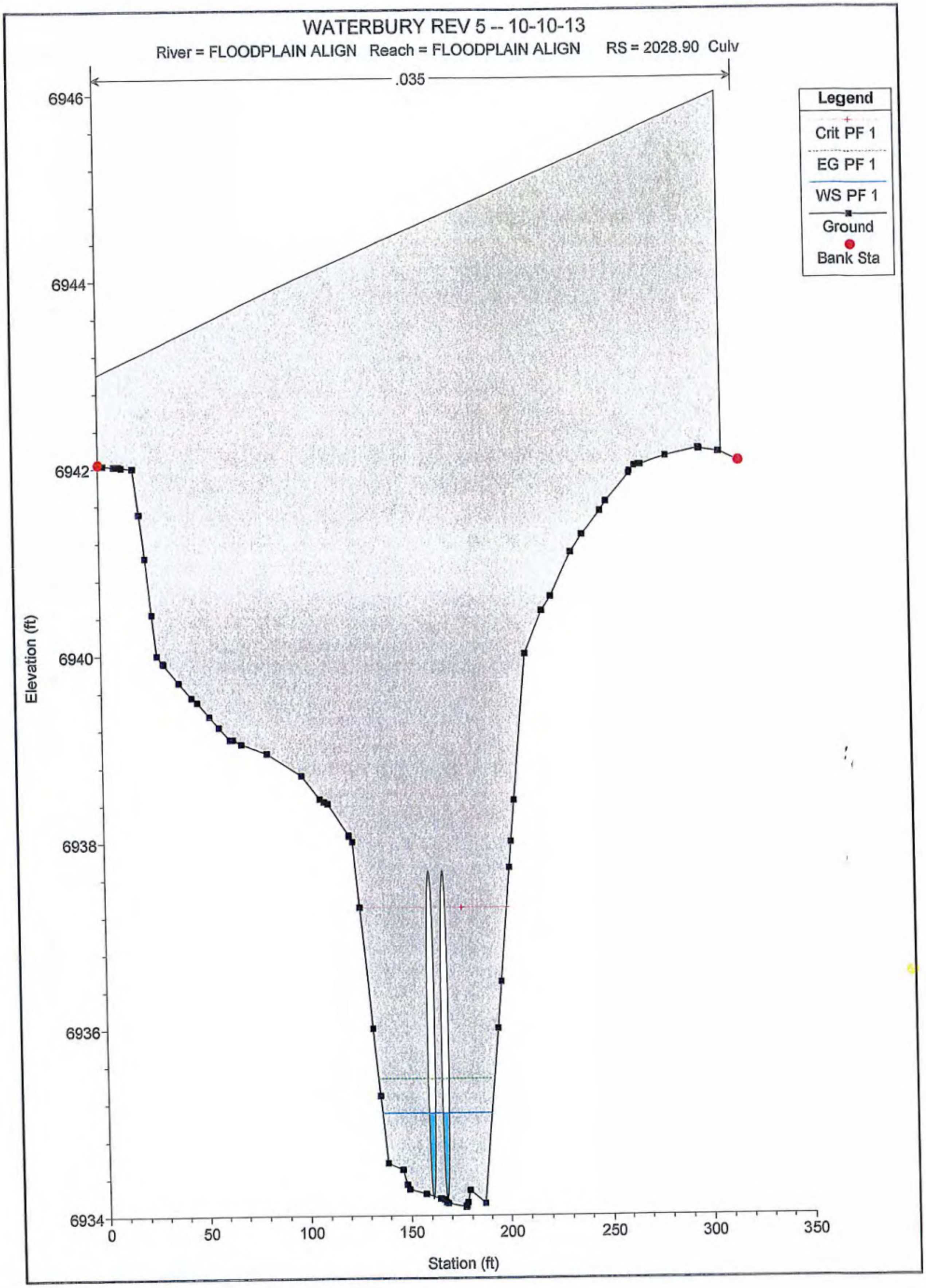

WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 2050
.035
0
3
5
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
6946
6944
6942
6940
6938
6936
20
40
60
80
100
120
140
160
180
200



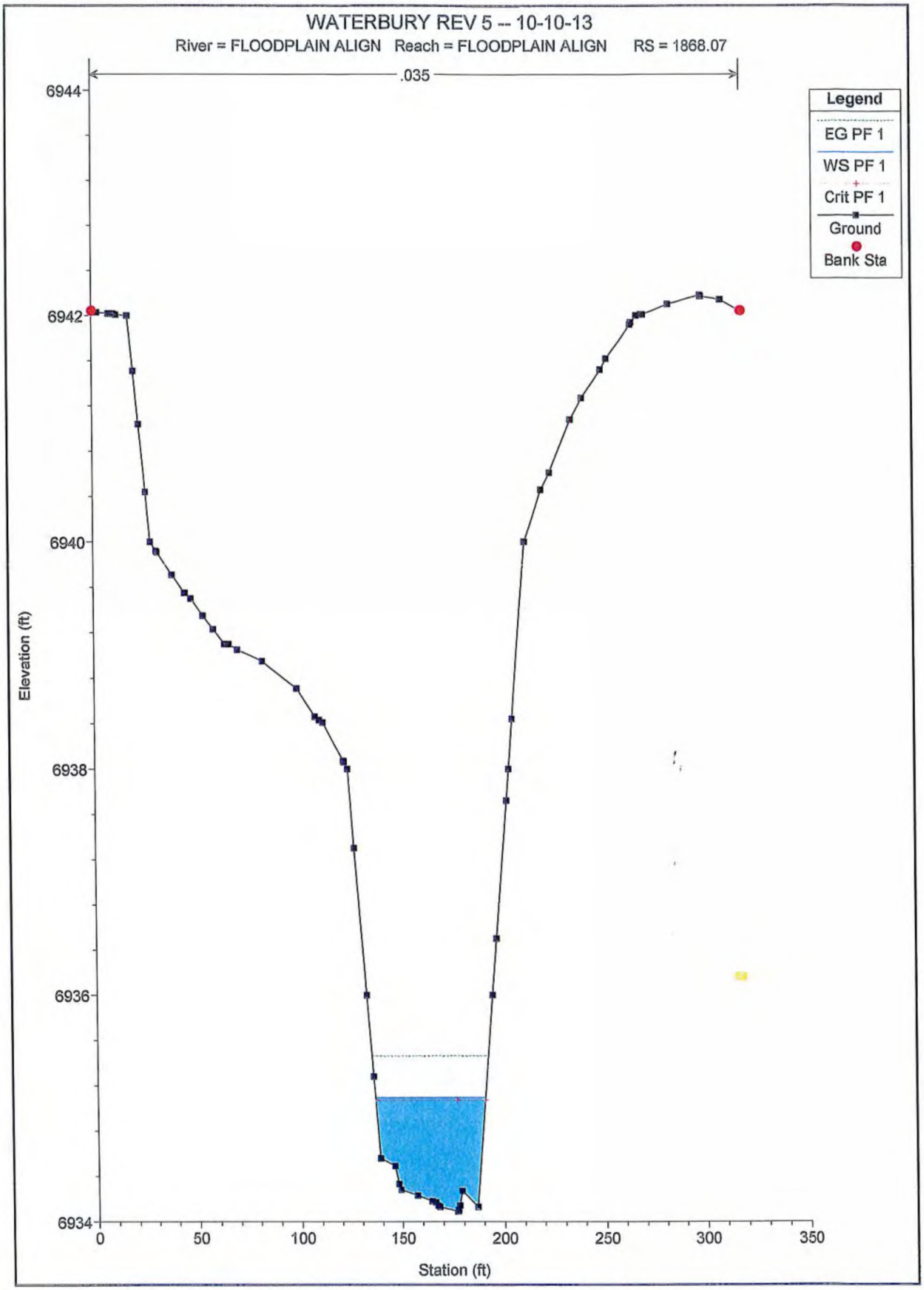
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 2030.81
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6948
6946
6944
6942
6940
6938
6936
Station (ft)
40
60
80
100
120
140
160
180
200



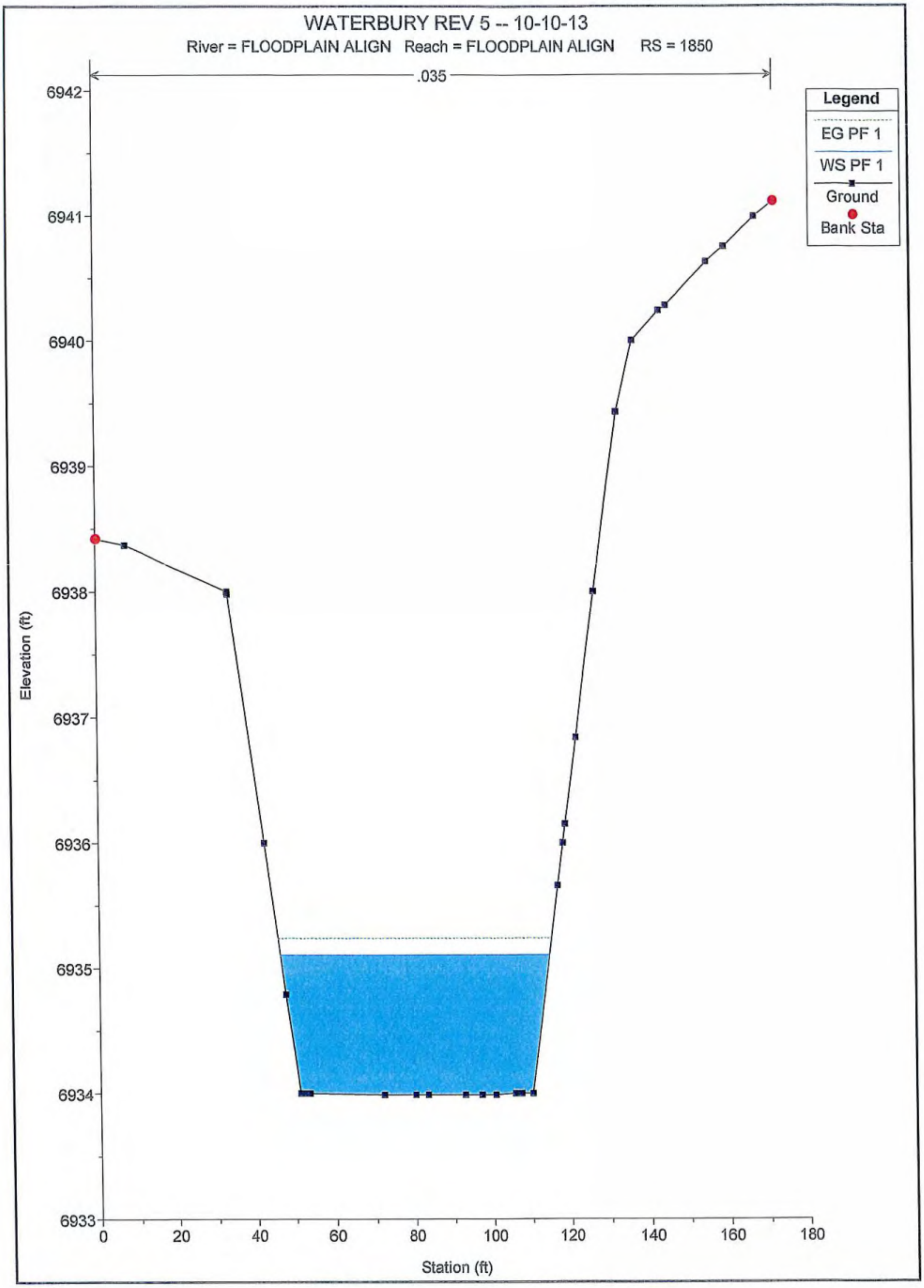
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 2028.90 Culv
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6948
6946
6944
6942
6940
6938
6936
6934
Station (ft)
40
60
80
100
120
140
160
180
200



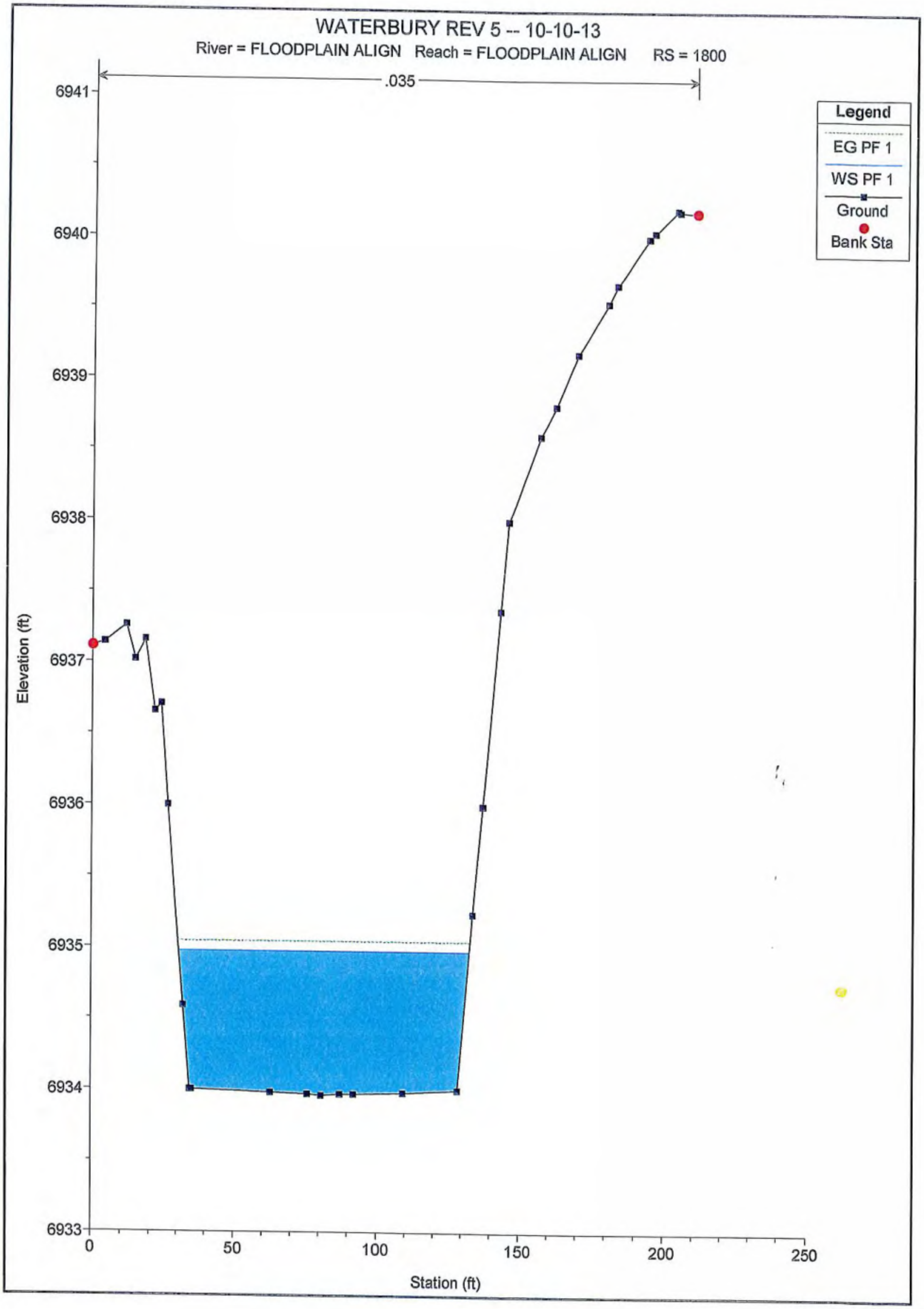
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 2028.90 Culv
.035
Legend
Crit PF 1
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
6946
6944
6942
6940
6938
6936
6934
0
50
100
150
200
250
300
350



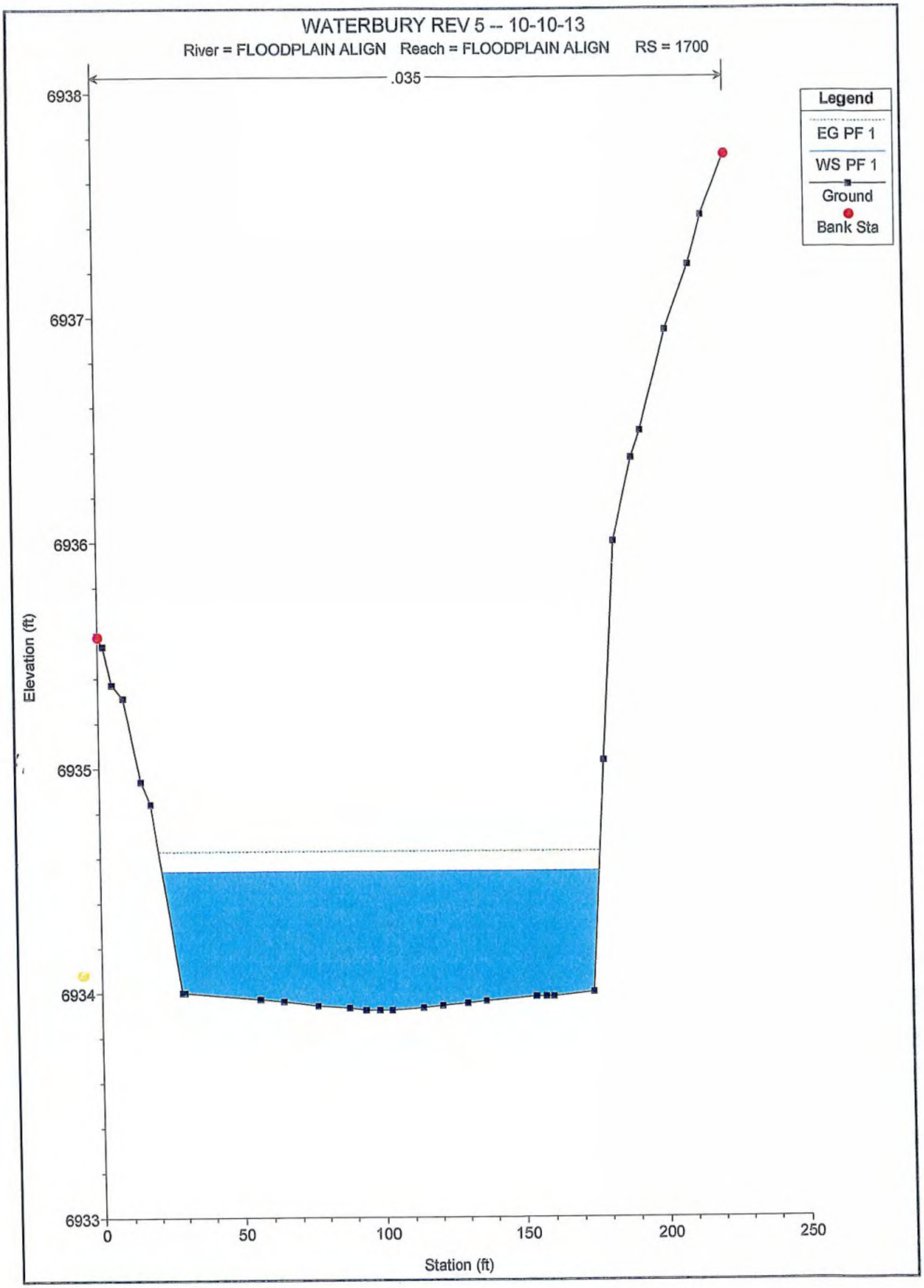
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 1868.07
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6944
6942
6940
6938
6936
6934
Station (ft)
0
50
100
150
200
250
300
350

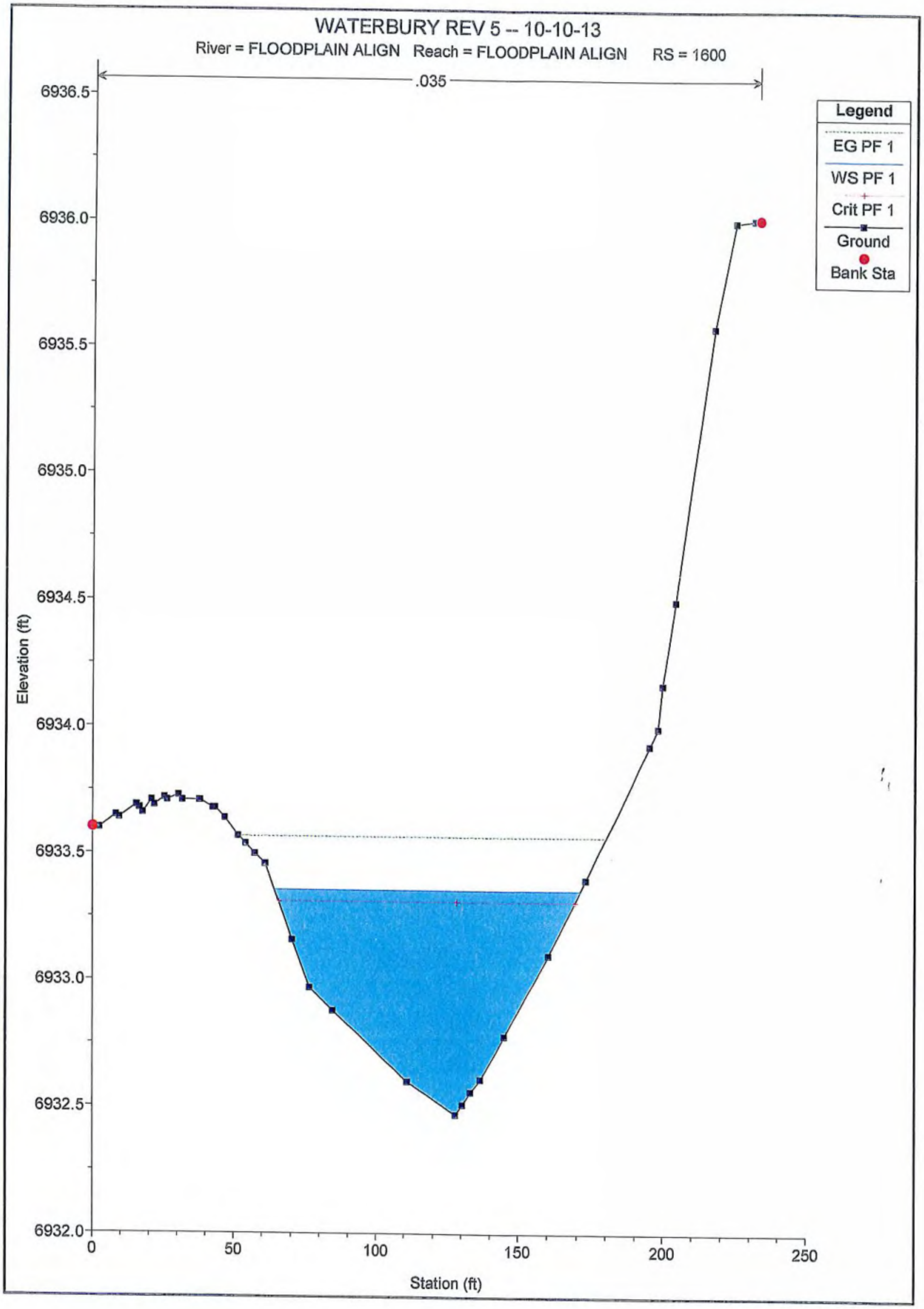


WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 1850
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
6942
6941
6940
6939
6938
6937
6936
6935
6934
6933
Station (ft)
0
20
40
60
80
100
120
140
160
180

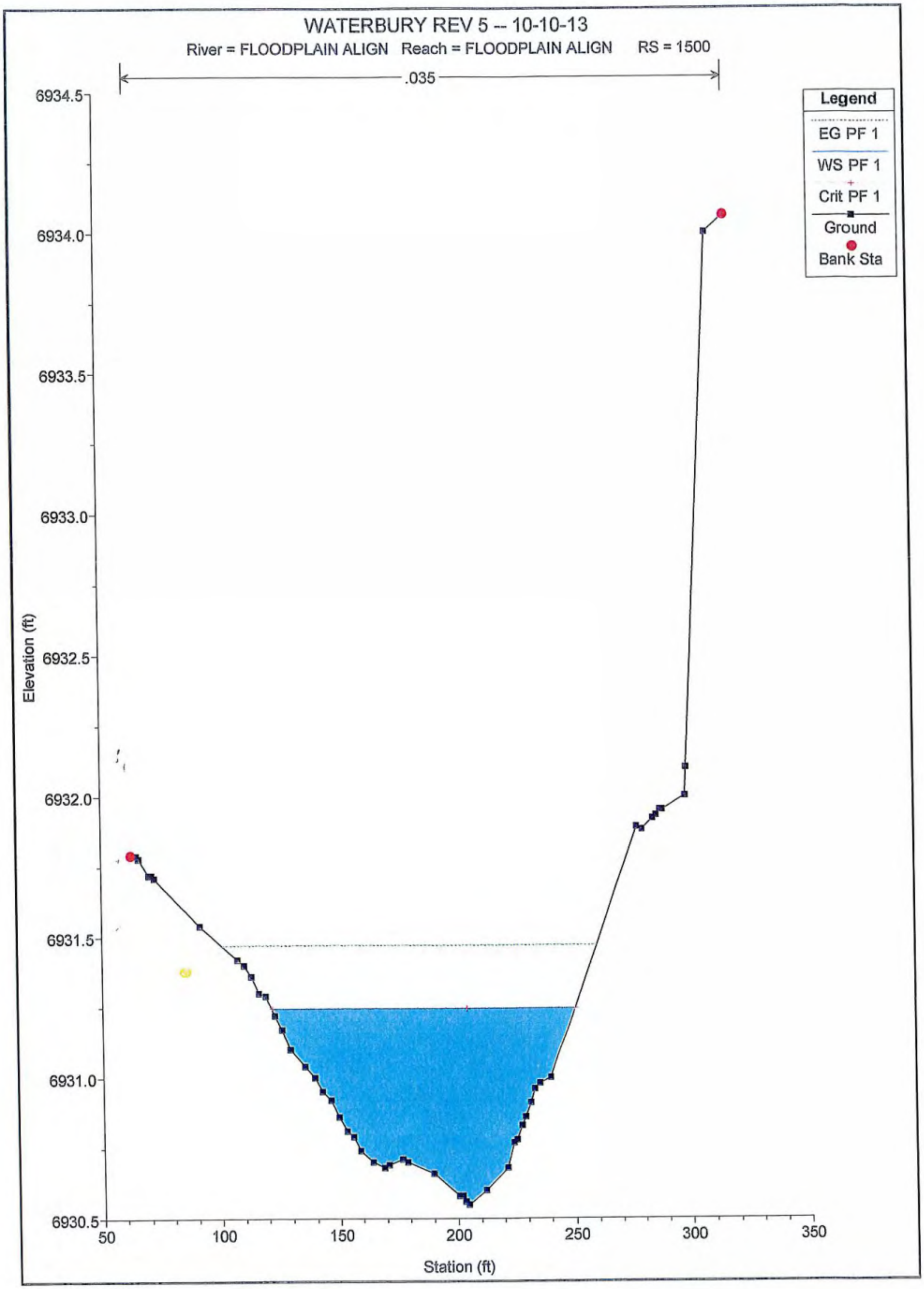


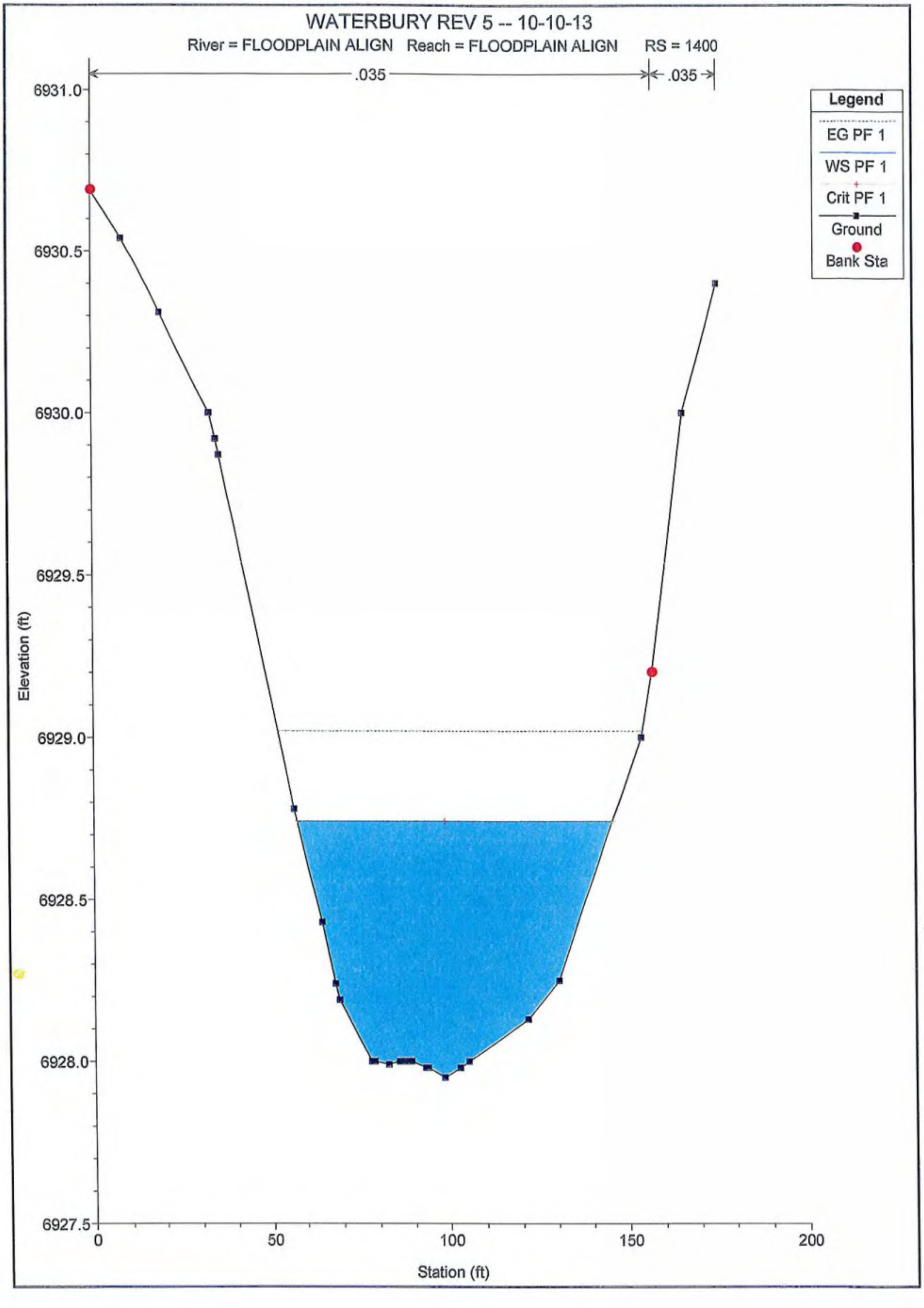
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 1800
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
6941
6940
6939
6938
6937
6936
6935
6934
6933
0
50
100
150
200
250
Station (ft)


WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 1700
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
6938
6937
6936
6935
6934
6933
0
50
100
150
200
250
Station (ft)

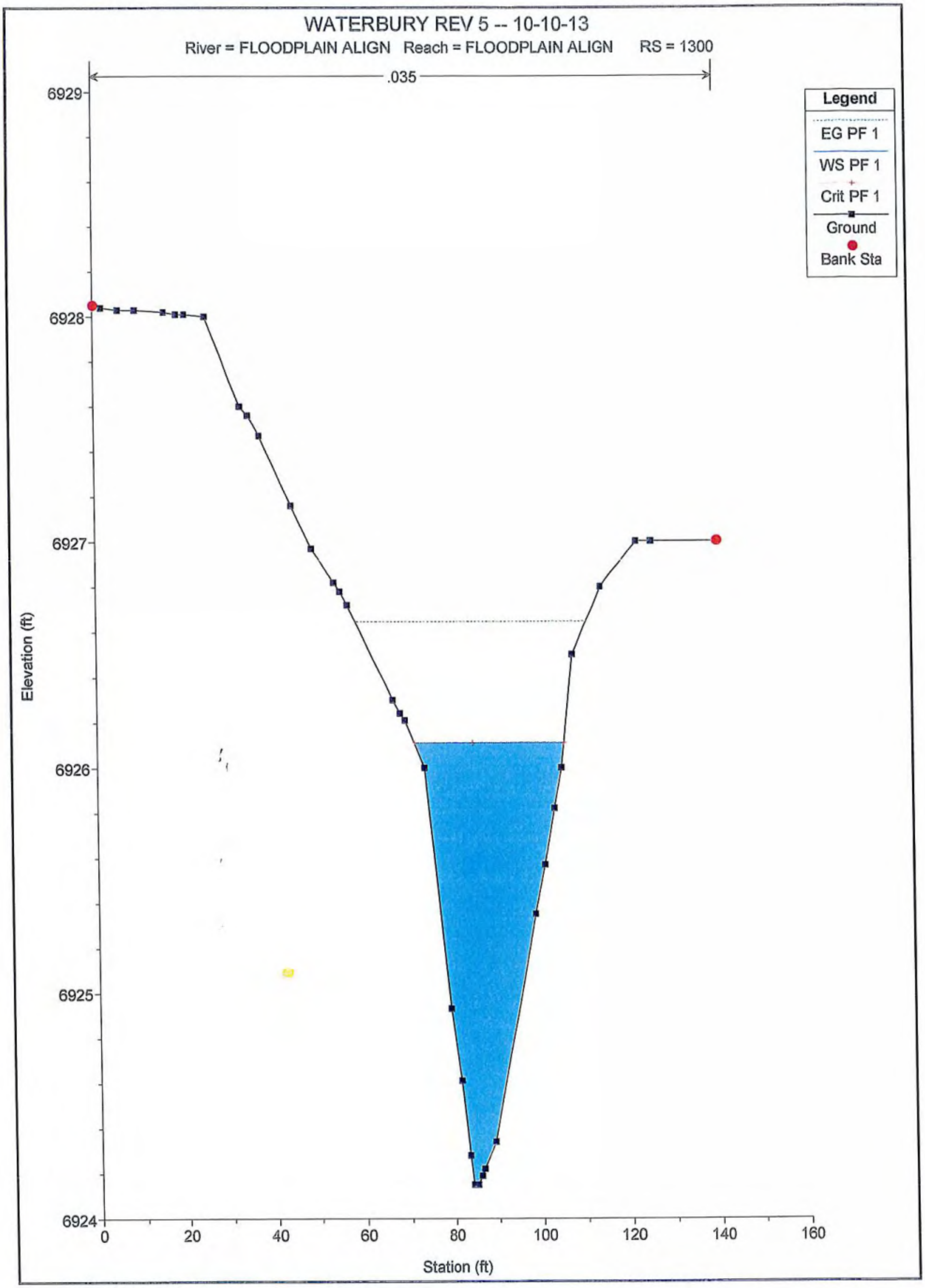


WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 1600
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
6936.5
6936.0
6935.5
6935.0
6934.5
6934.0
6933.5
6933.0
6932.5
6932.0
0
50
100
150
200
250

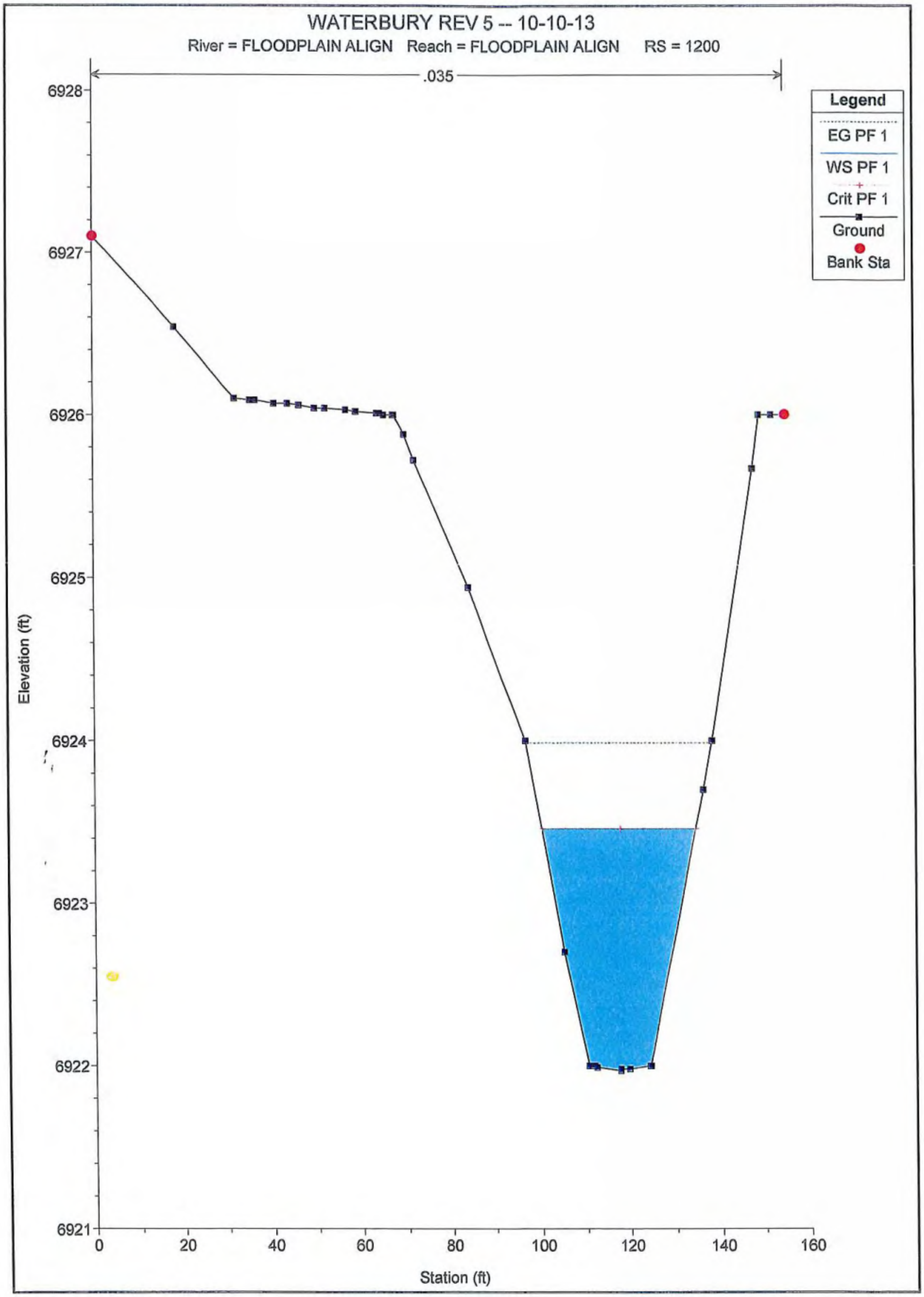

WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 1500
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6934.5
6934.0
6933.5
6933.0
6932.5
6932.0
6931.5
6931.0
6930.5
50
100
150
200
250
300
350
Station (ft)

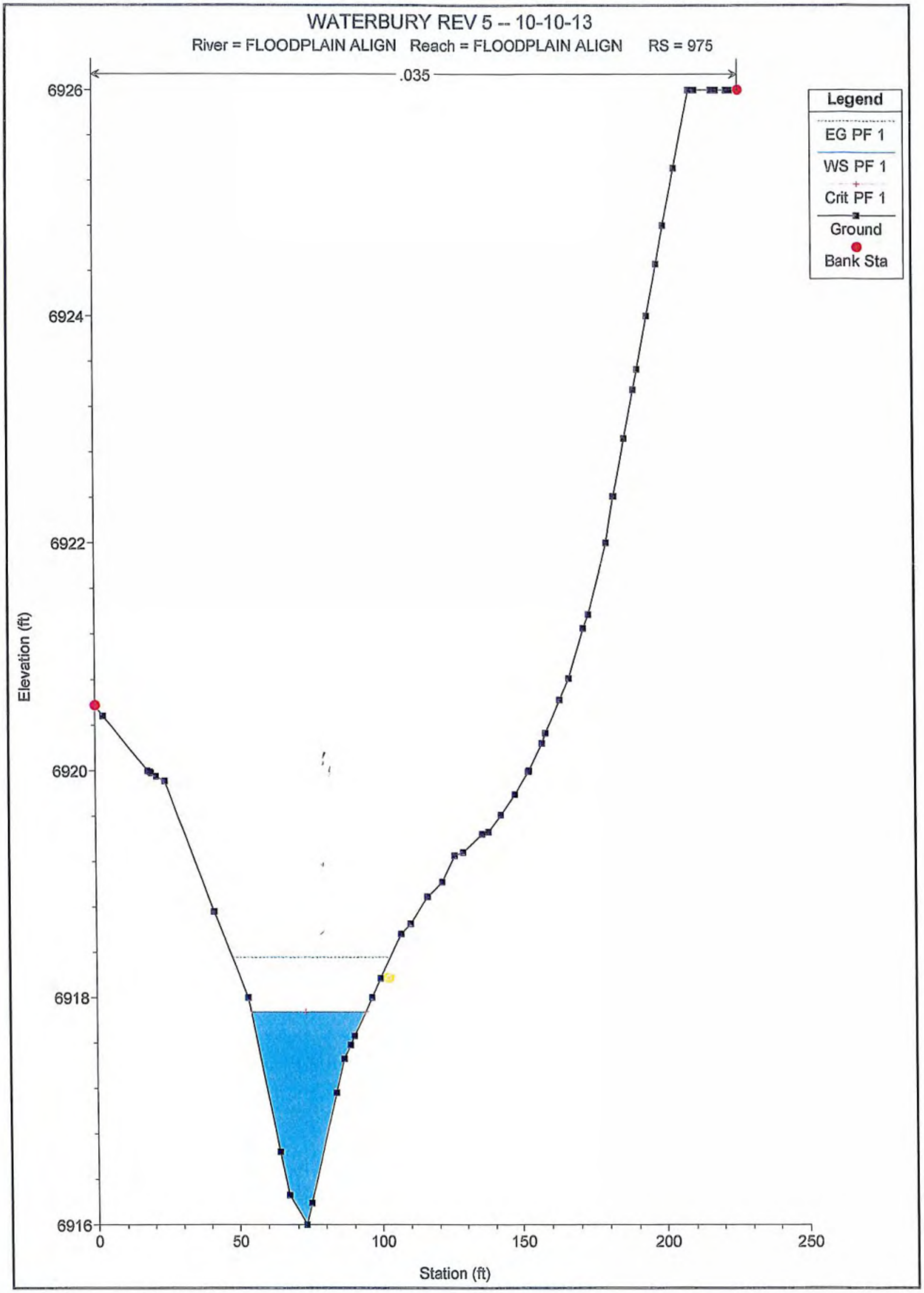


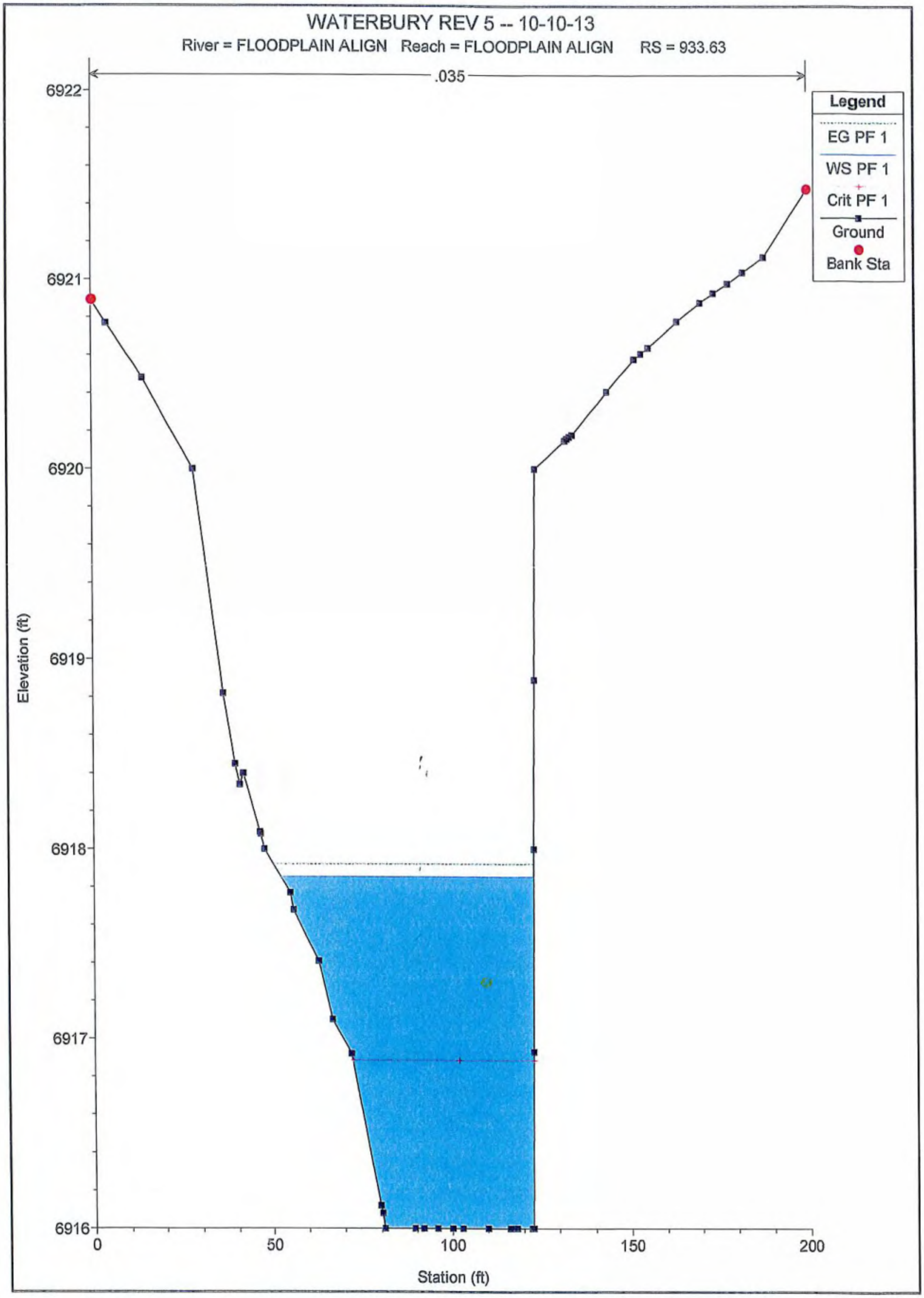
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 1400
.035
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6931.0
6930.5
6930.0
6929.5
6929.0
6928.5
6928.0
6927.5
0
50
100
150
200
Station (ft)

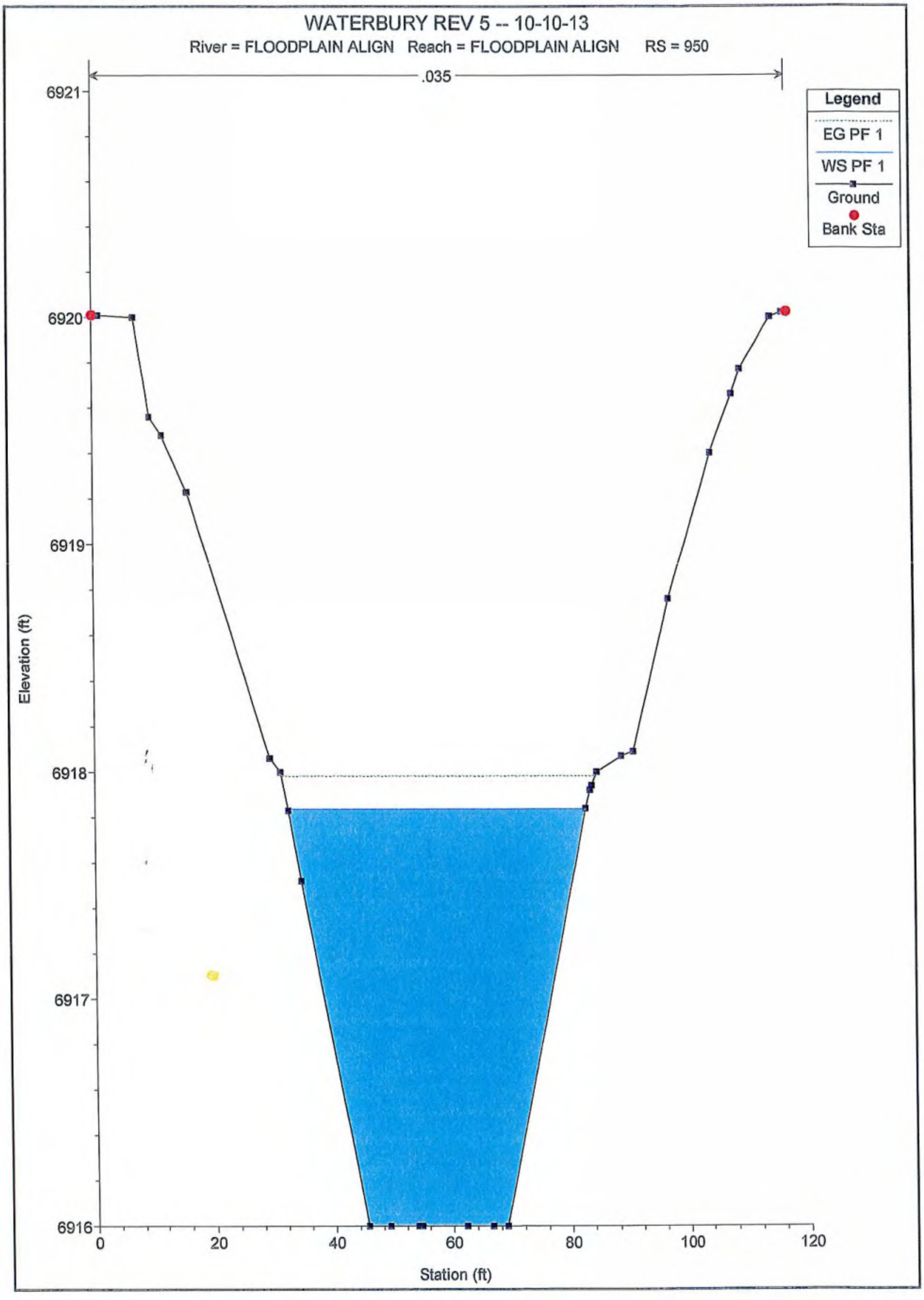


WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 1300
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6929
6928
6927
6926
6925
6924
Station (ft)
0
20
40
60
80
100
120
140
160

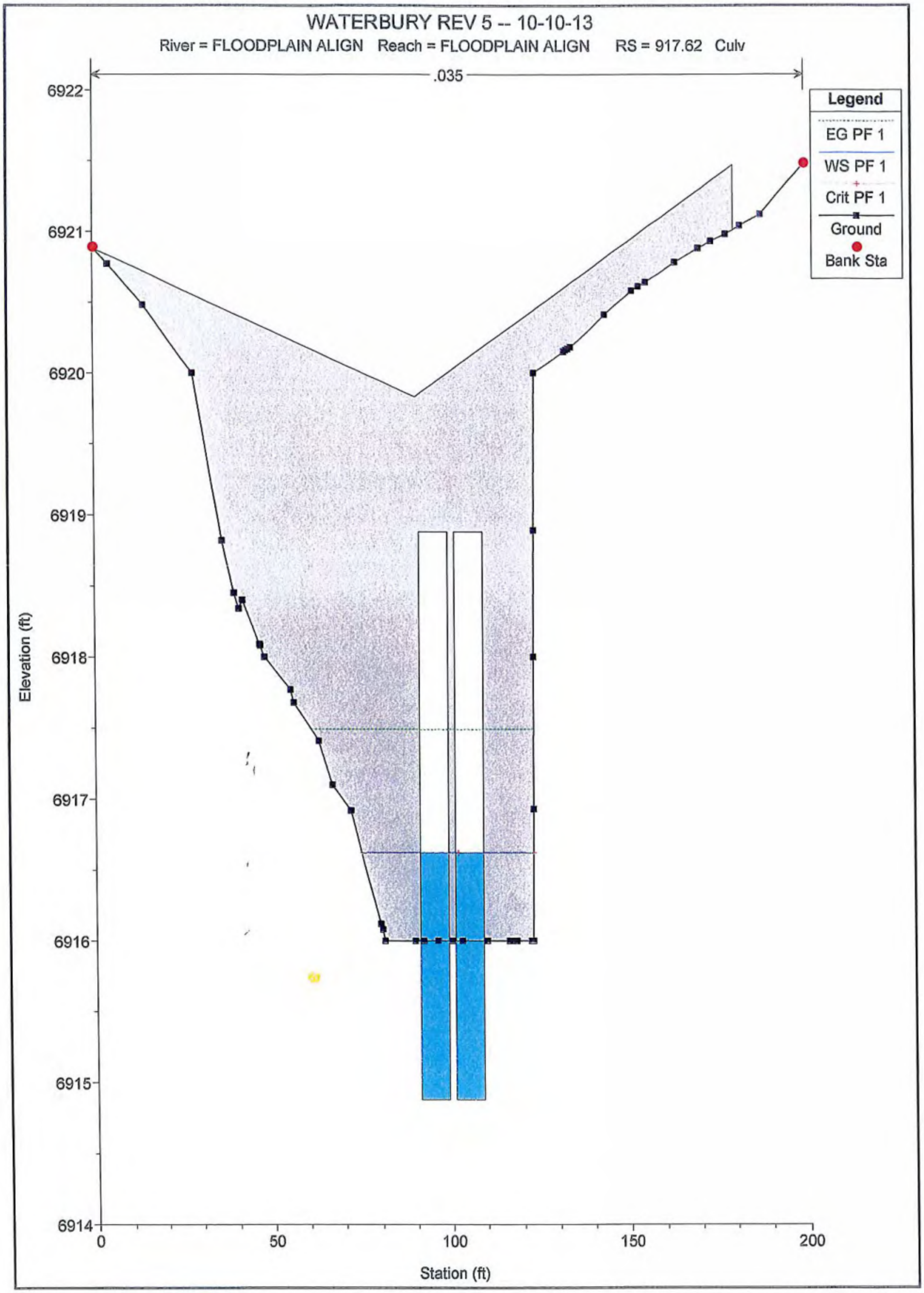

WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 1200
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6928
6927
6926
6925
6924
6923
6922
6921
0
20
40
60
80
100
120
140
160
Station (ft)

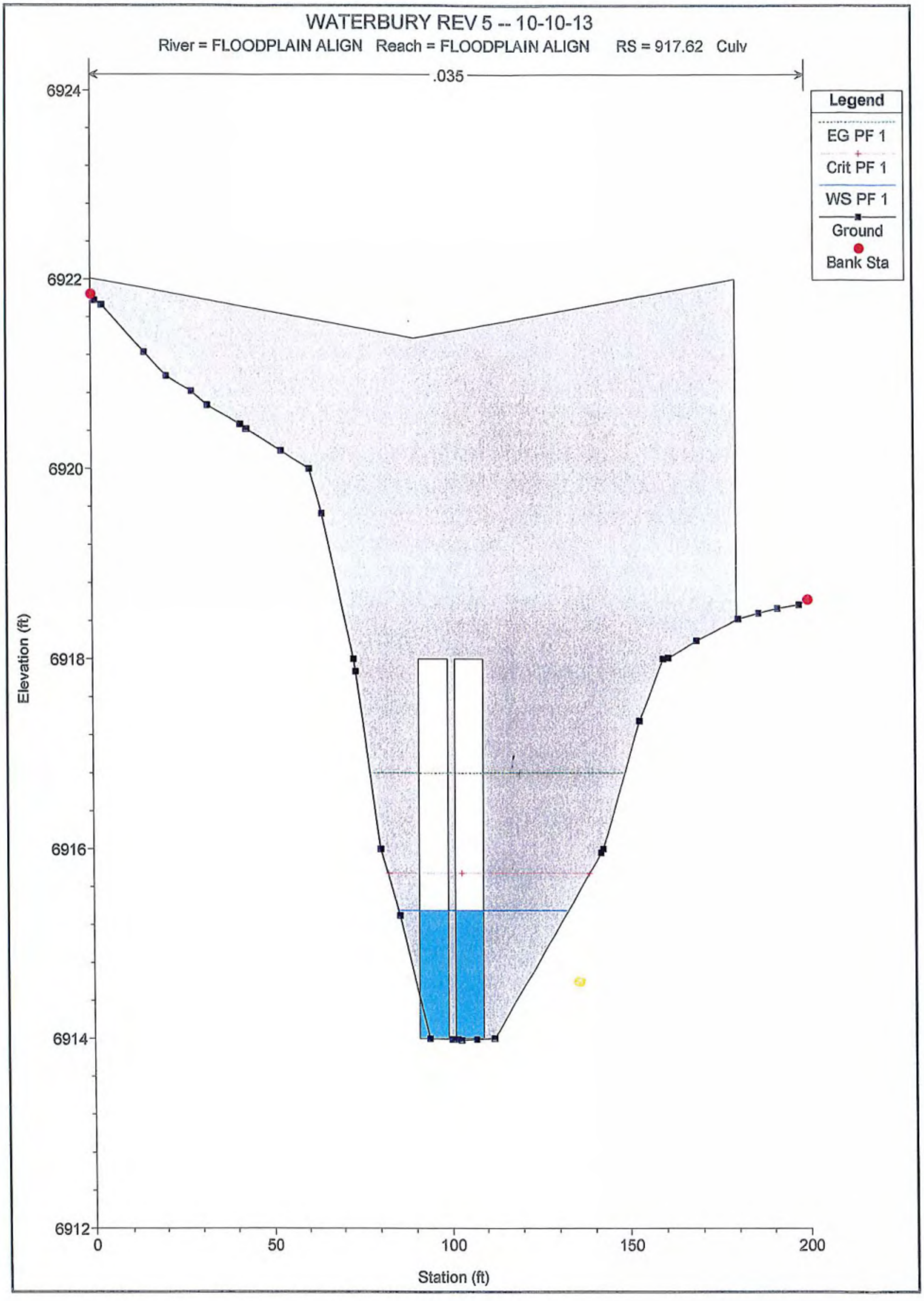

WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN   Reach = FLOODPLAIN ALIGN   RS = 975
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6926
6924
6922
6920
6918
6916
Station (ft)
0
50
100
150
200
250

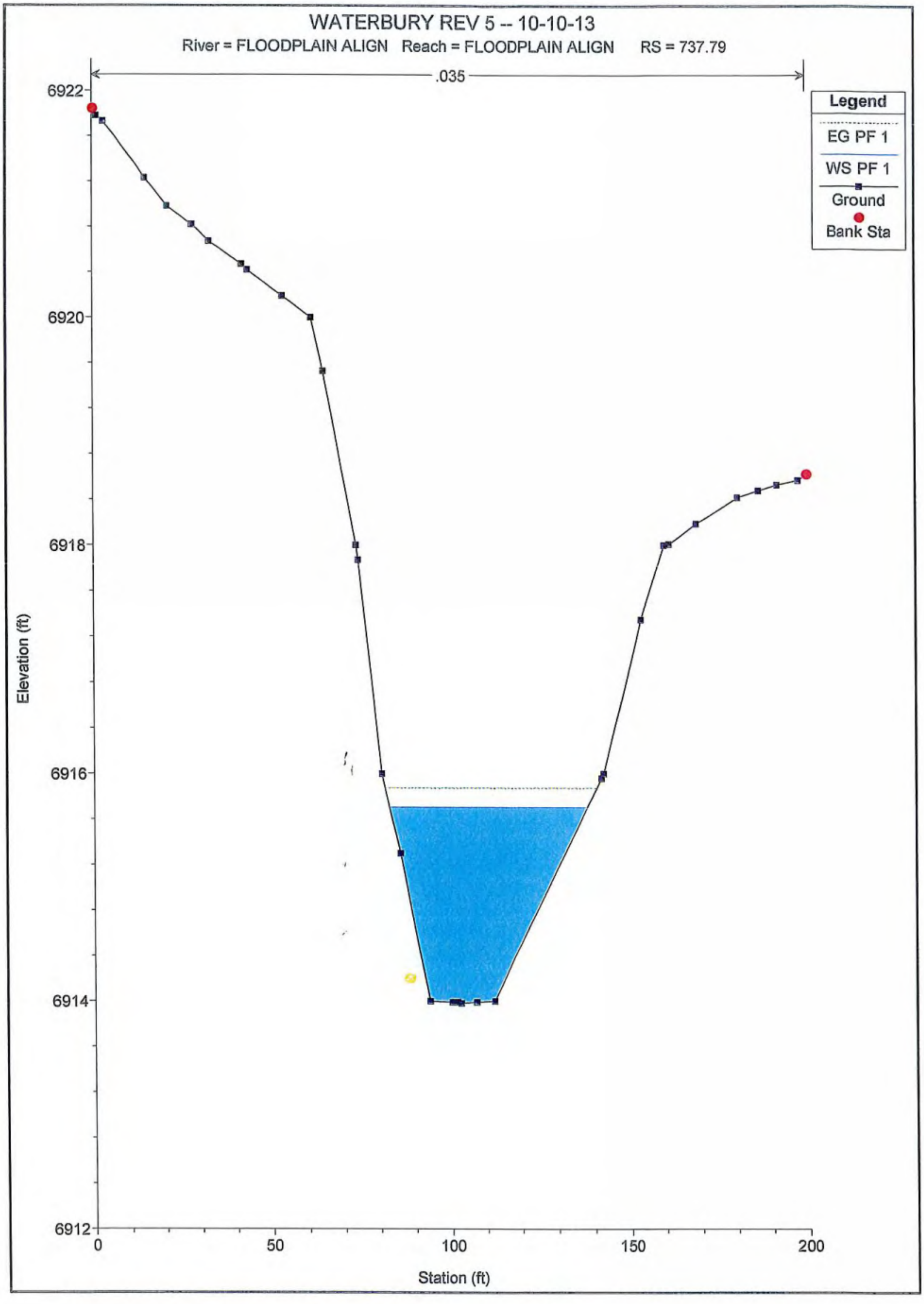

WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 933.63
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6922
6921
6920
6919
6918
6917
6916
0
50
100
150
200
Station (ft)

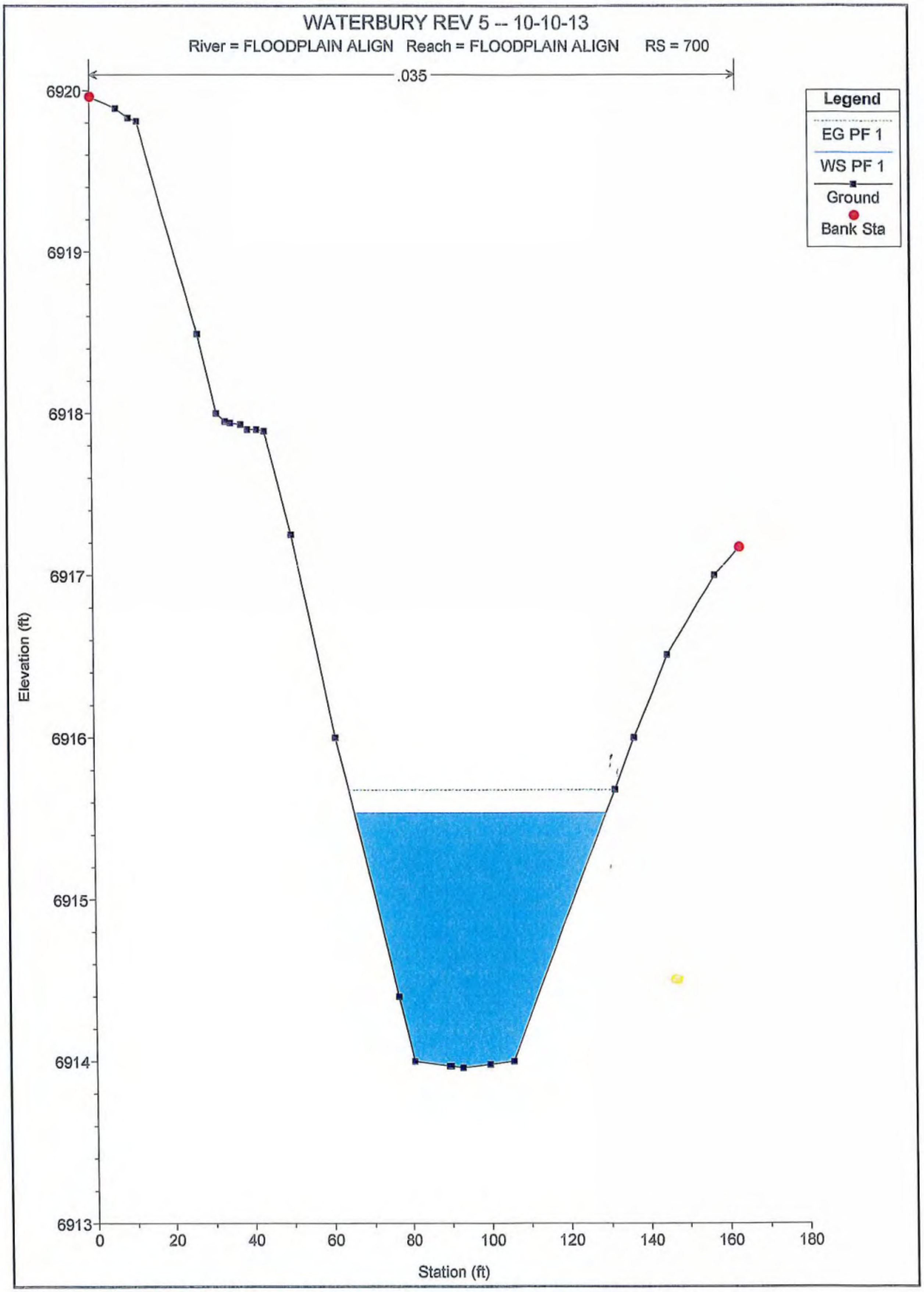


WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 950
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
6921
6920
6919
6918
6917
6916
Elevation (ft)
0
20
40
60
80
100
120
Station (ft)

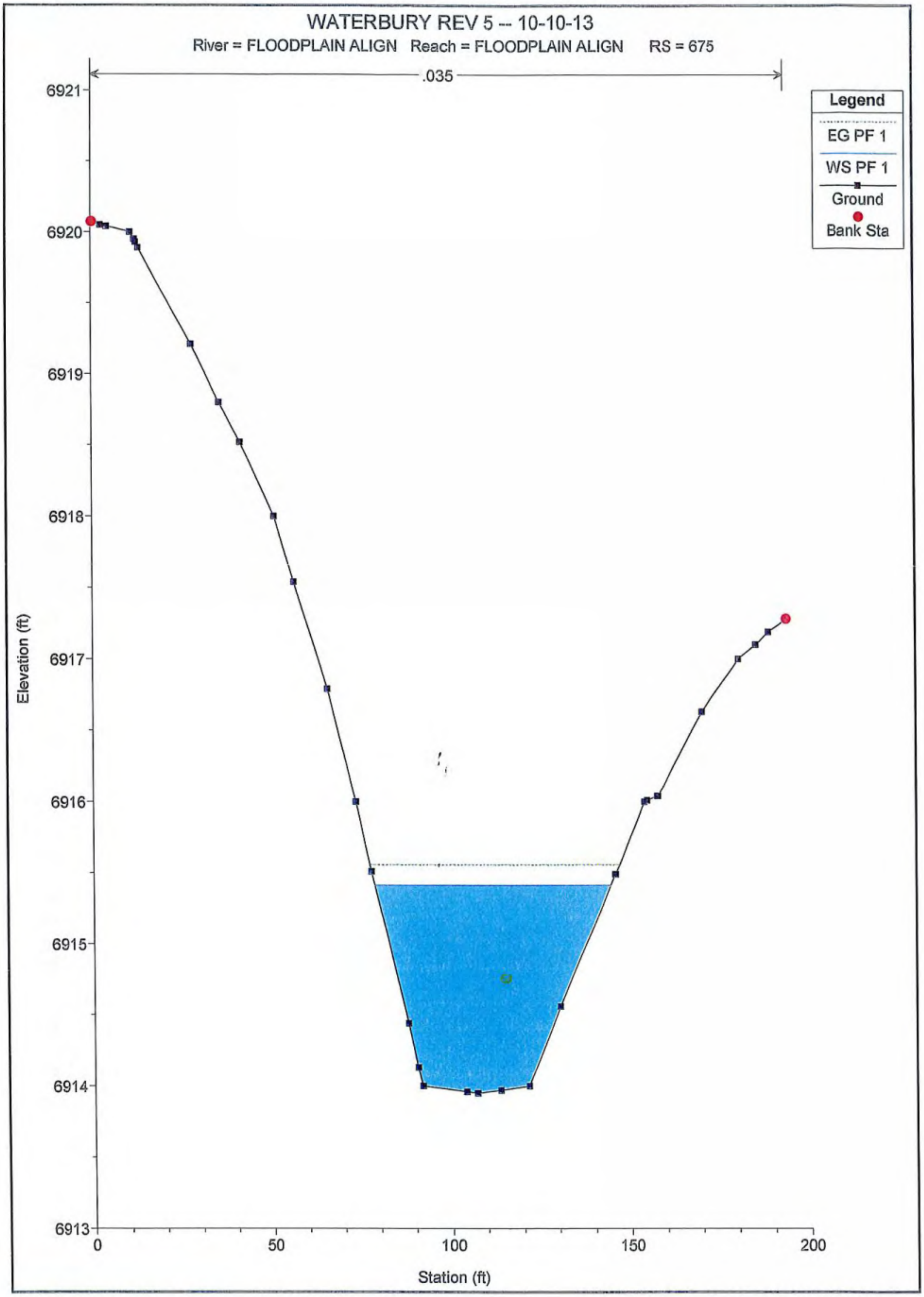

WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 917.62 Culv
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6922
6921
6920
6919
6918
6917
6916
6915
6914
Station (ft)
0
50
100
150
200

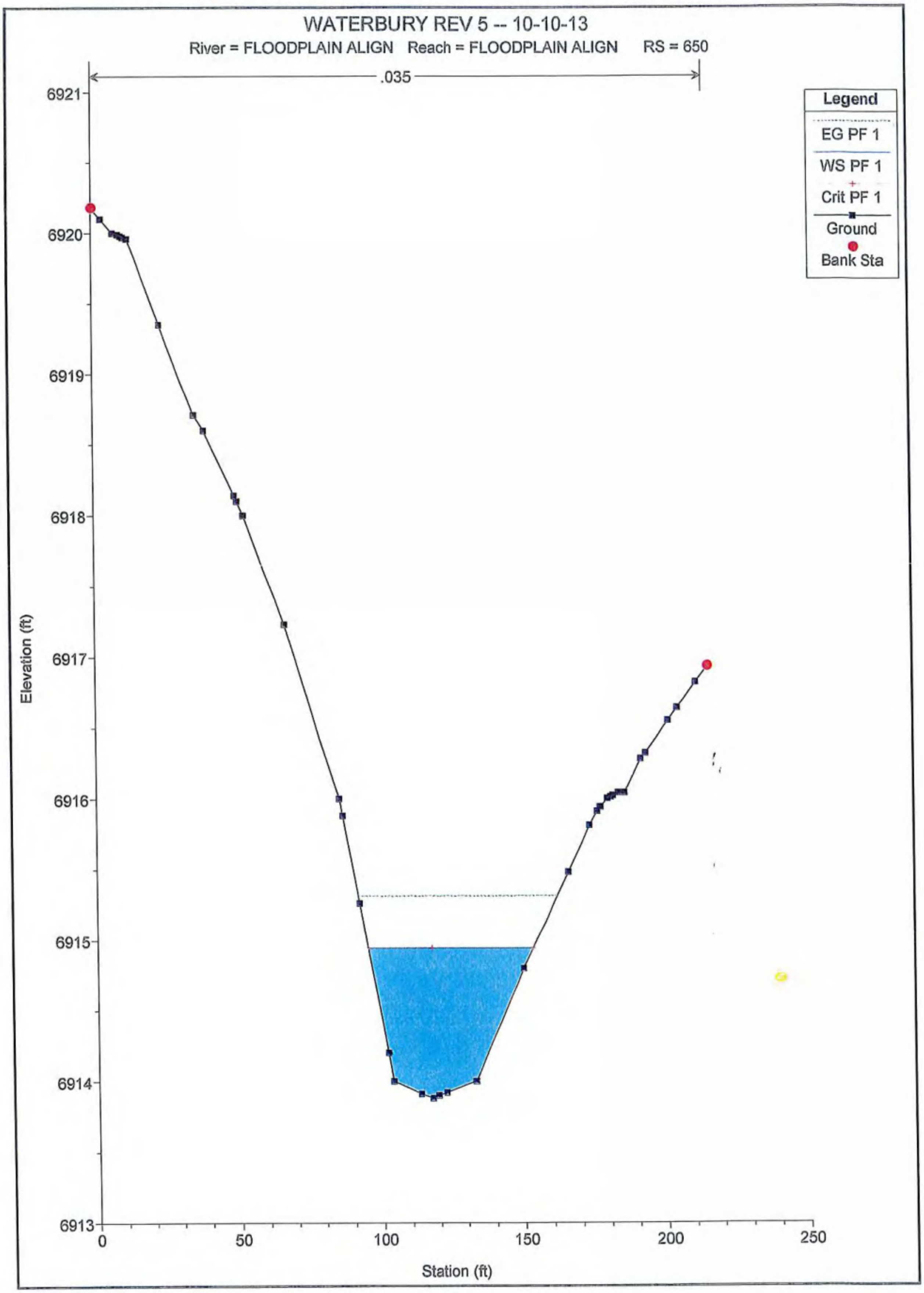

WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 917.62 Culv
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
6924
6922
6920
6918
6916
6914
6912
Station (ft)
0
50
100
150
200

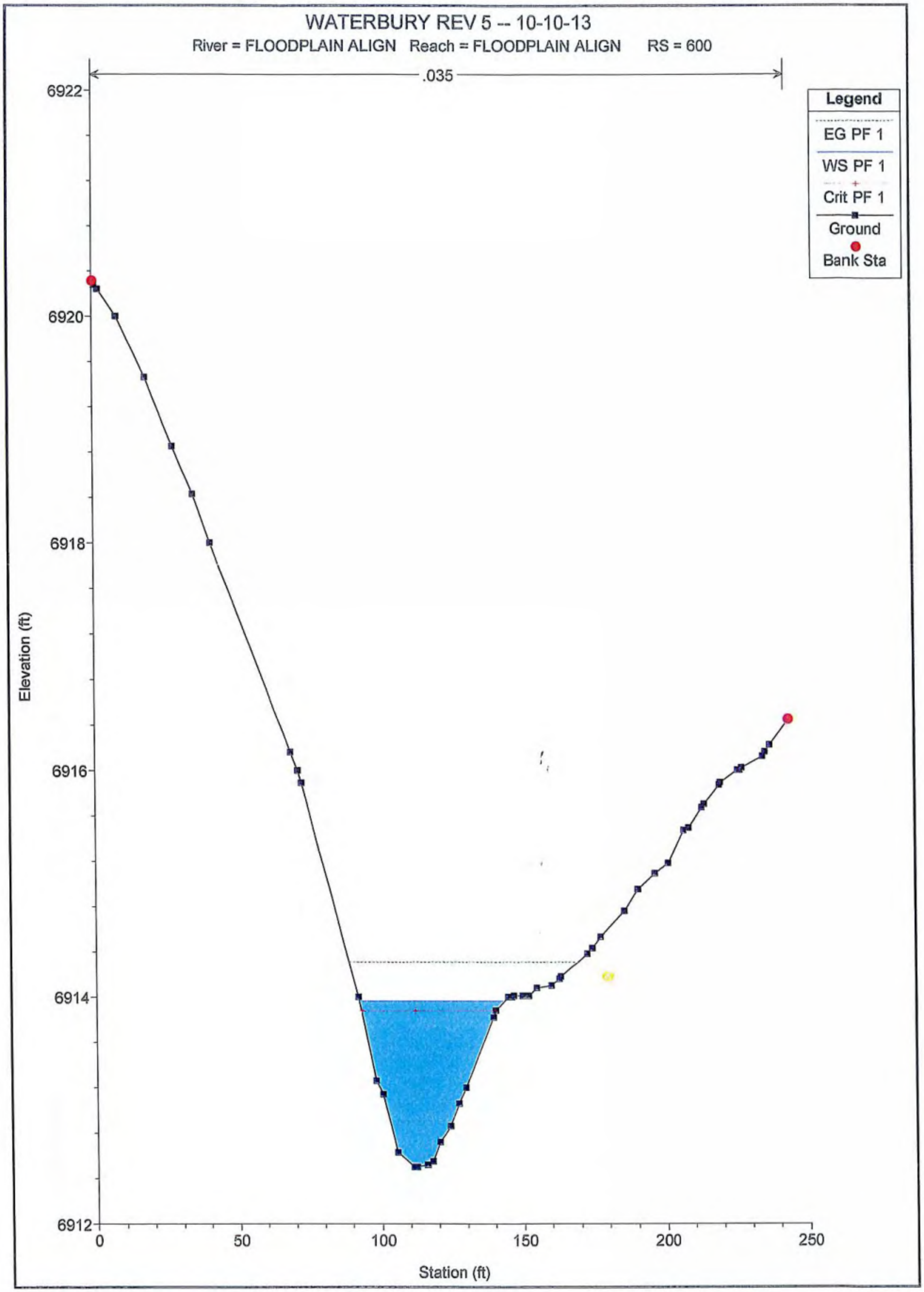

WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 737.79
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
6922
6920
6918
6916
6914
6912
Elevation (ft)
0
50
100
150
200
Station (ft)



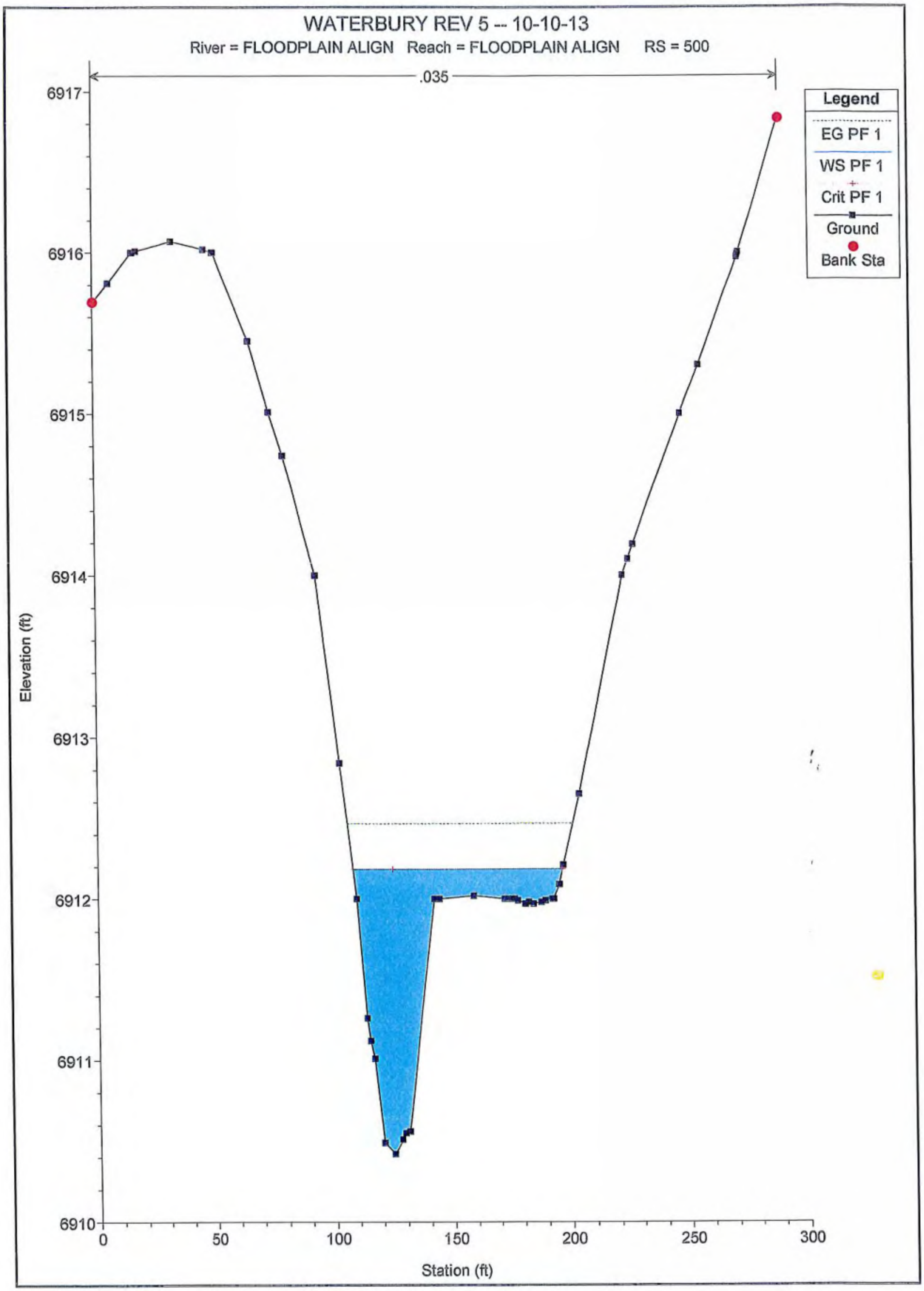
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 700
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
6920
6919
6918
6917
6916
6915
6914
6913
0
20
40
60
80
100
120
140
160
180
Station (ft)


WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 675
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
6921
6920
6919
6918
6917
6916
6915
6914
6913
Station (ft)
0
50
100
150
200

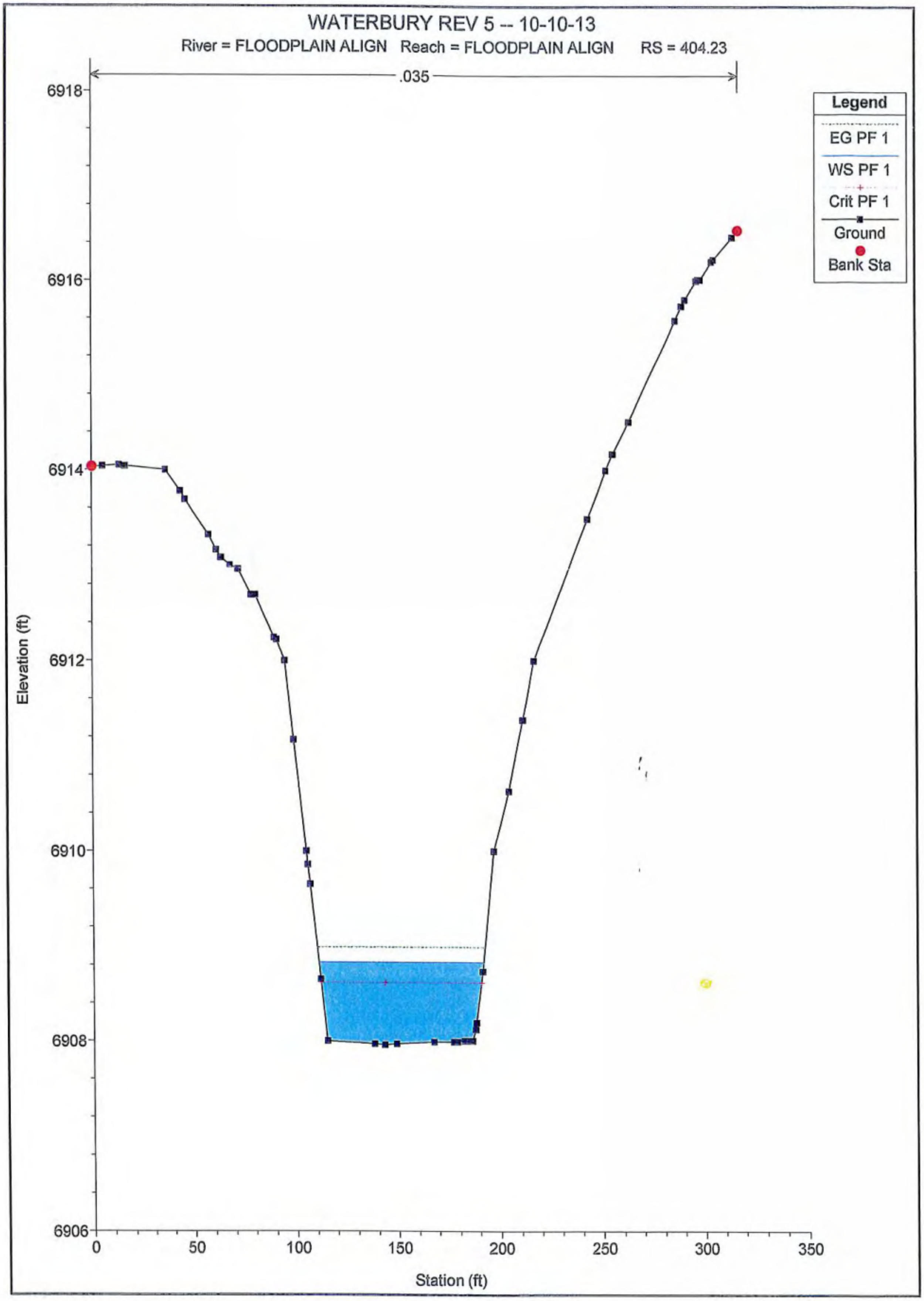

WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 650
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6913
6914
6915
6916
6917
6918
6919
6920
6921
Station (ft)
0
50
100
150
200
250



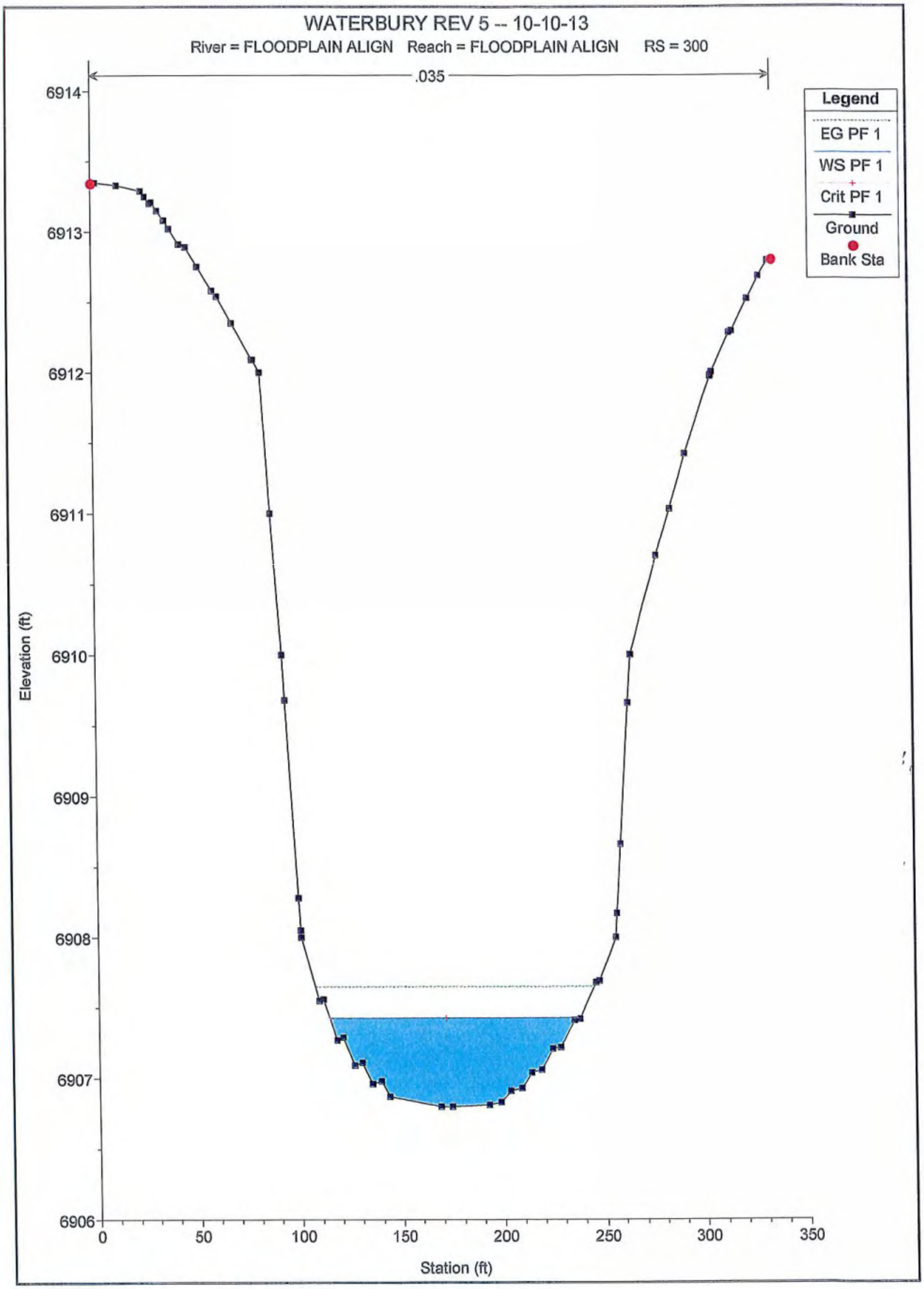
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 600
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6922
6920
6918
6916
6914
6912
0
50
100
150
200
250
Station (ft)

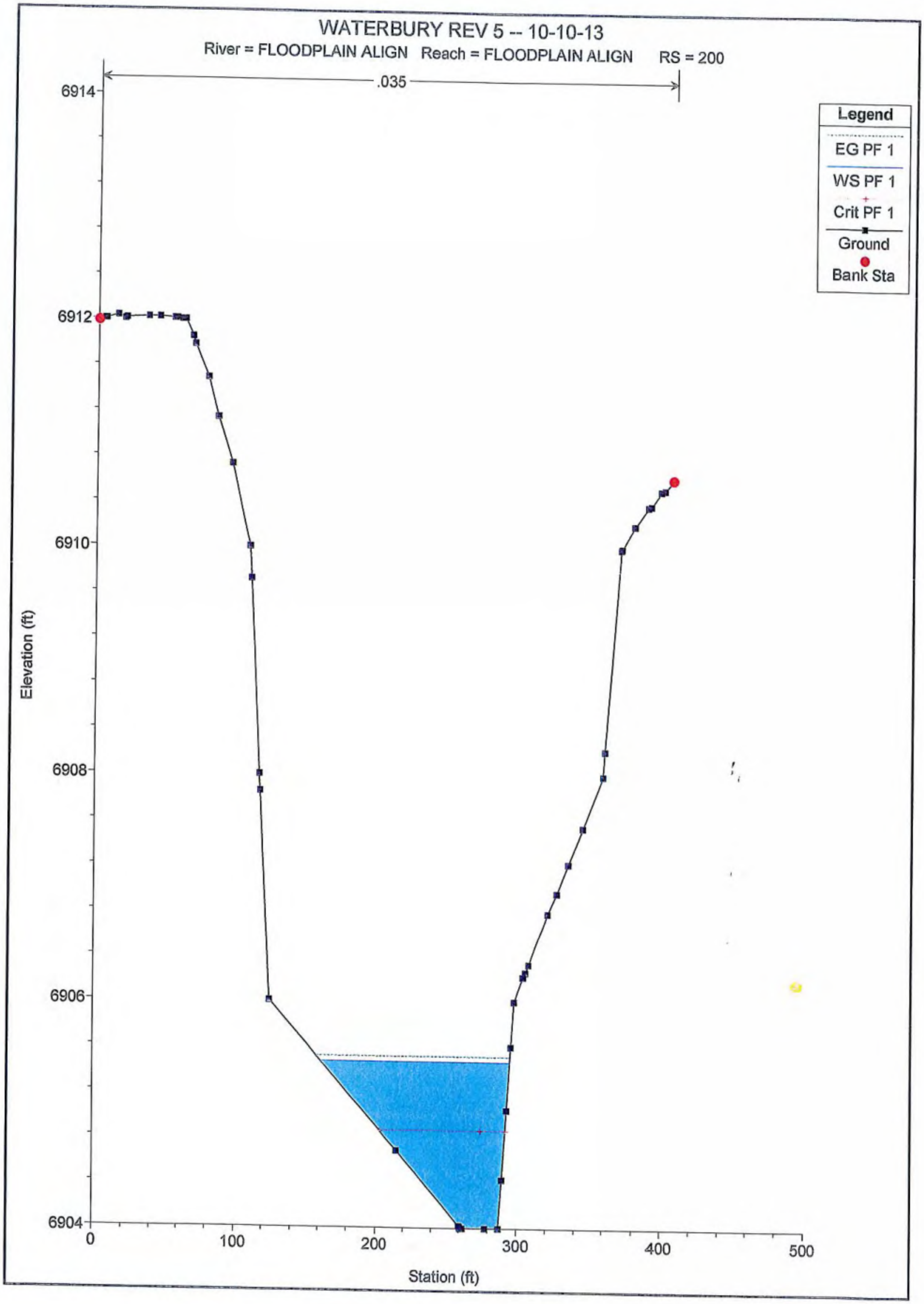


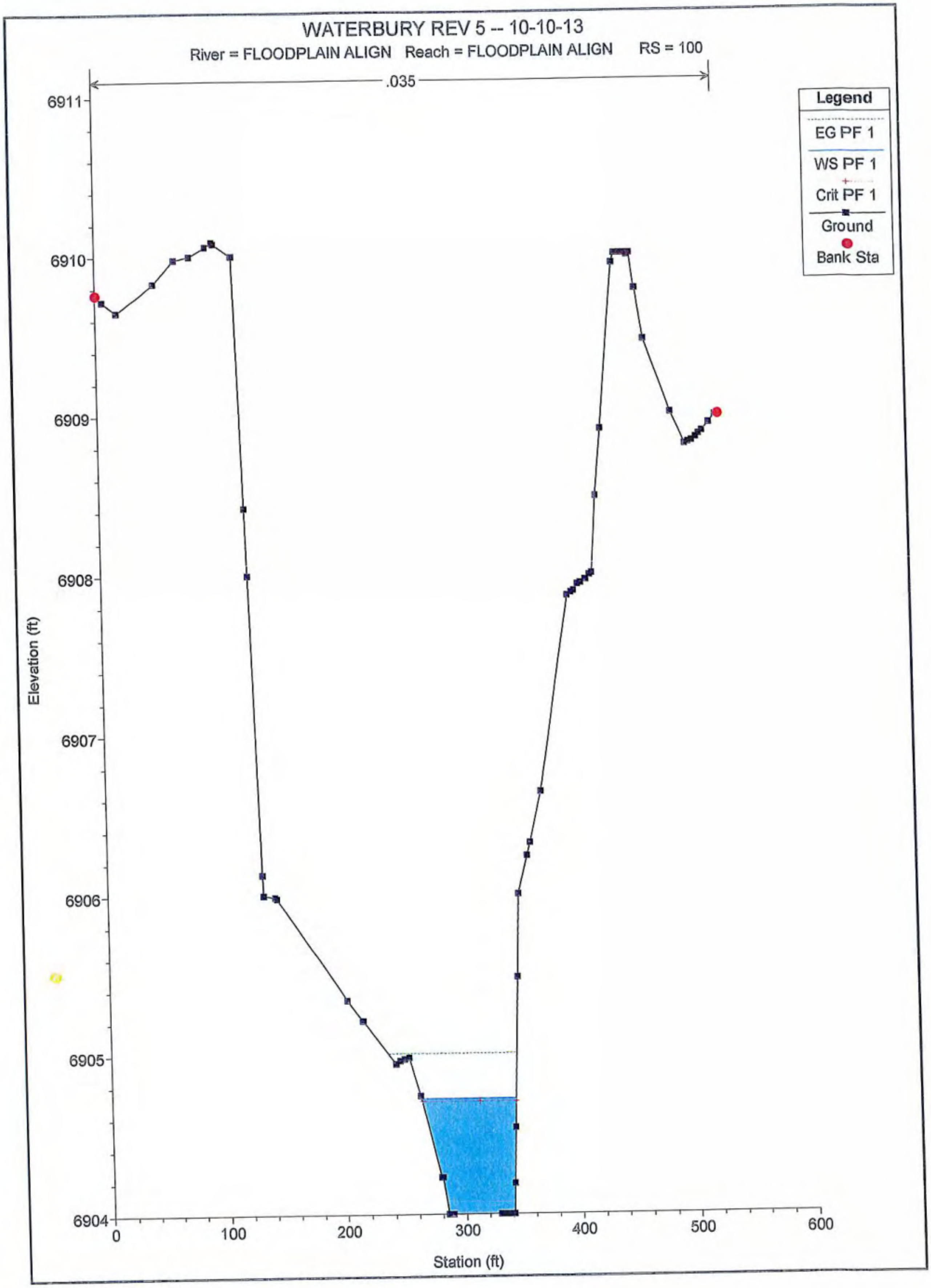
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 500
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6917
6916
6915
6914
6913
6912
6911
6910
0
50
100
150
200
250
300
Station (ft)



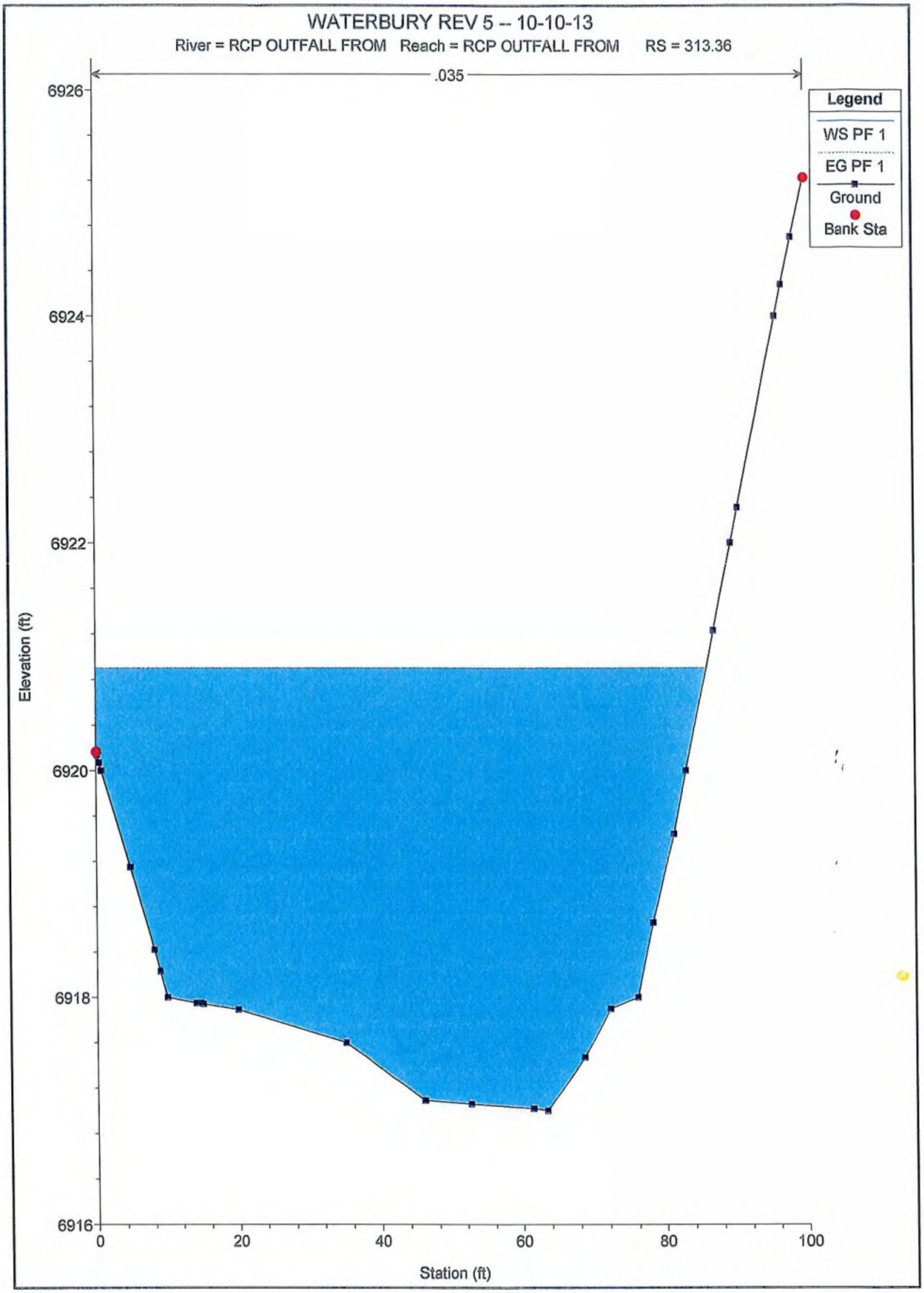
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 404.23
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
6918
6916
6914
6912
6910
6908
6906
0
50
100
150
200
250
300
350


WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 300
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6914
6913
6912
6911
6910
6909
6908
6907
6906
0
50
100
150
200
250
300
350
Station (ft)

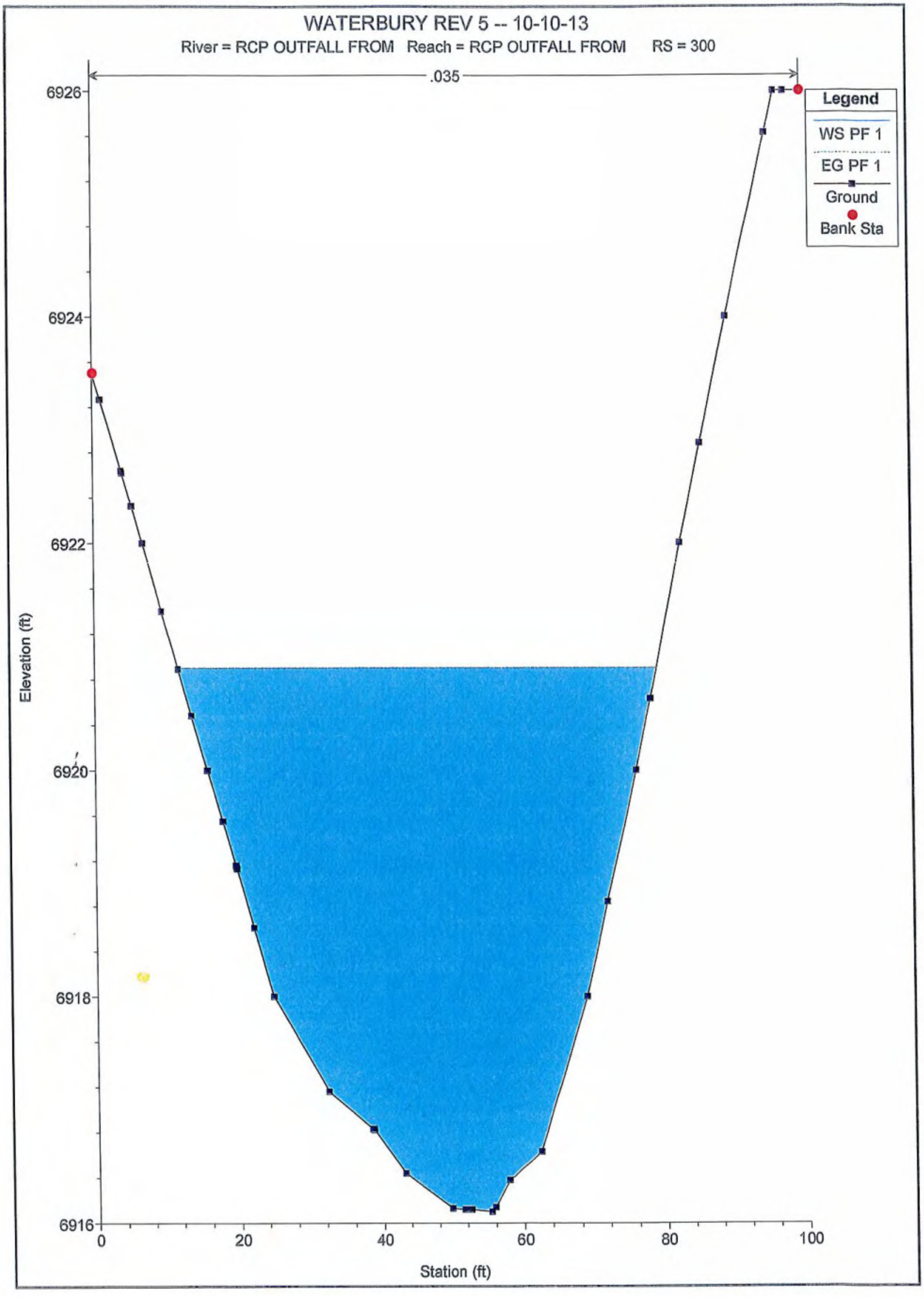

WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 200
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6914
6912
6910
6908
6906
6904
Station (ft)
0
100
200
300
400
500



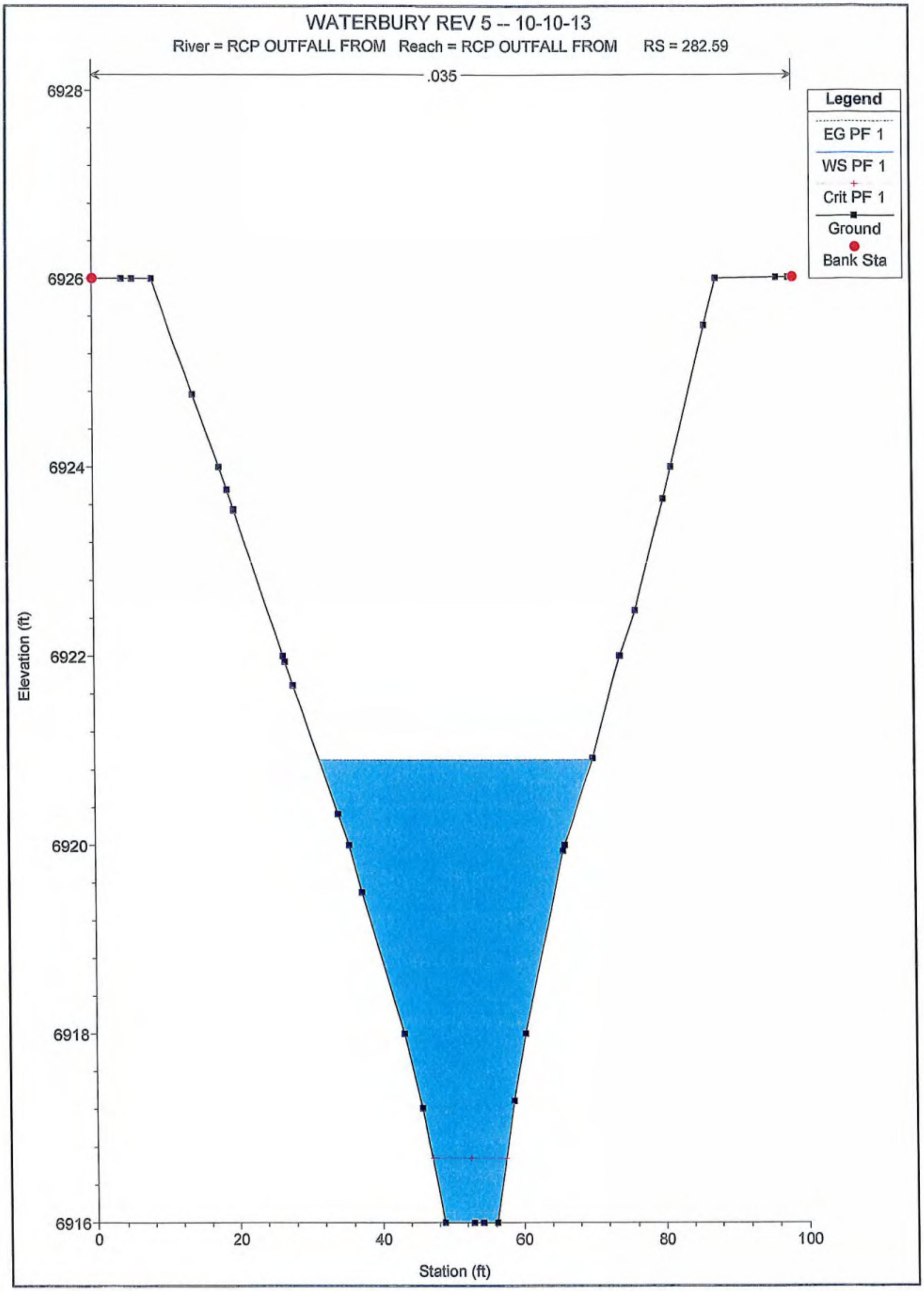
WATERBURY REV 5 -- 10-10-13
River = FLOODPLAIN ALIGN Reach = FLOODPLAIN ALIGN RS = 100
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6911
6910
6909
6908
6907
6906
6905
6904
0
100
200
300
400
500
600
Station (ft)



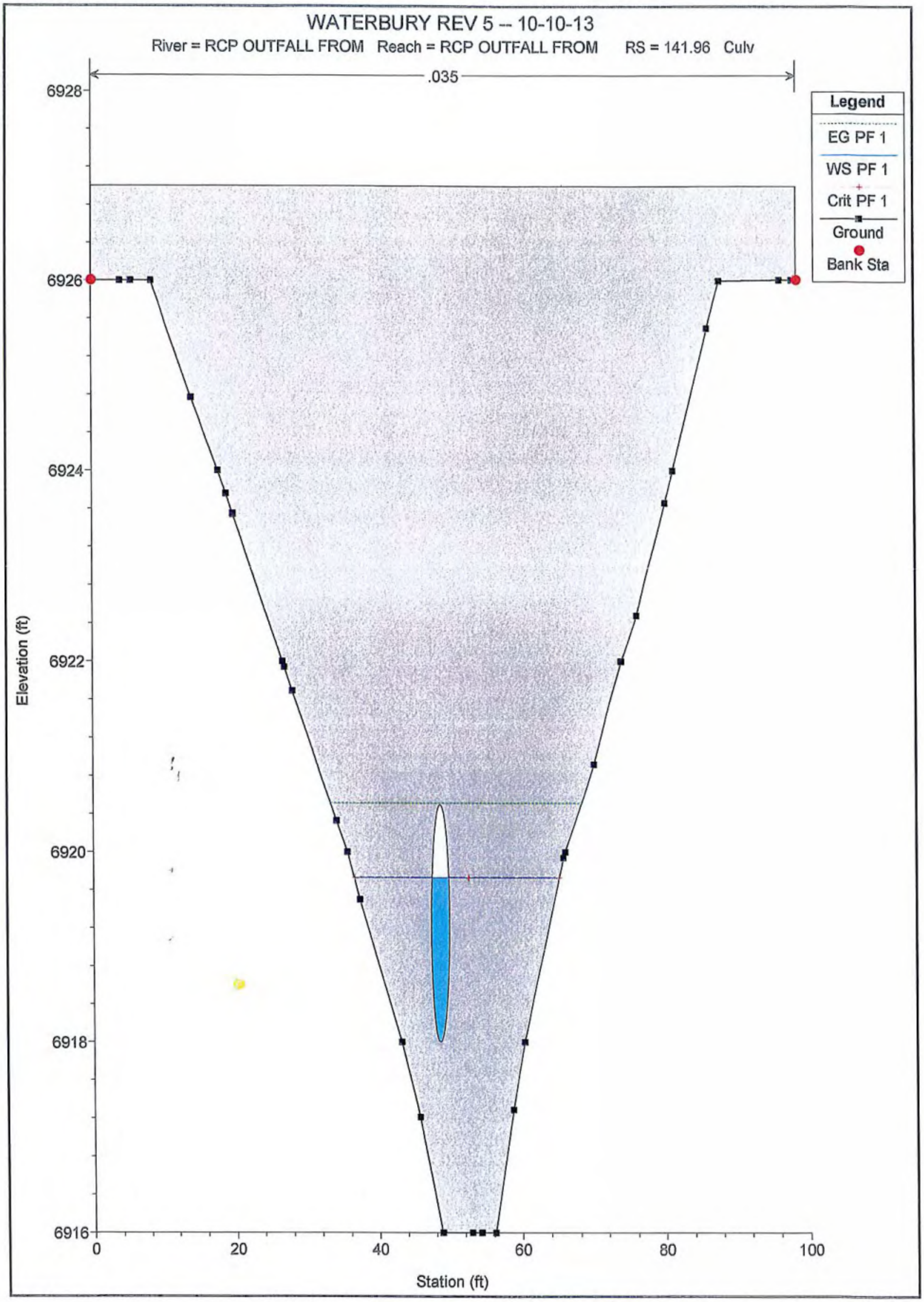
WATERBURY REV 5 -- 10-10-13
River = RCP OUTFALL FROM Reach = RCP OUTFALL FROM RS = 313.36
.035
Legend
WS PF 1
EG PF 1
Ground
Bank Sta
Elevation (ft)
6926
6924
6922
6920
6918
6916
0
20
40
60
80
100
Station (ft)



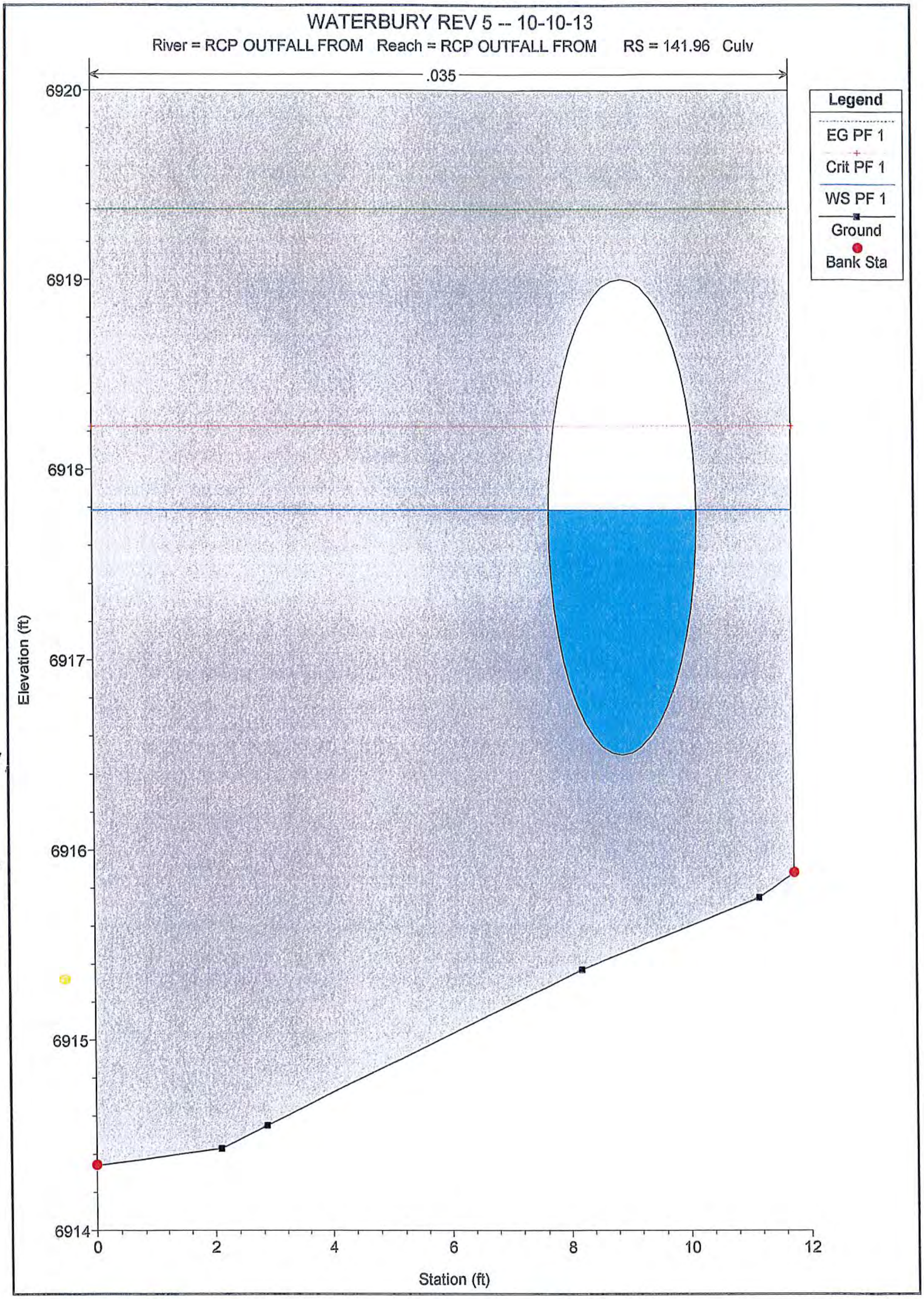
WATERBURY REV 5 -- 10-10-13
River = RCP OUTFALL FROM Reach = RCP OUTFALL FROM RS = 300
.035
Legend
WS PF 1
EG PF 1
Ground
Bank Sta
6926
6924
6922
6920
6918
6916
Elevation (ft)
0
20
40
60
80
100
Station (ft)



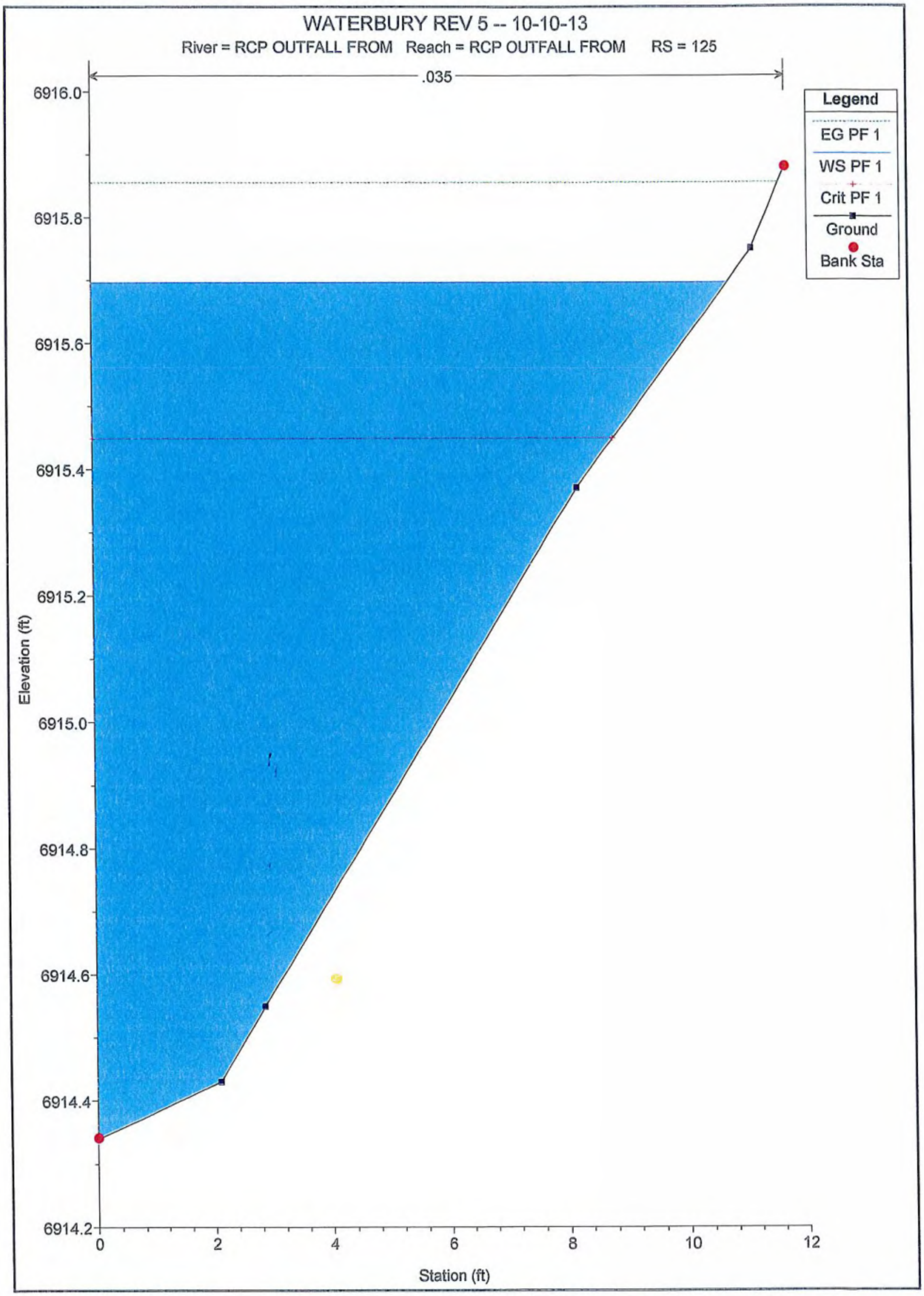
WATERBURY REV 5 -- 10-10-13
River = RCP OUTFALL FROM Reach = RCP OUTFALL FROM RS = 282.59
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6928
6926
6924
6922
6920
6918
6916
Station (ft)
0
20
40
60
80
100

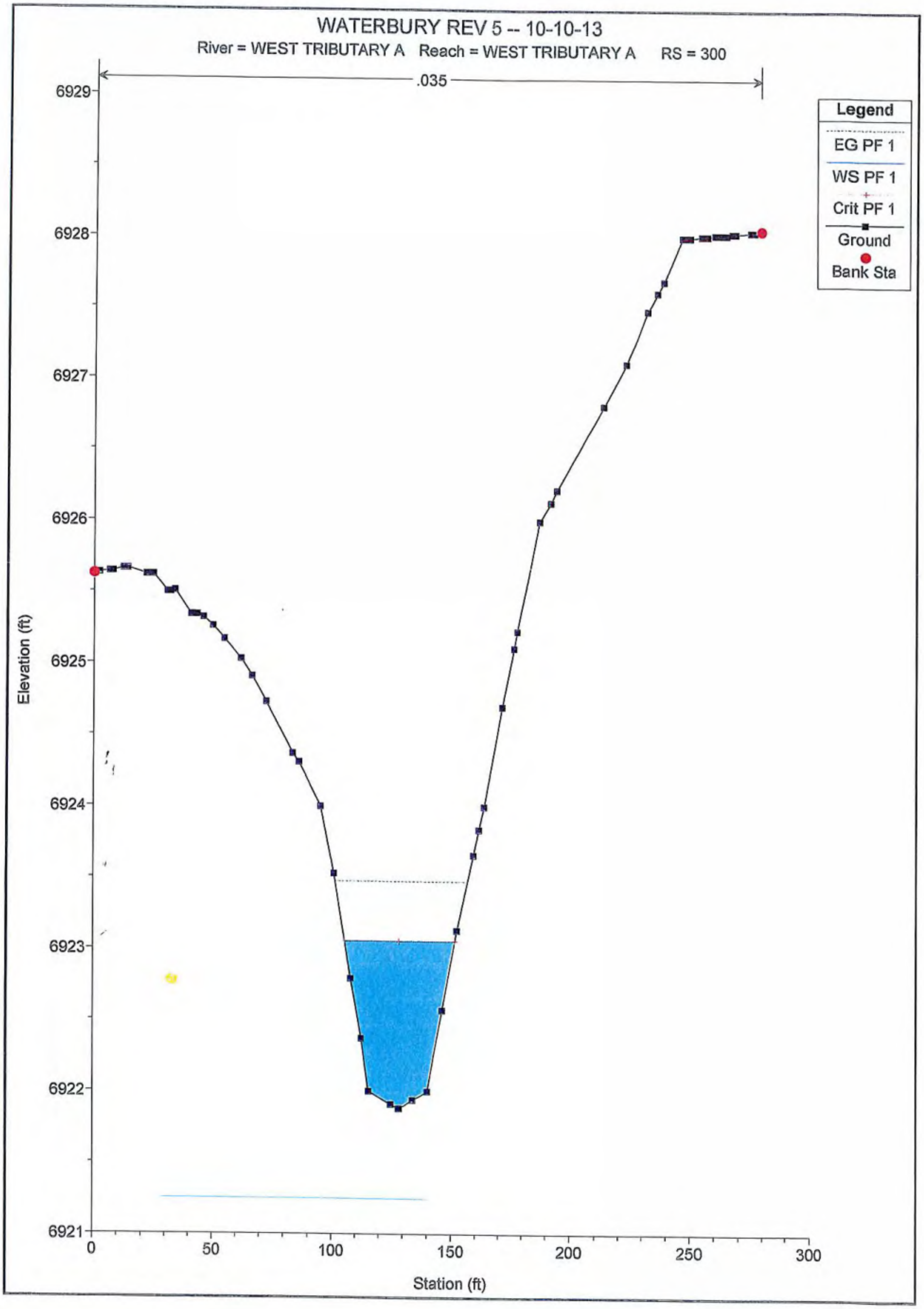


WATERBURY REV 5 -- 10-10-13
River = RCP OUTFALL FROM Reach = RCP OUTFALL FROM RS = 141.96 Culv
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6928
6926
6924
6922
6920
6918
6916
0
20
40
60
80
100
Station (ft)

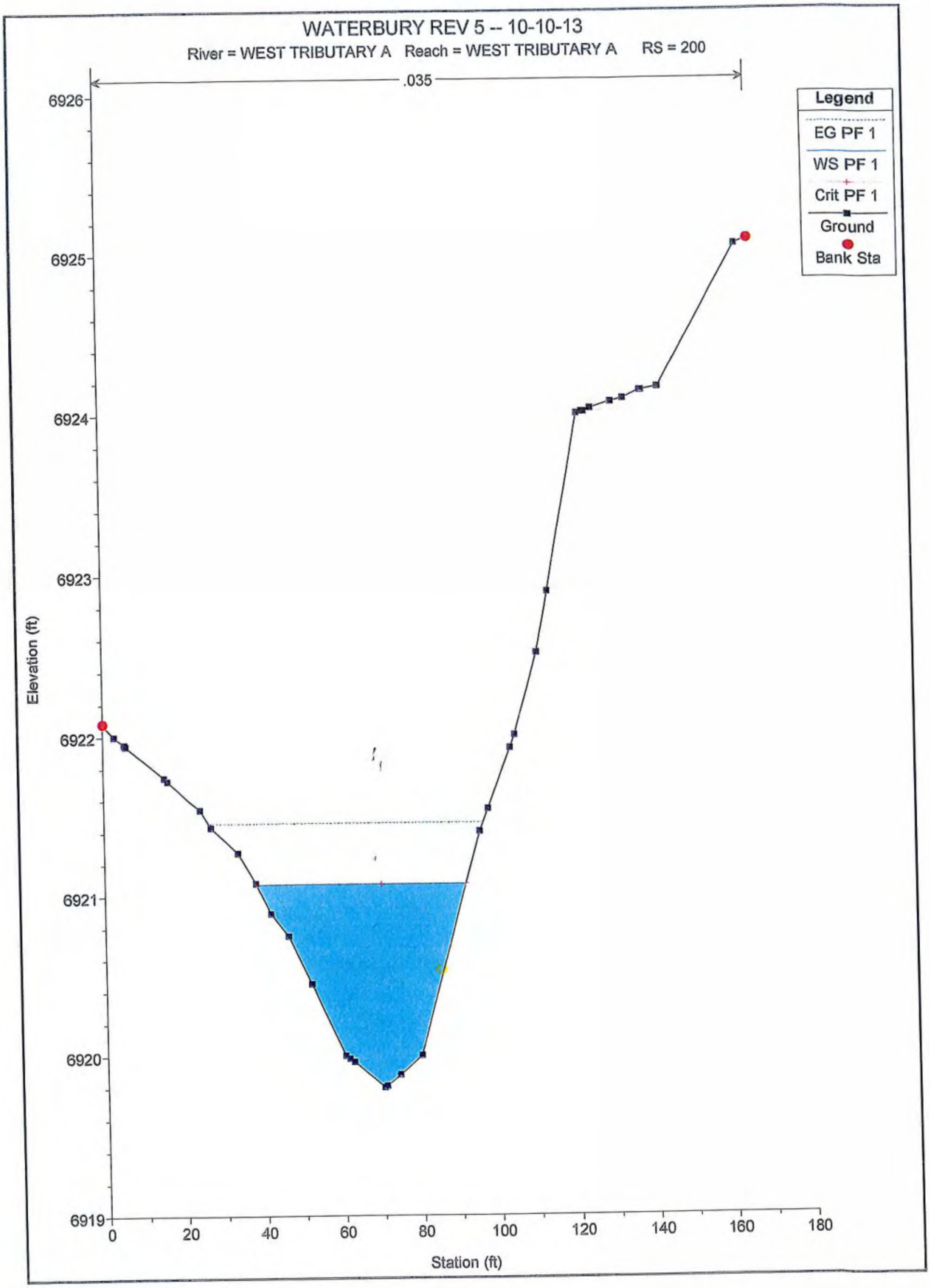


WATERBURY REV 5 -- 10-10-13
River = RCP OUTFALL FROM Reach = RCP OUTFALL FROM RS = 141.96 Culv
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
6920
6919
6918
6917
6916
6915
6914
Elevation (ft)
0
2
4
6
8
10
12
Station (ft)

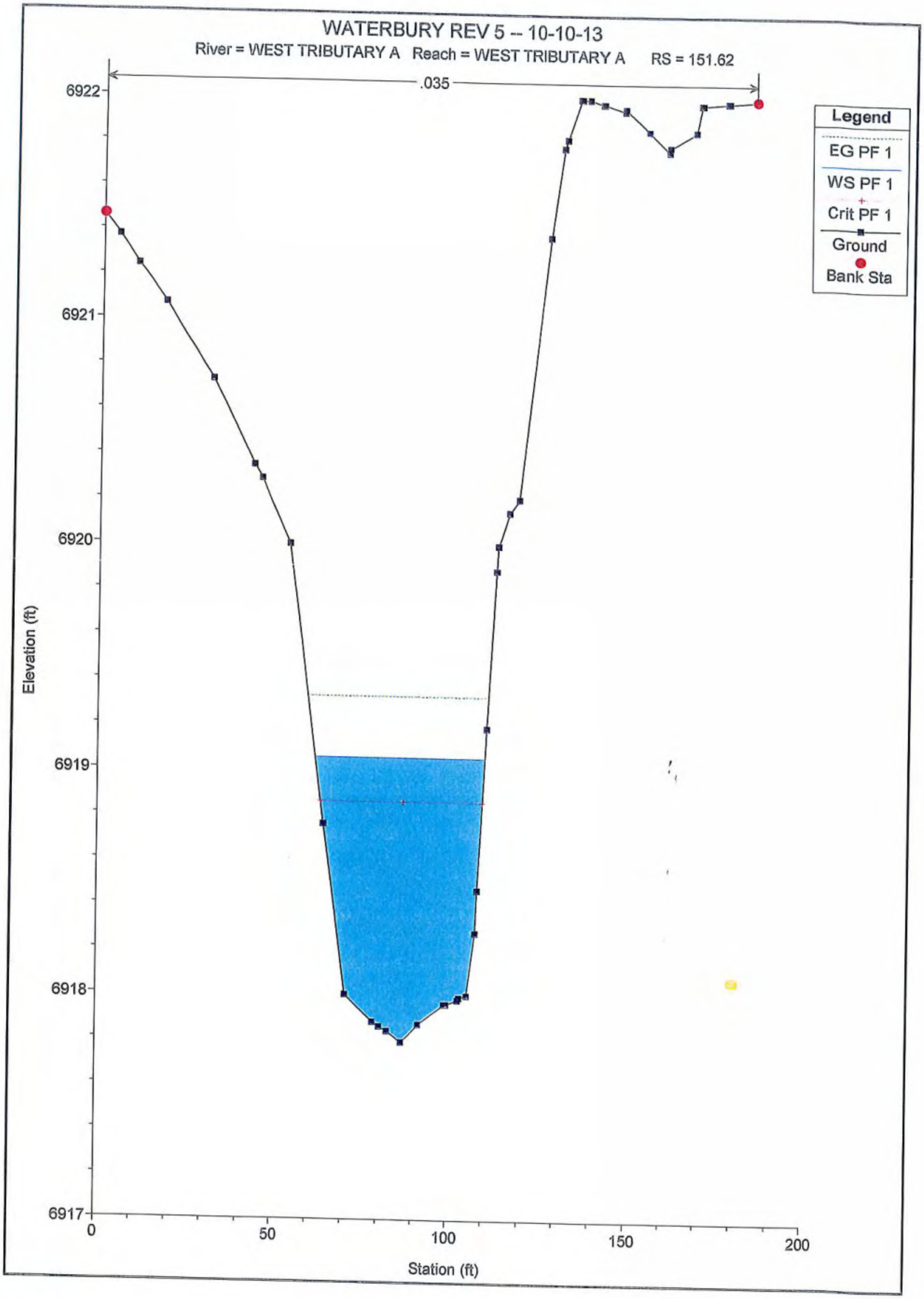

WATERBURY REV 5 -- 10-10-13
River = RCP OUTFALL FROM   Reach = RCP OUTFALL FROM   RS = 125
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6916.0
6915.8
6915.6
6915.4
6915.2
6915.0
6914.8
6914.6
6914.4
6914.2
Station (ft)
0
2
4
6
8
10
12



WATERBURY REV 5 -- 10-10-13
River = WEST TRIBUTARY A   Reach = WEST TRIBUTARY A   RS = 300
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6929
6928
6927
6926
6925
6924
6923
6922
6921
0
50
100
150
200
250
300
Station (ft)



WATERBURY REV 5 -- 10-10-13
River = WEST TRIBUTARY A Reach = WEST TRIBUTARY A RS = 200
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
6926
6925
6924
6923
6922
6921
6920
6919
Elevation (ft)
0
20
40
60
80
100
120
140
160
180
Station (ft)


WATERBURY REV 5 -- 10-10-13
River = WEST TRIBUTARY A Reach = WEST TRIBUTARY A RS = 151.62
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
6922
6921
6920
6919
6918
6917
Station (ft)
0
50
100
150
200

DRAINAGE MAPS

Provide existing conditions drainage plan.

Provide pre-development grading drainage plan

MDDP ~ BASIN RUNOFF SUMMARY

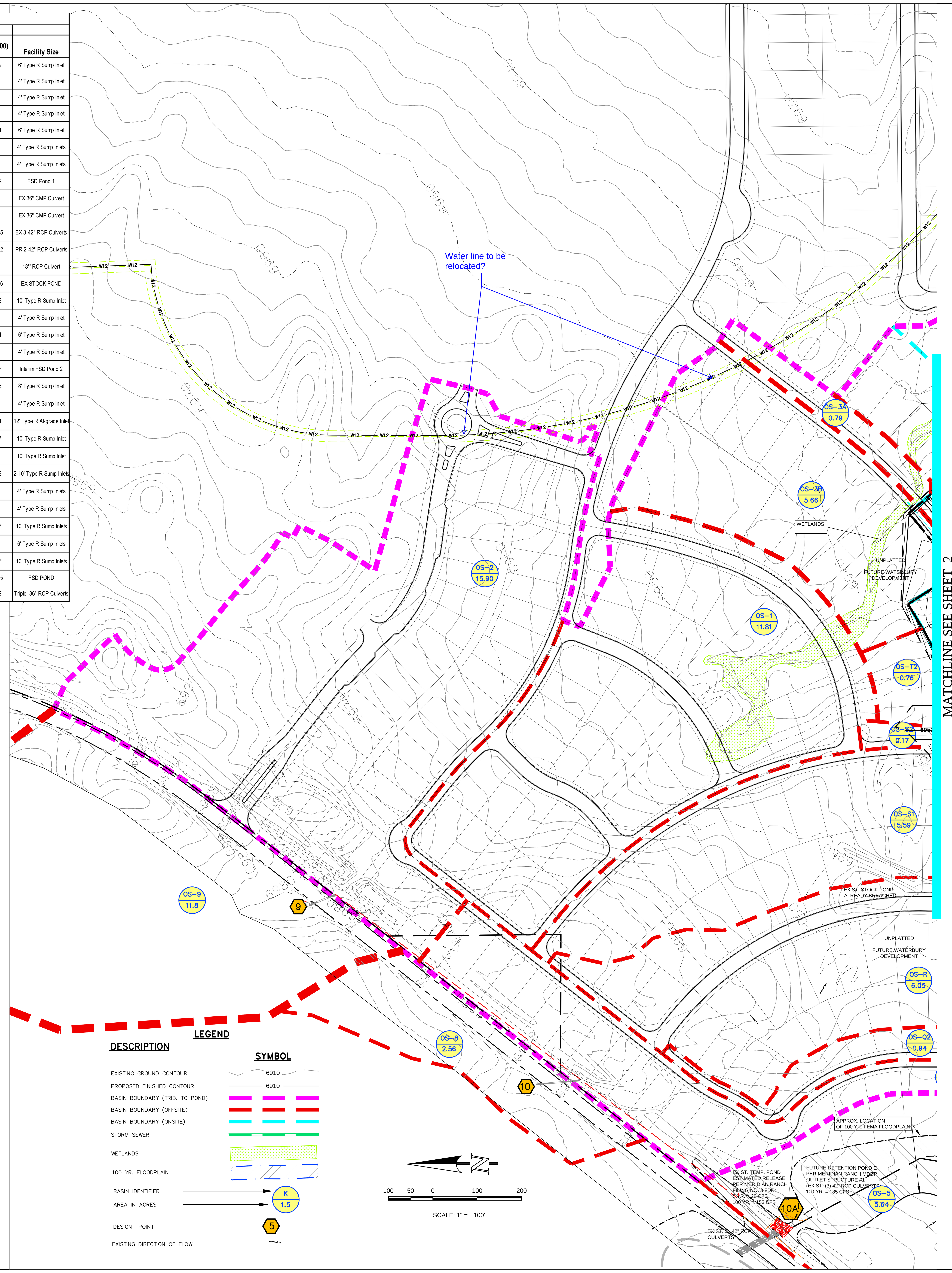
	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY		TOTAL FLOWS	
BASIN	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
A	1.52	2.00	0.25	100	2	12.6	420	1.5%	4.3	1.6	14.3	3.54	6.03	**5**	**12**
B1	1.03	1.36	0.25	100	2	12.6	400	1.5%	4.3	1.6	14.2	3.55	6.05	**4**	**8**
B2	1.21	1.59	0.25	100	2	12.6	550	1.5%	4.3	2.1	14.8	3.49	5.93	**4**	**9**
C	0.39	0.51	0.25	20	0.5	5.3	500	2.0%	4.9	1.7	6.9	4.58	8.14	**2**	**4**
D	0.95	1.24	0.25	80	2	10.5	300	2.5%	5.5	0.9	11.4	3.87	6.69	**4**	**8**
E	0.98	1.29	0.25	100	2	12.6	400	2.5%	5.5	1.2	13.8	3.59	6.12	**4**	**8**
F	0.98	1.29	0.25	50	2	7.1	620	1.5%	4.3	2.4	9.5	4.14	7.22	**4**	**9**
G	NOT USED														
H	0.51	0.67	0.25	50	2	7.1	525	1.5%	4.3	2.0	9.2	4.19	7.33	**2**	**5**
I	1.28	2.53	0.25	80	4	8.4	250	2.0%	4.9	0.8	9.2	4.18	7.32	**5**	**19**
J	0.90	1.17	0.25	90	6	8.1	850	2.0%	4.9	2.9	10.9	3.94	6.81	**4**	**8**
K	0.69	1.37	0.25	100	18	6.1	80	1.0%	3.5	0.4	6.5	4.67	8.33	**3**	**11**
L1	2.37	3.11	0.25	100	2	12.6	860	1.4%	4.1	3.5	16.1	3.36	5.69	**8**	**18**
L2	0.90	1.18	0.25	55	1.1	9.4	860	1.4%	4.1	3.5	12.8	3.70	6.34	**3**	**7**
M1	1.31	1.71	0.25	70	1.5	10.3	200	2.0%	4.9	0.7	11.0	3.92	6.79	**5**	**12**
M2	0.21	0.28	0.25	65	3	7.7	0	0.0%	0.0	0.0	7.7	4.43	7.83	**1**	**2**
N	0.10	0.13	0.25								5.0	5.00	9.06	**1**	**1**
O1	1.27	1.66	0.25	100	3	11.1	460	1.5%	4.3	1.8	12.8	3.70	6.34	**5**	**11**
O2	0.42	0.56	0.25	100	2	12.6	850	2.0%	4.9	2.9	15.5	3.42	5.80	**1**	**3**
P	0.53	0.70	0.25	65	3	7.7	0	0.0%	0.0	0.0	7.7	4.43	7.83	**2**	**5**
Q1	0.47	0.61	0.25	55	1.3	8.9	445	2.0%	5.0	1.5	10.4	4.01	6.97	**2**	**4**
Q2	0.49	0.65	0.25	55	1.3	8.9	445	2.0%	5.0	1.5	10.4	4.01	6.97	**2**	**5**
R	0.06	0.08	0.25	100	4	10.1	700	2.0%	4.9	2.4	12.4	3.75	6.44	**0**	**1**
S1	0.70	0.91	0.25	100	6	8.8	175	2.0%	4.9	0.6	9.4	4.16	7.26	**3**	**7**
S2	0.06	0.08	0.25								5.0	5.00	9.06	**0**	**1**
T1	0.64	0.84	0.25	55	1.1	9.4	390	2.0%	4.9	1.3	10.7	3.97	6.88	**3**	**6**
T2	0.55	0.73	0.25	100	2	12.6	245	2.0%	5.0	0.8	13.5	3.63	6.20	**2**	**5**
U1	1.97	2.58	0.25	100	2	12.6	520	2.3%	5.3	1.6	14.3	3.54	6.03	**7**	**16**
U2	0.85	1.11	0.25	100	2	12.6	385	2.3%	5.4	1.2	13.8	3.59	6.12	**3**	**7**
W	2.34	3.07	0.25	100	2	12.6	630	1.6%	4.4	2.4	15.0	3.47	5.89	**8**	**18**
V	0.59	0.78	0.25	95	6	8.4					8.4	4.31	7.58	**3**	**6**
OS-1	5.31	6.97	0.25	100	2	12.6	690	2.0%	5.0	2.3	15.0	3.47	5.90	**18**	**41**
OS-2	7.15	9.38	0.25	100	2	12.6	1700	1.8%	4.6	6.1	18.7	3.14	5.27	**22**	**49**
0S-3A	0.35	0.47	0.25	55	1.1	9.4	480	1.3%	3.9	2.0	11.4	3.87	6.68	**1**	**3**
0S-3B	2.55	3.34	0.25	100	2	12.6	480	1.3%	3.9	2.0	14.7	3.50	5.95	**9**	**20**
OS-4	0.98	3.92	0.25	800	26	30.5					30.5	2.46	4.01	**2**	**16**
OS-5	2.54	3.33	0.25	80	5	7.8	1000	2.5%	5.5	3.0	10.8	3.96	6.85	**10**	**23**
OS-6	0.48	0.63	0.25	30	0.6	6.9	900	1.8%	4.7	3.2	10.1	4.05	7.04	**2**	**4**
OS-7	0.25	1.01									5.0	5.00	9.06	**1**	**9**
OS-8	FLOW TAKEN FROM MERIDAIN RANCH MDDP													**5**	**11**
OS-9	FLOW TAKEN FROM MERIDAIN RANCH MDDP													**8**	**19**
OS-10	0.31	1.23	0.25	100	2	12.6	300	2.7%	5.7	0.9	13.5	3.62	6.19	**1**	**8**
OS-Q1	1.94	2.54	0.25	200	5	16.6	1500	1.5%	4.3	5.8	22.4	2.88	4.78	**6**	**12**
OS-Q2	0.42	0.55	0.25	50	1	8.9	900	1.5%	4.3	3.5	12.4	3.75	6.43	**2**	**4**
OS-R	2.72	3.57	0.25	50	1	8.9	850	2.7%	5.8	2.5	11.4	3.87	6.69	**11**	**24**
OS-S1	2.51	3.30	0.25	100	2	12.6	920	1.2%	3.8	4.0	16.7	3.32	5.60	**8**	**18**
OS-S2	0.08	0.10	0.25	100	2	12.6					12.6	3.72	6.39	**0**	**1**
OS-T2	0.34	0.45	0.25	100	2	12.6					12.6	3.72	6.39	**1**	**3**

MDDP ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Area (AC)	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Facility Size
1	A	3.39	1.52	2.00	14.3	3.54	6.03	5	12	6' Type R Sump Inlet
2	C	0.86	0.39	0.51	6.9	4.58	8.14	2	4	4' Type R Sump Inlet
3	B1	2.30	1.03	1.36	14.2	3.55	6.05	4	8	4' Type R Sump Inlet
4	B2	2.69	1.21	1.59	14.8	3.49	5.93	4	9	4' Type R Sump Inlet
5	F & H	3.31	1.49	1.95	9.5	4.14	7.22	6	14	6' Type R Sump Inlet
6	D	2.11	0.95	1.24	11.4	3.87	6.69	4	8	4' Type R Sump Inlets
7	E	2.18	0.98	1.29	13.8	3.59	6.12	4	8	4' Type R Sump Inlets
8	DESIGN POINTS 1-7	16.84	7.58	9.94	14.8	3.49	5.93	26	59	FSD Pond 1
9	OS-9	11.80	0.00	0.00	0.0	7.12	14.19	0	0	EX 36" CMP Culvert
10	OS-8	2.56	0.00	0.00	0.0	7.12	14.19	0	0	EX 36" CMP Culvert
10A	MERIDIAN POND E RELEASE							28	135	EX 3-42" RCP Culverts
11	OS-5, I, OS-& MERIDIAN POND E RELEASE	SCS MODEL						53	212	PR 2-42" RCP Culverts
12	OS-6	1.06	0.48	0.63	10.1	4.05	7.04	2	4	18"' RCP Culvert
13	TOTAL OFFISITE EX. STOCK POND INFLOW	SCS MODEL						69	396	EX STOCK POND
14	L1	5.27	2.37	3.11	16.1	3.36	5.69	8	18	10' Type R Sump Inlet
15	L2	2.00	0.90	1.18	12.8	3.70	6.34	3	7	4' Type R Sump Inlet
16	O1	2.82	1.27	1.66	12.8	3.70	6.34	5	11	6' Type R Sump Inlet
17	O2	0.94	0.42	0.56	15.5	3.42	5.80	1	3	4' Type R Sump Inlet
18	DESIGN POINTS 7-10 & BASIN 0S-4	21.93	5.95	6.51	16.1	3.36	5.69	20	37	Interim FSD Pond 2
19	Q1 & OS-Q1	5.34	2.40	3.15	22.4	2.88	4.78	7	15	8' Type R Sump Inlet
20	Q2 & OS-Q2	2.03	0.91	1.20	12.4	3.75	6.43	3	8	4' Type R Sump Inlet
21	R & OS-R	6.18	2.78	3.65	11.4	3.87	6.69	11	24	12' Type R At-grade Inlet
22	S1 & OS-S1 & DP 21 FLOW BY	7.14	4.61	6.55	16.7	3.32	5.60	15	37	10' Type R Sump Inlet
23	S2 & OS-S2	0.31	0.14	0.18	12.6	3.72	6.39	1	1	10' Type R Sump Inlet
22 & 23 SPLIT	S1, OS-S1, S2, OS-S2, & DP 21 FLOW BY	7.44	4.75	6.73	16.7	3.32	5.60	16	38	2-10' Type R Sump Inlets
24	T1	1.42	0.64	0.84	10.7	3.97	6.88	3	6	4' Type R Sump Inlets
25	T2 & OS-T2	1.99	0.90	1.18	13.5	3.63	6.20	3	7	4' Type R Sump Inlets
26	U1	4.38	1.97	2.58	14.3	3.54	6.03	7	16	10' Type R Sump Inlets
27	U2	1.89	0.85	1.11	13.8	3.59	6.12	3	7	6' Type R Sump Inlets
28	W	5.20	2.34	3.07	15.0	3.47	5.89	8	18	10' Type R Sump Inlets
29	DESIGN POINTS 19-28, OFFSITE BASINS OS-1, 2, 3A, 3B, 7, & 9	84.64	37.91	51.40	22.4	2.88	4.78	117	265	FSD POND
30	V & OS-10	4.72	0.90	2.00	13.5	3.62	6.19	3	12	Triple 36" RCP Culverts

MDDP ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Design Points/Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Pipe Size*
1	DP 2	0.39	0.51	6.9	4.58	8.14	2	4	18" RCP
2	DP 1 & 2	1.91	2.51	14.3	3.54	6.03	7	15	24" RCP
3	DP 3	1.03	1.36	14.2	3.55	6.05	4	8	18" RCP
4	DP-4	1.21	1.59	14.8	3.49	5.93	4	9	18" RCP
5	DP 3 & 4	2.25	2.94	14.8	3.49	5.93	8	17	24" RCP
6	DP 1-4	4.16	5.45	14.8	3.49	5.93	15	32	30" RCP
7	DP-1-5	5.65	7.41	14.8	3.49	5.93	20	44	36" RCP
8	DP-6	0.95	1.24	11.4	3.87	6.69	4	8	18" RCP
9	DP-7	0.98	1.29	13.8	3.59	6.12	4	8	18" RCP
10	DP-6 & 7	1.97	2.58	13.8	3.59	6.12	7	16	18" RCP
10A	POND 1 RELEASE	2.95	3.87	13.8	3.59	6.12	0.4	8.3	18" RCP
11	DP-14	2.37	3.11	16.1	3.36	5.69	8	18	24" RCP
12	DP-15	0.90	1.18	12.8	3.70	6.34	3	7	18" RCP
13	DP 14 & 15	3.27	4.29	16.1	3.36	5.69	11	24	30" RCP
14	DP 16	1.27	1.66	12.8	3.70	6.34	5	11	24" RCP
15	DP 14, 15 & 16	4.54	5.95	16.1	3.36	5.69	15	34	36" RCP
16	DP 17	0.42	0.56	15.5	3.42	5.80	1	3	18" RCP
17	DP 14, 15, 16, & 17	4.97	6.51	16.1	3.36	5.69	17	37	36" RCP
17A	POND 2 RELEASE						0.2	10.6	18" RCP
18	DP 19	2.40	3.15	22.4	2.88	4.78	7	15	24" RCP
19	DP 20	0.91	1.20	12.4	3.75	6.43	3	8	18" RCP
20	DP 19 & 20	3.32	4.35	22.4	2.88	4.78	10	21	24" RCP
21	DP 21 PICK UP	1.38	1.31	11.4	3.87	6.69	5	9	18" RCP
22	DP 19, 20 & 21	4.70	5.66	22.4	2.88	4.78	14	27	24" RCP
23	DP 22	2.37	3.36	16.7	3.32	5.60	8	19	24" RCP
24	DP 23	2.37	3.36	16.7	3.32	5.60	8	19	24" RCP
25	DP 22 & 23	4.75	6.73	16.7	3.32	5.60	16	38	30" RCP
26	DP 19 -23	9.45	12.39	22.4	2.88	4.78	27	59	36" RCP
27	DP 24	0.64	0.84	10.7	3.97	6.88	3	6	18" RCP
28	DP 25	0.90	1.18	13.5	3.63	6.20	3	7	18" RCP
29	DP 19-25	10.99	14.40	22.4	2.88	4.78	32	69	36" RCP
30	DP 26	1.97	2.58	14.3	3.54	6.03	7	16	24" RCP
31	DP 19-26	12.96	16.99	22.4	2.89	4.79	37	81	36" RCP
32	DP 27	0.85	1.11	13.8	3.59	6.12	3	7	18" RCP
33	DP 19-27	13.80	18.10	22.4	2.88	4.78	40	87	36" RCP
34	28	2.34	3.07	15.0	3.47	5.89	8	18	24" RCP
35	Pond 3 Release	0.90	2.00	13.5	3.62	6.19	1.0	60.7	36" RCP



REVISIONS

NO.	DESCRIPTION	DATE

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PREPARED FOR:
4-WAY RANCH JOINT VENTURES
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Terra Nova Engineering, Inc.
"Creative Civil Engineering Solutions"
721 S. 23RD STREET
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OFFICE: 719-635-6422
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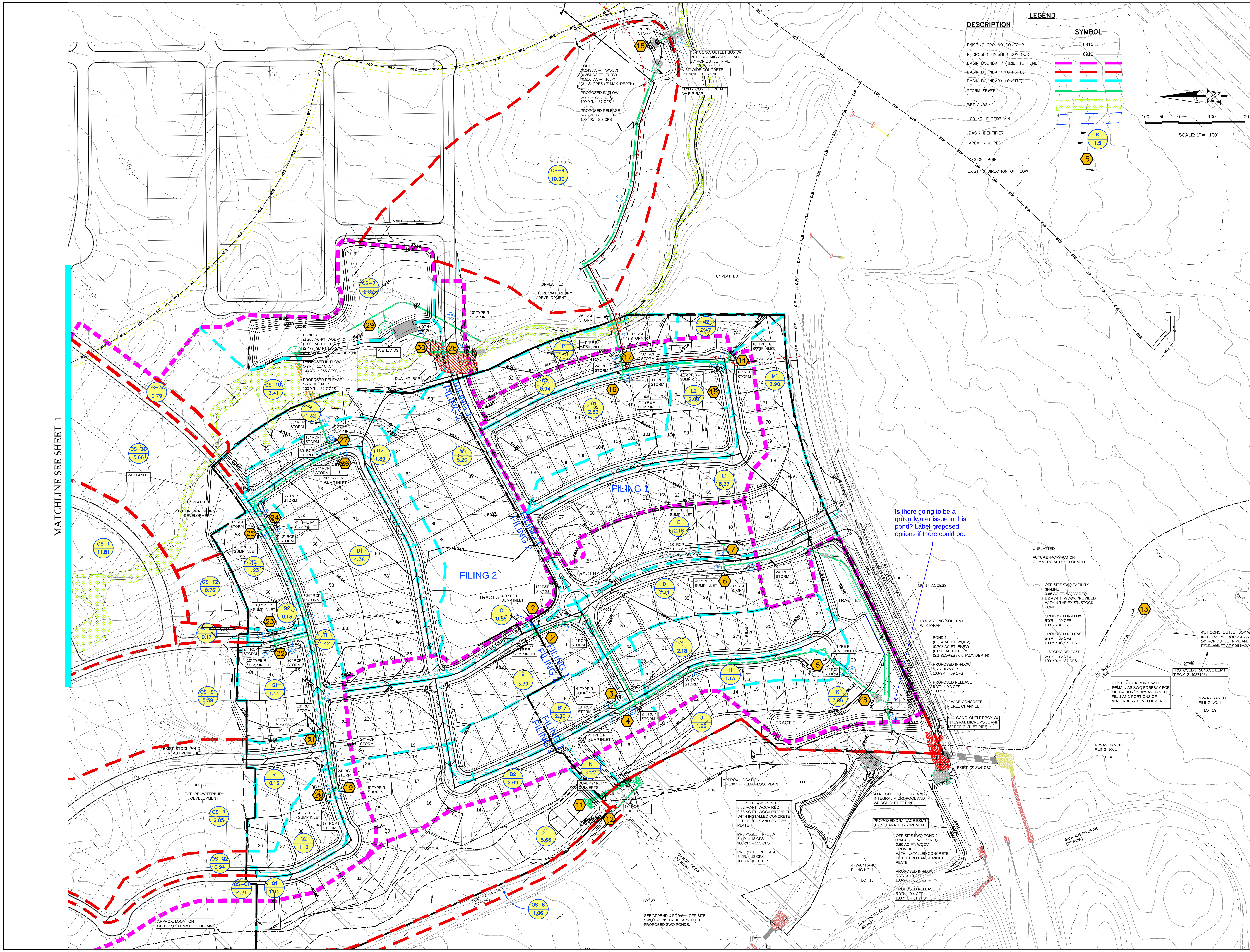
WATERBURY FILING 1 & 2

PROPOSED MDDP DRAINAGE MAP
OFFSITE MAP

DESIGNED BY QNA
DRAWN BY QNA
CHECKED BY
H-SCALE 1"=100'
V-SCALE
JOB NO. 1715.00
DATE ISSUED 12/23/20
SHEET NO. 1 OF 2



REVISIONS

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WATERBURY FILING 1 & 2

PROPOSED MDDP DRAINAGE MAP
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V-SCALE
JOB NO. 1715.00
DATE ISSUED 12/23/20
SHEET NO. 2 OF 2

Revise to Sheet 2 of 2 and move to below Sheet 1

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

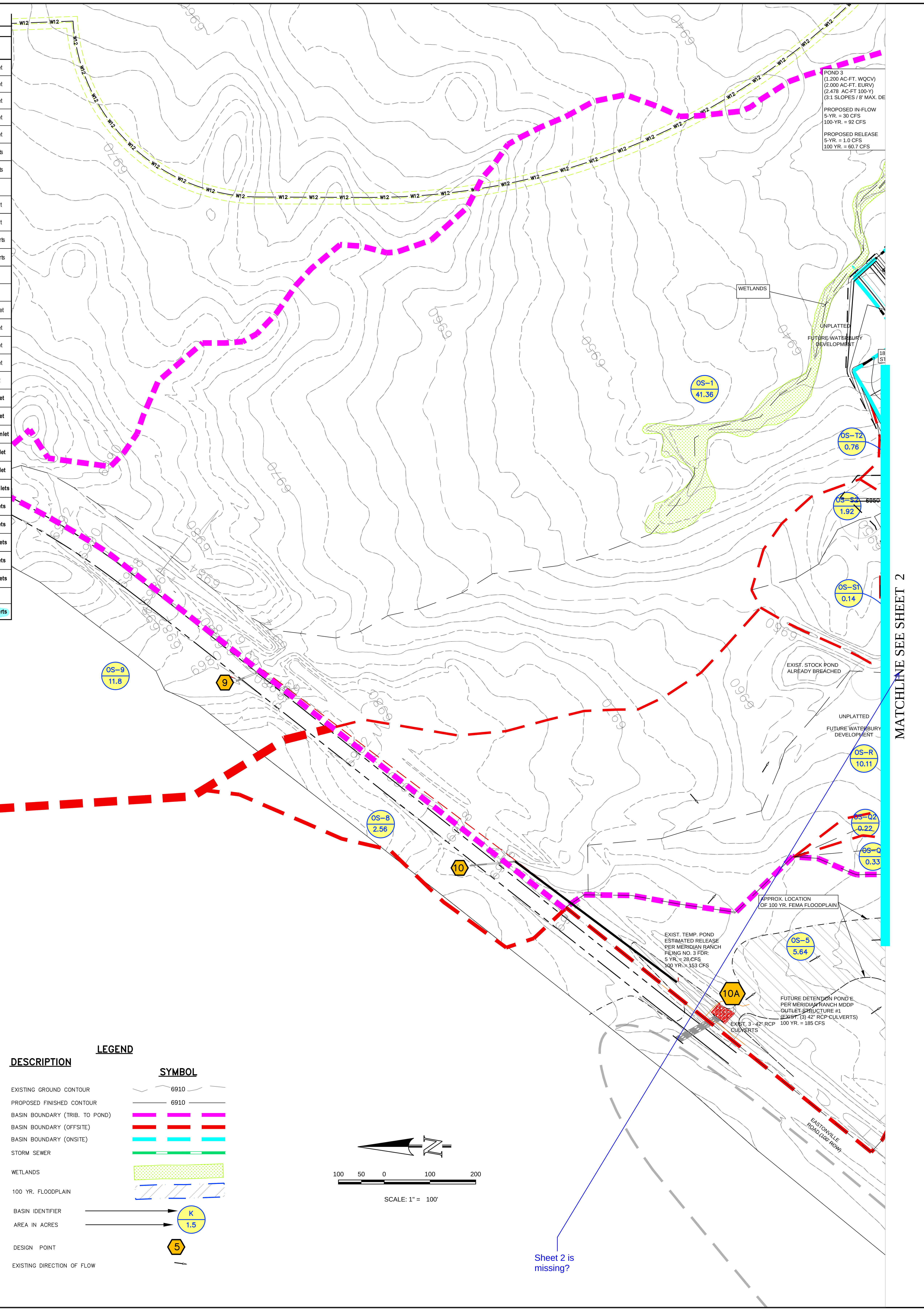
BASIN	WEIGHTED CA(5)	CA(100)	OVERLAND C(5)	Length (ft)	Height (ft)	Tc (min)	STREET / CHANNEL FLOW Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	Tc TOTAL (min)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)
A	1.52	2.00	0.25	100	2	12.6	420	1.5%	4.3	1.6	14.3	3.54	6.03	**5**	**12**
B1	1.03	1.36	0.25	100	2	12.6	400	1.5%	4.3	1.6	14.2	3.55	6.05	**4**	**8**
B2	1.21	1.59	0.25	100	2	12.6	550	1.5%	4.3	2.1	14.8	3.49	5.93	**4**	**9**
C	0.39	0.51	0.25	20	0.5	5.3	500	2.0%	4.9	1.7	6.9	4.58	8.14	**2**	**4**
D	0.95	1.24	0.25	80	2	10.5	300	2.5%	5.5	0.9	11.4	3.87	6.69	**4**	**8**
E	0.98	1.29	0.25	100	2	12.6	400	2.5%	5.5	1.2	13.8	3.59	6.12	**4**	**8**
F	0.98	1.29	0.25	50	2	7.1	620	1.5%	4.3	2.4	9.5	4.14	7.22	**4**	**9**
G	0.30	0.39	0.25	25	2	4.0	620	1.0%	3.4	3.0	7.0	4.57	8.12	**1**	**3**
H	0.51	0.67	0.25	50	2	7.1	525	1.5%	4.3	2.0	9.2	4.19	7.33	**2**	**5**
I	1.28	2.53	0.25	80	4	8.4	250	2.0%	4.9	0.8	9.2	4.18	7.32	**5**	**19**
J	0.90	1.17	0.25	90	6	8.1	850	2.0%	4.9	2.9	10.9	3.94	6.81	**4**	**8**
K	0.69	1.37	0.25	100	18	6.1	80	1.0%	3.5	0.4	6.5	4.67	8.33	**3**	**11**
L1	2.37	3.11	0.25	100	2	12.6	860	1.4%	4.1	3.5	16.1	3.36	5.69	**8**	**18**
L2	0.90	1.18	0.25	55	1.1	9.4	860	1.4%	4.1	3.5	12.8	3.70	6.34	**3**	**7**
M1	1.31	1.71	0.25	70	1.5	10.3	200	2.0%	4.9	0.7	11.0	3.92	6.79	**5**	**12**
M2	0.21	0.28	0.25	65	3	7.7	0	0.0%	0.0	0.0	7.7	4.43	7.83	**1**	**2**
N	0.10	0.13	0.25								5.0	5.00	9.06	**1**	**1**
O1	1.27	1.66	0.25	100	3	11.1	460	1.5%	4.3	1.8	12.8	3.70	6.34	**5**	**11**
O2	0.42	0.56	0.25	100	2	12.6	850	2.0%	4.9	2.9	15.5	3.42	5.80	**1**	**3**
P	0.53	0.70	0.25	65	3	7.7	0	0.0%	0.0	0.0	7.7	4.43	7.83	**2**	**5**
Q1	0.47	0.61	0.25	55	1.3	8.9	445	2.0%	5.0	1.5	10.4	4.01	6.97	**2**	**4**
Q2	0.49	0.65	0.25	55	1.3	8.9	445	2.0%	5.0	1.5	10.4	4.01	6.97	**2**	**5**
R	0.06	0.08	0.25	100	4	10.1	700	2.0%	4.9	2.4	12.4	3.75	6.44	**0**	**1**
S1	0.70	0.91	0.25	100	6	8.8	175	2.0%	4.9	0.6	9.4	4.16	7.26	**3**	**7**
S2	0.06	0.08	0.25								5.0	5.00	9.06	**0**	**1**
T1	0.64	0.84	0.25	55	1.1	9.4	390	2.0%	4.9	1.3	10.7	3.97	6.88	**3**	**6**
T2	0.55	0.73	0.25	100	2	12.6	245	2.0%	5.0	0.8	13.5	3.63	6.20	**2**	**5**
U1	1.97	2.58	0.25	100	2	12.6	520	2.3%	5.3	1.6	14.3	3.54	6.03	**7**	**16**
U2	0.85	1.11	0.25	100	2	12.6	385	2.3%	5.4	1.2	13.8	3.59	6.12	**3**	**7**
W	2.34	3.07	0.25	100	2	12.6	630	1.6%	4.4	2.4	15.0	3.47	5.89	**8**	**18**
V	0.59	0.78	0.25	95	6	8.4					8.4	4.31	7.58	**3**	**6**
OS-1	**3.72**	**14.89**	**0.25**	**100**	**2**	**12.6**	**2700**	**2.3%**	**5.3**	**8.5**	**21.1**	**2.97**	**4.94**	11	74
OS-4	0.98	3.92	0.25	800	26	30.5					30.5	2.46	4.01	2	16
OS-5	2.54	3.33	0.25	600	18	27.1					27.1	2.62	4.30	7	14
OS-6	0.48	0.63	0.25	30	0.6	6.9	900	1.8%	4.7	3.2	10.1	4.05	7.04	2	4
OS-7	**0.33**	**1.31**	**0.25**								**5.0**	**5.00**	**9.06**	2	12
OS-8	FLOW TAKEN FROM MERIDAIN RANCH MDDP													5	11
OS-9	FLOW TAKEN FROM MERIDAIN RANCH MDDP													8	19
OS-Q1	**0.03**	**0.12**	**0.25**	**100**	**2**	**12.6**	**135**	**1.5%**	**4.3**	**0.5**	**13.2**	**3.66**	**6.27**	0	1
OS-Q2	**0.02**	**0.08**	**0.25**	**50**	**1**	**8.9**	**135**	**1.5%**	**4.3**	**0.5**	**9.5**	**4.14**	**7.24**	0	1
OS-R	**0.91**	**3.64**	**0.25**	**100**	**2**	**12.6**	**850**	**2.7%**	**5.8**	**2.5**	**15.1**	**3.46**	**5.87**	3	21
OS-S1	**0.01**	**0.05**									**5.0**	**5.00**	**9.06**	0	0
OS-S2	**0.17**	**0.69**	**0.25**	**100**	**2.5**	**11.7**	**275**	**2.9%**	**6.0**	**0.8**	**12.5**	**3.74**	**6.42**	1	4
OS-T2	**0.07**	**0.27**									**5.0**	**5.00**	**9.06**	0	2

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Area (AC)	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	I(100)	Flow Q(5)	Q(100)	Facility Size
1	A	3.39	1.52	2.00	14.3	3.54	6.03	5	12	6' Type R Sump Inlet
2	C	0.86	0.39	0.51	6.9	4.58	8.14	2	4	4' Type R Sump Inlet
3	B1	2.30	1.03	1.36	14.2	3.55	6.05	4	8	4' Type R Sump Inlet
4	B2	2.69	1.21	1.59	14.8	3.49	5.93	4	9	4' Type R Sump Inlet
5	F & H	3.31	1.49	1.95	9.5	4.14	7.22	6	14	6' Type R Sump Inlet
6	D	2.11	0.95	1.24	11.4	3.87	6.69	4	8	4' Type R Sump Inlets
7	E	2.18	0.98	1.29	13.8	3.59	6.12	4	8	4' Type R Sump Inlets
8	DESIGN POINTS 1-7	16.84	7.58	9.94	14.8	3.49	5.93	26	59	FSD Pond 1
9	OS-9	0.14	0.01	0.05	5.0	5.00	9.06	0	0	EX 36" CMP Culvert
10	OS-8	10.11	0.91	3.64	15.1	3.46	5.87	3	21	EX 36" CMP Culvert
10A	MERIDIAN POND E RELEASE							28	135	EX 3-42" RCP Culverts
11	OS-5, I, OS-& MERIDIAN POND E RELEASE	SCS MODEL						53	212	PR 2-42" RCP Culverts
12	OS-6	0.33	0.48	0.63	10.1	4.05	7.04	2	4	18"' RCP Culvert
13	TOTAL OFFISITE EX. STOCK POND INFLOW	SCS MODEL						69	396	EX STOCK POND
14	L1	5.27	2.37	3.11	16.1	3.36	5.69	8	18	10' Type R Sump Inlet
15	L2	2.00	0.90	1.18	12.8	3.70	6.34	3	7	4' Type R Sump Inlet
16	O1	2.82	1.27	1.66	12.8	3.70	6.34	5	11	6' Type R Sump Inlet
17	O2	0.94	0.42	0.56	15.5	3.42	5.80	1	3	4' Type R Sump Inlet
18	DESIGN POINTS 7-10 & BASIN 0S-4	21.93	4.97	6.51	16.1	3.36	5.69	17	37	Interim FSD Pond 2
19	**Q1 & OS-Q1**	**1.36**	**0.50**	**0.73**	**13.2**	**3.66**	**6.27**	2	5	**8' Type R Sump Inlet**
20	**Q2 & OS-Q2**	**1.32**	**0.51**	**0.73**	**9.5**	**4.14**	**7.24**	2	5	**4' Type R Sump Inlet**
21	**R, OS-R & OS-8**	**10.24**	**0.97**	**3.72**	**12.4**	**3.75**	**6.44**	9	35	**12' Type R At-grade Inlet**
22	**S1 & OS-S1 & DP 21 FLOW BY**	**1.69**	**1.74**	**4.67**	**21.1**	**2.97**	**4.94**	5	23	**10' Type R Sump Inlet**
23	**S2 & OS-S2**	**0.13**	**0.23**	**0.77**	**12.5**	**3.74**	**6.42**	1	5	**10' Type R Sump Inlet**
22 & 23 SPLIT	**S1, OS-S1, S2, OS-S2, & DP 21 FLOW BY**	**1.82**	**1.98**	**5.44**	**21.1**	**2.97**	**4.94**	6	27	**2-10' Type R Sump Inlets**
24	**T1**	**1.42**	**0.64**	**0.84**	**10.7**	**3.97**	**6.88**	3	6	**4' Type R Sump Inlets**
25	**T2 & OS-T2**	**1.99**	**0.62**	**1.00**	**13.5**	**3.63**	**6.20**	2	6	**4' Type R Sump Inlets**
26	**U1**	**4.38**	**1.97**	**2.58**	**14.3**	**3.54**	**6.03**	7	16	**10' Type R Sump Inlets**
27	**U2**	**1.89**	**0.85**	**1.11**	**13.8**	**3.59**	**6.12**	3	7	**6' Type R Sump Inlets**
28	**W**	**5.20**	**2.34**	**3.07**	**15.0**	**3.47**	**5.89**	8	18	**10' Type R Sump Inlets**
29	**DESIGN POINTS 19-28 & OS-7**	**30.94**	**10.97**	**19.99**	**21.1**	**2.97**	**4.94**	33	99	**FSD POND**
30	**V, OS-1 & OS-9**	**54.47**	**4.31**	**15.67**	**21.1**	**2.97**	**4.94**	21	96	**Triple 36" RCP Culverts**

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Design Points/Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	I(100)	Flow Q(5)	Q(100)	Pipe Size*
1	DP 2	0.39	0.51	6.9	4.58	8.14	2	4	18" RCP
2	DP 1 & 2	1.91	2.51	14.3	3.54	6.03	7	15	24" RCP
3	DP 3	1.03	1.36	14.2	3.55	6.05	4	8	18" RCP
4	DP-4	1.21	1.59	14.8	3.49	5.93	4	9	18" RCP
5	DP 3 & 4	2.25	2.94	14.8	3.49	5.93	8	17	24" RCP
6	DP 1-4	4.16	5.45	14.8	3.49	5.93	15	32	30" RCP
7	DP-1-5	5.65	7.41	14.8	3.49	5.93	20	44	36" RCP
8	DP-6	0.95	1.24	11.4	3.87	6.69	4	8	18" RCP
9	DP-7	0.98	1.29	13.8	3.59	6.12	4	8	18" RCP
10	DP-6 & 7	1.93	2.53	13.8	3.59	6.12	7	15	18" RCP
10A	Pond 1 Release						0.4	8.3	18" RCP
11	DP-14	2.37	3.11	16.1	3.36	5.69	8	18	24" RCP
12	DP-15	0.90	1.18	12.8	3.70	6.34	3	7	18" RCP
13	DP 14 & 15	3.27	4.29	16.1	3.36	5.69	11	24	30" RCP
14	DP 16	1.27	1.66	12.8	3.70	6.34	5	11	24" RCP
15	DP 14, 15 & 16	4.54	5.95	16.1	3.36	5.69	15	34	36" RCP
16	DP 17	0.42	0.56	15.5	3.42	5.80	1	3	18" RCP
17	DP 14, 15, 16, & 17	4.97	6.51	16.1	3.36	5.69	17	37	36" RCP
17A	Pond 2 Release						0.2	10.6	18" RCP
18	**DP 19**	**0.50**	**0.73**	**13.2**	**3.66**	**6.27**	**2**	**5**	**24" RCP**
19	**DP 20**	**0.51**	**0.73**	**9.5**	**4.14**	**7.24**	**2**	**5**	**18" RCP**
20	**DP 19 & 20**	**1.01**	**1.46**	**13.2**	**3.66**	**6.27**	**4**	**9**	**24" RCP**
21	**DP 21 PICK UP**	**1.34**	**1.72**	**12.4**	**3.75**	**6.44**	**5**	**11**	**18" RCP**
22	**DP 19, 20 & 21**	**2.35**	**3.18**	**13.2**	**3.66**	**6.27**	**9**	**20**	**24" RCP**
23	**DP 22**	**0.99**	**2.72**	**21.1**	**2.97**	**4.94**	**3**	**13**	**24" RCP**
24	**DP 23**	**0.99**	**2.72**	**21.1**	**2.97**	**4.94**	**3**	**13**	**24" RCP**
25	**DP 22 & 23**	**1.98**	**5.44**	**21.1**	**2.97**	**4.94**	**6**	**27**	**30" RCP**
26	**DP 19 -23**	**4.32**	**8.62**	**21.1**	**2.97**	**4.94**	**13**	**43**	**36" RCP**
27	**DP 24**	**0.64**	**0.84**	**10.7**	**3.97**	**6.88**	**3**	**6**	**18" RCP**
28	**DP 25**	**0.62**	**1.00**	**13.5**	**3.63**	**6.20**	**2**	**6**	**18" RCP**
29	**DP 19-25**	**5.59**	**10.46**	**21.1**	**2.97**	**4.94**	**17**	**52**	**36" RCP**
30	**DP 26**	**1.97**	**2.58**	**14.3**	**3.54**	**6.03**	**7**	**16**	**24" RCP**
31	**DP 19-26**	**7.56**	**13.04**	**21.1**	**2.97**	**4.94**	**22**	**64**	**36" RCP**
32	**27**	**0.85**	**1.11**	**15.0**	**3.47**	**5.89**	**3**	**7**	**18" RCP**
33	**DP 19-27**	**8.41**	**14.15**	**21.1**	**2.97**	**4.94**	**25**	**70**	**36" RCP**
34	**DP 30**	**4.31**	**15.67**	**21.1**	**2.97**	**4.94**	**13**	**77**	**24" RCP**
35	Pond 3 Release	0.00	0.00	0.0	7.12	14.19	1.0	60.7	36" RCP



REVISIONS

NO.	DESCRIPTION	DATE

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WATERBURY FILING NO. 1

PROPOSED FINAL DRAINAGE MAP
ON-SITE

DESIGNED BY QNA
DRAWN BY QNA
CHECKED BY
H-SCALE 1"=100
V-SCALE NA
JOB NO. 1715.00
DATE ISSUED 12/23/20
SHEET NO. 1 OF 2